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ORACLE'S PEOPLESOFT HRMS 9.1 FP2 SELF-SERVICE AND PAYROLL USING ORACLE DB FOR ORACLE SOLARIS (UNICODE) ON AN ORACLE'S SPARC T4-4 AND T4-2 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

	PeopleSoft HRMS 9.1 FP2 Self-Service	
Concurrent Benchmark	Extra-Large Data Model	
	Average Response	Search 0.98 sec, Save 0.54 sec
	Concurrent Users	18,000

	PeopleSoft HRMS 9.1 FP2 Payroll Batch	
500,480 Employees / Payments	Extra-Large Data Model	
	Minutes	32.4
128 Job Streams	Payments per Hour	926,814

Figure 1: Average Response Times

* This average is weighted based on the business mix as reflected in Table 1: Business Process Mix.

BENCHMARK PROFILE

In October 2012, Oracle (PeopleSoft) conducted a benchmark in Burlington, MA to measure the online and batch performance of Oracle's PeopleSoft Enterprise Human Resources Management System (HRMS) 9.1 FP2. The database server used Oracle11g™ R2 on a 4-way Eight-Core (32 cores in all – 256 vcpus) Oracle's SPARC T4-4 database server, running Solaris 11 11/11. The application server was a SPARC T4-4 server and ran Oracle Solaris 11 (11/11). The web server was run on Oracle's SPARC T4-2 server. Approximately 568 GB of storage (296 GB on Comstar/F5100 + 182 GB on F5100 + 90 GB redo logs on X4275) was allocated to the database instance.

The benchmark measured client response times for 18,000 concurrent users with concurrent Payroll batch execution. The standard database composition model represents an extra-large-sized company profile. The testing was conducted in a controlled environment with no other applications running. **The goal of this Benchmark was to obtain baseline results for PeopleSoft HRMS 9.1 FP2 self-service and batch transactions with Oracle Database for Solaris on Oracle SPARC T4 Servers.**

This report summarizing concurrent OLTP and batch processing in HCM 9.1 FP2 on this particular hardware and software environment is the baseline. Two complementary reports cover stand-alone batch and stand-alone OLTP results on this same environment for further performance analysis.
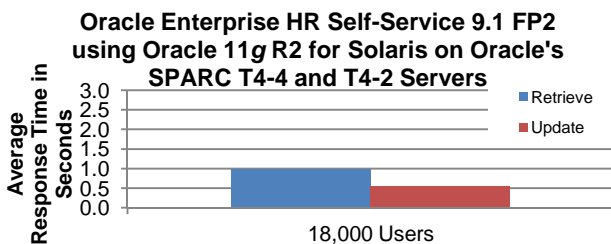
METHODOLOGY

Oracle® ATS™ was used as the load driver, simulating concurrent users. It submitted a business process at an average rate of one every five minutes for each concurrent user.

Measurements were recorded when the user load was attained and the environment reached a steady state.

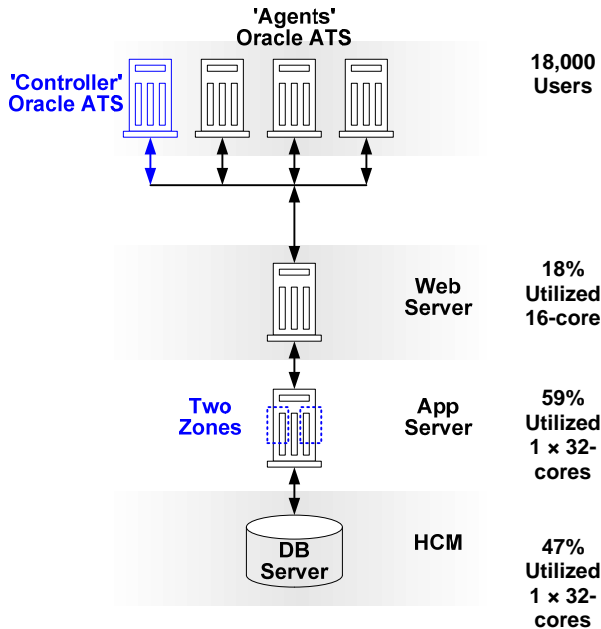Figure 2 shows a typical 4-tier benchmark configuration.

Figure 2: 4-Tier Configuration

Load (search/retrieval) times were measured from the time the user clicks the <OK> button until all the data for the entire business transaction has been retrieved.

Update (save) times were measured from the time the user clicks the <SAVE> button until the system has released the page.

ONLINE BUSINESS PROCESSES

Oracle (PeopleSoft) defines a business transaction as a series of HTML pages that guide a user through a particular scenario, such as promoting an employee.

The fourteen PeopleSoft Enterprise 9.1 FP2 HRMS business processes tested in this benchmark are as follows:

EMPLOYEE SELF-SERVICE
eProfile

Update Home Address: Update address in Personal Data section.

Update Home Phone: Update phone number in Personal Data section.

eBenefits

View Benefits Summary: View overall benefits enrollment data.

Benefits Change Life: View benefits and alter the beneficiaries' allocations in the Basic Life Plan.

ePay

View Paycheck: View current paycheck information.

Update Direct Deposit Info: Add a direct deposit directive.

Employee Adds Profile Items: Add competencies to personnel profile.

MANAGER SELF-SERVICE
eDevelopment

View Employee Info: View job and personal information.

eProfile

Initiate Termination: Initiate a termination by recording an effective date and reason for termination.

Initiate Promotion: Initiate a promotion by entering a new job title and salary.

eCompensation

Initiate Employee Salary Change: Process a salary change for a single employee.

HR ADMINISTRATION

Add a Person: Add a person and their biographical details.

Hire a Person: Enter the specified job data and work location, followed by the payroll and compensation details.

Add a Job: Add job details to an existing employee.

ONLINE PROCESS RESULTS

The table below shows average retrieval (search) and update (save) times, in seconds, for each business process.

HRMS Process	% within Group	% Overall	Pacing in Min
Employee Self-Service (60%)			
Update Home Address	3%	1.8%	5
Update Phone Numbers	3%	1.8%	5
View Benefits Summary	10%	6%	5
Update Beneficiary	2%	1.2%	5
View Paycheck	78%	46.8%	5
Update Direct Deposit	2%	1.2%	5
Employee Adds Profile Items	2%	1.2%	5
Manager Self-Service (20%)			
View Employee Info	50%	10%	5
Initiate Termination	20%	4%	5
Initiate Promotion	10%	2%	5
Initiate Employee Salary Change	20%	4%	5
HR Administrator (20%)			
Add a Person	20%	4%	5
Hire a Person	40%	8%	5
Add a Job Row	40%	8%	5
Total		100%	5

Table 1: Business Process Mix

The table above shows the proportions of the business processes used in the measurements of this benchmark. The proportions are intended to simulate a typical user scenario.

The database and application servers were processing a total of 3,600 business processes per minute at the peak load of 18,000 concurrent users. The estimated transaction rate is calculated by dividing the total number of concurrent users by the average pacing rate.

Performance may vary on other hardware and software platforms and with other data composition models.

Process		All Proc.
Update Home Address	Search	0.86
	Save	1.43
Update Home Phone	Search	0.63
	Save	0.67
View Benefits Summary	View	0.78
Update Beneficiary	Search	0.82
	Save 1	0.13
	Save 2	0.17
	Edit/ Calc	0.07
View Paycheck	Search	1.08
	View	1.09
Update Direct Deposit Info	Search	0.64
	Save	0.14
Employee Adds Profile Items	Search	0.53
	Save	1.54
	Submit	6.50
	Confirm	1.15
View Employee Info	Search	0.90
Initiate Termination	Search	0.89
	Save	0.19
	Confirm	0.15
Initiate Promotion	Search	0.96
	Save	1.19
Initiate Salary Change	Search	1.03
	Save	2.70
	Calc	0.17
Add a Person	Save	0.11
Hire a Person	Save 1	0.11
	Save 2	0.09
Add a Job	Search	0.79
	Save	0.36
* Average Search		0.98
* Average Save		0.54
Trans/min Est.		3,600

Table 2: Employee/Manager Process Runtimes

BATCH BUSINESS PROCESSES

The five Payroll processes tested are as follows:

Paysheet Creation: Generates payroll data worksheets for employees, consisting of standard payroll information for each employee for the given pay cycle. The Paysheet process can be run separately from the other two tasks, usually before the end of the pay period.

Payroll Calculation: Looks at Paysheets and calculates checks for those employees. Payroll Calculation can be run any number of times throughout the pay period. The first run will do most of the processing, while each successive run updates only the calculated totals of changed items. This iterative design minimizes the time required to calculate a payroll, as well as the processing resources required. In this benchmark, Payroll Calculation was run only once, as though at the end of a pay period.

Payroll Confirmation: Takes the information generated by Payroll Calculation and updates the employees' balances with the calculated amounts. The system assigns check numbers at this time and creates direct deposit records. Confirm can only be run once, and therefore, must be run at the end of the pay period.

Print Advice Forms: This process takes the information generated by Payroll Calculation and Confirmation and produces an Advice for each employee to report Earnings, Taxes, Deductions, net pay and bank accounts where Net Pay were sent.

Create Direct Deposit File: This process takes the information generated by Payroll Calculation and Confirmation and produces an electronic transmittal file used to transfer payroll funds directly into an employee's bank account.

BATCH RESULTS

The table below contains the actual runtimes, in minutes, for the Payroll processes. It also shows how many employees were processed and the number of checks and advices produced.

Job Streams	**128**
Single Check	**No**
Employees	*500,480*
Jobs	*500,480*
PayCheck	*0*
PayAdvice	*500,480*
Payments	*500,480*
Paysheet	2.78
PayCalc	16.85
PayConfirm	12.77
Total Minutes	32.4
Total Hours	0.54
Print Advice	10.18
Direct Deposit	0.42
Total Minutes	10.6

Table 3: PeopleSoft 9.1 FP2 Payroll Process Runtimes

Job Streams	**128**
Single Check	**No**
Paysheet	10,788,790
PayCalc	1,782,124
PayConfirm	2,352,125
Net per Hour	926,814
Print Advice	2,948,818
Direct Deposit	72,069,120

Table 4: PeopleSoft 9.1 FP2 Payroll Process Throughputs

The throughputs above are linear extrapolations only. For Paysheet, PayCalc and PayConfirm the throughputs are payments per hour. For Print Advice and Direct Deposit, throughputs are PayAdvice per hour. Performance may vary on other hardware and software platforms and with other data composition models.

SERVER PERFORMANCE

Figure 3 shows the average CPU utilization for the database server. The CPU utilization is the average across all of the CPUs. Notice that the OLTP ramp-up and ramp-down phases clearly book-end the batch execution. The three 'Payroll' batch processes are in the dark color, followed by the 'Advice' and brief 'Direct Deposit' processes in the light color.
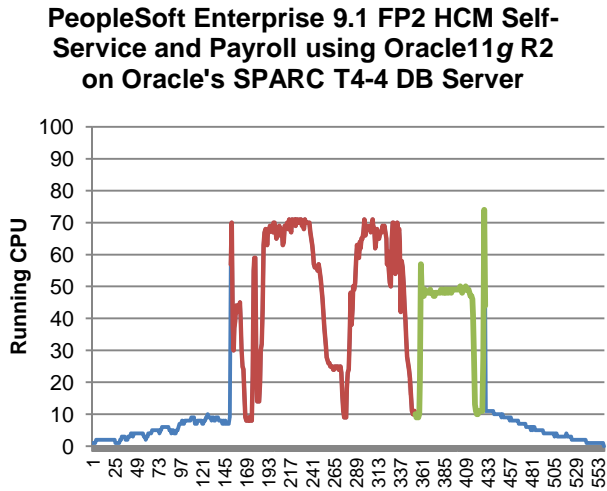
PeopleSoft Enterprise 9.1 FP2 HCM Self-Service and Payroll using Oracle11*g* R2 on Oracle's SPARC T4-4 DB Server

Figure 3: Average Server CPU Utilization

% CPU		User	System	I/O Wait	Idle
DB Server					
PaySheet		31.13	7.94	0	61.00
PayCalc		44.04	8.71	0	47.26
PayConfirm		43.57	10.35	0	46.11
Advice		36.57	10.75	0	52.53
Direct Dep.		41.50	17.50	0	41.00
App Server					
All Process.		52.93	6.52	0	40.50
Web Server					
All Process.		13.67	3.78	0	82.64

Table 5: Summary of CPU Utilization

		18,000 Users
DB Server		185 GB
App Server		217 GB
Web Server		52 GB

Table 6: Average Memory Utilization

I/O PERFORMANCE

The Oracle 's Sun Server X2-4 Storage Server with attached Sun Storage F5100 Flash Array storage and a directly attached Oracle's Sun Storage F5100 Flash Array storage was used for storage of tables and indexes. An Oracle's Sun X4275 Storage Server was used for Redo log data. I/O performance is crucial to performance and is summarized as follows:

Users		18,000
DB		Average
r/s		1,319
w/s		1,731
KB r/s		17,916
KB w/s		34,721
App Server		
r/s		78.0
w/s		713.0
KB r/s		669.0
KB w/s		12,203.0

Table 7: I/O Metrics

DATA COMPOSITION DESCRIPTION

There are 500,480 active employees and each employee has eleven months of payroll history. Within the active employee population, there are a total of 500,480 Jobs from which the active employees receive compensation. In this benchmark there are a total of 500,480 payments.

The employees were distributed over four monthly, semi-monthly, bi-weekly and weekly pay groups. Each of these pay groups was assigned to 32 pay groups for a total of 128 pay groups. With further sub-divisions, the benchmark was set up for 32, 64, or 128 concurrent processes for the Paysheet, PayCalc and PayConfirm processes for this test. The employee profiles are as follows:

Employee ID	Pay Group	Pay Freq.	Employee Type	Employee Status
KU0200	PB1	Weekly	Hourly	PT 20 Hrs
KU0202, ER0	PB4	Monthly	Salaried	PT 30 Hrs
KU0202, ER1	PB2	Bi-Weekly	Exc Hourly	PT 10 Hrs
KU0203	PB4	Monthly	Salaried	FT
KU0204	PB2	Bi-Weekly	Salaried	FT
KU0205	PB3	Semi-Mon.	Salaried	FT
KU0208, ER0	PB1	Weekly	Salaried	PT 20 Hrs
KU0209	PB3	Semi-Mon.	Hourly	FT

Table 8: Employee Profiles for Seed Data

- Part-time, hourly paid weekly with one additional pay, with Federal and California State tax, two general deductions and eight per pay period benefit deductions, one garnishment (KU0200).

- One Part-time salaried and paid monthly with one additional pay, with Federal and California State tax, one general deduction, three garnishments and seven per pay period benefit deductions with Absence Management (KU0202 ER0).

- One Part-time exception hourly paid bi-weekly with one additional pay, with Federal and California State tax, one general deduction, three garnishments and seven per pay period benefit deductions with Absence Management (KU0202 ER1).

- Full-time salaried paid monthly with Federal, New Jersey and New York State tax and New Jersey local tax, with five benefit deductions and no general deductions with Absence Management (KU0203).

- Full time, salaried paid biweekly with Federal and Pennsylvania State tax and seven per pay period benefit deductions (KU0204).

- Full time, salaried paid semi-monthly with one additional pay, with Federal and Michigan State tax, five per pay period benefit deductions, with Time and Labor (KU0205).

- One Part-time salaried paid weekly with one additional pay, with Federal and Georgia State tax, seven per pay period benefit deductions and one general deduction with Absence Management and Time and Labor (KU0208 ER0).

- Full time, hourly paid semi-monthly with one additional pay, with Federal and California State tax, seven per pay period benefit deductions and no general deductions (KU0209)

The benchmarking payroll Pay_End_Dt is Dec 9th (PB1 weekly), Dec 16th (PB2 bi-weekly), Dec 15th (PB3 semi-monthly), or Dec 31st (PB4 monthly). The database reflects ~11 months history in calendar year 2006.

Note that this 'Data Model' has been revised from that used for Release 9.1. Direct comparison between this result and results published for earlier releases is impossible.

OLTP DATA COMPOSITION DESCRIPTION

The standard database was comprised of:

- 500,480 Employees (8 per Department)
- 62,560 Managers
- 62,560 Department Table Entries

BENCHMARK ENVIRONMENT

HARDWARE CONFIGURATION

Database Server:

1 × Oracle's SPARC T4-4 server was used as the database server. It was equipped with the following:

- 4 × 3.0 GHz SPARC T4 Eight-Core processors (sockets), each with 16 Kilobytes of Instruction and 16 Kilobytes of Data Level-1 on core cache, 128 Kilobytes of shared Instruction and Data Level-2 cache per core, and 4 Megabytes of Level-3 on-chip cache (32 cores total – 256 vcpus)

- 256 Gigabytes of Memory (~117 GB used at peak load)

- 1 × 600 GB SAS internal disk (Oracle 11*g*R2 software, UFS file system)

- 1 × 300 GB SAS internal disks (PeopleSoft tools, UFS file system)

- 1 × 300 GB SAS internal disks (OS disk installed on ZFS storage pool)

One of Oracle 's Sun Server X2-4 Storage Server (4 × 2 GHz Xeon X7550, 128 GB mem) with 1 × 8 Gbit FiberChannel HBA , 4 × SAS HBA and with attached Oracle's Sun Storage F5100 Flash Array Storage systems with 80 Flash Modules (FMODs) was used. The F5100 was equipped with the following:

- 80 × 24 GB FMODs in sun Storage Flash Array F511 device (FM size is 24 GB, once formatted ~22.98 GB)

- Approximately 296 GB of database data storage out of ~900 GB (aggregate) from one ~1800 GB (mirrored) Oracle's Sun Storage F5100 Flash Array storage system was allocated as data storage to the database instance using Oracle Automatic Storage Management (ASM) for database files management.

- Oracle Solaris 11 11/11 X86 configured as COMSTAR Storage Server.

One of Oracle's Sun Storage F5100 Flash Array Storage system directly attached via 4 × SAS HBA interfaces to SPARC T4-4 was used. The F5100 was equipped with the following:

- 40 × 24 GB FMODs in sun Storage Flash Array F511 device

- Approximately 182 GB of database data storage out of ~450 GB (aggregate) from one ~900 GB (mirrored) Oracle's Sun Storage F5100 Flash Array storage system was allocated as data storage to the database instance using Oracle Automatic Storage Management (ASM) for database files management.

One of Oracle's Sun X4275 Storage Servers for Redo log data, equipped with:

- 1 × 2.53 GHz XEON E5540 and 6 GB memory

- 12 × 2 TB SAS disks with Niwot Raid controller

- 1 × 8 Gb FC HBA

- The X4275 was attached to the database instance on the SPARC T4-4 providing 3 × 30 GB mirrored (hardware RAID 1) redo Logs (total space used ~180 GB)

- Oracle Solaris 11 Express 2010.11 X86 configured as COMSTAR Storage Servers.

Application Server(s):

1 × Oracle's SPARC T4-4 server was used as the application server. It was equipped with the following:

2 zones are configured each with 5 PeopleSoft Application Server domains containing 40 PSAPPSRV processes.

- 4 × 3.0 GHz SPARC T4 Eight-Core processors (sockets), each with 16 Kilobytes of Instruction and 16 Kilobytes of Data Level-1 on core cache, 128 Kilobytes of shared Instruction and Data Level-2 cache per core, and 4 Megabytes of Level-3 on-chip cache (32 cores total – 256 vcpus)

- 512 Gigabytes of Memory (~217 GB used at peak load)

- 1 × 600 GB SAS internal disk (OS disk on ZFS pool)

- 4 × 300 GB SAS internal disks (OS disks for Oracle Solaris Zones, mirrored ZFS storage pool for each zone, 2 disks per zone)

- 2 × 300 GB internal SSD (One disk for each Oracle Solaris Zone, mounted as UFS file system for application server cache)

Web Server(s):

1 × Oracle's SPARC T4-2 server was used as the web server. It was equipped with the following:

- 2 × 2.85 GHz SPARC T4 Eight-Core processors (sockets), each with 16 Kilobytes of Instruction and 16 Kilobytes of Data Level-1 on core cache, 128 Kilobytes of shared Instruction and Data Level-2 cache per core, and 4 Megabytes of Level-3 on-chip cache (16 cores total – 128 vcpus)

- 256 Gigabytes of Memory (~52 GB used at peak load)

- 1 × 300 GB SSD internal disk (OS disk installed on ZFS storage pool)

- 1 × 100 GB SSD internal disk (PeopleSoft Webservers logging, UFS file system)

- 2 × 300 GB SAS internal disks (WebLogic server, mirrored ZFS storage pool)

- 1 × 300 GB SAS internal disk (backup)

30 Web Logic instances with 1 GB heap size are configured to handle the workload of 18,000 users.

Load Simulation Driver(s):

4 × Sun Blade X6240 servers were used as the load driver controller and drivers. They were equipped with the following:

- 1 × 2.3 Gigahertz AMD® Opteron™ 2356 Quad-Core Processors,
  each with 2 Megabytes of Level-2 Cache (4 cores total)

- 32 Gigabytes of Memory

Oracle ATS is configured to spawn an agent for every 2,000 users.

SOFTWARE VERSIONS

Oracle's PeopleSoft HRMS and Campus Solutions 9.10.00.000 with FP 2

Oracle's PeopleSoft Enterprise (PeopleTools) 8.52.03

Oracle Database 11*g* 11.2.0.3.0 (64-bit)

Oracle Solaris 11 (11/11) (on the Database Server)

Oracle Solaris 11 (11/11) (on the App Server and Web Server)

Java Platform, Std. Edition Development Kit 6 with Update 32

Microsoft® Windows Server 2003 Enterprise Edition w/SP 2 (on the Controller and Drivers)

Oracle ATS Load Test software 9.20.0370

Oracle (BEA) Tuxedo® 10.3.0.0 Patch Level 043 (64-bit)

Oracle WebLogic Server™ 11*g* (10.3.5)

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Oracle (PeopleSoft) Pleasanton
5815 Owens Drive
P. O. Box 8018
Pleasanton, California 94588-8618
Tel 925/694-3000
Fax 925/694-3100
Email info@peoplesoft.com
World Wide Web http://www.oracle.com

ORACLE®

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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

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