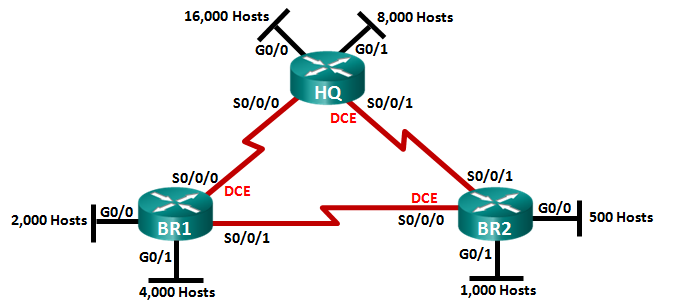
Lab 8.2.1.5 Designing and Implementing a VLSM Addressing Scheme

1. Topology



1. Objectives

Part 1: Examine Network Requirements

Part 2: Design the VLSM Address Scheme

1. 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 **172.16.128.0/17** network address to develop an address scheme for the network displayed in the topology diagram. VLSM is used to meet the IPv4 addressing requirements.

1. 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 **172.16.128.0/17** network address.

* 1. Determine how many host addresses and subnets are available.

How many host addresses are available in a **/17** network? 2 a la 15 – 2 = 32766\_\_\_\_\_\_\_\_

What is the total number of host addresses needed in the topology diagram? 31506\_\_\_\_\_\_\_\_

How many subnets are needed in the network topology? \_9\_\_\_\_\_

* 1. Determine the largest subnet.

|  |  |
| --- | --- |
| Subnet description | **HQ G0/0** |
| Number of Hosts Needed | **16000** |
| IP mask (decimal) / Slash notation | **255.255.1000 0000.0000 0000**  **255.255.1100 0000.0000 0000**  **255.255.192.0 /18**  **2 a la 14 -2 = 16 382**  **256 – 192 = 64** |
| Number of bits in the subnet | **1** |
| Maximum Number of usable hosts per subnet | **2 a la 14 -2 = 16 382** |
| Write the two network addresses that would result from this subnetting.  *Use the first network address for this subnet.* | **172.16.128.0**  **172.16.192.0** |
| IP Subnet | **172.16.128.0** |
| First IP Host address | **172.16.128.1** |
| Last IP Host address | **172.16.191.254** |
| IP Broadcast | **172.16.128+63.255**  **172.16.191.255** |

* 1. Determine the second largest subnet.

|  |  |
| --- | --- |
| Subnet description | **HQ G0/1** |
| Number of Hosts Needed | **8000** |
| IP mask (decimal) / Slash notation | **255.255.1000 0000.0000 0000**  **255.255.1110 0000.0000 0000**  **255.255.224.0 /19**  **2 a la 13 -2 = 8190**  **256 – 224 = 32** |
| Number of bits in the subnet | **2** |
| Maximum Number of usable hosts per subnet | **2 a la 13 -2 = 8190** |
| Write the two network addresses that would result from this subnetting.  *Use the first network address for this subnet.* | **172.16.192.0**  **172.16.192+32.0**  **172.16.224.0** |
| IP Subnet | **172.16.192.0** |
| First IP Host address | **172.16.192.1** |
| Last IP Host address | **172.16.223.254** |
| IP Broadcast | **172.16.223.255**  **172.16.192+31.255** |

* 1. Determine the next largest subnet.

|  |  |
| --- | --- |
| Subnet description | **Branch1 G0/1** |
| Number of Hosts Needed | **4000** |
| IP mask (decimal) / Slash notation | **255.255.1000 0000.0000 0000**  **255.255.1111 0000.0000 0000**  **255.255.240.0 /20**  **2 a la 12 -2 = 4094**  **256 – 240 = 16** |
| Number of bits in the subnet | **3** |
| Maximum Number of usable hosts per subnet | **2 a la 12 -2 = 4094** |
| Write the two network addresses that would result from this subnetting.  *Use the first network address for this subnet.* | **172.16.224.0**  **172.16.240.0**  **172.16.224+16.0** |
| IP Subnet | **172.16.224.0** |
| First IP Host address | **172.16.224.1** |
| Last IP Host address | **172.16.239.254** |
| IP Broadcast | **172.16.239.255**  **172.16.224+15.255** |

* 1. Determine the next largest subnet.

|  |  |
| --- | --- |
| Subnet description | **Branch 1 G0/0** |
| Number of Hosts Needed | **2000** |
| IP mask (decimal) / Slash notation | **255.255.1000 0000.0000 0000**  **255.255.1111 1000.0000 0000**  **255.255.248.0 /21**  **2 a la 11 -2 = 2046**  **256 – 248 = 8** |
| Number of bits in the subnet | **4** |
| Maximum Number of usable hosts per subnet | **2 a la 11 -2 = 2046** |
| Write the two network addresses that would result from this subnetting.  *Use the first network address for this subnet.* | **172.16.240.0**  **172.16.248.0**  **172.16.240+8.0** |
| IP Subnet | **172.16.240.0** |
| First IP Host address | **172.16.240.1** |
| Last IP Host address | **172.16.247.254** |
| IP Broadcast | **172.16.247.255**  **172.16.240+7.255** |

* 1. Determine the next largest subnet.

|  |  |
| --- | --- |
| Subnet description | **Branch 2 G0/1** |
| Number of Hosts Needed | **1000** |
| IP mask (decimal) / Slash notation | **255.255.1000 0000.0000 0000**  **255.255.1111 1100.0000 0000**  **255.255.252.0 /22**  **2 a la 10 -2 = 1022**  **256 – 252 = 4** |
| Number of bits in the subnet | **5** |
| Maximum Number of usable hosts per subnet | **2 a la 10 -2 = 1022** |
| Write the two network addresses that would result from this subnetting.  *Use the first network address for this subnet.* | **172.16.248.0**  **172.16.252.0**  **172.16.248+4.0** |
| IP Subnet | **172.16.248.0** |
| First IP Host address | **172.16.248.1** |
| Last IP Host address | **172.16.251.254** |
| IP Broadcast | **172.16.251.255**  **172.16.248+3.255** |

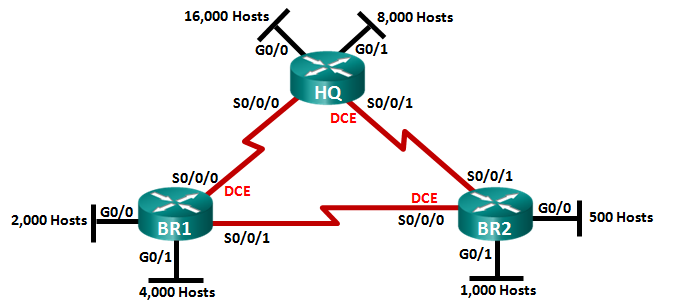
* 1. Determine the next largest subnet.

|  |  |
| --- | --- |
| Subnet description | **Branch 2 G0/0** |
| Number of Hosts Needed | **500** |
| IP mask (decimal) / Slash notation | **255.255.1000 0000.0000 0000**  **255.255.1111 1110.0000 0000**  **255.255.254.0 /23**  **2 a la 9 -2 = 510**  **256 – 254 = 2** |
| Number of bits in the subnet | **6** |
| Maximum Number of usable hosts per subnet | **2 a la 9 -2 = 510** |
| Write the two network addresses that would result from this subnetting.  *Use the first network address for this subnet.* | **172.16.252.0**  **172.16.254.0**  **172.16.252+2.0** |
| IP Subnet | **172.16.252.0** |
| First IP Host address | **172.16.252.1** |
| Last IP Host address | **172.16.253.254** |
| IP Broadcast | **172.16.253.255**  **172.16.252+1.255** |

* 1. Determine the subnets needed to support the serial links.

|  |  |  |  |
| --- | --- | --- | --- |
| Subnet description | **HQ – B1** | **HQ - B2** | **B1 – B2** |
| Number of Hosts Needed | **2** | | |
| IP mask (decimal) / Slash notation | **255.255.1000 0000.0000 0000**  **255.255.1111 1111. 11111100**  **255.255.255.252 /30**  **2 a la 2 -2 = 2**  **256 – 252 = 4** | | |
| Number of bits in the subnet | **13** | | |
| Maximum Number of usable hosts per subnet | **2 a la 2 -2 = 2** | | |
| IP Subnet | **172.16.254.0** | **172.16.254.4** | **172.16.254.8** |
| First IP Host address | **172.16.254.1** | **172.16.254.5** | **172.16.254.9** |
| Last IP Host address | **172.16.254.2** | **172.16.254.6** | **172.16.254.10** |
| IP Broadcast | **172.16.254.3** | **172.16.254.7** | **172.16.254.11** |

1. Design the VLSM Address Scheme



Complete the device interface address table.

Assign the first host address in the subnet to the Ethernet interfaces. HQ should be given the first host address on the Serial links to BR1 and BR2. BR1 should be given the first host address for the serial link to BR2.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Device | Interface | IP Address | Subnet Mask | Device Interface |
| HQ | G0/0 | **172.16.128.1** | **255.255.192.0** | 16,000 Host LAN |
| G0/1 | **172.16.192.1** | **255.255.224.0** | 8,000 Host LAN |
| S0/0/0 | **172.16.254.1** | **255.255.255.252** | BR1 S0/0/0 |
| S0/0/1 | **172.16.254.5** | **255.255.255.252** | BR2 S0/0/1 |
| BR1 | G0/0 | **172.16.240.1** | **255.255.248.0** | 2,000 Host LAN |
| G0/1 | **172.16.224.1** | **255.255.240.0** | 4,000 Host LAN |
| S0/0/0 | **172.16.254.2** | **255.255.255.252** | HQ S0/0/0 |
| S0/0/1 | **172.16.254.9** | **255.255.255.252** | BR2 S0/0/0 |
| BR2 | G0/0 | **172.16.252.1** | **255.255.254.0** | 500 Host LAN |
| G0/1 | **172.16.248.1** | **255.255.252.0** | 1,000 Host LAN |
| S0/0/0 | **172.16.254.10** | **255.255.255.252** | BR1 S0/0/1 |
| S0/0/1 | **172.16.254.6** | **255.255.255.252** | HQ S0/0/1 |