

Dynamic Root Disk A.3.13* Administrator's Guide

HP-UX 11i v2, HP-UX 11i v3



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HP secure development lifecycle

Starting with HP-UX 11i v3 March 2013 update release, HP secure development lifecycle provides the ability to authenticate HP-UX software. Software delivered through this release has been digitally signed using HP's private key. You can now verify the authenticity of the software before installing the products, delivered through this release.

To verify the software signatures in signed depot, the following products must be installed on your system:

- B.11.31.1303 or later version of SD (Software Distributor)
- A.01.01.07 or later version of HP-UX Whitelisting (WhiteListInf)

To verify the signatures, run: `/usr/sbin/swsign -v -s <depot_path>`

For more information, see *Software Distributor documentation* at: <http://www.hp.com/go/sd-docs>.

NOTE: Ignite-UX software delivered with HP-UX 11i v3 March 2014 release or later supports verification of the software signatures in signed depot or media, during cold installation. For more information, see *Ignite-UX documentation* at: <http://www.hp.com/go/ignite-ux-docs>.

1 About Dynamic Root Disk

Conceptual overview

This document describes the Dynamic Root Disk (DRD) toolset, which you can use to perform software maintenance and recovery on an HP-UX operating system with minimum system downtime. DRD enables you to easily and safely clone a system image from a root disk to another disk on the same system and modify the image without shutting down the system. DRD significantly reduces system downtime and allows you to do software maintenance during normal business hours. This document is primarily for HP-UX system administrators who apply software maintenance on HP-UX systems, such as installing new software product revisions, as well as updating from an older HP-UX operating environment (OE) to a newer one. Some understanding of HP-UX system administration is assumed.

Hewlett-Packard developed DRD to minimize the usual maintenance window during which you shut down the system to apply software maintenance. With DRD, the system keeps running while you clone the system image and apply software maintenance to the cloned image. DRD tools can manage the two system images simultaneously. DRD also provides a fail-safe mechanism for returning the system to its original state, if necessary.

Using DRD commands, you can perform software maintenance or make other modifications on the cloned system image without affecting the active system image. When ready, you can boot the cloned image on either the original system or a different system. The only downtime required for this process is while the system reboots.

Other uses of DRD include using the clone for quick software recovery or using the clone to boot another system, which is referred to as *rehosting*. For details of rehosting, see [Rehosting and unrehosting systems \(page 36\)](#).

Terminology

In this guide, “root group” refers to the LVM volume group or VxVM disk group that contains the root (“/”) file system. The term “logical volume” refers to an LVM logical volume or a VxVM volume.

❗ **IMPORTANT:** DRD supports the following LVM root volume group versions:

- DRD A.3.5.* and earlier:
 - HP-UX 11i v2: LVM 1.0
 - HP-UX 11i v3: LVM 1.0
 - DRD A.3.6.* and later:
 - HP-UX 11i v2: LVM 1.0
 - HP-UX 11i v3: LVM 1.0 and LVM 2.2
-

Commands overview

The `drd` command provides a command line interface to DRD tools. The `drd` command has nine major modes of operation:

- **activate**

After using the DRD commands to create and optionally modify a clone, using `drd activate` invokes `setboot(1M)` and sets the primary boot path to the clone. After the clone is booted, using `drd activate` invokes `setboot(1M)` to set the primary boot path to the original system

image. The `drd activate` command always sets the primary boot path to the inactive (not booted) system image.

- **clone**

Clones a booted system to an inactive system image. The `drd clone` mode copies the LVM volume group or VxVM disk group, containing the volume on which the root file system ("/") is mounted, to the target disk specified in the command.

- **deactivate**

If the `drd activate` command (which invokes `setboot(1M)`) has previously been utilized and set the clone as the primary boot path, but the system has not yet been rebooted, the `drd deactivate` command can be used to “undo” the `drd activate` command. That is, the `drd deactivate` command will set the original system image to be the primary boot path. The `drd deactivate` command always sets the primary boot path to the active (currently booted) system image.

- **mount**

Mounts all file systems in an inactive system image. The mount point of the root file system is either `/var/opt/drd/mnts/sysimage_000` or `/var/opt/drd/mnts/sysimage_001`. If the inactive system image was created by the most recent `drd clone` command, the mount point of the root file system is `/var/opt/drd/mnts/sysimage_001`. If the inactive system image was the booted system when the most recent `drd clone` command was run, the mount point of the root file system is `/var/opt/drd/mnts/sysimage_000`.

- **rehost**

Copies the specified system information file—containing hostname, IP address, and other system-specific information—to `EFI/HPUX/SYSINFO.TXT` on the disk to be rehosted.

- **runcmd**

Runs a command on an inactive system image. Only a select group of commands may be run by the `runcmd` mode. These are commands that have been verified to have no effect on the booted system when executed by `drd runcmd`. Such commands are referred to as *DRD-safe*. The commands `kctune`, `swinstall`, `swjob`, `swlist`, `swmodify`, `swremove`, `swverify`, `update-ux`, and `view` are currently certified DRD-safe. An attempt to execute any other command will result in a `runcmd` error. In addition, not every software package may safely be processed by the `sw*` and `update-ux` commands. The DRD-safe `update-ux` and `SW-DIST` commands are aware of running in a DRD session and will reject any unsafe packages. For more information about DRD-safe packages, see `drd-runcmd(1M)`.

NOTE: The `drd runcmd` command suppresses all reboots. The option `-x autoreboot` is ignored when an `swinstall`, `swremove`, or `update-ux` command is executed by `drd runcmd`.

- **status**

Displays (system-specific) status information about the original disk and the clone disk, including which disk is currently booted and which disk is activated (that is, the disk that will be booted when the system is restarted).

- **sync**

Propagates file system changes from the booted original system to the inactive clone image.

- **umount**

Unmounts all file systems in the inactive system image previously mounted by a `drd mount` command.

- **unrehost**

Removes the system information file, `EFI/HPUX/SYSINFO.TXT`, from a disk that was rehosted, optionally preserving a copy in a file system on the booted system.

For details of DRD commands syntax, including all options and extended options, see [DRD commands \(page 43\)](#).

Downloading and installing Dynamic Root Disk

For up-to-date detailed instructions about downloading and installing the DRD product, see <https://h20392.www2.hp.com/portal/swdepot/displayInstallInfo.do?productNumber=DynRootDisk>.

NOTE: Due to system calls DRD depends on, DRD expects legacy Device Special Files (DSFs) to be present and the legacy naming model to be enabled on HP-UX 11i v3 (11.31) servers. HP recommends only partial migration to persistent DSFs be performed. For details of migration to persistent DSFs, see the [HP-UX 11i v3 Persistent DSF Migration Guide](#).

NOTE: On VxVM configurations, DRD expects OS Native Naming (osn) to be enabled. Enclosure Based Naming (ebn) must be turned off.

2 Cloning the active system image

This chapter describes how to use the `drd clone` command to clone the active system image. It also describes where the cloned image is saved.

NOTE: You must be logged in as root to use any DRD command.

The active system image

The `drd clone` command creates a bootable disk that is a copy of the volume group containing the root file system (/). The source of the `drd clone` command is the LVM volume group or VxVM disk group containing the root (/) and boot (/stand) file systems. For a system with an LVM root, the source does not need to reside on a single physical disk. For a system with a VxVM root, all volumes in the root disk group must reside on every physical disk in the root group. Thus, each disk must be a mirror of every other disk. The target must be a single physical disk large enough to hold all volumes in the root group. In addition, a mirror for the target may be specified. For more details, see the *Dynamic Root Disk and MirrorDisk/UX* white paper, available at <http://www.hp.com/go/drd-docs>.

Because the `drd clone` operation clones a single group, systems with file systems to be patched must not reside in multiple volume groups. (For example, if /stand resides in vg00 and /var resides in vg01, the system is not appropriate for DRD.)

For additional information about source and target disks, see the *drd-clone* (1M) manpage (`man drd-clone`) and the *Dynamic Root Disk: Quick Start & Best Practices* white paper, available at <http://www.hp.com/go/drd-docs>.

NOTE:

After creating a DRD clone, your system has two system images—the original and the cloned image. Throughout this document, the system image that is currently in use is called the *active* system image. The image that is not in use is called the *inactive* system image.

Locating disks

The target of a `drd clone` operation must be a single disk or SAN LUN that is write-accessible to the system and not currently in use. Depending on your HP-UX operating system, refer to one of the following sections:

- [Locating Disks on HP-UX 11i v2](#)
- [Locating Disks on HP-UX 11i v3](#)

Locating disks on HP-UX 11i v2 systems

To help find and select the target disk on an HP-UX 11i v2 system, you can find out what disks are on the system with the `ioscan` command:

```
# /usr/sbin/ioscan -fnkC disk
```

The `ioscan` command displays a list of system disks with identifying information, location, and size. On a PA-RISC system, the output looks similar to [Example 2-1](#).

Example 1 The `ioscan -fnkC disk` command output on an HP-UX 11i v2 PA-RISC system

```
# /usr/sbin/ioscan -fnkC disk
Class I  H/W Path      Driver S/W State  H/W Type  Description
=====
disk  0   10/0/14/0.0.0    sdisk CLAIMED    DEVICE    TEAC CD-532E-B
          /dev/dsk/c0t0d0    /dev/rdisk/c0t0d0
disk  1   10/0/15/1.5.0    sdisk CLAIMED    DEVICE    HP 18.2GMAN3184MC
          /dev/dsk/clt2d0    /dev/rdisk/clt2d0
disk  2   10/0/15/1.6.0    sdisk CLAIMED    DEVICE    HP 18.2GMAN3184MC
          /dev/dsk/c2t3d0    /dev/rdisk/c2t3d0
```

On an Integrity system, the output looks similar to [Example 2-2](#).

Example 2 The `ioscan -fnkC disk` command output on an HP-UX 11i v2 Integrity system

```
# /usr/sbin/ioscan -fnkC disk
Class  I  H/W Path      Driver      S/W State  H/W Type      Description
=====
disk    0   0/0/2/0.0.0.0    sdisk      CLAIMED     DEVICE        TEAC      DV-28E-N
          /dev/dsk/c0t0d0    /dev/rdisk/c0t0d0
disk    1   0/1/1/0.0.0      sdisk      CLAIMED     DEVICE        HP 36.4GST336754LC
          /dev/dsk/c2t0d0    /dev/dsk/c2t0d0s3  /dev/rdisk/c2t0d0s2
          /dev/dsk/c2t0d0s1 /dev/rdisk/c2t0d0  /dev/rdisk/c2t0d0s3
          /dev/dsk/c2t0d0s2 /dev/rdisk/c2t0d0s1
disk    2   0/1/1/0.1.0      sdisk      CLAIMED     DEVICE        HP 36.4GST336754LC
          /dev/dsk/c2t1d0    /dev/dsk/c2t1d0s3  /dev/rdisk/c2t1d0s2
          /dev/dsk/c2t1d0s1 /dev/rdisk/c2t1d0  /dev/rdisk/c2t1d0s3
          /dev/dsk/c2t1d0s2 /dev/rdisk/c2t1d0s1
```



IMPORTANT:

The above output includes block device special files ending with `s1`, `s2`, or `s3`. These endings indicate an idisk partition on the disk. Do NOT use a partition as a clone target!

The first disk in the above list is a DVD drive, indicated by the `DV` in the description field. Do NOT use a DVD as a clone target!

Some device files are identified as `/dev/rdisk/. . .` following the block device special file designation. This identifies them as raw files. Do NOT use a raw file as a clone target!

If you have recently added a disk to your system you may need to run `ioscan` without the `-k` option to display the new disk. See the `ioscan(1M)` manpage for more information about `ioscan` options.

Locating disks on HP-UX 11i v3 Integrity systems

To help find and select the target disk on an Integrity system running HP-UX 11i v3 (11.31), you can find out what disks are on the system with the `ioscan` command:

```
# /usr/sbin/ioscan -fNnkC disk
```

The `ioscan` command displays a list of system disks with identifying information, location, and size. On an Integrity system running HP-UX 11i v3, the output looks similar to [Example 2-3](#).

Example 3 The `ioscan -fNnC disk` command output on an HP-UX 11i v3 Integrity system

```
# /usr/sbin/ioscan -fNnC disk
Class      I  H/W Path          Driver    S/W State  H/W Type    Description
=====
disk       4  64000/0xfa00/0x0  esdisk    CLAIMED    DEVICE      HP 36.4GMAN3367MC
              /dev/disk/disk4      /dev/rdisk/disk4
              /dev/disk/disk4_p1    /dev/rdisk/disk4_p1
              /dev/disk/disk4_p2    /dev/rdisk/disk4_p2
              /dev/disk/disk4_p3    /dev/rdisk/disk4_p3
disk       5  64000/0xfa00/0x1  esdisk    CLAIMED    DEVICE      HP 36.4GMAN3367MC
              /dev/disk/disk5      /dev/rdisk/disk5
              /dev/disk/disk5_p1    /dev/rdisk/disk5_p1
              /dev/disk/disk5_p2    /dev/rdisk/disk5_p2
              /dev/disk/disk5_p3    /dev/rdisk/disk5_p3
disk       6  64000/0xfa00/0x2  esdisk    CLAIMED    DEVICE      HP 36.4GMAN3367MC
              /dev/disk/disk6      /dev/rdisk/disk6
              /dev/disk/disk6_p1    /dev/rdisk/disk6_p1
              /dev/disk/disk6_p2    /dev/rdisk/disk6_p2
              /dev/disk/disk6_p3    /dev/rdisk/disk6_p3
disk       7  64000/0xfa00/0x3  esdisk    CLAIMED    DEVICE      TEAC      DW-28E
              /dev/disk/disk7      /dev/rdisk/disk7
```



IMPORTANT:

The above output includes block device special files ending with `_p1`, `_p2`, or `_p3`. These endings indicate an idisk partition on the disk. Do NOT use a partition as a clone target!

The last disk in the above list is a DVD drive, indicated by the `DW` in the description field. Do NOT use a DVD as a clone target!

Some device files are identified as `/dev/rdisk` following the block device special file designation. This identifies them as raw files. Do NOT use a raw file as a clone target!

Additionally, on HP-UX 11i v3 Integrity systems, you may find it useful to use the following `ioscan` command to identify persistent and legacy DSFs:

Example 4 The `ioscan -m dsf` command output on an HP-UX 11i v3 Integrity system

```
# /usr/sbin/ioscan -m dsf
Persistent DSF          Legacy DSF(s)
=====
/dev/rdisk/disk4        /dev/rdisk/c2t0d0
/dev/rdisk/disk4_p1     /dev/rdisk/c2t0d0s1
/dev/rdisk/disk4_p2     /dev/rdisk/c2t0d0s2
/dev/rdisk/disk4_p3     /dev/rdisk/c2t0d0s3
/dev/rdisk/disk5        /dev/rdisk/c2t1d0
/dev/rdisk/disk5_p1     /dev/rdisk/c2t1d0s1
/dev/rdisk/disk5_p2     /dev/rdisk/c2t1d0s2
/dev/rdisk/disk5_p3     /dev/rdisk/c2t1d0s3
/dev/rdisk/disk6        /dev/rdisk/c3t2d0
/dev/rdisk/disk6_p1     /dev/rdisk/c3t2d0s1
/dev/rdisk/disk6_p2     /dev/rdisk/c3t2d0s2
/dev/rdisk/disk6_p3     /dev/rdisk/c3t2d0s3
/dev/rdisk/disk7        /dev/rdisk/c0t0d0
```

For additional information about LVM volume group configurations from legacy to the agile naming model, see the [LVM Migration from Legacy to Agile Naming Model HP-UX 11i v3](#) white paper.

Choosing a target disk



CAUTION: It is the system administrator's responsibility to identify a target disk that is not currently in use! Cloning a disk removes all current data on the target disk.

In [Example 2-1](#), the disk with the active system image is `/dev/dsk/c2t3d0`. You need to choose a free disk to be the target of the `drd clone` command. Your system may have many more disks than [Example 2-1](#) shows.

The target disk must:

- Be a block device special file.
- Be writable by the system.
- Not currently be in use by other applications.
- Be large enough to hold a copy of each logical volume in the root group.

The target's physical disk need not be as large as the disk allocated for the root group, as long as there is enough space for a copy of each logical volume in the root group. However, the disk needs to be larger than the used space in each logical volume because each logical volume will be created with the number of physical extents currently allocated to the corresponding root group logical volume.

[Example 2-1](#) shows three system disks: `/dev/dsk/c0t0d0`, `/dev/dsk/c1t2d0`, and `/dev/dsk/c2t3d0`. You need to determine which disks are available and large enough.

Using other utilities to determine disk availability

You can determine which disks are in use with the `lvm(7M)` (Logical Volume Manager) and `VxVM` (Veritas Volume Manager) commands. For example, to see which disks are in use by `lvm`, enter this command:

```
# /usr/sbin/vgdisplay -v | /usr/bin/more
```

and look in the output for PV Name, which describes physical volumes.

This information is under the `Physical Volumes` heading. It looks similar to this:

```
--- Physical Volumes ---
PV Name           /dev/dsk/c2t3d0
PV Status          available
Total PE           4340
Free PE            428
Autoswitch         On
```

You can use the `vxdisk -o all dgs list` command to display information about all disks managed by `VxVM`. Do not specify any disk in use by `VxVM` as a clone target.

The `swapinfo` command can be used to display information about disks currently used for swap.

The HP System Management Homepage, `hpsmh(1M)`, or System Administration Manager, `sam(1M)`, can be used to investigate the disks on the system and their current usage.

Using DRD for limited disk availability checks

You can use `drd clone` with the `-p` option to get minimal availability information about a disk. (See the following section for an example.)

The `drd clone` command performs the following checks:

- If the disk is currently in use by the LVM Manager, it is rejected by the `drd clone` operation.
- If the disk is currently in use by the `VxVM` Manager, it will be accepted only if the following two conditions are met:
 - The disk is an inactive image managed by DRD
 - The extended option `-x overwrite=true` is specified on the `drd clone` command
- If the disk is not currently in use by LVM or `VxVM`, but contains LVM, `VxVM`, or boot records, it is only accepted as a `drd clone` target if `-x overwrite=true` is specified on the `drd clone` command.

NOTE: A selected target disk will not be overwritten if it is part of the root volume. However, the `drd clone` command will overwrite swap or raw data disks because it does not detect this type of usage. For example, any raw disks in use by databases would be overwritten if given as the target clone disk.

Using `drd clone` to analyze disk size

A simple way to determine if a disk is large enough for a DRD clone is to run `drd clone` in preview mode:

Example 5 `drd clone preview` example on HP-UX 11i v2 or 11i v3

```
# /opt/drd/bin/drd clone -p -v -t /dev/dsk/cxtxdx
```

Example 6 `drd clone preview` example on HP-UX 11i v3 (using agile DSF)

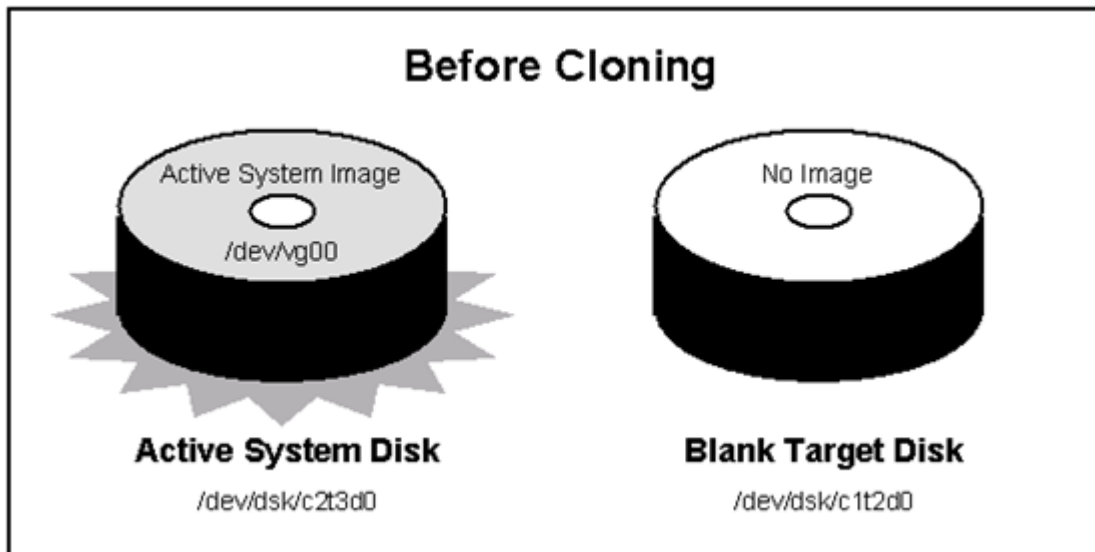
```
# /opt/drd/bin/drd clone -p -v -t /dev/disk/diskn
```

The preview operation includes disk space analysis that shows whether a target disk is large enough. If you prefer to investigate disk sizes before previewing the clone, you can use the `diskinfo` command.

Creating the clone

After determining that sufficient disk space exists and that the target disk contains no data you want to keep, you are ready to run the `drd clone` command. [Figure 2-1](#) illustrates the content of the active system disk and the clone target disk before cloning happens.

Figure 1 Preparing to Clone the Active System Image



Use the following command to clone the system image, substituting your target disk identifier for the one shown in the command:

```
# /opt/drd/bin/drd clone -v -x overwrite=true -t /dev/dsk/c1t2d0
```

On HP-UX 11i v3 systems, you can also use the agile device file to the target disk, substituting your target disk identifier for the one shown in the following command:

```
# /opt/drd/bin/drd clone -v -x overwrite=true -t /dev/disk/disk10
```

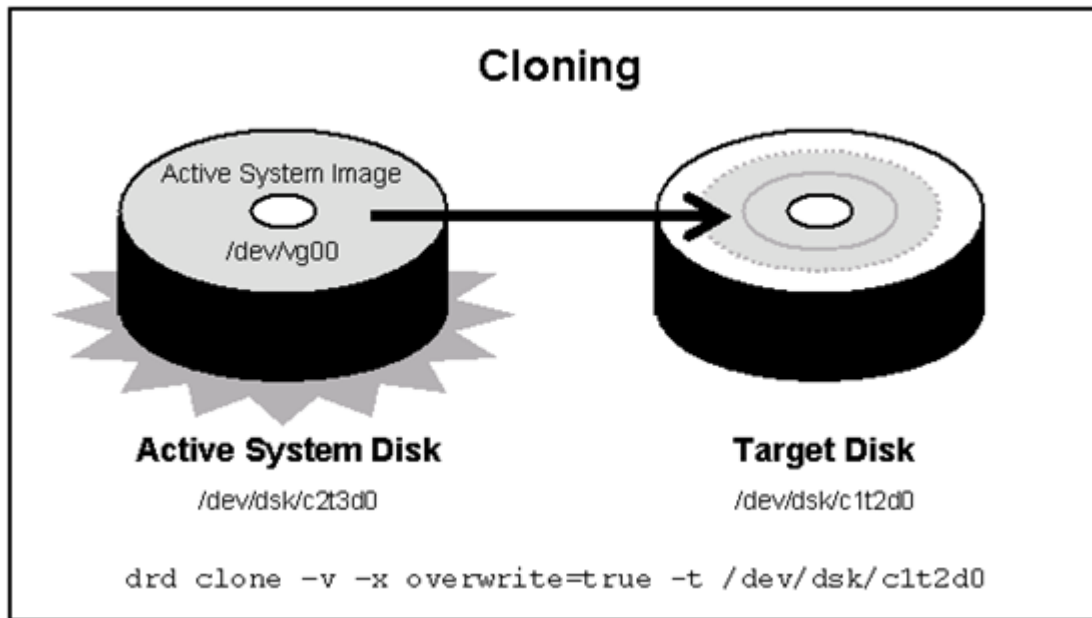
NOTE: For descriptions of the `drd clone` command, see [The `drd clone` command](#).

The `-x` option lets you choose whether to overwrite data on the target disk. The `-x overwrite=true` option tells the command to overwrite any data on the disk. The `-x overwrite=false` option tells the command not to write the cloned image if the disk appears to contain LVM, VxVM, or boot records. The default value is `false`.

Cloning creates an inactive system image on the target disk at `/dev/dsk/c1t2d0`. [Figure 2-2](#) shows the active system image being cloned to the target disk.

NOTE: The `drd clone` command does not write over a disk that is part of the root volume.

Figure 2 Cloning the Active System Image



The output you see as this command runs is similar to [Example 2-7](#).

When you see the message, Copying File Systems to New System Image, the active system image is being cloned. This operation can take quite a while, and you see no more messages until the file systems have been copied.

Example 7 The `drd clone` command output

```
===== 12/01/06 11:07:28 MST BEGIN Clone System Image (user=root)
(jobid=drdtest2)

* Reading Current System Information
* Selecting System Image To Clone
* Selecting Target Disk
* Selecting Volume Manager For New System Image
* Analyzing For System Image Cloning
* Creating New File Systems
* Copying File Systems To New System Image
* Making New System Image Bootable
* Unmounting New System Image Clone
* System image: "sysimage_001" on disk "/dev/dsk/c1t2d0"

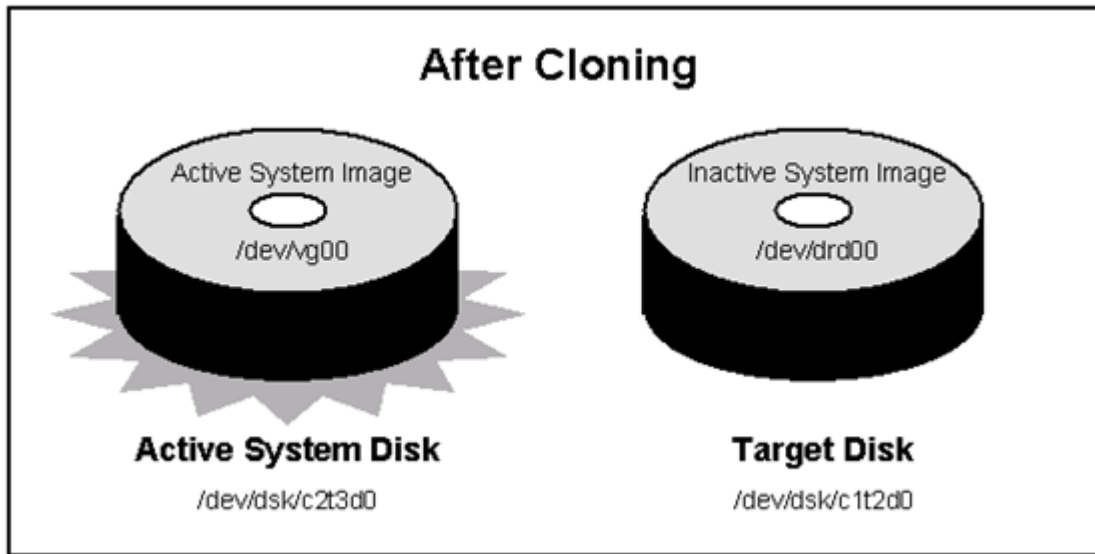
===== 12/01/06 11:38:19 MST END Clone System Image succeeded. (user=root)
(jobid=drdtest2)
```

[Figure 2-3](#) shows the two disks after cloning. Both disks contain the system image. The image on the target disk is the inactive system image.

The DRD clone operation will have some impact on the booted system's I/O resources, particularly if the source disk is on the same SCSI chain as the target disk. DRD's performance is similar to

system performance when using Ignite to create recovery images, which many system administrators find acceptable.

Figure 3 Disk Configurations After Cloning



After running `drd clone`, you have identical system images on the system disk and the target disk. The image on the system disk is the active system image. The image on the target disk is the inactive system image.

The `drd clone` command returns the following values:

- 0 Success
- 1 Error
- 2 Warning

For more details, you can examine messages written to the log file at `/var/opt/drd/drd.log`.

Here is an example of creating a clone from a HP-UX 11i v3 system to a storage area network (SAN) disk. First, [Example 2-8](#) displays the output of the following `drd clone` command:

```
# /opt/drd/bin/drd clone -t /dev/disk/disk14 -x overwrite=true
```

Example 8 The `drd clone` command output for SAN disk

```
===== 06/24/08 11:55:58 MDT BEGIN Clone System Image (user=root) (jobid=drdtest14)

* Reading Current System Information
* Selecting System Image To Clone
* Selecting Target Disk
* The disk "/dev/disk/disk14" contains data which will be overwritten.
* Selecting Volume Manager For New System Image
* Analyzing For System Image Cloning
* Creating New File Systems
* Copying File Systems To New System Image
* Making New System Image Bootable
* Unmounting New System Image Clone

===== 06/24/08 12:06:00 MDT END Clone System Image succeeded. (user=root) (jobid=drdtest14)
```

Next, the `drd status` command is executed to verify the clone disk and the original disk. [Example 2-9](#) displays the output of the following `drd status` command:

```
# /opt/drd/bin/drd status
```

Example 9 The `drd status` command output for SAN disk

```
===== 06/24/08 12:09:46 MDT BEGIN Displaying DRD Clone Image Information (user=root) (jobid=drdtest14)

* Clone Disk: /dev/disk/disk14
* Clone EFI Partition: AUTO file present, Boot loader present, SYSINFO.TXT not present
* Clone Creation Date: 06/24/08 11:56:18 MDT
* Clone Mirror Disk: None
* Mirror EFI Partition: None
* Original Disk: /dev/disk/disk15
* Original EFI Partition: AUTO file present, Boot loader present, SYSINFO.TXT not present
* Booted Disk: Original Disk (/dev/disk/disk15)
* Activated Disk: Original Disk (/dev/disk/disk15)

===== 06/24/08 12:10:01 MDT END Displaying DRD Clone Image Information succeeded. (user=root)
(jobid=drdtest14)
```

NOTE: The elapsed time of the clone creation will vary, depending on the size of the root disk, independent of whether it's going to a SAN or an internal disk.

Adding or removing a disk

After creating a clone, you can remove it or the original system image from the system. For example, if you may need to boot the image on different hardware (See [Rehosting and unrehosting systems](#)) or need disk storage for use on another system.

After you remove an image from the system, DRD operations other than clone will fail. In addition, if a VxVM image is removed from the system without updating the VxVM metadata, the `drd clone` command will also fail. The inactive image disk group is still present which prevents it from being recreated, but the disk residing in it is missing. This prevents DRD from recognizing it as a disk group in use by DRD.

To remove the disk group and enable future `drd clone` commands, determine the VxVM disk group of the inactive image as follows:

- If the booted group does *NOT* begin with the “`drd_`” prefix the booted group name with “`drd_`” to determine the inactive image disk group.
- OR
- If the booted group *DOES* begin with “`drd_`” remove the “`drd_`” prefix to determine the inactive image disk group. Issue the command “`vxdg deport <inactive image disk group>`”.

3 Updating and maintaining software on the clone

After cloning the active system image, you can use `drd runcmd` to run a limited set of commands and to apply patches to the inactive system image. This chapter describes this process.

For details of the `drd runcmd` command, including available options and extended options, see [The `drd runcmd` command](#).

NOTE: You must be logged in as root to run any DRD command.

DRD-Safe commands and Packages

The `drd runcmd` operation runs a command on the inactive system image that does not make any changes to the booted system, the running kernel, or the process space. This enables a system administrator to make changes to the inactive system image without incurring any disruption to the currently booted system.

NOTE: The `drd runcmd` command suppresses all reboots. The option `-x autoreboot` is ignored when a `swinstall`, `swremove`, or `update-ux` command is executed by `drd runcmd`.

Not all commands can safely be executed by the `drd runcmd` operation. For example, commands that start or stop daemons or change dynamic kernel tuneables are disruptive to current processes and must be prevented by the `drd runcmd` operation.

Restrictions on commands executed by `drd runcmd` are:

- When calling `swinstall` and `update-ux`, `drd runcmd` supports installation from directory depots on the booted system and on remote servers. Note that installing from serial depots or from depots on the inactive system image is not supported.
- `drd runcmd` can also be used to `swlist`, `swverify`, `swremove`, and `swmodify` software that is installed on the inactive image. It cannot be used to list or modify any depot's contents. Using these commands outside of `drd runcmd` allows for depot listing and management.

Commands that are not disruptive to the booted system and perform appropriate actions on the inactive system are known as *DRD-safe*. For this release of DRD, a short list of commands is recognized by the `drd runcmd` operation to be DRD-safe. An attempt to use DRD to run commands that are not DRD-safe will terminate with an ERROR return code without executing the command.

A number of Software Distributor commands have been made safe at a sufficient maintenance level of SW-DIST. The DRD product has a package co-requisite on a minimum release of SW-DIST. (For details of the DRD product dependencies, see the following webpage: <https://h20392.www2.hp.com/portal/swdepot/displayInstallInfo.do?productNumber=DynRootDisk#download>.)

Similarly, `drd runcmd update-ux` includes a run-time check for the revision of SWManager (SWM), which provides DRD-safe tools used during the update. This functionality supports updates on the clone from an older version of HP-UX 11i v3 to HP-UX 11i v3 update 4 or later. (For details of the DRD product dependencies, see the following webpage: <https://h20392.www2.hp.com/portal/swdepot/displayInstallInfo.do?productNumber=DynRootDisk#download>.)

The DRD-safe commands are the following:

- `swinstall`
- `swremove`
- `swlist`
- `swmodify`
- `swverify`

- swjob
- kctune
- update-ux
- view
- kcmodule
- kconfig
- mk_kernel
- swm job

See the *Software Distributor Administrator's Guide*, located at <http://www.hp.com/go/sd-docs>, as well as `swinstall(1M)`, `swremove(1M)`, `swlist(1M)`, `swmodify(1M)`, `swverify(1M)`, `swjob(1M)`, `kctune(1M)`, `update-ux(1M)`, `view(1M)`, `kcmodule(1M)`, `kconfig(1M)`, `mk_kernel(1M)`, and `swm(1M)` for additional information about these commands.

The DRD-safe commands may be specified by their base names, such as `swinstall` or `swremove`, or their full paths, such as `/usr/sbin/swinstall` or `/usr/sbin/swremove`. However, paths that are symlinks to the DRD-safe commands are not supported.

If the inactive system image has not been mounted, the `drd runcmd` operation mounts it, executes the DRD-safe command, and then unmounts it. If the inactive system image is already mounted, the `drd runcmd` operation leaves it mounted.

When `swinstall`, `swremove`, and `update-ux` are used to manage software packages, SD control scripts included in the packages—such as pre-install, post-remove, and update-prep scripts—are executed. For management of such packages to be DRD-safe, the control scripts must not take any action that will affect the booted system. (The configure scripts are not executed.) A package satisfying this restriction is also known as DRD-safe. The `swlist`, `swmodify`, and `swverify` commands—without `-F` or `-x fix=true` options—may be invoked by `drd runcmd` for arbitrary packages. The `swlist` and `swmodify` commands do not call control scripts, and verify scripts do not change the system.

When executing the `drd runcmd kctune` command, the `kctune` command outputs the prompt:

```
==> Update the automatic 'backup' configuration first?
```

If the user types **y**, the following error is displayed:

```
WARNING: The backup behavior 'yes' is not supported in alternate
         root environments. The behavior 'once' will be used instead.
```

This message can be ignored.

Updating and managing patches with `drd runcmd`

DRD-Safe patches and the `drd_unsafe_patch_list` file

An HP program was initiated in November 2004 to make all patches DRD-safe. Although most patches delivered after November 2004 are DRD-safe, a few are not. Patches that are not DRD-safe are listed in the file `/etc/opt/drd/drd_unsafe_patch_list`, which is delivered as a volatile file with the DRD product. The copy of this file on the inactive system image is used to filter patches that are selected for installation with `drd runcmd`.

-
- ❗ **IMPORTANT:** When invoked by the `drd runcmd` operation, the `swinstall`, `swremove`, and `update-ux` commands reject any attempt to install or remove a patch included in the `drd_unsafe_patch_list` file on the inactive system image.
-

In the rare event that a new patch is determined not to be DRD-safe, a new version of the `drd_unsafe_patch_list` file is made available on *HP's IT Resource Center website*.

To determine if you need to update the `drd_unsafe_patch_list` files, see the *Update the drd_unsafe_patch_list File* procedure in the *DRD Downloads and Patches* page at <https://h20392.www2.hp.com/portal/swdepot/displayInstallInfo.do?productNumber=DynRootDisk#download>.

It is helpful during maintenance planning for system administrators to be able to determine which, if any, patches are not DRD-safe, and to make plans regarding these patches. See the *DRD-Safe Concepts for HP-UX 11i v2 and Later* white paper, located at <http://www.hp.com/go/drd-docs>, for information about identifying such patches and alternatives on how to manage them without using the `drd runcmd` operation.

Patches with special installation instructions

Patches may include Special Installation Instructions, or SIIs, which contain specific tasks for the user to perform when they install certain patches. If you install patches with SIIs on an inactive DRD system image, ensure the following:

- You must not stop/kill or restart any processes or daemons. Because the patch is being installed on an inactive DRD system image, these actions are not needed, and in fact could leave the running system in an undesirable state. When the inactive system image is booted, all processes are stopped and restarted.
- Only make kernel changes by executing: `drd runcmd kctune`

Updating and managing products with `drd runcmd`

For non-patch products, a new fileset-level packaging attribute, `is_drd_safe`, has been introduced. The value of the attribute defaults to `false`, so any package created before the attribute was introduced will be rejected by `swinstall`, `swremove`, and `update-ux` commands invoked by the `drd runcmd` operation. Because the DRD product was not available at the initial release of 11i v2, relatively few non-patch products have the `is_drd_safe` attribute set to `true`. For HP-UX 11i v3, however, most products will have the `is_drd_safe` attribute set to `true`.

To determine if a non-patch product can be installed or removed using `drd runcmd`, execute the command:

```
# /usr/sbin/swlist -l fileset -a is_drd_safe _product_name_
and check that all filesets have is_drd_safe set to true.
```

Special considerations for firmware patches

A firmware patch changes the firmware the next time the patched image is booted. Because the firmware is shared by both the active and inactive system images, there is no ability to have an unchanged copy of the firmware as a fail-safe mechanism. As a result, the benefit of DRD as a Hot Recovery mechanism cannot be provided with firmware patches. Firmware patches set the fileset attribute `is_drd_safe` to `false` to supply a checkinstall script that prevents installation in a DRD session.

-
- ❗ **IMPORTANT:** System administrators need to be aware that any firmware change cannot be reversed by booting a different system image.
-

Restrictions on `update-ux` and `sw*` commands invoked by `drd runcmd`

Options on the Software Distributor commands that can be used with `drd runcmd` are limited by the need to ensure that operations are DRD-safe. The restrictions include the following:

- The `-F` and `-x fix=true` options are not supported for `drd runcmd swverify` operations. Use of these options could result in changes to the booted system.
- The use of double quotation marks and wild card symbols (`*`, `?`) in the command line must be escaped with a backslash character (`\`), as in the following example:

```
drd runcmd swinstall -s depot_server:/var/opt/patches \*
```

- Files referenced in the command line must both:
 - Reside in the inactive system image
 - Be referenced in the DRD-safe command by the path relative to the mount point of the inactive system image

This applies to files referenced as arguments for the `-C`, `-f`, `-S`, `-X`, and `-x logfile` options for an `sw` command run by `drd runcmd` and for the `update-ux` command `-f` option.

- To use `update-ux` with a media source or local depot, SWM version A.3.5.1 or later must be present on the clone.

See *drd-runcmd(1M)* for further information about restrictions on Software Distributor commands invoked by `drd runcmd`.

Viewing logs

When a `drd runcmd` operation executes a DRD-safe command, the DRD command runs on the booted system, and the DRD log, `/var/opt/drd/drd.log`, is created on the booted system. However, the DRD-safe command runs on the inactive system image, and its logs (if they exist), reside on the inactive system image.

Logs can be viewed on the inactive system image by using the `drd runcmd view` command. For example, to view the `swagent` log on the inactive image, execute the following command:

```
# /opt/drd/bin/drd runcmd view /var/adm/sw/swagent.log
```

For more information on viewing log files and on maintaining the integrity of system logs, see the *Dynamic Root Disk: Quick Start & Best Practices* white paper, located at <http://www.hp.com/go/drd-docs>.

4 Accessing the inactive system image

This chapter describes how to mount and unmount the inactive system image.

❗ **IMPORTANT:** If you choose to mount the inactive DRD system image, exercise caution to ensure that any actions taken do not impact the running system. You must:

- Not stop/kill or restart any processes or daemons.
- Only make kernel changes by executing: `drd runcmd kctune`.

For example, to change the value of the `maxfiles_lim` kernel tunable on the inactive system image to 8192, execute the command:

```
# /opt/drd/bin/drd runcmd kctune maxfiles_lim=8192
```

Using `drd runcmd` to change the value of `maxfiles_lim` on the inactive system image ensures that its value on the booted system is unchanged.

NOTE: Accessing the inactive system image is not always required; however, you may need to access the inactive system image prior to activating it.

You can mount DRD-cloned file systems to access them and:

- Check the logs of commands executed by `drd runcmd`.
- Create files on the inactive system image. In particular, you can create files that will be referenced by `swinstall` commands, executed by the `drd runcmd` command. (For an example of this type of file creation, see [Example 13](#).)
- Verify the integrity of certain files on the inactive system image. If a file is known to have changed during the `drd clone` operation, you might want to compute a checksum on the copy of the file on the booted system and the copy on the target system to validate the clone copy.

NOTE: You must be logged in as root to run any DRD command.

Mounting the inactive system image

For details of the `drd mount` command, including available options and extended options, see [The drd mount command](#).

To mount the inactive system image, execute the `drd mount` command:

```
# /opt/drd/bin/drd mount
```

The command locates the inactive system image and mounts it.

The output of this command is similar to [Example 4-1](#).

Example 10 The `drd mount` command output

```
# /opt/drd/bin/drd mount

===== 12/08/06 22:19:31 MST BEGIN Mount Inactive System Image (user=root)
(jobid=dlkma1)

* Reading Current System Information
* Locating Inactive System Image
* Mounting Inactive System Image

===== 12/08/06 22:19:52 MST END Mount Inactive System Image succeeded.
(user=root) (jobid=dlkma1)
```

The `drd mount` command automatically chooses the mount point for the inactive system image. If the image was created by the `drd clone` command, the mount point is `/var/opt/drd/mnts/sysimage_001`. If the clone has been booted, `drd mount` mounts the original system at the mount point `/var/opt/drd/mnts/sysimage_000`. To see all mounted file systems, including those in the active and inactive system images, execute the following command:

```
# /usr/bin/bdf
```

The output of this command should look similar to [Example 4-2](#), if the `drd mount` command has been executed:

Example 11 The `bdf` command output

```
# /usr/bin/bdf
file system      kbytes    used    avail    %used    Mounted on
/dev/vg00/lvol3  1048576   320456   722432    31%     /
/dev/vg00/lvol11 505392    43560   411288    10%     /stand
/dev/vg00/lvol8   3395584   797064   2580088   24%     /var
/dev/vg00/lvol17 4636672   1990752  2625264   43%     /usr
/dev/vg00/lvol4   204800    8656    194680    4%     /tmp
/dev/vg00/lvol6   3067904   1961048  1098264   64%     /opt
/dev/vg00/lvol5   262144    9320    250912    4%     /home
/dev/drd00/lvol3  1048576   320504   722392    31%     /var/opt/drd/mnts/sysimage_001
/dev/drd00/lvol11 505392    43560   411288    10%     /var/opt/drd/mnts/sysimage_001/stand
/dev/drd00/lvol4   204800    8592    194680    4%     /var/opt/drd/mnts/sysimage_001/tmp
/dev/drd00/lvol5   262144    9320    250912    4%     /var/opt/drd/mnts/sysimage_001/home
/dev/drd00/lvol6   3067904   1962912  1096416   64%     /var/opt/drd/mnts/sysimage_001/opt
/dev/drd00/lvol7  4636672   1991336  2624680   43%     /var/opt/drd/mnts/sysimage_001/usr
/dev/drd00/lvol8  3395584   788256   2586968   23%     /var/opt/drd/mnts/sysimage_001/var
```

In this output, file systems identified as `dev/vg00/*` are the active system image file systems. Those identified as `/dev/drd00/*` are the inactive system image file systems.

Performing administrative tasks on the inactive system image

The following examples show some tasks you can perform on the inactive system image.



TIP: HP recommends that a clone be deployed shortly after creating and (optionally) modifying it.

Example 12 Checking a warning message

You verify software on the inactive system image with `drd runcmd swverify` and see a warning message.

Task:

Find additional information about the message.

To see detailed information about the warning message supplied by the `swagent` log, execute the following command:

```
# /opt/drd/bin/drd runcmd view /var/adm/sw/swagent.log
```

Example 13 Creating a patch install file

Task:

Create a file containing a list of patches to be applied to the inactive system image. You want to use the file as the argument of a `-f` option in a `swinstall` command run by `drd runcmd`. Follow this procedure:

1. Mount the inactive system image:

```
# /opt/drd/bin/drd mount
```

2. Enter the patches into a file such as

```
/var/opt/drd/mnts/sysimage_001/var/opt/drd/my_patch_list
```

with the following commands:

- a.

```
# /usr/bin/echo "PHCO_02201" > \  
/var/opt/drd/mnts/sysimage_001/var/opt/drd/my_patch_list
```
- b.

```
# /usr/bin/echo "PHCO_12134" >> \  
/var/opt/drd/mnts/sysimage_001/var/opt/drd/my_patch_list
```
- c.

```
# /usr/bin/echo "PHCO_56178" >> \  
/var/opt/drd/mnts/sysimage_001/var/opt/drd/my_patch_list
```

NOTE: If the inactive system image is the original system image, and not the clone, the root file system mount point is `/var/opt/drd/mnts/sysimage_000`.

3. Apply the patches using `drd runcmd`, identifying the file by its path relative to the mount point of the inactive system image root file system:

```
# /opt/drd/bin/drd runcmd swinstall -s patch_server:/var/opt/patch_depot \  
-f /var/opt/drd/my_patch_list
```

NOTE: Because the inactive system image was mounted when `drd runcmd` was executed, it is still mounted after `drd runcmd` completes. You can unmount it with the following command:

```
# /opt/drd/bin/drd umount
```

Example 14 Editing symlinked files

Task:

You changed the value of `NUM_BK` in `/opt/VRTS/bin/vxconfigbackup` from 5 to 10 by editing the file. You want the change applied to the clone as well.

Execute the following commands:

1. Mount the inactive system image:

```
# /opt/drd/bin/drd mount
```

2. Compare `vxconfigbackup` with the clone copy:

```
# /usr/bin/diff /opt/VRTS/bin/vxconfigbackup \  
/var/opt/drd/mnts/sysimage_000/opt/VRTS/bin/vxconfigbackup
```

Surprisingly, the files are equal! What happened?

A long listing shows that the files are symlinks:

```
# /usr/bin/ll /opt/VRTS/bin/vxconfigbackup \  
/var/opt/drd/mnts/sysimage_000/opt/VRTS/bin/vxconfigbackup
```

The listing shows:

```
lrwxr-xr-x 1 bin bin 32 Apr 3 17:34  
/opt/VRTS/bin/vxconfigbackup -> /usr/lib/vxvm/bin/vxconfigbackup  
lrwxr-xr-x 1 bin bin 32 Nov 16 12:45  
/var/opt/drd/mnts/sysimage_000/opt/VRTS/bin/vxconfigbackup  
-> /usr/lib/vxvm/bin/vxconfigbackup
```

When the clone is booted, the target of the symlink on the clone resides on the clone. However, when the clone is mounted under the booted system, the target of the symlink resides on the booted system.

To change the data on the clone, edit the file that will be the target of the symlink when the clone is booted:

```
# /usr/bin/vi /var/opt/drd/mnts/sysimage_001/usr/lib/vxvm/vxconfigbackup
```

and change the value of `NUM_BK` to 10.

⚠ CAUTION: Attempting to edit a path on the clone that is an absolute symlink results in changes on the booted system!

Unmounting the inactive system image

For details of the `drd umount` command, including available options and extended options, see [The `drd umount` command](#).

To unmount the inactive system image, the command is:

```
# /opt/drd/bin/drd umount
```

The output is similar to [Example 4-7](#).

Example 15 The `drd umount` command output

```
===== 12/08/06 22:09:22 MST BEGIN Unmount Inactive System Image (user=root)
(jobid=dlkma1)

* Reading Current System Information
* Locating Inactive System Image
* Unmounting Inactive System Image

===== 12/08/06 22:09:48 MST END Unmount Inactive System Image succeeded.
(user=root) (jobid=dlkma1)
```

The `drd umount` command:

- Unmounts the file systems in the inactive system image.
- Inactivates the inactive system image's volume group.
- For an LVM-based system, exports the volume group.

If you run the `bdf` command after the `drd umount` command, you no longer see the inactive system image in the output.

5 Synchronizing the inactive clone image with the booted system

Overview

The `drd sync` command is introduced in release B.11.xx.A.3.5 of Dynamic Root Disk (DRD) to propagate root volume group file system changes from the booted original system to the inactive clone image.

Example 16 `drd sync` scenario

Here is a sample scenario that can be improved by using the `drd sync` command:

1. A system administrator creates a DRD clone on a Thursday.
2. The administrator applies a collection of software changes to the clone on Friday using the `drd runcmd` command.
3. On Friday, several log files are updated on the booted system.
4. On Saturday, the clone is booted.

Prior to DRD release B.11.xx.A.3.5, the system administrator needed to take manual actions to ensure that changes made to log files on the booted system (on Friday) were copied to the clone before or after it was booted. This was particularly important for logs that were audited for security purposes.

With the introduction of the `drd sync` command, the administrator can run `drd sync` before booting the clone (preferably as part of a shutdown script) to ensure that changes made to the booted system are propagated to the clone.

The `drd sync` command does not propagate changes to software installed on the clone. In most cases, software installed on the clone is intentionally different from software installed on the booted system. For example, patches might have been applied to the clone, new revisions of software products installed, or an entire new release of HP-UX installed using `drd runcmd`. More information on how `drd sync` handles software changes is provided in [“The `drd sync` command” \(page 27\)](#).

- ❗ **IMPORTANT:** HP recommends that `drd sync` not be used for clones that have diverged greatly from the booted system over a period of time. In some cases, it is more appropriate to re-create the clone and apply the software changes, or install newer software changes. For ways to determine how much a clone differs from the original booted system, see [“Using the `drd sync` preview to determine divergence of the clone from the booted system” \(page 29\)](#).

Quick start—basic synchronization

To propagate the maximum number of file changes from the booted system to the inactive clone image, you need to create a shutdown script on the booted system that does the following:

- Mount the clone:

```
# /opt/drd/bin/drd mount
```
- Execute the `drd sync` command:

```
# /opt/drd/bin/drd sync
```
- Remove the copy of the script on the clone:

```
# /usr/bin/rm /var/opt/drd/mnts/sysimage_001/<rc_location>
```
- Unmount the clone:

```
# /opt/drd/bin/drd umount
```

For a sample shutdown script, see “[drd sync system shutdown script](#)” (page 29).

Additional information is provided below in the comparison between the booted system and the clone. This information is provided by the preview option on the `drd sync` command, the preparatory actions that can be used to precisely control what files are synchronized, and the considerations advised when multiple iterations of the `drd sync` command are run.

The `drd sync` command

The `drd sync` command

- Determines the list of files in the booted volume group that are not excluded by the `-x exclude_list` option
- Trims the list based on criteria described below
- Copies the files to the clone, preserving ownership and permissions

When the `drd sync preview (-p)` option is used, the file-copy step is suppressed. In any case, the list of files to be copied is produced.

Determining the list of files in the booted volume group

The `drd sync` command finds each file in the root LVM volume group (or VxVM disk group) on the booted system that is not excluded by the `x exclude_list` option to provide the initial list of files to be synchronized.

Note that files that have been erased from the booted root volume group since the clone was created are not identified by this process.

Trimming the list of files to be synchronized

The list of files produced above is reduced based on the following criteria:

1. *Locations that are not synchronized*

- `/var/adm/sw/*`: Because the appropriate mechanism for managing software changes on the clone is `drd runcmd`, the directory tree rooted at `/var/adm/sw` (which contains the Software Distributor Installed Products Database and associated log files) is not copied by `drd sync`. Instead, files in this location are created and modified by execution of Software Distributor commands (such as `swinstall` and `swremove`) during execution of the `drd runcmd` command.
- `/tmp/*`, `/var/tmp/*`, `/var/opt/drd/tmp/*`: These locations contain transient files, so changes to files in these locations are not propagated to the clone.
- `/stand/*`: Changes to the HP-UX kernel should be applied by using `drd runcmd` with either a Software Distributor command or the `kctune`, `kcmodule`, `konfig`, or `mk_kernelcommands`, so changes in this location are not propagated by `drd sync`.
- `/etc/lvmconf/*`, `/etc/lvmtab*`, `/etc/lvmpvg*`, `/etc/vx/*`, and `/etc/vxvmconf/*`: These locations contain information specific to the root LVM volume group (or VxVM disk group) on the booted system and should not be propagated to the clone's system image.
- `/etc/fstab*`: This location contains information specific to the VxVM disk group mount point for the clone's system image.
- `/dev/<clone_group>/*`: To prevent errors in the `drd mount` command, the `/dev/<clone_group>` directory is not copied to the clone.

The collection of files that are not synchronized—because they reside in locations that are not synchronized—is written to the `/var/opt/drd/sync/`

`filtered_out_by_non_synced_location_filter_sync_phase` file, which is refreshed each time `drd sync` is run, even if the command is run with the `-p` preview option.

2. *Files that have changed on the clone*

A file residing on the clone might have been changed by a `drd runcmd` operation, and it may have been updated on the booted system as well. This can occur even if the file is not listed in the Software Distributor Installed Products Database (that is, in the output of `swlist -l file`). For example, the installation of a product can add a new user to `/etc/passwd`.

In the case that a file has been updated on the booted system and updated on the clone by a mechanism other than a previous `drd sync`, `drd sync` does not copy the file. This avoids overwriting any changes made by installation (or removal) of software on the clone.

Because administrators might be interested in identifying changed files on the clone that will not be synchronized, the list of such files is written to the `/var/opt/drd/filtered_out_by_target_changed_filter_sync_phase` file, even if the `drd sync` command is run with the `-p` preview option. For any file listed in `/var/opt/drd/filtered_out_by_target_changed_filter_sync_phase`, the administrator can use a command such as `diff` to compare the versions of the file on the booted disk and the clone. If the administrator determines that the file should be copied to the clone, the copy on the clone can be erased and the `drd sync` command executed again.

3. *Nonvolatile files in the Software Distributor Installed Products Database (IPD)*

Most files delivered in software packages should not be changed by a system administrator. To emphasize this fact, the files have the attribute `is_volatile` set to false. Any change to such a file results in an error if the `swverify` command is run (on the booted system if the file is changed there, or through `drd runcmd` if the file is changed on the clone.)

To keep files delivered by Software Distributor in accordance with the information recorded about them in the Software Distributor Installed Products Database (IPD), changes to nonvolatile files in the IPD are not propagated by `drd sync`. (Note that nonvolatile files are those displayed as output from the command `/usr/sbin/swlist -l file -a is_volatile | grep false`).

The list of files on the booted system that are not propagated by `drd sync` because they are nonvolatile files in the Installed Products Database is written to `/var/opt/drd/filtered_out_by_nonvolatile_filter_sync_phase`, even if the `drd sync` command is run with the `-p` preview option.

4. *Volatile files in the Software Distributor Installed Products Database. (IPD)*

Files delivered by Software Distributor with the file attribute `is_volatile` set to true may be changed by the system administrator. In fact, in many cases, they must be changed by the system administrator. For example, the `/etc/rc.config.d/netconf` file must be customized for each system to include its network configuration. Typically, such a customization applies to both the booted system and the clone image. Thus, such changes are ordinarily propagated to the clone by the `drd sync` command.

However, if the clone has been updated to a new release of the operating system (or a release of a particular software package that changes the format of the file), propagation of the changes may be inappropriate. DRD uses the configuration template (delivered to a location containing a directory named `newconfig`) for the volatile file to determine if the changes should be propagated to the clone. If the templates are the same, the change is propagated, otherwise, they are not.

Volatile files that cannot be copied to the clone due to differing templates, are listed in the `/var/opt/drd/filtered_out_by_volatile_filter_sync_phase` file, even if the `drd sync` command is run with the `-p` preview option.

After criteria 1 through 4 (above) are applied, the list of files to be copied to the inactive clone during a `drd sync` operation is written to `/var/opt/drd/`

`files_to_be_copied_by_drd_sync`, even if the `drd sync` command is run with the `-p` preview option.

Copying the files to the inactive clone image

The `drd sync` command uses the `/usr/bin/pax` command to propagate changes from the booted original system to the inactive clone.

- ❗ **IMPORTANT:** The original system must be booted when `drd sync` is run, and changes are always propagated *from* the original system *to* the clone.

The current limitations apply to actual propagation of changes:

- If a new hard link is created to a file that existed when the clone was created, the `drd sync` command does not recognize that the file should be created as a hard link on the inactive clone image, and creates a new copy of the file with the new (hard-linked) name. In rare cases, this could result in an “insufficient space” error on the clone during synchronization.
- If a permission or ownership of a file on the original booted system is changed, the modification time of the file is not updated, so this change by itself does not cause the file to be copied to the clone. However, new permission or ownership of the file is propagated to the clone when it is copied.

The copy of a file to the inactive clone image does not include modification of any file system access control lists (ACLs) on the clone.

Using the `drd sync` preview to determine divergence of the clone from the booted system

If many changes were made to the booted system after the clone was created, it can be preferable to run `drd clone` rather than attempt to use `drd sync` to update the inactive clone. To determine the extent of the changes to the booted system, run `drd sync` with the `-p` preview option:

```
# /opt/drd/bin/drd sync -p
```

Next, examine the `/var/opt/drd/files_to_be_copied_by_drd_sync` file. If the file is large, consider running `drd clone` to re-create the clone.

Additional information can be obtained by examining other files in `/var/opt/drd/sync`, which are described in [“The `drd sync` command” \(page 27\)](#).

`drd sync` system shutdown script

To run the following script during system shutdown, create the script in the `/sbin/init.d` directory and create a symlink to it from `/sbin/rc[n].d/K[mmm]`. The system administrator can choose values for `n` and `mmm` to ensure that file updates made during shutdown occur before the script is run. The script must be run before file systems are unmounted, which is generally done by `/sbin/rc0.d/K900localmount`. See `rc(1)` for further information on `rc` script numbering.

```
#!/sbin/sh
#
# synchronize source root group with cloned root group
# drd-sync(1M).
#
PATH=/sbin:/usr/sbin:/usr/bin:/opt/drd/bin
export PATH
rval=0
DRD_MOUNT_PT=/var/opt/drd/mnts/sysimage_001

set_return() {
    if [ $1 -ne 0 ]; then
        echo $2
        rval=1
    fi
}

case $1 in
stop_msg)
    echo "Running drd sync to synchronize cloned root file systems"
    ;;
;;
```

```

stop)
    # Synchronize the source disk with the cloned system
    drd mount >/dev/null 2>&1 # Ignore errors, may already be mounted.
    drd sync
    sync_ret=$?
    set_return $sync_ret "ERROR: Return code from drd sync is $sync_ret"
    rm -f $0 ${DRD_MOUNT_PT}$0 > /dev/null 2>&1
    [[ -x $0 ]] && \
        set_return 1 "ERROR: The $0 script (on image being shut down) could not be removed."
    [[ -x ${DRD_MOUNT_PT}$0 ]] && \
        set_return 1 "ERROR: The ${DRD_MOUNT_PT}$0 script ($0 on clone) could not be removed."
    drd umount >/dev/null 2>&1 # Ignore errors.
    ;;

*)
    echo "usage: $0 { stop_msg | stop }"
    rval=1
    ;;
esac
exit $rval

```

6 Activating the inactive system image

This chapter describes how to set the inactive system image so it will become the active system image the next time the system boots.

For details of the `drd activate` command, including available options and extended options, see [The drd activate command](#).

NOTE: You must be logged in as root to run any DRD command.

To make the inactive system image the active system image, run the following command:

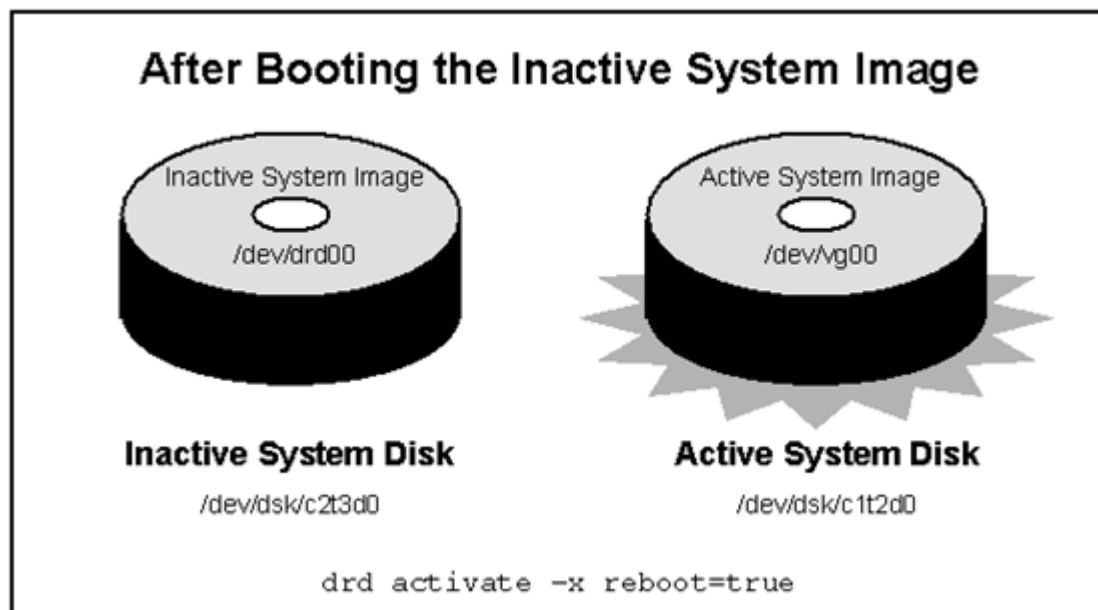
```
# /opt/drd/bin/drd activate -x reboot=true
```

This command:

1. Modifies stable storage to indicate that the inactive system image should become the active system image when the system boots.
2. It then reboots the system.
3. After the reboot, the formerly inactive system image is the active system image, and the formerly active system image is the inactive system image.

Figure 5-1 shows an example of using the `drd activate` command with the option `-x reboot=true`. Initially, `/dev/dsk/c2t3d0` was the active system disk and `drd clone` was used to create an inactive system disk on `/dev/dsk/c1t2d0`. By using the `drd activate` command noted above, `/dev/dsk/c2t3d0` has become the inactive system disk and `/dev/dsk/c1t2d0` has become the active system disk.

Figure 4 Disk Configurations After Activating the Inactive System Image



NOTE: The alternate boot path and the High Availability (HA) alternate boot path are not affected by the `drd activate` command. In addition, the value of the autoboot flag (set by `setboot -b`) is not affected by the `drd activate` command.

Preparing the inactive system image to activate later

If you do not want to make the inactive system image the active system image right away, you can configure the `drd activate` command so that it does not reboot the system. Because `-x reboot=false` is the default, the command is simply:

```
# /opt/drd/bin/drd activate
```

If you are not certain which system image is set to become the active system image when the system boots, execute the following command:

```
# /usr/sbin/setboot -v
```

For additional information, see the *setboot(1M)* manpage.

In the following example on an HP-UX 11i v2 system, a system administrator uses */stand/bootconf*, *setboot*, and *ioscan* to determine that, currently, the primary boot disk (the one that will be booted on the next reboot) is the same as the currently booted disk. The system administrator is ready to boot to the clone, but wants to set the alternate boot disk to the current boot disk. (In the event of any problem booting the clone, the system will then fall back to booting the alternate, current disk.)

The system administrator issues the *drd activate* command shown below, then uses *setboot* to verify the settings.

NOTE: The following example does not correspond to any of the figures in this guide.

Example 17 Booting the primary boot disk with an alternate boot disk (HP-UX 11i v2)

```
# /usr/bin/more /stand/bootconf
1 /dev/dsk/c2t0d0s2
#
# /usr/sbin/setboot
Primary bootpath : 0/1/1/0.0.0
HA Alternate bootpath : 0/1/1/1.2.0
Alternate bootpath : 0/1/1/1.2.0

Autoboot is ON (enabled)

#
# /usr/sbin/ioscan -fnkC disk
Class      I  H/W Path      Driver      S/W State  H/W Type    Description
=====
disk       0  0/0/2/0.0.0.0  sdisk       CLAIMED     DEVICE      TEAC        DV-28E-N
              /dev/dsk/c0t0d0  /dev/rdisk/c0t0d0
disk       1  0/1/1/0.0.0    sdisk       CLAIMED     DEVICE      HP 36.4GST336754LC
              /dev/dsk/c2t0d0  /dev/dsk/c2t0d0s3  /dev/rdisk/c2t0d0s2
              /dev/dsk/c2t0d0s1 /dev/rdisk/c2t0d0  /dev/rdisk/c2t0d0s3
              /dev/dsk/c2t0d0s2 /dev/rdisk/c2t0d0s1
disk       2  0/1/1/0.1.0    sdisk       CLAIMED     DEVICE      HP 36.4GST336754LC
              /dev/dsk/c2t1d0  /dev/dsk/c2t1d0s3  /dev/rdisk/c2t1d0s2
              /dev/dsk/c2t1d0s1 /dev/rdisk/c2t1d0  /dev/rdisk/c2t1d0s3
              /dev/dsk/c2t1d0s2 /dev/rdisk/c2t1d0s1
disk       3  0/1/1/1.2.0    sdisk       CLAIMED     DEVICE      HP 36.4GST336706LC
              /dev/dsk/c3t2d0  /dev/dsk/c3t2d0s3  /dev/rdisk/c3t2d0s2
              /dev/dsk/c3t2d0s1 /dev/rdisk/c3t2d0  /dev/rdisk/c3t2d0s3
              /dev/dsk/c3t2d0s2 /dev/rdisk/c3t2d0s1

#
# /usr/bin/more /stand/bootconf
1 /dev/dsk/c2t0d0s2
#
# /opt/drd/bin/drd activate -x alternate_bootdisk=/dev/dsk/c2t0d0

===== 06/06/07 22:38:02 MDT BEGIN Activate Inactive System Image (user=root) (jobid=drd2)
* Checking for Valid Inactive System Image
* Reading Current System Information
* Locating Inactive System Image
* Determining Bootpath Status
* Primary bootpath : 0/1/1/0.0.0 [/dev/dsk/c2t0d0] before activate.
* Primary bootpath : 0/1/1/1.2.0 [/dev/dsk/c3t2d0] after activate.
* Alternate bootpath : 0/1/1/1.2.0 [/dev/dsk/c3t2d0] before activate.
* Alternate bootpath : 0/1/1/0.0.0 [/dev/dsk/c2t0d0] after activate.
* HA Alternate bootpath : 0/1/1/1.2.0 [/dev/dsk/c3t2d0] before activate.
* HA Alternate bootpath : 0/1/1/1.2.0 [/dev/dsk/c3t2d0] after activate.
* Activating Inactive System Image

===== 06/06/07 22:38:13 MDT END Activate Inactive System Image succeeded. (user=root) (jobid=drd2)

#
# /usr/sbin/setboot
Primary bootpath : 0/1/1/1.2.0
HA Alternate bootpath : 0/1/1/1.2.0
Alternate bootpath : 0/1/1/0.0.0

Autoboot is ON (enabled)
```

The *drd activate* and *drd deactivate* commands enable you to choose an image to be booted the next time the system is restarted. An image is considered to be *activated* if it will be

booted at the next restart of the system. Executing the `drd activate` command activates the inactive system image. Executing the `drd deactivate` command activates the booted image. For more details about the use of `drd activate` and `drd deactivate`, see the *Using Dynamic Root Disk Activate and Deactivate Commands* white paper, at <http://www.hp.com/go/drd-docs>.

Undoing activation of the inactive system image

If you run `drd activate` and then decide not to boot the inactive image on the next reboot, use the `drd deactivate` command to set the primary boot disk to the currently booted disk. For further information on the `drd deactivate` command, see [The `drd deactivate` command](#) and the `drd-deactivate(1M)` manpage.



TIP: If you have already booted the (previously) inactive image, you can use `drd activate` to return to the (previously) active image.

Example 18 Using drd deactivate after activating — legacy DSF

In this example, `/dev/dsk/c2t3d0` contains your root volume group, and you use `drd clone` to create an inactive system disk at `/dev/dsk/c1t2d0`. Next, you execute `drd activate`. The results are:

- Disk set to become the active system disk after the next reboot: `/dev/dsk/c1t2d0`
- Disk set to become the inactive system disk after the next reboot: `/dev/dsk/c2t3d0`

The output of `drd status` is:

```
# /opt/drd/bin/drd status
```

```
===== 07/01/08 13:14:36 MDT BEGIN Displaying DRD Clone Image Information
        (user=root) (jobid=drdtest1)

    * Clone Disk:                /dev/dsk/c1t2d0
    * Clone LIF Area:            AUTO file present, Boot loader present
    * Clone Creation Date:       07/01/08 09:37:58 MDT
    * Clone Mirror Disk:         None
    * Mirror LIF Area:           None
    * Original Disk:             /dev/dsk/c2t3d0
    * Original LIF Area:         AUTO file present, Boot loader present
    * Booted Disk:               Original Disk (/dev/dsk/c2t3d0)
    * Activated Disk:            Clone Disk (/dev/dsk/c1t2d0)

===== 07/01/08 13:14:42 MDT END Displaying DRD Clone Image Information
        succeeded. (user=root) (jobid=drdtest1)
```

If plans change prior to rebooting the system and you do not want to have `/dev/dsk/c1t2d0` become the active system disk, you can use `drd deactivate` to “undo” the previous `drd activate` command.

The results are:

- Disk set to become the active system disk after the next reboot: `/dev/dsk/c2t3d0`
- Disk set to become the inactive system disk after the next reboot: `/dev/dsk/c1t2d0`

The output of `drd status` is:

```
# drd status
```

```
===== 07/01/08 13:14:36 MDT BEGIN Displaying DRD Clone Image Information
        (user=root) (jobid=drdtest1)

    * Clone Disk:                /dev/dsk/c1t2d0
    * Clone LIF Area:            AUTO file present, Boot loader present
    * Clone Creation Date:       07/01/08 09:37:58 MDT
    * Clone Mirror Disk:         None
    * Mirror LIF Area:           None
    * Original Disk:             /dev/dsk/c2t3d0
    * Original LIF Area:         AUTO file present, Boot loader present
    * Booted Disk:               Original Disk (/dev/dsk/c2t3d0)
    * Activated Disk:            Original Disk (/dev/dsk/c2t3d0)

===== 07/01/08 13:14:42 MDT END Displaying DRD Clone Image Information
        succeeded. (user=root) (jobid=drdtest1)
```

Example 19 Using drd deactivate after activating — agile DSF

In this example, `drd activate` is executed on a system without performing a reboot, followed by running `drd deactivate`, and the end result is no change. For example, if you have a system with the root volume group on `/dev/disk/disk11` and a clone created on `/dev/disk/disk10`, the output of `drd status` is:

```
# drd status
```

```
===== 07/01/08 13:20:04 MDT BEGIN Displaying DRD Clone Image Information
        (user=root) (jobid=drdtest1)

* Clone Disk:                /dev/disk/disk10
* Clone LIF Area:            AUTO file present, Boot loader present
* Clone Creation Date:       07/01/08 09:37:58 MDT
* Clone Mirror Disk:         None
* Mirror LIF Area:           None
* Original Disk:              /dev/disk/disk11
* Original LIF Area:          AUTO file present, Boot loader present
* Booted Disk:                Original Disk (/dev/disk/disk11)
* Activated Disk:             Original Disk (/dev/disk/disk11)

===== 07/01/08 13:20:10 MDT END Displaying DRD Clone Image Information
        succeeded. (user=root) (jobid=drdtest1)
```

If you use `drd activate` and do not perform a reboot, and then use `drd deactivate`, the output of `drd status` is:

```
# drd status
```

```
===== 07/01/08 13:20:04 MDT BEGIN Displaying DRD Clone Image Information
        (user=root) (jobid=drdtest1)

* Clone Disk:                /dev/disk/disk10
* Clone LIF Area:            AUTO file present, Boot loader present
* Clone Creation Date:       07/01/08 09:37:58 MDT
* Clone Mirror Disk:         None
* Mirror LIF Area:           None
* Original Disk:              /dev/disk/disk11
* Original LIF Area:          AUTO file present, Boot loader present
* Booted Disk:                Original Disk (/dev/disk/disk11)
* Activated Disk:             Original Disk (/dev/disk/disk11)

===== 07/01/08 13:20:10 MDT END Displaying DRD Clone Image Information
        succeeded. (user=root) (jobid=drdtest1)
```

7 Rehosting and unrehosting systems

A new feature of Dynamic Root Disk (DRD) version B.1131.A.3.2 is *rehosting*. Rehosting enables you to boot a DRD clone on a system other than the one where it was created. This new functionality is supported on LVM-managed root volumes running on Itanium® systems with HP-UX 11i v3. This capability enables a number of new uses for DRD clones. There are three main uses of rehosting:

- Provisioning of new systems, particularly Itanium BladeSystems (blades) and Integrity Virtual Machines
- Testing of new software before deploying it in a production environment
- Installing software on a clone by an alternative method, other than `drd runcmd`

❗ **IMPORTANT:** For additional information on rehosting, including required software, see the *Exploring DRD Rehosting in HP-UX 11i v2 and 11i v3* white paper, located at <http://www.hp.com/go/drd-docs>.

The initial release of `drd rehost` has been tested on Integrity Virtual Machines and on blades with Virtual Connect. In addition, preliminary testing indicates that simple (single root volume group) standalone LVM-managed Itanium-based systems running a September 2008 HP-UX 11i v3 Operating Environment (OE) can be rehosted to another system with the exact same hardware. The benefit of the September 2008 HP-UX 11i v3 Operating Environment is the availability of “Self healing of boot disk configuration”, which is provided by LVM and described in the *September 2008 HP-UX 11i v3 Release Notes*, located in the [HP-UX 11i v3 - 2008 Release Documents Portfolio](#).

Rehosting overview

For details of the `drd rehost` command, including available options and extended options, see [The drd rehost command](#).

The common steps for rehosting are:

1. Create a system image using the `drd clone` command
2. Create a system information file for the new image, which contains information such as hostname, IP addresses, language, time zone, and other system information
3. Copy the system information file to the EFI partition using the `drd rehost` command
4. Unpresent the disk (new image) from the source system and present it to the target system that will boot the rehosted image.
5. Process the new system information file with the `auto_parms(1M)` utility during the boot of the rehosted image

In order to perform these steps, minimal revisions of Dynamic Root Disk and `auto_parms(1M)`, delivered in the `SystemAdmin.FIRST-BOOT` fileset are required. For details, see the *Exploring DRD Rehosting in HP-UX 11i v2 and 11i v3* white paper, located at <http://www.hp.com/go/drd-docs>.

Rehosting examples

In the following examples you can substitute a hot-swappable disk for the SAN LUN. Refer to your Storage Area Network software documentation for information on presenting and unpresenting a LUN to a system.

Example 20 Provisioning a new system

In this example, you have a blade named SALES01 that is running all the correct releases of the correct OE software, and you have another blade (not yet running anything) that you want to set up as SALES02 (a hostname not yet in use), with the identical OE software as SALES01.

You would perform the following steps:

1. Clone the SALES01 system to a SAN LUN.
2. Create a system information file with `SYSINFO_HOSTNAME=SALES02`, and the `SYSINFO_MAC_ADDRESS`, `SYSINFO_IP_ADDRESS`, and `SYSINFO_SUBNET_MASK` for SALES02.
3. Execute the `drd rehost` command, specifying the system information file created in the previous step.
4. Create a Virtual Connect Profile for the second blade, SALES02.
5. Unpresent the LUN from the first blade, SALES01, and present it to the second blade, SALES02.
6. Choose the new LUN from the boot screens and boot the SALES02 blade.

In this example, no system with hostname SALES02 existed before you booted the new blade. *You must specify a unique hostname for the rehosted clone.*

Example 21 Updating a system to an existing system's maintenance level

In the next example, you use cloning to bring a system up to the same maintenance level as another system. Support system DEVEL01 is running an HP-UX 11i v3 0803 maintenance level, and DEVEL02 is running an HP-UX 11i v3 0709 maintenance level. Rather than use `drd runcmd` to install 0803 on DEVEL02, you want to clone DEVEL01 and boot the clone on DEVEL02 (with hostname DEVEL02).

You would perform the following steps:

1. Clone DEVEL01 to a SAN LUN.
2. Create a system information file with `SYSINFO_HOSTNAME=DEVEL02`, and the `SYSINFO_MAC_ADDRESS`, `SYSINFO_IP_ADDRESS`, and `SYSINFO_SUBNET_MASK` for SALES02.
3. Execute the `drd rehost` command to copy the DEVEL02 system information file to the cloned disk. The system information file has `SYSINFO_HOSTNAME=DEVEL02` and the correct `SYSINFO_MAC_ADDRESS`, `SYSINFO_IP_ADDRESS`, and `SYSINFO_SUBNET_MASK` for DEVEL02.
4. Unpresent the SAN LUN from DEVEL01 and present it to DEVEL02
5. Use `setboot` to make the cloned disk on DEVEL02 the boot disk and then reboot DEVEL02; or you can simply reboot DEVEL02 and interrupt the boot to set the new LUN as the boot disk in the EFI interface.

In this example, DEVEL02 is a pre-existing hostname, but you are booting the same system, just using a different boot disk.

Rehosting a mirrored image

To rehost a mirrored image, use the following procedure:

1. The `drd rehost` command must be executed on one of the disks. If the image is inactive, simply running `drd rehost [-f sysinfo_file]` will accomplish this.
2. Both copies (mirrors) of the image must be moved to the new system. This can usually be accomplished by having the SAN management software transfer visibility of both LUNs to the new system.
3. The rehosted disk should be chosen from the EFI menus for boot.
4. After the system is booted, the DRD registry can be removed by issuing the command:

```
# rm /var/opt/drd/registry/registry.xml
```

If the rehosted disk is the only disk to be moved to the new system, the disk can be booted by interrupting the boot sequence and booting with the command: `hpux -lq /stand/vmunix`. The `-lq` option will disable quorum checking, allowing you to boot from the single copy.

Unrehosting overview

For details of the `drd unrehost` command, including available options and extended options, see [The drd unrehost command](#).

The `drd unrehost` command removes `EFI/HPUX/SYSINFO.TXT`, and optionally preserves a copy of it in a file on the booted system.

You can execute the `drd unrehost` command after previously executing the `drd rehost` command, specifying the same target, if the disk should not be rehosted.

The format of the `sysinfo` file is defined in `sysinfo(4)`. To determine the most recent patch that supplies `sysinfo(4)`, see the *Download DRD and Patches* webpage, located at <https://h20392.www2.hp.com/portal/swdepot/displayInstallInfo.do?productNumber=DynRootDisk#download>.

8 Troubleshooting DRD

This chapter provides information about unexpected DRD situations and outcomes.

For the most recent troubleshooting information, check the *DRD Frequently Asked Questions* document at <http://www.hp.com/go/drd-docs>.

- 8.8.1.1 Q: Why can't I see the inactive system image file systems when I run the `bdf` command?
A: You have to mount the inactive system image before you can see the file systems using `bdf`. Use the `drd mount` command to mount the inactive system image.
- 8.8.1.2 Q: I can't remember which disk was used as the target of my clone operation. How can I identify it?
A: Use the `drd status` command.
- 8.8.1.3 Q: I issued a `drd activate` command but changed my mind and do not want to boot the clone. How can I undo the `drd activate` command?
A: If you run `drd activate` and then decide not to boot the inactive image on the next reboot, use the `drd deactivate` command to set the primary boot disk to the currently booted disk. For further information on the `drd deactivate` command, see [The `drd deactivate` command](#) and the `drd-deactivate(1M)` manpage.
- 8.8.1.4 Q: Can I change file system sizes when I create a clone?
A: This release of DRD does not provide a mechanism for resizing file systems during a `drd clone` operation. However, after the clone is created, you can manually change file system sizes on the inactive system without needing an immediate reboot. For information on resizing file systems, see the *Dynamic Root Disk: Quick Start & Best Practices* white paper, available at <http://www.hp.com/go/drd-docs>.
- 8.8.1.5 Q: What versions of LVM are supported by DRD?
A: DRD supports the following LVM root volume group versions:
- DRD A.3.5.* and earlier:
 - HP-UX 11i v2: LVM 1.0
 - HP-UX 11i v3: LVM 1.0
 - DRD A.3.6.* and later:
 - HP-UX 11i v2: LVM 1.0
 - HP-UX 11i v3: LVM 1.0 and LVM 2.2
- 8.8.1.6 Q: What versions of VxVM are supported by DRD?
A: DRD supports VxVM versions 4.1, 5.0, 5.0.1 and 5.1SP1. Versions of DRD prior to A.3.13 support VxVM versions up to 5.1SP1 with disk group version (DGV) up to 140. Only A.3.13 and higher versions of DRD support 5.1SP1 VxVM with DGV 160. Starting with March 2014 release of HP-UX 11i v3, a VxVM root disk group with 5.1SP1 VxVM is configured with DGV 160 by default during cold installation using Ignite-UX. To check the DGV of the root disk group, run:
- ```
/usr/sbin/vxdg list rootdg | grep version.
```

---

## 9 Support and other resources

This chapter contains support information and the available resources for the HP Dynamic Root Disk software product.

### Information to collect before contacting HP

Be sure to have the following information available before you call contact HP:

- Technical support registration number (if applicable)
- Product serial number
- Product model name and number
- Product identification number
- Applicable error message
- Add-on boards or hardware
- Third-party hardware or software
- Operating system type and revision level

### How to contact HP

Use the following methods to contact HP:

For the name of the nearest HP authorized reseller:

- See the Contact HP worldwide (in English) webpage (<http://www8.hp.com/us/en/hp-information/summary/ww-contact-us.html>).

For HP technical support:

- In the United States, for contact options see the Contact HP United States webpage ([http://welcome.hp.com/country/us/en/contact\\_us.html](http://welcome.hp.com/country/us/en/contact_us.html)). To contact HP by phone:
  - Call 1-800-HP-INVENT (1-800-474-6836). This service is available 24 hours a day, 7 days a week. For continuous quality improvement, calls may be recorded or monitored.
  - If you have purchased a Care Pack (service upgrade), call 1-800-633-3600. For more information about Care Packs, refer to the HP website (<http://www8.hp.com/us/en/business-services/it-services.html?compURI=1077422>).
- In other locations, see the Contact HP worldwide (in English) webpage ([http://welcome.hp.com/country/us/en/wwcontact\\_us.html](http://welcome.hp.com/country/us/en/wwcontact_us.html)).

### Subscription service

HP recommends that you register your product at the Subscriber's Choice for Business website:

[http://www.hp.com/country/us/en/contact\\_us.html](http://www.hp.com/country/us/en/contact_us.html)

After registering, you will receive email notification of product enhancements, new driver versions, firmware updates, and other product resources.

To obtain product support, see “Information to collect before contacting HP” (page 40).

For a forum with other DRD users, visit the *HP\_UX\_Docs* twitter page:

[http://twitter.com/HP\\_UX\\_Docs](http://twitter.com/HP_UX_Docs)



## New and changed information in this edition

The following chapter has been updated for this edition:

- *Chapter 8 Troubleshooting DRD*

## Locating this guide

This guide is available from the following sources:

- The *HP-UX Dynamic Root Disk - Manuals* page at <http://www.hp.com/go/drd-docs>
- The *September 2010 HP-UX Instant Information* media (CD or DVD) that is included with both the *September 2010 HP-UX Application Release (AR)* media and *September 2010 HP-UX Operating Environment (OE)* media for both HP-UX 11i v2 and 11i v3.

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❗ **IMPORTANT:** Check the *HP-UX Dynamic Root Disk - Manuals* page (<http://www.hp.com/go/drd-docs>) for the latest revision of this guide. The guide on the *September 2010 HP-UX Instant Information* media is an initial version and may contain outdated information.

---

## Related information

For more information about HP Dynamic Root Disk, see <http://www.hp.com/go/drd-docs>.

For more information related to HP-UX technical documentation, see <http://www.hp.com/go/hpux-core-docs>.

## Typographic conventions

This document uses the following typographic conventions.

|                                                          |                                                                                                                                                                                                                                  |
|----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Book Title</i>                                        | Title of a book or other document.                                                                                                                                                                                               |
| <u><a href="#">Linked Title</a></u>                      | Title that is a hyperlink to a book or other document.                                                                                                                                                                           |
| <u><a href="http://www.hp.com">http://www.hp.com</a></u> | A website address that is a hyperlink to the site.                                                                                                                                                                               |
| Command                                                  | Command name or qualified command phrase.                                                                                                                                                                                        |
| <b>user input</b>                                        | Commands and other text that you type.                                                                                                                                                                                           |
| computer output                                          | Text displayed by the computer.                                                                                                                                                                                                  |
| <b>Enter</b>                                             | The name of a keyboard key. Note that <b>Return</b> and <b>Enter</b> both refer to the same key. A sequence such as <b>Ctrl+A</b> indicates that you must hold down the key labeled <b>Ctrl</b> while pressing the <b>A</b> key. |
| variable                                                 | The name of an environment variable, for example <code>PATH</code> or <code>errno</code> .                                                                                                                                       |
| value                                                    | A value that you may replace in a command or function, or information in a display that represents several possible values.                                                                                                      |
| <i>find</i> (1)                                          | HP-UX manpage. In this example, “find” is the manpage name and “1” is the manpage section.                                                                                                                                       |

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## 10 Documentation feedback

HP is committed to providing documentation that meets your needs. To help us improve the documentation, send any errors, suggestions, or comments to Documentation Feedback ([docsfeedback@hp.com](mailto:docsfeedback@hp.com)). Include the document title and part number, version number, or the URL when submitting your feedback.

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## A DRD commands

term    para

This appendix describes the DRD commands you can use to clone an image and work with the cloned image. The commands are:

- `drd-activate(1M)`
- `drd-clone(1M)`
- `drd-deactivate(1M)`
- `drd-mount(1M)`
- `drd-rehost(1M)`
- `drd-runcmd(1M)`
- `drd-status(1M)`
- `drd-sync(1M)`
- `drd-umount(1M)`
- `drd-unrehost(1M)`

Chapters 2 through 6 describe how to use these commands to perform DRD operations.

You must be logged in as root to use any DRD command.

### DRD command syntax

This section explains DRD command syntax, including the options that are specific to certain commands.

---

**NOTE:** This section is intended for quick reference after you are familiar with using DRD. Chapters 2 through 6 explain how to perform operations with DRD commands.

---

### The `drd activate` command

The `drd activate` command causes the inactive system image to boot either immediately or the next time the system boots. Immediate or delayed booting is controlled by the `-x reboot={true|false}` extended option. The default is *false*.

The `drd-activate(1M)` command invokes the `setboot(1M)` command to set the primary boot disk to the target of the `drd clone` operation. It also optionally sets the alternate and High Availability alternate boot disks to values specified on the command line.

The `drd activate` command syntax is:

```
drd activate [-?] [-p] [-q] [-v] [-x extended option=value] [-x -?] [-X option_file]
```

#### Options

- |    |                                                                                                                                                                                                                                                                                                                                                                        |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| -? | Displays the usage message for a DRD command. This option cannot be used with other options.                                                                                                                                                                                                                                                                           |
| -p | Sets preview mode. When run with the <code>-p</code> option, a DRD command performs analysis without running the command and reports any errors.                                                                                                                                                                                                                       |
| -q | Decreases the verbosity level by one each time it is specified. For example, <code>-qq</code> will reduce the verbosity from the default value of 4 to 2. If both <code>-x verbosity=5</code> and <code>-qqq</code> are included on the command line, the effective verbosity is 2. The minimum verbosity level is 0. (See also the <code>-x verbosity</code> option.) |

|                                       |                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>-v</code>                       | Increases the verbosity level by one each time it is specified. For example, <code>-v</code> will increase the effective verbosity from the default value of 4 to 5. If both <code>-x verbosity=1</code> and <code>-vv</code> are included on the command line, the effective verbosity is 3. The maximum verbosity level is 5. (See also the <code>-x verbosity</code> option.) |
| <code>-x extended_option=value</code> | Sets the extended option to a value.                                                                                                                                                                                                                                                                                                                                             |
| <code>-x -?</code>                    | Displays the list of possible <code>-x</code> (extended) options.                                                                                                                                                                                                                                                                                                                |
| <code>-X option_file</code>           | Gets the extended options from a file.                                                                                                                                                                                                                                                                                                                                           |

## Extended options

The following extended options are available:

|                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>-x<br/>alternate_bootdisk=block_device_special_file</code>   | This is the alternate boot disk. The alternate boot disk must be specified as a block device special file.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <code>-x<br/>HAalternate_bootdisk=block_device_special_file</code> | This is the High Availability alternate boot disk. The High Availability alternate boot disk must be specified as a block device special file. High Availability alternate boot disk is supported only on Itanium-based architecture and for PA-RISC systems that support hardware partitions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <code>-x<br/>ignore_unmounted_fs={true false}</code>               | (Default is <i>false</i> ) Controls whether a clone fails when an unmounted file system in the root volume group is detected.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <code>-x<br/>logfile=/var/opt/drd/drd.log</code>                   | This is the path to the log file for this command. Each time DRD is run, this file will grow larger. This can be changed, for example, to a month-specific location for easier archiving, off-host backup, and rotation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <code>-x log_verbosity=4</code>                                    | (Default.) Specifies the level of log verboseness. Replace 4 with the following values:<br>0 Only ERRORS and the starting/ending BANNER messages.<br>1 Adds WARNING messages.<br>2 Adds NOTE messages.<br>3 Adds INFO messages (informational messages preceded by the * character.)<br>4 (Default) Adds verbose INFO messages.<br>5 Adds additional detailed INFO messages.                                                                                                                                                                                                                                                                                                                                                                                       |
| <code>-x<br/>mirror_disk=block_device_special_file</code>          | Specifies the target's block device special file of the mirror disk. The block device special file should refer to an entire disk, not to a partition. This option requires that LVM mirroring is installed. The block device special file specified is used to mirror each logical volume in the target of the clone operation.                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <code>-x overwrite={true false}</code>                             | Specifies whether <code>drd clone</code> should overwrite existing information on the target disk. That is, it controls whether a disk containing boot, LVM, or VxVM records can be overwritten. The <code>-x overwrite=false</code> (default) prevents a disk that contains boot, LVM, or VxVM records from being overwritten. The <code>-x overwrite=true</code> allows a disk to be overwritten, even if it contains boot, LVM, or VxVM records. Note that DRD does not overwrite a disk associated with an active LVM volume group or VxVM disk group, regardless of the setting of the overwrite option. If a previously created clone is mounted, use the <code>drd umount</code> command to unmount it before attempting to create a new clone on the disk. |

|                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>-x preview={true false}</code>   | If true, run this command in preview mode only. That is, complete the analysis phase and exit; no changes are committed to disk. This option has the same effect as specifying <code>-p</code> on the command line. The default is <code>false</code> . This option is available on every DRD command except <code>drd runcmd</code> .                                                                                                                   |
| <code>-x reboot={true false}</code>    | If true, specifies the system is rebooted at the successful completion of a <code>drd activate</code> operation. The default is <code>false</code> .                                                                                                                                                                                                                                                                                                     |
| <code>-x verbosity=3 (Default.)</code> | Specifies the level of stdout/stderr verboseness. Replace 3 with the following values: <ul style="list-style-type: none"> <li>0 Only ERRORS and the starting/ending BANNER messages.</li> <li>1 Adds WARNING messages.</li> <li>2 Adds NOTE messages.</li> <li>3 (Default) Adds INFO messages (informational messages preceded by the * character.)</li> <li>4 Adds verbose INFO messages.</li> <li>5 Adds additional detailed INFO messages.</li> </ul> |

## The `drd clone` command

The `drd-clone(1M)` command creates a copy of the volume group containing the root file system (/). It does not clone the entire disk configuration.

The `drd clone` command:

- Creates Extensible Firmware Interface (EFI) partitions on HP-UX Integrity systems.
- Creates boot records.
- Copies the EFI/HPUX/AUTO file from the active to inactive system image under control of the `-x copy_autofile` option.
- Creates a new LVM volume group, or VxVM disk group and a volume, in the new group for each volume in the root volume group. The volume management type of the clone matches that of the root group
- Configures swap and dump volumes.
- Copies the contents of each file system in the root volume group to the corresponding file system in the new group.
- Modifies particular files on the clone that identify the disk on which the volume group resides.
- For LVM-based systems, modifies volume group metadata on the clone so that the volume group name is the same as the original root volume group when the clone is booted.

The `drd clone` command performs the following checks:

- If the disk is currently in use by the LVM Manager, it is rejected by the `drd clone` operation.
- If the disk is currently in use by the VxVM Manager, it will be accepted only if the following two conditions are met:
  - The disk is an inactive image managed by DRD
  - The extended option `-x overwrite=true` is specified on the `drd clone` command
- If the disk is not currently in use by LVM or VxVM, but contains LVM, VxVM, or boot records, it is only accepted as a `drd clone` target if `-x overwrite=true` is specified on the `drd clone` command.

---

**NOTE:** A selected target disk will not be overwritten if it is part of the root volume. However, the `drd clone` command will overwrite swap or raw data disks—it does not detect this type of usage. For example, any raw disks in use by databases would be overwritten if given as the target clone disk.

---

When run with the `-x overwrite` extended option set to `true`, the `drd clone` command overwrites any existing data on the target disk. If the target disk contains a mounted inactive system image, run the `drd umount` command before attempting another clone operation with `-x overwrite=true`. If other volume groups (not related to DRD) reside on the target disk and you want to overwrite them, use the `vgexport(1M)` command first to remove any knowledge of them from the booted system.

When run with the `-x mirror_disk=block_device_special_file`, you must specify the target's block device special file of the mirror disk. The block device special file should refer to an entire disk, not to a partition. For a system with an LVM root, this option requires that LVM mirroring is installed. The block device special file specified will be used to mirror each logical volume in the target of the clone operation.

A log of the cloning operation is available at `/var/opt/drd/drd.log`. This log is written to the booted system. Because it is located in the `/var` file system, it is copied during the clone operation to the `/var` file system on the clone. However, because the clone file systems must be unmounted before the final ending banner message of the operation is written to the log, the record of the clone operation in the log on the clone is truncated at the message indicating that file systems are being copied. The next message in the log on the clone is issued by the next DRD command run on the clone itself after it is booted. The log on the booted system is complete, ending with the final banner message.

The `drd clone` command syntax is:

```
drd clone [-?] [-p] [-q] [-v] -t target_device_file [-x extended option=value] [-x -?] [-X option_file]
```

## Options

|                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| -?                               | Displays the usage message for a DRD command. This option cannot be used with other options.                                                                                                                                                                                                                                                                                                                                                                                                                    |
| -p                               | Sets preview mode. When run with the <code>-p</code> option, a DRD command performs analysis without running the command and reports any errors.                                                                                                                                                                                                                                                                                                                                                                |
| -q                               | Decreases the verbosity level by one each time it is specified. For example, <code>-qq</code> will reduce the verbosity from the default value of 4 to 2. If both <code>-x verbosity=5</code> and <code>-qqq</code> are included on the command line, the effective verbosity is 2. The minimum verbosity level is 0. (See also the <code>-x verbosity</code> option.)                                                                                                                                          |
| -v                               | Increases the verbosity level by one each time it is specified. For example, <code>-v</code> will increase the effective verbosity from the default value of 4 to 5. If both <code>-x verbosity=1</code> and <code>-vv</code> are included on the command line, the effective verbosity is 3. The maximum verbosity level is 5. (See also the <code>-x verbosity</code> option.)                                                                                                                                |
| -t <i>target_device_file</i>     | The <code>-t target_device_file</code> option and parameter are required with the <code>drd clone</code> command. This option specifies the <i>block device special file</i> (for example, <code>/dev/dsk/c2t0d0</code> ) of a single physical disk on which the cloned system image is to be written. The block device special file must exist on the system and be writeable. All data previously on a disk will be unavailable after a clone operation. (See the <code>-x overwrite</code> extended option.) |
| -x <i>extended_option= value</i> | Sets the extended option to a value.                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| -x -?                            | Displays the list of possible <code>-x</code> (extended) options.                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| -X <i>option_file</i>            | Gets the extended options from a file.                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

## Extended options

The following extended options are available:

|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>-x</code><br><code>alternate_bootdisk=block_device_special_file</code>      | This is the alternate boot disk. The alternate boot disk must be specified as a block device special file.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <code>-x</code><br><code>copy_atfile={true false}block_device_special_file</code> | (Default is <i>true</i> ) Controls whether to copy the EFI/HPUX/AUTO file from the active to the inactive system image.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <code>-x enforce_dsa={true false}</code>                                          | Usage: Advanced/Dangerous. Controls whether or not a failure in the disk space analysis (DSA) part of the analysis phase is fatal to the session.<br><br>true: A failure in DSA will result in a failure of Analysis phase for the entire session. The command will not proceed.<br><br>false: A failure in DSA will be logged, but the session will be allowed to proceed. There is a risk of filling a mounted disk or volume to its maximum capacity at some point during the session. Attempts to exceed the capacity will result in a catastrophic failure of the session, and possibly leave an unusable system. |
| <code>-x</code><br><code>HAalternate_bootdisk=block_device_special_file</code>    | This is the High Availability alternate boot disk. The High Availability alternate boot disk must be specified as a block device special file. High Availability alternate boot disk is supported only on Itanium-based architecture and for PA-RISC systems that support hardware partitions.                                                                                                                                                                                                                                                                                                                         |
| <code>-x</code><br><code>ignore_unmounted_fs={true false}</code>                  | (Default is <i>false</i> ) Controls whether a clone fails when an unmounted file system in the root volume group is detected.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <code>-x</code><br><code>logfile=/var/opt/drd/drd.log</code>                      | This is the path to the log file for this command. Each time DRD is run, this file will grow larger. This can be changed, for example, to a month-specific location for easier archiving, off-host backup, and rotation.                                                                                                                                                                                                                                                                                                                                                                                               |
| <code>-x log_verbosity=4</code>                                                   | (Default.) Specifies the level of log verboseness. Replace 4 with the following values:<br><br>0 Only ERRORS and the starting/ending BANNER messages.<br>1 Adds WARNING messages.<br>2 Adds NOTE messages.<br>3 Adds INFO messages (informational messages preceded by the * character.)<br>4 (Default) Adds verbose INFO messages.<br>5 Adds additional detailed INFO messages.                                                                                                                                                                                                                                       |

## The drd deactivate command

The `drd-deactivate(1M)` command invokes the `setboot(1M)` command to set the primary boot disk to the active (booted) system image the next time the system is booted.

---

**NOTE:** `drd deactivate` is a mechanism for “undoing” a `drd activate` command.

---

The `drd deactivate` command syntax is:

```
drd deactivate [-?] [-p] [-q] [-v] [-x extended option=value] [-x -?]
[-X option_file]
```

### Options

|                 |                                                                                              |
|-----------------|----------------------------------------------------------------------------------------------|
| <code>-?</code> | Displays the usage message for a DRD command. This option cannot be used with other options. |
|-----------------|----------------------------------------------------------------------------------------------|

|                                       |                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>-p</code>                       | Sets preview mode. When run with the <code>-p</code> option, a DRD command performs analysis without running the command and reports any errors.                                                                                                                                                                                                                                 |
| <code>-q</code>                       | Decreases the verbosity level by one each time it is specified. For example, <code>-qq</code> will reduce the verbosity from the default value of 4 to 2. If both <code>-x verbosity=5</code> and <code>-qqq</code> are included on the command line, the effective verbosity is 2. The minimum verbosity level is 0. (See also the <code>-x verbosity</code> option.)           |
| <code>-v</code>                       | Increases the verbosity level by one each time it is specified. For example, <code>-v</code> will increase the effective verbosity from the default value of 4 to 5. If both <code>-x verbosity=1</code> and <code>-vv</code> are included on the command line, the effective verbosity is 3. The maximum verbosity level is 5. (See also the <code>-x verbosity</code> option.) |
| <code>-x extended_option=value</code> | Sets the extended option to a value.                                                                                                                                                                                                                                                                                                                                             |
| <code>-x -?</code>                    | Displays the list of possible <code>-x</code> (extended) options.                                                                                                                                                                                                                                                                                                                |
| <code>-X option_file</code>           | Gets the extended options from a file.                                                                                                                                                                                                                                                                                                                                           |

## Extended options

The following extended options are available:

|                                                                 |                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>-x alternate_bootdisk=block_device_special_file</code>    | This is the alternate boot disk. The alternate boot disk must be specified as a block device special file.                                                                                                                                                                                                                                                                   |
| <code>-x HA_alternate_bootdisk=block_device_special_file</code> | This is the High Availability alternate boot disk. The High Availability alternate boot disk must be specified as a block device special file. High Availability alternate boot disk is supported only on Itanium-based architecture and for PA-RISC systems that support hardware partitions.                                                                               |
| <code>-x ignore_unmounted_fs={true false}</code>                | (Default is <i>false</i> ) Controls whether a clone fails when an unmounted file system in the root volume group is detected.                                                                                                                                                                                                                                                |
| <code>-x logfile=/var/opt/drd/drd.log</code>                    | This is the path to the log file for this command. Each time DRD is run, this file will grow larger. This can be changed, for example, to a month-specific location for easier archiving, off-host backup, and rotation.                                                                                                                                                     |
| <code>-x log_verbosity=4</code>                                 | (Default.) Specifies the level of log verboseness. Replace 4 with the following values:<br>0 Only ERRORS and the starting/ending BANNER messages.<br>1 Adds WARNING messages.<br>2 Adds NOTE messages.<br>3 Adds INFO messages (informational messages preceded by the * character.)<br>4 (Default) Adds verbose INFO messages.<br>5 Adds additional detailed INFO messages. |
| <code>-x mirror_disk=block_device_special_file</code>           | Specifies the target's block device special file of the mirror disk. The block device special file should refer to an entire disk, not to a partition. This option requires that LVM mirroring is installed. The block device special file specified is used to mirror each logical volume in the target of the clone operation.                                             |
| <code>-x overwrite={true false}</code>                          | Specifies whether <code>drd clone</code> should overwrite existing information on the target disk. That is, it controls whether a disk containing boot, LVM, or VxVM records can be overwritten. The <code>-x overwrite=false</code> (default) prevents a disk that contains boot, LVM, or VxVM records from being                                                           |



overwritten. The `-x overwrite=true` allows a disk to be overwritten, even if it contains boot, LVM, or VxVM records. Note that DRD does not overwrite a disk associated with an active LVM volume group or VxVM disk group, regardless of the setting of the `overwrite` option. If a previously created clone is mounted, use the `drd umount` command to unmount it before attempting to create a new clone on the disk.

`-x preview={true|false}`

If true, run this command in preview mode only. That is, complete the analysis phase and exit; no changes are committed to disk. This option has the same effect as specifying `-p` on the command line. The default is `false`. This option is available on every DRD command except `drd runcmd`.

`-x reboot={true|false}`

If true, specifies the system is rebooted at the successful completion of a `drd activate` operation. The default is `false`.

`-x verbosity=3 (Default.)`

Specifies the level of stdout/stderr verbosity. Replace 3 with the following values:

- 0 Only ERRORS and the starting/ending BANNER messages.
- 1 Adds WARNING messages.
- 2 Adds NOTE messages.
- 3 (Default) Adds INFO messages (informational messages preceded by the \* character.)
- 4 Adds verbose INFO messages.
- 5 Adds additional detailed INFO messages.

## The `drd mount` command

The `drd-mount(1M)` command mounts all the file systems in the cloned system image.

If the booted volume group contains the file systems `/`, `/var`, `/usr`, `/tmp`, `/stand`, `/opt`, and `/home`, the cloned file systems are mounted at the mount points shown in [Example A-1](#).

### Example 22 File system mount points

---

```

/var/opt/drd/mnts/sysimage_001
/var/opt/drd/mnts/sysimage_001/var
/var/opt/drd/mnts/sysimage_001/usr
/var/opt/drd/mnts/sysimage_001/tmp
/var/opt/drd/mnts/sysimage_001/stand
/var/opt/drd/mnts/sysimage_001/opt
/var/opt/drd/mnts/sysimage_001/home

```

---

If the inactive system image was created by the `drd clone` command, the mount point for the root file system, chosen automatically by the mount command, is `/var/opt/drd/mnts/sysimage_001`. If the currently-booted system was created by the `drd clone` command, the mount point of the root file system of the original system (now inactive) is `/var/opt/drd/mnts/sysimage_000`.

The `drd mount` command syntax is:

```
drd mount [-?] [-p] [-q] [-v] [-x extended option=value] [-x -?] [-X option_file]
```

### Options

`-?`

Displays the usage message for a DRD command. This option cannot be used with other options.

|                                       |                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>-p</code>                       | Sets preview mode. When run with the <code>-p</code> option, a DRD command performs analysis without running the command and reports any errors.                                                                                                                                                                                                                                 |
| <code>-q</code>                       | Decreases the verbosity level by one each time it is specified. For example, <code>-qq</code> will reduce the verbosity from the default value of 4 to 2. If both <code>-x verbosity=5</code> and <code>-qqq</code> are included on the command line, the effective verbosity is 2. The minimum verbosity level is 0. (See also the <code>-x verbosity</code> option.)           |
| <code>-v</code>                       | Increases the verbosity level by one each time it is specified. For example, <code>-v</code> will increase the effective verbosity from the default value of 4 to 5. If both <code>-x verbosity=1</code> and <code>-vv</code> are included on the command line, the effective verbosity is 3. The maximum verbosity level is 5. (See also the <code>-x verbosity</code> option.) |
| <code>-x extended_option=value</code> | Sets the extended option to a value.                                                                                                                                                                                                                                                                                                                                             |
| <code>-x -?</code>                    | Displays the list of possible <code>-x</code> (extended) options.                                                                                                                                                                                                                                                                                                                |
| <code>-X option_file</code>           | Gets the extended options from a file.                                                                                                                                                                                                                                                                                                                                           |

## Extended options

The following extended options are available:

|                                                                 |                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>-x alternate_bootdisk=block_device_special_file</code>    | This is the alternate boot disk. The alternate boot disk must be specified as a block device special file.                                                                                                                                                                                                                                                                   |
| <code>-x HA_alternate_bootdisk=block_device_special_file</code> | This is the High Availability alternate boot disk. The High Availability alternate boot disk must be specified as a block device special file. High Availability alternate boot disk is supported only on Itanium-based architecture and for PA-RISC systems that support hardware partitions.                                                                               |
| <code>-x ignore_unmounted_fs={true false}</code>                | (Default is <i>false</i> ) Controls whether a clone fails when an unmounted file system in the root volume group is detected.                                                                                                                                                                                                                                                |
| <code>-x logfile=/var/opt/drd/drd.log</code>                    | This is the path to the log file for this command. Each time DRD is run, this file will grow larger. This can be changed, for example, to a month-specific location for easier archiving, off-host backup, and rotation.                                                                                                                                                     |
| <code>-x log_verbosity=4</code>                                 | (Default.) Specifies the level of log verboseness. Replace 4 with the following values:<br>0 Only ERRORS and the starting/ending BANNER messages.<br>1 Adds WARNING messages.<br>2 Adds NOTE messages.<br>3 Adds INFO messages (informational messages preceded by the * character.)<br>4 (Default) Adds verbose INFO messages.<br>5 Adds additional detailed INFO messages. |
| <code>-x mirror_disk=block_device_special_file</code>           | Specifies the target's block device special file of the mirror disk. The block device special file should refer to an entire disk, not to a partition. This option requires that LVM mirroring is installed. The block device special file specified is used to mirror each logical volume in the target of the clone operation.                                             |
| <code>-x overwrite={true false}</code>                          | Specifies whether <code>drd clone</code> should overwrite existing information on the target disk. That is, it controls whether a disk containing boot, LVM, or VxVM records can be overwritten. The <code>-x overwrite=false</code> (default) prevents a disk that contains boot, LVM, or VxVM records from being                                                           |

|                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                        | overwritten. The <code>-x overwrite=true</code> allows a disk to be overwritten, even if it contains boot, LVM, or VxVM records. Note that DRD does not overwrite a disk associated with an active LVM volume group or VxVM disk group, regardless of the setting of the <code>overwrite</code> option. If a previously created clone is mounted, use the <code>drd umount</code> command to unmount it before attempting to create a new clone on the disk. |
| <code>-x preview={true false}</code>   | If true, run this command in preview mode only. That is, complete the analysis phase and exit; no changes are committed to disk. This option has the same effect as specifying <code>-p</code> on the command line. The default is <code>false</code> . This option is available on every DRD command except <code>drd runcmd</code> .                                                                                                                       |
| <code>-x reboot={true false}</code>    | If true, specifies the system is rebooted at the successful completion of a <code>drd activate</code> operation. The default is <code>false</code> .                                                                                                                                                                                                                                                                                                         |
| <code>-x verbosity=3 (Default.)</code> | Specifies the level of stdout/stderr verboseness. Replace 3 with the following values: <ol style="list-style-type: none"> <li>0 Only ERRORS and the starting/ending BANNER messages.</li> <li>1 Adds WARNING messages.</li> <li>2 Adds NOTE messages.</li> <li>3 (Default) Adds INFO messages (informational messages preceded by the * character.)</li> <li>4 Adds verbose INFO messages.</li> <li>5 Adds additional detailed INFO messages.</li> </ol>     |

## The `drd rehost` command

The `drd-rehost(1M)` command copies new host information to `EFI/HPUX/SYSINFO.TXT` for processing by `auto_parms` during the boot of the disk.

The `drd rehost` command considerations are:

- Patches to the `auto_parms` utility are needed to process the `SYSINFO.TXT` file during the boot of the disk. Please refer to the *Download DRD and Patches* webpage at <https://h20392.www2.hp.com/portal/swdepot/displayInstallInfo.do?productNumber=DynRootDisk#download> for information about the appropriate patches to install.
- A system administrator can execute the `drd rehost` command after cloning a system image to setup the clone to run on another system.
- The initial implementation of `drd rehost` only supports rehosting of an LVM-managed root volume group on an Integrity virtual machine to another Integrity virtual machine, or an LVM-managed root volume group on a Blade with Virtual Connect I/O to another such Blade.
- The format of the `sysinfo` file is defined in `sysinfo(4)`, which is provided by a patch documented at the *Download DRD and Patches* webpage at <https://h20392.www2.hp.com/portal/swdepot/displayInstallInfo.do?productNumber=DynRootDisk#download>. Only files conforming to `sysinfo(4)` can be used for rehosting.
- The disk to be rehosted must be a bootable disk and may be specified as the argument of the `-t` option. If no `-t` option is specified, the disk to be rehosted is the inactive system image. The inactive system image is either a clone created by the `drd clone` command, or the original booted image that was cloned, whichever is not currently booted.
- If no `-t` option is specified, the inactive image chosen is checked to ensure that it is managed by LVM. However, if a disk is specified using the `-t` option, the volume management of the disk is not checked.
- If a preview operation is run—by specifying the `-p` option—the syntax of the system information file is checked, but the file is not copied to the target.

The `drd rehost` command syntax is:

```
drd rehost [-?] [-p] -f system_information_file [-q] -t
device_special_file [-v] [-x extended_option=value] [-x -?] [-X
option_file]
```

## Options

|                                   |                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| -?                                | Displays the usage message for a DRD command. This option cannot be used with other options.                                                                                                                                                                                                                                 |
| -p                                | Sets preview mode. When run with the -p option, a DRD command performs analysis without running the command and reports any errors.                                                                                                                                                                                          |
| -f <i>system_information_file</i> | Specifies the file containing the system information (hostname, IP address, network information, etc.) to be copied to EFI/HPUX/SYSINFO.TXT on the disk specified by the -t option. See <i>sysinfo(4)</i> for the syntax of this file. If not specified, the file defaults to /etc/opt/drd/default_sysinfo_file.             |
| -q                                | Decreases the verbosity level by one each time it is specified. For example, -qq will reduce the verbosity from the default value of 4 to 2. If both -x verbosity=5 and -qqq are included on the command line, the effective verbosity is 2. The minimum verbosity level is 0. (See also the -x verbosity option.)           |
| -t <i>device_special_file</i>     | Specifies the block device special file of a single writeable physical disk. The file specified by the -f option will be written to EFI/HPUX/SYSINFO.TXT in the EFI partition of this disk. If no target is specified, the inactive system image is used as a target.                                                        |
| -v                                | Increases the verbosity level by one each time it is specified. For example, -v will increase the effective verbosity from the default value of 4 to 5. If both -x verbosity=1 and -vv are included on the command line, the effective verbosity is 3. The maximum verbosity level is 5. (See also the -x verbosity option.) |
| -x <i>extended_option=value</i>   | Sets the extended option to a value.                                                                                                                                                                                                                                                                                         |
| -x -?                             | Displays the list of possible -x (extended) options.                                                                                                                                                                                                                                                                         |
| -X <i>option_file</i>             | Gets the extended options from a file.                                                                                                                                                                                                                                                                                       |

## Extended options

The following extended options are available:

|                                                              |                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| -x<br><i>alternate_bootdisk=block_device_special_file</i>    | This is the alternate boot disk. The alternate boot disk must be specified as a block device special file.                                                                                                                                                                                     |
| -x<br><i>HA_alternate_bootdisk=block_device_special_file</i> | This is the High Availability alternate boot disk. The High Availability alternate boot disk must be specified as a block device special file. High Availability alternate boot disk is supported only on Itanium-based architecture and for PA-RISC systems that support hardware partitions. |
| -x<br><i>ignore_unmounted_fs={true false}</i>                | (Default is <i>false</i> ) Controls whether a clone fails when an unmounted file system in the root volume group is detected.                                                                                                                                                                  |
| -x<br><i>logfile=/var/opt/drd/drd.log</i>                    | This is the path to the log file for this command. Each time DRD is run, this file will grow larger. This can be changed, for example, to a month-specific location for easier archiving, off-host backup, and rotation.                                                                       |

|                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>-x log_verbosity=4</code>                       | <p>(Default.) Specifies the level of log verbosity. Replace 4 with the following values:</p> <ul style="list-style-type: none"> <li>0 Only ERRORS and the starting/ending BANNER messages.</li> <li>1 Adds WARNING messages.</li> <li>2 Adds NOTE messages.</li> <li>3 Adds INFO messages (informational messages preceded by the * character.)</li> <li>4 (Default) Adds verbose INFO messages.</li> <li>5 Adds additional detailed INFO messages.</li> </ul>                                                                                                                                                                                                                                                                                                            |
| <code>-x mirror_disk=block_device_special_file</code> | <p>Specifies the target's block device special file of the mirror disk. The block device special file should refer to an entire disk, not to a partition. This option requires that LVM mirroring is installed. The block device special file specified is used to mirror each logical volume in the target of the clone operation.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <code>-x overwrite={true false}</code>                | <p>Specifies whether <code>drd clone</code> should overwrite existing information on the target disk. That is, it controls whether a disk containing boot, LVM, or VxVM records can be overwritten. The <code>-x overwrite=false</code> (default) prevents a disk that contains boot, LVM, or VxVM records from being overwritten. The <code>-x overwrite=true</code> allows a disk to be overwritten, even if it contains boot, LVM, or VxVM records. Note that DRD does not overwrite a disk associated with an active LVM volume group or VxVM disk group, regardless of the setting of the overwrite option. If a previously created clone is mounted, use the <code>drd umount</code> command to unmount it before attempting to create a new clone on the disk.</p> |
| <code>-x preview={true false}</code>                  | <p>If true, run this command in preview mode only. That is, complete the analysis phase and exit; no changes are committed to disk. This option has the same effect as specifying <code>-p</code> on the command line. The default is false. This option is available on every DRD command except <code>drd runcmd</code>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <code>-x reboot={true false}</code>                   | <p>If true, specifies the system is rebooted at the successful completion of a <code>drd activate</code> operation. The default is false.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <code>-x verbosity=3 (Default.)</code>                | <p>Specifies the level of stdout/stderr verbosity. Replace 3 with the following values:</p> <ul style="list-style-type: none"> <li>0 Only ERRORS and the starting/ending BANNER messages.</li> <li>1 Adds WARNING messages.</li> <li>2 Adds NOTE messages.</li> <li>3 (Default) Adds INFO messages (informational messages preceded by the * character.)</li> <li>4 Adds verbose INFO messages.</li> <li>5 Adds additional detailed INFO messages.</li> </ul>                                                                                                                                                                                                                                                                                                             |

## The `drd runcmd` command

The `drd-runcmd(1M)` command runs a *DRD-safe* command, which is specified by `command <args>`, on the cloned (inactive) system image.

The `drd runcmd` command runs the designated command on the inactive system image. Several commands, known as DRD-safe commands, can be executed with `drd runcmd`. See [Maintaining Software on the Cloned Image](#) for more information about the DRD-safe commands.

The `drd runcmd` command mounts the inactive system image if it has not been mounted. Generally, when `drd runcmd` completes, it unmounts the inactive system image. However, if the inactive system image was mounted before the command, `drd runcmd` leaves it mounted after completion of `drd runcmd`.

The `drd runcmd` command returns the following error codes:

0 Success

1 Error

2 Warning

The `drd runcmd` operation involves two commands: `drd runcmd` and the HP-UX command that is its argument, but it returns only a single error code. The code reflects the worst result of the two commands. If both commands are successful, the error code is 0. If either command has an error or warning result, the error code is 1 or 2. To determine which command issued the error or warning, examine the messages.

For additional information, see the *drd-runcmd(1M)* manpage (`man drd-runcmd`)

The `drd runcmd` command syntax is:

```
drd runcmd [-?] [-q] [-v] [-x extended option=value] [-x -?] [-X
option_file] command <args>
```

## Options

|                                 |                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| -?                              | Displays the usage message for a DRD command. This option cannot be used with other options.                                                                                                                                                                                                                                                                                     |
| -q                              | Decreases the verbosity level by one each time it is specified. For example, <code>-qq</code> will reduce the verbosity from the default value of 4 to 2. If both <code>-x verbosity=5</code> and <code>-qqq</code> are included on the command line, the effective verbosity is 2. The minimum verbosity level is 0. (See also the <code>-x verbosity</code> option.)           |
| -v                              | Increases the verbosity level by one each time it is specified. For example, <code>-v</code> will increase the effective verbosity from the default value of 4 to 5. If both <code>-x verbosity=1</code> and <code>-vv</code> are included on the command line, the effective verbosity is 3. The maximum verbosity level is 5. (See also the <code>-x verbosity</code> option.) |
| -x <i>extended_option=value</i> | Sets the extended option to a value.                                                                                                                                                                                                                                                                                                                                             |
| -x -?                           | Displays the list of possible <code>-x</code> (extended) options.                                                                                                                                                                                                                                                                                                                |
| -X <i>option_file</i>           | Gets the extended options from a file.                                                                                                                                                                                                                                                                                                                                           |

## Extended options

The following extended options are available:

|                                                              |                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| -x<br><i>alternate_bootdisk=block_device_special_file</i>    | This is the alternate boot disk. The alternate boot disk must be specified as a block device special file.                                                                                                                                                                                     |
| -x<br><i>HA_alternate_bootdisk=block_device_special_file</i> | This is the High Availability alternate boot disk. The High Availability alternate boot disk must be specified as a block device special file. High Availability alternate boot disk is supported only on Itanium-based architecture and for PA-RISC systems that support hardware partitions. |
| -x<br><i>ignore_unmounted_fs={true false}</i>                | (Default is <i>false</i> ) Controls whether a clone fails when an unmounted file system in the root volume group is detected.                                                                                                                                                                  |
| -x<br><i>logfile=/var/opt/drd/drd.log</i>                    | This is the path to the log file for this command. Each time DRD is run, this file will grow larger. This can be changed, for example, to a month-specific location for easier archiving, off-host backup, and rotation.                                                                       |
| -x <i>log_verbosity=4</i>                                    | (Default.) Specifies the level of log verboseness. Replace 4 with the following values:<br><br>0 Only ERRORS and the starting/ending BANNER messages.                                                                                                                                          |

|                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                     | <pre> 1  Adds WARNING messages. 2  Adds NOTE messages. 3  Adds INFO messages (informational messages preceded    by the * character.) 4  (Default) Adds verbose INFO messages. 5  Adds additional detailed INFO messages. </pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <pre>-x mirror_disk=block_device_special_file</pre> | <p>Specifies the target's block device special file of the mirror disk. The block device special file should refer to an entire disk, not to a partition. This option requires that LVM mirroring is installed. The block device special file specified is used to mirror each logical volume in the target of the clone operation.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <pre>-x overwrite={true false}</pre>                | <p>Specifies whether <code>drd clone</code> should overwrite existing information on the target disk. That is, it controls whether a disk containing boot, LVM, or VxVM records can be overwritten. The <code>-x overwrite=false</code> (default) prevents a disk that contains boot, LVM, or VxVM records from being overwritten. The <code>-x overwrite=true</code> allows a disk to be overwritten, even if it contains boot, LVM, or VxVM records. Note that DRD does not overwrite a disk associated with an active LVM volume group or VxVM disk group, regardless of the setting of the overwrite option. If a previously created clone is mounted, use the <code>drd umount</code> command to unmount it before attempting to create a new clone on the disk.</p> |
| <pre>-x preview={true false}</pre>                  | <p>If true, run this command in preview mode only. That is, complete the analysis phase and exit; no changes are committed to disk. This option has the same effect as specifying <code>-p</code> on the command line. The default is false. This option is available on every DRD command except <code>drd runcmd</code>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <pre>-x reboot={true false}</pre>                   | <p>If true, specifies the system is rebooted at the successful completion of a <code>drd activate</code> operation. The default is false.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <pre>-x verbosity=3 (Default.)</pre>                | <p>Specifies the level of stdout/stderr verbosity. Replace 3 with the following values:</p> <pre> 0  Only ERRORS and the starting/ending BANNER messages. 1  Adds WARNING messages. 2  Adds NOTE messages. 3  (Default) Adds INFO messages (informational messages    preceded by the * character.) 4  Adds verbose INFO messages. 5  Adds additional detailed INFO messages. </pre>                                                                                                                                                                                                                                                                                                                                                                                      |

## The `drd status` command

The `drd-status(1M)` command displays system-specific information about the clone (the inactive system image) and the original disk (the active system image). The `drd-status` command provides the following convenient information:

- Clone Disk – specifies the target disk used to create the clone of the original image.
- Clone Disk State – reports whether the boot loader, AUTO file, and SYSINFO.TXT file (Itanium® only) are present on the clone disk.
- Date Created – specifies when the clone image was created.
- Clone Mirror Disk – indicates “None” if the clone does not have a mirror, or lists the device special file of the mirror disk.
- Mirror Disk State – reports whether the boot loader, AUTO file, and SYSINFO.TXT file (Itanium® only) are present on the mirror disk.



- Original Disk – specifies which disk the original image is on.
- Original Disk State – reports whether the boot loader, AUTO file, and SYSINFO.TXT file (Itanium® only) are present on the original disk.
- Booted Disk – specifies which disk is currently booted.
- Activated Disk – upon reboot, the system will boot off this disk.

---

**NOTE:** Disk State varies depending on the system's architecture. The `drd status` command will list either LIF Area or EFI Partition instead of Disk State. For Itanium® systems, the Disk State will report whether the personality file, SYSINFO.TXT, exists on the specified disk. This file is used to rehost a disk. See the `drd-rehost(1M)` man page for more information.

Disk State varies depending on the system's architecture. The `drd status` command lists either Clone LIF Area or Clone EFI Partition.

---

The `drd status` command syntax is:

```
drd status [-?] [-q] [-v] [-x extended option=value] [-x -?] [-X option_file]
```

### Options

|                                 |                                                                                                                                                                                                                                                                                                                              |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| -?                              | Displays the usage message for a DRD command. This option cannot be used with other options.                                                                                                                                                                                                                                 |
| -q                              | Decreases the verbosity level by one each time it is specified. For example, -qq will reduce the verbosity from the default value of 4 to 2. If both -x verbosity=5 and -qqq are included on the command line, the effective verbosity is 2. The minimum verbosity level is 0. (See also the -x verbosity option.)           |
| -v                              | Increases the verbosity level by one each time it is specified. For example, -v will increase the effective verbosity from the default value of 4 to 5. If both -x verbosity=1 and -vv are included on the command line, the effective verbosity is 3. The maximum verbosity level is 5. (See also the -x verbosity option.) |
| -x <i>extended_option=value</i> | Sets the extended option to a value.                                                                                                                                                                                                                                                                                         |
| -x -?                           | Displays the list of possible -x (extended) options.                                                                                                                                                                                                                                                                         |
| -X <i>option_file</i>           | Gets the extended options from a file.                                                                                                                                                                                                                                                                                       |

### Extended options

The following extended options are available:

|                                                              |                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| -x<br><i>alternate_bootdisk=block_device_special_file</i>    | This is the alternate boot disk. The alternate boot disk must be specified as a block device special file.                                                                                                                                                                                     |
| -x<br><i>HA_alternate_bootdisk=block_device_special_file</i> | This is the High Availability alternate boot disk. The High Availability alternate boot disk must be specified as a block device special file. High Availability alternate boot disk is supported only on Itanium-based architecture and for PA-RISC systems that support hardware partitions. |
| -x<br><i>ignore_unmounted_fs={true false}</i>                | (Default is <i>false</i> ) Controls whether a clone fails when an unmounted file system in the root volume group is detected.                                                                                                                                                                  |
| -x<br><i>logfile=/var/opt/drd/drd.log</i>                    | This is the path to the log file for this command. Each time DRD is run, this file will grow larger. This can be changed, for example, to a month-specific location for easier archiving, off-host backup, and rotation.                                                                       |
| -x <i>log_verbosity=4</i>                                    | (Default.) Specifies the level of log verboseness. Replace 4 with the following values:                                                                                                                                                                                                        |



|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                             | 0 Only ERRORS and the starting/ending BANNER messages.<br>1 Adds WARNING messages.<br>2 Adds NOTE messages.<br>3 Adds INFO messages (informational messages preceded by the * character.)<br>4 (Default) Adds verbose INFO messages.<br>5 Adds additional detailed INFO messages.                                                                                                                                                                                                                                                                                                                                                                                                                              |
| -x<br>mirror_disk=block_device_special_file | Specifies the target's block device special file of the mirror disk. The block device special file should refer to an entire disk, not to a partition. This option requires that LVM mirroring is installed. The block device special file specified is used to mirror each logical volume in the target of the clone operation.                                                                                                                                                                                                                                                                                                                                                                               |
| -x overwrite={true false}                   | Specifies whether drd clone should overwrite existing information on the target disk. That is, it controls whether a disk containing boot, LVM, or VxVM records can be overwritten. The -x overwrite=false (default) prevents a disk that contains boot, LVM, or VxVM records from being overwritten. The -x overwrite=true allows a disk to be overwritten, even if it contains boot, LVM, or VxVM records. Note that DRD does not overwrite a disk associated with an active LVM volume group or VxVM disk group, regardless of the setting of the overwrite option. If a previously created clone is mounted, use the drd umount command to unmount it before attempting to create a new clone on the disk. |
| -x preview={true false}                     | If true, run this command in preview mode only. That is, complete the analysis phase and exit; no changes are committed to disk. This option has the same effect as specifying -p on the command line. The default is false. This option is available on every DRD command except drd runcmd.                                                                                                                                                                                                                                                                                                                                                                                                                  |
| -x reboot={true false}                      | If true, specifies the system is rebooted at the successful completion of a drd activate operation. The default is false.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| -x verbosity=3 (Default.)                   | Specifies the level of stdout/stderr verbosity. Replace 3 with the following values:<br>0 Only ERRORS and the starting/ending BANNER messages.<br>1 Adds WARNING messages.<br>2 Adds NOTE messages.<br>3 (Default) Adds INFO messages (informational messages preceded by the * character.)<br>4 Adds verbose INFO messages.<br>5 Adds additional detailed INFO messages.                                                                                                                                                                                                                                                                                                                                      |

## The drd sync command

The `drd-sync(1M)` command propagates file system changes—whose modification time is newer than the clone creation time—from the booted original system to the inactive clone image.

**NOTE:** The initial implementation of `drd sync` only supports refresh of the inactive clone from the booted original system.

A file in the root LVM volume group or VxVM disk group on the booted original system is copied to the inactive clone if all of the following criteria is satisfied:

- The file does NOT reside in the following non-synchronized locations:
  - `/stand/*`
  - `/tmp/*`

- `/var/adm/sw/*`
- `/var/opt/drd/tmp/*`
- `/var/tmp/*`
- `/etc/lvmconf*`
- `/etc/vx/*`
- `/etc/vxvmconf/*`
- `/dev/<clone_group>/*` (Where *clone\_group* is the name of the LVM group used to import the clone (usually `drd00`.) This non-synchronized location does not apply to VxVM-managed roots.)
- The file does NOT appear in the Installed Products Database (that is, the output of `/usr/sbin/swlist -l file`), OR:
  - The file appears in the Installed Products Database with the attribute `is_volatile` set to true, AND:
  - The newconfig templates for the file on the original system and the clone are the same. A newconfig template is the delivered template for a configuration file that is copied to create a “volatile” file when some Software Distributor packages are installed. If the path to the volatile file is *path*, the path to the newconfig template is generally `/usr/newconfig/<path>`, or `<product_dir>/newconfig/<path>`, where *product\_dir* is the value of the “directory” product attribute of the product delivering the volatile file. If the newconfig templates do not match, or the location of the newconfig template cannot be determined, the file is not copied.

The files contained in the SW-DIST Installed Products Database are not copied to the clone because these files are intended to be managed by SW-DIST commands. Similarly, the contents of `/var/adm/sw`, which contains the Installed Products Database and logs associated with SW-DIST commands executed on the booted system, are not copied.

See `drd-runcmd(1M)` for information about using `drd runcmd swinstall` to install software to the clone.

Files containing blocks of binary zeroes that are copied by `drd sync` are converted to sparse files on the clone.

The `drd runcmd` command returns the following error codes:

0 Success

1 Error

2 Warning

The `drd sync` command syntax is:

**`drd sync [-?] [-p] [-q] [-v] [-x extended option=value] [-x -?] [-X option_file]`**

## Options

- |    |                                                                                                                                                  |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------|
| -? | Displays the usage message for a DRD command. This option cannot be used with other options.                                                     |
| -p | Sets preview mode. When run with the <code>-p</code> option, a DRD command performs analysis without running the command and reports any errors. |
| -q | Decreases the verbosity level by one each time it is specified. For example, <code>-qq</code> will reduce the verbosity from the default         |

|                                       |                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                       | value of 4 to 2. If both <code>-x verbosity=5</code> and <code>-qqq</code> are included on the command line, the effective verbosity is 2. The minimum verbosity level is 0. (See also the <code>-x verbosity</code> option.)                                                                                                                                                    |
| <code>-v</code>                       | Increases the verbosity level by one each time it is specified. For example, <code>-v</code> will increase the effective verbosity from the default value of 4 to 5. If both <code>-x verbosity=1</code> and <code>-vv</code> are included on the command line, the effective verbosity is 3. The maximum verbosity level is 5. (See also the <code>-x verbosity</code> option.) |
| <code>-x extended_option=value</code> | Sets the extended option to a value.                                                                                                                                                                                                                                                                                                                                             |
| <code>-x -?</code>                    | Displays the list of possible <code>-x</code> (extended) options.                                                                                                                                                                                                                                                                                                                |
| <code>-X option_file</code>           | Gets the extended options from a file.                                                                                                                                                                                                                                                                                                                                           |

## Extended options

The following extended options are available:

|                                              |                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>-x exclude_list=</code>                | The full path for a file containing fully qualified file system locations to be excluded from synchronization, listed one per line, in addition to those described in <i>drd-sync(1M)</i> . If the location is a directory, the contents of the directory, including all subdirectories, are excluded. Note, file names must NOT end with a space.                           |
| <code>-x logfile=/var/opt/drd/drd.log</code> | This is the path to the log file for this command. Each time DRD is run, this file will grow larger. This can be changed, for example, to a month-specific location for easier archiving, off-host backup, and rotation.                                                                                                                                                     |
| <code>-x log_verbosity=4</code>              | (Default.) Specifies the level of log verboseness. Replace 4 with the following values:<br>0 Only ERRORS and the starting/ending BANNER messages.<br>1 Adds WARNING messages.<br>2 Adds NOTE messages.<br>3 Adds INFO messages (informational messages preceded by the * character.)<br>4 (Default) Adds verbose INFO messages.<br>5 Adds additional detailed INFO messages. |
| <code>-x verbosity=3 (Default.)</code>       | Specifies the level of stdout/stderr verboseness. Replace 3 with the following values:<br>0 Only ERRORS and the starting/ending BANNER messages.<br>1 Adds WARNING messages.<br>2 Adds NOTE messages.<br>3 (Default) Adds INFO messages (informational messages preceded by the * character.)<br>4 Adds verbose INFO messages.<br>5 Adds additional detailed INFO messages.  |

## The `drd umount` command

The `drd-umount(1M)` command unmounts all the file systems in the cloned system image.

The `drd umount` command fails:

- If the inactive system image was created by a `drd clone` command and no file system is mounted at `/var/opt/drd/mnts/sysimage_001`.
- If the inactive system image was the original source system when a `drd clone` command was run and no file system is mounted at `/var/opt/drd/mnts/sysimage_000`.

If a cloned file system is mounted, `drd umount` unmounts the file systems, unmounting the root file system (`/`) last. For a system with an LVM root, `drd umount` uses `deactivate` and `vgexport` to export the inactive volume group from the system. This makes the unmounted inactive system

image invisible to LVM management commands. For a system with a VxVM root, the inactivate image must remain imported to ensure that it is bootable.

The `drd umount` command syntax is:

```
drd umount [-?] [-p] [-q] [-v] [-x extended option=value] [-x -?] [-X option_file]
```

## Options

|                                 |                                                                                                                                                                                                                                                                                                                              |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| -?                              | Displays the usage message for a DRD command. This option cannot be used with other options.                                                                                                                                                                                                                                 |
| -p                              | Sets preview mode. When run with the -p option, a DRD command performs analysis without running the command and reports any errors.                                                                                                                                                                                          |
| -q                              | Decreases the verbosity level by one each time it is specified. For example, -qq will reduce the verbosity from the default value of 4 to 2. If both -x verbosity=5 and -qqq are included on the command line, the effective verbosity is 2. The minimum verbosity level is 0. (See also the -x verbosity option.)           |
| -v                              | Increases the verbosity level by one each time it is specified. For example, -v will increase the effective verbosity from the default value of 4 to 5. If both -x verbosity=1 and -vv are included on the command line, the effective verbosity is 3. The maximum verbosity level is 5. (See also the -x verbosity option.) |
| -x <i>extended_option=value</i> | Sets the extended option to a value.                                                                                                                                                                                                                                                                                         |
| -x -?                           | Displays the list of possible -x (extended) options.                                                                                                                                                                                                                                                                         |
| -X <i>option_file</i>           | Gets the extended options from a file.                                                                                                                                                                                                                                                                                       |

## Extended options

The following extended options are available:

|                                                              |                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| -x<br><i>alternate_bootdisk=block_device_special_file</i>    | This is the alternate boot disk. The alternate boot disk must be specified as a block device special file.                                                                                                                                                                                                                                                                       |
| -x<br><i>HA_alternate_bootdisk=block_device_special_file</i> | This is the High Availability alternate boot disk. The High Availability alternate boot disk must be specified as a block device special file. High Availability alternate boot disk is supported only on Itanium-based architecture and for PA-RISC systems that support hardware partitions.                                                                                   |
| -x<br><i>ignore_unmounted_fs={true false}</i>                | (Default is <i>false</i> ) Controls whether a clone fails when an unmounted file system in the root volume group is detected.                                                                                                                                                                                                                                                    |
| -x<br><i>logfile=/var/opt/drd/drd.log</i>                    | This is the path to the log file for this command. Each time DRD is run, this file will grow larger. This can be changed, for example, to a month-specific location for easier archiving, off-host backup, and rotation.                                                                                                                                                         |
| -x <i>log_verbosity=4</i>                                    | (Default.) Specifies the level of log verboseness. Replace 4 with the following values:<br><br>0 Only ERRORS and the starting/ending BANNER messages.<br>1 Adds WARNING messages.<br>2 Adds NOTE messages.<br>3 Adds INFO messages (informational messages preceded by the * character.)<br>4 (Default) Adds verbose INFO messages.<br>5 Adds additional detailed INFO messages. |

|                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>-x mirror_disk=block_device_special_file</code> | Specifies the target's block device special file of the mirror disk. The block device special file should refer to an entire disk, not to a partition. This option requires that LVM mirroring is installed. The block device special file specified is used to mirror each logical volume in the target of the clone operation.                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <code>-x overwrite={true false}</code>                | Specifies whether <code>drd clone</code> should overwrite existing information on the target disk. That is, it controls whether a disk containing boot, LVM, or VxVM records can be overwritten. The <code>-x overwrite=false</code> (default) prevents a disk that contains boot, LVM, or VxVM records from being overwritten. The <code>-x overwrite=true</code> allows a disk to be overwritten, even if it contains boot, LVM, or VxVM records. Note that DRD does not overwrite a disk associated with an active LVM volume group or VxVM disk group, regardless of the setting of the overwrite option. If a previously created clone is mounted, use the <code>drd umount</code> command to unmount it before attempting to create a new clone on the disk. |
| <code>-x preview={true false}</code>                  | If true, run this command in preview mode only. That is, complete the analysis phase and exit; no changes are committed to disk. This option has the same effect as specifying <code>-p</code> on the command line. The default is <code>false</code> . This option is available on every DRD command except <code>drd runcmd</code> .                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <code>-x reboot={true false}</code>                   | If true, specifies the system is rebooted at the successful completion of a <code>drd activate</code> operation. The default is <code>false</code> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <code>-x verbosity=3 (Default.)</code>                | Specifies the level of stdout/stderr verbosity. Replace 3 with the following values: <ul style="list-style-type: none"> <li>0 Only ERRORS and the starting/ending BANNER messages.</li> <li>1 Adds WARNING messages.</li> <li>2 Adds NOTE messages.</li> <li>3 (Default) Adds INFO messages (informational messages preceded by the * character.)</li> <li>4 Adds verbose INFO messages.</li> <li>5 Adds additional detailed INFO messages.</li> </ul>                                                                                                                                                                                                                                                                                                             |

## The `drd unrehost` command

The `drd-unrehost(1M)` command removes `EFI/HPUX/SYSINFO.TXT`, and optionally preserves a copy of it in a file on the booted system.

A system administrator can execute the `drd unrehost` command after having previously issued the `drd rehost` command, specifying the same target, if the disk should not be rehosted.

The format of the `sysinfo` file is defined in `sysinfo(4)`. To determine the most recent patch that supplies `sysinfo(4)`, please refer to the *Download DRD and Patches* webpage at <https://h20392.www2.hp.com/portal/swdepot/displayInstallInfo.do?productNumber=DynRootDisk#download>.

The `drd unrehost` command syntax is:

```
drd unrehost[-?] [-p] -f system_information_file [-q] -t
device_special_file [-v] [-x extended_option=value] [-x -?] [-X
option_file]
```

### Options

`-?` Displays the usage message for a DRD command. This option cannot be used with other options.

|                                         |                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>-p</code>                         | Sets preview mode. When run with the <code>-p</code> option, a DRD command performs analysis without running the command and reports any errors.                                                                                                                                                                                                                                 |
| <code>-f system_information_file</code> | Specifies the file containing the system information (hostname, IP address, network information, etc.) to be copied to <code>EFI/HPUX/SYSINFO.TXT</code> on the disk specified by the <code>-t</code> option. See <code>sysinfo(4)</code> for the syntax of this file. If not specified, the file defaults to <code>/etc/opt/drd/default_sysinfo_file</code> .                   |
| <code>-q</code>                         | Decreases the verbosity level by one each time it is specified. For example, <code>-qq</code> will reduce the verbosity from the default value of 4 to 2. If both <code>-x verbosity=5</code> and <code>-qqq</code> are included on the command line, the effective verbosity is 2. The minimum verbosity level is 0. (See also the <code>-x verbosity</code> option.)           |
| <code>-t device_special_file</code>     | Specifies the block device special file of a single writeable physical disk. The file specified by the <code>-f</code> option will be written to <code>EFI/HPUX/SYSINFO.TXT</code> in the EFI partition of this disk. If no target is specified, the inactive system image is used as a target.                                                                                  |
| <code>-v</code>                         | Increases the verbosity level by one each time it is specified. For example, <code>-v</code> will increase the effective verbosity from the default value of 4 to 5. If both <code>-x verbosity=1</code> and <code>-vv</code> are included on the command line, the effective verbosity is 3. The maximum verbosity level is 5. (See also the <code>-x verbosity</code> option.) |
| <code>-x extended_option=value</code>   | Sets the extended option to a value.                                                                                                                                                                                                                                                                                                                                             |
| <code>-x -?</code>                      | Displays the list of possible <code>-x</code> (extended) options.                                                                                                                                                                                                                                                                                                                |
| <code>-X option_file</code>             | Gets the extended options from a file.                                                                                                                                                                                                                                                                                                                                           |

## Extended options

The following extended options are available:

|                                                                                 |                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>-x</code><br><code>alternate_bootdisk=block_device_special_file</code>    | This is the alternate boot disk. The alternate boot disk must be specified as a block device special file.                                                                                                                                                                                                                                                                   |
| <code>-x</code><br><code>HA_alternate_bootdisk=block_device_special_file</code> | This is the High Availability alternate boot disk. The High Availability alternate boot disk must be specified as a block device special file. High Availability alternate boot disk is supported only on Itanium-based architecture and for PA-RISC systems that support hardware partitions.                                                                               |
| <code>-x</code><br><code>ignore_unmounted_fs={true false}</code>                | (Default is <code>false</code> ) Controls whether a clone fails when an unmounted file system in the root volume group is detected.                                                                                                                                                                                                                                          |
| <code>-x</code><br><code>logfile=/var/opt/drd/drd.log</code>                    | This is the path to the log file for this command. Each time DRD is run, this file will grow larger. This can be changed, for example, to a month-specific location for easier archiving, off-host backup, and rotation.                                                                                                                                                     |
| <code>-x log_verbosity=4</code>                                                 | (Default.) Specifies the level of log verboseness. Replace 4 with the following values:<br>0 Only ERRORS and the starting/ending BANNER messages.<br>1 Adds WARNING messages.<br>2 Adds NOTE messages.<br>3 Adds INFO messages (informational messages preceded by the * character.)<br>4 (Default) Adds verbose INFO messages.<br>5 Adds additional detailed INFO messages. |

|                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>-x mirror_disk=block_device_special_file</code> | Specifies the target's block device special file of the mirror disk. The block device special file should refer to an entire disk, not to a partition. This option requires that LVM mirroring is installed. The block device special file specified is used to mirror each logical volume in the target of the clone operation.                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <code>-x overwrite={true false}</code>                | Specifies whether <code>drd clone</code> should overwrite existing information on the target disk. That is, it controls whether a disk containing boot, LVM, or VxVM records can be overwritten. The <code>-x overwrite=false</code> (default) prevents a disk that contains boot, LVM, or VxVM records from being overwritten. The <code>-x overwrite=true</code> allows a disk to be overwritten, even if it contains boot, LVM, or VxVM records. Note that DRD does not overwrite a disk associated with an active LVM volume group or VxVM disk group, regardless of the setting of the overwrite option. If a previously created clone is mounted, use the <code>drd umount</code> command to unmount it before attempting to create a new clone on the disk. |
| <code>-x preview={true false}</code>                  | If true, run this command in preview mode only. That is, complete the analysis phase and exit; no changes are committed to disk. This option has the same effect as specifying <code>-p</code> on the command line. The default is <code>false</code> . This option is available on every DRD command except <code>drd runcmd</code> .                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <code>-x reboot={true false}</code>                   | If true, specifies the system is rebooted at the successful completion of a <code>drd activate</code> operation. The default is <code>false</code> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <code>-x verbosity=3 (Default.)</code>                | Specifies the level of stdout/stderr verbosity. Replace 3 with the following values: <ul style="list-style-type: none"> <li>0 Only ERRORS and the starting/ending BANNER messages.</li> <li>1 Adds WARNING messages.</li> <li>2 Adds NOTE messages.</li> <li>3 (Default) Adds INFO messages (informational messages preceded by the * character.)</li> <li>4 Adds verbose INFO messages.</li> <li>5 Adds additional detailed INFO messages.</li> </ul>                                                                                                                                                                                                                                                                                                             |

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# Glossary

|                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Booted system environment</b>   | The system environment that is currently running — also known as the current, active, or running system environment.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>CLI</b>                         | Command line user interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Clone</b>                       | * (noun) - clone - a Cloned System Image . * (verb) - clone - to create a Cloned System Image.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Cloned system image</b>         | A copy of the booted volume group from the system image of a booted system environment — produced by the <code>drd clone</code> command. A cloned system image may be inactive, or the cloned system image may be booted, in which case the system activities are started and the clone becomes the system image in the booted system environment. When a particular system image is booted, all other system images are inactive. A system administrator may modify a cloned system image by installing software on it using the <code>drd runcmd</code> command.                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>DRD</b>                         | Dynamic Root Disk. The collection of utilities that manages creation, modification, and booting of system images.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>DRD-chrooted shell</b>          | The modification environment provided by the DRD utilities for managing (swinstalling, swremoving, and swverifying) software to and from an inactive system image while logged on to a booted system environment. Because the POSIX shell is running in an environment provided by the <code>chroot</code> command, modifications to the booted system environment's files are prevented. In addition, the file systems of the inactive system image, mounted under the <code>chroot</code> directory, are available for software management on the inactive system image.                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>DRD-safe</b>                    | Refers to software packages for HP-UX, as well as to HP-UX commands. A package is DRD-safe if it can be swinstalled, swremoved, and swverified on an inactive system image without modifying any part of the booted system environment. There is no requirement that the package can be configured on an inactive system image. Examples of components of the booted system environment that cannot be changed are: the installed software, file systems, device configuration, process space, kernel definition, networking configuration, users and passwords, and auditing and security. A command is DRD-safe if it can be run in a DRD <code>runcmd</code> environment without modifying any part of the booted system environment. Further information on DRD-safe is available in the <i>Dynamic Root Disk: Quick Start &amp; Best Practices</i> white paper, which is available at <a href="http://www.hp.com/go/drd-docs">http://www.hp.com/go/drd-docs</a> . |
| <b>Hot backup</b>                  | See Hot recovery                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Hot maintenance</b>             | The ability to perform modifications to an inactive system image using commands issued on the booted system environment without affecting the booted system environment.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Hot recovery</b>                | The ability to return to a known good system environment simply by booting. That is, have a backup system image standing by waiting to be used. Sometimes referred to as <i>hot backup</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>LVM</b>                         | Logical Volume Manager. A subsystem that manages disk space — supplied at no charge with HP-UX.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Original system environment</b> | A booted system environment whose system image is cloned to create another system image. Each system image has exactly one original system environment. (That is, the booted system environment at the time the <code>drd clone</code> command was issued.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Rehost</b>                      | The capability to boot a DRD clone of an LVM-managed Itanium-based copy of HP-UX 11i v3 on a system other than the one where it was created. DRD provides the <code>drd rehost</code> command that copies the system information file—containing hostname, IP address, and other system-specific information—to <code>EFI/HPUX/SYSINFO.TXT</code> on the disk to be rehosted.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Root file system</b>            | The file system that must be mounted at <code>/</code> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>System activities</b>           | All of the running processes that correspond to programs on a booted system. This includes the running kernel, all network processes, all daemons and all other processes — both system and user. System activities frequently access in-memory copies of data. Thus any change to in-memory data may affect system activities.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>System environment</b>          | The combination of the system image and the system activities that comprise a running installation of HP-UX.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |



|                        |                                                                                                                                                                                              |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>System image</b>    | The file systems and their contents that comprise an installation of HP-UX — residing on disk and therefore persisting across reboots.                                                       |
| <b>System recovery</b> | See Hot recovery                                                                                                                                                                             |
| <b>Unrehost</b>        | DRD command that removes the system information file, <code>EFI/HPUX/SYSINFO.TXT</code> , from a disk that was rehosted, optionally preserving a copy in a file system on the booted system. |
| <b>VxVM</b>            | Veritas Volume Manager                                                                                                                                                                       |

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