UNISYS

UNIX® System V Release 4.0

Unisys Volume Manager (UVM) Installation Guide

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Audience

The audience for the *Volume Manager (UVM) Installation Guide* is system administrators responsible for maintaining systems under the control of the UNISYS Volume Manager (UVM).

This guide assumes that the user has a:

- working knowledge of the UNIX® system
- basic understanding of system administration

Scope

This guide provides the user with installation procedures for the UNISYS Volume Manager.

Organization

The *UNISYS Volume Manager (UVM) Basic User's Guide* is comprised of three chapters, organized as follows:

- Chapter 1—Installation of the Volume Manager

  Chapter 1 provides instructions for installing the Volume Manager from a cartridge tape and configuring your disk drivers for use with the Volume Manager.

- Chapter 2—General Volume Manager Configuration

  Chapter 2 discusses using the Volume Manager to create, mirror, and manage volumes. This chapter discusses the `volassist` utility.

- Chapter 3— Deinstallation of the Volume Manager

  Chapter 3 provides instructions for deinstalling the Volume Manager from a system.

Related Documents

The following documents provide information related to the Volume Manager:

- The *UNISYS Volume Manager (UVM) Release Notes* provide up-to-date information about UVM that may not have been included in the manuals. Please read the release notes first.
- The *UNISYS Volume Manager (UVM) Basic User's Guide* provides information about using the Volume Manager commands and utilities.
- The *UNISYS Volume Manager (UVM) System Administrator's Guide* provides detailed information about the of the Volume Manager interfaces, as well as advanced Volume Manager concepts. In addition to detailed information about the UNISYS Volume Manager, this guide contains the reference manual pages that describe the commands and utilities associated with the Volume Manager.

Conventions

This guide uses several typographical conventions to identify certain types of information. Table 1 describes the typographical conventions used throughout this guide.

Table 1: Typographical Conventions

Convention	Interpretation
`constant width`	User input, computer output or prompts, commands and utilities, and the names of icons and configuration objects appear in `constant width` font.
italic	Titles of books and variables that the user types appear in text in *italics.*
Shift	This is the Shift keyboard key.
F3	This is the F3 function key. *Note: If your keyboard does not include function keys, you can simulate its function by pressing CTRL-F followed by the key number. For example, for F3, press CTRL-F and then 3.*
↑	This is the up-arrow key.
↓	This is the down-arrow key.
>	This represents the pointer within menus.

1 Installation of the Volume Manager

Introduction

This installation guide for the Unisys Volume Manager contains three parts:

- installation of the add-on package
- configuration and set up of the Volume Manager
- deinstallation of the add-on package

NOTE

Most of the commands used in the installation are in either the `/sbin` or the `/usr/sbin` directory. We recommend that you add both of these directories to your `PATH` environment variable. For example, using the Bourne Shell, modify your `.profile` with:

```
PATH=/sbin:/usr/sbin:$PATH export PATH
```

Preparation

Some of the installation processes require repeated reboots. You are asked for permission to reboot when the reboots are needed. If you choose not to reboot, the install will not complete. After the first reboot, the installation process takes control of the system until the installation is complete.

Before installing the Volume Manager, make sure you know what each of your disks contains. During the installation process, you will have to decide the following:

- Do you wish to place all or just some of the disks on the system under Volume Manager control?
- Do you wish to place the system's root disk under Volume Management control (necessary in the case of a one disk system)?
- Do you wish to preserve, by encapsulating, any or all existing file systems and partitions under Volume Manager control?
- Do you want to manually chose between encapsulating and initializing a disk or leaving the disk alone (Custom Installation)?
- Do you want to encapsulate any disks with active partitions and initialize all others (Quick Installation)?

Any disk you wish to be managed by UVM must have 512 blocks of free space. This space is used for storing disk group configurations and a disk label. This

label ensures that the Volume Manager can identify the disk, even if it is moved to a different address or controller.

The Volume Manager allocates 512 blocks (250K) for the disk group configurations and the label. This space is sufficient to handle normal disk group configurations for up to 15 or 20 disks.

NOTE

Although it is not recommended, UVM does support the use of "unlabeled" disks after installation. For more information, see the *Unisys Volume Manager (UVM) System Administrator's Guide.*

The boot drive (the root disk) is a special case; if no other space is available, the Volume Manager will attempt to allocate space usually reserved for the swap partition. This process is known as "Swap Relocation" and will happen automatically during installation if necessary.

Loading from a Cartridge Tape

To load the package from cartridge tape, do the following:

1. Log in as root.
2. Insert the installation tape cartridge in the tape drive.
3. Enter:

   ```
   pkgadd -d ctape1 uvm
   ```

4. During the installation, you are asked if you want to install the UVM interface forms and menus for use with the Operations, Administration, and Maintenance (OA&M) menus. If you use or ever intend to use the OA&M, (a menu-oriented system administration aid), type `y` and press **Return**. Otherwise, answer `n`.

```
Unisys Volume Manager
(i386at) 1.2
Using </> as the package base directory.
Copyright (c) 1991,1992,1993 Unisys Corporation.
ALL RIGHTS RESERVED.
THIS SOFTWARE IS THE PROPERTY OF AND IS LICENSED BY UNISYS CORPORATION,
AND/OR ITS SUPPLIERS.
You have the Operations, Administration, and Maintenance package installed.
Would you like to add the UVM interface Forms and Menus? [y]
```

5. The system prints out a series of status messages as the installation progresses. No errors should be reported.
6. Once the `pkgadd` process is complete, go to the section in this document entitled "Initializing UVM."

Initializing UVM

Once you have completed the package install, initialize UVM as follows:

1. If you choose to exclude one or more disks from being considered for Volume Manager control, you can add these disks to the `/etc/vol/disks.exclude` file. If you do not use the `disks.exclude` file, you are prompted for which disks to exclude. An example of the contents of the file follows:

```
c0.0d0
c0.0d1
```

2. Enter:

   `volinstall`

NOTE

If you are upgrading from the 1.1.2 UVM release, do *not* run `volinstall` on those disks to be upgraded; use `volupgrade` instead.

3. The `volinstall` program first examines all disks that it can find attached to the system and then lists them. `volinstall` then displays a menu of installation options with the following options:

```
1       Quick Installation
2       Custom Installation

?       Display help about menu
??      Display help about menuing system
q       Exit from menus
```

NOTE

Selecting `?` at this menu, and at most other prompts, displays a help file describing the current operation or menu choices.

Selecting `??` at this, and at most other prompts, displays general information about using `volinstall`.

Selecting `q` at this, and at all other prompts, exits from the current operation, or from the `volinstall` program.

4. The two main options for the `volinstall` program are Quick Installation and Custom Installation, which can be selected by entering `1` or `2`, respectively. For most installations, Quick Installation is sufficient. Custom Installation is used when your system has attached disks that you do not wish to convert for use with the Volume Manager.

Quick Installation

The Quick Installation option is the easiest to use. This option examines all disks connected to the system, encapsulates existing partitions (adds these partitions to the Volume Manager's control, leaving them intact and maintaining the integrity of the data), and initializes disks that do not have existing partitions.

The /etc/vfstab file is updated to ensure that file systems previously mounted on disk partitions will be mounted on volumes instead.

To use the Quick Installation option, do the following:

1. Select menu item 1 from the volinstall menu.
2. If Quick Installation finds a disk that has not been divided into partitions yet (disks that have not been added with diskadd), you are prompted with a question similar to the following:

```
The c0.0d2 disk does not appear to be prepared for t

Add as a new disk [y,n,q,?] (default: y)
```

3. If you answer y (the default), the disk will be initialized and will be added as free space for use in creating volumes. If you answer n, the disk will not be added for use with the Volume Manager.
4. After selecting Quick Installation and adding the new disks, reboot the system as described in the section "Rebooting After volinstall."

Custom Installation

Using Custom Installation allows you to control which disks are added to Volume Manager control and how they are added. This is important if you do not want all your disks under Volume Manager control.

To choose Custom Installation:

1. Select menu item 2 from the volinstall menu.
2. For the first disk (named c0.0d0), Custom Installation displays the following:

```
The c0.0d0 disk is your Boot Disk.  You cannot add it as a new
disk.  If you encapsulate it, you will make your root file system
and other system areas on the Boot Disk into volumes.  This is
required if you wish to mirror your root file system or system
swap area.

Encapsulate Boot Disk [y,n,q,?] (default: y)
```

3. If you answer `y` (the default), `volinstall` encapsulates (turns disk partitions into volumes) your root and `/stand` file systems, along with your swap device and all other disk partitions found on your boot disk.
4. For other disks the following choices are available:

```
1       Install as a pre-existing disk. (encapsulate)
2       Install as a new disk. (discards data on disk!)
3       Leave this disk alone.
```

If you choose the first option, volumes will be created to encapsulate any partitions on the disk. The `/etc/vfstab` file will be updated to ensure that file systems previously mounted on disk partitions will be mounted as volumes instead.

If you choose the second option, `Install as a new disk`, the disk will be reinitialized. This destroys all data on the disk and makes the disk available as free space for allocating new volumes, or mirrors of existing volumes.

Be careful when using this option as it may result in a loss of data.

If you choose the third option, `Leave this disk alone`, then no changes will be made to the disk. If there are applications that use this disk that you do not wish to upgrade to use the Volume Manager, you can use this option to ensure that your applications can continue to use the disk without modification.

If you choose to leave all your disks alone, `volinstall` does not complete the installation of the Volume Manager or ask you for a reboot.

Disks that are not added by `volinstall` for use with the Volume Manager can be added to the system later, either by using the `voldiskadm` menus or by using the `voldiskadd` utility. However, you must add at least one disk with `volinstall` before you can add disks using other utilities or interfaces.

Rebooting After volinstall

After you have customized all of the disks attached to your system, you must reboot the system to make changes to your disk partitioning that cannot be made while your disks are in use; several reboots may be required, depending on the setup you choose. The reboot begins automatically.

The reboot procedure is as follows:

1. `volinstall` asks if you wish to reboot now.
2. Enter `y`, to begin an immediate shutdown.

   Enter `n` to cause `volinstall` to exit without starting a shutdown.
3. If you choose not to shutdown immediately, you should shutdown the system at the earliest convenient opportunity.

   

   Do not make any changes to your disk and file system configurations before shutting down and rebooting your system.
4. During the next one or two reboots, you may be asked several times if you wish to continue an operation. Press the **Return** key at all of these prompts to accept the default answer.

   If you select a different answer from the default for any of these prompts, or press `q`, installation may fail.

2 General Volume Manager Configuration

Introduction

Once the Volume Manager has been successfully installed, This section provides various examples of how to use the Volume Manager for creating, mirroring, and managing volumes. These examples are intended to help you to initially configure your system. Refer to the *Unisys Volume Manager (UVM) Basic User's Guide* and the *Unisys Volume Manager (UVM) System Administrator's Guide* for more complete information on how to use the Volume Manager.

General Use of the volassist Utility

The `volassist` utility is a simple way to create and manage volumes from the command line. Use `volassist` to create, mirror, grow, shrink, and backup volumes. Select the specific action to perform by specifying an operation keyword as the first argument on the command line. For example, the keyword for creating a new volume is `make`; therefore, you can create a new volume by entering:

```
volassist make volume-name length
```

The first argument after any `volassist` keyword is always a volume name. Follow the volume name with a set of attributes. Use these attributes to specify where to allocate space, and whether you want mirroring or striping to be used.

You can select the disks on which the volumes are to be created by specifying the disk names at the end of the command line. For example, to create a 30 megabyte striped volume on three specific disks (`disk03`, `disk04`, and `disk05`), enter:

```
volassist make stripevol 30m layout=stripe disk03 disk04 disk0!
```

To see a list of available disks, use the `voldisk list` command. `voldisk list` provides a list of all disks available to the Volume Manager. The output of `voldisk list` lists the device name, the type of device, the disk name, the group to which the disk belongs, and the disk's status. The disk names are listed in the column labeled `DISK`.

The following is an example `voldisk list` output:

```
DEVICE      TYPE      DISK        GROUP       STATUS
c0.0d0s0    sliced    disk01      rootdg      online
c0.0d1s0    sliced    disk02      rootdg      online
c0.0d2s0    sliced    disk03      rootdg      online
```

NOTE

`volassist`, `voldiskadm` and `voldiskadd` allow you to enter your own disk name or choose the default disk name. The default disk name in this case is `disk`*nn*, where *nn* is a two-digit number.

Disks in disk groups other than `rootdg` have default names made up of the disk group name followed by two or more digits.

Refer to the *Unisys Volume Manager (UVM) Basic User's Guide*, the *Unisys Volume Manager (UVM) System Administrator's Guide*, or the `volassist`(1m) man page for more information on operations, options, and attributes for the `volassist` utility.

Device Names versus Disk names

When you perform disk administration, it is important that you recognize the difference between a *device name* and a *disk name.*

The *device name* (sometimes referred to as *devname* or *disk access name*) is the location of the disk. The syntax of a device name for an internal SCSI channel is `c`*x*`.`*y*`d`*z*`s`*n*, where:

x is the controller type (for example, normally 0).

y is the controller number (for example, normally 0).

z is the logical disk number of the target disk.

n is the number of the disk slice.

The syntax of a device name for an ISIC channel is `c`*w*`.`*x*`d`*y*`z`*s*`n`, where:

w is the controller type (for example, 1 is an ISIC board).

x is the controller number (for example, the EISA slot where the ISIC is located).

y is the bus number.

z is the SCSI ID of the drive.

n is the number of the disk slice.

The full pathname of a device is `/dev/dsk/`*devicename*. In this document, only the device name is listed and `/dev/dsk` is assumed. An example of a device name is `c0.0d0s0`. A suffix of `s0` is used to indicate default disk partitioning. Normally, you would not use any other suffix.

The disk name is an optional administrative name for the disk, such as `disk01`.

Adding New Disks

To add a new disk to your system after initial installation, use the `voldiskadd` command. For example, to attach a new disk named c1.4d14:

1. Enter:

```
voldiskadd c1.4d14
```

Notice that the `s0` suffix is not used.

2. `voldiskadd` prompts you for a disk group name and a disk name. Normally, the default disk group, `rootdg`, should be used. You can create your own disk name, or use the default disk name. You should remember the disk name assigned to the disk. You may wish to label the disk drive cabinet, if possible.

If you are planning to use the drive in a Ready Reserve or MassCab-2 Dual Initiator configuration, you need to create another disk group for the drives (normally MassCab drives, since they can be shared between two systems).

Reserving Disks

By default, `volassist` allocates space for volumes from any disk that has free space. You may wish to reserve some set of disks for special purposes, such as to avoid general use of a particularly slow or a particularly fast disk or to avoid general use of available space on the boot disk. To reserve a disk for special purposes, enter:

```
voledit set reserve=yes diskname
```

After you enter this command, `volassist` will not allocate space from the selected disk unless that disk is specifically mentioned on the `volassist` command line. For example, if disk `disk03` is reserved, the command:

```
volassist make vol03 20m disk03
```

creates a 20 megabyte volume on `disk03`. However, the command:

```
volassist make vol04 20m
```

does not use `disk03`, even if there is no free space on any other disk.

To turn off reservation of a disk, enter:

```
voledit set reserve=no diskname
```

Mirroring the Boot Disk

You can mirror your boot (root) disk onto another disk in two ways: with `voldiskadd` (shown here) and `voldiskadm` (see the *Unisys Volume Manager (UVM) Basic User's Guide*). This makes it possible to recover from failure of your boot disk by replacing it with the mirror of the boot disk.

To mirror your boot disk, do the following:

1. Select a disk that is at least as large as your boot disk.
2. Use the `voldiskadd` command to add the selected disk as a new disk (if it is not already added).
3. Execute the following command:

   ```
   /etc/vol/bin/volrootmir alternate-disk
   ```

   where *alternate-disk* is the disk name assigned to the disk.

4. `volrootmir` creates mirrors for the following volumes:
   - `rootvol` — contains the volumes for the root file system.
   - `swapvol` — is the primary paging device.
   - `standvol` — is a file system used for booting the operating system.

   The alternate boot disk is configured to enable booting from it if the primary boot disk fails.

5. There may be other volumes on the boot disk, such as volumes for `/var`, `/usr`, `/lhome`, or `/tmp` file systems. These must be mirrored separately using the `volassist` utility. For example, if you have a `/usr` file system on a volume `usrvol`, you can mirror it to *alternate-disk* using the command:

   ```
   volassist mirror usrvol alternate-disk
   ```

6. If you do not have space for a copy of some of these file systems on your alternate boot disk, you can mirror them to other disks. You can also span or stripe these other volumes across other disks attached to your system.

   To list all volumes on your primary boot disk, use the command:

   ```
   volprint -t -v -e 'aslist.aslist.sd_disk="disk01"'
   ```

   By default, the primary boot disk is "disk01." If you chose another disk name as the primary boot disk, use that name.

7. To mirror all of the simple volumes on this disk to your alternate boot disk, use the command:

   ```
   volmirror disk01 alternate_disk
   ```

   If you have any problems creating you alternate boot disk, refer to your system service guide for more information.

Creating New Volumes

To create a new volume, enter:

```
volassist make volume-name length
```

Where *volume-name* is a name to give to the volume, and *length* specifies the number of sectors in the volume. This length can be specified in kilobytes or megabytes by using a suffix character on the length of `k` or `m`.

To create a 30 megabyte volume named `vol01`, use the command:

```
volassist make vol01 30m
```

To specify 30 megabytes in blocks, use:

```
volassist make vol01 61440
```

Other units of measurement can be used to specify volume lengths. Refer to the `volassist` manual page for more information.

Creating a volume creates two device node files that can be used to access the volume: `/dev/vol/`*volume-name* and `/dev/rvol/`*volume-name*. These files are the block and raw device nodes for the volume, respectively.

Creating a File System on a Volume

To create a file system on a volume, do the following:

1. List the volume to see its length, in sectors, using the command:

   ```
   volprint -tvh volume-name
   ```

   For example, printing volume `vol01` might yield the output:

```
V  NAME         USETYPE     KSTATE   STATE    LENGTH   READPOL   PREFPLEX
PL NAME         VOLUME      KSTATE   STATE    LENGTH   LAYOUT    ST-WIDTH MODE
SD NAME         PLEX        PLOFFS   DISKOFFS LENGTH   DISK-MEDIA   ACCESS

v  vol01        fsgen       DISABLED ACTIVE   61440    SELECT    -
pl vol01-01     vol01       DISABLED RECOVER  61440    CONCAT    -        RW
sd disk01-01    vol01-01    0        32768    61440    disk01       c0.0d1s0
```

2. Create a file system on `vol01` of this length (for example a `s5` file system) using the command:

   ```
   mkfs -F s5 /dev/rvol/vol01 61440
   ```

3. Specify the mount parameters for this file system in the file `/etc/vfstab`. To specify default mounting parameters for `vol01`, using a mount point of `/vol01`, add the following line to `/etc/vfstab`:

   ```
   /dev/vol/vol01 /dev/rvol/vol01 /vol01 s5 1 yes -
   ```

4. Mount this volume with the command:

   ```
   mount /vol01
   ```

5. The volume will be remounted automatically on startup.

Removing Volumes

To remove a volume:

1. Remove all references to the volume.
2. If the volume is mounted as a file system, unmount it.
3. If the volume is listed in `/etc/vfstab`, remove its entry.

To remove the volume device and return all space that it is using to free disk space, use the command:

```
voledit -rf rm volume-name
```

For example, to remove the `vol01` volume:

1. Unmount it with:

   ```
   umount /dev/vol/vol01
   ```

2. Remove its entry from `/etc/vfstab`.
3. Remove the volume device with:

   ```
   voledit -rf rm vol01
   ```

Mirroring All Volumes

To mirror all existing volumes to available disk space, type:

```
volmirror -a
```

You can also configure the Volume Manager to create mirrored volumes by default. To do this, enter the command:

```
volmirror -d yes
```

If you make this change, you can still make unmirrored volumes by specifying `nmirror=1` as an attribute to the `volassist` command. For example, to create a nonmirrored 20 megabyte volume named `nomirror`, use the command:

```
volassist make nomirror 20m nmirror=1
```

3 Deinstallation of the Volume Manager

Introduction

This chapter describes the steps involved in deinstalling the Volume Manager package.

Preparation for Deinstallation

If the Volume Manager needs to be removed, the following preparations must be completed before you perform the deinstallation:

- All file systems and other applications that use volume devices must be modified to use the underlying disk devices.
- Make sure that a disk partition device can be used to access any file systems which have been created since the Volume Manager was installed.
- All data from any volumes that were created from multiple regions of storage, including striped or spanned volumes, must be moved onto a single subdisk.
- Any mirror copies of all file systems and other databases should be removed so that only one copy remains that starts on a partition boundary.

  To display the list of all volumes, use the command:

  ```
  volprint -Ath
  ```

- If any volume contains more than one plex (mirror), all but one plex should be removed.

  To remove a plex, use the command:

  ```
  volplex -o rm dis plex-name
  ```

Leave exactly one plex for the special volumes `rootvol`, `swapvol`, and `standvol`. Make the remaining plex for each volume consist of one subdisk on device `c0.0d1s0`. These subdisks must be either the original subdisks created by running `volinstall` or they must have been created using `volrootmir` or the `voldiskadm mirror disk` operation.

- If any remaining plex has more than one subdisk, consolidate those subdisks into a single plex. A simple way to do this is to use the commands:

  ```
  volassist mirror volume-name layout=contig
  volplex -o rm dis plex-name
  ```

  NOTE: This operation wont work if you do not have sufficient space on another disk.

- Modify the `/etc/vfstab` to mount all file systems using a partition device instead of the volume device.
- Create partitions for each volume using the `prtvtoc` and `edvtoc` utilities to update the Volume Table of Contents (VTOC) on each drive.

  NOTE: The entry for `/stand` in `/etc/vfstab` file is updated automatically when you invoke the command `/etc/vol/bin/volunroot`, as described below.

- Due to the potential for inadvertently making mistakes during a de-installation it is recommended that you back up the system fully onto tape.

Deinstallation Procedures

The following are the procedures to follow to deinstall the Volume Manager:

1. In deinstalling the Volume Manager, volumes for the root, swap, and `/stand` file system devices must be converted back to using disk partitions. Once all mirror copies of root have been removed, reconfigure the kernel by running the command:

   ```
   /etc/vol/bin/volunroot
   ```

   This removes all changes that were made to the system to support booting from a root volume. This also updates the `/etc/vfstab` file to replace the entry for `/stand`, if you have not done so already. The system should be rebooted before continuing.

2. After rebooting, there should no longer by any volumes in use. To check for volumes that are still in use, use the command:

   ```
   volprint -Aht -e v_open
   ```

   If any volumes are listed, determine what application or file system is using each volume. One way you can determine which applications reference the listed volumes is to rename the volume, so that the application can not find the volume under its original name. To rename a volume, enter:

   ```
   voledit rename old_vol_name new_vol_name
   ```

3. If you have to rename any volumes, reboot again to ensure that the volumes are no longer in use.
4. After rebooting, use `volprint` once more to ensure that no volumes are in use. Applications that reference the volume prints error messages to the console that may be useful for converting those applications.
5. Shut down the Volume Manager by entering:

   ```
   voldctl stop
   voliod -f set 0
   ```

6. To remove the Volume Manager package, use the command:

   ```
   pkgrm uvm
   ```

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UNISYS

Product Information Announcement

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Title

Unisys Volume Manager (UVM) Basic User's Guide

This Product Information Announcement announces the release of the *Unisys Volume Manager (UVM) Basic User's Guide*.

This guide provides the user with the basic and most commonly used procedures for Volume Manager. The guide introduces and explains the basic concepts of volume management. The guide also describes the available disk and volume operations accessed through the Volume Manager Support Operations menu and the Operations, Administration, and Maintenance (OA&M) menu. Additionally, the guide describes the available comand line interface.

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Audience

The audience for the *Unisys Volume Manager Basic User's Guide* is system administrators responsible for maintaining systems under the control of the Unisys Volume Manager.

This guide assumes that the user has a:

- working knowledge of the UNIX® system
- basic understanding of system administration

Scope

The purpose of this guide is to provide the user with the basic and most commonly used procedures for volume management and system administration using the Unisys Volume Manager.

Organization

The *Unisys Volume Manager Basic User's Guide* is comprised of three chapters, organized as follows:

- Chapter 1—Introduction to the Volume Manager

  Chapter 1 provides general information about volume management and related concepts. This chapter also contains a list of relevant terms.

- Chapter 2—Menuing Interfaces

  Chapter 2 discusses the basic disk and volume operations available via the Volume Manager Support Operations and the Operations, Administration, and Maintenance (OA&M) menus.

- Chapter 3—Command Line Interface

  Chapter 3 contains information about the command line interface available with the Volume Manager.

Related Documents

The following documents provide information related to the Volume Manager:

- The *Unisys Volume Manager (UVM) Release Notes* contains the most up-to-date information about UVM and should be read first.
- The *Unisys Volume Manager (UVM) Installation Guide* contains the instructions necessary to install the Volume Manager software.
- The *Unisys Volume Manager System Administrator's Guide* provides more detailed information about the Volume Manager command line interface, as well as advanced Volume Manager concepts. In addition to detailed information about the Unisys Volume Manager, this guide contains the reference manual pages that describe the various commands and utilities associated with the Volume Manager.

Using This Guide

This guide describes how to perform basic Volume Manager system administration functions. UVM administration functions can be performed using menus, a command line interface, or a Graphical User Interface.

This guide focuses on the simpler approaches to Volume Manager administration, as offered by the following interfaces:

- The Volume Manager Support Operations for disk administration (described in Chapter 2)
- The OA&M menu interface for volume administration (described in Chapter 2)
- Simple command line interfaces (described in Chapter 3)

Conventions

This guide uses several typographical conventions to identify certain types of information. Table 1 describes the typographical conventions used throughout this guide.

Table 1: Typographical Conventions

Convention	Interpretation
`constant width`	User input, computer output or prompts, commands and utilities, form names, menu items, and the names of icons and configuration entities appear in `constant width` font.
italic	Titles of books and variables that the user types appear in text in *italics*.
Shift	This is the Shift keyboard key.
F3	This is the F3 function key. If your keyboard does not include function keys, you can simulate a function key by pressing CTRL-F followed by the key number. For example, for F3, press CTRL-F and then 3.
↑	This is the up-arrow key.
↓	This is the down-arrow key.
>	This represents the pointer within menus.

1 Volume Manager Fundamentals

Introduction

This chapter provides a general introduction to the Unisys Volume Manager (UVM). The Unisys Volume Manager is a disk management tool that increases data availability and improves disk I/O performance.

The Volume Manager can be used to:

- Simplify the management of the disk configuration by providing convenient operations to add, move, replace, and remove disks.
- Protect against data loss due to hardware malfunction by creating a *mirror* (duplicate) image of important file systems and databases.
- Change the disk configuration without rebooting or otherwise interrupting users.
- Perform file system backup while the system is in active use.
- Increase disk performance through the use of striping (division of volumes and file systems across several physical disks).

This chapter begins with an overview of how disk storage management is accomplished in a UNIX system that does not make use of the Volume Manager. Then, the principles of disk storage management using the Volume Manager are introduced. This chapter goes on to describe how disk failure protection can be achieved by using mirroring. Finally, some more advanced concepts for performance improvement and support of disk groups are introduced.

How the Volume Manager Works

The basic principles of disk storage management using the Volume Manager are introduced by reviewing some key elements of disk storage management as follows:

- Space allocation

  For each file system or database created, disk space must be allocated. As space requirements can change over time, it must also be possible to alter the space allocation. It should also be noted that the manner in which data is allocated can have a significant performance impact, since it influences disk head movements as well as the distribution of accesses across disk drives.

- Addressing

  File systems, Data Base Management Systems (DBMS), and system administrators must be able to address the space allocated for a particular file system or database.

- Data access

  File systems, Data Base Management Systems, and system administrators must be able to store and retrieve data through an appropriate API (Application Programming Interface).

Disk Storage Management Without the Volume Manager

This section describes disk storage administration of UNIX systems that *do not* use the Volume Manager.

- Space allocation

  To allocate space for file systems or databases, disks are divided into *partitions* (also called *slices*). A partition is defined by its start address on the physical disk and its length.

- Addressing

  A partition is addressed through a physical address, generally referred to as the *device name* or *devname*. The syntax of a device name for an internal SCSI channel is `cx.ydzsn`, where:

  x is the controller type (for example, normally 0).

  y is the controller number (for example, normally 0).

  z is the logical disk number of the target disk.

  n is the number of the disk slice.

  The syntax of a device name for an ISIC channel is `cw.xdyzsn`, where:

  w is the controller type (for example, 1 is an ISIC board).

  x is the controller number (for example, the EISA slot where the ISIC is located).

  y is the bus number.

  z is the SCSI ID of the drive.

  n is the number of the disk slice.

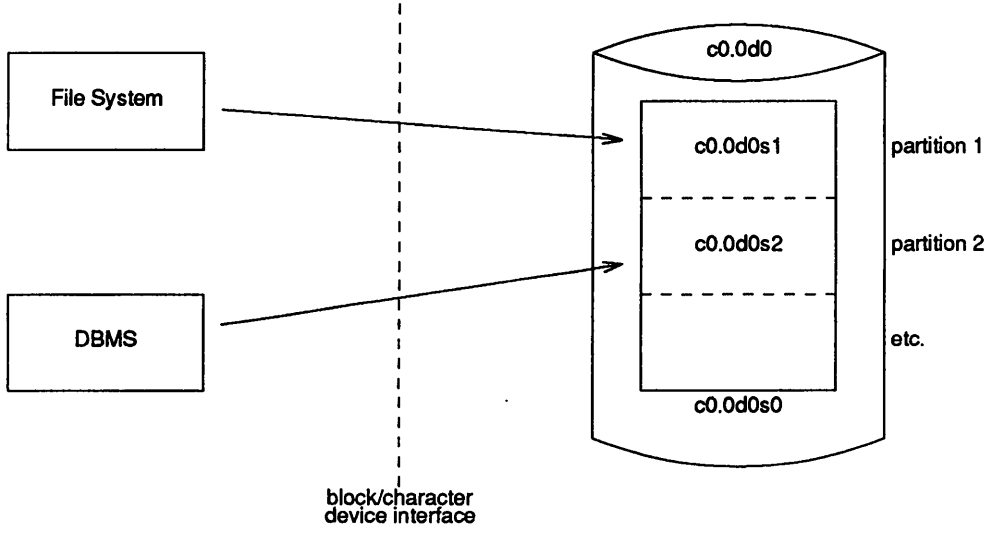
  The full pathname of a device is `/dev/dsk/`*devicename*.

- Data access

  Storage and retrieval of data on a partition is achieved through the so-called block and character device interfaces, a standard API used by file systems and Data Base Management Systems.

Figure 1 gives an overview of how disk storage is allocated, addressed and accessed in UNIX systems that do not make use of the Volume Manager.

Figure 1-1: Disk Storage Management Without Volume Manager



There are a number of drawbacks associated with this scheme:

- The system administrator must partition the disks according to the needs of the users on the system. The administrator must keep a record of how the drives are partitioned, since no record is kept within the system.
- Slices cannot be moved or extended in size. therefore, changes in the space needed by a file system or database require that the administrator:
    1. Make the system unavailable for normal use.
    2. Back up all data to a tape.
    3. Repartition the drives to reflect the space changes required.
    4. After the repartitioning is complete, restore the data from the tape.
    5. Make the system available for use.

- Partitions cannot exceed the size of a physical disk.
- Reconfiguring disks (for example moving a disk to a new controller) results in a change of the addresses through which the partitions on the disk are accessed. This requires the administrator to perform manual actions to change all references to the partitions on the disk drives involved.

In addition, the fact that the partitioning of disks cannot be changed easily makes it difficult for the administrator to ensure that data is placed on the available disk drives for optimal performance.

Principles of Disk Storage Management with Volume Manager

This section describes disk storage management of UNIX systems using the Volume Manager.

- Space allocation

  The Volume Manager is able to fully manage the allocation of space on the disk drives connected to a system. This is achieved in the following manner:

  - It creates two partitions on each physical disk: a small partition in which it keeps its disk label and other administrative data and a large partition that covers the remainder of the disk. A symbolic name (the *disk name* or *disk media name*) can be established to refer to a disk that is managed by the Volume Manager (for example: `disk01`, `disk02`).
  - Space for a file system or raw database partition is obtained by creating a *volume* of the appropriate size. A volume is built from one or more areas of disk space (also called "subdisks") located on one or more physical disks. The administrator can leave the space allocation completely up to the Volume Manager or keep a selectable amount of control over where space is allocated.

- Addressing

  Volumes are addressed using a *volume name* that is independent of the manner in which the volume is mapped onto physical disks.

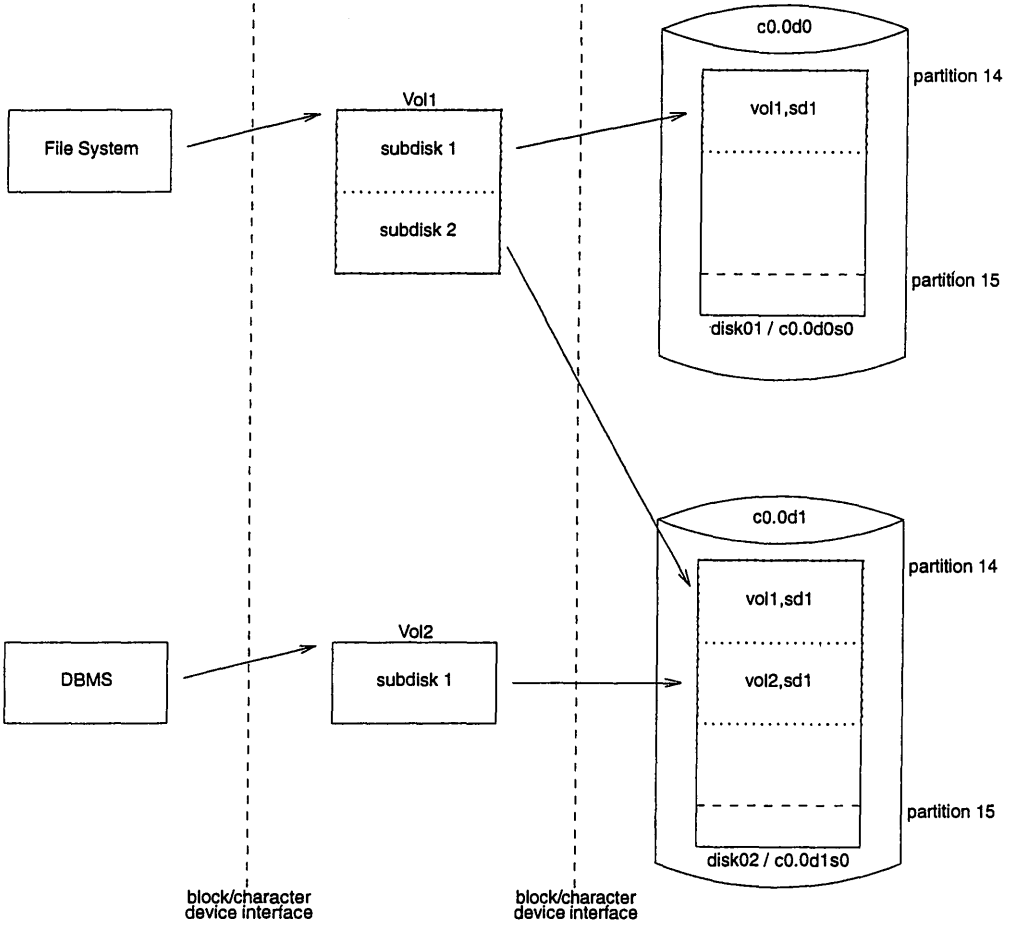
- Data access

  Volumes can be accessed through the standard block/character device interface. This means that applications do not have to be changed to use the Volume Manager.

To maintain data on volumes in a consistent state in the face of device failures, the Volume manager differentiates between two types of volumes: volumes that have file systems located on them (usage type *fsgen*) and all other types of volumes (usage type *gen*).

Figure 2 gives an overview of how disk storage is allocated, addressed and accessed in systems that make use of the Volume Manager.

Figure 1-2: Disk Storage Management With the Volume Manager



As compared to the situation without Volume Manager, this scheme offers a number of advantages:

- The Volume Manager maintains complete disk space administration, thereby freeing the administrator from the task of partitioning disks and maintaining the space administration. However, it remains possible for the administrator to keep control over the space allocation.
- Volumes can be extended or reduced in size as needed, without interrupting access to data.
- Volumes can be built from disjunct areas of disk space located on one or more physical disks. This makes it possible to extend volumes by adding disk space that is not contiguous with the space already allocated, and to create volumes that exceed the size of a physical disk.

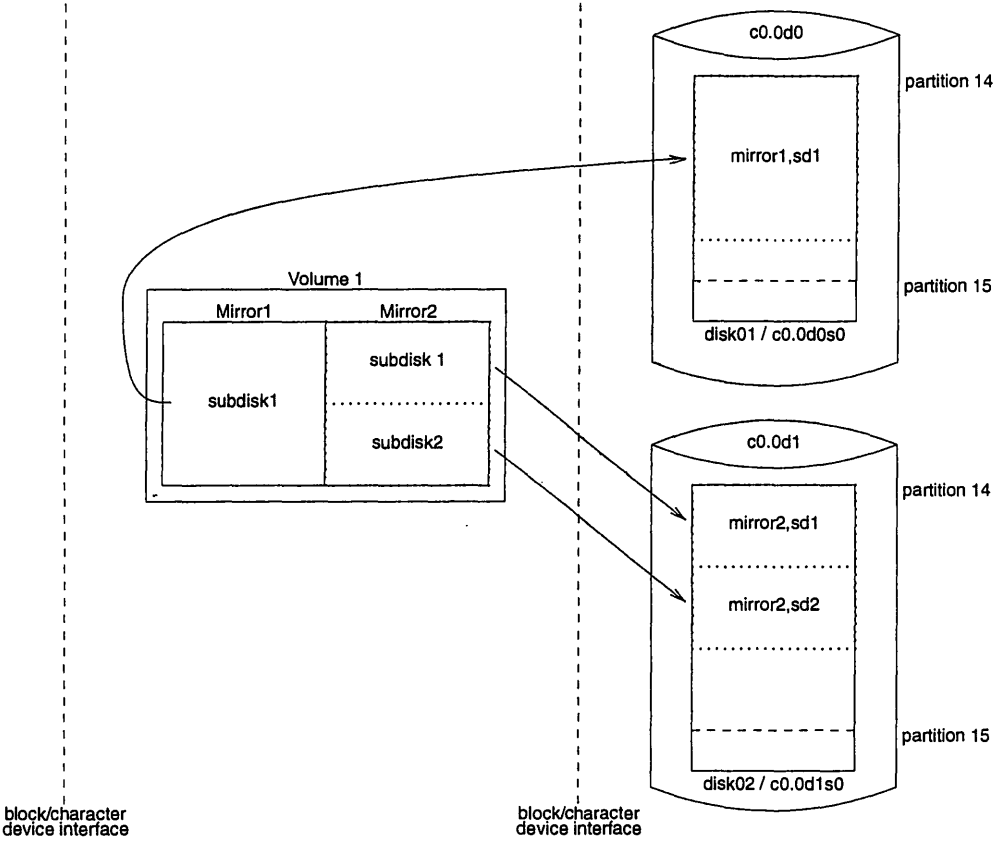
  Two types of volumes that use space from more than one physical disk are *concatenated* volumes and *spanned* volumes. Concatenated volumes consist of one or more discontiguous segments of disk space. Spanned volumes consist of space from more than one disk.
- Volumes are referenced volume names that are independent of the physical storage addresses used by the volume. As part of the administrative information on each physical disk, the Volume Manager maintains a unique identification of the disk. This makes it possible to automatically readjust its volume and space administration in case disks are moved in the configuration.

Mirroring

In a system without the Volume Manager, failures of a physical disk result in loss of the data on that disk. To recover from such an event, the data needs to be restored from a backup and all changes made to the data since that backup have to be re-applied. This is a time-consuming process during which applications have no access to the data.

The Volume Manager makes it possible to protect critical data against disk failures by maintaining multiple copies (called "mirrors" or "plexes") of the data in a volume. Figure 3 shows how this is achieved.

Figure 1-3: Mirroring Using the Volume Manager



Mirroring Boot and Swap

The disk from which a system is booted (also referred to as the "boot disk") has to contain a boot track (at a location that is fixed by convention) and 3 partitions that are used by firmware and operating system software before the Volume Manager is operational. These partitions are:

- The "stand alone partition" (containing the kernel executables)
- The "root partition" (containing the root file system)
- The "swap partition" (the primary paging device)

By convention, specific tags are used for these partitions.

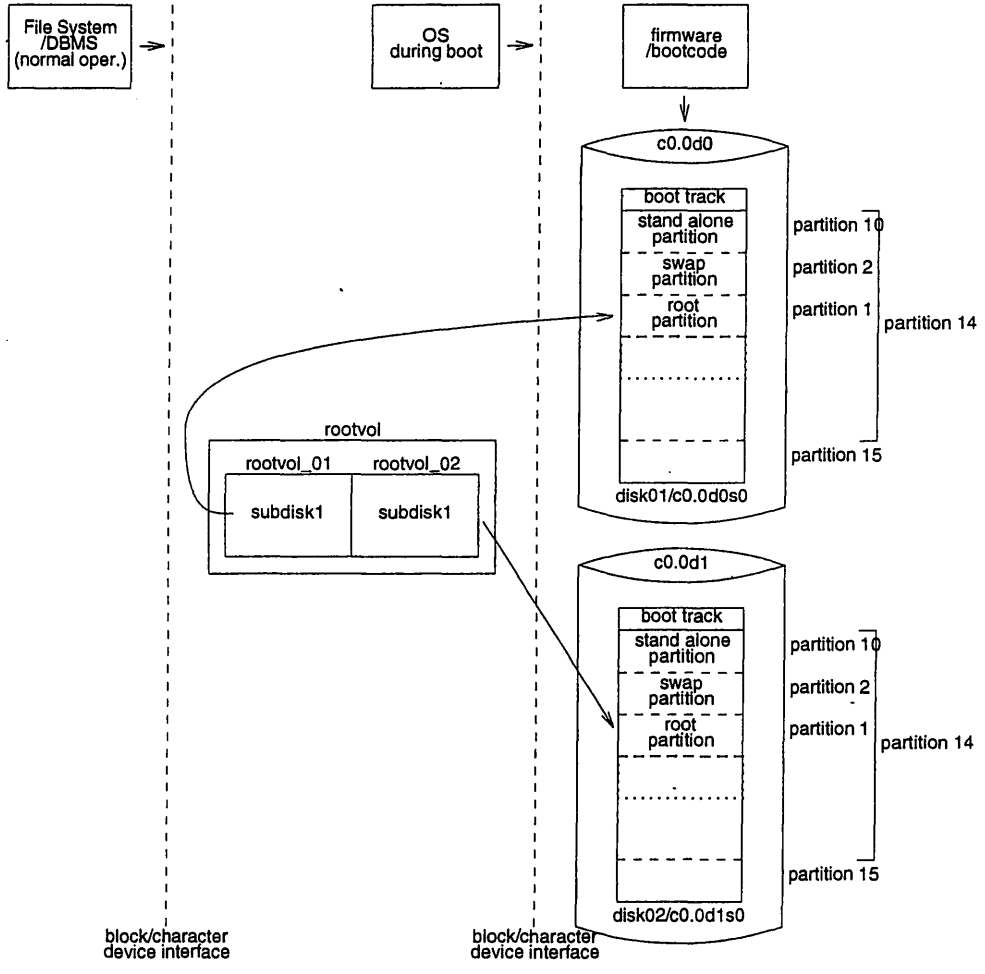
To allow a system to boot in case the root disk has failed, a second disk can be set up, with a boot track and the three partitions mentioned above.

The volume mirroring scheme as explained in the previous section cannot be used to mirror the root disk because it does not provide a method to access some of the data required for reboot (the boot track). Additionally, this mirroring scheme does not provide a method to access the required partitions using the conventions mentioned above.

For these reasons, the Volume Manager provides a simple way to create a secondary root disk. This method ensures that the secondary root disk has a boot track in the proper location and that the stand alone, root and swap partitions are accessible as partitions according to the conventions mentioned above.

Figure 4 gives an example of how root disk mirroring is achieved. For simplicity, it only shows the mirrored root volume; mirrored volumes that encapsulate the swap and stand alone partitions are also created.

Figure 1-4: Root disk mirroring using the Volume Manager



Advanced Concepts

The following sections describe some of the advanced operations available with the Volume Manager.

Striping

As mentioned earlier, the manner in which storage space is allocated to file systems and databases has a direct impact on disk head movements and on the distribution of the I/O load between disk drives. An optimal allocation minimizes head movements and distributes the I/O load evenly between disk drives.

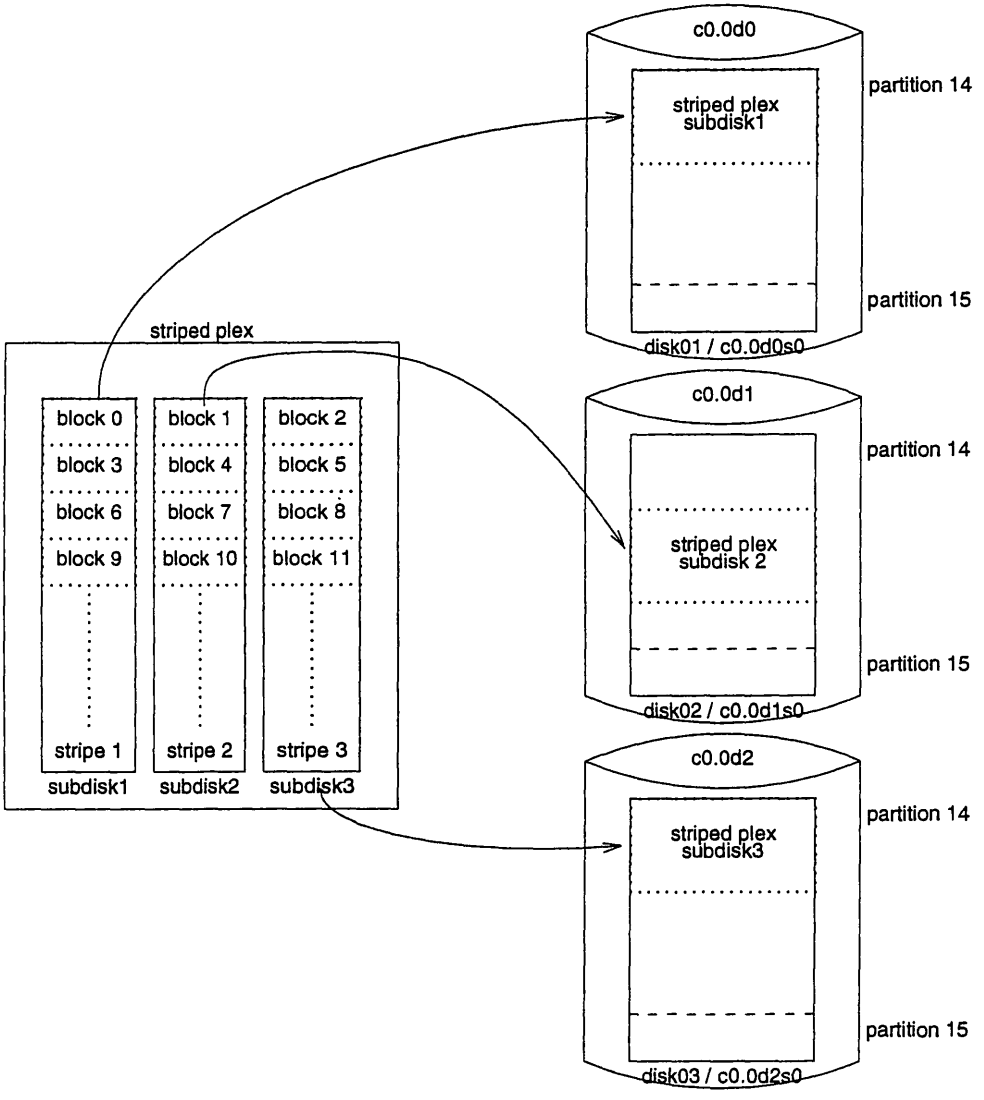
By supporting *striping* (in addition to concatenation) as a storage allocation scheme for plexes (mirrors), the Volume Manager makes it possible to evenly distribute the I/O load for a plex across a number of disk drives. A striped plex consists of a number of equal sized subdisks, each located on a separate disk drive.

Data is allocated on the subdisks in *stripe blocks* of a fixed size (referred to as the *stripe width*). Stripe blocks are interleaved between the subdisks as shown in Figure 5, resulting in an even distribution of accesses between the subdisks.

NOTE

The effect of striping on performance is dependent on the choice of the stripe width and on application characteristics. The Volume Manager uses a default stripe width of 128 sectors that has been chosen to give good results in typical multi-user, business application environments.

Figure 1-5: Striping With the Volume Manager



Disk Groups

There can be situations in which all data related to a particular set of applications or a particular group of users needs to be made accessible to another system. Examples of this are:

- Moving the data from a failed system to another system while maintaining the Volume manager configuration on the target system.
- Balancing the work load across a number of systems.

In such cases, it is important that the data related to particular application(s) or users is located on an identifiable set of disk drives, such that when these drives are moved, all data of the application(s) or group of users is moved as a unit and no data of other applications or users is moved.

To make this possible, the Volume Manager supports the concept of *disk groups*. A disk group is a set of physical disk drives which are administrated separate from any other disks or disk groups on the system. A volumes is always contained in a single disk group. This allows the system administrator to create separate disk groups for specific applications or user groups and have all data associated with the applications or group of users located on the associated disk group. The Volume Manager provides convenient facilities to export and import disk groups.

NOTE

On most systems, the use of disk groups is not necessary. The Volume Manager supports a default disk group, the "root disk group" (`rootdg`), in which all volumes are created if no further specification is given.

Using the Volume Manager

The Volume Manager can be used at various levels, ranging from a relatively simple level to an extremely advanced level. At the most basic level, minimal UVM knowledge is required of the user. At the more advanced levels, a thorough understanding of underlying UVM concepts is required.

Any of the UVM interfaces can be used interchangeably, although some may not be available on certain systems. Volume Manager objects created by one interface are fully inter-operable and compatible with those created by the other interfaces.

This guide focuses on how basic disk and volume administration can be performed, using the menu-driven interfaces (The Volume Manager Support Operations and the OA&M interface), and the command-line interface. The *Unisys Volume Manager (UVM) System Administrator's Guide* should be consulted for more advanced information on UVM and its utilities.

UVM administration functions can be performed in various ways:

Volume Manager Support Operations
: The Volume Manager Support Operations interface provides a menu driven interface for performing disk administration functions.

OA&M Interface
: The OA&M menu-driven interface permits the user to specify operations and data using menus and forms.

Command Line Interface
: The Volume Manager command line interface consists of a number of comprehensive commands that range from simple commands, requiring a single piece of information, to complex commands, requiring detailed input. Many of the UVM commands require a thorough understanding of Volume Manager concepts. These are intended to be used by programs and Shell scripts.

2 Menu Interface Operations

Introduction

This chapter describes the Volume Manager Support operations and the Operations, Administration, and Maintenance (OA&M) interface. These are menu-driven interfaces designed for use with the Volume Manager. These interfaces are used to perform physical and logical device administration.

The Volume Manager allows you to do two types of administration:

Physical device administration
: Physical device administration is the management of the physical disk device. Physical device administration includes putting a device under Volume Manager control or removing a device from Volume Manager control.

Volume and file system administration
: Volume and file system administration includes the creation and removal of volumes and file systems.

Currently, the Volume Manager Support (`voldiskadm`) operations provide menus for performing physical device administration. These menus are designed to be easy to use. The menus provide information about each step to help you decide the correct response for each prompt.

The OA&M interface provides menus for performing basic physical disk, volume, and file system administration tasks provided with the Volume Manager. Due to the complex interface requirements of the Forms and Menu Language Interface (FMLI), the menuing package on which OA&M is based, OA&M does not provide the full functionality of UVM. Eventually, OA&M is to be replaced by the Volume Manager Support operations.

The Volume Manager Support Operations

This section describes how to use the Volume Manager Support Operations to perform physical device administration tasks.

This section describes how to:

- Add a disk to Volume Manager control
- Remove a disk
- Replace a failed disk
- Mirror volumes on a disk
- Move volumes from a disk
- Enable or disable a disk group
- Enable or disable a disk device
- List disk information

Starting the Volume Manager Support Operations

To start the Volume Manager Support Operations, enter:

```
voldiskadm
```

The Volume Manager displays a menu containing the disk operations available to you.

The voldiskadm Main Menu

Figure 2-1: The Volume Manager Support Operations Main Menu

```
Volume Manager Support Operations
Menu: VolumeManager/Disk

 1       Add or initialize a disk
 2       Encapsulate a disk
 3       Remove a disk
 4       Remove a disk for replacement
 5       Replace a failed or removed disk
 6       Mirror volumes on a disk
 7       Move volumes from a disk
 8       Enable access to (import) a disk group
 9       Remove access to (deport) a disk group
 10      Enable (online) a disk device
 11      Disable (offline) a disk device
 list    List disk information

 ?       Display help about menu
 ??      Display help about the menuing system
 q       Exit from menus

Select an operation to perform
```

NOTE

The ? command may be entered at any time to provide help in using the menu. The output of the ? command is a list of operations and a definition of each.

The ?? command gives you a list of inputs that can be used at any prompt.

The q command brings you back to the main menu if you need to restart a process; however, using q at the main menu level exits the Volume Manager Support Operations.

Add or initialize a disk

This menu operation allows you to add formatted disks to the system. SCSI disks are already formatted. For other disks, see the manufacturer's documentation for formatting instructions. You are prompted for a disk device name and a disk group name, which is optional. If you specify a disk group, the disk is added to that disk group. Otherwise, the disk is held as a spare, to be used for future operations or disk replacements, without needing to be initialized at that time. If the disk has not been initialized already, the disk is partitioned and initialized for use with the Volume Manager.

Encapsulate a disk

This menu operation is used to bring a disk that was added to the system before installing the Volume Manager under Volume Manager control. You are prompted for a disk device, a disk group, and a disk name. The disk is added to that group. The disk is examined to search for partitions that are used for file systems or other purposes. Volumes are created to replace disk partitions as the means of accessing the data. If the encapsule operation cannot determine the purpose of a partition automatically, you are asked what to do with it. You can choose to replace the partition with a volume, leave the partition alone, or remove the partition.

You must reboot the system if any partitions are being used for mounted file systems or for running applications. You may have to modify application configuration files to use volumes, rather than direct disk devices, to access the disk partitions. File system mount information is adjusted automatically.

Remove a disk

This menu operation is used to remove a disk from a disk group. You are prompted for the name of a disk to remove. You cannot remove a disk if any volumes use storage on that disk. If any volumes are using storage on the disk, you have the option of asking the Volume Manager to move that storage to other disks in the disk group.

NOTE

You cannot remove the last disk in a disk group using this operation. If you wish to use all the remaining disks in a disk group for some purpose, you should disable (deport) the disk group. You will then be able to reuse the disks.

Remove a disk for replacement

This menu operation is used to remove a physical disk from a disk group, while retaining the disk name. This changes the state for the named disk to *removed*. If there are any initialized disks that are not part of a disk group, you are given the option of using one of these disks as a replacement.

Replace a failed or removed disk

This menu operation is used to specify a replacement disk for a disk that you removed with the `Remove a disk for replacement` menu entry, or one that failed during use. You are prompted for a disk name to replace and a disk device to use as a replacement. You can choose an uninitialized disk, in which case the disk will be initialized, or you can choose a disk that you have already initialized using the `Add or initialize a disk` menu operation.

Move volumes from a disk

This menu operation moves any volumes (or parts of a volume) that are using a disk onto other disks. Use this menu operation immediately prior to removing a disk, either permanently or for replacement.

NOTE

Simply moving volumes off a disk, without also removing the disk, does not prevent other volumes from being moved onto the disk by future operations.

Enable (import) a disk group

This menu operation enables access by this system to a disk group. If you wish to move a disk group from one system to another, you must first disable (deport) it on the original system. Then, move the disks from the deported disk group to the other system and enable (import) the disk group there.

You are prompted for the device name of the disk on which the disk group was created. All enabled (online) disks are searched to locate all disks that are in the same disk group as the disk whose device name you entered.

Disable (deport) a disk group

This menu operation disables access to a disk group that is currently enabled (imported) by this system. Deport a disk group if you intend to move the disks in a disk group to another system. Also, deport a disk group if you want to use all of the disks remaining in a disk group for some new purpose.

You are prompted for the name of a disk group. You are asked if the disks should be disabled (offlined). For removable disk devices on some systems, it is important to disable all access to the disk before removing the disk.

Enable (online) a disk device

If you move a disk from one system to another during normal system operation, the Volume Manager will not recognize the disk automatically. Use this menu operation to tell the Volume Manager to scan the disk to find what disk it is, and to determine if this disk is part of a disk group. Also, use this operation to re-enable access to a disk that was disabled by either the disk group deport operation or the disk device disable (offline) operation.

Disable (offline) a disk device

This menu operation is used to disable all access to a disk device through the Volume Manager. This operation can be applied only to disks that are not currently in a disk group. Use this operation if you intend to remove a disk from a system without rebooting.

Many systems do not support disks that can be removed from a system during normal operation. On such systems, the offline operation is seldom useful.

List disk information

This menu operation is used to display the list of disks attached to your system. This will also list removed or failed disks.

You can also use this operation to list detail for a particular disk. This detail includes, among other things, the disk group of which the disk is a member, even if that disk group is currently disabled.

Disk Operations

This section describes the disk operations available with `voldiskadm`.

Adding Disks

When you add a disk to a system that is running UVM, you may wish to put the disk under control of UVM so that it can control the space allocation on the disk. If the disk was previously in use, but not under UVM control, then you may wish to preserve existing data on the disk while still letting UVM take control of the disk. This can be accomplished using the encapsulation function of UVM (see "Adding an Initialized Disk"). If the disk is new, then it will need to be initialized (see "Initializing a New Disk"). If a disk was previously not under UVM control, but no data is required to be preserved, an initialization operation should be performed (see "Adding a Initialized Disk").

When you perform disk administration, it is important that you recognize the difference between a *device name* and a *disk name*.

The *device name* (sometimes referred to as *devname* or *disk access name*) is the location of the disk. The syntax of a device name for an internal SCSI channel is c*x*.*y*d*z*s*n*, where:

x is the controller type (for example, normally 0).

y is the controller number (for example, normally 0).

z is the logical disk number of the target disk.

n is the number of the disk slice.

The syntax of a device name for an ISIC channel is c*w*.*x*d*y**z*s*n*, where:

w is the controller type (for example, 1 is an ISIC board).

x is the controller number (for example, the EISA slot where the ISIC is located).

y is the bus number.

z is the SCSI ID of the drive.

n is the number of the disk slice.

The full pathname of a device is `/dev/dsk/`*devicename*. In this document, only the device name is listed and `/dev/dsk` is assumed. An example of a device name is `c0.0d0s0`.

The *disk name* (sometimes referred to as *disk media name*) is an optional administrative name for the disk, such as *disk01*. If you do not assign a disk name, the disk name defaults to `disk`*nn*, where *nn* is a sequence number if the disk is being added to `rootdg`. Otherwise, the disk is named *groupnamenn*, where the *groupname* is the name of the group to which the disk is being added.

Adding an Initialized Disk

When you add a disk to a system under Volume Manager control, you must put the disk under Volume Manager control as well. If the disk has not been initialized before, initialize it by following the instructions in the section entitled "Initializing a Disk". If the disk has been initialized and partitioned into file systems previously and you wish to keep the file systems, add the disk by doing these steps:

1. Go to the main menu and select menu item 1 (`Add or initialize a disk`).

```
Volume Manager Support Operations
Menu: VolumeManager/Disk

 1       Add or initialize a disk
 2       Encapsulate a disk
 3       Remove a disk
 4       Remove a disk for replacement
 5       Replace a failed or removed disk
 6       Mirror volumes on a disk
 7       Move volumes from a disk
 8       Enable access to (import) a disk group
 9       Remove access to (deport) a disk group
 10      Enable (online) a disk device
 11      Disable (offline) a disk device
 list    List disk information

 ?       Display help about menu
 ??      Display help about the menuing system
 q       Exit from menus

Select an operation to perform: 1
```

The Volume Manager prompts you with the following screen:

```
Add or initialize a disk
Menu: VolumeManager/Disk/AddDisk

  Use this operation to add a disk to a disk group.  You can
  select an existing disk group or create a new disk group.  You
  can also initialize a disk without adding it to a disk group,
  which leaves the disk available for use as a replacement disk.
  This operation takes, as input, a disk device, for example
  c0.0d2, a disk group (or none to leave the disk available for
  as a replacement disk).  If you are adding the disk to a disk
  group, you will be asked to give a name to the disk.

Select disk device to add [<address>,list,q,?]
```

2. If you do not know the address (device name) of the disk to be added, enter `l` or `list` at the prompt. The Volume Manager displays a list of the disks available to the system:

```
DEVICE      DISK        GROUP       STATUS
c0.0d0      disk01      rootdg      online
c0.0d2      -           -           error
c1.4d14     -           -           error

Select disk device to add [<address>,list,q,?]
```

All disks attached to the system are recognized by the Volume Manager and displayed.

The word `error` in the status line of c1.4d14 tells you that a disk has not yet been added to Volume Manager control. These disks may or may not have been initialized before. The Disks that are listed with a disk name and disk group cannot be used for this operation, as they are already under Volume Manager control.

3. Enter the address of the disk to be added.

```
DEVICE      DISK        GROUP       STATUS
c0.0d0      disk01      rootdg      online
c0.0d2      -           -           error
c1.4d14     -           -           error

Select disk device to add [<address>,list,q,?] c0.0d2
```

The Volume Manager displays the following prompt.

```
  Disk device c0.0d2 does not appear to have been initialized for
  use with the volume manager.  However, it may have been initialized
  for other purposes.  You may want to encapsulate the existing
  disk partitions as volumes instead of adding it as a new disk.

Do you wish to encapsulate c0.0d2? [y,n,q,?] (default: y)
```

Press **Return** to allow the Volume Manager to encapsulate the disk. This process adds a disk that has active partitions to Volume Manager control. This allows you to add active disks to Volume Manager control without losing any data. If the disk you wish to add is uninitialized, this screen does not display.

4. If you choose `y` to encapsulate, `voldiskadm` prompts you for the name of the disk group to which you want this disk assigned.

```
You can choose to add this disk to an existing disk group, to
create a new disk group.  To create a new disk group, select a
disk group name that does not yet exist.

Which disk group [<group>,list,q,?] (default: rootdg)
```

Press **Return** to assign the disk to the default disk group `rootdg`. Otherwise, enter the name of the disk group to which you want the disk assigned.

NOTE You can create other disk groups if necessary. (Instructions for creating a disk group are included later in this chapter.) However, for most systems, the use of disk groups is not necessary. Therefore, the Volume Manager supports the default disk group, `rootdg`, in which all volumes are created if no further specification is given. All commands default to `rootdg` as well.

5. At this point, `voldiskadm` prompts you for a disk name for the disk being added. You can press **Return** to choose the default name or type in a disk name.

```
You must now select a disk name for the disk.  This disk name
can be specified to disk removal, move, or replacement
operations.  If you move the disk, such as between host bus
adapters, the disk will retain the same disk name, even though
it will be accessed using a different disk device address name.

Enter disk name [<name>,q,?] (default: disk02)
```

6. If you selected to encapsulate the disk and chose the the default disk group `rootdg` and the default disk name (in this case `disk02`), the following screen is displayed.

```
The requested operation is to encapsulate disk device c0.0d2 and
to add this device to disk group rootdg as disk disk02.  The
system must be rebooted before this can take effect.

Continue with operation? [y,n,q,?] (default: y)
```

   Press **Return** to encapsulate the disk.

7. The Volume Manager displays the following message:

```
The first stage of encapsulation for c0.0d0 has completed
successfully.  You should now reboot your system at the earliest
possible opportunity.  The encapsulation will require two or three
reboots which will happen automatically after the next reboot.
To reboot execute the command:

      shutdown -g0 -y -i6

This will update the /etc/vfstab file so that volume devices are
used to mount the file systems on this disk device.  You will need
to update any other references such as backup scripts, databases,
or manually created swap devices.

Encapsulate another disk? [y,n,q,?] (default: n)
```

   Press **Return** to return to the main menu.

Once you have added the disk, you must reboot the system before the Volume Manager can take over control of the disk.

Initializing a New Disk

If the disk you wish to add has never been initialized, it can be initialized in the following manner:

1. From the main menu, select 1, Add or Initialize a disk.

```
Volume Manager Support Operations
Menu: VolumeManager/Disk

 1       Add or initialize a disk
 2       Encapsulate a disk
 3       Remove a disk
 4       Remove a disk for replacement
 5       Replace a failed or removed disk
 6       Mirror volumes on a disk
 7       Move volumes from a disk
 8       Enable access to (import) a disk group
 9       Remove access to (deport) a disk group
 10      Enable (online) a disk device
 11      Disable (offline) a disk device
 list    List disk information

 ?       Display help about menu
 ??      Display help about the menuing system
 q       Exit from menus

Select an operation to perform: 1
```

2. The Volume Manager prompts you for a disk device name.

```
Add or initialize a disk
Menu: VolumeManager/Disk/AddDisk

  Use this operation to add a disk to a disk group.  You can
  select an existing disk group or create a new disk group.  You
  can also initialize a disk without adding it to a disk group,
  which leaves the disk available for use as a replacement disk.
  This operation takes, as input, a disk device, for example
  c0.0d2, a disk group (or none to leave the disk available for
  as a replacement disk).  If you are adding the disk to a disk
  group, you will be asked to give a name to the disk.

Select disk device to add [<address>,list,q,?] c0.0d2
```

3. Once you select the disk device to be added, `voldiskadm` asks if you wish to initialize the disk.

```
Do you wish to initialize c0.0d2? [y,n,q,?] (default: y)
```

Press **Return** to initialize the disk. If you choose `n`, `voldiskadm` returns you to the main menu.

4. If you choose `y`, `voldiskadm` prompts you for the name of the disk group to which you want this disk assigned.

```
You can choose to add this disk to an existing disk group, to
create a new disk group, or you can choose to leave the disk
available for use by future add or replacement operations.  To
create a new disk group, select a disk group name that does not
yet exist.  To leave the disk available for future use, specify
a disk group name of "none".

Which disk group [<group>,none,list,q,?] (default: rootdg)
```

Press **Return** to select the default disk group, `rootdg`.

NOTE You can create other disk groups if necessary. (Instructions for creating a disk group are included later in this chapter.) However, for most systems, the use of disk groups is not necessary. Therefore, the Volume Manager supports the default disk group, `rootdg`, in which all volumes are created if no further specification is given. All commands default to `rootdg` as well.

5. You are now prompted for a disk name.

```
You must now select a disk name for the disk.  This disk name
can be specified to disk removal, move, or replacement
operations.  If you move the disk, such as between host bus
adapters, the disk will retain the same disk name, even though
it will be accessed using a different disk device address name.

Enter disk name [<name>,q,?] (default: disk01)
```

Press **Return** to select the default disk name or enter a disk name.

6. If you selected the default disk group, `rootdg` and the default disk name, `disk01`, `voldiskadm` displays the following confirmation screen.

```
The requested operation is to initialize disk device c0.0d2 and
to add this device to disk group rootdg as disk disk01.

Continue with operation? [y,n,q,?] (default: y)
```

Press **Return** to initialize the disk.

7. The Volume Manager now prepares to assign operating system partitioning to your disk. You can create separate operating systems for use with the DOS operating system. You must create one UNIX system partition.

```
Initialize a disk
Menu: VolumeManager/Disk/AddDisk

        The recommended default partitioning for your disk is:

          a 100% "UNIX System" partition.

        To select this, please type "y".  To partition your disk
        differently, type "n" and the "fdisk" program will let you
        select other partitions.
```

Type `y` to select the default UNIX partitioning. If you want a different set up, enter `n` and follow the directions on the subsequent screens.

8. `voldiskadm` now asks if you wish the Volume Manager to do a surface analysis of the new disk. Since this disk has never been initialized, it is recommended that you allow the surface analysis to take place.

```
Initialize a disk
Menu: VolumeManager/Disk/AddDisk

  Surface analysis may be necessary to locate any damaged blocks
  on the disk and to arrange for undamaged blocks to be used as
  replacements.  This may take a few minutes to half an hour.
  You can skip this step, if you wish.  However, it is advisable
  that you not skip this step unless you are certain that this
  disk maintains its own list of damaged and replacement blocks,
  and that this list is correct.  If you aren't sure, do surface
  analysis.

Perform surface analysis? [y,n,q,?] (default: y)
```

Press **Return** to allow the surface analysis to take place.

9. The surface analysis can take several minutes to an hour depending upon the type and size of the disk. Once the surface analysis is complete, `voldiskadm` returns the following success screen:

```
  Disk initialization for c0.0d2 completed successfully.

Add or initialize another disk? [y,n,q,?] (default: n)
```

Press **Return** to return to the main menu.

Adding a Previously-Initialized Disk

If the disk you wish to add has been used before, but not with UVM, you can encapsulate it, saving the information (see "Adding an Initialized Disk") or you can reinitialize the disk, allowing the Volume Manager to configure the disk for UVM. If you wish to have the disk reinitialized, do the following:

1. Select menu item 1 on the main menu.
2. Select the device name of the disk you wish to reinitialize.

```
Add or initialize a disk
Menu: VolumeManager/Disk/AddDisk

  Use this operation to add a disk to a disk group.  You can
  select an existing disk group or create a new disk group.  You
  can also initialize a disk without adding it to a disk group,
  which leaves the disk available for use as a replacement disk.
  This operation takes, as input, a disk device, for example
  c0.0d2, a disk group (or none to leave the disk available for
  as a replacement disk).  If you are adding the disk to a disk
  group, you will be asked to give a name to the disk.

Select disk device to add [<address>,list,q,?] c0.0d2
```

3. The Volume Manager asks if you want to encapsulate the disk.

```
  Disk device c0.0d2 does not appear to have been initialized for
  use with the volume manager.  However, it may have been initialized
  for other purposes.  You may want to encapsulate the existing
  disk partitions as volumes instead of adding it as a new disk.

Do you wish to encapsulate c0.0d2? [y,n,q,?] (default: y) n
```

Type n for no.

4. The Volume Manager asks if you wish to initialize the disk.

```
Do you wish to initialize c0.0d2? [y,n,q,?] (default: y)
```

Press (Return) to initialize the disk.

5. voldiskadm now asks you to select the disk group to which you want the disk added.

```
You can choose to add this disk to an existing disk group, to
create a new disk group, or you can choose to leave the disk
available for use by future add or replacement operations.  To
create a new disk group, select a disk group name that does not
yet exist.  To leave the disk available for future use, specify
a disk group name of "none".

Which disk group [<group>,none,list,q,?] (default: rootdg)
```

Press (Return) to select the default disk group, rootdg, type in the name of your chosen disk group, or enter none.

NOTE

You can create other disk groups if necessary. (Instructions for creating a disk group are included later in this chapter.) However, for most systems, the use of disk groups is not necessary. Therefore, the Volume Manager supports the default disk group, rootdg, in which all volumes are created if no further specification is given. All commands default to rootdg as well.

6. The Volume Manager now prompts you for a disk name.

```
You must now select a disk name for the disk.  This disk name
can be specified to disk removal, move, or replacement
operations.  If you move the disk, such as between host bus
adapters, the disk will retain the same disk name, even though
it will be accessed using a different disk device address name.

Enter disk name [<name>,q,?] (default: disk01)
```

Press **Return** to select the default disk name or enter a disk name.

7. The Volume Manager displays the following screen to confirm the operation.

```
The requested operation is to initialize disk device c0.0d2 and
to add this device to disk group rootdg as disk disk01.

Continue with operation? [y,n,q,?] (default: y)
```

Press **Return** to continue with the initialization.

8. The disk must be partitioned. UVM displays this screen explaining the partitioning scheme.

```
Initialize a disk
Menu: VolumeManager/Disk/AddDisk

  The fdisk utility will now be invoked to allow you to select
  partitions to be used for the DOS operating system, and one
  fdisk partition to use for storing UNIX partitions.  Please
  create exactly one partition with type UNIX.  If you wish to be
  able to boot UNIX on this disk, you must also make the UNIX
  partition the active partition.

Continue? [y,n,q,?] (default: y)
```

Press **Return** to continue.

9. The `fdisk` utility sets up partitions similar to that shown below.

```
            Total disk size is 100 cylinders (100.0 MB)

                                        Cylinders                  Approx
Partition   Status      Type          Start   End   Length   %      MB
=========   ======   ============     =====   ===   ======   ===   ======
    1       Active   UNIX System        0      99     100     100    100.0



SELECT ONE OF THE FOLLOWING:

     1.   Create a partition
     2.   Change Active (Boot from) partition
     3.   Delete a partition
     4.   Update (Update disk configuration and exit)
     5.   Exit (Exit without updating disk configuration)
Enter Selection:
```

Select item 4 for UNIX systems and press **Return**.

10. The Volume Manager asks if you wish to have a surface analysis performed. If this disk has been used before and you are confident of its integrity, you can select n. If you are unsure of the disk, it is recommended that you allow the surface analysis to be performed.

```
Initialize a disk
Menu: VolumeManager/Disk/AddDisk

  Surface analysis may be necessary to locate any damaged blocks
  on the disk and to arrange for undamaged blocks to be used as
  replacements.  This may take a few minutes to half an hour.
  You can skip this step, if you wish.  However, it is advisable
  that you not skip this step unless you are certain that this
  disk maintains its own list of damaged and replacement blocks,
  and that this list is correct.  If you aren't sure, do surface
  analysis.

Perform surface analysis? [y,n,q,?] (default: y)
```

Press **Return** to allow the surface analysis to be performed.

The surface analysis can take from a few minutes to an hour depending on the type and size of the disk.

11. Once the surface analysis has finished, or immediately if you choose not to perform surface analysis, UVM returns the following display to notify you that the initialization was a success.

```
  Disk initialization for c0.0d2 completed successfully.

Add or initialize another disk? [y,n,q,?] (default: n)
```

Press **Return** to return to the main menu.

Adding a Disk as a Spare

If you wish to add a disk as a spare, follow the steps in "Initializing a New Disk" or "Initializing a Previously-Initialized Disk". However, when you are asked to name a disk group, enter `none` instead of selecting `rootdg` or typing in a disk group name. The disk is then initialized as before, but held as a spare to be used at some later time.

Display Disk Information

Displaying a disk lets you check to see what disks are initialized, to which disk groups they belong, and the disk status. The `list` command displays device names for all recognized disks, the disk names, the disks groups names associated with each disk, and the status of each disk. To display disk information, do the following:

1. Select `1` or `list` on the main menu.

```
Volume Manager Support Operations
Menu: VolumeManager/Disk

 1       Add or initialize a disk
 2       Encapsulate a disk
 3       Remove a disk
 4       Remove a disk for replacement
 5       Replace a failed or removed disk
 6       Mirror volumes on a disk
 7       Move volumes from a disk
 8       Enable access to (import) a disk group
 9       Remove access to (deport) a disk group
 10      Enable (online) a disk device
 11      Disable (offline) a disk device
 list    List disk information

 ?       Display help about menu
 ??      Display help about the menuing system
 q       Exit from menus

Select an operation to perform: 1
```

`voldiskadm` displays the following screen:

```
List disk information
Menu: VolumeManager/Disk/ListDisk

  Use this menu operation to display a list of disks.  You can
  also choose to list detailed information about the disk at
  a specific disk device address.

Enter disk device or "all" [<address>,all,q,?] (default: all)
```

2. At the next prompt, enter the address of the disk you want to see or select `l` or `list` for a list of all disks. If you select `list`, the Volume Manager displays the following information:

```
DEVICE       DISK         GROUP        STATUS
c0.0d0       c0.0d0s0     rootdg       online
c0.0d2       disk01       rootdg       online
c1.4d14      -            -            online


Device to list in detail [<address>,none,q,?] (default: none)
```

3. Enter the address of the device on which you want information. Complete disk information, including the device name, the type of disk, and information about the public and private partitions of the disk, is shown. Once you have examined this information, press **Return** to return to the main menu.

Remove a Disk

To remove a disk, first make sure it has no data on it, the data is no longer needed, or the data can be moved to other disks, then do the following:

1. Select menu item 3, `Remove a disk`, from the main menu to remove the disk from its disk group.

```
Volume Manager Support Operations
Menu: VolumeManager/Disk

 1      Add or initialize a disk
 2      Encapsulate a disk
 3      Remove a disk
 4      Remove a disk for replacement
 5      Replace a failed or removed disk
 6      Mirror volumes on a disk
 7      Move volumes from a disk
 8      Enable access to (import) a disk group
 9      Remove access to (deport) a disk group
 10     Enable (online) a disk device
 11     Disable (offline) a disk device
 list   List disk information

 ?      Display help about menu
 ??     Display help about the menuing system
 q      Exit from menus

Select an operation to perform: 3
```

NOTE You must disable the disk group before you can remove the last disk in that group.

2. On the `Remove a disk` screen, select the disk name of the disk to be removed.

```
Remove a disk
Menu: VolumeManager/Disk/RemoveDisk

  Use this operation to remove a disk from a disk group.  This
  operation takes, as input, a disk name.  This is the same name
  that you gave to the disk when you added the disk to the disk
  group.

Enter disk name [<disk>,list,q,?]
```

3. If there are any volumes on the disk UVM asks you whether they should be evacuated from the disk. If you wish to keep volumes, answer `y`. Otherwise, answer `n`.
4. UVM displays a verification screen:

```
  Requested operation is to remove disk disk01 from group rootdg.

Continue with operation? [y,n,q,?] (default: y)
```

Press **Return** to continue.

5. UVM removes the disk from the disk group and displays the following success message.

```
  Removal of disk disk01 is complete.

Remove another disk? [y,n,q,?] (default: n)
```

Press **Return** to return to the main menu.

You can now remove the disk or leave it on your system as a replacement disk.

Rename a Disk

Rename a disk using the `voledit` command explained in the section entitled "Rename a Disk" in Chapter 3.

Disable (Offline) a Disk

Occasionally, you may need to offline a disk. If the disk is corrupted, you need to offline it and remove it. You may be moving the physical disk device to another location to be connected to another system. To offline a disk, first remove it from any disk group, then do the following:

1. Select menu item `11`, `Disable (offline) a disk device`, from the main menu.

```
Volume Manager Support Operations
Menu: VolumeManager/Disk

 1      Add or initialize a disk
 2      Encapsulate a disk
 3      Remove a disk
 4      Remove a disk for replacement
 5      Replace a failed or removed disk
 6      Mirror volumes on a disk
 7      Move volumes from a disk
 8      Enable access to (import) a disk group
 9      Remove access to (deport) a disk group
 10     Enable (online) a disk device
 11     Disable (offline) a disk device
 list   List disk information

 ?      Display help about menu
 ??     Display help about the menuing system
 q      Exit from menus

Select an operation to perform: 11
```

2. Select the disk you want to disable.

```
Disable (offline) a disk device
Menu: VolumeManager/Disk/OfflineDisk

  Use this menu operation to disable all access to a disk device
  by the volume manager.  This operation can be applied only to
  disks that are not currently in a disk group.  Use this operation
  if you intend to remove a disk from a system without rebooting.

  NOTE:  Many systems do not support disks that can be removed from
         a system during normal operation.  On such systems, the
         offline operation is seldom useful.

Select a disk device to disable [<address>,list,q,?] c1.4d14
```

3. The Volume Manager disables c1.4d14 and then asks if you want to disable another device.

```
Disable another device? [y,n,q,?] (default: n)
```

Press **Return** to return to the main menu.

Enable a Disk

If you move a disk from one system to another during normal system operation, the Volume Manager does not recognize the disk automatically. Use this operation to tell the Volume Manager to scan the disk to find what disk it is, and to determine if this disk is part of a disk group. Also, use this operation to re-enable access to a disk that was disabled by either the disk group deport operation or the disk device disable (offline) operation. To enable a disk, do the following:

1. Select menu item `10`, `Enable (online) a disk device`, from the main menu.

```
Volume Manager Support Operations
Menu: VolumeManager/Disk

 1       Add or initialize a disk
 2       Encapsulate a disk
 3       Remove a disk
 4       Remove a disk for replacement
 5       Replace a failed or removed disk
 6       Mirror volumes on a disk
 7       Move volumes from a disk
 8       Enable access to (import) a disk group
 9       Remove access to (deport) a disk group
 10      Enable (online) a disk device
 11      Disable (offline) a disk device
 list    List disk information

 ?       Display help about menu
 ??      Display help about the menuing system
 q       Exit from menus

Select an operation to perform: 10
```

2. Select the device name of the disk to be enabled or enter `l` for a list of devices.

```
Enable (online) a disk device
Menu: VolumeManager/Disk/OnlineDisk

  Use this operation to enable access to a disk that was disabled
  with the "Disable (offline) a disk device" operation.

  You can also use this operation to re-scan a disk that may have
  been changed outside of the volume manager.  For example, If a
  disk is shared between two systems, the volume manager running on
  the other system may have changed the disk.  If so, you can use
  this operation to re-scan the disk.

  NOTE: Many voldiskadm operations re-scan disks without user
        intervention.  This will eliminate most needs to online a
        disk directly, except when the disk is directly offlined.

Select a disk device to enable [<address>,list,q,?] c1.4d14
```

3. The Volume Manager enables the device and displays the following success screen:

```
Enable another device? [y,n,q,?] (default: n)
```

Press **Return** to return to the main menu.

Replace a Disk

If a disk fails, you need to replace that disk with another. This is referred to as replacing a disk. It requires disabling and removing the failed disk and installing a new disk in its place. To replace a disk, do the following:

1. Select menu item 4, `Remove a disk for replacement`, from the main menu.

```
Volume Manager Support Operations
Menu: VolumeManager/Disk

 1       Add or initialize a disk
 2       Encapsulate a disk
 3       Remove a disk
 4       Remove a disk for replacement
 5       Replace a failed or removed disk
 6       Mirror volumes on a disk
 7       Move volumes from a disk
 8       Enable access to (import) a disk group
 9       Remove access to (deport) a disk group
 10      Enable (online) a disk device
 11      Disable (offline) a disk device
 list    List disk information

 ?       Display help about menu
 ??      Display help about the menuing system
 q       Exit from menus

Select an operation to perform: 4
```

2. At the `Remove a disk for replacement` screen, enter the name of the disk to be replaced or enter `l` for a list of disks.

```
Remove a disk for replacement
Menu: VolumeManager/Disk/RemoveForReplace

  Use this menu operation to remove a physical disk from a disk
  group, while retaining the disk name.  This changes the state
  for the disk name to a removed disk.  If there are any
  initialized disks that are not part of a disk group, you will be
  given the option of using one of these disks as a replacement.

Enter disk name [<disk>,list,q,?] disk02
```

3. Additional screens display if there are volumes associated with the disk you wish to remove. You must decide whether to keep the data associated with the volumes or to allow that data to be lost when the disk is replaced.
4. Select the replacement disk from the list provided in the next prompt screen.

```
  The following devices are available as replacements:

        c1.4d14

  You can choose one of these disks now, to replace disk02.
  Select "none" if you do not wish to select a replacement disk.

Choose a device, or select "none"
[<device>,none,q,?] (default: c1.4d14)
```

Press **Return** to choose the default disk.

5. The Volume Manager displays the following screen:

```
Requested operation is to remove disk disk02 from group rootdg.
The removed disk will be replaced with disk device c1.4d14.

Continue with operation? [y,n,q,?] (default: y)
```

Press **Return** to continue.

6. As the Volume Manager successfully completes the operation, it displays the following screens:

```
Removal of disk disk02 completed successfully.

Proceeding to replace disk02 with device c1.4d14.
```

```
Disk replacement completed successfully.

Remove another disk? [y,n,q,?] (default: n)
```

Press **Return** to return to the main menu.

Replacing a Failed or Removed Disk

Disks can be removed and then replaced later. To do this, follow the instructions for removing a disk provided in "Remove a Disk for Replacement" and do the following:

1. Select menu item 5, `Replace a failed or removed disk`, from the main menu.

```
Volume Manager Support Operations
Menu: VolumeManager/Disk

 1      Add or initialize a disk
 2      Encapsulate a disk
 3      Remove a disk
 4      Remove a disk for replacement
 5      Replace a failed or removed disk
 6      Mirror volumes on a disk
 7      Move volumes from a disk
 8      Enable access to (import) a disk group
 9      Remove access to (deport) a disk group
 10     Enable (online) a disk device
 11     Disable (offline) a disk device
 list   List disk information

 ?      Display help about menu
 ??     Display help about the menuing system
 q      Exit from menus

Select an operation to perform: 5
```

2. Select the disk name of the disk to be replaced.

```
Replace a failed or removed disk
Menu: VolumeManager/Disk/ReplaceDisk

  Use this menu operation to specify a replacement disk for a disk
  that you removed with the "Remove a disk for replacement" menu
  operation, or that failed during use.  You will be prompted for
  a disk name to replace and a disk device to use as a replacement.
  You can choose an uninitialized disk, in which case the disk will
  be initialized, or you can choose a disk that you have already
  initialized using the Add or initialize a disk menu operation.

Select a removed or failed disk [<disk>,list,q,?]  disk02
```

3. The Volume Manager displays the device names of the the disk devices available for use as replacement disks.

```
  The following devices are available as replacements:

        c0.0d2s0 c1.4d14s0

  You can choose one of these disks to replace disk02.
  Choose "none" to initialize another disk to replace disk02.

Choose a device, or select "none"
[<device>,none,q,?] (default: c0.0d2s0)
```

Press **Return** to select the default device or enter the device name of the device of your choice.

4. The Volume Manager displays a confirmation screen.

```
The requested operation is to use the initialized device c0.0d2s0
to replace the removed or failed disk disk02 in disk group rootdg.

Continue with operation? [y,n,q,?] (default: y)
```

Press **Return** to replace the disk.

5. The Volume Manager displays the following success screen:

```
Replacement of disk disk02 in group rootdg with disk device
c0.0d2s0 completed successfully.

Replace another disk? [y,n,q,?] (default: n)
```

Press **Return** to return to the main menu.

Volume Operations

This section describes the volume operations which can be performed with the Volume Manager Support Operations. These volume operations are used to protect data in case of device failures.

Mirror Volumes on a Disk

Mirroring the volumes on a disk gives you one or more copies of your volumes in another disk location. By creating mirror copies of your volumes, you protect yourself against loss of data in case of a disk failure.

Use this operations on your root disk to make a second copy of the boot information available on an alternate disk. This will allow you to boot your system even if your root disk is corrupted.

To mirror volumes on a disk, make sure that the target disk has an equal or greater amount of space as the originating disk and then do the following:

1. Select menu item 6, `Mirror volumes on a disk`, from the main menu.

```
Volume Manager Support Operations
Menu: VolumeManager/Disk

 1      Add or initialize a disk
 2      Encapsulate a disk
 3      Remove a disk
 4      Remove a disk for replacement
 5      Replace a failed or removed disk
 6      Mirror volumes on a disk
 7      Move volumes from a disk
 8      Enable access to (import) a disk group
 9      Remove access to (deport) a disk group
 10     Enable (online) a disk device
 11     Disable (offline) a disk device
 list   List disk information

 ?      Display help about menu
 ??     Display help about the menuing system
 q      Exit from menus

Select an operation to perform: 6
```

2. Select the disk name of the disk whose volumes you wish to mirror.

```
Mirror volumes on a disk
Menu: VolumeManager/Disk/Mirror

  This operation can be used to mirror volumes on a disk.  These
  volumes can be be mirrored onto another disk or onto any
  available disk space.  Volumes will not be mirrored if they are
  already mirrored.  Also, volumes that are comprised of more than
  one subdisk will not be mirrored.

  Mirroring volumes from the boot disk will produce a disk that
  can be used as an alternate boot disk.

Enter disk name [<disk>,list,q,?] disk02
```

3. Select the target disk name (this disk must be the same size or larger than the originating disk).

```
  You can choose to mirror volumes from disk disk02 onto any
  available disk space, or you can choose to mirror onto a specific
  disk.  To mirror to a specific disk, select the name of that disk.
  To mirror to any available disk space, select "any".

Enter destination disk [<disk>,list,q,?] (default: any) disk01
```

NOTE Be sure to always specify the destination disk when you are creating an alternate root disk. Otherwise, the Volume Manager will select a disk to be the alternate root disk; however, your system may not be able to boot from that disk.

4. The Volume Manager displays the verifications screen:

```
The requested operation is to mirror all volumes on disk disk02
in disk group rootdg onto available disk space on disk disk01.

NOTE: This operation can take a long time to complete.

Continue with operation? [y,n,q,?] (default: y)
```

Press **Return** to make the mirror.

5. The Volume Manager displays the status of the operation as it performs the mirroring.

```
Mirror volume voltest-bk00 ...

Mirroring of disk disk01 is complete.
```

6. Once the Volume Manager has completed the mirroring operation, it displays the following screen:

```
Mirror volumes on another disk? [y,n,q,?] (default: n)
```

Press **Return** to return to the main menu.

Move Volumes from a Disk

Before you disable or remove a disk, you may want to move the data from that disk to other disks on the system. To do this, make sure that the target disks have sufficient space, then do the following:

1. Select menu item 7, `Move volumes from a disk`, from the main menu.

```
Volume Manager Support Operations
Menu: VolumeManager/Disk

 1      Add or initialize a disk
 2      Encapsulate a disk
 3      Remove a disk
 4      Remove a disk for replacement
 5      Replace a failed or removed disk
 6      Mirror volumes on a disk
 7      Move volumes from a disk
 8      Enable access to (import) a disk group
 9      Remove access to (deport) a disk group
 10     Enable (online) a disk device
 11     Disable (offline) a disk device
 list   List disk information

 ?      Display help about menu
 ??     Display help about the menuing system
 q      Exit from menus

Select an operation to perform: 7
```

Select the disk name of the disk whose volumes you wish to move.

```
Move volumes from a disk
Menu: VolumeManager/Disk/Evacuate

  Use this menu operation to move any volumes that are using a
  disk onto other disks.  Use this menu immediately prior to
  removing a disk, either permanently or for replacement.

  NOTE:  Simply moving volumes off of a disk, without also removing
         the disk, does not prevent volumes from being moved onto
         the disk by future operations.  For example, using two
         consecutive move operations may move volumes from the
         second disk to the first.

Enter disk name [<disk>,list,q,?] disk01
```

2. The Volume Manager displays the following verification screen:

```
  Requested operation is to move all volumes from disk disk01 in
  group rootdg.

  NOTE: This operation can take a long time to complete.

Continue with operation? [y,n,q,?] (default: y)
```

Press **Return** to move the volumes.

3. As the Volume Manager moves the volumes from the disk, it displays the status of the operation.

```
  Move volume voltest ...
  Move volume voltest-bk00 ...
```

4. When the volumes have all been moved, the Volume Manager displays the following success screen:

```
Evacuation of disk disk01 is complete.

Move volumes from another disk? [y,n,q,?] (default: n)
```

Press Return to return to the main menu.

Disk Group Operations

The following sections describe disk group operations available with the Volume Manager Support operations.

Create a Disk Group

There can be situations in which all data related to a particular set of applications of a particular group of users needs to be made accessible on another system. Examples of this are:

- A system has failed and its data need to be moved to other systems.
- The work load must be balanced across a number of systems.

In such cases, it is important that the data related to particular application(s) or users be located on an identifiable set of disk drives such that, when these drives are moved, all data of the application(s) or group of users on these disk drives is moved and no other data.

NOTE

On most systems, the use of disk groups is not necessary. Therefore, the Volume Manager supports a default disk group, `rootdg`, in which all volumes are created if no further specification is given. All commands will default to `rootdg` as well.

A disk group can only be created along with a disk. A disk group cannot exist with at least one disk associated with it.

If you need to create a disk group in addition to `rootdg`, do the following:

1. On the main menu, select menu item 1, `Add or Initialize a disk`.

```
Volume Manager Support Operations
Menu: VolumeManager/Disk

 1      Add or initialize a disk
 2      Encapsulate a disk
 3      Remove a disk
 4      Remove a disk for replacement
 5      Replace a failed or removed disk
 6      Mirror volumes on a disk
 7      Move volumes from a disk
 8      Enable access to (import) a disk group
 9      Remove access to (deport) a disk group
 10     Enable (online) a disk device
 11     Disable (offline) a disk device
 list   List disk information

 ?      Display help about menu
 ??     Display help about the menuing system
 q      Exit from menus

Select an operation to perform: 1
```

2. UVM prompts you with the following screen:

```
Add or initialize a disk
Menu: VolumeManager/Disk/AddDisk

  Use this operation to add a disk to a disk group.  You can
  select an existing disk group or create a new disk group.  You
  can also initialize a disk without adding it to a disk group,
  which leaves the disk available for use as a replacement disk.
  This operation takes, as input, a disk device, for example
  c0.0d2, a disk group (or none to leave the disk available for
  as a replacement disk).  If you are adding the disk to a disk
  group, you will be asked to give a name to the disk.

Select disk device to add [<address>,list,q,?] c1.4d14
```

Select the address of the disk on which UVM will create the disk group. The following screen appears:

```
Disk device c1.4d14 appears to have been initialized already.
The disk is currently available as a replacement disk.

Do you wish to reinitialize c1.4d14? [y,n,q,?] (default: y) n
```

If you wish to reinitialize your disk, press **Return**. Otherwise, select `n` for no.

3. UVM now prompts you for the disk group name.

```
You can choose to add this disk to an existing disk group, to
create a new disk group, or you can choose to leave the disk
available for use by future add or replacement operations.  To
create a new disk group, select a disk group name that does not
yet exist.  To leave the disk available for future use, specify
a disk group name of "none".

Which disk group [<group>,none,list,q,?] (default: rootdg) newdg
```

Enter the disk group name. In our example, `newdg` is the name of the new disk group.

4. The Volume Manager responds with:

```
There is no active disk group named newdg.

Create a new group named newdg? [y,n,q,?] (default: y)
```

Press **Return** to continue.

5. The Volume Manager prompts you for a disk name.

```
You must now select a disk name for the disk.  This disk name
can be specified to disk removal, move, or replacement
operations.  If you move the disk, such as between host bus
adapters, the disk will retain the same disk name, even though
it will be accessed using a different disk device address name.

Enter disk name [<name>,q,?] (default: newdg01
```

Press **Return** to choose the default disk name. Otherwise, type in a new disk name and press **Return**.

6. UVM displays a confirmations window:

```
The requested operation is to create a new disk group named newdg
containing disk device c1.4d14.  The disk will be named newdg01
within the disk group.

Continue with operation? [y,n,q,?] (default: y)
```

Press **Return** to continue.

7. Once the operation is complete, UVM returns the following display:

```
Disk initialization for c1.4d14 completed successfully.

Add or initialize another disk? [y,n,q,?] (default: n)
```

Press Return to return to the main menu.

Add a Disk to a Disk Group

You may wish to add a new disk to an already established disk group. Perhaps the current disks have insufficient space for the project or work group requirements, especially if these requirements have changed. You can add a disk to a disk group by following the steps required to add a disk. Refer to the section entitled "Adding a Disk".

Deporting a Disk Group

Use this operation to disable access to a disk group that is currently enabled (imported) by this system. Deport a disk group if you intend to move the disks in a disk group to another system. Also, deport a disk group if you want to use all of the disks remaining in a disk group for some new purpose.

To deport a disk group, do the following:

1. Select menu item 9, `Remove access to (deport) a disk group`, from the main menu.

```
Volume Manager Support Operations
Menu: VolumeManager/Disk

 1       Add or initialize a disk
 2       Encapsulate a disk
 3       Remove a disk
 4       Remove a disk for replacement
 5       Replace a failed or removed disk
 6       Mirror volumes on a disk
 7       Move volumes from a disk
 8       Enable access to (import) a disk group
 9       Remove access to (deport) a disk group
 10      Enable (online) a disk device
 11      Disable (offline) a disk device
 list    List disk information

 ?       Display help about menu
 ??      Display help about the menuing system
 q       Exit from menus

Select an operation to perform: 9
```

2. Select the disk group to be deported.

```
Remove access to (deport) a disk group
Menu: VolumeManager/Disk/CreateDiskGroup

  Use this menu operation to remove access to a disk group that
  is currently enabled (imported) by this system.  Deport a disk
  group if you intend to move the disks in a disk group to another
  system.  Also, deport a disk group if you want to use all of the
  disks remaining in a disk group for some new purpose.

  You will be prompted for the name of a disk group.  You will
  also be asked if the disks should be disabled (offlined).  For
  removable disk devices on some systems, it is important to
  disable all access to the disk before removing the disk.

Enter name of disk group [<group>,list,q,?] (default: list) newdg
```

3. The Volume Manager displays a confirmation screen.

```
The requested operation is to disable access to the removable
disk group named newdg.  This disk group is stored on the
following disks:

      newdg01 on device c1.4d14s0

You can choose to disable access to (also known as "offline")
these disks.  This may be necessary to prevent errors if
you actually remove any of the disks from the system.

Disable (offline) the indicated disks? [y,n,q,?] (default: n)
```

Press **Return** to deport the disk group.

4. The Volume Manager asks if you wish to continue with the operation.

```
Continue with operation? [y,n,q,?] (default: y)
```

Press **Return** to continue.

5. Once the group is deported, the Volume Manager displays the following screen.

```
  Removal of disk group newdg was successful.

Disable another disk group? [y,n,q,?] (default: n)
```

Press **Return** to go to the main menu.

Import a Disk Group

Use this menu operation to enable access by this system to a disk group. If you wish to move a disk group from one system to another you must first disable (deport) it on the original system, then move the disk between systems and enable (import) the disk group.

To import a disk group, do the following:

1. Select menu item 8, `Enable access to (import) a disk group`, from the main menu.

```
Volume Manager Support Operations
Menu: VolumeManager/Disk

 1       Add or initialize a disk
 2       Encapsulate a disk
 3       Remove a disk
 4       Remove a disk for replacement
 5       Replace a failed or removed disk
 6       Mirror volumes on a disk
 7       Move volumes from a disk
 8       Enable access to (import) a disk group
 9       Remove access to (deport) a disk group
 10      Enable (online) a disk device
 11      Disable (offline) a disk device
 list    List disk information

 ?       Display help about menu
 ??      Display help about the menuing system
 q       Exit from menus

Select an operation to perform: 8
```

2. Select the name of the disk group to import.

```
Enable access to (import) a disk group
Menu: VolumeManager/Disk/EnableDiskGroup

  Use this operation to enable access to a disk group.  This can be
  used as the final part of moving a disk group from one system to
  another.  The first part of moving a disk group is to use the
  "Remove access to (deport) a disk group" operation on the
  original host.

  A disk group can be imported from another host that failed without
  first deporting the disk group.  Be sure that all disks in the disk
  group are moved between hosts.

  If two hosts share a SCSI bus, be very careful to ensure that the
  other host really has failed or has deported the disk group.  If
  two active hosts import a disk group at the same time, the disk
  group will be corrupted and will become unusable.

Select disk group to import [<group>,list,q,?] (default: list) newdg
```

3. Once the import is complete, the Volume Manager displays the following success screen:

```
  The import of newdg was successful.

Select another disk group? [y,n,q,?] (default: n)
```

Press **Return** to return to the main menu

Exiting the Volume Manager Support Operations

When you have completed all of your disk administration activities, be sure to exit the Volume Manager Support Operations. To exit from the Volume Manager Support Operations, select menu item q from the main menu.

```
Volume Manager Support Operations
Menu: VolumeManager/Disk

1         Add or initialize a disk
2         Encapsulate a disk
3         Remove a disk
4         Remove a disk for replacement
5         Replace a failed or removed disk
6         Move volumes from a disk
7         Create a removable disk group
8         Enable (import) a removable disk group
9         Disable (deport) a removable disk group
10        Enable (online) a disk device
11        Disable (offline) a disk device
list      List disk information
?         Display help about menu
??        Display help about the menuing system
q         Exit from menus

Select an operation to perform: q
```

The OA&M Menu Interface

The Operation, Administration, and Maintenance (OA&M) menu interface is based on the Forms and Menu Language Interface (FMLI), a curses-based menuing package. OA&M controls administrative functions.

The UVM interface with OA&M provides add-on menus to perform basic Volume Manager administration operations.

The OA&M menus, by default, operate on the disk group listed in the `/etc/default/volassist` file. If this file does not exist or the disk group is not listed in this file, the OA&M menus operate on the disk group "rootdg." To change the defaults, use the `Set Defaults` menu.

NOTE

The OA&M menus are available only with UNIX System V, Version 4 or later. If your system uses an earlier version of System V, you will not be able to use the OA&M menus.

Because of the continuing development of the OA&M menu interface, some of your screens may differ in appearance from those in this document.

The buttons along the bottom of the OA&M screen are used as follows:

- F1 =HELP (Help information about a command)
- F2 =CHOICES (The input choices available for a command)
- F3 =SAVE or ENTER (Accepts the input and processes the command)
- F6 =CANCEL (cancel the current display and return to the previous display)
- F7 =CMD-MENU (brings up the command menu)

NOTE

Some of the OA&M buttons have more than one label. These buttons perform different actions at different times. The buttons listed in this document are those that are used most often.

Starting OA&M

To initialize the OA&M menu interface, enter the following command:

```
sysadm
```

The UNIX System V Administration menu appears (Figure 2-2). This menu provides the interface to system administration functions.

Figure 2-2: The System Administration Menu

```
UNIX System V/386 Operations, Administration and Maintenance
                UNIX System V Administration
backup_service    - Backup Scheduling, Setup and Control
file_systems      - File System Creation, Checking and Mounting
machine           - Machine Configuration, Display and Shutdown
network_services  - Network Services Administration
ports             - Port Access Services and Monitors
preSVR4           - Peripherals Setup
printers          - Printer Configuration and Services
restore_service   - Restore From Backup Data
schedule_task     - Schedule Automatic Task
software          - Software Installation and Removal
storage_devices   - Storage Device Operations and Definitions
system_setup      - System Name, Date/Time and Initial Password Setup
users             - User Login and Group Administration
volume_mgmt(old)  - Unisys Volume Manager Administration
volume_mgmt(new)  - Unisys Volume Manager Administration

Move the cursor to the item you want and press RETURN to select it.
```

The administration menu contains a list of several administration options. However, the only operations currently supported are the Volume Manager OA&M operations, listed in the menu as `volume_mgmt (new)` and `volume_mgmt (old)`.

The `volume_mgmt (new)` option represents UVM 1.2.1 and includes new features that are not supplied with UVM 1.1.2. The `volume_mgmt (old)` option represents UVM 1.1.2 and does not have the full functionality supplied with UVM 1.2.1.

Disk Operations

This section describes the disk administration operations available to you using OA&M. However, because the `voldiskadm` menus are faster and simpler to use, it is recommended that you use the disk administration menus provided with the Volume Manager Support operations described in the beginning of this chapter.

Adding a Disk

Whenever you add a new disk to Volume Manager control, you must identify the new disk to the Volume Manager. If you want the disk to be under Volume Manager control, you must add the disk through the following procedure.

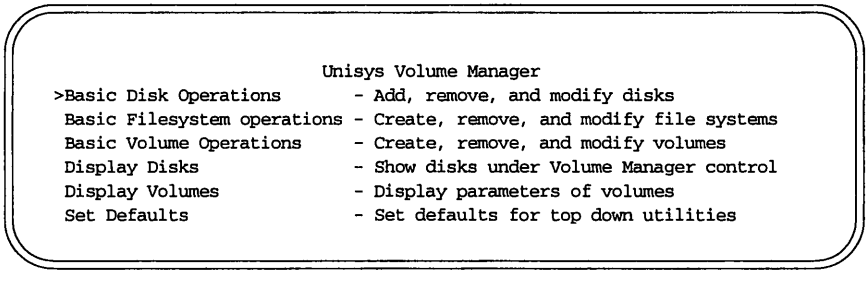
1. At the main menu, use the down arrow key on your keyboard to move the cursor to `volume_mgmt (new)`. Press **Return** to select `volume_mgmt (new)`.

   NOTE

   All of the operations in this section require you to select the `volume_mgmt (new)` menu of OA&M.

   While working with menus and forms, you can return to a previous menu or exit a form without saving by pressing **F6** **(CANCEL).**

2. The `Unisys Volume Manager` menu pops up.



```
                        Unisys Volume Manager
>Basic Disk Operations       - Add, remove, and modify disks
 Basic Filesystem operations - Create, remove, and modify file systems
 Basic Volume Operations     - Create, remove, and modify volumes
 Display Disks               - Show disks under Volume Manager control
 Display Volumes             - Display parameters of volumes
 Set Defaults                - Set defaults for top down utilities
```

   Move the pointer to `Basic Disk Operations` and press **Return**.

3. On the `Basic Disk Operations` menu, select `Add Disks`

```
                        Basic Disk Operations
> Add Disks                    - Add disks to VM and initialize
  Encapsulate Disks            - Add disks to VM, preserving data
  Remove Disks                 - Remove a disk from VM
  Remove Disk For Replacement  - Remove a disk for later replacement
  Replace Disk                 - Replace failed or removed disk
  Evacuate Disk                - Move volumes from a disk
  Display Disks                - Show information about disks in VM
  Enable (online) Devices      - Enable checking of a disk device
  Disable (Offline) Devices    - Disable checking of a disk device
```

4. In the `Add Disks to VM` window, fill in the `Device Address` field. You can use the `CHOICES` button (F2) to list all the devices available.

```
                    Add Disks to VM
Device Address              c0.0d2




Disk Group                  rootdg
Name for disk:              _________
```

5. If the disk has not been previously initialized, the Volume Manager returns the following message:

```
                    Add Disks to VM
Device Address              c0.0d2




Perform surface analysis? yes
Disk Group                  rootdg
Name for disk:              disk01
```

Press **Return** if you wish surface analysis to be performed. It is a good idea to let the surface analysis be performed with a new or unknown disk device.

If the disk has been previously initialized, the Volume Manager returns the following message:

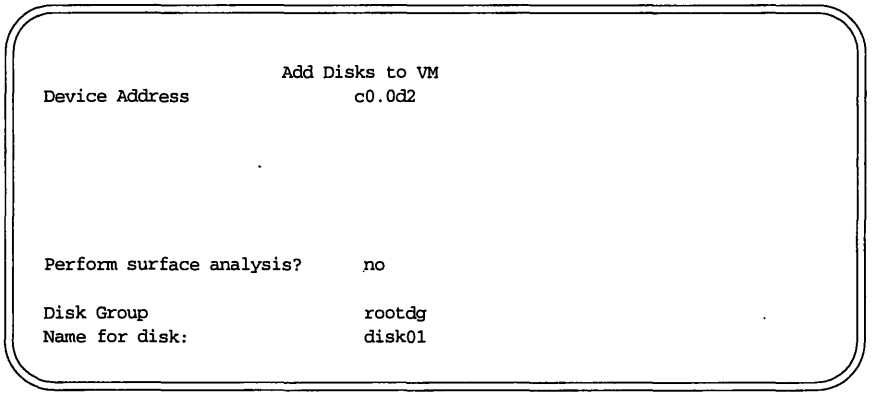
```
                    Add Disks to VM
Device Address              c0.0d2
The device c0.0d2 appears to have already been
initialized and is currently available as a replacement
disk.  Reinitializing it will destroy its current
configuration.
Reinitialize disk?          no

Disk Group                  rootdg
Name for disk:              disk01
```

Press **Return** for no.

6. When you press **Return**, the cursor moves down to the `Disk Group` field. The Volume Manager supplies the default disk group, `rootdg`. If you want your disk to be added to this disk group, press **Return**. If you wish the disk to belong to another disk group or to be kept as a spare, you must change the `Disk Group` field. Either enter the name of the disk group (press **F2** for a list of available disk groups) to which you want the disk added or enter `none` in the `Disk Group` field.

NOTE

You can create other disk groups if necessary. (Instructions for creating a disk group are included in this chapter.) However, for most systems, the use of disk groups is not necessary. Therefore, the Volume Manager supports the default disk group, `rootdg`, in which all volumes are created if no further specification is given. All commands default to `rootdg` as well.



7. After you select the disk group and press [Return], UVM moves the cursor to the `Name for disk:` field. Either press [Return] to accept the default disk name, or type in a name for the disk.

```
                Add or Initialize A Disk
Device Address          c0.0d2




Perform surface analysis?       no

Disk Group              rootdg
Name for disk:          disk01
```

8. Press [F3] (SAVE) to save your new disk information. If the disk needs to be initialized, the Volume Manager responds with the following several screens:

```
The fdisk will now be invoked to allow you to select fdisk
partitions to be used for the DOS operating system, and one
fdisk partition to use for storing UNIX partitions.  Please
create exactly one partition with type UNIX.  If you wish to be
able to boot UNIX on this disk, you must also make the UNIX
partition the active partition.

Press return to continue . . .
```

Press [Return].

9. The next display shows the partitioning of the disk device. You can create partitions, changed the boot partition, delete a partition, update the disk configuration, or exit without updating the disk configuration (see the `fdisk`(1) manual page for configuration information).

Unless you want a DOS disk, create only one UNIX partition to occupy 100% of the disk and make the disk's status `Active`.

```
            Total disk size is 100 cylinders (100.0 MB)

                                          Cylinders               Approx
Partition   Status       Type        Start   End   Length    %      MB
=========   ======   ===========     =====   ===   ======   ===   ======
    1       Active   UNIX System       0     99     100     100    100.0




SELECT ONE OF THE FOLLOWING:

     1.   Create a partition
     2.   Change Active (Boot from) partition
     3.   Delete a partition
     4.   Update (Update disk configuration and exit)
     5.   Exit (Exit without updating disk configuration)
Enter Selection:
```

Select item number 5 and press **Return**.

10. The Volume Manager prompts you to continue.

```
Press ENTER to continue
```

Press **Return** to continue.

11. The Volume Manager displays the message:

```
Setting up disk c0.0d2 . . .
```

as it prepares the disk for initialization. This will take some time, especially when doing surface analysis. Surface analysis can take a few minutes to an hour depending on the type and size of the disk.

The remainder of the messages shown in this document appear whenever you add a disk, with or without initializing it.

12. The Volume Manager displays the following message as it adds the disk to the disk group.

```
Adding device c0.0d2s0 to disk group rootdg as disk disk01 . . .
```

13. Once the disk has been added, the Volume Manager displays a `Success` window.

```
                    Success

The device c0.0d2 has been added to Volume Manager
control as disk disk01 in disk group rootdg.
```

If any errors occur, a window will appear containing the error messages.

Display Disk Information

Before you use a disk, you want to know if it has been initialized. You may need to know if the disk is part of a disk group, especially if the disks are grouped by application or user group. The `list` command displays device names for all recognized disks, the disk names, the disks groups names associated with each disk, and the status of each disk. To display disk information, do the following:

1. Select `volume_mgmt (new)` from the main menu.
2. Select `Display Disks` in the `Unisys Volume Manager` menu.

```
                          Unisys Volume Manager
  Basic Disk Operations .      - Add, remove, and modify disks
  Basic Filesystem operations - Create, remove, and modify file systems
  Basic Volume Operations      - Create, remove, and modify volumes
 >Display Disks                - Show disks under Volume Manager control
  Display Volumes              - Display parameters of volumes
  Set Defaults                 - Set defaults for top down utilities
```

3. In the `Display Disks` window, select the disk you want information on or select `all` for a list of all disks under UVM control.

```
                    Display Disks
>all
 disk00
 disk01
```

4. If you select `disk01`, the Volume Manager displays the disk name, device name, status, and length of disk01. The `list` command also lists any volumes on the disk. Currently, there are no disks associated with disk01.

```
                    Display Disk disk01
Disk Name: disk01                   Status: online
Device Name: c0.0d2s0                Length: 202240

 Volumes on disk disk01:
```

If you select `all`, the Volume Manager displays a list of all disks under its control.

```
                    Display All Disks
DISK            DEVICE                  LENGTH          STATUS
-------------------------------------------------------------------
disk00          c0.0d0s0                143632          ONLINE
disk01          c0.0d2s0                660992          ONLINE
```

Refer to the *Unisys Volume Manager (UVM) System Administrator's Guide* for explanations of the fields shown in the display above.

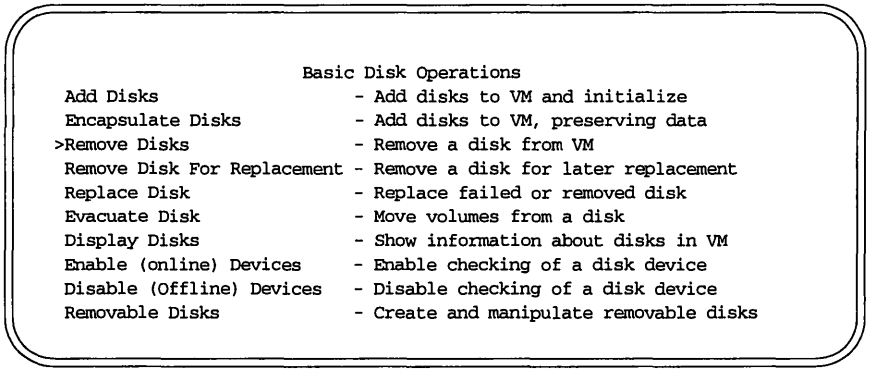
Rename a Disk

Rename a disk using the `voledit` command explained in the section entitled "Rename a Disk" in Chapter 3.

Remove a Disk

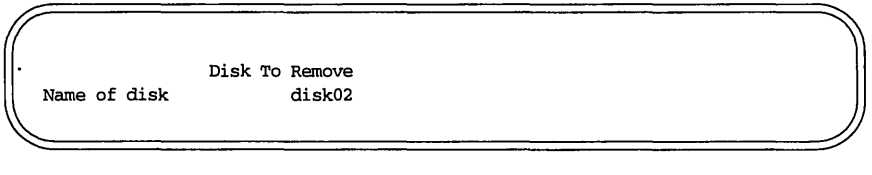
If you find that you no longer need a disk in a particular disk group, you may want to remove it from the group and either put it in a new group or keep it as a spare. If the disk has volumes or file systems on it, they should be moved to other disks or removed. This is true unless the disk is failing. In that case, remove the disk as quickly as possible using `Remove Disks For Replacement`. To remove a disk from a disk group, do the following:

1. Select `Basic Disk Operations` from the `Unisys Volume Manager` menu.
2. Select the `Remove Disks` option.



```
                        Basic Disk Operations
  Add Disks                    - Add disks to VM and initialize
  Encapsulate Disks            - Add disks to VM, preserving data
 >Remove Disks                 - Remove a disk from VM
  Remove Disk For Replacement - Remove a disk for later replacement
  Replace Disk                 - Replace failed or removed disk
  Evacuate Disk                - Move volumes from a disk
  Display Disks                - Show information about disks in VM
  Enable (online) Devices      - Enable checking of a disk device
  Disable (Offline) Devices    - Disable checking of a disk device
  Removable Disks              - Create and manipulate removable disks
```

3. Enter the name of the disk in the `Disk To Remove` window.



```
                 Disk To Remove
  Name of disk           disk02
```

4. Press F3 (ENTER)to save your change.

   If there are any volumes or file systems on your disk, a window will pop up to tell you. You must decide whether to move the data to other disks or allow them to be lost when the disk is removed. If you wish to save the data, follow the instructions in the section entitled "Move Volumes from a Disk." If there are no volumes or file systems on the disk, the Volume Manager displays a `Success` window.

```
The disk disk02 has been removed from Volume Manager
```

Disabling a Device

Occasionally, you may need to disable a device. If the device is corrupted, you need to disable it and remove it. Or you may be moving the physical device to another location to be connected to another system. To disable a disk, you must first remove it from the disk group. See the previous section, "Remove a Disk." To disable a device, do the following:

1. Select `Basic Disk Operations` from the `Unisys Volume manager` menu.

```
                          Unisys Volume Manager
>Basic Disk Operations       - Add, remove, and modify disks
 Basic Filesystem operations - Create, remove, and modify file systems
 Basic Volume Operations     - Create, remove, and modify volumes
 Display Disks               - Show disks under Volume Manager control
 Display Volumes             - Display parameters of volumes
 Set Defaults                - Set defaults for top down utilities
```

2. Enter the name of the device in the `Offline Devices` window.

```
                Offline Disks
Name:                 c0.0d2
```

3. Press the F3 function key (ENTER) to save your change.

   The Volume Manager displays a `Success` window.

```
Disk device c0.0d2 successfully placed offline.
```

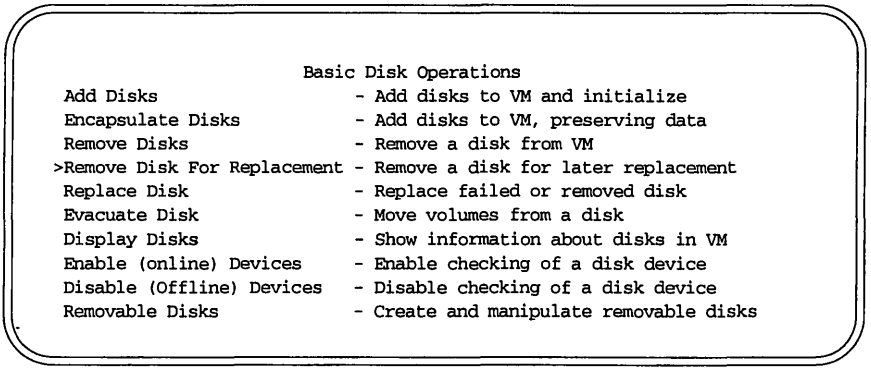
Replace a Disk

If a disk fails, you need to replace that disk with another. This requires disabling and removing the failed disk and installing a new disk in its place. To replace a disk, you must first remove the disk for replacement. Then you can add a disk to replace the one you removed. To remove and replace a disk, do the following:

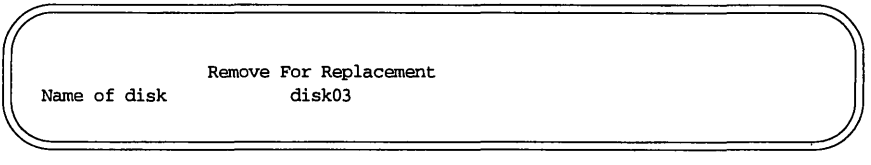
1. Select `Basic Disk Operations` from the `Unisys Volume manager` menu.

```
                        Unisys Volume Manager
>Basic Disk Operations       - Add, remove, and modify disks
 Basic Filesystem operations - Create, remove, and modify file systems
 Basic Volume Operations     - Create, remove, and modify volumes
 Display Disks               - Show disks under Volume Manager control
 Display Volumes             - Display parameters of volumes
 Set Defaults                - Set defaults for top down utilities
```

2. Select `Remove Disk For Replacement` from the `Basic Disk Operations` menu.

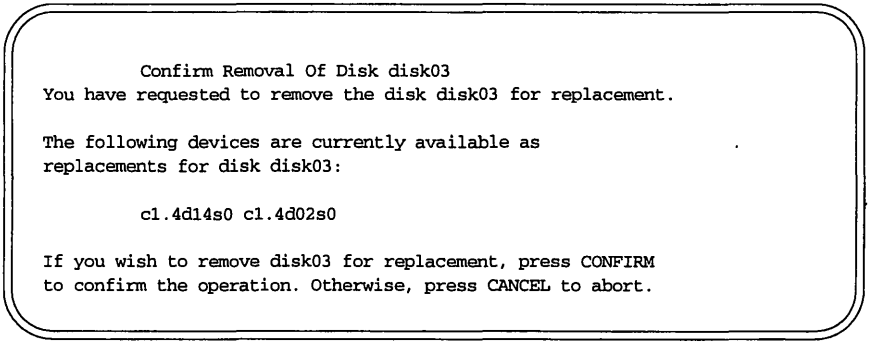


3. Enter the name of the device in the `Remove For Replacement` window.



4. Press the F3 function key (ENTER) to save your change.

   The Volume Manager displays a confirmation window.



5. Press the F3 function key to confirm.
6. The Volume Manager displays a `Success` window.

```
        Success
The disk disk03 was successfully removed for replacement.
```

7. Select `Replace Disk` from the `Basic Disk Operations` menu.

```
                        Basic Disk Operations
  Add Disks                    - Add disks to VM and initialize
  Encapsulate Disks            - Add disks to VM, preserving data
  Remove Disks                 - Remove a disk from VM
  Remove Disk For Replacement  - Remove a disk for later replacement
 >Replace Disk                 - Replace failed or removed disk
  Evacuate Disk                - Move volumes from a disk
  Display Disks                - Show information about disks in VM
  Enable (online) Devices      - Enable checking of a disk device
  Disable (Offline) Devices    - Disable checking of a disk device
  Removable Disks              - Create and manipulate removable disks
```

8. In the `Replace Disk` window, put the name of the disk to be replaced in the `Disk to replace` field. If you need to see the disks available, press F2 (CHOICES).

```
                    Replace Disk

Disk to replace             disk03
Replacement Device:         _____________________
```

9. Enter the device name of the disk to be used as a replacement disk in the `Replacement Device:` field.

```
                Replace Disk
Disk to replace          disk03
Replacement Device:      c1.4d14
```

If you don't know what disks are available, press **F2** (CHOICES) for a list of available devices.

10. Press **Return** to add the disk.
11. The Volume Manager displays the following message:

```
                Replace Disk
Disk to replace          disk03
Replacement Device:      c1.4d14



Perform surface analysis?   yes
```

12. Press **F3** (ENTER) to save your changes.
13. The Volume Manager displays a `Success` window to notify you of the successful completion of the replacement.

```
                    Success
The device c1.4d14 has been added to Volume Manager
control as a replacement for the disk disk03 in
disk group rootdg.
```

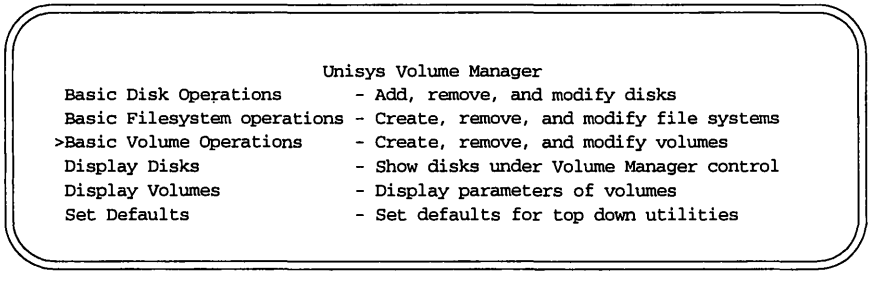
Volume Operations

This section describes the volume administration operations available to you using OA&M.

Create a Volume

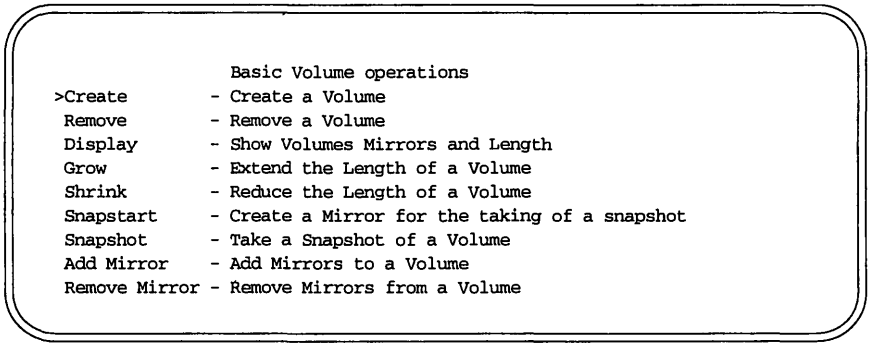
To create a volume, do the following:

1. Select `Basic Volume Operations` from the main menu.



```
                        Unisys Volume Manager
 Basic Disk Operations       - Add, remove, and modify disks
 Basic Filesystem operations - Create, remove, and modify file systems
>Basic Volume Operations     - Create, remove, and modify volumes
 Display Disks               - Show disks under Volume Manager control
 Display Volumes             - Display parameters of volumes
 Set Defaults                - Set defaults for top down utilities
```

2. Select `Create` from the `Basic Volume Operations` menu.



```
                Basic Volume operations
>Create         - Create a Volume
 Remove         - Remove a Volume
 Display        - Show Volumes Mirrors and Length
 Grow           - Extend the Length of a Volume
 Shrink         - Reduce the Length of a Volume
 Snapstart      - Create a Mirror for the taking of a snapshot
 Snapshot       - Take a Snapshot of a Volume
 Add Mirror     - Add Mirrors to a Volume
 Remove Mirror - Remove Mirrors from a Volume
```

3. In the `Create Volumes` window, enter the name of your new volume in the `Volume Name:` field

```
                    Create Volumes
Volume Name:              voltest
Volume Length:            _____________
Number of Mirrors:        1
Volume Layout:            concat


Logging Type:             None
Disk Group:               rootdg
Disk List:
c0.0d0s0 disk01
```

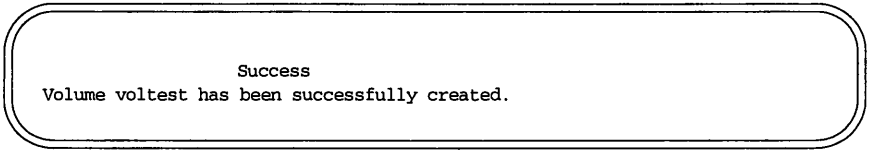
4. Enter the desired volume length. For information about volume length specifications, see the `volintro` man page.

```
                    Create Volumes
Volume Name:              voltest
Volume Length:            100000
Number of Mirrors:        2
Volume Layout:            concat


Logging Type:             None
Disk Group:               rootdg
Disk List:
c0.0d0s0 disk01
```

5. Press **Return** to select the default layout, or press **F2** (CHOICES) to choose another layout. See the *Unisys Volume Manager (UVM) System Administrator's Guide* for a description of alternate layouts.

6. Press **F3** (ENTER) to save the new volume.

7. The Volume Manager displays the following `Success` message window:



This produces a concatenated volume since the defaults were chosen.

A concatenated volume consists of one or more sections of disk space (subdisks). This allows you to put together a volume larger than any individual section of free disk space available.

Striped Volume

A striped volume consists of a number of equal sized subdisks, each located on a separate disk drive. For more information on striping, refer to Chapter 1.

To create a striped volume, enter `striped` in the `Volume Layout:` field, the Number of stripes in the `Number of stripes` field, and the stripe width in the `Stripe width` field of the `Create Volume` window.

For more information about striped volumes, see the *Unisys Volume Manager (UVM) System Administrator's Guide.*

Displaying Volume Configuration Information

If you are administering a volume created by someone else, you may want to know how this volume is configured. To display volume configuration information, do the following:

1. Select the `Basic Volume Operations` menu.
2. Select `Display` on the `Basic Volume Operations` menu.

```
                Basic Volume operations
 Create        - Create a Volume
 Remove        - Remove a Volume
>Display       - Show Volumes Mirrors and Length
 Grow          - Extend the Length of a Volume
 Shrink        - reduce the Length of a Volume
 Snapstart     - Create a Mirror for the taking of a snapshot
 Snapshot      - Take a Snapshot of a Volume
 Add Mirror    - Add Mirrors to a Volume
 Remove Mirror - Remove Mirrors from a Volume
```

3. Select either `all` or the name of a specific volume from the `Display Volumes` menu.

```
        Display Volumes
>all
 voltest
```

4. The Volume Manager displays the volume information.

```
                        Display all Volumes

TYPE    NAME            ASSOC    KSTATE     LENGTH       COMMENT
------------------------------------------------------------------------
vol     voltest         fsgen    ENABLED    1000000
vol     voltest02       fsgen    ENABLED    256
```

For an explanation of the fields in this display, refer to the *Unisys Volume Manager (UVM) System Administrator's Guide.*

If you select to display one volume, such as voltest02, the display is similar to this:

```
                        Display Volume voltest02

TYPE    NAME            ASSOC    KSTATE       LENGTH        COMMENT
vol     voltest02       fsgen    ENABLED      256

Number of mirrors on voltest02: 1

Volume voltest02 occupies space on the following disks:
disk00 disk03
```

For an explanation of the fields in this display, refer to the *Unisys Volume Manager (UVM) System Administrator's Guide.*

Mirror a Volume

A mirror (also called a plex) is a copy of a volume and its data. The mirror copy is not stored on the same disk(s) as the original copy of the volume. Mirroring a volume assure you that the data in that volume will not be lost if one of your disk fails. To mirror a volume, do the following:

1. Select the `Basic Volume Operations` menu.
2. Select `Add Mirror`.

```
                Basic Volume operations
  Create        - Create a Volume
  Remove        - Remove a Volume
  Display       - Show Volumes Mirrors and Length
  Grow          - Extend the Length of a Volume
  Shrink        - reduce the Length of a Volume
  Snapstart     - Create a Mirror for the taking of a snapshot
  Snapshot      - Take a Snapshot of a Volume
 >Add Mirror    - Add Mirrors to a Volume
  Remove Mirror - Remove Mirrors from a Volume
```

3. Enter the name of the volume to be mirrored in the `Mirror a Volume` window.

```
                    Mirror a Volume
Mirror Volume named:                  voltest

Layout For this mirror:               concat, noncontig
```

4. Press F3 (ENTER) to create a new mirror.

Remove a Mirror

You may have more than one mirror for each volume. If you find that you have more mirrors than you need, you can remove a mirror. Or, if you feel the volume no longer needs to be mirrored (for example if the volume is no longer being actively changed and is archived somewhere) you can remove the only mirror of a volume. To remove a mirror, do the following:

1. Select the Basic Volume Operations menu.
2. Select `Remove Mirror`.

```
                  Basic Volume operations
  Create        - Create a Volume
  Remove        - Remove a Volume
  Display       - Show Volumes Mirrors and Length
  Grow          - Extend the Length of a Volume
  Shrink        - Reduce the Length of a Volume
  Snapstart     - Create a Mirror for the taking of a snapshot
  Snapshot      - Take a Snapshot of a Volume
  Add Mirror    - Add Mirrors to a Volume
 >Remove Mirror - Remove Mirrors from a Volume
```

3. The `Remove Mirrors` window appears.

```
                              Remove Mirrors
Remove a Mirror from the Volume named:          voltest
Number of Mirrors currently on this Volume:     3
press Choices to Select Mirrors to Remove
```

Enter the name of the volume from which you want to remove a mirror.

4. Select the mirror you wish to remove. To get a list of mirrors available for removal, press **F2** (CHOICES). The Volume Manager returns a list of mirrors.

```
   Select Mirrors to be removed
Select the mirrors using MARK
and press ENTER.

MIRROR     DISKS OCCUPIED
voltest-01         disk00
voltest-03         disk03
```

Select the mirror to be removed and press **F3** to remove the mirror.

5. The Volume Manager returns a `Success` window.

```
The mirror voltest-03 was successfully removed from
the volume voltest.
```

Extend a Volume

If the volume is not large enough for the amount of data being stored in it, you need to extend the volume's length. To extend a volume, do the following:

1. Select the `Basic Volume Operations` menu.
2. Select `Grow`.

The Extend a Volume operation cannot be used with striped volumes.

3. Enter the name of the volume you want to extend in the `Volume name:` field of the `Extend a Volume's length` menu.
4. Enter either the amount you want to extend the volume by

```
                    Extend a Volume's Length
Volume Name:                voltest
Current Length:             1000000
Increase Length by:         100
Increase Length to:         1000100
All lengths in 512 byte sectors
```

or the length you want to extend the volume to.

```
                    Extend a Volume's Length
Volume Name:                voltest
Current Length              1000000
Increase Length by:         100
Increase Length to:         1000100
All lengths in 512 byte sectors
```

5. Press F3 to save your change.
6. The Volume Manager displays a `Success` window to inform you that it completed your volume extend successfully.

Shrink a Volume

If you find that your volume is much larger than you really need it to be, you can shrink the volume's size. To shrink a volume, do the following:

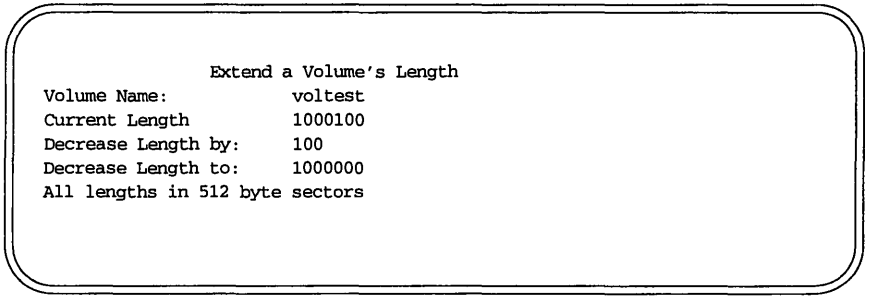
1. Select the `Basic Volume Operations` menu.

> **NOTE** Be sure to back up any data in a volume prior to shrinking the volume. Otherwise, data may be lost.

2. Select `Shrink`.
3. Enter the name of the volume you want to shrink in the `Volume Name:` field of the `Reduce a Volume's Length` menu.

```
                Reduce a Volume's Length
Volume Name:              voltest
Current Length:           1000100
Decrease Length by:       100
Decrease Length to:       1000000
All lengths in 512 byte sectors
```

or the length you want to shrink the volume to.

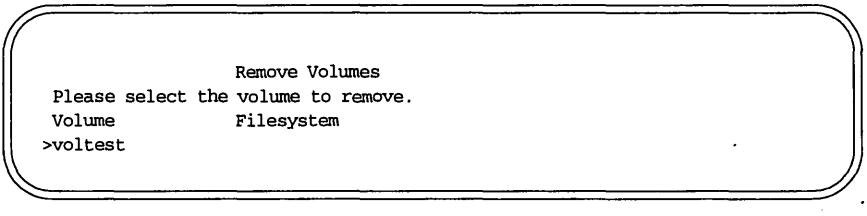


4. Press F3 to save your change.
5. The Volume Manager displays a `Success` window to inform you that it completed your volume shrink successfully.

Remove a Volume

Once a volume is no longer necessary (it is inactive and archived, for example), you can remove the volume and free up the disk space for other uses. To remove a volume, do the following:

1. Select `Basic Volume Operations`.
2. Select `Remove`.
3. Select the volume you wish to remove from the list of volumes in the `Remove Volumes` menu.



4. Click the mouse button on the volume to be removed, the Volume Manager displays the following message:

```
        Confirm Removal of Volume voltest
You have requested that the volume voltest be removed.

If you still wish to remove the volume voltest, press CONFIRM
to confirm the operation; otherwise, press CANCEL to abort.
```

5. Press F3 (CONFIRM) to remove the volume.

Back Up a Volume

It is very important to make back up copies of your volumes. This provides a copy of the data as it stands at the time of the backup. Backup copies are used to restore volumes lost due to disk failure, or data destroyed due to human error. Backing up a volume involves the following procedure:

1. Select the `Basic Volume Operations` menu.
2. Select `Snapstart`

```
                Basic Volume operations
  Create        - Create a Volume
  Remove        - Remove a Volume
  Display       - Show Volumes Mirrors and Length
  Grow          - Extend the Length of a Volume
  Shrink        - reduce the Length of a Volume
 >Snapstart     - Create a Mirror for the taking of a snapshot
  Snapshot      - Take a Snapshot of a Volume
  Add Mirror    - Add Mirrors to a Volume
  Remove Mirror - Remove Mirrors from a Volume
```

3. In the `Snapstart` window, enter the name of the volume to be backed up.

```
                    Snapstart
Create a Backup Mirror for Volume named:   voltest
Run in background?                         no
```

4. Press F3 to create a backup mirror.

   The Volume Manager displays the following screen while it creates the backup mirror:

```
Creating a backup mirror (this could take some time) . . .
```

5. Once the backup mirror is created, the Volume Manager displays the following message:

```
                      Success
A snapshot mirror has been attached to volume voltest and is
now caught up.  A snapshot volume can now be created using
the snapshot operation.
```

   Press F3 to CONTINUE.

6. In the `Basic Volume Operations` menu, select `Snapshot`

```
                Basic Volume operations
 Create        - Create a Volume
 Remove        - Remove a Volume
 Display       - Show Volumes Mirrors and Length
 Grow          - Extend the Length of a Volume
 Shrink        - reduce the Length of a Volume
 Snapstart     - Create a Mirror for the taking of a snapshot
>Snapshot      - Take a Snapshot of a Volume
 Add Mirror    - Add Mirrors to a Volume
 Remove Mirror - Remove Mirrors from a Volume
```

7. UVM prompts you for the name of the volume to be backed up.

```
                        Snapshot
Take a snapshot of Volume named:  voltest
Name of snapshot Volume:          _____________________
```

Enter the name of the volume.

8. The Volume Manager fills in the `Name of snapshot Volume:` field with the default backup name.

```
                        Snapshot
Take a snapshot of Volume named:  voltest
Name of snapshot Volume:          voltest-bk00
```

Press **F3** to save the default name or choose a name for the backup volume and press **F3**.

9. Once the backup volume is created, the Volume Manager displays the following `Success` window:

```
                                Success

The volume voltest-bk00 is now a snapshot backup of volume voltest
and is available for reading.
```

File System Operations

This section describes the file system administration operations available with OA&M.

Make and Mount a File System

A file system is a collection of files that can be mounted on a volume. To make a file system, do the following:

1. Select `Basic Filesystem Operations` menu.

```
                Unisys Volume Manager
 Basic Disk Operations        - Add, remove, and modify disks
>Basic Filesystem operations  - Create, remove, and modify file systems
 Basic Volume Operations      - Create, remove, and modify volumes
 Display Disks                - Show disks under Volume Manager control
 Display Volumes              - Display parameters of volumes
 Set Defaults                 - Set defaults for top down utilities
```

2. On the `File System Operations` menu, select `Create`.

```
                File System Operations
>Create  - Create and mount a File System on a Volume
 Remove  - Remove a File System
 Display - Show a File System's Attributes
 Grow    - Extend the Length of a File System
 Shrink  - Reduce the Length of a File System
```

3. In the `Create a File System on a Volume`, select the mount point directory for the new file system.

```
              Create a File System on a Volume
File System mount point:                  /usr/pub/fstest
Create filesystem on volume named:
Length of filesystem (512 byte sectors):
File System type:                         vxfs
```

4. Press **Return**.

   The Volume Manager adds two lines to the `Create a File System on a Volume` menu.

```
              Create a File System on a Volume
File System mount point:                  /usr/pub/fstest
Create filesystem on volume named:
Length of filesystem (512 byte sectors):
File System type:                         vxfs
Automatically mount on reboot?            yes
Mount now?                                yes
```

5. Select the volume on which you want to create a file system or select to create a new volume.

```
                Create a File System on a Volume
File System mount point:                    /usr/pub/fstest
Create filesystem on volume named:          voltest
Length of filesystem (512 byte sectors):
File System type:                           vxfs
Automatically mount on reboot?              yes
Mount now?                                  yes
```

6. Press **Return**.

   If the volume exists, the Volume Manager fills in the entire length of the volume in the `Length of filesystem` field.

```
                Create a File System on a Volume
File System mount point:                    /usr/pub/fstest
Create filesystem on volume named:          voltest
Length of filesystem (512 byte sectors):    10000
File System type:                           vxfs
Automatically mount on reboot?              yes
Mount now?                                  yes
```

   If the volume doesn't exist, OA&M displays the following screen:

```
volprint: Record voltest not found;
```

Press Return for the next screen. This screen instructs as follows:

```
Press CHOICES for a valid list, or enter "make a new volume";
```

Either press F2 for CHOICES, or enter `make a new volume` and follow the directions for making a new volume.

7. Change the length of the file system to the length you want, or choose the default.
8. Press Return.
9. If you don't want the file system to mount automatically every time the system is rebooted, change the `yes` to `no` in the `Automatically mount on reboot` field.
10. If you do not want to mount the file system immediately when you press F3, change the `yes` to `no` in the `Mount now?` field.
11. Press F3 to create the file system.

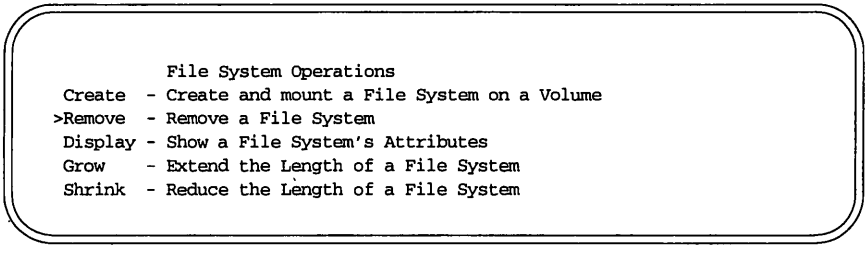
    The creation and mounting of the file system takes a few moments.
12. Once the file system has been created and mounted, a `Success` window appears.

```
                    Success

A file system of type vxfs has been created on the volume voltest.
it has been mounted on the directory /usr/pub/fstest and will
automatically be mounted there when the system is booted.
```

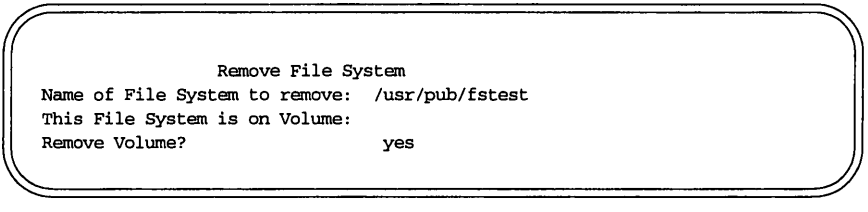
Removing a File System

If a file system is no longer needed, you may wish to archive it and then remove it. After you have archived the file system, follow the steps below to remove the file system.

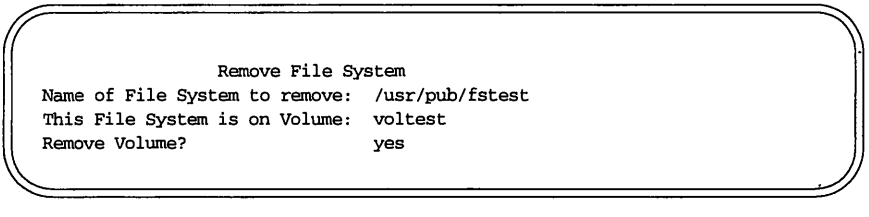
1. Select the `Basic Filesystem Operations` menu.
2. Select the `Remove` menu from the `File System Operations` menu.



3. In the `Remove File System` menu, enter the name of the file system that you want to remove.



4. The name of the volume on which the file system resides appears in the `remove File Systems` window.

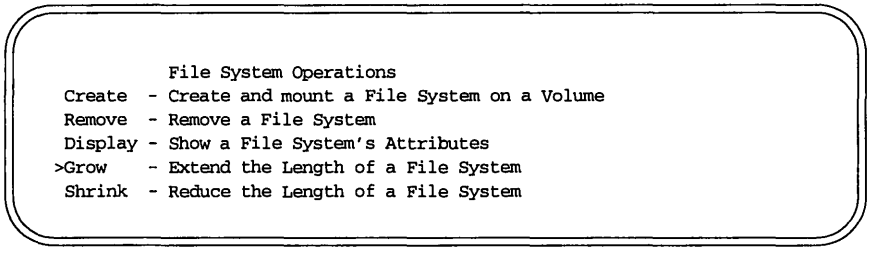


5. Press F3 if you wish to remove the entire volume. Otherwise, enter no in the remove Volume? field of the Remove File System window and then press F3 to remove the file system.

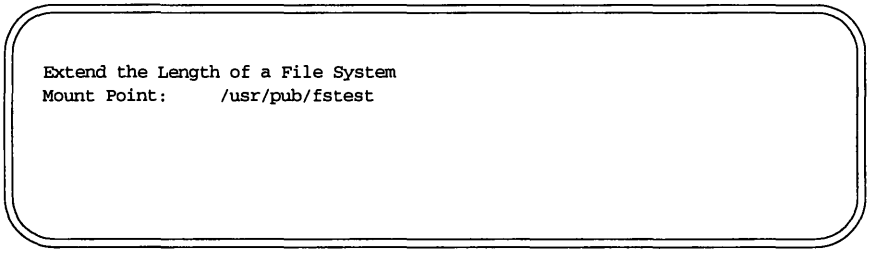
Extending a File System

If you find that your file system is not large enough to handle all the data, you can increase the length of the file system. To extend a file system, do the following:

1. In the File System Operations menu, select Grow.



2. In the Extend the Length of a File System window, enter the mount point of the file system you want to extend.



The volume name and current length of the volume appear in the `Extend the length of a File system` window.

```
Extend the Length of a File System
Mount Point:      /usr/pub/fstest
Volume            voltest
Current Length:   10000
Length Modifier   _____________
New Length
```

3. Enter the new length in 512-byte sectors (or a plus sign (+) and the number of sectors by which you want the file system to grow) in the `Length Modifier` field.

```
Extend the Length of a File System
Mount Point:      /usr/pub/fstest
Volume            voltest
Current Length:   10000
Length Modifier   +500
New Length        10500
```

4. Press F3 to save the change.

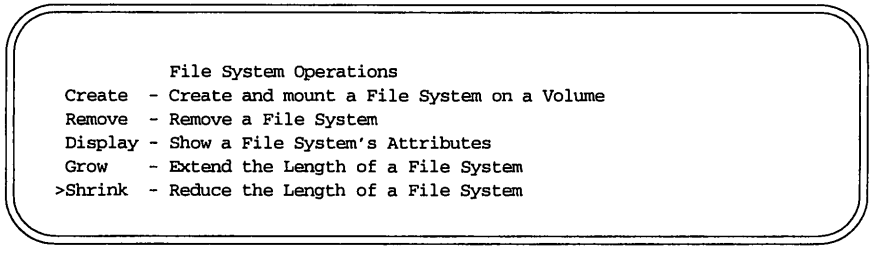
NOTE

This operation is only possible with the VxFS advanced file system. The extend operation can not be done for file systems on striped volumes if the new length would exceed the size of the volume.

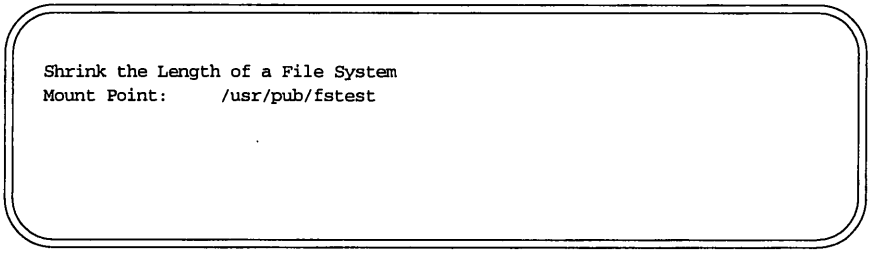
Shrinking a File System

If you find that you have allocated more space for your file system than you need, you can decrease the size of the file system. To shrink the file system, do the following:

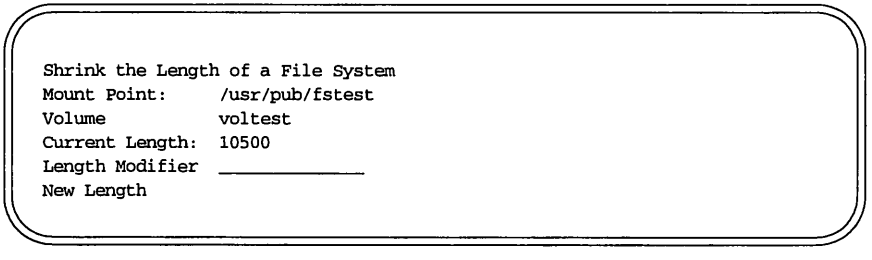
1. In the `File System Operations` menu, select `Shrink`.



2. Enter the mount point of the file system in the `Shrink the Length of a File System` window.



3. The volume name and the current length of the file system appear in the `Shrink the Length of a File System` window.



4. Enter the new length (or a minus sign (-) and the amount you want to shrink the file system) in the `Length Modifier` field.

```
Shrink the Length of a File System
Mount Point:      /usr/pub/fstest
Volume            voltest
Current Length:   10500
Length Modifier   -500
New Length          10000
```

5. Press F3 to save the change.

NOTE

Shrinkage is only possible with the VxFS advanced file system. You cannot shrink striped volumes.

Display Mounted File Systems

It is important to keep track of which file systems are mounted and which are not. This saves users from trying to access unmounted file systems. You can look at the status of file systems by doing the following:

1. Select `Display` in the `File System Operations` menu.

```
              File System Operations
  Create  - Create and mount a File System on a Volume
  Remove  - Remove a File System
 >Display - Show a File System's Attributes
  Grow    - Extend the Length of a File System
  Shrink  - Reduce the Length of a File System
```

2. Either select `all` or the volume name of the volume for which you want to see the file system.

```
Display Mounted File Systems
all
voltest     /usr/pub/fstest
```

If you select `all`, the Volume Manager displays all the mounted file systems on all volumes under Volume Manager control.

```
          Display Volumes With Mounted File Systems
Mount Dir        Filesystem              blocks  used   avail   %used
-------------------------------------------------------------------

/usr/pub/f       /dev/vol/voltest           500   106     394     21%
```

if you select a specific volume, the Volume Manager displays the following information concerning the file system.

```
          Display Mounted File System voltest
Mount Dir        Filesystem              blocks  used   avail   %used
-------------------------------------------------------------------
/usr/pub/fstest      (/dev/vol/voltest):    394 blocks     43 files
                                 total:     500 blocks     48 files
```

For a full description of the fields shown in the displays above, refer to the *Unisys Volume Manager (UVM) System Administrator's Guide*

Quitting OA&M

When you have finished your administrative tasks, be sure to exit OA&M. To exit the OA&M session, do the following:

1. Press the CMD-MENU key, (F7) to view the Command menu.
2. Position the pointer beside `exit`
3. Press (Return) to return to the command line prompt.

3 Command Line Interface

Introduction

This chapter presents some of the most frequently-used administrative commands provided by the Volume Manager. Each function is accompanied by the appropriate procedure(s) necessary to complete that function.

For details on any of the commands mentioned in this chapter, refer to the appropriate manual pages in the *Unisys Volume Manager (UVM) System Administrator's Guide.*

The functions described in this chapter can also be performed using the menu interfaces (the Volume Manager Support Operations and OA&M) in Chapter 2.

Disk Operations

This section summarizes how to perform various disk and disk group operations. The majority of these operations can be performed more easily using the Volume Manager Support Operations menus (`voldiskadm`) discussed in Chapter 3. The `voldiskadm` menus are recommended for users new to the Volume Manager.

Adding Disks

When you add a disk to a system that is running the Volume Manager, you may wish to put the disk under control of the Volume Manager so that it can control the space allocation on the disk. If the disk was previously in use, but not under Volume Manager control, then you may wish to preserve existing data on the disk while still letting the Volume Manager take control of the disk. This can be accomplished using the encapsulation function of the Volume Manager. If the disk is new, then it will need to be initialized. If a disk was previously not under Volume Manager control, but no data is required to be preserved, an initialization operation should also be performed.

NOTE

When you perform disk administration, it is important that you recognize the difference between a *device name* and a *disk name.*

The *device name* (sometimes referred to as *devname* or *disk access name*) is the location of the disk. The syntax of a device name for an internal SCSI channel is `c`*x*`.`*y*`d`*z*`s`*n*, where:

x is the controller type (for example, normally 0).

y is the controller number (for example, normally 0).

z is the logical disk number of the target disk.

n is the number of the disk slice.

The full pathname of a device is `/dev/dsk/`*devicename*. In this document, only the device name is listed and `/dev/dsk` is assumed. An example of a device name is `c0.0d0s0`.

The *disk name* (sometimes referred to as *disk media name*) is an administrative name for the disk, such as *disk01*. If you do not assign a disk name, the disk name defaults to `disk`*nn*, where *nn* is a sequence number if the disk is being added to `rootdg`. Otherwise, the default disk name is *groupnamenn*, where *groupname* is the name of the disk group to which the disk is added.

Add a disk by entering the command:

`voldiskadd` *devname*

To add the device c0.0d2 to Volume Manager control,do the following:

1. Enter:

   ```
   voldiskadd c0.0d2
   ```

2. `voldiskadd` displays the following screen:

```
Add or initialize a disk
Menu: VolumeManager/Disk/AddDisk

  Use this operation to add a disk to a disk group.  You can
  select an existing disk group or create a new disk group.  You
  can also initialize a disk without adding it to a disk group,
  which leaves the disk available for use as a replacement disk.
  This operation takes, as input, a disk device, for example
  c0.0d2, a disk group (or none to leave the disk available for
  as a replacement disk).  If you are adding the disk to a disk
  group, you will be asked to give a name to the disk.

  Disk device c0.0d2 does not appear to have been initialized for
  use with the volume manager.  However, it may have been initialized
  for other purposes.  You may want to encapsulate the existing
  disk partitions as volumes instead of adding it as a new disk.

Do you wish to encapsulate c0.0d2? [y,n,q,?] (default: y)
```

If your disk is already partitioned and you want to keep the data as it is, press **Return**. If the disk has not been partitioned or if you don't need to keep the data on a previously-partitioned disk, enter n and press **Return**.

3. Regardless of your answer in the previous screen, the Volume Manager prompts you for a disk group name.

```
You can choose to add this disk to an existing disk group, to
create a new disk group.  To create a new disk group, select a
disk group name that does not yet exist.

Which disk group [<group>,list,q,?] (default: rootdg)
```

Press **Return** to assign the disk to the default disk group `rootdg`. Otherwise, enter the name of the disk group to which you want the disk assigned or enter `none` to assign the disk as a spare.

NOTE You can create other disk groups if necessary. (Instructions for creating a disk group are included later in this chapter.) However, for most systems, the use of disk groups is not necessary. Therefore, the Volume Manager supports the default disk group, `rootdg`, in which all volumes are created if no further specification is given. All commands default to `rootdg` as well.

4. The Volume Manager now prompts you for a disk name (unless you entered `none` for a disk group, since spare disks do not get named).

```
You must now select a disk name for the disk.  This disk name
can be specified to disk removal, move, or replacement
operations.  If you move the disk, such as between host bus
adapters, the disk will retain the same disk name, even though
it will be accessed using a different disk device address name.

Enter disk name [<name>,q,?] (default: disk01)
```

If you selected to encapsulate the disk and chose the the default disk group `rootdg` and the default disk name (in this case `disk01`), the following screen is displayed.

```
The requested operation is to encapsulate disk device c0.0d2 and
to add this device to disk group rootdg as disk disk01.  The
system must be rebooted before this can take effect.

Continue with operation? [y,n,q,?] (default: y)
```

If you are initializing a non-partitioned disk or reinitializing a previously-partitioned disk and selected the default disk group and disk name, the following screen appears:

```
The requested operation is to initialize disk device c0.0d2 and
to add this device to disk group rootdg as disk disk01.

Continue with operation? [y,n,q,?] (default: y)
```

In either case, press **Return** if you wish to continue with the chosen operation.

5. If you are encapsulating a disk, the following screen appears next:

```
The first stage of encapsulation for c0.0d0 has completed
successfully.  You should now reboot your system at the earliest
possible opportunity.  The encapsulation will require two or three
reboots which will happen automatically after the next reboot.
To reboot execute the command:

      shutdown -g0 -y -i6

This will update the /etc/vfstab file so that volume devices are
used to mount the file systems on this disk device.  You will need
to update any other references such as backup scripts, databases,
or manually created swap devices.

Encapsulate another disk? [y,n,q,?] (default: n)
```

Press **Return** to exit the `voldiskadd` session.

If you are initializing a non-partitioned disk, the next screen is:

```
Initialize a disk
Menu: VolumeManager/Disk/AddDisk

      The recommended default partitioning for your disk is:

        a 100% "UNIX System" partition.

      To select this, please type "y".  To partition your disk
      differently, type "n" and the "fdisk" program will let you
      select other partitions.
```

Type y to select the default UNIX partitioning. If you want a different set up, enter n and follow the directions on the subsequent screens.

6. If you selected to have UNIX partitioning for your non-partitioned disk or if you are repartitioning a previously partitioned disk, this will be your next screen:

```
Initialize a disk
Menu: VolumeManager/Disk/AddDisk

  The fdisk utility will now be invoked to allow you to select
  partitions to be used for the DOS operating system, and one
  fdisk partition to use for storing UNIX partitions.  Please
  create exactly one partition with type UNIX.  If you wish to be
  able to boot UNIX on this disk, you must also make the UNIX
  partition the active partition.

Continue? [y,n,q,?] (default: y)
```

Press Return to continue.

7. The fdisk utility partitions the disk in a manner similar to that shown below.

```
            Total disk size is 100 cylinders (100.0 MB)

                                          Cylinders                  Approx
Partition   Status      Type          Start   End    Length    %      MB
=========   ======  ============      =====   ===    ======   ===   ======
    1       Active    UNIX System       0     99      100     100    100.0




SELECT ONE OF THE FOLLOWING:

     1.   Create a partition
     2.   Change Active (Boot from) partition
     3.   Delete a partition
     4.   Update (Update disk configuration and exit)
     5.   Exit (Exit without updating disk configuration)
Enter Selection:
```

Select item 5 for UNIX systems and press (Return).

8. The Volume Manager asks if you wish to have a surface analysis performed. If this disk has been used before and you are confident of its integrity, you can select n. If you are unsure of the disk, it is recommended that you allow the surface analysis to be performed.

```
Initialize a disk
Menu: VolumeManager/Disk/AddDisk

  Surface analysis may be necessary to locate any damaged blocks
  on the disk and to arrange for undamaged blocks to be used as
  replacements.  This may take a few minutes to half an hour.
  You can skip this step, if you wish.  However, it is advisable
  that you not skip this step unless you are certain that this
  disk maintains its own list of damaged and replacement blocks,
  and that this list is correct.  If you aren't sure, do surface
  analysis.

Perform surface analysis? [y,n,q,?] (default: y)
```

Press **Return** to allow the surface analysis to be performed.

The surface analysis can take from a few minutes to an hour depending on the type and size of the disk.

9. Once the surface analysis has finished, or immediately if you choose not to perform surface analysis, UVM returns the following display to notify you that the initialization was a success.

```
  Disk initialization for c0.0d2 completed successfully.

Add or initialize another disk? [y,n,q,?] (default: n)
```

Press **Return** to exit `voldiskadd`.

Reserving disks

By default, `volassist` operations will allocate space from any disk that has free space. You may wish to reserve some set of disks for special purposes, such as to avoid general use of a particularly slow or a particularly fast disk. To reserve a disk for special purposes, enter:

```
voledit set reserve=yes diskname
```

After you enter this command, `volassist` will not allocate space from the selected disk unless that disk is specifically mentioned on the `volassist` command line. For example, if disk `disk03` is reserved, the command:

```
volassist make vol03 20m disk03
```

creates a 20 megabyte volume on `disk03`. However, the command:

```
volassist make vol04
```

does not use `disk03`, even if there is no free space on any other disk.

To turn off reservation of a disk, enter:

```
voledit set reserve=no diskname
```

Display Disk Information

Before you use a disk, you need to know if it has been initialized. You need to know if the disk is part of a disk group, since you cannot create volumes on a disk that is not part of a disk group. The `list` command displays device names for all recognized disks, the disk names, the disk group names associated with each disk, and the status of each disk.

Display information on all disks that are defined to the Volume Manager as follows:

```
voldisk list
```

The Volume Manager returns the following display:

```
DEVICE       TYPE      DISK        GROUP       STATUS
c0.0d0s0     sliced    c0.0d0s0    rootdg      online
c0.0d2s0     sliced    disk01      rootdg      online
c1.4d14s0     sliced    -           -           online
```

Display details on a particular disk defined to the Volume Manager as follows:

```
voldisk list c0.0d2
```

Add a Disk to a Disk Group

You may wish to add a new disk to an already established disk group. Perhaps the current disks have insufficient space for the application or work group requirements, especially if these requirements have changed.

To add an initialized disk to a disk group, enter:

```
voldiskadd devname
```

To add device c1.4d14 to rootdg, Do the following:

1. Enter the command:

```
voldiskadd c1.4d14
```

The Volume Manager displays the following message:

```
Add or initialize a disk
Menu: VolumeManager/Disk/AddDisk

  Use this operation to add a disk to a disk group.  You can
  select an existing disk group or create a new disk group.  You
  can also initialize a disk without adding it to a disk group,
  which leaves the disk available for use as a replacement disk.
  This operation takes, as input, a disk device, for example
  c0.0d2, a disk group (or none to leave the disk available for
  as a replacement disk).  If you are adding the disk to a disk
  group, you will be asked to give a name to the disk.

  Disk device c1.4d14 appears to have been initialized already.
  The disk is currently available as a replacement disk.

Do you wish to reinitialize c1.4d14? [y,n,q,?] (default: y)n
```

Enter `n` to add the disk without reinitializing it.

2. The Volume Manager now asks you to choose a disk group.

```
  You can choose to add this disk to an existing disk group, to
  create a new disk group, or you can choose to leave the disk
  available for use by future add or replacement operations.  To
  create a new disk group, select a disk group name that does not
  yet exist.  To leave the disk available for future use, specify
  a disk group name of "none".

Which disk group [<group>,none,list,q,?] (default: rootdg)
```

Press **Return** to select the default disk group, `rootdg`.

3. The Volume Manager prompts you for a disk name.

```
You must now select a disk name for the disk.  This disk name
can be specified to disk removal, move, or replacement
operations.  If you move the disk, such as between host bus
adapters, the disk will retain the same disk name, even though
it will be accessed using a different disk device address name.

Enter disk name [<name>,q,?] (default: disk03)
```

Either enter a disk name or press **Return** to select the default disk name.

4. The following verification screen is displayed:

```
The requested operation is to add disk device c1.4d14 to disk
group rootdg as disk disk03.

Continue with operation? [y,n,q,?] (default: y)
```

Press **Return** to continue.

5. The Volume Manager adds the disk to disk group `rootdg`, displays a success message, and exits.

```
Disk initialization for c1.4d14 completed successfully.

Goodbye.
```

To see that the disk has been added to the disk group, enter:

```
voldisk list
```

The Volume Manager returns:

```
DEVICE       TYPE      DISK        GROUP       STATUS
c0.0d0s0     sliced    c0.0d0s0    rootdg      online
c0.0d2s0     sliced    disk01      rootdg      online
c1.4d14s0     sliced    disk03     rootdg      online
```

Rename a Disk

It isn't necessary to give your disks special names. The Volume Manager gives the disk a default name when you add the disk to Volume Manager control. The disk name is used by the Volume Manager to identify the disk's location or type. If you wish to change the disk name to reflect a change of ownership or use, enter:

```
voledit rename old_diskname new_diskname
```

To rename disk01 to disk03, enter:

```
voledit rename disk01 disk03
```

To see if the name change took place, enter:

```
voldisk list
```

The Volume Manager returns:

```
DEVICE       TYPE      DISK        GROUP       STATUS
c0.0d0s0     sliced    c0.0d0s0    rootdg      online
c0.0d2s0     sliced    disk03      rootdg      online
c1.4d14s0     sliced    -           -           online
```

Initialize a New Disk Group

There can be situations in which all data related to a particular set of applications of a particular group of users needs to be made accessible on another system. Examples of this are:

- A system has failed and its data need to be moved to other systems.
- The work load must be balanced across a number of systems.

In such cases, it is important that the data related to particular application(s) or users be located on an identifyable set of disk drives, such that when these drives are moved, all data of the application(s) or group of users is moved and no other data.

On most systems, the use of disk groups is not necessary. Therefore, the Volume Manager supports a default disk group, `rootdg`, in which all volumes are created if no further specification is given. All commands will default to `rootdg` as well.

To create the disk group `newdg` associated with disk02, enter:

1.

```
voldiskadd c1.4d14
```

2. Since c1.4d14 has already been initialized, the Volume Manager asks if you wish to reinitialize it.

```
Add or initialize a disk
Menu: VolumeManager/Disk/AddDisk

  Use this operation to add a disk to a disk group.  You can
  select an existing disk group or create a new disk group.  You
  can also initialize a disk without adding it to a disk group,
  which leaves the disk available for use as a replacement disk.
  This operation takes, as input, a disk device, for example
  c0.0d2, a disk group (or none to leave the disk available for
  as a replacement disk).  If you are adding the disk to a disk
  group, you will be asked to give a name to the disk.

  Disk device c1.4d14 appears to have been initialized already.
  The disk is currently available as a replacement disk.

Do you wish to reinitialize c1.4d14? [y,n,q,?] (default: y)n
```

Enter n to add the disk to a disk group without reinitializing it.

3. The Volume Manager prompts you for a disk group.

```
  You can choose to add this disk to an existing disk group, to
  create a new disk group, or you can choose to leave the disk
  available for use by future add or replacement operations.  To
  create a new disk group, select a disk group name that does not
  yet exist.  To leave the disk available for future use, specify
  a disk group name of "none".

Which disk group [<group>,none,list,q,?] (default: rootdg) newdg
```

Enter the new disk group name and press **Return**.

4. The Volume Manager responds with:

```
There is no active disk group named newdg.

Create a new group named newdg? [y,n,q,?] (default: y)
```

Press **Return** to continue.

5. The Volume Manager asks for a disk name.

```
You must now select a disk name for the disk.  This disk name
can be specified to disk removal, move, or replacement
operations.  If you move the disk, such as between host bus
adapters, the disk will retain the same disk name, even though
it will be accessed using a different disk device address name.

Enter disk name [<name>,q,?] (default: disk02)
```

Enter the disk name of your choice or press **Return** to select the default name.

6. UVM displays a confirmations window:

```
The requested operation is to create a new disk group named newdg
containing disk device c1.4d14.  The disk will be named newdg01
within the disk group.

Continue with operation? [y,n,q,?] (default: y)
```

Press **Return** to continue.

7. Once the operation is complete, the Volume Manager returns the following display:

```
Disk initialization for c1.4d14 completed successfully.

Goodbye.
```

8. Enter:

   ```
   voldisk list
   ```

   to see if the disk group was created.

```
DEVICE       TYPE      DISK        GROUP       STATUS
c0.0d0s0     sliced    c0.0d0s0    rootdg      online
c0.0d2s0     sliced    disk03      rootdg      online
c1.4d14s0     sliced    disk02      newdg       online
```

Display Disk Group Information

To use disk groups, you need to know what they are and what disks belong to each group.

Display information on existing disk groups as follows:

```
voldg list
```

The Volume Manager returns the following:

```
NAME         STATE    ID
rootdg       enabled  730344554.1025.harley
newdg        enabled  731118794.1213.harley
```

Display Free Space

Before you add volumes and file systems to your system, you may want to make sure you have enough free disk space to adequately meet your needs. The Volume Manager lets you request a display of free space.

To display free space for a group, enter:

```
voldg free disk_group
```

To see the free space in the default disk group, `rootdg`, enter:

```
voldg free
```

The Volume Manager returns:

```
GROUP       DISK        DEVICE      TAG         OFFSET    LENGTH    FLAGS
rootdg      c0.0d0s0    c0.0d0s0    c0.0d0      726400    102672    -
rootdg      disk01      c0.0d2s0    c0.0d2      0         102128    -
rootdg      disk01      c0.0d2s0    c0.0d2      175856    26384     -
rootdg      disk02      c1.4d14s0    c1.4d14      26624     175616    -
```

The free space is measured in 512-byte sectors.

Disable (Offline) a Disk

Occasionally, you may need to disable (offline) a disk. If the disk is corrupted, you need to disable it and remove it. You also must disable a disk before moving the physical disk device to another location to be connected to another system.

To disable a disk, first remove the disk from its disk group. Then place a disk in an "offline" state as follows:

```
voldisk offline devname
```

To take the device c1.4d14s0 offline, enter:

```
voldisk offline c1.4d14s0
```

NOTE The device name is used because the disk is no longer in a disk group and so does not have an administrative name.

Remove a Disk

You can remove a disk to move it to another system or you may remove the disk because the disk is failing or has failed. However, before removing the disk from the current system, you must:

- Unmount the file system (see later in this chapter).
- Stop the volumes (see later in this chapter).
- Move the volumes to other disks or back up the volumes to tape (see later in this chapter). To move a volume, mirror the volume on one or more other disks, then remove the original copy of the volume.

  Alternatively, if the volumes are no longer needed, they can be removed.

Removing a disk involves the following steps:

1. Remove the disk from its disk group.

   Remove a disk from a disk group as follows:

   ```
   voldg [-g groupname] rmdisk diskname
   ```

   where

   groupname is the name of the group to which the disk belongs.

   diskname is the name of the disk to be removed.

   For example, to remove disk01 from `rootdg`, enter:

   ```
   voldg rmdisk disk01
   ```

   Since `rootdg` is the default disk group, you do not need to specify it.

2. Remove the disk from the Volume Manager and the system.

After removing a disk from its disk group, remove it from the system as follows:

```
voldisk rm devname
```

For example, to remove c0.0d2 from Volume Manager control, enter:

```
voldisk rm c1.4d03s0
```

Volume Operations

This section summarizes various volume operations using the `volassist command`.

`volassist` is the simplest and most powerful Volume Manager command. While many of these operations can be performed using the UVM OA&M menus described in Chapter 2, the `volassist` command is generally easier and faster.

NOTE The file `/etc/default/volassist` contains default options for `volassist`. This file can be edited to change the default behavior of `volassist` on your system.

`volassist` contains an online help program to help you use `volassist` effectively. To activate the online help, enter:

```
volassist help
```

The `volassist help` command displays the following information:

```
volassist - Perform simple general administrative actions

Usage:  volassist [-D debugopt[,...]] [-g diskgroup] [-U usetype] %
            [-d file] -b keyword arg ...
Recognized keywords:
    make volume_name length [options]
    mirror volume_name [options]
    move volume_name [options]
    growto volume_name new_length [options]
    growby volume_name length_change [options]
    shrinkto volume_name new_length [options]
    shrinkby volume_name length_change [options]
    snapstart volume_name [options]
    snapwait volume_name
    snapshot volume_name snapshot_name
    help [debug | flags | options]
```

Create a Volume

A volume is a logical disk device on which file systems and data bases can be created.

Create a volume using system defaults as follows:

```
volassist make volume_name length
```

To create the volume `voldef` enter:

```
volassist make voldef 10m
```

This creates a 10 MB volume named voldef.

Concatenated Volume

A concatenated volume is a volume using one or more sections of disk space. On a fragmented disk, this allows you to put together a volume larger than any individual section of free disk space available. Create a concatenated volume as follows:

```
volassist make volume_name length layout=concat
```

To create the concatenated volume `volcat`, enter:

```
volassist make volcat 10m layout=concat
```

Concatenation is typically set as the default in the `volassist` defaults file `/etc/defaults/volassist`.

Spanned Volume

A spanned volume is a concatenated volume with sections of disk space spread across more than one disk. A spanned volume can be larger than the single largest disk, since it takes space from more than one disk. Create a spanned volume as follows:

```
volassist make volume_name length layout=concat,span
```

The concatenated, spanned layout is the default.

To create the spanned volume `volspan`, enter:

```
volassist make volspan 1000m layout=concat,span
```

Striped Volume

A striped volume consists of a number of equal sized subdisks, each located on a separate disk drive. For more information on striping, refer to Chapter 1. Create a striped volume as follows:

```
volassist make volume_name length layout=stripe
```

To create the striped volume `volzebra`, enter:

```
volassist make volzebra 10m layout=stripe
```

This creates a volume with the default stripe width on the default number of drives.

Volume on Specific Disk

The Volume Manager automatically selects the disk or disks each volume will reside on, unless you specify otherwise. If you want a volume to reside on a specific disk, you must designate the disk for the Volume Manager. Create a volume on a specific disk as follows:

```
volassist make volume_name length diskname [...]
```

More than one disk can be specified.

To create the volume `volspec` on disk03, enter:

```
volassist make volspec 3m disk03
```

Display Volume Configuration Information

If you are administering a volume created by someone else, you may want to know how this volume is configured.

Display the volume, mirror, and subdisk record information for all volumes as follows:

```
volprint -ht
```

For example:

```
DG NAME         GROUP-ID
DM NAME         DEVICE       TYPE     PRIVLEN  PUBLEN   PUBPATH
V  NAME         USETYPE      KSTATE   STATE    LENGTH   READPOL   PREFPLEX
PL NAME         VOLUME       KSTATE   STATE    LENGTH   LAYOUT    ST-WIDTH MODE
SD NAME         PLEX         PLOFFS   DISKOFFS LENGTH   DISK-MEDIA   ACCESS

dg rootdg       730344554.1025.harley

dm c0.0d0s0     c0.0d0s0     sliced   512      829072   /dev/rdsk/c0.0d0se
dm disk01       c0.0d2s0     sliced   512      202240   /dev/rdsk/c0.0d2se
dm disk02       c1.4d14s0     sliced   512      202240   /dev/rdsk/c1.4d14se

pl volmir-02    -            DISABLED -        10240    CONCAT    -        RW
sd disk02-02    volmir-02    0        16384    10240    disk02       c1.4d14s0

v  homevol      fsgen        ENABLED  ACTIVE   275184   SELECT    -
pl homevol-01   homevol      ENABLED  ACTIVE   275184   CONCAT    -        RW
sd c0.0d0s0-04  homevol-01   0        410256   275184   c0.0d0s0     c0.0d0s0

v  rootvol      root         ENABLED  ACTIVE   314496   SELECT    -
pl rootvol-01   rootvol      ENABLED  ACTIVE   314496   CONCAT    -        RW
sd c0.0d0s0-01  rootvol-01   0        95760    314496   c0.0d0s0     c0.0d0s0

v  snapvol      fsgen        ENABLED  -        20480    ROUND     -
pl voltest-03   snapvol      ENABLED  ACTIVE   20480    CONCAT    -        RW
sd disk01-01    voltest-03   0        143088   20480    disk01       c0.0d2s0

v  standvol     gen          ENABLED  ACTIVE   31248    SELECT    -
pl standvol-01  standvol     ENABLED  ACTIVE   31248    CONCAT    -        RW
sd c0.0d0s0-03  standvol-01  0        0        31248    c0.0d0s0     c0.0d0s0

v  swapvol      swap         ENABLED  ACTIVE   64512    SELECT    -
pl swapvol-01   swapvol      ENABLED  ACTIVE   64512    CONCAT    -        RW
```

(continued on next page)

```
sd c0.0d0s0-02  swapvol-01   0         31248    64512    c0.0d0s0     c0.0d0s0

v  volcat       fsgen        ENABLED   ACTIVE   20480    SELECT   -
pl volcat-01    volcat       ENABLED   ACTIVE   20480    CONCAT   -        RW
sd c0.0d0s0-06  volcat-01    0         705920   20480    c0.0d0s0     c0.0d0s0

v  volspec      fsgen        ENABLED   ACTIVE   6144     SELECT   -
pl volspec-01   volspec      ENABLED   ACTIVE   6144     CONCAT   -        RW
sd disk02-01    volspec-01   0         10240    6144     disk02       c1.4d14s0

v  volzebra     fsgen        ENABLED   ACTIVE   20480    SELECT   volstripe-01
pl volzebra-01  volzebra     ENABLED   ACTIVE   20480    STRIPE   128      RW
sd disk01-02    volzebra-01  0         102128   10240    disk01       c0.0d2s0
sd c1.4d14s0-01  volzebra-01  10240     0         10240    disk02       c1.4d14s0

v  voltest      fsgen        ENABLED   ACTIVE   20480    SELECT   -
pl voltest-01   voltest      ENABLED   ACTIVE   20480    CONCAT   -        RW
sd c0.0d0s0-05  voltest-01   0         685440   20480    c0.0d0s0     c0.0d0s0
pl voltest-02   voltest      ENABLED   ACTIVE   20480    CONCAT   -        RW
sd disk01-04    voltest-02   0         122608   20480    disk01       c0.0d2s0
```

where:

dg	Is a disk group.
dm	Is a disk.
pl	Is a plex (or mirror).
sd	Is a subdisk.
v	Is a volume.

Display volume-related information for a specific volume as follows:

```
volprint -t volume_name
```

To display the information about `volspec`, enter:

```
volprint -t volspec
```

```
DG NAME         GROUP-ID
DM NAME         DEVICE       TYPE      PRIVLEN  PUBLEN   PUBPATH
V  NAME         USETYPE      KSTATE    STATE    LENGTH   READPOL PREFPLEX
PL NAME         VOLUME       KSTATE    STATE    LENGTH   LAYOUT ST-WIDTH MODE
SD NAME         PLEX         PLOFFS    DISKOFFS LENGTH   DISK-MEDIA ACCESS

v  volspec      fsgen        ENABLED   ACTIVE   6144     SELECT   -
```

Mirror a Volume

A mirror (plex) is a copy of a volume. The mirror copy is not stored on the same disk (s) as the original copy of the volume. Mirroring a volume assures you that the data in that volume will not be lost if one of your disks fails.

Create a new volume with a mirror as follows:

```
volassist make volume_name length mirror=yes
```

To create the mirrored volume, `volmir`, enter:

```
volassist make volmir 5m mirror=yes
```

Create a mirror for an existing volume as follows:

```
volassist mirror volume_name
```

For example:

```
volassist mirror voltest
```

creates a mirror of the volume `voltest`.

Remove a Mirror

You may have more than one mirror (plex) for each volume. If you find that you have more mirrors than you need, you can remove a mirror.

Removing a mirror involves the following procedure:

1. Dissociate the mirror from its volume.

   Dissociate the mirror from the volume as follows:

   ```
   volplex dis plex_name
   ```

   For example, the volume `volmir` is a mirrored volume.

   ```
   TYPE NAME         ASSOC        KSTATE     LENGTH COMMENT
   vol  volmir       fsgen        ENABLED     10240
   plex volmir-01    volmir       ENABLED     10240
   sd   disk01-03    volmir-01    -           10240
   plex volmir-02    volmir       ENABLED     10240
   sd   disk02-02    volmir-02    -           10240
   ```

   To disassociate `volmir-02` from the parent volume, enter:

   ```
   volplex dis volmir-02
   ```

2. Remove the mirror and any associated subdisks completely.

After dissociating the plex from the volume, remove the plex and any associated subdisks as follows:

```
voledit -r rm plex_name
```

Remove `volmir-02` as shown below:

```
voledit -r rm volmir-02
```

The output of `volprint -h` for `volmir` is:

```
TYPE NAME         ASSOC        KSTATE     LENGTH COMMENT
vol  volmir       fsgen        ENABLED     10240
plex volmir-01    volmir       ENABLED     10240
sd   disk01-03    volmir-01    -           10240
```

Extend a Volume

If the volume is not large enough for the amount of data that needs to be stored in it, you need to extend the volume's length.

Extend a volume *to* a specific length as follows:

```
volassist growto volume_name length
```

To extend `volcat` to 2000 512-byte sectors, enter:

```
volassist growto volcat 2000
```

Extend a volume *by* a specific length as follows:

```
volassist growby volume_name length
```

To extend `volcat` by 100 sectors, enter:

```
volassist growby volcat 100
```

If you have the Unisys File System (VxFS) on the volume and you have installed the VxFS Advanced Features Package, you can use the `fsadm` command to grow or shrink the file system. Refer to the section entitled "File System Operations" or to the *Unisys File System (VxFS) System Administrator's Guide* for more information on resizing file systems.

NOTE `volassist growto` and `volassist growby` cannot be used with striped volumes.

Shrink a Volume

If you find that your volume is much larger than you really need it to be, you can shrink the volume's size. Shrink a volume *to* a specific length as follows:

CAUTION Do not shrink a volume below the size of the file system. If you have a VxFS file system, you can shrink the file system and then shrink the volume. If you do not shrink the file system first, you will lose data.

```
volassist shrinkto volume_name length
```

Make sure not to shrink the volume below current size of the file system or database using the volume. If the file system is VxFS Advanced, shrink the file system first, then shrink the volume. This command can be safely used on empty volumes. To shrink `volcat` to 1300 sectors, enter:

```
volassist shrinkto volcat 1300
```

Shrink a volume *by* a specific length as follows:

```
volassist shrinkby volume_name length
```

To shrink `volcat` by 300 sectors, enter:

```
volassist shrinkby volcat 300s
```

NOTE `volassist shrinkto` and `volassist shrinkby` cannot be used with striped volumes.

Remove a Volume

Once a volume is no longer necessary (it is inactive and archived, for example), you can remove the volume and free up the disk space for other uses.

To remove a volume, make sure the volume is stopped (using the `volume stop` command). The `volume stop` command stops all Volume Manager activity to the volume.

After stopping the volume, make sure the file systems are unmounted, then do the following:

```
voledit -rf rm volume_name
```

To remove the volume `volspan`, enter:

```
voledit -rf rm volspan
```

Back Up a Volume

It is very important to make back up copies of your volumes. This provides a copy of the data as it stands at the time of the backup. Backup copies are used to restore volumes lost due to disk failure, or data destroyed due to human error. The Volume Manager allows you to back up volumes with minimal interruption of the volume's availability for users. Backing up a volume involves the following procedure:

1. Create a snapshot mirror of the volume to be backed up.
2. Select a suitable time to create a snapshot. You need to ensure that the data in the volume is in a consistent state and that no users are accessing the volume at the time the snapshot is taken.
3. Create a snapshot volume that reflects the original volume at the time of the snapshot.
4. The snapshot volume is a read-only volume that can now be used by back up utilities while the original volume continues to be available for applications and users.

Create a snapshot mirror for a volume as follows:

```
volassist snapstart volume_name
```

To create a snapshot mirror of a volume called `voldef`, enter:

```
volassist snapstart voldef
```

After creating the snapshot mirror, create a snapshot volume that reflects the original volume as follows:

```
volassist snapshot volume_name new_volume_name
```

To create a snapshot volume of `voldef`, enter:

```
volassist snapshot voldef snapvol
```

File System Operations

This section summarizes how to create file systems on volumes. In most examples, the VxFS file system is used as it supports advanced operations, such as extending and shrinking file systems.

Make and Mount a File System

A file system is created on a volume and cannot be larger than the volume on which it is created.

Create a file system on a volume as follows:

```
mkfs [-F vxfs] [generic_options] [-o specific_options]
 special_file size
```

where:

vxfs — is the vxfs file system type

generic_options — are the common file system options (such as `-g`).

specific_options — are options specific to this file system.

special_file — is the full pathname of the volume on which to create the file system (`/dev/rvol/pubs`).

size — is the size of the new file system.

For more information about the options and variables available for use with the `mkfs` command, see the `mkfs(1)` manual page.

If you want to use a file system which is expandable and has quick recovery, be sure to specify `-F vxfs`.

To create a file system on a volume called `/dev/rvol/pubs`, first create the volume called `pubs` using `volassist`. Once the volume is created, enter:

```
mkfs -F vxfs /dev/rvol/pubs 12288
```

to create the file system.

NOTE The size of the file system (in this case 12288 sectors) is the same size or smaller than the volume on which the file system is mounted.

The Volume Manager displays the following warning message:

```
Mkfs: make vxfs file system?
(DEL if wrong)
```

and allows you approximately 10 seconds to change you mind. After the 10 seconds, the file system is created and the Volume Manager displays the following message:

```
12288 sectors, 6144 blocks of size 1024
1320 inodes, 5294 data blocks, log size 512
1 allocation units of 5630 blocks, 1320 inodes, 5294 data blocks
first allocation unit starts at block 514
overhead per allocation unit is 336 blocks
```

After creating the file system, mount it as follows:

```
mount [-F vxfs] [generic_options] [-o specific_options]
  block_special mount_point
```

To mount the file system `/dev/vol/pubs`, enter

```
mount -F vxfs /dev/vol/pubs /pubs
```

Unmount a File System

If you no longer need to access the data in a file system, you can unmount it.

Unmount a file system as follows:

```
umount block_special | mount_point
```

To unmount file system `/dev/vol/pubs`, enter:

```
unmount /dev/vol/pubs
```

Extend a File System

If you find that your file system is not large enough, you can increase the length of the file system. The new size of the file system is specified in units of 512 byte blocks.

Extend a `vxfs` file system as follows:

```
fsadm [-F vxfs] [-b newsize] [-r rawdev] mount_point
```

To extend `vxfs` file systems using /pubs as a mount point, enter

```
fsadm -F vxfs -b 22528 /pubs
```

Shrink a File System

If you find that you have allocated more space for your file system than you need, you can decrease the size of the file system.

Shrink a `vxfs` file system as follows:

```
fsadm [-F vxfs] [-b newsize] [-r rawdev] mount_point
```

Example

To shrink `vxfs` file systems using /pubs as a mount point, enter

```
fsadm -F vxfs -b 20480 /pubs
```

NOTE

The extend and shrink operations can only be done with VxFS Advanced file system. In cases where data is allocated towards the end of the file system, shrinkage may not be possible and may have to reorganize the file system. See the *VxFS System Administrator's Guide* for more information.

Display Mounted File Systems

It is important to keep track of which file systems are mounted and which are not. This saves users from trying to access unmounted file systems. You can look at the status of file systems by doing the following:

```
mount
```

The `mount` command displays the file system information similar to that shown below:

```
/ on /dev/root read/write/setuid on Sun Feb 21 17:45:22 1993
/proc on /proc read/write on Sun Feb 21 17:45:24 1993
/dev/fd on /dev/fd read/write on Sun Feb 21 17:45:24 1993
/stand on /dev/vol/standvol read/write on Sun Feb 21 17:45:25 1993
/lhome on /dev/vol/homevol read/write/delaylog/setuid/mincache=closesync %
      on Sun Feb 21 17:47:12 1993
```

Glossary

Glossary

associate — The process of establishing a relationship between Volume Manager (UVM) objects; for example, a subdisk that has been created and defined as having a starting point within a plex is referred to as being *associated* with that plex.

atomic operation — An operation that either succeeds completely or fails and leaves everything as it was before the operation was started. If the operation succeeds, all aspects of the operation take effect at once and the intermediate stages of change are invisible. If any aspect of the operation fails, then the operation aborts without leaving partial changes.

block change logging — The way the Volume Manager (UVM) monitors and logs modifications to a mirror. A log of changed blocks is kept in an associated subdisk called a *log subdisk*.

concatenation — A layout style characterized by subdisks that are arranged sequentially and contiguously.

configuration database — A set of records containing detailed information on existing Volume Manager objects (such as disk and volume attributes). A single copy of a configuration database is called a *configuration copy*.

device name — The device name used to access a physical disk, such as `c0.0d0s0`. This is also referred to as the *disk access name*.

disk — A collection of read/write data blocks that are indexed and can be accessed fairly quickly. Each disk has a universally unique identifier.

disk access name — The device name used to access a physical disk, such as `c0.0d0s0`. The term *device name* may also be used to refer to the *disk access name*.

disk access records Configuration records used to specify the access paths to particular disks. Each disk access record contains a name, a type, and possibly some type-specific information, which is used by the Volume Manager (UVM) in deciding how to access and manipulate the disk that is defined by the disk access record.

disk group A collection of disks that share the same configuration database. The *root disk group* is a special private disk group that always exists.

disk ID A universally unique identifier that is given to each disk and can be used to identify the disk, even if it is moved.

disk media name A logical or administrative name chosen for the disk, such as `disk3`. The term *disk name* may also be used to refer to the *disk media name*.

disk media record A configuration record that identifies a particular disk, by disk ID, and gives that disk a logical (or administrative) name.

dissociate Dissociating Volume Manager (UVM) objects removes any link that exists between them; for example, dissociating a subdisk from a mirror removes the subdisk from the mirror and adds the subdisk to the free pool.

free space An area of a disk under UVM control that is not allocated to any volume or reserved for use by any Volume Manager object.

initial swap area The first disk region used as a swap area for the kernel.

log subdisk A subdisk that is used to store a block change log.

mirror A duplicate copy of a volume and the data therein (in the form of an ordered collection of subdisks). Each mirror is one copy of the volume with which the mirror is associated. The terms *mirror* and *plex* can be used synonymously.

mirroring — A technique involving the use of multiple mirrors to make duplicate (potentially backup) copies of the information contained in a volume.

object — An entity that is defined to and recognized internally by the Volume Manager. The UVM objects are: volume, plex, subdisk, disk, and disk group. There are actually two types of disk object —one for the physical aspect of the disk and the other for the logical aspect.

partition — The standard division of a physical disk device, as supported directly by the operating system and disk drives.

persistent state logging — A logging type that ensures that only active mirrors are used for recovery purposes and prevents failed mirrors from being selected for recovery.

plex — A duplicate copy of a volume and the data therein (in the form of an ordered collection of subdisks). Each mirror is one copy of the volume with which the mirror is associated. The terms *mirror* and *plex* can be used synonymously.

private region — A region of a physical disk used to store private, structured Volume Manager (UVM) information. The *private region* contains a disk header, a table of contents, and a configuration database. The table of contents maps the contents of the disk. The disk header contains a disk ID. All data in the private region is duplicated for extra reliability.

public region — A region of a physical disk managed by the Volume Manager that contains available space and is used for allocating subdisks.

root configuration The configuration database for the root disk group. This is special in that it always contains records for other disk groups, which are used for backup purposes only. It also contains disk records that define all disk devices on the system.

root disk group A special private disk group that always exists on the system.

root file system The initial file system mounted as part of the UNIX kernel startup sequence.

root partition The disk region on which the root file system resides.

root volume The UVM volume that contains the root file system, if such a volume is designated by the system configuration.

spanning A technique that permits a file or database too large to fit on a single disk to span across multiple physical disks.

sparse mirror A mirror that is not as long as the volume or that has holes (regions of the mirror that don't have a backing subdisk).

stripe Relatively small, equally-sized areas that are allocated alternately on the subdisks of each striped mirror.

striping A technique that spreads data across several physical disks using stripes. The data is allocated alternately to the stripes within the subdisks of each mirror.

subdisk The internal representation of a portion of a physical disk. Subdisks can be allocated to mirrors to form volumes.

swap area A disk region used to hold copies of memory pages swapped out by the system pager process.

swap volume A UVM volume that is configured for use as a swap area.

transaction A set of configuration changes that succeed or fail as a group, rather than individually. Transactions are used internally to maintain consistent configurations.

volboot file A small file that is used to locate copies of the root configuration. The file may list disks that contain configuration copies in standard locations, and can also contain direct pointers to configuration copy locations. `volboot` is stored in a system-dependent location.

hostid A string that identifies a host to the Volume Manager. The *hostid* for a host is stored in its `volboot` file, and is used in defining ownership of disks and disk groups.

volume A virtual disk, representing an addressable range of disk blocks used by applications such as file systems or databases. A volume is a collection of from one to eight mirrors (mirrors).

volume configuration daemon (vold) The Volume Manager (UVM) utility that is the interface between the kernel `volconfig` device and the other Volume Manager (UVM) utilities.

volume configuration device The volume configuration device (`/dev/volconfig`) is the interface through which all configuration changes to the volume device driver are performed.

volume event log The volume event log device (`/dev/volevent`) is the interface through which volume driver events are reported to the utilities.

volume device driver The driver that forms the virtual disk drive between the application and the physical device driver level. The volume device driver is accessed through a virtual disk device node whose character device nodes appear in `/dev/rvol`, and whose block device nodes appear in `/dev/vol`.

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