Multi-Destination Protocol: An Alternate Approach to SMTP

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Abstract—The principle objective of this paper is about providing an alternate approach to the Simple Mail Transfer Protocol (SMTP) when dealing with multiple recipients for the same message. MDP puts forward a new protocol for the existing mail system. This concept is introduced in order to increase the efficiency of mail delivery, reduce the delay and congestion in the network especially in the case of multiple destinations.

Index Terms—mail system, multiple recipients, MDP, POP3, SMTP.

I. INTRODUCTION

For the vast majority of people right now, the real e-mail system consists of two different servers running on a server machine. One is called the SMTP server, where SMTP stands for Simple Mail Transfer Protocol. The SMTP server handles outgoing mail. The other is either a POP3 server or an IMAP server, both of which handle incoming mail. POP stands for Post Office Protocol, and IMAP stands for Internet Mail Access Protocol. A typical e-mail server looks like this:

Using traditional SMTP to send e-mail to multiple recipients the message packet is replicated and attached with each destination address separately and sent. Thus consuming lot of space and congesting the network.

Using MDP as an alternative would reduce the replicating of messages to a large extent thus saving lot of space and improving the efficiency of sending e-mails to multiple recipients.

II. SIMPLE MAIL TRANSFER PROTOCOL

Simple Mail Transfer Protocol is the standard e-mail protocol on the Internet and part of the TCP/IP protocol suite.

SMTP Architecture

One important point to make about the SMTP protocol is that it does not require authentication. This allows anyone on the Internet to send email to anyone else or even to large groups of people. It is this characteristic of SMTP that makes junk email or spam possible.

When an SMTP client has a message to transmit, it establishes a two-way transmission channel to an SMTP server. The responsibility of an SMTP client is to transfer mail messages to one or more SMTP servers.
Once the transmission channel is established and initial handshaking completed, the SMTP client normally initiates a mail transaction. Such a transaction consists of a series of commands to specify the originator and destination of the mail and transmission of the message content (including any headers or other structure) itself.

The server responds to each command with a reply; replies may indicate that the command was accepted, that additional commands are expected, or that a temporary or permanent error condition exists.

Once a given mail message has been transmitted, the client may either request that the connection be shut down or may initiate other mail transactions.

The SMTP server understands very simple text commands like HELO, MAIL, RCPT and DATA. The most common commands are:

- **HELO** - introduce yourself
- **EHLO** - introduce yourself and request extended mode
- **MAIL FROM** - specify the sender
- **RCPT TO** - specify the recipient
- **DATA** - specify the body of the message (To, From and Subject should be the first three lines.)
- **RSET** - reset
- **QUIT** - quit the session
- **HELP** - get help on commands
- **VRFY** - verify an address
- **EXPN** - expand an address
- **VERB** – verbose

### III. Need for An Alternative

The first one relates to message length. Some older implementations cannot handle messages exceeding 64KB.

Another problem relates to timeouts. If the Client and server have different timeouts, one of them may give up while the other is still busy, unexpectedly terminating the connection.

Infinite mail storms can be triggered. For example, If host 1 holds mailing list A and host 2 holds mailing list B and each list contains an entry for the other one, then a message sent to either list could generate a never ending amount of email traffic unless somebody checks for it.

Considering a typical case for an e-mail service provider if a message is of size 1 Mb (Megabytes) and the number of recipients are 50 then the same message is replicated for each recipient which amounts to 50 Mb on the network. Using an alternative such as MDP we can reduce that drastically.

### IV. Multi-Destination Protocol

The various phases of MDP are as listed below:-

**Phase 1**- The mails are grouped according to the domain names so that similar domain emails are stored consecutively, when the user enters multiple recipients.

**Algorithm- client end**-

Input: N number of emails

```plaintext
e-mail[N] initialized with the N mails

\( d := 1 \)
for(i:=1 to N)
do
j:=i
for(K:=1 to N)
do
if(domain name of email[j]==domain name of email[k])
\( t := e-mail[j+d] \)
\( e-mail[j+d] := e-mail[k] \)
\( e-mail[k] := t \)
\( d := d+1 \)
end
end
end
```

**Figure 3: Working Of Multi-Destination Protocol**
Phase 2- Two queues, one with the message body and the number of recipients and another with the ordered array from phase 1, are sent to the submission agent. Both queues are given a unique id and checksum. The number of distinct domain names and number of recipients of each domain are also sent.

Algorithm: submission agent end-

\[ \begin{align*}
& n:=1 \ i:=1 \\
& \text{for}(j:=i+1 \text{ to } N) \\
& \quad \text{if}(\text{domain name of email}[j]\neq \text{domain name of email}[i]) \\
& \quad \quad n++ \\
& \quad \text{initialize distinct}[n] \text{ to } 0 \\
& \quad x:=1 \ d:=1 \\
& \quad \text{for}(i:=1 \text{ to } N) \\
& \quad \quad \text{for}(j:=i+1 \text{ to } N) \\
& \quad \quad \quad \text{if}(\text{domain name of email}[j] = \text{domain name of email}[i]) \\
& \quad \quad \quad \quad d++ \\
& \quad \quad \quad \text{initialize distinct}[x++] = d \\
& \quad i:=i+d \\
& \end{align*} \]

Phase 3- In the ISP mail server, one copy of the message is stored along with number of recipients and the ordered set of recipients. For each distinct mail server, a copy of the message along with the destination addresses of the all its corresponding recipients are sent in two packets. For a server having multiple recipients only one copy of the message is sent.

Algorithm: ISP server end-

\[ \begin{align*}
& x:=n \ // n \text{ is no of distinct servers} \\
& \text{for}(i:=N \text{ to } 1) \\
& \quad \text{if}(\text{distinct}[x]=1) \\
& \quad \quad \text{send message with corresponding server destination address in header.} \\
& \quad \quad \text{send packet containing recipient of that server} \\
& \quad \text{else} \\
& \quad \quad \text{end} \\
& \quad \text{end} \\
& \quad \text{end} \\
& \end{align*} \]

Phase 4- Once the message and the recipients packet reaches a particular mail server, it is sent to a pop3/imap server which creates a virtual file and saves the corresponding message along with the recipients. Once a recipient accesses his account, a copy of the message is sent to that particular recipient and the destination address of that particular recipient is discarded from the virtual file. The virtual file accommodates the message until all the destination addresses are discarded in this step.

Algorithm: pop3/imap server end-

\[ \begin{align*}
& x:=n \ // n \text{ is no of distinct servers} \\
& \text{while}(N!=0) \\
& \quad \text{if any recipient i syncs} \\
& \quad \quad \text{do} \\
& \quad \quad \quad \text{send copy of message to recipient i} \\
& \quad \quad \quad \text{corresponding recipient[]} \text{ of recipient i is set to 0} \\
& \quad \quad \text{N}-- \\
& \quad \text{end} \\
& \text{end} \\
& \end{align*} \]

V. CONCLUSION

In this paper we discussed the demerits of SMTP and the alternate approach to overcome it. We discussed the various functionalities of MDP along with the algorithm for its implementation. This new approach will help us in getting the mails delivered to various domains quickly and reduce the congestion on the network.

REFERENCES

[1] Working of mail in Introduction, SMTP and figure 1, 2, 3 have been taken as reference- http://en.wikipedia.org/wiki/Email
[2] Working of mail n Introduction, SMTP and figure 1, 2, 3 have been taken as reference- http://computer.howstuffworks.com/e-mail-messaging/email1.htm