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#### **Computer Network**

A computer network is a collection of two or more computers, which are connected together to share information and resources.

The computers may be connected via any data communication link, like wires, cables, satellite links and other communication media.



#### **Type of Computer Network** Annpus, Hospital, Offices I. LAN: Local Area Network 100km, 1 000km (Country, Continent) 2. WAN : Wide Area Network -3. MAN: Metropolitan Area Network 10m, 100m, 1km (Room, Duilding, Campus) 4. PAN: Personal Area Network Square meter (Around person) Buretooth. Airdrop. 10m - 20m

WAN

MAN

10km (City)

LAN

PAN



#### **Network Devices**

Repeater
Hub
Router
Modem
Switch



- A repeater in a network is a device that receives a signal and retransmits it at a higher power level or to the other side of an obstruction, so that the signal can cover longer distances.
- Its primary function is to extend the range of a network by amplifying or regenerating the signal, ensuring that data can travel further without degradation.

• A switch is a networking device that connects multiple devices within a local area network (LAN) and uses MAC addresses to forward data to the correct destination. required destination

Switch

 Switches are essential for creating efficient, highperformance networks.

Media Access Control Adress







- Hub is like a repeater with multiple ports used to connect the network channels.
- It acts as a centralized connection to several computers with the central node or server.
- When a hub receives a packet of data at one of its ports from a network channel, it transmits the packet to all of its ports to all other network channel.



### Modem = Modulator + Demodulator

- Modem is a device that converts digital signal to analog signal (modulator) at the sender's site and converts back analog signal to digital signal (demodulator) at the receiver's end, in order make communication possible via telephone lines.
- A MODEM is always placed between a telephone line analog signalo. and a computer.

Modem

#### Router -> route

 A router is a networking device that forwards data packets between computer networks. It operates at the network layer (Layer 3) of the OSI model and is a key component in connecting multiple networks, such as a home network to the internet. Routers are intelligent devices that use routing tables and algorithms to determine the best path for data to travel from the source to the destination.



#### **Router vs. Other Networking Devices:**

#### **Router vs. Switch:**

A switch operates at the data link layer (Layer 2) and connects devices within the same network, using MAC addresses to forward data.

A router connects different networks and uses IP addresses to forward data between them.

#### **Router vs. Hub:**

A hub is a simple device that broadcasts data to all devices on a network, operating at the physical layer (Layer 1).

A router is intelligent and directs data specifically to the intended destination.

#### **Router vs. Modem:**

A modem connects a network to the internet by converting digital data to analog signals (and vice versa) for transmission over telephone or cable lines.

A router directs traffic between devices on the network and the modem.



#### **RJ45 Connector**

- An RJ45 connector (Registered Jack 45) is a standardized physical interface used for connecting network cables, primarily in Ethernet networks.
- It is the most common type of connector used for wired networking and is typically found at the ends of Ethernet cables.
- Types: Cat5, Cat5e, Cat6, Cat6a, and Cat7 cables
- The RJ45 connector is used to connect devices like computers, routers, switches, and modems to a local area network (LAN).





### **Network Topology**



- The term 'topology refers to the way a network is laid out, either physically or logically.
- Topology can be referred as the geometric arrangement of a computer system.
- Each computer system in a topology is known as node.



#### **Bus Topology**



- A bus topology is such that there is a single line to which all nodes are connected. It is usually used when a network installation is small, simple or temporary. In bus topology, all the network components are connected with a same (single) line.
- Ethernet is common protocol in networks connected by bus topology.





#### **Ring or Circular Topology**

- Ring topology is a type of network configuration where devices are connected in a circular manner, forming a closed loop.
- In this setup, each device is connected to exactly two other devices, creating a continuous pathway for data transmission.





### **Star Topology**

• A Star topology is a type of network topology in which all the devices or nodes are physically connected to a central node such as a router, switch, or hub. The central node (hub) acts as a server, and the connecting nodes act as clients.







#### **Mesh Topology**



Mesh topology is a network configuration where devices are interconnected in a decentralized manner. Instead of relying on a central hub or switch, each device connects directly to multiple other devices, forming a mesh-like structure.



#### **Tree Topology**

 In networking, tree topology is a structure where devices are connected hierarchically. It resembles a tree with a root node and various branches. The root node is connected to multiple levels of child nodes, forming a hierarchy





#### **Network Interface Card**

A Network Interface Card (NIC), also known as a network adapter, LAN adapter, or Ethernet card, is a hardware component that allows a computer or other device to connect to a network.

It provides the physical interface between the device and the network medium, such as Ethernet cables or wireless signals.

The NIC enables communication over a local area network (LAN) or the internet by converting data into a format that can be transmitted over the network.

### SION ADEMY

- ISDN (Integrated Services Digital Network) is a set of communication standards for digital transmission of voice, video, data, and other network services over traditional telephone lines.
- It was developed in the 1980s as an upgrade to the analog Public Switched Telephone Network (PSTN) and provided faster and more reliable connections compared to older dial-up systems.





### What is Internet?

The full form of Internet is Interconnected Network. Originated in the year 1969 with development of ARPANET.

The Internet allows different computer systems to communicate with one another and share information, regardless of location or device.

It is based on a set of protocols and standards known as the Internet Protocol Suite (or TCP/IP) that allow different computer networks to "talk" to one another.



### Who developed TCP/IP?

#### BOB KAHN (1938-) AND VINT CERF (1943-)

American computer scientists who developed TCP/IP, the set of protocols that governs how data moves through a network. Vint Cerf is credited with the first written use of the word 'internet'. Vint Cerf is also known as one of 'the Fathers of Internet'.



#### What is TCP/IP ?



TCP/IP stands for Transmission Control Protocol/Internet Protocol and is a suite of communication protocols used to interconnect network devices on the internet. TCP/IP is also used as a communications protocol in a private computer network -- an intranet or extranet.

TCP/IP specifies how data is exchanged over the internet by providing end-to-end communications that identify how it should be broken into packets, addressed, transmitted, routed and received at the destination.



#### DARPA –

US Defense Advanced Research Projects Agency February 7, 1958, by President Dwight D. Eisenhower in response to the Soviet launching of Sputnik 1 in 1957.



### What is **ARPANET**?

Started in year 1969

Advanced Research Projects Agency Network (ARPANET) was the first wide-area packet-switched network with distributed control and one of the first computer networks to implement the TCP/IP protocol suite.





#### What is SATNET?

Started in year 1973 SATNET, also known as the Atlantic Packet Satellite Network, was an early satellite network that formed an initial segment of the Internet. It was implemented by BBN Technologies under the direction of the Advanced Research Projects Agency.





### Internet Protocol (IP)

- Internet Protocol Version 4 (IPv4) is the primary version used on the internet today.
- It was introduced in 1981 by DARPA and was the first deployed version in 1982 for production on SATNET and on the ARPANET in January 1983.
- However, due to a limited number of addresses, a newer protocol known as IPv6 was developed in 1998 by the Internet Engineering Task Force (IETF).



#### IPv4 vs IPv6

IPv6 has a greater address space than IPv4, which is required for expanding the IP Connected Devices.

IPv6 has 128 bit IP Address rather and IPv4 has a 32-bit Address.

**Example Addresses:** 

IPv4: 192.168.1.1 IPv6: 2001:0db8:85a3:0000:0000:8a2e:0370:7334



.

Feature	IPv4	IPv6
Address Length	32-bit	128-bit
Address Format	Dotted-decimal	Hexadecimal
Address Space	4.3 billion addresses	3.4×10383.4×1038 addresses



#### **IP Address**

- An IP address (Internet Protocol address) is a unique numerical identifier assigned to each device connected to a network that uses the Internet Protocol for communication.
- The global allocation of IP addresses is managed by the Internet Assigned Numbers Authority (IANA), which is a function of the Internet Corporation for Assigned Names and Numbers (ICANN).
- It serves two main purposes:
  - Identifying the host or device on the network.
  - Providing the location of the device in the network.



#### **Special IP Addresses:**

• Loopback Address:

Used to test network software without sending data to the network. IPv4: 127.0.0.1

- IPv6: ::1
- Default Gateway:

The IP address of the router that connects a local network to the internet. Example: 192.168.1.1, 198.168.0.1

• Broadcast Address:

Used to send data to all devices on a network.

Example: 192.168.1.255



#### **Port Number**

- A port number is a 16-bit integer (ranging from 0 to 65535) used to identify specific processes or services on a device connected to a network. It works in conjunction with an IP address to enable communication between devices over the internet or a local network.
- Example: Port 80 for HTTP, Port 443 for HTTPS.



Port Number	Protocol/Service	Description	
20, 21	FTP	File Transfer Protocol (data and control)	
22	SSH	Secure Shell for remote login	
23	Telnet	Unencrypted remote login	
25	SMTP	Simple Mail Transfer Protocol (email sending)	
53	DNS	Domain Name System (name resolution)	
67, 68	DHCP	Dynamic Host Configuration Protocol	
80	НТТР	Hypertext Transfer Protocol (web traffic)	
110	POP3	Post Office Protocol (email retrieval)	
123	NTP	Network Time Protocol (time synchronization)	
143	IMAP	Internet Message Access Protocol (email)	
161, 162	SNMP	Simple Network Management Protocol	
443	HTTPS	HTTP Secure (encrypted web traffic)	
465	SMTPS	SMTP over SSL/TLS	
587	SMTP (Submission)	Email submission port	
993	IMAPS	IMAP over SSL/TLS	
995	POP3S	POP3 over SSL/TLS	
3306	MySQL	MySQL Database	
3389	RDP	Remote Desktop Protocol	
8080	HTTP (Alternative)	Often used for web proxies or testing	



#### Some more protocols

HTTP
HTTPS
FTP


#### HTTP

- Hypertext Transfer Protocol (HTTP) is an application-layer protocol for transmitting hypermedia documents, such as HTML. Mypertext Markup Language.
- It was designed for communication between web browsers and web servers.
- HTTP follows a classical client-server model, with a client opening a connection to make a request, then waiting until it receives a response.
- HTTP is a stateless protocol, meaning that the server does not keep any data (state) between two requests.





- HTTPS (Hypertext Transfer Protocol Secure) is a secure version of HTTP, the protocol used for transferring data between a web browser and a website.
- HTTPS ensures that the data transmitted is encrypted and secure, protecting it from eavesdropping, tampering, and other attacks.
- HTTPS uses SSL/TLS (Secure Sockets Layer/Transport Layer Security) to encrypt data between the client (browser) and the server.
- HTTPS uses port 443 by default (HTTP uses port 80).



#### FTP

- File transfer protocol (FTP) is a way to download, upload, and transfer files from one location to another on the Internet and between computer systems.
- FTP enables the transfer of files back and forth between computers or through the cloud.



#### Browser

A web browser is an application for accessing websites. When a user requests a web page from a particular website, the browser retrieves its files from a web server and then displays the page on the user's screen.









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HTML =language

HyperText Markup Language or HTML is the standard markup language for documents designed to be displayed in a web browser. It defines the content and structure of web content. It is often assisted by technologies such as Cascading Style Sheets and scripting languages such as JavaScript.

Browser Web Pages App Software

Search Engine Web Apt



#### WWW

- The World Wide Web (WWW or Web) is an information system that enables content sharing over the Internet.
- The Web was invented by English computer scientist Tim Berners-Lee while at CERN in (1989) and opened to the public in 1991.
- Documents and other media content are made available to the network through web servers and can be accessed by programs such as web browsers.
- Servers and resources on the World Wide Web are identified and located through character strings called uniform resource locators (URLs).



## Web Address / URL

- A uniform resource locator (URL), also known as Web address on the Web, is a reference to a resource that specifies its location on a computer network and a mechanism for retrieving it.
- URLs occur most commonly to reference web pages (HTTP/HTTPS) but are also used for file transfer (FTP), email (mailto), database access (JDBC), and many other applications.
- Most web browsers display the URL of a web page above the page in an address bar. A typical URL could have the form http://www.example.com/index.html,
- which indicates a protocol (http), a hostname (www.example.com), and a file name (index.html).

google.com/ maps

#### **Domain Name**

protocol

• Human-readable address for a website

- http://www.example.com/index.html,
- which indicates a protocol (http), a hostname (www.example.com), and a file name (index.html).
- The Hostname is known as Domain Name
- A domain name is an address via which internet users can access your website.



# Difference in URL and Domain Name

Domain name is designed for human readability

 URL is the complete address for the resource we are looking on internet

Example:

https://forms.gle/QreVonxto8SM3ERa7

https://docs.google.com/forms/d/e/1FAIpQLScclKDqPx9tl2WXJGt8 dBMeYaBl8GB2OPqWM1-Jp5abGDMTbQ/viewform?usp=header



# Web Page & Website

- A web page (or webpage) is a document on the Web that is accessed in a web browser.
- A website typically consists of many web pages linked together under a common domain name.
- A webpage is created using HTML.
- For adding design elements CSS (Cascading Style Sheets) is used.
- For adding interactivity JS (JavaScript) is used.



### Web Server



A web server is computer software and underlying hardware that accepts requests via HTTP (the network protocol created to distribute web content) or its secure variant HTTPS.

Commonly a web browser initiates communication by making a request for a web page or other resource using HTTP, and the server responds with the content of that resource or an error message.

A web server can also accept and store resources sent from the user agent if configured to do so.



google.com - 38.8.8.8.8

The Domain Name System (DNS) is a hierarchical and distributed naming system for computers, services, and other resources in the Internet or other Internet Protocol (IP) networks.

The Domain Name System has been an essential component of the functionality of the Internet since 1985.



### **Services of Internet**

Search Engine // Google / Bing / DuckDuckgo\_ 1.

2. Downloading and Uploading of Files

7

3. Emails

**4**.

Chat

-



## **Services of Internet**

5. Video Conferencing / Calling

- 6. E-Learning
- 7. E-Banking
- 8. E-Shopping / E-Commerce

9. Social Media



D. Tree



Computer connected to LAN can \_\_\_\_\_. A. Work fast X B. Send email X Share information or peripheral devices D. None



0

Hub is associated with \_\_\_\_\_ network. A. mesh B. bus C. ring D. star



Which type of network would use phone lines?





Wide Area Netwook

Which of the following is not a network device?A. RouterB. SwitchC. ModemD. None of these



is a combination of hardware and software that Α facilities the sharing of information between computing devices. (a) Network (b) Peripheral (c) Expansion board (d) Digital device



Personal computer can be connected together to form a

(a) Server
(b) Super Computer
(c) Network
(d) Enterprise



The network connecting several computers all over the world is –

(a) Arpanet(b) Internet(c) Network(d) Intranet



Which is the name of the network topology in which there are bi-directional links between each possible node?

K. Ring
B. Star
C. Mesh
D. Tree





is a small group of computers and peripherals linked together in a small area. A. MAN B. PAN C. LAN D. WAN



Which of the following is used to deliver the data packet only to the destination node in the network.

A. Hub 
$$\longrightarrow$$
 all broadcast  
B. Switch  $\rightarrow$  only desfination  
C. NIC  $\rightarrow$  interface.  
D. None

Which of the following does the job of converting digital signals to analog signals?

A. Modem B. Router C. Switch D. Hub



What does LAN stand for? A Local Area network B. Large Area Network C. Light Access Network D. Logical Access Network



A network that links many different types of computers all over the world.

A. LAN
B. WAN
C. Arpanet
D. Internet



Switch is a network device whose responsibility is to

- A. Protect from virus attack
- B. Turn on/off power to the network
  - Connection Network devices
- D. Boot the network



The digital telecommunications term ISDN is an abbreviation for \_\_\_\_\_.

- A. Integrated Standard Digital Networks
- B. Internet Services Data Network
- C. Interactive standard Dynamic Network
  - Integrated Services Digital Network





#### Which of the following is not a type of computer network?

A. LAN, B. WAN<sup>,</sup> C. MAN<sup>,</sup> FAN<sup>,</sup>



# Which device is used to connect a computer to a network?





#### Which of the following is not a type of network topology?

A. Star
B. Tree
C. Bus
D. Grass



The code for web page is written using A. A fifth gen language B. Win Zip C. HTML D. Peripherals



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Extension of web pages is A. mdb B. .html C. .exe D. .hlp


SMTP stands for A. Simple Mail Tracking Protocol B. Simple Mail Transport Protocol Simple Mail Transfer Protocol D. Simple Mail Travel Protocol



Programs that help us to navigate on the internet is called X. Browser B. Network C. Internet D. Hypertext



## What is the full form of TCP / IP? A. Transmission Control Practice / Internet Protocol W. Transmission Control Protocol / Internet Protocol C. Transport Control Protocol / Internet Protocol D. Transmission Component Protocol / Internet Protocol



## What does DNS stand for?

A. Domain Name Server
D. Domain Name System
D. Data Network System



What is the primary purpose of DNS?

a) To store website content
b) To translate domain names into IP addresses
c) To encrypt internet traffic
d) To manage email servers



Which protocol is used for sending emails over the internet?
A. HTTP
B. FTP
C. SMTP
D. TCP

What is the full form of ISP? M. Internet Service Provider B. Internet System Protocol C. International Service Provider D. Internal System Protocol



Which protocol is used for transferring web pages on the internet?

a) FTP b) HTTP c) SMTP d) TCP





What does WWW stand for? A. Web world wide B. Word war web C. Word wide web D. Wide world web

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A network that links many different types of computers all over the world.
A. LAN
B. WAN
C. Arpanet
D. Internet



URL stand of \_\_\_\_\_\_ A. Uniform Resource Locator B. Uniform Record Locator C. Uninterrupted Read Locator D. Uninterrupted Record Locator



It provides the facility of finding the information to the user related to certain topic, while surfing the net. A. Operating System B. Search Engine C. Keyboard D. Digital Camera What does the acronym HTML stand for? A. Hyper Text Markup Language B. High Text Markup Language C. Hyperlinks Text Mark Language D. Java Language



A. File Transfer Protocol
B. File Transport Protocol
C. File Transaction Protocol
D. File Transformation Protocol



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