CHAPTER 4

Configuring Small Office to ISP Networks

This chapter describes how to configure three small-office-to-Internet service provider (ISP) networks, which Table 4-1 presents.

Table 4-1 Sample Networks

No.	WAN Options	WAN Encapsulation	Routed Protocols	Other Features	Configuration Options
1	Synchronous leased line	PPP	IP	Static IP route	• Cisco 805 Fast Step software • CLI
2	Asynchronous dial-up line	PPP	IP	• Static IP route • Easy IP (Phase 1) – Network Address Translation (NAT) and Point-to-Point Protocol/IP Control Protocol (PPP/IPCP) • Firewall	• Cisco 805 Fast Step software (template option) • CLI
3	Frame Relay	Frame Relay	IP	• Static IP route • NAT overload • Firewall	• Cisco 805 Fast Step software • CLI

Note Cisco Systems strongly recommends that inexperienced network administrators use the Cisco 805 Fast Step software to configure sample networks 1 and 3. The Cisco 805 Fast Step software might configure the sample networks differently than is described in this guide.

The Cisco 805 Fast Step software is a Windows 95, Windows NT, and Windows 98 based configuration tool included with the Cisco 805 router. For more information, refer to the Cisco 805 Fast Step CD-ROM.

For more information on configuring your router using the CLI, continue reading this chapter.

Before Configuring Networks

Refer to Table 4-2 to determine what you need to do before configuring each network.

Table 4-2 Before Configuring Networks

Number	WAN Options	What You Must Do
1	Leased line, PPP	• Set up IP address scheme. • Buy a range of registered IP addresses for your router Ethernet interface and your LAN devices that require Internet access from the ISP. (If you plan to configure this sample network using the Cisco 805 Fast Step software, you must also buy a registered IP address for your router serial interface.) • Order leased line from your WAN service provider.
2	Dial-up line, PPP	• Set up IP address scheme. • Ask your ISP to provide the following information: — PPP client name that the ISP assigns as your login name. — PPP password to access your ISP account. — ISP telephone number to dial when you want to establish Internet connection. — PPP authentication protocol used by ISP. (Challenge Handshake Authentication Protocol [CHAP] or Password Authentication Protocol [PAP][1].) • Buy one registered IP address for router dialer interface. • Order dial-up line from WAN service provider.

Table 4-2 Before Configuring Networks (continued)

Number	WAN Options	What You Must Do
3	Frame Relay	• Set up IP address scheme. • Do the following with the ISP: — Buy one registered IP address for router serial interface. — Ask ISP to provide IP address and subnet mask of ISP serial interface. • Do the following with the WAN service provider: — Order one PVC. — Ask WAN service provider to provide LMI type.

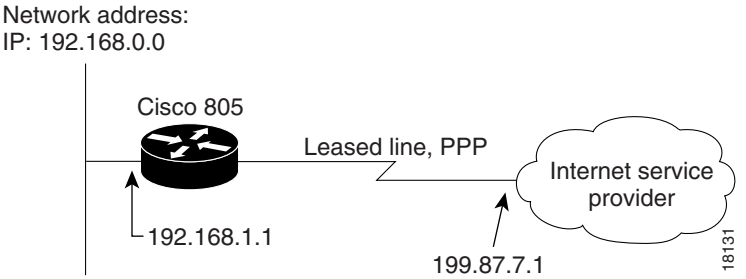
1 For more information on CHAP and PAP, refer to Appendix C, "Concepts."

Network 1: Leased Line, PPP

Figure 4-1 shows a sample small office network connected to an ISP with a synchronous leased line. This sample network uses IP as the only routed protocol. Instead of using a dynamic routing protocol such as RIP to learn the route to the ISP, this network uses a *static IP route*, which is a user-defined route to the ISP.

This network uses registered IP addresses on the router Ethernet interface and on the LAN devices that require Internet access. (You can buy a range of registered IP addresses from your ISP.) To save the cost of buying a registered IP address for the router serial interface, this interface uses the IP address assigned to the Ethernet interface. (If you configure this sample network using the Cisco 805 Fast Step software, you must buy a registered IP address for the router serial interface.)

Figure 4-1 Network 1



Configuring the Cisco 805 Router

To configure the features for this sample network, perform the tasks described in the following sections on a PC. A sample configuration file that illustrates how to configure the network is presented after the tasks.

After your router boots, the following prompt displays. Enter **no**.

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

For complete information on how to access global configuration mode, refer to the "Entering Global Configuration Mode" section in Chapter 2, "Cisco IOS Basic Skills." For more information on the commands used in the following tables, refer to the Cisco IOS Release 12.0 documentation set.

Global Parameters

Use the following table to configure the router for global parameters.

Step	Task	Router Prompt	Command
1	Enter configuration mode.	`Router#`	**configure terminal**
2	Specify name for router.	`Router (config)#`	**hostname** *name*
3	Specify encrypted password to prevent unauthorized access to router.	`Router (config)#`	**enable secret** <*password*>
4	Configure router to recognize zero subnet range as valid range of addresses.	`Router (config)#`	**ip subnet-zero**
5	Disable router from translating unfamiliar words (typos) entered during a console session into IP addresses.	`Router (config)#`	**no ip domain-lookup**

Ethernet Interface

Use the following table to configure the Ethernet interface.

Step	Task	Router Prompt	Command
1	Enter configuration mode for Ethernet interface.	`Router (config)#`	**interface ethernet 0**
2	Set IP address and subnet mask.	`Router (config-if)#`	**ip address** *ip-address mask*
3	Enable interface and configuration changes just made to interface.	`Router (config-if)#`	**no shutdown**
4	Exit configuration mode for Ethernet interface.	`Router (config-if)#`	**exit**

Serial Interface

Use the following table to configure the serial interface.

Step	Task	Router Prompt	Command
1	Enter configuration mode for serial interface.	`Router (config)#`	**interface serial 0**
2	Set IP address to address used on Ethernet interface.	`Router (config-if)#`	**ip unnumbered ethernet 0**
3	Specify PPP as encapsulation (framing) method.	`Router (config-if)#`	**encapsulation ppp**
4	Enable interface and configuration changes just made to interface.	`Router (config-if)#`	**no shutdown**
5	Exit configuration mode for serial interface.	`Router (config-if)#`	**exit**
6	Set up a static route to ISP router.	`Router (config)#`	**ip route 0.0.0.0 0.0.0.0 serial 0**

Command-Line Access to the Router

Use the following table to configure parameters to control access to the router.

Step	Task	Router Prompt	Command
1	Enter line configuration mode, and specify the console terminal line.	`Router (config)#`	**line console 0**
2	Specify a unique password on the line.	`Router (config-line)#`	**password** *<password>*
3	Enable password checking at terminal session login.	`Router (config-line)#`	**login**
4	Specify a virtual terminal for remote console access.	`Router (config-line)#`	**line vty 0 4**
5	Specify a unique password on the line.	`Router (config-line)#`	**password** *<password>*

Step	Task	Router Prompt	Command
6	Enable password checking at virtual terminal session login.	`Router (config-line)#`	**login**
7	Exit line configuration mode, and return to privileged EXEC mode.	`Router (config-line)#`	**end**

Sample Configuration

The following is a sample configuration based on performing the tasks in "Configuring the Cisco 805 Router" section on page 4-4. 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** command.

```
Current configuration:
!
version 12.0
no service pad (default)
service timestamps debug uptime (default)
service timestamps log uptime (default)
no service password-encryption (default)
hostname Cisco805
enable secret 5 $1$RnI.$K4mh5q4MFetaqKzBbQ7gv0
ip subnet-zero
no ip domain-lookup
!
interface Ethernet0
ip address 192.168.1.1 255.255.255.0
no ip directed-broadcast (default)
!
interface Serial0
ip unnumbered ethernet 0
no ip directed-broadcast (default)
encapsulation ppp
!
no ip http server (default)
ip classless (default)
!
ip route 0.0.0.0 0.0.0.0 serial 0
!
line con 0
exec-timeout 10 0 (default)
```

```
password 4youreyesonly
login
transport input none (default)
stopbits 1 (default)
line vty 0 4
password secret
login
!
end
```

Network 2: Dial-up Line, PPP

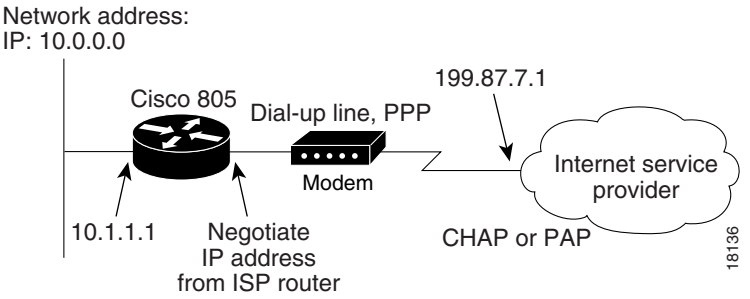
Figure 4-2 shows a sample small office network connected to an ISP with a asynchronous dial-up line running PPP. This sample network uses IP as the only routed protocol. Instead of using a dynamic routing protocol such as RIP to learn the route to the ISP, this network uses a *static IP route*, which is a user-defined route to the ISP.

This sample network uses the dial-on-demand routing (DDR) implementation of dialer profiles. For conceptual information, refer to the "Dialer Profiles" section in Appendix C, "Concepts."

This sample network uses nonregistered IP addresses on the router Ethernet interface and the LAN devices. To solve the problem of using nonregistered IP addresses when accessing the Internet, this sample network uses Easy IP (Phase 1). This feature combines NAT and PPP/IPCP. With this feature, the Cisco 805 router can automatically negotiate a registered IP address for the router dialer interface from the ISP router. All devices in this sample network can use this registered IP address when accessing the Internet. For more information on this feature, including configuration information, refer to the "Configuring Easy IP (Phase 1)" section in Chapter 5, "Advanced Features."

You can also configure the firewall feature in this sample network.

Figure 4-2 Network 2



Configuring the Cisco 805 Router

To configure the features for this sample network, perform the tasks described in the following sections on a PC. A sample configuration file that illustrates how to configure the network is presented after the tasks.

After your router boots, the following prompt displays. Enter **no**.

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

For complete information on how to access global configuration mode, refer to the "Entering Global Configuration Mode" section in Chapter 2, "Cisco IOS Basic Skills." For more information on the commands used in the following tables, refer to the Cisco IOS Release 12.0 documentation set.

Global Parameters

Use the following table to configure the router for global parameters.

Step	Task	Router Prompt	Command
1	Enter configuration mode.	`Router#`	**configure terminal**
2	Specify name for router.	`Router (config)#`	**hostname** *name*
3	Specify encrypted password to prevent unauthorized access to router.	`Router (config)#`	**enable secret** <*password*>
4	Configure router to recognize zero subnet range as valid range of addresses.	`Router (config)#`	**ip subnet-zero**
5	Disable router from translating unfamiliar words (typos) entered during a console session into IP addresses.	`Router (config)#`	**no ip domain-lookup**

Ethernet Interface

Use the following table to configure the Ethernet interface.

Step	Task	Router Prompt	Command
1	Enter configuration mode for Ethernet interface.	`Router (config)#`	**interface ethernet 0**
2	Set IP address and subnet mask.	`Router (config-if)#`	**ip address** *ip-address mask*
3	Enable interface and configuration changes just made to interface.	`Router (config-if)#`	**no shutdown**
4	Exit configuration mode for Ethernet interface.	`Router (config-if)#`	**exit**

Serial Interface

Use the following table to configure the serial interface.

Step	Task	Router Prompt	Command
1	Enter configuration mode for serial interface.	`Router (config)#`	**interface serial 0**
2	Remove any IP address associated with interface.	`Router (config-if)#`	**no ip address**
3	Specify PPP as encapsulation (framing) type.	`Router (config-if)#`	**encapsulation ppp**
4	Enable CHAP and/or PAP, and specify authentication on incoming (received) calls only.	`Router (config-if)#`	**ppp authentication chap pap callin** or **ppp authentication chap callin** or **ppp authentication pap callin**
5	Specify mode of serial interface as asynchronous.	`Router (config-if)#`	**physical-layer async**
6	Configure asynchronous line for data traffic.	`Router (config-if)#`	**async mode dedicated**
7	Specify that you are using DDR.	`Router (config-if)#`	**dialer in-band**
8	Set up dialer pool, and assign serial interface to the dialer pool.	`Router (config-if)#`	**dialer pool-member** *number*
9	Enable interface and configuration changes just made to interface.	`Router (config-if)#`	**no shutdown**
10	Exit serial configuration mode.	`Router (config-if)#`	**exit**

Dialer Profile

To configure the dialer profile, you must set up a dialer interface and dialer pool. (Dialer pools are set up with the serial interface.) For conceptual information, refer to the "Dialer Profiles" section in Appendix C, "Concepts."

Use the following table to configure the dialer interface.

Step	Task	Router Prompt	Command
1	Enter configuration mode for and define dialer rotary group.	`Router (config)#`	**interface dialer 1**
2	Specify PPP as encapsulation (framing) type.	`Router (config-if)#`	**encapsulation ppp**
3	Specify ISP router authentication name.	`Router (config-if)#`	**dialer remote-name** *name*
4	Specify amount of idle time before calls are disconnected.	`Router (config-if)#`	**dialer idle-timeout** *seconds* **either**
5	Specify telephone number of ISP router.	`Router (config-if)#`	**dialer string** *string* **modem-script** *chat-script-name*
6	Specify dialer pool to use for calls to ISP. (Dialer pool was set up in "Serial Interface" section on page 4-11.)	`Router (config-if)#`	**dialer pool** *number*
7	Assign dialer interface to a dialer group.	`Router (config-if)#`	**dialer-group** *number*
8	Enable CHAP and/or PAP, and specify authentication on incoming (received) calls only.	`Router (config-if)#`	**ppp authentication chap pap callin** or **ppp authentication chap callin** or **ppp authentication pap callin**
9	Set up CHAP hostname and password.	`Router (config-if)#`	**ppp chap hostname** *hostname* **ppp chap password** <*secret*>
10	Set up PAP username and password.	`Router (config-if)#`	**ppp pap sent-username** *username* **password** <*password*>
11	Disable CDP.	`Router (config-if)#`	**no cdp enable**
12	Enable interface and configuration changes just made to interface.	`Router (config-if)#`	**no shutdown**
13	Exit configuration mode for dialer interface.	`Router (config-if)#`	**exit**
14	Set up static route to ISP router.	`Router (config)#`	**ip route 0.0.0.0 0.0.0.0 dialer 1**

Step	Task	Router Prompt	Command
15	Create script that causes connected modem to place call to ISP router.	`Router (config)#`	**chat-script** *script-name expect-send*
16	Set up dialer list that determines that IP triggers a call.	`Router (config)#`	**dialer-list** *dialer-group* **protocol ip permit**

For information on controlling the types of traffic that can activate your dial-up line and increase your monthly dial-up line cost, refer to the "Controlling Dial-up Line Activation" section in Chapter 5, "Advanced Features."

Asynchronous Line

Use the following table to configure the asynchronous line.

Step	Task	Router Prompt	Command
1	Enter configuration mode for asynchronous line (line 1).	`Router (config)#`	**line 1**
2	Specifies that router should send and listen to flow control information from attached serial device.	`Router (config-line)#`	**flowcontrol hardware**
3	Specify that all protocols can connect to line 1.	`Router (config-line)#`	**transport input all**
4	Configure line 1 for both incoming and outgoing calls.	`Router (config-line)#`	**modem inout**
5	Set baud rate.	`Router (config-line)#`	**speed 115200**
6	Set stop bits.	`Router (config-line)#`	**stopbits 1**
7	Exit configuration mode for serial interface.	`Router (config-if)#`	**exit**

Easy IP (Phase 1)

For information on configuring Easy IP (Phase 1), refer to the "Configuring Easy IP (Phase 1)" section in Chapter 5, "Advanced Features."

Firewall Feature

For information on configuring a firewall, refer to the *Cisco IOS Firewall Feature Set* feature module, which appears on Cisco Connection Online (CCO) only.

Command-Line Access to the Router

Use the following table to configure parameters to control access to the router.

Step	Task	Router Prompt	Command
1	Enter line configuration mode, and specify the console terminal line.	`Router (config)#`	**line console 0**
2	Specify a unique password on the line.	`Router (config-line)#`	**password** <*password*>
3	Enable password checking at terminal session login.	`Router (config-line)#`	**login**
4	Specify a virtual terminal for remote console access.	`Router (config-line)#`	**line vty 0 4**
5	Specify a unique password on the line.	`Router (config-line)#`	**password** <*password*>
6	Enable password checking at virtual terminal session login.	`Router (config-line)#`	**login**
7	Exit line configuration mode, and return to privileged EXEC mode.	`Router (config-line)#`	**end**

Sample Configuration

The following is a sample configuration based on performing the tasks in "Configuring the Cisco 805 Router" section on page 4-9. It does not show firewall-related commands. For a sample configuration of the firewall feature, refer to the *Cisco IOS Firewall Feature Set* feature module, which appears on Cisco Connection Online (CCO) only.

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** command.

```
Current configuration:
!
version 12.0
no service pad (default)
service timestamps debug uptime (default)
service timestamps log uptime (default)
no service password-encryption (default)
hostname Cisco805
enable secret 5 $1$RnI.$K4mh5q4MFetaqKzBbQ7gv0
ip subnet-zero
no ip domain-lookup
chat-script dial "" AT OK "\patdt\T" TIMEOUT 60 CONNECT \C
!This generic chat script is known to work. For information on
!customizing your chat script, refer to the Dial Solutions Configuration
!Guide.

interface Ethernet0
ip address 10.1.1.1 255.255.255.0
no ip directed-broadcast (default)
ip nat inside
!
interface Serial0
physical-layer async
no ip address
no ip directed-broadcast (default)
encapsulation ppp
dialer in-band
dialer pool-member 1
async mode dedicated
ppp authentication chap pap callin
ppp chap hostname chapisp
ppp chap password abra
ppp pap sent-username papisp password cadabra
!
interface Dialer1
ip address negotiated
no ip directed-broadcast (default)
encapsulation ppp
dialer remote-name isp
dialer idle-timeout 500
dialer string 5551111 modem-script dial
```

```
dialer pool 1
dialer-group 1
no cdp enable
ppp authentication chap pap callin
ppp chap hostname chapisp
ppp chap password abra
ppp pap sent-username papisp password cadabra
ip nat outside
!
no ip http server (default)
ip classless (default)
!
ip route 0.0.0.0 0.0.0.0 dialer 1
dialer-list 1 protocol ip permit
ip nat inside source list 1 interface dialer 0 overload
access-list 1 permit 10.0.0.0 0.255.255.255
!
line con 0
exec-timeout 10 0 (default)
password 4youreyesonly
login
transport input none (default)
stopbits 1 (default)
line 1
modem InOut
transport input all
speed 115200
flowcontrol hardware
line vty 0 4
password secret
login
!
end
```

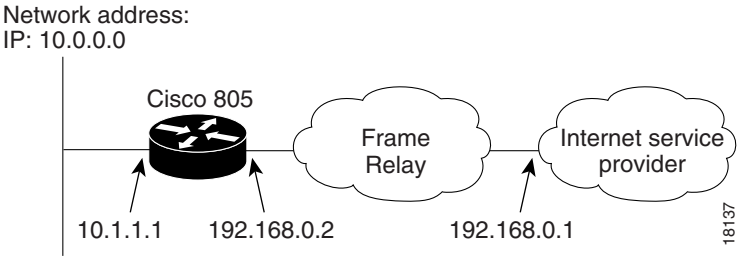
Network 3: Frame Relay

Figure 4-3 shows a sample small office network connected to an ISP with Frame Relay. This sample network uses IP as the only routed protocol. Instead of using a dynamic routing protocol such as RIP to learn the route to the ISP, this network uses a *static IP route*, which is a user-defined route to the ISP.

This sample network uses nonregistered IP addresses on the router Ethernet interface and the LAN devices. To solve the problem of using nonregistered IP addresses when accessing the Internet, this sample network uses the NAT overload feature. You buy one registered IP address for the serial interface from the ISP, then using NAT overload, all devices in this sample network can use this registered IP address when accessing the Internet. For more information on this feature, including configuration information, refer to the "Configuring NAT Overload" section in Chapter 5, "Advanced Features."

You can also configure the firewall feature in this sample network.

Figure 4-3 Network 3



Configuring the Cisco 805 Router

To configure the features for this sample network, perform the tasks described in the following sections on a PC. A sample configuration file that illustrates how to configure the network is presented after the tasks.

After your router boots, the following prompt displays. Enter **no**.

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

For complete information on how to access global configuration mode, refer to the "Entering Global Configuration Mode" section in Chapter 2, "Cisco IOS Basic Skills." For more information on the commands used in the following tables, refer to the Cisco IOS Release 12.0 documentation set.

Global Parameters

Use the following table to configure the router for global parameters.

Step	Task	Router Prompt	Command
1	Enter configuration mode.	`Router#`	**configure terminal**
2	Specify name for router.	`Router (config)#`	**hostname** *name*
3	Specify encrypted password to prevent unauthorized access to router.	`Router (config)#`	**enable secret** <*password*>
4	Configure router to recognize zero subnet range as valid range of addresses.	`Router (config)#`	**ip subnet-zero**
5	Disable router from translating unfamiliar words (typos) entered during a console session into IP addresses.	`Router (config)#`	**no ip domain-lookup**

Ethernet Interface

Use the following table to configure the Ethernet interface.

Step	Task	Router Prompt	Command
1	Enter configuration mode for Ethernet interface.	`Router (config)#`	**interface ethernet 0**
2	Set IP address and subnet mask.	`Router (config-if)#`	**ip address** *ip-address mask*
3	Enable interface and configuration changes just made to interface.	`Router (config-if)#`	**no shutdown**
4	Exit configuration mode for Ethernet interface.	`Router (config-if)#`	**exit**

Serial Interface

Use the following table to configure the serial interface.

Step	Task	Router Prompt	Command
1	Enter configuration mode for serial interface.	`Router (config)#`	**interface serial 0**
2	Set IP address and subnet mask.	`Router (config-if)#`	**ip address** *ip-address mask*
4	Set encapsulation (framing) method to Frame Relay. If the ISP router is not a Cisco router, use **ietf** option.	`Router (config-if)#`	**encapsulation frame relay** [**ietf**]
5	Set LMI type to type provided by Frame Relay service provider. (Default is **cisco**.)	`Router (config-if)#`	**frame-relay lmi-type** {**ansi** | **cisco** | **q933a**}
6	Enable interface and configuration changes just made to interface.	`Router (config-if)#`	**no shutdown**
7	Exit configuration mode for serial interface.	`Router (config-if)#`	**exit**
8	Set up a static route to ISP router.	`Router (config)#`	**ip route 0.0.0.0 0.0.0.0 serial 0**

NAT Overload

For information on configuring NAT overload, refer to the "Configuring NAT Overload" section in Chapter 5, "Advanced Features."

Firewall Feature

For information on configuring a firewall, refer to the *Cisco IOS Firewall Feature Set* feature module, which appears on Cisco Connection Online (CCO) only.

Command-Line Access to the Router

Use the following table to configure parameters to control access to the router.

Step	Task	Router Prompt	Command
1	Enter line configuration mode, and specify the console terminal line.	`Router (config)#`	**line console 0**
2	Specify a unique password on the line.	`Router (config-line)#`	**password** <*password*>
3	Enable password checking at terminal session login.	`Router (config-line)#`	**login**
4	Specify a virtual terminal for remote console access.	`Router (config-line)#`	**line vty 0 4**
5	Specify a unique password on the line.	`Router (config-line)#`	**password** <*password*>
6	Enable password checking at virtual terminal session login.	`Router (config-line)#`	**login**
7	Exit line configuration mode, and return to privileged EXEC mode.	`Router (config-line)#`	**end**

Sample Configuration

The following is a sample configuration based on performing the tasks in "Configuring the Cisco 805 Router" section on page 4-17. 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** command.

```
Current configuration:
!
version 12.0
no service pad (default)
service timestamps debug uptime (default)
service timestamps log uptime (default)
no service password-encryption (default)
hostname Cisco805
enable secret 5 $1$RnI.$K4mh5q4MFetaqKzBbQ7gv0
ip subnet-zero
no ip domain-lookup
!
interface Ethernet0
ip address 10.1.1.1 255.255.255.0
no ip directed-broadcast (default)
ip nat inside
!
interface Serial0
ip address 192.168.0.2 255.255.255.0
no ip directed-broadcast (default)
no ip mroute-cache (default)
encapsulation frame-relay ietf
frame-relay lmi-type ansi
ip nat outside
!
no ip http server (default)
ip classless (default)
!
ip route 0.0.0.0 0.0.0.0 serial 0
ip nat inside source list 1 interface serial 0 overload
access-list 1 permit 10.0.0.0 0.255.255.255
!
line con 0
exec-timeout 10 0 (default)
password 4youreyesonly
login
transport input none (default)
stopbits 1 (default)
line vty 0 4
password secret
login
!
end
```