

Networking

What is networking?

Networking is a concept of connecting two or more computing devices together so that we can share resources.

“**Net**” meaning: One point is connected to another point. If any word “net” then things are connected like Social network, Mobile network, Cable network etc.

Advantage of Networking:

- Sharing information like we use internet a lot to share data.
- Sharing devices: We don't need separate device for each computer. We can share single device to all computers like we do with printer. We connect single printer to all computing devices and one by one they can use it.

Disadvantage of Networking:

- Through networking viruses can enter inside the device that can steal data. Data hacking is the biggest disadvantage of networking.

How Computers communicates with each other?

Computers running on network communicate to each other using either the Transmission Control Protocol TCP or User Datagram Protocol UDP.

When we run Java program that communicate over the network we are performing at the application layer. Typical we do not need to concern ourself with that TCP and UDP layers. Instead we can use the classes in the

java.net packages. These classes provide system independent network communication.

TCP

TCP is the connection based protocol that provides a reliable flow of data between two computers.

UDP

UDP is a protocol that sends independent packets of data called data grams from one computer to another with no guarantees about arrival. UDP is not connection based like TCP.

Port Number: It is a logical statement. Generally a computer has a single physical connection to the network. All data destined for a particular computer arrives through that connection.

However the data may be intended for different application running on the computer so how does the computer know to which application to forward the data and the answer is using a port number.

Data transmitted over the network is achieved by addressing information that identifies the computer and the parts for which it is destined. The computer is identified by its 32 bit IP address which IP protocol uses to deliver the data to right computer on the network. Ports are identified by a 16 bit number which TCP and UDP use to deliver the data to right application.

Difference between TCP and UDP:

TCP is a connection oriented and UDP is connection less. TCP is reliable protocol and UDP is not reliable protocol. TCP has guarantee that it will share complete data but UDP has no guarantee.

We can consider TCP as a private courier service and UDP as India Postal Service.

Need of Java in Networking:

To communicate computers it requires three things:

- 1. Hardware** like Router, Amplifier, and Data Cable etcetera. We often notice mobile tower, amplifier (for Cable Network, Broadband service provider) that receives our data and sent to the destination.
- 2. Medium:** It connects two devices like Wire based cable, Bluetooth, Wi-Fi, and Satellite etcetera.

Diagram.....

- 3. Certain application** that will send and receive data from computing device. And here java comes in the light. Java is the number 1 programming language to create network based application that will receive and send data from computing device. Java has nothing to do with establishing connection, in fact java networking only works with established connection.

Data Travel:

Source-Computer -> Java Program -> Medium -> Source-Hardware ->
Destination-Hardware -> Medium -> Java Program -> Destination-Computer

Protocol

“Protocol” meaning: Set of rules, required standard procedure.

“Protocol in computer”: Set of rules of communication. It means, it is pre-decided, which devices need to connect, what resources will share etcetera. For example a browser. If we enter address without “http” then browser add it. Because “http” denotes that this request is for webpage. If there is “ftp” then the request is for file. So it proves that shared resource is pre-decided.

Protocol applies on unknown communications. Like we usually say “Hello” after picking the phone call. However it is not required but it is a kind of response that other person is ready to communicate.

There are two types of Protocols:

1. High level protocol
2. Low level protocol

High Level Protocol: It works on Application layer, it decides what data is going to shared.

Low level Protocol: Also known as carrier protocol, it is like a truck, used to drop data from one place to another place.

IP Address 4 Byte, 0-255

To recognize computer on a network a unique number assigned to a node of a network called IP address. It is a logical address that can be changed.

For Example: 0-255. 0-255. 0 -255. 0-255 → 100.100.100.**10**

IP address are divided in two parts. First three numbers **100.100.100** are called **Subnet Mask or Network Address**. The Last address **10** is called **Node address**.

What is subnet mask: If we want to go Ducat then first we have to reach Noida Sector-16. If we want to reach to Node address then first we have to reach to subnet mask.

Port Number 2 Byte

The port number is used to uniquely identify different applications. It acts as a communication endpoint between applications. The port number is associated with the IP address for communication between two applications

Port numbers range is from zero to 65535 because ports are represented by a 16 bit. The port number ranging from 0 to 1023 are restricted. They are reserved for use by well-known services such as HTTP and FTTP. These ports are called well known ports. If we want to run our own program in internet then port number must be greater than 1023.

For example: Computer runs so many applications simultaneously. If data comes from IP protocol then which application will receive that data? That's why if an application wants to receive data from network then it has to run on port number. Like we may often notice skype that receives data from network also runs on port number.

Socket

A socket is one-end of two way communication link between two programs running on the network. A Socket is round to a port number, address and

protocol so that the TCP layer can identify the application that data is destined to be sent.

Socket is combination of **Protocol**, **IP address**, and **Port Number** that's why it is called socket programming. **Socket = IP + Protocol + Port**

Diagrams.....