Networking
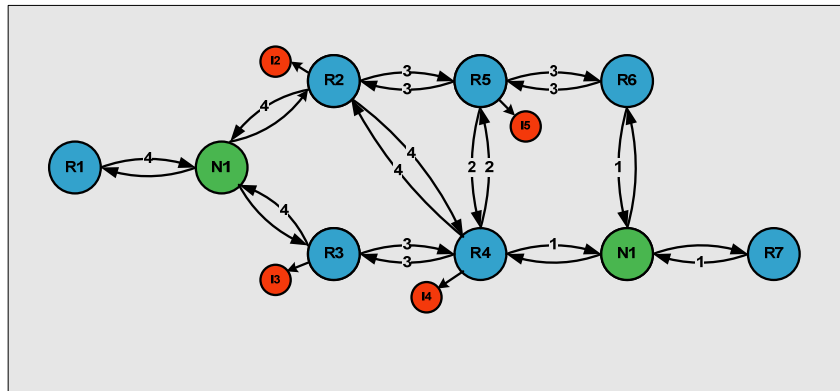Consulting
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ROUTING AND SWITCHING CCIE® TRACK

DOiT-200v6
VOLUME II

DOiT-200v6 Lab 4
Multi-Topic CCIE-Level Scenario
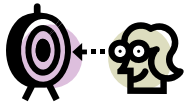
For CCIE® Candidates

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Table of Contents

Goals and Restrictions

- IP subnets on the diagram belong to network 151.90.0.0/16.
- Do not use any static routes.
- Advertise Loopback interfaces involved in IGP configurations with their original mask. Do not change the mask.
- Network 0.0.0.0/0 should not appear in any routing table (show ip route).
- 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.
- Use conventional routing algorithms.

FOR PHYSICAL CONNECTIVITY, CHECK THE DIAGRAM "NMC POD LAYOUT" DISPAYED IN THE APPENDIX A AT THE END OF THIS DOCUMENT.

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Netmasterclass 200v6 POD Layout

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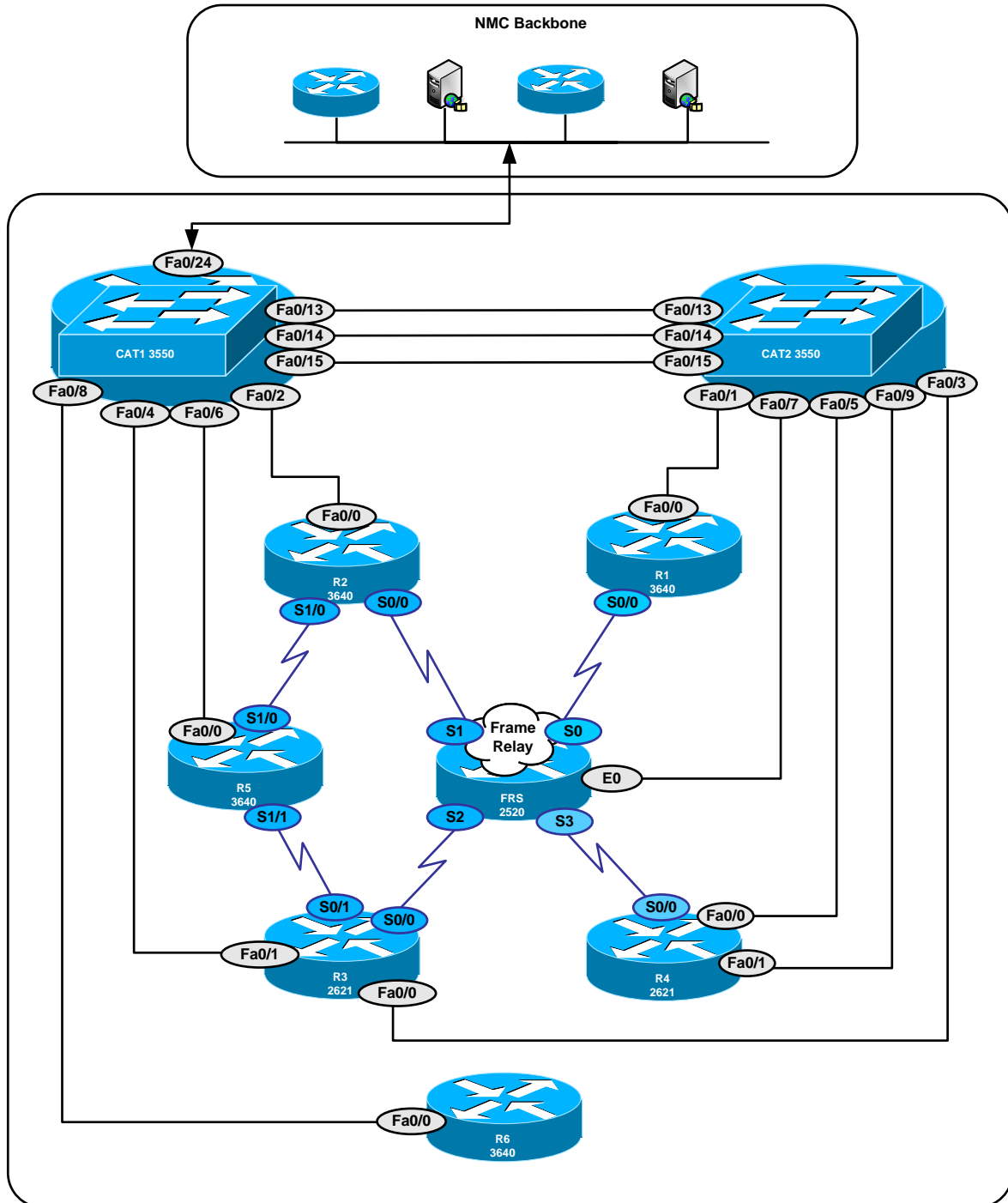
Netmasterclass DOiT-200v6 Scenario 4 IPv4 IGP diagram

Lo64:192.168.100.77/28
Lo80192.168.100.91/28
Lo96192.168.100.97/28
Lo112:192.168.100.126/28

FRS
E0
67.7/24

Lo107:107.1/24

A60

VLAN67

67.20/24

A0

Lo101:101.1/24

R1
Fa0/0
16.1/24

VLAN16

Fa0/0
16.6/24

Lo106:106.1/24

Fa0/0
60.6/24

R6

VLAN60

60.20/24   CAT2

S0/0
12.1/24

Fa0/0
163.1/24

Fa0/0
163.6/24

Lo109:109.1/24

102

Frame Relay

201

VLAN10

R3
Fa0/0
163.3/24

S0/0
34.3/24

Lo103:103.1/24

CAT1
CAT2

VLAN10

VLAN10

VLAN10

EIGRP AS10

304

Frame Relay

403

VLAN10

VLAN10

12.2/24
S0/0

24.2/24
Fa0/0

24.4/24
Fa0/0

34.4/24
S0/0

R2

S1/0
25.2/24

Lo104:104.1/24

R4

Fa0/1
45.4/24

Lo102:102.1/24

PPP

VLAN45

45.5/24
Fa0/0

RIPv2

25.5/24
S1/0

Lo105:105.1/24

R5

Fa0/0
50.5/24

VLAN50

50.10/24

Lo10:10.10.10.1/24   CAT1   Lo100:100.1/24

Netmasterclass DOiT-200v6 Scenario 4 IPv6 IGP diagram
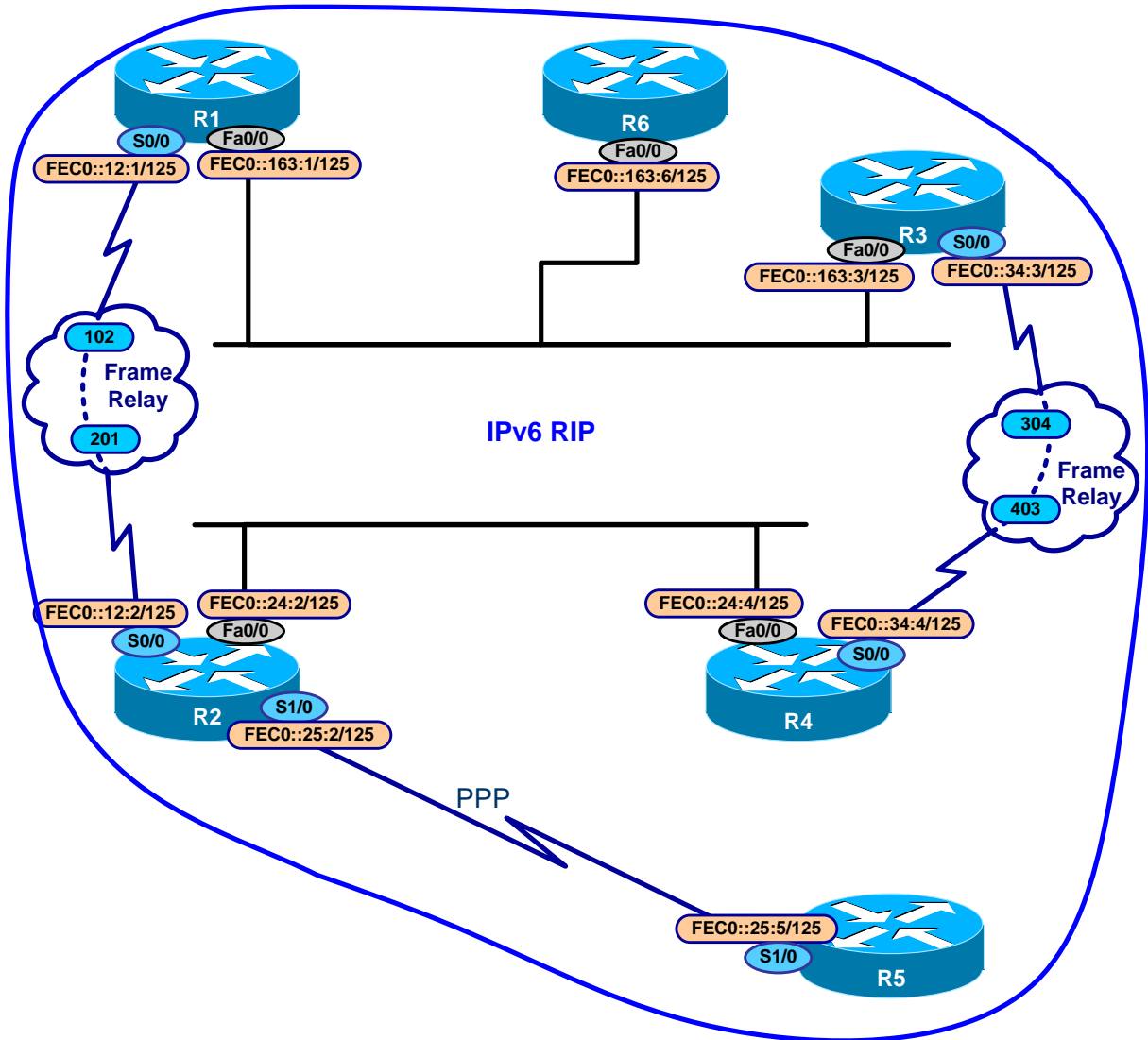
4.1 Frame Relay

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

4.1.1   Use only the PVC's displayed in the diagram.

4.1.2   Use a physical interface on R3 and a point-to-point interface on R4 on subnet 151.90.34.0/24.

4.1.3   Use logical interfaces on subnet 151.90.12.0/24.

4.1.4   Use PPP encapsulation on R2-R5 serial connection.

4.2 Catalyst Configuration

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

4.2.1   Configure VLAN10 for subnet 151.90.163.0/24 between R1, R6 and R3.

VLAN Configuration Table

Router	Interface	VLAN
R1	FastEthernet0/0	VLAN10 VLAN 16
R2	FastEthernet0/0	VLAN10
R3	FastEthernet0/0	VLAN10
R4	FastEthernet0/0	VLAN10
R4	FastEthernet0/1	VLAN45
R5	FastEthernet0/0	VLAN45 VLAN50
R6	FastEthernet0/0	VLAN10 VLAN16 VLAN 60
FRS	Ethernet0	VLAN67
CAT1	-	VLAN50
CAT2	-	VLAN60 VLAN67

4.2.2   Configure VLAN10 for subnet 151.90.24.0/24 between R2 and R4.

4.2.3   Networks 151.90.163.0/24 and 151.90.24.0/24 must represent separate broadcast domains. Do not use filtering to accomplish this task.

4.2.4   Configure other VLAN's according to the "VLAN configuration" table, above.

4.2.5   Use the dot1q trunking protocol in this scenario.

4.3 OSPF

4.3.1   Configure OSPF as follows:
    area 0 on subnet 151.90.163.0/24 between R1 and R6.
    area 0 on subnet 151.90.16.0/24 between R1 and R6.
    area 0 on subnet 151.90.12.0/24 between R1 and R2.

4.3.2   Make sure R1 sees two next-hops to R6 for external prefixes learned from R6.

4.3.3   Configure OSPF area 60 on subnet 151.90.60/24 of R6, and on CAT2 and FRS. Make Area 60 a stub area. CAT2 and FRS may have one Inter-Area route and may not have any default route. Make sure CAT2 and FRS can still reach other prefixes in the 151.90.0.0/16 range.

4.4 RIP

4.4.1   Configure RIP version 2 between R5 and CAT1.

4.4.2   Configure RIP version 2 between R2 – R5 and R4 - R5. Do not allow R2 and R4 to exchange routes via RIP.

4.4.3   RIP must exchange updates only on the links between R2 and R5, R4 and R5, R5 and CAT1 and on the Ethernet link between CAT2 and FRS only.

4.4.4   Router R5 should prefer the paths through R4 to the paths through R2.

4.5 EIGRP

4.5.1   Configure EIGRP AS 10 on the subnets 151.90.24.0/24, 151.90.34.0/24, and between R3 and R6 on subnet 151.90.163.0/24.

4.5.2   R2 and R4 should consider each other as valid neighbors for a period that is twice longer than the default.

4.6 Redistribution

4.6.1   Perform mutual redistribution between IGPs on R4, R3 and R6. Make sure redundant physical paths could be used in case of link failure.

4.7 BGP

4.7.1   Configure AS 100 on routers R5 and CAT1.

4.7.2   Configure AS 200 on routers R2, R1 and R6.

4.7.3   Configure AS 300 on routers R3 and R4.

4.7.4   Configure AS 400 on routers CAT2 and FRS.

4.7.5   Peer AS400 and AS200 between CAT2 and R6.

4.7.6   Peer AS400 and AS300 between CAT2 and R3.

4.7.7   Peer AS 200 and AS100 between R2 and R5.

4.7.8   Peer AS 300 and AS100 between R4 and R5.

4.7.9   Routers R6, R1 and R2 should be in different AS's.

4.7.10   Advertise the following loopback interfaces from FRS:

o   192.168.100.77/28
o   192.168.100.91/28
o   192.168.100.97/28
o   192.168.100.126/28

4.7.11   All other BGP routers must possess only one prefix best describing these loopbacks.

4.7.12   R5 should prefer R4 as a next hop for networks advertised by AS400.

4.7.13   Advertise network 10.10.10.0/8 from CAT1. This network should be seen in AS400 with the AS PATH three times longer via R3 than via R6.

4.8 Network Monitoring

4.8.1   The system Administrator would like to monitor network performance. Specifically, he wants monitor echoes to 151.90.102.1 from R1. The collection interval should be every thirty seconds. Collection should continue indefinitely.

4.8.2   If the test times out, then R1 should send an SNMP trap to an imaginary management station at 151.90.106.2.

4.9 Security

4.9.1   There is a potential for asymmetrical routing between R5 and the 192.168.100.0 prefixes advertised via BGP from FRS. Under normal network conditions, R5 should see R4 as the next hop to these prefixes. However, it is possible that an echo reply from one of these networks would arrive at R5 from R2.

4.9.2   Implement a solution that will detect this potential asymmetric routing. Do not drop any of these packets. Log occurrences to the local logging buffer.

4.9.3   Do not use "ip access-group" to accomplish these tasks.

4.10 IPv6

4.10.1 Configure IPv6 on VLAN 10 between R1, R5 and R3; on VLAN 10 between R2 and R4; on the Frame-Relay links between R1 and R2, R3 and R4; and over the Serial link between R2 and R5. Use the following addresses:

Router	Interface	IPv6 address
R1	F0/0.10	FEC0::163:1/125
R1	S0/0.12	FEC0::12:1/125
R2	F0/0	FEC0::24:2/125
R2	S0/0.12	FEC0::12:2
R2	S1/0	FEC0::25:2/125
R3	F0/0.10	FEC0::163:3/125
R3	S0/0	FEC0::34:3/125
R4	S0/0.34	FEC0::34:4/125
R4	F0/0	FEC0::24:4/125 FE80::4 link-local
R5	S1/0	FEC0::25:5/125
R6	F0/0.10	FEC0::163:6/125

4.10.2 Configure RIP for IPv6 process on all IPv6 links using id "RIPV6". Make sure you can ping all IPv6 interfaces from all IPv6 routers.

4.11 QOS

4.11.1 Prioritize traffic sent via R2 based on the following regulations:

o   DNS traffic is very critical
o   NTP traffic is very critical
o   HTTP traffic is critical
o   SMTP traffic is normal
o   FTP traffic is not critical

4.11.2 Prioritize traffic coming from VLAN50 and forwarded to R4 as medium.

4.11.3 Apply this configuration on R5.

4.12 Address Administration

4.12.1 Loopback network 151.90.100.0/24 should be in the routing table of only two routers: CAT1 and R5.

4.12.2 Make sure you can ping the rest of the network from 151.90.100.1

4.13 Multicast

4.13.1 Source traffic (151.90.50.10, 230.4.4.4) from CAT1.

4.13.2 Configure PIM Dense Mode multicast routing between R5, R4 and R2.

4.13.3 Configure Loopback interfaces as members of the destination multicast group on routers R5, R4 and R2.

4.13.4 An IPTV server is connected to VLAN50. The server is streaming 64 audio programs.

4.13.5 Configure links between R2 and R5 for minimal bandwidth consumption by the audio streams.

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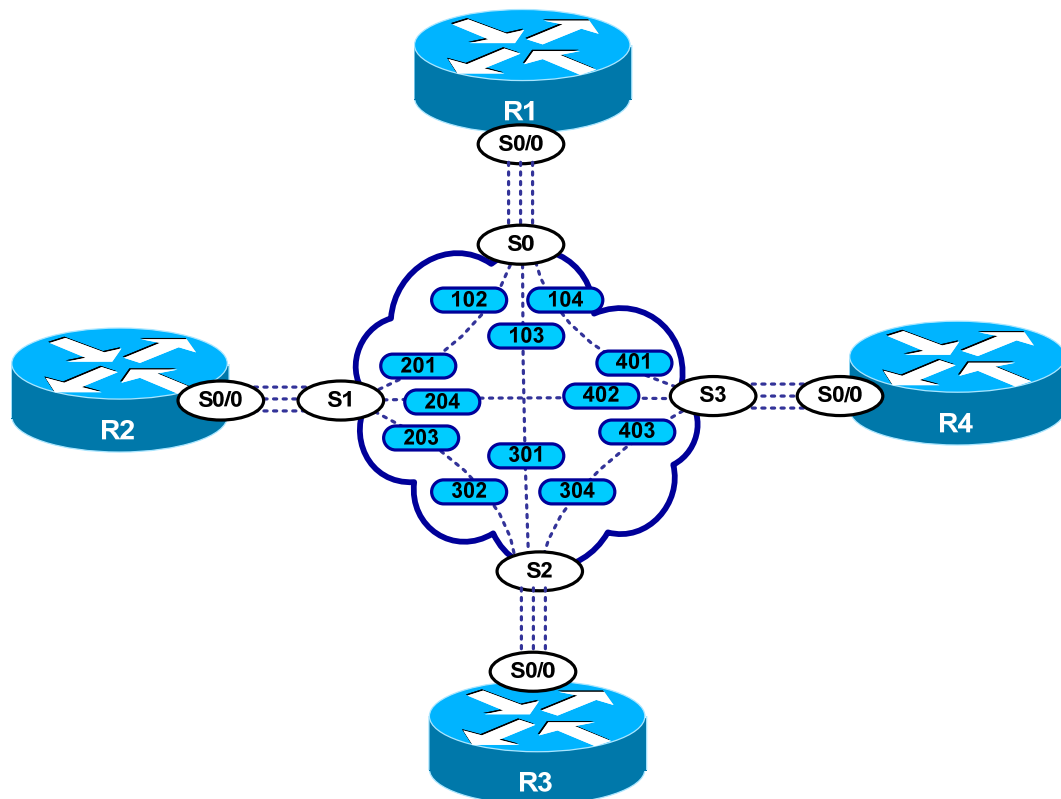
Provided below is the Frame-Relay switch configuration. If you enter this configuration into a router acting as a Frame-Switch and you cable up your pod in the manner displayed on this page, you will have configured a full-mesh Frame-Relay topology.

Frame Relay Switch Configuration Example

```
frame-relay switching
!
interface Serial0
 no ip address
 encapsulation frame-relay
 clockrate 64000
 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
!
interface Serial1
 no ip address
 encapsulation frame-relay
 clockrate 64000
 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
!
interface Serial2
 no ip address
 encapsulation frame-relay
 clockrate 64000
 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
!
interface Serial3
 no ip address
 encapsulation frame-relay
 clockrate 64000
 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
```

Hints

4.1 Frame-Relay

No hint.

4.2 Catalyst Configuration

In order to configure, two different subnets on VLAN 10, you might consider configuring 802.1Q Tunneling.

4.3 OSPF

An option to consider to when excluding external routing information from Area 60 is a stub area configuration. However, remember that Area 60 also possesses an ASBR. Therefore, consider making Area 60 a Not So Stubby Area.

4.4 RIP

Consider an offset-list.

4.5 EIGRP

No hint

4.6 Redistribution

Try tags to prevent route feedback.

4.7 BGP

Remember that you use local-preference to influence "outbound" routing decisions. Also, remember that you can use the AS prepend command within a route-map configuration to increase the AS-Path length for a given prefix.

4.8 Network Monitoring

To perform the type of network monitoring described in this section, consider configuring Cisco's Service Assurance Agent (SAA).

4.9 Security

If you cannot filter packets using an IP access-list, consider using the following interface configuration command: "ip verify unicast reverse-path". This allows you to log packets based upon an examination of the source address of packets received on a specific interface.

4.10 IPv6

No hint.

4.11 QoS

When you see in a QOS scenario, the language of dividing traffic into categories of "critical", "medium" and "normal", consider configuring priority queuing.

4.12 Address Administration

No hint.

4.13 Multicasting

By default, RTP header compression only supports 32 compression connections. You can adjust this number if desired.