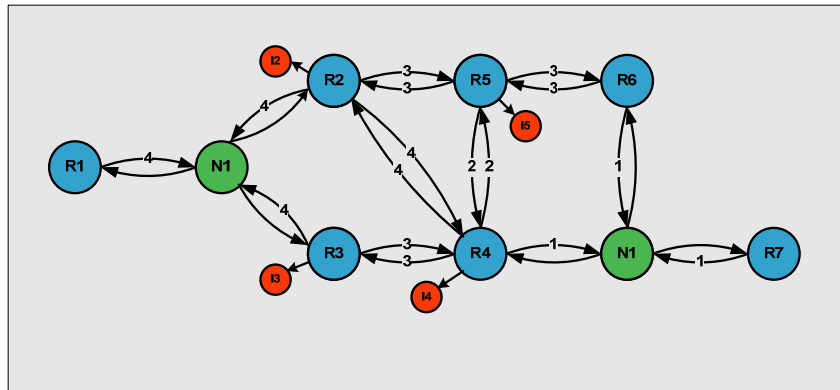


**NETMASTERCLASS**  
**ROUTING AND SWITCHING CCIE® TRACK**

# DOiT-200v6

# VOLUME II



## DOiT-200v6 Lab 15

## Multi-Topic CCIE-Level Scenario

**For CCIE® Candidates**

## Disclaimer

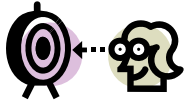
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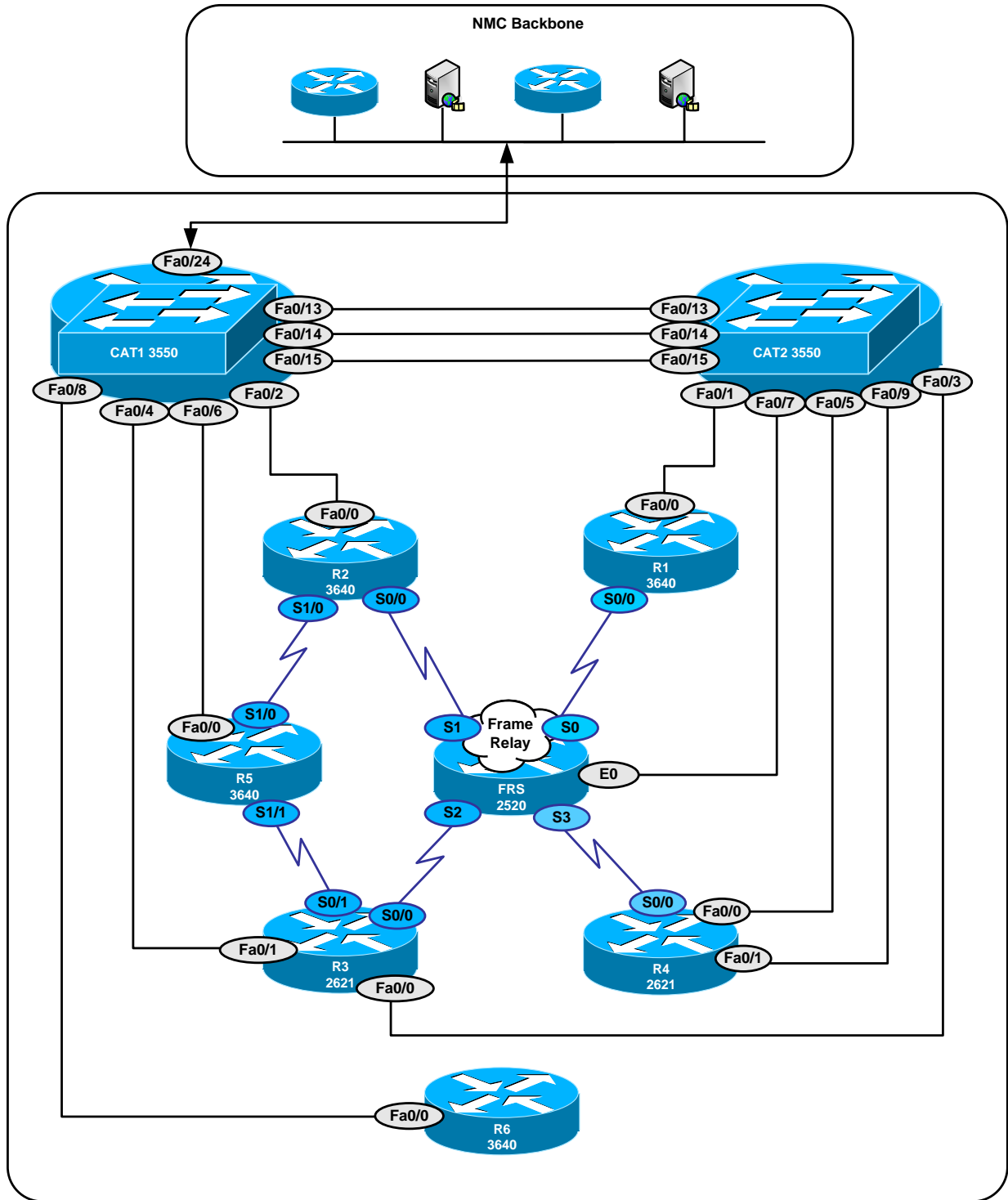
## Goals and Restrictions

- IP subnets on the diagram belong to network 160.20.0.0/16.
- Do not use any static routes.
- Advertise IPv4 Loopback interfaces with their original masks.
- Do not use “ip default-network”.
- All IP addresses involved in this scenario must be reachable, unless specified otherwise.
- Networks 192.50.\*.\* are excluded from the previous requirement.
- Networks advertised in the BGP section must be reachable only in the BGP domain.

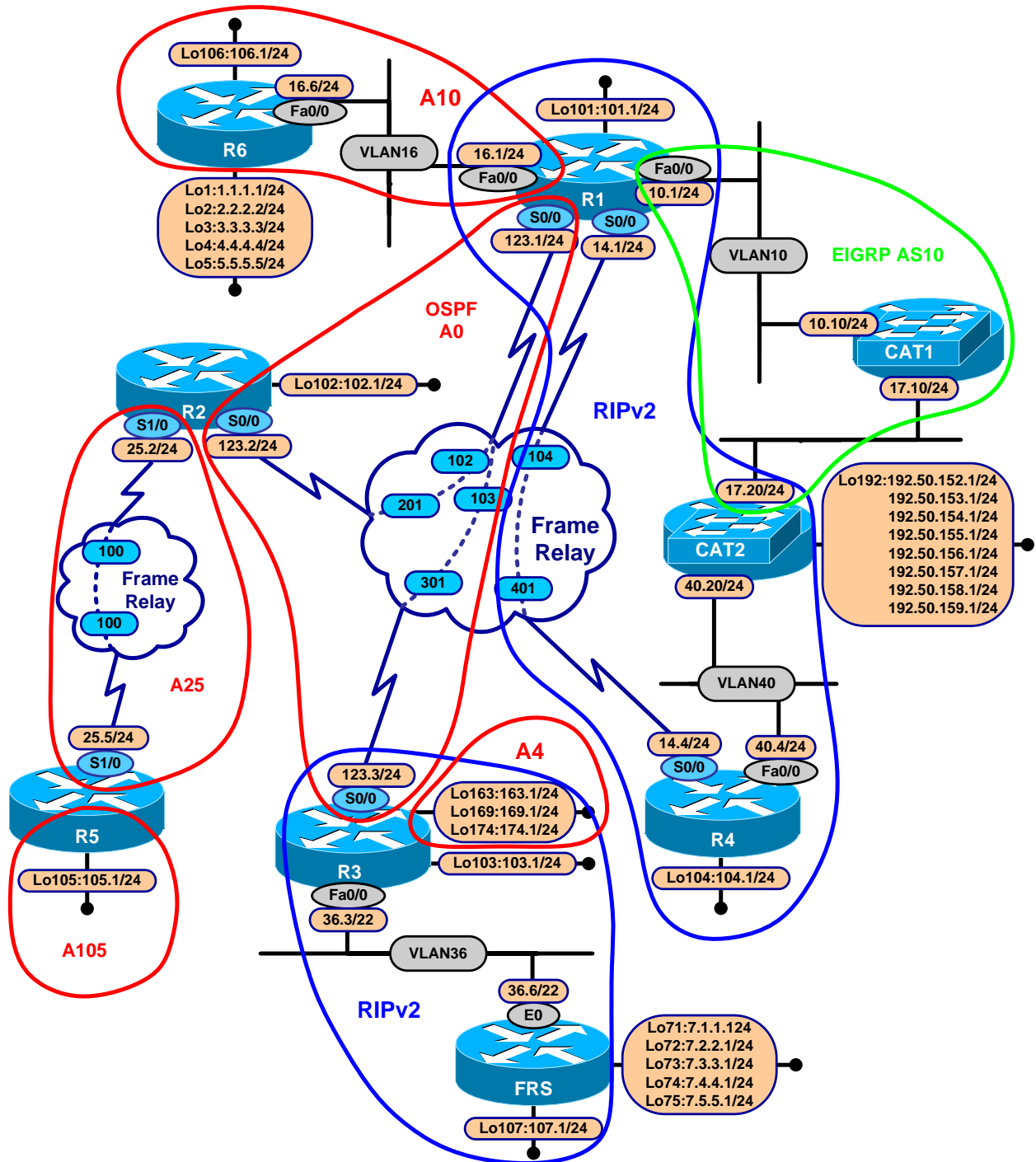


**FOR PHYSICAL CONNECTIVITY, CHECK THE DIAGRAM  
“NETMASTERCLASS 200V6 POD LAYOUT”.**

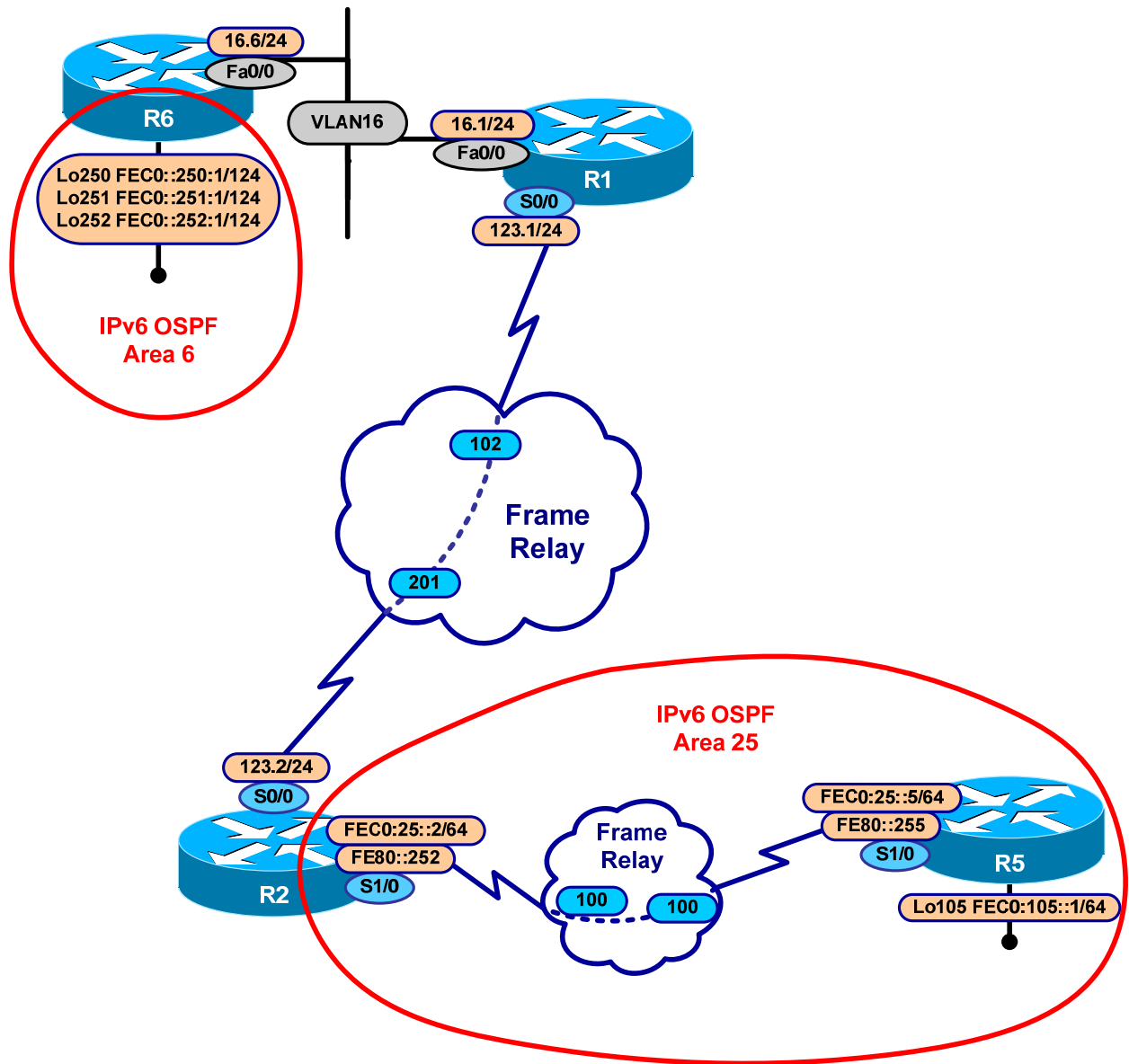
### Netmasterclass 200v6 POD Layout



### Netmasterclass DOIT-200v6 Scenario 15 IPv4 IGP diagram



### Netmasterclass DOiT-200v6 Scenario 15 IPv6 IGP diagram



## 15.1 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.**

- 15.1.1 Configure the Frame links according to DLCI assignments listed on the diagram. Also, configure a back-to-back Frame-Relay configuration between routers R2 and R5. Refer to diagram.
- 15.1.2 Enable Frame-Relay interfaces on the R2 and R5 routers. Use physical interfaces on this link.
- 15.1.3 Configure logical interfaces on the subnet 160.20.123.0/24, use point-to-point interfaces on the spokes.
- 15.1.4 Configure physical interfaces on the link 160.20.14.0/24.
- 15.1.5 Use only the PVCs displayed on the diagram.

## 15.2 Catalyst Configuration



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

- 15.2.1 Configure VLAN's according to the diagram and the VLAN table.

**VLAN Configuration Table**

Router	Interface	VLAN
R1	FastEthernet0/0	VLAN10 VLAN16
R2	FastEthernet0/0	-
R3	FastEthernet0/1	-
R3	FastEthernet0/0	VLAN36
R4	FastEthernet0/0	VLAN40
R5	FastEthernet0/0	-
R6	FastEthernet0/0	VLAN16
FRS	Ethernet0	VLAN36
CAT1	-	VLAN10
CAT2	-	VLAN40

- 15.2.2 Use a trunk protocol that does not support native VLANs.



15.2.3 Make sure only VLANs used for this scenario are permitted on the configured trunks.

15.2.4 Use interfaces F0/14 on subnet 160.20.17.0/24. Do not create a VLAN on this subnet.

### 15.3 OSPF

15.3.1 Configure OSPF over Frame-Relay between routers R1, R2 and R3. Use the OSPF non-broadcast network type. Make the Frame-Relay network the OSPF backbone area.

15.3.2 On R3, create three loopback interfaces with the following subnets and place them into OSPF area 4:

- o 160.20.163.0/24
- o 160.20.169.0/24
- o 160.20.174.0/24

Summarize the three entries with the most efficient mask.

15.3.3 Configure OSPF area 10 on the link between R1 and R6. Make sure that the routers in this OSPF area possess the minimum amount of routing information to reach all destinations within your pod. Advertise the loopback network 160.20.106.0/24 in area 10 from R6.

15.3.4 Configure OSPF area 25 on the link between R2 and R5. Advertise the loopback 160.20.105.1/24 in OSPF area 105.

### 15.4 RIP

15.4.1 Configure RIP version 2 update exchange over the Frame-Relay connection between R1 and R4 and between R4 and CAT2. Make sure that RIP advertises only over the specified links.

15.4.2 On CAT2 configure the following addresses on one loopback interface and advertise them into RIP without using a network statement.

- o 192.50.152.0
- o 192.50.153.0
- o 192.50.154.0
- o 192.50.155.0
- o 192.50.156.0
- o 192.50.157.0
- o 192.50.158.0
- o 192.50.159.0

15.4.3 Make sure R4 learns only the following networks from CAT2:

- o 192.50.152.0
- o 192.50.153.0
- o 192.50.154.0
- o 192.50.155.0

Use a single filtering statement to accomplish this task.

15.4.4 Configure RIP for the 160.20.0.0/16 networks on R3 and FRS.

## 15.5 EIGRP

15.5.1 Configure EIGRP AS 10 on the subnets 160.20.10.0/24 and 160.20.17.0/24 between R1, CAT1 and CAT2

15.5.2 Cat2 advertises the following networks into EIGRP:

- o 192.50.152.0
- o 192.50.153.0
- o 192.50.154.0
- o 192.50.155.0
- o 192.50.156.0
- o 192.50.157.0
- o 192.50.158.0
- o 192.50.159.0

Use one loopback interface to advertise all these networks from CAT2. Do not use network statements to advertise these networks.

15.5.3 CAT1 should accept only networks 192.50.157.0 and 192.50.159.0 from CAT2. Implement this requirement using a single-line access-list.

## 15.6 Redistribution

15.6.1 Do not redistribute between dynamic protocols on CAT2. Redundant paths are not required.

15.6.2 On R1, redistribute RIP and EIGRP into OSPF. Redistribute OSPF and RIP into EIGRP.

15.6.3 On R3, redistribute RIP into OSPF. Redistribute Loopback 103 as a connected network into OSPF.

15.6.4 Do not redistribute into RIP on any router. Do not allow 0.0.0.0/0 in any routing table, other than R6.

## 15.7 BGP

- 15.7.1 Make R1, R2, R3, R4, CAT1 and CAT2 BGP speakers within AS 100. Do not allow a full mesh of IBGP speakers within AS 100.
- 15.7.2 Provide redundant NLRI exchange using R2 and R3 routers.
- 15.7.3 Configure AS 600 on R6 and AS 700 on FRS. Peer them to AS 100 between R6 and R1 as well as FRS and R3.
- 15.7.4 Advertise the following networks from AS 600:
  - o 1.1.1.1/24
  - o 2.2.2.1/24
  - o 3.3.3.1/24
  - o 4.4.4.1/24
  - o 5.5.5.1/24
- 15.7.5 Advertise the following networks from AS 700:
  - o 7.1.1.1/24
  - o 7.2.2.1/24
  - o 7.3.3.1/24
  - o 7.4.4.1/24
  - o 7.5.5.1/24
- 15.7.6 On each EBGP peer, accept only prefixes with a third octet of only 4 and 5 and originated from a locally connected AS into AS 100.

## 15.8 Address Administration

- 15.8.1 Configure the R3 VLAN36 interface and the FRS Ethernet interface with an IP address from the 11.1.1.0/24 subnetwork. Configure these new addresses without removing the currently configured IP addresses. Using a source IP address from the 11.1.1.0/24 subnet, ping R1 from both R3 and FRS. When performing these pings, do not let the packets originating from R3 and FRS reach R1 with the IP address 11.1.1.0/24.
- 15.8.2 Ping the FRS Ethernet interface belonging to 11.1.1.0/24 subnet using a pre-selected destination address extracted from the 22-bit subnet assigned to VLAN 36.

## 15.9 Network Monitoring

- 15.9.1 On R6, create loopback166 and leave it shutdown. If Loopback 106 goes down, the router should bring up Loopback 166 and attempt to email bob@netmasterclass.net. Use the following environmental variables. Set the domain name on R6 to netmasterclass.net.

Variable Name	Value
_email_server	160.20.101.2
_email_to	bob@netmasterclass.net
_email_from	candidate@netmasterclass.net
_email_cc	instructor@netmasterclass.net
_cron_entry	0-59/2 0-23/1 * * 0-7
_show_cmd	show event manager policy registered
_syslog_pattern	.*UPDOWN.*Loopback106
_config_cmd1	interface Loopback166
_config_cmd2	no shut

## 15.10 IPv6

15.10.1 Configure Link-local and Site-local IPv6 addresses in accordance with the IPv6 Diagram and the table below.

Router	Interface	Link-local IPv6 addresses	Site-local IPv6 address
R2	S1/0	FE80::252	FEC0:25::2/64
R5	S1/0	FE80::255	FEC0:25::5/64
R5	Loopback 105	Default	FEC0:105::1/64
R6	Loopback 250	Default	FEC0::250:1/124
R6	Loopback251	Default	FEC0::251:1/124
R6	Loopback 252	Default	FEC0::252:1/124

15.10.2 Configure IPv6 OSPF areas 6 and 25 as shown in the IPv6 diagram. Connect them via IPv6 area 0. You may add a single IPv6 network, as required. Do not change the default OSPF network types. Do not configure IPv6 addresses on the Frame Relay hub-and-spoke or on the VLAN16 interfaces.

15.10.3 Make sure that routers R2 and R5 see only a summary route representing the IPv6 loopback interfaces on R6.

15.10.4 All traffic that leaves R6 destined to IPv6 addresses should be tagged with DSCP value EF. Routers R2 and R5 should not see these DSCP values.

## 15.11 QOS

15.11.1 A Traffic Generator on VLAN10 is connected to port FastEthernet 0/24 of CAT1. It is generating 5 UDP packets per second. Packet size is 1024 Bytes. The UDP stream is destined to 160.20.10.1 port 5111. See the diagram.

15.11.2 Limit incoming UDP traffic destined to port 5111 to a rate of 8000 bit/sec on the interface Fa0/0 of router R1. Configure the minimal syntax values for burst size and extended burst size.

15.11.3 Drop excessive traffic.

## 15.12 Catalyst Specialties

15.12.1 Set port fa0/18 of CAT2 to bypass the learning and listening states of Spanning Tree

15.12.2 On CAT2, monitor both transmitted and received traffic on port fa0/19 from a SNIFFER attached on port fa0/20.

15.12.3 Configure the Catalyst so that learned MAC addresses in VLAN 40 are retained by the Catalyst for a period that is one and one half times as long as the default.

15.12.4 Send all Catalyst error messages to the syslog server at 160.20.1.150

The table displayed below lists and briefly describes the severity levels supported by system message logs:

Severity Level	Keyword	Description
0	emergencies	System unusable
1	alerts	Immediate action required
2	critical	Critical condition
3	errors	Error conditions
4	warning	Warning conditions
5	notifications	Normal but significant event
6	informational	Informational messages
7	debugging	Debugging messages

## 15.13 Multicast

15.13.1 Enable multicast routing between routers R1, R2, R3, R5 and R6. Enable a multicast routing protocol that will use any unicast routing protocol for source address determination and that is also based on a shared tree.

15.13.2 Make R1 the root of the shared tree. Do not use any dynamic methods to discover or advertise the root of the shared tree.

15.13.3 Configure R1, R2, R3, R5 and R6 to join the multicast group 227.7.7.7 only. Associate this multicast group with a loopback interface on each router.

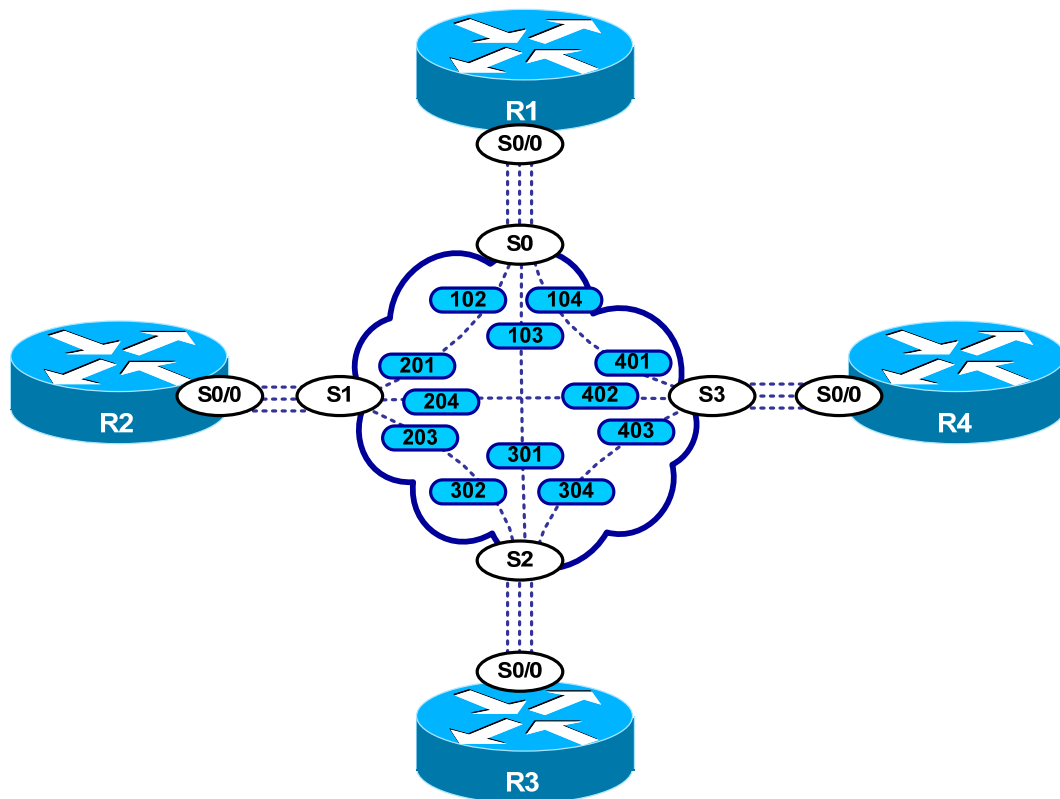
15.13.4 Ping the multicast group 227.7.7.7 from R4.

## 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 72000
  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
  clockrate 72000
  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
  clockrate 72000
  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
  no ip route-cache
  clockrate 72000
  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

### 15.1 Frame-Relay

No hint.

### 15.2 Catalyst Configuration

The 802.1Q trunking protocol implements the concept of a native VLAN.

### 15.3 OSPF

No hint.

### 15.4 RIP

No hint.

### 15.5 EIGRP

No hint.

### 15.6 Redistribution

Try summaries for RIP connectivity. Don't all prefixes that must be reachable fall into 160.20.0.0/16?

### 15.7 BGP

You can configure multiple route-reflectors within the same AS. Multiple route-reflectors can be configured in a manner that provides BGP update redundancy.

### 15.8 Address Administration

If you need to access a specific private address from an outside untrusted side, consider using an **ip nat inside source static** configuration.

### 15.9 Network Monitoring

Use the built-in script for the Embedded Event Manager (EEM).

### 15.10 IPv6

Configure a manual tunnel between R2 and R6. If OSPF neighbors refuse to come, **debug ipv6 ospf adjacency**. Check out the 12.2T features regarding marking across tunnels.



## 15.11 QOS

Traffic shaping buffers traffic that is out of profile. Traffic policing drops or marks traffic that is out of profile. You can deploy traffic policing with CAR or the Modular QOS CLI.

## 15.12 Catalyst Specialties

No hint.

## 15.13 Multicasting

Only PIM Sparse Mode constructs a shared tree. The root of the shared tree is the Rendezvous Point.