

# HOW INTERNET WORKS ?

Now let's see how this Internet actually works

## *Wires, Cables, Wi-Fi*

Internet is a tangible physical system made to share more information/Data. Hardware devices like mobile phones, servers, radio, satellites, computers Some of these computers are web servers, etc. All these devices together create the network of networks. The internet share binary information (BITS) 1 or 0. We typically use a 1 meaning on, or a 0 meaning off. Everything around the internet is represented and send in BITS also called as atoms of information.

All the text messages, videos, images, audio we send comes down to 1 and 0. Today, we physically send bits by electricity, light, and radio waves. To send a bit via electricity, imagine that you have two lightbulbs connected by a copper wire. If one device operator turns on the electricity then the lightbulb lights up. If the operators on both ends agree that light on means 1 and light off means 0, then we have a system for sending bits of information from one person to another using electricity.

To send the maximum number of BITS/second, we need to increase the Bandwidth. Bandwidth is measured by bitrate, it increases the capacity . There are multiple ways you can send the data from one place to another, like Electric, light and radio. All these methods has their own respective pros and cons. The electric method is cheap but there are a lot of signal loss, and gets degrade when moving to long distance. The light method is fast and no signal loss but it become expensive and hard to work with. The radio waves are wireless but there is somewhat loss of signal.

Everything on the Internet, whether it's words, emails, images, videos all come down to these 1s and 0s being delivered by electronic pulses, light beams, radio waves.

## *IP Addresses and DNS*

Before the Internet i.e. in **1970** there was no standard method for networks to communicate. **Vinton Cerf** and **Bob Kahn** wrote an influential paper describing how computers linked on a network they called an "internet" could send messages via packet switching, using a protocol called TCP. Protocols are well-known set of rules and standard used to communicate between machines.

The address on the internet is just a number that is unique to the each device on the Network. The address system on the internet is like the mailing address. To send a mail to someone we need to mention their home address correctly, similarly in the case of Internet. Each IP address is represented in the BITS. IP addresses are 32bits longs for IPV4 but now IPV6 IP addresses are being used which are 128bits. Each web server has an unique IP address example Google IP address is 2001:4860:4860::8888.

In 1982–1984 DNS (Domain Name System) is developed, allowing people to refer to unfriendly IP addresses (12.34.56.78) with friendly and memorable names (like google.com. Whenever we type in the URL of a website in the browser it means the IP address. The browser contacts the DNS(Domain Name Service). So what the browser does is that it contacts the DNS (domain name service) and looks up the IP address for that URL. DNS servers are connected in a distribute hierarchy and into zones so that they can handle multiple requests.

## *Packets, Routing and Reliability*

Data travels on the internet in a much less direct fashion. The way information gets transferred from one computer to another is pretty interesting. It need not follow a fixed path, in fact, your path may change in the midst of a computer to computer conversation. Information on the internet goes from one computer to another in what we call a packet of information and a packet travels from one place to another on the internet. Many different kinds of digital information like Music, videos, e-books can be sent with IP Packets. Each packet contains address where it came from and where is it going. special computers on the internet called routers/modems act like traffic managers to keep the packets moving through the networks smoothly. If one route is congested, individual packets may travel different routes they can even arrive at the destination at slightly different times in different order.

TCP manages the sending and receiving of all your data as packets. It's like a '*guaranteed mail service*'. When packets arrive, TCP does a full inventory check and send back acknowledgement of each packet received. This make the reliability of packets being delivered properly to the destination.

The TCP and Router systems are scalable, which is the best part of it.

## *HTTP and HTML*

HTTP (Hyper Text Transfer Protocol) is the language in which the server talks to our computer or another server. Whenever we need to request anything or document from another system HTTP comes into the picture. HTTP is made of 'GET' requests. So whenever we are trying to login into some portal using login page, eventually we are sending a GET request to the server. HTML (Hyper Text Markup Language) is the language to create a web page. HTML is usually used to create simple web pages but, if we need more fancy ones there are more advance languages we need to use along with HTML. The text of a web page is included directly in the HTML, but other parts like images or videos are separate files with their own URLs that need to be requested. The browser sends separate HTTP requests for each of these and displays them as they arrive. If a web page has a lot of different images, each of them causes a separate HTTP request and the page loads slower.

But, when we fill out some form or enter any information to create a profile, the browser sends this information in plain text to the web server using an HTTP POST request. But along with that web page, it also attaches a little invisible cookie data that your browser sees so that your browser knows next time when you access that page again. These cookie act like and ID card.

One problem with this system is that it's open and shared. Which means that data/information can be easily stolen by hackers. The solution to this is Secure Sockets Layer (SSL) and its successor Transport Layer Security (TLS). These are the security layers which are behind every communication taking place between networks or servers, to make sure there are no hackers stealing private information. HTTPS protocols ensure that your HTTP requests are secure and protected. When a website asks your browser to engage in a secure connection, it first provides a digital certificate using SSL/TLS. Digital certificates are published by certificate authorities, which are trusted entities that verify the identities of websites and issue certificates for them.