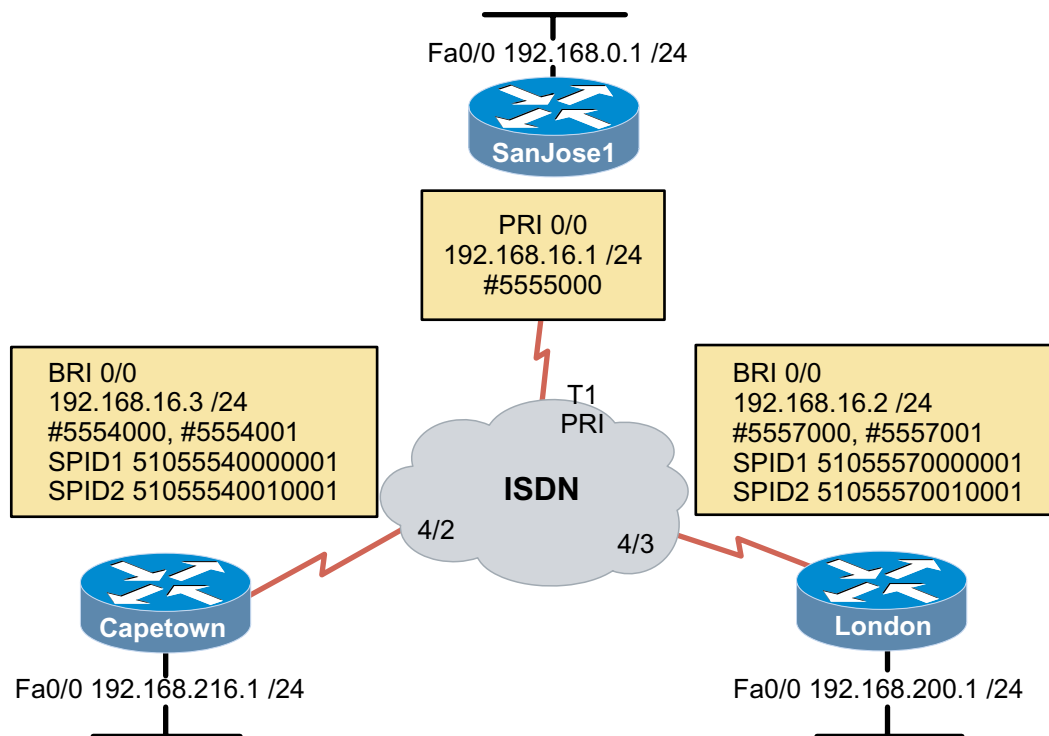


## Lab 4.9.4: Configuring ISDN PRI



### Objective

In this lab, you configure ISDN BRI and ISDN PRI on the remote and central site routers.

### Scenario

The International Travel Agency wants you to configure a connection between remote offices (i.e., Capetown and London) and its corporate network router (SanJose1). The corporate office has just had an ISDN PRI provisioned so that SanJose1 can handle 23 ISDN BRI and/or V.90 asynchronous dial up calls simultaneously. Your job is to configure the BRI's on the remote routers, and configure the T1 controller and PRI D channel on SanJose1. When your configuration is complete, each router should be able to dial the other two routers; SanJose1 should be able to receive calls from both London and Capetown.

### Step 1

This lab assumes that SanJose1 has a T1 controller module installed.

Before beginning this lab, it is recommended that you reload the routers after erasing their startup configuration. This will prevent you from having problems caused by residual configurations. Build and configure the network according to the above diagram, but do not configure the routers' PRI and BRI interfaces yet. Use the Adtran Atlas 550 or similar device to simulate the ISDN cloud. If you are using the Atlas 550, be sure to use straight-through cables and connect both routers to the BRI module ports of the Atlas 550, as labeled in the diagram. Connect SanJose's T1 controller to the T1 PRI port on the Atlas 550. This connection may require a DB-15-to-RJ45 adapter on the T1 controller module and the appropriate cable supplied with the Atlas 550.

## Step 2

Configure the ISDN PRI connection. You must specify the ISDN PRI switch type, which is determined by the carrier. For this lab, the switch type is National. The command to configure the switch type is:

```
SanJose1(config)#isdn switch-type primary-ni
```

Next, configure the local username and password database, so that SanJose1 can authenticate the remote routers with CHAP:

```
SanJose1(config)#username Capetown password cisco
SanJose1(config)#username London password cisco
```

Specify what types of traffic will generate a call to the remote router. Configure a dialer list to specify any IP traffic as interesting with the following command:

```
SanJose1(config)#dialer-list 1 protocol ip permit
```

The SanJose1 router must have a route to both the Capetown and London Ethernet networks. Using the appropriate commands, configure two static routes to the LAN interfaces of these routers.

1. What are the commands to do this?

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## Step 3

In this step, you will configure the T1 controller. The controller must be configured according to your provider's framing and line coding. In this case, use extended super frame and the binary 8-zero substitution linecode. Also, set the T1 controller to use all timeslots (remember that a T1 has twenty-four 64-kbps channels). To configure the PRI controller issue the following commands:

```
SanJose1(config)#controller t1 1/0
SanJose1(config-controller)#framing esf
SanJose1(config-controller)#linecode b8zs
SanJose1(config-controller)#pri-group timeslots 1-24
```

The final part of the configuration is to configure the PRI D channel, which is responsible for call setup and signaling. The D channel uses channel 23 (which is the 24<sup>th</sup> channel, since they are numbered beginning with 0). Issue the following commands:

```
SanJose1(config)#interface serial 1/0:23
SanJose1(config-if)#ip address 192.168.16.1 255.255.255.0
SanJose1(config-if)#dialer-group 1
SanJose1(config-if)#dialer load-threshold 1 outbound

SanJose1(config-if)#dialer idle-timeout 60
SanJose1(config-if)#encapsulation ppp
SanJose1(config-if)#ppp multilink
SanJose1(config-if)#ppp authentication chap
```

Configure dialer map statements so that the router knows which numbers to dial to reach specific next-hop IP addresses:

```
SanJose1(config-if)#dialer map ip 192.168.16.3 name Capetown 5554000
SanJose1(config-if)#dialer map ip 192.168.16.3 name Capetown 5554001
SanJose1(config-if)#dialer map ip 192.168.16.2 name London 5557000
SanJose1(config-if)#dialer map ip 192.168.16.2 name London 5557001
```

Finally use the **show isdn status** command to verify that communication between the router and the ISDN switch has been successfully established.

```
SanJose1#show isdn status
Global ISDN Switchtype = primary-ni
ISDN Serial1/0:23 interface
    dsl 0, interface ISDN Switchtype = primary-ni
    Layer 1 Status:
        ACTIVE
    Layer 2 Status:
        TEI = 0, Ces = 1, SAPI = 0, State = MULTIPLE_FRAME_ESTABLISHED
    Layer 3 Status:
        0 Active Layer 3 Call(s)

Activated dsl 0 CCBs = 0
The Free Channel Mask: 0x801FFFFF
Total Allocated ISDN CCBs = 2
```

1. How is the **show isdn status** output for layer 2 of a PRI different from a BRI?
- 

#### Step 4

Configure *both* of the remote routers to use the appropriate ISDN switch type, National ISDN-1. Since you will be using PPP encapsulation and CHAP on the B channels, enter username and password information on *both* routers, as shown below for London. When configuring Capetown, be sure to substitute the appropriate information:

```
London(config)#enable password cisco
London(config)#line vty 0 4
London(config-line)#password cisco
London(config-line)#exit

London(config)#isdn switch-type basic-ni
London(config)#username SanJose1 password cisco
London(config)#username Capetown password cisco
London(config)#interface bri0/0
London(config)#ip address 192.168.16.2 255.255.255.0
London(config-if)#encapsulation ppp
London(config-if)#ppp authenticate chap
London(config-if)#isdn spid1 51055570000001 5557000
London(config-if)#isdn spid2 51055570010001 5557001
London(config-if)#dialer-group 1
London(config-if)#dialer idle-timeout 60
London(config-if)#no shutdown
```

1. PPP is the line encapsulation on the B channels; what is the encapsulation protocol used on the D channel?
- 

Configure **dialer-list 1** to identify all IP traffic as “interesting” on *both* routers.

```
London(config)#dialer-list 1 protocol ip permit
```

Configure *both* routers with the username and password of SanJose1, so that they will each authenticate SanJose1 using CHAP. You must also configure a static route to the central office LAN on both routers. Example commands for Capetown are shown:

```
Capetown(config)#username SanJose1 password cisco
Capetown(config)#username London password cisco
Capetown(config)#ip route 192.168.0.0 255.255.255.0 192.168.16.1
Capetown(config)#ip route 192.168.200.0 255.255.255.0 192.168.16.2
```

Finally, configure the remote routers' BRI interfaces with the appropriate **dialer map** commands. The commands required for Capetown are shown:

```
Capetown(config)#interface bri 0/0
Capetown(config-if)#dialer map ip 192.168.16.1 name SanJose1 5555000
Capetown(config-if)#dialer map ip 192.168.16.2 name London 5557000
Capetown(config-if)#dialer map ip 192.168.16.2 name London 5557001
```

### Step 5

Test your configuration by sending pings to SanJose1's FastEthernet interface from both Capetown and London. These pings to 192.168.0.1 should be successful; troubleshoot as necessary.

After the pings, both Capetown and London will be connected to SanJose1 simultaneously. With multilink configured, Capetown and London should be using both of their B channels.

If either link is disconnected, **ping** SanJose1's FastEthernet interface again. Once both the Capetown and London links are up, issue the **show ip interface brief** command on SanJose1:

```
SanJose1#show ip interface brief
```

Interface Protocol	IP-Address	OK?	Method	Status
FastEthernet0/0	192.168.0.1	YES	NVRAM	up up
Serial0/0	unassigned	YES	NVRAM	administratively down down
Serial0/1	unassigned	YES	NVRAM	administratively down down
Serial1/0:0	unassigned	YES	unset	down down
Serial1/0:1	unassigned	YES	unset	down down
Serial1/0:2	unassigned	YES	unset	down down
Serial1/0:3	unassigned	YES	unset	down down
Serial1/0:4	unassigned	YES	unset	down down

Serial1/0:5	unassigned	YES	unset	down	down
Serial1/0:6	unassigned	YES	unset	down	down
Serial1/0:7	unassigned	YES	unset	down	down
Serial1/0:8	unassigned	YES	unset	down	down
Serial1/0:9	unassigned	YES	unset	down	down
Serial1/0:10	unassigned	YES	unset	down	down
Serial1/0:11	unassigned	YES	unset	down	down
Serial1/0:12	unassigned	YES	unset	down	down
Serial1/0:13	unassigned	YES	unset	down	down
Serial1/0:14	unassigned	YES	unset	down	down
Serial1/0:15	unassigned	YES	unset	down	down
Serial1/0:16	unassigned	YES	unset	down	down
Serial1/0:17	unassigned	YES	unset	down	down
Serial1/0:18	unassigned	YES	unset	down	down
Serial1/0:19	unassigned	YES	unset	up	up
Serial1/0:20	unassigned	YES	unset	up	up
Serial1/0:21	unassigned	YES	unset	up	up
Serial1/0:22	unassigned	YES	unset	up	up
Serial1/0:23	192.168.16.1	YES	NVRAM	up	up
Virtual-Access1	unassigned	YES	TFTP	up	up

2. According to the output of this command, which channels of the PRI are connected?

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3. Why does Serial1/0:23 have an IP address, and not Serial1/0:22 or Serial1/0:20?

---

With both connections active, issue the **show dialer** command on SanJose1.

4. What is the dialer reason for Serial1/0:19?

---

5. What is the dialer reason for Serial1/0:20?

---

6. What is the dialer reason for Serial1/0:21?

---

7. What is the dialer reason for Serial1/0:22?

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