

Unit-4: Mail Services

4.1 Application Layer services:

4.1.1 Concepts of email

4.1.2 Working of email account and services

4.1.3 URL and URL types (Absolute, Relative)

Introduction to Electronic Mail

Electronic Mail (e-mail) is one of most widely used services of [Internet](#). This service allows an Internet user to send a **message in formatted manner (mail)** to the other Internet user in any part of world. Message in mail not only contain text, but it also contains images, audio and videos data. The person who is sending mail is called **sender** and person who receives mail is called **recipient**. It is just like postal mail service.³.

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 include **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**.

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 : User Agent (UA), Message Transfer Agent (MTA), Mail Box, and Spool file. These are explained as following below.

1. User Agent (UA) :

The UA is normally a program which is used to send and receive mail. Sometimes, it is called as mail reader. It accepts variety of commands for composing, receiving and replying to messages as well as for manipulation of the mailboxes.

2. Message Transfer Agent (MTA) :

MTA is actually responsible for transfer of mail from one system to another. To send a mail, a system must have client MTA and system MTA. It transfers mail to mailboxes of recipients if they are connected in the same machine. It delivers mail to peer MTA if destination mailbox is in another machine. The delivery from one MTA to another MTA is done by [Simple Mail Transfer Protocol](#).

3. Mailbox :

It is a file on local hard drive to collect mails. Delivered mails are present in this file. The user can read it delete it according to his/her requirement. To use e-mail system each user must have a mailbox. Access to mailbox is only to owner of mailbox.

4. Spool file :

This file contains mails that are to be sent. User agent appends outgoing mails in this file using SMTP. MTA extracts pending mail from spool file for their delivery.

Services provided by E-mail system :

- **Composition**
The composition refers to process that creates messages and answers. For composition any kind of text editor can be used.
- **Transfer**
Transfer means sending procedure of mail i.e. from the sender to recipient.
- **Reporting**
Reporting refers to confirmation for delivery of mail. It help user to check whether their mail is delivered, lost or rejected.
- **Displaying**
It refers to present mail in form that is understand by the user.
- **Disposition**
This step concern with recipient that what will recipient do after receiving mail i.e. save mail, delete before reading or delete after reading.

E-mail is represented as the transmission of messages on the Internet. It is one of the most commonly used features over communications networks containing text, files, images, or other attachments.

Format of E-mail– an e-mail includes three parts that are as follows–

E-mail Envelope

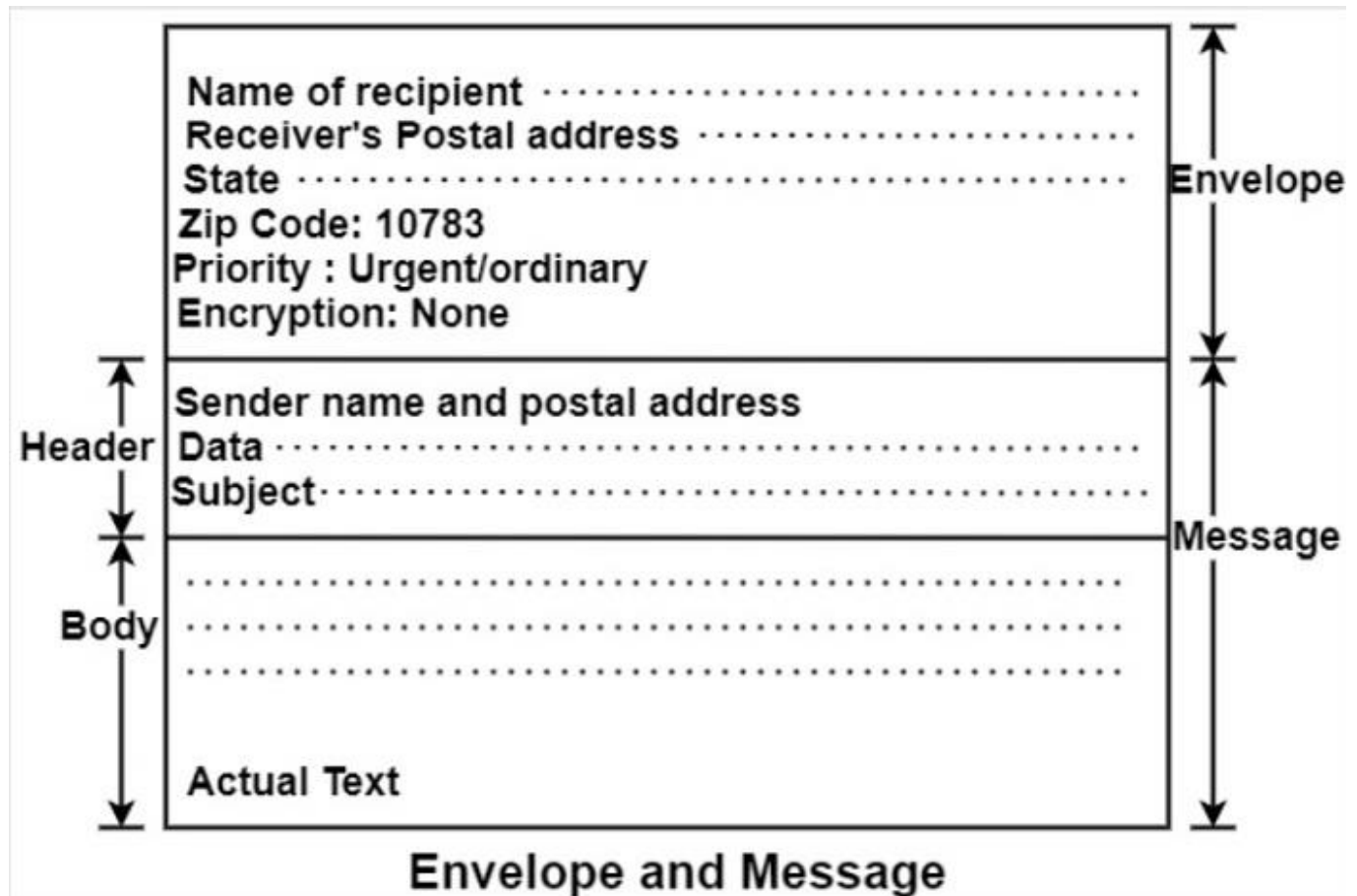
In modern e-mail systems, there is a distinction made between the e-mail and its contents. An e-mail envelope contains the message, destination Address, Priority security level etc. The message transport agents use this envelope for routing.

Message

The actual message inside the envelope is made of two parts

- Header
- Body

The header carries the control information while the Body contains the message contents. The envelope and messages are shown in the figure below –



Message Formats

Let us understand the RFC 822 message format in an email.

Messages consist of a primitive envelope, some header fields and a blank line, and the message body. Each header field logically includes a single line of ASCII text which contains the field name, a colon and a field. RFC 822 is an old standard. Usually, the user agent builds a message and passes it to be the message transfer agent with the user's header fields to construct an envelope.

The following table shows the principal header fields related to message transport.
RFC 822 header fields related to message transport

Header	Meaning
To –	E-mail address of primary recipients.
Cc –	E-mail address of secondary recipients.
BCC	E-mail address for blind carbon copies.
From –	Person who created the message.
Sender	E-mail address of the actual sender.
Received	Line inserted by each transfer agent along the route.
Return Patch	It can use it to identify the path to the sender.

The To – field

The field gives the DNS address of the primary recipient. It is allowed to have multiple recipients.

The Cc – field

This field gives the addresses of any secondary recipients.

The Bcc

The long form of Bcc is Blind Carbon Copy. This field is such as the Cc field, except that this is removed from all the copies shared with the primary and secondary recipients. This feature allows people to send copies to third parties without primary and secondary recipients knowing this.

From – and Sender fields

These fields tell about who wrote the message and who sent the message, respectively, because the person who creates the message and the person who sends it can be different.

The from the field is required, but the sender field can be omitted if it is the same as the one from the field. These fields are required in case the message is undeliverable and is to be returned to the sender.

Received field

A-line containing the Received field is added by each message transfer agent along the way. This line carries the agent's identity, date and time at which they received the message. It also contains some other information that can be used to find bugs in the routing system.

The Return-Path– field

The final message transfer agent adds this field, and it is predetermined to tell how to receive back to the sender. It can gather this information from all the received headers.

Other header fields

In addition to the field to table below, RFC 822 messages may contain various header fields used by user agents or human recipients. Many of them are shown in the table below

Some fields in RFC 822 message header are as follows:

Header	Meaning
Date:	The date and time of the message.
Reply– To	The E-mail address to which the reply is to be sent.
Message-Id:	Message identifying number
In– Reply – To:	Message-Id of the message to which this is a reply.

Header	Meaning
References:	Other relevant messages identifying numbers.
Keywords:	Keywords chosen by users.
Subject:	Summary of the message for the one-line display.

Message Body

The message body comes after the header. The users can put whatever they want to send in the message body. It is possible to terminate the messages with ASCII cartoons, quotations, and political statements.

Working of Email

The email refers to the electronic means of communication of sending and receiving messages over the Internet. Email is the most common form of communication nowadays. An email has significantly evolved over the past couple of years. There are now stronger sync and messaging features along with stronger security and spam-related features.

Components of an Email:

1. **Sender:** The sender creates an email in which he records the information that needs to be transferred to the receiver.
2. **Receiver:** The receiver gets the information sent by the sender via email.
3. **Email address:** An email address is just like a house address where the communication arrives for the sender and receiver and they communicate with each other.
4. **Mailer:** The mailer program contains allows the ability to read, write, manage and delete the emails like Gmail, Outlook, etc.

5. **Mail Server:** The mail server is responsible for sending, receiving, managing, and recording all the data proceeded by their respective mail programs and then processing them to their respective users.
6. **SMTP:** SMTP stands for [Simple mail transfer protocol](#). SMTP basically uses the internet network connection to send and receive email messages over the Internet.

Protocols of Email:

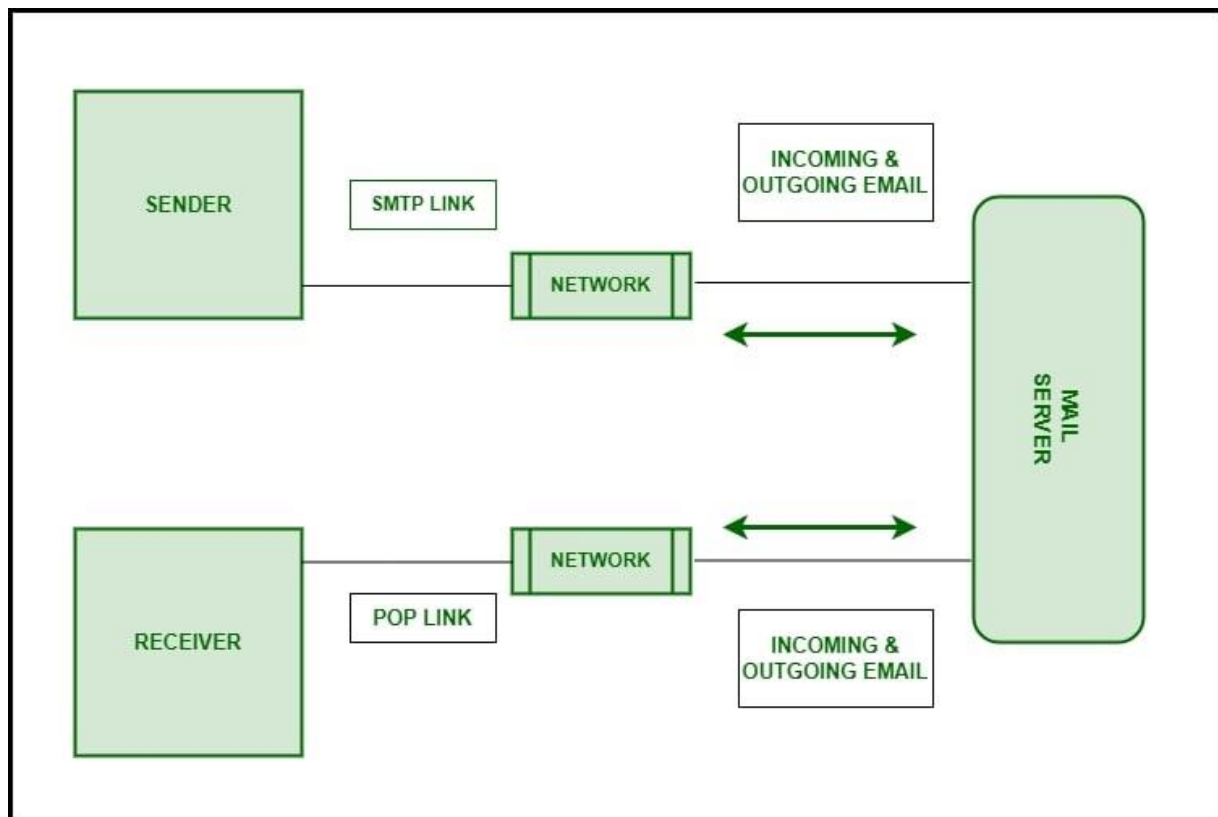
Emails basically use two types of standard protocols for communication over the Internet. They are:-

1. **POP:** POP stands for [post office protocol](#) for email. Similar to a post office, our approach is just to drop the email over the service mail provider and then leave it for services to handle the transfer of messages. We can be even disconnected from the Internet after sending the email via POP. Also, there is no requirement of leaving a copy of the email over the web server as it uses very little memory.
2. **IMAP:** IMAP stands for [Internet message access protocol](#). IMAP has some special advantages over POP like it supports bidirectional communication over email and there is no need to store conversations on servers as they are already well-maintained in a database. It has some advanced features like it tells the sender that the receiver has read the email sent by him.

Working of Email:

1. When the sender sends the email using the mail program, then it gets redirected to the simple mail transfer protocol which checks whether the receiver's email address is of another domain name or it belongs to the same domain name as that of the sender (Gmail, Outlook, etc.). Then the email gets stored on the server for later purposes transfer using POP or IMAP protocols.
2. If the receiver has another domain name address then, the SMTP protocol communicates with the DNS ([domain name server](#)) of the other address that the receiver uses. Then the SMTP of the sender communicates with the SMTP of the receiver which then carries out the communication and the email gets delivered in this way to the SMTP of the receiver.
3. If due to certain network traffic issues, both the SMTP of the sender and the receiver are not able to communicate with each other, the email to be transferred is put in a queue of the SMTP of the receiver and then it finally gets receiver after the issue resolves. And if due to very bad circumstances, the

message remains in a queue for a long time, then the message is returned back to the sender as undelivered.



From Sender to Receiver:

The sender first needs the email address of the receiver to send the information to be communicated via email. When the sender writes all the information in the email along with the email address of the receiver and clicks on the send button, the mail program transfers the message to the MTA (Mail Transfer Agent) which is transferred from the local computer of the sender to the mail server via the SMTP protocol.

Then the webmail server looks out for the similar mail transfer agent of the receiver and locates it whether it is using the same DNS (domain name server) or a different service. The DNS looks for the mail exchanger service of the receiver. Now, the SMTP protocol transfers the message between both mail servers through their mailing agents. Then the receiver's MTA finally transfers this message to the receiver's local computer.

Advantages of Email

There are many advantages of email, which are as follows:

- **Cost-effective**
- **Speed and simplicity**
- **Mass sending**
- Email is beneficial for the planet, as it is paperless. It reduces the cost of paper and helps to save the environment by reducing paper usage.
- It also offers a benefit to attaching the original message at the time you reply to an email. This is beneficial when you get hundreds of emails a day, and the recipient knows what you are talking about.
- Furthermore, emails are beneficial for advertising products. As email is a form of communication, organizations or companies can interact with a lot of people and inform them in a short time.

Disadvantages of Email

- **Impersonal**
- **Misunderstandings**
- **Malicious Use**
- **Accidents Will Happen**
- **Spam**
- **Information Overload**
- **Viruses**
- **Pressure to Respond**
- **Time Consuming**

What is the URL?

A URL is a type of uniform resource identifier and is address of a resource on the World Wide Web and the protocol used to access it. It is used to indicate the location of a web resource to access the web pages

Types of URL

URL stands for Uniform Resource Locator. Any internet location available on server is called a web URL, web address or website. Each website or webpage has a unique address called URL. e.g., the website of **geeksforgeeks** website has an address or URL called <https://www.geeksforgeeks.org/>

type://address/path

**Basic Structure
of URL**

type: It specifies the type of the server in which the file is located.

address: It specifies the address or location of the internet server.

path: It specifies the location of the file on the internet server.

Types of URL: URL gives the address of files created for webpages or other documents like an image, pdf for a doc file, etc.

There are two types of URL:

- Absolute URL
- Relative URL

Absolute URL: This type of URL contains both the domain name and directory/page path. An absolute URL gives complete location information. It begins with a protocol like “http://” and continues, including every detail. An absolute URL typically comes with the following syntax.
protocol://domain/path

Relative URL: This type of URL contains the path excluding the domain name. Relative means “in relation to”, and a relative URL tells a URL location on terms of the current location. Relative path is used for reference to a given link of a file that exist within the same domain.