

Oracle® Solaris 10 1/13 Installation Guide: Planning for Installation and Upgrade

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Preface

This book describes planning your installation or upgrade with the Oracle Solaris operating system (OS) on both networked and nonnetworked SPARC and x86 architecture based systems. This book also provides overviews of several technologies that relate to installation such as Oracle Solaris ZFS installations, Oracle Solaris Zones “zones” partitioning technology, booting, and the creation of RAID-1 volumes during installation.

This book does not include instructions about how to set up system hardware or other peripherals.

Note – This Oracle Solaris release supports systems that use the SPARC and x86 families of processor architectures. The supported systems appear in the *Oracle Solaris OS: Hardware Compatibility Lists*. This document cites any implementation differences between the platform types.

In this document, these x86 related terms mean the following:

- x86 refers to the larger family of 64-bit and 32-bit x86 compatible products.
- x64 relates specifically to 64-bit x86 compatible CPUs.
- "32-bit x86" points out specific 32-bit information about x86 based systems.

For supported systems, see the *Oracle Solaris OS: Hardware Compatibility Lists*.

Who Should Use This Book

This book is intended for system administrators responsible for installing the Oracle Solaris OS. This book provides the following types of information.

- Advanced Oracle Solaris installation planning information for enterprise system administrators who manage multiple Oracle Solaris machines in a networked environment
- Basic Oracle Solaris installation planning information for system administrators who perform infrequent Oracle Solaris installations or upgrades

Related Books

The following table lists related documentation for system administrators.

| Description | Information |
|---|---|
| Do you need to install a single system from DVD or CD media? The Oracle Solaris installation program steps you through an installation. | <i>Oracle Solaris 10 1/13 Installation Guide: Basic Installations</i> |
| Do you need to upgrade or patch your system with almost no downtime? Save system downtime when upgrading by using Live Upgrade, a feature of Oracle Solaris. | <i>Oracle Solaris 10 1/13 Installation Guide: Live Upgrade and Upgrade Planning</i> |
| Do you need to install a secure installation over the network or Internet? Use WAN boot to install a remote client. Or, do you need to install over the network from a network installation image? The Oracle Solaris installation program steps you through an installation. | <i>Oracle Solaris 10 1/13 Installation Guide: Network-Based Installations</i> |
| Do you need to install Oracle Solaris on multiple machines? Use JumpStart to automate your installation. | <i>Oracle Solaris 10 1/13 Installation Guide: JumpStart Installations</i> |
| Do you need to install or patch multiple systems quickly? Use Flash Archive, a feature of Oracle Solaris, to create an archive and install a copy of the OS on clone systems. | <i>Oracle Solaris 10 1/13 Installation Guide: Flash Archives (Creation and Installation)</i> |
| Do you need to back up your system? | Chapter 19, “Backing Up and Restoring UFS File Systems (Overview/Tasks),” in <i>System Administration Guide: Devices and File Systems</i> |
| Do you need troubleshooting information, a list of known problems, or a list of patches for this release? | <i>Oracle Solaris Release Notes</i> |
| Do you need to verify that your system works on Oracle Solaris? | SPARC: <i>Oracle Solaris Sun Hardware Platform Guide</i> |
| Do you need to check on which packages have been added, removed, or changed in this release? | <i>Oracle Solaris Package List</i> |
| Do you need to verify that your system and devices work with Solaris SPARC and x86 based systems and other third-party vendors? | <i>Solaris Hardware Compatibility List for x86 Platforms</i> |

Access to Oracle Support

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Typographic Conventions

The following table describes the typographic conventions that are used in this book.

TABLE P-1 Typographic Conventions

| Typeface | Description | Example |
|------------------|---|---|
| AaBbCc123 | The names of commands, files, and directories, and onscreen computer output | Edit your <code>.login</code> file. Use <code>ls -a</code> to list all files. <code>machine_name% you have mail.</code> |
| AaBbCc123 | What you type, contrasted with onscreen computer output | <code>machine_name% su</code> Password: |
| <i>aabbcc123</i> | Placeholder: replace with a real name or value | The command to remove a file is <code>rm filename</code> . |
| <i>AaBbCc123</i> | Book titles, new terms, and terms to be emphasized | Read Chapter 6 in the <i>User's Guide</i> . <i>A cache</i> is a copy that is stored locally. Do <i>not</i> save the file. Note: Some emphasized items appear bold online. |

Shell Prompts in Command Examples

The following table shows UNIX system prompts and superuser prompts for shells that are included in the Oracle Solaris OS. In command examples, the shell prompt indicates whether the command should be executed by a regular user or a user with privileges.

TABLE P-2 Shell Prompts

| Shell | Prompt |
|--|--------|
| Bash shell, Korn shell, and Bourne shell | \$ |

TABLE P-2 Shell Prompts *(Continued)*

| Shell | Prompt |
|--|---------------|
| Bash shell, Korn shell, and Bourne shell for superuser | # |
| C shell | machine_name% |
| C shell for superuser | machine_name# |

PART I

Overall Planning of an Oracle Solaris Installation or Upgrade

This part guides you through planning the installation or upgrade of the Oracle Solaris operating system when using any installation program.

Where to Find Oracle Solaris Installation Planning Information

This book contains two parts: the high-level planning of your installation or upgrade and overviews of several technologies that relate to installation. This chapter provides a roadmap through this book.

Where to Find Planning and System Requirement Information

Oracle Solaris 10 8/11 Installation Guide: Planning for Installation and Upgrade provides system requirements and high-level planning information, such as planning guidelines for file systems, upgrade planning and much more. The following list describes the chapters in this book and provides links to them.

- [Chapter 2, “Oracle Solaris Installation and Upgrade Roadmap,”](#) provides you with information about decisions you need to make before you install or upgrade the Oracle Solaris OS. Examples are deciding when to use a network installation image or DVD media and descriptions of all the Oracle Solaris installation programs.
- [Chapter 3, “System Requirements, Guidelines, and Upgrade Information,”](#) describes system requirements to install or upgrade to the Oracle Solaris OS. General guidelines for planning the disk space and default swap space allocation are also provided. Upgrade limitations are also described.
- [Chapter 4, “Gathering Information Before an Installation or Upgrade,”](#) contains checklists to help you gather all of the information that you need to install or upgrade your system. This information is useful, for example, if you are performing an interactive installation. You'll have all the information in the checklist that you'll need to do an interactive installation.
- [Part II, “Understanding Installations Related to ZFS, Booting, Oracle Solaris Zones, and RAID-1 Volumes,”](#) provide overviews of several technologies that relate to Oracle Solaris OS installation or upgrade. Guidelines and requirements related to these technologies are also included. These chapters include information about ZFS installations, GRUB based booting, Oracle Solaris Zones partitioning technology, and RAID-1 volumes that can be created at installation.

Oracle Solaris Installation and Upgrade Roadmap

This chapter provides you with information about decisions you need to make before you install or upgrade the Oracle Solaris OS. This chapter contains the following sections:

- “Installing or Upgrading the Oracle Solaris Software Task Map” on page 15
- “Installing From the Network or From DVD or CDs?” on page 18

Note – Starting with the Oracle Solaris 10 9/10 release, only a DVD is provided. Oracle Solaris Software CDs are no longer provided.

- “Performing an Initial Installation or an Upgrade” on page 19
- “Choosing an Oracle Solaris Installation Method” on page 19
- “Planning Network Security” on page 36

Note – This book uses the term *slice*, but some Oracle Solaris documentation and programs might refer to a slice as a partition.

x86: To avoid confusion, this book distinguishes between x86 `fdisk` partitions and the divisions within the Oracle Solaris `fdisk` partition. The x86 `fdisk` divisions are called *partitions*. The divisions within the Oracle Solaris `fdisk` partition are called *slices*.

Installing or Upgrading the Oracle Solaris Software Task Map

The following task map is an overview of the steps necessary to install or upgrade the Oracle Solaris OS when using any installation program. Use this task map to identify all of the decisions that you need to make to complete the most efficient installation for your environment.

TABLE 2-1 Task Map: Installing or Upgrading the Oracle Solaris Software

| Task | Description | For Instructions |
|--|--|--|
| Choose initial installation or upgrade. | Decide if you want to perform an initial installation or an upgrade. | “Performing an Initial Installation or an Upgrade” on page 19. |
| Decide whether you want to install a UFS file system or ZFS root pool. | You can install a UFS root (/) file system or a ZFS root pool. | Most of this book relates to installing a UFS file system. For information about how to install a ZFS root pool, see Chapter 5, “ZFS Root File System Installation Planning” |
| Choose an installation program. | The Oracle Solaris OS provides several programs for installation or upgrade. Choose the installation method that is most appropriate for your environment. | “Choosing an Oracle Solaris Installation Method” on page 19 |
| (Oracle Solaris interactive installation program) Choose a default or custom installation. | Decide which type of installation is suitable for your environment: <ul style="list-style-type: none"> ■ If you are using a graphical user interface (GUI), you can choose a default or a custom installation: <ul style="list-style-type: none"> ■ A default installation formats the hard disk and installs a preselected set of software. ■ A custom installation enables you to modify the hard disk layout and select the software that you want to install. ■ If you use a text installer (non-graphical interface), you can select the default values or edit the values to select the software you want to install. | For information about the Oracle Solaris installation program’s choices, see Chapter 4, “Gathering Information Before an Installation or Upgrade” |
| For initial installations only, choose open network security or restricted network security. | For an initial installation, determine whether to disable or constrain network services to respond to local requests only during the installation. The default is to select open network security during installation. | “Planning Network Security” on page 36 |
| Review system requirements. Also, plan and allocate disk space and swap space. | Determine whether your system meets the minimum requirements to install or upgrade. Allocate disk space on your system for the components of the Oracle Solaris OS that you want to install. Determine the appropriate swap-space layout for your system. | Chapter 3, “System Requirements, Guidelines, and Upgrade Information” |
| Choose to install a system from local media or from the network. | Decide on the most appropriate installation media for your environment. | “Installing From the Network or From DVD or CDs?” on page 18 |

TABLE 2-1 Task Map: Installing or Upgrading the Oracle Solaris Software (Continued)

| Task | Description | For Instructions |
|---|--|---|
| Gather information about your system. | <ul style="list-style-type: none"> ■ For the Oracle Solaris installation program, complete the worksheet to collect all of the information that you need to install or upgrade. ■ For the JumpStart installation method, decide which profile keywords to use in your profile. Then review the keyword descriptions to find the information about your system that you need. | <ul style="list-style-type: none"> ■ For the Oracle Solaris installation program, see either of the following resources: <ul style="list-style-type: none"> ■ For an initial installation: “Checklist for Installation” on page 41 ■ For an upgrade: Chapter 4, “Gathering Information Before an Installation or Upgrade” ■ For the custom JumpStart installation method, see Chapter 8, “JumpStart Keyword Reference,” in <i>Oracle Solaris 10 1/13 Installation Guide: JumpStart Installations</i> |
| (Optional) Set system parameters. | You can preconfigure system information to avoid being prompted for the information during the installation or upgrade. | Chapter 2, “Preconfiguring System Configuration Information (Tasks),” in <i>Oracle Solaris 10 1/13 Installation Guide: Network-Based Installations</i> . |
| (Optional) Prepare to install the Oracle Solaris software from the network. | <p>If you chose to install the Oracle Solaris software from the network, complete the following tasks:</p> <ul style="list-style-type: none"> ■ (x86 based systems) Verify that your system supports PXE ■ Create an installation server ■ Create a boot server (if necessary) ■ Configure a DHCP server (if necessary) ■ Set up systems to be installed from the network | <p>To install over a local area network, see Chapter 6, “Installing From the Network With CD Media (Tasks),” in <i>Oracle Solaris 10 1/13 Installation Guide: Network-Based Installations</i>.</p> <p>To install over a wide area network, see Chapter 12, “Installing With WAN Boot (Tasks),” in <i>Oracle Solaris 10 1/13 Installation Guide: Network-Based Installations</i></p> |
| (Upgrade only) Perform tasks prior to upgrade. | Back up your system and determine whether you can upgrade with disk space reallocation. | “Upgrade Planning” on page 30 |
| Perform an installation or upgrade. | Use the Oracle Solaris installation method that you chose to install or upgrade the Oracle Solaris software. | The chapter or chapters that provide detailed instructions for the installation programs. |

Installing From the Network or From DVD or CDs?

Note – Starting with the Oracle Solaris 10 9/10 release, only a DVD is provided. Oracle Solaris Software CDs are no longer provided.

The Oracle Solaris software is distributed on DVD or CD media so that you can install or upgrade systems that have access to a DVD-ROM or CD-ROM drive.

You can set up the systems to install from the network with remote DVD or CD images. You might want to set up systems this way for the following reasons:

- If you have systems that do not have local DVD-ROM or CD-ROM drives
- If you are installing several systems and do not want to insert the discs into every local drive to install the Oracle Solaris software

You can use all of the Oracle Solaris installation methods to install a system from the network. However, by installing systems from the network with the flash archive installation feature or with a JumpStart installation, you can centralize and automate the installation process in a large enterprise. For more details about the different installation methods, refer to [“Choosing an Oracle Solaris Installation Method”](#) on page 19.

Installing the Oracle Solaris software from the network requires initial setup. The following table lists resources for information about preparing to install from the network.

| Description | For More Information |
|---|--|
| For detailed instructions about preparing to install from a local area network | Chapter 6, “Installing From the Network With CD Media (Tasks),” in <i>Oracle Solaris 10 1/13 Installation Guide: Network-Based Installations</i> |
| For instructions about preparing to install over a wide area network | Chapter 12, “Installing With WAN Boot (Tasks),” in <i>Oracle Solaris 10 1/13 Installation Guide: Network-Based Installations</i> |
| For instructions about how to install x86 based clients over the network by using PXE | “Overview of Booting and Installing Over the Network With PXE” in <i>Oracle Solaris 10 1/13 Installation Guide: Network-Based Installations</i> |

Performing an Initial Installation or an Upgrade

You can choose to perform an initial installation or, if your system is already running the Oracle Solaris OS, you can upgrade your system.

Initial Installation

An initial installation overwrites the system's disk with the new version of the Oracle Solaris OS. If your system is not running the Oracle Solaris OS, you must perform an initial installation.

If the system is already running the Oracle Solaris OS, you can choose to perform an initial installation. If you want to preserve any local modifications before you install, you must back up the local modifications. After you complete the installation, you can restore the local modifications.

You can use any of the Oracle Solaris installation methods to perform an initial installation. For detailed information about the different Oracle Solaris installation methods, refer to [“Choosing an Oracle Solaris Installation Method”](#) on page 19.

Upgrade

You can upgrade the Oracle Solaris OS by using either of two upgrade methods: standard and Live Upgrade. A standard upgrade maintains as many existing configuration parameters as possible of the current Oracle Solaris OS. Live Upgrade creates a copy of the current system. This copy can be upgraded with a standard upgrade. You can then switch the upgraded Oracle Solaris OS to become the current system by a simple reboot. If a failure occurs, you can switch back to the original Oracle Solaris OS with a reboot. Live Upgrade enables you to keep your system running while you upgrade and enables you to switch back and forth between Oracle Solaris OS releases.

For more information about upgrading and the list of upgrade methods, see [“Upgrade Planning”](#) on page 30.

Choosing an Oracle Solaris Installation Method

The Oracle Solaris OS provides several programs for installation or upgrade. Each installation technology offers different features that are designed for specific installation requirements and environments. Use the following table to help you decide which installation method to use.

TABLE 2-2 Choosing Your Installation Method

| Task | Installation Method | Reasons for Choosing This Program | Instructions |
|--|--|---|--|
| Install one system from CD-ROM or DVD-ROM media with an interactive program. | Oracle Solaris installation program | <ul style="list-style-type: none"> ■ This program divides tasks into panels, prompts you for information, and offers default values. ■ This program is not an efficient method when you have to install or upgrade multiple systems. For batch installations of multiple systems, use JumpStart or the flash archive installation feature. | <i>Oracle Solaris 10 1/13 Installation Guide: Basic Installations</i> |
| Install one system over a local area network. | Oracle Solaris installation program over the network | This program enables you to set up an image of the software you want to install on a server and install this image on a remote system. If you need to install multiple systems, you can use the network installation image with the JumpStart and flash archive installation methods to efficiently install or upgrade systems on your network. | Part II, “Installing Over a Local Area Network,” in <i>Oracle Solaris 10 1/13 Installation Guide: Network-Based Installations</i> |
| Automate the installation or upgrade of multiple systems based on profiles you create. | JumpStart | This program efficiently installs multiple systems. If you only have a few systems, the creation of a JumpStart environment might be time consuming. Therefore use the Oracle Solaris interactive installation program. | Chapter 3, “Preparing JumpStart Installations (Tasks),” in <i>Oracle Solaris 10 1/13 Installation Guide: JumpStart Installations</i> |
| Replicate the same software and configuration on multiple systems. | Flash archives | <ul style="list-style-type: none"> ■ This program saves installation time by installing all Oracle Solaris packages at once on your system. Other programs install each individual Oracle Solaris package and update the package map for each package. ■ Flash archives are large files and require a significant amount of disk space. To manage different installation configurations or to change your installation configuration, you might consider using the JumpStart installation method. Alternatively, you can accomplish system-specific customizations by using a JumpStart finish script or an embedded flash archive postdeployment script. | Chapter 1, “Flash Archive Overview,” in <i>Oracle Solaris 10 1/13 Installation Guide: Flash Archives (Creation and Installation)</i> |

TABLE 2-2 Choosing Your Installation Method (Continued)

| Task | Installation Method | Reasons for Choosing This Program | Instructions |
|---|--|--|---|
| Install systems over a wide area network (WAN) or the Internet. | WAN boot | If you want to install a Flash Archive over the network, this program enables a secure installation. | Chapter 10, “WAN Boot (Overview),” in <i>Oracle Solaris 10 1/13 Installation Guide: Network-Based Installations</i> |
| Install on an iSCSI target disk. | Different methods are available. | Before installing Oracle Solaris on an iSCSI target, a few additional steps have to be executed. | For detailed instructions, see Chapter 4, “Installing the Oracle Solaris 10 OS on an iSCSI Target Disk,” in <i>Oracle Solaris 10 1/13 Installation Guide: Basic Installations</i> . |
| Upgrade a system while it is running. | Live Upgrade | <ul style="list-style-type: none"> ■ Enables you to upgrade or add patches and avoid the system down time related to a standard upgrade ■ Enables you to test an upgrade or new patches without affecting the current OS | Chapter 2, “Live Upgrade (Overview),” in <i>Oracle Solaris 10 1/13 Installation Guide: Live Upgrade and Upgrade Planning</i> |
| After installing the Oracle Solaris OS, create an isolated application environment. | Oracle Solaris Zones partitioning technology | This program creates isolated non-global zones that provide a secure application environment. This isolation prevents processes that are running in one zone from monitoring or affecting processes that are running in any other zones. | Chapter 16, “Introduction to Solaris Zones,” in <i>System Administration Guide: Oracle Solaris Containers-Resource Management and Oracle Solaris Zones</i> |

System Requirements, Guidelines, and Upgrade Information

This chapter describes system requirements to install or upgrade to the Oracle Solaris OS. General guidelines for planning the disk space and default swap space allocation are also provided. This chapter contains the following sections:

- “System Requirements and Recommendations” on page 24
- “Allocating Disk and Swap Space” on page 25
- “Upgrade Planning” on page 30
- “Locale Values” on page 38
- “Platform Names and Groups” on page 38
- “x86: Partitioning Recommendations” on page 39
- “How to Find the Version of the Oracle Solaris OS That Your System Is Running” on page 40

System Requirements and Recommendations

TABLE 3-1 Memory, Swap, and Processor Recommendations

| Requirement Type | Size |
|------------------------------|---|
| Memory to install or upgrade | <ul style="list-style-type: none"> ■ For UFS or ZFS root file systems, 1.5 GB is the minimum memory required for installation. However, note that some optional installation features are enabled only when sufficient memory is present. For example, if your system has insufficient memory and you install from a DVD, you install through the Oracle Solaris installation program's text installer, not through the GUI. ■ In previous Solaris releases, you could not install and boot the Oracle Solaris OS from a disk that was greater than 1 TB in size. Starting with the Oracle Solaris 10 10/09 release, you can install and boot the Oracle Solaris OS from a disk that is up to 2 TB in size. Starting with the Oracle Solaris 10 10/09 release, you can use the VTOC label on a disk of any size, but the addressable space by the VTOC is limited to 2 TB. This feature allows disks that are larger than 2 TB to be used as boot drives, but the usable space from the label is limited to 2 TB. Note – This feature is only available on systems that run a 64-bit kernel. A minimum of 1.5 GB of memory is required for x86 based systems. For detailed information, see “Two-Terabyte Disk Support for Installing and Booting the Oracle Solaris OS” in <i>System Administration Guide: Devices and File Systems</i>. |
| Swap area | <ul style="list-style-type: none"> ■ For UFS file systems, 512 MB is the default size. ■ For ZFS root pools, see “Disk Space Requirements for a ZFS Installation” on page 63 <p>Note – You might need to customize the swap space. Swap space is based on the size of the system's hard disk.</p> |
| Processor requirements | <ul style="list-style-type: none"> ■ SPARC: 200 MHz or faster processor is required. ■ x86: 120 MHz or faster processor is recommended. Hardware floating-point support is required. |

You can choose to install the software with a GUI or with or without a windowing environment. If there is sufficient memory, the GUI is displayed by default. Other environments are displayed by default if memory is insufficient for the GUI. You can override defaults with the `nowin` or `text` boot options, but, you are limited by the amount of memory in your system or if you install remotely. Also, if the Oracle Solaris installation program does not detect a video adapter, it automatically displays in a console-based environment.

For both the text-based and GUI-based installation methods, the minimal memory requirement is 1.5 GB or greater. The types of installation are as follows:

- Text-based – Contains no graphics, but provides a window and the ability to open other windows.
If you install by using the text boot option and the system has enough memory, you are installing in a windowing environment. If you are installing remotely through a tftp line or using the nowin boot option, you are limited to the console-based installation.
- GUI-based – Provides windows, pull-down menus, buttons, scrollbars, and iconic images.

Allocating Disk and Swap Space

Before you install the Oracle Solaris software, you can determine if your system has enough disk space by doing some high-level planning.

General Disk Space Planning and Recommendations

Planning disk space is different for everyone. The following table lists some conditions and considerations for allocating space.

Note – For information about disk space for a ZFS root pool installation, see [“Disk Space Requirements for a ZFS Installation”](#) on page 63

TABLE 3-2 General Disk Space and Swap Space Planning

| Conditions for Space Allocations | Description |
|---|---|
| For UFS file systems | <p data-bbox="396 256 1233 309">For each file system that you create, allocate an additional 30 percent more disk space than you need to enable you to upgrade to future Oracle Solaris versions.</p> <p data-bbox="396 331 1253 548">By default, the Oracle Solaris installation methods create only root (/) and /swap. When space is allocated for OS services, the /export directory is also created. If you are upgrading to a major Oracle Solaris release, you might need to reslice your system or allocate double the space that you need at installation time. If you are upgrading to an update, you could prevent having to reslice your system by allocating extra disk space for future upgrades. An Oracle Solaris update release needs approximately 10 percent more disk space than the previous release. You can allocate an additional 30 percent of disk space for each file system to allow space for several Oracle Solaris updates.</p> <p data-bbox="396 571 1262 649">Note – In previous Solaris releases, you could not install and boot the Oracle Solaris OS from a disk that was greater than 1 TB in size. Starting with the Oracle Solaris 10 10/09 release, you can install and boot the Oracle Solaris OS from a disk that is up to 2 TB in size.</p> <p data-bbox="396 671 1265 749">Starting with the Solaris 10 10/09 release, you can use the VTOC label on a disk of any size, but the addressable space by the VTOC is limited to 2 TB. This feature allows disks that are larger than 2 TB to be used as boot drives, but the usable space from the label is limited to 2 TB.</p> <p data-bbox="396 772 1270 824">This feature is available only on systems that run a 64-bit kernel. A minimum of 1 GB of memory is required for x86 based systems.</p> <p data-bbox="396 847 1248 899">For detailed information, see “Two-Terabyte Disk Support for Installing and Booting the Oracle Solaris OS” in <i>System Administration Guide: Devices and File Systems</i>.</p> |
| The /var file system for UFS file systems | <p data-bbox="396 920 1233 972">If you intend to use the crash dump feature <code>savecore(1M)</code>, allocate double the amount of your physical memory in the /var file system.</p> |

TABLE 3-2 General Disk Space and Swap Space Planning (Continued)

| Conditions for Space Allocations | Description |
|--|--|
| Swap | <p>Note – For swap allocations for a ZFS root pool, see “Disk Space Requirements for a ZFS Installation” on page 63.</p> <p>For UFS file systems, the Oracle Solaris installation program allocates a default swap area of 512 MB under the following conditions:</p> <ul style="list-style-type: none"> ▪ If you use the installation program’s automatic layout of disk slices ▪ If you avoid manually changing the size of the swap slice <p>By default, the Oracle Solaris installation programs allocate swap space by placing swap so that it starts at the first available disk cylinder (typically cylinder 0 on SPARC based systems). This placement provides maximum space for the root (/) file system during the default disk layout and enables the growth of the root (/) file system during an upgrade.</p> <p>If you think you might need to expand the swap area in the future, you can place the swap slice so that it starts at another disk cylinder by using one of the following methods:</p> <ul style="list-style-type: none"> ▪ For the Oracle Solaris installation program, you can customize the disk layout in cylinder mode and manually assign the swap slice to the desired location. ▪ For the JumpStart installation program, you can assign the swap slice in the profile file. For more information about the JumpStart profile file, see “Creating a Profile” in <i>Oracle Solaris 10 1/13 Installation Guide: JumpStart Installations</i>. <p>For an overview of swap space, see Chapter 16, “Configuring Additional Swap Space (Tasks),” in <i>System Administration Guide: Devices and File Systems</i>.</p> |
| A server that is providing home directory file systems | By default, home directories are usually located in the /export file system. |
| The Oracle Solaris software group you are installing | A software group is a grouping of software packages. When you are planning disk space, remember that you can add or remove individual software packages from the software group that you select. For information about software groups, see “ Disk Space Recommendations for Software Groups ” on page 28. |
| Upgrade | <ul style="list-style-type: none"> ▪ If you are using Live Upgrade to upgrade an inactive boot environment and want information about disk space planning, see “Live Upgrade Disk Space Requirements” in <i>Oracle Solaris 10 1/13 Installation Guide: Live Upgrade and Upgrade Planning</i> ▪ If you are using the Oracle Solaris installation program or JumpStart to plan disk space, see “Upgrading With Disk Space Reallocation” on page 34 ▪ If you have non-global zones installed on a system, see “Disk Space Requirements for Non-Global Zones” on page 76 ▪ If you are upgrading with Live Upgrade for a ZFS root pool, see Chapter 11, “Live Upgrade for ZFS (Planning),” in <i>Oracle Solaris 10 1/13 Installation Guide: Live Upgrade and Upgrade Planning</i> |

TABLE 3-2 General Disk Space and Swap Space Planning (Continued)

| Conditions for Space Allocations | Description |
|---|--|
| Language support | If you plan to install a single language, allocate approximately 0.7 GB of additional disk space for the language. If you plan to install support for all languages, you need to allocate up to approximately 2.5 GB of additional disk space depending on the software group you install. |
| Printing or mail support | Allocate additional space. |
| Additional software or third-party software | Allocate additional space. |

Disk Space Recommendations for Software Groups

The Oracle Solaris software groups are collections of Oracle Solaris packages. Each software group includes support for different functions and hardware drivers.

- For an initial installation, you select the software group to install based on the functions that you want to perform on the system.
- For an upgrade, you must upgrade to a software group that is installed on the system. For example, if you previously installed the End User Oracle Solaris Software Group on your system, you cannot use the upgrade option to upgrade to the Developer Oracle Solaris Software Group. However, during the upgrade, you can add software to the system that is not part of the currently installed software group.

When you are installing the Oracle Solaris software, you can choose to add or remove packages from the Oracle Solaris software group that you selected. When you are selecting which packages to add or remove, you need to know about software dependencies and how the Oracle Solaris software is packaged.

The following figure shows the grouping of software packages. Reduced Network Support contains the minimal number of packages and Entire Oracle Solaris Software Group Plus OEM Support contains all the packages.

FIGURE 3-1 Oracle Solaris Software Groups

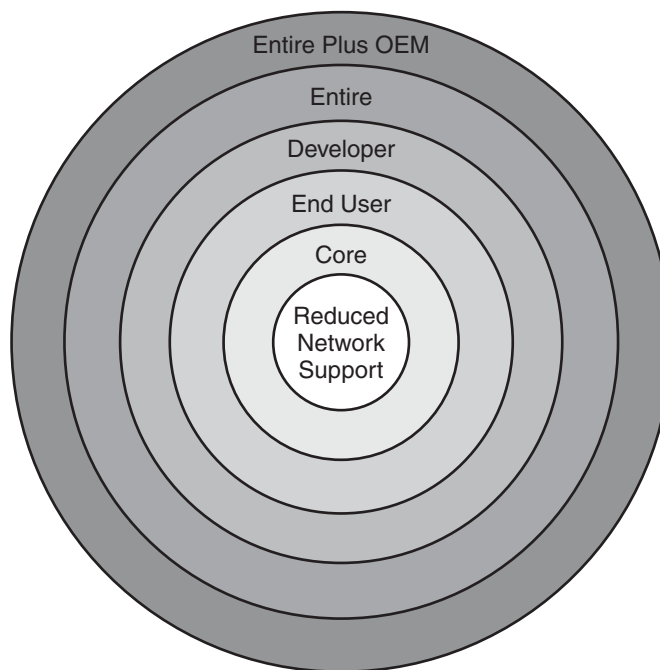


Table 3-3 lists the Oracle Solaris software groups and the recommended amount of disk space that you need to install each group. The disk space recommendations in the table include space for the following items:

- Swap space
- Patches
- Additional software packages

You might find that the software groups require less disk space than the amount that is listed.

TABLE 3-3 Disk Space Recommendations for Software Groups

| Software Group | Description | Recommended Disk Space |
|---|--|------------------------|
| Entire Oracle Solaris Software Group Plus OEM Support | Contains the packages for the Entire Oracle Solaris Software Group plus additional hardware drivers, including drivers for hardware that is not on the system at the time of installation. | 8575 MB |
| Entire Oracle Solaris Software Group | Contains the packages for the Developer Oracle Solaris Software Group and additional software that is needed for servers. | 8529 MB |

TABLE 3-3 Disk Space Recommendations for Software Groups (Continued)

| Software Group | Description | Recommended Disk Space |
|---|--|------------------------|
| Developer Oracle Solaris Software Group | Contains the packages for the End User Oracle Solaris Software Group plus additional support for software development. The additional software development support includes libraries, include files, man pages, and programming tools. Compilers are not included. | 8336 MB |
| End User Oracle Solaris Software Group | Contains the packages that provide the minimum code that is required to boot and run a networked Oracle Solaris system and the Common Desktop Environment. | 7074 MB |
| Core System Support Software Group | Contains the packages that provide the minimum code that is required to boot and run a networked Oracle Solaris system. | 3093 MB |
| Reduced Network Support Software Group | Contains the packages that provide the minimum code that is required to boot and run an Oracle Solaris system with limited network service support. The Reduced Network Support Software Group provides a multiuser text-based console and system administration utilities. This software group also enables the system to recognize network interfaces, but does not activate network services. | 3035 MB |

Upgrade Planning

- For a UFS file system, you can upgrade a system by using one of three different upgrade methods: Live Upgrade, the Oracle Solaris installation program, and JumpStart.
- For a ZFS root pool, you must use Live Upgrade to upgrade. For information about ZFS upgrades, see [Chapter 11, “Live Upgrade for ZFS \(Planning\),”](#) in *Oracle Solaris 10 1/13 Installation Guide: Live Upgrade and Upgrade Planning*.

The upgrade methods for Solaris 8, Solaris 9, and Oracle Solaris 10 are:

- Live Upgrade – Upgrades a system by creating and upgrading a copy of the running system
- Oracle Solaris installation program – Provides an interactive upgrade with a graphical user interface or command-line interface
- JumpStart method – Provides an automated upgrade

Upgrade Programs

You can perform a standard interactive upgrade with the Oracle Solaris installation program or an unattended upgrade with the JumpStart installation method. Live Upgrade enables you to upgrade a running system.

| Upgrade Program | Description | For More Information |
|-------------------------------------|---|---|
| Live Upgrade | Enables you to create a copy of the currently running system. The copy can be upgraded and then a reboot switches the upgraded copy to become the currently running system. Using Live Upgrade reduces the downtime that is required to upgrade the Oracle Solaris OS. Also, Live Upgrade can prevent problems with upgrading. For example, you can recover from an upgrade if the power fails because the copy being upgraded is not the currently running system. | To plan for disk space allocation when using Live Upgrade, see “Live Upgrade Requirements” in <i>Oracle Solaris 10 1/13 Installation Guide: Live Upgrade and Upgrade Planning</i> . |
| Oracle Solaris installation program | Guides you through an upgrade with an interactive GUI. | Chapter 2, “Installing With the Oracle Solaris Installation Program For UFS File Systems (Tasks),” in <i>Oracle Solaris 10 1/13 Installation Guide: Basic Installations</i> . |
| JumpStart program | Provides an automated upgrade. A profile file and optional preinstallation and postinstallation scripts provide the information required. When creating a JumpStart profile for an upgrade, specify <code>install_type upgrade</code> . You must test the JumpStart profile against the system's disk configuration and currently installed software before you upgrade. Use the <code>pfinstall -D</code> command on the system that you are upgrading to test the profile. You cannot test an upgrade profile by using a disk configuration file. | <ul style="list-style-type: none"> ■ For more information about testing the upgrade option, refer to “Testing a Profile” in <i>Oracle Solaris 10 1/13 Installation Guide: JumpStart Installations</i> ■ For more information about creating an upgrade profile, see “Profile Examples” in <i>Oracle Solaris 10 1/13 Installation Guide: JumpStart Installations</i> ■ For more information about performing an upgrade, see “Performing a JumpStart Installation” in <i>Oracle Solaris 10 1/13 Installation Guide: JumpStart Installations</i> |

Upgrading and Patching Limitations

The following table lists limitations when you upgrade a system under some conditions.

| Issue | Description | For More Information |
|---|--|---|
| For ZFS root pools, there are other upgrade limitations | You can only use Live Upgrade to upgrade ZFS root pools. | For requirements and limitations, see Chapter 11, “Live Upgrade for ZFS (Planning),” in <i>Oracle Solaris 10 1/13 Installation Guide: Live Upgrade and Upgrade Planning</i> . |

| Issue | Description | For More Information |
|---|---|--|
| Upgrading to a different software group | <p>You cannot upgrade your system to a software group that is not installed on the system. For example, if you previously installed the End User Oracle Solaris Software Group on your system, you cannot use the upgrade option to upgrade to the Developer Oracle Solaris Software Group. However, during the upgrade, you can add software to the system that is not part of the currently installed software group.</p> | <p>For more information about software groups, see “Disk Space Recommendations for Software Groups” on page 28.</p> |
| Upgrading when non-global zones are installed | <p>You can upgrade a system that has non-global zones installed with the Oracle Solaris installation program, Live Upgrade, or JumpStart. The following limitations apply:</p> <ul style="list-style-type: none"> ■ Live Upgrade is the recommended program to upgrade or patch a system. Other upgrade programs might require extensive upgrade time because of the time required to complete the upgrade increases linearly with the number of installed non-global zones. If you are patching a system with Live Upgrade, you do not have to take the system to single-user mode and you can maximize your system's uptime. ■ When you use a Flash Archive to install, an archive that contains non-global zones is not properly installed on your system. | <p>For requirements and limitations, see “Upgrading With Non-Global Zones” on page 72.</p> |
| Patching with Live Upgrade from the Solaris 8 or Solaris 9 OS | <p>You cannot use Live Upgrade to patch an Oracle Solaris 10 inactive boot environment when the active boot environment is running the Solaris 8 or Solaris 9 OS. Live Upgrade will invoke the patch utilities on the active boot partition to patch the inactive boot partition. The Solaris 8 and Solaris 9 patch utilities are unaware of Oracle Solaris Zones, Service Management Facility (SMF), and other enhancements in the Oracle Solaris 10 OS. Therefore, the patch utilities fail to correctly patch an inactive Oracle Solaris 10 boot environment. If you are using Live Upgrade to upgrade a system from the Solaris 8 or Solaris 9 OS to the Oracle Solaris 10 OS, you must first activate the Oracle Solaris 10 boot environment before patching. After the Oracle Solaris 10 boot environment is activated, you can either patch the active boot environment directly or set up another inactive boot environment and patch that one by using Live Upgrade.</p> | <p>For more information about patching with Live Upgrade, see “Adding Patches to or Removing Patches From a Network Installation Image on a Boot Environment” in <i>Oracle Solaris 10 1/13 Installation Guide: Live Upgrade and Upgrade Planning</i></p> |

| Issue | Description | For More Information |
|-------------------------------------|--|---|
| Upgrading with Veritas file systems | <p>The Oracle Solaris interactive installation and JumpStart programs do not present you with the opportunity to upgrade a system when you are using Veritas VxVM file systems under these conditions:</p> <ul style="list-style-type: none"> ■ If the root file system to be upgraded is under Veritas control. For example, if the root (/) file system is mounted on a /dev/vx/... device. ■ If any Oracle Solaris software is installed on any file system that is under Veritas control. For example, if the /usr file system is mounted on a /dev/vx/... device. | <p>To upgrade when Veritas VxVM is configured, use one of the following methods:</p> <ul style="list-style-type: none"> ■ Use Live Upgrade with the procedure described in, “How to Upgrade When Running Veritas VxVm” in Oracle Solaris 10 1/13 Installation Guide: Live Upgrade and Upgrade Planning. ■ If you have non-global zones installed, you must migrate the affected file systems from VxVM file systems to UFS file systems. You cannot use the Live Upgrade procedure in the previous procedure. |

Installing a Flash Archive Instead of Upgrading

The Flash Archive installation feature provides a method of creating a copy of the whole installation from a master system that can be replicated on many clone systems. This copy is called a flash archive. You can install an archive by using any installation program.



Caution – A flash archive cannot be properly created when a non-global zone is installed. The Solaris Flash feature is not compatible with zones partitioning technology. If you create a flash archive, the resulting archive is not installed properly when the archive is deployed under these conditions:

- The archive is created in a non-global zone
- The archive is created in a global zone that has non-global zones installed

Creating an Archive That Contains Large Files

The default copy method that is used when you create a Flash Archive is the `cpio` utility. Individual file sizes cannot be greater than 4 GB. If you have large individual files, the `flarcreate` command with the `-L pax` option uses the `pax` utility to create an archive without limitations on individual file sizes. Individual file sizes can be greater than 4 GB.

For information about installing an archive using the various installation programs, see the following resources:

- Live Upgrade: “Installing Flash Archives on a Boot Environment” in *Oracle Solaris 10 1/13 Installation Guide: Live Upgrade and Upgrade Planning*
- Custom JumpStart: “To Prepare to Install a Flash Archive With a JumpStart Installation” in *Oracle Solaris 10 1/13 Installation Guide: JumpStart Installations*
- Oracle Solaris interactive installation: Chapter 4, “Installing and Administering Flash Archives (Tasks),” in *Oracle Solaris 10 1/13 Installation Guide: Flash Archives (Creation and Installation)*
- WANboot: Chapter 13, “Installing With WAN Boot (Tasks),” in *Oracle Solaris 10 1/13 Installation Guide: Network-Based Installations*

Upgrading With Disk Space Reallocation

The upgrade option in the Oracle Solaris installation program and the upgrade keyword in the JumpStart program provide the ability to reallocate disk space. This reallocation automatically changes the sizes of the disk slices. You can reallocate disk space if the current file systems do not have enough space for the upgrade. For example, file systems might need more space for the upgrade for the following reasons:

- The Oracle Solaris software group that is currently installed on the system contains new software in the new release. Any new software that is included in a software group is automatically selected to be installed during the upgrade.
- The size of the existing software on the system has increased in the new release.

The auto-layout feature attempts to reallocate the disk space to accommodate the new size requirements of the file system. Initially, auto-layout attempts to reallocate space based on a set of default constraints. If auto-layout cannot reallocate space, you must change the constraints on the file systems.

Note – Auto-layout does not have the ability to “grow” file systems. Auto-layout reallocates space by using the following process:

1. Backing up required files on the file systems that need to change.
2. Repartitioning the disks on the basis of the file system changes.
3. Restoring the backup files before the upgrade happens.

-
- If you are using the Oracle Solaris installation program and auto-layout cannot determine how to reallocate the disk space, you must use the JumpStart program to upgrade.
 - If you are using the JumpStart method to upgrade and you create an upgrade profile, disk space might be a concern. If the current file systems do not contain enough disk space for the upgrade, you can use the `backup_media` and `layout_constraint` keywords to reallocate disk space. For an example of how to use the `backup_media` and `layout_constraint` keywords in a profile, refer to “Profile Examples” in *Oracle Solaris 10 1/13 Installation Guide: JumpStart Installations*.

Using the Patch Analyzer When Upgrading

The Patch Analyzer performs an analysis on your system if you want to upgrade to one of these releases that follow the initial Solaris 10 3/05 release:

- Solaris 10 1/06 release
- Solaris 10 6/06 release

If you are already running the Oracle Solaris OS and have installed individual patches, upgrading to a subsequent Oracle Solaris 10 release causes the following:

- Any patches that were supplied as part of one of the releases are reapplied to your system. You cannot back out these patches.
- Any patches that were previously installed on your system and are not included in one of the releases are removed.

You can use the Patch Analyzer to determine which patches, if any, will be removed. For detailed instructions about using the Patch Analyzer, refer to [Appendix D, “Using the Patch Analyzer When Upgrading \(Tasks\),”](#) in *Oracle Solaris 10 1/13 Installation Guide: Live Upgrade and Upgrade Planning*.

Backing Up And Restarting Systems For an Upgrade

Backing up your existing file systems before you upgrade to the Oracle Solaris OS is highly recommended. If you copy file systems to removable media, such as tape, you can safeguard against data loss, damage, or corruption.

- For detailed instructions describing how to back up your system, refer to [Chapter 19, “Backing Up and Restoring UFS File Systems \(Overview/Tasks\),”](#) in *System Administration Guide: Devices and File Systems*.
- For information about how to back up your system when non-global zones are installed, see [Chapter 27, “Oracle Solaris Zones Administration \(Overview\),”](#) in *System Administration Guide: Oracle Solaris Containers-Resource Management and Oracle Solaris Zones*.

In previous releases, the restart mechanism enabled you to continue an upgrade after a loss of power or other similar problem. Starting with the Solaris 10 10/08 release, if you have a problem, your upgrade might not restart.

Planning Network Security

Starting with the Solaris 10 11/06 release, you have the option during an initial installation to change the network security settings so that all network services except Secure Shell are disabled or restricted to respond to local requests only. This option minimizes the potential vulnerabilities a remote attacker might try to exploit. In addition, this option provides a base for customers to enable only the services they require. This security option is only available during an initial installation, not during an upgrade. An upgrade maintains any set services that were previously set. If necessary, you can restrict network services after an upgrade by using the `net services` command.

Depending on the installation program you are using, you can select to restrict network services or keep the services enabled by default:

- For the Oracle Solaris interactive installation, you can select the option of enabling network services by default as in previous Oracle Solaris releases. Or, you can select the option to restrict network services. For a detailed description of hands-on installations, see [Chapter 2, “Installing With the Oracle Solaris Installation Program For UFS File Systems \(Tasks\)”](#), in *Oracle Solaris 10 1/13 Installation Guide: Basic Installations*.
- For JumpStart installation, you can set this security restriction by using a new keyword, `service_profile` in the `sysidcfg` file. For further information about this keyword, see [“service_profile Keyword”](#) in *Oracle Solaris 10 1/13 Installation Guide: Network-Based Installations*.

Restricted Security Specifics

If you choose to restrict network security, numerous services are fully disabled. Other services are still enabled, but these services are restricted to local connections only. The Secure Shell remains fully enabled.

The following table lists network services that for the Solaris 10 11/06 release are restricted to local connections.

TABLE 3-4 Solaris 10 11/06 SMF Restricted Services

| Service | FMRI | Property |
|--------------|------------------------------------|------------------------|
| rpcbind | svc:/network/rpc/bind | config/local_only |
| syslogd | svc:/system/system-log | config/log_from_remote |
| sendmail | svc:/network/smtp:sendmail | config/local_only |
| smcwebserver | svc:/system/ webconsole:console | options/tcp_listen |

TABLE 3-4 Solaris 10 11/06 SMF Restricted Services (Continued)

| Service | FMRI | Property |
|-----------|--|---------------------|
| WBEM | svc:/application/ management/wbem | options/tcp_listen |
| X server | svc:/application/ x11/x11-server | options/tcp_listen |
| dtlogin | svc:/application/ graphical-login/cde-login | dtlogin/args |
| ToolTalk | svc:/network/rpc cde-ttdbserver:tcp | proto=ticotsord |
| dctm | svc:/network/rpc cde-calendar-manager | proto=ticits |
| BSD print | svc:/application/ print/rfc1179:default | bind_addr=localhost |

Revising Security Settings After Installation

With the restricted network security feature, all of the affected services are controlled by the Service Management Framework (SMF). Any individual network service can be enabled after an initial installation by using the `svcadm` and `svccfg` commands.

The restricted network access is achieved by invoking the `netservices` command from the SMF upgrade file found in `/var/svc/profile`. The `netservices` command can be used to switch the service startup behavior.

To disable network services manually, run the following command:

```
# netservices limited
```

This command can be used on upgraded systems, where no changes are made by default. This command can also be used to re-establish the restricted state after enabling individual services.

Similarly, default services can be enabled as they were in previous Oracle Solaris releases by running the following command:

```
# netservices open
```

For further information about revising security settings, see “[How to Create an SMF Profile](#)” in *Oracle Solaris Administration: Basic Administration*. See also the following man pages:

- `netservices(1M)`
- `svcadm(1M)`
- `svccfg(1M)`

Locale Values

As a part of your installation, you can preconfigure the locale that you want the system to use. A *locale* determines how online information is displayed in a specific language and specific region. A language might also include more than one locale to accommodate regional differences, such as differences in the format of date and time, numeric and monetary conventions, and spelling.

You can preconfigure the system locale in a JumpStart profile or in the `sysidcfg` file.

The following table lists resources for more information.

| Task | For More Information |
|--|---|
| Setting the locale in a profile | <i>“Creating a Profile” in Oracle Solaris 10 1/13 Installation Guide: JumpStart Installations</i> |
| Setting the locale in the <code>sysidcfg</code> file | <i>“Preconfiguring With the <code>sysidcfg</code> File” in Oracle Solaris 10 1/13 Installation Guide: Network-Based Installations</i> |
| List of locale values | <i>International Language Environments Guide</i> |

Platform Names and Groups

When you are adding clients for a network installation, you must know your system architecture (platform group). If you are writing a custom JumpStart installation rules file, you need to know the platform name.

The following table provides some examples of platform names and groups. For a full list of SPARC based systems, see *Oracle Solaris Sun Hardware Platform Guide* at <http://www.oracle.com/technetwork/indexes/documentation/index.html>.

TABLE 3-5 Example of Platform Names and Groups

| System | Platform Name | Platform Group |
|-----------|--------------------|----------------|
| Sun Fire | T2000 | sun4v |
| Sun Blade | SUNW Sun-Blade-100 | sun4u |
| x86 based | i86pc | i86pc |

Note – On a running system, you can also use the `uname -i` command to determine a system's *platform name* or the `uname -m` command to determine a system's *platform group*.

x86: Partitioning Recommendations

When using the Oracle Solaris OS on x86 based systems, follow these guidelines for partitioning your system.

The Oracle Solaris installation program uses a default boot-disk partition layout. These partitions are called `fdisk` partitions. An `fdisk` partition is a logical partition of a disk drive that is dedicated to a particular operating system on x86 based systems. To install the Oracle Solaris software, you must set up at least one Oracle Solaris `fdisk` partition on an x86 based system. x86 based systems allow up to four different `fdisk` partitions on a disk. These partitions can be used to hold individual operating systems. Each operating system must be located on a unique `fdisk` partition. A system can only have one Oracle Solaris `fdisk` partition per disk.

TABLE 3-6 x86: Default Partitions

| Partitions | Partition Name | Partition Size |
|------------------------------------|---------------------------------|---|
| First partition (on some systems) | Diagnostic or Service partition | Existing size on system. |
| Second partition (on some systems) | x86 boot partition | <ul style="list-style-type: none"> ■ If you are performing an initial installation, this partition is not created. ■ If you upgrade and your system does not have an existing x86 boot partition, this partition is not created. ■ If you upgrade and your system has an x86 boot partition: <ul style="list-style-type: none"> ■ If the partition is required to bootstrap from one boot device to another, the x86 boot partition is preserved on the system. ■ If the partition is not required to boot additional boot devices, the x86 boot partition is removed. The contents of the partition are moved to the root partition. |
| Third partition | Oracle Solaris OS partition | Remaining space on the boot disk. |

Default Boot-Disk Partition Layout Preserves the Service Partition

The Oracle Solaris installation program uses a default boot-disk partition layout to accommodate the diagnostic or Service partition. If your system currently includes a diagnostic or Service partition, the default boot-disk partition layout enables you to preserve this partition.

If you install the Oracle Solaris OS on an x86 based system that does not currently include a diagnostic or Service partition, the installation program does not create a new diagnostic or Service partition by default. If you want to create a diagnostic or Service partition on your system, see your hardware documentation.

How to Find the Version of the Oracle Solaris OS That Your System Is Running

To see the version of Oracle Solaris software that is running on your system, type either of the following commands.

```
$ uname -a
```

The `cat` command provides more detailed information.

```
$ cat /etc/release
```


Gathering Information Before an Installation or Upgrade

This chapter contains checklists to help you gather all of the information that you need to install or upgrade your system.

- “Checklist for Installation” on page 41
- “Checklist for Upgrading” on page 50

Checklist for Installation

Use the following checklist to gather the information that you need to install the Oracle Solaris OS. You do not need to gather all of the information that is requested on the worksheet. You need to collect only the information that applies to your system.

TABLE 4-1 Installation Checklist

| Information for Installation | Description or Example | Answer — Defaults are noted with an asterisk (*) |
|------------------------------|--|---|
| Network connection | Is the system connected to a network? | Networked/Nonnetworked |
| Auto Registration | Do you want to provide your support credentials and proxy information for Auto Registration with Oracle? | My Oracle Support user name and password Proxy server host name and port number HTTP proxy user name and password |

TABLE 4-1 Installation Checklist (Continued)

| Information for Installation | Description or Example | Answer — Defaults are noted with an asterisk (*) |
|---|--|--|
| Network security | <p>Starting with the Solaris 10 11/06 release, you have the option during an initial installation to change the network security settings so that all network services except Secure Shell are disabled or restricted to respond to local requests only. This security option is only available during an initial installation, not during an upgrade. An upgrade maintains any previously set services. If necessary, you can restrict network services after an upgrade by using the <code>net services</code> command.</p> <p>During the installation, you can select restricted network security. Or, you can enable a larger set of services as in previous Solaris releases. If in doubt, you can safely select the restricted network security option, because any services can be individually enabled after installation. For further information about these options, see “Planning Network Security” on page 36.</p> <p>The network services can be enabled after installation by using the <code>net services open</code> command or by enabling individual services by using SMF commands. See “Revising Security Settings After Installation” on page 37.</p> | Restricted/Open network security |
| DHCP | <p>Can the system use Dynamic Host Configuration Protocol (DHCP) to configure its network interfaces?</p> <p>DHCP provides the network parameters that are necessary for installation.</p> | Yes/No* |
| If you are not using DHCP, note the network address | IP Address | <p>If you are not using DHCP, supply the IP address for the system.</p> <p>Example: 172 . 31 . 255 . 255</p> <p>To find this information on a running system, type the following command.</p> <pre># ypmatch host-name hosts</pre> |
| | Subnet | <p>If you are not using DHCP, is the system part of a subnet?</p> <p>If yes, what is the netmask of the subnet?</p> <p>Example: 255 . 255 . 255 . 0</p> <p>To find this information on a running system, type the following command.</p> <pre># more /etc/netmasks</pre> |
| | IPv6 | <p>Do you want to enable IPv6 on this machine?</p> <p>IPv6 is a part of the TCP/IP Internet protocol that facilitates IP addressing by adding better security and increasing Internet addresses.</p> |

TABLE 4-1 Installation Checklist (Continued)

| Information for Installation | | Description or Example | Answer — Defaults are noted with an asterisk (*) |
|--|----------------|--|--|
| Host name | | <p>Host name that you choose for the system.</p> <p>To find this information on a running system, type the following command.</p> <pre># uname -n</pre> | |
| Kerberos | | <p>Do you want to configure Kerberos security on this machine?</p> <p>If yes, gather this information:</p> <p style="text-align: right;">Default Realm:</p> <p style="text-align: right;">Administration Server:</p> <p style="text-align: right;">First KDC:</p> <p style="text-align: right;">(Optional) Additional KDCs:</p> <p>The Kerberos service is a client-server architecture that provides secure transactions over networks.</p> | Yes/No* |
| If the system uses a naming service, provide the described information | Naming Service | <p>Which naming service should this system use?</p> <p>To find this information on a running system, type the following command.</p> <pre># cat /etc/nsswitch.conf</pre> <p>A naming service stores information in a central place, which enables users, machines, and applications to communicate across the network. Examples of information that is stored are host names and addresses or user names and passwords.</p> | NIS+/NIS/DNS/ LDAP/None |
| | Domain Name | <p>Provide the name of the domain in which the system resides.</p> <p>During installation, you can choose the default NFSv4 domain name or specify a custom NFSv4 domain name.</p> <ul style="list-style-type: none"> ■ For instructions about how to find the domain name on a running system, see “Checking for the NFS Version 4 Domain” in <i>System Administration Guide: Network Services</i> ■ To preconfigure the NFSv4 domain name in the <code>sysidcfg</code> file, see “<code>nfs4_domain</code> Keyword” in <i>Oracle Solaris 10 1/13 Installation Guide: Network-Based Installations</i> | |

TABLE 4-1 Installation Checklist (Continued)

| Information for Installation | Description or Example | Answer — Defaults are noted with an asterisk (*) |
|------------------------------|--|--|
| NIS+ and NIS | <p>Do you want to specify a name server or let the installation program find one?</p> <p>If you want to specify a name server, provide the following information.</p> <p style="text-align: right;">Server's host name:</p> <ul style="list-style-type: none"> ■ For NIS clients, type the following command to display the server's host name. <p style="padding-left: 2em;"># ypwhich</p> <ul style="list-style-type: none"> ■ For NIS+ clients, type the following command to display the server's host name. <p style="padding-left: 2em;"># nisping</p> <p style="text-align: right;">Server's IP Address:</p> <ul style="list-style-type: none"> ■ For NIS clients, type the following command to display the server's IP address. <p style="padding-left: 2em;"># ypmatch nameserver-name hosts</p> <ul style="list-style-type: none"> ■ For NIS+ clients, type the following command to display the server's IP address. <p style="padding-left: 2em;"># nismatch nameserver-name hosts.org_dir</p> <p>Network Information Service (NIS) makes network administration more manageable by providing centralized control over a variety of network information, such as machine names and addresses.</p> | Specify one/Find one* |

TABLE 4-1 Installation Checklist (Continued)

| Information for Installation | Description or Example | Answer — Defaults are noted with an asterisk (*) |
|------------------------------|---|--|
| DNS | <p>Provide IP addresses for the DNS server. You must provide at least one IP address, and can provide up to three addresses.</p> <p style="text-align: right;">Server's IP Address:</p> <p>To display the server's IP address, type the following command.</p> <p># getent hosts dns</p> <p>You can provide a list of domains to search when a DNS query is made.</p> <p style="text-align: right;">List of domains to be searched:</p> <p>The domain name system (DNS) is the naming service that the Internet provides for TCP/IP networks. DNS provides host names to the IP address service. DNS simplifies communication by using machine names instead of numerical IP addresses. DNS also serves as a database for mail administration.</p> | |
| LDAP | <p>Provide the following information about your LDAP profile.</p> <p style="text-align: right;">Profile Name:</p> <p style="text-align: right;">Profile Server:</p> <p>If you specify a proxy credential level in your LDAP profile, gather this information.</p> <p style="text-align: right;">Proxy-bind distinguished name:</p> <p style="text-align: right;">Proxy-bind password:</p> <p>The Lightweight Directory Access Protocol (LDAP) defines a relatively simple protocol for updating and searching directories that are running over TCP/IP.</p> | |

TABLE 4-1 Installation Checklist (Continued)

| Information for Installation | Description or Example | Answer — Defaults are noted with an asterisk (*) |
|------------------------------|--|---|
| Default route | <p>Do you want to specify a default route IP address or let the Oracle Solaris installation program find one?</p> <p>The default route provides a bridge that forwards traffic between two physical networks. An IP address is a unique number that identifies each host on a network.</p> <p>You have the following choices:</p> <ul style="list-style-type: none"> ■ You can specify the IP address. An <code>/etc/default/router</code> file is created with the specified IP address. When the system is rebooted, the specified IP address becomes the default route. ■ You can let the Oracle Solaris installation program detect an IP address. However, the system must be on a subnet that has a router that advertises itself by using the ICMP router discovery protocol. If you are using the command-line interface, the software detects an IP address when the system is booted. ■ You can choose None if you do not have a router or do not want the software to detect an IP address at this time. The software automatically tries to detect an IP address on reboot. | Detect one*/Specify one/None |
| Time zone | How do you want to specify your default time zone? | Geographic region* Offset from GMT Time zone file |
| Root password | Provide the root password for the system. | |

TABLE 4-1 Installation Checklist (Continued)

| Information for Installation | Description or Example | Answer — Defaults are noted with an asterisk (*) |
|---|--|--|
| Keyboard | <p>This feature is new in the following releases:</p> <ul style="list-style-type: none"> ■ For SPARC: Solaris10 10/06 ■ For x86: Solaris 10 8/07 <p>If the keyboard is self-identifying, the keyboard language and layout automatically configures during installation. If the keyboard is not self-identifying, the <code>sysidkdb</code> tool provides a list of supported keyboard layouts during installation so that you can select a layout for keyboard configuration.</p> <p>SPARC: Previously the installation program assumed a self-identifying value of 1 for USB keyboards during the installation. Therefore, all of the keyboards that were not self-identifying always configured for a U.S. English keyboard layout during installation.</p> <p>For further information, see “Preconfiguring With the sysidcfg File” in <i>Oracle Solaris 10 1/13 Installation Guide: Network-Based Installations</i>.</p> | |
| Locales | <p>For which geographic regions do you want to install support?</p> <p>Note – The locale can be preconfigured by NIS or NIS+. For more information, see “sysidcfg File Keywords” in <i>Oracle Solaris 10 1/13 Installation Guide: Network-Based Installations</i>.</p> | |
| SPARC: Power Management (only available on SPARC systems that support Power Management) | <p>Do you want to use Power Management?</p> <p>Note – If your system has Energy Star version 3 or later, you are not prompted for this information.</p> | Yes*/No |
| Automatic reboot or CD/DVD ejection | <p>Reboot automatically after software installation?</p> <p>Eject CD/DVD automatically after software installation?</p> | Yes*/No Yes*/No |
| Default or custom installation | <p>Do you want to perform a default installation, or customize the installation?</p> <ul style="list-style-type: none"> ■ Select Default Installation to format the entire hard disk and install a preselected set of software. ■ Select Custom Installation to modify the hard disk layout and select the software that you want to install. <p>Note – The text installer does not prompt you to select a Default or Custom Installation. To perform a default installation, accept the default values that are provided in the text installer. To perform a custom installation, edit the values in the text installer screens.</p> | Default installation*/Custom installation |

TABLE 4-1 Installation Checklist (Continued)

| Information for Installation | Description or Example | Answer — Defaults are noted with an asterisk (*) |
|------------------------------|---|---|
| Software group | Which Oracle Solaris Software Group do you want to install? | Entire Plus OEM Entire* Developer End User Core Reduced Networking |
| Custom package selection | Do you want to add or remove software packages from the Oracle Solaris Software Group that you install? Note – When you select which packages to add or remove, you need to know about software dependencies and how Oracle Solaris software is packaged. | |
| Select disks | On which disks do you want to install the Oracle Solaris software? Example: c0t0d0 | |
| x86: fdisk partitioning | Do you want to create, delete, or modify a Oracle Solaris fdisk partition? Each disk that is selected for file system layout must have a Oracle Solaris fdisk partition. If your system currently has a Service partition, the Oracle Solaris installation program preserves the Service partition by default. If you do not want to preserve the Service partition, you must customize the fdisk partitions. For more information about preserving a Service partition, see “Default Boot-Disk Partition Layout Preserves the Service Partition” on page 39. Select Disks for fdisk Partition Customization? Customize fdisk partitions? | Yes/No* Yes/No* |
| Preserve data | Do you want to preserve any data that exists on the disks where you are installing the Oracle Solaris software? | Yes/No* |

TABLE 4-1 Installation Checklist (Continued)

| Information for Installation | Description or Example | Answer — Defaults are noted with an asterisk (*) |
|--|---|--|
| Auto-layout file systems | <p>Do you want the installation program to automatically lay out file systems on your disks?</p> <p>If yes, which file systems should be used for auto-layout?</p> <p>Example: /, /opt, /var</p> <p>If no, you must provide file system configuration information.</p> <p>Note – The Oracle Solaris installation GUI lays out file systems automatically by default.</p> | Yes*/No |
| Mount remote file systems | <p>Does this system need to access software on another file system?</p> <p>If yes, provide the following information about the remote file system.</p> <p style="text-align: right;">Server:</p> <p style="text-align: right;">IP Address:</p> <p style="text-align: right;">Remote File System:</p> <p style="text-align: right;">Local Mount Point:</p> | Yes/No* |
| If you are installing through a <code>tip</code> line, follow these instructions | <p>Ensure that your window display is at least 80 columns wide and 24 rows long. For more information, see the <code>tip(1)</code> manpage.</p> <p>To determine the current dimensions of your <code>tip</code> window, use the <code>stty</code> command. For more information, see the <code>stty(1)</code> man page.</p> | |
| Check your Ethernet connection | <p>If the system is part of a network, verify that an Ethernet connector or similar network adapter is connected to your system.</p> | |

TABLE 4-1 Installation Checklist (Continued)

| Information for Installation | Description or Example | Answer — Defaults are noted with an asterisk (*) |
|--|--|--|
| Review the planning chapter and other relevant documentation | <ul style="list-style-type: none"> ■ Review the entire planning chapter or specific sections in Chapter 3, “System Requirements, Guidelines, and Upgrade Information.” ■ Review the <i>Oracle Solaris 10 8/11 Release Notes</i> at http://www.oracle.com/technetwork/indexes/documentation/index.html and vendor release notes to ensure that the software you use is supported in the new Oracle Solaris release. ■ Review the following information to ensure that your hardware is supported: <ul style="list-style-type: none"> ■ Oracle Solaris Hardware Compatibility List ■ <i>SPARC: Oracle Solaris Sun Hardware Platform Guide</i> at http://www.oracle.com/technetwork/indexes/documentation/index.html ■ Review the documentation that accompanied your system to ensure that your system and devices are supported by the Oracle Solaris release. | |

Checklist for Upgrading

Use the following checklist to gather the information that you need to upgrade the Oracle Solaris OS. You do not need to gather all of the information that is requested on the checklist. You only need to collect the information that applies to your system. If you are performing the upgrade over the network, the installation program provides the information for you, based on the current system configuration.

You cannot change basic system identification, such as host name or IP address. The installation program might prompt you for basic system identification, but you must enter the original values. If you use the Oracle Solaris installation program to upgrade, the upgrade fails if you attempt to change any of the values.

TABLE 4-2 Upgrade Checklist

| Information for Upgrade | Description or Example | Answer – Defaults are noted with an asterisk (*) |
|-------------------------|---------------------------------------|--|
| Network connection | Is the system connected to a network? | Networked/Nonnetworked |

TABLE 4-2 Upgrade Checklist (Continued)

| Information for Upgrade | | Description or Example | Answer – Defaults are noted with an asterisk (*) |
|---|------------|--|---|
| Auto Registration | | Do you want to provide your support credentials and proxy information for Auto Registration with Oracle? | My Oracle Support user name and password Proxy server host name and port number HTTP proxy user name and password |
| DHCP | | Can the system use Dynamic Host Configuration Protocol (DHCP) to configure its network interfaces? DHCP provides the network parameters that are necessary for installation. | Yes/No* |
| If you are not using DHCP, note the network address | IP Address | If you are not using DHCP, supply the IP address for the system. Example: 172 . 31 . 255 . 255 To find this information on a running system, type the following command. # ypmatch host-name hosts | |
| | Subnet | If you are not using DHCP, is the system part of a subnet? If yes, what is the netmask of the subnet? Example: 255 . 255 . 255 . 0 To find this information on a running system, type the following command. # more /etc/netmasks | |
| | IPv6 | Do you want to enable IPv6 on this machine? IPv6 is a part of the TCP/IP Internet protocol that facilitates IP addressing by adding better security and increasing Internet addresses. | Yes/No* |
| Host name | | Host name that you choose for the system. To find this information on a running system, type the following command. # uname -n | |

TABLE 4-2 Upgrade Checklist (Continued)

| Information for Upgrade | Description or Example | Answer – Defaults are noted with an asterisk (*) | |
|--|--|---|-------------------------|
| Kerberos | <p>Do you want to configure Kerberos security on this machine?</p> <p>If yes, gather this information:</p> <p style="text-align: right;">Default Realm:</p> <p style="text-align: right;">Administration Server:</p> <p style="text-align: right;">First KDC:</p> <p style="text-align: right;">(Optional) Additional KDCs:</p> <p>The Kerberos service is a client-server architecture that provides secure transactions over networks.</p> | Yes/No* | |
| If the system uses a naming service, provide the described information | Naming service | <p>Which naming service should this system use?</p> <p>To find this information on a running system, type the following command.</p> <p># cat /etc/nsswitch.conf</p> <p>A naming service stores information in a central place, which enables users, machines, and applications to communicate across the network. Examples of information that is stored are host names and addresses or user names and passwords.</p> | NIS+/NIS/DNS/ LDAP/None |
| | Domain name | <p>Provide the name of the domain in which the system resides.</p> <p>During installation, you can choose the default NFSv4 domain name or specify a custom NFSv4 domain name.</p> <ul style="list-style-type: none"> ■ For instructions about how to find the domain name on a running system, see “Checking for the NFS Version 4 Domain” in <i>System Administration Guide: Network Services</i> ■ To preconfigure the NFSv4 domain name in the <code>sysidcfg</code> file, see “nfs4_domain Keyword” in <i>Oracle Solaris 10 1/13 Installation Guide: Network-Based Installations</i> | |

TABLE 4-2 Upgrade Checklist (Continued)

| Information for Upgrade | Description or Example | Answer – Defaults are noted with an asterisk (*) |
|-------------------------|--|--|
| NIS+ and NIS | <p>Do you want to specify a name server or let the installation program find one?</p> <p>If you want to specify a name server, provide the following information.</p> <p style="text-align: right;">Server's host name:</p> <ul style="list-style-type: none"> ■ For NIS clients, type the following command to display the server's host name. # ypwhich ■ For NIS+ clients, type the following command to display the server's host name. # nisping <p style="text-align: right;">Server's IP Address:</p> <ul style="list-style-type: none"> ■ For NIS clients, type the following command to display the server's IP address. # ypmatch nameserver-name hosts ■ For NIS+ clients, type the following command to display the server's IP address. # nismatch nameserver-name hosts.org_dir <p>Network Information Service (NIS) makes network administration more manageable by providing centralized control over a variety of network information, such as machine names and addresses.</p> | Specify one/Find one* |

TABLE 4-2 Upgrade Checklist (Continued)

| Information for Upgrade | Description or Example | Answer – Defaults are noted with an asterisk (*) |
|-------------------------|--|--|
| DNS | <p>Provide IP addresses for the DNS server. You must provide at least one IP address and can provide up to three addresses.</p> <p style="text-align: right;">Server's IP Address:</p> <p>To display the server's IP address, type the following command.</p> <p># getent hosts dns</p> <p>You can provide a list of domains to search when a DNS query is made.</p> <p style="text-align: right;">List of domains to be searched:</p> <p>The domain name system (DNS) is the naming service that the Internet provides for TCP/IP networks. DNS provides host names to the IP address service. DNS simplifies communication by using machine names instead of numerical IP addresses. DNS also serves as a database for mail administration.</p> | |
| LDAP | <p>Provide the following information about your LDAP profile.</p> <p style="text-align: right;">Profile Name:</p> <p style="text-align: right;">Profile Server:</p> <p>If you specify a proxy credential level in your LDAP profile, gather this information.</p> <p style="text-align: right;">Proxy-bind distinguished name:</p> <p style="text-align: right;">Proxy-bind password:</p> <p>The Lightweight Directory Access Protocol (LDAP) defines a relatively simple protocol for updating and searching directories that are running over TCP/IP.</p> | |

TABLE 4-2 Upgrade Checklist (Continued)

| Information for Upgrade | Description or Example | Answer – Defaults are noted with an asterisk (*) |
|-------------------------|--|---|
| Default route | <p>Do you want to specify a default route IP address or let the Oracle Solaris installation program find one?</p> <p>The default route provides a bridge that forwards traffic between two physical networks. An IP address is a unique number that identifies each host on a network.</p> <p>You have the following choices:</p> <ul style="list-style-type: none"> ■ You can specify the IP address. An <code>/etc/default/router</code> file is created with the specified IP address. When the system is rebooted, the specified IP address becomes the default route. ■ You can let the Oracle Solaris installation program detect an IP address. However, the system must be on a subnet that has a router that advertises itself by using the ICMP router discovery protocol. If you are using the command-line interface, the software detects an IP address when the system is booted. ■ You can choose None if you do not have a router or do not want the software to detect an IP address at this time. The software automatically tries to detect an IP address on reboot. | Detect one*/Specify one/None |
| Time zone | How do you want to specify your default time zone? | Geographic region* Offset from GMT Time zone file |
| Root password | Provide the root password for the system. | |

TABLE 4-2 Upgrade Checklist (Continued)

| Information for Upgrade | Description or Example | Answer – Defaults are noted with an asterisk (*) |
|--------------------------------|---|--|
| Default or custom installation | <p>Do you want to perform a default installation, or customize the installation?</p> <ul style="list-style-type: none"> ■ Select Default Installation to format the entire hard disk and install a preselected set of software. ■ Select Custom Installation to modify the hard disk layout and select the software that you want to install. <p>Note – The text installer does not prompt you to select a Default or Custom Installation. To perform a default installation, accept the default values that are provided in the text installer. To perform a custom installation, edit the values in the text installer screens.</p> | Default installation*/Custom installation |
| Keyboard | <p>This feature is new in the following releases:</p> <ul style="list-style-type: none"> ■ For SPARC: Solaris 10 10/06 ■ For x86: Solaris 10 8/07 <p>If the keyboard is self-identifying, the keyboard language and layout automatically configures during installation. If the keyboard is not self-identifying, the <code>sysidkbd</code> tool provides a list of supported keyboard layouts during installation so that you can select a layout for keyboard configuration.</p> <p>SPARC: Previously the installation program assumed a self-identifying value of 1 for USB keyboards during the installation. Therefore, all of the keyboards that were not self-identifying always configured for a U.S. English keyboard layout during installation.</p> <p>For further information, see “Preconfiguring With the sysidcfg File” in <i>Oracle Solaris 10 1/13 Installation Guide: Network-Based Installations</i>.</p> | |
| Locales | <p>For which geographic regions do you want to install support?</p> <p>Note – The locale can be preconfigured by NIS or NIS+. For more information, see “sysidcfg File Keywords” in <i>Oracle Solaris 10 1/13 Installation Guide: Network-Based Installations</i>.</p> | |

TABLE 4-2 Upgrade Checklist (Continued)

| Information for Upgrade | Description or Example | Answer – Defaults are noted with an asterisk (*) |
|---|---|--|
| SPARC: Power Management (only available on SPARC systems that support Power Management) | Do you want to use Power Management? Note – If your system has Energy Star version 3 or later, you are not prompted for this information. | Yes/No |
| Automatic reboot or CD/DVD ejection | Reboot automatically after software installation? Eject CD/DVD automatically after software installation? | Yes*/No Yes*/No |
| Disk space reallocation | Do you want the installation program to automatically re-layout the systems on your disks? If yes, which file system should be used for auto-layout? Example: /, /opt, /var If no, you must provide information for the system configuration. | Yes/No* |
| If you are installing through a <code>tip</code> line, follow these instructions | Ensure that your window display is at least 80 columns wide and 24 rows long. For more information, see the <code>tip(1)</code> man page. To determine the current dimensions of your <code>tip</code> window, use the <code>stty</code> command. For more information, see the <code>stty(1)</code> man page. | |
| Check your Ethernet connection | If the system is part of a network, verify that an Ethernet connector or similar network adapter is connected to your system. | |
| Live Upgrade use | <ul style="list-style-type: none"> ■ Determine your resource requirements for creating a new boot environment and upgrading it. For detailed information, refer to Chapter 3, “Live Upgrade (Planning),” in <i>Oracle Solaris 10 1/13 Installation Guide: Live Upgrade and Upgrade Planning</i>. ■ Determine the requirements if you are using RAID-1 volumes. For detailed information, refer to “Guidelines for Selecting Slices for File Systems” in Oracle Solaris 10 1/13 Installation Guide: Live Upgrade and Upgrade Planning. | |

TABLE 4-2 Upgrade Checklist (Continued)

| Information for Upgrade | Description or Example | Answer – Defaults are noted with an asterisk (*) |
|--|---|--|
| Check the system for the existence of Prestoserve software | If you begin the upgrade process by shutting down the system with the <code>init 0</code> command and you're using Prestoserve software, you might lose data. Refer to the Prestoserve documentation for shutdown instructions. | |
| Check for patches needed | The most recent patch list is provided at http://support.oracle.com . | |
| Review the planning chapter and other relevant documentation | <ul style="list-style-type: none"> ■ Review the entire planning chapter or specific sections in Chapter 3, “System Requirements, Guidelines, and Upgrade Information.” ■ Review the <i>Oracle Solaris 10 8/11 Release Notes</i> at http://www.oracle.com/technetwork/indexes/documentation/index.html and vendor release notes to ensure that the software you use is supported in the new Oracle Solaris release. ■ Review the <i>10 8/11 Oracle Solaris Sun Hardware Platform Guide</i> to ensure that your hardware is supported. ■ Review the documentation that accompanied your system to ensure that your system and devices are supported by the Oracle Solaris release. | |

PART II

Understanding Installations Related to ZFS, Booting, Oracle Solaris Zones, and RAID-1 Volumes

This part provides an overview of several technologies that relate to an Oracle Solaris OS installation or upgrade. Guidelines and requirements are also included.

- Installation for the ZFS root (/) file system
- Booting on x86 or SPARC based systems
- Oracle Solaris Zones partitioning technology
- Solaris Volume Manager components such as RAID-1 volumes

ZFS Root File System Installation Planning

This chapter provides system requirements and limitations to assist you when you install a ZFS root pool. Also provided is an overview of the installation programs that can install a ZFS root pool. This chapter includes the following sections:

- “Requirements for Installing a ZFS Root Pool” on page 62
- “Oracle Solaris Installation Programs for Installing ZFS Root Pools” on page 64

If you have multiple boot environments on your system see [Chapter 6, “SPARC and x86 Based Booting \(Overview and Planning\)”](#) for information about booting.

What's New in the Oracle Solaris 10 8/11 Release for ZFS Installation

Starting with the Oracle Solaris 10 8/11 release, the ZFS file system has the following installation enhancements:

- You can use the text-mode installation method to install a system with a ZFS flash archive.
- You can use the Live Upgrade `luupgrade` command to install a ZFS root flash archive.
- You can use the Live Upgrade `lucreate` command to migrate a UFS boot environment or a ZFS boot environment to a ZFS boot environment with a separate `/var` file system.

For detailed instructions and limitations, see [Chapter 4, “Installing and Booting an Oracle Solaris ZFS Root File System,”](#) in *Oracle Solaris ZFS Administration Guide*.

What's New in the Oracle Solaris 10 10/09 Release for ZFS Installation

Starting with the Solaris 10 10/09 release, you can set up a JumpStart profile to identify a flash archive of a ZFS root pool.

A flash archive can be created on a system that is running a UFS root file system or a ZFS root file system. A flash archive of a ZFS root pool contains the entire pool hierarchy except for the swap and dump volumes and any excluded datasets. The swap and dump volumes are created when the flash archive is installed.

You can use the flash archive installation method as follows:

1. Generate a flash archive that can be used to install and boot a system with a ZFS root file system.
2. Perform a JumpStart installation of a system by using the ZFS flash archive.

Note – Creating a ZFS flash archive backs up an entire root pool, not individual boot environments. Individual datasets within the pool can be excluded by using the `-D` option of the `flarcreate` and `flar` command.

For detailed instructions and limitations, see “[Installing a ZFS Root File System \(Oracle Solaris Flash Archive Installation\)](#)” in *Oracle Solaris ZFS Administration Guide*.

Requirements for Installing a ZFS Root Pool

The following table lists the system requirements and limitations for installing a ZFS Root Pool.

TABLE 5-1 System Requirements and Limitations

| Requirement or Limitation | Description | Information |
|---------------------------|---|--|
| Memory | 1.5 GB is the minimum memory. 1.5 GB or greater is recommended for overall performance. | <i>Oracle Solaris ZFS Administration Guide</i> . |
| Disk space | The minimum amount of available pool space for a bootable ZFS root file system depends on the amount of physical memory, the disk space available, and the number of boot environments to be created. | For an explanation, see “ Disk Space Requirements for a ZFS Installation ” on page 63. |

TABLE 5-1 System Requirements and Limitations (Continued)

| Requirement or Limitation | Description | Information |
|--|--|---|
| The ZFS storage pool must be created with slices rather than whole disks to be upgradeable and bootable. | <ul style="list-style-type: none"> ■ The pool created with slices can be mirrored but not a RAID-Z or non-redundant configuration of multiple disks. The SVM device information must be already available in the <code>/dev/md/[r]disk</code> directory. ■ The pool must have an SMI label. An EFI-labeled disk cannot be booted. ■ x86 only: The ZFS pool must be in a slice with an <code>fdisk</code> partition. | <ul style="list-style-type: none"> ■ For information about other restrictions for an EFI-labeled disk, see “Overview of Disk Management” in <i>System Administration Guide: Devices and File Systems</i>. ■ To create an <code>fdisk</code> partition with an SMI label, see “How to Create a Solaris fdisk Partition” in <i>System Administration Guide: Devices and File Systems</i>. ■ For information about <code>fdisk</code> partitions, see “x86: Partitioning Recommendations” on page 39. |
| When you migrate from a UFS root (<code>/</code>) file system to a ZFS root pool with Live Upgrade, consider these requirements. | <ul style="list-style-type: none"> ■ Migrating from a UFS file system to a ZFS root pool with Live Upgrade or creating a new boot environment in a root pool is new starting with the Solaris 10 10/08 release. This release contains the software needed to use Live Upgrade with ZFS. You must have at least this release installed to use ZFS with Live Upgrade. ■ Migration is possible only from a UFS file system to a ZFS file system. <ul style="list-style-type: none"> ■ File systems other than a UFS file system cannot be migrated to a ZFS root pool. ■ A UFS file system cannot be created from a ZFS root pool. ■ Before migrating, a ZFS storage pool must exist. | <ul style="list-style-type: none"> ■ For more limitations on using Live Upgrade, see “System Requirements and Limitations When Using Live Upgrade” in <i>Oracle Solaris 10 1/13 Installation Guide: Live Upgrade and Upgrade Planning</i>. ■ For step-by-step procedures, see “Migrating a UFS File System to a ZFS File System” in <i>Oracle Solaris 10 1/13 Installation Guide: Live Upgrade and Upgrade Planning</i>. |

Disk Space Requirements for a ZFS Installation

Normally on a system with a UFS root file system, swap and dump are on the same slice. Therefore, UFS shares the swap space with the dump device. In a ZFS root pool, swap and dump are separate ZFS volumes, so they do not share the same physical space. When a system is installed or upgraded with a ZFS root file system, the size of the swap area and the dump device are dependent on the amount of physical memory. The minimum amount of available pool space for a bootable ZFS root file system depends on the amount of physical memory, the disk space available, and the number of boot environments to be created. The space is consumed as follows:

- **Swap area and dump device** – The default size of swap is half the size of physical memory, but no less than 512 MB and no greater than 2 GB. The dump device is calculated based on the size of the memory and the contents of the `dumpadm.conf` file. This file defines what goes into a crash dump. You can adjust the sizes of your swap and device volumes before or after installation. For more information, see [“Introducing ZFS Properties”](#) in *Oracle Solaris ZFS Administration Guide*.
- **Boot environments** – In addition to either new swap and dump space requirements or adjusted swap and dump device sizes, a ZFS boot environment that is migrated from a UFS boot environment needs approximately 6 GB. Each ZFS boot environment that is cloned from another ZFS boot environment does not need additional disk space. However, the boot environment size might increase when patches are applied. All ZFS boot environments in the same root pool use the same swap and dump devices.

Oracle Solaris Installation Programs for Installing ZFS Root Pools

The following installation programs perform an initial installation of a ZFS root pool.

- Oracle Solaris installation program text installer
- JumpStart with an installation profile

Live Upgrade can migrate a UFS file system to a ZFS root pool. Also, Live Upgrade can create ZFS boot environments that can be upgraded.

Text Installer and ZFS Installation

The Oracle Solaris text installer performs an initial installation for a ZFS root pool. During the installation, you can choose to install either a UFS file system or a ZFS root pool. You can set up a mirrored ZFS root pool by selecting two or more slices during the installation. Or, you can attach or add additional disks after the installation to create a mirrored ZFS root pool. Swap and dump devices on ZFS volumes are automatically created in the ZFS root pool.

Note the following limitations:

- The installation GUI is not available to install a ZFS root pool.
- You cannot use the standard upgrade program to upgrade. You must use Live Upgrade to upgrade a ZFS root pool.

For more information, see [Chapter 3, “Installing With the Oracle Solaris Interactive Text Installer for ZFS Root Pools \(Planning and Tasks\)”](#) in *Oracle Solaris 10 1/13 Installation Guide: Basic Installations*

Live Upgrade and ZFS Installation

You can use the Live Upgrade feature to perform the following tasks:

- Migrate a UFS root (/) file system to a ZFS root pool
- Create a new boot environment in the following ways:
 - Within an existing ZFS root pool
 - Within another ZFS root pool
 - From a source other than the currently running system
 - On a system with non-global zones installed

After you have used the `lucreate` command to create a ZFS boot environment, you can use the other Live Upgrade commands on the boot environment. Note that a storage pool must be created before you use the `lucreate` command.

For more information, see [Chapter 10, “Live Upgrade and ZFS \(Overview\),”](#) in *Oracle Solaris 10 1/13 Installation Guide: Live Upgrade and Upgrade Planning*

JumpStart and ZFS Installation

Starting with the Solaris 10 10/09 release, you can set up a JumpStart profile to identify a flash archive of a ZFS root pool. See [“What's New in the Oracle Solaris 10 10/09 Release for ZFS Installation”](#) on page 62.

You can create a profile to create a ZFS storage pool and designate a bootable ZFS file system. New ZFS keywords provide an initial installation.

Note the following limitations:

- You cannot use the `install_type` upgrade keyword to upgrade a ZFS root pool. You also cannot use the flash archive keywords.
- Some keywords that are allowed in a UFS specific profile are not allowed in a ZFS specific profile.

See the following resources for more information:

- For a quick reference about keywords that can be used in a ZFS installation, see [“Profile Keywords Quick Reference”](#) in *Oracle Solaris 10 1/13 Installation Guide: JumpStart Installations*.
- For descriptions of ZFS keywords and profile examples, see [Chapter 9, “Installing a ZFS Root Pool With JumpStart,”](#) in *Oracle Solaris 10 1/13 Installation Guide: JumpStart Installations*.

SPARC and x86 Based Booting (Overview and Planning)

Starting with the Solaris 10 10/08 release, changes in Oracle Solaris boot architecture provides many new features, including the ability to boot from different file system types, such as ZFS file systems. This chapter describes some of these changes and provides references to more information about booting. Also, this chapter provides an overview of GRUB based booting for x86 systems.

This chapter contains the following sections:

- “[Booting for Oracle Solaris \(Overview\)](#)” on page 67
- “[x86: GRUB Based Booting \(Overview\)](#)” on page 69
- “[x86: GRUB Based Booting \(Planning\)](#)” on page 69

Booting for Oracle Solaris (Overview)

Starting with the Solaris 10 10/08 release, the Oracle Solaris SPARC bootstrap process has been redesigned to increase commonality with the Oracle Solaris x86 boot architecture. The improved Oracle Solaris boot architecture brings direct boot, ramdisk-based booting, and the ramdisk miniroot to the SPARC platform. These enabling technologies support the following functions:

- Booting a system from additional file system types, such as a ZFS file system.
- Booting a single miniroot for software installation from DVD, NFS, or HTTP

Additional improvements include significantly faster boot times, increased flexibility, and reduced maintenance requirements.

As part of this architecture redesign, the Oracle Solaris boot archives and the `bootadm` command, previously only available on the Oracle Solaris x86 platform, are now an integral part of the Oracle Solaris SPARC boot architecture.

Although the implementation of the Oracle Solaris SPARC boot has changed, no administrative procedures for booting a SPARC-based system have been affected. Oracle Solaris installations now include the ability to install from a ZFS file system, but otherwise have not changed for the new boot architecture.

Booting ZFS Boot Environments (Overview)

If your system has more than one OS installed on the system or more than one root boot environment in a ZFS root pool, you can boot from these boot environments for both SPARC and x86 platforms. The boot environments available for booting include boot environments created by Live Upgrade.

- **Starting with the Solaris 10 10/08 release** for a SPARC based system, you can boot a ZFS root file system in a ZFS pool. For ZFS root pools, you can list the available boot environments with the `boot` command with the `-L` option. You can then choose a boot environment and use the OBP `boot` command with the `-Z` option to boot that boot environment. The `-Z` option is an alternative for the `luactivate` command that is also used to boot a new boot environment for a ZFS root pool. The `luactivate` command is the preferred method of switching boot environments. For a UFS file system, you continue to use the OpenBoot PROM OBP as the primary administrative interface, with boot options selected by using OBP commands.
- **Starting with the Solaris 10 1/06 release** for x86 based systems, a GRUB boot menu provides the interface for booting between different boot environments. **Starting with the Solaris 10 10/08 release**, this menu lists ZFS boot environments that are available for booting. If the default boot environment is a ZFS file system and the GRUB menu is displayed, you can let the default boot environment boot or choose another boot environment to boot. The GRUB menu is an alternative to using the `luactivate` command that is also used to boot a new boot environment for a ZFS root pool. The `luactivate` is the preferred method of switching boot environments.

On both SPARC and x86 based systems, each ZFS root pool has a dataset designated as the default root file system. For SPARC, you type the `boot` command. For x86, you take the default from the GRUB menu, and then the default root file system is booted.

See the following resources for more information:

- For a high-level overview of booting features, see [Chapter 8, “Introduction to Shutting Down and Booting a System,”](#) in *Oracle Solaris Administration: Basic Administration*.
- For a more detailed overview of booting features, see [Chapter 9, “Shutting Down and Booting a System \(Overview\),”](#) in *Oracle Solaris Administration: Basic Administration*.
- x86: For information about modifying boot behavior such as editing the `menu.lst` file and locating the `menu.lst` file, see [“Modifying Boot Behavior on x86 Based Systems \(Task Map\)”](#) in *Oracle Solaris Administration: Basic Administration*.

- For procedures for booting a ZFS file system, see [Chapter 12, “Booting an Oracle Solaris System \(Tasks\)”](#), in *Oracle Solaris Administration: Basic Administration*.
- For procedures for managing a boot archive, such as locating the GRUB menu .lst file and using the bootadm command, see [Chapter 13, “Managing the Oracle Solaris Boot Archives \(Tasks\)”](#), in *Oracle Solaris Administration: Basic Administration*.

x86: GRUB Based Booting (Overview)

GRUB, the open source boot loader, is the default boot loader in the Oracle Solaris OS on x86 based systems.

The *boot loader* is the first software program that runs after you power on a system. After you power on an x86 based system, the Basic Input/Output System (BIOS) initializes the CPU, the memory, and the platform hardware. When the initialization phase has completed, the BIOS loads the boot loader from the configured boot device and then transfers control of the system to the boot loader.

GRUB is an open source boot loader with a simple menu interface that includes boot options that are predefined in a configuration file. GRUB also has a command-line interface that is accessible from the menu interface for performing various boot commands. In the Oracle Solaris OS, the GRUB implementation is compliant with the Multiboot Specification, which is described in detail at <http://www.gnu.org/software/grub/grub.html>.

Because the Oracle Solaris kernel is fully compliant with the Multiboot Specification, you can boot a Oracle Solaris x86 based system by using GRUB. With GRUB, you can more easily boot and install various operating systems.

A key benefit of GRUB is that it is intuitive about file systems and kernel executable formats, which enables you to load an operating system without recording the physical position of the kernel on the disk. With GRUB based booting, the kernel is loaded by specifying its file name, the drive, and the partition where the kernel resides. GRUB based booting replaces the Oracle Solaris Device Configuration Assistant and simplifies the booting process.

x86: GRUB Based Booting (Planning)

This section describes the basics of GRUB, a feature of Oracle Solaris, based booting and describes the GRUB menu.

When you install the Oracle Solaris OS, two GRUB menu entries are installed on the system by default. The first entry is the Oracle Solaris OS entry. The second entry is the failsafe boot archive, which is to be used for system recovery. The GRUB menu entries are installed and updated automatically as part of the Oracle Solaris software installation and upgrade process. These entries are directly managed by the OS and should not be manually edited.

During a standard Oracle Solaris OS installation, GRUB is installed on the Oracle Solaris `fdisk` partition without modifying the system BIOS setting. If the OS is not on the BIOS boot disk, you need to do one of the following:

- Modify the BIOS setting.
- Use a boot manager to bootstrap to the Oracle Solaris partition. For more details, see your boot manager.

The preferred method is to install the Oracle Solaris OS on the boot disk. If multiple operating systems are installed on the machine, you can add entries to the `menu.lst` file. These entries are then displayed in the GRUB menu the next time you boot the system.

For additional information about GRUB and multiple operating systems, see [“How Multiple Operating Systems Are Supported by GRUB”](#) in *Oracle Solaris Administration: Basic Administration*.

x86: Performing a GRUB Based Installation From the Network

Performing a GRUB based network boot requires a DHCP server that is configured for PXE clients and an install server that provides `tftp` service. The DHCP server must be able to respond to the `PXEClient` and `GRUBClient` DHCP classes. The DHCP response must contain the following information:

- IP address of the file server
- Name of the boot file (`pxegrub`)

Note – `rpc.bootparamd`, which is usually a requirement on the server side for performing a network boot, is not required for a GRUB based network boot.

If no PXE or DHCP server is available, you can load GRUB from CD-ROM or local disk. You can then manually configure the network in GRUB and download the multiboot program and the boot archive from the file server.

For more information, see [“Overview of Booting and Installing Over the Network With PXE”](#) in *Oracle Solaris 10 1/13 Installation Guide: Network-Based Installations*.

Upgrading When Oracle Solaris Zones Are Installed on a System

This chapter provides an overview of how the Oracle Solaris Zones partitioning technology relates to upgrading the Oracle Solaris OS when non-global zones are configured.

This chapter contains the following sections:

- [“Oracle Solaris Zones Overview” on page 71](#)
- [“Upgrading With Non-Global Zones” on page 72](#)
- [“Disk Space Requirements for Non-Global Zones” on page 76](#)

Oracle Solaris Zones Overview

The Oracle Solaris Zones partitioning technology is used to virtualize operating system services and provide an isolated and secure environment for running applications. A non-global zone is a virtualized operating system environment created within a single instance of the Oracle Solaris OS.

When you create a non-global zone, you produce an application execution environment in which processes are isolated from the rest of the system. This isolation prevents processes that are running in one non-global zone from monitoring or affecting processes that are running in other non-global zones. Even a process running with superuser credentials cannot view or affect activity in other zones. A non-global zone also provides an abstract layer that separates applications from the physical attributes of the machine on which they are deployed. Examples of these attributes include physical device paths.

Every Oracle Solaris system contains a global zone. The global zone has a dual function. The global zone is both the default zone for the system and the zone used for system-wide administrative control. All processes run in the global zone if no non-global zones are created by the global administrator. The global zone is the only zone from which a non-global zone can be configured, installed, managed, or uninstalled. Only the global zone is bootable from the system hardware. Administration of the system infrastructure, such as physical devices,

routing, or dynamic reconfiguration (DR), is possible only in the global zone. Appropriately privileged processes running in the global zone can access objects associated with the non-global zones.

For complete information on creating and configuring non-global zones, see [Chapter 16, “Introduction to Solaris Zones,”](#) in *System Administration Guide: Oracle Solaris Containers-Resource Management and Oracle Solaris Zones*.

Upgrading With Non-Global Zones

The following sections describe how you can upgrade a system that contains non-global zones.

After the Oracle Solaris OS is installed, you can install and configure non-global zones. You can upgrade the Oracle Solaris OS when non-global zones are installed. If you have branded non-global zones installed, they are ignored during the upgrade process.

Zones Parallel Patching

Starting with the Solaris 10 10/09 release, zones parallel patching enhances the standard Oracle Solaris 10 patch utilities. This feature improves zones patching performance by patching non-global zones in parallel.

The global zone is still patched before the non-global zones are patched.

For releases prior to the Solaris 10 10/09 release, this feature is delivered in the following patch utilities patches:

- SPARC: Patch 119254-66 or later revision
- x86: Patch 119255-66 or later revision

For more information, see the following documentation:

- “Oracle Solaris 10 10/09: Zones Parallel Patching to Reduce Patching Time” in *System Administration Guide: Oracle Solaris Containers-Resource Management and Oracle Solaris Zones*
- “Oracle Solaris 10 10/09: How to Patch Non-Global Zones in Parallel” in *System Administration Guide: Oracle Solaris Containers-Resource Management and Oracle Solaris Zones*

Choosing an Installation Program to Upgrade a System Using Non-Global Zones

Installation programs that can accommodate systems that have non-global zones installed are described in this section.

Live Upgrade and Non-Global Zones

You can upgrade or patch a system that contains non-global zones. If you have a system that contains non-global zones, Live Upgrade is the recommended upgrade program or program to add patches. Other upgrade programs might require extensive upgrade time due to the time required to complete the upgrade increases linearly with the number of installed non-global zones. If you are patching a system with Live Upgrade, you do not have to take the system to single-user mode and you can maximize your system's uptime.

Starting with the Solaris 10 8/07 release, changes to accommodate systems that have non-global zones installed are as follows:

- A new package, `SUNWlucfg`, must be installed with the other Live Upgrade packages, `SUNWlur` and `SUNWluu`.
- Creating a new boot environment from the currently running boot environment remains the same with one exception: You can specify a destination slice for a shared file system within a non-global zone. This exception occurs under the following circumstances:
 - If on the current boot environment the `zonecfg add fs` command was used to create a separate file system for a non-global zone
 - If this separate file system resides on a shared file system, such as `/zone/root/export`

To prevent this separate file system from being shared in the new boot environment, the `lucreate` command has changed to enable specifying a destination slice for a separate file system for a non-global zone. The argument to the `-m` option has a new optional field, *zonename*. This new field places the non-global zone's separate file system on a separate slice in the new boot environment. For more information about setting up a non-global zone with a separate file system, see the [zonecfg\(1M\)](#) man page.

Note – By default, any file system other than the critical file systems (`root (/)`, `/usr`, and `/opt` file systems) is shared between the current and new boot environments. Updating shared files in the active boot environment also updates data in the inactive boot environment. The `/export` file system is an example of a shared file system. If you use the `-m` option and the *zonename* option, the non-global zone's shared file system is copied to a separate slice and data is not shared. This option prevents non-global zone file systems that were created with the `zonecfg add fs` command from being shared between the boot environments.

Additional changes starting with the Solaris 10/8/07 release that accommodate systems with non-global zones installed include the following:

- Comparing boot environments is enhanced. The `lucompare` command now generates a comparison of boot environments that includes the contents of any non-global zone.

- The `lumount` command now provides non-global zones with access to their corresponding separate file systems that exist on inactive boot environments. When the global zone administrator uses the `lumount` command to mount an inactive boot environment, the boot environment is mounted for non-global zones as well.
- Listing file systems with the `lufslist` command is enhanced to display a list of file systems for both the global zone and the non-global zones.

For step-by-step instructions on using Live Upgrade on UFS file systems when non-global zones are installed, see [Chapter 8, “Upgrading the Oracle Solaris OS on a System With Non-Global Zones Installed,”](#) in *Oracle Solaris 10 1/13 Installation Guide: Live Upgrade and Upgrade Planning*.

For an overview and step-by-step instructions about installing with ZFS root pools, see [Chapter 13, “Live Upgrade for ZFS With Non-Global Zones Installed,”](#) in *Oracle Solaris 10 1/13 Installation Guide: Live Upgrade and Upgrade Planning*.

Interactive GUI Installation and Non-Global Zones

You can upgrade or patch a system when non-global zones are installed. The time required to upgrade or patch might be extensive, depending on the number of non-global zones that are installed.

For more information about installing with this program, see [Chapter 2, “Installing With the Oracle Solaris Installation Program For UFS File Systems \(Tasks\),”](#) in *Oracle Solaris 10 1/13 Installation Guide: Basic Installations*.

JumpStart Installation and Non-Global Zones

You can upgrade or patch with any keyword that applies to an upgrade or patching. The time required to upgrade or patch might be extensive, depending on the number of non-global zones that are installed.

For more information about installing with this program, see *Oracle Solaris 10 1/13 Installation Guide: JumpStart Installations*.

Limitations When Upgrading With Non-global Zones

Note the following limitations:

- When using Live Upgrade on a system with zones installed it is critical to avoid zone state transitions during `lucreate` and `lumount` operations.
 - When you use the `lucreate` command to create an inactive boot environment, if a given non-global zone is not running, then the zone cannot be booted until the `lucreate` operation has completed.

- When you use the `lucreate` command to create an inactive boot environment if a given non-global zone is running, the zone should not be halted or rebooted until the `lucreate` operation has completed.
- When an inactive boot environment is mounted with the `lumount` command, you cannot boot non-global zones or reboot them, although zones that were running before the `lumount` operation can continue to run.
- Because a non-global zone can be controlled by a non-global zone administrator as well as by the global zone administrator, to prevent any interaction, halt all zones during `lucreate` or `lumount` operations.
- Problems can occur when the global zone administrator does not notify the non-global zone administrator of an upgrade with Live Upgrade.

When Live Upgrade operations are underway, non-global zone administrator involvement is critical. The upgrade affects the work of the administrators, who will be addressing the changes that occur as a result of the upgrade. Zone administrators should ensure that any local packages are stable throughout the sequence, handle any post-upgrade tasks such as configuration file adjustments, and generally schedule around the system outage.

For example, if a non-global zone administrator adds a package while the global zone administrator is copying the file systems with the `lucreate` command, the new package is not copied with the file systems and the non-global zone administrator is unaware of the problem.

- Flash archives cannot be used with non-global zones.
A flash archive cannot be properly created when a non-global zone is installed. This feature is not compatible with Oracle Solaris Zones partitioning technology. If you create a flash archive, the resulting archive is not installed properly when the archive is deployed under these conditions:
 - The archive is created in a non-global zone.
 - The archive is created in a global zone that has non-global zones installed.
- The `-R` command option or equivalent must not be used in some situations.
Any command that accepts an alternate root (`/`) file system by using the `-R` option or equivalent must not be used if the following are true:
 - The command is run in the global zone.
 - The alternative root (`/`) file system refers to any path within a non-global zone.

An example is the `-R root-path` option to the `pkgadd` utility run from the global zone with a path to the root (`/`) file system in a non-global zone.

Backing Up Your System Before Performing an Upgrade With Zones

You should back up the global and non-global zones on your Oracle Solaris system before you perform the upgrade. For information about backing up a system with zones installed, see [Chapter 27, “Oracle Solaris Zones Administration \(Overview\),”](#) in *System Administration Guide: Oracle Solaris Containers-Resource Management and Oracle Solaris Zones*.

Disk Space Requirements for Non-Global Zones

When installing the global zone, be sure to reserve enough disk space for all of the zones you might create. Each non-global zone might have unique disk space requirements.

No limits are placed on how much disk space can be consumed by a zone. The global zone administrator is responsible for space restriction. Even a small uniprocessor system can support a number of zones running simultaneously. The characteristics of the packages installed in the global zone affect the space requirements of the non-global zones that are created. The number of packages and space requirements are factors.

For complete planning requirements and recommendations, see [Chapter 18, “Planning and Configuring Non-Global Zones \(Tasks\),”](#) in *System Administration Guide: Oracle Solaris Containers-Resource Management and Oracle Solaris Zones*.

Creating RAID-1 Volumes (Mirrors) During Installation (Overview)

This chapter discusses the advantages of creating RAID-1 volumes (mirrors) for the root (/) file system. This chapter also describes the Solaris Volume Manager components that are required to create mirrors for file systems. This chapter includes the following topics:

- “Why Use RAID-1 Volumes?” on page 77
- “How Do RAID-1 Volumes Work?” on page 78
- “Overview of Solaris Volume Manager Components” on page 80
- “Example of RAID-1 Volume Disk Layout” on page 82

For additional information specific to Live Upgrade or JumpStart, see the following references:

- For Live Upgrade: “General Guidelines When Creating RAID-1 Volumes (Mirrored) File Systems” in *Oracle Solaris 10 1/13 Installation Guide: Live Upgrade and Upgrade Planning*
- For JumpStart:
 - “filesys Profile Keyword (Creating RAID-1 Volumes)” in *Oracle Solaris 10 1/13 Installation Guide: JumpStart Installations*
 - “metadb Profile Keyword (Creating State Database Replicas)” in *Oracle Solaris 10 1/13 Installation Guide: JumpStart Installations*

For detailed information about complex Solaris Volume Manager software and components, see *Solaris Volume Manager Administration Guide*.

Why Use RAID-1 Volumes?

During the installation or upgrade, you can create RAID-1 volumes to duplicate your system data over multiple physical disks. By duplicating your data over separate disks, you can protect your data from disk corruption or a disk failure.

The JumpStart and Live Upgrade programs use the Solaris Volume Manager technology to create RAID-1 volumes that mirror a file system. Solaris Volume Manager provides a powerful way to reliably manage your disks and data by using volumes. Solaris Volume Manager enables

concatenations, stripes, and other complex configurations. The JumpStart and Live Upgrade installation methods enable a subset of these tasks, such as creating a RAID-1 volume for the root (/) file system. You can create RAID-1 volumes during your installation or upgrade, eliminating the need to create them after the installation. For guidelines, see [“JumpStart and Live Upgrade Guidelines” on page 87](#).

How Do RAID-1 Volumes Work?

Solaris Volume Manager uses virtual disks to manage physical disks and their associated data. In Solaris Volume Manager, a virtual disk is called a *volume*. A *volume* is a name for a group of physical slices that appear to the system as a single, logical device. Volumes are actually pseudo, or virtual, devices in standard UNIX terms.

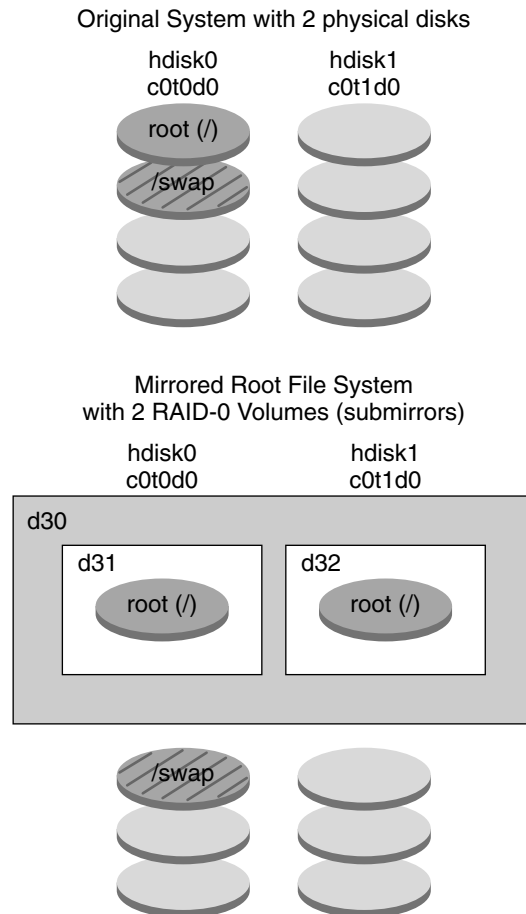
A volume is functionally identical to a physical disk in the view of an application or a file system (such as UFS). Solaris Volume Manager converts I/O requests that are directed at a volume into I/O requests to the underlying member disks. Solaris Volume Manager volumes are built from slices (disk partitions) or from other Solaris Volume Manager volumes.

You use volumes to increase performance and data availability. In some instances, volumes can also increase I/O performance. Functionally, volumes behave the same way as slices. Because volumes look like slices, they are transparent to end users, applications, and file systems. Like physical devices, you can use Solaris Volume Manager software to access volumes through block or raw device names. The volume name changes depending on whether the block or raw device is used. The JumpStart installation method and Live Upgrade support the use of block devices to create mirrored file systems. See [“RAID Volume Name Requirements and Guidelines” on page 89](#) for details about volume names.

When you create RAID-1 volumes with RAID-0 volumes (single-slice concatenations), Solaris Volume Manager duplicates data on the RAID-0 submirrors and treats the submirrors as one volume.

The following figure shows a mirror that duplicates the root (/) file system over two physical disks.

FIGURE 8-1 Creating RAID-1 Volumes on the Root (/) File System on Two Disks



d30 — RAID-1 volume (mirror)

d31 — Single-slice concatenation (submirror)

d32 — Single-slice concatenation (submirror)

The figure shows a system with the following configuration.

- The mirror that is named d30 consists of the submirrors that are named d31 and d32. The mirror, d30, duplicates the data in the root (/) file system on both submirrors.
- The root (/) file system on hdisk0 is included in the single-slice concatenation that is named d31.
- The root (/) file system is copied to the hard disk named hdisk1. This copy is the single-slice concatenation that is named d32.

Overview of Solaris Volume Manager Components

The JumpStart installation method and Live Upgrade enable you to create the following components that are required to replicate data.

- State database and state database replicas “metadbs”
- RAID-1 volumes (mirrors) with single-slice concatenations submirrors

This section briefly describes each of these components. For complete information about these components, see *Solaris Volume Manager Administration Guide*.

State Database and State Database Replicas

The *state database* is a database that stores information on a physical disk. The state database records and tracks changes that are made to your configuration. Solaris Volume Manager automatically updates the state database when a configuration or state change occurs. Creating a new volume is an example of a configuration change. A submirror failure is an example of a state change.

The state database is actually a collection of multiple, replicated database copies. Each copy, referred to as a *state database replica*, ensures that the data in the database is always valid. Having copies of the state database protects against data loss from single points of failure. The state database tracks the location and status of all known state database replicas.

Solaris Volume Manager cannot operate until you have created the state database and its state database replicas. A Solaris Volume Manager configuration must have an operating state database.

The state database replicas ensure that the data in the state database is always valid. When the state database is updated, each state database replica is also updated. The updates occur one at a time to protect against corruption of all updates if the system crashes.

If your system loses a state database replica, Solaris Volume Manager must identify which state database replicas still contain valid data. Solaris Volume Manager determines this information by using a *majority consensus algorithm*. This algorithm requires that a majority (half + 1) of the state database replicas be available and in agreement before any of them are considered valid. Because of this majority consensus algorithm, you must create at least three state database replicas when you set up your disk configuration. A consensus can be reached if at least two of the three state database replicas are available.

Each state database replica occupies 4 MB (8192 disk sectors) of disk storage by default. Replicas can be stored on the following devices:

- A dedicated local disk slice
- **Live Upgrade only:**

- A local slice that will be part of a volume
- A local slice that will be part of a UFS logging device

Replicas cannot be stored on the root (`/`), `swap`, or `/usr` slices, or on slices that contain existing file systems or data. After the replicas have been stored, volumes or file systems can be placed on the same slice.

You can keep more than one copy of a state database on one slice. However, this setup could make the system more vulnerable to a single point of failure.

For more detailed information about the state database and state database replicas, see [Solaris Volume Manager Administration Guide](#).

RAID-1 Volumes (Mirrors)

A RAID-1 volume, or *mirror*, is a volume that maintains identical copies of the data in RAID-0 volumes (single-slice concatenations). After you configure a RAID-1 volume, the volume can be used as if it were a physical slice. You can duplicate any file system, including existing file systems. You can also use a RAID-1 volume for any application, such as a database.

Using RAID-1 volumes to mirror file systems has advantages and disadvantages.

- Data can be read from both RAID-0 volumes simultaneously because either volume can service any request, providing improved performance. If one physical disk fails, you can continue to use the mirror with no loss in performance or loss of data.
- Using RAID-1 volumes requires an investment in disks. You need at least twice as much disk space as the amount of data.
- Because Solaris Volume Manager software must write to all RAID-0 volumes, duplicating the data can also increase the time that is required for write requests to be written to disk.

For information about planning for RAID-1 volumes, see “[RAID-1 and RAID-0 Volume Requirements and Guidelines](#)” on page 87.

RAID-0 Volumes (Concatenations)

A RAID-0 volume is a single-slice concatenation. The concatenation is a volume whose data is organized serially and adjacently across components, forming one logical storage unit. The JumpStart installation method and Live Upgrade do not enable you to create stripes or other complex Solaris Volume Manager volumes.

During the installation or upgrade, you can create RAID-1 volumes (mirrors) and attach RAID-0 volumes to these mirrors. The RAID-0 volumes that are *mirrored* are called *submirrors*. A mirror is made of one or more RAID-0 volumes. After the installation, you can manage the data on separate RAID-0 submirror volumes by administering the RAID-1 mirror volume through the Solaris Volume Manager software.

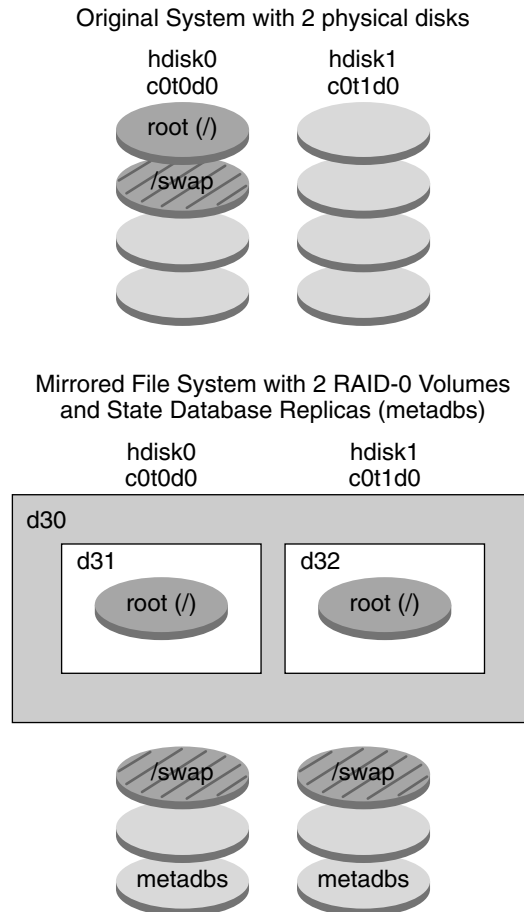
The JumpStart installation method enables you to create a mirror that consists of up to two submirrors. Live Upgrade enables you to create a mirror that consists of up to three submirrors, although a two-way mirror is usually sufficient. A third submirror enables you to make online backups without losing data redundancy while one submirror is offline for the backup.

For information about planning for RAID-1 volumes, see [“RAID-1 and RAID-0 Volume Requirements and Guidelines”](#) on page 87.

Example of RAID-1 Volume Disk Layout

The following figure shows a RAID-1 volume that duplicates the root file system (/) over two physical disks. State database replicas (metadbs) are placed on both disks.

FIGURE 8-2 RAID-1 Volume Disk Layout



d30 — RAID-1 volume (mirror)

d31 — Single-slice concatenation (submirror)

d32 — Single-slice concatenation (submirror)

The figure shows a system with the following configuration.

- The mirror that is named d30 consists of the submirrors that are named d31 and d32. The mirror, d30, duplicates the data in the root (/) file system on both submirrors.
- The root (/) file system on hdisk0 is included in the single-slice concatenation that is named d31.
- The root (/) file system is copied to the hard disk named hdisk1. This copy is the single-slice concatenation that is named d32.

- State database replicas are created on both slices: `hdisk0` and `hdisk1`.

See the following resources for more information:

- For a JumpStart profile example, see “[Profile Examples](#)” in *Oracle Solaris 10 1/13 Installation Guide: JumpStart Installations*.
- For Live Upgrade step-by-step procedures, see “[How to Create a Boot Environment With RAID-1 Volumes \(Mirrors\)](#)” in *Oracle Solaris 10 1/13 Installation Guide: Live Upgrade and Upgrade Planning*.

Creating RAID-1 Volumes (Mirrors) During Installation (Planning)

This chapter describes the requirements and guidelines that are necessary to create RAID-1 volumes with the JumpStart or Live Upgrade installation methods.

This chapter includes the following topics:

- “System Requirement” on page 85
- “State Database Replicas Guidelines and Requirements” on page 86
- “RAID-1 and RAID-0 Volume Requirements and Guidelines” on page 87
- “Troubleshooting: Booting Into Single-User Mode Causes Mirror to Appear to Need Maintenance” on page 92

For additional information specific to Live Upgrade or JumpStart, see the following references:

- For Live Upgrade: “General Guidelines When Creating RAID-1 Volumes (Mirrored) File Systems” in *Oracle Solaris 10 1/13 Installation Guide: Live Upgrade and Upgrade Planning*
- For JumpStart:
 - “filesys Profile Keyword (Creating RAID-1 Volumes)” in *Oracle Solaris 10 1/13 Installation Guide: JumpStart Installations*
 - “metadb Profile Keyword (Creating State Database Replicas)” in *Oracle Solaris 10 1/13 Installation Guide: JumpStart Installations*

System Requirement

To create RAID-1 volumes to duplicate data on specific slices, the disks that you plan to use must be directly attached and available to the system during the installation.

State Database Replicas Guidelines and Requirements

You should distribute state database replicas across slices, drives, and controllers to avoid single points of failure. You want a majority of replicas to survive a single component failure. If you lose a replica, when a device fails, for example, the failure might cause problems with running Solaris Volume Manager software or when rebooting the system. Solaris Volume Manager software requires at least half of the replicas to be available to run, but a majority (half plus one) to reboot into multiuser mode.

For detailed instructions about creating and administering state database replicas, see [Solaris Volume Manager Administration Guide](#).

Selecting Slices for State Database Replicas

Before selecting slices for state database replicas, consider the following guidelines and recommendations:

- Choose a dedicated slice – You should create state database replicas on a dedicated slice of at least 4 MB per replica. If necessary, you could create state database replicas on a slice that is to be used as part of a RAID-0 or RAID-1 volume. You must create the replicas before you add the slice to the volume.
- Resize a slice – By default, the size of a state database replica is 4 MB or 8192 disk blocks. Because your disk slices might not be that small, you can resize a slice to hold the state database replica. For information about resizing a slice, see [Chapter 9, “Administering Disks \(Tasks\),” in System Administration Guide: Devices and File Systems](#).
- Choose a slice that is not in use – You can create state database replicas on slices that are not in use. The part of a slice that is reserved for the state database replica should not be used for any other purpose.

You cannot create state database replicas on existing file systems, or the root (/), /usr, and swap file systems. If necessary, you can create a new slice (provided a slice name is available) by allocating space from swap and then put state database replicas on that new slice.

- Choosing a slice that becomes a volume – When a state database replica is placed on a slice that becomes part of a volume, the capacity of the volume is reduced by the space that is occupied by the replica or replicas. The space that is used by a replica is rounded up to the next cylinder boundary and this space is skipped by the volume.

Choosing the Number of State Database Replicas

Before choosing the number of state database replicas, consider the following guidelines:

- A minimum of 3 state database replicas are recommended, up to a maximum of 50 replicas per Solaris Volume Manager disk set. The following guidelines are recommended:

- For a system with only a single drive, put all three replicas in one slice.
- For a system with two to four drives, put two replicas on each drive.
- For a system with five or more drives, put one replica on each drive.
- Additional state database replicas can improve the mirror's performance. Generally, you need to add two replicas for each mirror you add to the system.
- If you have a RAID-1 volume that is to be used for small-sized random I/O (for example, for a database), consider your number of replicas. For best performance, ensure that you have at least two extra replicas per RAID-1 volume on slices (and preferably on disks and controllers) that are unconnected to the RAID-1 volume.

Distributing State Database Replicas Across Controllers

If multiple controllers exist, replicas should be distributed as evenly as possible across all controllers. This strategy provides redundancy if a controller fails and also helps balance the load. If multiple disks exist on a controller, at least two of the disks on each controller should store a replica.

RAID-1 and RAID-0 Volume Requirements and Guidelines

When you are working with RAID-1 volumes (mirrors) and RAID-0 volumes (single-slice concatenations), consider the following guidelines.

JumpStart and Live Upgrade Guidelines

The custom JumpStart installation method and Live Upgrade support a subset of the features that are available in the Solaris Volume Manager software. When you create mirrored file systems with these installation programs, consider the guidelines in the following table.

TABLE 9-1 JumpStart and Live Upgrade Guidelines for Creating Mirrored File Systems

| Installation Program | Supported Feature | Unsupported Feature |
|----------------------------|---|--|
| JumpStart and Live Upgrade | <ul style="list-style-type: none"> ▪ Supports RAID-0 and RAID-1 volumes, but does not support other Solaris Volume Manager components such as RAID-5 volumes. ▪ RAID-0 volume is supported, but only as a single-slice concatenation. | In Solaris Volume Manager, a RAID-0 volume can refer to disk stripes or disk concatenations. You cannot create RAID-0 stripe volumes during the installation or upgrade. |

TABLE 9-1 JumpStart and Live Upgrade Guidelines for Creating Mirrored File Systems (Continued)

| Installation Program | Supported Feature | Unsupported Feature |
|----------------------|---|--|
| JumpStart | <ul style="list-style-type: none"> ■ Supports the creation of RAID-1 volumes during an initial installation only. ■ You can create up to two RAID-0 volumes (submirrors) for each RAID-1 volume. Two submirrors usually provide sufficient data redundancy for most applications, and the disk drive costs are less expensive. | <ul style="list-style-type: none"> ■ Does not support an upgrade when RAID-1 volumes are configured. ■ More than two RAID-0 volumes are not supported. |
| Live Upgrade | <ul style="list-style-type: none"> ■ You can create up to three RAID-0 volumes (submirrors) for each RAID-1 volume. Three submirrors enable you to take a submirror offline and perform a backup while maintaining the two remaining submirrors for continued data redundancy. ■ Supports the creation of RAID-1 volumes during an upgrade. <p>For examples, see “How to Create a Boot Environment With RAID-1 Volumes (Mirrors)” in <i>Oracle Solaris 10 1/13 Installation Guide: Live Upgrade and Upgrade Planning</i>.</p> | More than three RAID-0 volumes are not supported. |

TABLE 9-1 JumpStart and Live Upgrade Guidelines for Creating Mirrored File Systems (Continued)

| Installation Program | Supported Feature | Unsupported Feature |
|--|--|---|
| Creating and installing a flash archive, with RAID-1 volumes | <p>You can create a flash archive created from a master system that has Solaris Volume Manager RAID-1 volumes configured. The flash archive creation software removes all RAID-1 volume information from the archive to keep the integrity of the clone system. You can rebuild the RAID-1 volumes by using a JumpStart profile. With Live Upgrade, you create a boot environment with RAID-1 volumes configured and install the archive. The Oracle Solaris installation program cannot be used to install RAID-1 volumes with a flash archive.</p> <p>For examples of RAID-1 volumes in JumpStart profiles, see “Profile Examples” in <i>Oracle Solaris 10 1/13 Installation Guide: JumpStart Installations</i>.</p> | Veritas VxVM stores configuration information in areas not available to flash archives. If Veritas VxVM file systems have been configured, you should not create a flash archive. Also, Oracle Solaris installation methods, including JumpStart and Live Upgrade do not support rebuilding VxVM volumes at installation time. Therefore, if you are planning to deploy Veritas VxVM software using a flash archive, the archive must be created prior to configuring the VxVM file systems. The clone systems must then be configured individually after the archive has been applied and the system rebooted. |

RAID Volume Name Requirements and Guidelines

Observe the following rules when assigning names for volumes:

- Use a naming method that maps the slice number and disk number to volume numbers.
- Volume names must begin with the letter *d* followed by a number, for example, *d0*.
- Solaris Volume Manager has 128 default volume names from 0–127. The following list shows some example volume names.
 - Device */dev/md/dsk/d0* – block volume *d0*
 - Device */dev/md/dsk/d1* – block volume *d1*
- Use ranges for each particular type of volume. For example, assign numbers 0–20 for RAID-1 volumes, and 21–40 for RAID-0 volumes.

RAID Volume Naming Conventions for Live Upgrade

When you use Live Upgrade to create RAID-1 volumes (mirrors) and RAID-0 volumes (submirrors), you can enable the software to detect and assign volume names, or you can assign the names. If you enable the software to detect the names, the software assigns the first mirror or submirror name that is available.

If you assign mirror names, assign names ending in zero so that the installation can use the names ending in 1 and 2 for submirrors. If you assign numbers incorrectly, the mirror might not be created. For example, if you specify a mirror name with a number that ends in 1 or 2 (*d1* or *d2*), Live Upgrade fails to create the mirror if the mirror name duplicates a submirror's name.

Note – In previous releases, an abbreviated volume name could be entered. Starting with the Solaris 10 10/08 release, only the full volume name can be entered. For example, only the full volume name, such as `/dev/md/dsk/d10`, can be used to specify a mirror.

EXAMPLE 9-1 Live Upgrade: Enable the Software to Detect and Name the Mirror and Submirror

In this example, Live Upgrade assigns the volume names. The RAID-1 volumes `d0` and `d1` are the only volumes in use. For the mirror `d10`, Live Upgrade chooses `d2` for the submirror for the device `c0t0d0s0` and `d3` for the submirror for the device `c1t0d0s0`.

```
lucreate -n newbe -m /:/dev/md/dsk/d10:mirror,ufs \  
-m /:/dev/dsk/c0t0d0s0:attach -m /:/dev/dsk/c1t0d0s0:attach
```

EXAMPLE 9-2 Live Upgrade: Assign Mirror and Submirror Names

In this example, the volume names are assigned in the command. For the mirror `d10`, `d11` is the name for the submirror for the device `c0t0d0s0` and `d12` is the name for the submirror for the device `c1t0d0s0`.

```
lucreate -n newbe -m /:/dev/md/dsk/d10:mirror,ufs \  
-m /:/dev/dsk/c0t0d0s0,/dev/md/dsk/d11:attach \  
-m /:/dev/dsk/c1t0d0s0,/dev/md/dsk/d12:attach
```

For detailed information about Solaris Volume Manager naming requirements, see [Solaris Volume Manager Administration Guide](#).

RAID-Volume Naming Conventions for JumpStart

When you use the JumpStart installation method to create RAID-1 volumes (mirrors) and RAID-0 volumes (submirrors), you can enable the software to detect and assign volume names to mirrors, or you can assign the names in the profile.

- If you enable the software to detect the names, the software assigns the first volume number that is available.
- If you assign names in the profile, assign mirror names ending in zero so that the installation can use the names ending in 1 and 2 for submirrors.

Note – If you assign numbers incorrectly, the mirror might not be created. For example, if you specify a mirror name with a number that ends in 1 or 2 (`d1` or `d2`), JumpStart fails to create the mirror if the mirror name duplicates a submirror's name.

Note – You can abbreviate the names of physical disk slices and Solaris Volume Manager volumes. The abbreviation is the shortest name that uniquely identifies a device. For example:

- A Solaris Volume Manager volume can be identified by its *dnum* designation, so that, for example, `/dev/md/dsk/d10` becomes simply `d10`.
 - If a system has a single controller and multiple disks, you might use `t0d0s0`, but with multiple controllers, you would use `c0t0d0s0`.
-

EXAMPLE 9-3 JumpStart: Enable the Software to Detect the Mirror and Submirror Names

In the following profile example, the mirror is assigned the first volume numbers that are available. If the next available mirror ending in zero is `d10`, then the names `d11` and `d12` are assigned to the submirrors.

```
filesys                mirror c0t0d0s1 /
```

EXAMPLE 9-4 JumpStart: Assigning Mirror and Submirror Names

In the following profile example, the mirror number is assigned in the profile as `d30`. The submirror names are assigned by the software, based on the mirror number and the first available submirrors. The submirrors are named `d31` and `d32`.

```
filesys                mirror:d30 c0t1d0s0 c0t0d0s0 /
```

For detailed information about Solaris Volume Manager naming requirements, see [Solaris Volume Manager Administration Guide](#).

Guidelines for Selecting Disks and Controllers

When you choose the disks and controllers that you want to use to mirror a file system, consider the following guidelines:

- Use components that are on different controllers to increase the number of simultaneous reads and writes that can be performed.
- Keep the slices of different submirrors on different disks and controllers. Data protection is diminished considerably if slices of two or more submirrors of the same mirror are on the same disk.
- Organize submirrors across separate controllers, because controllers and associated cables tend to fail more often than disks. This practice also improves mirror performance.
- Use the same type of disks and controllers in a single mirror. Particularly in old SCSI storage devices, different models or brands of disk or controller can have widely varying performance. Mixing the different performance levels in a single mirror can cause performance to degrade significantly.

Guidelines for Selecting Slices

When you choose the slices that you want to use to mirror a file system, consider the following guidelines:

- Any file system, including root (/), swap, and /usr, can use a mirror. Any application, such as a database, also can use a mirror.
- Make sure that your submirror slices are of equal size. Submirrors of different sizes result in unused disk space.
- If you have a mirrored file system in which the first submirror attached does not start on cylinder 0, all additional submirrors you attach also must not start on cylinder 0. If you attempt to attach a submirror starting on cylinder 0 to a mirror in which the original submirror does not start on cylinder 0, the following error message is displayed:

```
can't attach  
labeled submirror to an unlabeled mirror
```

You must ensure that either all submirrors you plan to attach to a mirror start on cylinder 0, or none do.

Starting cylinders do not have to be identical across all submirrors, but all submirrors must either include or not include cylinder 0.

Troubleshooting: Booting Into Single-User Mode Causes Mirror to Appear to Need Maintenance

If a system with mirrors for root (/), /usr, and swap is booted into single-user mode, the system indicates that these mirrors are in need of maintenance. When you view these mirrors with the `metastat` command, these mirrors, and possibly all mirrors on the system, appear in the “Needing Maintenance” state.

Though this situation appears to be potentially dangerous, do not be concerned. The `metasync -r` command, which normally occurs during boot to resynchronize mirrors, is interrupted when the system is booted into single-user mode. After the system is rebooted, the `metasync -r` command runs and resynchronizes all mirrors.

If this interruption is a concern, run the `metasync -r` command manually.

For more information, see the `metasync(1M)` man page, and *Solaris Volume Manager Administration Guide*.

Glossary

| | |
|-------------------------|---|
| archive | <p>A file that contains a collection of files that were copied from a master system. The file also contains identification information about the archive, such as a name and the date that you created the archive. After you install an archive on a system, the system contains the exact configuration of the master system.</p> <p>An archive could be a differential archive, which is a flash archive that contains only the differences between two system images, an unchanged master image, and an updated master image. The differential archive contains files to be retained, modified, or deleted from the clone system. A differential update changes only the files specified and is restricted to systems that contain software consistent with the unchanged master image.</p> |
| begin script | <p>A user-defined Bourne shell script, specified within the <code>rules</code> file, that performs tasks before the Oracle Solaris software is installed on the system. You can use begin scripts only with JumpStart installations.</p> |
| boot | <p>To load the system software into memory and start it.</p> |
| boot archive | <p>x86 only: A boot archive is a collection of critical files that is used to boot the Oracle Solaris OS. These files are needed during system startup before the root (/) file system is mounted. Two boot archives are maintained on a system:</p> <ul style="list-style-type: none">■ The boot archive that is used to boot the Oracle Solaris OS on a system. This boot archive is sometimes called the primary boot archive.■ The boot archive that is used for recovery when the primary boot archive is damaged. This boot archive starts the system without mounting the root (/) file system. On the GRUB menu, this boot archive is called failsafe. The archive's essential purpose is to regenerate the primary boot archive, which is usually used to boot the system. |
| boot environment | <p>A collection of mandatory file systems (disk slices and mount points) that are critical to the operation of the Oracle Solaris OS. These disk slices might be on the same disk or distributed across multiple disks.</p> <p>The active boot environment is the one that is currently booted. Exactly one active boot environment can be booted. An inactive boot environment is not currently booted, but can be in a state of waiting for activation on the next reboot.</p> |
| boot loader | <p>x86 only: The boot loader is the first software program that runs after you turn on a system. This program begins the booting process.</p> |
| boot server | <p>A server system that provides client systems on the same network subnet with the programs and information that they need to start. A boot server is required to install over the network if the install server is on a different subnet than the systems on which Oracle Solaris software is to be installed.</p> |

| | |
|--|---|
| concatenation | A RAID-0 volume. If slices are concatenated, the data is written to the first available slice until that slice is full. When that slice is full, the data is written to the next slice, serially. A concatenation provides no data redundancy unless it is contained in a mirror. See also RAID-0 volume. |
| Core Software Group | A software group that contains the minimum software that is required to boot and run the Oracle Solaris OS on a system. Core includes some networking software and the drivers that are required to run the Common Desktop Environment (CDE) desktop. Core does not include the CDE software. |
| dataset | A generic name for the following ZFS entities: clones, file systems, snapshots, or volumes. |
| Developer Oracle Solaris Software Group | A software group that contains the End User Oracle Solaris Software Group plus the libraries, include files, man pages, and programming tools for developing software. |
| DHCP | (Dynamic Host Configuration Protocol) An application-layer protocol. Enables individual computers, or clients, on a TCP/IP network to extract an IP address and other network configuration information from a designated and centrally maintained DHCP server or servers. This facility reduces the overhead of maintaining and administering a large IP network. |
| End User Oracle Solaris Software Group | A software group that contains the Core Software Group plus the recommended software for an end user, including the Common Desktop Environment (CDE) and DeskSet software. |
| Entire Oracle Solaris Software Group | A software group that contains the entire Oracle Solaris release. |
| Entire Oracle Solaris Software Group Plus OEM Support | A software group that contains the entire Oracle Solaris release plus additional hardware support for OEMs. This software group is recommended when installing Oracle Solaris software on SPARC based servers. |
| /etc directory | A directory that contains critical system configuration files and maintenance commands. |
| /export file system | A file system on an OS server that is shared with other systems on a network. For example, the /export file system can contain the root (/) file system and swap space for diskless clients and the home directories for users on the network. Diskless clients rely on the /export file system on an OS server to boot and run. |
| failsafe boot archive | x86 only: A boot archive that is used for recovery when the primary boot archive is damaged. This boot archive starts the system without mounting the root (/) file system. This boot archive is called failsafe on the GRUB menu. The archive's essential purpose is to regenerate the primary boot archive, which is usually used to boot the system. See <i>boot archive</i> . |
| fallback | A reversion to the environment that ran previously. Use fallback when you are activating an environment and the boot environment that is designated for booting fails or shows some undesirable behavior. |
| fdisk partition | A logical partition of a disk drive that is dedicated to a particular operating system on x86 based systems. To install the Oracle Solaris software, you must set up at least one Oracle Solaris fdisk partition on an x86 based system. x86 based systems allow up to four different fdisk partitions on a disk. These partitions can be used to hold individual operating systems. Each operating system must be located on a unique fdisk partition. A system can only have one Oracle Solaris fdisk partition per disk. |

| | |
|-------------------------------|--|
| file server | A server that provides the software and file storage for systems on a network. |
| file system | In the Oracle Solaris operating system, a tree-structured network of files and directories that you can access. |
| finish script | A user-defined Bourne shell script, specified within the <code>rules</code> file, that performs tasks after the Oracle Solaris software is installed on the system but before the system reboots. You use finish scripts with JumpStart installations. |
| flash archive | An Oracle Solaris installation feature that enables you to create an archive of the files on a system, called the <i>master system</i> . You can then use the archive to install other systems, making the other systems identical in their configuration to the master system. See also <i>archive</i> . |
| format | To put data into a structure or divide a disk into sectors for receiving data. |
| global zone | In Oracle Solaris Zones, the global zone is both the default zone for the system and the zone used for system-wide administrative control. The global zone is the only zone from which a non-global zone can be configured, installed, managed, or uninstalled. Administration of the system infrastructure, such as physical devices, routing, or dynamic reconfiguration (DR), is only possible in the global zone. Appropriately privileged processes running in the global zone can access objects associated with other zones. See also <i>Solaris Zones</i> and <i>non-global zone</i> . |
| GRUB | x86 only: GNU GRand Unified Bootloader (GRUB) is an open source boot loader with a simple menu interface. The menu displays a list of operating systems that are installed on a system. GRUB enables you to easily boot these various operating systems, such as the Oracle Solaris OS, Linux, or Microsoft Windows. |
| initial installation | An installation that overwrites the currently running software or initializes a blank disk. An initial installation of the Oracle Solaris OS overwrites the system's disk or disks with the new version of the Oracle Solaris OS. If your system is not running the Oracle Solaris OS, you must perform an initial installation. If your system is running an upgradable version of the Oracle Solaris OS, an initial installation overwrites the disk and does not preserve the OS or local modifications. |
| install server | A server that provides the Oracle Solaris DVD or CD images from which other systems on a network can install Oracle Solaris (also called a <i>media server</i>). You can create an install server by copying the Oracle Solaris DVD or CD images to the server's hard disk. |
| JumpStart | A type of installation in which the Oracle Solaris software is automatically installed on a system that is based on a user-defined profile. You can create customized profiles for different types of users and systems. |
| JumpStart installation | A type of installation in which the Oracle Solaris software is automatically installed on a system by using the factory-installed JumpStart software. |
| Kerberos | A network authentication protocol that uses strong, secret-key cryptography to enable a client and server to identify themselves to each other over an insecure network connection. |
| LAN | (local area network) A group of computer systems in close proximity that can communicate by way of some connecting hardware and software. |
| LDAP | (Lightweight Directory Access Protocol) A standard, extensible directory access protocol that is used by LDAP naming service clients and servers to communicate with each other. |

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| Live Upgrade | An upgrade method that enables a duplicate boot environment to be upgraded while the active boot environment is still running, thus eliminating downtime of the production environment. |
| locale | A geographic or political region or community that shares the same language, customs, or cultural conventions (English for the U.S. is <code>en_US</code> , and English for the U.K. is <code>en_UK</code>). |
| logical device | A group of physical slices on one or more disks that appear to the system as a single device. A logical device is called a volume in Solaris Volume Manager. A volume is functionally identical to a physical disk for the purposes of an application or file system. |
| manifest section | A section of a flash archive that is used to validate a clone system. The manifest section lists the files on a system to be retained, added to, or deleted from the clone system. This section is informational only. The section lists the files in an internal format and cannot be used for scripting. |
| master system | A system that you use to create a flash archive. The system configuration is saved in the archive. |
| MD5 | (Message Digest 5) An iterative cryptographic hash function that is used for message authentication, including digital signatures. The function was developed in 1991 by Rivest. |
| media server | See <i>install server</i> . |
| menu.lst file | x86 only: A file that lists all the operating systems that are installed on a system. The contents of this file dictate the list of operating systems that is displayed on the GRUB menu. From the GRUB menu, you can easily boot an operating system without modifying the BIOS or <code>fdisk</code> partition settings. |
| metadevice | See <i>volume</i> . |
| miniroot | A minimal, bootable root (<code>/</code>) file system that is included in Oracle Solaris installation media. A miniroot consists of the Oracle Solaris software that is required to install and upgrade systems. On x86 based systems, the miniroot is copied to the system to be used as the failsafe boot archive. See <i>failsafe boot archive</i> . |
| mirror | See <i>RAID-1 volume</i> . |
| mount | The process of accessing a directory from a disk that is attached to a machine that is making the mount request or a remote disk on a network. To mount a file system, you need a mount point on the local system and the name of the file system to be mounted (for example, <code>/usr</code>). |
| mount point | A workstation directory to which you mount a file system that exists on a remote machine. |
| name server | A server that provides a naming service to systems on a network. |
| naming service | A distributed network database that contains key system information about all the systems on a network so that the systems can communicate with each other. With a naming service, the system information can be maintained, managed, and accessed on a network-wide basis. Without a naming service, each system has to maintain its own copy of the system information in the local <code>/etc</code> files. Oracle supports the following naming services: LDAP, NIS, and NIS+. |
| network installation | A way to install software over the network from a system with a CD-ROM or DVD-ROM drive to a system without a CD-ROM or DVD-ROM drive. Network installations require a <i>name server</i> and an <i>install server</i> . |

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| networked systems | A group of systems (called hosts) that are connected through hardware and software so that they can communicate and share information. Referred to as a local area network (LAN). One or more servers are usually needed when systems are networked. |
| NIS | The SunOS 4.0 (minimum) Network Information Service. A distributed network database that contains key information about the systems and the users on the network. The NIS database is stored on the master server and all the slave servers. |
| NIS+ | The SunOS 5.0 (minimum) Network Information Service. NIS+ replaces NIS, the SunOS 4.0 (minimum) Network Information Service. |
| non-global zone | A virtualized operating system environment created within a single instance of the Oracle Solaris operating system. One or more applications can run in a non-global zone without interacting with the rest of the system. Non-global zones are also called zones. See also <i>Solaris Zones</i> and <i>global zone</i> . |
| nonnetworked systems | Systems that are not connected to a network or do not rely on other systems. |
| /opt file system | A file system that contains the mount points for third-party and unbundled software. |
| Oracle Solaris DVD or CD images | The Oracle Solaris software that is installed on a system, which you can access on the Oracle Solaris DVDs or CDs or an install server's hard disk to which you have copied the Oracle Solaris DVD or CD images. |
| Oracle Solaris installation program | A graphical user interface (GUI) or command-line interface (CLI) installation program that uses wizard panels to guide you step-by-step through installing the Oracle Solaris software and third-party software. |
| Oracle Solaris Zones | A software partitioning technology used to virtualize operating system services and provide an isolated and secure environment for running applications. When you create a non-global zone, you produce an application execution environment in which processes are isolated from all other zones. This isolation prevents processes that are running in a zone from monitoring or affecting processes that are running in any other zones. See also <i>global zone</i> and <i>non-global zone</i> . |
| OS server | A system that provides services to systems on a network. To serve diskless clients, an OS server must have disk space set aside for each diskless client's root (<i>/</i>) file system and swap space (<i>/export/root</i> , <i>/export/swap</i>). |
| package | A collection of software that is grouped into a single entity for modular installation. The Oracle Solaris software is divided into <i>software groups</i> , which are each composed of <i>clusters</i> and packages. |
| panel | A container for organizing the contents of a window, a dialog box, or applet. The panel might collect and confirm user input. Panels might be used by wizards and follow an ordered sequence to fulfill a designated task. |
| patch analyzer | A script that you can run manually or as part of the Oracle Solaris installation program. The patch analyzer performs an analysis on your system to determine which (if any) patches will be removed by upgrading to a Oracle Solaris update. |
| platform group | A vendor-defined grouping of hardware platforms for the purpose of distributing specific software. Examples of valid platform groups are <i>i86pc</i> and <i>sun4u</i> . |

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| platform name | The output of the <code>uname -i</code> command. For example, the platform name for the Ultra 60 is <code>SUNW,Ultra-60</code> . |
| pool | A logical group of devices describing the layout and physical characteristics of the available ZFS storage. Space for datasets is allocated from a pool. |
| Power Management | <p>Software that automatically saves the state of a system and turns it off after it is idle for 30 minutes. When you install the Oracle Solaris software on a system that complies with Version 2 of the U.S. Environmental Protection Agency's Energy Star guidelines, the Power Management software is installed by default. A sun4u SPARC based system is an example of a system that has Power Management installed by default. After a subsequent reboot, you are prompted to enable or disable the Power Management software.</p> <p>Energy Star guidelines require that systems or monitors automatically enter a "sleep state" (consume 30 watts or less) after the system or monitor becomes inactive.</p> |
| primary boot archive | A boot archive that is used to boot the Oracle Oracle Solaris OS on a system. This boot archive is sometimes called the primary boot archive. See <i>boot archive</i> . |
| private key | The decryption key used in public-key encryption. |
| probe keyword | A syntactical element that extracts attribute information about a system when using the custom JumpStart method to install. A probe keyword does not require you to set up a matching condition and run a profile as required for a rule. See also <i>rule</i> . |
| profile | A text file that defines how to install the Oracle Solaris software when using the custom JumpStart method. For example, a profile defines which software group to install. Every rule specifies a profile that defines how a system is to be installed when the rule is matched. You usually create a different profile for every rule. However, the same profile can be used in more than one rule. See also <i>rules file</i> . |
| profile diskette | A diskette that contains all the essential custom JumpStart files in its root directory (JumpStart directory). |
| profile server | A server that contains all the essential custom JumpStart files in a JumpStart directory. |
| public key | The encryption key used in public-key encryption. |
| public-key cryptography | A cryptographic system that uses two keys: a public key known to everyone, and a private key known only to the recipient of the message. |
| RAID-0 volume | A class of volume that can be a stripe or a concatenation. These components are also called submirrors. A stripe or concatenation is the basic building block for mirrors. |
| RAID-1 volume | A class of volume that replicates data by maintaining multiple copies. A RAID-1 volume is composed of one or more RAID-0 volumes called <i>submirrors</i> . A RAID-1 volume is sometimes called a <i>mirror</i> . |
| RAID-Z storage pool | A virtual device that stores data and parity on multiple disks that can be used as a ZFS storage pool. RAID-Z is similar to RAID-5. |
| Reduced Network Support Software Group | A software group that contains the minimum code that is required to boot and run a Oracle Solaris system with limited network service support. The Reduced Networking Software Group provides a multiuser text-based console and system administration utilities. This software group also enables the system to recognize network interfaces, but does not activate network services. |

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| root | The top level of a hierarchy of items. Root is the one item from which all other items are descended. See <i>root directory</i> or <i>root (/) file system</i> . |
| root (/) file system | The top-level file system from which all other file systems stem. The root (/) file system is the base on which all other file systems are mounted, and is never unmounted. The root (/) file system contains the directories and files critical for system operation, such as the kernel, device drivers, and the programs that are used to start (boot) a system. |
| root directory | The top-level directory from which all other directories stem. |
| rule | A series of values that assigns one or more system attributes to a profile. A rule is used in a custom JumpStart installation. |
| rules file | A text file that contains a rule for each group of systems or single systems that you want to install automatically. Each rule distinguishes a group of systems, based on one or more system attributes. The rules file links each group to a profile, which is a text file that defines how the Oracle Solaris software is to be installed on each system in the group. A rules file is used in a custom JumpStart installation. See also <i>profile</i> . |
| rules.ok file | A generated version of the rules file. The rules.ok file is required by the custom JumpStart installation software to match a system to a profile. You <i>must</i> use the check script to create the rules.ok file. |
| Secure Sockets Layer | (SSL) A software library establishing a secure connection between two parties (client and server) used to implement HTTPS, the secure version of HTTP. |
| server | A network device that manages resources and supplies services to a client. |
| SHA1 | (Secure Hashing Algorithm) The algorithm that operates on any input length less than 2^{64} to produce a message digest. |
| shareable file systems | File systems that are user-defined files such as /export/home and /swap. These file systems are shared between the active and inactive boot environment when you use Live Upgrade. Shareable file systems contain the same mount point in the vfstab file in both the active and inactive boot environments. Updating shared files in the active boot environment also updates data in the inactive boot environment. Shareable file systems are shared by default, but you can specify a destination slice, and then the file systems are copied. |
| slice | The unit into which the disk space is divided by the software. |
| snapshot | A read-only image of a ZFS file system or volume at a given point in time. |
| software group | A logical grouping of the Oracle Solaris software (clusters and packages). During a Oracle Solaris installation, you can install one of the following software groups: Core, End User Oracle Solaris Software, Developer Oracle Solaris Software, or Entire Oracle Solaris Software, and for SPARC systems only, Entire Oracle Solaris Software Group Plus OEM Support. |
| standalone | A computer that does not require support from any other machine. |
| state database | A database that stores information about the state of your Solaris Volume Manager configuration. The state database is a collection of multiple, replicated database copies. Each copy is referred to as a <i>state database replica</i> . The state database tracks the location and status of all known state database replicas. |

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| state database replica | A copy of a state database. The replica ensures that the data in the database is valid. |
| submirror | See <i>RAID-0 volume</i> . |
| swap space | A slice or file that temporarily holds the contents of a memory area till it can be reloaded in memory. Also called the <i>/swap</i> or <i>swap volume</i> . |
| sysidcfg file | A file in which you specify a set of special system configuration keywords that preconfigure a system. |
| unmount | The process of removing access to a directory on a disk that is attached to a machine or to a remote disk on a network. |
| update | An installation, or to perform an installation, on a system that changes software that is of the same type. Unlike an upgrade, an update might downgrade the system. Unlike an initial installation, software of the same type that is being installed must be present before an update can occur. |
| upgrade | <p>An installation that merges files with existing files and preserves modifications where possible.</p> <p>An upgrade of the Oracle Solaris OS merges the new version of the Oracle Solaris OS with the existing files on the system's disk or disks. An upgrade saves as many modifications as possible that you have made to the previous version of the Oracle Solaris OS.</p> |
| upgrade option | An option that is presented by the Oracle Solaris installation program. The upgrade procedure merges the new version of Oracle Solaris with existing files on your disk or disks. An upgrade also saves as many local modifications as possible since the last time Oracle Solaris was installed. |
| /usr file system | A file system on a standalone system or server that contains many of the standard UNIX programs. Sharing the large <i>/usr</i> file system with a server rather than maintaining a local copy minimizes the overall disk space that is required to install and run the Oracle Solaris software on a system. |
| /var file system | A file system or directory (on standalone systems) that contains system files that are likely to change or grow over the life of the system. These files include system logs, <i>vi</i> files, mail files, and UUCP files. |
| virtual device | A logical device in a ZFS pool, which can be a physical device, a file, or a collection of devices. |
| volume | <p>A group of physical slices or other volumes that appear to the system as a single logical device. A volume is functionally identical to a physical disk for the purposes of an application or file system.</p> <p>In some command-line utilities, a volume is called a metadvice. Volume is also called <i>pseudo device</i> or <i>virtual device</i> in standard UNIX terms.</p> |
| Volume Manager | A program that provides a mechanism to administer and obtain access to the data on DVD-ROMs, CD-ROMs, and diskettes. |
| ZFS | A file system using storage pools to manage physical storage. |
| zone | See <i>non-global zone</i> |

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