Solaris 10 11/06 Installation Guide: Solaris Live Upgrade and Upgrade Planning

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Preface

This book describes how to install and upgrade the Solaris™ Operating System (OS) on both networked and nonnetworked SPARC® and x86 architecture based systems.

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 might need when you install the Solaris software.

TABLE P–1 Related Information

Information	Description
Solaris 10 11/06 Installation Guide: Planning for Installation and Upgrade	Guides you through planning the installation or upgrade of the Solaris operating system. This book provides overviews of all the Solaris installation programs. This book also provides overviews of the following features as they relate to installation: ■ GRUB, the open source boot loader ■ Solaris Zones partitioning technology ■ RAID-1 volumes that can be created at installation time
Solaris 10 11/06 Installation Guide: Basic Installations	Describes a basic OS installation with a graphical user interface (GUI).
Solaris 10 11/06 Installation Guide: Network-Based Installations	Describes how to perform a remote Solaris installation over a local area network or a secure installation over a wide area network.
Solaris 10 11/06 Installation Guide: Custom JumpStart and Advanced Installations	Describes how to create the files and directories necessary to perform an unattended custom JumpStart™ installation.
Solaris 10 11/06 Installation Guide: Solaris Flash Archives (Creation and Installation)	Provides instructions for creating Solaris Flash archives that are used to install the Solaris OS on multiple systems.
Chapter 24, "Backing Up and Restoring File Systems (Overview)," in *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*	Contains information about supported Sun hardware.
Solaris Package List	Lists and describes the packages in the Solaris OS.
Solaris Hardware Compatibility List for x86 Platforms	Contains supported hardware information and device configuration.
	A web-based database that contains supported hardware information and device configuration. Covers SPARC and x86 based systems from Sun Microsystems and other vendors.

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

Upgrading With Solaris Live Upgrade

This part provides an overview and instructions for using Solaris Live Upgrade to create and upgrade an inactive boot environment. The boot environment can then be switched to become the current boot environment.

◆ ◆ ◆ CHAPTER 1

Where to Find Solaris Installation Planning Information

This book provides information on how to use the Solaris Live Upgrade program to upgrade the Solaris operating system. This book provides all you need to know about using Solaris Live Upgrade, but a planning book in our collection of installation documentation might be useful to read before you begin. The following references provide useful information before you upgrade your system.

Where to Find Planning and System Requirement Information

The *Solaris 10 11/06 Installation Guide: Planning For Installation and Upgrade* provides system requirements and high-level planning information, such as planning guidelines for file systems, and upgrade planning and much more. The following list describes the chapters in the planning book and provides links to those chapters.

Chapter Descriptions From the Planning Guide	Reference
This chapter describes new features in the Solaris installation programs.	Chapter 2, "What's New in Solaris Installation," in *Solaris 10 11/06 Installation Guide: Planning for Installation and Upgrade*
This chapter provides you with information about decisions you need to make before you install or upgrade the Solaris OS. Examples are deciding when to use a network installation image or DVD media and descriptions of all the Solaris installation programs.	Chapter 3, "Solaris Installation and Upgrade (Roadmap)," in *Solaris 10 11/06 Installation Guide: Planning for Installation and Upgrade*
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. Upgrade limitations are also described.	Chapter 4, "System Requirements, Guidelines, and Upgrade (Planning)," in *Solaris 10 11/06 Installation Guide: Planning for Installation and Upgrade*

Chapter Descriptions From the Planning Guide	Reference
This chapter contains checklists to help you gather all of the information that you need to install or upgrade your system. This information is useful, for example, if you are performing an interactive installation. You'll have all the information in the checklist that you'll need to do an interactive installation.	Chapter 5, "Gathering Information Before Installation or Upgrade (Planning)," in *Solaris 10 11/06 Installation Guide: Planning for Installation and Upgrade*
These chapters provide overviews of several technologies that relate to a Solaris OS installation or upgrade. Guidelines and requirements related to these technologies are also included. These chapters include information about GRUB based booting, Solaris Zones partitioning technology, and RAID-1 volumes that can be created at installation.	Part II, "Understanding Installations That Relate to GRUB, Solaris Zones, and RAID-1 Volumes," in *Solaris 10 11/06 Installation Guide: Planning for Installation and Upgrade*

◆ ◆ ◆

CHAPTER 2

Solaris Live Upgrade (Overview)

This chapter describes the Solaris Live Upgrade process.

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

Solaris Live Upgrade Introduction

Solaris Live Upgrade provides a method of upgrading a system while the system continues to operate. While your current boot environment is running, you can duplicate the boot environment, then upgrade the duplicate. Or, rather than upgrading, you can install a Solaris Flash archive on a boot environment. The original system configuration remains fully functional and unaffected by the upgrade or installation of an archive. When you are ready, you can activate the new boot environment by rebooting the system. If a failure occurs, you can quickly revert to the original boot environment with a simple reboot. This switch eliminates the normal downtime of the test and evaluation process.

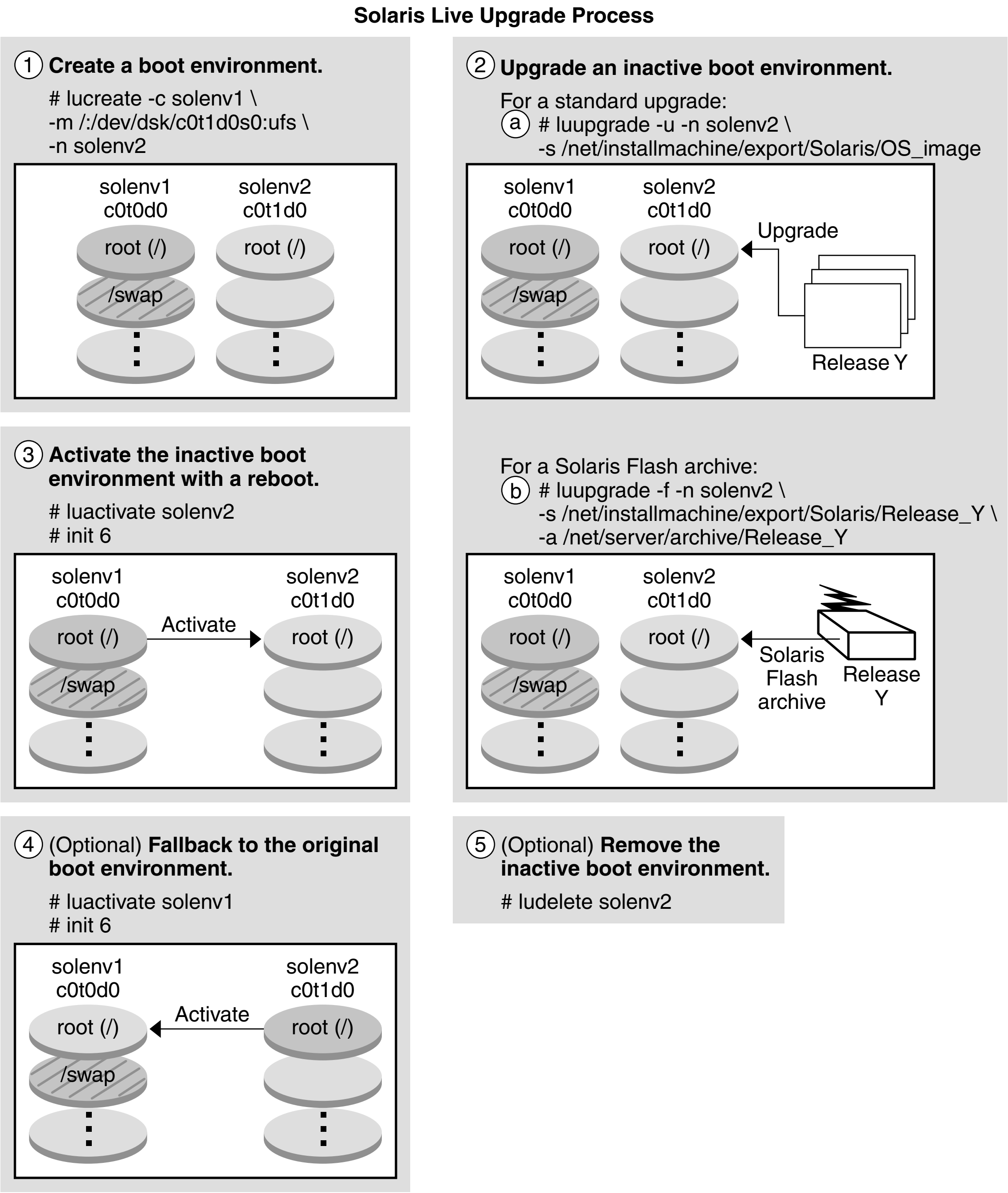
Solaris Live Upgrade enables you to duplicate a boot environment without affecting the currently running system. You can then do the following:

- Upgrade a system.
- Change the current boot environment's disk configuration to different file system types, sizes, and layouts on the new boot environment.
- Maintain numerous boot environments with different images. For example, you can create one boot environment that contains current patches and create another boot environment that contains an Update release.

Some understanding of basic system administration is necessary before using Solaris Live Upgrade. For background information about system administration tasks such as managing file systems, mounting, booting, and managing swap, see the *System Administration Guide: Devices and File Systems*.

Solaris Live Upgrade Process

The following overview describes the tasks necessary to create a copy of the current boot environment, upgrade the copy, and switch the upgraded copy to become the active boot environment. The fallback process of switching back to the original boot environment is also described. Figure 2–1 describes this complete Solaris Live Upgrade process.


Solaris Live Upgrade Process
① Create a boot environment.
② Upgrade an inactive boot environment.
For a standard upgrade:
ⓐ
For a Solaris Flash archive:
ⓑ
③ Activate the inactive boot environment with a reboot.
④ (Optional) Fallback to the original boot environment.
⑤ (Optional) Remove the inactive boot environment.
solenv1
c0t0d0
solenv2
c0t1d0
root (/)
/swap
Upgrade
Release Y
Activate
Solaris Flash archive
Release Y

```
# lucreate -c solenv1 \
-m /:/dev/dsk/c0t1d0s0:ufs \
-n solenv2
```

```
# luupgrade -u -n solenv2 \
-s /net/installmachine/export/Solaris/OS_image
```

```
# luupgrade -f -n solenv2 \
-s /net/installmachine/export/Solaris/Release_Y \
-a /net/server/archive/Release_Y
```

```
# luactivate solenv2
# init 6
```

```
# luactivate solenv1
# init 6
```

```
# ludelete solenv2
```

FIGURE 2–1 Solaris Live Upgrade Process

The following sections describe the Solaris Live Upgrade process.

1. A new boot environment can be created on a physical slice or a logical volume:
   - "Creating a Boot Environment" on page 22
   - "Creating a Boot Environment With RAID-1 Volume File Systems" on page 26
2. "Upgrading a Boot Environment" on page 32
3. "Activating a Boot Environment" on page 35
4. "Falling Back to the Original Boot Environment" on page 36

Creating a Boot Environment

The process of creating a boot environment provides a method of copying critical file systems from an active boot environment to a new boot environment. The disk is reorganized if necessary, file systems are customized, and the critical file systems are copied to the new boot environment.

File System Types

Solaris Live Upgrade distinguishes between two file system types: critical file systems and shareable. The following table describes these file system types.

File System Type	Description	Examples and More Information
Critical file systems	Critical file systems are required by the Solaris OS. These file systems are separate mount points in the `vfstab` of the active and inactive boot environments. These file systems are always copied from the source to the inactive boot environment. Critical file systems are sometimes referred to as *nonshareable*.	Examples are root (`/`), `/usr`, `/var`, or `/opt`.
Shareable file systems	Shareable file systems are user-defined files such as `/export` that contain the same mount point in the `vfstab` in both the active and inactive boot environments. Therefore, updating shared files in the active boot environment also updates data in the inactive boot environment. When you create a new boot environment, shareable file systems are shared by default. But you can specify a destination slice and then the file systems are copied.	`/export` is an example of a file system that can be shared. For more detailed information about shareable file systems, see "Guidelines for Selecting Slices for Shareable File Systems" on page 48.
Swap	Swap is a special shareable file system. Like a shareable file system, all swap slices are shared by default. But, if you specify a destination directory for swap, the swap slice is copied.	For procedures about reconfiguring swap, see the following: ■ "To Create a Boot Environment (Character User Interface)" Step 9 ■ "To Create a Boot Environment and Reconfiguring Swap (Command-Line Interface)" on page 70

Creating RAID-1 Volumes on File Systems

Solaris Live Upgrade can create a boot environment with RAID-1 volumes (mirrors) on file systems. For an overview, see "Creating a Boot Environment With RAID-1 Volume File Systems" on page 26.

Copying File Systems

The process of creating a new boot environment begins by identifying an unused slice where a critical file system can be copied. If a slice is not available or a slice does not meet the minimum requirements, you need to format a new slice.

After the slice is defined, you can reconfigure the file systems on the new boot environment before the file systems are copied into the directories. You reconfigure file systems by splitting and merging them, which provides a simple way of editing the `vfstab` to connect and disconnect file system directories. You can merge file systems into their parent directories by specifying the same mount point. You can also split file systems from their parent directories by specifying different mount points.

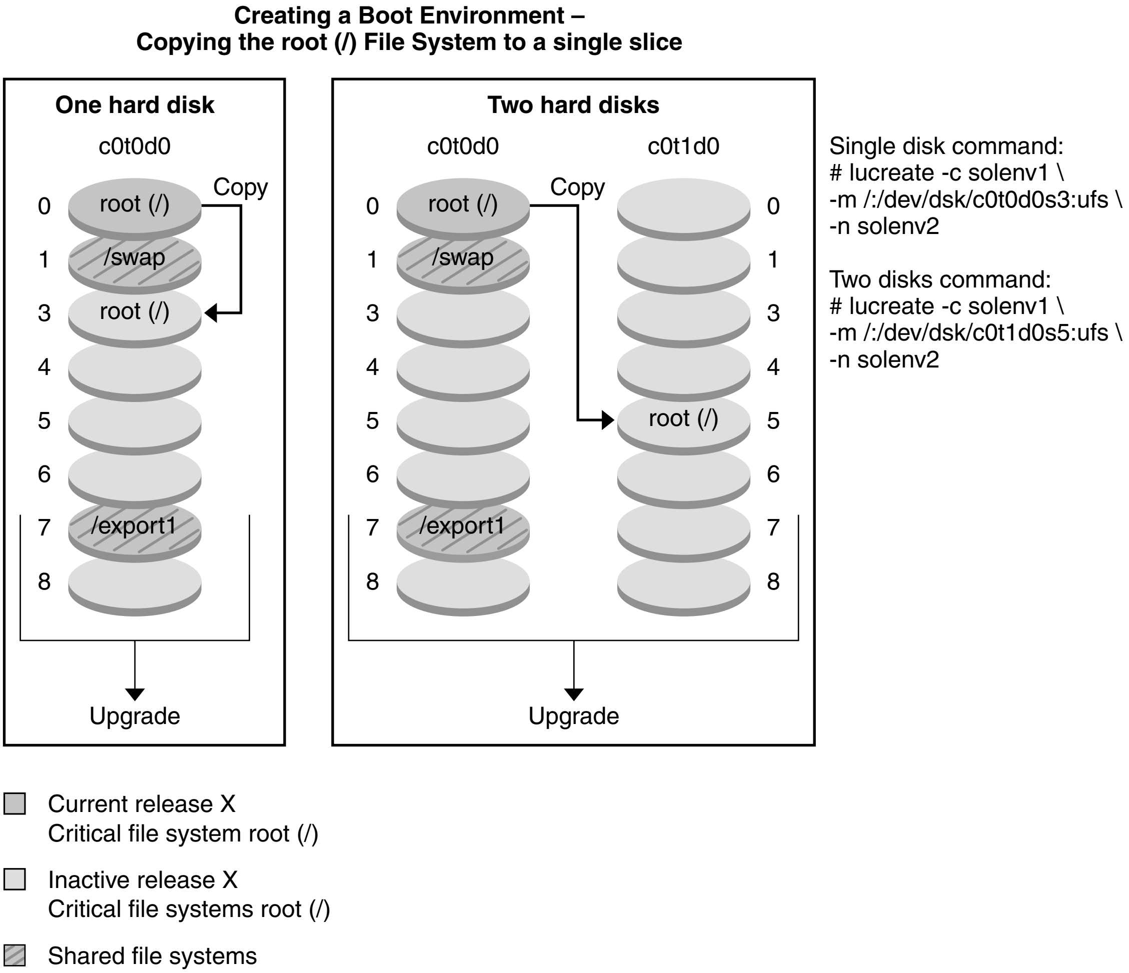
After file systems are configured on the inactive boot environment, you begin the automatic copy. Critical file systems are copied to the designated directories. Shareable file systems are not copied, but are shared. The exception is that you can designate some shareable file systems to be copied. When the file systems are copied from the active to the inactive boot environment, the files are directed to the new directories. The active boot environment is not changed in any way.

For procedures to split or merging file systems	■ "To Create a Boot Environment (Character User Interface)" Step 7 or Step 8 ■ "To Create a Boot Environment and Merge File Systems (Command-Line Interface)" on page 67 ■ "To Create a Boot Environment and Split File Systems (Command-Line Interface)" on page 68
For an overview of creating a boot environment with RAID–1 volume file systems	"Creating a Boot Environment With RAID-1 Volume File Systems" on page 26

Examples of Creating a New Boot Environment

The following figures illustrate various ways of creating new boot environments.

Figure 2–2 shows that critical file system root (`/`) has been copied to another slice on a disk to create a new boot environment. The active boot environment contains the root (`/`) file system on one slice. The new boot environment is an exact duplicate with the root (`/`) file system on a new slice. The file systems `/swap` and `/export/home` are shared by the active and inactive boot environments.

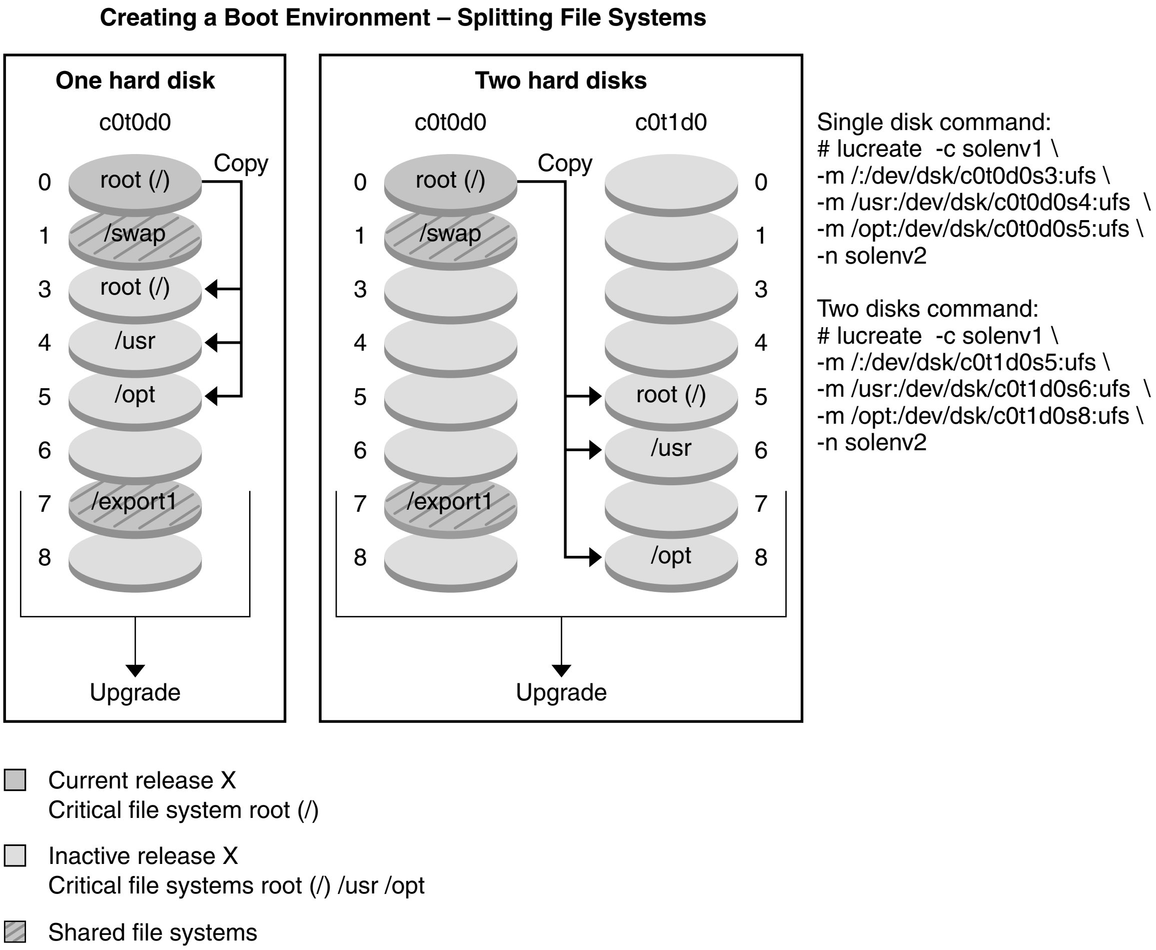

Creating a Boot Environment –
Copying the root (/) File System to a single slice
One hard disk
c0t0d0
Copy
0 root (/)
1 /swap
3 root (/)
4
5
6
7 /export1
8
Upgrade
Two hard disks
c0t0d0
c0t1d0
Copy
0 root (/) 0
1 /swap 1
3 3
4 4
5 root (/) 5
6 6
7 /export1 7
8 8
Upgrade
Single disk command:
Two disks command:
▨ Current release X
Critical file system root (/)
☐ Inactive release X
Critical file systems root (/)
▨ Shared file systems

```
# lucreate -c solenv1 \
-m /:/dev/dsk/c0t0d0s3:ufs \
-n solenv2
```

```
# lucreate -c solenv1 \
-m /:/dev/dsk/c0t1d0s5:ufs \
-n solenv2
```

FIGURE 2–2 Creating an Inactive Boot Environment – Copying the root (`/`) File System

Figure 2–3 shows critical file systems that have been split and have been copied to slices on a disk to create a new boot environment. The active boot environment contains the root (`/`) file system on one slice. On that slice, the root (`/`) file system contains the `/usr`, `/var`, and `/opt` directories. In the new boot environment, the root (`/`) file system is split and `/usr` and `/opt` are put on separate slices. The file systems `/swap` and `/export/home` are shared by both boot environments.


Creating a Boot Environment – Splitting File Systems
One hard disk
c0t0d0
Copy
0 root (/)
1 /swap
3 root (/)
4 /usr
5 /opt
6
7 /export1
8
Upgrade
Two hard disks
c0t0d0
c0t1d0
Copy
0 root (/)
1 /swap
3
4
5
6
7 /export1
8
root (/) 5
/usr 6
/opt 8
Upgrade
Current release X
Critical file system root (/)
Inactive release X
Critical file systems root (/) /usr /opt
Shared file systems

Single disk command:

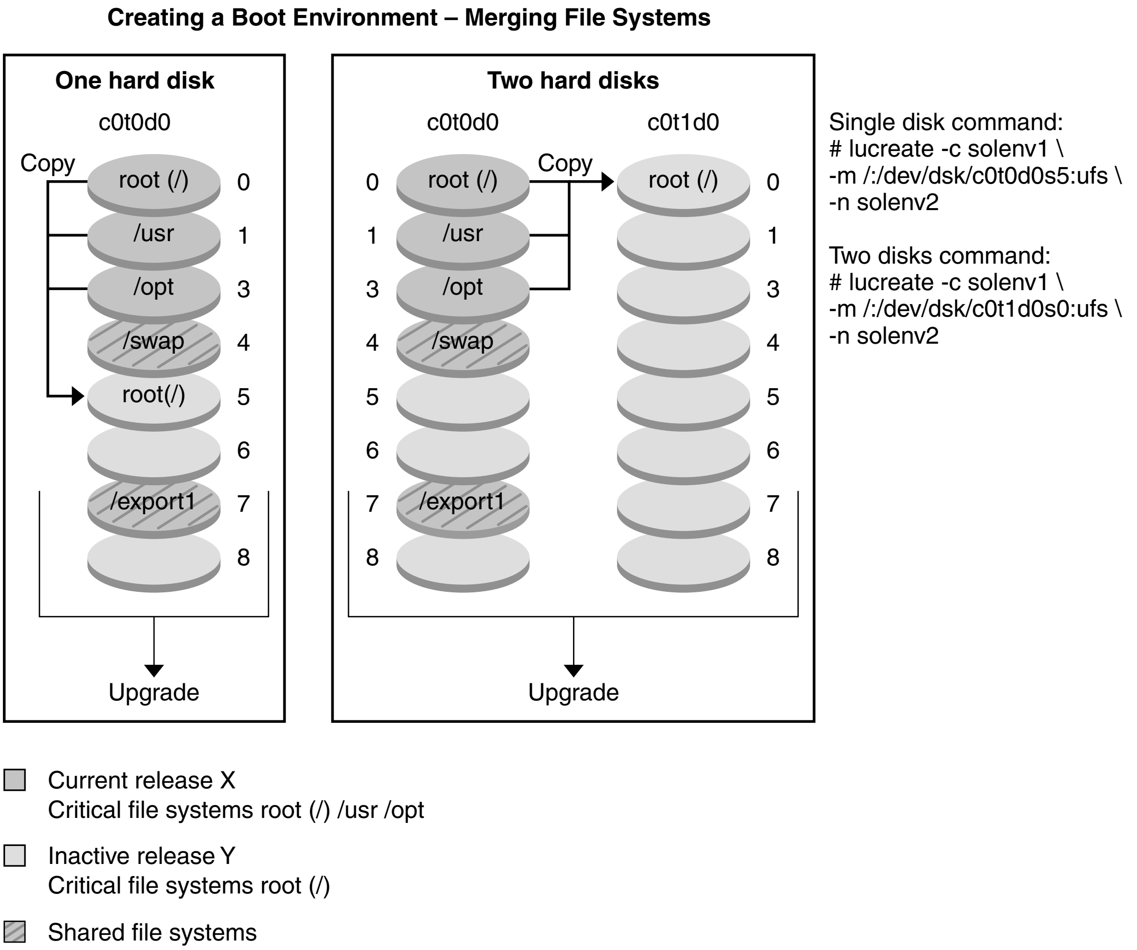
```
# lucreate  -c solenv1 \
-m /:/dev/dsk/c0t0d0s3:ufs \
-m /usr:/dev/dsk/c0t0d0s4:ufs  \
-m /opt:/dev/dsk/c0t0d0s5:ufs \
-n solenv2
```

Two disks command:

```
# lucreate  -c solenv1 \
-m /:/dev/dsk/c0t1d0s5:ufs \
-m /usr:/dev/dsk/c0t1d0s6:ufs  \
-m /opt:/dev/dsk/c0t1d0s8:ufs \
-n solenv2
```

FIGURE 2–3 Creating an Inactive Boot Environment – Splitting File Systems

Figure 2–4 shows critical file systems that have been merged and have been copied to slices on a disk to create a new boot environment. The active boot environment contains the root (`/`) file system, `/usr`, `/var`, and `/opt` with each file system on their own slice. In the new boot environment, /usr and `/opt` are merged into the root (`/`) file system on one slice. The file systems `/swap` and `/export/home` are shared by both boot environments.


Creating a Boot Environment – Merging File Systems
One hard disk
c0t0d0
Copy
root (/)
/usr
/opt
/swap
root(/)
/export1
0
1
3
4
5
6
7
8
Upgrade
Two hard disks
c0t0d0
c0t1d0
Copy
root (/)
/usr
/opt
/swap
/export1
root (/)
Upgrade
Single disk command:
Two disks command:
Current release X
Critical file systems root (/) /usr /opt
Inactive release Y
Critical file systems root (/)
Shared file systems

Single disk command:

```
# lucreate -c solenv1 \
-m /:/dev/dsk/c0t0d0s5:ufs \
-n solenv2
```

Two disks command:

```
# lucreate -c solenv1 \
-m /:/dev/dsk/c0t1d0s0:ufs \
-n solenv2
```

FIGURE 2–4 Creating an Inactive Boot Environment – Merging File Systems

Creating a Boot Environment With RAID-1 Volume File Systems

Solaris Live Upgrade uses Solaris Volume Manager technology to create a boot environment that can contain file systems encapsulated in RAID-1 volumes. 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. Solaris Live Upgrade enables a subset of these tasks, such as creating a RAID-1 volume for the root (`/`) file system.

A volume can group disk slices across several disks to transparently appear as a single disk to the OS. Solaris Live Upgrade is limited to creating a boot environment for the root (`/`) file system that contains single-slice concatenations inside a RAID-1 volume (mirror). This limitation is because the boot PROM is restricted to choosing one slice from which to boot.

How to Manage Volumes With Solaris Live Upgrade

When creating a boot environment, you can use Solaris Live Upgrade to manage the following tasks.

- Detach a single-slice concatenation (submirror) from a RAID-1 volume (mirror). The contents can be preserved to become the content of the new boot environment if necessary. Because the contents are not copied, the new boot environment can be quickly created. After the submirror is detached from the original mirror, the submirror is no longer part of the mirror. Reads and writes on the submirror are no longer performed through the mirror.
- Create a boot environment that contains a mirror.
- Attach a maximum of three single-slice concatenations to the newly created mirror.

You use the `lucreate` command with the `-m` option to create a mirror, detach submirrors, and attach submirrors for the new boot environment.

Note – If VxVM volumes are configured on your current system, the `lucreate` command can create a new boot environment. When the data is copied to the new boot environment, the Veritas file system configuration is lost and a UFS file system is created on the new boot environment.

For step-by-step procedures	"To Create a Boot Environment With RAID-1 Volumes (Mirrors) (Command-Line Interface)" on page 78
For an overview of creating RAID-1 volumes when installing	Chapter 8, "Creating RAID-1 Volumes (Mirrors) During Installation (Overview)," in *Solaris 10 11/06 Installation Guide: Planning for Installation and Upgrade*
For in-depth information about other complex Solaris Volume Manager configurations that are not supported if you are using Solaris Live Upgrade	Chapter 2, "Storage Management Concepts," in *Solaris Volume Manager Administration Guide*

Mapping Solaris Volume Manager Tasks to Solaris Live Upgrade

Solaris Live Upgrade manages a subset of Solaris Volume Manager tasks. Table 2–1 shows the Solaris Volume Manager components that Solaris Live Upgrade can manage.

TABLE 2–1 Classes of Volumes

Term	Description
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.
mirror	A RAID-1 volume. See RAID-1 volume.
RAID-1 volume	A class of volume that replicates data by maintaining multiple copies. A RAID-1 volume is sometimes called a mirror. A RAID-1 volume is composed of one or more RAID-0 volumes that are called submirrors.
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.
state database	A state database 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.
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.

Examples of Using Solaris Live Upgrade to Create RAID-1 Volumes

The following examples present command syntax for creating RAID-1 volumes for a new boot environment.

Create RAID-1 Volume on Two Physical Disks

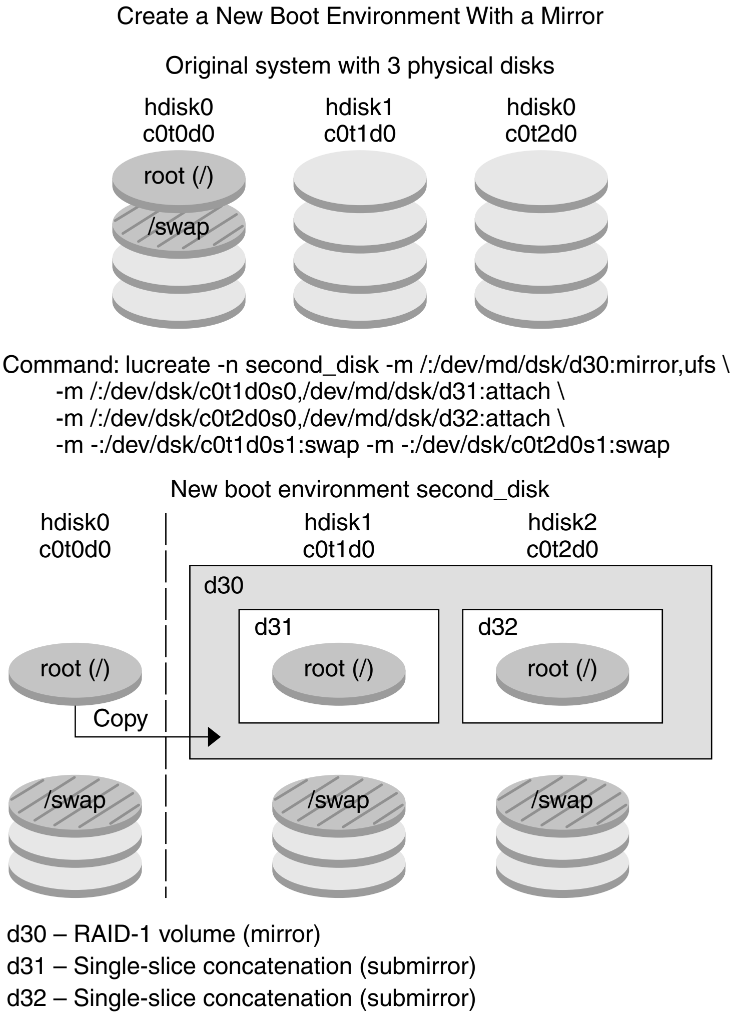
Figure 2–5 shows a new boot environment with a RAID-1 volume (mirror) that is created on two physical disks. The following command created the new boot environment and the mirror.

```
# lucreate -n second_disk -m /:/dev/md/dsk/d30:mirror,ufs \
-m /:/dev/dsk/c0t1d0s0,/dev/md/dsk/d31:attach -m /:/dev/dsk/c0t2d0s0,/dev/md/dsk/d32:attach \
-m -:/dev/dsk/c0t1d0s1:swap -m -:/dev/dsk/c0t2d0s1:swap
```

This command performs the following tasks:

- Creates a new boot environment, `second_disk`.
- Creates a mirror `d30` and configures a UFS file system.

- Creates a single-device concatenation on slice 0 of each physical disk. The concatenations are named `d31` and `d32`.
- Adds the two concatenations to mirror `d30`.
- Copies the root (`/`) file system to the mirror.
- Configures files systems for swap on slice 1 of each physical disk.


Create a New Boot Environment With a Mirror
Original system with 3 physical disks
hdisk0
c0t0d0
hdisk1
c0t1d0
hdisk0
c0t2d0
root (/)
/swap
New boot environment second_disk
hdisk0
c0t0d0
hdisk1
c0t1d0
hdisk2
c0t2d0
d30
d31
d32
root (/)
root (/)
root (/)
Copy
/swap
/swap
/swap

```
Command: lucreate -n second_disk -m /:/dev/md/dsk/d30:mirror,ufs \
        -m /:/dev/dsk/c0t1d0s0,/dev/md/dsk/d31:attach \
        -m /:/dev/dsk/c0t2d0s0,/dev/md/dsk/d32:attach \
        -m -:/dev/dsk/c0t1d0s1:swap -m -:/dev/dsk/c0t2d0s1:swap
```

d30 – RAID-1 volume (mirror)
d31 – Single-slice concatenation (submirror)
d32 – Single-slice concatenation (submirror)

FIGURE 2–5 Create a Boot Environment and Create a Mirror

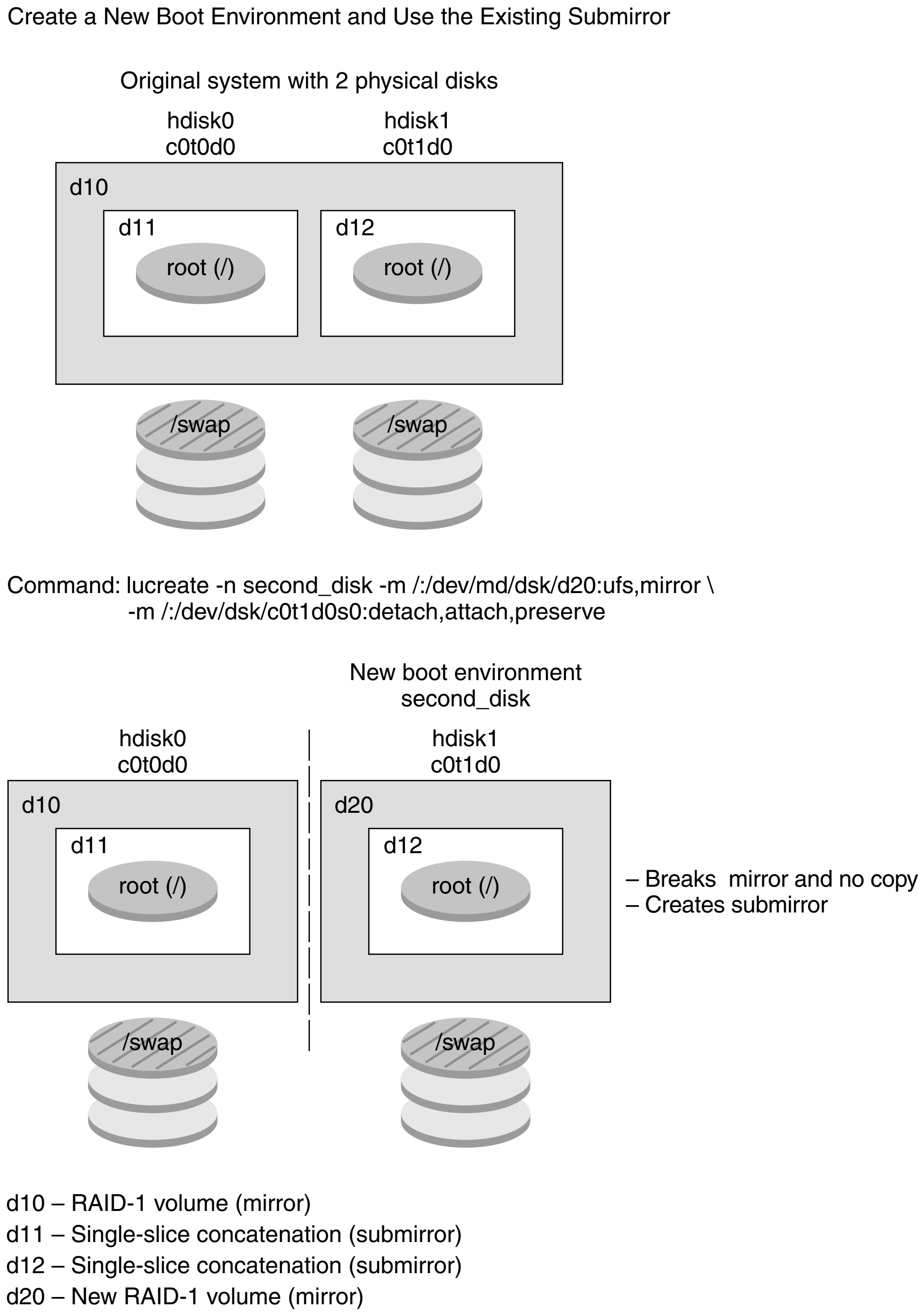
Create a Boot Environment and Use the Existing Submirror

Figure 2–6 shows a new boot environment that contains a RAID-1 volume (mirror). The following command created the new boot environment and the mirror.

```
# lucreate -n second_disk -m /:/dev/md/dsk/d20:ufs,mirror \
-m /:/dev/dsk/c0t1d0s0:detach,attach,preserve
```

This command performs the following tasks:

- Creates a new boot environment, `second_disk`.
- Breaks mirror `d10` and detaches concatenation `d12`.
- Preserves the contents of concatenation `d12`. File systems are not copied.
- Creates a new mirror `d20`. You now have two one-way mirrors `d10` and `d20`.
- Attaches concatenation `d12` to mirror `d20`.



Create a New Boot Environment and Use the Existing Submirror
Original system with 2 physical disks
hdisk0
c0t0d0
hdisk1
c0t1d0
d10
d11
root (/)
d12
root (/)
/swap
/swap
New boot environment
second_disk
hdisk0
c0t0d0
hdisk1
c0t1d0
d10
d11
root (/)
d20
d12
root (/)
– Breaks mirror and no copy
– Creates submirror
/swap
/swap
d10 – RAID-1 volume (mirror)
d11 – Single-slice concatenation (submirror)
d12 – Single-slice concatenation (submirror)
d20 – New RAID-1 volume (mirror)

```
Command: lucreate -n second_disk -m /:/dev/md/dsk/d20:ufs,mirror \
         -m /:/dev/dsk/c0t1d0s0:detach,attach,preserve
```

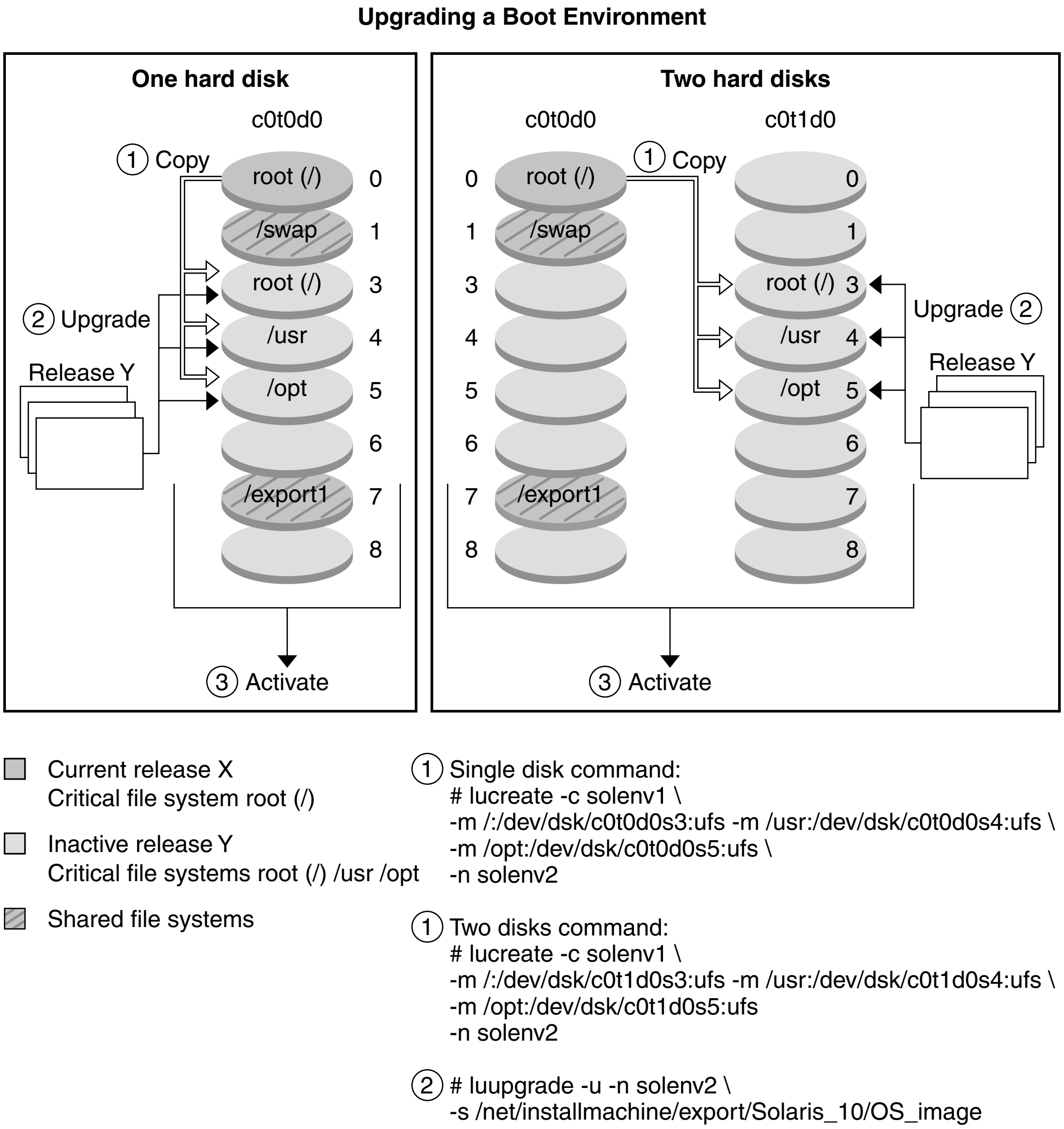
FIGURE 2–6 Create a Boot Environment and Use the Existing Submirror

Upgrading a Boot Environment

After you have created a boot environment, you can perform an upgrade on the boot environment. As part of that upgrade, the boot environment can contain RAID-1 volumes (mirrors) for any file systems. The upgrade does not affect any files in the active boot environment. When you are ready, you activate the new boot environment, which then becomes the current boot environment.

For procedures about upgrading a boot environment	Chapter 5
For an example of upgrading a boot environment with a RAID–1 volume file system	"Example of Detaching and Upgrading One Side of a RAID-1 Volume (Mirror) (Command-Line Interface)" on page 154

Figure 2–7 shows an upgrade to an inactive boot environment.


Upgrading a Boot Environment
One hard disk
c0t0d0
① Copy
root (/)
0
/swap
1
root (/)
3
② Upgrade
/usr
4
Release Y
/opt
5
6
/export1
7
8
③ Activate
Two hard disks
c0t0d0
c0t1d0
0
root (/)
① Copy
0
1
/swap
1
3
root (/) 3
Upgrade ②
4
/usr 4
Release Y
5
/opt 5
6
6
7
/export1
7
8
8
③ Activate

■ Current release X
Critical file system root (/)

☐ Inactive release Y
Critical file systems root (/) /usr /opt

▨ Shared file systems

① Single disk command:

```
# lucreate -c solenv1 \
-m /:/dev/dsk/c0t0d0s3:ufs -m /usr:/dev/dsk/c0t0d0s4:ufs \
-m /opt:/dev/dsk/c0t0d0s5:ufs \
-n solenv2
```

① Two disks command:

```
# lucreate -c solenv1 \
-m /:/dev/dsk/c0t1d0s3:ufs -m /usr:/dev/dsk/c0t1d0s4:ufs \
-m /opt:/dev/dsk/c0t1d0s5:ufs
-n solenv2
```

②

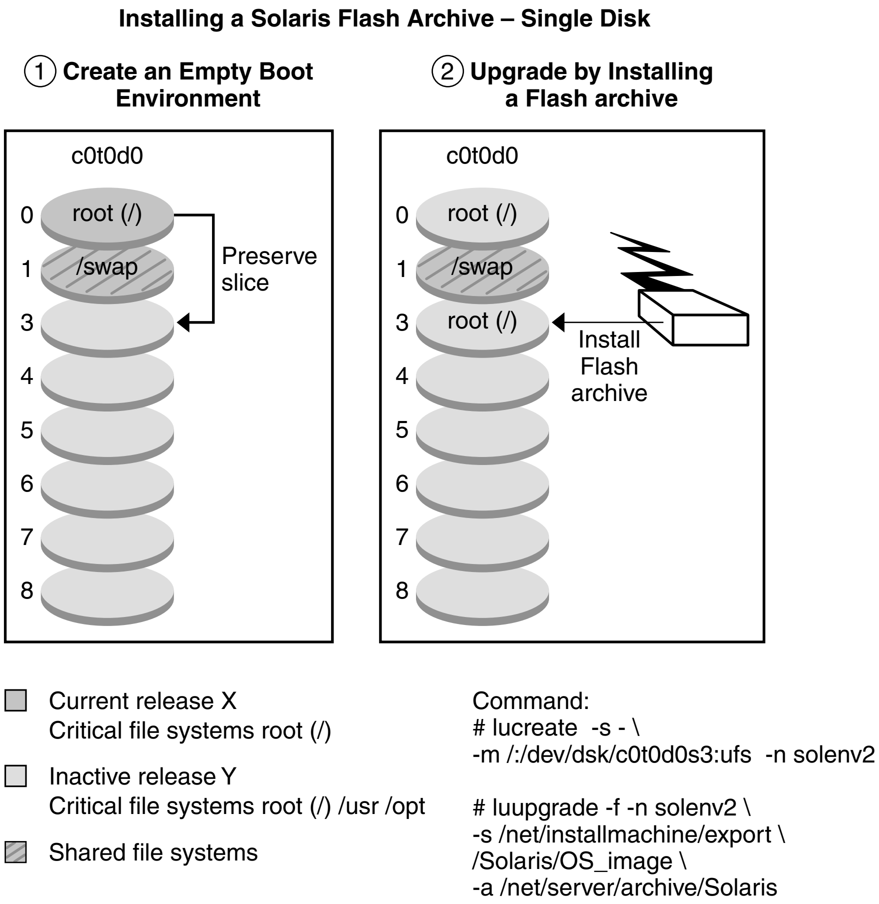
```
# luupgrade -u -n solenv2 \
-s /net/installmachine/export/Solaris_10/OS_image
```

FIGURE 2–7 Upgrading an Inactive Boot Environment

Rather than an upgrade, you can install a Solaris Flash archive on a boot environment. The Solaris Flash installation feature enables you to create a single reference installation of the Solaris OS on a system. This system is called the master system. Then, you can replicate that installation on a number of systems that are called clone systems. In this situation, the inactive boot environment is a clone. When you install the Solaris Flash archive on a system, the archive replaces all the files on the existing boot environment as an initial installation would.

For procedures about installing a Solaris Flash archive, see "Installing Solaris Flash Archives on a Boot Environment" on page 103.

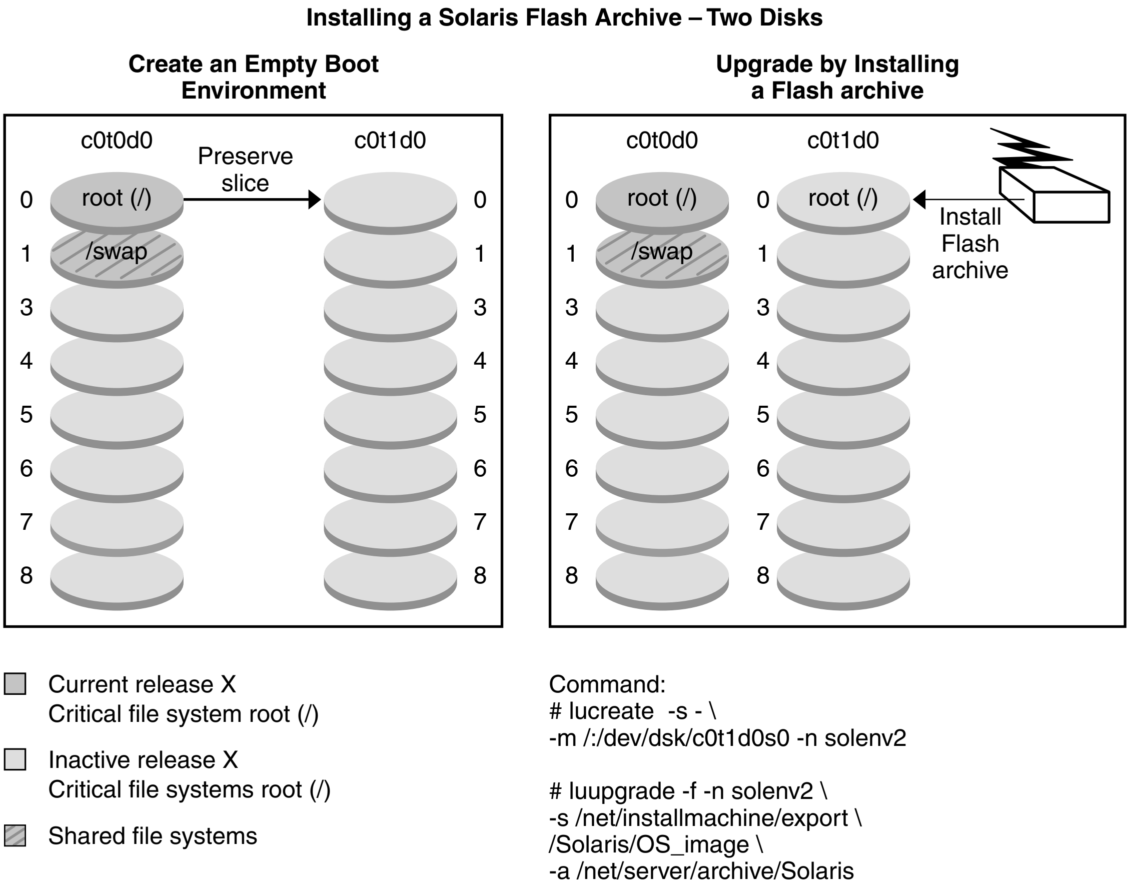
The following figures show an installation of a Solaris Flash archive on an inactive boot environment. Figure 2–8 shows a system with a single hard disk. Figure 2–9 shows a system with two hard disks.


Installing a Solaris Flash Archive – Single Disk
① Create an Empty Boot Environment
② Upgrade by Installing a Flash archive
c0t0d0
0
root (/)
1
/swap
3
4
5
6
7
8
Preserve slice
c0t0d0
0
root (/)
1
/swap
3
root (/)
4
5
6
7
8
Install Flash archive
Current release X
Critical file systems root (/)
Inactive release Y
Critical file systems root (/) /usr /opt
Shared file systems
Command:

```
# lucreate  -s - \
-m /:/dev/dsk/c0t0d0s3:ufs  -n solenv2

# luupgrade -f -n solenv2 \
-s /net/installmachine/export \
/Solaris/OS_image \
-a /net/server/archive/Solaris
```

FIGURE 2–8 Installing a Solaris Flash Archive on a Single Disk


Installing a Solaris Flash Archive – Two Disks
Create an Empty Boot Environment
Upgrade by Installing a Flash archive
c0t0d0
c0t1d0
Preserve slice
root (/)
/swap
0
1
3
4
5
6
7
8
Install Flash archive
▨ Current release X
Critical file system root (/)
☐ Inactive release X
Critical file systems root (/)
▨ Shared file systems
Command:

```
# lucreate  -s - \
-m /:/dev/dsk/c0t1d0s0 -n solenv2

# luupgrade -f -n solenv2 \
-s /net/installmachine/export \
/Solaris/OS_image \
-a /net/server/archive/Solaris
```

FIGURE 2–9 Installing a Solaris Flash Archive on Two Disks

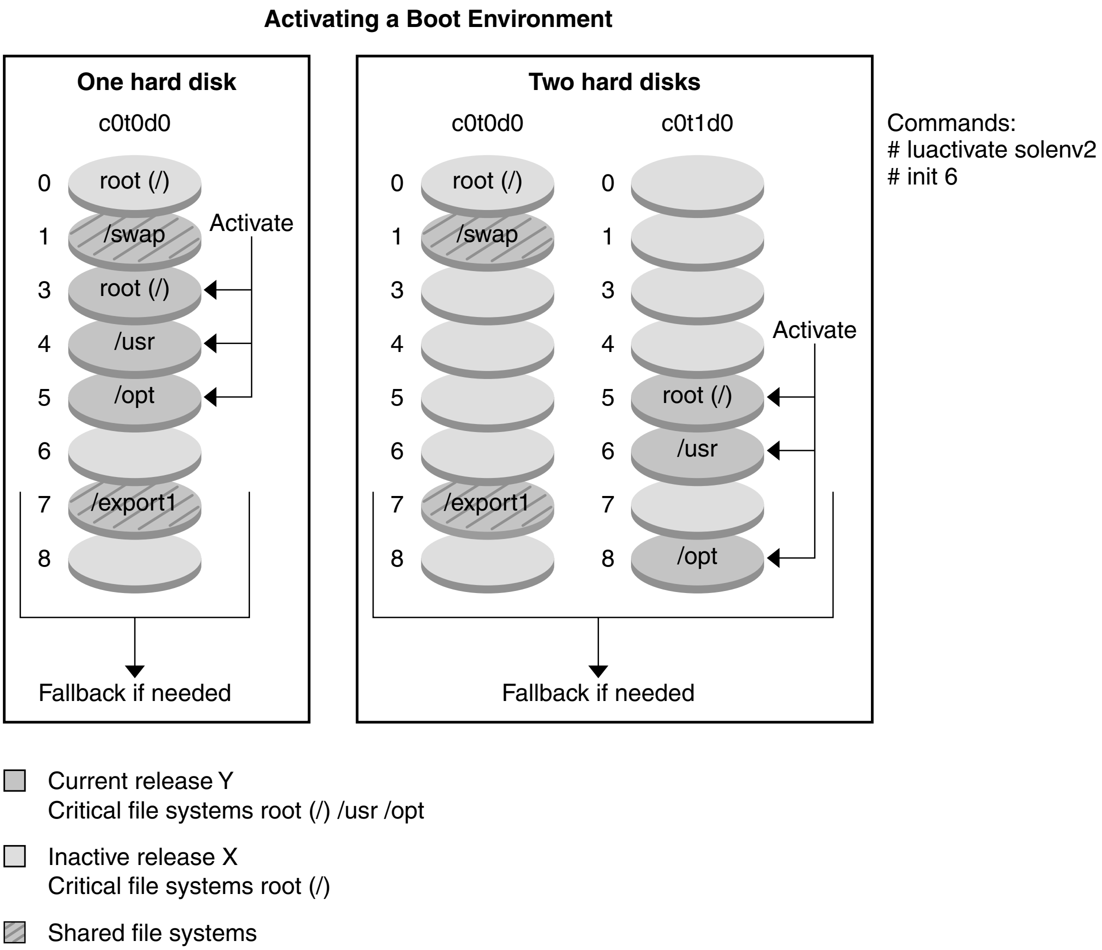
Activating a Boot Environment

When you are ready to switch and make the new boot environment active, you quickly activate the new boot environment and reboot. Files are synchronized between boot environments the first time that you boot a newly created boot environment. "Synchronize" means that certain system files and directories are copied from the last-active boot environment to the boot environment being booted. When you reboot the system, the configuration that you installed on the new boot environment is active. The original boot environment then becomes an inactive boot environment.

For procedures about activating a boot environment	"Activating a Boot Environment" on page 109

For information about synchronizing the active and inactive boot environment	"Synchronizing Files Between Boot Environments" on page 49

Figure 2–10 shows a switch after a reboot from an inactive to an active boot environment.


Activating a Boot Environment
One hard disk
c0t0d0
0
root (/)
1
/swap
3
root (/)
4
/usr
5
/opt
6
7
/export1
8
Activate
Fallback if needed
Two hard disks
c0t0d0
c0t1d0
0
root (/)
1
/swap
3
4
5
6
7
/export1
8
0
1
3
4
5
root (/)
6
/usr
7
8
/opt
Activate
Fallback if needed
Current release Y
Critical file systems root (/) /usr /opt
Inactive release X
Critical file systems root (/)
Shared file systems

```
Commands:
# luactivate solenv2
# init 6
```

FIGURE 2–10 Activating an Inactive Boot Environment

Falling Back to the Original Boot Environment

If a failure occurs, you can quickly fall back to the original boot environment with an activation and reboot. The use of fallback takes only the time to reboot the system, which is much quicker than backing up and restoring the original. The new boot environment that failed to boot is preserved.

The failure can then be analyzed. You can only fall back to the boot environment that was used by `luactivate` to activate the new boot environment.

You fall back to the previous boot environment the following ways:

Problem	Action
The new boot environment boots successfully, but you are not happy with the results.	Run the `luactivate` command with the name of the previous boot environment and reboot. **x86 only – Starting with the Solaris 10 1/06 release**, you can fall back by selecting the original boot environment that is found on the GRUB menu. The original boot environment and the new boot environment must be based on the GRUB software. Booting from the GRUB menu does not synchronize files between the old and new boot environments. For more information about synchronizing files, see "Forcing a Synchronization Between Boot Environments" on page 51.
The new boot environment does not boot.	Boot the fallback boot environment in single-user mode, run the `luactivate` command, and reboot.
You cannot boot in single-user mode.	Perform one of the following: ■ Boot from DVD or CD media or a net installation image ■ Mount the root (`/`) file system on the fallback boot environment ■ Run the `luactivate` command and reboot

For procedures to fall back, see Chapter 6.

Figure 2–11 shows the switch that is made when you reboot to fallback.

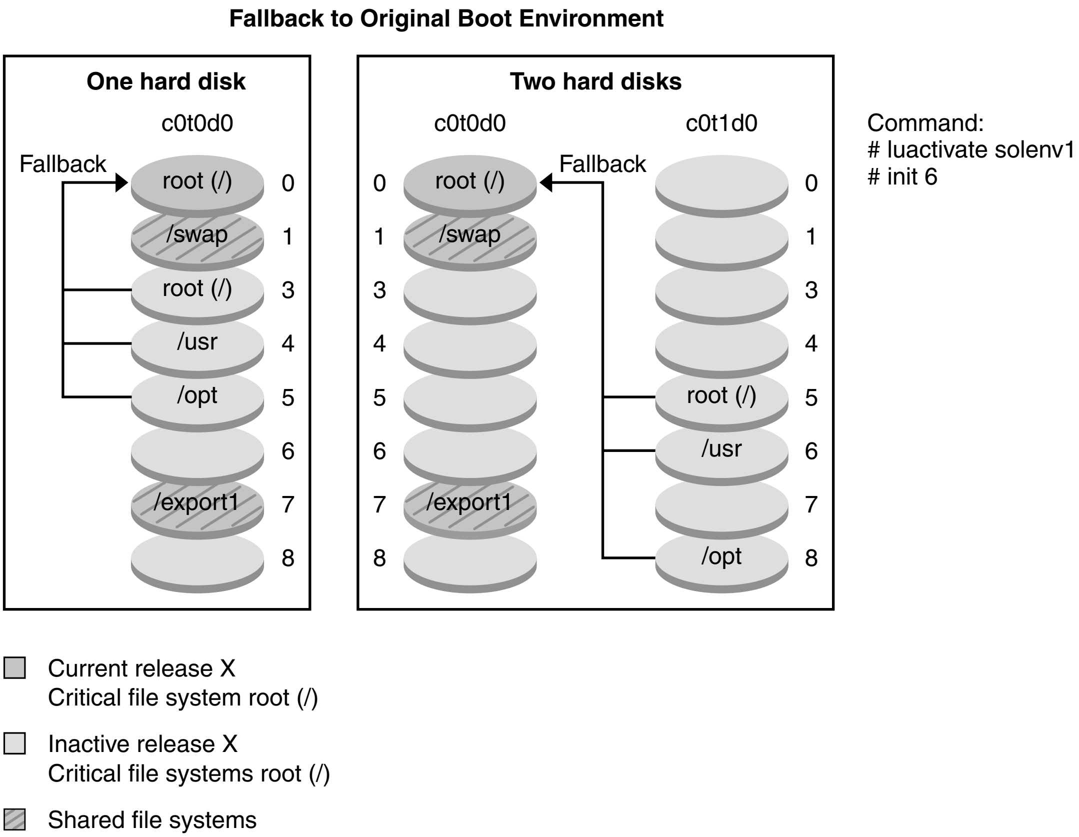

Fallback to Original Boot Environment
One hard disk
c0t0d0
Fallback
root (/) 0
/swap 1
root (/) 3
/usr 4
/opt 5
6
/export1 7
8
Two hard disks
c0t0d0
c0t1d0
Fallback
0 root (/)
1 /swap
3
4
5
6
7 /export1
8
0
1
3
4
root (/) 5
/usr 6
7
/opt 8
Command:
# luactivate solenv1
# init 6
Current release X
Critical file system root (/)
Inactive release X
Critical file systems root (/)
Shared file systems

FIGURE 2–11 Fallback to the Original Boot Environment

Maintaining a Boot Environment

You can also do various maintenance activities such as checking status, renaming, or deleting a boot environment. For maintenance procedures, see Chapter 7.

◆ ◆ ◆ CHAPTER 3

Solaris Live Upgrade (Planning)

This chapter provides guidelines and requirements for review before installing and using Solaris Live Upgrade. You also should review general information about upgrading in "Upgrade Planning" in *Solaris 10 11/06 Installation Guide: Planning for Installation and Upgrade*. This chapter contains the following sections:

- "Solaris Live Upgrade Requirements" on page 39
- "Upgrading a System With Packages or Patches" on page 43
- "Guidelines for Creating File Systems With the `lucreate` Command" on page 44
- "Guidelines for Selecting Slices for File Systems" on page 45
- "Customizing a New Boot Environment's Content" on page 49
- "Synchronizing Files Between Boot Environments" on page 49
- "Using Solaris Live Upgrade From a Remote System" on page 52

Solaris Live Upgrade Requirements

Before you install and use Solaris Live Upgrade, become familiar with these requirements.

Solaris Live Upgrade System Requirements

Solaris Live Upgrade is included in the Solaris software. You need to install the Solaris Live Upgrade packages on your current OS. The release of the Solaris Live Upgrade packages must match the release of the OS you are upgrading to. For example, if your current OS is the Solaris 9 release and you want to upgrade to the Solaris 10 11/06 release, you need to install the Solaris Live Upgrade packages from the Solaris 10 11/06 release.

Table 3–1 lists releases that are supported by Solaris Live Upgrade.

TABLE 3–1 Supported Solaris Releases

Your Current Release	Compatible Upgrade Release
Solaris 8 OS	Solaris 8, 9, or any Solaris 10 release
Solaris 9 OS	Solaris 9 or any Solaris 10 release
Solaris 10 OS	Any Solaris 10 release

Installing Solaris Live Upgrade

You can install the Solaris Live Upgrade packages by using the following:

- The `pkgadd` command. The Solaris Live Upgrade packages are `SUNWlur` and `SUNWluu`, and these packages must be installed in that order.
- An installer on the Solaris Operating System DVD, the Solaris Software - 2 CD, or a net installation image.

Be aware that the following patches might need to be installed for the correct operation of Solaris Live Upgrade.

Description	For More Information

Caution: Correct operation of Solaris Live Upgrade requires that a limited set of patch revisions be installed for a particular OS version. Before installing or running Solaris Live Upgrade, you are required to install these patches.
x86 only – If this set of patches is not installed, Solaris Live Upgrade fails and you might see the following error message. If you don't see the following error message, necessary patches still might not be installed. Always verify that all patches listed on the SunSolve info doc have been installed before attempting to install Solaris Live Upgrade.
`ERROR: Cannot find or is not executable: </sbin/biosdev>.`
`ERROR: One or more patches required by Live Upgrade has not been installed.`
The patches listed in info doc 72099 are subject to change at any time. These patches potentially fix defects in Solaris Live Upgrade, as well as fix defects in components that Solaris Live Upgrade depends on. If you experience any difficulties with Solaris Live Upgrade, please check and make sure that you have the latest Solaris Live Upgrade patches installed.
	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.

Description	For More Information
If you are running the Solaris 8 or 9 OS, you might not be able to run the Solaris Live Upgrade installer. These releases do not contain the set of patches needed to run the Java 2 runtime environment. You must have the recommended patch cluster for the Java 2 runtime environment recommended to run the Solaris Live Upgrade installer and install the packages.	To install the Solaris Live Upgrade packages, use the `pkgadd` command. Or install, for the Java 2 runtime environment, the recommended patch cluster. The patch cluster is available on http://sunsolve.sun.com.

For instructions about installing the Solaris Live Upgrade software, see "Installing Solaris Live Upgrade" on page 55.

Required Packages

If you have problems with Solaris Live Upgrade, you might be missing packages. In the following table, check that your OS has the listed packages , which are required to use Solaris Live Upgrade.

For the Solaris 10 release:

- If you install one of the following software groups, these software groups contain all the required Solaris Live Upgrade packages.
  - Entire Solaris Software Group Plus OEM Support
  - Entire Solaris Software Group
  - Developer Solaris Software Group
  - End User Solaris Software Group
- If you install one of these Software Groups, then you might not have all the packages required to use Solaris Live Upgrade.
  - Core System Support Software Group
  - Reduced Network Support Software Group

For information about software groups, see "Disk Space Recommendations for Software Groups" in *Solaris 10 11/06 Installation Guide: Planning for Installation and Upgrade*.

TABLE 3–2 Required Packages for Solaris Live Upgrade

Solaris 8 Release	Solaris 9 Release	Solaris 10 Release
SUNWadmap	SUNWadmap	SUNWadmap
SUNWadmc	SUNWadmc	SUNWadmlib-sysid
SUNWlibC	SUNWadmfw	SUNWadmr
SUNWbzip	SUNWlibC	SUNWlibC
SUNWgzip	SUNWgzip	**For Solaris 10 3/05 only**: SUNWgzip

TABLE 3–2 Required Packages for Solaris Live Upgrade *(Continued)*

Solaris 8 Release	Solaris 9 Release	Solaris 10 Release
SUNWj2rt	SUNWj2rt	SUNWj5rt
Note – The SUNWj2rt package is needed only under the following conditions: ■ When you run the Solaris Live Upgrade installer to add Solaris Live Upgrade packages ■ When you upgrade and use CD media	**Note –** The SUNWj2rt package is needed only under the following conditions: ■ When you run the Solaris Live Upgrade installer to add Solaris Live Upgrade packages ■ When you upgrade and use CD media	**Note –** The SUNWj5rt package is needed only under the following conditions: ■ When you run the Solaris Live Upgrade installer to add Solaris Live Upgrade packages ■ When you upgrade and use CD media

To check for packages on your system, type the following command.

```
% pkginfo package_name
```

Solaris Live Upgrade Disk Space Requirements

Follow general disk space requirements for an upgrade. See Chapter 4, “System Requirements, Guidelines, and Upgrade (Planning),” in *Solaris 10 11/06 Installation Guide: Planning for Installation and Upgrade*.

To estimate the file system size that is needed to create a boot environment, start the creation of a new boot environment. The size is calculated. You can then abort the process.

The disk on the new boot environment must be able to serve as a boot device. Some systems restrict which disks can serve as a boot device. Refer to your system’s documentation to determine if any boot restrictions apply.

The disk might need to be prepared before you create the new boot environment. Check that the disk is formatted properly:

- Identify slices large enough to hold the file systems to be copied.
- Identify file systems that contain directories that you want to share between boot environments rather than copy. If you want a directory to be shared, you need to create a new boot environment with the directory put on its own slice. The directory is then a file system and can be shared with future boot environments. For more information about creating separate file systems for sharing, see “Guidelines for Selecting Slices for Shareable File Systems” on page 48.

Solaris Live Upgrade Requirements if Creating RAID-1 Volumes (Mirrors)

Solaris Live Upgrade uses Solaris Volume Manager technology to create a boot environment that can contain file systems that are RAID-1 volumes (mirrors). Solaris Live Upgrade does not implement the full functionality of Solaris Volume Manager, but does require the following components of Solaris Volume Manager.

TABLE 3–3 Required Components for Solaris Live Upgrade and RAID-1 Volumes

Requirement	Description	For More Information
You must create at least one state database and at least three state database replicas.	A state database 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. When a state database is copied, the replica protects against data loss from single points of failure.	For information about creating a state database, see Chapter 6, “State Database (Overview),” in *Solaris Volume Manager Administration Guide*.
Solaris Live Upgrade supports only a RAID-1 volume (mirror) with single-slice concatenations on the root (`/`) file system.	A concatenation is 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 RAID-1 volume A RAID—1 volume can be comprised of a maximum of three concatenations.	For guidelines about creating mirrored file systems, see “Guidelines for Selecting Slices for Mirrored File Systems” on page 45.

Upgrading a System With Packages or Patches

You can use Solaris Live Upgrade to add patches and packages to a system. When you use Solaris Live Upgrade, the only downtime the system incurs is that of a reboot. You can add patches and packages to a new boot environment with the `luupgrade` command. When you use `luupgrade` command, you can also use a Solaris Flash archive to install patches or packages.

Caution – When upgrading and adding and removing packages or patches, Solaris Live Upgrade requires packages or patches that comply with the SVR4 advanced packaging guidelines. While Sun packages conform to these guidelines, Sun cannot guarantee the conformance of packages from third-party vendors. If a package violates these guidelines, the package can cause the package-addition software during an upgrade to fail or alter the active boot environment.

For more information about packaging requirements, see Appendix B.

Type of Installation	Description	For More Information
Adding patches to a boot environment	Create a new boot environment and use the `luupgrade` command with the `-t` option.	"To Add Patches to an Operating System Image on a Boot Environment (Command-Line Interface)" on page 94.
Adding packages to a boot environment	Use the `luupgrade` command with the `-p` option.	"To Add Packages to an Operating System Image on a Boot Environment (Command-Line Interface)" on page 93
Using Solaris Live Upgrade to install a Solaris Flash archive	An archive contains a complete copy of a boot environment with new packages and patches already included. This copy can be installed on multiple systems.	■ For details about how to create a Solaris Flash archive, see Chapter 3, "Creating Solaris Flash Archives (Tasks)," in *Solaris 10 11/06 Installation Guide: Solaris Flash Archives (Creation and Installation)*. ■ For information about using Solaris Live Upgrade to install a Solaris Flash archive, see "Installing Solaris Flash Archives on a Boot Environment" on page 103

Guidelines for Creating File Systems With the `lucreate` Command

The `lucreate -m` option specifies which file systems and the number of file systems to be created in the new boot environment. You must specify the exact number of file systems you want to create by repeating this option. When using the `-m` option to create file systems, follow these guidelines:

- You must specify one `-m` option for the root (`/`) file system for the new boot environment. If you run `lucreate` without the `-m` option, the Configuration menu is displayed. The Configuration menu enables you to customize the new boot environment by redirecting files onto new mount points.
- Any critical file systems that exist in the current boot environment and that are not specified in a `-m` option are merged into the next highest-level file system created.
- Only the file systems that are specified by the `-m` option are created on the new boot environment. To create the same number of files systems that is on your current system, you must specify one `-m` option for each file system to be created.

  For example, a single use of the `-m` option specifies where to put all the file systems. You merge all the file systems from the original boot environment into the one file system that is specified by the `-m` option. If you specify the `-m` option twice, you create two file systems. If you have file systems for root (`/`), `/opt`, and `/var`, you would use one `-m` option for each file system on the new boot environment.
- Do not duplicate a mount point. For example, you cannot have two root (`/`) file systems.

Guidelines for Selecting Slices for File Systems

When you create file systems for a boot environment, the rules are identical to the rules for creating file systems for the Solaris OS. Solaris Live Upgrade cannot prevent you from creating invalid configurations for critical file systems. For example, you could type a `lucreate` command that would create separate file systems for root (`/`) and `/kernel` which is an invalid division of the root (`/`) file system.

Do not overlap slices when reslicing disks. If this condition exists, the new boot environment appears to have been created, but when activated, the boot environment does not boot. The overlapping file systems might be corrupted.

For Solaris Live Upgrade to work properly, the `vfstab` file on the active boot environment must have valid contents and must have an entry for the root (`/`) file system at the minimum.

Guidelines for Selecting a Slice for the root (`/`) File System

When you create an inactive boot environment, you need to identify a slice where the root (`/`) file system is to be copied. Use the following guidelines when you select a slice for the root (`/`) file system. The slice must comply with the following:

- Must be a slice from which the system can boot.
- Must meet the recommended minimum size.
- Can be on different physical disks or the same disk as the active root (`/`) file system.
- Can be a Veritas Volume Manager volume (VxVM). If VxVM volumes are configured on your current system, the `lucreate` command can create a new boot environment. When the data is copied to the new boot environment, the Veritas file system configuration is lost and a UFS file system is created on the new boot environment.

Guidelines for Selecting Slices for Mirrored File Systems

You can create a new boot environment that contains any combination of physical disk slices, Solaris Volume Manager volumes, or Veritas Volume Manager volumes. Critical file systems that are copied to the new boot environment can be of the following types:

- A physical slice.
- A single-slice concatenation that is included in a RAID-1 volume (mirror). The slice that contains the root (`/`) file system can be a RAID-1 volume.
- A single-slice concatenation that is included in a RAID-0 volume. The slice that contains the root (`/`) file system can be a RAID-0 volume.

When you create a new boot environment, the `lucreate -m` command recognizes the following three types of devices:

- A physical slice in the form of /dev/dsk/*cwtxdysz*
- A Solaris Volume Manager volume in the form of /dev/md/dsk/d*num*
- A Veritas Volume Manager volume in the form of /dev/vx/dsk/*volume_name*. If VxVM volumes are configured on your current system, the `lucreate` command can create a new boot environment. When the data is copied to the new boot environment, the Veritas file system configuration is lost and a UFS file system is created on the new boot environment.

Note – If you have problems upgrading with Veritas VxVM, see "System Panics When Upgrading With Solaris Live Upgrade Running Veritas VxVm" on page 182.

General Guidelines When Creating RAID-1 Volumes (Mirrored) File Systems

Use the following guidelines to check if a RAID-1 volume is busy, resyncing, or if volumes contain file systems that are in use by a Solaris Live Upgrade boot environment.

For volume naming guidelines, see "RAID Volume Name Requirements and Guidelines for Custom JumpStart and Solaris Live Upgrade" in *Solaris 10 11/06 Installation Guide: Planning for Installation and Upgrade*.

Checking Status of Volumes

If a mirror or submirror needs maintenance or is busy, components cannot be detached. You should use the `metastat` command before creating a new boot environment and using the `detach` keyword. The `metastat` command checks if the mirror is in the process of resynchronization or if the mirror is in use. For information, see the man page `metastat`(1M).

Detaching Volumes and Resynchronizing Mirrors

If you use the `detach` keyword to detach a submirror, `lucreate` checks if a device is currently resyncing. If the device is resyncing, you cannot detach the submirror and you see an error message.

Resynchronization is the process of copying data from one submirror to another submirror after the following problems:

- Submirror failures.
- System crashes.
- A submirror has been taken offline and brought back online.
- The addition of a new submirror.

For more information about resynchronization, see "RAID-1 Volume (Mirror) Resynchronization" in *Solaris Volume Manager Administration Guide*.

Using Solaris Volume Manager Commands

Use the `lucreate` command rather than Solaris Volume Manager commands to manipulate volumes on inactive boot environments. The Solaris Volume Manager software has no knowledge of boot environments, whereas the `lucreate` command contains checks that prevent you from inadvertently destroying a boot environment. For example, `lucreate` prevents you from overwriting or deleting a Solaris Volume Manager volume.

However, if you have already used Solaris Volume Manager software to create complex Solaris Volume Manager concatenations, stripes, and mirrors, you must use Solaris Volume Manager software to manipulate them. Solaris Live Upgrade is aware of these components and supports their use. Before using Solaris Volume Manager commands that can create, modify, or destroy volume components, use the `lustatus` or `lufslist` commands. These commands can determine which Solaris Volume Manager volumes contain file systems that are in use by a Solaris Live Upgrade boot environment.

Guidelines for Selecting a Slice for a Swap File System

These guidelines contain configuration recommendations and examples for a swap slice.

Configuring Swap for the New Boot Environment

You can configure a swap slice in three ways by using the `lucreate` command with the `-m` option:

- If you do not specify a swap slice, the swap slices belonging to the current boot environment are configured for the new boot environment.
- If you specify one or more swap slices, these slices are the only swap slices that are used by the new boot environment. The two boot environments do not share any swap slices.
- You can specify to both share a swap slice and add a new slice for swap.

The following examples show the three ways of configuring swap. The current boot environment is configured with the root (`/`) file system on `c0t0d0s0`. The swap file system is on `c0t0d0s1`.

- In the following example, no swap slice is specified. The new boot environment contains the root (`/`) file system on `c0t1d0s0`. Swap is shared between the current and new boot environment on `c0t0d0s1`.

  ```
  # lucreate -n be2 -m /:/dev/dsk/c0t1d0s0:ufs
  ```

- In the following example, a swap slice is specified. The new boot environment contains the root (`/`) file system on `c0t1d0s0`. A new swap file system is created on `c0t1d0s1`. No swap slice is shared between the current and new boot environment.

  ```
  # lucreate -n be2 -m /:/dev/dsk/c0t1d0s0:ufs -m -:/dev/dsk/c0t1d0s1:swap
  ```

- In the following example, a swap slice is added and another swap slice is shared between the two boot environments. The new boot environment contains the root (`/`) file system on `c0t1d0s0`. A new swap slice is created on `c0t1d0s1`. The swap slice on `c0t0d0s1` is shared between the current and new boot environment.

```
# lucreate -n be2 -m /:/dev/dsk/c0t1d0s0:ufs -m -:shared:swap -m -:/dev/dsk/c0t1d0s1:swap
```

Failed Boot Environment Creation if Swap is in Use

A boot environment creation fails if the swap slice is being used by any boot environment except for the current boot environment. If the boot environment was created using the `-s` option, the alternate-source boot environment can use the swap slice, but not any other boot environment.

Guidelines for Selecting Slices for Shareable File Systems

Solaris Live Upgrade copies the entire contents of a slice to the designated new boot environment slice. You might want some large file systems on that slice to be shared between boot environments rather than copied to conserve space and copying time. File systems that are critical to the OS such as root (`/`) and `/var` must be copied. File systems such as `/home` are not critical file systems and could be shared between boot environments. Shareable file systems must be user-defined file systems and on separate swap slices on both the active and new boot environments. You can reconfigure the disk several ways, depending your needs.

Reconfiguring a disk	**Examples**	**For More Information**
You can reslice the disk before creating the new boot environment and put the shareable file system on its own slice.	For example, if the root (`/`) file system, `/var`, and `/home` are on the same slice, reconfigure the disk and put `/home` on its own slice. When you create any new boot environments, `/home` is shared with the new boot environment by default.	`format`(1M)
If you want to share a directory, the directory must be split off to its own slice. The directory is then a file system that can be shared with another boot environment. You can use the `lucreate` command with the `-m` option to create a new boot environment and split a directory off to its own slice. But, the new file system cannot yet be shared with the original boot environment. You need to run the `lucreate` command with the `-m` option again to create another boot environment. The two new boot environments can then share the directory.	For example, if you wanted to upgrade from the Solaris 9 release to the Solaris 10 11/06 release and share `/home`, you could run the `lucreate` command with the `-m` option. You could create a Solaris 9 release with `/home` as a separate file system on its own slice. Then run the `lucreate` command with the `-m` option again to duplicate that boot environment. This third boot environment can then be upgraded to the Solaris 10 11/06 release. `/home` is shared between the Solaris 9 and Solaris 10 11/06 releases.	For a description of shareable and critical file systems, see "File System Types" on page 22.

Customizing a New Boot Environment's Content

When you create a new boot environment, some directories and files can be excluded from a copy to the new boot environment. If you have excluded a directory, you can also reinstate specified subdirectories or files under the excluded directory. These subdirectories or files that have been restored are then copied to the new boot environment. For example, you could exclude from the copy all files and directories in `/etc/mail`, but include all files and directories in `/etc/mail/staff`. The following command copies the `staff` subdirectory to the new boot environment.

```
# lucreate -n second_disk -x /etc/mail -y /etc/mail/staff
```

Caution – Use the file-exclusion options with caution. Do not remove files or directories that are required by the system.

The following table lists the `lucreate` command options for removing and restoring directories and files.

How Specified?	Exclude Options	Include Options
Specify the name of the directory or file	`-x` *exclude_dir*	`-y` *include_dir*
Use a file that contains a list	`-f` *list_filename*	`-Y` *list_filename*
	`-z` *list_filename*	`-z` *list_filename*

For examples of customizing the directories and files when creating a boot environment, see "To Create a Boot Environment and Customize the Content (Command-Line Interface)" on page 84.

Synchronizing Files Between Boot Environments

When you are ready to switch and make the new boot environment active, you quickly activate the new boot environment and reboot. Files are synchronized between boot environments the first time that you boot a newly created boot environment. "Synchronize" means that certain critical system files and directories might be copied from the last-active boot environment to the boot environment being booted. Those files and directories that have changed are copied.

Adding Files to the `/etc/lu/synclist`

Solaris Live Upgrade checks for critical files that have changed. If these files' content is not the same in both boot environments, they are copied from the active boot environment to the new boot environment. Synchronizing is meant for critical files such as `/etc/passwd` or `/etc/group` files that might have changed since the new boot environment was created.

The `/etc/lu/synclist` file contains a list of directories and files that are synchronized. In some instances, you might want to copy other files from the active boot environment to the new boot environment. You can add directories and files to `/etc/lu/synclist` if necessary.

Adding files not listed in the `/etc/lu/synclist` could cause a system to become unbootable. The synchronization process only copies files and creates directories. The process does not remove files and directories.

The following example of the `/etc/lu/synclist` file shows the standard directories and files that are synchronized for this system.

```
/var/mail                    OVERWRITE
/var/spool/mqueue            OVERWRITE
/var/spool/cron/crontabs     OVERWRITE
/var/dhcp                    OVERWRITE
/etc/passwd                  OVERWRITE
/etc/shadow                  OVERWRITE
/etc/opasswd                 OVERWRITE
/etc/oshadow                 OVERWRITE
/etc/group                   OVERWRITE
/etc/pwhist                  OVERWRITE
/etc/default/passwd          OVERWRITE
/etc/dfs                     OVERWRITE
/var/log/syslog              APPEND
/var/adm/messages            APPEND
```

Examples of directories and files that might be appropriate to add to the `synclist` file are the following:

```
/var/yp                    OVERWRITE
/etc/mail                  OVERWRITE
/etc/resolv.conf           OVERWRITE
/etc/domainname            OVERWRITE
```

The `synclist` file entries can be files or directories. The second field is the method of updating that occurs on the activation of the boot environment. You can choose from three methods to update files:

- OVERWRITE – The contents of the active boot environment's file overwrites the contents of the new boot environment file. OVERWRITE is the default action if no action is specified in the second field. If the entry is a directory, all subdirectories are copied. All files are overwritten. The new boot environment file has the same date, mode, and ownership as the same file on the previous boot environment.
- APPEND – The contents of the active boot environment's file are added to the end of the new boot environment's file. This addition might lead to duplicate entries in the file. Directories cannot be listed as APPEND. The new boot environment file has the same date, mode, and ownership as the same file on the previous boot environment.

- PREPEND – The contents of the active boot environment's file are added to the beginning of the new boot environment's file. This addition might lead to duplicate entries in the file. Directories can not be listed as PREPEND. The new boot environment file has the same date, mode, and ownership as the same file on the previous boot environment.

Forcing a Synchronization Between Boot Environments

The first time you boot from a newly created boot environment, Solaris Live Upgrade synchronizes the new boot environment with the boot environment that was last active. After this initial boot and synchronization, Solaris Live Upgrade does not perform a synchronization unless requested.

- To force synchronization by using the CUI, you type **`yes`** when prompted.
- To force synchronization by using the CLI, you use the `luactivate` command with the `-s` option.

You might want to force a synchronization if you are maintaining multiple versions of the Solaris OS. You might want changes in files such as `email` or `passwd/group` to be in the boot environment you are activating to. If you force a synchronization, Solaris Live Upgrade checks for conflicts between files that are subject to synchronization. When the new boot environment is booted and a conflict is detected, a warning is issued and the files are not synchronized. Activation can be completed successfully, despite such a conflict. A conflict can occur if you make changes to the same file on both the new boot environment and the active boot environment. For example, you make changes to the `/etc/passwd` file on the original boot environment. Then you make other changes to `/etc/passwd` file on the new boot environment. The synchronization process cannot choose which file to copy for the synchronization.

Caution – Use this option with great care, because you might not be aware of or in control of changes that might have occurred in the last-active boot environment. For example, if you were running Solaris 10 11/06 software on your current boot environment and booted back to a Solaris 9 release with a forced synchronization, files could be changed on the Solaris 9 release. Because files are dependent on the release of the OS, the boot to the Solaris 9 release could fail because the Solaris 10 11/06 files might not be compatible with the Solaris 9 files.

x86: Activating a Boot Environment With the GRUB Menu

Starting with the Solaris 10 1/06 release, a GRUB boot menu provides an optional method of switching between boot environments. The GRUB menu is an alternative to activating with the `luactivate` command or the Activate menu.

Task	Information
To activate a boot environment with the GRUB menu	"x86: To Activate a Boot Environment With the GRUB Menu (Command-Line Interface)" on page 115
To fall back to the original boot environment with a GRUB menu	"x86: To Fall Back Despite Successful New Boot Environment Activation With the GRUB Menu" on page 120
For overview and planning information for GRUB	Chapter 6, "GRUB Based Booting for Solaris Installation," in *Solaris 10 11/06 Installation Guide: Planning for Installation and Upgrade*
For a complete GRUB overview and system administration tasks	*System Administration Guide: Basic Administration*

Using Solaris Live Upgrade From a Remote System

When viewing the character user interface remotely, such as over a tip line, you might need to set the `TERM` environment variable to VT220. Also, when using the Common Desktop Environment (CDE), set the value of the `TERM` variable to `dtterm`, rather than `xterm`.

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CHAPTER 4

Using Solaris Live Upgrade to Create a Boot Environment (Tasks)

This chapter explains how to install Solaris Live Upgrade, use the menus, and to create a boot environment. This chapter contains the following sections:

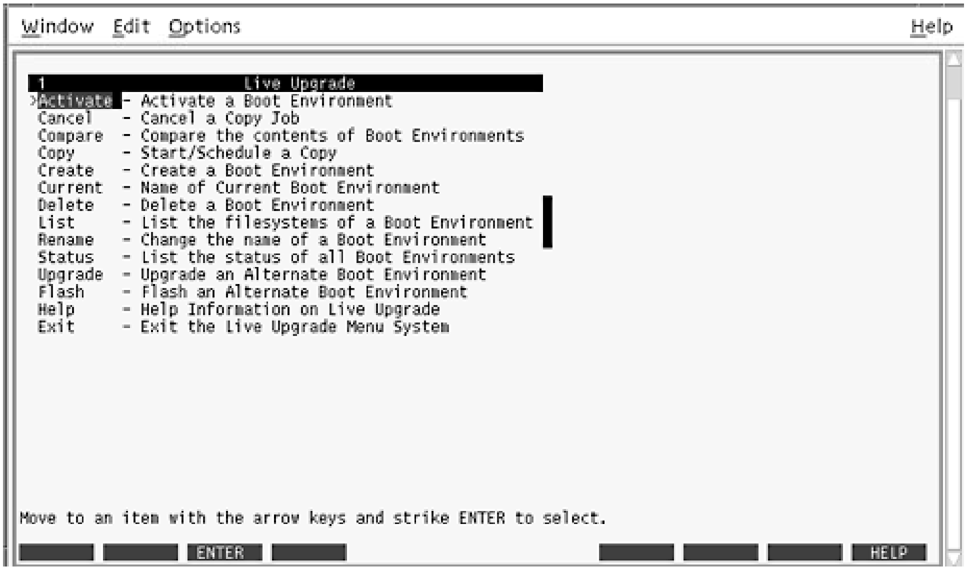
- "About Solaris Live Upgrade Interfaces" on page 53
- "Using Solaris Live Upgrade Menus (CUI)" on page 54
- "Task Map: Installing Solaris Live Upgrade and Creating Boot Environments" on page 55
- "Installing Solaris Live Upgrade" on page 55
- "Starting and Stopping Solaris Live Upgrade (Character User Interface)" on page 58
- "Creating a New Boot Environment" on page 59

About Solaris Live Upgrade Interfaces

You can run Solaris Live Upgrade with a character user interface (CUI) or the command-line interface (CLI). Procedures for both the CUI and CLI are provided in the following sections.

Interface Type	Description
Character user interface (CUI)	The CUI does not provide access to all features of Solaris Live Upgrade. The CUI does not run in multibyte locales and 8-bit locales.
Command-line interface (CLI)	The CLI procedures in this document cover the basic uses of the Solaris Live Upgrade commands. See Chapter 10 for a list of commands and also see the appropriate, associated man pages for more options to use with these commands.

Using Solaris Live Upgrade Menus (CUI)



```
1                         Live Upgrade
>Activate - Activate a Boot Environment
 Cancel   - Cancel a Copy Job
 Compare  - Compare the contents of Boot Environments
 Copy     - Start/Schedule a Copy
 Create   - Create a Boot Environment
 Current  - Name of Current Boot Environment
 Delete   - Delete a Boot Environment
 List     - List the filesystems of a Boot Environment
 Rename   - Change the name of a Boot Environment
 Status   - List the status of all Boot Environments
 Upgrade  - Upgrade an Alternate Boot Environment
 Flash    - Flash an Alternate Boot Environment
 Help     - Help Information on Live Upgrade
 Exit     - Exit the Live Upgrade Menu System

Move to an item with the arrow keys and strike ENTER to select.
```

FIGURE 4–1 Solaris Live Upgrade Main Menu

Navigation through the menus of the Solaris Live Upgrade character user interface requires that you use arrow keys and function keys. Use arrow keys to navigate up and down before making a selection or to place the cursor in a field. To perform a task, use the function keys. At the bottom of the menu, you see black rectangles that represent function keys on the keyboard. For example, the first black rectangle represents F1 and the second black rectangle represents F2. Rectangles that are active contain a word that represents a task, such as Save. The Configuration menu notes the function key number plus the task, rather than a rectangle.

- F3 is always SAVE and completes the task for that menu.
- F6 is always CANCEL and exits the menu without saving changes.
- Other function keys' tasks vary, depending on the menu.

In the following procedures, you might be asked to press a function key. If your function keys do not properly map to the function keys on the Solaris Live Upgrade menus, use Control-F plus the appropriate number.

Task Map: Installing Solaris Live Upgrade and Creating Boot Environments

TABLE 4–1 Task Map: Using Solaris Live Upgrade

Task	Description	For Instructions
Install patches on your system	Solaris Live Upgrade requires a limited set of patch revisions	"Installing Patches Needed by Solaris Live Upgrade" on page 56
Install Solaris Live Upgrade packages	Install packages on your OS	"Installing Solaris Live Upgrade" on page 55
Start Solaris Live Upgrade	Start the Solaris Live Upgrade main menu	"Starting and Stopping Solaris Live Upgrade (Character User Interface)" on page 58
Create a boot environment	Copy and reconfigure file systems to an inactive boot environment	"Creating a New Boot Environment" on page 59

Installing Solaris Live Upgrade

You need to install the Solaris Live Upgrade packages on your current OS. The release of the Solaris Live Upgrade packages must match the release of the OS you are upgrading to. For example, if your current OS is the Solaris 9 release and you want to upgrade to the Solaris 10 11/06 release, you need to install the Solaris Live Upgrade packages from the Solaris 10 11/06 release.

Some patches might be required. Install these patches before you install Solaris Live Upgrade packages. For more information, see the following:

- "Installing Patches Needed by Solaris Live Upgrade" on page 56
- "To Install Solaris Live Upgrade With the `pkgadd` Command" on page 57
- "To Install Solaris Live Upgrade With the Solaris Installation Program" on page 57

Installing Patches Needed by Solaris Live Upgrade

Description	For More Information

Caution – Correct operation of Solaris Live Upgrade requires that a limited set of patch revisions be installed for a particular OS version. Before installing or running Solaris Live Upgrade, you are required to install these patches.
x86 only – If this set of patches is not installed, Solaris Live Upgrade fails and you might see the following error message. If you don't see the following error message, necessary patches still might not be installed. Always verify that all patches listed on the SunSolve info doc have been installed before attempting to install Solaris Live Upgrade.
`ERROR: Cannot find or is not executable: </sbin/biosdev>.`
`ERROR: One or more patches required by Live Upgrade has not been installed.`
The patches listed in info doc 72099 are subject to change at any time. These patches potentially fix defects in Solaris Live Upgrade, as well as fix defects in components that Solaris Live Upgrade depends on. If you experience any difficulties with Solaris Live Upgrade, please check and make sure that you have the latest Solaris Live Upgrade patches installed.
	Ensure 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.

If you are running the Solaris 8 or Solaris 9 OS, you might not be able to run the Solaris Live Upgrade installer. These releases do not contain the set of patches needed to run the Java 2 runtime environment. You must have the recommended patch cluster for the Java 2 runtime environment that is recommended to run the Solaris Live Upgrade installer and install the packages.	To install the Solaris Live Upgrade packages, use the `pkgadd` command. Or install, for the Java 2 runtime environment, the recommended patch cluster. The patch cluster is available at http://sunsolve.sun.com.

▼ To Install Required Patches

1. **From the SunSolve℠ web site, obtain the list of patches.**

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. **Install the patches with the `patchadd` command.**

```
# patchadd path_to_patches
```

4 **Reboot the system if necessary. Certain patches require a reboot to be effective.**

x86 only: Rebooting the system is required or Solaris Live Upgrade fails.

▼ To Install Solaris Live Upgrade With the `pkgadd` Command

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 **Install the packages in the following order.**

```
# pkgadd -d path_to_packages SUNWlur SUNWluu
```

path_to_packages	Specifies the absolute path to the software packages.

3 **Verify that the package has been installed successfully.**

```
# pkgchk -v SUNWlur SUNWluu
```

▼ To Install Solaris Live Upgrade With the Solaris Installation Program

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Note – This procedure assumes that the system is running *Volume Manager*. For detailed information about managing removable media with the Volume Manager, refer to *System Administration Guide: Devices and File Systems*.

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1 **Insert the Solaris Operating System DVD or Solaris Software - 2 CD.**

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 **Run the installer for the media you are using.**

- If you are using the Solaris Operating System DVD, change directories to the installer and run the installer.
  - **For SPARC based systems**:

```
# cd /cdrom/cdrom0/s0/Solaris_10/Tools/Installers
# ./liveupgrade20
```

  - **For x86 based systems**:

    ```
    # cd /cdrom/cdrom0/Solaris_10/Tools/Installers
    # ./liveupgrade20
    ```

  The Solaris installation program GUI is displayed.
- If you are using the Solaris Software - 2 CD, run the installer.

  ```
  % ./installer
  ```

  The Solaris installation program GUI is displayed.

4 **From the Select Type of Install panel, click Custom.**

5 **On the Locale Selection panel, click the language to be installed.**

6 **Choose the software to install.**

- For DVD, on the Component Selection panel, click Next to install the packages.
- For CD, on the Product Selection panel, click Default Install for Solaris Live Upgrade and click on the other software choices to deselect them.

7 **Follow the directions on the Solaris installation program panels to install the software.**

Starting and Stopping Solaris Live Upgrade (Character User Interface)

This procedure starts and stops the Solaris Live Upgrade menu program.

▼ To Start Solaris Live Upgrade Menus

Note – When viewing the character user interface remotely, such as over a tip line, you might need to set the `TERM` environment variable to VT220. Also, when using the Common Desktop Environment (CDE), set the value of the `TERM` variable to `dtterm`, rather than `xterm`.

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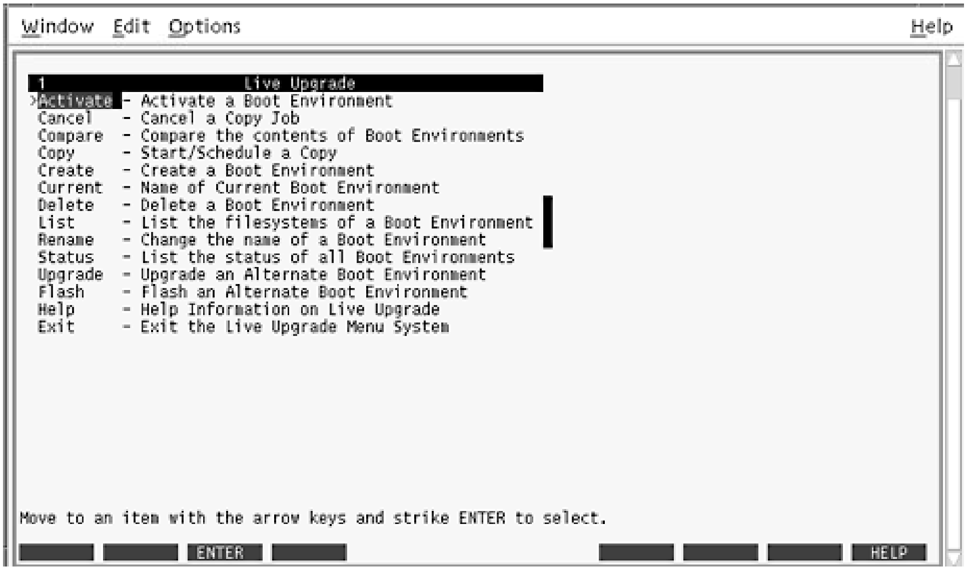
1 **Become superuser or assume an equivalent role.**

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

2 **Type:**

```
# /usr/sbin/lu
```

The Solaris Live Upgrade main menu is displayed.



```
1                         Live Upgrade
>Activate - Activate a Boot Environment
 Cancel   - Cancel a Copy Job
 Compare  - Compare the contents of Boot Environments
 Copy     - Start/Schedule a Copy
 Create   - Create a Boot Environment
 Current  - Name of Current Boot Environment
 Delete   - Delete a Boot Environment
 List     - List the filesystems of a Boot Environment
 Rename   - Change the name of a Boot Environment
 Status   - List the status of all Boot Environments
 Upgrade  - Upgrade an Alternate Boot Environment
 Flash    - Flash an Alternate Boot Environment
 Help     - Help Information on Live Upgrade
 Exit     - Exit the Live Upgrade Menu System

Move to an item with the arrow keys and strike ENTER to select.
```

FIGURE 4–2 Solaris Live Upgrade Main Menu

▼ To Stop Solaris Live Upgrade Menus

◗ **From the main menu, select Exit.**

Creating a New Boot Environment

Creating a boot environment provides a method of copying critical file systems from the active boot environment to a new boot environment. The CUI's Create menu and Configuration submenu, and the `lucreate` command enable reorganizing a disk if necessary, customizing file systems, and copying the critical file systems to the new boot environment.

Before file systems are copied to the new boot environment, they can be customized so that critical file system directories are either merged into their parent directory or split from their parent directory. User-defined (shareable) file systems are shared between boot environments by default. But shareable file systems can be copied if needed. Swap, which is a shareable file system, can be split and merged also. For an overview of critical and shareable file systems, see "File System Types" on page 22.

▼ To Create a Boot Environment (Character User Interface)

1. **From the main menu, select Create.**

   The system displays the Create a Boot Environment submenu.

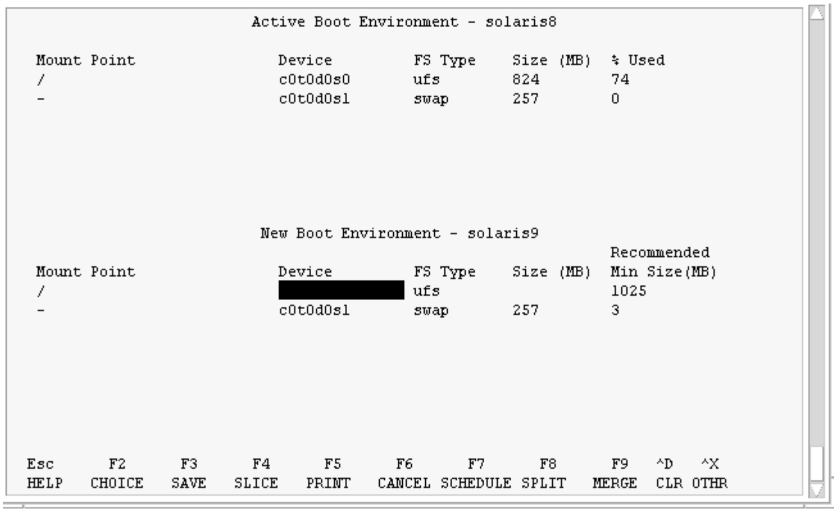
2. **Type the name of the active boot environment (if necessary) and the new boot environment and confirm. You are only required to type the name of the active boot environment the first time you create a boot environment.**

   The boot environment name can be no longer than 30 characters, can contain only alphanumeric characters, and can contain no multibyte characters.

   ```
   Name of Current Boot Environment:    solaris8
   Name of New Boot Environment:   solaris10
   ```

3. **To save your changes, press F3.**

   The configuration menu appears.



```
                        Active Boot Environment - solaris8

 Mount Point                  Device        FS Type    Size (MB)  % Used
 /                            c0t0d0s0      ufs        824        74
 -                            c0t0d0s1      swap       257        0




                        New Boot Environment - solaris9
                                                                  Recommended
 Mount Point                  Device        FS Type    Size (MB)  Min Size(MB)
 /                                          ufs                   1025
 -                            c0t0d0s1      swap       257        3




Esc     F2     F3     F4     F5     F6      F7       F8     F9    ^D   ^X
HELP   CHOICE  SAVE  SLICE  PRINT  CANCEL SCHEDULE SPLIT  MERGE  CLR  OTHR
```

FIGURE 4–3 Solaris Live Upgrade Configuration Menu

The configuration menu contains the following parts:

- The original boot environment is located at the top of the screen. The boot environment to be created is at the bottom.
- The Device field contains the following information.
  - The name of a disk device of the form `/dev/dsk/c`*w*`t`*x*`d`*y*`s`*z*.
  - The name of a Solaris Volume Manager metadevice, of the form /dev/md/dsk/d*num*.

    - The name of a Veritas Volume Manager volume, of the form /dev/vx/dsk/*volume_name*.
    - The area for selecting a critical file system is blank until you select a critical file system. The critical file systems such as `/usr`, `/var`, or `/opt` can be split or merged with the root (`/`) file system.
    - Shareable file systems such as `/export` or swap are displayed in the Device field. These file systems contain the same mount point in both the source and target boot environments. Swap is shared by default, but you can also split and merge (add and remove) swap slices.

      For an overview of critical and shareable file systems, see "File System Types" on page 22.
- The FS_Type field enables you to change file system type. The file system type can be one of the following:
    - `vxfs`, which indicates a Veritas file system
    - `swap`, which indicates a swap file system
    - `ufs`, which indicates a UFS file system

4 (Optional) The following tasks can be done at any time:

- To print the information onscreen to an ASCII file, press F5.
- To scroll through the file system list, press Control-X.

  You can then switch between the file systems of the active and new boot environment and scroll.
- To exit the Configuration menu at any time, press F6.
    - If you are in the Configuration menu, changes are not saved and file systems are not altered.
    - If you are in a Configuration submenu, you return to the Configuration menu.

5 Select an available slice by pressing F2.

The Choices menu displays available slices on the system for the field where the cursor is placed. The menu displays a device field and a file system FS_Type field.

a. Use the arrow keys to place the cursor in a field to select a slice or file system type.

- When you place your cursor in the Device field, all free slices are displayed. For the root (`/`) file system, the Choices menu only displays free slices that meet the root (`/`) file system limitations. See "Guidelines for Selecting a Slice for the root (`/`) File System" on page 45.
- When you place your cursor in the FS_Type field, all available file system types are displayed.
- Slices in bold can be selected for the current file system. The size of the slice is estimated by adding the size of the file system plus 30 percent to accommodate an upgrade.
- Slices not in bold are too small to support the given file system. To reslice a disk, see Step 6.

b. Press Return to choose a slice.

The slice appears in the Device field or the file system type changes in the FS_Type field.

6. **(Optional) If available slices do not meet the minimum requirements, to reslice any available disks, press F4.**

   The Solaris Live Upgrade Slice Configuration menu appears.

   The `format`(1M) command runs, which enables you to create new slices. Follow the screen to create a new slice.

   To navigate through this menu, use the arrow keys to move between the Device field and FS_Type field. The Size (Mbytes) field is automatically completed as the devices are selected.

   a. **To free a device, press Control-D.**

      The slice is now available and appears on the Choices menu.

   b. **To return to the Configuration menu, press F3.**

7. **(Optional) Splitting critical file systems puts the file systems on separate mount points. To split a file system, do the following:**

   (To merge file systems, see Step 8).

   a. **Select the file system to split.**

      You can split or exclude file systems such as `/usr`, `/var`, or `/opt` from their parent directory.

      Note – When creating file systems for a boot environment, the rules are identical to the rules for creating file systems for the Solaris OS. Solaris Live Upgrade cannot prevent you from making invalid configurations on critical file systems. For example, you could enter a `lucreate` command that would create separate file systems for root (`/`) and `/kernel`, which is an invalid division of the root (`/`) file system.

      ---

   b. **Press F8.**

   c. **Type the file system name for the new boot environment, for example:**

      ```
      Enter the directory that will be a separate file system
      on the new boot environment: /opt
      ```

      When the new file system is verified, a new line is added to the screen.

   d. **To return to the Configuration menu, press F3.**

      The Configuration menu is displayed.

8 (Optional) Merging puts the file systems on the same mount point. To merge a file system into its parent directory:

(To split file systems, see Step 7.)

a. Select the file system to merge.

You can merge file systems such as `/usr`, `/var`, or `/opt` into their parent directory.

b. Press F9.

The file systems that will be combined are displayed, for example:

```
/opt will be merged into /.
```

c. Press Return.

d. To return to the Configuration menu, press F3.

The Configuration menu is displayed.

9 (Optional) Decide if you want to add or remove swap slices.

- If you want to split a swap slice and put swap on a new slice, continue with Step 10.
- If you want to remove a swap slice, continue with Step 11.

10 (Optional) To split a swap slice, do the following:

a. In the Device field, select the swap slice that you want to split.

b. Press F8.

c. At the prompt, type:

```
Enter the directory that will be a separate filesystem on
the new BE: swap
```

d. Press F2 Choice.

The Choice menu lists the available slices for swap.

e. Select the slice to put swap on.

The slice appears in the Device field and you have a new slice for swap.

11 (Optional) To remove a swap slice, do the following:

a. In the Device field, select the swap slice that you are removing.

b. Press F9.

c. **At the prompt, type `y`.**

```
Slice /dev/dsk/c0t4d0s0 will not be swap partition.
Please confirm? [y, n]: y
```

The swap slice no longer exists.

12 **Decide if you want to create the boot environment now or schedule the creation for later:**

- Press F3 to create the new boot environment now.

  The configuration is saved and you exit the configuration screen. The file systems are copied, the boot environment is made bootable, and an inactive boot environment is created.

  Creating a boot environment might take an hour or more, depending on your system configuration. The Solaris Live Upgrade main menu is then displayed.

- If you want to schedule the creation for a later time, type **`y`**, then the start time, and an email address, as in this example.

  ```
  Do you want to schedule the copy? y
  Enter the time in 'at' format to schedule create: 8:15 PM
  Enter the address to which the copy log should be mailed: someone@anywhere.com
  ```

  You are notified of the completion by email.

  For information about time formats, see the `at`(1) man page.

  You can schedule only one job at a time.

After the creation is complete, the inactive boot environment is ready to be upgraded. See Chapter 5.

▼ To Create a Boot Environment for the First Time (Command-Line Interface)

The `lucreate` command that is used with the `-m` option specifies which file systems and the number of file systems to be created in the new boot environment. You must specify the exact number of file systems you want to create by repeating this option. For example, a single use of the `-m` option specifies where to put all the file systems. You merge all the file systems from the original boot environment into the one file system that is specified by the `-m` option. If you specify the `-m` option twice, you create two file systems. When using the `-m` option to create file systems, follow these guidelines:

- You must specify one `-m` option for the root (`/`) file system for the new boot environment. If you run `lucreate` without the `-m` option, the Configuration menu is displayed. The Configuration menu enables you to customize the new boot environment by redirecting files onto new mount points.

- Any critical file systems that exist in the current boot environment and are not specified in a `-m` option are merged into the next highest-level file system created.
- Only the file systems that are specified by the `-m` option are created on the new boot environment. If your current boot environment contains multiple file systems, and you want to have the same number of file systems in the new boot environment created, you must specify one `-m` option for each file system to be created. For example, if you have file systems for root (`/`), `/opt`, and `/var`, you would use one `-m` option for each file system on the new boot environment.
- Do not duplicate a mount point. For example, you cannot have two root (`/`) file systems.

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 create the new boot environment, type:**

```
# lucreate [-A 'BE_description'] -c BE_name \
 -m mountpoint:device[,metadevice]:fs_options [-m ...] -n BE_name
```

`-A` '*BE_description*'

(Optional) Enables the creation of a boot environment description that is associated with the boot environment name (BE_name). The description can be any length and can contain any characters.

`-c` *BE_name*

Assigns the name *BE_name* to the active boot environment. This option is not required and is only used when the first boot environment is created. If you run `lucreate` for the first time and you omit the `-c` option, the software creates a default name for you.

The default name is chosen according to the following criteria:

- If the physical boot device can be determined, then the base name of the physical boot device is used to name the current boot environment.

  For example, if the physical boot device is `/dev/dsk/c0t0d0s0`, then the current boot environment is given the name `c0t0d0s0`.
- If the physical boot device cannot be determined, then names from the `uname` command with the `-s` and `-r` options are combined to produce the name.

  For example, if the `uname -s` returns the OS name of SunOS and the `uname -r` returns the release name of 5.9, then the name `SunOS5.9` is given to the current boot environment.
- If both of the above cannot determine the name, then the name `current` is used to name the current boot environment.

Note – If you use the `-c` option after the first boot environment creation, the option is ignored or an error message is displayed.

- If the name specified is the same as the current boot environment name, the option is ignored.
- If the name specified is different than the current boot environment name, then an error message is displayed and the creation fails. The following example shows a boot environment name that causes an error message.

```
# lucurr
c0t0d0s0
# lucreate -c /dev/dsk/c1t1d1s1 -n newbe -m /:/dev/dsk/c1t1d1s1:ufs
ERROR: current boot environment name is c0t0d0s0: cannot change
name using <-c c1t1d1s1>
```

`-m` *mountpoint:device[,metadevice]:fs_options* [`-m` ...]

Specifies the file systems' configuration of the new boot environment in the `vfstab`. The file systems that are specified as arguments to `-m` can be on the same disk or they can be spread across multiple disks. Use this option as many times as needed to create the number of file systems that are needed.

- *mountpoint* can be any valid mount point or – (hyphen), indicating a swap partition.
- *device* field can be one of the following:
  - The name of a disk device, of the form `/dev/dsk/c`*w*`t`*x*`d`*y*`s`*z*
  - The name of a Solaris Volume Manager volume, of the form /dev/md/dsk/d*num*
  - The name of a Veritas Volume Manager volume, of the form /dev/md/vxfs/dsk/d*num*
  - The keyword `merged`, indicating that the file system at the specified mount point is to be merged with its parent
- *fs_options* field can be one of the following:
  - `ufs`, which indicates a UFS file system.
  - `vxfs`, which indicates a Veritas file system.
  - `swap`, which indicates a swap file system. The swap mount point must be a – (hyphen).
  - For file systems that are logical devices (mirrors), several keywords specify actions to be applied to the file systems. These keywords can create a logical device, change the configuration of a logical device, or delete a logical device. For a description of these keywords, see "To Create a Boot Environment With RAID-1 Volumes (Mirrors) (Command-Line Interface)" on page 78.

`-n` *BE_name*

The name of the boot environment to be created. *BE_name* must be unique on the system.

When creation of the new boot environment is complete, it can be upgraded and can be activated (made bootable). See Chapter 5.

Example 4–1 Creating a Boot Environment (Command Line)

In this example, the active boot environment is named first_disk. The mount points for the file systems are noted by using the `-m` option. Two file systems are created, root (`/`) and `/usr`. The new boot environment is named second_disk. A description, `mydescription`, is associated with the name second_disk. Swap, in the new boot environment second_disk, is automatically shared from the source, first_disk.

```
# lucreate -A 'mydescription' -c first_disk  -m /:/dev/dsk/c0t4d0s0:ufs \
-m /usr:/dev/dsk/c0t4d0s3:ufs  -n second_disk
```

▼ To Create a Boot Environment and Merge File Systems (Command-Line Interface)

Note – You can use the `lucreate` command with the `-m` option to specify which file systems and the number of file systems to be created in the new boot environment. You must specify the exact number of file systems you want to create by repeating this option. For example, a single use of the `-m` option specifies where to put all the file systems. You merge all the file systems from the original boot environment into one file system. If you specify the `-m` option twice, you create two file systems.

---

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. **Type:**

```
# lucreate  -A 'BE_description' \
-m mountpoint:device[,metadevice]:fs_options \
-m [...] -m mountpoint:merged:fs_options -n BE_name
```

`-A` *BE_description*

(Optional) Enables the creation of a boot environment description that is associated with the boot environment name (BE_name). The description can be any length and can contain any characters.

`-m` *mountpoint:device[,metadevice]:fs_options* [`-m`...]

Specifies the file systems' configuration of the new boot environment. The file systems that are specified as arguments to `-m` can be on the same disk or they can be spread across multiple disks. Use this option as many times as needed to create the number of file systems that are needed.

- *mountpoint* can be any valid mount point or – (hyphen), indicating a swap partition.
- *device* field can be one of the following:
  - The name of a disk device, of the form `/dev/dsk/c`*w*`t`*x*`d`*y*`s`*z*
  - The name of a Solaris Volume Manager metadevice, of the form /dev/md/dsk/d*num*

  - The name of a Veritas Volume Manager volume, of the form /dev/vx/dsk/*volume_name*
  - The keyword `merged`, indicating that the file system at the specified mount point is to be merged with its parent
- *fs_options* field can be one of the following:
  - `ufs`, which indicates a UFS file system.
  - `vxfs`, which indicates a Veritas file system.
  - `swap`, which indicates a swap file system. The swap mount point must be a – (hyphen).
  - For file systems that are logical devices (mirrors), several keywords specify actions to be applied to the file systems. These keywords can create a logical device, change the configuration of a logical device, or delete a logical device. For a description of these keywords, see "To Create a Boot Environment With RAID-1 Volumes (Mirrors) (Command-Line Interface)" on page 78.

`-n` *BE_name*

The name of the boot environment to be created. *BE_name* must be unique on the system.

When creation of the new boot environment is complete, it can be upgraded and activated (made bootable). See Chapter 5.

Example 4–2 Creating a Boot Environment and Merging File Systems (Command-Line Interface)

In this example, the file systems on the current boot environment are root (`/`), `/usr`, and `/opt`. The `/opt` file system is combined with its parent file system `/usr`. The new boot environment is named second_disk. A description, `mydescription`, is associated with the name second_disk.

```
# lucreate -A 'mydescription' -c first_disk \
 -m /:/dev/dsk/c0t4d0s0:ufs -m /usr:/dev/dsk/c0t4d0s1:ufs \
 -m /usr/opt:merged:ufs -n second_disk
```

▼ To Create a Boot Environment and Split File Systems (Command-Line Interface)

Note – When creating file systems for a boot environment, the rules are identical to the rules for creating file systems for the Solaris OS. Solaris Live Upgrade cannot prevent you from making invalid configurations on critical file systems. For example, you could enter an `lucreate` command that would create separate file systems for root (`/`) and `/kernel`, which is an an invalid division of the root (`/`) file system.

When splitting a directory into multiple mount points, hard links are not maintained across file systems. For example, if `/usr/stuff1/file` is hard linked to `/usr/stuff2/file`, and `/usr/stuff1` and `/usr/stuff2` are split into separate file systems, the link between the files no longer exists. `lucreate` issues a warning message and a symbolic link is created to replace the lost hard link.

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. **Type:**

```
# lucreate [-A 'BE_description'] \
 -m mountpoint:device[,metadevice]:fs_options \
-m mountpoint:device[,metadevice]:fs_options -n new_BE
```

`-A` '*BE_description*'
(Optional) Enables the creation of a boot environment description that is associated with the boot environment name (BE_name). The description can be any length and contain any characters.

`-m` *mountpoint:device[,metadevice]:fs_options* [`-m`...]
Specifies the file systems' configuration of the new boot environment. The file systems that are specified as arguments to `-m` can be on the same disk or they can be spread across multiple disks. Use this option as many times as needed to create the number of file systems that are needed.

- *mountpoint* can be any valid mount point or – (hyphen), indicating a swap partition.
- *device* field can be one of the following:
  - The name of a disk device, of the form `/dev/dsk/c`*w*`t`*x*`d`*y*`s`*z*
  - The name of a Solaris Volume Manager metadevice, of the form /dev/md/dsk/d*num*
  - The name of a Veritas Volume Manager volume, of the form /dev/vx/dsk/*volume_name*
  - The keyword `merged`, indicating that the file system at the specified mount point is to be merged with its parent
- *fs_options* field can be one of the following:
  - `ufs`, which indicates a UFS file system.
  - `vxfs`, which indicates a Veritas file system.
  - `swap`, which indicates a swap file system. The swap mount point must be a – (hyphen).
  - For file systems that are logical devices (mirrors), several keywords specify actions to be applied to the file systems. These keywords can create a logical device, change the configuration of a logical device, or delete a logical device. For a description of these keywords, see “To Create a Boot Environment With RAID-1 Volumes (Mirrors) (Command-Line Interface)” on page 78.

`-n` *BE_name*
The name of the boot environment to be created. *BE_name* must be unique on the system.

Example 4–3 Creating a Boot Environment and Splitting File Systems (Command-Line Interface)

In this example, the preceding command splits the root (`/`) file system over multiple disk slices in the new boot environment. Assume a source boot environment that has `/usr`, `/var`, and `/opt` on root (`/`): `/dev/dsk/c0t0d0s0 /`.

On the new boot environment, separate `/usr`, `/var`, and `/opt`, mounting these file systems on their own slices, as follows:

```
/dev/dsk/c0t1d0s0 /

/dev/dsk/c0t1d0s1 /var

/dev/dsk/c0t1d0s7 /usr

/dev/dsk/c0t1d0s5 /opt
```

A description, `mydescription`, is associated with the boot environment name second_disk.

```
# lucreate -A 'mydescription' -c first_disk \
 -m /:/dev/dsk/c0t1d0s0:ufs -m /usr:/dev/dsk/c0t1d0s7:ufs  \
-m /var:/dev/dsk/c0t1d0s1:ufs -m /opt:/dev/dsk/c0t1d0s5:ufs \
-n second_disk
```

When creation of the new boot environment is complete, it can be upgraded and activated (made bootable). See Chapter 5.

▼ To Create a Boot Environment and Reconfiguring Swap (Command-Line Interface)

Swap slices are shared between boot environments by default. By *not* specifying swap with the `-m` option, your current and new boot environment share the same swap slices. If you want to reconfigure the new boot environment's swap, use the `-m` option to add or remove swap slices in the new boot environment.

Note – The swap slice cannot be in use by any boot environment except the current boot environment or if the `-s` option is used, the source boot environment. The boot environment creation fails if the swap slice is being used by any other boot environment, whether it is a swap, UFS, or any other file system.

You can create a boot environment with the existing swap slices and then edit the `vfstab` file after the creation.

---

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 **Type:**

```
# lucreate  [-A 'BE_description'] \
 -m mountpoint:device[,metadevice]:fs_options \
-m -:device:swap -n BE_name
```

`-A` ’*BE_description*’
(Optional) Enables the creation of a boot environment description that is associated with the boot environment name (BE_name). The description can be any length and can contain any characters.

`-m` *mountpoint:device[,metadevice]:fs_options* [`-m`...]
Specifies the file systems’ configuration of the new boot environment. The file systems that are specified as arguments to `-m` can be on the same disk or they can be spread across multiple disks. Use this option as many times as needed to create the number of file systems that are needed.

- *mountpoint* can be any valid mount point or – (hyphen), indicating a swap partition.
- *device* field can be one of the following:
  - The name of a disk device, of the form `/dev/dsk/c`*w*`t`*x*`d`*y*`s`*z*
  - The name of a Solaris Volume Manager metadevice, of the form /dev/md/dsk/d*num*
  - The name of a Veritas Volume Manager volume, of the form /dev/vx/dsk/*volume_name*
  - The keyword `merged`, indicating that the file system at the specified mount point is to be merged with its parent
- *fs_options* field can be one of the following:
  - `ufs`, which indicates a UFS file system.
  - `vxfs`, which indicates a Veritas file system.
  - `swap`, which indicates a swap file system. The swap mount point must be a – (hyphen).
  - For file systems that are logical devices (mirrors), several keywords specify actions to be applied to the file systems. These keywords can create a logical device, change the configuration of a logical device, or delete a logical device. For a description of these keywords, see “To Create a Boot Environment With RAID-1 Volumes (Mirrors) (Command-Line Interface)” on page 78.

`-n` *BE_name*
The name of the boot environment to be created. *BE_name* must be unique.

The new boot environment is created with swap moved to a different slice or device.

When creation of the new boot environment is complete, it can be upgraded and can be activated (made bootable). See Chapter 5.

Example 4–4 Creating a Boot Environment and Reconfiguring Swap (Command-Line Interface)

In this example, the current boot environment contains root (`/`) on `/dev/dsk/c0t0d0s0` and swap is on `/dev/dsk/c0t0d0s1`. The new boot environment copies root (`/`) to `/dev/dsk/c0t4d0s0` and uses both `/dev/dsk/c0t0d0s1` and `/dev/dsk/c0t4d0s1` as swap slices. A description, `mydescription`, is associated with the boot environment name second_disk.

```
# lucreate -A 'mydescription' -c first_disk \
-m /:/dev/dsk/c0t4d0s0:ufs -m -:/dev/dsk/c0t0d0s1:swap \
-m -:/dev/dsk/c0t4d0s1:swap -n second_disk
```

These swap assignments are effective only after booting from `second_disk`. If you have a long list of swap slices, use the `-M` option. See "To Create a Boot Environment and Reconfigure Swap by Using a List (Command-Line Interface)" on page 72.

▼ To Create a Boot Environment and Reconfigure Swap by Using a List (Command-Line Interface)

If you have a long list of swap slices, create a swap list. `lucreate` uses this list for the swap slices in the new boot environment.

Note – The swap slice cannot be in use by any boot environment except the current boot environment or if the `-s` option is used, the source boot environment. The boot environment creation fails if the swap slice is being used by any other boot environment, whether the swap slice contains a swap, UFS, or any other file system.

---

1 **Create a list of swap slices to be used in the new boot environment. The location and name of this file is user defined. In this example, the content of the `/etc/lu/swapslices` file is a list of devices and slices:**

```
-:/dev/dsk/c0t3d0s2:swap
-:/dev/dsk/c0t3d0s2:swap
-:/dev/dsk/c0t4d0s2:swap
-:/dev/dsk/c0t5d0s2:swap
-:/dev/dsk/c1t3d0s2:swap
-:/dev/dsk/c1t4d0s2:swap
-:/dev/dsk/c1t5d0s2:swap
```

2 **Type:**

```
# lucreate  [-A 'BE_description'] \
 -m mountpoint:device[,metadevice]:fs_options \
-M slice_list  -n BE_name
```

`-A` '*BE_description*'
(Optional) Enables the creation of a boot environment description that is associated with the boot environment name (BE_name). The description can be any length and can contain any characters.

`-m` *mountpoint:device[,metadevice]:fs_options* [`-m`...]
Specifies the file systems' configuration of the new boot environment. The file systems that are specified as arguments to `-m` can be on the same disk or they can be spread across multiple disks. Use this option as many times as needed to create the number of file systems that are needed.

- *mountpoint* can be any valid mount point or – (hyphen), indicating a swap partition.
- *device* field can be one of the following:
    - The name of a disk device, of the form `/dev/dsk/c`*w*`t`*x*`d`*y*`s`*z*

  - The name of a Solaris Volume Manager metadevice, of the form /dev/md/dsk/d*num*
  - The name of a Veritas Volume Manager volume, of the form /dev/vx/dsk/*volume_name*
  - The keyword `merged`, indicating that the file system at the specified mount point is to be merged with its parent
- *fs_options* field can be one of the following:
  - `ufs`, which indicates a UFS file system.
  - `vxfs`, which indicates a Veritas file system.
  - `swap`, which indicates a swap file system. The swap mount point must be a – (hyphen).
  - For file systems that are logical devices (mirrors), several keywords specify actions to be applied to the file systems. These keywords can create a logical device, change the configuration of a logical device, or delete a logical device. For a description of these keywords, see "To Create a Boot Environment With RAID-1 Volumes (Mirrors) (Command-Line Interface)" on page 78.

`-M` *slice_list*

List of `-m` options, which are collected in the file *slice_list*. Specify these arguments in the format that is specified for `-m`. Comment lines, which begin with a hash mark (`#`), are ignored. The `-M` option is useful when you have a long list of file systems for a boot environment. Note that you can combine `-m` and `-M` options. For example, you can store swap slices in *slice_list* and specify root (`/`) and `/usr` slices with `-m`.

The `-m` and `-M` options support the listing of multiple slices for a particular mount point. In processing these slices, `lucreate` skips any unavailable slices and selects the first available slice.

`-n` *BE_name*

The name of the boot environment to be created. *BE_name* must be unique.

When creation of the new boot environment is complete, it can be upgraded and can be activated (made bootable). See Chapter 5.

Example 4–5 Create a Boot Environment and Reconfiguring Swap By Using a List (Command-Line Interface)

In this example, swap in the new boot environment is the list of slices that are noted in the `/etc/lu/swapslices` file. A description, `mydescription`, is associated with the name second_disk.

```
# lucreate -A 'mydescription' -c first_disk \
-m /:/dev/dsk/c02t4d0s0:ufs -m /usr:/dev/dsk/c02t4d0s1:ufs \
-M /etc/lu/swapslices -n second_disk
```

▼ To Create a Boot Environment and Copy a Shareable File System (Command-Line Interface)

If you want a shareable file system to be copied to the new boot environment, specify the mount point to be copied with the `-m` option. Otherwise, shareable file systems are shared by default, and maintain the same mount point in the `vfstab` file. Any updating that is applied to the shareable file system is available to both boot environments.

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. **Create the boot environment.**

```
# lucreate [-A 'BE_description'] \
-m mountpoint:device[,metadevice]:fs_options \
-m mountpoint:device[,metadevice]:fs_options  -n BE_name
```

`-A` '*BE_description*'

(Optional) Enables the creation of a boot environment description that is associated with the boot environment name (BE_name). The description can be any length and can contain any characters.

`-m` *mountpoint:device[,metadevice]:fs_options* [`-m`...]

Specifies the file systems' configuration of the new boot environment. The file systems that are specified as arguments to `-m` can be on the same disk or they can be spread across multiple disks. Use this option as many times as needed to create the number of file systems that are needed.

- *mountpoint* can be any valid mount point or – (hyphen), indicating a swap partition.
- *device* field can be one of the following:
  - The name of a disk device, of the form `/dev/dsk/c`*w*`t`*x*`d`*y*`s`*z*
  - The name of a Solaris Volume Manager metadevice, of the form /dev/md/dsk/d*num*
  - The name of a Veritas Volume Manager volume, of the form /dev/vx/dsk/*volume_name*
  - The keyword `merged`, indicating that the file system at the specified mount point is to be merged with its parent
- *fs_options* field can be one of the following:
  - `ufs`, which indicates a UFS file system.
  - `vxfs`, which indicates a Veritas file system.
  - `swap`, which indicates a swap file system. The swap mount point must be a – (hyphen).
  - For file systems that are logical devices (mirrors), several keywords specify actions to be applied to the file systems. These keywords can create a logical device, change the configuration of a logical device, or delete a logical device. For a description of these keywords, see "To Create a Boot Environment With RAID-1 Volumes (Mirrors) (Command-Line Interface)" on page 78.

`-n` *BE_name*
The name of the boot environment to be created. *BE_name* must be unique.

When creation of the new boot environment is complete, it can be upgraded and activated (made bootable). See Chapter 5.

Example 4–6 Creating a Boot Environment and Copying a Shareable File System (Command-Line Interface)

In this example, the current boot environment contains two file systems, root (`/`) and `/home`. In the new boot environment, the root (`/`) file system is split into two file systems, root (`/`) and `/usr`. The `/home` file system is copied to the new boot environment. A description, `mydescription`, is associated with the boot environment name second_disk.

```
# lucreate -A 'mydescription' -c first_disk \
-m /:/dev/dsk/c0t4d0s0:ufs -m /usr:/dev/dsk/c0t4d0s3:ufs \
-m /home:/dev/dsk/c0t4d0s4:ufs -n second_disk
```

▼ To Create a Boot Environment From a Different Source (Command-Line Interface)

The `lucreate` command creates a boot environment that is based on the file systems in the active boot environment. If you want to create a boot environment based on a boot environment other than the active boot environment, use `lucreate` with the `-s` option.

Note – If you activate the new boot environment and need to fall back, you boot back to the boot environment that was last active, not the source boot environment.

---

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 **Create the boot environment.**

```
# lucreate [-A 'BE_description'] -s source_BE_name
-m mountpoint:device[,metadevice]:fs_options -n BE_name
```

`-A` '*BE_description*'
(Optional) Enables the creation of a boot environment description that is associated with the boot environment name (BE_name). The description can be any length and can contain any characters.

`-s` *source_BE_name*
Specifies the source boot environment for the new boot environment. The source would not be the active boot environment.

`-m` *mountpoint:device[,metadevice]:fs_options* [`-m`...]
Specifies the file systems' configuration of the new boot environment. The file systems that are specified as arguments to `-m` can be on the same disk or they can be spread across multiple disks. Use this option as many times as needed to create the number of file systems that are needed.

- *mountpoint* can be any valid mount point or – (hyphen), indicating a swap partition.
- *device* field can be one of the following:
  - The name of a disk device, of the form `/dev/dsk/c`*w*`t`*x*`d`*y*`s`*z*
  - The name of a Solaris Volume Manager metadevice, of the form /dev/md/dsk/d*num*
  - The name of a Veritas Volume Manager volume, of the form /dev/vx/dsk/*volume_name*
  - The keyword `merged`, indicating that the file system at the specified mount point is to be merged with its parent
- *fs_options* field can be one of the following:
  - `ufs`, which indicates a UFS file system.
  - `vxfs`, which indicates a Veritas file system.
  - `swap`, which indicates a swap file system. The swap mount point must be a – (hyphen).
  - For file systems that are logical devices (mirrors), several keywords specify actions to be applied to the file systems. These keywords can create a logical device, change the configuration of a logical device, or delete a logical device. For a description of these keywords, see "To Create a Boot Environment With RAID-1 Volumes (Mirrors) (Command-Line Interface)" on page 78.

`-n` *BE_name*
The name of the boot environment to be created. *BE_name* must be unique on the system.

When creation of the new boot environment is complete, it can be upgraded and activated (made bootable). See Chapter 5.

Example 4–7 Creating a Boot Environment From a Different Source (Command-Line Interface)

In this example, a boot environment is created that is based on the root (`/`) file system in the source boot environment named `third_disk.` `Third_disk` is not the active boot environment. A description, `mydescription`, is associated with the new boot environment named `second_disk.`

```
# lucreate -A 'mydescription' -s third_disk \
-m /:/dev/dsk/c0t4d0s0:ufs  -n second_disk
```

▼ To Create an Empty Boot Environment for a Solaris Flash Archive (Command-Line Interface)

The `lucreate` command creates a boot environment that is based on the file systems in the active boot environment. When using the `lucreate` command with the `-s -` option, `lucreate` quickly creates an empty boot environment. The slices are reserved for the file systems that are 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.

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 **Create the empty boot environment.**

```
# lucreate -A 'BE_name' -s - \
-m mountpoint:device[,metadevice]:fs_options -n BE_name
```

`-A` '*BE_description*'
(Optional) Enables the creation of a boot environment description that is associated with the boot environment name (BE_name). The description can be any length and can contain any characters.

`-s -`
Specifies that an empty boot environment be created.

`-m` *mountpoint:device[,metadevice]:fs_options* [`-m`...]
Specifies the file systems' configuration of the new boot environment. The file systems that are specified as arguments to `-m` can be on the same disk or they can be spread across multiple disks. Use this option as many times as needed to create the number of file systems that are needed.

- *mountpoint* can be any valid mount point or – (hyphen), indicating a swap partition.
- *device* field can be one of the following:
  - The name of a disk device, of the form `/dev/dsk/c`*w*`t`*x*`d`*y*`s`*z*
  - The name of a Solaris Volume Manager metadevice, of the form /dev/md/dsk/d*num*
  - The name of a Veritas Volume Manager volume, of the form /dev/vx/dsk/*volume_name*
  - The keyword `merged`, indicating that the file system at the specified mount point is to be merged with its parent
- *fs_options* field can be one of the following:
  - `ufs`, which indicates a UFS file system.
  - `vxfs`, which indicates a Veritas file system.
  - `swap`, which indicates a swap file system. The swap mount point must be a – (hyphen).
  - For file systems that are logical devices (mirrors), several keywords specify actions to be applied to the file systems. These keywords can create a logical device, change the configuration of a logical device, or delete a logical device. For a description of these keywords, see “To Create a Boot Environment With RAID-1 Volumes (Mirrors) (Command-Line Interface)” on page 78.

`-n` *BE_name*
The name of the boot environment to be created. *BE_name* must be unique on the system.

Example 4–8 Creating an Empty Boot Environment for a Solaris Flash Archive (Command-Line Interface)

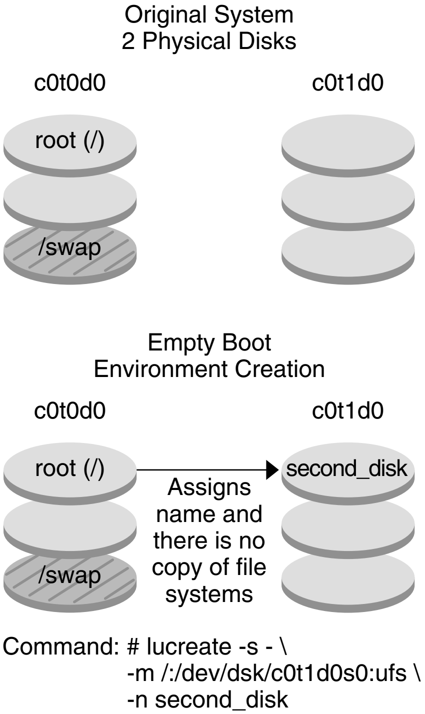
In this example, a boot environment is created but contains no file systems. A description, `mydescription`, is associated with the new boot environment that is named second_disk.

```
# lucreate -A 'mydescription' -s - \
-m /:/dev/dsk/c0t1d0s0:ufs  -n second_disk
```

When creation of the empty boot environment is complete, a flash archive can be installed and can be activated (made bootable). See Chapter 5.

For an example of creating and populating an empty boot environment, see "Example of Creating an Empty Boot Environment and Installing a Solaris Flash Archive (Command-Line Interface)" on page 158.

The following image shows the creation of an empty boot environment.


Original System
2 Physical Disks
c0t0d0
c0t1d0
root (/)
/swap
Empty Boot
Environment Creation
c0t0d0
c0t1d0
root (/)
second_disk
Assigns name and there is no copy of file systems
/swap
Command: # lucreate -s - \
-m /:/dev/dsk/c0t1d0s0:ufs \
-n second_disk

▼ To Create a Boot Environment With RAID-1 Volumes

(Mirrors) (Command-Line Interface)

When you create a boot environment, Solaris Live Upgrade uses Solaris Volume Manager technology to create RAID-1 volumes. When creating a boot environment, you can use Solaris Live Upgrade to manage the following tasks.

- Remove a single-slice concatenation (submirror) from a RAID-1 volume (mirror). The contents can be saved to become the content of the new boot environment if necessary. Because the contents are not copied, the new boot environment can be quickly created. After the submirror is detached from a mirror, it is no longer part of the original mirror. Reads and writes to the submirror are no longer performed through the mirror.
- Create a boot environment that contains a mirror.
- Attach a single-slice concatenation to the newly created mirror.

To use the mirroring capabilities of Solaris Live Upgrade, you must create a state database and a state database replica. A state database stores information about disk about the state of your Solaris Volume Manager configuration.

- For information about creating a state database, see Chapter 6, "State Database (Overview)," in *Solaris Volume Manager Administration Guide*.
- For an overview of Solaris Volume Manager and the tasks that Solaris Live Upgrade can provide, see "Creating a Boot Environment With RAID-1 Volume File Systems" on page 26.
- For in-depth information about complex Solaris Volume Manager configurations that are not allowed when using Solaris Live Upgrade, see Chapter 2, "Storage Management Concepts," in *Solaris Volume Manager Administration Guide*.

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 create the new boot environment, type:**

```
# lucreate [-A 'BE_description']  \
-m mountpoint:device[,metadevice]:fs_options [-m...] \
-n BE_name
```

`-A` '*BE_description*'

(Optional) Enables the creation of a boot environment description that is associated with the boot environment name *BE_name*. The description can be any length and can contain any characters.

`-m` *mountpoint:device[,metadevice]:fs_options* [`-m`...]

Specifies the file systems' configuration of the new boot environment in the `vfstab`. The file systems that are specified as arguments to `-m` can be on the same disk or they can be spread across multiple disks. Use this option as many times as needed to create the number of file systems that are needed.

- *mountpoint* can be any valid mount point or – (hyphen), indicating a swap partition.
- *device* field can be one of the following:

  - The name of a disk device, of the form `/dev/dsk/c`*w*`t`*x*`d`*y*`s`*z*
  - The name of a Solaris Volume Manager volume, of the form /dev/md/dsk/d*num*
  - The name of a Veritas Volume Manager volume, of the form /dev/md/vxfs/dsk/d*num*
  - The keyword `merged`, indicating that the file system at the specified mount point is to be merged with its parent
- *fs_options* field can be one of the following types of file systems and keywords:
  - `ufs`, which indicates a UFS file system.
  - `vxfs`, which indicates a Veritas file system.
  - `swap`, which indicates a swap file system. The swap mount point must be a – (hyphen).
  - For file systems that are logical devices (mirrors), several keywords specify actions to be applied to the file systems. These keywords can create a logical device, change the configuration of a logical device, or delete a logical device.
    - `mirror` creates a RAID–1 volume or mirror on the specified device. In subsequent `-m` options, you must specify `attach` to attach at least one concatenation to the new mirror. The specified device must be correctly named. For example, a logical device name of `/dev/md/dsk/d10` can serve as a mirror name. For more information about naming devices, see "Overview of Solaris Volume Manager Components" in *Solaris Volume Manager Administration Guide*.
    - `detach` removes a concatenation from a volume that is associated with a specified mount point. The volume does not need to be specified.
    - `attach` attaches a concatenation to the mirror that is associated with a specified mount point. The physical disk slice that is specified is made into a single device concatenation for attaching to the mirror. To specify a concatenation to attach to a disk, you append a comma and the name of that concatenation to the device name. If you omit the comma and the concatenation name, `lucreate` selects a free volume for the concatenation.

      `lucreate` allows you to create only concatenations that contain a single physical slice. This command allows you to attach up to three concatenations to a mirror.
    - `preserve` saves the existing file system and its content. This keyword enables you to bypass the copying process that copies the content of the source boot environment. Saving the content enables a quick creation of the new boot environment. For a particular mount point, you can use `preserve` with only one physical device. When you use `preserve`, `lucreate` checks that the device's content is suitable for a specified file system. This check is limited and cannot guarantee suitability.

      The `preserve` keyword can be used with both a physical slice and a Solaris Volume Manager volume.
      - If you use the `preserve` keyword when the UFS file system is on a physical slice, the content of the UFS file system is saved on the slice. In the following example of the `-m` option, the `preserve` keyword saves the content of the physical device `c0t0d0s0` as the file system for the mount point for the root (`/`) file system.

```
-m /:/dev/dsk/c0t0d0s0:preserve,ufs
```

- If you use the `preserve` keyword when the UFS file system is on a volume, the contents of the UFS file system are saved on the volume.

  In the following example of the `-m` option, the `preserve` keyword saves the contents of the RAID-1 volume (mirror) `d10` as the file system for the mount point for the root (`/`) file system.

  ```
  -m /:/dev/md/dsk/d10:preserve,ufs
  ```

  In the following example of the `-m` option, a RAID-1 volume (mirror) `d10` is configured as the file system for the mount point for the root (`/`) file system. The single-slice concatenation `d20` is detached from its current mirror. `d20` is attached to mirror `d10`. The root (`/`) file system is preserved on submirror `d20`.

```
-m /:/dev/md/dsk/d10:mirror,ufs -m /:/dev/md/dsk/d20:detach,attach,preserve
```

`-n` *BE_name*
The name of the boot environment to be created. *BE_name* must be unique on the system.

When the creation of the new boot environment is complete, it can be upgraded and can be activated (made bootable). See Chapter 5.

Example 4–9 Creating a Boot Environment With a Mirror and Specifying Devices (Command Line)

In this example, the mount points for the file systems are specified by using the `-m` option.

- A description, `mydescription`, is associated with the name `another_disk`.
- `lucreate` configures a UFS file system for the mount point root (`/`). A mirror, `d10`, is created. This mirror is the receptacle for the current boot environment's root (`/`) file system that is copied to the mirror `d10`. All data on the mirror `d10` is overwritten.
- Two slices, `c0t0d0s0` and `c0t1d0s0`, are submirrors, `d1` and `d2`. These two submirrors are added to mirror `d10`.
- The new boot environment is named `another_disk`.

```
# lucreate -A ’mydescription’ \
-m /:/dev/md/dsk/d10:ufs,mirror \
-m /:/dev/dsk/c0t0d0s0,/dev/md/dsk/d1:attach \
-m /:/dev/dsk/c0t1c0s0,/dev/md/dsk/d2:attach -n another_disk
```

Example 4–10 Creating a Boot Environment With a Mirror and Not Specifying a Submirror Name (Command Line Interface)

In this example, the mount points for the file systems are specified by using the `-m` option.

- A description, `mydescription`, is associated with the name `another_disk`.

- `lucreate` configures a UFS file system for the mount point root (`/`). A mirror, `d10`, is created. This mirror is the receptacle for the current boot environment's root (`/`) file system that is copied to the mirror `d10`. All data on the mirror `d10` is overwritten.
- Two slices, `c0t0d0s0` and `c0t1d0s0`, are specified to be used as submirrors. The submirrors are not specified, but the `lucreate` command chooses names from a list of available volume names. These two submirrors are attached to mirror `d10`.
- The new boot environment is named `another_disk`.

```
# lucreate -A 'mydescription' \
-m /:/dev/md/dsk/d10:ufs,mirror \
-m /:/dev/dsk/c0t0d0s0:attach \
-m /:/dev/dsk/c0t1d0s0:attach -n another_disk
```

When the creation of the new boot environment is complete, it can be upgraded and can be activated (made bootable). See Chapter 5.

Example 4–11 Creating a Boot Environment and Detaching a Submirror (Command Line)

In this example, the mount points for the file systems are specified by using the `-m` option.

- A description, `mydescription`, is associated with the name `another_disk`.
- `lucreate` configures a UFS file system for the mount point root (`/`). A mirror, `d10`, is created.
- Slice `c0t0d0s0` is removed from its current mirror. The slice is specified to be submirror `d1` and is added to mirror d10. The contents of the submirror, the root (`/`) file system, are saved and no copy occurs. Slice `c0t1d0s0` is submirror `d2` and is added to mirror `d10`.
- The new boot environment is named `another_disk`.

```
# lucreate -A 'mydescription' \
-m /:/dev/md/dsk/d10:ufs,mirror \
-m /:/dev/dsk/c0t0d0s0,/dev/md/dsk/d1:detach,attach,preserve \
-m /:/dev/dsk/c0t1d0s0,/dev/md/dsk/d2:attach -n another_disk
```

This example can be abbreviated as in the following example. The physical and logical device names are shortened. The specifiers for the submirrors `d1` and `d2` are omitted.

```
# lucreate -A 'mydescription' \
-m /:/dev/md/dsk/d10:ufs,mirror \
-m /:/dev/dsk/c0t0d0s0:detach,attach,preserve \
-m /:/dev/dsk/c0t1d0s0:attach -n another_disk
```

When the creation of the new boot environment is complete, it can be upgraded and can be activated (made bootable). See Chapter 5.

Example 4–12 Creating a Boot Environment, Detaching a Submirror, and Saving Its Contents (Command Line)

In this example, the mount points for the file systems are specified by using the `-m` option.

- A description, `mydescription`, is associated with the name `another_disk`.
- `lucreate` configures a UFS file system for the mount point root (`/`). A mirror, `d20`, is created.
- Slice `c0t0d0s0` is removed from its current mirror and added to the mirror `d20`. The name of the submirror is not specified. The contents of the submirror, the root (`/`) file system, are saved and no copy occurs.
- The new boot environment is named `another_disk`.

```
# lucreate -A 'mydescription' \
-m /:/dev/md/dsk/d20:ufs,mirror \
-m /:/dev/dsk/c0t0d0s0:detach,attach,preserve \
-n another_disk
```

When the creation of the new boot environment is complete, the boot environment can be upgraded and can be activated (made bootable). See Chapter 5.

Example 4–13 Creating a Boot Environment With Two Mirrors (Command Line Interface)

In this example, the mount points for the file systems are specified by using the `-m` option.

- A description, `mydescription`, is associated with the name `another_disk`.
- `lucreate` configures a UFS file system for the mount point root (`/`). A mirror, `d10`, is created. This mirror is the receptacle for the current boot environment's root (`/`) file system that is copied to the mirror `d10`. All data on the mirror `d10` is overwritten.
- Two slices, `c0t0d0s0` and `c0t1d0s0`, are submirrors `d1` and `d2`. These two submirrors are added to mirror `d10`.
- `lucreate` configures UFS file system for the mount point `/opt`. A mirror, `d11`, is created. This mirror is the receptacle for the current boot environment's `/opt` file system that is copied to the mirror `d11`. All data on the mirror `d11` is overwritten.
- Two slices, `c2t0d0s1` and `c3t1d0s1`, are submirrors `d3` and `d4`. These two submirrors are added to mirror `d11`.
- The new boot environment is named `another_disk`.

```
# lucreate -A 'mydescription' \
-m /:/dev/md/dsk/d10:ufs,mirror \
-m /:/dev/dsk/c0t0d0s0,/dev/md/dsk/d1:attach \
-m /:/dev/dsk/c0t1d0s0,/dev/md/dsk/d2:attach \
-m /opt:/dev/md/dsk/d11:ufs,mirror \
-m /opt:/dev/dsk/c2t0d0s1,/dev/md/dsk/d3:attach \
-m /opt:/dev/dsk/c3t1d0s1,/dev/md/dsk/d4:attach -n another_disk
```

When the creation of the new boot environment is complete, it can be upgraded and can be activated (made bootable). See Chapter 5.

▼ To Create a Boot Environment and Customize the Content (Command-Line Interface)

The content of the file system on the new boot environment can be modified by using the following options. Directories and files are not copied to the new boot environment.

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 create the new boot environment, type:**

```
# lucreate -m mountpoint:device[,metadevice]:fs_options [-m ...]  \
[-x exclude_dir] [-y include] \
[-Y include_list_file] \
[-f exclude_list_file]\
[-z filter_list] [-I] -n BE_name
```

`-m` *mountpoint:device[,metadevice]:fs_options* [`-m` ...]

Specifies the file systems' configuration of the new boot environment in the `vfstab`. The file systems that are specified as arguments to `-m` can be on the same disk or they can be spread across multiple disks. Use this option as many times as needed to create the number of file systems that are needed.

- *mountpoint* can be any valid mount point or – (hyphen), indicating a swap partition.
- *device* field can be one of the following:
  - The name of a disk device, of the form `/dev/dsk/c`*w*`t`*x*`d`*y*`s`*z*
  - The name of a Solaris Volume Manager volume, of the form /dev/md/dsk/d*num*
  - The name of a Veritas Volume Manager volume, of the form /dev/md/vxfs/dsk/d*num*
  - The keyword `merged`, indicating that the file system at the specified mount point is to be merged with its parent
- *fs_options* field can be one of the following:
  - `ufs`, which indicates a UFS file system.
  - `vxfs`, which indicates a Veritas file system.
  - `swap`, which indicates a swap file system. The swap mount point must be a – (hyphen).
  - For file systems that are logical devices (mirrors), several keywords specify actions to be applied to the file systems. These keywords can create a logical device, change the configuration of a logical device, or delete a logical device. For a description of these keywords, see "To Create a Boot Environment With RAID-1 Volumes (Mirrors) (Command-Line Interface)" on page 78.

`-x` *exclude_dir*

Excludes files and directories by not copying them to the new boot environment. You can use multiple instances of this option to exclude more than one file or directory.

exclude_dir is the name of the directory or file.

`-y` *include_dir*

Copies directories and files that are listed to the new boot environment. This option is used when you have excluded a directory, but want to restore individual subdirectories or files.

include_dir is the name of the subdirectory or file to be included.

`-Y` *list_filename*

Copies directories and files from a list to the new boot environment. This option is used when you have excluded a directory, but want to restore individual subdirectories or files.

- *list_filename* is the full path to a file that contains a list.
- The *list_filename* file must contain one file per line.
- If a line item is a directory, all subdirectories and files beneath that directory are included. If a line item is a file, only that file is included.

`-f` *list_filename*

Uses a list to exclude directories and files by not copying them to the new boot environment.

- *list_filename* is the full path to a file that contains a list.
- The *list_filename* file must contain one file per line.

`-z` *list_filename*

Uses a list to copy directories and files to the new boot environment. Each file or directory in the list is noted with a plus "+" or minus "-". A plus indicates an included file or directory and the minus indicates an excluded file or directory.

- *list_filename* is the full path to a file that contains a list.
- The *list_filename* file must contain one file per line. A space must follow the plus or minus before the file name.
- If a line item is a directory and is indicated with a + (plus), all subdirectories and files beneath that directory are included. If a line item is a file and is indicated with a + (plus), only that file is included.

`-I`

Overrides the integrity check of system files. Use this option with caution.

To prevent you from removing important system files from a boot environment, `lucreate` runs an integrity check. This check examines all files that are registered in the system package database and stops the boot environment creation if any files are excluded. Use of this option overrides this integrity check. This option creates the boot environment more quickly, but might not detect problems.

`-n` *BE_name*

The name of the boot environment to be created. *BE_name* must be unique on the system.

When creation of the new boot environment is complete, it can be upgraded and can be activated (made bootable). See Chapter 5.

Example 4–14 Creating a Boot Environment and Excluding Files (Command Line Interface)

In this example, the new boot environment is named `second_disk`. The source boot environment contains one file system, root (`/`). In the new boot environment, the `/var` file system is split from the root (`/`) file system and put on another slice. The `lucreate` command configures a UFS file system for the mount points root (`/`) and `/var`. Also, two `/var` mail files, `root` and `staff` are not copied to the new boot environment. Swap is automatically shared between the source and the new boot environment.

```
# lucreate -n second_disk \
-m /:/dev/dsk/c0t1d0s0:ufs -m /var/mail:/dev/dsk/c0t2d0s0:ufs  \
-x /var/mail/root -x /var/mail/staff
```

Example 4–15 Creating a Boot Environment and Excluding and Including Files (Command Line Interface)

In this example, the new boot environment is named `second_disk`. The source boot environment contains one file system for the OS, root (`/`). The source also contains a file system that is named `/mystuff`. `lucreate` configures a UFS file system for the mount points root (`/`) and `/mystuff`. Only two directories in `/mystuff` are copied to the new boot environment: `/latest` and `/backup`. Swap is automatically shared between the source and the new boot environment.

```
# lucreate -n second_disk \
-m /:/dev/dsk/c01t0d0s0:ufs -m /mystuff:/dev/dsk/c1t1d0s0:ufs  \
-x /mystuff -y /mystuff/latest -y /mystuff/backup
```

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CHAPTER 5

Upgrading With Solaris Live Upgrade (Tasks)

This chapter explains how to use Solaris Live Upgrade to upgrade and activate an inactive boot environment. This chapter contains the following sections:

- "Task Map: Upgrading a Boot Environment" on page 87
- "Upgrading a Boot Environment" on page 88
- "Installing Solaris Flash Archives on a Boot Environment" on page 103
- "Activating a Boot Environment" on page 109

You can use Solaris Live Upgrade with menus or by using the command-line interface (CLI). Procedures are documented for both interfaces. These procedures do not exhaust the possibilities for using Solaris Live Upgrade. For more information about commands, see Chapter 10 and the appropriate man pages, which more fully document CLI options.

Task Map: Upgrading a Boot Environment

TABLE 5–1 Task Map: Upgrading With Solaris Live Upgrade

Task	Description	For Instructions
Either upgrade a boot environment or install a Solaris Flash archive.	■ Upgrade the inactive boot environment with an OS image. ■ Install a Solaris Flash archive on an inactive boot environment.	■ "Upgrading a Boot Environment" on page 88 ■ "Installing Solaris Flash Archives on a Boot Environment" on page 103
Activate an inactive boot environment.	Makes changes effective and switches the inactive boot environment to active .	"Activating a Boot Environment" on page 109

TABLE 5–1 Task Map: Upgrading With Solaris Live Upgrade *(Continued)*

Task	Description	For Instructions
(optional) Switch back if a failure occurs when activating.	Reactivates to the original boot environment if a failure occurs.	Chapter 6

Upgrading a Boot Environment

Use the Upgrade menu or `luupgrade` command to upgrade a boot environment. This section provides the procedure for upgrading an inactive boot environment from files that are located on the following media:

- NFS server
- Local file
- Local tape
- Local device, including DVD or CD

Guidelines for Upgrading

When you upgrade a boot environment with the latest OS, you do not affect the active boot environment. The new files merge with the inactive boot environment critical file systems, but shareable file systems are not changed.

Rather than upgrading, if you have created a Solaris Flash archive, you could install the archive on an inactive boot environment. The new files overwrite critical file systems of the inactive boot environment, but shareable file systems are not changed. See "Installing Solaris Flash Archives on a Boot Environment" on page 103.

You can upgrade an inactive boot environment that contains any combination of physical disk slices, Solaris Volume Manager volumes, or Veritas Volume Manager volumes. The slice that is chosen for the root (`/`) file system must be a single-slice concatenation that is included in a RAID–1 volume (mirror). For procedures about creating a boot environment with mirrored file systems, see "To Create a Boot Environment With RAID-1 Volumes (Mirrors) (Command-Line Interface)" on page 78.

Note – If VxVM volumes are configured on your current system, the `lucreate` command can create a new boot environment. When the data is copied to the new boot environment, the Veritas file system configuration is lost and a UFS file system is created on the new boot environment.

Upgrading a System With Packages or Patches

You can use Solaris Live Upgrade to add patches and packages to a system. Solaris Live Upgrade creates a copy of the currently running system. This new boot environment can be upgraded or you can add packages or patches. When you use Solaris Live Upgrade, the only downtime the system incurs is that of a reboot. You can add patches and packages to a new boot environment with the `luupgrade` command.

⚠ **Caution –** When adding and removing packages or patches, Solaris Live Upgrade requires packages or patches that comply with the SVR4 advanced packaging guidelines. While Sun packages conform to these guidelines, Sun cannot guarantee the conformance of packages from third-party vendors. If a package violates these guidelines, the package can cause the package-addition software to fail or alter the active boot environment during an upgrade.

For more information about packaging requirements, see Appendix B.

TABLE 5–2 Upgrading a Boot Environment With Packages and Patches

Type of Installation	Description	For More Information
Adding patches to a boot environment.	Create a new boot environment and use the `luupgrade` command with the `-t` option.	"To Add Patches to an Operating System Image on a Boot Environment (Command-Line Interface)" on page 94
Adding packages to a boot environment.	Use the `luupgrade` command with the `-p` option.	"To Add Packages to an Operating System Image on a Boot Environment (Command-Line Interface)" on page 93

▼ To Upgrade an Operating System Image on a Boot Environment (Character User Interface)

To upgrade by using this procedure, you must use a DVD or a combined installation image. For an installation with CDs, you must use the procedure "To Upgrade an Operating System Image From Multiple CDs (Command-Line Interface)" on page 91.

Note – This procedure assumes that the system is running *Volume Manager*. For detailed information about managing removable media with the Volume Manager, refer to *System Administration Guide: Devices and File Systems*.

---

1. **From the Solaris Live Upgrade main menu, select Upgrade.**

   The Upgrade menu screen is displayed.

2. **Type the new boot environment's name.**

3. **Type the path to where the Solaris installation image is located.**

Installation Media Type	Description
Network File System	Specify the path to the network file system where the installation image is located.
Local file	Specify the path to the local file system where the installation image is located.
Local tape	Specify the local tape device and the position on the tape where the installation image is located.
Local device, DVD, or CD	Specify the local device and the path to the installation image.

- SPARC: If you are using a DVD or a CD, type the path to that disc, as in this example:

  ```
  /cdrom/cdrom0/s0/Solaris_10/s0
  ```

- If you have a combined image on the network, type the path to the network file system as in this example:

  ```
  /net/installmachine/export/Solaris_10/os_image
  ```

4 **To upgrade, press F3.**

When the upgrade is completed, the main menu is displayed.

To Upgrade an Operating System Image on a Boot Environment (Command-Line Interface)

To upgrade by using this procedure, you must use a DVD or a combined installation image. If the installation requires more than one CD, you must use the procedure "To Upgrade an Operating System Image From Multiple CDs (Command-Line Interface)" on page 91.

1 **Install the Solaris Live Upgrade `SUNWlur` and `SUNWluu` packages on your system. These packages must be from the release you are upgrading to. For step-by-step procedures, see "To Install Solaris Live Upgrade With the `pkgadd` Command" on page 57.**

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 **Indicate the boot environment to upgrade and the path to the installation software by typing:**

```
# luupgrade -u -n BE_name -s os_image_path
```

`-u`	Upgrades an operating system image on a boot environment
`-n` *BE_name*	Specifies the name of the boot environment that is to be upgraded

`-s` *os_image_path*	Specifies the path name of a directory that contains an operating system image

Example 5–1 Upgrading an OS Image on a Boot Environment From DVD Media (Command-Line Interface)

In this example, the `second_disk` boot environment is upgraded by using DVD media. The pkgadd command adds the Solaris Live Upgrade packages from the release you are upgrading to.

```
# pkgadd -d /server/packages SUNWlur SUNWluu
# luupgrade -u -n second_disk -s /cdrom/cdrom0/s0
```

Example 5–2 Upgrading an OS Image on a Boot Environment From a Network Installation Image (Command-Line Interface)

In this example, the `second_disk` boot environment is upgraded. The pkgadd command adds the Solaris Live Upgrade packages from the release you are upgrading to.

```
# pkgadd -d /server/packages SUNWlur SUNWluu# luupgrade -u -n second_disk \
-s /net/installmachine/export/Solaris_10/OS_image
```

▼ To Upgrade an Operating System Image From Multiple CDs (Command-Line Interface)

Because the operating system image resides on more than one CD, you must use this upgrade procedure. Use the `luupgrade` command with the `-i` option to install any additional CDs.

1. **Install the Solaris Live Upgrade `SUNWlur` and `SUNWluu` packages on your system. These packages must be from the release you are upgrading to. For step-by-step procedures, see "To Install Solaris Live Upgrade With the `pkgadd` Command" on page 57.**

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. **Indicate the boot environment to upgrade and the path to the installation software by typing:**

```
# luupgrade -u -n BE_name -s os_image_path
```

`-u`	Upgrades an operating system image on a boot environment
`-n` *BE_name*	Specifies the name of the boot environment that is to be upgraded

`-s` *os_image_path*	Specifies the path name of a directory that contains an operating system image

4. **When the installer is finished with the contents of the first CD, insert the second CD.**

5. **This step is identical to the previous step, but the `-u` option is replaced by the `-i` option. Also, choose to run the installer on the second CD with menus or with text.**

   - This command runs the installer on the second CD with menus.

     ```
     # luupgrade -i -n BE_name -s os_image_path
     ```

   - This command runs the installer on the second CD with text and requires no user interaction.

     ```
     # luupgrade -i -n BE_name -s os_image_path -O '-nodisplay -noconsole'
     ```

`-i`	Installs additional CDs. The software looks for an installation program on the specified medium and runs that program. The installer program is specified with `-s`.
`-n` *BE_name*	Specifies the name of the boot environment that is to be upgraded.
`-s` *os_image_path*	Specifies the path name of a directory that contains an operating system image.
`-O'-nodisplay -noconsole'`	(Optional) Runs the installer on the second CD in text mode and requires no user interaction.

6. **Repeat Step 4 and Step 5 for each CD that you want to install.**

   The boot environment is ready to be activated. See "Activating a Boot Environment" on page 109.

Example 5–3

SPARC: Upgrading an Operating System Image From Multiple CDs (Command-Line Interface)

In this example, the `second_disk` boot environment is upgraded and the installation image is on two CDs: the Solaris Software - 1 and the Solaris Software - 2 CDs. The `-u` option determines if sufficient space for all the packages is on the CD set. The `-O` option with the `-nodisplay` and `-noconsole` options prevents the character user interface from displaying after the reading of the second CD. If you use these options, you are not prompted to type information. Omit these options to display the interface.

Install the Solaris Live Upgrade packages from the release you are upgrading to.

```
# pkgadd -d /server/packages SUNWlur SUNWluu
```

Insert the Solaris Software - 1 CD and type:

- For SPARC based systems:

```
# luupgrade -u -n second_disk -s /cdrom/cdrom0/s0
```

- For x86 based systems:

  ```
  # luupgrade -u -n second_disk -s /cdrom/cdrom0/
  ```

Insert the Solaris Software - 2 CD and type the following.

```
# luupgrade -i -n second_disk -s /cdrom/cdrom0 -O '-nodisplay \
-noconsole'
Repeat this step for each CD that you need.
```

Repeat the previous step for each CD that you want to install.

▼ To Add Packages to an Operating System Image on a Boot Environment (Command-Line Interface)

In the following procedure, packages are removed from and added to a new boot environment.

Caution – When you are upgrading. adding and removing packages or patches, Solaris Live Upgrade requires packages or patches that comply with the SVR4 advanced packaging guidelines. While Sun packages conform to these guidelines, Sun cannot guarantee the conformance of packages from third-party vendors. If a package violates these guidelines, the package can cause the package-addition software to fail or can alter the active boot environment.

For more information about packaging requirements, see Appendix B.

---

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 remove a package or set of packages from a new boot environment, type:**

```
#  luupgrade -P -n second_disk package-name
```

`-P`	Indicates to remove the named package or packages from the boot environment
`-n` *BE_name*	Specifies the name of the boot environment where the package is to be removed
package-name	Specifies the names of the packages to be removed. Separate multiple package names with spaces.

3 **To add a package or a set of packages to the new boot environment, type:**

```
# luupgrade -p -n second_disk -s /path-to-packages  package-name
```

`-p`	Indicates to add packages to the boot environment.

`-n` *BE_name*	Specifies the name of the boot environment where the package is to be added.
`-s` *path-to-packages*	Specifies the path to a directory that contains the package or packages that are to be added.
package-name	Specifies the names of the package or packages to be added. Separate multiple package names with a space.

Example 5–4 Adding packages to an Operating System Image on a Boot Environment (Command-Line Interface)

In this example, packages are removed then added to the `second_disk` boot environment.

```
# luupgrade -P -n second_disk SUNWabc SUNWdef SUNWghi
# luupgrade -p -n second_disk -s /net/installmachine/export/packages \
SUNWijk SUNWlmn SUNWpkr
```

▼ To Add Patches to an Operating System Image on a Boot Environment (Command-Line Interface)

In the following procedure, patches are removed from and added to a new boot environment.

Caution – When you are adding and removing packages or patches, Solaris Live Upgrade requires packages or patches that comply with the SVR4 advanced packaging guidelines. While Sun packages conform to these guidelines, Sun cannot guarantee the conformance of packages from third-party vendors. If a package violates these guidelines, the package can cause the package-addition software to fail or can alter the active boot environment.

---

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 remove a patch or set of patches from a new boot environment, type:**

```
# luupgrade -T -n second_disk patch_name
```

`-T`	Indicates to remove the named patch or patches from the boot environment.
`-n` *BE_name*	Specifies the name of the boot environment where the patch or patches are to be removed.
patch-name	Specifies the names of the patches to be removed. Separate multiple patch names with spaces.

3 **To add a patch or a set of patches to the new boot environment, type the following command.**

```
# luupgrade -t -n second_disk -s /path-to-patches  patch-name
```

`-t`	Indicates to add patches to the boot environment.
`-n` *BE_name*	Specifies the name of the boot environment where the patch is to be added.
`-s` *path-to-patches*	Specifies the path to the directory that contains the patches that are to be added.
patch-name	Specifies the names of the patch or patches that are to be added. Separate multiple patch names with a space.

Example 5–5 Adding Patches to an Operating System Image on a Boot Environment (Command-Line Interface)

In this example, patches are removed then added to the `second_disk` boot environment .

```
# luupgrade -T -n second_disk 222222-01
# luupgrade -t -n second_disk -s /net/installmachine/export/packages \
333333-01 4444444-01
```

▼ To Obtain Information on Packages Installed on a Boot Environment (Command-Line Interface)

The follow procedure checks the integrity of the packages installed on the new boot environment.

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 check the integrity of the newly installed packages on the new boot environment, type:**

```
#  luupgrade -C -n second_disk -O "-v" package-name
```

`-C`	Indicates to run the `pkgchk` command on the named packages
`-n` *BE_name*	Specifies the name of the boot environment where the check is to be performed
`-O`	Passes the options directly to the `pkgchk` command
package-name	Specifies the names of the packages to be checked. Separate multiple package names with spaces. If package names are omitted, the check is done on all packages in the specified boot environment.
“`-v`”	Specifies to run the command in verbose mode

Example 5–6 Checking the Integrity of Packages on a Boot Environment (Command-Line Interface)

In this example, the packages `SUNWabc`, `SUNWdef`, and `SUNWghi` are checked to make sure they were installed properly and are not damaged.

```
# luupgrade -C -n second_disk SUNWabc SUNWdef SUNWghi
```

Upgrading by Using a JumpStart Profile

You can create a JumpStart profile to use with Solaris Live Upgrade. If you are familiar with the custom JumpStart program, this is the same profile that custom JumpStart uses. The following procedures enable you to create a profile, test the profile, and install by using the `luupgrade` command with the `-j` option.

Caution – When you install the Solaris OS with a Solaris Flash archive, the archive and the installation media must contain identical OS versions. For example, if the archive is the Solaris 10 operating system and you are using DVD media, then you must use Solaris 10 DVD media to install the archive. If the OS versions do not match, the installation on the target system fails. Identical operating systems are necessary when you use the following keyword or command:

- `archive_location` keyword in a profile
- `luupgrade` command with `-s`, `-a`, `-j`, and `-J` options

For more information see the following:

- "To Create a Profile to be Used by Solaris Live Upgrade" on page 96
- "To Test a Profile to Be Used by Solaris Live Upgrade" on page 100
- "To Upgrade With a Profile by Using Solaris Live Upgrade (Command-Line Interface)" on page 101
- For creating a JumpStart profile, see "Creating a Profile" in *Solaris 10 11/06 Installation Guide: Custom JumpStart and Advanced Installations*

▼ To Create a Profile to be Used by Solaris Live Upgrade

This procedure shows you how to create a profile for use with Solaris Live Upgrade. You can use this profile to upgrade an inactive boot environment by using the `luupgrade` command with the `-j` option.

For procedures to use this profile, see the following sections:

- For an upgrade with a profile, see "To Upgrade With a Profile by Using Solaris Live Upgrade (Command-Line Interface)" on page 101.

- For a Solaris Flash installation with a profile, see "To Install a Solaris Flash Archive With a Profile (Command-Line Interface)" on page 106.

1 Use a text editor to create a text file.

Name the file descriptively. 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 this profile `upgrade_Solaris_10`.

2 Add profile keywords and values to the profile.

Only the upgrade keywords in the following tables can be used in a Solaris Live Upgrade profile.

The following table lists the keywords you can use with the `Install_type` keyword values of `upgrade` or `flash_install`.

Keywords for an Initial Archive Creation	Description	Reference
(Required) `Install_type`	Defines whether to upgrade the existing Solaris environment on a system or install a Solaris Flash archive on the system. Use the following values with this keyword: ■ `upgrade` for an upgrade ■ `flash_install` for a Solaris Flash installation ■ `flash_update` for a Solaris Flash differential installation	For a description of all the values for this keyword, see "install_type Profile Keyword" in *Solaris 10 11/06 Installation Guide: Custom JumpStart and Advanced Installations*.
(Required for a Solaris Flash archive) `archive_location`	Retrieves a Solaris Flash archive from a designated location.	For a list of values that can be used with this keyword, see "archive_location Keyword" in *Solaris 10 11/06 Installation Guide: Custom JumpStart and Advanced Installations*.
(Optional) `cluster` (adding or deleting clusters)	Designates whether a cluster is to be added or deleted from the software group that is to be installed on the system.	For a list of values that can be used with this keyword, see "cluster Profile Keyword (Adding Software Groups)" in *Solaris 10 11/06 Installation Guide: Custom JumpStart and Advanced Installations*.
(Optional) `geo`	Designates the regional locale or locales that you want to install on a system or to add when upgrading a system.	For a list of values that can be used with this keyword, see "geo Profile Keyword" in *Solaris 10 11/06 Installation Guide: Custom JumpStart and Advanced Installations*.

Keywords for an Initial Archive Creation	Description	Reference
(Optional) `local_customization`	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. The value is the path to the script on the clone system.	For information about predeployment and postdeployment scripts, see “Creating Customization Scripts” in *Solaris 10 11/06 Installation Guide: Solaris Flash Archives (Creation and Installation)*.
(Optional) `locale`	Designates the locale packages you want to install or add when upgrading.	For a list of values that can be used with this keyword, see “locale Profile Keyword” in *Solaris 10 11/06 Installation Guide: Custom JumpStart and Advanced Installations*.
(Optional) `package`	Designates whether a package is to be added to or deleted from the software group that is to be installed on the system.	For a list of values that can be used with this keyword, see “package Profile Keyword” in *Solaris 10 11/06 Installation Guide: Custom JumpStart and Advanced Installations*.

The following table lists the keywords you can use with the `Install_type` keyword value `flash_update`.

Keywords for a Differential Archive Creation	Description	Reference
(Required) `Install_type`	Defines the installation to install a Solaris Flash archive on the system. The value for a differential archive is `flash_update`.	For a description of all the values for this keyword, see “install_type Profile Keyword” in *Solaris 10 11/06 Installation Guide: Custom JumpStart and Advanced Installations*.
(Required) `archive_location`	Retrieves a Solaris Flash archive from a designated location.	For a list of values that can be used with this keyword, see “archive_location Keyword” in *Solaris 10 11/06 Installation Guide: Custom JumpStart and Advanced Installations*.
(Optional) `forced_deployment`	Forces the installation of a Solaris Flash differential archive onto a clone system that is different than the software expects. 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 to be deleted, use the default, which protects new files by stopping the installation.	For more information about this keyword, see “forced_deployment Profile Keyword (Installing Solaris Flash Differential Archives)” in *Solaris 10 11/06 Installation Guide: Custom JumpStart and Advanced Installations*.

Keywords for a Differential Archive Creation	Description	Reference
(Optional) `local_customization`	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. The value is the path to the script on the clone system.	For information about predeployment and postdeployment scripts, see "Creating Customization Scripts" in *Solaris 10 11/06 Installation Guide: Solaris Flash Archives (Creation and Installation)*.
(Optional) `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.	For more information about this keyword, see "no_content_check Profile Keyword (Installing Solaris Flash Archives)" in *Solaris 10 11/06 Installation Guide: Custom JumpStart and Advanced Installations*.
(Optional) `no_master_check`	When installing a clone system with a Solaris Flash differential archive, you can use the `no_master_check` keyword to ignore a check of files. Clone system files are not checked. A check would ensure the clone 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 more information about this keyword, see "no_master_check Profile Keyword (Installing Solaris Flash Archives)" in *Solaris 10 11/06 Installation Guide: Custom JumpStart and Advanced Installations*.

3. **Save the profile in a directory on the local system.**

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

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

   For a procedure to test the profile, see "To Test a Profile to Be Used by Solaris Live Upgrade" on page 100.

Example 5–7 Creating a Solaris Live Upgrade Profile

In this example, a profile provides the upgrade parameters. This profile is to be used to upgrade an inactive boot environment with the Solaris Live Upgrade `luupgrade` command and the `-u` and `-j` options. This profile adds a package and a cluster. A regional locale and additional locales are also added to the profile. If you add locales to the profile, make sure that you have created a boot environment with additional disk space.

```
# profile keywords         profile values
# ----------------         -------------------
  install_type             upgrade
  package                  SUNWxwman add
  cluster                  SUNWCacc add
  geo                      C_Europe
  locale                   zh_TW
  locale                    zh_TW.BIG5
  locale                    zh_TW.UTF-8
  locale                    zh_HK.UTF-8
  locale                    zh_HK.BIG5HK
  locale                    zh
  locale                    zh_CN.GB18030
  locale                    zh_CN.GBK
  locale                    zh_CN.UTF-8
```

Example 5–8 Creating a Solaris Live Upgrade Profile to Install a Differential Archive

The following example of a profile is to be used by Solaris Live Upgrade to install a differential archive on a clone system. Only files that are specified by the differential archive are added, deleted, or changed. The Solaris Flash archive is retrieved from an NFS server. Because the image was built by the original master system, the clone system is not checked for a valid system image. This profile is to be used with the Solaris Live Upgrade `luupgrade` command and the `-u` and `-j` options.

```
# profile keywords          profile values
# ----------------          -------------------
 install_type               flash_update
 archive_location           nfs installserver:/export/solaris/archive/solarisarchive
 no_master_check
```

To use the `luupgrade` command to install the differential archive, see "To Install a Solaris Flash Archive With a Profile (Command-Line Interface)" on page 106.

▼ To Test a Profile to Be Used by Solaris Live Upgrade

After you create a profile, use the `luupgrade` command to test the profile. By looking at the installation output that is generated by `luupgrade`, you can quickly determine if a profile works as you intended.

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. **Test the profile.**

   `# luupgrade -u -n BE_name -D -s os_image_path -j profile_path`

`-u`	Upgrades an operating system image on a boot environment.
`-n` *BE_name*	Specifies the name of the boot environment that is to be upgraded.
`-D`	`luupgrade` command uses the selected boot environment's disk configuration to test the profile options that are passed with the `-j` option.
`-s` *os_image_path*	Specifies the path name of a directory that contains an operating system image. This directory can be on an installation medium, such as a DVD-ROM, CD-ROM, or it can be an NFS or UFS directory.

`-j` *profile_path*	Path to a profile that is configured for an upgrade. The profile must be in a directory on the local machine.

Example 5–9

Testing a Profile by Using Solaris Live Upgrade

In the following example, the profile is named `Flash_profile`. The profile is successfully tested on the inactive boot environment that is named `second_disk`.

```
# luupgrade -u -n u1b08 -D -s /net/installsvr/export/u1/combined.u1wos \
 -j /var/tmp/flash_profile
Validating the contents of the media /net/installsvr/export/u1/combined.u1wos.
The media is a standard Solaris media.
The media contains an operating system upgrade image.
The media contains Solaris version 10.
Locating upgrade profile template to use.
Locating the operating system upgrade program.
Checking for existence of previously scheduled Live Upgrade requests.
Creating upgrade profile for BE second_disk.
Determining packages to install or upgrade for BE second_disk.
Simulating the operating system upgrade of the BE second_disk.
The operating system upgrade simulation is complete.
INFORMATION: var/sadm/system/data/upgrade_cleanup contains a log of the
upgrade operation.
INFORMATION: var/sadm/system/data/upgrade_cleanup contains a log of
cleanup operations required.
The Solaris upgrade of the boot environment second_disk is complete.
```

You can now use the profile to upgrade an inactive boot environment.

▼ To Upgrade With a Profile by Using Solaris Live Upgrade (Command-Line Interface)

This procedure provides step-by-step instructions for upgrading an OS by using a profile.

If you want to install a Solaris Flash archive by using a profile, see "To Install a Solaris Flash Archive With a Profile (Command-Line Interface)" on page 106.

If you added locales to the profile, make sure that you have created a boot environment with additional disk space.

Caution – When you install the Solaris OS with a Solaris Flash archive, the archive and the installation media must contain identical OS versions. For example, if the archive is the Solaris 10 operating system and you are using DVD media, then you must use Solaris 10 DVD media to install the archive. If the OS versions do not match, the installation on the target system fails. Identical operating systems are necessary when you use the following keyword or command:

- `archive_location` keyword in a profile
- `luupgrade` command with `-s`, `-a`, `-j`, and `-J` options

---

1. **Install the Solaris Live Upgrade `SUNWlur` and `SUNWluu` packages on your system. These packages must be from the release you are upgrading to. For step-by-step procedures, see "To Install Solaris Live Upgrade With the `pkgadd` Command" on page 57.**

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 profile.**

   See "To Create a Profile to be Used by Solaris Live Upgrade" on page 96 for a list of upgrade keywords that can be used in a Solaris Live Upgrade profile.

4. **Type:**

```
# luupgrade -u -n BE_name -s os_image_path -j profile_path
```

`-u`	Upgrades an operating system image on a boot environment.
`-n` *BE_name*	Specifies the name of the boot environment that is to be upgraded.
`-s` *os_image_path*	Specifies the path name of a directory that contains an operating system image. This directory can be on an installation medium, such as a DVD-ROM, CD-ROM, or it can be an NFS or UFS directory.
`-j` *profile_path*	Path to a profile. The profile must be in a directory on the local machine. For information about creating a profile, see "To Create a Profile to be Used by Solaris Live Upgrade" on page 96.

The boot environment is ready to be activated.

Example 5–10 Upgrading a Boot Environment by Using a Custom JumpStart Profile (Command-Line Interface)

In this example, the `second_disk` boot environment is upgraded by using a profile. The `-j` option is used to access the profile. The boot environment is then ready to be activated. To create a profile, see "To Create a Profile to be Used by Solaris Live Upgrade" on page 96. The `pkgadd` command adds the Solaris Live Upgrade packages from the release you are upgrading to.

```
# pkgadd -d /server/packages SUNWlur SUNWluu
# luupgrade -u -n second_disk \
-s /net/installmachine/export/solarisX/OS_image \
-j /var/tmp/profile
```

Installing Solaris Flash Archives on a Boot Environment

This section provides the procedure for using Solaris Live Upgrade to install Solaris Flash archives. Installing a Solaris Flash archive overwrites all files on the new boot environment except for shared files. Archives are stored on the following media:

- HTTP server
- FTP server – Use this path from the command line only
- NFS server
- Local file
- Local tape
- Local device, including DVD or CD

Note the following issues with installing and creating a Solaris Flash archive.

Description	Example
Caution – When you install the Solaris OS with a Solaris Flash archive, the archive and the installation media must contain identical OS versions. If the OS versions do not match, the installation on the target system fails. Identical operating systems are necessary when you use the following keyword or command: ■ `archive_location` keyword in a profile ■ `luupgrade` command with `-s`, `-a`, `-j`, and `-J` options	For example, if the archive is the Solaris 10 operating system and you are using DVD media, then you must use Solaris 10 DVD media to install the archive.
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 feature. If you create a Solaris Flash archive in a non-global zone or create an archive in a global zone that has non-global zones installed, the resulting archive does not install properly when the archive is deployed.	

Description	For More Information
For examples of the correct syntax for paths that are associated with archive storage.	See "archive_location Keyword" in *Solaris 10 11/06 Installation Guide: Custom JumpStart and Advanced Installations*.
To use the Solaris Flash installation feature, you install a master system and create the Solaris Flash archive.	For more information about creating an archive, see Chapter 3, "Creating Solaris Flash Archives (Tasks)," in *Solaris 10 11/06 Installation Guide: Solaris Flash Archives (Creation and Installation)*.

▼ To Install a Solaris Flash Archive on a Boot Environment (Character User Interface)

1. **Install the Solaris Live Upgrade `SUNWlur` and `SUNWluu` packages on your system. These packages must be from the release you are upgrading to. For step-by-step procedures, see "To Install Solaris Live Upgrade With the `pkgadd` Command" on page 57.**

2. **From the Solaris Live Upgrade main menu, select Flash.**

   The Flash an Inactive Boot Environment menu is displayed.

3. **Type the name of the boot environment where you want to install the Solaris Flash archive and the location of the installation media:**

   ```
   Name of Boot Environment: Solaris_10
   Package media: /net/install-svr/export/Solaris_10/latest
   ```

4. **Press F1 to add an archive.**

   An Archive Selection submenu is displayed.

   ```
   Location            - Retrieval Method
   <No Archives added> - Select ADD to add archives
   ```

   This menu enables you to build a list of archives. To add or remove archives, proceed with the following steps.

   a. **To add an archive to the menu, press F1.**

      A Select Retrieval Method submenu is displayed.

      ```
      HTTP
      NFS
      Local File
      Local Tape
      Local Device
      ```

   b. **On the Select Retrieval Method menu, select the location of the Solaris Flash archive.**

Media Selected	Prompt
HTTP	Specify the URL and proxy information that is needed to access the Solaris Flash archive.
NFS	Specify the path to the network file system where the Solaris Flash archive is located. You can also specify the archive file name.
Local file	Specify the path to the local file system where the Solaris Flash archive is located.
Local tape	Specify the local tape device and the position on the tape where the Solaris Flash archive is located.
Local device	Specify the local device, the path to the Solaris Flash archive, and the type of file system on which the Solaris Flash archive is located.

A Retrieval submenu is displayed, similar to the following example, which depends on the media you selected.

```
NFS Location:
```

c. **Type the path to the archive, as in the following example.**

```
NFS Location: host:/path/to archive.flar
```

d. **Press F3 to add the archive to the list.**

e. **(Optional) To remove an archive from the menu, press F2.**

f. **When the list contains the archives that you want to install, press F6 to exit.**

5 **Press F3 to install one or more archives.**

The Solaris Flash archive is installed on the boot environment. All files on the boot environment are overwritten, except for shareable files.

The boot environment is ready for activation. See “To Activate a Boot Environment (Character User Interface)” on page 111.

▼ To Install a Solaris Flash Archive on a Boot Environment (Command-Line Interface)

1 **Install the Solaris Live Upgrade `SUNWlur` and `SUNWluu` packages on your system. These packages must be from the release you are upgrading to. For step-by-step procedures, see “To Install Solaris Live Upgrade With the `pkgadd` Command” on page 57.**

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 **Type:**

```
# luupgrade -f -n BE_name -s os_image_path -a archive
```

`-f`	Indicates to install an operating system from a Solaris Flash archive.
`-n` *BE_name*	Specifies the name of the boot environment that is to be installed with an archive.
`-s` *os_image_path*	Specifies the path name of a directory that contains an operating system image. This directory can be on an installation medium, such as a DVD-ROM, CD-ROM, or it can be an NFS or UFS directory.
`-a` *archive*	Path to the Solaris Flash archive when the archive is available on the local file system. The operating system image versions that are specified with the `-s` option and the `-a` option must be identical.

Example 5–11 Installing Solaris Flash Archives on a Boot Environment (Command-Line Interface)

In this example, an archive is installed on the `second_disk` boot environment. The archive is located on the local system. The operating system versions for the `-s` and `-a` options are both Solaris10 11/06 releases. All files are overwritten on `second_disk` except shareable files. The `pkgadd` command adds the Solaris Live upgrade packages from the release you are upgrading to.

```
# pkgadd -d /server/packages SUNWlur SUNWluu
# luupgrade -f -n second_disk \
-s /net/installmachine/export/Solaris_10/OS_image \
-a /net/server/archive/10
```

The boot environment is ready to be activated.

▼ To Install a Solaris Flash Archive With a Profile (Command-Line Interface)

This procedure provides the steps to install a Solaris Flash archive or differential archive by using a profile.

If you added locales to the profile, make sure that you have created a boot environment with additional disk space.

1 **Install the Solaris Live Upgrade `SUNWlur` and `SUNWluu` packages on your system. These packages must be from the release you are upgrading to. For step-by-step procedures, see "To Install Solaris Live Upgrade With the `pkgadd` Command" on page 57.**

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 profile.**

See "To Create a Profile to be Used by Solaris Live Upgrade" on page 96 for a list of keywords that can be used in a Solaris Live Upgrade profile.

4 **Type:**

```
# luupgrade -f -n BE_name -s os_image_path -j profile_path
```

`-f`	Indicates to install an operating system from a Solaris Flash archive.
`-n` *BE_name*	Specifies the name of the boot environment that is to be upgraded.
`-s` *os_image_path*	Specifies the path name of a directory that contains an operating system image. This directory can be on an installation medium, such as a DVD-ROM, CD-ROM, or it can be an NFS or UFS directory.
`-j` *profile_path*	Path to a JumpStart profile that is configured for a flash installation. The profile must be in a directory on the local machine. The `-s` option's operating system version and the Solaris Flash archive operating system version must be identical.

The boot environment is ready to be activated.

Example 5–12 Install a Solaris Flash archive on a Boot Environment With a Profile (Command-Line Interface)

In this example, a profile provides the location of the archive to be installed.

```
# profile keywords          profile values
# ----------------          -------------------
 install_type               flash_install
 archive_location           nfs installserver:/export/solaris/flasharchive/solarisarchive
```

After creating the profile, you can run the `luupgrade` command and install the archive. The `-j` option is used to access the profile. The `pkgadd` command adds the Solaris Live Upgrade packages from the release you are upgrading to.

```
# pkgadd -d /server/packages SUNWlur SUNWluu
# luupgrade -f -n second_disk \
-s /net/installmachine/export/solarisX/OS_image \
-j /var/tmp/profile
```

The boot environment is then ready to be activated. To create a profile, see "To Create a Profile to be Used by Solaris Live Upgrade" on page 96.

▼ To Install a Solaris Flash Archive With a Profile Keyword (Command-Line Interface)

This procedure enables you to install a Solaris Flash archive and use the `archive_location` keyword at the command line rather than from a profile file. You can quickly retrieve an archive without the use of a profile file.

1. **Install the Solaris Live Upgrade `SUNWlur` and `SUNWluu` packages on your system. These packages must be from the release you are upgrading to. For step-by-step procedures, see "To Install Solaris Live Upgrade With the `pkgadd` Command" on page 57.**

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. **Type:**

```
# luupgrade -f -n BE_name -s os_image_path -J 'archive_location path-to-profile'
```

`-f`	Specifies to upgrade an operating system from a Solaris Flash archive.
`-n` *BE_name*	Specifies the name of the boot environment that is to be upgraded.
`-s` *os_image_path*	Specifies the path name of a directory that contains an operating system image. This directory can be on an installation medium, such as a DVD-ROM, CD-ROM, or it can be an NFS or UFS directory.
`-J` 'archive_location *path-to-profile*'	Specifies the `archive_location` profile keyword and the path to the JumpStart profile. The `-s` option's operating system version and the Solaris Flash archive operating system version must be identical. For the keyword values, see "archive_location Keyword" in *Solaris 10 11/06 Installation Guide: Custom JumpStart and Advanced Installations*.

The boot environment is ready to be activated.

Example 5–13 Installing a Solaris Flash Archive By Using a Profile Keyword (Command-Line Interface)

In this example, an archive is installed on the `second_disk` boot environment. The `-J` option and the `archive_location` keywords are used to retrieve the archive. All files are overwritten on `second_disk` except shareable files. The `pkgadd` command adds the Solaris Live Upgrade packages from the release you are upgrading to.

```
# pkgadd -d /server/packages SUNWlur SUNWluu
# luupgrade -f -n second_disk \
-s /net/installmachine/export/solarisX/OS_image \
-J 'archive_location http://example.com/myflash.flar'
```

Activating a Boot Environment

Activating a boot environment makes it bootable on the next reboot of the system. You can also switch back quickly to the original boot environment if a failure occurs on booting the newly active boot environment. See Chapter 6.

Description	For More Information
Use this procedure to activate a boot environment and use a character user interface (CUI). **Note –** The first time you activate a boot environment, the Activate menu or the `luactivate` command must be used.	"To Activate a Boot Environment (Character User Interface)" on page 111
Use this procedure to activate a boot environment with the `luactivate` command. **Note –** The first time you activate a boot environment, the Activate menu or the `luactivate` command must be used.	"To Activate a Boot Environment (Command-Line Interface)" on page 112
Use this procedure to activate a boot environment and force a synchronization of files. **Note –** Files are synchronized with the first activation. If you switch boot environments after the first activation, files are not synchronized.	"To Activate a Boot Environment and Synchronize Files (Command-Line Interface)" on page 113
x86: Use this procedure to activate a boot environment with the GRUB menu. **Note –** A GRUB menu can facilitate switching from one boot environment to another. A boot environment appears in the GRUB menu after the first activation.	"x86: To Activate a Boot Environment With the GRUB Menu (Command-Line Interface)" on page 115

Requirements and Limitations for Activating a Boot Environment

To successfully activate a boot environment, that boot environment must meet the following conditions:

Description	For More Information
The boot environment must have a status of "complete."	To check status, see "Displaying the Status of All Boot Environments" on page 128.
If the boot environment is not the current boot environment, you cannot have mounted the partitions of that boot environment by using the `luumount` or `mount` commands.	To view man pages, see `lumount`(1M) or `mount`(1M).
The boot environment that you want to activate cannot be involved in a comparison operation.	For procedures, see "Comparing Boot Environments" on page 132.
If you want to reconfigure swap, make this change prior to booting the inactive boot environment. By default, all boot environments share the same swap devices.	To reconfigure swap, see one of the following procedures: ■ "To Create a Boot Environment and Reconfiguring Swap (Command-Line Interface)" on page 70 ■ "To Create a Boot Environment (Character User Interface," Step 9

---

x86 only – If you have an x86 based system, you can also activate with the GRUB menu. Note the following exceptions:

- If a boot environment was created with the **Solaris 8, 9, or 10 3/05 release**, the boot environment must always be activated with the `luactivate` command or the Activate menu. These older boot environments do not display on the GRUB menu.
- The first time you activate a boot environment, you must use the `luactivate` command or the Activate menu. The next time you boot, that boot environment's name is displayed in the GRUB main menu. You can thereafter switch to this boot environment by selecting the appropriate entry in the GRUB menu.

See "x86: Activating a Boot Environment With the GRUB Menu" on page 114.

▼ To Activate a Boot Environment (Character User Interface)

The first time you boot from a newly created boot environment, Solaris Live Upgrade software synchronizes the new boot environment with the boot environment that was last active. “Synchronize” means that certain critical system files and directories are copied from the last-active boot environment to the boot environment being booted. Solaris Live Upgrade does not perform this synchronization after this initial boot unless you request to do so when prompted to force a synchronization.

For more information about synchronization, see “Synchronizing Files Between Boot Environments” on page 49.

---

x86 only – If you have an x86 based system, you can also activate with the GRUB menu. Note the following exceptions:

- If a boot environment was created with the **Solaris 8, 9, or 10 3/05 release**, the boot environment must always be activated with the `luactivate` command or the Activate menu. These older boot environments do not display on the GRUB menu.
- The first time you activate a boot environment, you must use the `luactivate` command or the Activate menu. The next time you boot, that boot environment’s name is displayed in the GRUB main menu. You can thereafter switch to this boot environment by selecting the appropriate entry in the GRUB menu.

See “x86: Activating a Boot Environment With the GRUB Menu” on page 114.

---

1. **From the Solaris Live Upgrade main menu, select Activate.**

2. **Type the name of the boot environment to make active:**

```
Name of Boot Environment: Solaris_10
Do you want to force a Live Upgrade sync operations: no
```

3. **You can either continue or force a synchronization of files.**

   - Press Return to continue.

     The first time that the boot environment is booted, files are automatically synchronized.

   - You can force a synchronization of files, but use this feature with caution. Operating systems on each boot environment must be compatible with files that are being synchronized. To force a synchronization of files, type:

```
Do you want to force a Live Upgrade sync operations: yes
```

Caution – Use a forced synchronization with great care, because you might not be aware of or in control of changes that might have occurred in the last-active boot environment. For example, if you were running Solaris 10 11/06 software on your current boot environment and booted back to a Solaris 9 release with a forced synchronization, files could be changed on the Solaris 9 release. Because files are dependent on the release of the OS, the boot to the Solaris 9 release could fail because the Solaris 10 11/06 files might not be compatible with the Solaris 9 files.

---

4 **Press F3 to begin the activation process.**

5 **Press Return to continue.**

The new boot environment is activated at the next reboot.

6 **To activate the inactive boot environment, reboot:**

```
# init 6
```

▼ To Activate a Boot Environment (Command-Line Interface)

The following procedure switches a new boot environment to become the currently running boot environment.

---

x86 only – If you have an x86 based system, you can also activate with the GRUB menu. Note the following exceptions:

- If a boot environment was created with the **Solaris 8, 9, or 10 3/05 release**, the boot environment must always be activated with the `luactivate` command or the Activate menu. These older boot environments do not display on the GRUB menu.
- The first time you activate a boot environment, you must use the `luactivate` command or the Activate menu. The next time you boot, that boot environment's name is displayed in the GRUB main menu. You can thereafter switch to this boot environment by selecting the appropriate entry in the GRUB menu.

See "x86: Activating a Boot Environment With the GRUB Menu" on page 114.

---

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 activate the boot environment, type:**

```
# /sbin/luactivate   BE_name
```

BE_name	Specifies the name of the boot environment that is to be activated

3 **Reboot.**

```
# init 6
```

Caution – Use only the `init` or `shutdown` commands to reboot. If you use the `reboot`, `halt`, or `uadmin` commands, the system does not switch boot environments. The last-active boot environment is booted again.

Example 5–14 Activating a Boot Environment (Command-Line Interface)

In this example, the `second_disk` boot environment is activated at the next reboot.

```
# /sbin/luactivate second_disk
# init 6
```

▼ To Activate a Boot Environment and Synchronize Files (Command-Line Interface)

The first time you boot from a newly created boot environment, Solaris Live Upgrade software synchronizes the new boot environment with the boot environment that was last active. “Synchronize” means that certain critical system files and directories are copied from the last-active boot environment to the boot environment being booted. Solaris Live Upgrade does not perform this synchronization after the initial boot, unless you force synchronization with the `luactivate` command and the `-s` option.

---

x86 only – When you switch between boot environments with the GRUB menu, files also are not synchronized. You must use the following procedure to synchronize files.

For more information about synchronization, see “Synchronizing Files Between Boot Environments” on page 49.

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 activate the boot environment, type:**

```
# /sbin/luactivate  -s BE_name
```

`-s`	Forces a synchronization of files between the last-active boot environment and the new boot environment. The first time that a boot environment is activated, the files between the boot environment are synchronized With subsequent activations, the files are not synchronized unless you use the `-s` option.

Caution – Use this option with great care, because you might not be aware of or in control of changes that might have occurred in the last-active boot environment. For example, if you were running Solaris 10 11/06 software on your current boot environment and booted back to a Solaris 9 release with a forced synchronization, files could be changed on the Solaris 9 release. Because files are dependent on the release of the OS, the boot to the Solaris 9 release could fail because the Solaris 10 11/06 files might not be compatible with the Solaris 9 files.

BE_name	Specifies the name of the boot environment that is to be activated.

3 **Reboot.**

```
# init 6
```

Example 5–15 Activating a Boot Environment (Command-Line Interface)

In this example, the `second_disk` boot environment is activated at the next reboot and the files are synchronized.

```
# /sbin/luactivate -s second_disk
# init 6
```

x86: Activating a Boot Environment With the GRUB Menu

A GRUB menu provides an optional method of switching between boot environments. The GRUB menu is an alternative to activating (booting) with the `luactivate` command or the Activate menu. The table below notes cautions and limitations when using the GRUB menu.

TABLE 5–3 x86: Activating With the GRUB Menu Summary

Task	Description	For More Information
Caution	After you have activated a boot environment, do not change the disk order in the BIOS. Changing the order might cause the GRUB menu to become invalid. If this problem occurs, changing the disk order back to the original state fixes the GRUB menu.	
Activating a boot environment for the first time	The first time you activate a boot environment, you must use the `luactivate` command or the Activate menu. The next time you boot, that boot environment's name is displayed in the GRUB main menu. You can thereafter switch to this boot environment by selecting the appropriate entry in the GRUB menu.	"To Activate a Boot Environment (Command-Line Interface)" on page 112

TABLE 5–3 x86: Activating With the GRUB Menu Summary *(Continued)*

Task	Description	For More Information
Synchronizing files	The first time you activate a boot environment, files are synchronized between the current boot environment and the new boot environment. With subsequent activations, files are not synchronized. When you switch between boot environments with the GRUB menu, files also are not synchronized. You can force a synchronization when using the `luactivate` command with the `-s` option.	"To Activate a Boot Environment and Synchronize Files (Command-Line Interface)" on page 113
Boot environments created before the **Solaris 10 1/06 release**	If a boot environment was created with the **Solaris 8, 9, or 10 3/05 release**, the boot environment must always be activated with the `luactivate` command or the Activate menu. These older boot environments do not display on the GRUB menu.	"To Activate a Boot Environment (Command-Line Interface)" on page 112
Editing or customizing the GRUB menu entries	The `menu.lst` file contains the information that is displayed in the GRUB menu. You can revise this file for the following reasons: ■ To add to the GRUB menu entries for operating systems other than the Solaris OS. ■ To customize booting behavior. For example, you could change booting to verbose mode or change the default time that automatically boots the OS. **Note –** If you want to change the GRUB menu, you need to locate the `menu.lst` file. For step-by-step instructions, see "x86: Locating the GRUB Menu's `menu.lst` File (Tasks)" on page 143. **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, 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 could be lost.	■ "GRUB Based Booting (Overview)" in *Solaris 10 11/06 Installation Guide: Planning for Installation and Upgrade* ■ Chapter 11, "GRUB Based Booting (Tasks)," in *System Administration Guide: Basic Administration*

▼ x86: To Activate a Boot Environment With the GRUB Menu (Command-Line Interface)

You can switch between two boot environments with the GRUB menu. Note the following limitations:

- The first activation of a boot environment must be done with the `luactivate` command or the Activate menu. After the initial activation, the boot environment is displayed on the GRUB menu. The boot environment can then be booted from the GRUB menu.

- **Caution** - Switching to a boot environment with the GRUB menu bypasses synchronization. For more information about synchronizing files, see link "Forcing a Synchronization Between Boot Environments" on page 51.
- If a boot environment was created with the **Solaris 8, 9, or 10 3/05 release**, the boot environment must always be activated with the `luactivate` command or the Activate menu. These older boot environments are not displayed on 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 Reboot the system.

```
# init 6
```

The GRUB main menu is displayed. The two operating systems are listed, Solaris and `second_disk`, which is a Solaris Live Upgrade boot environment. The `failsafe` entries are for recovery, if for some reason the primary OS does not boot.

```
GNU GRUB version 0.95 (616K lower / 4127168K upper memory)
+-------------------------------------------------------------------+
|Solaris                                                            |
|Solaris  failsafe                                                  |
|second_disk                                                        |
|second_disk failsafe                                               |
+-------------------------------------------------------------------+
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.
```

3 To activate a boot environment, use the arrow key to select the desired boot environment and press Return.

The selected boot environment is booted and becomes the active boot environment.

◆ ◆ ◆

CHAPTER 6

Failure Recovery: Falling Back to the Original Boot Environment (Tasks)

This chapter explains how to recover from an activation failure.

If a failure is detected after upgrading or if the application is not compatible with an upgraded component, fall back to the original boot environment by using one of the following procedures, depending on your platform.

- **For SPARC based systems:**
  - "SPARC: To Fall Back Despite Successful New Boot Environment Activation" on page 118
  - "SPARC: To Fall Back From a Failed Boot Environment Activation" on page 118
  - "SPARC: To Fall Back to the Original Boot Environment by Using a DVD, CD, or Net Installation Image" on page 119
- **For x86 based systems:**
  - "x86: To Fall Back Despite Successful New Boot Environment Activation With the GRUB Menu" on page 120
  - "x86: To Fall Back From a Failed Boot Environment Activation With the GRUB Menu" on page 122
  - "x86: To Fall Back From a Failed Boot Environment Activation With the GRUB Menu and the DVD or CD" on page 124

SPARC: Falling Back to the Original Boot Environment (Command-Line Interface)

You can fallback to the original boot environment by using three methods:

- "SPARC: To Fall Back Despite Successful New Boot Environment Activation" on page 118
- "SPARC: To Fall Back From a Failed Boot Environment Activation" on page 118
- "SPARC: To Fall Back to the Original Boot Environment by Using a DVD, CD, or Net Installation Image" on page 119

▼ SPARC: To Fall Back Despite Successful New Boot Environment Activation

Use this procedure when you have successfully activated your new boot environment, but are unhappy with the results.

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. **Type:**

   ```
   # /sbin/luactivate BE_name
   ```

BE_name	Specifies the name of the boot environment to be activated

3. **Reboot.**

   ```
   # init 6
   ```

   The previous working boot environment becomes the active boot environment.

▼ SPARC: To Fall Back From a Failed Boot Environment Activation

- If you experience a failure while booting the new boot environment and can boot the original boot environment in single-user mode, use this procedure to fall back to the original boot environment.
- If you need to boot from media or a net installation image, see "SPARC: To Fall Back to the Original Boot Environment by Using a DVD, CD, or Net Installation Image" on page 119.

1. **At the OK prompt, boot the machine to single-user state from the Solaris Operating System DVD, Solaris Software - 1 CD, the network, or a local disk.**

   ```
   OK boot device_name -s
   ```

device_name	Specifies the name of devices from where the system can boot, for example `/dev/dsk/c0t0d0s0`

2. **Type:**

   ```
   # /sbin/luactivate BE_name
   ```

BE_name	Specifies the name of the boot environment to be activated

   - If this command fails to display a prompt, proceed to "SPARC: To Fall Back to the Original Boot Environment by Using a DVD, CD, or Net Installation Image" on page 119.
   - If the prompt is displayed, continue.

3 **At the prompt, type:**

```
Do you want to fallback to activate boot environment <disk name>
(yes or no)? yes
```

A message displays that the fallback activation is successful.

4 **Reboot.**

```
# init 6
```

The previous working boot environment becomes the active boot environment.

▼ SPARC: To Fall Back to the Original Boot Environment by Using a DVD, CD, or Net Installation Image

Use this procedure to boot from a DVD, CD, a net installation image or another disk that can be booted. You need to mount the root (`/`) slice from the last-active boot environment. Then run the `luactivate` command, which makes the switch. When you reboot, the last-active boot environment is up and running again.

1 **At the OK prompt, boot the machine to single-user state from the Solaris Operating System DVD, Solaris Software - 1 CD, the network, or a local disk:**

```
OK boot cdrom -s
```

or

```
OK boot net -s
```

or

```
OK boot device_name -s
```

device_name	Specifies the name of the disk and the slice where a copy of the operating system resides, for example `/dev/dsk/c0t0d0s0`

2 **If necessary, check the integrity of the root (`/`) file system for the fallback boot environment.**

```
# fsck device_name
```

device_name	Specifies the location of the root (`/`) file system on the disk device of the boot environment you want to fall back to. The device name is entered in the form of `/dev/dsk/c`*w*`t`*x*`d`*y*`s`*z*.

3 **Mount the active boot environment root (`/`) slice to some directory, such as `/mnt`:**

```
# mount device_name /mnt
```

device_name	Specifies the location of the root (`/`) file system on the disk device of the boot environment you want to fall back to. The device name is entered in the form of

/dev/dsk/c*w*t*x*d*y*s*z*.

4. **From the active boot environment root (`/`) slice, type:**

   ```
   # /mnt/sbin/luactivate
   ```

   `luactivate` activates the previous working boot environment and indicates the result.

5. **Unmount `/mnt`**

   ```
   # umount  /mnt
   ```

6. **Reboot.**

   ```
   # init 6
   ```

   The previous working boot environment becomes the active boot environment.

x86: Falling Back to the Original Boot Environment

To fall back to the original boot environment, choose the procedure the best fits your circumstances.

- "x86: To Fall Back Despite Successful New Boot Environment Activation With the GRUB Menu" on page 120
- "x86: To Fall Back From a Failed Boot Environment Activation With the GRUB Menu" on page 122
- "x86: To Fall Back From a Failed Boot Environment Activation With the GRUB Menu and the DVD or CD" on page 124

▼ x86: To Fall Back Despite Successful New Boot Environment Activation With the GRUB Menu

Use this procedure when you have successfully activated your new boot environment, but are dissatisfied with the results. You can quickly switch back to the original boot environment by using the GRUB menu.

Note – The boot environments that are being switched must be GRUB boot environments that were created with GRUB software. If a boot environment was created with the **Solaris 8, 9, or 10 3/05 release**, the boot environment is not a GRUB boot environment.

---

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 Reboot the system.

```
# init 6
```

The GRUB menu is displayed. The Solaris OS is the original boot environment. The `second_disk` boot environment was successfully activated and appears on the GRUB menu. The `failsafe` entries are for recovery if for some reason the primary entry does not boot.

```
GNU GRUB version 0.95 (616K lower / 4127168K upper memory)
+-------------------------------------------------------------------+
|Solaris                                                            |
|Solaris failsafe                                                   |
|second_disk                                                        |
|second_disk failsafe                                               |
+-------------------------------------------------------------------+
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.
```

3 To boot to the original boot environment, use the arrow key to select the original boot environment and press Return.

Example 6–1 To Fall Back Despite Successful New Boot Environment Activation

```
# su
# init 6

GNU GRUB version 0.95 (616K lower / 4127168K upper memory)
+-------------------------------------------------------------------+
|Solaris                                                            |
|Solaris  failsafe                                                  |
|second_disk                                                        |
|second_disk failsafe                                               |
+-------------------------------------------------------------------+
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.
```

Select the original boot environment, `Solaris`.

x86: To Fall Back From a Failed Boot Environment Activation With the GRUB Menu

If you experience a failure while booting, use the following procedure to fall back to the original boot environment. In this example, the GRUB menu is displayed correctly, but the new boot environment is not bootable. The device is `/dev/dsk/c0t4d0s0`. The original boot environment, `c0t4d0s0`, becomes the active boot environment.

Caution – **For the Solaris 10 3/05 release**, the recommended action to fall back if the previous boot environment and new boot environment were on different disks included changing the hard disk boot order in the BIOS. **Starting with the Solaris 10 1/06 release**, changing the BIOS disk order is unnecessary and is strongly discouraged. Changing the BIOS disk order might invalidate the GRUB menu and cause the boot environment to become unbootable. If the BIOS disk order is changed, reverting the order back to the original settings restores system functionality.

---

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 display the GRUB menu, reboot the system.**

   ```
   # init 6
   ```

   The GRUB menu is displayed.

   ```
   GNU GRUB version 0.95 (616K lower / 4127168K upper memory)
   +--------------------------------------------------------------------+
   |Solaris                                                             |
   |Solaris failsafe                                                    |
   |second_disk                                                         |
   |second_disk failsafe                                                |
   +--------------------------------------------------------------------+
   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.
   ```

3. **From the GRUB menu, select the original boot environment. The boot environment must have been created with GRUB software. A boot environment that was created before the Solaris 10 1/06 release is not a GRUB boot environment. If you do not have a bootable GRUB boot environment, then skip to this procedure, "x86: To Fall Back From a Failed Boot Environment Activation With the GRUB Menu and the DVD or CD" on page 124.**

4 **Boot to single user mode by editing the Grub menu.**

  a. **To edit the GRUB main menu, type e.**

  The GRUB edit menu is displayed.

```
root (hd0,2,a)
kernel /platform/i86pc/multiboot
module /platform/i86pc/boot_archive
```

  b. **Select the original boot environment's kernel entry by using the arrow keys.**

  c. **To edit the boot entry, type e.**

  The kernel entry is displayed in the GRUB edit menu.

```
grub edit>kernel /boot/multiboot
```

  d. **Type `-s` and press Enter.**

  The following example notes the placement of the `-s` option.

```
grub edit>kernel /boot/multiboot -s
```

  e. **To begin the booting process in single user mode, type b.**

5 **If necessary, check the integrity of the root (`/`) file system for the fallback boot environment.**

```
# fsck mount_ point
```

mount_point	A root (`/`) file system that is known and reliable

6 **Mount the original boot environment root slice to some directory (such as `/mnt`):**

```
# mount device_name /mnt
```

device_name	Specifies the location of the root (`/`) file system on the disk device of the boot environment you want to fall back to. The device name is entered in the form of `/dev/dsk/c`*w*`t`*x*`d`*y*`s`*z*.

7 **From the active boot environment root slice, type:**

```
# /mnt/sbin/luactivate
```

`luactivate` activates the previous working boot environment and indicates the result.

8 **Unmount `/mnt`.**

```
# umount /mnt
```

9 **Reboot.**

```
# init 6
```

The previous working boot environment becomes the active boot environment.

▼ x86: To Fall Back From a Failed Boot Environment Activation With the GRUB Menu and the DVD or CD

If you experience a failure while booting, use the following procedure to fall back to the original boot environment. In this example, the new boot environment was not bootable. Also, the GRUB menu does not display. The device is `/dev/dsk/c0t4d0s0`. The original boot environment, `c0t4d0s0`, becomes the active boot environment.

Caution – For the Solaris 10 3/05 release, the recommended action to fall back if the previous boot environment and new boot environment were on different disks included changing the hard disk boot order in the BIOS. **Starting with the Solaris 10 1/06 release**, changing the BIOS disk order is unnecessary and is strongly discouraged. Changing the BIOS disk order might invalidate the GRUB menu and cause the boot environment to become unbootable. If the BIOS disk order is changed, reverting the order back to the original settings restores system functionality.

---

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. **Insert the Solaris Operating System for x86 Platforms DVD or Solaris Software for x86 Platforms - 1 CD.**

3. **Boot from the DVD or CD.**

   ```
   # init 6
   ```

   The GRUB menu is displayed.

   ```
   GNU GRUB version 0.95 (616K lower / 4127168K upper memory)
   +-------------------------------------------------------------------+
   |Solaris                                                            |
   |Solaris failsafe                                                   |
   +-------------------------------------------------------------------+
   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.
   ```

4. **Boot to single user mode by editing the Grub menu.**

   a. **To edit the GRUB main menu, type e.**

      The GRUB edit menu is displayed.

      ```
      root (hd0,2,a)
      kernel /platform/i86pc/multiboot
      module /platform/i86pc/boot_archive
      ```

b. **Select the original boot environment's kernel entry by using the arrow keys.**

c. **To edit the boot entry, type e.**

   The kernel entry is displayed in an editor.

   ```
   grub edit>kernel /boot/multiboot
   ```

d. **Type `-s` and press Enter.**

   The following example notes the placement of the `-s` option.

   ```
   grub edit>kernel /boot/multiboot -s
   ```

e. **To begin the booting process in single user mode, type b.**

5 **If necessary, check the integrity of the root (`/`) file system for the fallback boot environment.**

```
# fsck mount_ point
```

mount_point	A root (`/`) file system that is known and reliable

6 **Mount the original boot environment root slice to some directory (such as `/mnt`):**

```
# mount device_name /mnt
```

device_name	Specifies the location of the root (`/`) file system on the disk device of the boot environment you want to fall back to. The device name is entered in the form of `/dev/dsk/c`*w*`t`*x*`d`*y*`s`*z*.

7 **From the active boot environment root slice, type:**

```
# /mnt/sbin/luactivate
Do you want to fallback to activate boot environment c0t4d0s0
(yes or no)? yes
```

`luactivate` activates the previous working boot environment and indicates the result.

8 **Unmount `/mnt`.**

```
# umount device_name
```

device_name	Specifies the location of the root (`/`) file system on the disk device of the boot environment you want to fall back to. The device name is entered in the form of `/dev/dsk/c`*w*`t`*x*`d`*y*`s`*z*.

9 **Reboot.**

```
# init 6
```

The previous working boot environment becomes the active boot environment.

◆ ◆ ◆

CHAPTER 7

Maintaining Solaris Live Upgrade Boot Environments (Tasks)

This chapter explains various maintenance tasks such as keeping a boot environment file system up to date or deleting a boot environment. This chapter contains the following sections:

- "Overview of Solaris Live Upgrade Maintenance" on page 127
- "Displaying the Status of All Boot Environments" on page 128
- "Updating a Previously Configured Boot Environment" on page 130
- "Canceling a Scheduled Create, Upgrade, or Copy Job" on page 131
- "Comparing Boot Environments" on page 132
- "Deleting an Inactive Boot Environment" on page 134
- "Displaying the Name of the Active Boot Environment" on page 135
- "Changing the Name of a Boot Environment" on page 136
- "Adding or Changing a Description Associated With a Boot Environment Name" on page 138
- "Viewing the Configuration of a Boot Environment" on page 141

Overview of Solaris Live Upgrade Maintenance

TABLE 7–1 Overview of Solaris Live Upgrade Maintenance

Task	Description	For Instructions
(Optional) View Status.	■ View whether a boot environment is active, being activated, scheduled to be activated, or in the midst of a comparison. ■ Compare the active and inactive boot environments. ■ Display the name of the active boot environment.	■ "Displaying the Status of All Boot Environments" on page 128 ■ "Comparing Boot Environments" on page 132 ■ "Displaying the Name of the Active Boot Environment" on page 135

TABLE 7–1 Overview of Solaris Live Upgrade Maintenance *(Continued)*

Task	Description	For Instructions
	■ View the configurations of a boot environment.	■ “Viewing the Configuration of a Boot Environment” on page 141
(Optional) Update an inactive boot environment.	Copy file systems from the active boot environment again without changing the configuration of file systems.	“Updating a Previously Configured Boot Environment” on page 130
(Optional) Other tasks.	■ Delete a boot environment. ■ Change the name of a boot environment. ■ Add or change a description that is associated with a boot environment name. ■ Cancel scheduled jobs.	■ “Deleting an Inactive Boot Environment” on page 134 ■ “Changing the Name of a Boot Environment” on page 136 ■ “Adding or Changing a Description Associated With a Boot Environment Name” on page 138 ■ “Canceling a Scheduled Create, Upgrade, or Copy Job” on page 131

Displaying the Status of All Boot Environments

Use the Status menu or the `lustatus` command to display the information about the boot environment. If no boot environment is specified, the status information for all boot environments on the system is displayed.

The following details for each boot environment are displayed:

- Name – Name of each boot environment.
- Complete – Indicates that no copy or create operations are in progress. Also, the boot environment can be booted. Any current activity or failure in a create or upgrade operation causes a boot environment to be incomplete. For example, if a copy operation is in process or scheduled for a boot environment, that boot environment is considered incomplete.
- Active – Indicates if this is the active boot environment.
- ActiveOnReboot – Indicates if the boot environment becomes active on next reboot of the system.
- CopyStatus – Indicates if the creation or copy of the boot environment is scheduled, active, or in the process of being upgraded. A status of `SCHEDULED` prevents you from performing live upgrade copy, rename, or upgrade operations.

▼ To Display the Status of All Boot Environments (Character User Interface)

◗ **From the main menu, select Status.**

A table that is similar to the following is displayed:

```
boot environment   Is        Active  Active     Can        Copy
Name               Complete  Now     OnReboot   Delete     Status
------------------------------------------------------------------------
disk_a_S9          yes       yes     yes        no         -
disk_b_S10database  yes       no      no         yes      COPYING
disk_b_S9a         no        no      no         yes        -
```

Note – In this example, you could not perform copy, rename, or upgrade operations on `disk_b_S9a` because it is not complete, nor on `disk_b_S10database`, because a live upgrade operation is in progress.

▼ To Display the Status of All Boot Environments (Command-Line Interface)

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. **Type:**

   ```
   # lustatus BE_name
   ```

BE_name	Specifies the name of the inactive boot environment to view status. If *BE_name* is omitted, `lustatus` displays status for all boot environments in the system.

   In this example, the status for all boot environments is displayed.

   ```
   # lustatus
   boot environment   Is        Active  Active     Can        Copy
   Name               Complete  Now     OnReboot   Delete     Status
   ------------------------------------------------------------------------
   disk_a_S9           yes       yes     yes        no         -
   disk_b_S10database   yes       no      no         yes      COPYING
   disk_b_S9a          no        no      no         yes        -
   ```

Note – You could not perform copy, rename, or upgrade operations on `disk_b_S9a` because it is not complete, nor on `disk_b_S10database` because a live upgrade operation is in progress.

Updating a Previously Configured Boot Environment

You can update the contents of a previously configured boot environment with the Copy menu or the `lumake` command. File Systems from the active (source) boot environment are copied to the target boot environment. The data on the target is also destroyed. A boot environment must have the status “complete” before you can copy from it. See “Displaying the Status of All Boot Environments” on page 128 to determine a boot environment’s status.

The copy job can be scheduled for a later time, and only one job can be scheduled at a time. To cancel a scheduled copy, see “Canceling a Scheduled Create, Upgrade, or Copy Job” on page 131.

▼ To Update a Previously Configured Boot Environment (Character User Interface)

1. **From the main menu, select Copy.**

2. **Type the name of the inactive boot environment to update:**

   ```
   Name of Target Boot Environment: solaris8
   ```

3. **Continue or schedule the copy to occur later:**

   - To continue with the copy, press Return.

     The inactive boot environment is updated.

   - To schedule the copy for later, type **y**, a time (by using the `at` command format), and the email address to which to send the results:

     ```
     Do you want to schedule the copy? y
     Enter the time in 'at' format to schedule copy: 8:15 PM
     Enter the address to which the copy log should be mailed:
     someone@anywhere.com
     ```

     For information about time formats, see the `at(1)` man page.

     The inactive boot environment is updated.

     To cancel a scheduled copy, see “Canceling a Scheduled Create, Upgrade, or Copy Job” on page 131.

▼ To Update a Previously Configured Boot Environment (Command-Line Interface)

This procedure copies source files over outdated files on a boot environment that was previously created.

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. **Type:**

```
# lumake -n  BE_name [-s source_BE] [-t  time] [-m email_address]
```

`-n` *BE_name*	Specifies the name of the boot environment that has file systems that are to be replaced.
`-s` *source_BE*	(Optional) Specifies the name of the source boot environment that contains the file systems to be copied to the target boot environment. If you omit this option, `lumake` uses the current boot environment as the source.
`-t` *time*	(Optional) Set up a batch job to copy over file systems on a specified boot environment at a specified time. The time is given in the format that is specified by the man page, `at(1)`.
`-m` *email_address*	(Optional) Enables you to send an email of the `lumake` output to a specified address on command completion. *email_address* is not checked. You can use this option only in conjunction with `-t`.

Example 7–1 Updating a Previously Configured Boot Environment (Command-Line Interface)

In this example, file systems from `first_disk` are copied to `second_disk`. When the job is completed, an email is sent to Joe at `anywhere.com`.

```
# lumake -n  second_disk -s first_disk -m joe@anywhere.com
```

The files on `first_disk` are copied to `second_disk` and email is sent for notification. To cancel a scheduled copy, see “Canceling a Scheduled Create, Upgrade, or Copy Job” on page 131.

Canceling a Scheduled Create, Upgrade, or Copy Job

A boot environment’s scheduled creation, upgrade, or copy job can be canceled just prior to the time the job starts. A job can be scheduled for a specific time either in the GUI with the Create a Boot

Environment, Upgrade a Boot Environment, or Copy a Boot Environment menus. In the CLI, the job can be scheduled by the `lumake` command. At any time, only one job can be scheduled on a system.

▼ To Cancel a Scheduled Create, Upgrade, or Copy Job (Character User Interface)

1. **From the main menu, select Cancel.**

2. **To view a list of boot environments that is available for canceling, press F2.**

3. **Select the boot environment to cancel.**

   The job no longer executes at the time specified.

▼ To Cancel a Scheduled Create, Upgrade, or Copy Job (Command-Line Interface)

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. **Type:**

   ```
   # lucancel
   ```

   The job no longer executes at the time that is specified.

Comparing Boot Environments

Use the Compare menu or `lucompare` to check for differences between the active boot environment and other boot environments. To make a comparison, the inactive boot environment must be in a complete state and cannot have a copy job that is pending. See "Displaying the Status of All Boot Environments" on page 128.

The specified boot environment cannot have any partitions that are mounted with `lumount` or `mount`.

▼ To Compare Boot Environments (Character User Interface)

1 **From the main menu, select Compare.**

2 **Select either Compare to Original or Compare to an Active Boot Environment.**

3 **Press F3.**

4 **Type the names of the original (active) boot environment, the inactive boot environment, and the path to a file:**

```
Name of Parent: solaris8
Name of Child: solaris8-1
Full Pathname of the file to Store Output: /tmp/compare
```

5 **To save to the file, press F3.**

The Compare menu displays the following file attributes:

- Mode.
- Number of links.
- Owner.
- Group.
- Checksum – Computes checksums only if the file in the specified boot environment matches its counterpart on the active boot environment in all of the fields that are described previously. If everything matches but the checksums differ, the differing checksums are appended to the entries for the compared files.
- Size.
- Existence of files in only one boot environment.

6 **To return to the Compare menu, press F3.**

▼ To Compare Boot Environments (Command-Line Interface)

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 **Type:**

```
# /usr/sbin/lucompare -i  infile (or) -t -o  outfile BE_name
```

`-i` *infile*	Compare files that are listed in *infile*. The files to be compared should have absolute file names. If the entry in the file is a directory, then comparison is recursive to the directory. Use either this option or `-t`, not both.
`-t`	Compare only nonbinary files. This comparison uses the `file`(1) command on each file to determine if the file is a text file. Use either this option or `-i`, not both.
`-o` *outfile*	Redirect the output of differences to *outfile*.
BE_name	Specifies the name of the boot environment that is compared to the active boot environment.

Example 7–2 Comparing Boot Environments (Command-Line Interface)

In this example, `first_disk` boot environment (source) is compared to `second_disk` boot environment and the results are sent to a file.

```
# /usr/sbin/lucompare -i  /etc/lu/compare/ \
-o /var/tmp/compare.out second_disk
```

Deleting an Inactive Boot Environment

Use either the Delete menu or the `ludelete` command to remove a boot environment. Note the following limitations.

- You cannot delete the active boot environment or the boot environment that is activated on the next reboot.
- The boot environment to be deleted must be complete. A complete boot environment is not participating in an operation that will change its status. Use “Displaying the Status of All Boot Environments” on page 128 to determine a boot environment’s status.
- You cannot delete a boot environment that has file systems mounted with `lumount`.
- x86 only: **Starting with the Solaris 10 1/06 release**, you cannot delete a boot environment that contains the active GRUB menu. Use the `lumake` or `luupgrade` commands to reuse the boot environment. To determine which boot environment contains the active GRUB menu, see “x86: Locating the GRUB Menu’s `menu.lst` File (Tasks)” on page 143.

▼ To Delete an Inactive Boot Environment (Character User Interface)

1 **From the main menu, select Delete.**

2 **Type the name of the inactive boot environment you want to delete:**

```
Name of boot environment: solaris8
```

The inactive boot environment is deleted.

▼ To Delete an Inactive Boot Environment (Command-Line Interface)

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 **Type:**

```
# ludelete BE_name
```

BE_name	Specifies the name of the inactive boot environment that is to be deleted

Example 7–3 Deleting an Inactive Boot Environment (Command-Line Interface)

In this example, the boot environment, `second_disk`, is deleted.

```
# ludelete second_disk
```

Displaying the Name of the Active Boot Environment

Use the Current menu or the `lucurr` command to display the name of the currently running boot environment. If no boot environments are configured on the system, the message "No Boot Environments are defined" is displayed. Note that `lucurr` reports only the name of the current boot environment, not the boot environment that is active on the next reboot. See "Displaying the Status of All Boot Environments" on page 128 to determine a boot environment's status.

▼ To Display the Name of the Active Boot Environment (Character User Interface)

◗ **From the main menu, select Current.**

The active boot environment's name or the message "No Boot Environments are defined" is displayed.

▼ To Display the Name of the Active Boot Environment (Command-Line Interface)

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. **Type:**

   ```
   # /usr/sbin/lucurr
   ```

Example 7–4 Displaying the Name of the Active Boot Environment (Command-Line Interface)

In this example, the name of the current boot environment is displayed.

```
# /usr/sbin/lucurr
solaris8
```

Changing the Name of a Boot Environment

Renaming a boot environment is often useful when you upgrade the boot environment from one Solaris release to another release. For example, following an operating system upgrade, you might rename the boot environment `solaris8` to `solaris10`.

Use the Rename menu or `lurename` command to change the inactive boot environment's name.

---

x86 only – Starting with the Solaris 10 1/06 release, the GRUB menu is automatically updated when you use the Rename menu or `lurename` command. The updated GRUB menu displays the boot environment's name in the list of boot entries. For more information about the GRUB menu, see "x86: Activating a Boot Environment With the GRUB Menu" on page 51.

To determine the location of the GRUB menu's `menu.lst` file, see "x86: Locating the GRUB Menu's `menu.lst` File (Tasks)" on page 143.

TABLE 7–2 Limitations for Naming a Boot Environment

Limitation	For Instructions
The name must not exceed 30 characters in length.	
The name can consist only of alphanumeric characters and other ASCII characters that are not special to the UNIX shell.	See the "Quoting" section of `sh`(1).
The name can contain only single-byte, 8-bit characters.	
The name must be unique on the system.	
A boot environment must have the status "complete" before you rename it.	See "Displaying the Status of All Boot Environments" on page 128 to determine a boot environment's status.
You cannot rename a boot environment that has file systems mounted with `lumount` or `mount`.	

▼ To Change the Name of an Inactive Boot Environment (Character User Interface)

1. **From the main menu, select Rename.**
2. **Type the boot environment to rename and then the new name.**
3. **To save your changes, press F3.**

▼ To Change the Name of an Inactive Boot Environment (Command-Line Interface)

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 **Type:**

```
# lurename -e  BE_name -n  new_name
```

`-e` *BE_name*	Specifies the inactive boot environment name to be changed
`-n` *new_name*	Specifies the new name of the inactive boot environment

In this example, `second_disk` is renamed to `third_disk`.

```
# lurename -e  second_disk  -n  third_disk
```

Adding or Changing a Description Associated With a Boot Environment Name

You can associate a description with a boot environment name. The description never replaces the name. Although a boot environment name is restricted in length and characters, the description can be of any length and of any content. The description can be simple text or as complex as a `gif` file. You can create this description at these times:

- When you create a boot environment with the `lucreate` command and use the `-A` option
- After the boot environment has been created by using the `ludesc` command

For more information about using the `-A` option with `lucreate`	"To Create a Boot Environment for the First Time (Command-Line Interface)" on page 64
For more information about creating the description after the boot environment has been created	`ludesc`(1M)

▼ To Add or Change a Description for a Boot Environment Name With Text

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 **Type:**

```
# /usr/sbin/ludesc -n  BE_name 'BE_description'
```

`-n` *BE_name* '*BE_description*'	Specifies the boot environment name and the new description to be associated with the name

Example 7–5 Adding a Description to a Boot Environment Name With Text

In this example, a boot environment description is added to a boot environment that is named `second_disk`. The description is text that is enclosed in single quotes.

```
# /usr/sbin/ludesc -n second_disk 'Solaris 10 11/06 test build'
```

▼ To Add or Change a Description for a Boot Environment Name With a File

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. **Type:**

   ```
   # /usr/sbin/ludesc -n BE_name -f file_name
   ```

`-n` *BE_name*	Specifies the boot environment name
file_name	Specifies the file to be associated with a boot environment name

Example 7–6 Adding a Description to a Boot Environment Name With a File

In this example, a boot environment description is added to a boot environment that is named `second_disk`. The description is contained in a `gif` file.

```
# /usr/sbin/ludesc -n second_disk -f rose.gif
```

▼ To Determine a Boot Environment Name From a Text Description

The following command returns the name of the boot environment associated with the specified description.

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. **Type:**

   ```
   # /usr/sbin/ludesc -A 'BE_description'
   ```

`-A` '*BE_description*'	Specifies the description to be associated with the boot environment name.

Example 7–7 Determining a Boot Environment Name From a Description

In this example, the name of the boot environment, `second_disk`, is determined by using the `-A` option with the description.

```
# /usr/sbin/ludesc -A  'Solaris 10 11/06 test build'
 second_disk
```

▼ To Determine a Boot Environment Name From a Description in a File

The following command displays the boot environment's name that is associated with a file. The file contains the description of the boot environment.

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. **Type:**

   ```
   # /usr/sbin/ludesc -f  file_name
   ```

`-f` *file_name*	Specifies the name of the file that contains the description of the boot environment.

Example 7–8 Determining a Boot Environment Name From a Description in a File

In this example, the name of the boot environment, `second_disk`, is determined by using the `-f` option and the name of the file that contains the description.

```
# /usr/sbin/ludesc -f rose.gif
second_disk
```

▼ To Determine a Boot Environment Description From a Name

This procedure displays the description of the boot environment that is named in the command.

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 **Type:**

```
# /usr/sbin/ludesc -n BE_name
```

`-n` *BE_name*	Specifies the boot environment name.

Example 7–9 Determining a Boot Environment Description From a Name

In this example, the description is determined by using the `-n` option with the boot environment name.

```
# /usr/sbin/ludesc -n  second_disk
Solaris 10 11/06 test build
```

Viewing the Configuration of a Boot Environment

Use the List menu or the `lufslist` command to list the configuration of a boot environment. The output contains the disk slice (file system), file system type, and file system size for each boot environment mount point.

▼ To View the Configuration of Each Inactive Boot Environment (Character User Interface)

1 **From the main menu, select List.**

2 **To view the status of a boot environment, type the name.**

```
Name of Boot Environment: solaris8
```

3 **Press F3.**

The following example displays a list.

```
Filesystem                fstype       size(Mb) Mounted on
------------------------------------------------------------------
/dev/dsk/c0t0d0s1         swap           512.11 -
/dev/dsk/c0t4d0s3         ufs           3738.29 /
/dev/dsk/c0t4d0s4         ufs            510.24 /opt
```

4 **To return to the List menu, press F6.**

▼ To View the Configuration of a Boot Environment (Command-Line Interface)

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 **Type:**

```
# lufslist -n BE_name
```

BE_name	Specifies the name of the boot environment to view file system specifics

The following example displays a list.

```
Filesystem                fstype       size(Mb) Mounted on
------------------------------------------------------------------
/dev/dsk/c0t0d0s1         swap           512.11 -
/dev/dsk/c0t4d0s3         ufs           3738.29 /
/dev/dsk/c0t4d0s4         ufs            510.24 /opt
```

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CHAPTER 8

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

This chapter describes updating the GRUB `menu.lst` file if you want to manually update the file. 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. This chapter provides several examples for finding the `menu.lst` file.

For background information on GRUB based booting, see Chapter 6, "GRUB Based Booting for Solaris Installation," in *Solaris 10 11/06 Installation Guide: Planning for Installation and Upgrade*.

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

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.

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 "Partitioning Recommendations" in *Solaris 10 11/06 Installation Guide: Planning for Installation and Upgrade*.

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`.

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CHAPTER 9

Solaris Live Upgrade (Examples)

This chapter provides examples of creating a boot environment, then upgrading and activating the new boot environment which then becomes the currently running system. This chapter contains the following sections:

- "Example of Upgrading With Solaris Live Upgrade (Command-Line Interface)" on page 147
- "Example of Detaching and Upgrading One Side of a RAID-1 Volume (Mirror) (Command-Line Interface)" on page 154
- "Example of Migrating From an Existing Volume to a Solaris Volume Manager RAID-1 Volume (Command-Line Interface)" on page 158
- "Example of Creating an Empty Boot Environment and Installing a Solaris Flash Archive (Command-Line Interface)" on page 158
- "Example of Upgrading Using Solaris Live Upgrade (Character User Interface)" on page 160

Example of Upgrading With Solaris Live Upgrade (Command-Line Interface)

In this example, a new boot environment is created by using the `lucreate` command on a system that is running the Solaris 9 release. The new boot environment is upgraded to the Solaris 10 11/06 release by using the `luupgrade` command. The upgraded boot environment is activated by using the `luactivate` command. An example of falling back to the original boot environment is also given.

To Install Required Patches

Description	For More Information

Caution – Correct operation of Solaris Live Upgrade requires that a limited set of patch revisions be installed for a particular OS version. Before installing or running Solaris Live Upgrade, you are required to install these patches.
x86 only – Starting with the Solaris 10 1/06 release, if this set of patches is not installed, Solaris Live Upgrade fails and you might see the following error message. If you don't see the following error message, necessary patches still might not be installed. Always verify that all patches listed on the SunSolve info doc have been installed before attempting to install Solaris Live Upgrade.
`ERROR: Cannot find or is not executable: </sbin/biosdev>.`
`ERROR: One or more patches required by Live Upgrade has not been installed.`
The patches listed in info doc 72099 are subject to change at any time. These patches potentially fix defects in Solaris Live Upgrade, as well as fix defects in components that Solaris Live Upgrade depends on. If you experience any difficulties with Solaris Live Upgrade, please check and make sure that you have the latest Solaris Live Upgrade patches installed.
	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.

If you are running the Solaris 8 or Solaris 9 OS, you might not be able to run the Solaris Live Upgrade installer. These releases do not contain the set of patches needed to run the Java 2 runtime environment. You must have the recommended patch cluster for the Java 2 runtime environment that is recommended to run the Solaris Live Upgrade installer and install the packages.	To install the Solaris Live Upgrade packages, use the `pkgadd` command. Or install, for the Java 2 runtime environment, the recommended patch cluster. The patch cluster is available at http://sunsolve.sun.com.

Follow these steps to install the required patches.

From the SunSolve web site, obtain the list of patches.

```
# patchadd /net/server/export/patches
# init 6
```

To Install Solaris Live Upgrade on the Active Boot Environment

---

Note – This procedure assumes that the system is running *Volume Manager*. For detailed information about managing removable media with the Volume Manager, refer to *System Administration Guide: Devices and File Systems*.

---

1. Insert the Solaris Operating System DVD or Solaris Software - 2 CD.
2. Follow the step for the media you are using.
   - If you are using the Solaris Operating System DVD, change the directory to the installer and run the installer.
     - **For SPARC based systems**:

       ```
       # cd /cdrom/cdrom0/s0/Solaris_10/Tools/Installers
       # ./liveupgrade20
       ```
     - **For x86 based systems**:

       ```
       # cd /cdrom/cdrom0/Solaris_10/Tools/Installers
       # ./liveupgrade20
       ```

     The Solaris installation program GUI is displayed.
   - If you are using the Solaris Software - 2 CD, run the installer.

     ```
     % ./installer
     ```

     The Solaris installation program GUI is displayed.
3. From the Select Type of Install panel, click Custom.
4. On the Locale Selection panel, click the language to be installed.
5. Choose the software to install.
   - For DVD, on the Component Selection panel, click Next to install the packages.
   - For CD, on the Product Selection panel, click Default Install for Solaris Live Upgrade and click the other product choices to deselect this software.
6. Follow the directions on the Solaris installation program panels to install the software.

To Create a Boot Environment

The source boot environment is named `c0t4d0s0` by using the `-c` option. Naming the source boot environment is required only when the first boot environment is created. For more information about naming using the `-c` option, see the description in “To Create a Boot Environment for the First Time” Step 2.

The new boot environment is named `c0t15d0s0`. The `-A` option creates a description that is associated with the boot environment name.

The root (`/`) file system is copied to the new boot environment. Also, a new swap slice is created rather than sharing the source boot environment's swap slice.

```
# lucreate -A 'BE_description' -c /dev/dsk/c0t4d0s0 -m /:/dev/dsk/c0t15d0s0:ufs\
-m -:/dev/dsk/c0t15d0s1:swap -n /dev/dsk/c0t15d0s0
```

To Upgrade the Inactive Boot Environment

The inactive boot environment is named `c0t15d0s0`. The operating system image to be used for the upgrade is taken from the network.

```
# luupgrade -n c0t15d0s0 -u -s /net/ins-svr/export/Solaris_10 \
combined.solaris_wos
```

To Check if Boot Environment Is Bootable

The `lustatus` command reports if the boot environment creation is complete. `lustatus` also shows if the boot environment is bootable.

```
# lustatus
boot environment   Is        Active  Active     Can        Copy
Name               Complete  Now     OnReboot   Delete     Status
------------------------------------------------------------------------
c0t4d0s0           yes       yes      yes      no      -
c0t15d0s0          yes       no       no       yes     -
```

To Activate the Inactive Boot Environment

The `c0t15d0s0` boot environment is made bootable with the `luactivate` command. The system is then rebooted and `c0t15d0s0` becomes the active boot environment. The `c0t4d0s0` boot environment is now inactive.

```
# luactivate c0t15d0s0
# init 6
```

(Optional) To Fall Back to the Source Boot Environment

The following procedures for falling back depend on your new boot environment activation situation:

- For SPARC based systems:
  - The activation is successful, but you want to return to the original boot environment. See Example 9–1.
  - The activation fails and you can boot back to the original boot environment. See Example 9–2.
  - The activation fails and you must boot back to the original boot environment by using media or a net installation image. See Example 9–3.
- For x86 based systems, **starting with the Solaris 10 1/06 release** and when you use the GRUB menu:
  - The activation fails, the GRUB menu is displayed correctly, but the new boot environment is not bootable. See Example 9–4
  - The activation fails and the GRUB menu does not display. See Example 9–5.

EXAMPLE 9–1 SPARC: To Fall Back Despite Successful Boot Environment Creation

In this example, the original `c0t4d0s0` boot environment is reinstated as the active boot environment although it was activated successfully. The device name is `first_disk`.

```
# /sbin/luactivate first_disk
# init 6
```

EXAMPLE 9–2 SPARC: To Fall Back From a Failed Boot Environment Activation

In this example, the new boot environment was not bootable. You must return to the OK prompt before booting from the original boot environment, `c0t4d0s0`, in single-user mode.

```
OK boot net -s
# /sbin/luactivate first_disk
Do you want to fallback to activate boot environment c0t4d0s0
(yes or no)? yes
# init 6
```

The original boot environment, `c0t4d0s0`, becomes the active boot environment.

EXAMPLE 9–3 SPARC: To Fall Back to the Original Boot Environment by Using a DVD, CD, or Net Installation Image

In this example, the new boot environment was not bootable. You cannot boot from the original boot environment and must use media or a net installation image. The device is `/dev/dsk/c0t4d0s0`. The original boot environment, `c0t4d0s0`, becomes the active boot environment.

```
OK boot net -s
# fsck /dev/dsk/c0t4d0s0
# mount /dev/dsk/c0t4d0s0 /mnt
# /mnt/sbin/luactivate
Do you want to fallback to activate boot environment c0t4d0s0
(yes or no)? yes
# umount /mnt
# init 6
```

EXAMPLE 9–4 x86: To Fall Back to the Original Boot Environment By Using the GRUB Menu

Starting with the Solaris 10 1/06 release, the following example provides the steps to fall back by using the GRUB menu.

In this example, the GRUB menu is displayed correctly, but the new boot environment is not bootable. To enable a fallback, the original boot environment is booted in single-user mode.

1. Become superuser or assume an equivalent role.
2. To display the GRUB menu, reboot the system.

   ```
   # init 6
   ```

   The GRUB menu is displayed.

   ```
   GNU GRUB version 0.95 (616K lower / 4127168K upper memory)
   +-------------------------------------------------------------------+
   |Solaris                                                            |
   |Solaris failsafe                                                   |
   |second_disk                                                        |
   |second_disk failsafe                                               |
   +-------------------------------------------------------------------+
   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.
   ```
3. From the GRUB menu, select the original boot environment. The boot environment must have been created with GRUB software. A boot environment that was created before the **Solaris 10 1/06 release** is not a GRUB boot environment. If you do not have a bootable GRUB boot environment, then skip to Example 9–5.
4. Edit the GRUB menu by typing: **`e`**.

EXAMPLE 9–4 x86: To Fall Back to the Original Boot Environment By Using the GRUB Menu *(Continued)*

5. Select `kernel /boot/multiboot` by using the arrow keys and type **e**. The grub edit menu is displayed.

   ```
   grub edit>kernel /boot/multiboot
   ```

6. Boot to single user mode, by typing **`-s`**.

   ```
   grub edit>kernel /boot/multiboot -s
   ```

7. Boot and mount the boot environment. Then activate it.

```
# b
# fsck /dev/dsk/c0t4d0s0
# mount /dev/dsk/c0t4d0s0 /mnt
# /mnt/sbin/luactivate
Do you want to fallback to activate boot environment c0t4d0s0
(yes or no)? yes
# umount /mnt
# init 6
```

EXAMPLE 9–5 x86: To Fall Back to the Original Boot Environment With the GRUB Menu by Using the DVD or CD

Starting with the Solaris 10 1/06 release, the following example provides the steps to fall back by using the DVD or CD.

In this example, the new boot environment was not bootable. Also, the GRUB menu does not display. To enable a fallback, the original boot environment is booted in single-user mode.

1. Insert the Solaris Operating System for x86 Platforms DVD or Solaris Software for x86 Platforms - 1 CD.
2. Become superuser or assume an equivalent role.
3. Boot from the DVD or CD.

   ```
   # init 6
   ```

   The GRUB menu is displayed.

   ```
   GNU GRUB version 0.95 (616K lower / 4127168K upper memory)
   +-------------------------------------------------------------------+
   |Solaris                                                            |
   |Solaris failsafe                                                   |
   +-------------------------------------------------------------------+
   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.
   ```

EXAMPLE 9–5 x86: To Fall Back to the Original Boot Environment With the GRUB Menu by Using the DVD or CD *(Continued)*

4. Edit the GRUB menu by typing: **e**.
5. Select `kernel /boot/multiboot` by using the arrow keys and type **e**. The grub edit menu is displayed.

   ```
   grub edit>kernel /boot/multiboot
   ```
6. Boot to single user mode, by typing **-s**.

   ```
   grub edit>kernel /boot/multiboot -s
   ```
7. Boot and mount the boot environment. Then activate and reboot.

```
Edit the GRUB menu by typing: e
Select the original boot environment by using the arrow keys.
grub edit>kernel /boot/multiboot -s
# b
# fsck /dev/dsk/c0t4d0s0
# mount /dev/dsk/c0t4d0s0 /mnt
# /mnt/sbin/luactivate
Do you want to fallback to activate boot environment c0t4d0s0
(yes or no)? yes
# umount /mnt
# init 6
```

Example of Detaching and Upgrading One Side of a RAID-1 Volume (Mirror) (Command-Line Interface)

This example shows you how to do the following tasks:

- Create a RAID-1 volume (mirror) on a new boot environment
- Break the mirror and upgrade one half of the mirror
- Attach the other half of the mirror, the concatenation, to the new mirror

Figure 9–1 shows the current boot environment, which contains three physical disks.

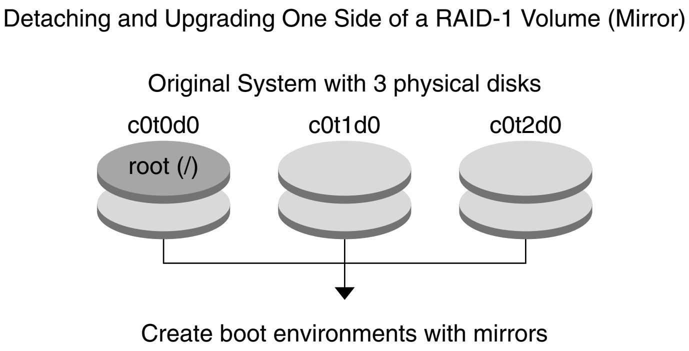

Detaching and Upgrading One Side of a RAID-1 Volume (Mirror)
Original System with 3 physical disks
c0t0d0
c0t1d0
c0t2d0
root (/)
Create boot environments with mirrors

FIGURE 9–1 Detaching and Upgrading One Side of a RAID-1 Volume (Mirror)

1. Create a new boot environment, `second_disk`, that contains a mirror.

   The following command performs these tasks.

   - `lucreate` configures a UFS file system for the mount point root (`/`). A mirror, `d10`, is created. This mirror is the receptacle for the current boot environment's root (`/`) file system, which is copied to the mirror `d10`. All data on the mirror `d10` is overwritten.
   - Two slices, `c0t1d0s0` and `c0t2d0s0`, are specified to be used as submirrors. These two submirrors are attached to mirror `d10`.

   ```
   # lucreate -c first_disk -n second_disk \
   -m /:/dev/md/dsk/d10:ufs,mirror \
   -m /:/dev/dsk/c0t1d0s0:attach \
   -m /:/dev/dsk/c0t2d0s0:attach
   ```

2. Activate the `second_disk` boot environment.

   ```
   # /sbin/luactivate second_disk
   # init 6
   ```

3. Create another boot environment, `third_disk`.

   The following command performs these tasks.

   - `lucreate` configures a UFS file system for the mount point root (`/`). A mirror, `d20`, is created.
   - Slice `c0t1d0s0` is removed from its current mirror and is added to mirror `d20`. The contents of the submirror, the root (`/`) file system, are preserved and no copy occurs.

   ```
   # lucreate -n third_disk \
   -m /:/dev/md/dsk/d20:ufs,mirror \
   -m /:/dev/dsk/c0t1d0s0:detach,attach,preserve
   ```

4. Upgrade the new boot environment, `third_disk`

   ```
   # luupgrade -u -n third_disk \
   -s /net/installmachine/export/Solaris_10/OS_image
   ```

5. Add a patch to the upgraded boot environment.

```
# luupgrade -t n third_disk -s /net/patches 222222-01
```

6. Activate the `third_disk` boot environment to make this boot environment the currently running system.

   ```
   # /sbin/luactivate third_disk
   # init 6
   ```

7. Delete the boot environment `second_disk`.

   ```
   # ludelete second_disk
   ```

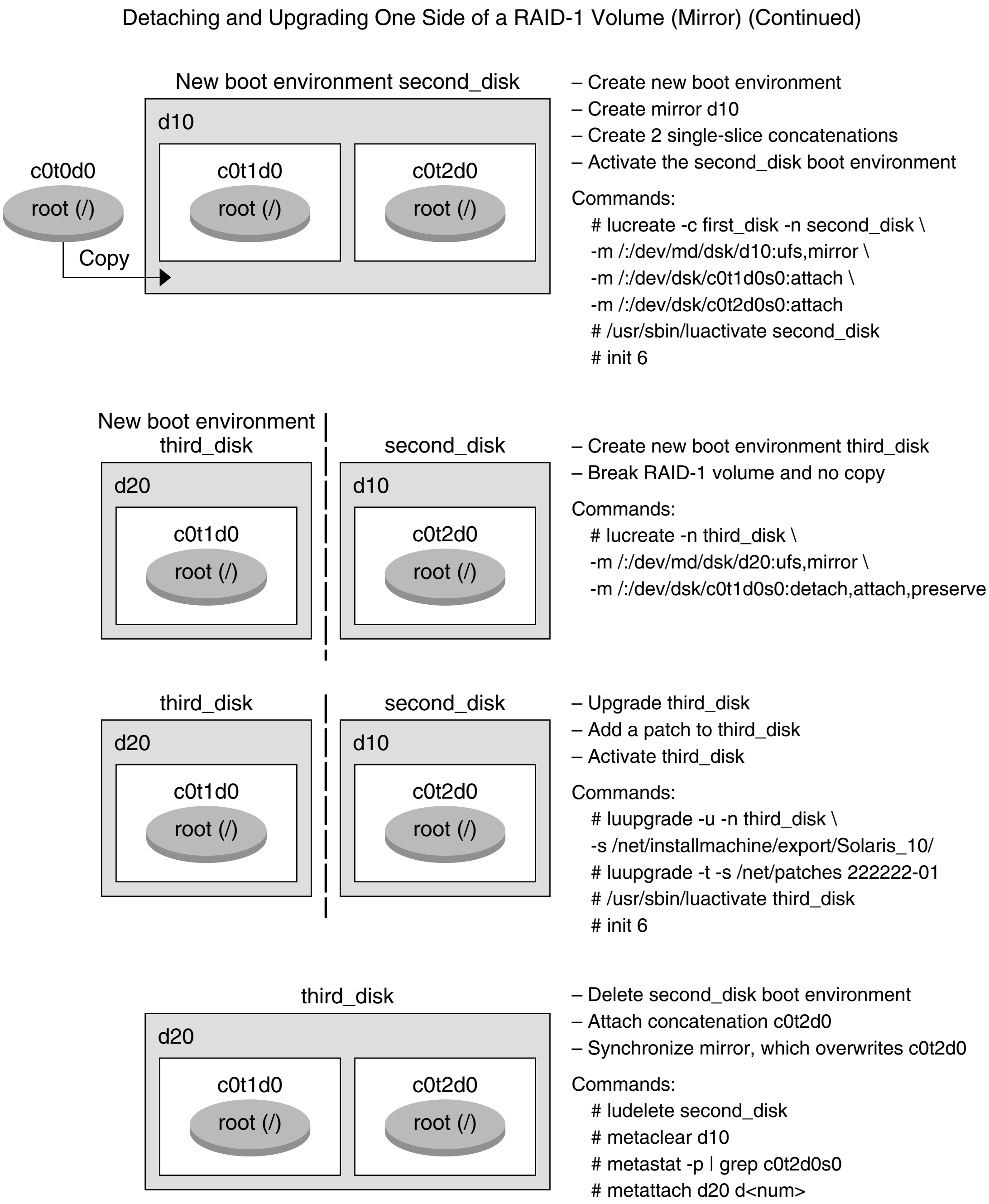
8. The following commands perform these tasks.
   - Clear mirror `d10`.
   - Check for the number for the concatenation of `c0t2d0s0`.
   - Attach the concatenation that is found by the `metastat` command to the mirror `d20`. The `metattach` command synchronizes the newly attached concatenation with the concatenation in mirror `d20`. All data on the concatenation is overwritten.

   ```
   # metaclear d10
   # metastat -p | grep c0t2d0s0
   dnum 1 1 c0t2d0s0
   # metattach d20 dnum
   ```

num	Is the number found in the `metastat` command for the concatenation

The new boot environment, `third_disk`, has been upgraded and is the currently running system. `third_disk` contains the root (`/`) file system that is mirrored.

Figure 9–2 shows the entire process of detaching a mirror and upgrading the mirror by using the commands in the preceding example.


New boot environment second_disk
d10
c0t0d0
root (/)
Copy
c0t1d0
root (/)
c0t2d0
root (/)
New boot environment third_disk
d20
c0t1d0
root (/)
second_disk
d10
c0t2d0
root (/)
third_disk
d20
c0t1d0
root (/)
second_disk
d10
c0t2d0
root (/)
third_disk
d20
c0t1d0
root (/)
c0t2d0
root (/)

Detaching and Upgrading One Side of a RAID-1 Volume (Mirror) (Continued)

– Create new boot environment
– Create mirror d10
– Create 2 single-slice concatenations
– Activate the second_disk boot environment

Commands:

```
# lucreate -c first_disk -n second_disk \
-m /:/dev/md/dsk/d10:ufs,mirror \
-m /:/dev/dsk/c0t1d0s0:attach \
-m /:/dev/dsk/c0t2d0s0:attach
# /usr/sbin/luactivate second_disk
# init 6
```

– Create new boot environment third_disk
– Break RAID-1 volume and no copy

Commands:

```
# lucreate -n third_disk \
-m /:/dev/md/dsk/d20:ufs,mirror \
-m /:/dev/dsk/c0t1d0s0:detach,attach,preserve
```

– Upgrade third_disk
– Add a patch to third_disk
– Activate third_disk

Commands:

```
# luupgrade -u -n third_disk \
-s /net/installmachine/export/Solaris_10/
# luupgrade -t -s /net/patches 222222-01
# /usr/sbin/luactivate third_disk
# init 6
```

– Delete second_disk boot environment
– Attach concatenation c0t2d0
– Synchronize mirror, which overwrites c0t2d0

Commands:

```
# ludelete second_disk
# metaclear d10
# metastat -p | grep c0t2d0s0
# metattach d20 d<num>
```

FIGURE 9–2 Detaching and Upgrading One Side of a RAID-1 Volume (Mirror) (continued)

Example of Migrating From an Existing Volume to a Solaris Volume Manager RAID-1 Volume (Command-Line Interface)

Solaris Live Upgrade enables the creation of a new boot environment on RAID–1 volumes (mirrors). The current boot environment's file systems can be on any of the following:

- A physical storage device
- A Solaris Volume Manager controlled RAID–1 volume
- A Veritas VXFS controlled volume

However, the new boot environment's target must be a Solaris Volume Manager RAID-1 volume. For example, the slice that is designated for a copy of the root (`/`) file system must be `/dev/vx/dsk/rootvol`. `rootvol` is the volume that contains the root (`/`) file system.

In this example, the current boot environment contains the root (`/`) file system on a volume that is not a Solaris Volume Manager volume. The new boot environment is created with the root (`/`) file system on the Solaris Volume Manager RAID-1 volume `c0t2d0s0`. The `lucreate` command migrates the current volume to the Solaris Volume Manager volume. The name of the new boot environment is `svm_be`. The `lustatus` command reports if the new boot environment is ready to be activated and be rebooted. The new boot environment is activated to become the current boot environment.

```
# lucreate -n svm_be -m /:/dev/md/dsk/d1:mirror,ufs \
-m /:/dev/dsk/c0t2d0s0:attach
# lustatus
# luactivate svm_be
# lustatus
# init 6
```

Example of Creating an Empty Boot Environment and Installing a Solaris Flash Archive (Command-Line Interface)

The following procedures cover the three-step process:

- Creating the empty boot environment
- Installing the archive
- Activating the boot environment which then becomes the currently running boot environment.

The `lucreate` command creates a boot environment that is based on the file systems in the active boot environment. When you use the `lucreate` command with the `-s -` option, `lucreate` quickly creates an empty boot environment. 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 boot environment is then activated.

To Create an Empty Boot Environment

In this first step, an empty boot environment is created. Slices are reserved for the file systems that are specified, but no copy of file systems from the current boot environment occurs. The new boot environment is named `second_disk`.

```
# lucreate  -s - -m /:/dev/dsk/c0t1d0s0:ufs \
-n second_disk
```

The boot environment is ready to be populated with a Solaris Flash archive.

Figure 9–3 shows the creation of an empty boot environment.

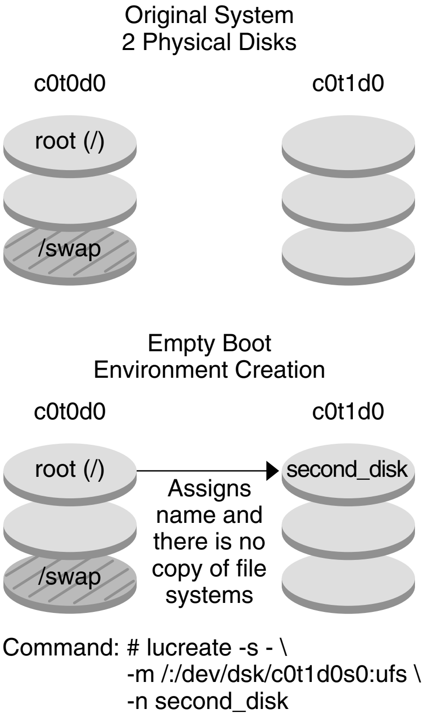

Original System
2 Physical Disks
c0t0d0
c0t1d0
root (/)
/swap
Empty Boot
Environment Creation
c0t0d0
c0t1d0
root (/)
second_disk
Assigns name and there is no copy of file systems
/swap
Command: # lucreate -s - \
-m /:/dev/dsk/c0t1d0s0:ufs \
-n second_disk

FIGURE 9–3 Creating an Empty Boot Environment

To Install a Solaris Flash Archive on the New Boot Environment

In this second step, an archive is installed on the `second_disk` boot environment that was created in the previous example. The archive is located on the local system. The operating system versions for the `-s` and `-a` options are both Solaris 10 11/06 releases. The archive is named `Solaris_10.flar`.

```
# luupgrade -f -n second_disk \
-s /net/installmachine/export/Solaris_10/OS_image \
-a /net/server/archive/10.flar
```

The boot environment is ready to be activated.

To Activate the New Boot Environment

In this last step, the `second_disk` boot environment is made bootable with the `luactivate` command. The system is then rebooted and `second_disk` becomes the active boot environment.

```
# luactivate second_disk
# init 6
```

- For step-by-step information about creating an empty boot environment, see "To Create an Empty Boot Environment for a Solaris Flash Archive (Command-Line Interface)" on page 76.
- For step-by-step information about creating a Solaris Flash archive, see Chapter 3, "Creating Solaris Flash Archives (Tasks)," in *Solaris 10 11/06 Installation Guide: Solaris Flash Archives (Creation and Installation)*.
- For step-by-step information about activating a boot environment or falling back to the original boot environment, see Chapter 6.

Example of Upgrading Using Solaris Live Upgrade (Character User Interface)

In this example, a new boot environment is created on a system that is running the Solaris 9 release. The new boot environment is upgraded to the Solaris 10 6/06 release. The upgraded boot environment is then activated.

To Install Solaris Live Upgrade on the Active Boot Environment

1. Insert the Solaris Operating System DVD or Solaris Software - 2 CD.
2. Run the installer for the media you are using.
   - If you are using the Solaris Operating System DVD, change directories to the installer and run the installer.
     - For SPARC based systems:

       ```
       # cd /cdrom/cdrom0/S0/Solaris_10/Tools/Installers
       # ./liveupgrade20
       ```

       The Solaris installation program GUI is displayed.
     - For x86 based systems:

       ```
       # cd /cdrom/cdrom0/Solaris_10/Tools/Installers
       # ./liveupgrade20
       ```

       The Solaris installation program GUI is displayed.
   - If you are using the Solaris Software - 2 CD, run the installer.

     ```
     % ./installer
     ```

     The Solaris installation program GUI is displayed.
3. From the Select Type of Install panel, click Custom.
4. On the Locale Selection panel, click the language to be installed.
5. Choose the software to install.
   - For DVD, on the Component Selection panel, click Next to install the packages.
   - For CD, on the Product Selection panel, click Default Install for Solaris Live Upgrade and click the other product choices to deselect the software.
6. Follow the directions on the Solaris installation program panels to install the software.

To Install Required Patches

Description	For More Information

Caution – Correct operation of Solaris Live Upgrade requires that a limited set of patch revisions be installed for a particular OS version. Before installing or running Solaris Live Upgrade, you are required to install these patches.
x86 only – Starting with the Solaris 10 1/06 release, if this set of patches is not installed, Solaris Live Upgrade fails and you might see the following error message. If you don't see the following error message, necessary patches still might not be installed. Always verify that all patches listed on the SunSolve info doc have been installed before attempting to install Solaris Live Upgrade.
`ERROR: Cannot find or is not executable:`
`</sbin/biosdev>.`
`ERROR: One or more patches required by`
`Live Upgrade has not been installed.`
The patches listed in info doc 72099 are subject to change at any time. These patches potentially fix defects in Solaris Live Upgrade, as well as fix defects in components that Solaris Live Upgrade depends on. If you experience any difficulties with Solaris Live Upgrade, please check and make sure that you have the latest Solaris Live Upgrade patches installed.
	Ensure you have the most recently updated patch list by consulting http://sunsolve.sun.com. Search for the info doc 72099 at the SunSolve web site.

If you are running the Solaris 8 or Solaris 9 OS, you might not be able to run the Solaris Live Upgrade installer. These releases do not contain the set of patches needed to run the Java 2 runtime environment. You must have the recommended patch cluster for the Java 2 runtime environment that is recommended to run the Solaris Live Upgrade installer and install the packages.	To install the Solaris Live Upgrade packages, use the `pkgadd` command. Or install, for the Java 2 runtime environment, the recommended patch cluster. The patch cluster is available on http://sunsolve.sun.com.

Follow these steps to install the required patches.

From the SunSolve web site, obtain the list of patches.

```
# patchadd /net/server/export/patches
# init 6
```

To Create a Boot Environment

In this example, the source boot environment is named `c0t4d0s0`. The root (`/`) file system is copied to the new boot environment. Also, a new swap slice is created instead of sharing the source boot environment's swap slice.

1. Become superuser or assume an equivalent role.
2. Display the character user interface:

   ```
   # /usr/sbin/lu
   ```

   The Solaris Live Upgrade Main Menu is displayed.
3. From the main menu, select Create.

   ```
   Name of Current Boot Environment:    c0t4d0s0
   Name of New Boot Environment:   c0t15d0s0
   ```
4. Press F3.

   The Configuration menu is displayed.
5. To select a slice from the configuration menu, press F2.

   The Choices menu is displayed.
6. Choose slice 0 from disk `c0t15d0` for the root (`/`) file system.
7. From the configuration menu, create a new slice for swap on `c0t15d0` by selecting a swap slice to be split.
8. To select a slice for swap, press F2. The Choices menu is displayed.
9. Select slice 1 from disk `c0t15d0` for the new swap slice.
10. Press F3 to create the new boot environment.

To Upgrade the Inactive Boot Environment

The new boot environment is then upgraded. The new version of the operating system for the upgrade is taken from a network image.

1. From the main menu, select Upgrade.

   ```
   Name of New Boot Environment:   c0t15d0s0
   Package Media: /net/ins3-svr/export/Solaris_10/combined.solaris_wos
   ```
2. Press F3.

To Activate the Inactive Boot Environment

The `c0t15d0s0` boot environment is made bootable. The system is then rebooted and `c0t15d0s0` becomes the active boot environment. The `c0t4d0s0` boot environment is now inactive.

1. From the main menu, select Activate.

   ```
   Name of Boot Environment: c0t15d0s0
   Do you want to force a Live Upgrade sync operations: no
   ```

2. Press F3.
3. Press Return.
4. Type:

   ```
   # init 6
   ```

If a fallback is necessary, use the command-line procedures in the previous example: "(Optional) To Fall Back to the Source Boot Environment" on page 151.

◆ ◆ ◆

CHAPTER 10

Solaris Live Upgrade (Command Reference)

The following list shows commands that you can type at the command line. The Solaris Live Upgrade includes man pages for all the listed command-line utilities.

Solaris Live Upgrade Command-Line Options

Task	Command
Activate an inactive boot environment.	`luactivate`(1M)
Cancel a scheduled copy or create job.	`lucancel`(1M)
Compare an active boot environment with an inactive boot environment.	`lucompare`(1M)
Recopy file systems to update an inactive boot environment.	`lumake`(1M)
Create a boot environment.	`lucreate`(1M)
Name the active boot environment.	`lucurr`(1M)
Delete a boot environment.	`ludelete`(1M)
Add a description to a boot environment name.	`ludesc`(1M)
List critical file systems for each boot environment.	`lufslist`(1M)
Enable a mount of all of the file systems in a boot environment. This command enables you to modify the files in a boot environment while that boot environment is inactive.	`lumount`(1M)
Rename a boot environment.	`lurename`(1M)

Task	**Command**
List status of all boot environments.	`lustatus`(1M)
Enable an unmount of all the file systems in a boot environment. This command enables you to modify the files in a boot environment while that boot environment is inactive.	`luumount`(1M)
Upgrade an OS or install a flash archive on an inactive boot environment.	`luupgrade`(1M)

PART II

Appendices

This part provides 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 11/06 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.

- "Problems With Setting Up Network Installations" on page 169
- "Problems With Booting a System" on page 170
- "Initial Installation of the Solaris OS" on page 175
- "Upgrading the Solaris OS" on page 177

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 naming service.

Solution: Add the host *host_name* to the naming service and execute the `add_install_client` command again.

```
Error: <system name> does not exist in the NIS ethers map
Add it, and rerun the add_install_client command
```

Description: When you run the `add_install_client` command, the command fails with the above error.

Cause: The client you are adding to the install server does not exist in the server's `/etc/ethers` file.

Solution: Add the needed information to the `/etc/ethers` file on the install server and run the `add_install_client` command again.

1. Become superuser or assume an equivalent role.
2. On the client, find the ethers address.

```
# ifconfig -a grep ethers
ether 8:0:20:b3:39:1d
```

3. On the install server, open the `/etc/ethers` file in an editor. Add the address to the list.
4. On the client, run `add_install_client` again as in this example.

```
# ./add_install_client bluegill sun4u
```

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 11/06 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 11/06 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 naming 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 11/06 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+ naming 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 naming service. If the system's host naming is listed in the NIS or NIS+ naming 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 11/06 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/cdrom0/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 Device Configuration Assistant 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 Device Configuration Assistant.

---

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 177.

▼ 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. **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. **Boot to the installation media.**

3. **When you are prompted to select an installation type, select option 6, Single user shell.**

4. **Start the `format`(1M) program.**

   ```
   # format
   ```

5. **Specify the IDE disk drive on which you want to perform a surface analysis.**

   ```
   # cxdy
   ```

c*x*	Is the controller number
d*y*	Is the device number

6. **Determine if you have an `fdisk` partition.**

   - If a Solaris `fdisk` partition already exists, proceed to Step 7.
   - If a Solaris `fdisk` partition does not exist, use the `fdisk` command to create a Solaris partition on the disk.

   ```
   format> fdisk
   ```

7. **To begin the surface analysis, type:**

   ```
   format> analyze
   ```

8 **Determine the current settings, type:**

```
analyze> config
```

9 **(Optional) To change settings, type:**

```
analyze> setup
```

10 **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.

11 **To exit the analysis, type:**

```
analyze> quit
```

12 **Determine if you want to specify blocks to remap.**

- If no, go to Step 13.
- If yes, type:

  ```
  format> repair
  ```

13 **To exit the format program, type:**

```
quit
```

14 **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 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 `$MEDIA_DIR/Solaris_10/Tools/Boot`
- `MINIROOT_ARCHIVE` is `$MEDIA_DIR/boot/x86.miniroot`
- `TEMP_FILE_NAME` is `/tmp/test`

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. Uncompress the miniroot archive.

   ```
   # /usr/bin/gzcat $MINIROOT_ARCHIVE > $TEMP_FILE_NAME
   ```

3. Create the miniroot device by using the `lofiadm` command.

```
# LOFI_DEVICE=/usr/sbin/lofiadm -a $TEMP_FILE_NAME
# echo $LOFI_DEVICE
/dev/lofi/1
```

4. Mount the miniroot with the `lofi` command under the Miniroot directory.

   ```
   # /usr/sbin/mount -F ufs  $LOFI_DEVICE  $MINIROOT_DIR
   ```

5. Test the profile.

   ```
   # /usr/sbin/install.d/pfinstall -D -c $MEDIA_DIR $path-to-jumpstart_profile
   ```

6. After the testing is completed, unmount the lofi device.

   ```
   # umount  $LOFI_DEVICE
   ```

7. 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" in *Solaris 10 11/06 Installation Guide: Planning for Installation and Upgrade* 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 **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 **Create an inactive boot environment. See “Creating a New Boot Environment” on page 59.**

3 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
```

4 Upgrade the inactive boot environment. See Chapter 5.

5. **Activate the inactive boot environment. See “Activating a Boot Environment” on page 109.**

6. **Shut down the system.**

   ```
   # init 0
   ```

7. **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.

8. **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
      ```

9. **Restore the original `vfstab` and system files:**

   ```
   # cp /etc/vfstab.original /etc/vfstab
   # cp /etc/system.original /etc/system
   ```

10. **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 11/06 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 11/06 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 11/06 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" on page 187.
- "Preventing User Interaction When Installing or Upgrading" on page 191.
- "Setting Package Parameters For Zones" on page 192

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
- 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 can be installed in the global zone only. When the `pkgadd` command is run, the package is installed in the global zone and in all non-global zones. The entire contents of the package is visible in all zones. **Note –** Any attempt to install the package in a non-global zone fails.

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 24, "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 24, "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 2
For an overview of custom JumpStart	Chapter 2, "Custom JumpStart (Overview)," in *Solaris 10 11/06 Installation Guide: Custom JumpStart and Advanced Installations*
For an overview of Solaris Zones	Chapter 16, "Introduction to Solaris Zones," in *System Administration Guide: Solaris Containers-Resource Management and Solaris Zones*

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APPENDIX C

Using the Patch Analyzer When Upgrading (Tasks)

This chapter provides instructions on checking patches with the Patch Analyzer before upgrading the Solaris OS. 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

Upgrading to a Solaris Update Release

If you are already running the 10 3/05 release OS and have installed individual patches, upgrading to a subsequent Solaris 10 release causes the following:

- Any patches that are 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 that are not included in one of the releases noted above are removed.

The Patch Analyzer performs an analysis on your system to determine which patches, if any, will be removed by upgrading to any of the above releases. The Patch Analyzer is available in the following formats.

- If you are using the Solaris installation program to upgrade, the Patch Analyzer dialog box appears. Select Yes to perform the analysis.
- If you are using the text installer to upgrade, select Analyze on the Analyze Patches dialog box to perform the analysis.
- If you are using a custom JumpStart installation or Solaris Live Upgrade to upgrade, run the `analyze_patches` script to perform the analysis. For detailed instructions, see “To Run the `analyze_patches` Script” on page 198.

After you perform the analysis, refer to “To Review the Patch Analyzer Output” on page 199 for detailed information about the patch analysis results.

▼ To Run the `analyze_patches` Script

Note – To run the `analyze_patches` script, the installed system and the Solaris Operating System DVD, Solaris Software CDs, or network installation image must be accessible by the script either through NFS or locally mounted media.

---

1 Change to the `Misc` directory.

- SPARC: If the image is located on locally mounted media, type:

  ```
  # cd /cdrom/cdrom0/s0/Solaris_10/Misc
  ```

  In this command, *Update* is the actual Update identifier.

- x86: If the image is located on locally mounted media, type:

  ```
  # cd /cdrom/cdrom0/Solaris_10/Misc
  ```

  In this command, *date* is the actual date of the release such as 06.

- If the image is available on an NFS file system, type:

  ```
  # cd /NFS_mount_directory/Solaris_10/Misc
  ```

2 Run the `analyze_patches` script.

```
# ./analyze_patches -R rootdir -N netdir -D databasedir
```

`-R` *rootdir*	*rootdir* is the root of the installed system. The default is `/`.
`-N` *netdir*	*netdir* is the path to the root of the OS image to be installed. The default is `/cdrom/cdrom0`. *netdir* is the path to the directory that contains the `Solaris_10` directory. You must use this option if you are running the `patch_analyzer` from an NFS mount point.
`-D` *databasedir*	If the script is invoked from a directory other than the `Misc/` directory in the OS image, the program cannot find the database it uses for patch analysis. Use the `-D` option to supply the path to the database. Without this database, which is located in `Solaris_10 /Misc/database` on the OS image, the script does not work properly.

▼ To Review the Patch Analyzer Output

After you perform the analysis, use these steps to review the output.

1. **Review the output of the Patch Analyzer.**

   The Patch Analyzer provides a list of patches that will be removed, downgraded, accumulated, or obsoleted by other patches. Patch accumulations are similar to patch upgrades. The accumulated patch is removed and its fixes are delivered by a new patch. Messages such as the following are shown:

   ```
   Patch 105644-03 will be removed.
   Patch 105925 will be downgraded from -02 to -01.
   Patch 105776-01 will be accumulated/obsoleted by patch 105181-05.
   ```

   If the Patch Analyzer program does not provide a list, no action is taken against any patches that were previously installed on your system.

2. **Decide if the patch replacements and deletions are acceptable.**

   - If yes, upgrade the system.
   - If no, do not upgrade the system.

Glossary

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` **program**	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` **file**	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 install 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` file 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 the `pfinstall` command 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 11/06 release.
Entire Solaris Software Group Plus OEM Support	A software group that contains the entire Solaris 10 11/06 release plus additional hardware support for OEMs. This software group is recommended when installing Solaris software on SPARC based servers.
`/etc` **directory**	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` **file system**	A file system on an OS server that is shared with other systems on a network. For example, the `/export` file system can contain the root (`/`) file system and swap space for diskless clients and the home directories for users on the network. Diskless clients rely on the `/export` file system on an OS server to boot and run.
failsafe boot archive	**x86 only**: A boot archive that is used for recovery when the primary boot archive is damaged. This boot archive starts the system without mounting the root (`/`) file system. This boot archive is called failsafe on the GRUB menu. The archive's essential purpose is to regenerate the primary boot archive, which is usually used to boot the system. See *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 called 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` **file**	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 for the purposes 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 naming service to systems on a network.
naming service	A distributed network database that contains key system information about all the systems on a network so that the systems can communicate with each other. With a naming service, the system information can be maintained, managed, and accessed on a network-wide basis. Without a naming

	service, each system has to maintain its own copy of the system information in the local `/etc` files. Sun supports the following naming services: LDAP, NIS, and NIS+.
network installation	A way to install software over the network from a system with a CD-ROM or DVD-ROM drive to a system without a CD-ROM or DVD-ROM drive. Network installations require a *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.
`/opt` **file system**	A file system that contains the mount points for third-party and unbundled software.
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, the Power Management software is installed by default. A `sun4u` SPARC based system is an example of a system that has Power Management installed by default. After a subsequent reboot, you are prompted to enable or disable the Power Management software. 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 unmounted. The root (`/`) file system contains the directories and files critical for system operation, such as the kernel, device drivers, and the programs that are used to start (boot) a system.
root directory	The top-level directory from which all other directories stem.
rule	A series of values that assigns one or more system attributes to a profile. A rule is used in a custom JumpStart installation.
`rules` **file**	A text file that contains a rule for each group of systems or single systems that you want to install automatically. Each rule distinguishes a group of systems, based on one or more system attributes. The `rules` file links each group to a profile, which is a text file that defines how the 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` file in both the active and inactive boot environments. Updating shared files in the active boot environment also updates data in the inactive boot environment. Shareable file systems are shared by default, but you can specify a destination slice, and then the file systems are copied.
slice	The unit into which the disk space is divided by the software.
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, called 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 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 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 reloaded in 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` **file**	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 preserves 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. 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`.
`/usr` **file system**	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.
utility	A standard program, usually furnished at no charge with the purchase of a computer, that does the computer's housekeeping.
`/var` **file system**	A file system or directory (on standalone systems) that contains system files that are likely to change or grow over the life of the system. These files include system logs, `vi` files, mail files, and UUCP files.
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 for the purposes 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-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.
`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.
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