

IPv4 Addressing and Subnetting

1. Objectives

- To introduce **IPv4 addressing** and **subnetting**.
- To design an **enterprise network IP addressing scheme**.

2. Instructions

- a) Use [**Handout_1_Basic_Subnetting_Algorithm**] for introduction to IP addressing and subnetting.
- b) Understand the following **IPv4 table**:

Address Class	1st octet range (decimal)	1st octet bits (green bits do not change)	Network(N) and Host(H) parts of address	Default subnet mask (decimal and binary)	Number of possible networks and hosts per network
A	1-127**	00000000-01111111	N.H.H.H	255.0.0.0	128 nets (2^7) 16,777,214 hosts per net (2^{24-2})
B	128-191	10000000-10111111	N.N.H.H	255.255.0.0	16,384 nets (2^{14}) 65,534 hosts per net (2^{16-2})
C	192-223	11000000-11011111	N.N.N.H	255.255.255.0	2,097,150 nets (2^{21}) 254 hosts per net (2^{8-2})

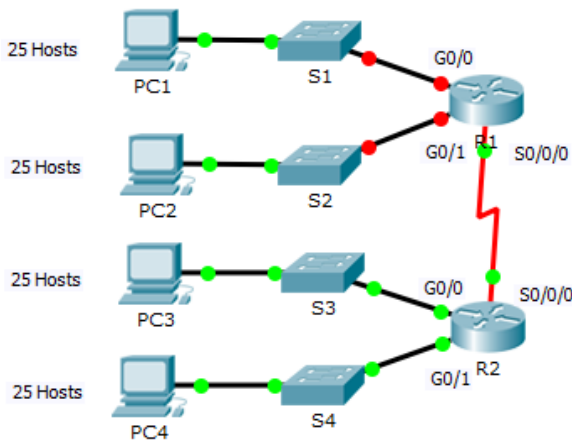
Now, use the above IPv4 address table, **determine** the **class**, **network address** and **broadcast address** for the following IP addresses:

- i. IP address: **207.21.54.240** Address Class: _____
 Subnet mask: **255.255.255.0** Network Address: _____
 Broadcast Address: _____
 Possible # of Hosts: _____
- ii. IP address: **60.41.211.5** Address Class: _____
 Subnet mask: **255.0.0.0** Network Address: _____
 Broadcast Address: _____
 Possible # of Hosts: _____
- iii. IP address: **190.101.2.199** Address Class: _____
 Subnet mask: **255.255.0.0** Network Address: _____
 Broadcast Address: _____
 Possible # of Hosts: _____

c) Determine the **class and major network address** for the following IPv4 addresses. Use the **subnet masks** to determine the **number of subnets created for the address**, and the **number of hosts** permitted on each subnet:

- i. IP address: **207.21.54.140** Address Class: _____
 Subnet mask: **255.255.255.224** Network Address: _____
 Possible # of Subnets: _____
 Possible # of Hosts: _____
- ii. IP address: **60.41.211.5** Address Class: _____
 Subnet mask: **255.255.255.0** Network Address: _____
 Possible # of Subnets: _____
 Possible # of Hosts: _____
- iii. IP address: **182.191.25.11** Address Class: _____
 Subnet mask: **255.255.254.0** Network Address: _____
 Possible # of Subnets: _____
 Possible # of Hosts: _____

3. Exercise



Step 1: Subnet the 192.168.100.0/24 network into the appropriate number of subnets.

- Based on the topology, how many subnets are needed?.....
- How many bits must be borrowed to support the number of subnets in the topology table?.....
- How many subnets does this create?.....
- How many usable hosts does this create per subnet?.....
- Calculate the binary value for the first five subnets. The first subnet is already shown.
 Net 0: 192 . 168 . 100 . 0 0 0 0 0 0 0 0
 Net 1: 192 . 168 . 100 . _____
 Net 2: 192 . 168 . 100 . _____
 Net 3: 192 . 168 . 100 . _____
 Net 4: 192 . 168 . 100 . _____
- Calculate the binary and decimal value of the new subnet mask.
 11111111.11111111.11111111. _____
 255 . 255 . 255 . _____
- Fill in the **Subnet Table**, listing the decimal value of all available subnets, the first and last usable host address, and the broadcast address. Repeat until all addresses are listed.

Subnet Table

Subnet Number	Subnet Address	First Usable Host Address	Last Usable Host Address	Broadcast Address
0				
1				
2				
3				
4				
5				
6				
7				

Step 2: Assign the subnets to the network shown in the topology.

- Assign Subnet 0 to the LAN connected to the GigabitEthernet 0/0 interface of R1:.....
- Assign Subnet 1 to the LAN connected to the GigabitEthernet 0/1 interface of R1:.....
- Assign Subnet 2 to the LAN connected to the GigabitEthernet 0/0 interface of R2:.....

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Lab Experiment # 3 – Part 2

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- d. Assign Subnet 3 to the LAN connected to the GigabitEthernet 0/1 interface of R2:.....
- e. Assign Subnet 4 to the WAN link between R1 to R2:.....

Step 3: Document the addressing scheme.

- a. Assign the **first usable IP addresses** to R1 for the two LAN links and the WAN link.
- b. Assign the **first usable IP addresses** to R2 for the LANs links. Assign the **last usable IP address** for the WAN link.
- c. Assign the **second usable IP addresses** to the switches.
- d. Assign the **last usable IP addresses** to the hosts.

Step 4: Assign IP Addresses to Network Devices and Verify Connectivity

Most of the IP addressing is already configured on this network. Implement the following steps to complete the addressing configuration.

- Step 1: Configure IP addressing on R1 LAN interfaces.
- Step 2: Configure IP addressing on S3, including the default gateway.
- Step 3: Configure IP addressing on PC4, including the default gateway.
- Step 4: Verify connectivity.

[IP Addressing and Subnetting – More practice]

Q.1 You have the IP address **186.111.0.0**, this network is subnetted by **10-bits**. Find the following:

- i. Find the **Subnet Mask**.
- ii. Determine the **number of usable hosts per subnet**.
- iii. To **which subnet** the following IP's belong to: **186.111.169.213**
- iv. Determine the **network address** and **broadcast address** of the subnet to which this ip belongs to: **186.111.169.213**
- v. Find **Network Address, Broadcast Address** and **Host Range** for the **subnet # 121**.

Q.2 Given a host with IP address **160.50.145.189/21**:

- i. Is a host with IP address **160.50.146.210/21** part of the same network? **Show calculations**.
- ii. Is the IP address **160.50.145.255** valid according to the given IP? Why or why not?
- iii. What is the **first valid host** on the subnetwork that the node **172.18.142.179 255.255.254.0** belongs to?
- iv. **Which subnet** does host **192.168.11.198 255.255.255.240** belong to?
- v. What is the **last valid host** on the subnetwork **192.168.98.176 255.255.255.240**?
- vi. What is the **last valid host** on the subnetwork **172.25.13.112 255.255.255.240**?
- vii. **How many subnets** and **hosts per subnet** can you get from the network **10.0.0.0 255.255.240.0**?
- viii. What is the **first valid host** on the subnetwork that the node **192.168.207.190/28** belongs to?

Demonstrate your work to the instructors and submit lab report.