

E-BUSINESS SUITE APPLICATIONS R12 (R12.1.2) HR SELF-SERVICE (OLTP) BENCHMARK - USING ORACLE DATABASE 11g ON ORACLE'S SPARC T3-2 AND SUN SPARC ENTERPRISE M5000 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

This OLTP benchmark test was run on a 16-core DB server and a 32-core application/web (mid-tier) server.

Online Workload		
Number of Users	Average Response (Sec)	90 th Percentile Response Time (Sec)
800 Concurrent Users Cash Expense	1.472	1.636
800 Concurrent Users Credit Card Expense	1.499	1.656
1,200 Concurrent Users Submit Timecard	0.770	0.867
1,200 Concurrent Users View Payslip	1.354	1.524
Weighted Average	1.231	1.376

Many factors can influence performance and your results may differ.

BENCHMARK PROFILE

In September 2010 Oracle conducted a benchmark in Burlington MA to measure the online (OLTP) performance of the Oracle E-Business Human Resources Self-Service (HR SS) business flow in an environment running Oracle E-Business Suite R12 (12.1.2) using the Oracle Database 11g with Oracle Solaris 10 operating system (OS) on an Oracle's SPARC T3-2 server and an Oracle's Sun SPARC Enterprise M5000 server, respectively. Moreover, one of Oracle's Sun Storage F5100 Flash Array storage devices and one of Oracle's StorageTek SE2540 arrays were used for data storage (~252 GB).

The benchmark measured the Human Resources Self-Service OLTP business process response times for a Large/Extra-Large database model. Testing was conducted in a controlled environment with no other applications running. The goal of this Benchmark was to obtain reference online response times for the Oracle E-Business Suite R12 Benchmark, using Oracle's SPARC servers running Oracle Solaris 10 OS.

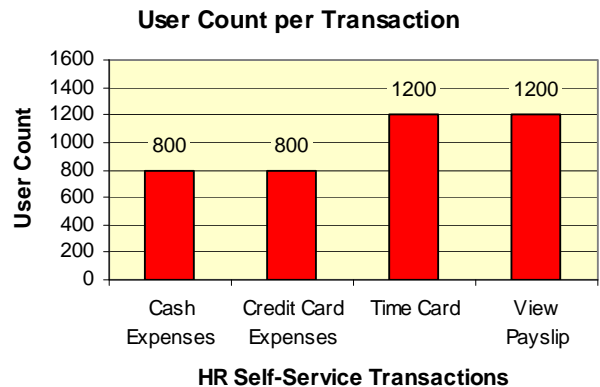


Figure 1: Oracle E-Business Suite Benchmark Concurrent User Distribution

BENCHMARK METHODOLOGY

E-Business Suite 12 Benchmark 12.1.2 online processes can be initiated from a browser. For this benchmark, all runs used a browser to initiate the on-line user transactions.

Hewlett-Packard® LoadRunner® was used as the load driver, simulating concurrent users. It submitted transactions at an average rate of one every 6 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.





	<p>SPARC T3-2 App/Web Server 32-core 128 GB</p> <p>24% Utilized</p>
	<p>Sun SPARC Enterprise M5000 DB Server 16-core 128 GB</p> <p>41% Utilized</p>
	<p>Sun Storage F5100 Flash Array</p>
	<p>StorageTek 2540 Array System Storage 12 Disks – Data and Logs</p>

Figure 2: 3-Tier Configuration

This benchmark was run as a “Physical” 3-Tier configuration with discrete machines hosting the Database and Application server instances on their respective OS images.

The complete E-Business Suite benchmark consists of a mix of on-line transactions and batch processes running in parallel. This test utilized a single flow of OLTP transactions. The following table describes the on-line transactions included in the benchmark run.

Oracle Application Product Flow	% within App.	% Overall	Pacing in Min
Self Service (10%)			
Create & Query Cash Exp.	20	20	6
Create & Query C. Card Exp.	20	20	6
Create Project Timecard	30	30	6
View Employee Payslip	30	30	6
		100%	

Table 1: Online Transaction Mix

HR Self-Service OLTP Processes

Cash Expenses: The user navigates to the “Expenses Home” and enters various travel and lodging expenses including airfare, car rental, hotel, entertainment, meals, etc. Finally, the user clicks on “Submit” to enter the completed expense report. The response time is to ‘save’ the entry.

Credit Card Expenses: The user navigates to the “Expenses Home” and enters various travel and lodging expenses including airfare, car rental, hotel, entertainment, meals, etc. Finally, the user clicks on “Submit” to enter the completed expense report. The response time is to ‘save’ the entry.

Create Timecard: The user navigates to the “Create Timecard” button and enters information about their project, the type(s) of tasks undertaken and the hours spent. Finally, the user clicks on “Submit” to enter the completed time card. The response time is to ‘save’ the entry.

View Payslip: The user navigates to the “Employee Self-Service” page and clicks on ‘Payslip.’ The response time is for the ‘retrieval’ of the search.

BENCHMARK RESULTS

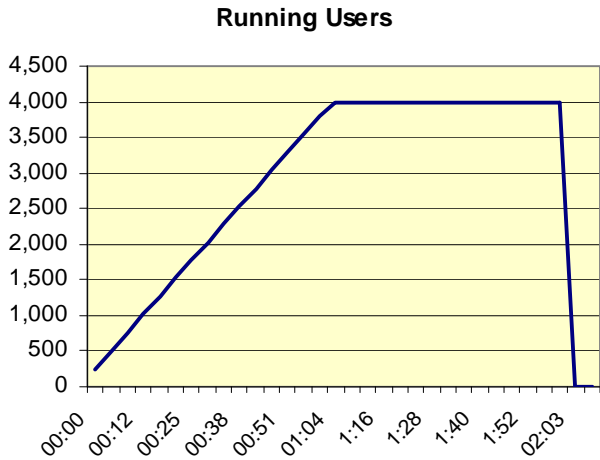


Figure 3: User Load Over Time: 100% Load = 4,000 Users

Online Business Metrics	Achieved Output
Self-Service	
Number of Cash Expenses Created	8,000
Number of Credit Card Expenses Created	8,000
Number of Timecards Created	12,000

Table 2: Online Transactions Completed (3,000 Users)

	4,000 Users	
	Avg.	90 th %
Self Service		
Submit Cash Exp.	1.472	1.636
Submit Credit Card Expense	1.499	1.656
Submit Project Timecard	0.770	0.867
View Employee Payslip	1.354	1.524
Weighted Average	1.231	1.376
Transactions/min	666	

Table 3: Detailed Online Transaction Response Times

The transaction rate is estimated by dividing the number of running users by the average pacing.

R12 Application changes, data model additions and test methodology improvements render direct comparison to previous Oracle E-Business release 11.5.10 and 11.5.9 results invalid.

SERVER PERFORMANCE

Figure 4 shows the running load on the Database and App/Web servers. The plot shown is the average across the processors in the database server (a total of 16 cores) and the four processors (32 cores) in the application server. Consequently, not all cores were utilized for much of the test.

Oracle EBS 12.1.2 OLTP HR Self-Service using Oracle 11g on SPARC Servers

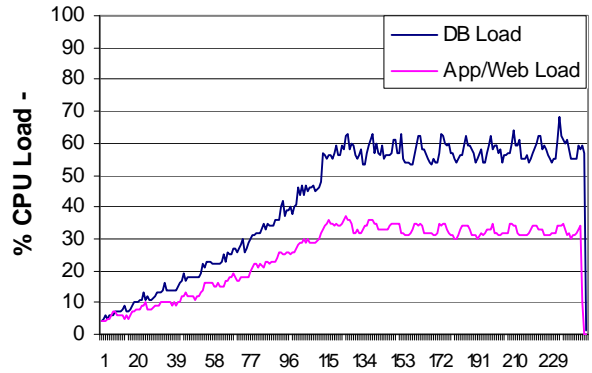


Figure 4: Monitored CPU Utilization

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
DB Server	35.07	5.71	0.03	59.19
App/Web Server	22.91	1.58	0.00	75.45

Table 4: Average CPU Utilization Breakout

Average GB Used	4,000 Users
DB Server 1	66.2
App/Web 1	80.73

Table 5: Average Memory Utilization Breakout

I/O PERFORMANCE

A StorageTek SE2540 array equipped with three disk trays was used for storage. The batch workload requires optimal I/O performance.

I/O Performance		4,000 Users
Transfers/Sec	Avg	500
	Peak	830
Writes/Sec	Avg	455
	Peak	480
Reads/Sec	Avg	18
	Peak	261
(812) Blocks Written/Sec	Avg	821
	Peak	844
(812) Blocks Read/Sec	Avg	19
	Peak	46
(512) Blocks Written/Sec	Avg	13,150
	Peak	13,510
(512) Blocks Read/Sec	Avg	304
	Peak	736
Avg Service Time (ms)	Avg	2.7
	Peak	2.8

Table 6: Average I/O Utilization Breakout

DATA COMPOSITION DESCRIPTION

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

Application	Business Objects	Medium Model
HR	Managers	10,000
	Employees	250,000

Table 7: Data Composition

PATCHES

The following patches were applied to the benchmark environment on top of Oracle E-Business Applications R12 (12.1.2).

NOTE: There were four extra, "patch-like" steps taken after the database instance was started.

1. Added extra temp space.

```
alter tablespace TEMP1 add tempfile
'/oracle/data/temp1_09.dbf' size 8000M reuse;
alter tablespace TEMP1 add tempfile
'/oracle/data/temp1_10.dbf' size 8000M reuse;
alter tablespace TEMP1 add tempfile
'/oracle/data/temp1_11.dbf' size 8000M reuse;
alter tablespace TEMP1 add tempfile
'/oracle/data/temp1_12.dbf' size 8000M reuse;
```

2. Added three extra indexes for the View-Payslip transaction

```
sqlplus /nolog <<!
conn / as sysdba;
@ViewPaySlipIndexes_072110.sql
exit;
!
```

rem For EBS R12.1.2, View Payslip rem 07/21/2010

Prompt SQL_ID c97zd4jjs1gct and f99dmwwa771hw will work better with the following index change.

```
prompt keep original
hr.PAY_ACTION_INFORMATION_n2 index as below.
```

```
drop index hr.PAY_ACTION_INFORMATION_n2 ;
```

```
create index hr.PAY_ACTION_INFORMATION_n2
on
hr.PAY_ACTION_INFORMATION(ACTION_CONT
EXT_ID, ACTION_CONTEXT_TYPE,
ACTION_INFORMATION_CATEGORY) parallel
nologging ;
```

```
alter index hr.PAY_ACTION_INFORMATION_n2
noprogram logging ;
```

```
prompt appending
ACTION_INFORMATION_CATEGORY,ACTION_C
ONTEXT_ID,ACTION_INFORMATION16 into
hr.PAY_ACTION_INFORMATION_N5 index.
```

```
drop index hr.PAY_ACTION_INFORMATION_N5 ;
```

```
create index hr.PAY_ACTION_INFORMATION_N5
on hr.PAY_ACTION_INFORMATION
(ASSIGNMENT_ID,EFFECTIVE_DATE,
ACTION_INFORMATION_CATEGORY,ACTION_C
ONTEXT_ID,ACTION_INFORMATION16) parallel
nologging;
```

```
alter index hr.PAY_ACTION_INFORMATION_N5
noperallel logging ;
```

```
prompt appending rule_type into
hr.PAY_LEGISLATIVE_FIELD_INFO_N1 index.
```

```
drop index
hr.PAY_LEGISLATIVE_FIELD_INFO_N1 ;
```

```
create index
hr.PAY_LEGISLATIVE_FIELD_INFO_N1 on
hr.PAY_LEGISLATIVE_FIELD_INFO
( FIELD_NAME,LEGISLATION_CODE,RULE_TYP
E) ;
```

prompt if above modification of
PAY_ACTION_INFORMATION_N5 and
PAY_LEGISLATIVE_FIELD_INFO_N1 doesn't help
the performance,

prompt run the following.
But note most of envs. didn't need the following step.

```
exec
dbms_stats.gather_table_stats('HR','PAY_ACTION_IN
FORMATION',method_opt => 'for columns
EFFECTIVE_DATE size 254,
ACTION_CONTEXT_TYPE size 2,
ACTION_INFORMATION_CATEGORY size 100');
```

3. Performed a gather stats for APPLSYS table:

```
exec
fnd_stats.gather_table_stats('APPLSYS','WF_NOTIFIC
ATIONS', PERCENT=>35);
```

4. Performed a gather fixed objects stats:

```
exec
DBMS_STATS.GATHER_FIXED_OBJECTS_STATS;
```

OPERATING SYSTEM TUNING

DATABASE OPERATING SYSTEM TUNING

```
set shmsys:shminfo_shmmax=0xffffffffffffffff
set shmsys:shminfo_shmseg = 1024
set msgsys:msginfo_msgmax = 65535
set msgsys:msginfo_msgmnb = 131070
set msgsys:msginfo_msgmni = 3584
set msgsys:msginfo_msgtql = 7168
set semsys:seminfo_semmns = 16384
set semsys:seminfo_semmnu = 4096
set semsys:seminfo_semume = 256
set semsys:seminfo_semap = 1026
set semsys:seminfo_semmsl = 100
set shmsys:shminfo_shmmin=1
set msgsys:msginfo_msgmap=2048
set msgsys:msginfo_msgmnb=16384
set msgsys:msginfo_msgssz=32
set msgsys:msginfo_msgseg=32767
set msgsys:msginfo_msgmni = 10240
set semsys:seminfo_semmni = 12288
set shmsys:shminfo_shmmni = 12288
set vxio:vol_default_iodelay = 10
set vxio:vol_maxkiocount = 32768
set vxio:vol_maxioctl = 131072
set vxio:vol_maxio = 8192
set vxio:vol_maxspecialio = 10240
set maxpgio = 65536
set fastscan = 65536
set ufs:ufs_HW = 20971520
set ufs:ufs_LW = 15728640
set autoup = 1024
set tune_t_fsflushr = 1
set sq_max_size = 100
set sdd:sdd_max_throttle=32
set maxphys = 8388608
set sd:sd_max_throttle=32
set enable_halt_idle_cpus = 0
set profile:profile_aframes = 4
```

APPLICATION TIER OPERATING SYSTEM TUNING

```
set lgrp_mem_pset_aware=1
* set segspt_minfree=0x100000
set segspt_minfree=0x80000
* set swapfs_minfree=0x100000
set swapfs_minfree=0x80000
set lotsfree=0x8000
set desfree=0x4000
set minfree=0x2000
set maxphys=1048576
set maxpgio=128
set autoup=600
set tune_t_fsflushr=10
set dopageflush=0
set rlim_fd_cur=32000
set rlim_fd_max=32000
set md_mirror:md_resync_bufsz = 2048
```

BENCHMARK ENVIRONMENT

HARDWARE CONFIGURATION

DATABASE SERVER

A single Sun SPARC® Enterprise™ M5000 server was used as the database server. It was equipped with the following:

- 4 × 2.53 GHz SPARC64 VII+ Quad-Core processors, each with 5.5 Megabytes of Level-2 on-chip cache (16 cores total – 32 vcpus) (4-socket card used, can be upgraded to 8-sockets)
- 128 Gigabytes of Memory (~96.72 GB used at peak load)
- 16 × LSI SAS Controllers(1058E); 2 Qlogic FC-AL(QLE2462)

One Sun Storage F5100 Flash Array storage system with 80 Flash Modules (FMODs) and one StorageTek 2540 array were used. The storage arrays were equipped with the following:

- 80 × 24 GB FMODs in Flash Array F5100, and 12 × 300 GB (RAID 0) SAS 15K RPM disk drives in 2540 Array.
- ~5.5 Terabytes of total Flash and Disk Space available. Approximately 251.9 GB was used for the database from the 482.4 GB of storage allocated to the database instance.

MIDDLE-TIER SERVER

A single SPARC® T3-2 server was used as the middle-tier (application/web) server. It was equipped with the following:

- 2 × 1.65 GHz SPARC T3 sixteen-core processors, each with 5.5 Megabytes of Level-2 on-chip cache (32 cores total – 256 Strands) (2-socket card used)
- 128 Gigabytes of Memory (~117.09 GB used at peak load)

LOAD DRIVER SERVER(S)

One of Oracle's Sun Fire X4250 servers was used as the LoadRunner controller. It was equipped with the following:

- 2 × 2.66 GHz Intel Xeon 5430 Quad-Core processors, each with 2 × 6 Megabytes of Level-2 on-chip cache (8 cores total)
- 8 Gigabytes of Memory

Three of Oracle's Sun Blade X6240 server modules were used as load drivers. They were equipped with the following:

- 2 × 2.38 GHz AMD Quad-Core processors, each with 6 Megabytes of Level-3 cache (8 cores total)
- 32 Gigabytes of Memory

SOFTWARE VERSIONS

Oracle's E-Business Suite (E-Business Suite Kit) R12.1.2

Oracle11g 11.2.0.1.0 (64-bit)

Oracle Solaris 10 10/09 on the database server

Oracle Solaris 10 9/10 on the app/web server

Windows® 2003 (64-bit) on the LoadRunner controller and drivers

Hewlett-Packard® (Mercury) LoadRunner 9.10.0.0

Glossary and Acronyms:

ATP Available to Promise

BEE Batch Element Entries

HVOP High Volume Order Processing

OASB Oracle Applications Standard Benchmark

OLTP On Line Transaction Processing

RAC Real Applications Clusters

The Oracle logo, consisting of the word "ORACLE" in a bold, red, sans-serif font.

Oracle

Applications Performance & Benchmarks

500 Oracle Parkway

Redwood Shores, California 94065

Tel 650/506-7000

Fax 650/506-7000

Email eBKit_us@oracle.com

World Wide Web <http://www.oracle.com>

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

The InfoSizing logo, featuring the word "INFO" in a bold, black, sans-serif font, followed by a stylized green circular icon with a white swoosh, and the word "SIZING" in a bold, black, sans-serif font.

E-Business Suite, AppsNet, Collaboration Suite, Oracle Direct and RAC are trademarks of Oracle, Inc. Oracle, JD Edwards, PeopleSoft, Siebel, Java, Sun, Solaris and SPARC are registered trademarks of Oracle Corporation and/or its affiliates. Other names may be trademarks of their respective owners. The information contained herein is subject to change without notice. Copyright © 2010 Oracle, Inc. All rights reserved. C/N 0XX-0910 Results Registration Number: 0916