HP StorageWorks

RAID Manager XP user guide

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Contents

About this guide

This guide provides information about:

- Installation and configuration procedures
- RAID Manager (RM) command usage
- Troubleshooting procedures
- Configuration file examples
- High Availability failover and failback
- Fibre Channel addressing
- Standard input (STDIN) file formats

Intended audience

This guide is intended for system administrators with knowledge of:

- Host server and operating system commands and utilities
- RAID technology
- Continuous Access XP and Business Copy XP programs
- XP disk arrays

Disk arrays

Unless otherwise noted, the term disk array refers to these disk arrays:

- HP Surestore Disk Array XP48
- HP Surestore Disk Array XP512
- HP StorageWorks Disk Array XP128
- HP StorageWorks Disk Array XP1024
- HP StorageWorks XP10000 Disk Array
- HP StorageWorks XP12000 Disk Array

Related documentation

The following documents [and web sites] provide related information:

- *HP StorageWorks Continuous Access XPuser guide for the XP12000/XP10000/SVS200*
- *HP StorageWorks Continuous Access XPuser guide for the XP1024/XP128*
- *HP StorageWorks Continuous Access XPJournal user guide*
- *HP StorageWorks Business Copy XP user guide for the XP12000/XP10000/SVS200*
- *HP StorageWorks Business Copy XP user guide for the XP128/XP1024*
- *HP StorageWorks XP Command View user guide for XP Disk Arrays*
- *HP StorageWorks Command View XP Advanced Edition v5.1 Device Manager Web Client user guide*
- *HP StorageWorks XP Remote Web Console user guide for XP12000/XP10000/SVS200*
- *HP StorageWorks Snapshot XP user guide*

You can find these documents from the Manuals page of the HP Business Support Center web site:

http://www.hp.com/support/manuals

In the Storage section, click **Storage array systems** and then select your product.

Document conventions and symbols

Convention	Element
Blue text: Document conventions and symbols	Cross-reference links and e-mail addresses
Blue, underlined text: http://www.hp.com	Web site addresses
Bold text	• Keys that are pressed • Text typed into a GUI element, such as a box • GUI elements that are clicked or selected, such as menu and list items, buttons, tabs, and check boxes
Italic text	Text emphasis
`Monospace` text	• File and directory names • System output • Code • Commands, their arguments, and argument values
`Monospace, italic` text	• Code variables • Command variables
`Monospace, bold` text	Emphasized monospace text

WARNING!

Indicates that failure to follow directions could result in bodily harm or death.

CAUTION:

Indicates that failure to follow directions could result in damage to equipment or data.

IMPORTANT:

Provides clarifying information or specific instructions.

NOTE:

Provides additional information.

TIP:

Provides helpful hints and shortcuts.

HP technical support

Telephone numbers for worldwide technical support are listed on the HP support web site: http://www.hp.com/support/.

Collect the following information before calling:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Error messages
- Operating system type and revision level
- Detailed questions

For continuous quality improvement, calls may be recorded or monitored.

Subscription service

HP recommends that you register your product at the Subscriber's Choice for Business web site: http://www.hp.com/go/e-updates.

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

HP web sites

For additional information, see the following HP web sites:

- http://www.hp.com
- http://www.hp.com/go/storage
- http://www.hp.com/service_locator
- http://www.hp.com/support/manuals

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1 Description

HP StorageWorks RAID Manager XP (RM) enables you to configure and control data replication and data protection on XP disk arrays. RM interfaces with the host system software and host high availability (HA) software, as well as the Business Copy XP and Continuous Access XP software on the disk array(s).

This manual provides instructions for installing and using RAID Manager on various versions of UNIX, Microsoft Windows, OpenVMS, and MPE/iX. It has an extensive command reference section and additional information on configuration, failover, and failback.

RAID Manager features and environment

RAID Manager lets you issue Business Copy (BC) and Continuous Access (CA) commands from a host. These commands can be issued from the command line or built into a script (for example, a ksh, perl script, or an MS-DOS batch file).

You can execute a large number of Business Copy and Continuous Access commands in a short period of time by using scripts containing RM commands. In MPE/iX, you can create POSIX command scripts. For more information about scripting, see RAID Manager commands in scripts , page 47.

RM also provides failover and operation commands that can support mutual hot standby when used with industry-standard failover software.

RM software consists of the following:

- RM instances (daemons)
- configuration files
- Business Copy/Continuous Access commands and shell scripts

RM uses these entities:

- a special volume called a command device
- BC/Continuous Access volumes

RM runs in these (and other) environments :

UNIX	RM runs on a UNIX host as the HORCM daemon.
Windows NT/2000/ 2003	RM runs on a Windows NT/2000/2003 host as a service.
MPE/iX	RM runs in MPE/iX as a job stream. See Appendix E, "Using RM with MPE/iX" on page 285.
OpenVMS	RM runs on OpenVMS as a detached process. See Appendix F, "Using RM with OpenVMS" on page 291.

Continuous Access (CA)

Continuous Access copies data from a local HP XP disk array to one or more remote HP XP disk arrays. You can use Continuous Access for data duplication, migration, and offsite backup.

RM displays Continuous Access volume or group information and allows you to perform Continuous Access operations through either the command line, a script (UNIX), or a batch file (Windows).

Continuous Access has a number of features that ensure reliable transfers in asynchronous mode, including journaling and protection against link failure.

For effective and complete disaster recovery solutions, Continuous Access (and therefore RM) is integrated with many cluster solutions, such as Cluster Extension (CLX) for Windows, Linux, Solaris and AIX, as well as MetroCluster and ContinentalCluster for HP-UX.

Continuous Access modes

Continuous Access can operate in 3 different modes:

Continuous Access-Synchronous (CA-Sync): With Continuous Access-Sync all write operations on the primary (source) volume have to be replicated to the secondary (copy) volume before the write can be acknowledged to the host. This mode ensures the highest level of data concurrency possible. Host I/O performance is directly impacted by the distance between the primary and secondary volumes and therefore Continuous Access-Sync is recommended for metropolitan distances.

Continuous Access-Asynchronous (CA-Async): With Continuous Access-Async all write operations on the primary volume are time stamped and stored in the array system cache, also known as the side file, before the write is acknowledged to the host. The data is then asynchronously replicated to the secondary array and re-applied in sequence to the secondary devices. With Continuous Access-Async data is not always current, but due to the unique timestamp implementation, data will always be consistent. The side file functions to protect host I/O performance from any temporary degradations of the communication link between the sites. It also acts as a buffer for temporary high write bursts from the host. Continuous Access-Async is ideal for long distance replication.

Continuous Access-Journal CA-Journal): Continuous Access-Journal is supported on XP10000/XP12000 arrays. Continuous Access-Journal works in principal the same as Continuous Access-Async, but instead of buffering write I/Os in the more expensive and limited XP array cache (the side file), Continuous Access-Journal writes data on special XP LUNS called journal pools. Journal pools consist of up to 16 physical LDEVs of any size, and can therefore buffer much larger amounts of data. Continuous Access-Journal also implements a unique read operation from the remote array, instead of the normal write (push) operation from the local (primary) array, and is therefore much more tolerant of short communication link outages.

Business Copy (BC)

Business Copy software allows you to create and maintain up to nine copies of data on the local disk array. You can use these copies for backup, data duplication, or testing.

Business Copy duplicate volumes are created within the same disk array at hardware speeds.

RM displays Business Copy volume or group information and allows you to perform Business Copy operations through either the command line, a script (UNIX), or a batch file (Windows).

When you use Continuous Access to make a duplicate copy of a volume on a remote disk array, and then make up to 9 internal Business Copy copies on the remote disk array from that volume, you can effectively create up to 10 copies of a logical volume on the remote disk array.

SnapShot

SnapShot allows you to create point-in-time copies of only changed data blocks (Copy-on-Write) and store them in a SnapShot storage pool.

SnapShot creates a virtual volume (V-VOL) for copy-on-write without designating a specific LUN as S-VOL. However, for the host to use the ShapShot volume, there must be a LUN mapped.

SnapShot employs two techniques:

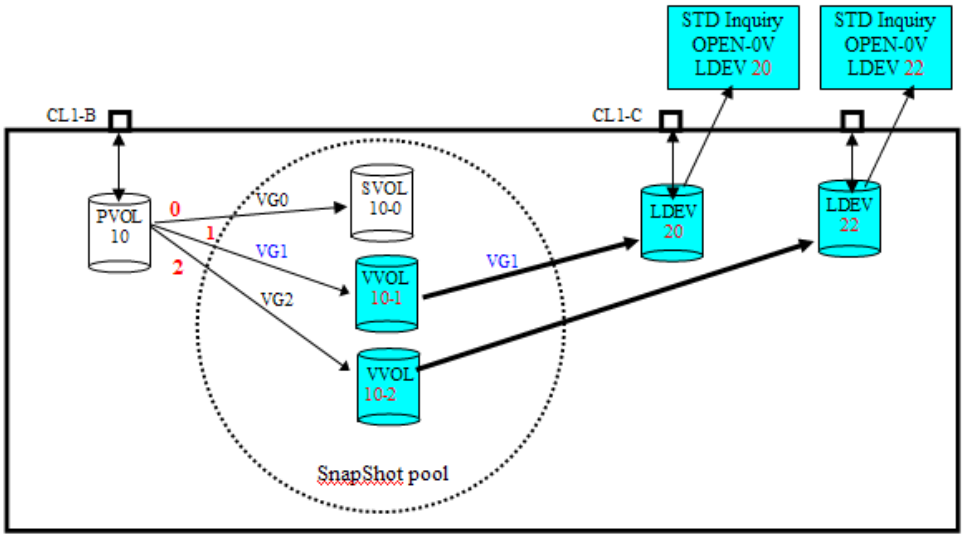
- creating or mapping a virtual volume (V-VOL)
- copy-on-write to a SnapShot pool volume (pool-VOL) identified by a pool ID.

SnapShot uses current Business Copy commands with new arguments.

Note:

SnapShot is used in Unix and Windows environments only. SnapShot does not work in MPE/iX or OpenVMS environments.

The following figure illustrates the basic concept.



Three data center replication (3DC)

XP10000 and XP12000 only

The three data center replication topology provides protection against local and metropolitan area disasters by combining local synchronous (Continuous Access Sync) and long-distance journal replication (Continuous Access Journal) capabilities.

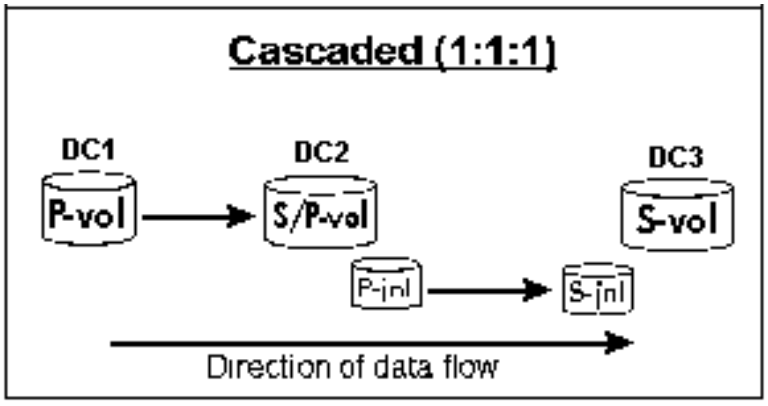
The RAID Manager CLI is the preferred way to manage a 3 Data Center configuration.

There are two configurations possible:

- cascaded configuration
- multi-target configuration

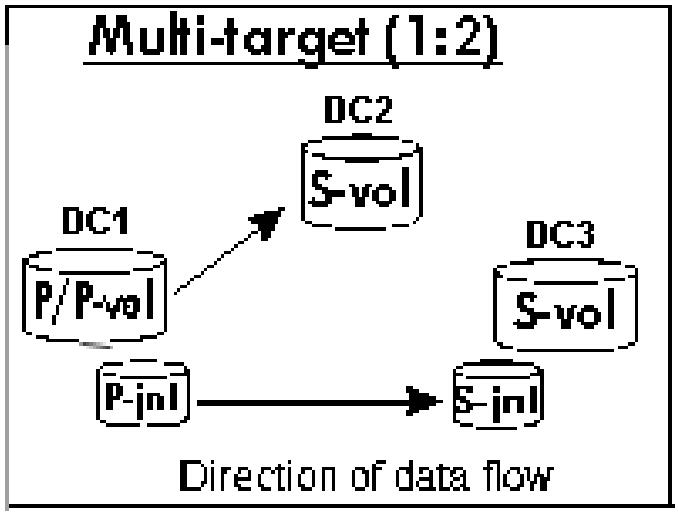
Cascaded configuration (1:1:1)

Under normal operating conditions, Data Center 1 (DC1) is where the application normally runs and is the application data origination point. Data is synchronously replicated to the local, metropolitan recovery center, Data Center 2 (DC2) and at the same time recorded in the DC2 journal. This journal data is then asynchronously replicated from DC2 to the long distance, out of region recovery center, Data Center 3 (DC3).



Multi-target configuration (1:2)

DC1 is again where the application normally runs and the application data origination point. In this case however, DC1 is also where the journal is maintained. Data is replicated synchronously to the metropolitan recovery center DC2 and asynchronously from the DC1 journal to the long distance , out of region recovery center DC3.



Pairs and pair management

Both Business Copy (non-SnapShot) and Continuous Access continuously copy data from a primary source volume known as a P-VOL to a secondary volume known as an S-VOL.

The relationship between a P-VOL and an S-VOL is called a pair.

You can use RM's `paircreate` command to establish pairs. Once a pair is established, updates to the P-VOL are automatically and continuously copied to the S-VOL.

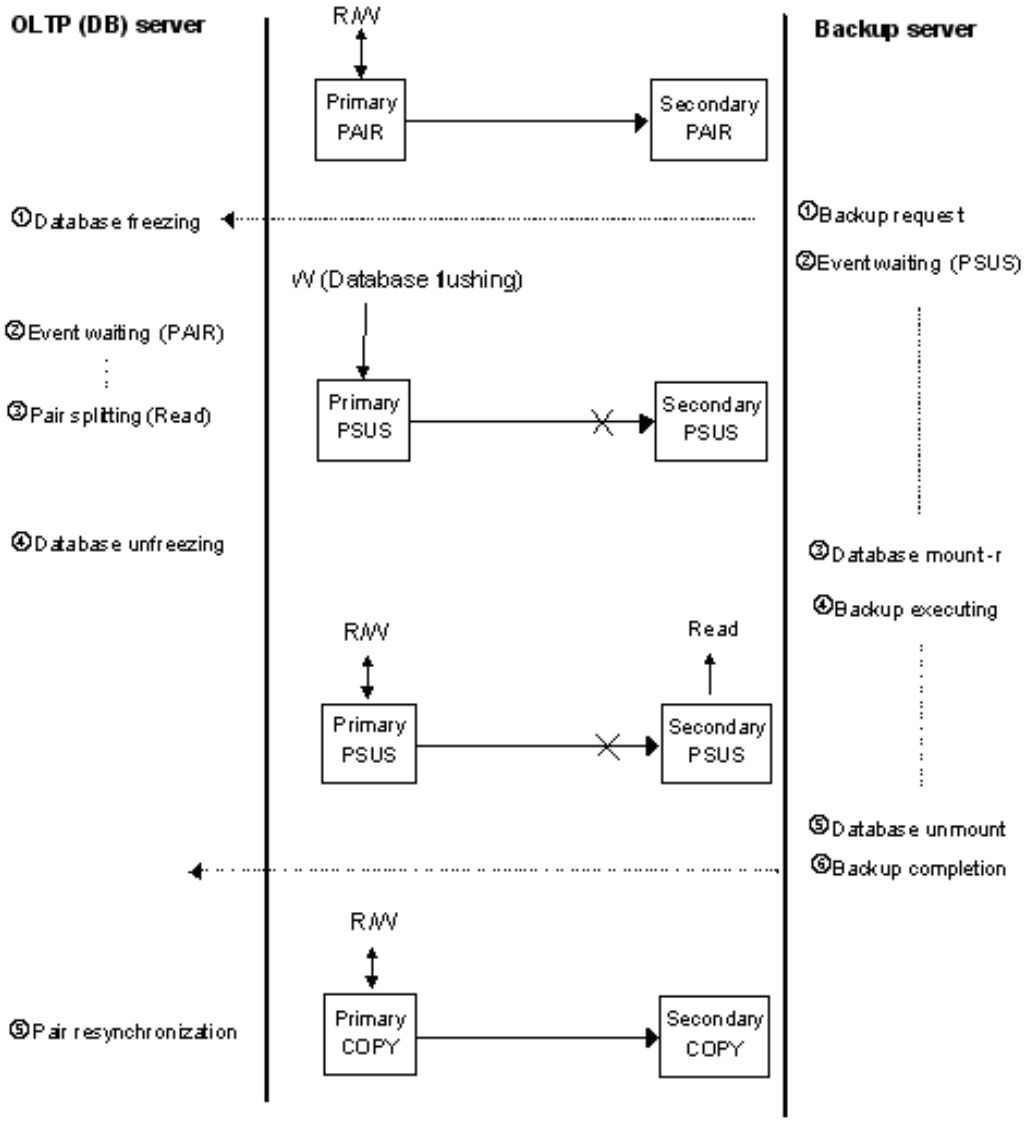
Additional commands for managing pairs allow you to temporarily suspend copy operations, create a SnapShot pair, resync the pair, and delete the pair relationship.

In addition, RM has many commands to display status, manage failover, manage failback, and set the conditions under which Business Copy and Continuous Access execute.

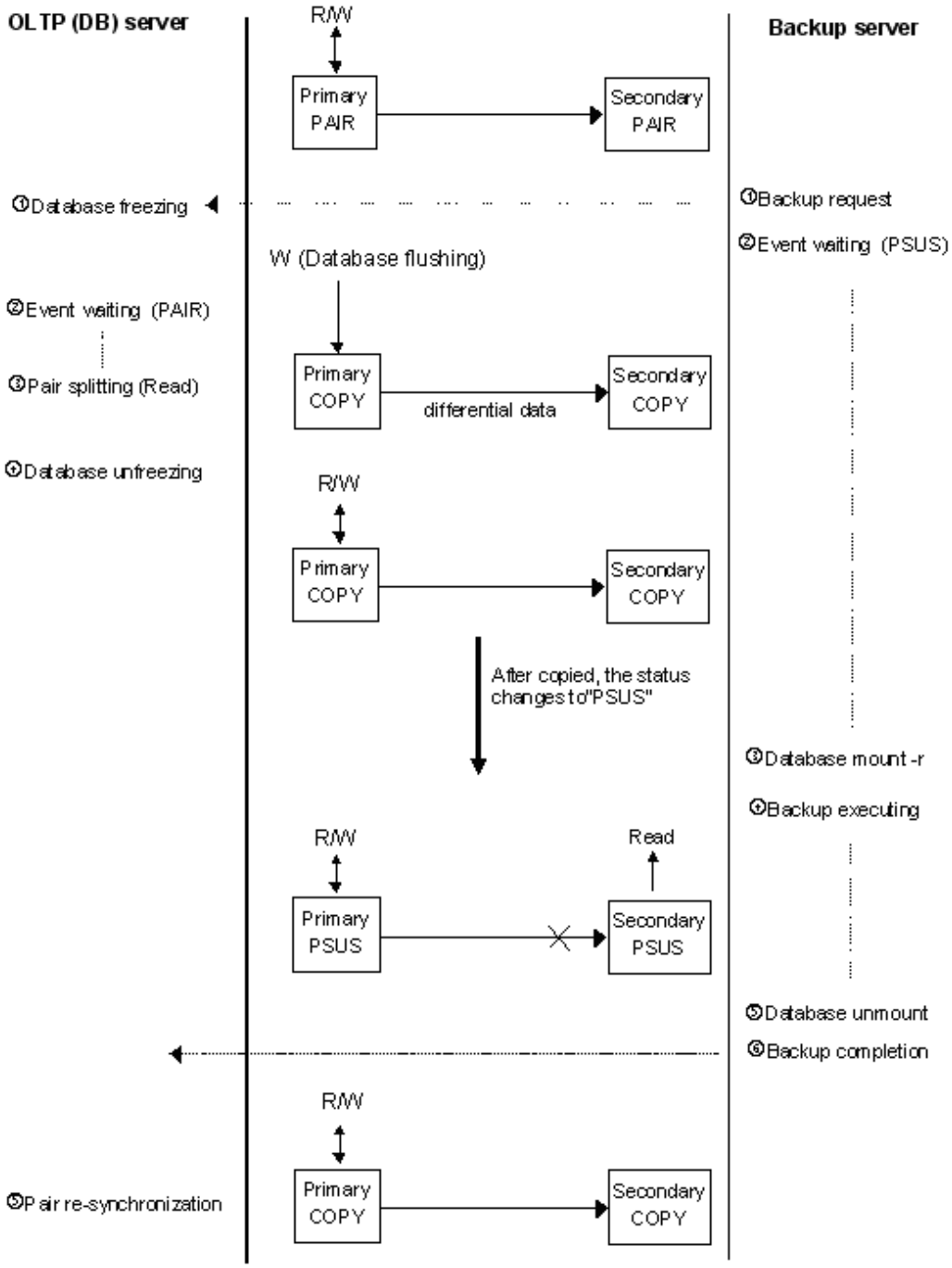
Continuous Access and Business Copy commands (examples)

The following figures illustrate RAID tasks that can be performed using Continuous Access and/or Business Copy commands:

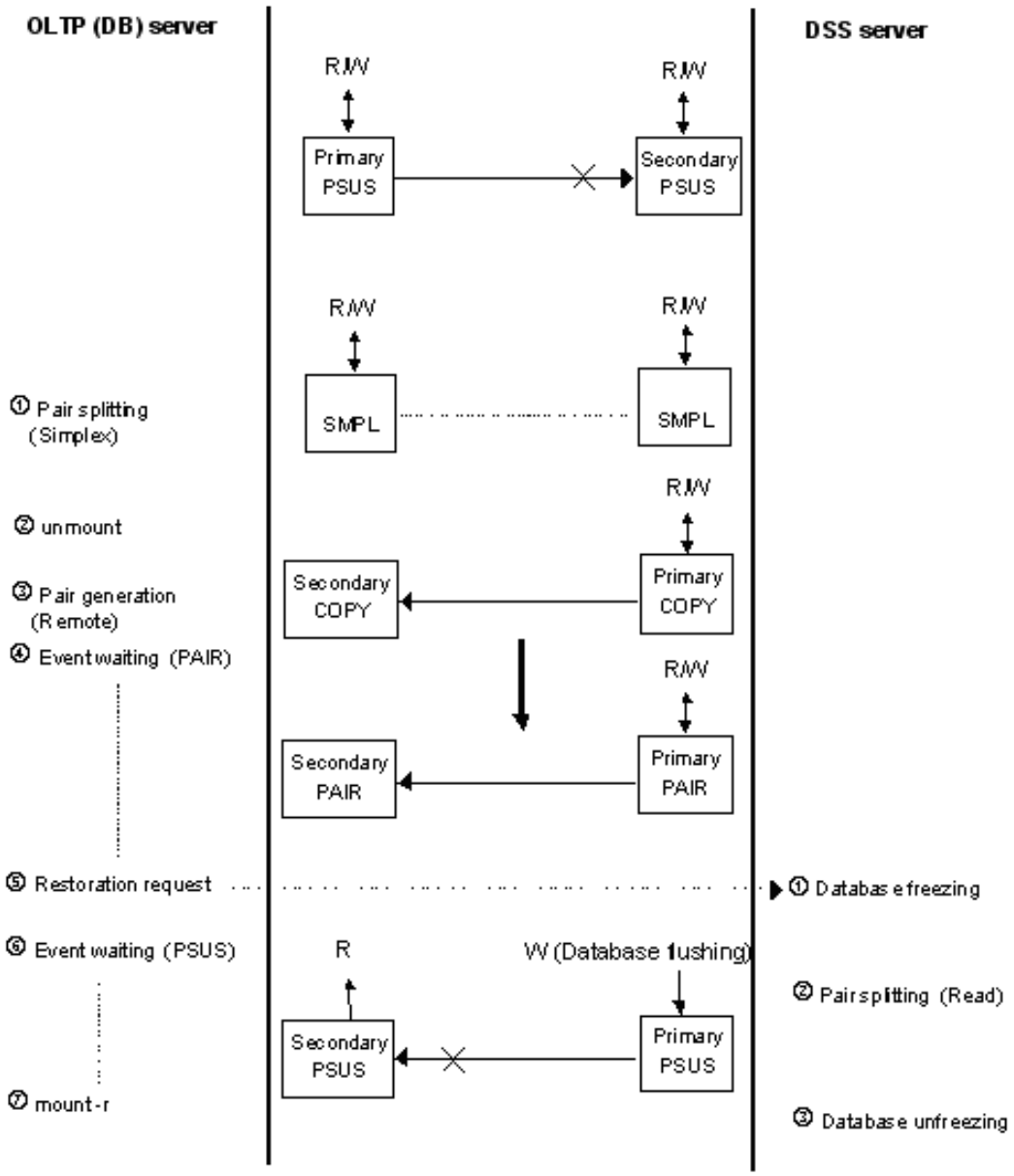
Back up the S-VOL in paired status (Continuous Access)



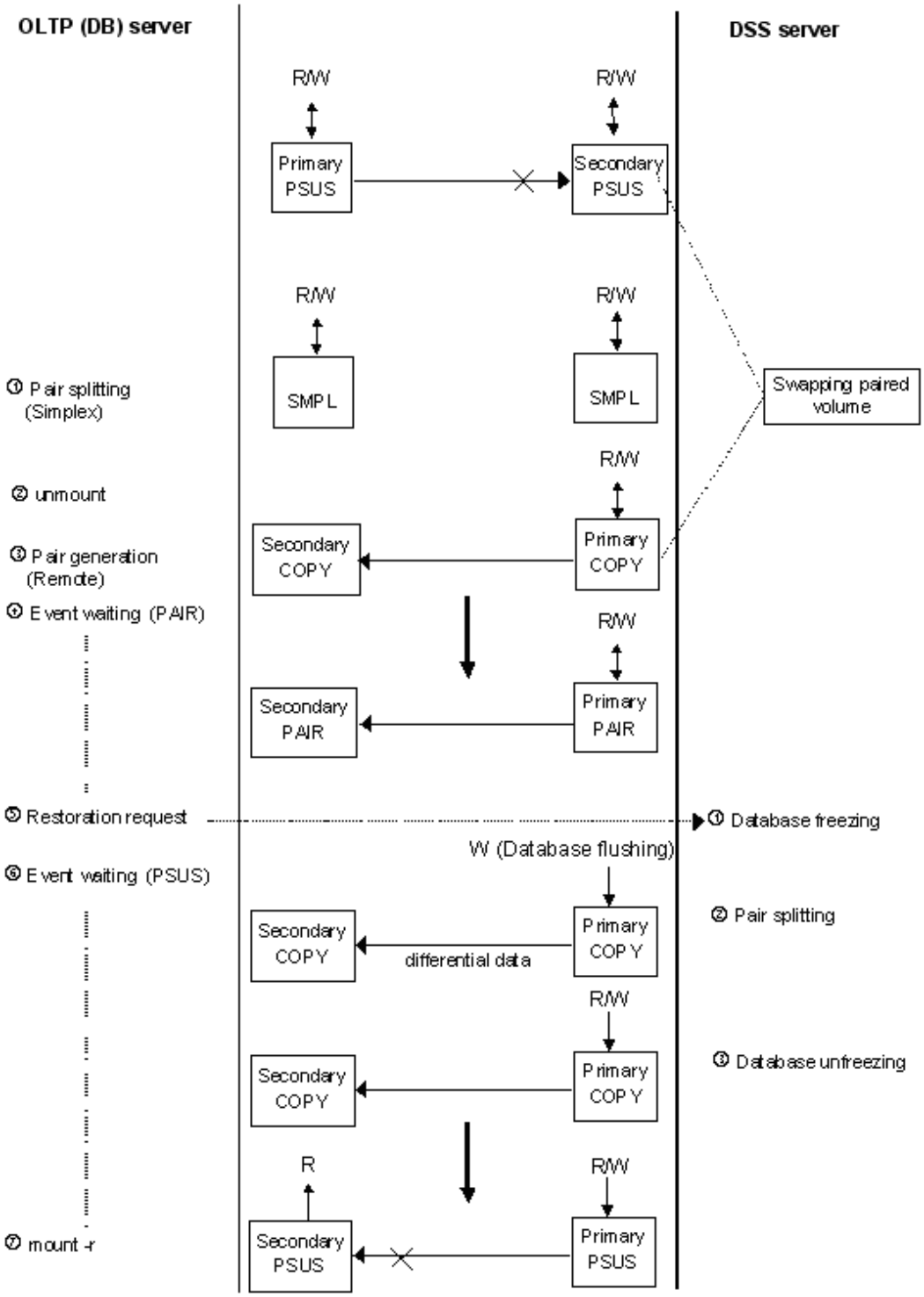
Back up the S-VOL in paired status (Business Copy)



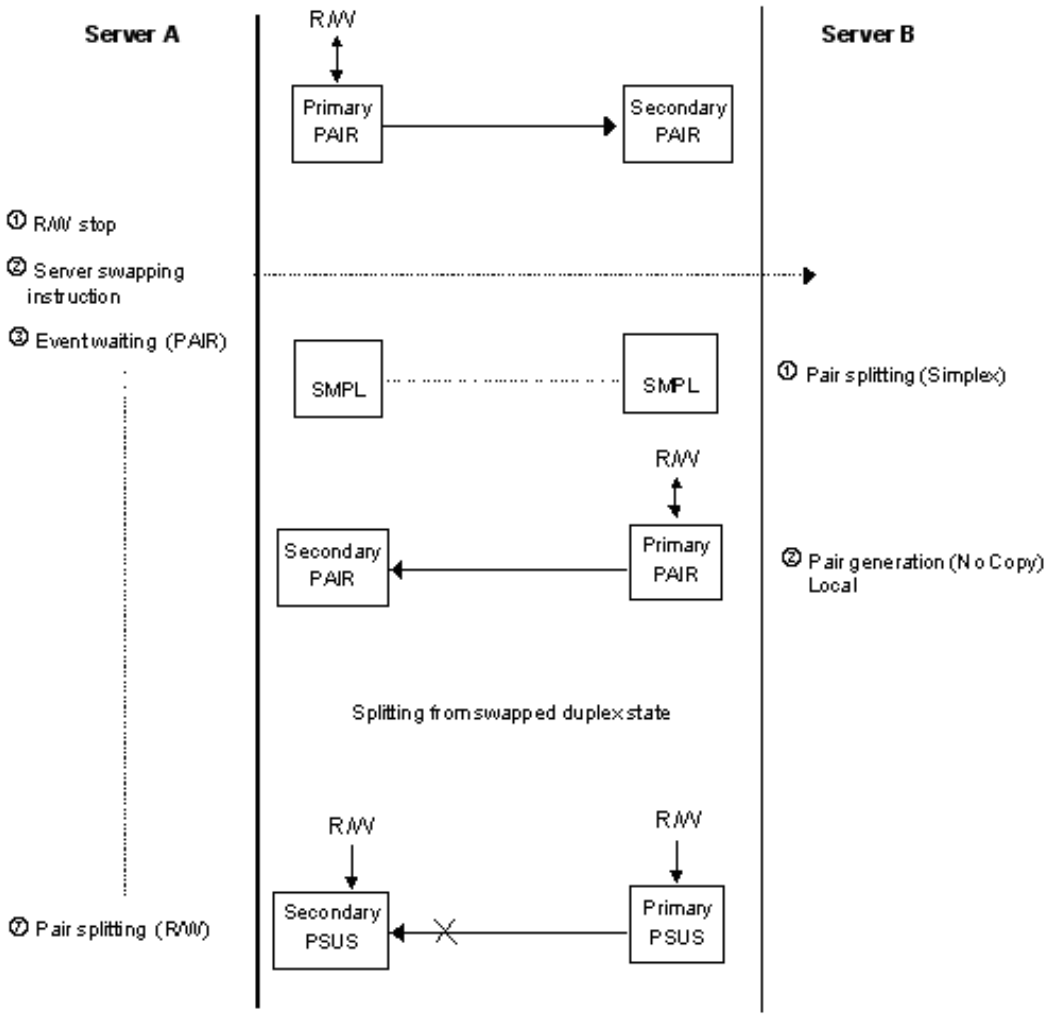
Restore the S-VOL to P-VOL in split status (Continuous Access)



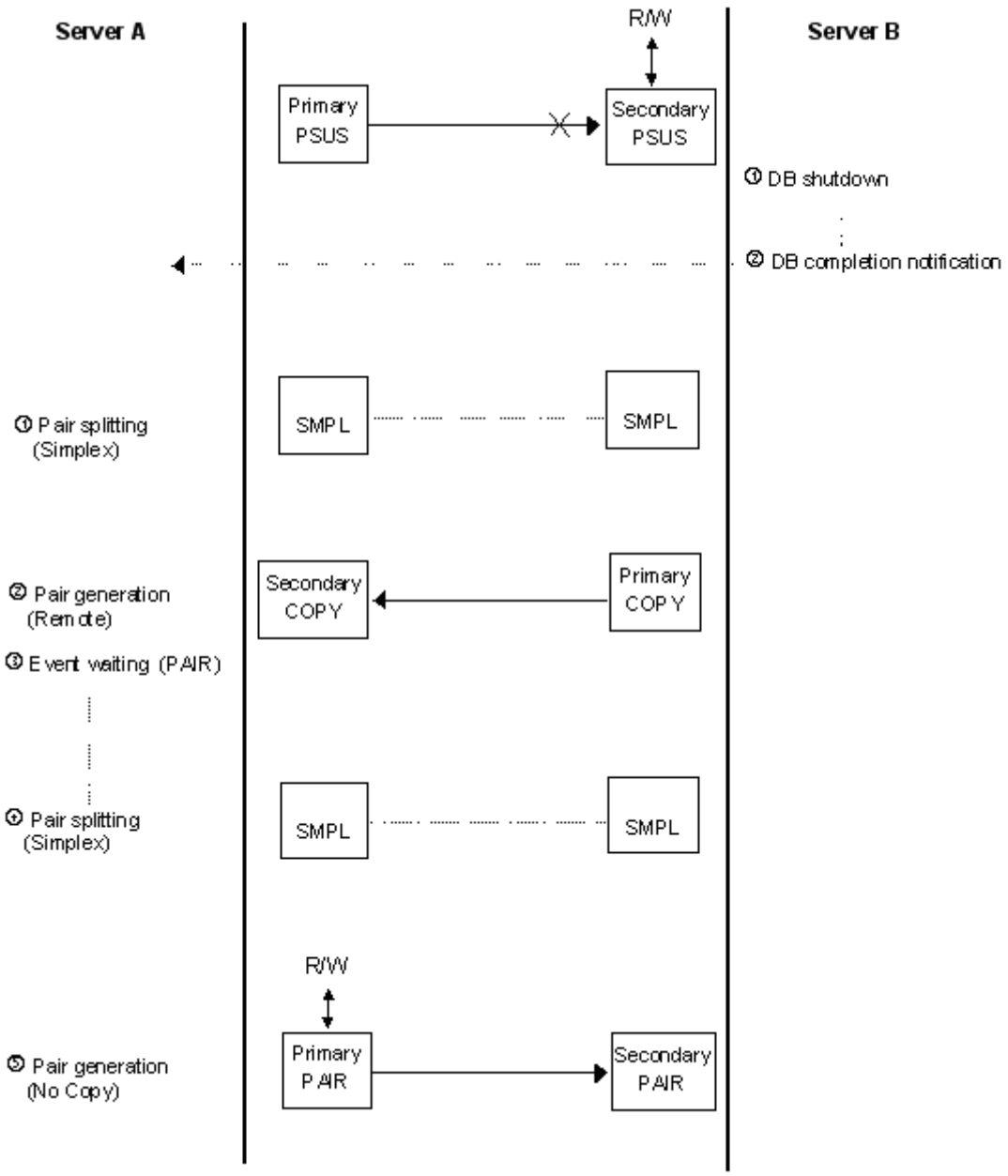
Restore the S-VOL to P-VOL in split status (Business Copy)



Swapping a paired volume for duplex operation (Continuous Access only)



Restoring the S-VOL for duplex operation (Continuous Access only)



Creating SnapShot pairs

When a command is given that will generate a pair-volume, such as `paircreate`, its type (SnapShot or Business Copy) is determined by the attributes of the S-VOL. If either of the following requirements are met, a SnapShot pair is created:

- If the S-VOL is specified as OPEN-0V (creates an unmapped V-VOL).
- If no S-VOL is specified.

V-VOL characteristics.

- Identified as OPEN-0V after a SCSI Inquiry or RAID Manager command.
- An unmapped V-VOL will reply to a SCSI Inquiry but provides read capacity only. After a V-VOL is mapped as the S-VOL, read/write ability is enabled.

RAID Manager instances

Each execution of RM is known as an RM instance. Instances are local or remote and can run on the same host or different hosts. Two RM instances are typically required to manage Business Copy or Continuous Access pairs.

Local instance	The RM instance currently being used, that is, the instance to which commands are issued. Local instances link to remote instances by using UDP socket services.
Remote instance	The RM instance that the local instance communicates with, as configured in the **HORCM_INST** section of an RM instance configuration file. (For further information see RM instance configuration files, page 32)

There are four possible RM topologies:

1. **One host connected to one disk array**

   If you are using one host, both RM instances are located on the same host.

2. **One host connected to two or more disk arrays**

   Using a single host connected to two or more disk arrays allows you to maintain duplicate data on two different disk arrays. When you choose this option, the host Logical Volume Manager must not be able to see both sides of the same Business Copy or Continuous Access pair or it will become confused.

3. **Two or more hosts connected to one disk array**

   Using two hosts connected to one disk array allows you to locate one RM instance on each host and thus maintain separate copies of the data controlled by independent hosts; primary volumes (P-VOLs) are used by one host while secondary volumes (S-VOLs) are used by the other host (for example, for backup, testing, or data duplication).

4. **Two or more hosts connected to two or more disk arrays**

   Using two or more hosts connected to two or more disk arrays provides the most flexible Continuous Access disaster recovery plan. The remote and local sets of data are administered by different hosts, guarding against host and disk failure.

   This is the configuration used by high availability (HA) software (such as HP MetroCluster) in conjunction with RAID Manager's `horctakeover` command (see horctakeover , page 94) allowing for both failover and failback.

RAID Manager command device

You must designate a special volume on the disk array as the RAID Manager command device. The command device accepts Business Copy or Continuous Access control operations. These are seen as in-band SCSI read and write commands, and are executed by the disk array. The volume designated as the command device is used only by RM and is blocked from other user access.

The command device can be any OPEN-x device that the host can access. An RM command device uses a minimum of 16 MB of space. The remaining volume space is reserved for RM and its utilities. You cannot use a Logical Unit Size Expansion (LUSE) volume as a command device; however, you can use the Volume Size Configuration (VSC) feature of Command View XP, LUN Configuration Manager XP, Remote Web Console XP, or Command View XP Advanced Edition to make custom volumes as small as 35 MB. (NOTE: VSC operations cannot be accomplished using Command View XP Advanced Edition on XP12000/XP10000 disk arrays)

△ CAUTION:

There should be no data on the volume you select as the command device since any data on the volume you select becomes inaccessible.

△ CAUTION:

MPE/iX systems will need a dummy volume set. Create this through the VOLUTIL utility program and scratch the volume set before converting to a command device.

△ CAUTION:

OpenVMS systems need a LUN 0 device of 35 MB. Note that storage assigned to the LUN 0 device is not accessible from OpenVMS.

RM issues SCSI read/write commands to the command device. If the command device fails for any reason, all Business Copy and Continuous Access commands terminate abnormally and the host cannot issue RM commands to the disk array.

To avoid data loss and system downtime, you can designate an alternate command device. Then, should RM receive an error notification in reply to a request, RM automatically switches to the alternate command device.

Manually switching command devices

To prevent abnormal command termination during a failure, RM allows you to manually switch command devices using the `horcctl` command.

- **When the command device switches**

  When RM receives an error notification from the operating system, RM switches automatically to the alternate device.

  You can also alternate command devices manually by issuing the RM `horcctl -C` command. See horcctl , page 85.

- **When to issue the horcctl (alternate command device) command**

  Issue a **horcctl** command to switch command devices before a command device is blocked due to online maintenance.

  After completing online maintenance, issue the `horcctl` command again to activate the original command device.

- **How to define alternate command devices**

  You can define two or more command devices in the **HORCM_CMD** section of the configuration definition file. If you specify two or more devices on the same line, they are recognized as alternating control devices for the same array. See HORCM_CMD section, page 37.

2 Installation and configuration

This chapter describes how to install and configure RAID Manager for UNIX, Windows, MPE/iX, and OpenVMS systems.

Disk array and host requirements

RM requires an activated installation of Business Copy or Continuous Access on the disk array. For information on activating and operating these programs, refer to the following manuals:

- *HP StorageWorks Business Copy XP: User's Guide*
- *HP StorageWorks Continuous Access XP: User's Guide*
- *HP StorageWorks Command View XP for XP Disk Arrays: User Guide*
- *HP StorageWorks Command View XP Advanced Edition Device Manager Web Client User's Guide*
- *HP StorageWorks XP Remote Web Console User Guide for the XP1024/XP128*
- *HP StorageWorks XP Remote Web Console User Guide for the XP12000/XP10000*

RAID Manager requirements with Continuous Access

- Have your HP representative configure the disk arrays for Continuous Access functions.
- Install Continuous Access license keys on the disk arrays.
- Configure the sender ports (Initiator for Fibre Channel, RCP for ESCON) and receiver ports (RCU-Target for Fibre Channel and LCP for ESCON) on the local and remote disk arrays.
- Establish a path between the local and remote control units (CUs) using Continuous Access.
- Enable bidirectional swap between local and remote volumes. Verify that at least two physical links exist in each direction.
- Designate one or more RM command devices using Command View XP, LUN Configuration Manager XP, Remote Web Console XP, or Command View XP Advanced Edition. If none of these are available, ask your HP representative to configure the devices.
- Plan the mapping of the Continuous Access disk volume pairs. Determine which volumes to access.
- Map the paths to be used for each host.

Using RAID Manager with Business Copy

- Have your HP representative configure the disk array for Business Copy functions.
- Install the Business Copy license key on the disk array.
- Designate one or more RM command devices using Command View XP, LUN Configuration Manager XP, Remote Web Console XP, or Command View XP Advanced Edition. If none of these are available, ask your HP representative to configure the devices.
- Plan the mapping of the Business Copy disk volume pairs. Determine which volumes to access.
- Map the paths to be used for each host.

Installation and configuration outline

RM installation and configuration consists of the following tasks. Task details appear in the subsequent sections.

- **Installing RAID Manager**

Install the RM software on the hosts.

- **Configuring the services and hosts files**

  Add a service name/number to the host services file (for example, `/etc/services`) for each RM instance. Configure the hosts file.

- **Setting up the RM instance configuration file**

  Configure paths to one or more RM command devices for each host. All hosts and RM instances can use the same command device for a given disk array. However, it is recommended that each host have its own command device.

- **Starting the instances**

  Set the necesary environment variables to issue commands to the desired RM instance.

Installing RAID Manager on UNIX systems

Follow the steps specific for your UNIX system to install RM.

NOTE:

Note: Before performing the installation (upgrade), shut down all active RM instances that are running on the primary host and any secondary hosts it is communicating with.

1. Place the CD-ROM in the CD-ROM drive.
2. Identify the CD-ROM device file to be substituted in the `mount` commands below (for example, `/dev/dsk/c1t1d0`).
3. Log in as root.

   ```
   su root
   ```

4. Create a CD-ROM mount directory and make it accessible to all users.

   ```
   mkdir –p /cdrom
   chmod 777 /cdrom
   ```

5. Mount the CD-ROM.

   HP-UX

   For HP-UX, use the `mount` command with the `–f` option:

   ```
   mount –f cdfs –o ro /dev/dsk/c1t1d0 /cdrom
   ```

   Sun Solaris

   For Sun Solaris, use the `mount` command with the `–f` option:

   ```
   mount –f hsfs –o ro /dev/dsk/c0t6d0s2 /cdrom/cdrom0
   ```

   In most cases, Sun Solaris automatically mounts the CD-ROM. If not, use this `mount` command:

   ```
   mount –f hsfs –o ro /vol/dev/dsk/c0t6d0/cdrom0 /cdrom/cdrom0
   ```

   IBM AIX

   For IBM AIX, use the `mount` command with the `–rv` option:

   ```
   mount –rv cdrfs /dev/cd0 /cdrom
   ```

6. Choose a file system for the RM software. You need about 5 MB of disk space. The standard and recommended file system to load the software to is `/opt`.
7. From the `/opt` directory, use `cpio` to unpack the appropriate archive. Create the **HORCM** directory if it does not already exist.

```
cd /opt
mkdir HORCM (choose the next command according to your OS)
cat /cdrom/LINUX/rmxp* | cpio –idum (or)
cat /cdrom/AIX/rmxp* | cpio –idum (or)
cat /cdrom/DIGITAL/rmxp* | cpio –idum (or)
cat /cdrom/HP_UX/rmxp* | cpio -idum (or)
cat /cdrom/SOLARIS/rmxp* | cpio –idum
```

8. Change the directory to `/opt/HORCM` and verify the contents.

   ```
   cd /opt/HORCM
   ls
   ```

   Example

   ```
   etc horcmuninstall.sh  log0   usr
   horcminstall.sh        log    log1
   ```

9. Create a link from the root directory to the `/opt/HORCM` directory.

   ```
   ln –s /opt/HORCM /HORCM
   ```

10. Run the RM Installer.

    ```
    /HORCM/horcminstall.sh
    ```

    This script creates symbolic links in the `/usr/bin` directory for RM commands.

Installing RAID Manager on Windows systems

1. Boot the Windows server and log in with administrator access.
2. Insert the RAID Manager CD in the CD-ROM drive.
3. Under the **Start** menu, select **Run**.
4. When the Run window opens, enter `D:\WIN_NT\setup.exe` (where **D** is the letter of your CD-ROM drive) in the Open dialog box and click **OK.**
5. The installation wizard opens. Follow the on-screen instructions to install the RM software.

Installing RAID Manager on MPE/iX systems

NOTE:

Before performing the installation (upgrade), shut down all active RM instances that are running on the primary host and any secondary hosts it is communicating with.

1. Update your system with MPE/iX 6.5 or greater, along with that OS version's latest Power Patch.
2. Install the MPE/iX RAID Manager Patch ID **XPMMX65.**
3. Verify that at least one logical volume on the disk array is configured to function as a command device.

△ CAUTION:

MPE/iX systems require that the command device be recognized as a dummy volume set. Create this through the VOLUTIL utility program and then scratch the volume before converting it to a command device.

4. Run the POSIX shell from CI and change your working directory to the temporary directory `/tmp/raidmgr`.

   ```
   : Sh
   ```

   ```
   Shell/iX> cd /tmp/raidmgr
   ```

5. Execute the install script

   ```
   Shell/iX> ./RMinstsh
   ```

   This install script requests that you specify a POSIX directory where the RAID Manager executables and log files will be placed. The standard and recommended POSIX directory is `/opt`.

   This script creates the necessary POSIX directories. All relevant files are placed under the directory `/opt/HORCM`. The RAID Manager executables are placed under `/opt/HORCM/usr/bin`. A symbolic link (`/HORCM`) that points to `/opt/HORCM` is created under the root directory.

6. Once the above installation completes successfully, create the device files:

   ```
   Shell/iX> mknod /dev/ldev99 c 31 99 ← LDEV devices
   ```

   ```
   Shell/iX> mknod /dev/ldev100 c 31 100
   ```

   ```
   Shell/iX> mknod /dev/cmddev c 31 102 ← Command device
   ```

   The 31 in the above example is called the major number. The 99, 100, 102 are called minor numbers. For RAID Manager, always specify **31** as the major number. The minor number should correspond to the LDEV numbers as configured in sysgen. Create device files for all the LDEVs configured through sysgen and for the command device. The device link file for the command device should be called `/dev/cmddev`.

7. Add a service entry for each RM instance in the SERVICES.NET.SYS file.
8. Each host running an instance should be listed in the HOSTS.NET.SYS file.
9. Create RM instance configuration files for each instance.

   You will have to start RAID Manager without a description for HORCM_DEV and HORCM_INST because the target ID and LUN are not yet known. After RAID Manager is up and running, you can find the target ID and LUN by using the raidscan –find command.

   ```
   :SHOWJOB
   JOBNUM  STATE IPRI JIN  JLIST    INTRODUCED  JOB NAME
   #S2     EXEC        20  20       THU  5:29P  MANAGER.SYS
   #J15    EXEC        10S LP       FRI  5:08P  JRAIDMR1,MANAGER.SYS
   #J16    EXEC        10S LP       FRI  5:08P  JRAIDMR2,MANAGER.SYS
   ```

10. Get the physical mapping of the available LDEVs to fill in the HORCM_DEV and HORCM_INST sections of the `horcm1.conf` file. Invoke the shell and change your working directory to `/HORCM/usr/bin`. Execute:

```
:sh
Shell/iX>  cd /HORCM/usr/bin
Shell/iX>  export HORCMINST=1
Shell/iX>  ls /dev/* | ./raidscan -find
DEVICE_FILE   UID  S/F PORT   TARG  LUN   SERIAL  LDEV  PROD_ID
/dev/cmddev    0   S  CL1-D     1    0     35393    22  OPEN-3-CM
/dev/ldev407   0   S  CL1-E     8    0     35393   263  OPEN-3
/dev/ldev408   0   S  CL1-E     9    0     35393   264  OPEN-3
/dev/ldev409   0   S  CL1-E    10    0     35393   265  OPEN-3
/dev/ldev410   0   S  CL1-E    11    0     35393   266  OPEN-3
/dev/ldev411   0   S  CL1-E    12    0     35393   267  OPEN-3
/dev/ldev412   0   S  CL1-E    13    0     35393   268  OPEN-3
```

11. Now fill in the HORCM_DEV and HORCM_INST sections in your `/etc/horcm#.conf` files.

Sample Configuration for Instance 1:

```
#
#/************************For HORCM_MON**************************/
HORCM_MON
#ip_address        service         poll(10ms)     timeout(10ms)
NONE                horcm0        1000             3000
#/************************* For HORCM_CMD************************/
HORCM_CMD
#dev_name                dev_name                dev_name
/dev/cmddev0
#/************************* For HORCM_DEV************************/
HORCM_DEV
#dev_group        dev_name        port#     TargetID      LU#       MU#
VG01              oradb1          CL1-E         8          0
VG02              oradb2          CL1-E         9          0         0
#/************************* For HORCM_INST ************************/
HORCM_INST
#dev_group        ip_address      service
VG01              HSTB            horcm1
VG02              HSTC            horcm1
```

12. Shut down the RAID Manager daemon within the shell and the current working directory `/HORCM/usr/bin`.

```
Shell/iX> ./horcmshutdown.sh 1
```

Restart the RAID Manager job using the completed RM configuration file:

```
: stream jraidmr1.pub.sys
```

Installing RAID Manager on OpenVMS systems

Installation prerequisites

- A user account for RAID Manager must have the same privileges as “SYSTEM” (that is, it must be able to use the SCSI class driver and Mailbox driver directly). Some OpenVMS system administrators may not allow RAID Manager to run from the system account. In this case, create another account on the system, such as “RMadmin” that has the same privileges as “SYSTEM.”
- RAID Manager uses the Mailbox driver for communication between RAID Manager components. So, the RAID Manager command processor and RM daemon (called HORCM) must have the same privileges. If the RAID Manager command processor and HORCM execute with different privileges, then the RAID Manager command processor will hang or be unable to attach to the daemon.
- RAID Manager also requires that the logical name **sys$posix_root** exist on the system. Therefore, you must define **sys$posix_root** before installing RAID Manager.

It is recommended that you define the following in LOGIN.COM before RM installation:

```
$ DEFINE/TRANSLATION=(CONCEALED,TERMINAL) SYS$POSIX_ROOT  "Device:[directory]"
$ DEFINE DCL$PATH SYS$POSIX_ROOT:[horcm.usr.bin], SYS$POSIX_ROOT:[horcm.etc]
$ DEFINE/TABLE=LNM$PROCESS_DIRECTORY LNM$TEMPORARY_MAILBOX LNM$GROUP
$ DEFINE DECC$ARGV_PARSE_STYLE ENABLE
$ SET PROCESS/PARSE_STYLE=EXTENDED
```

In the above defines, `Device:[directory]` is the SYS$POSIX_ROOT.

Installation on OpenVMS systems

Install RAID Manager by using the file

HP-AXPVMS-RMXP-V0117-3-1.PCSI

1. Insert and mount the installation media.
2. Execute the following command.

```
$ PRODUCT INSTALL RMXP /source=Device:[PROGRAM.RM.OVMS]/LOG -
  _$ /destination=SYS$POSIX_ROOT:[000000]
```

where Device:[PROGRAM.RMOVMS] is where file HP-AXPVMS-RMXP-V0117-3-1.PCSI exists.

3. Confirm the installation:

```
$ raidqry –h
Model  : Raid-Manager-XP/OpenVMS
Ver&Rev: 01.17.03
:
:
```

For additional information, see Appendix F, "Using RM with OpenVMS" on page 291.

Configuring the services and hosts files

After installing, configuring RM requires editing the services and hosts files on the hosts that run RM instances.

Directory locations

UNIX

The services and hosts files are contained in this directory:

`/etc`

Windows NT/2000/2003

The services and hosts files are contained in this directory:

`%systemroot%\system32\drivers\etc`

MPE/iX

The services and hosts files are contained in the MPE group directory:

`SERVICES.NET.SYS`

`HOSTS.NET.SYS`

OpenVMS

The services file is contained in this directory:

`SYS$SYSROOT:[000000.TCPIP$ETC]SERVICES.DAT`

The hosts file is contained in this directory:

`SYS$SYSROOT:[SYSEXE]HOST.DAT`

Services file

To configure the services file:

1. Edit the **services** file on each system.
2. Add a **udp** service entry for each RM instance that runs on the host and each RM instance referenced in the configuration file. The service number selected must be unique to the **services** file and in the range 1024 to 65535.

   Example

```
horcm0  11000/udp#RaidManager  instance 0
horcm1  11001/udp#RaidManager  instance 1
```

To configure the services file in MPE/iX:

- Add a service entry for each RM instance in the SERVICES.NET.SYS file.

  Example

```
horcm0  6100g#RaidManager  instance 0
horcm1  6100g#RaidManager  instance 1
```

Hosts file

Each host running an RM instance should be entered in the **hosts** file (for example, `/etc/hosts`). This lets you refer to any remote host by either its name or IP address.

If a DNS (domain name server) manages host name resolution on your network, no **hosts** file editing is required.

Setting up the RM instance configuration file

Each Business Copy and Continuous Access pair has a primary volume (P-VOL), the volume that contains the data to be copied, and a secondary volume (S-VOL), the volume that receives the data from the primary volume. Each of these volumes is linked to at least one instance of RM for the purpose of pair creation, suspension, and deletion. Each instance of RM can manage multiple volumes (on up to four arrays) and manage either P-VOLs or S-VOLs.

IMPORTANT:

Instances can be on the same or different host systems. The host that is running the instance must have access to the volumes to which it is linked and have access to a disk array command device for the array.

The RM instance configuration file defines the link between a volume and an RM instance. This file also defines the relationships between RM instances and the physical and logical names for volumes.

The RM instance configuration file is a UNIX text file. The system administrator creates it using a text editor. A sample HORCM_CONF file is provided. The system administrator copies the sample file, changes necessary parameters, and saves the copied file under the specified directory. Formatting and editing procedures follow.

RM instance configuration files

HP-UX

An example `horcm.conf` file can be found in the `/HORCM/etc` directory.

Windows NT/2000/2003

An example `horcm.conf` file can be found in the `C:\HORCM\etc` directory.

MPE/iX

An example `horcm.conf` file can be found in the `/HORCM/etc` directory.

See Appendix E, "Using RM with MPE/iX" on page 285.

Open VMS

See Appendix F, "Using RM with OpenVMS" on page 291.

Creating an instance configuration file

When you create an RM configuration file, follow this naming convention, where *instance* is the instance number:

`horcm`*`instance`*`.conf`

Example

```
horcm0.conf
```

The configuration file has five sections:

- HORCM_MON section
- HORCM_CMD section
- HORCM_DEV section
- HORCM_LDEV section
- HORCM_INST section

You can use the `mkconf` command to create a configuration file. See "mkconf " on page 109 for usage information.

If the level of detail provided in the following pages is not sufficient, ask your HP representative to consult the HP internal document:

RAID Manager XP Basic Specifications

For examples of configuration files, see "Configuration file examples" on page 229

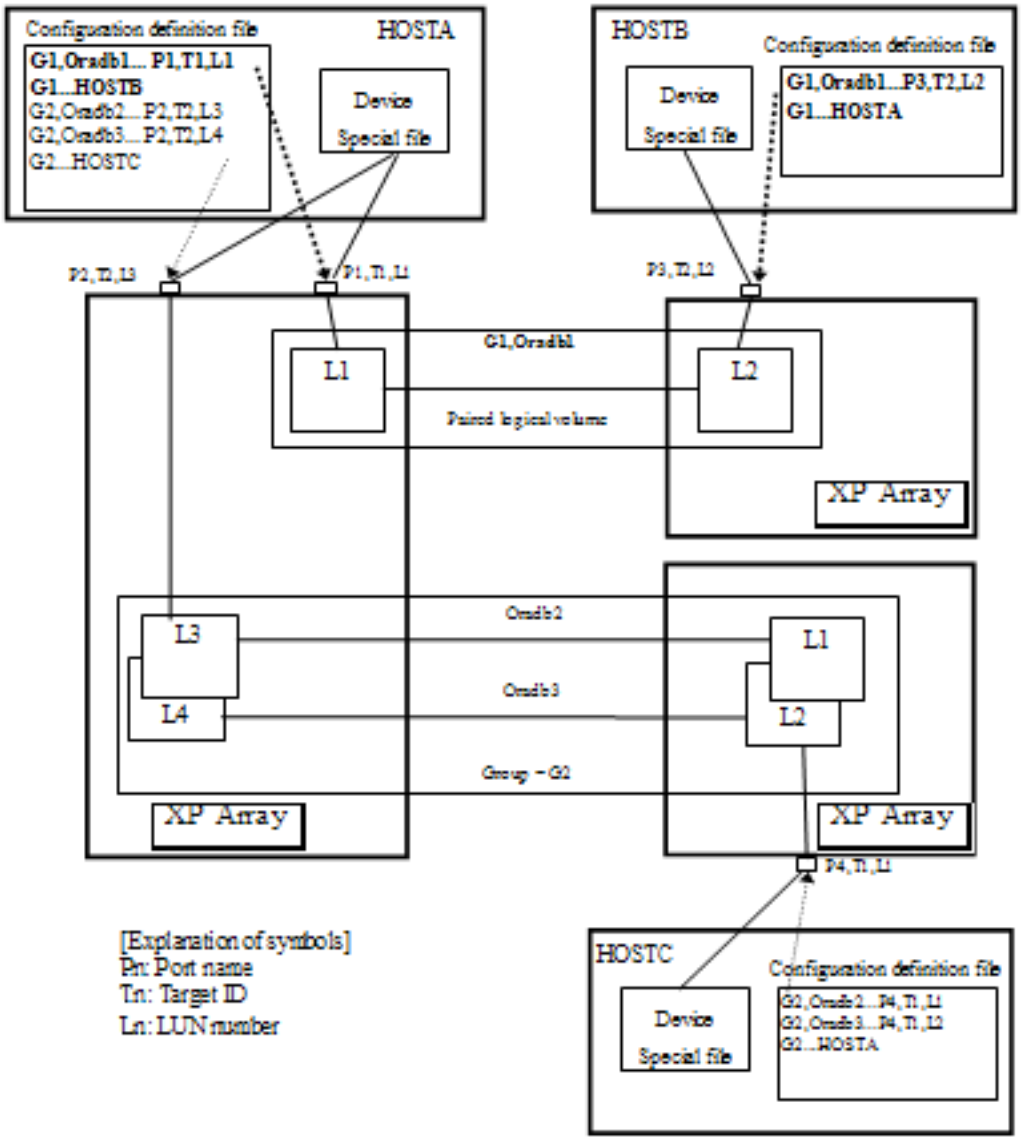
RM instance configuration file parameters

The configuration file contains all parameters and values for a RM instance. Some parameters have size or type constraints as listed in the table below:

Parameter	Default Value	Type	Limit
IP_address	*None*	Character string	63 characters
host_name	*None*	Character string	31 characters
service_name or *service_number*	*None*	Character string or numeric value	15 characters
poll_value (10 ms increments)	**1000**	Numeric value	None
timeout_value (10 ms increments)	**3000**	Numeric value	None
device_name for HORCM_DEV	*None*	Character string	31 characters
dev_group	*None*	Character string	31 characters
port	*None*	Character string	31 characters
target_ID	*None*	Numeric value	7 characters
LUN	*None*	Numeric value	7 characters
mirror_unit	**0**	Numeric value	7 characters
RM_group	*None*	Character string	31 characters
dev_name for HORCM_CMD	*None*	Character string	63 characters

Paired volume configuration

Users describe the connection between physical volumes used by the servers and the paired logical (named) volumes (and the names of the remote servers connected to the volumes) in a configuration definition file. See the figure below.


Configuration definition file
HOSTA
G1,Oradb1... P1,T1,L1
G1...HOSTB
G2,Oradb2... P2,T2,L3
G2,Oradb3... P2,T2,L4
G2...HOSTC
Device
Special file
HOSTB
Configuration definition file
Device
Special file
G1,Oradb1...P3,T2,L2
G1...HOSTA
P2,T2,L3
P1,T1,L1
P3,T2,L2
G1,Oradb1
L1
L2
Paired logical volume
XP Array
Oradb2
Oradb3
L3
L4
L1
L2
Group = G2
XP Array
XP Array
P4,T1,L1
[Explanation of symbols]
Pn: Port name
Tn: Target ID
Ln: LUN number
HOSTC
Configuration definition file
Device
Special file
G2,Oradb2...P4,T1,L1
G2,Oradb3...P4,T1,L2
G2...HOSTA

HORCM_MON section

Description

The **HORCM_MON** section describes the host name or IP address, the port number, and the paired volume error monitoring interval of the local host.

Syntax

HORCM_MON

{ *host_name* | *IP_address* } { *service_name* | *service_number* } *poll_value timeout_value* }

host_name	Name of the host on which this RM instance runs.
IP_address	IP address of the host on which this RM instance runs. Specify NONE when two or more network cards are installed in the server, or several networks (subnets) are configured, and you want to use this RM feature to listen on all networks.
service_name	Service name that was configured in the host services file.
service_number	Service number that was configured in the host services file.
poll_value	Specifies a monitoring interval for paired volumes. By making this interval longer, the RM daemon load is reduced, but it may take longer to notice a change in pair status. If this interval is set to **–1**, paired volumes are not monitored. Set to **–1** when two or more instances of RM run on the same machine and one is already monitoring the pair.
timeout_value	Specifies the remote server communication timeout period.

Examples

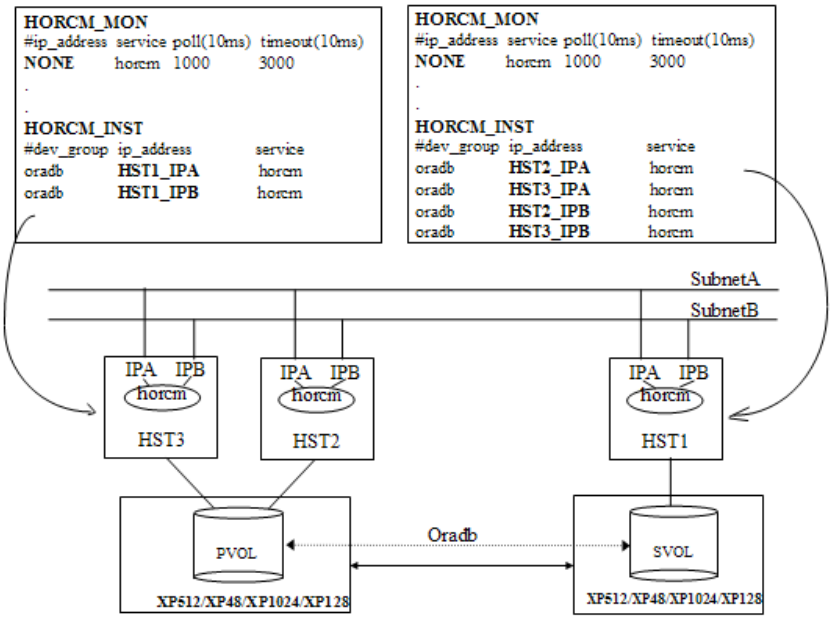
```
HORCM_MON
blue horcm1 1000 3000
```

The RM instance is running on system **blue**, service name horcm1, with a poll value of 10 seconds and a timeout value of 30 seconds.

```
HORCM_MON
NONE horcm1 1000 3000
```

The RM instance is running on system NONE, indicating two or more network cards are installed in the server, or several networks (subnets) are configured, and the RM listens on all networks. The service name is horcm1 with a poll value of 10 seconds and a timeout value of 30 seconds.

Execute the `raidqry -r` *group* command on each host to examine multiple network configurations. The following figure shows that the volume group known as **oradb** is controlled from the right side of the diagram by host HST1 (using either subnet A or B) and from the left side of the diagram by either HST2 or HST3 (using either subnet A or B).


HORCM_MON
#ip_address service poll(10ms) timeout(10ms)
NONE horcm 1000 3000
HORCM_INST
#dev_group ip_address service
oradb HST1_IPA horcm
oradb HST1_IPB horcm
HORCM_MON
#ip_address service poll(10ms) timeout(10ms)
NONE horcm 1000 3000
HORCM_INST
#dev_group ip_address service
oradb HST2_IPA horcm
oradb HST3_IPA horcm
oradb HST2_IPB horcm
oradb HST3_IPB horcm
SubnetA
SubnetB
IPA IPB
horcm
HST3
IPA IPB
horcm
HST2
IPA IPB
horcm
HST1
PVOL
Oradb
SVOL
XP512/XP48/XP1024/XP128
XP512/XP48/XP1024/XP128

HORCM_CMD section

Description

The **HORCM_CMD** section defines the RM command devices RM uses to communicate with the disk array. An RM command is initiated to write command data to the special disk array command device. The disk array then reads this data and carries out the appropriate actions.

Multiple command devices are defined in this section of the configuration file to provide alternate command devices and paths in the event of failure.

It is recommended that each host have a unique command device. A command device should not be accessed by more than one host. Multiple instances on the same host can use the same command device.

To configure command devices, use Command View XP, LUN Configuration Manager, Remote Web Console XP or Command View XP Advanced Edition. If none of these are available, ask your HP representative to configure the command devices.

Syntax

HORCM_CMD

command_device [*command_device*] . . .

Examples

HP-UX

```
HORCM_CMD
/dev/rdsk/c2t3d0 /dev/rdsk/c6t2d4
```

This example defines two device files as paths to a command device. These devices can be pvlinks to the same volume on the disk array, or may be different command devices. Placing the second command device on the same line implies that it is an alternate within the same array.

```
HORCM_CMD
#unitID0 (Array 1)
/dev/rdsk/c1t3d5
#unitID1 (Array 2)
/dev/rdsk/c2t3d5
```

This HP-UX example shows multiple disk arrays connected to the host. One RM instance can control multiple disk arrays. To enable this feature, the different command devices have to be specified on different lines. RM uses unit IDs to control multiple disk arrays. A device group can span multiple disk arrays (Continuous Access-Sync only). The unit ID must be appended for every volume device name in the **HORCM_DEV** section, as shown in the following figure.

```
HORCM_MON
#ip_address        service         poll(10ms)   timeout(10ms)
HST1               horcm           1000         3000

HORCM_CMD
#unitID 0... (seq#30014)
#dev_name          dev_name        dev_name
/dev/rdsk/c0t0d0
#unitID 1... (seq#30015)
#dev_name          dev_name        dev_name
/dev/rdsk/c1t0d0

HORCM_DEV
#dev_group         dev_name        port#        TargetID  LU#   MU#
oradb              oradb1          CL1-A        3         1     0
oradb              oradb2          CL1-A        3         1     1
oralog             oralog1         CL1-A        5         0
oralog             oralog2         CL1-A1       5         0
oralog             oralog3         CL1-A1       5         1
oralog             oralog4         CL1-A1       5         1     h1

HORCM_INST
#dev_group         ip_address      service
oradb              HST2            horcm
oradb              HST3            horcm
oralog             HST3            horcm
```

Windows NT/2000/ 2003

```
HORCM_CMD
\\.\PHYSICALDRIVE3
```

This example shows the path to a shared command device in Windows.

```
\\.\Volume{GUID}
```

This example shows the use of a Volume GUID for the command device in Windows.

Since the Volume{GUID} is changed whenever there is a reboot, the command device can be designated using the serial, ldev, and port numbers.

```
\\.\CMD Ser# - Ldev# - Port#
```

MPE/iX

See Appendix E, "Using RM with MPE/iX" on page 285.

OpenVMS

See Appendix F, "Using RM with OpenVMS" on page 291.

HORCM_DEV section

Description

The **HORCM_DEV** section describes the physical volumes corresponding to the paired volume names. Each volume listed in **HORCM_DEV** is defined on a separate line.

Syntax

HORCM_DEV

device_group device_name port target_ID LUN [*mirror_unit*]

device_group	Each device group contains one or more volumes. This parameter gives you the capability to act on a group of volumes with one RM command. The device group can be any user-defined name up to 31 characters in length.
device_name	User-defined and unique to the instances using the device groups. It can be up to 31 characters in length and is a logical name that can be used instead of the physical Port/TID/LUN/MU# designation.
port	Disk array I/O port through which the volume is configured to be accessed. Port specification is not case sensitive (CL1-A= cl1-a= CL1-a= cl1-A).
target_ID	SCSI/Fibre target ID assigned to the volume.
LUN	Decimal logical unit number assigned to the volume.
mirror_unit	Used when you are making multiple Business Copy copies from a P-VOL. The mirror unit is a number ranging from 0 to 2 and has to be explicitly supplied for all Business Copy volumes. If mirror_unit is left blank it will be assumed that Continuous Access-Sync or Continuous Access-Async is being used. The number is not a count of the number of copies to be made but rather a label for a specific P-VOL to S-VOL relationship. Continuous Access-Journal will allow up to four copies from a P-VOL. The mirror unit for a Continuous Access-Journal volume is indicated by an “h” and a number ranging from 0 to 3. If mirror_unit is omitted, the value of h0 will be assumed. Mirror unit value “h1”, “h2” and “h3” are valid only for Continuous Access-Journal operations.

Example

```
HORCM_MON
#ip_address service  poll(10ms  timeout(10ms)
HST1         horcm  1000       3000

HORCM_CMD
#dev_name   dev_name   dev_name
/dev/rsd0e

HORCM_DEV
#dev_group dev_name port# TargetID LU#  MU#
Group  dev         CL1-A 3   1
Group1  dev1     CL1-A 3   1  0
Group2     dev2     CL1-A 3   1  1
Group3     dev3     CL1-A 3   1  2
Group4     dev4     CL1-A 3   1  h1

HORCM_INST
#dev_group  ip_address   service
Group   HST2   horcm
Group1   HST3   horcm
```

The validity of the mirror descriptor is shown for various pair states in the tables below.

MU# in Continuous Access and Continuous Access Journal

Feature	SMPL		P-VOL		S-VOL	
	MU#0	MU#1-3	MU#0	MU#1-3	MU#0	MU#1-3
Continuous Access	Valid	Invalid	Valid	Invalid	Valid	Invalid
Continuous Access-Journal	Valid	Valid	Valid	Valid	Valid	Valid

MU# in Business Copy and SnapShot

Feature	SMPL		P-VOL		S-VOL	
	MU#0-2	MU#3-63	MU#0-2	MU#3-63	MU#0	MU#1-63
Business Copy	Valid	Invalid	Valid	Invalid	Valid	Invalid
SnapShot	Valid	Valid	Valid	Valid	Valid	Invalid

Example

```
HORCM_DEV
group1     g1-d1   CL1-A   12   1  0
```

This example shows a volume defined in device group1 known as device g1–d1. It is accessible through disk array unit 0 and I/O port CL1-A. The SCSI target ID is 12, the LUN is 1, and the Business Copy mirror unit number is 0.

You can use RM to control multiple disk arrays with one RM instance by specifying the unit ID appended to the port. This example refers to the example in the "HORCM_CMD section" on page 37.

```
HORCM_DEV
group1     g1-d1    CL1-A    12    0
group2     g2-d1   CL1-A1    12    0
```

This example shows that the volume pair with the device name g2–d1 resides on disk array unit 1 while the volume pair with device name g1–d1 resides on disk array unit 0.

Tip

In the case of Fibre Channel, if the host reports a different target ID and LU# than `raidscan`, use the `raidscan` value.

Related information

To see configuration file examples, and to see how devices belonging to different unit IDs are configured, see Appendix A, "Configuration file examples" on page 229.

HORCM_LDEV section

Description

The **HORCM_LDEV** section specifies stable LDEV#'s and Serial#'s of physical volumes that correspond to paired logical volume names. Each group name is unique and typically has a name fitting its use (e.g. database data, Redo log file, UNIX file). The group and paired logical volume name described in this item must also be known to the remote server.

NOTE:

HORCM_LDEV is usable only with XP10000/XP12000, microcode 21-03-00/00 or later. If **HORCM_LDEV** fails at startup, use **HORCM_DEV**.

Syntax

HORCM_LDEV

device_group device_name Serial# CU:LDEV(LDEV#) MU#

device_group	Each device group contains one or more volumes. This parameter gives you the capability to act on a group of volumes with one RM command. The device group can be any user-defined name up to 31 characters in length.
device_name	User-defined and unique to the instances using the device groups. It can be up to 31 characters in length and is a logical name that can be used instead of the physical Port/TID/LUN/MU# designation.
Serial#	Serial number of the array
CU:LDEV(LDEV#)	Specifies the LDEV number in three possible formats: As hex used by the SVP or Web console Example: `(LDEV# 260) 01:  04` As decimal used by the `inqraid` command Example: `(LDEV# 260) 260` As hex used by the `inqraid` command Example: `(LDEV# 260) 0x104`

Example

```
HORCM_LDEV
#dev_group   dev_name    Serial#        CU:LDEV(LDEV#)   MU#
     oradb   dev1        30095          02:40             0
     oradb   dev2        30095          02:41             0
```

HORCM_INST section

Description

The **HORCM_INST** section defines how RM groups link to remote RM instances.

Syntax

HORCM_INST

device_group { *host_name* | *IP_address* } { *service_name* | *service_number* }

device_group	Defined in the HORCM_DEV section. Each group defined in HORCM_DEV must be represented in the HORCM_INST section only once for every remote RM instance.
host_name	Host name of the host on which the remote instance runs. The remote instance can run on the same host as the local instance.
IP_address	IP address of the host on which the remote instance runs. The remote instance can run on the same host as the local instance.
service_name	Service name that was entered into the services file for the remote instance.
service_number	Service number that was entered into the services file for the remote instance.

Example

The example below shows that the opposite side of the pairs contained within the group called `group1` are serviced by an RM instance residing on host yellow that listens on a UDP port defined in `/etc/services` named `horcm0`.

```
HORCM_INST
group1  yellow  horcm0
```

Starting the instances

After setting up the RM instance configuration files, you can start the instances.

HP-UX

Run this shell command on each host that runs an RM instance:

`/usr/bin/horcmstart.sh [ instance_number ] [ instance_number ] . . .`

If you do not specify an instance number, the command uses the value stored in the **HORCM_INST** environment variable. The default value is 0.

Windows NT/2000/2003

From the command prompt, under the **\HORCM\etc** directory, type this command:

`horcmstart instance_number [ instance_number ] . . .`

MPE/iX

See Appendix E, "Using RM with MPE/iX" on page 285.

OpenVMS

Run instances as a detached process. See Appendix F, "Using RM with OpenVMS" on page 291.

Environment variables for Business Copy

By default, all RM operations affect Continuous Access volumes. To enable RM commands to control Business Copy operations, set the **HORCC_MRCF** environment variable to **1.**

RM commands are issued to the local instance host. To specify which instance is the local instance, set the **HORCMINST** environment variable, as in the following environment variable examples, where *n* is the value of the RM instance.

UNIX

For UNIX ksh, use the `export` command:

```
export HORCC_MRCF=1
export HORCMINST=n
```

For UNIX csh, use the `setenv` command:

```
setenv HORCC_MRCF=1
setenv HORCMINST=n
```

Windows NT/2000/2003

For Windows NT/2000/2003, use the `set` command:

```
set HORCC_MRCF=1
set HORCMINST=n
```

MPE/iX

For MPE/iX, use the `setenv` command.

```
setenv HORCC_MRCF 1
setenv HORCMINST n
```

OpenVMS

For OpenVMS, set the environment variable using symbol.

```
HORCC_MRCF := 1
HORCMINST := 0
```

Environment variables for Continuous Access

To issue Continuous Access commands, the **HORCC_MRCF** environment variable must be removed and the **HORCMINST** environment variable must be set.

UNIX

Setting a null value is not sufficient.

For UNIX ksh, use the `unset`

```
unset HORCC_MRCF
set HORCMINST=n
```

For UNIX csh, use the `unsetenv` command:

```
unsetenv HORCC_MRCF
setenv HORCMINST=n
```

Windows NT/2000/2003

For Windows NT/2000/2003, use the `usetenv` command option:

```
raidscan –x usetenv HORCC_MRCF
raidscan –x setenv HORCMINST n
```

Related Information

For syntax descriptions, see "usetenv " on page 198 and "setenv " on page 192.

MPE/iX

Within the POSIX shell, use the `unset` command:

```
unset HORCC_MRCF
set HORCMINST=n
```

OpenVMS

For Open VMS, use the following command:

```
$DELETE/SYMBOL HORCC_MRCF
```

Clearing command device instances

An array can handle *x* number of instances per command device. Each instance has a unique LBA area on the command device it write to and reads from. If an instance has started on a specific LBA area, the array marks that as an active instance with a `1 1`. When a host program tries to write to the command device, the array sets only the first bit (`1 0`), identifying it as a “temporary” instance. Only true RM instances will have both bits set.

A command device will automatically clear all temporary instances (`1 0`) when it detects a full LBA status.

The command `horcctl –DI` will display the number of temporary and real instances for a command device. See "horcctl " on page 85.