



# Configuring Cisco WAAS Network Modules for Cisco Access Routers

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**Revised: January 7, 2009**

The Cisco Wide Area Application Services (WAAS) network module (NME-WAE family of devices) works together with other wide area application engines (WAEs) in your network to optimize TCP traffic over your network.

When client and server applications attempt to communicate with each other, the network intercepts and redirects this traffic to the WAEs so that they can act on behalf of the client application and the destination server. The WAEs examine the traffic and use built-in application policies to determine whether to optimize the traffic or allow it to pass through your network unoptimized.

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# Prerequisites for Cisco WAAS Network Modules

The prerequisites for the Cisco WAAS network modules are as follows:

## Router

- Plan software upgrades or downgrades for times when you can take out of service or offline all applications that run on the host router.
- Ensure that you have the appropriate Cisco access router to serve as the host router. The Cisco Wide Area Application Services network module is supported on the following Cisco access routers:
  - Cisco 2811, Cisco 2821, and Cisco 2851
  - Cisco 3825 and Cisco 3845 (required for the NME-WAE-522-K9)
- Use the **show version** command to ensure that the router is running the IOS version listed in [Table 1](#).



### Note

When minimum release requirements are met, you can change images on either the router or the network modules without affecting performance.

## Network Module

- The Cisco NME-WAE modules are supported in WAAS 4.0.3 and later versions of WAAS software.
- To install the Cisco NME-WAE use the *Quick Start Guide: Network Modules for Cisco Access Routers* and *Cisco Network Modules and Interface Cards Regulatory Compliance and Safety Information*.
- The Cisco NME-WAE ships from the factory with the hardware listed in [Table 1](#) preinstalled.

**Table 1**      **Network Module Hardware**

Model	Hard Disk	Memory	IOS Version Required
NME-WAE-302-K9	80 GB	512 MB	12.4(9)T or 12.4(9)T1 (recommended)
NME-WAE-502-K9	120 GB	1 GB	12.4(9)T or 12.4(9)T1 (recommended)
NME-WAE-522-K9	160 GB	2 GB	12.4(15)T

- Make a note of the network module's location in the host router:
  - slot*—Number of the router chassis slot for the module. After you install the module, you can get this information from the router's **show running-config** command output.
  - unit*—Number of the daughter card on the module. This value is always 0.



### Note

You need the slot and unit numbers for the “[Setting Up Network Module Interfaces](#)” section on [page 6](#) and the “[Opening and Closing a Network Module Session](#)” section on [page 8](#).

## File Server

- Verify that your download FTP or TFTP file server is accessible:
  - FTP file server—Use for installations, backups, and restores.
  - TFTP file server—Use (on the FTP-file-server machine) for boothelper operations to recover from a failed installation.

# Restrictions for Cisco WAAS Network Modules

The restrictions for the Cisco WAAS network modules are as follows:

## Upgrade or Downgrade

- You can do a software upgrade or downgrade only on an inactive system. You must plan upgrades or downgrades for times when you can take all applications that run on the host router out of service or offline.
- All WAE appliances and network modules that are in your network must be running the same version of the Cisco WAAS software.

## Configuration

- You can configure network module software only by using a console that connects to a single serial-port console port on the host router
- You can access the WAAS software that runs on the network module by first accessing one of the following:
  - The router's Cisco IOS command-line interface (CLI) to open a console session to the network module
  - The WAAS graphical user interface (GUI)

# About Cisco WAAS Network Modules

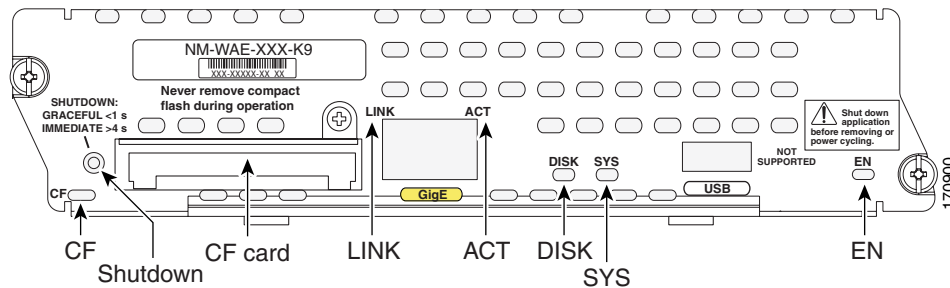
Cisco Wide Area Application Services is a Linux system-based application that resides on a network module that plugs into a host Cisco access router that runs Cisco IOS software. The network module is also referred to as the *integrated service engine* (ISE) on the Cisco IOS CLI.

The network module is a standalone Wide Area Application Engine (WAE) with its own startup and run-time configurations that are independent of the Cisco IOS configuration on the router. The module does not have an external console port. Instead, you launch and configure the module through the router, by means of a configuration session on the module. After the session, you return to the router CLI and clear the session.

The host router and the network module (the module is also referred to as an *appliance* or *blade* or, with installed software, a *network module*)—provide a router-integrated application platform for accelerating data-intensive applications. Typically, such applications involve the following services:

- Application-oriented networking
- Contact centers and interactive voice-response applications
- Content caching and delivery
- Data and video storage
- Network analysis
- Voice mail and auto-attendant applications

Figure 1 shows the Cisco NME-WAE faceplate and LEDs.

**Figure 1** *NME-WAE Faceplate and LEDs*

<b>CF</b>	Not used
<b>SHUTDOWN</b>	Press the SHUTDOWN button for less than 1 second to gracefully shut down the module. Press the SHUTDOWN button for more than 4 seconds to cause an immediate module shutdown, which may impact file operations that are in progress.
<b>CF card</b>	CompactFlash memory card
<b>LINK</b>	Status of Gigabit Ethernet link On—Link is enabled Off—Link is disabled
<b>ACT</b>	Status of Gigabit Ethernet activity On—Active Off—Inactive
<b>DISK</b>	Status of hard drive activity On—Active Off—Inactive
<b>SYS</b>	Status of system shutdown <b>Note</b> Do not remove power without first shutting down the application. On—System is shut down and ready for host power down Off—Application is stable Flashing—System shutdown is in progress
<b>EN</b>	Status of the network module On—Detected by the host Cisco IOS software and enabled Off—Disabled

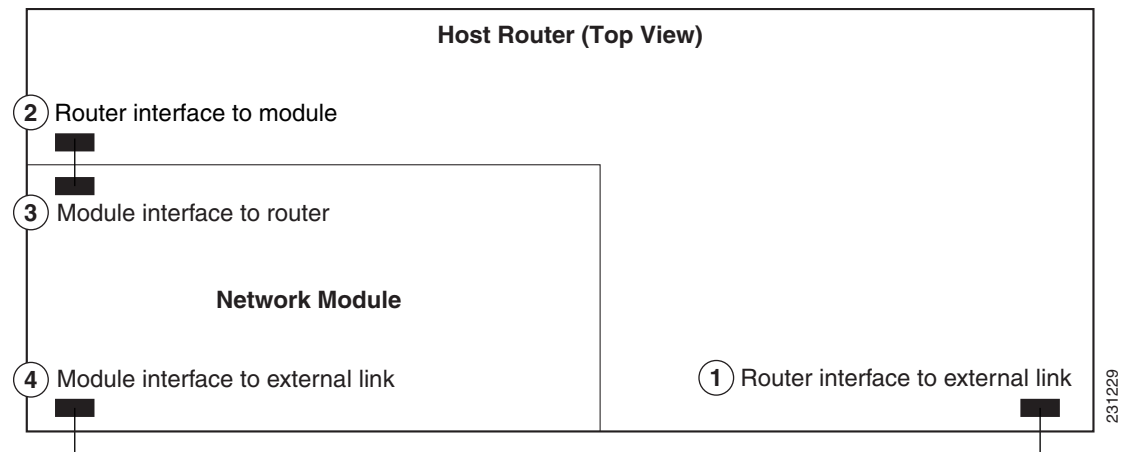
**Note**

The USB port is not used.

## Hardware Interfaces

The host router and network module use several interfaces for internal and external communication (see [Figure 2](#)). Each interface is configurable by using a Cisco IOS software-like CLI.

**Figure 2 Router and Network Module Interface**



	On This Hardware Interface...	Configure These Settings...	Using This Configuration Interface
1	Router interface to external link (GigabitEthernet <i>slot/0</i> )	Standard router settings	Router's Cisco IOS CLI
2	Router interface to module (Integrated-Service-Engine <i>slot/0</i> )	Module's IP address and default gateway router	
3	Module interface to router (Integrated-Service-Engine <i>slot/0</i> )	All other module and WAAS application settings	Cisco NME-WAE network module command-line interface
4	Module interface to external link (Integrated-Service-Engine <i>slot/0</i> )	All other module and WAAS application settings	

The NME-WAE accepts traffic to be optimized on either its internal or external interface but not on both interfaces. Configure either the module internal interface to the router (3 above) or the module external interface (4) but not both interfaces.



### Note

When using the WAAS Central Manager GUI for an NME-WAE device, the internal interface to the router is designated as slot 1, port 0 and the external network interface is designated as slot 2, port 0, regardless of the physical slot in which the NME-WAE is installed.

# Setting Up Cisco WAAS Network Modules and Opening a Session

This section contains the following topics:

- [Setting Up Network Module Interfaces, page 6](#)
- [Opening and Closing a Network Module Session, page 8](#)



## Note

- If you lose power or connection during any of the following procedures, the system usually detects the interruption and tries to recover. If it fails to recover, reinstall the system using the boothelper.
- You can configure basic network parameters for the network module by means of the CLI, which is described in this document. For additional configuration instructions, see the Cisco Wide Area Application Services online help included with the software application.

## Setting Up Network Module Interfaces

Your first configuration task is to set up the network module interfaces to the host router and to its external links. You use these interfaces to access the module for installing and configuring the Cisco Wide Area Application Services software application.



## Note

The first several steps open the host-router CLI to the module. The subsequent steps configure the interface.

## SUMMARY STEPS

### From the Host-Router CLI

1. **enable**
2. **configure terminal**
3. **interface integrated-service-engine slot/0**
4. **ip address** *router-side-ip-address subnet-mask*
5. **service-module ip address** *module-side-ip-address subnet-mask*  
or  
**service-module external ip address** *module-side-ip-address subnet-mask*
6. **service-module ip default-gateway** *gateway-ip-address*
7. **end**
8. **copy running-config startup-config**
9. **show running-config**

## DETAILED STEPS

	Command or Action	Purpose
	<b>From the Host-Router CLI</b>	
<b>Step 1</b>	<b>enable</b>  <b>Example:</b> Router> enable	Enters privileged EXEC mode on the host router. Enter your password if prompted.
<b>Step 2</b>	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode on the host router.
<b>Step 3</b>	<b>interface integrated-service-engine slot/0</b>  <b>Example:</b> Router(config)# interface integrated-service-engine 1/0	Enters interface configuration mode for the slot where the network module resides.
<b>Step 4</b>	<b>ip address router-side-ip-address subnet-mask</b>  <b>Example:</b> Router(config-if)# ip address 10.0.0.20 255.255.255.0	Specifies the router interface to the module (2 in <a href="#">Figure 2</a> ). Arguments are as follows: <ul style="list-style-type: none"> <li><i>router-side-ip-address subnet-mask</i>—IP address and subnet mask for the interface.</li> </ul>
<b>Step 5</b>	<b>service-module ip address module-side-ip-address subnet-mask</b>  or <b>service-module external ip address module-side-ip-address subnet-mask</b>  <b>Example:</b> Router(config-if)# service-module ip address 10.0.0.30 255.255.255.0  or Router(config-if)# service-module external ip address 10.0.0.30 255.255.255.0	Specifies the IP address for the module interface to the router (3 in <a href="#">Figure 2</a> ). To configure the external interface (4 in <a href="#">Figure 2</a> ) instead of the internal interface, use the second form of the command. Arguments are as follows: <ul style="list-style-type: none"> <li><i>module-side-ip-address</i>—IP address for the interface.</li> <li><i>subnet-mask</i>—Subnet mask to append to the IP address; must be in the same subnet as the host-router subnet specified in Step 4.</li> </ul>
<b>Step 6</b>	<b>service-module ip default-gateway gateway-ip-address</b>  <b>Example:</b> Router(config-if)# service-module ip default-gateway 10.0.0.20	Specifies the IP address for the default gateway router for the module. The argument is as follows: <ul style="list-style-type: none"> <li><i>gateway-ip-address</i>—IP address for the gateway router.</li> </ul>
<b>Step 7</b>	<b>end</b>  <b>Example:</b> Router(config-if)# end	Returns to global configuration mode on the host router.

	Command or Action	Purpose
Step 8	<b>copy running-config startup-config</b>  <b>Example:</b> Router# copy running-config startup-config	Saves the router's new running configuration.
Step 9	<b>show running-config</b>  <b>Example:</b> Router# show running-config	Displays the router's running configuration so that you can verify address configurations.

## Examples

The following partial output from the **show running-config** command shows how the interfaces are configured:

```
interface service-engine1/0
 ip address 10.0.0.20 255.255.255.0
 service-module integrated-service-engine ip address 10.0.0.30 255.255.255.0
 service-module integrated-service-engine ip default-gateway 10.0.0.20
```

## Opening and Closing a Network Module Session

You can now open and close a session on the network module. Opening a session is the equivalent of accessing a WAE appliance from its console.

The procedure listed below uses the **service-module integrated-service-engine slot/0 session** command to open a session. Alternatively, you can access the network module console by telnetting to a specific port at the network module IP address, depending on the slot where the network module is installed, as follows:

- slot 1—telnet to port 2066
- slot 2—telnet to port 2130
- slot 3—telnet to port 2194
- slot 4—telnet to port 2258



### Note

You can conduct only one session at a time.

## SUMMARY STEPS

### From the Host-Router CLI

1. **enable**
2. **service-module integrated-service-engine slot/0 status**
3. **service-module integrated-service-engine slot/0 session**

### From the Network Module Interface

4. Log in to the network module.



5. Perform configuration or other procedures by using the CLI.
6. Press **Control-Shift-6 x**.

#### From the Host-Router CLI

7. `service-module integrated-service-engine slot/0 session clear`

## DETAILED STEPS

	Command or Action	Purpose
	<b>From the Host-Router CLI</b>	
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enters privileged EXEC mode on the host router. Enter your password if prompted.
Step 2	<b>service-module integrated-service-engine slot/0 status</b>  <b>Example:</b> Router# service-module integrated-service-engine 2/0 status	Displays the status of the specified module so that you can ensure that the module is running (that is, in the steady state). For details, see the <a href="#">service-module integrated-service-engine status</a> command.  <b>Note</b> If the module is not running, start it with one of the startup commands listed in the “ <a href="#">Shutting Down and Starting Up Cisco WAAS Network Modules</a> ” section on page 11.
Step 3	<b>service-module integrated-service-engine slot/0 session</b>  or <b>telnet module-ip-address port</b>  <b>Example:</b> Router# service-module integrated-service-engine 1/0 session  Trying 10.10.10.1, 2066 ... Open  or Router# telnet 10.10.10.1 2066	Begins a service module session on the specified module. Do one of the following: <ul style="list-style-type: none"> <li>To interrupt the auto-boot sequence and access the bootloader, quickly type <b>***</b>.</li> <li>To start a configuration session, press <b>Enter</b>.</li> </ul> To use telnet to access the network module, use the second form of the command.
	<b>From the Network-Module Interface</b>	
Step 4	Cisco Wide Area Application Services Engine Console  Username: <b>admin</b> Password:  System Initialization Finished.  SE-Module#	Log in to the network module. The default username is admin and the default password is default.

	Command or Action	Purpose
Step 5	<b>Example (Configuration):</b> <pre>SE-Module# configure terminal SE-Module(config)# . . . SE-Module(config)# exit SE-Module# write</pre>	Enter configuration commands on the module as needed. Configuration command choices are similar to those commands that are available on the router. Access global configuration mode by using the <b>configure terminal</b> command. Enter configuration commands. Then exit global configuration mode with the <b>exit</b> command and save your new configuration with the <b>write</b> command.
Step 6	Press <b>Ctrl-Shift-6 x</b> .	Closes the service module session and returns to the router CLI.  <b>Note</b> The service module session stays up until you clear it in the next step. While it remains up, you can return to it from the router CLI by pressing <b>Enter</b> .
<b>From the Host-Router CLI</b>		
Step 7	<pre>service-module integrated-service-engine slot/0 session clear</pre> <b>Example:</b> <pre>Router# service-module integrated-service-engine 1/0 session clear</pre>	Clears the service module session for the specified module. When prompted to confirm this command, press <b>Enter</b> .

## Where to go Next

See the “[Operating, Maintaining, and Troubleshooting Cisco WAAS Network Modules](#)” section on [page 10](#) for information about maintaining and administering the Cisco Wide Area Application Services module.

See the “[Command Reference](#)” section on [page 15](#) for a list of new and modified Cisco IOS commands used to configure the Cisco Wide Area Application Services.

# Operating, Maintaining, and Troubleshooting Cisco WAAS Network Modules

This section contains the following topics:

- [Shutting Down and Starting Up Cisco WAAS Network Modules, page 11](#)
- [Verifying the System Status, page 12](#)



### Note

- The tables in these sections list only the most common router and network module commands.
  - To view a complete list of available commands, type **?** at the prompt (Example: Router(config-if)# **?**).
  - To view a complete list of command keyword options, type **?** at the end of the command (Example: Router# **service-module integrated-service-engine?**).
- The tables group commands by the configuration mode in which they are available. If the same command is available in more than one mode, it may act differently in each mode.

For details about configuring and maintaining your WAAS network, see the following documents:

- *Cisco Wide Area Application Services Configuration Guide*
- *Cisco Wide Area Application Services Quick Configuration Guide*
- *Cisco Wide Area Application Services Command Reference*


**Note**

When using the WAAS Central Manager GUI, for an NME-WAE device, the internal interface to the router is designated as slot 1, port 0 and the external network interface is designated as slot 2, port 0, regardless of the physical slot in which the NME-WAE is installed.


## Shutting Down and Starting Up Cisco WAAS Network Modules

To shut down or start up the network module or the Cisco WAAS application that runs on the module, select from the common router and network module commands listed in [Table 2](#).


**Note**

- Some shutdown commands can potentially disrupt service. If the command output for such a command displays a confirmation prompt, confirm by pressing **Enter** or cancel by typing **n** and pressing **Enter**. Alternatively, you can prevent the prompt from displaying by using the **no-confirm** keyword.
- Some commands shut the module or application down and then immediately restart it.

**Table 2** Common Shutdown and Startup Commands

Configuration Mode	Command	Purpose
Router#	<b>service-module integrated-service-engine slot/0 reload</b>	Shuts down the network module operating system gracefully and then restarts it from the bootloader.
Router#	<b>service-module integrated-service-engine slot/0 reset</b>	Resets the hardware on a module. Use this command only to recover from shutdown or a failed state.  <div>  <b>Caution</b> Using this command does <i>not</i> provide an orderly software shutdown and may impact file operations that are in progress. </div>
Router#	<b>service-module integrated-service-engine slot/0 session</b>	Accesses the specified service engine and begins a network module configuration session.
Router#	<b>service-module integrated-service-engine slot/0 shutdown</b>	Shuts down the network module operating system gracefully. Use when removing or replacing a hot-swappable module during online insertion and removal (OIR).

**Table 2** Common Shutdown and Startup Commands (continued)

Configuration Mode	Command	Purpose
Router#	<b>service-module integrated-service-engine slot/0 status</b>	Displays configuration and status information for the network module hardware and software.
Router (config) #	<b>shutdown</b>	Shuts down the entire system (both the host router and the service module) gracefully.
SE-Module#	<b>reload</b>	Shuts down Cisco WAAS gracefully, and then reboots it from the bootloader.
SE-Module#	<b>shutdown</b>	Shuts down the Cisco WAAS application gracefully, and then shuts down the module.

## Verifying the System Status

To verify the status of an installation, upgrade, or downgrade, or to troubleshoot problems, use commands as needed from the common router and network module commands listed in [Table 3](#).


**Note**

Many **show** commands provide keyword options to display diagnostic output on your screen or send the output to a file or a URL.

**Table 3** Common Verification and Troubleshooting Commands

Configuration Mode	Command	Purpose
Router#	<b>ping</b>	Pings a specified IP address to check network connectivity (does not accept a hostname as destination).
Router#	<b>show arp</b>	Displays the current Address Resolution Protocol (ARP) table.
Router#	<b>show clock</b>	Displays the current date and time.
Router#	<b>show configuration</b>	Displays the current bootloader configuration as entered by means of the <b>configure</b> command.
Router#	<b>show controllers integrated-service-engine</b>	Displays interface debug information.
Router#	<b>show diag</b>	Displays standard Cisco IOS diagnostic information including information about the Cisco WAAS software.
Router#	<b>show hardware</b>	Displays information about network module and host-router hardware.
Router#	<b>show hosts</b>	Displays the default domain name, style of name lookup, list of name-server hosts, and cached list of hostnames and addresses.

**Table 3** Common Verification and Troubleshooting Commands (continued)

Configuration Mode	Command	Purpose
Router#	<b>show interfaces</b>	Displays information about hardware interfaces, including the network and the disk.
Router#	<b>show interfaces integrated-service-engine</b>	Displays information about the module side of the router-module interface.
Router#	<b>show ntp status</b>	Displays information about the Network Time Protocol (NTP).
Router#	<b>show processes</b>	Displays a list of the application processes that are running.
Router#	<b>show running-config</b>	Displays the configuration commands that are in effect.
Router#	<b>show startup-config</b>	Displays the startup configuration.
Router#	<b>show tech-support</b>	Displays general information about the host router. This information is useful to Cisco technical support for problem diagnosis.
Router#	<b>show version</b>	Displays information about the loaded router software or network module bootloader version as well as hardware and device information.
Router#	<b>test scp ping</b>	Pings the service module to check network connectivity.
Router#	<b>verify</b>	Displays version information for installed hardware and software.
SE-Module#	<b>ping</b>	Pings a specified IP address to check network connectivity (does not accept a hostname as destination).
SE-Module#	<b>show arp</b>	Displays the current Address Resolution Protocol (ARP) table.
SE-Module#	<b>show clock</b>	Displays the current date and time.
SE-Module#	<b>show config</b>	Displays the startup configuration stored on the CompactFlash drive.
SE-Module#	<b>show hosts</b>	Displays the default IP domain name, lookup style, name servers, and host table.
SE-Module#	<b>show interfaces <i>interfacename</i></b>	Displays information about the network module interfaces.
SE-Module#	<b>show ntp status</b>	Displays information about the Network Time Protocol (NTP).
SE-Module#	<b>show processes</b>	Displays a list of the application processes that are running.
SE-Module#	<b>show running-config</b>	Displays the configuration commands that are in effect.
SE-Module#	<b>show startup-config</b>	Displays the startup configuration.

**Table 3**      **Common Verification and Troubleshooting Commands (continued)**

Configuration Mode	Command	Purpose
SE-Module#	<b>show tech-support</b>	Displays general information about the service module. This information is useful to Cisco technical support for problem diagnosis.
SE-Module#	<b>show version</b>	Displays information about the loaded router software or network module bootloader version and also hardware and device information.

# Command Reference

This section documents the following new and modified Cisco IOS commands and specific commands that are used to configure the Cisco WAAS software. All other Cisco IOS software commands used with this feature are documented in the Cisco IOS Release 12.4(9) T command reference publication at this URL: [http://www.cisco.com/en/US/products/ps6441/tsd\\_products\\_support\\_series\\_home.html](http://www.cisco.com/en/US/products/ps6441/tsd_products_support_series_home.html)

**Note**

The network module is also known as the *integrated-service-engine* within the Cisco IOS command-line interface (CLI).

**New Commands**

- [interface integrated-service-engine, page 16](#)
- [service-module integrated-service-engine default-boot, page 17](#)
- [service-module integrated-service-engine reload, page 18](#)
- [service-module integrated-service-engine reset, page 19](#)
- [service-module integrated-service-engine session, page 21](#)
- [service-module integrated-service-engine shutdown, page 23](#)
- [service-module integrated-service-engine statistics, page 25](#)
- [service-module integrated-service-engine status, page 26](#)
- [show controllers integrated-service-engine, page 28](#)
- [show interfaces integrated-service-engine, page 34](#)

**Modified Commands**

- [show diag, page 31](#)

# interface integrated-service-engine

To enter the interface configuration mode for an integrated-service-engine (ISE) network module, use the **interface integrated-service-engine** command in global configuration mode.

**interface integrated-service-engine** *slot/unit*

## Syntax Description

<i>slot</i>	Interface slot number.
<i>unit</i>	Number of the daughter card on the network module. For ISE network modules, always use 0.

## Defaults

None

## Command Modes

Global configuration

## Command History

Release	Modification
12.4(9)T	This command was introduced for ISE network modules.

## Usage Guidelines

This command may be used only for ISE network modules. If your system does not have this hardware, then you will not be able to enter this command.

A **no** form of this command (**no interface integrated-service-engine**) is not available. The **exit** command can be used to exit the interface configuration mode.

## Examples

The following example shows the command for entering configuration mode for ISE network modules located in slot 1, unit 0:

```
Router (config)# interface integrated-service-engine 1/0
Router (config-if)# exit
```



# service-module integrated-service-engine default-boot

To configure the integrated-service-engine (ISE) network module to use the default BIOS and bootloader, use the **service-module integrated-service-engine default-boot** command in privileged EXEC mode.

**service-module integrated-service-engine *slot/unit* default-boot**

<b>Syntax Description</b>	<i>slot</i>	Number of the router chassis slot for the network module.
	<i>unit</i>	Number of the daughter card on the network module. For ISE network modules, always use 0.

<b>Defaults</b>	None
-----------------	------

<b>Command Modes</b>	Privileged EXEC
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.4(9)T	This command was introduced for the ISE network module.

**Examples** After a downtime event or failed upgrade, use the **service-module integrated-service-engine *slot/unit* default-boot** command to configure the network module to use the primary BIOS and primary bootloader to perform startup routines.

The following is sample output from the **integrated-service-engine *slot/unit* default-boot** command for a port adapter in chassis slot 2 on a Cisco router:

```
Router# service-module integrated-service-engine 2/0 default-boot
clear  Clear Default Boot
set    Set Default Boot
```

```
Router# service-module integrated-service-engine 2/0 default-boot clear
Router# service-module integrated-service-engine 2/0 default-boot set
```

# service-module integrated-service-engine reload

To perform a graceful shutdown and reboot of the integrated-service-engine (ISE) network module WAAS operating system, use the **service-module integrated-service-engine reload** command in privileged EXEC mode.

**service-module integrated-service-engine** *slot/unit* **reload**

<b>Syntax Description</b>	<i>slot</i>	Number of the router chassis slot for the network module.
	<i>unit</i>	Number of the daughter card on the network module. For ISE network modules, always use 0. The slash mark (/) is required between the <i>slot</i> argument and the <i>unit</i> argument.
<b>Defaults</b>	None	
<b>Command Modes</b>	Privileged EXEC	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.4(9)T	This command was introduced for ISE network modules.
<b>Usage Guidelines</b>	At the confirmation prompt, press <b>Enter</b> to confirm the action or <b>n</b> to cancel.	
<b>Examples</b>	The following example gracefully shuts down and reboots the ISE network module's WAAS operating system in slot 1:	
	<pre>Router# service-module integrated-service-engine 1/0 reload Do you want to proceed with reload?[confirm]</pre>	
<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>interface integrated-service-engine</b>	Configures an interface for ISE network modules and enters interface configuration mode.
	<b>service-module integrated-service-engine reset</b>	Resets the hardware on ISE network modules.
	<b>service-module integrated-service-engine shutdown</b>	Gracefully shuts down ISE network modules.
	<b>show diag</b>	Displays controller information for ISE network modules.
	<b>show interfaces integrated-service-engine</b>	Displays basic interface configuration information for ISE network modules.

# service-module integrated-service-engine reset

To reset the integrated-service-engine (ISE) network module hardware, use the **service-module integrated-service-engine reset** command in privileged EXEC mode.

**service-module integrated-service-engine *slot/unit* reset**

<b>Syntax Description</b>	<i>slot</i>	Number of the router chassis slot for the network module.
	<i>unit</i>	Number of the daughter card on the network module. For ISE network modules, always use 0. The slash mark (/) is required between the <i>slot</i> argument and the <i>unit</i> argument.

<b>Defaults</b>	None
-----------------	------

<b>Command Modes</b>	Privileged EXEC
----------------------	-----------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.4(9)T	This command was introduced for ISE network modules.

<b>Usage Guidelines</b>	At the confirmation prompt, press <b>Enter</b> to confirm the action or <b>n</b> to cancel.
-------------------------	---



## Caution

Because you may lose data, use the **service-module integrated-service-engine reset** command only to recover from a shutdown or failed state.

<b>Examples</b>	The following example resets the hardware on the ISE network module in slot 1:
-----------------	--

```
Router# service-module integrated-service-engine 1/0 reset
```

```
Use reset only to recover from shutdown or failed state
```

```
Warning: May lose data on the hard disk!
```

```
Do you want to reset?[confirm]
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>interface integrated-service-engine</b>	Configures an interface for ISE network modules and enters interface configuration mode.
	<b>service-module integrated-service-engine reload</b>	Performs a graceful shutdown and reboot on the ISE network module WAAS operating system.
	<b>service-module integrated-service-engine shutdown</b>	Gracefully shuts down ISE network modules.

Command	Description
<b>show diag</b>	Displays controller information for ISE network modules.
<b>show interfaces integrated-service-engine</b>	Displays basic interface configuration information for ISE network modules.

# service-module integrated-service-engine session

To begin a configuration session with an integrated-service-engine (ISE) network module through a console connection, use the **service-module integrated-service-engine session** command in privileged EXEC mode.

**service-module integrated-service-engine *slot/unit* session [clear]**

<b>Syntax Description</b>	<i>slot</i>	Number of the router chassis slot for the network module.
	<i>unit</i>	Number of the daughter card on the network module. For ISE network modules, always use 0. The slash mark (/) is required between the <i>slot</i> argument and the <i>unit</i> argument.
	<b>clear</b>	(Optional) Clears the ISE configuration session.

**Defaults** None

**Command Modes** Privileged EXEC

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.4(9)T	This command was introduced for ISE network modules.

**Usage Guidelines**

Only one session at a time is allowed into the network module from the internal ISE network-module-side interface.

After starting a session, you can perform any ISE configuration task. You first access the ISE console in a user-level shell. To access the privileged EXEC command shell, where most commands are available, use the **enable** command.

After you finish ISE configuration and exit the ISE console session, use this command with the **clear** keyword to clear the session. At the confirmation prompt, press **Enter** to confirm the action or **n** to cancel.

**Examples** The following example shows an ISE session being opened for an ISE network module in slot 2:

```
Router# service-module integrated-service-engine 2/0 session
```

```
Trying 10.10.10.1, 2066 ... Open
```

```
Cisco Wide Area Application Services Engine Console
```

```
Username:
```

The following example clears the session that had been used to configure the ISE in the network module in slot 2:

```
Router# service-module integrated-service-engine 2/0 session clear
[confirm]
[OK]
```

**Related Commands**

Command	Description
<b>enable</b>	Enters privileged EXEC mode.
<b>interface</b>	Configures an interface and enters interface configuration mode.
<b>show diag</b>	Displays controller information for a network module.
<b>show interface integrated-service engine</b>	Displays basic interface configuration information for network modules.

# service-module integrated-service-engine shutdown

To gracefully shut down an integrated-service-engine (ISE) network module, use the **service-module integrated-service-engine shutdown** command in privileged EXEC mode.

**service-module integrated-service-engine *slot/unit* shutdown**

<b>Syntax Description</b>	<i>slot</i>	Number of the router chassis slot for the network module.
	<i>unit</i>	Number of the daughter card on the network module. For ISE network modules, always use 0. The slash mark (/) is required between the <i>slot</i> argument and the <i>unit</i> argument.

<b>Defaults</b>	None
-----------------	------

<b>Command Modes</b>	Privileged EXEC
----------------------	-----------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.4(9)T	This command was introduced for ISE network modules.

<b>Usage Guidelines</b>	At the confirmation prompt, press <b>Enter</b> to confirm the action or <b>n</b> to cancel.
	The <b>service-module integrated-service-engine shutdown</b> command brings down the operating system of the specified integrated-service-engine network module in an orderly fashion to protect the hard drive. When the system has been shut down, the module can be removed from the router.

<b>Examples</b>	The following example gracefully shuts down the ISE network module in slot 1:
-----------------	---

```
Router# service-module integrated-service-engine 1/0 shutdown
```

Shutdown is used for Online removal of Service Module.

Do you want to proceed with shutdown?[confirm]

Use service module reset command to recover from shutdown.

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>interface integrated-service-engine</b>	Configures an interface for ISE network modules and enters interface configuration mode.
	<b>service-module integrated-service-engine reload</b>	Performs a graceful shutdown and reboot of an ISE network module WAAS operating system.
	<b>service-module integrated-service-engine reset</b>	Resets the hardware on ISE network modules.

Command	Description
<b>show diag</b>	Displays controller information for ISE network modules.
<b>show interfaces integrated-service-engine</b>	Displays basic interface configuration information for ISE network modules.



# service-module integrated-service-engine statistics

To display reset and reload information for an integrated-service-engine (ISE) network module and its Cisco IOS software, use the **service-module integrated-service-engine statistics** command in EXEC mode.

## **service-module integrated-service-engine slot/unit statistics**

<b>Syntax Description</b>	<i>slot</i>	Number of the router chassis slot for the network module.
	<i>/unit</i>	Number of the daughter card on the network module. For ISE network modules, always use 0. The slash mark (/) is required between the <i>slot</i> argument and the <i>unit</i> argument.

<b>Defaults</b>	none
-----------------	------

<b>Command Modes</b>	User EXEC
	Privileged EXEC

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.4(9)T	This command was introduced for ISE network modules.

<b>Usage Guidelines</b>	The statistics displayed by this command represent control communication events between the network module and the router. For WAAS-specific statistics, access the WAAS CLI and use the <b>show statistics</b> commands documented in the <i>Cisco Wide Area Application Services Command Reference</i> .
-------------------------	--

<b>Examples</b>	The following example displays information for an ISE network module that is installed in slot 2 of an access router:
-----------------	---

```
Router# service-module integrated-service-engine 2/0 statistics
```

```
Module Reset Statistics:
```

```
CLI reset count = 1
CLI reload count = 0
Registration request timeout reset count = 0
Error recovery timeout reset count = 0
Module registration count = 2
```

```
The last IOS initiated event was a cli reset at *13:34:33.847 UTC Sun Dec 18 2005
```

# service-module integrated-service-engine status

To display configuration information related to software on the integrated-service-engine (ISE) side of a network module, use the **service-module integrated-service-engine status** command in privileged EXEC mode.

**service-module integrated-service-engine** *slot/unit* **status**

<b>Syntax Description</b>	<i>slot</i>	Number of the router chassis slot for the network module.
	<i>unit</i>	Number of the daughter card on the network module. For ISE network modules, always use 0. The slash mark (/) is required between the <i>slot</i> argument and the <i>unit</i> argument.

**Defaults** None

**Command Modes** Privileged EXEC

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.4(9)T	This command was introduced for ISE network modules.

**Usage Guidelines** Use the **service-module integrated-service-engine status** command to do the following tasks:

- Display the ISE network module's software release version
- Check the ISE network module status (steady or down)

**Examples** The following example displays information for an ISE network module that is installed in slot 1 of an access router:

```
Router# service-module integrated-service-engine 1/0 status
```

```
Service Module is Cisco Integrated-Service-Engine1/0
Service Module supports session via TTY line 66
Service Module is in Steady state
Getting status from the Service Module, please wait..
Cisco Wide Area Application Services Software 4.0.2 (b170 Sep 27 2006 08:56:37)
Restarted at Sun Jan 1 15:32:38 2006
```

The following example displays information for an ISE network module that is not running:

```
Router# service-module integrated-service-engine 1/0 status
```

```
Service Module is Cisco Integrated-Service-Engine1/0
Service Module supports session via TTY line 258
Service Module is trying to recover from reset/shutdown
Service Module status is not available
```

**Related Commands**

Command	Description
<b>interface integrated-service-engine</b>	Configures an interface for ISE network modules and enters interface configuration mode.
<b>show diag</b>	Displays controller information for ISE network modules.
<b>show interfaces integrated-service-engine</b>	Displays basic interface configuration information for ISE network modules.

# show controllers integrated-service-engine

To display controller information for integrated-service-engine (ISE) network modules, use the **show controllers integrated-service-engine** command in privileged EXEC mode.

**show controllers integrated-service-engine** *slot/unit*

<b>Syntax Description</b>	<i>slot</i>	Number of the router chassis slot for the network module.
	<i>/unit</i>	Number of the daughter card on the network module. For ISE network modules, always use 0. The slash mark (/) is required between the <i>slot</i> argument and the <i>unit</i> argument.

**Defaults** None

**Command Modes** Privileged EXEC

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.4(9)T	This command was introduced for ISE network modules.

**Examples** The following example displays controller information for the network module that is installed in slot 1 of an access router:

```
Router# show controllers integrated-service-engine 1/0
```

```
Interface Integrated-Service-Engine1/0
Hardware is Intel 82559 FastEthernet
IDB: 82A92DC4, FASTSEND: 8021B488, MCI_INDEX: 0
```

```
INSTANCE=0x82A94534
Rx Ring entries = 64
Rx Shadow = 0x82A947A0
Rx Ring = 0x 3CB5160
Rx Ring Head = 14
Rx Ring Last = 13
Rx Buffer Descr = 0x 3CB55A0
Rx Buffer Descr Head = 14
Rx Buffer Descr Last = 13
Rx Shadow (malloc) = 0x82A947A0
Rx Ring (malloc) = 0x 3CB5160
Rx Buffer Descr (malloc) = 0x 3CB55A0
Tx Ring entries = 128
Tx Shadow = 0x82A948D0
Tx Shadow Head = 79
Tx Shadow Tail = 79
Tx Shadow Free = 128
Tx Ring = 0x 3CB59E0
Tx Head = 81
Tx Last = 80
Tx Tail = 81
```

```

Tx Count = 0
Tx Buffer Descr = 0x 3CB6A20
Tx Buffer Descr Head = 0
Tx Buffer Descr Tail = 0
Tx Shadow (malloc) = 0x82A948D0
Tx Ring (malloc) = 0x 3CB59E0
Tx Buffer Descr (malloc) = 0x 3CB6A20

```

## CONTROL AND STATUS REGISTERS (CSR)=0x40800000

```

SCB Intr Mask = 00
SCB CU/RU Cmd = 00
SCB Intr Status = 00
SCB CU/RU Status = 50
SCB General Ptr = 00000000
PORT = 00000000
EEPROM = 0008
FLASH = 0002
MDI = 1821782D
Rx Byte Count = 00000608
PMDR = 80
FC Cmd = 00
FC Threshold = 03
Early Rx = 00
General Status = 05
General Control = 00

```

## PHY REGISTERS

```

Register 0x00: 1000 782D 02A8 0154 0441 45E1 0001 0000
Register 0x08: 0000 0000 0000 0000 0000 0000 0000 0000
Register 0x10: 0401 0000 0001 0000 0000 0000 0000 0000
Register 0x18: 0000 0000 8000 0000 0000 0000 0000 0000

```

## HARDWARE STATISTICS

```

Rx good frames: 14
Rx CRC: 0
Rx alignment: 0
Rx resource: 0
Rx overrun: 0
Rx collision detects: 0
Rx short: 0
Tx good frames: 79
Tx maximum collisions: 0
Tx late collisions: 0
Tx underruns: 0
Tx lost carrier sense: 0
Tx deferred: 0
Tx single collisions: 0
Tx multiple collisions: 0
Tx total collisions: 0
FC Tx pause: 0
FC Rx pause: 0
FC Rx unsupported: 0

```

## INTERRUPT STATISTICS

```

CX = 613298
FR = 805
CNA = 0
RNR = 0
MDI = 0
SWI = 0
FCP = 0

```

```

Receive All Multicasts = enabled
Receive Promiscuous = disabled
Loopback Mode = disabled

```

Table 4 describes the significant fields shown in the command output.

**Table 4** *show controllers integrated-service-engine Field Descriptions*

Field	Description
Hardware	Description of the chip being used.
IDB, FASTSEND	Address in router memory of the interface descriptor block (IDB) and the fastsend routine.
INSTANCE	Device-specific data stored in router memory that lists the memory locations and current indexes of receive (Rx) and transmit (Tx) rings in the router I/O memory.
CONTROL AND STATUS REGISTERS (CSR)	Control and status registers that are physically located on the chip itself and that are accessed by the CPU over the protocol control information (PCI) bus.
PHY REGISTERS	Contents of the physical layer (PHY) registers. A PHY module is a device that interfaces to the physical Ethernet line and that is located between the chip and the physical line.
HARDWARE STATISTICS	Receive (Rx) and transmit (Tx) traffic statistics collected by the chip.
INTERRUPT STATISTICS	Transmit (Tx), Receive (Rx), control, software, and flow control interrupt statistics collected by the chip.

#### Related Commands

Command	Description
<b>service-module external ipv6 address</b>	Configures an interface for ISE network modules and enters interface configuration mode.
<b>show interfaces integrated-service-engine</b>	Displays basic interface configuration information for ISE network modules.

# show diag

To display hardware and diagnostic information for a networking device, a line card, a processor, a jacket card, a chassis, or a network module, use the **show diag** command in privileged EXEC configuration mode.

**show diag** [*slot-number*]

<b>Syntax Description</b>	<i>slot-number</i>	(Optional) Slot number of the interface. If a slot number is not specified, diagnostic information for all slots is displayed.
<b>Defaults</b>	None Privileged EXEC	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	11.1CA	This command was introduced.
	11.2	This command was integrated into Cisco IOS Release 11.2.
	11.2P	This command output was modified for the PA-12E/2FE port adapter, PA-E3 port adapter, and PA-T3 port adapter.
	11.2GS	This command was implemented on the Cisco 12000 series Gigabit Switch Routers (GSRs).
	11.3 XA	This command was integrated in Cisco IOS Release 11.3 XA.
	12.0	This command was implemented on the Cisco AS5300.
	12.0(5)XQ	This command was implemented on the Cisco 1750 router.
	12.0(7)T	This command was integrated into Cisco IOS Release 12.0(7)T.
	12.1(9)EX	This command was introduced on the Cisco 7300 series routers, and the <i>slot-number</i> argument and <b>chassis</b> keyword were added.
	12.1(10)EX	This command was enhanced to display information about Field-Programmable Gate Array (FPGA) image versions on installed NSEs and line cards on Cisco 7304 routers.
	12.2(11)YZ	Support was added for the 7300-CC-PA.
	12.2(8)T	This command was implemented for AIC and WIC cards on the Cisco 2600 series routers and the Cisco 3600 series routers.
	12.2(13)T	This command was implemented for the AIM-VPN/EPII and AIM-VPN/HPII cards on the Cisco 2691, Cisco 3660, Cisco 3725, and Cisco 3745 routers.
	12.2(15)ZJ	This command was implemented for the AIM-VPN/BPII card on the Cisco 2610XM, Cisco 2611XM, Cisco 2620XM, Cisco 2621XM, Cisco 2650XM, and Cisco 2651XM routers.
	12.2(18)S	This command was integrated into Cisco IOS Release 12.2(18)S and implemented on the Cisco 7304 router.
	12.3(4)T	Support for the AIM-VPN/BPII card on the Cisco 2600XM series was integrated into Cisco IOS Release 12.3(4)T.

Release	Modification
12.2(20)S2	This command was integrated into Cisco IOS Release 12.2(20)S2 and the <b>subslot slot/subslot</b> keyword and arguments were added to support SPAs on the Cisco 7304 router.
12.0(31)S	This command was integrated into Cisco IOS Release 12.0(31)S and the <b>subslot slot/subslot</b> keyword and arguments were added to support SIPs and SPAs on the Cisco 12000 series router.
12.4(4)T	This command was implemented for the HWIC-1ADSL and HWIC-1ADSLI interface cards on the following platforms: Cisco 1800 (modular) series, Cisco 2800 series, and Cisco 3800 series routers.
12.4(9)T	This command was implemented for the NME-WAE-xxx-K9 and NME-AON-K9= network modules on the following platforms: Cisco 2811, Cisco 2821, Cisco 2851, Cisco 3725, and Cisco 3745 routers.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

### Usage Guidelines

Use this command to determine the type of hardware installed in your router, and to show detailed hardware information and EEPROM version information.

This command displays information for the motherboard, WAN interface cards (WICs), voice interface cards (VICs), high-speed WICs (HWICs), ATM interface cards (AICs), advanced integration modules (AIMs), port adapters, shared port adapters (SPAs), modular services cards (MSCs), SPA interface processors (SIPs), and network modules (NME).

### Examples

#### NME-WAE-502-K9 Installed in a Cisco 3845: Example

The following is sample output of the **show diag** command for an integrated-service-engine WAAS network module that is installed in slot 2 of a Cisco 3845 router:

```
Router# show diag 2
```

```
Slot 2:
```

```
Integrated Service Engine Port adapter, 1 port
Port adapter is analyzed
Port adapter insertion time unknown
EEPROM contents at hardware discovery:
Hardware Revision       : 1.0
Top Assy. Part Number   : 800-28152-01
Board Revision          : 03
Deviation Number        : 0
Fab Version             : 01
PCB Serial Number       : FOC101430NK
RMA Test History        : 00
RMA Number              : 0-0-0-0
RMA History             : 00
Version Identifier      : NA
CLEI Code               : TDB
Product (FRU) Number    : NME-WAE-502-K9
EEPROM format version 4
EEPROM contents (hex):
0x00: 04 FF 40 05 5B 41 01 00 C0 46 03 20 00 6D F8 01
0x10: 42 30 33 88 00 00 00 02 01 C1 8B 46 4F 43 31
0x20: 30 31 34 33 30 4E 4B 03 00 81 00 00 00 00 04 00
0x30: 89 4E 41 00 00 D9 02 40 C1 C6 8A 54 44 42 00 00
0x40: 00 00 00 00 00 CB 88 4E 4D 45 2D 52 56 50 4E FF
0x50: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
```



```

0x60: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x70: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF

```

Table 5 describes the significant fields shown in the command output.

**Table 5** *show diag subslot Field Descriptions*

Field	Description
Hardware Revision	Revision number (signifying a minor revision) of the NME hardware.
Top Assy. Part Number	Part number of the NME.
Product Identifier (PID)	Product number of the NME.
Board Revision	Revision number of the circuit board in the module.
Deviation Number	Deviation number of the module.
Fab Version	Fabrication version of the module.
PCB Serial Number	Serial number of the printed circuit board.
Top Assy. Revision	Revision number (signifying a minor revision) of the NME.
RMA Test History	History of RMA testing.
RMA Number	RMA number of the module.
RMA History	History of RMA on this module.
Version Identifier	Not applicable to this module.
CLEI Code	Common Language Equipment Identification number (not applicable on this module).
Product (FRU) Number	Product identification number.
EEPROM Format Version	Version of EEPROM format.
EEPROM Contents	Contents of EEPROM output.

#### Related Commands

Command	Description
<b>show controllers integrated-service-engine</b>	Displays controller information for integrated-service-engine network modules.
<b>show interfaces integrated-service-engine</b>	Displays basic interface configuration information for integrated-service-engine network modules.

# show interfaces integrated-service-engine

To display basic interface configuration information for an integrated-service-engine (ISE) network module, use the **show interfaces integrated-service-engine** command in privileged EXEC mode.

**show interfaces integrated-service-engine** *slot/unit*

<b>Syntax Description</b>	<i>slot</i>	Number of the router chassis slot for the network module.
	<i>unit</i>	Number of the daughter card on the network module. For ISE network modules, always use 0. The slash mark (/) is required between the <i>slot</i> argument and the <i>unit</i> argument.

<b>Command Modes</b>	Privileged EXEC
----------------------	-----------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.4(9)T	This command was introduced for ISE network modules.

**Usage Guidelines** The following example displays interface status and data for an ISE that is installed in slot 1 of a Cisco 2811 router:

```
Router# show interfaces integrated-service-engine 1/0

Integrated-Service-Engine1/0 is up, line protocol is up
  Hardware is BCM5703, address is 0017.942a.c9c0 (bia 0017.942a.c9c0)
  Internet address is 2.43.181.181/30
  MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive not set
  Full-duplex, 1000Mb/s, link type is force-up, media type is internal
  output flow-control is XON, input flow-control is XON
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:00:02, output 00:00:02, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/512 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    298674 packets input, 20019979 bytes, 0 no buffer
    Received 1413 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
    0 watchdog, 1365 multicast, 0 pause input
    0 input packets with dribble condition detected
  396589 packets output, 384808087 bytes, 0 underruns
    0 output errors, 0 collisions, 1 interface resets
    0 babbles, 0 late collision, 0 deferred
    0 lost carrier, 0 no carrier, 0 pause output
    0 output buffer failures, 0 output buffers swapped out
```

Table 6 describes the significant fields shown in the command output.

**Table 6** *show interfaces integrated-service-engine Field Descriptions*

Field	Description
Integrated-Service-Engine	Indicates whether the ISE interface hardware is currently active. If the ISE interface hardware is operational, the output states that “Integrated-Service-Engine slot/port is up.” If it has been taken down by an administrator, the output states that “Integrated-Service-Engine slot/port is administratively down.”
line protocol	Indicates whether the software processes that handle the line protocol consider the line usable or whether the line has been taken down by an administrator.
Hardware address	Hardware type and address.
Internet address	IP address.
MTU	Maximum transmission unit (MTU) of the integrated-service-engine interface.
BW	Bandwidth of the interface, in kilobits per second.
DLY	Delay of the interface, in microseconds.
reliability	Reliability of the interface as a fraction of 255 (255/255 is 100-percent reliability), calculated as an exponential average over 5 minutes.
txload	Transmit load on the interface as a fraction of 255 (255/255 is completely saturated), calculated as an exponential average over 5 minutes.
rxload	Receive load on the interface as a fraction of 255 (255/255 is completely saturated), calculated as an exponential average over 5 minutes.
Encapsulation	Encapsulation method that is assigned to the interface, ARPA in this case.
loopback	Indicates whether loopback is set.
Keepalive	Indicates whether keepalives are set and the interval between keepalives if they have been set.
Full-duplex	Indicates either full-duplex or half-duplex mode and other link configuration details.
ARP type Timeout	Type of Address Resolution Protocol (ARP) assigned and length of timeout.
Last input	Number of hours, minutes, and seconds since the last packet was successfully received by the interface and processed locally on the router. This field is useful for detecting when a dead interface failed.  <b>Note</b> This field is not updated by fast-switched traffic.
output	Number of hours, minutes, and seconds since the last packet was successfully transmitted by the interface. This field is useful for detecting when a dead interface failed.

**Table 6** *show interfaces integrated-service-engine Field Descriptions (continued)*

Field	Description
output hang	Number of hours, minutes, and seconds (or never) since the interface was last reset because a transmission took too long. When the number of hours in any of the “last” fields exceeds 24 hours, the number of days and hours is printed. If that field overflows, asterisks are printed.
Last clearing	Elapsed time since the counters that measure cumulative statistics (such as number of bytes transmitted and received) shown in this report were last reset to zero. Variables that might affect routing (for example, load and reliability) are not cleared when the counters are cleared.  Asterisks (***) indicate that the elapsed time is too large to be displayed.
Input queue	Number of packets in the input queue. A slash separates the following values that indicate the maximum size of the queue, the number of packets dropped because of a full queue, and the number of times that queued packets have been discarded.
Total output drops	Number of packets in the output queue that have been dropped because of a full queue.
Queueing strategy	Queueing strategy applied to the interface, which is configurable under the interface. The default is FIFO.
Output queue	Number of packets in the output queue. A slash separates the following values that indicate the maximum size of the queue and the number of packets dropped because of a full queue.
5 minute input rate, 5 minute output rate	Average number of bits and packets transmitted per second in the last 5 minutes. If the interface is not in promiscuous mode, it senses network traffic that it sends and receives (rather than all network traffic).  The 5-minute input and output rates should be used only as an approximation of traffic per second during a given 5-minute period. These rates are exponentially weighted averages with a time constant of 5 minutes. A period of four time constants must pass before the average will be within 2 percent of the instantaneous rate of a uniform stream of traffic over that period.  <b>Note</b> The 5-minute period referenced in this output is a load interval that is configurable under the interface. The default value is 5 minutes.
packets input	Total number of error-free packets received by the system.
bytes	Total number of bytes, including data and MAC encapsulation, in the error-free packets received by the system.
no buffer	Number of received packets discarded because there was no buffer space in the main system. Ignored Broadcast storms on Ethernet and bursts of noise on serial lines are often responsible for no input buffer events.
Received broadcasts	Number of broadcasts received.

**Table 6** *show interfaces integrated-service-engine Field Descriptions (continued)*

Field	Description
runt	Number of packets that are discarded because they are smaller than the minimum packet size of the medium. For instance, any Ethernet packet that is less than 64 bytes is considered a runt.
giants	Number of packets that are discarded because they exceed the maximum packet size of the medium. For example, any Ethernet packet that is greater than 1518 bytes is considered a giant.
throttles	Number of times that the interface requested another interface within the router to slow down.
input errors	Errors that include runts, giants, no buffer, cyclic redundancy check (CRC), frame, overrun, and ignored counts. Other input-related errors can also cause the input errors count to be increased, and some datagrams may have more than one error; therefore, this sum may not balance with the sum of enumerated input error counts.
CRC	Errors created when the CRC generated by the originating LAN station or far-end device does not match the checksum calculated from the data received. On a LAN, such errors usually indicate noise or transmission problems on the LAN interface or the LAN bus. A high number of CRCs is usually the result of collisions or a station that is transmitting bad data.
frame	Number of packets received incorrectly that have a CRC error and a non-integer number of octets. On a LAN, this error is usually the result of collisions or a malfunctioning Ethernet device.
overrun	Number of times that the receiver hardware was unable to handle received data to a hardware buffer because the input rate exceeded the receiver's ability to handle the data.
ignored	Number of received packets that were ignored by the interface because the interface hardware ran low on internal buffers. These buffers are different from system buffer space. Broadcast storms and bursts of noise can cause the ignored count to increase.
input packets with dribble condition detected	Number of packets with a dribble condition. Dribble bit error indicates that a frame is slightly too long. This frame error counter is incremented only for informational purposes; the router accepts the frame.
packets output	Total number of messages that have been transmitted by the system.
bytes	Total number of bytes, including data and MAC encapsulations, that have been transmitted by the system.
underruns	Number of times that the transmitter has run faster than the router could handle. This error may never be reported on some interfaces.

**Table 6** *show interfaces integrated-service-engine Field Descriptions (continued)*

Field	Description
output errors	Sum of all errors that prevented the final transmission of datagrams out of the integrated service engine that is being examined. This number may not balance with the sum of the enumerated output errors, because some datagrams may have more than one error, and others may have errors that do not fall into any of the specifically tabulated categories.
collisions	Number of messages that have been retransmitted because of an Ethernet collision. This error is usually the result of an overextended LAN (such as an Ethernet or transceiver cable that is too long, there are more than two repeaters between stations, or there are too many cascaded multiport transceivers). A packet that collides is counted only once in output packets.
interface resets	Number of times that an interface has been completely reset. This can occur if packets that were queued for transmission were not sent within several seconds. On a serial line, this error can be caused by a malfunctioning modem that is not supplying the transmit clock signal or caused by a cable problem. If the system notices that the carrier detect line of a serial interface is up, but the line protocol is down, it periodically resets the interface in an effort to restart it. Interface resets can also occur when an interface is looped back or shut down.
babbles	Count of frames that are greater than 1518 bytes and that have been transmitted. This error indicates that the transmitter has been on the interface longer than the time necessary to transmit the largest frame.
late collision	Number of late collisions. A collision becomes a late collision when it occurs after the preamble has been transmitted.
deferred	Indicates that the chip, while ready to transmit a frame, had to defer because the carrier was asserted.
lost carrier	Number of times that the carrier was lost during transmission.
no carrier	Number of times that the carrier was not present during the transmission.
output buffer failures, output buffers swapped out	Number of failed buffers and number of buffers swapped out.

**Related Commands**

Command	Description
<b>interface integrated-service-engine</b>	Configures an interface for an ISE and enters interface configuration mode.
<b>show diag</b>	Displays controller information for ISE network modules.

# Glossary

<b>ARP</b>	Address Resolution Protocol. Internet protocol used to map an IP address to a MAC address.
<b>blade</b>	Alternate term for <i>service module</i> .
<b>boothelper</b>	A small subset of the system software that runs on the module. It boots the module from the network and assists in software installation and upgrades, disaster recovery, and other operations when the module cannot access its software.
<b>bootloader</b>	A small set of system software that runs when the system first powers up. It loads the operating system (from the disk, network, or compactFlash), which loads and runs the Cisco Wide Area Application Services application. The bootloader may optionally load and run the boothelper.
<b>FTP</b>	File Transfer Protocol. Application protocol, part of the TCP/IP protocol stack, used for transferring files between network nodes.
<b>network module</b>	Standalone content engine with its own startup and run-time configurations that are independent of the Cisco IOS configuration on the router.
<b>NTP</b>	Network Time Protocol. Protocol built on top of TCP that ensures accurate local timekeeping with reference to radio and atomic clocks located on the Internet. This protocol is capable of synchronizing distributed clocks within milliseconds over long time periods.
<b>service (or services) engine</b>	Alternate term for service module with installed application software.
<b>syslog</b>	Industry-standard protocol for capturing log information for devices on a network.
<b>TCP</b>	Transmission Control Protocol. Connection-oriented transport-layer protocol that provides reliable full-duplex data transmission. TCP is part of the TCP/IP protocol stack.
<b>TFTP</b>	Trivial File Transfer Protocol. Simplified version of FTP that allows files to be transferred from one computer to another over a network, usually without the use of client authentication (for example, username and password).
<b>UDP</b>	User Datagram Protocol. Connectionless transport-layer protocol in the TCP/IP protocol stack that exchanges datagrams without acknowledgments or guaranteed delivery, requiring that error processing and retransmission be handled by other protocols.
<b>WAE</b>	Wide Area Application Engine (hardware plus software) that accelerates content delivery, while ensuring the maximum scalability and availability of the content.



## Note

See [Internet working Terms and Acronyms](#) for terms not included in this glossary.

# Obtaining Documentation, Obtaining Support, and Security Guidelines

For information on obtaining documentation, obtaining support, providing documentation feedback, security guidelines, and also recommended aliases and general Cisco documents, see the monthly *What's New* in Cisco Product Documentation, which also lists all new and revised Cisco technical documentation, at:

<http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html>

## Related Documentation

For additional information on the Cisco WAAS software, Cisco IOS software, and the network module hardware, see the following documentation:

Related Topic	Document Title
Cisco Wide Area Application Services	<i>Cisco Wide Area Application Services Configuration Guide</i> <i>Cisco Wide Area Application Services Quick Configuration Guide</i> <i>Cisco Wide Area Application Services Command Reference</i> All available on the Cisco WAAS documentation page at: <a href="http://www.cisco.com/en/US/products/ps6870/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/ps6870/tsd_products_support_series_home.html</a>
Cisco IOS software	<i>Cisco IOS Software</i> <a href="http://www.cisco.com/en/US/products/ps6441/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/ps6441/tsd_products_support_series_home.html</a>
Network Modules	<i>Installing Cisco Network Modules in Cisco Access Routers</i> <a href="http://www.cisco.com/en/US/docs/routers/access/interfaces/nm/hardware/installation/guide/InstNetM.html">http://www.cisco.com/en/US/docs/routers/access/interfaces/nm/hardware/installation/guide/InstNetM.html</a> <i>Cisco Network Modules and Interface Cards Regulatory Compliance and Safety Information</i> <a href="http://www.cisco.com/en/US/docs/routers/access/interfaces/rcsi/IOHrcsi.html">http://www.cisco.com/en/US/docs/routers/access/interfaces/rcsi/IOHrcsi.html</a>



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