



CHAPTER 16

Maintaining Your WAAS System

This chapter describes the tasks that you may need to perform to maintain your WAAS system.



Note

Throughout this chapter, the term WAAS device is used to refer collectively to the WAAS Central Managers and WAEs in your network. The term WAE refers to WAE appliances, WAE Network Modules (the NME-WAE family of devices), and SM-SRE modules running WAAS.

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- [Backing Up and Restoring your WAAS System, page 16-8](#)
- [Performing Disk Maintenance for RAID-1 Systems, page 16-24](#)
- [Replacing Disks in RAID-5 Systems, page 16-25](#)
- [Configuring the Central Manager Role, page 16-26](#)
- [Enabling Disk Encryption, page 16-30](#)
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Upgrading the WAAS Software

[Table 16-1](#) outlines the steps you must complete to upgrade your WAAS software to a more recent version.

We recommend that all devices in your WAAS network should be running the same version of the WAAS software. If some of your WAAS devices are running different software versions, the WAAS Central Manager should be the highest version. For details on version interoperability limitations, see the *Release Note for Cisco Wide Area Application Services*.

If the WAAS Central Manager sees any registered WAE devices that are at a higher version level, it raises a minor alarm to alert you. Additionally, the WAE devices are shown in red on the device listing page.

WAAS Central Manager version 5.0.1 can manage WAE devices that are running version 4.2.1 and later releases. Some WAAS Central Manager windows (with new features) are not applicable to WAAS devices that are running a version lower than 5.0.1. If you modify the configuration in such windows, the configuration is saved, but it has no effect on the device until the device is upgraded to version 5.0.1.

**Note**

WAAS version 5.0 is not supported running in a mixed version WAAS network where any WAAS device is running a software version lower than 4.2.1. If you have any WAAS devices running versions earlier than 4.2.1, you must first upgrade them to version 4.2.1 (or a later version) before you install version 5.0 on the Central Manager. Do not upgrade any device to a version later than the existing Central Manager version. After all devices and the Central Manager are running version 4.2.1 or later, then you can begin the upgrade to version 5.0 on the WAAS Central Manager. Directly upgrading a device from version 4.0 or 4.1 to 5.0 is not supported.

Upgrading is supported only from certain older releases to a particular release. If you have a WAAS device that is running a release from which upgrading to the desired release is not supported, first upgrade the device to an intermediate supported release and then to the final desired release. For details on what versions are supported for upgrades, see the [Release Note for Cisco Wide Area Application Services](#) for the software version to which you want to upgrade.

Table 16-1 Checklist for Upgrading the WAAS Software

Task	Additional Information and Instructions
1. Determine the current software version running on your WAAS network.	Check the software version that you are currently using so when you go to Cisco.com, you know if there is a newer version to download. For more information, see the “Determining the Current Software Version” section on page 16-3 .
2. Obtain the new WAAS software version from Cisco.com.	Visit Cisco.com to download a newer software version and place this file on a local FTP or HTTP server. For more information, see the “Obtaining the Latest Software Version from Cisco.com” section on page 16-3 .
3. Register the new software version with the WAAS Central Manager.	Register the URL of the new software file so the WAAS Central Manager knows where to go to access the file. For more information, see the “Specifying the Location of the Software File in the WAAS Central Manager GUI” section on page 16-3 .
4. Upgrade your WAAS Central Manager.	Upgrade the standby and primary WAAS Central Managers. For more information, see the “Upgrading the WAAS Central Manager” section on page 16-5 .
5. Upgrade your WAAS devices using Device Groups.	After upgrading the WAAS Central Manager, upgrade all your WAAS devices that are members of a device group. For more information, see the “Upgrading Multiple Devices Using Device Groups” section on page 16-7 .
6. Delete the software version file.	After completely upgrading your WAAS network, you can remove the software file if desired. For more information, see the “Deleting a Software File” section on page 16-8 .

If you need to downgrade or roll back the WAAS software to a lower version, first downgrade or roll back the WAE devices, then the standby Central Manager (if applicable), and finally the primary Central Manager. For more information about downgrading, see the [Release Note for Cisco Wide Area Application Services](#) for your software version.

Determining the Current Software Version

To view the current software version running on any particular device, choose **Devices > All Devices**. The All Devices window displays the software version for each device listed.

You can also click **Devices > device-name** or the **Edit** icon next to the name of a device in the Devices window. The Device Dashboard window appears, listing the software version for that device.



Note The software version is not upgraded until a software upgrade has been successfully completed. If a software upgrade is in progress, the version number displayed is the base version, not the upgraded version number.

Alternatively, in the device context, choose **Monitor > CLI Commands > Show Commands**. Choose **version** and click **Submit**. A secondary window pops up and displays the CLI output for the **show version** command.

Obtaining the Latest Software Version from Cisco.com

To obtain the latest WAAS software version from Cisco.com, follow these steps:

-
- Step 1** Launch your web browser and open this location:
<http://www.cisco.com/cisco/software/navigator.html>
 - Step 2** Navigate to the **Application Networking Services > Wide Area Application Services > Cisco Wide Area Application Services (WAAS) Software** download area.
 - Step 3** Choose the WAAS software version that you want and download the appropriate software image (Universal, Accelerator only, or No Payload Encryption [NPE]).
 - Step 4** Register the location of the software file in the WAAS Central Manager GUI, as described in the section that follows.
-

Specifying the Location of the Software File in the WAAS Central Manager GUI

To upgrade your WAAS software, you must first specify the location of the WAAS software file in the WAAS Central Manager GUI and configure the software file settings.

There are two types of WAAS software files, as follows:

- **Universal**—Includes Central Manager, Application Accelerator, and AppNav Controller functionality. You can use this type of software file to upgrade a device operating in any mode.
- **Accelerator only**—Includes Application Accelerator and AppNav Controller functionality only. You can use this type of software file to upgrade only an Application Accelerator or AppNav Controller device. If you want to change an Application Accelerator or AppNav Controller to a Central

Manager, you must install the Universal software file, reload the device, change the device mode to central-manager, and then reload the device again. Additionally, kdump analysis functionality is not included in the Accelerator only image.

To configure the software file settings form, follow these steps:

Step 1 From the WAAS Central Manager menu, choose **Admin > Version Management > Software Update**.

Step 2 Click the **Create New Software File** icon in the taskbar.

The Creating New Software File window appears. (See [Figure 16-1](#).)

Figure 16-1 Creating New Software File Window

The screenshot shows a web-based form titled "Creating New Software File". The form is divided into several sections:

- Software File Settings:** Contains a dropdown menu for "Software File URL" (set to "ftp"), a text input for "Software File URL", a "Username" field, a "Password" field, a "Confirm Password" field, a "Software Version" field, and an "Image Type" field.
- Advanced Settings:** Features an "Auto Reload" checkbox (unchecked) and a large text area containing a warning: "Reload completes the installation process and allows the new software to run. If checked, reload will happen immediately following successful download. If unchecked, you must manually reload the upgraded devices, but you will have greater control over when devices reload. Manual reload can be done from device or group home pages. Also note that virtual blades (if any) in running state on the impacted host devices will be shutdown and may be adversely affected due to potential incompatibility with the Virtualization software. It is advisable to stop the running images gracefully before reloading."
- Comments:** A large empty text area for user notes.
- Buttons:** "Submit" and "Cancel" buttons at the bottom right.
- Note:** A small note at the bottom left states "Note: * - Required Field".

Step 3 In the Software File URL field, specify the location of the new WAAS software file as follows:

- a. Choose a protocol (**http** or **ftp**) from the drop-down list.
- b. Enter the URL for the .bin software file that you downloaded from Cisco.com. For example, a valid URL might look like the following:

`http://internal.mysite.com/waas/WAAS-xxx-K9.bin`

where WAAS-xxx-K9.bin is the name of the software upgrade file. (The filename typically includes the version number.)

Be sure that the URL identifies the correct type of software image for the devices you want to upgrade, either Universal or Accelerator only.

Step 4 If your server requires user login authentication, enter your username in the Username field and enter your login password in the Password field. Enter the same password in the Confirm Password field.

The Software Version and Image Type fields cannot be edited. They are filled in automatically after you submit the settings and the image is validated.

Step 5 In the Advanced Settings section, check the **Auto Reload** check box to automatically reload a device when you upgrade the software. If you do not check this box, you will need to manually reload a device after you upgrade the software on it to complete the upgrade process.



Note During a device reload, any virtual blades running on the device are shut down and may be adversely affected due to a potential incompatibility with the virtualization software. Therefore, you should stop the running images gracefully before reloading.

Step 6 (Optional) Enter comments in the field provided.

Step 7 Click **Submit**.

The software image file is validated and the Software Version and Image Type fields are filled in with the appropriate information extracted from the image file.



Caution

If your browser is configured to save the username and password for the WAAS Central Manager GUI, the browser will autopopulate the username and password fields in the Creating New Software File window. You must clear these fields before you click **Submit**.

The software file that you want to use is now registered with the WAAS Central Manager. When you perform the software upgrade or downgrade, the URL that you just registered becomes one of the choices available in the Update Software window.

To reload a device from the CLI, use the **reload EXEC** command.



Note When you are viewing the list of registered software files, if the Image Type column shows Unknown for a software file, it indicates that the software file was added under a WAAS version previous to 4.2.1. These Unknown software files must be resubmitted if you want to use them. Click the **Edit** icon next to the file to open the Modifying Software File window, and then click the **Submit** button to resubmit the file.

Upgrading the WAAS Central Manager

When upgrading software in your WAAS network, begin with WAAS Central Manager before upgrading the WAE devices.

Primary and standby WAAS Central Manager devices must be running the same version of WAAS software. If they are not, the standby WAAS Central Manager detects this and will not process any configuration updates it receives from the primary WAAS Central Manager. If the primary WAAS Central Manager sees that the standby WAAS Central Manager has a different version level, it shows the standby WAAS Central Manager in red on the device listing page.

If you use the primary WAAS Central Manager to perform the software upgrade, you need to upgrade your standby WAAS Central Manager first, and then upgrade your primary WAAS Central Manager. We also recommend that you create a database backup for the primary WAAS Central Manager and copy the database backup file to a safe place before you upgrade the software.

Use this upgrade procedure for WAAS Central Manager devices. You can also use this upgrade procedure to upgrade WAAS devices one at a time (after the WAAS Central Manager).

To upgrade your software to another WAAS software release on a single device, follow these steps:

Step 1 From the WAAS Central Manager menu, choose **Devices** > *device-name*.

The Device Dashboard window appears.

Step 2 Verify that the device is not already running the version to which you plan to upgrade.

Step 3 Click the **Update** link.

The Software Update window appears.

Step 4 Choose the software file URL from the Software Files list by clicking the radio button next to the filename.

The list displays only software files with an image type of Universal, because you are upgrading a Central Manager device. If no such images are available, you must create a software file as described in the “[Specifying the Location of the Software File in the WAAS Central Manager GUI](#)” section on page 16-3.

Step 5 Click **Submit**, and then click **OK** to confirm your decision.

The Devices listing window reappears. You can monitor the progress of your upgrade from this window.

Software upgrade status messages are displayed in the Software Version column. These intermediate messages are also written to the system log on the WAAS devices. See [Table 16-2](#) for a description of upgrade status messages.

Step 6 Clear your browser cache, close the browser, and restart the browser session to the WAAS Central Manager.

The WAAS Central Manager may reboot at the conclusion of the upgrade procedure (if Auto Reload was checked in the Creating New Software File window), causing you to temporarily lose contact with the device and the graphical user interface.

Table 16-2 Upgrade Status Messages

Upgrade Status Message	Condition
Pending	The request has yet to be sent from the WAAS Central Manager to the device, or receipt of the request has yet to be acknowledged by the device.
Downloading	The download method for the software file is being determined.
Proceeding with Download	The download method for the software file is determined to be direct download. Proceeding with the request for direct download of the software file.
Download in Progress (Completed ...)	The direct download of the software file is being processed. “Completed” indicates the number of megabytes processed.
Download Successful	The direct download of the software file has been successful.
Download Failed	The direct download of the software file cannot be processed. Further troubleshooting is required; see the device system message log. If you are upgrading several devices at once, the download may fail if the server hosting the software file becomes overloaded with requests. Retry the upgrade by clicking the Retry link if shown.
Proceeding with Flash Write	A request has been made to write the software file to the device flash memory.

Table 16-2 Upgrade Status Messages (continued)

Upgrade Status Message	Condition
Flash Write in Progress (Completed ...)	The write of the device flash memory is being processed. “Completed” indicates the number of megabytes processed.
Flash Write Successful	The flash write of the software file has been successful.
Reloading	A request to reload the device has been made in order to complete the software upgrade. The device may be offline for several minutes.
Reload Needed	A request to reload the device has not been made. The device must be reloaded manually to complete the software upgrade.
Cancelled	The software upgrade request was interrupted, or a previous software upgrade request was bypassed from the CLI.
Update Failed	The software upgrade could not be completed. Troubleshooting is required; see the device system message log. If you are upgrading several devices at once, the upgrade may fail if the server hosting the software file becomes overloaded with requests. Retry the upgrade by clicking the Retry link if shown.

Upgrading Multiple Devices Using Device Groups



Note

This procedure is for WAE devices only. WAAS Central Manager devices cannot be upgraded using device groups.

To upgrade to a more recent WAAS software release on multiple devices, follow these steps:

- Step 1** From the WAAS Central Manager menu, choose **Device Groups** > *device-group-name*.
- Step 2** Choose **Admin** > **Versioning** > **Software Update**.
The Software Update for Device Group window appears.
- Step 3** Choose the software file URL from the Software File URL list by clicking the radio button next to the filename. If no images are available, you must create a software file as described in the [“Specifying the Location of the Software File in the WAAS Central Manager GUI”](#) section on page 16-3.
If you are updating many devices and you want to use a smaller size software file to save network bandwidth, specify a software file with an image type of Accelerator only, which is smaller than a Universal image. If you later want to change an Accelerator-only device to a Central Manager, you must install the Universal software file, reload the device, change the device mode to central-manager, and then reload the device again.
- Step 4** Click **Submit**.

To view the progress of an upgrade, go to the All Devices window (**Devices > All Devices**) and view the software upgrade status message in the Software Version column. These intermediate messages are also written to the system log on WAAS devices. See [Table 16-2](#) for a description of the upgrade status messages.

Deleting a Software File

After you have successfully upgraded your WAAS devices, you can remove the software file from your WAAS system.

**Note**

You may want to wait a few days before removing a software file in the event you need to downgrade your system for any reason.

To delete a WAAS software file, follow these steps:

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- Step 1** From the WAAS Central Manager menu, choose **Admin > Version Management > Software Update**.
 - Step 2** Click the **Edit** icon next to the software file that you want to delete. The Modifying Software File window appears.
 - Step 3** Click the **Trash** icon in the taskbar.
You are prompted to confirm your decision to delete the software file.
 - Step 4** Click **OK**.
You are returned to the Software Files listing window with the selected software file removed from the WAAS network.
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Backing Up and Restoring your WAAS System

This section contains the following topics:

- [Backing Up and Restoring the WAAS Central Manager Database, page 16-9](#)
- [Backing Up and Restoring a WAE Device, page 16-10](#)
- [Reinstalling the System Software, page 16-11](#)
- [Recovering the System Software, page 16-18](#)
- [Recovering a Lost Administrator Password, page 16-21](#)
- [Recovering from Missing Disk-Based Software, page 16-22](#)
- [Recovering WAAS Device Registration Information, page 16-23](#)

Backing Up and Restoring the WAAS Central Manager Database

The WAAS Central Manager device stores WAAS network-wide device configuration information in its Centralized Management System (CMS) database. You can manually back up the CMS database contents for greater system reliability.

The CMS database backup is in a proprietary format that contains an archive database dump, WAAS Central Manager registration information, and device information that the WAAS Central Manager uses to communicate with other WAAS devices. CMS database backup files are not interchangeable between primary and standby WAAS Central Manager devices. This means you cannot use the backup file from a primary WAAS Central Manager to restore a standby WAAS Central Manager.

To back up the CMS database for the WAAS Central Manager, use the **cms database backup** EXEC command. For database backups, you need to specify the location, password, and user ID of the remote server that you want to store the backup file.



Note

If you have a backup made when the secure store was in user-passphrase mode and you restore it to a system where the secure store is in auto-passphrase mode, you must enter the user passphrase to proceed with the restore. After the restore, the system is in user-passphrase mode. If you have a backup made when the secure store was in auto-passphrase mode and you restore it to a system where the secure store is in user-passphrase mode, you do not need to enter a password. After the restore, the system is in auto-passphrase mode.

To back up and restore the CMS database, follow these steps:

- Step 1** On the WAAS Central Manager GUI device, use the **cms database backup** command to back up the CMS database to a file, as shown in the following example:

```
CM# cms database backup
Creating database backup file cms-db-11-05-2010-15-22_4.3.1.0.1.dump
Backup file cms-db-11-05-2010-15-22_4.3.1.0.1 is ready.
Please use 'copy' commands to move the backup file to a remote host.
```



Note

The backup file is automatically given a name in the following format `cms-db-date-timestamp_version.dump`. For example, `cms-db-7-22-2010-17-36_4.3.1.0.1.dump`. Note that the timestamp is in 24-hour format (HH:MM) that does not show seconds.

- Step 2** Save the file to a remote server by using the **copy disk ftp** command.

This command copies the file from the local disk to a remote FTP server, as shown in the following example:

```
CM# cd /local1
CM# copy disk ftp 10.86.32.82 /incoming cms-db-7-22-2008-17-36_4.1.3.0.1.dump
cms-db-7-22-2008-17-36_4.1.3.0.1.dump
```

```
Enter username for remote ftp server:ftp
Enter password for remote ftp server:*****
Initiating FTP upload...
Sending:USER ftp
10.86.32.82 FTP server (Version wu-2.6.1-18) ready.
Password required for ftp.
Sending:PASS *****
User ftp logged in.
Sending:TYPE I
```

```

Type set to I.
Sending: PASV
Entering Passive Mode (10,86,32,82,112,221)
Sending: CWD /incoming
CWD command successful.
Sending PASV
Entering Passive Mode (10,86,32,82,203,135)
Sending: STOR cms-db-7-22-2008-17-36_4.1.3.0.1.dump
Opening BINARY mode data connection for cms-db-7-22-2008-17-36_4.1.3.0.1.dump.
Transfer complete.
Sent 18155 bytes

```

Step 3 Restore the CMS database as follows:

a. Disable the CMS service:

```

CM# configure
CM(config)# no cms enable
CM(config)# exit

```



Note Stopping the CMS service disables the WAAS Central Manager GUI. All users currently logged into this GUI are automatically logged out once the CMS service is disabled.

b. Delete the existing CMS database:

```

CM# cms database delete

```

c. Initialize the CMS database:

```

CM# cms database create

```

d. Restore the CMS database contents from the backup file:

```

CM# cms database restore cms-db-7-22-2008-17-36_4.1.3.0.1.dump

```



Note After the restore, any WAEs that were registered with the Central Manager during the time since the backup was created will be disconnected from the Central Manager because there is no information about them in the backup file. To bring these WAEs online, you must deregister and reregister them with the Central Manager. On each WAE that was disconnected, use the following commands:

```

WAE# cms deregister force
WAE# configure
WAE(config)# cms enable

```

e. Enable the CMS service on the Central Manager:

```

CM# configure
CM(config)# cms enable

```

Backing Up and Restoring a WAE Device

You should back up the database of each WAAS device on a regular basis in case a system failure should occur.

**Note**

The backup and restore methods described in this section apply only to a WAE device that is not configured as a WAAS Central Manager. For information on backing up the WAAS Central Manager device, see the [“Backing Up and Restoring the WAAS Central Manager Database” section on page 16-9](#).

You can use either of the following methods to back up and restore the database of an individual WAE device:

- WAE Device Manager—For information on using the WAE Device Manager to back up and restore a device’s database, see the [“Backing Up the Configuration Files” section on page 11-6](#).
- CLI—You can use the **copy running-config** command to back up and restore a device’s configuration. This command saves the currently running configuration.

Additionally, you can restore a WAE to the default configuration that it was manufactured with at any time by removing the user data from the disk and Flash memory, and erasing all existing files cached on the appliance. Basic configuration information, such as network settings, can be preserved. The appliance is accessible through Telnet and Secure Shell (SSH) after it reboots.

**Note**

If software upgrades have been applied, the restoration process returns to the defaults of the currently installed version and not the factory defaults.

To restore a WAE to its factory defaults or the defaults of the current configuration from the CLI, use the **restore factory-default [preserve basic-config]** EXEC command.

For more information about the CLI commands, see the *Cisco Wide Area Application Services Command Reference*.

Reinstalling the System Software

This section contains instructions for using the software recovery files to reinstall your system software if for some reason the software that is installed has failed. A software recovery CD-ROM ships with some WAE and WAVE hardware devices and some WAVE devices use a USB flash drive for recovery.

**Caution**

If you upgraded your software after you received your software recovery CD-ROM or image files, using the recovery software images may downgrade your system. Ensure that you are using the desired software recovery version.

The WAAS software consists of three basic components:

- Disk-based software
- Flash-based software
- Hardware platform cookie (stored in flash memory)

All of these components must be correctly installed for WAAS software to work properly.

The software is contained in two types of software images provided by Cisco Systems:

- A .bin image that contains disk and flash memory components (the Universal version of the WAAS software)
- A .sysimg image that contains a flash memory component only

An installation that contains only the WAAS flash memory-based software, without the corresponding disk-based software, boots and operates in a limited mode, allowing for further disk configuration before completing a full installation.

The .sysimg component is provided for recovery purposes and allows for repair of flash memory only without modifying the disk contents.



Note The system image used depends on your device. For all WAVE and WAE-674/7341/7371 devices (64-bit platforms), use the 64-bit system image (with “x86_64” in its name). For all other devices, use the 32-bit system image named without this designator.

An NPE image is provided that has the disk encryption feature disabled for use in countries where disk encryption is not permitted.

If you have a WAVE appliance that requires a USB flash drive for software recovery, your USB flash drive must contain both of the needed software images in the form of an ISO archive file that you copy to the flash drive. (See the [“Preparing the USB Flash Drive”](#) section on page 16-13).

These options are available from the software recovery installer menu:

- **Option 1: Configure Network**—If the .bin image you need to install is located on the network instead of the CD-ROM or USB flash drive (which may be the case when an older CD-ROM or USB image is used to install new software), then you must choose this option to configure the network before attempting to install the .bin image.

This option is performed automatically if you install a .sysimg file from the network.

- **Option 2: Manufacture Flash**—This option verifies the flash memory and, if invalid, automatically reformats it to contain a Cisco standard layout. If reformatting is required, a new cookie is installed automatically.

This option is performed automatically as part of a .bin or .sysimg installation.

- **Option 3: Install Flash Cookie**—This option generates a hardware-specific platform cookie and installs it in flash memory. You need to use this option only if there has been a change in the hardware components, such as replacing the motherboard, or if you moved a flash memory card between systems.

This option is performed automatically during the flash manufacturing process, if needed, as part of a .bin or .sysimg installation.

- **Option 4: Install Flash Image from Network and Option 5: Install Flash Image from USB/CD-ROM**—These options allow installation of the flash memory .sysimg only and do not modify disk contents. They may be used when a new chassis has been provided and populated with the customer’s old disks that need to be preserved.

These options automatically perform flash verification and hardware cookie installation, if required. When installing from the network, you are prompted to configure the network if you have not already done so.

- **Option 6: Install Flash Image from Disk**—This option is reserved for future expansion and is not available.
- **Option 7: Recreate RAID device**—This option applies only to WAE-674, WAE-7341, WAE-7371, WAVE-7541, WAVE-7571, and WAVE-8541 devices and recreates the RAID array.
- **Option 8: Wipe Out Disks and Install .bin Image**—This option provides the preferred procedure for installing the WAAS software.



Caution Option 8 erases the content from all disk drives in your device.

This option performs the following steps:

- a. Checks that flash memory is formatted to Cisco specifications. If yes, the system continues to step b. If no, the system reformats the flash memory, which installs the Cisco file system, and generates and installs a platform-specific cookie for the hardware.
- b. Erases data from all drives.
- c. Remanufactures the default Cisco file system layout on the disk.
- d. Installs the flash memory component from the .bin image.
- e. Installs the disk component from the .bin image.



Note When option 8 is used and the system reboots and begins optimizing traffic, the **show disks details command** may show that the /dre1 partition is 98% or more used, due to the preallocation of DRE cache space. Use the **show statistics dre** command to display the actual DRE cache usage.

- Option 9: Exit (reboot)—This option ejects the CD-ROM (if applicable) and reboots the device. If you are using a USB flash drive for software installation, remove it from the device before rebooting.

The following sections describe how to reinstall the WAAS system software:

- “[Preparing the USB Flash Drive](#)” section on page 16-13—Read this section if you have a WAVE appliance that requires a USB flash drive instead of a CD to install the system software.
- “[Reinstalling the System Software](#)” section on page 16-15—Describes how to reinstall the system software from a CD or USB flash drive.
- “[Ensuring RAID Pairs Rebuild Successfully](#)” section on page 16-18—Describes how to ensure that RAID disks rebuild successfully.

Preparing the USB Flash Drive

If you have a WAVE appliance that requires a USB flash drive for software recovery, you must prepare the USB flash drive with the appropriate files before you can start the software recovery process. You will need the following:

- Windows PC (Windows XP or 7) or Mac computer
- USB flash drive that is 1 GB or larger in size
- The following software recovery files:
 - WAAS Rescue CD ISO image file, which is available in the [WAAS Software Download](#) area of Cisco.com. The filename is similar to waas-rescue-cdrom-x.x.x.x-k9.iso, where the *x*'s denote the software version number. Alternatively, the ISO image file is available on the WAAS release DVD, or you can make an ISO image file from a WAAS recovery CD.
 - syslinux.cfg file, which is also available in the [WAAS Software Download](#) area of Cisco.com and on the WAAS release DVD.
 - Unetbootin utility for Windows, which is available from the [Unetbootin Sourceforge website](#). (This file is not needed if you are using a Mac computer to prepare the USB flash drive.)

The steps for preparing the USB flash drive differ if you are using a Windows or Mac computer. See the appropriate topic:

- [“Using a Windows Computer to Prepare the USB Flash Drive” section on page 16-14](#)
- [“Using a Mac Computer to Prepare the USB Flash Drive” section on page 16-14](#)

Using a Windows Computer to Prepare the USB Flash Drive

To prepare the USB flash drive on a Windows PC, follow these steps:

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- Step 1** Transfer the software recovery files onto the Windows computer, noting the directory where they are stored.
 - Step 2** Insert the USB flash drive into a USB port on the PC.
 - Step 3** Open My Computer.
 - Step 4** Right click on the Removable Disk (drive letter will vary with system) and select **Format**.
In the formatting tool, select FAT32 for the File System and check the Quick Format check box, and then click **Start**. Click OK on the warning message. Close the formatting tool after the formatting is complete.
 - Step 5** Double-click the Windows Unetbootin utility to run it.
 - Step 6** Select the Diskimage option and click the corresponding browse button (...) to select the `waas-rescue-cdrom-x.x.x.x-k9.iso` image file.
 - Step 7** Ensure that USB Drive is selected in the Type pull-down list and that the correct drive letter is selected for Drive.
 - Step 8** Click OK to install the bootable image on the USB flash drive. When the installation has completed, click **Exit**.
 - Step 9** Drag copy the `syslinux.cfg` file onto the USB flash drive and confirm to replace. This file replaces the existing file on the USB flash drive with one customized for your WAAS system.
 - Step 10** Remove the USB flash drive from the PC.
-

To continue reinstalling the system software from the prepared USB flash drive, follow the instructions in the [“Reinstalling the System Software” section on page 16-15](#).

Using a Mac Computer to Prepare the USB Flash Drive

-
- Step 1** Transfer the software recovery files onto the Mac computer, noting the directory where they are stored.
 - Step 2** Open the Terminal application.
 - Step 3** Enter the `diskutil` command to list the current storage devices.
 - Step 4** Insert the USB flash drive into a USB port on the Mac computer.
 - Step 5** Enter the `diskutil` command again to list the current storage devices and note the device node assigned to your USB flash drive (for example, `/dev/disk2`)
 - Step 6** Enter the `diskutil unmountDisk /dev/diskN` command to unmount the USB flash drive. (*N* denotes the number of the USB flash drive node.)

- Step 7** Enter the command `sudo dd if=/path/waas-rescue-cdrom-x.x.x.x-k9.iso of=/dev/diskN bs=1m` to install the bootable image on the USB flash drive. (*path* denotes the folder path to the WAAS ISO file, *x.x.x.x* denotes the WAAS software version number, and *N* denotes the number of the USB flash drive node.)
- Step 8** You may receive a warning message about the `sudo` command and a prompt to enter your password to proceed. Enter your password if required.
- Step 9** Copy the `syslinux.cfg` file onto the USB flash drive.
- Step 10** Enter the `diskutil eject /dev/diskN` command and remove your USB flash drive when the command completes.

To continue reinstalling the system software from the prepared USB flash drive, follow the instructions in the next section, [Reinstalling the System Software](#).

Reinstalling the System Software

To reinstall the system software on a WAE appliance using the software recovery CD-ROM or USB flash drive, follow these steps:

- Step 1** Connect a serial console to the WAAS appliance and use the console for the following steps.
- Step 2** Insert the software recovery CD-ROM in the CD drive of the WAE device or, if the device uses a USB flash drive for recovery, insert a bootable USB flash drive with the software recovery files into the USB port of the device (see the [“Preparing the USB Flash Drive”](#) section on page 16-13). WAVE-294/594/694/7541/7571/8541 devices do not have CD drives and instead use a USB flash drive for software recovery.
- Step 3** Reboot the WAE. During the boot process, the boot loader pauses for 30 seconds and you must choose the VGA console if you are using vWAAS. The prompt is shown as follows:

```
Type "serial" for WAE/WAVE appliance.
Type "vga" for vWAAS.
boot:
```

Enter the **vga** command at the prompt to continue the boot process for the VGA console on vWAAS. After 30 seconds with no input, the boot process continues with the standard serial console for WAAS appliances.

After the WAE boots, you see the following menu:

```
Installer Main Menu:
 1. Configure Network
 2. Manufacture flash
 3. Install flash cookie
 4. Install flash image from network
 5. Install flash image from usb/cdrom
 6. Install flash image from disk
 7. Recreate RAID device (WAE-674/7341/7371/7541/7571/8541 only)
 8. Wipe out disks and install .bin image
 9. Exit (reboot)
Choice [0]:
```



Note The option numbers in the installer main menu may vary, depending on the WAAS software release being installed.

- Step 4** Choose option 2 to prepare the flash memory.
- This step prepares a cookie for the device and also retrieves the network configuration that was being used by the WAAS software. This network configuration is stored in the flash memory and is used to configure the network when the WAAS software boots up after installation.
- Step 5** Choose option 3 to install the flash cookie that you prepared in the previous step.
- Step 6** Choose option 5 to install the flash image from a CD-ROM or USB flash drive.
- Step 7** (Optional) If you are working with a WAE-674, WAE-7341, WAE-7371, WAVE-7541, WAVE-7571, or WAVE-8541 device, choose option 7 to recreate the RAID array.
- Step 8** Choose option 8 to wipe the disks and install the binary image.
- This step prepares the disks by erasing them. The WAAS software image is installed.
- Step 9** If you are using a USB flash drive to install the software, remove it from the device.
- Step 10** Choose option 9 to reboot the WAE.
- After the WAE reboots, it is running the newly installed WAAS software. The WAE has a minimal network configuration and is accessible via the terminal console for further configuration.
-

To reinstall the system software on an NME-WAE network module installed in a Cisco access router, follow these steps:

- Step 1** Log in to the Cisco router in which the NME-WAE module is installed, and reload the NME-WAE module:
- ```
router-2851> enable
router-2851# service-module integrated-Service-Engine 1/0 reload
```
- Step 2** Immediately open a session on the module:
- ```
router-2851# service-module integrated-Service-Engine 1/0 session
```
- Step 3** While the module is reloading, you will see the following option during boot phase 3. Enter ******* as instructed:
- ```
[BOOT-PHASE3]: enter `***' for rescue image: ***
```
- Step 4** The rescue image dialog appears. The following example demonstrates how to interact with the rescue dialog (user input is denoted by entries in bold typeface):

This is the rescue image. The purpose of this software is to let you install a new system image onto your system's boot flash device. This software has been invoked either manually (if you entered **\*\*\*** to the bootloader prompt) or has been invoked by the bootloader if it discovered that your system image in flash had been corrupted.

To download an image from network, this software will request the following information from you:

- which network interface to use
- IP address and netmask for the selected interface
- default gateway IP address
- FTP server IP address
- username and password on FTP server
- path to system image on server

Please enter an interface from the following list:  
0: GigabitEthernet 1/0



```

 1: GigabitEthernet 2/0
enter choice: 0
Using interface GigabitEthernet 1/0

Please enter the local IP address to use for this interface:
[Enter IP Address]: 10.1.13.2

Please enter the netmask for this interface:
[Enter Netmask]: 255.255.255.240

Please enter the IP address for the default gateway:
[Enter Gateway IP Address]: 10.1.13.1

Please enter the IP address for the FTP server where you wish
to obtain the new system image:
[Enter Server IP Address]: 10.107.193.240

Please enter your username on the FTP server (or 'anonymous'):
[Enter Username on server (e.g. anonymous)]: username

Please enter the password for username 'username' on FTP server:

Please enter the directory containing the image file on the FTP server:
[Enter Directory on server (e.g. /)]: /

Please enter the file name of the system image file on the FTP server:
[Enter Filename on server]: WAAS-5.0.1.10-K9.sysimg

Here is the configuration you have entered:

Current config:
 IP Address: 10.1.13.2
 Netmask: 255.255.255.240
 Gateway Address: 10.1.13.1
 Server Address: 10.107.193.240
 Username: username
 Password: *****
 Image directory: /
 Image filename: WAAS-5.0.1.10-K9.sysimg

Attempting download...
Downloaded 15821824 byte image file
A new system image has been downloaded.
You should write it to flash at this time.
Please enter 'yes' below to indicate that this is what you want to do:
[Enter confirmation ('yes' or 'no')]: yes
Ok, writing new image to flash
..... done.
Finished writing image to flash.
Enter 'reboot' to reboot, or 'again' to download and install a new image:
[Enter reboot confirmation ('reboot' or 'again')]: reboot
Restarting system.

```

**Step 5** After the module reboots, install the .bin image from an HTTP server:

```
NM-WAE-1# copy http install 10.77.156.3 /waas WAAS-5.0.1.10-k9.bin
```

**Step 6** Reload the module:

```
NM-WAE-1# reload
```

After the module reboots, it is running the newly installed WAAS software.

---

## Ensuring RAID Pairs Rebuild Successfully

You must ensure that all RAID pairs are done rebuilding before you reboot your WAE device. If you reboot while the device is rebuilding, you risk corrupting the file system.

RAID pairs will rebuild on the next reboot after you use the **restore factory-default** command, replace or add a hard disk drive, delete disk partitions, or reinstall WAAS from the booted recovery CD-ROM or USB flash drive.

To view the status of the drives and check if the RAID pairs are in “NORMAL OPERATION” or in “REBUILDING” status, use the **show disk details EXEC** command. When you see that RAID is rebuilding, you must let it complete that rebuild process. This rebuild process can take several hours.

If you do not wait for the RAID pairs to complete the rebuild process before you reboot the device, you may see the following symptoms indicating a problem:

- The device is offline in the Central Manager GUI.
- CMS can not be loaded.
- Error messages say that the file system is read-only.
- The syslog contains errors such as “Aborting journal on device md2,” “Journal commit I/O error,” “Journal has aborted,” and “ext3\_readdir: bad entry in directory.”
- Other unusual behaviors related to disk operations or the inability to perform them.

If you encounter any of these symptoms, reboot the WAE device and wait until the RAID rebuild finishes normally.

## Recovering the System Software

WAAS devices have a resident rescue system image that is invoked if the image in flash memory is corrupted. A corrupted system image can result from a power failure that occurs while a system image is being written to flash memory. The rescue image can help you download a system image to the main memory of the device and write it to flash memory.



**Note** The system image used depends on your device. For all WAVE and WAE-674/7341/7371 devices (64-bit platforms), use the 64-bit system image (with “x86\_64” in its name). For all other devices, use the 32-bit system image named without this designator.

An NPE image is provided that has the disk encryption feature disabled for use in countries where disk encryption is not permitted.

---

To install a new system image using the rescue image, follow these steps:

---

- Step 1** Download the system image file (\*.sysimg) to a host that is running an FTP server.
- Step 2** Establish a console connection to the WAAS device and open a terminal session.
- Step 3** Reboot the device by toggling the power on/off switch.

After a few seconds, the bootloader pauses and prompts you to enter 1 to boot WAAS, r to boot the rescue image, x to reboot, or 9 to escape to the loader prompt. You have 10 seconds to respond before the normal boot process continues.

**Step 4** Enter r to boot the rescue image.

The rescue image dialog appears and differs depending on whether your WAAS device was initially manufactured with version 4.x or 5.x. [Step 5](#) describes the rescue image on a device that was initially manufactured with version 5.x. [Step 6](#) describes the rescue image on a device that was initially manufactured with version 4.x.

**Step 5** If you see the following output (from a device that was initially manufactured with version 5.x), login and use the **copy install** command to install the WAAS system software image (.bin file), as shown in the following example (user input is denoted by entries in bold typeface):

```
The device is running WAAS rescue image. WAAS functionality is unavailable
in a rescue image. If the rescue image was loaded by accident, please reload
the device. If the rescue image was loaded intentionally to reinstall WAAS software
please use the following command:
```

```
copy [ftp|http|usb] install ...
```

```
SW up-to-date
...
```

```
Cisco Wide Area Virtualization Engine Console
```

```
Username: admin
Password:
System Initialization Finished.
```

```
WAVE# copy ftp install 172.16.10.10 / waas-universal-5.0.1.12-k9.bin
...
```

```
Installing system image to flash... Creating backup of database content before database
upgrade.
```

```
The new software will run after you reload.
```

```
WAVE# reload
Proceed with reload?[confirm]yes
Shutting down all services, will timeout in 15 minutes.
reload in progress ..Restarting system.
```

**Step 6** If you see the following output (from a device that was initially manufactured with version 4.x), login and install the WAAS system image (.sysimg file), as shown in the following example (user input is denoted by entries in bold typeface):

```
This is the rescue image. The purpose of this software is to let
you download and install a new system image onto your system's
boot flash device. This software has been invoked either manually
(if you entered `***' to the bootloader prompt) or has been
invoked by the bootloader if it discovered that your system image
in flash had been corrupted.
```

```
To download an image, this software will request the following
information from you:
```

- which network interface to use
- IP address and netmask for the selected interface
- default gateway IP address
- server IP address
- which protocol to use to connect to server
- username/password (if applicable)
- path to system image on server

```

Please enter an interface from the following list:
 0: GigabitEthernet 0/0
 1: GigabitEthernet 0/1
enter choice: 0
Using interface GigabitEthernet 0/0

Please enter the local IP address to use for this interface:
[Enter IP Address]: 172.16.22.22

Please enter the netmask for this interface:
[Enter Netmask]: 255.255.255.224

Please enter the IP address for the default gateway:
[Enter Gateway IP Address]: 172.16.22.1

Please enter the IP address for the FTP server where you wish
to obtain the new system image:
[Enter Server IP Address]: 172.16.10.10

Please enter your username on the FTP server (or 'anonymous'):
[Enter Username on server (e.g. anonymous)]: anonymous

Please enter the password for username 'anonymous' on FTP server:

Please enter the directory containing the image file on the FTP server:
[Enter Directory on server (e.g. /)]: /

Please enter the file name of the system image file on the FTP server:
[Enter Filename on server (e.g. WAAS-x86_64-4.x.x-K9.sysimg)]:
waas-x86_64-5.0.1.12-k9.sysimg

Here is the configuration you have entered:
Current config:
 IP Address: 172.16.22.22
 Netmask: 255.255.255.224
Gateway Address: 172.16.22.1
Server Address: 172.16.10.10
 Username: anonymous
 Password:
Image directory: /
Image filename: waas-x86_64-5.0.1.12-k9.sysimg

Attempting download...
Downloaded 31899648 byte image file
A new system image has been downloaded.
You should write it to flash at this time.
Please enter 'yes' below to indicate that this is what you want to do:
[Enter confirmation ('yes' or 'no')]: yes
Ok, writing new image to flash.
Finished writing image to flash.
Enter 'reboot' to reboot, or 'again' to download and install a new image:
[Enter reboot confirmation ('reboot' or 'again')]: reboot
Restarting system.
Booting system, please wait.....

```

**Step 7** Log in to the device as username **admin**. Verify that you are running the correct version by entering the **show version** command.

```

Username: admin
Password:

Console# show version
Cisco Wide Area Application Services Software (WAAS)

```

```
Copyright (c) 1999-2012 by Cisco Systems, Inc.
Cisco Wide Area Application Services (universal-k9) Software Release 5.0.1 (build
d b12 May 28 2012)
Version: oe294-5.0.1.12
```

```
Compiled 23:23:45 May 28 2012 by damaster
```

```
Device Id: 50:3d:e5:9c:8f:a5
System was restarted on Tue May 29 16:35:50 2012.
System restart reason: called via cli.
The system has been up for 8 hours, 10 minutes, 19 seconds.
```

## Recovering a Lost Administrator Password

If an administrator password is forgotten, lost, or misconfigured, you will need to reset the password on the device.



### Note

You cannot restore a lost administrator password. You must reset the password to a new one, as described in this procedure.

To reset the password, follow these steps:

**Step 1** Establish a console connection to the device and open a terminal session.

**Step 2** Reboot the device.

While the device is rebooting, watch for the following prompt, then press **Enter** when you see it:

```
Cisco WAAS boot:hit RETURN to set boot flags:0009
```

**Step 3** When prompted to enter bootflags, enter the following value: **0x8000**

```
Available boot flags (enter the sum of the desired flags):
0x4000 - bypass nvram config
0x8000 - disable login security
```

```
[CE boot - enter bootflags]:0x8000
You have entered boot flags = 0x8000
Boot with these flags? [yes]:yes
```

[Display output omitted]

Setting the configuration flags to **0x8000** lets you into the system, bypassing all security. Setting the configuration flags field to **0x4000** lets you bypass the NVRAM configuration.

**Step 4** When the device completes the boot sequence, you are prompted to enter the username to access the CLI. Enter the default administrator username (**admin**).

```
Cisco WAE Console
```

```
Username: admin
```

**Step 5** When you see the CLI prompt, set the password for the user using the **username passwd** command in global configuration mode.

```
WAE# configure
WAE(config)# username admin passwd
```

This command invokes interactive password configuration. Follow the CLI prompts.

**Step 6** Save the configuration change:

```
WAE(config)# exit
WAE# write memory
```

**Step 7** (Optional) Reboot your device:

```
WAE# reload
```

Rebooting is optional; however, you might want to reboot to ensure that the boot flags are reset, and to ensure that subsequent console administrator logins do not bypass the password check.



**Note** In the WAAS software, the bootflags are reset to 0x0 on every reboot.

## Recovering from Missing Disk-Based Software

This section describes how to recover from the following types of disk drive issues:

- Your WAAS device contains a single disk drive that needs to be replaced due to a disk failure.
- Your WAAS device contains two disk drives and you intentionally deleted the disk partitions on both drives (diks00 and disk01).

Systems with two or more disk drives are normally protected automatically by RAID-1 on critical system partitions, so the procedures in this section do not need to be followed when replacing a disk drive in a multi-drive system.

To recover from this condition, follow these steps:

**Step 1** Deactivate the device by completing the following steps:

- a. From the WAAS Central Manager menu, go to **Devices** > *device-name*.
- b. Choose *device-name* > **Activation**. The Device Activation window appears.
- c. Uncheck the **Activate** check box, and then click **Submit**.

The device is deactivated.

**Step 2** Power down the device and replace the failed hard drive.

**Step 3** Power on the device.


**Step 4** Install the WAAS software. For more information on initial configuration, see the *Cisco Wide Area Application Services Quick Configuration Guide*.

**Step 5** Use the CMS identity recovery procedure to recover the device CMS identity and associate this device with the existing device record on the WAAS Central Manager. For more information, see the [“Recovering WAAS Device Registration Information” section on page 16-23](#).

## Recovering WAAS Device Registration Information

Device registration information is stored both on the device itself and on the WAAS Central Manager. If a device loses its registration identity or needs to be replaced because of a hardware failure, the WAAS network administrator can issue a CLI command to recover the lost information, or in the case of adding a new device, assume the identity of the failed device.

To recover lost registration information, or to replace a failed device with a new one having the same registration information, follow these steps:

- 
- Step 1** Mark the failed device as “Inactive” and “Replaceable” by completing the following steps:
- From the Central Manager menu, choose **Devices** > *device-name*.
  - Choose *device-name* > **Activation**.
  - Uncheck the **Activate** check box. The window refreshes, displaying a check box for marking the device as replaceable.
  - Check the **Replaceable** check box, and click **Submit**.
-  **Note** This check box appears in the GUI only when the device is inactive.
- 
- Step 2** If the failed device is configured as a non-optimizing peer with another device, disable the peer settings on the other device.
- A pop-up message appears if the failed device is a non-optimizing peer and the message indicates the device that is its non-optimizing peer. When a device is replaced, its device ID changes and so the non-optimizing peer configuration must be updated.
- From the WAAS Central Manager menu, choose **Configure** > **Global** > **Peer Settings**. The Peer Settings window for all devices appears.
  - Click the **Edit** icon next to the non-optimizing peer device identified in the message, which will appear in red because its peer is unknown. The Peer Settings window for that device appears.
  - Click the **Remove Device Settings** icon in the taskbar.
  - Click **Submit**.
- Step 3** Configure a system device recovery key as follows:
- From the WAAS Central Manager menu, choose **Configure** > **Global** > **System Properties**.
  - Click the **Edit** icon next to the System.device.recovery.key property. The Modifying Config Property window appears.
  - Enter a password in the Value field, and click **Submit**. The default password is **default**.
- Step 4** Configure the basic network settings for the new device.
- Step 5** Open a Telnet session to the device CLI and enter the **cms recover identity keyword EXEC** command. *keyword* is the device recovery key that you configured in the WAAS Central Manager GUI.
- When the WAAS Central Manager receives the recovery request from the WAAS device, it searches its database for the device record that meets the following criteria:
- The record is inactive and replaceable.
  - The record has the same hostname or primary IP address as given in the recovery request.

If the recovery request matches the device record, then the WAAS Central Manager updates the existing record and sends the requesting device a registration response. The replaceable state is cleared so that no other device can assume the same identity. When the WAAS device receives its recovered registration information, it writes it to file, initializes its database tables, and starts.

**Step 6** Enter the following commands to enable the CMS service on the device:

```
WAE# config
WAE(config)# cms enable
WAE(config)# exit
```

**Step 7** Activate the device:

- a. From the WAAS Central Manager menu, choose **Devices** > *device-name*.
- b. Choose *Device Name* > **Activation**. The WAAS device status should be Online.
- c. Check the **Activate** check box, and click **Submit**.

**Step 8** Reconfigure the device peer settings, if the device was configured as a non-optimizing peer with another device (see the [“Information About Clustering Inline WAEs”](#) section on page 5-53).

**Step 9** Save the device configuration settings by entering the **copy running-config startup-config EXEC** command.

## Performing Disk Maintenance for RAID-1 Systems

WAAS supports hot-swap functionality for both failed disk replacement and scheduled disk maintenance. When a disk fails, WAAS automatically detects the disk failure, marks the disk as bad, and removes the disk from the RAID-1 volume. To schedule disk maintenance, you must manually shut down the disk.

You must wait for the disk to be completely shut down before you physically remove the disk from the WAE. When the RAID removal process is complete, WAAS generates a disk failure alarm and trap. In addition, a syslog ERROR message is logged.



### Note

If the removal event (such as, a disk failure or software shutdown) occurs while the RAID array is in the rebuild process, the RAID removal process may take up to 1 minute to complete. The duration of this process depends on the size of the disk.

If the WAAS software removes a failed disk during the RAID rebuild process, a RAID rebuild failure alarm is generated. If you administratively shut down the disk during the RAID rebuild process, a RAID rebuild abort alarm is generated instead.

When you install a replacement disk, the WAAS software detects the replacement disk and performs compatibility checks on the disk, initializes the disk by creating partitions, and adds the disk to the software RAID to start the RAID rebuild process.

If the newly inserted disk has the same disk ID as a disk that was previously marked bad in the same physical slot, then the disk will not be mounted, and the post-replacement checks, initialization, and RAID rebuilding will not occur.

A newly installed disk must be of the same type and speed as the old disk and it must meet the following compatibility requirements:




- If the replacement disk is for disk00, disk02, or disk04 of a RAID pair, the replacement disk must be the same size as the running disk in the array.
- If the replacement disk is for disk01, disk03, or disk05 of a RAID pair, then the replacement disk must have the same or greater RAID capacity as the running disk in the array.

Compatibility checks, which are part of the hot-swap process, check for capacity compatibility. Incompatibility generates an alarm and aborts the hot-swap process.

To perform disk maintenance, follow these steps:

- 
- Step 1** Manually shut down the disk.
- a. Enter global configuration mode and then enter the **disk disk-name diskxx shutdown** command:
 

```
WAE# configure
WAE(config)# disk disk-name diskxx shutdown
```
  - b. Wait for the disk to be completely shut down before you physically remove the disk from the WAE. When the RAID removal process is complete, WAAS generates a disk failure alarm and trap. In addition, a syslog ERROR message is logged.
-  **Note** We recommend that you disable the **disk error-handling reload** option, if enabled, because it is not necessary to power down the system to remove a disk.
- 
- Step 2** Insert a replacement disk into the slot in the WAE. The replacement disk must have a disk ID number that is different from the disk that it is replacing.
- Step 3** Reenable the disk by entering the **no disk disk-name diskxx shutdown** global configuration command.
- 

## Replacing Disks in RAID-5 Systems

To remove and replace a physical disk drive in a system that uses a RAID-5 logical drive, follow these steps:

- 
- Step 1** Enter the **disk disk-name diskxx replace** command in EXEC mode at the WAAS CLI on the WAE.
- Step 2** Verify that the disk drive *diskxx* is in the Defunct state by entering the **show disks details** command in EXEC mode. The RAID logical drive is in the Critical state at this point.
- Step 3** Move the handle on the drive to the open position (perpendicular to the drive).
- Step 4** Pull the hot-swap drive assembly from the bay.
- Step 5** Wait for one minute and then insert the new drive into the same slot by aligning the replacement drive assembly with guide rails in the bay and sliding the drive assembly into the bay until it stops. Make sure that the drive is properly seated in the bay.
- Step 6** Close the drive handle.
- Step 7** Check the hard disk drive status LED to verify that the hard disk drive is operating correctly. If the amber hard disk drive status LED for a drive is lit continuously, that drive is faulty and must be replaced. If the green hard disk drive activity LED is flashing, the drive is being accessed.
- Step 8** Wait 1 minute and then verify that the replaced disk drive is in the Rebuilding state by using the **show disks details** command in EXEC mode.




---

**Note** The ServeRAID controller automatically starts the rebuild operation when it detects the removal and reinsertion of a drive that is part of the logical RAID drive.

---

- Step 9** Wait until the rebuild operation is complete. You can check if the rebuild operation is complete by using the **show disks details** command in EXEC mode. The physical drive state will be Online and the RAID logical drive state will be Okay after the rebuild operation is completed.
- 

A 300-GB SAS drive may take up to 5 hours to finish rebuilding.

If you have multiple disk failures and your RAID-5 logical status is Offline, you must recreate the RAID-5 array by following these steps:

---

- Step 1** Enter global configuration mode and then enter the **disk logical shutdown** command to disable the RAID-5 array.
- Step 2** Enter the **write** command in EXEC mode to save the running configuration to NVRAM.
- Step 3** Enter the **reload** command in EXEC mode to reload the system.
- Step 4** Enter the **show disks details** command in EXEC mode to check the system configuration after the system is rebooted. At this point, the disks are not mounted and the logical RAID drive should be in the Shutdown state.
- Step 5** Enter the **disk recreate-raid** command in EXEC mode to recreate the RAID-5 array.
- Step 6** After successful execution of the previous command, enter global configuration mode and then enter the **no disk logical shutdown** command to disable the logical disk shutdown configuration.
- Step 7** Enter the **write** command in EXEC mode to save the configuration to NVRAM.
- Step 8** Enter the **reload** command in EXEC mode to reload the system.
- Step 9** Enter the **show disks details** command in EXEC mode to check the system configuration after the system is rebooted. At this point, the disks should be mounted and the logical RAID drive should not be in the Shutdown state.
- Step 10** Wait until the rebuild operation is complete. You can check if the rebuild operation is complete by using the **show disks details** command in EXEC mode. The physical drive state will be Online and the RAID logical drive state will be Okay after the rebuild operation is completed.
- 

It takes several hours to finish rebuilding the RAID-5 array.

After a multiple disk failure or RAID controller failure, and after the drives are replaced and the RAID disk is rebuilt, the logical disk may remain in the error state. To reenble the disk, use the **no disk logical shutdown force** command, then reload the WAE.

## Configuring the Central Manager Role

The WAAS software implements a standby WAAS Central Manager. This process allows you to maintain a copy of the WAAS network configuration on a second WAAS Central Manager device. If the primary WAAS Central Manager fails, the standby can be used to replace the primary.

For interoperability, when a standby WAAS Central Manager is used, it must be at the same software version as the primary WAAS Central Manager to maintain the full WAAS Central Manager configuration. Otherwise, the standby WAAS Central Manager detects this status and does not process any configuration updates that it receives from the primary WAAS Central Manager until the problem is corrected.

**Note**

Primary and standby Central Managers communicate on port 8443. If your network includes a firewall between primary and standby Central Managers, you must configure the firewall to allow traffic on port 8443 so that the Central Managers can communicate and stay synchronized.

This section contains the following topics:

- [Converting a WAE to a Standby Central Manager, page 16-27](#)
- [Converting a Primary Central Manager to a Standby Central Manager, page 16-28](#)
- [Converting a Standby Central Manager to a Primary Central Manager, page 16-28](#)
- [Switching Both Central Manager Roles, page 16-29](#)
- [Central Manager Failover and Recovery, page 16-30](#)

## Converting a WAE to a Standby Central Manager

This section describes how to convert a WAE that is operating as an application accelerator to a standby Central Manager.

There are two types of WAAS software files, as follows:

- Universal—Includes Central Manager, Application Accelerator, and AppNav Controller functionality.
- Accelerator only—Includes Application Accelerator and AppNav Controller functionality only. If you want to change an Application Accelerator or AppNav Controller to a Central Manager, you must use the Universal software file.

If the WAE is operating with an Accelerator only image, you cannot convert it to a Central Manager until after you update it with the Universal software file, reload the device, change the device mode to central-manager, and then reload the device again. For information on updating a WAE, see the [“Upgrading the WAAS Software” section on page 16-1](#).

You can use the **show version EXEC** command to check if the WAE is running an Accelerator only image. Also, the **show running-config EXEC** command displays the image type.

To convert a WAE with a Universal image to a standby Central Manager, follow these steps:

**Step 1** Deregister the WAE from the Central Manager using the **cms** command:

```
WAE# cms deregister force
```

This command cleans up any previous association to any other Central Manager.

**Step 2** Configure the device mode as Central Manager using the **device** command:

```
WAE# configure
WAE(config)# device mode central-manager
```

You must reload the device to apply the changes.

**Step 3** Configure the Central Manager role as standby using the **central-manager** command:

```
WAE(config)# central-manager role standby
```

- Step 4** Configure the address of primary Central Manager using the **central-manager** command:

```
WAE(config)# central-manager address cm-primary-address
```

- Step 5** Enable the CMS service using the **cms** command:

```
WAE(config)# cms enable
```

---

## Converting a Primary Central Manager to a Standby Central Manager

To convert a primary Central Manager to a standby Central Manager, follow these steps:

- Step 1** Deregister the Central Manager using the **cms** command:

```
WAE# cms deregister
```

This command cleans up any previous association to any other Central Manager.

- Step 2** Configure the Central Manager role as standby using the **central-manager** command:

```
WAE# configure
WAE(config)# central-manager role standby
```

- Step 3** Configure the address of primary Central Manager using the **central-manager** command:

```
WAE(config)# central-manager address cm-primary-address
```

- Step 4** Enable the CMS service using the **cms** command:

```
WAE(config)# cms enable
```

---

## Converting a Standby Central Manager to a Primary Central Manager

If your primary WAAS Central Manager becomes inoperable, you can manually reconfigure one of your warm standby Central Managers to be the primary Central Manager. Configure the new role by using the global configuration **central-manager role primary** command as follows:

```
WAE# configure
WAE(config)# central-manager role primary
```

This command changes the role from standby to primary and restarts the management service to recognize the change.

If the previous failed primary Central Manager again becomes available, you can recover it to again become the primary Central Manager. For details, see the [“Central Manager Failover and Recovery” section on page 16-30](#).

If you switch a warm standby Central Manager to primary while your primary Central Manager is still online and active, both Central Managers detect each other, automatically shut themselves down, and disable management services. The Central Managers are switched to halted, which is automatically saved in flash memory.

To return halted WAAS Central Managers to an online status, decide which Central Manager should be the primary device and which should be the standby device. On the primary device, execute the following CLI commands:

```
WAE# configure
WAE(config)# central-manager role primary
WAE(config)# cms enable
```

On the standby device, execute the following CLI commands:

```
WAE# configure
WAE(config)# central-manager role standby
WAE(config)# central-manager address cm-primary-address
WAE(config)# cms enable
```

## Switching Both Central Manager Roles



### Caution

When you switch a WAAS Central Manager from primary to standby, the configuration on the Central Manager is erased. The Central Manager, after becoming a standby, will begin replicating its configuration information from whichever Central Manager is now the primary. If standby and primary units are not synchronized before switching roles, important configuration information can be lost.

Before you switch Central Manager roles, follow these steps:

- Step 1** Ensure that your Central Manager devices are running the same version of WAAS software.
- Step 2** Synchronize the physical clocks on both devices so that both WAAS Central Managers have the same Coordinated Universal Time (UTC) configured.
- Step 3** Ensure that the standby is synchronized with the primary by checking the status of the following items:
  - a. Check the online status of your devices.

The original standby Central Manager and all currently active devices should be showing as online in the Central Manager GUI. This step ensures that all other devices know about both Central Managers.
  - b. Check the status of recent updates from the primary WAAS Central Manager.

Use the **show cms info EXEC** command and check the time of the last update. To be current, the value of the Time of last config-sync field should be between 1 and 5 minutes old. You are verifying that the standby WAAS Central Manager has fully replicated the primary WAAS Central Manager configuration.

If the update time is not current, determine whether or not there is a connectivity problem or if the primary WAAS Central Manager is down. Fix the problem, if necessary, and wait until the configuration has replicated, as indicated by the time of the last update.
- Step 4** Switch roles in the following order:
  - a. Switch the original primary to standby mode:

```
WAE1# configure
WAE1(config)# central-manager role standby
WAE1(config)# cms enable
```
  - b. Switch the original standby to primary mode:

```
WAE2# configure
WAE2(config)# central-manager role primary
WAE2(config)# cms enable
```

The CMS service is restarted automatically when you configure a role change.

## Central Manager Failover and Recovery

If your primary WAAS Central Manager becomes inoperable, you can reconfigure one of your standby Central Managers to be the primary Central Manager and then later, when the failed Central Manager becomes available, you can reconfigure it to be primary again. Follow these steps:

- 
- Step 1 Convert a standby Central Manager to be the primary Central Manager as described in the [“Converting a Standby Central Manager to a Primary Central Manager”](#) section on page 16-28.
  - Step 2 When the failed Central Manager is again available, configure it as a standby Central Manager as described in the [“Converting a Primary Central Manager to a Standby Central Manager”](#) section on page 16-28, beginning with Step 2. Skip the first step and do not use the **cms deregister** command.
  - Step 3 Switch both Central Manager roles as described in the [“Switching Both Central Manager Roles”](#) section on page 16-29.
- 

## Enabling Disk Encryption

Disk encryption addresses the need to securely protect sensitive information that flows through deployed WAAS systems and that is stored in WAAS persistent storage. The disk encryption feature includes two aspects: the actual data encryption on the WAE disk and the encryption key storage and management.

When you enable disk encryption, all data in WAAS persistent storage will be encrypted. The encryption key for unlocking the encrypted data is stored on the Central Manager, and key management is handled by the Central Manager. When you reboot the WAE after configuring disk encryption, the WAE retrieves the key from the Central Manager automatically, allowing normal access to the data that is stored in WAAS persistent storage.



### Note

If a WAE is unable to reach the WAAS Central Manager during a reboot, it will do everything except mount the encrypted partitions. In this state, all traffic will be handled as pass-through. Once communication with the WAAS Central Manager is restored (and the encryption key is obtained), the encrypted partitions are mounted. There is no loss of cache content.

Disk encryption requirements are as follows:

- You must have a Central Manager configured for use in your network.
- Your WAE devices must be registered with the Central Manager.
- Your WAE devices must be online (have an active connection) with the Central Manager. This requirement applies only if you are enabling disk encryption.
- You must reboot your WAE for the disk encryption configuration to take effect.

After you reboot your WAE, the encryption partitions are created using the new key, and any previously existing data is removed from the partition.

Any change to the disk encryption configuration, whether to enable or disable encryption, causes the disk to clear its cache. This feature protects sensitive customer data from being decrypted and accessed should the WAE ever be stolen.

If you enable disk encryption and then downgrade to a software version that does not support this feature, you will not be able to use the data partitions. In such cases, you must delete the disk partitions after you downgrade.

To enable and disable disk encryption from the Central Manager GUI, choose **Devices** > *device-name*, then choose **Configure** > **Storage** > **Disk Encryption**. To enable disk encryption, check the **Enable** check box and click **Submit**. This box is unchecked by default. To disable disk encryption, uncheck the **Enable** check box and click **Submit**.

To enable and disable disk encryption from the WAE CLI, use the **disk encrypt** global configuration command.

**Note**

---

If you are using an NPE image, the disk encryption feature has been disabled for use in countries where disk encryption is not permitted.

---

When you enable or disable disk encryption, the file system is reinitialized during the first subsequent reboot. Reinitialization may take from ten minutes to several hours, depending on the size of the disk partitions. During this time, the WAE will be accessible, but it will not be providing any services.

If you change the Central Manager IP address, or if you relocate the Central Manager, or replace one Central Manager with another Central Manager that has not copied over all of the information from the original Central Manager, and you reload the WAE when disk encryption is enabled, the WAE file system will not be able to complete the reinitialization process or obtain the encryption key from the Central Manager.

If the WAE fails to obtain the encryption key, disable disk encryption by using the **no disk encrypt enable** global configuration command from the CLI, and reload the WAE. Ensure connectivity to the Central Manager before you enable disk encryption and reload the WAE. This process will clear the disk cache.

**Note**

---

When a standby Central Manager has been in service for at least 2 times the datafeed poll rate time interval (approximately 10 minutes) and has received management updates from the primary Central Manager, the updates will include the latest version of the encryption key. Failover to the standby in this situation occurs transparently to the WAE. The datafeed poll rate defines the interval for the WAE to poll the Central Manager for configuration changes. This interval is 300 seconds by default.

---

To view the encryption status details, use the **show disks details** EXEC command. While the file system is initializing, **show disks details** displays the following message: “System initialization is not finished, please wait...” You may also view the disk encryption status, whether it is enabled or disabled, in the Central Manager GUI, Device Dashboard window.

## Configuring a Disk Error-Handling Method



### Note

Configuring and enabling disk error handling is no longer necessary for devices that support disk hot-swap. In WAAS 4.0.13 and later, the software automatically removes from service any disk with a critical error.

The WAAS Central Manager allows you to configure how disk errors should be handled and to define a disk device error-handling threshold for WAAS devices running software versions 4.1.1 and earlier.

If the bad disk drive is a critical disk drive, and the automatic reload feature is enabled, then the WAAS software marks the disk drive “bad” and the WAAS device is automatically reloaded. After the WAAS device is reloaded, a syslog message and an SNMP trap are generated.



### Note

The automatic reload feature is automatically enabled and not configurable on devices running WAAS version 4.1.3 and later.

To configure a disk error-handling method using the WAAS Central Manager GUI, follow these steps:

- 
- Step 1** From the WAAS Central Manager menu, choose **Devices** > *device-name* (or **Device Groups** > *device-group-name*).
- Step 2** Choose **Configure** > **Storage** > **Disk Error Handling**.  
The Disk Error Handling Settings window appears.
- Step 3** Check the **Enable** check box to enable the window for configuration, and then check the following options as necessary:
- **Enable Disk Error Handling Reload**—Forces the device to reload the disk if the file system (sysfs) (disk00) has problems. This option appears only for device groups and version 4.1.1 and earlier WAAS devices and is disabled by default. It does not apply to WAAS versions later than 4.1.1.
  - **Enable Disk Error Handling Remap**—Forces the disks to attempt to remap disk errors automatically. This option is enabled by default.
  - **Enable Disk Error Handling Threshold**—Specifies the number of disk errors allowed before the disk is marked as bad. You must enter a number between 0 to 100 in the Threshold field. The default threshold is 10. This option is disabled by default. This option appears only for device groups and version 4.1.1 and earlier WAAS devices. It does not apply to WAAS versions later than 4.1.1.
- Step 4** Click **Submit** to save the settings.
- 

## Enabling Extended Object Cache

The WAAS Central Manager allows you to configure additional disk space for CIFS object caching. Disk caching is used for DRE and CIFS to serve content at the edge. The extended object cache feature lets you choose the amount of disk storage that is used by CIFS and Virtual Blade Services.

This feature is supported only on WAVE-694-16G, WAVE-694-24G, WAE-674-4G, or WAE-674-8G models and does not have any effect on other models in a device group.





**Note** If extended object cache is enabled and the device is downgraded to a version prior to 4.2.1, all CIFS cache data, DRE cache data, and virtual blade data is lost.

To enable extended object cache using the WAAS Central Manager GUI, follow these steps:

- Step 1** From the WAAS Central Manager menu, choose **Devices** > *device-name* (or **Device Groups** > *device-group-name*).
- Step 2** Choose **Configure** > **Storage** > **Extended Object Cache**.  
The Extended Disk Space Settings window appears.
- Step 3** Check the **Enable** check box to enable extended object cache. See [Table 16-3](#) and [Table 16-4](#) for sizing details.



**Note** If extended object cache is enabled on WAVE-694-16G, WAVE-694-24G, WAE-674-4G, or WAE-674-8G models with a virtual blade disk size that is greater than 30 GB, the device goes into override mode. In override mode, a Force Device Group settings button will be present on the device page (or device group page).

If you have a virtual blade enabled with a disk size that is greater than 30 GB, you must stop the virtual blade and remove the configuration before enabling extended object cache. Otherwise, the size of the virtual blade filesystem will be reduced to 30 GB.

- Step 4** Click **Submit** to save the settings.

The disk cache size varies depending upon the features enabled.

[Table 16-3](#) shows the usable disk cache sizes for the WAE-674-4G platform.

**Table 16-3** WAE-674-4G Platform Disk Cache Sizes

| Disk Partition    | Extended Object Cache Disabled |                       | Extended Object Cache Enabled |                       |
|-------------------|--------------------------------|-----------------------|-------------------------------|-----------------------|
|                   | Virtual Blade Disabled         | Virtual Blade Enabled | Virtual Blade Disabled        | Virtual Blade Enabled |
| DRE Cache         | 114 GB                         | 120 GB                | 114 GB                        | 114 GB                |
| CIFS Object Cache | 96 GB                          | 96 GB                 | 340 GB                        | 305 GB                |
| Virtual Blade     | --                             | 242 GB                | --                            | 29 GB                 |

[Table 16-4](#) shows the usable disk cache sizes for the WAE-674-8G platform.

**Table 16-4** WAE-674-8G Platform Disk Cache Sizes

| Disk Partition    | Extended Object Cache Disabled |                       | Extended Object Cache Enabled |                       |
|-------------------|--------------------------------|-----------------------|-------------------------------|-----------------------|
|                   | Virtual Blade Disabled         | Virtual Blade Enabled | Virtual Blade Disabled        | Virtual Blade Enabled |
| DRE Cache         | 304 GB                         | 143 GB                | 143 GB                        | 143 GB                |
| CIFS Object Cache | 96 GB                          | 96 GB                 | 310 GB                        | 275 GB                |
| Virtual Blade     | --                             | 210 GB                | --                            | 27 GB                 |

Table 16-5 shows the usable disk cache sizes for the WAVE-694-16G platform.

**Table 16-5** WAVE-694-16G Platform Disk Cache Sizes

| Disk Partition    | Extended Object Cache Disabled and Virtual Blade Enabled <sup>1</sup> | Extended Object Cache and Virtual Blade Enabled |
|-------------------|-----------------------------------------------------------------------|-------------------------------------------------|
| DRE Cache         | 114 GB                                                                | 114 GB                                          |
| CIFS Object Cache | 77 GB                                                                 | 304 GB                                          |
| Virtual Blade     | 161 GB                                                                | 22 GB                                           |

1. The Virtual Blade cannot be disabled on this platform.

Table 16-6 shows the usable disk cache sizes for the WAVE-694-24G platform.

**Table 16-6** WAVE-694-24G Platform Disk Cache Sizes

| Disk Partition    | Extended Object Cache Disabled and Virtual Blade Enabled <sup>1</sup> | Extended Object Cache and Virtual Blade Enabled |
|-------------------|-----------------------------------------------------------------------|-------------------------------------------------|
| DRE Cache         | 190 GB                                                                | 142 GB                                          |
| CIFS Object Cache | 77 GB                                                                 | 272 GB                                          |
| Virtual Blade     | 161 GB                                                                | 22 GB                                           |

1. The Virtual Blade cannot be disabled on this platform.

## Activating All Inactive WAAS Devices

To activate all inactivated WAAS devices in your network, follow these steps:

- Step 1** From the WAAS Central Manager menu, choose **Devices > All Devices**. The All Devices window appears.
- Step 2** Click the **Activate all inactive WAEs** icon in the taskbar. The Activate All Inactive WAEs window appears.
- Step 3** Choose an existing location for all inactivated WAAS devices by clicking the **Select an existing location for all inactive WAEs** radio button, and then choose a location from the drop-down list.

Alternatively, choose to create a new location for each inactive device by clicking the **Create a new location for each inactive WAE** radio button. Specify a parent location for all newly created locations by choosing a location from the Select a parent location for all newly created locations drop-down list.

- Step 4** Click **Submit**. The inactive WAEs are reactivated and placed in the specified location.
- 

## Rebooting a Device or Device Group

Using the WAAS Central Manager GUI, you can reboot a device or device group remotely.

To reboot an individual device, follow these steps:

---

- Step 1** From the WAAS Central Manager menu, choose **Devices** > *device-name*. The device Dashboard appears.
- Step 2** Click the **Reload** icon in the Device Info pane. You are prompted to confirm your decision.
- Step 3** Click **OK** to confirm that you want to reboot the device.
- 

To reboot a device from the CLI, use the **reload EXEC** command.

If you reboot a WAAS Central Manager that has the secure store enabled with user-provided passphrase mode, you must reopen the secure store after the reboot by using the **cms secure-store open EXEC** command.

To reboot an entire device group, follow these steps:

---

- Step 1** From the WAAS Central Manager menu, choose **Device Groups** > *device-group-name*. The Modifying Device Group window appears.
- Step 2** In the taskbar, click the **Reboot All Devices in Device Group** icon. You are prompted to confirm your decision.
- Step 3** Click **OK** to confirm that you want to reboot the device group.
- 

## Performing a Controlled Shutdown

A controlled shutdown refers to the process of properly shutting down a WAAS device without turning off the power on the device (the fans continue to run and the power LED remains on). With a controlled shutdown, all of the application activities and the operating system are properly stopped on the appliance, but the power remains on. Controlled shutdowns can help you minimize the downtime when the appliance is being serviced.



### Caution

If a controlled shutdown is not performed, the WAAS file system can be corrupted. It also takes longer to reboot the appliance if it was not properly shut down.

---

You can perform a controlled shutdown from the CLI by using the **shutdown EXEC** command. For more details, see the *Cisco Wide Area Application Services Command Reference*.

If you are running WAAS on a network module that is installed in a Cisco access router, perform a controlled shutdown from the router CLI by using the **service-module integrated-service-engine slot/unit shutdown** EXEC command. For more details, see the document [Configuring Cisco WAAS Network Modules for Cisco Access Routers](#).