



Easy Lifecycle Management with the Image Packaging System on Oracle Solaris 11

Reduce cost with higher uptimes and avoid human error

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Introduction

For most enterprise IT organizations, significant effort goes into upgrading operating system software to appropriate patch levels so as to benefit from bug fixes, security updates, or new hardware driver support when available. Proper management of system software can also help ensure a well-known, tested, and consistent system state across a variety of systems in the data center. With increasing trends towards consolidation using virtualization, system administrators are being asked to manage large volumes of software often with complex interdependencies, making it harder for them to keep systems running smoothly.

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Oracle Solaris 11 takes a new approach to package management that greatly simplifies the process of managing patches and updates to help reduce the risk of operating system maintenance issues.

Image Packaging System

Based on extensive customer feedback about patch and upgrade processes for Oracle Solaris 10, Oracle engineers completely redesigned the software packaging system in Oracle Solaris 11. Oracle Solaris 11 represents a significant change for system administrators because of its new software packaging model—the Image Packaging System (IPS). IPS is a comprehensive delivery framework that spans the complete software lifecycle, addressing software installation, updates, system upgrades, and the removal of software packages. In contrast to the SVR4 packaging model used in earlier Oracle Solaris releases, IPS eliminates the need for patching. Relying on the use of software repositories, IPS dramatically changes how an administrator updates system and application software, as shown in Figure 1.

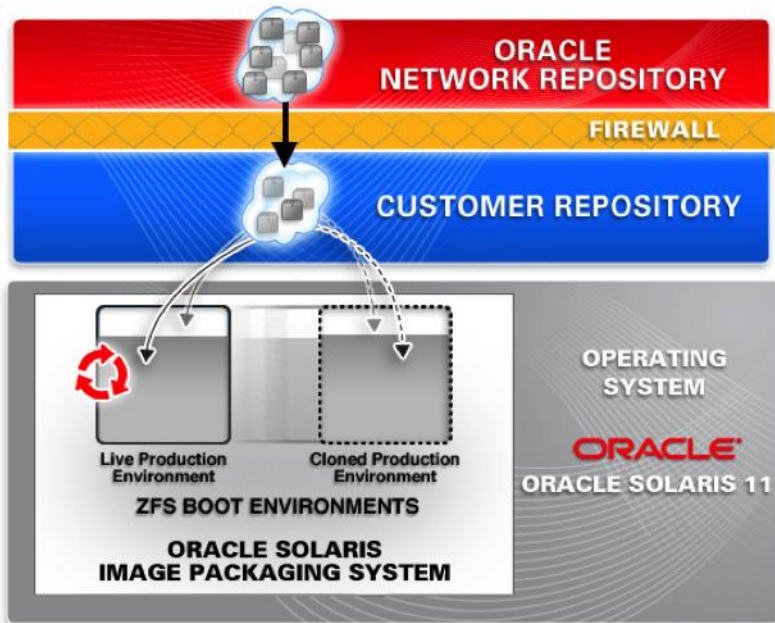


Figure 1. Oracle Solaris Image Packaging System

A design goal behind the development of this new model (in addition to simplifying software lifecycle maintenance and improving reliability) is compatibility with zones and other installation contexts. From the perspective of keeping system software up to date, the IPS framework greatly simplifies software maintenance. For Oracle Solaris 10 and earlier releases, patching is often a complex manual process requiring manual patch analysis to understand dependencies and to determine and apply appropriate patches. With the former patching process, administrators sometimes inadvertently introduced problems when appropriate patches were not applied or patch dependencies were not well understood. With Oracle Solaris 11, the IPS model reduces the risk of introducing incompatibilities or problems resulting from human error since all updated OS packages are fully integration-tested before download and installation.

Network Based Repositories

IPS relies on network-accessible or locally available software repositories as a delivery mechanism, which is similar to how other operating systems (notably Oracle Linux) supply software updates. During a package install, IPS performs automatic dependency checking, adding additional packages, such as libraries, that might be required. Administrators can easily set up and manage local repositories to deploy both OS and application packages within network-restricted environments. Repositories are also easily mirrored, allowing an administrator to optimize for more efficient access. Table 1 lists default network-accessible repositories for Oracle Solaris 11.

TABLE 1. ORACLE SOLARIS 11 REPOSITORIES

Repository	Description
http://pkg.oracle.com/solaris/release	Default repository for Oracle Solaris 11. This repository contains updates for each new release of Oracle Solaris. Significant bug fixes, security updates, and new software may be provided at any time, at Oracle's discretion, for users to install.

<https://pkg.oracle.com/solaris/support>

Support repository providing the latest bug fixes and updates. Access is restricted to users with current Oracle Solaris support contracts.

Package Management

IPS provides a variety of command-line interfaces including `pkg` (1) to allow easy management and creation of software packages and software package repositories. Table 2 shows IPS command-line equivalents for a few frequently used SVR4 packaging commands.

While IPS packaging is the default packaging technique for Oracle Solaris 11, SVR4 packaging tools, such as `pkgadd` (1M), are still provided for compatibility to support installations of SVR4 packaged application software.

TABLE 2. IPS AND SVR4 PACKAGING COMMANDS

Task	IPS Command	SVR4 Packaging Command
Install package	<code>pkg install</code>	<code>pkgadd</code>
Display package state and version information	<code>pkg list</code>	<code>pkginfo</code>
Verify package installation	<code>pkg verify</code>	<code>pkgchk -v</code>
Display package information, such as license	<code>pkg info</code>	<code>pkginfo -l</code>
Display contents of a package	<code>pkg contents</code>	<code>pkgchk -l</code>
Search for a package	<code>pkg search</code>	<code>pkgchk -l -p</code>
Uninstall a package	<code>pkg uninstall</code>	<code>pkgrm</code>

Upgrading Software in a System

In conjunction with the IPS packaging framework, Oracle Solaris 11 supplies a new methodology and tools to clone the active boot environment and subsequently use that image to upgrade the operating environment. Similar in concept to Live Upgrade in Oracle Solaris 10, upgrading in Oracle Solaris 11 takes advantage of the underlying ZFS file system technology, using its native fast snapshot and clone capabilities to replicate the active operating system image.

When an administrator updates system software (via a `pkg update`), Oracle Solaris 11 first clones the current boot environment and applies packaging changes to the clone. By default, the clone is automatically activated on reboot. If a problem occurs, the administrator can easily roll back to the previous boot environment image. In this way, Oracle Solaris 11 provides an administrative safety net for OS upgrades and software changes, which helps to improve system and application availability. A fast system reboot, default for SPARC and x86 systems, means that administrators can switch to a new boot environment quickly, often within seconds.

Managing Boot Environments

In Oracle Solaris 11, the new `beadm (1M)` utility is used to manage boot environments and snapshots of system images (in this context a snapshot is a read-only, non-bootable image). Table 3 shows `beadm` commands for common management tasks.

TABLE 3. BOOT ENVIRONMENT COMMANDS

Task	Boot Environment Command
Create a boot environment	<code>beadm create</code>
Make the specified boot environment active on next reboot	<code>beadm activate</code>
List information about boot environments	<code>beadm list</code>
Destroy a boot environment	<code>beadm destroy</code>
Mount or unmount a boot environment at a mount point	<code>beadm mount</code> or <code>beadm unmount</code>
Rename a boot environment	<code>beadm rename</code>

Note that it is possible to create and mount an inactive boot environment and then update it:

```
# beadm create special
# beadm mount special /mnt
# pkg -R /mnt install wireshark
# beadm unmount special
# beadm activate special
# reboot
```

This series of commands creates and mounts an inactive boot environment `Special` and then updates it by adding a new package. The boot environment is then unmounted, activated, and booted. Note that all these commands require special privilege, which can be gained by use of `sudo`, `pfexec`, or `su`.

Boot Environments and Zones

There are important implications to understand when managing systems that include Oracle Solaris Zones. When non-global zones are created within certain shared areas of the global zone (for example, `/system/zones`), new child boot environments can be created for that zone that are attached to the parent boot environment of the global zone. Installing a new package within the global zone does not automatically install it in any non-global zones.

Likewise, when a new package is installed in a non-global zone, it is not automatically installed into the global zone or any other non-global zones. However, packages in these zones are automatically upgraded when the base environment image is upgraded. This ensures that software running in different zones is at the same package level. Since administrative privileges for zones can now be delegated, a zone administrator can independently use `beadm` to create and roll back image snapshots created within a zone.

Summary

Image Packaging System (IPS) is a significant milestone in Oracle Solaris 11, providing a flexible and efficient software management solution that allows for safe system upgrades and better control over planned system downtime for administrators. IPS is fully integrated into existing Oracle Solaris technology, such as Oracle Solaris ZFS and Oracle Solaris Zones, providing a much-improved out-of-the-box experience for administrators and greater ability to manage software versions across multiple systems in the data center.

The Oracle Solaris 11 release forms a strong foundation for the entire Oracle software stack, allowing customers to deploy enterprise applications with confidence. Oracle Solaris 11 adds new functionality that helps to simplify administration, secure data and applications, improve system resource utilization, and promote business continuity. Oracle Solaris 11 is a production-capable release that administrators can download and deploy now, with full support available as an option from Oracle:

For More Information

TABLE 4. RESOURCES FOR ADDITIONAL INFORMATION

Reference	Web URL
Oracle Solaris 11 Lifecycle Management Resources	http://www.oracle.com/technetwork/server-storage/solaris11/technologies/lifecycle-management-2237945.html
Oracle Solaris 11 Download	http://www.oracle.com/technetwork/server-storage/solaris11/downloads/index.html
Oracle Solaris 11 Documentation	http://www.oracle.com/technetwork/server-storage/solaris11/documentation/index.html
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