



Configuring X.25

This chapter describes how to configure the Cisco router to connect to a central-site router over an X.25 line or over an ISDN line and provides verification steps and troubleshooting tips.

This chapter contains the following sections:

- [Before You Begin](#)
- [X.25](#)
- [X.25 over ISDN B Channel](#)
- [X.25 over ISDN D Channel](#)
- [Troubleshooting X.25 Problems](#)

Before You Begin

The configurations in this chapter are based on the following assumptions:

- The router is connected a central-site router.
- You are routing IP and Internetwork Packet Exchange (IPX) network traffic.

Before you begin configuration, be aware of the following:

- You need to enter the commands in the order shown in the task tables.
- The values shown in *italic* are examples. You should substitute the values shown with values that are appropriate for your network.
- You should be familiar with Cisco IOS software and its conventions.

**Note**

To use the verification steps described in this chapter, you must be familiar with Cisco IOS commands and command modes. When you use the verification steps, you need to change to different command modes. If you are not familiar with command modes, see the “[Understanding Command Modes](#)” section in the “[Introduction to Router Configuration](#)” chapter.

X.25

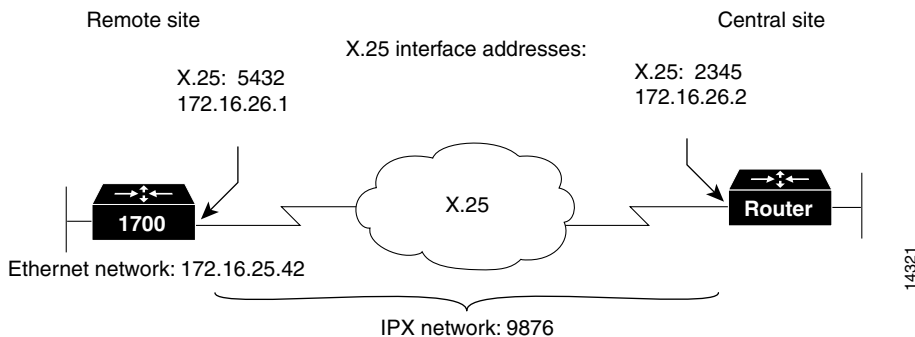
This section describes how to your router for a point-to-point X.25 WAN connection to the central-site router.

These are the major tasks in configuring your router:

- [Configuring Global Parameters](#)
- [Configuring Security](#)
- [Configuring the Fast Ethernet Interface](#)
- [Configuring the X.25 Interface](#)
- [Configuring Command-Line Access to the Router](#)

Figure 9-1 shows the configuration used in this example.

Figure 9-1 Configuration Example—X.25



Configuring Global Parameters

Follow these steps to configure the router for global parameters.

| | Command | Task |
|---------------|---|--|
| Step 1 | configure terminal | Enter configuration mode. |
| Step 2 | service timestamps debug datetime msec | Configure the router to show the date and time of all debug messages. This command is optional, but it is recommended if you use debug commands to troubleshoot your configuration. |
| Step 3 | service timestamps log datetime msec | Configure the router to show the date and time of all log messages. This command is optional, but it is recommended if you use the verification steps described in this guide. This feature is enabled for all the command output examples shown in this guide. |
| Step 4 | ipx routing 0060.834f.66dd | Enable IPX routing, and configure the router with an IPX address. |

Configuring Security

Follow these steps to configure the router with security measures.

| | Command | Task |
|--------|---|---|
| Step 1 | <code>hostname Router</code> | Configure the router with a host name, which is used in prompts and default configuration filenames. For Point-to-Point Protocol (PPP) authentication, the host name entered with this command must match the username of the central-site router. |
| Step 2 | <code>enable password <user></code> | Specify a password to prevent unauthorized access to the router. |

Configuring the Fast Ethernet Interface

Follow these steps to configure the Fast Ethernet interface, which connects your router to the local network.

| | Command | Task |
|--------|--|--|
| Step 1 | <code>interface fast ethernet0</code> | Enter configuration mode for the Ethernet interface. |
| Step 2 | <code>ip address 172.16.25.42 255.255.255.224</code> | Configure this interface with an IP address and a subnet mask. |
| Step 3 | <code>ipx network ABC</code> | Configure this interface with an IPX network number. |
| Step 4 | <code>no shutdown</code> | Enable the interface and the configuration changes that you have just made on the interface. |
| Step 5 | <code>exit</code> | Exit configuration mode for this interface. |

Configuring the X.25 Interface

Follow these steps to configure the X.25 interface, which connects your router to the central-site router over the wide-area network.

| | Command | Task |
|---------------|---|--|
| Step 1 | interface Serial0 | Enter configuration mode for the serial interface. |
| Step 2 | ip address 172.16.26.1 255.255.255.0 | Configure this interface with an IP address. |
| Step 3 | encapsulation x25 | Set the encapsulation type on this interface to X.25. |
| Step 4 | ipx network 9876 | Enable IPX routing on this interface. |
| Step 5 | x25 address 5432 | Set the X.121 address of this interface. |
| Step 6 | x25 map ip 172.16.26.2 2345 broadcast | Set up the LAN protocols-to-remote-host mapping for IP and X.25. |
| Step 7 | x25 map ipx 9876.0000.0c03.ecc6 2345 broadcast | Set up the LAN protocols-to-remote-host mapping for IPX and X.25. |
| Step 8 | no shutdown | Enable the interface and the configuration changes that you have just made on the interface. |
| Step 9 | exit | Exit configuration mode for this interface. |

Verifying Your Configuration

You can verify your configuration to this point by

- [Confirming Connectivity to the Central-Site Router over IP](#)
- [Confirming Connectivity to the Central-Site Router over IPX](#)
- [Confirming That the Serial Interface Is Functioning Correctly](#)
- [Confirming That the X.25 Map Is Configured Correctly](#)
- [Confirming Switched Virtual Circuit and Permanent Virtual Circuit Information](#)

Confirming Connectivity to the Central-Site Router over IP

Follow these steps to confirm connectivity to the central-site router over IP:

-
- Step 1** Confirm that the router is connected to the central-site router.

- Step 2** From the privileged EXEC command mode, enter the **ping** command, followed by the IP address of the central-site router:

```
Router# ping 172.16.26.2
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echo to 192.168.39.41, timeout is 2 seconds:
!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/20/20
ms
```

- Step 3** Confirm that the success rate shown in the output is 60 percent or greater. This means that your router is successfully transferring data to the central-site router.
- Step 4** To continue configuration, reenter global configuration mode.
-

Confirming Connectivity to the Central-Site Router over IPX

Follow these steps to confirm connectivity to the central-site router over IPX:

- Step 1** Confirm that the router is connected to the central-site router.
- Step 2** From the privileged EXEC command mode, enter the **ping** command.
- Step 3** Respond to the prompts shown in the following example, entering IPX as the protocol, and entering the target IPX address.



Note Substitute the IPX address of your central-site router for the IPX address shown in the example.

```
Router# ping
```

```
Protocol [ip]: ipx
```

```
Target IPX address: 9876.0000.0c03.ecc6
```

```
Repeat count [5]: <Return>
```

```
Datagram size [100]: <<Return>>
```

```
Timeout in seconds [2]: <<Return>>
```

```
Verbose [n]: <<Return>>
```

```
Novell Standard Echo [n]: <<Return>>
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte IPX cisco Echoes to 9876.0000.0c03.ecc6, timeout
is 2 seconds: !!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/21/24
ms
```

- Step 4** Confirm that the success rate shown in the output is 60 percent or greater. This means that your router is successfully transferring data to the central-site router.
- Step 5** To continue configuration, reenter global configuration mode.
-

Confirming That the Serial Interface Is Functioning Correctly

Follow these steps to confirm that the serial interface is functioning correctly:

- Step 1** From the privileged EXEC command mode, enter the **show interface serial0** command. You should see command output similar to the following:

```
Router# show interface serial0

Serial0 is up, line protocol is up
Hardware is QUICC Serial
Internet address is 172.16.26.1/24
MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
Encapsulation X25, loopback not set
x25 DTE, modulo 8, k 7, N1 12056, N2 20
T1 3000, interface outage (partial T3) 0, T4 0 State CONNECT, VS 6, VR
1, Remote VR 6, Retransmissions 0
Queues: U/S frames 0, I frames 0, unack. 0, reTx 0 IFRAMES 22/25 RNRs
0/0 REJs 0/0 SABM/Es 0/1 FRMRs 0/0 DISCs 0/0 X25 DTE, address 5432,
state R1, modulo 8, timer 0
Defaults: cisco encapsulation, idle 0, nvc 1
input/output window sizes 2/2, packet sizes 128/128 Timers: T10 60,
T11 180, T12 60, T13 60, TH 0 Channels: Incoming-only none, Two-way
1-1024, Outgoing-only none RESTARTs 1/1 CALLs 1+0/2+2/0+0 DIAGs 0/0
Last input 00:00:32, output 00:00:32, output hang never Last clearing
of "show interface" counters never Queueing strategy: fifo
Output queue 0/40, 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
40 packets input, 1903 bytes, 0 no buffer Received 0 broadcasts, 0
runts, 0 giants 2 input errors, 0 CRC, 2 frame, 0 overrun, 0 ignored,
0 abort 42 packets output, 2033 bytes, 0 underruns 0 output errors, 0
collisions, 11 interface resets 0 output buffer failures, 0 output
buffers swapped out 7 carrier transitions
DCD=up DSR=up DTR=up RTS=up CTS=up
```

- Step 2** Check that the “line protocol is up” and the “State CONNECT” messages appear in the command output. If you do not see these messages, see the [“X.25 over ISDN B Channel”](#) section on page 9-10 for suggestions.
- Step 3** To continue configuration, reenter global configuration mode.
-

Confirming That the X.25 Map Is Configured Correctly

Follow these steps to confirm that the X.25 map is configured correctly:

- Step 1** From the privileged EXEC command mode, enter the **show x25 map** command. You should see command output similar to the following:

```
Router# show x25 map

Serial0: X.121 2345 <--> ip 172.16.26.2,
ipx 9876.0000.0c03.ecc6
PERMANENT, BROADCAST, 1 VC: 1*
```

- Step 2** Confirm that your IPX network number and the central-site router IP address and IPX address appear in the command output. The IP and IPX addresses shown in your output will be different from those shown in the example.
-

Confirming Switched Virtual Circuit and Permanent Virtual Circuit Information

Follow these steps to confirm the switched virtual circuit and permanent virtual circuit information:

- Step 1** From the privileged EXEC command mode, enter the **show x25 vc** command, as follows. You should see command output similar to the following:

```
Router# show x25 vc

SVC 1, State: D1, Interface: Serial0
Started 00:04:10, last input 00:00:26, output 00:00:33 Connects 2345
<-->
ip 172.16.26.1
ipx 9876.0000.0c03.ecc6
multiprotocol cud pid, standard Tx data PID Window size input: 2,
output: 2
Packet size input: 128, output: 128
```

```
PS: 7 PR: 3 ACK: 3 Remote PR: 7 RCNT: 0 RNR: FALSE Retransmits: 0
Timer (secs): 0 Reassembly (bytes): 0 Held Fragments/Packets: 0/0
Bytes 1540/1724 Packets 15/19 Resets 0/0 RNRs 0/0 REJs 0/0 INTs 0/0
```

Step 2 Look for the following messages in the output:

- “SVC 1”—Means that the X.25 service is active for the X.25 interface.
- “State: D1”—Means that there is an active virtual circuit on the X. 25 interface.
- “Connects 2345 <-->”—Means that the X.25 address is correctly associated with the IP address and IPX address of the X.25 interface.
- “Packets 15/19”—Means that data is being transferred across the X.25 interface. The number shown in this message varies and shows the success rate of data that is being sent.

Step 3 To continue configuration, reenter global configuration mode.

Configuring Command-Line Access to the Router

Follow these steps to configure parameters that control access to the router.

| | Command | Task |
|--------|--|--|
| Step 1 | <code>line console 0</code> | Specify the console terminal line. |
| Step 2 | <code>exec-timeout 5</code> | Set the interval that the EXEC command interpreter waits until user input is detected. |
| Step 3 | <code>line vty 0 4</code> | Specify a virtual terminal for remote console access. |
| Step 4 | <code>password <lineaccess></code> | Specify a password on the line. |
| Step 5 | <code>login</code> | Enable password checking at terminal session login. |

X.25 over ISDN B Channel

This section describes how to configure the router to encapsulate IP and IPX packets as X.25 and how to route them over an ISDN B-channel connection.

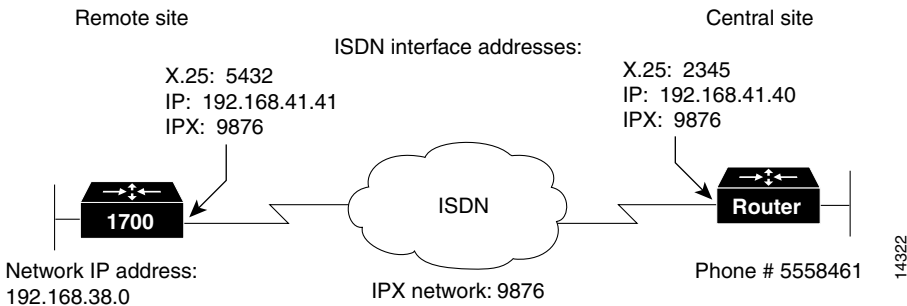
In addition to the assumptions described in the “[Before You Begin](#)” section in this chapter, this configuration is based on the assumption that you can only use one of the two ISDN B channels for this type of configuration.

These are the major tasks in configuring your router:

- [Configuring Global Parameters](#)
- [Configuring Security](#)
- [Configuring the Fast Ethernet Interface](#)
- [Configuring the ISDN Interface for X.25](#)
- [Configuring Command-Line Access to the Router](#)

Figure 9-2 shows the configuration used in this example.

Figure 9-2 Configuration Example—X.25 over ISDN B Channel



Configuring Global Parameters

Follow these steps to configure the router for global parameters.

| | Command | Task |
|---------------|---|--|
| Step 1 | configure terminal | Enter configuration mode. |
| Step 2 | service timestamps debug datetime msec | Configure the router to show the date and time of all debug messages. This command is optional, but it is recommended if you use debug commands to troubleshoot your configuration. |
| Step 3 | service timestamps log datetime msec | Configure the router to show the date and time of all log messages. This command is optional, but it is recommended if you use the verification steps described in this guide. This feature is enabled for all the command output examples shown in this guide. |
| Step 4 | ipx routing 0060.834f.66dd | Enable IPX routing, and configure the router with an IPX address. |

| | Command | Task |
|--------|---|--|
| Step 5 | isdn switch-type <i>basic-ni</i> | <p>Configure the type of central office switch being used on the ISDN interface. Use the keyword that matches the ISDN switch type that you are using:</p> <ul style="list-style-type: none"> • basic-1tr6—German 1TR6 ISDN switches • basic-5ess—Basic rate 5ESS switches • basic-dms100—NT DMS-100 basic rate switches • basic-net3—NET3 ISDN switches • basic-ni—National ISDN-1 switches • basic-nwnet3—Norway NET3 switches (phase 1) • basic-nznet3—New Zealand NET3 switches • basic-ts013—Australian TS013 switches • ntt—Japanese NTT ISDN switches • vn2—French VN2 ISDN switches • vn3—French VN3 ISDN switches |
| Step 6 | interface bri0 | Enter configuration mode for the ISDN interface. |
| Step 7 | no shutdown | Enable the ISDN switch type configuration for the ISDN interface. |
| Step 8 | exit | Exit configuration mode for the ISDN interface. |

Verifying Your Configuration

You can verify your configuration to this point by confirming the ISDN line status as follows:

- Step 1** From the privileged EXEC command mode, enter the **show isdn status** command. You should see command output similar to the following:

```
Router# show isdn status
The current ISDN Switchtype = basic-5ess
ISDN BRI0 interface
  Layer 1 Status:
    ACTIVE
  Layer 2 Status:
    TEI = 80, State = MULTIPLE_FRAME_ESTABLISHED
  Layer 3 Status:
    No Active Layer 3 Call(s)
  Activated dsl 0 CCBs = 0
  Total Allocated ISDN CCBs =
```

- Step 2** Confirm that the “State = MULTIPLE_FRAME_ESTABLISHED” message appears in the command output, as shown in the example.



Note In some cases, you might see a “State = TEI_ASSIGNED” message instead of the “State = MULTIPLE_FRAME_ESTABLISHED” message. This message also means that the ISDN line is correctly configured.

- Step 3** If you do not see the message, do the following:
- Make sure that the router is correctly cabled.
 - Make sure that any external Network Termination 1 (NT1) equipment is functioning correctly. Refer to the documentation that came with the NT1.
 - Make sure that the ISDN line is correctly configured. Check with the ISDN service provider.
- Step 4** To continue configuration, reenter global configuration mode.

Configuring Security

Follow these steps to configure the router with security measures.

| | Command | Task |
|--------|---|--|
| Step 1 | <code>hostname Router</code> | Configure the router with a host name, which is used in prompts and default configuration filenames. For PPP authentication, the host name entered with this command must match the username of the central-site router. |
| Step 2 | <code>enable password <user></code> | Specify a password to prevent unauthorized access to the router. |
| Step 3 | <code>username HQ password <guessme></code> | Specify the password used during caller identification and Challenge Handshake Authentication Protocol (CHAP) and Password Authentication Protocol (PAP) authentication. For CHAP and PAP authentication, the username entered with this command must match the host name of the central-site router. |

Configuring the Fast Ethernet Interface

Follow these steps to configure the Fast Ethernet interface, which connects your router to the local network.

| | Command | Task |
|--------|---|---|
| Step 1 | <code>interface fastethernet0</code> | Enter configuration mode for the Fast Ethernet interface. |
| Step 2 | <code>ip address 192.168.38.42 255.255.255.0</code> | Configure this interface with an IP address. |

| | Command | Task |
|--------|--------------------|--|
| Step 3 | no shutdown | Enable the interface and the configuration changes that you have just made on the interface. |
| Step 4 | exit | Exit configuration mode for this interface. |

Configuring the ISDN Interface for X.25

Follow these steps to configure the ISDN interface, which connects your router to the central-site router over the wide-area network, for X.25 packet encapsulation.

| | Command | Task |
|--------|--|---|
| Step 1 | interface BRI0 | Enter configuration mode for the ISDN interface. |
| Step 2 | ip address <i>192.168.41.41 255.255.255.0</i> | Configure this interface with an IP address. |
| Step 3 | encapsulation x25 | Set the encapsulation type on this interface to X.25. |
| Step 4 | snapshot client <i>5 60</i> | Enable snapshot routing. Because your router is dialing into a central-site router, it is considered the client router. The first number is the amount of “active time” (in minutes) during which routing updates are exchanged between your router and the central-site router. The second number is the amount of “quiet time” (in minutes) during which routing entries are frozen and remain unchanged. |
| Step 5 | ipx network <i>9876</i> | Enable IPX routing on this interface. |
| Step 6 | x25 address <i>5432</i> | Set the X.25 address of this interface. |
| Step 7 | x25 map ip <i>192.168.39.40 2345 broadcast</i> | Set up the LAN protocols-to-remote-host mapping for X.25 to IP. |
| Step 8 | x25 map ipx <i>9876.0000.0c03.ecc6 2345 broadcast</i> | Set up the LAN protocols-to-remote-host mapping for IPX and X.25. |

| | Command | Task |
|---------|--|---|
| Step 9 | dialer map ip <i>192.168.39.40</i> name <i>HQ</i> <i>5558461</i> | Configure this interface to place a call to multiple sites and to authenticate calls from multiple sites, based on IP address and dialer string. The name you enter after the name keyword in this command must match the name entered with the username command in the “Configuring Security” section on page 9-14. |
| Step 10 | dialer map ipx <i>9876.0000.0c03.e336</i> name <i>HQ</i> <i>5558461</i> | Configure this interface to place a call to multiple sites and to authenticate calls from multiple sites, based on IP address and dialer string. The name you enter after the name keyword in this command must match the name entered with the username command in the “Configuring Security” section on page 9-14. |
| Step 11 | dialer-group <i>1</i> | Assign this interface to a dialer group. |
| Step 12 | dialer-list 1 protocol ip permit | Define a dial-on-demand routing (DDR) dialer list to control dialing based on access lists and IP packets. |
| Step 13 | dialer-list 1 protocol ipx permit | Define a DDR dialer list to control dialing based on access lists and IPX packets. |

Verifying Your Configuration

You can verify your configuration to this point by

- [Confirming Connectivity with the Central-Site Router over IP](#)
- [Confirming Connectivity to the Central-Site Router over IPX](#)
- [Confirming That the X.25 Map Is Configured Correctly](#)
- [Confirming Switched Virtual Circuit and Permanent Virtual Circuit Information](#)

Confirming Connectivity with the Central-Site Router over IP

Follow these steps to confirm connectivity with the central-site router over IP:

-
- Step 1** Confirm that your router X.25 connection is active.
- Step 2** From the privileged EXEC command mode, enter the **ping** command, followed by the IP address of the central-site router. You should see command output similar to the following:
- ```
Router# ping 192.168.39.40
```
- Type escape sequence to abort.  
Sending 5, 100-byte ICMP Echo to 192.168.39.40, timeout is 2 seconds:  
!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/20/20 ms
- Step 3** Confirm that the success rate shown in the output is 60 percent or greater. This means that your router is successfully transferring data to the central-site router.
- Step 4** To continue configuration, reenter global configuration mode.
- 

## Confirming Connectivity to the Central-Site Router over IPX

Follow these steps to confirm connectivity with the central-site router over IPX:

- 
- Step 1** Confirm that your router X.25 connection is active.
- Step 2** Enter the **ping** command, followed by the IPX address of the central-site router. You should see command output similar to the following:
- ```
Router# ping 9876.0000.0c03.ecc6
[ip]: ipx
IPX address: 105.0060.834f.667d
Repeat count [5]:
Datagram size [100]:
Timeout in seconds [2]:
Verbose [n]:
Type escape sequence to abort.5, 100-byte IPX cisco Echoes to
9876.0000.0c03.ecc6, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms
```



Note Substitute the IPX address of your central-site router for the IPX address shown in the example.

- Step 3** Confirm that the success rate shown in the output is 60 percent or greater. This means that your router is successfully transferring data to the central-site router.
- Step 4** To continue configuration, reenter global configuration mode.
-

Confirming That the X.25 Map Is Configured Correctly

Follow these steps to confirm that the X.25 map is configured correctly:

- Step 1** From the privileged EXEC command mode, enter the **show x25 map** command:

```
Router# show x25 map

Serial0: X.121 2345 <--> ip 192.168.39.40,
ipx 9876.0000.0c03.ecc6
PERMANENT, BROADCAST, 1 VC: 1*
```

- Step 2** Confirm that the following appear in the command output:

- Your router IPX network number
- Central-site router IP address
- Central-site router IPX address



Note The IP and IPX addresses, and your router IPX network number shown in your output are different than those shown in the example.

- Step 3** To continue configuration, reenter global configuration mode.
-

Confirming Switched Virtual Circuit and Permanent Virtual Circuit Information

Follow these steps to confirm switched virtual circuit and permanent virtual circuit information:

- Step 1** From the privileged EXEC command mode, enter the **show x25 vc** command. You should see command output similar to the following:

```
Router# show x25 vc
SVC 1, State: D1, Interface: Serial0
Started 00:04:10, last input 00:00:26, output 00:00:33 Connects 2345
<-->
ip 192.168.39.40
ipx 9876.0000.0c03.ecc6
multiprotocol cud pid, standard Tx data PID Window size input: 2,
output: 2
Packet size input: 128, output: 128
PS: 7 PR: 3 ACK: 3 Remote PR: 7 RCNT: 0 RNR: FALSE Retransmits: 0
Timer (secs): 0 Reassembly (bytes): 0 Held Fragments/Packets: 0/0
Bytes 1540/1724 Packets 15/19 Resets 0/0 RNRs 0/0 REJs 0/0 INTs 0/0
```

- Step 2** Confirm that the X.25 network number, shown in the “Connect” message, is associated with the correct IP and IPX addresses.
- Step 3** To continue configuration, reenter global configuration mode.

Configuring Command-Line Access to the Router

Follow these steps to configure parameters that control access to the router.

| | Command | Task |
|--------|------------------------------------|--|
| Step 1 | line console 0 | Specify the console terminal line. |
| Step 2 | exec-timeout 5 | Set the interval that the EXEC command interpreter waits until user input is detected. |
| Step 3 | line vty 0 4 | Specify a virtual terminal for remote console access. |
| Step 4 | password <lineaccess> | Specify a password on the line. |

| | Command | Task |
|--------|---------|---|
| Step 5 | login | Enable password checking at terminal session login. |
| Step 6 | end | Exit configuration mode. |

X.25 over ISDN D Channel

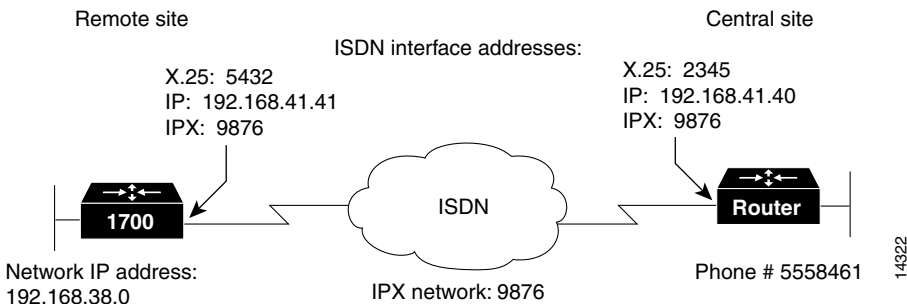
This section tells how to configure the router to send data as X.25 over an ISDN D-channel connection. This section also tells how to configure the router to encapsulate IP and IPX packets as X.25 and to then route them over an ISDN B-channel connection.

These are the major tasks in configuring your router:

- [Configuring Global Parameters](#)
- [Configuring Security](#)
- [Configuring the Fast Ethernet Interface](#)
- [Configuring the ISDN Interface for X.25](#)
- [Configuring the ISDN Subinterface for X.25](#)
- [Configuring Command-Line Access to the Router](#)

Figure 9-3 shows the configuration used in this example.

Figure 9-3 Configuration Example—X.25 over ISDN D Channel



Configuring Global Parameters

Follow these steps to configure global parameters.

| | Command | Task |
|---------------|---------------------------|---------------------------|
| Step 1 | configure terminal | Enter configuration mode. |

| | Command | Task |
|--------|--|--|
| Step 2 | <code>ipx routing 0060.834f.66dd</code> | <p>Enable IPX routing, and configure the router with an IPX address.</p> <p>If you do not know your router IPX address, you can enter this command without an address. The router then determines its own IPX address. You can then enter a write terminal command. The address will be displayed in the command output.</p> |
| Step 3 | <code>isdn switch-type basic-5ess</code> | <p>Configure the type of central office switch being used on the ISDN interface. Use the keyword that matches the ISDN switch type that you are using:</p> <ul style="list-style-type: none"> • basic-1tr6—German 1TR6 ISDN switches • basic-5ess—Basic rate 5ESS switches • basic-dms100—NT DMS-100 basic rate switches • basic-net3—NET3 ISDN switches • basic-ni—National ISDN-1 switches • basic-nwnet3—Norway NET3 switches (phase 1) • basic-nznet3—New Zealand NET3 switches • basic-ts013—Australian TS013 switches • ntt—Japanese NTT ISDN switches • vn2—French VN2 ISDN switches • vn3—French VN3 ISDN switches |

Verifying Your Configuration

You can verify your configuration to this point by confirming the ISDN line status, as follows:

Step 1 Enter the **show isdn status** command. You should see command output similar to the following:

```
Router# show isdn status
The current ISDN Switchtype = basic-5ess
ISDN BRI0 interface
  Layer 1 Status:
    ACTIVE
  Layer 2 Status:
    TEI = 80, State = MULTIPLE_FRAME_ESTABLISHED
  Layer 3 Status:
    No Active Layer 3 Call(s)
  Activated dsl 0 CCBs = 0
  Total Allocated ISDN CCBs =
```

Step 2 Confirm that the “State = MULTIPLE_FRAME_ESTABLISHED” message appears in the command output.

Step 3 If you do not see the message, follow these steps:

- a. Make sure that the router is correctly cabled.
- b. Make sure that any external NT1 is functioning correctly. Refer to the documentation that came with the NT1.
- c. Make sure the ISDN line is correctly configured by checking with the ISDN service provider.
- d. See the [“Troubleshooting X.25 Problems” section on page 9-30](#) for additional suggestions.

Configuring Security

Follow these steps to configure security measures.

| | Command | Task |
|--------|---|---|
| Step 1 | <code>hostname Router</code> | Configure the router with a host name, which is used in prompts and default configuration filenames. For PPP authentication, the host name entered with this command must match the username of the remote device. |
| Step 2 | <code>enable password <user></code> | Specify a password to prevent unauthorized access to the router. |

Configuring the Fast Ethernet Interface

Follow these steps to configure the Fast Ethernet interface, which connects your router to the local network.

| | Command | Task |
|--------|---|--|
| Step 1 | <code>interface fastethernet0</code> | Enter configuration mode for the Fast Ethernet interface. |
| Step 2 | <code>ip address 192.168.38.42 255.255.255.0</code> | Configure this interface with an IP address. |
| Step 3 | <code>no shutdown</code> | Enable the interface and the configuration changes that you have just made on the interface. |
| Step 4 | <code>exit</code> | Exit configuration mode for this interface. |

Configuring the ISDN Interface for X.25

Follow these steps to configure the ISDN, which connects your router to the central-site router over the wide-area network, for X.25 packet encapsulation.

| | Command | Task |
|--------|---|---|
| Step 1 | interface BRI0 | Enter configuration mode for the ISDN interface. |
| Step 2 | ip address 192.168.40.41 255.255.255.0 | Configure this interface with an IP address. |
| Step 3 | encapsulation ppp | Set the encapsulation method on this interface to PPP. |
| Step 4 | isdn x25 dchannel | Create a configurable interface for X.25 traffic over the ISDN D channel. |
| Step 5 | isdn x25 static-tei 1 | Configure a static ISDN Layer 2 terminal endpoint identifier (TEI) for X.25 over the ISDN D channel. |
| Step 6 | dialer map ip 192.168.40.40 name remote broadcast 5558461 dialer-group 1 | Configure this interface to place a call to multiple sites and to authenticate calls from multiple sites, based on IP address and dialer string. The name you enter after the name keyword in this command must match the name entered with the username command in the “Configuring Security” section on page 9-23. |
| Step 7 | ppp authentication chap | Enable CHAP or PAP authentication on this interface. |
| Step 8 | no shutdown | Enable the interface and the configuration changes that you have just made on the interface. |
| Step 9 | exit | Exit configuration mode for this interface. |

Configuring the ISDN Subinterface for X.25

Follow these steps to configure an ISDN subinterface.

| | Command | Task |
|---------|--|--|
| Step 1 | interface BRI0:0 | Enter configuration mode for the ISDN subinterface. |
| Step 2 | ip address <i>192.168.41.41 255.255.255.0</i> | Configure this interface with an IP address and a subnet mask. |
| Step 3 | encapsulation x25 | Set the encapsulation type on this interface to X.25. |
| Step 4 | ipx network <i>9876</i> | Enable IPX routing on this interface. |
| Step 5 | x25 address <i>5432</i> | Set the X.25 address of this interface. |
| Step 6 | dialer in-band | Specify that DDR is supported on this interface. |
| Step 7 | x25 map ip <i>192.168.41.40</i> ipx <i>9876.0000.0c03.ecc6 2345 broadcast</i> | Set up the LAN protocols-to-remote-host mapping for IP and IPX. |
| Step 8 | dialer-list 1 protocol ip permit | Define a DDR dialer list to control dialing based on access lists and IP packets. |
| Step 9 | no shutdown | Enable the interface and the configuration changes that you have just made on the interface. |
| Step 10 | exit | Exit configuration mode for this interface. |

Verifying Your Configuration

You can verify your configuration to this point by

- [Confirming Connectivity to the Remote Device over IP](#)
- [Confirming Connectivity to the Remote Device over IPX](#)
- [Confirming That the X.25 Map Is Configured Correctly](#)
- [Confirming Switched Virtual Circuit and Permanent Virtual Circuit Information](#)

Confirming Connectivity to the Remote Device over IP

Follow these steps to confirm connectivity with the remote device over IP:

- Step 1** Enter the **ping** command, followed by the IP address of the remote device. You should see command output similar to the following:

```
Router# ping 192.168.39.40
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echoes to 192.168.39.40, timeout is 2 seconds: !!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/20/20 ms
```

- Step 2** Check the success rate in the command output. If the success rate is below 100 percent, see the [“Troubleshooting X.25 Problems”](#) section on page 9-30 for suggestions.

Confirming Connectivity to the Remote Device over IPX

Follow these steps to confirm connectivity with the remote device over IPX:

- Step 1** Enter the **ping** command, and respond to the prompts shown in the following command output example:

```
Router# ping
```

```
Protocol [ip]: ipx
```

```
Target IPX address: 9876.0000.0c03.ecc6
```

```
Repeat count [5]: <Return>
```

```
Datagram size [100]: <<Return>>
```

```
Timeout in seconds [2]: <<Return>>
```

```
Verbose [n]: <<Return>>
```

```
Novell Standard Echo [n]: <<Return>>
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte IPX cisco Echoes to 9876.0000.0c03.ecc6, timeout is 2 seconds: !!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/21/24 ms
```

Substitute the IPX address of your remote device for the IPX address shown in the example.

- Step 2** Check the success rate in the command output. If the success rate is below 100 percent, refer to the following “[Troubleshooting X.25 Problems](#)” section for suggestions.



Note The modem might need time to synchronize with the central-site router. You might have to enter the **ping** command several times before you get a response.

Confirming That the X.25 Map Is Configured Correctly

Follow these steps to confirm that the X.25 map is configured correctly:

- Step 1** Enter the **show x25 map** command. You should see command output similar to the following:

```
Router# show x25 map

Serial0: X.121 2345 <--> ip 192.168.39.40,
ipx 9876.0000.0c03.ecc6
PERMANENT, BROADCAST, 1 VC: 1*
```

- Step 2** Confirm that your IPX network number and the remote device IP address and IPX address appear in the command output as shown in the example. The IP and IPX addresses shown in your output will be different from those shown in the example.

Confirming Switched Virtual Circuit and Permanent Virtual Circuit Information

Follow these steps to confirm the switched virtual circuit and permanent virtual circuit information:

- Step 1** From the privileged EXEC command mode, enter the **show x25 vc** command. You should see command output similar to the following:

```
Router# show x25 vc
SVC 1, State: D1, Interface: Serial0
Started 00:04:10, last input 00:00:26, output 00:00:33 Connects 2345
<-->
```

```

ip 172.16.26.1
ipx 9876.0000.0c03.ecc6
multiprotocol cud pid, standard Tx data PID Window size input: 2,
output: 2
Packet size input: 128, output: 128
PS: 7 PR: 3 ACK: 3 Remote PR: 7 RCNT: 0 RNR: FALSE Retransmits: 0
Timer (secs): 0 Reassembly (bytes): 0 Held Fragments/Packets: 0/0
Bytes 1540/1724 Packets 15/19 Resets 0/0 RNRs 0/0 REJs 0/0 INTs 0/0

```

Step 2 Look for the following messages in the output:

- “SVC 1”—Means that the X.25 service is active for the X.25 interface.
- “State: D1”—Means that there is an active virtual circuit on the X. 25 interface.
- “Connects 2345 <-->”—Means that the X.25 address is correctly associated with the IP address and IPX address of the X.25 interface.
- “Packets 15/19”—Means that data is being transferred across the X.25 interface. The number shown in this message varies and indicates the success rate of data that is being transferred.

Configuring Command-Line Access to the Router

Follow these steps to configure parameters that control access to the router.

| | Command | Task |
|--------|--|---|
| Step 1 | <code>line console 0</code> | Specify the console terminal line. |
| Step 2 | <code>exec-timeout 5</code> | Set the interval (in minutes) that the EXEC command interpreter waits until user input is detected. |
| Step 3 | <code>line vty 0 4</code> | Specify a virtual terminal for remote console access. |
| Step 4 | <code>password <lineaccess></code> | Specify a password on the line. |
| Step 5 | <code>login</code> | Enable password checking at terminal session login. |
| Step 6 | <code>end</code> | Exit configuration mode. |

Troubleshooting X.25 Problems

If you are having problems or if the output that you received during the verification steps is very different from that shown in the command output examples, you can troubleshoot your router by performing some or all of the following suggested actions.

**Caution**

If you are not familiar with Cisco IOS debug commands, you should read the “[Using Debug Commands](#)” section in the “[Introduction to Router Configuration](#)” chapter before attempting any debugging.

- If the **ping** command is unsuccessful, use the **debug x25** command.
- If you cannot use the **ping** command to confirm connectivity to any device other than the central-site router, verify that your routing (static or dynamic) is correctly configured.
- If you do not see the “line protocol up” message in the **show interface** command output, use the **debug x25 event** command.
- If you do not see the “State CONNECT” message in the **show interface** command output, use the **debug lapb** command.
- For more detailed information than is contained in the **show isdn status** command output, use the **debug isdn q931** and **debug isdn q921** commands.