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Transitioning From Oracle® Solaris 10 to Oracle® Solaris 11.4

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This document provides information to assist you to transition to Oracle Solaris 11 from Oracle Solaris 10.

Key Differences between Oracle Solaris 10 and Oracle Solaris 11

Upgrading from Oracle Solaris 10 to Oracle Solaris 11 requires a fresh installation of Oracle Solaris 11.

Tools to help you make the transition include the following:

- Oracle Solaris 10 branded zones. Migrate Oracle Solaris 10 instances to Oracle Solaris 10 zones on Oracle Solaris 11 systems.
- ZFS shadow migration. Migrate UFS data from an existing file system, either local or NFS, to a new local ZFS file system. Do not mix UFS directories and ZFS file systems in the same file system hierarchy.

  You can also remotely mount UFS file systems from an Oracle Solaris 10 system onto an Oracle Solaris 11 system, or use the `ufsrestore` command on an Oracle Solaris 10 system to restore UFS data (`ufsdump`) into an Oracle Solaris 11 ZFS file system.

- ZFS pool import. Export and disconnect storage devices that contain ZFS storage pools on your Oracle Solaris 10 systems and then import them into your Oracle Solaris 11 systems.
- NFS file sharing. Share files from an Oracle Solaris 10 system to an Oracle Solaris 11 system. Do not mix NFS legacy shared ZFS file systems and ZFS NFS shared file systems. Use only ZFS NFS shared file systems.

For the main Oracle Solaris documentation, see Oracle Solaris Documentation. For additional documentation and examples, select a technology on the Oracle Solaris 11 Technology Spotlights page.

Applications that run on Oracle Solaris 10 should also run on Oracle Solaris 11 if they use only public Oracle Solaris interfaces. Oracle Solaris Preflight Applications Checker 11.3 can determine the Oracle Solaris 11 readiness of an application by analyzing the working application on Oracle Solaris 10. A successful check with this tool strongly indicates that you can run the application without modification on Oracle Solaris 11.

Versions of FOSS and other software are updated. In some cases, a system can have more than one version of a command or tool simultaneously installed. If your application depends on a particular version, use the full path to the executable rather than depend on a link.

See End of Feature Notices for Oracle Solaris 11 for lists of commands and tools that are no longer available in Oracle Solaris 11. In most cases, Oracle Solaris 11 provides alternative commands and tools. The list also includes hardware that does not support newer Oracle Solaris 11 versions.

For a summary of new or updated features in each release, see the following documents:

- *What's New in Oracle Solaris 11.4*
- *What's New in Oracle Solaris 11.3*
- *What's New in Oracle Solaris 11.2*
- *What's New in Oracle Solaris 11.1* in Oracle Solaris 11.1 Information Library
- *Oracle Solaris 11 What's New* in Oracle Solaris 11 Information Library

A graphical desktop is not included by default with some system installations. If you want a graphical desktop, install the `group/system/solaris-desktop` IPS package.

Installation and Upgrade Changes

The following are key changes from Oracle Solaris 10 to Oracle Solaris 11:

- Installation and upgrade:
    - Instead of JumpStart, use Automated Installer.
    - Instead of Live Upgrade, use the text installer or Image Packaging System (IPS) `pkg` commands.
    - Software packages are delivered in package repositories, similar to Linux package repositories.
- Archive and recovery: Instead of Flash Archives, use Unified Archives.
- System services: More system configuration is done by setting Service Management Facility (SMF) service property values and not by directly editing configuration files. Look for comments in the configuration files and see the documentation for that configuration.
- `root` user: By default, `root` is a role, not a user. Instead of doing privileged tasks as `root`, create and assign roles targeted to each set of related tasks.
- Shell: The default shell for the `root` user is `ksh`. The default shell for other users is `bash`. Default user `PATH` also has changed.

Changes in How to Configure Oracle Solaris Features

More configuration is provided by partial configuration files in the `/etc/system.d` directory, where customer-specific system configuration files should also be stored. Routinely editing `/etc/system` should be avoided. In some cases, the partial configuration file is created by an SMF service using service property values that you provide.

For network configuration, Oracle Solaris 11 assigns generic names to each datalink on a system by using the `net0`, `net1`, `net`*N* naming convention. Configuration is also managed through SMF service property values rather than by directly editing configuration files. In addition, new commands for setting up datalinks and IP interfaces have been introduced to replace the commonly used commands in Oracle Solaris 10, such as `ifconfig`.

Networking in Oracle Solaris 11 has advanced to provide better network performance, efficient network resource management, higher network availability, and new technologies such as in the area of network virtualization. See the documentation in Administering Oracle Solaris Networks and Administering Network Services in Oracle Solaris.

Changes in User Environment

- **Default login and other shell changes** - In Oracle Solaris 11, `/bin/sh` is the Korn shell (`ksh93`), and the default interactive shell is the Bourne-again (`bash`) shell. When used as a login shell, bash retrieves configuration information from the first instance of `.bash_profile`, `.bash_login`, or `.profile` file.
    - The legacy Bourne shell is available as `/usr/sunos/bin/sh`.
    - The legacy `ksh88` is available as `/usr/sunos/bin/ksh` from the `shell/ksh88` package.
    - Korn shell compatibility information is available in `/usr/share/doc/ksh/COMPATIBILITY`.
- **Default user path and `PATH` environment variable** – The default user path is `/usr/bin`. The default path for the root role is `/usr/bin:/usr/sbin`. The default `PATH` environment variable for `bash` is `/usr/bin:/usr/sbin`

For more details about user environment in Oracle Solaris 11.4, see "About the User Work Environment" in *Managing User Accounts and User Environments in Oracle Solaris 11.3*.

Changes in Security

Security in Oracle Solaris 11 supports industry standards more closely. For an overview of security in Oracle Solaris 11, see *Security: An Oracle Solaris Differentiator*.

Other enhancements increase hardening, add compliance functionality, and enable remote administration of security:

In Oracle Solaris 11, the following programs are based on the most recent version of the industry or Open Source standard. Each program is enhanced to include the latest security fixes, but also to work seamlessly with Oracle Solaris 11 features, such as privileges, zones, and the Service Management Framework (SMF).

- KMIP – Chapter 5, "KMIP and PKCS #11 Client Applications" in *Managing Encryption and Certificates in Oracle Solaris 11.4*
- Packet Filter (PF) – Chapter 4, "Oracle Solaris Firewall" in *Securing the Network in Oracle Solaris 11.4*

Note - IP Filter is not supported in Oracle Solaris 11.4.

- MIT Kerberos V – *Managing Kerberos in Oracle Solaris 11.4*
- OpenSSH – *Managing Secure Shell Access in Oracle Solaris 11.4*

Note - SunSSH is not supported in Oracle Solaris 11.4.

- Cyrus SASL (`libsasl2`) – Chapter 2, "Using Simple Authentication and Security Layer" in *Managing Authentication in Oracle Solaris 11.4*
- Trusted Extensions – Supports single-level Trusted Extensions clients, and single-level and multilevel Trusted Extensions servers

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Note - Oracle Solaris 11.4 desktop support is limited to the most recent version of the GNOME desktop. The multilevel Trusted Extensions desktop is not supported in Oracle Solaris 11.4.

The following features ease security administration or provide a safer working environment.

- Process and file isolation by adding labels such as "Confidential"
  - Chapter 6, "Labeling Processes for Data Loss Protection" in *Securing Users and Processes in Oracle Solaris 11.4*
  - Chapter 3, "Labeling Files for Data Loss Protection" in *Securing Files and Verifying File Integrity in Oracle Solaris 11.4*
- Friendly audit report interfaces and audit event selection – "What's New in the Audit Service in Oracle Solaris 11.4" in *Managing Auditing in Oracle Solaris 11.4*
- Two-factor authentication
  - Chapter 4, "Using One-Time Passwords for Multifactor Authentication in Oracle Solaris" in *Managing Authentication in Oracle Solaris 11.4*
  - Chapter 3, "Using Smart Cards for Multifactor Authentication in Oracle Solaris" in *Managing Authentication in Oracle Solaris 11.4*
- Centralized compliance reports – *Oracle Solaris 11.4 Compliance Guide*
- FIPS 140-2 – *Using a FIPS 140-2 Enabled System in Oracle Solaris 11.4*
- Immutable zones, global and non-global – Chapter 10, "Configuring and Administering Immutable Zones" in *Creating and Using Oracle Solaris Zones*
- Security extensions – "Protecting Against Malware With Security Extensions" in *Securing Systems and Attached Devices in Oracle Solaris 11.4*

- OHMP for simpler management of hardware – Systems Management and Diagnostics Documentation Library (`https://docs.oracle.com/cd/F24624_01/index.html`)
- Direct access to user-level cryptographic primitives – "Simple and Fast ucrypto Provider" in *Managing Encryption and Certificates in Oracle Solaris 11.4*

Oracle Solaris 11 eases the administration of security-related features in LDAP and on a network by centralizing and enabling remote administration.

- Remote administration of smart cards – Chapter 3, "Using Smart Cards for Multifactor Authentication in Oracle Solaris" in *Managing Authentication in Oracle Solaris 11.4*
- Centralized management of compliance reports – "Modifying System-Wide Privileges, Authorizations, and Rights Profiles" in *Securing Users and Processes in Oracle Solaris 11.4*
- SMF management of user accounts – "New Feature – Enabling the account-policy Service" in *Securing Users and Processes in Oracle Solaris 11.4*
- Storing SSH public keys in LDAP – "Secure Shell and Remote Public Keys" in *Managing Secure Shell Access in Oracle Solaris 11.4* and the `ssh-ldap-getpubkey`(8) man page

Feature Difference Tables

This section presents in table format some Oracle Solaris key features, and shows the differences between Oracle Solaris 10 and Oracle Solaris 11.4.

TABLE 1   Install, Boot Environment Management, Update, Archive and Recovery

Feature or Command	Oracle Solaris 10	Oracle Solaris 11
Automated installation of a single system or multiple systems	JumpStart	Automated Installer (AI) *Automatically Installing Oracle Solaris 11.4 Systems* *Customizing Automated Installations With Manifests and Profiles*
Interactive installation, from media or over the network	Live Upgrade	Text installer *Manually Installing an Oracle Solaris 11.4 System*
Base software sets	Clusters	Group packages `solaris-large-server` – Default for AI and text install `solaris-small-server` – Default for non-global zones `solaris-minimal-server` – Installs the minimal supported set of packages required to run Oracle Solaris If you do not have access to an Oracle Solaris 11 system, you can view package content at `http://pkg.oracle.com/solaris/release/en/index.shtml`
System upgrade, installing additional software, software update	Live Upgrade	`pkg`(1) *Updating Systems and Adding Software in Oracle Solaris 11.4* *Creating Package Repositories in Oracle Solaris 11.4*
Archive and recovery	Flash Archives	Unified Archives *Using Unified Archives for System Recovery and Cloning in Oracle Solaris 11.4*
Boot Environment (BE) management	`lu*`	`beadm`(8) *Creating and Administering Oracle Solaris 11.4 Boot Environments*

TABLE 2   Booting Features

Feature or Command	Oracle Solaris 10	Oracle Solaris 11
Booting (from a root device)	From a ZFS, UFS, or Solaris Volume Manager root device	From a ZFS root file system *Booting and Shutting Down Oracle Solaris 11.4 Systems*
Booting (from the network)	SPARC: `boot net[:dhcp]` or `boot net[:rarp]` x86: Requires a DHCP server that supports a Preboot Execution Environment (PXE) boot from the network	SPARC: `boot net:dhcp` x86: PXE boot process has changed *only* for UEFI firmware
Booting (recovery)	Failsafe	Unified Archives *Using Unified Archives for System Recovery and Cloning in Oracle Solaris 11.4*
Boot loader (administration)	SPARC: `installboot` x86: `installgrub`	SPARC and x86: `bootadm install-bootloader` `bootadm(8)`
x86 firmware support	BIOS	UEFI and BIOS

TABLE 3   File System and Storage Management

Feature or Command	Oracle Solaris 10	Oracle Solaris 11
File systems	ZFS, UFS, or Solaris Volume Manager root file systems	ZFS root file system *Managing ZFS File Systems in Oracle Solaris 11.4* *Managing Devices in Oracle Solaris 11.4* UFS is a supported legacy file system, but it is not supported as a bootable root file system. The legacy Solaris Volume Manager product is supported, but you cannot boot from a Solaris Volume Manager root device.
Swap and dump	A UFS root environment provides one disk slice for both swap and dump devices.	Two separate volumes are created as a swap device and a dump device. You cannot use a single volume for both swap and dump devices in a ZFS root environment. You cannot use a file as a swap device in a ZFS root environment. The dump device must be approximately one-half to three-quarters of the size of physical memory. *Managing ZFS File Systems in Oracle Solaris 11.4* *Managing File Systems in Oracle Solaris 11.4*
Configure iSCSI LUNs	iSCSI target daemon, the `iscsitadm` command, and the ZFS `shareiscsi` property	COMSTAR (Common Multiprotocol SCSI Target) supports different types of SCSI targets, not just the iSCSI protocol *Managing Devices in Oracle Solaris 11.4*
Backup	`ufsdump` and `ufsrestore`	ZFS snapshot and clone *Managing ZFS File Systems in Oracle Solaris 11.4*
File copy	`rdist`	`rsync(1)` and `scp(1)`

In addition to the documentation cited in the following table, see *Managing System Information, Processes, and Performance in Oracle Solaris 11.4*.

TABLE 4   System Configuration and Administration

Feature or Command	Oracle Solaris 10	Oracle Solaris 11
Periodic tasks	`cron`	Periodic or scheduled service *Developing System Services in Oracle Solaris 11.4* *Managing System Services in Oracle Solaris 11.4*
Single system configuration of operating system and network	`sys-unconfig` and `sysidtool`	System Configuration Interactive (SCI) utility `sysconfig`(8) *Manually Installing an Oracle Solaris 11.4 System*
Single or multiple system configuration of operating system and network	Edit `/etc/system`	Add partial configuration files to `/etc/system.d` Use SMF profiles to configure services SMF profiles and layers, IPS packages *Managing System Services in Oracle Solaris 11.4*
Centralized multiple system configuration of entire stack	Ops Center	Puppet, Chef, Oracle Enterprise Manager Ops Center *Using Puppet to Perform Configuration Management in Oracle Solaris 11.4* Oracle Fusion Middleware – Chef and Puppet Sample Code
Setting host name	Edit `/etc/nodename`	`hostname`(1)
Power management	`pmconfig` and `/etc/power.conf`	`poweradm`(8)
Remote login	`rstart` and `rstartd`	`ssh`(1)

TABLE 5   Network Administration

Feature or Command	Oracle Solaris 10	Oracle Solaris 11
Network administration commands	`ifconfig`, `ndd`, `wificonfig`	`dladm`(8) – datalinks, IP tunnels, driver configuration `ipadm`(8) – IP configuration To see the exact equivalents between `ifconfig` commands and the corresponding `dladm` and `ipadm` subcommands, see *Oracle Solaris 11.4 Network Administration Cheatsheet*.
Routing	`/etc/defaultrouter`	`route`(8)
Naming and directory services	Edit files in `/etc`	Set SMF service property values *Working With Oracle Solaris 11.4 Directory and Naming Services: DNS and NIS* *Working With Oracle Solaris 11.4 Directory and Naming Services: LDAP*

TABLE 6   Virtualization and High Availability

Feature or Command	Oracle Solaris 10	Oracle Solaris 11
Child systems	Oracle Solaris non-global zones	Oracle Solaris non-global zones *Creating and Using Oracle Solaris Zones* Oracle Solaris 10 zones *Creating and Using Oracle Solaris 10 Zones*
Standalone systems	LDOMs	Oracle Solaris kernel zones *Creating and Using Oracle Solaris Kernel Zones* Oracle Solaris VM Server

Feature or Command	Oracle Solaris 10	Oracle Solaris 11
		Oracle VM Server and Oracle VM Manager
		Oracle VM Templates

TABLE 7   Desktop Features

Feature or Command	Oracle Solaris 10	Oracle Solaris 11
Desktop	Common Desktop Environment (CDE) (default) GNOME 2.6 (optional)	GNOME 3 *Oracle Solaris 11.4 Desktop*
Printing	LP print service, `lp` print commands, Solaris Print Manager GUI	CUPS *Configuring and Managing Printing in Oracle Solaris 11.4*
Locale, time zone, keymap configuration	`localeadm`	`nlsadm(8)` *International Language Environments Guide for Oracle Solaris 11.4*

TABLE 8   User Management

Feature or Command	Oracle Solaris 10	Oracle Solaris 11
Commands	`user*`, `group*`, `role*`	Addition of the `useradm` command `useradm(8)`
Interactive Tool	Solaris Management Console and associated command lines	`useradm` application Oracle Solaris User Account Manager BUI *Managing User Accounts and User Environments in Oracle Solaris 11.4*

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