Solaris 10 6/06 Installation Guide: Custom JumpStart and Advanced Installations

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Contents

Preface

This book describes how to install and upgrade the Solaris™ OS on both networked and nonnetworked SPARC® and x86 architecture based systems. This book covers using the custom JumpStart installation method 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 Solaris release supports systems that use the SPARC and x86 families of processor architectures: UltraSPARC®, SPARC64, AMD64, Pentium, and Xeon EM64T. The supported systems appear in the *Solaris 10 Hardware Compatibility List* at `http://www.sun.com/bigadmin/hcl`. 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" points out specific 64-bit information about AMD64 or EM64T systems.
- "32-bit x86" points out specific 32-bit information about x86 based systems.

For supported systems, see the *Solaris 10 Hardware Compatibility List*.

Who Should Use This Book

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

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

Related Books

Table P–1 lists related information that you need when you install the Solaris software.

TABLE P–1 Related Information

Information	Description
Solaris 10 6/06 Installation Guide: Basic Installations	Describes a basic OS installation with a graphical user interface (GUI).
Solaris 10 6/06 Installation Guide: Network-Based Installations	Describes how to perform a remote Solaris installation over a local area network or a wide area network.
Solaris 10 6/06 Installation Guide: Solaris Live Upgrade and Upgrade Planning	Provides planning information when using CD or DVD media to upgrade a system to the Solaris OS. This book also describes how to use Solaris Live Upgrade to create and upgrade new boot environments.
Solaris 10 6/06 Installation Guide: Solaris Flash Archives (Creation and Installation)	Provides instructions for creating Solaris Flash archives and using Solaris Flash archives to install the Solaris OS on multiple systems.
System Administration Guide: Devices and File Systems	Describes how to back up system files and other system administration tasks.
Solaris Release Notes	Describes any bugs, known problems, software that is being discontinued, and patches that are related to the Solaris release.
SPARC: *Solaris Sun Hardware Platform Guide* at `http://docs.sun.com`	Contains information about supported hardware.
Solaris Package List	Lists and describes the packages in the Solaris OS.
x86: Solaris Hardware Compatibility List	Contains supported hardware information and device configuration.

Documentation, Support, and Training

The Sun web site provides information about the following additional resources:

- Documentation (`http://www.sun.com/documentation/`)
- Support (`http://www.sun.com/support/`)
- Training (`http://www.sun.com/training/`)

Typographic Conventions

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

TABLE P–2 Typographic Conventions

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

Shell Prompts in Command Examples

The following table shows the default UNIX® system prompt and superuser prompt for the C shell, Bourne shell, and Korn shell.

TABLE P–3 Shell Prompts

Shell	Prompt
C shell	`machine_name%`
C shell for superuser	`machine_name#`
Bourne shell and Korn shell	`$`
Bourne shell and Korn shell for superuser	`#`

PART I

Overall Planning of Any Solaris Installation or Upgrade

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

◆ ◆ ◆ CHAPTER 1

What's New in Solaris Installation

This chapter describes new features in the Solaris installation programs. To view features for all of the Solaris OS, see *Solaris 10 What's New*.

What's New in the Solaris 10 1/06 Release For Solaris Installation

This section describes the following new installation features in the Solaris 10 1/06 release.

Upgrading the Solaris OS When Non-Global Zones Are Installed

Solaris Zones partitioning technology provides the ability to configure non-global zones in a single instance of Solaris, the global zone. A non-global zone is an application execution environment in which processes are isolated from all other zones. **Starting with the Solaris 10 1/06 release** and if you are running a system with non-global zones installed, you can use standard Solaris upgrade programs to upgrade. You can use either the Solaris interactive installation program or custom JumpStart to upgrade. There are some limitations to upgrading with non-global zones installed.

- A limited number of custom JumpStart keywords are supported. For a list of supported custom JumpStart keywords, see *Solaris 10 6/06 Installation Guide: Custom JumpStart and Advanced Installations*.
- CD-ROMs are not distributed, but you can upgrade with a DVD-ROM or a network installation image.

- On a system with non-global zones installed, do not use Solaris Live Upgrade to upgrade your system. While you can create a boot environment with the `lucreate` command, the `luupgrade` command cannot upgrade a boot environment that has non-global zones installed. In that case, the upgrade fails and an error message is displayed.

For details on using the Solaris interactive installation program, see *Solaris 10 6/06 Installation Guide: Basic Installations*

x86: GRUB Based Booting

Starting with the Solaris 10 1/06 release, the open source GNU GRand Unified Boot Loader (GRUB) has been adopted in the Solaris OS for x86 based systems. GRUB is responsible for loading a boot archive into the system's memory. A boot archive is a collection of critical files that is needed during system startup before the root (`/`) file system is mounted. The boot archive is used to boot the Solaris OS.

The most notable change is the replacement of the Solaris Device Configuration Assistant with the GRUB menu. The GRUB menu facilitates booting the different operating systems that are installed on your system. The GRUB menu is displayed when you boot an x86 based system. From the GRUB menu, you can select an OS instance to install by using the arrow keys. If you do not make a selection, the default OS instance is booted.

The GRUB based boot feature provides the following improvements:

- Faster boot times
- Installation from USB CD or DVD drives
- Ability to boot from USB storage devices
- Simplified DHCP setup for PXE boot (no vendor-specific options)
- Elimination of all realmode drivers
- Ability to use Solaris Live Upgrade and the GRUB menu to quickly activate and fall back to boot environments

For more information about GRUB refer to the following sections.

Task	GRUB Task	For More Information
Installation	Overview information about GRUB based booting	"x86: GRUB Based Booting (Overview)" on page 49
	Installation planning for GRUB based booting	"x86: GRUB Based Booting (Planning)" on page 52
	How to boot and install over the network with the GRUB menu	"Booting and Installing the System From the Network With a DVD Image" in *Solaris 10 6/06 Installation Guide: Network-Based Installations*
	How to boot and install with the GRUB menu and the Custom JumpStart installation method	"x86: Performing a Custom JumpStart Installation" on page 130
	How to use the GRUB menu and Solaris Live Upgrade to activate and fall back to boot environments	■ "Activating a Boot Environment" in *Solaris 10 6/06 Installation Guide: Solaris Live Upgrade and Upgrade Planning* ■ Chapter 10, "Failure Recovery: Falling Back to the Original Boot Environment (Tasks)," in *Solaris 10 6/06 Installation Guide: Solaris Live Upgrade and Upgrade Planning*
	Locating the GRUB menu's `menu.lst` file	"x86: Locating the GRUB Menu's `menu.lst` File (Tasks)" on page 56
System Administration	How to perform system administration tasks with the GRUB menu	■ *System Administration Guide: Basic Administration* ■ *System Administration Guide: Devices and File Systems* ■ `bootadm`(1M) ■ `installgrub`(1M)

Note – GNU is a recursive acronym for "GNU's Not UNIX." For more information, go to `http://www.gnu.org`.

Upgrade Support Changes for Solaris Releases

Starting with the Solaris 10 1/06 release, you can upgrade the Solaris OS from the Solaris 8, 9, or 10 releases. Upgrades from the Solaris 7 release are not supported.

What's New in the Solaris 10 3/05 Release For Solaris Installation

This section describes the following new installation features in the Solaris 10 3/05 release.

Solaris Installation Changes Including Installation Unification

Starting with the Solaris 10 3/05 release, several changes in the installation of the Solaris OS provide a more simplified and unified installation experience.

The changes include the following:

- This release has one installation DVD and several installation CDs. The Solaris Operating System DVD includes the content of all the installation CDs.
  - **Solaris Software 1** – This CD is the only bootable CD. From this CD, you can access both the Solaris installation graphical user interface (GUI) and the console-based installation. This CD also enables you to install selected software products from both the GUI and the console-based installation.
  - **Other Solaris Operating System CDs** – These CDs contain the following:
    - Solaris packages that the software prompts you to install if necessary
    - ExtraValue software that includes supported and unsupported software
    - Installers
    - Localized interface software and documentation
- The Solaris Installation CD no longer exists.
- For both CD and DVD media, the GUI installation is the default (if your system has enough memory). However, you can specify a console-based installation with the `text` boot option.
- The installation process has been simplified, enabling you to select the language support at boot time, but select locales later.

Note – The (noninteractive) Solaris custom JumpStart™ installation method has not changed.

To install the OS, simply insert the Solaris Software - 1 CD or the Solaris Operating System DVD and type one of the following commands.

- For the default GUI installation (if system memory permits), type **`boot cdrom`**.
- For the console-based installation, type **`boot cdrom - text`**.

For instructions about how to install the Solaris OS by using CD or DVD media with the new `text` boot option	*Solaris 10 6/06 Installation Guide: Basic Installations*
For changes to setting up an installation server with CD media	*Solaris 10 6/06 Installation Guide: Network-Based Installations*

Accessing the GUI or Console-based Installations

Starting with the Solaris 10 3/05 release, you can choose to install the software with a GUI or with or without a windowing environment. If the memory is sufficient, the GUI is displayed by default. If the memory is insufficient for the GUI, other environments are displayed by default. You can override defaults with the `nowin` or `text` boot options. However, you are limited by the amount of memory in your system or by installing remotely. Also, if the Solaris installation program does not detect a video adapter, the program is automatically displayed in a console-based environment.

For specific memory requirements, see "System Requirements and Recommendations" on page 33.

Custom JumpStart Installation Package and Patch Enhancements

Starting with the Solaris 10 3/05 release, when you install and upgrade the Solaris OS by using the custom JumpStart installation method, new customizations enable the following:

- A Solaris Flash installation with additional packages

  The custom JumpStart profile `package` keyword has been enhanced to enable installing a Solaris Flash archive with additional packages. For example, you can install the same base archive on two machines, but add a different set of packages to each machine. These packages do not have to be a part of the Solaris OS distribution.

- An installation with additional packages that might not be part of the Solaris distribution

  The `package` keyword has also been enhanced to enable an installation with a package that is not part of the Solaris distribution. You no longer need to write a postinstallation script to add extra packages.

- An installation with the ability to install Solaris OS patches

  The new custom JumpStart profile `patch` keyword enables the installation of Solaris OS patches. This feature allows the installation of a list of patches that are specified in a patch file.

For further information, see *Solaris 10 6/06 Installation Guide: Custom JumpStart and Advanced Installations*.

Configuring Multiple Network Interfaces During Installation

Starting with the Solaris 10 3/05 release, the Solaris installation programs enable you to configure multiple interfaces during your installation. You can preconfigure these interfaces in the `sysidcfg` file for your system. Or you can configure multiple interfaces during the installation. For more information, see the following documents:

- *Solaris 10 6/06 Installation Guide: Network-Based Installations*
- `sysidtool`(1M)
- `sysidcfg`(4)

SPARC: 64-bit Package Changes

In previous Solaris releases, the Solaris software was delivered in separate packages for 32-bit components and 64-bit components. **Starting with the Solaris 10 3/05 release**, packaging has been simplified with the delivery of most 32-bit components and 64-bit components in a single package. The combined packages retain the names of the original 32-bit packages, and the 64-bit packages are no longer delivered.

The removal of the 64-bit packages simplifies installation and increases performance:

- Reduces the number of packages, which simplifies Custom JumpStart scripts that contain lists of packages
- Simplifies the packaging system with only one package that groups software functions
- Reduces installation time because fewer packages are installed

The 64-bit packages are renamed with the following conventions:

- If a 64-bit package has a 32-bit counterpart, the 64-bit package is named with the 32-bit package name. For example, a 64-bit library such as `/usr/lib/sparcv9/libc.so.1` previously would have been delivered in `SUNWcslx`, but now is delivered in `SUNWcsl`. The 64-bit `SUNWcslx` package is no longer delivered.
- If a package does not have a 32-bit counterpart, the "x" suffix is removed from the name. For example, `SUNW1394x` becomes `SUNW1394`.

This change means that you might need to modify your custom JumpStart script or other package installation scripts to remove references to the 64-bit packages.

Custom JumpStart Installation Method Creates New Boot Environment

Starting with the Solaris 10 3/05 release, you can now use the JumpStart installation method to create an empty boot environment when you install the Solaris Operating System. The empty boot environment can then be populated with a Solaris Flash archive for later use.

For further information, see Chapter 11.

Reduced Networking Software Group

Starting with the Solaris 10 3/05 release, you can now create a more secure system with fewer enabled network services by selecting or specifying the Reduced Networking software group (SUNWCrnet) during your installation. The Reduced Networking software group provides system administration utilities and a multiuser text-based console. SUNWCrnet enables the system to recognize network interfaces. During the installation, you can customize your system's configuration by adding software packages and by activating network services as needed.

For further information, see *Solaris 10 6/06 Installation Guide: Custom JumpStart and Advanced Installations*.

Modifying Disk Partition Tables by Using a Virtual Table of Contents

Starting with the Solaris 10 3/05 release, the Solaris installation program now enables you to load existing slices from the virtual table of contents (VTOC.) You can now preserve and use the system's existing disk slice tables during your installation, rather than use the installer's default disk layout.

x86: Change in Default Boot-Disk Partition Layout

Starting with the Solaris 10 3/05 release, a new feature in the Solaris installation program is a boot-disk partition layout. This layout, by default, accommodates the Service partition on Sun x86 based systems. This installation program enables you to preserve an existing Service partition.

The new default includes the following partitions.

- First partition – Service partition (existing size on system)
- Second partition – x86 boot partition (approximately 11 Mbytes)
- Third partition – Solaris Operating System partition (remaining space on the boot disk)

If you want to use this default layout, select Default when the Solaris installation program asks you to choose a boot-disk layout.

Note – If you install the Solaris OS for x86 based systems on a system that does not currently include a Service partition, the Solaris installation program does not create a new Service partition. If you want to create a Service partition on your system, first use your system's diagnostic CD to create the Service partition. After the Service partition is created, then install the Solaris Operating System.

For information about how to create the Service partition, see your hardware documentation.

For more information, see *Solaris 10 6/06 Installation Guide: Custom JumpStart and Advanced Installations*.

◆ ◆ ◆ CHAPTER 2

Solaris Installation and Upgrade (Roadmap)

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

Note – This book uses the term *slice*, but some 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 Solaris `fdisk` partition. The x86 `fdisk` divisions are called partitions. The divisions within the Solaris `fdisk` partition are called slices.

Task Map: Installing or Upgrading the Solaris Software

The following task map is an overview of the steps necessary to install or upgrade the 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 Solaris Software

Task	Description	For Instructions
Choose initial installation or upgrade.	Decide if you want to perform an initial installation or an upgrade.	"Initial Installation, or Upgrade?" on page 28.

TABLE 2–1 Task Map: Installing or Upgrading the Solaris Software *(Continued)*

Task	Description	For Instructions
Choose an installation program.	The Solaris OS provides several programs for installation or upgrade. Choose the installation method that is most appropriate for your environment.	"Choosing a Solaris Installation Method" on page 29.

(Solaris interactive installation program) Choose a default or custom installation.	Decide which type installation is suitable for your environment:
	■ If you are using a graphical user interface (GUI) you can choose a default or a custom installation:
	  ■ 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 on the Solaris installation program's choices, see Chapter 5, "Gathering Information Before Installation or Upgrade (Planning)," in *Solaris 10 6/06 Installation Guide: Network-Based Installations*

Review system requirements. Also, plan and allocate disk space and swap space.	Determine if your system meets the minimum requirements to install or upgrade. Allocate disk space on your system for the components of the Solaris OS that you want to install. Determine the appropriate swap-space layout for your system.	Chapter 3.
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 27.

Gather information about your system.	■ For the Solaris installation program, complete the worksheet to collect all of the information that you need to install or upgrade.
	■ For the custom 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.
		■ For the Solaris installation program, see either of the following documents:
		  ■ For an initial installation: "Checklist for Installation" in *Solaris 10 6/06 Installation Guide: Network-Based Installations*
		  ■ For an upgrade: Chapter 4, "Gathering Information Before Upgrade (Planning)," in *Solaris 10 6/06 Installation Guide: Solaris Live Upgrade and Upgrade Planning*
		■ For the custom JumpStart installation method, see Chapter 11

TABLE 2–1 Task Map: Installing or Upgrading the Solaris Software *(Continued)*

Task	Description	For Instructions
(Optional) Set system parameters.	You can preconfigure system information to avoid being prompted for the information during the installation or upgrade.	Chapter 6, "Preconfiguring System Configuration Information (Tasks)," in *Solaris 10 6/06 Installation Guide: Network-Based Installations*.
(Optional) Prepare to install the Solaris software from the network.	If you chose to install the Solaris software from the network, complete the following tasks. ■ (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	To install over a local area network, see Chapter 9, "Preparing to Install From the Network With CD Media (Tasks)," in *Solaris 10 6/06 Installation Guide: Network-Based Installations*. To install over a wide area network, see Chapter 13, "Preparing to Install With WAN Boot (Tasks)," in *Solaris 10 6/06 Installation Guide: Network-Based Installations*.
(Upgrade only) Perform tasks prior to upgrade.	Back up your system and determine if you can upgrade with disk space reallocation.	"Upgrade Planning" on page 38.
Perform an installation or upgrade.	Use the Solaris installation method that you chose to install or upgrade the Solaris software.	The chapter or chapters that provide detailed instructions for the installation programs.
Troubleshoot installation problems	Review the troubleshooting information when you encounter problems with your installation.	Appendix A.

Installing From the Network or From DVD or CDs?

The 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 Solaris software

You can use all of the Solaris installation methods to install a system from the network. However, by installing systems from the network with the Solaris Flash installation feature or with a custom 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 a Solaris Installation Method" on page 29.

Installing the Solaris software from the network requires initial setup. For information about preparing to install from the network, choose one of the following options.

For detailed instructions about preparing to install from a local area network	Chapter 9, "Preparing to Install From the Network With CD Media (Tasks)," in *Solaris 10 6/06 Installation Guide: Network-Based Installations*
For instructions about preparing to install over a wide area network	Chapter 13, "Preparing to Install With WAN Boot (Tasks)," in *Solaris 10 6/06 Installation Guide: Network-Based Installations*
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 *Solaris 10 6/06 Installation Guide: Network-Based Installations*

Initial Installation, or Upgrade?

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

Initial Installation

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

If the system is already running the 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 Solaris installation methods to perform an initial installation. For detailed information about the different Solaris installation methods, refer to "Choosing a Solaris Installation Method" on page 29.

Upgrade

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

For more information about upgrading and the list of upgrade methods, see "Upgrade Planning" on page 38.

Choosing a Solaris Installation Method

The 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.	Solaris installation program	■ 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 custom JumpStart or the Solaris Flash installation feature.	*Solaris 10 6/06 Installation Guide: Basic Installations*
Install one system over a local area network.	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 custom JumpStart and Solaris Flash installation methods to efficiently install or upgrade systems on your network.	Part II, "Installing Over a Local Area Network," in *Solaris 10 6/06 Installation Guide: Network-Based Installations*
Automate the installation or upgrade of multiple systems based on profiles you create.	Custom JumpStart	This program efficiently installs multiple systems. But if you only have a few systems, the creation of a custom JumpStart environment might be time consuming. For a few systems, use the Solaris interactive installation program.	Chapter 6

TABLE 2–2 Choosing Your Installation Method *(Continued)*

Task	Installation Method	Reasons for Choosing This Program	Instructions
Replicate the same software and configuration on multiple systems.	Solaris Flash archives	■ This program saves installation time by installing all Solaris packages at once on your system. Other programs install each individual Solaris package and update the package map for each package. ■ Solaris 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 custom JumpStart installation method. Alternatively, you can accomplish system-specific customizations by using a JumpStart finish script or an embedded Solaris Flash postdeployment script.	Chapter 1, "Solaris Flash (Overview)," in *Solaris 10 6/06 Installation Guide: Solaris Flash Archives (Creation and Installation)*
Install systems over a wide area network (WAN) or the Internet.	WAN boot	If you want to install a Solaris Flash archive over the network, this program enables a secure installation.	Chapter 11, "WAN Boot (Overview)," in *Solaris 10 6/06 Installation Guide: Network-Based Installations*
Upgrade a system while it is running.	Solaris Live Upgrade	■ This program enables you to upgrade or add patches to avoid the system down time related to a standard upgrade ■ This program enables you to test an upgrade or new patches without affecting the current OS	Chapter 6, "Solaris Live Upgrade (Overview)," in *Solaris 10 6/06 Installation Guide: Solaris Live Upgrade and Upgrade Planning*
After installing the Solaris OS, create an isolated application environment.	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 *System Administration Guide: Solaris Containers-Resource Management and Solaris Zones*

Sun Java System Application Server Platform Edition 8

The Sun Java System Application Server Platform Edition 8 provides for broad deployment of application services and web services. This software is automatically installed with the Solaris OS. You can find documentation for the server in the following areas:

For documentation about starting the server	See *Sun Java System Application Server Platform Edition 8 QuickStart Guide* in the installation directory at `/docs/QuickStart.html`
For the full Application Server documentation set	`http://docs.sun.com/db/coll/ApplicationServer8_04q2`
For a tutorial	`http://java.sun.com/j2ee/1.4/docs/tutorial/doc/index.html`

◆ ◆ ◆ CHAPTER 3

Solaris Installation and Upgrade (Planning)

This chapter describes system requirements to install or upgrade to the 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

TABLE 3–1 Memory, Swap, and Processor Recommendations

Requirement Type	Size
Memory to install or upgrade	■ **SPARC**: 256 MB is the recommended size. 128 MB is the minimum size. ■ **x86**: 512 MB is the recommended size. 256 MB is the minimum size. **Note –** Some optional installation features are enabled only when sufficient memory is present. For example, if you install from a DVD with insufficient memory, you install through the Solaris installation program 's text installer, not through the GUI. For more information about these memory requirements, see Table 3–2.
Swap area	512 MB is the default size. **Note –** You might need to customize the swap space. Swap space is based on the size of the system's hard disk.

TABLE 3–1 Memory, Swap, and Processor Recommendations *(Continued)*

Requirement Type	Size
Processor requirements	■ **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 by installing remotely. Also if the Solaris installation program does not detect a video adapter, it automatically displays in a console-based environment. Table 3–2 describes these environments and lists minimal memory requirements for displaying them.

TABLE 3–2 Memory Requirements for Display Options

Memory	Type of Installation	Description
■ **SPARC**: 128–383 MB ■ **x86**: 256–511 MB	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 `tip` line or using the `nowin` boot option, you are limited to the console-based installation.
■ **SPARC**: 384 MB or greater ■ **x86**: 512 MB	GUI-based	Provides windows, pull-down menus, buttons, scrollbars, and iconic images.

Allocating Disk and Swap Space

Before you install the 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. Consider allocating space for the following conditions, depending on your needs.

TABLE 3–3 General Disk Space and Swap Space Planning

Conditions for Space Allocations	Description
File systems	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 Solaris versions. By default, the 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 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. A 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 Solaris updates.
The /var file system	If you intend to use the crash dump feature savecore(1M), allocate double the amount of your physical memory in the /var file system.
Swap	The Solaris installation program allocates a default swap area of 512 Mbytes under the following conditions: ■ If you use the installation program's automatic layout of disk slices ■ If you avoid manually changing the size of the swap slice By default, the 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. 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. ■ For the Solaris installation program, you can customize the disk layout in cylinder mode and manually assign the swap slice to the desired location. ■ For the custom 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" on page 81. For an overview of the swap space, see Chapter 21, "Configuring Additional Swap Space (Tasks)," in *System Administration Guide: Devices and File Systems*.
A server that is providing home directory file systems	By default, home directories are usually located in the /export file system.
The 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 36.

TABLE 3–3 General Disk Space and Swap Space Planning *(Continued)*

Conditions for Space Allocations	Description
Upgrade	■ If you are using Solaris Live Upgrade to upgrade an inactive boot environment and want information about disk space planning, see "Solaris Live Upgrade Disk Space Requirements" in *Solaris 10 6/06 Installation Guide: Solaris Live Upgrade and Upgrade Planning* ■ If you are using the Solaris installation program or custom Jumpstart to plan disk space, see "Upgrading With Disk Space Reallocation" on page 40 ■ If you have non-global zones installed on a system, see "Disk Space Requirements for Non-Global Zones" on page 45
Language support	For example, Chinese, Japanese, or Korean. If you plan to install a single language, allocate approximately 0.7 Gbytes of additional disk space for the language. If you plan to install all language supports, you need to allocate up to approximately 2.5 Gbytes of additional disk space for the language supports, 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 Solaris software groups are collections of 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 Solaris Software Group on your system, you cannot use the upgrade option to upgrade to the Developer 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 Solaris software, you can choose to add or remove packages from the 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 Solaris software is packaged.

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

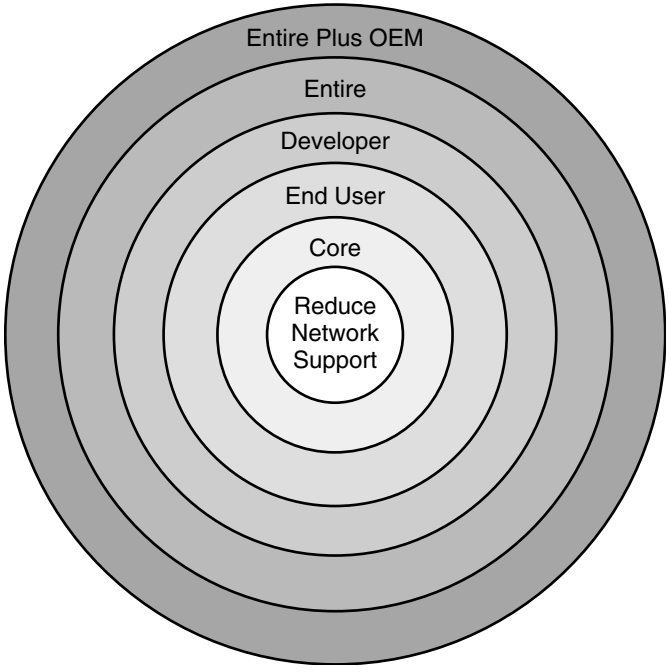


FIGURE 3–1 Solaris Software Groups

Table 3–4 lists the Solaris software groups and the recommended amount of disk space that you need to install each group.

Note – The disk space recommendations in Table 3–4 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 in this table.

TABLE 3–4 Disk Space Recommendations for Software Groups

Software Group	Description	Recommended Disk Space
Entire Solaris Software Group Plus OEM Support	Contains the packages for the Entire Solaris Software Group plus additional hardware drivers, including drivers for hardware that is not on the system at the time of installation.	6.8 Gbytes

TABLE 3–4 Disk Space Recommendations for Software Groups *(Continued)*

Software Group	Description	Recommended Disk Space
Entire Solaris Software Group	Contains the packages for the Developer Solaris Software Group and additional software that is needed for servers.	6.7 Gbytes
Developer Solaris Software Group	Contains the packages for the End User 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.	6.6 Gbytes
End User Solaris Software Group	Contains the packages that provide the minimum code that is required to boot and run a networked Solaris system and the Common Desktop Environment.	5.3 Gbytes
Core System Support Software Group	Contains the packages that provide the minimum code that is required to boot and run a networked Solaris system.	2.0 Gbytes
Reduced Network Support Software Group	Contains the packages that provide the minimum code that is required to boot and run a 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.	2.0 Gbytes

Upgrade Planning

You can upgrade a system by using one of three different upgrade methods: Solaris Live Upgrade, the Solaris installation program, and custom JumpStart.

TABLE 3–5 Solaris Upgrade Methods

Current Solaris OS	Solaris Upgrade Methods
Solaris 8, Solaris 9, Solaris 10	■ Solaris Live Upgrade – Upgrades a system by creating and upgrading a copy of the running system ■ The Solaris installation program – Provides an interactive upgrade with a graphical user interface or command-line interface ■ Custom JumpStart method – Provides an automated upgrade

Upgrade Limitations

Issue	Description
Upgrading to a different software group	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 Solaris Software Group on your system, you cannot use the upgrade option to upgrade to the Developer Solaris Software Group. However, during the upgrade you can add software to the system that is not part of the currently installed software group.
Upgrading when non-global zones are installed	When you are upgrading the Solaris OS, you can upgrade a system that has non-global zones installed. The Solaris interactive installation program and custom JumpStart programs enable an upgrade. For limitations when upgrading, see "Upgrading When Solaris Zones are Installed on a System" on page 43.
Upgrading with Veritas file systems	The Solaris interactive installation and custom JumpStart programs do not present you with the opportunity to upgrade a system when you are using Veritas VxVM file systems under these conditions: ■ 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 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. To upgrade when Veritas VxVM is configured, use one of the following methods: ■ Use Solaris Live Upgrade "System Panics When Upgrading With Solaris Live Upgrade Running Veritas VxVm" on page 227 ■ If you have non-global zones installed, you must migrate the affected file systems from VxVM file systems to UFS file systems

Upgrade Programs

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

Upgrade Program	Description	For More Information
Solaris 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 Solaris Live Upgrade reduces the downtime that is required to upgrade the Solaris OS. Also, Solaris Live Upgrade can prevent problems with upgrading. An example is the ability to 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 Solaris Live Upgrade, see "Solaris Live Upgrade Requirements" in *Solaris 10 6/06 Installation Guide: Solaris Live Upgrade and Upgrade Planning.*

Upgrade Program	Description	For More Information
The Solaris installation program	Guides you through an upgrade with an interactive GUI.	Chapter 2, "Installing With the Solaris Installation Program (Tasks)," in *Solaris 10 6/06 Installation Guide: Basic Installations*.
Custom JumpStart program	Provides an automated upgrade. A profile file and optional preinstallation and postinstallation scripts provide the information required. When creating a custom JumpStart profile for an upgrade, specify `install_type upgrade`. You must test the custom JumpStart profile against the system's disk configuration and currently installed software before you upgrade. Use the `pfinstall -D` command on the system that you are upgrading to test the profile. You cannot test an upgrade profile by using a disk configuration file.	■ For more information about testing the upgrade option, refer to "Testing a Profile" on page 94 ■ For more information about creating a upgrade profile, see "Profile Examples" on page 83 ■ For more information about performing an upgrade, see "SPARC: Performing a Custom JumpStart Installation" on page 124

Installing a Solaris Flash Archive Instead of Upgrading

The Solaris Flash 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 Solaris Flash archive. You can install an archive by using any installation program.

Caution – A Solaris Flash archive cannot be properly created when a non-global zone is installed. The Solaris Flash feature is not compatible with Solaris Zones partitioning technology. If you create a Solaris 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

Upgrading With Disk Space Reallocation

The upgrade option in the Solaris installation program and the `upgrade` keyword in the custom 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 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 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 Solaris installation program, and auto-layout cannot determine how to reallocate the disk space, you must use the custom JumpStart program to upgrade.
- If you are using the custom 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" on page 83.

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 Solaris OS and have installed individual patches, upgrading to a subsequent Solaris 10 release causes the following:

- Any patches that were supplied as part of one of the releases noted above 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 noted above 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 C, "Using the Patch Analyzer When Upgrading (Tasks)," in *Solaris 10 6/06 Installation Guide: Solaris Live Upgrade and Upgrade Planning*.

Backing Up Systems Before Upgrading

Backing up your existing file systems before you upgrade to the 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 to back up your system, refer to Chapter 24, "Backing Up and Restoring File Systems (Overview)," in *System Administration Guide: Devices and File Systems*.
- To backup your system when non-global zones are installed, see Chapter 25, "Solaris Zones Administration (Overview)," in *System Administration Guide: Solaris Containers-Resource Management and Solaris Zones*.

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

To see the version of 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
```

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 custom JumpStart profile or in the `sysidcfg` file.

Setting the locale in a profile	"Creating a Profile" on page 81
Setting the locale in the `sysidcfg` file	"Preconfiguring With the sysidcfg File" in *Solaris 10 6/06 Installation Guide: Network-Based Installations*
List of locale values	*International Language Environments Guide*

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.

Some examples of platform names and groups follow. For a full list of SPARC based systems, see *Solaris Sun Hardware Platform Guide* at `http://docs.sun.com/`.

TABLE 3–6 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*.

Upgrading When Solaris Zones are Installed on a System

This section provides a brief overview of Solaris Zones partitioning technology, an upgrading with non-global zones overview, and disk space planning guidelines.

For complete information on overview, planning, creating and configuring zones, see Chapter 16, "Introduction to Solaris Zones," in *System Administration Guide: Solaris Containers-Resource Management and Solaris Zones*.

The 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 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 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 only possible in the global zone. Appropriately privileged processes running in the global zone can access objects associated with the non-global zones.

Upgrading With Non-Global Zones

After the Solaris OS is installed, you can install and configure non-global zones. When you are ready to upgrade the Solaris OS, you can upgrade a system that has non-global zones installed. The Solaris interactive installation program and custom JumpStart programs enable an upgrade.

- With the Solaris interactive installation program, you can upgrade a system with non-global zones by selecting the Upgrade Install on the Select Upgrade or Initial Install panel. The installation program then analyzes your system to determine if your system is upgradable, and provides you a summary of the analysis. The installation program then prompts you to continue the upgrade. You can use this program with the following limitations:
  - You cannot customize your upgrade. For example, you cannot install additional software products, install additional locale packages, or modify the disk layout.
  - You must use the Solaris Operating System DVD or a DVD-created network installation image. You cannot use the Solaris Software CDs to upgrade a system. For more information about installing with this program, see Chapter 2, "Installing With the Solaris Installation Program (Tasks)," in *Solaris 10 6/06 Installation Guide: Basic Installations*.
- With the custom JumpStart installation program, you can upgrade by using only the `install_type` and `root_device` keywords.

  Because some keywords affect non-global zones, some keywords cannot be included in a profile. For example, using keywords that add packages, reallocate disk space, or add locales would affect non-global zones. If you use these keywords, they are ignored or cause the JumpStart upgrade to fail. For a list of these keywords, see "Limiting Profile Keywords When Upgrading With Non-Global Zones" on page 190.

TABLE 3–7 Limitations When Upgrading With Non-Global Zones

Program or Condition	Description
Solaris Live Upgrade	You cannot use Solaris Live Upgrade to upgrade a system when non-global zones are installed. You can create a boot environment with the `lucreate` command, but if you use the `luupgrade` command, the upgrade fails. An error message is displayed.

TABLE 3–7 Limitations When Upgrading With Non-Global Zones *(Continued)*

Program or Condition	Description
Solaris Flash archives	A Solaris Flash archive cannot be properly created when a non-global zone is installed. The Solaris Flash feature is not compatible with Solaris Zones partitioning technology. If you create a Solaris 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.
Using a command that uses the `-R` 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. For a list of utilities that accept an alternate root (`/`) file system and more information about zones, see "Restriction on Accessing A Non-Global Zone From the Global Zone" in *System Administration Guide: Solaris Containers-Resource Management and Solaris Zones*.

Backing Up Your System Before Performing an Upgrade With Zones

You should back up the global and non-global zones on your Solaris system before you perform the upgrade. For information about backing up a system with zones installed, see Chapter 25, "Solaris Zones Administration (Overview)," in *System Administration Guide: Solaris Containers-Resource Management and 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: Solaris Containers-Resource Management and Solaris Zones*.

x86: Partitioning Recommendations

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

The 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 Solaris software, you must set up at least one 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 Solaris `fdisk` partition per disk.

TABLE 3–8 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	■ 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:
		  ■ 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	Solaris OS partition	Remaining space on the boot disk.

Default Boot-Disk Partition Layout Preserves the Service Partition

The 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.

Note – If you install the 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.

◆ ◆ ◆ CHAPTER 4

x86: GRUB Based Booting For Solaris Installation

This chapter describes the GRUB based booting on x86 based systems that relates to Solaris installation. This chapter contains the following sections:

x86: GRUB Based Booting (Overview)

GRUB, the open source boot loader, has been adopted as the default boot loader in the Solaris OS.

Note – GRUB based booting is not available on SPARC 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 Solaris OS, the GRUB implementation is compliant with the Multiboot Specification. The specification is described in detail at `http://www.gnu.org/software/grub/grub.html`.

Because the Solaris kernel is fully compliant with the Multiboot Specification, you can boot a Solaris x86 based system by using GRUB. With GRUB, you can more easily boot and install various operating systems. For example, on one system, you could individually boot the following operating systems:

- Solaris OS
- Microsoft Windows

Note – GRUB detects Microsoft Windows partitions but does not verify that the OS can be booted.

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, and the drive, and the partition where the kernel resides. GRUB based booting replaces the Solaris Device Configuration Assistant and simplifies the booting process with a GRUB menu.

x86: How GRUB Based Booting Works

After GRUB gains control of the system, a menu is displayed on the console. In the GRUB menu, you can do the following:

- Select an entry to boot your system
- Modify a boot entry by using the built-in GRUB edit menu
- Manually load an OS kernel from the command line

A configurable timeout is available to boot the default OS entry. Pressing any key aborts the default OS entry boot.

To view an example of a GRUB menu, see "Description of the GRUB Main Menu" on page 53.

x86: GRUB Device Naming Conventions

The device naming conventions that GRUB uses are slightly different from previous Solaris OS versions. Understanding the GRUB device naming conventions can assist you in correctly specifying drive and partition information when you configure GRUB on your system.

The following table describes the GRUB device naming conventions.

TABLE 4–1 Naming Conventions for GRUB Devices

Device Name	Description
(`fd0`), (`fd1`)	First diskette, second diskette
(`nd`)	Network device
(`hd0,0`), (`hd0,1`)	First and second `fdisk` partition of first `bios` disk
(`hd0,0,a`), (`hd0,0,b`)	Solaris/BSD slice 0 and 1 on first `fdisk` partition on the first `bios` disk

Note – All GRUB device names must be enclosed in parentheses. Partition numbers are counted from 0 (zero), not from 1.

For more information about `fdisk` partitions, see "Guidelines for Creating an fdisk Partition" in *System Administration Guide: Devices and File Systems*.

x86: Where to Find Information About GRUB Based Installations

For more information about these changes, see the following references.

TABLE 4–2 Where to Find Information on GRUB Based Installations

Topic	GRUB Menu Tasks	For More Information
Installation	To install from the Solaris OS CD or DVD media	*Solaris 10 6/06 Installation Guide: Basic Installations*.
	To install from a network installation image	Part II, "Installing Over a Local Area Network," in *Solaris 10 6/06 Installation Guide: Network-Based Installations*
	To configure a DHCP server for network installations	"Preconfiguring System Configuration Information With the DHCP Service (Tasks)" in *Solaris 10 6/06 Installation Guide: Network-Based Installations*
	To install with the Custom JumpStart program	"x86: Performing a Custom JumpStart Installation" on page 130
	To activate or fall back to a boot environment by using Solaris Live Upgrade	■ "Activating a Boot Environment" in *Solaris 10 6/06 Installation Guide: Solaris Live Upgrade and Upgrade Planning* ■ Chapter 10, "Failure Recovery: Falling Back to the Original Boot Environment (Tasks)," in *Solaris 10 6/06 Installation Guide: Solaris Live Upgrade and Upgrade Planning*
System Administration	For more detailed information about GRUB and for administrative tasks	Chapter 11, "GRUB Based Booting (Tasks)," in *System Administration Guide: Basic Administration*

x86: GRUB Based Booting (Planning)

This section describes the basics of GRUB based booting and describes the GRUB menu.

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

During a standard Solaris OS installation, GRUB is installed on the 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 Solaris partition. For more details, see your boot manager.

The preferred method is to install the 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 on multiple operating systems, see "How Multiple Operating Systems Are Supported in the GRUB Boot Environment" in *System Administration Guide: 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 DHCP classes, `PXEClient` and `GRUBClient`. 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 *Solaris 10 6/06 Installation Guide: Network-Based Installations*.

Description of the GRUB Main Menu

When you boot an x86 based system, the GRUB menu is displayed. This menu provides a list of boot entries to choose from. A *boot entry* is an OS instance that is installed on your system. The GRUB menu is based on the `menu.lst` file, which is a configuration file. The `menu.lst` file is created by the Solaris installation program and can be modified after installation. The `menu.lst` file dictates the list of OS instances that are shown in the GRUB menu.

- If you install or upgrade the Solaris OS, the GRUB menu is automatically updated. The Solaris OS is then displayed as a new boot entry.
- If you install an OS other than the Solaris OS, you must modify the `menu.lst` configuration file to include the new OS instance. Adding the new OS instance enables the new boot entry to appear in the GRUB menu the next time that you boot the system.

EXAMPLE 4–1 GRUB Main Menu

In the following example, the GRUB main menu shows the Solaris and Microsoft Windows operating systems. A Solaris Live Upgrade boot environment is also listed that is named `second_disk`. See the following for descriptions of each menu item.

```
GNU GRUB version 0.95 (616K lower / 4127168K upper memory)
+-------------------------------------------------------------------+
|Solaris                                                            |
|Solaris failsafe                                                   |
|second_disk                                                        |
|second_disk failsafe                                               |
|Windows                                                            |
+-------------------------------------------------------------------+
Use the ^ and v keys to select which entry is highlighted. Press
enter to boot the selected OS, 'e' to edit the commands before
booting, or 'c' for a command-line.
```

Solaris	Specifies the Solaris OS.
Solaris failsafe	Specifies a boot archive that can be used for recovery if the Solaris OS is damaged.
second_disk	Specifies a Solaris Live Upgrade boot environment. The `second_disk` boot environment was created as a copy of the Solaris OS. It was upgraded and activated with the `luactivate` command. The boot environment is available for booting.
Windows	Specifies the Microsoft Windows OS. GRUB detects these partitions but does not verify that the OS can be booted.

Description of GRUB `menu.lst` File

The GRUB `menu.lst` file lists the contents of the GRUB main menu. The GRUB main menu lists boot entries for all the OS instances that are installed on your system, including Solaris Live Upgrade boot environments. The Solaris software upgrade process preserves any changes that you make to this file.

Any revisions made to the `menu.lst` file are displayed on the GRUB main menu, along with the Solaris Live Upgrade entries. Any changes that you make to the file become effective at the next system reboot. You can revise this file for the following reasons:

- To add to the GRUB menu entries for operating systems other than Solaris
- To customize booting behavior such as specifying the default OS on the GRUB menu

Caution – Do not use the GRUB `menu.lst` file to modify Solaris Live Upgrade entries. Modifications could cause Solaris Live Upgrade to fail.

Although you can use the `menu.lst` file to customize booting behavior such as booting with the kernel debugger, the preferred method for customization is to use the `eeprom` command. If you use the `menu.lst` file to customize, the Solaris OS entries might be modified during a software upgrade. Changes to the file would then be lost.

For information about how to use the `eeprom` command, see "How to Set Solaris Boot Parameters by Using the eeprom Command" in *System Administration Guide: Basic Administration*.

EXAMPLE 4–2 `Menu.lst` File

Here is a sample of a `menu.lst` file:

```
default 0
timeout 10
title Solaris
  root (hd0,0,a)
  kernel /platform/i86pc/multiboot -B console=ttya
  module /platform/i86pc/boot_archive
title Solaris failsafe
  root (hd0,0,a)
  kernel /boot/multiboot -B console=ttya -s
  module /boot/x86.miniroot.safe
#----- second_disk - ADDED BY LIVE UPGRADE - DO NOT EDIT  -----
title second_disk
  root (hd0,1,a)
  kernel /platform/i86pc/multiboot
  module /platform/i86pc/boot_archive
title second_disk failsafe
  root (hd0,1,a)
```

EXAMPLE 4–2 `Menu.lst` File *(Continued)*

```
  kernel /boot/multiboot kernel/unix -s
  module /boot/x86.miniroot-safe
#----- second_disk -------------- END LIVE UPGRADE ------------
title Windows
  root (hd0,0)
  chainloader -1
```

`default`	Specifies which item to boot if the timeout expires. To change the default, you can specify another item in the list by changing the number. The count begins with zero for the first title. For example, change the default to 2 to boot automatically to the `second_disk` boot environment.
`timeout`	Specifies the number of seconds to wait for user input before booting the default entry. If no timeout is specified, you are required to choose an entry.
`title` *OS name*	Specifies the name of the operating system. ■ If this is a Solaris Live Upgrade boot environment, *OS name* is the name you gave the new boot environment when it was created. In the previous example, the Solaris Live Upgrade boot environment is named `second_disk`. ■ If this is a failsafe boot archive, this boot archive is used for recovery when the primary OS is damaged. In the previous example, Solaris failsafe and `second_disk` failsafe are the recovery boot archives for the Solaris and `second_disk` operating systems.
`root (hd0,0,a)`	Specifies on which disk, partition, and slice to load files. GRUB automatically detects the file system type.
`kernel /platform/i86pc/multiboot`	Specifies the multiboot program. The kernel command must always be followed by the multiboot program. The string after multiboot is passed to the Solaris OS without interpretation.

For a complete description of multiple operating systems, see "How Multiple Operating Systems Are Supported in the GRUB Boot Environment" in *System Administration Guide: Basic Administration*.

Locating the `menu.lst` File To Change the GRUB Menu

You must always use the `bootadm` command to locate the GRUB menu's `menu.lst` file. The `list-menu` subcommand finds the active GRUB menu. The `menu.lst` file 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. If you want to make changes to this file, see "x86: Locating the GRUB Menu's menu.lst File (Tasks)" on page 56.

x86: Locating the GRUB Menu's menu.lst File (Tasks)

The GRUB menu can be updated. For example, you might want to change the default time for how fast the default OS is booted. Or, you might want to add another OS to the GRUB menu.

Typically, the active GRUB menu's menu.lst file is located at /boot/grub/menu.lst. In some situations, the GRUB menu.lst file resides elsewhere. For example, in a system that uses Solaris Live Upgrade, the GRUB menu.lst file might be on a boot environment that is not the currently running boot environment. Or if you have upgraded a system with an x86 boot partition, the menu.lst file might reside in the /stubboot directory. Only the active GRUB menu.lst file is used to boot the system. In order to modify the GRUB menu that is displayed when you boot the system, the active GRUB menu.lst file must be modified. Changing any other GRUB menu.lst file has no effect on the menu that is displayed when you boot the system. To determine the location of the active GRUB menu.lst file, use the bootadm command. The list-menu subcommand displays the location of the active GRUB menu. The following procedures determine the location of the GRUB menu's menu.lst file.

For more information about the bootadm command, see bootadm(1M) man page.

▼ Locating the GRUB Menu's menu.lst file

In the following procedure, the system contains two operating systems: Solaris and a Solaris Live Upgrade boot environment, second_disk. The Solaris OS has been booted and contains the GRUB menu.

1 Become superuser or assume an equivalent role.

Roles contain authorizations and privileged commands. For more information about roles, see "Configuring RBAC (Task Map)" in *System Administration Guide: Security Services*.

2 To locate the menu.lst file, type:

```
# /sbin/bootadm list-menu
```

The location and contents of the file are displayed.

```
The location for the active GRUB menu is: /boot/grub/menu.lst
default 0
timeout 10
0 Solaris
1 Solaris failsafe
```

```
2 second_disk
3 second_disk failsafe
```

▼ Locating the GRUB Menu's menu.lst File When the active menu.lst file is in Another Boot Environment

In the following procedure, the system contains two operating systems: Solaris and a Solaris Live Upgrade boot environment, second_disk. In this example, the menu.lst file does not exist in the currently running boot environment. The second_disk boot environment has been booted. The Solaris boot environment contains the GRUB menu. The Solaris boot environment is not mounted.

1 Become superuser or assume an equivalent role.

Roles contain authorizations and privileged commands. For more information about roles, see "Configuring RBAC (Task Map)" in *System Administration Guide: Security Services*.

2 To locate the menu.lst file, type:

```
# /sbin/bootadm list-menu
```

The location and contents of the file are displayed.

```
The location for the active GRUB menu is: /dev/dsk/device_name(not mounted)
The filesystem type of the menu device is <ufs>
default 0
timeout 10
0 Solaris
1 Solaris failsafe
2 second_disk
3 second_disk failsafe
```

3 Because the file system containing the menu.lst file is not mounted, mount the file system. Specify the UFS file system and the device name.

```
# /usr/sbin/mount -F ufs /dev/dsk/device_name /mnt
```

Where *device_name* specifies the location of the root (/) file system on the disk device of the boot environment that you want to mount. The device name is entered in the form of /dev/dsk/c*w*t*x*d*y*s*z*. For example:

```
# /usr/sbin/mount -F ufs /dev/dsk/c0t1d0s0 /mnt
```

You can access the GRUB menu at /mnt/boot/grub/menu.lst

4 Unmount the filesystem

```
# /usr/sbin/umount /mnt
```

Note – If you mount a boot environment or a file system of a boot environment, ensure that the file system or file systems are unmounted after use. If these file systems are not unmounted, future Solaris Live Upgrade operations on that boot environment might fail.

▼ Locating the GRUB Menu's menu.lst File When a Solaris Live Upgrade Boot Environment is Mounted

In the following procedure, the system contains two operating systems: Solaris and a Solaris Live Upgrade boot environment, second_disk. The second_disk boot environment has been booted. The Solaris boot environment contains the GRUB menu. The Solaris boot environment is mounted at /.alt.Solaris.

1 Become superuser or assume an equivalent role.

Roles contain authorizations and privileged commands. For more information about roles, see "Configuring RBAC (Task Map)" in *System Administration Guide: Security Services*.

2 To locate the menu.lst file, type:

```
# /sbin/bootadm list-menu
```

The location and contents of the file are displayed.

```
The location for the active GRUB menu is:
/.alt.Solaris/boot/grub/menu.lst
default 0
timeout 10
0 Solaris
1 Solaris failsafe
2 second_disk
3 second_disk failsafe
```

Since the boot environment containing the GRUB menu is already mounted, then you can access the menu.lst file at /.alt.Solaris/boot/grub/menu.lst.

▼ Locating the GRUB Menu's menu.lst File When Your System Has an x86 Boot Partition

In the following procedure, the system contains two operating systems: Solaris and a Solaris Live Upgrade boot environment, second_disk. The second_disk boot environment has been booted.

Your system has been upgraded and an x86 boot partition remains. The boot partition is mounted at `/stubboot` and contains the GRUB menu. For an explanation of x86 boot partitions, see "x86: Partitioning Recommendations" on page 46.

1 Become superuser or assume an equivalent role.

Roles contain authorizations and privileged commands. For more information about roles, see "Configuring RBAC (Task Map)" in *System Administration Guide: Security Services*.

2 To locate the `menu.lst` file, type:

```
# /sbin/bootadm list-menu
```

The location and contents of the file are displayed.

```
The location for the active GRUB menu is:
/stubboot/boot/grub/menu.lst
default 0
timeout 10
0 Solaris
1 Solaris failsafe
2 second_disk
3 second_disk failsafe
```

You can access the `menu.lst` file at `/stubboot/boot/grub/menu.lst`.

PART II

Using Custom JumpStart

This part provides instructions for creating, preparing, and performing custom JumpStart installations.

◆ ◆ ◆ CHAPTER 5

Custom JumpStart (Overview)

This chapter provides an introduction and overview to the custom JumpStart installation process.

Custom JumpStart Introduction

The custom JumpStart installation method is a command–line interface that enables you to automatically install or upgrade several systems, based on profiles that you create. The profiles define specific software installation requirements. You can also incorporate shell scripts to include preinstallation and postinstallation tasks. You choose which profile and scripts to use for installation or upgrade. The custom JumpStart installation method installs or upgrades the system, based on the profile and scripts that you select. Also, you can use a `sysidcfg` file to specify configuration information so that the custom JumpStart installation is completely hands-off.

Custom JumpStart Example Scenario

The custom JumpStart process can be described by using an example scenario. In this example scenario, the systems need to be set up with the following parameters:

- Install Solaris on 100 new systems.
- Seventy of the systems are SPARC based systems that are owned by the engineering group and need to be installed as standalone systems with the Solaris OS software group for developers.
- The remaining 30 systems are x86 based, owned by the marketing group and need to be installed as standalone systems with the Solaris OS software group for end users.

First, the system administrator must create a `rules` file and a profile for each group of systems. The `rules` file is a text file that contains a rule for each group of systems or single systems on which you want to install the Solaris software. Each rule distinguishes a group of systems that are based on one or more system attributes. Each rule also links each group to a profile.

A profile is a text file that defines how the Solaris software is to be installed on each system in the group. Both the `rules` file and profile must be located in a JumpStart directory.

For the example scenario, the system administrator creates a `rules` file that contains two different rules, one for the engineering group and another for the marketing group. For each rule, the system's network number is used to distinguish the engineering group from the marketing group.

Each rule also contains a link to an appropriate profile. For example, in the rule for the engineering group, a link is added to the profile, `eng_profile`, which was created for the engineering group. In the rule for the marketing group, a link is added to the profile, `market_profile`, which was created for the marketing group.

You can save the `rules` file and the profiles on a diskette or on a server.

- A profile diskette is required when you want to perform custom JumpStart installations on nonnetworked, standalone systems.
- A profile server is used when you want to perform custom JumpStart installations on networked systems that have access to a server.

After creating the `rules` file and profiles, validate the files with the `check` script. If the `check` script runs successfully, the `rules.ok` file is created. The `rules.ok` is a generated version of the `rules` file that the JumpStart program uses to install the Solaris software.

How the JumpStart Program Installs Solaris Software

After you validate the `rules` file and the profiles, you can begin a custom JumpStart installation. The JumpStart program reads the `rules.ok` file. Then, the JumpStart program searches for the first rule with defined system attributes that match the system on which the JumpStart program is attempting to install the Solaris software. If a match occurs, the JumpStart program uses the profile that is specified in the rule to install the Solaris software on the system.

Figure 5–1 illustrates how a custom JumpStart installation works on a standalone, nonnetworked system. The system administrator initiates the custom JumpStart installation on Pete's system. The JumpStart program accesses the rules files on the diskette in the system's diskette drive. The JumpStart program matches `rule 2` to the system. `rule 2` specifies that the JumpStart program use `Pete's profile` to install the Solaris software. The JumpStart program reads `Pete's profile` and installs the Solaris software, based on the instructions that the system administrator specified in `Pete's profile`.

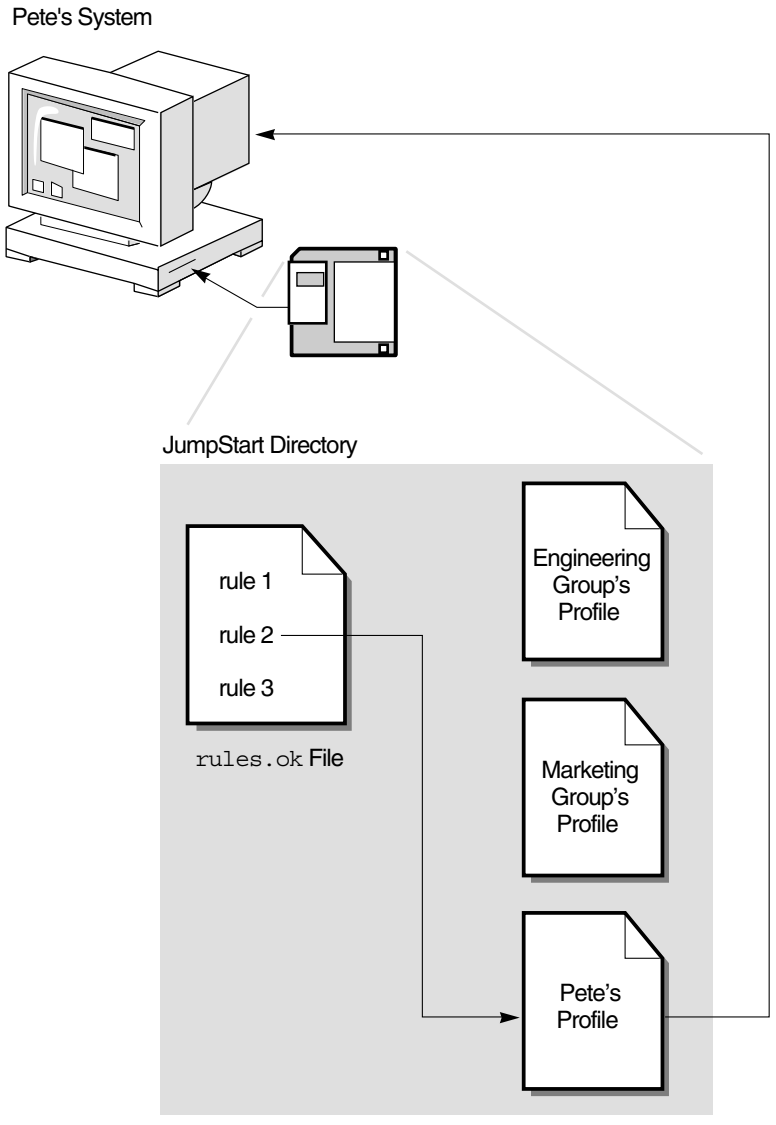


FIGURE 5–1 How a Custom JumpStart Installation Works: nonnetworked Example

Figure 5–2 illustrates how a custom JumpStart installation works with more than one system on a network. Previously, the system administrator set up different profiles and saved the profiles on a single server. The system administrator initiates the custom JumpStart installation on one of the engineering systems. The JumpStart program accesses the rules files in the `JumpStart/` directory on the server. The JumpStart program matches the engineering system to `rule 1`. `rule 1` specifies that

the JumpStart program use `Engineering Group's Profile` to install the Solaris software. The JumpStart program reads `Engineering Group's Profile` and installs the Solaris software, based on the instructions that the system administrator specified in `Engineering Group's Profile`.

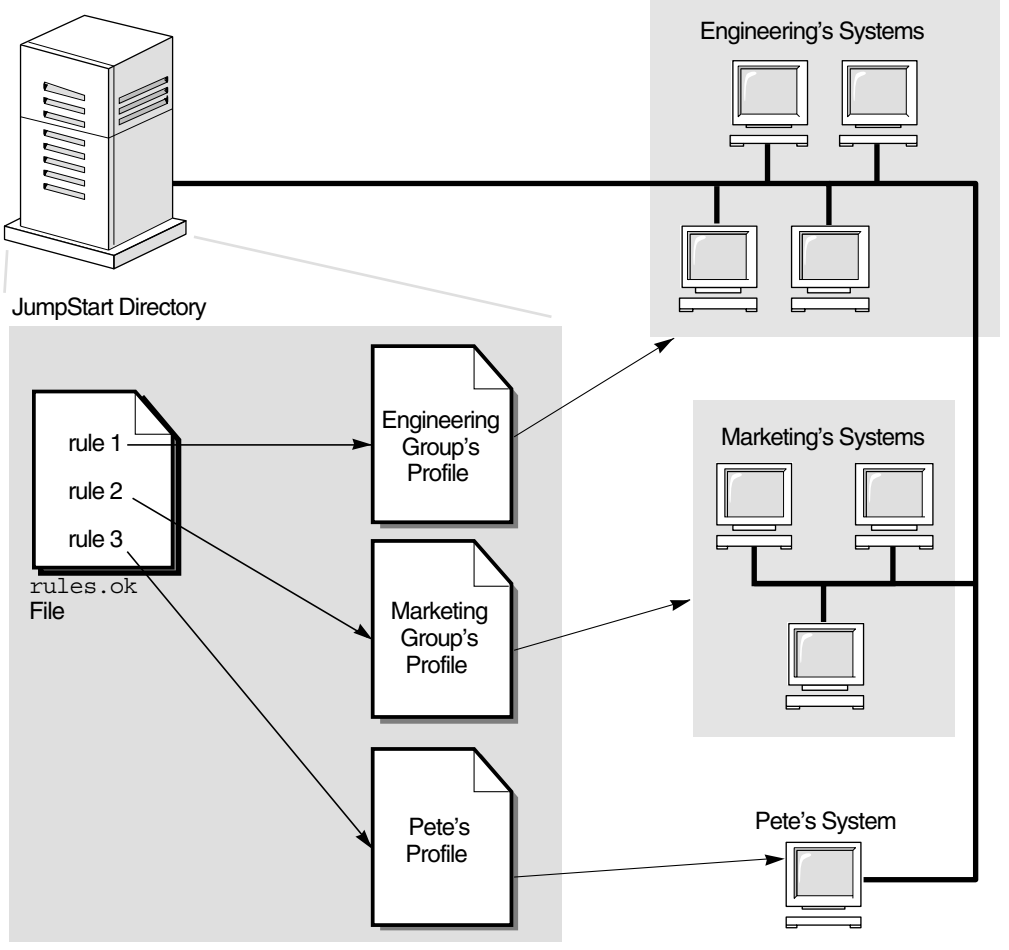


FIGURE 5–2 How a Custom JumpStart Installation Works: Networked Example

Figure 5–3 describes the order in which the JumpStart program searches for custom JumpStart files.

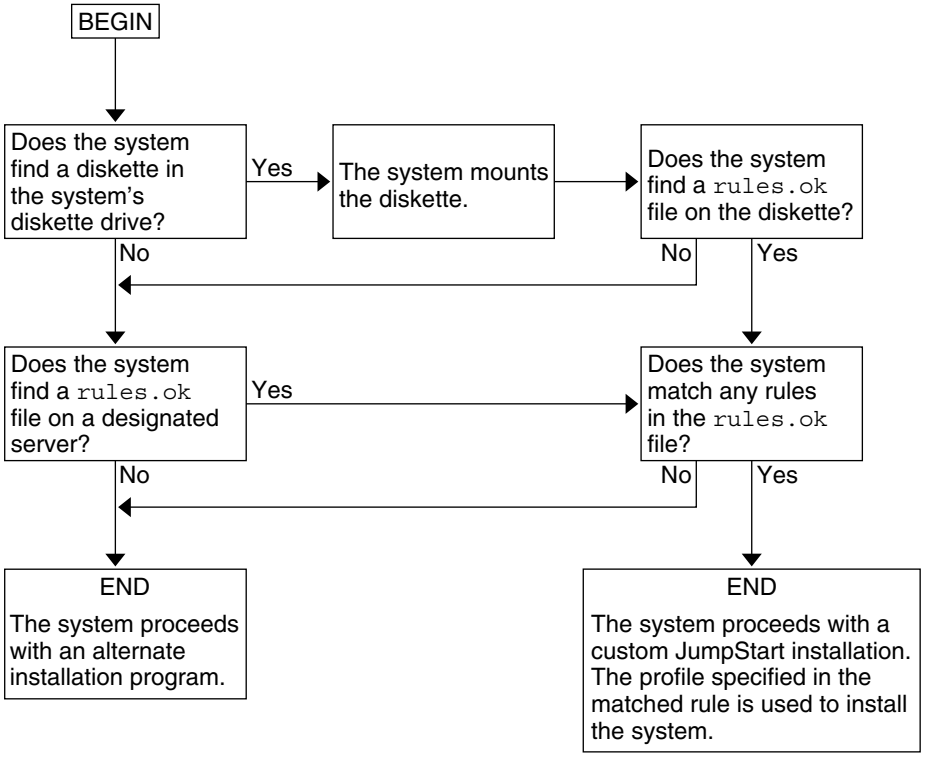


FIGURE 5–3 What Happens During a Custom JumpStart Installation

◆ ◆ ◆ CHAPTER 6

Preparing Custom JumpStart Installations (Tasks)

This chapter provides step-by-step instructions about how to prepare the systems at your site from which and on which you intend to install the Solaris software by using the custom JumpStart installation method.

Task Map: Preparing Custom JumpStart Installations

TABLE 6–1 Task Map: Preparing Custom JumpStart Installations

Task	Description	For Instructions
Decide how to upgrade the system if a previous version of the Solaris software is installed on the system.	If a previous release of Solaris is installed on the system, you need to determine how to upgrade the system. Ensure that you know what to do before and after you upgrade a system. Planning helps you to create your profiles, begin scripts, and finish scripts.	"Upgrade Planning" on page 38

TABLE 6–1 Task Map: Preparing Custom JumpStart Installations *(Continued)*

Task	Description	For Instructions
Create a JumpStart directory.	**On a server** If you want to perform custom JumpStart installations on systems that are connected to a network, you must create a profile server. The profile server contains a JumpStart directory for the custom JumpStart files. **On a diskette** If you want to perform custom JumpStart installations on systems that are not connected to a network, you must create a profile diskette. A profile diskette contains the custom JumpStart files.	"Creating a Profile Server for Networked Systems" on page 71 "Creating a Profile Diskette for Standalone Systems" on page 75
Add rules to the `rules` file.	After you decide how you want each group of systems or single systems to be installed, create a rule for each group that you want to install. Each rule distinguishes a group, based on one or more system attributes. The rule links each group to a profile.	"Creating the `rules` File" on page 78
Create a profile for every rule.	A profile is a text file that defines how to install the Solaris software, for example, which software group to install on a system. Every rule specifies a profile to define how a system is to be installed with the Solaris software 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.	"Creating a Profile" on page 81
(Optional) Test the profiles.	After you create a profile, use the `pfinstall`(1M) command to test the profile before you use the profile to install or upgrade a system.	"Testing a Profile" on page 94
Validate the `rules` file.	The `rules.ok` file is a generated version of the `rules` file that the JumpStart program uses to match the system to be installed with a profile. You must use the `check` script to validate the `rules` file.	"Validating the `rules` File" on page 98

Creating a Profile Server for Networked Systems

When setting up custom JumpStart installations for systems on the network, you need to create a directory on a server that is called a JumpStart directory. The JumpStart directory contains all of the essential custom JumpStart files, for example, the `rules` file, `rules.ok` file, and profiles. You must save the JumpStart directory in the root (`/`) directory of the profile server.

The server that contains a JumpStart directory is called a profile server. A profile server can be the same system as an install server or a boot server, or the server can be a completely different server. A profile server can provide custom JumpStart files for different platforms. For example, an x86 server can provide custom JumpStart files for both SPARC based systems and x86 based systems.

Note – After you create a profile server, you must allow systems to access the server. For detailed instructions, see "To Allow All Systems Access to the Profile Server" on page 73.

▼ To Create a JumpStart Directory on a Server

Note – This procedure assumes that the system is running *Volume Manager*. If you are not using Volume Manager to manage discs, refer to *System Administration Guide: Devices and File Systems* for detailed information about managing removable media without Volume Manager.

---

1. **Log in as superuser on the server on which you want to create the JumpStart directory.**

2. **Create the JumpStart directory anywhere on the server.**

   `# mkdir -m 755` *jumpstart_dir_path*

   In the command, *jumpstart_dir_path* is the absolute path of the JumpStart directory.

   For example, the following command creates a directory that is called `jumpstart` in the root (`/`) directory and sets the permissions to 755:

   ```
   # mkdir -m 755 /jumpstart
   ```

3. **Edit the `/etc/dfs/dfstab` file by adding the following entry.**

   `share -F nfs -o ro,anon=0` *jumpstart_dir_path*

   For example, the following entry shares the `/jumpstart` directory:

   ```
   share -F nfs -o ro,anon=0 /jumpstart
   ```

4. **Type `shareall` and press Enter.**

5. **Determine if you want to copy examples of custom JumpStart files to your JumpStart directory.**

- If no, go to Step 8.
- If yes, use the following decision table to determine what to do next.

Example Locations	Instructions
The Solaris Operating System DVD or the Solaris Software - 1 CD for your platform	Insert the Solaris Operating System DVD or the Solaris Software - 1 CD into the server's CD-ROM drive. Volume Manager automatically mounts the CD.
An image of the Solaris Operating System DVD or the Solaris Software - 1 CD for your platform on a local disk	Change directory to the location of the Solaris Operating System DVD or the Solaris Software - 1 image. For example, type the following command: `cd /export/install`

6 Copy the example custom JumpStart files into the JumpStart directory on the profile server.

`# cp -r` *media_path*`/Solaris_10_606/Misc/jumpstart_sample/*` *jumpstart_dir_path*

media_path	The path to the CD, DVD, or image on the local disk
jumpstart_dir_path	The path on the profile server where you are placing the example custom JumpStart files

For example, the following command copies the `jumpstart_sample` directory into the `/jumpstart` directory on the profile server:

- For SPARC based systems:

```
cp -r /cdrom/cdrom0/s0/Solaris_10_606/Misc/jumpstart_sample/* /jumpstart
```

- For x86 based systems:

```
cp -r /cdrom/cdrom0/Solaris_10_606/Misc/jumpstart_sample/* /jumpstart
```

7 Update the example JumpStart files so that the files work in your environment.

8 Ensure that `root` owns the JumpStart directory and that the permissions are set to 755.

9 Allow systems on the network to access the profile server.

For detailed instructions, see "To Allow All Systems Access to the Profile Server" on page 73.

Allowing All Systems Access to the Profile Server

When you create a profile server, you must ensure that systems can access the JumpStart directory on the profile server during a custom JumpStart installation. Use one of the following ways to ensure access.

Command or File	Providing Access	Instructions
`add_install_client` command	Each time that you add a system for network installation, use the `-c` option with the `add_install_client` command to specify the profile server. **Note –** If you are not using NFS, then you must use another means to provide access. ■ **For SPARC based systems**, use the `boot` command ■ **For x86 based systems**, edit the GRUB menu	■ For DVD media, see "Adding Systems to Be Installed From the Network With a DVD Image" in *Solaris 10 6/06 Installation Guide: Network-Based Installations* ■ For CD media, see "Adding Systems to Be Installed From the Network With a CD Image" in *Solaris 10 6/06 Installation Guide: Network-Based Installations*
Specify the location of the JumpStart directory when you boot the system	■ **For SPARC based systems**, use the `boot` command to boot the system. Specify the location of the JumpStart directory on the profile server when you boot the system. You must compress the custom JumpStart configuration files into one file. Then, save the compressed configuration file on an HTTP or HTTPS server.	■ "Creating a Compressed Configuration File" on page 109 ■ Step 5 in "SPARC: To Perform an Installation or Upgrade With the Custom JumpStart Program" on page 127
	■ **For x86 based systems**, specify the location of the JumpStart directory on the profile server when you boot the system by editing the boot entry on the GRUB menu. You must compress the custom JumpStart configuration files into one file. Then, save the compressed configuration file on an HTTP or HTTPS server. When you edit the GRUB menu entry, specify the location of the compressed file.	■ "Creating a Compressed Configuration File" on page 109 ■ "x86: Performing a Custom JumpStart Installation by Editing the GRUB Boot Command" on page 133
`/etc/bootparams` file	Add a wildcard in the `/etc/bootparams` file.	"To Allow All Systems Access to the Profile Server" on page 73

▼ To Allow All Systems Access to the Profile Server

Use the following procedure only if you store network installation information in the following places:

- In the `/etc/bootparams` file.
- In the name service `bootparams` database. To update the `bootparams` database, add the entry that is shown in Step 3.

If you use the following procedure, the systems must be of the same type, such as all SPARC systems.

Do not use this procedure under the following conditions:

- If you save the JumpStart directory on a diskette.

- If you specify the location of the profile server when you boot the system. If you have systems of different architectures, you must specify the location of the profile server when you boot the system

If you have the above conditions, use the SPARC `boot` command or use the x86 GRUB menu.

Note – You also can store network installation information on a DHCP server.

- **For SPARC based systems**, you use the `add_install_client` command and the `-d` option to specify that the custom JumpStart program use the DHCP server. Or you use the `boot` command with the `dhcp` option to specify that the custom JumpStart program use the DHCP server. For instructions about using this option, see "SPARC: Command Reference for the `boot` Command" on page 128.
- **For x86 based systems**, you use dhcp in one of the following ways:
  - If you use an install server, use the `add_install_client` command and the `-d` option to specify that the custom JumpStart program use the DHCP server with PXE.
  - You can edit the GRUB entry on the GRUB menu and add the dhcp option. For instructions about editing the GRUB entry, see "x86: Performing a Custom JumpStart Installation by Editing the GRUB Boot Command" on page 133

---

1 On the installation or boot server, log in as superuser.

2 Use a text editor to open `/etc/bootparams`.

3 Add this entry.

`* install_config=`*`server:jumpstart_dir_path`*

*	A wildcard character that specifies that all systems have access
server	The host name of the profile server where the JumpStart directory is located
jumpstart_dir_path	The absolute path of the JumpStart directory

For example, the following entry enables all systems to access the `/jumpstart` directory on the profile server that is named `sherlock`:

```
* install_config=sherlock:/jumpstart
```

Caution – Use of this procedure might produce the following error message when an installation client is booted:

```
WARNING: getfile: RPC failed: error 5: (RPC Timed out).
```

"Booting From the Network, Error Messages" on page 217 contains details about this error message.

All systems can now access the profile server.

Creating a Profile Diskette for Standalone Systems

A diskette that contains a JumpStart directory is called a profile diskette. A system that is not connected to the network does not have access to a profile server. As a result, you must create a JumpStart directory on a diskette if a system is not connected to a network. The system on which you create a profile diskette must have a diskette drive.

The JumpStart directory contains all of the essential custom JumpStart files, for example, the `rules` file, `rules.ok` file, and profiles. You must save the JumpStart directory in the root (`/`) directory of the profile diskette.

See one of the following procedures:

- "SPARC: To Create a Profile Diskette" on page 75
- "x86: To Create a Profile Diskette With GRUB" on page 77

▼ SPARC: To Create a Profile Diskette

Note – This procedure assumes that the system is running Volume Manager. If you are not using Volume Manager to manage diskettes, CDs, and DVDs, refer to *System Administration Guide: Devices and File Systems* for detailed information about managing removable media without Volume Manager.

1 Log in as superuser on a SPARC based system to which a diskette drive is attached.

2 Insert a blank diskette or a diskette that can be overwritten in the diskette drive.

3 Mount the diskette.

```
# volcheck
```

4 Determine if the diskette contains a UNIX file system (UFS).

Examine the contents of the file `/etc/mnttab` on the system for an entry such as the following:

```
/vol/dev/diskette0/scrap  /floppy/scrap  ufs  suid,rw,largefiles,dev=1740008  927147040
```

- If the entry exists, go to Step 6.
- If the entry does not exist, go to the next step.

5 Create a UFS on the diskette.

```
# newfs /vol/dev/aliases/floppy0
```

6 Determine if you want to copy examples of custom JumpStart files to your JumpStart directory.

- If no, go to Step 9.
- If yes, use the following decision table to determine what to do next.

Example Locations	Instructions
The Solaris Operating System for SPARC Platforms DVD or the Solaris Software for SPARC Platforms - 1 CD	Insert the Solaris Operating System for SPARC Platforms DVD or the Solaris Software for SPARC Platforms - 1 CD into the server's CD-ROM drive. Volume Manager automatically mounts the CD.
An image of the Solaris Operating System for SPARC Platforms DVD or the Solaris Software for SPARC Platforms - 1 CD on a local disk	Change the directory to the location of the Solaris Operating System for SPARC Platforms DVD or the Solaris Software for SPARC Platforms - 1 CD image. For example, type the following command: `cd /export/install`

7 Copy the example custom JumpStart files into the JumpStart directory on the profile diskette.

`# cp -r` *media_path*`/Solaris_10_606/Misc/jumpstart_sample/*` *jumpstart_dir_path*

media_path	The path to the CD, DVD, or image on the local disk
jumpstart_dir_path	The path to the profile diskette where you want to place the example custom JumpStart files

Note – You must place all custom JumpStart installation files in the root (`/`) directory on the diskette.

For example, the following command copies the contents of `jumpstart_sample` on the Solaris Software for SPARC Platforms - 1 CD to the root (`/`) directory on a profile diskette that is named `scrap`:

```
cp -r /cdrom/sol_10_606_sparc/s0/Solaris_10_606/Misc/jumpstart_sample/* /floppy/scrap
```

8 Update the example JumpStart files on the profile diskette so that the files work in your environment.

9 Ensure that `root` owns the JumpStart directory and that permissions are set to 755.

10 Eject the diskette.

```
# eject floppy
```

You have completed the creation of a profile diskette. You can now update the `rules` file and create profiles on the profile diskette to perform custom JumpStart installations. To continue, go to "Creating the `rules` File" on page 78.

▼ x86: To Create a Profile Diskette With GRUB

Use this procedure to create a profile diskette with GRUB. A GRUB menu is provided during the installation procedure that enables the boot process. The GRUB menu replaces the Solaris Device Configuration Assistant that might have been needed to boot a system in past releases.

Note – This procedure assumes that the system is running Volume Manager. If you are not using Volume Manager to manage diskettes, CDs, and DVDs, refer to *System Administration Guide: Devices and File Systems* for detailed information about managing removable media without Volume Manager.

---

1 Log in as superuser on an x86 based system to which a diskette drive is attached.

2 Insert a blank diskette or a diskette that can be overwritten into the diskette drive.

3 Mount the diskette.

```
# volcheck
```

4 Determine if you want to copy examples of custom JumpStart files to your JumpStart directory.

- If no, go to Step 7.
- If yes, use the following decision table to determine what to do next.

Example Locations	Instructions
The Solaris Operating System for x86 Platforms DVD or the Solaris Software for x86 Platforms - 1 CD	Insert the Solaris Operating System for x86 Platforms DVD or the Solaris Software for x86 Platforms - 1 CD into the server's CD-ROM drive. Volume Manager automatically mounts the CD.
An image of the Solaris Operating System for x86 Platforms DVD or the Solaris Software for x86 Platforms - 1 CD on a local disk	Change directory to the location of the Solaris Operating System for x86 Platforms DVD or the Solaris Software for x86 Platforms - 1 CD image. For example, type the following: `cd /export/install`

5 Copy the example custom JumpStart files into the JumpStart directory on the profile diskette.

```
# cp -r media_path/Solaris_10_606/Misc/jumpstart_sample/* jumpstart_dir_path
```

media_path	The path to the CD, DVD, or image on the local disk
jumpstart_dir_path	The path to the profile diskette where you want to place the example custom JumpStart files

Note – You must place all custom JumpStart installation files in the root (/) directory on the profile diskette.

For example, the following command copies the contents of jumpstart_sample on the Solaris Software for x86 Platforms - 1 CD to the root (/) directory on a profile diskette that is named scrap:

```
cp -r /cdrom/sol_10_606_x86/Solaris_10_606/Misc/jumpstart_sample/* /floppy/scrap
```

6. **Update the example JumpStart files on the profile diskette so that the files work in your environment.**
7. **Ensure that root owns the JumpStart directory and that permissions are set to 755.**
8. **Eject the diskette by clicking Eject Disk in the File Manager window or by typing eject floppy on the command line.**
9. **In the Removable Media Manager dialog box, click OK.**
10. **Manually eject the diskette.**

See Also You have completed the creation of a profile diskette. Now you can update the rules file and create profiles on the profile diskette to perform custom JumpStart installations. To continue, go to "Creating the rules File" on page 78.

Creating the rules File

The rules file is a text file that contains a rule for each group of systems on which you want to install the Solaris OS. Each rule distinguishes a group of systems that are based on one or more system attributes. Each rule also links each group to a profile. A profile is a text file that defines how the Solaris software is to be installed on each system in the group. For example, the following rule specifies that the JumpStart program use the information in the basic_prof profile to install any system with the sun4u platform group.

```
karch sun4u - basic_prof -
```

The rules file is used to create the rules.ok file, which is required for custom JumpStart installations.

Note – If you set up the JumpStart directory by using the procedures in "Creating a Profile Diskette for Standalone Systems" on page 75 or "Creating a Profile Server for Networked Systems" on page 71, an example `rules` file is already located in the JumpStart directory. The sample `rules` file contains documentation and some example rules. If you use the sample `rules` file, ensure that you comment out the example rules you do not intend to use.

Syntax of the `rules` File

The `rules` file must have the following attributes:

- The file must be assigned the name `rules`.
- The file must contain at least one rule.

The `rules` file can contain any of the following:

- Commented text

  Any text that is included after the # symbol on a line is treated by JumpStart as commented text. If a line begins with the # symbol, the entire line is treated as a comment.
- One or more blank lines
- One or more multiline rules

  To continue a single rule onto a new line, include a backslash character (\) just before pressing Return.

▼ To Create a `rules` File

1 **Use a text editor to create a text file that is named `rules`. Or, open the sample `rules` file in the JumpStart directory that you created.**

2 **Add a rule in the `rules` file for each group of systems on which you want to install the Solaris software.**

For a list of `rules` file keywords and values, see "Rule Keywords and Values" on page 147.

A rule within a `rules` file must adhere to the following syntax:

`!`*rule_keyword rule_value* `&&` `!`*rule_keyword rule_value* `...` *begin profile finish*

`!`	A symbol that is used before a keyword to indicate negation.
rule_keyword	A predefined lexical unit or word that describes a general system attribute, such as host name, `hostname`, or memory size, `memsize`. *rule_keyword* is used with the rule value to match a system with the same attribute to a profile. For the list of rule keywords, see "Rule Keywords and Values" on page 147.

rule_value — A value that provides the specific system attribute for the corresponding rule keyword. Rule values are described in "Rule Keywords and Values" on page 147.

&& — A symbol you must use to join rule keyword and rule value pairs in the same rule (a logical AND). During a custom JumpStart installation, a system must match every pair in the rule before the rule matches.

begin — The name of an optional Bourne shell script that can be executed before the installation begins. If no begin script exists, you must type a minus sign (-) in this field. All begin scripts must be located in the JumpStart directory.

Information about how to create begin scripts is presented in "Creating Begin Scripts" on page 101.

profile — The name of a text file that defines how the Solaris software is to be installed on the system when a system matches the rule. The information in a profile consists of profile keywords and their corresponding profile values. All profiles must be located in the JumpStart directory.

Note – Optional ways to use the profile field are described in "Using a Site-Specific Installation Program" on page 116 and "Creating Derived Profiles With a Begin Script" on page 102.

---

finish — The name of an optional Bourne shell script that can be executed after the installation is completed. If no finish script exists, you must type a minus sign (-) in this field. All finish scripts must be located in the JumpStart directory.

Information about how to create finish scripts is presented in "Creating Finish Scripts" on page 103.

At the minimum, each rule must contain the following:

- A keyword, a value, and a corresponding profile
- A minus sign (-) in the *begin* and *finish* fields if no begin or finish scripts are specified

3 Save the `rules` file in the JumpStart directory.

4 Ensure that `root` owns the `rules` file and that the permissions are set to 644.

`rules` File Example

The following example shows several example rules in a `rules` file. Each line has a rule keyword and a valid value for that keyword. The JumpStart program scans the `rules` file from top to bottom.

When the JumpStart program matches a rule keyword and value with a known system, the JumpStart program installs the Solaris software that is specified by the profile that is listed in the profile field.

EXAMPLE 6–1 `rule` File

```
# rule keywords and rule values       begin script       profile       finish script
# ------------------------------       ------------       --------      -------------
  hostname eng-1                      -                  basic_prof    -
  network 192.168.255.255 && !model \
 'SUNW,Sun-Blade-100'                 -                  net_prof      -
  model SUNW,SPARCstation-LX          -                  lx_prof       complete
  network 192.168.2.0 && karch i86pc  setup              x86_prof      done
  memsize 64-128 && arch i386         -                  prog_prof     -
  any   -                             -                  generic_prof  -
```

The following list describes some of the keywords and values from this example.

`hostname` The rule matches if the system's host name is `eng-1`. The `basic_prof` profile is used to install the Solaris software on the system that matches the rule.

`network` The rule matches if the system is on subnet 192.168.255.255 and if the system is *not* a Sun Blade ™ 100 (`SUNW,Sun-Blade-100`). The `net_prof` profile is used to install the Solaris software on systems that match this rule. The rule also provides an example of rule wrap, which is defined in "Syntax of the `rules` File" on page 79.

`model` The rule matches if the system is a SPARCstation LX. The `lx_prof` profile and the `complete` finish script are used to install the Solaris software on systems that match this rule.

`network` The rule matches if the system is on subnet 192.168.2.0 and is an x86 based sun4u system. The `setup` begin script, the `x864u_prof` profile, and the `done` finish script are used to install the Solaris software on systems that match the rule.

`memsize` The rule matches if the system has between 64 and 128 Mbytes of memory and is an x86 based system. The `prog_prof` profile is used to install the Solaris software on systems that match the rule.

`any` The rule matches any system that did not match the previous rules. The `generic_prof` profile is used to install the Solaris software on systems that match the rule. If `any` is used, it should always be the last rule in the `rules` file.

Creating a Profile

A profile is a text file that defines how to install the Solaris software on a system. A profile defines elements of the installation, for example, the software group to install. Every rule specifies a profile that defines how a system is to be installed. You can create different profiles for every rule or the same profile can be used in more than one rule.

A profile consists of one or more profile keywords and their values. Each profile keyword is a command that controls one aspect of how the JumpStart program is to install the Solaris software on a system. For example, the following profile keyword and value specify that the JumpStart program install the system as a server:

```
system_type  server
```

Note – Sample profiles are already located in the JumpStart directory if you created the JumpStart directory by using either of these procedures:

- "Creating a Profile Server for Networked Systems" on page 71
- "Creating a Profile Diskette for Standalone Systems" on page 75

Syntax of Profiles

A profile must contain the following:

- The `install_type` profile keyword as the first entry
- One keyword per line
- The `root_device` keyword if the systems that are being upgraded by the profile contain more than one root (`/`) file system that can be upgraded

A profile can contain the following:

- Commented text

  Any text that is included after the # symbol on a line is treated by the JumpStart program as commented text. If a line begins with the # symbol, the entire line is treated as a comment.
- One or more blank lines

▼ To Create a Profile

1 Use a text editor to create a text file. Name the file descriptively. Or, open a sample profile in the JumpStart directory that you created.

Note – Ensure that the name of the profile reflects how you intend to use the profile to install the Solaris software on a system. For example, you might name the profiles `basic_install`, `eng_profile`, or `user_profile`.

---

2 **Add profile keywords and values to the profile.**

For a list of profile keywords and values, see "Profile Keywords and Values" on page 151.

Note – Profile keywords and their values are case sensitive.

3 **Save the profile in the JumpStart directory.**

4 **Ensure that `root` owns the profile and that the permissions are set to 644.**

5 **Test the profile (optional).**

"Testing a Profile" on page 94 contains information about testing profiles.

Profile Examples

The following examples of profiles show how to use different profile keywords and profile values to control how the Solaris software is installed on a system. "Profile Keywords and Values" on page 151 contains a description of profile keywords and values.

EXAMPLE 6–2 Mounting Remote File Systems and Adding and Deleting Packages

```
# profile keywords        profile values
# -----------------       -----------------
  install_type            initial_install
  system_type             standalone
  partitioning            default
  filesys                 any 512 swap   # specify size of /swap
  cluster                 SUNWCprog
  package                 SUNWman delete
  cluster                 SUNWCacc
```

The following list describes some of the keywords and values from this example.

`install_type` The `install_type` keyword is required in every profile.

`system_type` The `system_type` keyword defines that the system is to be installed as a standalone system.

`partitioning` The file system slices are determined by the software to be installed with the value `default`. The size of `swap` is set to 512 Mbytes and is installed on any disk, value `any`.

`cluster` The Developer Solaris Software Group, `SUNWCprog`, is installed on the system.

EXAMPLE 6–2 Mounting Remote File Systems and Adding and Deleting Packages *(Continued)*

`package` If the standard man pages are mounted from the file server, `s_ref`, on the network, the man page packages are not to be installed on the system. The packages that contain the System Accounting utilities are selected to be installed on the system.

EXAMPLE 6–3 Mounting Remote File Systems and Adding a Third-Party Package

```
# profile keywords        profile values
# -----------------       -----------------
  install_type            initial_install
  system_type             standalone
  partitioning            default
  filesys                 any 512 swap   # specify size of /swap
  cluster                 SUNWCprog
  cluster                 SUNWCacc
  package                 apache_server  \
                           http://package.central/packages/apache timeout 5
```

The following list describes some of the keywords and values from this example.

`install_type` The `install_type` keyword is required in every profile.

`system_type` The `system_type` keyword defines that the system is to be installed as a standalone system.

`partitioning` The file system slices are determined by the software to be installed with the value `default`. The size of `swap` is set to 512 Mbytes and is installed on any disk, value `any`.

`cluster` The Developer Solaris Software Group, `SUNWCprog`, is installed on the system.

`package` A third-party package is installed on the system located on an HTTP server.

EXAMPLE 6–4 Specifying Where to Install File Systems

```
# profile keywords        profile values
# ----------------        -------------------
  install_type            initial_install
  system_type             standalone
  partitioning            explicit
  filesys                 c0t0d0s0 auto /
  filesys                 c0t3d0s1 auto swap
  filesys                 any auto usr
  cluster                 SUNWCall
```

EXAMPLE 6–4 Specifying Where to Install File Systems *(Continued)*

The following list describes some of the keywords and values from this example.

`partitioning` The file system slices are determined by the `filesys` keywords, value `explicit`. The size of root (`/`) is based on the selected software, value `auto`, and is installed on `c0t0d0s0`. The size of `swap` is set to the necessary size and is installed on `c0t3d0s1`. `usr` is based on the selected software and the installation program determines where `usr` is installed, based on the value `any`.

`cluster` The Entire Solaris Software Group, `SUNWCall`, is installed on the system.

EXAMPLE 6–5 Upgrading and Installing Patches

```
# profile keywords         profile values
# ----------------         -------------------
  install_type             upgrade
  root_device              c0t3d0s2
  backup_media             remote_filesystem timber:/export/scratch
  package                  SUNWbcp delete
  package                  SUNWxwman add
  cluster                  SUNWCacc add
  patch                    patch_list nfs://patch_master/Solaris_10_606/patches \
                           retry 5
  locale                   de
```

The following list describes some of the keywords and values from this example.

`install_type` The profile upgrades a system by reallocating disk space. In this example, disk space must be reallocated because some file systems on the system did not have enough space for the upgrade.

`root_device` The root file system on `c0t3d0s2` is upgraded.

`backup_media` A remote system that is named `timber` is to be used to back up data during the disk space reallocation. For more backup-media keyword values, see "`backup_media` Profile Keyword" on page 158.

`package` The binary compatibility package, `SUNWbcp`, is not installed on the system after the upgrade.

`package` The code ensures that the X Window System man pages and the System Accounting Utilities are to be installed if they are not already installed on the system. All packages already on the system are automatically upgraded.

`patch` A list of patches that are installed with the upgrade. The patch list is located on an NFS server named `patch_master` under the directories `Solaris_10_606/patches`. In case of a mount failure, the NFS mount is tried five times.

EXAMPLE 6–5 Upgrading and Installing Patches *(Continued)*

`locale` The German localization packages are to be installed on the system.

EXAMPLE 6–6 Reallocating Disk Space for an Upgrade

```
# profile keywords         profile values
# ----------------         -------------------
  install_type             upgrade
  root_device              c0t3d0s2
  backup_media             remote_filesystem timber:/export/scratch
  layout_constraint        c0t3d0s2 changeable 100
  layout_constraint        c0t3d0s4 changeable
  layout_constraint        c0t3d0s5 movable
  package                  SUNWbcp delete
  package                  SUNWxwman add
  cluster                  SUNWCacc add
  locale                   de
```

The following list describes some of the keywords and values from this example.

`install_type` The profile upgrades a system by reallocating disk space. In this example, disk space must be reallocated because some file systems on the system did not have enough space for the upgrade.

`root_device` The root file system on `c0t3d0s2` is upgraded.

`backup_media` A remote system that is named `timber` is to be used to back up data during the disk space reallocation. For more backup-media keyword values, see "`backup_media` Profile Keyword" on page 158.

`layout_constraint` The `layout_constraint` keywords designate that auto-layout can perform the following when auto-layout attempts to reallocate disk space for the upgrade.

- Change slices 2 and 4. The slices can be moved to another location and the size can be changed.
- Move slice 5. The slice can be moved to another location but its size cannot change.

`package` The binary compatibility package, `SUNWbcp`, is not installed on the system after the upgrade.

`package` The code ensures that the X Window System man pages and the System Accounting Utilities are to be installed if they are not already installed on the system. All packages already on the system are automatically upgraded.

`locale` The German localization packages are to be installed on the system.

EXAMPLE 6–7 Retrieving a Solaris Flash Archive From an HTTP Server

In the following example, the profile indicates that the custom JumpStart program retrieves the Solaris Flash archive from an HTTP server.

```
# profile keywords        profile values
# ----------------        -------------------
install_type              flash_install
archive_location          http://192.168.255.255/flasharchive/solarisarchive
partitioning              explicit
filesys                   c0t1d0s0 4000 /
filesys                   c0t1d0s1 512 swap
filesys                   c0t1d0s7 free /export/home
```

The following list describes some of the keywords and values from this example.

`install_type` The profile installs a Solaris Flash archive on the clone system. All files are overwritten as in an initial installation.

`archive_location` The Solaris Flash archive is retrieved from an HTTP server.

`partitioning` The file system slices are determined by the `filesys` keywords, value `explicit`. The size of root (`/`) is based on the size of the Solaris Flash archive. The root file system is installed on `c0t1d0s0`. The size of `swap` is set to the necessary size and is installed on `c0t1d0s1`. `/export/home` is based on the remaining disk space. `/export/home` is installed on `c0t1d0s7`.

EXAMPLE 6–8 Retrieving a Solaris Flash Archive From a Secure HTTP Server

In the following example, the profile indicates that the custom JumpStart program retrieves the Solaris Flash archive from a secure HTTP server.

```
# profile keywords        profile values
# ----------------        -------------------
install_type              flash_install
archive_location          https://192.168.255.255/solarisupdate.flar
partitioning              explicit
filesys                   c0t1d0s0 4000 /
filesys                   c0t1d0s1 512 swap
filesys                   c0t1d0s7 free /export/home
```

The following list describes some of the keywords and values from this example.

`install_type` The profile installs a Solaris Flash archive on the clone system. All files are overwritten as in an initial installation.

`archive_location` The compressed Solaris Flash archive is retrieved from a secure HTTP server.

EXAMPLE 6–8 Retrieving a Solaris Flash Archive From a Secure HTTP Server *(Continued)*

`partitioning`	The file system slices are determined by the `filesys` keywords, value `explicit`. The size of root (`/`) is based on the size of the Solaris Flash archive. The size of `swap` is set to the necessary size and is installed on `c0t1d0s1`. `/export/home` is based on the remaining disk space. `/export/home` is installed on `c0t1d0s7`.

EXAMPLE 6–9 Retrieving a Solaris Flash Archive and Installing a Third-Party Package

In the following example, the profile indicates that the custom JumpStart program retrieves the Solaris Flash archive from an HTTP server.

```
# profile keywords        profile values
# ----------------        -------------------
install_type              flash_install
archive_location          http://192.168.255.255/flasharchive/solarisarchive
partitioning              explicit
filesys                   c0t1d0s0 4000 /
filesys                   c0t1d0s1 512 swap
filesys                   c0t1d0s7 free /export/home
package                   SUNWnew http://192.168.254.255/Solaris_10_606 timeout 5
```

The following list describes some of the keywords and values from this example.

`install_type`	The profile installs a Solaris Flash archive on the clone system. All files are overwritten as in an initial installation.
`archive_location`	The Solaris Flash archive is retrieved from an HTTP server.
`partitioning`	The file system slices are determined by the `filesys` keywords, value `explicit`. The size of root (`/`) is based on the size of the Solaris Flash archive. The root file system is installed on `c0t1d0s0`. The size of `swap` is set to the necessary size and is installed on `c0t1d0s1`. `/export/home` is based on the remaining disk space. `/export/home` is installed on `c0t1d0s7`.
`package`	The SUNWnew package is added from the `Solaris_10_606` directory from the HTTP server `192.168.254.255`.

EXAMPLE 6–10 Retrieving a Solaris Flash Differential Archive From an NFS Server

In the following example, the profile indicates that the custom JumpStart program retrieves the Solaris Flash archive from an NFS server. The `flash_update` keyword indicates that this is a differential archive. A differential archive installs only the differences between two system images.

```
# profile keywords        profile values
# ----------------        -------------------
```

EXAMPLE 6–10 Retrieving a Solaris Flash Differential Archive From an NFS Server *(Continued)*

```
install_type              flash_update
archive_location          nfs installserver:/export/solaris/flasharchive \
                          /solarisdiffarchive
no_master_check
```

The following list describes some of the keywords and values from this example.

`install_type` The profile installs a Solaris Flash differential archive on the clone system. Only files that are specified by the archive are installed.

`archive_location` The Solaris Flash archive is retrieved from an NFS server.

`no_master_check` The clone system is not checked for a valid system image. A valid system image would have been built from the original master system.

EXAMPLE 6–11 Creating an Empty Boot Environment

In the following example, the profile indicates that the custom JumpStart program creates an empty boot environment. An empty boot environment contains no file systems and no copy from the current boot environment occurs. The boot environment can be populated later with a Solaris Flash archive and then activated.

```
# profile keywords        profile values
# ----------------        -------------------
  install_type            initial_install
  system_type             standalone
  partitioning            explicit
  filesys                 c0t0d0s0 auto /
  filesys                 c0t3d0s1 auto swap
  filesys                 any auto usr
  cluster                 SUNWCall
  bootenv createbe bename second_BE \
  filesystem /:/dev/dsk/c0t1d0s0:ufs \
  filesystem -:/dev/dsk/c0t1d0s0:swap \
  filesystem /export:shared:ufs
```

The following list describes some of the keywords and values from this example.

`partitioning` The file system slices are determined by the `filesys` keywords, value `explicit`. The size of root (`/`) is based on the selected software, value `auto`, and is installed on `c0t0d0s0`. The size of `swap` is set to the necessary size and is installed on `c0t3d0s1`. `usr` is based on the selected software and the installation program determines where `usr` is installed, based on the value `any`.

`cluster` The Entire Solaris Software Group, `SUNWCall`, is installed on the system.

EXAMPLE 6–11 Creating an Empty Boot Environment *(Continued)*

`bootenv createbe` An empty, inactive boot environment is set up on disk `c0t1d0`. File systems for root (`/`), swap, and `/export` are created, but left empty. This second boot environment can be installed with a Solaris Flash archive at a later time. The new boot environment can then be activated to become the current boot environment.

For keyword values and background about using this keyword, see the following references:

- For descriptions of keyword values, see "Profile Keywords and Values" on page 151.
- For background about using Solaris Live Upgrade that creates, upgrades, and activates inactive boot environments, see Chapter 6, "Solaris Live Upgrade (Overview)," in *Solaris 10 6/06 Installation Guide: Solaris Live Upgrade and Upgrade Planning*.
- For background about using a Solaris Flash archive, see Chapter 1, "Solaris Flash (Overview)," in *Solaris 10 6/06 Installation Guide: Solaris Flash Archives (Creation and Installation)*.

EXAMPLE 6–12 Creating RAID-1 Volumes When Installing a Solaris Flash Archive

In the following example, the profile indicates that the custom JumpStart program uses Solaris Volume Manager technology to create RAID-1 volumes (mirrors) for the root (`/`), `swap`, `/usr` and `/export/home` file systems. A Solaris Flash archive is installed on the boot environment.

```
# profile keywords        profile values
# ----------------        -------------------
  install_type            flash_install
  arhcive_location        nfs server:/export/home/export/flash.s10.SUNWCall
  partitioning            explicit
  filesys                 mirror:d10 c0t0d0s0 c0t1d0s0 4096 /
  filesys                 mirror c0t0d0s1 2048 swap
  filesys                 mirror:d30 c0t0d0s3 c0t1d0s3 4096 /usr
  filesys                 mirror:d40 c0t0d0s4 c0t1d0s4 4096 /usr
  filesys                 mirror:d50 c0t0d0s5 c0t1d0s5 free /export/home
  metadb                  c0t1d0s7 size 8192 count 3
```

The following list describes some of the keywords and values from this example.

`install_type` The profile installs a Solaris Flash archive on the clone system. All files are overwritten as in an initial installation.

`archive_location` The Solaris Flash archive is retrieved from an NFS server.

EXAMPLE 6–12 Creating RAID-1 Volumes When Installing a Solaris Flash Archive *(Continued)*

`partitioning`	The file system slices are determined by the `filesys` keywords, value `explicit`.
`filesys`	The root (`/`) file system is created and mirrored on the slices `c0t0d0s0` and `c0t1d0s0`. The size of the root (`/`) file system is set to 4096 Mbytes. The RAID-1 volume that mirrors `c0t0d0s0` and `c0t1d0s0` is named `d10`.
`filesys`	The `swap` file system is created and mirrored on the slice `c0t0d0s1`, and is sized at 2048 Mbytes. The custom JumpStart program assigns a name to the mirror.
`filesys`	The `/usr` file system is created and mirrored on the slices `c0t1d0s3` and `c0t0d0s3`. The size of the `/usr` file system is set to 4096 Mbytes. The RAID-1 volume is named `d30`.
`filesys`	The `/usr` file system is created and mirrored on the slices `c0t1d0s4` and `c0t0d0s4`. The size of the `/usr` file system is set to 4096 Mbytes. The RAID-1 volume is named `d40`.
`metadb`	Three state database replicas (metadbs) are installed on slice `c0t1d0s7`, and are sized at 8192 blocks (4 Mbytes).

- For overview information about how to create mirrored file systems during your installation, see Chapter 12.
- For guidelines and requirements of creating mirrored file systems, see Chapter 13.
- For descriptions of keyword values, see "`filesys` Profile Keyword (Creating RAID-1 Volumes)" on page 170 and "`metadb` Profile Keyword (Creating State Database Replicas)" on page 176.

EXAMPLE 6–13 Creating a RAID-1 Volume to Mirror the Root File System

In the following example, the profile indicates that the custom JumpStart program uses Solaris Volume Manager technology to create a RAID-1 volume (mirror) for the root (`/`) file system.

```
# profile keywords        profile values
# ----------------        -------------------
  install_type            initial_install
  cluster                 SUNWCXall
  filesys                 mirror:d30 c0t1d0s0 c0t0d0s0  /
  filesys                 c0t0d0s3 512 swap
  metadb                  c0t0d0s4 size 8192 count 4
  metadb                  c0t1d0s4 size 8192 count 4
```

The following list describes some of the keywords and values from this example.

EXAMPLE 6–13 Creating a RAID-1 Volume to Mirror the Root File System *(Continued)*

`cluster` The Entire Solaris Software Plus OEM Support software group, SUNWCXall, is installed on the system.

`filesys` The root (`/`) file system is created and mirrored on the slices `c0t1d0s0` and `c0t0d0s0`. The RAID-1 volume that mirrors `c0t1d0s0` and `c0t0d0s0` is named `d30`. The custom JumpStart program assigns names to the two submirrors.

`filesys` The `swap` file system is created and mirrored on the slice `c0t0d0s3`, and is sized at 512 Mbytes.

`metadb` Four state database replicas (metadbs) are installed on slice `c0t0d0s4`, and are sized at 8192 blocks (4 Mbytes).

`metadb` Four state database replicas (metadbs) are installed on slice `c0t1d0s4`, and are sized at 8192 blocks (4 Mbytes).

- For overview information about how to create RAID-1 volumes during your installation, see Chapter 12.
- For guidelines and requirements about creating RAID-1 volumes, see Chapter 13.
- For descriptions of keyword values, see "`filesys` Profile Keyword (Creating RAID-1 Volumes)" on page 170 and "`metadb` Profile Keyword (Creating State Database Replicas)" on page 176.

EXAMPLE 6–14 Creating RAID-1 Volumes to Mirror Multiple File Systems

In the following example, the profile indicates that the custom JumpStart program uses Solaris Volume Manager technology to create RAID-1 volumes (mirrors) for the root (`/`), `swap`, and `/usr` file systems.

```
# profile keywords        profile values
# ----------------        -------------------
  install_type            initial_install
  cluster                 SUNWCXall
  filesys                 mirror:d100 c0t1d0s0 c0t0d0s0 200 /
  filesys                 c0t1d0s5 500 /var
  filesys                 c0t0d0s5 500
  filesys                 mirror c0t0d0s1 512 swap
  metadb                  c0t0d0s3 size 8192 count 5
  filesys                 mirror c0t1d0s4 c0t0d0s4 2000 /usr
  filesys                 c0t1d0s7 free /export/home
  filesys                 c0t0d0s7 free
```

The following list describes some of the keywords and values from this example.

`cluster` The Entire Solaris Software Plus OEM Support software group, SUNWCXall, is installed on the system.

EXAMPLE 6–14 Creating RAID-1 Volumes to Mirror Multiple File Systems *(Continued)*

`filesys` The root (`/`) file system is created and mirrored on the slices `c0t1d0s0` and `c0t0d0s0`. The size of the root (`/`) file system is set to 200 Mbytes. The RAID-1 volume that mirrors `c0t1d0s0` and `c0t0d0s0` is named `d100`.

`filesys` The `/var` file system is installed on the slice `c0t1d0s5` and is sized at 500 Mbytes. The root (`/`) file system is created and mirrored on the slices `c0t1d0s0` and `c0t0d0s0`. The size of the root (`/`) file system is set to 200 Mbytes. The RAID-1 volume that mirrors `c0t1d0s0` and `c0t0d0s0` is named `d100`.

`filesys` The `swap` file system is created and mirrored on the slice `c0t0d0s1`, and is sized at 512 Mbytes. The custom JumpStart program assigns a name to the mirror.

`metadb` Five state database replicas (metadbs) are installed on slice `c0t0d0s3`, and are sized at 8192 blocks (4 Mbytes).

`filesys` The `/usr` file system is created and mirrored on the slices `c0t1d0s4` and `c0t0d0s4`. The size of the `/usr` file system is set to 2000 Mbytes. The custom JumpStart program assigns a name to the mirror.

- For overview information about how to create mirrored file systems during your installation, see Chapter 12.
- For guidelines and requirements of creating mirrored file systems, see Chapter 13.
- For descriptions of keyword values, see "`filesys` Profile Keyword (Creating RAID-1 Volumes)" on page 170 and "`metadb` Profile Keyword (Creating State Database Replicas)" on page 176.

EXAMPLE 6–15 x86: Using the `fdisk` Keyword

```
# profile keywords      profile values
# ----------------      ------------------
  install_type          initial_install
  system_type           standalone

  fdisk                 c0t0d0 0x04 delete
  fdisk                 c0t0d0 solaris maxfree
  cluster               SUNWCall
  cluster               SUNWCacc delete
```

The following list describes some of the keywords and values from this example.

`fdisk` All `fdisk` partitions of type DOSOS16 (04 hexadecimal) are deleted from the `c0t0d0` disk.

`fdisk` A Solaris `fdisk` partition is created on the largest contiguous free space on the `c0t0d0` disk.

`cluster` The Entire Distribution software group, `SUNWCall`, is installed on the system.

EXAMPLE 6–15 x86: Using the `fdisk` Keyword *(Continued)*

`cluster` The system accounting utilities, `SUNWCacc`, are not to be installed on the system.

Testing a Profile

After you create a profile, use the `pfinstall`(1M) command to test the profile. Test the profile before you use the profile to install or upgrade a system. Testing a profile is especially useful when you are creating upgrade profiles that reallocate disk space.

By looking at the installation output that is generated by `pfinstall`, you can quickly determine if a profile works as you intended. For example, use the profile to determine if a system has enough disk space to upgrade to a new release of the Solaris software before you perform the upgrade on that system.

`pfinstall` enables you to test a profile against the following:

- The system's disk configuration where `pfinstall` is being run.
- Other disk configurations. You use a disk configuration file that represents a structure of a disk, for example, a disk's bytes/sector, flags, and slices. Creating disk configuration files is described in "Creating Disk Configuration Files" on page 111 and "x86: To Create a Disk Configuration File" on page 113.

Note – You cannot use a disk configuration file to test a profile you intend to use to upgrade a system. Instead, you must test the profile against the system's actual disk configuration and the software that is currently installed on that system.

▼ To Create a Temporary Solaris Environment to Test a Profile

To test a profile for a particular Solaris release successfully and accurately, you must test a profile within the Solaris environment of the same release. For example, if you want to test a Solaris initial installation profile, run the `pfinstall` command on a system that is running the Solaris OS.

You need to create a temporary installation environment if you are testing a profile under one of the following conditions:

- You want to test a Solaris 10 6/06 upgrade profile on a system that is running a previous version of the Solaris software.
- You do not have a Solaris 10 6/06 system installed yet to test Solaris 10 6/06 initial installation profiles.

1 **Boot a system from an image of one of the following:**

For SPARC based systems:

- Solaris Operating System for SPARC Platforms DVD
- Solaris Software for SPARC Platforms - 1 CD

For x86 based systems:

- Solaris Operating System for x86 Platforms DVD
- Solaris Software for x86 Platforms - 1 CD

Note – If you want to test an upgrade profile, boot the system that you are upgrading.

---

2 **Respond to the system identification questions.**

3 **To exit from the installation program, type ! at the following prompt.**

```
The Solaris installation program  will assist you in installing software for Solaris.
<Press ENTER to continue> {"!" exits}
```

4 **Execute the `pfinstall` command from the shell. For details about using the `pfinstall` command, see Step 7 in "To Test a Profile" on page 95.**

▼ To Test a Profile

---

x86 only – If you are using the `locale` keyword, the `pfinstall -D` command fails to test the profile. For a workaround, see the error message "could not select locale," in the section, "Upgrading the Solaris OS" on page 223.

---

1 **Locate a system on which to test the profile that is the same type of platform, SPARC or x86, for which the profile was created.**

If you are testing an upgrade profile, you must test the profile on the actual system that you intend to upgrade.

2 **Use the following decision table to determine what to do next.**

Test Scenario	Instructions
Test an initial installation profile and have a system that is running the Solaris 10 6/06 software.	Become superuser on the system and go to Step 5.

Test Scenario	Instructions
Test an upgrade profile, or you do not have a system that is running Solaris 10 6/06 to test an initial installation profile.	Create a temporary Solaris 10 6/06 environment to test the profile. For details, see "To Create a Temporary Solaris Environment to Test a Profile" on page 94. Then, go to Step 3.

3 Create a temporary mount point.

```
# mkdir /tmp/mnt
```

4 Mount the directory that contains the profile or profiles that you want to test.

Mount Scenario	Typing Instructions
Mount a remote NFS file system for systems on the network.	**mount -F nfs** *server_name*:*path* **/tmp/mnt**
SPARC: Mount a UFS-formatted diskette.	**mount -F ufs /dev/diskette /tmp/mnt**
Mount a PCFS-formatted diskette.	**mount -F pcfs /dev/diskette /tmp/mnt**

5 To test the profile with a specific system memory size, set `SYS_MEMSIZE` to the specific memory size in Mbytes.

```
# SYS_MEMSIZE=memory_size
# export SYS_MEMSIZE
```

6 Did you mount a directory in Step 4?

- If yes, change the directory to `/tmp/mnt`.

  ```
  # cd /tmp/mnt
  ```

- If no, change the directory to where the profile is located, which is usually the JumpStart directory.

  ```
  # cd jumpstart_dir_path
  ```

7 Test the profile with the `pfinstall`(1M) command.

```
# /usr/sbin/install.d/pfinstall -D:-d disk_config_file -c path profile
```

Caution – You *must* include the `-d` or `-D` option. If you do not include one of these options, `pfinstall` uses the profile you specify to install the Solaris software. All of the data on the system is overwritten.

`-D`	`pfinstall` uses the current system's disk configuration to test the profile. You must use the `-D` option to test an upgrade profile.

`-d` *disk_config_file*

`pfinstall` uses the disk configuration file, *disk_config_file*, to test the profile. If *disk_config_file* is not located in the directory where `pfinstall` is run, you must specify the path.

For instructions about how to create a disk configuration file, see "Creating Disk Configuration Files" on page 111.

Note – You cannot use the `-d` *disk_config_file* option with an upgrade profile, `install_type upgrade`. You must always test an upgrade profile against a system's disk configuration, that is, you must use the `-D` option.

`-c` *path*

The path to the Solaris software image. You use this option, for example, if the system is using Volume Manager to mount the Solaris Software - 1 CD for your platform.

Note – The `-c` option is not required if you booted from a Solaris Operating System DVD or a Solaris Software - 1 CD image for your platform. The DVD or CD image is mounted on `/cdrom` as part of the booting process.

profile

The name of the profile to test. If *profile* is not in the directory where `pfinstall` is being run, you must specify the path.

Profile Test Examples

The following example shows how to use `pfinstall` to test a profile that is named `basic_prof`. The profile is tested against the disk configuration on a system on which the Solaris 10 6/06 software is installed. The `basic_prof` profile is located in the `/jumpstart` directory, and the path to the Solaris Operating System DVD image is specified because Volume Manager is being used.

EXAMPLE 6–16 Profile Test Using a Solaris 10 6/06 System

```
# cd /jumpstart
# /usr/sbin/install.d/pfinstall -D -c /cdrom/pathname basic_prof
```

The following example shows how to use `pfinstall` to test the profile that is named `basic_prof` on a Solaris 10 6/06 system. The test is performed against the `535_test` disk configuration file. The test checks for 64 Mbytes of system memory. This example uses a Solaris Software for SPARC Platforms - 1 CD or Solaris Software for x86 Platforms - 1 CD image that is located in the `/export/install` directory.

EXAMPLE 6–17 Profile Test Using a Disk Configuration File

```
# SYS_MEMSIZE=64
# export SYS_MEMSIZE
# /usr/sbin/install.d/pfinstall -d 535_test -c /export/install basic_prof
```

Validating the rules File

Before you can use a profile and rules file, you must run the check script to validate that the files are set up correctly. If all rules and profiles are correctly set up, the rules.ok file is created, which is required by the custom JumpStart installation software to match a system to a profile.

Table 6–2 describes what the check script does.

TABLE 6–2 What Happens When You Use the check Script

Stage	Description
1	The rules file is checked for syntax. check verifies that the rule keywords are legitimate and that the *begin*, *class*, and *finish* fields are specified for each rule. The *begin* and *finish* fields can consist of a minus sign (-) instead of a file name.
2	If no errors are found in the rules file, each profile that is specified in the rules is checked for syntax.
3	If no errors are found, check creates the rules.ok file from the rules file, removes all comments and blank lines, retains all rules, and adds the following comment line at the end: # version=2 checksum=num

▼ To Validate the rules File

1 Ensure that the check script is located in the JumpStart directory.

Note – The check script is in the Solaris_10_606/Misc/jumpstart_sample directory on the Solaris Operating System DVD or on the Solaris Software - 1 CD.

2 Change the directory to the JumpStart directory.

3 Run the check script to validate the rules file:

$ **./check -p** *path* **-r** *file_name*

-p *path*	Validates the rules by using the check script from the Solaris software image instead of the check script from the system you are using. *path* is the image on a local disk or a mounted Solaris Operating System DVD or a Solaris Software - 1 CD. Use this option to run the most recent version of check if your system is running a previous version of Solaris.
-r *file_name*	Specifies a rules file other than the one that is named rules. Using this option, you can test the validity of a rule before you integrate the rule into the rules file.

As the check script runs, the script reports the checking of the validity of the rules file and each profile. If no errors are encountered, the script reports the following information.

```
The custom JumpStart configuration is ok
```

4 Ensure that root owns the rules.ok file and that the permissions are set to 644.

See Also After you validate the rules file, you can learn more about optional custom JumpStart features in Chapter 7. You can learn about performing custom JumpStart installations in Chapter 9.

◆ ◆ ◆ CHAPTER 7

Using Optional Custom JumpStart Features (Tasks)

This chapter describes the optional features that are available to create additional custom JumpStart installation tools.

Note – Instructions in this chapter are valid for either a SPARC server or an x86 server that is being used to provide custom JumpStart files, called a profile server. A profile server can provide custom JumpStart files for different platform types. For example, a SPARC server can provide custom JumpStart files for both SPARC based systems and x86 based systems.

Creating Begin Scripts

A begin script is a user-defined Bourne shell script that you specify in the `rules` file. A begin script performs tasks before the Solaris software is installed on a system. You can use begin scripts only when using custom JumpStart to install the Solaris software.

Use a begin script to perform one of the following tasks:

- Creating derived profiles
- Backing up files before upgrading

Important Information About Begin Scripts

- Do not specify something in the script that would prevent the mounting of file systems onto `/a` during an initial or upgrade installation. If the JumpStart program cannot mount the file systems onto `/a`, an error occurs and installation fails.

- During the installation, output from the begin script is deposited in `/tmp/begin.log`. After the installation is completed, the log file is redirected to `/var/sadm/system/logs/begin.log`.
- Ensure that `root` owns the begin script and that the permissions are set to 644.
- You can use custom JumpStart environment variables in your begin scripts. For a list of environment variables, see "Custom JumpStart Environment Variables" on page 190.
- Save begin scripts in the JumpStart directory.

Creating Derived Profiles With a Begin Script

A derived profile is a profile that is dynamically created by a begin script during a custom JumpStart installation. Derived profiles are needed when you cannot set up the `rules` file to match specific systems to a profile. For example, you might need to use derived profiles for identical system models that have different hardware components, such as systems that contain different frame buffers.

To set up a rule to use a derived profile, you must perform the following tasks:

- Set the profile field to an equal sign (=) instead of a profile.
- Set the begin field to a begin script that creates a derived profile that depends on the system on which you intend to install Solaris.

When a system matches a rule with the profile field equal to an equal sign (=), the begin script creates the derived profile that is used to install the Solaris software on the system.

The following is an example of a begin script that creates the same derived profile every time. You can write a begin script to create different derived profiles that depend on the evaluation of rules.

EXAMPLE 7–1 Begin Script That Creates a Derived Profile

```
#!/bin/sh
echo "install_type        initial_install"    > ${SI_PROFILE}
echo "system_type         standalone"        >> ${SI_PROFILE}
echo "partitioning        default"           >> ${SI_PROFILE}
echo "cluster             SUNWCprog"         >> ${SI_PROFILE}
echo "package       SUNWman     delete"      >> ${SI_PROFILE}
echo "package       SUNWolman   delete"      >> ${SI_PROFILE}
echo "package       SUNWxwman   delete"      >> ${SI_PROFILE}
```

In the example, the begin script must use the `SI_PROFILE` environment variable for the name of the derived profile, which is set to `/tmp/install.input` by default.

Note – If a begin script is used to create a derived profile, ensure the script does not have any errors. A derived profile is not verified by the `check` script because derived profiles are not created until the execution of the begin script.

Creating Finish Scripts

A finish script is a user-defined Bourne shell script that you specify in the `rules` file. A finish script performs tasks after the Solaris software is installed on a system, but before the system reboots. You can use finish scripts only when using custom JumpStart to install Solaris.

Tasks that you can perform with a finish script include the following:

- Adding files
- Adding individual packages or patches in addition to the ones that are installed in a particular software group
- Customizing the root environment
- Setting the system's root password
- Installing additional software

Important Information About Finish Scripts

- The Solaris installation program mounts the system's file systems on `/a`. The file systems remain mounted on `/a` until the system reboots. You can use the finish script to add, change, or remove files from the newly installed file system hierarchy by modifying the file systems that are respective to `/a`.
- During the installation, output from the finish script is deposited in `/tmp/finish.log`. After the installation is completed, the log file is redirected to `/var/sadm/system/logs/finish.log`.
- Ensure that `root` owns the finish script and that the permissions are set to 644.
- You can use custom JumpStart environment variables in your finish scripts. For a list of environment variables, see "Custom JumpStart Environment Variables" on page 190.
- Save finish scripts in the JumpStart directory.

▼ To Add Files With a Finish Script

Through a finish script, you can add files from the JumpStart directory to an already installed system. You can add the files because the JumpStart directory is mounted on the directory that is specified by the `SI_CONFIG_DIR` variable. The directory is set to `/tmp/install_config` by default.

Note – You can also replace files by copying files from the JumpStart directory to already existing files on the installed system.

1. **Copy all of the files that you are adding to the installed system to the JumpStart directory.**

2. **Insert the following line in the finish script for each file that you want to be copied to the newly installed file system hierarchy:**

   `cp ${SI_CONFIG_DIR}/`*file_name* `/a/`*path_name*

Example 7–2 Adding a File With a Finish Script

For example, assume you have a special application, `site_prog`, developed for all users at your site. If you place a copy of `site_prog` into the JumpStart directory, the following line in a finish script copies `site_prog` from the JumpStart directory into a system's `/usr/bin` directory:

```
cp ${SI_CONFIG_DIR}/site_prog  /a/usr/bin
```

Adding Packages or Patches With a Finish Script

You can create a finish script to automatically add packages or patches after the Solaris software is installed on a system. By adding packages with a finish script, you reduce time and ensure consistency in which packages and patches are installed on different systems at your site.

When you use the `pkgadd`(1M) or `patchadd`(1M) commands in finish scripts, use the `-R` option to specify `/a` as the root path.

- Example 7–3 shows an example of a finish script that adds packages.
- Example 7–4 shows an example of a finish script that adds patches.

EXAMPLE 7–3 Adding Packages With a Finish Script

```
#!/bin/sh

BASE=/a
MNT=/a/mnt
ADMIN_FILE=/a/tmp/admin

mkdir ${MNT}
mount -f nfs sherlock:/export/package ${MNT}
cat >${ADMIN_FILE} <<DONT_ASK
mail=root
instance=overwrite
partial=nocheck
runlevel=nocheck
```

EXAMPLE 7–3 Adding Packages With a Finish Script *(Continued)*

```
idepend=nocheck
rdepend=nocheck
space=ask
setuid=nocheck
conflict=nocheck
action=nocheck
basedir=default
DONT_ASK

/usr/sbin/pkgadd -a ${ADMIN_FILE} -d ${MNT} -R ${BASE} SUNWxyz
umount ${MNT}
rmdir ${MNT}
```

The following describes some commands for this example.

- The following command mounts a directory on a server that contains the package to install.

  ```
  mount -f nfs sherlock:/export/package ${MNT}
  ```

- The following command creates a temporary package administration file, `admin`, to force the `pkgadd`(1M) command not to perform checks or prompt for questions when installing a package. Use the temporary package administration file to maintain a hands-off installation when you are adding packages.

  ```
  cat >${ADMIN_FILE} <<DONT_ASK
  ```

- The following `pkgadd` command adds the package by using the `-a` option, specifying the package administration file, and the `-R` option, specifying the root path.

  ```
  /usr/sbin/pkgadd -a ${ADMIN_FILE} -d ${MNT} -R ${BASE} SUNWxyz
  ```

EXAMPLE 7–4 Adding Patches With a Finish Script

```
 #!/bin/sh

########
#
# USER-CONFIGURABLE OPTIONS
#
########

# The location of the patches to add to the system after it's installed.
# The OS rev (5.x) and the architecture ('mach') will be added to the
# root.  For example, /foo on a 8 SPARC would turn into /foo/5.8/sparc
LUPATCHHOST=ins3525-svr
LUPATCHPATHROOT=/export/solaris/patchdb
#########
```

EXAMPLE 7–4 Adding Patches With a Finish Script *(Continued)*

```
#
# NO USER-SERVICEABLE PARTS PAST THIS POINT
#
#########

BASEDIR=/a

# Figure out the source and target OS versions
echo Determining OS revisions...
SRCREV=‘uname -r‘
echo Source $SRCREV

LUPATCHPATH=$LUPATCHPATHROOT/$SRCREV/‘mach‘

#
# Add the patches needed
#
echo Adding OS patches
mount $LUPATCHHOST:$LUPATCHPATH /mnt >/dev/null 2>&1
if [ $? = 0 ] ; then
    for patch in ‘cat /mnt/*Recommended/patch_order‘ ; do
        (cd /mnt/*Recommended/$patch ; echo yes | patchadd -u -d -R $BASEDIR .)
    done
    cd /tmp
    umount /mnt
else
    echo "No patches found"
if
```

Note – In the past, the `chroot`(1M) command was used with the `pkgadd` and `patchadd` commands in the finish script environment. In rare instances, some packages or patches do not work with the `-R` option. You must create a dummy `/etc/mnttab` file in the `/a` root path before issuing the `chroot` command.

To create a dummy `/etc/mnttab` file, add the following line to your finish script:

```
cp /etc/mnttab /a/etc/mnttab
```

Customizing the Root Environment With a Finish Script

You can also use finish scripts to customize files that are already installed on a system. For example, the finish script in Example 7–5 customizes the root environment by appending information to the `.cshrc` file in the root (`/`) directory.

EXAMPLE 7–5 Customizing the Root Environment With a Finish Script

```
#!/bin/sh
#
# Customize root's environment
#
echo "***adding customizations in /.cshrc"
test -f a/.cshrc || {
cat >> a/.cshrc <<EOF
set history=100 savehist=200 filec ignoreeof prompt="\$user@'uname -n'> "
alias cp cp -i
alias mv mv -i
alias rm rm -i
alias ls ls -FC
alias h history
alias c clear
unset autologout
EOF
}
```

Setting a System's Root Password With a Finish Script

After the Solaris software is installed on a system, the system reboots. Before the boot process is completed, the system prompts for the root password. Until someone types a password, the system cannot finish booting.

A finish script that is named `set_root_pw` is saved in the `auto_install_sample` directory. The finish script shows how to set the root password automatically, without prompting. `set_root_pw` is shown in Example 7–6.

Note – If you set the system's root password with a finish script, users might attempt to discover the root password from the encrypted password in your finish script. Ensure that you safeguard against users who might try to determine the root password.

EXAMPLE 7–6 Setting the System's Root Password With a Finish Script

```
    #!/bin/sh
    #
    #       @(#)set_root_pw 1.4 93/12/23 SMI
    #
    # This is an example Bourne shell script to be run after installation.
    # It sets the system's root password to the entry defined in PASSWD.
    # The encrypted password is obtained from an existing root password entry
    # in /etc/shadow from an installed machine.

    echo "setting password for root"

    # set the root password
PASSWD=dKO5IBkSF42lw
    #create a temporary input file
cp /a/etc/shadow /a/etc/shadow.orig

    mv /a/etc/shadow /a/etc/shadow.orig
    nawk -F: '{
        if ( $1 == "root" )
          printf"%s:%s:%s:%s:%s:%s:%s:%s:%s\n",$1,passwd,$3,$4,$5,$6,$7,$8,$9
     else
               printf"%s:%s:%s:%s:%s:%s:%s:%s:%s\n",$1,$2,$3,$4,$5,$6,$7,$8,$9
     }' passwd="$PASSWD" /a/etc/shadow.orig > /a/etc/shadow
#remove the temporary file
rm -f /a/etc/shadow.orig
# set the flag so sysidroot won't prompt for the root password
sed -e 's/0 # root/1 # root/' ${SI_SYS_STATE} > /tmp/state.$$
 mv /tmp/state.$$ ${SI_SYS_STATE}
```

The following describes some of the commands in this example.

- The following command sets the variable `PASSWD` to an encrypted root password that is obtained from an existing entry in a system's `/etc/shadow` file.

  ```
  #create a temporary input file
  ```

- The following command creates a temporary input file of `/a/etc/shadow`.

  ```
  cp /a/etc/shadow /a/etc/shadow.orig
  ```

- The following command changes the root entry in the `/etc/shadow` file for the newly installed system by using `$PASSWD` as the password field.

  ```
  if ( $1 == "root" )
  ```

- The following command removes the temporary `/a/etc/shadow` file.

  ```
  rm -f /a/etc/shadow.orig
  ```

EXAMPLE 7–6 Setting the System's Root Password With a Finish Script *(Continued)*

- The following command changes the entry from `0` to a `1` in the state file so that the user is not prompted for the root password. The state file is accessed by using the variable `SI_SYS_STATE`, which has a value currently of `/a/etc/.sysIDtool.state`. To avoid problems with your scripts if this value changes, always reference this file by using `$SI_SYS_STATE`. The `sed` command that is shown here contains a tab character after the `0` and after the `1`.

```
sed -e 's/0 # root/1 # root/' ${SI_SYS_STATE} > /tmp/state.$$
```

Non-Interactive Installations With Finish Scripts

You can use finish scripts to install additional software after the Solaris OS is installed. The Solaris installation program prompts you to enter information during the installation. To maintain a hands-off installation, you can run the Solaris installation program with the `-nodisplay` or `-noconsole` options.

TABLE 7–1 Solaris Installation Options

Option	Description
`-nodisplay`	Runs the installer without a graphic user interface. Use the default product installation unless the installation was modified by the `-locales` option.
`-noconsole`	Runs the installation without any interactive text console device. Useful when paired with `-nodisplay` for UNIX script use.

For more information, see the man page `installer`(1M).

Creating a Compressed Configuration File

Instead of using the `add_install_client` command to specify the location of the custom JumpStart configuration files, you can specify the location of the files when you boot the system. However, you can only specify the name of one file. As a result, you must compress all of the custom JumpStart configuration files into one file.

- **For SPARC based systems**, you specify the location of the file in the `boot` command
- **For x86 based systems**, you specify the location of the files by editing the GRUB entry in the GRUB menu

The compressed configuration file can be one of the following types:

- `tar`
- Compressed `tar`

- `zip`
- `bzip tar`

▼ To Create a Compressed Configuration File

1 Change the directory to the JumpStart directory on the profile server.

`#` **`cd`** *jumpstart_dir_path*

2 Use a compression tool to compress the custom JumpStart configuration files into one file.

Note – The compressed configuration file cannot contain relative paths. The custom JumpStart configuration files must be in the same directory as the compressed file.

The compressed configuration file must contain the following files:

- Profile
- `rules`
- `rules.ok`

You can also include the `sysidcfg` file in the compressed configuration file.

3 Save the compressed configuration file on an NFS server, an HTTP server, or on a local hard disk.

Compressed Configuration File Example

The following example shows how to use the `tar` command to create a compressed configuration file that is named `config.tar`. The custom JumpStart configuration files are located in the `/jumpstart` directory.

EXAMPLE 7–7 Creating a Compressed Configuration File

```
# cd /jumpstart
# tar -cvf config.tar *
a profile 1K
a rules 1K
a rules.ok 1K
a sysidcfg 1K
```

Creating Disk Configuration Files

This section describes how to create single-disk and multiple-disk configuration files. Disk configuration files enable you to use `pfinstall`(1M) from a single system to test profiles against different disk configurations.

▼ SPARC: To Create a Disk Configuration File

1 Locate a SPARC based system with a disk you want to test.

2 Become superuser or assume an equivalent role.

Roles contain authorizations and privileged commands. For more information about roles, see "Configuring RBAC (Task Map)" in *System Administration Guide: Security Services*.

3 Create a single–disk configuration file by redirecting the output of the `prtvtoc`(1M) command to a file.

```
# prtvtoc /dev/rdsk/device_name >disk_config_file
```

`/dev/rdsk/`*device_name*	The device name of the system's disk. *device_name* must be in the form `c`*w*`t`*x*`d`*y*`s2` or `c`*x*`d`*y*`s2`.
disk_config_file	The name of the disk configuration file.

4 Determine if you are testing the installation of Solaris software on multiple disks.

- If no, stop. You are finished.
- If yes, concatenate the single–disk configuration files and save the output in a new file.

  ```
  # cat disk_file1 disk_file2 >multi_disk_config
  ```

  The new file becomes the multiple-disk configuration file, as in the following example.

  ```
  # cat 104_disk2 104_disk3 104_disk5 >multi_disk_test
  ```

5 Determine if the target numbers in the disk device names are unique in the multiple-disk configuration file that you created in the previous step.

- If yes, stop. You are finished.
- If no, open the file with a text editor and make the target numbers unique in the disk device names.

  For example, assume that the file contains the same target number, `t0`, for different disk device names, as shown here.

```
* /dev/rdsk/c0t0d0s2 partition map
...
* /dev/rdsk/c0t0d0s2 partition map
```

Change the second target number to `t2`, as shown here:

```
* /dev/rdsk/c0t0d0s2 partition map
...
* /dev/rdsk/c0t2d0s2 partition map
```

SPARC: Disk Configuration File Example

The following example shows how to create a single–disk configuration file, `104_test`, on a SPARC based system with a 104-Mbyte disk.

EXAMPLE 7–8 SPARC: Creating a Disk Configuration File

You redirect the output of the `prtvtoc` command to a single–disk configuration file that is named `104_test`:

```
# prtvtoc /dev/rdsk/c0t3d0s2 >104_test
```

The contents of the `104_test` file resemble the following:

```
* /dev/rdsk/c0t3d0s2 partition map
*
* Dimensions:
*     512 bytes/sector
*      72 sectors/track
*      14 tracks/cylinder
*    1008 sectors/cylinder
*    2038 cylinders*    2036 accessible cylinders
* Flags:
*   1: unmountable
*  10: read-only
*
*                          First     Sector    Last
* Partition  Tag  Flags    Sector     Count    Sector  Mount Directory
       1      2    00          0     164304   164303   /
       2      5    00          0    2052288  2052287
       3      0    00     164304     823536   987839   /disk2/b298
       5      0    00     987840     614880  1602719   /install/298/sparc/work
       7      0    00    1602720     449568  2052287   /space
```

You have created disk configuration files for a SPARC based system. "Testing a Profile" on page 94 contains information about using disk configuration files to test profiles.

▼ x86: To Create a Disk Configuration File

1 Locate an x86 based system that contains a disk that you are testing.

2 Become superuser or assume an equivalent role.

Roles contain authorizations and privileged commands. For more information about roles, see "Configuring RBAC (Task Map)" in *System Administration Guide: Security Services*.

3 Create part of the single-disk configuration file by saving the output of the `fdisk`(1M) command in a file.

`#` `fdisk -R -W` *disk_config_file* **`-h /dev/rdsk/`***device_name*

disk_config_file	The name of a disk configuration file.
`/dev/rdsk/`*device_name*	The device name of the `fdisk` layout of the entire disk. *device_name* must be in the form c*w*t*x*d*y*`s0` or c*x*d*y*`s0`.

4 Append the output of the `prtvtoc`(1M) command to the disk configuration file:

`#` `prtvtoc /dev/rdsk/`*device_name* **`>>`***disk_config*

`/dev/rdsk/`*device_name*	The device name of the system's disk. *device_name* must be in the form c*w*t*x*d*y*`s2` or c*x*d*y*`s2`.
disk_config	The name of the disk configuration file.

5 Determine if you are testing the installation of Solaris software on multiple disks.

- If no, stop. You are finished.
- If yes, concatenate the single-disk configuration files and save the output in a new file.

  `#` `cat` *disk_file1 disk_file2* **`>`***multi_disk_config*

  The new file becomes the multiple-disk configuration file, as in the following example.

  ```
  # cat 104_disk2 104_disk3 104_disk5 >multi_disk_test
  ```

6 Determine if the target numbers in the disk device names are unique in the multiple-disk configuration file that you created in the previous step.

- If yes, stop. You are finished.
- If no, open the file with a text editor and make the target numbers unique.

  For example, the file might contain the same target number, `t0`, for different disk device names as shown here:

```
* /dev/rdsk/c0t0d0s2 partition map
...
* /dev/rdsk/c0t0d0s2 partition map
```

Change the second target number to `t2`, as shown here:

```
* /dev/rdsk/c0t0d0s2 partition map
...
* /dev/rdsk/c0t2d0s2 partition map
```

x86: Disk Configuration File Example

The following example shows how to create a single-disk configuration file, `500_test`, on an x86 based system that contains a 500-Mbyte disk.

EXAMPLE 7–9 x86: Creating a Disk Configuration File

First, you save the output of the `fdisk` command to a file that is named `500_test`:

```
# fdisk -R -W 500_test -h /dev/rdsk/c0t0d0p0
```

The `500_test` file looks like the following:

```
 * /dev/rdsk/c0t0d0p0 default fdisk table
* Dimensions:
*     512 bytes/sector
*      94 sectors/track
*      15 tracks/cylinder
*    1455 cylinders
*
*  HBA Dimensions:
*     512 bytes/sector
*      94 sectors/track
*      15 tracks/cylinder
*    1455 cylinders
*
* systid:
*  1:    DOSOS12
*  2:    PCIXOS
*  4:    DOSOS16
*  5:    EXTDOS
*  6:    DOSBIG
*  86:   DOSDATA
*  98:   OTHEROS
*  99:   UNIXOS
* 130:   SUNIXOS
```

EXAMPLE 7–9 x86: Creating a Disk Configuration File *(Continued)*

```
*
* Id  Act Bhead Bsect   Bcyl  Ehead  Esect  Ecyl Rsect  Numsect
 130  128 44    3       0     46    30     1001 1410   2050140
```

Second, you append the output of the `prtvtoc` command to the `500_test` file:

```
# prtvtoc /dev/rdsk/c0t0d0s2 >>500_test
```

The `500_test` file is now a complete disk configuration file:

```
* /dev/rdsk/c0t0d0p0 default fdisk table
* Dimensions:
*     512 bytes/sector
*      94 sectors/track
*      15 tracks/cylinder
*    1455 cylinders
*
*  HBA Dimensions:
*     512 bytes/sector
*      94 sectors/track
*      15 tracks/cylinder
*    1455 cylinders
*
* systid:
*  1:    DOSOS12
*  2:    PCIXOS
*  4:    DOSOS16
*  5:    EXTDOS
*  6:    DOSBIG
*  86:   DOSDATA
*  98:   OTHEROS
*  99:   UNIXOS
*  130:  SUNIXOS
*
* Id  Act Bhead Bsect Bcyl  Ehead  Esec  Ecyl Rsect  Numsect
 130  128 44    3     0     46    30    1001 1410   2050140
* /dev/rdsk/c0t0d0s2 partition map
*
* Dimensions:
*      512 bytes/sector
*       94 sectors/track
*       15 tracks/cylinder
*     1110 sectors/cylinder
*     1454 cylinders
*     1452 accessible cylinders
```

EXAMPLE 7–9 x86: Creating a Disk Configuration File *(Continued)*

```
*
* Flags:
*   1: unmountable
*  10: read-only
*                          First    Sector    Last
* Partition  Tag  Flags    Sector     Count    Sector  Mount Directory
       2      5    01       1410   2045910   2047319
       7      6    00       4230   2043090   2047319  /space
       8      1    01          0      1410     1409
       9      9    01       1410      2820     422987
```

You have created disk configuration files for an x86 based system. "Testing a Profile" on page 94 contains information about using disk configuration files to test profiles.

Using a Site-Specific Installation Program

You can also use begin and finish scripts to create your own installation program to install Solaris software.

When you specify a minus sign (`-`) in the profile field, begin and finish scripts control how Solaris software is installed on a system instead of the profile and the Solaris installation program.

For example, if the following rule matches a system, the `x_install.beg` begin script and the `x_install.fin` finish script install Solaris software on the system that is named `clover`:

```
hostname clover x_install.beg - x_install.fin
```

◆ ◆ ◆ CHAPTER 8

Creating Custom Rule and Probe Keywords (Tasks)

This chapter provides information and procedures for creating your own custom rule and probe keywords.

Probe Keywords

To understand what a probe keyword is, you first need to recall what a rule keyword is. A rule keyword is a predefined lexical unit or word that describes a general system attribute, such as host name, `hostname`, or memory size, `memsize`. Rule keywords and the values that are associated with them enable you to match a system that has the same attribute to a profile. This match of a system's attributes defines how the Solaris software is to be installed on each system in the group.

Custom JumpStart environment variables, which you use in begin and finish scripts, are set on demand. For example, information about which operating system is already installed on a system is only available in `SI_INSTALLED` after the `installed` rule keyword is used.

In some situations, you might need to extract the same information in a begin or finish script for a purpose other than to match a system and run a profile. Probe keywords provide the solution. Probe keywords extract attribute information and remove the need for you to set up a matching condition and run a profile.

For a list of probe keywords and values, see "Probe Keywords and Values" on page 192.

Creating a custom_probes File

The rule and probe keywords that are described in "Rule Keywords and Values" on page 147 and "Probe Keywords and Values" on page 192 might not be precise enough for your needs. You can define your own custom rule or probe keywords by creating a custom_probes file.

The custom_probes file is a Bourne shell script that contains two types of functions. You must save the custom_probes file in the same JumpStart directory where you saved the rules file. The two types of functions that you can define in a custom_probes file are as follows:

- Probe – Gathers the information you want or does the actual work and sets a corresponding SI_ environment variable that you define. Probe functions become probe keywords.
- Comparison – Calls a corresponding probe function, compares the output of the probe function, and returns 0 if the keyword matches or 1 if the keyword does not match. Comparison functions become rule keywords.

Syntax of the custom_probes File

The custom_probes file can contain any valid Bourne shell command, variable, or algorithm.

Note – You can define probe and comparison functions that require a single argument in the custom_probes file. When you use the corresponding custom probe keyword in the rules file, the argument after the keyword is interpreted (as $1).

When you use the corresponding custom rule keyword in the rules file, the arguments are interpreted in sequence. The sequence starts after the keyword and ends before the next && or begin script, whichever comes first.

The custom_probes file must meet the following requirements:

- Have the name custom_probes
- Have root as its owner
- Be executable and have permissions set to 755
- Contain at least one probe function and one corresponding comparison function

To improve clarity and organization, define all probe functions first, at the top of the file, followed by all comparison functions.

Syntax of Function Names in custom_probes

The name of a probe function must begin with probe_. The name of a comparison function must begin with cmp_.

Functions that begin with probe_ define new probe keywords. For example, the function probe_tcx defines the new probe keyword tcx. Functions that begin with cmp_ define new rule keywords. For example, cmp_tcx defines the new rule keyword tcx.

▼ To Create a custom_probes File

1 **Use a text editor to create a Bourne shell script text file. Name the file** custom_probes**.**

2 **In the** custom_probes **text file, define your probe and comparison functions.**

Note – You can define probe and comparison functions that require arguments in the custom_probes file. When you use the corresponding custom probe keyword in the rules file, the arguments after the keyword are interpreted in sequence (as $1, $2, and so on).

When you use the corresponding custom rule keyword in the rules file, the arguments are interpreted in sequence. The sequence starts after the keyword and ends before the next && or begin script, whichever comes first.

---

3 **Save the** custom_probes **file in the JumpStart directory next to the** rules **file.**

4 **Ensure that** root **owns the** rules **file and that the permissions are set to 644.**

Examples of a custom_probes File and Keyword

You can find additional examples of probe and comparison functions in the following directories:

- /usr/sbin/install.d/chkprobe on a system that has the Solaris software installed
- /Solaris_10_606/Tools/Boot/usr/sbin/install.d/chkprobe on the Solaris Operating System DVD or on the Solaris Software - 1 CD

The following custom_probes file contains a probe and comparison function that tests for the presence of a TCX graphics card.

EXAMPLE 8–1 custom_probes File

```
#!/bin/sh
#
# custom_probe script to test for the presence of a TCX graphics card.
#

#
# PROBE FUNCTIONS
#
```

EXAMPLE 8–1 custom_probes File *(Continued)*

```
probe_tcx() {
  SI_TCX=‘modinfo | grep tcx | nawk ’{print $6}’‘
  export SI_TCX
}

#
# COMPARISON FUNCTIONS
#
cmp_tcx() {
  probe_tcx

  if [ "X${SI_TCX}" = "X${1}" ]; then
     return 0
  else
     return 1
  if
}
```

The following example `rules` file shows the use of the probe keyword that is defined in the preceding example, `tcx`. If a TCX graphics card is installed and found in a system, `profile_tcx` is run. Otherwise, `profile` is run.

Note – Always place probe keywords at or near the beginning of the `rules` file. This placement ensures that the keywords are read and run before other rule keywords that might rely on the probe keywords.

EXAMPLE 8–2 Custom Probe Keyword Used in a `rules` File

```
probe tcx
tcx     tcx     -     profile_tcx     -
any     any     -     profile         -
```

Validating the `custom_probes` File

Before you can use a profile, `rules`, and `custom_probes` file, you must run the `check` script to validate that the files are set up correctly. If all profiles, rules, and probe and comparison functions are correctly set up, the `rules.ok` and `custom_probes.ok` files are created. Table 8–1 describes what the `check` script does.

TABLE 8–1 What Happens When You Use the check Script

Stage	Description
1	check searches for a custom_probes file.
2	If the file exists, check creates the custom_probes.ok file from the custom_probes file, removes all comments and blank lines, and retains all Bourne shell commands, variables, and algorithms. Then, check adds the following comment line at the end: `# version=2 checksum=num`

▼ To Validate the custom_probes File

1 Verify that the check script is located in the JumpStart directory.

Note – The check script is in the Solaris_10_606/Misc/jumpstart_sample directory on the Solaris Operating System DVD or on the Solaris Software - 1 CD.

2 Change to the JumpStart directory.

3 Run the check script to validate the rules and custom_probes files.

```
$ ./check -p path -r file_name
```

-p *path* — Validates the custom_probes file by using the check script from the Solaris software image for your platform instead of the check script from the system you are using. *path* is the image on a local disk or a mounted Solaris Operating System DVD or Solaris Software - 1 CD.

Use this option to run the most recent version of check if your system is running a previous version of Solaris.

-r *file_name* — Specifies a file name other than the one that is named custom_probes. By using the -r option, you can test the validity of a set of functions before integrating the functions into the custom_probes file.

As the check script runs, the script reports the validity of the rules and custom_probes files and each profile. If no errors are encountered, the script reports: "The custom JumpStart configuration is ok" and creates the rules.ok and custom_probes.ok files in the JumpStart directory.

4 Determine if the custom_probes.ok file is executable.

- If yes, go to Step 5.
- If no, type the following command.

```
# chmod +x custom_probes
```

5 Ensure that root owns the custom_probes.ok file and that the permissions are set to 755.

◆ ◆ ◆ CHAPTER 9

Performing a Custom JumpStart Installation (Tasks)

This chapter describes how to perform a custom JumpStart installation on a SPARC based or an x86 based system. You need to follow these procedures on the system on which you intend to install the Solaris software.

SPARC: Task Map: Setting Up a System for a Custom JumpStart Installation

TABLE 9–1 Task Map: Setting Up a System for a Custom JumpStart Installation

Task	Description	For Instructions
Check if the system is supported.	Check the hardware documentation for system support in the Solaris environment.	*Solaris Sun Hardware Platform Guide* at `http://docs.sun.com`
Check if the system has enough disk space for the Solaris software.	Verify that you have planned enough space to install the Solaris software on your system.	Chapter 3
(Optional) Set system parameters.	You can preconfigure system information to avoid being prompted for the information during the installation or upgrade.	Chapter 6, "Preconfiguring System Configuration Information (Tasks)," in *Solaris 10 6/06 Installation Guide: Network-Based Installations*
Prepare the system for custom JumpStart installation.	Create and validate a `rules` file and profile files.	Chapter 6

TABLE 9–1 Task Map: Setting Up a System for a Custom JumpStart Installation *(Continued)*

Task	Description	For Instructions
(Optional) Prepare optional custom JumpStart features.	If you are using begin scripts, finish scripts, or other optional features, prepare the scripts or files.	Chapter 7 and Chapter 8
(Optional) Prepare to install the Solaris software from the network.	To install a system from a remote Solaris Operating System DVD or Solaris Software for SPARC Platforms CD image, you need to set up the system to boot and install from an install server or a boot server.	Chapter 8, "Preparing to Install From the Network With DVD Media (Tasks)," in *Solaris 10 6/06 Installation Guide: Network-Based Installations* Chapter 9, "Preparing to Install From the Network With CD Media (Tasks)," in *Solaris 10 6/06 Installation Guide: Network-Based Installations*
(Optional) Prepare for a Solaris Flash archive installation.	Set up specifics for a Solaris Flash archive installation.	"To Prepare to Install a Solaris Flash Archive With a Custom JumpStart Installation" on page 124
Perform an installation or upgrade.	Boot the system to initiate the installation or upgrade.	"SPARC: To Perform an Installation or Upgrade With the Custom JumpStart Program" on page 127

SPARC: Performing a Custom JumpStart Installation

During a custom JumpStart installation, the JumpStart program attempts to match the system that is being installed to the rules in the `rules.ok` file. The JumpStart program reads the rules from the first rule through the last. A match occurs when the system that is being installed matches all the system attributes that are defined in the rule. When a system matches a rule, the JumpStart program stops reading the `rules.ok` file and begins to install the system, based on the matched rule's profile.

▼ To Prepare to Install a Solaris Flash Archive With a Custom JumpStart Installation

You can install a full archive for an initial installation or if you have already installed an archive, a differential archive for an update. You can use the custom JumpStart installation method or use Solaris Live Upgrade to install an archive on an inactive boot environment. This procedure provides the instructions to install an archive with custom JumpStart.

- For an overview of a full or differential archive, see Chapter 1, "Solaris Flash (Overview)," in *Solaris 10 6/06 Installation Guide: Solaris Flash Archives (Creation and Installation)*.

- For procedures about installing an archive on an inactive boot environment by using Solaris Live Upgrade, see "To Install a Solaris Flash Archive With a Profile (Command-Line Interface)" in *Solaris 10 6/06 Installation Guide: Solaris Live Upgrade and Upgrade Planning*.

1 Review the following limitations.

Description	Example
Caution: When using the `archive_location` keyword to install a Solaris Flash archive, the archive and the installation media must contain identical operating system versions.	For example, if the archive is a Solaris 10 operating system and you are using DVD media, then you must use Solaris 10 DVD media to install the archive. If the operating systems versions do not match, the installation on the clone system fails.
Caution – A Solaris Flash archive cannot be properly created when a non-global zone is installed. The Solaris Flash feature is not compatible with the Solaris Zones partitioning technology. If you create a Solaris 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	

2 On the install server, create the custom JumpStart `rules` file.

For detailed instructions about creating custom JumpStart files, refer to Chapter 6.

3 On the install server, create the custom JumpStart profile file.

For examples of Solaris Flash archive profiles, see "Profile Examples" on page 83.

From the existing list of custom JumpStart keywords in Table 11–2, the only keywords valid when you install a Solaris Flash archive are the following:

Keyword	Initial Installation	Differential Archive
(required)`archive_location`	X	X
`fdisk` (x86 only)	X	X
`filesys`	X	
Note – You cannot set the `filesys` keyword to the value `auto`.		
`forced_deployment`		X
(required) `install_type`	X	X

Keyword	Initial Installation	Differential Archive
`local_customization`	X	X
`no_content_check`		X
`no_master_check`		X
`package`	X	
`root_device`	X	X

a. Set the value of the keyword `install_type` to one of the following types.

- For a full archive installation, set the value to `flash_install`.
- For a differential archive installation, set the value to `flash_update`.

b. Add the path to the Solaris Flash archive by using the `archive_location` keyword.

For details about the `archive_location` keyword, refer to "`archive_location` Keyword" on page 153.

c. Specify the file system configuration.

The Solaris Flash archive extraction process does not support auto-layout of partitions.

d. (Optional) If you want to install additional packages at the same time you install an archive, use the `package` keyword. For more information, see "`package` Profile Keyword" on page 177.

e. (Optional) If you want to install an additional Solaris Flash archive on the clone system, add one `archive_location` line for each archive that you want to install.

4 On the install server, add the clients that you are installing with the Solaris Flash archive.

For detailed instructions, refer to the following:

- "Adding Systems to Be Installed From the Network With a DVD Image" in *Solaris 10 6/06 Installation Guide: Network-Based Installations*
- "Adding Systems to Be Installed From the Network With a CD Image" in *Solaris 10 6/06 Installation Guide: Network-Based Installations*

5 Perform the custom JumpStart installation on the clone systems.

For detailed instructions, refer to "SPARC: To Perform an Installation or Upgrade With the Custom JumpStart Program" on page 127.

▼ SPARC: To Perform an Installation or Upgrade With the Custom JumpStart Program

1 If the system is part of a network, ensure that an Ethernet connector or similar network adapter is attached to your system.

2 If you are installing a system that is connected through a `tip`(1) line, ensure that your window display is at least 80 columns wide and 24 rows long.

To determine the current dimensions of your `tip` window, use the `stty`(1) command.

3 If you are using the system's DVD-ROM or CD-ROM drive to install the Solaris software, insert the Solaris Operating System for SPARC Platforms DVD or the Solaris Software for SPARC Platforms - 1 CD in the drive.

4 If you are using a profile diskette, insert the profile diskette in the system's diskette drive.

5 Boot the system.

- If the system is new, out–of–the–box, turn on the system.
- If you want to install or upgrade an existing system, shut down the system. At the `ok` prompt, type the appropriate options for the boot command. The syntax of the `boot` command is the following.

  ```
  ok boot [cd–dvd|net] - install [url|ask] options
  ```

  For example, if you type the following command, the OS is installed over the network by using a JumpStart profile.

  ```
  ok boot net - install http://131.141.2.32/jumpstart/config.tar
  ```

  For a description of the boot command options, see the following table.

SPARC only – The system checks hardware and system components and your SPARC based system boots. Booting lasts several minutes.

---

6 If you did not preconfigure system information in the `sysidcfg` file, when prompted, answer the questions about system configuration.

7 Follow the instructions on the screen to install the software.

When the JumpStart program finishes installing the Solaris software, the system reboots automatically.

After the installation is finished, installation logs are saved in a file. You can find the installation logs in the following directories:

- `/var/sadm/system/logs`
- `/var/sadm/install/logs`

SPARC: Command Reference for the `boot` Command

The syntax of the `boot` command is the following.

`ok` **`boot`** [*cd–dvd*|**`net`**] **`- install`** [*url*|**`ask`**] *options*

The following table describes the command-line options for the `boot` command that are appropriate for a JumpStart installation.

Option	Description
[*cd–dvd*|net]	Specifies to boot from a CD or a DVD or to boot from an install server on the network. ■ *cd-dvd* - Use `cdrom` to boot from a CD or a DVD. ■ `net` - Specifies to boot from an install server on the network.

[*url*| ask]	Specifies the location of the custom JumpStart files or prompts you for the location.
	■ *url* – Specifies the path to the files. You can specify a URL for files that are located in an HTTP or HTTPS server:
	HTTP server
	`http://`*server_name:IP_address/jumpstart_dir_path/ compressed_config_file&proxy_info*
	■ If you placed a `sysidcfg` file in the compressed configuration file, you must specify the IP address of the server that contains the file, as in the following example:
	`http://131.141.2.32/jumpstart/config.tar`
	■ If you saved the compressed configuration file on an HTTP server that is behind a firewall, you must use a proxy specifier during boot. You do not need to specify an IP address for the server that contains the file. You must specify an IP address for the proxy server, as in the following example:
	`http://www.shadow.com/jumpstart/ config.tar&proxy=131.141.6.151`
	■ `ask` – Specifies that the installation program prompt you to type the location of the compressed configuration file. The prompt happens after the system boots and connects to the network. If you use this option, you are not able to do a completely hands off JumpStart installation.
	If you bypass the prompt by pressing Return, the Solaris installation program interactively configures the network parameters. The installation program then prompts you for the location of the compressed configuration file.

Option	Description
options	■ `dhcp` – Specifies to use a DHCP server to obtain network installation information that is needed to boot the system. This option is not needed for a JumpStart installation. If you do not specify to use a DHCP server by typing `dhcp`, the system uses the `/etc/bootparams` file or the name service `bootparams` database. For example, you would not specify `dhcp` if you wanted keep a static IP address. ■ The options `nowin` and `text` do not apply to a JumpStart installation. These options are useful with an interactive installation. For more information, see "To Install or Upgrade With the Solaris Installation Program" in *Solaris 10 6/06 Installation Guide: Basic Installations*.

x86: Task Map: Setting Up a System for a Custom JumpStart Installation

TABLE 9–2 x86: Task Map: Setting Up a System for a Custom JumpStart Installation

Task	Description	For Instructions
Determine if you need to preserve an existing operating system and user data.	If the existing operating system on the system uses the entire disk, you must preserve the existing operating system so it can co-exist with the Solaris 10 6/06 software. This decision determines how to specify the `fdisk`(1M) keyword in the system's profile.	"x86: `fdisk` Profile Keyword" on page 165
Check if the system is supported.	Check the hardware documentation for system support in the Solaris environment.	Hardware manufacturer's documentation
Check if the system has enough disk space for the Solaris software.	Verify that you have planned enough space to install the Solaris software on your system.	Chapter 3
(Optional) Set system parameters.	You can preconfigure system information to avoid being prompted for the information during the installation or upgrade.	Chapter 6, "Preconfiguring System Configuration Information (Tasks)," in *Solaris 10 6/06 Installation Guide: Network-Based Installations*
Prepare the system for custom JumpStart installation.	Create and validate a `rules` file and profile files.	Chapter 6
(Optional) Prepare optional custom JumpStart features.	If you are using begin scripts, finish scripts, or other optional features, prepare the scripts or files.	Chapter 7 and Chapter 8

TABLE 9–2 x86: Task Map: Setting Up a System for a Custom JumpStart Installation *(Continued)*

Task	Description	For Instructions
(Optional) Prepare to install the Solaris software from the network.	To install a system from a remote Solaris Operating System for x86 Platforms DVD or Solaris Software For x86 Platforms CD image, you need to set up the system to boot and install from an install server or a boot server.	Chapter 9, "Preparing to Install From the Network With CD Media (Tasks)," in *Solaris 10 6/06 Installation Guide: Network-Based Installations*
(Optional) Prepare for a Solaris Flash archive installation.	Set up specifics for a Solaris Flash archive installation.	"To Prepare to Install a Solaris Flash Archive With a Custom JumpStart Installation" on page 124
Perform an installation or upgrade.	Boot the system to initiate the installation or upgrade.	"x86: To Perform an Installation or Upgrade With the Custom JumpStart Program and With GRUB" on page 130

x86: Performing a Custom JumpStart Installation

During a custom JumpStart installation, the JumpStart program attempts to match the system that is being installed to the rules in the `rules.ok` file. The JumpStart program reads the rules from the first rule through the last rule. A match occurs when the system that is being installed matches all of the system attributes that are defined in the rule. As soon as a system matches a rule, the JumpStart program stops reading the `rules.ok` file and begins to install the system, based on the matched rule's profile.

You can install a Solaris Flash archive with custom JumpStart. For instructions, see "To Prepare to Install a Solaris Flash Archive With a Custom JumpStart Installation" on page 124.

Choose one of the following procedures:

- For a standard custom JumpStart procedure, see "x86: To Perform an Installation or Upgrade With the Custom JumpStart Program and With GRUB" on page 130.
- To perform a custom JumpStart by editing the GRUB command, see "x86: Performing a Custom JumpStart Installation by Editing the GRUB Boot Command" on page 133.

▼ x86: To Perform an Installation or Upgrade With the Custom JumpStart Program and With GRUB

Use this procedure to install the Solaris OS for an x86 based system with the GRUB menu.

1 If the system is part of a network, ensure that an Ethernet connector or similar network adapter is attached to your system.

2 If you want to install a system that is connected through a `tip`(1) line, ensure that your window display is at least 80 columns wide and 24 rows long.

To determine the current dimensions of your `tip` window, use the `stty`(1) command.

3 Decide if you want to use a profile diskette.

A profile diskette is no longer used to boot the system but, a diskette can be prepared that includes only the JumpStart directory. The diskette can then be used situations such as performing a JumpStart installation and booting off the CD-ROM.

- If you are using a profile diskette, insert the profile diskette into the system's diskette drive.
- If you are not using a profile diskette, continue with step Step 4.

4 Decide how to boot the system.

- If you boot from the Solaris Operating System DVD or the Solaris Software - 1 CD, insert the disc. Your system's BIOS must support booting from a DVD or CD.
- If you boot from the network, use Preboot Execution Environment (PXE) network boot. The system must support PXE. Enable the system to use PXE by using the system's BIOS setup tool or the network adapter's configuration setup tool.

5 (Optional) If you are booting from a DVD or CD, change the boot setting in your system's BIOS and set to boot from DVD or CD media. See your hardware documentation for instructions.

6 If the system is off, turn the system on. If the system is on, reboot the system.

The GRUB menu is displayed. This menu provides a list of boot entries. The entry that is provided is the Solaris instance to be installed.

```
GNU GRUB version 0.95 (631K lower / 2095488K upper memory)
+-------------------------------------------------------------------+
|Solaris 10 image_directory                                         |
|                                                                    |
+-------------------------------------------------------------------+
Use the ^ and v keys to select which entry is highlighted. Press
enter to boot the selected OS, 'e' to edit the commands before
booting, or 'c' for a command-line.
```

The *image_directory* is the name of the directory where the installation image is located. The path to the JumpStart files was defined with the `add_install_client` command and the `-c` option.

Note – Instead of booting from the GRUB entry now, you can edit the boot entry. After editing the GRUB entry, you then perform the JumpStart installation. For instructions about how to edit the GRUB entry and a list of installation options, see "x86: Performing a Custom JumpStart Installation by Editing the GRUB Boot Command" on page 133.

---

7 On the Boot Solaris screen, select the device from which to boot the system. Select DVD, CD, Net, or Disk.

8 At the prompt, perform one of the following instructions:

```
Select the type of installation you want to perform:

        1 Solaris Interactive
        2 Custom JumpStart
        3 Solaris Interactive Text (Desktop session)
        4 Solaris Interactive Text (Console session)
        5. Apply driver updates
        6. Single User Shell
Enter the number of your choice.
Please make a selection (1-6).
```

To select the custom JumpStart method, type **2** and press Enter.

The JumpStart installation begins.

Note –

- If you do not make a selection within 30 seconds, the Solaris interactive installation program begins. You can stop the timer by typing any key at the command line.
- If you select items 1, 3, or 4, you install with an interactive installation. For information about interactive installations, see *Solaris 10 6/06 Installation Guide: Basic Installations*.
- For information about these installations, see the *Solaris 10 6/06 Installation Guide: Basic Installations*.
  - If you select item 5, you install driver updates.
  - If you select item 6, you can perform maintenance tasks.

---

9 If you did not preconfigure system information in the `sysidcfg` file, when prompted, answer the questions about system configuration.

10 Follow the instructions on the screen to install the software.

When the JumpStart program finishes installing the Solaris software, the system reboots automatically. Also, the GRUB `menu.lst` file is automatically updated. Then the instance of Solaris that you have installed appears in the next use of the GRUB menu.

After the installation is finished, installation logs are saved in a file. You can find the installation logs in the following directories:

- `/var/sadm/system/logs`
- `/var/sadm/install/logs`

x86: Performing a Custom JumpStart Installation by Editing the GRUB Boot Command

In some circumstances such as for debugging purposes, you might want to modify the GRUB boot command. The following procedure describes the steps to edit the GRUB boot command before performing the custom JumpStart installation.

▼ x86: To Modify the GRUB Boot Command

1 **To begin the installation, proceed with Step 1 through Step 5 in the preceding procedure, "x86: To Perform an Installation or Upgrade With the Custom JumpStart Program and With GRUB" on page 130.**

2 **If the system is off, turn the system on. If the system is on, reboot the system.**

The GRUB menu is displayed. This menu provides a list of boot entries. The entry that is provided is the Solaris instance to be installed.

```
GNU GRUB version 0.95 (631K lower / 2095488K upper memory)
+-------------------------------------------------------------------+
|Solaris 10 image_directory                                         |
|                                                                    |
+-------------------------------------------------------------------+
Use the ^ and v keys to select which entry is highlighted. Press
enter to boot the selected OS, 'e' to edit the commands before
booting, or 'c' for a command-line.
```

The *image_directory* is the name of the directory where the installation image is located.

Note –

- If you used the NFS to set the path to the JumpStart directory with the `add_install_client` command and the `-c` option, then you do not need to include the path in the boot entry.
- If you are not using NFS, then you must note the path to the compressed configuration file that contains the JumpStart directory.

---

3 **To stop the booting process and use the menu entry editor, type `e`.**

The GRUB edit menu is displayed.

```
kernel /I86PC.Solaris_11-8/multiboot kernel/unix -B console=ttyb,\
install_media=131.141.2.32:/export/mary/v11 \
module /I86PC.Solaris_11-8/x86.new
```

4 **Use the arrow keys to select the boot entry.**

5 To edit the selected command, type e.

A command that is similar to the following example displays.

```
grub edit>kernel /I86PC.Solaris_11-8/multiboot kernel/unix -B \
console=ttyb,install_media=131.141.2.32:/export/mary/_\
module /I86PC.Solaris_11-8/x86.new
```

6 Edit the command by typing the options that you need.

The syntax for a JumpStart installation is the following.

```
grub edit>kernel /I86PC.Solaris_11-image_directory/multiboot kernel/unix/ \
install [url|ask] options -B install_media=media_type
```

For a description of JumpStart options, see "x86: Command Reference for Booting the System" on page 134.

In the following example, the OS is installed over the network with a custom JumpStart profile.

```
kernel /I86PC.Solaris_11-8/multiboot kernel/unix/ install \
-B install_media=131.141.2.32:/export/mary/v11 \
module /I86PC.Solaris_11-8/x86.new
```

7 To accept the edits, press Enter.

Your changes are saved and the GRUB main menu is displayed.

Note – Pressing the Escape key returns you to the GRUB main menu without saving your changes.

---

8 To begin the installation, type b.

x86: Command Reference for Booting the System

The following table describes the command-line options for the GRUB menu boot command. The options listed are appropriate for a JumpStart installation.

The syntax of the boot command is the following.

```
kernel /I86PC.Solaris_11-image_directory/multiboot kernel/unix/ install \
[url|ask] options -B install_media=media_type
```

TABLE 9–3 GRUB Menu Boot Command Reference

Option	Description

`install`	Performs a custom JumpStart installation.
	
	In the following example, the system boots from DVD media and the following options were used:
	■ `install` performs a custom JumpStart
	■ `file://jumpstart/config.tar` finds the JumpStart profile on the local disk
	
	`kernel /I86pc.Solaris_11.8/multiboot` **`install file://jumpstart/config.tar`** `\`
	`-B install_media=dvdrom module /I86Solaris_11.8/x86.new`

[*url*| ask]	Specifies the location of the custom JumpStart files or prompts you for the location.
	■ *url* – Specifies the path to the files. You can specify a URL for files that are located on an HTTP or HTTPS server:
	The syntax for an HTTP server is the following:
	
	`http://`*server_name:IP_address/jumpstart_dir_path/ compressed_config_file&proxy_info*
	■ If you placed a `sysidcfg` file in the compressed configuration file, you must specify the IP address of the server that contains the file, as in the following example:
	
	`kernel /I86pc.Solaris_11.8/multiboot` **`install \`**
	`http://192.168.2.1/jumpstart/config.tar` `\`
	`-B install_media=192.168.2.1/export/Solaris_11.8/boot \`
	`module /I86PC.Solaris_11.8/x86.new`
	■ If you saved the compressed configuration file on an HTTP server that is behind a firewall, you must use a proxy specifier during boot. You do not need to specify an IP address for the server that contains the file. You must specify an IP address for the proxy server, as in the following example:
	
	`kernel /I86pc.Solaris_11.8/multiboot` **`install \`**
	`http://www.shadow.com/jumpstart/config.tar&proxy=131.141.6.151` `\`
	`-B install_media=192.168.2.1/export/Solaris_11.8/boot \`
	`module /I86PC.Solaris_11.8/x86.new`

TABLE 9–3 GRUB Menu Boot Command Reference *(Continued)*

Option	Description

	■ `ask` – Specifies that the installation program prompt you to type the location of the compressed configuration file. You are prompted after the system boots and connects to the network. If you use this option, you are not able to do a completely hands off JumpStart installation.
	If you bypass the prompt by pressing Return, the Solaris installation program interactively configures the network parameters. The installation program then prompts you for the location of the compressed configuration file.
	The following example performs a custom JumpStart and boots from DVD media. You are prompted to type the location of the configuration file after the system connects to the network.
	
	`kernal /boot/multiboot kernel/unix` **`install ask`** `-B \`
	`install_media=192.168.2.1:export/sol_11_x86/boot module \`
	`/I86PC.Solaris_11.8_`

options	■ `dhcp` – Specifies to use a DHCP server to obtain network installation information that is needed to boot the system. This option is not needed for a JumpStart installation. If you do not specify to use a DHCP server by typing `dhcp`, the system uses the `/etc/bootparams` file or the name service `bootparams` database. For example, you would not specify `dhcp` if you wanted keep a static IP address. For example:
	
	`kernel /I86pc.Solaris_11.8/multiboot` **`install`** `\`
	`dhcp` `-B install_media=192.168.2.1:/export/Solaris_11.8/ \`
	`boot module /I86PC.Solaris_11.8/x86.new`
	■ The options `nowin` and `text` do not apply to a JumpStart installation. These options are useful with an interactive installation. For more information, see "To Install or Upgrade With the Solaris Installation Program With GRUB" in *Solaris 10 6/06 Installation Guide: Basic Installations*.

◆ ◆ ◆ CHAPTER 10

Installing With Custom JumpStart (Examples)

This chapter provides an example of setting up and installing Solaris software on both SPARC based and x86 based systems by using a custom JumpStart installation.

Sample Site Setup

Figure 10–1 shows the site setup for this example.

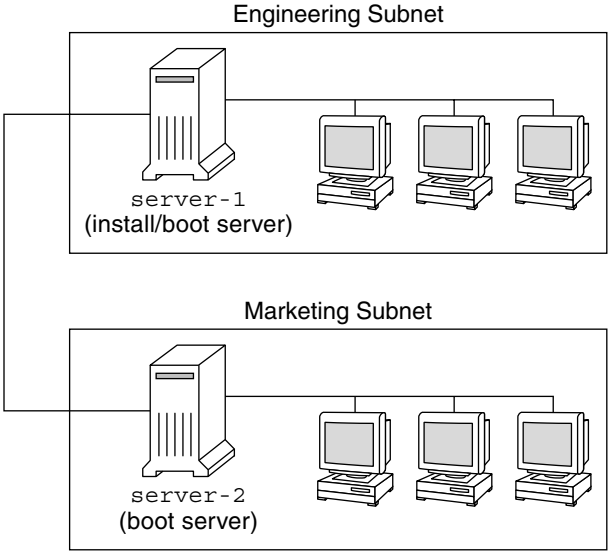


FIGURE 10–1 Sample Site Setup

At this sample site, the conditions are as follows:

- SPARC: The engineering group is located on its own subnet. This group uses SPARCstation™ systems for software development.
- x86: The marketing group is located on its own subnet. This group uses x86 based systems for running word processors, spreadsheets, and other office productivity tools.
- The site uses NIS. The Ethernet addresses, IP addresses, and host names of the systems are preconfigured in the NIS maps. The subnet mask, date and time, and geographic region for the site are also preconfigured in the NIS maps.

  Note – The peripheral devices for the marketing systems are preconfigured in the `sysidcfg` file.

- Both the engineering and marketing systems are to be installed with Solaris 10 6/06 software from the network.

Create an Install Server

Because the groups need to install Solaris 10 6/06 software from the network, you make `server-1` an install server for both groups. You use the `setup_install_server`(1M) command to copy the images to the `server-1` local disk (in the `/export/install` directory). Copy the images from the either of the following media.

- Solaris Software CDs and the Solaris Languages CD
- Solaris Operating System DVD

You must copy the image from the disc to an empty directory, in these examples the `sparc_10_606` directory and the `x86_10_606` directory.

EXAMPLE 10–1 SPARC: Copying the Solaris 10 6/06 CDs

Insert the Solaris Software for SPARC Platforms - 1 CD in the CD-ROM drive that is attached to `server-1` and type the following commands:

```
server-1# mkdir -p /export/install/sparc_10_606
server-1# cd /CD_mount_point/Solaris_10_606/Tools
server-1# ./setup_install_server /export/install/sparc_10_606
```

Insert the Solaris Software for SPARC Platforms - 2 CD in the CD-ROM drive that is attached to `server-1` and type the following commands:

```
server-1# cd /CD_mount_point/Solaris_10_606/Tools
server-1# ./add_to_install_server /export/install/sparc_10_606
```

Repeat the previous command for each Solaris Software you want to install.

Insert the SPARC: Solaris Languages for SPARC Platforms CD in the CD-ROM drive that is attached to `server-1` and type the following commands:

```
server-1# cd /CD_mount_point/Solaris_10_606/Tools
server-1# ./add_to_install_server /export/install/sparc_10_606
```

EXAMPLE 10–2 x86: Copying the Solaris 10 6/06 CDs

Insert the Solaris Software for x86 Platforms - 1 CD in the CD-ROM drive that is attached to `server-1` and type the following commands:

```
server-1# mkdir -p /export/install/x86_10_606
server-1# cd /CD_mount_point/Solaris_10_606/Tools
server-1# ./setup_install_server /export/install/x86_10_606
```

Insert the Solaris Software for x86 Platforms - 2 CD in the CD-ROM drive that is attached to `server-1` and type the following commands:

EXAMPLE 10–2 x86: Copying the Solaris 10 6/06 CDs *(Continued)*

```
server-1# cd /CD_mount_point/Solaris_10_606/Tools
server-1# ./add_to_install_server /export/install/x86_10_606
```

Repeat the previous command for each Solaris Software you want to install.

Insert the Solaris Languages for x86 Platforms CD in the CD-ROM drive that is attached to `server-1` and type the following commands:

```
server-1# cd /CD_mount_point/Solaris_10_606/Tools
server-1# ./add_to_install_server /export/install/x86_10_606
```

EXAMPLE 10–3 SPARC: Copying the Solaris 10 6/06 DVD

Insert the Solaris Operating System for SPARC Platforms DVD in the DVD-ROM drive that is attached to `server-1` and type the following commands:

```
server-1# mkdir -p /export/install/sparc_10_606
server-1# cd /DVD_mount_point/Solaris_10_606/Tools
server-1# ./setup_install_server /export/install/sparc_10_606
```

EXAMPLE 10–4 x86: Copying the Solaris Operating System for x86 Platforms DVD

Insert the Solaris Operating System for x86 Platforms DVD in the DVD-ROM drive that is attached to `server-1` and type the following commands:

```
server-1# mkdir -p /export/install/x86_10_606
server-1# cd /DVD_mount_point/Solaris_10_606/Tools
server-1# ./setup_install_server /export/install/x86_10_606
```

x86: Create a Boot Server for Marketing Systems

Systems cannot boot from an install server on a different subnet, so you make `server-2` a boot server on the marketing group's subnet. You use the `setup_install_server`(1M) command to copy the boot software from the Solaris Operating System for x86 Platforms DVD or the Solaris Software for x86 Platforms - 1 CD. The boot software is copied to the `server-2` local disk in the `/export/boot` directory.

Choose the media and install the boot software to local disk.

- If you insert the Solaris Software for x86 Platforms - 1 CD in the CD-ROM drive that is attached to `server-2`, type the following command:

  ```
  server-2# cd /CD_mount_point/Solaris_10_606/Tools
  server-2# ./setup_install_server -b /export/boot
  ```

- If you insert the Solaris Operating System for x86 Platforms DVD in the DVD-ROM drive that is attached to `server-2`, type the following command:

```
server-2# cd /DVD_mount_point/Solaris_10_606/Tools
server-2# ./setup_install_server -b /export/boot
```

In the `setup_install_server` command, `-b` specifies that `setup_install_server` is to copy the boot information to the directory that is named `/export/boot`.

Create a JumpStart Directory

Now that you have the install server and boot server set up, you create a JumpStart directory on `server-1`. You can use any system on the network. This directory holds files that are required for a custom JumpStart installation of Solaris software. You set up this directory by copying the sample directory from the Solaris Operating System DVD image or from the Solaris Software - 1 CD image that has been copied to `/export/install`:

```
server-1# mkdir /jumpstart
server-1# cp -r /export/install/sparc_10_606/Solaris_10_606/Misc/jumpstart_sample /jumpstart
```

Share the JumpStart Directory

To make the `rules` file and profiles accessible to systems on the network, you share the `/jumpstart` directory. To enable the sharing of a directory, you add the following line to the `/etc/dfs/dfstab` file:

```
share -F nfs -o ro,anon=0 /jumpstart
```

Then, at the command line, you type the `shareall` command:

```
server-1# shareall
```

SPARC: Create the Engineering Group's Profile

For the engineering systems, you create a file that is named `eng_prof` in the `/jumpstart` directory. The `eng_prof` file contains the following entries, which define the Solaris 10 6/06 software to be installed on systems in the engineering group:

```
install_type  initial_install
system_type   standalone
partitioning  default
cluster       SUNWCprog
filesys       any 512 swap
```

The previous example profile specifies the following installation information.

`install_type`	The installation is to be treated as an initial installation, as opposed to an upgrade.
`system_type`	The engineering systems are standalone systems.
`partitioning`	The JumpStart software uses default disk partitioning for installing Solaris software on the engineering systems.
`cluster`	The Developer System Support software group is to be installed.
`filesys`	Each system in the engineering group is to have 512 Mbytes of swap space.

x86: Create the Marketing Group's Profile

For the marketing systems, you create a file that is named `marketing_prof` in the `/jumpstart` directory. The `marketing_prof` file contains the following entries, which define the Solaris 10 6/06 software to be installed on systems in the marketing group:

```
install_type  initial_install
system_type   standalone
partitioning  default
cluster       SUNWCuser
package       SUNWaudio
```

The previous example profile specifies the following installation information.

`install_type`	The installation is to be treated as an initial installation, as opposed to an upgrade.
`system_type`	The marketing systems are standalone systems.
`partitioning`	The JumpStart software is to use default disk partitioning for installing Solaris on the marketing systems.
`cluster`	The End User Solaris Software Group is to be installed.
`package`	The audio demo software package is to be added to each system.

Update the `rules` File

Now you must add rules to the `rules` file. The Solaris installation program uses the rules to select the correct installation (profile) for each system during a custom JumpStart installation.

At this site, each department is located on its own *subnet* and has its own network address. The engineering department is located on subnet 255.222.43.0. The marketing department is located on 255.222.44.0. You can use this information to control how the engineering and marketing systems

are installed with the Solaris 10 6/06 software. In the `/jumpstart` directory, you edit the `rules` file, delete all of the example rules, and add the following lines to the file:

```
network 255.222.43.0 - eng_prof -
network 255.222.44.0 - marketing_prof -
```

Basically, these rules state that systems on the 255.222.43.0 network are to be installed with the Solaris 10 6/06 software by using the `eng_prof` profile. The systems on the 255.222.44.0 network are to be installed with the Solaris 10 6/06 software by using the `marketing_prof` profile.

Note – You can use the sample rules to use a network address to identify the systems to be installed with the Solaris 10 6/06 software by using `eng_prof` and `marketing_prof`, respectively. You can also use host names, memory size, or model type as the rule keyword. Table 11–1 contains a complete list of keywords you can use in a `rules` file.

Validate the `rules` File

After the `rules` and profiles are set up, you run the `check` script to verify that the files are correct:

```
server-1# cd /jumpstart
server-1# ./check
```

If the `check` script does not find any errors, the script creates the `rules.ok` file.

SPARC: Set Up Engineering Systems to Install From the Network

After setting up the `/jumpstart` directory and files, you use the `add_install_client` command on the install server, `server-1`, to set up the engineering systems to install the Solaris software from the install server. `server-1` is also the boot server for the engineering group's subnet.

```
server-1# cd /export/install/sparc_10_606/Solaris_10_606/Tools
server-1# ./add_install_client -c server-1:/jumpstart host-eng1 sun4u
server-1# ./add_install_client -c server-1:/jumpstart host-eng2 sun4u
```

In the `add_install_client` command, the options that are used have the following meanings:

`-c` Specifies the server (`server-1`) and path (`/jumpstart`) to the JumpStart directory. Use this option if you are using NFS.

Note – If you are not using NFS, you specify the path to the JumpStart directory by using the following commands:

- **For SPARC based systems**, specify the path in the `boot` command
- **For x86 based systems**, specify the path by editing the GRUB menu entry

host-eng1	The name of a system in the engineering group.
host-eng2	The name of another system in the engineering group.
sun4u	Specifies the platform group of the systems that use `server-1` as an install server. The platform group is for Ultra 5 systems.

x86: Set Up Marketing Systems to Install From the Network

Next, you use the `add_install_client` command on the boot server (`server-2`). This command sets up the marketing systems to boot from the boot server and install the Solaris software from the install server (`server-1`):

```
server-2# cd /marketing/boot-dir/Solaris_10_606/Tools
server-2# ./add_install_client -s server-1:/export/install/x86_10_606 \
-c server-1:/jumpstart host-mkt1 i86pc
server-2# ./add_install_client -s server-1:/export/install/x86_10_606 \
-c server-1:/jumpstart host-mkt2 i86pc
server-2# ./add_install_client -d -s server-1:/export/install/x86_10_606 \
-c server-1:/jumpstart SUNW.i86pc i86pc
server-2# ./add_install_client -c server-1:/jumpstart host-mkt1 sun4u
server-2# ./add_install_client -c server-1:/jumpstart host-mkt2 sun4u
```

In the `add_install_client` command, the options that are used have the following meanings:

-d	Specifies that the client is to use DHCP to obtain the network install parameters. This option is required for clients to use PXE network boot to boot from the network. `-d` is optional for network boot clients that do not use PXE network boot.
-s	Specifies the install server (`server-1`) and the path to the Solaris software (`/export/install/x86_10_606`).
-c	Specifies the server (`server-1`) and path (`/jumpstart`) to the JumpStart directory. Use this option if you are using NFS.

Note – If you are not using NFS, you specify the path to the JumpStart directory by using the following commands:

- **For SPARC based systems**, specify the path in the `boot` command
- **For x86 based systems**, specify the path by editing the GRUB menu entry

host-mkt1	The name of a system in the marketing group.
host-mkt2	The name of another system in the marketing group.
sun4u	Specifies the platform group of the systems that use `server-1` as an install server. The platform group is for Ultra 5 systems.
SUNW.i86pc	The DHCP class name for all Solaris x86 clients. If you want to configure all Solaris x86 DHCP clients with a single command, use this class name.
`i86pc`	Specifies the platform group of the systems that use this boot server. The platform name represents x86 based systems.

SPARC: Boot the Engineering Systems and Install Solaris Software

After setting up the servers and files, you can boot the engineering systems by using the following `boot` command at the `ok` (PROM) prompt of each system:

```
ok boot net - install
```

The Solaris OS is automatically installed on the engineering group's systems.

x86: Boot the Marketing Systems and Install Solaris Software

You can boot the system from one of the following:

- Solaris Software for x86 Platforms - 1 CD
- Solaris Operating System for x86 Platforms DVD
- The network by using PXE network boot

Solaris software is automatically installed on the marketing group's systems.

◆ ◆ ◆ CHAPTER 11

Custom JumpStart (Reference)

This chapter lists keywords and values that you can use in the `rules` file, profiles, and begin and finish scripts.

Rule Keywords and Values

Table 11–1 describes the keywords and values that you can use in the `rules` file. For detailed instructions to create a `rules` file, see "Creating the `rules` File" on page 78.

TABLE 11–1 Descriptions of Rule Keywords and Values

Keyword	Value	Matches
`any`	minus sign (`-`)	Anything. The `any` keyword always succeeds.
`arch`	*processor_type* Valid values for *processor_type* are the following: ■ SPARC: `sparc` ■ x86: `i386`	A system's processor type. The `uname -p` command reports the system's processor type.

TABLE 11–1 Descriptions of Rule Keywords and Values *(Continued)*

Keyword	Value	Matches

`disksize`	*actual_disk_name size_range*
	
	actual_disk_name – A disk name in the form `c`*x*`t`*y*`d`*z*, such as `c0t3d0` or `c0d0`, or the special word `rootdisk`. If `rootdisk` is used, the disk to be matched is determined in the following order:
	■ SPARC: The disk that contains the preinstalled boot image, which is a new SPARC based system with factory JumpStart installed
	■ The `c0t3d0s0` disk, if the disk exists
	■ The first available disk that is searched in kernel probe order
	
	size_range – The size of the disk, which must be specified as a range of Mbytes (*x*-*x*).
	
	Note – When calculating *size_range*, remember that a Mbyte equals 1,048,576 bytes. A disk might be advertised as a "535–Mbyte" disk, but the disk might contain only 510 million bytes of disk space. The JumpStart program views the "535–Mbyte" disk as a 510–Mbyte disk because 535,000,000 / 1,048,576 = 510. A "535–Mbyte" disk does not match a *size_range* equal to 530–550.
		The name and size of a system's disk in Mbytes.
		
		Example:
		
		`disksize c0t3d0 250-300`
		
		In the example, the JumpStart program attempts to match a system disk that is named `c0t3d0`. The disk can hold between 250 and 300 Mbytes of information.
		
		Example:
		
		`disksize rootdisk 750-1000`
		
		In the example, the JumpStart program attempts to match a disk in the following order:
		1. A system disk that contains a preinstalled boot image
		2. The `c0t3d0s0` disk, if the disk exists
		3. The first available disk that can hold between 750 Mbytes and 1 Gbyte of information

`domainname`	*actual_domain_name*	A system's domain name, which controls how a name service determines information. If you have a system already installed, the `domainname` command reports the system's domain name.
`hostaddress`	*actual_IP_address*	A system's IP address.
`hostname`	*actual_host_name*	A system's host name. If you have a system that is already installed, the `uname -n` command reports the system's host name.

TABLE 11–1 Descriptions of Rule Keywords and Values *(Continued)*

Keyword	Value	Matches
`installed`	*slice version* *slice* – A disk slice name in the form `c`*w*`t`*x*`d`*y*`s`*z*, such as `c0t3d0s5`, or the special words `any` or `rootdisk`. If `any` is used, the JumpStart program attempts to match all of the system's disks in kernel probe order. If `rootdisk` is used, the disk to be matched is determined in the following order: ■ SPARC: The disk that contains the preinstalled boot image, which is a new SPARC based system with factory JumpStart installed ■ The `c0t3d0s0` disk, if the disk exists ■ The first available disk that is searched in kernel probe order *version* – A version name or the special words `any` or `upgrade`. If `any` is used, any Solaris or SunOS release is matched. If `upgrade` is used, any Solaris release that is supported and can be upgraded is matched. If the JumpStart program finds a Solaris release but is unable to determine the version, the version that is returned is `SystemV`.	A disk that has a root (`/`) file system that corresponds to a particular version of Solaris software. Example: `installed c0t3d0s1 Solaris 10_606` In the example, the JumpStart program attempts to match a system that has a Solaris root (`/`) file system on `c0t3d0s1`.
`karch`	*actual_platform_group* Valid values are `sun4u`, `i86pc`, and `prep`. A list of systems and their corresponding platform group is presented in the *Solaris Sun Hardware Platform Guide* at `http://docs.sun.com`.	A system's platform group. If you have a system that is already installed, the `arch -k` command or the `uname -m` command reports the system's platform group.
`memsize`	*physical_mem* The value must be a range of Mbytes, *x*-*x*, or a single Mbyte value.	A system's physical memory size in Mbytes. Example: `memsize 64-128` The example tries to match a system with a physical memory size between 64 and 128 Mbytes. If you have a system that is already installed, the output of the `prtconf` command, line 2, reports the system's physical memory size.

TABLE 11–1 Descriptions of Rule Keywords and Values *(Continued)*

Keyword	Value	Matches
`model`	*actual_platform_name*	A system's platform name. See the *Solaris Sun Hardware Platform Guide* at `http://docs.sun.com` for a list of valid platform names. To find the platform name of an installed system, use the `uname -i` command or the output of the `prtconf` command, line 5. **Note –** If the *actual_platform_name* contains spaces, you must replace spaces with underscores (_). Example: SUNW,Sun_4_50
`network`	*network_num*	A system's network number, which the JumpStart program determines by performing a logical AND between the system's IP address and the subnet mask. Example: `network 192.168.2.0` The example tries to match a system with a 192.168.2.8 IP address, if the subnet mask is 255.255.255.0.
`osname`	`Solaris_`*x*	A version of Solaris software that is already installed on a system. Example: `osname Solaris 10_606` In the example, the JumpStart program attempts to match a system with the Solaris 10 6/06 OS already installed.

TABLE 11–1 Descriptions of Rule Keywords and Values *(Continued)*

Keyword	Value	Matches
`probe`	*probe_keyword*	A valid probe keyword or a valid custom probe keyword. Example: `probe disks` The example returns the size of a system's disks in Mbytes and in kernel probe order, for example, `c0t3d0s1`, `c0t4d0s0`, on a SPARC based system. The JumpStart program sets the `SI_DISKLIST`, `SI_DISKSIZES`, `SI_NUMDISKS`, and `SI_TOTALDISK` environment variables. **Note –** The `probe` keyword is unique in that the keyword does not attempt to match an attribute and run a profile. The `probe` keyword returns a value. Consequently, you cannot specify begin scripts, profiles, and finish scripts with the `probe` rule keyword. Probe keywords are described in Chapter 8.
`totaldisk`	*size_range* The value must be specified as a range of Mbytes (*x*-*x*). **Note –** When calculating *size_range*, remember that one Mbyte equals 1,048,576 bytes. A disk might be advertised as a "535–Mbyte" disk, but the disk might have only 510 million bytes of disk space. The JumpStart program views the "535–Mbyte" disk as a 510–Mbyte disk because 535,000,000 / 1,048,576 = 510. A "535–Mbyte" disk does not match a *size_range* equal to 530–550.	The total disk space on a system in Mbytes. The total disk space includes all the operational disks that are attached to a system. Example: `totaldisk 300-500` In the example, the JumpStart program tries to match a system with a total disk space between 300 and 500 Mbytes.

Profile Keywords and Values

This section describes the profile keywords and values that you can use in a profile. For detailed instructions to create a profile, see "Creating a Profile" on page 81.

Profile Keywords Quick Reference

Table 11–2 provides a quick way to determine which keywords you can use, based on your installation scenario. Unless otherwise noted in the keyword descriptions, the keyword can only be used with the initial installation option.

TABLE 11–2 Profile Keywords Overview

	Installation Scenarios				
Profile Keyword	**Standalone System (Nonnetworked)**	**Standalone System (Networked) or Server**	**OS Server**	**Upgrade**	**Upgrade With Disk Space Reallocation**
`archive_location` (installing Solaris Flash archives)	X	X			
`backup_media`					X
`boot_device`	X	X	X		
`bootenv createbe`	X	X	X		
`client_arch`			X		
`client_root`			X		
`client_swap`			X		
`cluster` (adding software groups)	X	X	X		
`cluster` (adding or deleting clusters)	X	X	X	X	X
`dontuse`	X	X	X		
`fdisk` (x86 only)	X	X	X		
`filesys` (mounting remote file systems)		X	X		
`filesys` (creating local file systems)	X	X	X		
`filesys` (creating mirrored file systems)	X	X	X		
`forced_deployment` (installing Solaris Flash differential archives)	X	X			
`geo`	X	X	X	X	X
`install_type`	X	X	X	X	X
`layout_constraint`					X
`local_customization` (installing Solaris Flash archives)	X	X			
`locale`	X	X	X	X	X
`metadb` (creating state database replicas)	X	X	X		

TABLE 11–2 Profile Keywords Overview *(Continued)*

	Installation Scenarios				
Profile Keyword	**Standalone System (Nonnetworked)**	**Standalone System (Networked) or Server**	**OS Server**	**Upgrade**	**Upgrade With Disk Space Reallocation**
`no_master_check` (installing Solaris Flash differential archives)	X	X			
`no_content_check` (installing Solaris Flash differential archives)	X	X			
`num_clients`			X		
`package`	X	X	X	X	X
`partitioning`	X	X	X		
`patch`	X	X	X	X	X
`root_device`	X	X	X	X	X
`system_type`	X	X	X		
`usedisk`	X	X	X		

Profile Keyword Descriptions and Examples

`archive_location` Keyword

`archive_location` *retrieval_type location*

retrieval_type The values of *retrieval_type* and *location* depend on where the Solaris Flash archive is stored. The following sections contain the values you can use for *retrieval_type* and *location* and examples of how to use the `archive_location` keyword.

- "Archive Stored on an NFS Server" on page 154
- "Archive Stored on an HTTP or HTTPS Server" on page 154
- "Archive Stored on an FTP Server" on page 156
- "Archive Stored on a Local Tape" on page 157
- "Archive Stored on a Local Device" on page 157
- "Archive Stored on a Local File" on page 158

location Specifics for locations are noted in the following sections.

Caution – Solaris Flash archive cannot be properly created when a non-global zone is installed. The Solaris Flash feature is not compatible with the Solaris Zones partitioning technology. If you create a Solaris 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

Archive Stored on an NFS Server

If the archive is stored on an NFS server, use the following syntax for the `archive_location` keyword.

`archive_location nfs` *server_name:/path/filename retry n*

server_name The name of the server where you stored the archive.

path The location of the archive to be retrieved from the specified server. If the path contains $HOST, the Solaris Flash installation utilities replace $HOST with the name of the clone system that you are installing.

filename The name of the Solaris Flash archive file.

retry n An optional keyword. *n* is the maximum number of times the Solaris Flash utilities attempt to mount the archive.

EXAMPLE 11–1 Archive Stored on an NFS Server

```
archive_location nfs golden:/archives/usrarchive

archive_location nfs://golden/archives/usrarchive
```

Archive Stored on an HTTP or HTTPS Server

If the archive is stored on an HTTP server, use the following syntax for the `archive_location` keyword.

`archive_location http://`*server_name:port/path/filename optional_keywords*

If the archive is stored on an HTTPS server, use the following syntax for the `archive_location` keyword.

`archive_location https://`*server_name:port/path/filename optional_keywords*

server_name The name of the server where you stored the archive.

port	An optional port. *port* can be a port number or the name of a TCP service that has a port number that is determined at runtime. If you do not specify a port, the Solaris Flash installation utilities use the default HTTP port number, 80.
path	The location of the archive to be retrieved from the specified server. If the path contains $HOST, the Solaris Flash installation utilities replace $HOST with the name of the clone system that you are installing.
filename	The name of the Solaris Flash archive file.
optional_keywords	The optional keywords that you can specify when you retrieve a Solaris Flash archive from an HTTP server.

TABLE 11–3 Optional Keywords to Use With `archive_location` HTTP

Keyword	Value Definition
`auth basic` *user_name password*	If the archive is located on an HTTP server that is password protected, you must include the user name and password that you need to access the HTTP server in the profile file. **Note –** The use of this authentication method in a profile that is intended for use with custom JumpStart is risky. Unauthorized users might have access to the profile file that contains the password.
`timeout` *min*	The `timeout` keyword enables you to specify, in minutes, the maximum length of time that is allowed to pass without receipt of data from the HTTP server. If a timeout occurs, the connection is closed, reopened, and resumed. If you specify a `timeout` value of 0 (zero), the connection is not reopened. ■ If a timeout reconnection occurs, the Solaris Flash installation utilities attempt to resume the installation at the last known position in the archive. If the Solaris Flash installation utilities cannot resume the installation at the last known position, the retrieval restarts from the beginning of the archive and the data that was retrieved prior to the timeout is discarded. ■ If a timeout reconnection occurs while a package is being installed, the package is retried from the beginning of the package and the data that was retrieved prior to the timeout is discarded.
`proxy` *host:port*	The `proxy` keyword enables you to specify a proxy host and proxy port. You can use a proxy host to retrieve a Solaris Flash archive from the other side of a firewall. You must supply a proxy port when you specify the `proxy` keyword.

EXAMPLE 11–2 Archive Stored on a HTTP or HTTPS Server

```
archive_location http://silver/archives/usrarchive.flar timeout 5
```

Example of the `auth basic` *user_name password* keyword:

```
archive_location http://silver/archives/usrarchive.flar timeout 5 user1 secret
```

Archive Stored on an FTP Server

If the archive is stored on an FTP server, use the following syntax for the `archive_location` keyword.

`archive_location ftp://`*user_name:password*`@`*server_name:port/path/filename optional_keywords*

user_name:password	The user name and password that you need to access the FTP server in the profile file.
server_name	The name of the server where you stored the archive.
port	A is an optional port. *port* can be a port number or the name of a TCP service that has a port number that is determined at runtime. If you do not specify a port, the Solaris Flash installation utilities use the default FTP port number, 21.
path	The location of the archive to be retrieved from the specified server. If the path contains $HOST, the Solaris Flash installation utilities replace $HOST with the name of the clone system that you are installing.
filename	The name of the Solaris Flash archive file.
optional_keywords	The optional keywords that you can specify when you retrieve a Solaris Flash archive from an FTP server.

TABLE 11–4 Optional Keywords to Use With `archive_location` FTP

Keyword	Value Definition
`timeout` *min*	The `timeout` keyword enables you to specify, in minutes, the maximum length of time that is allowed to pass without receipt of data from the HTTP server. If a timeout occurs, the connection is closed, reopened, and resumed. If you specify a `timeout` value of 0 (zero), the connection is not reopened. ■ If a timeout reconnection occurs, the Solaris Flash installation utilities attempt to resume the installation at the last known position in the archive. If the Solaris Flash installation utilities cannot resume the installation at the last known position, the retrieval restarts from the beginning of the archive and the data that was retrieved prior to the timeout is discarded. ■ If a timeout reconnection occurs while a package is being installed, the package is retried from the beginning of the package and the data that was retrieved prior to the timeout is discarded.
`proxy` *host:port*	The `proxy` keyword enables you to specify a proxy host and proxy port. You can use a proxy host to retrieve a Solaris Flash archive from the other side of a firewall. You must supply a proxy port when you specify the `proxy` keyword.

EXAMPLE 11–3 Archive Stored on an FTP Server

```
archive_location ftp://user1:secret@silver/archives/usrarchive.flar timeout 5
```

Archive Stored on a Local Tape

If the archive is stored on a tape, use the following syntax for the `archive_location` keyword.

`archive_location local_tape` *device position*

device The name of the tape drive where you stored the Solaris Flash archive. If the device name is a canonical path, the Solaris Flash installation utilities retrieve the archive from the path to the device node. If you supply a device name that is not a canonical path, the Solaris Flash installation utilities add `/dev/rmt/` to the path.

position Designates the place on the tape drive where you saved the archive. If you do not supply a position, the Solaris Flash installation utilities retrieve the archive from the current position on the tape drive. By specifying a *position*, you can place a begin script or a `sysidcfg` file on the tape drive before the archive.

EXAMPLE 11–4 Archive Stored on a Local Tape

```
archive_location local_tape /dev/rmt/0n 5

archive_location local_tape 0n 5
```

Archive Stored on a Local Device

You can retrieve a Solaris Flash archive from a local device if you stored the Solaris Flash archive on a file system-oriented, random-access device, such as a diskette or a DVD. Use the following syntax for the `archive_location` keyword.

Note – You can retrieve an archive from stream-oriented devices, such as tape, by using the syntax for local tape.

`archive_location local_device` *device path/filename file_system_type*

device The name of the drive where you stored the Solaris Flash archive. If the device name is a canonical path, the device is mounted directly. If you supply a device name that is not a canonical path, the Solaris Flash installation utilities add `/dev/dsk/` to the path.

path The path to the Solaris Flash archive, relative to the root of the file system on the device you specified. If the path contains $HOST, the Solaris Flash installation utilities replace $HOST with the name of the clone system that you are installing.

filename The name of the Solaris Flash archive file.

file_system_type Specifies the type of file system on the device. If you do not supply a file system type, the Solaris Flash installation utilities attempt to mount a UFS file system. If the UFS mount fails, the Solaris Flash installation utilities attempt to mount an HSFS file system.

EXAMPLE 11–5 Archive Stored on a Local Device

To retrieve an archive from a local hard drive that is formatted as a UFS file system, use the following command:

```
archive_location local_device c0t0d0s0 /archives/$HOST
```

To retrieve an archive from a local CD-ROM that has an HSFS file system, use the following command:

```
archive_location local_device c0t0d0s0 /archives/usrarchive
```

Archive Stored on a Local File

You can retrieve an archive that you stored in the miniroot from which you booted the clone system as a local file. When you perform a custom JumpStart installation, you boot the system from a DVD, CD, or an NFS-based miniroot. The installation software is loaded and run from this miniroot. Therefore, a Solaris Flash archive that you stored in the DVD, CD, or NFS-based miniroot is accessible as a local file. Use the following syntax for the `archive_location` keyword.

`archive_location local_file` *path/filename*

path The location of the archive. The path must be accessible to the system as a local file while the system is booted from the Solaris Software - 1 CD or from the Solaris Operating System DVD. The system cannot access `/net` or any other automounted directory when it is booted from the Solaris Software - 1 CD or from the Solaris Operating System DVD.

filename The name of the Solaris Flash archive file.

EXAMPLE 11–6 Archive Stored on a Local File

```
archive_location local_file /archives/usrarchive
```

`backup_media` Profile Keyword

`backup_media` *type path*

You can use `backup_media` only with the upgrade option when disk space reallocation is required.

If non-global zones are installed, do not use this keyword. If this keyword is used in the JumpStart profile, the upgrade stops and an error message is displayed.

`backup_media` defines the media that is to be used to back up file systems if space needs to be reallocated during an upgrade because of insufficient space. If multiple tapes or diskettes are required for the backup, you are prompted to insert tapes or diskettes during the upgrade.

Valid *type* Value	**Valid *path* Value**	**Specification**
`local_tape`	`/dev/rmt/`*n*	A local tape drive on the system that is being upgraded. *path* must be the character (raw) device path for the tape drive. *n* is the number of the tape drive.
`local_diskette`	`/dev/rdiskette`*n*	A local diskette drive on the system that is being upgraded. *path* must be the character (raw) device path for the diskette drive. *n* is the number of the diskette drive. Diskettes that you use for the backup must be formatted.
`local_filesystem`	`/dev/dsk/c`*w*`t`*x*`d`*y*`s`*z* */file_system*	A local file system on the system that is being upgraded. You cannot specify a local file system that is being changed by the upgrade. *path* can be a block device path for a disk slice. For example, the `t`*x* in `/dev/dsk/c`*w*`t`*x*`d`*y*`s`*z* might not be needed. Or, *path* can be the absolute path to a file system that is mounted by the `/etc/vfstab` file.
`remote_filesystem`	*host*`:`*/file_system*	An NFS file system on a remote system. *path* must include the name or IP address of the remote system, *host*, and the absolute path to the NFS file system, *file_system*. The NFS file system must have read/write access.
`remote_system`	*user*`@`*host*`:`*/directory*	A directory on a remote system that can be reached by a remote shell, `rsh`. The system that is being upgraded must have access to the remote system through the remote system's `.rhosts` file. *path* must include the name of the remote system *host* and the absolute path to the directory *directory*. If a user login ID *user* is not specified, `root` is used by default.

EXAMPLE 11–7 `backup_media` Profile Keyword

```
backup_media local_tape /dev/rmt/0

backup_media local_diskette /dev/rdiskette1

backup_media local_filesystem /dev/dsk/c0t3d0s4
```

EXAMPLE 11–7 `backup_media` Profile Keyword *(Continued)*

```
backup_media local_filesystem /export

backup_media remote_filesystem system1:/export/temp

backup_media remote_system user1@system1:/export/temp
```

`boot_device` Profile Keyword

`boot_device` *device eeprom*

`boot_device` designates the device where the JumpStart program is to install the root (`/`) file system and the system's boot device. `boot_device` must match any `filesys` keywords that specify the root (`/`) file system and the `root_device` keyword.

If you do not specify the `boot_device` keyword in a profile, the following `boot_device` keyword is specified by default during the installation:

```
boot_device any update
```

device Use one of the following values.

SPARC: c*w*t*x*d*y*s*z* or c*x*d*y*s*z*	The disk slice where the JumpStart program places the root (`/`) file system, for example, `c0t0d0s0`.
x86: c*w*t*x*d*y* or c*x*d*y*	The disk where the JumpStart program places the root (`/`) file system, for example, `c0d0`.
`existing`	The JumpStart program places the root (`/`) file system on the system's existing boot device.
`any`	The JumpStart program chooses where to place the root (`/`) file system. The JumpStart program attempts to use the system's existing boot device. The JumpStart program might choose a different boot device if necessary.

eeprom Choose to update or preserve the system's EEPROM.

The *eeprom* value enables you to update the system's EEPROM if you change the system's current boot device. By updating the system's EEPROM, the system can automatically boot from the new boot device.

Note – x86: You must specify the `preserve` value.

`update`	The JumpStart program updates the system's EEPROM to the specified boot device so that the installed system automatically boots from it.

`preserve` The boot device value in the system's EEPROM is not changed. If you specify a new boot device without changing the system's EEPROM, you need to change the system's EEPROM manually so it can automatically boot from the new boot device.

EXAMPLE 11–8 `boot_device` Profile Keyword

```
boot_device c0t0d0s2 update
```

`bootenv createbe` Profile Keyword

`bootenv createbe bename` *new_BE_name* `filesystem` *mountpoint*:*device*:*fs_options* `[filesystem...]`

`bootenv createbe` keyword enables you to quickly create an empty-and-inactive boot environment at the same time you are installing the Solaris OS. At the least, you must create the root (`/`) file system. The slices are reserved for the file systems specified, but no file systems are copied. The boot environment is named, but not actually created until installed with a Solaris Flash archive. When the empty boot environment is installed with an archive, file systems are installed on the reserved slices. The following lists the values for *bename* and *filesystem*.

`bename` *new_BE_name*

`bename` specifies the name of the new boot environment to be created. *new_BE_name* can be no longer than 30 characters, can contain only alphanumeric characters, and can contain no multibyte characters. The name must be unique on the system.

`filesystem` *mountpoint*:*device*:*fs_options*

`filesystem` determines the type and number of file systems that are to be created in the new boot environment. At least one slice that contains the root (`/`) file system must be defined. File systems can be on the same disk or spread across multiple disks.

- *mountpoint* can be any valid mount point or – (hyphen), indicating a swap slice.
- *device* must be available when the operating system that is being installed is first booted. The device has no relation to JumpStart special storage devices such as *free*. The device cannot be a Solaris Volume Manager volume or Veritas Volume Manager volume. *device* is the name of a disk device, of the form `/dev/dsk/c`*w*`t`*x*`d`*y*`s`*z*.
- *fs_options* can be one of the following:
  - `ufs`, which indicates a UFS file system.
  - `swap`, which indicates a swap file system. The swap mount point must be a – (hyphen).

For a profile example and background about using this keyword, see the following references:

For an example of a profile	Example 6–11

For background about using Solaris Live Upgrade that creates, upgrades, and activates inactive boot environments	Chapter 6, "Solaris Live Upgrade (Overview)," in *Solaris 10 6/06 Installation Guide: Solaris Live Upgrade and Upgrade Planning*
For background about using a Solaris Flash archive	Chapter 1, "Solaris Flash (Overview)," in *Solaris 10 6/06 Installation Guide: Solaris Flash Archives (Creation and Installation)*

`client_arch` Profile Keyword

`client_arch` *karch_value* `...`

`client_arch` specifies that the operating system server is to support a different platform group than the server uses. If you do not specify `client_arch` in the profile, any diskless client that uses the operating system server must contain the same platform group as the server. You must specify each platform group that you want the operating system server to support.

Valid values for *karch_value* are `sun4u` and `i86pc`. For a detailed list of platform names and various systems, see *Solaris Sun Hardware Platform Guide* at `http://docs.sun.com`.

Note – You can use `client_arch` only when `system_type` is specified as `server`.

`client_root` Profile Keyword

`client_root` *root_size*

`client_root` defines the amount of root space, *root_size* in Mbytes, to allocate for each client. If you do not specify `client_root` in a server's profile, the installation software allocates 15 Mbytes of root space per client. The size of the client root area is used in combination with the `num_clients` keyword to determine how much space to reserve for the `/export/root` file system.

Note – You can use `client_root` only when `system_type` is specified as `server`.

`client_swap` Profile Keyword

`client_swap` *swap_size*

`client_swap` defines the amount of swap space, *swap_size* in Mbytes, to allocate for each diskless client. If you do not specify `client_swap` in the profile, 32 Mbytes of swap space is allocated by default.

Note – You can use `client_swap` only when `system_type` is specified as `server`.

EXAMPLE 11–9 `client_swap` Profile Keyword

The following example specifies that each diskless client is to have a swap space of 64 Mbytes.

```
client_swap 64
```

How the Size of `swap` Is Determined

If a profile does not specify the size of `swap`, the JumpStart program determines the size of the swap space, based on the system's physical memory. Table 11–5 shows how the size of `swap` is determined during a custom JumpStart installation.

TABLE 11–5 Determining `swap` Size

Physical Memory (in Mbytes)	Swap Space (in Mbytes)
16–64	32
64–128	64
128–512	128
Greater than 512	256

The JumpStart program makes the size of `swap` no more than 20 percent of the disk where `swap` is located. The allocation is different if the disk contains free space after laying out the other file systems. If free space exists, the JumpStart program allocates the free space to `swap`, and if possible, allocates the amount that is shown in Table 11–5.

Note – Physical memory plus swap space must total a minimum of 32 Mbytes.

`cluster` Profile Keyword (Adding Software Groups)

`cluster` *group_name*

`cluster` designates the software group to add to the system.

Note – A software group is a metacluster that contains a collection of clusters and packages. The software group is installed by using the `cluster` keyword and *group_name* variable. This cluster keyword can only be installed in an initial installation. This `cluster` keyword refers to metaclusters found in the `clustertoc(4)` file.

A cluster is a collection of packages that is named SUNW*name*. A cluster is installed by using the `cluster` keyword and *cluster_name* variable. A cluster can be added or removed from a software group (metacluster) in an initial install or an upgrade.

The *group_name* for each software group is listed in the following table.

Software Group	*group_name*
Reduced Network Support Software Group	`SUNWCrnet`
Core System Support Software Group	`SUNWCreq`
End User Solaris Software Group	`SUNWCuser`
Developer Solaris Software Group	`SUNWCprog`
Entire Solaris Software Group	`SUNWCall`
Entire Solaris Software Group Plus OEM Support	`SUNWCXall`

The following limitations apply:

- You can specify only one software group in a profile.
- The software group must be specified before other `cluster` and `package` entries.
- If you do not specify a software group with `cluster` in the profile, the end–user software group, `SUNWCuser`, is installed on the system.

For more information about software groups, see "Disk Space Recommendations for Software Groups" on page 36.

`cluster` Profile Keyword (Adding or Deleting Clusters)

`cluster` *cluster_name add_delete_switch*

`cluster` designates whether a cluster is to be added or deleted from the software group that is to be installed on the system.

cluster_name — The name of the cluster that must be in the form `SUNWC`*name*.

add_delete_switch — An optional keyword that indicates whether to add or delete the cluster that is specified. Use the value `add` or `delete`. If you do not specify `add` or `delete`, `add` is used by default.

When you use `cluster` during an upgrade, the following conditions apply:

- All clusters that are already on the system are automatically upgraded.
- If you specify *cluster_name* `add`, and *cluster_name* is not installed on the system, the cluster is installed.
- If you specify *cluster_name* `delete`, and *cluster_name* is installed on the system, the package is deleted *before* the upgrade begins.

Note – If non-global zones are installed, do not use this keyword to upgrade. If this keyword is used, the upgrade continues, but the keyword is ignored.

Note – A software group is a metacluster that contains a collection of clusters and packages. The software group is installed by using the `cluster` keyword and *group_name* variable. This cluster keyword can only be installed in an initial installation. This `cluster` keyword refers to metaclusters found in the `clustertoc(4)` file.

A cluster is collection of packages. Clusters can be grouped together to form a software group (metacluster). A cluster name is always in the form of SUNW<name>. A cluster is installed by using the `cluster` keyword and *cluster_name* variable. A cluster can be added or removed from a software group (metacluster) in an initial install or an upgrade.

`dontuse` Profile Keyword

`dontuse` *disk_name* `...`

By default, the JumpStart program uses all of the operational disks on the system when `partitioning default` is specified. `dontuse` designates one or more disks that you do not want the JumpStart program to use. *disk_name* must be specified in the form c*x*t*y*d*z*or c*y*d*z*, for example, `c0t0d0`.

Note – You cannot specify the `dontuse` keyword and the `usedisk` keyword in the same profile.

x86: `fdisk` Profile Keyword

`fdisk` *disk_name type size*

`fdisk` defines how the `fdisk` partitions are set up on an x86 based system. You can specify `fdisk` more than once. When `fdisk` partitions an x86 based system, the following occurs:

- All `fdisk` partitions on the disk are preserved unless you delete the partitions with the `fdisk` keyword by assigning *size* the value of `delete` or `0`. Also, all existing `fdisk` partitions are deleted when *size* is set to `all`.
- A Solaris `fdisk` partition that contains a root (`/`) file system is always designated as the active partition on the disk.

  Note – The system boots from the active partition by default.

- If the `fdisk` keyword is not specified in a profile, the following `fdisk` keyword is used by default during the installation.

  ```
  fdisk all solaris maxfree
  ```

- `fdisk` entries are processed in the order in which the entries are listed in the profile.

disk_name Use the following values to specify where the `fdisk` partition is to be created or deleted:

- c*x*t*y*d*z* or c*y*d*z* – A specific disk, for example, `c0t3d0`.
- `rootdisk` – The variable that contains the value of the system's root disk, which is determined by the JumpStart program as described in "How the System's Root Disk Is Determined" on page 188.
- `all` – All the selected disks.

type Use the following values to specify the type of `fdisk` partition that is to be created or deleted on the specified disk:

- `solaris` – A Solaris `fdisk` partition (`SUNIXOS fdisk` type).
- `dosprimary` – An alias for primary DOS `fdisk` partitions, not for `fdisk` partitions that are extended or reserved for data DOS. When you delete `fdisk` partitions by assigning *size* the value `delete`, `dosprimary` is an alias for the DOSHUGE, DOSOS12, and DOSOS16 `fdisk` types. When you create an `fdisk` partition, `dosprimary` is an alias for the DOSHUGE `fdisk` partition.
- *DDD* – An integer `fdisk` partition. *DDD* is an integer between 1 and 255 inclusive.

  Note – You can specify this value only if *size* is `delete`.

- 0x*HH* – A hexadecimal `fdisk` partition. *HH* is a hexadecimal number between 01 and FF.

  Note – You can specify this value only if *size* is `delete`.

The following table shows the integer and hexadecimal numbers for some of the `fdisk` types.

`fdisk` **Type**	*DDD*	*HH*
DOSOS12	`1`	`01`
PCIXOS	`2`	`02`

`fdisk` **Type**	*DDD*	*HH*
DOSOS16	`4`	`04`
EXTDOS	`5`	`05`
DOSHUGE	`6`	`06`
DOSDATA	`86`	`56`
OTHEROS	`98`	`62`
UNIXOS	`99`	`63`

size Use one of the following values:

- *DDD* – An `fdisk` partition of size *DDD* in Mbytes is created on the specified disk. *DDD* must be an integer, and the JumpStart program automatically rounds the number up to the nearest cylinder boundary. Specifying a value of `0` is the same as specifying `delete`.
- `all` – An `fdisk` partition is created on the entire disk. All existing `fdisk` partitions are deleted.

  x86 only – The `all` value can be specified only if *type* is `solaris`.

- `maxfree` – An `fdisk` partition is created in the largest contiguous free space on the specified disk. If an `fdisk` partition of the specified *type* already exists on the disk, the existing `fdisk` partition is used. A new `fdisk` partition is *not* created on the disk.

  x86 only – The disk must contain at least one unused `fdisk` partition. Also, the disk must have free space or the installation fails. The `maxfree` value can be specified only if *type* is `solaris` or `dosprimary`.

- `delete` – All `fdisk` partitions of the specified *type* are deleted on the specified disk.

`filesys` Profile Keyword (Mounting Remote File Systems)

`filesys` *server*:*path server_address mount_pt_name mount_options*

By using `filesys` with the listed values, the JumpStart program sets up the installed system to automatically mount remote file systems when the system boots. You can specify `filesys` more than once.

server The name of the server where the remote file system is located, followed by a colon.

path The remote file system's mount-point name. For example, `/usr` or `/export/home`

server_address The IP address of the server that is specified in *server*:*path*. If a name service is not running on the network, the *server_address* value can be used to populate the `/etc/hosts` file with the server's host name and IP address. If you are not specifying the server's IP address, you must specify a minus sign (`-`). For example, if you have a name service that is running on the network, you do not need to specify the server's IP address.

mount_pt_name The name of the mount point on which the remote file system is to be mounted.

mount_options One or more mount options, which is the same as the `-o` option of the `mount`(1M) command. The mount options are added to the `/etc/vfstab` entry for the specified *mount_pt_name*.

Note – If you need to specify more than one mount option, the mount options must be separated by commas and no spaces (`ro,quota` for example).

EXAMPLE 11–10 `filsys` Profile Keyword

```
filesys sherlock:/export/home/user2 - /home
```

`filesys` Profile Keyword (Creating Local File Systems)

`filesys` *slice size file_system optional_parameters*

By using `filesys` with the values that are listed, the JumpStart program creates local file systems during the installation. You can specify `filesys` more than once.

slice Use one of the following values:

`any` The JumpStart program places the file system on any disk.

Note – You cannot specify `any` when `size` is `existing`, `all`, `free`, *start*:*size*, or `ignore`.

c*w*t*x*d*y*s*z* or c*x*d*y*s*z* The disk slice where the JumpStart program places the file system, for example, `c0t0d0s0` or `c0d0s0`.

`rootdisk.s`*n* The variable that contains the value for the system's root disk, which is determined by the

JumpStart program as described in "How the System's Root Disk Is Determined" on page 188. The s*n* suffix indicates a specific slice on the disk.

size — Use one of the following values:

- *num* — The size of the file system is set to *num* in Mbytes.
- `existing` — The current size of the existing file system is used.

  Note – When you use the `existing` value, you can change the name of an existing slice by specifying *file_system* as a different *mount_pt_name*.

- `auto` — The size of the file system is automatically determined, depending on the software that is selected.
- `all` — The specified *slice* uses the entire disk for the file system. When you specify the `all` value, no other file systems can be placed on the specified disk.
- `free` — The remaining unused space on the disk is used for the file system.

  Note – If `free` is used as the value to `filesys`, the `filesys` entry must be the last entry in a profile.

- *start*:*size* — The file system is explicitly partitioned. *start* is the cylinder where the slice begins. *size* is the number of cylinders for the slice.

file_system — The *file_system* value is optional and used when *slice* is specified as `any` or c*w*t*x*d*y*s*z*. If *file_system* is not specified, `unnamed` is set by default. If `unnamed` is set, you cannot specify the *optional_parameters* value. Use one of the following values:

- *mount_pt_name* — The file system's mount-point name, for example, `/var`.
- `swap` — The specified *slice* is used as `swap`.
- `overlap` — The specified *slice* is defined as a representation of a disk region. The VTOC value is V_BACKUP. By default, slice 2 is an overlap slice that is a representation of the whole disk.

Note – You can specify `overlap` only when *size* is `existing`, `all`, or *start*:*size*.

	`unnamed`	The specified *slice* is defined as a raw slice, so *slice* does not have a mount-point name. If you do not specify *file_system*, `unnamed` is used by default.
	`ignore`	The specified *slice* is not used or recognized by the JumpStart program. You can use this option to specify that you want a file system to be ignored on a disk during installation. The JumpStart program creates a new file system on the same disk with the same name. You can use `ignore` only when `partitioning existing` is specified.
optional_parameters	Use one of the following values:	
	`preserve`	The file system on the specified *slice* is preserved.

Note – `preserve` can be specified only when *size* is `existing` and *slice* is c*w*t*x*d*y*s*z*.

	mount_options	One or more mount options, which is the same as the `-o` option of the `mount`(1M) command. The mount options are added to the `/etc/vfstab` entry for the specified *mount_pt_name*.

Note – If you need to specify more than one mount option, the mount options must be separated by commas and no space (`ro,quota`, for example).

`filesys` Profile Keyword (Creating RAID-1 Volumes)

`filesys mirror[:`*name*`]`*slice* `[`*slice*`]` *size file_system optional_parameters*

By using the `filesys mirror` keywords with the values that are listed, the JumpStart program creates the RAID-1 and RAID-0 volumes that are necessary to create a mirrored file system. You can specify `filesys mirror` more than once to create RAID-1 volumes (mirrors) for different file systems.

Note – The `filesys mirror` keyword is only supported for initial installations.

name	This optional keyword enables you to name the RAID-1 volume (mirror). Mirror names must start with the letter "d", followed by a number between 0 and 127, for example, `d100`. If you do not specify a mirror name, the custom JumpStart program assigns a mirror name for you. For guidelines about how to name mirrors, see "RAID Volume Name Requirements and Guidelines for Custom JumpStart and Solaris Live Upgrade" on page 208.
slice	This value specifies the disk slice where the custom JumpStart program places the file system you want to duplicate. The slice value must follow the format *cwtxdysz*, for example `c0t0d0s0` or `c0t0d0s5`. The custom JumpStart program creates a RAID-0 volume (single-slice concatenation) on the slice, and creates a RAID-1 volume to mirror the concatenation. You can specify up to two slices for two RAID-0 volumes.
size	This value specifies the size, in Mbytes, of the file system.
file_system	This value specifies the file system that you are duplicating. The custom JumpStart program creates the RAID-1 volume from the slices that are specified and mounts the RAID-1 volume on the specified file system. In addition to critical file systems, such as root (`/`), `/usr`, and `/var`, you can also specify `swap` as the file system.
optional_parameters	One or more mount options, which is the same as the `-o` option of the `mount`(1M) command. The mount options are added to the `/etc/vfstab` entry for the specified *file_system*. If you need to specify more than one mount option, the mount options must be separated by commas and no spaces, for example, `ro,quota`.

For more information about creating mirrored file systems during your installation, see Chapter 12.

`forced_deployment` Profile Keyword (Installing Solaris Flash Differential Archives)

```
forced_deployment
```

`forced_deployment` forces the installation of a Solaris Flash differential archive onto a clone system that is different than the software expects.

Caution – If you use `forced_deployment`, all new files are deleted to bring the clone system to the expected state. If you are not certain that you want files deleted, use the default, which protects new files by stopping the installation.

`geo` Profile Keyword

`geo` *region*

`geo` designates the regional locale or locales that you want to install on a system or to add when upgrading a system. *region* designates a geographical area that contains the locales that you want to install. Values you can specify for *region* are listed in the following table.

Note – If non-global zones are installed, do not use this keyword to upgrade. If this keyword is used, the upgrade continues, but the keyword is ignored.

Value	Description
`N_Africa`	Northern Africa, including Egypt
`C_America`	Central America, including Costa Rica, El Salvador, Guatemala, Mexico, Nicaragua, Panama
`N_America`	North America, including Canada, United States
`S_America`	South America, including Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay, Venezuela
`Asia`	Asia, including Japan, Republic of Korea, People's Republic of China, Taiwan, Thailand
`Ausi`	Australasia, including Australia, New Zealand
`C_Europe`	Central Europe, including Austria, Czech Republic, Germany, Hungary, Poland, Slovakia, Switzerland
`E_Europe`	Eastern Europe, including Albania, Bosnia, Bulgaria, Croatia, Estonia, Latvia, Lithuania, Macedonia, Romania, Russia, Serbia, Slovenia, Turkey
`N_Europe`	Northern Europe, including Denmark, Finland, Iceland, Norway, Sweden
`S_Europe`	Southern Europe, including Greece, Italy, Portugal, Spain
`W_Europe`	Western Europe, including Belgium, France, Great Britain, Ireland, Netherlands
`M_East`	Middle East, including Israel

A complete list of the component locale values that compose each regional locale that is listed previously is presented in *International Language Environments Guide*.

Note – You can specify a `geo` keyword for each locale you need to add to a system.

`install_type` Profile Keyword

`install_type` *initial_upgrade_flash_switch*

`install_type` defines whether to erase and install a new Solaris OS on a system, upgrade the existing Solaris OS on a system, or install a Solaris Flash archive on the system.

Note – You must specify `install_type` in a profile, and `install_type` must be the first profile keyword in every profile.

You must use one of the following options for the *initial_upgrade_flash_switch*:

`initial_install`	Specifies to perform an initial installation of the Solaris OS
`upgrade`	Specifies to perform an upgrade of the Solaris OS
`flash_install`	Specifies to install a Solaris Flash archive that overwrites all files
`flash_update`	Specifies to install a Solaris Flash differential archive that overwrites only the files that are specified

---

Note – Some profile keywords can only be used with the `initial_install` option. Some profile keywords can only be used with the `upgrade` option. Some profile keywords can only be used with the `flash_install` option.

`layout_constraint` Profile Keyword

`layout_constraint` *slice constraint minimum_size*

`layout_constraint` designates the constraint auto-layout has on a file system if auto-layout needs to reallocate space during an upgrade because of space problems.

Limitation	Description
This keyword is used only with upgrade option.	You can use `layout_constraint` only for the upgrade option when you need to reallocate disk space.
If non-global zones are installed, do not use this keyword.	If this keyword is used, the upgrade stops, and an error message is displayed.
If you do not specify the `layout_constraint` keyword	The JumpStart program lays out the disk as follows: ■ File systems that require more space for the upgrade are marked changeable. ■ File systems that are on the same disk as the file system that requires more space and that are mounted by the `/etc/vfstab` file are marked changeable. ■ Remaining file systems are marked fixed because auto-layout cannot change the file systems.

Limitation	Description
If you specify one or more `layout_constraint` keywords	The JumpStart program lays out the disk as follows: ■ File systems that require more space for the upgrade are marked changeable. ■ File systems for which you specified a `layout_constraint` keyword are marked with the specified constraint. ■ The remaining file systems are marked fixed.
If the file system is not marked changeable	You cannot change the constraint on file systems that require more space for the upgrade because the file systems must be marked changeable. You can use the `layout_constraint` keyword to change the *minimum_size* values on file systems that require more space for the upgrade.
If file systems require more space for upgrade	To help auto-layout reallocate space, select more file systems to be changeable or movable, especially those file systems that are located on the same disks as the file systems that require more space for the upgrade.

slice Specifies the file system's disk slice on which to specify the constraint. You must specify the system's disk slice in the form c*w*t*x*d*y*s*z* or c*x*d*y*s*z*.

constraint Use one of the following constraints for the specified file system:

`changeable` Auto-layout can move the file system to another location and it can change the file system size. The `changeable` constraint can only be specified on file systems that are mounted by the `/etc/vfstab` file. You can change the file system's size by specifying the *minimum_size* value.

When you mark a file system as changeable and *minimum_size* is not specified, the file system's minimum size is set to 10 percent more than the minimum size that is required. For example, if the minimum size for a file system is 100 Mbytes, the changed size is 110 Mbytes. If *minimum_size* is specified, any free space that remains, original size minus minimum size, is used for other file systems.

`movable` Auto-layout can move the file system to another slice on the same disk or different disk. The file system size remains the same.

`available` Auto-layout can use all of the space on the file system to reallocate space. All of the data in the file system is lost. The `available` constraint can only be specified on file systems that are not mounted by the `/etc/vfstab` file.

`collapse` Auto-layout moves and collapses the specified file system into the parent file system. You can use the `collapse` option to

reduce the number of file systems on a system as part of the upgrade. For example, if a system has the `/usr` and `/usr/share` file systems, collapsing the `/usr/share` file system moves the file system into `/usr`, the parent file system. You can specify the `collapse` constraint only on file systems that are mounted by the `/etc/vfstab` file.

minimum_size Specifies the size of the file system after auto-layout reallocates space. The *minimum_size* option enables you to change the size of a file system. The size of the file system might be larger if unallocated space is added to the file system. But, the size is never less than the value you specify. The *minimum_size* value is optional. Use this value only if you have marked a file system as changeable and the minimum size cannot be less than what the file system needs for the existing file system contents.

EXAMPLE 11–11 `layout_constraint` Profile Keyword

```
layout_constraint c0t3d0s1 changeable 200

layout_constraint c0t3d0s4 movable

layout_constraint c0t3d1s3 available

layout_constraint c0t2d0s1 collapse
```

`local_customization` Profile Keyword (Installing Solaris Flash Archives)

`local_customization` *local_directory*

Before you install a Solaris Flash archive on a clone system, you can create custom scripts to preserve local configurations on the clone system. The `local_customization` keyword designates the directory where you have stored these scripts. *local_directory* is the path to the script on the clone system.

For information about predeployment and postdeployment scripts, see "Creating Customization Scripts" in *Solaris 10 6/06 Installation Guide: Solaris Flash Archives (Creation and Installation)*.

`locale` Profile Keyword

`locale` *locale_name*

Note – You can use `locale` with both the initial installation and upgrade options.

`locale` designates the locale packages you want to install or add when upgrading for the specified *locale_name*. The *locale_name* values are the same as those values that are used for the `$LANG` environment variable. *International Language Environments Guide* contains a list of valid locale values.

When you use the `locale` keyword, consider the following:

- If you have preconfigured a default locale, the locale is automatically installed. The English language packages are installed by default.
- You can specify a `locale` keyword for each locale you need to add to a system.
- If non-global zones are installed, do not use this keyword to upgrade. If this keyword is used, the upgrade continues, but the keyword is ignored. Locales already installed on the system are upgraded automatically.

`metadb` Profile Keyword (Creating State Database Replicas)

`metadb` *slice* `[size` *size-in-blocks*`] [count` *number-of-replicas*`]`

The `metadb` keyword enables you to create Solaris Volume Manager state database replicas (mediates) during your custom JumpStart installation. You can use the `metadb` keyword multiple times in your profile file to create state database replicas on different disk slices.

slice	You must specify the disk slice on which you want the custom JumpStart program to place the state database replica. The *slice* value must follow the format c*w*t*x*d*y*s*z*.
`size` *size-in-blocks*	The `size` optional keyword enables you to specify the size, in blocks, of the state database replica to be created. If you do not specify a `size` value, the custom JumpStart program uses a default size of 8192 blocks for the state database replica.
`count` *number-of-replicas*	You can specify the number of state database replicas you are creating by setting the optional `count` keyword value in your profile. If you do not specify a `count` value, the custom JumpStart program creates three state database replicas by default.

For more information about creating Solaris Volume Manager state database replicas during your installation, see "State Database Replicas Guidelines and Requirements" on page 205.

`no_content_check` Profile Keyword (Installing Solaris Flash Archives)

`no_content_check`

When installing a clone system with a Solaris Flash differential archive, you can use the `no_content_check` keyword to ignore file-by-file validation. File-by-file validation ensures that the clone system is a duplicate of the master system. Avoid using this keyword unless you are sure the clone system is a duplicate of the original master system.

Caution – If you use `no_content_check`, all new files are deleted to bring the clone system to the expected state. If you are not certain that you want files deleted, use the default, which protects new files by stopping the installation.

For information about installing Solaris Flash differential archives, see "To Prepare to Install a Solaris Flash Archive With a Custom JumpStart Installation" on page 124.

`no_master_check` Profile Keyword (Installing Solaris Flash Archives)

```
no_master_check
```

When installing a clone system with a Solaris Flash differential archive, you can use the `no_master_check` keyword to ignore checking the clone system to make sure it was built from the original master system. Avoid using this keyword unless you are sure the clone system is a duplicate of the original master system.

For information about installing Solaris Flash differential archives, see "To Prepare to Install a Solaris Flash Archive With a Custom JumpStart Installation" on page 124.

`num_clients` Profile Keyword

`num_clients` *client_num*

When a server is installed, space is allocated for each diskless client's root (`/`) and `swap` file systems. `num_clients` defines the number of diskless clients, *client_num*, that a server supports. If you do not specify `num_clients` in the profile, five diskless clients are allocated by default.

Note – You can use `num_clients` only when `system_type` is specified as `server`.

`package` Profile Keyword

`package` *package_name* `[add [`*retrieval_type location*`]| delete]`

You can use `package` with both the initial installation and upgrade options. The `package` keyword enables you to do the following:

- Add a package to the software group from the Solaris distribution that is to be installed.
- Add a package to the software group from outside the distribution that is being installed.
- Exclude or remove a package from the software group that is to be installed or upgraded.
- Add a package from outside the distribution that is being installed when installing a Solaris Flash archive.

package_name	Specifies the package name in the form `SUNW`*name*. To view detailed information about packages and their names, on an installed system, use the `pkginfo -l` command.
add | delete	Specifies to add or remove the specified package. If you do not specify `add` or `delete`, `add` is used by default.
	Note – You can add more than one package by adding another package entry to the profile and omitting the location. The location of the previous package is used for all subsequent packages if the location is left blank.
[*retrieval_type location*]	Specifies the addition of a package or packages that are located outside the Solaris distribution that is being installed. The values of *retrieval_type* and *location* depend on where the package is stored. The following sections contain the values you can use for *retrieval_type* and *location* and examples of how to use the `package_name` keyword.

Note – If non-global zones are installed, do not use this keyword to upgrade. If this keyword is used, the upgrade continues, but the keyword is ignored.

Packages Stored on an NFS Server

If the package is stored on an NFS server, use one of the following syntaxes for the `package` keyword.

```
package package_name add nfs server_name:/path [retry n]
package package_name add nfs://server_name:/path [retry n]
```

package_name	Specifies the package name in the form `SUNW`*name*. To view detailed information about packages and their names, on an installed system, use the `pkginfo -l` command.
server_name	Specifies the name of the server where you stored the package.
path	Specifies the location of the package directory on the specified server. If the path contains $HOST, $HOST is replaced with the name of the host system that you are installing.
retry *n*	Is an optional keyword. *n* is the maximum number of times the installation process attempts to mount the directory.

EXAMPLE 11–12 Adding a Package by Using NFS

In this example, the `package` profile keyword adds the SUNWnew package from the NFS location `nfs://golden/packages/Solaris_10_606/`. If a mount fails, the NFS mount is tried five times.

EXAMPLE 11–12 Adding a Package by Using NFS *(Continued)*

```
package SUNWnew add nfs golden:/packages/Solaris_10 6/06 retry 5
```

Packages Stored on an HTTP Server

If the package is stored on an HTTP server, use one of the following syntaxes for the `package` keyword.

```
package package_name add http://server_name[:port] path optional_keywords
package package_name add http server_name[:port] path optional_keywords
```

package_name	Specifies the package name in the form `SUNW`*name*. To view detailed information about packages and their names, on an installed system, use the `pkginfo -l` command.
server_name	Specifies the name of the server where you stored the package.
port	Specifies an optional port. *port* can be a port number or the name of a TCP service that has a port number that is determined at runtime. If you do not specify a port, the default HTTP port number 80 is used.
path	Specifies the location of the package to be retrieved from the specified server. When using an HTTP server, the package must be in package datastream format.
optional_keywords	Specifies the optional keywords to use when you retrieve a package from an HTTP server.

TABLE 11–6 Optional `package` Keywords to Use With HTTP

Keyword	Value Definition
`timeout` *min*	The `timeout` keyword enables you to specify, in minutes, the maximum length of time that is allowed to pass without receipt of data from the HTTP server. If a timeout occurs, the connection is closed, reopened, and resumed. If you specify a `timeout` value of 0 (zero), the connection is not reopened. If a timeout reconnection occurs, the package is retried from the beginning of the package and the data that was retrieved prior to the timeout is discarded.
`proxy` *host:port*	The `proxy` keyword enables you to specify a proxy host and proxy port. You can use a proxy host to retrieve a Solaris package from the other side of a firewall. You must supply a proxy port when you specify the `proxy` keyword.

EXAMPLE 11–13 Adding a Package by Using HTTP

In this example, the `package` profile keyword adds all the packages listed in the `Solaris 10_606` directory from the HTTP location `http://package.central/Solaris_10_606`. If five minutes pass and no data is received, the package data is retrieved again. Previous package data is discarded. Either of the following formats can be used.

```
package SUNWnew add http package.central/Solaris_10_606 timeout 5

package SUNWnew add http://package.central/Solaris_10_606 timeout 5
```

EXAMPLE 11–14 Adding a Package by Using HTTP with a Proxy Port

In this example, the `package` profile keyword adds all the packages listed in the `Solaris_10_606` directory from the HTTP location `http://package.central/Solaris_10_606`. The package is retrieved across a firewall by using the `proxy` keyword.

```
package SUNWnew add http://package.central/Solaris_10_606 proxy webcache.east:8080
```

Packages Stored on a Local Device

You can retrieve a Solaris package from a local device if you stored the package on a file system-oriented, random-access device, such as a diskette or a DVD-ROM. Use the following syntax for the `package` keyword.

`package` *package_name* `add local_device` *device path file_system_type*

package_name	Specifies the package name in the form `SUNW`*name*. To view detailed information about packages and their names, on an installed system, use the `pkginfo -l` command.
device	Specifies the name of the drive where the Solaris package resides. If the device name is a canonical path, the device is mounted directly. If you supply a device name that is not a canonical path, the installation utility adds `/dev/dsk/` to the path.
path	Specifies the path to the Solaris package, relative to the root (`/`) file system on the device you specified.
file_system_type	Specifies the type of file system on the device. If you do not supply a file system type, the installation utility attempts to mount a UFS file system. If the UFS mount fails, the installation utility attempts to mount an HSFS file system.

EXAMPLE 11–15 Adding a Package by Using a Local Device With a UFS File System

In this example, the `package` profile keyword adds the `SUNWnew` package from the directory `/Solaris_10_606/Product` from the local device c0t6d0s0. This is a UFS file system.

EXAMPLE 11–15 Adding a Package by Using a Local Device With a UFS File System *(Continued)*

```
package SUNWnew add local_device c0t6d0s0 /Solaris_10_606/Product ufs
```

EXAMPLE 11–16 Adding a Package by Using a Local Device From an HSFS File System

In this example, the `package` profile keyword adds the `SUNWnew` package from the directory `/Solaris_10_606/Product` from the local device c0t6d0s0. This is an HSFS file system.

```
package SUNWnew add local_device c0t6d0s0 /Solaris_10_606/Product  hsfs
```

Packages Stored on a Local File

A package can be installed from the miniroot from which you booted the system. When you perform a custom JumpStart installation, you boot the system from a DVD, CD, or an NFS-based miniroot. The installation software is loaded and run from this miniroot. Therefore, a package that you stored in the DVD, CD, or NFS-based miniroot is accessible as a local file. Use the following syntax for the `package` keyword.

`package` *package_name* `add local_file` *path*

package_name Specifies the package name in the form `SUNW`*name*. To view detailed information about packages and their names, on an installed system, use the `pkginfo -l` command.

path Specifies the location of the package. The path must be accessible to the system as a local file while the system is booted from the Solaris Software - 1 CD or from the Solaris Operating System DVD. The system cannot access `/net` when it is booted from the Solaris Software - 1 CD or from the Solaris Operating System DVD.

EXAMPLE 11–17 Adding a Package by Using a Local File

In this example, the `package` profile keyword adds the `SUNWnew` package from the `/Solaris_10_606/Product` directory.

```
package SUNWnew add local_file /Solaris_10_606/Product
```

Limitations When Using the `package` Keyword

Note these limitations when using the `package` keyword:

- Some packages are required and cannot be deleted.
- You cannot individually add or delete localization packages by using the `package` profile keyword. To add localization packages, use the `locale` profile keyword.
- Packages cannot be retrieved from an FTP server location or local backup, such as tape.

- Packages within the Solaris distribution being installed cannot be added from alternate locations. If a package from the Solaris distribution is specified, the package cannot be followed by an alternative location in order to maintain consistency with the resulting installed system.
- In order to install without manual intervention, the package must be installable by using the `pkgadd` command. The same `admin` file must be used to install the software group packages and the package that resides in another location.
  - If the retrieval_type is HTTP, then the package must be in stream format.
  - If the retrieval_type is NFS server, local device, or local file, then the package should follow standard packaging format with the directory name being the same as the package being installed.
  - If a package is being added from a separate location and a package depends on another package that is not currently installed, the package is not installed. An error message is logged into the install or upgrade log file.
- If the package is being installed with a Solaris Flash archive, follow these guidelines.
  - Any package installed must be compatible with the archive.
  - If a package is present in the archive, the JumpStart overwrites the existing package.

Upgrade Behavior When Using the `package` Keyword

When you use `package` for an upgrade, the JumpStart program performs the following actions:

- All packages already on the system are automatically upgraded.
- If you specify *package_name* `add` and *package_name* is not installed on the system, the package is installed.
- If you specify *package_name* `delete` and *package_name* is installed on the system, the package is deleted *before* the upgrade begins.
- If you specify *package_name* `delete` and *package_name* is not installed on the system, the package is not installed if the package is part of a cluster that is designated to be installed.

`partitioning` Profile Keyword

`partitioning` *type*

`partitioning` defines how the disks are divided into slices for file systems during the installation.

If you do not specify `partitioning` in the profile, the `default` type of partitioning is used by default.

type Use one of the following values:

`default` The JumpStart program selects the disks and creates the file systems on which to install the specified software, except for any file systems that are specified by the `filesys` keywords. `rootdisk` is selected first. The JumpStart program uses additional disks if the specified software does not fit on `rootdisk`.

`existing` The JumpStart program uses the existing file systems on the system's disks. All file systems except `/`, `/usr`, `/usr/openwin`, `/opt`, and `/var` are preserved. The JumpStart program uses the last mount-point field from the file system superblock to determine which file-system mount point the slice represents.

Note – When you use both the `filesys` and `partitioning existing` profile keywords, you must set size *size* to `existing`.

`explicit` The JumpStart program uses the disks and creates the file systems that are specified by the `filesys` keywords. If you specify only the root (`/`) file system with the `filesys` keyword, all of the Solaris software is installed in the root (`/`) file system.

Note – If you use the `explicit` profile value, you must use the `filesys` keyword to specify the disks to use and file systems to create.

`patch` Profile Keyword

`patch` *patch_id_list* | *patch_file patch_location optional_keywords*]

patch_id_list Specifies the patch ID numbers that are to be installed. The list should be a list of comma-separated Solaris patch IDs. The patches are installed in the order specified in the list. Do not add a space after the comma, for example: 112467-01,112765-02.

patch_file A file with a list of patches that is found in the *patch_location*. The patches are installed in the order specified in the file.

patch_location Specifies the location where the patches reside. The locations allowed are the following:

- NFS server
- HTTP server
- Local device
- Local file

optional_keywords Optional keywords depend on where patches are stored. The following sections describe the possible locations and optional keywords.

Note – If non-global zones are installed, do not use this keyword to upgrade. If this keyword is used, the upgrade continues, but the keyword is ignored.

Patches Stored on an NFS Server

If the patch is stored on an NFS server, use one of the following syntaxes for the `patch` keyword.

```
patch patch_id_list | patch_file nfs server_name:/patch_directory [retry n]
patch patch_id_list | patch_file nfs://server_name/patch_director  [retry n]
```

patch_id_list	Specifies the patch ID numbers that are to be installed. The list should be a list of comma-separated Solaris patch IDs. The patches are installed in the order specified in the list.
patch_file	A file with a list of patches that is found in the *patch_location*. The patches are installed in the order specified in the file.
server_name	Specifies the name of the server where you stored the patches.
patch_directory	Specifies the location of the patch directory on the specified server. The patches must be in standard patch format.
retry *n*	Is an optional keyword. *n* is the maximum number of times the install utility attempts to mount the directory.

EXAMPLE 11–18 Adding a Patch With an Ordered List by Using NFS

In this example, the `patch` profile keyword adds all the patches listed in the `patch` file from the NFS patch directory `nfs://patch_master/Solaris/v10_606/patches`. Patches are installed in the order listed in the `patch`. If a mount fails, the NFS mount is tried five times.

```
patch patch_file nfs://patch_master/Solaris/v10_606/patches retry 5
```

EXAMPLE 11–19 Adding a Patch by Using NFS

In this example, the `patch` profile keyword adds the patches 112467–01 and 112765–02 from the patch directory `/Solaris/v10_606/patches` on the server `patch_master`.

```
patch 112467-01,112765-02 nfs patch_master:/Solaris/v10_606/patches
```

Patches Stored on an HTTP Server

If the patch is stored on an HTTP server, use one of the following syntaxes for the `patch` keyword.

`patch` *patch_id_list* | *patch_file* `http://`*server_name [:port] patch_directory optional_http_keywords*

`patch` *patch_id_list* | *patch_file* `http` *server_name [:port] patch_directory optional_http_keywords*

patch_id_list	Specifies the patch ID numbers that are to be installed. The list should be a list of comma-separated Solaris patch IDs. The patches are installed in the order specified in the list. Do not add a space after the comma, for example: 112467-01,112765-02.
patch_file	A file with a list of patches that is found in the *patch_location*. The patches are installed in the order specified in the file.
server_name	Specifies the name of the server where you stored the patch.
port	Specifies an optional port. *port* can be a port number or the name of a TCP service that has a port number that is determined at runtime. If you do not specify a port, the default HTTP port number 80 is used.
patch_directory	Specifies the location of the patch directory to be retrieved from the specified server. When using an HTTP server, the patch must be in JAR format.
optional_keywords	Specifies the optional keywords to use when you retrieve a patch from an HTTP server.

TABLE 11–7 Optional `patch` Keywords to Use With HTTP

Keyword	Value Definition
`timeout` *min*	The `timeout` keyword enables you to specify, in minutes, the maximum length of time that is allowed to pass without receipt of data from the HTTP server. If a timeout occurs, the connection is closed, reopened, and resumed. If you specify a `timeout` value of 0 (zero), the connection is not reopened. If a timeout reconnection occurs, the package is retried from the beginning of the package and the data that was retrieved prior to the timeout is discarded.
`proxy` *host*:*port*	The `proxy` keyword enables you to specify a proxy host and proxy port. You can use a proxy host to retrieve a Solaris package from the other side of a firewall. You must supply a proxy port when you specify the `proxy` keyword.

EXAMPLE 11–20 Adding a Patch With an Ordered List by Using HTTP

In this example, the `patch` profile keyword adds all the patches listed in the `patch_file` file from the HTTP location `http://patch.central/Solaris/v10_606/patches`. The patches are installed in the order specified in the file the `patch` file. If five minutes pass and no data is received, the patch data is retrieved again. Previous patch data is discarded.

```
patch patch_file http://patch.central/Solaris/v10_606/patches timeout 5
```

EXAMPLE 11–21 Adding a Patch by Using HTTP

In this example, the `patch` profile keyword entry adds the patches 112467–01 and 112765–02 from the patch location `http://patch_master/Solaris/v10_606/patches`.

EXAMPLE 11–21 Adding a Patch by Using HTTP *(Continued)*

```
patch 112467-01,112765-02 http://patch.central/Solaris/v10_606/patches
```

Patches Stored on a Local Device

You can retrieve a Solaris package from a local device if you stored the package on a file system-oriented, random-access device, such as a diskette or a DVD-ROM. Use the following syntax for the `patch` keyword.

`patch` *patch_id_list* `|` *patch_file* `local_device \`
device path file_system_type

patch_id_list — Specifies the patch ID numbers that are to be installed. The list should be a list of comma-separated Solaris patch IDs. The patches are installed in the order specified in the list. Do not add a space after the comma, for example: 112467-01,112765-02.

patch_file — A file with a list of patches that is found in the *patch_location*. The patches are installed in the order specified in the file.

device — Specifies the name of the drive where the Solaris package resides. If the device name is a canonical path, the device is mounted directly. If you supply a device name that is not a canonical path, the installation utility adds `/dev/dsk/` to the path.

path — Specifies the path to the Solaris patch, relative to the root (`/`) file system on the device you specified.

file_system_type — Specifies the type of file system on the device. If you do not supply a file system type, the installation utility attempts to mount a UFS file system. If the UFS mount fails, the installation utility attempts to mount an HSFS file system.

EXAMPLE 11–22 Adding a Patch With an Ordered List by Using a Local Device

In this example, the `patch` profile keyword adds all the patches listed in the `patch_file` file from the directory `/Solaris_10_606/patches` from the local device c0t6d0s0. The `patch` file determines the order of patches to be installed.

```
patch patch_file c0t6d0s0 /Solaris_10_606/patches
```

EXAMPLE 11–23 Adding a Patch by Using a Local Device

In this example, the `patch` profile keyword adds the patches 112467–01 and 112765–02 from the patch directory `/Solaris_10_606/patches` from local device c0t6d0s0.

```
patch 112467-01,112765-02 local_device c0t6d0s0 /Solaris_10_606/patches
```

Patches Stored on a Local File

A patch can be installed from the miniroot from which you booted the system. When you perform a custom JumpStart installation, you boot the system from a DVD, CD, or an NFS-based miniroot. The installation software is loaded and run from this miniroot. Therefore, a patch that you stored in the DVD, CD, or NFS-based miniroot is accessible as a local file. Use the following syntax for the `patch` keyword.

`patch` *patch_id_list* | *patch_file* `local_file` *patch _directory*

patch_id_list — Specifies the patch ID numbers that are to be installed. The list should be a list of comma-separated Solaris patch IDs. The patches are installed in the order specified in the list. Do not add a space after the comma, for example: 112467-01,112765-02.

patch_file — A file with a list of patches that is found in the *patch_location*. The patches are installed in the order specified in the file.

patch_directory — Specifies the location of the patch directory. The patch directory must be accessible to the system as a local file while the system is booted from the Solaris Software - 1 CD or from the Solaris Operating System DVD. The system cannot access `/net` when it is booted from the Solaris Software - 1 CD or from the Solaris Operating System DVD.

EXAMPLE 11–24 Adding a Patch With an Ordered List by Using a Local File

In this example, the `patch` profile keyword adds all the patches that are listed in the `patch_file` file from the `/Solaris_10_606/patches` directory. The `patch` file determines the order of patches to be installed.

```
patch patch_cal_file /Solaris_10_606/patches
```

EXAMPLE 11–25 Adding a Patch by Using a Local File

In this example, the `patch` profile keyword adds the patches 112467–01 and 112765–02 from the patch directory `/Solaris_10_606/patches`.

```
patch 112467-01,112765-02 local_file /Solaris_10_606/patches
```

Limitations When Using the `patch` Keyword

Note the following limitations when using the `patch` keyword:

- Patches cannot be retrieved from FTP locations or local backup, such as tape.
- Signed patches cannot be added.
- Patches must be installable with the `patchadd` command.

- If a patch depends on a patch that is not currently installed, the patch is not installed. An error message is logged into the installation or upgrade log file.
- You must determine the correct order of the patches for a correct installation of the patches.

`root_device` Profile Keyword

`root_device` *slice*

`root_device` designates the system's root disk. "How the System's Root Disk Is Determined" on page 188 contains additional information.

When you are upgrading a system, `root_device` designates the root (`/`) file system and the file systems that are mounted by its `/etc/vfstab` file to be upgraded. You must specify `root_device` if more than one root (`/`) file system can be upgraded on a system. You must specify *slice* in the form `c`*w*`t`*x*`d`*y*`s`*z* or `c`*x*`d`*y*`s`*z*.

When you use the `root_device` keyword, consider the following:

- If you specify `root_device` on a system with only one disk, the `root_device` and the disk must match. Also, any `filesys` keywords that specify the root (`/`) file system must match `root_device`.
- If you are upgrading a RAID-1 volume (mirror), the value that is specified for `root_device` should be one side of the mirror. The other side of the mirror is automatically upgraded.

EXAMPLE 11–26 `root_device` Profile Keyword

```
root_device c0t0d0s2
```

How the System's Root Disk Is Determined

A system's root disk is the disk on the system that contains the root (`/`) file system. In a profile, you can use the `rootdisk` variable in place of a disk name, which the JumpStart program sets to the system's root disk. Table 11–8 describes how the JumpStart program determines the system's root disk for the installation.

Note – The JumpStart program only determines a system's root disk size during an initial installation. You cannot change a system's root disk during an upgrade.

TABLE 11–8 How JumpStart Determines a System's Root Disk (Initial Installation)

Stage	Action
1	If the `root_device` keyword is specified in the profile, the JumpStart program sets `rootdisk` to the root device.

TABLE 11–8 How JumpStart Determines a System's Root Disk (Initial Installation) *(Continued)*

Stage	Action
2	If `rootdisk` is not set and the `boot_device` keyword is specified in the profile, the JumpStart program sets `rootdisk` to the boot device.
3	If `rootdisk` is not set and a `filesys` c*w*t*x*d*y*s*z size* `/` entry is specified in the profile, the JumpStart program sets `rootdisk` to the disk that is specified in the entry.
4	If `rootdisk` is not set and a `rootdisk.s`*n* entry is specified in the profile, the JumpStart program searches the system's disks in kernel probe order for an existing root file system on the specified slice. If a disk is found, the JumpStart program sets `rootdisk` to the found disk.
5	If `rootdisk` is not set and `partitioning existing` is specified in the profile, the JumpStart program searches the system's disks in kernel probe order for an existing root file system. If a root file system is not found or more than one is found, an error occurs. If a root file system is found, the JumpStart program sets `rootdisk` to the found disk.
6	If `rootdisk` is not set, the JumpStart program sets `rootdisk` to the disk where the root (`/`) file system is installed.

`system_type` Profile Keyword

`system_type` *type_switch*

`system_type` defines the type of system on which the Solaris OS is to be installed.

type_switch represents the option `standalone` or `server`, which you use to indicate the type of system on which the Solaris software is to be installed. If you do not specify `system_type` in a profile, `standalone` is used by default.

`usedisk` Profile Keyword

`usedisk` *disk_name* `...`

By default, the JumpStart program uses all of the operational disks on the system when you specify `partitioning default`. The `usedisk` profile keyword designates one or more disks that you want the JumpStart program to use. You must specify *disk_name* in the form c*x*t*y*d*z* or c*y*d*z*, for example, `c0t0d0` or `c0d0s0`.

If you specify `usedisk` in a profile, the JumpStart program uses only the disks that you specify after the `usedisk` keyword.

Note – You cannot specify the `usedisk` keyword and the `dontuse` keyword in the same profile.

Limiting Profile Keywords When Upgrading With Non-Global Zones

When non-global zones are installed, you can use the custom JumpStart program to upgrade. Only two profile keywords should be used in the profile, the `install_type` and `root_device` keywords.

Because some keywords affect non-global zones, some keywords cannot be included in a profile. For example, using keywords that add packages, reallocate disk space, or add locales would affect non-global zones. If you use keywords that adversely affect non-global zones, these keywords are either ignored or prevent the upgrade from being completed. For a list of keywords that should not be used in a profile, see the following table.

TABLE 11–9 Keywords That Produce Errors in an Upgrade With Non-Global Zones

Profile Keyword	Upgrade Behavior
`backup_media`	This keyword stops the upgrade, and an error message is displayed.
`cluster`	This keyword is ignored, and the upgrade continues.
`geo`	This keyword is ignored, and the upgrade continues.
`layout_constraint`	This keyword stops the upgrade, and an error message is displayed.
`locale`	This keyword is ignored, and the upgrade continues.
`package`	This keyword is ignored, and the upgrade continues.
`patch`	This keyword is ignored, and the upgrade continues.

For more information on non-global zones, see the following:

- "Upgrading When Solaris Zones are Installed on a System" on page 43
- Chapter 16, "Introduction to Solaris Zones," in *System Administration Guide: Solaris Containers-Resource Management and Solaris Zones*

Custom JumpStart Environment Variables

You can use environment variables in your begin and finish scripts. For example, a begin script might extract the disk size, `SI_DISKSIZES`, and install or not install particular packages on a system, based on the actual disk size the script extracts.

Information that is gathered about a system is stored in these environment variables, which are generally set or not, depending on the rule keywords and values you use in the `rules` file.

For example, information about which operating system is already installed on a system is only available in `SI_INSTALLED` after the `installed` keyword is used.

Table 11–10 describes these variables and their values.

TABLE 11–10 Installation Environment Variables

Environment Variable	Value
SI_ARCH	The hardware architecture of the install client. The SI_ARCH variable is set when the arch keyword is used in the rules file.
SI_BEGIN	The name of the begin script, if one is used.
SI_CLASS	The name of the profile that is used to install the install client.
SI_DISKLIST	A comma-separated list of disk names on the install client. The SI_DISKLIST variable is set when the disksize keyword is used and matched in the rules file. The SI_DISKLIST and SI_NUMDISKS variables are used to determine the physical disk to use for the rootdisk. rootdisk is described in "How the System's Root Disk Is Determined" on page 188.
SI_DISKSIZES	A comma-separated list of disk sizes on the install client. The SI_DISKSIZES variable is set when the disksize keyword is used and matched in the rules file.
SI_DOMAINNAME	The domain name. The SI_DOMAINNAME variable is set when the dommainname keyword is used and matched in the rules file.
SI_FINISH	The name of the finish script, if one is used.
SI_HOSTADDRESS	The install client's IP address.
SI_HOSTNAME	The install client's host name. The SI_HOSTNAME variable is set when the hostname keyword is used and matched in the rules file.
SI_INSTALLED	The device name of a disk with a specific operating system on the disk, for example, Solaris, SunOS, or System V. The SI_INSTALLED variable is set when the installed keyword is used and matched in the rules file. SI_INST_OS and SI_INST_VER are used to determine the value of SI_INSTALLED.
SI_INST_OS	The name of the operating system. SI_INST_OS and SI_INST_VER are used to determine the value of SI_INSTALLED.
SI_INST_VER	The version of the operating system. SI_INST_OS and SI_INST_VER are used to determine the value of SI_INSTALLED.
SI_KARCH	The install client's kernel architecture. The SI_KARCH variable is set when the karch keyword is used and matched in the rules file.
SI_MEMSIZE	The amount of physical memory on the install client. The SI_MEMSIZE variable is set when the memsize keyword is used and matched in the rules file.
SI_MODEL	The install client's model name. The SI_MODEL variable is set when the model keyword is used and matched in the rules file.
SI_NETWORK	The install client's network number. The SI_NETWORK variable is set when the network keyword is used and matched in the rules file.

TABLE 11–10 Installation Environment Variables *(Continued)*

Environment Variable	Value
SI_NUMDISKS	The number of disks on an install client. The SI_NUMDISKS variable is set when the disksize keyword is used and matched in the rules file. The SI_NUMDISKS and SI_DISKLIST variables are used to determine the physical disk to use for the rootdisk. rootdisk is described in "How the System's Root Disk Is Determined" on page 188.
SI_OSNAME	The operating system release on the Solaris software image. For example, you can use the SI_OSNAME variable in a script if you are installing the Solaris software on systems that are based on the version of the operating system on the Solaris Operating System DVD or the Solaris Software - 1 CD image.
SI_ROOTDISK	The device name of the disk that is represented by the logical name rootdisk. The SI_ROOTDISK variable is set when the disksize or the installed keyword is set to rootdisk in the rules file.
SI_ROOTDISKSIZE	The size of the disk that is represented by the logical name rootdisk. The SI_ROOTDISKSIZE variable is set when the disksize or the installed keyword is set to rootdisk in the rules file.
SI_TOTALDISK	The total amount of disk space on the install client. The SI_TOTALDISK variable is set when the totaldisk keyword is used and matched in the rules file.

Probe Keywords and Values

Table 11–11 describes each rule keyword and its equivalent probe keyword.

Note – Always place probe keywords at or near the beginning of the rules file.

TABLE 11–11 Descriptions of Probe Keywords

Rule Keyword	Equivalent Probe Keyword	Description of Probe Keyword
any	None	
arch	arch	Determines the kernel architecture, i386 or SPARC, and sets SI_ARCH.
disksize	disks	Returns the size of a system's disks in Mbytes in kernel probe order, c0t3d0s0, c0t3d0s1, c0t4d0s0. disksize sets SI_DISKLIST, SI_DISKSIZES, SI_NUMDISKS, and SI_TOTALDISK.
domainname	domainname	Returns a system's NIS or NIS+ domain name or blank and sets SI_DOMAINNAME. The domainname keyword returns the output of domainname(1M).
hostaddress	hostaddress	Returns a system's IP address, the first address that is listed in the output of ifconfig(1M) -a that is not lo0, and sets SI_HOSTADDRESS.
hostname	hostname	Returns a system's host name that is the output from uname(1) -n and sets SI_HOSTNAME.

TABLE 11–11 Descriptions of Probe Keywords *(Continued)*

Rule Keyword	Equivalent Probe Keyword	Description of Probe Keyword
`installed`	`installed`	Returns the version name of the Solaris OS that is installed on a system and sets `SI_ROOTDISK` and `SI_INSTALLED`. If the JumpStart program finds a Solaris release but is unable to determine the version, the version that is returned is `SystemV`.
`karch`	`karch`	Returns a system's platform group, for example i86pc or sun4u, and sets `SI_KARCH`. For a list of platform names, see *Solaris Sun Hardware Platform Guide* at `http://docs.sun.com`.
`memsize`	`memsize`	Returns the size of physical memory on a system in Mbytes and sets `SI_MEMSIZE`.
`model`	`model`	Returns a system's platform name and sets `SI_MODEL`. For a list of platform names, see the *Solaris Sun Hardware Platform Guide* at `http://docs.sun.com`.
`network`	`network`	Returns a system's network number, which the JumpStart program determines by performing a logical AND between the system's IP address and the subnet mask. The system's IP address and the subnet mask are extracted from the first address that is listed in the output of `ifconfig`(1M) `-a` that is not lo0. The `network` keyword sets `SI_NETWORK`.
`osname`	`osname`	Returns the version and operating system name of the Solaris OS that is found on a CD and sets `SI_OSNAME`. If the JumpStart program finds a Solaris release but is unable to determine the version, the version that is returned is `SystemV`.
	`rootdisk`	Returns the name and size in Mbytes of a system's root disk and sets `SI_ROOTDISK`.
`totaldisk`	`totaldisk`	Returns the total disk space on a system (in Mbytes) and sets `SI_TOTALDISK`. The total disk space includes all of the operational disks that are attached to a system.

PART III

Using RAID-1 Volumes

This part provides an overview of Solaris Volume Manager components that can be used in a Solaris installation or upgrade. This part also includes guidelines and requirements that are necessary to use RAID-1 volumes.

◆ ◆ ◆ CHAPTER 12

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

This section discusses the advantages of creating mirrored file systems. The section also describes the Solaris Volume Manager components that are required to create mirrored file systems.

This chapter describes the following topics.

For additional information about how to create mirrored file systems with Solaris Live Upgrade, see "General Guidelines When Creating RAID-1 Volumes (Mirrored) File Systems" in *Solaris 10 6/06 Installation Guide: Solaris Live Upgrade and Upgrade Planning*.

For additional information about how to create mirrored file systems with the custom JumpStart installation method, see "`filesys` Profile Keyword (Creating RAID-1 Volumes)" on page 170 and "`metadb` Profile Keyword (Creating State Database Replicas)" on page 176.

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 Solaris custom JumpStart and Solaris Live Upgrade installation methods 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 custom JumpStart and Solaris 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 "Custom JumpStart and Solaris Live Upgrade Guidelines" on page 207.

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

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.

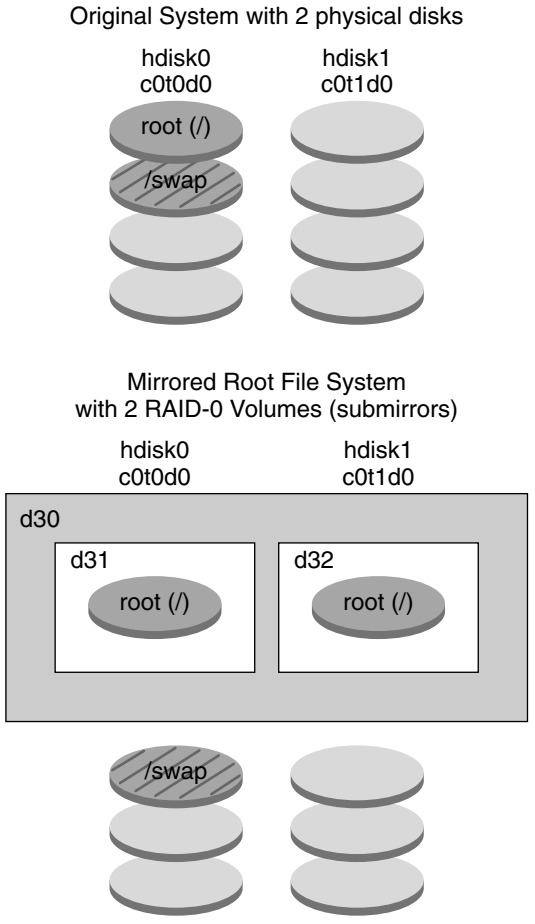
Solaris Volume Manager volumes are built from slices (disk partitions) or from other Solaris Volume Manager volumes.

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 custom JumpStart installation method and Solaris Live Upgrade support the use of block devices to create mirrored file systems. See "RAID Volume Name Requirements and Guidelines for Custom JumpStart and Solaris Live Upgrade" on page 208 for details about volume names.

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

Figure 12–1 shows a mirror that duplicates the root (/) file system over two physical disks.



d30 — RAID-1 volume (mirror)
d31 — Single-slice concatenation (submirror)
d32 — Single-slice concatenation (submirror)

FIGURE 12–1 Creating RAID-1 Volumes on the Root (/) File System on Two Disks

Figure 12–1 shows a system with the following configuration.

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

Overview of Solaris Volume Manager Components

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

- State database and state database replicas (metadbs)
- Single-slice concatenations (submirrors)
- RAID-1 volumes (mirrors)

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 about the state of your Solaris Volume Manager configuration. 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.

When you set up your configuration, you can locate the state database replicas on either of the following:

- Dedicated slices
- (Solaris Live Upgrade only) Slices that will later become part of volumes

You can keep more than one copy of a state database on one slice. However, you might make the system more vulnerable to a single point of failure by placing state database replicas on a single slice.

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 Mbytes (8192 disk sectors) of disk storage by default. Replicas can be stored on the following devices:

- A dedicated local disk slice
- (Solaris Live Upgrade only) A local slice that will be part of a volume
- (Solaris Live Upgrade only) 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.

When using custom JumpStart or Solaris Live Upgrade to install RAID-1 volumes, review these guidelines and requirements	"State Database Replicas Guidelines and Requirements" on page 205
For more detailed information about the state database and state database replicas	*Solaris Volume Manager Administration Guide*

RAID-0 Volumes (Concatenations)

The custom JumpStart and Solaris Live Upgrade installation methods enable you to create RAID-0 volumes. A RAID-0 volume single-slice concatenation is a volume whose data is organized serially and adjacently across components, forming one logical storage unit. The custom JumpStart installation method and Solaris 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 custom JumpStart installation method enables you to create a mirror that consists of up to two submirrors. Solaris Live Upgrade enables you to create a mirror that consists of up to three submirrors. Practically, 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 RAID–0 volume planning information	"RAID-1 and RAID-0 Volume Requirements and Guidelines" on page 207
For RAID-0 volumes details	*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.) Using RAID-1 volumes to mirror file systems 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.

With RAID-1 volumes, data can be read from both RAID-0 volumes simultaneously (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.

After you configure a RAID-1 volume, the volume can be used just 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.

For RAID-1 volume planning information	"RAID-1 and RAID-0 Volume Requirements and Guidelines" on page 207
For RAID-1 volume details	*Solaris Volume Manager Administration Guide*

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.

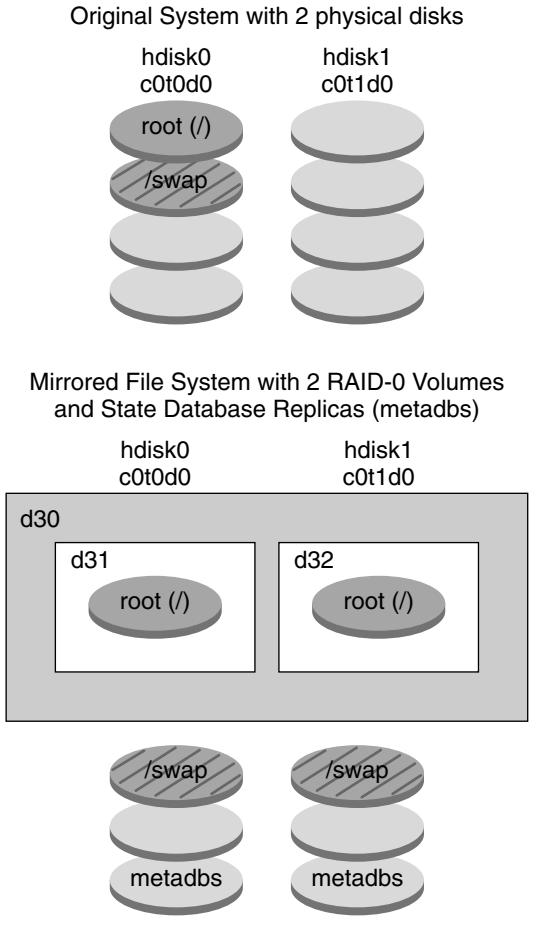


FIGURE 12–2 RAID-1 Volume Disk Layout

Figure 12–2 shows a system with the following configuration.

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

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

For an example profile that uses the custom JumpStart installation method to create this configuration	Example 6–13
For instructions about how to create RAID-1 volumes with Solaris Live Upgrade	"To Create a Boot Environment With RAID-1 Volumes (Mirrors) (Command-Line Interface)" in *Solaris 10 6/06 Installation Guide: Solaris Live Upgrade and Upgrade Planning*

◆ ◆ ◆ CHAPTER 13

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 custom JumpStart or Solaris Live Upgrade installation methods.

This chapter describes the following topics.

For additional information about planning to create mirrored file systems with the Solaris Live Upgrade installation method, see "General Guidelines When Creating RAID-1 Volumes (Mirrored) File Systems" in *Solaris 10 6/06 Installation Guide: Solaris Live Upgrade and Upgrade Planning*.

For instructions about how to create mirrored file systems with the custom JumpStart installation method, see "`filesys` Profile Keyword (Creating RAID-1 Volumes)" on page 170 and "`metadb` Profile Keyword (Creating State Database Replicas)" on page 176.

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.

- You should create state database replicas on a dedicated slice of at least 4 Mbytes 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.
- By default, the size of a state database replica is 4 Mbytes 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 12, "Administering Disks (Tasks)," in *System Administration Guide: Devices and File Systems*.
- 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.
- 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.

Custom JumpStart and Solaris Live Upgrade Guidelines

The custom JumpStart installation method and Solaris 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 following guidelines.

Installation Program	Supported Feature	Unsupported Feature
Custom JumpStart and Solaris Live Upgrade	■ 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.
Custom JumpStart	■ 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.	■ Does not support an upgrade when RAID-1 volumes are configured. ■ More than two RAID-0 volumes are not supported.

Installation Program	Supported Feature	Unsupported Feature
Solaris Live Upgrade	■ 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. For examples, see "To Create a Boot Environment With RAID-1 Volumes (Mirrors) (Command-Line Interface)" in *Solaris 10 6/06 Installation Guide: Solaris Live Upgrade and Upgrade Planning*.	More than three RAID-0 volumes are not supported.
Creating and Installing a Solaris Flash with RAID-1 volumes	You can create a Solaris Flash archive created from a master system that has Solaris Volume Manager RAID-1 volumes configured. The Solaris Flash creation software removes all RAID-1 volume information from the archive to keep the integrity of the clone system. With custom JumpStart you can rebuild the RAID-1 volumes by using a JumpStart profile. With Solaris Live Upgrade, you create a boot environment with RAID-1 volumes configured and install the archive. The Solaris installation program cannot be used to install RAID-1 volumes with a Solaris Flash archive. For examples of RAID-1 volumes in JumpStart profiles, see "Profile Examples" on page 83.	Veritas VxVM stores configuration information in areas not available to Solaris Flash. If Veritas VxVm file systems have been configured, you should not create a Solaris Flash archive. Also, Solaris install, including JumpStart and Solaris Live Upgrade do not support rebuilding VxVM volumes at installation time. Therefore, if you are planning to deploy Veritas VxVM software using a Solaris Flash archive, the archive must be created prior to configuring the VxVM file systems. The clone systems must be then configured individually after the archive has been applied and the system rebooted.

RAID Volume Name Requirements and Guidelines for Custom JumpStart and Solaris Live Upgrade

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.
- Instead of specifying the full volume name, such as `/dev/md/dsk/d1`, you can often use an abbreviated volume name, such as `d1`.

RAID Volume Naming Conventions for Solaris Live Upgrade

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. Examples follow.

- A Solaris Volume Manager volume can be identified by its d*num* 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 use `c0t0d0s0`.

When you use the Solaris Live Upgrade to create RAID-1 volumes (mirrors) and RAID-0 volumes (submirrors), you can let the software detect and assign volume names, or you can assign the names. If you let the software 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 submirror names, assign names ending in 1 or 2. 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`), Solaris Live Upgrade fails to create the mirror if the mirror name is a duplicate of a submirror's name.

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

```
lucreate -n newbe -m /:d10:mirror,ufs -m /:c0t0d0s0:attach -m
/:c1t0d0s0:attach
```

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 /:d10:mirror,ufs -m /:c0t0d0s0,d11:attach -m
/:c1t0d0s0,d12:attach
```

For detailed information about Solaris Volume Manager naming requirements, see *Solaris Volume Manager Administration Guide*.

RAID Volume Naming Conventions for Custom JumpStart

When you use the custom JumpStart installation method to create RAID-1 volumes (mirrors) and RAID-0 volumes (submirrors), you can let the software detect and assign volume names to mirrors, or you can assign the names in the profile. If you let the software 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. 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 is a duplicate of a submirror's name. 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  /
```

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. In this example, 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 must also 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 all submirrors you plan to attach to a mirror either all start on cylinder 0, or that none of them start on cylinder 0.

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

How Booting Into Single-User Mode Affects RAID-1 Volumes

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

PART IV

Appendixes

This part contains troubleshooting and reference information.

◆ ◆ ◆ APPENDIX A

Troubleshooting (Tasks)

This chapter contains a list of specific error messages and general problems you might encounter when installing Solaris 10 6/06 software. The chapter also explains how to fix the problems. Start by using this list of sections to determine where in the installation process the problem occurred.

Note – When you see the phrase "bootable media," this means the Solaris installation program and JumpStart installation method.

Problems With Setting Up Network Installations

`Unknown client "`*host_name*`"`

Cause: The *host_name* argument in the `add_install_client` command is not a host in the name service.

Description: Add the host *host_name* to the name service and execute the `add_install_client` command again.

Problems With Booting a System

Booting From Media, Error Messages

`le0: No carrier - transceiver cable problem`

Cause: The system is not connected to the network.

Solution: If this is a nonnetworked system, ignore this message. If this is a networked system, ensure that the Ethernet cabling is attached securely.

`The file just loaded does not appear to be executable`
Cause: The system cannot find the proper media for booting.

Solution: Verify that the system has been set up properly to install the Solaris 10 6/06 software from the network from an install server. The following are examples of checks you can make.

- If you copied the images of the Solaris Operating System DVD or the Solaris Software CDs to the install server, ensure that you specified the correct platform group for the system when you set it up.
- If you are using DVD or CD media, ensure that the Solaris Operating System DVD or Solaris Software - 1 CD is mounted and accessible on the install server.

`boot: cannot open` <*filename*> (*SPARC based systems only*)
Cause: This error occurs when you override the location of the `boot -file` by explicitly setting it.

Note – *filename* is a variable for the name of the file affected.

Solution: Follow these instructions:

- Reset the `boot -file` in the PROM to " " (blank).
- Ensure that the diag-switch is set to off and to true.

`Can't boot from file/device`
Cause: The installation media cannot find the bootable media.

Solution: Ensure that the following conditions are met:

- The DVD-ROM or CD-ROM drive is installed properly and turned on.
- Solaris Operating System DVD or the Solaris Software - 1 CD is inserted into the drive.
- The disc is free of damage or dirt.

`WARNING: clock gained` *xxx* `days -- CHECK AND RESET DATE!` (*SPARC based systems only*)
Description: This is an informational message.

Solution: Ignore the message and continue with the installation.

`Not a UFS file system` (*x86 based systems only*)
Cause: When Solaris 10 6/06 software was installed (either through the Solaris installation program or custom JumpStart), no boot disk was selected. You now must edit the BIOS to boot the system.

Solution: Select the BIOS to boot. See your BIOS documentation for instructions.

Booting From Media, General Problems

`The system does not boot.`

Description: When initially setting up a custom JumpStart server, you might encounter boot problems that do not return an error message. To verify information about the system and how the system is booting, run the boot command with the `-v` option. When you use the `-v` option, the boot command displays verbose debugging information about the screen.

Note – If this flag is not given, the messages are still printed, but the output is directed to the system log file. For more information, see `syslogd`(1M).

Solution: For SPARC based systems, at the `ok` prompt, type the following command.

```
ok boot net -v - install
```

`Boot from DVD media fails on systems with Toshiba SD–M 1401 DVD-ROM`

Description: If your system has a Toshiba SD-M1401 DVD-ROM with firmware revision 1007, the system cannot boot from the Solaris Operating System DVD.

Solution: Apply patch 111649–03, or later version, to update the Toshiba SD-M1401 DVD-ROM drive's firmware. The patch 111649–03 is available at sunsolve.sun.com.

`The system hangs or panics when nonmemory PC cards are inserted.` (*x86 based systems only*)

Cause: Nonmemory PC cards cannot use the same memory resources that are used by other devices.

Solution: To correct this problem, see the instructions for your PC card and check for the address range.

`The system hangs before displaying the system prompt.` (*x86 based systems only*)

Solution: You have hardware that is not supported. Check your hardware manufacturer's documentation.

Booting From the Network, Error Messages

`WARNING: getfile: RPC failed: error 5 (RPC Timed out).`

Description: This error occurs when you have two or more servers on a network responding to an install client's boot request. The install client connects to the wrong boot server, and the installation hangs. The following specific reasons might cause this error to occur:

Cause: *Reason 1:* `/etc/bootparams` files might exist on different servers with an entry for this install client.

Solution: *Reason 1:* Ensure that servers on the network do not have multiple `/etc/bootparams` entries for the install client. If they do have multiple entries, remove duplicate client entries in the `/etc/bootparams` file on all install servers and boot servers except the one you want the install client to use.

Cause: *Reason 2:* Multiple `/tftpboot` or `/rplboot` directory entries might exist for this install client.

Solution: *Reason 2:* Ensure that servers on the network do not have multiple `/tftpboot` or `/rplboot` directory entries for the install client. If they do have multiple entries, remove duplicate client entries from the `/tftpboot` or `/rplboot` directories on all install servers and boot servers except the one you want the install client to use.

Cause: *Reason 3:* An install client entry might exist in the `/etc/bootparams` file on a server and an entry in another `/etc/bootparams` file that enables all systems to access the profile server. Such an entry resembles the following:

```
* install_config=profile_server:path
```

A line that resembles the previous entry in the NIS or NIS+ `bootparams` table can also cause this error.

Solution: *Reason 3:* If a wildcard entry is in the name service `bootparams` map or table (for example, `* install_config=`), delete it and add it to the `/etc/bootparams` file on the boot server.

`No network boot server. Unable to install the system. See installation instructions.` (*SPARC based systems only*)

Cause: This error occurs on a system that you are attempting to install from the network. The system is not set up correctly.

Solution: Ensure that you correctly set up the system to install from the network. See "Adding Systems to Be Installed From the Network With a CD Image" in *Solaris 10 6/06 Installation Guide: Network-Based Installations*.

`prom_panic: Could not mount file system` (*SPARC based systems only*)

Cause: This error occurs when you are installing Solaris from a network, but the boot software cannot locate the following:

- Solaris Operating System DVD, either the DVD or a copy of the DVD image on the install server
- Solaris Software - 1 CD image, either the Solaris Software - 1 CD or a copy of the CD image on the install server

Solution: Ensure that the installation software is mounted and shared.

- If you are installing Solaris from the install server's DVD-ROM or CD-ROM drive, ensure that the Solaris Operating System DVD or Solaris Software - 1 CD is inserted in the CD-ROM drive, is mounted, and is shared in the `/etc/dfs/dfstab` file.

- If installing from a copy of the Solaris Operating System DVD image or Solaris Software - 1 CD image on the install server's disk, ensure that the directory path to the copy is shared in the `/etc/dfs/dfstab` file.

`Timeout waiting for ARP/RARP packet...`(*SPARC based systems only*)

Cause: *Reason 1:* The client is trying to boot from the network, but it cannot find a system that knows about the client.

Solution: *Reason 1:* Verify the system's host name is in the NIS or NIS+ name service. Also, verify the `bootparams` search order in the boot server's `/etc/nsswitch.conf` file.

For example, the following line in the `/etc/nsswitch.conf` file indicates that JumpStart or the Solaris installation program first looks in the NIS maps for `bootparams` information. If the program does not find any information, the installer looks in the boot server's `/etc/bootparams` file.

```
bootparams: nis files
```

Cause: *Reason 2:* The client's Ethernet address is not correct.

Solution: *Reason 2:* Verify that the client's Ethernet address in the install server's `/etc/ethers` file is correct.

Cause: *Reason 3:* In a custom JumpStart installation, the `add_install_client` command specifies the platform group that uses a specified server as an install server. If the wrong architecture value is used when using the `add_install_client`, this problem occurs. For example, the machine you want to install is a sun4u, but you used i86pc instead.

Solution: *Reason 3:* Rerun `add_install_client` with the correct architecture value.

`ip: joining multicasts failed on tr0 - will use link layer broadcasts for multicast` (*x86 based systems only*)

Cause: This error message is displayed when you boot a system with a token ring card. Ethernet multicast and token ring multicast do not work the same way. The driver returns this error message because an invalid multicast address was provided to it.

Solution: Ignore this error message. If multicast does not work, IP uses layer broadcasts instead and does not cause the installation to fail.

`Requesting Internet address for` *Ethernet_Address* (*x86 based systems only*)

Cause: The client is trying to boot from the network, but it cannot find a system that knows about the client.

Solution: Verify the system's host name is listed in the name service. If the system's host name is listed in the NIS or NIS+ name service, and the system continues to print this error message, try rebooting.

`RPC: Timed out No bootparams (whoami) server responding; still trying...` (*x86 based systems only*)

Cause: The client is trying to boot from the network, but it cannot find a system with an entry in the `/etc/bootparams` file on the install server.

Solution: Use `add_install_client` on the install server. Using this command adds the proper entry in the `/etc/bootparams` file, enabling the client to boot from the network.

`Still trying to find a RPL server...` (*x86 based systems only*)

Cause: The system is trying to boot from the network, but the server is not set up to boot this system.

Solution: On the install server, execute `add_install_client` for the system to be installed. The `add_install_client` command sets up an `/rplboot` directory, which contains the necessary network boot program.

`CLIENT MAC ADDR: FF FF FF FF FF FF` (*network installations with DHCP only*)

Cause: The DHCP server is not configured correctly. This error might occur if the options or macros are not correctly defined in the DHCP Manager software.

Solution: In the DHCP Manager software, verify that the options and macros are correctly defined. Confirm that the Router option is defined, and that the value of the Router option is correct for the subnet you are using for the network installation.

Booting From the Network, General Problems

`The system boots from the network, but from a system other than the specified install server.`

Cause: An `/etc/bootparams` and perhaps an `/etc/ethers` entry exist on another system for the client.

Solution: On the name server, update the `/etc/bootparams` entry for the system that is being installed. The entry should conform to the following syntax:

install_system `root=`*boot_server*`:`*path* `install=`*install_server*`:`*path*

Also, ensure that only one `bootparams` entry is on the subnet for the install client.

`The system does not boot from the network` (*network installations with DHCP only*)`.`

Cause: The DHCP server is not configured correctly. This error might occur if the system is not configured as an installation client on the DHCP server.

Solution: In the DHCP manager software, verify that installation options and macros are defined for the client system. For more information, see "Preconfiguring System Configuration Information With the DHCP Service (Tasks)" in *Solaris 10 6/06 Installation Guide: Network-Based Installations*.

Initial Installation of the Solaris OS

`Initial installation fails`

Solution: If the Solaris installation fails, you must restart the installation. To restart the installation, boot the system from the Solaris Operating System DVD, the Solaris Software - 1 CD, or from the network.

You cannot uninstall the Solaris software after the software has been partially installed. You must restore your system from a backup or begin the Solaris installation process again.

`/cdrom/10_606/SUNW`*xxxx*`/reloc.cpio: Broken pipe`

Description: This error message is informational and does not affect the installation. The condition occurs when a write on a pipe does not have a reading process.

Solution: Ignore the message and continue with the installation.

`WARNING: CHANGE DEFAULT BOOT DEVICE` *(x86 based systems only)*

Cause: This is an informational message. The default boot device set in the system's BIOS might be set to a device that requires you to use the Solaris 10 3/05 Device Configuration Assistant diskette to boot the system.

Solution: Continue with the installation and, if necessary, change the system's default boot device specified in the BIOS after you install the Solaris software to a device that does not require the Solaris 10 3/05 Device Configuration Assistant diskette.

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x86 only – If you are using the `locale` keyword to test a custom JumpStart profile for an initial installation, the `pfinstall -D` command fails to test the profile. For a workaround, see the error message "could not select locale," in the section, "Upgrading the Solaris OS" on page 223.

▼ x86: To Check IDE Disk for Bad Blocks

IDE disk drives do not automatically map out bad blocks like other drives supported by Solaris software. Before installing Solaris on an IDE disk, you might want to perform a surface analysis on the disk. To perform surface analysis on an IDE disk, follow this procedure.

1. **Boot to the installation media.**
2. **When you are prompted to select an installation type, select option 6, Single user shell.**
3. **Start the `format`(1M) program.**

```
# format
```

4 Specify the IDE disk drive on which you want to perform a surface analysis.

```
# cxdy
```

cx Is the controller number

d*y* Is the device number

5 Determine if you have an `fdisk` partition.

- If a Solaris `fdisk` partition already exists, proceed to Step 6.
- If a Solaris `fdisk` partition does not exist, use the `fdisk` command to create a Solaris partition on the disk.

```
format> fdisk
```

6 To begin the surface analysis, type:

```
format> analyze
```

7 Determine the current settings, type:

```
analyze> config
```

8 (Optional) To change settings, type:

```
analyze> setup
```

9 To find bad blocks, type:

```
analyze> type_of_surface_analysis
```

type_of_surface_analysis Is read, write, or compare

If `format` finds bad blocks, it remaps them.

10 To exit the analysis, type:

```
analyze> quit
```

11 Determine if you want to specify blocks to remap.

- If no, go to Step 12.
- If yes, type:

```
format> repair
```

12 To exit the format program, type:

```
quit
```

13 Restart the media in multiuser mode by typing the following command.

```
# exit
```

Upgrading the Solaris OS

Upgrading, Error Messages

`No upgradable disks`

Cause: A swap entry in the `/etc/vfstab` file is causing the upgrade to fail.

Solution: Comment out the following lines in the `/etc/vfstab` file:

- All swap files and slices on disks not being upgraded
- Swap files that are no longer present
- Any unused swap slices

`usr/bin/bzcat not found`

Cause: Solaris Live Upgrade fails because of needing a patch cluster.

Solution: A patch is needed to install Solaris Live Upgrade. Ensure that you have the most recently updated patch list by consulting http://sunsolve.sun.com. Search for the info doc 72099 on the SunSolve web site.

`Upgradeable Solaris root devices were found, however, no suitable partitions to hold the Solaris install software were found. Upgrading using the Solaris Installer is not possible. It might be possible to upgrade using the Solaris Software 1 CDROM. (x86 based systems only)`

Cause: You cannot upgrade with the Solaris Software - 1 CD because you do not have enough space.

Solution: To upgrade, you can either create a swap slice that is larger than or equal to 512 Mbytes or use another method of upgrading such as the Solaris installation program from Solaris Operating System DVD, a net installation image, or JumpStart.

`ERROR: Could not select locale` (*x86 based systems only*)

Cause: When you test your JumpStart profile by using the `pfinstall -D` command, the dry run test fails under the following conditions:

- The profile contains the locale keyword.
- You're testing a release that contains GRUB software. Starting with the Solaris 10 1/06 release, the GRUB boot loader facilitates booting different operating systems installed on your system with the GRUB menu.

With the introduction of GRUB software, the miniroot is compressed. The software can no longer find the list of locales from the compressed miniroot. The miniroot is the smallest possible Solaris root (/) file system and is found on the Solaris installation media.

Solution: Perform the following steps. Use the following values.

- MEDIA_DIR is /cdrom/cdrom0/
- MINIROOT_DIR is $MEDIA_DIR/Solaris_10 6/06/Tools/Boot
- MINIROOT_ARCHIVE is $MEDIA_DIR/boot/x86.miniroot
- TEMP_FILE_NAME is /tmp/test

1. Uncompress the miniroot archive.

```
# /usr/bin/gzcat $MINIROOT_ARCHIVE > $TEMP_FILE_NAME
```

2. Create the miniroot device by using the lofiadm command.

```
# LOFI_DEVICE=/usr/sbin/lofiadm -a $TEMP_FILE_NAME
# echo $LOFI_DEVICE
/dev/lofi/1
```

3. Mount the miniroot with the lofi command under the Miniroot directory.

```
# /usr/sbin/mount -F ufs  $LOFI_DEVICE  $MINIROOT_DIR
```

4. Test the profile.

```
# /usr/sbin/install.d/pfinstall -D -c $MEDIA_DIR $path-to-jumpstart_profile
```

5. After the testing is completed, unmount the lofi device.

```
# umount  $LOFI_DEVICE
```

6. Delete the lofi device.

```
# lofiadm -d $TEMP_FILE_NAME
```

Upgrading, General Problems

The upgrade option is not presented even though there is a version of Solaris software that's upgradable on the system.

Cause: *Reason 1:* The /var/sadm directory is a symlink or it is mounted from another file system.

Solution: *Reason 1:* Move the /var/sadm directory into the root (/) or /var file system.

Cause: *Reason 2:* The /var/sadm/softinfo/INST_RELEASE file is missing.

Solution: *Reason 2:* Create a new INST_RELEASE file by using the following template:

```
OS=Solaris
VERSION=x
REV=0
```

x
Is the version of Solaris software on the system

Cause: *Reason 3:* SUNWusr is missing from `/var/sadm/softinfo`.

Solution: *Solution 3:* You need to do an initial installation. The Solaris software is not upgradable.

`Couldn't shut down or initialize the md driver`
Solution: Follow these instructions:

- If the file system is not a RAID-1 volume, comment out in the `vsftab` file.
- If the file system is a RAID-1 volume, break the mirror and reinstall. For information about unmirroring, see "Removing RAID-1 Volumes (Unmirroring)" in *Solaris Volume Manager Administration Guide*.

`The upgrade fails because the Solaris installation program cannot mount a file system.`
Cause: During an upgrade, the script attempts to mount all the file systems that are listed in the system's `/etc/vfstab` file on the root (`/`) file system that is being upgraded. If the installation script cannot mount a file system, it fails and exits.

Solution: Ensure that all file systems in the system's `/etc/vfstab` file can be mounted. Comment out any file systems in the `/etc/vfstab` file that cannot be mounted or that might cause the problem so that the Solaris installation program does not try to mount them during the upgrade. Any system-based file systems that contain software to be upgraded (for example, `/usr`) cannot be commented out.

`The upgrade fails`
Description: The system does not have enough space for the upgrade.

Cause: Check "Upgrading With Disk Space Reallocation" on page 40 for the space problem and see if you can fix it without using auto-layout to reallocate space.

`Problems upgrading RAID–1 volume root (/) file systems`
Solution: If you have problems upgrading when using Solaris Volume Manager RAID-1 volumes that are the root (`/`) file system, see Chapter 25, "Troubleshooting Solaris Volume Manager (Tasks)," in *Solaris Volume Manager Administration Guide*.

▼ To Continue Upgrading After a Failed Upgrade

The upgrade fails and the system cannot be soft-booted. The failure is for reasons beyond your control, such as a power failure or a network connection failure.

1. **Reboot the system from the Solaris Operating System DVD, the Solaris Software - 1 CD, or from the network.**

2. **Choose the upgrade option for installation.**

   The Solaris installation program determines if the system has been partially upgraded and continues the upgrade.

x86: Problems With Solaris Live Upgrade When You Use GRUB

The following errors can occur when you use Solaris Live Upgrade and the GRUB boot loader on an x86 based system.

`ERROR: The media product tools installation directory` *path-to-installation-directory* `does not exist.`

`ERROR: The media` *dirctory* `does not contain an operating system upgrade image.`

Description: The error messages are seen when using the `luupgrade` command to upgrade a new boot environment.

Cause: An older version of Solaris Live Upgrade is being used. The Solaris Live Upgrade packages you have installed on your system are incompatible with the media and the release on that media.

Solution: Always use the Solaris Live Upgrade packages from the release you are upgrading to.

Example: In the following example, the error message indicates that the Solaris Live Upgrade packages on the system are not the same version as on the media.

```
# luupgrade -u -n s10u1 -s /mnt
    Validating the contents of the media </mnt>.
    The media is a standard Solaris media.
    ERROR: The media product tools installation directory
</mnt/Solaris_10/Tools/Boot/usr/sbin/install.d/install_config> does
not exist.
    ERROR: The media </mnt> does not contain an operating system upgrade
image.
```

`ERROR: Cannot find or is not executable: </sbin/biosdev>.`

`ERROR: One or more patches required by Solaris Live Upgrade has not been installed.`

Cause: One or more patches required by Solaris Live Upgrade are not installed on your system. Beware that this error message does not catch all missing patches.

Solution: Before using Solaris Live Upgrade, always install all the required patches. Ensure that you have the most recently updated patch list by consulting http://sunsolve.sun.com. Search for the info doc 72099 on the SunSolve web site.

`ERROR: Device mapping command </sbin/biosdev> failed. Please reboot and try again.`
Cause: *Reason 1*: Solaris Live Upgrade is unable to map devices because of previous administrative tasks.

Solution: *Reason 1*: Reboot the system and try Solaris Live Upgrade again

Cause: *Reason 2*: If you reboot your system and get the same error message, you have two or more identical disks. The device mapping command is unable to distinguish between them.

Solution: *Reason 2*: Create a new dummy `fdisk` partition on one of the disks. See the `fdisk`(1M) man page. Then reboot the system.

`Cannot delete the boot environment that contains the GRUB menu`
Cause: Solaris Live Upgrade imposes the restriction that a boot environment cannot be deleted if the boot environment contains the GRUB menu.

Solution: Use `lumake`(1M) or `luupgrade`(1M) commands to reuse that boot environment.

`The file system containing the GRUB menu was accidentally remade. However, the disk has the same slices as before. For example, the disk was not re-sliced.`
Cause: The file system that contains the GRUB menu is critical to keeping the system bootable. Solaris Live Upgrade commands do not destroy the GRUB menu. But, if you accidentally remake or otherwise destroy the file system containing the GRUB menu with a command other than a Solaris Live Upgrade command, the recovery software attempts to reinstall the GRUB menu. The recovery software puts the GRUB menu back in the same file system at the next reboot. For example, you might have used the `newfs` or `mkfs` commands on the file system and accidentally destroyed the GRUB menu. To restore the GRUB menu correctly, the slice must adhere to the following conditions:

- Contain a mountable file system
- Remain a part of the same Solaris Live Upgrade boot environment where the slice resided previously

Before rebooting the system, make any necessary corrective actions on the slice.

Solution: Reboot the system. A backup copy of the GRUB menu is automatically installed.

`The GRUB menu's menu.lst file was accidentally deleted.`
Solution: Reboot the system. A backup copy of the GRUB menu is automatically installed.

▼ System Panics When Upgrading With Solaris Live Upgrade Running Veritas VxVm

When you use Solaris Live Upgrade while upgrading and running Veritas VxVM, the system panics on reboot unless you upgrade by using the following procedure. The problem occurs if packages do not conform to Solaris advanced packaging guidelines.

1. **Create an inactive boot environment. See "Creating a New Boot Environment" in** *Solaris 10 6/06 Installation Guide: Solaris Live Upgrade and Upgrade Planning***.**

2. **Before upgrading the inactive boot environment, you must disable the existing Veritas software on the inactive boot environment.**

   a. **Mount the inactive boot environment.**

      # **lumount** *inactive_boot_environment_name mount_point*

      For example:

      ```
      # lumount solaris8 /mnt
      ```

   b. **Change to the directory that contains the** `vfstab`**, for example:**

      ```
      # cd /mnt/etc
      ```

   c. **Make a copy of the inactive boot environment's** `vfstab` **file, for example:**

      ```
      # cp vfstab vfstab.501
      ```

   d. **In the copied** `vfstab`**, comment out all Veritas file system entries, for example:**

      ```
      #  sed  '/vx\/dsk/s/^/#/g'  < vfstab >  vfstab.novxfs
      ```

      The first character of each line is changed to #, which makes the line a comment line. Note that this comment line is different than the system file-comment lines.

   e. **Copy the changed** `vfstab` **file, for example:**

      ```
      # cp vfstab.novxfs vfstab
      ```

   f. **Change directories to the inactive boot environment's system file, for example:**

      ```
      # cd /mnt/etc
      ```

   g. **Make a copy of the inactive boot environment's system file, for example:**

      ```
      # cp system system.501
      ```

   h. **Comment out all "forceload:" entries that include** `drv/vx`**.**

      ```
      # sed '/forceload:   drv\/vx/s/^/*/' <system> system.novxfs
      ```

      The first character of each line is changed to *, which makes the line a command line. Note that this comment line is different than the `vfstab` file comment lines.

   i. **Create the Veritas** `install-db` **file, for example:**

      ```
      # touch vx/reconfig.d/state.d/install-db
      ```

   j. **Unmount the inactive boot environment.**

      # **luumount** *inactive_boot_environment_name*

3. **Upgrade the inactive boot environment. See Chapter 9, "Upgrading With Solaris Live Upgrade (Tasks)," in** *Solaris 10 6/06 Installation Guide: Solaris Live Upgrade and Upgrade Planning***.**

4. **Activate the inactive boot environment. See "Activating a Boot Environment" in** *Solaris 10 6/06 Installation Guide: Solaris Live Upgrade and Upgrade Planning***.**

5. **Shut down the system.**

   ```
   # init 0
   ```

6. **Boot the inactive boot environment in single-user mode:**

   ```
   OK boot -s
   ```

   Several messages and error messages that contain "vxvm" or "VXVM" are displayed that can be ignored. The inactive boot environment becomes active.

7. **Upgrade Veritas.**

   a. **Remove the Veritas VRTSvmsa package from the system, for example:**

      ```
      # pkgrm VRTSvmsa
      ```

   b. **Change directories to the Veritas packages.**

      ```
      # cd /location_of_Veritas_software
      ```

   c. **Add the latest Veritas packages to the system:**

      ```
      #  pkgadd -d 'pwd' VRTSvxvm VRTSvmsa VRTSvmdoc VRTSvmman VRTSvmdev
      ```

8. **Restore the original** `vfstab` **and system files:**

   ```
   # cp /etc/vfstab.original /etc/vfstab
   # cp /etc/system.original /etc/system
   ```

9. **Reboot the system.**

   ```
   # init 6
   ```

x86: Service Partition Not Created by Default on Systems With No Existing Service Partition

If you install the Solaris 10 6/06 OS on a system that does not currently include a service or diagnostic partition, the installation program might not create a service partition by default. If you want to include a service partition on the same disk as the Solaris partition, you must re-create the service partition before you install the Solaris 10 6/06 OS.

If you installed the Solaris 8 2/02 OS on a system with a service partition, the installation program might not have preserved the service partition. If you did not manually edit the `fdisk` boot partition layout to preserve the service partition, the installation program deleted the service partition during the installation.

Note – If you did not specifically preserve the service partition when you installed the Solaris 8 2/02 OS, you might not be able to re-create the service partition and upgrade to the Solaris 10 6/06 OS.

If you want to include a service partition on the disk that contains the Solaris partition, choose one of the following workarounds.

▼ To Install Software From a Network Installation Image or From the Solaris Operating System DVD

To install the software from a net installation image or from the Solaris Operating System DVD over the network, follow these steps.

1. **Delete the contents of the disk.**
2. **Before you install, create the service partition by using the diagnostics CD for your system.**

   For information about how to create the service partition, see your hardware documentation.
3. **Boot the system from the network.**

   The Customize `fdisk` Partitions screen is displayed.
4. **To load the default boot disk partition layout, click Default.**

   The installation program preserves the service partition and creates the Solaris partition.

▼ To Install From the Solaris Software - 1 CD or From a Network Installation Image

To use the Solaris installation program to install from the Solaris Software - 1 CD or from a network installation image on a boot server, follow these steps.

1. **Delete the contents of the disk.**
2. **Before you install, create the service partition by using the diagnostics CD for your system.**

   For information about how to create the service partition, see your hardware documentation.
3. **The installation program prompts you to choose a method for creating the Solaris partition.**

4. **Boot the system.**

5. **Select the** `Use rest of disk for Solaris partition` **option.**
   The installation program preserves the service partition and creates the Solaris partition.

6. **Complete the installation.**

◆ ◆ ◆ APPENDIX B

Additional SVR4 Packaging Requirements (Reference)

This appendix is for system administrators who install or remove packages, especially third-party packages. Following these packaging requirements enables the following:

- Avoids modifying the currently running system so you can upgrade with Solaris Live Upgrade and create and maintain non-global zones and diskless clients
- Prevents a package from being interactive to automate installations when using installation programs such as custom JumpStart

This chapter contains the following sections:

Preventing Modification of the Current OS

Following the requirements in this section keeps the currently running OS unaltered.

Using Absolute Paths

For an installation of an operating system to be successful, packages must recognize and correctly respect alternate root (/) file systems, such as a Solaris Live Upgrade inactive boot environment.

Packages can include absolute paths in their `pkgmap` file (package map). If these files exist, they are written relative to the `-R` option of the `pkgadd` command. Packages that contain both absolute and relative (relocatable) paths can be installed to an alternative root (`/`) file system as well. `$PKG_INSTALL_ROOT` is prepended to both absolute and relocatable files so all paths are resolved properly when being installed by `pkgadd`.

Using the pkgadd -R Command

Packages being installed by using the `pkgadd -R` option or being removed using the `pkgrm -R` option must not alter the currently running system. This feature is used by custom JumpStart, Solaris Live Upgrade, non-global zones and diskless client.

Any procedure scripts that are included in the packages being installed with the `pkgadd` command `-R` option or being removed by using the `pkgrm` command `-R` option must not alter the currently running system. Any installation scripts that you provide must reference any directory or file that is prefixed with the `$PKG_INSTALL_ROOT` variable. The package must write all directories and files with the `$PKG_INSTALL_ROOT` prefix. The package must not remove directories without a `$PKG_INSTALL_ROOT` prefix.

Table B–1 provides examples of script syntax.

TABLE B–1 Examples of Installation Script Syntax

Script Type	Correct Syntax	Incorrect Syntax
Bourne shell "if" statement fragments	`if [ -f ${PKG_INSTALL_ROOT}\ /etc/myproduct.conf ] ; then`	`if [ -f /etc/myproduct.conf ] ; \ then`
Removing a file	`/bin/rm -f ${PKG_INSTALL_ROOT}\ /etc/myproduct.conf`	`/bin/rm -f /etc/myproduct.conf`
Changing a file	`echo "test=no" > ${PKG_INSTALL_ROOT}\ /etc/myproduct.conf`	`echo "test=no" > \ /etc/myproduct.conf`

Differences Between $PKG_INSTALL_ROOT and $BASEDIR Overview

`$PKG_INSTALL_ROOT` is the location of the root (`/`) file system of the machine to which you are adding the package. The location is set to the `-R` argument of the `pkgadd` command. For example, if the following command is invoked, then `$PKG_INSTALL_ROOT` becomes `/a` during the installation of the package.

```
# pkgadd -R /a SUNWvxvm
```

`$BASEDIR` points to the *relocatable* base directory into which relocatable package objects are installed. Only relocatable objects are installed here. Nonrelocatable objects (those that have *absolute* paths in the `pkgmap` file) are always installed relative to the inactive boot environment, but not relative to the `$BASEDIR` in effect. If a package has no relocatable objects, then the package is said to be an absolute package (or nonrelocatable), and `$BASEDIR` is undefined and not available to package procedure scripts.

For example, suppose a package's `pkgmap` file has two entries:

```
1 f none sbin/ls 0555 root sys 3541 12322 1002918510
1 f none /sbin/ls2 0555 root sys 3541 12322 2342423332
```

The `pkginfo` file has a specification for `$BASEDIR`:

```
BASEDIR=/opt
```

If this package is installed with the following command, then `ls` is installed in `/a/opt/sbin/ls`, but `ls2` is installed as `/a/sbin/ls2`.

```
# pkgadd -R /a SUNWtest
```

Guidelines for Writing Scripts

Your package procedure scripts must be independent of the currently running OS to prevent modifying the OS. Procedure scripts define actions that occur at particular points during package installation and removal. Four procedure scripts can be created with these predefined names: `preinstall`, `postinstall`, `preremove`, and `postremove`.

TABLE B–2 Guidelines For Creating Scripts

Guidelines	Affects Solaris Live Upgrade	Affects non-global zones
Scripts must be written in Bourne shell (`/bin/sh`). Bourne shell is the interpreter that is used by the `pkgadd` command to execute the procedure scripts.	X	X
Scripts must not start or stop any processes or depend on the output of commands such as `ps` or `truss`, which are operating system dependent and report information about the currently running system.	X	X
Scripts are free to use other standard UNIX commands such as `expr`, `cp`, and `ls` and other commands that facilitate shell scripting.	X	X
Any commands that a script invokes must be available in all supported releases, since a package must run on all of those releases. Therefore, you cannot use commands that were added or removed after the Solaris 8 release. To verify that a specific command or option is supported in a Solaris 8, 9, or 10 release, see the specific version of *Solaris Reference Manual AnswerBook* on http://docs.sun.com.	X	

Maintaining Diskless Client Compatibility

Packages must not execute commands delivered by the package itself. This is to maintain diskless client compatibility and avoids running commands that might require shared libraries that are not installed yet.

Verifying Packages

All packages must pass `pkgchk` validation. After a package is created and before it is installed, it must be checked with the following command.

 # pkgchk -d *dir_name pkg_name*

dir_name Specifies the name of the directory where the package resides

pkg_name Specifies the name of the package

EXAMPLE B–1 Testing a Package

After a package is created, it must be tested by installing it in an alternate root (`/`) file system location by using the `-R` *dir_name* option to `pkgadd`. After the package is installed, it must be checked for correctness by using `pkgchk`, as in this example.

```
# pkgadd -d . -R /a SUNWvxvm
# pkgchk -R /a SUNWvxvm
```

No errors should be displayed.

EXAMPLE B–2 Testing a Package on `/export/SUNWvxvm`

If a package exists at `/export/SUNWvxvm`, then you would issue the following command.

```
# pkgchk -d /export SUNWvxvm
```

No errors should be displayed.

Other commands can check the package when you are creating, modifying, and deleting files. The following commands are some examples.

- For example, the `dircmp` or `fssnap` commands can be used to verify that packages behave properly.
- Also, the `ps` command can be used for testing daemon compliance by making sure daemons are not stopped or started by the package.
- The `truss`, `pkgadd -v`, and `pkgrm` commands can test runtime package installation compliance, but might not work in all situations. In the following example, the `truss` command strips out all read-only, non-`$TEMPDIR` access and shows only non-read-only access to paths that do not lie within the specified inactive boot environment.

```
# TEMPDIR=/a; export TEMPDIR
# truss -t open /usr/sbin/pkgadd -R ${TEMPDIR} SUNWvxvm \
2>&1 > /dev/null | grep -v O_RDONLY | grep -v \
'open("'${TEMPDIR}
```

Preventing User Interaction When Installing or Upgrading

Packages must be added or removed without the user being prompted for information when using the following standard Solaris utilities.

- The custom JumpStart program
- Solaris Live Upgrade
- Solaris installation program program
- Solaris Zones

To test a package to ensure that it will install with no user interaction, a new administration file can be set up with the `pkgadd` command `-a` option. The `-a` option defines an installation administration file to be used in place of the default administration file. Using the default file might result in the user being prompted for more information. You can create an administration file that indicates to `pkgadd` that it should bypass these checks and install the package without user confirmation. For details, see the man page `admin`(4) or `pkgadd`(1M).

The following examples show how the `pkgadd` command uses the administration file.

- If no administration file is provided, `pkgadd` uses `/var/sadm/install/admin/default`. Using this file might result in user interaction.

  ```
  # pkgadd
  ```

- If a relative administration file is provided on the command line, `pkgadd` looks in `/var/sadm/install/admin` for the file name and uses it. In this example, the relative administration file is named `nocheck` and `pkgadd` looks for `/var/sadm/install/admin/nocheck`.

  ```
  # pkgadd -a nocheck
  ```

- If an absolute file is provided `pkgadd` uses it. In this example, `pkgadd` looks in `/tmp` for the `nocheck` administration file.

  ```
  # pkgadd -a /tmp/nocheck
  ```

EXAMPLE B–3 Installation Administration File

The following is an example of an installation administration file that requires very little user interaction with the `pkgadd` utility. Unless the package requires more space than is available on the system, the `pkgadd` utility uses this file and installs the package without prompting the user for more information.

```
mail=
instance=overwrite
partial=nocheck
runlevel=nocheck
idepend=nocheck
```

EXAMPLE B–3 Installation Administration File *(Continued)*

```
space=ask
setuid=nocheck
confiict=nocheck
action=nocheck
basedir=default
```

Setting Package Parameters For Zones

Packages have parameters that control how their content is distributed and made visible on a system with non-global zones installed. The `SUNW_PKG_ALLZONES`, `SUNW_PKG_HOLLOW`, and `SUNW_PKG_THISZONE` package parameters define the characteristics of packages on a system with zones installed. These parameters must be set so that packages can be administered in a system with non-global zones.

The following table lists the four valid combinations for setting package parameters. If you choose setting combinations that are not listed in the following table, those settings are invalid and result in the package failing to install.

Note – Ensure that you have set all three package parameters. You can leave all three package parameters blank. The package tools interpret a missing zone package parameter as if the setting were "false," but not setting the parameters is strongly discouraged. By setting all three package parameters, you specify the exact behavior the package tools should exhibit when installing or removing the package.

TABLE B–3 Valid Package Parameter Settings For Zones

`SUNW_PKG_ALLZONES` **Setting**	`SUNW_PKG_HOLLOW` **Setting**	`SUNW_PKG_THISZONE` **Setting**	**Package Description**
false	false	false	This is the default setting for packages that do not specify values for all the zone package parameters. A package with these settings can be installed in either the global zone or a non-global zone. ■ If the `pkgadd` command is run in the global zone, the package is installed in the global zone and in all non-global zones. ■ If the `pkgadd` command is run in a non-global zone, the package is installed in the non-global zone only. In both cases, the entire contents of the package is visible in all zones where the package is installed.

TABLE B–3 Valid Package Parameter Settings For Zones *(Continued)*

SUNW_PKG_ALLZONES Setting	SUNW_PKG_HOLLOW Setting	SUNW_PKG_THISZONE Setting	Package Description
false	false	true	A package with these settings can be installed in either the global zone or a non-global zone. If new non-global zones are created after the installation, the package is not propagated to these new non-global zones. ■ If the `pkgadd` command is run in the global zone, the package is installed in the global zone only. ■ If the `pkgadd` command is run in a non-global zone, the package is installed in the non-global zone only. In both cases, the entire contents of the package is visible in the zone where the package is installed.
true	false	false	A package with these settings must follow these requirements: ■ The identical package must be present in all zones ■ The package version must be identical in all zones ■ Any patches to the package must be present, and identical, in all zones A package with these settings can only be installed by running the `pkgadd` command in the global zone. Any attempt to run the `pkgadd` command in a non-global zone to install this package fails. When the `pkgadd` command is run in the global zone, the package is installed in the global zone and then installed in all non-global zones. The entire contents of the package is visible in all zones.

TABLE B–3 Valid Package Parameter Settings For Zones *(Continued)*

SUNW_PKG_ALLZONES Setting	SUNW_PKG_HOLLOW Setting	SUNW_PKG_THISZONE Setting	Package Description
true	true	false	A package with these settings can only be installed in the global zone, by the global administrator. When the `pkgadd` command is run, the contents of the package is fully installed in the global zone. If a package has the package parameters set to these values, the package content itself is not delivered on any non-global zone. Only the package installation information necessary to make the package appear to be installed is installed on all non-global zones. This enables the installation of other packages to be installed that depend on this package. For more information on "hollow" packages, see Chapter 23, "About Packages and Patches on a Solaris System with Zones Installed (Overview)," in *System Administration Guide: Solaris Containers-Resource Management and Solaris Zones*. For package dependency checking purposes, the package appears to be installed in all zones. ■ In the global zone, the entire contents of the package is visible. ■ In whole root non-global zones, the entire contents of the package is not visible. ■ When a non-global zone inherits a file system from the global zone, a package installed in this file system is visible in a non-global zone. All other files delivered by the package are not visible within the non-global zone. For example, a sparse root non-global zone shares certain directories with the global zone. These directories are read-only. Sparse root non-global zones share the `/platform` file system among others. Another example is packages that deliver files relevant only to booting hardware. **Note –** Any attempt to install the package in a non-global zone fails.

Description	For More Information
For more details on packages and zones	Chapter 23, "About Packages and Patches on a Solaris System with Zones Installed (Overview)," in *System Administration Guide: Solaris Containers-Resource Management and Solaris Zones*

Description	For More Information
For an overview of sparse and whole root zones	Chapter 16, "Introduction to Solaris Zones," in *System Administration Guide: Solaris Containers-Resource Management and Solaris Zones*
For information about package characteristics and parameters	`pkginfo`(4)
For information about displaying package parameter values	`pkgparam`(1)

For Background Information

The following references provide background information about packaging requirements and specific command syntax.

For more specific information about packaging requirements and definitions of terminology	Chapter 6, "Advanced Techniques for Creating Packages," in *Application Packaging Developer's Guide*
For basic information about adding and removing packages and the installation administration file	Chapter 16, "Managing Software (Overview)," in *System Administration Guide: Basic Administration*
For detailed information about specific commands that are referenced in this appendix, see these man pages	`dircmp`(1), `fssnap`(1M), `ps`(1), or `truss`(1) `pkgadd`(1M), `pkgchk`(1M), or `pkgrm`(1M)
For an overview of Solaris Live Upgrade	Chapter 6, "Solaris Live Upgrade (Overview)," in *Solaris 10 6/06 Installation Guide: Solaris Live Upgrade and Upgrade Planning*
For an overview of custom JumpStart	Chapter 5
For an overview of Solaris Zones	Chapter 16, "Introduction to Solaris Zones," in *System Administration Guide: Solaris Containers-Resource Management and Solaris Zones*

Glossary

`/etc` A directory that contains critical system configuration files and maintenance commands.

`/etc/netboot` **directory** The directory on a WAN boot server that contains the client configuration information and security data that are required for a WAN boot installation.

`/export` 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.

`/opt` A file system that contains the mount points for third-party and unbundled software.

`/usr` A file system on a standalone system or server that contains many of the standard UNIX programs. Sharing the large `/usr` file system with a server rather than maintaining a local copy minimizes the overall disk space that is required to install and run the Solaris software on a system.

`/var` 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, `vi` files, mail files, and uucp files.

3DES ([Triple DES] Triple-Data Encryption Standard). A symmetric-key encryption method that provides a key length of 168 bits.

AES (Advanced Encryption Standard) A symmetric 128-bit block data encryption technique. The U.S. government adopted the Rijndael variant of the algorithm as its encryption standard in October 2000. AES replaces DES encryption as the government standard.

archive 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.

An archive could be a differential archive which is a Solaris 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.

arrow keys One of the four directional keys on the numeric keypad.

begin script A user-defined Bourne shell script, specified within the `rules` file, that performs tasks before the Solaris software is installed on the system. You can use begin scripts only with custom JumpStart installations.

boot To load the system software into memory and start it.

boot archive **x86 only**: A boot archive is a collection of critical files that is used to boot the Solaris OS. These files are needed during system startup before the root (`/`) file system is mounted. Two boot archives are maintained on a system:

- The boot archive that is used to boot the 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 A collection of mandatory file systems (disk slices and mount points) that are critical to the operation of the Solaris OS. These disk slices might be on the same disk or distributed across multiple disks.

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.

boot loader **x86 only**: The boot loader is the first software program that runs after you turn on a system. This program begins the booting process.

boot server 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 Solaris software is to be installed.

`bootlog-cgi` The CGI program that enables a web server to collect and store remote client-booting and installation console messages during a WAN boot installation.

certificate authority (CA) A trusted third-party organization or company that issues digital certificates that are used to create digital signatures and public-private key pairs. The CA guarantees that the individual who is granted the unique certificate is who she or he claims to be.

`certstore` A file that contains a digital certificate for a specific client system. During an SSL negotiation, the client might be asked to provide the certificate file to the server. The server uses this file to verify the identity of the client.

CGI (Common Gateway Interface) An interface by which external programs communicate with the HTTP server. Programs that are written to use CGI are called CGI programs or CGI scripts. CGI programs handle forms or parse output the server does not normally handle or parse.

checksum The result of adding a group of data items that are used for checking the group. The data items can be either numerals or other character strings that are treated as numerals during the checksum calculation. The checksum value verifies that communication between two devices is successful.

client In the client-server model for communications, the client is a process that remotely accesses resources of a compute server, such as compute power and large memory capacity.

clone system A system that you installed by using a Solaris Flash archive. The clone system has the same installation configuration as the master system.

cluster A logical collection of packages (software modules). The Solaris software is divided into *software groups*, which are each composed of clusters and *packages*.

command line A string of characters that begins with a command, often followed by arguments, including options, file names, and other expressions, and terminated by the end-of-line character.

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 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.

critical file systems File systems that are required by the Solaris OS. When you use Solaris Live Upgrade, these file systems are separate mount points in the `vfstab` of the active and inactive boot environments. Example file systems are `root` (/), `/usr`, `/var`, and `/opt`. These file systems are always copied from the source to the inactive boot environment.

custom JumpStart A type of installation in which the 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. A custom JumpStart installation is a JumpStart installation you create.

custom probes file A file, which must be located in the same JumpStart directory as the `rules` file, that is a Bourne shell script that contains two types of functions: probe and comparison. Probe functions gather the information you want or do the actual work and set a corresponding `SI_` environment variable you define. Probe functions become probe keywords. Comparison functions call a corresponding probe function, compare the output of the probe function, and return 0 if the keyword matches or 1 if the keyword doesn't match. Comparison functions become rule keywords. See also *rules file*.

decryption The process of converting coded data to plain text. See also encryption.

derived profile A profile that is dynamically created by a begin script during a custom JumpStart installation.

DES (Data Encryption Standard) A symmetric-key encryption method that was developed in 1975 and standardized by ANSI in 1981 as ANSI X.3.92. DES uses a 56-bit key.

Developer Solaris Software Group A software group that contains the End User 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.

differential archive A Solaris 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 that are specified and is restricted to systems that contain software consistent with the unchanged master image.

digital certificate A nontransferable, nonforgeable, digital file issued from a third party that both communicating parties already trust.

disc An optical disc, as opposed to a magnetic disk, which recognizes the common spelling that is used in the compact disc (CD) market. For example, a CD-ROM or DVD-ROM is an optical disc.

disk A round platter, or set of platters, of a magnetized medium that is organized into concentric tracks and sectors for storing data such as files. See also disc.

disk configuration file A file that represents a structure of a disk (for example, bytes/sector, flags, slices). Disk configuration files enable you to use `pfinstall` from a single system to test profiles on different–size disks.

diskless client A client on a network that relies on a server for all of its disk storage.

document root directory The root of a hierarchy on a web server machine that contains the files, images, and data you want to present to users who are accessing the web server.

domain A part of the Internet naming hierarchy. A domain represents a group of systems on a local network that share administrative files.

domain name The name that is assigned to a group of systems on a local network that share administrative files. The domain name is required for the Network Information Service (NIS) database to work properly. A domain name consists of a sequence of component names that are separated by periods (for example: `tundra.mpk.ca.us`). As you read a domain name from left to right, the component names identify more general (and usually remote) areas of administrative authority.

encryption The process of protecting information from unauthorized use by making the information unintelligible. Encryption is based on a code, called a key, which is used to decrypt the information. See also decryption.

End User 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 Solaris Software Group A software group that contains the entire Solaris 10 6/06 release.

Entire Solaris Software Group Plus OEM Support A software group that contains the entire Solaris 10 6/06 release, plus additional hardware support for OEMs. This software group is recommended when installing Solaris software on SPARC based servers.

failsafe boot archive **x86 only**: A boot archive that is used for recovery when the primary boot archive is damaged. This boot archive brings the system up 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 *boot archive*.

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 Solaris software, you must set up at least one 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 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 SunOS™ 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 `rules` file, that performs tasks after the Solaris software is installed on the system, but before the system reboots. You use finish scripts with custom JumpStart installations.

format To put data into a structure or divide a disk into sectors for receiving data.

function key One of the 10 or more keyboard keys that are labeled F1, F2, F3, and so on that are mapped to particular tasks.

global zone In 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 Solaris Zones and non-global zone.

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 Solaris OS, Linux, or Microsoft Windows.

GRUB edit menu **x86 only**: A boot menu that is a submenu of the GRUB main menu. GRUB commands are displayed on this menu. These commands can be edited to change boot behavior.

GRUB main menu **x86 only**: A boot menu that lists the operating systems that are installed on a system. From this menu, you can easily boot an operating system without modifying the BIOS or fdisk partition settings.

hard link A directory entry that references a file on disk. More than one such directory entry can reference the same physical file.

hash A number that is produced by taking some input and generating a number that is significantly shorter than the input. The same output value is always generated for identical inputs. Hash functions can be used in table search algorithms, in error detection, and in tamper detection. When used for tamper detection, hash functions are chosen such that it is difficult to find two inputs that yield the same hash result. MD5 and SHA-1 are examples of one-way hash functions. For example, a message digest takes a variable-length input such as a disk file and reduces it to a small value.

hashing The process of changing a string of characters into a value or key that represents the original string.

HMAC Keyed hashing method for message authentication. HMAC is used with an iterative cryptographic hash function, such as MD5 or SHA-1, in combination with a secret shared key. The cryptographic strength of HMAC depends on the properties of the underlying hash function.

host name The name by which a system is known to other systems on a network. This name must be unique among all the systems within a particular domain (usually, this means within any single organization). A host name can be any combination of letters, numbers, and minus signs (-), but it cannot begin or end with a minus sign.

HTTP (Hypertext Transfer Protocol) (n.) The Internet protocol that fetches hypertext objects from remote hosts. This protocol is based on TCP/IP.

HTTPS A secure version of HTTP, implemented by using the Secure Sockets Layer (SSL).

initial installation An installation that overwrites the currently running software or initializes a blank disk.

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

If your system is running an upgradable version of the Solaris OS, an initial installation overwrites the disk and does not preserve the OS or local modifications.

install server A server that provides the Solaris DVD or CD images from which other systems on a network can install Solaris (also known as a *media server*). You can create an install server by copying the Solaris DVD or CD images to the server's hard disk.

IP address (Internet protocol address) In TCP/IP, a unique 32-bit number that identifies each host in a network. An IP address consists of four numbers that are separated by periods (192.168.0.0, for example). Most often, each part of the IP address is a number between 0 and 225. However, the first number must be less than 224 and the last number cannot be 0.

IP addresses are logically divided into two parts: the network (similar to a telephone area code), and the local system on the network (similar to a phone number). The numbers in a Class A IP address, for example, represent "`network.local.local.local`" and the numbers in a Class C IP address represent "`network.network.network.local`."

Class	Range (*xxx* is a number 0 to 255)	Number of Available IP Addresses
Class A	1.*xxx.xxx.xxx* - 126.*xxx.xxx.xxx*	Over 16 million
Class B	128.0.*xxx.xxx* - 191.255.*xxx.xxx*	Over 65,000
Class C	192.0.0.*xxx* - 223.255.255.*xxx*	256

IPv6 IPv6 is a version (version 6) of Internet Protocol (IP) that is designed to be an evolutionary step from the current version, IPv4 (version 4). Deploying IPv6, by using defined transition mechanisms, does not disrupt current operations. In addition, IPv6 provides a platform for new Internet functionality.

IPv6 is described in more detail in Part I, "Introducing System Administration: IP Services," in *System Administration Guide: IP Services*.

job A user-defined task to be completed by a computer system.

JumpStart directory When you use a profile diskette for custom JumpStart installations, the JumpStart directory is the root directory on the diskette that contains all the essential custom JumpStart files. When you use a profile server for custom JumpStart installations, the JumpStart directory is a directory on the server that contains all the essential custom JumpStart files.

JumpStart installation A type of installation in which the 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.

key The code for encrypting or decrypting data. See also encryption.

`keystore` A file that contains keys shared by a client and server. During a WAN boot installation, the client system uses the keys to verify the integrity of, or decrypt the data and files transmitted from, the server.

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.

locale A geographic or political region or community that shares the same language, customs, or cultural conventions (English for the U.S. is `en_US`, and English for the U.K. is `en_UK`).

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 in the view of an application or file system.

manifest section A section of a Solaris 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 Solaris 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 *install server*.

`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 fdisk partition settings.

metadevice See *volume*.

miniroot A minimal, bootable root (`/`) file system that is included in Solaris installation media. A miniroot consists of the 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 *failsafe boot archive*.

mirror See *RAID-1 volume*.

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, `/usr`).

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 name service to systems on a network.

name 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 name service, the system information can be maintained, managed, and accessed on a network-wide basis. Without a name service, each system has to maintain its own copy of the system information in the local `/etc` files. Sun supports the following name 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 *name server* and an *install server*.

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 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 Solaris Zones and global zone.

nonnetworked systems Systems that are not connected to a network or do not rely on other systems.

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 (/) file system and swap space (`/export/root`, `/export/swap`).

package A collection of software that is grouped into a single entity for modular installation. The Solaris software is divided into *software groups*, which are each composed of *clusters* 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 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 Solaris update.

platform group A vendor-defined grouping of hardware platforms for the purpose of distributing specific software. Examples of valid platform groups are i86pc and sun4u.

platform name The output of the `uname -i` command. For example, the platform name for the Ultra 60 is SUNW,Ultra-60.

Power Management Software that automatically saves the state of a system and turns it off after it is idle for 30 minutes. When you install the Solaris software on a system that complies with Version 2 of the U.S. Environmental Protection Agency's Energy Star guidelines—a sun4u SPARC system, for example—the Power Management software is installed by default. After a subsequent reboot, you are prompted to enable or disable the Power Management software.

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.

primary boot archive A boot archive that is used to boot the Solaris OS on a system. This boot archive is sometimes called the primary boot archive. See *boot archive*.

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 *rule*.

profile A text file that defines how to install the 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 *rules file*.

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 submirrors. A RAID-1 volume is sometimes called a mirror.

Reduced Network Support Software Group A software group that contains the minimum code that is required to boot and run a 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.

root The top level of a hierarchy of items. Root is the one item from which all other items are descended. See root directory or root (`/`) file system.

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 dismounted. 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 Solaris software is to be installed on each system in the group. A rules file is used in a custom JumpStart installation. See also *profile*.

`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 *must* 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 Solaris Live Upgrade. Shareable file systems contain the same mount point in the `vfstab` 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.

software group A logical grouping of the Solaris software (clusters and packages). During a Solaris installation, you can install one of the following software groups: Core, End User Solaris Software, Developer Solaris Software, or Entire Solaris Software, and for SPARC systems only, Entire Solaris Software Group Plus OEM Support.

Solaris DVD or CD images The Solaris software that is installed on a system, which you can access on the Solaris DVDs or CDs or an install server's hard disk to which you have copied the Solaris DVD or CD images.

Solaris Flash A Solaris installation feature that enables you to create an archive of the files on a system, known as the master system. You can then use the archive to install other systems, making the other systems identical in their configuration to the master system. See also *archive*.

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 Solaris software and third-party software.

Solaris 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.

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 the 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 global zone and non-global zone.

standalone A computer that does not require support from any other machine.

state database A database that stores information about disk 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 state database replica. The state database tracks the location and status of all known state database replicas.

state database replica A copy of a state database. The replica ensures that the data in the database is valid.

submirror See RAID-0 volume.

subnet A working scheme that divides a single logical network into smaller physical networks to simplify routing.

subnet mask A bit mask that is used to select bits from an Internet address for subnet addressing. The mask is 32 bits long and selects the network portion of the Internet address and 1 or more bits of the local portion.

superuser A special user who has privileges to perform all administrative tasks on the system. The superuser has the ability to read and write to any file, run all programs, and send kill signals to any process.

swap space A slice or file that temporarily holds the contents of a memory area till it can be loaded back into memory. Also called the `/swap` or `swap` file system.

`sysidcfg` **file** A file in which you specify a set of special system configuration keywords that preconfigure a system.

system configuration file (`system.conf`) A text file in which you specify the locations of the `sysidcfg` file and the custom JumpStart files you want to use in a WAN boot installation.

time zone Any of the 24 longitudinal divisions of the earth's surface for which a standard time is kept.

`truststore` A file that contains one or more digital certificates. During a WAN boot installation, the client system verifies the identity of the server that is trying to perform the installation by consulting the data in the `truststore` file.

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 An installation that merges files with existing files and saves modifications where possible.

An upgrade of the Solaris OS merges the new version of the 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 Solaris OS.

upgrade option An option that is presented by the Solaris installation program program. The upgrade procedure merges the new version of Solaris with existing files on your disk or disks. An upgrade also saves as many local modifications as possible since the last time Solaris was installed.

URL (Uniform Resource Locator) The addressing system used by the server and the client to request documents. A URL is often called a location. The format of a URL is *protocol://machine:port/document*.

A sample URL is `http://www.example.com/index.html`.

utility A standard program, usually furnished at no charge with the purchase of a computer, that does the computer's housekeeping.

volume 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 in the view of an application or file system.

In some command-line utilities, a volume is called a metadevice. Volume is also called pseudo device or virtual device in standard UNIX terms.

Volume Manager A program that provides a mechanism to administer and obtain access to the data on DVD-ROMs, CD-ROMs, and diskettes.

WAN (wide area network) A network that connects multiple local area networks (LANs) or systems at different geographical sites by using telephone, fiber-optic, or satellite links.

WAN boot installation A type of installation that enables you to boot and install software over a wide area network (WAN) by using HTTP or HTTPS. The WAN boot installation method enables you to transmit an encrypted Solaris Flash archive over a public network and perform a custom JumpStart installation on a remote client.

WAN boot miniroot A miniroot that has been modified to perform a WAN boot installation. The WAN boot miniroot contains a subset of the software in the Solaris miniroot. See also miniroot.

WAN boot server A web server that provides the configuration and security files that are used during a WAN boot installation.

`wanboot` **program** The second-level boot program that loads the WAN boot miniroot, client configuration files, and installation files that are required to perform a WAN boot installation. For WAN boot installations, the `wanboot` binary performs tasks similar to the `ufsboot` or `inetboot` second-level boot programs.

`wanboot-cgi` **program** The CGI program that retrieves and transmits the data and files that are used in a WAN boot installation.

`wanboot.conf` **file** A text file in which you specify the configuration information and security settings that are required to perform a WAN boot installation.

zone See non-global zone

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