UNIT I INTRODUCTION TO WWW

Understanding the working of Internet-Web Application Architecture-Brief history of Internet-Web Standards – W3C-Technologies involved in Web development – Protocols-Basic Principles Involved in developing a website-Five Golden Rules of Web Designing

UNDERSTANDING THE WORKING OF INTERNET

A network is a group of connected computers that are able to send data to each other. A computer network is much like a social circle, which is a group of people who all know each other, regularly exchange information, and coordinate activities together.

The Internet is a vast, sprawling collection of networks that connect to each other. In fact, the word "Internet" could be said to come from this concept: interconnected *net*works.

Since computers connect to each other within networks and these networks also all connect with each other, one computer can talk to another computer in a faraway network thanks to the Internet. This makes it possible to rapidly exchange information between computers across the world.

Computers connect to each other and to the Internet via wires, cables, radio waves, and other types of networking infrastructure. All data sent over the Internet is translated into pulses of light or electricity, also called "bits," and then interpreted by the receiving computer. The wires, cables, and radio waves conduct these bits at the speed of light. The more bits that can pass over these wires and cables at once, the faster the Internet works.

DISTRIBUTED NETWORKING:

There is no control center for the Internet. Instead, it is a distributed networking system, meaning it is not dependent on any individual machine. Any computer or hardware that can send and receive data in the correct fashion (e.g. using the correct networking protocols) can be part of the Internet.

The Internet's distributed nature makes it resilient. Computers, servers, and other pieces of networking hardware connect and disconnect from the Internet all the time without

impacting how the Internet functions — unlike a computer, which may not function at all if it is missing a component. This applies even at a large scale: if a server, an entire data center, or an entire region of data centers goes down, the rest of the Internet can still function (if more slowly).

How Does it Work?

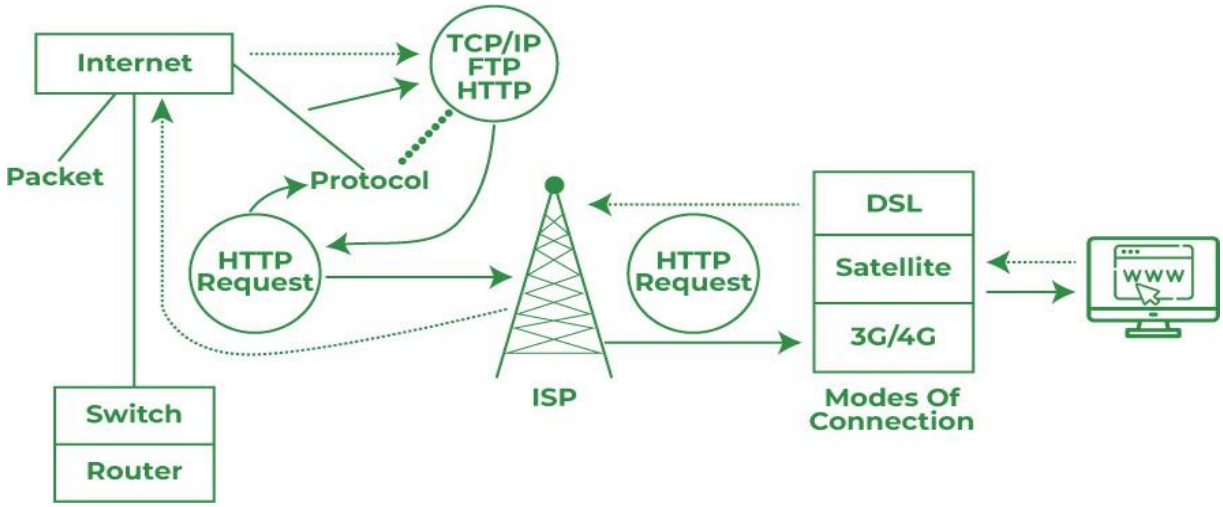
Generally, two main components uphold the functionality of the Internet, they are:

- Packets
- Protocols

In networking, the data which is being transmitted through the internet is sent via small segments which are later translated into bits and the packets get routed to their endpoint (destination) through different networking devices i.e. routers or switches. Later, once the packet arrives at the receiver's end, that small chunks of data get reassembled in order to utilize or check the data that he/she requested. That's why they are used to push ease in networking and large data can be easily sent by sending small units and this whole process of sending/receiving small bits is known as Packet Switching.

Connecting two computers with the help of any communication method and to solve this, protocols were introduced. It is a standardized method of performing certain tasks and data formatting so that two or more devices can communicate with each other. However, if both systems are connected over the same network i.e. Ethernet for receiving and sending packets from network to network i.e. IP (Internet Protocol), and to ensure that those packets are arriving successfully in the same order (TCP), and for formatting data over websites and apps (HTTP). Besides this, there are several other protocols for testing, routing, and encryption, and for streaming games/videos, rather than using TCP, we use UDP (User Datagram Protocol).

From opening a web browser to visiting a website, it all happens with specific methods in **5 easy steps**.



1. Firstly, you'll be required to connect your system or PC with any router or modem to establish a connection. This connection is the base of the connection.
2. When you open the browser and start typing something like "www.google.com", your system will push a query command to your ISP (Internet Service Provider) that is connected

with other servers that store and process data.

3. Now, the web browser will start indexing the URL that you've entered and will fetch the details in numeric format (in their own language to identify the address (unique) that you're trying to reach.
4. Next is, now your browser will start sending the HTTP request where you're trying to reach and sends a copy of the website on the user's system. Note: The server will send data in the form of small packets (from the website to the browser)
5. Once all the data (of small packets) will be received at the user's end (PC/Laptop), the browser will start arranging all those small packets and later will form a collective file (here, the browser will gather all the small packets and rearrange them just like a puzzle) and then you'll be able to see the contents of that website

MODES OF CONNECTING THROUGH THE INTERNET

DSL: This technology uses a Broadband connection which is in trend for the past few years. ISP will connect our premises with the help of telephone wire despite the fact that own any telephone.

Dial-Up: People used to connect their system with the help of a dial-up connection, and it is one of the slowest types of Internet connection. This is used to enable internet connectivity with the help of a telephone connection and the user must have multiple connections then only they can use a Dial-up connection.

Cable TV Connection: It is being used to connect our system with the Internet, and for that, ISP will connect it via cable TV wire. It also uses Broadband technology and really don't need to have a Cable connection for that. Cable is being considered as most accessible as and faster than dial-up and DSL that we have for connection.

Satellite: It also uses broadband technology but without interacting with any cable connection. Hence, it connects wirelessly with the help of a satellite and this enables its availability anywhere in the world. Thus, being fancy and accessible it comes with a few drawbacks:

a- There can be network disturbance if the weather is unstable because it connects via satellite.

b- The connectivity is not stable and they are considered slower as compared to DSL or cable connection.

3G/4G/5G: This is the new age technology in the entire world. It connects wirelessly via different ISPs and is widely used in cellphones. But they aren't being considered as stable that DSL or cable and most importantly they come with a DATA LIMITATION cap for each month.

Internet Connection Protocols

The protocols decide how the technology is going to work and in what governing ways and what would be the quantity of data will be shared. They all are defined by protocols and as per standard, both the parties (sender/receiver) have to follow the same rule in order to communicate. However, these protocols are categorized into 3 major units:

1. **TCP/IP**: It is a variety of internet protocols for communicating between a sender and a receiver. TCP (Transmission Control Protocol) / IP (Internet Protocol) ensures that all users who are connected to the internet have their own unique identity known as IP Address. However, how data will flow into what segments (packets) is being decided by TCP. IT divides the whole message into small packets and reassembles them before it reaches the receiver.
2. **FTP:** It is used for communicating from one point to another (computer) over LAN (Local Area Network) or WAN (Wide Area Network). File Transfer Protocol or FTP acts like a host and establishing connections between computers and transferring files between them are seamless whereas one connection is used for data connection and the other for the control connection.
3. **HTTP**: The base of the Internet starts from HTTP (Hypertext Transfer Protocol) and is being used to communicate all over (World Wide Web) WWW. The concept of HTTP is to provide data over the Internet (image, video, text, etc.) and the moment a user opens their web browser, they're connecting to the internet and establishing an HTTP connection. The foundation of HTTP began in the '90s by Tim Berners-Lee which runs on top of the TCP/IP network.

Pillars of the Internet

Switches: Switches help for connecting devices in a single network and use small packet switching to send and receive data packets over the Internet. Besides this, they have multiple ports by which a system can be connected. So, when a packet arrives at any port, it starts cross-checking the specifications and forward the same to its destination. It also supports broadcast and unicast communication.

Router: They operate at the layer 3 OSI (Open Systems Interconnection Model) model that is created for sending, receiving, and forwarding small data packets within the connected system over the same network. In this architecture, once the router receives the data packets, it inspects the destined address, then consults its routing and transfers the same packet to its desired location.

How do Websites and Several Applications use the Internet?

The specific steps involved in this process are:

1. **DNS query:** When our browser started to load the webpage, it likely first made a DNS query to find out the website's IP address.

2. **TCP handshake: B**rowser opened a connection with that IP address.

3. **TLS handshake:** Browser also set up encryption between a web server and our device so that attackers cannot read the data packets that travel between those two endpoints.

4. **HTTP request:** Our browser requested the content that appears on this webpage.

5. **HTTP response:** Server transmitted the content in the form of HTML, CSS, and JavaScript code, broken up into a series of data packets. Once our device received the packets and verified it had received all of them, our browser interpreted the HTML, CSS, and JavaScript code contained in the packets to render.

HISTORY OF INTERNET /Origins of the Internet

The history of the Internet has its origin in information theory and the efforts to build and interconnect computer networks that arose from research and development in the United States and involved international collaboration, particularly with researchers in the United Kingdom and France.

Computer science was an emerging discipline in the late 1950s that began to consider time-sharing between computer users, and later, the possibility of achieving this over wide area networks. Independently, Paul Baran proposed a distributed network based on data in message blocks in the early 1960s, and Donald Davies conceived of packet switching in 1965 at the National Physical Laboratory (NPL), proposing a national commercial data network in the UK.

The Advanced Research Projects Agency (ARPA) of the U.S. Department of Defense awarded contracts in 1969 for the development of the ARPANET project, directed by Robert Taylor and managed by Lawrence Roberts. ARPANET adopted the packet switching technology proposed by Davies and Baran, underpinned by mathematical work in the early 1970s by Leonard Kleinrock at UCLA. The network was built by Bolt, Beranek, and Newman.

Several early packet-switched networks emerged in the 1970s which researched and provided data networking. ARPA projects, international working groups and commercial initiatives led to the development of various standards and protocols for internetworking, in which multiple separate networks could be joined into a network of networks. Bob Kahn, at ARPA, and Vint Cerf, at Stanford University, published research in 1974 that evolved into the Transmission Control Protocol (TCP) and Internet Protocol (IP), the two protocols of the Internet protocol suite. The design included concepts from the French CYCLADES project directed by Louis Pouzin.[5]

In the early 1980s, the National Science Foundation (NSF) funded national supercomputing centers at several universities in the United States, and provided interconnectivity in 1986 with the NSFNET project, thus creating network access to these supercomputer sites for research and academic organizations in the United States. International connections to NSFNET, the emergence of architecture such as the Domain Name System, and the adoption of TCP/IP internationally on existing networks marked the beginnings of the Internet.

Commercial Internet service providers (ISPs) emerged in 1989 in the United States and Australia. The ARPANET was decommissioned in 1990. Limited private connections to parts of the Internet by officially commercial entities emerged in several American cities by late 1989 and 1990 The optical backbone of the NSFNET was decommissioned in 1995, removing the last restrictions on the use of the Internet to carry commercial traffic, as traffic transitioned to optical networks managed by Sprint, MCI and AT&T.

Research at CERN in Switzerland by the British computer scientist Tim Berners-Lee in 1989–90 resulted in the World Wide Web, linking hypertext documents into an information system, accessible from any node on the network. The dramatic expansion of capacity of the Internet with the advent of wave division multiplexing (WDM) and the roll out of fiber optic cables in the mid-1990s had a revolutionary impact on culture, commerce, and technology. This made possible the rise of near-instant communication by electronic mail, instant messaging, voice over Internet Protocol (VoIP) telephone calls, video chat, and the World Wide Web with its discussion forums, blogs, social networking services, and online shopping sites. Increasing amounts of data are transmitted at higher and higher speeds over fiber-optic networks operating at 1 Gbit/s, 10 Gbit/s, and 800 Gbit/s by 2019.

The Internet's takeover of the global communication landscape was rapid in historical terms: it only communicated 1% of the information flowing through two-way telecommunications networks in the year 1993, 51% by 2000, and more than 97% of the telecommunicated information by 2007. The Internet continues to grow, driven by ever greater amounts of online information, commerce, entertainment, and social networking services. However, the future of the global network may be shaped by regional differences.