**Questions 2 - Solutions**

1)

Connecting to the Internet basically represents connecting to a different network or a different computer. We communicate with any device in the world over the Internet. And as you know, if we want to communicate with a different network than the one we are in, we definitely need a router.

\*\*\*As a result, we definitely need a router if we want to connect to the internet.

2)

ISPs are companies that enable us to connect to the internet. We rent lines from these companies in order to connect to the internet.

3)

A router is like an exit door of a network. If a packet will go out of the network where it is in, it must pass through the router.

4)

The Internet is a vast network that connects computers and electronic devices all over the world. Through the Internet, people can share information and communicate from anywhere with an Internet connection.

5)

POP is primarily the infrastructure that allows remote users to connect to the Internet.  A POP is generally present at an Internet service provider (ISP) or the telecommunication service provider. It can consist of a router, switches, servers, and other data communication devices. An ISP or telecom provider might maintain more than one POP at different locations, with each catering to a distinct user base.

Point of presence (POP) is the point at which two or more different networks or communication devices build a connection with each other. POP mainly refers to a location or facility that connects to and helps other devices establish a connection with the Internet. A POP is not just one single item, system, or device; it’s a collection of telecommunications technologies and equipment that allows users to access the Internet.

6)

a) As you know, load balancing is a very important concept. Suppose there is only one giant router in the middle of the world. Let this router control the internet of the whole world. Imagine billions of packets going to this router at the same time. It's easy to imagine a lot of load on this router. Instead, we distribute all this load by placing POPs in different parts of the world.

b) In addition to the load balancing problem, if the giant router in the middle of the world somehow breaks down, the whole world's Internet will crash down at the same time. If you remember, we called this problem 'Single Point of Failure'. With the distributed POP structure, 'the single point of failure'-related problems is prevented.

c) Thanks to the distributed POP structure, a very serious cable mess is prevented. Imagine all the devices in the world connecting to the same point. What a mess!!!

7)

ARPANET is the ancestor of the Internet infrastructure you learned in this course. This project aimed to keep computers in the USA communicating with each other in the event of a disaster.

Now consider this idea on the internet, the common network of the whole world. Let's say a meteorite hit the earth and a part of the earth got serious damage from this hit. In other words, POPs in a certain area of the world destroyed. But the internet can continue to work and devices in other parts of the world can continue to communicate with each other. This is the power of distributed structure.

8)

Basically, we can configure almost any network by using switches, access points, and routers. However, these individual devices can be more expensive than necessary. For example, a normal person does not need a 20-port switch. Or a normal person doesn't need a very powerful router that can handle many packets at the same time.

This is where the home-router comes into play. A home-router has both switch, router, and access point features. A home-router is an affordable device and can meet all the needs of a normal person.

9)

So what if we apply the distributed POP structure to a specific point in the middle of the world? (I mean imagine that the internet is controlled by 300 POPs in the middle of the world.)

This is definitely a better solution than the Giant router solution. However, similar problems still persist.

First of all, the giant router design is an already imaginary design. In other words, it is impossible to design a giant, very powerful device to which all electronic devices in the world can be connected. However, an internet structure consisting of many POPs located in a specific part of the world is possible.

If you are aware, the basic logic is to connect the whole world to the internet through a single point and you know what problems this design causes. (Load balancing, single point of failure, cable mess and etc.)

10)

a) Fiber optic is the fastest type of cable.

b) Fiber optic cable is very successful in transmitting data over long distances compared to copper cable. While the probability of data corruption increases as the distance increases in the copper cable, the data is not corrupted in the fiber optic cable even if the distance is too long.

11)

A router looks at the routing table to decide over which path it must send the packet. In short, the routing table is a database storing information related to the best possible routes.

12)

After a router receives a packet, it looks at the routing table and sends it to an appropriate port. This process is called forwarding. The forwarding process is handled entirely within the router. The packet is received on one port and sent to the other port. That's it.