Application Layer Protocol

Domain Name System (DNS)

Most commonly used domain are :

(i) **com** — usually used by commercial organization
eg: Yahoo(yahoo.com)

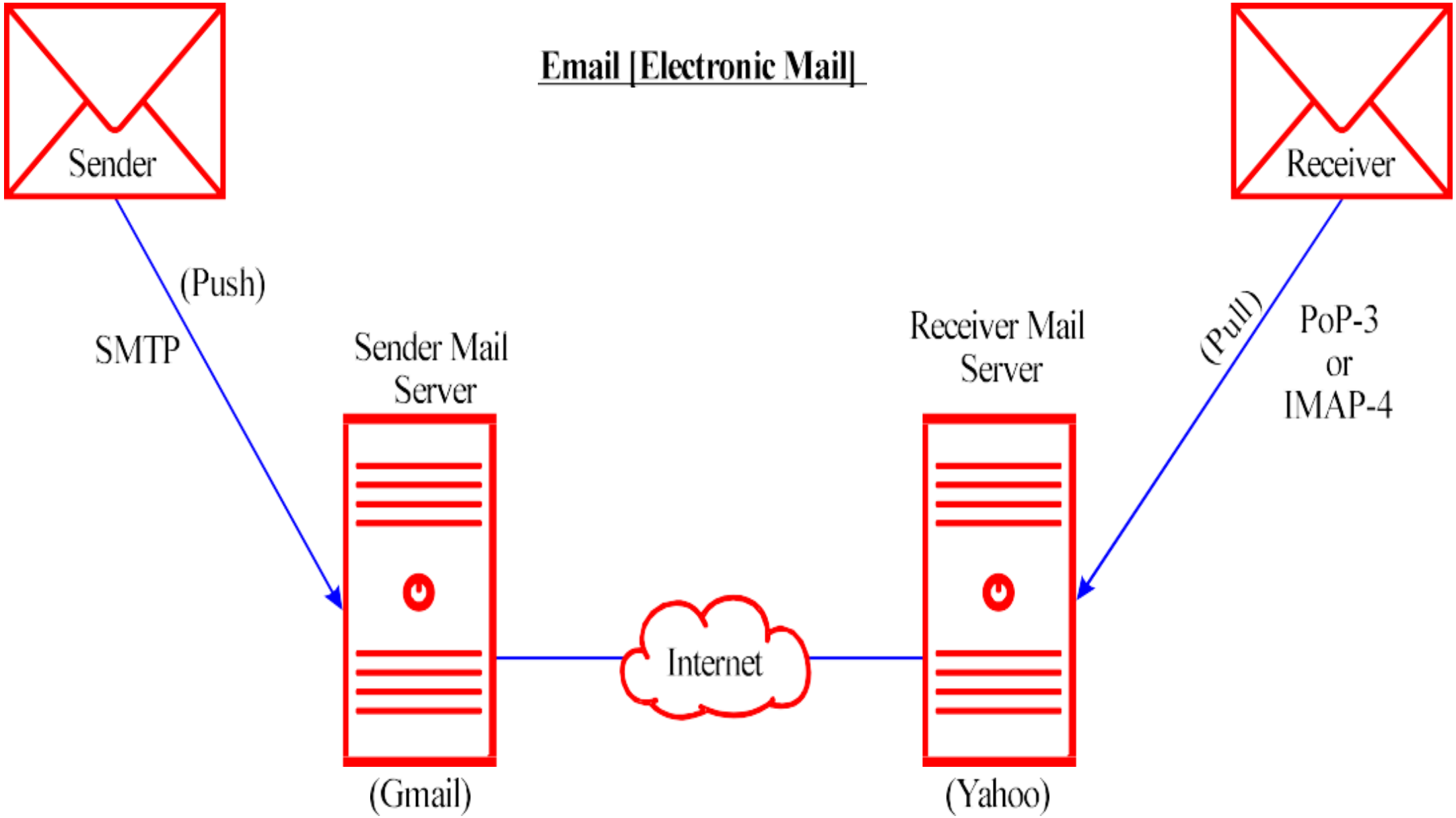
(ii) **edu** — usually used by educational institute
eg: iisc.edu

(iii) **org** — used by Non profit organization
eg: ieee.org

(iv) **mil** — used by Military organization

(v) **net** — It is open public for any commercial organization

(vi) **gov** — used to represent government organization
eg: isro.gov


Email [Electronic Mail]
Sender
Receiver
(Push)
SMTP
Sender Mail Server
Receiver Mail Server
(Pull)
PoP-3 or IMAP-4
Internet
(Gmail)
(Yahoo)

E-mail

SMTP transfer the mail from sender's mail server to receiver's mail server.

While sending the mail ,SMTP is used two times-.

1. Between the sender and sender's mail server
2. Between the sender's mail server and receiver's mail server

To receive or download the email

Another protocol is needed between the receiver mail server and receiver.

The most commonly used protocols are POP3 and IMAP4.

SMTP- Simple Mail Transfer Protocol

1. The objective of SMTP is to transfer the email reliably and efficiently.
2. It uses port number-25 at TCP.
3. In SMTP there are two components:
   (i) User Agent (UA)
   (ii) Mail transfer Agent (MTA)
4. User Agent prepares the message, creates the envelope and put the message in the envelope.
5. Mail transfer Agent transfer the mail across the internet i.e. Actual mail transfer is done through MTA.
6. To send mail, system must have a client MTA and to receive the mail. it must have a server MTA.

1. SMTP can only handle the message containing 7 bit ASCII text.
2. SMTP cannot transfer other types of data like images, video, audio, etc.
3. SMTP cannot transfer binary files or executable files.
4. SMTP cannot transfer the text data for the language other than English (such as French, Japanese, and Chinese etc.).
5. Only SMTP is not sufficient to send binary files or to send videos or audio so we require MIME (Multipurpose Internet mail extension).
6. SMTP is a text based protocol.
7. SMTP is stateless protocol. It does not maintain any information of user. If an e-mail is asked to be sent twice, then server resends it without saying that e-mail has already been sent.
8. SMTP is a connection-oriented protocol.
9. SMTP uses persistent TCP connections, so it can send multiple e-mail at once.
10. SMTP is used for Push the e-mail.
11. SMTP Pushes the mail from client to server on other hand, It needs a pull protocol(Download).
12. POP3 and IMAP4 are used for Pulling the e-mail.

Post Office Protocol-Version3

1. It is a message access protocol.
2. It is a pull protocol.
3. POP3 uses port number-110 at TCP.
4. POP3 is a connection-oriented protocol.
5. POP3 uses persistent TCP connection.
6. POP3 is a stateful protocol.
7. POP3 does not allow users to partially check the content of the mail before downloading.
8. POP3 does not allow user to organize the mail on the mail server.
9. POP 3 is an “In-band” Protocol.

IMAP-4(Internet Mail Access Protocol version-4)

1. IMAP-4 is similar to POP3 but it has more features. IMAP-4 is more powerful and more complex.
2. IMAP-4 provides the following extra functions.
3. A user checks the email header prior to downloading.
4. A user can search the content of the email for a specific string of characters prior to downloading.
5. A user can partially download the email.
6. IMAP is a pull protocol.
7. IMAP uses port number-143 at TCP.
8. IMAP is a connection-oriented protocol.
9. IMAP uses persistent TCP connection.

POP3	IMAP
(1) Mails can only be accessed from a single device.	Mails can be accessed from multiple device.
(2) Download the email from server to a single computer and the copy at the server is deleted.	The email message is stored on the mail server itself.
(3) User cannot organize the mails in the mail box of the mail server.	User can organize mails on the mail server.
(4) It does not allow user to sync emails.	It allows user to sync their emails.
(5) It is unidirectional i.e all the changes made on a device does not effect the content present on the server.	It is bidirectional i.e all the chances made on server or device are made on the other side too.

File Transfer Protocol

1. File transfer protocol is a standard internet protocol for transferring files b/w computers over TCP/IP connection.
2. It uses port number - 20 & 21 on TCP.
3. It has two types of connection
   (i) Control connection (port number. - 21)
   (ii) Data connection (port number - 20)
4. Control connection remains connected during the entire interactive FTP session.
5. The data connection is opened and closed for each file transfer activity.
6. When user starts an FTP session, the control connection opens. While the control connection is open, the data connection can be opened and closed multiple times if several files are transferred.
7. FTP uses persistent TCP connections for control information.
8. FTP uses Non-persistent TCP connections for data information.
9. FTP is a connection-oriented protocol
10. FTP is out-band protocol as data and control information flow over different connection.
11. HTTP & SMTP are In-Band protocol.

FTP is state full protocol. FTP can transfer one of the following file types across the data connection:

ASCII file ,EBCDIC file (File format used by IBM) and Image file

HTTP Protocol

1. HTTP protocol is used mainly to access data on world wide web (www).
2. It is client server protocol using port number - 80 on TCP.
3. HTTP is in-band protocol i.e. both request and data we will send only in one connection.
4. HTTP is a stateless protocol i.e. It does not maintain any information of user.
5. There are two types of HTTP protocol
6. (i) Non-persistent(1.0)
7. (ii) Persistent(1.1)

In a Non persistent (1.0) connection one TCP connection is made for each request/response. This strategy follow the following steps: -

(i) The client opens a TCP connection and sends a request.

(ii) Server sends the response and closes the connection.

(iii) In this strategy , If a file contains link to N-different pictures in different files(all located on same server) the connection must be opened and closed N+1 times.

1. In a persistent(1.1) connection the server leaves the connection open for more request after sending a response.
2. The server closes the connection at the request of client or time out has been reached.

Application	Port Number.	Transport Protocol
DNS	53	UDP
HTTP	80	TCP
FTP	20 (Data connection) 21(Control connection)	TCP
SMTP	25	TCP
POP	110	TCP
SNMP	161, 162	UDP
TFTP	69	UDP
IMAP	143	TCP
Telnet	23	TCP
DHCP	67. (DHCP Server) 68. (DHCP Client)	UDP