

The Solaris™ 9 Operating System



Increase service levels. Decrease costs. Reduce risks.

Key Feature Highlights

- Integration of the Sun Java™ System Directory Server and the Java 2 Platform, Enterprise Edition (J2EE™) technology-based Sun Java System Application Server in the Solaris™ 9 Operating System provides the foundation for Network Identity Management.
- Delivers the performance and stability to meet production database and file system requirements — with no incremental costs.
- Provisioning and change management provide secure installation and deployment of software stacks.
- Solaris Containers, combined with Dynamic System Domains, enable higher utilization of system resources.
- Provides out-of-the-box security solutions and a fully integrated suite of security services to deliver the highest levels of security.
- Champions the RAS lifestyle into every step of the software development process.
- Configuration services and Patch Manager, combined with SunPlex™ systems, deliver high service levels.
- Applications run faster without recompiling and recoding.
- Compatibility with previous versions, and built-in Linux compatibility, offer investment protection.
- The Solaris OS has been optimized for x86-based platforms, including Xeon and Opteron servers, giving customers the freedom to choose the solution that best meets their business needs.

Today, businesses are rethinking how they create, manage, extend, and ultimately deliver information technology (IT) services with greater functionality and reduced cost and complexity. Managing data center complexity from a services perspective lets businesses focus on choosing the right solution for the job at hand rather than managing individual systems.

Since its inception in 1982, Sun’s vision and strategy has been the same: Connect everything through network computing. Sun continues to leverage open standards and technologies, innovate on top of them, and create the types of systems customers demand.

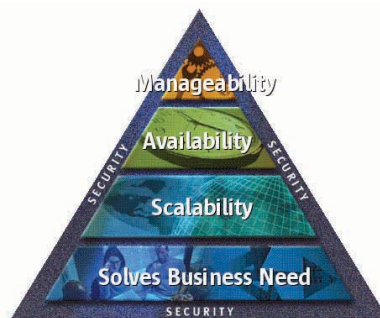
For years, the Solaris™ Operating System (OS) has delivered the power, massive scalability, high levels of security, and mainframe-class functionality that companies demand. The Solaris OS is the leading UNIX® environment — and the choice for powering enterprise networks that need to deliver information to networked users at any time, any place, on any platform.

Sun has also brought the industrial strength of the Solaris OS and the military-grade security of the Trusted Solaris™ OS to x86-based systems. Providing the same functionality through a common source code base, the Solaris OS delivers stability and innovation on both UltraSPARC® and x86-based systems.

The Solaris 9 OS Is Scalable

Companies offering Web-based services can no longer predict how many customers might visit their sites. Today’s companies need the ability to grow to support millions of new customers overnight.

The Solaris 9 Operating System is the third major release of the complete 64-bit computing environment tuned for Sun’s powerful line of highly scalable 64-bit servers. The multithreaded, fully preemptible kernel delivers much faster performance for core system functions and enterprise applications. And with the new increased performance and scalability of the Solaris 9 OS, customers can immediately see an improvement in the price/performance ratio of their servers, thus, increasing the return on their investments.



The industrial strength of the Solaris OS and the military-grade security of the Trusted Solaris OS deliver stability and innovation on both UltraSPARC and x86-based systems.

The Solaris 9 OS offers the capabilities to scale and support massive systems and applications:

- One million simultaneous processes on a single system
- Up to 128 CPUs in a single system and 848 CPUs in a clustered environment
- Support for up to 576 GB of memory
- More than four billion network connections
- Up to 252 TB file systems with Sun StorEdge™ Performance Suite software
- IPv6, enabling a 128-bit IP address space
- A 64-bit Java™ virtual machine

In addition, Solaris 9 software introduces a group of new features designed to increase system performance and scalability.

Solaris 9 Threads Model

By automatically utilizing an enhanced multi-threading library, applications on the Solaris 9 platform demonstrate greater scalability and an overall performance increase of up to 4 times. There are no changes to the interfaces and no need to recode applications.

Solaris 9 Memory Optimizer

- *Multiple Page Size Support.* Applications can use multiple page sizes ranging from 8 KB to 4 MB for different memory segments. This increases performance by enhancing resource efficiency and reducing overhead. No code changes are needed, and page sizes are dynamically changed as an application executes.

- *Advanced Page Coloring.* The Solaris 9 OS includes enhancements to the algorithm that controls virtual/physical memory pages and how they are used. As a result, system performance is increased for particularly heavy user loads.
- *Memory Placement Optimization.* Solaris 9 software is designed to optimize memory management in the way that best suits the particular servers on which it is running.
- *Memory Allocation.* The Solaris OS now allocates memory to user-level applications much faster, and enables users to more easily debug memory leaks in their applications.

UNIX File System (UFS) Enhancements

- *UFS Performance Enhancements.* For databases created on a UFS file system, UFS Concurrent Direct I/O provides near raw device performance, leading to an 87-percent improvement in TPC-C measurements on OLTP workloads. UFS now has logging enabled by default, ensuring fast file system recovery and maximum performance — much better than third-party file systems.
- *Multiterabyte UFS.* For 64-bit SPARC® platforms, UFS now supports much larger file systems — up to 16 TB in size.
- *mkfs.* Enhancements to the mkfs command have dramatically reduced the time it takes to create a UNIX file system; you can now create a UNIX file system 96 times faster.

- *64-Bit Java Virtual Machine.* With Java 2 Platform, Standard Edition (J2SE™) 1.4 software, users benefit from full 64-bit support in the Java HotSpot™ virtual machine (VM). This feature, combined with the Java HotSpot Server VM code optimizer, has significantly improved Java performance.

The Solaris 9 OS Is Available

With businesses operating around the clock and around the globe, organizations no longer know when their customers might demand their services. The reliability of the Solaris 9 Operating System increases users' confidence that their long-running and resource-intensive applications will execute without interruption.

The Solaris 9 OS is designed with a small, compact kernel that limits the exposure to errors that can crash a system. It is also designed with a clear distinction between the kernel, shared libraries, and applications, to further limit the impact of application failure. To deliver mainframe reliability with Internet agility, the Solaris 9 OS raises the bar for reliability, availability, and serviceability (RAS) by strengthening the following characteristics in every aspect of the development process.

Robust

- *Dynamic System Domains.* The Solaris 9 OS provides failure containment and high-level control over system resource allocations in electronically isolated partitions. Partition boundaries can be adjusted on the fly to rapidly adapt to changing workloads, or on a scheduled basis to enable a resource shift between applications. This helps improve service levels economically.
- *Solaris Containers.* Solaris Containers isolate software applications or services using flexible, software-defined boundaries. The Solaris 9 Resource Manager allows resources to be dynamically allocated to applications.

- *Kernel and User Mode Separation.* With the kernel occupying a protected address space and the user-level libraries and applications occupying separate user address spaces, it is extremely difficult for a user error to cause a system failure. This significantly enhances system availability.
- *Kernel and Device Driver Hardening.* The kernel and device drivers are further hardened by identifying and eliminating panics and kernel memory leaks. The new device driver testing framework enables developers to stress drivers and simulate hardware failures to further validate that the drivers can handle unforeseeable circumstances.

Recoverable

- *File System Logging.* By reducing file system check times during reboot, the Solaris 9 OS increases recoverability.
- *NFS Failover.* With NFS Failover, client systems can retry network file access on an alternate server when the primary server fails.
- *Network Multipathing.* The Network Multipathing feature allows multiple network connections to provide load balancing and failover.
- *Sun StorEdge Traffic Manager.* The Solaris 9 OS supports multiple paths for I/O devices, such as SCSI- and Fiber Channel-accessible storage, for load balancing and failover.

Manageable

- *Dynamic Reconfiguration.* Dynamic Reconfiguration enables system configurations to be changed without rebooting, minimizing planned and unplanned downtime.
- *Solaris Live Upgrade.* The Solaris OS can be upgraded while the system is still running, significantly reducing the usual service outage time associated with standard upgrades. Enhancements to the Solaris Live Upgrade Boot Environment allow Solaris JumpStart™ software to automatically create boot environments during install time, resulting in a faster Solaris Live Upgrade copy process.

Observable

- *Modular Debugger Framework.* The Modular Debugger mdb is an extensible utility that enables low-level debugging and editing of the live OS.
- *Kernel Analysis Tools.* The Solaris 9 OS provides a comprehensive set of “on-the-fly” kernel analysis tools. kstat, lockstat, prstat, and cpustat provide statistics and parameters for the kernel, file locks, process status, and CPU utilization, respectively. truss can be used to wrap an application so that all of its system calls can be observed externally.

Availability With Sun Cluster 3.0

Sun Cluster software, available separately, provides continuous access to services via Global Network and File Services. Data, networks, and devices are available to all domains in the SunPlex™ systems as well as to applications running on any domain.

The Solaris 9 OS Is Manageable

As IT infrastructures grow increasingly larger and more complex, IT organizations must optimize for efficiency. Deploying and redeploying servers is a daily event. To stay ahead, businesses today must manage IT growth while at the same time reducing complexity and management costs. The Solaris 9 Operating System provides a rich set of management facilities that can simplify the process of securely installing and deploying the software stack, resulting in lower cost of operation.

Solaris Containers and Resource Management

Solaris Containers create an execution environment within a single instance of the Solaris OS, providing resource isolation. This approach simplifies service provisioning and makes it easier to consolidate applications onto fewer servers while maintaining quality of service (QoS).

Solaris Containers are enabled by Solaris 9 Resource Manager software, which is integrated into the Solaris 9 OS. It consists of a set of resource management and network QoS features. Solaris 9 Resource Manager enables administrators to allocate system and network resources to multiple users, groups, or applications to provide more predictable service levels. Customers can set and enforce policies that control and monitor how resources are used, and generate extended accounting information for billing or chargeback purposes. Solaris 9 Resource Manager redefines the traditional single application system model and offers a better solution by enabling server consolidation to reduce service costs while delivering more predictable service levels.

Data Management

In the Solaris 9 OS, new features are introduced to help manage the data that gives a company its competitive advantage.

- *Solaris Volume Manager.* The Solaris Volume Manager storage management tool, which now includes a GUI, is integrated into the Solaris 9 OS. It enables users to manage large numbers of disks into logical volumes. Solaris Volume Manager has been enhanced to support disks larger than 1 TB in size. Solaris Live Upgrade makes it much easier for customers to adopt Solaris Volume Manager because Solaris Live Upgrade greatly simplifies migration from other volume managers to Solaris Volume Manager. Reconfiguration Coordination Manager (RCM) support is integrated in Solaris Volume Manager, allowing the safe removal of disks through Dynamic Reconfiguration (DR) requests.
- *Soft Disk Partitions.* The soft disk partitions feature increases the number of file systems per device from eight to thousands. Partitions can also be created on top of previously defined logical volumes, giving administrators additional flexibility in configuring and managing the volumes.

- *UFS Snapshot.* With UFS snapshot, the Solaris 9 OS provides an online backup mechanism by creating a point-in-time image of the file systems. It helps eliminate downtime or offline time previously required to guarantee a consistent backup.

System Management

- *Administration.* The Solaris 9 OS provides a wide range of administration tools that assist both user and system administration tasks. It provides command line tools and GUIs for managing users, resources, and disk storage.
- *Patch Management.* Solaris Patch Manager offers the most comprehensive patch management features for the Solaris OS. Administrators now can analyze the patch state of a system and automatically download the recommended patches. The patches are provided with the install order necessary to accommodate patch dependencies and can use the tools on local and remote systems. All patches delivered via Solaris Patch Manager are digitally signed, helping ensure that the patches are from Sun and have not been altered in transmission.
- *Monitoring and Management.* Sun Management Center provides a powerful, easy-to-use single management point for all Sun servers and storage, independent of geographic location. System administrators can perform remote system configuration and performance monitoring, and isolate hardware and software faults through a single interface. Sun Management Center easily integrates with enterprise management frameworks, and provides a central facility for managing events and alarms, automated responses, and diagnostics.

Solaris Provisioning Services

- *Solaris Web Start.* Solaris Web Start software simplifies the installation, setup, and administration of applications written for both Solaris and Java technology-based environments with point-and-click ease of use.
- *Solaris Flash.* Solaris Flash makes it easy to provision large numbers of servers having similar configurations. It enables administrators to create a single reference installation of the entire software stack and replicate the installation on a numbers of servers. Solaris Flash reduces installation time and configuration complexity, and simplifies the process of redeployment to support different service levels as customer demands change.
- *Solaris Live Upgrade.* Solaris Live Upgrade provides a mechanism to install a Solaris image on an inactive boot environment while the active boot environment is fully functional. A simple reboot will migrate the system to the updated environment when the process is finished. This significantly reduces the downtime associated with system updates, as well as providing “roll-back” capability for updates.
- *Solaris JumpStart Software.* With Solaris JumpStart software, installation of the Solaris OS can be automated for machines locally or across the network.
- *Secure WAN Boot.* Sun’s new secure WAN boot technology provides mechanisms that enable system administrators to boot and install new or upgrade systems over the Internet. It further enhances system scalability by enabling administrators to remotely install multiple duplicate systems, such as Web servers or application servers, over geographically dispersed areas.

- *Sun Management Center Change Manager.* Available separately, Sun Management Center Change Manager extends Solaris platform functionality by offering advanced provisioning capabilities. It delivers a fast and easy way to install, upgrade, and audit the software on your systems. Change Manager enables today’s business to quickly and easily provision software stacks to their servers by providing automated tools for installation or upgrade of hundreds of servers at a time — while the systems continue to operate. This can save IT costs and minimize disruptions of services. Sun Management Center Change Manager has an easy-to-use Web browser interface as well as a command line interface (CLI) for experienced system administrators.
- *User Management.* The Java System Directory Server is integrated into the Solaris 9 OS. It creates an LDAP-based environment that can scale to millions of users. A transition kit is available to help ease migration from NIS+ to LDAP. Also, the secure LDAP client has been enhanced to support various encryption mechanisms, including DIGEST-MD5 and SSL, enabling secure password management through the Java System Directory Server.

The Solaris 9 OS Is Secure

The Solaris Operating System has been built to securely interconnect with other systems and to be more secure from the viruses and worms that plague software designed without security and networking in mind. These aspects of network and platform security are critical — whether building an enterprise network or providing services to millions of users over the Internet. The Solaris 9 OS includes a number of new security features.

Network Security

The network security provided by the Solaris 9 OS helps ensure secure authentication over the network, secure remote access, secure network connections that can't be snooped, and protection from network-based attacks.

- **Solaris Secure Shell.** Solaris Secure Shell software enables strong authentication — of both client and server machines as well as users — for use in remote access solutions. It also provides encryption for privacy using the 3DES, AES, and Blowfish algorithms. It is compatible with other Secure Shell protocol implementations.
- **IPSec With Internet Key Exchange (IPSec/IKE).** The IPSec standard provides data integrity, privacy, and authentication of network traffic between servers for both IPv4 and IPv6 networks. IKE provides a standards-based mechanism for exchange of encryption keying material and digital certificates for use on IPv4 and IPv6 networks. Encryption is transparent to applications, and as such requires no changes to the customer experience. IPSec/IKE features DES, 3DES, AES (256-bit), and Blowfish (448-bit) encryption — all approved for export and use worldwide — and is compatible with other IPSec/IKE implementations.
- **SunScreen™ 3.2. Software.** SunScreen 3.2 software is a high-speed, stateful packet-filtering firewall offering advanced features that protect a single system or an entire network of servers. It is now included with the Solaris 9 OS at no extra charge.
- **Kerberos Single Sign-On Environment.** The Solaris Enterprise Authentication Mechanism™ server and client is included in the Solaris 9 OS to provide single sign-on capabilities for servers and applications. Kerberos-enabled versions of telnet, r* commands, and more are available as a free download from the Sun Download Center.

- **TCP Wrappers.** Based on open source, TCP Wrappers provide a means of protecting your server from incoming traffic. Connections can be limited by DNS domains, IP addresses, or by substituting wild cards for part of the domains or addresses.

Platform Security

The platform security features in the Solaris 9 OS support server and cluster hardening through:

- Pluggable authentication modules (PAMs): Flexible security standards
- SSL-encrypted LDAP authentication for native login
- Role-based access control (RBAC)
- Kernel Pseudo Random Number Generator
- Disable stack execution
- Modular software packaging
- Extensive higher performance auditing with XML output
- Pluggable algorithms for password encryption (Crypt, MD5, and Blowfish included)
- Smart card authentication support
- Secure by default file permissions
- Free Solaris Fingerprint Database for file integrity verification
- Free Solaris Security Toolkit for proven system hardening

Compatibility

Compatibility is one of the hallmarks of the Solaris Operating System, and is key to enabling customers to move up the hardware product line without having to port or recompile their applications. Solaris software supports a public application binary interface (ABI) which guarantees that conforming applications will run on all Sun servers without modification.

SolCAT: Solaris Compatibility Assurance Toolkit
The Solaris Compatibility Assurance Toolkit (SolCAT) is a collection of tools and services, including the Sun Guarantee Test Suite and the Certification Test Suite, to help customers

and ISVs easily and seamlessly ensure that their applications will run on the latest version of Solaris software.

Linux Compatibility

In today's world of heterogeneous computing, compatibility leads to efficiency. Combining the Linux community with thousands of Solaris software developers and nearly three million Java and XML software developers, Sun provides customers with unified access to the broadest array of innovation in the industry on which to provide services. In the Solaris 9 OS, more Linux applications, tools, and APIs are made available.

- **API Compatibility.** Common libraries and build environments, such as libxml, glib, and GTK+, are integrated in the Solaris OS to streamline source code development across Linux and Solaris environments.
- **Application Compatibility.** Common Linux applications, such as Samba, Apache, Linux (GNU) commands, etc., are included in the Solaris 9 OS. The Solaris Software Companion CD has an even more comprehensive set of free software.

Now Available for x86 and AMD

Opteron Platforms

Sun extends Solaris software's value to x86 and AMD Opteron systems by providing the same benefits and features as available on SPARC systems. This makes the Solaris OS (x86 Platform Edition) well-suited for companies that have already invested in Solaris software expertise and commercial Solaris applications; that need a predictable release and update process with an application compatibility guarantee; and that want Solaris source code access — all while still leveraging standard x86 and AMD Opteron system hardware and common management tools. Applications that need even higher levels of security than those found in the Solaris OS can also take advantage of Trusted Solaris software on x86 and AMD Opteron systems.

The Solaris™ 9 Operating System

Modern Desktop

The GNOME 2.0 Desktop takes desktop computing on the Solaris Operating System to an entirely new level. It not only provides an easy-to-use, appealing interface, but also a wealth of productivity tools and utilities to help users get their work done efficiently.

Serious Software Made Simple

Sun provides a complete portfolio of affordable, interoperable, and open software systems designed to help you maximize the utilization and efficiency of your IT infrastructure. Built from the secure, highly available foundations of UNIX and Java, these systems deliver implementations that are preintegrated and backward compatible. Sun's portfolio consists of Solaris and Linux software for SPARC and x86 platforms, the N1™ Grid platform for dynamic and utility computing, and the Sun Java System — five integrated software systems for the data center, the desktop, the developer, mobile devices, and identity implementations.

Standards

- Interface Standards: X/Open® UNIX 98
- Graphic Standards: X11, PostScript™, Display PostScript™, OpenGL®
- Desktop Standards: CDE (Common Desktop Environment), GNOME, Motif
- Object Standards: Java IDL
- Connectivity Standards: ONC™, ONC+™, NFS, WebNFS™, SMB technologies, XML
- Internet Standards: HTTP, FTP, Telnet, DNS, NTP, IMAP4, DHCP, SNMP, IPv6, IPSec, Kerberos, SASL, OCF
- Protocols: LDAP v3 IETF; RFCs 1323, 1510, 1652, 1869, 1870, 1891-1894, 1985, 1996, 2018, 2136, 2045, 2078
- Web Services Standards: Java API for XML (JAXR), ebXML, UDDI
- XML Messaging: Java API for XML Messaging (JAXM) — SOAP, ebXML, TR&P, SOAP-RP; Java API for XML-based RPC (JAX-RPC) — SOAP, WSD
- XML Processing: Java API for XML Processing (JAXP) — XSLT, SAX2, DOM2, Schema, XSLTc

System Requirements

- SPARC 32-bit and 64-bit platforms
- x86 from Sun, AMD Opteron, and other third-party platforms
- Disk Space: 600 MB for desktop systems; 1 GB for servers
- Memory: 64 MB for x86 platforms (minimum); 128 MB for SPARC platforms (minimum)

For More Information

To learn more about the Solaris 9 Operating System, visit sun.com/solaris. For additional technical and development information, please visit the BigAdmin™ portal at sun.com/bigadmin.

Learn More
 Get the inside story on the trends and technologies shaping the future of computing by signing up for the Sun Inner Circle program. You'll receive a monthly newsletter packed with information, plus access to a wealth of resources. Register today at sun.com/joinic.

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