ORACLE 12 E-BUSINESS SUITE

IBM

ORACLE E-BUSINESS BENCHMARK REV. 1.1

# E-BUSINESS SUITE APPLICATIONS R12 (12.1.3) EXTRA-LARGE PAYROLL (BATCH) BENCHMARK - USING ORACLE11*g* ON AN IBM Power System S824

*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 12-cores.

| Batch Workload | | | |
|---|---|---|---|
| **250,000 Employees** | **Threads** | **Time (Min)** | **Hourly Employee Throughput** |
| **Payroll Processing** | 42 | 2.42 | 6,198,347 |
| **PrePayments** | 32 | 1.10 | 13,636,364 |
| **External Archive** | 48 | 8.50 | 1,764,706 |
| **NACHA** | 20 | 0.20 | 75,000,000 |
| **Checkwriter** | 24 | 0.73 | 20,547,945 |
| **Costing** | 24 | 0.80 | 18,750,000 |
| **Totals:** | | 13.75 | 1,090,909 |
| **Parent Proc. Total** | | 20.6 | 728,155 |
| **Wall Clock Duration*** | | 20.6 | 728,155 |

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 toward the "Totals:" value.

## BENCHMARK PROFILE

In March 2014, Oracle and IBM conducted a benchmark in Beaverton, OR to measure the batch performance of the Oracle E-Business Standard Benchmark processes in an environment running Oracle E-Business Suite R12 (12.1.3) with Oracle11*g*™ database (11.2.0.3) for the AIX® operating system on a single IBM® Power System® S824 (POWER8™) server configured with two twelve-core processors (only 12-cores Active), running AIX® 7.1 7100-01-03-1207 (64-bit) OS. A single IBM Storwize™ V7000 disk array was used for storage.

The benchmark measured the Payroll batch business process hourly throughputs for an 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 batch throughputs for Oracle E-Business Suite R12 Benchmark on an IBM Power System S824 running AIX.**

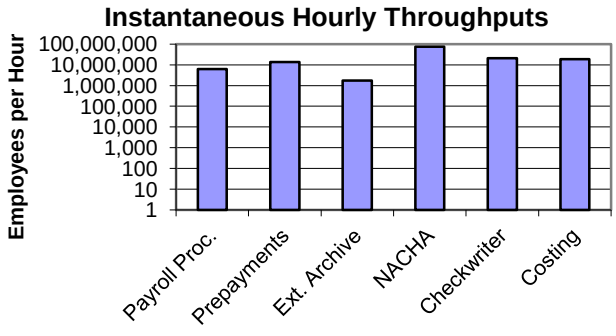


**Figure 1: Oracle E-Business Payroll Batch Throughputs**

## 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.

| | |
|---|---|
|  | Power System S824<br>DB Server & Apps Server<br>12-cores Active<br>64 GB<br><br>53% Utilized |
|  | Storwize V7000<br><br>4SSDs × 300GB – Data<br>1 Drawer – Logs<br>24 × 300 GB |

**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 | 42 | Pro-C |
| PrePayments | 32 | Pro-C |
| External Archive Process | 48 | Pro-C & PL/SQL |
| NACHA | 20 | Pro-C |
| Check Writer | 24 | Pro-C & Oracle Report Writer |
| Costing | 24 | Pro-C |

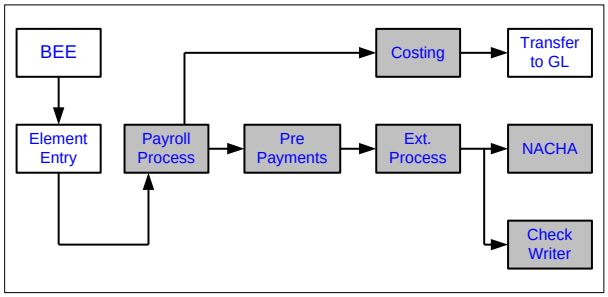


**Figure 3: Payroll Process Flow**

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 | | 500,000 |
| PrePayments | | 250,000 |
| NACHA + Check | | 250,000 |
| Costing | | 250,000 |

**Table 1: Batch Transactions Completed**

In this test, 250,000 employees were processed. One checkpoint was completed during the measurement interval. Table 2 shows the processing time in minutes.

| Batch Workload | | | |
|---|---|---|---|
| **250,000 Employees** | **Threads** | **Time (Min)** | **Hourly Employee Throughput** |
| **Payroll Processing** | 42 | 2.42 | 6,198,347 |
| **PrePayments** | 32 | 1.10 | 13,636,364 |
| **External Archive** | 48 | 8.50 | 1,764,706 |
| **NACHA** | 20 | 0.20 | 75,000,000 |
| **Checkwriter** | 24 | 0.73 | 20,547,945 |
| **Costing** | 24 | 0.80 | 18,750,000 |
| **Totals:** | | 13.75 | 1,090,909 |
| **Parent Proc. Total** | | 20.6 | 728,155 |
| **Wall Clock Duration*** | | 20.6 | 728,155 |

**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 Database/Application-Tier server. The value shown is the average across the processors (12 cores Active).

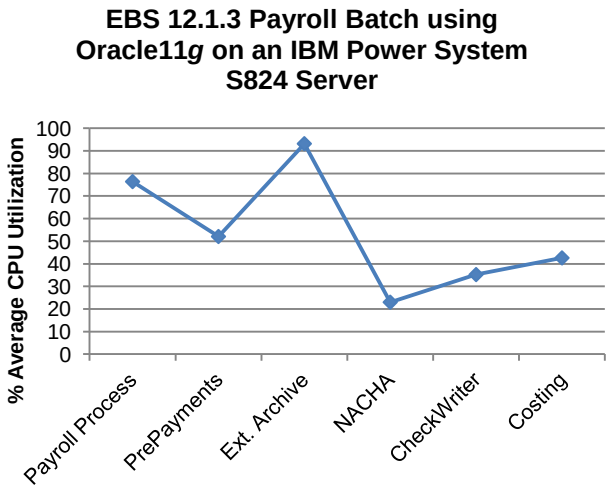


**Figure 4: Average Server CPU Utilization**

Note that the high processing power applied to the briefest business processes resulted in sparse CPU data sampling.

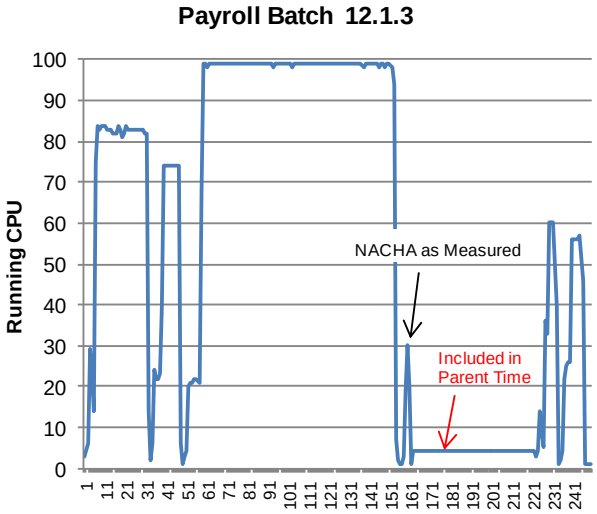


**Figure 5: Running CPU Utilization**

Figure 5 shows the CPU activity for the entire sequence of processes. Processing after the reported NACHA 'child' threads appears to account for much of the discrepancy between the overall sum of the 'child' threads and the overall sum of the 'parent' threads.

## SERVER PERFORMANCE CONTINUED

| Online Workload | | % User | % System | % I/O Wait | % Idle |
|---|---|---|---|---|---|
| **Payroll Processing** | | 69.34 | 6.66 | 23.62 | 0.21 |
| **PrePayments** | | 48.57 | 3.79 | 47.93 | 0.00 |
| **External Archive** | | 92.20 | 1.04 | 6.84 | 0.00 |
| **NACHA** | | 21 | 2 | 77 | 0 |
| **Checkwriter** | | 30.11 | 4.11 | 64.78 | 0.89 |
| **Costing** | | 34.60 | 7.90 | 57.40 | 0.00 |
| **Wall Clock Avg.** | | 53.26 | 1.97 | 44.50 | 0.06 |

**Table 3: Average Server CPU Utilization**

| Average GB Used | DB Server |
|---|---|
| 48 Threads | ~59 GB |

**Table 5: Average Memory Utilization**

## I/O PERFORMANCE

A V7000 storage system equipped with four and one half disk drawers was used for storage. The batch workload requires optimal I/O performance.

| I/O Performance | | 48-Thread |
|---|---|---|
| Transfers/Sec | Avg. | 785 |
| | Peak | 3,598 |
| Writes KB/Sec | Avg. | 29,729 |
| | Peak | 61,161 |
| Reads KB/Sec | Avg. | 3,088 |
| | Peak | 53,412 |

**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 | Extra-Large Model |
|---|---|---|
| HR | Employees | 250,000 |

**Table 7: Data Composition**

## PATCHES

The following patches were applied to the benchmark environment on top of Oracle E-Business Suite R12 (12.1.3).

1. Oracle E-Business Applications R12 (12.1.3)

DB: 8328200
8993052
9081430
9218789
9318214
9500046
9535951
9644960
9657344
9719541
9756939
8496830
10190759
Oracle 11g Examples CD

Note: quite a few from the above list are due to Database import requirements. If import is not performed, the import-related patches need not be applied.

## APPLICATION TUNING

**Database:**

9858539
12942119
12960302
13004894
4247037

(Please refer to Appendix K of EBS R12x Benchmark Kit Environment Installation Guide)

Application Tuning:

Please refer to Jinsoo's performance page for all the Payroll index tuning recommendations. It was already included in the database that was being imported from Linux.

https://mediawiki.us.oracle.com/appsperf/index.php/Payroll/LPayroll_Batch_Index.sql

## OPERATING SYSTEM TUNING

### DATABASE OPERATING SYSTEM TUNING

/etc/security/limits: (DB user and APPs user)
: fsize = -1
: core = 2097151
: cpu = -1
: data = -1
: rss = -1
: stack = -1
: nofiles = -1
: stack_hard = -1
: data_hard = -1

Large pages were enabled for Database instance

## AIX TUNING

SMT-4 thread
: smtctl -t 4

Memory prefetch disable:
: dscrctl -n -s 1

Multipage enable:
DB: export LDR_CNTRL=DATAPSIZE=64K@TEXTPSIZE=64K@STACKPSIZE=64K@SHMPSIZE=64K
APP: export LDR_

CNTRL=DATAPSIZE=64K@TEXTPSIZE=64K@STACKPSIZE=64K@MAXDATA=0xA0000000@DSA

Maximum number of processes adjustment:
eg. smitty
System Environments
Change/Show Characteristics of Operating System:
update Maximum number of PROCESSES allowed per_user [99999]
ARG/ENV list size in 4K byte blocks [512]

# BENCHMARK ENVIRONMENT

## HARDWARE CONFIGURATION

An IBM Power System S824 (8286-42A) was used for the database and application/web server. It was equipped with the following:

- 1 × 12-Core 3.525 GHz with IBM POWER8 twelve-core processor chip (12 cores Active) (four-threaded SMT-enabled), each with L2 Cache of 512 KB per core and 8 MB L3 cache per core. Intelligent Energy Optimization has been deployed with setting for 'maximum performance.' (up to 3.92 GHz reported for this test)
- Total Memory: 64 GB (~59.2 GB peak)
- Network: Gigabit full duplex.
- Operating system: IBM AIX 7.1 TL07 7100-01-03-1207
- For more details on IBM Power System S824, please visit http://www.redbooks.ibm.com/redpieces/abstracts/redp5097.html?Open
- Storage: V7000 with 5 drawers of 6.5 TB each (Total 23.5 Terabytes.). Each drawer has 24 physical disks --- RAID 0, two controllers - one exclusively for redo logs.
- For more details on IBM Storwize v7000, please visit http://www-03.ibm.com/systems/storage/disk/storwize_v7000/index.html

## SOFTWARE VERSIONS

Oracle E-Business Suite R12 (12.1.3)

Oracle11*g*™ 11.2.0.3.0 (64-bit)

IBM AIX 7.1 TL07 7100-01-03-1207 (on the database and Application /Web/CM servers)

The following Java versions have all been used in the Oracle Apps environment:
: Java 6 SR14
: Java 5 SR16 FP3
: Java 4 SR13 FP17

Glossary and Acronyms:

BEE Batch Element Entries

OASB Oracle Applications Standard Benchmark

**RAC** **R**eal **A**pplications **C**lusters

**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:

INFO SIZING

E-Business R12 Payroll Batch
April 2014
Audit Approved Mar. 27, 2014

Oracle Corporation
World Headquarters
500 Oracle Parkway
Redwood Shores, CA 94065
U.S.A.

Worldwide Inquiries:
Phone: +1.650.506.7000
Fax: +1.650.506.7200

oracle.com

Oracle is committed to developing practices and products that help protect the environment