            FTP Operation Over Big Address Records (FOOBAR)

Status of this Memo

   This memo defines an Experimental Protocol for the Internet
   community. This memo does not specify an Internet standard of any
   kind. Discussion and suggestions for improvement are requested.
   Distribution of this memo is unlimited.

Abstract

   This paper describes a convention for specifying address families
   other than the default Internet address family in FTP commands and
   replies.

Introduction

   In the File Transfer Protocol (STD 9, RFC 959), the PORT command
   argument <host-port> specifies the data port to be used to establish
   a data connection for FTP (STD 9, RFC 959). This argument is also
   used in the PASV reply to request the server-DTP to listen on a data
   port other than its default data port. This RFC specifies a method
   for assigning addresses other than 32-bit IPv4 addresses to data
   ports through the specification of a "long Port (LPRT)" command and
   "Long Passive (LPSV)" reply, each having as its argument a <long-
   host-port>, which allows for additional address families, variable
   length network addresses and variable length port numbers.

   This is a general solution, applicable for all "next generation" IP
   alternatives, as well as for other network protocols than IP. This
   revision also extends FTP to allow for its operation over transport
   interfaces other than TCP.

1. Background

    The PORT command of File Transfer Protocol allows users to specify an
    address other than the default data port for the transport connection
    over which data are transferred. The PORT command syntax is:

        PORT <SP> <host-port> <CRLF>

    The <host-port> argument is the concatenation of a 32-bit internet
    <host-address> and a 16-bit TCP <port-address>. This address
    information is broken into 8-bit fields and the value of each field
    is transmitted as a decimal number (in character string
    representation). The fields are separated by commas. A PORT command
    is thus of the general form "PORT h1,h2,h3,h4,p1,p2", where h1 is the
    high order 8 bits of the internet host address.

    The <host-port> argument is also used by the PASV reply, and in
    certain negative completion replies.

    To accommodate larger network addresses anticipated for all IP "next
    generation" alternatives, and to accommodate FTP operation over
    network and transport protocols other than IP, new commands and reply
    codes are needed for FTP.

2. The LPRT Command

    The LPRT command allows users to specify a "long" address for the
    transport connection over which data are transferred. The LPRT
    command syntax is:

        LPRT <SP> <long-host-port> <CRLF>

    The <long-host-port> argument is the concatenation of the following
    fields;

    o   an 8-bit <address-family> argument (af)

    o   an 8-bit <host-address-length> argument (hal)

    o   a <host-address> of <host-address-length> (h1, h2, ...)

    o   an 8-bit <port-address-length> (pal)

    o   a <port-address> of <port-address-length> (p1, p2, ...)

    The initial values assigned to the <address-family> argument take the
    value of the version number of IP (see Assigned Numbers, STD 2, RFC
    1340); values in the range of 0-15 decimal are thus reserved for IP

and assigned by IANA. Values in the range 16-255 are available for
the IANA to assign to all other network layer protocols over which
FTP may be operated.

Relevant assigned <address-family> numbers for FOOBAR are:

```
Decimal         Keyword
------          -------
0               reserved
1-3             unassigned
4               Internet Protocol (IP)
5               ST Datagram Mode
6               SIP
7               TP/IX
8               PIP
9               TUBA
10-14           unassigned
15              reserved
16              Novell IPX
```

The value of each field is broken into 8-bit fields and the value of
each field is transmitted as an unsigned decimal number (in character
string representation, note that negative numbers are explicitly not
permitted). The fields are separated by commas.

A LPRT command is thus of the general form

    LPRT af,hal,h1,h2,h3,h4...,pal,p1,p2...

where h1 is the high order 8 bits of the internet host address, and
p1 is the high order 8 bits of the port number (transport address).

3. The LPSV Command

The L(ONG) PASSIVE command requests the server-DTP to listen on a
data port other than its default data port and to wait for a
connection rather than initiate one upon receipt of a transfer
command. The response to this command includes the address family,
host address length indicator, host address, port address length, and
port address of the listener process at the server. The reply code
and text for entering the passive mode using a long address is 228
(Interpretation according to FTP is: positive completion reply 2yz,
connections x2z, passive mode entered using long address xy8).

The suggested text message to accompany this reply code is:

  228 Entering Long Passive Mode
      (af, hal, h1, h2, h3,..., pal, p1, p2...)

4. Permanent Negative Completion Reply Codes

   The negative completion reply codes that are associated with syntax
   errors in the PORT and PASV commands are appropriate for the LPRT and
   LPSV commands (500, 501). An additional negative completion reply
   code is needed to distinguish the case where a host supports the LPRT
   or LPSV command, but does not support the address family specified.

   Of the FTP function groupings defined for reply codes (syntax,
   information, connections, authentication and accounting, and file
   system), "connections" seems the most logical choice; thus, an
   additional negative command completion reply code, 521 is added, with
   the following suggested textual message:

      521 Supported address families are (af1, af2, ..., afn)

   Where (af1, af2, ..., afn) are the values of the version numbers of
   the "next generation" or other protocol families supported. (Note: it
   has been suggested that the families could also be represented by
   ASCII strings.)

5. Rationale

   An explicit address family argument in the LPRT command and LPSV
   reply allows the Internet community to experiment with a variety of
   "next generation IP" and other network layer protocol alternatives
   within a common FTP implementation framework. (It also allows the use
   of a different address family on the command and data connections.)
   An explicit length indicator for the host address is necessary
   because some of the IPNG alternatives make use of variable length
   addresses. An explicit host address is necessary because FTP says
   it's necessary.

   The decision to provide a length indicator for the port number is not
   as obvious, and certainly goes beyond the necessary condition of
   having to support TCP port numbers.

   Currently, at least one IPng alternative (TP/IX) supports longer port
   addresses. And given the increasingly "multi-protocol" nature of the
   Internet, it seems reasonable that someone, somewhere, might wish to
   operate FTP operate over Appletalk, IPX, and OSI networks as well as
   TCP/IP networks. (In theory, FTP should operate over *any* transport
   protocol that offers the same service as TCP.) Since some of these
   transport protocols may offer transport selectors or port numbers
   that exceed 16 bits, a length indicator may be desirable. If FTP must
   indeed be changed to accommodate larger network addresses, it may be
   prudent to determine at this time whether the same flexibility is
   useful or necessary with respect to transport addresses.

6. Conclusions

   The mechanism defined here is simple, extensible, and meets both IPNG
   and multi-protocol internet needs.

7. References

   STD 9, RFC 959 Postel, J., and J. Reynolds, "File Transfer Protocol",
                   STD 9, RFC 959, USC/Information Sciences Institute,
                   October 1985.

   STD 2, RFC 1340 Reynolds, J., and J. Postel, "Assigned Numbers",
                   STD 2, RFC 1340, USC/Information Sciences Institute,
                   July 1992. (Does not include recently assigned IPv7
                   numbers).

   STD 3, RFC 1123 Braden, R., Editor, "Requirements for Internet
                   Hosts - Application and Support", STD 3, RFC 1123,
                   USC/Information Sciences Institute, October 1989.

8. Security Considerations

   Security issues are not discussed in this memo.

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