CHAPTER 3

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.

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 in Appendix A, "Cisco IOS Basic Skills."

Interface Ports

Table 3-1 lists the interfaces that are supported for each router and their associated port labels on the equipment.

Table 3-1 Supported Interfaces and Associated Port Labels by Cisco Router

Router	Interface	Port Label
Cisco 860, Cisco 880, and Cisco 890 series	Fast Ethernet LAN	LAN, FE0–FE3
	Wireless LAN	(no label)
Cisco 861, 861W, 881, 881W, 881G, 881GW	Fast Ethernet WAN	WAN, FE4
Cisco 867, 867W	ADSL2oPOTS WAN	ADSLoPOTS
Cisco 886, 886W, 886G, 886GW	ADSL2oISDN WAN	ADSLoPOTS
Cisco 887, 887W	ADSL2oPOTS WAN	ADSLoPOTS
Cisco 887V, 887VW, 887VG, 887VGW	VDSL2oPOTS WAN	VDSLoPOTS
Cisco 888, 888W	G.SHDSL WAN	G.SHDSL
Cisco 891, 892	Fast Ethernet WAN	FE8
	Gigabit Ethernet WAN	WAN GE 0

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 881W.

```
Router# show running-config


User Access Verification

Password:
Router> en
Password:
Router# show running-config
Building configuration...

Current configuration : 986 bytes
!
version 12.4
no service pad
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Router
!
boot-start-marker
```

```
boot-end-marker
!
enable secret 5 $1$g4y5$NxDeM.0hON6YA51bcfGvN1
enable password ciscocisco
!
no aaa new-model
!
!
!
!
no ip routing
no ip cef
!
!
!
!
!
multilink bundle-name authe
!
!
archive
 log config
  hidekeys
!
!
!
!
!
interface FastEthernet0
!
interface FastEthernet1
 shutdown
!
interface FastEthernet2
 shutdown
!
interface FastEthernet3
 shutdown
!
interface FastEthernet4
 ip address 10.1.1.1 255.255.255.0
 no ip route-cache
 duplex auto
 speed auto
!
interface Vlan1
 no ip address
 no ip route-cache
 shutdown
!
interface wlan-ap0
 description Service Module interface to manage the embedded AP
 ip unnumbered Vlan1
 no cdp enable
 arp timeout 0
!
ip route 0.0.0.0 0.0.0.0 10.1.1.1
!
!
no ip http server
no ip http secure-server
!
!
!
```

```
!
!
control-plane
!
!
line con 0
 no modem enable
line aux 0
line vty 0 4
 password cisco
 login
 transport input telnet ssh
!
scheduler max-task-time 5000

!
webvpn cef
end

Router#
```

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.
  - Determine the IP routing parameter information, including IP address and ATM permanent virtual circuits (PVCs). These PVC parameters are typically virtual path identifier (VPI), virtual circuit identifier (VCI), and traffic-shaping parameters.
  - Determine the number of PVCs that your service provider has given you, along with their VPIs and VCIs.
  - For each PVC determine the type of AAL5 encapsulation supported. It can be one of the following:

AAL5SNAP—This can be either routed RFC 1483 or bridged RFC 1483. For routed RFC 1483, the service provider must provide you with a static IP address. For bridged RFC 1483, you may use DHCP to obtain your IP address, or you may obtain a static IP address from your service provider.

AAL5MUX PPP—With this type of encapsulation, you need to determine the PPP-related configuration items.

- If you plan to connect over an ADSL or G.SHDSL line:
  - Order the appropriate line from your public telephone service provider.

    For ADSL lines—Ensure that the ADSL signaling type is DMT (also known as ANSI T1.413) or DMT Issue 2.

    For G.SHDSL lines—Verify that the G.SHDSL line conforms to the ITU G.991.2 standard and supports Annex A (North America) or Annex B (Europe).

Once 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 3-5.

If you plan to connect voice equipment:

- Seethe *Cisco IOS Voice Port Configuration Guide*

To obtain or change software licenses:

- See *Software Activation On Cisco Integrated Services Routers*

Configuring Command-Line Access

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

	Command	Purpose

Step 1	**line** [**aux** | **console** | **tty** | **vty**] *line-number*
	
	Example:
	`Router(config)# line console 0`
	`Router(config-line)#`
		Enters line configuration mode, and specifies the type of line.
		
		This example specifies a console terminal for access.

Step 2	**password** *password*
	
	Example:
	`Router(config)# password 5dr4Hepw3`
	`Router(config-line)#`
		Specifies a unique password for the console terminal line.

Step 3	**login**
	
	Example:
	`Router(config-line)# login`
	`Router(config-line)#`
		Enables password checking at terminal session login.

	Command	Purpose

Step 4	**exec-timeout** *minutes* [*seconds*]
	
	Example:
	`Router(config-line)# exec-timeout 5 30`
	`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.
		
		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*
	
	Example:
	`Router(config-line)# line vty 0 4`
	`Router(config-line)#`
		Specifies a virtual terminal for remote console access.

Step 6	**password** *password*
	
	Example:
	`Router(config-line)# password aldf2ad1`
	`Router(config-line)#`
		Specifies a unique password for the virtual terminal line.

Step 7	**login**
	
	Example:
	`Router(config-line)# login`
	`Router(config-line)#`
		Enables password checking at the virtual terminal session login.

Step 8	**end**
	
	Example:
	`Router(config-line)# end`
	`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:

	Command	Purpose

Step 1	**configure terminal**
	
	Example:
	`Router> enable`
	`Router# configure terminal`
	`Router(config)#`
		Enters global configuration mode, when using the console port.
		
		If you are connecting to the router using a remote terminal, use the following:
		`telnet router name or address`
		`Login: login id`
		`Password: *********`
		`Router> enable`

Step 2	**hostname** *name*
	
	Example:
	`Router(config)# hostname Router`
	`Router(config)#`
		Specifies the name for the router.

Step 3	**enable secret** *password*
	
	Example:
	`Router(config)# enable secret cr1ny5ho`
	`Router(config)#`
		Specifies an encrypted password to prevent unauthorized access to the router.

Step 4	**no ip domain-lookup**
	
	Example:
	`Router(config)# no ip domain-lookup`
	`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 a Fast Ethernet WAN Interface, page 3-8
- Configuring a Gigabit Ethernet WAN Interface, page 3-9
- Configuring a V.92 Modem Interface, page 3-9
- Configuring a VDSL2 WAN Interface, page 3-11
- Configuring a G.SHDSL WAN Interface, page 3-12
- Configuring the Cellular Wireless WAN Interface, page 3-14

Configuring a Fast Ethernet WAN Interface

To configure the Fast Ethernet interface on a Cisco 861 or 881 ISR, perform these steps, beginning in global configuration mode:

	Command	Purpose

Step 1	**interface** *type number*
	
	Example:
	`Router(config)# interface fastethernet 4`
	`Router(config-if)#`
		Enters the configuration mode for a Fast Ethernet WAN interface on the router.

Step 2	**ip address** *ip-address mask*
	
	Example:
	`Router(config-if)# ip address 192.168.12.2 255.255.255.0`
	`Router(config-if)#`
		Sets the IP address and subnet mask for the specified Fast Ethernet interface.

Step 3	**no shutdown**
	
	Example:
	`Router(config-if)# no shutdown`
	`Router(config-if)#`
		Enables the Ethernet interface, changing its state from administratively down to administratively up.

Step 4	**exit**
	
	Example:
	`Router(config-if)# exit`
	`Router(config)#`
		Exits configuration mode for the Fast Ethernet interface and returns to global configuration mode.

Configuring a Gigabit Ethernet WAN Interface

To configure the Gigabit Ethernet interface on a Cisco 891 or 892 ISR, perform these steps, beginning in global configuration mode:

	Command	Purpose

Step 1	**interface** *type number*
	
	Example:
	`Router(config)# interface gigabitethernet 1`
	`Router(config-if)#`
		Enters the configuration mode for a Gigabit Ethernet WAN interface on the router.

Step 2	**ip address** *ip-address mask*
	
	Example:
	`Router(config-if)# ip address 192.168.12.2 255.255.255.0`
	`Router(config-if)#`
		Sets the IP address and subnet mask for the specified Gigabit Ethernet interface.

Step 3	**no shutdown**
	
	Example:
	`Router(config-if)# no shutdown`
	`Router(config-if)#`
		Enables the Ethernet interface, changing its state from administratively down to administratively up.

Step 4	**exit**
	
	Example:
	`Router(config-if)# exit`
	`Router(config)#`
		Exits configuration mode for the Gigabit Ethernet interface and returns to global configuration mode.

Configuring a V.92 Modem Interface

The Cisco 891 ISR has a V.92 modem backup interface. To configure this interface, perform these steps, beginning in global configuration mode:

	Command	Purpose
Step 1	**interface** *type number* **Example:** `Router(config)# interface async 1`	Enters the configuration mode for a V.92 WAN interface (serial interface) on the router.
Step 2	**ip address** *ip-address mask* **Example:** `Router(config-if)# ip address 192.168.12.2 255.255.255.0`	Sets the IP address and subnet mask for the specified V.92 interface.

	Command	Purpose
Step 3	**encapsulation** *ppp* **Example:** `Router(config-if)# encapsulation ppp`	Sets the encapsulation method to point-to-point protocol (PPP) for the serial interface.
Step 4	**dialer in-band** **Example:** `Router(config-if)# dialer in-band`	Specifies that dial-on-demand routing (DDR) is supported.
Step 5	**dialer string** *dial-string* **Example:** `Router(config-if)# dialer string 102`	Specifies the string (telephone number) to be used when placing a call from the interface.
Step 6	**dialer-group** *group-number* **Example:** `Router(config-if)# dialer-group 1`	Configures the interface to belong to a specific dialing access group.
Step 7	**async mode dedicated** **Example:** `Router(config-if)# async mode dedicated`	Places the line into dedicated asynchronous mode using Serial Line Internet Protocol (SLIP) or PPP encapsulation.

Step 8	**exit**
	
	Example:
	`Router(config-if)# exit`
	`Router(config)#`
		Exits configuration mode for the V.92 interface and returns to global configuration mode.

Configuring a VDSL2 WAN Interface

The VDSL2 WAN interface is used on the Cisco 887V ISR platforms. Note that the VDSL2 WAN interface uses Ethernet as the Layer 2 transport mechanism. To configure VDSL2 on the Cisco 887V ISR, perform these steps, beginning in global configuration mode.

	Command	Purpose

Step 1	**controller** *vdsl 0*
	
	Example:
	`Router# config t`
	`Router(config)# controller vdsl 0`
		Enters controller configuration mode and the controller number.
		
		Note There is no need to configure any VDSL2 parameters from CPE side. Any specific VDSL2 settings should be set on the DSLAM side.

Step 2	**interface** *type number*
	
	Example:
	`Router(config)# interface ethernet 0`
	`Router(config-if)#`
		Enters the configuration mode for Ethernet Layer 2 transport on the VDSL WAN interface on the router.

Step 3	**ip address** *ip-address mask*
	
	Example:
	`Router(config-if)# ip address 192.168.12.2 255.255.255.0`
	`Router(config-if)#`
		Sets the IP address and subnet mask for the interface.

Step 4	**shutdown**
	
	Example:
	`Router(config-if)# no shutdown`
	`Router(config-if)#`
		Disables the interface, changing its state from administratively up to administratively down.

Step 5	**no shutdown**
	
	Example:
	`Router(config-if)# no shutdown`
	`Router(config-if)#`
		Enables the interface, changing its state from administratively down to administratively up.

Step 6	**exit**
	
	Example:
	`Router(config-if)# exit`
	`Router(config)#`
		Exits configuration mode and returns to global configuration mode.

Configuring a G.SHDSL WAN Interface

To configure G.SHDSL on the Cisco 888 ISR perform these steps, beginning in global configuration mode:

	Command	Purpose
Step 1	`Router(config)# controller dsl 0`	Enters controller configuration mode and the controller number.
Step 2	`Router(config-ctrl)# mode atm`	Enables ATM encapsulation and creates logical ATM interface 0.
Step 3	`Router(config-ctrl)# line-term cpe`	Enables CPE.
Step 4	`Router(config-ctrl)# line-mode 4 wire standard`	Enables 4 wire operation.
Step 5	`Router(config-ctrl)# line-rate 4608`	Specifies the DSL line rate for the SHDSL port. The range is 192 to 2312 kb/s. The default is **auto** (negotiated between the SHDSL port and the DSLAM). **Note** If different DSL line rates are configured at opposite ends of the DSL uplink, the actual DSL line rate is always the lower rate. **Note** The maximum peak cell rate is 8 kb/s less than the line rate.
Step 6	`Router(config-ctrl)# interface atm0`	Enters ATM configuration mode for interface ATM 0.
Step 7	`Router(config-ctrl)#ip-address IP-address`	Assigns an IP address to the DSL ATM interface.
Step 8	`Router(config-ctrl)#load-interval 3`	
Step 9	`Router(config-ctrl)# no atm ilmi-keepalive0`	(Optional) Disables Integrated Local Management Interface (ILMI) keepalives. If you enable ILMI keepalives without specifying the number of seconds, the default time interval is 3 seconds.

	Command	Purpose
Step 10	`Router(config-ctrl)# pvc 0/35`	Enters atm-virtual-circuit (interface-atm-vc) configuration mode, and configures a new ATM PVC by assigning a name (optional) and VPI/VCI numbers. The default traffic shaping is UBR; the default encapsulation is AAL5+LLC/SNAP.
Step 11	`Router(config-ctrl)# protocol ip 10.10.10.2 broadcast`	(Optional) Enables IP connectivity and creates a point-to-point IP address for the VC.
Step 12	`Router(config-ctrl)# encapsulation aal5snap`	(Optional) Configures the ATM adaptation layer (AAL) and encapsulation type. • Use the **aal2** keyword for AAL2 • Use the **aal5ciscoppp** keyword for Cisco PPP over AAL5 • Use the **aal5mux** keyword for AAL5+MUX • Use the **aal5nlpid** keyword for AAL5+NLPID • Use the **aal5snap** keyword for AAL5+LLC/SNAP (the default)

Example

The following configuration example shows a 4-wire standard G.SHDSL configuration.

```
!
controller DSL 0
 mode atm
 line-term cpe
 line-mode 4-wire standard
 dsl-mode shdsl symmetric annex B
 line-rate 4608
!
interface BRI0
 no ip address
 encapsulation hdlc
 shutdown
 isdn termination multidrop
!
!
interface ATM0
 ip address 10.10.10.1 255.255.255.0
 no atm ilmi-keepalive
 pvc 0/35
  protocol ip 10.10.10.2 broadcast
  encapsulation aal5snap
 !
!
interface FastEthernet0
!
interface FastEthernet1
!
interface FastEthernet2
```

```
!
interface FastEthernet3
 shutdown
!
interface Vlan1
 ip address 2.15.15.26 255.255.255.0
!
ip forward-protocol nd
ip route 223.255.254.254 255.255.255.255 Vlan1
no ip http server
no ip http secure-server
!
```

Verifying Configuration

To verify that you have properly configured the router, enter the **show run** command and look for controller DSL and interface ATM0 paramters.

```
Router#sh run
Building configuration...

Current configuration : 1298 bytes
!
.......

!
controller DSL 0
 mode atm
 line-term cpe
 line-mode 4-wire standard
 dsl-mode shdsl symmetric annex B
 line-rate 4608
!
!
interface ATM0
 ip address 10.10.10.1 255.255.255.0
 no atm ilmi-keepalive
 pvc 0/31
  protocol ip 10.10.10.5 broadcast
  encapsulation aal5snap
 !
```

Configuring the Cellular Wireless WAN Interface

The Cisco 880 series 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-mm PCMCIA slot.

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, page 3-15
- Restrictions for Configuring the Cellular Wireless Interface, page 3-16

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 the following URL:

  http://www.cisco.com/en/US/prod/routers/networking_solutions_products_genericcontent0900aecd80601f7e.html
- 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 3-2.
- You should be familiar with the Cisco IOS software, beginning with Cisco IOS Release 12.4(15)XZ or later for Cisco 3G Wireless support. (See the Cisco IOS documentation.)
- To configure your GSM data profile, you will need the following information from your service provider:
  - Username
  - Password
  - Access point name (APN)
- To configure your CDMA 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)

Table 3-2 Front Panel LED Signal Strength Indications

LED	LED Color	Signal Strength
3G RSSI[1]	Amber	No service available and no RSSI detected
	Solid green	High RSSI (-69 dBm or higher)
	Fast (16 Hz) blinking green	Medium RSSI (-89 to -70 dBm)
	Slow (1 Hz) blinking green	Low to medium RSSI (-99 to -90 dBm), minimum level for a reliable connection
	Off	Low RSSI (less than -100 dBm)

1. 3G receive signal strength indication

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 not currently supported.
- Any restrictions that are part of the terms of service from your carrier also apply to the Cisco 3G wireless interface.
- The Cisco 880G ISR does not support online insertion and removal (OIR) of 3G modems. To replace a modem with another modem of the same modem type, use the Cisco CLI to enter the **shutdown** command on the cellular interface before you replace the modems.
- When a 3G modem is removed, the **show interface cellular 0**, **show run**, and **show version** outputs will still display cellular interface related information. The **show interface** command wil display the message below, all other show commands will have empty outputs.

  ```
  3G Modem not inserted
  ```

- You can configure the cellular interface when the 3G modem is removed. However, the configuration will not be effective until the 3Gmodem is inserted. The following message will be shown when trying to configure the cellular interface while modem is absent.

  ```
  Router(config)#interface cellular 0
  Warning: 3G Modem is not inserted
  Configuration will not be effective until modem is inserted
  ```

- Inserting a modem of different type than 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 3-17
- Configuring a GSM Modem Data Profile, page 3-18
- CDMA Modem Activation and Provisioning, page 3-18

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 radio**
5. **show cellular 0 profile**
6. **show cellular 0 security**
7. **show cellular 0 all**

DETAILED STEPS

	Command or Action	Purpose
Step 1	`Router# show cellular 0 network` **Example:** `Router# show cellular 0 network`	Displays information about the carrier network, cell site, and available service.
Step 2	`Router# show cellular 0 hardware` **Example:** `Router# show cellular 0 hardware`	Displays the cellular modem hardware information.
Step 3	`Router# show cellular 0 connection` **Example:** `Router# show cellular 0 connection`	Displays the current active connection state and data statistics.
Step 4	`Router# show cellular 0 radio` **Example:** `Router# show cellular 0 radio`	Shows the radio signal strength. **Note** The RSSI should be better than -90 dBm for steady and reliable connection.

Step 5	`Router# show cellular 0 profiles`
	
	Example:
	`Router# show cellular 0 profile`
		Shows information about the modem data profiles created.

	Command or Action	Purpose
Step 6	`Router# show cellular 0 security` **Example:** `Router# show cellular 0 security`	Shows the security information for the modem, such as SIM and modem lock status.
Step 7	`Router# show cellular 0 all` **Example:** `Router# show cellular 0 all`	Shows consolidated information about the modem. 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 gsm profile create** <*profile number*> <*apn*> <*authentication*> <*username*> <*password*>

DETAILED STEPS

Command or Action	Purpose

`Router# cellular 0 gsm profile create <profile number> <apn> <authentication> <username> <password>`
 	
Example:
`Router# cellular 0 gsm profile create 3 apn.com chap GSM GSMPassword`
	Creates a new modem data profile. See Table 3-3 for details about the command parameters.

The following table lists the modem data profile parameters.

Table 3-3 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	The type of authentication. For example, CHAP, PAP.
Username	The username provided by your service provider.
Password	The 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.

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. Over the Air Service Provisioning
2. Internet Over the Air

Manual Activation

Note You must have valid mobile directory numner (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 0 cdma activate manual mdn msid sid nid 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 cdma activate manual** command.

Here is a sample output from this command:

```
router# cellular 0 cdma activate manual 1234567890 1234567890 1234 12 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 commited 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 refresh 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:

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.

Here is a sample output from this command:

```
router# cellular 0 cdma activate otasp  *22899
Beginning OTASP activation
OTASP number is *22899
steelers_c881G#
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 commited 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** <*host*>
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	`Router# configure terminal` **Example:** `Router# configure terminal`	Enters global configuration mode from the terminal.

Step 2	`Router(config)# interface cellular 0`
	
	Example:
	`Router (config)# interface cellular 0`
		Specifies the cellular interface.

Step 3	`Router(config-if)# encapsulation ppp`
	
	Example:
	`Router (config-if)# encapsulation ppp`
		Specifies PPP encapsulation for an interface configured for dedicated asynchronous mode or dial-on-demand routing (DDR).

Step 4	`Router(config-if)# ppp chap hostname <hostname>`
	
	Example:
	`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	`Router(config-if)# ppp chap password 0 <password>`
	
	Example:
	`Router (config-if)# ppp chap password 0 cisco`
		Defines an interface-specific CHAP password. This must match the password given by the carrier.

Step 6	`Router(config-if)# asynchronous mode interactive`
	
	Example:
	`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	`Router(config-if)# ip address negotiated`
	
	Example:
	`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 **ip address unnumbered** <*cellular interface*>, 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 3-24.

Configuring DDR

To configure dial-on-demand routing (DDR) for the cellular interface, follow these steps.

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**
14. **interface cellular 0**
15. **dialer string** <*string*>

DETAILED STEPS

	Command or Action	Purpose
Step 1	`Router# configure terminal` **Example:** `Router# configure terminal`	Enters global configuration mode.

Step 2	`Router(config)# interface cellular 0`
	
	Example:
	`Router (config)# interface cellular 0`
		Specifies the cellular interface.

Step 3	`Router(config-if)# dialer in-band`
	
	Example:
	`Router (config-if)# dialer in-band`
		Enables DDR and configures the specified serial interface for in-band dialing.

Step 4	`Router(config-if)# dialer idle-timeout <seconds>`
	
	Example:
	`Router (config-if)# dialer idle-timeout 30`
		Specifies the duration of idle time, in seconds, after which a line will be disconnected.

	Command or Action	Purpose

Step 5	`Router(config-if)# dialer string <string>`
	
	Example:
	`Router (config-if)# dialer string gsm`
		Specifies the number or string to dial. Use the name of the chat script here.

Step 6	`Router(config-if)# dialer-group <number>`
	
	Example:
	`Router (config-if)# dialer-group 1`
		Specifies the number of the dialer access group to which a specific interface belongs.

Step 7	`Router(config-if)# exit`
	
	Example:
	`Router (config-if)# exit`
		Enters the global configuration mode.

Step 8	`Router(config)# dialer-list <dialer-group> protocol <protocol-name> {permit | deny | list <access-list-number> | access-group}>`
	
	Example:
	`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	`Router(config)# ip access-list <access list number> permit <ip source address>`
	
	Example:
	`Router (config)# ip access list 1 permit any`
		Defines traffic of interest.

Step 10	`Router(config)# line 3`
	
	Example:
	`Router (config-line)# line 3`
		Specifies the line configuration mode. It is always 3.

Step 11	`Router(config-line)script dialer <regexp>`
	
	Example:
	`Router (config-line)# script-dialer gsm`
		Specifies a default modem chat script.

Step 12	`Router(config-line)exit`
	
	Example:
	`Router (config-line)# exit`
		Exits line configuration mode.

	Command or Action	Purpose

Step 13	For GSM:
	`Router(config)# chat-script <script name> "" "ATDT*99*<profile number>#" TIMEOUT <timeout value> CONNECT`
	
	For CDMA:
	`Router(config)# chat-script <script name> "" "ATDT*777*<profile number>#" TIMEOUT <timeout value> CONNECT`
	
	Example:
	`Router (config)# chat-script gsm "" "ATDT*98*2#" TIMEOUT 60 "CONNECT"`
		This line is for GSM
		
		This line is for CDMA
		
		Defines the Attention Dial Tone (ATDT) commands when the dialer is initiated.

Step 14	`Router(config)# interface cellular 0`
	
	Example:
	`Router (config)# interface cellular 0`
		Specifies the cellular interface.

Step 15	`Router(config-if)# dialer string <string>`
	
	Example:
	`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 3-24
- Tunnel over Cellular Interface Configuration, page 3-25

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. 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
```

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 Chapter 6, "Configuring the Ethernet Switches."

Configuring the Wireless LAN Interface

The Cisco 860, Cisco 880, and Cisco 890 series wireless routers have an integrated 802.11n module for wireless LAN connectivity. The router can then act as an access point in the local infrastructure. For more information about configuring a wireless connection, see Chapter 8, "Basic Wireless Device Configuration."

Configuring a Loopback Interface

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

To configure a loopback interface perform these steps, beginning in global configuration mode:

	Command	Purpose

Step 1	**interface** *type number*
	
	Example:
	`Router(config)# interface Loopback 0`
	`Router(config-if)#`
		Enters configuration mode for the loopback interface.

Step 2	**ip address** *ip-address mask*
	
	Example:
	`Router(config-if)# ip address 10.108.1.1 255.255.255.0`
	`Router(config-if)#`
		Sets the IP address and subnet mask for the loopback interface.

Step 3	**exit**
	
	Example:
	`Router(config-if)# exit`
	`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 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.

To configure static routes perform these steps, beginning in global configuration mode:

	Command	Purpose

Step 1	**ip route** *prefix mask* {*ip-address* | *interface-type interface-number* [*ip-address*]}
	
	Example:
	`Router(config)# ip route 192.168.1.0 255.255.0.0 10.10.10.2`
	`Router(config)#`
		Specifies the static route for the IP packets.
		
		For details about this command and about additional parameters that can be set, see the *Cisco IOS IP Routing Protocols Command Reference*.

Step 2	**end**
	
	Example:
	`Router(config)# end`
	`Router#`
		Exits router configuration mode, and enters privileged EXEC mode.

For general information on static routing, see Appendix B, "Floating Static Routes."

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 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 3-29
- Configuring Enhanced Interior Gateway Routing Protocol, page 3-31

Configuring Routing Information Protocol

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

	Command	Task

Step 1	**router rip**
	
	Example:
	`Router> configure terminal`
	`Router(config)# router rip`
	`Router(config-router)#`
		Enters router configuration mode, and enables RIP on the router.

Step 2	**version** {**1** | **2**}
	
	Example:
	`Router(config-router)# version 2`
	`Router(config-router)#`
		Specifies use of RIP version 1 or 2.

Step 3	**network** *ip-address*
	
	Example:
	`Router(config-router)# network 192.168.1.1`
	`Router(config-router)# network 10.10.7.1`
	`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.

	Command	Task

Step 4	**no auto-summary**
	
	Example:
	`Router(config-router)# no auto-summary`
	`Router(config-router)#`
		Disables automatic summarization of subnet routes into network-level routes. This allows subprefix routing information to pass across classful network boundaries.

Step 5	**end**
	
	Example:
	`Router(config-router)# end`
	`Router#`
		Exits router configuration mode, and enters privileged EXEC mode.

For general information on RIP, see Appendix B, "RIP."

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 example shown below.

```
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 GRP (EGRP) perform these steps, beginning in global configuration mode:

	Command	Purpose

Step 1	**router eigrp** *as-number*
	
	Example:
	`Router(config)# router eigrp 109`
	`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*
	
	Example:
	`Router(config)# network 192.145.1.0`
	`Router(config)# network 10.10.12.115`
	`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**
	
	Example:
	`Router(config-router)# end`
	`Router#`
		Exits router configuration mode, and enters privileged EXEC mode.

For general information on EIGRP concepts, see Appendix B, "Enhanced IGRP."

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 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
```