

# Accelerating Oracle's PeopleSoft Applications

Achieving World-Record Performance on  
Oracle's SPARC T7 and M7 Servers.

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## Introduction

Organizations increasingly depend on Oracle's PeopleSoft applications to provide sophisticated enterprise resource planning (ERP) capabilities to meet their growing needs. PeopleSoft applications provide innovative business and industry solutions and powerful ERP modules that are designed to address the most-complex business requirements. At the same time, deploying high-performance infrastructure that scales with the business requires a comprehensive approach that combines hardware and software into secure and effective solutions.

Oracle's SPARC M7 processor-based servers represent an ideal technology platform for deploying PeopleSoft applications. The following results of benchmark testing conducted by Oracle demonstrated that Oracle's SPARC T7-2 and SPARC M7-8 servers, which are both based on Oracle's SPARC M7 processor, can support multiple tiers for mission-critical enterprise applications, when combined with Oracle VM Server for SPARC virtualization technology:

- » **PeopleSoft Financials 9.2 on the SPARC T7-2 server.** The SPARC T7-2 server has set a world record for PeopleSoft Enterprise Financials 9.2 General Ledger (GL) Journal Edit and Post (with combination editing) processing 200 million journal lines in 18.60 minutes at 10,742,688 journal lines per minute. Testing utilized only the resources of a single SPARC M7 processor for both PeopleSoft Enterprise Financials and Oracle Database, resulting in only 62 percent CPU utilization. This result was accomplished using Oracle's integral virtualization technology including Oracle VM Server for SPARC and Oracle Solaris Zones.
- » **PeopleSoft Human Capital Management 9.1 FP2 on the SPARC M7-8 server.** The SPARC M7-8 server has set a world-record, two-chip PeopleSoft Human Capital Management benchmark result. Testing placed PeopleSoft Human Capital Management workloads on a two-CPU logical domain (LDom) with 1 TB of memory, utilizing Oracle VM Server for SPARC and Oracle Solaris Zones. Testing supported 35,000 Human Resources self-service online users with response times under one second while simultaneously running a Payroll batch workload with a database of 500,480 employees. In addition, a second identical two-CPU LDom ran the same PeopleSoft Human Capital Management benchmark concurrently, and matched the world record.

Together these benchmarks demonstrate that multitier applications can be deployed effectively on the same physical SPARC M7 processor-based server, with record-breaking performance as well as security, and availability—allowing for simpler and more-dynamic management of system resources. Together with Oracle virtualization technology, these SPARC servers provide enterprise applications with high availability and no-compromise security, and each application is executed on its own environment independent of the others.



## Oracle's SPARC M7 Processor–Based Servers

Ideal for PeopleSoft applications, SPARC M7 processor–based servers power the real-time enterprise, allowing organizations to compete in today's digital marketplace, save money and time, and boost their bottom line. At the same time, Oracle's technology innovation creates value and drives lower costs and higher ROI for organizations. Based on SPARC M7 processor advances, the server family provides new levels of performance and throughput. The server models have from one to 16 SPARC M7 processors, and constitute a flexible and extensible product family with very high levels of system integration to help improve security, lower costs, and increase reliability. An optimized system design provides support for all enterprise services and application types. Uniformity of management interfaces and the adoption of standards also help reduce administrative costs, while an innovative chassis design provides density, efficiency, and economy for modern data centers.

### SPARC M7 Processor

With Oracle's new Software in Silicon capabilities and innovative cache and memory hierarchy, the SPARC M7 processor delivers dramatically higher processing speed and revolutionary protection against malware and software errors. The 32-core SPARC M7 processor is binary-compatible with earlier SPARC processors and offers up to 256 hardware threads—more than any other available multicore processor. It is particularly ideal for virtualized PeopleSoft applications as well as for cloud computing environments, supporting a large number of virtual machines and delivering excellent multithreaded performance. The processor enables organizations to rapidly scale the delivery of new network services with maximum efficiency and predictability. To help facilitate commercial workloads with appropriate levels of throughput, the SPARC M7 processor implements a new cache and memory hierarchy coupled with other improvements that can provide up to triple the processing speed of previous-generation processors. Power management improvements are also key to the increased in-system performance, and dynamic voltage frequency scaling (DVFS) is provided to reduce power consumption and heat generation.

### Security in Silicon

The Silicon Secured Memory feature of the SPARC M7 processor provides real-time data integrity checking to guard against pointer-related software errors and malware. It replaces very costly software instrumentation with low-overhead hardware monitoring. Silicon Secured Memory enables applications to identify erroneous or unauthorized memory access, diagnose the cause, and take appropriate recovery actions. The SPARC M7 processor incorporates hardware units that accelerate specific software functions or primitives. Eight on-chip accelerators offload database query processing and perform real-time data decompression. Through the In-Memory Query Acceleration feature, the processor delivers performance that is up to ten times faster compared to other processors, and the In-Line Decompression feature allows up to three times more data to be stored in the same memory footprint, without any performance penalty. The SPARC M7 processor also has Crypto Instruction Accelerators integrated directly into each processor core. These accelerators enable high-speed encryption for over a dozen industry-standard ciphers, eliminating the performance and cost barriers typically associated with end-to-end secure computing. When employed across all layers of the Oracle stack, the M7 built-in cryptography enables end-to-end encryption without the typical cost and performance penalty.

### SPARC T7-2 Server

The SPARC T7-2 server features dual SPARC M7 processors and up to 1 TB of memory housed in a three-unit (3U) rackmount enclosure. The server includes eight low-profile PCIe 3.0 expansion slots, accessible from the rear of the system. The six 2.5-inch small form factor (SFF) front-loading drive bays are supported by two onboard 12 Gb/sec SAS host bus adapters (HBAs)—split two and four across the HBAs—that provide RAID 0 and RAID 1 protection. Factory-configured options are available to support up to four 2.5-inch SFF Non-Volatile Memory Express (NVMe) drives. Mixing SAS and NVMe drives is supported.

## SPARC M7-8 Server

The SPARC M7-8 server is designed to support demanding modern cloud infrastructures. The server is ideal for database and mission-critical commercial business applications requiring operational efficiency, reliability, and scalability. The server supports up to eight SPARC M7 processors (256 cores) and up to 4 TB of memory. The large memory footprint and outstanding memory bandwidth of the SPARC M7-8 server make it ideal for deploying database and enterprise PeopleSoft applications with extreme performance and capacity.

Based on an innovative new CPU, memory, and IO unit (CMIOU) chassis, the SPARC M7-8 server provides additional scalability, data center features, and functionality making it ideally suited for demanding business and data center applications. The server scales effectively to support larger numbers of SPARC M7 processors and memory capacities, while offering additional features to extend reliability and availability. While the SPARC M7-8 server allows for up to eight SPARC M7 processors to be configured in a single physical domain (PDom), its considerable resources can be easily partitioned and deployed, as required, using Oracle VM Server for SPARC and Oracle Solaris Zones virtualization technologies.

### Oracle Virtualization Technology

Oracle servers are specifically designed for virtualization, and Oracle provides advanced no-cost virtualization technology.

- » **Physical domains (PDOMs).** PDOMs on Oracle's SPARC M7-8 and M7-16 servers provide IT organizations with the ability to divide a single hardware system into multiple security- and fault-isolated servers. The SPARC M7-8 server can be ordered from the factory with two PDOMs. SPARC M7-16 servers can be reconfigured via software to include one, two, three, or four PDOMs. With proper configuration, hardware or software faults in one domain remain isolated and unable to impact the operation of other domains.
- » **Logical domains (LDOMs).** Like prior generations of SPARC processors, the SPARC M7 processor supports a multithreaded hypervisor that enables the creation of LDOMs within a single PDOM, or within a single server in the case of the SPARC T7-1, T7-2 and T7-4 servers. Supported in all servers that use Oracle's multicore/multithreaded technology, Oracle VM Server for SPARC provides full virtual machines that run an independent operating system instance. Each operating system instance contains virtualized CPU, memory, storage, console, and cryptographic devices.
- » **Oracle Solaris 11 Zones.** Oracle Solaris Zones provide a unique partitioning technology that can be used to create an isolated and secure environment for running applications. A zone is a virtualized operating system environment created within a single instance of Oracle Solaris. Oracle Solaris Zones can be used to isolate applications and processes from the rest of the system. This isolation helps enhance security and reliability, because processes in one zone are prevented from interfering with processes running in another zone.

## PeopleSoft Financials on the SPARC T7-2 Server

Oracle's PeopleSoft Financials reduces costs by automating, centralizing, and standardizing global transactional processes. Organizations can manage risk and reduce compliance costs with end-to-end processes for governance, risk, and compliance. The unified approach also allows making the right investments in the business with integrated performance management and business intelligence.

### Architecture

To evaluate the efficacy of the SPARC T7-2 server for PeopleSoft Financials, Oracle configured a SPARC T7-2 server with two LDOMs—one per SPARC M7 processor—using Oracle VM Server for SPARC. The benchmark testing was conducted within a single LDOM, while the other LDOM remained inactive. As shown in Figure 1, Oracle Solaris Zones were used to further partition the LDOM, with a zone each being dedicated to an instance of Oracle Database 11g Release 2 and PeopleSoft Financials 9.2.

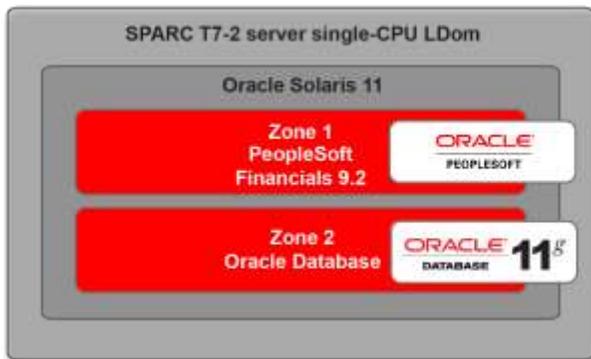


Figure 1. The SPARC T7-2 server was configured to run PeopleSoft Financials and Oracle Database on a single SPARC M7 CPU.

## World-Record Benchmark Results

The PeopleSoft Enterprise Financials 9.2 benchmark emulates a large enterprise that processes and validates a significant number of financial journal transactions before posting the journaled entries to the ledger. The validation process certifies that the journal entries are accurate, helping to ensure that ChartFields values are valid, debits and credits are equal, and inter/intra-units are balanced.

Once validated, the entries are processed, ensuring that each journal line posts to the correct target ledger. The journal status is then changed to “posted.” In this benchmark, the Journal Edit and Post is configured to edit and post both Inter-Unit and Regular multicurrency journals. The benchmark processes 200 million journal lines using AppEngine for edits and Cobol for post-processes. The back-end database is nearly a terabyte in size.

Under Oracle testing, the single-CPU LDom on a SPARC T7-2 server was utilized at only 62 percent, indicating considerable processor headroom remaining. The server demonstrated excellent performance under test, including

- » Executing 200 million General Ledger Journal Edit and Post batch jobs (lines) in 18.6 minutes for a world record
- » Executing 10,752,688 General Ledger Journal Edit and Post batch jobs (lines) per minute, performing highly competitive Journal processing for Ledger

## Configuration Details

The LDom under test was configured to utilize the resources of a single 4.13 GHz SPARC M7 CPU in a SPARC T7-2 server, 512 GB of memory, and four internal disk drives. In addition, four Oracle Flash Accelerator F160 PCIe Cards—each with 1.46 GB of flash memory—were installed in the server to service database redo logs, undo logs, and data. Oracle Flash Accelerator F160 PCIe Card offers high performance with low latency. It has a low CPU burden and interfaces to the SPARC T7-2 server via the server’s PCIe 3.0 slots.

Software configured on the system included

- » Oracle Solaris 11 SRU 11.3
- » Oracle Database 11g Release 2 (11.2.0.4)
- » Oracle’s PeopleSoft PeopleTools 8.53.09
- » PeopleSoft Financials 9.20.348 and PeopleSoft supply chain management 9.20.348
- » Oracle Tuxedo, version 11.1.1.3.0, 64-bit
- » Java version 1.7.0\_45
- » Java SE Runtime Environment (build 1.7.0\_45-b18)
- » Java HotSpot 64-bit Server VM (build 24.45-b08, mixed mode)

## Oracle's PeopleSoft Human Capital Management on the SPARC M7-8 Server

Oracle's PeopleSoft Human Capital Management enables organizations to architect a global foundation for human resources (HR) data and improved business processes. It delivers a robust set of best-in-class human resources functionalities that enables organizations to increase productivity, accelerate business performance, and lower cost of ownership. As a demanding multitiered application, PeopleSoft Human Capital Management is ideally matched to the considerable processor and memory resources of the SPARC M7-8 server.

### Architecture

To evaluate the SPARC M7-8 server for PeopleSoft Human Capital Management, the server was configured with two LDom, as shown in Figure 2. Each LDom ran an instance of Oracle Solaris 11, and was configured to utilize the resources of two SPARC M7 processors. Each Oracle Solaris instance was then subdivided via Oracle Solaris Zones as follows:

- » One zone was provided for Oracle WebLogic Server
- » One zone was provided for Oracle Database 11g
- » Two separate zones were provided for PeopleSoft Human Capital Management

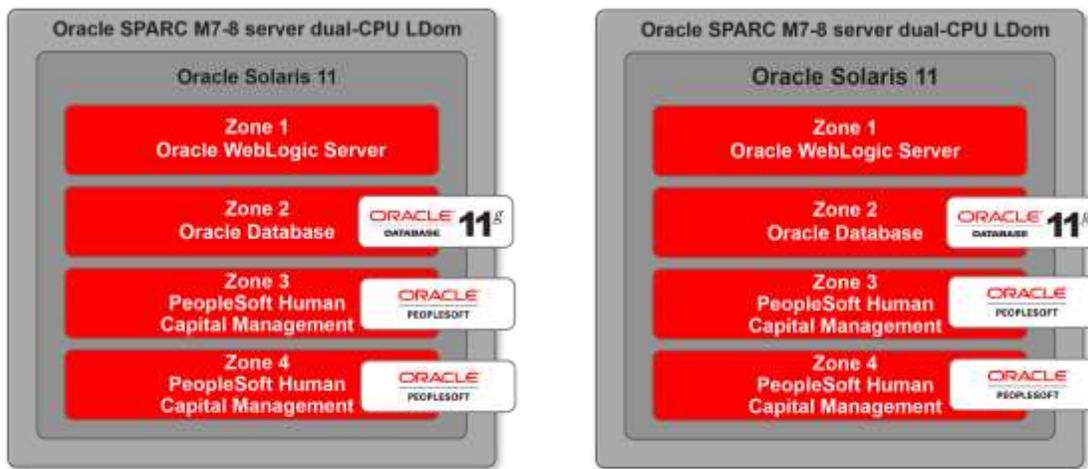


Figure 2. Two dual-CPU SPARC M7-8 LDom were configured with four Oracle Solaris Zones each to isolate software components.

### World-Record Benchmark Results<sup>1</sup>

The PeopleSoft Human Capital Management benchmark simulates thousands of online employees, managers, and Human Resource administrators executing transactions typical of a Human Resources self service application for the enterprise. Typical transactions include viewing paychecks, hiring and promoting employees, and updating employee profiles. For this testing, the database tier employed a database instance approximately 500 GB in size

<sup>1</sup> A single two-chip LDom on the SPARC M7-8 server demonstrated four times better Search and six times better Save response times running almost double the number of online users along with Payroll batch, compared with a combination of a single four-chip Cisco UCS B460 M4 server and three two-chip Cisco UCS B200 M3 servers (total 10 chips). Using only a single chip in a two-chip LDom on the SPARC M7-8 server, the batch-only test demonstrated 2.3 times better batch elapsed times and throughput (payments per hour) compared to a nine-chip IBM z196 server. The record result also demonstrates that an LDom of two SPARC M7 processors in a SPARC M7-8 server can run the same number of online users as a dynamic domain (PDom) of eight SPARC M6 processors in a SPARC M6-32 server—with better response times, batch elapsed times, and batch throughput.

that contained information on 500,480 employees. For testing, identical workloads were run concurrently in two LDomS to demonstrate scaling utilizing Oracle's no-cost no-overhead virtualization technology.

Three separate tests were conducted, varying the workload configurations as follows:

1. Human Resources Self-Service (OLTP) and Payroll NA (batch) workloads run concurrently in each LDom.
2. Human Resources Self-Service (OLTP) workloads run simultaneously in both LDomS.
3. Payroll NA (batch) workloads run simultaneously in both LDomS.

The flexibility of Oracle's no-cost virtualization technology allowed the number of zones and cores to be varied as was deemed appropriate for each of the tests, as is described in the sections that follow.

### Running Concurrent OLTP and Batch Workloads

To evaluate a mixed workloads scenario, OLTP and batch workloads were run concurrently in both configured Oracle Solaris 11 LDomS, as depicted in Figure 3. The figure indicates the processor cores and threads that were dedicated to each zone within the LDom. In addition, two cores were dedicated to network and disk interrupt handling. Each LDom served 35,000 Human Resources Self-Service users while processing batch payroll transactions for 500,480 users. The system concurrently delivered the following world-record results:

- » Batch payroll processing was completed for 500,480 employees in only 23 minutes.
- » Human Resources Self Service transactions supported 35,000 Human Resources self-service online users per LDom at an average user Search Time of 0.67 seconds and Save Time of 0.42 seconds.

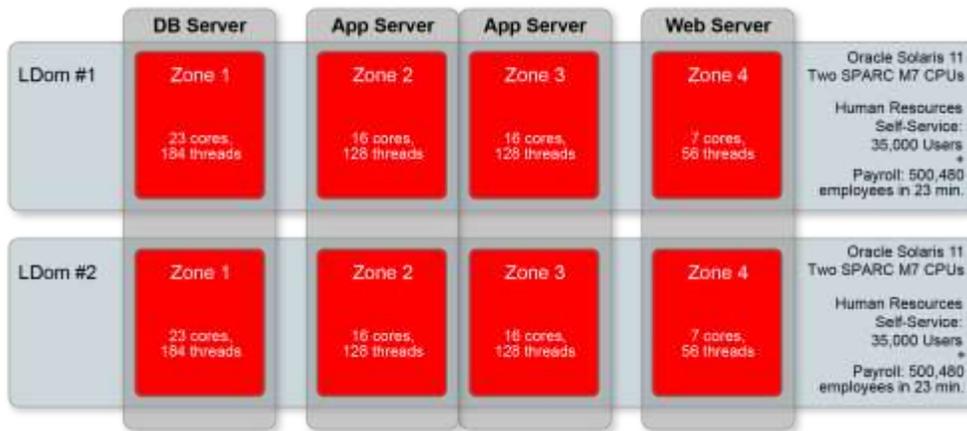


Figure 3. Mixed workloads served 35,000 simulated OLTP users per LDom while processing 500,480 batch transactions in 23 minutes, with both LDomS returning identical results.

### Running Dedicated OLTP Workloads

Testing was then repeated, running dedicated PeopleSoft Human Capital Management OLTP workloads in both of the LDomS on the SPARC M7-8 server. Again, two LDomS were used, with differing numbers of cores assigned to individual zones as compared to the concurrent OLTP and batch testing (Figure 4). In addition, two cores were dedicated to network and disk interrupt handling. In this case, 40,000 Human Resources Self-Service users were serviced with an average Search Time of 0.55 seconds and Save Time of 0.33 seconds. Both LDomS returned equivalent results.



Figure 4. Dedicated OLTP workloads served 40,000 simulated Human Resources Self Service users per LDom with a Search Time of under one second.

### Running Dedicated Batch Workloads

The testing was then repeated with simultaneous batch payroll workloads running in the two LDom on the SPARC M7-8 server, as shown in Figure 5. In this case, only a single SPARC M7 chip was used within the two-chip LDom. One core was also dedicated to interrupt handling. Each LDom was able to process payroll for 500,480 employees in only 13 minutes. Both LDom returned equivalent results.



Figure 5. A dedicated batch configuration processed 500,480 payroll records in only 13 minutes.

### Configuration Details

The SPARC M7-8 server used in this testing was configured with eight 4.13 GHz SPARC M7 processors and 4 TB of memory. Two processors were dedicated to each of the two LDom used for running the PeopleSoft Human Capital Management testing. The remaining four processors were configured in their own LDom, and were not utilized as a part of this testing. In the application tier on each LDom, five PeopleSoft domains with 350 application servers (70 per domain) were hosted in the two separate Oracle Solaris Zones for a total of 10 domains with 700 application server processes. All database data files, recovery files, and Oracle Clusterware files for the PeopleSoft test were created with the Oracle Automatic Storage Management (Oracle ASM) volume manager. The Oracle ASM



integrated storage management solution provides ease of management. All PeopleSoft application processes and the 32 Java Virtual Machine (JVM) instances were executed in the Oracle Solaris FX scheduler class. The Oracle Log Writer process was executed in the Oracle Solaris RT scheduler class.

### Storage Configuration

Storage for the test configuration was implemented as follows:

- » **Database data and system files.** Oracle ZFS Storage ZS3-2 was used for both system and database files. Database data was hosted on an Oracle ZFS Storage ZS3-2 with forty 300-GB 10K RPM SAS-2 disks with eight write-accelerator solid-state drives (SSDs) and two read-accelerator SSDs. The zone root file systems were hosted on an Oracle ZFS Storage ZS3-2 with twenty 300-GB disks, four write-accelerator SSDs, and two read-accelerator SSDs.
- » **Database redo logs and application object cache.** Database redo logs and the application object cache were hosted on an two Oracle Server X5-2L with Intel Xeon processor E5-2630 v3, 32 GB of DDR4 memory, and four 1.6 TB NVMe SSDs.

### Software Configuration

Software configured on the system included

- » Oracle Solaris 11.3
- » Oracle Database 11g Release 2 (11.2.0.3.0)
- » PeopleSoft Human Capital Management 9.1 FP2
- » PeopleSoft PeopleTools 8.52.03
- » Java SE 6u32
- » Oracle Tuxedo, Version 10.3.0.0, 64-bit, Patch Level 043
- » Oracle WebLogic Server 11g (10.3.5)

### Sizing Recommendations

Full sizing recommendations are beyond the scope of this document. However, the performance results of Oracle's testing can be used to extrapolate high-level sizing guidance for PeopleSoft Human Capital Management self-service users on SPARC M7-based systems:

- » **Database tier:** 495 concurrent users per M7 core (370 per T5 core)
- » **Application tier:** 310 concurrent users per M7 core (230 per T5 core)
- » **Web tier:** 990 concurrent users per M7 core (740 per T5 core)

These numbers are only to be used as general guidance during the preliminary design phase of a PeopleSoft Human Capital Management Deployment. Actual appropriate sizing can vary greatly depending on the specific configuration, the workloads, and the types of users that are expected. For accurate architecture design, capacity planning, and scaling recommendations, please contact the Oracle Solution Center, Application Competency, at: [www.oracle.com/osc](http://www.oracle.com/osc)



## Conclusion

These world-record results prove that multitier deployments of Oracle's PeopleSoft applications can be consolidated effectively onto the same physical server, without compromising performance, security, nor availability. The tests demonstrated that a SPARC T7-2 server could easily provide world-record PeopleSoft Enterprise Financials results utilizing only one of its SPARC M7 processors. The SPARC M7-8 server with Oracle virtualization technologies can likewise easily support all of the software components necessary for PeopleSoft Human Capital Management, setting a world record for performance while utilizing only a fraction of the considerable resources of the SPARC M7-8 server. For even greater resiliency and performance, PeopleSoft configurations can easily be built using clustered SPARC M7-8 servers as a part of Oracle Optimized Solution for PeopleSoft.

## For More Information

For more information on Oracle Optimized Solution for Oracle WebLogic Server on SPARC processor-based servers, see the references listed in Table 1.

**TABLE 1. REFERENCES FOR MORE INFORMATION.**

|   |  |
|---|--|
| Oracle's PeopleSoft applications        | <a href="http://oracle.com/us/products/applications/peoplesoft-enterprise/overview/index.html">oracle.com/us/products/applications/peoplesoft-enterprise/overview/index.html</a> |
| Oracle's SPARC M7 process-based servers | <a href="http://oracle.com/servers">oracle.com/servers</a>   |
| Oracle Solaris 11                       | <a href="http://oracle.com/us/products/servers-storage/solaris/solaris11/overview/index.htm">oracle.com/us/products/servers-storage/solaris/solaris11/overview/index.htm</a>     |
| Oracle Database 11g                     | <a href="http://oracle.com/us/products/database/index.html">oracle.com/us/products/database/index.html</a>   |



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