



CHAPTER 5

Configuring the Router

This chapter describes how to power up the router and perform the initial configuration in the following sections:

- [Powering up the Router, page 5-1](#)
- [Performing the Initial Configuration on the Router, page 5-3](#)
 - [Using the Cisco Setup Command Facility, page 5-3](#)
 - [Using Cisco Configuration Professional Express, page 5-6](#)
 - [Using the Cisco CLI—Manual Configuration, page 5-6](#)
- [Verifying the Initial Configuration, page 5-23](#)

Powering up the Router



Warning

Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place. Statement 1029

- [Checklist Before Powering Up the Cisco Router, page 5-1](#)
- [Powering Up the Cisco Router, page 5-2](#)
- [Verifying the Front Panel LED Indications, page 5-3](#)

Checklist Before Powering Up the Cisco Router

Check the following items before powering up the router:

- You have securely mounted and grounded the chassis.
- You have connected the power and interface cables.
- You have properly seated the external Compact Flash memory card into its slot. For installation instructions, see [Installing and Upgrading Internal Modules and FRUs in Cisco 1900 Series ISRs](#).

- You have a PC with a terminal emulation program (HyperTerminal or equivalent) that is connected to the console port. It is configured for 9600 baud, 8 data bits, 1 stop bit, no parity, and flow control is set to “none.”
- You have selected a suitable PC COM port in the terminal emulation program.
- You have selected passwords for access control.
- You have determined the IP addresses for the Ethernet and serial interfaces.

Powering Up the Cisco Router

To power up your Cisco router, follow this procedure to verify the router has performed the initialization and self-test. When the procedure is finished, the router is ready to configure.

If you encounter problems while powering on the router, see the routers troubleshooting page on Cisco.com.

For information about the ROM monitor and the bootstrap program, see *Using the ROM Monitor*. For information about the configuration register, see *Changing the Configuration Register Settings*.



Note

To view the boot sequence, you must establish console connection to the Cisco router *before* it powers up.

Before You Begin

- Make sure that your PC is ready to be powered up and connected as described in the “[Checklist Before Powering Up the Cisco Router](#)” section on page 5-1.

Procedure

Step 1

Move the power switch to the ON position.

- The SYS LED on the front of the chassis begins blinking green.
- The fans begin operating.
- Startup messages appear in your console window. When the startup messages finish, the SYS LED appears solid green.
- Depending on your installation, some LEDs at the rear of the chassis and on installed modules might also illuminate.



Caution

Do not press any keys on the keyboard until the messages stop and the SYS LED is solid green. Any keys pressed during this time are interpreted as the first command typed when the messages stop, which might cause the router to power off and start over. It takes a few minutes for the messages to stop.

Related Information

If you encounter a problem during the power up process see *Troubleshooting Cisco 3900 Series, 2900 Series, and 1900 Series ISRs*.

Verifying the Front Panel LED Indications

The front-panel indicator LEDs described in [Table 1-4](#) provide power, activity, and status information useful during power up.

Performing the Initial Configuration on the Router

Use any of the following tools to perform the initial configuration on the router:

- [Using the Cisco Setup Command Facility, page 5-3](#)
- [Using Cisco Configuration Professional Express, page 5-6](#)
- [Using the Cisco CLI—Manual Configuration, page 5-6](#)

**Note**

Cisco recommends using Cisco Configuration Professional Express to perform the initial configuration on the router because it provides a web-based graphical-user interface (GUI).

Using the Cisco Setup Command Facility

Cisco Setup Command Facility lets you configure the initial router settings through a configuration dialog. If you see the following messages, the router has booted and is ready for initial configuration using the setup command facility.

```
--- System Configuration Dialog ---
```

```
At any point you may enter a question mark '?' for help.  
Use ctrl-c to abort configuration dialog at any prompt.  
Default settings are in square brackets '['].
```

```
Would you like to enter the initial configuration dialog? [yes/no]:
```

If the system configuration dialog message does not appear, a default configuration file was installed on the router prior to shipping. See the [“Using Cisco Configuration Professional Express” section on page 5-6](#) to configure the router.

The setup command facility prompts you to enter the information that is needed to configure a router quickly. The facility steps you through a initial configuration, including LAN and WAN interfaces. For more general information about the setup command facility, see [Cisco IOS Configuration Fundamentals Configuration Guide, Release 12.4](#).

**Note**

- The messages that are displayed will vary based on your router model, the installed interface modules, and the software image. The following example and the user entries (in **bold**) are shown as examples only.
 - If you make a mistake while using the setup command facility, you can exit and run the setup command facility again. Press **Ctrl-C**, and enter the **setup** command in privileged EXEC mode (Router#).
-

Procedure

- Step 1** Enter the setup command facility. From the Cisco IOS CLI, enter the **setup** command in privileged EXEC mode, enter the following:

```
Router> enable
Password: <password>
Router# setup

--- System Configuration Dialog ---
Continue with configuration dialog? [yes/no]:
```

- Step 2** To proceed using the setup command facility, enter **yes**.

```
Continue with configuration dialog? [yes/no]:

At any point you may enter a question mark '?' for help.

Use ctrl-c to abort configuration dialog at any prompt.
Default settings are in square brackets '[]'.
```

- Step 3** Proceed using basic management setup, which configures only enough connectivity:

```
Would you like to enter basic management setup? [yes/no]: yes
```

- Step 4** Enter a hostname for the router:

```
Configuring global parameters:
Enter host name [Router]: myrouter
```

- Step 5** Enter an enable secret password. This password is encrypted (for more security) and cannot be seen when viewing the configuration.

```
The enable secret is a password used to protect access to
privileged EXEC and configuration modes. This password, after
entered, becomes encrypted in the configuration.
Enter enable secret: cisco
```

- Step 6** Enter an enable password that is different from the enable secret password. This password is *not* encrypted (and is less secure) and can be seen when viewing the configuration.

```
The enable password is used when you do not specify an
enable secret password, with some older software versions, and
some boot images.
Enter enable password: cisco123
```

- Step 7** Enter the virtual terminal password, which prevents unauthenticated access to the router through ports other than the console port:

```
The virtual terminal password is used to protect
access to the router over a network interface.
Enter virtual terminal password: cisco
```

- Step 8** Respond to the following prompts as appropriate for your network:

```
Configure SNMP Network Management? [no]: yes
Community string [public]:
```

The system displays a summary of the available interfaces.



Note The interface summary includes interface numbering, which depends on the router model and the installed modules and interface cards.

Current interface summary

Interface	IP-Address	OK?	Method	Status	Protocol
GigabitEthernet0/0	unassigned	YES	NVRAM	administratively down	down
GigabitEthernet0/1	10.10.10.12	YES	DHCP	up	up
GigabitEthernet0/2	unassigned	YES	NVRAM	administratively down	down
SSLVPN-VIF0	unassigned	NO	unset	up	

Any interface listed with OK? value "NO" does not have a valid configuration

Step 9 Select one of the available interfaces for connecting the router to the management network:

Enter interface name used to connect to the management network from the above interface summary: **gigabitethernet0/1**

Step 10 Respond to the following prompts as appropriate for your network:

```
Configuring interface GigabitEthernet0/1:
Configure IP on this interface? [yes]: yes
IP address for this interface [10.10.10.12]:
Subnet mask for this interface [255.0.0.0] : 255.255.255.0
Class A network is 10.0.0.0, 24 subnet bits; mask is /24
```

The system creates the following configuration command script:

```
hostname myrouter
enable secret 5 $1$t/Dj$yAeGKviLLZNOBX0b9eif00 enable password cisco123 line vty 0 4
password cisco snmp-server community public !
no ip routing

!
interface GigabitEthernet0/0
shutdown
no ip address
!
interface GigabitEthernet0/1
no shutdown
ip address 10.10.10.12 255.255.255.0
!
interface GigabitEthernet0/2
shutdown
no ip address
!
end
```

Step 11 Respond to the following prompts. Select **2** to save the initial configuration:

```
[0] Go to the IOS command prompt without saving this config.
[1] Return back to the setup without saving this config.
[2] Save this configuration to nvram and exit.

Enter your selection [2]: 2
Building configuration...
Use the enabled mode 'configure' command to modify this configuration.
```

Press RETURN to get started! **RETURN**

The system displays the user prompt:

```
myrouter>
```

Step 12 The facility prompts you to save the configuration. Enter **yes** to save the configuration and return to the user EXEC prompt (Router>).

```
Use this configuration? {yes/no} : yes
```

```
Building configuration...
Use the enabled mode 'configure' command to modify this configuration.
```

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

```
%LINK-3-UPDOWN: Interface Ethernet0/0, changed state to up
%LINK-3-UPDOWN: Interface Ethernet0/1, changed state to up
%LINK-3-UPDOWN: Interface Serial0/0/0, changed state to up
%LINK-3-UPDOWN: Interface Serial0/0/1, changed state to down
%LINK-3-UPDOWN: Interface Serial0/2, changed state to down
%LINK-3-UPDOWN: Interface Serial1/0, changed state to up
%LINK-3-UPDOWN: Interface Serial1/1, changed state to down
%LINK-3-UPDOWN: Interface Serial1/2, changed state to down
```

```
<Additional messages omitted.>
```

Step 13 When the messages stop appearing on your screen, press **Return** to get the Router> prompt.



Note If you see the following message, it means that no other routers were found on the network attached to the port:

```
%AT-6-ONLYROUTER: Ethernet0/0: AppleTalk port enabled; no neighbors found
```

Step 14 The Router> prompt indicates that you are now at the CLI and you have just completed the initial router configuration. Nevertheless, this is *not* a complete configuration. At this point, you have two choices:

- Run the setup command facility again, and create another configuration.

```
Router> enable
Password: password
Router# setup
```

- Modify the existing configuration or configure additional features by using the CLI:

```
Router> enable
Password: password
Router# configure terminal
Router(config)#
```

Using Cisco Configuration Professional Express

Use the Cisco Configuration Professional Express web-based application to configure the initial router settings. See *Cisco Configuration Professional Express User Guide* for detailed instructions.

For help with interface and port numbering, see the “[Interface Numbering](#)” section on page 1-13.

Using the Cisco CLI—Manual Configuration

This section shows you how to access the CLI to perform the initial configuration on the router.



Note

If the rommon 1> prompt appears, your system has booted in ROM monitor mode. For information on the ROM monitor, see *Using the ROM Monitor*.

If the system configuration dialog message does not appear, a default configuration file was installed on the router prior to shipping. See the “Using Cisco Configuration Professional Express” section on page 5-6 to configure the router.

For help with interface and port numbering, see the “Interface Numbering” section on page 1-13.

This section contains the following sections:

- [Initial CLI Configuration, page 5-7](#) (Required)
- [Configuring the Router Hostname, page 5-8](#) (Optional)
- [Configuring the Enable and Enable Secret Passwords, page 5-9](#) (Required)
- [Configuring the Console Idle Privileged EXEC Timeout, page 5-10](#) (Optional)
- [Configuring Gigabit Ethernet Interfaces, page 5-12](#) (Required)
- [Specifying a Default Route or Gateway of Last Resort, page 5-14](#) (Required)
- [Configuring IP Routing and IP Protocols, page 5-14](#) (Required)
- [Configuring Virtual Terminal Lines for Remote Console Access, page 5-17](#) (Required)
- [Configuring the Auxiliary Line, page 5-18](#) (Optional)
- [Verifying Network Connectivity, page 5-19](#) (Required)
- [Saving Your Router Configuration, page 5-20](#) (Required)
- [Saving Backup Copies of Configuration and System Image, page 5-21](#) (Optional)

Initial CLI Configuration

Procedure

Step 1 When the system message appears on the router, enter **no**.

```
--- System Configuration Dialog ---
```

```
At any point you may enter a question mark '?' for help.  
Use ctrl-c to abort configuration dialog at any prompt.  
Default settings are in square brackets '['].
```

```
Would you like to enter the initial configuration dialog? [yes/no]: no
```

Step 2 Press **Return** to terminate autoinstall and continue with manual configuration:

```
Would you like to terminate autoinstall? [yes] Return
```

Several messages are displayed, ending with a line similar to the following:

```
...  
Copyright (c) 1986-2004 by cisco Systems, Inc.  
Compiled <date> <time> by <person>
```

Step 3 Press **Return** to bring up the Router> prompt.

```
...  
flashfs[4]: Initialization complete.  
Router>
```

Step 4 Type **enable** to enter privileged EXEC mode:

```
Router> enable
```

Router#

Configuring the Router Hostname

The hostname is used in CLI prompts and default configuration filenames. If you do not configure the router hostname, the router uses the factory-assigned default hostname “Router.”

Do not expect capitalization and lower casing to be preserved in the hostname. Uppercase and lowercase characters are treated as identical by many Internet software applications. It may seem appropriate to capitalize a name as you would ordinarily do, but conventions dictate that computer names appear in all lowercase characters. For more information, see the RFC 1178, *Choosing a Name for Your Computer*.

The name must also follow the rules for Advanced Research Projects Agency Network (ARPANET) hostnames. They must start with a letter, end with a letter or digit, and have as interior characters only letters, digits, and hyphens. Names must be 63 characters or fewer. For more information, see the RFC 1035, *Domain Names—Implementation and Specification*.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **hostname *name***
4. Verify that the router prompt displays your new hostname.
5. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	hostname <i>name</i> Example: Router(config)# hostname myrouter	Specifies or modifies the hostname for the network server.

	Command or Action	Purpose
Step 4	Verify that the router prompt displays your new hostname. Example: myrouter(config)#	—
Step 5	end Example: myrouter# end	(Optional) Returns to privileged EXEC mode.

Configuring the Enable and Enable Secret Passwords

To provide an additional layer of security, particularly for passwords that cross the network or are stored on a TFTP server, you can use either the **enable password** command or **enable secret** command. Both commands accomplish the same thing—they allow you to establish an encrypted password that users must enter to access privileged EXEC (enable) mode.

We recommend that you use the **enable secret** command because it uses an improved encryption algorithm. Use the **enable password** command only if you boot an older image of the Cisco IOS software or if you boot older boot ROMs that do not recognize the **enable secret** command.

For more information, see the “Configuring Passwords and Privileges” chapter in the *Cisco IOS Security Configuration Guide*. Also see the [Cisco IOS Password Encryption Facts](#) tech note and the [Improving Security on Cisco Routers](#) tech note.

Restrictions

If you configure the **enable secret** command, it takes precedence over the **enable password** command; the two commands cannot be in effect simultaneously.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **enable password** *password*
4. **enable secret** *password*
5. **end**
6. **enable**
7. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>enable</code> Example: <code>Router> enable</code>	Enables privileged EXEC mode. <ul style="list-style-type: none"> Enter your password if prompted.
Step 2	<code>configure terminal</code> Example: <code>Router# configure terminal</code>	Enters global configuration mode.
Step 3	<code>enable password password</code> Example: <code>Router(config)# enable password pswd2</code>	(Optional) Sets a local password to control access to various privilege levels. <ul style="list-style-type: none"> We recommend that you perform this step only if you boot an older image of the Cisco IOS software or if you boot older boot ROMs that do not recognize the enable secret command.
Step 4	<code>enable secret password</code> Example: <code>Router(config)# enable secret greentree</code>	Specifies an additional layer of security over the enable password command. <ul style="list-style-type: none"> Do not use the same password that you entered in Step 3.
Step 5	<code>end</code> Example: <code>Router(config)# end</code>	Returns to privileged EXEC mode.
Step 6	<code>enable</code> Example: <code>Router> enable</code>	Enables privileged EXEC mode. <ul style="list-style-type: none"> Verify that your new enable or enable secret password works.
Step 7	<code>end</code> Example: <code>Router(config)# end</code>	(Optional) Returns to privileged EXEC mode.

Configuring the Console Idle Privileged EXEC Timeout

This section describes how to configure the console line's idle privileged EXEC timeout. By default, the privileged EXEC command interpreter waits 10 minutes to detect user input before timing out.

When you configure the console line, you can also set communication parameters, specify autobaud connections, and configure terminal operating parameters for the terminal that you are using. For more information on configuring the console line, see the *Cisco IOS Configuration Fundamentals and Network Management Configuration Guide*. In particular, see the “Configuring Operating Characteristics for Terminals” and “Troubleshooting and Fault Management” chapters.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **line console 0**
4. **exec-timeout** *minutes* [*seconds*]
5. **end**
6. **show running-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	line console 0 Example: Router(config)# line console 0	Configures the console line and starts the line configuration command collection mode.
Step 4	exec-timeout <i>minutes</i> [<i>seconds</i>] Example: Router(config-line)# exec-timeout 0 0	Sets the idle privileged EXEC timeout, which is the interval that the privileged EXEC command interpreter waits until user input is detected. <ul style="list-style-type: none"> • The example shows how to specify no timeout. Setting the exec-timeout value to 0 will cause the router to never log out once logged in. This could have security implications if you leave the console without manually logging out using the disable command.
Step 5	end Example: Router(config)# end	Returns to privileged EXEC mode.
Step 6	show running-config Example: Router(config)# show running-config	Displays the running configuration file. <ul style="list-style-type: none"> • Verify that you properly configured the idle privileged EXEC timeout.

Examples

The following example shows how to set the console idle privileged EXEC timeout to 2 minutes 30 seconds:

```
line console
  exec-timeout 2 30
```

The following example shows how to set the console idle privileged EXEC timeout to 10 seconds:

```
line console
  exec-timeout 0 10
```

Configuring Gigabit Ethernet Interfaces

This section shows how to assign an IP address and interface description to an Ethernet interface on your router.

For comprehensive configuration information on Gigabit Ethernet interfaces, see the “Configuring LAN Interfaces” chapter of the *Cisco IOS Interface and Hardware Component Configuration Guide*.

For information on interface numbering, see the software configuration guide for your router.

SUMMARY STEPS

1. **enable**
2. **show ip interface brief**
3. **configure terminal**
4. **interface {fastethernet | gigabitethernet} 0/port**
5. **description string**
6. **ip address ip-address mask**
7. **no shutdown**
8. **end**
9. **show ip interface brief**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	show ip interface brief Example: Router# show ip interface brief	Displays a brief status of the interfaces that are configured for IP. <ul style="list-style-type: none"> • Learn which type of Ethernet interface is on your router.
Step 3	configure terminal Example: Router# configure terminal	Enters global configuration mode.

	Command or Action	Purpose
Step 4	interface {fastethernet gigabitethernet} 0/port Example: Router(config)# interface gigabitethernet 0/0	Specifies the Ethernet interface and enters interface configuration mode. Note For information on interface numbering, see the software configuration guide.
Step 5	description string Example: Router(config-if)# description GE int to 2nd floor south wing	(Optional) Adds a description to an interface configuration. <ul style="list-style-type: none"> The description helps you remember what is attached to this interface. The description can be useful for troubleshooting.
Step 6	ip address ip-address mask Example: Router(config-if)# ip address 172.16.74.3 255.255.255.0	Sets a primary IP address for an interface.
Step 7	no shutdown Example: Router(config-if)# no shutdown	Enables an interface.
Step 8	end Example: Router(config)# end	Returns to privileged EXEC mode.
Step 9	show ip interface brief Example: Router# show ip interface brief	Displays a brief status of the interfaces that are configured for IP. <ul style="list-style-type: none"> Verify that the Ethernet interfaces are up and configured correctly.

Examples

Configuring the GigabitEthernet Interface

```
!
interface GigabitEthernet0/0
 description GE int to HR group
 ip address 172.16.3.3 255.255.255.0
 duplex auto
 speed auto
 no shutdown
!
```

Sample Output for the show ip interface brief Command

```
Router# show ip interface brief
```

```
Interface                IP-Address      OK? Method Status          Protocol
GigabitEthernet0/0      172.16.3.3     YES NVRAM  up              up
GigabitEthernet0/1      unassigned     YES NVRAM  administratively down down
Router#
```

Specifying a Default Route or Gateway of Last Resort

This section describes how to specify a default route with IP routing enabled. For alternative methods of specifying a default route, see the *Configuring a Gateway of Last Resort Using IP Commands* tech note.

The Cisco IOS software uses the gateway (router) of last resort if it does not have a better route for a packet and if the destination is not a connected network. This section describes how to select a network as a default route (a candidate route for computing the gateway of last resort). The way in which routing protocols propagate the default route information varies for each protocol.

Configuring IP Routing and IP Protocols

For comprehensive configuration information about IP routing and IP routing protocols, see *Cisco IOS IP Routing Protocols Configuration Guide, Release 12.4T*.

- [IP Routing, page 5-14](#)
- [Default Routes, page 5-14](#)
- [Default Network, page 5-14](#)

IP Routing

You can configure integrated routing and bridging (IRB) so the router can route and bridge simultaneously. The router will act as an IP host on the network whether routing is enabled or not. To read more about IRB see the following URL on Cisco.com,

http://www.cisco.com/en/US/tech/tk389/tk815/tk855/tsd_technology_support_sub-protocol_home.html

IP routing is automatically enabled in the Cisco IOS software. When IP routing is configured, the system will use a configured or learned route to forward packets, including a configured default route.



Note

This task section does not apply when IP routing is disabled. To specify a default route when IP routing is disabled, refer to the *Configuring a Gateway of Last Resort Using IP Commands* tech note.

Default Routes

A router might not be able to determine the routes to all other networks. To provide complete routing capability, the common practice is to use some routers as smart routers and give the remaining routers default routes to the smart router. (Smart routers have routing table information for the entire internetwork.) These default routes can be passed along dynamically, or can be configured into the individual routers.

Most dynamic interior routing protocols include a mechanism for causing a smart router to generate dynamic default information that is then passed along to other routers.

Default Network

If a router has an interface that is directly connected to the specified default network, the dynamic routing protocols running on the router will generate or source a default route. In the case of RIP, the router will advertise the pseudonetwork 0.0.0.0. In the case of IGRP, the network itself is advertised and flagged as an exterior route.

A router that is generating the default for a network also may need a default of its own. One way a router can generate its own default is to specify a static route to the network 0.0.0.0 through the appropriate device.

Gateway of Last Resort

When default information is being passed along through a dynamic routing protocol, no further configuration is required. The system periodically scans its routing table to choose the optimal default network as its default route. In the case of RIP, there is only one choice, network 0.0.0.0. In the case of IGRP, there might be several networks that can be candidates for the system default. The Cisco IOS software uses both administrative distance and metric information to determine the default route (gateway of last resort). The selected default route appears in the gateway of last resort display of the **show ip route EXEC** command.

If dynamic default information is not being passed to the software, candidates for the default route are specified with the **ip default-network** global configuration command. In this usage, the **ip default-network** command takes an unconnected network as an argument. If this network appears in the routing table from any source (dynamic or static), it is flagged as a candidate default route and is a possible choice as the default route.

If the router has no interface on the default network, but does have a route to it, it considers this network as a candidate default path. The route candidates are examined and the best one is chosen, based on administrative distance and metric. The gateway to the best default path becomes the gateway of last resort.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip routing**
4. **ip route** *dest-prefix mask next-hop-ip-address* [*admin-distance*] [**permanent**]
5. **ip default-network** *network-number*
or
ip route *dest-prefix mask next-hop-ip-address*
6. **end**
7. **show ip route**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	ip routing Example: Router(config)# ip routing	Enables IP routing.

	Command or Action	Purpose
Step 4	<pre>ip route dest-prefix mask next-hop-ip-address [admin-distance] [permanent]</pre> <p>Example: Router(config)# ip route 192.168.24.0 255.255.255.0 172.28.99.2</p>	Establishes a static route.
Step 5	<pre>ip default-network network-number or ip route dest-prefix mask next-hop-ip-address</pre> <p>Example: Router(config)# ip default-network 192.168.24.0</p> <p>Example: Router(config)# ip route 0.0.0.0 0.0.0.0 172.28.99.1</p>	<p>Selects a network as a candidate route for computing the gateway of last resort.</p> <p>Creates a static route to network 0.0.0.0 0.0.0.0 for computing the gateway of last resort.</p>
Step 6	<pre>end</pre> <p>Example: Router(config)# end</p>	Returns to privileged EXEC mode.
Step 7	<pre>show ip route</pre> <p>Example: Router# show ip route</p>	<p>Displays the current routing table information.</p> <ul style="list-style-type: none"> Verify that the gateway of last resort is set.

Examples

Specifying a Default Route: Example

```
!
ip routing
!
ip route 192.168.24.0 255.255.255.0 172.28.99.2
!
ip default-network 192.168.24.0
!
```

Sample Output for the show ip route Command

```
Router# show ip route

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, * - candidate default
Gateway of last resort is 172.28.99.2 to network 192.168.24.0

    172.24.0.0 255.255.255.0 is subnetted, 1 subnets
C       172.24.192.0 is directly connected, FastEthernet0
S       172.24.0.0 255.255.0.0 [1/0] via 172.28.99.0
S*     192.168.24.0 [1/0] via 172.28.99.2
    172.16.0.0 255.255.255.0 is subnetted, 1 subnets
C       172.16.99.0 is directly connected, FastEthernet1
Router#
```


Configuring Virtual Terminal Lines for Remote Console Access

Virtual terminal (vty) lines are used to allow remote access to the router. This section shows you how to configure the virtual terminal lines with a password, so that only authorized users can remotely access the router.

The router has five virtual terminal lines by default. However, you can create additional virtual terminal lines as described in the Cisco IOS Terminal Services Configuration Guide, Release 12.4. See the [Configuring Terminal Operating Characteristics for Dial-In Sessions](#) section.

Line passwords and password encryption is described in the Cisco IOS Security Configuration Guide, Release 12.4. See the [Security with Passwords, Privilege Levels, and Login Usernames for CLI Sessions on Networking Devices](#) section. If you want to secure the vty lines with an access list, see the [Access Control Lists: Overview and Guidelines](#). Also see the [Cisco IOS Password Encryption Facts](#) tech note.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **line vty** *line-number* [*ending-line-number*]
4. **password** *password*
5. **login**
6. **end**
7. **show running-config**
8. From another network device, attempt to open a Telnet session to the router.

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	line vty <i>line-number</i> [<i>ending-line-number</i>] Example: Router(config)# line vty 0 4	Starts the line configuration command collection mode for the virtual terminal lines (vty) for remote console access. <ul style="list-style-type: none"> • Make sure that you configure all vty lines on your router. <p>Note To verify the number of vty lines on your router, use the line vty ? command.</p>

	Command or Action	Purpose
Step 4	<code>password password</code> Example: Router(config-line)# <code>password guessagain</code>	Specifies a password on a line.
Step 5	<code>login</code> Example: Router(config-line)# <code>login</code>	Enables password checking at login.
Step 6	<code>end</code> Example: Router(config-line)# <code>end</code>	Returns to privileged EXEC mode.
Step 7	<code>show running-config</code> Example: Router# <code>show running-config</code>	Displays the running configuration file. <ul style="list-style-type: none"> Verify that you properly configured the virtual terminal lines for remote access.
Step 8	From another network device, attempt to open a Telnet session to the router. Example: Router# <code>172.16.74.3</code> Password:	Verifies that you can remotely access the router and that the virtual terminal line password is correctly configured.

Example

The following example shows how to configure virtual terminal lines with a password:

```
!
line vty 0 4
  password guessagain
  login
!
```

What to Do Next

After you configure the vty lines, follow these steps:

- (Optional) To encrypt the virtual terminal line password, see the “Configuring Passwords and Privileges” chapter in the *Cisco IOS Security Configuration Guide*. Also see the [Cisco IOS Password Encryption Facts](#) tech note.
- (Optional) To secure the VTY lines with an access list, see the “Part 3: Traffic Filtering and Firewalls” in the *Cisco IOS Security Configuration Guide*.

Configuring the Auxiliary Line

This section describes how to enter line configuration mode for the auxiliary line. How you configure the auxiliary line depends on your particular implementation of the auxiliary port. See the following documents for information on configuring the auxiliary line:

- [Configuring a Modem on the AUX Port for EXEC Dialin Connectivity](#), tech note

- [Configuring Dialout Using a Modem on the AUX Port](#), sample configuration
- [Configuring AUX-to-AUX Port Async Backup with Dialer Watch](#), sample configuration
- [Modem-Router Connection Guide](#), tech note

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **line aux 0**
4. See the tech notes and sample configurations to configure the line for your particular implementation of the auxiliary port.

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	line aux 0 Example: Router(config)# line aux 0	Starts the line configuration command collection mode for the auxiliary line.
Step 4	See the tech notes and sample configurations to configure the line for your particular implementation of the auxiliary port.	—

Verifying Network Connectivity

This section describes how to verify network connectivity for your router.

Prerequisites

- Complete all previous configuration tasks in this chapter.
- The router must be connected to a properly configured network host.

SUMMARY STEPS

1. **enable**
2. **ping** [*ip-address* | *hostname*]
3. **telnet** {*ip-address* | *hostname*}

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> Enter your password if prompted.
Step 2	ping [ip-address hostname] Example: Router# ping 172.16.74.5	Diagnoses initial network connectivity. <ul style="list-style-type: none"> To verify connectivity, ping the next hop router or connected host for each configured interface.
Step 3	telnet {ip-address hostname} Example: Router# telnet 10.20.30.40	Logs in to a host that supports Telnet. <ul style="list-style-type: none"> If you want to test the vty line password, perform this step from a different network device, and use your router's IP address.

Examples

The following display shows sample output for the ping command when you ping the IP address 192.168.7.27:

```
Router# ping

Protocol [ip]:
Target IP address: 192.168.7.27
Repeat count [5]:
Datagram size [100]:
Timeout in seconds [2]:
Extended commands [n]:
Sweep range of sizes [n]:
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.7.27, timeout is 2 seconds:
!!!!
Success rate is 100 percent, round-trip min/avg/max = 1/2/4 ms
```

The following display shows sample output for the ping command when you ping the IP hostname donald:

```
Router# ping donald

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.7.27, timeout is 2 seconds:
!!!!
Success rate is 100 percent, round-trip min/avg/max = 1/3/4 ms
```

Saving Your Router Configuration

This section describes how to avoid losing your configuration at the next system reload or power cycle by saving the running configuration to the startup configuration in NVRAM. The NVRAM provides 256KB of storage on the router.

SUMMARY STEPS

1. `enable`
2. `copy running-config startup-config`

DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>enable</code> Example: Router> <code>enable</code>	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	<code>copy running-config startup-config</code> Example: Router# <code>copy running-config startup-config</code>	Saves the running configuration to the startup configuration.

Saving Backup Copies of Configuration and System Image

To aid file recovery and minimize downtime in case of file corruption, we recommend that you save backup copies of the startup configuration file and the Cisco IOS software system image file on a server.

SUMMARY STEPS

1. `enable`
2. `copy nvram:startup-config {ftp: | rcp: | tftp:}`
3. `show {flash0|flash1}:`
4. `copy {flash0|flash1}: {ftp: | rcp: | tftp:}`

DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>enable</code> Example: Router> <code>enable</code>	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	<code>copy nvram:startup-config {ftp: rcp: tftp:}</code> Example: Router# <code>copy nvram:startup-config ftp:</code>	Copies the startup configuration file to a server. <ul style="list-style-type: none"> • The configuration file copy can serve as a backup copy. • Enter the destination URL when prompted.

	Command or Action	Purpose
Step 3	<code>show {flash0 flash1}:</code> Example: Router# <code>show {flash0 flash1}:</code>	Displays the layout and contents of a flash memory file system. <ul style="list-style-type: none"> Learn the name of the system image file.
Step 4	<code>copy {flash0 flash1}: {ftp: rcp: tftp:}</code> Example: Router# <code>copy {flash0 flash1}: ftp:</code>	Copies a file from flash memory to a server. <ul style="list-style-type: none"> Copy the system image file to a server to serve as a backup copy. Enter the filename and destination URL when prompted.

Examples

Copying the Startup Configuration to a TFTP Server: Example

The following example shows the startup configuration being copied to a TFTP server:

```
Router# copy nvram:startup-config tftp:

Remote host[]? 172.16.101.101

Name of configuration file to write [rtr2-config]? <cr>
Write file rtr2-config on host 172.16.101.101?[confirm] <cr>
! [OK]
```

Copying from Flash Memory to a TFTP Server: Example

The following example shows the use of the `show {flash0|flash1}:` command in privileged EXEC to learn the name of the system image file and the use of the `copy {flash0|flash1}: tftp:` privileged EXEC command to copy the system image (c3900-2is-mz) to a TFTP server. The router uses the default username and password.

```
Router# show {flash0|flash1}:

System flash directory:
File Length Name/status
1 4137888 c3900-c2is-mz
[4137952 bytes used, 12639264 available, 16777216 total]
16384K bytes of processor board System flash (Read/Write)\

Router# copy {flash0|flash1}: tftp:

IP address of remote host [255.255.255.255]? 172.16.13.110
filename to write on tftp host? c3900-c2is-mz
writing c3900-c2is-mz !!!!!...
successful ftp write.
```



Note To avoid losing work you have completed, be sure to save your configuration occasionally as you proceed. Use the `copy running-config startup-config` command to save the configuration to NVRAM.

Verifying the Initial Configuration

To verify the initial configuration on the router, enter the following commands in the Cisco IOS:

- **show version**—Displays the system hardware version; the installed software version; the names and sources of configuration files; the boot images; and the amount of installed DRAM, NVRAM, and flash memory.
- **show diag**—Lists and displays diagnostic information about the installed controllers, interface processors, and port adapters.
- **show interfaces**— Shows interfaces are operating correctly and that the interfaces and line protocol are in the correct state—up or down
- **show ip interface brief**— Displays a summary status of the interfaces configured for IP protocol.
- **show configuration**— Verify that you have configured the correct hostname and password.

When you have completed and verified the initial configuration, the specific features and functions are ready to be configured. See the [Cisco 1900 Series, 2900 Series, and 3900 Series Software Configuration Guide](#).

