



## E-BUSINESS SUITE PAYROLL 11i (11.5.10) USING ORACLE10g ON A HEWLETT-PACKARD PROLIANT ML570 G3 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

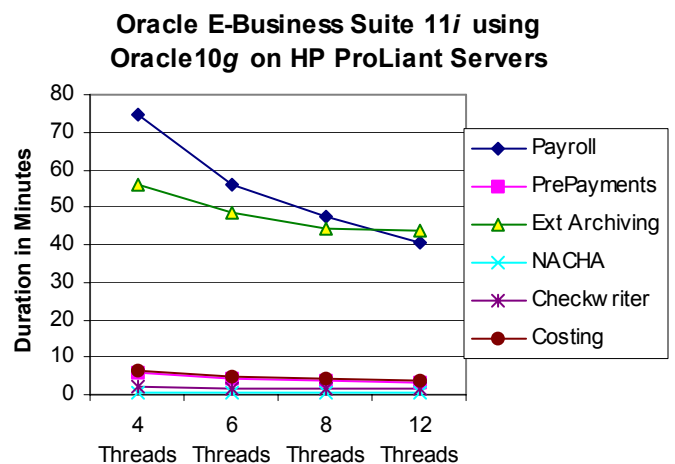
50,000 Employees (8 Threads)	Time	Hourly Throughput
<b>Payroll Process</b>	47.32 min	63,403
<b>PrePayments</b>	3.62 min	829,493
<b>Ext. Proc. Archive</b>	44.15 min	67,950
<b>NACHA</b>	0.3 min	n/a
<b>Check Writer</b>	1.43 min	2,093,023
<b>Costing</b>	4.13 min	725,806
<b>Total</b>	101 min	29,718

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

### BENCHMARK PROFILE

In August 2005, Oracle and Hewlett-Packard conducted a benchmark in Houston, TX to measure the batch performance of the Payroll processes in Oracle's E-Business Suite Payroll 11i (11.5.10) with Oracle10g™ 10.1.0.4 for Linux on a 4-way Hewlett-Packard® ProLiant™ ML570 G3 database server, running Red Hat® Enterprise Linux® Advanced Server release 3.0 Update 4. A 2-way ProLiant BL25p was used as an application server. An HP StorageWorks MSA30 disk array was used for data storage.

The benchmark measured 'Payroll' application business process runtimes for a medium database model. Testing was conducted in a controlled environment with no other applications running. The tuning changes, if any, were approved by Oracle Applications Development and will be generally available in a future update. **The goal of this Benchmark was to obtain reference performance results for Oracle's E-Business Suite 11i Payroll on an HP ProLiant server.**



**Figure 1: Oracle Payroll 11i Processing Times**

The benefits from running increasing numbers of threads are more pronounced on the two longer processes, Payroll and External Archiving. Note that the gains decline at higher numbers of parallel threads.

## METHODOLOGY

E-Business Suite 11i Payroll 11.5.10 batch processes can be initiated from a browser. For this benchmark, all runs used a browser to initiate Pro-C, PL/SQL and Oracle Report Writer jobs.

The batch processes were run as a single concurrent process which automatically and dynamically divides the employee population across the number of sub-processes configured by the user (AKA threads). The Payroll multithreading engine is fully load balanced ensuring that each of the threads has a roughly equal amount of work to do. For this benchmark 4, 6, 8 or 12 threads were used.

Business Process	Threads	Process Type
Payroll Process	4, 6, 8 or 12	Pro-C
PrePayments	4, 6, 8 or 12	Pro-C
Ext. Process Archive	4, 6, 8 or 12	Pro-C & PL/SQL
NACHA	4, 6, 8 or 12	Pro-C
Check Writer	4, 6, 8 or 12	Pro-C & Oracle Report Writer
Costing	4, 6, 8 or 12	Pro-C

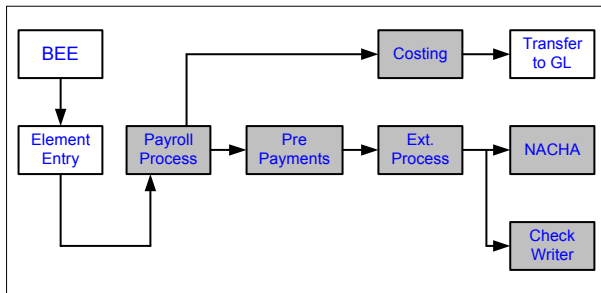


Figure 2: Process Flow

## BUSINESS PROCESSES

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

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

**External Process Archive:** (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:** (Pro-C) 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:** (Pro-C and Oracle Report Writer) This process allocates check numbers and creates/prints the payroll check and associated paper payslip.

**Costing:** (Pro-C) 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.

## BATCH RESULTS

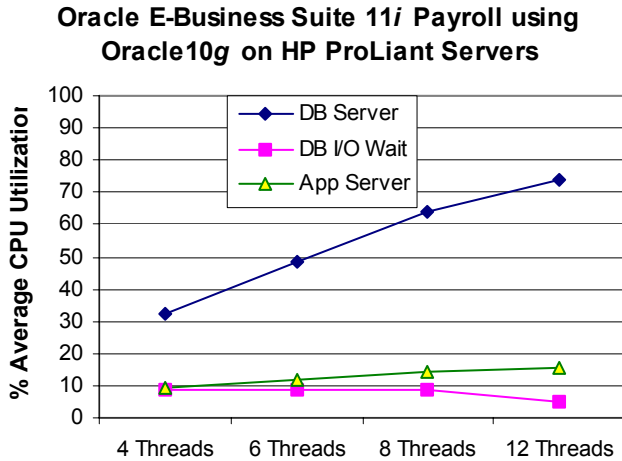
50,000 employees were processed for the semi-monthly payroll in this test. Table 1 shows the processing time in minutes for increasing numbers of parallel threads.

50,000 Employees	4 Threads	6 Threads	8 Threads	12 Threads
Payroll Process	74.58	55.98	47.32	40.68
PrePayments	5.75	4.23	3.62	3.17
Ext. Proc. Archive	55.78	48.50	44.15	43.87
NACHA	0.35	0.33	0.30	0.33
Check Writer	2.05	1.67	1.43	1.43
Costing	6.35	4.80	4.13	3.50
<b>Totals:</b>	<b>144.87</b>	<b>115.52</b>	<b>100.95</b>	<b>92.98</b>

Table 1: Batch Performance

## SERVER PERFORMANCE

Figure 3 shows the average CPU utilization for each process. The value shown is the average across all 4 processors in the database server and the 2 processors in the application server.



**Figure 3: Average CPU Utilization**

No processes were I/O bound in these tests.

## I/O PERFORMANCE

The Direct-Connected HP Storage Works MSA30 disk arrays were used for storage. I/O performance is crucial to batch performance and is summarized as follows:

(8K Blocks)	4 Threads	6 Threads	8 Threads	12 Threads
<b>Xfers/Sec Average</b>	7.24	7.22	7.21	8.12
<b>Peak</b>	10.54	10.24	9.80	14.55
<b>Writes/Sec Avg.</b>	171.64	170.92	170.31	178.31
<b>Peak</b>	268.01	249.15	235.20	315.89

**Table 2: I/O Subsystem Metrics**

Note that the average transfer rates and 8K Block Writes per second did not vary much as the number of threads run was increased.

## DATA COMPOSITION DESCRIPTION

History data was created prior to the timed benchmark runs. This yielded data for 6 semi-monthly pay periods.

	Medium Model
# of employees	Configurable (50,000)
# of assignments	Equal to number of employees (50,000)
# of elements	11
# of payroll	1
# of consolidation sets	1
# of Location	2

**Table 3: Payroll Data**

	Criteria & Deductions
<b>Elements</b>	Regular Salary
	Federal Income Tax (FIT)
	FUTA
	SS_EE
	SS_ER
	Medicare_EE
	Medicare_ER
	Vertex
	Workers Compensation
	Union Dues
	After-Tax Life
<b>Payroll</b>	Semi-Monthly
<b>Locations</b>	Texas
	Orlando (FL)

**Table 4: Workload Factors**

## TUNING RECOMMENDATIONS

### Database:

1. Refer to the MetaLink document 216205.1 “Database Initialization Parameters and Configuration for Oracle Applications 11i”. Make sure that the mandatory parameters are properly initialized.
2. Optimally configure the buffer cache and shared pool as per the workload and the number of users.
3. Enable asynchronous I/O. Consider using Quick I/O or equivalent if using filesystem based files for the DB files.
4. Use locally managed temp files (uniform) for the temporary tablespace.
5. Monitor CPU and Memory Utilization in your environment. Also monitor paging and I/O statistics, including service times.
6. Review Stats Pack reports and correlate top SQL to the business flows.
7. Do not gather statistics excessively on entire schemas or the entire database such as nightly or weekly. Do not gather statistics on permanent objects during peak intervals
8. Enable the Auto memory manager.
9. Enable System Managed Undo. Set undo\_retention to the length of the longest running request.
10. Enable PL/SQL Native Compilation.

### Concurrent Manager:

1. The number of target processes for Standard Manager should be greater than number of THREADS defined in PAY\_ACTION\_PARAMETERS table.

### Payroll:

1. Set CHUNCK\_SIZE to 20 in PAY\_ACTION\_PARAMETERS table.
2. Execute “Generate Run Balance” concurrent program to improve External Archival Processing.

## BENCHMARK ENVIRONMENT

### HARDWARE CONFIGURATION

A Hewlett-Packard® ProLiant™ ML570 G3 was used as the batch/database server. It was equipped with the following:

- 4 × 3.33 GHz Intel® Xeon™ Processors, each with 8 Megabytes of Level-3 Cache
- 48 Gigabytes of Memory (~5.6 GB used at peak load)
- 4 × Direct-Connected HP StorageWorks MSA30 disk arrays attached to 1 SmartArray 6404 controller for Data
- 1 × Direct-Connected HP StorageWorks MSA35 disk array attached to 1 SmartArray 6404 controller for Logs
- ~4.3 Terabytes of (Data) total Disk Space available (56 × 72 GB + 4 × 72 GB internal disk drives), approximately 1.4 TB of RAID 0 storage used for this benchmark
- ~1 Terabyte of (Log) total Disk Space available (14 × 72 GB), approximately 475 GB of RAID 1+0 storage used for this benchmark

### Application Server:

The HP ProLiant® BL25p blade server was used as the application server. It was equipped with the following:

- 2 × 2.6 GHz AMD® Opteron™ 252 processors, each with 1 Megabyte of Level 2 Cache write-back cache
- 16 Gigabytes of Memory
- ~72 GB of storage with an integrated SmartArray 6i Plus Controller

### CM/NFS Server:

The Hewlett-Packard® ProLiant® DL585 was used as the CM/NFS server. It was equipped with the following:

- 4 × 2.4 GHz AMD® Opteron™ 850 processors, each with 1 Megabyte of Level 2 Cache write-back cache
- 64 Gigabytes of Memory
- ~144 GB of storage with an integrated SmartArray 5i Plus Controller

### F5 BIG-IP Server:

The HP ProLiant® BL20p G2 blade server was used as the Big-IP server. It was equipped with the following:

- 2 × 3.06 GHz Intel® Xeon™ processors, each with 512 Kilobytes of Level 2 Cache and 2 Megabytes of Level-3 write-back cache
- 2 Gigabytes of Memory
- ~72 GB of storage with an integrated SmartArray 5i Plus Controller

### SOFTWARE VERSIONS

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

Oracle10g™ 10.1.0.4 (64-bit)

Red Hat Enterprise Linux Advanced Server release 3.0 Update 4 (on the database server, application servers and web servers)



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