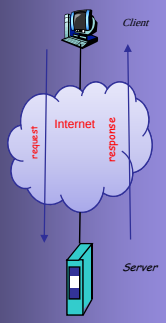

INTERNET PROTOCOLS AND CLIENT-SERVER PROGRAMMING SWE344

Fall Semester 2008-2009 (081)

Module 10.1: Mail Protocols (Part 1)

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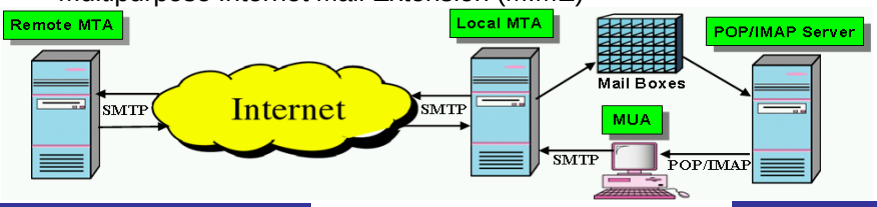
Objectives

- Learn about the Components of E-Mail system
- Learn about the Mail Format Protocol [RFC 2822] : http://www.ietf.org/rfc/rfc2822.txt
- Learn about the Simple Mail Transfer Protocol, SMTP [RFC 2821]: http://www.ietf.org/rfc/rfc2821.txt

Components of E-Mail System

- Communicating E-Mail on the Internet involves a number Components and Protocols.
- The main components are:
  - Mail User Agent (MUA) – sometimes shortened as UA
  - Mail Transport Agent (MTA)
  - POP server and/or IMAP server
- The main protocols are:
  - Mail Format Protocol
  - Simple Mail Transfer Protocol (SMTP)
  - Post Office Protocol (POP3)/ Internet Message Access Protocol (IMAP)
  - Multipurpose Internet Mail Extension (MIME)



Components of E-Mail System …

Mail User Agent (MUA):

- This is an application that is directly used by a user to compose, read, reply to, or forward messages. It also allow the user to manage his/her mailboxes.
- MUA may allow a user to access and manage his/her mails that are residing on a mail server in one of two ways:
  - By downloading the mails to a local machine (using **POP3**)
  - Without downloading to a local machine (using **IMAP**).
- MUA cannot deliver mails to the intended recipients by itself. It forward all mails to a local MTA for delivery.
  - MUA communicates with the local MTA using SMTP protocol
- Common example of MUAs are Microsoft Outlook and Pine. Many MUAs are also available as Web applications.

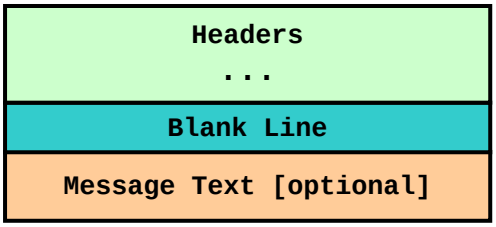
Components of E-Mail System …

Mail Transfer Agent (MTA) :

- MTA is an application that handles the transmission of outgoing mails and the reception of incoming mails destined for local users.
- For each outgoing message, the MTA determines the address of the recipient and perform one of the following:
  - If the destination address is local, the MTA delivers the mail directly to the local mailbox of the recipient.
  - If the destination is remote, the MTA establishes connection with the remote MTA and deliver the message using SMTP.
- A remote MTA may also communicate (using SMTP) with the local MTA to deliver a mail destined for a local user. Such a mail is stored in the user's mailbox.
  - MTA can act both as an SMTP server and as SMTP client.
- A typical example of MTA is **SendMail** (a utility in UNIX). IIS also has an SMTP server.

Mail Format Protocol

- The Mail Format Protocol (RFC 2822), describes the structure and content of Internet E-Mail messages.
- The protocol provides a standard for creating e-mail messages intended for transmission over the Internet.
- According to the protocol, a mail message consists of two parts separated by a blank line.
  - The first part is a set of headers describing the message – its source, target, etc. Each header ends with CRLF.
  - The optional second part is the text of the message in ASCII characters.



Mail Format Protocol …

Mail Header Format

- Each header consists of a name-value pair in the format:

  <header name>: <header value>

- A header (and other lines in the body) MUST be no more than 998 characters and SHOULD be no more than 78 characters.
- Headers can be "folded" into multiple lines if they are very lengthy.
  - Each continuation line *must* begin with at least one "white space" character, such as a <space> or <Tab> character:

    <header name>: <header value part 1>
    <white space> <header value part 2>
    <white space> <header value part 3>

  - For example, to specify a large number of recipients for a message, it is constructed as follows:

    To: person1@domain1.org, person2@domain2.com,
    person3@domain3.net, person4@domain4.edu.

Mail Format Protocol …

Header Groups :The headers are categorized into groups:

- **Origination Date Field:** Specifies the date and time that the message was made ready for delivery.
- **Originator Fields:** Contain information about the sender of the message.
- **Destination Fields:** Specify the recipient(s) of the message.
- **Identification Fields:** Contain information that identifies the message.
- **Informational Fields:** Optional additional information.
- **Resent Fields:** Used to preserve the original originator, destination and other fields when a message is resent.
- **Trace Fields:** Used to show the path taken by mail as it was transported.
- Other, user-defined fields can be added provided they correspond to the "<header name>: <header value>" syntax.

Mail Format Protocol …

Field Group	Field Name	Description
Origination Date	*Date:*	The date and time that the message was made available for delivery by the mail transport system.
Originator Fields	*From:*	The e-mail address(s) of the originator(s) of the message.
	Sender:	The address of the person who is sending the mail if different from the originator. Example, if *B* is sending a mail from *A* on *A*'s behalf. In case of more than one address in From: field, Sender: is required.
	Reply-To:	The address that the originator would like to receive replies. If absent, replies are sent to the *From:* address.

- Note: The only required header fields are the Date: and From: fields. All other header fields are syntactically optional

Mail Format Protocol …

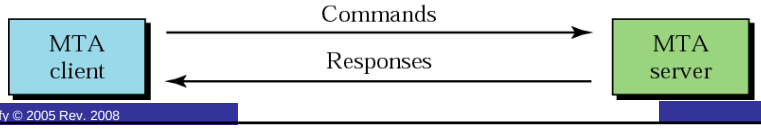
Field Group	Field Name	Description
Destination Address	*To:*	A comma-separated list of primary recipients of the message.
	Cc:	A comma-separated list of recipients to receive a "copy" of the message.
	Bcc:	A comma-separated list of recipients to receive a "blind carbon copy" - without other recipients knowing.
Identification Fields	*Message-ID:*	A unique code identifying a message.
	In-Reply-To:	The *Message-ID:* of the original message being replied to
	References:	Identifies other messages related to this message – e.g same thread or conversation.

Mail Format Protocol …

Field Group	Field Name	Description
Informational Fields	*Subject:*	Describes the subject or topic of the message.
	Comments:	For adding comments on the message without changing its body.
	Keywords:	A list of comma-separated keywords that may be of use to the recipient.
Resent Fields	*Resent-Date:* *Resent-From:* *Resent-To:* *Resent-Cc:* *etc.*	These are fields used only when a message is resent by the recipient to someone else. • A separate set of resent fields SHOULD be added each time a message is re-sent. • The resent fields for a particular resending SHOULD be pre-pended together.
Trace Fields	*Received:* *Return-Path:*	A Received: is inserted by each mail transport systems that processes the message on its way from the originator to the recipient.

Simple Mail Transfer Protocol

- Simple Mail Transfer Protocol (SMTP : *RFC 2821*) is the protocol that governs the behavior of communicating MTAs.
- An SMTP server is normally implemented using TCP and runs on well-know port 25
- SMTP uses commands and responses to transfer messages between an MTA client and an MTA server.
  - Commands consist of a keyword followed by zero or more arguments separated by space character.
  - Responses consist of a three-digit code followed by textual information.
  - Each command or reply is terminated by CRLF.
  - A response is received for each command in a 1-1 fashion. Client is expected to read the response for the last command before sending another command.



Simple Mail Transfer Protocol …

SMTP Commands:

HELO *sendinghostname*	Initiates SMTP session. The client identifies itself by it's fully qualified domain name.
EHLO *sendinghostname*	Alternative to HELO. It states that the sending server wants to use the extended SMTP (ESMTP) protocol.
MAIL From:<*source address*>	This is the start of an email message. The source address identifies the sender of the message. Problems in sending the mail are communicated back through this address.
RCPT To:<destination address>	Identifies the recipient of the message. This command can be repeated multiple times for a message in order to deliver a single message to multiple recipients.

Simple Mail Transfer Protocol …

SMTP Commands:

DATA	Signifies that the email message body, will follow. The message is terminated by a "." on a line by itself.
QUIT	This terminates an SMTP connection. Multiple messages can be transferred with a single connection. To start another message in the same session, simply issue another "MAIL" command.
VRFY *username*	Requests the server to verify a given email username. The server will reply with the login name of the user.
EXPN *aliasname*	EXPN is similar to VRFY, except that when used with a distribution list, it will list all users on that list.

- Other commands are: NOOP, RSET, HELP.

Simple Mail Transfer Protocol …

SMTP Responses:

- For each Command, the sever sends back a single reply consisting of a 3 digit code, a space and a text comment ending with CRLF.
- The reply text may span multiple lines; In such case each line except the last, begins with the reply code, followed immediately by a hyphen, "-" (minus), followed by text. The last line is normal.

  123-First line
  123-Second line
  123-234 text beginning with numbers
  123 The last line

- The first digit denotes the status - good, bad or incomplete.
  - An unsophisticated client will be able to determine its next action (proceed as planned, redo, retrench, etc.) by examining the first digit.
  - A client that wants to know approximately what kind of error occurred (e.g., mail system error, syntax error) may examine the second digit.
  - The third digit provides the finest gradation of information.

Simple Mail Transfer Protocol …

- 1yz Positive Preliminary reply:
  - SMTP does not have any commands that allow this type of reply.
- 2yz Positive Completion reply:
  - The requested action has been successfully completed.
- 3yz Positive Intermediate reply:
  - The command has been accepted, but the requested action is being held pending receipt of further information.
  - The client should send another command specifying this information.
- 4yz Transient Negative Completion reply:
  - The command was not accepted and the requested action did not occur. However, the error condition is temporary and the action may be requested again.
- 5yz Permanent Negative Completion reply:
  - The command was not accepted and the requested action did not occur. The client is discouraged from repeating the exact command

Simple Mail Transfer Protocol …

- Sample Response Codes:

211	System status, or system help reply
220	Service ready
221	Service closing transmission channel
250	Requested mail action okay, completed
354	Start mail input; end with .
450	Requested action not taken: mailbox unavailable. e.g. mailbox busy
452	Requested action not taken: insufficient system storage
500	Syntax error, command unrecognized.
501	Syntax error in parameters or arguments
502	Command not implemented
503	Bad sequence of commands
554	Transaction failed

SMTP Service Extension for Authentication

- Due to the problem of mail spam, SMTP has been extended to provide authentication [**RFC 2554**] **:** http://www.ietf.org/rfc/rfc2554.txt
- This is done by adding the **AUTH LOGIN** command, which is used to supply username and password (in Base64 encoding).
- The AUTH LOGIN follows the HELO/EHLO command. The sequence is:

  auth login

  334 supply username in base 64 encoding

  username-in-base64

  334 enter password base 64 encoding

  Password-in-base64

  235 2.0.0 OK Authenticated
- The SMTP server at ITC (smtp.kfupm.edu.sa) is configured to require authentication.

Sample SMTP Session using TELNET

```
telnet smtp.kfupm.edu.sa 25
```

220 smtp.kfupm.edu.sa ESMTP ITC-KFUPM MAIL Server ready at Thu, 27 Nov 2003 17:22:13 +0300 - SPAM Prohibited

```
helo localhost
```

250 smtp.kfupm.edu.sa Hello ics-bmghandi.pc.ccse.kfupm.edu.sa [196.1.65.143], pleased to meet you

```
auth login
```

334 VXNlcm5hbWU6

```
Z21iYXNoaXI=
```

334 UGFzc3dvcmQ6

```
c3dlMzQ0MDMx
```

235 2.0.0 OK Authenticated

```
MAIL FROM: gmbashir@kfupm.edu.sa
```

250 2.1.0 gmbashir@kfupm.edu.sa... Sender ok

```
RCPT TO: bmghandi@yahoo.co.uk
```

250 2.1.5 bmghandi@yahoo.co.uk... Recipient ok

Sample SMTP Session using TELNET …

```
DATA
```

354 Enter mail, end with "." on a line by itself

```
From: Bashir Ghandi <gmbashir@kfupm.edu.sa>
To: bmghandi@yahoo.co.uk
Subject: Testing SMTP Server at KFUPM

This is just to test the SMTP server at KFUPM.
Please ignore this mail.
Thanks,
Bashir.
.
```

250 2.0.0 hAREMDql018976 Message accepted for delivery

```
quit
```

221 2.0.0 smtp.kfupm.edu.sa closing connection

Connection to host lost.

Resources

- MSDN Library
  - http://msdn.microsoft.com/en-us/default.aspx
- [RFC 2822] : http://www.ietf.org/rfc/rfc2822.txt
- [RFC 2821]: http://www.ietf.org/rfc/rfc2821.txt
- Books
  - Richard Blum, C# Network Programming. Sybex 2002.
- Lecture notes of previous offerings of SWE344 and ICS343
- Some other web sites and books; check the course website at
  - http://faculty.kfupm.edu.sa/ics/alfy/files/teaching/swe344/index.htm