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Oracle Optimized Solution for Oracle WebCenter Portal—A Technical White Paper

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Introduction

The Oracle Optimized Solution for Oracle WebCenter Portal provides a complete, secure applications-to-disk Web portal reference architecture that combines highly scalable servers and leading-edge storage and networking technologies with best-of-breed software from Oracle. This paper describes the solution architecture, provides suggested sizing guidelines for configuration planning, and presents testing and performance characterization information. The technical testing was done using a combination of the following:

- Oracle WebCenter Portal 11*g* software
- SPARC T-Series server hardware
- Oracle Solaris

The architecture detailed in this paper showcases an optimized hardware infrastructure. The term *optimized* means that the hardware is highly performant, the operating systems and software architectures are fully tuned for best performance, and the management of the entire deployment is as efficient as possible to save ongoing time.

Architecture

The Oracle Optimized Solution for Oracle WebCenter Portal combines key components in computing, storage, networking, and software into a complete and integrated platform. It employs a traditional three-tier architecture shown in Figure 1.

The Web tier contains multiple Web servers and a load balancer to distribute user requests across the multiple servers. For the purposes of this paper, the Web tier is represented as a "load generation" tier using load generation software to mimic actual user load. The middle tier contains the Oracle WebCenter Portal 11*g* middleware servers and services as well as additional services usually found in a portal deployment (for example, content management and identity services). The database tier in this solution includes Oracle Database 11*g*. The architecture is flexible and scalable; and multiple servers can be added to each tier to address changing business requirements.

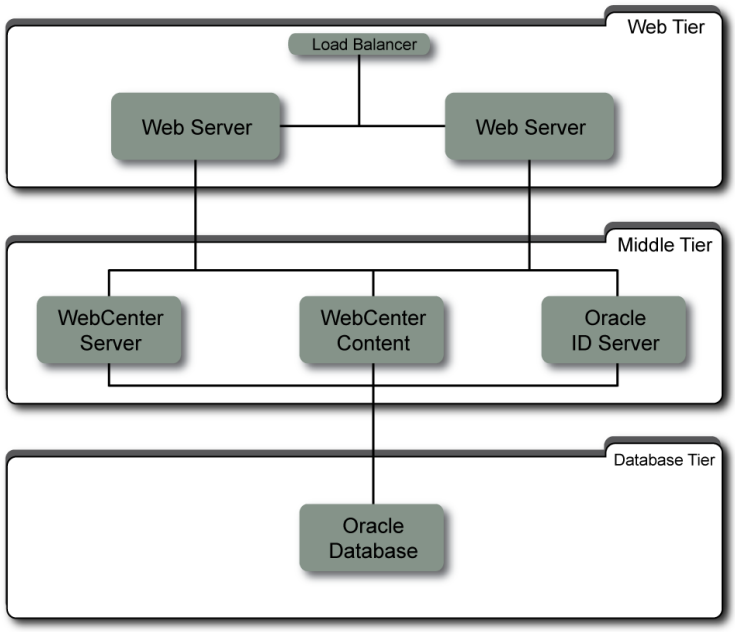

Figure 1 Architectural logical diagram.

Major hardware components of the Oracle Optimized Solution for Oracle WebCenter Portal include the SPARC T4-2 server for the portal tier, one SPARC T4-1 server for the database tier, and Oracle's Sun Storage 2540-M2 storage array (Fibre Channel) attached to the database. Major software components include Oracle WebCenter Portal 11*g*, Oracle Internet Directory 11*g* , Oracle WebCenter Content, Oracle Database 11*g*, and the Oracle Solaris 10 operating system. Figure 2 depicts the relationship among the hardware and software components.

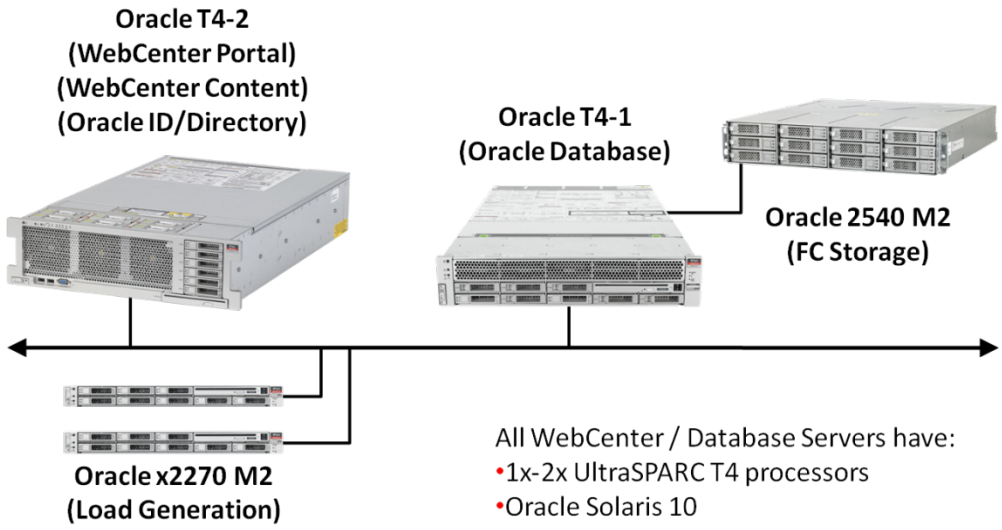

Figure 2. System architecture.

Hardware Components

lists the specific hardware components included in the solution described in this paper.

TABLE 1. HARDWARE COMPONENTS

COMPONENT	PRODUCT
Server hardware	SPARC T4-2 server (portal and other services) and SPARC T4-1 server (database) • 2.8 GHz processors (8 cores, 8 threads per core) • 128 GB memory on each server • Oracle Solaris 10 operating system
Networking	1 gigabit Ethernet (GbE) between all nodes
Storage	Fibre Channel-based Sun Storage array for database storage
Load balancer	Hardware load balancer (customer choice for client/customer tier)

SPARC T4 Processor

The SPARC T4 processor is Oracle's newest processor for the SPARC T-Series line of servers. The SPARC T4-1, T4-2, and T4-4 servers feature one, two, or four SPARC T4 processors with chip multithreading (CMT) technology, respectively. A full description of the capabilities of this server platform is beyond the scope of this paper, but additional information about these server platforms can be found through the Web links in the "References" section at the end of this paper.

The SPARC T-Series servers include on-processor cryptographic functionality that directly applies to the Oracle WebCenter Portal testing and is discussed in this paper. The high-performance cryptographic processing provides excellent scalability with from 300% to 500% faster transaction processing times for SSL transactions compared to other leading x86 processors at no added cost. (More details on transaction processing performance can be found in the testing section of this paper).

Software Components

Table 2 lists the specific software components included in the solution architecture. More information on these products can be found through the Web links in the "References" section at the end of this paper.

TABLE 2. SOFTWARE COMPONENTS

COMPONENT	PRODUCT
Web and application tier	Oracle WebCenter Portal 11*g*, Patch Set 4 running inside of Oracle WebLogic Server (application server)
Identity management	Oracle Internet Directory 11*g*
Content management	Oracle WebCenter Content
Database	Oracle Database 11*g*
Operating system	Oracle Solaris 10 9/10

Oracle WebCenter Portal

Oracle Web Center Portal 11*g*, is part of the Oracle WebCenter Suite portfolio and offers the portal capabilities of information aggregation and display for internal and external users/services.

Oracle Internet Directory 11*g*

Oracle Internet Directory 11*g*, an LDAPv3-compliant directory storage, provides data storage and synchronization services. Identity management was included in this testing because virtually all portal deployments are integrated with directory and identity services of some sort. So the inclusion of identity/directory lookups and authentication was a requirement for this testing.

Oracle Database 11*g*

Oracle Database 11*g* was used as the database repository for this testing.

Oracle Solaris 10

Oracle Solaris 10 provided the operating system platform for the Oracle WebCenter Portal testing. Oracle Solaris was used for its streamlined integration of virtualization as well as the use of the on-processor cryptographic functionality of the SPARC T-Series processors. Both of these features are discussed later in this paper.

Goals of This Paper

Oracle WebCenter Portal comprises numerous components and layers, and it can be used in a variety of ways in a wide range of usage scenarios. To get meaningful results, we chose to test the scalability of only the Oracle WebCenter Framework and Services with simple use cases so comparison can be made between different hardware configurations. Because there is such a variety of ways customers deploy Oracle WebCenter Portal, base Oracle WebCenter Framework and Services scalability was tested and is meant to demonstrate the core stability and scalability of the product.

Each use case was implemented through a custom Oracle WebCenter Portal application and deployed on a dedicated, managed server. Each application was stress tested and various tunings were done to fully utilize the CPU resources on the Oracle WebCenter Portal system. For each particular use case, the results provided information on the maximum throughput that the system under test could handle.

Application Test Driver Used

The tests involved ramping up a large number of concurrent users until CPU utilization approached 80% on the Oracle WebCenter Portal zone. The 80% threshold was chosen because that level allows for peaks in application load, while offering almost full utilization of the domain resources. Any load that would otherwise exceed 80% should use Oracle WebLogic Server clustering to add application server nodes to reduce overall load.

Virtualization was used throughout the tests. Oracle Solaris enables, as a no-added-cost feature, virtually unlimited numbers of Oracle Solaris Zones to be created, all sharing the same kernel. Each individual Oracle Solaris Zone in this instance was a "sparse root zone," meaning that patching of all zones on the server could be performed at once, sharing binaries and patches among all zones. A full description of the capabilities of Oracle Solaris Zones can be found in the Oracle Solaris documentation.

The Oracle WebCenter Portal zone was assigned a small number of hardware threads initially, and the number kept increasing as CPU usage became the bottleneck. The tests were run without think time, since the goal was to saturate the CPU as quickly as possible[1]. The duration of the run usually lasted between 10 and 30 minutes, depending on the number of users and the time delay for ramp-up and ramp-down times.

[1] Typical customer think times would be more than zero; thus, the numbers of supported users on a typical system would likely be much higher than reported here.

Test Configuration

As stated previously, all tests described in this document were done on Oracle Solaris and SPARC-based Sun servers from Oracle. The intention of the configuration was to drive the maximum amount of load on Oracle WebCenter Portal in order to characterize performance and scalability[2].

The following sections provide more detailed information on both the hardware and software setup along with guidance on how to most effectively utilize the system resources.

Hardware Configuration

Table 3 shows the hardware setup for the test. Each row represents a physical system and is labeled with the server model, operating system, and test software. All systems are currently shipping from Oracle as of this writing.

All servers are placed in the same subnet with dedicated GbE. Table 3 lists the specifications for each system.

TABLE 3. HARDWARE AS TESTED

SERVER MODEL	USED FOR	CPU	CORES/CPU	HARDWARE THREADS/CORE	TOTAL HARDWARE THREADS	MEMORY
SPARC T4-2	Oracle WebCenter Portal, LDAP, Oracle Universal Content Management	2x 2.8 GHz SPARC T4	8	8	128	128 GB
SPARC T4-1[3]	Database	1x 2.8 GHz SPARC T4	8	8	64	128 GB
Oracle's Sun Fire X2270 M2	Load generation	2x 2.93 GHz Intel Xeon 5670	6	1	12	96 GB

[2] This setup should not be taken as a recommendation for an actual deployment configuration but used as a starting point for specific testing on actual data as part of a sales interaction and investigation.

[3] The database server also had a Sun Storage 2540-M2 FC storage array with 12x 300 GB 15K RPM drives connected though an 8 GB Fibre Channel connection.

Software Configuration

All the systems were configured with Solaris 10 9/10. The Oracle Fusion Middleware components were installed on a single SPARC T4-2 server, and Oracle Database was installed on a separate SPARC T4-1 server with a direct-attach disk array. lists the software components used in these tests.

TABLE 4. TESTED SOFTWARE VERSIONS	
COMPONENT	**VERSION**
Oracle WebLogic Server	10.3.5
Oracle WebCenter Portal	11.1.1.5
Oracle HotSpot JVM (64-bit)	1.6.0_21
Oracle Internet Directory	11.1.1.4.0
Oracle WebCenter Content	11.1.1.4.0
Oracle Database 11*g* Release 2	11.2.0.1.0

Notes:

- The Discussion server is installed with Oracle WebCenter Portal and runs on the same machine (zone) as the Oracle WebCenter Portal.
- Oracle WebCenter Portal, the Discussion server, and Oracle WebCenter Content share the same Oracle Database 11*g* instance.
- Oracle Internet Directory (LDAP server) has its own Oracle Database 11*g* instance.

The Oracle WebCenter Portal test instance was preconfigured with users and groups before testing (no loading or creation of users was performed as part of this test).

Response times were measured during testing, and acceptable response time for transactions was considered to be 3 seconds or less.

Using Oracle Solaris Zones for Added Deployment Flexibility

As mentioned previously, the SPARC T-Series server has a large number of CPU hardware threads. To effectively use this system, Oracle Solaris Zones (also known as Oracle Solaris Containers) were used to "slice" the system into multiple virtual environments. Doing this not only isolates the environments but it also makes it easy to allocate resources, such as CPU and memory, to each Oracle Solaris Zone. Additionally, when an Oracle Solaris Zone becomes fully utilized, an additional zone can be provisioned and made available to the application, which is analogous to adding another physical system.

In the testing done for this paper, Oracle WebCenter Portal and Oracle WebLogic Server share the same zone on a SPARC T4-2 server. Oracle Internet Directory and Oracle Universal Content Management are deployed to separate zones on the same system. Oracle Database is deployed into its own zone on a different SPARC T4-1 server.

Table 5 details the Oracle Solaris Zones used for this testing.

TABLE 5. ZONE CONFIGURATIONS AS TESTED			
ZONE	SOFTWARE DEPLOYED	CPU THREADS ASSIGNED	MEMORY ASSIGNED
WCzone	Oracle WebCenter Portal, Oracle WebLogic Server	64	64 GB
LDAPzone	Oracle Internet Directory	32	16 GB
CMzone	Oracle WebCenter Content, Oracle WebLogic Server	32	16 GB
DBzone	Oracle Database	32	64 GB

It should be noted that Oracle Solaris Zones are very appropriate for more than just testing environments; they are used extensively in large enterprise production environments today.

In these tests, the overhead for running any of the software in an Oracle Solaris Zone was at most 1%.

Performance and Scalability Tuning

Using the application test driver described previously, the scalability tests were performed by injecting load from the load generation systems into the Oracle WebCenter Portal. The user load was then increased until the CPU cycles were saturated or until the observed response times were above acceptable limits (as described previously.)

The tests were done by applying various tunings to different components in the test configuration. Tuning details are listed next.

Recommended Tunings

With any complex Java application, tuning of each layer helps achieve optimal application performance and scaling. The following sections show the tunings that were done across each layer for these tests.

Oracle WebCenter Portal

Through profiling and experimentation, the following Java Virtual Machine (JVM) options have been found to provide good performance improvement.

Options used for tuning the SPARC T4 servers:

```
-d64 -server -Xms6g -Xmx6g -XX:PermSize=512m
-XX:MaxPermSize=1024m -XX:+AggressiveOpts
-XX:+UseParallelGC -XX:ParallelGCThreads=16
-verbose:gc -XX:+PrintGCDetails
-XX:+PrintGCTimeStamps -XX:NewRatio=4
-Xnoclassgc
-Xloggc:<file_name>
```

```
-Dweblogic.threadpool.MinPoolSize=1000

-Dweblogic.threadpool.MaxPoolSize=1000

-Dweblogic.security.SSL.ignoreHostnameVerification=true

-Djps.auth.debug=false
```

JDBC Datasource

The default connection pool capacity is too low, and it is recommended that the capacity be increased significantly higher based on the application's load pattern. The best way to observe whether the pool is big enough is to monitor the JDBC connection using the following steps.

1. From the Oracle WebLogic Administration Console, select **Environment → Servers → <server> → Monitoring → JDBC**.
2. Customize the table by adding **Waiting for Connection High Count** and **Waiting for Connection Failure Total**.

If the Wait for Connection High Count value significantly exceeds the connection pool capacity or there are a lot of errors under the Wait for Connection Failure Total, the connection pool capacity needs to be increased. In our test, the initial capacity was increased from 10 (default) to 100, and the maximum capacity was increased from 50 (default) to 500 with capacity increments of 10 instead of 1 (default).

To edit the JDBC datasource, do the following:

1. Log in to the Oracle WebLogic Server Administration Console.
2. From the Home page, select **Services**, **Data Sources**, and **WebCenterDS or mds-SpaceDS**, and then select the **Connection Pool** tab.
3. Edit properties, as required.

It is important that the Oracle WebLogic Server runs in Production Mode to avoid unnecessary class recompilation and loading. This option is selected during installation, but it can be changed after installation. To ensure that Oracle WebLogic Server runs in Production Mode, from the Oracle WebLogic Server Administration Console, select **domain → <domain_name>** and then select the **Production Mode** option. This option can also be enabled by adding the following option to the startup script:

```
-Dweblogic.ProductionModeEnabled=true
```

The following options also have some impact on performance:

```
-Dweblogic.SocketReaders=4

-Djps.auth.debug=false
```

To reduce the volume of data written to the log files (which can slow down the application), all occurrences of `loglevel` in `$MW_HOME/user_projects/domains`

/<domain_name>/config/fmwconfig/servers/WLS_Spaces/logging.xml should be changed to ERROR:1.

Oracle Internet Directory (OID)

The LDAP server attributes were changed to the following values.

```
Orclmaxcc = 10

orclserverprocs = 16

orclskipprefinsql = 1

orclgeneratechangelog = 0

orcllldapconntimeout = 60

orclmachdnenabled = 0
```

Oracle Database

Below are the options used for the database:

```
db_name = wcdb

db_block_size = 8192

db_cache_size = 20G

db_cache_advice = on

db_files = 200

open_cursors = 500

parallel_max_servers = 535

processes = 550

sessions = 1024

transactions = 1126
```

Oracle Solaris 10

Below are the Oracle Solaris network tunings for both the Oracle WebCenter Portal and Oracle Database zones.

Network tuning on the Oracle WebCenter Portal zone:

```
ndd -set /dev/tcp tcp_conn_req_max_q 16384

ndd -set /dev/tcp tcp_conn_req_max_q0 16384

ndd -set /dev/tcp tcp_xmit_hiwat 524288

ndd -set /dev/tcp tcp_recv_hiwat 524288
```

```
ndd -set /dev/tcp tcp_naglim_def 1
ndd -set /dev/tcp tcp_time_wait_interval 10000
ndd -set /dev/tcp tcp_smallest_anon_port 4096
```

Network tuning for Oracle Database zone:

```
ndd -set /dev/tcp tcp_conn_req_max_q 16384
ndd -set /dev/tcp tcp_conn_req_max_q0 16384
ndd -set /dev/tcp tcp_xmit_hiwat 524288
ndd -set /dev/tcp tcp_recv_hiwat 524288
ndd -set /dev/tcp tcp_naglim_def 1
ndd -set /dev/tcp tcp_time_wait_interval 10000
ndd -set /dev/tcp tcp_smallest_anon_port 4096
```

Observed Performance and Scaling

The graphs in the following sections show the scalability results for the different applications.

For any amount of hardware resources used in an application tier Oracle Solaris Zone (and, by extension, a SPARC T-Series server configured similarly), throughput, as measured in operations per second, initially increases almost linearly. At a particular point, the CPU hardware threads become saturated with work, response times increase, throughput drops, and the overall system grows less and less productive as load increases.

All tests were run both with and without SSL encryption to highlight the on-chip cryptographic capabilities of the SPARC T4 processor. Generally speaking, the overhead for the cryptographic calculations was around 6%. This is significantly (4x or more) faster than software-based cryptographic acceleration in competitor systems, and it is offered as a no-added-cost feature of SPARC T4-based platforms.

Note: The results below are based a single instance of Oracle WebCenter Portal running on a SPARC T4-2 server with LDAP and Oracle WebCenter Content on the same system, each in its own zone. The database runs in a zone on a separate SPARC T4-1 system.

Use Case #1: Blank Page

This use case shows a blank page with no Oracle Application Development Framework (Oracle ADF) component. It has a login page with user name and password form fields and a login button. If the login is successful, it shows a success page; otherwise, it shows an error page. The authentication is done against users residing on an external LDAP server.

This test was chosen because it represents a basic Web page as created in Oracle JDeveloper without any "assistance" frameworks, such as Oracle ADF. The next tests use Oracle ADF and, therefore, this use case collects a baseline for the upcoming tests.

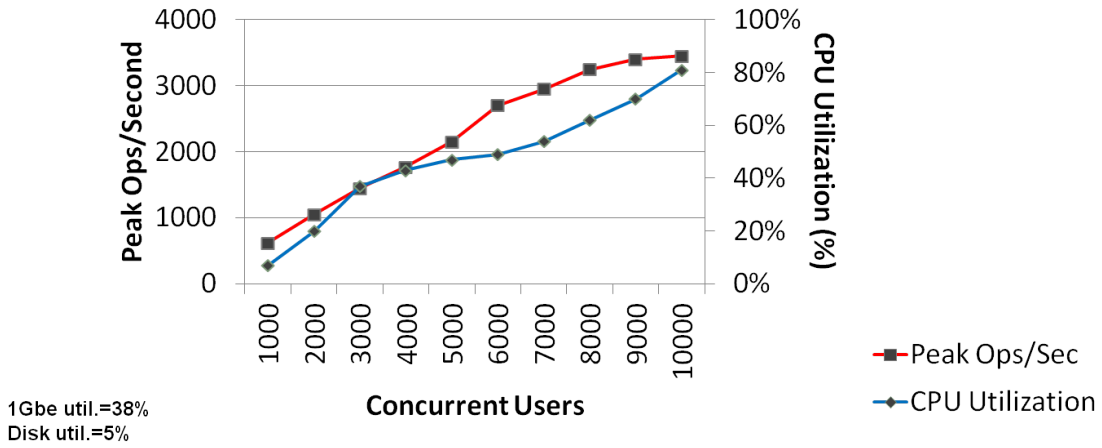

Figure 3. Blank login page without SSL enabled.

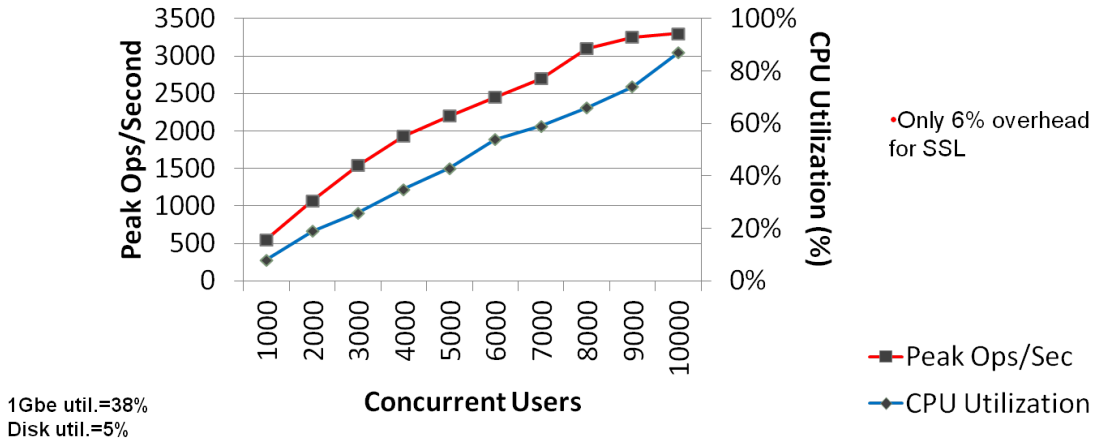

Figure 4. Blank login page with SSL enabled.

Use Case #2: Blank Page with Oracle ADF Template

This use case also shows a blank page but uses the Oracle ADF template. It has a login page with user name and password form fields and a login button. If the login is successful, it shows a success page; otherwise, it shows an error page. The authentication is done against users residing on an external LDAP server.

Here, Oracle ADF is used to create the same user experience as for use case #1. Oracle ADF is used as a development framework for display through Oracle WebCenter Portal, and it can be used to create very complex interactions that are integrated into many other enterprise applications. The results here show that the difference between raw HTML coding and the use of a development framework is negligible, with **both coding methods delivering statistically equivalent performance (lack of significant overhead)**.

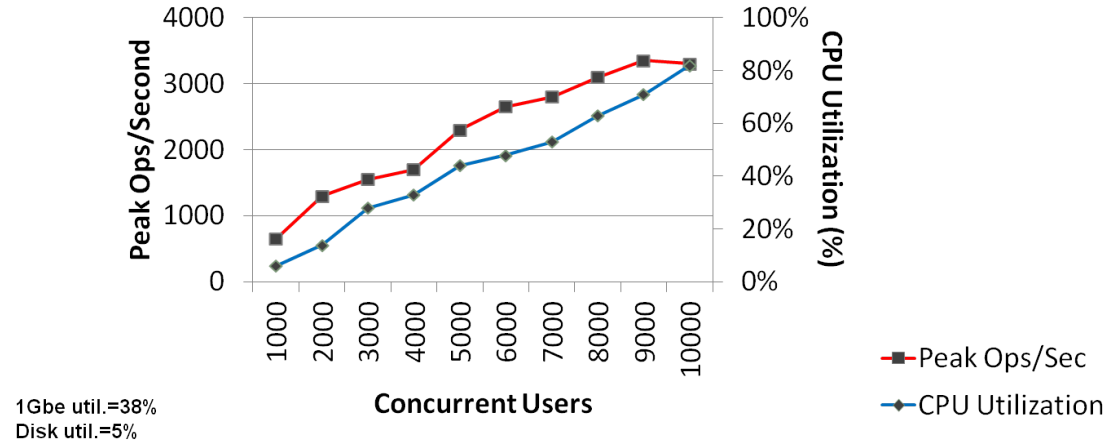

Figure 5. Blank login page with Oracle ADF and without SSL enabled.

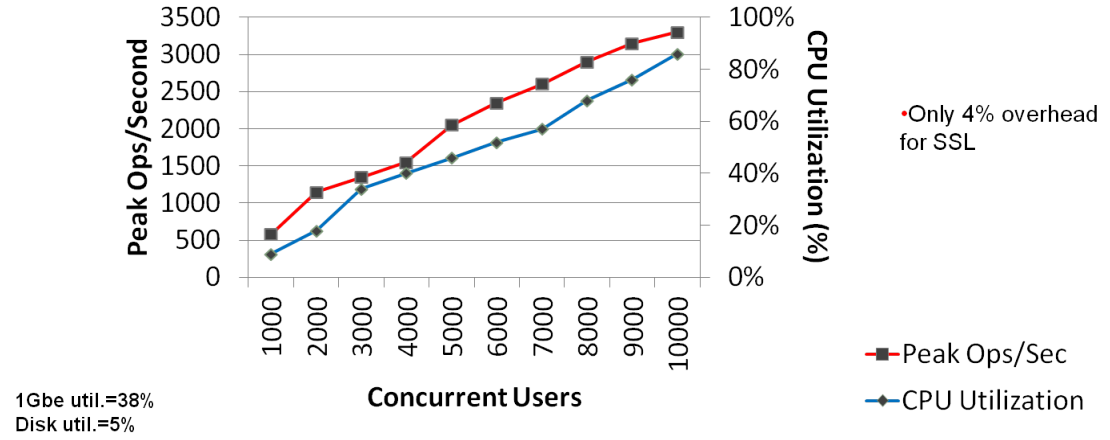

Figure 6. Blank login page with Oracle ADF and with SSL enabled.

Use Case #3: Blank Page with Oracle ADF Panel Stretch Layout

This use case also shows a blank page but it uses the Oracle ADF Panel Stretch Layout. It uses the same authentication as use case #2. It has a login page with user name and password form fields and a login button. If the login is successful, it shows a success page; otherwise, it shows an error page. The authentication is done against users residing on an external LDAP server.

The Oracle ADF Panel Stretch Layout adds more complexity to the tests by requiring rendering of the created Web pages. The previous test measured the performance of the login/logout systems of the Oracle WebLogic Server/Oracle WebCenter Portal itself without regard to presenting the results in a format the end user would understand. This test renders the output Web pages and, as such, it shows performance not only for login/logout, but also for the presentation engine that is responsible for actually displaying graphics and human-readable output to end users.

The results here show that performance of the rendered Web pages scales well[4] with the underlying authentication systems that handle logins and logouts. There is still significant overhead available on the networking and disk throughput to handle other applications as well during these tests.

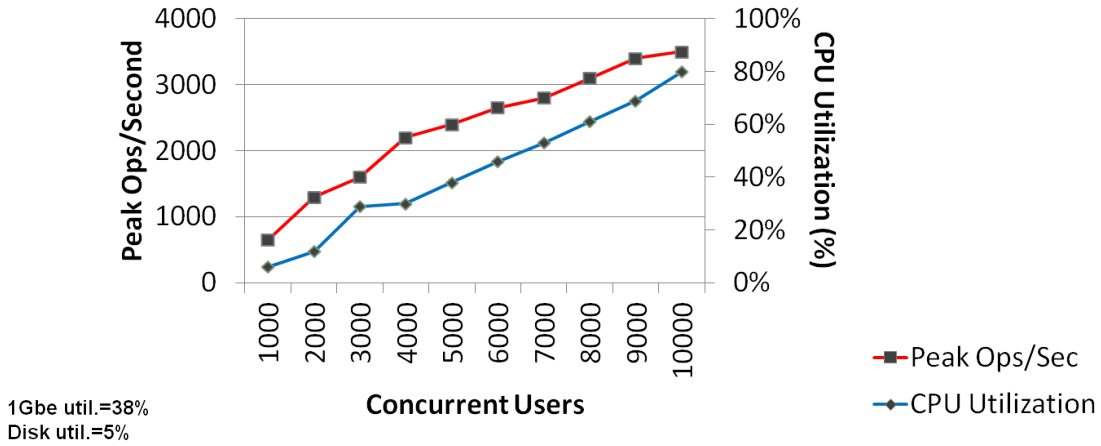

Figure 7. Blank login page with Oracle ADF Panel Stretch Layout and without SSL enabled.

[4] The previous graphs show a slight irregularity at 2000 to 4000 concurrent users. This is due to a garbage collection event that occurred at those test levels but then leveled out once the GC event did its job.

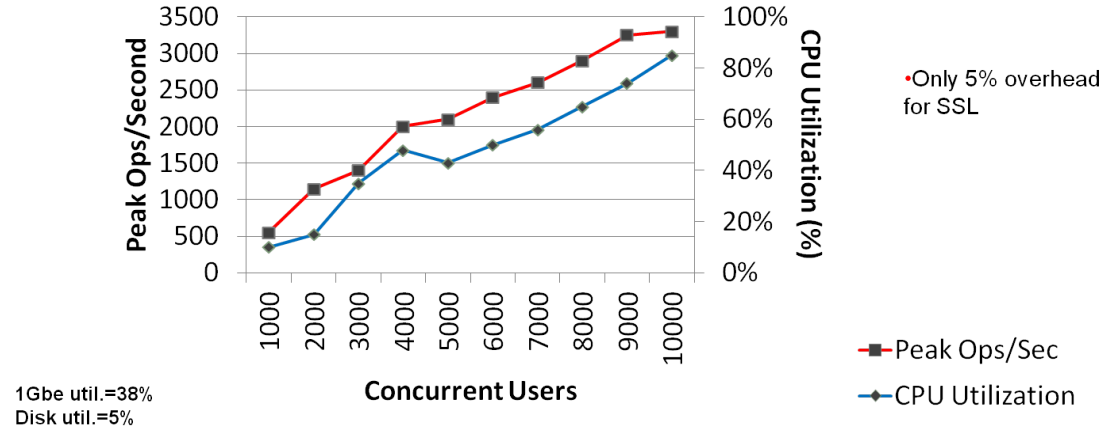

Figure 8. Blank login page with Oracle ADF Panel Stretch Layout and with SSL enabled.

Use Case #4: Oracle WebCenter Suite Spaces Feature

This use case tests the scalability of the out-of-the-box default installation of the Spaces feature of the Oracle WebCenter Suite. The Spaces feature provides multiple tabbed groups for users to perform many tasks. This use case is the most heavyweight of the tested applications because there are many components working simultaneously including back-end features (login authentication and so on), as well as front-end Web page rendering and presentation.

The user logs in to the site and then traverses all the tabs presented on the home page (Activities, Documents, Spaces, and My Profile), and then the user logs out. These tabs represent significant presentation layer access, as well as underlying infrastructure access. As such, the number of concurrent users drops significantly compared to the previous lightweight tests, but the number of concurrent users is still **far higher than with the previous generation of server and software platforms (there is more on this in the "Conclusion" section)**.

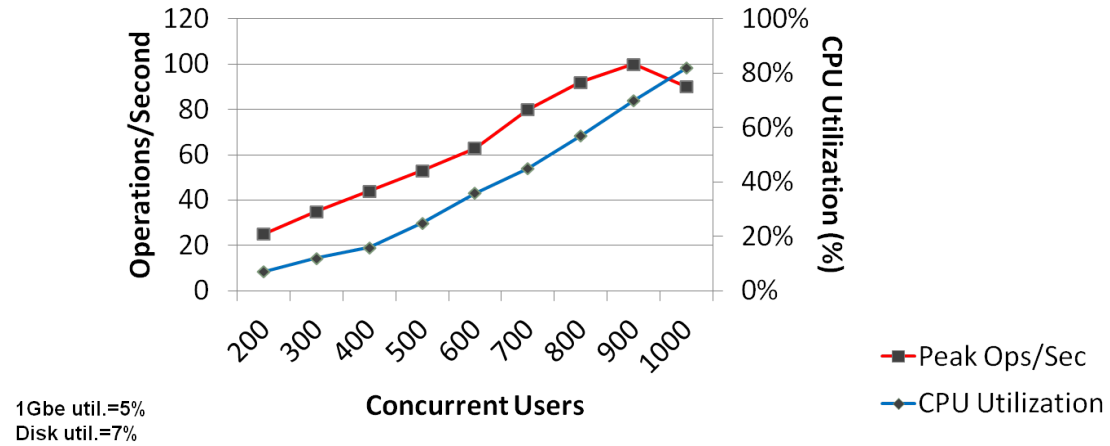

Figure 9. Spaces without SSL enabled.

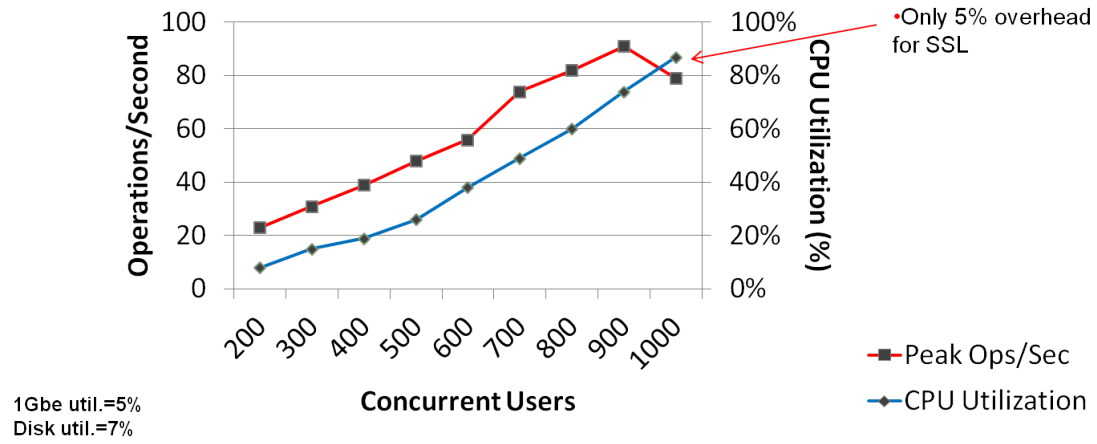

Figure 10. Spaces with SSL enabled.

Notes on Performance

Network Utilization

The maximum network utilization for Spaces is 5% and in use case #1 through #3, it is 38% of the single GbE.

Disk I/O for the Database

The maximum disk utilization for Spaces is 7% and in use cases #1 through #3, it is 5% of the disk throughput capacity.

Note on Scalability

Spaces scales almost linearly up to 900 users, and the throughput drops after that with a CPU utilization of around 80%. The application does not have an I/O or network bottleneck, and it was able to utilize most of the CPU resources in the zone.

Use cases #1 through #3 behave almost the same. The throughput reaches around 3500 ops/sec without SSL enabled and around 3300 ops/sec with SSL enabled, with a CPU utilization of around 80% without SSL enabled and 90% with SSL enabled. The scaling gradually tapers off as the number of users increases. Based on the statistics collected, these applications do not have disk I/O or network bottlenecks.

Example Configurations Based on Testing

Based on the previous performance results, some suggestions can be made to shrink or grow the underlying hardware to fit customer deployment sizes.

Note: Only the "Departmental" use case was tested. Other smaller and larger configurations are listed here as educated guesses based on experience from scaling Oracle WebCenter Portal during testing. Any actual deployment would require customer validation before deployment regardless of the size chosen.

lists example sizing configuration information for small, departmental, and enterprise deployments ranging from 200 to 4,000 total users. This sizing information is provided as a starting point for configuration planning.

TABLE 6. SIZING CONFIGURATIONS FOR HEAVIEST USE CASE (ORACLE WEBCENTER PORTAL SPACES FEATURE)

	SMALL DEPARTMENTAL	DEPARTMENTAL	ENTERPRISE
TOTAL USERS	10,000	35,000	50,000+
CONCURRENT USERS	500	2700	10,000
ACTIVE CONCURRENT USERS	170	900	3600
WEB TIER	SPARC T4-1 server 32 GB RAM	Oracle's x86 Sun Blade modular system (Oracle Solaris 10 or 11) 16 GB memory	
PORTAL TIER, INCLUDING CONTENT MANAGEMENT		1x SPARC T4-2 server 128 GB RAM	1x SPARC T4-4 server 1 TB RAM
DATABASE TIER	1x SPARC T4-1 server 64 GB RAM	1x SPARC T4-1 server 128 GB RAM	1x SPARC T4-2 server 512 GB RAM
STORAGE	Sun Storage 2540-M2 FC Array		Oracle's Pillar Axiom storage system

When choosing systems for Oracle WebCenter Portal deployments, organizations have a choice of servers. The tested architecture in this study uses one SPARC T4-2 server to run the portal software and the identity/content management (ID/CM) software components. Splitting the infrastructure so that the portal runs on a single-processor system (SPARC T4-1 server) and the ID/CM components run on another SPARC T4-1 server is completely acceptable.

Larger configurations with greater processing demands are better served with a dedicated system for each logical component. Enterprise-level configurations are typically configured with dual systems in a clustered environment to provide greater performance and reliability.

The flexible and modular architecture allows organizations to start small and grow as needed to meet changing business priorities. Virtualization technologies built into Oracle Solaris and Oracle VM server virtualization software make it easy to quickly create new virtual environments and provision new servers to meet changing workload demands.

Conclusion

Significant performance and scaling improvement was observed on Oracle Solaris and SPARC-based servers by using several basic system and product settings. The extreme parallelism afforded by Oracle's SPARC T-Series servers is well suited for all portal use cases. The test results shown in this paper showcase a performance **improvement of over 2x** compared to the previous generation of SPARC T-Series servers and Oracle WebCenter Portal software. In all tests, scalability of the SPARC T4-based solution offers a jump from 500 concurrent users to 900+ concurrent users running the same tests.

Oracle Solaris Zones have proven to be a very useful mechanism for both testing and actual deployment of pieces of large software stacks. The testing described in this paper demonstrated the use of Oracle Solaris Zones on SPARC T-Series servers for Oracles WebCenter Portal, Oracle WebLogic Server, Oracle Internet Directory, Oracle Universal Content Management, as well as Oracle Database. All components can be scaled to multiple instances without the need to necessarily add additional hardware, which is a competitive differentiator in favor of Oracle Solaris.

Based on the testing in this paper, Oracle recommends the SPARC T-Series servers as the premier platform for running high-performance portal-based workloads. Scalability tuning and performance tuning show that no single place in the architecture is a "weak spot." The Oracle Optimized Solution for Oracle WebCenter Portal offers well-rounded performance for Oracle WebCenter Portal deployments that scale up from small to large numbers of uses, while offering features from the operating system and hardware that do not exist on other platforms.

References

Table 1 provides links to additional information.

TABLE 7. REFERENCES FOR MORE INFORMATION

DESCRIPTION	URL
Oracle WebCenter Portal	http://www.oracle.com/us/products/middleware/webcenter/portal/overview/index.html
Oracle Optimized Solutions Website	http://www.oracle.com/optimizedsolutions
Oracle's Sun server and storage systems	http://www.oracle.com/us/products/servers-storage/index.html
SPARC T-Series servers	http://www.oracle.com/us/products/servers-storage/servers/sparc-enterprise/t-series/overview/index.html
Oracle Solaris	http://www.oracle.com/us/products/servers-storage/solaris/solaris11/overview/index.html
Oracle Database	http://www.oracle.com/us/products/database/index.html

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Author: Nick Kloski, Robert Lor

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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