

Creating and Administering Oracle® Solaris 11.3 Boot Environments



Part No: E54749
January 2016

Part No: E54749

Copyright © 2008, 2016, Oracle and/or its affiliates. All rights reserved.

This software and related documentation are provided under a license agreement containing restrictions on use and disclosure and are protected by intellectual property laws. Except as expressly permitted in your license agreement or allowed by law, you may not use, copy, reproduce, translate, broadcast, modify, license, transmit, distribute, exhibit, perform, publish, or display any part, in any form, or by any means. Reverse engineering, disassembly, or decompilation of this software, unless required by law for interoperability, is prohibited.

The information contained herein is subject to change without notice and is not warranted to be error-free. If you find any errors, please report them to us in writing.

If this is software or related documentation that is delivered to the U.S. Government or anyone licensing it on behalf of the U.S. Government, then the following notice is applicable:

U.S. GOVERNMENT END USERS. Oracle programs, including any operating system, integrated software, any programs installed on the hardware, and/or documentation, delivered to U.S. Government end users are "commercial computer software" pursuant to the applicable Federal Acquisition Regulation and agency-specific supplemental regulations. As such, use, duplication, disclosure, modification, and adaptation of the programs, including any operating system, integrated software, any programs installed on the hardware, and/or documentation, shall be subject to license terms and license restrictions applicable to the programs. No other rights are granted to the U.S. Government.

This software or hardware is developed for general use in a variety of information management applications. It is not developed or intended for use in any inherently dangerous applications, including applications that may create a risk of personal injury. If you use this software or hardware in dangerous applications, then you shall be responsible to take all appropriate fail-safe, backup, redundancy, and other measures to ensure its safe use. Oracle Corporation and its affiliates disclaim any liability for any damages caused by use of this software or hardware in dangerous applications.

Oracle and Java are registered trademarks of Oracle and/or its affiliates. Other names may be trademarks of their respective owners.

Intel and Intel Xeon are trademarks or registered trademarks of Intel Corporation. All SPARC trademarks are used under license and are trademarks or registered trademarks of SPARC International, Inc. AMD, Opteron, the AMD logo, and the AMD Opteron logo are trademarks or registered trademarks of Advanced Micro Devices. UNIX is a registered trademark of The Open Group.

This software or hardware and documentation may provide access to or information about content, products, and services from third parties. Oracle Corporation and its affiliates are not responsible for and expressly disclaim all warranties of any kind with respect to third-party content, products, and services unless otherwise set forth in an applicable agreement between you and Oracle. Oracle Corporation and its affiliates will not be responsible for any loss, costs, or damages incurred due to your access to or use of third-party content, products, or services, except as set forth in an applicable agreement between you and Oracle.

Documentation Accessibility

For information about Oracle's commitment to accessibility, visit the Oracle Accessibility Program website at <http://www.oracle.com/pls/topic/lookup?ctx=acc&id=docacc>.

Access to Oracle Support

Oracle customers that have purchased support have access to electronic support through My Oracle Support. For information, visit <http://www.oracle.com/pls/topic/lookup?ctx=acc&id=info> or visit <http://www.oracle.com/pls/topic/lookup?ctx=acc&id=trs> if you are hearing impaired.

Référence: E54749

Copyright © 2008, 2016, Oracle et/ou ses affiliés. Tous droits réservés.

Ce logiciel et la documentation qui l'accompagne sont protégés par les lois sur la propriété intellectuelle. Ils sont concédés sous licence et soumis à des restrictions d'utilisation et de divulgation. Sauf stipulation expresse de votre contrat de licence ou de la loi, vous ne pouvez pas copier, reproduire, traduire, diffuser, modifier, accorder de licence, transmettre, distribuer, exposer, exécuter, publier ou afficher le logiciel, même partiellement, sous quelque forme et par quelque procédé que ce soit. Par ailleurs, il est interdit de procéder à toute ingénierie inverse du logiciel, de le désassembler ou de le décompiler, excepté à des fins d'interopérabilité avec des logiciels tiers ou tel que prescrit par la loi.

Les informations fournies dans ce document sont susceptibles de modification sans préavis. Par ailleurs, Oracle Corporation ne garantit pas qu'elles soient exemptes d'erreurs et vous invite, le cas échéant, à lui en faire part par écrit.

Si ce logiciel, ou la documentation qui l'accompagne, est livré sous licence au Gouvernement des Etats-Unis, ou à quiconque qui aurait souscrit la licence de ce logiciel pour le compte du Gouvernement des Etats-Unis, la notice suivante s'applique:

U.S. GOVERNMENT END USERS. Oracle programs, including any operating system, integrated software, any programs installed on the hardware, and/or documentation, delivered to U.S. Government end users are "commercial computer software" pursuant to the applicable Federal Acquisition Regulation and agency-specific supplemental regulations. As such, use, duplication, disclosure, modification, and adaptation of the programs, including any operating system, integrated software, any programs installed on the hardware, and/or documentation, shall be subject to license terms and license restrictions applicable to the programs. No other rights are granted to the U.S. Government.

Ce logiciel ou matériel a été développé pour un usage général dans le cadre d'applications de gestion des informations. Ce logiciel ou matériel n'est pas conçu ni n'est destiné à être utilisé dans des applications à risque, notamment dans des applications pouvant causer des dommages corporels. Si vous utilisez ce logiciel ou matériel dans le cadre d'applications dangereuses, il est de votre responsabilité de prendre toutes les mesures de secours, de sauvegarde, de redondance et autres mesures nécessaires à son utilisation dans des conditions optimales de sécurité. Oracle Corporation et ses affiliés déclinent toute responsabilité quant aux dommages causés par l'utilisation de ce logiciel ou matériel pour ce type d'applications.

Oracle et Java sont des marques déposées d'Oracle Corporation et/ou de ses affiliés. Tout autre nom mentionné peut correspondre à des marques appartenant à d'autres propriétaires qu'Oracle.

Intel et Intel Xeon sont des marques ou des marques déposées d'Intel Corporation. Toutes les marques SPARC sont utilisées sous licence et sont des marques ou des marques déposées de SPARC International, Inc. AMD, Opteron, le logo AMD et le logo AMD Opteron sont des marques ou des marques déposées d'Advanced Micro Devices. UNIX est une marque déposée d'The Open Group.

Ce logiciel ou matériel et la documentation qui l'accompagne peuvent fournir des informations ou des liens donnant accès à des contenus, des produits et des services émanant de tiers. Oracle Corporation et ses affiliés déclinent toute responsabilité ou garantie expresse quant aux contenus, produits ou services émanant de tiers, sauf mention contraire stipulée dans un contrat entre vous et Oracle. En aucun cas, Oracle Corporation et ses affiliés ne sauraient être tenus pour responsables des pertes subies, des coûts occasionnés ou des dommages causés par l'accès à des contenus, produits ou services tiers, ou à leur utilisation, sauf mention contraire stipulée dans un contrat entre vous et Oracle.

Accessibilité de la documentation

Pour plus d'informations sur l'engagement d'Oracle pour l'accessibilité à la documentation, visitez le site Web Oracle Accessibility Program, à l'adresse <http://www.oracle.com/pls/topic/lookup?ctx=acc&id=docacc>.

Accès aux services de support Oracle

Les clients Oracle qui ont souscrit un contrat de support ont accès au support électronique via My Oracle Support. Pour plus d'informations, visitez le site <http://www.oracle.com/pls/topic/lookup?ctx=acc&id=info> ou le site <http://www.oracle.com/pls/topic/lookup?ctx=acc&id=trs> si vous êtes malentendant.

Contents

Using This Documentation	7
 1 Introduction to Managing Boot Environments	 9
About Boot Environments and Datasets	9
Advantages to Maintaining Multiple Boot Environments	10
About the beadm Command	12
 2 beadm Zones Support	 13
beadm in Non-Global Zones	13
Unbootable Boot Environments	13
Zones and Shared Datasets	14
 3 Creating Boot Environments and Snapshots	 17
Creating a Boot Environment	17
beadm create Command Options	17
▼ How to Clone a Boot Environment	18
Examples of Cloning Boot Environments	19
Creating and Copying Snapshots	22
Creating a Snapshot of a Boot Environment	22
Cloning a Boot Environment From an Existing Snapshot	23
 4 Administering Boot Environments	 25
Listing Existing Boot Environments and Snapshots	25
Viewing Information About Boot Environments	26
Viewing Information About Boot Environments in Machine-Parsable Output	26
Viewing Snapshot Specifications	27
Changing the Default Boot Environment	28
Mounting and Updating an Inactive Boot Environment	28
▼ How to Mount and Update a Boot Environment	28

Unmounting Boot Environments	29
Destroying a Boot Environment	29
Creating Custom Names for Boot Environments	31
Creating Additional Datasets for Boot Environments	31
Index	33

Using This Documentation

- **Overview** – Describes how to manage and create boot environments
- **Audience** – Technicians, system administrators, and authorized service providers
- **Required knowledge** – Experience administering a Oracle Solaris 11.3 system

Product Documentation Library

Documentation and resources for this product and related products are available at <http://www.oracle.com/pls/topic/lookup?ctx=E53394>.

Feedback

Provide feedback about this documentation at <http://www.oracle.com/goto/docfeedback>.

◆◆◆ 1 CHAPTER 1

Introduction to Managing Boot Environments

This document describes how to use the `beadm` command to manage boot environments. The `beadm` command is specifically designed to perform tasks on a boot environment structure including a root dataset and all the datasets nested under that root dataset. This chapter describes datasets and provides an overview of managing boot environments.

About Boot Environments and Datasets

A *boot environment* is a bootable instance of the Oracle Solaris 11.3 operating system image plus any other application software packages installed into that image. System administrators can maintain multiple boot environments on their systems, and each boot environment can have different software versions installed.

Upon the initial installation of the Oracle Solaris 11.3 release onto a system, a boot environment is created. You can use the `beadm` command to create and administer additional boot environments on your system. In addition, the Package Manager GUI provides some options for managing boot environments. Exactly one boot environment can be active at a time.

In terms of file structure, each boot environment consists of a *root dataset* and, optionally, other datasets nested under that root dataset.

Note - A *dataset* is a generic name for ZFS entities such as clones, file systems, or snapshots. In the context of boot environment administration, the dataset more specifically refers to the file system specifications for a particular boot environment.

For more information about ZFS datasets, see [“ZFS Terminology” in *Managing ZFS File Systems in Oracle Solaris 11.2*](#).

The following example shows the root dataset for a sample boot environment named BE1: `rpool/ROOT/BE1`. In this example, `rpool` is the name of the storage pool (`zpool`). The pool was previously set up and therefore already exists on the system. `ROOT` is a special dataset that was created the installer. The `rpool/ROOT` dataset is reserved exclusively for use by boot environment root datasets. The root dataset and any other datasets nested beneath it are included in the BE1 boot environment.

```
# zfs list
NAME                                USED  AVAIL  REFER  MOUNTPOINT
rpool                               42.5G  24.4G  4.65M  /rpool
rpool/ROOT                          25.6G  24.4G   31K   legacy
rpool/ROOT/BE1                      8.91M  24.4G  4.17G  /
rpool/ROOT/BE1/var                  3.96M  24.4G  276M  /var
```

Shared datasets, in contrast, are located outside the root dataset area of each boot environment. Shared datasets are user-defined directories, such as /export. An example of a shared dataset might be a dataset where user accounts are kept; these user accounts can be accessed regardless of which boot environment is booted.

See the following example:

```
# zfs list
NAME                                USED  AVAIL  REFER  MOUNTPOINT
rpool                               42.5G  24.4G  4.65M  /rpool
rpool/ROOT                          25.6G  24.4G   31K   legacy
rpool/ROOT/BE1                      8.91M  24.4G  4.17G  /
rpool/ROOT/BE1/var                  3.96M  24.4G  276M  /var
tank                                450K   457G   18K   /export
tank/home                          315K   457G   21K   /export/home
```

Note - For further information, see the [zpool\(1M\)](#) and the [zfs\(1M\)](#) man pages. See, also, [“Querying ZFS Storage Pool Status” in Managing ZFS File Systems in Oracle Solaris 11.2.](#)

Snapshots and boot environments can be automatically created by utilities other than the beadm command. For example, the pkg command may automatically create a clone of a boot environment when you install or update packages using that command.

The beadm command should always be used to manipulate boot environments. For example, use the beadm command to make a reference copy of a boot environment before making changes. Even though the beadm command is based on zfs technology, it has additional functionalities specific to managing a BE's root dataset and the datasets under the root datasets. And, the command also has special logic to track and manage the associations between BEs within a global zone, within multiple zones, or across multiple zones. For more information, see the [beadm\(1M\)](#) man page.

Advantages to Maintaining Multiple Boot Environments

Multiple boot environments reduce risk when updating software because system administrators can create backup boot environments before making any software updates to the system. If needed, they have the option of booting a backup boot environment.

The following specific examples show how having more than one Oracle Solaris 11.3 boot environment and managing them with the `beadm` command can be useful.

- You can maintain more than one boot environment on your system and perform various updates on each of them as needed. For example, you can clone a boot environment by using the `beadm create` command. (The clone you create is a bootable copy of the original.) Then, you can install, test, and update different software packages on the original boot environment and on its clone.

Although only one boot environment can be active at a time, you can mount an inactive boot environment by using the `beadm mount` command. Then, you could use the `pkg` command with the alternate root (`-R`) option to install or update specific packages on that environment. For more information, see [“Installing a Package Into a New Boot Environment” in *Adding and Updating Software in Oracle Solaris 11.3*](#).

- If you are modifying a boot environment, you can take a snapshot of that environment at any stage during modifications by using the `beadm create` command and specifying a snapshot name. For example, if you are doing monthly upgrades to your boot environment, you can capture snapshots for each monthly upgrade.

Note - You can use the `beadm list -s` command to view the available snapshots for a boot environment.

Although a snapshot is not bootable, you can create a boot environment based on that snapshot by using the `-e` option in the `beadm create` command. Then you can use the `beadm activate` command to specify that this boot environment will become the default boot environment on the next reboot.

- Using `pkg` command to install or update packages in your active Oracle Solaris 11.3 boot environment might create a clone of that boot environment. If a clone is created, packages are installed or updated in the clone rather than in the original boot environment. After successfully completing the changes, the new clone is activated. Then, the clone will become the new default boot environment on the next reboot. The original boot environment remains and is unaffected by the update.
- You can use the `beadm list` command to see a list of all the boot environments on the system, including the backup boot environment that still has its original, unchanged software. If you are not satisfied with the changes made to the environment, you can use the `beadm activate` command to specify that the backup will become the default boot environment on the next reboot.

About the beadm Command

The beadm command enables you to perform the following tasks:

- Create a new boot environment based on the active boot environment
- Create a new boot environment based on an inactive boot environment
- Create a snapshot of an existing boot environment
- Create a new boot environment based on an existing snapshot
- Create a new boot environment in a different zpool
- Create a new boot environment and add a custom title and description to the x86 GRUB menu or the SPARC boot menu
- Activate an existing, inactive boot environment
- Mount a boot environment
- Unmount a boot environment
- Destroy a boot environment
- Destroy a snapshot of a boot environment
- Rename an existing, inactive boot environment
- Display information about your boot environment snapshots and datasets

The beadm command has the following features:

- Aggregates all datasets in a boot environment and performs actions on the entire boot environment at once. You should not perform ZFS commands to modify each dataset individually.
- Manages the dataset structures within boot environments. For example, when the beadm command clones a boot environment that has shared datasets, the command automatically recognizes and manages those shared datasets for the new boot environment.
- Enables you to perform administrative tasks on your boot environments in a global zone or in a non-global zone.
- Automatically manages and updates the GRUB menu for x86 systems or the boot menu for SPARC systems. For example, when you use the beadm command to create a new boot environment, that environment is automatically added to the GRUB menu or boot menu.

◆ ◆ ◆ CHAPTER 2

beadm Zones Support

Zones partitioning technology is used to virtualize operating system services and provide an isolated and secure environment for running applications. Each Oracle Solaris 11.3 system has a global zone. Within a global zone, specific non-global zones can be created.

For information about creating and administering non-global zones on your system, see [Creating and Using Oracle Solaris Zones](#).

The `beadm` command includes support for creating and administering non-global zone boot environments.

beadm in Non-Global Zones

Note the following support specifications for non-global zones in the `beadm` command and in related processes:

- The `beadm` command is supported inside a non-global zone.
- The root dataset for non-global zones must not be under the `rpool/ROOT` namespace.
- Although the `beadm` command affects the non-global zones on your system, the `beadm` command does not display zones information. Use the `zoneadm` command to view changes in the zones in your boot environment. For example, use the `zoneadm list` command to view a list of all current zones on the system.

For further information, see the [zoneadm\(1M\)](#) man page.

- Not all of the `beadm` command options can be used in non-global zones. See the specific limitations for each command option in the [beadm\(1M\)](#) man page.

Unbootable Boot Environments

Both global zones and non-global zones contain boot environments. Each boot environment in a non-global zone is associated with a parent boot environment in the global zone. If a global

zone boot environment is inactive, the related non-global zone boot environment is unbootable. However, if you boot into that parent boot environment in the global zone, the related boot environment in the non-global zone becomes bootable.

Note - If the boot environment is unbootable, it is marked with an exclamation point (!) in the Active column in the `beadm list` output.

The `beadm` command restricts actions on unbootable boot environments as follows:

- You cannot activate an unbootable boot environment.
- You cannot destroy a boot environment that is both unbootable and marked as active on reboot.
- You cannot create a snapshot of an unbootable boot environment.
- You cannot use an unbootable boot environment or boot environment snapshot with the `-e` option of `beadm create`.
- You cannot rename an unbootable boot environment.

Zones and Shared Datasets

The `beadm` command automatically handles all zones naming tasks related to the `beadm` processes. The `beadm` command can operate on boot environments in a global zone that also contains non-global zones.

A zone root dataset name is stated in the following format:

zone-path dataset/rpool/ROOT/BE-name

For example:

`rpool/zones/zone1/rpool/ROOT/BE1`

In this example, `rpool/zones/zone1` is the path for a zone root dataset. Nested under that dataset is `rpool/ROOT/BE1`, which is the root dataset for the BE1 boot environment.

When a zone is copied from one boot environment to another boot environment, only the datasets that are under the zone's root dataset are copied.

Shared datasets are user-defined directories, such as `/export`, that contain the same mount point in both active and inactive boot environments. Shared datasets are located outside the root dataset area of each boot environment. A dataset can be shared between zone boot environments.

A shared dataset is identified by using the following format:

zone-path dataset/rpool/export

For example:

`rpool/zones/zone1/rpool/export`

A shared dataset must be explicitly added during zones configuration. A shared dataset is not cloned when the zone dataset is cloned. See the examples in [Chapter 3, “Creating Boot Environments and Snapshots”](#).

Creating Boot Environments and Snapshots

Use the `beadm` command to create and copy boot environments and snapshots of boot environments.

Creating a Boot Environment

If you want to create a backup of an existing boot environment, for example, prior to modifying the original boot environment, you can use the `beadm` command to create and mount a new boot environment that is a clone of your active boot environment. This clone is listed as an alternate boot environment in the GRUB menu for x86 systems or in the boot menu for SPARC systems.

When you clone a boot environment by using the `beadm create` command, all supported zones in that boot environment are copied into the new boot environment.

`beadm create` Command Options

The `beadm create` command has the following options:

- a – Activate the newly created boot environment upon creation. The default is to not activate the newly created boot environment.
- d *description* – Provide a custom description to be used as the title in the x86 GRUB menu or the SPARC boot menu to describe the new boot environment. If this option is not used, *BeName* is used for the title.
- e *non-activeBeName* – Create a new boot environment from a specified existing, but inactive, boot environment. The default is to create the boot environment from the active boot environment.
- e *BeName@snapshot* – Create a new boot environment from a specified, existing snapshot of the boot environment.
- o *property=value* – Create the datasets for a new boot environment with specific ZFS properties. Multiple -o options can be specified. See the [zfs\(1M\)](#) man page for more information on the -o option.

-p *zpool* – Create the datasets for a new boot environment within a specified *zpool*. If this option is not provided, the default behavior is to create the new boot environment in the same pool as the original boot environment. The -p option is not supported within a non-global zone.

Use the command as follows:

```
# beadm create BeName@snapshotdescription
```

The snapshot name must use the format, *BeName@snapshotdescription*, where *BeName* is the name of an existing boot environment that you want to make a snapshot from. Provide a custom snapshot description to identify the date or purpose of the snapshot.

▼ How to Clone a Boot Environment

1. Become an administrator.

For more information, see [“Using Your Assigned Administrative Rights” in *Securing Users and Processes in Oracle Solaris 11.3*](#).

2. Clone the boot environment.

```
# beadm create BeName
```

BeName is the name of the new boot environment. This new boot environment is inactive.

Note the following:

- *BeName* cannot be a boot environment name that is already being used.
- This command clones the active boot environment, unless the -e option is used to specify an inactive boot environment.
- `beadm create` does not create a partial boot environment. The command either successfully creates a full boot environment, or the command fails.

3. (Optional) Use the `beadm mount` command to mount the new boot environment.

```
# beadm mount BeName mount-point
```

You might mount the new boot environment, for example, if you want to modify some configuration files inside the new boot environment before rebooting into it.

The boot environment is mounted but remains inactive. You can upgrade a mounted, inactive boot environment.

Note - If the directory for the mount point does not exist, the `beadm` command creates the directory, then mounts the boot environment on that directory.

If the boot environment is already mounted, the `beadm mount` command fails and does not remount the boot environment at the newly specified location.

4. (Optional) Activate the boot environment.

`beadm activate BeName`

BeName is the name of the boot environment to be activated.

On reboot, the newly active boot environment is displayed as the default selection in the x86 GRUB menu or the SPARC boot menu.

Note - The GRUB menu or boot menu always displays the most recently activated boot environment as the default.

Examples of Cloning Boot Environments

The following examples illustrate how to clone boot environments, and how the cloning process varies depending on the zone and dataset structure. The first example illustrates how cloning operates in a system that includes global and non-global zones. The second example shows dataset specifics related to cloning. The third example show what happens with shared datasets when you clone a system.

Note - For zones and dataset information, see the following:

- [“beadm in Non-Global Zones” on page 13](#)
 - [“Zones and Shared Datasets” on page 14](#)
-

EXAMPLE 1 Cloning a Boot Environment in a Global Zone That Contains Non-Global Zones

This example shows the zones impact of the `beadm create` command when you are cloning a boot environment in a global zone that contains non-global zones.

If the boot environment being cloned has an associated zone boot environment in a non-global zone, that associated boot environment is also cloned. For example, BE1 has an associated zone boot environment, BE2, in a non-global zone. If BE1 is cloned, BE2 is also cloned.

- In this example, the original boot environment in the global zone is named `solaris` with its root dataset at `rpool/ROOT/solaris`.

- A non-global zone named `z1` exists that has the dataset `rpool/zones/z1` as its zonepath. The original `solaris` boot environment in the global zone has an associated boot environment in the `z1` non-global zone. This associated zone boot environment is named `solaris`, with a root dataset at `rpool/zones/z1/rpool/ROOT/solaris`.

```
# zfs list -r rpool
```

NAME	USED	AVAIL	REFER	MOUNTPOINT
rpool	11.5G	3.89G	4.46M	/rpool
rpool/ROOT	8.47G	3.89G	31K	legacy
rpool/ROOT/solaris	2.98M	3.89G	2.49G	/
rpool/ROOT/solaris/var	428K	3.89G	298M	/var
rpool/dump	1.03G	3.92G	1.00G	-
rpool/export	120K	3.89G	32K	/export
rpool/export/home	88.5K	3.89G	32K	/export/home
rpool/export/home/user1	56.5K	3.89G	56.5K	/export/home/user1
rpool/swap	1.03G	3.92G	1.00G	-
rpool/zones	672M	3.89G	32K	/zones
rpool/zones/z1	672M	3.89G	32K	/zones/z1
rpool/zones/z1/rpool	671M	3.89G	31K	/rpool
rpool/zones/z1/rpool/ROOT	671M	3.89G	31K	legacy
rpool/zones/z1/rpool/ROOT/solaris	671M	3.89G	591M	/zones/z1/root
rpool/zones/z1/rpool/ROOT/solaris/var	79.3M	3.89G	78.4M	/zones/z1/root/var
rpool/zones/z1/rpool/export	62K	3.89G	31K	/export
rpool/zones/z1/rpool/export/home	31K	3.89G	31K	/export/home

In this example, you would issue the following command as root to clone the boot environment in the global zone and name the new boot environment `solaris-1`:

```
# beadm create test
# zfs list -r rpool
```

NAME	USED	AVAIL	REFER	MOUNTPOINT
rpool	11.5G	3.89G	4.46M	/rpool
rpool/ROOT	8.47G	3.89G	31K	legacy
rpool/ROOT/solaris	2.98M	3.89G	2.49G	/
rpool/ROOT/solaris/var	428K	3.89G	298M	/var
rpool/ROOT/test	71K	3.89G	2.50G	/
rpool/ROOT/test/var	1K	3.89G	2.88G	/var
rpool/dump	1.03G	3.92G	1.00G	-
rpool/export	120K	3.89G	32K	/export
rpool/export/home	88.5K	3.89G	32K	/export/home
rpool/export/home/user1	56.5K	3.89G	56.5K	/export/home/user1
rpool/swap	1.03G	3.92G	1.00G	-
rpool/zones	672M	3.89G	32K	/zones
rpool/zones/z1	672M	3.89G	32K	/zones/z1
rpool/zones/z1/rpool	671M	3.89G	31K	/rpool
rpool/zones/z1/rpool/ROOT	671M	3.89G	31K	legacy
rpool/zones/z1/rpool/ROOT/solaris	671M	3.89G	591M	/zones/z1/root
rpool/zones/z1/rpool/ROOT/solaris/var	79.3M	3.89G	78.4M	/zones/z1/root/var
rpool/zones/z1/rpool/ROOT/solaris-1	2K	3.89G	591M	/
rpool/zones/z1/rpool/ROOT/solaris-1/var	1K	3.89G	78.4M	/var
rpool/zones/z1/rpool/export	62K	3.89G	31K	/export
rpool/zones/z1/rpool/export/home	31K	3.89G	31K	/export/home

The clone is named `test`, with a root dataset at `rpool/ROOT/test`.

Note that because the `solaris` boot environment in the global zone has an associated zone boot environment in the `z1` non-global zone, the cloning process also clones the associated zone boot environment in `z1`. The new `solaris-1` clone in zone `z1` has its root dataset at `rpool/zones/z1/rpool/ROOT/solaris-1`.

EXAMPLE 2 Cloning a New Boot Environment with Datasets

This example illustrates how datasets are set up in a newly created boot environment. This example does not involve multiple zones.

As root, you would type the following command.

```
# beadm create BE2
```

The original boot environment in this example is `BE1` with a root dataset at `rpool/ROOT/BE1` containing another dataset, `var`.

```
# zfs list
```

NAME	USED	AVAIL	REFER	MOUNTPOINT
<code>rpool</code>	42.5G	24.4G	4.65M	<code>/rpool</code>
<code>rpool/ROOT</code>	25.6G	24.4G	31K	<code>legacy</code>
<code>rpool/ROOT/BE1</code>	8.91M	24.4G	4.17G	<code>/</code>
<code>rpool/ROOT/BE1/var</code>	3.96M	24.4G	276M	<code>/var</code>

After `BE1` is cloned, the new clone, `BE2`, contains a root dataset and other nested datasets, all cloned from `BE1`. Because `BE1` contains the `/var` file system under the root dataset, `/var` was also cloned.

```
# zfs list
```

NAME	USED	AVAIL	REFER	MOUNTPOINT
<code>rpool</code>	42.5G	24.4G	4.65M	<code>/rpool</code>
<code>rpool/ROOT</code>	25.6G	24.4G	31K	<code>legacy</code>
<code>rpool/ROOT/BE1</code>	8.91M	24.4G	4.17G	<code>/</code>
<code>rpool/ROOT/BE1/var</code>	3.96M	24.4G	276M	<code>/var</code>
<code>rpool/ROOT/BE2</code>	8.91M	24.4G	4.17G	<code>/</code>
<code>rpool/ROOT/BE2/var</code>	3.96M	24.4G	276M	<code>/var</code>

In contrast, if there was a shared file system outside of the root dataset, that shared file system would not have been cloned. The original boot environment and the clone would both “share” the original shared file system, as shown in the next example.

EXAMPLE 3 Creating a New Boot Environment With Existing Shared Datasets

This example illustrates creating a new boot environment when there are existing shared datasets. In this example, the original boot environment is `BE1`, and the shared datasets are `rpool/export` and `rpool/export/home`. This example does not involve multiple zones.

As root, you would type the following command to clone BE1 and name the clone BE2:

```
# beadm create BE2
```

The shared datasets, tank and tank/export, are not cloned when the boot environment is cloned. The shared datasets are located outside the `rpool/ROOT/BeName` datasets and are referenced at their original locations by the cloned boot environment, BE2.

The original boot environment, BE1, and datasets are as follows:

```
# zfs list
NAME                                USED  AVAIL  REFER  MOUNTPOINT
rpool                              42.5G  24.4G  4.65M  /rpool
rpool/ROOT                         25.6G  24.4G   31K   legacy
rpool/ROOT/BE1                     8.91M  24.4G  4.17G   /
rpool/ROOT/BE1/var                 3.96M  24.4G  276M   /var
tank                               450K   457G   18K   /tank
tank/home                         315K   457G   21K   /tank/home
```

The root dataset is at `rpool/ROOT/BE1` and a `/var` dataset is located under the root dataset. The root dataset and `/var` are both cloned.

The cloned boot environment, BE2, has new root dataset and a new `/var` dataset, but the original shared datasets, tank and tank/home, are unchanged.

```
# zfs list
NAME                                USED  AVAIL  REFER  MOUNTPOINT
rpool                              42.5G  24.4G  4.65M  /rpool
rpool/ROOT                         25.6G  24.4G   31K   legacy
rpool/ROOT/BE1                     8.91M  24.4G  4.17G   /
rpool/ROOT/BE1/var                 3.96M  24.4G  276M   /var
rpool/ROOT/BE2                     8.91M  24.4G  4.17G   /
rpool/ROOT/BE2/var                 3.96M  24.4G  276M   /var
tank                               450K   457G   18K   /tank
tank/home                         315K   457G   21K   /tank/home
```

Creating and Copying Snapshots

You can manually create a snapshot of an existing boot environment for reference. This snapshot is a read-only image of a dataset or boot environment at a given point in time. You can create a custom name for the snapshot that indicates when the snapshot was created or what it contains. You can then copy that snapshot.

Creating a Snapshot of a Boot Environment

The following command creates a snapshot of the existing boot environment named `BeName`.

beadm create *BeName@snapshotdescription*

The snapshot name must use the format *BeName@snapshotdescription*. *BeName* is the name of an existing boot environment that you want to make a snapshot from. If the existing boot environment name is not valid, the command fails. *snapshotdescription* is a custom description to identify the date or purpose of the snapshot.

Note - If you do not use the snapshot name format, the `beadm create` command will try to make a bootable clone instead of a unbootable snapshot. A clone is a complete bootable copy of an image that can be much larger than a mere snapshot. The snapshot merely records what's changed in the datasets instead of copying all the datasets contents.

Note the following snapshot sample names and descriptions:

- `BE1@0312200.12:15pm` – The name for a snapshot of the existing BE1 boot environment. The custom description, `0312200.12:15pm`, records the date and time that the snapshot was taken for future reference.
- `BE2@backup` – The name for a snapshot of an original boot environment named BE2. The snapshot description merely notes that this is a backup of BE2.
- `BE1@march132008` – The name for a snapshot of an original boot environment named BE1. The snapshot description records the date that the snapshot was taken.

Some other system functions automatically take snapshots of a boot environment. Names for such snapshots automatically include a timestamp that indicates when the snapshot was taken. You must use the `beadm create` command if you want to customize a snapshot name.

Cloning a Boot Environment From an Existing Snapshot

A snapshot of a boot environment is not bootable. However, you can clone a new boot environment from an existing snapshot. Then you can activate and boot that new boot environment.

▼ How to Clone a Boot Environment From a Snapshot

1. Become an administrator.

For more information, see [“Using Your Assigned Administrative Rights” in *Securing Users and Processes in Oracle Solaris 11.3*](#).

2. Clone a new boot environment from a snapshot.

```
# beadm create -e BEname@snapshotdescription NewName
```

BName@snapshotdescription is the name of an existing snapshot and description. *NewName* is a custom name for your new boot environment.

For example:

```
# beadm create -e BE1@now BE2
```

This command creates a new boot environment named BE2 from the existing snapshot named BE1@now.

Next Steps You can activate this new boot environment. See [“Changing the Default Boot Environment” on page 28](#).

Administering Boot Environments

This chapter describes administration tasks related to boot environments, covering the following topics:

- [“Listing Existing Boot Environments and Snapshots” on page 25](#)
- [“Changing the Default Boot Environment” on page 28](#)
- [“Mounting and Updating an Inactive Boot Environment” on page 28](#)
- [“Destroying a Boot Environment” on page 29](#)
- [“Creating Custom Names for Boot Environments” on page 31](#)
- [“Creating Additional Datasets for Boot Environments” on page 31](#)

Listing Existing Boot Environments and Snapshots

You can display information about snapshots, boot environments, and datasets that were created by the `beadm` command by using the `beadm list` command. The `beadm list` command output also displays boot environments that are created by the `pkg` command.

To view information for a specific boot environment, include a boot environment name on the command line. If a specific boot environment is not specified, the command lists information about all boot environments. The default is to list boot environments without additional information.

The following options are available:

- a – Lists all available information about the boot environment. This information includes subordinate datasets and snapshots.
- d – Lists information about all subordinate datasets that belong to the boot environment.
- s – Lists information about the snapshots of the boot environment.
- H – Lists information in machine-parseable format. Each field in the output is separated by a semicolon.

Viewing Information About Boot Environments

The `-a` option shows full information for a specified boot environment or for all boot environments, including all dataset and snapshot information. This information includes flags to indicate whether the boot environment is active or not, the mountpoint for the dataset, the amount of space used by the dataset, the policy and the date the dataset was created.

The values for the Active column are as follows:

- R – Active on reboot
- N – Active now
- O – Orphaned non-global zone boot environment, only visible inside a non-global zone
- NR – Active now and active on reboot
- – Inactive
- ! – Unbootable boot environments in a non-global zone

The following example displays full information for the BE5 boot environment.

```
# beadm list -a BE5
BE/Dataset/Snapshot    Active Mountpoint Space   Policy Created
-----
BE5
  p/ROOT/BE5           NR      /           6.10G   static 2013-09-09 16:53
  p/ROOT/BE5/var        -       /var       24.55M   static 2013-09-09 16:53
  p/ROOT/BE5/var@boo    -       -          18.38M   static 2013-09-10 00:59
  p/ROOT/BE5/var@foo    -       -          18.38M   static 2013-06-10 16:37
  p/ROOT/BE5@boo        -       -          139.44M static 2013-09-10 00:59
  p/ROOT/BE5@foo        -       -          912.85M static 2013-06-10 16:37
```

For more information about orphaned boot environments see [“About Orphaned Zone Boot Environments”](#) in *Creating and Using Oracle Solaris Zones*.

Viewing Information About Boot Environments in Machine-Parsable Output

The `-H` option suppresses header titles and displays results separated by semicolons. The following example shows information for all boot environments.

```
# beadm list -H
BE2;4659d6ee-76a0-c90f-e2e9-a3fcb570ccd5;;;55296;static;1211397974
BE3;ff748564-096c-449a-87e4-8679221d37b5;;;339968;static;1219771706
BE4;1efe3365-02c5-6064-82f5-a530148b3734;;;16541696;static;1220664051
BE5;215b8387-4968-627c-d2d0-f4a011414bab;NR;/;7786206208;static;1221004384
```

Each field in the output is separated by a semicolon. The output fields, in display order, are as follows.

TABLE 1 Output Fields for `beadm list -H`

Field	Description
1	BE name
2	UUID
3	Active
4	Mountpoint
5	Space; size in bytes
6	Policy
7	Creation time (in seconds since 00:00:00 UTC, Jan 1, 1970)

Each field is separated by a semicolon. In this example, a boot environment was not specified in the command, so all boot environments are displayed. Because no other options were used with the command, the universally unique identifier (UUID) for the boot environment is provided in the second field. In this example, the UUID for BE5 is 215b8387-4968-627c-d2d0-f4a011414bab. For a boot environment in a non-global zone, the UUID field represents the parent ID with which that boot environment is associated.

Viewing Snapshot Specifications

The `-s` option displays information for any snapshots that exist.

In the following sample output, each snapshot title includes a timestamp indicating when that snapshot was taken.

```
# beadm list -s test-2
BE/Snapshot          Space  Policy Created
-----
test-2
test-2@2013-04-12-22:29:27 264.02M static 2013-04-12 16:29
test-2@2013-06-02-20:28:51 32.50M static 2013-06-02 14:28
test-2@2013-06-03-16:51:01 16.66M static 2013-06-03 10:51
test-2@2013-07-13-22:01:56 25.93M static 2013-07-13 16:01
test-2@2013-07-21-17:15:15 26.00M static 2013-07-21 11:15
test-2@2013-07-25-19:07:03 13.75M static 2013-07-25 13:07
test-2@2013-07-25-20:33:41 12.32M static 2013-07-25 14:33
test-2@2013-07-25-20:41:23 30.60M static 2013-07-25 14:41
test-2@2013-08-06-15:53:15 8.92M static 2013-08-06 09:53
test-2@2013-08-06-16:00:37 8.92M static 2013-08-06 10:00
test-2@2013-08-09-16:06:11 193.72M static 2013-08-09 10:06
test-2@2013-08-09-20:28:59 102.69M static 2013-08-09 14:28
```

test-2@install

205.10M static 2013-03-16 19:04

Changing the Default Boot Environment

You can change an inactive boot environment into an active boot environment, which means that the named boot environment will be used when the system is next rebooted. Only one boot environment can be active at a time. The newly activated boot environment becomes the default environment upon reboot.

Use the `beadm activate` command as follows to activate an existing, inactive boot environment:

```
# beadm activate BeName
```

`beadm activate` sets the specified boot environment as the default in the `menu.lst` file.

Note - When a boot environment is created, regardless of whether it is active or inactive, an entry is created for the boot environment on the x86 GRUB menu or the SPARC boot menu. The default boot environment is the last boot environment that was activated.

Mounting and Updating an Inactive Boot Environment

To update packages on an existing, inactive boot environment, mount that environment first, in order to gain access to it. Then, you can update packages on it.

Note - When you mount a boot environment, the supported zones in that environment are mounted relative to the mount points for the environment.

The `beadm mount` command mounts a specified boot environment at a specified mount point. If the mount point already exists, it must be empty. If the directory for the mount point does not exist, the `beadm` command creates the directory, then mounts the boot environment on that directory. Although the boot environment is mounted, it remains inactive.

If the specified boot environment is already mounted, the `beadm mount` command fails and does not remount the boot environment at the newly specified location.

▼ How to Mount and Update a Boot Environment

1. **Become an administrator.**

For more information, see [“Using Your Assigned Administrative Rights” in *Securing Users and Processes in Oracle Solaris 11.3*](#).

2. Mount the boot environment.

```
# beadm mount BeName mount-point
```

3. (Optional) Update packages on the boot environment by using the `pkg` command.

For example, you can use the `pkg install` command with the `-R` option to update specific packages on the boot environment.

```
# pkg -R /mnt install package-name
```

where `/mnt` is the mount point for the boot environment.

Unmounting Boot Environments

You can use the `beadm` command to unmount an existing boot environment. When you unmount a boot environment, the zones in that environment are also unmounted. All mount points are returned to their states prior to being mounted.

Note - You cannot unmount the boot environment that is currently booted.

The command syntax is as follows.

```
beadm unmount [-f] BeName
```

The command unmounts the specified boot environment.

The `-f` option forcefully unmounts the boot environment even if it is currently busy.

Destroying a Boot Environment

To make more room available on your system, use the `beadm` command to destroy an existing boot environment. The command syntax is as follows:

```
beadm destroy [[-fF] BeName | BeName@snapshot] [[-fF] -O
```

The command destroys the specified boot environment or snapshot. The command prompts the user to provide confirmation before destroying the boot environment.

- f – Forces destruction of the boot environment even if it is mounted.
- F – Forces destruction of the boot environment without prompting for confirmation.
- O – Destroys all orphan non-global zone boot environments. Only works in a non-global zone.

Note the following specifications:

- You cannot destroy the boot environment that is currently booted.
- The `beadm destroy` command automatically removes the destroyed boot environment's entry from the x86 GRUB menu or the SPARC boot menu.
- When you destroy an inactive boot environment, any zone boot environments that are associated with that inactive boot environment are also destroyed.
- The `beadm destroy` command destroys only the nonshared datasets of the boot environment. Shared datasets are located outside of the boot environment root dataset area and are not affected when a boot environment is destroyed.

In the following example, BE1 and BE2 share the `/tank` and `/tank/home` datasets. The datasets include the following:

```
# zfs list
NAME                                USED  AVAIL  REFER  MOUNTPOINT
rpool                               42.5G  24.4G  4.65M  /rpool
rpool/ROOT                          25.6G  24.4G   31K  legacy
rpool/ROOT/BE1                     8.91M  24.4G  4.17G  /
rpool/ROOT/BE1/var                  3.96M  24.4G  276M  /var
rpool/ROOT/BE2                     8.91M  24.4G  4.17G  /
rpool/ROOT/BE2/var                  3.96M  24.4G  276M  /var
tank                                450K   457G   18K  /export
tank/home                          315K   457G   21K  /export/home
```

You would destroy BE2 by using the following command:

```
# beadm destroy BE2
```

The shared datasets, `rpool/export` and `rpool/export/home`, are not destroyed when the boot environment BE2 is destroyed. The following datasets remain:

```
# zfs list
NAME                                USED  AVAIL  REFER  MOUNTPOINT
rpool                               42.5G  24.4G  4.65M  /rpool
rpool/ROOT                          25.6G  24.4G   31K  legacy
rpool/ROOT/BE1                     8.91M  24.4G  4.17G  /
rpool/ROOT/BE1/var                  3.96M  24.4G  276M  /var
tank                                450K   457G   18K  /export
tank/home                          315K   457G   21K  /export/home
```

For more information about destroying orphaned boot environments see [“About Orphaned Zone Boot Environments” in *Creating and Using Oracle Solaris Zones*](#).

Creating Custom Names for Boot Environments

The `beadm rename` command enables you to rename an existing boot environment so you can supply a name that is more meaningful for your particular situation. For example, you could rename boot environments to specify how you customized that environment. The boot environment's dataset name is also changed to conform to the new boot environment name.

When you rename a boot environment, that change does not impact the names of the zones or the names of the datasets that are used for those zones in that boot environment. The change does not affect the relationships between the zones and their related boot environments.

An active boot environment cannot be renamed. Only an inactive boot environment can be renamed.

You cannot rename the boot environment that is currently booted. If you want to rename the active boot environment, you must first make a different boot environment active and boot that environment. Then you can rename the inactive boot environment.

The command syntax is as follows:

```
beadm rename BeName newBeName
```

The command renames `BeName` to `newBeName`.

If the new name is already in use, the `beadm rename` command fails.

Note - A new boot environment or a backup boot environment might be created when you install, update, or uninstall a package using the `pkg` command. You can create custom names for new or backup boot environments by using the `--be-name` or `--backup-be-name` options with the `pkg` command. For information, see [“Boot Environment Options” in *Adding and Updating Software in Oracle Solaris 11.3*](#).

Creating Additional Datasets for Boot Environments

You can create additional private datasets for an existing boot environment by using the `zfs` command to create a dataset located hierarchically under the root dataset of the boot environment.

This new dataset will not be automatically cloned to existing, associated zone boot environments. Also, because the new dataset is under the root dataset of a boot environment, the new dataset will be private to that boot environment. The new dataset will not be a shared dataset.

Once this new dataset has been created under the root dataset, if you then clone that whole boot environment, the new dataset would be included in the new, cloned boot environment.

Note - When creating additional datasets for boot environments, the `canmount` ZFS property of the dataset must be set to `noauto`. The dataset's mountpoint is inherited from the boot environment's root dataset and hence should be mounted at `/myfs` when this boot environment is in use.

For example, to create a new, non-shared dataset mounted at `/myfs` for the boot environment, BE1:

```
# zfs create -o canmount=noauto rpool/ROOT/BE1/myfs
```

For further information, see the [zfs\(1M\)](#) man page.

Index

A

-a

beadm list command, 25

Active column in boot environment listing, 26

administering boot environments, 25

advantages to maintaining multiple boot environments, 10

B

beadm activate command, 28

beadm command

overview, 12

syntax and options, 17

when to use, 10

zones support

in non-global zones, 13

unbootable environments and, 13

zones naming conventions, 14

beadm create command

cloning boot environments and zones, 19

options, 17

beadm destroy command, 29

beadm list command

displaying snapshot information with, 27

output example, 26

overview, 25

suppressing header titles in output, 26

unbootable environments and, 14

values for Active column in output, 26

beadm mount command, 28

beadm rename command, 31

beadm unmount command, 29

boot environments

adding datasets, 31

administering, 25

advantages to maintaining multiple, 10

changing default, 28

cloning, 18

examples, 19

with existing shared datasets, 21

with new datasets, 21

cloning a snapshot, 23

creating, 17

definition of, 9

destroying, 29

listing, 25

making an inactive boot environment active, 28

mounting and updating an inactive, 28

orphan, 29

overview, 9

renaming, 31

unbootable

displayed in beadm list output, 14

restricted actions, 14

zones support and, 13

unmounting, 29

viewing information about, 26

in machine-parsable output, 26

snapshots, 27

C

clone

setting up datasets in new, 21

cloning

boot environments, 18

creating

boot environments, 17

snapshots, 22

D

- d
 - beadm list command, 25
- datasets
 - creating additional, 31
 - definition of, 9
 - root
 - description of, 9
 - naming conventions, 14
 - setting up in new boot environment, 21
 - shared
 - cloning new boot environment with existing, 21
 - definition of, 10
 - identifying, 14
- destroying a boot environment, 29

F

- F
 - beadm destroy command, 29
- f
 - beadm destroy command, 29

H

- H
 - beadm list command, 25

I

- inactive boot environments
 - making active, 28
 - mounting and updating, 28

L

- listing boot environments information, 25

M

- mounting an inactive boot environment, 28

N

- non-global zones
 - beadm command and, 13

O

- O
 - beadm destroy command, 29
- orphan boot environments, 29

R

- renaming boot environments, 31
- root datasets
 - description of, 9
 - naming conventions, 14

S

- s
 - beadm list command, 25
- shared datasets
 - cloning new boot environment with existing, 21
 - definition of, 10
 - identifying, 14
- snapshots
 - cloning a boot environment from existing, 23
 - creating, 22
 - definition of, 22
 - naming, 23
 - viewing information about, 27

U

- unbootable boot environments
 - in beadm list output, 14
 - zones and, 13
- unmounting boot environments, 29
- updating packages on an inactive boot environment, 28

V

- viewing

boot environment information, 26
snapshot information, 27

Z

zones

- how to view information related to, 13
- restricted beadm actions on unbootable environments, 13
- root dataset naming conventions, 14
- support for beadm command
 - in non-global zones, 13
 - zones naming conventions, 14

