UTM

UNIVERSITI TEKNOLOGI MALAYSIA

FACULTY OF COMPUTING

SEMESTER I, SESION 2024/2025

BACHELOR OF COMPUTER SCIENCE (BIOINFORMATICS)

SECR1213 NETWORK COMMUNICATIONS - SECTION 01

PROJECT TASK 5

IP ADDRESSING SCHEME

GROUP NAME: DATA VOYAGERS

GROUP MEMBERS	MATRIC NO
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SUBMISSION DATE : 17 JANUARY 2025

TABLE CONTENT

1.0 Network Address

Group/Section	Network Address
1	192.16.0.0/8
2	192.17.0.0/8
3	192.18.0.0/8
4	192.19.0.0/8
5	192.20.0.0/8
6	192.21.0.0/8
7	192.22.0.0/8
8	192.23.0.0/8
9	192.24.0.0/8
10	192.25.0.0/8

An IP address is like a tag for the hosts on the internet. The network address is a part of this tag that shows which group the hosts belong to. On the other hand, the broadcast address is a way to talk to everyone in that group at once. Subnet masks help break down the tag into parts, making it easier to organize and manage different groups on the internet. These things are fundamental to setting up networks.

The IP address for our group given by the faculty representative is 192.19.0.0/8 . In this task we would do the subnetting and IP address assignation to ensure that all hosts in the faculty would have their own unique IP address. The following is our report about this task.

2.0 Subnetting

2.1 Subnet Mask

A subnet mask is a 32-bit number used in networking to separate an IP address into its network and host components. It helps to determine which part of the IP address identifies the network and which part identifies individual devices within that network. Written in the same format as IP address, the subnet mask uses a sequence of 1s to denote the network portion and 0s to denote the host portion. Subnet masks are essential for organizing the networks, optimizing IP address allocation and enhancing the security by segmenting traffic. They enable efficient communication within and between subnets by defining the scope of the network and the devices it can include. Our group is given a network address with an "/8" notation representing the subnet mask. A "/8" network means the first 8 bits of the IP address define the network portion and leave the remaining 24 bits for hosts.

IP address: 192.19.0.0/8
Subnet mask: 255.0.0.0

IP address (Decimal)	192.	19.	0.	0
IP address (Binary)	1100 0000.	0001 0011.	0000 0000.	0000 0000
Subnet Mask (Decimal)	255.	0.	0.	0
Subnet Mask (Binary)	1111 1111.	0000 0000.	0000 0000.	0000 0000

The binary of the IP address 192.19.0.0 is 1100 0000.0001 0011.0000 0000.0000 0000. The CIDR notation 192.19.0.0/8 represents a network where the first 8 bits (the first octet) of the IP address are reserved for the network portion, leaving the remaining 24 bits for host addresses. This corresponds to a subnet mask of 255.0.0.0, meaning that all IP addresses within the range share the same first octet of 192 while the other three octets can vary. The network includes IP addresses ranging from 192.0.0.1 to 192.255.255.254 which provides a total of 16,777,214 usable addresses with 2 reserved for the network address and broadcast address. This makes it a very large network which is suitable for organizations requiring millions of IP addresses.

2.2 Subnet Address

A subnet address is a unique identifier for a specific subnet within a network. It is calculated by performing a bitwise AND operation between an IP address and a subnet mask. There are $2^{24} = 16,777,216$ possible hosts which can range from 192.19.0.1 to 192.19.255.254. The network IP address is 192.19.0.0 which is the first IP address used to identify the network itself and cannot be assigned to individual hosts. The broadcast address is 192.19.255.255 which is the last IP address. It also cannot be assigned to individual hosts as it is reserved for the broadcasting information to all hosts within the subnet.

Calculation of subnet address:

IP Address (Binary)	1100 0000. 0000 0000. 0000 0000. 0000 0000			
Subnet Mask (Binary)	AND 1111 1111. 0000 0000. 0000 0000. 0000 0000			
Subnet Address (Binary)	1100 0000. 0000 0000. 0000 0000. 0000 0000			
Subnet Address (Decimal)	192.	0.	0.	0

From the above calculation, we apply the AND operation to calculate the subnet address by converting both IP address and subnet mask into binary. The result of the AND operation is 192.0.0.0 in decimal is the subnet address.

IP Address 192.19.0.0/8

IP Address	Network Portion	Host Portion
192.19.0.0/8	**1100 0000.**	0001 0011. 0000 0000. 0000 0000
	8 bits	24 bits

The 7 work areas in the Faculty of Computing are General Purpose Lab 1, General Purpose Lab 2, Video Conferencing Room, Student Lounge, Cisco Network Lab, Embedded Lab and Hybrid Classroom. Since there are at least 7 work areas, the network needs to have 8 major subnets. Hence, 192.19.0.0/8 will be divided into 8 subnets which is 2^3. Now, the IP address is 192.19.0.0/11. The number of bits borrowed from the host portion is 3 bits. The network portion becomes 11 bits and the host portion becomes 12 bits.

Subnet	Work Area	Subnet Address (Decimal)	Subnet Address (Binary)
0	General Purpose Lab 1	192.0.0.0/11	1100 0000.000**0 0000.0000 0000.0000 0000**
1	General Purpose Lab 2	192.32.0.0/11	1100 0000.001**0 0000.0000 0000.0000 0000**
2	Video Conferencing Room	192.64.0.0/11	1100 0000.010**0 0000.0000 0000.0000 0000**
3	Student Lounge	192.96.0.0/11	1100 0000.011**0 0000.0000 0000.0000 0000**
4	Cisco Network Lab (Switch 1)	192.128.0.0/11	1100 0000.100**0 0000.0000 0000.0000 0000**
5	Cisco Network Lab (Switch 2)	192.16.0.0/11	1100 0000.101**0 0000.0000 0000.0000 0000**
6	Embedded Lab	192.192.0.0/11	1100 0000.110**0 0000.0000 0000.0000 0000**
7	Hybrid Classroom	192.224.0.0/11	1100 0000.111**0 0000.0000 0000.0000 0000**

3.0 IP Assignation

3.1 Network and Broadcast Address for each Subnet

The ranges for the 8 subnets are as follows:

Subnet	Work Area	Network Address	Broadcast Address	Range of Usable Address
0	General Purpose Lab 1	192.0.0.0	192.31.255.255	192.0.0.1 - 192.31.255.254
		1100 0000.0001 0011. 0000 0000.0000 0000	1100 0000.0001 0011. 1111 1111.1111 1111	1100 0000.0000 0000. 0000 0000.0000 0001- 1100 0000.0001 0011. 1111 1111.1111 1110
1	General Purpose Lab 2	192.32.0.0	192.63.255.255	192.32.0.1 - 192.63.255.254
		1100 0000.0010 0000. 0000 0000.0000 0000	1100 0000.0011 1111. 1111 1111.1111 1111	1100 0000.0010 0000. 0000 0000.0000 0001- 1100 0000.0011 1111. 1111 1111.1111 1110
2	Cisco Network Lab (Switch 1)	192.64.0.0	192.95.255.255	192.64.0.1 - 192.95.255.254
		1100 0000.0100 0000. 0000 0000.0000 0000	1100 0000.0101 1111. 1111 1111.1111 1111	1100 0000.0100 0000. 0000 0000.0000 0001- 1100 0000.0101 1111. 1111 1111.1111 1110
3	Cisco Network Lab (Switch 2)	192.96.0.0	192.127.255.255	192.96.0.1 - 192.127.255.254
		1100 0000.0110 0000. 0000 0000.0000 0000	1100 0000.0111 1111. 1111 1111.1111 1111	1100 0000.0110 0000. 0000 0000.0000 0001- 1100 0000.0111 1111. 1111 1111.1111 1110
4	Embedded Lab	192.128.0.0	192.159.255.255	192.128.0.1 - 192.159.255.254
		1100 0000.1000 0000. 0000 0000.0000 0000	1100 0000.1001 1111. 1111 1111.1111 1111	1100 0000.1000 0000. 0000 0000.0000 0001- 1100 0000.1001 1111. 1111 1111.1111 1110

5	Hybrid Classroom	192.160.0.0	192.191.255.255	192.160.0.1 - 192.191.255.254
		1100 0000.1010 0000. 0000 0000.0000 0000	1100 0000.1011 1111. 1111 1111.1111 1111	1100 0000.1010 0000. 0000 0000.0000 0001- 1100 0000.1011 1111. 1111 1111.1111 1110
6	Video conferencing Room	192.192.0.0	192.223.255.255	192.192.0.1 - 192.223.255.254
		1100 0000.1100 0000. 0000 0000.0000 0000	1100 0000.1101 1111. 1111 1111.1111 1111	1100 0000.1100 0000. 0000 0000.0000 0001- 1100 0000.1101 1111. 1111 1111.1111 1110
7	Student Lounge	192.224.0.0	192.255.255.255	192.224.0.1 - 192.255.255.254
		1100 0000.1110 0000.0000 0000.0000 0000	1100 0000. 1111 1111.1111 1111. 1111 1111	1100 0000.1110 0000. 0000 0000.0000 0001- 1100 0000. 1111 1111. 1111 1111. 1111 1110

3.2 IP assignation for each work area

The table below shows detail information about the remaining work area in relation to its IP Addresses :

Work Area	Hosts	Range IP Address
General Purpose Lab 1	30 student workstations	192.0.0.1–192.0.0.30
	1 lecturer workstation	192.0.0.31
	IP phone	192.0.0.32
	Projector	192.0.0.33
	Patch panel	192.0.0.34
	Switch	192.0.0.35
	Server	192.0.0.36
	Wireless Access Point	192.0.0.37
General Purpose Lab 2	30 student workstations	192.32.0.1–192.32.0.30
	1 lecturer workstation	192.32.0.31
	IP phone	192.32.0.32
	Projector	192.32.0.33
	Patch panel	192.32.0.34
	Switch	192.32.0.35
	Server	192.32.0.36
	Wireless Access Point	192.32.0.37
Cisco Network Lab (Switch 1)	24 student workstations	192.64.0.1-192.64.0.24
	Speaker	192.64.0.25
	IP camera	192.64.0.26
	Switch	192.64.0.27
	Server	192.64.0.28

	Wireless Access Point	192.64.0.29
	Patch panel	192.64.0.30
Cisco Network Lab (Switch 2)	6 student workstations	192.96.0.1-192.96.0.6
	1 lecturer workstation	192.96.0.7
	Projector	192.96.0.8
	16 hard disk bay	192.96.0.9-192.96.0.24
	IP camera	192.96.0.25
	IP phone	192.96.0.26
	Smart TV	192.96.0.27
	Switch	192.96.0.28
	Server	192.96.0.29
	Wireless Access Point	192.96.0.30
	Patch Panel	192.96.0.31
Embedded Lab	30 student workstations	192.128.0.1–192.128.0.30
	1 lecturer workstation	192.128.0.31
	2 IP camera	192.128.0.32–192.128.0.33
	IP phone	192.128.0.34
	Projector	192.128.0.35
	Smart TV	192.128.0.36
	Patch panel	192.128.0.37
	Switch	192.128.0.38
	Server	192.128.0.39
	Wireless Access Point	192.128.0.40
Hybrid Classroom	30 student workstations	192.160.0.1–192.160.0.30
	1 lecturer workstation	192.160.0.31

	Projector	192.160.0.32
	2 IP camera	192.160.0.33–192.160.0.34
	IP phone	192.160.0.35
	Smart TV	192.160.0.36
	Patch panel	192.160.0.37
	Switch	192.160.0.38
	Server	192.160.0.39
	Wireless access point	192.160.0.40
Video Conferencing Room	I lecturer workstation	192.192.0.1
	Projector	192.192.0.2
	2 Smart TV	192.192.0.3-192.192.0.4
	IP Phone	192.192.0.5
	3 IP Camera	192.192.0.6-192.192.0.8
	Speakers	192.192.0.9
	Patch panel	192.192.0.10
	Switch	192.192.0.11
	Server	192.192.0.12
	Wireless access point	192.192.0.13
Student lounge	Wireless Access Point 1	192.224.0.1
	Firewall	192.224.0.2
	Switch	192.224.0.3
	Router	192.224.0.4

Meeting Minutes #9

DATE/TIME	13 Jan 2025 5:00pm
LOCATION	Physical
AGENDA	1. Discuss the question on Task 5
	2. Calculate subnet address for each work areas
	3. Assign IP address for each devices
MEETING MC	CHIN PEI WEN

ATTENDANCE

NAME	TIME	REASON FOR ABSENCE
CHIN PEI WEN	1700	-
KOO XUAN	1700	-
LING YU QIAN	1700	-
TAN ZHAO HONG	1700	-

Minutes

No.	Item Discussed	Details	Person-In-Charge
1	Understand the task requirement and task distribution	Slide showed the question and rubric given on Task 5	All members
2	Subnetting	Members shared their ideas about the subnet for each work area.	All members

3	Subnet Address calculation	We discussed how to calculate the subnet address for each work area.	All members
4	IP Assignation	Members calculate the network and broadcast address for each work area	All members
5	Meeting ended	1930	All members