CCA-102: Data Communications

ASSIGNMENT

1. What are the different types of networks?

Types of Computer Networks: A computer network is a cluster of computers over a shared communication path that work for the purpose of sharing resources from one computer to another, provided by or located on the network nodes.

Types of Computer Networks

1. Personal Area Network (PAN)
2. Local Area Network (LAN)
3. Wide Area Network (WAN)
4. Wireless Local Area Network (WLAN)
5. Campus Area Network (CAN)
6. Metropolitan Area Network (MAN)
7. Storage Area Network (SAN)
8. System-Area Network (SAN)
9. Passive Optical Local Area Network (POLAN)
10. Enterprise Private Network (EPN)
11. Virtual Private Network

1. Personal Area Network (PAN):
PAN is the most basic type of computer network. This network is restrained to a single person, that is, communication between the computer devices is centred only to an individual's work space. PAN offers a network range of 10 meters from a person to the device providing communication. Examples of PAN are USB, computer, phone, tablet, printer, PDA, etc.

2. Local Area Network (LAN):
LAN is the most frequently used network. A LAN is a computer network that connects computers together through a common communication path, contained within a limited area, that is, locally. A LAN encompasses two or more computers connected over a server. The two important technologies involved in this network are Ethernet and Wi-fi.
Examples of LAN are networking in a home, school, library, laboratory, college, office, etc.

3. Wide Area Network (WAN):
WAN is a type of computer network that connects computers over a large geographical distance through a shared communication path. It is not restrained to a single location but extends over many locations. WAN can also be defined as a group of local area networks that communicate with each other.
The most common example of WAN is the Internet.

4. Wireless Local Area Network (WLAN):
WLAN is a type of computer network that acts as a local area network but makes use of wireless network technology like Wi-Fi. This network doesn't allow devices communicating over physical cables like in LAN, but allows devices to communicate wirelessly.
The most common example of WLAN is Wi-Fi.

5. Campus Area Network (CAN):
CAN is bigger than a LAN but smaller than a MAN. This is a type of computer network which is usually used in places like a school or college. This network covers a limited geographical area that is, it spreads across several buildings within the campus.
Examples of CAN are networks that cover schools, colleges, buildings, etc.

6. Metropolitan Area Network (MAN):
A MAN is larger than a LAN but smaller than a WAN. This is the type of computer network that connects computers over a geographical distance through a shared communication path over a city, town or metropolitan area.
Examples of MAN are networking in towns, cities, a single large city, large area within multiple buildings, etc.

7. Storage Area Network (SAN):
SAN is a type of computer network that is high speed and connects groups of storage devices to several servers. This network does not depend on LAN or WAN. Instead, a SAN moves the storage resources from the network to its own high-powered network. A SAN provides access to block-level data storage. Examples of SAN are a network of disks accessed by a network of servers.

8. System Area Network (SAN):
A SAN is a type of computer network that connects a cluster of high-performance computers. It is a connection-oriented and high bandwidth network. A SAN is a type of LAN that handles high amounts of information in large requests. This network is useful for processing applications that require high network performance.
Microsoft SQL Server 2005 uses SAN through virtual interface adapter.

9. Passive Optical Local Area Network (POLAN):
A POLAN is a type of computer network which is an alternative to a LAN. POLAN uses optical splitters to split an optical signal from a single strand of single mode optical fibre to multiple signals to distribute users and devices. In short, POLAN is a point to multipoint LAN architecture.

10. Enterprise Private Network (EPN):
EPN is a type of computer network mostly used by businesses that want a secure connection over various locations to share computer resources.

11. Virtual Private Network (VPN):
A VPN is a type of computer network that extends a private network across the internet and lets the user send and receive data as if they were connected to a private network even

though they are not. Through a virtual point to point connection users can access a private network remotely. VPN protects you from malicious sources by operating as a medium that gives you protected network connection.

2. Explain the Shielded twisted pair (STP) and Unshielded twisted pair (UTP)

STP (Shielded twisted pair): A shielded twisted pair is a type of twisted pair cable that contains an extra wrapping foil or copper braid jacket to protect the cable from defects like cuts, losing bandwidth, noise, and signal to the interference. It is a cable that is usually used underground, and therefore it is costly than UTP. It supports the higher data transmission rates across the long distance. We can also say it is a cable with metal sheath or coating that surround each pair of the insulated conductor to protect the wire from external users and prevent electromagnetic noise from penetrating.

Features of Shielded twisted pair cable:

1. **Frequency:** It has higher frequency data transmission as compared to the UTP.
2. **Thickness:** It is a thick shielded twisted pair cable as it contains the wrapping of plastic material to the copper conductor.
3. **Grounding practices:** The uses of shielded twisted pair cable are underground for a longer distance.
4. **Installation** of the shielded wire is more difficult than the UTP (Unshielded twisted pair) cable.

Advantages of the STP cable:

1. It has lower noise and attenuation than UTP.
2. It is shielded with a plastic cover that protects the STP cable from a harsh environment and increases the data transmission rate.
3. It reduces the chances of crosstalk and protects from external interference.
4. A modular connection helps to terminate the connection of the STP cable.

Disadvantages of the STP cable:

1. It is the most expensive wire from UTP cables.
2. It requires more maintenance to reduce the loss of data signals.
3. There is no segment improvement in length despite its thick and heavier connection.
4. It is used only as a grounded wire.

UTP (Unshielded Twisted Pair): UTP is an unshielded twisted pair cable used in computer and telecommunications mediums. Its frequency range is suitable for transmitting both data and voice via a UTP cable. Therefore, it is widely used in the telephone, computers, etc. It is a pair of insulated copper wires twisted together to reduce noise generated by external interference. It is a wire with no additional shielding, like aluminium foil, to protect its data from the exterior.

Advantages of the UTP:

1. It is a less costly and less expensive unshielded wire from another network medium.
2. It is designed to reduce crosstalk, RFI, and EMI.
3. Its size is small, and hence the installation of the UTP is easier.
4. It is mostly useful for short-distance network connections like home and small organizations.
5. It is the most commonly used networking cable in the market. It is considered as faster copper-based data transmission cable.
6. It is suitable for transmitting both data and voice via UTP cable.
7.

Disadvantage of the UTP:

1. It can only be used in length segment up to 100 meters.
2. It has limited bandwidth for transmitting the data.
3. It does not provide a secure connection for data transmitting over the network.

3. What is difference between baseband and broadband transmission?

Difference between Baseband and Broadband

Technology: A baseband transmission is a single, fixed signal that uses the entire available bandwidth and uses the transmission medium as a single-channel device meaning only one station can transmit at a time, and all stations must transmit and receive the same types of signals. A broadband transmission, on the other hand, is a digital electrical transmission in which signals are modulated as radiofrequency analogy waves that use different frequency ranges. Each transmission is assigned a portion of the total allocated bandwidth; therefore, multiple transmissions can be possible at the same time.

Communication: With baseband systems, communication is bi-directional which means the same channel is used to transmit and receive signals and each device shares the same channel. When one node transmits data, all the other nodes on the network must wait until the transmission ends before they can start sending data. Broadband communication, on the other hand, is unidirectional meaning two different channels are needed in order to send and receive signals – one for sending and the other for receiving. Through frequency division multiplexing

(FDM), multiple independent channels can carry analogy or digital information, depending on the interfaces.

Capacity: Baseband implies a single-channel digital system and this single channel carries information in packets or frames specified by the LAN standard in use. Baseband LANs are inexpensive and less complicated. The shielded twisted-pair cable offers more capacity than the twisted-pair baseband, but it's more expensive. The problem with baseband LANs is their limited capacity over a limited distance which is no more than a couple miles. Broadband, on the other hand, LANs span much longer distances than baseband but the broadband systems are generally more expensive because of the additional hardware involved.

Application: The most common and the widely used baseband standard is Ethernet-based wired local area networks, which accounts for about 85% of the installed LAN base. In Ethernet, each device on a network can transmit over the wire, but only one device at a time. The best example of broadband transmission is the cable TV, which carries at least 25 times as much data as a typical baseband system carries. Other applications of broadband technology include radio and telecommunications, computer networks, Internet broadband, etc.

4. What is the difference between a hub, modem, router and a switch?

Device	**Switch**	**Router**	**Modem**	**Hub**
Use	Joins several computers together within one local area network. They cannot join multiple networks, and are incapable of sharing an Internet connection.	Joins multiple area networks (LAN & WAN). Serving as "middle man" or intermediate destinations for network traffic. Using the IP, they forward data to specific destination.	Modems, like routers connect home PCs to the Internet	Connects a network of personal computers together so they can be joined through a central hub.
Function	A home network with a switch must designate one computer as	Creates a home network, where all home computers are	Codes and decodes data so that it can pass between home	Broadcasts data, does not select where the data goes, but rather

	the gateway to the internet. Connects multiple computers together within one local network.	connected equally to the router, where there is no hierarchy in performance.	network and Internet service provider (ISP). Modem brings in the information, while the router distributes it to the devices.	sends it to every destination.
Network	LAN	LAN & WAN		LAN
Sophistication level	Medium	High	High	Low

5. When you move the NIC cards from one PC to another PC, does the MAC address gets transferred as well?

Yes, because MAC address one hard wire into NIC circuity not the PC. This means PC can have different MAC address when another one replaces the NIC card.

6. When troubleshooting computer network problems, what common hardware-related problems can occur?

A large percentage of a network is made up of hardware. Problems in these areas can range from malfunctioning hard drives, broken NICs, and even hardware start-ups

7. In a network that contains two servers and twenty workstations, where is the best place to install an Anti-virus program?

The best solution is to install anti-virus on all the computers in the network.

8. Define Static IP and Dynamic IP? Discuss the difference between IPV4 and IPV6.

Static IP: A static IP address is simply an address that doesn't change. Once your device is assigned a static IP address, that number typically stays the same until the device is decommissioned or your network architecture changes. Static IP addresses generally are used by servers or other important equipment.

Dynamic IP: As the name suggests, dynamic IP addresses are subject to change, sometimes at a moment's notice. Dynamic addresses are assigned, as needed, by Dynamic Host Configuration Protocol (DHCP) servers.

We use dynamic addresses because IPv4 doesn't provide enough static IP addresses to go around. So, for example, a hotel probably has a static IP address, but each individual device within its rooms would have a dynamic IP address.

Difference between IPV4 and IPV6.

IPv4 (Internet Protocol Version 4)	**IPv6 (Internet Protocol Version 6)**
Encryption and authentication is not provided in IPv4 (Internet Protocol Version 4).	Encryption and authentication is provided in IPv6 (Internet Protocol Version 6)
Header of IPv4 is 20 – 60 bytes.	Header of IPv6 is fixed at 40 bytes
Checksum field is available in IPv4.	Checksum field is not available in IPv6.
Packet flow identification is not available in IPv4 (Internet Protocol Version 4).	Packet flow identification is not available in IPv4 (Internet Protocol Version 4).
IPv4 addresses are usually represented in dot-decimal notation, consisting of four decimal numbers, each ranging from 0 to 255, separated by dots.	An IPv6 address is represented as eight groups of four hexadecimal digits, each group representing 16 bits.

9. Discuss TCP/IP model in detail.

TCP/IP Model helps you to determine how a specific computer should be connected to the internet and how data should be transmitted between them. It helps you to create a virtual network when multiple computer networks are connected together. The purpose of TCP/IP model is to allow communication over large distances.

TCP/IP stands for Transmission Control Protocol/ Internet Protocol. TCP/IP Stack is specifically designed as a model to offer highly reliable and end-to-end byte stream over an unreliable internetwork.

TCP Characteristics

Here, are the essential characteristics of TCP IP protocol:

- Support for a flexible TCP/IP architecture
- Adding more system to a network is easy.
- In TCP IP protocols suite, the network remains intact until the source, and destination machines were functioning properly.
- TCP is a connection-oriented protocol.
- TCP offers reliability and ensures that data which arrives out of sequence should put back into order.
- TCP allows you to implement flow control, so sender never overpowers a receiver with data.

Four Layers of TCP/IP model

Application Layer

Application layer interacts with an application program, which is the highest level of OSI model. The application layer is the OSI layer, which is closest to the end-user. It means the OSI application layer allows users to interact with other software application.

Application layer interacts with software applications to implement a communicating component. The interpretation of data by the application program is always outside the scope of the OSI model.

Example of the application layer is an application such as file transfer, email, remote login, etc.

Transport Layer

Transport layer builds on the network layer in order to provide data transport from a process on a source system machine to a process on a destination system. It is hosted using single or multiple networks, and also maintains the quality-of-service functions.

It determines how much data should be sent where and at what rate. This layer builds on the message which are received from the application layer. It helps ensure that data units are delivered error-free and in sequence. Transport layer helps you to control the reliability of a link through flow control, error control, and segmentation or de-segmentation. The transport layer also offers an acknowledgment of the successful data transmission and sends the next data in case no errors occurred. TCP is the best-known example of the transport layer.

Internet Layer

An internet layer is a second layer of TCP/IP lays of the TCP/IP model. It is also known as a network layer. The main work of this layer is to send the packets from any network, and any computer still they reach the destination irrespective of the route they take.

The Internet layer offers the functional and procedural method for transferring variable length data sequences from one node to another with the help of various networks.

Message delivery at the network layer does not give any guaranteed to be reliable network layer protocol.

The Network Interface Layer

Network Interface Layer is this layer of the four-layer TCP/IP model. This layer is also called a network access layer. It helps you to defines details of how data should be sent using the network.

It also includes how bits should optically be signalled by hardware devices which directly interfaces with a network medium, like coaxial, optical, coaxial, fibre, or twisted-pair cables.

A network layer is a combination of the data line and defined in the article of OSI reference model. This layer defines how the data should be sent physically through the network. This layer is responsible for the transmission of the data between two devices on the same network.

Advantages of the TCP/IP model

Here, are pros/benefits of using the TCP/IP model:

- It helps you to establish/set up a connection between different types of computers.
- It operates independently of the operating system.
- It supports many routing-protocols.
- It enables the internetworking between the organizations.
- TCP/IP model has a highly scalable client-server architecture.
- It can be operated independently.
- Supports a number of routing protocols.
- It can be used to establish a connection between two computers.

Disadvantages of the TCP/IP model

Here, are few drawbacks of using the TCP/IP model:

- TCP/IP is a complicated model to set up and manage.
- The shallow/overhead of TCP/IP is higher-than IPX (Internetwork Packet Exchange).
- In this, model the transport layer does not guarantee delivery of packets.
- Replacing protocol in TCP/IP is not easy.
- It has no clear separation from its services, interfaces, and protocols.

10. What is a Web Browser (Browser)? Give some examples of browsers.

"A web browser, or simply 'browser,' is an application used to access and view websites. The primary function of a web browser is to render HTML, the code used to design or 'mark up' webpages".

Example: Common web browsers include Microsoft Edge, Internet Explorer, Google Chrome, Mozilla Firefox, and Apple Safari.

11. What is a search engine? Give example.

A search engine is a web-based tool that enables users to locate information on the World Wide Web. Search engines utilize automated software applications (referred to as robots, bots, or spiders) that travel along the Web, following links from page to page, site to site. The information gathered by the spiders is used to create a searchable index of the Web.

Examples: Google, Yahoo!, and MSN Search

12. What is the Internet & WWW? What are the uses of internet in our daily life?

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

WWW: The World Wide Web (WWW) The World Wide Web, commonly referred to as the Web, is a system of interlinked, hypertext documents accessed through the Internet. It enables the retrieval and display of text and media to your computer.

Uses of Internet in daily life: A few of the Internet's major uses are e-commerce, e-learning, knowledge sharing, social connectivity, variety of media, file transfer, communication, etc.

13. What is an Internet Service Provider? Give some examples of ISP in India.

Internet service provider: Internet service provider (ISP), company that provides Internet connections and services to individuals and organizations. In addition to providing access to the Internet, ISPs may also provide software packages (such as browsers), e-mail accounts, and a personal Web site or home page.

Examples of ISP in India

- MTNL
- Bharti Airtel
- Hathway Cable
- Tata Communications
- You Telecom

- Reliance Communications
- Sify Broadband

14. Discuss the difference between MAC address, IP address and Port address.

MAC ADDRESS	IP ADDRESS	PORT ADDRESS
Layer of two address	Layer of three address	Port address is described as numbers
It can't be change	It can be change at any time	Post address is most of 16 bites
It is called as physical address	It is called as logical address	IT is identified as applicator in user computer
Hardcoded into device at manufacturing	Assigned to device through software configuration	Port number is facilitated by the OS
It is media access control address	It is internet protocol address	All TCP ports can be viewed by applying the command "restart"

15. How do we view my Internet browser's history?

1. Open the Google Chrome Internet browser.
2. In the upper-right corner of the screen, tap the. icon.
3. In the drop-down menu that appears, select History and shown in the image.
4. The page that opens contains your device's history.