Lab11.10.2 - Design and Implement a VLSM Addressing Scheme

# Topology



# Objectives

Part 1: Examine Network Requirements

Part 2: Design the VLSM Address Scheme

Part 3: Cable and Configure the IPv4 Network

# Background / Scenario

Variable Length Subnet Mask (VLSM) was designed to avoid wasting IP addresses. With VLSM, a network is subnetted and then re-subnetted. This process can be repeated multiple times to create subnets of various sizes based on the number of hosts required in each subnet. Effective use of VLSM requires address planning.

In this lab, use the provided network address to develop an address scheme for the network displayed in the topology diagram. VLSM is used to meet the IPv4 addressing requirements. After you have designed the VLSM address scheme, you will configure the interfaces on the routers with the appropriate IP address information. The future LANS at BR2 will need to have addresses allocated, but no interfaces will be configured at this time.

# Required Resources

* 2 Routers (Cisco 4221 with Cisco IOS XE Release 16.9.4 universal image or comparable)
* 2 Switches (Cisco 2960 with Cisco IOS Release 15.2(2) lanbasek9 image or comparable)
* 1 PCs (Windows with terminal emulation program, such as Tera Term)
* Console cables to configure the Cisco IOS devices via the console ports
* Ethernet and serial cables as shown in the topology
* Windows Calculator (optional)

# Instructions

* Enter your screenshots/answers below the items highlighted in blue and turn in the completed file without making any changes to the original content.
* Lab must be completed using actual equipment accessed remotely through NetLab or directly on campus. No credit will be awarded for labs submitted using Packet Tracer.
* Once the Lab is graded it cannot be resubmitted for a new grade.

## Examine Network Requirements

In Part 1, you will examine the network requirements to develop a VLSM address scheme for the network displayed in the topology diagram using the **192.168.33.128/25** network address.

### Determine how many host addresses and subnets are available.

#### Questions:

How many host addresses are available in a /25 network? (2 points) 2^7 = **128 host addresses (126 usable, because one is the network address and one is the broadcast address).**

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What is the total number of host addresses needed in the topology diagram? (2 points) **80 host addresses are needed (**

**40 for BR1 LAN,**

**25 for BR2 LAN, and smaller numbers for other subnets).**

How many subnets are needed in the network topology? (2 points) **6 subnets are needed (BR1 LAN, BR2 LAN, BR2 IoT LAN, BR2 CCTV LAN, BR2 HVAC C2LAN, BR1-BR2 Link).**

Type your answers here.

### Determine the largest subnet.

#### Questions:

What is the subnet description (e.g. BR1 LAN or BR1-BR2 link)? (1 point) **BR1 LAN.**

Type your answers here.

How many IP addresses are required in the largest subnet? (1 point) **40 IP addresses**

Type your answers here.

What subnet mask can support that many host addresses? (1 point) **/26**

Type your answers here.

How many total host addresses can that subnet mask support? (1 point) 2^6 = **64 total addresses (62 usable).**

Type your answers here.

Can you subnet the 192.168.33.128/25 network address to support this subnet? (1 point) **Yes**

Type your answers here.

What are the network addresses that would result from this subnetting? (1 point) **192.168.33.128/26**

Type your answers here.

Use the first network address for this subnet.

### Determine the second largest subnet.

#### Questions:

What is the subnet description? (1 point) **BR2 LAN.**

Type.

How many IP addresses are required for the second largest subnet? (1 point) **25 IP addresses**

Type your answers here.

What subnet mask can support that many host addresses? (1 point) **/27 (supports up to 30 usable host addresses).**

Type your answers here.

How many total host addresses can that subnet mask support? (1 point) **32 total addresses (30 usable)**

Type your answers here.

Can you subnet the remaining subnet again and still support this subnet? (1 point) **Yes**

Type your answers here.

What are the network addresses that would result from this subnetting? (1 point) **192.168.33.192/27 would be the second subnet, assuming sequential allocation after the first subnet.**

Type your answers here.

Use the first network address for this subnet.

### Determine the third largest subnet.

#### Questions:

What is the subnet description? (1 point) **BR2 IoT LAN.**

Type your answers here.

How many IP addresses are required for the next largest subnet? (1 point) **5 IP addresses**

What subnet mask can support that many host addresses? (1 point) **/29 (supports up to 6 usable host addresses).**

Type your answers here.

How many total host addresses can that subnet mask support? (1 point**) 8 total addresses (6 usable).**

Can you subnet the remaining subnet again and still support this subnet? (1 point) **Yes**

here.

What are the network addresses that would result from this subnetting? (1 point) **192.168.33.224/29**

Use the first network address for this subnet.

Use the second network address for the CCTV LAN. **192.168.33.232/29**

Use the third network address for the HVAC C2 LAN. **192.168.33.240/29**

### Determine the fourth largest subnet.

#### Questions:

What is the subnet description? (1 point) **BR2 CCTV LAN**

Type your answers here.

How many IP addresses are required for the next largest subnet(1 point) **4 IP addresses**

Type your answers here.

What subnet mask can support that many host addresses? (1 point) **/29**

Type your answers here.

How many total host addresses can that subnet mask support? (1 point) **8 total addresses (6 usable).**

Type your answers here.

Can you subnet the remaining subnet again and still support this subnet? (1 point) **Yes**

Type your answers here.

What are the network addresses that would result from this subnetting? (1 point) **192.168.33.232/29**

Type your answers here.

Use the first network address for this subnet. **192.168.33.233**

## Design the VLSM Address Scheme

### Calculate the subnet information.

Use the information that you obtained in Part 1 to fill in the following table. (30 points)

| Subnet Description | Number of Hosts Needed | Network Address /CIDR | First Host Address | Broadcast Address |
| --- | --- | --- | --- | --- |
| BR1 LAN | 40 | 192.168.33.128/26 | 192.168.33.129 | 192.168.33.191 |
| BR2 LAN | 25 | 192.168.33.192/27 | 192.168.33.193 | 192.168.33.223 |
| BR2 IoT LAN | 5 | 192.168.33.224/29 | 192.168.33.225 | 192.168.33.231 |
| BR2 CCTV LAN | 4 | 192.168.33.232/29 | 192.168.33.233 | 192.168.33.239 |
| BR2 HVAC C2LAN | 4 | 192.168.33.240/29 | 192.168.33.241 | 192.168.33.247 |
| BR1-BR2 Link | 2 | 192.168.33.248/30 | 192.168.33.249 | 192.168.33.251 |

### Complete the device interface address table. (20 points)

Assign the first host address in the subnet to the Ethernet interfaces. BR1 should be assigned the first host address in the BR1-BR2 Link.

| **Device** | **Interface** | **IP Address** | **Subnet Mask** | **Device Interface** |
| --- | --- | --- | --- | --- |
| BR1 | G0/0/0 | 192.168.33.249 | 255.255.255.252 | BR1-BR2 Link |
|  | G0/0/1 | 192.168.33.129 | 255.255.255.192 | 40 Host LAN |
| BR2 | G0/0/0 | 192.168.33.250 | 255.255.255.252 | BR1-BR2 Link |
|  | G0/0/1 | 192.168.33.193 | 255.255.255.224 | 25 Host LAN |

## Cable and Configure the IPv4 Network

In Part 3, you will cable the network to match the topology and configure the three routers using the VLSM address scheme that you developed in Part 2.

### Cable the network as shown in the topology. (Not required if using NetLab)

### Configure basic settings on each router.

Open a configuration window

* + - 1. Assign the device name to the routers.
      2. Disable DNS lookup to prevent the routers from attempting to translate incorrectly entered commands as though they were hostnames.
      3. Assign **class** as the privileged EXEC encrypted password for both routers.
      4. Assign **cisco** as the console password and enable login for the routers.
      5. Assign **cisco** as the VTY password and enable login for the routers.
      6. Encrypt the plaintext passwords for the routers.
      7. Create a banner that will warn anyone accessing the device that unauthorized access is prohibited on both routers.

### Configure the interfaces on each router.

* + - 1. Assign an IP address and subnet mask to each interface using the table that you completed in Part 2.
      2. Configure an interface description for each interface.
      3. Activate the interfaces.

### Save the configuration on all devices.

### Test Connectivity.

* + - 1. From BR1, ping BR2’s G0/0/0 interface. Provide a screenshot of the result. (10 points)
      2. From BR2, ping BR1’s G0/0/0 interface. Provide a screenshot of the result. (10 points)
      3. Troubleshoot connectivity issues if pings were not successful.

1. Close a configuration w

**Note:** Pings to the GigabitEthernet LAN interfaces on other routers will not be successful. A routing protocol needs to be in place for other devices to be aware of those subnets. The GigabitEthernet interfaces also need to be in an up/up state before a routing protocol can add the subnets to the routing table. The focus of this lab is on VLSM and configuring the interfaces.

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