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Benefits of Using the Solaris™ 10 OS with Oracle Directory Server Enterprise Edition

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Benefits of Using the Solaris Operating System.....	2
General Platform Benefits	2
Debugging Benefits.....	2
Performance and Scalability Benefits.....	3
Security Benefits.....	5
For More Information	6

Benefits of Using the Solaris Operating System

The following sections explain the benefits of using the Solaris™ 10 OS for SPARC or x86 platforms rather than other operating systems with the Oracle Directory Server Enterprise Edition (hereafter referred to as Directory Server).

General Platform Benefits

The Solaris OS is continually and rapidly expanding its features and capabilities. The Solaris™ 10 OS has many enhancements over previous releases, and it continues to deliver innovative approaches and tools. Some of the many features that specifically benefit the Directory Server are presented in this document.

The Solaris OS runs on different systems with SPARC, x86, and x64 processors. Although Sun servers frequently set new world records in performance, Sun certifies the Solaris OS on systems from many hardware vendors.

Compatibility and scalability is taken seriously by Sun. Applications that are developed based on public interfaces for current Solaris versions continue to work in newer Solaris versions. Sun also provides tools to help **towards performance analysis**. This may not necessarily be the case with other operating systems.

Solaris Fault Manager for systems using SPARC and AMD Opteron x64 processors provides the following:

- Automatic monitoring and diagnosis of CPU and memory
- Automatic off-lining of resources while the Solaris OS is running
- Support for SNMP enabling integration with existing Network Management Systems (NMS)
- Increased system uptime
- Resilient “self-restarting” software services

Debugging Benefits

Superior analysis and debugging tools allow faster isolation-to-resolution time with support channels on the Solaris OS rather than with other operating systems. The lack of analysis tools on other operating systems prolongs problem isolation.

All of the standard performance analysis tools are available (for example, `vmstat`, `iostat`, `mpstat`, `pstack`, `pfiles`, `gcore`, `libumem`), and a number of additional tools are also provided, including `lockstat/plockstat`, `dtrace`, `prstat`, `cpustat`, and

`trapstat`. These tools can help identify potential problems or bottlenecks that might be responsible for unnecessarily low performance.

DTrace provides complete analysis of virtually all aspects of a system in a way that is unmatched by any competing offering. Even for external users without access to the Directory Server source code, it is very useful to be able to collect information about the underlying system and the way that the Directory Server interacts with it. For cases in which there is a problem with the Directory Server, Sun engineering might be able to provide custom DTrace scripts that provide a more detailed analysis of a problem without significantly impacting the running server.

The `coreadm` utility provides a mechanism for managing core file creation and offers a way for allowing `setuid/setgid` processes such as the Directory Server to dump core (which is not allowed by most UNIX-based operating systems).

The service management framework (SMF) provides a mechanism for ensuring that services are started appropriately when the system boots, and it can also monitor processes and restart them if a failure is detected. SMF can also provide further integration with process rights management to offer greater control over which rights are granted to and removed from individual processes.

Performance and Scalability Benefits

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The Solaris™ OS runs on systems with anywhere from 1 to 144 CPU cores and anywhere from hundreds of megabytes to over a terabyte of memory. These top-level constraints are primarily based on the hardware that is currently available and are not necessarily limitations in the operating system.

The Solaris™ 10 OS for SPARC platforms and the Solaris™ 10 OS for x86 platforms are 64-bit operating systems. Larger memory/cache management is most effectively achieved in 64-bit environments.

The Solaris™ OS effectively deals with subtle but important differences between different types of hardware concurrency models (SMP, CMT, NUMA, dual-core, multi-core, HyperThreading, and so on), and it can optimize its behavior accordingly.

The Solaris™ OS has excellent resource management capabilities that make it possible to control how computing resources are allocated between processes. This can be done through fixed-size processor sets, variable-size resource pools, and various scheduler models, such as the fairshare scheduler, the fixed-priority scheduler, and the real-time scheduler. The available scheduling classes that can run on the system at the same time include the following:

- Time Shared

- Interactive
- Fixed
- Fair Share Scheduler
- System
- Real Time
- New scheduling classes that can be added

The Solaris™ 10 TCP/IP and network stacks are superior to those of other operating systems.

The Solaris™ 10 framework can offer the following:

- Greatly improved performance due to:
 - Direct function calls and packet chaining between IP and device driver
 - IP controlling the NIC and dynamically switching it between interrupt and polling mode
 - Lower CPU utilization
 - Use of advanced NIC features
- VLAN support
- 802.3ad Link Aggregation (trunking) support

In many areas, the `libumem` memory manager provides dramatically improved performance (especially when compared with previous alternatives, such as `mtmalloc`), in addition to providing many features that can help identify memory leaks and other related problems. Upcoming enhancements to the virtual memory subsystem are planned to even further improve performance, especially with with very large caches.

UFS file system performance was dramatically improved in the Solaris™ 9 OS updates and this improvement was carried through to the Solaris™ 10 OS. In many cases (particularly for the kinds of workloads typical in the Directory Server), ZFS is notably faster than UFS and offers many attractive features, such as compression and snapshots, that work well in a directory environment. ZFS can check the correctness of all data with minimal overhead, and upon detecting damaged data, ZFS can correct the damage (if there is a level of redundancy). With the default checksum mechanism in ZFS, there is a nineteen nines probability of detecting damaged data.

Considerably more Directory Server testing and validation is conducted on the Solaris™ OS for SPARC and x86/x64 platforms than on any other platform. As a result, if a performance problem is identified with the Directory Server on the Solaris™ OS, Sun is more likely to identify and resolve the potential problem on the Solaris™ OS before it is released.

The Solaris™ 10 OS scales well across multi-CPU systems than competitor operating systems, especially when more than four CPUs are involved. The Directory Server also scales across multiple CPUs (linear performance increases up to 18 CPUs).

In relation to scalability, Solaris™ Containers (which include zones) isolate software applications and services using flexible, software-defined boundaries. This breakthrough approach to virtualization and software partitioning enables the creation of many private execution environments within a single instance of the Solaris OS.

Security Benefits

Process rights management (also called least privilege) in the Solaris™ 10 OS makes it easy to provide the Directory Server with the privileges it needs to operate and to take away capabilities it doesn't need. Even if an exploitable security hole were found in the Directory Server, least privilege can be used to severely constrain what a potential attacker could do. For older Solaris systems, role-based access control (RBAC) can be used to limit the need to have root access when starting the server, although RBAC is not as flexible as process rights management.

In relation to security, Solaris™ Containers (which include zones) can provide tightly constrained environments in which applications, such as Directory Server, can operate in a manner that isolates them from anything else that might be running on the system. When used with features such as resource pools, Solaris Containers can help limit the impact of denial-of-service attacks or other forms of resource exhaustion.

The Solaris™ Cryptographic Framework provides a centralized mechanism for encryption and message digest operations, particularly those using the PKCS#11 framework. Although the Directory Server in typical deployment models is unlikely to benefit from hardware SSL acceleration in most cases, it can still use this mechanism for secure key storage using FIPS 140-2 compliant devices. In addition, future developments in hardware (for example, those taking advantage of the "free encryption" capabilities of the Niagara 2 processor) might provide performance benefits. Note that Directory Server Enterprise Edition 6.0 is the first version that takes full advantage of the Solaris Cryptographic Framework.

The Solaris™ 10 OS supports Sun Cryptographic Accelerator cards natively, as well as Broadcom cryptographic accelerators that implement the same architecture as the Sun Cryptographic Accelerators 500 and 1000. The Solaris™ OS provides the needed hardware driver so these cards can work with the Solaris™ 10 OS and the Solaris cryptographic framework on SPARC and x86/x64 architectures.

Solaris™ Basic Security Module (BSM) provides fine-grained auditing capabilities for keeping track of what happens on the system.

Additional security-related enhancements include Trusted Extensions (which adds labeling capabilities to the Solaris™ 10 OS), ZFS encryption, and a key management framework.

The Solaris™ 9 OS has been evaluated at Evaluation Assurance Level 4 (EAL4) for the Controlled Access Protection Profile (CAPP) and Role Based Access Control Protection Profile (RBACPP) protection profiles. The Solaris™ 10 OS is currently under EAL4+ evaluation for the same profiles, and Solaris™ 10 with Trusted Extensions is also being evaluated with the LSPP protection profile.

For More Information

Here are additional resources:

- Oracle Directory Server Enterprise Edition web site:
http://www.oracle.com/technology/products/id_mgmt/odsee/index.html
- Oracle Directory Server Enterprise Edition downloads:
http://www.sun.com/software/products/directory_srvr_ee/get.jsp
Oracle Directory Server Enterprise Edition documentation:
<http://docs.sun.com/app/docs/prod/sun.dirsvr.ee70?l=en&a=view>
- Oracle Directory Server Enterprise Edition training courses:
<http://www.sun.com/training/catalog/software/identity.xml>
- Oracle Directory Server Enterprise Edition blog:
<http://blogs.sun.com/directoryservices>



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