

Exercises Sheet #5 : Network Layer

Communication Networks
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Duration : 2 sessions

Exercise #1 :

In each subtask of this exercise, a sender transmits an IP packet to a receiver :

- | | | |
|--------------|-------------------------------------|-----------------|
| 1) Sender: | 11001001.00010100.11011110.00001101 | 201.20.222.13 |
| Subnet mask: | 11111111.11111111.11111111.11110000 | 255.255.255.240 |
| Receiver: | 11001001.00010100.11011110.00010001 | 201.20.222.17 |
| Subnet mask: | 11111111.11111111.11111111.11110000 | 255.255.255.240 |
| | | |
| 2) Sender: | 10000100.10011000.01010011.11111110 | 132.152.83.254 |
| Subnet mask: | 11111111.11111111.11111100.00000000 | 255.255.252.0 |
| Receiver: | 10000100.10011000.01010001.00000010 | 132.152.81.2 |
| Subnet mask: | 11111111.11111111.11111100.00000000 | 255.255.252.0 |

Question :

- a) Determine for each subtask the subnet ID of the sender and the receiver
- b) Indicate whether the IP packet leaves the subnet during transmission or not.

Exercise #2 :

Consider the following IP addresses :

- o 10.0.15.1
 - o 192.168.45.12
 - o 172.16.4.100
 - o 224.0.0.5
1. Assuming applying classful addressing, identify for each IP address :
 - o The Class of the IP address
 - o The Default subnet mask
 - o The Address range (first host address, last host address)
 - o The Number of usable hosts
 - o The Network IP address
 - o The Broadcast address
 - o Whether it's public or private
 2. What is the purpose of the **loopback** address?

Exercise #3 : CIDR (Classless Inter-Domain Routing)

1. What is CIDR and how does it differ from classful addressing?
2. Represent the following CIDR block as a range of IP addresses: **192.168.4.0/22**
3. How many hosts are available in a **/20** subnet?
4. Write the IP address using CIDR notation : 126.4.20.5 with subnet mask : 255.255.240.0

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Exercise #4 :

Consider applying FLSM to split the following networks:

- 1) Split the class C network 195.1.31.0 for implementing 30 subnets.

Network ID: 11000011.00000001.00011111.00000000 195.1.31.0

Number of bits for subnet IDs?

Subnet mask: -----.-----.-----.----- ---.---.---.---

Number of bits for host IDs?

Number of host IDs per subnet?

- 2) Split the class B network 189.23.0.0 for implementing 20 subnets.

Network ID: 10111101.00010111.00000000.00000000 189.23.0.0

Number of bits for subnet IDs?

Subnet mask: -----.-----.-----.----- ---.---.---.---

Number of bits for host IDs?

Number of host IDs per subnet?

Exercise #5 : Fixed Length Subnet Masking (FLSM)

- You are given the IP address **192.168.10.0/24**.
 - Divide this into 4 equal subnets.
 - Write the subnet address, first and last usable IP, and broadcast address for each subnet.
- How many subnets and how many hosts per subnet can you get from the network **10.0.0.0/8** using **/16** subnetting?

Exercise #6: Variable Length Subnet Masking (VLSM)

- Given the IP block **192.168.1.0/24**, design subnets for the following needs:
 - One subnet with 100 hosts
 - One subnet with 50 hosts
 - Two subnets with 25 hosts eachProvide:
 - Subnet mask used
 - Network address
 - Range of usable IPs
 - Broadcast address
- Why is VLSM considered more efficient than FLSM?