

Cisco 360 CCIE R&S Exercise Workbook Introduction

The Cisco 360 CCIE® R&S Exercise Workbook contains 20 challenging scenarios at the Cisco CCIE level that can be used for rigorous self-paced practice.

Each lab provides an extensive answer key, Mentor Guide support, and verification tables and is designed to maximize learning by providing practical experience. Also, self-paced learning resources such as the Cisco 360 CCIE R&S Reference Library and Cisco 360 CCIE R&S lessons supplement the Exercise Workbook scenarios.

Cisco 360 CCIE R&S

Exercise Workbook Lab 4

Troubleshooting Section

COPYRIGHT 2013, CISCO SYSTEMS, INC. ALL RIGHTS RESERVED. ALL CONTENT AND MATERIALS, INCLUDING WITHOUT LIMITATION, RECORDINGS, COURSE MATERIALS, HANDOUTS AND PRESENTATIONS AVAILABLE ON THIS PAGE, ARE PROTECTED BY COPYRIGHT LAWS. THESE MATERIALS ARE LICENSED EXCLUSIVELY TO REGISTERED STUDENTS FOR THEIR INDIVIDUAL PARTICIPATION IN THE SUBJECT COURSE. DOWNLOADING THESE MATERIALS SIGNIFIES YOUR AGREEMENT TO THE FOLLOWING: (1) YOU ARE PERMITTED TO PRINT THESE MATERIALS ONLY ONCE, AND OTHERWISE MAY NOT REPRODUCE THESE MATERIALS IN ANY FORM, OR BY ANY MEANS, WITHOUT PRIOR WRITTEN PERMISSION FROM CISCO; AND (2) YOU ARE NOT PERMITTED TO SAVE ON ANY SYSTEM, MODIFY, DISTRIBUTE, REBROADCAST, PUBLISH, TRANSMIT, SHARE OR CREATE DERIVATIVE WORKS OF ANY OF THESE MATERIALS. IF YOU ARE NOT A REGISTERED STUDENT THAT HAS ACCEPTED THESE AND OTHER TERMS OUTLINED IN THE STUDENT AGREEMENT OR OTHERWISE AUTHORIZED BY CISCO, YOU ARE NOT AUTHORIZED TO ACCESS THESE MATERIALS.

Table of Contents

Cisco 360 CCIE R&S Exercise Workbook Lab 4 Troubleshooting Section	2
Activity Objectives	4
General Lab Instructions	4
Difficulty Levels.....	5
Exercise Workbook Lab 4 Troubleshooting Section	6
Grading and Duration	6
Difficulty Level	6
Restrictions and Goals	6
1. Switched Network Troubleshooting Section (Total: 3 points)	11
1.1. Troubleshooting Ticket.....	11
1.2. Description of the Topology	11
1.3. Expected Behavior and Network Policies	12
1.4. Special Goals and Restrictions	12
2. IPv4 OSPF Troubleshooting Section (Total: 3 points)	12
2.1. Troubleshooting Ticket.....	12
2.2. Description of the Topology	13
2.3. Expected Behavior and Network Policies	13
2.4. Special Goals and Restrictions	13
3. EIGRP Troubleshooting Section (Total: 3 points)	13
3.1. Troubleshooting Ticket.....	13
3.2. Description of the Topology	13
3.3. Expected Behavior and Network Policies	13
3.4. Special Goals and Restrictions	13
4. IPv4 RIP Troubleshooting Section (Total: 3 points)	13
4.1. Troubleshooting Ticket.....	13
4.2. Description of the Topology	13
4.3. Expected Behavior and Network Policies	14
4.4. Special Goals and Restrictions	14
5. IPv4 Redistribution Troubleshooting Section (Total: 3 points)	14
5.1. Troubleshooting Ticket.....	14
5.2. Description of the Topology	14
5.3. Expected Behavior and Network Policies	14
5.4. Special Goals and Restrictions	14
6. BGP Troubleshooting Section (Total: 3 points)	14
6.1. Troubleshooting Ticket.....	14
6.2. Description of the Topology	14
6.3. Expected Behavior and Network Policies	15
6.4. Special Goals and Restrictions	15
7. IPv6 Troubleshooting Section (Total: 3 points)	15
7.1. Troubleshooting Ticket.....	15
7.2. Description of the Topology	15
7.3. Expected Behavior and Network Policies	15
7.4. Special Goals and Restrictions	15
8. Multicast Troubleshooting Section (Total: 3 points)	15
8.1. Troubleshooting Ticket.....	15
8.2. Description of the Topology	15
8.3. Expected Behavior and Network Policies	15
8.4. Special Goals and Restrictions	16

Activity Objectives

When performing any Practice Lab, it is recommended that you formulate a test-taking strategy that includes the following activities. Some of these activities should be conducted in the actual lab:

- Download the latest copy of a Practice Lab, then print it and read it carefully from beginning to end.
- Create a strategy for how to perform a Practice Lab.
- Draw diagrams if necessary.
- Create a checklist of general best practices to follow during the Practice Lab.
- Develop skill in finding issues in the lab so that you are able to uncover the hidden and complex internetworking issues.
- Carefully track your time so that you can develop good time-management techniques.
- Estimate the points that you have gained or lost to see where you are in your overall goal.

General Lab Instructions

Read the following instructions carefully. It is important to remember that if you misinterpret any directions, you could lose points. After you have read the “General Lab Instructions” section, read through the entire lab and look for connections between the tasks. Pay close attention to the “Restrictions and Goals” section because the information may reduce the configuration options that are available to you.

- Your pod should be cabled according to the example in the “Ethernet Switched Cabling Topology” figure, and the IPv4 and IPv6 IGP diagrams.
- Each router should have an initial IP configuration loaded.
- You should be able to access all devices on your learner virtual pod via Telnet.
- To begin, check the following base configuration for each router and switch:
 - Configure a hostname on each device.
 - If a DNS server is being used in your pod, disable the DNS lookups.
 - Familiarize yourself with any Cisco IOS Software shortcuts.
 - Remember that some Cisco IOS command parameters and regular expressions are case-sensitive.
- Verify the following information on each router and switch:
 - Determine the Cisco IOS Software versions that are being used for the routers and the virtual switches.
- Review all the tasks in the scenario.

Difficulty Levels

Tasks are categorized as follows:

- **Basic:** These fundamental tasks are generally those that are needed to provide the basic functions of the protocol or feature. You must complete these tasks to provide reachability and to move forward in the lab.
- **Intermediate:** These tasks include protocol features like routing optimization, route filtering, optimal path selection, load sharing, and summarization. Failure to complete these tasks will usually not affect later lab sections.
- **Advanced:** This category includes new Cisco IOS Software features and IP services, complex optimizations, and fine-tuning.

Scenarios are categorized as follows based on task classifications:

- Basic
- Basic to Intermediate
- Intermediate
- Intermediate to Advanced
- Advanced

Exercise Workbook Lab 4

Troubleshooting Section

Grading and Duration

- Troubleshooting lab duration: 2 hours
- Troubleshooting lab maximum score: 24 points

Note You can assess your progress on the self-paced labs in this workbook by adding up the points that are assigned to sections and tasks. Consider taking the full Assessment Labs to assess your readiness level.

Difficulty Level

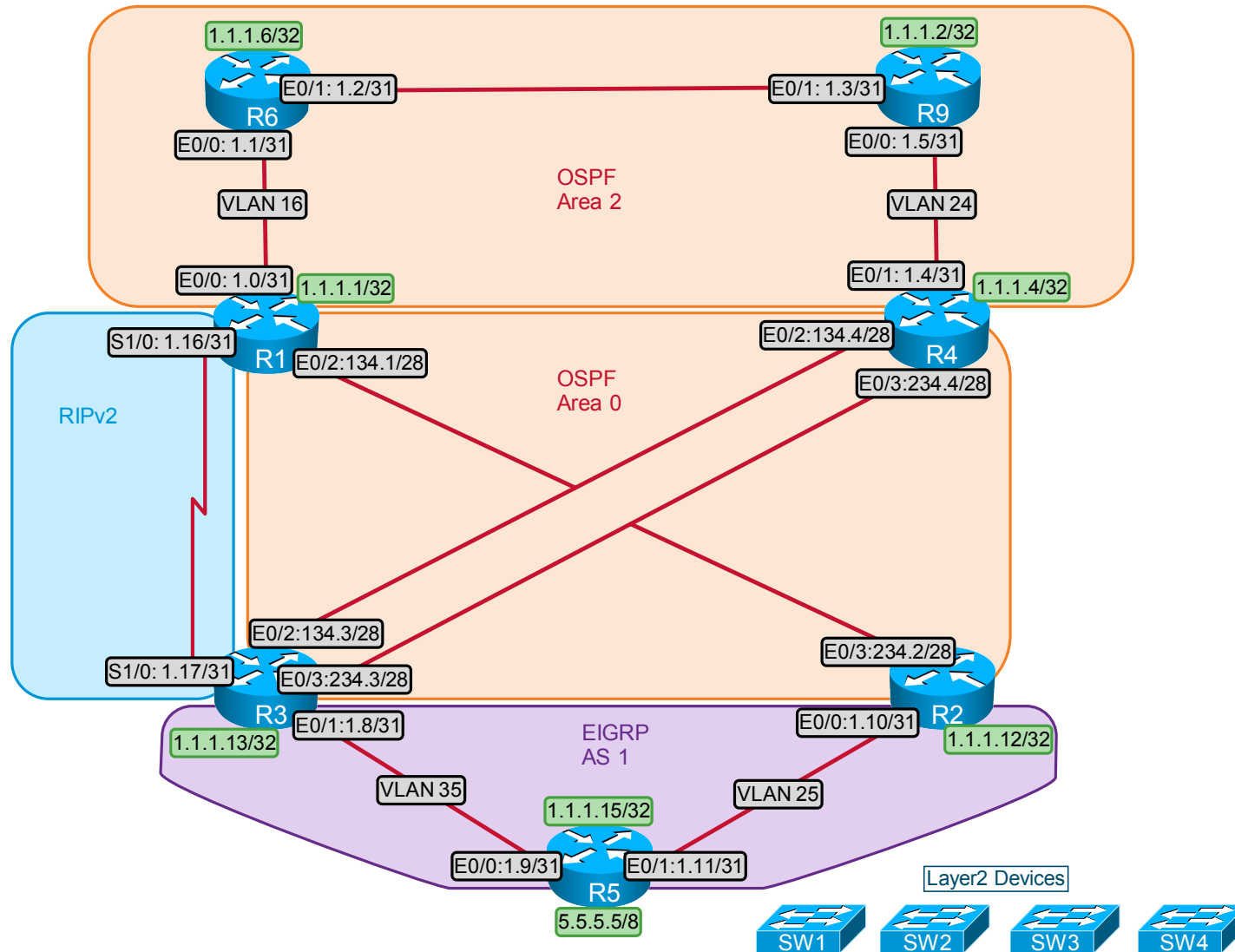
- Difficulty: Intermediate

Restrictions and Goals

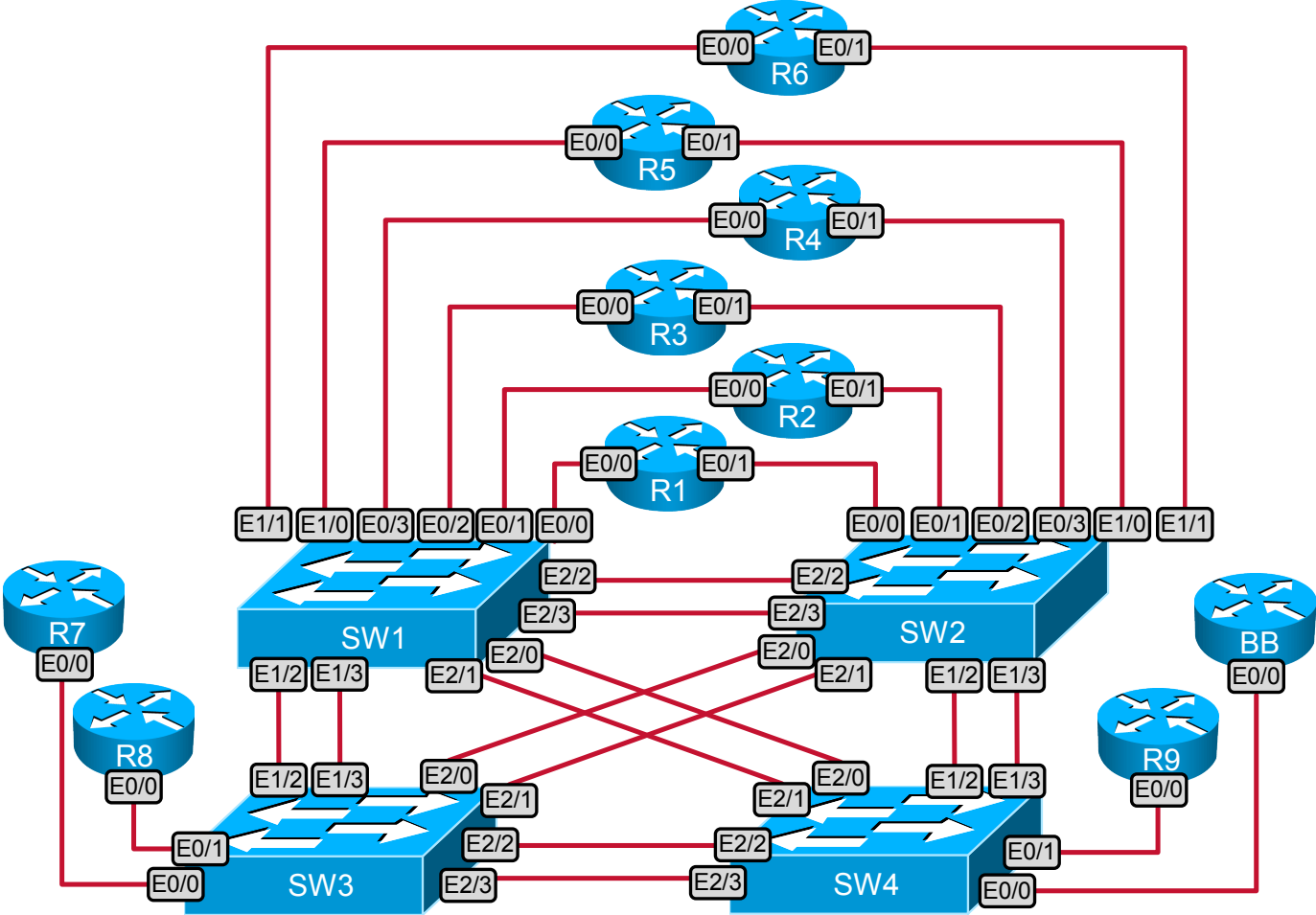
Note Read this section carefully.

- To receive any credit for a subsection, you must fully complete the subsection as per requirements. You will *not* receive partial credit for partially completed subsections.
- IPv4 subnets displayed in the IPv4 IGP diagram are /24 networks of 192.168.0.0, except as noted otherwise. *Points will be deducted from multiple sections for failing to assign correct IPv4 addresses.*
- Advertise loopback interfaces with their original masks.
- All IP addresses involved in this scenario must be reachable unless explicitly specified otherwise.
- Unless explicitly specified otherwise, addresses and networks that are advertised in the BGP section must be reachable by all BGP routers but do not have to be reachable by routers that use only IGP.
- Use conventional routing algorithms only, unless specified otherwise.
- Do not create new interfaces to fulfill IGP requirements, and do not summarize unless explicitly asked to do so.
- *Do not* modify the hostname, console, or vty configuration unless you are specifically asked to do so.
- *Do not* modify the initial interface or IP address numbering.

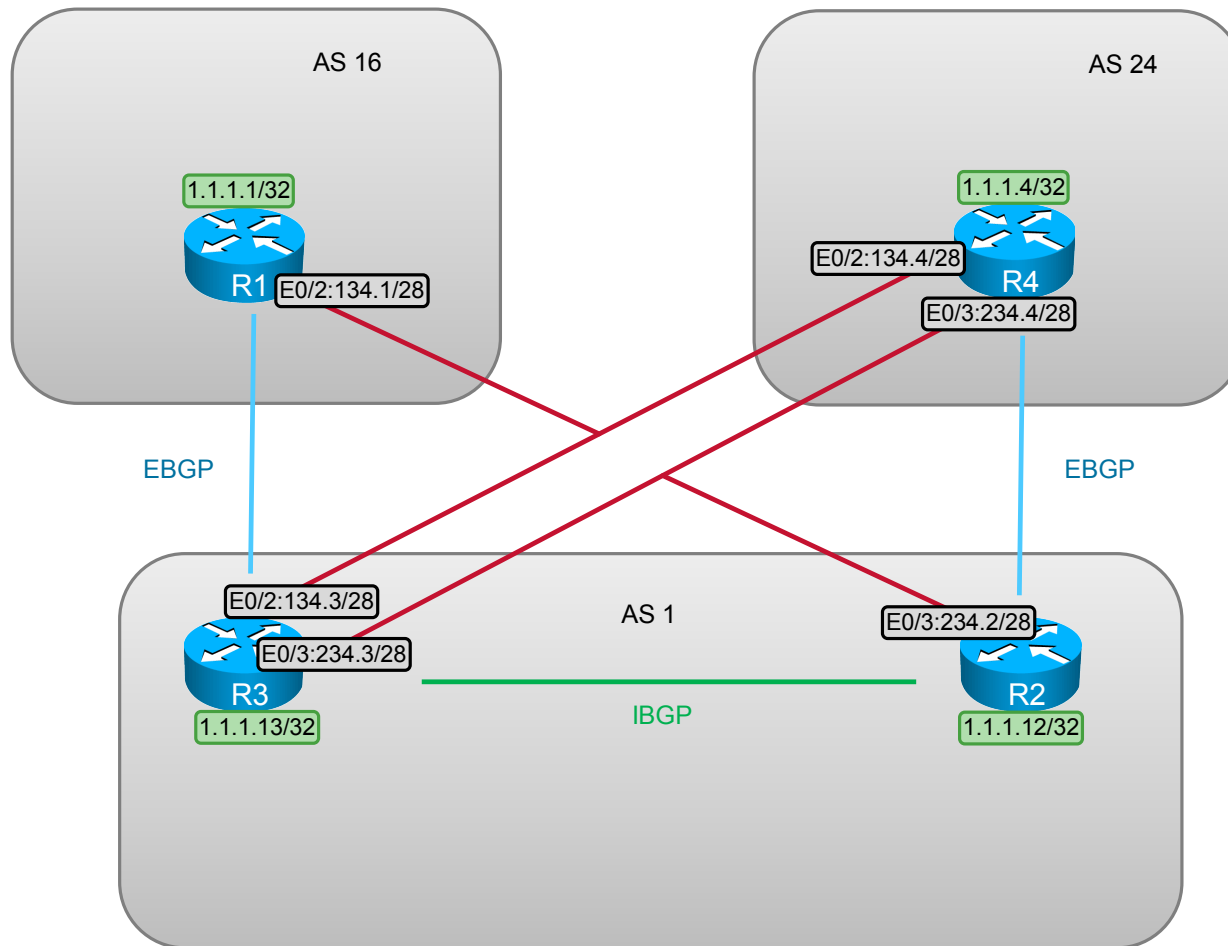
IPv4 IGP Diagram



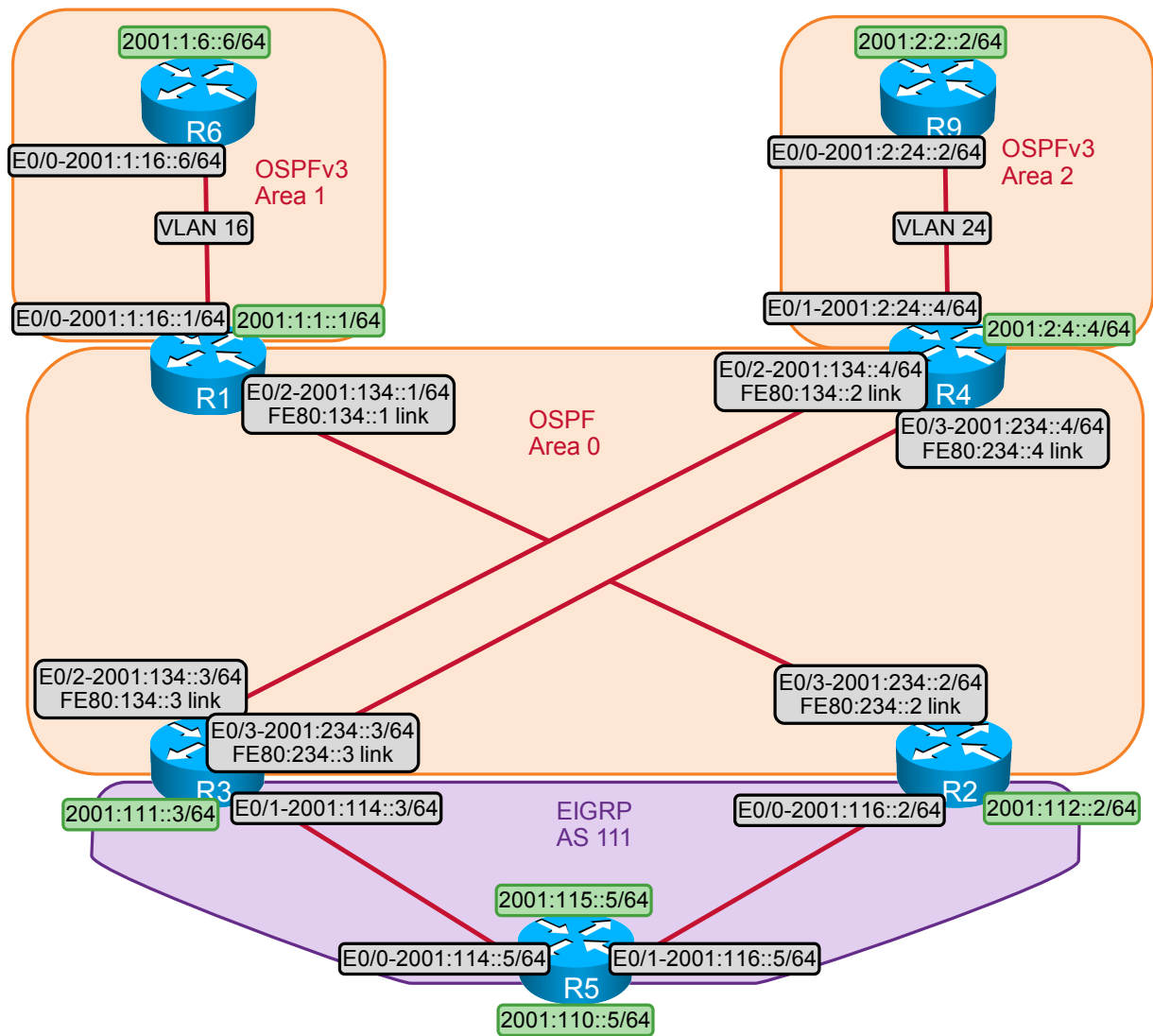
Ethernet Switched Cabling Topology



IPv4 BGP Diagram



IPv6 IGP Diagram



1. Switched Network Troubleshooting Section (Total: 3 points)

1.1. Troubleshooting Ticket

- Users reported that the switched network does not operate according to the requirements provided in the “Switched Network Troubleshooting” section. The distribution of the VLANs across the trunk links does not meet the scenario requirements. VLAN 25 traffic is not blocked on SW4.
- While resolving this ticket, refer to the “Description of the Topology,” the “Expected Behavior and Network Policies,” and the “Special Goals and Restrictions” subsections to determine if your solution is appropriate.

1.2. Description of the Topology

- The switched Ethernet topology for this lab consists of the VLANs that are listed in the IPv4 IGP diagram and the following table:

Switch	Router	VLAN
SW1	R1	VLAN 16
SW1	R2	VLAN 25
SW1	R5	VLAN 35
SW1	R6	VLAN 16
SW2	R3	VLAN 35
SW2	R4	VLAN 24
SW2	R5	VLAN 25
SW4	R9	VLAN 24

- Make sure that all VLANs are configured and that switch-to-router connections are configured as shown in the table above.
- Make sure that the following ports are in a shutdown state on the Catalyst switches specified in the table:

Switch	Port
SW1	1/3
	2/0
	2/1
	2/3
SW2	1/3
	2/0
	2/1
	2/3
SW3	1/3
	2/0
	2/1
	2/3
SW4	1/3
	2/0
	2/1
	2/3

- Configure switch-to-switch links as shown in the following table. Do not use the ISL trunking protocol.

Switch	Port	Switch	Port	Mode
SW1	2/2	SW2	2/2	Trunk
SW1	1/2	SW3	1/2	Access VLAN 25
SW2	1/2	SW4	1/2	Trunk
SW3	2/2	SW4	2/2	Access VLAN 25

1.3. Expected Behavior and Network Policies

- The trunk between SW1 and SW2 should permit only the required VLANs.
- All switches should be in VTP mode transparent.
- Spanning Tree Protocol should block VLAN 25 on SW4. You may change only bridge priorities to satisfy this requirement.

1.4. Special Goals and Restrictions

- Create only the necessary VLANs.

2. IPv4 OSPF Troubleshooting Section (Total: 3 points)

2.1. Troubleshooting Ticket

- Users reported that the OSPF routing domain does not operate according to the requirements provided in the “IPv4 OSPF Troubleshooting” section. R1 cannot communicate with the OSPF area 0 networks. OSPF area 2 network is broken.

- While resolving this ticket, refer to the “Description of the Topology,” the “Expected Behavior and Network Policies,” and the “Special Goals and Restrictions” subsections to determine if your solution is appropriate.

2.2. Description of the Topology

- Configure the two OSPF areas in the diagram.

2.3. Expected Behavior and Network Policies

- OSPF must provide stable reachability among all internal subnets and neighbors.

2.4. Special Goals and Restrictions

- OSPF should advertise IPv4 addresses 192.168.134.0/28 and 192.168.234.0/24 subnets as host routes.

3. EIGRP Troubleshooting Section (Total: 3 points)

3.1. Troubleshooting Ticket

- Users reported that the EIGRP routing domain does not operate according to the requirements provided in the “IPv4 EIGRP Troubleshooting” section. Neighbor relationships EIGRP AS 1 are broken.
- While resolving this ticket, refer to the “Description of the Topology,” the “Expected Behavior and Network Policies,” and the “Special Goals and Restrictions” subsections to determine if your solution is appropriate.

3.2. Description of the Topology

- As shown in the IPv4 IGP diagram, EIGRP AS 1 should operate over VLANs 25 and 35.
- As indicated in the IPv4 IGP diagram, the EIGRP routing domain possesses redundant paths for external routes learned within the domain.

3.3. Expected Behavior and Network Policies

- Because the EIGRP routing domain possesses redundant paths, make sure that all paths are used and that load balancing for external routes is maintained on R5.

3.4. Special Goals and Restrictions

- Redistribute the 5.0.0.0/8 network into EIGRP on R5. Do not autosummarize this route.

4. IPv4 RIP Troubleshooting Section (Total: 2 points)

4.1. Troubleshooting Ticket

- Users reported that the RIP routing domain does not operate according to the requirements provided in the “IPv4 RIP Troubleshooting” section. R1 does not learn any RIP routes.
- While resolving this ticket, refer to the “Description of the Topology,” the “Expected Behavior and Network Policies,” and the “Special Goals and Restrictions” subsections to determine if your solution is appropriate.

4.2. Description of the Topology

- RIPv2 operates between routers R1 and R3 on a Frame Relay link.

4.3. Expected Behavior and Network Policies

- Ensure that RIP routes are only advertised over the link connecting R1 and R3.

4.4. Special Goals and Restrictions

- RIP routes should only be used as a backup to the 192.168.134.0/28 and 192.168.234.0/28 subnets.
- RIP should not auto-summarize routes.

5. IPv4 Redistribution Troubleshooting Section (Total: 3 points)

5.1. Troubleshooting Ticket

- Users reported that the IPv4 IGP routing domain does not operate according to the requirements provided in the “IPv4 Redistribution Troubleshooting” section. R2 prefers 5.0.0.0/8 via OSPF. R1 cannot ping 5.5.5.5.
- While resolving this ticket, refer to the “Description of the Topology,” the “Expected Behavior and Network Policies,” and the “Special Goals and Restrictions” subsections to determine if your solution is appropriate.

5.2. Description of the Topology

- A set of route redistribution commands have been configured to provide universal connectivity among all routers in this scenario.
- All dynamic IPv4 routing protocols are mutually redistributed.
- R2 and R3 must use the fastest available path to the 5.0.0.0/8 network.

5.3. Expected Behavior and Network Policies

- Ensure that there is universal connectivity among all routers in all routing domains.
- Make sure that all external routes are stable in all routing domains.

5.4. Special Goals and Restrictions

- Do not configure any static or default routes to attain universal connectivity.

6. BGP Troubleshooting Section (Total: 3 points)

6.1. Troubleshooting Ticket

- Users reported that the IPv4 BGP routing domain does not operate according to the requirements provided in the “BGP Troubleshooting” section. R4 does not display 1.1.1.1/32 in its BGP table.
- While resolving this ticket, refer to the “Description of the Topology,” the “Expected Behavior and Network Policies,” and the “Special Goals and Restrictions” subsections to determine if your solution is appropriate.

6.2. Description of the Topology

- R1 is in AS 16. R2 and R3 are assigned to AS 1. R4 is assigned to AS 24. Using the existing loopback addresses in the 1.0.0.0/8 address space, R1 is peered with R3, R3 with R2, and R2 with R4.

6.3. Expected Behavior and Network Policies

- Make sure that the 1.1.1.1/32 subnet is in the routing tables of R2, R3, and R4 from a source other than BGP. Do not use a distance statement to accomplish this requirement.

- On R1, advertise loopback 101 into BGP using a network statement. This route must be marked as a best route in all BGP tables.

6.4. Special Goals and Restrictions

- Do not create any other BGP peer relationships.

7. IPv6 Troubleshooting Section (Total: 3 points)

7.1. Troubleshooting Ticket

- Users reported that the IPv6 routing domain does not operate according to the requirements provided in the “IPv6 Troubleshooting” section. OSPFv3 neighbor relationships are broken in the OSPFv3 Area 0.
- While resolving this ticket, refer to the “Description of the Topology,” the “Expected Behavior and Network Policies,” and the “Special Goals and Restrictions” subsections to determine if your solution is appropriate.

7.2. Description of the Topology

- IPv6 is configured according to the diagram.

7.3. Expected Behavior and Network Policies

- R1, R2, R3, and R4 should all be adjacent in area 0 over 2001:134::/64 and 2001:234::/64 subnets.
- Summarize the EIGRP AS 111 routes as they are redistributed into OSPF using the single best longest match.

7.4. Special Goals and Restrictions

- No DR should be elected in area 0.
- OSPFv3 packets must be exchanged via IPv6 unicast transmission in OSPFv3 area 0.

8. Multicast Troubleshooting Section (Total: 3 points)

8.1. Troubleshooting Ticket

- Users reported that multicast does not operate according to the requirements provided in the “Multicast Troubleshooting” section. R2 does not receive any multicast ping replies.
- While resolving this ticket, refer to the “Description of the Topology,” the “Expected Behavior and Network Policies,” and the “Special Goals and Restrictions” subsections to determine if your solution is appropriate.

8.2. Description of the Topology

- R6 IP address 1.1.1.6 is statically configured as a rendezvous point (RP).
- R1, R3, and R6 are configured with active multicast receivers that are attempting to join the 239.255.1.1 multicast group.

8.3. Expected Behavior and Network Policies

- Ping 239.255.1.1 from router R2 with a source address from the R2 E0/3 interface.
- Statically configure R6 as the RP on routers R1 and R3 and on R6 itself.
- Join loopbacks 101, 103, and 106 to group 239.255.1.1.

8.4. Special Goals and Restrictions

- PIM sparse mode must be configured only on the following interfaces:
R1: Loopback 101, Ethernet0/0, Ethernet0/2
R3: Loopback 103, Ethernet0/2, Ethernet0/3
R6: Loopback 106, Ethernet0/0