Network Working Group
Request for Comments: 1060
Obsoletes RFCs: 1010, 990, 960, 943, 923, 900, 870, 820, 790, 776, 770, 762, 758,755, 750, 739, 604, 503, 433, 349
Obsoletes IENs: 127, 117, 93

J. Reynolds
J. Postel
ISI

March 1990

ASSIGNED NUMBERS

STATUS OF THIS MEMO

This memo is a status report on the parameters (i.e., numbers and keywords) used in protocols in the Internet community. Distribution of this memo is unlimited.

Table of Contents

INTRODUCTION

This Network Working Group Request for Comments documents the currently assigned values from several series of numbers used in network protocol implementations. This RFC will be updated periodically, and in any case current information can be obtained from the Internet Assigned Numbers Authority (IANA). If you are developing a protocol or application that will require the use of a link, socket, port, protocol, etc., please contact the IANA to receive a number assignment.

Joyce K. Reynolds
Internet Assigned Numbers Authority
USC - Information Sciences Institute
4676 Admiralty Way
Marina del Rey, California 90292-6695

Phone: (213) 822-1511

Electronic mail: JKREY@ISI.EDU

Most of the protocols mentioned here are documented in the RFC series of notes. Some of the items listed are undocumented. Further information on protocols can be found in the memo "Official Internet Protocols" [118]. The more prominent and more generally used are documented in the "DDN Protocol Handbook, Volume Two, DARPA Internet Protocols" [45] prepared by the NIC. Other collections of older or obsolete protocols are contained in the "Internet Protocol Transition Workbook" [76], or in the "ARPANET Protocol Transition Handbook" [47]. For further information on ordering the complete 1985 DDN Protocol Handbook, write: SRI International (SRI-NIC), DDN Network Information Center, Room EJ291, 333 Ravenswood Avenue, Menlo Park, CA., 94025; or call: 1-800-235-3155. Also, the Internet Activities Board (IAB) publishes the "IAB Official Protocol Standards" [62], which describes the state of standardization of protocols used in the Internet. This document is issued quarterly. Current copies may be obtained from the DDN Network Information Center or from the IANA.

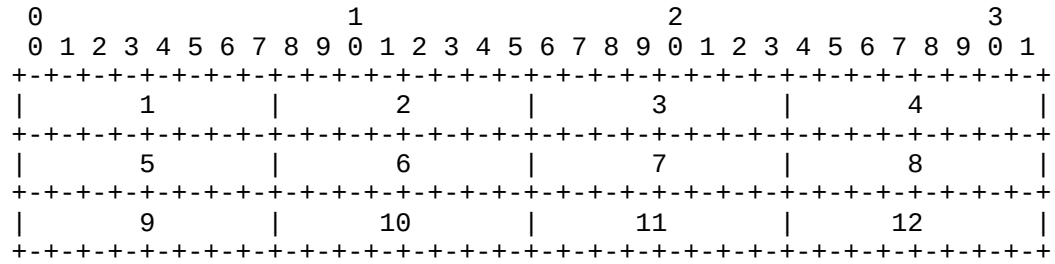
In the entries below, the name and mailbox of the responsible

individual is indicated. The bracketed entry, e.g., [nn,iii], at the right hand margin of the page indicates a reference for the listed protocol, where the number ("nn") cites the document and the letters ("iii") cites the person. Whenever possible, the letters are a NIC Ident as used in the WhoIs (NICNAME) service.

Data Notations

The convention in the documentation of Internet Protocols is to express numbers in decimal and to picture data in "big-endian" order [21]. That is, fields are described left to right, with the most significant octet on the left and the least significant octet on the right.

The order of transmission of the header and data described in this document is resolved to the octet level. Whenever a diagram shows a group of octets, the order of transmission of those octets is the normal order in which they are read in English. For example, in the following diagram the octets are transmitted in the order they are numbered.



Transmission Order of Bytes

Whenever an octet represents a numeric quantity the left most bit in the diagram is the high order or most significant bit. That is, the bit labeled 0 is the most significant bit. For example, the following diagram represents the value 170 (decimal).

Significance of Bits

Similarly, whenever a multi-octet field represents a numeric quantity

the left most bit of the whole field is the most significant bit. When a multi-octet quantity is transmitted the most significant octet is transmitted first.

Special Addresses:

There are five classes of IP addresses: Class A through Class E [119]. Of these, Class D and Class E addresses are reserved for experimental use. A gateway which is not participating in these experiments must ignore all datagrams with a Class D or Class E destination IP address. ICMP Destination Unreachable or ICMP Redirect messages must not result from receiving such datagrams.

There are certain special cases for IP addresses [11]. These special cases can be concisely summarized using the earlier notation for an IP address:

IP-address ::= { <Network-number>, <Host-number> }

or

IP-address ::= { <Network-number>, <Subnet-number>, <Host-number> }

if we also use the notation "-1" to mean the field contains all 1 bits. Some common special cases are as follows:

(a) {0, 0}

This host on this network. Can only be used as a source address (see note later).

(b) {0, <Host-number>}

Specified host on this network. Can only be used as a source address.

(c) { -1, -1}

Limited broadcast. Can only be used as a destination address, and a datagram with this address must never be forwarded outside the (sub-)net of the source.

(d) {<Network-number>, -1}

Directed broadcast to specified network. Can only be used as a destination address.

(e) {<Network-number>, <Subnet-number>, -1}

Directed broadcast to specified subnet. Can only be used as a destination address.

(f) {<Network-number>, -1, -1}

Directed broadcast to all subnets of specified subnetted network. Can only be used as a destination address.

(g) {127, <any>}

Internal host loopback address. Should never appear outside a host.

VERSION NUMBERS

In the Internet Protocol (IP) [45,105] there is a field to identify the version of the internetwork general protocol. This field is 4 bits in size.

Assigned Internet Version Numbers

Decimal	Keyword	Version	References
0		Reserved	[JBP]
1-3		Unassigned	[JBP]
4	IP	Internet Protocol	[105,JBP]
5	ST	ST Datagram Mode	[49,JWF]
6-14		Unassigned	[JBP]
15		Reserved	[JBP]

PROTOCOL NUMBERS

In the Internet Protocol (IP) [45,105] there is a field, called Protocol, to identify the the next level protocol. This is an 8 bit field.

Assigned Internet Protocol Numbers

Decimal	Keyword	Protocol	References
0		Reserved	[JBP]
1	ICMP	Internet Control Message	[97,JBP]
2	IGMP	Internet Group Management	[43,JBP]
3	GGP	Gateway-to-Gateway	[60,MB]
4		Unassigned	[JBP]
5	ST	Stream	[49,JWF]
6	TCP	Transmission Control	[106,JBP]
7	UCL	UCL	[PK]
8	EGP	Exterior Gateway Protocol	[123,DLM1]
9	IGP	any private interior gateway	[JBP]
10	BBN-RCC-MON	BBN RCC Monitoring	[SGC]
11	NVP-II	Network Voice Protocol	[22,SC3]
12	PUP	PUP	[8,XEROX]
13	ARGUS	ARGUS	[RWS4]
14	EMCON	EMCON	[BN7]
15	XNET	Cross Net Debugger	[56,JFH2]
16	CHAOS	Chaos	[NC3]
17	UDP	User Datagram	[104,JBP]
18	MUX	Multiplexing	[23,JBP]
19	DCN-MEAS	DCN Measurement Subsystems	[DLM1]
20	HMP	Host Monitoring	[59,RH6]
21	PRM	Packet Radio Measurement	[ZSU]
22	XNS-IDP	XEROX NS IDP	[133,XEROX]
23	TRUNK-1	Trunk-1	[BWB6]
24	TRUNK-2	Trunk-2	[BWB6]
25	LEAF-1	Leaf-1	[BWB6]
26	LEAF-2	Leaf-2	[BWB6]
27	RDP	Reliable Data Protocol	[138,RH6]
28	IRTP	Internet Reliable Transaction	[79,TXM]
29	ISO-TP4	ISO Transport Protocol Class 4	[63,RC77]
30	NETBLT	Bulk Data Transfer Protocol	[20,DDC1]
31	MFE-NSP	MFE Network Services Protocol	[124,BCH2]
32	MERIT-INP	MERIT Internodal Protocol	[HWB]
33	SEP	Sequential Exchange Protocol	[JC120]
34	3PC	Third Party Connect Protocol	[SAF3]
35-60		Unassigned	[JBP]
61		any host internal protocol	[JBP]
62	CFTP	CFTP	[50,HCF2]

63		any local network	[JBP]
64	SAT-EXPAK	SATNET and Backroom EXPAK	[SHB]
65		Unassigned	[JBP]
66	RVD	MIT Remote Virtual Disk Protocol	[MBG]
67	IPPC	Internet Pluribus Packet Core	[SHB]
68		any distributed file system	[JBP]
69	SAT-MON	SATNET Monitoring	[SHB]
70	VISA	VISA Protocol	[GXT1]
71	IPCV	Internet Packet Core Utility	[SHB]
72-75		Unassigned	[JBP]
76	BR-SAT-MON	Backroom SATNET Monitoring	[SHB]
77	SUN-ND	SUN ND PROTOCOL-Temporary	[WM3]
78	WB-MON	WIDEBAND Monitoring	[SHB]
79	WB-EXPAK	WIDEBAND EXPAK	[SHB]
80	ISO-IP	ISO Internet Protocol	[MTR]
81	VMTP	VMTP	[DRC3]
82	SECURE-VMTP	SECURE-VMTP	[DRC3]
83	VINES	VINES	[BXH]
84	TTP	TTP	[JXS]
85	NSFNET-IGP	NSFNET-IGP	[HWB]
86	DGP	Dissimilar Gateway Protocol	[74,ML109]
87	TCF	TCF	[GAL5]
88	IGRP	IGRP	[18,GXS]
89	OSPFIGP	OSPFIGP	[83,JTM4]
90	Sprite-RPC	Sprite RPC Protocol	[143,BXW]
91	LARP	Locus Address Resolution Protocol	[BXH]
92-254		Unassigned	[JBP]
255		Reserved	[JBP]

PORT NUMBERS

Ports are used in the TCP [45,106] to name the ends of logical connections which carry long term conversations. For the purpose of providing services to unknown callers, a service contact port is defined. This list specifies the port used by the server process as its contact port. The contact port is sometimes called the "well-known port".

To the extent possible, these same port assignments are used with the UDP [46,104].

To the extent possible, these same port assignments are used with the ISO-TP4 [64].

The assigned ports use a small portion of the possible port numbers. The assigned ports have all except the low order eight bits cleared to zero. The low order eight bits are specified here.

Port Assignments:

Decimal	Keyword	Description	References
0		Reserved	[JBP]
1	TCPMUX	TCP Port Service Multiplexer	[MKL]
2-4		Unassigned	[JBP]
5	RJE	Remote Job Entry	[12,JBP]
7	ECHO	Echo	[95,JBP]
9	DISCARD	Discard	[94,JBP]
11	USERS	Active Users	[89,JBP]
13	DAYTIME	Daytime	[93,JBP]
15		Unassigned	[JBP]
17	QUOTE	Quote of the Day	[100,JBP]
19	CHARGEN	Character Generator	[92,JBP]
20	FTP-DATA	File Transfer [Default Data]	[96,JBP]
21	FTP	File Transfer [Control]	[96,JBP]
23	TELNET	Telnet	[112,JBP]
25	SMTP	Simple Mail Transfer	[102,JBP]
27	NSW-FE	NSW User System FE	[24,RHT]
29	MSG-ICP	MSG ICP	[85,RHT]
31	MSG-AUTH	MSG Authentication	[85,RHT]
33	DSP	Display Support Protocol	[EXC]
35		any private printer server	[JBP]
37	TIME	Time	[108,JBP]
39	RLP	Resource Location Protocol	[MA]
41	GRAPHICS	Graphics	[129,JBP]
42	NAMESERVER	Host Name Server	[99,JBP]
43	NICNAME	Who Is	[55,MARY]

44	MPM-FLAGS	MPM FLAGS Protocol	[JBP]
45	MPM	Message Processing Module [recv]	[98,JBP]
46	MPM-SND	MPM [default send]	[98,JBP]
47	NI-FTP	NI FTP	[134,SK8]
49	LOGIN	Login Host Protocol	[PHD1]
51	LA-MAINT	IMP Logical Address Maintenance	[76,AGM]
53	DOMAIN	Domain Name Server	[81,95,PM1]
55	ISI-GL	ISI Graphics Language	[7,RB9]
57		any private terminal access	[JBP]
59		any private file service	[JBP]
61	NI-MAIL	NI MAIL	[5,SK8]
63	VIA-FTP	VIA Systems - FTP	[DXD]
65	TACACS-DS	TACACS-Database Service	[3,KH43]
67	BOOTPS	Bootstrap Protocol Server	[36,WJC2]
68	BOOTPC	Bootstrap Protocol Client	[36,WJC2]
69	TFTP	Trivial File Transfer	[126,DDC1]
71	NETRJS-1	Remote Job Service	[10,RTB3]
72	NETRJS-2	Remote Job Service	[10,RTB3]
73	NETRJS-3	Remote Job Service	[10,RTB3]
74	NETRJS-4	Remote Job Service	[10,RTB3]
75		any private dial out service	[JBP]
77		any private RJE service	[JBP]
79	FINGER	Finger	[52,KLH]
81	HOSTS2-NS	HOSTS2 Name Server	[EAK1]
83	MIT-ML-DEV	MIT ML Device	[DPR]
85	MIT-ML-DEV	MIT ML Device	[DPR]
87		any private terminal link	[JBP]
89	SU-MIT-TG	SU/MIT Telnet Gateway	[MRC]
91	MIT-DOV	MIT Dover Spooler	[EBM]
93	DCP	Device Control Protocol	[DT15]
95	SUPDUP	SUPDUP	[27,MRC]
97	SWIFT-RVF	Swift Remote Vitural File Protocol	[MXR]
98	TACNEWS	TAC News	[ANM2]
99	METAGRAM	Metagram Relay	[GEOF]
101	HOSTNAME	NIC Host Name Server	[54,MARY]
102	ISO-TSAP	ISO-TSAP	[16,MTR]
103	X400	X400	[HCF2]
104	X400-SND	X400-SND	[HCF2]
105	CSNET-NS	Mailbox Name Nameserver	[127,MS56]
107	RTELNET	Remote Telnet Service	[101,JBP]
109	POP2	Post Office Protocol - Version 2	[14,JKR1]
110	POP3	Post Office Protocol - Version 3	[122,MTR]
111	SUNRPC	SUN Remote Procedure Call	[DXG]
113	AUTH	Authentication Service	[130,MCSJ]
115	SFTP	Simple File Transfer Protocol	[73,MKL1]
117	UUCP-PATH	UUCP Path Service	[44,MAE]
119	NNTP	Network News Transfer Protocol	[65,PL4]
121	ERPC	Encore Expedited Remote Proc. Call	[132,JXO]

123	NTP	Network Time Protocol	[80,DLM1]
125	LOCUS-MAP	Locus PC-Interface Net Map Server	[137,EP53]
127	LOCUS-CON	Locus PC-Interface Conn Server	[137,EP53]
129	PWDGEN	Password Generator Protocol	[141,FJW]
130	CISCO-FNA	CISCO FNATIVE	[WXB]
131	CISCO-TNA	CISCO TNATIVE	[WXB]
132	CISCO-SYS	CISCO SYSMAINT	[WXB]
133	STATSRV	Statistics Service	[DLM1]
134	INGRES-NET	INGRES-NET Service	[MXB]
135	LOC-SRV	Location Service	[JXP]
136	PROFILE	PROFILE Naming System	[LLP]
137	NETBIOS-NS	NETBIOS Name Service	[JBP]
138	NETBIOS-DGM	NETBIOS Datagram Service	[JBP]
139	NETBIOS-SSN	NETBIOS Session Service	[JBP]
140	EMFIS-DATA	EMFIS Data Service	[GB7]
141	EMFIS-CNTL	EMFIS Control Service	[GB7]
142	BL-IDM	Britton-Lee IDM	[SXS1]
143	IMAP2	Interim Mail Access Protocol v2	[MRC]
144	NEWS	NewS	[JAG]
145	UAAC	UAAC Protocol	[DAG4]
146	ISO-TP0	ISO-IP0	[86,MTR]
147	ISO-IP	ISO-IP	[MTR]
148	CRONUS	CRONUS-SUPPORT	[135,JXB]
149	AED-512	AED 512 Emulation Service	[AXB]
150	SQL-NET	SQL-NET	[MXP]
151	HEMS	HEMS	[87,CXT]
152	BFTP	Background File Transfer Program	[AD14]
153	SGMP	SGMP	[37,MS9]
154	NETSC-PROD	NETSC	[SH37]
155	NETSC-DEV	NETSC	[SH37]
156	SQLSRV	SQL Service	[CMR]
157	KNET-CMP	KNET/VM Command/Message Protocol	[77,GSM11]
158	PCMail-SRV	PCMail Server	[19,MXL]
159	NSS-Routing	NSS-Routing	[JXR]
160	SGMP-TRAPS	SGMP-TRAPS	[37,MS9]
161	SNMP	SNMP	[15,MTR]
162	SNMPTRAP	SNMPTRAP	[15,MTR]
163	CMIP-Manage	CMIP/TCP Manager	[4,AXB1]
164	CMIP-Agent	CMIP/TCP Agent	[4,AXB1]
165	XNS-Courier	Xerox	[144,SXA]
166	S-Net	Sirius Systems	[BXL]
167	NAMP	NAMP	[MS9]
168	RSVD	RSVD	[NT12]
169	SEND	SEND	[WDW11]
170	Print-SRV	Network PostScript	[BKR]
171	Multiplex	Network Innovations Multiplex	[KXD]
172	CL/1	Network Innovations CL/1	[KXD]
173	Xyplex-MUX	Xyplex	[BXS]

174	MAILQ	MAILQ	[RXZ]
175	VMNET	VMNET	[CXT]
176	GENRAD-MUX	GENRAD-MUX	[RXT]
177	XDMCP	X Display Manager Control Protocol	[RWS4]
178	NextStep	NextStep Window Server	[LXH]
179	BGP	Border Gateway Protocol	[KSL]
180	RIS	Intergraph	[DXB]
181	Unify	Unify	[VXS]
182	Unisys-Cam	Unisys-Cam	[GXG]
183	OCBinder	OCBinder	[JXO1]
184	OCServer	OCServer	[JXO1]
185	Remote-KIS	Remote-KIS	[RXD1]
186	KIS	KIS Protocol	[RXD1]
187	ACI	Application Communication Interface	[RXC1]
188	MUMPS	MUMPS	[HS23]
189	QFT	Queued File Transport	[WXS]
190	GACP	Gateway Access Control Protocol	[PCW]
191	Prospero	Prospero	[BCN]
192	OSU-NMS	OSU Network Monitoring System	[DXK]
193	SRMP	Spider Remote Monitoring Protocol	[TXS]
194	IRC	Internet Relay Chat Protocol	[JXO2]
195	DN6-NLM-AUD	DNSIX Network Level Module Audit	[LL69]
196	DN6-SMM-RED	DNSIX Session Mgt Module Audit Redirect	[LL69]
197	DLS	Directory Location Service	[SXB]
198	DLS-Mon	Directory Location Service Monitor	[SXB]
198-200		Unassigned	[JBP]
201	AT-RMTP	AppleTalk Routing Maintenance	[RXC]
202	AT-NBP	AppleTalk Name Binding	[RXC]
203	AT-3	AppleTalk Unused	[RXC]
204	AT-ECHO	AppleTalk Echo	[RXC]
205	AT-5	AppleTalk Unused	[RXC]
206	AT-ZIS	AppleTalk Zone Information	[RXC]
207	AT-7	AppleTalk Unused	[RXC]
208	AT-8	AppleTalk Unused	[RXC]
209-223		Unassigned	[JBP]
224-241		Reserved	[JBP]
243	SUR-MEAS	Survey Measurement	[6,DDC1]
245	LINK	LINK	[1,RDB2]
246	DSP3270	Display Systems Protocol	[39,WJS1]
247-255		Reserved	[JBP]

UNIX PORTS

By convention, ports in the range 256 to 1024 are used for "Unix Standard" services. Listed here are some of the normal uses of these port numbers.

Service Name	Port/Protocol	Description
echo	7/tcp	
discard	9/tcp	sink null
systat	11/tcp	users
daytime	13/tcp	
netstat	15/tcp	
qotd	17/tcp	quote
chargen	19/tcp	ttytst source
ftp-data	20/tcp	
ftp	21/tcp	
telnet	23/tcp	
smtp	25/tcp	mail
time	37/tcp	timserver
name	42/tcp	nameserver
whois	43/tcp	nicname
nameserver	53/tcp	domain
apts	57/tcp	any private terminal service
apfs	59/tcp	any private file service
rje	77/tcp	netrjs
finger	79/tcp	
link	87/tcp	ttylink
supdup	95/tcp	
newacct	100/tcp	[unauthorized use]
hostnames	101/tcp	hostname
iso-tsap	102/tcp	tsap
x400	103/tcp	
x400-snd	104/tcp	
csnet-ns	105/tcp	CSNET Name Service
pop-2	109/tcp	pop postoffice
sunrpc	111/tcp	
auth	113/tcp	authentication
sftp	115/tcp	
uucp-path	117/tcp	
nntp	119/tcp	usenet readnews untp
ntp	123/tcp	network time protocol
statsrv	133/tcp	
profile	136/tcp	
NeWS	144/tcp	news
print-srv	170/tcp	
exec	512/tcp	remote process execution;

		authentication performed using passwords and UNIX loppgin names
login	513/tcp	remote login a la telnet; automatic authentication performed based on priviledged port numbers and distributed data bases which identify "authentication domains"
cmd	514/tcp	like exec, but automatic authentication is performed as for login server
printer	515/tcp	spooler
efs	520/tcp	extended file name server
tempo	526/tcp	newdate
courier	530/tcp	rpc
conference	531/tcp	chat
netnews	532/tcp	readnews
uucp	540/tcp	uucpd
klogin	543/tcp	
kshell	544/tcp	krcmd
dsf	555/tcp	
remotefs	556/tcp	rfs server
chshell	562/tcp	chcmd
meter	570/tcp	demon
pcserver	600/tcp	Sun IPC server
nqs	607/tcp	nqs
mdqs	666/tcp	
rfile	750/tcp	
pump	751/tcp	
qrh	752/tcp	
rrh	753/tcp	
tell	754/tcp	send
nlogin	758/tcp	
con	759/tcp	
ns	760/tcp	
rxe	761/tcp	
quotad	762/tcp	
cycleserv	763/tcp	
omserv	764/tcp	
webster	765/tcp	
phonebook	767/tcp	phone
vid	769/tcp	
rtip	771/tcp	
cycleserv2	772/tcp	
submit	773/tcp	
rpasswd	774/tcp	
entomb	775/tcp	
wpages	776/tcp	
wpgs	780/tcp	

```
   mdbs_daemon     800/tcp
   device          801/tcp
   maitrd          997/tcp
   busboy          998/tcp
   garcon          999/tcp
   blackjack       1025/tcp       network blackjack
   bbn-mmc         1347/tcp       multi media conferencing
   bbn-mmx         1348/tcp       multi media conferencing
   orasrv          1525/tcp       oracle
   ingreslock      1524/tcp
   issd            1600/tcp
   nkd             1650/tcp
   dc              2001/tcp
   mailbox         2004/tcp
   berknet         2005/tcp
   invokator       2006/tcp
   dectalk         2007/tcp
   conf            2008/tcp
   news            2009/tcp
   search          2010/tcp
   raid-cc         2011/tcp       raid
   ttyinfo         2012/tcp
   raid-am         2013/tcp
   troff           2014/tcp
   cypress         2015/tcp
   cypress-stat    2017/tcp
   terminaldb      2018/tcp
   whosockami      2019/tcp
   servexec        2021/tcp
   down            2022/tcp
   ellpack         2025/tcp
   shadowserver    2027/tcp
   submitserver    2028/tcp
   device2         2030/tcp
   blackboard      2032/tcp
   glogger         2033/tcp
   scoremgr        2034/tcp
   imsldoc         2035/tcp
   objectmanager   2038/tcp
   lam             2040/tcp
   interbase       2041/tcp
   isis            2042/tcp
   rimsl           2044/tcp
   dls             2047/tcp
   dls-monitor     2048/tcp
   shilp           2049/tcp
   NSWS            3049/tcp
   rfa             4672/tcp       remote file access server
```

commplex-main	5000/tcp	
commplex-link	5001/tcp	
padl2sim	5236/tcp	
man	9535/tcp	
echo	7/udp	
discard	9/udp	sink null
systat	11/udp	users
daytime	13/udp	
netstat	15/udp	
qotd	17/udp	quote
chargen	19/udp	ttytst source
time	37/udp	timserver
rlp	39/udp	resource
name	42/udp	nameserver
whois	43/udp	nicname
nameserver	53/udp	domain
bootps	67/udp	bootp
bootpc	68/udp	
tftp	69/udp	
sunrpc	111/udp	
erpc	121/udp	
ntp	123/udp	
statsrv	133/udp	
profile	136/udp	
snmp	161/udp	
snmp-trap	162/udp	
at-rtmp	201/udp	
at-nbp	202/udp	
at-3	203/udp	
at-echo	204/udp	
at-5	205/udp	
at-zis	206/udp	
at-7	207/udp	
at-8	208/udp	
biff	512/udp	used by mail system to notify users of new mail received; currently receives messages only from processes on the same machine
who	513/udp	maintains data bases showing who’s logged in to machines on a local net and the load average of the machine
syslog	514/udp	
talk	517/udp	like tenex link, but across machine - unfortunately, doesn’t use link protocol (this is actually just a rendezvous port from which a

```
                                    tcp connection is established)
   ntalk           518/udp
   utime           519/udp          unixtime
   router          520/udp          local routing process (on site);
                                    uses variant of Xerox NS routing
                                    information protocol
   timed           525/udp          timeserver
   netwall         533/udp          for emergency broadcasts
   new-rwho        550/udp          new-who
   rmonitor        560/udp          rmonitord
   monitor         561/udp
   meter           571/udp          udemon
   elcsd           704/udp          errlog copy/server daemon
   loadav          750/udp
   vid             769/udp
   cadlock         770/udp
   notify          773/udp
   acmaint_dbd     774/udp
   acmaint_transd  775/udp
   wpages          776/udp
   puparp          998/udp
   applix          999/udp          Applix ac
   puprouter       999/udp
   cadlock         1000/udp
   hermes          1248/udp
   wizard          2001/udp         curry
   globe           2002/udp
   emce            2004/udp         CCWS mm conf
   oracle          2005/udp
   raid-cc         2006/udp         raid
   raid-am         2007/udp
   terminaldb      2008/udp
   whosockami      2009/udp
   pipe_server     2010/udp
   servserv        2011/udp
   raid-ac         2012/udp
   raid-cd         2013/udp
   raid-sf         2014/udp
   raid-cs         2015/udp
   bootserver      2016/udp
   bootclient      2017/udp
   rellpack        2018/udp
   about           2019/udp
   xinupageserver  2020/udp
   xinuexpansion1  2021/udp
   xinuexpansion2  2022/udp
   xinuexpansion3  2023/udp
   xinuexpansion4  2024/udp
```

```
   xribs           2025/udp
   scrabble        2026/udp
   isis            2042/udp
   isis-bcast      2043/udp
   rimsl           2044/udp
   cdfunc          2045/udp
   sdfunc          2046/udp
   dls             2047/udp
   shilp           2049/udp
   rmonitor_secure 5145/udp
   xdsxdm          6558/udp
   isode-dua       17007/udp
```

INTERNET MULTICAST ADDRESSES

Host Extensions for IP Multicasting (RFC-1112) [43] specifies the extensions required of a host implementation of the Internet Protocol (IP) to support multicasting. Current addresses are listed below.

224.0.0.0	Reserved	[43,JBP]
224.0.0.1	All Hosts on this Subnet	[43,JBP]
224.0.0.2	All Gateways on this Subnet (proposed)	[JBP]
224.0.0.3	Unassigned	[JBP]
224.0.0.4	DVMRP Routers	[140,JBP]
224.0.0.5	OSPFIGP OSPFIGP All Routers	[83,JXM1]
224.0.0.6	OSPFIGP OSPFIGP Designated Routers	[83,JXM1]
244.0.0.7-244.0.0.255	Unassigned	[JBP]
224.0.1.0	VMTP Managers Group	[17,DRC3]
224.0.1.1	NTP Network Time Protocol	[80,DLM1]
224.0.1.2	SGI-Dogfight	[AXC]
224.0.1.3	Rwhod	[SXD]
224.0.1.4	VNP	[DRC3]
244.0.1.5-244.0.1.255	Unassigned	[JBP]
224.0.2.1	"rwho" Group (BSD) (unofficial)	[JBP]
232.x.x.x	VMTP transient groups	[17,DRC3]

Note that when used on an Ethernet or IEEE 802 network, the 23 low-order bits of the IP Multicast address are placed in the low-order 23 bits of the Ethernet or IEEE 802 net multicast address 1.0.94.0.0.0. See the next section on "IANA ETHERNET ADDRESS BLOCK".

IANA ETHERNET ADDRESS BLOCK

The IANA owns an Ethernet address block which may be used for multicast address asignments or other special purposes.

The address block in IEEE binary is (which is in bit transmission order):

0000 0000 0000 0000 0111 1010

In the normal Internet dotted decimal notation this is 0.0.94 since the bytes are transmitted higher order first and bits within bytes are transmitted lower order first (see "Data Notation" in the Introduction).

IEEE CSMA/CD and Token Bus bit transmission order: 00 00 5E

IEEE Token Ring bit transmission order: 00 00 7A

Appearance on the wire (bits transmitted from left to right):

```
0                           23                              47
|                           |                               |
1000 0000 0000 0000 0111 1010 xxxx xxx0 xxxx xxxx xxxx xxxx
|                                    |
Multicast Bit                        0 = Internet Multicast
                                     1 = Assigned by IANA for
                                         other uses
```

Appearance in memory (bits transmitted right-to-left within octets, octets transmitted left-to-right):

```
0                           23                              47
|                           |                               |
0000 0001 0000 0000 0101 1110 0xxx xxxx xxxx xxxx xxxx xxxx
        |                    |
        Multicast Bit        0 = Internet Multicast
                             1 = Assigned by IANA for other uses
```

The latter representation corresponds to the Internet standard bit-order, and is the format that most programmers have to deal with. Using this representation, the range of Internet Multicast addresses is:

01-00-5E-00-00-00 to 01-00-5E-7F-FF-FF in hex, or

1.0.94.0.0.0 to 1.0.94.127.255.255 in dotted decimal

IP TOS PARAMETERS

This documents the default Type-of-Service values that are currently recommended for the most important Internet protocols.

There are three binary TOS attributes: low delay, high throughput, and high reliability; in each case, an attribute bit is turned on to indicate "better". The three attributes cannot all be optimized simultanously, and in fact the TOS algorithms that have been discussed tend to make "better" values of the attributes mutually exclusive. Therefore, the recommended values have at most one bit on.

Generally, protocols which are involved in direct interaction with a human should select low delay, while data transfers which may involve large blocks of data are need high throughput. Finally, high reliability is most important for datagram-based Internet management functions.

Application protocols not included in these tables should be able to make appropriate choice of low delay (1 0 0) or high throughput (0 1 0).

The following are recommended values for TOS:

	----- Type-of-Service Value -----		
Protocol	Low Delay	High Throughput	High Reliability
TELNET (1)	1	0	0
FTP			
Control	1	0	0
Data (2)	0	1	0
TFTP	1	0	0
SMTP (3)			
Cmd phase	1	0	0
DATA phase	0	1	0
Domain Name Service			
UDP Query	1	0	0
TCP Query	0	0	0
Zone Tnsfr	0	1	0
NNTP	0	0	0

ICMP			
Errors	0	0	0
Queries	0	0	0
Any IGP	0	0	1
EGP	0	0	0
SNMP	0	0	1
BOOTP	0	0	0

Notes:

(1) Includes all interactive user protocols (e.g., rlogin).

(2) Includes all bulk data transfer protocols (e.g., rcp).

(3) If the implementation does not support changing the TOS during the lifetime of the connection, then the recommended TOS on opening the connection is (0,0,0).

IP TIME TO LIVE PARAMETER

The current recommended default TTL for the Internet Protocol (IP) RFC-791 [45,105] is 32.

DOMAIN SYSTEM PARAMETERS

The Internet Domain Naming System (DOMAIN) includes several parameters. These are documented in RFC-1034, [81] and RFC-1035 [82]. The CLASS parameter is listed here. The per CLASS parameters are defined in separate RFCs as indicated.

Domain System Parameters:

Decimal	Name	References
0	Reserved	[PM1]
1	Internet (IN)	[81,PM1]
2	Unassigned	[PM1]
3	Chaos (CH)	[PM1]
4	Hessoid (HS)	[PM1]
5-65534	Unassigned	[PM1]
65535	Reserved	

BOOTP PARAMETERS

The Bootstrap Protocol (BOOTP) RFC-951 [36] describes an IP/UDP bootstrap protocol (BOOTP) which allows a diskless client machine to discover its own IP address, the address of a server host, and the name of a file to be loaded into memory and executed. The BOOTP Vendor Information Extensions RFC-1084 [117] proposes an addition to the Bootstrap Protocol (BOOTP).

Vendor Extensions are listed below:

Tag	Name	Data Length	Meaning	References
0	Pad	0	None	
1	Subnet Mask	4	Subnet Mask Value	
2	Time Zone	4	Time Offset in Seconds from UTC	
3	Gateways	N	N/4 Gateway addresses	
4	Time Server	N	N/4 Timeserver addresses	
5	Name Server	N	N/4 IEN-116 Server addresses	
6	Domain Server	N	N/4 DNS Server addresses	
7	Log Server	N	N/4 Logging Server addresses	
8	Quotes Server	N	N/4 Quotes Server addresses	
9	LPR Server	N	N/4 Printer Server addresses	
10	Impress Server	N	N/4 Impress Server addresses	
11	RLP Server	N	N/4 RLP Server addresses	
12	Hostname	N	Hostname string	
13	Boot File Size	2	Size of boot file in 512 byte checks	
14	Merit Dump File		Client to dump and name the file to dump it to	
15-127	Unassigned			
128-154	Reserved			
255	End	0	None	

NETWORK MANAGEMENT PARAMETERS

For the management of hosts and gateways on the Internet a data structure for the information has been defined. This data structure should be used with any of several possible management protocols, such as the "Simple Network Management Protocol" (SNMP) RFC-1098 [15], or the "Common Management Information Protocol over TCP" (CMOT) [142].

The data structure is the "Structure and Indentification of Management Information for TCP/IP-based Internets" (SMI) RFC-1065 [120], and the "Management Information Base for Network Management of TCP/IP-based Internets" (MIB) [121].

The SMI includes the provision for parameters or codes to indicate experimental or private data structures. These parameter assignments are listed here.

The older "Simple Gateway Monitoring Protocol" (SGMP) RFC-1028 [37] also defined a data structure. The parameter assignments used with SGMP are included here for hist orical completeness.

SMI Network Management Experimental Codes:

Prefix: 1.3.6.1.3.

Decimal	Name	Description	References
0	Reserved		[JKR1]
1	CLNP	ISO CLNP Objects	[MTR]
2	T1-Carrier	T1 Carrier Objects	[MTR]
3	IEEE8023	Ethernet-like Objects	[MTR]
4	IEEE8025	Token Ring-like Objects	[MTR]

SMI Network Management Private Enterprise Codes:

Prefix: 1.3.6.1.4.1.

Decimal	Name	References
0	Reserved	[JKR1]
1	Proteon	[GSM11]
2	IBM	[JXR]
3	CMU	[SXW]
4	Unix	[KXS]
5	ACC	[AB20]
6	TWG	[KZM]
7	CAYMAN	[BP52]
8	NYSERNET	[MS9]

9	cisco	[GXS]
10	NSC	[GS123]
11	HP	[RDXS]
12	Epilogue	[KA4]
13	U of Tennessee	[JDC20]
14	BBN	[RH6]
15	Xylogics, Inc.	[JRL3]
16	Unisys	[UXW]
17	Canstar	[SXP]
18	Wellfleet	[JCB1]
19	TRW	[GGB2]
20	MIT	[JR35]
21	EON	[MXW]
22	Spartacus	[YXK]
23	Excelan	[RXB]
24	Spider Systems	[VXW]
25	NSFNET	[HWB]
26	Hughes LAN Systems	[AXC1]
27	Intergraph	[SXC]
28	Interlan	[FJK2]
29	Vitalink Communications	[FXB]
30	Ulana	[BXA]
31	NSWC	[SRN1]
32	Santa Cruz Operation	[KR35]
33	Xyplex	[BXS]
34	Cray	[HXE]
35	Bell Northern Research	[GXW]
36	DEC	[RXB1]
37	Touch	[BXB]
38	Network Research Corp.	[BXV]
39	Baylor College of Medicine	[SB98]
40	NMFECC-LLNL	[SXH]
41	SRI	[DW181]
42	Sun Microsystems	[DXY]
43	3Com	[TB6]
44	CMC	[DXP]
45	SynOptics	[BXB1]
46	Cheyenne Software	[RXH]
47	Prime Computer	[MXS]
48	MCNC/North Carolina Data Network	[KXW]
49	Chipcom	[JXC]
50	Optical Data Systems	[JXF]
51	gated	[JXH]
52	Cabletron Systems	[RXD]
53	Apollo Computers	[JXB]
54	DeskTalk Systems, Inc.	[DXK]
55	SSDS	[RXS]
56	Castle Rock Computing	[JXS1]

57	MIPS Computer Systems	[CXM]
58	TGV, Inc.	[KAA]
59	Silicon Graphics, Inc.	[RXJ]
60	University of British Columbia	[DXM]
61	Merit	[BXN]
62	FiberCom	[EXR]
63	Apple Computer Inc	[JXH1]
64	Gandalf	[HXK]
65	Dartmouth	[PXK]
66	David Systems	[DXM]
67	Reuter	[BXZ]
68	Cornell	[DC126]
69	TMAC	[MLS34]
70	Locus Computing Corp.	[AXS]
71	NASA	[SS92]
72	Retix	[AXM]
73	Boeing	[JXG]
74	AT&T	[AXC2]
75	Ungermann-Bass	[DXM]
76	Digital Analysis Corp.	[SXK]
77	LAN Manager	[JXG1]
78	Netlabs	[JB478]
79	ICL	[JXI]
80	Auspex Systems	[BXE]
81	Lannet Company	[EXR]
82	Network Computing Devices	[DM280]
83	Raycom Systems	[BXW1]
84	Pirelli Focom Ltd.	[SXL]
85	Datability Software Systems	[LXF]
86	Network Application Technology	[YXW]
87	LINK (Lokales Informatik-Netz Karlsruhe)	[GXS]
88	NYU	[BJR2]
89	RND	[RXN]
90	InterCon Systems Corporation	[AW90]

SGMP Vendor Specific Codes:

Prefix: 1,255,

Decimal	Name	References
0	Reserved	[JKR1]
1	Proteon	[JS18]
2	IBM	[JXR]
3	CMU	[SXW]
4	Unix	[MS9]
5	ACC	[AB20]
6	TWG	[MTR]

7	CAYMAN	[BP52]
8	NYSERNET	[MS9]
9	cisco	[GS2]
10	BBN	[RH6]
11	Unassigned	[JKR1]
12	MIT	[JR35]
13-254	Unassigned	[JKR1]
255	Reserved	[JKR1]

ARPANET AND MILNET LOGICAL ADDRESSES

The ARPANET facility for "logical addressing" is described in RFC-878 [57] and RFC-1005 [109]. A portion of the possible logical addresses are reserved for standard uses.

There are 49,152 possible logical host addresses. Of these, 256 are reserved for assignment to well-known functions. Assignments for well-known functions are made by the IANA. Assignments for other logical host addresses are made by the NIC.

Logical Address Assignments:

Decimal	Description	References
0	Reserved	[JBP]
1	The BBN Core Gateways	[MB]
2-254	Unassigned	[JBP]
255	Reserved	[JBP]

ARPANET AND MILNET LINK NUMBERS

The word "link" here refers to a field in the original ARPANET Host/IMP interface leader. The link was originally defined as an 8-bit field. Later specifications defined this field as the "message-id" with a length of 12 bits. The name link now refers to the high order 8 bits of this 12-bit message-id field. The Host/IMP interface is defined in BBN Report 1822 [2].

The low-order 4 bits of the message-id field are called the sub-link. Unless explicitly specified otherwise for a particular protocol, there is no sender to receiver significance to the sub-link. The sender may use the sub-link in any way he chooses (it is returned in the RFNM by the destination IMP), the receiver should ignore the sub-link.

Link Assignments:

Decimal	Description	References
0-63	BBNCC Monitoring	[MB]
64-149	Unassigned	[JBP]
150	Xerox NS IDP	[133,XEROX]
151	Unassigned	[JBP]
152	PARC Universal Protocol	[8,XEROX]
153	TIP Status Reporting	[JGH]
154	TIP Accounting	[JGH]
155	Internet Protocol [regular]	[105,JBP]
156-158	Internet Protocol [experimental]	[105,JBP]
159	Figleaf Link	[JBW1]
160	Blacker Local Network Protocol	[DM28]
161-194	Unassigned	[JBP]
195	ISO-IP	[64,RXM]
196-247	Experimental Protocols	[JBP]
248-255	Network Maintenance	[JGH]

ARPANET AND MILNET X.25 ADDRESS MAPPINGS

All MILNET hosts are assigned addresses by the Defense Data Network (DDN). The address of a MILNET host may be obtained from the Network Information Center (NIC), represented as an ASCII text string in what is called "host table format". This section describes the process by which MILNET X.25 addresses may be derived from addresses in the NIC host table format.

A NIC host table address consists of the ASCII text string representations of four decimal numbers separated by periods, corresponding to the four octeted of a thirty-two bit Internet address. The four decimal numbers are referred to in this section as "n", "h' "l", and "i". Thus, a host table address may be represented as: "n.h.l.i". Each of these four numbers will have either one, two, or three decimal digits and will never have a value greater than 255. For example, in the host table, address: "10.2.0.124", n=10, h=2, l=0, and i=124. To convert a host table address to a MILNET X.25 address:

1. If h < 64, the host table address corresponds to the X.25 physical address:

ZZZZ F IIIHHZZ (SS)

where:

ZZZZ = 0000	as required
F = 0	because the address is a physical address;
III	is a three decimal digit respresentation of "i", right-adjusted and padded with leading zeros if required;
HH	is a two decimal digit representation of "h", right-adjusted and padded with leading zeros if required;
ZZ = 00	and
(SS)	is optional

In the example given above, the host table address 10.2.0.124 corresponds to the X.25 physical address 000001240200.

2. If h > 64 or h = 64, the host table address corresponds to the X.25 logical address

ZZZZ F RRRRRZZ (SS)

where:

ZZZZ = 0000 as required

F = 1 because the address is a logical address;

RRRRR is a five decimal digit representation of the result "r" of the calculation

r = h * 256 + i

(Note that the decimal representation of "r" will always require five digits);

ZZ = 00 and

(SS) is optional

Thus, the host table address 10.83.0.207 corresponds to the X.25 logical address 000012145500.

In both cases, the "n" and "l" fields of the host table address are not used.

IEEE 802 NUMBERS OF INTEREST

Some of the networks of all classes are IEEE 802 Networks. These systems may use a Link Service Access Point (LSAP) field in much the same way the ARPANET uses the "link" field. Further, there is an extension of the LSAP header called the Sub-Network Access Protocol (SNAP).

The IEEE likes to describe numbers in binary in bit transmission order, which is the opposite of the big-endian order used throughout the Internet protocol documentation.

Assignments:

Link Service Access Point			Description	References
IEEE binary	Internet binary	decimal		
00000000	00000000	0	Null LSAP	[IEEE]
01000000	00000010	2	Indiv LLC Sublayer Mgt	[IEEE]
11000000	00000011	3	Group LLC Sublayer Mgt	[IEEE]
00100000	00000100	4	SNA Path Control	[IEEE]
01100000	00000110	6	Reserved (DOD IP)	[104,JBP]
01110000	00001110	14	PROWAY-LAN	[IEEE]
01110010	01001110	78	EIA-RS 511	[IEEE]
01111010	01011110	94	ISI IP	[JBP]
01110001	10001110	142	PROWAY-LAN	[IEEE]
01010101	10101010	170	SNAP	[IEEE]
01111111	11111110	254	ISO DIS 8473	[64,JXJ]
11111111	11111111	255	Global DSAP	[IEEE]

These numbers (and others) are assigned by the IEEE Standards Office. The address is: IEEE Standards Office, 345 East 47th Street, New York, N.Y. 10017, Attn: Vince Condello. Phone: (212) 705-7092.

At an ad hoc special session on "IEEE 802 Networks and ARP", held during the TCP Vendors Workshop (August 1986), an approach to a consistent way to send DoD-IP datagrams and other IP related protocols (such as the Address Resolution Protocol (ARP)) on 802 networks was developed, using the SNAP extension (see RFC-1010 and RFC-1042 [90]).

ETHERNET NUMBERS OF INTEREST

Many of the networks of all classes are Ethernets (10Mb) or Experimental Ethernets (3Mb). These systems use a message "type" field in much the same way the ARPANET uses the "link" field.

If you need an Ethernet type, contact the Xerox Corporation, Xerox Systems Institute, 475 Oakmead Parkway, Sunnyvale, CA 94086, Attn: Ms. Fonda Pallone, (408) 737-4652.

The following list is contributed unverified information from various sources.

Assignments:

Ethernet		Exp. Ethernet		Description	References
decimal	Hex	decimal	octal		
000	0000-05DC	-	-	IEEE802.3 Length Field	[XEROX]
257	0101-01FF	-	-	Experimental	[XEROX]
512	0200	512	1000	XEROX PUP (see 0A00)	[8,XEROX]
513	0201	-	-	PUP Addr Trans (see 0A01)	[XEROX]
1536	0600	1536	3000	XEROX NS IDP	[133,XEROX]
2048	0800	513	1001	DOD IP	[105,JBP]
2049	0801	-	-	X.75 Internet	[XEROX]
2050	0802	-	-	NBS Internet	[XEROX]
2051	0803	-	-	ECMA Internet	[XEROX]
2052	0804	-	-	Chaosnet	[XEROX]
2053	0805	-	-	X.25 Level 3	[XEROX]
2054	0806	-	-	ARP	[88,JBP]
2055	0807	-	-	XNS Compatability	[XEROX]
2076	081C	-	-	Symbolics Private	[DCP1]
2184	0888-088A	-	-	Xyplex	[XEROX]
2304	0900	-	-	Ungermann-Bass net debugr	[XEROX]
2560	0A00	-	-	Xerox IEEE802.3 PUP	[XEROX]
2561	0A01	-	-	PUP Addr Trans	[XEROX]
2989	0BAD	-	-	Banyan Systems	[XEROX]
4096	1000	-	-	Berkeley Trailer nego	[XEROX]
4097	1001-100F	-	-	Berkeley Trailer encap/IP	[XEROX]
5632	1600	-	-	Valid Systems	[XEROX]
16962	4242	-	-	PCS Basic Block Protocol	[XEROX]
21000	5208	-	-	BBN Simnet	[XEROX]
24576	6000	-	-	DEC Unassigned (Exp.)	[XEROX]
24577	6001	-	-	DEC MOP Dump/Load	[XEROX]
24578	6002	-	-	DEC MOP Remote Console	[XEROX]
24579	6003	-	-	DEC DECNET Phase IV Route	[XEROX]
24580	6004	-	-	DEC LAT	[XEROX]
24581	6005	-	-	DEC Diagnostic Protocol	[XEROX]

24582	6006	-	-	DEC Customer Protocol	[XEROX]
24583	6007	-	-	DEC LAVC, SCA	[XEROX]
24584	6008-6009	-	-	DEC Unassigned	[XEROX]
24586	6010-6014	-	-	3Com Corporation	[XEROX]
28672	7000	-	-	Ungermann-Bass download	[XEROX]
28674	7002	-	-	Ungermann-Bass dia/loop	[XEROX]
28704	7020-7029	-	-	LRT	[XEROX]
28720	7030	-	-	Proteon	[XEROX]
28724	7034	-	-	Cabletron	[XEROX]
32771	8003	-	-	Cronus VLN	[131,DT15]
32772	8004	-	-	Cronus Direct	[131,DT15]
32773	8005	-	-	HP Probe	[XEROX]
32774	8006	-	-	Nestar	[XEROX]
32776	8008	-	-	AT&T	[XEROX]
32784	8010	-	-	Excelan	[XEROX]
32787	8013	-	-	SGI diagnostics	[AXC]
32788	8014	-	-	SGI network games	[AXC]
32789	8015	-	-	SGI reserved	[AXC]
32780	8016	-	-	SGI bounce server	[AXC]
32783	8019	-	-	Apollo Computers	[XEROX]
32815	802E	-	-	Tymshare	[XEROX]
32816	802F	-	-	Tigan, Inc.	[XEROX]
32821	8035	-	-	Reverse ARP	[48,JXM]
32822	8036	-	-	Aeonic Systems	[XEROX]
32824	8038	-	-	DEC LANBridge	[XEROX]
32825	8039-803C	-	-	DEC Unassigned	[XEROX]
32829	803D	-	-	DEC Ethernet Encryption	[XEROX]
32830	803E	-	-	DEC Unassigned	[XEROX]
32831	803F	-	-	DEC LAN Traffic Monitor	[XEROX]
32832	8040-8042	-	-	DEC Unassigned	[XEROX]
32836	8044	-	-	Planning Research Corp.	[XEROX]
32838	8046	-	-	AT&T	[XEROX]
32839	8047	-	-	AT&T	[XEROX]
32841	8049	-	-	ExperData	[XEROX]
32859	805B	-	-	Stanford V Kernel exp.	[XEROX]
32860	805C	-	-	Stanford V Kernel prod.	[XEROX]
32861	805D	-	-	Evans & Sutherland	[XEROX]
32864	8060	-	-	Little Machines	[XEROX]
32866	8062	-	-	Counterpoint Computers	[XEROX]
32869	8065-8066	-	-	Univ. of Mass. @ Amherst	[XEROX]
32871	8067	-	-	Veeco Integrated Auto.	[XEROX]
32872	8068	-	-	General Dynamics	[XEROX]
32873	8069	-	-	AT&T	[XEROX]
32874	806A	-	-	Autophon	[XEROX]
32876	806C	-	-	ComDesign	[XEROX]
32877	806D	-	-	Computgraphic Corp.	[XEROX]
32878	806E-8077	-	-	Landmark Graphics Corp.	[XEROX]
32890	807A	-	-	Matra	[XEROX]

32891	807B	-	-	Dansk Data Elektronik	[XEROX]
32892	807C	-	-	Merit Internodal	[HWB]
32893	807D-807F	-	-	Vitalink Communications	[XEROX]
32896	8080	-	-	Vitalink TransLAN III	[XEROX]
32897	8081-8083	-	-	Counterpoint Computers	[XEROX]
32923	809B	-	-	Appletalk	[XEROX]
32924	809C-809E	-	-	Datability	[XEROX]
32927	809F	-	-	Spider Systems Ltd.	[XEROX]
32931	80A3	-	-	Nixdorf Computers	[XEROX]
32932	80A4-80B3	-	-	Siemens Gammasonics Inc.	[XEROX]
32960	80C0-80C3	-	-	DCA Data Exchange Cluster	[XEROX]
32966	80C6	-	-	Pacer Software	[XEROX]
32967	80C7	-	-	Applitek Corporation	[XEROX]
32968	80C8-80CC	-	-	Intergraph Corporation	[XEROX]
32973	80CD-80CE	-	-	Harris Corporation	[XEROX]
32974	80CF-80D2	-	-	Taylor Instrument	[XEROX]
32979	80D3-80D4	-	-	Rosemount Corporation	[XEROX]
32981	80D5	-	-	IBM SNA Service on Ether	[XEROX]
32989	80DD	-	-	Varian Associates	[XEROX]
32990	80DE-80DF	-	-	Integrated Solutions TRFS	[XEROX]
32992	80E0-80E3	-	-	Allen-Bradley	[XEROX]
32996	80E4-80F0	-	-	Datability	[XEROX]
33010	80F2	-	-	Retix	[XEROX]
33011	80F3	-	-	AppleTalk AARP (Kinetics)	[XEROX]
33012	80F4-80F5	-	-	Kinetics	[XEROX]
33015	80F7	-	-	Apollo Computer	[XEROX]
33023	80FF-8103	-	-	Wellfleet Communications	[XEROX]
33031	8107-8109	-	-	Symbolics Private	[XEROX]
33072	8130	-	-	Waterloo Microsystems	[XEROX]
33073	8131	-	-	VG Laboratory Systems	[XEROX]
33079	8137-8138	-	-	Novell, Inc.	[XEROX]
33081	8139-813D	-	-	KTI	[XEROX]
33100	814C	-	-	SNMP	[JKR1]
36864	9000	-	-	Loopback	[XEROX]
36865	9001	-	-	3Com(Bridge) XNS Sys Mgmt	[XEROX]
36866	9002	-	-	3Com(Bridge) TCP-IP Sys	[XEROX]
36867	9003	-	-	3Com(Bridge) loop detect	[XEROX]
65280	FF00	-	-	BBN VITAL-LanBridge cache	[XEROX]

The standard for transmission of IP datagrams over Ethernets and Experimental Ethernets is specified in RFC-894 [61] and RFC-895 [91] respectively.

NOTE: Ethernet 48-bit address blocks are assigned by the IEEE.

IEEE Standards Office, 345 East 47th Street, New York, N.Y. 10017, Attn: Vince Condello. Phone: (212) 705-7092.

ETHERNET VENDOR ADDRESS COMPONENTS

Ethernet hardware addresses are 48 bits, expressed as 12 hexadecimal digits (0-9, plus A-F, capitalized). These 12 hex digits consist of the first/left 6 digits (which should match the vendor of the Ethernet interface within the station) and the last/right 6 digits which specify the interface serial number for that interface vendor.

Ethernet addresses might be written unhyphenated (e.g., 123456789ABC), or with one hyphen (e.g., 123456-789ABC), but should be written hyphenated by octets (e.g., 12-34-56-78-9A-BC).

These addresses are physical station addresses, not multicast nor broadcast, so the second hex digit (reading from the left) will be even, not odd.

At present, it is not clear how the IEEE assigns Ethernet block addresses. Whether in blocks of 2**24 or 2**25, and whether multicasts are assigned with that block or separately. A portion of the vendor block address is reportedly assigned serially, with the other portion intentionally assigned randomly. If there is a global algorithm for which addresses are designated to be physical (in a chipset) versus logical (assigned in software), or globally-assigned versus locally-assigned addresses, some of the known addresses do not follow the scheme (e.g., AA0003; 02xxxx).

```
00000C  Cisco
00000F  NeXT
000010  Sytek
00001D  Cabletron
000020  DIAB (Data Intdustrier AB)
000022  Visual Technology
00002A  TRW
00005A  S & Koch
00005E  IANA
000065  Network General
00006B  MIPS
000077  MIPS
00007A  Ardent
000089  Cayman Systems  Gatorbox
000093  Proteon
00009F  Ameristar Technology
0000A2  Wellfleet
0000A3  Network Application Technology
0000A6  Network General (internal assignment, not for products)
0000A7  NCD             X-terminals
0000A9  Network Systems
0000AA  Xerox           Xerox machines
```

```
   0000B3  CIMLinc
   0000B7  Dove            Fastnet
   0000BC  Allen-Bradley
   0000C0  Western Digital
   0000C6  HP Intelligent Networks Operation (formerly Eon Systems)
   0000C8  Altos
   0000C9  Emulex          Terminal Servers
   0000D7  Dartmouth College (NED Router)
   0000D8  3Com? Novell?   PS/2
   0000DD  Gould
   0000DE  Unigraph
   0000E2  Acer Counterpoint
   0000EF  Alantec
   0000FD  High Level Hardvare (Orion, UK)
   000102  BBN             BBN internal usage (not registered)
   001700  Kabel
   00802D  Xylogics, Inc.  Annex terminal servers
   00808C  Frontier Software Development
   00AA00  Intel
   00DD00  Ungermann-Bass
   00DD01  Ungermann-Bass
   020701  MICOM/Interlan  UNIBUS or QBUS machines, Apollo
   020406  BBN             BBN internal usage (not registered)
   026086  Satelcom MegaPac (UK)
   02608C  3Com            IBM PC; Imagen; Valid; Cisco
   02CF1F  CMC             Masscomp; Silicon Graphics; Prime EXL
   080002  3Com (Formerly Bridge)
   080003  ACC (Advanced Computer Communications)
   080005  Symbolics       Symbolics LISP machines
   080008  BBN
   080009  Hewlett-Packard
   08000A  Nestar Systems
   08000B  Unisys
   080010  AT&T
   080011  Tektronix, Inc.
   080014  Excelan         BBN Butterfly, Masscomp, Silicon Graphics
   080017  NSC
   08001A  Data General
   08001B  Data General
   08001E  Apollo
   080020  Sun             Sun machines
   080022  NBI
   080025  CDC
   080026  Norsk Data (Nord)
   080027  PCS Computer Systems GmbH
   080028  TI              Explorer
   08002B  DEC
   08002E  Metaphor
```

08002F	Prime Computer	Prime 50-Series LHC300
080036	Intergraph	CAE stations
080037	Fujitsu-Xerox	
080038	Bull	
080039	Spider Systems	
080041	DCA Digital Comm. Assoc.	
080045	???? (maybe Xylogics, but they claim not to know this number)	
080046	Sony	
080047	Sequent	
080049	Univation	
08004C	Encore	
08004E	BICC	
080056	Stanford University	
080058	???	DECsystem-20
08005A	IBM	
080067	Comdesign	
080068	Ridge	
080069	Silicon Graphics	
08006E	Excelan	
080075	DDE (Danish Data Elektronik A/S)	
08007C	Vitalink	TransLAN III
080080	XIOS	
080086	Imagen/QMS	
080087	Xyplex	terminal servers
080089	Kinetics	AppleTalk-Ethernet interface
08008B	Pyramid	
08008D	XyVision	XyVision machines
080090	Retix Inc	Bridges
484453	HDS ???	
800010	AT&T	[misrepresentation of 080010?]
AA0000	DEC	obsolete
AA0001	DEC	obsolete
AA0002	DEC	obsolete
AA0003	DEC	Global physical address for some DEC machines
AA0004	DEC	Local logical address for systems running DECNET

ETHERNET MULTICAST ADDRESSES

Ethernet Address	Type Field	Usage
Multicast Addresses:		
01-00-5E-00-00-00- 01-00-5E-7F-FF-FF	0800	Internet Multicast (RFC-1112) [43]
01-00-5E-80-00-00- 01-00-5E-FF-FF-FF	????	Internet reserved by IANA
01-80-C2-00-00-00	-802-	Spanning tree (for bridges)
09-00-02-04-00-01?	8080?	Vitalink printer
09-00-02-04-00-02?	8080?	Vitalink management
09-00-09-00-00-01	8005	HP Probe
09-00-09-00-00-01	-802-	HP Probe
09-00-09-00-00-04	8005?	HP DTC
09-00-1E-00-00-00	8019?	Apollo DOMAIN
09-00-2B-00-00-00	6009?	DEC MUMPS?
09-00-2B-00-00-01	8039?	DEC DSM/DTP?
09-00-2B-00-00-02	803B?	DEC VAXELN?
09-00-2B-00-00-03	8038	DEC Lanbridge Traffic Monitor (LTM)
09-00-2B-00-00-04	????	DEC MAP End System Hello?
09-00-2B-00-00-05	????	DEC MAP Intermediate System Hello?
09-00-2B-00-00-06	803D?	DEC CSMA/CD Encryption?
09-00-2B-00-00-07	8040?	DEC NetBios Emulator?
09-00-2B-00-00-0F	6004	DEC Local Area Transport (LAT)
09-00-2B-00-00-1x	????	DEC Experimental
09-00-2B-01-00-00	8038	DEC LanBridge Copy packets (All bridges)
09-00-2B-01-00-01	8038	DEC LanBridge Hello packets (All local bridges) 1 packet per second, sent by the designated LanBridge
09-00-2B-02-00-00	????	DEC DNA Level 2 Routing Layer routers?
09-00-2B-02-01-00	803C?	DEC DNA Naming Service Advertisement?
09-00-2B-02-01-01	803C?	DEC DNA Naming Service Solicitation?
09-00-2B-02-01-02	803E?	DEC DNA Time Service?
09-00-2B-03-xx-xx	????	DEC default filtering by bridges?
09-00-2B-04-00-00	8041?	DEC Local Area System Transport (LAST)?
09-00-2B-23-00-00	803A?	DEC Argonaut Console?
09-00-4E-00-00-02?	8137?	Novell IPX
09-00-56-00-00-00- 09-00-56-FE-FF-FF	????	Stanford reserved
09-00-56-FF-00-00- 09-00-56-FF-FF-FF	805C	Stanford V Kernel, version 6.0
09-00-77-00-00-01	????	Retix spanning tree bridges
09-00-7C-02-00-05	8080?	Vitalink diagnostics
09-00-7C-05-00-01	8080?	Vitalink gateway?
0D-1E-15-BA-DD-06	????	HP

AB-00-00-01-00-00	6001	DEC Maintenance Operation Protocol (MOP) Dump/Load Assistance
AB-00-00-02-00-00	6002	DEC Maintenance Operation Protocol (MOP) Remote Console 1 System ID packet every 8-10 minutes, by every: DEC LanBridge DEC DEUNA interface DEC DELUA interface DEC DEQNA interface (in a certain mode)
AB-00-00-03-00-00	6003	DECNET Phase IV end node Hello packets 1 packet every 15 seconds, sent by
each DECNET host		
AB-00-00-04-00-00	6003	DECNET Phase IV Router Hello packets 1 packet every 15 seconds, sent by the
DECNET router		
AB-00-00-05-00-00	????	Reserved DEC
through		
AB-00-03-FF-FF-FF		
AB-00-03-00-00-00	6004	DEC Local Area Transport (LAT) - old
AB-00-04-00-xx-xx	????	Reserved DEC customer private use
AB-00-04-01-xx-yy	6007	DEC Local Area VAX Cluster groups System Communication Architecture (SCA)
CF-00-00-00-00-00	9000	Ethernet Configuration Test protocol (Loopback)
Broadcast Address:		
FF-FF-FF-FF-FF-FF	0600	XNS packets, Hello or gateway search? 6 packets every 15 seconds, per XNS station
FF-FF-FF-FF-FF-FF	0800	IP (e.g. RWHOD via UDP) as needed
FF-FF-FF-FF-FF-FF	0804	CHAOS
FF-FF-FF-FF-FF-FF	0806	ARP (for IP and CHAOS) as needed
FF-FF-FF-FF-FF-FF	0BAD	Banyan
FF-FF-FF-FF-FF-FF	1600	VALID packets, Hello or gateway search? 1 packets every 30 seconds, per VALID station
FF-FF-FF-FF-FF-FF	8035	Reverse ARP
FF-FF-FF-FF-FF-FF	807C	Merit Internodal (INP)
FF-FF-FF-FF-FF-FF	809B	EtherTalk

XNS PROTOCOL TYPES

Assigned well-known socket numbers

Routing Information	1
Echo	2
Router Error	3
Experimental	40-77

Assigned internet packet types

Routing Information	1
Echo	2
Error	3
Packet Exchange	4
Sequenced Packet	5
PUP	12
DoD IP	13
Experimental	20-37

PROTOCOL/TYPE FIELD ASSIGNMENTS

Below are two tables describing the arrangement of protocol fields or type field assignments so that one could send NS Datagrams on the ARPANET or Internet Datagrams on 10Mb Ethernet, and also protocol and type fields so one could encapsulate each kind of Datagram in the other.

\ upper / lower \	DoD IP	PUP	NS IP
3Mb Ethernet	Type 1001 octal	Type 1000 octal	Type 3000 octal
10 Mb Ethernet	Type 0800 hex	Type 0200 hex	Type 0600 hex
ARPANET	Link 155 decimal	Link 152 decimal	Link 150 decimal

\ upper / lower \	DoD IP	PUP	NS IP
DoD IP	X	Protocol 12 decimal	Protocol 22 decimal
PUP	?	X	?
NS IP	Type 13 decimal	Type 12 decimal	X

PRONET 80 TYPE NUMBERS

Below is the current list of PRONET 80 Type Numbers. Note: a protocol that is on this list does not necessarily mean that there is any implementation of it on ProNET.

Of these, protocols 1, 14, and 20 are the only ones that have ever been seen in ARP packets.

For reference, the header is (one byte/line):

```
destination hardware address
source hardware address
data link header version (2)
data link header protocol number
data link header reserved (0)
data link header reserved (0)
```

Some protocols have been known to tuck stuff in the reserved fields.

Those who need a protocol number on ProNET-10/80 should contact John Shriver (jas@proteon.com).

1	IP
2	IP with trailing headers
3	Address Resoloution Protocol
4	Proteon HDLC
5	VAX Debugging Protocol (MIT)
10	Novell NetWare (IPX and pre-IPX) (old format, 3 byte trailer)
11	Vianetix
12	PUP
13	Watstar protocol (University of Waterloo)
14	XNS
15	Diganostics
16	Echo protocol (link level)
17	Banyan Vines
20	DECnet (DEUNA Emulation)
21	Chaosnet
23	IEEE 802.2 or ISO 8802/2 Data Link
24	Reverse Address Resolution Protocol
29	TokenVIEW-10
31	AppleTalk LAP Data Packet
33	Cornell Boot Server Location Protocol
34	Novell NetWare IPX (new format, no trailer, new XOR checksum)

ADDRESS RESOLUTION PROTOCOL PARAMETERS

The Address Resolution Protocol (ARP) specified in RFC-826 [88] has several parameters. The assigned values for these parameters are listed here.

Assignments:

Operation Code (op)

1	REQUEST
2	REPLY

Hardware Type (hrd)

Type	Description	References
1	Ethernet (10Mb)	[JBP]
2	Experimental Ethernet (3Mb)	[JBP]
3	Amateur Radio AX.25	[PXK]
4	Proteon ProNET Token Ring	[JBP]
5	Chaos	[GXP]
6	IEEE 802 Networks	[JBP]
7	ARCNET	[JBP]
8	Hyperchannel	[JBP]
9	Lanstar	[TU]
10	Autonet Short Address	[MXB1]
11	LocalTalk	[LXE]
12	LocalNet (IBM PCNet or SYTEK LocalNET)	[JXM]

Protocol Type (pro)

Use the same codes as listed in the section called "Ethernet Numbers of Interest" (all hardware types use this code set for the protocol type).

REVERSE ADDRESS RESOLUTION PROTOCOL OPERATION CODES

The Reverse Address Resolution Protocol (RARP) specified in RFC-903 [48] has the following operation codes:

Assignments:

Operation Code (op)

3	request Reverse
4	reply Reverse

DYNAMIC REVERSE ARP

Assignments:

Operation Code (op)

5	DRARP-Request
6	DRARP-Reply
7	DRARP-Error

For further information, contact: David Brownell (suneast!helium!db@Sun.COM).

X.25 TYPE NUMBERS

CCITT defines the high order two bits of the first octet of call user data as follows:

00 - Used for other CCITT recomendations (such as X.29)
01 - Reserved for use by "national" administrative authorities
10 - Reserved for use by international administrative authoorities
11 - Reserved for arbitrary use between consenting DTEs

Call User Data (hex)	Protocol	Reference
01	PAD	[GS2]
C5	Blacker front-end descr dev	[AGM]
CC	IP	[69,AGM]*
CD	ISO-IP	[AGM]

* NOTE: ISO SC6/WG2 approved assignment in ISO 9577 (January 1990).

PUBLIC DATA NETWORK NUMBERS

One of the Internet Class A Networks is the international system of Public Data Networks. This section lists the mapping between the Internet Addresses and the Public Data Network Addresses (X.121).

The numbers below are assigned for networks that are connected to the Internet, and for independent networks. These independent networks are marked with an asterisk preceding the number.

Assignments:

* Internet	Public Data Net	Description	References
014.000.000.000		Reserved	[JBP]
014.000.000.001	3110-317-00035 00	PURDUE-TN	[TN]
014.000.000.002	3110-608-00027 00	UWISC-TN	[TN]
014.000.000.003	3110-302-00024 00	UDEL-TN	[TN]
014.000.000.004	2342-192-00149 23	UCL-VTEST	[PK]
014.000.000.005	2342-192-00300 23	UCL-TG	[PK]
014.000.000.006	2342-192-00300 25	UK-SATNET	[PK]
014.000.000.007	3110-608-00024 00	UWISC-IBM	[MS56]
014.000.000.008	3110-213-00045 00	RAND-TN	[MO2]
014.000.000.009	2342-192-00300 23	UCL-CS	[PK]
014.000.000.010	3110-617-00025 00	BBN-VAN-GW	[JD21]
*014.000.000.011	2405-015-50300 00	CHALMERS	[UXB]
014.000.000.012	3110-713-00165 00	RICE	[PAM6]
014.000.000.013	3110-415-00261 00	DECWRL	[PAM6]
014.000.000.014	3110-408-00051 00	IBM-SJ	[SA1]
014.000.000.015	2041-117-01000 00	SHAPE	[JFW]
014.000.000.016	2628-153-90075 00	DFVLR4-X25	[GB7]
014.000.000.017	3110-213-00032 00	ISI-VAN-GW	[JD21]
014.000.000.018	2624-522-80900 52	FGAN-SIEMENS-X25	[GB7]
014.000.000.019	2041-170-10000 00	SHAPE-X25	[JFW]
014.000.000.020	5052-737-20000 50	UQNET	[AXH]
014.000.000.021	3020-801-00057 50	DMC-CRC1	[VXT]
014.000.000.022	2624-522-80329 02	FGAN-FGANFFMVAX-X25	[GB7]
*014.000.000.023	2624-589-00908 01	ECRC-X25	[PXD]
014.000.000.024	2342-905-24242 83	UK-MOD-RSRE	[JXE2]
014.000.000.025	2342-905-24242 82	UK-VAN-RSRE	[AXM]
014.000.000.026	2624-522-80329 05	DFVLRSUN-X25	[GB7]
014.000.000.027	2624-457-11015 90	SELETFMSUN-X25	[BXD]
014.000.000.028	3110-408-00146 00	CDC-SVL	[RAM57]
014.000.000.029	2222-551-04400 00	SUN-CNUCE	[ABB2]
014.000.000.030	2222-551-04500 00	ICNUCEVM-CNUCE	[ABB2]
014.000.000.031	2222-551-04600 00	SPARE-CNUCE	[ABB2]
014.000.000.032	2222-551-04700 00	ICNUCEVX-CNUCE	[ABB2]
014.000.000.033	2222-551-04524 00	CISCO-CNUCE	[ABB2]

014.000.000.034	2342-313-00260 90	SPIDER-GW	[AD67]
014.000.000.035	2342-313-00260 91	SPIDER-EXP	[AD67]
014.000.000.036	2342-225-00101 22	PRAXIS-X25A	[TXR]
014.000.000.037	2342-225-00101 23	PRAXIS-X25B	[TXR]
014.000.000.038	2403-712-30250 00	DIAB-TABY-GW	[FXB]
014.000.000.039	2403-715-30100 00	DIAB-LKP-GW	[FXB]
014.000.000.040	2401-881-24038 00	DIAB-TABY1-GW	[FXB]
014.000.000.041	2041-170-10060 00	STC	[TC27]
014.000.000.042-014.255.255.254		Unassigned	[JBP]
014.255.255.255		Reserved	[JBP]

The standard for transmission of IP datagrams over the Public Data Network is specified in RFC-877 [69].

TELNET OPTIONS

The Telnet Protocol has a number of options that may be negotiated. These options are listed here. "Official Internet Protocols" [118] provides more detailed information.

Options	Name	References
0	Binary Transmission	[110,JBP]
1	Echo	[111,JBP]
2	Reconnection	[42,JBP]
3	Suppress Go Ahead	[114,JBP]
4	Approx Message Size Negotiation	[133,JBP]
5	Status	[113,JBP]
6	Timing Mark	[115,JBP]
7	Remote Controlled Trans and Echo	[107,JBP]
8	Output Line Width	[40,JBP]
9	Output Page Size	[41,JBP]
10	Output Carriage-Return Disposition	[28,JBP]
11	Output Horizontal Tab Stops	[32,JBP]
12	Output Horizontal Tab Disposition	[31,JBP]
13	Output Formfeed Disposition	[29,JBP]
14	Output Vertical Tabstops	[34,JBP]
15	Output Vertical Tab Disposition	[33,JBP]
16	Output Linefeed Disposition	[30,JBP]
17	Extended ASCII	[136,JBP]
18	Logout	[25,MRC]
19	Byte Macro	[35,JBP]
20	Data Entry Terminal	[145,38,JBP]
22	SUPDUP	[26,27,MRC]
22	SUPDUP Output	[51,MRC]
23	Send Location	[68,EAK1]
24	Terminal Type	[128,MS56]
25	End of Record	[103,JBP]
26	TACACS User Identification	[1,BA4]
27	Output Marking	[125,SXS]
28	Terminal Location Number	[84,RN6]
29	Telnet 3270 Regime	[116,JXR]
30	X.3 PAD	[70,SL70]
31	Negotiate About Window Size	[139,DW183]
32	Terminal Speed	[57,CLH3]
33	Remote Flow Control	[58,CLH3]
34	Linemode	[9,DB14]
35	X Display Location	[75,GM23]
255	Extended-Options-List	[109,JBP]

MAIL ENCRYPTION TYPES

RFC-822 specifies that Encryption Types for mail may be assigned. There are currently no RFC-822 encryption types assigned. Please use instead the Mail Privacy procedures defined in [71,72,66].

MACHINE NAMES

These are the Official Machine Names as they appear in the Domain Name System WKS records and the NIC Host Table. Their use is described in RFC-952 [53].

A machine name or CPU type may be up to 40 characters taken from the set of uppercase letters, digits, and the two punctuation characters hyphen and slash. It must start with a letter, and end with a letter or digit.

ALTO
ALTOS-6800
AMDAHL-V7
APOLLO
ATARI-104ST
ATT-3B1
ATT-3B20
ATT-7300
BBN-C/60
BURROUGHS-B/29
BURROUGHS-B/4800
BUTTERFLY
C/30
C/70
CADLINC
CADR
CDC-170
CDC-170/750
CDC-173
CELERITY-1200
CLUB-386
COMPAQ-386/20
COMTEN-3690
CP8040
CRAY-1
CRAY-X/MP
CRAY-2
CTIWS-117
DANDELION
DEC-10
DEC-1050
DEC-1077
DEC-1080
DEC-1090
DEC-1090B
DEC-1090T
DEC-2020T
DEC-2040
DEC-2040T
DEC-2050T
DEC-2060
DEC-2060T
DEC-2065
DEC-FALCON
DEC-KS10
DEC-VAX-11730
DORADO
DPS8/70M
ELXSI-6400
EVEREX-386
FOONLY-F2
FOONLY-F3
FOONLY-F4
GOULD
GOULD-6050
GOULD-6080
GOULD-9050
GOULD-9080
H-316
H-60/68
H-68
H-68/80
H-89
HONEYWELL-DPS-6
HONEYWELL-DPS-8/70
HP3000

HP3000/64
IBM-158
IBM-360/67
IBM-370/3033
IBM-3081
IBM-3084QX
IBM-3101
IBM-4331
IBM-4341
IBM-4361
IBM-4381
IBM-4956
IBM-6152
IBM-PC
IBM-PC/AT
IBM-PC/RT
IBM-PC/XT
IBM-SERIES/1
IMAGEN
IMAGEN-8/300
IMSAI
INTEGRATED-SOLUTIONS
INTEGRATED-SOLUTIONS-68K
INTEGRATED-SOLUTIONS-CREATOR
INTEGRATED-SOLUTIONS-CREATOR-8
INTEL-386
INTEL-IPSC
IS-1
IS-68010
LMI
LSI-11
LSI-11/2
LSI-11/23
LSI-11/73
M68000
MAC-II
MASSCOMP
MC500
MC68000
MICROPORT
MICROVAX
MICROVAX-I
MV/8000
NAS3-5
NCR-COMTEN-3690
NEXT/N1000-316
NOW
ONYX-Z8000
PDP-11
PDP-11/3
PDP-11/23
PDP-11/24
PDP-11/34
PDP-11/40
PDP-11/44
PDP-11/45
PDP-11/50
PDP-11/70
PDP-11/73
PE-7/32
PE-3205
PERQ
PLEXUS-P/60
PLI
PLURIBUS
PRIME-2350
PRIME-2450
PRIME-2755
PRIME-9655
PRIME-9755
PRIME-9955II
PRIME-2250
PRIME-2655
PRIME-9955
PRIME-9950
PRIME-9650
PRIME-9750
PRIME-2250
PRIME-750
PRIME-850
PRIME-550II
PYRAMID-90
PYRAMID-90MX
PYRAMID-90X
RIDGE
RIDGE-32
RIDGE-32C
ROLM-1666
S1-MKIIA
SMI
SEQUENT-BALANCE-8000
SIEMENS
SILICON-GRAPHICS
SILICON-GRAPHICS-IRIS
SGI-IRIS-2400
SGI-IRIS-2500

SGI-IRIS-3010
SGI-IRIS-3020
SGI-IRIS-3030
SGI-IRIS-3110
SGI-IRIS-3115
SGI-IRIS-3120
SGI-IRIS-3130
SGI-IRIS-4D/20
SGI-IRIS-4D/20G
SGI-IRIS-4D/25
SGI-IRIS-4D/25G
SGI-IRIS-4D/25S
SGI-IRIS-4D/50
SGI-IRIS-4D/50G
SGI-IRIS-4D/50GT
SGI-IRIS-4D/60
SGI-IRIS-4D/60G
SGI-IRIS-4D/60T
SGI-IRIS-4D/60GT
SGI-IRIS-4D/70
SGI-IRIS-4D/70G
SGI-IRIS-4D/70GT
SGI-IRIS-4D/80GT
SGI-IRIS-4D/80S
SGI-IRIS-4D/120GTX
SGI-IRIS-4D/120S
SGI-IRIS-4D/210GTX
SGI-IRIS-4D/210S
SGI-IRIS-4D/220GTX
SGI-IRIS-4D/220S
SGI-IRIS-4D/240GTX
SGI-IRIS-4D/240S
SGI-IRIS-4D/280GTX
SGI-IRIS-4D/280S
SGI-IRIS-CS/12
SGI-IRIS-4SERVER-8
SPERRY-DCP/10
SUN
SUN-2
SUN-2/50
SUN-2/100
SUN-2/120
SUN-2/130
SUN-2/140
SUN-2/150
SUN-2/160
SUN-2/170
SUN-3/50
SUN-3/60
SUN-3/75
SUN-3/80
SUN-3/110
SUN-3/140
SUN-3/150
SUN-3/160
SUN-3/180
SUN-3/200
SUN-3/260
SUN-3/280
SUN-3/470
SUN-3/480
SUN-4/60
SUN-4/110
SUN-4/150
SUN-4/200
SUN-4/260
SUN-4/280
SUN-4/330
SUN-4/370
SUN-4/390
SUN-50
SUN-100
SUN-120
SUN-130
SUN-150
SUN-170
SUN-386i/250
SUN-68000
SYMBOLICS-3600
SYMBOLICS-3670
SYMMETRIC-375
SYMULT
TANDEM-TXP
TANDY-6000
TEK-6130
TI-EXPLORER
TP-4000
TRS-80
UNIVAC-1100
UNIVAC-1100/60
UNIVAC-1100/62
UNIVAC-1100/63
UNIVAC-1100/64
UNIVAC-1100/70
UNIVAC-1160
UNKNOWN

```
      VAX-11/725
      VAX-11/730
      VAX-11/750
      VAX-11/780
      VAX-11/785
      VAX-11/790
      VAX-11/8600
      VAX-8600
      WANG-PC002
      WANG-VS100
      WANG-VS400
      WYSE-386
      XEROX-1108
      XEROX-8010
      ZENITH-148
```

SYSTEM NAMES

These are the Official System Names as they appear in the Domain Name System WKS records and the NIC Host Table. Their use is described in RFC-952 [53].

A system name may be up to 40 characters taken from the set of upper-case letters, digits, and the two punctuation characters hyphen and slash. It must start with a letter, and end with a letter or digit.

AEGIS	MACOS	TP3010
APOLLO	MINOS	TRSDOS
BS-2000	MOS	ULTRIX
CEDAR	MPE5	UNIX
CGW	MSDOS	UNIX-BSD
CHORUS	MULTICS	UNIX-V1AT
CHRYSALIS	MVS	UNIX-V
CMOS	MVS/SP	UNIX-V.1
CMS	NEXUS	UNIX-V.2
COS	NMS	UNIX-V.3
CPIX	NONSTOP	UNIX-PC
CTOS	NOS-2	UNKNOWN
CTSS	OS/DDP	UT2D
DCN	OS4	V
DDNOS	OS86	VM
DOMAIN	OSX	VM/370
DOS	PCDOS	VM/CMS
EDX	PERQ/OS	VM/SP
ELF	PLI	VMS
EMBOS	PSDOS/MIT	VMS/EUNICE
EMMOS	PRIMOS	VRTX
EPOS	RMX/RDOS	WAITS
FOONEX	ROS	WANG
FUZZ	RSX11M	X11R3
GCOS	SATOPS	XDE
GPOS	SCO-XENIX/386	XENIX
HDOS	SCS	
IMAGEN	SIMP	
INTERCOM	SUN	
IMPRESS	SUN OS 3.5	
INTERLISP	SUN OS 4.0	
IOS	SWIFT	
IRIX	TAC	
ISI-68020	TANDEM	
ITS	TENEX	
LISP	TOPS10	
LISPM	TOPS20	
LOCUS	TOS	

PROTOCOL AND SERVICE NAMES

These are the Official Protocol Names as they appear in the Domain Name System WKS records and the NIC Host Table. Their use is described in RFC-952 [53].

A protocol or service may be up to 40 characters taken from the set of uppercase letters, digits, and the punctuation character hyphen. It must start with a letter, and end with a letter or digit.

```
ARGUS               - ARGUS Protocol
ARP                 - Address Resolution Protocol
AUTH                - Authentication Service
BBN-RCC-MON         - BBN RCC Monitoring
BL-IDM              - Britton Lee Intelligent Database Machine
BOOTP               - Bootstrap Protocol
BOOTPC              - Bootstrap Protocol Client
BOOTPS              - Bootstrap Protocol Server
BR-SAT-MON          - Backroom SATNET Monitoring
CFTP                - CFTP
CHAOS               - CHAOS Protocol
CHARGEN             - Character Generator Protocol
CISCO-FNA           - CISCO FNATIVE
CISCO-TNA           - CISCO TNATIVE
CISCO-SYS           - CISCO SYSMAINT
CLOCK               - DCNET Time Server Protocol
CMOT                - Common Mgmnt Info Services and Protocol over TCP/IP
COOKIE-JAR          - Authentication Scheme
CSNET-NS            - CSNET Mailbox Nameserver Protocol
DAYTIME             - Daytime Protocol
DCN-MEAS            - DCN Measurement Subsystems Protocol
DCP                 - Device Control Protocol
DGP                 - Dissimilar Gateway Protocol
DISCARD             - Discard Protocol
DOMAIN              - Domain Name System
ECHO                - Echo Protocol
EGP                 - Exterior Gateway Protocol
EMCON               - Emission Control Protocol
EMFIS-CNTL          - EMFIS Control Service
EMFIS-DATA          - EMFIS Data Service
FINGER              - Finger Protocol
FTP                 - File Transfer Protocol
FTP-DATA            - File Transfer Protocol Data
GGP                 - Gateway Gateway Protocol
GRAPHICS            - Graphics Protocol
HMP                 - Host Monitoring Protocol
HOST2-NS            - Host2 Name Server
HOSTNAME            - Hostname Protocol
```

```
   ICMP              - Internet Control Message Protocol
   IGMP              - Internet Group Management Protocol
   IGP               - Interior Gateway Protocol
   IMAP2             - Interim Mail Access Protocol version 2
   INGRES-NET        - INGRES-NET Service
   IP                - Internet Protocol
   IPCU              - Internet Packet Core Utility
   IPPC              - Internet Pluribus Packet Core
   IP-ARC            - Internet Protocol on ARCNET
   IP-ARPA           - Internet Protocol on ARPANET
   IP-DC             - Internet Protocol on DC Networks
   IP-DVMRP          - Distance Vector Multicast Routing Protocol
   IP-E              - Internet Protocol on Ethernet Networks
   IP-EE             - Internet Protocol on Exp. Ethernet Nets
   IP-FDDI           - Transmission of IP over FDDI
   IP-HC             - Internet Protocol on Hyperchannnel
   IP-IEEE           - Internet Protocol on IEEE 802
   IP-IPX            - Transmission of 802.2 over IPX Networks
   IP-MTU            - IP MTU Discovery Options
   IP-NETBIOS        - Internet Protocol Datagrams over NetBIOS Networks
   IP-SLIP           - Transmission of IP over Serial Lines
   IP-WB             - Internet Protocol on Wideband Network
   IP-X25            - Internet Protocol on X.25 Networks
   IRTP              - Internet Reliable Transaction Protocol
   ISI-GL            - ISI Graphics Language Protocol
   ISO-TP4           - ISO Transport Protocol Class 4
   ISO-TSAP          - ISO TSAP
   LA-MAINT          - IMP Logical Address Maintenance
   LARP              - Locus Address Resoultion Protocol
   LDP               - Loader Debugger Protocol
   LEAF-1            - Leaf-1 Protocol
   LEAF-2            - Leaf-2 Protocol
   LINK              - Link Protocol
   LOC-SRV           - Location Service
   LOGIN             - Login Host Protocol
   MAIL              - Format of Electronic Mail Messages
   MERIT-INP         - MERIT Internodal Protocol
   METAGRAM          - Metagram Relay
   MIB               - Management Information Base
   MIT-ML-DEV        - MIT ML Device
   MFE-NSP           - MFE Network Services Protocol
   MIT-SUBNET        - MIT Subnet Support
   MIT-DOV           - MIT Dover Spooler
   MPM               - Internet Message Protocol (Multimedia Mail)
   MPM-FLAGS         - MPM Flags Protocol
   MPM-SND           - MPM Send Protocol
   MSG-AUTH          - MSG Authentication Protocol
   MSG-ICP           - MSG ICP Protocol
```

```
   MUX               - Multiplexing Protocol
   NAMESERVER        - Host Name Server
   NETBIOS-DGM       - NETBIOS Datagram Service
   NETBIOS-NS        - NETBIOS Name Service
   NETBIOS-SSN       - NETBIOS Session Service
   NETBLT            - Bulk Data Transfer Protocol
   NETED             - Network Standard Text Editor
   NETRJS            - Remote Job Service
   NI-FTP            - NI File Transfer Protocol
   NI-MAIL           - NI Mail Protocol
   NICNAME           - Who Is Protocol
   NFILE             - A File Access Protocol
   NNTP              - Network News Transfer Protocol
   NSW-FE            - NSW User System Front End
   NTP               - Network Time Protocol
   NVP-II            - Network Voice Protocol
   OSPF              - Open Shortest Path First Interior GW Protocol
   PCMAIL            - Pcmail Transport Protocol
   POP2              - Post Office Protocol - Version 2
   POP3              - Post Office Protocol - Version 3
   PPP               - Point-to-Point Protocol
   PRM               - Packet Radio Measurement
   PUP               - PUP Protocol
   PWDGEN            - Password Generator Protocol
   QUOTE             - Quote of the Day Protocol
   RARP              - A Reverse Address Resolution Protocol
   RATP              - Reliable Asynchronous Transfer Protocol
   RDP               - Reliable Data Protocol
   RIP               - Routing Information Protocol
   RJE               - Remote Job Entry
   RLP               - Resource Location Protocol
   RTELNET           - Remote Telnet Service
   RVD               - Remote Virtual Disk Protocol
   SAT-EXPAK         - Satnet and Backroom EXPAK
   SAT-MON           - SATNET Monitoring
   SEP               - Sequential Exchange Protocol
   SFTP              - Simple File Transfer Protocol
   SGMP              - Simple Gateway Monitoring Protocol
   SNMP              - Simple Network Management Protocol
   SMI               - Structure of Management Information
   SMTP              - Simple Mail Transfer Protocol
   SQLSRV            - SQL Service
   ST                - Stream Protocol
   STATSRV           - Statistics Service
   SU-MIT-TG         - SU/MIT Telnet Gateway Protocol
   SUN-RPC           - SUN Remote Procedure Call
   SUPDUP            - SUPDUP Protocol
   SUR-MEAS          - Survey Measurement
```

```
   SWIFT-RVF          - Remote Virtual File Protocol
   TACACS-DS          - TACACS-Database Service
   TACNEWS            - TAC News
   TCP                - Transmission Control Protocol
   TELNET             - Telnet Protocol
   TFTP               - Trivial File Transfer Protocol
   THINWIRE           - Thinwire Protocol
   TIME               - Time Server Protocol
   TP-TCP             - ISO Transport Service on top of the TCP
   TRUNK-1            - Trunk-1 Protocol
   TRUNK-2            - Trunk-2 Protocol
   UCL                - University College London Protocol
   UDP                - User Datagram Protocol
   NNTP               - Network News Transfer Protocol
   USERS              - Active Users Protocol
   UUCP-PATH          - UUCP Path Service
   VIA-FTP            - VIA Systems-File Transfer Protocol
   VISA               - VISA Protocol
   VMTP               - Versatile Message Transaction Protocol
   WB-EXPAK           - Wideband EXPAK
   WB-MON             - Wideband Monitoring
   XNET               - Cross Net Debugger
   XNS-IDP            - Xerox NS IDP
```

TERMINAL TYPE NAMES

These are the Official Terminal Type Names. Their use is described in RFC-930 [128]. The maximum length of a name is 40 characters.

A terminal names may be up to 40 characters taken from the set of upper-case letters, digits, and the two punctuation characters hyphen and slash. It must start with a letter, and end with a letter or digit.

ADDS-CONSUL-980
ADDS-REGENT-100
ADDS-REGENT-20
ADDS-REGENT-200
ADDS-REGENT-25
ADDS-REGENT-40
ADDS-REGENT-60
ADDS-VIEWPOINT
ADDS-VIEWPOINT-60
AED-512
AMPEX-DIALOGUE-210
AMPEX-DIALOGUE-80
AMPEX-210
AMPEX-230
ANDERSON-JACOBSON-510
ANDERSON-JACOBSON-630
ANDERSON-JACOBSON-832
ANDERSON-JACOBSON-841
ANN-ARBOR-AMBASSADOR
ANSI
ARDS
BITGRAPH
BUSSIPLEXER
CALCOMP-565
CDC-456
CDI-1030
CDI-1203
C-ITOH-101
C-ITOH-50
C-ITOH-80
CLNZ
COMPUCOLOR-II
CONCEPT-100
CONCEPT-104
CONCEPT-108
DATA-100
DATA-GENERAL-6053
DATAGRAPHIX-132A
DATAMEDIA-1520
DATAMEDIA-1521
DATAMEDIA-2500
DATAMEDIA-3025
DATAMEDIA-3025A
DATAMEDIA-3045
DATAMEDIA-3045A
DATAMEDIA-DT80/1
DATAPOINT-2200
DATAPOINT-3000
DATAPOINT-3300
DATAPOINT-3360
DEC-DECWRITER-I
DEC-DECWRITER-II
DEC-GIGI
DEC-GT40
DEC-GT40A
DEC-GT42
DEC-LA120
DEC-LA30
DEC-LA36
DEC-LA38
DEC-VT05
DEC-VT100
DEC-VT101
DEC-VT102
DEC-VT125
DEC-VT131
DEC-VT132
DEC-VT200
DEC-VT220
DEC-VT240
DEC-VT241
DEC-VT300
DEC-VT320
DEC-VT340
DEC-VT50
DEC-VT50H
DEC-VT52
DEC-VT55

DEC-VT61
DEC-VT62
DELTA-DATA-5000
DELTA-DATA-NIH-7000
DELTA-TELTERM-2
DIABLO-1620
DIABLO-1640
DIGILOG-333
DTC-300S
DTC-382
EDT-1200
EXECUPORT-4000
EXECUPORT-4080
FACIT-TWIST-4440
FREEDOM-100
FREEDOM-110
FREEDOM-200
GENERAL-TERMINAL-100A
GENERAL-TERMINAL-101
GIPSI-TX-M
GIPSI-TX-ME
GIPSI-TX-C4
GIPSI-TX-C8
GSI
HAZELTINE-1420
HAZELTINE-1500
HAZELTINE-1510
HAZELTINE-1520
HAZELTINE-1552
HAZELTINE-2000
HAZELTINE-ESPRIT
HP-2392
HP-2621
HP-2621A
HP-2621P
HP-2623
HP-2626
HP-2626A
HP-2626P
HP-2627
HP-2640
HP-2640A
HP-2640B
HP-2645
HP-2645A
HP-2648
HP-2648A
HP-2649
HP-2649A
IBM-1050
IBM-2741
IBM-3101
IBM-3101-10
IBM-3151
IBM-3275-2
IBM-3276-2
IBM-3276-3
IBM-3276-4
IBM-3277-2
IBM-3278-2
IBM-3278-3
IBM-3278-4
IBM-3278-5
IBM-3279-2
IBM-3279-3
IBM-5151
IBM-5154
IBM-5081
IBM-6153
IBM-6154
IBM-6155
IBM-AED
IBM-3278-2-E
IBM-3278-3-E
IBM-3278-4-E
IBM-3278-5-E
IBM-3279-2-E
IBM-3279-3-E
IMLAC
INFOTON-100
INFOTON-400
INFOTONKAS
ISC-8001
LSI-ADM-1
LSI-ADM-11
LSI-ADM-12
LSI-ADM-2
LSI-ADM-20
LSI-ADM-22
LSI-ADM-220
LSI-ADM-3
LSI-ADM-31
LSI-ADM-3A
LSI-ADM-42
LSI-ADM-5
MEMOREX-1240

```
   MICROBEE
   MICROTERM-ACT-IV
   MICROTERM-ACT-V
   MICROTERM-ERGO-301
   MICROTERM-MIME-1
   MICROTERM-MIME-2
   MICROTERM-ACT-5A
   MICROTERM-TWIST
   NEC-5520
   NETRONICS
   NETWORK-VIRTUAL-TERMINAL
   OMRON-8025AG
   PERKIN-ELMER-550
   PERKIN-ELMER-1100
   PERKIN-ELMER-1200
   PERQ
   PLASMA-PANEL
   QUME-SPRINT-5
   QUME-101
   QUME-102
   SOROC
   SOROC-120
   SOUTHWEST-TECHNICAL-PRODUCTS-CT82
   SUN
   SUPERBEE
   SUPERBEE-III-M
   TEC
   TEKTRONIX-4006
   TEKTRONIX-4010
   TEKTRONIX-4012
   TEKTRONIX-4013
   TEKTRONIX-4014
   TEKTRONIX-4023
   TEKTRONIX-4024
   TEKTRONIX-4025
   TEKTRONIX-4027
   TEKTRONIX-4105
   TEKTRONIX-4107
   TEKTRONIX-4110
   TEKTRONIX-4112
   TEKTRONIX-4113
   TEKTRONIX-4114
   TEKTRONIX-4115
   TEKTRONIX-4125
   TEKTRONIX-4404
   TELERAY-1061
   TELERAY-3700
   TELERAY-3800
   TELETEC-DATASCREEN
   TELETERM-1030
   TELETYPE-33
   TELETYPE-35
   TELETYPE-37
   TELETYPE-38
   TELETYPE-40
   TELETYPE-43
   TELEVIDEO-910
   TELEVIDEO-912
   TELEVIDEO-920
   TELEVIDEO-920B
   TELEVIDEO-920C
   TELEVIDEO-925
   TELEVIDEO-955
   TELEVIDEO-950
   TELEVIDEO-970
   TELEVIDEO-975
   TERMINET-1200
   TERMINET-300
   TI-700
   TI-733
   TI-735
   TI-743
   TI-745
   TI-800
   TYCOM
   UNIVAC-DCT-500
   VIDEO-SYSTEMS-1200
   VIDEO-SYSTEMS-5000
   VOLKER-CRAIG-303
   VOLKER-CRAIG-303A
   VOLKER-CRAIG-404
   VISUAL-200
   VISUAL-55
   WYSE-30
   WYSE-50
   WYSE-60
   WYSE-75
   WYSE-85
   XEROX-1720
   XTERM
   ZENITH-H19
   ZENITH-Z29
   ZENTEC-30
```

DOCUMENTS

[1] Anderson, B., "TACACS User Identification Telnet Option", RFC-927, BBN, December 1984.

[2] BBN, "Specifications for the Interconnection of a Host and an IMP", Report 1822, Bolt Beranek and Newman, Cambridge, Massachusetts, revised, December 1981.

[3] BBN, "User Manual for TAC User Database Tool", Bolt Beranek and Newman, September 1984.

[4] Ben-Artzi, Amatzia, "Network Management for TCP/IP Network: An Overview", 3Com, May 1988.

[5] Bennett, C., "A Simple NIFTP-Based Mail System", IEN 169, University College, London, January 1981.

[6] Bhushan, A., "A Report on the Survey Project", RFC-530, NIC 17375, June 1973.

[7] Bisbey, R., D. Hollingworth, and B. Britt, "Graphics Language (version 2.1)", ISI/TM-80-18, Information Sciences Institute, July 1980.

[8] Boggs, D., J. Shoch, E. Taft, and R. Metcalfe, "PUP: An Internetwork Architecture", XEROX Palo Alto Research Center, CSL-79-10, July 1979; also in IEEE Transactions on Communication, Volume COM-28, Number 4, April 1980.

[9] Borman, D., Editor, "Telnet Linemode Option", RFC 1116, Cray Research, Inc., August 1989.

[10] Braden, R., "NETRJS Protocol", RFC-740, NIC 42423, Information Sciences Institute, November 1977.

[11] Braden, R., and J. Postel, "Requirements for Internet Gateways", RFC-1009, Obsoletes RFC-985, Information Sciences Institute, June 1987.

[12] Bressler, B., "Remote Job Entry Protocol", RFC-407, NIC 12112, October 1972.

[13] Bressler, R., "Inter-Entity Communication -- An Experiment", RFC-441, NIC 13773, January 1973.

[14] Butler, M., J. Postel, D. Chase, J. Goldberger, and

J. K. Reynolds, "Post Office Protocol - Version 2", RFC-937, Information Sciences Institute, February 1985.

[15] Case, J., M. Fedor, M. Schoffstall, and C. Davin, "A Simple Network Management Protocol", RFC-1098, (Obsoletes RFC-1067), University of Tennessee at Knoxville, NYSERNet, Inc., Rensselaer Polytechnic Institute, and MIT Laboratory for Computer Science, April 1989.

[16] Cass, D., and M. Rose, "ISO Transport Services on Top of the TCP", RFC-983, NTRC, April 1986.

[17] Cheriton, D., "VMTP: Versatile Message Transaction Protocol Specification", RFC-1045, pgs 103 & 104, Stanford University, February 1988.

[18] Cisco Systems, "Gateway Server Reference Manual", Manual Revision B, January 10, 1988.

[19] Clark, D., "PCMAIL: A Distributed Mail System for Personal Computers", RFC-984, MIT, May 1986.

[20] Clark, D., M. Lambert, and L. Zhang, "NETBLT: A Bulk Data Transfer Protocol", RFC-969, MIT Laboratory for Computer Science, December 1985.

[21] Cohen, D., "On Holy Wars and a Plea for Peace", IEEE Computer Magazine, October 1981.

[22] Cohen, D., "Specifications for the Network Voice Protocol", RFC-741, ISI/RR 7539, Information Sciences Institute, March 1976.

[23] Cohen, D. and J. Postel, "Multiplexing Protocol", IEN 90, Information Sciences Institute, May 1979.

[24] COMPASS, "Semi-Annual Technical Report", CADD-7603-0411, Massachusetts Computer Associates, 4 March 1976. Also as, "National Software Works, Status Report No. 1," RADC-TR-76-276, Volume 1, September 1976. And COMPASS. "Second Semi-Annual Report," CADD-7608-1611, Massachusetts Computer Associates, August 1976.

[25] Crispin, M., "Telnet Logout Option", Stanford University-AI, RFC-727, April 1977.

[26] Crispin, M., "Telnet SUPDUP Option", Stanford University-AI,

RFC-736, October 1977.

[27] Crispin, M., "SUPDUP Protocol", RFC-734, NIC 41953, October 1977.

[28] Crocker, D., "Telnet Output Carriage-Return Disposition Option", RFC-652, October 1974.

[29] Crocker, D., "Telnet Output Formfeed Disposition Option", RFC-655, October 1974.

[30] Crocker, D., "Telnet Output Linefeed Disposition", RFC-658, October 1974.

[31] Crocker, D., "Telnet Output Horizontal Tab Disposition Option", RFC-654, October 1974.

[32] Crocker, D., "Telnet Output Horizontal Tabstops Option", RFC-653, October 1974.

[33] Crocker, D., "Telnet Output Vertical Tab Disposition Option", RFC-657, October 1974.

[34] Crocker, D., "Telnet Output Vertical Tabstops Option", RFC-656, October 1974.

[35] Crocker, D. and R. Gumpertz, "Revised Telnet Byte Marco Option", RFC-735, November 1977.

[36] Croft, B., and J. Gilmore, "BOOTSTRAP Protocol (BOOTP)", RFC-951, Stanford and SUN Microsytems, September 1985.

[37] Davin, J., J. Case, M. Fedor, and M. Schoffstall, "A Simple Gateway Monitoring Protocol", RFC-1028, November 1987.

[38] Day, J., "Telnet Data Entry Terminal Option", RFC-732, September 1977.

[39] DCA, "3270 Display System Protocol", #1981-08.

[40] DDN Protocol Handbook, "Telnet Output Line Width Option", NIC 50005, December 1985.

[41] DDN Protocol Handbook, "Telnet Output Page Size Option", NIC 50005, December 1985.

[42] DDN Protocol Handbook, "Telnet Reconnection Option", NIC 50005, December 1985.

[43] Deering, S., "Host Extensions for IP Multicasting", RFC-1112, Obsoletes RFC-988, RFC-1054, Stanford University, August 1989.

[44] Elvy, M., and R. Nedved, "Network Mail Path Service", RFC-915, Harvard and CMU, July 1986.

[45] Feinler, E., editor, "DDN Protocol Handbook", Network Information Center, SRI International, December 1985.

[46] Feinler, E., editor, "Internet Protocol Transition Workbook", Network Information Center, SRI International, March 1982.

[47] Feinler, E. and J. Postel, eds., "ARPANET Protocol Handbook", NIC 7104, for the Defense Communications Agency by SRI International, Menlo Park, California, Revised January 1978.

[48] Finlayson, R., T. Mann, J. Mogul, and M. Theimer, "A Reverse Address Resolution Protocol", RFC-903, Stanford University, June 1984.

[49] Forgie, J., "ST - A Proposed Internet Stream Protocol", IEN 119, MIT Lincoln Laboratory, September 1979.

[50] Forsdick, H., "CFTP", Network Message, Bolt Beranek and Newman, January 1982.

[51] Greenberg, B., "Telnet SUPDUP-OUTPUT Option", RFC-749, MIT-Multics, September 1978.

[52] Harrenstien, K., "Name/Finger", RFC-742, NIC 42758, SRI International, December 1977.

[53] Harrenstien, K., M. Stahl, and E. Feinler, "DOD Internet Host Table Specification", RFC-952, Obsoletes RFC-810, October 1985.

[54] Harrenstien, K., V. White, and E. Feinler, "Hostnames Server", RFC-811, SRI International, March 1982.

[55] Harrenstien, K., and V. White, "Nicname/Whois", RFC-812, SRI International, March 1982.

[56] Haverty, J., "XNET Formats for Internet Protocol Version 4", IEN 158, October 1980.

[57] Hedrick, C., "Telnet Terminal Speed Option", RFC-1079, Rutgers University, December 1988.

[58] Hedrick, C., "Telnet Remote Flow Control Option", RFC-1080, Rutgers University, December 1988.

[59] Hinden, R., "A Host Monitoring Protocol", RFC-869, Bolt Beranek and Newman, December 1983.

[60] Hinden, R., and A. Sheltzer, "The DARPA Internet Gateway", RFC-823, September 1982.

[61] Hornig, C., "A Standard for the Transmission of IP Datagrams over Ethernet Networks, RFC-894, Symbolics, April 1984.

[62] Internet Activities Board, J. Postel, Editor, "IAB Official Protocol Standards", RFC-1130, Internet Activities October 1989.

[63] International Standards Organization, "ISO Transport Protocol Specification - ISO DP 8073", RFC-905, April 1984.

[64] International Standards Organization, "Protocol for Providing the Connectionless-Mode Network Services", RFC-926, ISO, December 1984.

[65] Kantor, B., and P. Lapsley, "Network News Transfer Protocol", RFC-977, UC San Diego & UC Berkeley, February 1986.

[66] Kent, S., and J. Linn, "Privacy Enhancement for Internet Electronic Mail: Part II -- Certificate-Based Key Management", BBNCC and DEC, August 1989.

[67] Khanna, A., and A. Malis, "The ARPANET AHIP-E Host Access Protocol (Enhanced AHIP)", RFC-1005, BBN Communications Corporation, May 1987.

[68] Killian, E., "Telnet Send-Location Option", RFC-779, April 1981.

[69] Korb, J., "A Standard for the Transmission of IP Datagrams Over Public Data Networks", RFC-877, Purdue University, September 1983.

[70] Levy, S., and T. Jacobson, "Telnet X.3 PAD Option", RFC-1053, Minnesota Supercomputer Center, April 1988.

[71] Linn, J., "Privacy Enhancement for Internet Electronic Mail: Part I: Message Encipherment and Authentication Procedures", RFC-1113, Obsoletes RFC-989 and RFC-1040, DEC, August 1989.

[72] Linn, J., "Privacy Enhancement for Internet Electronic Mail: Part III -- Algorithms, Modes, and Identifiers", RFC-1115, DEC, August 1989.

[73] Lottor, M., "Simple File Transfer Protocol", RFC-913, MIT, September 1984.

[74] M/A-COM Government Systems, "Dissimilar Gateway Protocol Specification, Draft Version", Contract no. CS901145, November 16, 1987.

[75] Marcy, G., "Telnet X Display Location Option", RFC-1096, Carnegie Mellon University, March 1989.

[76] Malis, A., "Logical Addressing Implementation Specification", BBN Report 5256, pp 31-36, May 1983.

[77] Malkin, G., "KNET/VM Command Message Protocol Functional Overview", Spartacus, Inc., January 4, 1988.

[78] Metcalfe, R. M. and D. R. Boggs, "Ethernet: Distributed Packet Switching for Local Computer Networks", Communications of the ACM, 19 (7), pp 395-402, July 1976.

[79] Miller, T., "Internet Reliable Transaction Protocol", RFC-938, ACC, February 1985.

[80] Mills, D., "Network Time Protocol (Version 1), Specification and Implementation", RFC-1059, University of Delaware, July 1988.

[81] Mockapetris, P., "Domain Names - Concepts and Facilities", RFC-1034, Obsoletes RFCs 882, 883, and 973, Information Sciences Institute, November 1987.

[82] Mockapetris, P., "Domain Names - Implementation and Specification", RFC-1035, Obsoletes RFCs 882, 883, and 973, Information Sciences Institute, November 1987.

[83] Moy, J., "The OSPF Specification", RFC 1131, Proteon, October 1989.

[84] Nedved, R., "Telnet Terminal Location Number Option", RFC-946, Carnegie-Mellon University, May 1985.

[85] NSW Protocol Committee, "MSG: The Interprocess Communication Facility for the National Software Works", CADD-7612-2411, Massachusetts Computer Associates, BBN 3237, Bolt Beranek and

Newman, Revised December 1976.

[86] Onions, J., and M. Rose, "ISO-TP0 bridge between TCP and X.25", RFC-1086, Nottingham, TWG, December 1988.

[87] Partridge, C. and G. Trewitt, The High-Level Entity Management System (HEMS), RFCs 1021, 1022, 1023, and 1024, BBN/NNSC, Stanford, October, 1987.

[88] Plummer, D., "An Ethernet Address Resolution Protocol or Converting Network Protocol Addresses to 48-bit Ethernet Addresses for Transmission on Ethernet Hardware", RFC-826, MIT-LCS, November 1982.

[89] Postel, J., "Active Users", RFC-866, Information Sciences Institute, May 1983.

[90] Postel, J., and J. Reynolds, "A Standard for the Transmission of IP Datagrams over IEEE 802 Networks", RFC-1042, USC/Information Sciences Institute, February 1988.

[91] Postel, J., "A Standard for the Transmission of IP Datagrams over Experimental Ethernet Networks, RFC-895, Information Sciences Institute, April 1984.

[92] Postel, J., "Character Generator Protocol", RFC-864, Information Sciences Institute, May 1983.

[93] Postel, J., "Daytime Protocol", RFC-867, Information Sciences Institute, May 1983.

[94] Postel, J., "Discard Protocol", RFC-863, Information Sciences Institute, May 1983.

[95] Postel, J., "Echo Protocol", RFC-862, Information Sciences Institute, May 1983.

[96] Postel, J. and J. Reynolds, "File Transfer Protocol", RFC-959, Information Sciences Institute, October 1985.

[97] Postel, J., "Internet Control Message Protocol - DARPA Internet Program Protocol Specification", RFC-792, Information Sciences Institute, September 1981.

[98] Postel, J., "Internet Message Protocol", RFC-759, IEN 113, Information Sciences Institute, August 1980.

[99] Postel, J., "Name Server", IEN 116, Information Sciences

Institute, August 1979.

[100] Postel, J., "Quote of the Day Protocol", RFC-865, Information Sciences Institute, May 1983.

[101] Postel, J., "Remote Telnet Service", RFC-818, Information Sciences Institute, November 1982.

[102] Postel, J., "Simple Mail Transfer Protocol", RFC-821, Information Sciences Institute, August 1982.

[103] Postel, J., "Telnet End of Record Option", RFC-885, Information Sciences Institute, December 1983.

[104] Postel, J., "User Datagram Protocol", RFC-768 Information Sciences Institute, August 1980.

[105] Postel, J., ed., "Internet Protocol - DARPA Internet Program Protocol Specification", RFC-791, Information Sciences Institute, September 1981.

[106] Postel, J., ed., "Transmission Control Protocol - DARPA Internet Program Protocol Specification", RFC-793, Information Sciences Institute, September 1981.

[107] Postel, J. and D. Crocker, "Remote Controlled Transmission and Echoing Telnet Option", RFC-726, March 1977.

[108] Postel, J., and K. Harrenstien, "Time Protocol", RFC-868, Information Sciences Institute, May 1983.

[109] Postel, J. and J. Reynolds, "Telnet Extended Options - List Option", RFC-861, Information Sciences Institute, May 1983.

[110] Postel, J. and J. Reynolds, "Telnet Binary Transmission", RFC-856, Information Sciences Institute, May 1983.

[111] Postel, J. and J. Reynolds, "Telnet Echo Option", RFC-857, Information Sciences Institute, May 1983.

[112] Postel, J., and J. Reynolds, "Telnet Protocol Specification", RFC-854, Information Sciences Institute, May 1983.

[113] Postel, J. and J. Reynolds, "Telnet Status Option", RFC-859, Information Sciences Institute, May 1983.

[114] Postel, J. and J. Reynolds, "Telnet Suppress Go Ahead Option", RFC-858, Information Sciences Institute, May 1983.

[115] Postel, J. and J. Reynolds, "Telnet Timing Mark Option", RFC-860, Information Sciences Institute, May 1983.

[116] Rekhter, J., "Telnet 3270 Regime Option", RFC-1041, IBM, January 1988.

[117] Reynolds, J., "BOOTP Vendor Information Extensions", RFC 1084, Information Sciences Institute, December 1988.

[118] Reynolds, J. and J. Postel, "Official Internet Protocols", RFC-1011, USC/Information Sciences Institute, May 1987.

[119] Romano, S., M. Stahl, and M. Recker, "Internet Numbers", RFC-1117, SRI-NIC, August 1989.

[120] Rose, M., and K. McCloghrie, "Structure and Identification of Management Information for TCP/IP-based internets", RFC-1065, TWG, August 1988.

[121] Rose, M., and K. McCloghrie, "Management Information Base for Network Management of TCP/IP-based internets", RFC-1066, TWG, August 1988.

[122] Rose, M., "Post Office Protocol - Version 3", RFC-1081, TWG, November 1988.

[123] Seamonson, L. J., and E. C. Rosen, "STUB" Exterior Gateway Protocol", RFC-888, BBN Communications Corporation, January 1984.

[124] Shuttleworth, B., "A Documentary of MFENet, a National Computer Network", UCRL-52317, Lawrence Livermore Labs, Livermore, California, June 1977.

[125] Silverman, S., "Output Marking Telnet Option", RFC-933, MITRE, January 1985.

[126] Sollins, K., "The TFTP Protocol (Revision 2)", RFC-783, MIT/LCS, June 1981.

[127] Solomon, M., L. Landweber, and D. Neuhengen, "The CSNET Name Server", Computer Networks, v.6, n.3, pp. 161-172, July 1982.

[128] Solomon, M., and E. Wimmers, "Telnet Terminal Type Option", RFC-930, Supercedes RFC-884, University of Wisconsin, Madison, January 1985.

[129] Sproull, R., and E. Thomas, "A Networks Graphics Protocol",

NIC 24308, August 1974.

[130] St. Johns, M., "Authentication Service", RFC-931, TPSC, January 1985.

[131] Tappan, D., "The CRONUS Virtual Local Network", RFC-824, Bolt Beranek and Newman, August 1982.

[132] Taylor, J., "ERPC Functional Specification", Version 1.04, HYDRA Computer Systems, Inc., July 1984.

[133] "The Ethernet, A Local Area Network: Data Link Layer and Physical Layer Specification", AA-K759B-TK, Digital Equipment Corporation, Maynard, MA. Also as: "The Ethernet - A Local Area Network", Version 1.0, Digital Equipment Corporation, Intel Corporation, Xerox Corporation, September 1980. And: "The Ethernet, A Local Area Network: Data Link Layer and Physical Layer Specifications", Digital, Intel and Xerox, November 1982. And: XEROX, "The Ethernet, A Local Area Network: Data Link Layer and Physical Layer Specification", X3T51/80-50, Xerox Corporation, Stamford, CT., October 1980.

[134] The High Level Protocol Group, "A Network Independent File Transfer Protocol", INWG Protocol Note 86, December 1977.

[135] Thomas, Bob, "The Interhost Protocol to Support CRONUS/DIAMOND Interprocess Communication", BBN, September 1983.

[136] Tovar, "Telnet Extended ASCII Option", RFC-698, Stanford University-AI, July 1975.

[137] Uttal, J., J. Rothschild, and C. Kline, "Transparent Integration of UNIX and MS-DOS", Locus Computing Corporation.

[138] Velten, D., R. Hinden, and J. Sax, "Reliable Data Protocol", RFC-908, BBN Communications Corporation, July 1984.

[139] Waitzman, D., "Telnet Window Size Option", RFC-1073, BBN STC, October, 1988.

[140] Waitzman, D., C. Partridge, and S. Deering "Distance Vector Multicast Routing Protocol", RFC-1075, BBN STC and Stanford University, November 1988.

[141] Wancho, F., "Password Generator Protocol", RFC-972, WSMR, January 1986.

[142] Warrier, U., and L. Besaw, "The Common Management

Information Services and Protocol over TCP/IP (CMOT)", RFC-1095, Unisys Corp. and Hewlett-Packard, April 1989.

[143] Welch, B., "The Sprite Remote Procedure Call System", Technical Report, UCB/Computer Science Dept., 86/302, University of California at Berkeley, June 1986.

[144] Xerox, "Courier: The Remote Procedure Protocol", XSIS 038112, December 1981.

[145] Yasuda, A., and T. Thompson, "TELNET Data Entry Terminal Option DODIIS Implementation", RFC-1043, DIA, February 1988.

PEOPLE

[AB20]	Art Berggreen	ACC	art@SALT.ACC.ARPA
[ABB2]	A. Blasco Bonito	CNUCE	blasco@ICNUCEVM.CNUCE.CNR.IT
[AD14]	Annette DeSchon	ISI	DESCHON@ISI.EDU
[AGM]	Andy Malis	BBN	Malis@BBN.COM
[AKH5]	Arthur Hartwig	UQNET	munnari!wombat.decnet.uq.oz.au!ccarthur@UUNET.UU.NET
[ANM2]	April N. Marine	SRI	APRIL@NIC.DDN.MIL
[AW90]	Amanda Walker	Intercon	AMANDA@INTERCON.COM
[AXB]	Albert G. Broscius	UPENN	broscius@DSL.CIS.UPENN.EDU
[AXB1]	Amatzia Ben-Artzi		---none---
[AXC]	Andrew Cherenson	SGI	arc@SGI.COM
[AXC1]	Anthony Chung	Sytek	sytek!syteka!anthony@HPLABS.HP.COM
[AXC2]	Asheem Chandna	AT&T	ac0@mtuxo.att.com
[AXM]	Alex Martin	Retix	---none---
[AXS]	Arthur Salazar	Locus	lcc.arthur@SEAS.UCLA.EDU
[BA4]	Brian Anderson	BBN	baanders@CCQ.BBN.COM
[BB257]	Brian W. Brown	SynOptics	BBROWN@MVIS1.SYNOPTICS.COM
[BCH2]	Barry Howard	LLL	Howard@NMFECC.ARPA
[BCN]	Clifford B. Newman	UWASH	bcn@CS.WASHINGTON.EDU
[BD70]	Bernd Doleschal	SEL	Doleschal@A.ISI.EDU
[BH144]	Bridget Halsey	Banyan	bah@BANYAN.BANYAN.COM
[BJR2]	Bill Russell	NYU	russell@cmcl2.NYU.EDU
[BKR]	Brian Reid	DEC	reid@DECWRL.DEC.COM

[BP52]	Brad Parker	CAYMAN	brad@cayman.Cayman.COM
[BS221]	Bob Stewart	Xyplex	STEWART@XYPLEX.COM
[BWB6]	Barry Boehm	DARPA	boehm@DARPA.MIL
[BXA]	Bill Anderson	MITRE	wda@MITRE-BEDFORD.ORG
[BXB]	Brad Benson	Touch	---none---
[BXE]	Brian A. Ehrmantraut	Auspex Systems	bae@auspex.com
[BXH]	Brian Horn	Locus	---none---
[BXL]	Brian Lloyd	SIRIUS	---none---
[BXN]	Bill Norton	Merit	wbn@MERIT.EDU
[BXV]	Bill Versteeg	NRC	bvs@NRC.COM
[BXW]	Brent Welch	Sprite	brent%sprite.berkeley.edu@GINGER.BERKELEY.EDU
[BXW1]	Bruce Willins	Raycom	---none---
[BXZ]	Bob Zaniolo	Reuter	---none---
[CLH3]	Charles Hedrick	RUTGERS	HEDRICK@ARAMIS.RUTGERS.EDU
[CMR]	Craig Rogers	ISI	Rogers@ISI.EDU
[CXM]	Charles Marker II	MIPS	marker@MIPS.COM
[CXT]	Christopher Tengi	Princeton	tengi@Princeton.EDU
[DAG4]	David A. Gomberg	MITRE	gomberg@GATEWAY.MITRE.ORG
[DB14]	Dave Borman	Cray	dab@CRAY.COM
[DC126]	Dick Cogger	Cornell	rhx@CORNELLC.CIT.CORNELL.EDU
[DCP1]	David Plummer	MIT	DCP@SCRC-QUABBIN.ARPA
[DDC1]	David Clark	MIT	ddc@LCS.MIT.EDU
[DJK13]	David Kaufman	DeskTalk	---none---
[DLM1]	David Mills	LINKABIT	Mills@HUEY.UDEL.EDU

[DM28]	Dennis Morris	DCA	Morrisd@IMO-UVAX.DCA.MIL
[DM280]	Dave Mackie	NCD	lupine!djm@UUNET.UU.NET
[DM354]	Don McWilliam	UBC	mcwillm@CC.UBC.CA
[DPR]	David Reed	MIT-LCS	Reed@MIT-MULTICS.ARPA
[DRC3]	Dave Cheriton	STANFORD	cheriton@PESCADERO.STANFORD.EDU
[DT15]	Daniel Tappan	BBN	Tappan@BBN.COM
[DW181]	David Wolfe	SRI	ctabka@TSCA.ISTC.SRI.COM
[DW183]	David Waitzman	BBN	dwaitzman@BBN.COM
[DXB]	Dave Buehmann	Intergraph	ingr!daveb@UUNET.UU.NET
[DXD]	Dennis J.W. Dube	VIA SYSTEMS	---none---
[DXG]	David Goldberg	SMI	sun!dg@UCBARPA.BERKELEY.EDU
[DXK]	Doug Karl	OSU	KARL-D@OSU-20.IRCC.OHIO-STATE.EDU
[DXM]	Didier Moretti	Ungermann-Bass	---none---
[DXM1]	Donna McMalster	David Systems	---none---
[DXP]	Dave Preston	CMC	---none---
[DY26]	Dennis Yaro	SUN	yaro@SUN.COM
[EAK4]	Earl Killian	LLL	EAK@MORDOR.S1.GOV
[EBM]	Eliot Moss	MIT	EBM@XX.LCS.MIT.EDU
[EP53]	Eric Peterson	Locus	lcc.eric@SEAS.UCLA.EDU
[EXC]	Ed Cain	DCA	cain@edn-unix.dca.mil
[EXR]	Eric Rubin	FiberCom	err@FIBERCOM.COM
[EXR1]	Efrat Ramati	Lannet Co.	---none---
[FB77]	Fred Baker	Vitalink	baker%vitam6@UUNET.UU.NET

[FJK2]	Frank Kastenholz	Interlan	KASTEN@MITVMA.MIT.EDU
[FJW]	Frank J. Wancho	WSMR	WANCHO@SIMTEL20.ARPA
[FXB1]	Felix Burton	DIAB	FB@DIAB.SE
[GAL5]	Guillermo A. Loyola	IBM	LOYOLA@IBM.COM
[GB7]	Gerd Beling	FGAN	GBELING@ISI.EDU
[GEOF]	Geoff Goodfellow	OSD	Geoff@FERNWOOD.MPK.CA.US
[GGB2]	Geoff Baehr	SUN	geoffb@ENG.SUN.COM
[GM23]	Glenn Marcy	CMU	Glenn.Marcy@A.CS.CMU.EDU
[GS2]	Greg Satz	cisco	satz@CISCO.COM
[GS123]	Geof Stone	NSC	geof@NETWORK.COM
[GSM11]	Gary S. Malkin	Proteon	gmalkin@PROTEON.COM
[GXG]	Gil Greebaum	Unisys	gcole@nisd.cam.unisys.com
[GXP]	Gill Pratt	MIT	gill%mit-ccc@MC.LCS.MIT.EDU
[GXS]	Guenther Schreiner	LINK	guenther%ira.uka.de@RELAY.CS.NET
[GXT]	Glenn Trewitt	STANFORD	trewitt@AMADEUS.STANFORD.EDU
[GXT1]	Gene Tsudik	USC	tsudik@USC.EDU
[GXW]	Glenn Waters	Bell Northern	gwaters@BNR.CA
[HCF2]	Harry Forsdick	BBN	Forsdick@BBN.COM
[HS23]	Hokey Stenn	Plus5	hokey@PLUS5.COM
[HWB]	Hans-Werner Braun	MICHIGAN	HWB@MCR.UMICH.EDU
[HXE]	Hunaid Engineer	Cray	hunaid@OPUS.CRAY.COM
[HXK]	Henry Kaijak	Gandalf	---none---
[IEEE]	Vince Condello	IEEE	---none---
[JAG]	James Gosling	SUN	JAG@SUN.COM

[JB478]	Jonathan Biggar	Netlabs	jon@netlabs.com
[JBP]	Jon Postel	ISI	Postel@ISI.EDU
[JBW1]	Joseph Walters, Jr.	BBN	JWalters@BBN.COM
[JCB1]	John Burruss	BBN	JBurruss@VAX.BBN.COM
[JCM48]	Jeff Mogul	DEC	mogul@DECWRL.DEC.COM
[JD21]	Jonathan Dreyer	BBN	Dreyer@CCV.BBN.COM
[JDC20]	Jeffrey Case	UTK	case@UTKUX1.UTK.EDU
[JFH2]	Jack Haverty	BBN	JHaverty@BBN.COM
[JFW]	Jon F. Wilkes	STC	Wilkes@CCINT1.RSRE.MOD.UK
[JGH]	Jim Herman	BBN	Herman@CCJ.BBN.COM
[JJB25]	John Bowe	BBN	jbowe@PINEAPPLE.BBN.COM
[JKR1]	Joyce K. Reynolds	ISI	JKRey@ISI.EDU
[JR35]	Jon Rochlis	MIT	jon@ATHENA.MIT.EDU
[JRL3]	John LoVerso	Xylogics	loverso@XYLOGICS.COM
[JS28]	John A. Shriver	Proteon	jas@PROTEON.COM
[JTM4]	John Moy	Proteon	jmoy@PROTEON.COM
[JWF]	Jim Forgie	MIT/LL	FORGIE@XN.LL.MIT.EDU
[JXB]	Jeffrey Buffun	Apollo	jbuffum@APOLLO.COM
[JXC]	John Cook	Chipcom	cook@chipcom.com
[JXE2]	Jeanne Evans	UKMOD	JME%RSRE.MOD.UK@CS.UCL.AC.UK
[JXF]	Josh Fielk	Optical Data Systems	---none---
[JXG]	Jerry Geisler	Boeing	---none---
[JXG1]	Jim Greuel	HP	jimg%hpcndpc@hplabs.hp.com
[JXH]	Jeff Honig	Cornell	jch@sonne.tn.cornell.edu

[JXH1]	Jim Hayes	Apple	Hayes@APPLE.COM
[JXI]	Jon Infante	ICL	---none---
[JXM]	Joseph Murdock	Network Resources Corporation	---none---
[JXO]	Jack O'Neil	ENCORE	---none---
[JXO1]	Jerrilynn Okamura	Ontologic	---none---
[JXO2]	Jarkko Oikarinen	Tolsun	jto@TOLSUN.OULU.FI
[JXP]	Joe Pato	Apollo	apollo!pato@EDDIE.MIT.EDU
[JXR]	Jacob Rekhter	IBM	Yakov@IBM.COM
[JXS]	Jim Stevens	Rockwell	Stevens@ISI.EDU
[JXS1]	John Sancho	CastleRock	---none---
[KAA]	Ken Adelman	TGV, Inc.	Adelman@TGV.COM
[KA4]	Karl Auerbach	Epilogue	auerbach@csl.sri.com
[KH43]	Kathy Huber	BBN	khuber@bbn.com
[KLH]	Ken Harrenstien	SRI	KLH@NIC.DDN.MIL
[KR35]	Keith Reynolds	SCO	keithr@SCO.COM
[KSL]	Kirk Lougheed	cisco	LOUGHEED@MATHOM.CISCO.COM
[KXD]	Kevin DeVault	NI	---none---
[KXS]	Keith Sklower	Berkeley	sklower@okeeffe.berkeley.edu
[KXW]	Ken Whitfield	MCNC	ken@MCNC.ORG
[KZM]	Keith McCloghrie	TWG	kzm@TWG.ARPA
[LL69]	Lawrence Lebahn	DIA	DIA3@PAXRV-NES.NAVY.MIL
[LLP]	Larry Peterson	ARIZONA	llp@ARIZONA.EDU
[LXE]	Len Edmondson	SUN	len@TOPS.SUN.COM
[LXF]	Larry Fischer	DSS	lfischer@dss.com

[LXH]	Leo Hourvitz	NeXt	leo@NEXT.COM
[MA]	Mike Accetta	CMU	MIKE.ACCETTA@CMU-CS-A.EDU
[MARY]	Mary K. Stahl	SRI	Stahl@NIC.DDN.MIL
[MAR10]	Mark A. Rosenstein	MIT	mar@ATHENA.MIT.EDU
[MB]	Michael Brescia	BBN	Brescia@CCV.BBN.COM
[MBG]	Michael Greenwald	SYMBOLICS	Greenwald@SCRC-STONY-BROOK.ARPA
[MCSJ]	Mike StJohns	TPSC	StJohns@MIT-MULTICS.ARPA
[ME38]	Marc A. Elvy	Marble	ELVY@CARRARA.MARBLE.COM
[MKL]	Mark Lottor	SRI	MKL@NIC.DDN.MIL
[ML109]	Mike Little	MACOM	little@MACOM4.ARPA
[MLS34]	L. Michael Sabo	TMAC	darth!eniac!sabo@Sun.Com
[MO2]	Michael O'Brien	AEROSPACE	obrien@AEROSPACE.AERO.ORG
[MRC]	Mark Crispin	Simtel	MRC@SIMTEL20.ARPA
[MS9]	Marty Schoffstahl	Nysernet	schoff@NISC.NYSER.NET
[MS56]	Marvin Solomon	WISC	solomon@CS.WISC.EDU
[MXB]	Mike Berrow	Relational Technology	---none---
[MXB1]	Mike Burrows	DEC	burrows@SRC.DEC.COM
[MXL]	Mark L. Lambert	MIT	markl@PTT.LCS.MIT.EDU
[MXP]	Martin Picard	Oracle	---none---
[MXS]	Mike Spina	Prime	WIZARD%enr.prime.com@RELAY.CS.NET
[MXW]	Michael Waters	EON	---none---
[NC3]	J. Noel Chiappa	MIT	JNC@XX.LCS.MIT.EDU
[NT12]	Neil Todd	IST	mcvax!ist.co.uk!neil@UUNET.UU.NET

[PAM6]	Paul McNabb	RICE	pam@PURDUE.EDU
[PCW]	C. Philip Wood	LANL	cpw@LANL.GOV
[PD39]	Pete Delaney	ECRC	pete%ecrcvax@CSNET-RELAY.ARPA
[PHD1]	Pieter Ditmars	BBN	pditmars@BBN.COM
[PK]	Peter Kirstein	UCL	Kirstein@NSS.CS.UCL.AC.UK
[PL4]	Phil Lapsley	BERKELEY	phil@UCBARPA.BERKELEY.EDU
[PM1]	Paul Mockapetris	ISI	PVM@ISI.EDU
[PXK]	Philip Koch	Dartmouth	Philip.Koch@DARTMOUTH.EDU
[RAM57]	Rex Mann	CDC	---none---
[RDXS]	R. Dwight Schettler	HP	rds%hpcndm@HPLABS.HP.COM
[RH6]	Robert Hinden	BBN	Hinden@CCV.BBN.COM
[RHT]	Robert Thomas	BBN	BThomas@F.BBN.COM
[RN6]	Rudy Nedved	CMU	Rudy.Nedved@CMU-CS-A.EDU
[RTB3]	Bob Braden	ISI	Braden@ISI.EDU
[RWS4]	Robert W. Scheifler	ARGUS	RWS@XX.LCS.MIT.EDU
[RXB]	Ramesh Babu	Excelan	mtxinu!excelan!ramesh@UCBVAX.BERKELEY.EDU
[RXB1]	Ron Bhanukitsiri	DEC	rbhank@DECVAX.DEC.COM
[RXC]	Rob Chandhok	CMU	chandhok@gnome.cs.cmu.edu
[RXC1]	Rick Carlos	TI	rick.ticipa.csc.ti.com
[RXD]	Roger Dev	Cabletron	---none---
[RXD1]	Ralph Droms	NRI	rdroms@NRI.RESTON.VA.US
[RXH]	Reijane Huai	Cheyenne	sibal@CSD2.NYU.EDU
[RXJ]	Ronald Jacoby	SGI	rj@SGI.COM

[RXM]	Robert Myhill	BBN	Myhill@CCS.BBN.COM
[RXN]	Rina Nethaniel	RND	---none---
[RXS]	Ron Strich	SSDS	---none---
[RXT]	Ron Thornton	GenRad	thornton@qm7501.genrad.com
[RXZ]	Rayan Zachariassen	Toronto	rayan@AI.TORONTO.EDU
[SA1]	Sten Andler	IBM	andler.ibm-sj@RAND-RELAY.ARPA
[SAF3]	Stuart A. Friedberg	UWISC	stuart@CS.WISC.EDU
[SB98]	Stan Barber	BCM	SOB@BCM.TMC.EDU
[SC3]	Steve Casner	ISI	Casner@ISI.EDU
[SGC]	Steve Chipman	BBN	Chipman@F.BBN.COM
[SHB]	Steven Blumenthal	BBN	BLUMENTHAL@VAX.BBN.COM
[SH37]	Sergio Heker	JVNC	heker@JVNCC.CSC.ORG
[SL70]	Stuart Levy	UMN	slevy@UC.MSC.UMN.EDU
[SRN1]	Stephen Northcutt	NSWC	SNORTHC@RELAY-NSWC.NAVY.MIL
[SS92]	Steve Schoch	NASA	SCHOCH@AMES.ARC.NASA.GOV
[SXA]	Susie Armstrong	XEROX	Armstrong.wbst128@XEROX.COM
[SXB]	Scott Bellows	Purdue	smb@cs.purdue.edu
[SXC]	Steve Conklin	Intergraph	tesla!steve@ingr.com
[SXD]	Steve Deering	Stanford	deering@PECASERO.STANFORD.EDU
[SXH]	Steven Hunter	LLNL	hunter@CCC.MFECC.LLNL.GOV
[SXK]	Skip Koppenhaver	DAC	stubby!skip@uunet.UU.NET
[SXL]	Sam Lau	Pirelli/Focom	---none---
[SXP]	Sanand Patel	Canstar	sanand@HUB.TORONTO.EDU
[SXS]	Steve Silverman	MITRE	Blankert@MITRE-GATEWAY.ORG

[SXS1]	Susie Snitzer	Britton-Lee	---none---
[SXW]	Steve Waldbusser	CMU	sw01+@andrew.cmu.edu
[TB6]	Todd Baker	3COM	tzb@BRIDGE2.3COM.COM
[TC27]	Thomas Calderwood	BBN	TCALDERW@BBN.COM
[TN]	Thomas Narten	Purdue	narten@PURDUE.EDU
[TU]	Tom Unger	UMich	tom@CITI.UMICH.EDU
[TXM]	Trudy Miller	ACC	Trudy@ACC.ARPA
[TXR]	Tim Rylance	Praxis	praxis!tkr@UUNET.UU.NET
[TXS]	Ted J. Socolofsky	Spider	Teds@SPIDER.CO.UK
[UB3]	Ulf Bilting	CHALMERS	bilting@PURDUE.EDU
[UW2]	Unni Warrier	Netlabs	unni@NETLABS.COM
[VXS]	Vinod Singh	Unify	---none---
[VXT]	V. Taylor	CANADA	vktaylor@NCS.DND.CA
[WDW11]	William D. Wisner		wisner@HAYES.FAI.ALASKA.EDU
[WJC2]	Bill Croft	STANFORD	Croft@SUMEX-AIM.STANFORD.EDU
[WJS1]	Weldon J. Showalter	DCA	Gamma@EDN-UNIX.ARPA
[WLB8]	William L. Biagi	Advintech	CSS002.BLBIAGI@ADVINTECH-MVS.ARPA
[WM3]	William Melohn	SUN	Melohn@SUN.COM
[WXS]	Wayne Schroeder	SDSC	schroeder@SDS.SDSC.EDU
[VXW]	Val Wilson	Spider	cvax!spider.co.uk!val@uunet.UU.NET
[YXK]	Yoav Kluger	Spartacus	ykluger@HAWK.ULOWELL.EDU
[YXW]	Y.C. Wang	Network Application Technology	---none---
[XEROX]	Fonda Pallone	Xerox	---none---

[ZSU] Zaw-Sing Su SRI ZSu@TSCA.ISTC.SRI.COM

Security Considerations

Security issues are not discussed in this memo.

Authors' Addresses:

Joyce K. Reynolds
University of Southern California
Information Sciences Institute
4676 Admiralty Way
Marina del Rey, CA 90292

Phone: (213) 822-1511

Email: JKREY@ISI.EDU

Jon Postel
University of Southern California
Information Sciences Institute
4676 Admiralty Way
Marina del Rey, CA 90292

Phone: (213) 822-1511

Email: POSTEL@ISI.EDU