NETMASTERCLASS
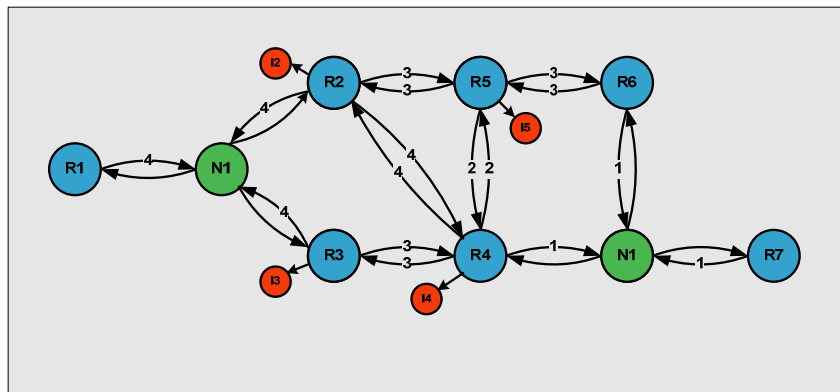## ROUTING AND SWITCHING CCIE® TRACK

DOiT-200v6
VOLUME II

DOiT-200v6 Lab 7
Multi-Topic CCIE-Level Scenario
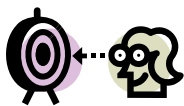
For CCIE® Candidates

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Goals and Restrictions

- IP subnets in the diagram belong to network 172.16.0.0/16.
- Do not use any static routes.
- Do not rely on dynamic Frame-Relay Inverse ARP.
- Make sure all IPv4 and IPv6 loopback interfaces are advertised with their original mask, unless noted otherwise.
- Make sure all IPv4 interfaces in the diagram are *reachable* within this internetwork. **DO NOT FORGET THIS!**
- Do not use "ip default-network".
- All IP addresses involved in this scenario must be reachable, unless specified otherwise.
- Networks advertised in the BGP section must be reachable only in the BGP domain.

FOR PHYSICAL CONNECTIVITY, CHECK THE DIAGRAM "NETMASTERCLASS 200V6 POD LAYOUT".

Netmasterclass 200v6 POD Layout
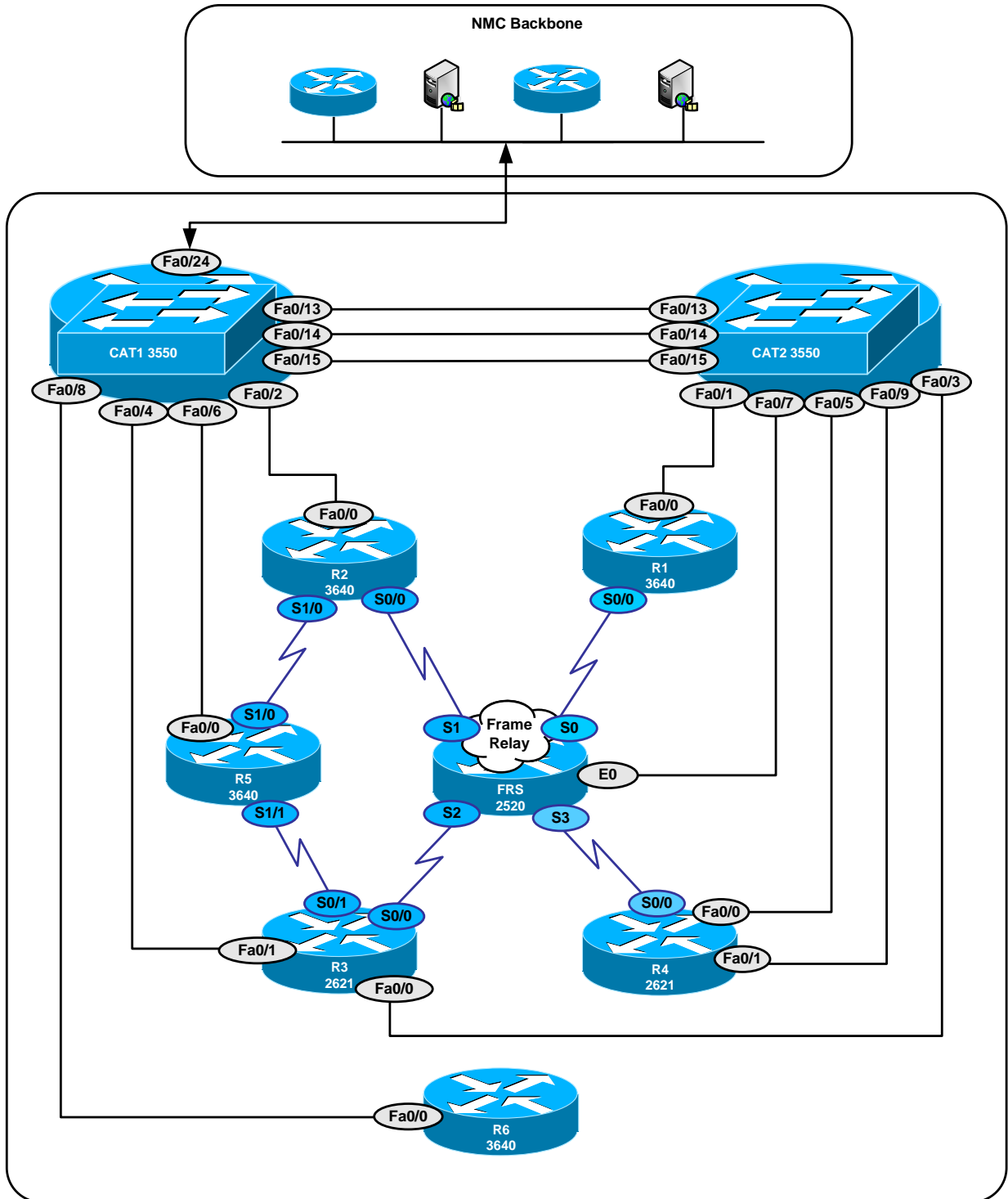
Netmasterclass DOiT-200v6 Scenario 7 IPv4 IGP diagram
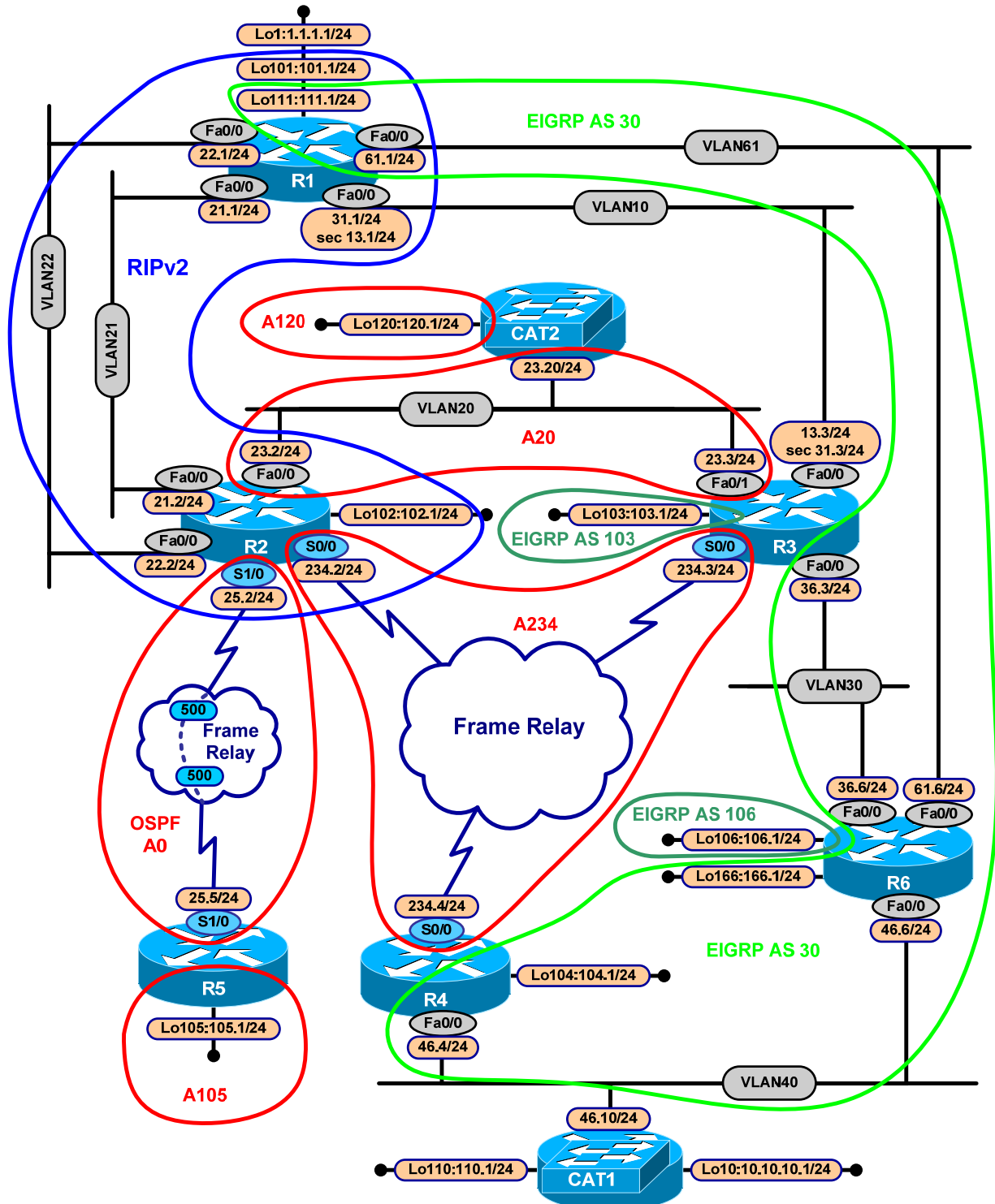
Netmasterclass DOiT-200v6 Scenario 7 IPv6 IGP diagram

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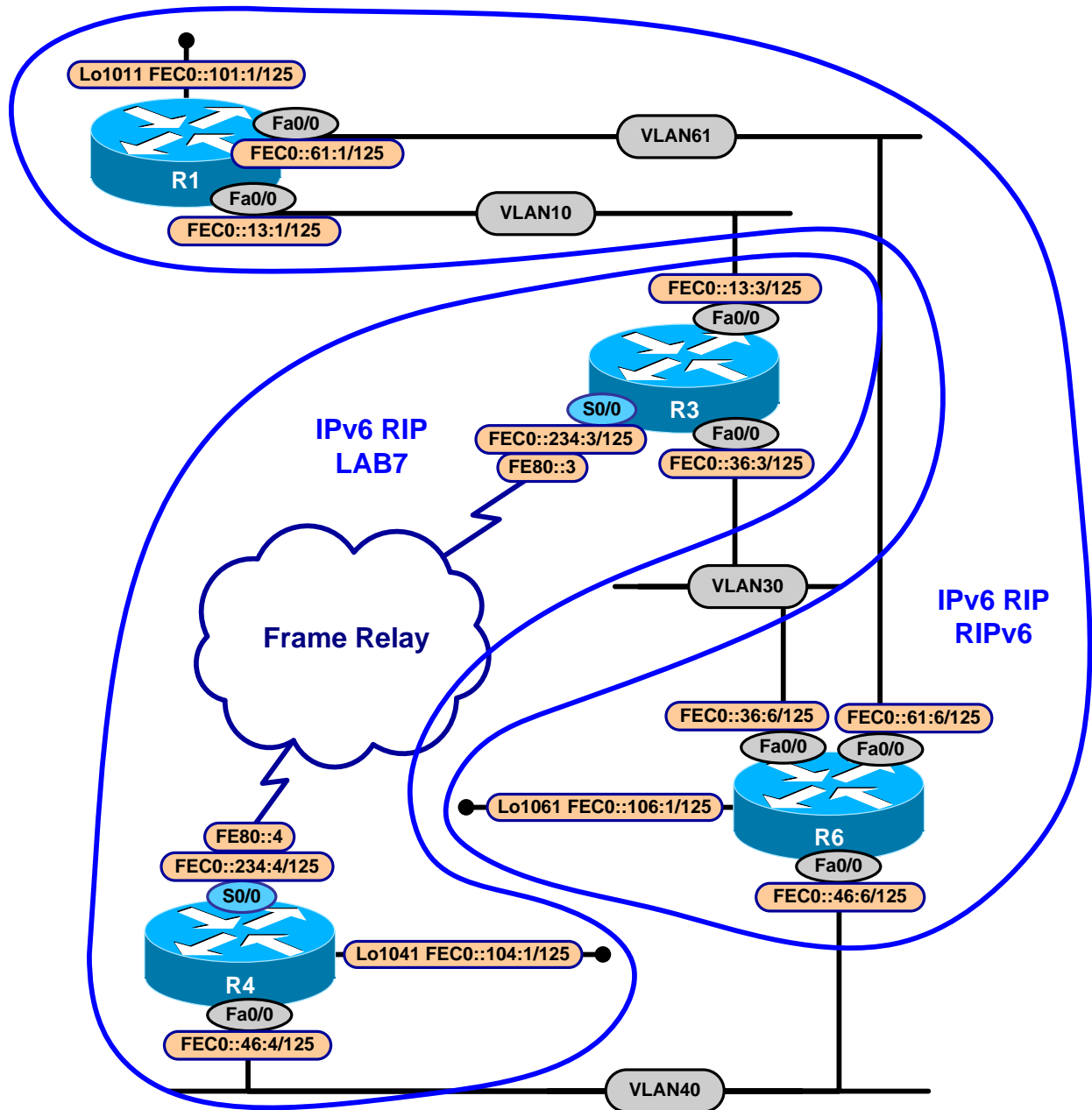
7.1 Frame Relay

> **The Frame-Relay Switch configuration is provided in the Appendix. Do not modify the frame relay route statements on the frame relay switch FRS.**

7.1.1   Configure the minimal number of PVC's for the subnet 172.16.234.0/24.

7.1.2   Configure logical interfaces on the subnet 172.16.234.0/24.

7.1.3   Configure Frame Relay physical interfaces on the subnet 172.16.25.0/24.

7.2 Catalyst Configuration

> **Shutdown interfaces FA0/15 on both switches CAT1 and CAT2**

7.2.1   Configure VLANs according to the diagram and the "VLAN configuration" table.

VLAN Configuration Table

Router	Interface	VLAN
R1	FastEthernet0/0	VLAN10 VLAN21 VLAN 22 VLAN 61
R2	FastEthernet0/0	VLAN20 VLAN21 VLAN 22
R3	FastEthernet0/1	VLAN20
R3	FastEthernet0/0	VLAN10 VLAN30
R4	FastEthernet0/0	VLAN40
R5	FastEthernet0/0	-
R6	FastEthernet0/0	VLAN30 VLAN40 VLAN 61
FRS	Ethernet0	-
CAT1	-	VLAN40
CAT2	-	VLAN20

7.3 Catalyst QoS

7.3.1   Port FastEthernet0/10 on CAT1 has Network Engineer's management laptop connected to it. Configure ports connected to VLAN20 to allow Network Engineer to operate on routers R2 and R3 even when network is heavily congested by any type of activity. Use CoS=3 for traffic from management laptop and make sure it has 25% of bandwidth when needed. Other CoS values must have bandwidth according to the table: CoS 6,7 – 20%, CoS 0,1 and 2 – 30%, CoS 4,5 – 25%. Also, traffic from this laptop must always be sent ahead of everything else.

7.4 OSPF

7.4.1   Configure OSPF area 0 on subnet 172.16.25.0/24.

7.4.2   Configure OSPF area 20 on all interfaces connected to subnet 172.16.23.0/24.

7.4.3   Configure OSPF area 234 on Frame Relay cloud. Make it NSSA area. R2 must perform 7-to-5 translation. Any router on area 234 must be able to become a DR and successfully perform this role.

7.4.4   Deliver area 0 to R3. Do not use "network … area" command.

7.4.5   Add the Loopback interface 172.16.120.1/24 of CAT2 to area 120.

7.4.6   Add the Loopback interface 172.16.105.1/24 of R5 to area 105.

7.5 RIP

7.5.1   Configure RIP version 2 between R1 and R2.

7.5.2   Advertise RIP routing updates on the VLAN 21 and 22 only.

7.5.3   Accept RIP updates only if they pass clear password authentication using the string "exam7".

7.5.4   Redistribute RIP and OSPF on R2.

7.6 EIGRP

7.6.1   Configure EIGRP AS 30 on the interfaces connected to VLAN30, VLAN40 and VLAN61.

7.6.2   Advertise the Loopback interface 172.16.103.1/24 in EIGRP AS 103 on R3.

7.6.3   Advertise the Loopback interface 172.16.106.1/24 in EIGRP AS 106 on R6.

7.6.4   Redistribute EIGRP and OSPF on R4.

7.7 BGP

7.7.1   Configure AS 100 on R1 and AS 300 on R3. Peer them over VLAN 10 without using any secondary IP addresses.

7.7.2   Advertise VLAN10 in both AS 100 and AS 300.

7.7.3   Advertise the VLAN 21 and 22 subnets 172.16.21.0/24 and 172.16.22.0/24.

7.7.4   Make sure the AS 100 does not destabilize the BGP domain if ISDN link goes up and down.

7.7.5   Add routers R2 and R5 to AS 300.

7.7.6   Peer all routers within AS300. Make sure they exchange NLRI with the local preference of 200. Do not use a route map to accomplish this task.

7.7.7   Configure AS 400 on router R4 and AS 600 on router R6.

7.7.8   Configure AS 3000 on R5 as well and peer AS3000 and AS 400 between R5 and R4.

7.7.9   Peer AS 600 and AS 300 between R6 and R3.

7.7.10   Configure AS 1000 on CAT1.

7.7.11   Peer AS 1000 with both AS 400 and AS 600.

7.7.12   Advertise networks 1.1.1.0/24 and 10.10.10.0/24 from AS 100 and AS 1000 respectively. Provide transit service between these networks.

7.7.13   Do not originate any other networks into BGP.

7.8 BGP Part 2

7.8.1   Make sure that **ebgp-multihop** is not present in **neighbor** command between R1 and R3 in BGP configuration on R1. Also, configure R1 neighbor as passive-only in transport for BGP. Make sure the same set of arguments is not configured twice would another similar link between R1 and AS300 appear later on.

7.9 IOS Features

7.9.1   Configure R5 so that you can reboot it with an SNMP "set" operation from a network management station.

7.10 Router Maintenance

7.10.1   Configure at least 40 small buffers on R1.

7.10.2   Configure not more than 170 big buffers free on R1.

7.11 Security

7.11.1   Router R5 will be connected to the Internet in the future.

7.11.2   Develop and apply the security protections against:

- o   ICMP redirect messages
- o   Broadcast packets
- o   Multicast packets
- o   Packets destined to the default network
- o   Packets sourced from the reserved Loopback addresses
- o   Packets from private non-routed IP addresses

7.11.3   Do not use a standard or extended numbered access-list to accomplish this task.

7.12 IPv6

7.12.1   Configure IPv6 on all interfaces marked with IPv6 addresses on IPv6 diagram.

7.12.2   Configure RIPng on all IPv6 links.

7.12.3   Make R3 send packets towards R4's loopback FEC0::104:1 in 2:1 ratio over FastEthernet and Serial link in favor of FastEthernet. Do not create any new addresses. Do not use commands that have word "unnumbered".

7.13 QOS

7.13.1   Configure WFQ on the Frame Relay links between R2 and R5 with the following parameters:

- o   Congestive discard threshold of 128 messages
- o   512 dynamic queues
- o   10 RSVP queues for future RSVP deployments

7.14 Catalyst Specialties

7.14.1   Configure VTP version 2 on CAT2.

7.14.2   CAT1 will be a server in VTP domain "NMC" with the password "NMC" as well.

7.14.3   Restrict the amount of flooded traffic on the trunks configured in this Scenario.

7.15 Address Administration

7.15.1   CAT1 should prefer R4 as its primary gateway based on a CISCO developed protocol.

7.15.2   In case router R4 fails, CAT1 should prefer R6.

7.15.3   Be able to ping the rest of the network from 172.16.110.1 from CAT1.

7.16 Multicast

7.16.1   Configure a PIM Sparse mode network. Do not use the CISCO proprietary method of distributing RP information through the multicast network.

7.16.2   CAT2 is the root of the shared tree for the multicast groups 228.8.8.8 and 227.7.7.7.

7.16.3   R2, R3, R4, R5 and R6 are members of the shared tree.

7.16.4   ISDN and ATM links are not part of this exercise.

7.16.5   Join one of the loopback interfaces on each member router to the multicast group 227.7.7.7.

7.16.6   Configure each member router to process only Join and Prune messages destined for 172.16.120.1 and 227.7.7.7 group while building the shared tree.

7.16.7   Generate (172.16.31.1, 227.7.7.7) traffic; make sure you receive responses from each multicast router.

Appendices

Frame Relay Switch Configuration

The Frame Relay Switch should be preconfigured as a full mesh for all exercises. See the diagram for the DLCI numbering and corresponding interfaces. All Frame Relay Switch interfaces are connected to the DCE cable connector.

Frame Relay Switch Configuration (Full Mesh)
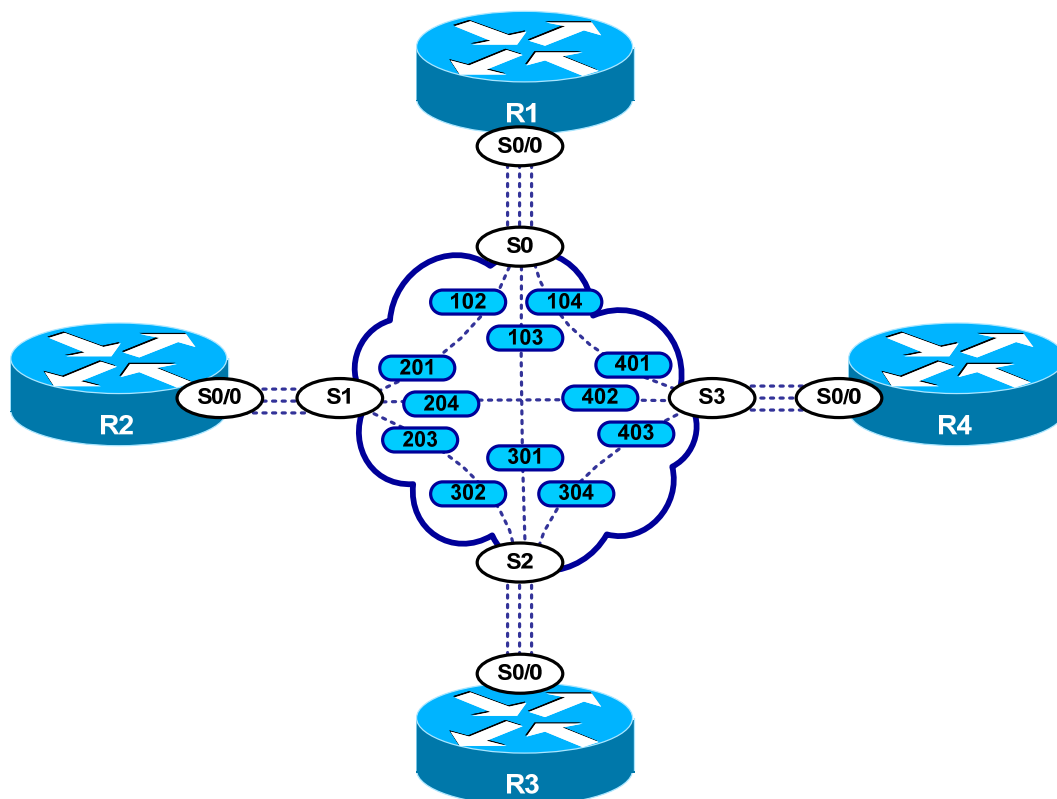
Provided below is the Frame-Relay switch configuration. If you enter this configuration into a router acting as a Frame-Switch and you cable up your pod in the manner displayed on this page, you will have configured a full-mesh Frame-Relay topology.

Frame Relay Switch Configuration Example

```
frame-relay switching
!
interface Serial0
 no ip address
 encapsulation frame-relay IETF
 clockrate 125000
 frame-relay lmi-type ansi
 frame-relay intf-type dce
 frame-relay route 102 interface Serial1 201
 frame-relay route 103 interface Serial2 301
 frame-relay route 104 interface Serial3 401
 no shutdown
!
interface Serial1
 no ip address
 encapsulation frame-relay IETF
 clockrate 125000
 frame-relay lmi-type ansi
 frame-relay intf-type dce
 frame-relay route 201 interface Serial0 102
 frame-relay route 203 interface Serial2 302
 frame-relay route 204 interface Serial3 402
 no shutdown
!
interface Serial2
 no ip address
 encapsulation frame-relay IETF
 clockrate 115200
 frame-relay lmi-type ansi
 frame-relay intf-type dce
 frame-relay route 301 interface Serial0 103
 frame-relay route 302 interface Serial1 203
 frame-relay route 304 interface Serial3 403
 no shutdown
!
interface Serial3
 no ip address
 encapsulation frame-relay IETF
 clockrate 115200
 frame-relay lmi-type ansi
 frame-relay intf-type dce
 frame-relay route 401 interface Serial0 104
 frame-relay route 402 interface Serial1 204
 frame-relay route 403 interface Serial2 304
 no shutdown
!
```

Hints

7.1   Serial Configuration

Disable Frame-Relay inverse ARP.

7.2   Catalyst Configuration

Verify VTP mode.

7.3   Catalyst QoS

Enable mls qos.

7.4   OSPF

Think about virtual links.

7.5   RIP

No hint.

7.6   EIGRP

No hint.

7.7   BGP

No hint.

7.8   BGP Part 2

Use session templates.

7.9   IOS Features

No hint.

7.10   Router Maintenance

No hint.

7.11   Security

No hint.

7.12   IPv6

Enable ipv6 unicast-routing.

7.13   QOS

No hint.

7.14   Catalyst Specialties

No hint.

7.15   Address Administration

No hint.

7.16   Multicast

No hint.