Veritas™ Dynamic Multi-Pathing Installation Guide

Linux

6.0

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Symantec

Veritas Dynamic Multi-Pathing Installation Guide

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Documentation

Product guides are available on the media in PDF format. Make sure that you are using the current version of the documentation. The document version appears on

page 2 of each guide. The latest product documentation is available on the Symantec website.

https://sort.symantec.com/documents

Your feedback on product documentation is important to us. Send suggestions for improvements and reports on errors or omissions. Include the title and document version (located on the second page), and chapter and section titles of the text on which you are reporting. Send feedback to:

doc_feedback@symantec.com

For information regarding the latest HOWTO articles, documentation updates, or to ask a question regarding product documentation, visit the Storage and Clustering Documentation forum on Symantec Connect.

https://www-secure.symantec.com/connect/storage-management/forums/storage-and-clustering-documentation

About Symantec Connect

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http://www.symantec.com/connect/storage-management

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Asia-Pacific and Japan	customercare_apac@symantec.com
Europe, Middle-East, and Africa	semea@symantec.com
North America and Latin America	supportsolutions@symantec.com

Contents

Section 1

Installation overview and planning

Chapter 1

Introducing Veritas Dynamic Multi-Pathing

This chapter includes the following topics:

About Veritas Dynamic Multi-Pathing

Veritas Dynamic Multi-Pathing (DMP) provides multi-pathing functionality for the operating system native devices configured on the system. DMP creates DMP metadevices (also known as DMP nodes) to represent all the device paths to the same physical LUN.

DMP is available as a component of Storage Foundation. DMP supports Veritas Volume Manager (VxVM) volumes on DMP metadevices, and Veritas File System (VxFS) file systems on those volumes.

DMP is also available as a stand-alone product, which extends DMP metadevices to support the OS native logical volume manager (LVM). You can create LVM volumes and volume groups on DMP metadevices.

Veritas Dynamic Multi-Pathing can be licensed separately from Storage Foundation products. Veritas Volume Manager and Veritas File System functionality is not provided with a DMP license.

DMP functionality is available with a Storage Foundation Enterprise license, SF HA Enterprise license, and Standard license.

Veritas Volume Manager (VxVM) volumes and disk groups can co-exist with LVM volumes and volume groups, but each device can only support one of the types. If a disk has a VxVM label, then the disk is not available to LVM. Similarly, if a disk is in use by LVM, then the disk is not available to VxVM.

Chapter 2

Planning to install Veritas Dynamic Multi-Pathing

This chapter includes the following topics:

About planning for DMP installation

Before you continue, make sure that you are using the current version of this guide. The latest documentation is available on the Symantec Symantec Operations Readiness Tools (SORT) website.

https://sort.symantec.com/documents

Document version: 6.0.3.

This installation guide is designed for system administrators who already have a knowledge of basic UNIX system and network administration. Basic knowledge includes commands such as `tar`, `mkdir`, and simple shell scripting. Also required is basic familiarity with the specific platform and operating system where DMP will be installed.

Follow the preinstallation instructions if you are installing Veritas Dynamic Multi-Pathing.

See the chapter, "Preparing to install Veritas Dynamic Multi-Pathing" for more information.

About installation and configuration methods

You can install and configure DMP using Veritas installation programs or using native operating system methods.

Use one of the following methods to install and configure DMP:

- The Veritas product installer
  The installer displays a menu that simplifies the selection of installation options.
- The product-specific installation scripts
  The installation scripts provide a command-line interface to install a specific product. The product-specific scripts enable you to specify some additional command-line options. Installing with the installation script is also the same as specifying DMP from the installer menu.
- The Web-based Veritas installer
  The installer provides an interface to manage the installation from a remote site using a standard Web browser.
  See “About the Web-based installer” on page 33.
- Silent installation with response files
  You can use any of the above options to generate a response file. You can then customize the response file for another system. Run the product installation script with the response file to install silently on one or more systems.
  See “About response files” on page 74.
- KickStart
  You can use the Veritas product installer or the product-specific installation script to generate a Kickstart script file. Use the generated script to install Veritas RPMs from your Kickstart server.

Chapter 3

System requirements

This chapter includes the following topics:

Release notes

The *Release Notes* for each Veritas product contains last minute news and important details for each product, including updates to system requirements and supported software. Review the Release Notes for the latest information before you start installing the product.

The product documentation is available on the Web at the following location:

https://sort.symantec.com/documents

Hardware compatibility list (HCL)

The hardware compatibility list contains information about supported hardware and is updated regularly. Before installing or upgrading Storage Foundation and High Availability Solutions products, review the current compatibility list to confirm the compatibility of your hardware and software.

For the latest information on supported hardware, visit the following URL:

http://www.symantec.com/docs/TECH170013

For information on specific High Availability setup requirements, see the *Veritas Cluster Server Installation Guide*.

Supported operating systems

For information on supported operating systems, see the *Veritas Dynamic Multi-Pathing Release Notes*.

Disk space requirements

Before installing your products, confirm that your system has enough free disk space.

Use the "Perform a Preinstallation Check" (P) menu for the Web-based installer or the `-precheck` option of the script-based installer to determine whether there is sufficient space.

```
# ./installer -precheck
```

If you have downloaded DMP, you must use the following command:

```
# ./installdmp -precheck
```

Discovering product versions and various requirement information

Symantec provides several methods to check the Veritas product you have installed, plus various requirement information.

You can check the existing product versions using the `installer` command with the `-version` option before or after you install. After you have installed the current version of the product, you can use the `showversion` script in the /opt/VRTS/install directory to find version information.

Information the `version` option or the `showversion` script discovers on systems includes the following:

- The installed version of all released Storage Foundation and High Availability Suite of products
- The required RPMs or patches (if applicable) that are missing
- The available updates (including patches or hotfixes) from Symantec Operations Readiness Tools (SORT) for the installed products

To run the version checker

1. Mount the media.
2. Start the installer with the `-version` option.

```
# ./installer -version system1 system2
```

Chapter 4

Licensing Veritas products

This chapter includes the following topics:

About Veritas SFHA Solutions product licensing

You have the option to install Veritas products without a license key. Installation without a license does not eliminate the need to obtain a license. A software license is a legal instrument governing the usage or redistribution of copyright protected software. The administrator and company representatives must ensure that a server or cluster is entitled to the license level for the products installed. Symantec reserves the right to ensure entitlement and compliance through auditing.

www.symantec.com/techsupp/

During the installation, you can choose to either:

- Install a license key for the product and features that you want to install.
  When you purchase a Symantec product, you receive a License Key certificate. The certificate specifies the product keys and the number of product licenses purchased.
- Continue to install without a license key.
  The installer prompts for the product modes and options that you want to install, and then sets the required product level.
  Within 60 days of choosing this option, you must install a valid license key corresponding to the license level entitled or continue with keyless licensing by managing the server or cluster with a management server, such as Veritas Operations Manager (VOM). If you do not comply with the above terms,

continuing to use the Symantec product is a violation of your end user license agreement, and results in warning messages.

For more information about keyless licensing, see the following URL: http://go.symantec.com/sfhakeyless

If you encounter problems while licensing this product, visit the Symantec licensing support website.

If you upgrade to this release from a prior release of the Veritas software, the product installer does not change the license keys that are already installed. The existing license keys may not activate new features in this release.

If you upgrade with the product installer, or if you install or upgrade with a method other than the product installer, you must do one of the following to license the products:

See About Veritas Storage Foundation and High Availability Solutions 6.0

- Run the `vxkeyless` command to set the product level for the products you have purchased. This option also requires that you manage the server or cluster with a management server.
  See "Setting or changing the Veritas SFHA Solutions product level for keyless licensing" on page 20.
  See the `vxkeyless(1m)` manual page.
- Use the `vxlicinst` command to install a valid product license key for the products you have purchased.
  See "Installing Veritas SFHA Solutions product license keys" on page 22.
  See the `vxlicinst(1m)` manual page.

You can also use the above options to change the product levels to another level that you are authorized to use. For example, you can add the replication option to the installed product. You must ensure that you have the appropriate license for the product level and options in use.

Note: In order to change from one product group to another, you may need to perform additional steps.

Setting or changing the Veritas SFHA Solutions product level for keyless licensing

The keyless licensing method uses product levels to determine the Veritas products and functionality that are licensed. In order to use keyless licensing, you must set up a Management Server to manage your systems.

For more information and to download the management server, see the following URL:

http://go.symantec.com/vom

When you set the product license level for the first time, you enable keyless licensing for that system. If you install with the product installer and select the keyless option, you are prompted to select the product and feature level that you want to license.

After you install, you can change product license levels at any time to reflect the products and functionality that you want to license. When you set a product level, you agree that you have the license for that functionality.

To set or change the product level

1 Show your current working directory:

```
# pwd
```

Output resembles:

```
/opt/VRTSvlic/bin
```

2 View the current setting for the product level.

```
# ./vxkeyless -v display
```

3 View the possible settings for the product level.

```
# ./vxkeyless displayall
```

4 Set the desired product level.

```
# ./vxkeyless set prod_levels
```

where *prod_levels* is a comma-separated list of keywords. The keywords are the product levels as shown by the output of step 3.

If you want to remove keyless licensing and enter a key, you must clear the keyless licenses. Use the NONE keyword to clear all keys from the system.

Warning: Clearing the keys disables the Veritas products until you install a new key or set a new product level.

To clear the product license level

1 View the current setting for the product license level.

```
# ./vxkeyless [-v] display
```

2 If there are keyless licenses installed, remove all keyless licenses:

```
# ./vxkeyless [-q] set NONE
```

For more details on using the `vxkeyless` utility, see the `vxkeyless(1m)` manual page.

Installing Veritas SFHA Solutions product license keys

The VRTSvlic RPM enables product licensing. After the VRTSvlic is installed, the following commands and their manual pages are available on the system:

vxlicinst	Installs a license key for a Symantec product
vxlicrep	Displays currently installed licenses
vxlictest	Retrieves features and their descriptions encoded in a license key

Even though other products are included on the enclosed software discs, you can only use the Symantec software products for which you have purchased a license.

To install a new license

- Run the following commands. In a cluster environment, run the commands on each node in the cluster:

```
# cd /opt/VRTS/bin
```

```
# ./vxlicinst -k xxxx-xxxx-xxxx-xxxx-xxxx-xxx
```

Section 2

Installation of Veritas Dynamic Multi-Pathing

Chapter 5

Preparing to install Veritas Dynamic Multi-Pathing

This chapter includes the following topics:

Installation preparation overview

Table 5-1 provides an overview of an installation using the product installer.

Table 5-1 Installation overview

Installation task	Section
Obtain product licenses.	See "About Veritas SFHA Solutions product licensing" on page 19.
Download the software, or insert the product DVD.	See "Mounting the product disc" on page 26.
Set environment variables.	See "Setting environment variables" on page 25.
Configure the secure shell (ssh) on all nodes.	See "About using ssh or rsh with the Veritas installer" on page 26.

Table 5-1 Installation overview *(continued)*

Installation task	Section
Verify that hardware, software, and operating system requirements are met.	See "Release notes" on page 16.
Check that sufficient disk space is available.	See "Disk space requirements" on page 17.
Use the installer to install the products.	See "" on page 29.

Setting environment variables

Most of the commands used in the installation are in the `/sbin` or `/usr/sbin` directory. Add these directories to your `PATH` environment variable as necessary.

After installation, DMP commands are in `/opt/VRTS/bin`. DMP manual pages are stored in `/opt/VRTS/man`.

Specify `/opt/VRTS/bin` in your PATH after the path to the standard Linux commands.

To invoke the VxFS-specific `df`, `fsdb`, `ncheck`, or `umount` commands, type the full path name: `/opt/VRTS/bin/`*command*.

To set your MANPATH environment variable to include `/opt/VRTS/man` do the following:

- If you are using a shell such as sh or bash, enter the following:

```
$ MANPATH=$MANPATH:/opt/VRTS/man; export MANPATH
```

- If you are using a shell such as csh or tcsh, enter the following:

```
% setenv MANPATH $(MANPATH):/opt/VRTS/man
```

On a Red Hat system, also include the 1m manual page section in the list defined by your `MANSECT` environment variable.

- If you are using a shell such as sh or bash, enter the following:

```
$ MANSECT=$MANSECT:1m; export MANSECT
```

- If you are using a shell such as csh or tcsh, enter the following:

```
% setenv MANSECT $(MANSECT):1m
```

If you use the `man`(1) command to access manual pages, set `LC_ALL=C` in your shell to ensure that they display correctly.

About using ssh or rsh with the Veritas installer

The installer uses passwordless secure shell (ssh) or remote shell (rsh) communications among systems. The installer uses the ssh or rsh daemon that comes bundled with the operating system. During an installation, you choose the communication method that you want to use. You then provide the installer with the superuser passwords for the systems where you plan to install. The ssh or rsh communication among the systems is removed when the installation process completes, unless the installation abruptly terminates. If installation terminated abruptly, use the installation script's `-comcleanup` option to remove the ssh or rsh configuration from the systems.

In most installation, configuration, upgrade (where necessary), and uninstallation scenarios, the installer can configure ssh or rsh on the target systems. In the following scenarios, you need to set up ssh or rsh manually:

- When you add new nodes to an existing cluster.
- When the nodes are in a subcluster during a phased upgrade.
- When you perform installer sessions using a response file.

See "About configuring secure shell or remote shell communication modes before installing products" on page 88.

Mounting the product disc

Mounting the product disc

You must have superuser (root) privileges to load the DMP software.

To mount the product disc

1. Log in as superuser on a system where you want to install DMP.

   The systems must be in the same subnet.

2. Insert the product disc with the DMP software into a drive that is connected to the system.

   The disc is automatically mounted.

3 If the disc does not automatically mount, then enter:

```
# mount -o ro /dev/cdrom /mnt/cdrom
```

4 Navigate to the location of the RPMs.

```
# cd /mnt/cdrom/dist_arch/rpms
```

Where *dist* is rhel5, rhel6, sles10, or sles11, and *arch* is x86_64 for RHEL and SLES.

Assessing the system for installation readiness

Symantec provides the following tools for assessing your system, to ensure that the system meets the requirements for installing Veritas Dynamic Multi-Pathing 6.0.

Symantec Operations Readiness Tools	Symantec Operations Readiness Tools (SORT) is a Web-based application that is designed to support Symantec enterprise products. See "Symantec Operations Readiness Tools" on page 27.
Prechecking your systems using the installer	Performs a pre-installation check on the specified systems. The Veritas product installer reports whether the specified systems meet the minimum requirements for installing Veritas Dynamic Multi-Pathing 6.0. See "Prechecking your systems using the Veritas installer" on page 28.

Symantec Operations Readiness Tools

Symantec Operations Readiness Tools (SORT) is a Web site that automates and simplifies some of the most time-consuming administrative tasks. SORT helps you manage your datacenter more efficiently and get the most out of your Symantec products.

Among its broad set of features, SORT lets you do the following:

- Generate server-specific reports that describe how to prepare your servers for installation or upgrade of Symantec enterprise products.

- Access a single site with the latest production information, including patches, agents, and documentation.
- Create automatic email notifications for changes in patches, documentation, and array-specific modules.

To access SORT, go to:

https://sort.symantec.com

Prechecking your systems using the Veritas installer

The script-based and Web-based installer's precheck option checks for the following:

- Recommended swap space for installation
- Recommended memory sizes on target systems for Veritas programs for best performance
- Required operating system versions

To use the precheck option

1. Start the script-based or Web-based installer.
2. Select the precheck option:
   - From the Web-based installer, select the **Perform a Pre-Installation Check** from the Task pull-down menu.
   - In the script-based installer, from root on the system where you want to perform the check, start the installer.

     ```
     # ./installer
     ```

     In the Task Menu, press the p key to start the precheck.
3. Review the output and make the changes that the installer recommends.

Chapter 6

Installing Veritas Dynamic Multi-Pathing using the script-based installer

This chapter includes the following topics:

The installer enables you to install and configure the product, verify preinstallation requirements, and view the product's description.

If you obtained a standalone Veritas product from an electronic download site, the single product download files do not contain the general product installer. Use the product installation script to install the product.

At most points during the installation you can type the following characters for different actions:

- Use `b` (back) to return to a previous section of the installation procedure. The back feature of the installation scripts is context-sensitive, so it returns to the beginning of a grouped section of questions.
- Use `Control+c` to stop and exit the program if an installation procedure hangs. After a short delay, the script exits.
- Use `q` to quit the installer.
- Use `?` to display help information.
- Use the Enter button to accept a default response.

Installing Veritas Dynamic Multi-Pathing

Use the installer program to install Veritas Dynamic Multi-Pathing (DMP) on your system.

The following sample procedure installs DMP on a single system.

To install DMP

1. To install on multiple systems, set up the systems so that commands between systems execute without prompting for passwords or confirmations.

   See "About configuring secure shell or remote shell communication modes before installing products" on page 88.

2. Load and mount the software disc.

   See "Mounting the product disc" on page 26.

3. Move to the top-level directory on the disc.

   ```
   # cd /mnt/cdrom
   ```

4. From this directory, type the following command to install on the local system. Also use this command to install on remote systems provided that the secure shell (SSH) or remote shell (rsh) utilities are configured:

   ```
   # ./installer
   ```

5. Enter `I` to install and press the Return key.
6. When the list of available products is displayed, to select **Veritas Dynamic Multi-Pathing**, enter the corresponding number, and press the Return key.
7. At the prompt, specify whether you accept the terms of the End User License Agreement (EULA). Press the return key to proceed.
8. Select one of the following installation options:
   - A minimal installation installs RPMs for minimal functionality for the selected product.
   - A recommended installation installs the recommended DMP RPMs that provide complete functionality of the product.
     Note that this option is the default.
   - The display selection displays all RPMs and provides information about them. Note that the recommended installation installs the minimum and the recommended RPMs.

9 When the installer prompts you, indicate the systems where you want to install DMP. Enter one or more system names, separated by spaces.

10 The installer program verifies the system for installation. If the installer does not verify a system, fix the issue and return to the installer.

After the system checks complete, the installer displays a list of the RPMs to be installed. Press Return to continue with the installation.

11 The installer can configure remote shell or secure shell communications for you among systems, however each system needs to have rsh or SSH servers installed. You also need to provide the superuser passwords for the systems. Note that for security reasons, the installation program neither stores nor caches these passwords.

12 The installer program prompts you to choose a licensing method.

If you have a valid license key, select 1 and enter the license key at the prompt.

To install through keyless licensing, select 2.

Note: With the keyless license option, you must manage the systems with a management server.

For more information, go to the following Web site:

http://go.symantec.com/sfhakeyless

---

13 The installer installs the product packages. Next, at the prompt, specify whether you want to send your installation information to Symantec. Note that the information sent to Symantec is only to help improve the installer software.

```
Would you like to send the information about
this installation to Symantec to help improve installation
in the future? [y,n,q,?] (y) y
```

14 The installer program completes the installation and starts the DMP processes.

If required, check the log files to confirm the installation.

```
Installation log files, summary file, and response file
are saved at:

        /opt/VRTS/install/logs/installer-****
```

15 Reboot the systems if the installer prompts for a reboot, to enable DMP native support.

Performing a postcheck on a node

The installer's `postcheck` command can help you to determine installation-related problems.

Note: This command option requires downtime for the system.

To run the postcheck command on a node

- Run the installer with the `-postcheck` option.

  ```
  # ./installer -postcheck system_name
  ```

  The installer reports some errors or warnings if any processes or drivers do not start.

Chapter 7

Installing Veritas Dynamic Multi-Pathing using the web-based installer

This chapter includes the following topics:

About the Web-based installer

Use the Web-based installer interface to install Veritas products. The Web-based installer can perform most of the tasks that the script-based installer performs.

You use the `webinstaller` script to start and stop the Veritas XPortal Server `xprtlwid` process. The `webinstaller` script can also be used to check the status of the XPortal Server.

When the `webinstaller` script starts the `xprtlwid` process, the script displays a URL. Use this URL to access the Web-based installer from a Web browser such as Internet Explorer or FireFox.

The Web installer creates log files whenever the Web installer is operating. While the installation processes are operating, the log files are located in a session-based

directory under the `/var/tmp` directory. After the install process completes, the log files are located in the `/opt/VRTS/install/logs` directory. It is recommended that you keep these files for auditing, debugging, and future use.

The location of the Veritas XPortal Server configuration file is `/var/opt/webinstaller/xprtlwid.conf`.

See "Before using the Veritas Web-based installer" on page 34.

See "Starting the Veritas Web-based installer" on page 34.

Before using the Veritas Web-based installer

The Veritas Web-based installer requires the following configuration.

Table 7-1 Web-based installer requirements

System	Function	Requirements
Target system	The systems where you plan to install the Veritas products.	Must be a supported platform for Veritas Dynamic Multi-Pathing 6.0.
Installation server	The server where you start the installation. The installation media is accessible from the installation server.	Must use the same operating system as the target systems and must be at one of the supported operating system update levels.
Administrative system	The system where you run the Web browser to perform the installation.	Must have a Web browser. Supported browsers: ■ Internet Explorer 6, 7, and 8 ■ Firefox 3.x and later

Starting the Veritas Web-based installer

This section describes starting the Veritas Web-based installer.

To start the Web-based installer

1 Start the Veritas XPortal Server process `xprtlwid`, on the installation server:

```
# ./webinstaller start
```

The webinstaller script displays a URL. Note this URL.

Note: If you do not see the URL, run the command again.

The default listening port is 14172. If you have a firewall that blocks port 14172, use the `-port` option to use a free port instead.

---

2 On the administrative server, start the Web browser.

3 Navigate to the URL that the script displayed.

4 Certain browsers may display the following message:

```
Secure Connection Failed
```

Obtain a security exception for your browser.

When prompted, enter `root` and root's password of the installation server.

5 Log in as superuser.

Obtaining a security exception on Mozilla Firefox

You may need to get a security exception on Mozilla Firefox.

The following instructions are general. They may change because of the rapid release cycle of Mozilla browsers.

To obtain a security exception

1 Click **Or you can add an exception** link.

2 Click **Add Exception** button.

3 Click **Get Certificate** button.

4 Uncheck **Permanently Store this exception checkbox (recommended)**.

5 Click **Confirm Security Exception** button.

6 Enter root in User Name field and root password of the web server in the Password field.

Performing a pre-installation check with the Veritas Web-based installer

This section describes performing a pre-installation check with the Veritas Web-based installer.

To perform a pre-installation check

1. Start the Web-based installer.

   See "Starting the Veritas Web-based installer" on page 34.

2. On the Select a task and a product page, select **Perform a Pre-installation Check** from the **Task** drop-down list.
3. Select the Veritas Dynamic Multi-Pathing from the **Product** drop-down list, and click **Next**.
4. Indicate the systems on which to perform the precheck. Enter one or more system names, separated by spaces. Click **Next**.
5. The installer performs the precheck and displays the results.
6. Click **Finish**. The installer prompts you for another task.

Installing DMP with the Web-based installer

This section describes installing DMP with the Veritas Web-based installer.

To install DMP using the Web-based installer

1. Perform preliminary steps.

   See "Performing a pre-installation check with the Veritas Web-based installer" on page 36.

2. Start the Web-based installer.

   See "Starting the Veritas Web-based installer" on page 34.

3. Select **Install a Product** from the **Task** drop-down list.
4. Select **Veritas Dynamic Multi-Pathing** from the Product drop-down list, and click Next.
5. On the License agreement page, read the End User License Agreement (EULA). To continue, select **Yes, I agree** and click **Next**.
6. Choose minimal or recommended RPMs. Click **Next**.
7. Indicate the systems where you want to install. Separate multiple system names with spaces. Click **Next**.

8 If you have not yet configured a communication mode among systems, you have the option to let the installer configure ssh or rsh. If you choose to allow this configuration, select the communication mode and provide the superuser passwords for the systems.

9 After the validation completes successfully, click **Next** to install DMP on the selected system.

10 After the installation completes, you must choose your licensing method.

On the license page, select one of the following tabs:

- Keyless licensing

  Note: The keyless license option enables you to install without entering a key. However, in order to ensure compliance you must manage the systems with a management server.

  For more information, go to the following website:

  http://go.symantec.com/sfhakeyless

  Click **Register**.

- Enter license key
  If you have a valid license key, select this tab. Enter the license key for each system. Click **Register**.

11 After the product is registered, the processes are started.

For information about migrating your data volumes to DMP devices, refer to the *Veritas Dynamic Multi-Pathing Administrator's Guide*.

12 If prompted, select the checkbox to specify whether you want to send your installation information to Symantec.

```
Would you like to send the information about this installation
to Symantec to help improve installation in the future?
```

Click **Finish**. The installer prompts you for another task.

Chapter 8

Installing Veritas Dynamic Multi-Pathing using other methods

This chapter includes the following topics:

Installing DMP using Kickstart

You can install DMP using Kickstart. Kickstart is supported for Red Hat Enterprise Linux (RHEL5) and Red Hat Enterprise Linux 6 (RHEL6).

To install DMP using Kickstart

1. Create a directory for the Kickstart configuration files.

   ```
   # mkdir /kickstart_files/
   ```

2. Generate the Kickstart configuration files. The configuration files have the extension `.ks`. Do one of the following:

   - To generate configuration files, enter the following command:

     ```
     # ./installer -kickstart /kickstart_files/
     ```

     The system lists the files.

- To only generate the configuration file for DMP, enter the following command:

  ```
  # ./installdmp -kickstart /kickstart_files/
  ```

  The command output includes the following:

  ```
  The kickstart script for DMP60 is generated at
  /kickstart_files/kickstart_dmp60.ks
  ```

3. Setup an NFS exported location which the Kickstart client can access. For example, if `/nfs_mount_kickstart` is the directory which has been NFS exported, the NFS exported location may look similar to the following:

   ```
   # cat /etc/exports
   /nfs_mount_kickstart  * (rw,sync,no_root_squash)
   ```

4. Copy the rpms directory from the installation media to the NFS location.
5. Verify the contents of the directory.

   ```
   # ls /nfs_mount_kickstart/
   ```

6. In the DMP Kickstart configuration file, modify the `BUILDSRC` variable to point to the actual NFS location. The variable has the following format:

   ```
   BUILDSRC="hostname_or_ip:/nfs_mount_kickstart"
   ```

7. Append the entire modified contents of the Kickstart configuration file to the operating system `ks.cfg` file.
8. Launch the Kickstart installation for the operating system.
9. After the operating system installation is complete, check the file `/var/tmp/kickstart.log` for any errors related to the installation of Veritas RPMs and Veritas product installer scripts.
10. Verify that all the product RPMs have been installed. Enter the following command:

    ```
    # rpm -qa | grep -i vrts
    ```

11. If you do not find any installation issues or errors, configure the product stack. Enter the following command:

    ```
    # /opt/VRTS/install/installdmp -configure node1 node2
    ```

Sample Kickstart configuration file

The following is a sample RedHat Enterprise Linux 5 (RHEL5) Kickstart configuration file.

```
# The packages that follow are required. These packages are automatically installed
# from the operating system's installation media.

%packages
libattr.i386
libacl.i386

%post --nochroot
# Add any necessary scripts or commands here.
# This generated kickstart file is only for
# the installation of products in the installation media.

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

#
# Notice:
# * Modify the BUILDSRC below according to your environment
# * The location that you specify in BUILDSRC should let the
#   Kickstart Server be NFS accessible.
# * Copy the rpms directory from installation media to the
#   BUILDSRC location.
#

BUILDSRC="<hostname_or_ipv4address_or_ipv6address>:/path/to/rpms"

#
# Notice:
# * You do not have to change the following scripts.
#

# Define the path varibles.
ROOT=/mnt/sysimage
BUILDDIR="${ROOT}/build"
RPMDIR="${BUILDDIR}/rpms"

# Define the log path.
KSLOG="${ROOT}/var/tmp/kickstart.log"
```

```
echo "==== Executing kickstart post section: ====" >> ${KSLOG}

mkdir -p ${BUILDDIR}
mount -t nfs -o nolock,vers=3 ${BUILDSRC} ${BUILDDIR} >> ${KSLOG} 2>&1


# Install the RPMs in the following order.
  for RPM in VRTSvlic VRTSperl VRTSsfcpi60 VRTSspt VRTSvxvm VRTSaslapm
  VRTSsfmh


do
    echo "Installing package  -- $RPM" >> ${KSLOG}
    rpm -U -v --root ${ROOT} ${RPMDIR}/${RPM}-* >> ${KSLOG} 2>&1
done

umount ${BUILDDIR}

${ROOT}/opt/VRTS/install/bin/UXRT60/add_install_scripts >> ${KSLOG} 2>&1

echo "==== Completed kickstart file ====" >> ${KSLOG}

exit 0
```

Installing Veritas Dynamic Multi-Pathing using yum

You can install DMP using yum. yum is supported for Red Hat Enterprise Linux 5 and Red Hat Enterprise Linux 6.

To install DMP using yum

1. Run the `installdmp -pkginfo` command to get DMP RPMs.

   ```
   # ./installdmp -pkginfo
   ```

2. Add the DMP RPMs into the yum repository. You can add DMP RPMs into either a new repository or an existing repository with other RPMs. Use the `createrepo` command to create or update the repository. The operating system package `createrepo-`*`ver-rel`*`.noarch.rpm` provides the command.

   - **To create the new repository */path/to/new/repository/* for DMP RPMs**

1. Create an empty directory, for example: */path/to/new/repository*. The yum client systems should be able to access the directory with the HTTP, FTP, or file protocols.

   ```
   # rm -rf /path/to/new/repository
   # mkdir -p /path/to/new/repository
   ```

2. Copy all the DMP RPMs into */path/to/new/repository/*.

   ```
   # cp -f VRTSvlic-* VRTSperl-* ... VRTSsfcpi60-*\
   /path/to/new/repository
   ```

3. Use the `createrepo` command to create the repository.

   ```
   # /usr/bin/createrepo /path/to/new/repository
   ```

   Output resembles:

   ```
   27/27 - VRTSsfcpi60-6.0.000.000-GA_GENERIC.noarch.rpm
   Saving Primary metadata
   Saving file lists metadata
   Saving other metadata
   ```

4. The metadata for this repository is created in */path/to/new/repository/repodata*.

- **To use an existing repository in */path/to/existing/repository/* for DMP RPMs**

  1. Copy all the DMP RPMs into */path/to/existing/repository/*. The yum client systems should be able to access the directory with the HTTP, FTP, or file protocols.

     ```
     # cp -f VRTSvlic-* VRTSperl-* ... VRTSsfcpi60-*\
     /path/to/existing/repository
     ```

  2. Use the `createrepo` command with the `--update` option to update the repository's metadata.

     ```
     # createrepo --update /path/to/existing/repository
     ```

     Output resembles:

     ```
     27/27 * VRTSsfcpi60-6.0.000.000-GA_GENERIC.noarch.rpm
     Saving Primary metadata
     Saving file lists metadata
     Saving other metadata
     ```

3. The metadata in */path/to/existing/repository/repodata* is updated for the newly added RPMs.

- **To create a packge group for DMP RPMs when the repository is created or updated (optional)**

1. Create an XML file, which you can name DMP_group.xml in the repository directory. In the file specify the name, the id, the package list, and other information for the group. An example of this XML file for DMP is:

```
# cat DMP_group.xml
<comps>
  <group>
    <id>DMP60</id>
    <name>DMP60</name>
    <default>true</default>
    <description>RPMs of DMP 6.0</description>
    <uservisible>true</uservisible>
    <packagelist>
      <packagereq type="default">VRTSvlic</packagereq>
      <packagereq type="default">VRTSperl</packagereq>
       ... [other RPMs for DMP]
      <packagereq type="default">VRTSsfcpi60</packagereq>
    </packagelist>
  </group>
</comps>
```

2. Create the group when the repository is created or updated. You can generate this XML file using the installer with the option `-yumgroupxml`.

```
# createrepo -g DMP_group.xml /path/to/new/repository/
```

Or

```
# createrepo -g DMP_group.xml --update /path/to/existing\
/repository/
```

Refer to the *Red Hat Enterpirse Linux Deployment Guide* for more information on yum repository configuration.

3 Configure a yum repository on a client system.

- Create a `.repo` file under `/etc/yum.repos.d/`. An example of this `.repo` file for DMP is:

```
# cat /etc/yum.repos.d/DMP.repo
[repo-DMP]
name=Repository for DMP
baseurl=file:///path/to/repository/
enabled=1
gpgcheck=0
```

The values for the baseurl attribute can start with http://, ftp://, or file://. The URL you choose needs to be able to access the repodata directory. It also needs to access all the DMP RPMs in the repository that you create or update.

- Check the yum configuration. List DMP RPMs.

```
# yum list 'VRTS*'
Available Packages
VRTSperl.x86_64        5.10.0.7-RHEL5.3           repo-DMP
VRTSsfcpi60.noarch       6.0.000.000-GA_GENERIC     repo-DMP
VRTSvlic.x86_64        3.02.52.000-0              repo-DMP
...
```

The DMP RPMs may not be visible immediately if:

- the repository was visited before the DMP RPMs were added, and
- the local cache of its metadata has not expired.

To eliminate the local cache of the repositories' metadata and get the latest information from the specified baseurl, run the following commands:

```
# yum clean expire-cache
# yum list 'VRTS*'
```

Refer to the *Red Hat Enterpirse Linux Deployment Guide* for more information on yum repository configuration.

4 Install the RPMs on the target systems.

- **To install all the RPMs**

  1. Specify each RPM name as its yum equivalent. For example:

     ```
     # yum install VRTSvlic VRTSperl ... VRTSsfcpi60
     ```

  2. Specify all of DMP's RPMs by its package glob. For example:

     ```
     # yum install 'VRTS*'
     ```

3. Specify the group name if a group is configured for DMP's RPMs. In this example, the group name is *DMP60*:

   ```
   # yum install @DMP60
   ```

   Or

   ```
   # yum groupinstall DMP60
   ```

- **To install one RPM at a time**

  1. Run the `installdmp -pkginfo` command to determine package installation order.
  2. Use the same order as the output from the `installdmp -pkginfo` command:

     ```
     # yum install VRTSvlic
     # yum install VRTSperl
       ...
     # yum install VRTSsfcpi60
     ```

5 After you install all the RPMs, use the `/opt/VRTS/install/installdmp` script to license, configure, and start the product.

If the VRTSsfcpi60 package is installed before you use yum to install DMP, this package is not reinstalled. The `/opt/VRTS/install/installdmp` script may not be created. If the script is not created, use the `/opt/VRTS/install/bin/UXRT60/add_install_scripts` script to create the installdmp or uninstalldmp scripts after all the other DMP RPMs are installed.

```
# /opt/VRTS/install/bin/UXRT60/add_install_scripts
Creating install/uninstall scripts for installed products
Creating /opt/VRTS/install/installdmp for UXRT60
Creating /opt/VRTS/install/uninstalldmp for UXRT60
```

Section 3

Verification of the installation

Chapter 9

Verifying the Veritas Dynamic Multi-Pathing installation

This chapter includes the following topics:

Verifying that the products were installed

Verify that the DMP products are installed.

Use the command to check which RPMs have been installed.

```
# rpm -qa | grep VRTS
```

See "Veritas Dynamic Multi-Pathing installation RPMs" on page 95.

You can verify the version of the installed product. Use the following command:

```
# /opt/VRTS/install/installdmp -version
```

Use the following sections to further verify the product installation.

Installation log files

The Veritas product installer or product installation script installdmp creates log files for auditing and debugging. After every product installation, configuration, or uninstall,

the installer displays the name and location of the files. The files are located in the `/opt/VRTS/install/logs` directory. Symantec recommends that you keep the files for auditing, debugging, and future use.

The log files include the following types of text files:

Installation log file	The installation log file contains all commands executed during the procedure, their output, and errors generated by the commands. This file is for debugging installation problems and can be used for analysis by Veritas Support.
Response file	The response file contains the configuration information that you entered during the procedure. You can use the response file for future installation procedures by invoking an installation script with the `responsefile` option. The response file passes arguments to the script to automate the installation of that product. You can edit the file to automate installation and configuration of additional systems.
Summary file	The summary file contains the results of the installation by the common product installer or product installation scripts. The summary includes the list of the RPMs, and the status (success or failure) of each RPM. The summary also indicates which processes were stopped or restarted during the installation. After installation, refer to the summary file to determine whether any processes need to be started.

Starting and stopping processes for the Veritas products

After the installation and configuration is complete, the Veritas product installer starts the processes that are used by the installed products. You can use the product installer to stop or start the processes, if required.

To stop the processes

- Use the `-stop` option to stop the product installation script.

  For example, to stop the product's processes, enter the following command:

  ```
  # ./installer -stop
  ```

To start the processes

- Use the `-start` option to start the product installation script.

  For example, to start the product's processes, enter the following command:

  ```
  # ./installer -start
  ```

Section 4

Upgrading Veritas Dynamic Multi-Pathing

Chapter 10

Preparing to upgrade

This chapter includes the following topics:

About upgrading

There are many types of upgrades available. Before you start to upgrade, review the types of upgrades for the Veritas products.

See “” on page 51.

Review the supported upgrade paths that are available for the different methods of upgrading.

After you determine the type of upgrade that you want to perform and its upgrade paths, review the steps to prepare for the upgrade.

Symantec offers you several different ways to upgrade. You need to decide which upgrade method best suits your environment, your expertise, and the downtime required.

Table 10-1 Review this table to determine how you want to perform the upgrade

Upgrade types and considerations	Methods available for upgrade
Typical upgrades—use a Veritas provided tool or you can perform the upgrade manually. Requires some server downtime.	Script-based—you can use this to upgrade for the supported upgrade paths Web-based—you can use this to upgrade for the supported upgrade paths Manual—you can use this to upgrade from the previous release Response file—you can use this to upgrade from the previous release
Native operating system upgrade—use the upgrade software that comes with the operating system. Note that not all operating systems support native upgrades.	Operating system specific methods Operating system upgrades

Supported upgrade paths for DMP

The following tables describe upgrading to 6.0.

Table 10-2 RHEL 5 x64 upgrades using the script- or Web-based installer

Veritas software versions	RHEL 4	RHEL 5
5.1 SP1 5.1 SP1 RPx	N/A	Upgrade to RHEL5 U5 or later. Use the installer to upgrade to 6.0.
New installation	N/A	Upgrade to RHEL5 U5 or later. Use the installer to install 6.0.

Table 10-3 RHEL6 x64 upgrades using the script- or Web-based installer

Veritas software versions	RHEL5	RHEL 6
5.1 SP1 5.1 SP1 RPx	No upgrade path exists. Uninstall product. Upgrade to RHEL 6 base or later. Use the installer to install to 6.0.	N/A
5.1 SP1 PR1	N/A	Use the installer to upgrade to 6.0.
New installation	N/A	Use the installer to install 6.0.

Table 10-4 SLES 10 x64 upgrades using the script- or Web-based installer

Veritas software versions	SLES 9	SLES 10
5.1 SP1 5.1 SP1 RPx	N/A	Upgrade to SLES10 SP4 or later. Use the installer to upgrade to 6.0.
New installation	N/A	Upgrade to SLES10 SP4 or later. Use the installer to install 6.0.

Table 10-5 SLES 11 x64 upgrades using the script- or Web-based installer

Veritas software versions	SLES 10	SLES 11
5.1 SP1 5.1 SP1 RPx	N/A	Upgrade to SLES11 SP1 or later. Use the installer to upgrade to 6.0.
New installation	N/A	Upgrade to SLES11 SP1 or later. Use the installer to install 6.0.

Preparing to upgrade

Before you upgrade, you need to prepare the systems and storage. Review the following procedures and perform the appropriate tasks.

Getting ready for the upgrade

Complete the following tasks before you perform the upgrade:

- Review the Symantec Technical Support website for additional information: http://www.symantec.com/techsupp/
- Make sure that the administrator who performs the upgrade has root access and a good knowledge of the operating system's administration.
- Make sure that all users are logged off and that all major user applications are properly shut down.
- Make sure that you have created a valid backup.
- Ensure that you have enough file system space to upgrade. Identify where you want to copy the RPMs, for example `/packages/Veritas` when the root file system has enough space or `/var/tmp/packages` if the `/var` file system has enough space.
  Do not put the files under `/tmp`, which is erased during a system reboot.

Do not put the files on a file system that is inaccessible prior to running the upgrade script.
You can use a Veritas-supplied disc for the upgrade as long as modifications to the upgrade script are not required.

- For any startup scripts in `/etc/rcS.d`, comment out any application commands or processes that are known to hang if their file systems are not present.
- Make sure that the current operating system supports version 6.0 of the product. If the operating system does not support it, plan for a staged upgrade.
- Schedule sufficient outage time and downtime for the upgrade and any applications that use the Veritas products. Depending on the configuration, the outage can take several hours.
- Any swap partitions not in `rootdg` must be commented out of `/etc/fstab`. If possible, swap partitions other than those on the root disk should be commented out of `/etc/fstab` and not mounted during the upgrade. Active swap partitions that are not in `rootdg` cause `upgrade_start` to fail.
- Make sure the file systems are clean before upgrading.
- Upgrade arrays (if required).
- To reliably save information on a mirrored disk, shut down the system and physically remove the mirrored disk. Removing the disk in this manner offers a failback point.

Creating backups

Save relevant system information before the upgrade.

To create backups

1. Log in as superuser.
2. Before the upgrade, ensure that you have made backups of all data that you want to preserve.
3. Back up information in files such as `/boot/grub/menu.lst`, `/etc/grub.conf` or `/etc/lilo.conf` , and `/etc/fstab`.
4. Run the `vxlicrep`, `vxdisk list`, and `vxprint -ht` commands and record the output. Use this information to reconfigure your system after the upgrade.

Upgrading the array support

The Storage Foundation 6.0 release includes all array support in a single RPM, VRTSaslapm. The array support RPM includes the array support previously included

in the VRTSvxvm RPM. The array support RPM also includes support previously packaged as external array support libraries (ASLs) and array policy modules (APMs).

See the 6.0 Hardware Compatibility List for information about supported arrays.

See “Hardware compatibility list (HCL)” on page 16.

When you upgrade Storage Foundation products with the product installer, the installer automatically upgrades the array support. If you upgrade Storage Foundation products with manual steps, you should remove any external ASLs or APMs that were installed previously on your system. Installing the VRTSvxvm RPM exits with an error if external ASLs or APMs are detected.

After you have installed Storage Foundation 6.0, Symantec provides support for new disk arrays through updates to the `VRTSaslapm` RPM.

For more information about array support, see the *Veritas Storage Foundation Administrator's Guide*.

Chapter 11

Upgrading Veritas Dynamic Multi-Pathing

This chapter includes the following topics:

Upgrading Veritas Dynamic Multi-Pathing using the script-based installer

Perform the following procedure to upgrade Veritas Dynamic Multi-Pathing. The operating system must be at a supported level for this upgrade.

To upgrade DMP

1. Prepare for the installation.

   See "Preparing to upgrade" on page 53.

2. Install DMP 6.0 using the installer script.

   ```
   # ./installer
   ```

3. Enter **G** to upgrade and press the **Return** key.
4. Enter the names of the systems that you want to upgrade and press the **Return** key.

   Various messages and prompts appear. Answer the prompts appropriately.

5 Review the End User License Agreement, and eter **y** if you agree with it. Press the **Return** key.

```
Do you agree with the terms of the End User License Agreement
as specified in the dynamic_multipathing/EULA/lang/
EULA_DMP_Ux_6.0.pdf file present on media?
[y,n,q,?] y
```

6 The installer lists the packages that it will install or update. Confirm that you are ready to stop DMP processes.

```
Do you want to stop DMP processes now? [y,n,q,?] (y)y
```

If you select **y**, the installer stops the product processes and makes some configuration updates.

7 The installer uninstalls and reinstalls the listed packages and starts the DMP processes.

Upgrading Veritas Dynamic Multi-Pathing using the Veritas Web-based installer

This section describes upgrading DMP with the Veritas Web-based installer. The installer detects and upgrades the product that is currently installed on the specified system or systems.

To upgrade DMP

1 Perform the required steps to save any data that you wish to preserve. For example, make configuration file backups.

2 Start the Web-based installer.

See "Starting the Veritas Web-based installer" on page 34.

3 On the Select a task and a product page, select **Upgrade a Product** from the Task drop-down menu.

The installer detects the product that is installed on the specified system. Click **Next**.

4 Indicate the systems on which to upgrade. Enter one or more system names, separated by spaces. Click **Next**.

5 Click **Next** to complete the upgrade.

After the upgrade completes, the installer displays the location of the log and summary files. If required, view the files to confirm the installation status.

Chapter 12

Performing post-upgrade tasks

This chapter includes the following topics:

Updating variables

In `/etc/profile`, update the `PATH` and `MANPATH` variables as needed.

MANPATH could include `/opt/VRTS/man` and PATH `/opt/VRTS/bin`.

Verifying the Veritas Dynamic Multi-Pathing upgrade

Refer to the section about verifying the installation to verify the upgrade.

See “Verifying that the products were installed” on page 47.

Section 5

Uninstallation of Veritas Dynamic Multi-Pathing

Chapter 13

Uninstalling Veritas Dynamic Multi-Pathing

This chapter includes the following topics:

Uninstalling Veritas Dynamic Multi-Pathing

Use the following procedure to remove Veritas Dynamic Multi-Pathing (DMP).

To uninstall DMP

1. To uninstall from multiple systems, set up the systems so that commands between systems execute without prompting for passwords or confirmations.

   See "About configuring secure shell or remote shell communication modes before installing products" on page 88.

2. On the system where you plan to remove DMP, move to the /opt/VRTS/install directory.

3. Run the `uninstalldmp` command.

   ```
   # ./uninstalldmp
   ```

4. When the installer prompts you, enter the names of each system where you want to uninstall DMP. Separate system names with spaces.

5 The installer program checks the systems. It then asks you if you want to stop DMP processes.

```
Do you want to stop DMP processes now? [y,n,q,?] (y)
```

If you respond yes, the processes are stopped and the RPMs are uninstalled.

6 Reboot the systems if the DMP native support is on and the systems need a reboot to disable the DMP native support. Re-run the uninstall task after reboot.

7 After the uninstall completes, the installer displays the location of the summary, response, and log files. If required, view the files to confirm the status of the removal.

Uninstalling DMP with the Veritas Web-based installer

This section describes how to uninstall using the Veritas Web-based installer.

Note: After you uninstall the product, you cannot access any file systems you created using the default disk layout Version in DMP 6.0 with with a previous version of DMP.

To uninstall DMP

1 Perform the required steps to save any data that you wish to preserve. For example, take back-ups of configuration files.

2 Start the Web-based installer.

See "Starting the Veritas Web-based installer" on page 34.

3 On the Select a task and a product page, select **Uninstall a Product** from the Task drop-down list.

4 Select **Veritas Dynamic Multi-Pathing** from the Product drop-down list, and click **Next**.

5 Indicate the systems on which to uninstall. Enter one or more system names, separated by spaces. Click **Next**.

6 After the validation completes successfully, click **Next** to uninstall DMP on the selected system.

7 If there are any processes running on the target system, the installer stops the processes. Click **Next**.

8 After the installer stops the processes, the installer removes the products from the specified system.

Click **Next**.

9 After the uninstall completes, the installer displays the location of the summary, response, and log files. If required, view the files to confirm the status of the removal.

10 Click **Finish**.

You see a prompt recommending that you reboot the system, and then return to the Web page to complete additional tasks.

Removing license files (Optional)

Optionally, you can remove the license files.

To remove the VERITAS license files

1 To see what license key files you have installed on a system, enter:

```
# /sbin/vxlicrep
```

The output lists the license keys and information about their respective products.

2 Go to the directory containing the license key files and list them:

```
# cd /etc/vx/licenses/lic
# ls -a
```

3 Using the output from step 1, identify and delete unwanted key files listed in step 2. Unwanted keys may be deleted by removing the license key file.

Section 6

Installation reference

Appendix A

Installation scripts

This appendix includes the following topics:

Command options for the installation script

The `installdmp` command usage takes the following form:

```
installdmp [ system1 system2... ]
 [ -configure | -install | -license | -precheck
         | -requirements | -start   | -stop | -uninstall
         | -upgrade | -postcheck ]
 [ -logpath log_path ]
 [ -responsefile response_file ]
 [ -tmppath tmp_path ]
 [ -hostfile hostfile_path ]

 [ -keyfile ssh_key_file ]

 [ -kickstart kickstart_path ]

 [ -pkgpath pkg_path ]

[ -rsh | -redirect | -installminpkgs | -installrecpkgs
        | -installallpkgs   | -minpkgs | -recpkgs | -allpkgs
        | -listpatches | -pkgset |  -copyinstallscripts
        | -pkginfo | -serial | -comcleanup | -makeresponsefile
        | -pkgtable | -ignorepatchreqs | -version | -nolic ]
```

Table A-1 lists the `installdmp` command options.

Table A-1 installdmp options

Option and Syntax	Description
`-allpkgs`	View a list of all DMP RPMs and patches. The installdmp lists the RPMs and patches in the correct installation order. You can use the output to create scripts for command-line installation, or for installations over a network. See the -minpkgs and the -recpkgs options.
`-comcleanup`	The `-comcleanup` option removes the ssh or rsh configuration added by installer on the systems. The option is only required when installation routines that performed auto-configuration of ssh or rsh are abruptly terminated.
`-configure`	Configure DMP after using `-install` option to install DMP.
`-copyinstallscripts`	Use this option when you manually install products and want to use the intallation scripts that are stored on the system to perform product configuration, uninstallation, and licensing tasks without the product media. Use this option to copy the installation scripts to an alternate rootpath when you use it with the `-rootpath` option. The following examples demonstrate the usage for this option: ■ `./installer -copyinstallscripts` Copies the installation and uninstallation scripts for all products in the release to /opt/VRTS/install. It also copies the installation Perl libraries to /opt/VRTSperl/lib/site_perl/*release_name* . ■ `./install`*`product_name`* `-copyinstallscripts` Copies the installation and uninstallation scripts for the specified product and any subset products for the product to /opt/VRTS/install. It also copies the installation Perl libraries to /opt/VRTSperl/lib/site_perl/*release_name* . ■ `./installer -rootpath` *`alt_root_path`* `-copyinstallscripts` The path *alt_root_path* can be a directory like /rdisk2. In that case, this command copies installation and uninstallation scripts for all the products in the release to /rdisk2/opt/VRTS/install. CPI perl libraries are copied at /rdisk2/opt/VRTSperl/lib/site_perl/release_name. For example, for the 5.1 SP1 the *release_name* is UXRT51SP1.
`-hostfile`	Specifies the location of a file that contains the system names for the installer.

Table A-1 installdmp options *(continued)*

Option and Syntax	Description
`-ignorepatchreqs`	The `-ignorepatchreqs` option is used to allow installation or upgrading even if the prerequisite packages or patches are missed on the system.
`-install`	Install product RPMs on systems without configuring DMP.
`-installallpkgs`	Selects all the RPMs for installation. See the `-allpkgs` option.
`-installminpkgs`	Selects the minimum RPMs for installation. See the `-minpkgs` option.
`-installrecpkgs`	Selects the recommended RPMs for installation. See the `-recpkgs` option.
`-kickstart` *`dir_path`*	Creates a kickstart configuration file to install DMP using the Kickstart utility for RHEL. The file contains the list of DMP RPMs in the correct installation order. The file contains the RPMs in the format that the Kickstart utility can use for installation. The *dir_path* indicates the path to an existing directory where the installer must create the file.
`-keyfile` *`ssh_key_file`*	Specifies a key file for SSH. The option passes `-i` *`ssh_key_file`* with each SSH invocation.
`-license`	Register or update product licenses on the specified systems. This option is useful to replace a demo license.
`-listpatches`	The `-listpatches` option displays product patches in correct installation order.
`-logpath` *`log_path`*	Specifies that log_path, not /opt/VRTS/install/logs, is the location where install log files, summary files, and response files are saved.
`-makeresponsefile`	Create a response file. This option only generates a response file and does not install DMP.

Table A-1 installdmp options *(continued)*

Option and Syntax	Description
`-minpkgs`	View a list of the minimal RPMs and the patches that are required for DMP. The installdmp lists the RPMs and patches in the correct installation order. The list does not include the optional RPMs. You can use the output to create scripts for command-line installation, or for installations over a network. See the -allpkgs and the -recpkgs options.
`-nolic`	Allows installation of product packages without entering a license key. Licensed features cannot be configured, started, or used when this option is specified.
`-pkginfo`	Displays a list of packages in the order of installation in a user-friendly format. Use this option with one of the following options: ■ -allpkgs If you do not specify an option, -allpkgs is used by default. ■ -minpkgs ■ -recpkgs
`-pkgpath` *`pkg_path`*	Specifies that *pkg_path* contains all RPMs that the installdmp is about to install on all systems. The *pkg_path* is the complete path of a directory, usually NFS mounted.
`-pkgset`	Discovers and lists the 6.0 RPMs installed on the systems that you specify.
`-pkgtable`	Displays the DMP 6.0 RPMs in the correct installation order.
`-postcheck`	Checks that the processes are running and other post-installation checks.
`-precheck`	Verify that systems meet the installation requirements before proceeding with DMP installation. Symantec recommends doing a precheck before you install DMP.

Table A-1 installdmp options *(continued)*

Option and Syntax	Description
`-recpkgs`	View a list of the recommended RPMs and the patches that are required for DMP. The installdmp lists the RPMs and patches in the correct installation order. The list does not include the optional RPMs. You can use the output to create scripts for command-line installation, or for installations over a network. See the -allpkgs and the -minpkgs options.
`-redirect`	Specifies that the installer need not display the progress bar details during the installation.
`-requirements`	View a list of required operating system version, required patches, file system space, and other system requirements to install DMP.
`-responsefile` *`response_file`*	Perform automated DMP installation using the system and the configuration information that is stored in a specified file instead of prompting for information. The *response_file* must be a full path name. You must edit the response file to use it for subsequent installations. Variable field definitions are defined within the file. See "Installing DMP using response files" on page 75. See "Upgrading DMP using response files" on page 75.
`-rsh`	Specifies that *rsh* and `rcp` are to be used for communication between systems instead of ssh and `scp`. This option requires that systems be preconfigured such that *rsh* commands between systems execute without prompting for passwords or confirmations
`-serial`	Performs the installation, uninstallation, start, and stop operations on the systems in a serial fashion. By default, the installer performs these operations simultaneously on all the systems.

Table A-1 installdmp options *(continued)*

Option and Syntax	Description
`-start`	Starts the daemons and processes for DMP. If the installdmp failed to start up all the DMP processes, you can use the -stop option to stop all the processes and then use the -start option to start the processes. See the -stop option. See "Starting and stopping processes for the Veritas products" on page 48.
`-stop`	Stops the daemons and processes for DMP. If the installdmp failed to start up all the DMP processes, you can use the -stop option to stop all the processes and then use the -start option to start the processes. See the -start option. See "Starting and stopping processes for the Veritas products" on page 48.
`-tmppath` *tmp_path*	Specifies that *tmp_path* is the working directory for installdmp. This path is different from the /var/tmp path. This destination is where the installdmp performs the initial logging and where the installdmp copies the RPMs on remote systems before installation.
`-upgrade`	Upgrades the installed RPMs on the systems that you specify.
`-uninstall`	Uninstalls DMP from the systems that you specify.
`-version`	Checks and reports the installed products and their versions. Identifies the installed and missing RPMs and patches where applicable for the product. Provides a summary that includes the count of the installed and any missing RPMs and patches where applicable. Lists the installed patches, hotfixes, and available updates for the installed product if an Internet connection is available.

Command options for uninstall script

The `uninstalldmp program` command usage takes the following form:

```
uninstalldmp [ <system1> <system2>... ]
        [ -logpath <log_path> ]
```

```
        [ -responsefile <response_file> ]
        [ -tmppath <tmp_path> ]
        [ -hostfile <hostfile_path> ]
        [ -keyfile <ssh_key_file> ]

  [ -rsh | -redirect | -copyinstallscripts
             | -serial | -comcleanup
             | -makeresponsefile | -version | -nolic ]
```

Table A-2 lists the `uninstalldmp program` command options.

Table A-2 uninstalldmp program options

Option and Syntax	Description
`-comcleanup`	The `-comcleanup` option removes the ssh or rsh configuration added by installer on the systems. The option is only required when installation routines that performed auto-configuration of ssh or rsh are abruptly terminated.
`-copyinstallscripts`	Use this option when you manually install products and want to use the intallation scripts that are stored on the system to perform product configuration, uninstallation, and licensing tasks without the product media. Use this option to copy the installation scripts to an alternate rootpath when you use it with the `-rootpath` option. The following examples demonstrate the usage for this option: ■ `./installer -copyinstallscripts` Copies the installation and uninstallation scripts for all products in the release to /opt/VRTS/install. It also copies the installation Perl libraries to /opt/VRTSperl/lib/site_perl/*release_name* . ■ `./install`*`product_name`* `-copyinstallscripts` Copies the installation and uninstallation scripts for the specified product and any subset products for the product to /opt/VRTS/install. It also copies the installation Perl libraries to /opt/VRTSperl/lib/site_perl/*release_name* . ■ `./installer -rootpath` *`alt_root_path`* `-copyinstallscripts` The path *alt_root_path* can be a directory like /rdisk2. In that case, this command copies installation and uninstallation scripts for all the products in the release to /rdisk2/opt/VRTS/install. CPI perl libraries are copied at /rdisk2/opt/VRTSperl/lib/site_perl/release_name. For example, for the 5.1 SP1 the *release_name* is UXRT51SP1.

Table A-2 uninstalldmp program options *(continued)*

Option and Syntax	Description
`-hostfile`	Specifies the location of a file that contains the system names for the installer.
`-keyfile` *`ssh_key_file`*	Specifies a key file for SSH. The option passes `-i` *`ssh_key_file`* with each SSH invocation.
`-logpath` *`log_path`*	Specifies that log_path, not /opt/VRTS/install/logs, is the location where uninstalldmp program log files, summary file, and response file are saved.
`-makeresponsefile`	Use this option to create a response file or to verify that your system configuration is ready for uninstalling DMP.
`-nolic`	Allows installation of product packages without entering a license key. Licensed features cannot be configured, started, or used when this option is specified.
`-redirect`	Displays progress details without showing progress bar.
`-responsefile` *`response_file`*	Perform automated DMP uninstallation using the system and the configuration information that is stored in a specified file instead of prompting for information. The *response_file* must be a full path name. You must edit the response file to use it for subsequent installations. Variable field definitions are defined within the file. See "Uninstalling DMP using response files" on page 76.
`-rsh`	Specifies that *rsh* and `rcp` are to be used for communication between systems instead of ssh and `scp`. This option requires that systems be preconfigured such that *rsh* commands between systems execute without prompting for passwords or confirmations
`-serial`	Performs the installation, uninstallation, start, and stop operations on the systems in a serial fashion. By default, the installer performs these operations simultaneously on all the systems.
`-tmppath` *`tmp_path`*	Specifies that *tmp_path* is the working directory for uninstalldmp program. This path is different from the /var/tmp path. This destination is where the uninstalldmp program performs the initial logging and where the installdmp copies the RPMs on remote systems before installation.

Table A-2 uninstalldmp program options *(continued)*

Option and Syntax	Description
`-version`	Checks and reports the installed products and their versions. Identifies the installed and missing RPMs and patches where applicable for the product. Provides a summary that includes the count of the installed and any missing RPMs and patches where applicable.

Appendix B

Response files

This appendix includes the following topics:

About response files

The installer or product installation script generates a response file during any installation, configuration, upgrade, or uninstall procedure. The response file contains the configuration information that you entered during the procedure. When the procedure completes, the installation script displays the location of the response files.

You can use the response file for future installation procedures by invoking an installation script with the `-responsefile` option. The response file passes arguments to the script to automate the installation of that product. You can edit the file to automate installation and configuration of additional systems.

You can generate a response file using the `-makeresponsefile` option.

Installing DMP using response files

Typically, you can use the response file that the installer generates after you perform DMP installation on a system to install DMP on other systems. You can also create a response file using the `-makeresponsefile` option of the installer.

To install DMP using response files

1. Make sure the systems where you want to install DMP meet the installation requirements.
2. Make sure the preinstallation tasks are completed.
3. Copy the response file to the system where you want to install DMP.
4. Edit the values of the response file variables as necessary.
5. Mount the product disc and navigate to the directory that contains the installation program.
6. Start the installation from the system to which you copied the response file. For example:

   ```
   # ./installer -responsefile /tmp/response_file

   # ./installdmp -responsefile /tmp/response_file
   ```

   Where /tmp/*response_file* is the response file's full path name.

Upgrading DMP using response files

Typically, you can use the response file that the installer generates after you perform DMP upgrade on one system to upgrade DMP on other systems. You can also create a response file using the `makeresponsefile` option of the installer.

To perform automated DMP upgrade

1. Make sure the systems where you want to upgrade DMP meet the upgrade requirements.
2. Make sure the pre-upgrade tasks are completed.
3. Copy the response file to one of the systems where you want to upgrade DMP.
4. Edit the values of the response file variables as necessary.

5 Mount the product disc and navigate to the folder that contains the installation program.

6 Start the upgrade from the system to which you copied the response file. For example:

```
# ./installer -responsefile /tmp/response_file

# ./installdmp -responsefile /tmp/response_file
```

Where /tmp/*response_file* is the response file's full path name.

Uninstalling DMP using response files

Typically, you can use the response file that the installer generates after you perform DMP uninstallation on one system to uninstall DMP on other systems.

To perform an automated uninstallation

1 Make sure that you meet the prerequisites to uninstall DMP.

2 Copy the response file to one of the cluster systems where you want to uninstall DMP.

3 Edit the values of the response file variables as necessary.

4 Start the uninstallation from the system to which you copied the response file. For example:

```
# /opt/VRTS/install/uninstalldmp -responsefile /tmp/response_file
```

Where /tmp/*response_file* is the response file's full path name.

Syntax in the response file

The syntax of the Perl statements that are included in the response file variables varies. It can depend on whether the variables require scalar or list values.

For example, in the case of a string value:

```
$CFG{Scalar_variable}="value";
```

or, in the case of an integer value:

```
$CFG{Scalar_variable}=123;
```

or, in the case of a list:

```
$CFG{List_variable}=["value", "value", "value"];
```

Response file variable definitions

Table B-1 lists the variables that are used in the response file and their definitions.

Table B-1 Response file variables

Variable	Description
CFG{opt}{install}	Installs DMP RPMs. Configuration can be performed at a later time using the `-configure` option. List or scalar: scalar Optional or required: optional
CFG{accepteula}	Specifies whether you agree with the EULA.pdf file on the media. List or scalar: scalar Optional or required: required
$CFG{opt}{vxkeyless}	Installs the product with keyless license. List of scalar: scalar Optional or required: optional
CFG{systems}	List of systems on which the product is to be installed, uninstalled, or configured. List or scalar: list Optional or required: required
CFG{prod}	Defines the product to be installed, uninstalled, or configured. List or scalar: scalar Optional or required: required
CFG{opt}{keyfile}	Defines the location of an ssh keyfile that is used to communicate with all remote systems. List or scalar: scalar Optional or required: optional

Table B-1 Response file variables *(continued)*

Variable	Description
CFG{opt}{pkgpath}	Defines a location, typically an NFS mount, from which all remote systems can install product RPMs. The location must be accessible from all target systems. List or scalar: scalar Optional or required: optional
CFG{opt}{tmppath}	Defines the location where a working directory is created to store temporary files and the RPMs that are needed during the install. The default location is /var/tmp. List or scalar: scalar Optional or required: optional
CFG{opt}{rsh}	Defines that *rsh* must be used instead of ssh as the communication method between systems. List or scalar: scalar Optional or required: optional
CFG{donotinstall} {RPM}	Instructs the installation to not install the optional RPMs in the list. List or scalar: list Optional or required: optional
CFG{donotremove} {RPM}	Instructs the uninstallation to not remove the optional RPMs in the list. List or scalar: list Optional or required: optional
CFG{opt}{logpath}	Mentions the location where the log files are to be copied. The default location is /opt/VRTS/install/logs. List or scalar: scalar Optional or required: optional
CFG{opt}{configure}	Performs the configuration after the RPMs are installed using the `-install` option. List or scalar: scalar Optional or required: optional

Table B-1 Response file variables *(continued)*

Variable	Description
CFG{opt}{upgrade}	Upgrades all RPMs installed, without configuration. List or scalar: list Optional or required: optional
CFG{opt}{uninstall}	Uninstalls DMP RPMs. List or scalar: scalar Optional or required: optional

Appendix C

Tunable files for installation

This appendix includes the following topics:

About setting tunable parameters using the installer or a response file

You can set non-default product and system tunable parameters using a tunables file. With the file, you can set tunables such as the I/O policy or toggle native multi-pathing. The tunables file passes arguments to the installer script to set tunables. With the file, you can set the tunables for the following operations:

- When you install, configure, or upgrade systems.

  ```
  # ./installer -tunablesfile tunables_file_name
  ```

  See “Setting tunables for an installation, configuration, or upgrade” on page 81.

- When you apply the tunables file with no other installer-related operations.

  ```
  # ./installer -tunablesfile tunables_file_name -settunables [
  system1 system2 ...]
  ```

See "Setting tunables with no other installer-related operations" on page 82.

- When you apply the tunables file with an un-integrated response file.

  ```
  # ./installer -responsefile response_file_name -tunablesfile
  tunables_file_name
  ```

  See "Setting tunables with an un-integrated response file" on page 83.

See "About response files" on page 74.

You must select the tunables that you want to use from this guide.

See "Tunables value parameter definitions" on page 85.

Setting tunables for an installation, configuration, or upgrade

You can use a tunables file for installation procedures to set non-default tunables. You invoke the installation script with the `tunablesfile` option. The tunables file passes arguments to the script to set the selected tunables. You must select the tunables that you want to use from this guide.

See "Tunables value parameter definitions" on page 85.

Note: Certain tunables only take effect after a system reboot.

To set the non-default tunables for an installation, configuration, or upgrade

1. Prepare the tunables file.

   See "Preparing the tunables file" on page 84.

2. Make sure the systems where you want to install DMP meet the installation requirements.
3. Complete any preinstallation tasks.
4. Copy the tunables file to one of the systems where you want to install, configure, or upgrade the product.
5. Mount the product disc and navigate to the directory that contains the installation program.
6. Start the installer for the installation, configuration, or upgrade. For example:

   ```
   # ./installer -tunablesfile /tmp/tunables_file
   ```

   Where /tmp/*tunables_file* is the full path name for the tunables file.

7 Proceed with the operation. When prompted, accept the tunable parameters.

Certain tunables are only activated after a reboot. Review the output carefully to determine if the system requires a reboot to set the tunable value.

8 The installer validates the tunables. If an error occurs, exit the installer and check the tunables file.

Setting tunables with no other installer-related operations

You can use the installer to set tunable parameters without any other installer-related operations. You must use the parameters described in this guide. Note that many of the parameters are product-specific. You must select the tunables that you want to use from this guide.

See "Tunables value parameter definitions" on page 85.

Note: Certain tunables only take effect after a system reboot.

To set tunables with no other installer-related operations

1 Prepare the tunables file.

See "Preparing the tunables file" on page 84.

2 Make sure the systems where you want to install DMP meet the installation requirements.

3 Complete any preinstallation tasks.

4 Copy the tunables file to one of the systems that you want to tune.

5 Mount the product disc and navigate to the directory that contains the installation program.

6 Start the installer with the `-settunables` option.

```
# ./installer -tunablesfile tunables_file_name -settunables [
sys123 sys234 ...]
```

Where /tmp/*tunables_file* is the full path name for the tunables file.

7 Proceed with the operation. When prompted, accept the tunable parameters.

Certain tunables are only activated after a reboot. Review the output carefully to determine if the system requires a reboot to set the tunable value.

8 The installer validates the tunables. If an error occurs, exit the installer and check the tunables file.

Setting tunables with an un-integrated response file

You can use the installer to set tunable parameters with an un-integrated response file. You must use the parameters described in this guide. Note that many of the parameters are product-specific. You must select the tunables that you want to use from this guide.

See "Tunables value parameter definitions" on page 85.

Note: Certain tunables only take effect after a system reboot.

To set tunables with an un-integrated response file

1 Make sure the systems where you want to install DMP meet the installation requirements.

2 Complete any preinstallation tasks.

3 Prepare the tunables file.

See "Preparing the tunables file" on page 84.

4 Copy the tunables file to one of the systems that you want to tune.

5 Mount the product disc and navigate to the directory that contains the installation program.

6 Start the installer with the `-settunables` option.

```
# ./installer -responsefile response_file_name -tunablesfile
tunables_file_name -settunables
```

Where *response_file_name* is the full path name for the response file and *tunables_file_name* is the full path name for the tunables file.

7 Proceed with the operation. When prompted, accept the tunable parameters.

Certain tunables are only activated after a reboot. Review the output carefully to determine if the system requires a reboot to set the tunable value.

8 The installer validates the tunables. If an error occurs, exit the installer and check the tunables file.

Preparing the tunables file

A tunables file is a Perl module and consists of an opening and closing statement, with the tunables defined between. Use the hash symbol at the beginning of the line to comment out the line. The tunables file opens with the line "our %TUN;" and ends with the return true "1;" line. The final return true line only needs to appear once at the end of the file. Define each tunable parameter on its own line.

Format the tunable parameter as follows:

```
$TUN{"tunable_name"}{"system_name"|"*"}=value_of_tunable;
```

For the *system_name*, use the name of the system, its IP address, or a wildcard symbol. The *value_of_tunable* depends on the type of tunable you are setting. End the line with a semicolon.

The following is an example of a tunables file.

```
#
# Tunable Parameter Values:
#
our %TUN;

$TUN{"tunable1"}{"*"}=1024;
$TUN{"tunable3"}{"sys123"}="SHA256";

1;
```

Setting parameters for the tunables file

Each tunables file defines different tunable parameters. The values that you can use are listed in the description of each parameter. Select the tunables that you want to add to the tunables file and then configure each parameter.

See “Tunables value parameter definitions” on page 85.

Each line for the parameter value starts with $TUN. The name of the tunable is in curly brackets and double-quotes. The system name is enclosed in curly brackets and double-quotes. Finally define the value and end the line with a semicolon, for example:

```
$TUN{"dmp_daemon_count"}{"node123"}=16;
```

In this example, you are changing the dmp_daemon_count value from its default of 10 to 16. You can use the wildcard symbol "*" for all systems. For example:

```
$TUN{"dmp_daemon_count"}{"*"}=16;
```

Tunables value parameter definitions

When you create a tunables file for the installer you can only use the parameters in the following list.

Prior to making any updates to the tunables, refer to the *Veritas Storage Foundation and High Availability Solutions Tuning Guide* for detailed information on product tunable ranges and recommendations .

Table C-1 describes the supported tunable parameters that can be specified in a tunables file.

Table C-1 Supported tunable parameters

Tunable	Description
dmp_cache_open	(Veritas Dynamic Multi-Pathing) Whether the first open on a device performed by an array support library (ASL) is cached. This tunable must be set after Veritas Dynamic Multi-Pathing is started.
dmp_daemon_count	(Veritas Dynamic Multi-Pathing) The number of kernel threads for DMP administrative tasks. This tunable must be set after Veritas Dynamic Multi-Pathing is started.
dmp_delayq_interval	(Veritas Dynamic Multi-Pathing) The time interval for which DMP delays the error processing if the device is busy. This tunable must be set after Veritas Dynamic Multi-Pathing is started.
dmp_fast_recovery	(Veritas Dynamic Multi-Pathing) Whether DMP should attempt to obtain SCSI error information directly from the HBA interface. This tunable must be set after Veritas Dynamic Multi-Pathing is started.
dmp_health_time	(Veritas Dynamic Multi-Pathing) The time in seconds for which a path must stay healthy. This tunable must be set after Veritas Dynamic Multi-Pathing is started.
dmp_log_level	(Veritas Dynamic Multi-Pathing) The level of detail to which DMP console messages are displayed. This tunable must be set after Veritas Dynamic Multi-Pathing is started.

Table C-1 Supported tunable parameters *(continued)*

Tunable	Description
dmp_low_impact_probe	(Veritas Dynamic Multi-Pathing) Whether the low impact path probing feature is enabled. This tunable must be set after Veritas Dynamic Multi-Pathing is started.
dmp_lun_retry_timeout	(Veritas Dynamic Multi-Pathing) The retry period for handling transient errors. This tunable must be set after Veritas Dynamic Multi-Pathing is started.
dmp_monitor_fabric	(Veritas Dynamic Multi-Pathing) Whether the Event Source daemon (vxesd) uses the Storage Networking Industry Association (SNIA) HBA API. This tunable must be set after Veritas Dynamic Multi-Pathing is started.
dmp_monitor_osevent	(Veritas Dynamic Multi-Pathing) Whether the Event Source daemon (vxesd) monitors operating system events. This tunable must be set after Veritas Dynamic Multi-Pathing is started.
dmp_monitor_ownership	(Veritas Dynamic Multi-Pathing) Whether the dynamic change in LUN ownership is monitored. This tunable must be set after Veritas Dynamic Multi-Pathing is started.
dmp_native_support	(Veritas Dynamic Multi-Pathing) Whether DMP does multi-pathing for native devices. This tunable must be set after Veritas Dynamic Multi-Pathing is started.
dmp_path_age	(Veritas Dynamic Multi-Pathing) The time for which an intermittently failing path needs to be monitored before DMP marks it as healthy. This tunable must be set after Veritas Dynamic Multi-Pathing is started.
dmp_pathswitch_blks_shift	(Veritas Dynamic Multi-Pathing) The default number of contiguous I/O blocks sent along a DMP path to an array before switching to the next available path. This tunable must be set after Veritas Dynamic Multi-Pathing is started.
dmp_probe_idle_lun	(Veritas Dynamic Multi-Pathing) Whether the path restoration kernel thread probes idle LUNs. This tunable must be set after Veritas Dynamic Multi-Pathing is started.

Table C-1 Supported tunable parameters *(continued)*

Tunable	Description
dmp_probe_threshold	(Veritas Dynamic Multi-Pathing) The number of paths will be probed by the restore daemon. This tunable must be set after Veritas Dynamic Multi-Pathing is started.
dmp_restore_cycles	(Veritas Dynamic Multi-Pathing) The number of cycles between running the check_all policy when the restore policy is check_periodic. This tunable must be set after Veritas Dynamic Multi-Pathing is started.
dmp_restore_interval	(Veritas Dynamic Multi-Pathing) The time interval in seconds the restore daemon analyzes the condition of paths. This tunable must be set after Veritas Dynamic Multi-Pathing is started.
dmp_restore_policy	(Veritas Dynamic Multi-Pathing) The policy used by DMP path restoration thread. This tunable must be set after Veritas Dynamic Multi-Pathing is started.
dmp_restore_state	(Veritas Dynamic Multi-Pathing) Whether kernel thread for DMP path restoration is started. This tunable must be set after Veritas Dynamic Multi-Pathing is started.
dmp_retry_count	(Veritas Dynamic Multi-Pathing) The number of times a path reports a path busy error consecutively before DMP marks the path as failed. This tunable must be set after Veritas Dynamic Multi-Pathing is started.
dmp_scsi_timeout	(Veritas Dynamic Multi-Pathing) The timeout value for any SCSI command sent via DMP. This tunable must be set after Veritas Dynamic Multi-Pathing is started.
dmp_sfg_threshold	(Veritas Dynamic Multi-Pathing) The status of the subpaths failover group (SFG) feature. This tunable must be set after Veritas Dynamic Multi-Pathing is started.
dmp_stat_interval	(Veritas Dynamic Multi-Pathing) The time interval between gathering DMP statistics. This tunable must be set after Veritas Dynamic Multi-Pathing is started.
vxfs_mbuf	(Veritas File System) Maximum memory used for VxFS buffer cache. This tunable requires system reboot to take effect.

Appendix D

Configuring the secure shell or the remote shell for communications

This appendix includes the following topics:

About configuring secure shell or remote shell communication modes before installing products

Establishing communication between nodes is required to install Veritas software from a remote system, or to install and configure a system. The system from which the installer is run must have permissions to run `rsh` (remote shell) or `ssh` (secure shell) utilities. You need to run the installer with superuser privileges on the systems where you plan to install Veritas software.

You can install products to remote systems using either secure shell (ssh) or remote shell (rsh). Symantec recommends that you use ssh as it is more secure than rsh.

This section contains an example of how to set up ssh password free communication. The example sets up ssh between a source system (system1) that contains the installation directories, and a target system (system2). This procedure also applies to multiple target systems.

Note: The script- and Web-based installers support establishing password less communication for you.

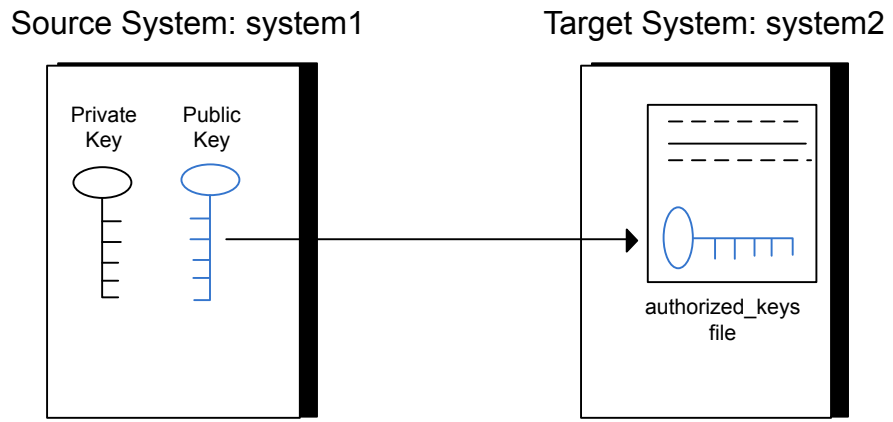
Manually configuring and passwordless ssh

The ssh program enables you to log into and execute commands on a remote system. ssh enables encrypted communications and an authentication process between two untrusted hosts over an insecure network.

In this procedure, you first create a DSA key pair. From the key pair, you append the public key from the source system to the authorized_keys file on the target systems.

Figure D-1 illustrates this procedure.

Figure D-1 Creating the DSA key pair and appending it to target systems



Read the ssh documentation and online manual pages before enabling ssh. Contact your operating system support provider for issues regarding ssh configuration.

Visit the OpenSSH website that is located at: http://openssh.org to access online manuals and other resources.

To create the DSA key pair

1. On the source system (system1), log in as root, and navigate to the root directory.

   ```
   system1 # cd /root
   ```

2. To generate a DSA key pair on the source system, type the following command:

   ```
   system1 # ssh-keygen -t dsa
   ```

   System output similar to the following is displayed:

   ```
   Generating public/private dsa key pair.
   Enter file in which to save the key (/root/.ssh/id_dsa):
   ```

3. Press Enter to accept the default location of `/root/.ssh/id_dsa`.
4. When the program asks you to enter the passphrase, press the Enter key twice.

   ```
   Enter passphrase (empty for no passphrase):
   ```

   Do not enter a passphrase. Press Enter.

   ```
   Enter same passphrase again:
   ```

   Press Enter again.

5. Output similar to the following lines appears.

   ```
   Your identification has been saved in /root/.ssh/id_dsa.
   Your public key has been saved in /root/.ssh/id_dsa.pub.
   The key fingerprint is:
   1f:00:e0:c2:9b:4e:29:b4:0b:6e:08:f8:50:de:48:d2 root@system1
   ```

To append the public key from the source system to the authorized_keys file on the target system, using secure file transfer

1. From the source system (system1), move the public key to a temporary file on the target system (system2).

   Use the secure file transfer program.

   In this example, the file name `id_dsa.pub` in the root directory is the name for the temporary file for the public key.

   Use the following command for secure file transfer:

   ```
   system1 # sftp system2
   ```

   If the secure file transfer is set up for the first time on this system, output similar to the following lines is displayed:

   ```
   Connecting to system2 ...
   The authenticity of host 'system2 (10.182.00.00)'
   can't be established. DSA key fingerprint is
   fb:6f:9f:61:91:9d:44:6b:87:86:ef:68:a6:fd:88:7d.
   Are you sure you want to continue connecting (yes/no)?
   ```

2. Enter `yes`.

   Output similar to the following is displayed:

   ```
   Warning: Permanently added 'system2,10.182.00.00'
   (DSA) to the list of known hosts.
   root@system2 password:
   ```

3. Enter the root password of system2.
4. At the `sftp` prompt, type the following command:

   ```
   sftp> put /root/.ssh/id_dsa.pub
   ```

   The following output is displayed:

   ```
   Uploading /root/.ssh/id_dsa.pub to /root/id_dsa.pub
   ```

5. To quit the SFTP session, type the following command:

   ```
   sftp> quit
   ```

6 Add the `id_dsa.pub` keys to the `authorized_keys` file on the target system. To begin the `ssh` session on the target system (system2 in this example), type the following command on system1:

```
system1 # ssh system2
```

Enter the root password of system2 at the prompt:

```
password:
```

Type the following commands on system2:

```
system2 # cat /root/id_dsa.pub >> /root/.ssh/authorized_keys
system2 # rm  /root/id_dsa.pub
```

7 When you install from a source system that is also an installation target, also add the local system `id_dsa.pub` key to the local `authorized_keys` file. The installation can fail if the installation source system is not authenticated.

To add the local system `id_dsa.pub` key to the local `authorized_keys` file, enter the following command:

```
system1 # cat /root/.ssh/id_dsa.pub >> /root/.ssh/authorized_keys
```

8 Run the following commands on the source installation system. If your ssh session has expired or terminated, you can also run these commands to renew the session. These commands bring the private key into the shell environment and make the key globally available to the user `root`:

```
system1 # exec /usr/bin/ssh-agent $SHELL
system1 # ssh-add

  Identity added: /root/.ssh/id_dsa
```

This shell-specific step is valid only while the shell is active. You must execute the procedure again if you close the shell during the session.

To verify that you can connect to a target system

1 On the source system (system1), enter the following command:

```
system1 # ssh -l root system2 uname -a
```

where system2 is the name of the target system.

2 The command should execute from the source system (system1) to the target system (system2) without the system requesting a passphrase or password.

3 Repeat this procedure for each target system.

Restarting the ssh session

After you complete this procedure, ssh can be restarted in any of the following scenarios:

- After a terminal session is closed
- After a new terminal session is opened
- After a system is restarted
- After too much time has elapsed, to refresh ssh

To restart ssh

1. On the source installation system (system1), bring the private key into the shell environment.

   ```
   system1 # exec /usr/bin/ssh-agent $SHELL
   ```

2. Make the key globally available for the user `root`

   ```
   system1 # ssh-add
   ```

Enabling rsh for Linux

The following section describes how to enable remote shell.

Veritas recommends configuring a secure shell environment for Veritas product installations.

See “Manually configuring and passwordless ssh” on page 89.

See the operating system documentation for more information on configuring remote shell.

To enable rsh

1. To ensure that the `rsh` and `rsh-server` packages are installed, type the following command:

   ```
   # rpm -qa | grep -i rsh
   ```

   If it is not already in the file, type the following command to append the line "`rsh`" to the `/etc/securetty` file:

   ```
   # echo "rsh" >> /etc/securetty
   ```

2. Modify /etc/init.d/rsh disable=no.

3 In the `/etc/pam.d/rsh` file, change the "`auth`" type from "`required`" to "`sufficient`":

```
auth      sufficient
```

4 Add the "promiscuous" flag into /etc/pam.d/rsh and /etc/pam.d/rlogin after item “pam_rhosts_auth.so”.

5 To enable the rsh server, type the following command:

```
# chkconfig rsh on
```

6 Modify the `.rhosts` file. Each line of the `.rhosts` file contains a fully qualified domain name or IP address for each remote system. This file also contains the name of a user having access to the local system. For example, if the root user must remotely access `system1` from `system2`, add an entry for `system2.`*`companyname`*`.com` to the `.rhosts` file on `system1` by typing the following command:

```
# echo "system2.companyname.com" >> $HOME/.rhosts
```

7 Install the Veritas product.

To disable rsh

1 Remove the "`rsh`" entry in the `/etc/securetty` file.

2 Disable the rsh server by typing the following command:

```
# chkconfig rsh off
```

3 After you complete an installation procedure, delete the `.rhosts` file from each user’s `$HOME` directory to ensure security:

```
# rm -f $HOME/.rhosts
```

Appendix E

Veritas Dynamic Multi-Pathing components

This appendix includes the following topics:

Veritas Dynamic Multi-Pathing installation RPMs

Table E-1 shows the RPM name and contents for each English language RPM for Veritas Dynamic Multi-Pathing. The table also gives you guidelines for which RPMs to install based whether you want the minimum, recommended, or advanced configuration.

Table E-1 Veritas Dynamic Multi-Pathing RPMs

RPMs	Contents	Configuration
VRTSaslapm	Veritas Array Support Library (ASL) and Array Policy Module(APM) binaries Required for the support and compatibility of various storage arrays.	Minimum
VRTSperl	Perl 5.10.0 for Veritas	Minimum
VRTSvlic	Veritas License Utilities Installs the license key layout files required to decode the Storage Foundation license keys. Provides the standard license key utilities vxlicrep, vxlicinst, and vxlictest.	Minimum
VRTSvxvm	Veritas Volume Manager binaries	Minimum

Table E-1 Veritas Dynamic Multi-Pathing RPMs *(continued)*

RPMs	Contents	Configuration
VRTSsfcpi60	Veritas Storage Foundation Common Product Installer The Storage Foundation Common Product installer RPM contains the scripts that perform the following: ■ installation ■ configuration ■ upgrade ■ uninstallation ■ adding nodes ■ removing nodes ■ etc. You can use this script to simplify the native operating system installations, configurations, and upgrades.	Minimum
VRTSsfmh	Veritas Storage Foundation Managed Host Discovers configuration information on a Storage Foundation managed host. This information is stored on a central database, which is not part of this release. You must download the database separately at: http://www.symantec.com/business/storage-foundation-manager	Recommended
VRTSspt	Veritas Software Support Tools	Recommended

Appendix F

Troubleshooting installation issues

This appendix includes the following topics:

Enable DMP root support manually when installing DMP 6.0

Installing or upgrading to DMP 6.0 with keyless or Veritas Dynamic Multi-pathing license requires the administrator to manually run the command to enable DMP root support, if it is not enabled automatically.

To do this, run the command `vxdmpadm settune dmp_native_support=on` after package installation.

Restarting the installer after a failed connection

If an installation is killed because of a failed connection, you can restart the installer to resume the installation. The installer detects the existing installation. The installer

prompts you whether you want to resume the installation. If you resume the installation, the installation proceeds from the point where the installation failed.

What to do if you see a licensing reminder

In this release, you can install without a license key. In order to comply with the End User License Agreement, you must either install a license key or make the host managed by a Management Server. If you do not comply with these terms within 60 days, the following warning messages result:

```
WARNING V-365-1-1 This host is not entitled to run Veritas Storage
Foundation/Veritas Cluster Server.As set forth in the End User
License Agreement (EULA) you must complete one of the two options
set forth below. To comply with this condition of the EULA and
stop logging of this message, you have <nn> days to either:
- make this host managed by a Management Server (see
  http://go.symantec.com/sfhakeyless for details and free download),
  or
- add a valid license key matching the functionality in use on this host
  using the command 'vxlicinst'
```

To comply with the terms of the EULA, and remove these messages, you must do one of the following within 60 days:

- Install a valid license key corresponding to the functionality in use on the host. After you install the license key, you must validate the license key using the following command:

  ```
  # /opt/VRTS/bin/vxkeyless
  ```

- Continue with keyless licensing by managing the server or cluster with a management server.
  For more information about keyless licensing, see the following URL:
  http://go.symantec.com/sfhakeyless

Troubleshooting information

The VRTSspt RPM provides a group of tools for troubleshooting a system and collecting information on its configuration. The tools can gather Veritas File System and Veritas Volume Manager metadata information and establish various benchmarks to measure file system and volume manager performance. Although the tools are not required for the operation of any Veritas product, Symantec recommends installing them should a support case be needed to be opened with

Symantec Support. If you are unfamiliar with their use and purpose, use caution when using them or use them in concert with Symantec Support.

Incorrect permissions for root on remote system

The permissions are inappropriate. Make sure you have remote root access permission on each system to which you are installing.

```
Failed to setup rsh communication on 10.198.89.241:
'rsh 10.198.89.241 <command>' failed
Trying to setup ssh communication on 10.198.89.241.
Failed to setup ssh communication on 10.198.89.241:
Login denied

Failed to login to remote system(s) 10.198.89.241.
Please make sure the password(s) are correct and superuser(root)
can login to the remote system(s) with the password(s).
If you want to setup rsh on remote system(s), please make sure
rsh with command argument ('rsh <host> <command>') is not
denied by remote system(s).

Either ssh or rsh is needed to be setup between the local node
and 10.198.89.241 for communication

Would you like the installer to setup ssh/rsh communication
automatically between the nodes?
Superuser passwords for the systems will be asked. [y,n,q] (y) n

System verification did not complete successfully

The following errors were discovered on the systems:

The ssh permission denied on 10.198.89.241
rsh exited 1 on 10.198.89.241
either ssh or rsh is needed to be setup between the local node
and 10.198.89.241 for communication
```

Suggested solution: You need to set up the systems to allow remote access using `ssh` or `rsh`.

See “About configuring secure shell or remote shell communication modes before installing products” on page 88.

Note: Remove remote shell permissions after completing the DMP installation and configuration.

Inaccessible system

The system you specified is not accessible. This could be for a variety of reasons such as, the system name was entered incorrectly or the system is not available over the network.

```
 Verifying systems: 12% .....................................
 Estimated time remaining: 0:10 1 of 8
 Checking system communication ............................. Done
System verification did not complete successfully
The following errors were discovered on the systems:
cannot resolve hostname host1
Enter the  system names separated by spaces: q,? (host1)
```

Suggested solution: Verify that you entered the system name correctly; use the `ping`(1M) command to verify the accessibility of the host.

Appendix G

Compatability issues when installing DMP with other products

This appendix includes the following topics:

Installing, uninstalling, or upgrading Storage Foundation products when other Veritas products are present

Installing Storage Foundation when other Veritas products are installed can create compatibility issues. For example, installing Storage Foundation products when VOM, ApplicationHA, and NetBackup are present on the systems.

Installing, uninstalling, or upgrading Storage Foundation products when VOM is already present

If you plan to install or upgrade Storage Foundation products on systems where VOM has already been installed, be aware of the following compatibility issues:

- When you install or upgrade Storage Foundation products where SFM or VOM Central Server is present, the installer skips the VRTSsfmh upgrade and leaves the SFM Central Server and Managed Host RPMs as is.
- When uninstalling Storage Foundation products where SFM or VOM Central Server is present, the installer does not uninstall VRTSsfmh.
- When you install or upgrade Storage Foundation products where SFM or VOM Managed Host is present, the installer gives warning messages that it will upgrade VRTSsfmh.

Installing, uninstalling, or upgrading Storage Foundation products when NetBackup is already present

If you plan to install or upgrade Storage Foundation on systems where NetBackup has already been installed, be aware of the following compatibility issues:

- When you install or upgrade Storage Foundation products where NetBackup is present, the installer does not uninstall VRTSpbx and VRTSicsco. It does not upgrade VRTSat.
- When you uninstall Storage Foundation products where NetBackup is present, the installer does not uninstall VRTSpbx, VRTSicsco, and VRTSat.

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