                       Protocol Information

Introduction

   This file contains information on the various protocols in the ARPA
   Network. An effort will be made to keep the information current, but
   his depends on the cooperation of the users of this file to convey
   any information about protocol developments, or corrections to this
   information to Jon Postel at SRI-ARC.

      Online address is POSTEL@BBNB; Phone is (415) 326-6200 x 3718;
      U.S. Mail address is Stanford Research Institute, Augmentation
      Research Center, 222 Ravenswood, Menlo park, California 94025.

   This is a compendium of all the protocol related activity and most of
   this activity and most of this activity is with experimental
   protocols, for those protocols, which are official standards the
   designation "[Official]" will be appended to the name.

   This protocol information file is online as:

      Pathname: [OFFICE-1] <NETINFO.PROTOCOL-INFORMATION.TXT

      and also [BBNB] <POSTEL.PROTCOL-INFORMATION.NLS

   Much of the documentation of protocols appears as Requests for
   Comments (RFCs) and many of these are available online. When a
   document is accessible online a pointer to that source will be given.
   Also note that recent RFCs are online at Office-1 in directory
   <NETINFO> with names of the form RFCnnn.TXT where nnn is replaced by
   the RFC number. There is also an index of recent RFCs as an online
   file:

      [Office-1] <NETINFOR>RFC-INDEX.TXT

   There are three other online files that are relevant to protocols:

      There is a file that lists Official Host Names and associated
      information as described in RFC 608, the pathname of this file is:

         [Office-1] <NETOINFO>HOSTS.TXT

There are two files that list the addresses of the Network
Liaisons, one file lists the online message address, and the other
the US Mail address and phone number. A network liaison is a
person designated by a host organization as the contact and
coordinator for network technical information fro that
organization.

    [Office-1] <NETINFO>LIAISON-SNDMSG.TXT

    [Office-1] <NETINFO>LIAISON.TXT

These files are prepared by Jake Feinler of the Network
Information Center (NIC). Indeed the NIC has been very helpful in
providing the online file space for the recent Request for
Comments, and other protocol related files. The NIC also
maintains the hardcopy reference library of all RFCs.

The NIC has assembled and filed with the National Technical
information Service the collection of documents known as "ARPA
Network Current Network Protocols". This collection represents the
more or less "official" protocols as of 1-December-74. The accession
number is ADA003890.

IMP-IMP

    surface

        Contact:

            Alex McKenzie (MCKENZIE@BBN)

        Documents:

            Heart, F. et. al. "the Interface Message Processor for the
            ARPA Computer Network," AFIPS Conference Proceedings,
            36:551-567, SJCC 1970.

            McQuillan, J.M. et. al. "Improvements in the Design and
            Performance of the ARPA Network," AFIPs Conference
            Proceedings, 41:741-754 RFCC, 1972.

            McQuillan, J.M. "Throughput in the ARPA network - Analysis
            and Measurement," BBN Report 2491, the text is also
            contained in BBN Quarterly Technical Report 16, available
            from the National Technical Information Service [NTIS]
            accession number AD7544441.

        People:

            John McQuillan (MCQUILLAN@BBN)

            Schedule:

            Comments:

            Recent developments:

        Satellite

            Contact:

                Randy Rettberg (RETTBERG@BBN)

            Documents:

            People:

                Robert Kahn (KAHN@ISI)

            Schedule:

            Comments:

            Recent developments:

  IMP-HOST

    IMP-HOST [Official]

        Contact:

            Alex McKenzie (MCKENZIE@BBN)

        Documents:

                "Specification for the Interconnection of a HOST and an
                IMP," BBN Report 1822, Revised December 1974. NTIS:
                ADA002751.

        People:

            Alex McKenzie (MCKENZIE@BBN)

            Dave Walden (WALDEN@BBN)

       Jon Postel (POSTEL@BBNB)

       Jerry Burchfiel (BURCHFIEL@BBN)

       John McQuillan (MCQUILLAN@BBN)

    Schedule:

    Comments:

       The "link number" field has been extended from 8 to 12
       bits and renamed the "message identification" field.
       Message type 6 now is used to indicate a reason for at
       type 7 (destination dead) message. (See BBN1822).

       There has been some recent changes to the Ready line
       interpretation by the IMP for deciding the alive/dead
       status of a host.

       Important changes to the IMP and IMP/HOST Interface
       announced in RFC 660 23-Oct-74.

       (31-DEC-74) The change to allow up to eight messages to
       be in transit between a source host and destination host
       should be made very soon. This should not effect the
       hosts at all except to provide better thruput and fewer
       inter-message delays.

       (6-JAN-75) BBN Report 1822 updated.

          Sections 1, 2, 4, and 5, and Appendix C now include
          data on the Pluribus IMP. The Pluribus IMP is based
          on a modular mutliprocessor hardware design; it should
          be capable of much higher bandwidth and greater
          reliability than other IMP models.

          Section 3.1 contains additional information, which may
          be helpful to Host programmers.

          Section 3.3 and 3.4 add a new type of Host to Host
          data message, the uncontrolled packet. Section 3.7
          has been added to describe the use of this new message
          type.

          Section 3.4 describes changes to the sub-types of IMP
          to host message types 6 and 7.

          Appendix A has been updated.

Appendix B has been expanded to provide specific
recommendations for Host implementation of the
Host/IMP Interface.

Minor clarifications have been made in Appendix F. (No
changes have been made to Figure F - (or F-9.)

Recent developments:

(18-June-75) Very important changes to the Host to IMP
and IMP to Host interface protocol are proposed
(specified?) in a recent note. The areas changed
include: expanded leader size, expanded address field,
new message length field, expanded handling type field,
source host control of packets per message, change in the
handling of unordered messages (current type 3 messages),
change in the addressing of fake hosts, including an
address field in the IMP/Host hop message, (best of all)
backward compatibility, and a possible change in the
maximum message length.

Walden, D. "IMP/Host and Host/IMP Protocol Change,"
RFC 687, NIC 32654, 2-Jun-75.

[OPfficed-1] <NETINFOR>RFC687.TXT

(18-Jun-75) Comments on the changes proposed by Walden in
RFC 687:

Postel, J. "Comments on the proposed Host/IMP Protocol
Changes," RFC 690, NIC 32699, 6-Jun-75.

HOST-HOST

ncp - standard host-to-host [Official]

Contact:

Jon Postel (POSTEL@BBN)

Documents:

McKenzie, A. "Host/Host Protocol for the ARPA Network," NIC
8246, NTIS: AD757680, Jan 1972.

Postel, J. "Assigned Link Numbers," RFC 604, NIC 21186, 26-
Dec-73.

People:

Jon Postel (POSTEL@BBNB)

Alex McKenzie (MCKENZIE@BBN)

Schedule:

Comments:

Recent developments:

ncp - host-to-host [Experimental]

Contact:

Jon Postel (POSTEL@BBNB)

Documents:

McKenzie, A. "host/Host Protocol for the ARPA Network," NIC 8246, NTIS: AD757680, Jan 1972.

Postel, J. "Assigned link Numbers," RFC 604, NIC 21186, 26-Dec-73.

Burchfiel, et. al. "Tip-Tenex Reliability Improvements" RFC 636 NIC 30490 June 1974.

People:

Jon Postel (POSTEL@BBNB)

Alex McKenzie (MCKENZIE@BBN)

Jerry Burchfiel (BURCHFIEL@BBN)

Dave Walden (WALDEN@BBN)

Schedule:

Comments:

The BBN TIP and TENEX groups have specified and are implementing additional protocol commands with the intention of providing better reliability and survivability over system

malfunctions. The additional protocol commands are for
cleaning up partly closed connections and resynchronizing the
allocation values on open connections (see RFC 636).

(31-DEC-74) Tenex 1.32 and the Tips are now running this
protocol.

Recent developments:

ncp - host-to-host [Experimental]

Contact:

Jon Postel (POSTEL@BBNB)

Documents:

McKenzie, A. "Host/Host Protocol for the ARPA Network," NIC
8246, [NTIS # AD-757 680], Jan 1972

Postel, J. "Assigned Link Numbers," RFC604, NIC211685, 26-Dec-
73.

Kanodia, R. "A Lost Message Detection and Recovery Protocol,"
RFC 663, NIC 31387, 29-Nov-74.

        [OFFICE-1] <NETINFO>RFC663.TXT

People:

Jon Postel (POSTEL@BBNB)

Alex McKenzie (MCKENZIE@BBN)

Raj Kanodia (Kanodia.CompNet@MIT-Multics)

Schedule:

Comments:

(31-DEC-74) This recent proposal is interesting in several
features, but some have suggested that is aimed at a non-
problem.

Recent developments:

msp - Message Switching Protocol

Contact:

Dave Walden (WALDEN@BBN)

Documents:

Walden, D. "A System for Interprocess Communication in a
Resource Sharing Computer Network, " RFC 62, NIC 4962, 3-Aug-
70. Also published in Communications of the ACM volume 15,
number 4, April 1972.

Bressler, B. "A Proposed Experiment with a Message Switching
Protocol, " RFC 333, NIC 9926, 15-May-72.

People:

Dave Walden (WALDEN@BBN)

Bob Bressler (BRESSLER@BBN)

Schedule:

Comments:

Recent developments:

tcp - Transmission Control Protocol

Contact:

Vint Cert (CERF@ISI)

Documents:

Cert, V. and R,. Kahn. "A Protocol for Packet Network
Intercommunication," IEEE Transactions on Communication Vol
COM- 22 No 5, May 1974.

Mader, E. "A Protocol Experiment," RFC 700, NIC 31020.

[OFFICE-1] <NETINFO> RFC700.TXT

Cerf, V. Y. Dalal, and C. Sunshine. "Specification of Internet
Transmission Control Program," RFC 675, INWG 72, NIC 31505,
December 1974 Revision.

People:

        Vint Cerf (CERF@ISI)

        Ray Tomilnson (TOMLINSON@BBN)

        Peter Kirstein (KIRSTEIN@ISI)

        Jon Postel (POSTEL@BBN)

    Schedule:

        Some experiments now running. Implementation of full protocol
        to begin by 1-Jan-75.

    Comments:

        Specification completed August 4th, but some work still in
        progress on handling of single message conversations. A new
        sequencing scheme (proposed by Tomlinson) may be utilized. The
        addressing field is now used as 4 bit format, 4 bit network, 16
        bit TCP, and 24 bit process&port.

        Crocker has suggested a 64 bit path address to be parsed and
        reformatted by the gateways along the route. There is
        reluctance to experiment with too many things at once though.

        (28-Oct-74) A file indicating some of the changes in the
        specifications since the 4-Aug-74 document is now available as
        [ISI] <CRF> TCP- CHANGES. The areas of change are "Initial
        Sequence Number", "Socket definition", "Additional User System
        Calls", "Packet Format", and "Discussion of opening and closing
        (SYN, REL)".

        (23-NOV-74) Specifications for test implementation are now said
        to be ready on 1-DEC-74, and an implementation completed by 1-
        FEB-74.

        (31-DEC-74) New specification document available:

            Cerf, V. Y. Dalal, and C. Sunshine. "Specification of
            Internet Transmission Control Program," RFC 675, INWG 72,
            NIC 31505, December 1974 Revision.

Recent developments:

(30-May-75)

Status of TCP development. The BBN version is running at
BBN-TENEXA, but simulates a lot of JSYS calls which will be
cast into the tenex operating system during the summer. The
SU-DSL version for the PDP-11/20 is in the debugging stage.
The UCL (London) version for a PDP-9 is in the coding stage.
We are continuing with the "three-way handshake" version
which is highly reliable in environments which permit
packets to be delivered on the order of hours later than
they were injected into the connected networks. A simple
TCP is being designed for the packet radio network and does
not use three-way handshake since waiting a second or so to
clear out old packets in not serious.

A test plan for packet radio net, arpanet, and atlantic
satellite networks is in preparation (delivery date 1 August
1975).

Recent international agreements indicate that a form of TCP
with a simpler header (144 bits instead of 256 bits) and no
three-way handshake is the most likely international
standard. An IFIP WG 6.1 Recommendation to CCITT stated
that the maximum packet delay through all concatenated
networks should not exceed 30 seconds.

nvp - Network Voice Protocol

Contact:

Danny Cohen (COHEN@ISIB)

Documents:

"Specifications for the Network Voice Protocol (NVP)" NSC Note
43.

People:

Schedule:

Comments:

Specification document available (10-Oct-74).

(20-JAN-75) An initial version of NVP was implemented for
real-time voice experiments between ISI and Lincoln Laboratory
in August 1974. An expanded version has been in operation
since December 1974 for real-time voice communication between
Lincoln and CHI. NVP uses both type 0 and type 3 IMP-Host
messages, and allows increased bandwidth and decreased delays
at the cost of reliability.

    Recent developments:

packet radio

    Contact:

        Robert Kahn (KAHN@ISI)

    Documents:

    People:

    Schedule:

    Comments:

    Recent developments:

Network Debugging Protocol

    Contact:

        Eric Mader (MADER@BBN)

    Documents:

        Mader, E. "Network Debugging Protocol," RFC 643, NIC 30873,
        July-74.

        Beeler, M. "Response Time in Cross-network Debugging," RFC 685,
        NIC 32298, 16-April-75.

                [Office-1] <NETINFO> RFC685.TXT

    People:

        Michael Beeler (BEELER@BBN)

        Eric Mader (MADER@BBN)

        Dave Retz (RETZ@ISI)

        Ken Victor (VICTOR@BBNB)

    Schedule:

    Comments:

        This is a protocol for a PDP-11 cross-network debugger.

    Recent Developments:

        (15-May-75) A measure of the responsiveness of cross-network
        debugging has been reported in:

            Beeler, M. "Response Time in Cross-network Debugging," RFC
            685, NIC 32298, 16-April-75.

        [Office-1] <NETINFO>RFC685.TXT

  pup - PARC Universal Protocol

    Contact:

        Ed Taft (TAF@PARC)

    Documents:

    People:

        Ed Taft (TAFT@PARC)

        Bob Metcalfe (METCALFE@PARC)

    Schedule:

    Comments:

    Recent developments

        (15-May-75) Link 151 (decimal) assigned.

HOST-FRONTED

  Host-Front End

    Contact:

        Michael Padlipsky (Padlipsky@MIT-Multics)

    Documents:

        Padlipsky, M. "A Proposed Protocol for Connecting Host
        Computers to ARPA-Like Networks via Front-End Processors," RFC
        647, NIC 31117, 12-Nov-74.

                [Office-1] <NETINFO>RFC647.TXT

    People:

        Michael Padlipsky (Padlipsky@MIT-Multics)

        Jon Postel (POSTEL@BBNB)

    Schedule:

    Comments:

        This is a suggested simple protocol for connecting host to
        front end computers, which are in turn connected to the
        network.

    Recent developments:

PROCESS-PROCESS

  ICP - Initial Connection Protocol [Official]

    Contact:

        Jon Postel (POSTEL@BBNB)

    Documents:

        Postel, J. "Official Initial Connection Protocol," NIC 7101,
        11-June-71.

        Wolfe, S. [no title] RFC 202, NIC 7155, 26-July-71.

        Postel, J. "Official Telnet-Logger Initial Connection
        Protocol," NIC 7103, 15-June-71.

    People:

        Jon Postel (POSTEL@BBNB)

        Schedule:

        Comments:

        Recent developments:

Telnet

    Old Telnet

        Contact:

            Jon Postel: (POSTEL@BBNB)

        Documents:

            Postel, J. "Telnet Protocol," RFC 318 3-April-72.

        People:

        Schedule:

        Comments:

        Recent developments:

    New Telnet [Official]

        Contact:

            Jon Postel (POSTEL@BBNB)

        Documents:

            NIC 18639 "TELNET Protocol Specifications" AUG 73

            NIC 18640 "Telnet Option Specification" Aug 73

                Telnet Options

                0   Transmit Binary

                     "Binary Transmission," NIC 15389

                1   Echo

                     "Echo," NIC 15390

2   Reconnection

        "Reconnection," NIC 15391

3   Suppress Go Ahead

        "Suppress Go Ahead Option," NIC 15392.

4   Negotiate Approximate Message Size

        "Approximate Message Size Negotiation," NIC

5   Status

        Crocker, D. "Status," RFC 651, NIC 31154, 25-Oct-74.

            [Office-1] <NETINFO>RFC651.TXT

6   Timing Mark

        "Timing Mark," NIC 16238.

7   Remote Controlled Transmission and Echoing

        Crocker, D. "Remote Controlled Transmission and
        Echoing," NIC 19859, 1-Nov-73.

8   Negotiate About Output Line Width

        Walden, D. "Output Line Width," NIC 20196,
        13-Nov-73.

9   Negotiate About Output Page Size

        Walden, D. "Output Page Size," NIC 20197, 13-Nov-73.

10   Output Carriage Return Disposition

        Crocker, D. "Output Carriage Return Disposition,"
        RFC 652, NIC 31155, 25-Oct-74.

            [Office-1] <NETINFO>RFC652.TXT

11   Output Horizontal Tab Stops

        Crocker, D. "Output Horizontal Tab Stops," RFC 653,
        NIC 31156, 25-Oct-74.

                    [Office-1] <NETINFO>RFC653.TXT

          12   Output Horizontal Tab Disposition

                 Crocker, D. "Output Horizontal Tab Disposition,"
                 RFC 654, NIC 31157, 25-Oct-74.

          13   Output Formfeed Disposition

                 Crocker, D. "Output Form Feed Disposition," RFC 655,
                 NIC 31158, 25-Oct-74.

                    [Office-1] <NETINFO>RFC655.TXT

          14   Output Vertical Tab Stops

                 Crocker, D. "Output Vertical Tab Stops," RFC 656,
                 NIC 31159, 25-Oct-74.

          15   Output Vertical Tab Disposition

                 Crocker, D. "Output Vertical Tab Disposition," RFC
                 657, NIC 31160, 25-Oct-74.

                    [Office-1] <NETINFO>RFC657.TXT

          16   Output Linefeed Disposition

                 Crocker, D. "Output Line Feed Disposition," RFC 658,
                 NIC 31161, 25-Oct-74.

                    [Office -1] <NETINFO>RFC658.TXT

          255 Extended Options List

                 "Extended Options List," NIC 16239.

     People:

        Jon Postel (POSTEL@BBN)

        Alex McKenzie (MCKENZIE@BBN)

        Doug Dodds (DODDS@BBN)

        Dave Crocker (DCROCKER@ISI)

     Schedule:

All Hosts were to have been running the new Telnet (both user
and server) by 1 January 1974.

Comments:

Note: the server program is to be available on socket 23
decimal (27 octal).

The Status Option has been revised to take advantage of the
subcommand feature and to reduce the amount of data transmitted
to report the option status.

Seven new options have been defined to allow control of the
format effectors Carriage Return, Line Feed, Form Feed,
Horizontal Tab, and Vertical Tab.

(31-DEC-74) Rick Schantz has made some suggestions regarding
the Reconnection Option in:

Schantz, R. "A Note on Reconnection Protocol," RFC 671, NIC
31439, 6-Dec-74.

[Office-1] <NETINFO>RFC671.TXT

Recent developments:

(15-May-75) The latest survey of Telnet Server status by Doug
Dodds is:

Dodds, D. "February, 1975, Survey of New-Protocol Telnet
Servers," RFC 679, NIC 31890, 21-Feb-75.

[Office-1] <NETINFO>RFC669.TXT

(18-Jun-75) A schedule for implementation of New Telnet in the
TIP has been published:

Walden, D. "Tentative Schedule for the New Telnet
Implementation for the TIP," RFC 688, NIC 32655, 4-Jun-75.

[Office-1] <NETINFO>RFC688.TXT

FTP

Old File Transfer

Contact:

        Jon Postel (POSTEL@BBNB)

    Documents:

        McKenzie, A. "File Transfer Protocol," NIC 14333, RFC 454, 16-
        Feb-73.

        Clements, R. "FTPSRV - Extensions for Tenex Paged Files, "RFC
        683, NIC 32251, 3-April-75.

            [Office-1] <NETINFO>RFC683.TXT

        Harvey, B. "One More Try on the FTP," RFC 691, NIC 32700, 6-
        Jun-75.

            [Office-1] <NETINFO>RFC691.TXT

    People:

        Nancy Neigus (NEIGUS@BBN)

        Jon Postel (POSTEL@BBN)

        Alex McKenzie (MCKENZIE@BBN)

        Robert Clements (CLEMENTS@BBN)

        Brian Harvey (BH@SU-AI)

    Schedule:

    Comments:

        (31-DEC-74) Kanodia has published an RFC on performance
        measurements of FTP at Multics, which shows the important
        effect of Host buffering in constraining thruput.

            Kanodia, R. "Performance Improvement in ARPANET File
            Transfers From Multics," RFC662, NIC 31386, 26-Nov-74.

                [Office-1] <NETINFO>RFC662.TXT

    Recent developments:

        (15-May-75) The Tenex FTP implementation has been extended to
        transfer paged files as described in:

        Clements, R. "FTPSRV - Extensions for Tenex Pages Files,"
        RFC 683, NIC 32251, 3-April-75.

            [Office-1] <NETINFO>RFC683.TXT

    (18-Jun-75) Brian Harvey has suggested that old FTP is good
    enough, that it is in wide use, so lets just fix the bugs
    instead of implementing new FTP. His suggested bug fixes are
    also included in his RFC:

        Harvey, B. "One More Try on the FTP," RFC 691, NIC 32700, 6-
        Jun-75.

            [Office-1] <NETINFO>RFC691.TXT

  New File Transfer

    Contact:

        Jon Postel (POSTEL@BBNB)

    Documents:

        Neigus, N. "File Transfer Protocol," NIC 17759 RFC 542 12-
        July-73.

        Postel, J. "Revised FTP Reply Codes," NIC 30843 RFC 640 5-
        June-74.

    People:

        Jon Postel (POSTEL@BBNB)

        Nancy Neigus (NEIGUS@BBN)

        Ken Pogran (Pogran.CompNet@MIT-Multics)

        Wayne Hathaway (Hathaway@AMES-67)

    Schedule:

    Comments:

    Recent developments:

  Pathnames

    Contact:

Jon Postel (POSTEL@BBNB)

Documents:

Crocker, D. "Network Standard Data Specification Syntax," RFC
645, NIC 30899, Jul-74.

People:

Dave Crocker (DCROCKER@ISI)

Schedule:

Comments:

Recent developments:

File Access Protocol

Contact:

Jon Day (Day.CAC@MIT-Multics)

Documents:

Day, J. "Memo to FTP Group: File Access Protocol," RFC 520, NIC
16819, 25-Jun-73.

People:

Ken Pogran (Pogran.CompNet@MIT-Multics)

Schedule:

Comments:

Recent developments:

File formats

Contact:

Jon Postel (POSTEL@BBNB)

Documents:

Postel, J. "Standard File Formats," RFC 678, NIC 31524, 19-
Dec-74.

                [Office-1] <NETINFO>RFC678.TXT

        People:

            Jon Postel (POSTEL@BBNB)

        Schedule:

        Comments:

            (31-DEC-74) This new format standard for document file was
            published:

                Postel, J. "Standard File Formats," RFC678, NIC 31524, 19-
                Dec-74.

                        [Office-1] <NETINFO>RFC678.TXT

        Recent developments:

Mail

    Current Mail

        Contact:

                    Jon Postel (POSTEL@BBNB)

        Documents:

            Page 26 of RFC 454 (see old file transfer).

            Myer, T. "Message Transmission Protocol," RFC 680, NIC 32116,
            30-April-75.

                        [Office-1] <NETINFO>RFC680.TXT

            Sussman, J. "FTP Error Code Usage for More Reliable Mail
            Service," RFC 630, NIC 30237, 10-Apr-74.

            Thomas, B. "On the problem of Signature Authentication for
            Network Mail," RFC 644, NIC 30874, 22-July-74.

        People:

            Ted Meyer (MYER@BBN)

            Austin Henderson (HENDERSON@BBN)

        Julie Sussman (SUSSMAN@BBN)

        Bob Thomas (THOMAS@BBN)

        Jon Postel (POSTEL@BBNB)

    Schedule:

    Comments:

        Concern over the authentication of the author of network
        messages has lead to the concept of an authorized mail sending
        process (see RFC 644).

    Recent developments:

        (15-May-75) The standard formats for mail header information
        fields have been extended as documented in:

            Myer, T. "Message Transmission Protocol," RFC 680, NIC
            32116, 30-April-75.

  Proposed Mail

    Contact:

        Jon Postel (POSTEL@BBNB)

    Documents:

        White, J. "A Proposed Mail Protocol," RFC 524, NIC 17140, 13-
        Jun-73.

        Crocker, D. "Thoughts on the Mail Protocol Proposed in RFC
        524," RFC 539, NIC 17644, 7-JULY-73.

        White, J. "Response to Critiques of the Proposed Mail
        Protocol," RFC 555, NIC 17993, 27-July-73.

        Crocker, D. "Mail Priority," RFC 577, NIC 19356, 18-Oct-73.

    People:

        Jim White (JWHITE@BBNB)

        Postel (POSTEL@BBNB)

        Dave Crocker at UCLA-NMC (DCROCKER@ISI)

        Schedule:

        Comments:

        Recent developments:

    RJE - Remote Job Entry

        Contact:

                Jon Postel (POSTEL@BBNB)

        Documents:

            Bressler, B. "Remote Job Entry Protocol," RFC 407, NIC 12112,
            16-Oct- 72.

            Krilanovich, M. "Announcement of RJS at UCSB," RFC 436, NIC
            13700, 10-Jan-73.

        People:

        Schedule:

        Comments:

        Recent developments:

    RJS - CCNs Remote Job Service

        Contact:

            Robert Braden (BRADEN@UCLA-CCN)

        Documents:

            Braden, R. "Interim NETRJS Specification," RFC 189, NIC 7133,
            15- July-71.

            Harslem, E. "Using Network Remote Job Entry," RFC 307, NIC
            9258, 24- Feb-72.

            Braden, R. "Update on NETRJS," RFC 599, NIC 20854, 13-Dec-73.

            Crocker, D. "CCNRJS: Remote Job Entry between Tenex and UCLA-
            CCN," NUTS Note 22, 5-Mar-75.

                    [ISI] <DOCUMENTATION>CCNRJS.DOC

People:

    Robert Braden (BRADEN@UCLA-CCN)

    Steve Wolfe (WOLFE@UCLA-CCN)

    Dave Crocker (DCROCKER@ISI)

Schedule:

Comments:

Recent developments:

Graphics

Contact:

    Robert Spoull (SPROULL@PARC-MAXC)

Documents:

    Sproull, R. and E. Thomas. "A Networks Graphics Protocol," NIC
    24308, 16-Aug-74.

People:

    Robert Sproull (SPROULL@PARC-MAXC)

    Elaine Thomas (Thomas@MIT-Multics)

    James Michener (JCM@MIT-DMS)

Schedule:

Comments:

    Document available from Robert Sproull.

Recent developments:

Data Reconfiguration Service

Contact:

    Jon Postel (POSTEL@BBNB)

Documents:

Anderson, B. "Status Report on Proposed Data Reconfiguration
Service," RFC 138, NIC 6715, 28-April-71.

Feah, "Data Reconfiguration Service at UCSB," RFC 437, NIC
13701, 30- June-74.

People:

Schedule:

Comments:

Recent developments:

RSEXEC - The Resource Sharing Executive

Contact:

Robert Thomas (THOMAS@BBN)

Documents:

Thomas, R. "A Resource Sharing Executive For the ARPANET,"
AFIPS Conference Proceedings, 42;155-163, NCC, 1973.

People:

Robert Thomas (THOMAS@BBN)

Schedule:

Comments:

The TIPs and some RSEXEC servers now are cooperating to perform
TIP user authentication and accounting functions.

Recent developments:

Line Processor Protocol

Contact:

Don Andrews (ANDREWS@BBNB)

Documents:

[BBNB] <LP>MCS4.NLS

        Andrews, D. "Line Processor - A Device for Amplification of
        Display Terminal Capabilities for Text Manipulation," AFIPS
        Conference Proceedings, 43:257-265, NCC, 1974.

    People:

        Martin Hardy (HARDY@BBNB)

        Don Andrews (ANDREWS@BBNB)

    Schedule:

    Comments:

    Recent developments:

PROGRAMS

  Neted - Network Standard Editor [Official]

    Contact:

        Michael Padlipsky (Padlipsky@MIT-Mulitics)

    Documents:

        Padlipsky, M. "NETED: A Common Editor for the ARPA Network,"
        RFC 569, NIC 18972, 15-Oct-73.

    People:

        Michale Padlipsky (Padlipsky@MIT-Multics)

        Jon Postel (POSTEL@BBNB)

        Wayne Hathaway (HATHAWAY@AMES-67)

    Schedule:

    Comments:

    Recent developments:

  UULP - Unified User-Level Protocol

    Contact:

            Michael Padlipsky (Padlipsky@MIT-Multics)

     Documents:

          Padlipsky, M. "Specification of a Unified User-Level Protocol,"
          RFC 666, NIC 31396, 26-Nov-73.

               [Office-1] <NETINFO>RFC666.TXT

     People:

          Michael Padlipsky (Padlispksy@MIT-Multics)

          Jon Postel (POSTEL@BBNB)

     Schedule:

     Comments:

          Also know as Common Command Language (CCL).

     Recent developments:

NATIONAL SOFTWARE WORKS

   The national Software Works (NSW) is developing a set of protocols
   for its use of the ARPA Network, other uses of these protocols is
   encouraged.

   The Distributed Programming System (DPS) is intended to facilitate
   the sharing of resources in the network at the subroutine level. The
   Distributed Programming System will be used to split NLS into a front
   end and back end components. Distributed Programming system is also
   to be used in the NSW and the basis for communication between the
   Works Manager, the Tool Bearing Hosts, and Front End procedure
   packages.

   The documents cited below give a view of the Distributed Programming
   System and its use.

   Contact:

      Jim White (JWHITE@BBNB)

      Jon Postel (POSTEL@BBNB)

Documents:

The documents cited here represent the state of the protocol in
January-75, much as changed since that time that has not been
adequately documented, therefore, these documents should be viewed
as generally descriptive not specifically definitive.

Each is available online in two forms: as an NLS file and as a
formatted text file. The Journal number (e.g., 24459) refers to
the former, of course and the pathname (e.g., [BBNB] <NLS>PCP.TXT)
to the latter, accessible via FTP using username=ANONYMOUS and
password=GUEST (no account required).

In addition, these documents are available from Jon Postel in
hardcopy.

PCP (24459,) "The Procedure Call Protocol"

This document describes the virtual programming environment
provided by PCP, and the inter-process exchanges that
implement it.

Pathname: [BBNB] <NLS>PCP.TXT

PIP (24460,) "The Procedure Interface Package"

This document describes a package that runs in the setting
provided by PCP and that serves as procedure-call-level
interface to PCP proper. It includes procedures for
calling, resuming, interrupting, and aborting remote
procedures.

Pathname: [BBNB] <NLS>PIP.TXT

PSP (24461,) "The PCP Support Package"

This document describes a package that runs in the setting
provided by PCP and that augments PCP proper, largely in the
area of data store manipulation. It includes procedures for
obtaining access to groups of remote procedures and data
stores, manipulating remote data stores, and creating
temporary ones.

Pathname: [BBNB] <NLS>PSP.TXT

PMP (24462,) "The Process Management Package"

   This document describes a package that runs in the setting
   provided by PCP and that provides the necessary tools for
   interconnecting two or more processes to form a multi-
   process system (e.g., NSW). It includes procedures for
   creating, deleting, logically and physically interconnecting
   processes, and for allocating and releasing processors.

        Pathname: [BBNB] <NLS>PMP.TXT

PCPFMT (24576,) "PCP Data Structure Formats"

   This document defines formats for PCP data structures, each
   of which is appropriate for one or more physical channel
   types.

        Pathname: [BBNB] <NLS>PCPFMT.TXT

PCPHST (24577,) "PCP ARPANET Inter-Host IPC Implementation"

   This document defines an implementation, appropriate for
   mediating communication between Tenex forks, of the IPC
   primitives required by PCP.

        Pathname: [BBNB] <NLS>PCPHST.TXT

PCPFRK (24578,) "PCP Tenex Inter-Fork IPC Implementation"

   This document defines an implementation, appropriate for
   mediating communication between processes on different hosts
   within the ARPANET, of the IPC primitives required by PCP.

        Pathname: [BBNB] <NLS>PCPFRK.TXT

PCPTNXINT (24792,) "Tenex PCP Process internal Structure"

   This document defines the internal structure of a PCP
   process implemented to run on Tenex, and as such serves as a
   process implementer's guide. It describes the process' fork
   structure, the role and composition of each fork, and the
   manner in which the various forks interact with one another;
   indicates which components are supplied with PCP and which
   are the responsibility of the process implementer; and
   describes the manner in which the components are assembled
   at load time.

        Pathname: [BBNB] <NLS>PCPTNXINT.TXT

HOST (24581,) "NSW Host Protocol"

   This document describes the host level protocol used in the
   NSW. The protocol is a slightly constrained version of the
   standard ARPANET host to host protocol. The constraints
   affect the allocation, RFNM wait, and retransmission
   policies.

           Pathname: [BBNB] <NLS>HOST.TXT

EXEC (24580,) "The Executive Package"

   This document describes a package that runs in the setting
   provided by PCP. It includes procedures and data stores for
   user identification, accounting, and usage information.

           Pathname: [BBNB] <NLS>EXEC.TXT

FILE (24582,) "The File Package"

   This document describes a package that runs in the setting
   provided by PCP. It includes procedures and data stores for
   opening, closing, and listing directories, for creating,
   deleting, and renaming files, and for transferring the files
   and file elements between processes.

           Pathname: [BBNB] <NLS>FILE.TXT

FILE-APP (24813,) "The File Package Appendix"

   This appendix contains some comments on implementation
   strategy. The thrust is to argue that the file package as
   specified is near minimal and that the conversion between
   the PCP format and the internal storage format can be
   encapsulated into a few subroutines.

           Pathname: [BBNB] <NLS>FILE-APP.TXT

BATCH (24583,) "The Batch Job Package"

   This document describes a package that urns in the setting
   provided by PCP. It includes procedures for creating and
   deleting batch jobs, obtaining the status of a batch job,
   and communicating with the operator of a batch processing
   host. This package is implemented at the host that provides
   the batch processing facility.

           Pathname: [BBNB] <NLS>BATCH.TXT

     LLDBUG (24579,) "The Low-Level Debug Package"

        This document describes a package that runs in the setting
        provided by PCP. It includes procedures for a remote
        process to debug at the assembly-language level, any
        processes known to the local process. The package contains
        procedures for manipulating and searching the process'
        address space, for manipulating and searching its symbol
        tables, and for setting and removing breakpoints from its
        address space. Its data stores hold process characteristics
        and state information, and the contents of program symbol
        tables.

             Pathname: [BBNB] <NLS.LLDBUG.TXT

     RJE-MODEL (24655,) "The NSW Remote Job Entry Model"

        This document discusses the process of utilizing a batch
        processing facility to complete a programming task in the
        NSW environment. This same activity in another environment
        might utilize a remote job entry system.

             Pathname: [BBNB] <NLS>RJE-MODEL.TXT

     TBH (24656,) "NSW Requirements on Tool Rearing Hosts"

        This document discusses the environment needed in the tool
        bearing host and the interfaces to the operating system
        components by various PCP packages.

             Pathname: [BBNB] <NLS>TBH.TXT

     NVTP (24827,) "The Network Virtual Terminal Package"

        The Network Virtual Terminal Package (package name = NVTP)
        contains the procedures interfacing PCP procedure calls to
        terminal oriented input and output character streams as
        defined by the ARPANET Telnet protocol.

             Pathname: [BBNB] <NLS>NVTP.TXT

     NTP (25008,) "The NSW Tool Package"

        This document describes the procedures and data stores
        required of a process for use as a tool within the NSW.

             Pathname: [BBNB] <NLS>NTP.TXT

    NSWSTRUC (25009,) "NSW Process Structure"

        This document describes the structure of the PCP process
        tree used in the NSW.

                Pathname: [BBNB] <NLS>NSWSTRUC.TXT

    PCPV2CHANGES (25062,) "PCP Inter-Version (2-3) Documentation"

        This document describes the divergence from the Version 2
        documentation in the implementation and current thinking.

                Pathname: [BBNB] <NLS>PCPV2CHANGES.TXT

  People:

    Jim White (JWHITE@BBNB)

    Jon Postel (POSTEL@BBNB)

    Steve Warshall (WARSHALL@BBNB)

    Robert Millstein (MILLSTEIN@BBNB)

    Dick Mandell (MANDELL@ISIB)

    Elizabeth Michael (MICHAEL@BBNB)

    Dave Maynard (MAYNARD@BBNB)

    Charles Irby (IRBY@BBNB)

    Ken Victor (VICTOR@BBNB)

  Schedule:

    A demonstration of the National Software Works is to be
    performed in summer 1975.

  Comments:

    (31-DEC-74) The following are the latest documents:

        PCPFRK (24578,) "PCP Tenex Inter-Fork IPC Implementation"

        FILE-APP (24813,) "The File Package Appendix"

        RJE-MODEL (24655,) "The NSW Remote Job Entry Model"

        TBH (24656,) "NSW Requirements on Tool Bearing Hosts"

        NVTP (24827,) "The Network Virtual Terminal Package"

    (21-JAN-75) The following are the latest documents:

        NTP (25008,) "The NSW Tool Package"

        NSWSTRUC (25009,) "NSW Process Structure"

        PCPV2CHANGES (25062,) "PCP Inter-Version (2-3)
        Documentation"

  Recent developments:

    (15-May-75) Significant changes in design and initial scope
    have altered the implementation of the Distributed Programming
    System from the design presented in these documents, the
    documents still serve to give the flavor of the intended
    system, but no longer are a reliable guide to the details of
    the actual implementation.

    (18-Jun-75) The L10 source code of the Tenex implementation is
    available online as:

            [BBNB] <NLS>C2DPS.TXT

    (18-Jun-75) A description of the user interface to DPS in Tenex
    is available online as:

            [BBNB] <JWHITE>DPSJSYS.TXT

    (18-Jun-75) A description of the Works Manager procedures is
    available online as:

            [BBNB] <MILLSTEIN>WM-PROCEDURES.TXT

    (18-Jun-75) A set of memos describing the interface to the
    B4700 batch system is available online as:

            [BBNB] <MUNTZ>BMEMO.n

                where n is in the range 1 thru 12.

    (18-Jun-75) A description of the file package is available
    online as:

            [BBNB] <NLS>25850.TXT

        (18-Jun-75) A description of the 8 bit binary communication
        format is available online as:

                [BBNB]25966.TXT

ADDRESS ASSIGNMENTS

    Assigned Links

        Contact:

            Jon Postel (POSTEL@BBNB)

        Documents:

        Link Assignments:

            Decimal   Octal   Use
            0   0   Control Messages
            1   1   Reserved
            2-71   2-107   Regular Messages
            72-151   110-227   Reserved
            152   230   PARC Universal Protocol
            153   231   TIP Status Reporting
            154   232   TIP Accounting
            155-158   233-236   Internet Protocol
            159-191   237-277   Measurements
            192-195   300-303   Message Switching Protocol
            196-255   304-255   Experimental Protocols

        People:

            Jon Postel (POSTEL@BBNB)

        Schedule:

        Comments:

            Numbers issued by Jon Postel (POSTEL@BBNB).

        Recent developments:

            (15-May-75) Link 151 (decimal) assigned for the PARC Universal
            Protocol.

    Assigned Sockets:

Contact:

  Jon Postel (POSTEL@BBNB)

Documents:

  Socket Assignments:

  General Assignments:

Decimal	Octal	Use
0-63	0-77	Network Wide Standard Function
64-127	100-177	Hosts Specific Functions
128-223	200-337	Reserved for Future Use
224-255	340-377	Any Experimental Function

  Specific Assignments:

Decimal	Octal	Use
1	1	Old Telnet
3	3	Old File Transfer
5	5	Remote Job Entry
7	7	Echo
9	11	Discard
11	13	Who is on or SYSTAT
13	15	Date and Time
15	17	Who is up or NETSTAT
17	21	Short Text Message
19	23	Character generator TTYTST
21	25	New File Transfer
23	27	New Telnet
25	31	Distributed Programming System
65	101	Speech Data Base at LL-TX-2
67	103	Datacomputer at CCA
69	105	CPYNET
71	107	NETRJS (EBCDIC) at UCLA-CCN
73	111	NETRJS (ASCII) at UCLA-CCN
75	113	NETRJS (TTY) at UCLA-CCN
77	115	any private RJE server
232-237	350-355	Authorized Mailer at BBN
239	357	Graphics
241	361	NCP Measurement
243	363	Survey Measurement
245	365	LINK
247	367	TIPSRV
249-255	371-377	RSEXEC

  People:

Jon Postel (POSTEL@BBNB)

Nancy Neigus (NEIGUS@BBN)

Schedule:

Comments:

Numbers issued by Jon Postel (POSTEL@BBNB)

(31-DEC-74) Socket 25 (31 octal) assigned to Distributed
Programming System.

Recent developments: