Internet Protocol Suite

Internet Protocol Suite is a conceptual model and set of communication protocols used in the Internet and similar computer network.

Application Layer – It is a scope within which application or processes create user data and communicate this data to other application on same or another host. This layes make use of services provided by the underlying lower layes especially the transport layer. Communication partners are characterized by the application architecture such as client-server model and peer-to-peer model. Ex – SMTP, FTP, SSH, HTTP.

Transport Layer – It perform the host to host communications on either the same or different hosts and on either a local network or remote network. It provide channel for communication need of applications.
Ex – UDP, TCP.

Internet Layer – It provide a uniform networking interface that hides the actual topology of the underlying network connections. Layer that established internetworking. This define the addresing and routing structure of used for Protocol. Ex- IP

Link Layer - Within the scope of local network link on which the host communicate without intervening routers.

TCP (Transmission Control Protocol)
- TCP is all about its **reliability** – packets sent with TCP are tracked so no data is lost or corrupted.
- It is **connection oriented** means a connection is required for transmitting of data.
- Packets arrives in **order**.
- **Slower** the UDP
- Used by HTTP, HTTPS, FTP, SMTP.
How TCP works -
- Three way handshake
        - Server – Socket, Bind, Listen
        - Client – Connect

UDP (User Datagram Protocol)
- a **datagram** is same thing as packet of information.
- It just send the packets **without checking loss or curruption.**
- Losing all this overhead means the communication **speed increases**.
- There is no sequence of data**(unorderd)**.
- **Faster** than TCP. Broadcast
- Used by DNS, DHCP.

SCTP (Stream Transmission Control Protocol)
- **Acknowledge error-free non-duplicated transfer** of user data.
- Sequenced delivery of user messages within multiple streams, with an option of order-of-arrival delivery of individual user messages.
- SCTP uses **multi-streaming** to transport data which means there can be several independent streams of messages in parallel between the points of the transmission. The data is sent out in larger chuck than is used in TCP just like UDP but the message include a sequence number which can be used to reassemble the data.(Web image with Webpage text)
- TCP stream represent **a sequence of bytes**, SCTP stream represent **a sequence of messages**.
- Used in 3G/4G networks.
- More **complex** than TCP.
- Multihoming support in which end points can have multiple ip addresses, enabling transparent fail-over between redundant network paths.
- Validation and acknowledment **protect against flooding attacks.(Also 4way handshake)**

Services/Features	SCTP	TCP	UDP
Connection-oriented	yes	yes	no
Full duplex	yes	yes	yes
Reliable data transfer	yes	yes	no
Partial-reliable data transfer	optional	no	no
Ordered data delivery	yes	yes	no
Unordered data delivery	yes	no	yes
Flow control	yes	yes	no
Congestion control	yes	yes	no
Selective ACKs	yes	optional	no
Preservation of message boundaries	yes	no	yes
Multistreaming	yes	no	no
Multihoming	yes	no	no
Protection against SYN flooding attacks	yes	no	n/a

All using TCP as underlying transfering protocol.
HTTP (Hyper Text Transfer Protocol)
- It defines the format throught which web browsers communicates with web servers.
- Transfer files between webserver and websites.
- High speed data exchnage capabilities as compared to xmpp.In case of high amount of data http would be useful and in case of security xmpp is better.
HTTPS(http+cryptograpic protocol(tsl,ssl)Transport Layer Security,Secure Sockets Layer)-
- More secured the HTTP
- Send and receive encrypted data.
FTP (File Transfer Protocol)
- Client Server Architecture.
- Transfer files over a communication network. It establishes two TCP Connections – Control connection to autheticate the user and data connection to transfer the files.
- Transfer files between computers.
SMTP(Simple Mail Transfer Protocol)
- Used by email servers to communicate with each other.
- Transfer mails via mail servers.
- As it is made for messages only so don't support character other than 7-bit ASCII.
XMPP-
- It is **decentralized server**. Protocol uses multiple servers to communicate between clients. There is no central server.
- XMPP is slower than web socket.
- More secure as provide multiple level security.
- Effective Support

IPv4 -
Connectionless protocol
Less memory
2^{32} uniques address approx 4 billions
IPv6 -
Hierarchical addressing and routing infrastructure

2^128 uniques address

Protocols -

DNS – It is a hierarchical and decentralized naming system for computers, services or other resources connected to the internet.