A background photograph showing a man in a white shirt and dark shorts carrying a large, thick red cable over his shoulder. He is walking across a landscape with rolling hills under a clear blue sky.

# Completing an ISDN BRI Call

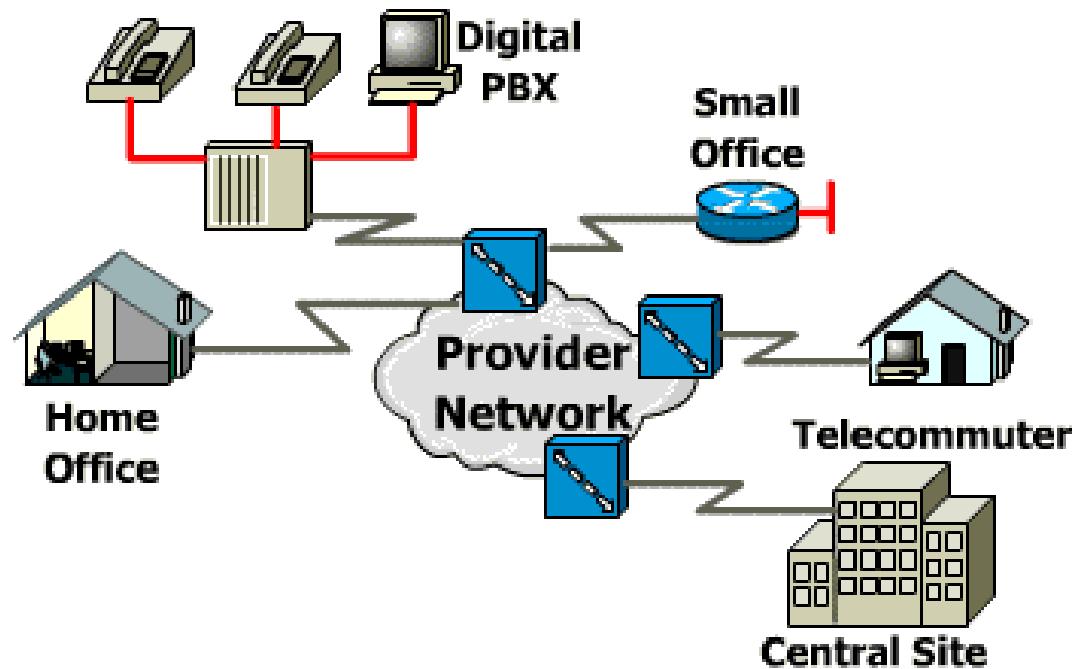


# Objectives

**Upon completion of this chapter, you will be able to perform the following tasks:**

- ? Describe the components that make up ISDN connectivity**
- ? Configure ISDN BRI and legacy dial-on-demand routing (DDR)**
- ? Verify DDR operation**

# What is ISDN?



**Voice, data, video, and special services**

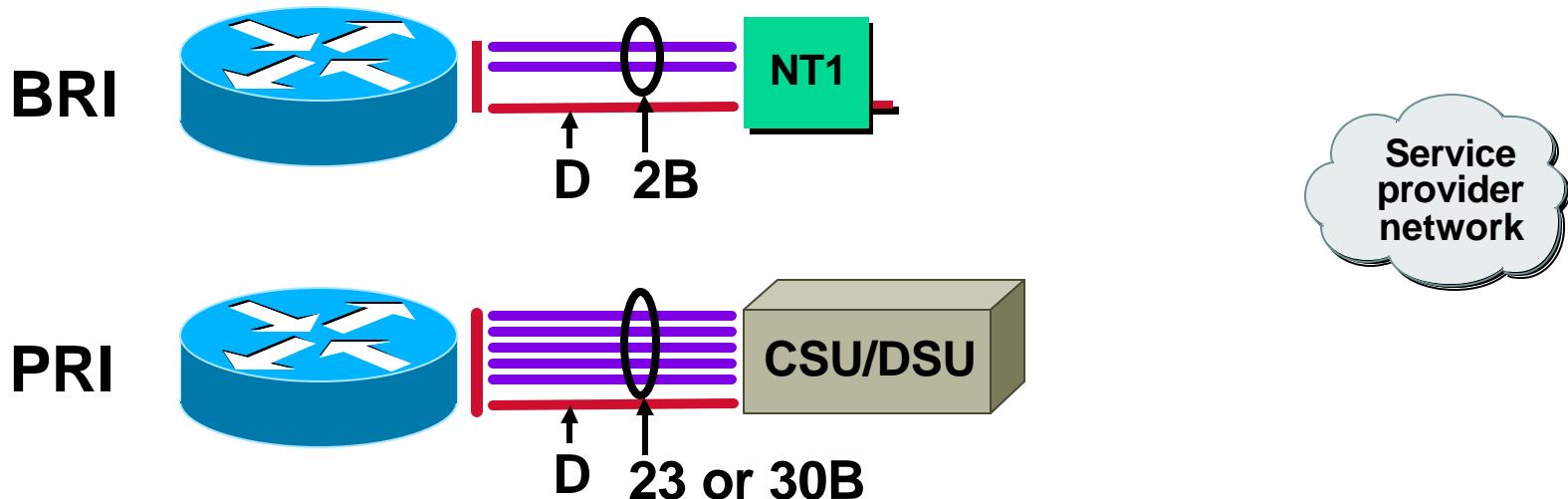
# ISDN Standards

Issue	Protocol	Key Examples
Telephone Network and ISDN	E-Series	E.163—International Telephone Numbering Plan E.164—International ISDN Addressing
ISDN Concepts, Aspects, and Interfaces	I-Series	I.100 Series—Concepts, Structures, Terminology I.400—User-Network Interfaces (UNIs)
Switching and Signaling	Q-Series	Q.921—LAPD (Link Access Procedure on the D channel) Q.931—ISDN Network Layer between Terminal and Switch

## Standards from the ITU (formerly CCITT)

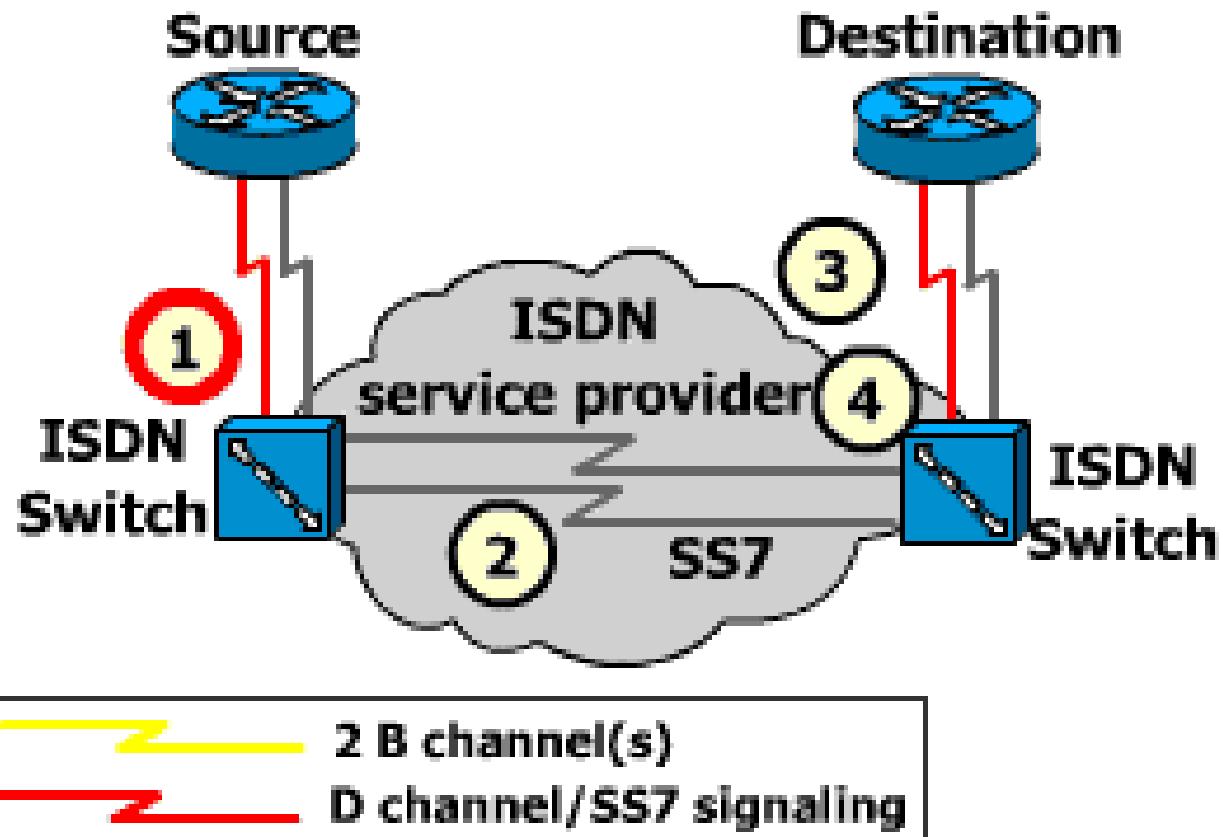
# ISDN Access Options

Channel	Capacity	Mostly Used for
B	64 kbps	Circuit-switched data (HDLC, PPP)
D	16/64 kbps	Signaling information (LAPD)

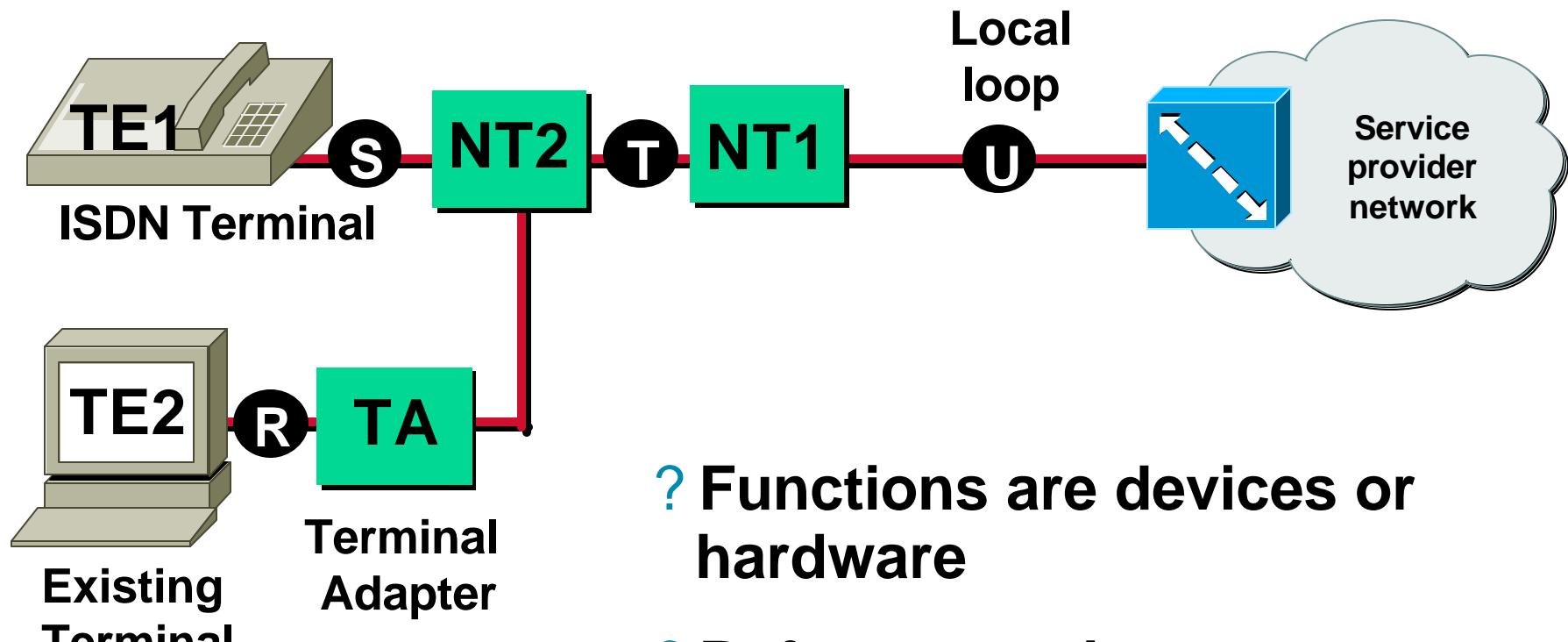


**BRI and PRI are used globally for ISDN**

# BRI Call Processing



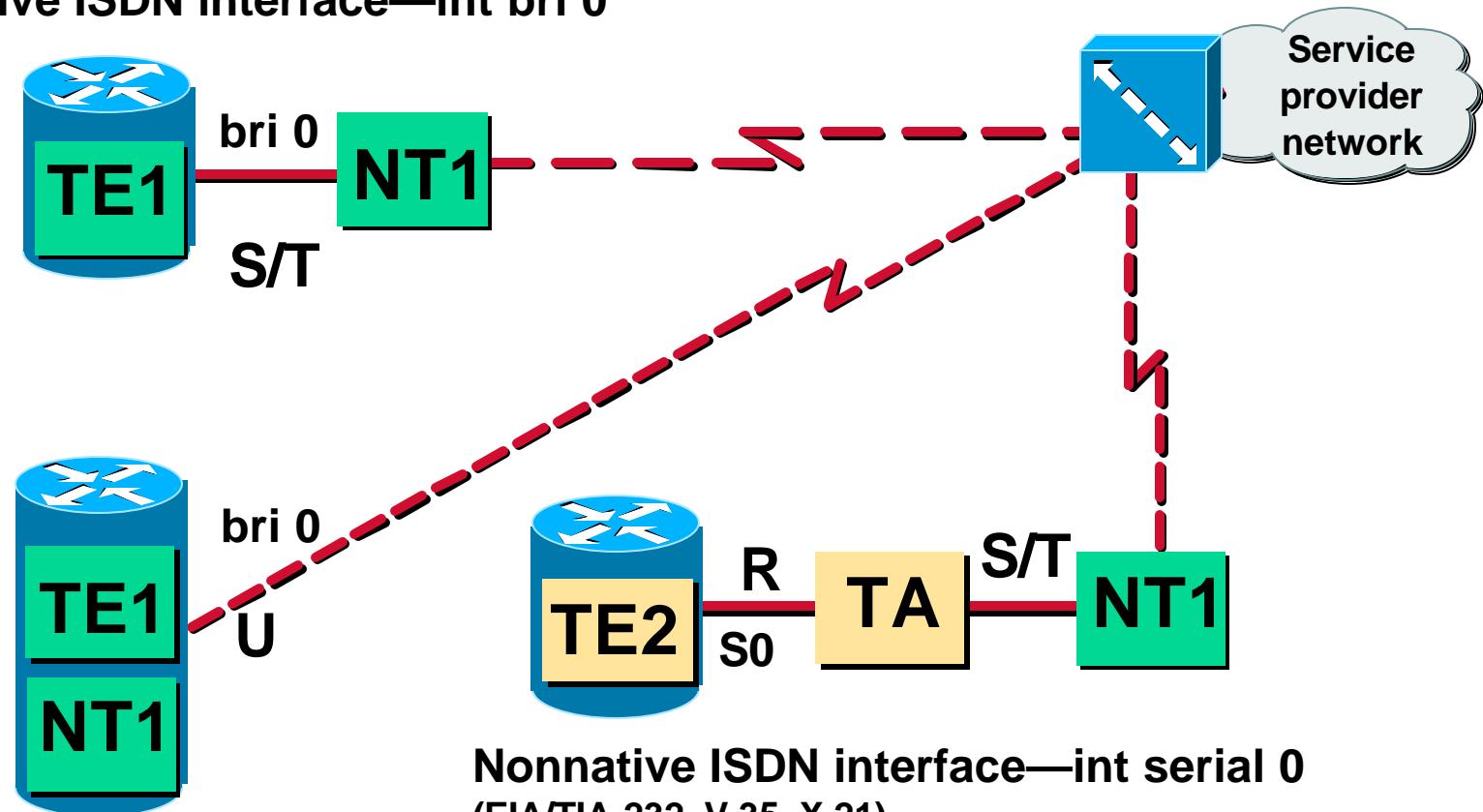
# ISDN Functions and Reference Points



- ? Functions are devices or hardware
- ? Reference points are demarcations or interfaces

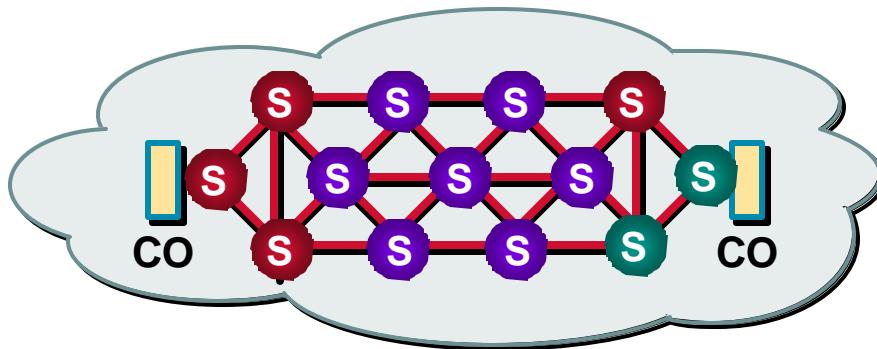
# Cisco ISDN BRI Interfaces

Native ISDN interface—int bri 0

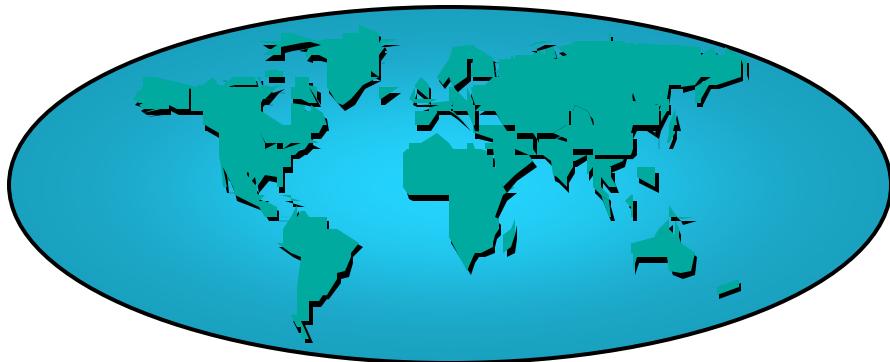


Nonnative ISDN interface—int serial 0  
(EIA/TIA-232, V.35, X.21)

# ISDN Switch Types



**Many providers and switch types**



**Services vary by regions and countries**

# Configuring ISDN BRI

## Step 1: Specify the ISDN switch type

```
Router(config)#isdn switch-type switch-type
```

```
Router(config-if)#isdn switch-type switch-type
```

- ? Specifies the type of ISDN switch with which the router communicates
- ? Other configuration requirements vary for specific providers

# Configuring ISDN BRI (cont.)

## Step 2: (Optional) Setting SPIDs

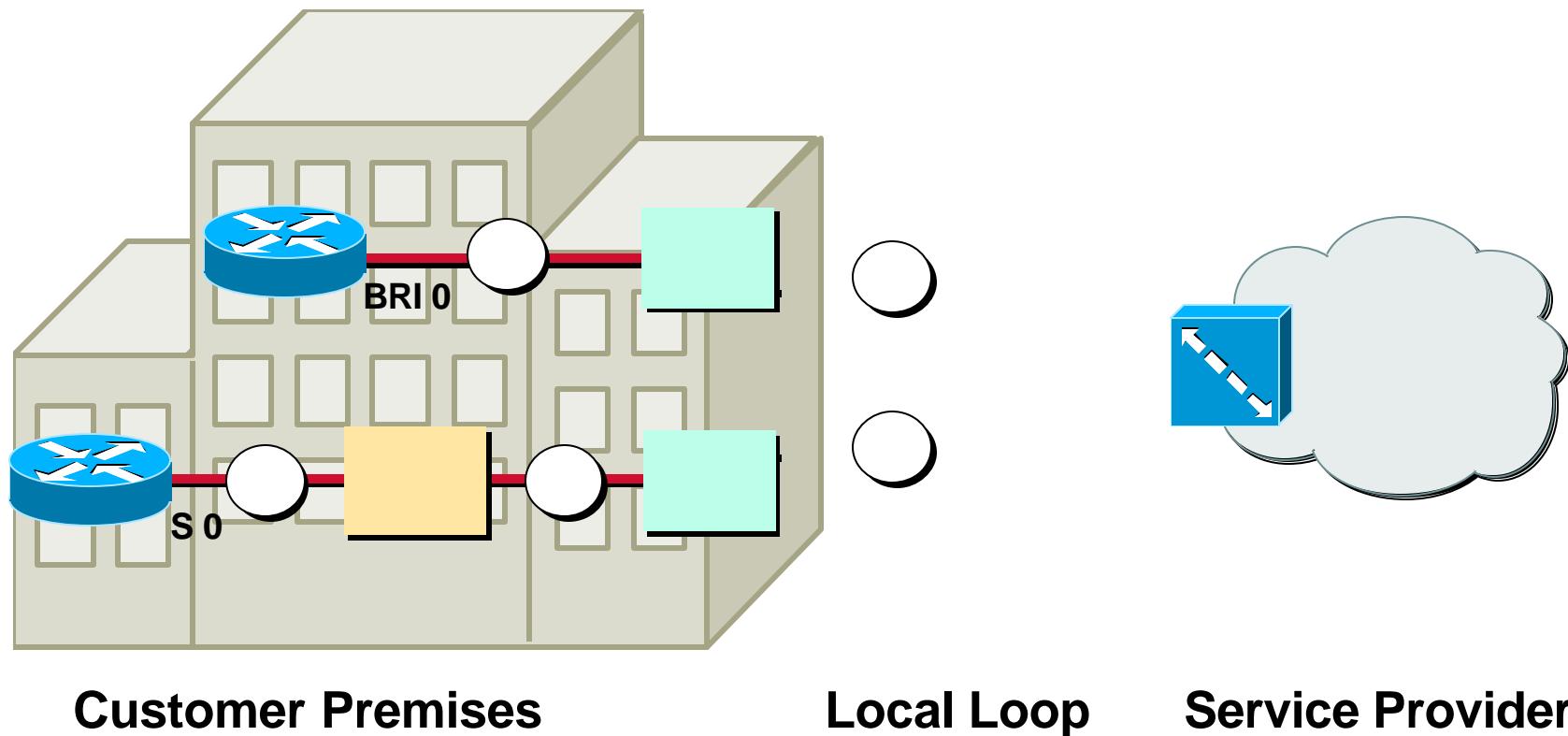
```
Router(config-if)#isdn spid1 spid-number [ ldn ]
```

? Sets a B channel SPID required by many service providers

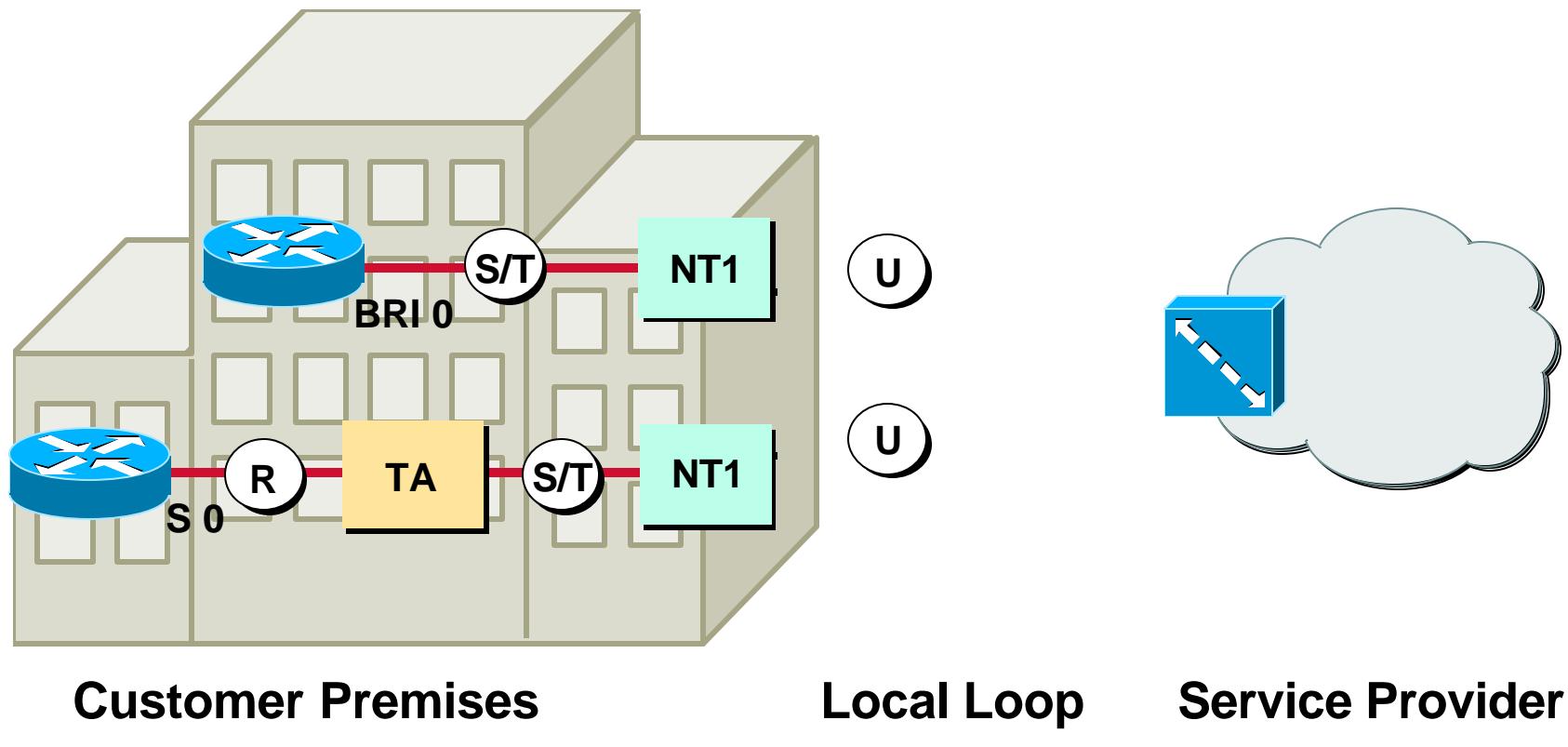
```
Router(config-if)#isdn spid2 spid-number [ ldn ]
```

? Sets a SPID for the second B channel

# Written Exercise

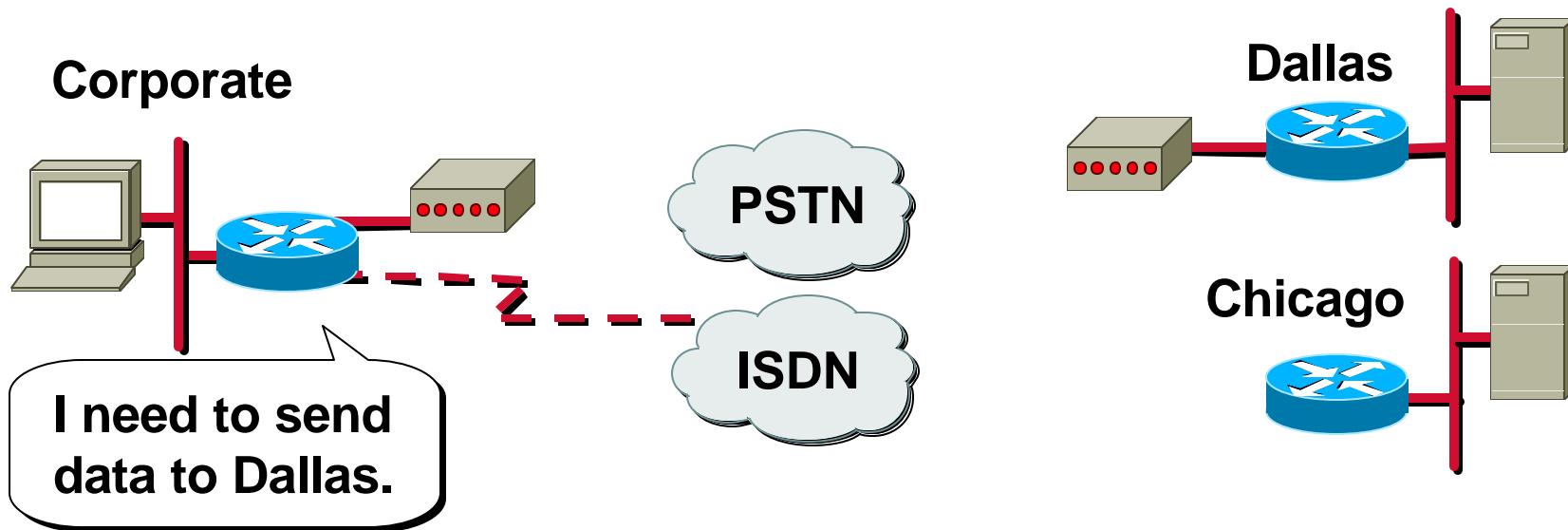


# Written Exercise: Answers



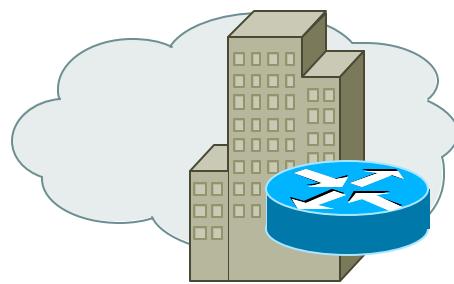
**Label the functional elements and reference points**

# What Is Dial-on-Demand Routing?

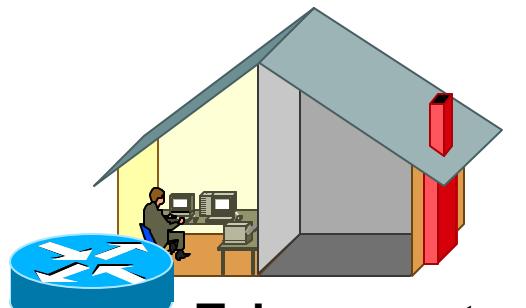
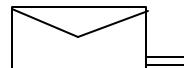


- ? Connect when needed
- ? Disconnect when finished
- ? ISDN or PSTN

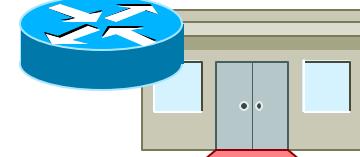
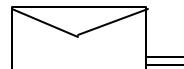
# When to Use DDR



**Headquarters**



**Telecommuter**

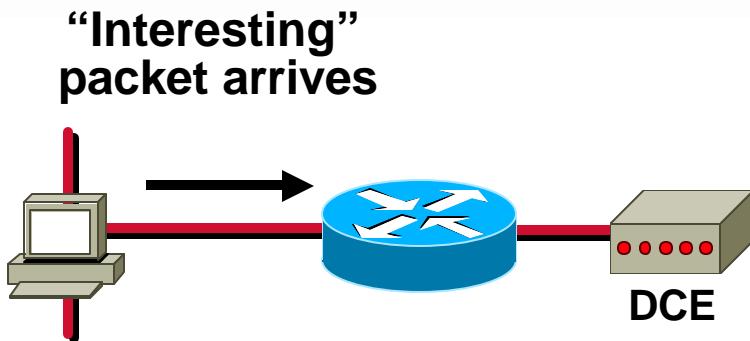


**Vendor**

? Periodic connections

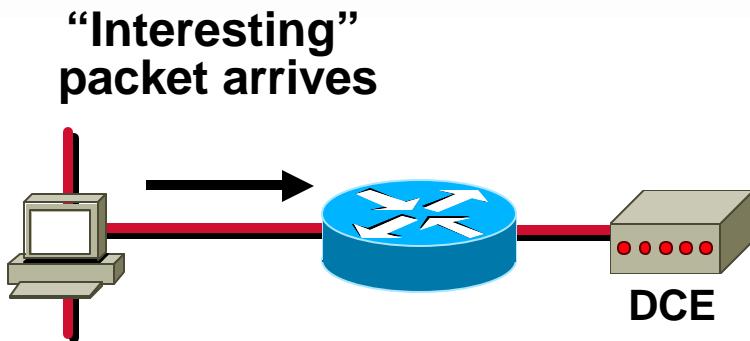
? Small amounts of data

# Generic DDR Operation



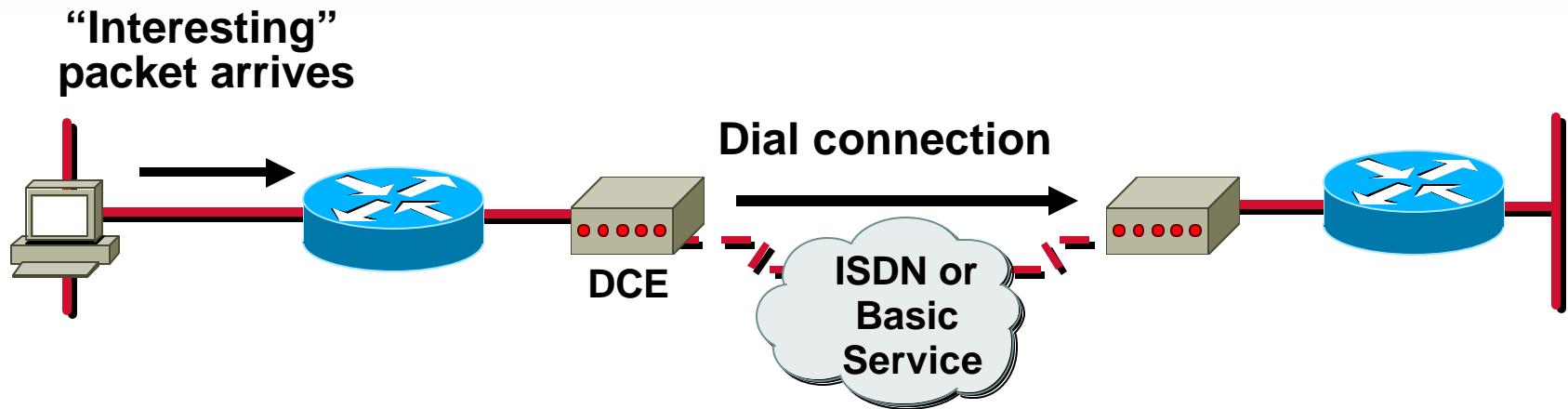
1. Route to destination is determined

# Generic DDR Operation



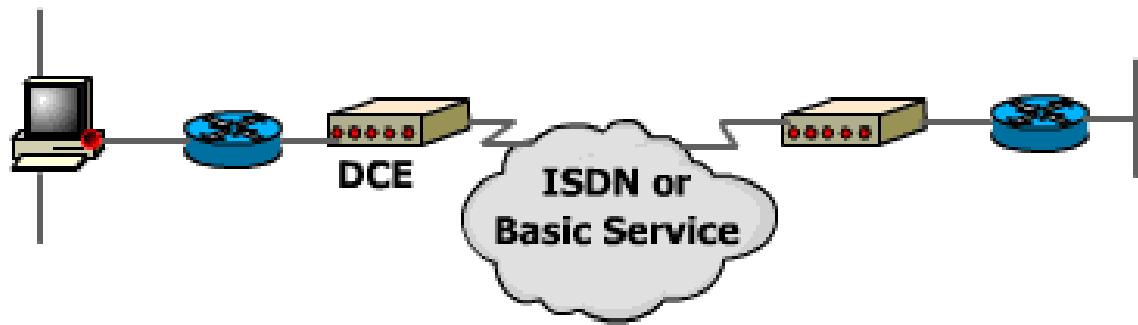
1. Route to destination is determined
2. Interesting packets dictate DDR call

# Generic DDR Operation



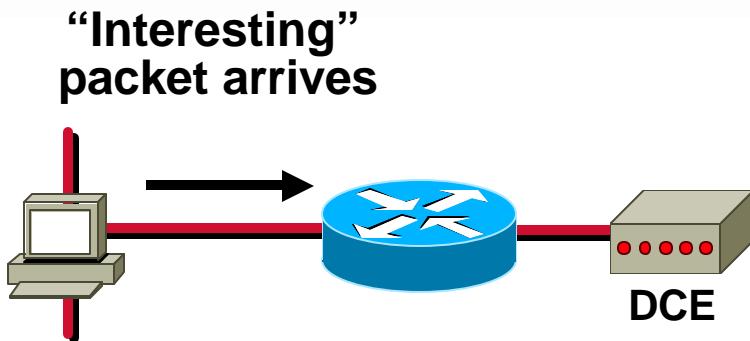
1. Route to destination is determined
2. Interesting packets dictate DDR call
3. Dialer information is looked up

# Generic DDR Operation



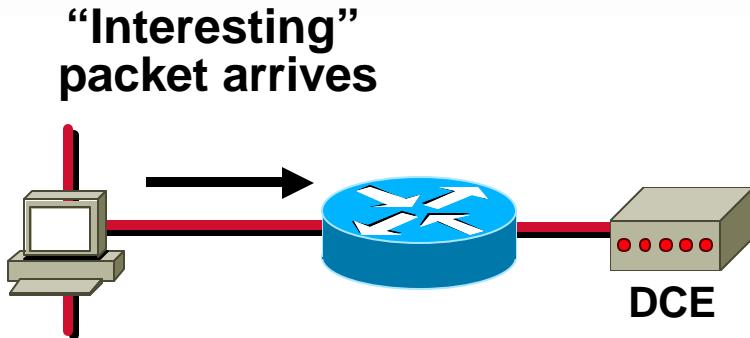
- 1. Route to destination is determined**
- 2. Interesting packets dictate DDR call**
- 3. Dialer information is looked up**
- 4. Traffic is transmitted**
- 5. Call is terminated**

# Configuring Legacy DDR



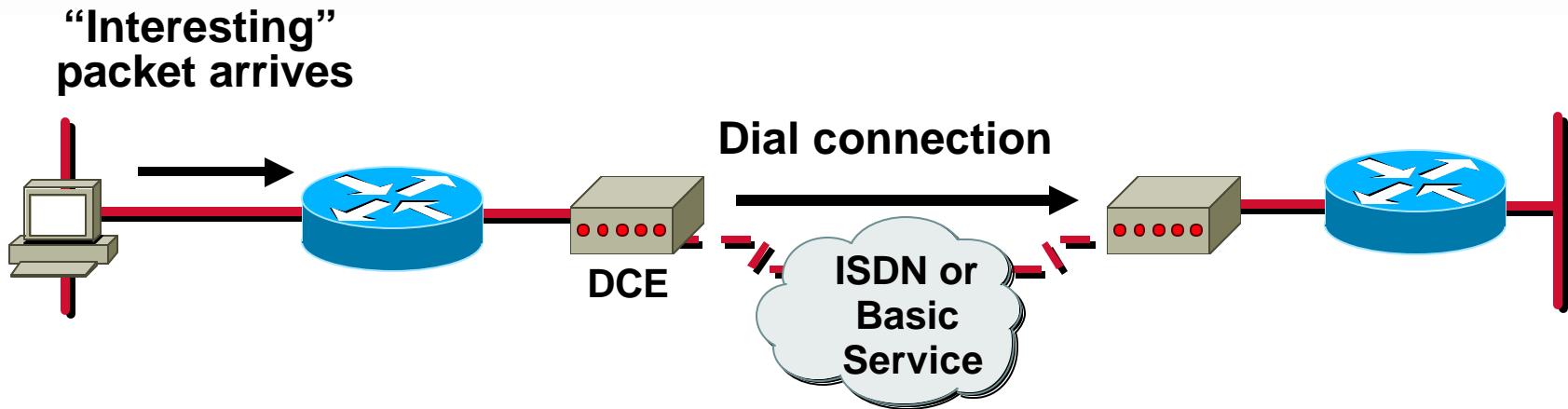
- ① Define static routes—**What route do I use?**

# Configuring Legacy DDR



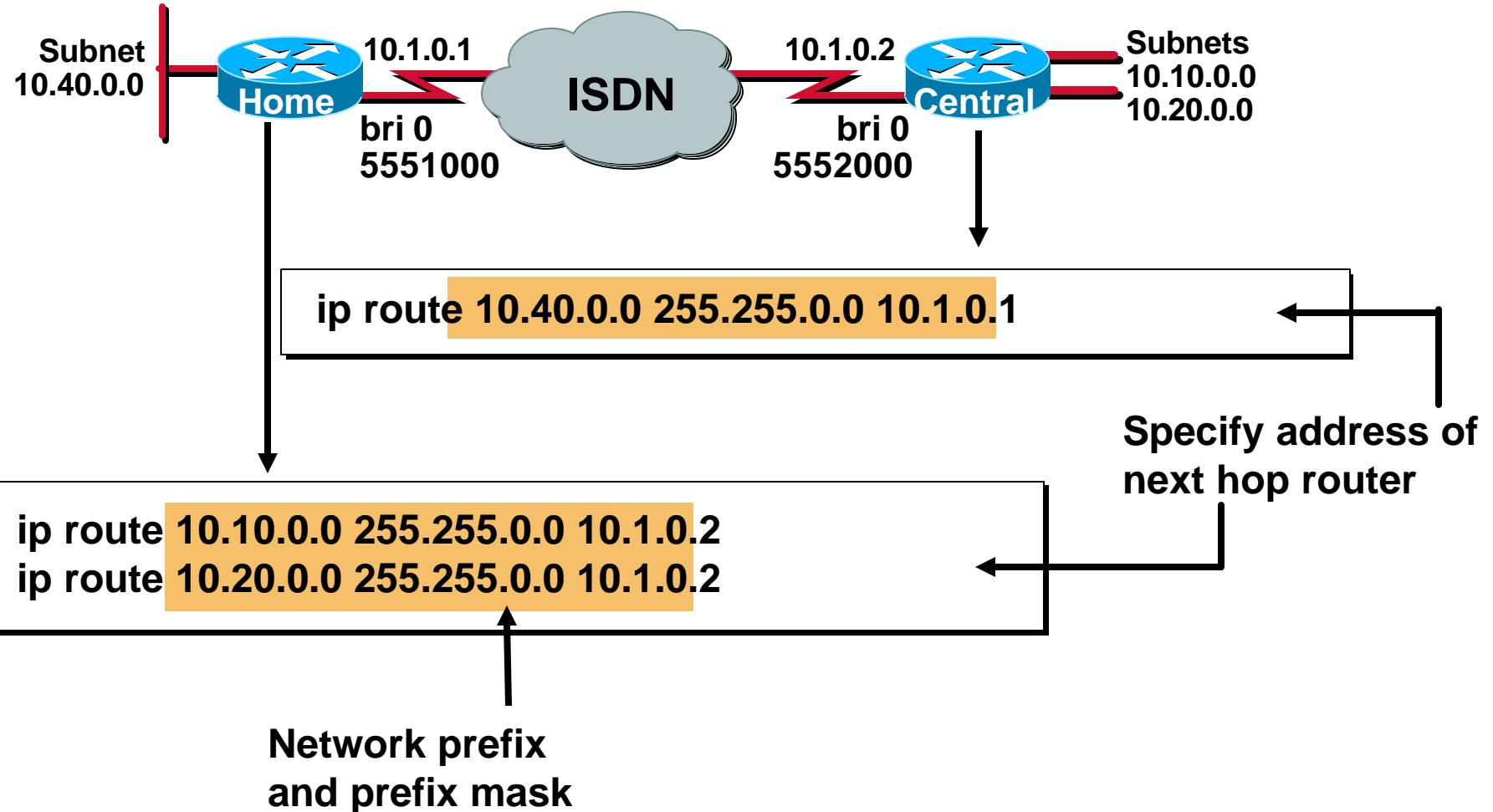
- ① Define static routes—**What route do I use?**
- ② Specify interesting traffic—**What traffic enables the link?**

# Configuring DDR



- ① Define static routes—**What route do I use?**
- ② Specify interesting traffic—**What traffic enables the link?**
- ③ Configure the dialer information—**What number do I call?**

# Task 1: Defining Static Routes (Route to Destination)



# Task 2: Specifying Interesting Traffic (What Enables the Connection?)

- Without Access Lists

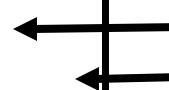
```
dialer-list 1 protocol ip permit
```

Any IP traffic will initiate the link

- With Access Lists (for better control)

```
dialer-list 1 protocol ip list 101
```

```
access-list 101 deny tcp any any eq ftp
access-list 101 deny tcp any any eq telnet
access-list 101 permit ip any any
```



Deny FTP  
Deny Telnet

Any IP traffic, except FTP and Telnet, will initiate the link

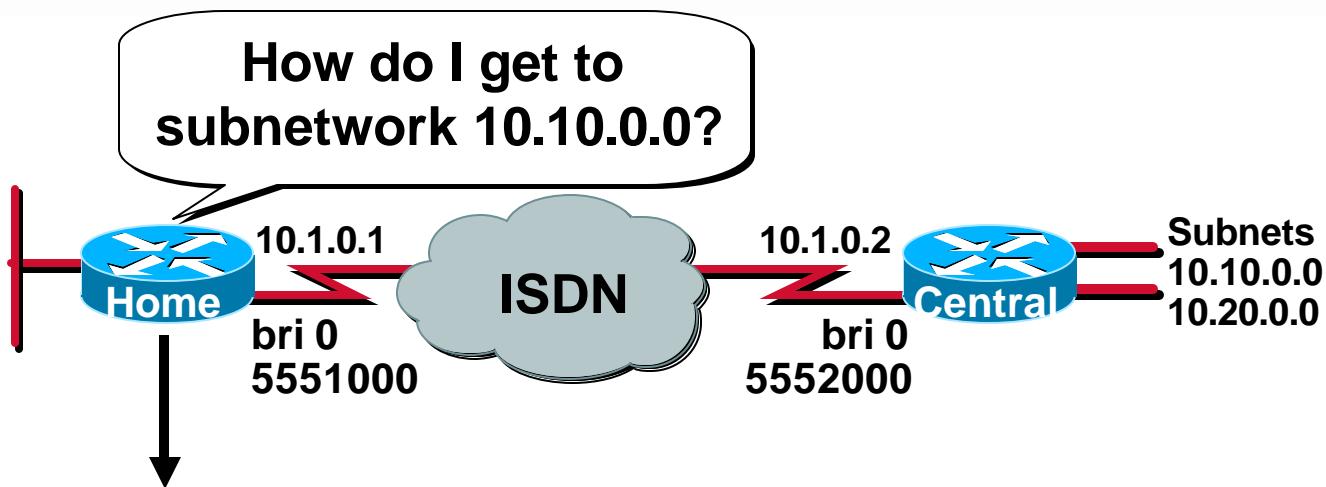
# Task 3: Configuring the Dialer Information

```
hostname Home
!
isdn switch-type basic-5ess
!
username central password cisco
interface BRI0
  ip address 10.1.0.1 255.255.255.0
  encapsulation ppp
  dialer idle-timeout 180
  dialer map ip 10.1.0.2 name Central 5552000
  dialer-group 1
  no fair-queue
  ppp authentication chap
!
router rip
network 10.0.0.0
!
no ip classless
ip route 10.10.0.0 255.255.0.0 10.1.0.2
ip route 10.20.0.0 255.255.0.0 10.1.0.2
!
dialer-list 1 protocol ip permit
```

**Applies rules defined by dialer-list to individual interfaces**

**Both values must match**

# Task 3: Configuring the Dialer Information (cont.)



```
interface BRI0
  ip address 10.1.0.1 255.255.255.0
  encapsulation ppp
  dialer idle-timeout 180
  dialer map ip 10.1.0.2 name Central 5552000
  dialer-group 1
  no fair-queue
  ppp authentication chap
```

Number to dial

Remote host name  
Used for PPP CHAP

# Legacy DDR Configuration Tasks Summarized

```
hostname Home
!
isdn switch-type basic-5ess
!
username central password cisco
interface BRI0
    ip address 10.1.0.1 255.255.255.0
    encapsulation ppp
    dialer idle-timeout 180
    dialer map ip 10.1.0.2 name Central 5552000
    dialer-group 1
    no fair-queue
    ppp authentication chap
!
router rip
network 10.0.0.0
!
no ip classless
ip route 10.10.0.0 255.255.0.0 10.1.0.2
ip route 10.20.0.0 255.255.0.0 10.1.0.2
dialer-list 1 protocol ip permit
!
```

③

①

②

# Optional Legacy DDR Commands

```
Router(config-if)#dialer load-threshold load  
[ outbound | inbound | either ]
```

? Establishes the amount of traffic on link  
before a second link is enabled

```
Router(config-if)#dialer idle-timeout seconds
```

? Establishes the idle time before disconnect

# Legacy DDR Using ACLs Configuration Example

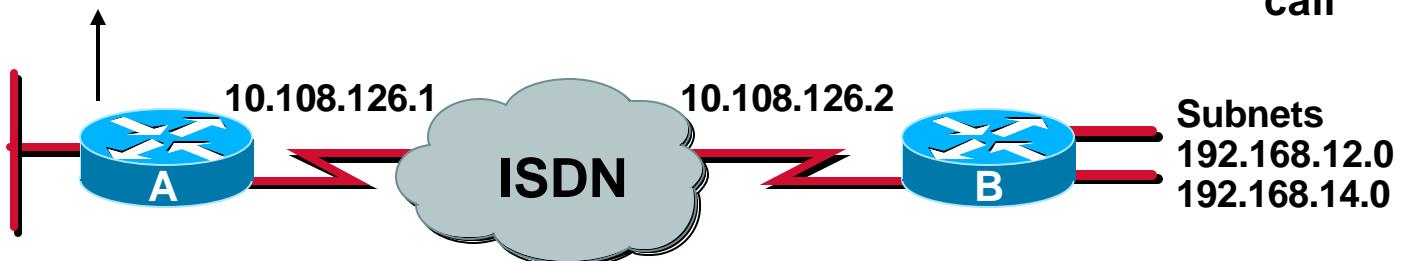
```
access-list 101 permit tcp any any eq smtp  
access-list 101 permit tcp any any eq telnet  
dialer-list 1 list 101  
  
!  
ip route 192.168.12.0 255.255.255.0    10.108.126.2  
ip route 192.168.14.0 255.255.255.0    10.108.126.2  
  
!  
interface bri 0  
ip address 10.108.126.1  255.255.255.0  
dialer-group 1  
dialer map ip 10.108.126.2  name B 5551234  
  
!  
dialer idle-timeout 300
```

Access list defining interesting packets on Cisco A

Static routes to reach destination

Interface configuration for DDR

Time to wait before dropping call



# Verifying Legacy DDR and ISDN Operation

**Router#ping or telnet**

- Triggers a link (assuming it is part of interesting traffic)
- Displays current status of link, including amount of time link is connected

**Router#show dialer**

**Router#show isdn active**

- When using ISDN, displays call status while call is in progress

**Router#show isdn status**

- Displays the status of an ISDN connection

**Router#show ip route**

- Displays all routes, including static routes

# Verifying Legacy DDR and ISDN Operation (cont.)

```
Router#debug isdn q921
```

- Shows ISDN layer 2 messages

```
Router#debug isdn q931
```

- Shows ISDN call setup and teardown activity

```
Router#debug dialer
```

- Shows call setup and teardown activity

```
Router(config-if)#shutdown
```

- Clears currently established connections from the interface