

UNIT-5
APPLICATION LAYER

DOMAIN NAME SYSTEM

This is primarily used for mapping host and e-mail destinations to IP addresses but can also be used other purposes. DNS is defined in RFCs 1034 and 1035.

Working:-

- To map a name onto an IP address, an application program calls a library procedure called Resolver, passing it the name as a parameter.
 - The resolver sends a UDP packet to a local DNS server, which then looks up the name and returns the IP address to the resolver, which then returns it to the caller. Armed with the IP address, the program can then establish a TCP connection with the destination, or send it UDP packets.
1. **The DNS name space.**
 2. **Resource Records.**
 3. **Name Servers.**

1. **THE DNS NAME SPACE:**

The Internet is divided into several hundred top level domains, where each domain covers many hosts. Each domain is partitioned into sub domains, and these are further partitioned as so on. All these domains can be represented by a tree, in which the leaves represent domains that have no sub domains. A leaf domain may contain a single host, or it may represent a company and contains thousands of hosts. Each domain is named by the path upward from it to the root. The components are separated by periods (pronounced “dot”)

Eg: Sun Microsystems Engg. Department = eng.sun.com.

The top domain comes in 2 flavours:-

- **Generic:** com(commercial), edu(educational institutions), mil(the U.S armed forces, government), int (certain international organizations), net(network providers), org (non profit organizations).
- **Country:** include 1 entry for every country. Domain names can be either absolute (ends with a period e.g. eng.sum.com) or relative (doesn't end with a period). Domain names are case sensitive and the component names can be up to 63 characters long and full path names must not exceed 255 characters.

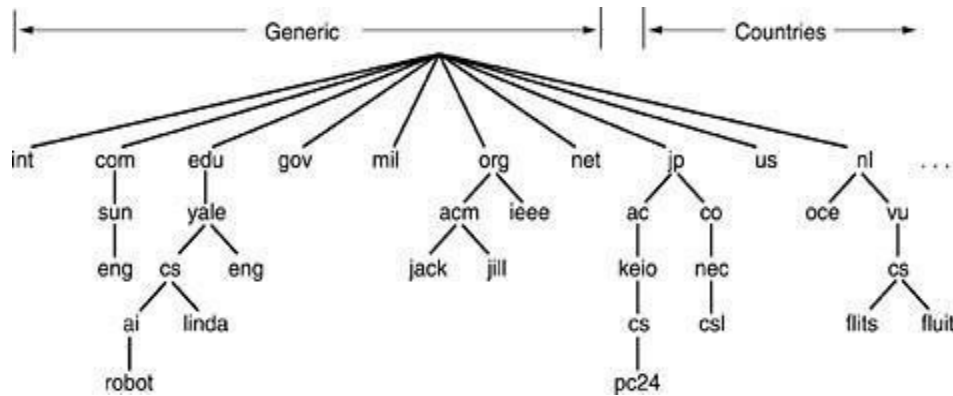


Figure 5-1. A portion of the Internet domain name space.

Insertions of a domain into the tree can be done in 2 ways:-

- Under a generic domain (Eg: cs.yale.edu)
- Under the domain of their country (E.g: cs.yale.ct.us)

2. RESOURCE RECORDS:

Every domain can have a sent of resource records associated with it. For a single host, the most common resource record is just its IP address. When a resolver gives a domain name to DNS, it gets both the resource records associated with that name i.e., the real function of DNS is to map domain names into resource records. A resource record is a 5-tuple and its format is as follows:

Domain	Name	Time to live	Type	Class	Value
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Domain_name : Tells the domain to which this record applies.

Time- to- live : Gives an identification of how stable the record is (High Stable = 86400 i.e. no. of seconds

/day) (High Volatile = 1 min)

Type: Tells what kind of record this is.

Class: It is IN for the internet information and codes for non internet information

Value: This field can be a number a domain name or an ASCII string

Type	Meaning	Value
SOA	Start of Authority	Parameters for this zone
A	IP address of a host	32-Bit integer
MX	Mail exchange	Priority, domain willing to accept e-mail
NS	Name Server	Name of a server for this domain
CNAME	Canonical name	Domain name
PTR	Pointer	Alias for an IP address
HINFO	Host description	CPU and OS in ASCII
TXT	Text	Uninterpreted ASCII text

3. NAME SERVERS

It contains the entire database and responds to all queries about it. DNS name space is divided up into non- overlapping zones, in which each zone contains some part of the tree and also contains name servers holding the authoritative information about that zone.

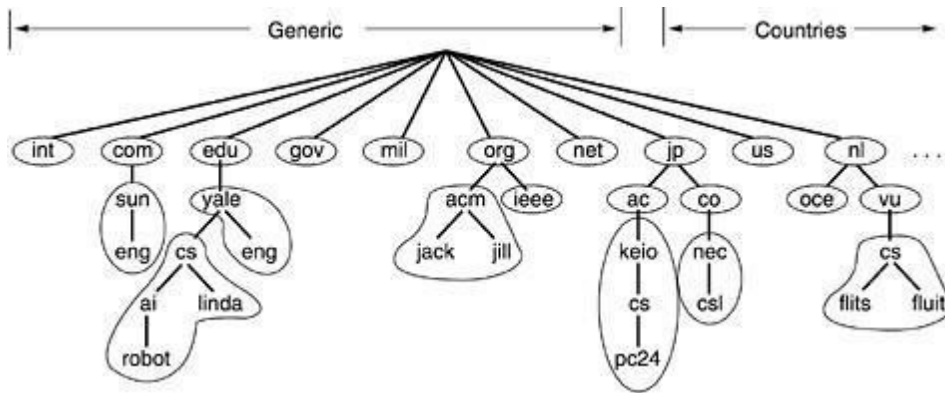


Figure 5-2. Part of the DNS name space showing the division into zones.

When a resolver has a query about a domain name, it passes the query to one of the local name servers:

1. If the domain being sought falls under the jurisdiction of name server, it returns the authoritative resource records (that comes from the authority that manages the record, and is always correct).
2. If the domain is remote and no information about the requested domain is available locally the name server sends a query message to the top level name server for the domain requested.

E.g.: A resolver of flits.cs.vu.nl wants to know the IP address of the host Linda.cs.yale.edu

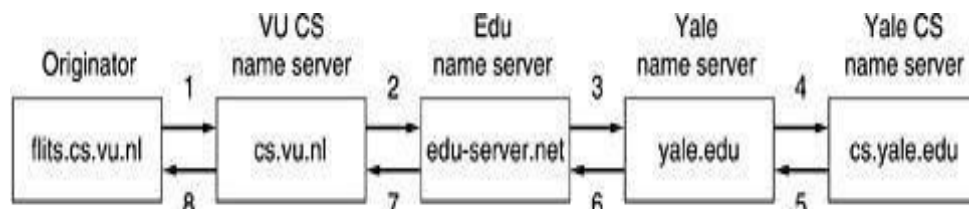


Figure 5-3. How a resolver looks up a remote name in eight steps.

- Step 1:** Resolver sends a query containing domain name sought the type and the class to local name server, cs.vu.nl.
- Step 2:** Suppose local name server knows nothing about it, it asks few others nearby name servers. If none of them know, it sends a UDP packet to the server for edu-server.net.
- Step 3:** This server knows nothing about Linda.cs.yale.edu or cs.yale.edu and so it forwards the request to the name server for yale.edu.
- Step 4:** This one forwards the request to cs.yale.edu which must have authoritative resource records.
- Step 5 to 8:** The resource record requested works its way back in steps 5-8 This query method is known as Recursive Query
3. When a query cannot be satisfied locally, the query fails but the name of the next server along the line to try is returned.

ELECTRONIC MAIL

1. ARCHITECTURE AND SERVICES:

E-mail systems consist of two subsystems. They are:-

(1). **User Agents**, which allow people to read and send e-mail

(2). **Message Transfer Agents**, which move messages from

source to destination E-mail systems support 5 basic functions:-

- a. Composition
- b. Transfer
- c. Reporting
- d. Displaying
- e. Disposition

(a). **Composition:** It refers to the process of creating messages and answers. Any text editor is used for body of the message. While the system itself can provide assistance with addressing and numerous header fields attached to each message.

(b). **Reporting:** It has to do with telling the originator what happened to the message that is, whether it was delivered, rejected (or) lost.

(c). **Transfer:** It refers to moving messages from originator to the recipient.

(d). **Displaying:** Incoming messages are to be displayed so that people can read their email.

(e). **Disposition:** It concerns what the recipient does with the message after receiving it. Possibilities include throwing it away before reading (or) after reading, saving it and so on. Most systems allow users to create **mailboxes** to store incoming e-mail. Commands are needed to create and destroy mailboxes, inspect the contents of mailboxes, insert and delete messages from mailboxes, and so on.

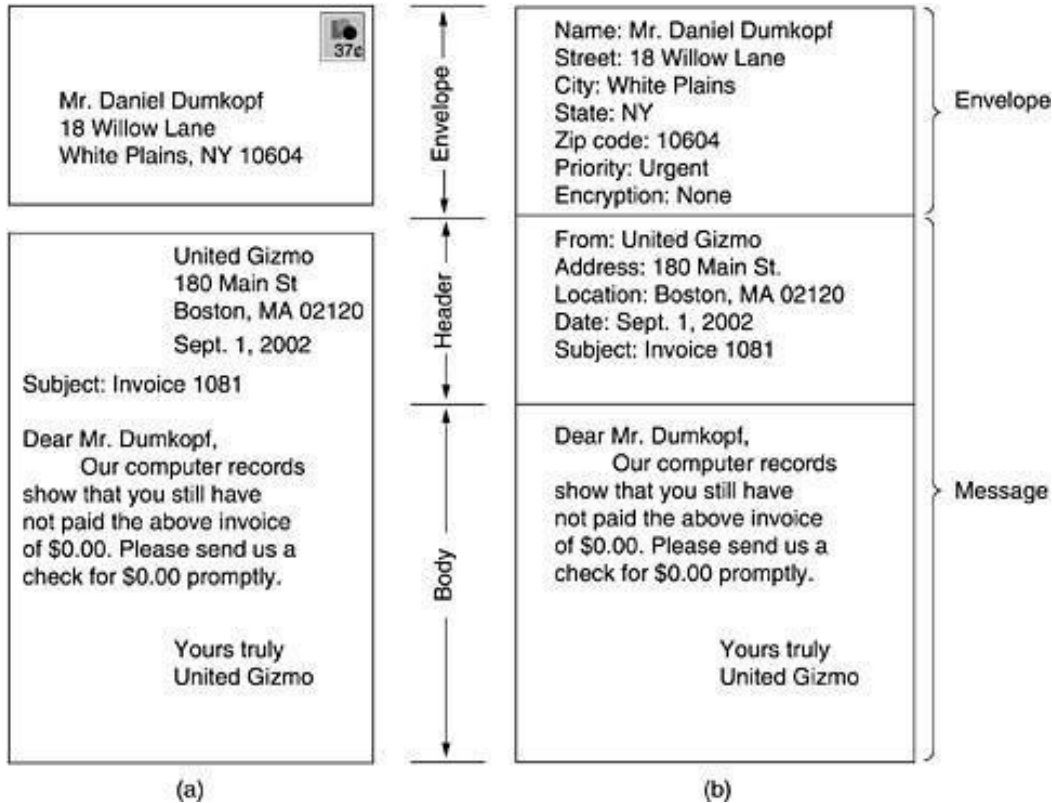


Figure 5-4: Envelopes and messages. (a) Paper mail. (b) Electronic mail.

THE USER AGENT

A user agent is normally a program (sometimes called a mail reader) that accepts a variety of commands for composing, receiving, and replying to messages, as well as for manipulating mailboxes.

SENDING E-MAIL

To send an e-mail message, a user must provide the message, the destination address, and possibly some other parameters. The message can be produced with a free-standing text editor, a word processing program, or possibly with a specialized text editor built into the user agent. The destination address must be in a format that the user agent can deal with. Many user agents expect addresses of the form *user@dns-address*.

READING E-MAIL

When a user agent is started up, it looks at the user's mailbox for incoming e-mail before displaying anything on the screen. Then it may announce the number of messages in the mailbox or display a one-line summary of each one and wait for a command.

- **Multiplexing:** Multiplexing is a process of accepting the data from different applications and forwarding to the different applications on different computers. At the receiving end, the data is forwarded to the correct application. This process is known as demultiplexing. TCP transmits the packet to the correct application by using the logical channels known as ports.
- **Destination port address:** It is used to define the address of the application program in a destination computer. It is a 16-bit field.
- **Sequence number:** A stream of data is divided into two or more TCP segments. The 32-bit sequence number field represents the position of the data in an original data stream.
 - **Acknowledgement number:** A 32-bit acknowledgement number acknowledge the data from other communicating devices. If ACK field is set to 1, then it specifies the sequence number.

SNMP Protocol

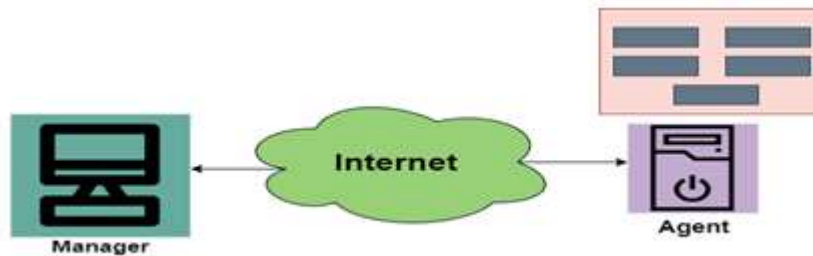
- SNMP mainly stands for Simple Network Management protocol.
- It is basically a framework that is used for managing the devices on the internet by using the TCP/IP protocol suite.
- Basically, SNMP provides a set of fundamental operations in order to monitor and maintain the Internet.
- It is an application layer protocol that was defined by the Internet engineering task force.
- This protocol is mainly used to monitor the network, detect the faults in the Network, and sometimes it is also used to configure the remote devices.

Concept of SNMP

The SNMP protocol makes the use of Manager and Agent; where the manager is usually a host that controls and monitors the set of agents.

- The SNMP is an application-level protocol and it consists of a few manager stations that mainly controls a set of agents. This protocol is mainly designed at the application level so that it can monitor the devices that are mainly made by different manufacturers and that are installed on different physical networks.

Thus there are three components in the architecture of the SNMP:



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- SNMP Manager
- SNMP Agent
- Management Information Base

SNMP Manager

It is basically a centralized system and it is mainly used to monitor and manage devices that are connected with the network. SNMP manager is typically a computer and it is used to run one or more network management systems.

Given below are the main functions of SNMP Manager:

1. Collects response from the agents.
2. To acknowledge asynchronous events from the agents.
3. To set variables in the agent.
4. Queries the Agent

SNMP Agent

SNMP Agent is basically a software program that is packaged within the network element. It is mainly installed on a managed device where managed devices can be switches, servers, routers, PC, etc.

Mainly the agents keep the information in the database also the manager has the access to the values present in the database.

Given below are the main responsibilities of the SNMP Agent:

- SNMP agents mainly collect the management information about its local environment
- The SNMP agent mainly signals an event to the manager.
- The SNMP agents also act as a proxy for some non-SNMP manageable network nodes. Thus the management with SNMP is mainly based on these given ideas:

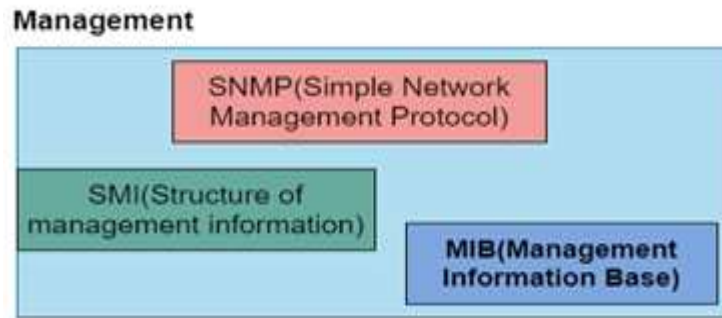
ideas:

1. An SNMP manager checks the agent by requesting information that mainly reflects the behavior of the SNMP agent.
2. The SNMP manager also forces the agent to perform the task by resetting the values in the database of the agent.
3. Management process is also contributed by the agent just by warning the SNMP manager about an unusual situation.

Management Components

In order to perform the Management tasks, the SNMP protocol makes the use of two other protocols and are SNMP and MIB. We can also say that the Management on the Internet is done by the cooperation of

three protocols and these are SNMP, MIB, SMI.



Let us discuss their roles one by one;

Role of SNMP

The SNMP protocol performs some specific roles in Network Management;

- It mainly defines the format of the packet that needs to be sent from the manager to the agent or vice-versa.
- SNMP is also used to interpret the result and create the statistics.
- The SNMP is also responsible for reading and changing these values.

Role of SMI

In order to use the SNMP, there is a need for some rules and these rules are for naming the objects.

Now it's time to take a look at the roles of SMI:

- SMI (Structure of Management Information) is mainly used to define the general rules for naming the objects.
- It is also used to define the type of objects that includes (range and length).
- This is also used to show how to encode the objects and values.
- The SMI does not define the number of objects that should be managed by an entity.
- It also does not define the association between the objects and their values.

Role of MIB

In order to manage each entity, this protocol is mainly used to define the number of objects and then to name them according to the rules defined by the SMI and after that associate a type to each named object.

- MIB (Management Information Base) is mainly used to create a set of objects that are defined for each entity that is similar to the database.
- Thus MIB mainly creates a collection of named objects, their types.

Advantages of SNMP Protocol

Given below are some of the benefits of using SNMP :

1. It is the standard network management protocol.
2. This protocol is independent of the operating system and programming language.
3. The functional design of this protocol is Portable.
4. The SNMP is basically a core set of operations and it remains the same on all managed devices. Thus SNMP supports extendibility.

5. SNMP is a universally accepted protocol.
6. It is a lightweight protocol.
7. This protocol allows distributed management access.

Disadvantages

Some of the drawbacks of SNMP are as follows:

- This protocol leads to the reduction of the bandwidth of the network.
- Access control, authentication, and privacy of data are some largest security issues using this.
- SNMP deals with information that is neither detailed nor enough well organized

ELECTRONIC MAIL

Electronic mail is often referred to as E-mail and it is a method used for **exchanging digital messages**.

- Electronic mail is mainly designed for **human use**.
- It allows a message to includes **text, image, audio** as well as **video**.
- This service allows one message to be **sent to one or more than one recipient**.
- The E-mail systems are mainly based on the **store-and-forward model** where the E-mail server system accepts, forwards, deliver and store the messages on behalf of users who only need to connect to the infrastructure of the Email.
- The Person who **sends the email** is referred to as **the Sender** while the person who receives an email is referred to as **the Recipient**.
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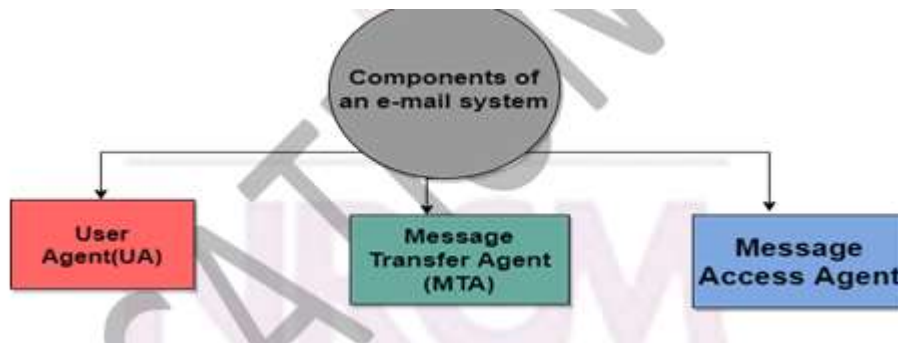
Need of an Email

By making use of Email, we can send any message at any time to anyone.

- We can send the same message to several peoples at the same time.
- It is a very fast and efficient way of transferring information.
- The email system is very fast as compared to the Postal system.
- Information can be easily forwarded to coworkers without retyping it.

Components of E-mail System

The basic Components of an Email system are as follows:



1. User Agent (UA)

It is a program that is mainly used to send and receive an email. It is also known as an email reader. User-Agent is used to compose, send and receive emails.

- It is the first component of an Email.
- User-agent also handles the mailboxes.
- The User-agent mainly provides the services to the user in order to make the sending and receiving process of message easier.

Given below are some services provided by the User-Agent:

Message Transfer Agent

The actual process of transferring the email is done through the Message Transfer Agent (MTA).

- In order to send an Email, a system must have an MTA client.
- In order to receive an email, a system must have an MTA server.
- The protocol that is mainly used to define the MTA client and MTA server on the internet is called SMTP (Simple Mail Transfer Protocol).
- The SMTP mainly defines how the commands and responses must be sent back and forth

1. Message Access Agent

In the first and second stages of email delivery, we make use of SMTP.

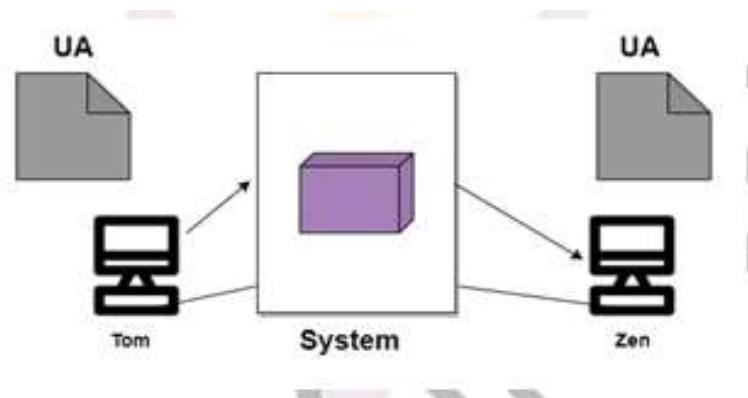
- SMTP is basically a Push protocol.
- The third stage of the email delivery mainly needs the pull protocol, and at this stage, the message access agent is used.
- The two protocols used to access messages are POP and IMAP4.

Architecture of Email

Now it's time to take a look at the architecture of e-mail with the help of four scenarios:

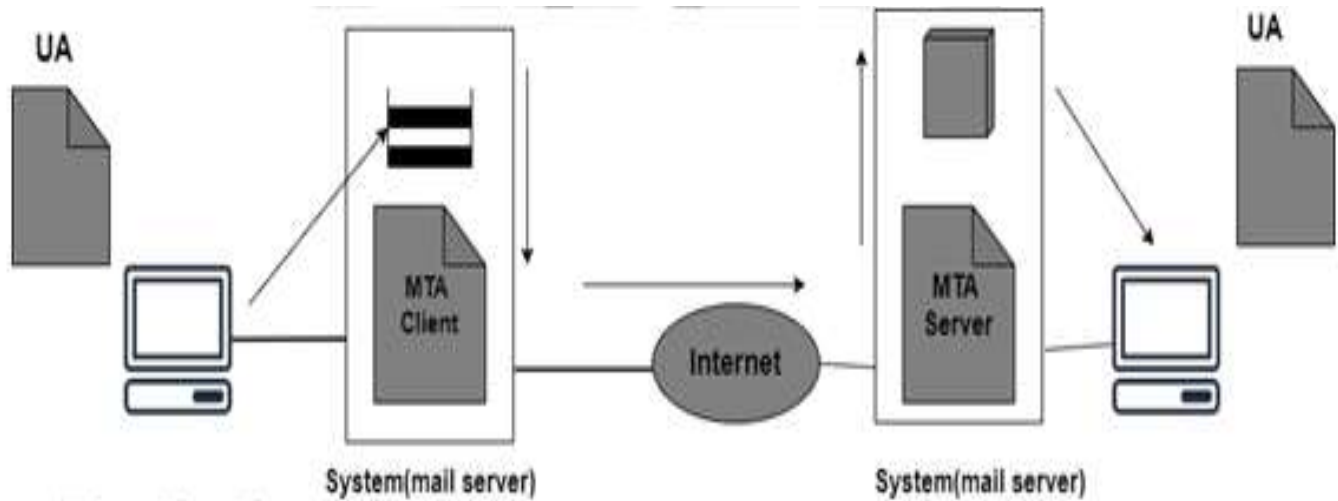
First Scenario

When the sender and the receiver of an E-mail are on the same system, then there is the need for only two user agents.



Second Scenario

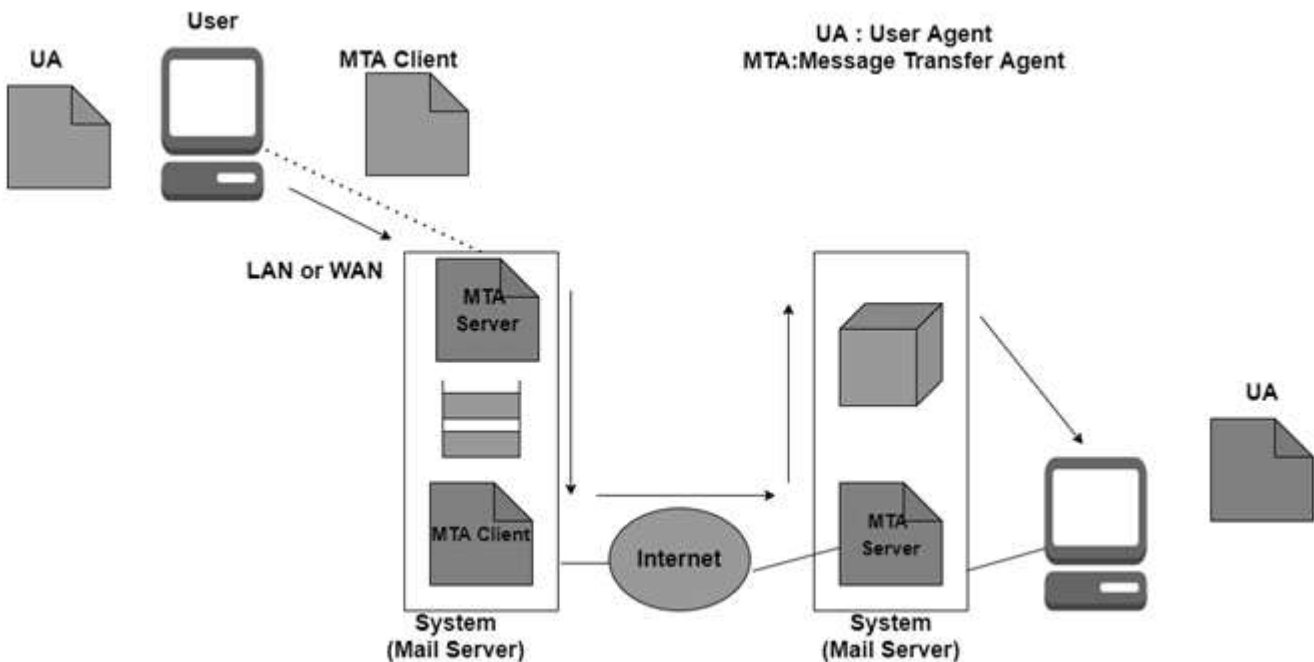
In this scenario, the sender and receiver of an e-mail are basically users on the two different systems. Also, the message needs to send over the Internet. In this case, we need to make use of User Agents and Message transfer agents (MTA).



Third Scenario

In this scenario, the sender is connected to the system via a point-to-point WAN it can be either a dial-up modem or a cable modem. While the receiver is directly connected to the system like it was connected in the second scenario.

Also in this case sender needs a User agent(UA) in order to prepare the message. After preparing the message the sender sends the message via a pair of MTA through LAN or WAN.



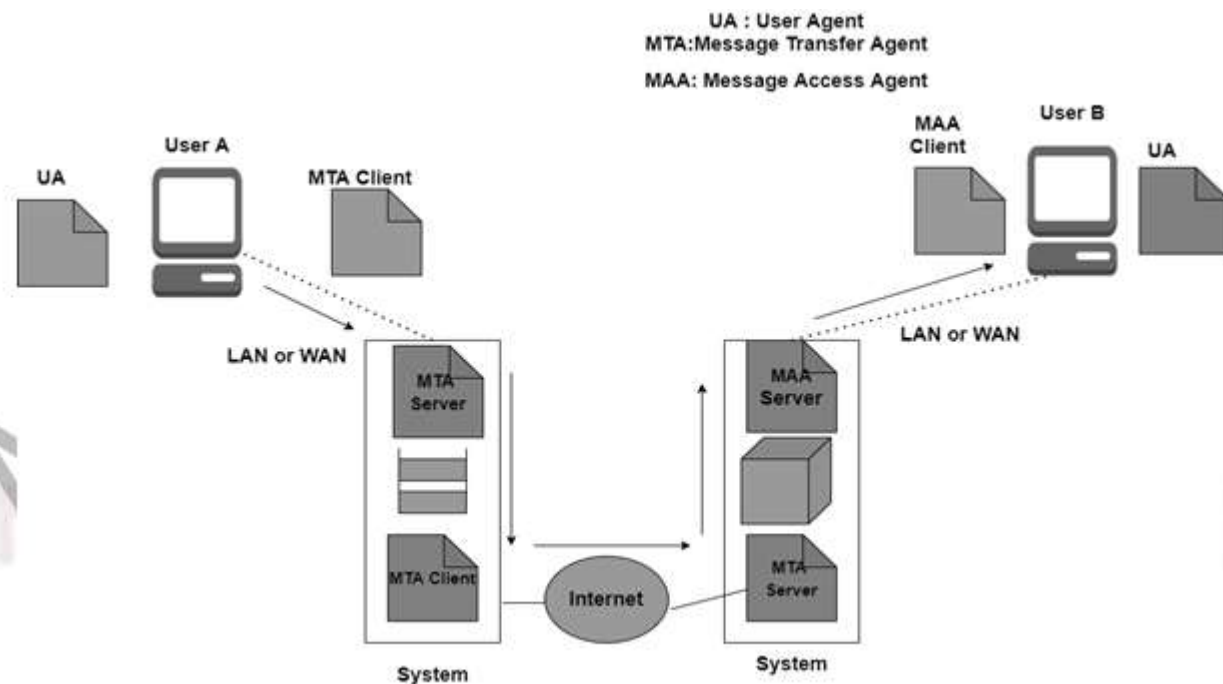
Fourth Scenario

In this scenario, the receiver is also connected to his mail server with the help of WAN or LAN.

When the message arrives the receiver needs to retrieve the message; thus there is a need for another set of client/server agents. The recipient makes use of MAA (Message access agent) client in order to retrieve the message.

In this, the client sends the request to the Mail Access agent (MAA) server and then makes a request for the transfer of messages.

This scenario is most commonly used today.



Structure of Email

The message mainly consists of two parts:

1. Header
2. Body

Header

The header part of the email generally contains the sender's address as well as the receiver's address and the subject of the message.

Body

The Body of the message contains the actual information that is meant for the receiver.

Email Address

In order to deliver the email, the mail handling system must make use of an addressing system with unique addresses.

The address consists of two parts:

- Local part
- Domain Name

Local Part

It is used to define the name of the special file, which is commonly called a user mailbox; it is the place where all the mails received for the user is stored for retrieval by the Message Access Agent.

Domain Name

It is the second part of the address is Domain Name.

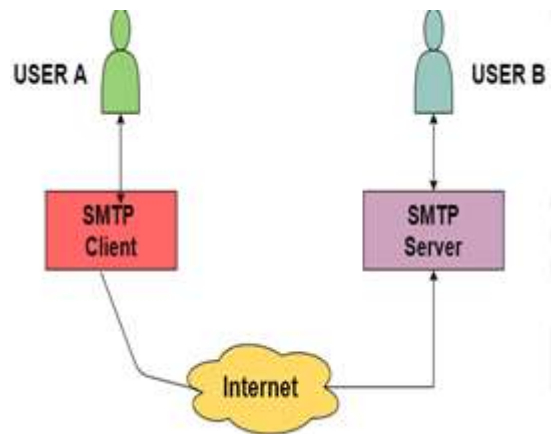
SMTP PROTOCOL

SMTP mainly stands for Simple Mail Transfer Protocol. Basically, the actual transfer of mail is done through the message transfer agents(MTA). Thus in order to send the mail, the system must have the **client MTA** and in order to receive the mail, the system must have a server MTA.

- In order to define the **MTA client** and **server** on the Internet, there is a formal way and it is known as

Simple Mail Transfer Protocol (SMTP).

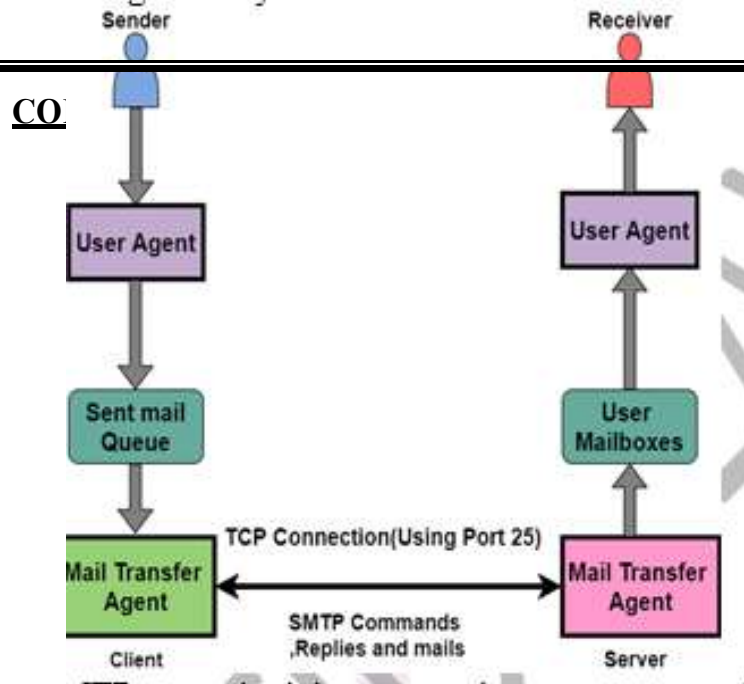
- SMTP also makes the use of TCP/IP for sending and receiving e-mail.
- SMTP is based on the client/server model.
- The original standard port for SMTP is Port 25.
- Using this protocol, the client who wants to send the e-mail first opens a TCP connection to the SMTP server and then sends the e-mail across the TCP connection. It is important to note that the SMTP server is always in listening mode. As soon as it listens for the TCP connection from any client then the connection is initiated on port 25 and after the successful connection, the client sends the e-mail/message immediately.



SMTP is used two times while sending an Email:

1. Between the Sender and Sender's mail server
 2. Between the Sender's mail server and the Receiver's mail server
- It is important to note that in order to receive or download the email,

- There is a need for another protocol between the mail server of receiver and the receiver.
- Commonly used protocols are POP3 and IMAP. Thus these two are mail access agents.



Architecture of SMTP

All the users make use of **User Agent (UA)**. The Mail Transfer Agent (**MTA**) mainly helps to exchange all the messages in between both sender and receiver using the TCP/IP. The system administrator has the authority to configure the set up of local MTA, thus the users who are sending the email do not need to deal with the MTA. The MTA keeps the queue in the pool of messages; if the receiver is not available at that moment then MTA can schedule the repeat delivery of all the messages.

The SMTP Client as well as the SMTP server both has two main components and these are:

- UA(User-Agent)
- MTA(Mail Transfer Agent)

Let us now take a look at communication between the sender and the receiver:

The user agent at the sender side prepares the message and then sent it to the MTA. The task of the MTA is to transfer the Email across the network to the Receiver MTA. Also in order to send the Email, a system must have the client MTA and in order to receive the email, a system must have a server MTA.

Sending the Email

An email is sent between the sender and receiver using a series of request and response messages. An Email mainly consists of two parts **a header and body**. The body part of an email indicates the main message area. It is the actual information that is to be read by the receiver. The header mainly contains the address of the sender and recipient and it also contains the subject of the email.

In order to terminate the header of the email, there is a NULL line, everything after the NULL line is considered as the body of the message.

Receiving the Email

Mailboxes are checked by the user agent at the server side at a particular interval of time. In case if any information is received then it informs the receiver about the email.

At the time when the user tries to read the email then MTA mainly displays a list of emails with their short description in the mailbox. If the user selects any of the emails then can easily view the contents inside the email.

1. **Store-and-Forward Method** The store and forward method is used within an organization.
2. **End-to-End Method** Mainly used in end-to-end network to communicate between the different organizations

An SMTP client is the one who wants to send the mail and will definitely contact the destination's host SMTP directly in the order to send the Email to the destination. Also, the session is initiated by the client SMTP.

On the other hand, the SMTP server will keep the mail to itself until it is successfully copied to the SMTP at the receiver. The server SMTP mainly responds to the session request.

Thus the session is started by the client-SMTP and the server-SMTP will respond to the request of the sender.

Characteristics of SMTP

Let us take a look at the characteristics of the SMTP:

- SMTP makes use of Port 25.
- It makes use of persistent TCP connections and thus can send multiple emails all at once.
- It is a stateless protocol.
- It is a connection-oriented protocol.
- It makes use of TCP at the transport layer.
- It is a push control protocol.

Advantages of SMTP

Let us take a look at the advantages offered by the simple mail transfer protocol (SMTP):

- SMTP offers reliability in terms of the outgoing email messages.
- It is the simplest form of communication between various computers in a network via Email.
- In those cases where a particular message was not **delivered successfully** then, the SMTP server always tries to re-send the same message until the **transmission** becomes **successful**.

Disadvantages of SMTP

- SMTP does not provide good security.
- It is only limited to 7-bit ASCII characters.
- Beyond some specific length, email messages are rejected by SMTP servers.
- The usefulness of SMTP is limited by its simplicity.
- With the help of SMTP, the transmission of executable files and binary files is not possible until they get converted into text files.

POP PROTOCOL

POP is a short form of Post Office Protocol. It is another protocol present at the Application Layer of the OSI reference model.

- POP is mainly a message access protocol.
- POP is basically an internet standard protocol and as we already told you it works on the application layer and is used by the local email software in order to retrieve emails from the remote email server over the TCP/IP connection.
- The Post office Protocol (POP) does not allow any search facility.
- This protocol mainly allows one protocol to be created on the server.
- As this protocol supports offline access to the messages and so less internet usage time is required by this.
- Non-email data is not accessed by this protocol.
- Some of the common clients that make use of POP3 are Gmail, Netscape, Internet Explorer, Eudora.

History of POP

The POP (post office protocol) was published in 1984 by Internet Engineering Task Force. After that, it has been updated two times, because the backend developers want to make the layout simple.

The second version of POP was developed in 1985 and known as POP2 and this version needs the SMTP protocol in order to push the emails.

Then after the third version of POP was released in 1988 and known as POP3, this version does not require the SMTP protocol. The POP (Post office protocol version 3) is also integrated into famous e-

mail software, like Eudora and Outlook Express.

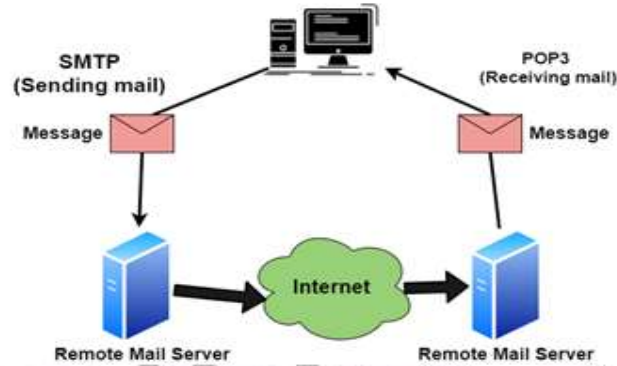
And since then (1988) the POP3 protocol version 3.0 was developed.

COMPUTER NETWORKS(CS3103PC)

Working of POP

All the incoming messages are stored on the POP server until the user login by using an email client and download the message to their computer. After the message is downloaded by the user it gets deleted from the server.

As we know that the SMTP is used to transfer the email message from the server to the server, basically POP is used to collect the email with an email client from the server and it does not include means to send messages.



If any user tries to check all the recent emails then they will establish a connection with the **POP3** at the server-side. The user sends the username and password to the server machine for getting the proper authentication. After getting the connection, users can receive all text-based emails and store them on their local terminal (machine), then finally discard all server copies and then breaks the connection from the server machine.

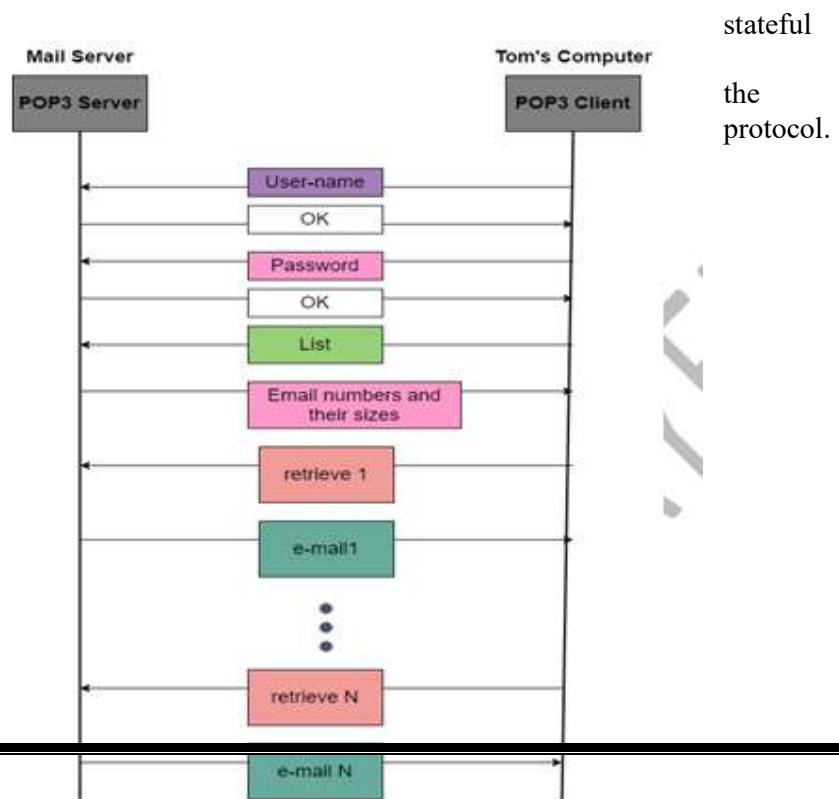
In order to retrieve a message from the server following steps are taken;

- Firstly a TCP connection is established by the client using port 110.
- The client identifies itself to the server.
- After that client issues a series of POP3 commands.

Features of POP protocol

Given below are some of the features provided by the POP protocol:

- The POP protocol uses PORT 110.
- It makes the use of a Persistent TCP connection.
- It is a Pull protocol.
- It is a connection-oriented protocol.
- The POP protocol is a protocol until the mail is downloaded and across sessions, it is a stateless



stateful
the
protocol.

COMPUTER NETWORKS(CS3103PC)

The above figure indicates the exchange of Commands and responses in the

POP3 Let us now take a look at the commands of POP:

Let us now take a look at the commands of POP:

Commands	Description
LOGIN	This command is used to open a connection.
STAT	This command is used to display the messages that are currently in the mailbox.
DELE	This command is used to delete a message.
RSET	This command is mainly used to reset the session to its initial state.
QUIT	This command is used to log off the session.
LIST	This command is mainly used to get the summary of each message where each message summary is shown.
RETR	This command is mainly used to select a mailbox in order to access the messages.

Disadvantages of POP

Now it's time to take a look at the drawbacks of Post office Protocol(POP):

- The same email account cannot be accessed from multiple computers or devices.
- The spread of the virus is easily using this protocol because it is possible that the file attached with the email contains the virus.
- The transfer of the local email folder to another email client terminal point is a difficult task.

WORLD WIDE WEB

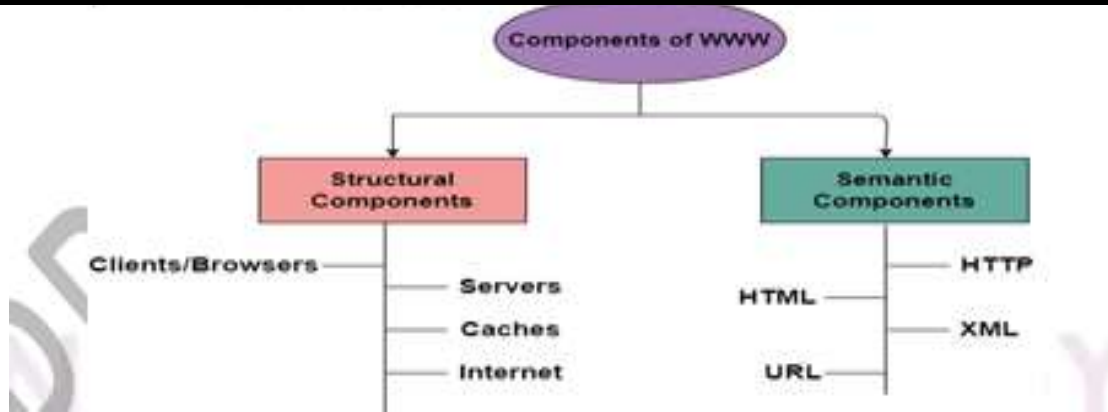
The **World Wide Web** or Web is basically a collection of information that is linked together from points all over the world. It is also abbreviated as **WWW**.

- World Wide Web provides flexibility, portability, and user-friendly features.
- It mainly consists of a worldwide collection of electronic documents (i.e, Web Pages).
- It is basically a way of exchanging information between computers on the Internet.
- The WWW is mainly the network of pages consists of images, text, and sounds on the Internet which can be simply viewed on the browser by using the browser software.
- It was invented by Tim Berners-Lee.

Components of WWW

The Components of WWW mainly falls into two categories:

1. Structural Components
2. Semantic Components



Architecture of WWW

The **WWW** is mainly a distributed **client/server** service where a client using the browser can access the service using a server. The Service that is provided is distributed over many different locations commonly known as **sites/websites**.

- Each website holds one or more documents that are generally referred to as **web pages**.
- Where each web page contains a link to other pages on the same site or at other sites.
- These pages can be retrieved and viewed by using browsers.

In the above case, the client sends some information that belongs to **site A**. It generally sends a request through its browser (It is a program that is used to fetch the documents on the web) and also the request generally contains other information like the address of the site, web page(URL). The server at **site A** finds the document then sends it to the client. After that when the user or say the client finds the reference to another document that includes the web page at **site B**. The reference generally contains the URL of site B. And the client is interested to take a look at this document too. Then after the client sends the request to the new site and then the new page is retrieved.

Now we will cover the components of WWW in detail.

1. Client/Browser

The Client/Web browser is basically a program that is used to communicate with the webserver on the Internet.

- Each browser mainly comprises of three components and these are:
 - Controller
 - Interpreter
 - Client Protocols
 - The Controller mainly receives the input from the input device, after that it uses the client programs in order to access the documents.
 - After accessing the document, the controller makes use of an interpreter in order to display the document on the screen.
 - An interpreter can be Java, HTML, and JavaScript mainly depending upon the type of the document.
 - The Client protocol can be FTP, HTTP, and TELNET.

2. Server

The Computer that is mainly available for the network resources and in order to provide services to the other computer upon request is generally known as the **server**.

- The Web pages are mainly stored on the server.
- Whenever the request of the client arrives then the corresponding document is sent to the client.
- The connection between the client and the server is TCP.
- It can become more efficient through multithreading or multiprocessing. Because in this case, the server can answer more than one request at a time.

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3. *URL*

URL is an abbreviation of **the Uniform resource locator**.

- It is basically a standard used for specifying any kind of information on the Internet.
- In order to access any page the client generally needs an address.
- To facilitate the access of the documents throughout the world HTTP generally makes use of Locators. URL mainly defines the four things:
- **Protocol** It is a client/server program that is mainly used to retrieve the document. A commonly used protocol is HTTP.
- **Host Computer** It is the computer on which the information is located. It is not mandatory because it is the name given to any computer that hosts the web page.
- **Port** The URL can optionally contain the port number of the server. If the port number is included then it is generally inserted in between the host and path and is generally separated from the host by the colon.
- **Path** It indicates the pathname of the file where the information is located.

4. *HTML*

HTML is an abbreviation of Hypertext Markup Language.

- It is generally used for creating web pages.
- It is mainly used to define the contents, structure, and organization of the web page.

5. *XML*

XML is an abbreviation of Extensible Markup Language. It mainly helps in order to define the common syntax in the semantic web.

Features of WWW

Given below are some of the features provided by the World Wide Web:

- Provides a system for Hypertext information
- Open standards and Open source
- Distributed.
- Mainly makes the use of Web Browser in order to provide a single interface for many services.
- Dynamic
- Interactive
- Cross-Platform

Advantages of WWW

Given below are the benefits offered by WWW:

- It mainly provides all the information for Free.
- Provides rapid Interactive way of Communication.
- It is accessible from anywhere.
- It has become the Global source of media.
- It mainly facilitates the exchange of a huge volume of data.

Disadvantages of WWW

There are some drawbacks of the WWW and these are as follows;

- It is difficult to prioritize and filter some information.
- There is no guarantee of finding what one person is looking for.
- There occurs some danger in case of overload of Information.
- There is no quality control over the available data.

Advantages of POP

Given below are the advantages offered by the POP :

- This protocol does not require any internet connection in order to access the downloaded emails.
- In order to receive emails on a single device, POP3 is very useful.

The Configuration of this protocol is simple and it is easy to use. Less storage space is needed in order to store emails on the hard disk.

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