Cisco vWAAS on Cisco ENCS 5400-W Series

This chapter describes Cisco vWAAS on the Cisco Enterprise Network Compute System 5400-W Series (Cisco ENCS 5400-W Series) appliance, and contains the following sections:

About the Cisco ENCS 5400-W Series

The Cisco Enterprise Network Compute Series (Cisco ENCS) is used to host the Cisco Enterprise Network Functions Virtualization (Cisco Enterprise NFV) solution. Cisco ENCS is also used to deploy the Cisco NFV Infrastructure Software (Cisco NFVIS), and Cisco and third-party VNFs on Cisco Enterprise NFV. For more information on Cisco NFVIS, see the chapter "Cisco vWAAS with Cisco Enterprise NFVIS."

The following table describes how the Cisco ENCS 5400 Series and the Cisco ENCS 5400-W Series (used with vWAAS) are used with Cisco Enterprise NFV. For more information, see the Cisco 5400 Enterprise Network Compute System Data Sheet.

Table 1: Cisco ENCS 5400 Series and Cisco ENCS 5400-W Series

Cisco ENCS Series	Description
Cisco ENCS 5400 Series	Cisco ENCS-5406, Cisco ENCS-5408, and Cisco ENCS-5412, is a line of compute appliances designed for the Cisco SD-Branch and Enterprise NFV solution.

Cisco ENCS Series	Description
Cisco ENCS 5400-W Series	Cisco ENCS 5406-W, Cisco ENCS 5408-W, and Cisco ENCS 5412-W, is an x86 hybrid platform is designed for the Cisco Enterprise NFV solution, for branch deployment and for hosting Cisco WAAS applications. These high-performance units achieves this goal by providing the infrastructure to deploy virtualized network functions while at the same time acting as a server that addresses processing, workload, and storage challenges.
	Note Cisco vWAAS is designed to run in appliance mode or as a Virtualized Network Function (VNF) in three Cisco ENCS 5400-W series models: Cisco ENCS 5406-W, Cisco ENCS 5408-W, Cisco ENCS 5412-W, and three Cisco PIDs: ENCS 5406-K9, ENCS 5408-K9, ENCS 5412-K9.

Cisco vWAAS as VM on Cisco ENCS 5400-W Series:

- For Cisco vWAAS with Cisco Enterprise NFVIS on ENCS, vWAAS operates as a VM to provide WAN and application optimization, and, optionally, application optimization with Akamai Connect.

- Cisco vWAAS with Cisco Enterprise NFVIS runs on Cisco ENCS 5400-W Series, which is a Cisco x86 hardware platform for branch deployment for routing and hosted applications.

- The following table shows supported Cisco vWAAS models for Cisco ENCS 5406-W, Cisco ENCS 5408-W, and Cisco ENCS 5412-W.

Table 2: Supported Cisco vWAAS Models for Cisco ENCS 5400-W Series

Cisco ENCS-W Model	Processor	CPUs	RAM	Supported Cisco vWAAS Model
ENCS 5406-W	Intel Xeon Processor D-1528 (1.9 GHz, 9 MB L2 cache)	6 core	16 GB	vWAAS-200 or vWAAS-750
ENCS 5408-W	Intel Xeon Processor D-1548 (2.0 GHz, and 12 MB L2 cache)	8 core	16 GB	vWAAS-1300
ENCS 5412-W	Intel Xeon Processor D-1557 (1.5 GHz, and 18 MB L2 cache)	12 core	32 GB	vWAAS-2500 or vWAAS 6000R

Cisco ENCS 5400-W Models that Replace EOL/EOS Cisco WAVE Devices

Cisco WAVE appliances have end-of-sale (EOS) and end-of-life (EOL) dates, highlighted in the End-of-Sale and End-of-Life Announcement for the Cisco WAVE 294, 594, 694, 7541, 7571 and 8541.

The following table shows the Cisco ENCS 5400-W Series models that replace the EOS/EOL WAVE models, and the supported Cisco vWAAS models for each Cisco ENCS 5400-W model.

Table 3: Cisco ENCS 5400-W Series Replacment Models for Cisco WAVE Devices

EOS/EOL Cisco WAVE Model	Cisco ENCS 5400-W Model to Replace WAVE Model	Supported Cisco vWAAS Models for Cisco ENCS 5400-W	Connection Size
WAVE-294	ENCS 5406-W	vWAAS-200	200 connections
WAVE-594-8G	ENCS 5406-W	vWAAS-750	750 connections
WAVE-594-12G	ENCS 5408-W	vWAAS-1300	1,300 connections
WAVE-694-16G	ENCS 5412-W	vWAAS-2500	2,500 connections
WAVE-694-24G	ENCS 5412-W	vWAAS-6000-R	6,000 connections

Cisco ENCS 5400-W Hardware Features and Specifications

The following table shows the features and specifications that apply to all three Cisco ENCS 5400-W Series models. For views of the Cisco ENCS 5400-W Series and further information, see the Cisco 5400 Enterprise Network Compute System Data Sheet.

Table 4: Cisco ENCS 5400-W Series Features and Specifications

Cisco ENCS 5400 Feature/Specification	Description
Cisco vWAAS models supported	One of the following configurations: • Cisco ENCS 5406-W supports vWAAS-200, vWAAS-750 • Cisco ENCS 5408-W supports vWAAS-1300 • Cisco ENCS 5412-W supports vWAAS-2500, vWAAS-6000-R

Cisco ENCS 5400 Feature/Specification	Description
CPU	One of the following specifications: • **ENCS 5406-W**: Intel Xeon Processor D-1528 (6-core, 1.9-GHz, and 9-MB cache) • **ENCS-5408-W**: Intel Xeon Processor D-1548 (8-core, 2.0-GHz, and 12-MB cache) • **ENCS-5412-W**: Intel Xeon Processor D-1557 (12-core, 1.5-GHz, and 18-MB cache)
BIOS	Version 2.4
Cisco NFVIS on KVM hypervisor	KVM hypervisor Version 3.10.0-327.el7.x86_64
CIMC	Version 3.2
Network Controller	Intel FTX710-AM2
WAN Ethernet port	Intel i350 dual port
DIMM	Two DDR4 dual in-line memory module (DIMM) slots for ENCS models with the following capacities: • **ENCS 5406-W**: 16 GB • **ENCS 5408-W**: 16 GB • **ENCS 5412-W**: 32 GB
Gigabit Ethernet ports	Two Gigabit Ethernet ports: For each RJ45 port, there is a corresponding fiber optic port. At a given time, you can use either the RJ45 connection or the corresponding fiber optic port.
NIM	One Network Interface Module (NIM) expansion slot: You can install a NIM in the NIM slot, or, if the slot is not needed, you can remove the NIM from the NIM module. Each ENCS 5400 model supports one NIM slot for a Cisco 4-port 1 G fail-to-wire NIM card.
Management Controller	Ethernet management port for Cisco Integrated Management Controller (CIMC), which monitors the health of the entire system.
HDD Storage	Although there are two hot-swappable HDD slots, we do not recommend HDD storage for the ENCS 5400-W Series.

Cisco ENCS 5400 Feature/Specification	Description
SSD Storage	• No RAID and one 960-GB SSD • RAID-1 and two SSDs (960-GB SSD) **Note** If you need to add or remove RAID-1 from your system, see Adding or Removing RAID-1 for Cisco ENCS 5400-W Series. Note that the RAID-1 option is available for Cisco vWAAS in WAAS Version 6.4.1a and later.
Offload Capabilities	Optional crypto module to provide offload capabilities to optimize CPU resources such as VM-to-VM traffic and to maintain open software support.

Cisco vWAAS Bundled Image Install Procedure

Before you begin

- Verify that the specified Cisco ENCS 5400-W Series chassis (Cisco ENCS 5406-W, Cisco 5408-W, or Cisco 5412-W) is already installed and powered up. For information on how to install a Cisco ENCS 5400-W Series device, see the *Cisco 5400 Enterprise Network Compute System Hardware Installation Guide*.

- If you need to add or remove RAID-1 for your system, see Adding or Removing RAID-1 for Cisco ENCS 5400-W Series, on page 11. Note that the RAID-1 option is available for Cisco vWAAS in WAAS Version 6.4.1a and later.

Procedure

Step 1 Copy the Cisco vWAAS bundled image file: An ISO file that contains the Cisco NFVIS 3.x.x image (file format "Cisco_NFVIS...") and the Cisco WAAS 6.x image for your system (file format "WAAS-APPLIANCE...") on your laptop.

For information on how to upgrade to the Cisco NFVIS 3.x.x version for your system, see Interoperabiity and Upgrade Guidelines for Cisco Enterprise NFVIS in the chapter "Cisco vWAAS with Cisco Enterprise NFVIS."

Step 2 Connect your laptop's Ethernet port to the Cisco ENCS device's Cisco Integrated Management Controller (CIMC) port.

Step 3 Configure your laptop with a static IP address, for example, 192.168.1.3.

Note By default, the IP address on the Cisco ENCS-W device's CIMC port is configured as 192.168.1.2.

Step 4 Open your web browser and enter https://192.168.1.2.

The **CIMC console login page** appears.

Step 5 Log in with your user name and password.

The default user name is **admin** and the default password is **password**.

Step 6   Click **Login**.

The **CIMC home page** is displayed.

Note   The **Change Password** dialog box appears only when you log in to the CIMC console for the first time. Change the password as needed and click **Save**.

Step 7   In the CIMC home page, choose **Home > Compute > BIOS > Configure Boot Order**.

The **Configure Boot Order** dialog box appears.

Step 8   From the **Device Type** drop-down list, choose **CD/DVD Linux Virtual CD/DVD**. Click **Add**.

Step 9   From the **Device Type** drop-down list, choose **HDD**. Click **Add**.

Step 10   Using the **Up** and **Down** options, set the boot order sequence.

Note   **CD/DVD Linux Virtual CD/DVD** must be the first listing in the boot order.

Step 11   To complete the boot order setup, click **Apply**.

Step 12   Launch the **KVM console**. You can launch the KVM console from the **CIMC home page** or the **Remote Management** area.

Step 13   In the KVM console, after the KVM console is initialized, map the Cisco vWAAS bundled image by choosing **Server > Remote Presence > Virtual Media** tab on the KVM console.

Step 14   To load the mapped image, use the **Power Cycle System [cold boot]** option under the **KVM Console Power** tab to power off and then power on the device.

Step 15   With the installation running in the background, use your laptop to connect to the CIMC default IP address.

After the installation is successful, the Cisco ENCS-W device reboots.

```
[ OK ] Unmounted /mnt/sysimage/dev.
[ OK ] Unmounted /mnt/sysimage/sys.
Unmounting /mnt/sysimage...
[ OK ] Unmounted /mnt/sysimage.
[ OK ] Reached target Unmount All Filesystems.
[ OK ] Stopped target Local File Systems (Pre).
[ OK ] Stopped Create Static Device Nodes in /dev.
Stopping Create Static Device Nodes in /dev...
[ OK ] Stopped Remount Root and Kernel File Systems.
Stopping Remount Root and Kernel File Systems...
[ OK ] Stopped Collect Read-Ahead Data.
Stopping Collect Read-Ahead Data...
Stopping Monitoring of LVM2 mirrors...
dmeventd or progress polling...
[ OK ] Stopped Monitoring of LVM2 mirrors,...
ng dmeventd or progress polling.
Stopping LVM2 metadata daemon...
[ OK ] Stopped LVM2 metadata daemon.
[ OK ] Started Restore /rdracut Warning: Killing all remaining processes
Rebooting.

[ deviceID] Restarting system.
```

The Cisco ENCS-W device boots up and displays options to install Cisco vWAAS. Depending on your Cisco ENCS-W model, one of the following choices is displayed:

• For Cisco ENCS 5406-W: vWAAS 200 and vWAAS-750 are displayed.

Select one Cisco vWAAS model for Cisco ENCS 5406-W.

• For Cisco ENCS 5408-W: vWAAS-1300 is the only choice displayed.

Cisco vWAAS-1300 is automatically selected for Cisco ENCS 5408-W.

• For Cisco ENCS 5412-W: vWAAS-2500 and vWAAS-6000-R are displayed.

Select one model for Cisco ENCS 5412-W.

In the following example, a vWAAS-6000-R is selected for an ENCS 5412-W:

Example:

```
vWAAS Model
1) vWAAS-2500
2) vWAAS-6000-R
3) Quit
Please enter your choice: 2
```

The following table shows the installation times required, by Cisco vWAAS model and number of connections:

Table 5: Installation Times Required, by Cisco vWAAS Model and Number of Connections

Cisco vWAAS Model	Number of Connections	Minimum Cisco NFVIS Installation Time	Minimum Cisco WAAS Installation Time	Minimum Total Installation Time
vWAAS-200	200	60 minutes	15 minutes	75 minutes
vWAAS-750	750	60 minutes	24 minutes	84 minutes
vWAAS-1300	1,300	55 minutes	28 minutes	83 minutes
vWAAS-2500	2,500	67 minutes	34 minutes	101 minutes
vWAAS-6000-R	6,000	66 minutes	38 minutes	104 minutes

After installation is complete, the Cisco WAAS login prompt appears.

The new Cisco **OE-ENCS** device is displayed in the Cisco WAAS Central Manager **Devices > All Devices** listing table.

You can view detailed information on the new Cisco OE-ENCS device by choosing **Devices > DeviceName > Dashboard**.

CLI Commands Used with Cisco vWAAS on Cisco ENCS 5400-W

The following table shows the CLI commands used to display information about Cisco vWAAS on Cisco ENCS 5400-W Series.

Table 6: CLI Commands Used with Cisco vWAAS on Cisco ENCS 5400-W Series

Mode	Command	Description
privileged-level EXEC	**copy sysreport disk**	Cisco ENCS 5400-W logs are part of the sysreport generation for debugging.
	reload	Halts the corresponding operation and performs a cold restart of the Cisco vWAAS VM.
	show hardware	Displays the following information for the specified device: • **Hardware information**: Manufacturer, PID, serial number, hardware version, CPU information, Memory information, and disk size. • **System information**: UUID, NFVIS version, compile time, kernel version, QEMU version, LibVirt version, and OVS version.
	show inventory	Displays system inventory information, including a description of the device, and the device's PID, chassis or slot number, version number, and serial number.
	show nfvis version	Displays Cisco NFVIS and BIOS version.
	show version	Displays the version of the Cisco OE-ENCS device, as well as device ID, system restart time, system restart reason, and amount of time for which system has been up.
	shutdown	Powers down the Cisco ENCS 5400-W host or server.
global configuration	**interface virtual**	The internal interface is used for communication between the Cisco NFVIS host and the Cisco WAAS guest. The IP address associated with this interface (virtual 1/0) is assigned automatically by Cisco NFVIS while booting up, and cannot be modified. **Note** The **interface virtual** *slot/port* command cannot be used to configure the Cisco ENCS 5400-W internal interface.

Cisco vWAAS on ENCS 5400-W with Akamai Connect System Requirements

The following table shows memory and disk requirements for Cisco vWAAS on ENCS 5400-W with Akamai Connect, by Cisco vWAAS model

Table 7: Memory and Disk Requirements for Cisco vWAAS on Cisco ENCS 5400-W with Akamai Connect

Cisco vWAAS Model	Cisco ENCS 5400-W Connections	Memory	Data Disk	Akamai Cache
vWAAS-200	200	3 GB	160 GB	100 GB
vWAAS-750	750	4 GB	250 GB	250 GB
vWAAS-1300	1,300	6 GB	300 GB	300 GB
vWAAS-2500	2,500	8 GB	400 GB	350 GB
vWAAS-6000	6,000	11 GB	500 GB	350 GB

Registering and Deploying Cisco vWAAS on a Cisco ENCS 5400-W Device

This section contains the following procedures:

Registering Cisco vWAAS on a Cisco ENCS 5400-W Device

Before you begin

Verify the following:

- The disk is already mounted.
- Gigabit Ethernet port 0/0 can be used for Cisco vWAAS management or data.
- Gigabit Ethernet port 0/1 can be used for Cisco vWAAS management or data.
- The existing LAN-net and SR-IOV will be used.

Procedure

Step 1 Power on the Cisco ENCS 5400-W device.

The Cisco vWAAS automatically starts up when the Cisco ENCS 5400-W device is powered on.

Step 2 Using an Ethernet cable, connect your laptop to the MGMT port of the Cisco ENCS 5400-W device.

Step 3 Verify that the WiFi is disabled on your laptop.

Step 4 Perform the following steps on a MAC system:

a) Choose **Preferences > Network > Thunderbolt**.

b) From the **Configure IPv4** drop-down list, choose **Manually**.

c) In the **IP Address** field, enter an IP address.

d) In the **Subnet Mask** field, enter **255.255.255.0**.

e) Open the terminal and use SSH to connect to the device (192.168.1.1). Use **admin** for login and password credentials.

Step 5 Run the shell script (**mfg.sh**), which registers, installs, and checks the status of the vWAAS instance.

Step 6 Exit the terminal.

Deploying Cisco vWAAS with Cisco NFVIS on a Cisco ENCS 5400-W Device

Procedure

Step 1 Perform the steps described in .

Step 2 Copy the vWAAS KVM **tar.gz** file to a directory on your laptop, for example, **/downloads**.

Step 3 Navigate to the directory that you have created.

Step 4 Start an HTTP server on your laptop to upload and register the image.

Step 5 Connect the Ethernet port of your laptop to the Management port of the Cisco ENCS 5400-W device.

Step 6 Configure the laptop with static IP, for example, 192.168.1.2.

By default, the Management port on the Cisco ENCS 5400-W device is 192.168.1.1.

Step 7 On your laptop, start the manufacturing script from the directory you have created.

a) Connect to the Cisco ENCS 5400-W device.

The following status messages are displayed:

```
Trying to connect to ENCS Device
NFVIS server up and running
Reconfiguring the LAN bridge.......
Reconfiguring the WAN bridge.......
Cleaning existing vWAAS instance.......
Checking disk health.......
Following vWAAS images are available:
list of images
```

b) At the **Enter the image number:** prompt, enter your image number.

The following status messages are displayed:

```
Preparing for WAAS installation
Progress: ############ 100%
Installation is in progress.......
Progress: ############ 100%
Installation is completed!!!
```

Step 8 Registration and installation are complete.

Step 9 Exit the device.

Registering the Cisco vWAAS ENCS 5400-W Device with the Cisco WAAS Central Manager

Before you begin

You must register the Cisco vWAAS instance or the Cisco WAAS appliance running in **Accelerator** mode with the Cisco WAAS Central Manager.

Procedure

Step 1 At the Cisco vWAAS instance or the Cisco WAAS appliance that you want to register, enter the following Cisco WAAS Central Manager IP address information:

```
DC2-WAE-1(config)# central-manager address xx.xx.xx.xxx
DC2-WAE-1(config)#
DC2-WAE-1(config)# end
DC2-WAE-1# show running-config | i central
```

Step 2 At the Cisco vWAAS instance or the Cisco WAAS appliance that you want to register, enable the Cisco Centralized Management System (Cisco CMS) service:

```
DC2-WAE-1(config)# cms enable
Registering WAAS Application Engine...
Sending device registration request to Central Manager with address xx.x.xx.xxx
Please wait, initializing CMS tables
Successfully initialized CMS tables
Registration complete.
Please preserve running configuration using 'copy running-config startup-config'.
Otherwise management service will not be started on reload and node will be shown
'offline' in WAAS Central Manager UI.
management services enabled
```

Step 3 In the Cisco WAAS Central Manager, choose **Devices > All Devices**.

The Cisco WAAS appliance will be displayed in the **Device Type** column as **OE-ENCS**.

Step 4 Exit the device.

Adding or Removing RAID-1 for Cisco ENCS 5400-W Series

Note Online Insertion Removal (OIR) is not supported on ENCS 5400-W appliances. We recommend that you do not remove or replace the external SSD drives while the ENCS 5400-W appliance is up and running.

This section contains the following topics:

Note For further information on RAID and the Cisco ENCS 5400-W Series, see the *Cisco 5400 Enterprise Network Compute System Hardware Installation Guide*.

Migrating Equipment from No RAID and One SSD to RAID-1 and Two SSDs

Before you begin

Note The RAID-1 option is available for Cisco vWAAS in Cisco WAAS Version 6.4.1a and later.

Consider the following guidelines for mixing drive types in the RAID group:

* SAS + HDD + SATA HDD: Allowed.

* SAS + SSD + SATA SSD: Allowed.

* HDD + SSD: Not allowed.

Consider these best practices for mixing drive types in the RAID group:

* Use either all SAS or all SATA drives in a RAID group.

* Use the same capacity for each drive in the RAID group.

* Never mix HDDs and SSDs in the same RAID group.

Before creating the virtual disk, both drives must be in **Unconfigured Good** state. If a drive is in other status, use the CIMC Web GUI or Cisco WAAS CLI and do the following:

* If disk is in **JBOD** state:

  1. Click the **Storage** tab > **Physical Drive** Info tab.

  2. In the **Actions** area, choose Set Sta**te as Unconfigured Good**.

  3. Confirm that the disk is in **Unconfigured Good** state.

* If disk is in **Foreign Config** state:

  1. Click the **Storage** tab > **Controller** Info tab.

  2. In the **Actions** area, choose **Clear Foreign Config**.

  3. In the **Actions** area, choose **Unconfigured Good**.

  4. Confirm that the disk is in **Unconfigured Good** state.

Procedure

Step 1 Log in to the CIMC console.

Step 2   In the CIMC console left pane, click the **Storage** tab.

Step 3   In the CIMC console middle pane, click the **Controller Info** tab.

Step 4   In the **Action** area, click **Create Virtual Drive from Unused Physical Drives**.

The **Create Virtual Drive from Unused Physical Drives Wait** dialog box is displayed.

a)   At the RAID Level drop-down box, choose **1**.

b)   In the **Create Drive Groups** area, select physical drives for your system from the **Physical Drives** pane and click **>>** to add these to the **Drive Groups** pane.

c)   In the **Virtual Drive Properties** area:

The **Virtual Drive Name** field displays the automatically assigned name.

The value for the **Size** drop-down list automatically filled.

1.   From the Strip Size drop-down list, choose the strip size (default is 64k).

2.   From the **Write Policy** drop-down list, choose the **Write** policy (default is **Write Through**).

3.   From the **Access Policy** drop-down list, choose the **Access** policy (default is **Read Write**).

4.   From the **Read Policy** drop-down list, choose the **Read** policy (default is **No Read Ahead**).

5.   From the **Cache Policy** drop-down list, choose the **Cache** policy (default is **Direct IO**).

6.   From the **Disk Cache Policy** drop-down list, choose the **Disk Cache** policy (default is **Unchanged**).

Step 5   Click **Create Virtual Drive**.

Migrating Equipment from RAID-1 and Two SSDs to No RAID and One SSD

Before you begin

Note   Online Insertion Removal (OIR) is not supported on ENCS 5400-W appliances. We recommend that you do *not* remove or replace the external SSD drives while the ENCS 5400-W appliance is up and running.

- You must wait for the disk to be completely shut down before you physically remove the disk from the Cisco WAE device. After the RAID removal process is complete, Cisco WAAS generates a disk failure alarm and trap. In addition, a syslog error message is displayed.

- If the removal event 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 you administratively shut down the disk during the RAID rebuild process, a RAID rebuild cancel alarm is generated instead.

Procedure

Step 1   To manually shut down the disk, run the **disk disk-name** *diskxx* **shutdown** global configuration command:

```
WAE# configure
WAE(config)# disk disk-name diskxx shutdown
```

Step 2   Wait for the disk to be completely shut down before you physically remove the disk from the Cisco WAE device.

Step 3   After the RAID removal process is complete, Cisco WAAS generates a disk failure alarm and trap. In addition, a syslog error message is displayed.

Note   We recommend that you disable the disk error-handling reload option if it is enabled because it is not necessary to power down the system to remove a disk.

Fail-to-Wire on Cisco vWAAS on ENCS 5400-W Series

This section contains the following topics:

About Fail-to-Wire on Cisco vWAAS on ENCS 5400-W Series

Fail-to-Wire (FTW) is a physical layer (Layer 1) bypass that allows interface port pairs to go into bypass mode: so that the hardware forwards packets between these port pairs without software intervention. FTW provides network connectivity when there are software or hardware failures.

The following are the operating guidelines for FTW on Cisco vWAAS on ENCS 5400-W:

* FTW is available for Cisco vWAAS in Cisco WAAS Version 6.4.3 and later.

* Hardware bypass is supported for a fixed set of ports. For example, you can pair Port 1 with Port 2, or Port 3 with Port 4, but you cannot pair Port 1 with Port 4.

* Configuring a standby and port channel in an on-board interface is supported; configuring standby over port channel in an on-board interface is not supported.

* Configuring a standby, port channel, and standby over port channel in an FTW interface is supported.

Fail-to-Wire Traffic Interception Modes

FTW uses two traffic interception modes: inline interception and WCCP.

Inline interception for FTW uses the following operating modes:

* **Interception Mode**: The NIM ports are in interception mode. Two inline groups are created for the four-port NIM card in Cisco vWAAS. The NIM card ports will use fail-to-wire after a failover timeout.

* **Bypass Mode**: You can shut down the inline group, putting the corresponding pair of ports in bypass mode. In bypass mode, traffic coming into Port 0 is redirected to Port 1, and traffic coming into Port 1 is redirected to Port 0.

* **Bypass All Mode**: If the system reloads or if the software experiences an unexpected event, all the inline groups can be put in bypass mode; no Ethernet connection can be established between the devices.

WCCP traffic interception for FTW uses the following operating mode:

- **Standalone Mode**: Each port in the NIM can be used separately. Cisco WAAS can use this mode to enable WCCP interception. The ports of the NIM card do not use fail-to-wire in this mode, and the watchdog timer remains disabled.

Fail-to-Wire Failure Handling

The following list shows how FTW handles different system failure scenarios:

- **Disk issue**: NFVIS detects the disk issue and puts the NIM into bypass mode.

- **NFVIS unexpected event**: FTW detects that the Cisco vWAAS keepalive messages have stopped, and FTW puts the NIM to pass-through FTW.

- **WAAS reload**: The Cisco vWAAS puts the FTW card into FTW mode immediately.

- **WAASnet restarts or experiences an unexpected event**: The FTW NIM card on the vWAAS goes into FTW mode immediately. After the WAASnet datapath is restored, the vWAAS returns the FTW ports to inline mode.

CLI Commands for Port Channel and Standby Interfaces

This section contains the following topics:

Show Commands Used with Port Channel and Standby Interfaces

The following table highlights the **show** commands used with port channel and standby interfaces.

Table 8: show Commands Used with Port Channel and Standby Interfaces

show Command	Description
show statistics f2w	Displays InlineGroup status, including the amount of time, in seconds, since the last keepalive was received, and how many bypass alarms have been received or cleared.
show interface InlineGroup	Displays InlineGroup connection statistics and InlineGroup status, as well as the failover timeout frequency.
show interface InlinePort LAN	Displays InlinePort LAN connection statistics and specific port status of the InlineGroup.
show interface InlinePort WAN	Displays InlinePort WAN connection statistics and specific port status of the InlineGroup.

Creating, Removing, and Showing Port Channel Interfaces

The following example shows how to create a port channel with the **interface portchannel** global configuration command:

```
vWAAS# configure
vWAAS(config)# interface portchannel 1
vWAAS(config-if)# ip address 10.10.10.10 255.0.0.0
vWAAS(config-if)# exit
```

The following example shows how to remove a port channel with the **no interface portchannel** global configuration command:

```
vWAAS# configure
vWAAS(config)# interface portchannel 1
vWAAS(config-if)# ip address 10.10.10.10 255.0.0.0
vWAAS(config-if)# exit
vWAAS(config-if)# no interface portchannel 1
```

Note The **interface port channel** and **no interface port channel** global configuration commands will be saved across reloads if you run the **copy running-config startup-config** command or run the **write-mem** command.

The following example shows a show running config command for a port channel interface:

```
interface PortChannel 1
ip address 10.10.10.10 255.0.0.0
exit
!
interface Virtual 1/0
channel-group 1
exit
interface Virtual 2/0
channel-group 1
exit
```

Creating, Removing, and Showing Standby Interfaces

The following example shows how to create a standby interface with the **interface standby** global configuration command:

```
ENCS-APPLIANCE# configure
ENCS-APPLIANCE(config)# interface standby 1
ENCS-APPLIANCE(config-if)# ip address 10.10.10.10 255.0.0.0
ENCS-APPLIANCE(config-if)# exit
```

The following example shows how to remove a standby interface with the **no interface standby** global configuration command:

```
ENCS-APPLIANCE# configure
ENCS-APPLIANCE(config)# interface standby 1
ENCS-APPLIANCE(config-if)# ip address 10.10.10.10 255.0.0.0
ENCS-APPLIANCE(config-if)# exit
ENCS-APPLIANCE(config-if)# no interface standby 1
```

Note The **interface standby** and **no interface standby** global configuration commands are saved across reloads if you run the **copy running-config startup-config** command or run the **write-mem** command.

The following example shows a **show running config** command for a standby interface:

```
interface Standby 1
 ip address <addr> <netmask>
 exit
!
interface Virtual 1/0
 standby 1 primary
 exit
interface Virtual 2/0
```
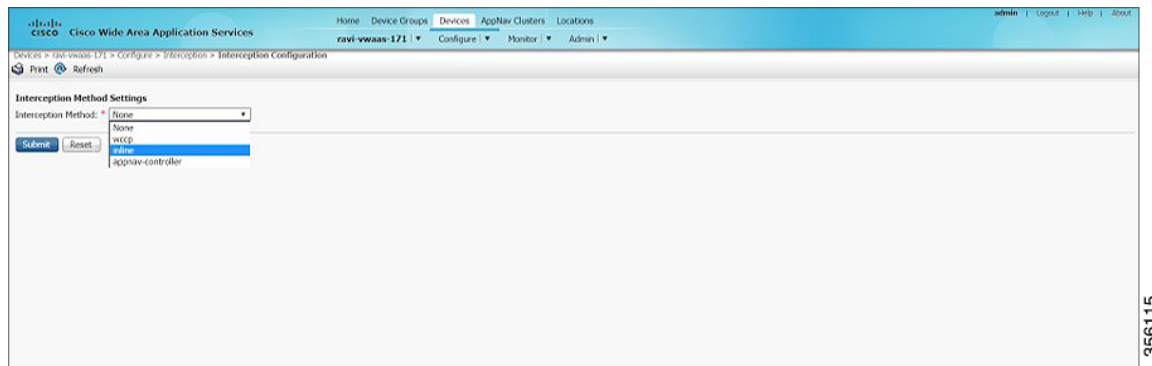
```
standby 1
exit
```

Configuring Inline Interception for FTW on a Cisco ENCS 5400-W Device

Procedure

Step 1   To configure inline interception for FTW with the Cisco WAAS Central Manager, choose **Devices > DeviceName > Configure > Interception > Interception Configuration**.

Figure 1: Cisco WAAS Central Manager Interception Method Configuration Window

Note   To configure inline interception with the Cisco WAAS CLI, see the optional Step 7.

Step 2   At the **Interception Method** drop-down list, choose **Inline**.

Step 3   Click **Submit**.

Step 4   Choose **Devices > DeviceName > Configure > Network > Network Interfaces**.

Figure 2: WAAS Central Manager Network Interfaces Window
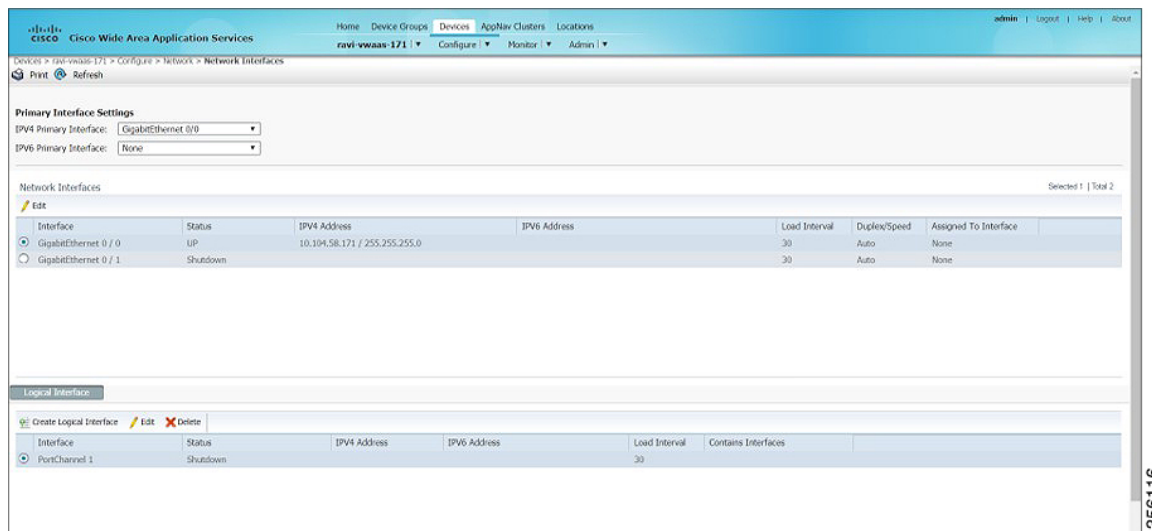
Step 5   In the **Primary Interface Settings** area, from the **IPv4 Primary Interface** drop-down list, choose the interface that should be the primary interface.

Step 6   From the **IPv6 Primary Interface** drop-down list, choose **None**.

For information on the **Network Interface** table listing or the **Logical Interface** table listing, see the "Configuring Network Interfaces" section in the "Configuring Network Settings" chapter of the *Cisco Wide Area Application Services Configuration Guide*.

Step 7   (Optional) To configure inline interception for FTW on a Cisco ENCS 5400-W device, use the commands shown in the following table.

Table 9: Cisco WAAS CLI Commands for Inline Interception

Mode	Command	Description
Global Configuration	**(config) inline failover timeout {1 | 3 | 5 | 25}**	Configures the failover timeout for the inline interfaces. Valid values are **1**, **3**, **5**, or **25 seconds**. The default value is **3**.
	(config) interception-method inline	Enables inline traffic interception.
	(config) interface InlineGroup *slot/groupnumber*	Configures an inline group interface.
EXEC	**show interface inlinegroup** *slot/groupnumber*	Displays the inline group information and the slot and inline group number for the selected interface.

Fail-to-Wire Upgrade and Downgrade Guidelines

Consider the following guidelines for upgrading or downgrading a Cisco WAAS device with FTW:

• FTW is not supported for Cisco vWAAS in Cisco WAAS versions earlier than WAAS 6.4.3.

• In a mixed version Cisco WAAS network with FTW, the Cisco WAAS Central Manager must be running Cisco WAAS Version 6.4.3 or later.

Upgrade and Downgrade Guidelines for Cisco vWAAS on Cisco ENCS 5400-W

Consider the following for upgrading or downgrading a Cisco vWAAS device on Cisco ENCS 5400-W:

• You can use the Cisco WAAS Central Manager or the Cisco WAAS CLI to upgrade a Cisco vWAAS on a Cisco ENCS 5400-W device to Cisco WAAS and Cisco NFVIS versions shown in the following table:

Table 10: Cisco WAAS and NFVIS Versions for Cisco ENCS 5400-W

Cisco WAAS Version	Supported Cisco NFVIS Version
6.4.5a	4.12
6.4.5	3.11.1
6.4.3e	4.12
6.4.3d	3.11.1
6.4.3c	3.10.1
6.4.3b	3.10.1
6.4.3a	3.10.1
6.4.3	3.9.1
6.4.1x	3.7.1

Note If you are running nfvis-371-waas-641a or nfvis-371-waas-641b on a Cisco ENCS 5400-W device, before upgrading Cisco NFVIS, upgrade to Cisco WAAS Version 6.4.3.

- You can use the Cisco WAAS Central Manager to upgrade from the device level and the device group level. To use the Cisco WAAS Central Manager to upgrade a Cisco vWAAS on a Cisco ENCS 5400-W device:

  1. Use Telnet to reach the Cisco vWAAS device.

  2. Update the Cisco WAAS Central Manager's IP address.

  3. Log in to the Cisco WAAS Central Manager.

- The Cisco WAAS Central Manager supports downgrade of all applicable device types in a device group.

  For example, if you are downgrading a device group that has a physical Cisco WAE, a virtual Cisco WAE, and a Cisco ENCS 5400-W platform to a Cisco WAAS version earlier than Cisco WAAS Version 6.4.1, the Cisco WAAS Central Manager initiates the downgrade process only for the physical and virtual Cisco WAEs, but not for the Cisco ENCS 5400-W platform.

- For upgrade and downgrade guidelines for Cisco vWAAS with Cisco NFVIS, see the chapter "Cisco vWAAS with Cisco Enterprise NFVIS."