DRONACHARYA
College of Engineering

Computer Science & Engineering

Data Communication and Computer Networks

(MTCSE-101-A)

SMTP

- SMTP (Simple Mail Transfer Protocol)
- SMTP is a standard electronic-mail **protocol that handles the sending of mail from one SMTP to another SMTP server.** To accomplish the transport, the SMTP server has its own MX (mail exchanger) record in the DNS database that corresponds to the domain for which it is configured to receive mail.
- When equipped for two-way communication, mail clients are configured with the address of a POP3 server to receive mail and the address of an SMTP server to send mail.
- SMTP uses TCP for communication and operates on port 25. Simple Mail Transfer Protocol (SMTP) is the application-layer protocol used for transmitting e-mail messages. SMTP is capable of receiving e-mail messages, but it's limited in its capabilities. The most common implementations of SMTP are in conjunction with either POP3 or IMAP4. For example, users download an e-mail message from a POP3 server, and **then transmit messages via an SMTP server**

SMTP Protocol:

- The **SMTP (Simple Mail Transfer Protocol)** protocol is used by the Mail Transfer Agent (MTA) to deliver your eMail to the recipient's mail server. The SMTP protocol can only be used to send emails, not to receive them. Depending on your network / ISP settings, you may only be able to use the SMTP protocol under certain conditions.

POP

- Post Office Protocol version 3 (POP3) is a standard mail protocol used to **receive emails** from a remote server to a local email client. POP3 allows you to download email messages on your local computer and read them even when you are offline. Note, that when you use POP3 to connect to your email account, messages are downloaded locally and removed from the servers. This means that if you access your account from multiple locations, that may not be the best option for you. On the other hand, if you use POP3, your messages are stored on your local computer, which reduces the space your email account uses on your web server.

POP

- The **POP (Post Office Protocol 3)** protocol provides a simple, standardized way for users to access mailboxes and download messages to their computers.

  When using the POP protocol all your eMail messages will be downloaded from the mail server to your local computer. You can choose to leave copies of your eMails on the server as well. The advantage is that once your messages are downloaded you can cut the internet connection and read your eMail at your leisure without incuring further communication costs. On the other hand you might have transferred a lot of message (including spam or viruses) in which you are not at all interested at this point.

IMAP Protocol:

- **IMAP (Internet Message Access Protocol)** – Is a standard protocol for accessing e-mail from your local server. **IMAP is a client/server protocol in which e-mail is received and held for you by your Internet server.** As this requires only a small data transfer this works well even over a slow connection such as a modem. Only if you request to read a specific email message will it be downloaded from the server. You can also create and manipulate folders or mailboxes on the server, delete messages etc.

POP/IMAP

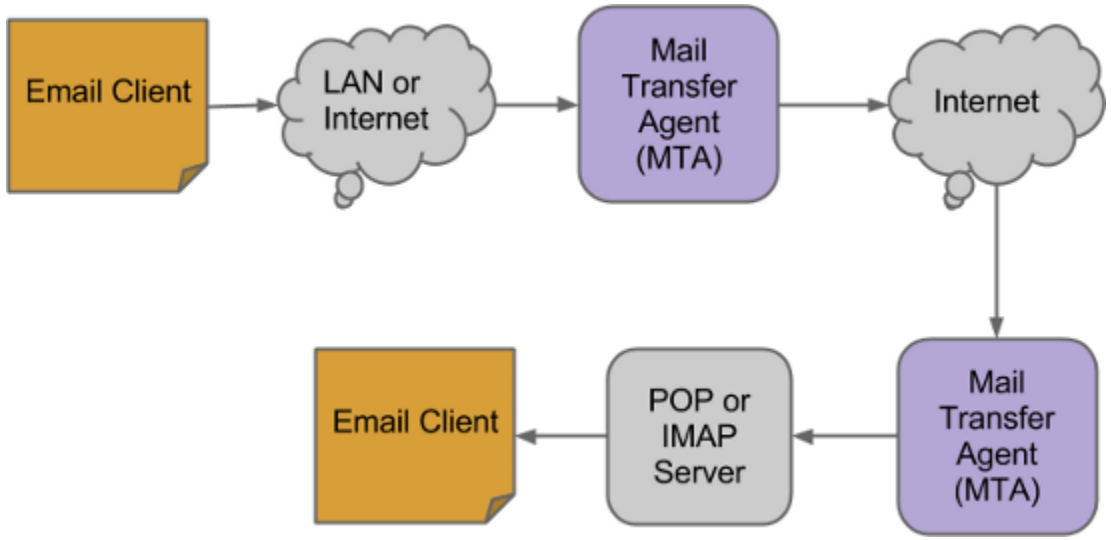
- Post Office Protocol 3 (POP3) and Internet Message Access Protocol 4 (IMAP4) are two application-layer protocols used for electronic messaging across the Internet. POP3 is a protocol that involves both a server and a client. A POP3 server receives an e-mail message and holds it for the user. A POP3 client application periodically checks the mailbox on the server to download mail. POP3 does not allow a client to send mail, only to receive it. POP3 transfers e-mail messages over TCP port 110.
- IMAP4 is an alternate e-mail protocol. IMAP4 works in the same way as POP3, in that an e-mail message is held on a server and then downloaded to an e-mail client application. Users can read their e-mail message locally in their e-mail client application, but they can't send an e-mail message using IMAP4. When users access e-mail messages via IMAP4, they have the option to view just the message header, including its title and the sender's name, before downloading the body of the message. Users can create, change, or delete folders on the server, as well as search for messages and delete them from the server.
- To perform these functions, users must have continued access to the IMAP server while they are working with e-mail messages. With IMAP4, an e-mail message is copied from the server to the e-mail client. When a user deletes a message in the e-mail client, the message remains on the server until it is deleted on the server. POP3 works differently in that an e-mail message is downloaded and not maintained on the server, unless configured otherwise. Therefore, the difference between POP3 and IMAP4 is that IMAP4 acts like a remote file server, while POP3 acts in a store-and-forward manner in its default configuration.

- **Server storage space**
- A server with limited storage space is one major factor that may force you to favor POP3. Since IMAP leaves messages on the server, it can consume storage space faster than POP3.
- **Advantage:** POP3
- **Anytime, anywhere access**
- There's one good reason why IMAP was designed to store messages on the server. It's meant to enable retrieval of messages from multiple devices; sometimes, even simultaneously. So if you have an iPhone, an Android tablet, a laptop, and a desktop, and you want to read email from any or all of these devices, IMAP would be the better choice.
- **Advantage:** IMAP
- **Synchronization**
- If you access email messages from multiple devices (who doesn't these days?), you'll likely want all devices to reflect whatever action you performed on one device.
- For instance, if you read messages, A, B, and C, then you'll want those messages to be also marked as "read" on the other devices. If you deleted messages B and C, then you'll want those same messages removed from your inbox on the other devices as well. If you moved message A to another folder ... well, you know what I mean. All these synchronizations can only be achieved if you're using IMAP.
- **Advantage:** IMAP
- **Organization**
- Because IMAP allows users to arrange messages in a hierarchical fashion and place them in folders, it's certainly better at helping users organize.
- **Advantage:** IMAP

- **Computational overhead**
- Of course, all that IMAP functionality comes at a price. It's arguably more difficult to implement and certainly consumes a lot more CPU and RAM, especially when it performs those synchronizations. In fact, high CPU and memory usage can happen at both the client and server side if there's a ton of messages to sync.
- Advantage: POP3
- **Privacy**
- This is one concern that would weigh heavily on end users who frequently deal with confidential information. These users would prefer to download all email messages and leave no copies behind on the server.
- Advantage: POP3
- **Speed**
- Whereas POP3 downloads all mail messages upon connection, IMAP may optionally download just the message headers or certain portions and leave, for example, the attachments on the server. Only when the user decides the remaining portions are worth downloading, will those portions be downloaded. In this regard, IMAP can be considered faster.
- However, if all messages on the server are supposed to be downloaded every single time, then POP3 would now be faster.
- Advantage: Depends on the situation
-

Diagram

Working


Email Client
LAN or Internet
Mail Transfer Agent (MTA)
Internet
Mail Transfer Agent (MTA)
POP or IMAP Server
Email Client

Working:-

- An email sent by an end user is first transferred to its local mail server, using SMTP (normally) or HTTP (in the case of web based mail alone) as the carrier protocol**. The local mail server then transfers the mail to the recipients mail server, again using SMTP** as the carrier protocol. The mail is then retrieved from the receiver's mail server by the receiving computer through a pull protocol like POP3 or IMAP or HTTP (web based email alone).

Working continue:-

- An e-mail client like Gmail, yahoo, outlook etc is used to create or reply to an e-mail.
- Once the e-mail is drafted successfully, it is sent using the e-mail client.
- This e-mail first goes to the SMTP server (also known as MTA (Mail transfer agent)) to which the e-mail client is connected.
- The e-mail server looks out for the recipients address. The address is of the form **<name>@domain.com**
- The e-mail server first uses the DNS technique to resolve the domain name into a valid IP address.
- Next it sends the e-mail to this IP address over the Internet.
- Now the e-mail traverses over the Internet in a series of IP packets and reaches the destination SMTP server or the MTA.
- This server collects all the e-mails and places them to appropriate location so that these are accessible to your e-mail clients through POP or IMAP services.

Summary of SMTP , POP and IMAP

- SMTP: SMTP stands for Simple Mail Transfer Protocol. SMTP is used when email is delivered from an email client, such as Outlook Express, to an email server or when email is delivered from one email server to another. SMTP uses port 25.
- POP3 stands for Post Office Protocol. POP3 allows an email client to download an email from an email server. The POP3 protocol is simple and does not offer many features except for download. Its design assumes that the email client downloads all available email from the server, deletes them from the server and then disconnects. POP3 normally uses port **110.**
- IMAP stands for Internet Message Access Protocol. IMAP shares many similar features with POP3. It, too, is a protocol that an email client can use to download email from an email server. However, IMAP includes many more features than POP3. **The IMAP protocol is designed to let users keep their email on the server. IMAP requires more disk space on the server and more CPU resources than POP3, as all emails are stored on the**

	POP3	IMAP
Name	Post Office Protocol	Internet Messaging Access Protocol
Method	Always download new emails to local storage	Only message summary are downloaded until the message is selected
Email inbox	All mails are downloaded into Inbox folder	Preserves a main folder “imap.hyperoffice.com”
Access	Can only be accessed by one computer	Email can be manipulated to multiple devices
Storage	Emails are deleted from server once it is successfully downloaded by user	Emails are kept in server storage until the user decides to delete it
Port number used	110	143

Comparison
How do IMAP and POP compare? READ
The chart below summarizes a some of the key features and differences.

Features	IMAP	POP
Mail Location	Your mail is stored on the mail server.	Your mail is downloaded to your local workstation and deleted from the server.
Accessing Mail from Multiple Locations/Clients	Since your mail resides on the server, you can access it from any system with an IMAP client or via a browser with a web-based email.	As email is downloaded from the server each time you use your POP client to read mail, it is not recommended that you use POP clients on multiple workstations. Your mail will be scattered across multiple systems and hard to manage.
Security	Your mail is accessed via secure connections to the mail server using Kerberos or SSL.	Access to your inbox is secure by Kerberos. Access to your local mail stores is determined by your workstation settings.
Viruses	Since your email is kept on the server, viruses that attack your workstation can not corrupt your mail even if your workstation is infected.	Since your mail is kept on your workstation, your mail files are vulnerable to any attacks on your machine.
New Hardware /Local Hardware Failures	Since your mail is stored on the server, there is nothing to move when you upgrade to a new workstation or to lose if your system is damaged.	Since your mail is stored on your local machine, you need to transfer any old mail you want to keep to your new workstation. In cases of system failure/damage, you are reliant on your own backups to restore your mail.
Spam Screening	Once you set up the Spam screen on the server, SPAM is filtered there automatically.	You have to create a local spam folder and set up your own local filters for local pop spam filtering.

MIME

- Short for ***M**ultipurpose **I**nternet **M**ail **E**xtensions,* a specification for formatting non-ASCII messages so that they can be sent over the Internet. Many e-mail clients now support MIME, **which enables them to send and receive graphics, audio, and video files via the Internet mail system.**
- There are many predefined MIME types, such as GIF graphics files and PostScript files. It is also possible to define your own MIME types.
- In addition to e-mail applications, Web browsers also support various MIME types. This enables the browser to display or

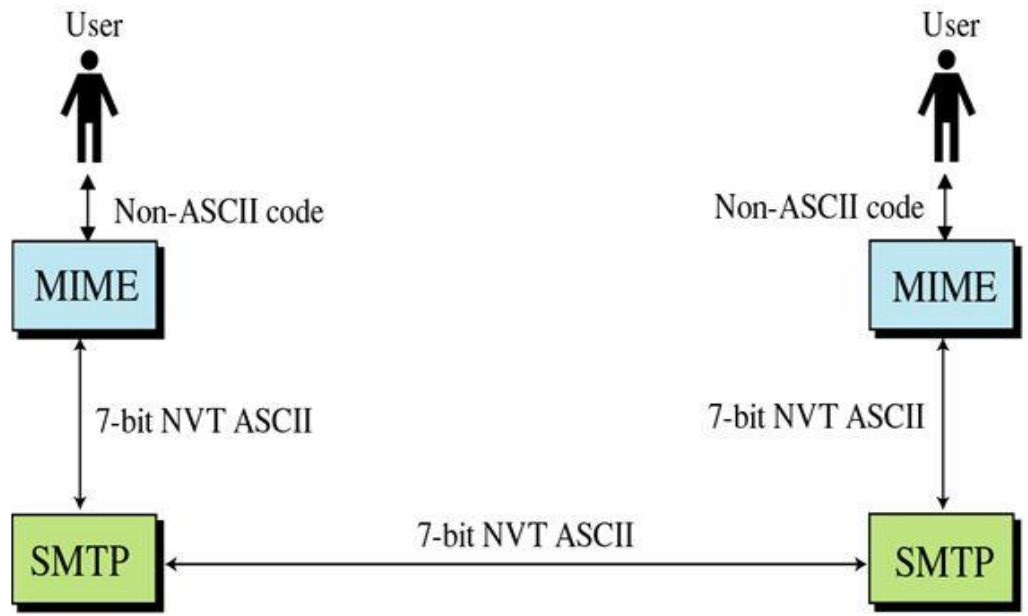
- **MIME was invented to overcome the following limitations of SMTP:**
- 1. SMTP cannot transfer executable files and binary objects.
- 2. SMTP cannot transmit text data of other language, *e.g.* French, Japanese, Chinese etc, as these are represented in 8-bit codes.
- 3. SMTP services may reject mails having size greater than a certain size.
- 4. SMTP cannot handle non-textual data such as pictures, images, and video/audio content.
- MIME is widely used internet standard for coding binary files to send them as e-mail attachments over the internet. **MIME**

There are seven different types and fourteen sub-types of content of MIME

Type	Sub type	Description
Text	Plain	Unformatted text in US ASCII ISO 8859.
Image	jpeg	Image in JPEG Format.
	gif	Image in GIF format.
Video	mpeg	MPEG format.
Audio	Basic	Single- channel encoding of voice at 8kHz.
Message	rfc 882	The boby is an encapsulated message that confirms to RFC 822.
	partial	Large mail is fragmented.
	External Body	contains pointer to an object that exists elsewhere and is accessible via FTP. TFTP etc.
Multipart	Mixed	The different parts are independent but are to be transmitted together. They should be presented to receiver in the appear in mail message.
	Parallel	same as mixed but order not defined.
	Alternate	The different parts are alternate versions of the same information
	Digest	similar to mixed, but the default type/subtype of each part is message/rfc 822.
Applciation	Postscript	Adobe postscript .
	Octet-stream	General binary data consisting of 8-bit bytes (Octets).

Extensions to SMTP

- MIME – Multipurpose Internet Mail Extensions
  - Transforms non-ASCII data to NVT (Network Virtual Terminal) ASCII data
    - Text
    - Application
    - Image
    - Audio
    - Video



Create A MIME Type

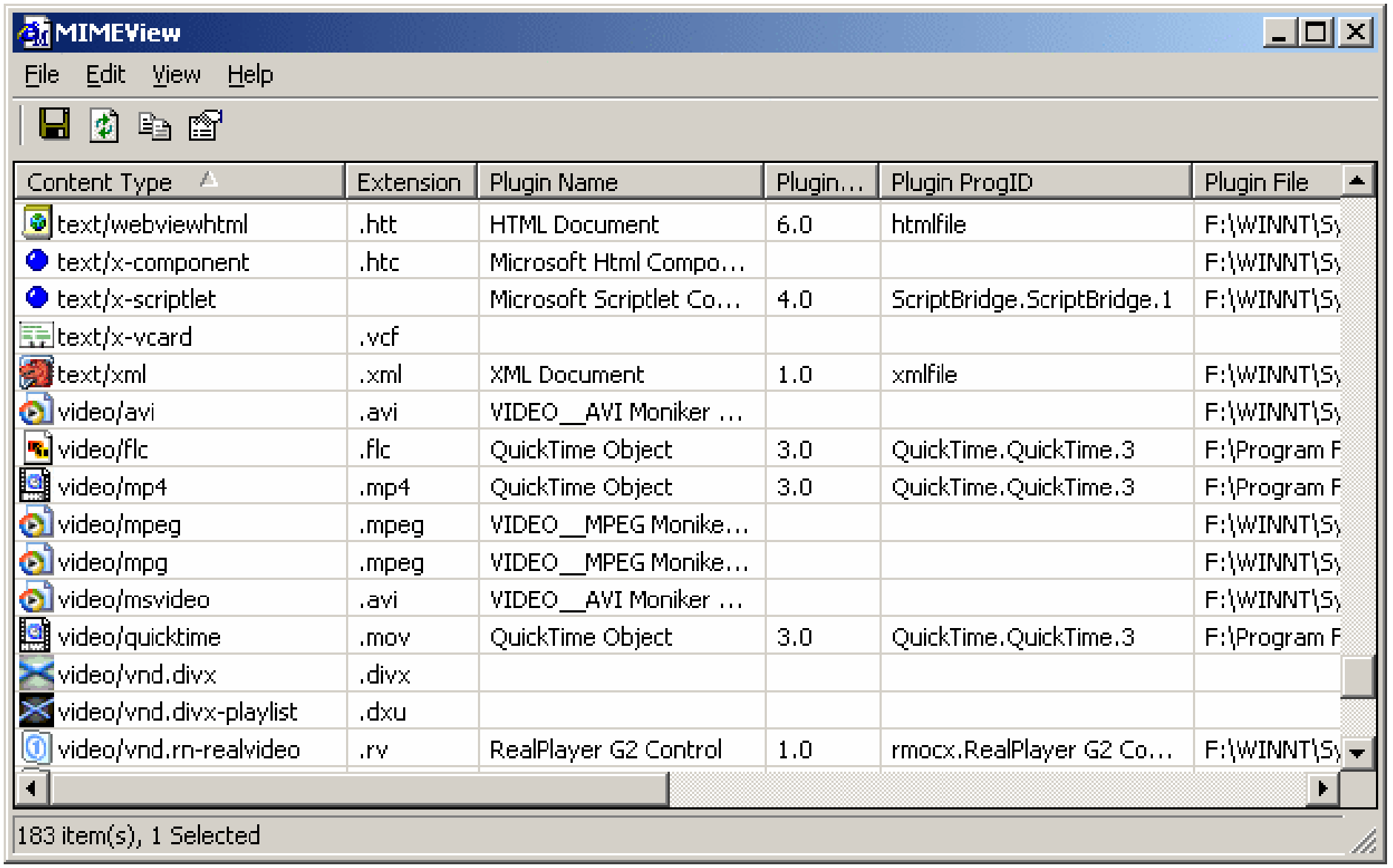
Mime Type	Extension(s)	
video/webm	.webm	Add

User Defined Mime Types

Mime Type	Extension(s)	Remove
audio/mp3	.mp3	
audio/mpeg3	.mp3	
audio/ogg	.ogg .oga	
audio/x-mpeg3	.mp3	
video/mp4	.mp4	
video/ogg	.ogv	

System Mime Types

Mime Type	Extension(s)
application/atom+xml	atom


MIMEView
File Edit View Help
Content Type | Extension | Plugin Name | Plugin... | Plugin ProgID | Plugin File
text/webviewhtml | .htt | HTML Document | 6.0 | htmlfile | F:\WINNT\Sy
text/x-component | .htc | Microsoft Html Compo... | | | F:\WINNT\Sy
text/x-scriptlet | | Microsoft Scriptlet Co... | 4.0 | ScriptBridge.ScriptBridge.1 | F:\WINNT\Sy
text/x-vcard | .vcf | | | | |
text/xml | .xml | XML Document | 1.0 | xmlfile | F:\WINNT\Sy
video/avi | .avi | VIDEO__AVI Moniker ... | | | F:\WINNT\Sy
video/flc | .flc | QuickTime Object | 3.0 | QuickTime.QuickTime.3 | F:\Program F
video/mp4 | .mp4 | QuickTime Object | 3.0 | QuickTime.QuickTime.3 | F:\Program F
video/mpeg | .mpeg | VIDEO__MPEG Monike... | | | F:\WINNT\Sy
video/mpg | .mpeg | VIDEO__MPEG Monike... | | | F:\WINNT\Sy
video/msvideo | .avi | VIDEO__AVI Moniker ... | | | F:\WINNT\Sy
video/quicktime | .mov | QuickTime Object | 3.0 | QuickTime.QuickTime.3 | F:\Program F
video/vnd.divx | .divx | | | | |
video/vnd.divx-playlist | .dxu | | | | |
video/vnd.rn-realvideo | .rv | RealPlayer G2 Control | 1.0 | rmocx.RealPlayer G2 Co... | F:\WINNT\Sy
183 item(s), 1 Selected

Summary of MIME

- **Multipurpose Internet Mail Extensions** (**MIME**) is an Internet standard that extends the format of email to support:
- Text in character sets other than ASCII
- **Non-text attachments: audio, video, images, application programs etc.**
- **Message bodies with multiple parts**
- Header information in non-ASCII character sets
- All manually composed and automated emails are transmitted through SMTP in MIME format. The association of Internet email with SMTP and MIME standards is such that the emails are sometimes referred to as SMTP/MIME email. The MIME standard defines the content types which are of prime importance in communication protocols like HTTP for the World Wide Web. The data are transmitted in the form of email messages through HTTP even though the data are not an email.
- Standard for attaching non-text files to an internet mail message, such as animation, graphics, hypertext files, sound files, spreadsheets. MIME standard converts (encodes) non-text files into text that is normally unreadable and then, at the other end, reconverts (decodes) the files to their original form. A more secure version is called secure MIME (S/MIME).

ASSIGNMENT:-

- **ASSIGNMENT -1**

- How POP3 Service Works. Also explain its architecture?
- What's the Difference Between TCP and UDP?

- **ASSIGNMENT -2**

Study of Research Paper related to Transport layer