

# Configuring Frame Relay

---

This chapter describes how to configure the Cisco 1700 router to connect to a central-site router over a Frame Relay line and provides verification steps and troubleshooting tips.

This chapter contains the following sections:

- Before You Begin
- Frame Relay
- Frame Relay with an Internal DSU/CSU
- ISDN as the Backup WAN Connection
- ISDN as a Backup Connection with Dialer Profiles
- ISDN as a Backup Connection with Floating Static Routes

## Before You Begin

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

- Your Cisco 1700 router hardware is correctly installed according to the *Cisco 1700 Router Hardware Installation Guide* that came with the router.
- Your Cisco 1700 router is connected to a central-site router over Frame Relay.
- Your Cisco 1700 router is using multilink Point-to-Point Protocol (PPP).

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, refer to the “Understanding Command Modes” section in the “Cisco IOS Basic Skills” chapter.

---

## Frame Relay

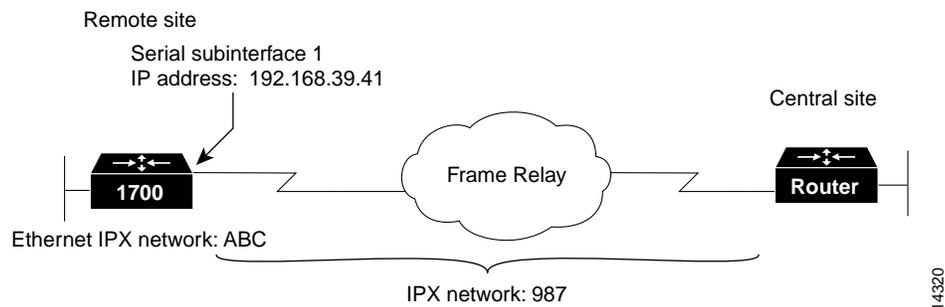
This section describes how to configure a basic Frame Relay connection to the central-site router.

These are the major tasks when configuring your router:

- Configuring Global Parameters
- Configuring Security
- Configuring the Fast Ethernet Interface
- Configuring the Serial Interface for a Frame Relay Connection
- Configuring the Point-to-Point Frame Relay Connection
- Configuring Routing Parameters
- Configuring Command-Line Access to the Router

Figure 5-1 illustrates the example configuration used in this section.

**Figure 5-1 Frame Relay Example Configuration**



## Configuring Global Parameters

Use this table to configure the router for some global parameters.

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

## Configuring Security

Use this table to configure the router with some security measures.

Step	Task	Router Prompt	Command
1	Configure the router with a host name, which is used in prompts and default configuration file names.  For PPP authentication, the host name entered with this command must match the username of the central-site router.	Router(config)#	<b>hostname</b> 1700
2	Specify a password to prevent unauthorized access to the router.	1700(config)#	<b>enable password</b> <1700user>

## Configuring the Fast Ethernet Interface

Use this table to configure the Fast Ethernet interface, which connects your router to the local network.

Step	Task	Router Prompt	Command
1	Enter configuration mode for the Fast Ethernet interface.	1700(config)#	<b>interface fastethernet0</b>
2	Configure this interface with an IP address and a subnet mask.	1700(config-if)#	<b>ip address</b> 172.16.25.1 255.255.255.0
3	Enable IPX routing on this interface.	1700(config-if)#	<b>ipx network</b> ABC
4	Enable the interface and the configuration changes that you have just made on the interface.	1700(config-if)#	<b>no shutdown</b>
5	Exit configuration mode for this interface.	1700(config-if)#	<b>exit</b>

## Configuring the Serial Interface for a Frame Relay Connection

Use this table to configure the serial interface for Frame Relay packet encapsulation.

Step	Task	Router Prompt	Command
1	Enter configuration mode for the serial interface.	1700(config)#	<b>interface Serial0</b>
2	Set the encapsulation method on this interface to Frame Relay.	1700(config-if)#	<b>encapsulation frame-relay</b>
3	Enable the configuration changes on this interface.	1700(config-if)#	<b>no shutdown</b>

## Verifying Your Configuration

You can verify your configuration to this point by confirming a permanent virtual circuit (PVC) is active on the Frame Relay line, as follows:

- Step 1** Wait 60 seconds after entering the **encapsulation frame-relay** command.
- Step 2** From privileged EXEC command mode, enter the **show frame-relay pvc** command.

**Step 3** Confirm that the “PVC STATUS=ACTIVE” message (shown in bold in the example) appears in the command output:

```
1700# show frame-relay pvc

PVC Statistics for interface Serial0 (Frame Relay DTE)

DLCI = 17, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial0.1

  input pkts 45          output pkts 52          in bytes 7764
  out bytes 9958         dropped pkts 0          in FECN pkts 0
  in BECN pkts 0        out FECN pkts 0        out BECN pkts 0
  in DE pkts 0          out DE pkts 0
  pvc create time 00:30:59, last time pvc status changed 00:19:21
```

**Step 4** Record the number shown in the “DLCI=” message. (In this example, the number is “17.”) You use this number to finish configuring the Frame Relay interface.

**Step 5** If there is no output after entering the command, use the **show interface serial0** command to determine whether or not the serial interface is active. An example of this command is in the next section, “Configuring the Point-to-Point Frame Relay Connection.” The first line of the command output should be this:

```
Serial0 is up, line protocol is up
```

If the first line of the command output is “Serial0 is up, line protocol is down,” you should confirm that the Local Management Interface (LMI) type for the Frame Relay switch is correct by checking for the “LMI type is CISCO” message in the same command output.

**Step 6** To continue configuration, re-enter global configuration mode.

## Configuring the Point-to-Point Frame Relay Connection

Use this table to configure the Frame Relay interface, which connects your router to the central-site router over the wide-area network.

Step	Task	Router Prompt	Command
1	Enter configuration mode for the serial subinterface and specify this interface as a point-to-point connection.	1700(config-if)#	<b>interface Serial0.1 point-to-point</b>
2	Configure this interface with an IP address and a subnet mask.	1700(config-if)#	<b>ip address 192.168.39.40 255.255.255.0</b>
3	Enable IPX routing on this interface.	1700(config-if)#	<b>ipx network 987</b>
4	Assign a data link connection identifier (DLCI) to the Frame Relay subinterface. If you are unsure of the DLCI, use the number that you recorded in Step 4 of the previous “Verifying Your Configuration” section.	1700(config-if)#	<b>frame-relay interface-dlci 17</b>
5	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.	1700(config-if)#	<b>snapshot client 5 60</b>

6	Enable the interface and the configuration changes that you have just made on the interface.	1700(config-if)#	<b>no shutdown</b>
	Exit configuration mode for this interface.	1700(config-if)#	<b>exit</b>

## Verifying Your Configuration

You can verify your configuration to this point by

- Confirming That the Line Is Up.
- Confirming the Frame Relay Maps.
- Confirming Connectivity to the Central-Site Router.

### Confirming That the Line Is Up

**Step 1** From the privileged EXEC command mode, enter the **show interface serial 0** command, as follows:

```
1700# show interface serial 0

Serial0 is up, line protocol is up
Hardware is QUICC Serial
__MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
Encapsulation FRAME-RELAY, loopback not set, keepalive set (10 sec)
LMI enq sent 163, LMI stat recvd 136, LMI upd recvd 0, DTE LMI up
LMI enq recvd 39, LMI stat sent 0, LMI upd sent 0
LMI DLCI 1023 LMI type is CISCO frame relay DTE
Broadcast queue 0/64, broadcasts sent/dropped 27/0, interface broadcasts 28
Last input 00:00:01, output 00:00:05, output hang never
Last clearing of "show interface" counters never
Input queue: 0/75/0 (size/max/drops); Total output drops: 0
Queueing strategy: weighted fair
Output queue: 0/64/0 (size/threshold/drops)
Conversations 0/1 (active/max active)
Reserved Conversations 0/0 (allocated/max allocated)
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
1813 packets input, 109641 bytes, 0 no buffer
Received 1576 broadcasts, 0 runts, 0 giants
13 input errors, 0 CRC, 13 frame, 0 overrun, 0 ignored, 0 abort
1848 packets output, 117260 bytes, 0 underruns
0 output errors, 0 collisions, 32 interface resets
0 output buffer failures, 0 output buffers swapped out
29 carrier transitions
DCD=up DSR=up DTR=up RTS=up CTS=up
```

**Step 2** Confirm that the following messages (shown in bold) appear in the command output:

- “Serial0 is up, line protocol is up”—The Frame Relay connection is active.
- “LMI enq sent 163, LMI stat recvd 136”—The connection is sending and receiving data. The number shown in your output will probably be different.
- “LMI type is CISCO”—The Local Management Interface (LMI) type is configured correctly for the router.

**Step 3** If the message does not appear in the command output, take the following steps:

- (a) Confirm with the Frame Relay service provider that the LMI setting is correct for your line.
- (b) Confirm that keepalives are set and that the router is receiving LMI updates.

**Step 4** To continue configuration, re-enter global configuration mode.

### Confirming the Frame Relay Maps

**Step 1** From the privileged EXEC command mode, enter the **show frame-relay map** command.

**Step 2** Confirm that the “status defined, active” message (shown in bold in the example) appears for each serial subinterface.

```
1700# show frame-relay map
Serial0.1 (up): point-to-point dlci, dlci 17(0x11,0x410), broadcast,
      status defined, active
```

**Step 3** If the message does not appear, confirm that

- (a) The central-site router is connected and configured.
- (b) Check with the Frame Relay carrier to verify that the line is operating correctly.

**Step 4** To continue configuration, re-enter global configuration mode.

### Confirming Connectivity to the Central-Site Router

**Step 1** From the privileged EXEC command mode, enter the **ping** command followed by the IP address of the central-site router.

**Step 2** Note the percentage in the “Success rate...” line (shown in bold in the example):

```
1700# ping 192.168.38.40

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to 192.168.38.40, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 32/32/32 ms
1700#
```

If the success rate is 60 percent or greater, this verification step is successful.

**Step 3** To continue configuration, re-enter global configuration mode.

## Configuring Routing Parameters

Use this table to configure the Frame Relay interface for Enhanced Interior Gateway Routing Protocol (EIGRP) routing.

Step	Task	Router Prompt	Command
1	Configure the IP EIGRP routing process.	1700(config)#	<b>router eigrp 202</b>
2	Specify a list of networks for the EIGRP routing process by entering the IP address of the directly connected network.	1700(config-router)#	<b>network 172.16.0.0</b>
3	Configure the router to forward packets addressed to a subnet of a network with no network default route.	1700(config-router)#	<b>ip classless</b>
4	Exit router configuration mode.	1700(config-router)#	<b>exit</b>

## Configuring Command-Line Access to the Router

Use this table to configure some parameters that control access to the router.

Step	Task	Router Prompt	Command
1	Specify the console terminal line.	1700(config)#	<b>line console 0</b>
2	Set the interval in minutes that the EXEC command interpreter waits until user input is detected.	1700(config-line)#	<b>exec-timeout 5</b>
3	Specify a virtual terminal for remote console access.	1700(config-line)#	<b>line vty 0 4</b>
4	Specify a password on the line.	1700(config-line)#	<b>password &lt;lineaccess&gt;</b>
5	Enable password checking at terminal session login.	1700(config-line)#	<b>login</b>
6	Exit configuration mode.	1700(config-line)#	<b>end</b>

## Frame Relay with an Internal DSU/CSU

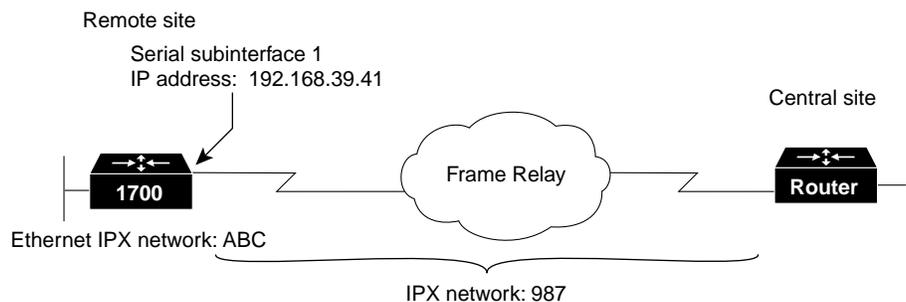
This section describes how to configure the Cisco 1700 router with an internal data service unit/channel service unit (DSU/CSU) for Frame Relay. In addition to the assumptions described in the “Before You Begin” section of this chapter, this configuration assumes that the internal DSU/CSU is a switched 56-kbps interface.

These are the major tasks when configuring your router:

- Configuring Global Parameters
- Configuring the Fast Ethernet Interface
- Configuring Security
- Configuring the Frame Relay Interface
- Configuring the Frame Relay Subinterface
- Configuring Routing Parameters
- Configuring Command-Line Access to the Router

Figure 5-2 illustrates the example configuration used in this section.

**Figure 5-2** Frame Relay Internal DSU/CSU Example Configuration



## Configuring Global Parameters

Use this table to configure the router for some global parameters.

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

## Configuring Security

Use this table to configure the router with some security measures.

Step	Task	Router Prompt	Command
1	Configure the router with a host name, which is used in prompts and default configuration file names.  For PPP authentication, the host name entered with this command must match the username of the central-site router.	Router(config)#	<b>hostname 1700</b>
2	Specify a password to prevent unauthorized access to the router.	1700(config)#	<b>enable password &lt;1700user&gt;</b>

## Configuring the Fast Ethernet Interface

Use this table to configure the Fast Ethernet interface, which connects your router to the local network.

Step	Task	Router Prompt	Command
1	Enter configuration mode for the Fast Ethernet interface.	1700(config)#	<b>interface fastethernet0</b>
2	Configure this interface with an IP address and a subnet mask.	1700(config-if)#	<b>ip address 172.16.25.1 255.255.255.224</b>
3	Enable IPX routing on this interface.	1700(config-if)#	<b>ipx network ABC</b>
4	Enable the interface and the configuration changes that you have just made on the interface.	1700(config-if)#	<b>no shutdown</b>
5	Exit configuration mode for this interface.	1700(config-if)#	<b>exit</b>

## Configuring the Frame Relay Interface

Use this table to configure the serial interface, which connects your router to the central-site router over the wide-area network.

Step	Task	Router Prompt	Command
1	Enter configuration mode for the serial interface.	1700(config)#	<b>interface Serial0</b>
2	Disable IP routing on this interface.	1700(config-if)#	<b>no ip address</b>
3	Set the encapsulation method on this interface to Frame Relay.	1700(config-if)#	<b>encapsulation frame-relay</b>
4	Configure the clock source for the 56-kbps DSU/CSU module.  In most applications, the DSU/CSU should be configured with the <b>clock source line</b> command. For back-to-back DSU/CSU configurations, configure one DSU/CSU with the <b>clock source internal</b> command and the other with the <b>clock source line</b> command.	1700(config-if)#	<b>service-module 56k clock source line</b>
5	Configure this interface to transmit packets in switched dial-up mode or digital data service mode using the 56-kbps DSU/CSU module.  If the clock rate has not been set correctly with the <b>service-module 56k clock source line</b> command, this command is not accepted by the router.	1700(config-if)#	<b>service-module 56k network type dds</b>

### Verifying Your Configuration

You can verify your configuration to this point by

- Confirming That the Line Is Up.
- Confirming That the Interface Is Receiving a Line Signal.

#### Confirming That the Line Is Up

**Step 1** From the privileged EXEC command mode, enter the **show interface serial 0** command.

**Step 2** Confirm that the “Serial0 is up, line protocol is up” message (shown in bold in the example) appears in the command output.

```
1700# show interface serial 0
Serial0 is up, line protocol is up
Hardware is QUICC Serial
MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
Encapsulation FRAME-RELAY, loopback not set, keepalive set (10 sec)
LMI enq sent 163, LMI stat recvd 136, LMI upd recvd 0, DTE LMI up
LMI enq recvd 39, LMI stat sent 0, LMI upd sent 0
LMI DLCI 1023 LMI type is CISCO frame relay DTE
Broadcast queue 0/64, broadcasts sent/dropped 27/0, interface broadcasts 28
Last input 00:00:01, output 00:00:05, output hang never
Last clearing of "show interface" counters never
Input queue: 0/75/0 (size/max/drops); Total output drops: 0
Queueing strategy: weighted fair
Output queue: 0/64/0 (size/threshold/drops)
Conversations 0/1 (active/max active)
Reserved Conversations 0/0 (allocated/max allocated)
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
1813 packets input, 109641 bytes, 0 no buffer
Received 1576 broadcasts, 0 runts, 0 giants
13 input errors, 0 CRC, 13 frame, 0 overrun, 0 ignored, 0 abort
```

```
1848 packets output, 117260 bytes, 0 underruns
0 output errors, 0 collisions, 32 interface resets
0 output buffer failures, 0 output buffers swapped out
29 carrier transitions
DCD=up DSR=up DTR=up RTS=up CTS=up
```

**Step 3** To continue configuration, re-enter global configuration mode.

### Confirming That the Interface Is Receiving a Line Signal

**Step 1** From the privileged EXEC command mode, enter the **show service module serial 0** command:

```
1700# show service-module serial 0
Module type is 4-wire Switched 56K in DDS mode,
Current line rate is 56 Kbits/sec and role is Telco side,
Last clearing of alarm counters 21:23:25
oos/oof          : 0,
loss of signal   : 0,
loss of sealing current: 0,
CSU/DSU loopback : 0,
loopback from remote : 0,
DTE loopback     : 0,
line loopback    : 0,
```

**Step 2** Confirm that the “loss of signal” message (shown in bold in the example) shows zero, which means that there are no problems with the interface receiving a line signal.

**Step 3** To continue configuration, re-enter global configuration mode.

## Configuring the Frame Relay Subinterface

Use this table to configure the Frame Relay subinterface network addresses.

Step	Task	Router Prompt	Command
1	Enter configuration mode for the serial subinterface and specify this interface as a point-to-point connection.	1700(config-if)#	<b>interface Serial0.1 point-to-point</b>
2	Configure this interface with an IP address and a subnet mask.	1700(config-if)#	<b>ip address 172.16.26.1 255.255.255.0</b>
3	Enable IPX routing on this interface.	1700(config-if)#	<b>ipx network 987</b>
4	Assign a DLCI to the Frame Relay subinterface.	1700(config-if)#	<b>frame-relay interface-dlci 17</b>
5	Configure this interface with an IP address and a subnet mask.	1700(config-if)#	<b>ip address 192.168.38.41 255.255.255.0</b>
6	Enable IPX routing on this interface.	1700(config-if)#	<b>ipx network 456</b>
7	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.	1700(config-if)#	<b>snapshot client 5 60</b>
8	Assign a DLCI to the Frame Relay subinterface.	1700(config-if)#	<b>frame-relay interface-dlci 17</b>

9	Enable the interface and the configuration changes that you have just made on the interface.	1700(config-if)#	<b>no shutdown</b>
10	Exit configuration mode for the serial interface.	1700(config-if)#	<b>exit</b>

## Configuring Routing Parameters

Use this table to configure the Frame Relay interface for Enhanced Interior Gateway Routing Protocol (EIGRP) routing.

Step	Task	Router Prompt	Command
1	Configure the IP EIGRP routing process.	1700(config)#	<b>router eigrp 202</b>
2	Specify a list of networks for the EIGRP routing process by entering the IP address of the directly connected network.	1700(config-router)#	<b>network 172.16.0.0</b>
3	Configure the router to forward packets addressed to a subnet of a network with no network default route.	1700(config-router)#	<b>ip classless</b>
4	Exit router configuration mode.	1700(config-router)#	<b>exit</b>

## Configuring Command-Line Access to the Router

Use this table to configure some parameters that control access to the router.

Step	Task	Router Prompt	Command
1	Specify the console terminal line.	1700(config)#	<b>line console 0</b>
2	Set the interval in minutes that the EXEC command interpreter waits until user input is detected.	1700(config-line)#	<b>exec-timeout 5</b>
3	Specify a virtual terminal for remote console access.	1700(config-line)#	<b>line vty 0 4</b>
4	Specify a password on the line.	1700(config-line)#	<b>password &lt;lineaccess&gt;</b>
5	Enable password checking at terminal session login.	1700(config-line)#	<b>login</b>
6	Exit configuration mode.	1700(config-line)#	<b>end</b>

## ISDN as the Backup WAN Connection

This section describes how to configure ISDN to operate as a secondary, or backup, WAN connection. You do this so that the router continues to operate if the main WAN connection is down. This configuration is usually used on an ISDN WAN interface card that is installed in a Cisco 1700 router. The router on-board WAN port is the primary, or main, WAN connection, and the card WAN port is the secondary connection.

In addition to the assumptions listed in the “Before You Begin” section of this chapter, the configuration is based on the following assumptions:

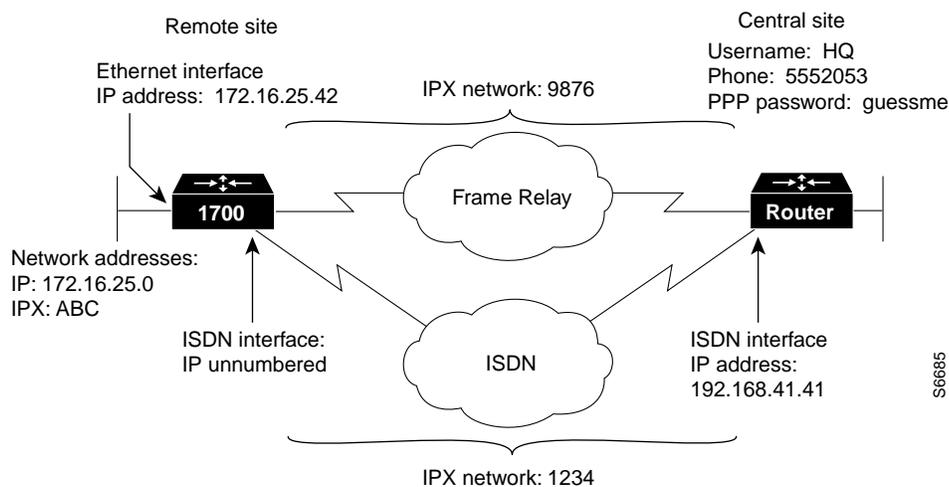
- Frame Relay is used as the primary WAN connection to the central site.
- The ISDN line is used as the secondary WAN connection to the central site.

These are the major tasks when configuring your router:

- Configuring Global Parameters
- Configuring Security
- Configuring the Fast Ethernet Interface
- Configuring the Frame Relay Interface
- Configuring the ISDN Interface
- Configuring Protocols and Dialing Behavior
- Configuring Command-Line Access to the Router

Figure 5-3 illustrates the example configuration that is used in this section.

**Figure 5-3 ISDN as Backup Connection Example Configuration**



## Configuring Global Parameters

Use this table to configure the router for some global parameters.

Step	Task	Router Prompt	Command
1	Enter configuration mode.	Router#	<b>configure terminal</b>
2	Configure the router to show the date and time of all debug messages.  This command is optional, but recommended if you use debug commands to troubleshoot your configuration.	Router(config)#	<b>service timestamps debug datetime msec</b>
3	Configure the router to show the date and time of all log messages.  This command is optional, but recommended if you use the verification steps described in this guide. This feature is enabled for all the example command output shown in this guide.	Router(config)#	<b>service timestamps log datetime msec</b>

4	Configure the router with its IPX address.	Router(config)#	<b>ipx routing</b> <i>0060.834f.66dd</i>
5	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: <ul style="list-style-type: none"> <li>• <b>basic-ts013</b>—Australian TS013 switches</li> <li>• <b>basic-1tr6</b>—German 1TR6 ISDN switches</li> <li>• <b>basic-nwnet3</b>—Norway NET3 switches (phase 1)</li> <li>• <b>basic-net3</b>—NET3 ISDN switches</li> <li>• <b>vn2</b>—French VN2 ISDN switches</li> <li>• <b>vn3</b>—French VN3 ISDN switches</li> <li>• <b>ntt</b>—Japanese NTT ISDN switches</li> <li>• <b>basic-5ess</b>—Basic rate 5ESS switches</li> <li>• <b>basic-dms100</b>—NT DMS-100 basic rate switches</li> <li>• <b>basic-ni</b>—National ISDN-1 switches</li> <li>• <b>basic-nznet3</b>—New Zealand Net3 switches</li> </ul>	Router(config)#	<b>isdn switch-type</b> <i>basic-ni</i>

## Configuring Security

Use this table to configure the router with some security measures.

Step	Task	Router Prompt	Command
1	Configure the router with a host name, which is used in prompts and default configuration file names.  For PPP authentication, the host name entered with this command must match the username of the central-site router.	Router(config)#	<b>hostname</b> <i>1700</i>
2	Specify a password to prevent unauthorized access to the router.	1700(config)#	<b>enable password</b> <i>&lt;1700user&gt;</i>
3	Specify the password used during caller identification and CHAP and PAP authentication.  For CHAP and PAP authentication, the username entered with this command must match the host name of the central-site router.	1700(config)#	<b>username</b> <i>HQ password &lt;guessme&gt;</i>

## Configuring the Fast Ethernet Interface

Use this table to configure the Fast Ethernet interface, which connects your router to the local network.

Step	Task	Router Prompt	Command
1	Enter configuration mode for the Fast Ethernet interface.	1700(config)#	<b>interface fastethernet0</b>
2	Configure this interface with an IP address and a subnet mask.	1700(config-if)#	<b>ip address</b> <i>172.16.25.1 255.255.255.0</i>
3	Configure the Fast Ethernet interface IPX network number.	1700(config-if)#	<b>ipx network</b> <i>ABC</i>

## ISDN as the Backup WAN Connection

---

4	Enable the interface and the configuration changes that you have just made on the interface.	1700(config-if)#	<b>no shutdown</b>
5	Exit configuration mode for the this interface.	1700(config-if)#	<b>exit</b>

## Configuring the Frame Relay Interface

Use this table to configure the Frame Relay interface, which connects your router to the central-site router over the wide-area network.

Step	Task	Router Prompt	Command
1	Enter configuration mode for the serial interface.	1700(config)#	<b>interface Serial0</b>
2	Set the encapsulation method on this interface to Frame Relay.	1700(config-if)#	<b>encapsulation frame-relay</b>
3	Enter configuration mode for the serial subinterface and specify this interface as a point-to-point connection.	1700(config-if)#	<b>interface Serial0.1 point-to-point</b>
4	Configure the BRI interface to act as a backup line for this interface.	1700(config-if)#	<b>backup interface BRI0</b>
5	Define when the ISDN line is used as a backup for this interface: <ul style="list-style-type: none"><li>• The first number is how many seconds the Frame Relay line is down before the ISDN line comes up as the backup line.</li><li>• The second number is how many seconds after the Frame Relay line comes back up until the ISDN line goes down.</li></ul>	1700(config-if)#	<b>backup delay 10 10</b>
6	Configure this interface with an IP address.	1700(config-if)#	<b>ip address 172.16.26.1 255.255.255.0</b>
7	Enable IPX routing on this interface.	1700(config-if)#	<b>ipx network 9876</b>
8	Assign a data link connection identifier (DLCI) to the Frame Relay subinterface.	1700(config-if)#	<b>frame-relay interface-dlci 17</b>
9	Enable the interface and the configuration changes that you have just made on the interface.	1700(config-if)#	<b>no shutdown</b>
10	Exit configuration mode for this interface.	1700(config-if)#	<b>exit</b>

## Configuring the ISDN Interface

Use this table to configure the ISDN line to act as a backup connection if for some reason the Frame Relay connection fails.

Step	Task	Router Prompt	Command
1	Enter configuration mode for the ISDN interface.	1700(config)#	<b>interface BRI0</b>
2	Enter the service profile identifier (SPID) number assigned by the ISDN service provider to the B1 channel.  This step is required only when the service provider has assigned a SPID to your ISDN line. Not all ISDN lines have SPIDs.	1700(config-if)#	<b>isdn spid1 555987601</b>

<b>3</b>	Define the SPID number assigned by the ISDN service provider to the B2 channel.  This step is required only when the service provider has assigned a SPID to your ISDN line. Not all ISDN lines have SPIDs.	1700(config-if)#	<b>isdn spid2 555987602</b>
<b>4</b>	Enable IP routing on this interface without assigning an IP address.	1700(config-if)#	<b>ip unnumbered fastethernet0</b>
<b>5</b>	Define the IPX network number for this interface.	1700(config-if)#	<b>ipx network 1234</b>
<b>6</b>	Set the encapsulation method on this interface to PPP.	1700(config-if)#	<b>encapsulation ppp</b>
<b>7</b>	Specify the telephone number that this interface dials to connect to the central-site router.  This command is used when the interface is only connecting to a single remote site.	1700(config-if)#	<b>dialer string 5552053</b>
<b>8</b>	Assign this interface to a dialer group.	1700(config-if)#	<b>dialer-group 1</b>
<b>9</b>	Enable CHAP and PAP authentication on this interface. CHAP authentication is attempted first. If the central-site router does not support CHAP, PAP is used for authentication.	1700(config-if)#	<b>ppp authentication chap pap</b>
<b>10</b>	Enable multilink PPP on this interface.	1700(config-if)#	<b>ppp multilink</b>
<b>11</b>	Enable the interface and the configuration changes that you have just made on the interface.	1700(config-if)#	<b>no shutdown</b>
<b>12</b>	Exit configuration mode for this interface.	1700(config-if)#	<b>exit</b>

## Verifying Your Configuration

You can verify your configuration by confirming connectivity to the central-site router as follows:

**Step 1** From the privileged EXEC command mode, enter the **ping** command followed by the IP address of the central-site route to have the router dial the remote router.

**Step 2** Wait for the “ISDN-6-CONNECT” message (shown in bold in the example):

```
1700# ping 192.168.37.40

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.37.40, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 40/43/48 ms
1700#
*Mar 1 03:37:46.526: %LINK-3-UPDOWN: Interface BRI0:1, changed state to up
*Mar 1 03:37:46.923: %LINEPROTO-5-UPDOWN: Line protocol on Interface BRI0:1, changed state to up
*Mar 1 03:37:46.939: %LINK-3-UPDOWN: Interface Virtual-Access1, changed state to up
*Mar 1 03:37:47.923: %LINEPROTO-5-UPDOWN: Line protocol on Interface Virtual-Access1, changed state to up
*Mar 1 03:35:57.217: %ISDN-6-CONNECT: Interface BRI0:1 is now connected to 5552053 HQ
```

**Step 3** Enter the ping command followed by the IP address of the central-site router a second time:

```
1700# ping 192.168.37.40

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.37.40, timeout is 2 seconds:
.!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 40/43/48 ms
1700#
*Mar 1 03:37:46.526: %LINK-3-UPDOWN: Interface BRI0:1, changed state to up
*Mar 1 03:37:46.923: %LINEPROTO-5-UPDOWN: Line protocol on Interface BRI0:1, changed state to up
*Mar 1 03:37:46.939: %LINK-3-UPDOWN: Interface Virtual-Access1, changed state to up
```

```
*Mar 1 03:37:47.923: %LINEPROTO-5-UPDOWN: Line protocol on Interface Virtual-Access1, changed
state to up
*Mar 1 03:35:57.217: %ISDN-6-CONNECT: Interface BRI0:1 is now connected to 5552053 HQ
```

- Step 4** If the success rate (shown in bold in the example) is 100 percent, this verification step is successful.
- Step 5** If the success rate is less than 60 percent, take the following steps:
- Use the **show frame-relay pvc** command to confirm that the DLCI for the Frame Relay interface is active.
  - Use the **show interface serial0** command to confirm that the “Serial0 is up, line protocol is up” message is displayed in the command output.
- Step 6** To continue configuration, re-enter global configuration mode.

## Configuring Protocols and Dialing Behavior

Use this table to configure how and when the ISDN line connects to the central-site router.

Step	Task	Router Prompt	Command
1	Configure the IP Enhanced Interior Gateway Routing Protocol (EIGRP) routing process.	1700(config)#	<b>router eigrp 202</b>
2	Specify a list of networks for the EIGRP routing process by entering the IP address of the directly connected network.	1700(config-router)#	<b>network 172.16.0.0</b>
3	Specify that the router does not forward packets that are destined for a subnet of a network that has no network default route.	1700(config-router)#	<b>ip classless</b>
4	Specify an access list by list number and protocol (IP) to define the “interesting” packets that can trigger a called to the destination.	1700(config-router)#	<b>dialer-list 1 protocol ip permit</b>
5	Specify an access list by list number and protocol (IPX) to define the “interesting” packets that can trigger a called to the destination.	1700(config-router)#	<b>dialer-list 1 protocol ipx permit</b>
6	Exit router configuration mode.	1700(config-router)#	<b>exit</b>

## Configuring Command-Line Access to the Router

Use this table to configure some parameters that control access to the router.

Step	Task	Router Prompt	Command
1	Specify the console terminal line.	1700(config)#	<b>line console 0</b>
2	Set the interval that the EXEC command interpreter waits until user input is detected.	1700(config-line)#	<b>exec-timeout 5</b>
3	Specify a virtual terminal for remote console access.	1700(config-line)#	<b>line vty 0 4</b>
4	Specify a password on the line.	1700(config-line)#	<b>password &lt;lineaccess&gt;</b>
5	Enable password checking at terminal session login.	1700(config-line)#	<b>login</b>
6	Exit configuration mode.	1700(config-line)#	<b>end</b>

## Verifying Your Configuration

You can verify your router configuration to this point by confirming that the ISDN connects dynamically to the remote site when the Frame Relay connection is disconnected by taking the following steps:

Step	Task
1	Remove the cable that connects the router to the Frame Relay services, or otherwise force the DLCI(s) to become inactive, which brings the line protocol down.
2	When the router generates routing updates, the ISDN line should begin dialing. If the ISDN line does not dial, use the <b>ping</b> command as described in the “Configuring the ISDN Interface” section.
3	Reconnect the cable that connects the router to the Frame Relay services, or force the DLCI(s) to become active. The ISDN line should disconnect dynamically.

## Troubleshooting Problems with ISDN as Frame Relay Backup Line

If you are having problems, take some or all of the following steps:

- 1 Confirm that you used the **broadcast** keyword in the **dialer map** command. This keyword causes dialing to occur with a flash routing update. If you do not use the **broadcast** keyword, routing updates do not trigger dialing on the ISDN line.
- 2 If you want to use the ISDN line even when the Frame Relay line is connected, use dialer profiles. Otherwise, the ISDN line operates in backup mode only.
- 3 If you are having problems, you can use some or all of the following **debug** commands:



**Caution** If you are not familiar with Cisco IOS debug commands, you should read the “Using Debug Commands” section in the “Cisco IOS Basic Skills” chapter before attempting any debugging.

- **debug dialer events**
- **debug isdn events**
- **debug isdn q931**
- **debug isdn q921**
- **debug ppp negotiation**
- **debug ppp authentication**
- **debug ppp multilink events**

## ISDN as a Backup Connection with Dialer Profiles

This section describes how to configure ISDN to operate as a secondary, or backup, WAN connection by using dialer profiles to connect to multiple central-site routers.

In addition to the assumptions listed in the “Before You Begin” section at the beginning of this chapter, this configuration is based on the following additional assumptions:

- The Frame Relay service provides end-to-end status of the Frame Relay connection.

This means that if the router primary serial WAN connection (in this example, Frame Relay) goes down, the Frame Relay switch sends LMI updates to the central-site router indicating that the line has gone down.

- Your router connects to two different central-site routers.

These are the major tasks when configuring your router:

- Configuring Global Parameters
- Configuring Security
- Configuring the Fast Ethernet Interface
- Configuring the Serial Interface
- Configuring the Primary Connection to the First Central-Site Router
- Configuring the Primary Connection to the Second Central-Site Router
- Configuring the ISDN Interface
- Configuring the Backup Connection to the First Central-Site Router
- Configuring the Backup Connection to the Second Central-Site Router
- Configuring Routing Protocols
- Configuring Command-Line Access to the Router

## Configuring Global Parameters

Use this table to configure the router for some global parameters.

Step	Task	Router Prompt	Command
1	Enter configuration mode.	Router#	<b>configure terminal</b>
2	Configure the router to show the date and time of all debug messages.  This command is optional, but recommended if you use debug commands to troubleshoot your configuration.	Router(config)#	<b>service timestamps debug datetime msec</b>
3	Configure the router to show the date and time of all log messages.  This command is optional, but recommended if you use the verification steps described in this guide. This feature is enabled for all the example command output shown in this guide.	Router(config)#	<b>service timestamps log datetime msec</b>

---

4	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:	Router(config)#	<i>basic-ni</i>
---	---	-----------------	-----------------

---

- **basic-ts013**—Australian TS013 switches
- **basic-1tr6**—German 1TR6 ISDN switches
- **basic-nwnet3**—Norway NET3 switches (phase 1)
- **basic-net3**—NET3 ISDN switches
- **vn2**—French VN2 ISDN switches
- **vn3**—French VN3 ISDN switches
- **ntt**—Japanese NTT ISDN switches
- **basic-5ess**—Basic rate 5ESS switches
- **basic-dms100**—NT DMS-100 basic rate switches
- **basic-ni**—National ISDN-1 switches
- **basic-nznet3**—New Zealand Net3 switches

---

## Configuring Security

Use this table to configure the router with some security measures.

Step	Task	Router Prompt	Command
1	Configure the router with a host name, which is used in prompts and default configuration file names.  For PPP authentication, the host name entered with this command must match the username of the central-site router.	Router(config)#	<b>hostname</b> <i>1700</i>
2	Specify a password to prevent unauthorized access to the router.	1700(config)#	<b>enable password</b> <i>&lt;1700user&gt;</i>
3	Specify the password used during caller identification and CHAP and PAP authentication.  This password applies only to one of the central-site routers. For security reasons, a different password should be used for each remote location that the router dials on the backup ISDN line.  For PPP authentication, the username entered with this command must match the host name of the central-site router.	1700(config)#	<b>username</b> <i>HQ1</i> <b>password</b> <i>&lt;guessme1&gt;</i>
4	Specify the password used during caller identification and CHAP and PAP authentication.  This password applies only to one of the central-site routers. For security reasons, a different password should be used for each remote location that the router dials on the backup ISDN line.  For PPP authentication, the username entered with this command must match the host name of the central-site router.	1700(config)#	<b>username</b> <i>HQ2</i> <b>password</b> <i>&lt;guessme2&gt;</i>

---

## Configuring the Fast Ethernet Interface

Use this table to configure the Fast Ethernet interface, which connects your router to the local network.

Step	Task	Router Prompt	Command
1	Enter configuration mode for this interface.	1700(config)#	<b>interface fastethernet0</b>
2	Configure this interface with an Ethernet address.	1700(config-if)#	<b>ip address 172.16.20.1 255.255.255.0</b>
3	Disable fast switching and autonomous switching on this interface.	1700(config-if)#	<b>no ip route-cache</b>
4	Enable IP multicast fast switching on this interface.	1700(config-if)#	<b>ip mroute-cache</b>
5	Enable the configuration changes for this interface.	1700(config-if)#	<b>no shutdown</b>
6	Exit configuration mode for this interface.	1700(config-if)#	<b>exit</b>

## Configuring the Serial Interface

Use this table to configure the serial interface, which connects your router to the central-site router over the wide-area network.

Step	Task	Router Prompt	Command
1	Enter configuration mode for this interface.	1700(config)#	<b>interface serial0</b>
2	Disable IP processing for this interface.	1700(config-if)#	<b>no ip address</b>
3	Configure this interface for Frame Relay encapsulation.	1700(config-if)#	<b>encapsulation frame-relay</b>
4	Enable the configuration changes for this interface.	1700(config-if)#	<b>no shutdown</b>
5	Exit configuration mode for this interface.	1700(config-if)#	<b>exit</b>

## Configuring the Primary Connection to the First Central-Site Router

Use this table to configure a Frame Relay connection to a central-site router.

Step	Task	Router Prompt	Command
1	Create a subinterface and enter configuration mode for the interface.	1700(config)#	<b>interface serial0.1 point-to-point</b>
2	Define when the ISDN line is used as a backup for this interface: <ul style="list-style-type: none"> <li>The first number is how many seconds the Frame Relay line is down before the ISDN line comes up as the backup line.</li> <li>The second number is how many seconds after the Frame Relay line comes back up until the ISDN line goes down.</li> </ul>	1700(config-if)#	<b>backup delay 10 10</b>
3	Configure the BRI interface to act as a dial backup line for this subinterface.	1700(config-if)#	<b>backup interface Dialer1</b>

4	Configure this subinterface with an IP address.	1700(config-if)#	<b>ip address</b> 172.16.30.40 255.255.255.0
5	Configure this subinterface with an IPX network address.	1700(config-if)#	<b>ipx network</b> AABB
6	Assign a data link connection identifier (DLCI) to this subinterface.	1700(config-if)#	<b>frame-relay interface-dlci</b> 17
7	Enable the configuration changes for this subinterface.	1700(config-if)#	<b>no shutdown</b>
8	Exit configuration mode for this subinterface.	1700(config-if)#	<b>exit</b>

## Configuring the Primary Connection to the Second Central-Site Router

Use this table to configure a Frame Relay connection to a second central-site router.

Step	Task	Router Prompt	Command
1	Create a subinterface and enter configuration mode for the interface.	1700(config)#	<b>interface serial0.2 point-to-point</b>
2	Define when the ISDN line is used as a backup for this interface: <ul style="list-style-type: none"> <li>The first number is how many seconds the Frame Relay line is down before the ISDN line comes up as the backup line.</li> <li>The second number is how many seconds after the Frame Relay line comes back up until the ISDN line goes down.</li> </ul>	1700(config-if)#	<b>backup delay</b> 10 10
3	Configure the BRI interface to act as a dial backup line for this subinterface.	1700(config-if)#	<b>backup interface Dialer2</b>
4	Configure this subinterface with an IP address.	1700(config-if)#	<b>ip address</b> 172.16.40.40 255.255.255.0
5	Configure this subinterface with an IPX network address.	1700(config-if)#	<b>ipx network</b> BBCC
6	Assign a data link connection identifier (DLCI) to this subinterface.	1700(config-if)#	<b>frame-relay interface-dlci</b> 18
7	Enable the configuration changes for this subinterface.	1700(config-if)#	<b>no shutdown</b>
8	Exit configuration mode for this subinterface.	1700(config-if)#	<b>exit</b>

## Configuring the ISDN Interface

Use this table to configure the ISDN interface, which connects your router to the central-site router if for some reason the Frame Relay interface fails.

Step	Task	Router Prompt	Command
1	Enter configuration mode for this interface.	1700(config)#	<b>interface BRI0</b>
2	Configure this interface for PPP packet encapsulation.	1700(config-if)#	<b>encapsulation</b> ppp
3	Assign this interface to a dialer pool.	1700(config-if)#	<b>dialer pool-member</b> 1
4	Enable the configuration changes on this interface.	1700(config-if)#	<b>no shutdown</b>
5	Exit configuration mode for this interface.	1700(config-if)#	<b>exit</b>

## Configuring the Backup Connection to the First Central-Site Router

Use this table to configure the ISDN backup connection to one central-site router.

Step	Task	Router Prompt	Command
1	Create an ISDN dialer interface, and enter configuration mode for the interface.  The number that you assign in this command must match the number you assigned with the <b>backup interface</b> command when you configured the primary connection to the first central-site router.	1700(config)#	<b>interface Dialer1</b>
2	Enable IP routing without assigning an IP address.	1700(config-if)#	<b>ip unnumbered fastethernet0</b>
3	Configure this interface for PPP packet encapsulation.	1700(config-if)#	<b>encapsulation ppp</b>
4	Configure this interface with an IPX network number.	1700(config-if)#	<b>ipx network DCBA</b>
5	Configure the name of the central-site router that this interface dials.  The name that you enter with this command should be the same name that you entered with the <b>username password</b> command in the “Configuring Security” section.	1700(config-if)#	<b>dialer remote-name HQ1</b>
6	Configure the number that the interface dials to connect to the central-site router.	1700(config-if)#	<b>dialer string 5551234</b>
7	Specify that the router can have only one call connected to the first central-site router at any one time.	1700(config-if)#	<b>dialer max-call 1</b>
8	Assign this interface to a dialer pool.	1700(config-if)#	<b>dialer pool 1</b>
9	Assign this interface to a dialer group.	1700(config-if)#	<b>dialer-group 1</b>
10	Enable CHAP and PAP authentication on this interface. CHAP authentication is attempted first. If the central-site router does not support CHAP, PAP is used for authentication.	1700(config-if)#	<b>ppp authentication chap pap</b>
11	Enable the configuration changes for this interface.	1700(config-if)#	<b>no shutdown</b>
12	Exit configuration mode for this subinterface.	1700(config-if)#	<b>exit</b>

## Configuring the Backup Connection to the Second Central-Site Router

Use this table to configure the ISDN backup connection to a second central-site router.

Step	Task	Router Prompt	Command
1	Create an ISDN dialer interface, and enter configuration mode for the interface.  The number that you assign in this command must match the number you assigned with the <b>backup interface</b> command when you configured the primary connection to the second central-site router.	1700(config)#	<b>interface Dialer2</b>
2	Enable IP routing without assigning an IP address.	1700(config-if)#	<b>ip unnumbered fastethernet0</b>

3	Configure this interface for PPP packet encapsulation.	1700(config-if)#	<b>encapsulation ppp</b>
4	Configure this interface with an IPX network number.	1700(config-if)#	<b>ipx network ABCD</b>
5	Configure the name of the central-site router that this interface dials.  The name that you enter with this command should be the same name that you entered with the <b>username password</b> command in the “Configuring Security” section.	1700(config-if)#	<b>dialer remote-name HQ2</b>
6	Configure the number that the interface dials to connect to the central-site router.	1700(config-if)#	<b>dialer string 5551122</b>
7	Specify that the router can have only one call connected to the first central-site router at any one time.	1700(config-if)#	<b>dialer max-call 1</b>
8	Assign this interface to a dialer pool.		<b>dialer pool 1</b>
9	Assign this interface to a dialer group.	1700(config-if)#	<b>dialer-group 1</b>
10	Enable CHAP and PAP authentication on this interface. CHAP authentication is attempted first. If the central-site router does not support CHAP, PAP is used for authentication.	1700(config-if)#	<b>ppp authentication chap pap</b>
11	Enable the configuration changes for this interface.	1700(config-if)#	<b>no shutdown</b>
12	Exit configuration mode for this subinterface.	1700(config-if)#	<b>exit</b>

## Configuring Routing Protocols

Use this table to configure the router for Enhanced Interior Gateway Routing Protocol (EIGRP) routing.

Step	Task	Router Prompt	Command
1	Configure the router for IP EIGRP routing.	1700(config) #	<b>router eigrp 1</b>
2	Configure the IP network address for EIGRP routing.	1700(config-router)#	<b>network 172.16.0.0</b>
3	Exit router configuration mode.	1700(config-router)#	<b>exit</b>

## Configuring Command-Line Access to the Router

Use this table to configure some parameters that control access to the router.

Step	Task	Router Prompt	Command
1	Specify the console terminal line.	1700(config)#	<b>line console 0</b>
2	Set the interval in minutes that the EXEC command interpreter waits until user input is detected.	1700(config-line)#	<b>exec-timeout 5</b>
3	Specify a virtual terminal for remote console access.	1700(config-line)#	<b>line vty 0 4</b>
4	Specify a password on the line.	1700(config-line)#	<b>password &lt;lineaccess&gt;</b>
5	Enable password checking at terminal session login.	1700(config-line)#	<b>login</b>
6	Exit configuration mode.	1700(config-line)#	<b>end</b>

## ISDN as a Backup Connection with Floating Static Routes

This section describes how to configure ISDN to operate as a secondary, or backup, WAN connection with floating static routes.

These are the major tasks when configuring your router:

- Configuring Global Parameters
- Configuring Security
- Configuring the Fast Ethernet Interface
- Configuring the Frame Relay Interface
- Configuring the ISDN Interface
- Configuring EIGRP Routing
- Configuring Command-Line Access to the Router

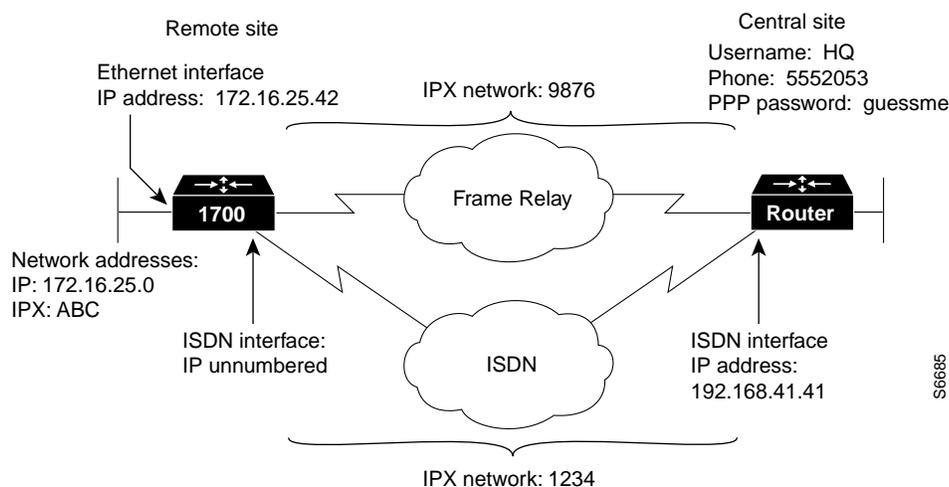
### Floating Static Routes

When the router makes routing decisions, static routes normally take precedence over learned routes. If you have configured static routes, the router usually sends data over these routes before using routes that it has learned and stored in the routing table.

However, when the ISDN line is used as a backup connection and is configured with static routes, the primary WAN connection (the Frame Relay line) does not come back up once the ISDN line is used. Floating static routes enable the ISDN line to use static routes to the central-site router until the main WAN connection, the Frame Relay line, is active again.

Figure 5-4 illustrates the example configuration that is used in this section.

**Figure 5-4 ISDN as Backup Connection with Floating Static Routes Example Configuration**



## Assumptions

In addition to the assumptions listed in the “Before You Begin” section of this chapter, the configuration in this section is based on the following assumptions:

- Frame Relay is being used as the primary WAN connection to the central site.
- You are routing IP data.
- The ISDN line is the being used as the secondary WAN connection to the central site.

## Configuring Global Parameters

Use this table to configure the router for some global parameters.

Step	Task	Router Prompt	Command
1	Enter configuration mode.	1700#	<b>configure terminal</b>
2	Configure the router to show the date and time of all debug messages.  This command is optional, but recommended if you use debug commands to troubleshoot your configuration.	1700(config)#	<b>service timestamps debug datetime msec</b>
3	Configure the router to show the date and time of all log messages.  This command is optional, but recommended if you use the verification steps described in this guide. This feature is enabled for all the example command output shown in this guide.	1700(config)#	<b>service timestamps log datetime msec</b>
4	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:  <ul style="list-style-type: none"> <li>• <b>basic-ts013</b>—Australian TS013 switches</li> <li>• <b>basic-1tr6</b>—German 1TR6 ISDN switches</li> <li>• <b>basic-nwnet3</b>—Norway NET3 switches (phase 1)</li> <li>• <b>basic-net3</b>—NET3 ISDN switches</li> <li>• <b>vn2</b>—French VN2 ISDN switches</li> <li>• <b>vn3</b>—French VN3 ISDN switches</li> <li>• <b>ntt</b>—Japanese NTT ISDN switches</li> <li>• <b>basic-5ess</b>—Basic rate 5ESS switches</li> <li>• <b>basic-dms100</b>—NT DMS-100 basic rate switches</li> <li>• <b>basic-ni</b>—National ISDN-1 switches</li> <li>• <b>basic-nznet3</b>—New Zealand Net3 switches</li> </ul>	1700(config)#	<b>isdn switch-type basic-ni</b>

## Configuring Security

Use this table to configure the router with some security measures.

Step	Task	Router Prompt	Command
1	Configure the router with a host name, which is used in prompts and default configuration file names.  For PPP authentication, the host name entered with this command must match the username of the central-site router.	1700(config)#	<b>hostname 1700</b>
2	Specify a password to prevent unauthorized access to the router.	1700(config)#	<b>enable password &lt;1700user&gt;</b>
3	Specify the password used during caller identification and CHAP and PAP authentication.  For CHAP and PAP authentication, the username entered with this command must match the host name of the central-site router.	1700(config)#	<b>username HQ password &lt;guessme&gt;</b>

## Configuring the Fast Ethernet Interface

Use this table to configure the Fast Ethernet interface, which connects your router to the local network.

Step	Task	Router Prompt	Command
1	Enter configuration mode for the Fast Ethernet interface.	1700(config)#	<b>interface fastethernet0</b>
2	Configure this interface with an IP address and a subnet mask.	1700(config-if)#	<b>ip address 172.16.25.1 255.255.255.224</b>
3	Enable the interface and the configuration changes that you have just made on the interface.	1700(config-if)#	<b>no shutdown</b>
4	Exit configuration mode for the this interface.	1700(config-if)#	<b>exit</b>

## Configuring the Frame Relay Interface

Use this table to configure parameters for the Frame Relay interface, which connects your router to the central-site router over the wide-area network.

Step	Task	Router Prompt	Command
1	Enter configuration mode for the serial interface.	1700(config)#	<b>interface Serial0</b>
2	Disable IP routing on this interface.	1700(config-if)#	<b>no ip address</b>
3	Set the encapsulation method on this interface to Frame Relay.	1700(config-if)#	<b>encapsulation frame-relay</b>
4	Enable the interface and the configuration changes that you have just made on the interface.	1700(config-if)#	<b>no shutdown</b>
5	Exit configuration mode for this interface.	1700(config-if)#	<b>exit</b>

## Configuring the Frame Relay Subinterface

Use this table to configure the Frame Relay subinterface network addresses.

Step	Task	Router Prompt	Command
1	Enter configuration mode for the serial subinterface and specify this interface as a point-to-point connection.	1700(config)#	<b>interface serial0.1 point-to-point</b>
2	Configure this subinterface with an IP address.	1700(config-if)#	<b>ip address 192.168.39.41 255.255.255.0</b>
3	Configure this subinterface with an IPX network number.	1700(config-if)#	<b>ipx network 9876</b>
4	Assign a data link connection identifier (DLCI) to the Frame Relay subinterface. If you are unsure of the DLCI, use the number that you recorded in Step 4 of the previous “Verifying Your Configuration” section.	1700(config-if)#	<b>frame-relay interface-dlci 17</b>
5	Exit configuration mode for this interface.	1700(config-if)#	<b>exit</b>

## Configuring the ISDN Interface

Use this table to configure parameters for the ISDN interface, which connects your router to the central-site router if for some reason the Frame Relay connection fails.

Step	Task	Router Prompt	Command
1	Enter configuration mode for the ISDN interface.	1700(config)#	<b>interface BRI0</b>
2	Enter the service profile identifier (SPID) number assigned by the ISDN service provider to the B1 channel.  This step is required only when the service provider has assigned a SPID to your ISDN line. Not all ISDN lines have SPIDs.	1700(config)#	<b>isdn spid1 555987601</b>
3	Define the SPID number assigned by the ISDN service provider to the B2 channel.  This step is required only when the service provider has assigned a SPID to your ISDN line. Not all ISDN lines have SPIDs.	1700(config)#	<b>isdn spid2 555987602</b>
4	Enable IP routing on this interface without assigning an IP address.	1700(config-if)#	<b>ip unnumbered fastethernet0</b>
5	Set the encapsulation method on this interface to PPP.	1700(config-if)#	<b>encapsulation ppp</b>
6	Configure this interface with an IPX network number.	1700(config-if)#	<b>ipx network 1234</b>
7	Configure this interface to exchange routing information while the ISDN line is up. Routing updates do not bring up the ISDN line if it is down.	1700(config-if)#	<b>ipx delay 200</b>
8	Disable fast switching and autonomous switching on this interface.	1700(config-if)#	<b>no ip route-cache</b>
9	Set the router to respond to a local server watchdog packets on behalf of a remote client (called <i>spoofing</i> ).	1700(config-if)#	<b>ipx watchdog-spoof</b>

## ISDN as a Backup Connection with Floating Static Routes

10	Configure the ISDN line to go down after a specified number of seconds with no network traffic.	1700(config-if)#	<b>dialer idle-timeout 300</b>
11	Configure the telephone number that this interface dials to reach the central site.	1700(config-if)#	<b>dialer-string 5552053</b>
12	Assign this interface to a dialer group.	1700(config-if)#	<b>dialer-group 1</b>
13	Disable weighted fair queuing for this interface.	1700(config-if)#	<b>no fair-queue</b>
14	Enable CHAP and PAP authentication on this interface. CHAP authentication is attempted first. If the central-site router does not support CHAP, PAP is used for authentication.	1700(config-if)#	<b>ppp authentication chap pap</b>
15	Enable multilink PPP on this interface.	1700(config-if)#	<b>ppp multilink</b>
16	Enable the interface and the configuration changes that you have just made on the interface.	1700(config-if)#	<b>no shutdown</b>
17	Exit configuration mode for this interface.	1700(config-if)#	<b>exit</b>

## Configuring EIGRP Routing

Use this table to configure the router for Enhanced Interior Gateway Routing Protocol (EIGRP) and IP routing parameters that the router uses to connect to the central-site router.

Step	Task	Router Prompt	Command
1	Configure the IP EIGRP routing process.	1700(config)#	<b>router eigrp 202</b>
2	Specify a list of networks for the EIGRP routing process by entering the IP address of the directly connected network.	1700(config-router)#	<b>network 172.16.0.0</b>
3	Specify a list of networks for the EIGRP routing process by entering the IP address of the directly connected network.	1700(config-router)#	<b>network 192.168.0.0</b>
4	Specify that the router does not forward packets that are destined for a subnet of a network that has no network default route.	1700(config-router)#	<b>ip classless</b>
5	Exit router configuration mode.	1700(config-router)#	<b>exit</b>

## Configuring When the Router Dials Out

Use the table to configure access lists and static routes that determine when the ISDN line dials the central-site router.

Step	Task	Router Prompt	Command
1	Establish a static IP route to the remote network.	1700(config)#	<b>ip route 0.0.0.0 0.0.0.0 192.168.41.41 150</b>
2	Establish a static IP route on the BRI interface to the remote network.	1700(config)#	<b>ip route 192.168.41.41 255.255.0.0 BRI0</b>
3	Define a standard access list based on network variables.	1700(config)#	<b>access-list 101 deny ip any 224.0.0.0 31.255.255.255</b>

4	Define a standard access list based on network variables.	1700(config)#	<b>access-list 101 permit ip any any</b>
5	Define a standard access list based on network variables.	1700(config)#	<b>access-list 900 deny any any all any 457</b>
6	Define a standard access list based on network variables.	1700(config)#	<b>access-list 900 deny rip any rip any rip</b>
7	Define a standard access list based on network variables.	1700(config)#	<b>access-list 900 deny sap any sap any sap</b>
8	Define a standard access list based on network variables.	1700(config)#	<b>access-list 900 permit any any all any all</b>
9	Define a floating static IPX route to the central-site network.	1700(config)#	<b>ipx route CBA 1234.0000.0c75.c689 floating-static</b>
10	Define a floating static IPX route to the central-site network.	1700(config)#	<b>ipx route CCB 1234.0000.0c75.c689 floating-static</b>
11	Define a floating static IPX route to the central-site network.	1700(config)#	<b>ipx route 5E11 1234.0000.0c75.c689 floating-static</b>
12	Define a static route to an IPX server on the central-site network.	1700(config)#	<b>ipx sap 4 MRKT_SERV 5E11.0000.0000.0001 452 2</b>
13	Define a static route to an IPX server on the central-site network.	1700(config)#	<b>ipx sap 4 ENG_SERV CCB.0000.0000.0001 452 2</b>
14	Define a static route to an IPX server on the central-site network.	1700(config)#	<b>ipx sap 4 COPR_SERV CBA.0000.0000.0001 452 2</b>
15	Specify an dialer list by list number and protocol (IPX) to define the “interesting” packets that can trigger a call to the destination.	1700(config)#	<b>dialer-list 1 protocol ipx list 900</b>
16	Specify an dialer list by list number and protocol (IP) to define the “interesting” packets that can trigger a call to the destination.	1700(config)#	<b>dialer-list 1 protocol ip list 101</b>

## Configuring Command-Line Access to the Router

Use this table to configure some parameters that control access to the router.

Step	Task	Router Prompt	Command
1	Specify the console terminal line.	1700(config)#	<b>line console 0</b>
2	Set the interval in minutes that the EXEC command interpreter waits until user input is detected.	1700(config-line)#	<b>exec-timeout 5</b>
3	Specify a virtual terminal for remote console access.	1700(config-line)#	<b>line vty 0 4</b>
4	Specify a password on the line.	1700(config-line)#	<b>password &lt;lineaccess&gt;</b>
5	Enable password checking at terminal session login.	1700(config-line)#	<b>login</b>
6	Exit configuration mode.	1700(config-line)#	<b>end</b>

### Verifying Your Configuration

Take the following steps to verify that the ISDN line is configured to back up the Frame Relay line:

Step	Task
1	Bring the Frame Relay connection down. This clears the routing table of all routes learned from the Frame Relay interface.
2	Use the <b>ping</b> command to test connectivity to any central-site router that is on the 192.168.0.0 network. This should cause the ISDN line to dynamically connect and dial the central-site router.
3	Bring the Frame Relay connection back up and confirm that the ISDN link disconnects.

### Troubleshooting Floating Static Route Problems

If you are having problems or the output that you received during the verification steps is very different from what is shown, you can troubleshoot your router with the Cisco IOS **debug** commands. The **debug** commands provide extensive command output that is not included in this document.



**Caution** If you are not familiar with Cisco IOS debug commands, you should read the “Using Debug Commands” section in the “Cisco IOS Basic Skills” chapter before attempting any debugging.

Following are **debug** commands that are helpful when troubleshooting ISDN with IP and IPX routing. Follow these commands with the **ping** command to begin debug output:

- **debug dialer events**
- **debug isdn events**
- **debug isdn q931**
- **debug isdn q921**
- **debug ppp negotiation**
- **debug ppp authentication**
- **debug ppp multilink events**