
# COMPUTER COMMUNICATION NETWORKS

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## IPv4 Addressing: CIDR, sub-netting and super-netting- Numericals

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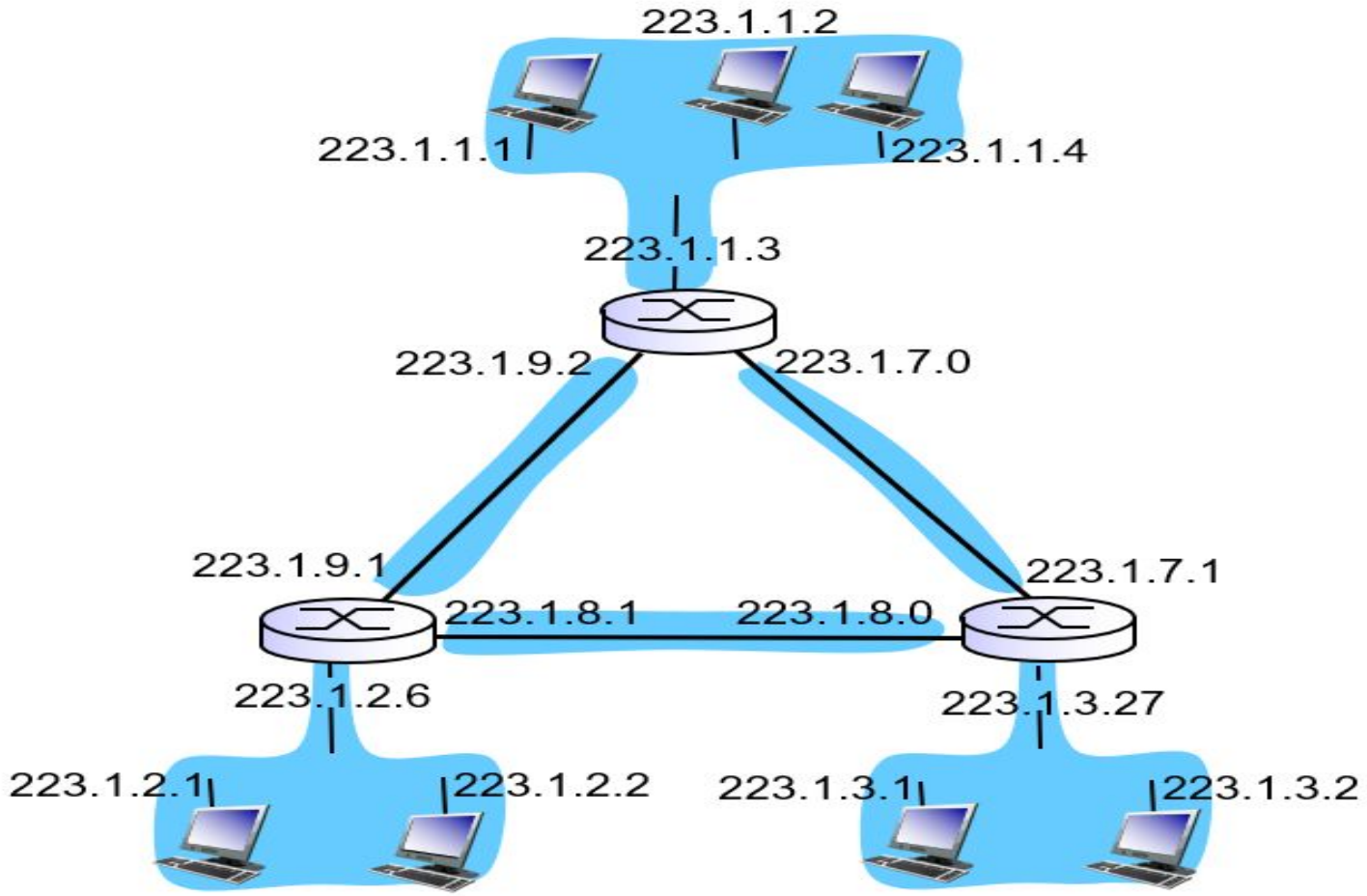
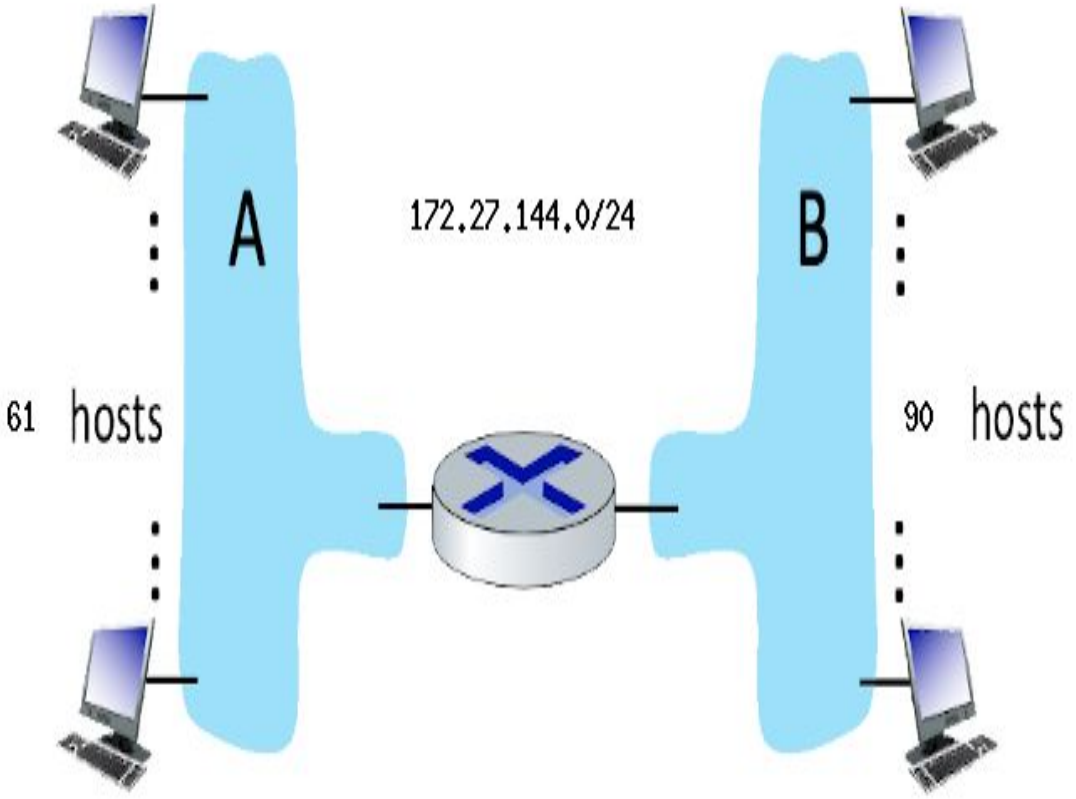
**Numerical 1**: How many subnets are present ?



## Subnetting

**Numerical 2:**

Consider the router and the two attached subnets below (A and B). The number of hosts is also shown below. The subnets share the 24 high-order bits of the address space: 172.27.144.0/24. Assign subnet addresses to each of the subnets (A and B) so that the amount of address space assigned is minimal, and at the same time leaving the largest possible contiguous address space available for assignment if a new subnet were to be added. Then answer the questions below.



## Subnetting

**Questions:**

1. Is the address space public or private?
2. How many hosts can there be in this address space?
3. What is the subnet address of subnet A? (CIDR notation)
4. What is the broadcast address of subnet A?
5. What is the starting address of subnet A?
6. What is the ending address of subnet A?
7. What is the subnet address of subnet B? (CIDR notation)
8. What is the broadcast address of subnet B?
9. What is the starting address of subnet B?
10. What is the ending address of subnet B?

## Solution

1. The address 172.27.144.0/24 is private.

2. Maximum number of hosts = 2^x - 2 = 2^8 - 2 = 254. The reason we have to subtract 2 from the final number is because there are always 2 addresses allocated for each address block: the subnet ID (the first address) and the broadcast address (the last address); for example, if you have 5 bits for hosts, you can have 30 hosts, because 2 of the addresses are for the subnet ID and the broadcast address which when added equals 32, which is 2^5.

3. Subnet A has 61 hosts, so it will need at least 63 addresses (for the subnet ID and broadcast address). The least number of bits that satisfy this is 6 bits. Knowing that, we take the prior subnet and add 64, the result of which is 172.27.144.128/26

4. The broadcast address of subnet A (172.27.144.128/26) is 172.27.144.191, because it is the last address in the IP range.

5. The first IP address of subnet A (172.27.144.128/26) is 172.27.144.129, found by adding 1 to the subnet address.

## Solution

6. The last IP address of subnet A (172.27.144.128/26) is 172.27.144.190, found by subtracting 1 from the broadcast address (172.27.144.191).

7. Similar to the prior subnet, subnet B has 90 hosts, so it will need at least 92 addresses (for the subnet ID and broadcast address). The least number of bits that satisfy this is 7 bits. Knowing that, we take the prior subnet and add 128, the result of which is 172.27.144.0/25

8. The broadcast address of subnet B (172.27.144.0/25) is 172.27.144.127, because it is the last address in the IP range.

9. The first IP address of subnet B (172.27.144.0/25) is 172.27.144.1, found by adding 1 to the subnet address.

10. The last IP address of subnet B (172.27.144.0/25) is 172.27.144.126, found by subtracting 1 from the broadcast address (172.27.144.127).

## Numerical 3:

Consider the network address 117.240.50.128/27. Answer the following:

1. Write the subnet mask for the above network.
2. Write the first and the last IP addresses belonging to the above address space.

Solution:

1. Subnet mask is 255.255.255.224
2. First IP address is 117.240.50.128 and last IP address is 117.240.50.159

Note: 117.240.50.128 is the subnet id and 117.240.50.159 is the broadcast id

The usable ip addresses for the host will be from 129-158 totaling 30 addresses (32-2)

## Supernetting

### Numerical 4:

Consider the four subnets with network addresses: 192.168.1.32/28, 192.168.1.48/28, 192.168.1.80/28 and 192.168.1.96/28 associated with one router. Answer the following

i. Apply route summarization and find a single prefix representing all the four subnets. (i.e., write the aggregate network address with the longest prefix length).
ii. Provide the subnet mask for any one subnet.

## Super-netting

### Solution

i. Expressing the four subnets in binary format, the first 25 bits are common whereas the remaining 7 bits are different. Therefore, writing the first 25 bits as such and remaining 7 bits as zero, we get the single prefix as 192.168.1.0/25.

ii. Subnet mask, which is the same for all subnets, is given by 255.255.255.240


# THANK YOU

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