# CSE 5004

## COMPUTER NETWORKS

## Assessment – 1

B2 | PLB131

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by

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## Question 1

1. An XYZ software limited located at tech park have implemented a star topology in their network branch. A centralized switch has installed and configured to connect the whole systems that exist in the environment. In the training department cell, all systems are connected in closed-loop format. A network admin wants to connect these two networks so that data can be shared among various divisions. Describe the following questions with the necessary illustration
   a. In this case, what network topology would be more appropriate?
   b. Create a suitable topology for the scenario described above.
   c. For this case, what kind of network would you recommend?

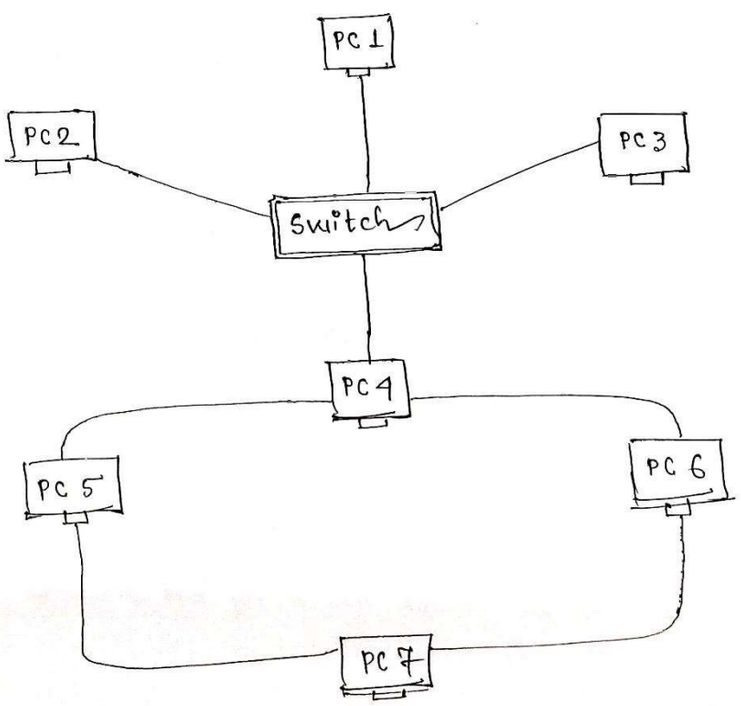
**Solution:**

Q1.

(a) XYZ Software Ltd. has implemented a star topology in their network branch with a centralized switch. In the training department cell systems are connected in closed-loop format that is a ring topology.

These two networks are to be connected, so we can go for Hybrid (star-ring) Network Topology.

(b)




(c) Campus area network would be recommended.

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## Question 2

2. Could you design various types of networks to link these devices? List and describe the "new" computer networks that you were able to build.
*Hint: A coffee machine could be linked to television and set to brew coffee any time the television was switched on after 6 p.m. on weekdays.*

**Solution:**

- Home automation: controlling Electrical Appliances with a Mobile device. They are connected with Local Area Network and mobile phone will send communications over phone network to marge device.
- Remote document sharing and real time document collaboration with multiple users over network.
- Popcorn and cola dispensers — linked to the TV set while watching movies during the weekend.
- Automatic mobile devices: eg. smartwatch charging when you turn on your PC.
- Linking a printer to your iPad to get instant important study notes as a hard copy.
- Automated door bell - camera system which connects over network and person can answer the door from remote location.
- Linking your house door-knob to the lights, fans and essential appliances of the house to save time, & electricity.
- In office building, a room booking or desk booking system can be implemented, where employee from remote location via a MAN can view real time camera feed.

## Question 3

3. a) VIT is granted a block of addresses 200.3.2.0/24. It has three offices in different locations and needs to divide the addresses into three subnets as in the following table:

| Venue | Number of hosts |
|---|---|
| SJT | 50 |
| TT | 20 |
| SMV | 12 |

Find the subnet mask, the number of addresses in each subnet and find subnet address and broadcast address for each subnet.

(b) XYZ company has 100 workstations in their head office and the IT manager would like to assign a subnetwork address for each department. He wants to create 5 subnets using the 192.168.1.0/24 block and assign the first subnetwork to their servers and the rest for their 100 workstations. Design the subnets.

**Solution:**

Q3 (a).

Address block given is 200.3.2.0/24, means 24 bits is network ID and last 8 bits are used as host IDs.

So we allot (can do) addresses to 254 ($2^8 - 2$) hosts in the network.

In subnet ①, there are total 50 hosts to which address should be assigned. If we use last 6 bits for host ID then this block has total 64 addresses ($2^6$) in which 62 are usable. So requirement for first subnet has been fulfilled.

Last 6 bits are used for host ID and 1st 26 bits for network identifier.

Subnet ①:

Network address : 200.3.2.0/26

First address : 200.3.2.1/26

Last address : 200.3.2.63/26

Broadcast address : 200.3.2.63/26

Subnet mask : 255.255.255.192/26

In subnet ②, there are total 20 hosts to which address should be assigned. If we use last 5 bits for host ID, then this block has total 32 addresses ($2^5$), in which 30 are usable. So requirement for 1st subnet has been fulfilled.

Last 5 bits are used for host ID and 1st 27 bits for network identifier.

Subnet ②:

Network address : 200.3.2.64 /27

First address : 200.3.2.65 /27

Last address : 200.3.2.95 /27

Broadcast address : 200.3.2.95 /27

Subnet mask : 255.255.255.224 /27

In subnet ③, there are total 12 hosts to which address should be assigned. If we use last 4 bits for host ID then this block has total 16 addresses ($2^4$), in which 14 are usable.

So requirement for 1st subnet has been fulfilled.

Last 4 bits are used for host ID and 1st 28 bits for network identifier.

Subnet ③:

Network address : 200.3.2.128 /28

First address : 200.3.2.129 /28

Last address : 200.3.2.142 /28

Broadcast address : 200.3.2.143 /28

Subnet mask : 255.255.255.240 /28

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Q3 (b).

No. of workstations = 100

Network address = 192.168.1.0 /24

Subnets required = 5

Now, Default subnet mask for class C = 255.255.255.0

This kind of address 24 network bits and 8 available host bits indicated by the 0 at the last portion of the network address.

Available host bits by default = $2^8 - 2 = 254$.

2 is subtracted because we need not count network address (192.168.1.0) and broadcast address (192.168.1.255).

Since the requirement is 5 subnets, we will borrow 3 host bits and make it part of the network bits.

So, our new mask is 24+3 = 27.

Hosts per subnet = $2^5 - 2$ = 30 hosts per subnet

Subnet ① = 192.168.1.0 to 192.168.1.31

Subnet ② = 192.168.1.32 to 192.168.1.63

Subnet ③ = 192.168.1.64 to 192.168.1.95

Subnet ④ = 192.168.1.96 to 192.168.1.127

Subnet ⑤ = 192.168.1.128 to 192.168.1.159

Subnet ⑥ = 192.168.1.160 to 192.168.1.191

Subnet ⑦ = 192.168.1.192 to 192.168.1.223

Subnet ⑧ = 192.168.1.224 to 192.168.1.225

The 3 extra subnets can be used in future (Right now, the 5 are using by the company).

## Question 4

4. Deploy an OpenFlow networks, using commercial Ethernet switches and routers. Expain the following with neat sketch:-

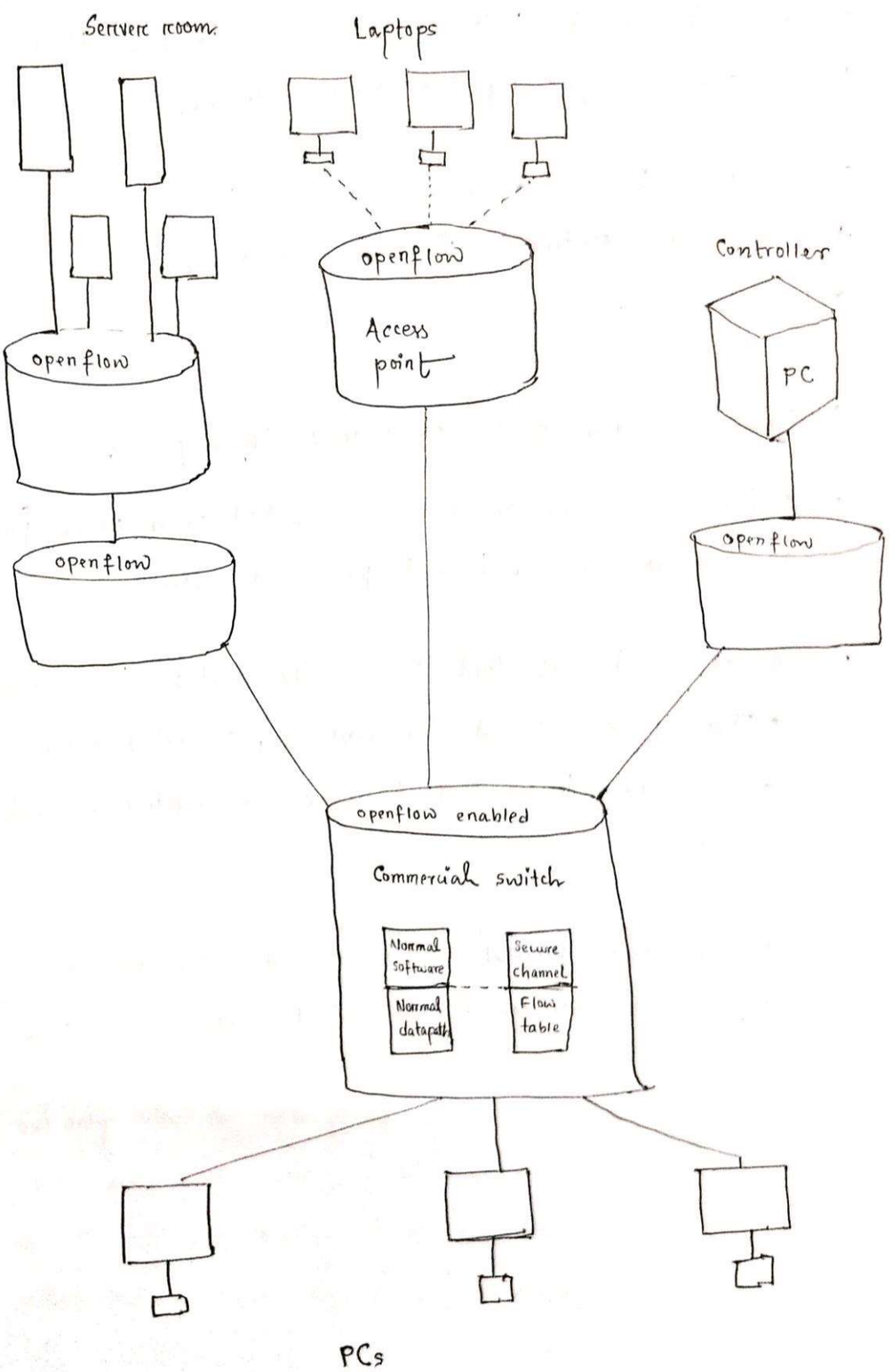
   a) Need for programmable networks

   b) Network Management & Access Control

   c) OpenFlow switch header format

**Solution:**

Q4.



The figure on the previous page shows a network of OpenFlow enabled Commercial Switches and Access Points. All the flow tables are managed by the same controller.

The OpenFlow Protocol allows a switch to be controlled by two or more controllers for increased performance and robustness.

An OpenFlow switch consists of atleast three parts:

① A flow table with an action associated with each flow entry to tell the switch how to process the flows.

② A secure channel that connects the switch to a remote controll process, called the controller, allowing commands and packets to be sent between a controller and the switch.

③ The OpenFlow protocol which provides an open & std way for a controller to communicate with a switch.

<a> Need for programmable Networks:

A high degree of programmable network components will be able to offer scalable and resilient network deployment on the fly without the need of previous network planning, by using network function virtualization and software defined networking. This will result in the availability of open network interfaces, virtualization of network infrastructure.

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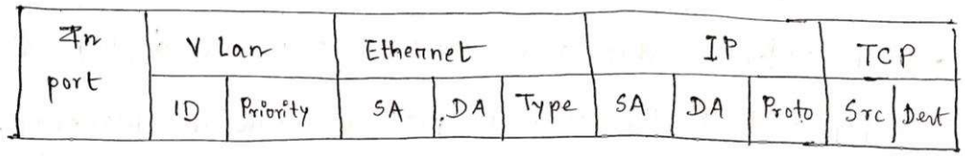
## ⟨b⟩ Network Management & Access Control :

An OpenFlow switch can be thought of as a generalization of Ethane's datapath switch. Ethane used a specific implementation of a controller suited for network management & access control, that manages the admittance and routine flows. The basic idea of Ethane is to allow network managers to define a network-wide policy in the central controller. A controller checks a new flow against a set of rules such as "guests can comment using HTTP, but only via a web proxy". A controller associates packets with their senders by managing bindings between names & address it essentially taking DHCP, DNS & authenticates all users when they are keeping track of which switch port they are connected with.

## ⟨c⟩ OpenFlow switch header format :




| Field | bits | when available |
|---|---|---|
| Ingress port | [Implementation dependent] | All packets |
| Ethernet SA | 48 | All packets on enabled ports |
| Ethernet DA | 48 | All packets on enabled ports |
| Ethernet type | 16 | All packets on enabled ports |
| VLAN ID | 12 | All packets of Ethernet type 0X8100 |

| | | |
|---|---|---|
| VLAN Priority | 3 | All packets of Ethernet type 0X8100 |
| IP SA | 32 | All IP & ARP packets |
| IP PA | 32 | All IP & ARP packets |
| IP Protocol | 8 | All IP & ARP packets & IP over Ethernet |
| TCP SP | 16 | All TCP, UDP & ICMP packets |
| TCP DP | 16 | All TCP, UDP & ICMP packets |