ANDINET BUSINESS AND TECHNOLGY COLLEGE

DEPARTMENT OF COMPUTER SCIENCE

Individual assignment

Course title: - Data communication and computer Network

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Submitted date: - 14/10/2018 E.C

General definition

1. **Subnet Mask:** A standard IPv4 address has 32 bits. The CIDR notation (like /27) tells you how many bits are turned "on" (set to 1) for the network portion. Write out that many 1s, fill the rest with 0s, and convert each 8-bit group (octet) back to decimal.
2. **Number of Hosts:** * Total Hosts = 2^h, where h is the number of remaining host bits (32 - CIDR prefix).
    - Usable Hosts = 2^h - 2 (we subtract 2 for the Network Address and the Broadcast Address).
3. **Block Size (Increment):** Find the value of the lowest "on" bit in the subnet mask, or subtract the interesting octet's mask value from 256. This tells you how your subnets count up (e.g., increments of 32, 16, 64).
4. **Network Address:** Find the largest multiple of the block size that is less than or equal to the corresponding octet in your given IP address.
5. **First Usable Host:** Network Address + 1
6. **Broadcast Address:** Add the block size to the Network Address and subtract 1 (Next Network Address - 1).
7. **Last Usable Host:** Broadcast Address - 1

Detailed Calculations

1. 192.168.5.77/27

- **Subnet Mask Calculation:** /27 means 27 ones and 5 zeros.
    - Binary: 11111111.11111111.11111111.11100000
    - Decimal: **255.255.255.224**
- **Number of Hosts:** Host bits (h) = 32 - 27 = 5.

    - Total Hosts: $2^5 = 32$
    - Usable Hosts: 32 - 2 = **30**
- **Network & Broadcast Address:** * The block size in the 4th octet is 256 - 224 = 32.
    - The subnets go by 32s: 0, 32, 64, 96...
    - The 4th octet of our IP is 77, which falls between 64 and 96. Therefore, the Network Address is **192.168.5.64**.
    - The next network starts at 96, so our Broadcast Address is 96 - 1 = **192.168.5.95**.
- **First Host:** 64 + 1 = **192.168.5.65**
- **Last Host:** 95 - 1 = **192.168.5.94**

2. 172.16.20.200/28

- **Subnet Mask Calculation:** /28 means 28 ones and 4 zeros.
    - Binary: 11111111.11111111.11111111.11110000
    - Decimal: **255.255.255.240**
- **Number of Hosts:** Host bits (h) = 32 - 28 = 4.
    - Total Hosts: $2^4 = 16$
    - Usable Hosts: 16 - 2 = **14**
- **Network & Broadcast Address:** * The block size in the 4th octet is 256 - 240 = 16.
    - The subnets go by 16s: ...160, 176, 192, 208...
    - The 4th octet of our IP is 200, which falls between 192 and 208. Therefore, the Network Address is **172.16.20.192**.
    - The next network starts at 208, so our Broadcast Address is 208 - 1 = **172.16.20.207**.
- **First Host:** 192 + 1 = **172.16.20.193**

- **Last Host:** 207 - 1 = **172.16.20.206**

3. 10.10.10.100/26

- **Subnet Mask Calculation:** /26 means 26 ones and 6 zeros.
  - Binary: 11111111.11111111.11111111.11000000
  - Decimal: **255.255.255.192**
- **Number of Hosts:** Host bits (h) = 32 - 26 = 6$.
  - Total Hosts: $2^6 = 64$
  - Usable Hosts: 64 - 2 = **62**
- **Network & Broadcast Address:** * The block size in the 4th octet is 256 - 192 = 64.
  - The subnets go by 64s: 0, 64, 128...
  - The 4th octet of our IP is 100, which falls between 64 and 128. Therefore, the Network Address is **10.10.10.64**.
  - The next network starts at 128, so our Broadcast Address is 128 - 1 = **10.10.10.127**.
- **First Host:** 64 + 1 = **10.10.10.65**
- **Last Host:** 127 - 1 = **10.10.10.126**

4. 192.168.100.50/29

- **Subnet Mask Calculation:** /29 means 29 ones and 3 zeros.
  - Binary: 11111111.11111111.11111111.11111000
  - Decimal: **255.255.255.248**
- **Number of Hosts:** Host bits (h) = 32 - 29 = 3.
  - Total Hosts: $2^3 = 8$
  - Usable Hosts: 8 - 2 = **6**

- **Network & Broadcast Address:** * The block size in the 4th octet is 256 - 248 = 8.
    - The subnets go by 8s: ...32, 40, 48, 56...
    - The 4th octet of our IP is 50, which falls between 48 and 56. Therefore, the Network Address is **192.168.100.48**.
    - The next network starts at 56, so our Broadcast Address is 56 - 1 = **192.168.100.55**.
- **First Host:** 48 + 1 = **192.168.100.49**
- **Last Host:** 55 - 1 = **192.168.100.54**

5. 172.31.1.150/25

- **Subnet Mask Calculation:** /25 means 25 ones and 7 zeros.
    - Binary: 11111111.11111111.11111111.10000000
    - Decimal: **255.255.255.128**
- **Number of Hosts:** Host bits (h) = 32 - 25 = 7.
    - Total Hosts: $2^7 = 128$
    - Usable Hosts: 128 - 2 = **126**
- **Network & Broadcast Address:** * The block size in the 4th octet is 256 - 128 = 128.
    - The subnets go by 128s: 0, 128
    - The 4th octet of our IP is 150, which falls between 128 and 256. Therefore, the Network Address is **172.31.1.128**.
    - The next subnet increment is 256, meaning the broadcast block boundary reaches the maximum available integer: 256 - 1 = **172.31.1.255**.
- **First Host:** 128 + 1 = **172.31.1.129**
- **Last Host:** 255 - 1 = **172.31.1.254**