

PEOPLESOFT ENTERPRISE CAMPUS SOLUTIONS 9.0 USING ORACLE FOR SOLARIS ON A SUN® SPARC Enterprise™ M4000 & Sun Blade X6270 Server Modules

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 Enterprise Campus Solutions 9 Benchmark	QuickTest Client Timers		
	Single User	5,000 Users	6,000 Users
Average Logon	0.57 sec	0.61 sec	0.64 sec
Avg. Load Student Center	0.63 sec	0.77 sec	0.78 sec
Avg. Page Load	0.67 sec	0.75 sec	0.82 sec
Avg. Page Save	1.06 sec	1.38 sec	1.57 sec
Batch Throughput			
10,000 Invoices		18.40 min	18.87 min
Invoices Printed/Hour		32,609	31,797
10,000 Transcripts		15.63 min	16.37 min
Transcripts/Hour		38,388	36,652

Approximately 96 GB of storage from one Sun Flash Accelerator F20 PCIe Card for indexes and hot tables and one 1.5 terabyte Sun StorageTek 2540 Array (RAID 0) was allocated to the database instance (~128 GB used for DB).

This benchmark measured the online performance for a large database model.

Testing was conducted in a controlled environment with no other applications running. The tuning changes, if any, were approved by Oracle Enterprise Development and will be generally available in a future update. **The goal of this Benchmark was to obtain reference response times for Campus Solutions Release 9 using Oracle 11g on Sun servers and Sun Blade Server Modules.**

BENCHMARK PROFILE

In January 2010, Oracle and Sun conducted a benchmark in Menlo Park, CA to measure the comparative online and batch performance of selected processes in Oracle's PeopleSoft Enterprise Campus Solutions 9 with Oracle 11g™ 11.1.0.7. A single 2-way Quad-Core (8 cores in all) Sun SPARC Enterprise M4000 server, running Solaris 10 10/09 was used for the database server. Two 2-way (16 cores total) Sun Blade X6270 Server Modules were used as Application Servers running Oracle® Enterprise Linux™ 4 Update 8. A single 2-way (8 cores total) X6270 was used as the Web Server and Process Scheduler.

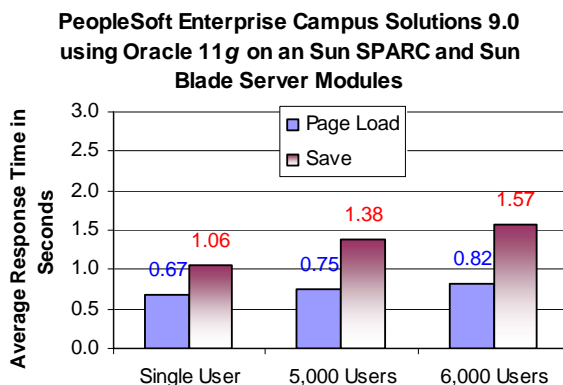


Figure 1: Oracle Enterprise Campus Solutions 9 Response Times

The weighted averages in Figure 1 correspond to the transaction proportions described in Table 1.

ONLINE METHODOLOGY

Hewlett-Packard LoadRunner® was used as the load driver, simulating concurrent users. It submitted a business transaction at an average rate of one every 10 minutes for each concurrent user to the application servers via the web servers.

Hewlett-Packard QuickTest® Professional was used to automatically submit transactions and to record the benchmark measurements on the client PC.

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. This benchmark was run using a physical 4-tier configuration; with the database server, the application servers, and the web server all being hosted on separate boxes. The Process Scheduler shared the same hardware as the web server.

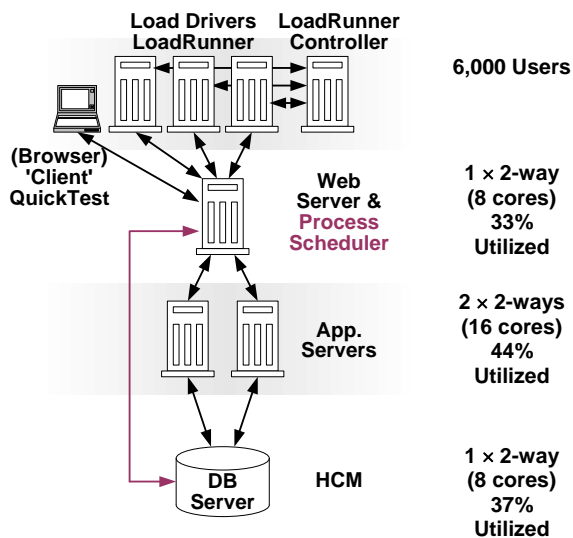


Figure 2: 4-Tier Configuration

Load times were measured from the time the user clicks a hyperlink or push button until the new HTML page has been rendered. Update times were measured from the time the user clicks the <SAVE> button until the new HTML page has been rendered.

Measurements were recorded on all of the servers when the user load was attained and the environment reached a steady state. The batch jobs were initiated about 25 minutes after LoadRunner started. QuickTest started about 35 minutes after LoadRunner.

BUSINESS PROCESSES

Oracle (PeopleSoft) defines a business transaction as a series of HTML pages that guide a user through a business process, such as creating a new business case.

The eight PeopleSoft Enterprise Campus Solutions 9.0 self-service processes tested in this benchmark are as follows:

CAMPUS SOLUTIONS

Accept/Decline Awards: - The student logs on and navigates to the Student Center page. They click on the “Accept/Decline Awards” link and accept, decline and reduce separate awards. The student completes the Accept/Decline Awards transaction and hits “Submit.”

Calculate Tuition: - The student logs on and navigates to the Student Center page. They click on the “Finances Section” link and navigate to the ‘Account Inquiry’ option. After viewing their balance, sign out.

Drop Class: - The student logs on and navigates to the Student Center page. They click on the “Drop a Class” link and enter the term and class id. The student completes the extensive enrollment options and hits “Save.”

Enrollment Backpack: - The student logs on and navigates to the Student Center page. They click on the “My Academic Requirements” link. The Academic Advisement engine runs to reassess degree progress data. The student reviews their degree progress data then sign out.

Add Class: - The student logs on and navigates to the Student Center page. They click on the “Add a Class” link and enter the term and class id for two separate classes. The student completes the extensive enrollment options and hits “Save.”

Load Student Center: - The student logs on and navigates to the Student Center page. They view some information then sign out.

Make A Payment: - The student logs on and navigates to the Student Center page. They click on the “Finances Section” link and navigate to the ‘Make a Payment’ option. Select ‘Pay by Credit Card’ and enter the credit card info and payment info. Hit “Save” and sign out.

Schedule Planner Validation: - The student logs on and navigates to the Student Center page. Navigate to the “Schedule Planner” page, enter the term and course numbers. Click to “Validate” the selected courses. Hit “Save” and sign out.

Process	% of Users	Avg. Pacing
Accept/Decline Awards	10%	10 min
Calculate Tuition	10%	10 min
Drop Class	10%	10 min
Enrollment Backpack	10%	10 min
Add Class	20%	10 min
Load Student Center	20%	10 min
Make a Payment	10%	10 min
Schedule Planner Validation	10%	10 min
Total	100%	

Table 1: Business Process Mix

Table 3 shows the proportions of the business processes used in the measurements of this benchmark. The proportions are intended to simulate a typical user scenario.

ONLINE PROCESS RESULTS

Table 2 shows the corresponding average QuickTest response times, in seconds, for each business process along with the overall averages.

Process	Single User	5,000 Users	6,000 Users
Accept/Decline Awards			
Logon	0.58	0.68	0.83
Load Student Center	0.62	0.67	0.77
Click Awards Link	0.65	0.60	0.59
(Awards) Page Load	0.62	0.63	0.58
Select Award 01	0.58	0.59	0.58
Submit Selection	0.58	0.59	0.57
Page (Selection) Save	0.77	1.25	1.47
Calculate Tuition			
Logon	0.58	0.58	0.62
Load Student Center	0.73	0.86	0.98
(Accounts) Page Load	1.5	2.27	2.49
Drop Class			
Logon	0.58	0.58	0.62
Load Student Center	0.62	0.75	0.74
Shopping Cart Page Ld.	0.69	0.81	0.70
Load Class Schedule	0.64	0.59	0.58
(Confirm Drop) Page Ld.	0.59	0.60	0.59
Page (Classes) Save	1.41	1.25	1.31
Enrollment Backpack			
Logon	0.58	0.57	0.62
(Require.) Page Load	1.51	2.69	2.96

Table 2a: Business Process Response Times

Process	Single User	5,000 Users	6,000 Users
Add Class			
Logon	0.57	0.67	0.68
Load Student Center	0.62	0.80	0.71
Load Shopping Cart	0.59	0.59	0.69
Load Preferences 01	0.69	0.60	0.58
Add Course 01 to Cart	0.59	0.59	0.58
Load Preferences 02	0.59	0.59	0.59
Add Course 02 to Cart	0.59	0.64	0.58
Load Related Class 01	0.59	0.59	0.59
Load Preferences 03	0.58	0.60	0.60
Add Course 03 to Cart	0.59	0.58	0.59
Load Preferences 04	0.59	0.59	0.64
Add Course 04 to Cart	0.59	0.63	0.59
Load Confirmation Page	0.64	0.85	1.35
Page (Classes) Save	1.09	1.59	1.85
Load Student Center			
Logon	0.58	0.57	0.62
Load Student Center	0.62	0.73	0.78
Make Payment			
Logon	0.57	0.62	0.57
Load Student Center	0.62	0.81	0.77
Page (Pay Details) Load	0.79	0.58	0.63
Page (Amount) Load	0.59	0.58	0.59
Load Confirmation Page	0.59	0.59	0.59
Page Save	0.95	1.20	1.36
Schedule Planner Valid			
Logon	0.58	0.57	0.56
Load Shopping Cart	0.61	0.67	0.67
Select Term	0.09	0.08	0.08
Load Class Sections 92	0.60	0.59	0.59
Load Pref. Page 92	0.59	0.58	0.58
Add Course 92 to Cart	0.59	0.58	0.58
Load Pref. Page 56	0.60	0.59	0.58
Add Course 56 to Cart	0.59	0.59	0.59
Load Pref. Page 12	0.06	0.06	0.06
Add Course 12 to Cart	0.58	0.59	0.58
Validate Shopping Cart	0.72	1.11	1.10
Weighted Logon	0.57	0.61	0.64
Weighted Load SC	0.63	0.77	0.78
Weighted Page Load	0.67	0.75	0.82
Weighted Page Save	1.06	1.38	1.57
Transactions / minute	n/a	500	600

Table 2b: Business Process Response Times

The database and application servers were processing a total of ~600 business processes per minute at the peak load of 6,000 concurrent users. The transaction rate is calculated by dividing the number of users by the corresponding pacing.

BATCH PROCESS RESULTS

10,000 Invoices and 10,000 Transcripts were processed.

	Print Invoice	Transcripts
	Single Stream	4 Job Streams
5,000 Users	18.40	15.63
6,000 Users	18.87	16.37

Table 3: Batch Run Times in Minutes

SERVER PERFORMANCE

PeopleSoft Enterprise Campus Solutions 9.0 using Oracle 11g on an Sun SPARC and Sun Blade Server Modules

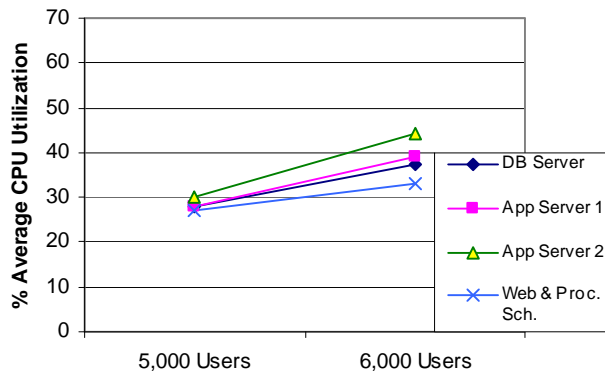


Figure 3: Average CPU Utilization

	5,000 Users	6,000 Users
DB Server	27.80%	37.29%
App Server 1	28.05%	39.20%
App Server 2	30.15%	44.18%
Web & Proc. Sched.	27.05%	33.08%
DB Server	20.96 GB	20.94 GB
App Server 1	4.21 GB	4.99 GB
App Server 2	4.39 GB	4.99 GB
Web & Proc. Sched.	6.03 GB	6.03 GB

Table 4: Average CPU and Memory Utilization

	5,000 Users	6,000 Users
DB Reads/Sec	66	71
DB Writes/Sec	220	264

Table 5: Average I/O Activity

DATA COMPOSITION DESCRIPTION

Table 6 summarizes the structure of the target organization.

Data Model	Large
Person records	600,000
Enrolled students	100,000
Employees	10,000
Student Career records	500,000
Courses in Course Catalog	5,000
Classes in Schedule of Classes	150,000
Student Enrollment records	10,000,000
SF Accounts	2,000,000
Item Types	2500
ITEM_SF lines	15,000,000
FA Student Award Records	2,000,000

Table 6: Selected Data Composition

Note that the Large Data Model represents five year's worth of history data.

BENCHMARK ENVIRONMENT

HARDWARE CONFIGURATION

A Sun SPARC® Enterprise™ M4000 was used as the database server. It was equipped with the following:

- 2 × 2.53 GHz SPARC64 VII Quad-Core processors, each with 5.5 Megabytes of Level-2 on-chip cache (8 cores total)
- 32 Gigabytes of Memory (~23.10 GB used at peak load)
- 1 × Sun StorageTek™ Dual-Port SAS Fibre Channel Host Bus Adapter (HBA)

One Sun Flash Accelerator F20 PCIe Card with 4 Flash Modules (FMODs) and one Sun StorageTek 2540 Array were used. The storage arrays were equipped with the following:

- 4 × 24 GB Enterprise-Class SLC Flash Modules in F20 PCIe Card, and 11 × 136.7 GB (RAID 0) SAS 15K RPM disk drives in ST2540 Array.
- ~1.6 Terabytes of total Flash and Disk Space available. Approximately 128 GB of RAID 0 storage used for this benchmark. The database size was ~70 GB.

Application Server(s):

2 × Sun Blade® X6270 Server Modules were used as the application servers. They were equipped with the following:

- 2 × 2.93 GHz Intel® Xeon™ 5570 Quad-Core processors, each with 8 Megabytes of shared Level 3 cache and 256 KB unified (data and instruction) L2 cache per core
- 24 Gigabytes of Memory
- ~119 GB of internal storage

Web Server(s) & Process Scheduler:

1 × Sun Blade® X6270 Server Module was used as the web server and process scheduler. It was equipped with the following:

- 2 × 2.8 GHz Intel® Xeon™ 5560 Quad-Core processors, each with 8 Megabytes of shared Level 3 cache and 256 KB unified (data and instruction) L2 cache per core
- 24 Gigabytes of Memory
- ~119 GB of internal storage

SOFTWARE VERSIONS

Oracle's PeopleSoft Enterprise Campus Solutions 9

Oracle's PeopleSoft Enterprise (PeopleTools) 8.48.16

Oracle 11g 11.1.0.7 (64-bit)

BEA Tuxedo 8.1 RP192

MicroFocus Server Express 4.0 SP4

Solaris 10 10/09 in database-tier

Oracle Enterprise Linux 4 Update 8 in web- and application-tiers
Linux version 2.6.9-89.0.0.1.ELsmp (mockbuild@ca-build10.us.oracle.com)

(gcc version 3.4.6 20060404 (Red Hat 3.4.6-11.0.1)) #1 SMP

Microsoft® Windows Server 2003 SP2 32-bit on load drivers

HP (Mercury) QuickTest Professional 9.2

HP (Mercury) LoadRunner 8.1 FP4

Microsoft® Windows® XP Professional Version 5.1 w/SP 2 (on the QTP client)

Microsoft Internet Explorer® 6.0 on the QTP client

BEA WebLogic Server™ 8.10 w/SP 6

Java version "1.4.2_08"

Java(TM) 2 Runtime Environment, Standard Edition (build 1.4.2_08-b03)

Java HotSpot(TM) Client VM (build 1.4.2_08-b03, mixed mode)

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