CHAPTER 5

# Basic Router Configuration

This chapter provides procedures for configuring the basic parameters of your Cisco router, including global parameter settings, routing protocols, interfaces, and command-line access. It also describes the default configuration on startup.



**Note** Individual router models may not support every feature described in this guide. Features that are not supported by a particular router are indicated whenever possible.

**Note** For instructions on how to configure the 4G LTE features on your Cisco 819 ISR, see the Cisco 4G LTE Software Installation Guide.

This chapter includes configuration examples and verification steps, as available.

For complete information on how to access global configuration mode, see the "Entering Global Configuration Mode" section on page A-5.

# Interface Ports

Table 5-1 lists the interfaces that are supported for each router and their associated port labels on the equipment.

***Table 5-1 Supported Interfaces and Associated Port Labels by Cisco Router***

| Router | Interface | Port Label |
|---|---|---|
| Cisco 819 Router | 4-port Fast Ethernet LAN | LAN, FE0–FE3 |
| | Gigabit Ethernet WAN | GE WAN 0 |
| | Serial | Serial |
| | Mini USB for 3G port Provisioning | 3G RSVD |
| | Console/Aux port | CON/AUX |

**Note** There are two labels for the associated antennas with the labels: Main and DIV/GPS.

# Default Configuration

When you first boot up your Cisco router, some basic configuration has already been performed. All of the LAN and WAN interfaces have been created, console and vty ports are configured, and the inside interface for Network Address Translation (NAT) has been assigned. Use the **show running-config** command to view the initial configuration, as shown in the following example for a Cisco 819 ISR:

```
Router# show running
Building configuration...

Current configuration : 977 bytes
!
version 15.1
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Router
!
boot-start-marker
boot-end-marker
no aaa new-model
ip source-route
ip cef

no ipv6 cef
license udi pid CISCO819G-G-K9 sn FHK1429768Q
controller Cellular 0
interface Cellular0
 no ip address
 encapsulation ppp
interface Ethernet-wan0
 no ip address
 shutdown
 duplex auto
```

```
 speed auto
interface FastEthernet0
interface FastEthernet1
interface FastEthernet2
interface FastEthernet3
interface Serial0
 no ip address
 shutdown
 no fair-queue
 clock rate 2000000
!
interface Vlan1
 no ip address
!
ip forward-protocol nd
no ip http server
no ip http secure-server

logging esm config

control-plane
line con 0
 no modem enable
line aux 0
line 3
 no exec
line 7
 stopbits 1
 speed 115200
line vty 0 4
 login
 transport input all
!
scheduler allocate 20000 1000
end
```

# Information Needed for Configuration

You need to gather some or all of the following information, depending on your planned network scenario, before configuring your network:

- If you are setting up an Internet connection, gather the following information:
  - PPP client name that is assigned as your login name
  - PPP authentication type: Challenge Handshake Authentication Protocol (CHAP) or Password Authentication Protocol (PAP)
  - PPP password to access your Internet service provider (ISP) account
  - DNS server IP address and default gateways
- If you are setting up a connection to a corporate network, you and the network administrator must generate and share the following information for the WAN interfaces of the routers:
  - PPP authentication type: CHAP or PAP
  - PPP client name to access the router
  - PPP password to access the router

- If you are setting up IP routing:
  - Generate the addressing scheme for your IP network.
- If you are setting up the serial interface:
  - Mode of operation (sync, async, bisync)
  - Clock rate depending on the mode
  - IP address depending on the mode
- If you are setting up 3G:
  - You must have service availability on the Cisco 819 ISR from a carrier, and you must have network coverage where your router will be physically placed. For a complete list of supported carriers, see the data sheet at *Cisco 3G Wireless Connectivity Solutions*.
  - You must subscribe to a service plan with a wireless service provider and obtain a SIM card.
  - You must install the SIM card before configuring the 3G Cisco 819 ISR. For instructions on how to install the SIM card, see *Cisco 800 Series RoutersConfiguring Cisco EHWIC and 880G for 3.7G (HSPA+)/3.5G (HSPA)*.
- You must install the required antennas before you configure the 3G for Cisco 819 ISR. See the following URLs for instructions on how to install the antennas:
  - 3G-ANTM1919D—See *Cisco Multiband Swivel-Mount Dipole Antenna (3G-ANTM1919D)*.
  - 3G-ANTM1916-CM—See *Cisco Multiband Omnidirectional Ceiling Mount Antenna (3G-ANTM1916-CM).*
  - 3G-AE015-R (Antenna Extension)—See *Cisco Single-Port Antenna Stand for Multiband TNC Male-Terminated Portable Antenna (Cisco 3G-AE015-R).*
  - 3G-AE010-R (Antenna Extension)—See *Cisco Single-Port Antenna Stand for Multiband TNC Male-Terminated Portable Antenna (Cisco 3G-AE015-R).* This document applies to both 3G-AE015-R and 3G-AE010-R. The only difference between these two products is the length of the cable.
  - 3G-ANTM-OUT-OM—See *Cisco 3G Omnidirectional Outdoor Antenna (3G-ANTM-OUT-OM)*.
  - 3G-ANTM-OUT-LP—See *Cisco Multiband Omnidirectional Panel-Mount Antenna (3G-ANTM-OUT-LP).*
  - 3G-ACC-OUT-LA—See *Cisco 3G Lightning Arrestor (3G-ACC-OUT-LA).*
  - 4G-ANTM-OM-CM—See *Cisco 4G Indoor Ceiling-Mount Omnidirectional Antenna (4G-ANTM-OM-CM)*.
- You must check your LEDs for signal reception as described in Table 2-1.
- You should be familiar with the Cisco IOS software. See the *Cisco IOS documentation* beginning with Release 12.4(15)T or later for Cisco 3G support.
- To configure your 3G data profile, you will need the username, password, and access point name (APN) from your service provider:

After you have collected the appropriate information, you can perform a full configuration on your router, beginning with the tasks in the "Configuring Command-Line Access" section on page 5-5.

To obtain or change software licenses:

- See *Software Activation on Cisco Integrated Services Routers and Cisco Integrated Service Routers G2.*

# Configuring Command-Line Access

To configure parameters to control access to the router, perform the following steps, beginning in global configuration mode:

## SUMMARY STEPS

1. **line** [**aux** | **console** | **tty** | **vty**] *line-number*
2. **password** *password*
3. **login**
4. **exec-timeout** *minutes* [*seconds*]
5. **line** [**aux** | **console** | **tty** | **vty**] *line-number*
6. **password** *password*
7. **login**
8. **end**

## DETAILED STEPS

| | Command | Purpose |
|---|---|---|
| **Step 1** | **line** [**aux** \| **console** \| **tty** \| **vty**] *line-number*<br><br>**Example:**<br>`Router(config)# line console 0`<br>`Router(config-line)#` | Enters line configuration mode and specifies the type of line.<br><br>This example specifies a console terminal for access. |
| **Step 2** | **password** *password*<br><br>**Example:**<br>`Router(config)# password 5dr4Hepw3`<br>`Router(config-line)#` | Specifies a unique password for the console terminal line. |
| **Step 3** | **login**<br><br>**Example:**<br>`Router(config-line)# login`<br>`Router(config-line)#` | Enables password checking at terminal session login. |
| **Step 4** | **exec-timeout** *minutes* [*seconds*]<br><br>**Example:**<br>`Router(config-line)# exec-timeout 5 30`<br>`Router(config-line)#` | Sets the interval that the EXEC command interpreter waits until user input is detected. The default is 10 minutes. Optionally, add seconds to the interval value.<br><br>This example shows a timeout of 5 minutes and 30 seconds. Entering a timeout of 0 0 specifies never to time out. |
| **Step 5** | **line** [**aux** \| **console** \| **tty** \| **vty**] *line-number*<br><br>**Example:**<br>`Router(config-line)# line vty 0 4`<br>`Router(config-line)#` | Specifies a virtual terminal for remote console access. |
| **Step 6** | **password** *password*<br><br>**Example:**<br>`Router(config-line)# password aldf2ad1`<br>`Router(config-line)#` | Specifies a unique password for the virtual terminal line. |

| | Command | Purpose |
|---|---|---|
| **Step 7** | **login**<br><br>**Example:**<br>`Router(config-line)# login`<br>`Router(config-line)#` | Enables password checking at the virtual terminal session login. |
| **Step 8** | **end**<br><br>**Example:**<br>`Router(config-line)# end`<br>`Router#` | Exits line configuration mode and returns to privileged EXEC mode. |

## Example

The following configuration shows the command-line access commands.

You do not need to input the commands marked "default." These commands appear automatically in the configuration file generated when you use the **show running-config** command.

```
!
line con 0
exec-timeout 10 0
password 4youreyesonly
login
transport input none (default)
stopbits 1 (default)
line vty 0 4
password secret
login
!
```

# Configuring Global Parameters

To configure selected global parameters for your router, perform these steps:

## SUMMARY STEPS

1. **configure terminal**
2. **hostname** *name*
3. **enable secret** *password*
4. **no ip domain-lookup**

## DETAILED STEPS

| | Command | Purpose |
|---|---|---|
| **Step 1** | **`configure terminal`**<br><br>**Example:**<br>`Router> enable`<br>`Router# configure terminal`<br>`Router(config)#` | Enters global configuration mode when using the console port.<br><br>If you are connecting to the router using a remote terminal, use the following:<br>`telnet router name or address`<br>`Login: login id`<br>`Password: *********`<br>`Router> enable` |
| **Step 2** | **`hostname`** *`name`*<br><br>**Example:**<br>`Router(config)# hostname Router`<br>`Router(config)#` | Specifies the name for the router. |
| **Step 3** | **`enable secret`** *`password`*<br><br>**Example:**<br>`Router(config)# enable secret cr1ny5ho`<br>`Router(config)#` | Specifies an encrypted password to prevent unauthorized access to the router. |
| **Step 4** | **`no ip domain-lookup`**<br><br>**Example:**<br>`Router(config)# no ip domain-lookup`<br>`Router(config)#` | Disables the router from translating unfamiliar words (typos) into IP addresses. |

# Configuring WAN Interfaces

Configure the WAN interface for your router using one of the following as appropriate:



- Configuring Router for Image and Config Recovery Using Push Button, page 5-23


## Configuring a Gigabit Ethernet WAN Interface

To configure the Ethernet interface on a Cisco 819 ISR, perform these steps, beginning in global configuration mode:

### SUMMARY STEPS

1. **interface** *type number*
2. **ip address** *ip-address mask*
3. **no shutdown**
4. **exit**

### DETAILED STEPS

| | Command | Purpose |
|---|---|---|
| **Step 1** | **interface** *type number*<br><br>**Example:**<br>`Router(config)# interface gigabitethernet 0`<br>`Router(config-if)#` | Enters the configuration mode for a Gigabit Ethernet WAN interface on the router. |
| **Step 2** | **ip address** *ip-address mask*<br><br>**Example:**<br>`Router(config-if)# ip address 192.168.12.2 255.255.255.0`<br>`Router(config-if)#` | Sets the IP address and subnet mask for the specified Gigabit Ethernet interface. |
| **Step 3** | **no shutdown**<br><br>**Example:**<br>`Router(config-if)# no shutdown`<br>`Router(config-if)#` | Enables the Ethernet interface, changing its state from administratively down to administratively up. |
| **Step 4** | **exit**<br><br>**Example:**<br>`Router(config-if)# exit`<br>`Router(config)#` | Exits configuration mode for the Gigabit Ethernet interface and returns to global configuration mode. |

# Configuring the Cellular Wireless WAN Interface

The Cisco 819 ISRs provide a Third-Generation (3G) wireless interface for use over Global System for Mobile Communications (GSM) and code division multiple access (CDMA) networks. The interface is a 34-millimetre embedded mini express card.

Its primary application is WAN connectivity as a backup data link for critical data applications. However, the 3G wireless interface can also function as the router's primary WAN connection.

To configure the 3G cellular wireless interface, follow these guidelines and procedures:

## Prerequisites for Configuring the 3G Wireless Interface

The following are prerequisites to configuring the 3G wireless interface:

- You must have wireless service from a carrier, and you must have network coverage where your router will be physically placed. For a complete list of supported carriers, see the data sheet at:

  www.cisco.com/go/m2m

- You must subscribe to a service plan with a wireless service provider and obtain a SIM card (GSM modem only) from the service provider.
- You must check your LEDs for signal strength, as described in Table 2-1.
- You should be familiar with the Cisco IOS software. See *Cisco IOS documentation* beginning with Cisco IOS Release 12.4(15)XZ or later for Cisco 3G Wireless support.
- To configure your GSM data profile, you need the following information from your service provider:
  - Username
  - Password
  - Access point name (APN)
- To configure your CDMA (CDMA only) data profile for manual activation, you need the following information from your service provider:
  - Master Subsidy Lock (MSL) number
  - Mobile Directory number (MDN)
  - Mobile Station Identifier (MSID)
  - Electronic Serial Number (ESN)
- Check the LED located on the front panel of the router for signal strength and other indications. Table 2-1 describes the 3G LEDs for the Cisco 819 ISR.

## Restrictions for Configuring the Cellular Wireless Interface

The following restrictions apply to configuring the Cisco 3G wireless interface:

- A data connection can be originated only by the 3G wireless interface. Remote dial-in is not supported.
- Because of the shared nature of wireless communications, the experienced throughput varies depending on the number of active users or the amount of congestion in a given network.
- Cellular networks have higher latency than wired networks. Latency rates depend on the technology and carrier. Latency may be higher when there is network congestion.
- VoIP is currently not supported.
- Any restrictions that are part of the terms of service from your carrier also apply to the Cisco 3G wireless interface.
- Inserting a different type of modem from what was previously removed requires configuration changes and you must reload the system.

## Data Account Provisioning

**Note** To provision your modem, you must have an active wireless account with a service provider. A SIM card must be installed in a GSM 3G wireless card.

To provision your data account, follow these procedures:

- Verifying Signal Strength and Service Availability, page 5-12
- Configuring a GSM Modem Data Profile, page 5-13
- CDMA Modem Activation and Provisioning, page 5-14

### Verifying Signal Strength and Service Availability

To verify the signal strength and service availability on your modem, use the following commands in privileged EXEC mode.

### SUMMARY STEPS

1. **show cellular 0 network**
2. **show cellular 0 hardware**
3. **show cellular 0 connection**
4. **show cellular 0 gps**
5. **show cellular 0 radio**
6. **show cellular 0 profile**
7. **show cellular 0 security**
8. **show cellular 0 sms**
9. **show cellular 0 all**

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **show cellular 0 network**<br><br>**Example:**<br>`Router# show cellular 0 network` | Displays information about the carrier network, cell site, and available service. |
| **Step 2** | **show cellular 0 hardware**<br><br>**Example:**<br>`Router# show cellular 0 hardware` | Displays the cellular modem hardware information. |
| **Step 3** | **show cellular 0 connection**<br><br>**Example:**<br>`Router# show cellular 0 connection` | Displays the current active connection state and data statistics. |

| | Command or Action | Purpose |
|---|---|---|
| **Step 4** | **show cellular 0 gps**<br><br>**Example:**<br>`Router# show cellular 0 gps` | Displays the cellular gps information. |
| **Step 5** | **show cellular 0 radio**<br><br>**Example:**<br>`Router# show cellular 0 radio` | Shows the radio signal strength.<br>**Note** The RSSI should be better than –90 dBm for steady and reliable connection. |
| **Step 6** | **show cellular 0 profile**<br><br>**Example:**<br>`Router# show cellular 0 profile` | Shows information about the modem data profiles created. |
| **Step 7** | **show cellular 0 security**<br><br>**Example:**<br>`Router# show cellular 0 security` | Shows the security information for the modem, such as SIM and modem lock status. |
| **Step 8** | **show cellular 0 sms**<br><br>**Example:**<br>`Router# show cellular 0 sms` | Displays the cellular sms information. |
| **Step 9** | **show cellular 0 all**<br><br>**Example:**<br>`Router# show cellular 0 all` | Shows consolidated information about the modem, such as the profiles that were created, the radio signal strength, the network security, and so on. |

### Configuring a GSM Modem Data Profile

To configure or create a new modem data profile, enter the following command in privileged EXEC mode.

### SUMMARY STEPS

1. **cellular 0 gsm profile create <profile number> <apn> <authentication> <username> <password> ipv4**

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **cellular 0 gsm profile create <profile number> <apn> <authentication> <username> <password> ipv4**<br><br>**Example:**<br>`Router# gsm profile create 2 <apn-name> chap username password ipv4` | Creates a new modem data profile. See Table 5-2 for details about the command parameters. |

Table 5-2 lists the modem data profile parameters.

***Table 5-2 Modem Data Profile Parameters***

| | |
|---|---|
| *profile number* | Number for the profile that you are creating. You can create up to 16 profiles. |
| *apn* | Access point name. You must get this information from the service provider. |
| *authentication* | Type of authentication, for example, CHAP, PAP. |
| *Username* | Username provided by your service provider. |
| *Password* | Password provided by your service provider. |

## CDMA Modem Activation and Provisioning

Activation procedures may differ, depending upon your carrier. Consult your carrier and perform one of the following procedures as appropriate:

- Manual activation
- Activating using over-the-air service provisioning

The following table lists the activation and provisioning processes supported by different wireless carriers.

***Table 5-3***

| Activation and Provisioning Process | Carrier |
|---|---|
| Manual Activation using MDN, MSID, MSL | Sprint |
| OTASP[1] Activation | Verizon Wireless |
| IOTA[2] for Data Profile refresh | Sprint |

1. OTASP = Over the Air Service Provisioning.
2. IOTA = Internet Over the Air.

### Manual Activation

**Note** You must have valid mobile directory number (MDN), mobile subsidy lock (MSL), and mobile station identifier (MSID) information from your carrier before you start this procedure.

To configure a modem profile manually, use the following command, beginning in EXEC mode:

**cellular** *unit* **cdma activate manual** *mdn msid msl*

Besides being activated, the modem data profile is provisioned through the Internet Over the Air (IOTA) process. The IOTA process is initiated automatically when you use the **cellular** *unit* **cdma activate manual** *mdn msid msl* command.

The following is a sample output from this command:

```
router# cellular 0 cdma activate manual 1234567890 1234567890 12345
NAM 0 will be configured and will become Active
Modem will be activated with following Parameters
MDN :1234567890; MSID :1234567890; SID :1234; NID 12:
Checking Current Activation Status
Modem activation status: Not Activated
Begin Activation
```

```
Account activation - Step 1 of 5
Account activation - Step 2 of 5
Account activation - Step 3 of 5
Account activation - Step 4 of 5
Account activation - Step 5 of 5
Secure Commit Result: Succeed
Done Configuring - Resetting the modem
The activation of the account is Complete
Waiting for modem to be ready to start IOTA
Beginning IOTA
router#
*Feb  6 23:29:08.459: IOTA Status Message Received. Event: IOTA Start, Result: SUCCESS
*Feb  6 23:29:08.459: Please wait till IOTA END message is received
*Feb  6 23:29:08.459: It can take up to 5 minutes
*Feb  6 23:29:27.951: OTA State = SPL unlock, Result = Success
*Feb  6 23:29:32.319: OTA State = Parameters committed to NVRAM, Result = Success
*Feb  6 23:29:40.999: Over the air provisioning complete; Result:Success
*Feb  6 23:29:41.679: IOTA Status Message Received. Event: IOTA End, Result: SUCCESS
```

The IOTA start and end must have “success” as the resulting output. If you receive an error message, you can run IOTA independently by using the **cellular cdma activate iota** command.

Your carrier may require periodic refreshes of the data profile. Use the following command to refresh the data profile:

**cellular cdma activate iota**

#### Activating with Over-the-Air Service Provisioning

To provision and activate your modem using Over-the-Air Service Provisioning (OTASP), use the following command, beginning in EXEC mode.

router # **cellular 0 cdma activate otasp** *phone_number*

**Note** You need to obtain the phone number for use with this command from your carrier. The standard OTASP calling number is *22899.

The following is a sample output from this command:

```
router# cellular 0 cdma activate otasp  *22899
Beginning OTASP activation
OTASP number is *22899
819H#
OTA State = SPL unlock, Result = Success
router#
OTA State = PRL downloaded, Result = Success
OTA State = Profile downloaded, Result = Success
OTA State = MDN downloaded, Result = Success
OTA State = Parameters committed to NVRAM, Result = Success
Over the air provisioning complete; Result:Success
```

## Configuring a Cellular Interface

To configure the cellular interface, enter the following commands, beginning in privileged EXEC mode.

### SUMMARY STEPS

1. **configure terminal**
2. **interface cellular 0**
3. **encapsulation ppp**
4. **ppp chap hostname** *hostname*
5. **ppp chap password 0** *password*
6. **asynchronous mode interactive**
7. **ip address negotiated**

**Note** The PPP Challenge Handshake Authentication Protocol (CHAP) authentication parameters that you use in this procedure must be the same as the username and password provided by your carrier and configured only under the GSM profile. CDMA does not require a username or password.

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **configure terminal**<br><br>**Example:**<br>`Router# configure terminal` | Enters global configuration mode from the terminal. |
| **Step 2** | **interface cellular 0**<br><br>**Example:**<br>`Router (config)# interface cellular 0` | Specifies the cellular interface. |
| **Step 3** | **encapsulation ppp**<br><br>**Example:**<br>`Router (config-if)# encapsulation ppp` | Specifies PPP encapsulation for an interface configured for dedicated asynchronous mode or dial-on-demand routing (DDR). |
| **Step 4** | **ppp chap hostname** *hostname*<br><br>**Example:**<br>`Router (config-if)# ppp chap hostname cisco@wwan.ccs` | Defines an interface-specific Challenge Handshake Authentication Protocol (CHAP) hostname. This must match the username given by the carrier. Applies to GSM only. |
| **Step 5** | **ppp chap password 0** *password*<br><br>**Example:**<br>`Router (config-if)# ppp chap password 0 cisco` | Defines an interface-specific CHAP password. This must match the password given by the carrier. |

| | Command or Action | Purpose |
|---|---|---|
| **Step 6** | **asynchronous mode interactive**<br><br>**Example:**<br>`Router (config-if)# asynchronous mode interactive` | Returns a line from dedicated asynchronous network mode to interactive mode, enabling the **slip** and **ppp** commands in privileged EXEC mode. |
| **Step 7** | **ip address negotiated**<br><br>**Example:**<br>`Router (config-if)# ip address negotiated` | Specifies that the IP address for a particular interface is obtained via PPP and IPCP address negotiation. |

**Note** When the cellular interface requires a static IP address, the address may be configured as **ip address negotiated**. Through IP Control Protocol (IPCP), the network ensures that the correct static IP address is allocated to the device. If a tunnel interface is configured with the **ip address unnumbered** <*cellular interface*> command, the actual static IP address must be configured under the cellular interface, in place of **ip address negotiated**. For a sample cellular interface configuration, see the "Basic Cellular Interface Configuration" section on page 5-20.

## Configuring DDR

Perform these steps to configure dial-on-demand routing (DDR) for the cellular interface.

### SUMMARY STEPS

1. **configure terminal**
2. **interface cellular 0**
3. **dialer in-band**
4. **dialer idle-timeout** *seconds*
5. **dialer string** *string*
6. **dialer group** *number*
7. **exit**
8. **dialer-list** *dialer-group* **protocol** *protocol-name* **{permit | deny | list** *access-list-number* **| access-group}**
9. **ip access-list** <*access list number*> **permit** <*ip source address*>
10. **line 3**
11. **script dialer <regexp>**
12. **exit**
13. **chat-script <script name> "" "ATDT*99*<profile number>#" TIMEOUT <timeout value> CONNECT**
    **or**
    **chat-script <script name> "" "ATDT*777*<profile number>#" TIMEOUT <timeout value> CONNECT**
14. **interface cellular 0**
15. **dialer string** <*string*>

## DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **configure terminal**<br><br>**Example:**<br>`Router# configure terminal` | Enters global configuration mode. |
| **Step 2** | **interface cellular 0**<br><br>**Example:**<br>`Router (config)# interface cellular 0` | Specifies the cellular interface. |
| **Step 3** | **dialer in-band**<br><br>**Example:**<br>`Router (config-if)# dialer in-band` | Enables DDR and configures the specified serial interface for in-band dialing. |
| **Step 4** | **dialer idle-timeout** *seconds*<br><br>**Example:**<br>`Router (config-if)# dialer idle-timeout 30` | Specifies the duration of idle time, in seconds, after which a line is disconnected. |
| **Step 5** | **dialer string** *string*<br><br>**Example:**<br>`Router (config-if)# dialer string gsm` | Specifies the number or string to dial. Use the name of the chat script here. |
| **Step 6** | **dialer-group** *number*<br><br>**Example:**<br>`Router (config-if)# dialer-group 1` | Specifies the number of the dialer access group to which a specific interface belongs. |
| **Step 7** | **exit**<br><br>**Example:**<br>`Router (config-if)# exit` | Enters the global configuration mode. |
| **Step 8** | **dialer-list** *dialer-group* **protocol** *protocol-name* {**permit** \| **deny** \| **list** *access-list-number* \| **access-group**}<br><br>**Example:**<br>`Router (config)# dialer-list 1 protocol ip list 1` | Creates a dialer list for traffic of interest and permits access to an entire protocol. |
| **Step 9** | **ip access-list** *<access list number>* **permit** *<ip source address>*<br><br>**Example:**<br>`Router (config)# ip access list 1 permit any` | Defines traffic of interest. |

| | Command or Action | Purpose |
|---|---|---|
| **Step 10** | **line 3**<br><br>**Example:**<br>Router (config-line)# line 3 | Specifies the line configuration mode. It is always 3. |
| **Step 11** | **script dialer** <**regexp**><br><br>**Example:**<br>Router (config-line)# script-dialer gsm | Specifies a default modem chat script. |
| **Step 12** | **exit**<br><br>**Example:**<br>Router (config-line)# exit | Exits line configuration mode. |
| **Step 13** | For GSM:<br>**chat-script <script name> ”” “ATDT*99*<profile number>#” TIMEOUT <timeout value> CONNECT**<br><br>For CDMA:<br>**chat-script <script name> "" "ATDT*777*<profile number>#" TIMEOUT <timeout value> CONNECT**<br><br>**Example:**<br>Router (config)# chat-script gsm "" "ATDT*98*2#" TIMEOUT 60 "CONNECT“ | Configures this line for GSM.<br><br>Configures this line for CDMA.<br><br>Defines the Attention Dial Tone (ATDT) commands when the dialer is initiated. |
| **Step 14** | **interface cellular 0**<br><br>**Example:**<br>Router (config)# interface cellular 0 | Specifies the cellular interface. |
| **Step 15** | **dialer string** *string*<br><br>**Example:**<br>Router (config)# dialer string gsm | Specifies the dialer script (defined using the **chat script** command). |

# Examples for Configuring Cellular Wireless Interfaces

This section provides the following configuration examples:


- Basic Cellular Interface Configuration, page 5-20
- Tunnel over Cellular Interface Configuration, page 5-21
- Configuration for 8705 modem, page 5-21


## Basic Cellular Interface Configuration

The following example shows how to configure a gsm cellular interface to be used as a primary WAN connection. It is configured as the default route.

```
chat-script gsm "" "ATDT*98*2#" TIMEOUT 60 "CONNECT"

!
interface Cellular0
 ip address negotiated
 encapsulation ppp
 dialer in-band
 dialer string gsm
 dialer-group 1
 async mode interactive
 ppp chap hostname cisco@wwan.ccs
 ppp chap password 0 cisco
 ppp ipcp dns request
!

ip route 0.0.0.0 0.0.0.0 Cellular0
!
!
access-list 1 permit any
dialer-list 1 protocol ip list 1
!
line 3
 exec-timeout 0 0
 script dialer gsm
 login
 modem InOut
```

The following example shows how to configure a cdma cellular interface to be used as a primary WAN connection. It is configured as the default route.

```
chat-script cdma "" "ATDT#777" TIMEOUT 60 "CONNECT"

!
interface Cellular0
 ip address negotiated
 encapsulation ppp
 dialer in-band
 dialer string cdma
 dialer-group 1
 async mode interactive
 ppp chap password 0 cisco
!

ip route 0.0.0.0 0.0.0.0 Cellular0
!
!
access-list 1 permit any
dialer-list 1 protocol ip list 1
!
```

```
line 3
 exec-timeout 0 0
 script dialer cdma
 login
 modem InOut
```

### Tunnel over Cellular Interface Configuration

The following example shows how to configure the static IP address when a tunnel interface is configured with the **ip address unnumbered** <*cellular interface*> command:

```
interface Tunnel2
 ip unnumbered Cellular0
 tunnel source Cellular0
 tunnel destination 128.107.248.254

interface Cellular0
 bandwidth receive 1400000
 ip address 23.23.0.1 255.255.0.0
 ip nat outside
 ip virtual-reassembly
 encapsulation ppp
 no ip mroute-cache
 dialer in-band
 dialer idle-timeout 0
 dialer string dial<carrier>
 dialer-group 1
 async mode interactive
 no ppp lcp fast-start
 ppp chap hostname <hostname>        *** gsm only ***
 ppp chap password 0 <password>
 ppp ipcp dns request

! traffic of interest through the tunnel/cellular interface
ip route 10.10.0.0 255.255.0.0 Tunnel2
```

### Configuration for 8705 modem

The following shows how to configure an HSPA+ modem:

```
chat-script hspa "" "AT!SCACT=1,1" TIMEOUT 60 "OK"

interface Cellular0
 ip address negotiated
 encapsulation slip
 dialer in-band
 dialer pool-member 1
 dialer-group 1
 async mode interactive

interface Dialer1
 ip address negotiated
 ip nat outside
 ip virtual-reassembly in
 encapsulation slip
 dialer pool 1
 dialer string hspa
 dialer-group 1

ip nat inside source list 1 interface Dialer1 overload
ip route 0.0.0.0 0.0.0.0 Dialer1
access-list 1 permit any
dialer-list 1 protocol ip permit
```

```
line 3
 script dialer hspa+
 modem InOut
 no exec
 transport input all
```

# Configuring Dual SIM for Cellular Networks

The Dual SIM feature implements auto-switch and failover between two cellular networks on a Cisco 819 ISR. This feature is enabled by default with SIM slot 0 being the primary slot and slot 1 being the secondary (failover) slot.

**Note** For instructions on how to configure the Dual SIM feature for 4G LTE cellular networks, see the *Cisco 4G LTE Software Installation Guide*.

You can configure the Dual SIM feature using the following commands:

| Command | Syntax | Description |
|---|---|---|
| gsm failovertimer | **gsm failovertimer** <1-7> | Sets the failover timer in minutes. |
| gsm sim authenticate | **gsm sim authenticate** <0,7> <pin> **slot** <0-1> | Verifies the SIM CHV1 code. |
| gsm sim max-retry | **gsm sim max-retry** <0-65535> | Specifies the maximum number of failover retries. The default value is 10. |
| gsm sim primary slot | **gsm sim primary slot** <0-1> | Modifies the primary slot assignment. |
| gsm sim profile | **gsm sim profile** <1-16> **slot** <0-1> | Configures the SIM profile. |

Note the following:

- For auto-switch and failover to work, configure the SIM profile for slots 0 and 1 using the **gsm sim profile** command.
- For auto-switch and failover to work, configure the chat script without a specific profile number.
- If no SIM profile is configured, profile #1 is used by default.
- If no GSM failover timer is configured, the default failover timeout is 2 minutes.
- If no GSM SIM primary slot is configured, the default primary SIM is slot 0.

The following example shows you how to set the SIM switchover timeout period to 3 minutes:

```
router(config-controller)# gsm failovertimer 3
```

The following example shows you how to authenticate using an unencrypted pin:

```
router(config-controller)# gsm sim authenticate 0 1234 slot 0
```

The following example shows you how to set the maximum number of SIM switchover retries to 20:

```
router(config-controller)# gsm sim max-retry 20
```

The following example shows you how to set SIM slot 1 as the primary slot:

```
router(config-controller)# gsm sim primary slot 1
```

The following example shows you how to configure the SIM card in slot 0 to use profile 10:

```
router(config-controller)# gsm sim profile 10 slot 0
```

Perform the following commands to manually switch the SIM:

| Command | Syntax | Description |
|---|---|---|
| cellular GSM SIM | **cellular GSM SIM** {lock \| unlock} | Locks or unlocks the SIM. |
| gsm sim | **cellular** <unit> **gsm sim** [lock \| unlock] <pin> | Locks or unlocks the gsm SIM. |
| gsm sim unblock | **cellular** <unit> **gsm sim unblock** <puk> <newpin> | Unblocks the gsm SIM. |
| gsm sim change-pin | **cellular** <unit> **gsm sim change-pin** <oldpin> <newpin> | Changes the PIN of the SIM. |
| gsm sim activate slot | **cellular** <unit> **gsm sim activate slot** <slot_no> | Activates the GSM SIM. |

The following command forces the modem to connect to SIM1:

```
Router# cellular 0 gsm sim activate slot 1
```

# Configuring Router for Image and Config Recovery Using Push Button

A push button feature is available on the Cisco 819 ISR. The reset button on the front panel of the router enables this feature.

Perform the following steps to use this feature:

**Step 1** Unplug power.

**Step 2** Press the reset button on the front panel of the router.

**Step 3** Power up the sytem while holding down the reset button.

The system LED blinks four times indicating that the router has accepted the button push.

Using this button takes effect only during ROMMON initialization. During a warm reboot, pressing this button has no impact on performance. Table 5-4 shows the high level functionality when the button is pushed during ROMMON initialization.

*Table 5-4 Push Button Functionality during ROMMON Initialization*

| ROMMON Behavior | IOS Behavior |
|---|---|
| • Boots using default baud rate.<br>• Performs auto-boot.<br>• Loads the *.default image if available on compact flash<br>**Note** If no *.default image is available, the ROMMON will boot up with the first Cisco IOS image on flash.<br><br>Examples of names for default images: c800-universalk9-mz.SPA.default, c-800-universalk9_npe-mz.151T.default, image.default<br>**Note** You can only have one configuration file with *.cfg option. Having more than one file will result in uncertain operational behavior. | If the configuration named *.cfg is available in nvram storage or flash storage, IOS will perform a backup of the original configuration and will boot up using this configuration.<br>**Note** You can only have one configuration file with *.cfg option. Having more than one file will result in uncertain operational behavior. |

Use the **show platform** command to display the current bootup mode for the router. The following sections show sample outputs when the button is not pushed and when the button is pushed.

## Output When Button Is Not Pushed: Example

```
router# show platform boot-record

Platform Config Boot Record :
============================
Configuration Register at boot time : 0x0
Reset Button Status at Boot Time    : Not Pressed
Startup-config Backup Status at Boot: No Status
Startup-config(backup file)location : No Backup
Golden config file at location      : No Recovery Detected
Config Recovery Status              : No Status
```

## Output When Button Is Pushed: Example

```
router# show platform boot-record

Platform Config Boot Record :
============================
Configuration Register at boot time : 0x0
Reset Button Status at Boot Time    : Pressed
Startup-config Backup Status at Boot: Ok
Startup-config(backup file)location : flash:/startup.backup.19000716-225840-UTC
Golden config file at location      : flash:/golden.cfg
Config Recovery Status              : Ok
```

### Push Button in WLAN AP

When the push button on the front panel is pressed, WLAN AP will perform both image and configuration recovery.

To perform image recovery, WLAN will go into the boot loader so that the user can download the image from the bootloader prompt.

To perform configuration recovery, WLAN AP will overwrite the contents of **flash:/config.txt** with the contents of **flash:/cpconfig-ap802.cfg** file if available in flash drive. Otherwise, **flash:/config.txt** will be deleted.

## Configuring the Fast Ethernet LAN Interfaces

The Fast Ethernet LAN interfaces on your router are automatically configured as part of the default VLAN and are not configured with individual addresses. Access is provided through the VLAN. You may assign the interfaces to other VLANs if you want. For more information about creating VLANs, see the "Configuring the Ethernet Switches" section on page 10-1.

# Configuring a Loopback Interface

The loopback interface acts as a placeholder for the static IP address and provides default routing information.

Perform these steps to configure a loopback interface, beginning in global configuration mode:

#### SUMMARY STEPS

1. **interface** *type number*
2. **ip address** *ip-address mask*
3. **exit**

### DETAILED STEPS

| | Command | Purpose |
|---|---|---|
| **Step 1** | **interface** *type number*<br><br>**Example:**<br>`Router(config)# interface Loopback 0`<br>`Router(config-if)#` | Enters configuration mode for the loopback interface. |
| **Step 2** | **ip address** *ip-address mask*<br><br>**Example:**<br>`Router(config-if)# ip address 10.108.1.1 255.255.255.0`<br>`Router(config-if)#` | Sets the IP address and subnet mask for the loopback interface. |
| **Step 3** | **exit**<br><br>**Example:**<br>`Router(config-if)# exit`<br>`Router(config)#` | Exits configuration mode for the loopback interface and returns to global configuration mode. |

## Example

The loopback interface in this sample configuration is used to support Network Address Translation (NAT) on the virtual-template interface. This configuration example shows the loopback interface configured on the Fast Ethernet interface with an IP address of 200.200.100.1/24, which acts as a static IP address. The loopback interface points back to virtual-template1, which has a negotiated IP address.

```
!
interface loopback 0
ip address 200.200.100.1 255.255.255.0 (static IP address)
ip nat outside
!
interface Virtual-Template1
ip unnumbered loopback0
no ip directed-broadcast
ip nat outside
!
```

## Verifying Configuration

To verify that you have properly configured the loopback interface, enter the **show interface loopback** command. You should see a verification output similar to the following example:

```
Router# show interface loopback 0
Loopback0 is up, line protocol is up
  Hardware is Loopback
  Internet address is 200.200.100.1/24
  MTU 1514 bytes, BW 8000000 Kbit, DLY 5000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation LOOPBACK, loopback not set
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
```

```
  Output queue 0/0, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     0 packets output, 0 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
```

Another way to verify the loopback interface is to ping it:

```
Router# ping 200.200.100.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 200.200.100.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms
```

# Configuring Static Routes

Static routes provide fixed routing paths through the network. They are manually configured on the router. If the network topology changes, the static route must be updated with a new route. Static routes are private routes unless they are redistributed by a routing protocol.

Follow these steps to configure static routes, beginning in global configuration mode.

## SUMMARY STEPS

1. **ip route** *prefix mask* {*ip-address* | *interface-type interface-number* [*ip-address*]}
2. **end**

## DETAILED STEPS

| | Command | Purpose |
|---|---|---|
| **Step 1** | **ip route** *prefix mask* {*ip-address* \| *interface-type interface-number* [*ip-address*]}<br><br>**Example:**<br>`Router(config)# ip route 192.168.1.0 255.255.0.0 10.10.10.2`<br>`Router(config)#` | Specifies the static route for the IP packets.<br><br>For details about this command and about additional parameters that can be set, see *Cisco IOS IP Routing: Protocol-Independent Command Reference*. |
| **Step 2** | **end**<br><br>**Example:**<br>`Router(config)# end`<br>`Router#` | Exits router configuration mode and enters privileged EXEC mode. |

For general information on static routing, see the "Floating Static Routes" section on page B-5.

## Example

In the following configuration example, the static route sends out all IP packets with a destination IP address of 192.168.1.0 and a subnet mask of 255.255.255.0 on the Fast Ethernet interface to another device with an IP address of 10.10.10.2. Specifically, the packets are sent to the configured PVC.

You do not need to enter the command marked "(**default**)." This command appears automatically in the configuration file generated when you use the **show running-config** command.

```
!
ip classless (default)
ip route 192.168.1.0 255.255.255.0 10.10.10.2!
```

## Verifying Configuration

To verify that you have properly configured static routing, enter the **show ip route** command and look for static routes signified by the "S."

You should see a verification output similar to the following:

```
Router# show ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

     10.0.0.0/24 is subnetted, 1 subnets
C       10.108.1.0 is directly connected, Loopback0
S* 0.0.0.0/0 is directly connected, FastEthernet0
```

# Configuring Dynamic Routes

In dynamic routing, the network protocol adjusts the path automatically, based on network traffic or topology. Changes in dynamic routes are shared with other routers in the network.

The Cisco routers can use IP routing protocols, such as Routing Information Protocol (RIP) or Enhanced Interior Gateway Routing Protocol (EIGRP), to learn routes dynamically. You can configure either of these routing protocols on your router.

- Configuring Routing Information Protocol, page 5-29
- Configuring Enhanced Interior Gateway Routing Protocol, page 5-30

# Configuring Routing Information Protocol

To configure the RIP routing protocol on the router, perform these steps, beginning in global configuration mode:

## SUMMARY STEPS

1. **router rip**
2. **version** {**1** | **2**}
3. **network** *ip-address*
4. **no auto-summary**
5. **end**

## DETAILED STEPS

| | Command | Task |
|---|---|---|
| **Step 1** | **`router rip`**<br><br>**Example:**<br>`Router> configure terminal`<br>`Router(config)# router rip`<br>`Router(config-router)#` | Enters router configuration mode and enables RIP on the router. |
| **Step 2** | **`version`** {**1** \| **2**}<br><br>**Example:**<br>`Router(config-router)# version 2`<br>`Router(config-router)#` | Specifies use of RIP version 1 or 2. |
| **Step 3** | **`network`** *ip-address*<br><br>**Example:**<br>`Router(config-router)# network 192.168.1.1`<br>`Router(config-router)# network 10.10.7.1`<br>`Router(config-router)#` | Specifies a list of networks on which RIP is to be applied, using the address of the network of each directly connected network. |
| **Step 4** | **`no auto-summary`**<br><br>**Example:**<br>`Router(config-router)# no auto-summary`<br>`Router(config-router)#` | Disables automatic summarization of subnet routes into network-level routes. This allows subprefix routing information to pass across classfull network boundaries. |
| **Step 5** | **`end`**<br><br>**Example:**<br>`Router(config-router)# end`<br>`Router#` | Exits router configuration mode and enters privileged EXEC mode. |

For general information on RIP, see the "RIP" section on page B-2.

## Example

The following configuration example shows RIP version 2 enabled in IP network 10.0.0.0 and 192.168.1.0.

To see this configuration, use the **show running-config** command from privileged EXEC mode.

```
!
Router# show running-config
router rip
 version 2
 network 10.0.0.0
 network 192.168.1.0
 no auto-summary
!
```

## Verifying Configuration

To verify that you have properly configured RIP, enter the **show ip route** command and look for RIP routes signified by "R." You should see a verification output like the following example:

```
Router# show ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

     10.0.0.0/24 is subnetted, 1 subnets
C       10.108.1.0 is directly connected, Loopback0
R    3.0.0.0/8 [120/1] via 2.2.2.1, 00:00:02, Ethernet0/0
```

# Configuring Enhanced Interior Gateway Routing Protocol

To configure Enhanced Interior Gateway Routing Protocol (EIGRP), perform these steps, beginning in global configuration mode:

### SUMMARY STEPS

1. **router eigrp** *as-number*
2. **network** *ip-address*
3. **end**

### DETAILED STEPS

| | Command | Purpose |
|---|---|---|
| Step 1 | **router eigrp** *as-number*<br><br>**Example:**<br>`Router(config)# router eigrp 109`<br>`Router(config)#` | Enters router configuration mode and enables EIGRP on the router. The autonomous-system number identifies the route to other EIGRP routers and is used to tag the EIGRP information. |
| Step 2 | **network** *ip-address*<br><br>**Example:**<br>`Router(config)# network 192.145.1.0`<br>`Router(config)# network 10.10.12.115`<br>`Router(config)#` | Specifies a list of networks on which EIGRP is to be applied, using the IP address of the network of directly connected networks. |
| Step 3 | **end**<br><br>**Example:**<br>`Router(config-router)# end`<br>`Router#` | Exits router configuration mode and enters privileged EXEC mode. |

For general information on EIGRP concept, see the "Enhanced IGRP" section on page B-3.

## Example

The following configuration example shows the EIGRP routing protocol enabled in IP networks 192.145.1.0 and 10.10.12.115. The EIGRP autonomous system number is 109.

To see this configuration, use the **show running-config** command, beginning in privileged EXEC mode.

```
!
router eigrp 109
    network 192.145.1.0
        network 10.10.12.115
!
```

## Verifying Configuration

To verify that you have properly configured IP EIGRP, enter the **show ip route** command and look for EIGRP routes indicated by "D." You should see a verification output similar to the following:

```
Router# show ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route

Gateway of last resort is not set
     10.0.0.0/24 is subnetted, 1 subnets
C       10.108.1.0 is directly connected, Loopback0
D    3.0.0.0/8 [90/409600] via 2.2.2.1, 00:00:02, Ethernet0/0
```