                        NETWORK MAIL PATH SERVICE

STATUS OF THIS MEMO

   This RFC proposes a new service for the ARPA-Internet community and
   requests discussion and suggestions for improvements. Distribution
   of this memo is unlimited.

INTRODUCTION

   The network mail path service fills the current need of people to
   determine mailbox addresses for hosts that are not part of the
   ARPA-Internet but can be reached by one or more relay hosts that have
   Unix To Unix Copy (UUCP) mail, CSNET mail, MAILNET mail, BITNET mail,
   etc.

   Anyone can use the service if they have TCP/TELNET to one of the
   hosts with a mail path server.

DISCUSSION

   Currently many hosts that are not connected to the ARPA-Internet
   network can send mail to and receive mail from the ARPA-Internet
   community. The ARPA-Internet community sends mail using mailbox
   addresses of the form "user@host" or "local-part@domain" [1, 5]. In
   an effort to provide service to hosts not connected directly to the
   ARPA-Internet, mail maintainers have used the feature that the
   "local-part" of the mailbox address is locally interpreted to imbed
   specially encoded mail routing or relaying information. These
   encoded mailbox addresses have a variety of forms and have become
   common practice. For example:

      demco%ucb-ean.cdn%ubc.csnet@CSNET-RELAY.ARPA

      "Rudy.Nedved%CMCCTE@CARNEGIE.MAILNET"@MIT-MULTICS.ARPA

      ihnp4!cmucsg!ern@UT-SALLY.ARPA

      mss.dartmouth@CSNET-RELAY.ARPA

      nedved%CMCCTF.BITNET@WISCVM.ARPA

   It is important that people be able to communicate, but it is clear
   from the rampant confusion and frustration that something must be

provided to make it easier for people to address mail to
non-ARPA-Internet hosts. The result, for a variety of reasons, has
been the work and development of the Domain Name system and
facilities [2, 3, 7, 9], and it is expected to make mailbox addresses
be as simple as the current ARPA-Internet mailbox format (e.g.,
"user@domain").

How do people discover the special encoded addresses for
non-ARPA-Internet host mailboxes until the domain name system is
working and covering the majority of hosts in the mail world? The
proposed solution to this problem is to provide a network service for
the ARPA-Internet and a mail service for the non-ARPA-Internet hosts
that, given a host and an optional addressing system or communication
protocol or some other piece of information, supplies the mailbox
address format for sending mail to that host. For example,
"nedved@Carnegie.MAILNET" would be translated by the server to
"nedved%Carnegie.MAILNET@MIT-MULTICS.ARPA". This memo covers the
proposed network service.

DOCUMENT CONVENTIONS

Unless otherwise noted, all numbers are in decimal.

The term "host", as used in this document, describes one computer
system which may have more than one name associated with it. It may
have a name for each network or mail connection it supports and may
have several nicknames or aliases for the computer and/or for each
set of network names that the computer has acquired.

OVERVIEW

The network service is a connection based application on TCP [4]. A
server listens for TCP connections on the assigned port of 117 [8].
It responds to the connection with a coded greeting message and waits
for a command line. For each command line sent to the server, the
server will respond with a coded message. The special command QUIT
causes the server to respond with a coded closing message and closes
the connection.

DESIGN GOALS

   One of the goals is to provide the service to as many ARPA-Internet
   hosts as possible. In the current ARPA-Internet, experience has shown
   that software people first implement TELNET/TCP [6] before any other
   network application or protocol. Therefore, it is a sub-goal that
   people be able to access the service using available programs (with
   minimal modifications) that implement TELNET/TCP. Therefore,
   TELNET/TCP on port 117 will work correctly. The server understands
   TELNET options but refuses all option negotiations that disagree with
   the NVT characteristics defined by the TELNET protocol (see [6]),
   does not echo, and expects command lines to end with <CRLF> (ASCII
   code 13 (octal 15) followed by code 10 (octal 12)). Character
   echoing and line editing is expected to be handled by the user host
   for the benefit of the user.

   Mail systems and other programs are also expected to be able to
   access and understand the service. Each command reply can have
   multiple line responses with text understandable by the novice user.
   Each command is encoded so as to make it easy for a program to parse
   the lines and extract interesting information, such as whether the
   operation was successful.

THE PROTOCOL

   Given the developing nature of the protocol and its intent, the
   command lines are composed of a command (case ignored) followed by
   white space, the argument(s) and a <CRLF>. The white space is
   required if any arguments are supplied but the arguments are
   optional. White space following the command and any optional
   arguments are ignored.

       <cmdline> := <cmd> [<WS> <args>] [<WS>] <CRLF>

       <WS> := [<WS>] <WS> | <TAB> | <SPACE>

   Coded response lines have the rigid format of a 3-digit decimal code
   followed by a space or a dash followed by text composed of characters
   within the ASCII range 32 to 126 (octal 40 to 176) with <CRLF> at the
   end of the line. The dash after the 3-digit code indicates at least
   one more response line will be supplied while the space indicates the
   current response line is the last one.

       <rspline> := <digit><digit><digit><cont><rtext><CRLF>

       <cont> := <SPACE> | "-"

        <rtext> := ASCII characters in the range 32 to 126.

   Some of the successful response text to certain commands have rigid
   formats so programs can extract path information. The commands that
   have format restrictions are clearly noted and the response format is
   documented with the command.

   The response codes are in the range from 200 to 599 inclusively. The
   following paragraphs provide the break down for each digit.

   The first, most significant, digit is the success indicator. It
   breaks down into the simple success and total failure responses but
   includes the ability to communicate a temporary failure condition and
   the need for further information that has worked so well for SMTP [5]
   and other similiar protocols. The codes are:

      2xx Positive reply.

      3xx Intermedate reply. Positive acknowlegement but more
           information is neccessary.

      4xx Temporary error. Try again later.

      5xx Permanent error. Do not retry.

   The second digit is used to classify the response to provide a flavor
   for certain types of success. The flavor is apparent in providing the
   response on whether a host name is known by a domain name server or
   not. The codes are:

      x0x Command related response.

      x1x Connection related response.

      x2x Database related response.

      x3x Domain transition related response.

      x4x Data added response.

      x5x Data deleted response.

      x6x Data modified response.

BASIC IMPLEMENTATION

   The minimum implementation is the support of three commands: HELP,
   PATH and QUIT. The HELP command provides some level of documentation
   and possibly lists the known addressing or communication protocols.
   The PATH command takes as a required argument a user name or id
   followed by a "@", followed by a domain style host name whose domain
   components may be an addressing protocol, a communication
   environment, or an unofficial or colloquial domain.

        S: (server listens on port 117)
        U: (user connects to port 117)
        S: 210-Welcome to the CMU network mail path service.
        S: 210 Type 'HELP' for help.
        U: help
        S: 200-The server currently knows about the following mail worlds:
        S: 200-   BITNET,UUCP,CSNET,.AC.UK,EARNET,JANET,CDNNET
        S: 200-Use the PATH command with "user@host.world" to get the
        S: 200 ARPA-Internet mail address.
        U: path root@inria.uucp
        S: 220 philabs!mcvax!inria!root@SEISMO.ARPA
        U: quit
        S: 211 Bye bye.
        S: (server closes connection)

DETAILED PROTOCOL DESCRIPTION

   The protocol is designed to provide a flexible but conservative
   mechanism for providing responses and adding experimental or extended
   commands.

      <user connects to server>

         The server responds with a message indicating the status of the
         server and optional information.

            210   Greeting message indicating the server is ready.

            410   The server is down for some unknown reason for a short
                  time.

            510   The server is unavailable.

      HELP [<arg>]

         The server can respond with general help information about the
         server, about the specific topic described by "arg", or it can

indicate that something is temporarily wrong with the HELP
facility. It is strongly recomended that the general HELP
command documentation be implemented and expanded.

    200   General or specific documentation given.

    220   Documentation given from a database.

    421   Service temporarily unavailable.

    501   Command not implemented or topic not known.

PATH <user>@<host>

The server normally responds with either the mail path that
will work for the given mailbox address or indicates the domain
style host name is unknown. If the database is in transition or
inconsistent, a temporary or permanent error can be supplied.

    220   Rigid format route given.

    230   Rigid format route given. Domain servers should be
          used.

    420   Database problems. Try again later.

    501   Invalid argument form or null argument given.

    520   No such host found in database.

    521   Host name is ambiguous.

When a route is supplied with the 2xx success responses. It has a
fixed format with a one-line response. The format is as follows:

    <3-digit-code><SP><local-part>@<domain><CRLF>

The "local-part" and "domain" components are defined under the
SMTP protocol [5] and are intended to be used over SMTP
connections.

QUIT

Respond and close the server down.

    211   Close the connection down.

One special code is reserved and is used for a special case. The code
is 412 and is sent when the server has been waiting for a response
for more then 2 minutes and has decided to timeout the connection.
After the "412 <timeout msg>" is sent, the server may close or
possibly abort the connection.

Because of the somewhat experimental nature of the server, additional
commands are expected to be added as they become needed. No
restrictions are placed on the names of these experimental commands
other then the must not conflict with the basic commands and are not
allowed to be abbreviated (i.e., "SEAR" can not be used for
"SEARCH").

PATH COMMAND ARGUMENTS

It is important to understand that the server is an aid to users that
may have minimal amount of information about the host. Therefore the
PATH command takes domain style host names that may be complete or
incomplete specifications for the host and may be common or
colloquial domain names. The servers look through the entire database
for anything that matches and try to find the best answer
disregarding any local domain information. If several hosts have the
same nickname or alias and lack distinguishing domain components, the
server returns an error response containing all of the hosts found.
Some implementation may even break down the host name and indicate in
error messages that even though it did not find the host, it found
something else that might be what the user wanted.

MAIL PATH SERVICE AND DOMAINS

As mentioned previously, the mail path service is not intended to be
a replacement or a parallel service to the domain name system. It is
a stop gap measure and, when most of the domain name system is in
place, will probably be disabled on some or most of the hosts with
the service.

Mail systems should check the domain name servers for the specified
host before trying a mail path server. The mail path servers should
be modified when one or more domain servers are in place to check if
a host is part of the domain system and to generate an error or an
indication (but still include the path information) if a host is
found to be a part of the domain system.

The names used by the mail path servers have no official standing in
the ARPA-Internet community and have colloquial origins. The domain
name components are based on the adminstrative entities involved
whereas many of the current unofficial common domain style names for

non-ARPA-Internet hosts are based on the protocol used, the relay
host used, or some acronym that someone dreamed up. Only a few of
the current domain style names that are privately in use are expected
to be used by the ARPA-Internet community when the domain name
service is in use by the majority of the ARPA-Internet community.

CAVEATS

The greatest problem with the new service, as implemented, is that it
reports paths from the service host rather than from the user's host.
This is due to the nature of software. It would be more convenient
if it reported a correct path from the caller's host, but this would
require a different method of database management (a method which
could quickly compute the path from the caller's machine or a machine
which would be willing to keep updated databases for each host (which
is impractical)).

Two minor problems exist with the database used by the software. Many
relay hosts exist in several different protocol or addressing name
spaces but under different names. The current software cross
referencing for the multiple protocol relay hosts is done by hand,
but, given the seeming reliability of these relay hosts, the problem
does not appear to be significant. The second problem is that the
data should be collected from the actual relay hosts to ensure
correctness, but in many cases this is impossible.

EXAMPLES

Find a route to CMU-CC-TE in the CARNEGIE part of MAILNET for user id
EN0C:

    S: (server listens on port 117)
    U: (user connects to port 117)
    S: 210-Welcome to the CMU network mail path service
    S: 210 Type 'HELP' for help.
    U: path EN0C@CMU-CC-TE.CARNEGIE.MAILNET
    S: 220 EN0C%CMU-CC-TE%CARNEGIE.MAILNET@MIT-MULTICS.ARPA
    U: quit
    S: 211 Bye bye.
    S: (server closes connection)

   Find a route to a host which has an unknown addressing system or
   communication protocol and for which the name may be an alias:

      S: (server listens on port 117)
      U: (user connects to port 117)
      S: 210-Welcome to the CMU network mail path service
      S: 210 Type 'HELP' for help.
      U: path mss@dartvax
      S: 220 mss%dartmouth@CSNET-RELAY.ARPA
      U: quit
      S: 211 Bye bye.
      S: (server closes connection)

   Find a route to a host that is known by a very long domain style name
   but is not in the current ARPA-Internet host tables:

      S: (server listens on port 117)
      U: (user connects to port 117)
      S: 210-Welcome to the CMU network mail path service
      S: 210 Type 'HELP' for help.
      U: path rob@vax1.cent.lanc.ac.uk
      S: 220 rob%vax1.cent.lanc@UCL-CS.ARPA
      U: quit
      S: 211 Bye bye.
      S: (server closes connection)

   Find a route to a host without any additional information and the
   name is discovered to be ambiguous:

      S: (server listens on port 117)
      U: (user connects to port 117)
      S: 210-Welcome to the CMU network mail path service
      S: 210 Type 'HELP' for help.
      U: path brad@pitt
      S: 521-Several hosts found under the name of 'pitt', try one of:
      S: 521-brad@pitt.UUCP
      S: 521-brad@pitt.CSNET
      U: path brad@pitt.CSNET
      S: 220 brad%pitt@CSNET-RELAY.ARPA
      U: quit
      S: 211 Bye bye.
      S: (server closes connection)

ACKNOWLEDGEMENTS

   The original protocol was documented by Marc Elvy for a server that
   he and Alan Langerman built. The server used the pathalias software
   created by Steve Bellovin, as modified by Peter Honeyman and Robert
   T. Morris, to maintain the host to host connection database. The
   software provided a way for people to make sense out of the jungle of
   UUCP hosts. The Info-Nets@MIT-MC mailing list, created and maintained
   by Robert Krawitz, made the CMU and Harvard mail path projects aware
   of each other and the people on the list provided many of the mail
   relay databases that are in use by the mail path servers. The
   original server may be accessed through TCP port 117 on harvard.arpa
   -- the "pathto" program that runs under 4.2BSD UNIX may be obtained
   as a front end to the server from RFC915@HARVARD.ARPA.

   The current protocol scope was changed by Rudy Nedved to cover
   BITNET, CSNET, MAILNET and other "mail networks" and further refined
   by Marc Elvy, Alan Langerman and others.

   Comments should be sent to RFC-915@HARVARD.ARPA or mailed (via the
   U.S. Postal Service) to:

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