

CCA -102: Data Communications

Assignment

Answers:

1. The different types of networks -

i) Personal Area Network (PAN) - The smallest and most basic type of network, a PAN is made up of a wireless modem, a computer or two, phones, printers, tablets, etc and revolves around one person in one building. These types of networks are typically found in small offices or residences, and are managed by one person or organization from a single device.

ii) Local Area Network (LAN) - LANs are the most frequently discussed networks, one of the most common, one of the most original and one of the most simplest types of networks. LANs connect groups of computers and low-voltage devices together across short distances (within a building or between a group of two or three, buildings a group of two or four in close

proximity to each other) to share information and resources. Enterprises typically manage and maintain LANs.

Using routers, LANs can connect to wide area networks (WANs, explained below) to rapidly and safely transfer data.

iii) Wireless Local Area Network (WLAN) - Functioning like LAN, WLANs make use of wireless network technology, such as Wi-Fi. Typically seen in the same types of applications as LANs, these types of networks don't require that devices rely on physical cables to connect to the network.

iv) Campus Area Network (CAN) - Larger than LANs, but smaller than metropolitan area networks (MANs), these types of networks are typically seen in universities, large K-12 school districts or small businesses. They can be spread across several buildings that are fairly close to each other so users can share resources.

v) Metropolitan Area Network (MAN) - These types of networks are larger than LANs but smaller than WANs and incorporate elements from both types of networks. MANs span an entire

geographic area (typically a town or city, but sometimes a campus). Ownership and maintenance is handled by either a single person or company (a local council, a large company, etc).

v) Wide Area Network (WAN) - WAN connects computers together across longer physical distances. This allows computers and low-voltage devices to be remotely connected to each other over one large network to communicate even when they are miles apart.

The internet is the most basic example of WAN, connecting all computers together around the world. Because of a WAN's vast reach, it is typically owned and maintained by multiple administrators or the public.

vi) Storage - Area Network (SAN) - As a dedicated high-speed network that connects shared pools of storage devices to several servers, these types of networks do not rely on a LAN or WAN. Instead, they move storage resources away from the network and place them into their own high-performance network. SANs can be accessed in the same fashion as a drive attached

to a server. Types of storage - area networks include converged, virtual and unified SANs.

VIII) System - Area Network (also known as SAN) - This term is fairly new within the past two decades. It is used to explain a relatively local network that is designed to provide high-speed connection in server-to-server applications (cluster environments), storage area networks (called "SANs" as well) and processor-to-processor applications. The computers connected on a SAN operate as a single system at very high speeds.

IX) Passive Optical Local Area Network (POLAN) - As an alternative to traditional switch-based Ethernet, LANs, POLAN technology can be integrated into structured cabling to overcome concerns about supporting traditional Ethernet protocols and network applications such as PoE (Power over Ethernet). A point-to-multipoint LAN architecture, POLAN uses optical splitters to split an optical signal from one strand of single mode optical fiber into multiple signals to serve users and devices.

X) Enterprise Private Network (EPN) - These types of networks are built and owned by businesses

that want to securely connect its various locations to share computer resources.

XII) Virtual Private Network (VPN) - By extending a private network across the Internet, a VPN lets its users send and receive data as if their devices were connected to the private network - even if they are not. Through a virtual point-to-point connection, users can access a private network remotely.

20. Shield Twisted Pair (STP) - Shield twisted pair (STP) cable was originally designed by IBM for token ring networks that include two individual wires covered with a foil shielding, which prevents electromagnetic interference, thereby transferring data faster.

STP is similar to unshielding twisted pair (UTP), however, it contains an extra foil wrapping or copper braid jacket to help shield the cable signals from interference. STP cables are costlier when compared to UTP, but has the advantage of being capable to supporting higher transmission rates across longer distances. The additional covering in STP cable stops electromagnetic

interference from leaking out of or into the cable.

STP cables are often used in Ethernet networks, particularly fast-data-rate Ethernets. The effectiveness of the additional covering varies according to the substance used for the shielding, such as:

- Frequency
- Thickness
- Type of electromagnetic noise field.
- Distance from the shield to the noise source.
- Shield discontinuity.
- Grounding practices.

Some STP cabling make use of a thick copper braided shield which makes the cable thicker, heavier, and in turn much more difficult for installation as compared to the UTP cables.

The other usual STP cables, often called foil twisted-pair cables or screened twisted-pair cables, make use of just a thinner outer foil shield. These cables are thin and more affordable versus the braided STP cable, but they are very difficult to install. Except in cases where the maximum pulling tension and minimum bend radius are strictly observed, these

thinner cables may be torn during the installation process.

Furthermore, STP cables have some other drawbacks. STP cables function by drawing external interference to the shield, then getting rid of it into a grounded cable. If the ground cable is not properly grounded, STP's noise-cancelling functionality can be seriously compromised.

Unshield Twisted Pair (UTP) - UTP cable is the most general type of telecommunication medium which is mostly used. Although most familiar from its use in telephone system, its frequency range is suitable for transmitting both data and voice. A twisted pair consists of two conductors, generally copper, each with its own coloured plastic insulation. The plastic insulation is colour-banded for identifications, colours are used both to identify the specific conductors in a cable end to indicate which wires belong in pairs and how they relate to other pairs in a large bundle.

A twisted pair consists of two conductors each surrounded by an insulating material.

The advantage of unshield twisted pair -

- Its cost and ease of use.
- UTP is cheap.
- It is flexible and easy to install.
- Higher grades of UTP are used in many LAN technologies including Ethernet and Token Ring.

3. Both base band and broad band describe how data is transmitted between two nodes.

Base band technology transmits a single data signal / stream / channel at a time while broadband technology transmits multiple data / signals / streams / channels simultaneously at the same time.

Baseband technology uses digital signals in data transmission. It sends binary values directly as pulses of different voltage levels. Digital signals can be regenerated using repeaters in order to travel longer distances before weakening and becoming unusable because of attenuation.

Baseband supports bidirectional communication. It means, this technology can send and receive data simultaneously. To support bidirectional communication, this technology uses two separate electric circuits.

together, one for sending and another for receiving. Although baseband transmits only a single data stream at a time, it is possible to transmit signals of multiple nodes simultaneously. This is done by combining all the signals into a single data stream. To combine the signals of multiple nodes, a technology known as multiplexing is used. Baseband supports the Time Division

Multiplexing (TDM).

Baseband technology is mainly used in Ethernet networks to exchange data between nodes. This technology can be used on all three popular cable media types of Ethernet, coaxial, twisted-pair, fiber-optic.

Broadband technology uses analog signals in data transmission. This technology uses a special analog wave known as the carrier wave. A carrier wave does not contain any data but contains all properties of the analog signal. This technology mixes data / digital signal / binary values into the carrier wave and sends the carrier wave across the channel / medium.

To transmit data of multiple nodes simulta-

neously, this technology supports the Frequency Division Multiplexing (FDM). FDM divides the channel into several sub channels and assigns a sub-channel to each node. Each sub-channel can carry a separate carrier wave.

Analog signals can be regenerated using amplifiers in order to travel longer distances.

Broadband supports only unidirectional communication. It means, nodes connected at both ends of a medium can send or receive data but cannot perform both actions simultaneously. Only one action is allowed at a time.

Broadband is typically used in an environment that transmits audio, video and data simultaneously.

For example, cable TV, Networks, Radio stations and Telephone companies. Usually radio waves, coaxial, fiber-optic cables are used for broadband transmission.

Baseband transmission	Broadband transmission
• It transmit digital signals.	• It transmit analog signals.

- | | |
|--|---|
| <ul style="list-style-type: none"> • To boost signal strength, use repeaters. • Can transmit only a single data stream at a time. • Support bidirectional communication simultaneously. • Support TDM based multiplexing. • Use coaxial, twisted-pair, and fiber-optic cables. • Mainly used in Ethernet LAN networks. | <ul style="list-style-type: none"> • To boost signal strength, use amplifiers. • Can transmit multiple signal waves at a time. • Support unidirectional communication only. • Support FDM based multiplexing. • Use radio waves, coaxial cables, and fiber optic cables. • Mainly used in cable and telephone networks. |
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4 Hub - A hub is a common connection point, also known as a network hub, which is used for connection of devices in a network. It works as a central connection for all the devices that are connected through a hub. The hub has numerous ports. If a packet reaches at one port, it is able to see by all the segments of the network due to a packet is copied to the other ports. A network hub has

no routing tables or intelligence, which is used to send information and broadcast all network data across each and every connection.

Modem - Modem is short for "Modulator - Demodulator". It is a hardware component that allows a computer or another device, such as a router or switch, to connect to the Internet. It converts or "modulates" an analog signal from a telephone or cable wire to digital data that a computer can recognize. Similarly, it converts digital data from a computer or other device into an analog signal that can be sent over standard telephone lines.

Modern modems are typically DSL or cable modems, which are considered "broad band" devices. DSL modems operate over standard telephone lines, but use a wider frequency range. Modem converts analog signals to digital and vice versa, it may be considered an ADC or DAC. Modems are not needed for fiber optic connections because the signals are transmitted digitally from beginning to end.

Router - This is a hardware device that routes data from a local area network

to another network connection. A router acts like a coin sorting machine, allowing only authorized machines to connect to other computer systems. Most routers are also keep log files about the local network activity.

Routers perform the traffic directing functions on the Internet. Data sent through the internet, such as a web page or email, is in the form of data packets. A packet is typically forwarded from one router to another router through the networks that constitute an internetwork until it reaches its destination node. It is connected to two or more data lines from different IP networks.

Switch - A switch is used to network multiple computers together. Switches made are more advanced than hubs and less capable than routers. Switches can limit the traffic to and from each port so that each device connected to the switch has a sufficient amount of bandwidth. For this reason, we can think of a switch as a smart hub. However, switches don't provide the firewall and logging capabilities that routers do. The ^{high-end} ~~low~~ switch can also be

having more than 50 ports and often one rack mounted.

5. Yes, when we move the NIC cards from one PC to another PC, the MAC address gets transferred as well because MAC address are hard-wired into the NIC circuitry, not the PC. This also means that a PC can have a different MAC address when one replaced the NIC card.

6. 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 startups. Incorrect hardware configuration is also one of those culprits to look into.

7. An anti-virus program must be installed on all servers and workstations to ensure protection. That is because individual users can access any workstation and introduce a computer virus when plugging in their removal hard drives or flash drives.

8. Static IP - A static IP is an IP address that is fixed, meaning that it never changes. If we are connected to an internet connection that is 'always on' most likely we have a static IP address, although some of the 'always on' connections used dynamic IP. Our internet service provider assigns a public IP address to our router while our router assigns internal IP address to connecting devices.

Dynamic IP - A dynamic IP address is one that changes from time to time and isn't always the same. If we have a residential cable or DSL service, we are most likely to have a dynamic IP address. Internet Service Providers provide customers with dynamic IP address because they are more cost effective. Dynamic IP address can make it tricky to remotely access our PC, DVR or Webcam because it would change after few minutes.

IPv4 is a 32 bit (4 bytes) and IPv6 is a 128 bits.

9. TCP/IP reference model is a four-layered suite of communication protocols. It was developed by the DoD (Department of Defence) in the 1960s. It is named after the two main pro-

protocols that are used in the model, namely, TCP and IP. TCP stands for Transmission Control Protocol and IP stands for Internet Protocol.

The four layers in the TCP/IP protocol suite are -

- Host-to-Network layer - It is the lowest layer that is concerned with the physical transmission of data. TCP/IP does not specifically define any protocol here but supports all the standard protocols.
- Internet layer - It defines the protocols for logical transmission of data over the network. The main protocol in this layer is Internet Protocol and it is supported by the protocols ICMP, IGMP, RARP and ARP.
- Transport layer - It is responsible for error-free end-to-end delivery of data. The protocols defined here are Transmission Control Protocol (TCP) and User Datagram Protocol (UDP).
- Application layer - This is the topmost layer and defines the interface of host programs with the transport layer services. This layer includes all high-level protocols like Telnet, DNS, HTTP, FTP, SMTP, etc.

10. A web browser is an application software for accessing the World Wide Web. When a user requests a web page from a particular website, the web browser retrieves the necessary content from a web server and then displays the page on the user's device.

The most popular web browsers are Google Chrome, Microsoft Edge (formerly Internet Explorer), Mozilla Firefox, and Apple's Safari.

11. A search engine is an information retrieval system designed to help find information stored on a computer system. The search results are usually presented in a list and are commonly called hits. Search engines help to minimize the time required to find information and the amount of information which must be consulted, akin to other techniques for managing information overload.

Example - Google, Yahoo, Bing, Baidu and DuckDuck Go are popular search engines. Google is one of the most used search engines world wide that is used with the Chrome browser.

12. Internet is a global ^{wide area} network that connects computer systems across the world. It includes several high-bandwidth data lines that comprise the Internet "backbone". These lines are connected

to major Internet hubs that distribute data to other locations, such as web servers and IPs. At present, internet is the fastest mean of sending or exchanging information and data between computers across the world.

World Wide Web is commonly referred to as WWW, W3 or the Web is an interconnected system of public web pages accessible through the Internet. The World Wide Web is not synonymous with the Internet, which pre-dated the Web in some form by over two decades and upon which technologies the Web is built.

Internet plays a vital role in our daily life. Some of the uses are -

- Uses of Internet in students daily life - Students have a free platform to learn through their lifetime. Using the internet to learn new skills and even acquire degrees in professional online courses. Similarly, educators are using the internet for teaching and sharing knowledge with the world.
- Uses of Internet to increase the speed of daily task - The internet has made human life so much easier, now that biggest and toughest tasks are done in minutes. No matter it is a simple email,

for application, register, money transfer it is much easier by the use of the Internet in life.

- Use of the Internet for research and development.
- Use of the Internet provide us quick and free communication.

13. An Internet service provider (ISP) is an organization that provides a myriad of services for accessing, using, or participating in the Internet. Internet service providers can be organized in various forms, such as commercial, community-owned, non-profit, or otherwise privately owned.

The examples of some internet service providers in India are - Reliance Jio, Airtel, Vodafone Idea, BSNL, ACT Fibernet, APSEF, MTNL, Excitel, Hathway, Yau Broadband, GTPL Broadband.

15. To view my Internet browser's history -

1. In Internet Explorer, select the Favorites button.
2. Select the History tab, and choose how we want to view our history by selecting a filter from the menu.
3. Click a result to open or expand it.