

The Solaris™ Operating System

An optimal platform for deploying IBM WebSphere Middleware



In today's global economy, flexibility is the key to keeping up with quickly changing demands and evolving business processes. Enterprises using IBM WebSphere software as a foundation for their Web services or Service Oriented Architectures (SOAs) require flexibility and security to cope with these challenges at the application level. A completely flexible solution also requires adaptability at the platform level. Additionally, increasing performance and reducing operating costs are imperative to improving business value. The advanced Solaris™ 10 Operating System (Solaris OS), combined with eco-responsible systems—Sun UltraSPARC® T2 and T1 processor-based servers with CoolThreads™ technology as well as AMD Opteron™ and Xeon™ processor-based servers—offer extreme flexibility, security, scalability, World Record setting performance, and significant power, cooling, and space savings—providing an optimal platform for consolidating and deploying IBM WebSphere middleware products.

Highlights

- The Solaris OS is a leading IBM WebSphere deployment platform for enterprises
- The Solaris OS is highly reliable, scalable, and has proven to be extremely capable in thread-rich environments
- The Solaris OS provides virtualization capabilities out-of-the-box with no additional license fees—in fact, the Solaris OS is free
- The Solaris OS is open source with OpenSolaris.org and runs on most popular processor architectures
- The Solaris OS and Sun systems deliver best-in-class, affordable, and efficient platforms for the IBM WebSphere family of products—leading to excellent Return On Investment (ROI)
- Sun UltraSPARC® T2 and T1 processor-based servers with CoolThreads™ technology deliver World Record setting performance while consuming less power and space

The number of servers supporting IBM WebSphere software can be dramatically reduced by consolidating applications onto fewer systems that utilize features within the Solaris OS and CoolThreads technology-based servers. In addition, lower floor space, power, and cooling requirements can reduce costs and improve efficiency in the datacenter.

The Solaris 10 Operating System

The Solaris 10 Operating System includes more than 600 innovative features that make it the most efficient, secure, and reliable operating system ever built—enabling enterprises to develop new ways to solve business problems and drive down operational costs. In particular, Solaris Containers, which enable operating system virtualization and finegrained resource management, are ideal for consolidating many applications on a single server. Other key features in the Solaris 10 OS that add value to IBM WebSphere environments include:

- **Solaris predictive self healing** – an innovative capability that automatically diagnoses, isolates, and recovers from many hardware and application faults, enabling business-critical application and essential system services to continue uninterrupted in the event of software failures, major hardware component failures, and even software misconfiguration problems.

- **Solaris Dynamic Tracing (DTrace)** – an advanced tracing tool that is specifically designed for use in live environments—including production—to troubleshoot performance and systemic problems in real time.
- **User and Process Rights Management** – technologies to reduce security risk by granting users and applications only the minimum capabilities needed to perform their duties, without changing the application.
- **High performance** – with a turbocharged TCP/IP stack, a radically improved kernel, advanced tracing technology, and special optimizations for memory allocation and Chip Multithreading (CMT), the Solaris 10 OS delivers performance advantages for database, Web, and Java services.
- **Platform choice** – the same features, functions, and tools are available on SPARC®, AMD Opteron, and Intel® Xeon systems, enabling the same OS to run on a wide range of Sun and third-party servers, workstations, laptops, and devices—without requiring any specialized hardware features.

- **Logical Domains** – a new Sun server virtualization and partitioning technology for UltraSPARC T2 and T1 servers available as of Solaris 10 11/06. Logical Domains subdivides resources (CPUs, memory, I/O, and storage) and enables single system to run multiple operating systems simultaneously, increasing server utilization, efficiency, and flexibility.
- **Solaris ZFS** – enables file systems to grow dynamically to virtually any size, without additional volume managers. Solaris ZFS delivers virtually unlimited capacity, provable data integrity, and near-zero administration.

The IBM WebSphere family of products is supported on the Solaris 10 OS, including:

- IBM WebSphere Application Server
- IBM WebSphere MQ
- IBM WebSphere Portal Server
- IBM WebSphere Message Broker
- IBM WebSphere Enterprise Service Bus
- IBM WebSphere Process Server
- IBM WebSphere Commerce Server
- IBM WebSphere Customer Center
- IBM WebSphere Service Registry and Repository Server

Solaris containers

Solaris Containers isolate software applications and services using flexible, software-defined boundaries, allowing many private execution environments to be created within a single instance of the Solaris OS. Each environment has its own identity, separate from the underlying hardware, which causes it to behave as if running on its own system. System and network resources can be allocated and controlled on a fine-grained, dynamic basis. As a result, companies can better consolidate applications onto fewer servers without concern for resource constraints, fault propagation, or security breaches, thus simplifying application service provisioning.

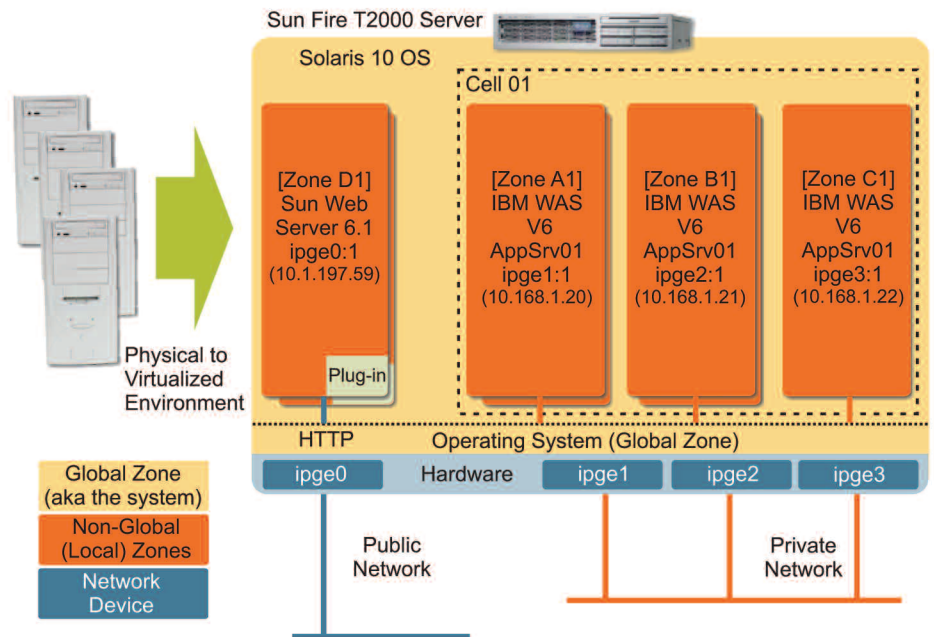


Figure 1. A sample scenario—deploying multiple applications in virtualized Solaris Containers

Solaris Containers consist of several technologies to control the virtual environment (zone) and resource management. A Solaris Zone is a virtual environment that delivers security, application fault containment, and namespace isolation. The security and fault containment mean that users or processes working inside the Solaris Zone have no way to compromise or even access anything outside of their environment. A global zone is the default zone for the system and is the zone used for system-wide administration. Non-global zones (or simply zones) are configured within the global zone to isolate applications.

The other components that comprise Solaris Containers are the resource management tools within the Solaris OS. They control the amount of resources an application is allocated, such as CPU cycles, physical memory, and network bandwidth. Resource management tools can also help measure the usage of an application. This could be used for health monitoring and capacity planning, as well as billing and charge back.

Deploying WebSphere Application Server and Web Server in Solaris Containers

Sun has performed extensive testing deploying IBM WebSphere Application Server version 6.0.2 and 6.1 in virtualized environments provided by Solaris Containers. The example in Figure 1 depicts how to deploy IBM WebSphere Application Server and Web Server in isolated zones within a Solaris Container. This scenario shows the reduction of physical servers required in IBM WebSphere environments.

Solaris Containers are designed to manage application workloads. Applications can be isolated in their own zone, each with its own appropriate attributes such as CPU and memory resources, IP address, and users with specific permissions. Because of their ability to isolate applications and manage resources, Solaris Containers provide an efficient and easy way to safely consolidate multiple applications onto a shared system while increasing resource utilization rates—all with very little overhead.

IBM WebSphere's official support statement for Solaris Containers is available¹. For more information on deploying IBM WebSphere Application Server in Solaris Containers, see the IBM Redbook SG247584, *WebSphere Application Server V6.1 on the Solaris Operating System*².

Extending the architecture for scalability

The deployment architecture in Figure 1 can be extended for scalability by deploying multiple application server instances in multiple Solaris Containers on multiple servers. Similarly, other containers can be configured to virtualize the deployment of IBM WebSphere Deployment Manager, IBM WebSphere MQ, and database (e.g., IBM DB2, Oracle) servers.

For additional details on IBM WebSphere topologies, see IBM Redbook *WebSphere Application Server V6 Planning and Design WebSphere Handbook Series* (Chapter 9, page 247-283)³. Another good reference is the IBM Redbook *WebSphere Application Server V6 Scalability and Performance Handbook*⁴.

Adding high availability

For mission-critical systems requiring highly available and scalable services, IBM WebSphere Application Server Network Deployment provides a clustering function along with IBM WebSphere HAManager for application failover functionality. In addition, Solaris Cluster software is supported with IBM WebSphere components, providing an integrated hardware and software solution that helps eliminate single points of failure.

Solaris Cluster software is a service level management platform that enables combined applications to be deployed as services, providing automatic and dynamic service availability, performance, and scalability to better manage service levels in a predictable manner.

Solaris Cluster software augments the high availability features in IBM WebSphere Application Server and provides the mechanism for transparent failover through a Solaris Cluster agent. An agent starts, stops, and monitors the application's health, and takes corrective action to regain application availability upon failure. Pre-built agents are available for IBM WebSphere MQ, DB2, and Message Broker. Developers can use the Solaris Cluster API or Solaris Cluster Agent Builder to cluster-enable IBM WebSphere Application Server processes as failover services. Detailed configuration scenarios for the IBM WebSphere Application Server environment are described in the IBM Redbook *WebSphere Application Server Network Deployment V6: High Availability Solutions (Chapter 3, page 483-546)*⁵.

Solaris Cluster software also supports Solaris Containers and Solaris ZFS, providing the ability to boot and shutdown a zone, start, shutdown and fault monitor applications within zones, as well as the ability to configure Solaris Containers and Solaris ZFS files systems as failover services.

Sun Fire™ T1000 and T2000 servers — breakthrough platforms for consolidation and energy savings

Sun Fire servers with CoolThreads technology set a new industry standard for performance, space and energy efficiency. Sun Fire T1000 and T2000 servers are designed for delivery of demanding Web and transaction services, especially when measured by Sun's new SWaP (Space, Watts, and Performance) metric⁶.

With their secure web scale and virtualized computing capabilities, Sun Fire T1000 and T2000 servers are ideal for all web-tier, application-tier and OLTP database environments. Powered by the ground-breaking UltraSPARC T1 processors, they offer up

to 32 simultaneous processing threads. Plus, they deliver the industry's best performance per watt by maximizing the use of energy and space.

As the world's first servers based on integrated open source, no-cost virtualization technology, the T1000 and T2000 offer the industry's most open platform, enabling up to over 1,250 isolated domains per rack.

Combined with the Solaris 10 Operating System, these servers set numerous World Record benchmarks across a range of Web, application, and database workloads, especially when the software takes advantage of multiple threads. Utilizing Solaris Containers, several applications can be safely deployed in secure and virtualized environments providing both optimal resource utilization and reduced datacenter requirements.

The Sun Fire T1000 is the world's most eco-efficient server, offering incredible performance at an unbelievable price. Designed to triple performance while cutting power and space consumption by 3X, the Sun Fire T1000 is the best rack-optimized 1RU server for massively horizontally scaled web environments. It delivers more than five times the throughput per rack of Xeon-based servers running Java applications.

The Sun Fire T2000 server maintains a leadership position for Java technology-based applications. Sun has submitted World Records for the SPECjAppServer 2004 benchmark with IBM WebSphere Application Server v6.1 and BEA WebLogic 9.0 on the Solaris 10 OS and the Sun Fire T2000 servers. These benchmark results clearly demonstrate that the Sun Fire T2000 server running the Solaris 10 OS along with Java™ Development Kit (JDK™) 5, delivers outstanding performance of a single instance on a single node. The results also show the infrastructure is capable of scaling even when highly loaded⁷.

Sun SPARC T5220/T5120 Enterprise servers — mainframe class RAS without the cost and complexity of vendor lock-in

The Sun SPARC Enterprise T5220 and T5120 servers are the first 64-thread, general-purpose servers powered by the UltraSPARC T2 “system on a chip” processor. They pack up to eight cores and up to 64 simultaneous threads onto a single piece of silicon, together with the key functions of an entire system on a single chip—computing, networking, security, and I/O. For the Sun SPARC Enterprise T5220, that power and functionality is packaged in a 2RU form factor with highly expandable internal storage and network connectivity. The Sun SPARC Enterprise T5120 packs those powerful features into a compact 1RU form factor.

The Sun SPARC Enterprise T5220 and T5120 Enterprise servers offer the industry’s only integrated, open-source, and no-cost virtualization technologies with a choice of Solaris Containers and Logical Domains (LDoms). By enabling up to 64 isolated domains per server, you can deploy more than 1,250 isolated domains per rack with the Sun SPARC Enterprise T5220 and more than 2,500 isolated domains per rack with the Sun SPARC Enterprise T5120—for ultimate server virtualization and consolidation.

Cost-effective licensing for UltraSPARC T2 and T1 processors

IBM WebSphere licensing for the UltraSPARC T2 and T1 processor, using IBM’s new Processor Value Unit (PVU) licensing, is both straightforward and cost-effective. UltraSPARC T1 processors require 30 PVUs per core—other architectures require up to 100 PVUs per core. For example, the eight core

implementation of the Sun Fire T2000 server requires 30 PVUs per core, or a total of 240, while an eight CPU single core system requires 800 PVUs⁸. The UltraSPARC T2 processor, which can have up to eight processor cores per chip, requires just 50 Processor Value Units (PVUs) per core for software licensing.

If only a fraction of a system’s capacity is needed, IBM allows WebSphere and many other IBM software products to be licensed on a sub-capacity basis by deploying IBM WebSphere in Solaris Containers⁹. This can significantly improve TCO for some deployments, as software license fees can be substantially lowered.

Unique server and operating system capabilities allow Sun to offer an IBM WebSphere middleware platform that can cost less to acquire, license, and operate than competing systems. The number of CoolThreads technology-based servers required to run a particular workload, the smaller number of licenses these servers require, along with low floor space, power, and cooling costs all support Sun’s claim that WebSphere software “Runs Best on Sun.”

Sun and IBM WebSphere—working together to optimize platforms for SOA

The Solaris 10 OS is a platform of choice for many enterprises seeking to deploy IBM WebSphere components on low-cost, high performance, secure, and reliable systems.

Sun and IBM have thousands of joint customers, and work closely together to help ensure their satisfaction and success. From integrating and adopting the Solaris platform to cooperation that includes early access to

Learn More

For more information on how Sun and IBM work together to optimize IBM WebSphere products on Sun platforms visit sun.com/websphere

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new systems and software, intensive testing, and benchmarking, the companies’ collaborated engineering efforts allow enterprises of any size and in practically every industry to confidently pair Sun and IBM products to drive their most mission-critical business systems.

The Solaris 10 OS—with powerful, built-in features such as Solaris Containers, Logical Domains, Solaris ZFS, and DTrace—together with CoolThreads technology available in Sun’s UltraSPARC T2 and T1 based servers, provide a compelling platform for virtually any enterprise’s IBM WebSphere infrastructure.

- 1) <http://www.ibm.com/support/docview.wss?uid=swg21242532>
- 2) <http://www.redbooks.ibm.com/redpieces/abstracts/sg247584.html>
- 3) <http://www.redbooks.ibm.com/redbooks/pdfs/sg246446.pdf>
- 4) <http://www.redbooks.ibm.com/redbooks/pdfs/sg246392.pdf>
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