J. Postel
(SRI-ARC)
18 June 1975

Protocol Information

1

INTRODUCTION 2

This file contains information on the various protocols in the ARPA Network. An effort will be made to keep the information current, but this 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. 2a

Online address is POSTEL@BBNB; Phone is (415) 326-6200x3718; U.S Mail address is Stanford Research Institute, Augmentation Research Center, 333 Ravenswood, Menlo Park, California 94025. 2a1

This is a compendium of all the protocol related 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. 2b

This protocol information file is on line as: 2c

Pathname: [OFFICE-1]<NETINFO>PROTOCOL-INFORMATION.TXT 2c1

and also [BBNB]<POSTEL>PROTOCOL-INFORMATION.NLS 2c2

Much of the documentation of protocols appears as Requests for Comments (RFCs) and many of these are available on line. When a document is accessible on line a pointer to that source will be given. Also note that recent RFCs are on line 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 onlie file: 2d

[Office-1]<NETINFO>RFC-INDEX.TXT 2d1

There are three other on line files that are relevant to protocols: 2e

There is a file that lists Official Host Names and associated information as described in RFC 608, the pathname of this file is: 2e1

[Office-1]<NETINFO>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 for that organization. 2e2

[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. 2e3

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. 2f

IMP-IMP 3

surface 3a

Contact: 3a1

Alex McKenzie (MCKENZIE@BBN)

Documents: 3a2

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 FJCC, 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: 3a3

John McQuillan (MCQUILLAN@BBN)

Schedule: 3a4

Comments: 3a5

Recent developments: 3a6

satellite 3b

Contact: 3b1

Randy Rettberg (RETTBERG@BBN)

Documents: 3b2

People: 3b3

Robert Kahn (KAHN@ISI)

Schedule: 3b4

Comments: 3b5

Recent developments: 3b6

IMP-HOST 4

IMP-Host [Official] 4a

Contact: 4a1

Alex McKenzie (MCKENZIE@BBN)

Documents: 4a2

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

People: 4a3

Alex McKenzie (MCKENZIE@BBN)

Dave Walden (WALDEN@BBN)

Jon Postel (POSTEL@BBNB)

Jerry Burchfiel (BURCHFIEL@BBN)

John McQuillan (MCQUILLAN@BBN)

Schedule: 4a4

Comments: 4a5

The "link number" field has been extended form 8 to 12 bits and renamed the "message identification" field. Message type 6 now is used to indicate a reason for a 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 execpt 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 multiprocessor 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 3.2 redefines the IMP's view of Host up/down conditions. Changes are backward compatible.

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

Recent developments: 4a6

(18-Jun-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 nop 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.

[Office-1]<NETINFO>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.

[Office-1]<NETINFO>RFC690.TXT

HOST-HOST 5

ncp - standard host-to-host [Official] 5a

Contact: 5a1

Jon Postel (POSTEL@BBNB)

Documents: 5a2

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: 5a3

Jon Postel (POSTEL@BBNB)

Alex McKenzie (MCKENZIE@BBN)

Schedule: 5a4

Comments: 5a5

Recent developments: 5a6

ncp - host-to-host [Experimental] 5b

Contact: 5b1

Jon Postel (POSTEL@BBNB)

Documents: 5b2

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 Relibility Improvements" RFC 636 NIC 30490 June 1974.

People: 5b3

Jon Postel (POSTEL@BBNB)

Alex McKenzie (MCKENZIE@BBN)

Jerry Burchfiel (BURCHFIEL@BBN)

Dave Walden (WALDEN@BBN)

Schedule: 5b4

Comments: 5b5

The BBN TIP and TENEX groups have specified and are implementing additional protocol commands with the intention of providing better reliablity and surviability 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: 5b6

ncp - host-to-host [Experimental] 5c

Contact: 5c1

Jon Postel (POSTEL@BBNB)

Documents: 5c2

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

Postel, J. "Assigned Link Numbers," RFC604, NIC21186, 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: 5c3

Jon Postel (POSTEL@BBNB)

Alex McKenzie (MCKENZIE@BBN)

Raj Kanodia (Kanodia.CompNet@MIT-Multics)

Schedule: 5c4

Comments: 5c5

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

Recent developments: 5c6

msp - Message Switching Protocol 5d

Contact: 5d1

Dave Walden (WALDEN@BBN)

Documents: 5d2

Walden, D. "A System for Interrprocess 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: 5d3

Dave Walden (WALDEN@BBN)

Bob Bressler (BRESSLER@BBN)

Schedule: 5d4

Comments: 5d5

Recent developments: 5d6

tcp - Transmission Control Protocol 5e

Contact: 5e1

Vint Cerf (CERF@ISI)

Documents: 5e2

Cerf, 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: 5e3

Vint Cerf (CERF@ISI)

Ray Tomlinson (TOMLINSON@BBN)

Peter Kirstein (KIRSTEIN@ISI)

Jon Postel (POSTEL@BBN)

Schedule: 5e4

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

Comments: 5e5

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]<CERF>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 a 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: 5e6

(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 is 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 internatinal 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 5f

Contact: 5f1

Danny Cohen (COHEN@ISIB)

Documents: 5f2

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

People: 5f3

Schedule: 5f4

Comments: 5f5

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: 5f6

packet radio 5g

Contact: 5g1

Robert Kahn (KAHN@ISI)

Documents: 5g2

People: 5g3

Schedule: 5g4

Comments: 5g5

Recent developments: 5g6

Network Debugging Protocol 5h

Contact: 5h1

Eric Mader (MADER@BBN)

Documents: 5h2

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: 5h3

Michael Beeler (BEELER@BBN)

Eric Mader (MADER@BBN)

Dave Retz (RETZ@ISI)

Ken Victor (VICTOR@BBNB)

Schedule: 5h4

Comments: 5h5

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

Recent Developments: 5h6

(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 5i

Contact: 5i1

Ed Taft (TAFT@PARC)

Documents: 5i2

People: 5i3

Ed Taft (TAFT@PARC)

Bob Metcalfe (METCALFE@PARC)

Schedule: 5i4

Comments: 5i5

Recent developments: 5i6

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

HOST-FRONTEND 6

Host-Front End 6a

Contact: 6a1

Michael Padlipsky (Padlipsky@MIT-Multics)

Documents: 6a2

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: 6a3

Michael Padlipsky (Padlipsky@MIT-Multics)

Jon Postel (POSTEL@BBNB)

Schedule: 6a4

Comments: 6a5

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

Recent developments: 6a6

PROCESS-PROCESS 7

ICP - Initial Connection Protocol [Official] 7a

Contact: 7a1

Jon Postel (POSTEL@BBNB)

Documents: 7a2

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: 7a3

Jon Postel (POSTEL@BBNB)

Schedule: 7a4

Comments: 7a5

Recent developments: 7a6

Telnet 7b

Old Telnet 7b1

Contact:

Jon Postel (POSTEL@BBNB)

Documents:

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

People:

Schedule:

Comments:

Recent developments:

New Telnet [Official] 7b2

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 Supress Go Ahead

"Suppress Go Ahead Option," NIC 15392.

4 Negotiate Approximate Message Size

"Approximate Message Size Negotiation," NIC 15393.

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.

[Office-1]<NETINFO>RFC654.TXT

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.

[Office-1]<NETINFO>RFC656.TXT

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@BBNB)

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 7c

Old File Transfer 7c1

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 Paged 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 indluded 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 7c2

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 7c3

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 7c4

Contact:

John 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 7c5

Contact:

Jon Postel (POSTEL@BBNB)

Documents:

Postel, J. "Standard File Formats," RFC678, 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 7d

Current Mail 7d1

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 Myer (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 led 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.

[Office-1]<NETINFO>RFC680.TXT

Proposed Mail 7d2

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-733.

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 7e

Contact: 7e1

Jon Postel (POSTEL@BBNB)

Documents: 7e2

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

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

People: 7e3

Schedule: 7e4

Comments: 7e5

Recent developments: 7e6

RJS - CCNs Remote Job Service 7f

Contact: 7f1

Robert Braden (BRADEN@UCLA-CCN)

Documents: 7f2

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: 7f3

Robert Braden (BRADEN@UCLA-CCN)

Steve Wolfe (WOLFE@UCLA-CCN)

Dave Crocker (DCROCKER@ISI)

Schedule: 7f4

Comments: 7f5

Recent developments: 7f6

Graphics 7g

Contact: 7g1

Robert Sproull (SPROULL@PARC-MAXC)

Documents: 7g2

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

People: 7g3

Robert Sproull (SPROULL@PARC-MAXC)

Elaine Thomas (Thomas@MIT-Multics)

James Michener (JCM@MIT-DMS)

Schedule: 7g4

Comments: 7g5

Document available from Robert Sproull.

Recent developments: 7g6

Data Reconfiguration Service 7h

Contact: 7h1

Jon Postel (POSTEL@BBNB)

Documents: 7h2

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: 7h3

Schedule: 7h4

Comments: 7h5

Recent developments: 7h6

RSEXEC - The Resource Sharing Executive 7i

Contact: 7i1

Robert Thomas (THOMAS@BBN)

Documents: 7i2

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

People: 7i3

Robert Thomas (THOMAS@BBN)

Schedule: 7i4

Comments: 7i5

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

Recent developments: 7i6

Recent developments: 8a6

UULP - Unified User-Level Protocol 8b

Contact: 8b1

Michael Padlipsky (Padlipsky@MIT-Multics)

Documents: 8b2

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

[Office-1]<NETINFO>RFC666.TXT

People: 8b3

Michael Padlipsky (Padlipsky@MIT-Multics)

Jon Postel (POSTEL@BBNB)

Schedule: 8b4

Comments: 8b5

Also known as Common Command Language (CCL).

Recent developments: 8b6

NATIONAL SOFTWARE WORKS 9

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. 9a

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 as the basis for communication between the Works Manager, the Tool Bearing Hosts, and Front End procedure packages. 9b

The documents cited below give a view of the Distributed Programming System and its use. 9c

Contact: 9c1

Jim White (JWHITE@BBNB)

Jon Postel (POSTEL@BBNB)

Documents: 9c2

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

Each is available on-line 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 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 a 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 transfering 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 runs 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 process 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 Requirments on Tool Bearing 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 currrent thinking.

Pathname: [BBNB]<NLS>PCPV2CHANGES.TXT

People: 9c3

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Steve Warshall (WARSHALL@BBNB)

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Dick Mandell (MANDELL@ISIB)

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Ken Victor (VICTOR@BBNB)

Schedule: 9c4

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

Comments: 9c5

(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 Requirments 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: 9c6

(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 discription 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 discription 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]<NLS>25966.TXT

ADDRESS ASSIGNMENTS 10

Assigned Links 10a

Contact: 10a1

Jon Postel (POSTEL@BBNB)

Documents: 10a2

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: 10a3

Jon Postel (POSTEL@BBNB)

Schedule: 10a4

Comments: 10a5

Numbers issued by Jon Postel (POSTEL@BBNB).

Recent developments: 10a6

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

Assigned Sockets 10b

Contact: 10b1

Jon Postel (POSTEL@BBNB)

Documents: 10b2

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 or 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: 10b3

Jon Postel (POSTEL@BBNB)

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Schedule: 10b4

Comments: 10b5

Numbers issued by Jon Postel (POSTEL@BBNB).

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

Recent developments: 10b6