



**SOLARISSM 10 OS UPGRADE SERVICE
BEST PRACTICES FOR UPGRADING TO
THE SOLARISTM 10 OPERATING SYSTEM**

White Paper
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Chapter 1

Executive Summary

While upgrading to the popular Solaris™ 10 Operating System (OS) may be important to many data center environments, upgrade projects are sometimes delayed because of the perceived risk, cost, or time involved. Sun has made the upgrade decision easier by offering the Solaris 10 OS Upgrade Service, a fixed-fee consulting service that can help customers:

- Simplify their upgrade process
- Help reduce risk
- Minimize disruption to users and application environments
- Help enable success at every phase of the upgrade

The Solaris 10 OS Upgrade Service is based on well-honed best practices distilled from Sun's many years of experience and utilizes sophisticated tools available with the Solaris 10 OS to simplify the upgrade process. The service is designed to help customers quickly and cost-effectively deploy the Solaris 10 OS into an existing SPARC® and/or x86 based platform environment where a previous version of the Solaris OS (Solaris 7, 8 or 9 OS) is already running. It minimizes disruption to the application environment and makes minimal or no changes to the existing hardware platform.

Sun offers a rapid and cost-effective approach to upgrades which also minimizes disruption and service downtime. By using automation to simplify the upgrade process and help reduce risk, Sun's approach limits application downtime to the time required for a simple reboot of the server. It also provides a fallback mechanism that helps to enable a quick return to the old environment in the event of an urgent problem. The safety of this fallback mechanism can help reduce project costs by limiting the need for application testing and the need for extra test hardware.

Key benefits of the Solaris 10 OS Upgrade Service include:

- Leveraging Sun experts can help reduce risk and make the migration easier
- Ability to reboot to a known good environment within minutes helps reduce the need for extensive testing of the application stack under the new OS
- Minimal disruption to users — No application down time except to reboot to the new OS
- Software and application environment remains unchanged
- Fewer system configurations increases maintainability and availability
- Customers are positioned to take advantage of enhanced Solaris 10 features through additional services that can optimize the Solaris 10 OS environment

Benefits of the Solaris™ 10 OS

New features and functions in the Solaris 10 OS can allow businesses to generate benefits that go well beyond the cost savings typically used to justify an upgrade. The unique combination of features found in the Solaris 10 OS help enable it to detect and correct faults before they result in application failures, deliver optimized resource utilization, provide higher performance, and protect applications with unparalleled security — all across multiple platform and processor architectures. These capabilities in Solaris 10 can help businesses achieve:

- Simplified data center operations using improved management features
- Higher application availability with predictive self-healing features
- Improved application performance with a faster TCP/IP stack and a powerful new Solaris Dynamic Tracing (DTrace) facility that helps developers quickly understand system behavior
- Reducing costs through consolidation and/or improved resource utilization using Solaris Containers and resource management tools
- Increased security with process rights management facilities that provide fine-grained control over the resources and objects that processes can manipulate so that the possibility of a compromised application doing real damage to a system can be significantly reduced

Scope of This Document

This document provides an overview of Sun's best practices for upgrading to the Solaris 10 OS and describes the contents of the Solaris 10 OS Upgrade Service. The best practices provided in this document are intended as general guidelines and should not be construed as a complete roadmap for the upgrade process. Customers attempting to upgrade to Solaris 10 without help from Sun or a Sun authorized partner can follow these guidelines to help improve their results. However these tasks require qualified personnel with advanced Solaris OS and systems administration skill sets. Sun is sharing these guidelines to demonstrate best practices used by Sun in the upgrade process. Sun is not responsible for the results achieved when customers follow these guidelines on their own.

Chapter 2

Sun's Approach to Upgrades

Whether upgrading thousands of servers or just a few, a successful upgrade project requires a well thought out plan. Based on years of experience with customers and with Sun's own internal IT operations, Sun has identified the following critical success factors for upgrades:

- Quick implementation and scalable process — The project must be completed in a short time frame regardless of scale
- Minimal application downtime — Servers must be upgraded without major disruption to users
- Dependable fallback mechanism — Users need a way to quickly revert back to their old environment in the event of an urgent problem
- Minimal application testing — Non-mission-critical applications must be assumed to work in the new environment based on binary compatibility so that testing can be limited to mission-critical applications
- Effective program management — The process must be well managed using a process that simplifies isolation of potential failures and helps enable rapid determination of root causes

Sun's approach to addressing these requirements is summarized in Table 2-1.

Table 2-1. Sun's Approach Addresses Critical Success Factors

Critical Success Factor	Sun's Approach
Quick implementation and scalable process	Deploy a <i>standard OS configuration</i> for all application servers in the data center using Solaris Flash Archive (FLAR) technology and <i>automated programs</i> for a seamless process that can help minimize system administrator effort and create a consistent environment throughout the data center. Sun's upgrade process is also designed to help reduce the manual effort required for server installation and patching by automating as many of the steps as possible. Automation not only accelerates the project implementation schedule, but also helps customers to standardize on a single OS configuration, thereby simplifying system administration and potentially improving service levels.
Minimal application downtime	Use Solaris Live Upgrade technology to install and configure the Solaris 10 OS on an <i>alternate boot device so that the old system could continue to operate</i> during the upgrade process. Using this approach, application downtime is often reduced to the time required for a reboot.

Critical Success Factor	Sun's Approach
Dependable fallback mechanism	Deploy a <i>dual boot environment</i> so that the server can be easily booted with either the Solaris 10 OS or the previously installed OS version. This helps enable application software problems to be easily reproduced on the previous OS platform in case a support call must be placed to an Independent Software Vendor (ISV).
Minimal application testing	Use Sun's Application Binary Interface (ABI) technology which allows most applications to run unchanged in the new environment without recompilation. This helps customers to <i>limit testing to mission-critical applications</i> . Other applications can simply be assumed to work unless a problem is reported.
Effective program management	Customers are encouraged to create a <i>dedicated project team assigned to manage incidents and track down root causes of reported errors</i> by working with Sun support engineers.

Dual Boot Environment

A primary characteristic of Sun's upgrade process is the use of a second boot drive on each server so that the server can be booted either from its old environment, or from the new environment using the Solaris 10 OS. Many servers that are being upgraded already have a disk configuration that includes a mirrored system disk for higher availability. As shown in Figure 2-1, this environment offers an opportunity to minimize changes to the hardware environment by temporarily utilizing the mirror system disk as an alternate boot disk. Disk mirroring can be temporarily turned off and the mirrored disk can be converted to an alternate boot disk that contains a boot environment for the Solaris 10 OS.

This approach saves the time and cost of adding an extra disk to the server during the upgrade process and this benefit must be weighed against the risk associated with turning off disk mirroring during the upgrade process. For situations where a mirror disk is not available, another means must be used to provide the alternate boot disk. In some cases it may be necessary to add an extra disk to the system in order to serve as the alternate boot disk.

After the upgrade is complete, the dual boot environment can be maintained to provide a fallback mechanism for as long as desired by the customer. When the fallback mechanism is no longer needed, the old boot disk can be returned to its original purpose. If it was originally a mirror disk for the old OS environment, it can be re-established as a mirror disk for the new Solaris 10 OS boot disk to add redundancy as shown at the bottom of Figure 2-1.

The major benefits of using this dual boot environment are:

- The alternate boot environment provides users with a fallback position, so that if they were to have an urgent problem, they could quickly revert to their old environment. It also circumvents the need to run a separate test server for all but the most mission-critical applications.
- Application downtime can often be limited to a simple reboot because Solaris Live Upgrade technology allows the old OS environment to continue running while the new system disk is being provisioned.

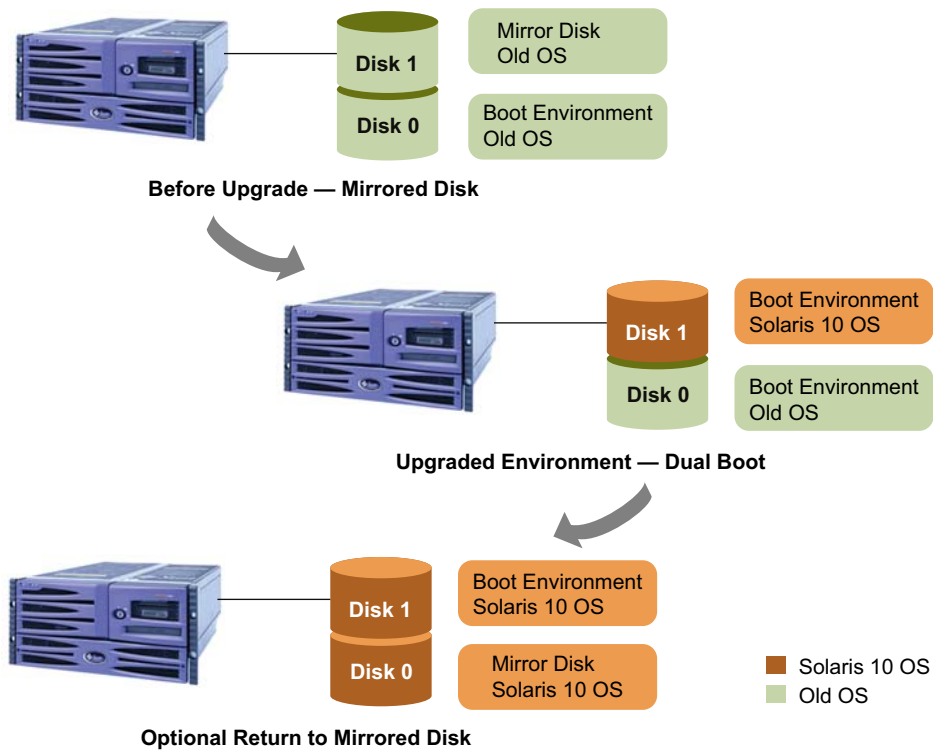


Figure 2-1. A dual boot environment provides a fallback mechanism and limits application downtime to a simple reboot

Application Testing

Given that Solaris 10 OS provides binary compatibility for applications that run on previous versions of Solaris, Sun recommends that application testing be limited to mission-critical applications. Because of the safety offered by the fallback mechanism in the dual boot environment, non-mission critical applications can be simply moved to the Solaris 10 OS environment and assumed to work unless a problem is reported by users. While there is some obvious risk in this approach, Sun's experience has been that most customer applications do indeed run without incident. All applications that comply with the Solaris Application Binary Interface (ABI) should run without modification when moved to a later version of the Solaris OS.

Mission-critical applications can be tested using their existing test processes. This usually involves a test system that is already in place and test procedures that are designed for testing new releases of the software before they are put into production. In these environments, the Solaris 10 OS can be introduced on the test configuration using the same procedures as for non-mission critical applications including the use of a temporary dual boot environment. Once the software has been fully tested on the Solaris 10 OS, it can be moved into production complete with the Solaris 10 OS environment. The dual boot environment can then also be used in the production environment for as long as desired.

Key Technologies That Enable Sun's Approach

Sun's approach to Solaris OS upgrades is made possible by two key technologies, Solaris Flash and Solaris Live Upgrade software. These technologies and their benefits are described briefly in the following subsections.

Solaris Flash Technology

Solaris Flash technology allows administrators to take a snapshot of a complete system image including the Solaris OS, the application stack, and system configuration information. This system image, called a flash archive (FLAR) can then be quickly and easily replicated onto multiple servers. Internal tests conducted at Sun have shown that a complete Web server can be set up using the network install feature of Solaris Flash software in under three minutes. Using Solaris Flash Archives to replicate a common reference system image to a broad number of servers has the additional benefits of reducing configuration complexity and improving deployment scalability.

This process is ideal for migrating a large number of servers and can provide the following major benefits:

- Greatly speeds up the process of installation
- Creates efficiency and avoids duplication of efforts in configuring software on each server
- Minimizes the risk of errors in the installation by deploying a proven and tested software stack
- Simplifies overall system management by helping administrators to configure servers identically

Solaris Live Upgrade Technology

Solaris Live Upgrade technology can be used with Solaris Flash technology to simplify the task of upgrading servers and to help minimize downtime. Solaris Live Upgrade software promotes greater availability by providing a mechanism to upgrade and manage multiple on-disk instances of the Solaris Operating Environment — allowing OS upgrades to take place while the system continues to operate.

With Solaris Live Upgrade software, the updates are made to an alternate boot environment while the system continues to run using the active boot environment. The original system configuration remains functional, and in operation, until the alternate boot environment is activated and the server is rebooted. The updated software stack goes into effect immediately upon system reboot.

The primary benefits of Solaris Live Upgrade technology are:

- Often reduces the downtime necessary in an operating system upgrade to that of a simple reboot
- Provides a fallback position, allowing the previous boot environment to remain available in case of an urgent need to revert to the prior software stack

Chapter 3

Three Stage Process of Solaris 10 OS Upgrade Service

Sun's upgrade process can be divided into three primary stages that are described in this chapter. The primary stages are:

- Taking an inventory of the data center environment to define the needs of the OS configuration
- Creating a master Solaris 10 OS configuration using Solaris Flash technology
- Migrating each server to the new Solaris 10 OS configuration

At the completion of the service the customer will be left with a dual boot environment in which the Solaris 10 OS is the primary boot drive and the old configuration is available as an alternate boot drive. After the customer has determined that the new OS environment is working well, they can optionally remove the alternate boot environment. If they had been using disk mirroring prior to the upgrade, they can re-establish this redundancy by turning the alternate boot disk into a mirror disk for the Solaris 10 OS boot disk as was shown at the bottom of Figure 2-1.

Stage 1 — Pre-assessment

The pre-assessment stage involves taking an inventory of existing servers in the data center to determine the requirements for the upgraded environment. It includes discovery of all applications that must be migrated, and a complete list of the different server architectures that exist in the data center.

The number of different server architectures will determine the number of master system images that must be created in the next stage. Servers of the same architecture can use the same OS image even if they are different model servers. For example, a Sun Enterprise™ 250 Server could use the same OS image as the much larger Sun Fire™ 25K server they are both based on Sun4u architecture, built on the UltraSPARC® central processing unit.

Sun engineers collect the following data to build an inventory of the data center environment:

- Software executables on each server
- System software such as a third-party volume managers
- Common infrastructure software modules such as Sun Java™ System Application Server that could be built into a master server configuration
- Types of server architectures
- Types of hardware interface, storage, and peripherals that are attached to servers
- Required OS patches in the old environment

After collecting and analyzing the data about the current environment, Sun engineers can determine how many master system images are needed and can define the OS and software stack configuration required for each master system image. Based on the documented needs for the OS configurations, Sun works with the customer to define one or more master server configurations that can then be replicated to any number of target servers.

Stage 2 — Create Master Solaris 10 OS System Image

In order to help reduce complexity in the data center, the upgrade process uses standard configurations for groups of servers. By deploying only a few configurations of the OS environment throughout the data center, customers will find it easier to track and maintain their server configurations.

Each master OS configuration is created by first installing and configuring the Solaris 10 OS on a master server. This server would then contain the standard “base” Solaris 10 OS with appropriate packages and patches installed, allowing that same configuration to then be replicated on many other servers.

Figure 3-1 shows the steps for configuring this master server and then creating and saving a Solaris Flash archive image for replication. The first step is simply preparing the hardware system for an OS installation and configuring the system to meet the minimum requirements for the installation.

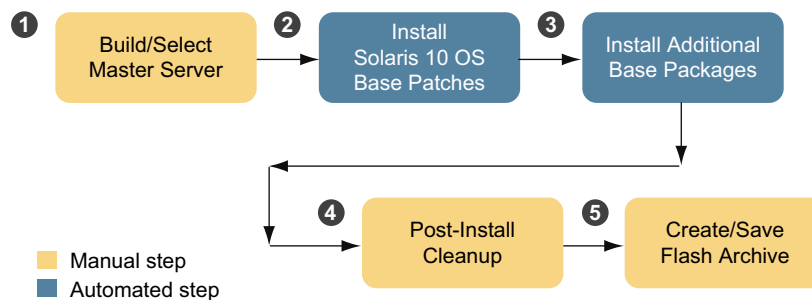


Figure 3-1. A master OS configuration is created and then archived using Solaris Flash technology

The installation of the Solaris 10 OS and additional base packages (steps 2 and 3) is an automated process whereas other steps require manual intervention by the administrator or Sun engineer performing the upgrade. In step 4, the administrator can delete all unwanted OS components and install any required patches.

Once the master server is configured, the Solaris 10 OS image can be saved using Solaris Flash technology to capture a snapshot image of the complete server configuration including all installed applications, OS patches, etc. Localization of target servers (adding additional Solaris packages beyond those configured in the master server) can be performed on individual servers after installing the master Solaris Flash image. The process for installing a Solaris Flash image on a target server is explained in more detail in the following section.

The end result of stage 2 is a system image or multiple system images that can be quickly and easily replicated on other servers to deploy standard OS configurations throughout the data center.

Stage 3— Upgrade Each Server to the Solaris 10 OS

In order to accelerate the upgrade process and help reduce the risk of manual errors, Sun has devised a highly automated update process. This process can shrink the time required to less than one hour per server, a big savings over traditional upgrade times of four to eight hours. In addition to driving greater efficiency and speed, this process also helps create greater consistency of OS configurations throughout the data center.

The major steps in this phase of the upgrade process are shown in Figure 3-2. Note that the first three boxes represent steps that are automated, leaving only two minor steps at the end that require operator intervention to complete the step.

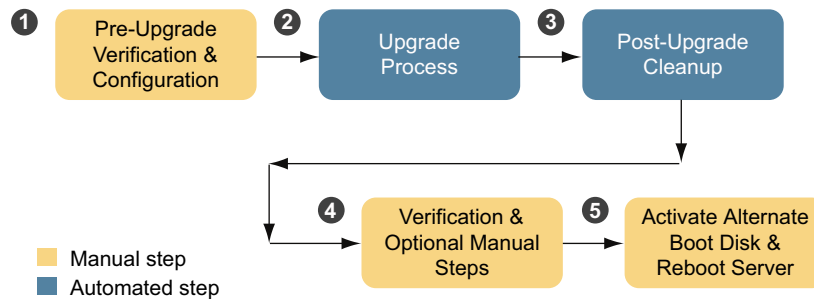


Figure 3-2. Each server is updated to the Solaris 10 OS by quickly provisioning the master OS image.

The first step, called pre-upgrade, brings the server up to the minimum requirements for the Solaris 10 OS upgrade process. If the server cannot be brought up to the minimum requirements through software updates, the program will abort the process and require the Sun engineer to restart the program after resolving the indicated issue. This automated pre-upgrade step includes the following actions:

- Verify that current OS level meets requirement (Solaris 7, 8, or 9)
- Validate minimum requirements for memory and OS disk space
- Check for installation of required packages and patches (e.g. Solaris Live Upgrade)
- Install packages and patches as necessary
- Break mirror of OS disk if using mirror disk as an alternate boot device
- Partition OS disk to recommended sizes

The second step, called the upgrade process, involves setting up the Solaris 10 OS disk partition by installing the Solaris Flash archive image containing the standard OS configuration. This automated step performs the following functions:

- Create file system and boot environments on target disk partition
- Install pre-built standardized Solaris 10 OS image on alternate boot disk
- Create Solaris 10 OS required mail user
- Create mount points for file systems
- Synchronize alternate boot environment with devices and file system (Solaris Live Upgrade synchronizes some additional system files when the boot environment is activated and the server rebooted)

The third step, post-migration cleanup, checks for inconsistencies between the old and the new boot environment and prepares a validation report so that an administrator can easily determine if any additional steps need to be taken before activating this new boot environment. A compact validation report makes it easy to identify the required manual actions (step 4).

The final step is to manually activate the alternate boot environment (Solaris 10 OS) and reboot the server. Solaris Live Upgrade technology allows the server to continue operating during the installation process, but this final step

requires some downtime. However, the downtime is generally limited to only the time required for the reboot of the server. Because this step will impact the user community, this final step of the upgrade process should be scheduled in advance so as to minimize the impact to users.

Acceptance of the Solaris 10 OS as the New Production Environment

When the three stages of the upgrade process are completed as described above, each server will have a dual boot environment in which the Solaris 10 OS is the primary boot drive and the old configuration is available as an alternate boot drive. This dual- boot configuration can remain in place as long as the customer would like. A waiting period, typically for 15-30 days, is a typical time frame for customers to observe the applications as they work in the new OS environment. If the waiting period is observed without any reported incidents, customers can be relatively comfortable that the new OS environment is working well and that the old OS environment can then be removed.

To remove the alternate boot environment, the customer can simply repurpose the alternate boot disk. If disk mirror had been in place prior to the upgrade, the customer can re-establish this redundancy by turning the alternate boot disk into a mirror disk for the Solaris 10 OS boot disk as was shown at the bottom of Figure 2-1. Alternatively, the old boot environment can simply be brought back into the pool of available storage for user and application data. In either case, the end of the waiting period signals an acceptance of the Solaris 10 OS application environment in production.

Chapter 4

Conclusion

There's no need to wait to start taking advantage of the new capabilities and cost saving features in the Solaris 10 OS. Sun has a proven track record of successfully helping thousands of satisfied customers upgrade or migrate to the latest release of the Solaris OS. With the Solaris 10 OS Upgrade Service, customers can keep their IT staff focused on business priorities while leveraging Sun's expertise to get the job done right and without losing precious time.

Related Offerings from Sun Services

In addition to helping customers upgrade from previous versions of Solaris, Sun offers related services for optimizing a Solaris 10 OS application environment and for migrating to the Solaris 10 OS from other platforms.

SunSM Advanced Features Suite for Solaris 10 OS

The SunSM Advanced Features Suite for Solaris 10 OS is designed to help customers take advantage of the advanced features of the Solaris 10 OS to optimize their application environment. It includes installation, configuration, optimization and performance testing of various advanced features pre-selected by the customer. The goal is to help optimize the newest features of Solaris 10 with the customer's application set.

Sun Enterprise Migration Suite

The Sun Enterprise Migration Suite is designed to make it easier for customers to migrate from other OS platforms to the Solaris 10 OS. It is based on best practices distilled from Sun's experience helping customers successfully navigate mainframe rehosting, as well as HP-UX, Tru64, AIX, Linux, and other platform migrations. Sun consultants carefully analyze business objectives, operational requirements, and existing constraints. After creating a unique, accurate assessment of a customer's IT environment, Sun uses a methodology quite similar to the Solaris 10 OS Upgrade Service to design and implement a solution based on Sun's best practices.

For more information

For more information, contact a local Sun Services representative or visit the Web sites shown in Table 4-2.

Table 4-2. Web Links for Additional Information

Web Site URL	Description
sun.com/service/solaris10/upgrade.html	Solaris 10 OS Upgrade Service
sun.com/service/	Sun Service Solutions
sun.com/solaris10/	Solaris 10 Operating System
sun.com/solaris/	Solaris Enterprise System
sun.com/software/solaris/liveupgrade	Solaris Live Upgrade Technology

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