**STUDY ON SOCKET PROGRAMMING!**

***What is computer network?***  
computer network is a of *connected devices* that can share resources and communicate with each other.

These networks can vary in size and scope.They can be LAN(local area network) and WAN(Wide area network).

***What is a node?***

The device which are connected to network are called nodes.They can be computers,servers,smartphones,printers.

***What is a link?***

They are the communication path that connect nodes.links can be physical or wireless.

***What are routers?***

Devices that *connect different network together* and use IP addresses to forward data between networks.

***What are protocols?***

Set of rules that governs data communication over network.

**TCP**-transfer control protocol

**HTTP**-HypterText Transfer protocol

**FTP**-File transfer Protocol

***What is socket programming?***

Socket programming is a way of connecting two nodes on a networks to communicate with one another.

**SOCKET:**

Socket is a *endpoint* for communication *between two machines* over a network.(A network that is connected with two devices as a link to execute two-way communication on the network).It allows for data to be sent and received between devices in a network.

The socket is a type of mechanism that is used to *exchange data between different processes.* Here these processes are either present in different devices or the same device which are connected over a network. Once the connection for the socket is created, then the data can be sent in both directions and continues until one of the endpoints closes the connection.

*“They are used to connection between a client and a server,so they can communicate with each other.”*

***So what is client or server?***

|  |  |
| --- | --- |
| **CLIENT** | **SERVER** |
| Client is a device or a program that *request service, resources* from server. | Server is a device or program thar *provides resources or services* to the client. |
| Clients initiate communication and send requests to server | Server waits for incoming request from the user(client) |
| They provide UI(user Interface) for end-users to interact with services provided by server. | They handle the incoming requests and send back the appropriate response or data.They can handle multiple clients simultaneously. |

* The socket address is a combination of IP address and port.

***IP address?***

It is the *unique address* assigned to each device connected to a network that uses IP for communication.

***FUNCTIONS***:identifies hosts,location of host in network TYPES:IPv4,IPv6

***Public vs private IP addresses?***

*Public IP* is provided by ISP(internet service provider),they are used on the internet.They are routable on internet!

*Private IP address*:They are used within private networks,not routable on the internet.

**RANGE:192.168.0.0 to 192.168.255.255**

**And 10.0.0.0 to 10.255.255.255**

***Port?***

Port is *numerical identifier* in networking *to specify particular process* or services *on a device within a network*.

**RANGE:0-65535**

***NOTE:***0-1023 are reserved for well-known services and protocols

* HTTP uses port 80,
* HTTPS uses port 443

“Now,in the TCP or IP layer socket is bound as a port number which can identify whether the data is to be sent to a applicant or not.”

***TYPES OF SOCKETS:***

There are two types of sockets TCP(transfer control protocol) AND UDP(user datagram protocol)

|  |  |
| --- | --- |
| **TCP(transfer control protocol)** | **UDP(user datagram protocol)** |
| *Connection-oriented* | *Connectionless* |
| *Reliable*(ensures data is received in order)Order in which *data received is guaranteed.* | *Unreliable*(no guarantee of the data itself)No *guarantee of order* of data. |
| Dtata transmission is *stream based*(there is continuous flow of data) | Datagram-based(individual packets)  Datagram-refers to self-conatined,*independent packets* of data that is sent over a network. |
| Connection setup happens in a *3WAY handshake manner*.  (SYN,SYN-ACK,ACK) | No connection setup required. |
| Automatic retransmission of lost packets. | No retransmission. |
| *Higher overhead* due to reliability,hence *slow* | *Lower overhead*,hence *fast* |
| **Ex:**HTTPS,HTTP,FTP  **USE:**suitable for application where reliablity and data integrity is critical.  Ie)web browsing,email,file transfer. | **Ex:*DNS-Domain name system***  **USE:** suitable when speed is critical and occasional data loss is acceptable.ie)gaming,video streaming. |

***THREE-WAY HANDSHAKE:***

In context of TCP

*SYN:Synchronise*

The client send a TCP packet with SYN flag set to server,this packet indicates that the clint wants to establish a connection.

*SYN-ACK:Synchronise-Acknowledge*

The server responds to the client with a TCP packet that has both SYN and ACK flag set.This packet acknowledges the receipt(client’s SYN packet) and also contains SYN flag indicating server is willing to make/establish connection.

ACK:Acknowledge

The client sends a final TCP packet with the ACK flag to set to the server.

This packet acknowledges the receipt of the servers’s SYN-ACK packet.

***PROCEDURE IN CLIENT-SEVER COMMUNICATION:***

**1.socket**:*creates new communication* endpoint

**2.Bind**:*attach a local address* to a socket

**3.Listen:**Announce a *willingness to make/accept connections*

**4.connect:**Actively *attempt to establish connection*

**5.send:**send some dat over the connection

**6.Receive:**receive some data over the connection

**7.close:**release the connection