CCA-102: Data Communications

ASSIGNMENT

Question-1What are the different types of networks?

Answer: There are 11 Types of Networks in Use Today

1. 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.

2. Local Area Network (LAN)

We're confident that you've heard of these types of networks before – LANs are the most frequently discussed networks, one of the most common, one of the most original and one of the 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 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.

3. Wireless Local Area Network (WLAN)

Functioning like a 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.

4. Campus Area Network (CAN)

Larger than LANs, but smaller than metropolitan area networks (MANs, explained below), 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.

5. 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 campus).

Ownership and maintenance is handled by either a single person or company (a local council, a large company, etc.).

6. Wide Area Network (WAN)

Slightly more complex than a LAN, a 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're miles apart.

The Internet is the most basic example of a 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.

7. Storage-Area Network (SAN)

As a dedicated high-speed network that connects shared pools of storage devices to several servers, these types of networks don't 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.

8. 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.

9. 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 singlemode optical fiber into multiple signals to serve users and devices.

10. 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.

11. 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're not. Through a virtual point-to-point connection, users can access a private network remotely.If you have questions about which type of network is right for your organization, or want to learn more about Belden's network solutions that improve uptime, maintain security, and help improve user access, click here.

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

Answer: **Unshielded Twisted Pair (UTP)**

Unshielded Twisted Pair or UTP are twisted pair cables and are used to transmit both data and voice as their frequency range is suitable for transmission. UTPs are more cost effective and are not needed to be grounded.

Shielded Twisted Pair (STP)

Shielded Twisted Pair or STP are also a twisted pair cables but are required to be grounded, wants more maintenance, have high data trasmission capacity and are more costly then UTP.

Following are some of the important differences between Unshielded Twisted Pair (UTP) and Abstract Classes in Scala.

Question-3 What is difference between baseband and broadband transmission?

Answer: **Baseband**

Baseband transmissions typically use digital signaling over a single wire; the transmissions themselves take the form of either electrical pulses or light. The digital signal used in baseband transmission occupies the entire bandwidth of the network media to transmit a single data signal. Baseband communication is bidirectional, allowing computers to both send and receive data using a single cable. However, the sending and receiving cannot occur on the same wire at the same time.

Ethernet networks use baseband transmissions; notice the word "base"—for example, 10BaseT or 10BaseFL.

Using baseband transmissions, it is possible to transmit multiple signals on a single cable by using a process known as *multiplexing*. Baseband uses Time-Division Multiplexing (TDM), which divides a single channel into time slots. The key thing about TDM is that it doesn't change how baseband transmission works, only the way data is placed on the cable.

Broadband

Whereas baseband uses digital signaling, broadband uses analog signals in the form of optical or electromagnetic waves over multiple transmission frequencies. For signals to be both sent and received, the transmission media must be split into two channels. Alternatively, two cables can be used: one to send and one to receive transmissions.

Multiple channels are created in a broadband system by using a multiplexing technique known as *Frequency-Division Multiplexing (FDM)*. FDM allows broadband media to accommodate traffic going in different directions on a single media at the same time

Key differences between baseband and broadband transmissions

Baseband transmission	Broadband transmission
Transmit digital signals	Transmit analog signals
To boost signal strength, use repeaters	To boost signal strength, use amplifiers
Can transmit only a single data stream at a time	Can transmit multiple signal waves at a time
Support bidirectional communication simultaneously	Support unidirectional communication only
Support TDM based multiplexing	Support FDM based multiplexing
Use coaxial, twisted-pair, and fiber-optic cables	Use radio waves, coaxial cables, and fiber optic cables
Mainly used in Ethernet LAN networks	Mainly used in cable and telephone networks

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

Answer:

Hub

Hub is commonly used to connect segments of a LAN (Local Area Network). A hub contains multiple ports. When a packet arrives at one port, it is copied to the other ports so that all segments of the LAN can see all packets. Hub acts as a common connection point for devices in a network.

Switch

A switch operates at the data link layer (layer 2) and sometimes the network layer (layer 3) of the OSI (Open Systems Interconnection) Reference Model and therefore support any packet protocol. LANs that use switches to join segments are called switched LANs or, in the case of Ethernet networks, switched Ethernet LANs. In networks, the switch is the device that filters and forwards packets between LAN segments. See more information on Network Switch and Selection Suggestions.

Router

A router is connected to at least two networks, commonly two LANs or WANs (Wide Area Networks) or a LAN and its ISP.s (Internet Service Provider.s) network. The router is generally located at gateways, the

places where two or more networks connect. Using headers and forwarding tables, router determines the best path to forward the packets. In addition, router uses protocols such as ICMP (Internet Control Message Protocol) to communicate with each other and configures the best route between any two hosts. In a word, router forwards data packets along with networks.

Modem

A **modem** is a hardware device that converts data from a digital format, intended for communication directly between devices with specialized wiring, into one suitable for a transmission medium such as telephone lines or radio. A modem modulates one or more carrier wave signals to encode digital information for transmission, and demodulates signals to decode the transmitted information. The goal is to produce a signal that can be transmitted easily and decoded reliably to reproduce the original digital data.

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

Answer: **Yes**, that's because **MAC addresses** are hard-wired into the **NIC** circuitry, not the **PC**. This also means that **a PC can** have **a different MAC address** when **another one** replaced the **NIC card**

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

Answer: **Static IP Addresses**

A static IP address is an IP address that always stays the same. If you have a web server, FTP server, or other Internet resource that must have an address that cannot change, you can get a static IP address from your ISP. A static IP address is usually more expensive than a dynamic IP address, and some ISPs do not supply static IP addresses. You must configure a static IP address manually.

Dynamic IP Addresses

A dynamic IP address is an IP address that an ISP lets you use temporarily. If a dynamic address is not in use, it can be automatically assigned to a different device. Dynamic IP addresses are assigned using either DHCP or PPPoE.

Difference Between IPv4 and IPv6:

IPV4	IPV6

IPV4	IPV6
• IPv4 has 32-bit address length	• IPv6 has 128-bit address length
• It Supports Manual and DHCP address configuration	• It supports Auto and renumbering address configuration
• In IPv4 end to end connection integrity is Unachievable	• In IPv6 end to end connection integrity is Achievable
• Address representation of IPv4 is in decimal	• Address Representation of IPv6 is in hexadecimal
• Fragmentation performed by Sender and forwarding routers	• In IPv6 fragmentation performed only by sender
• In IPv4 checksumfield is available	• In IPv6 checksumfield is not available
• It has broadcast Message Transmission Scheme	• In IPv6 multicast and any cast message transmission scheme is available
• In IPv4 Encryption and Authentication facility not provided	• In IPv6 Encryption and Authentication are provided
• IPv4 has header of 20-60 bytes.	• IPv6 has header of 40 bytes fixed

Question-9 Discuss TCP/IP model in detail.

Answer: 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 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 (IP) 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.

Question-10What is a Web Browser (Browser)? Give some example of browsers.

Answer: A **web browser** (commonly referred to as a **browser**) is a software application for accessing information on 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.

A web browser is not the same thing as a search engine, though the two are often confused.[1][2] For a user, a search engine is just a website that provides links to other websites. However, to connect to a website's server and display its web pages, a user must have a web browser installed.[3]

Web browsers are used on a range of devices, including desktops, laptops, tablets, and smartphones. In 2020, an estimated 4.9 billion people use a browser, with more than half of them in Asia.[4] The most used browser is Google Chrome, with a 66% global market share on all devices, followed by Safari with 17%.[5] Other notable browsers include Firefox and Microsoft Edge.

- Some examples of browser:-

- **Apple Safari**.
- Dolphin browser.
- **Google Chrome**.
- Microsoft Edge.
- **Mozilla Firefox**.
- **Opera** Mobile.
- Samsung Internet.
- UC Browser.

Question-11What is a search engine? Give example.

Answer: A search engine is a web based tool that is used by people to locate information on the internet. Some of the most popular examples of search engines are Google, Bing, Yahoo!, & MSN Search.

Google is the most used search engine worldwide with a 92 percent market share in mid-2019. Google may be one of the most popular search engines but there are many more alternative search engines available for users.

Top Search Engines alternative to Google

1. Bing
2. DuckDuckGo
3. Wiki.com
4. Ecosia
5. Yahoo!
6. Swisscows
7. CC Search
8. Gibiru
9. Qwant
10. Yandex

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

Answer: **Internet-**The internet is a global network of computers that works much like the postal system, only at sub-second speeds. Just as the postal service enables people to send one another envelopes containing messages, the internet enables computers to send one another small packets of digital data.

World wide web(www)- The **World Wide Web** (**WWW**), commonly known as **the Web**, is an information system where documents and other web resources are identified by Uniform Resource Locators (URLs, such as https://example.com/), which may be interlinked by hypertext, and are accessible over the Internet.[1][2] The resources of the Web are transferred via the Hypertext Transfer Protocol (HTTP), may be accessed by users by a software application called a *web browser*, and are published by a software application called a *web server.* The World Wide Web is not synonymous with the Internet, which pre-existed the Web in some form by over two decades and upon whose technologies the Web is built.

There are many uses of the internet, however, the use of the internet in our daily life depends on individual requirements and goals.

- **Uses** of the **Internet** in Education. ...
- **Internet** Use to Speed Up **Daily** Tasks. ...

- Use of the **Internet** for Shopping. ...
- **Internet** for Research & Development. ...
- Digital Transactions. ...
- Money Management

Question-13 What is an Internet Service Provider? Give some example of ISP in India.

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

Internet services typically provided by ISPs can include Internet access, Internet transit, domain name registration, web hosting, Usenet service, and colocation.

An ISP typically serves as the access point or the gateway that provides a user, access to everything available on the Internet.

- Some example of ISP in india are:-
  - Reliance Jio
  - Airtel
  - BSNL
  - V! (Vodafone & idea)
  - ACT Fibernet
  - MTNL

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

Answer:

BASIS FOR COMPARISON	MAC	IP
Full Form	Media Access Control Address.	Internet Protocol Address.
Purpose	It identifies the physical address of a computer on the internet.	It identifies connection of a computer on the internet.
Bits	It is 48 bits (6 bytes) hexadecimal	IPv4 is a 32-bit (4 bytes) address, and

BASIS FOR COMPARISON	MAC	IP
	address.	IPv6 is a 128-bits (16 bytes) address.
Address	MAC address is assigned by the manufacturer of NIC card.	IP address is assigned by the network administrator or Internet Service Provider.
Retrieve Address	ARP protocol can retrieve MAC address of a device.	RARP protocol can retrieve IP address of a device.

- **Difference between IP address and Port Number :**

SERIAL NO	IP ADDRESS	PORT NUMBER
01.	Internet Protocol address (IP address) used to identify a host in network.	Port number is used to identify an processes/services on your system
02.	IPv4 is of 32 bits (4 bytes) size and for IPv6 is 128 bits (16 bytes).	The Port number is 16 bits numbers.
03.	IP address is the address of the layer-3 IP protocol.	Port number is the address of the layer-4 protocols.
04.	IP address is provided by admin	Port number for application is provided

	of system or network administrator.	by kernel of Operating System.
05.	ipconfig command can be used to find IP address .	netstat command can be used to find Network Statistics Including Available TCP Ports.
06.	IP address identify a host/computer on a computer network.	Port numbers are logical interfaces used by communication protocols.
07.	192.168.0.2, 172.16.0.2 are some of IP address examples.	80 for HTTP, 123 for NTP, 67 and 68 for DHCP traffic, 22 for SSH etc.

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

Answer: To **view the** web **history** in Google Chrome, click to open **the** menu ⋮ at **the** top-right of its window and select **History**, then click **History** a second time. Or press Ctrl+H on your keyboard. This shows **the** web **history** as a list of pages, organised by time and date, in **the** current tab