

Solaris™ 10: Benefits for HPC and Grid Computing



Solaris 10 provides a number of new features and capabilities that are advantageous for high performance computing (HPC) and Grid computing. These include:

- N1™ Grid Containers
- Dynamic Tracing
- ZFS File System
- Enhanced Security features.

N1 GRID CONTAINERS

Benefit: Provides enhanced security for shared resources with application and data isolation.

What it is: N1 Grid Containers enhance security in support of Grid computing. They provide multiple software partitions within a single instance of the OS; each container is an isolated virtual environment that can only see or touch processes in that respective container. More than 4,000 containers can be supported within a single instance of Solaris. N1 Grid Containers allow different groups or user communities to share a system with increased security. The containers isolate applications and data against error propagation or security intrusions, and isolate faults in one container against faults in another.

How it works: Imagine a Grid configuration that consists of two clusters, one in the physics department, and another in mechanical engineering. Prof. Green in physics wants to use both clusters at night to run a large simulation. Prof. Plum in mechanical engineering agrees to share his cluster, because the N1 Grid Container's isolation and security features alleviate his concerns about sharing resources. In addition, both researchers can use the system simultaneously. Thanks to the N1 Grid Containers capability, the researchers can determine how much Prof. Green's applications use Prof. Plum's cluster. They can also schedule and manage both workloads using the Sun N1 Grid Engine. If necessary, they can restart each container in a matter of seconds using the Instant Restart capability.

Additional information: <http://www.sun.com/software/solaris/10/>

DYNAMIC TRACING (DTRACE)

Benefit: Provides dynamic, real-time application analysis for enhanced performance.

What it is: Dynamic Tracing (DTrace) is a powerful tool for analyzing and diagnosing elusive problems in real-time. It dynamically instruments the kernel and applications with more than 30,000 probes. DTrace is non-invasive, easy to use, and has little system overhead. When DTrace is used to analyze and optimize performance, optimized applications may run from three to as much as 30 times faster. DTrace also makes testing and tuning more effective, with shorter test cycles - which yields lower support costs.

DTrace includes several innovative features not found in other tracing software:

- Developers can safely use DTrace in real time on production machines, as well as in development and test bed systems.
- It provides a single view of the software stack, from kernel to application.
- Developers don't have to modify applications—or even restart them—before putting DTrace into action.
- DTrace fully instruments the operating system.

Additional information: <http://www.sun.com/software/solaris/10/>

ZFS FILE SYSTEM

Benefit: Addresses the highly demanding file system requirements of HPTC users.

What it is: HPC applications are very demanding on file system capabilities, and Data Grids only add to these demands. With Solaris 10, Sun introduces the ZFS File System with a 128-bit file addressing capability, providing virtually unlimited data scalability. ZFS provides 16 billion times the capacity of 64-bit file systems, as well as dynamic data management, efficient storage management, and cutting-edge data security and integrity.

ZFS also eliminates the need for a separate volume manager. A massive amount of storage can be allocated as a pool, with multiple file systems configured within the single storage pool.

Space is shared dynamically between the file systems in the pool. There is no need to statically partition storage into slices, volumes and file systems. ZFS is a copy-on-write file system; the on-disk structure is always consistent. All data is protected by 64-bit checksums. Existing Solaris applications run with DFS, eliminating the need to modify applications.

Additional information:

<http://www.sun.com/software/solaris/10/>

ENHANCED SECURITY FEATURES

Benefit: Enhanced military-grade security features for access and rights management.

What it is: With Solaris 10, Sun leverages its more than 20 years of experience in building security into the design and testing of the Solaris OS. Solaris 10 delivers enhanced system security with new military-grade security features, including:

- A pervasive cryptographic infrastructure for increased data security
- Stronger authentication and access rights management
- Process rights management that limits the ability of processes to access system resources, thus lowering the risk of exploits
- Open source components and standards for security, including OpenSSH, PAM, ipSec/IKE and Kerberos.

Additional information:

<http://www.sun.com/software/solaris/10/>

"We recently deployed the Solaris 10 OS beta because it provides expanded identity security, an important feature for an academic institution requiring strong authentication and the ability to limit access to our research and personal data."

"In addition, Dynamic Tracing allows the department to more easily diagnose system performance bottlenecks, often resulting in big performance gains, and to reduce the costs and time associated with determining root causes of intermittent problems."

James Dobson,
System Architect
Dartmouth College

Additional information on Solaris 10 (including demos on N1 Grid Containers and Dynamic Tracing):

<http://www.sun.com/software/solaris/10/>

"As one of Germany's foremost scientific and medical institutions, we have significant demand for reliable computing power, seamless updates and system interoperability. Through the Software Express for Solaris Pilot program, we've been able to take advantage of the improved security, relentless availability and great software compatibility in Solaris 10. We were also able to achieve higher levels of system throughput and system uptime, which in turn reduces TCO."

Thomas Nau, IT Director,
Communication and Information Center,
University of Ulm

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