

# Cisco Expert-Level Training for CCIE Service Provider Exercise Workbook Configuration Lab 02

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The Cisco Expert-Level Training for CCIE Service Provider Workbook contains challenging scenarios at the CCIE level that can be used for rigorous self-paced practice.

Each lab provides an extensive answer key and Mentor Guide support that are designed to maximize learning by providing practical experience.

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## 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, and then read it carefully from the beginning to the 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. The time suggested for each section is only to give you an idea how much time you have in average per item in a real lab.
- Estimate the points that you have gained or lost to see where you are in your overall goal. Remember, there is not partial score, if you missed a little deal in a question, you do not get any points for this question, even you got 90% correct. You only gain points if you complete 100% the requirements of the question.

## General Lab Instructions

Read the following instructions carefully. It is important to remember that if you misinterpret any direction, you could lose points. After you have read the “General Lab Instructions” section, read through the entire lab carefully 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.

- Get access to the lab and create the topology and paste the STARTUP configuration that is provided with this workbook. The access to the lab is not provided with this workbook. You can rent physical equipment or use a simulator environment that support Cisco IOS, Cisco IOS-XE, and Cisco IOS-XR images.
- Depending on which devices you are using, the interface name and number might be different, ensure you update the interface name and numbering, before you paste the STARTUP configuration provided.
- In the lab, you should be able to access all devices via Telnet.
- Before you start your lab practice, check the following for each device:
  - Hostname is configured.
  - For Cisco IOS-XR devices the username and password for login is “cisco”.
  - Verify that all devices see the neighbor devices according to the topology provided. Use **show cdp neighbor** command for this verification.
- When you are ready to start your lab practice, review all the tasks in the given scenario and create a strategy that you will follow. Which questions you can work combine. Remember, you do not need to follow the order of the questions. Start with the ones you know best to ensure you get those points.

# 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. These tasks should require reduce time to get completed.
- **Intermediate:** These tasks include protocol features like network optimization, route filtering, etc. In order to complete these tasks might take more time and might also require a certain amount of configuration.
- **Advanced:** This category includes new Cisco Software features, complex optimizations, and fine-tuning. These tasks can take most of your time to get it completed, and might be something that is not common knowledge, which might require some research in order to complete the task.

# Exercise Workbook Lab 02

## Configuration Section

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### Grading and Duration

- Configuration lab duration: 150 minutes
- Configuration lab maximum score: 32 points

### Difficulty Level

- Difficulty level: Advanced

### Restrictions and Goals

- To receive credit for a subsection, you must fully complete the subsection as per the requirements. You will *not* receive partial credit for partially completed subsections.
- Do *not* use any static routes, unless it is explicitly mentioned in the task.
- In this configuration section, you are presented with preconfigured devices, IPv4 and IPv6 address are already configured and also the basic IGP and BGP configuration.
- You are *not* allowed to remove the solution presented and use a different solution, you must meet all the requirement presented in the task.
- Do *not* modify the hostname, console, and vty parameters unless you are specifically asked to do so.

# Topology

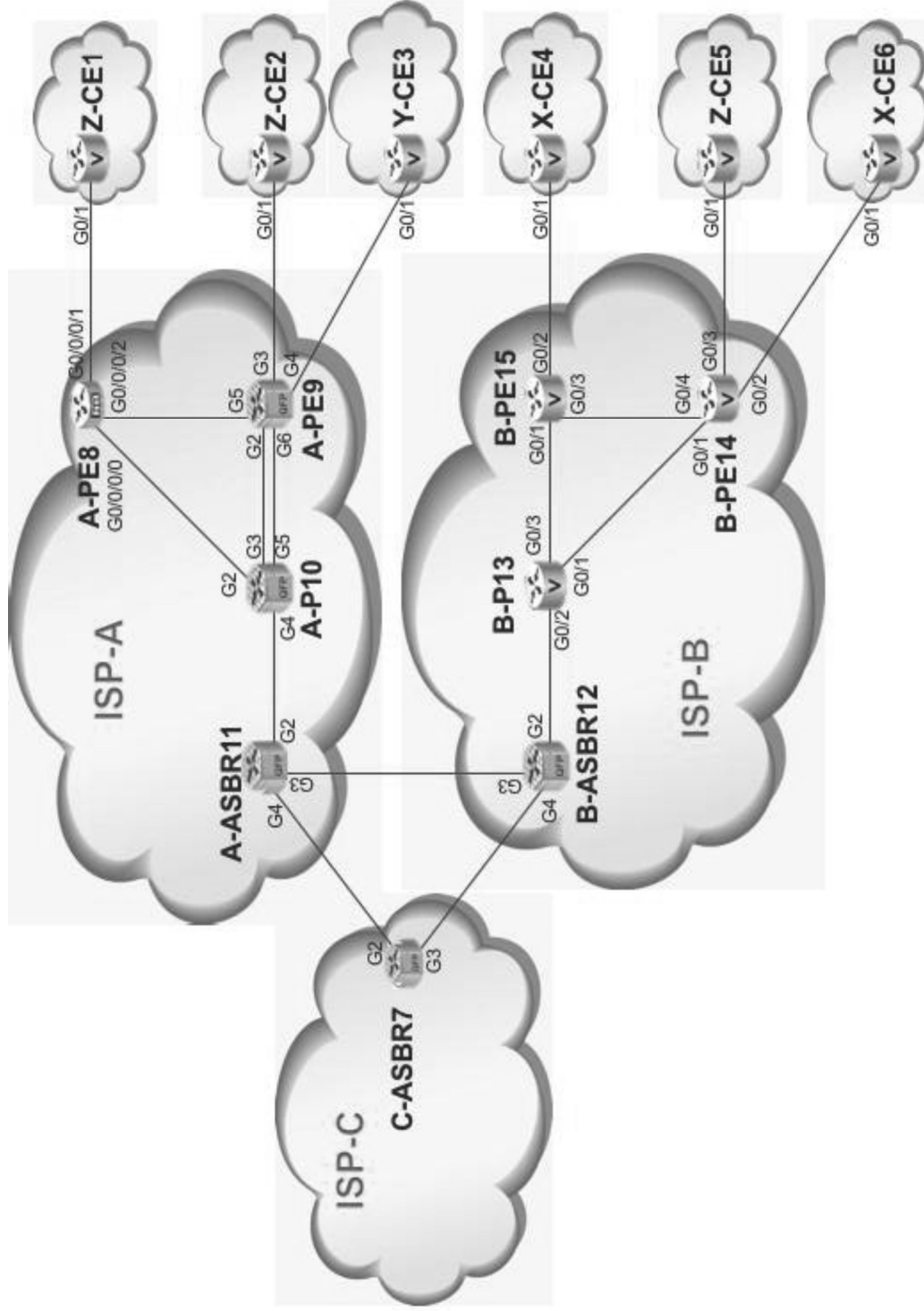


Figure 1 - Network Topology

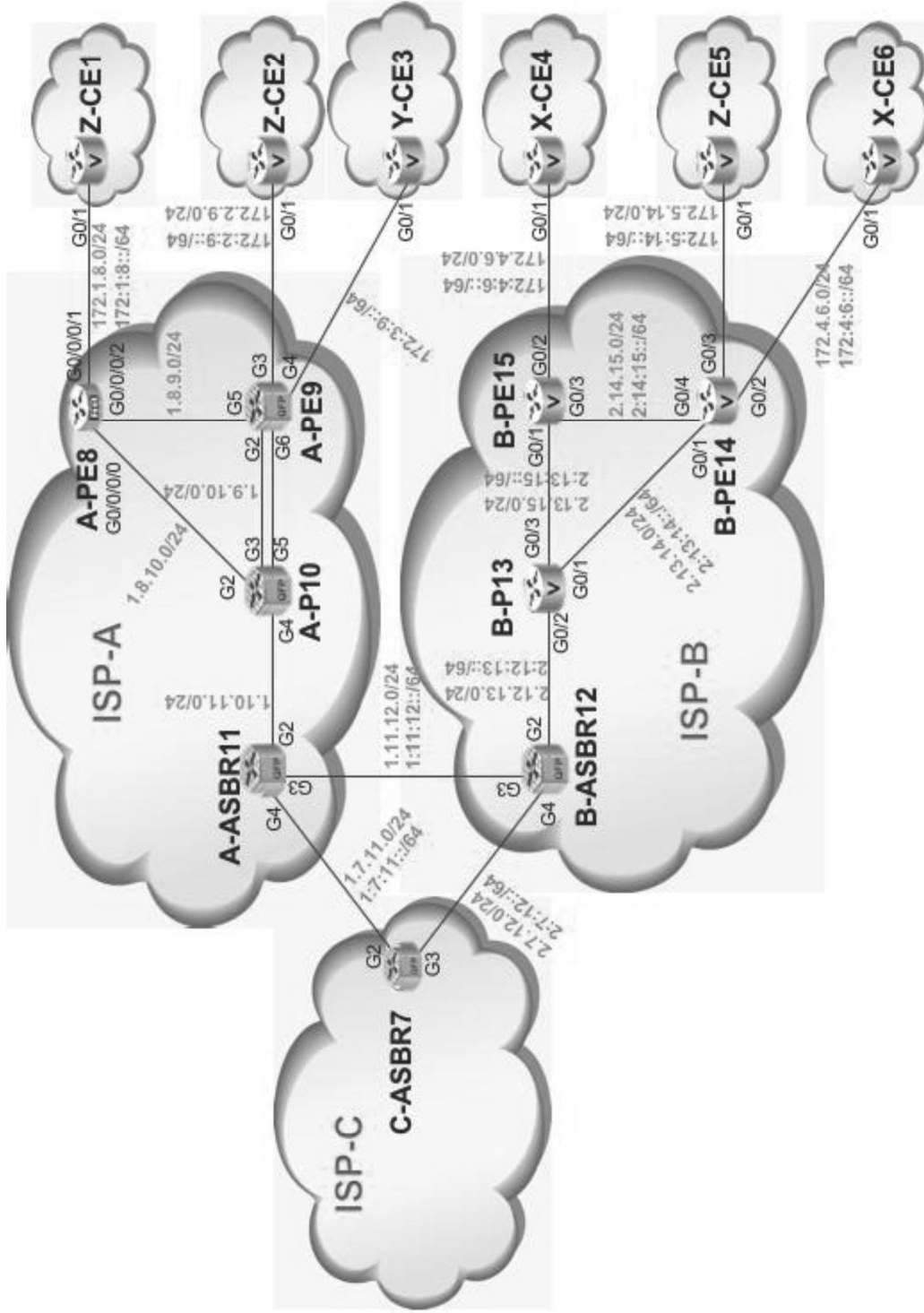


Figure 2 - IPv4 and IPv6 addressing

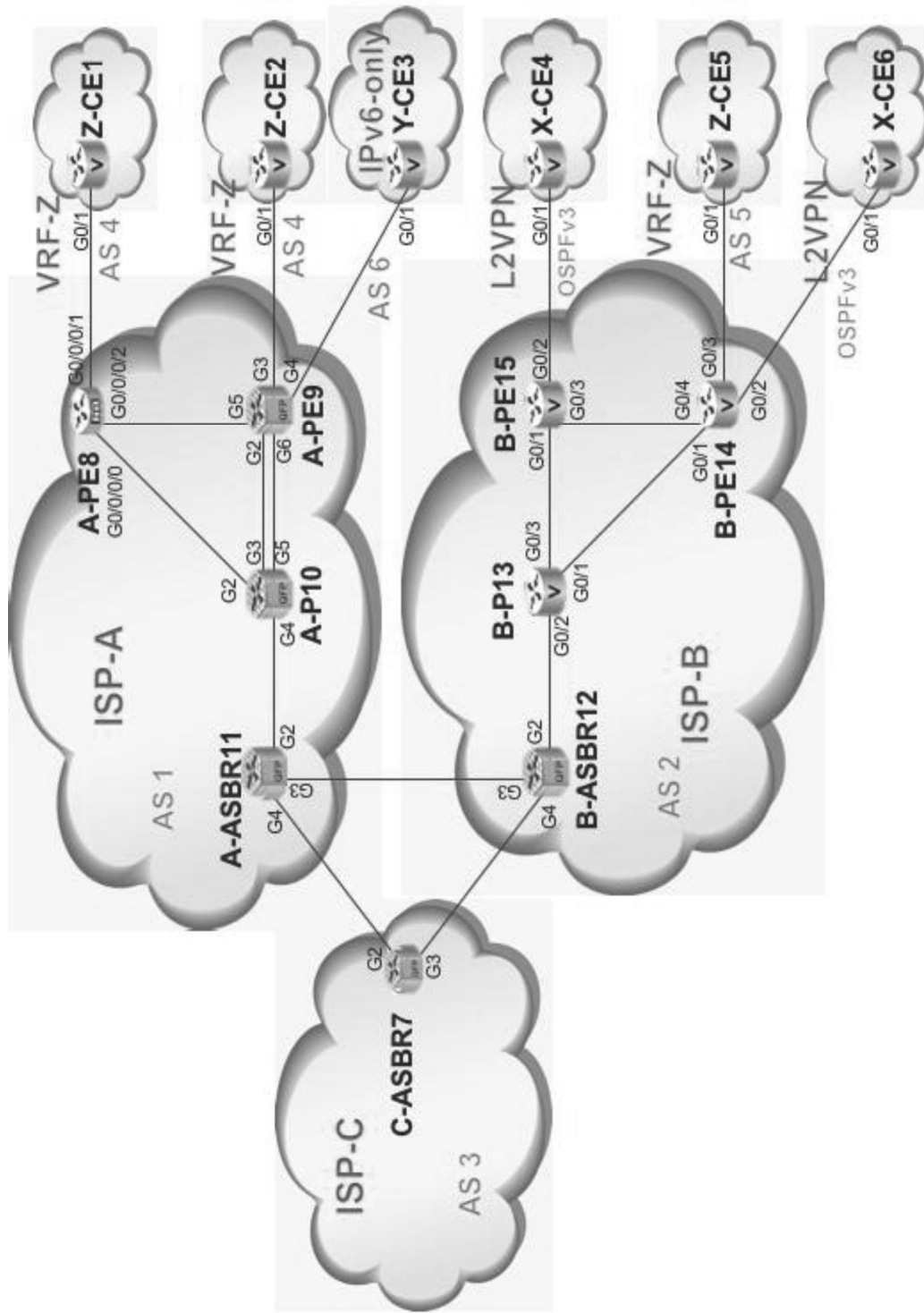


Figure 3 - PE-CE routing protocol, BGP, MPLS L2VPN, and MPLS L3VPN information

## Loopback Address

Router	Interface Number	VRF	IPv4 Address /32	IPv6 Address /128
A-PE8	Loopback0		8.8.8.8	n/a
A-PE9	Loopback0		9.9.9.9	n/a
A-P10	Loopback0		10.10.10.10	n/a
A-ASBR11	Loopback0		11.11.11.11	n/a
B-ASBR12	Loopback0		12.12.12.12	12::12
B-P13	Loopback0		13.13.13.13	13::13
B-PE14	Loopback0		14.14.14.14	14::14
B-PE15	Loopback0		15.15.15.15	15::15
B-PE15	Loopback15	VRF Z	172.15.15.15	172:15:15::15
C-ASBR7	Loopback0		17.17.17.17	17::15
Z-CE1	Loopback0		1.1.1.1	1::1
Z-CE2	Loopback0		2.2.2.2	2::2
Y-CE3	Loopback0		n/a	3::3
X-CE4	Loopback0		4.4.4.4	4::4
Z-CE5	Loopback0		5.5.5.5	5::5
X-CE6	Loopback0		6.6.6.6	6::6

Table 1 - Loopback IPv4 and IPv6 addresses

## DOMAIN 1: Core Routing

### 1. MPLS Traffic Engineering (Total: 3 points)

Configure an MPLS Traffic Engineering Tunnel on router A-PE8. To send traffic over this tunnel consider the following requirements:

- The Loopback 0 address of A-ASBR11 router is the MPLS TE tail-end.
- It must request 50 Mbps of bandwidth.
- It must use a dynamic path.

**Note:** You are *not* allowed to use a static route.

### 2. Multicast (Total: 4 points)

ISP-A must implement MVPN services. Configure the ISP-A devices to provision multicast for Customer Z with the following specifications:

- MPLS encapsulation must be used for both unicast and multicast traffic.
- The core tree must be MP2MP.
- PIM must be used to assign flows to the LSPs, but it should *not* be used inside of the ISP-A network core.
- BGP based auto-discovery is not required to discover the PEs members within the same MVPN.
- The Root of the Default MDT must be the Loopback address of PE9.
- The VPN ID is 200:1.
- Support is required for IPv4 multicast traffic only.
- Use a static RP 172.2.9.9 (the GigabitEthernet3 interface of router A-PE9).

### 3. Quality of Service (Total: 3 points)

Z-CE1 marks all its traffic with IP Precedence 3. Configure A-P10 to ensure that traffic originated from Z-CE1 towards ASBR11 has a guaranteed bandwidth of 5Mbps.

## DOMAIN 2: Service Provider Architecture and Services

### 1. L3VPN (Total: 4 points)

The Inter-AS link between ISP-A and ISP-B fails frequently. This causes a network outage for the Layer 3 VPN services that both ISPs offers. Configure ISP-A and ISP-B to use ISP-C as a transit when the direct link between ISP-A and ISP-B fails.

After you complete this task, for verification only, shutdown the link between ISP-A and ISP-B. Z-CE1 must be able to ping the Loopback 0 address of Z-CE5 and vice versa.

**Note:** Make sure after the verification you must **unshut** the link between ISP-A and ISP-B

### 2. Internet Service (Total: 3 points)

The Y-CE3 network is an IPv6 enabled network only and ISP-A is an IPv4 enabled network only. Y-CE3 must reach the Loopback 0 IPv6 address of C-ASBR7. Configure ISP-A to transport this traffic leveraging the MPLS core network.

**Note:** You are *not* allowed to enable IPv6 routing in the core of the ISP-A network.

## DOMAIN 3: Access and Aggregation

### 1. Transport and Encapsulation Technologies (Total: 3 points)

ISP-A must provision an extra link between PE9 and P10. Configure the two links between A-PE9 and A-P10 to functioning as a single Layer 3 link increasing redundancy and bandwidth.

**Note:** You are allowed to remove or modify any sub-set of the configuration applied on the interface.

### 2. PE-CE Connectivity (Total: 4 points)

Configure BGP as the PE-CE routing protocol between A-PE9 and Z-CE2 for both the IPv4 and IPv6 address-family.

After you complete this task Z-CE2 must be able to reach the Loopback 0 IPv4 and IPv6 addresses of Z-CE1.

**Note:** Use the information as described in the diagrams provided.

## **DOMAIN 4: High Availability and Fast Convergence**

### **1. System Level High Availability (Total: 2 points)**

ISP-B must avoid black-holed labeled traffic when a failed core link comes back up again. Configure all routers in the ISP-B network that meet this requirement.

### **2. Routing/Fast Convergence (Total: 3 points)**

Enable link protection for the MPLS TE tunnel configured on A-PE8.

## DOMAIN 5: Service Provider Security, Operation, and Management

### 1. Control Plane Security (Total: 2 points)

ISP-B must increase control plane security in their backbone. Enable MD5 for LDP message exchange on all routers of the ISP-B network.

### 2. Management Plane Security (Total: 2 points)

Increase management plane security on A-PE8 by allowing in-band TELNET and SSH via the GigabitEthernet 0/0/0/0 interface. No other management protocol should be allowed.

**Note:** You are *not* allowed to use an access-list.