



Session VII

ISDN and DDR IP Multicast



3304
1261_05_2000_c1_Sec7

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ISDN and DDR

- **Basic Configuration**
- **Debugging ISDN**
- **Authentication and Multilink**
- **DDR Scenarios**
- **Preparing for ISDN**

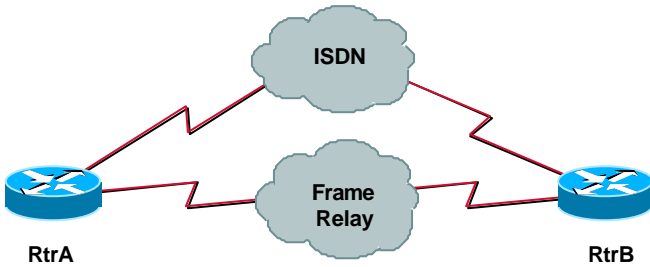
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Basic Setup



Common test scenario

Basics - Legacy DDR

```
hostname RtrA
!
enable password cisco
!
username RtrB password 0 cisco
!
interface BRI0
ip address 1.1.1.1 255.255.255.0
encapsulation ppp
dialer map ip 1.1.1.2 name RtrB broadcast 1113333
dialer-group 1
isdn switch-type basic-dms100
isdn spid1 902111222200 1112222
isdn spid2 902111222301 1112222
ppp authentication chap
!
dialer-list 1 protocol ip permit
```

Link encapsulation format

Define "interesting" traffic

Authentication info - RtrA

Authentication info - RtrB

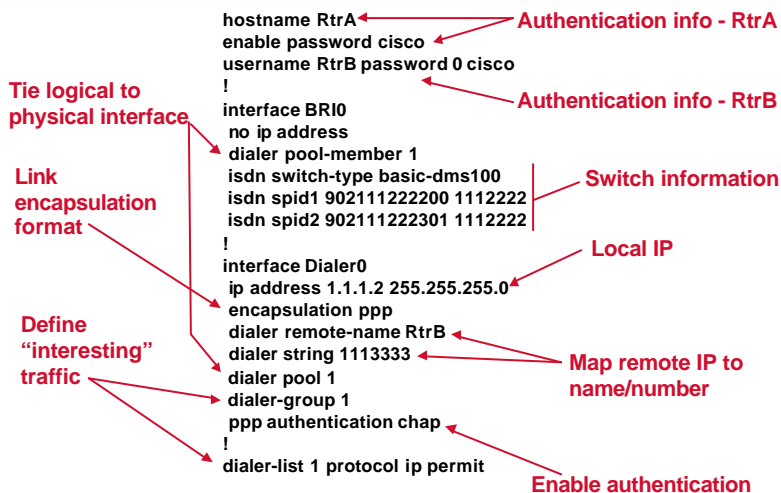
Local IP

Map remote IP to name/number

Switch information

Enable authentication

Basics - Profiles



Debugging - Basic Connectivity

show isdn status

```
The current ISDN Switchtype= basic-dms100
ISDN BRI0 interface
Layer 1 Status:
  ACTIVE
Layer 2 Status:
  TEI = 68, State = MULTIPLE_FRAME_ESTABLISHED
  TEI = 70, State = MULTIPLE_FRAME_ESTABLISHED
Spid Status:
  TEI 68, ces = 1, state = 8(established)
  spid1 configured, spid1 sent, spid1 valid
  Endpoint ID Info: epsf = 0, usid = 70, tid = 0
  TEI 70, ces = 2, state = 8(established)
  spid2 configured, spid2 sent, spid2 valid
  Endpoint ID Info: epsf = 0, usid = 71, tid = 0
Layer 3 Status:
  0 Active Layer 3 Call(s)
Activated dsl 0 CCBs = 0
Total Allocated ISDN CCBs = 0
```

Debugging - Call Progress

debug dialer, debug isdn events

```
08:45:08: BRI0 DDR: rotor dialout [priority]
08:45:08: BRI0 DDR: Dialing cause ip (s=1.1.1.2, d=1.1.1.1)
08:45:08: BRI0 DDR: Attempting to dial 1112222
08:45:08: ISDN BRI0: Outgoing call id = 0x800F, dsl 24
08:45:08: ISDN BRI0: Event: Call to 1112222 at 64 Kb/s
08:45:08: ISDN BRI0: process_bri_call(): call id 0x800F, called_number 1112222,
speed 64, call type DATA
08:45:08: CC_CHAN_GetIdleChanbri: dsl 24
08:45:08: Found idle channel B1
08:45:08: ISDN BRI0: received HOST_PROCEEDING call_id 0x800F
08:45:09: ISDN BRI0: received HOST_CONNECT call_id 0x800F
08:45:09: %LINK-3-UPDOWN: Interface BRI0:1, changed state to up
08:45:09: BRI0:1: interface must be fifo queue, force fifo
08:45:09: %DIALER-6-BIND: Interface BRI0:1 bound to profile Dialer0
08:45:09: %ISDN-6-CONNECT: Interface BRI0:1 is now connected to 1112222
08:45:09: isdn_call_connect: Calling lineaction of BRI0:1
08:45:09: ISDN BRI0: Event: Connected to 1112222 on B1 at 64 Kb/s
```

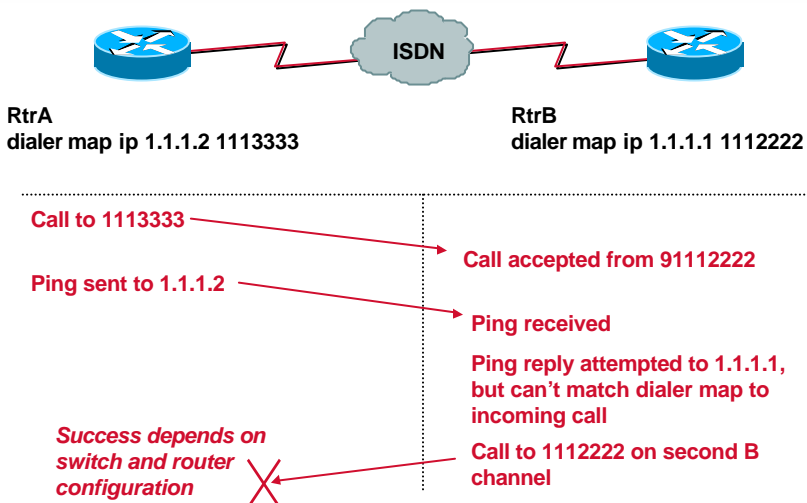
Other Debugging Commands

- **PPP: debug ppp negotiation, debug ppp authentication**
- **IP problems: debug ip packet**
- **More detailed call progress (as a last resort): debug isdn q931, debug isdn q921**

Authentication

- Authentication verifies the identity of a remote host
- Authentication is also part of calling and routing with ISDN.

ISDN without Authentication



ISDN without Authentication (Cont.)

- Can depend on router and telco switch configuration
- Creates two unidirectional channels - i.e. uses half the bandwidth

ISDN with Authentication



RtrA
dialer map ip name RtrB 1.1.1.2 1113333

RtrB
dialer map ip name RtrA 1.1.1.1 1112222

Call to 1113333 (RtrB)

Call accepted from 9112222 (RtrA)

Ping sent to 1.1.1.2

Ping received

Ping reply attempted to 1.1.1.1;
dialer map matches "RtrA" to
existing call

Ping reply received

Ping reply sent to 1.1.1.1
over existing channel

ISDN with Authentication

- Less sensitive to telco switch configuration
- More reliable in test situations
- Allows full use of ISDN bandwidth

PPP Feature Example

Implementation of Multilink PPP with both channels. This task requires:

- authentication
- *Local Directory Numbers (LDN's)* on SPID's
- a second dialer map or string
- **ppp multilink** command - to create bundles
- **dialer load-threshold** command, to bring up second channel.
- **show ppp multilink** shows:

```
Dialer0, bundle name is RtrA
0 lost fragments, 0 reordered, 0 unassigned, sequence 0x6/0x6 rcvd/sent
0 discarded, 0 lost received, 1/255 load
Member links: 2 (max not set, min not set)
  BRI0:1
  BRI0:2
```

DDR Techniques

- **Floating static routes**
- **Dial backup**
- **Dialer watch**
- **OSPF demand circuit**

Floating Static Routes

```
ip route 2.2.2.0 255.255.255.0 1.1.1.2 240
```

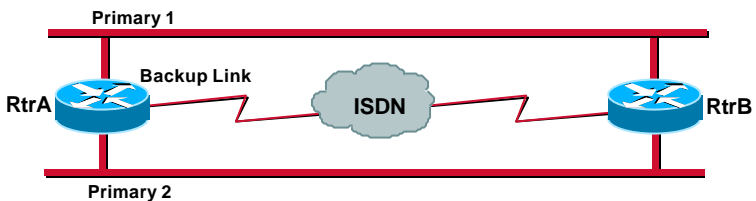
- **uses a higher administrative distance so that dynamic protocols will take precedence**
- **use only if explicitly allowed in a test question**
- **make sure the dynamic route actually exists when DDR is not active**

Dial Backup

```
interface Serial0
  backup delay 10 10
  backup interface Dialer0
```

- Use if the backup link can be tied to a physical interface
- Use it to trigger one end of a backup link or the other - not both!
- Requires careful use on multipoint interfaces

Dialer Watch



- Allows a backup link to support multiple primary links
- Monitors specific network addresses

Dialer Watch (Cont.)

```
hostname RtrA
!  
interface BRI0  
ip address 1.1.1.1 255.255.255.0  
encapsulation ppp  
dialer map ip 1.1.1.2 name RtrB broadcast 1113333  
dialer-group 1  
dialer watch-group 2  
isdn switch-type basic-dms100  
isdn spid1 902111222200 1112222  
isdn spid2 902111222301 1112222  
ppp authentication chap  
!  
dialer-list 1 protocol ip permit  
dialer watch-list 2 ip 10.1.1.0 255.255.255.0
```

Dialer Watch (Cont.)

- **Dialer Watch will keep the backup interface down until the monitored route(s) are no longer reachable through the primary interfaces.**
- **Dialer Watch requires IGRP or EIGRP on the router, and only supports IP.**

OSPF Demand Circuit

- **Useful if the backup link and failure point are in different parts of your network.**
- **Suppresses OSPF HELLO messages and keeps routes visible even if the backup link drops.**
- **Can be difficult to implement.**

OSPF Demand Circuit (Cont.)

- **Suggestions for use:**

Configure on one side of the link only.

Don't change the OSPF network type of the backup link.

Make sure the question permits the link to come up for topology changes.

Watch for routing loops.

OSPF Demand Circuit (Cont.)

Routing loop example:

```
interface BRI0
ip address 1.1.1.1 255.255.255.0
ip ospf demand-circuit
!
router ospf 10
 redistribute rip subnets
 network 1.1.1.1 0.0.0.0 area 5
!
router rip
 redistribute connected
 network 3.0.0.0
 default-metric 3
```

Preparation Suggestions

- ISDN requires hands-on practice with both ends of a link.
- The debug and show commands produce lots of output - you need to learn what's normal and what's unusual

Preparation Suggestions (Cont.)

References

ISDN (3rd ed.) (Kessler/Southwick, McGrath Hill)

Building Cisco Remote Access Networks (Paquet, Cisco Press)

<http://www.cisco.com/warp/public/129/index.shtml>

<http://www.cisco.com/warp/public/131/index.shtml>

<http://www.cisco.com/warp/public/123/index.shtml>

CiscoCD - Internetworking Design Guide

CiscoCD - Dial Solutions Quick Configuration Guide

CiscoCD - Configuration and Command References

Implementation Suggestions

- **Start with “minimal” configuration**
- **Use authentication!**
- **Read any DDR scenario carefully**
- **Watch for “typos”.**
- **Switch types vary from site to site.**

Implementation Suggestions (Cont.)

- **Debug from the bottom up - check:**
 - connection with the switch**
 - call progress**
 - ppp and authentication**
 - IP connectivity**
- **Leave a working configuration**



Questions?



Session VII

Multicast

Multicast

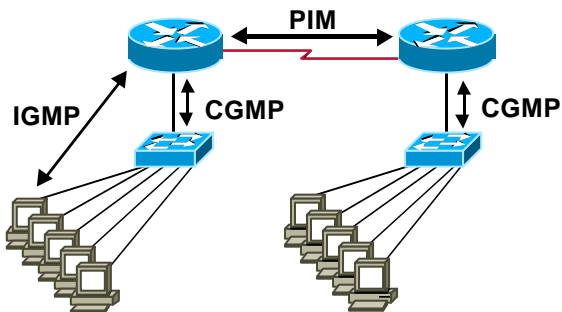
- **Overview**
- **Addressing**
- **PIM-DM Configuration**
- **PIM-SM Configuration**

Multicast

- **CGMP Configuration**
- **Monitoring**
- **Preparation**

Multicast

Overview



Multicast

Addressing

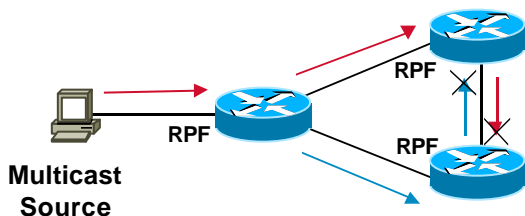
Class A	0.0.0.0 - 127.255.255.255
Class B	128.0.0.0 - 191.255.255.255
Class C	192.0.0.0 - 223.255.255.255
Class D	224.0.0.0 - 239.255.255.255

Class A, B, and C IP packets are forwarded based on the destination address. Class D (multicast) packets are forwarded based on the source IP address.

Multicast

Addressing

A multicast packet received on an interface will be accepted if received on the interface that would be used to send a unicast IP packet back to the source. This is called Reverse Path Forwarding (RPF)



Multicast

PIM-DM Configuration

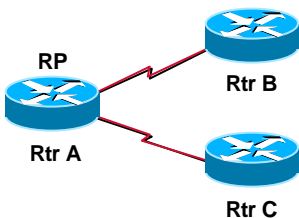
```
ip multicast-routing
```

```
interface serial 0  
ip pim dense-mode (IGMP automatically enabled)
```

```
interface ethernet 0  
ip pim dense-mode
```

Multicast

PIM-SM Configuration Static Rendezvous Point



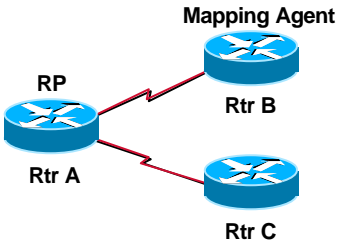
```
Rtr A  
ip multicast-routing  
interface s0  
ip pim sparse-mode  
interface s1  
ip pim sparse-mode
```

```
Rtr B  
ip multicast-routing  
ip pim rp-address (Rtr A)  
interface s0  
ip pim sparse-mode
```

```
Rtr C  
ip multicast routing  
ip pim rp-address (Rtr A)  
interface s0  
ip pim-sparse-mode
```

Multicast

PIM-SM Configuration Auto RP

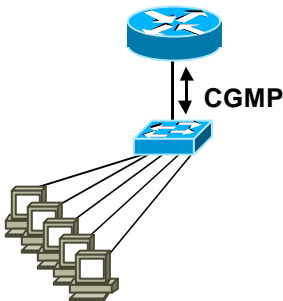


Rtr A
ip multicast-routing
ip pim send-rp-announce serial 0 scope 10
interface s0
ip pim sparse-mode
interface s1
ip pim sparse-mode

Rtr B
ip multicast-routing
ip pim send-rp-discovery scope 10
interface s0
ip pim sparse-mode

Multicast

CGMP



Router
interface ethernet 0
ip cgmp

Switch
set cgmp enable

Monitoring

Show Commands

```
show ip pim neighbor
show ip pim interface
show ip pim rp
show ip mroute
```

```
show ip rpf
```

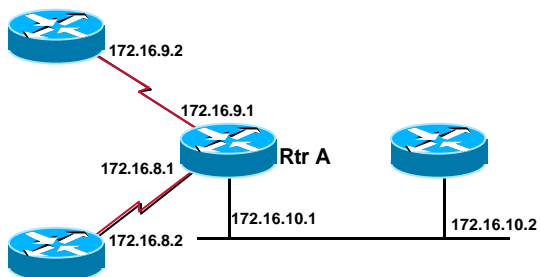
```
show ip igmp groups
show ip igmp interface
```

Monitoring

```
Rtr A#show ip pim neighbor
```

PIM Neighbor Table

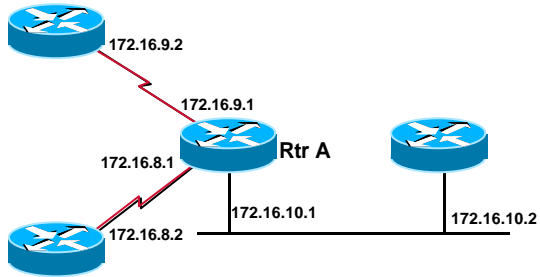
Neighbor Address	Interface	Uptime	Expires	Mode
172.16.8.2	Serial 0	4d15h	00:01:19	Dense
172.16.9.2	Serial 1	4d15h	00:01:00	Dense
172.16.10.2	Ethernet 0	4d15h	00:01:00	Dense



Monitoring

```
Rtr A#show ip pim interface
```

Address	Interface	Mode	Nbr Count	Query Intvl	DR
172.16.8.1	Serial0	Dense	1	30	0.0.0.0
172.16.9.1	Serial1	Dense	1	30	0.0.0.0
172.16.10.1	Ethernet0	Dense	1	30	172.16.10.2



Monitoring

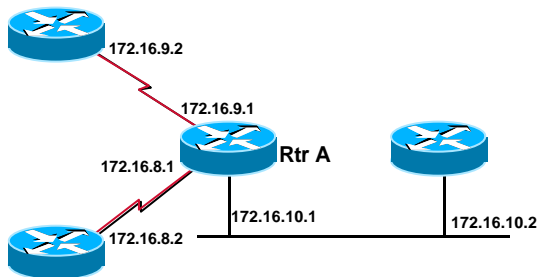
```
Rtr A#debug ip pim
```

```
PIM: Send Router-Query on Ethernet0
```

```
PIM: Send Router-Query on Serial0
```

```
PIM: Send Router-Query on Serial1
```

```
PIM: Received Router-Query on Ethernet0 from 172.16.10.2
```



Preparation

References

Developing IP Multicast Networks
Beau Williamson, Cisco Press

Cisco Multicast Routing and Switching
William R. Parkhurst, McGraw-Hill

ftp://ftpeng.cisco.com:/ipmulticast/multicast_training.html



Questions?