

E-BUSINESS SUITE APPLICATIONS R12 (RUP 4) PAYROLL (BATCH) BENCHMARK - USING ORACLE10g ON A HEWLETT-PACKARD PROLIANT DL380 G5 SERVER

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 batch benchmark test was run on an 8-core server.

Batch Workload			
10,000 Employees	Threads	Time (Min)	Hourly Employee Throughput
Payroll Processing	8	0.67	895,522
Prepayments	8	0.22	2,727,273
External Archive	8	1.60	375,000
NACHA	8	0.02	30,000,000
Checkwriter	8	0.37	1,621,622
Costing	8	0.15	4,000,000
Totals:		3.03	198,020
Wall Clock Duration*		~6.32	94,937

Note that the hourly throughput numbers mentioned above are linear extrapolations. Many factors can influence performance and your results may differ.

* The "Wall Clock Duration" includes all of the job scheduling and management activity (parent process) as well as some idle intervals due to polling or waiting for all workers in a particular process to complete prior to kicking off the subsequent process. These intervals would not increase substantially, if at all, as the workload size is increased. Consequently, the throughput for larger workloads would converge towards the "Totals:" value.

BENCHMARK PROFILE

In August 2008, Oracle and Hewlett-Packard conducted a benchmark in Corona, CA to measure the batch performance of the Oracle E-Business Standard Benchmark processes in an environment running Oracle E-Business Suite R12 (RUP 4) with Oracle10g™ database (10.2.0.3) for the Linux operating system on a Hewlett-Packard® ProLiant® DL380 G5 server configured with two quad-core processors (8-cores total), running Oracle® Enterprise Linux® release 4.0 Update 4. A single HP StorageWorks EVA6100 disk array was used for storage.

The benchmark measured the Payroll batch business process hourly throughputs for a medium database model. Testing was conducted in a controlled environment with no other applications running. **The goal of this Benchmark was to obtain reference batch throughputs for Oracle E-Business Suite R12 Benchmark on HP ProLiant servers running Oracle Enterprise Linux.**

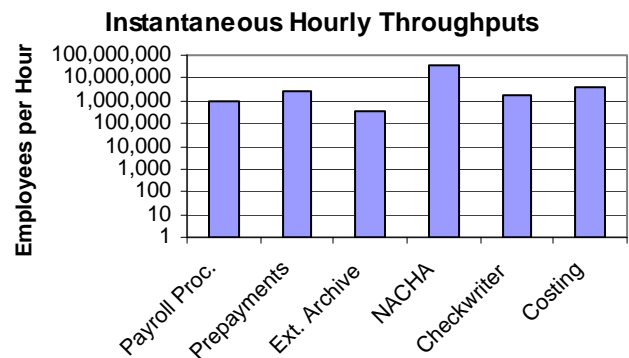


Figure 1: Oracle E-Business Payroll Batch Throughputs

BENCHMARK METHODOLOGY

E-Business Suite R12 Benchmark batch processes are initiated from a benchmark-provided SQL script.

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

Figure 2 shows the configuration used for this benchmark run.

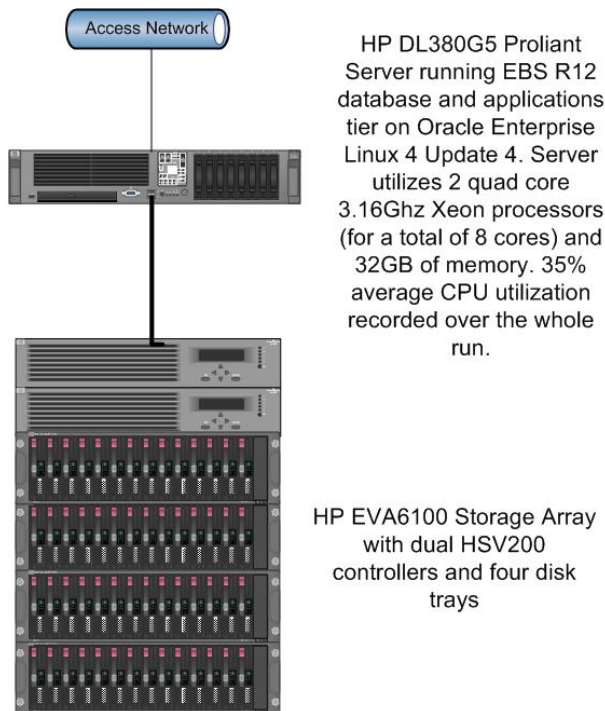


Figure 2: 2-Tier Configuration

This benchmark was run as a “Physical” 2-Tier configuration with a single machine hosting both the Database and Application server instances on a single OS image.

BENCHMARK BUSINESS PROCESSES

This E-Business Suite benchmark consists of a batch flow with six metered processes.

Batch Payroll Processes

Business Process	Number of Threads Used	Process Type
Payroll Process	8	Pro-C
PrePayments	8	Pro-C
External Archive Process	8	Pro-C & PL/SQL
NACHA	8	Pro-C
Check Writer	8	Pro-C & Oracle Report Writer
Costing	8	Pro-C

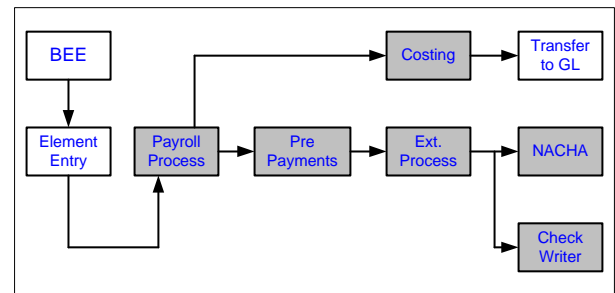


Figure 3: Payroll Process Flow

The Oracle E-Business Suite R12 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.

External Archiving Process: (Pro-C, PL/SQL) Replicates the results of the Payroll run into a separate archive for audit purposes. This data is primarily used for Payslips (Both printed and on line), as a source for check and direct deposit printing, third party interfaces, and tax remittance reporting.

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

Batch Business Metrics	Achieved Output
Payroll	
Payroll Process	20,000
Prepayment	10,000
NACHA + Check	10,000
Costing	10,000

Table 1: Batch Transactions Completed

10,000 employees were processed in this test. Table 2 shows the processing time in minutes.

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Table 2: Payroll Batch Performance

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 average CPU utilization on the combined Database, App/Web and CM server. The value shown is the average across the processors (8 cores total).

E-Business R12 Payroll using Oracle10g on an HP ProLiant DL380 Server

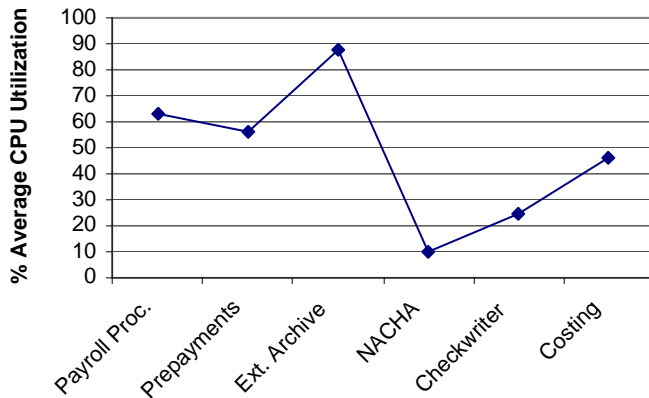


Figure 4: Average CPU Utilization

Online Workload	% User	% System	% I/O Wait	% Idle
Payroll Processing	52.45	4.23	6.04	37.29
Prepayments	42.48	2.41	1.12	54.01
External Archive	81.31	4.56	1.71	12.42
NACHA	8.29	0.85	0.74	90.12
Checkwriter	17.33	1.56	5.95	75.16
Costing	38.95	5.47	1.95	53.62
Wall Clock Avg.	33.77	2.23	1.88	62.12

Table 3: Average CPU Utilization Breakout

Average GB Used	Payroll
DB Server	31.9 GB

Table 4: Average Memory Utilization

The Oracle Enterprise Linux operating system ensured that all of the available physical memory was used throughout this test for either application memory requirements or system buffering and caching.

I/O PERFORMANCE

An EVA6100 storage system equipped with four disk trays was used for storage. The batch workload requires optimal I/O performance. The following table provides details of system-wide I/O throughput during the benchmark run:

I/O Performance		Payroll
Writes/Sec	Avg	96.79
	Peak	410.28
Reads/Sec	Avg	42.2
	Peak	310
Write KB/Sec	Avg	3,494
	Peak	16,159
Read KB/Sec	Avg	1,387
	Peak	14,950
Avg Service Time (ms)	Avg	2.6
	Peak	5.66

Table 5: 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
TCA	Organizations	616,207
	Contacts	2,630,672
	Contact Points	2,073,332
	Accounts	609,422
	Account Sites	610,152
	Account Site Uses	1,065,726
Contracts	Contracts	0
Install Base	Instances	278,494
	Trackable Items	5
Items		
HR	Managers	400
	Employees	10,000
	Payroll Users	10,000
	Users	10,000
	Credit Card Entries	2,500,055
	Supplier(s)	5,000
Assets	Asset Categories	984
General Ledger	GL Code Combinations	93,417
Sales & Marketing	Resources	9,021
	Resource Groups	820
	Sales Leads	1,217,062
	Campaigns	1
	Sales Territories	8,200

Table 6: Data Composition

PATCHES

The following patches were applied to the benchmark environment on top of Oracle E-Business Applications R12 (RUP 4).

Oracle supplied code change to address Bug 7142581

APPLICATION TUNING

Database:

1. R12 tuning through RUP 4 and handover of benchmark kit to HP from the Oracle OASB benchmarking team.
2. An index was added to per_time_periods as hr.per_time_periods(time_definition_id)
3. The index wsh.wsh_delivery_details_n8 was dropped
4. SQL Advisor was used to optimize the execution plan for a statement in Pre-Payment

OPERATING SYSTEM TUNING

DATABASE OPERATING SYSTEM TUNING

1. The following additional Kernel parameters were automatically setup during boot via the /etc/sysctl.conf file:

```
kernel.semmsl = 256 32000 100 142
kernel.shmall = 8388608
kernel.shmmax = 34359738368
kernel.shmmni = 4096
kernel.msgmax = 8192
kernel.msgmnb = 65535
kernel.msgmni = 2878
fs.file-max = 65536
net.ipv4.ip_local_port_range = 1024 65000
net.core.rmem_default = 262144
net.core.rmem_max = 262144
net.core.wmem_default = 262144
net.core.wmem_max = 262144
vm.nr_hugepages=12300
```

2. The following limits were modified via the /etc/security/limits.conf file:

```
* hard nfile 65535
* soft nfile 4096
* hard nproc 16384
* soft nproc 2047
* hard memlock 33554432
* soft memlock 33554432
```

3. Hugepages were enabled for the database instance

4. The following options were added to /etc/resolv.conf
 - options attempts:5
 - options timeout:15

BENCHMARK ENVIRONMENT

HARDWARE CONFIGURATION

A single Hewlett-Packard® ProLiant® DL380 G5 server was used as a combined database and application server. It was equipped with the following:

- 2 × 3.16 GHz Intel® Xeon™ Quad-Core X5460 processors (8 cores total), each socket with 12 MB cache
- 32 Gigabytes of Memory
- 8 × 72 GB internal disk drives attached to an embedded HP SmartArray P400i Controller
- 1 × HP StorageWorks EVA6100 disk array was attached to a single Emulex® Zephyr-X LightPulse® Fibre Channel Controller for data and logs
- 3.98 TB raw disk space available for allocation. (56 × 146 GB)
- Approximately 452 GB of VRAID1 storage configured for this benchmark (data and logs)

SOFTWARE VERSIONS

Oracle's E-Business Suite (E-Business Suite Kit) R12 (RUP 4)

Oracle10g™ 10.2.0.3 (64-bit)

Oracle Enterprise Linux release 4.0 Update 4 (on the database server)

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



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