WEEK - 1

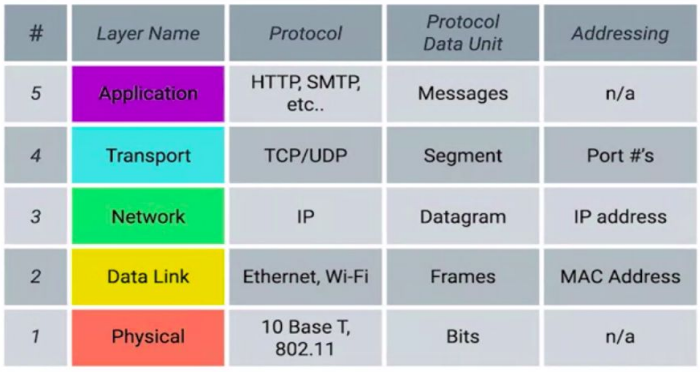
Whatever new technologies arise, the very very basic thing we need to learn is how it works through the internet. Yeah of course everything in this world is coming under the internet. From this, I hope everyone understands the importance of computer networking. Let's dive into the networks.

First thing We must learn What is protocol & What is computer networking.
Yeah protocol is nothing but a set of rules or standards that need to be followed by the computer during their communication.

Then what about computer networking ?

The name we've given to the full scoper of how computers communicate with each other. Networking is nothing but like our human communication.
Networking is carried out by several models. One of the important models is the TCP/IP model. It consists of five layers

- Physical layer
- Data Link layer
- Network layer
- Transport layer
- Application layer



#	Layer Name	Protocol	Protocol Data Unit	Addressing
5	Application	HTTP, SMTP, etc..	Messages	n/a
4	Transport	TCP/UDP	Segment	Port #'s
3	Network	IP	Datagram	IP address
2	Data Link	Ethernet, Wi-Fi	Frames	MAC Address
1	Physical	10 Base T, 802.11	Bits	n/a

Image Courtesy : coursera

To really understand networking , we need to know about all devices from cables to servers right. We will go one by one,

First I will give the basic insights about five layers of TCP/IP Model,

Physical layer : Simply it represents the physical devices that interconnect computers. This layer is all about cabling and connectors.
This layer will also includes the ,

- Specifications for network cables.
- Connectors that join devices

Data link layer : It is otherwise known as network interface or network access layer. Data link layer is responsible for defining a way of interpreting the signals so that network devices can easily communicate.

Network layer : It is responsible for the communication between different devices through the internet. This can be achieved by using a network device called routers. Now everyone has the confusion about data link and network layers right. While the data link layer is responsible for getting data form a single link, the network layer is responsible for getting data defined across a collection of networks. The most common protocol used in the network layer is IP(Internet Protocol). We all know that IP is the heart of the internet and most smaller networks around the world.

Transport layer : While the network layer delivers data between two individual nodes, the transport layer sorts out which client and server programs are supposed to get that data.

Common protocols used in the transport layer are TCP (Transmission Control Protocol) and UDP(User Datagram Protocol). The big difference between the two is that TCP provides mechanisms to ensure that data is reliably delivered while UDP does not.

Application layer : Last but not least, as the name specifies it is an application specific layer. The protocols used to allow you to browse the web or send receive email are some common ones including HTTPS, FTP etc.,

Simply the five layers can be depicted as ,

Image Courtesy : Coursera

Network Devices

Every computing device that we interact with on a day to day basis is a network device right?

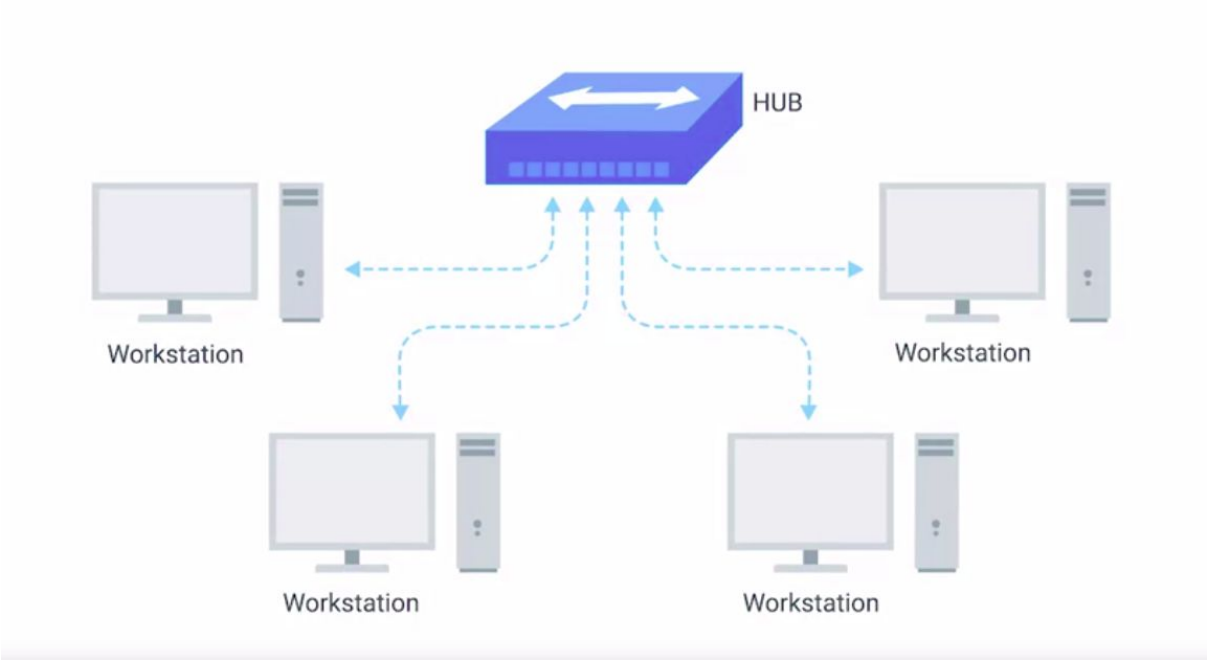
We will see some of the basic networking devices,

BITS AND BYTES OF NETWORKING

Cables : We are all familiar with cables that connect different devices to each other, allowing data to be transmitted over them. Cables which we are using can mainly classified into two categories

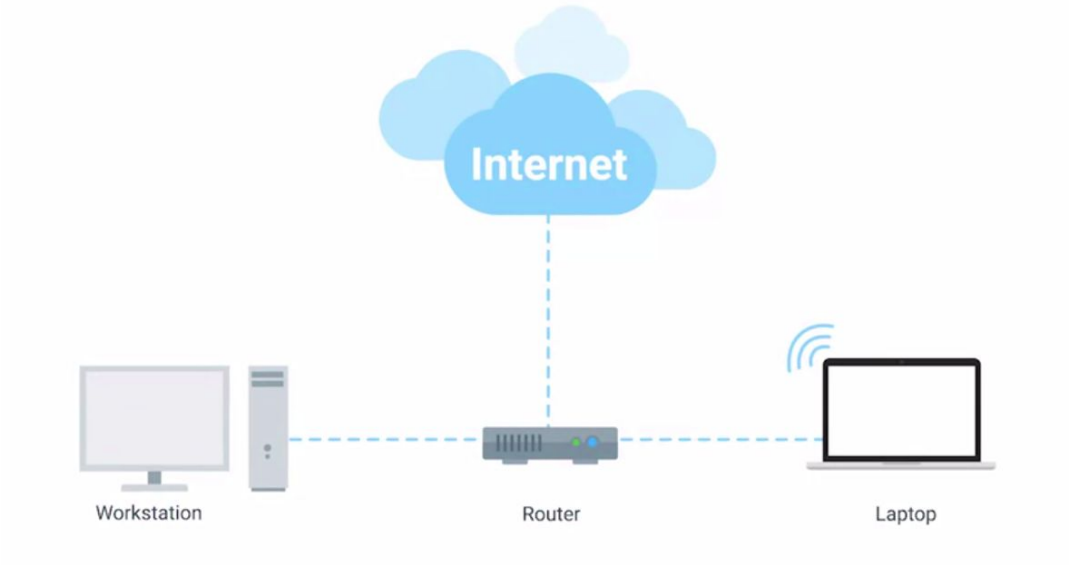
- Copper - Common one
- Fiber - tiny tubes made out of glass about the width of a human hair.

Hubs - A physical layer device that allows for connections from many computers at once.



Switches : It is also known as Network switch and primarily known as switching hub. It is a data link device which is introduced to avoid collisions in hubs.

Routers : A network layer device that knows how to forward data between independent networks. It can act as the global guide on the internet for our traffic.



BITS AND BYTES OF NETWORKING

Brief about Physical layer :

This layer mainly focuses on moving ones and zeros from one end of the link to the next. That process is known to be Modulation(i.e)Varying the voltage.

In this layer the communication is carried out in two ways

1. Duplex Communication
    a. Full duplex (Both sides simultaneously)
    b. Half duplex (Both sides but not simultaneously)
2. Simplex Communication (Unidirectional)

Brief about Data link layer :

Here only the sender and receiver are found and the data link layer is responsible for sending to the correct person . For that this layer introduces a concept called Media Access Control (MAC) address. It is a global unique identifier attached to an individual network interface.

MAC : It is a 48 bit number. It is divided into two parts 24 bits each. Every 24 bits are splitted into an octet. First three octets (i.e)24 bit contain an organizationally unique identifier. It is set by the IEEE for hardware. Through this 24 bit number we can easily find out the producer of that hardware. We now see which one is used by ethernet for communication Yeah , that is MAC address. Now We will see how the ethernet sends the data using MAC addresses. First the data which is needed to send are packed together as a Packet. That Packet is called a Data Packet. It is a term that represents any single set of binary data being sent across a network link.

That data packets are sent through an Ethernet frame- A highly structured collection of information presented in a specific order.

Yeah, we know how the data's are sent and through which medium it reaches our end, right. But my question is what the data we are sending will definitely reach completely to the end (i.e)without loss. No, there are always some losses in our communication. How to find the loss and rectify that error.

For that ethernet in the data link layer uses an algorithm called Cyclic Redundancy Check (CRC). But the drawback of this algorithm is it can only spot the error not rectify that error.

How does CRC work ?

CRC is used to calculate checksum that is embedded on an ethernet frame. Checksum is the value which is used to spot the error. Simply checksum is used to check whether all data are sent/received correctly.
