# Practical 3
# IPv4 Addressing and Subnetting

Aim:

a) Given an IP address and network mask, determine other information about the IP address such as
   i) Network address
   ii) Network broadcast address
   iii) Total number of host bits
   iv) Number of hosts

b) Given an IP address and network mask, determine other information about the IP address such as:
   i) The subnet address of this subnet
   ii) The broadcast address of this subnet
   iii) The range of host addresses for this subnet
   iv) The maximum number of subnets for this subnet mask
   v) The number of hosts for each subnet
   vi) The number of subnet bits
   vii) The number of this subnet

**Part a)** An address in a block is given as 180.8.17.9. Find the number of addresses inthe block, the first address, and the last address

**Solution:**

The given address is a Class B address therefore n= 16

1) **No of addresses:**

$N = 2^{32-n}$

$= 2^{32-16}$

$= 2^{16}$

$= 65536$

Therefore, the number of addresses are = 65536 addresses

2) **First address:**

For class B address netid = 16 Therefore network mask is 255.255.0.0

To find the first address we logically AND the given address with thenetwork mask

| | | | | |
|---|---|---|---|---|
| Given address | 180 | 8. | 17 | 9 |
| Network mask | 255 | 255 | 0 | 0 |
| AND operation | 180 | 8 | 0 | 0 |

Therefore, the first address is 180.8.0.0

**3) Last address:**

To find the last address we logically OR the given address with theCOMPLEMENT of the network mask

Network mask = 255.255.0.0

| | | | | |
|---|---|---|---|---|
| Network mask | 255 | 255 | 0 | 0 |
| Complementof mask | 0 | 0 | 255 | 255 |

| | | | | |
|---|---|---|---|---|
| Given address | 180 | 8 | 17 | 9 |
| Complement ofmask | 0 | 0 | 255 | 255 |
| OR operation | 180 | 8 | 255 | 255 |

Therefore, the last address is 180.8.255.255

Hence, we conclude that

a) Network address: The first address is the Network Address 180.8.0.0
b) Network broadcast address: The last address is the Network broadcast address 180.8.255.255
c) Total number of host bits: 16
d) Number of hosts: 65534 (65536 – 2)

**Part b)** An organization is granted the block 130.34.12.64/26. The organization needs four sub networks, each with an equal number of hosts. Design the sub networks and find the information about each network.

Solution:

The given address is address of type classless addressingwith
n= 26

**1) No of addresses:**

$N = 2^{32-n}$

$= 2^{32-26}$

$= 2^{6}$

$= 64$

Therefore, the number of addresses is = 64 addresses

**2) First address:**

For the given case n = 26

Therefore, network mask is 255.255.255.192

To find the first address we logically AND the given address with the network mask

| | | | | |
|---|---|---|---|---|
| Given address | 130 | 34 | 12 | 64 |
| Network mask | 255 | 255 | 255 | 192 |
| AND operation | 130 | 34 | 12 | 64 |

Therefore the first address is 130.34.12.64

**3) Last address:**

Network mask is 255.255.255.192

| | | | | |
|---|---|---|---|---|
| Network mask | 255 | 255 | 255 | 192 |
| Complementof mask | 0 | 0 | 0 | 63 |

To find the last address we logically OR the given address with the Complement of the network mask

| | | | | |
|---|---|---|---|---|
| Given address | 130 | 34 | 12 | 64 |
| Network mask | 0 | 0 | 0 | 63 |
| OR operation | 130 | 34 | 12 | 127 |

Therefore the last address is 130.34.12.127

**4) Creating sub-networks:**

In this case we need to create 4 sub-networks with equal number ofhosts

Total number of hosts N = 64

Therefore, number of hosts in each sub-network $N_{SUB}$ = 16

We calculate the sub-netid for each network as follows

$n_{SUB} = n + \log_2(N/ N_{SUB})$

$= 26 + \log_2(64/16)$

$= 28$

Therefore, the given sub-networks are

| Sub-network | First address | Last address |
|---|---|---|
| 1 | 130.34.12.64 | 130.34.12.79 |
| 2 | 130.34.12.80 | 130.34.12.95 |
| 3 | 130.34.12.96 | 130.34.12.111 |
| 4 | 130.34.12.112 | 130.34.12.127 |

a. The subnet address of this subnet: The First address of each subnet
b. The broadcast address of this subnet: The Last address of each subnet
c. The range of host addresses for this subnet: Shown in the above table
d. The maximum number of subnets for this subnet mask: 4
e. The number of hosts for each subnet: 14
f. The number of subnet bits: 28
g. The number of this subnet: Mentioned in the above table

For the video demonstration of the above practical scan the QR code