



# Content Engine Network Module for Caching and Content Delivery

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The Content Engine Network Module for Caching and Content Delivery feature integrates content engine (CE) functionality into branch office routers for enterprise and service provider sites. Content engine functionality provides the following benefits:

- Reduced bottlenecks and increased available bandwidth
- Offloading of a significant amount of traffic and number of TCP connections from origin servers

Transferring content engine capabilities from a router-attached appliance to an integrated network module provides the following benefits:

- Increased manageability
- Reduced complexity
- Decreased price
- Optimized performance

## Feature Specifications for the Content Engine Network Module for Caching and Content Delivery

### Feature History

Release	Modification
12.2(11)YT	This feature was introduced.
12.2(13)T	This feature was integrated into Cisco IOS Release 12.2(13)T.

### Supported Platforms

Cisco 2600 series, Cisco 2600XM series, Cisco 2691, Cisco 3640, Cisco 3640A, Cisco 3660, Cisco 3725, and Cisco 3745.

## Determining Platform Support Through Cisco Feature Navigator

Cisco IOS software is packaged in feature sets that are supported on specific platforms. To get updated information regarding platform support for this feature, access Cisco Feature Navigator. Cisco Feature Navigator dynamically updates the list of supported platforms as new platform support is added for the feature.



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**Americas Headquarters:**  
**Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134-1706 USA**

Cisco Feature Navigator is a web-based tool that enables you to determine which Cisco IOS software images support a specific set of features and which features are supported in a specific Cisco IOS image. You can search by feature or release. Under the release section, you can compare releases side by side to display both the features unique to each software release and the features in common.

To access Cisco Feature Navigator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to [cco-locksmith@cisco.com](mailto:cco-locksmith@cisco.com). An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions found at this URL:

<http://www.cisco.com/register>

Cisco Feature Navigator is updated regularly when major Cisco IOS software releases and technology releases occur. For the most current information, go to the Cisco Feature Navigator home page at the following URL:

<http://www.cisco.com/go/fn>

#### **Availability of Cisco IOS Software Images**

Platform support for particular Cisco IOS software releases is dependent on the availability of the software images for those platforms. Software images for some platforms may be deferred, delayed, or changed without prior notice. For updated information about platform support and availability of software images for each Cisco IOS software release, refer to the online release notes or, if supported, Cisco Feature Navigator.

## Contents

- [Prerequisites for the Content Engine Network Module for Caching and Content Delivery, page 2](#)
- [Restrictions for the Content Engine Network Module for Caching and Content Delivery, page 3](#)
- [Information About the Content Engine Network Module for Caching and Content Delivery, page 4](#)
- [How to Configure and Manage the Content Engine Network Module for Caching and Content Delivery, page 9](#)
- [Configuration Examples for the Content Engine Network Module for Caching and Content Delivery, page 25](#)
- [Additional References, page 28](#)
- [Command Reference, page 30](#)
- [Glossary, page 31](#)

## Prerequisites for the Content Engine Network Module for Caching and Content Delivery

- Install Cisco IOS Release 12.2(11)YT, Cisco IOS Release 12.2(13)T, or a later release.
- Install Cisco ACNS Version 4.2.3 or a later release if it is not already installed. If you have a CE network module with an installed SCSI controller expansion module, refer to the [“Installing Cisco ACNS Software on a CE Network Module with a SCSI Expansion Module”](#) section on page 14. For

other types of CE network modules, refer to software installation and upgrade instructions in the documentation for the appropriate ACNS software version at the following URL:

<http://www.cisco.com/univercd/cc/td/doc/product/webscale/uce/>

- Install the CE network module. Be sure that it is properly seated and that the EN (enable) and PWR (power) LEDs are lit. For information about installing CE network modules, refer to *Connecting CE Network Modules for Caching and Content Delivery*.
- For Cisco 2691, Cisco 3725, and Cisco 3745 routers only, ensure that the ROM monitor (ROMMON) version is 12.2(8r)T2 or a later version. This ROMMON version contains a fix that prevents the router from resetting all the network modules when it is reloaded.

## Restrictions for the Content Engine Network Module for Caching and Content Delivery

- Cisco IOS Release 12.2(11)YT, Cisco IOS Release 12.2(13)T, or a later release is required.
- Cisco ACNS software Version 4.2.3 or a later release is required.
- The only ACNS software features supported by the CE network module are the ACNS software content engine features.
- Online insertion and removal (OIR) is supported only on Cisco 3660 and Cisco 3745 platforms.
- Transmission speed over the internal CE link is automatically negotiated between the CE interface and the Cisco IOS interface on the router side. On Cisco 2600 series and Cisco 2600XM series platforms except for the Cisco 2691, a speed of 10 Mbps is negotiated. On all other platforms, the speed of 100 Mbps is automatically negotiated.
- The maximum number of CE network modules that can be installed in a router is limited by the amount and type of power that is provided to the network module slots. [Table 1](#) lists the maximum number of CE network modules that can be installed on different router types.

**Table 1**                      **Maximum Number of CE Network Modules per Router Type**

Router Type	Number of Network Modules
Cisco 2600 series	1
Cisco 2600XM series	1
Cisco 2691	1
Cisco 3640 and Cisco 3640A	3
Cisco 3660	6
Cisco 3725	2
Cisco 3745	4

# Information About the Content Engine Network Module for Caching and Content Delivery

The CE network module is specialized to run an integrated enterprise content delivery network (E-CDN) application on a Cisco Application and Content Networking System (ACNS) software platform that includes content-caching and content-delivery software.

The first task for the CE network module is to define IP addresses and subnet masks for the CE network module interfaces. Because the CE network module does not have direct console access, this is a necessary first step to allow access so that you can configure ACNS software on the CE itself.

After defining IP addresses, ensure that ACNS software Version 4.2.3 or a later release is loaded on the CE network module. The type of storage memory that your CE network module employs determines how the ACNS software is installed, as follows:

- CE network modules with optional IDE expansion modules for internal storage arrive with ACNS software already installed.
- CE network modules with optional SCSI expansion modules for connecting external storage arrays arrive without ACNS software installed. You must install ACNS software by following one of the procedures in the [“Installing Cisco ACNS Software on a CE Network Module with a SCSI Expansion Module”](#) section on page 14.

The following concepts are helpful in understanding the CE network module:

- [Cisco Content Delivery Networks](#)
- [Cisco Content Engines](#)
- [CE Network Module Hardware](#)

## Cisco Content Delivery Networks

When a Cisco E-CDN application is enabled, a combination of content engines, content routers, content services switches, and content distribution managers can be deployed to create a complete content delivery network system that includes content routing, content switching, content distribution and management, and content services, as well as content delivery. The CE network module is one element of that network. [Figure 1](#) shows a typical E-CDN topology.

Cisco ACNS software unifies caching software and Cisco E-CDN software into a single software platform that is supported on content engines, content distribution managers, and content routers. ACNS software accelerates content delivery and optimizes bandwidth usage by caching frequently accessed content and fulfilling content requests locally rather than traversing the Internet or intranet to a distant server each time a request is made. The ACNS software cache application works in tandem with Cisco IOS routing software to handle web traffic, including user requests to view pages and graphics (objects) on World Wide Web servers—whether the traffic is internal or external to your network.

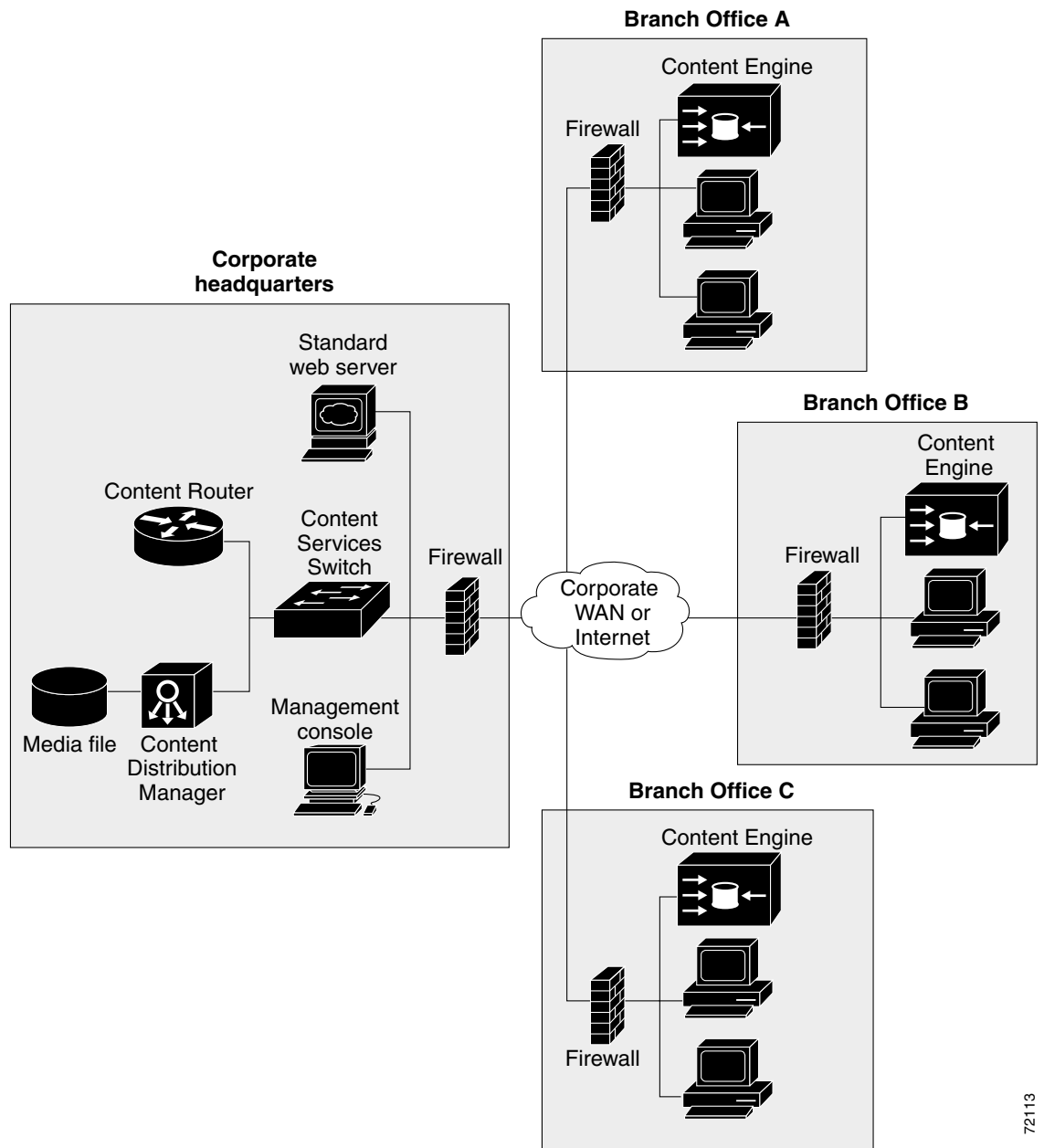
In addition to relieving WAN bottlenecks with localized caching, Cisco CEs can become the content delivery elements of a Cisco content delivery network (CDN) solution. CDN solutions enable the proactive distribution of rich media files to content engines at the network edge for local access. Primary CDN applications include e-learning, corporate communications, and software distribution. Designed for affordability and ease of installation, a CDN solution enables you to quickly deploy high-impact, high-bandwidth rich media, such as high-quality streaming video—with minimal administration.

The CE network module is completely interoperable with other CE appliances and components of an E-CDN. CE network module hardware is based on Cisco CE-507 and CE-560 architecture, uses an Intel Mobile Pentium III microprocessor, and runs under a Linux operating system.

For more information, refer to the following:

- [Cisco ACNS software](#)
- E-CDN application software within a content delivery network—[Cisco Enterprise CDN Software User Guide](#)
- [Cisco Content Networking Technology Solution](#)
- [The Cisco Content Delivery Network Solution for the Enterprise](#)
- Technical documentation—[Content Delivery Networking Products](#)

**Figure 1** Cisco Enterprise Content Delivery Network Topology



## Cisco Content Engines

Cisco CEs, including CE network modules, accelerate content delivery and optimize bandwidth usage in the following two ways:

- By transparently caching frequently accessed content through the Web Cache Communication Protocol (WCCP) V.2.
- By fulfilling content requests locally rather than by traversing the Internet or corporate intranet to a distant server farm each time that a request is made.

The CE leverages interception mechanisms based on Cisco IOS software to handle requests for web traffic—whether internal or external to your network. In addition, Cisco CEs can be deployed in reverse proxy mode in front of web servers to dramatically increase performance. By transparently caching inbound requests for content, CEs can offload a significant amount of traffic and number of TCP connections from origin servers. CEs dynamically distribute web content to eliminate bottlenecks and to speed access to content using this type of scenario:

1. A user (client) requests a web page from a browser.
2. A router enabled with WCCP analyzes the request and, on the basis of TCP port number, determines if it should transparently redirect the request to a CE. If so, the request is redirected to the CE.
3. If the CE has a copy of the requested object in storage, the CE sends the object to the user. Otherwise, the CE simultaneously obtains the requested object from the web server, stores a copy of the object (caches it) locally, and forwards the object to the user.
4. Subsequent requests for the same content are transparently fulfilled by the CE from its local storage.

By caching web objects in this manner, the CE can speed the satisfaction of user requests when more than one user wants to access the same object. Caching in this manner also reduces the amount of traffic between your network and the Internet, potentially improving your overall network performance and optimizing your bandwidth usage, typically resulting in WAN bandwidth savings of 25 to 60 percent.

## CE Network Module Hardware

The CE network module occupies a single router slot and has the properties that are summarized in [Table 2](#).

**Table 2** *CE Network Module Properties*

Property	Description
Part Number	<ul style="list-style-type: none"> <li>• NM-CE-BP-20G-K9 (20 GB internal storage)</li> <li>• NM-CE-BP-40G-K9 (40 GB internal storage)</li> <li>• NM-CE-BP-SCSI-K9 (SCSI connection for external storage)</li> </ul>
Router Slot Usage	One network module slot.
Processor	Intel Mobile Pentium III, 500 MHz.
Memory	256 MB DRAM, upgradable to 512 MB.
External Compact Flash Memory	(Optional) 256 MB, Cisco part number MEM-256CF-x.x-K9=, where x.x is the version of Cisco ACNS software.

**Table 2** *CE Network Module (continued) Properties*

Property	Description
Internal Storage	(Optional) One of the following 2.5-in. IDE drives (laptop) on an expansion module: <ul style="list-style-type: none"> <li>20 GB, 4200 RPM</li> <li>40 GB, 5400 RPM</li> </ul>
External Storage Connectivity	(Optional) SCSI expansion module with SCSI controller and 64-pin SCSI connector to provide connectivity to the types of external storage arrays supported by Cisco CE-507 and Cisco CE-560 content engines.
Platforms	Cisco 2600 series, Cisco 2600XM series, Cisco 2691, Cisco 3640, Cisco 3640A, Cisco 3660, Cisco 3725, and Cisco 3745.
Power Consumption	16 watts (including IDE disk).
Expansion Modules	EM-CE-20G EM-CE-40G EM-CE-SCSI

External hardware interfaces include the following:

- An external 10/100 (Fast Ethernet) interface port that provides direct LAN connectivity. This interface has an RJ-45 connector.
- An optional SCSI expansion module that has a 64-pin SCSI connector to provide external storage array connectivity.
- An external compact Flash slot that is available to house an optional Flash memory for image recovery.

## CE Network Module Operating Topologies

The CE network module can be deployed by branch office customers in one of the following topologies:

- The CE network module is directly connected to a LAN by an Ethernet switch or hub through the network module's external Fast Ethernet (FE) interface.

Similar to situations in which a PC is connected to a LAN, the Ethernet interface on the CE network module is given an IP address from the branch office's LAN IP subnet space, which is typically configured statically using the Cisco IOS command-line interface (CLI) on the console port. One advantage of this topology is that the Fast Ethernet port on the CE network module can operate at line speed. The only communication between the router and the CE network module is in the form of keepalives or heartbeats that are processed through the internal FE ports. All caching and streaming traffic goes through the external FE port.

- The CE network module is directly connected to an Ethernet interface on the router using the internal FE interface on the CE network module.

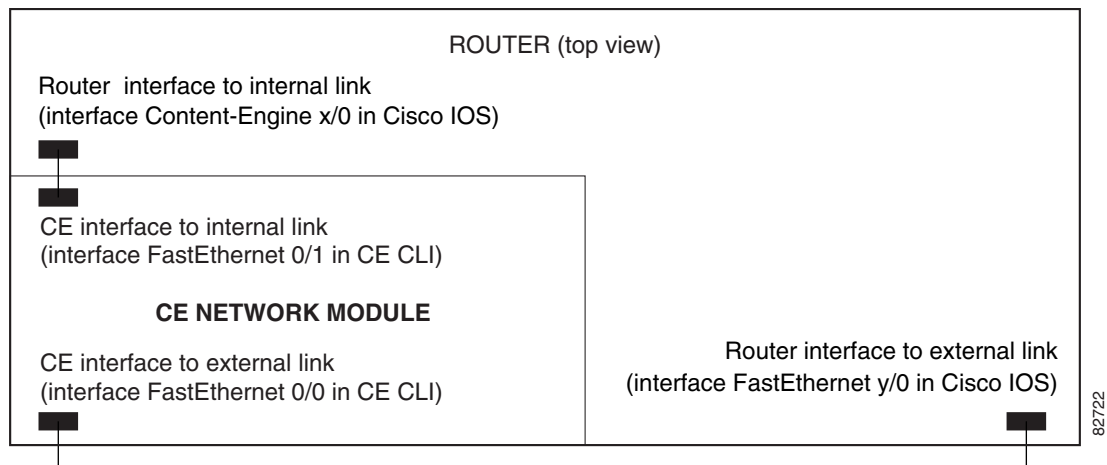
In this topology, the Ethernet interface is given an address from an IP subnet separate from the branch office LAN subnet. All caching and streaming traffic flows through the router. The CE's performance is limited by the router's switching performance. In this scenario, streaming and caching traffic, as well as keepalive traffic, goes through internal FE ports. Caching and streaming traffic uses router resources such as CPU, SDRAM bandwidth, and backplane PCI bandwidth.

## CE Network Module Interfaces

The CE network module uses three interfaces for communication, as shown in [Figure 2](#). Two of the interfaces enable internal administrative and management traffic between the router (Cisco IOS) and the CE (Cisco ACNS software) over an internal Ethernet segment. The third interface is the external link that supports CE functionality.

Note that the interfaces within the “Router” box in [Figure 2](#) are managed by Cisco IOS, while the interfaces within the “CE Network Module” box are managed by the CE CLI (Cisco ACNS software).

**Figure 2** CE Network Module Interfaces



The router-side interface for the internal Ethernet segment is known as interface Content-Engine in the Cisco IOS software. This interface is the only interface associated with the CE that is visible in the output of the **show interfaces** command. It provides access through the Cisco IOS software to configure the CE interfaces with IP addresses and a default gateway. The router-side internal interface is connected to the router PCI backplane and is managed by Cisco IOS CLI.

The CE side of the internal Ethernet segment is called interface FastEthernet 0/1 in the CE CLI (Cisco ACNS software). When packets are sent from the router to the CE, they are sent out from the router on interface Content-Engine and received at the CE on interface FastEthernet 0/1. When packets are sent from the CE to the router, they are sent out from the CE on interface FastEthernet 0/1 and received at the router on interface Content-Engine. The internal CE-side interface is connected to the PCI bus on the CE side, and it is managed by the CE software. Only the IP address is configured from Cisco IOS CLI. All other configurations are performed from the CE CLI or from the CE graphical user interface (GUI). Bandwidth, autosense, and duplex settings are not allowed on this interface.

The external CE interface is known as interface FastEthernet 0/0 in the CE CLI (Cisco ACNS software). This is the Ethernet port on the network module, and it supports data requests and transfers from outside sources. This link provides direct Fast Ethernet connectivity to the LAN through an RJ-45 connector. Only the IP address is configured from Cisco IOS CLI; all other configurations are performed from the CE CLI or from the CE GUI.



# How to Configure and Manage the Content Engine Network Module for Caching and Content Delivery

Refer to the following sections for configuration, installation, and troubleshooting tasks for the CE network module. Each task in the list is identified as either required or optional.

- [Configuring IP Addresses on the CE Network Module Interfaces](#) (required)
- [Opening a Console Access Session to Configure the CE Network Module](#) (required)
- [Managing the CE Network Module](#) (optional)
- [Installing Cisco ACNS Software on a CE Network Module with a SCSI Expansion Module](#) (optional)
- [Recovering a Corrupted ACNS Software Image](#) (optional)
- [Installing a Hot-Swappable CE Network Module \(Cisco 3660 and Cisco 3745 Only\)](#) (optional)
- [Troubleshooting Tips](#) (optional)

## Configuring IP Addresses on the CE Network Module Interfaces

In this procedure, IP addresses are configured on the three CE network module interfaces shown in [Figure 2 on page 8](#):

- Router-side interface to the internal link
- CE interface to the internal link
- CE external interface

### SUMMARY STEPS

1. **interface content-engine** *slot/unit*
2. **ip address** *router-side-ipaddr subnet-mask*
3. **service-module ip address** *ce-side-ipaddr subnet-mask*
4. **service-module external ip address** *external-ipaddr subnet-mask*
5. **service-module ip default-gateway** *gw-ipaddr*
6. **exit**
7. **exit**
8. **show running-config**

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>interface content-engine</b> <i>slot/unit</i>  <b>Example:</b> Router(config)# interface content-engine 4/0	Enters content-engine interface configuration mode for the specified interface. The arguments are as follows: <ul style="list-style-type: none"> <li><i>slot</i>—Number of the router chassis slot for the network module.</li> <li><i>unit</i>—Number of the daughter card on the network module. For CE network modules, always use 0.</li> </ul>
Step 2	<b>ip address</b> <i>router-side-ipaddr subnet-mask</i>  <b>Example:</b> Router(config-if)# ip address 172.18.12.1 255.255.255.0	Configures an IP address and subnet mask on the router-side interface to the internal link. The arguments are as follows: <ul style="list-style-type: none"> <li><i>router-side-ipaddr</i>—IP address for the internal router-side CE interface.</li> <li><i>subnet-mask</i>—Subnet mask to use with the IP address.</li> </ul>
Step 3	<b>service-module ip address</b> <i>ce-side-ipaddr subnet-mask</i>  <b>Example:</b> Router(config-if)# service-module ip address 172.18.12.2 255.255.255.0	Configures an IP address and subnet mask on the CE interface to the internal link. The arguments are as follows: <ul style="list-style-type: none"> <li><i>ce-side-ipaddr</i>—IP address for the internal CE-side interface.</li> <li><i>subnet-mask</i>—Subnet mask to use with the IP address.</li> </ul>
Step 4	<b>service-module external ip address</b> <i>external-ipaddr subnet-mask</i>  <b>Example:</b> Router(config-if)# service-module external ip address 10.3.208.190 255.255.0.0	Configures an IP address and subnet mask on the Fast Ethernet external interface of the CE network module. The arguments are as follows: <ul style="list-style-type: none"> <li><i>external-ipaddr</i>—IP address for the external CE interface.</li> <li><i>subnet-mask</i>—Subnet mask to use with the IP address.</li> </ul>
Step 5	<b>service-module ip default-gateway</b> <i>gw-ipaddr</i>  <b>Example:</b> Router(config-if)# service-module ip default-gateway 10.3.0.1	Configures an IP address for the default gateway for the CE network module. The argument is as follows: <ul style="list-style-type: none"> <li><i>gw-ipaddr</i>—IP address for the default gateway.</li> </ul>
Step 6	<b>exit</b>  <b>Example:</b> Router(config-if)# exit	Exits content-engine interface configuration mode.

	Command or Action	Purpose
Step 7	<b>exit</b>  <b>Example:</b> Router(config)# exit	Exits global configuration mode.
Step 8	<b>show running-config</b>  <b>Example:</b> Router# show running-config . . . ! interface Content-engine4/0 ip address 172.18.12.1 255.255.255.0 service-module external ip address 10.3.208.190 255.255.0.0 service-module ip address 172.18.12.2 255.255.255.0 service-module ip default-gateway 10.3.0.1 ! . . .	Verifies that the address configuration is correct.

## Opening a Console Access Session to Configure the CE Network Module

The CE network module is a standalone content engine with its own startup and run-time configurations that are independent of the Cisco IOS configuration on the router. Although IP addresses are defined on the CE network module interfaces through the router's Cisco IOS CLI, as explained in the [“Configuring IP Addresses on the CE Network Module Interfaces”](#) section on page 9, the CE itself is configured in the same way that standalone CE appliances are configured, with a combination of CE CLI and web-based GUI. The software to configure CEs is known as Cisco Application and Content Networking System (ACNS) software.

The CE network module differs from a standalone CE appliance because it does not have an external console port. Console access to the CE network module is enabled when you issue the **service-module content-engine session** command on the router, as explained in this section, or when you initiate a Telnet connection. The lack of an external console port means that the initial boot-up configuration is possible only through the router.

When you issue the **service-module content-engine session** command, you create a console session with the CE, in which you can issue any of the CE configuration commands. After completing work in the session and exiting the CE software, you are returned to Cisco IOS CLI, where you must clear the session using the **service-module content-engine session clear** command.



### Timesaver

Configure IP addresses on the CE network module interfaces before opening a console access session.

## SUMMARY STEPS

1. **service-module content-engine slot/unit session**

2. Enter ACNS configuration commands at the CE-netmodule prompt.
3. Press Control-Shift-6, and then press x to return to router configuration.
4. **service-module content-engine slot/unit session clear**

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<p><b>service-module content-engine slot/unit session</b></p> <p><b>Example:</b></p> <pre>Router# service-module content-engine 4/0 session</pre> <p>Trying 10.10.10.1, 2129 ... Open</p> <p>CE-netmodule con now available</p> <p>Press RETURN to get started!</p> <pre>CE-netmodule&gt; enable CE-netmodule#</pre>	<p>Provides console access to the CE network module from the router CLI by initiating a reverse Telnet connection. This command places you in CE CLI configuration mode. After using the <b>enable</b> command, you are in CE CLI privileged EXEC mode.</p> <p>The reverse Telnet connection is made using the IP address of the CE interface and the terminal (TTY) line associated with the CE network module. The TTY line number is calculated using the following formula <math>(n*32)+1</math>, where <math>n</math> is the number of the chassis slot that contains the CE network module. In the example output provided in this step, the CE interface IP address is 10.10.10.1, and the TTY line number is 129. The number 2000 has been added to the TTY line number for the reverse Telnet session.</p> <p>The arguments are as follows:</p> <ul style="list-style-type: none"> <li><i>slot</i>—Number of the router chassis slot for the network module.</li> <li><i>unit</i>—Number of the daughter card on the network module. For CE network modules, always use 0.</li> </ul> <p>The CE interface must be up before you can use the <b>service-module content-engine session</b> command.</p> <p>Once a session is started, you can perform any CE configuration task. You first access the CE console in a user-level shell. The <b>enable</b> command takes you to the privileged EXEC command shell, where most commands are available.</p>
Step 2	Enter ACNS configuration commands at the CE-netmodule prompt.	<p>CE configuration tasks are described in documentation for the appropriate version of Cisco ACNS software at the following URL:</p> <p><a href="http://www.cisco.com/univercd/cc/td/doc/product/webscale/uce/">http://www.cisco.com/univercd/cc/td/doc/product/webscale/uce/</a></p>
Step 3	Press Control-Shift-6, and then press x to return to router configuration.	<p>The CE session stays up until you use the <b>service-module content-engine session clear</b> command as described in <a href="#">Step 4</a>. While the CE session remains up, you can use <b>Enter</b> to return to the CE session from router configuration.</p>

Command or Action	Purpose
<b>Step 4</b> <b>service-module content-engine slot/unit session clear</b>  <b>Example:</b> Router# service-module content-engine 4/0 session clear	Clears the existing CE network module configuration session. Use this command after exiting the CE module as described in Step 2. The arguments are as follows: <ul style="list-style-type: none"> <li><i>slot</i>—Number of the router chassis slot for the network module.</li> <li><i>unit</i>—Number of the daughter card on the network module. For CE network modules, always use 0.</li> </ul> Press Enter when you are asked to confirm this command.

## Managing the CE Network Module

The commands in this section are used for the graceful shutdown, reset, and reload of a CE network module after it has been installed. For information on installation, refer to the following documents:

- CE network module—[Connecting CE Network Modules for Caching and Content Delivery](#)
- CE network module daughter card—[Installing Expansion Modules on the Cisco CE Network Module for Caching and Content Delivery](#)
- Network modules—[Cisco Network Modules Hardware Installation Guide](#)

### SUMMARY STEPS

Use the following commands as necessary:

- service-module content-engine slot/unit shutdown**
- service-module content-engine slot/unit reset**
- service-module content-engine slot/unit reload**

### DETAILED STEPS

Command or Action	Purpose
<b>service-module content-engine slot/unit shutdown</b>  <b>Example:</b> Router# service-module content-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.	Performs a graceful halt of the CE network module operating system so that the CE disks are not corrupted. Used when removing or replacing a hot-swappable CE network module during online insertion and removal (OIR). The arguments are as follows: <ul style="list-style-type: none"> <li><i>slot</i>—Number of the router chassis slot for the network module.</li> <li><i>unit</i>—Number of the daughter card on the network module. For CE network modules, always use 0.</li> </ul> At the confirmation prompt, press Enter to confirm the action or <b>n</b> to cancel.

Command or Action	Purpose
<b>service-module content-engine slot/unit reset</b>  <b>Example:</b> Router# service-module content-engine 1/0 reset  Use reset only to recover from shutdown or failed state Warning: May lose data on the hard disc! Do you want to reset?[confirm]	Performs a hardware reset of the CE network module. The arguments are as follows: <ul style="list-style-type: none"> <li><i>slot</i>—Number of the router chassis slot for the network module.</li> <li><i>unit</i>—Number of the daughter card on the network module. For CE network modules, always use 0.</li> </ul> At the confirmation prompt, press <i>Enter</i> to confirm the action or <b>n</b> to cancel.
<b>service-module content-engine slot/unit reload</b>  <b>Example:</b> Router# service-module content-engine 1/0 reload  Do you want to proceed with reload?[confirm]	Performs a graceful halt and reload of the CE network module operating system. The arguments are as follows: <ul style="list-style-type: none"> <li><i>slot</i>—Number of the router chassis slot for the network module.</li> <li><i>unit</i>—Number of the daughter card on the network module. For CE network modules, always use 0.</li> </ul> At the confirmation prompt, press <b>Enter</b> to confirm the action or <b>n</b> to cancel.

## Installing Cisco ACNS Software on a CE Network Module with a SCSI Expansion Module

A Cisco CE network module with an installed SCSI controller expansion module does not ship with installed ACNS software. If you have this type of CE network module, you also require an external storage array to hold the ACNS software.

Before using the CE network module, you need to install an external storage array and the Cisco ACNS software. ACNS software is installed by one of the following methods:

- From a CD-ROM—Download the software from the CD-ROM to a local FTP server. The local FTP server must be accessible to the router with the CE network module. Follow the instructions in the [“Installing Cisco ACNS Software from a CD-ROM or from Cisco.com”](#) section on page 14.
- From Cisco.com—Download the ACNS software from the Cisco Software Center at <http://www.cisco.com/kobayashi/sw-center/sw-content.shtml> to a local FTP server. The local FTP server must be accessible to the router with the CE network module. Follow the instructions in the [“Installing Cisco ACNS Software from a CD-ROM or from Cisco.com”](#) section on page 14.
- From a compact Flash card—Follow the instructions in the [“Installing Cisco ACNS Software from Compact Flash”](#) section on page 17.

### Installing Cisco ACNS Software from a CD-ROM or from Cisco.com

To perform the Cisco ACNS software installation from a CD-ROM or from Cisco.com, you need a local FTP server that can be reached from the router that contains the CE network module. The local FTP server should be configured with a valid username and password.

The external storage array is also installed during this procedure.

**Note**

In addition to the ACNS x.x.x image, the CD-ROM contains special upgrade and downgrade images, meta files, manifest samples, and so forth. These are not required for installation, but may be useful if you are using certain features of ACNS.

**SUMMARY STEPS**

1. Download to a local FTP server the Cisco ACNS software image.
2. **show disks** or **show disks details**
3. Attach the external storage array to the Cisco content engine network module.
4. **reload** or **service-module content-engine reload**
5. Configure the CE network module for IP address and default gateway.
6. **show disks** or **show disks details**
7. **disk recover**
8. **copy ftp install** {hostname | ip-address} remotefiledir remotefilename
9. **reload** or **service-module content-engine reload**
10. Configure the Cisco ACNS software as required.

**DETAILED STEPS**

- Step 1** Download to a local FTP server the Cisco ACNS software image. You can use the image from either of these locations:
- The CD-ROM that accompanied the CE network module—Copy the ACNS-x.x.x-K9.bin software file, which is located in the root directory. ACNS-x.x.x-K9.bin is the generic form for the Cisco ACNS file name. For example, Cisco ACNS software version 4.2.3 has the software file name ACNS-4.2.3-K9.bin.
  - The Cisco Software Center at <http://www.cisco.com/kobayashi/sw-center/sw-content.shtml> — Select the appropriate version of Cisco ACNS software and follow the prompts to download the ACNS software image.
- Step 2** Use the **show disks** command or the **show disks details** command in CE CLI privileged EXEC mode to establish a baseline value for CE disk usage. The output of these commands establish a baseline value for the amount of disk usage or the number of disks detected, respectively. This step must be completed before you attach the external storage array. Later, in [Step 6](#) of this procedure, you verify that the software detects the external storage array by comparing this output to the output from the same command after you have attached the external storage array.

**Note**

Before performing this step, make sure that you have used the **ip address** command under the content-engine interface to define an IP address for the router-side interface to the internal link and that the content-engine interface is in an up state. The **ip address** command is explained in Step 2 of the [“Configuring IP Addresses on the CE Network Module Interfaces”](#) section on [page 9](#).

The following example shows how to enter CE CLI privileged EXEC mode for the CE network module in slot 4 and then shows the two commands that you can use to establish baseline disk usage. An example of the output from the two commands is shown in [Step 6](#).

```
Router# service-module content-engine 4/0 session
```

```
Trying 10.10.10.1, 2129 ... Open
CE-netmodule con now available
Press RETURN to get started!
CE-netmodule> enable
Password:
```

```
CE-netmodule# show disks
```

```
CE-netmodule# show disks details
```

**Step 3** Attach the external storage array to the Cisco content engine network module. For information on attaching an external storage array, see the [Cisco Storage Array 6 Installation and Configuration Guide](#) and the hardware documents in the “Additional References” section on page 28.

**Step 4** Restart the network module using either of the following commands:

- **reload**—Use this command from CE CLI privileged EXEC mode.

```
CE-netmodule# reload
```

- **service-module content-engine reload**—Use this command from router CLI privileged EXEC mode.

```
Router# service-module content-engine 4/0 reload
Do you want to proceed with reload?[confirm]
```

**Step 5** Configure the network module for IP address and default gateway, using Cisco IOS CE interface configuration mode on the router, as explained in the “[Configuring IP Addresses on the CE Network Module Interfaces](#)” section on page 9.

**Step 6** Confirm that the external storage array is detected by the network module by using either the **show disks** command or the **show disks details** command, as explained here:

- Enter the **show disks** command in CE CLI privileged EXEC mode. The command output displays the file systems that are found on the network module. These file systems can exist on a single disk or can span multiple disks. You confirm the detection of the external storage array by noting whether the total disk space on all file systems has increased from the baseline that you noted in [Step 2](#). The following example shows output from the **show disks** command:

```
CE-netmodule# show disks
```

```
SYSFS      0.0GB      0.0%
CFS        0.0GB      0.0%
MEDIAFS    0.0GB      0.0%
ECDNFS     0.0GB      0.0%
FREE       113.7GB    100.0%
```

- Enter the **show disks details** command in CE CLI privileged EXEC mode. The command output provides an entry for each disk detected. If the external storage array is detected, the number of entries in the **show disks details** command output increases from the number in the output that you saw when you used the commands in [Step 2](#). The following example shows output from the **show disks details** command:

```
CE-netmodule# show disks details
```

```
disk00:Normal      (h00 c00 i08 100)    17364MB( 17.0GB)
      System use:           3317MB(  3.2GB)
      FREE:                14046MB( 13.7GB)
disk01:Normal      (h00 c00 i09 100)    17366MB( 17.0GB)
      disk01/00:SYSFS      17365MB( 17.0GB) mounted at /local1
      FREE:                0MB(  0.0GB)
```



```

disk02:Normal          (h00 c00 i10 100)      17366MB( 17.0GB)
    disk02/00:SYSFS      17365MB( 17.0GB) mounted at /local2
    FREE:                0MB( 0.0GB)
disk03:Normal          (h00 c00 i11 100)      17366MB( 17.0GB)
    disk03/00:SYSFS      17365MB( 17.0GB) mounted at /local3
    FREE:                0MB( 0.0GB)
disk04:Normal          (h00 c00 i11 100)      17366MB( 17.0GB)
    disk03/00:SYSFS      17365MB( 17.0GB) mounted at /local4
    FREE:                0MB( 0.0GB)
disk05:Normal          (h00 c00 i13 100)      17366MB( 17.0GB)
    disk05/00:SYSFS      17365MB( 17.0GB) mounted at /local5
    FREE:                0MB( 0.0GB)

```

If the external storage array is not detected by the network module, verify that the SCSI cables are connected and that the external storage array is operational. For more information on troubleshooting the external storage array, refer to the [Cisco Storage Array 6 Installation and Configuration Guide](#).

- Step 7** In CE CLI privileged EXEC mode, enter the **disk recover** command to create disk partitions on the external storage array for use by the network module.

```
CE-netmodule# disk recover
```

- Step 8** In CE CLI privileged EXEC mode, enter the **copy ftp install {hostname | ip-address} remotefiledir remotefilename** command to download the Cisco ACNS software image from the FTP server to the external storage array and to the onboard Strata Flash memory on the network module. In the following example, the FTP server is server4, the directory is /images, and the image name is acns\_file:

```
CE-netmodule# copy ftp install server4 /images acns_file
```

- Step 9** Restart the network module as described in [Step 4](#) of this procedure.

- Step 10** Configure the Cisco ACNS software as required. For more information, refer to documentation for the appropriate version of Cisco ACNS software at the following URL:  
<http://www.cisco.com/univercd/cc/td/doc/product/webscale/uce/>

## Installing Cisco ACNS Software from Compact Flash

If you do not have an FTP server available in the network or if the CE network module does not have network connectivity, you can install the ACNS software image from an external compact Flash card, Cisco part number MEM-256CF-x.x-K9=, where x.x is the Cisco ACNS software version.

### SUMMARY STEPS

1. Insert the compact Flash card in the compact Flash slot on the front of the network module.
2. **reload** or **service-module content-engine reload**
3. After the CE network module has booted up, enter CE CLI privileged EXEC mode and list the files in compact Flash memory.
  - a. **service-module content-engine slot/unit session**
  - b. **enable**
  - c. **cd flash**
  - d. **dir**
4. **copy compactflash install image-name**
5. **reload** or **service-module content-engine reload**

6. Configure the CE with the Cisco ACNS software.

## DETAILED STEPS

**Step 1** Insert the compact Flash card in the compact Flash slot on the front of the network module.

**Step 2** Restart the CE network module using either of the following commands:

- Use the **reload** command from CE CLI privileged EXEC mode.

```
CE-netmodule# reload
```

- Use the **service-module content-engine reload** command from router CLI privileged EXEC mode.

```
Router# service-module content-engine 4/0 reload
```

```
Do you want to proceed with reload?[confirm]
```

**Step 3** After the CE network module has booted up, enter CE CLI privileged EXEC mode and list the files in compact Flash memory, using the following commands:

- a. **service-module content-engine slot/unit session**
- b. **enable**
- c. **cd flash**
- d. **dir**

```
Router# service-module content-engine 4/0 session
```

```
Trying 10.10.10.1, 2129 ... Open
```

```
CE-netmodule con now available
```

```
Press RETURN to get started!
```

```
CE-netmodule> enable
```

```
Password:
```

```
CE-netmodule# cd flash1
```

```
CE-netmodule# dir
```

The **dir** command displays the list of files in the compact Flash memory. The following example shows the output from a **dir** command.

```
CE-netmodule# dir
      size      time of last change      name
-----
    12290784  Mon Jan  7 03:22:38 1980      sys422.img
    105990784  Mon Jan  7 03:22:38 1980      acns422.img
```

**Step 4** Copy the Cisco ACNS software image to the CE network module by using the following command from CE CLI privileged EXEC mode. Substitute the actual image name from your **dir** command output for the file name “acns4xx.img” in the following example.

```
CE-netmodule# copy compactflash install acns4xx.img
```

**Step 5** Restart the network module as described in [Step 2](#) of this procedure.

**Step 6** Configure the CE with the Cisco ACNS software. For more information, refer to the appropriate version of Cisco ACNS software at the following URL:  
<http://www.cisco.com/univercd/cc/td/doc/product/webscale/uce/>.

## Recovering a Corrupted ACNS Software Image

An ACNS software image can become corrupted if there is a power failure or other interruption during an operation in which the image is being written to the CE network module's onboard StrataFlash memory, such as during an ACNS software installation or upgrade.

If the ACNS software image on the CE network module's onboard StrataFlash memory is corrupted, the network module boots up using a special rescue image that is also located on the onboard StrataFlash memory. The rescue image serves a limited purpose, which is simply to download a fresh Flash component of the ACNS software image and write it to the onboard StrataFlash memory. The rescue image can download this Flash component either from an FTP server on the network or from an external compact Flash card that is installed locally.

If you are going to download the Flash component from an FTP server on the network, the Flash component must first be downloaded to an FTP server from a CD-ROM or from Cisco.com over the network. This procedure and the procedure to download the image from the FTP server to the onboard Flash memory are the same as those described in the [“Installing Cisco ACNS Software from a CD-ROM or from Cisco.com” section on page 14.](#)

If you do not have an FTP server available in the network or if the network module does not have network connectivity, you can recover the ACNS software image from a special external compact Flash card, Cisco part number MEM-256CF-x.x-K9=, where x.x is the Cisco ACNS software version number.

### SUMMARY STEPS

1. Insert the compact Flash card in the compact Flash slot on the front of the network module.
2. Type **4** to reboot the system.
3. Type **2** to read the image from the compact Flash and write it to the onboard StrataFlash memory.
4. Enter the directory name for the image file on the external compact Flash card.
5. Enter the filename for the image file on the external compact Flash card.
6. Type **yes** to write the image.
7. Type **yes** to reload.
8. Configure ACNS software on the network module.

### DETAILED STEPS

**Step 1** When a failure occurs in the ACNS software image, the CE network module automatically enters rescue mode during its bootup procedure and the following messages are displayed.

Insert the compact Flash card in the compact Flash slot on the front of the network module.

```
Freeing initrd memory:208k freed
VFS:Mounted root (ext2 filesystem).
Freeing unused kernel memory:448k freed
```

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

You now have the following options.

1. Download an image from the network and install it to flash
2. Insert a DOS formatted compact flash with a good system image on it, and install this image to flash. (The system must be rebooted to detect the compact flash).
3. Display diagnostic information about this system
4. Reboot the system

enter choice:

- Step 2** Type **4** to reboot the system so that the system detects the compact Flash card you installed in [Step 1](#).
- Step 3** After the system reboots, the rescue mode messages are displayed again. At the “enter choice” prompt, type **2** to read the image from the compact Flash and write it to the onboard StrataFlash memory.
- Step 4** At the next prompt, enter the directory name for the image file on the external compact Flash card. In the example below, the image file is found in the root directory (/) on the compact Flash.
- Please enter the directory containing the image file on the compact flash:  
[Enter directory on compact flash (e.g. /)]: /
- Step 5** At the next prompt, enter the filename for the image file on the external compact Flash card. The filename has the format ACNS-x.x.x-K9.sysimg, where x.x.x is the ACNS version number. In the following example, the version is ACNS 5.0.3 and the image is named ACNS-5.0.3-K9.sysimg:
- Please enter the file name of the system image file on the compact flash:  
[Enter filename on compact flash]: **ACNS-5.0.3-K9.sysimg**
- Step 6** The system provides feedback as it reads the file and then asks you to write the image to the onboard Flash memory. Type **yes** to write the image.
- Trying to access the file //ACNS-5.0.3-K9.sysimg...  
Read 12290784 byte image file  
A new system image has been read from compact flash.  
You should write it to system flash at this time.  
Please enter 'yes' below to indicate that this is what you want to do:  
**yes**
- Step 7** After the ACNS software has been written to the CE network module’s onboard Flash memory, the system will ask if you want to reload the network module. Type **yes** to reload.
- Step 8** After the reload is complete, you can continue to configure ACNS software on the network module. Previous ACNS software configurations are saved.

## Installing a Hot-Swappable CE Network Module (Cisco 3660 and Cisco 3745 Only)

Some Cisco modular access routers allow you to replace network modules without switching off the router or affecting the operation of other interfaces. This feature is often called *hot-swapping* or *online insertion and removal (OIR)*. Hot-swapping of network modules provides uninterrupted operation to network users, maintains routing information, and ensures session preservation.



### Note

OIR is supported only on Cisco 3660 and Cisco 3745 platforms.

**Caution**

Unlike other network modules, CE network modules use hard disks. Online removal of disks without proper shutdown can result in file system corruption and might render the disk unusable. The operating system on the CE network module must be shut down in an orderly fashion before the network module is removed.

**Caution**

Cisco routers support hot-swapping with similar modules only. If you remove a network module, install another module exactly like it in its place.

For a description of informational messages and error messages that may appear on the console during this procedure, refer to the hardware installation guide for your type of router.

**SUMMARY STEPS**

1. **service-module content-engine session**
2. **copy running-config tftp *tftp-server-address filename***
3. **Control-Shift-6**, followed by **x**
4. **service-module content-engine *slot/unit* session clear**
5. **service-module content-engine *slot/unit* shutdown**
6. Shut down the CE interface.
  - a. **interface content-engine *slot/unit***
  - b. **shutdown**
  - c. **exit**
7. Unplug all network interface cables from the CE network module.
8. Loosen the two captive screws holding the CE network module in the chassis slot.
9. Slide the CE network module out of the slot.
10. Align the replacement CE network module with the guides in the chassis slot, and slide it gently into the slot.
11. Push the module into place until you feel its edge connector mate securely with the connector on the backplane.
12. Reconnect the network interface cables previously removed in [Step 7](#).
13. Check that the network module LEDs are lit and that the Power and Enable LEDs on the front panel are also lit.
14. **service-module content-engine *slot/unit* session**
15. **copy tftp running-config *tftp-server-address filename***
16. **Control-Shift-6**, followed by **x**
17. **service-module content-engine *slot/unit* session clear**

**DETAILED STEPS**

- Step 1** Initiate a CE network module console access session using the **service-module content-engine session** command. The following example shows the starting of a session for the CE network module in slot 4.

```
Router# service-module content-engine 4/0 session

Trying 10.10.10.1, 2129 ... Open

CE-netmodule con now available

Press RETURN to get started!

CE-netmodule> enable
Password:

CE-netmodule#
```

- Step 2** Save the CE running configuration using the following command from CE CLI privileged EXEC mode.

```
CE-netmodule# copy running-config tftp //server12/configs/rtr11-config
```

- Step 3** Exit the CE network module console access session by pressing **Control-Shift-6**, followed by **x**.

- Step 4** On the router, clear the CE console access session using the following command.

```
Router# service-module content-engine 4/0 session clear
```

- Step 5** Perform a graceful halt of the CE network module disk drive using the following command.

```
Router# service-module content-engine 4/0 shutdown
```

- Step 6** Shut down the CE interface.

```
Router(config)# interface content-engine 4/0
Router(config-if)# shutdown
Router(config-if)# exit
```

- Step 7** Unplug all network interface cables from the CE network module.

- Step 8** Loosen the two captive screws holding the CE network module in the chassis slot.

- Step 9** Slide the CE network module out of the slot.

- Step 10** Align the replacement CE network module with the guides in the chassis slot, and slide it gently into the slot.




---

**Note** If the router is not fully configured with network modules, make sure that blank panels fill the unoccupied chassis slots to provide proper airflow.

---

- Step 11** Push the module into place until you feel its edge connector mate securely with the connector on the backplane.

- Step 12** Reconnect the network interface cables previously removed in [Step 7](#).

- Step 13** Check that the network module LEDs are lit and that the Power and Enable LEDs on the front panel are also lit. This inspection ensures that connections are secure and that the new unit is operational.

- Step 14** Initiate a CE network module console access session using the following command.

```
Router# service-module content-engine 4/0 session

Trying 10.10.10.1, 2129 ... Open

CE-netmodule con now available
Press RETURN to get started!

CE-netmodule> enable
Password:
```

```
CE-netmodule#
```

- Step 15** Restore the CE running configuration by using the following command from CE CLI privileged EXEC mode.

```
CE-netmodule# copy tftp running-config //server12/configs/rtr11-config
```

- Step 16** Exit the CE network module console access session by pressing **Control-Shift-6**, followed by **x**.

- Step 17** On the router, clear the CE console access session using the following command.

```
Router# service-module content-engine 1/0 session clear
```

## Troubleshooting Tips

To diagnose problems with CE network module operation, use the commands and actions in this section.

- Display configured commands using the **show running-config** command. Make sure that a new interface called Content-Engine is displayed and that the IP addresses listed for the CE are correct. The Content-Engine interface is the router-side interface for the internal Ethernet segment between the router and the CE, and it is the only CE interface that is displayed in the output of the **show running-config** command. The other two CE interfaces appear as “service-modules” under the Content-Engine interface. For more information on CE interfaces, refer to the “[CE Network Module Interfaces](#)” section on page 8.
- Display software version information using the **show version** command. The following output example shows a CE network module and its terminal line listed in the interface information section:

```
Router# show version
```

```
Cisco Internetwork Operating System Software
IOS (tm) C2600 Software (C2600-IS-M), Version 12.2(11)YT, RELEASE SOFTWARE (fc1)
TAC Support: http://www.cisco.com/tac
Copyright (c) 1986-2002 by cisco Systems, Inc.
Compiled Thu 12-Sep-02 21:34 by axpo
Image text-base: 0x80008098, data-base: 0x818AF44C

ROM: System Bootstrap, Version 12.1(3r)T2, RELEASE SOFTWARE (fc1)

router-2621 uptime is 10 minutes
System returned to ROM by power-on
System image file is "flash:c2600-is-mz"

cisco 2621 (MPC860) processor (revision 0x200) with 60416K/5120K bytes of memory.
Processor board ID JAD051516TV (4151953086)
M860 processor: part number 0, mask 49
Bridging software.
X.25 software, Version 3.0.0.
2 FastEthernet/IEEE 802.3 interface(s)
1 terminal line(s)
1 cisco content engine(s)
32K bytes of non-volatile configuration memory.
16384K bytes of processor board System flash (Read/Write)

Configuration register is 0x0
```

- Display the basic interface configuration and the number of packets transmitted, output rate, and related information using the **show interfaces content-engine** command.

- Display information for controllers that are associated with the CE network module using the **show controllers content-engine** command.
- Display the status of the content engine, as well as the hardware configuration, software version, and related information, using the **service-module content-engine status** command.
- Display hardware installed on the router using the **show diag** command. The following output example shows a CE network module in router slot 1:

Router# **show diag 1**

Slot 1:

```
Content 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   : 800-20382-01
Board Revision          : A0
Deviation Number        : 0-0
Fab Version             : 02
PCB Serial Number       : JAB060605C4
RMA Test History        : 00
RMA Number              : 0-0-0-0
RMA History             : 00
EEPROM format version 4
EEPROM contents (hex):
0x00: 04 FF 40 03 81 41 01 00 C0 46 03 20 00 4F 9E 01
0x10: 42 41 30 80 00 00 00 00 02 02 C1 8B 4A 41 42 30
0x20: 36 30 36 30 35 43 34 03 00 81 00 00 00 00 04 00
0x30: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x40: FF FF FF FF FF FF FF FF FF FF FF FF FF FF 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

20GB IDE Disc Daughter Card
Hardware Revision       : 1.0
Top Assy. Part Number   : 800-20520-01
Board Revision          : A0
Deviation Number        : 0-0
Fab Version             : 02
PCB Serial Number       : JAB060605A5
RMA Test History        : 00
RMA Number              : 0-0-0-0
RMA History             : 00
EEPROM format version 4
EEPROM contents (hex):
0x00: 04 FF 40 03 83 41 01 00 C0 46 03 20 00 50 28 01
0x10: 42 41 30 80 00 00 00 00 02 02 C1 8B 4A 41 42 30
0x20: 36 30 36 30 35 41 35 03 00 81 00 00 00 00 04 00
0x30: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x40: FF FF FF FF FF FF FF FF FF FF FF FF FF FF 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
```

- After exiting a CE console access session, remember to use the **service-module content-engine session clear** command to terminate the session.
- Check LEDs that are associated with the CE network module. The link activity LED should light up whenever packets are being transmitted through the port.



- If Cisco Discovery Protocol (CDP) is enabled in the CE network module, use the **debug cdp packet** command to see the CDP packets going across the interfaces every 60 seconds, which is the default. Use the **show cdp neighbor** command to see all the Cisco devices that have CDP enabled and that are in the same segment.
- Enable the **debug scp all** command to check the communication between the Cisco IOS software and the CE:

```
Router# debug scp all
```

```
*Mar  1 00:28:34.371: scp-tx: SA:0F/01 DA:01/01 Op:0012 Sq:0024 Ln:0004 I:00
*Mar  1 00:28:34.371: 000: 02 5A 00 00                               .Z..
*Mar  1 00:28:34.371: scp-rx: SA:01/01 DA:0F/01 Op:0012 Sq:0024 Ln:0004 I:01
*Mar  1 00:28:34.371: 000: 02 5A 00 00                               .Z..
```

## Configuration Examples for the Content Engine Network Module for Caching and Content Delivery

This section provides the following configuration examples:

- [Unnumbered IP Address Example](#)
- [Three IP Address Example](#)

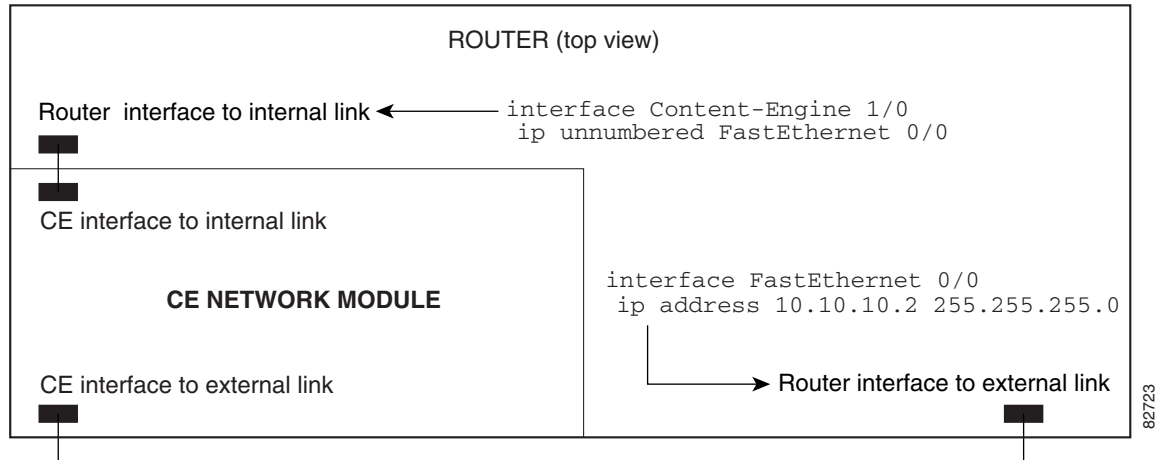


### Note

IP addresses and host names used in examples are fictitious.

## Unnumbered IP Address Example

[Figure 3](#) shows how the CE interfaces are configured using the unnumbered IP address method. In this example, the router interface to the internal router-CE link is configured using the **ip unnumbered** command to save IP address space. No new subnet needs to be defined for the internal network between the router and the CE. This configuration makes the CE interface that is pointing toward the Cisco IOS software an extension of the Fast Ethernet interface 0/0 of the router, which has an IP address of 10.10.10.2. When this method is used, a static IP route must be defined.

**Figure 3**      **Unnumbered IP Address Example**

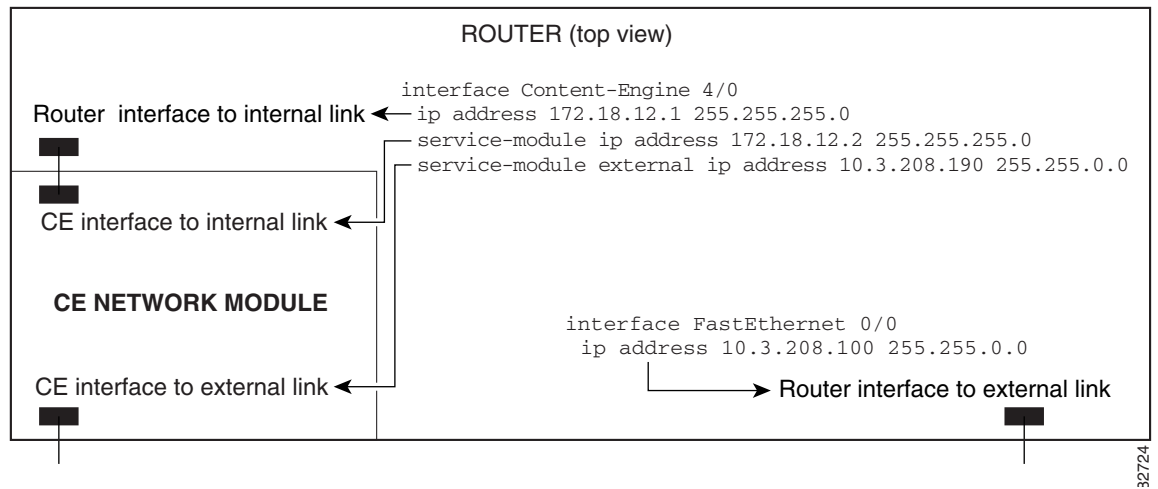
```

.
.
.
!
interface Content-Engine 1/0
 ip unnumbered FastEthernet 0/0
 service-module ip address 10.10.10.10 255.255.255.0
 service-module external ip address 172.18.12.20 255.255.255.0
 service-module ip default-gateway 10.10.10.2
!
ip route 10.10.10.10 255.255.255.255 Content-Engine 1/0
!
.
.
.

```

## Three IP Address Example

Figure 4 shows the configuration for the three IP address method. In this example, both the CE interface to the internal router-CE link and the router interface to the same link are on the 172.18.12.0/24 subnet. The external port of the CE network module is in the 10.3.0.0/16 subnet. Notice that there is no connection between the internal router interface to the CE and the external router interface in this configuration.

**Figure 4**      **Three IP Address Example**

```

.
.
.
!
interface Content-Engine 4/0
 ip address 172.18.12.1 255.255.255.0
 service-module ip address 172.18.12.2 255.255.255.0
 service-module external ip address 10.3.208.190 255.255.0.0
 service-module ip default-gateway 10.3.0.1
!
.
.

```

## Additional References

For additional information related to the Content Engine Network Module for Caching and Content Delivery, refer to the following references:

## Related Documents

Related Topic	Document Title
Related content delivery products	<a href="#">Content Delivery Networking Products</a>
Cisco ACNS software	Refer to documentation for the appropriate version of Cisco ACNS software at the following URL: <a href="http://www.cisco.com/univercd/cc/td/doc/product/webscale/uce/">http://www.cisco.com/univercd/cc/td/doc/product/webscale/uce/</a>
E-CDN application software within a content delivery network	<i>Cisco CDN Software Enterprise User Guide</i>
Cisco Content Delivery Networks	<i>The Cisco Content Delivery Network Solution for the Enterprise</i>
Cisco Content Networking technologies (web site)	<i>Cisco Content Networking Technology Solution</i>
Overview and installation of Content Delivery Networking products	<i>Cisco Content Delivery Networking Products Getting Started Guide</i>
Installing CE network modules	<i>Connecting CE Network Modules for Caching and Content Delivery</i>
Installing CE network module expansion modules	<i>Installing Expansion Modules on the Cisco CE Network Module for Caching and Content Delivery</i>
Installing CE network module memory modules	<i>Installing SODIMM Memory Modules in Cisco Network Modules for Caching and Content Delivery</i>
Installing network modules	<i>Cisco Network Modules Hardware Installation Guide</i>
Installing storage arrays	<i>Cisco Storage Array 6 Installation and Configuration Guide</i>
Cisco 2600 series	<a href="#">Cisco 2600 series product documentation</a>
Cisco 3600 series	<a href="#">Cisco 3600 series product documentation</a>
Cisco 3700 series	<a href="#">Cisco 3700 series product documentation</a>

## Standards

Standards <sup>1</sup>	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	—

1. Not all supported standards are listed.

## MIBs

MIBs <sup>1</sup>	MIBs Link
<ul style="list-style-type: none"><li>• CISCO-CONTENT-ENGINE-MIB</li><li>• CISCO-ENTITY-ASSET-MIB</li><li>• ENTITY-MIB</li><li>• MIB-2</li><li>• CDP-MIB</li></ul>	<p>To obtain lists of supported MIBs by platform and Cisco IOS release, and to download MIB modules, go to the Cisco MIB website on Cisco.com at the following URL:</p> <p><a href="http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml">http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml</a></p>

1. Not all supported MIBs are listed.

To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL:

<http://tools.cisco.com/ITDIT/MIBS/servlet/index>

If Cisco MIB Locator does not support the MIB information that you need, you can also obtain a list of supported MIBs and download MIBs from the Cisco MIBs page at the following URL:

<http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>

To access Cisco MIB Locator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to [cco-locksmith@cisco.com](mailto:cco-locksmith@cisco.com). An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions found at this URL:

<http://www.cisco.com/register>

## RFCs

RFCs <sup>1</sup>	Title
No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.	—

1. Not all supported RFCs are listed.

## Technical Assistance

Description	Link
Technical Assistance Center (TAC) home page, containing 30,000 pages of searchable technical content, including links to products, technologies, solutions, technical tips, tools, and lots more. Registered Cisco.com users can log in from this page to access even more content.	<a href="http://www.cisco.com/public/support/tac/home.shtml">http://www.cisco.com/public/support/tac/home.shtml</a>

## Command Reference

The following new and modified commands are pertinent to this feature. To see the command pages for these commands and other commands used with this feature, go to the *Cisco IOS Master Commands List*, Release 12.4, at <http://www.cisco.com/univercd/cc/td/doc/product/software/ios124/124mindx/124index.htm>.

### New Commands

- **service-module content-engine reload**
- **service-module content-engine reset**
- **service-module content-engine session**
- **service-module content-engine session clear**
- **service-module content-engine shutdown**
- **service-module content-engine status**
- **service-module external ip address**
- **service-module ip address**
- **service-module ip default-gateway**
- **show controllers content-engine**
- **show interfaces content-engine**

### Modified Command

- **interface**

# Glossary

**ACNS**—Cisco Application and Content Networking System. ACNS is a software platform that unifies the Cisco cache software and Cisco enterprise content delivery network (E-CDN) software into a single software platform. ACNS software allows you to access caching application features and E-CDN application features from a single software base. ACNS software is supported on content engines, content distribution managers, and content routers.

**CDM**—Cisco Content Distribution Manager. Management program that provides a browser-based user interface to configure and monitor content engines and content routers and to control and manage content switching, content distribution and delivery, and content services.

**CDN**—content delivery network. Content delivery networks help accelerate the delivery of advanced content by deploying five key components: content switching, content routing, content edge nodes, content distribution and management, and intelligent network services. Content edge nodes are content engines that are typically placed in the branch office, like the CE network module.

**CE**—content engine. Edge appliance for delivering live or on-demand streaming media and other rich file formats to the desktop.

**E-CDN**—enterprise content delivery network. Enterprise CDNs (also known as intranet CDNs) apply caching and multicasting technology in a corporate LAN/WAN environment to distribute video and other content-rich files in ways that help minimize WAN bottlenecks, while taking advantage of the relatively abundant bandwidth of the LANs close to users.

**WCCP**—Web Cache Communication Protocol. Developed by Cisco Systems, WCCP specifies interactions between one or more routers (or Layer 3 switches) and one or more web caches. The purpose of the interaction is to establish and maintain the transparent redirection of selected types of traffic flowing through a group of routers. The selected traffic is redirected to a group of web caches with the aim of optimizing resource usage and lowering response times.

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