

Class C subnetting

1. Subnet the Class C IP Address 205.11.2.0 so that you have 30 subnets.

What is the subnet mask for the maximum number of hosts?

How many hosts can each subnet have?

Solution:

Default mask= 255.255.255.0

Bits needs for 30 subnets =5

$2^5 = 32$ possible subnets

Reaming bits left for hosts = $8 - 5 = 3$

$2^3 = 8 - 2 = 6$ possible hosts.

Subnet Mask =255.255.255.248

2. You have sub-netted your class C network 200.138.1.0 with a subnet mask of 255.255.255.252.

Please list the following:

- number of networks
- number of hosts per network
- the full range of the first three networks
- the usable address range from those first three networks.

Additionally, identify the broadcast addresses for each network.

Solution:

Number of networks = 64

Number of hosts = 2

Full Range for first three networks: 200.138.1.0 - 3 200.138.1.4 - 7 200.138.1.8 - 11

Usable Range for first three networks: 200.138.1.1-2 200.138.1.5-6 200.138.1.9-10

Broadcast Addresses for first three: 200.138.1.3 200.138.1.7 200.138.1.11

Question: 172.18.0.0 and we need 60 subnets.

Locate the Private IP Class

Class B (128-191) as 172 falls within that range of addresses.

Default Mask: 255.255.0.0

As we know IP belong to Class B, we can write address as **172.18.0.0/16**.

number of subnets required → 64

If we borrow 6 bits we can have near to 60 subnets $2^6 = 64$

$8 - 6 = 2$

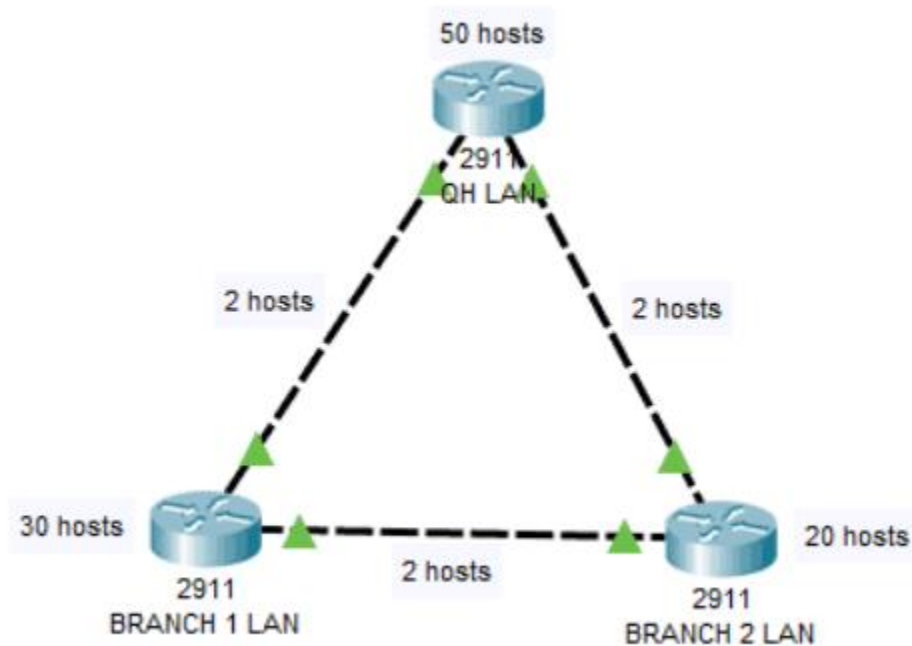
Block size = 4

Mask value: $256 - 4 = 252$

Subnet Mask: 255.255.252.0/22

Variable-Length Subnet Mask (VLSM)

With Variable-Length Subnet Mask (VLSM), we can allot the closest required number of IP addresses into a subnetwork in our LAN. We don't need to use a /23 subnet mask in all of our subnets, for example.



The total host requirement for our network is 106 hosts, and we will perform VLSM subnetting on the HQ LAN subnetwork first.

Step 2. Determine the class of IP subnet. We need to determine the class of IP subnet that we will use based on the required number of hosts.

Class A has 16,777,216, Class B has 65,536, and Class C has 256 IP addresses. As per our network requirement, we need only 106 hosts, therefore we will use a Class C IP address space. In our example, we will use 192.168.10.0. It could also be that the organization bought an IP address space from the IP address authorities.

Step 3. Identify the host bits for every subnet. In our network topology example, HQ LAN has 50 hosts requirement, therefore we would have 6 host bits.

2⁶ host bits will give us 64 hosts, minus 2 for the network address and broadcast address, which is equal to 62 usable host addresses. It suffices our 50 hosts requirement for HQ LAN.

Step 4. Calculate the subnet mask. Identify the network bits and determine the subnet mask of the subnet. We can get the subnet mask by subtracting the host bits from 32 (the total IPv4 address bits). For HQ LAN, it's $32 - 6$ host bits, which is equal to a /26. The subnet mask for HQ LAN is /26 and its long format is 255.255.255.192

Step 5. Get the increment. To determine in which block of number should we go up, we can use the formula of $2^{\text{host bits}}$. For HQ LAN, it is 2^6 host bits, which will give us an increment of 64.

Step 6. Determine the network address, broadcast address, and IP address range. Starting from the base IP address, we will go up or increment in the value computed in Step 5.

For our network, we have a base IP address of 192.168.10.0. For HQ LAN, we will increment in a block of 64 as calculated in Step 5. Moreover, since it is in the Class C IP address space, as identified in Step 2, we will increment in the 4th octet.

That will be:

192.168.10.0 + 64 (Current subnet)

192.168.10.64 (Base IP address for the next subnet)

We determined that the network address for HQ LAN subnet is 192.168.10.0. The broadcast address will be 1 less than the next IP subnet. That's $192.168.10.64 - 1$, which is 192.168.10.63.

Finally, to get the HQ LAN usable IP address range, it is the IP address range in between the network address and the broadcast address, 192.168.10.1 to 192.168.10.62.

HQ LAN:

Number of Hosts – 50

Host Bits – 6 bits

Subnet Mask – /26 or 255.255.255.192

Increment – 64

Network Address – 192.168.10.0

Broadcast Address – 192.168.10.63

Usable IP Addresses – 192.168.10.1 to 192.168.10.62

BRANCH 1 LAN:

Number of Hosts – 30

Host Bits – 5 bits

Subnet Mask – /27 or 255.255.255.224

Increment – 32

Network Address – 192.168.10.64

Broadcast Address – 192.168.10.95

Usable IP Addresses – 192.168.10.65 to 192.168.10.94

BRANCH 2 LAN:

Number of Hosts – 20

Host Bits – 5 bits

Subnet Mask – /27 or 255.255.255.224

Increment – 32

Network Address – 192.168.10.96

Broadcast Address – 192.168.10.127

Usable IP Addresses – 192.168.10.97 to 192.168.10.126

WAN 1:

Number of Hosts – 2

Host Bits – 2 bits

Subnet Mask – /30 or 255.255.255.252

Increment – 4

Network Address – 192.168.10.128

Broadcast Address – 192.168.10.131

Usable IP Addresses – 192.168.10.129 to 192.168.10.130

WAN 2:

Number of Hosts – 2

Host Bits – 2 bits

Subnet Mask – /30 or 255.255.255.252

Increment – 4

Network Address – 192.168.10.132

Broadcast Address – 192.168.10.135

Usable IP Addresses – 192.168.10.133 to 192.168.10.134

WAN 3:

Number of Hosts – 2

Host Bits – 2 bits

Subnet Mask – /30 or 255.255.255.252

Increment – 4

Network Address – 192.168.10.136

Broadcast Address – 192.168.10.139

Usable IP Addresses – 192.168.10.137 to 192.168.10.138