

Packet Tracer - Designing and Implementing a VLSM Addressing Scheme (Instructor Version)

Instructor Note: Red font color or gray highlights indicate text that appears in the instructor copy only.

Topology

You will receive one of three possible topologies.

Addressing Table

| Device | Interface | IP Address | Subnet Mask | Default Gateway |
|-------------|-----------|-------------|-------------|-----------------|
| [[R1Name]] | G0/0 | [[R1G0Add]] | [[R1G0Sub]] | N/A |
| | G0/1 | [[R1G1Add]] | [[R1G1Sub]] | N/A |
| | S0/0/0 | [[R1S0Add]] | [[R1S0Sub]] | N/A |
| [[R2Name]] | G0/0 | [[R2G0Add]] | [[R2G0Sub]] | N/A |
| | G0/1 | [[R2G1Add]] | [[R2G1Sub]] | N/A |
| | S0/0/0 | [[R2S0Add]] | [[R2S0Sub]] | N/A |
| [[S1Name]] | VLAN 1 | [[S1Add]] | [[S1Sub]] | [[R1G0Add]] |
| [[S2Name]] | VLAN 1 | [[S2Add]] | [[S2Sub]] | [[R1G1Add]] |
| [[S3Name]] | VLAN 1 | [[S3Add]] | [[S3Sub]] | [[R2G0Add]] |
| [[S4Name]] | VLAN 1 | [[S4Add]] | [[S4Sub]] | [[R2G1Add]] |
| [[PC1Name]] | NIC | [[PC1Add]] | [[PC1Sub]] | [[R1G0Add]] |
| [[PC2Name]] | NIC | [[PC2Add]] | [[PC2Sub]] | [[R1G1Add]] |
| [[PC3Name]] | NIC | [[PC3Add]] | [[PC3Sub]] | [[R2G0Add]] |
| [[PC4Name]] | NIC | [[PC4Add]] | [[PC4Sub]] | [[R2G1Add]] |

Objectives

Part 1: Examine the Network Requirements

Part 2: Design the VLSM Addressing Scheme

Part 3: Assign IP Addresses to Devices and Verify Connectivity

Background

In this activity, you are given a /24 network address to use to design a VLSM addressing scheme. Based on a set of requirements, you will assign subnets and addressing, configure devices and verify connectivity.

Part 1: Examine the Network Requirements

Step 1: Determine the number of subnets needed.

You will subnet the network address [[DisplayNet]]. The network has the following requirements:

- **[[S1Name]]** LAN will require **[[HostReg1]]** host IP addresses
- **[[S2Name]]** LAN will require **[[HostReg2]]** host IP addresses
- **[[S3Name]]** LAN will require **[[HostReg3]]** host IP addresses
- **[[S4Name]]** LAN will require **[[HostReg4]]** host IP addresses

How many subnets are needed in the network topology? **5**

Step 2: Determine the subnet mask information for each subnet.

- a. Which subnet mask will accommodate the number of IP addresses required for **[[S1Name]]**?
How many usable host addresses will this subnet support?
- b. Which subnet mask will accommodate the number of IP addresses required for **[[S2Name]]**?
How many usable host addresses will this subnet support?
- c. Which subnet mask will accommodate the number of IP addresses required for **[[S3Name]]**?
How many usable host addresses will this subnet support?
- d. Which subnet mask will accommodate the number of IP addresses required for **[[S4Name]]**?
How many usable host addresses will this subnet support?
- e. Which subnet mask will accommodate the number of IP addresses required for the connection between **[[R1Name]]** and **[[R2Name]]**?

Part 2: Design the VLSM Addressing Scheme

Step 1: Divide the **[[DisplayNet]]** network based on the number of hosts per subnet.

- a. Use the first subnet to accommodate the largest LAN.
- b. Use the second subnet to accommodate the second largest LAN.
- c. Use the third subnet to accommodate the third largest LAN.
- d. Use the fourth subnet to accommodate the fourth largest LAN.
- e. Use the fifth subnet to accommodate the connection between **[[R1Name]]** and **[[R2Name]]**.

Step 2: Document the VLSM subnets.

Complete the **Subnet Table**, listing the subnet descriptions (e.g. **[[S1Name]]** LAN), number of hosts needed, then network address for the subnet, the first usable host address, and the broadcast address. Repeat until all addresses are listed.

Subnet Table

Note: The correct answers for this table are variable depending on the scenario received. Refer to the Instructor Notes at the end of these instructions for further information. The format here follows what the student used in **Designing and Implementing a VLSM Addressing Scheme**.

| Subnet Description | Number of Hosts Needed | Network Address/CIDR | First Usable Host Address | Broadcast Address |
|--------------------|------------------------|----------------------|---------------------------|-------------------|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

Step 3: Document the addressing scheme.

- a. Assign the first usable IP addresses to **[[R1Name]]** for the two LAN links and the WAN link.
- b. Assign the first usable IP addresses to **[[R2Name]]** for the two LANs links. Assign the last usable IP address for the WAN link.
- c. Assign the second usable IP addresses to the switches.
- d. Assign the last usable IP addresses to the hosts.

Part 3: Assign IP Addresses to Devices and Verify Connectivity

Most of the IP addressing is already configured on this network. Implement the following steps to complete the addressing configuration.

Step 1: Configure IP addressing on **[[R1Name]] LAN interfaces.**

Step 2: Configure IP addressing on **[[S3Name]], including the default gateway.**

Step 3: Configure IP addressing on **[[PC4Name]], including the default gateway.**

Step 4: Verify connectivity.

You can only verify connectivity from **[[R1Name]]**, **[[S3Name]]**, and **[[PC4Name]]**. However, you should be able to ping every IP address listed in the **Addressing Table**.

Suggested Scoring Rubric

Note: The majority of points are allocated to designing and documenting the addressing scheme. Implementation of the addresses in Packet Tracer is of minimal consideration.

| Activity Section | Question Location | Possible Points | Earned Points |
|---|-------------------|-----------------|---------------|
| Part 1: Examine the Network Requirements | Step 1 | 1 | |
| | Step 2 | 4 | |
| Part 1 Total | | 5 | |
| Part 2: Design the VLSM Addressing Scheme | | | |
| Complete Subnet Table | | 25 | |
| Document Addressing | | 40 | |
| Part 2 Total | | 65 | |
| Packet Tracer Score | | 30 | |
| Total Score | | 100 | |

ID: [[indexAdds]][[indexNames]][[indexTopos]]

Instructor Notes:

The following addressing tables represent the three possible addressing scenarios the student may get. Note that the Device column is independent of the addressing scheme. For example, a student could receive the device names from Scenario 1 and the addressing scheme from Scenario 3. In addition, the three possible topologies are also independent of the device names and the addressing scheme (click reset in the activity to see the different topologies). Therefore, this activity uses three independent variables with three possible values each for a total of 27 possible combinations (3 device names x 3 addressing schemes x 3 topologies = 27 isomorphs).

Scenario 1 - Network Address: 10.11.48.0/24

Subnet Table

| Subnet Description | Number of Hosts Needed | Network Address/CIDR | First Usable Host Address | Last Usable Host Address | Broadcast Address |
|--------------------|------------------------|----------------------|---------------------------|--------------------------|-------------------|
| Host-D LAN | 60 | 10.11.48.0/26 | 10.11.48.1 | 10.11.48.62 | 10.11.48.63 |
| Host-B LAN | 30 | 10.11.48.64/27 | 10.11.48.65 | 10.11.48.94 | 10.11.48.95 |
| Host-A LAN | 14 | 10.11.48.96/28 | 10.11.48.97 | 10.11.48.110 | 10.11.48.111 |
| Host-C LAN | 6 | 10.11.48.112/29 | 10.11.48.113 | 10.11.48.118 | 10.11.48.119 |
| WAN Link | 2 | 10.11.48.120/30 | 10.11.48.121 | 10.11.48.122 | 10.11.48.123 |

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| Device | Interface | Address | Subnet Mask | Default Gateway |
|-----------|-----------|--------------|-----------------|-----------------|
| Building1 | G0/0 | 10.11.48.97 | 255.255.255.240 | N/A |
| | G0/1 | 10.11.48.65 | 255.255.255.224 | N/A |
| | S0/0/0 | 10.11.48.121 | 255.255.255.252 | N/A |
| Building2 | G0/0 | 10.11.48.113 | 255.255.255.248 | N/A |
| | G0/1 | 10.11.48.1 | 255.255.255.192 | N/A |
| | S0/0/0 | 10.11.48.122 | 255.255.255.252 | N/A |
| ASW1 | VLAN 1 | 10.11.48.98 | 255.255.255.240 | 10.11.48.97 |
| ASW2 | VLAN 1 | 10.11.48.66 | 255.255.255.224 | 10.11.48.65 |
| ASW3 | VLAN 1 | 10.11.48.114 | 255.255.255.248 | 10.11.48.113 |
| ASW4 | VLAN 1 | 10.11.48.2 | 255.255.255.192 | 10.11.48.1 |
| Host-A | NIC | 10.11.48.110 | 255.255.255.240 | 10.11.48.97 |
| Host-B | NIC | 10.11.48.94 | 255.255.255.224 | 10.11.48.65 |
| Host-C | NIC | 10.11.48.118 | 255.255.255.248 | 10.11.48.113 |
| Host-D | NIC | 10.11.48.62 | 255.255.255.192 | 10.11.48.1 |

Building 1

```
en
conf t
int g0/0
ip add 10.11.48.97 255.255.255.240
no shut
int g0/1
ip add 10.11.48.65 255.255.255.224
no shut
```

ASW3

```
en
conf t
int vlan 1
ip add 10.11.48.114 255.255.255.248
no shut
ip def 10.11.48.113
```

Scenario 2 - Network Address: 172.31.103.0/24

Subnet Table

| Subnet Description | Number of Hosts Needed | Network Address/CIDR | First Usable Host Address | Last Usable Host Address | Broadcast Address |
|--------------------|------------------------|----------------------|---------------------------|--------------------------|-------------------|
| PC-A LAN | 27 | 172.31.103.0/27 | 172.31.103.1 | 172.31.103.30 | 172.31.103.31 |
| PC-B LAN | 25 | 172.31.103.32/27 | 172.31.103.33 | 172.31.103.62 | 172.31.103.63 |
| PC-C LAN | 14 | 172.31.103.64/28 | 172.31.103.65 | 172.31.103.78 | 172.31.103.79 |
| PC-D LAN | 8 | 172.31.103.80/28 | 172.31.103.81 | 172.31.103.94 | 172.31.103.95 |
| WAN Link | 2 | 172.31.103.96/30 | 172.31.103.97 | 172.31.103.98 | 172.31.103.99 |

| Device | Interface | Address | Subnet Mask | Default Gateway |
|----------|-----------|---------------|-----------------|-----------------|
| Branch1 | G0/0 | 172.31.103.1 | 255.255.255.224 | N/A |
| | G0/1 | 172.31.103.33 | 255.255.255.224 | N/A |
| | S0/0/0 | 172.31.103.97 | 255.255.255.252 | N/A |
| Branch2 | G0/0 | 172.31.103.65 | 255.255.255.240 | N/A |
| | G0/1 | 172.31.103.81 | 255.255.255.240 | N/A |
| | S0/0/0 | 172.31.103.98 | 255.255.255.252 | N/A |
| Room-114 | VLAN 1 | 172.31.103.2 | 255.255.255.224 | 172.31.103.1 |
| Room-279 | VLAN 1 | 172.31.103.34 | 255.255.255.224 | 172.31.103.33 |
| Room-312 | VLAN 1 | 172.31.103.66 | 255.255.255.240 | 172.31.103.65 |
| Room-407 | VLAN 1 | 172.31.103.82 | 255.255.255.240 | 172.31.103.81 |
| PC-A | NIC | 172.31.103.30 | 255.255.255.224 | 172.31.103.1 |
| PC-B | NIC | 172.31.103.62 | 255.255.255.224 | 172.31.103.33 |
| PC-C | NIC | 172.31.103.78 | 255.255.255.240 | 172.31.103.65 |
| PC-D | NIC | 172.31.103.94 | 255.255.255.240 | 172.31.103.81 |

Branch 1

```

en
conf t
int g0/0
ip add 172.31.103.1 255.255.255.224
no shut
int g0/1
    
```

```
ip add 172.31.103.33 255.255.255.224  
no shut
```

Room-312

```
en  
conf t  
int vlan 1  
ip add 172.31.103.66 255.255.255.240  
no shut  
ip def 172.31.103.65
```

Scenario 3 - Network Address: 192.168.72.0/24

Subnet Table

| Subnet Description | Number of Hosts Needed | Network Address/CIDR | First Usable Host Address | Last Usable Host Address | Broadcast Address |
|--------------------|------------------------|----------------------|---------------------------|--------------------------|-------------------|
| User-4 LAN | 58 | 192.168.72.0/26 | 192.168.72.1 | 192.168.72.62 | 192.168.72.63 |
| User-3 LAN | 29 | 192.168.72.64/27 | 192.168.72.65 | 192.168.72.94 | 192.168.72.95 |
| User-2 LAN | 15 | 192.168.72.96/27 | 192.168.72.97 | 192.168.72.126 | 192.168.72.127 |
| User-1 LAN | 7 | 192.168.72.128/28 | 192.168.72.129 | 192.168.72.142 | 192.168.72.143 |
| WAN Link | 2 | 192.168.72.144/30 | 192.168.72.145 | 192.168.72.146 | 192.168.72.147 |

| Device | Interface | Address | Subnet Mask | Default Gateway |
|--------------|-----------|----------------|-----------------|-----------------|
| Remote-Site1 | G0/0 | 192.168.72.129 | 255.255.255.240 | N/A |
| | G0/1 | 192.168.72.97 | 255.255.255.224 | N/A |
| | S0/0/0 | 192.168.72.145 | 255.255.255.252 | N/A |
| Remote-Site2 | G0/0 | 192.168.72.65 | 255.255.255.224 | N/A |
| | G0/1 | 192.168.72.1 | 255.255.255.192 | N/A |
| | S0/0/0 | 192.168.72.146 | 255.255.255.252 | N/A |
| Sw1 | VLAN 1 | 192.168.72.130 | 255.255.255.240 | 192.168.72.129 |
| Sw2 | VLAN 1 | 192.168.72.98 | 255.255.255.224 | 192.168.72.97 |
| Sw3 | VLAN 1 | 192.168.72.66 | 255.255.255.224 | 192.168.72.65 |
| Sw4 | VLAN 1 | 192.168.72.2 | 255.255.255.192 | 192.168.72.1 |
| User-1 | NIC | 192.168.72.142 | 255.255.255.240 | 192.168.72.129 |
| User-2 | NIC | 192.168.72.126 | 255.255.255.224 | 192.168.72.97 |
| User-3 | NIC | 192.168.72.94 | 255.255.255.224 | 192.168.72.65 |
| User-4 | NIC | 192.168.72.62 | 255.255.255.192 | 192.168.72.1 |

Remote-Site1

```

en
conf t
int g0/0
ip add 192.168.72.129 255.255.255.240
no shut
int g0/1
    
```



```
ip add 192.168.72.97 255.255.255.224  
no shut
```

Sw-3

```
en  
conf t  
int vlan 1  
ip add 192.168.72.66 255.255.255.224  
no shut  
ip def 192.168.72.65
```