Network Working Group
Request for Comments: 1340
Obsoletes RFCs: 1060, 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

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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.

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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.

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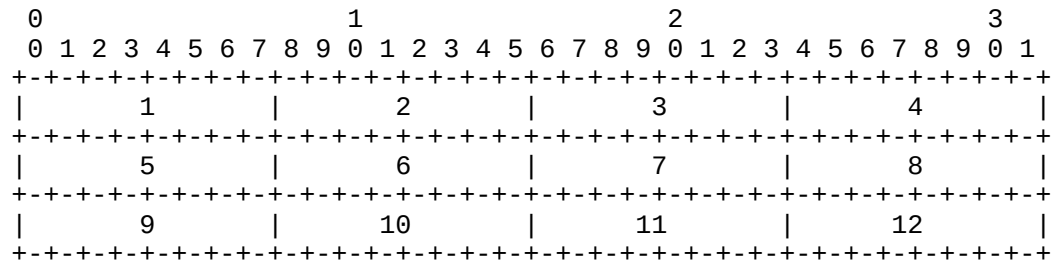
Most of the protocols mentioned here are documented in the RFC series of notes. Some of the items listed are undocumented. Further information on protocols can be found in the memo "IAB Official Protocol Standards" [62].

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

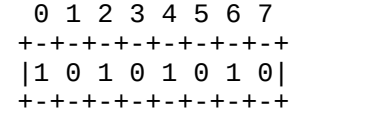
The convention in the documentation of Internet Protocols is to express numbers in decimal and to picture data in "big-endian" order [21]. That is, fields are described left to right, with the most significant octet on the left and the least significant octet on the right.

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 E addresses are reserved for experimental use. A gateway which is not participating in these experiments must ignore all datagrams with a 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	IP	IP in IP (encasulation)	[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	IDPR	Inter-Domain Policy Routing Protocol	[MXS1]
36	XTP	XTP	[GXC]
37	DDP	Datagram Delivery Protocol	[WXC]

38	IDPR-CMTP	IDPR Control Message Transport Proto	[MXS1]
39	TP++	TP++ Transport Protocol	[DXF]
40	IL	IL Transport Protocol	[DXP2]
41-60		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	KRYPTOLAN	Kryptolan	[PXL1]
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	CPNX	Computer Protocol Network Executive	[DXM2]
73	CPHB	Computer Protocol Heart Beat	[DXM2]
74	WSN	Wang Span Network	[VXD]
75	PVP	Packet Video Protocol	[SC3]
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	MTP	Multicast Transport Protocol	[SXA]
93	AX.25	AX.25 Frames	[BK29]
94	IPIP	IP-within-IP Encapsulation Protocol	[JXI1]
95	MICP	Mobile Internetworking Control Pro.	[JXI1]
96	AES-SP3-D	AES Security Protocol 3-D	[HXH]
97	ETHERIP	Ethernet-within-IP Encapsulation	[RXH1]
98	ENCAP	Encapsulation Header	[148,RXB3]
99-254		Unassigned	[JBP]
255		Reserved	[JBP]

WELL KNOWN PORT NUMBERS

The Well Known Ports are controlled and assigned by the IANA and on most systems can only be used by system (or root) processes or by programs executed by privileged users.

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].

The assigned ports use a small portion of the possible port numbers. For many years the assigned ports were in the range 0-255. Recently, the range for assigned ports managed by the IANA has been expanded to the range 0-1023.

Port Assignments:

Keyword	Decimal	Description	References
	0/tcp	Reserved	[JBP]
	0/udp	Reserved	[JBP]
tcpmux	1/tcp	TCP Port Service Multiplexer	[MKL]
tcpmux	1/udp	TCP Port Service Multiplexer	[MKL]
compressnet	2/tcp	Management Utility	[BV15]
compressnet	2/udp	Management Utility	[BV15]
compressnet	3/tcp	Compression Process	[BV15]
compressnet	3/udp	Compression Process	[BV15]
	4/tcp	Unassigned	[JBP]
	4/udp	Unassigned	[JBP]
rje	5/tcp	Remote Job Entry	[12,JBP]
rje	5/udp	Remote Job Entry	[12,JBP]
	6/tcp	Unassigned	[JBP]
	6/udp	Unassigned	[JBP]
echo	7/tcp	Echo	[95,JBP]
echo	7/udp	Echo	[95,JBP]
	8/tcp	Unassigned	[JBP]
	8/udp	Unassigned	[JBP]
discard	9/tcp	Discard	[94,JBP]
discard	9/udp	Discard	[94,JBP]
	10/tcp	Unassigned	[JBP]
	10/udp	Unassigned	[JBP]
systat	11/tcp	Active Users	[89,JBP]

systat	11/udp	Active Users	[89,JBP]
	12/tcp	Unassigned	[JBP]
	12/udp	Unassigned	[JBP]
daytime	13/tcp	Daytime	[93,JBP]
daytime	13/udp	Daytime	[93,JBP]
	14/tcp	Unassigned	[JBP]
	14/udp	Unassigned	[JBP]
	15/tcp	Unassigned [was netstat]	[JBP]
	15/udp	Unassigned	[JBP]
	16/tcp	Unassigned	[JBP]
	16/udp	Unassigned	[JBP]
qotd	17/tcp	Quote of the Day	[100,JBP]
qotd	17/udp	Quote of the Day	[100,JBP]
msp	18/tcp	Message Send Protocol	[RXN]
msp	18/udp	Message Send Protocol	[RXN]
chargen	19/tcp	Character Generator	[92,JBP]
chargen	19/udp	Character Generator	[92,JBP]
ftp-data	20/tcp	File Transfer [Default Data]	[96,JBP]
ftp-data	20/udp	File Transfer [Default Data]	[96,JBP]
ftp	21/tcp	File Transfer [Control]	[96,JBP]
ftp	21/udp	File Transfer [Control]	[96,JBP]
	22/tcp	Unassigned	[JBP]
	22/udp	Unassigned	[JBP]
telnet	23/tcp	Telnet	[112,JBP]
telnet	23/udp	Telnet	[112,JBP]
	24/tcp	any private mail system	[RA11]
	24/udp	any private mail system	[RA11]
smtp	25/tcp	Simple Mail Transfer	[102,JBP]
smtp	25/udp	Simple Mail Transfer	[102,JBP]
	26/tcp	Unassigned	[JBP]
	26/udp	Unassigned	[JBP]
nsw-fe	27/tcp	NSW User System FE	[24,RHT]
nsw-fe	27/udp	NSW User System FE	[24,RHT]
	28/tcp	Unassigned	[JBP]
	28/udp	Unassigned	[JBP]
msg-icp	29/tcp	MSG ICP	[85,RHT]
msg-icp	29/udp	MSG ICP	[85,RHT]
	30/tcp	Unassigned	[JBP]
	30/udp	Unassigned	[JBP]
msg-auth	31/tcp	MSG Authentication	[85,RHT]
msg-auth	31/udp	MSG Authentication	[85,RHT]
	32/tcp	Unassigned	[JBP]
	32/udp	Unassigned	[JBP]
dsp	33/tcp	Display Support Protocol	[EXC]
dsp	33/udp	Display Support Protocol	[EXC]
	34/tcp	Unassigned	[JBP]
	34/udp	Unassigned	[JBP]
	35/tcp	any private printer server	[JBP]

	35/udp	any private printer server	[JBP]
	36/tcp	Unassigned	[JBP]
	36/udp	Unassigned	[JBP]
time	37/tcp	Time	[108,JBP]
time	37/udp	Time	[108,JBP]
	38/tcp	Unassigned	[JBP]
	38/udp	Unassigned	[JBP]
rlp	39/tcp	Resource Location Protocol	[MA]
rlp	39/udp	Resource Location Protocol	[MA]
	40/tcp	Unassigned	[JBP]
	40/udp	Unassigned	[JBP]
graphics	41/tcp	Graphics	[129,JBP]
graphics	41/udp	Graphics	[129,JBP]
nameserver	42/tcp	Host Name Server	[99,JBP]
nameserver	42/udp	Host Name Server	[99,JBP]
nicname	43/tcp	Who Is	[55,ANM2]
nicname	43/udp	Who Is	[55,ANM2]
mpm-flags	44/tcp	MPM FLAGS Protocol	[JBP]
mpm-flags	44/udp	MPM FLAGS Protocol	[JBP]
mpm	45/tcp	Message Processing Module [recv]	[98,JBP]
mpm	45/udp	Message Processing Module [recv]	[98,JBP]
mpm-snd	46/tcp	MPM [default send]	[98,JBP]
mpm-snd	46/udp	MPM [default send]	[98,JBP]
ni-ftp	47/tcp	NI FTP	[134,SK8]
ni-ftp	47/udp	NI FTP	[134,SK8]
	48/tcp	Unassigned	[JBP]
	48/udp	Unassigned	[JBP]
login	49/tcp	Login Host Protocol	[PHD1]
login	49/udp	Login Host Protocol	[PHD1]
re-mail-ck	50/tcp	Remote Mail Checking Protocol	[171,SXD1]
re-mail-ck	50/udp	Remote Mail Checking Protocol	[171,SXD1]
la-maint	51/tcp	IMP Logical Address Maintenance	[76,AGM]
la-maint	51/udp	IMP Logical Address Maintenance	[76,AGM]
xns-time	52/tcp	XNS Time Protocol	[SXA]
xns-time	52/udp	XNS Time Protocol	[SXA]
domain	53/tcp	Domain Name Server	[81,95,PM1]
domain	53/udp	Domain Name Server	[81,95,PM1]
xns-ch	54/tcp	XNS Clearinghouse	[SXA]
xns-ch	54/udp	XNS Clearinghouse	[SXA]
isi-gl	55/tcp	ISI Graphics Language	[7,RB9]
isi-gl	55/udp	ISI Graphics Language	[7,RB9]
xns-auth	56/tcp	XNS Authentication	[SXA]
xns-auth	56/udp	XNS Authentication	[SXA]
	57/tcp	any private terminal access	[JBP]
	57/udp	any private terminal access	[JBP]
xns-mail	58/tcp	XNS Mail	[SXA]
xns-mail	58/udp	XNS Mail	[SXA]
	59/tcp	any private file service	[JBP]

	59/udp	any private file service	[JBP]
	60/tcp	Unassigned	[JBP]
	60/udp	Unassigned	[JBP]
ni-mail	61/tcp	NI MAIL	[5,SK8]
ni-mail	61/udp	NI MAIL	[5,SK8]
acas	62/tcp	ACA Services	[EXW]
acas	62/udp	ACA Services	[EXW]
via-ftp	63/tcp	VIA Systems - FTP	[DXD]
via-ftp	63/udp	VIA Systems - FTP	[DXD]
covia	64/tcp	Communications Integrator (CI)	[TXD]
covia	64/udp	Communications Integrator (CI)	[TXD]
tacacs-ds	65/tcp	TACACS-Database Service	[3,KH43]
tacacs-ds	65/udp	TACACS-Database Service	[3,KH43]
sql*net	66/tcp	Oracle SQL*NET	[JFH2]
sql*net	66/udp	Oracle SQL*NET	[JFH2]
bootps	67/tcp	Bootstrap Protocol Server	[36,WJC2]
bootps	67/udp	Bootstrap Protocol Server	[36,WJC2]
bootpc	68/tcp	Bootstrap Protocol Client	[36,WJC2]
bootpc	68/udp	Bootstrap Protocol Client	[36,WJC2]
tftp	69/tcp	Trivial File Transfer	[126,DDC1]
tftp	69/udp	Trivial File Transfer	[126,DDC1]
gopher	70/tcp	Gopher	[MXC1]
gopher	70/udp	Gopher	[MXC1]
netrjs-1	71/tcp	Remote Job Service	[10,RTB3]
netrjs-1	71/udp	Remote Job Service	[10,RTB3]
netrjs-2	72/tcp	Remote Job Service	[10,RTB3]
netrjs-2	72/udp	Remote Job Service	[10,RTB3]
netrjs-3	73/tcp	Remote Job Service	[10,RTB3]
netrjs-3	73/udp	Remote Job Service	[10,RTB3]
netrjs-4	74/tcp	Remote Job Service	[10,RTB3]
netrjs-4	74/udp	Remote Job Service	[10,RTB3]
	75/tcp	any private dial out service	[JBP]
	75/udp	any private dial out service	[JBP]
	76/tcp	Unassigned	[JBP]
	76/udp	Unassigned	[JBP]
	77/tcp	any private RJE service	[JBP]
	77/udp	any private RJE service	[JBP]
vettcp	78/tcp	vettcp	[CXL1]
vettcp	78/udp	vettcp	[CXL1]
finger	79/tcp	Finger	[52,KLH]
finger	79/udp	Finger	[52,KLH]
www	80/tcp	World Wide Web HTTP	[TXL]
www	80/udp	World Wide Web HTTP	[TXL]
hosts2-ns	81/tcp	HOSTS2 Name Server	[EAK1]
hosts2-ns	81/udp	HOSTS2 Name Server	[EAK1]
xfer	82/tcp	XFER Utility	[TXS2]
xfer	82/udp	XFER Utility	[TXS2]
mit-ml-dev	83/tcp	MIT ML Device	[DXR3]

mit-ml-dev	83/udp	MIT ML Device	[DXR3]
ctf	84/tcp	Common Trace Facility	[HXT]
ctf	84/udp	Common Trace Facility	[HXT]
mit-ml-dev	85/tcp	MIT ML Device	[DXR3]
mit-ml-dev	85/udp	MIT ML Device	[DXR3]
mfcobol	86/tcp	Micro Focus Cobol	[SXE]
mfcobol	86/udp	Micro Focus Cobol	[SXE]
	87/tcp	any private terminal link	[JBP]
	87/udp	any private terminal link	[JBP]
kerberos	88/tcp	Kerberos	[BCN]
kerberos	88/udp	Kerberos	[BCN]
su-mit-tg	89/tcp	SU/MIT Telnet Gateway	[MRC]
su-mit-tg	89/udp	SU/MIT Telnet Gateway	[MRC]
dnsix	90/tcp	DNSIX Securit Attribute Token Map	[CXW1]
dnsix	90/udp	DNSIX Securit Attribute Token Map	[CXW1]
mit-dov	91/tcp	MIT Dover Spooler	[EBM]
mit-dov	91/udp	MIT Dover Spooler	[EBM]
npp	92/tcp	Network Printing Protocol	[LXM]
npp	92/udp	Network Printing Protocol	[LXM]
dcp	93/tcp	Device Control Protocol	[DT15]
dcp	93/udp	Device Control Protocol	[DT15]
objcall	94/tcp	Tivoli Object Dispatcher	[TXB1]
objcall	94/udp	Tivoli Object Dispatcher	[TXB1]
supdup	95/tcp	SUPDUP	[27,MRC]
supdup	95/udp	SUPDUP	[27,MRC]
dixie	96/tcp	DIXIE Protocol Specification	[TXH1]
dixie	96/udp	DIXIE Protocol Specification	[TXH1]
swift-rvf	97/tcp	Swift Remote Vitural File Protocol	[MXR]
swift-rvf	97/udp	Swift Remote Vitural File Protocol	[MXR]
tacnews	98/tcp	TAC News	[ANM2]
tacnews	98/udp	TAC News	[ANM2]
metagram	99/tcp	Metagram Relay	[GEOF]
metagram	99/udp	Metagram Relay	[GEOF]
newacct	100/tcp	[unauthorized use]	
hostname	101/tcp	NIC Host Name Server	[54,ANM2]
hostname	101/udp	NIC Host Name Server	[54,ANM2]
iso-tsap	102/tcp	ISO-TSAP	[16,MTR]
iso-tsap	102/udp	ISO-TSAP	[16,MTR]
gppitnp	103/tcp	Genesis Point-to-Point Trans Net	[PXM1]
gppitnp	103/udp	Genesis Point-to-Point Trans Net	[PXM1]
acr-nema	104/tcp	ACR-NEMA Digital Imag. & Comm. 300	[PXM1]
acr-nema	104/udp	ACR-NEMA Digital Imag. & Comm. 300	[PXM1]
csnet-ns	105/tcp	Mailbox Name Nameserver	[127,MS56]
csnet-ns	105/udp	Mailbox Name Nameserver	[127,MS56]
3com-tsmux	106/tcp	3COM-TSMUX	[JXS5]
3com-tsmux	106/udp	3COM-TSMUX	[JXS5]
rtelnet	107/tcp	Remote Telnet Service	[101,JBP]
rtelnet	107/udp	Remote Telnet Service	[101,JBP]

snagas	108/tcp	SNA Gateway Access Server	[KXM]
snagas	108/udp	SNA Gateway Access Server	[KXM]
pop2	109/tcp	Post Office Protocol - Version 2	[14,JKR1]
pop2	109/udp	Post Office Protocol - Version 2	[14,JKR1]
pop3	110/tcp	Post Office Protocol - Version 3	[122,MTR]
pop3	110/udp	Post Office Protocol - Version 3	[122,MTR]
sunrpc	111/tcp	SUN Remote Procedure Call	[DXG]
sunrpc	111/udp	SUN Remote Procedure Call	[DXG]
mcidas	112/tcp	McIDAS Data Transmission Protocol	[GXD]
mcidas	112/udp	McIDAS Data Transmission Protocol	[GXD]
auth	113/tcp	Authentication Service	[130,MCSJ]
auth	113/udp	Authentication Service	[130,MCSJ]
audionews	114/tcp	Audio News Multicast	[MXF2]
audionews	114/udp	Audio News Multicast	[MXF2]
sftp	115/tcp	Simple File Transfer Protocol	[73,MKL1]
sftp	115/udp	Simple File Transfer Protocol	[73,MKL1]
ansanotify	116/tcp	ANSA REX Notify	[NXH]
ansanotify	116/udp	ANSA REX Notify	[NXH]
uucp-path	117/tcp	UUCP Path Service	[44,MAE]
uucp-path	117/udp	UUCP Path Service	[44,MAE]
sqlserv	118/tcp	SQL Services	[LXB3]
sqlserv	118/udp	SQL Services	[LXB3]
nntp	119/tcp	Network News Transfer Protocol	[65,PL4]
nntp	119/udp	Network News Transfer Protocol	[65,PL4]
cfdptkt	120/tcp	CFDPTKT	[JXO3]
cfdptkt	120/udp	CFDPTKT	[JXO3]
erpc	121/tcp	Encore Expedited Remote Pro.Call	[132,JXO]
erpc	121/udp	Encore Expedited Remote Pro.Call	[132,JXO]
smakynet	122/tcp	SMAKYNET	[MXO]
smakynet	122/udp	SMAKYNET	[MXO]
ntp	123/tcp	Network Time Protocol	[80,DLM1]
ntp	123/udp	Network Time Protocol	[80,DLM1]
ansatrader	124/tcp	ANSA REX Trader	[NXH]
ansatrader	124/udp	ANSA REX Trader	[NXH]
locus-map	125/tcp	Locus PC-Interface Net Map Ser	[137,EP53]
locus-map	125/udp	Locus PC-Interface Net Map Ser	[137,EP53]
unitary	126/tcp	Unisys Unitary Login	[FEIL]
unitary	126/udp	Unisys Unitary Login	[FEIL]
locus-con	127/tcp	Locus PC-Interface Conn Server	[137,EP53]
locus-con	127/udp	Locus PC-Interface Conn Server	[137,EP53]
gss-xlicen	128/tcp	GSS X License Verification	[JXL]
gss-xlicen	128/udp	GSS X License Verification	[JXL]
pwdgen	129/tcp	Password Generator Protocol	[141,FJW]
pwdgen	129/udp	Password Generator Protocol	[141,FJW]
cisco-fna	130/tcp	cisco FNATIVE	[WXB]
cisco-fna	130/udp	cisco FNATIVE	[WXB]
cisco-tna	131/tcp	cisco TNATIVE	[WXB]
cisco-tna	131/udp	cisco TNATIVE	[WXB]

cisco-sys	132/tcp	cisco SYSMAINT	[WXB]
cisco-sys	132/udp	cisco SYSMAINT	[WXB]
statsrv	133/tcp	Statistics Service	[DLM1]
statsrv	133/udp	Statistics Service	[DLM1]
ingres-net	134/tcp	INGRES-NET Service	[MXB]
ingres-net	134/udp	INGRES-NET Service	[MXB]
loc-srv	135/tcp	Location Service	[JXP]
loc-srv	135/udp	Location Service	[JXP]
profile	136/tcp	PROFILE Naming System	[LLP]
profile	136/udp	PROFILE Naming System	[LLP]
netbios-ns	137/tcp	NETBIOS Name Service	[JBP]
netbios-ns	137/udp	NETBIOS Name Service	[JBP]
netbios-dgm	138/tcp	NETBIOS Datagram Service	[JBP]
netbios-dgm	138/udp	NETBIOS Datagram Service	[JBP]
netbios-ssn	139/tcp	NETBIOS Session Service	[JBP]
netbios-ssn	139/udp	NETBIOS Session Service	[JBP]
emfis-data	140/tcp	EMFIS Data Service	[GB7]
emfis-data	140/udp	EMFIS Data Service	[GB7]
emfis-cntl	141/tcp	EMFIS Control Service	[GB7]
emfis-cntl	141/udp	EMFIS Control Service	[GB7]
bl-idm	142/tcp	Britton-Lee IDM	[SXS1]
bl-idm	142/udp	Britton-Lee IDM	[SXS1]
imap2	143/tcp	Interim Mail Access Protocol v2	[MRC]
imap2	143/udp	Interim Mail Access Protocol v2	[MRC]
news	144/tcp	NewS	[JAG]
news	144/udp	NewS	[JAG]
uaac	145/tcp	UAAC Protocol	[DAG4]
uaac	145/udp	UAAC Protocol	[DAG4]
iso-tp0	146/tcp	ISO-IP0	[86,MTR]
iso-tp0	146/udp	ISO-IP0	[86,MTR]
iso-ip	147/tcp	ISO-IP	[MTR]
iso-ip	147/udp	ISO-IP	[MTR]
cronus	148/tcp	CRONUS-SUPPORT	[135,JXB]
cronus	148/udp	CRONUS-SUPPORT	[135,JXB]
aed-512	149/tcp	AED 512 Emulation Service	[AXB]
aed-512	149/udp	AED 512 Emulation Service	[AXB]
sql-net	150/tcp	SQL-NET	[MXP]
sql-net	150/udp	SQL-NET	[MXP]
hems	151/tcp	HEMS	[87,CXT]
hems	151/udp	HEMS	[87,CXT]
bftp	152/tcp	Background File Transfer Program	[AD14]
bftp	152/udp	Background File Transfer Program	[AD14]
sgmp	153/tcp	SGMP	[37,MS9]
sgmp	153/udp	SGMP	[37,MS9]
netsc-prod	154/tcp	NETSC	[SH37]
netsc-prod	154/udp	NETSC	[SH37]
netsc-dev	155/tcp	NETSC	[SH37]
netsc-dev	155/udp	NETSC	[SH37]

sqlsrv	156/tcp	SQL Service	[CMR]
sqlsrv	156/udp	SQL Service	[CMR]
knet-cmp	157/tcp	KNET/VM Command/Message Protocol	[77,GSM11]
knet-cmp	157/udp	KNET/VM Command/Message Protocol	[77,GSM11]
pcmail-srv	158/tcp	PCMail Server	[19,MXL]
pcmail-srv	158/udp	PCMail Server	[19,MXL]
nss-routing	159/tcp	NSS-Routing	[JXR]
nss-routing	159/udp	NSS-Routing	[JXR]
sgmp-traps	160/tcp	SGMP-TRAPS	[37,MS9]
sgmp-traps	160/udp	SGMP-TRAPS	[37,MS9]
snmp	161/tcp	SNMP	[15,MTR]
snmp	161/udp	SNMP	[15,MTR]
snmptrap	162/tcp	SNMPTRAP	[15,MTR]
snmptrap	162/udp	SNMPTRAP	[15,MTR]
cmip-man	163/tcp	CMIP/TCP Manager	[4,AXB1]
cmip-man	163/udp	CMIP/TCP Manager	[4,AXB1]
cmip-agent	164/tcp	CMIP/TCP Agent	[4,AXB1]
smip-agent	164/udp	CMIP/TCP Agent	[4,AXB1]
xns-courier	165/tcp	Xerox	144,SXA]
xns-courier	165/udp	Xerox	[144,SXA]
s-net	166/tcp	Sirius Systems	[BXL]
s-net	166/udp	Sirius Systems	[BXL]
namp	167/tcp	NAMP	[MS9]
namp	167/udp	NAMP	[MS9]
rsvd	168/tcp	RSVD	[NT12]
rsvd	168/udp	RSVD	[NT12]
send	169/tcp	SEND	[WDW11]
send	169/udp	SEND	[WDW11]
print-srv	170/tcp	Network PostScript	[BKR]
print-srv	170/udp	Network PostScript	[BKR]
multiplex	171/tcp	Network Innovations Multiplex	[KXD]
multiplex	171/udp	Network Innovations Multiplex	[KXD]
cl/1	172/tcp	Network Innovations CL/1	[KXD]
cl/1	172/udp	Network Innovations CL/1	[KXD]
xyplex-mux	173/tcp	Xyplex	[BXS]
xyplex-mux	173/udp	Xyplex	[BXS]
mailq	174/tcp	MAILQ	[RXZ]
mailq	174/udp	MAILQ	[RXZ]
vmnet	175/tcp	VMNET	[CXT]
vmnet	175/udp	VMNET	[CXT]
genrad-mux	176/tcp	GENRAD-MUX	[RXT]
genrad-mux	176/udp	GENRAD-MUX	[RXT]
xdmcp	177/tcp	X Display Manager Control Protocol	[RWS4]
xdmcp	177/udp	X Display Manager Control Protocol	[RWS4]
nextstep	178/tcp	NextStep Window Server	[LXH]
NextStep	178/udp	NextStep Window Server	[LXH]
bgp	179/tcp	Border Gateway Protocol	[KSL]
bgp	179/udp	Border Gateway Protocol	[KSL]

ris	180/tcp	Intergraph	[DXB]
ris	180/udp	Intergraph	[DXB]
unify	181/tcp	Unify	[VXS]
unify	181/udp	Unify	[VXS]
audit	182/tcp	Unisys Audit SITP	[GXG]
audit	182/udp	Unisys Audit SITP	[GXG]
ocbinder	183/tcp	OCBinder	[JXO1]
ocbinder	183/udp	OCBinder	[JXO1]
ocserver	184/tcp	OCServer	[JXO1]
ocserver	184/udp	OCServer	[JXO1]
remote-kis	185/tcp	Remote-KIS	[RXD1]
remote-kis	185/udp	Remote-KIS	[RXD1]
kis	186/tcp	KIS Protocol	[RXD1]
kis	186/udp	KIS Protocol	[RXD1]
aci	187/tcp	Application Communication Interface	[RXC1]
aci	187/udp	Application Communication Interface	[RXC1]
mumps	188/tcp	Plus Five's MUMPS	[HS23]
mumps	188/udp	Plus Five's MUMPS	[HS23]
qft	189/tcp	Queued File Transport	[WXS]
qft	189/udp	Queued File Transport	[WXS]
gacp	190/tcp	Gateway Access Control Protocol	[PCW]
cacp	190/udp	Gateway Access Control Protocol	[PCW]
prospero	191/tcp	Prospero	[BCN]
prospero	191/udp	Prospero	[BCN]
osu-nms	192/tcp	OSU Network Monitoring System	[DXK]
osu-nms	192/udp	OSU Network Monitoring System	[DXK]
srmp	193/tcp	Spider Remote Monitoring Protocol	[TXS]
srmp	193/udp	Spider Remote Monitoring Protocol	[TXS]
irc	194/tcp	Internet Relay Chat Protocol	[JXO2]
irc	194/udp	Internet Relay Chat Protocol	[JXO2]
dn6-nlm-aud	195/tcp	DNSIX Network Level Module Audit	[LL69]
dn6-nlm-aud	195/udp	DNSIX Network Level Module Audit	[LL69]
dn6-smm-red	196/tcp	DNSIX Session Mgt Module Audit Redir	[LL69]
dn6-smm-red	196/udp	DNSIX Session Mgt Module Audit Redir	[LL69]
dls	197/tcp	Directory Location Service	[SXB]
dls	197/udp	Directory Location Service	[SXB]
dls-mon	198/tcp	Directory Location Service Monitor	[SXB]
dls-mon	198/udp	Directory Location Service Monitor	[SXB]
smux	199/tcp	SMUX	[MTR]
smux	199/udp	SMUX	[MTR]
src	200/tcp	IBM System Resource Controller	[GXM]
src	200/udp	IBM System Resource Controller	[GXM]
at-rtmp	201/tcp	AppleTalk Routing Maintenance	[RXC]
at-rtmp	201/udp	AppleTalk Routing Maintenance	[RXC]
at-nbp	202/tcp	AppleTalk Name Binding	[RXC]
at-nbp	202/udp	AppleTalk Name Binding	[RXC]
at-3	203/tcp	AppleTalk Unused	[RXC]
at-3	203/udp	AppleTalk Unused	[RXC]

at-echo	204/tcp	AppleTalk Echo	[RXC]
at-echo	204/udp	AppleTalk Echo	[RXC]
at-5	205/tcp	AppleTalk Unused	[RXC]
at-5	205/udp	AppleTalk Unused	[RXC]
at-zis	206/tcp	AppleTalk Zone Information	[RXC]
at-zis	206/udp	AppleTalk Zone Information	[RXC]
at-7	207/tcp	AppleTalk Unused	[RXC]
at-7	207/udp	AppleTalk Unused	[RXC]
at-8	208/tcp	AppleTalk Unused	[RXC]
at-8	208/udp	AppleTalk Unused	[RXC]
tam	209/tcp	Trivial Authenticated Mail Protocol	[DXB1]
tam	209/udp	Trivial Authenticated Mail Protocol	[DXB1]
z39.50	210/tcp	ANSI Z39.50	[MXN]
z39.50	210/udp	ANSI Z39.50	[MXN]
914c/g	211/tcp	Texas Instruments 914C/G Terminal	[BXH1]
914c/g	211/udp	Texas Instruments 914C/G Terminal	[BXH1]
anet	212/tcp	ATEXSSTR	[JXT]
anet	212/udp	ATEXSSTR	[JXT]
ipx	213/tcp	IPX	[DP666]
ipx	213/udp	IPX	[DP666]
vmpwscs	214/tcp	VM PWSCS	[DXS]
vmpwscs	214/udp	VM PWSCS	[DXS]
softpc	215/tcp	Insignia Solutions	[MXT]
softpc	215/udp	Insignia Solutions	[MXT]
atls	216/tcp	Access Technology License Server	[LXD]
atls	216/udp	Access Technology License Server	[LXD]
dbase	217/tcp	dBASE Unix	[DXG1]
dbase	217/udp	dBASE Unix	[DXG1]
mpp	218/tcp	Netix Message Posting Protocol	[STY]
mpp	218/udp	Netix Message Posting Protocol	[STY]
uarps	219/tcp	Unisys ARPs	[AXM1]
uarps	219/udp	Unisys ARPs	[AXM1]
imap3	220/tcp	Interactive Mail Access Protocol v3	[JXR2]
imap3	220/udp	Interactive Mail Access Protocol v3	[JXR2]
fln-spx	221/tcp	Berkeley rlogind with SPX auth	[KXA]
fln-spx	221/udp	Berkeley rlogind with SPX auth	[KXA]
fsh-spx	222/tcp	Berkeley rshd with SPX auth	[KXA]
fsh-spx	222/udp	Berkeley rshd with SPX auth	[KXA]
cdc	223/tcp	Certificate Distribution Center	[KXA]
cdc	223/udp	Certificate Distribution Center	[KXA]
	224-241	Reserved	[JBP]
sur-meas	243/tcp	Survey Measurement	[6,DDC1]
sur-meas	243/udp	Survey Measurement	[6,DDC1]
link	245/tcp	LINK	[1,RDB2]
link	245/udp	LINK	[1,RDB2]
dsp3270	246/tcp	Display Systems Protocol	[39,WJS1]

dsp3270	246/udp	Display Systems Protocol	[39,WJS1]
	247-255	Reserved	[JBP]
pawserv	345/tcp	Perf Analysis Workbench	
pawserv	345/udp	Perf Analysis Workbench	
zserv	346/tcp	Zebra server	
zserv	346/udp	Zebra server	
fatserv	347/tcp	Fatmen Server	
fatserv	347/udp	Fatmen Server	
clearcase	371/tcp	Clearcase	[DXL1]
clearcase	371/udp	Clearcase	[DXL1]
ulistserv	372/tcp	Unix Listserv	[AXK]
ulistserv	372/udp	Unix Listserv	[AXK]
legent-1	373/tcp	Legent Corporation	[KXB]
legent-1	373/udp	Legent Corporation	[KXB]
legent-2	374/tcp	Legent Corporation	[KXB]
legent-2	374/udp	Legent Corporation	[KXB]
exec	512/tcp	remote process execution; authentication performed using passwords and UNIX loppgin names	
biff	512/udp	used by mail system to notify users of new mail received; currently receives messages only from processes on the same machine	
login	513/tcp	remote login a la telnet; automatic authentication performed based on priviledged port numbers and distributed data bases which identify "authentication domains"	
who	513/udp	maintains data bases showing who’s logged in to machines on a local net and the load average of the machine	
cmd	514/tcp	like exec, but automatic authentication is performed as for login server	
syslog	514/udp		
printer	515/tcp	spooler	
printer	515/udp	spooler	
talk	517/tcp	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)	
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/tcp
   ntalk            518/udp
   utime            519/tcp    unixtime
   utime            519/udp    unixtime
   efs              520/tcp    extended file name server
   router           520/udp    local routing process (on site);
                               uses variant of Xerox NS routing
                               information protocol
   timed            525/tcp    timeserver
   timed            525/udp    timeserver
   tempo            526/tcp    newdate
   tempo            526/udp    newdate
   courier          530/tcp    rpc
   courier          530/udp    rpc
   conference       531/tcp    chat
   conference       531/udp    chat
   netnews          532/tcp    readnews
   netnews          532/udp    readnews
   netwall          533/tcp    for emergency broadcasts
   netwall          533/udp    for emergency broadcasts
   uucp             540/tcp    uucpd
   uucp             540/udp    uucpd
   klogin           543/tcp
   klogin           543/udp
   kshell           544/tcp    krcmd
   kshell           544/udp    krcmd
   new-rwho         550/tcp    new-who
   new-rwho         550/udp    new-who
   dsf              555/tcp
   dsf              555/udp
   remotefs         556/tcp    rfs server
   remotefs         556/udp    rfs server
   rmonitor         560/tcp    rmonitord
   rmonitor         560/udp    rmonitord
   monitor          561/tcp
   monitor          561/udp
   chshell          562/tcp    chcmd
   chshell          562/udp    chcmd
   9pfs             564/tcp    plan 9 file service
   9pfs             564/udp    plan 9 file service
   whoami           565/tcp    whoami
   whoami           565/udp    whoami
   meter            570/tcp    demon
   meter            570/udp    demon
   meter            571/tcp    udemon
   meter            571/udp    udemon
```

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   ipcserver       600/tcp    Sun IPC server
   ipcserver       600/udp    Sun IPC server
   nqs             607/tcp    nqs
   nqs             607/udp    nqs
   mdqs            666/tcp
   mdqs            666/udp
   elcsd           704/tcp    errlog copy/server daemon
   elcsd           704/udp    errlog copy/server daemon
   netcp           740/tcp    NETscout Control Protocol          [AXS2]
   netcp           740/udp    NETscout Control Protocol          [AXS2]
   netgw           741/tcp    netGW                               [OXK]
   netgw           741/udp    netGW                               [OXK]
   netrcs          742/tcp    Network based Rev. Cont. Sys.      [GXC2]
   netrcs          742/udp    Network based Rev. Cont. Sys.      [GXC2]
   flexlm          744/tcp    Flexible License Manager           [MXC2]
   flexlm          744/udp    Flexible License Manager           [MXC2]
   fujitsu-dev     747/tcp    Fujitsu Device Control
   fujitsu-dev     747/udp    Fujitsu Device Control
   ris-cm          748/tcp    Russell Info Sci Calendar Manager
   ris-cm          748/udp    Russell Info Sci Calendar Manager
   kerberos-adm    749/tcp    kerberos administration
   kerberos-adm    749/udp    kerberos administration
   rfile           750/tcp
   loadav          750/udp
   pump            751/tcp
   pump            751/udp
   qrh             752/tcp
   qrh             752/udp
   rrh             753/tcp
   rrh             753/udp
   tell            754/tcp     send
   tell            754/udp     send
   nlogin          758/tcp
   nlogin          758/udp
   con             759/tcp
   con             759/udp
   ns              760/tcp
   ns              760/udp
   rxe             761/tcp
   rxe             761/udp
   quotad          762/tcp
   quotad          762/udp
   cycleserv       763/tcp
   cycleserv       763/udp
   omserv          764/tcp
   omserv          764/udp
   webster         765/tcp
   webster         765/udp
```

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   phonebook       767/tcp    phone
   phonebook       767/udp    phone
   vid             769/tcp
   vid             769/udp
   cadlock         770/tcp
   cadlock         770/udp
   rtip            771/tcp
   rtip            771/udp
   cycleserv2      772/tcp
   cycleserv2      772/udp
   submit          773/tcp
   notify          773/udp
   rpasswd         774/tcp
   acmaint_dbd     774/udp
   entomb          775/tcp
   acmaint_transd  775/udp
   wpages          776/tcp
   wpages          776/udp
   wpgs            780/tcp
   wpgs            780/udp
   hp-collector    781/tcp        hp performance data collector
   hp-collector    781/udp        hp performance data collector
   hp-managed-node 782/tcp        hp performance data managed node
   hp-managed-node 782/udp        hp performance data managed node
   hp-alarm-mgr    783/tcp        hp performance data alarm manager
   hp-alarm-mgr    783/udp        hp performance data alarm manager
   mdbs_daemon     800/tcp
   mdbs_daemon     800/udp
   device          801/tcp
   device          801/udp
   xtreelic        996/tcp        XTREE License Server
   xtreelic        996/udp        XTREE License Server
   maitrd          997/tcp
   maitrd          997/udp
   busboy          998/tcp
   puparp          998/udp
   garcon          999/tcp
   applix          999/udp        Applix ac
   puprouter       999/tcp
   puprouter       999/udp
   cadlock         1000/tcp
   ock             1000/udp
```

REGISTERED PORT NUMBERS

The Registered Ports are not controlled by the IANA and on most systems can be used by ordinary user processes or programs executed by ordinary users.

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. While the IANA can not control uses of these ports it does register or list uses of these ports as a convienence to the community.

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

The Registered Ports are in the range 1024-65535.

Port Assignments:

Keyword	Decimal	Description	References
blackjack	1025/tcp	network blackjack	
blackjack	1025/udp	network blackjack	
hermes	1248/tcp		
hermes	1248/udp		
bbn-mmc	1347/tcp	multi media conferencing	
bbn-mmc	1347/udp	multi media conferencing	
bbn-mmx	1348/tcp	multi media conferencing	
bbn-mmx	1348/udp	multi media conferencing	
sbook	1349/tcp	Registration Network Protocol	[SXS4]
sbook	1349/udp	Registration Network Protocol	[SXS4]
editbench	1350/tcp	Registration Network Protocol	[SXS4]
editbench	1350/udp	Registration Network Protocol	[SXS4]
equationbuilder	1351/tcp	Digital Tool Works (MIT)	[TXT1]
equationbuilder	1351/udp	Digital Tool Works (MIT)	[TXT1]
lotusnote	1352/tcp	Lotus Note	[GXP1]
lotusnote	1352/udp	Lotus Note	[GXP1]
ingreslock	1524/tcp	ingres	
ingreslock	1524/udp	ingres	
orasrv	1525/tcp	oracle	
orasrv	1525/udp	oracle	
prospero-np	1525/tcp	prospero non-privileged	
prospero-np	1525/udp	prospero non-privileged	
tlisrv	1527/tcp	oracle	
tlisrv	1527/udp	oracle	
coauthor	1529/tcp	oracle	

```
   coauthor        1529/udp   oracle
   issd            1600/tcp
   issd            1600/udp
   nkd             1650/tcp
   nkd             1650/udp
   callbook        2000/tcp
   callbook        2000/udp
   dc              2001/tcp
   wizard          2001/udp    curry
   globe           2002/tcp
   globe           2002/udp
   mailbox         2004/tcp
   emce            2004/udp    CCWS mm conf
   berknet         2005/tcp
   oracle          2005/udp
   invokator       2006/tcp
   raid-cc         2006/udp    raid
   dectalk         2007/tcp
   raid-am         2007/udp
   conf            2008/tcp
   terminaldb      2008/udp
   news            2009/tcp
   whosockami      2009/udp
   search          2010/tcp
   pipe_server     2010/udp
   raid-cc         2011/tcp    raid
   servserv        2011/udp
   ttyinfo         2012/tcp
   raid-ac         2012/udp
   raid-am         2013/tcp
   raid-cd         2013/udp
   troff           2014/tcp
   raid-sf         2014/udp
   cypress         2015/tcp
   raid-cs         2015/udp
   bootserver      2016/tcp
   bootserver      2016/udp
   cypress-stat    2017/tcp
   bootclient      2017/udp
   terminaldb      2018/tcp
   rellpack        2018/udp
   whosockami      2019/tcp
   about           2019/udp
   xinupageserver  2020/tcp
   xinupageserver  2020/udp
   servexec        2021/tcp
   xinuexpansion1  2021/udp
   down            2022/tcp
```

```
   xinuexpansion2  2022/udp
   xinuexpansion3  2023/tcp
   xinuexpansion3  2023/udp
   xinuexpansion4  2024/tcp
   xinuexpansion4  2024/udp
   ellpack         2025/tcp
   xribs           2025/udp
   scrabble        2026/tcp
   scrabble        2026/udp
   shadowserver    2027/tcp
   shadowserver    2027/udp
   submitserver    2028/tcp
   submitserver    2028/udp
   device2         2030/tcp
   device2         2030/udp
   blackboard      2032/tcp
   blackboard      2032/udp
   glogger         2033/tcp
   glogger         2033/udp
   scoremgr        2034/tcp
   scoremgr        2034/udp
   imsldoc         2035/tcp
   imsldoc         2035/udp
   objectmanager   2038/tcp
   objectmanager   2038/udp
   lam             2040/tcp
   lam             2040/udp
   interbase       2041/tcp
   interbase       2041/udp
   isis            2042/tcp
   isis            2042/udp
   isis-bcast      2043/tcp
   isis-bcast      2043/udp
   rimsl           2044/tcp
   rimsl           2044/udp
   cdfunc          2045/tcp
   cdfunc          2045/udp
   sdfunc          2046/tcp
   sdfunc          2046/udp
   dls             2047/tcp
   dls             2047/udp
   dls-monitor     2048/tcp
   dls-monitor     2048/udp
   shilp           2049/tcp
   shilp           2049/udp
   www-dev         2784/tcp   world wide web - development
   www-dev         2784/udp   world wide web - development
   NSWS            3049/tcp
```

```
   NSWS            3049/ddddp
   rfa             4672/tcp   remote file access server
   rfa             4672/udp   remote file access server
   commplex-main   5000/tcp
   commplex-main   5000/udp
   commplex-link   5001/tcp
   commplex-link   5001/udp
   rfe             5002/tcp   radio free ethernet
   rfe             5002/udp   radio free ethernet
   rmonitor_secure 5145/tcp
   rmonitor_secure 5145/udp
   padl2sim        5236/tcp
   padl2sim        5236/udp
   sub-process     6111/tcp   HP SoftBench Sub-Process Control
   sub-process     6111/udp   HP SoftBench Sub-Process Control
   xdsxdm          6558/udp
   xdsxdm          6558/tcp
   afs3-fileserver 7000/tcp   file server itself
   afs3-fileserver 7000/udp   file server itself
   afs3-callback   7001/tcp   callbacks to cache managers
   afs3-callback   7001/udp   callbacks to cache managers
   afs3-prserver   7002/tcp   users & groups database
   afs3-prserver   7002/udp   users & groups database
   afs3-vlserver   7003/tcp   volume location database
   afs3-vlserver   7003/udp   volume location database
   afs3-kaserver   7004/tcp   AFS/Kerberos authentication service
   afs3-kaserver   7004/udp   AFS/Kerberos authentication service
   afs3-volser     7005/tcp   volume managment server
   afs3-volser     7005/udp   volume managment server
   afs3-errors     7006/tcp   error interpretation service
   afs3-errors     7006/udp   error interpretation service
   afs3-bos        7007/tcp   basic overseer process
   afs3-bos        7007/udp   basic overseer process
   afs3-update     7008/tcp   server-to-server updater
   afs3-update     7008/udp   server-to-server updater
   afs3-rmtsys     7009/tcp   remote cache manager service
   afs3-rmtsys     7009/udp   remote cache manager service
   man             9535/tcp
   man             9535/udp
   isode-dua       17007/tcp
   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 Systems on this Subnet	[43,JBP]
224.0.0.2	All Routers on this Subnet	[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]
224.0.0.7	ST Routers	[KS14]
224.0.0.8	ST Hosts	[KS14]
224.0.0.9	RIP2 Routers	[GSM11]
224.0.0.10-224.0.0.255	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]
224.0.1.5	Artificial Horizons - Aviator	[BXF]
224.0.1.6	NSS - Name Service Server	[BXS2]
224.0.1.7	AUDIONEWS - Audio News Multicast	[MXF2]
224.0.1.8	SUN NIS+ Information Service	[CXM3]
224.0.1.9	MTP Multicast Transport Protocol	[SXA]
224.0.1.10-224.0.1.255	Unassigned	[JBP]
224.0.2.1	"rwho" Group (BSD) (unofficial)	[JBP]
224.0.2.2	SUN RPC PMAPPROC_CALLIT	[BXE1]
224.0.3.0-224.0.3.255	RFE Generic Service	[DXS3]
224.0.4.0-224.0.4.255	RFE Individual Conferences	[DXS3]
224.1.0.0-224.1.255.255	ST Multicast Groups	[KS14]
224.2.0.0-224.2.255.255	Multimedia Conference Calls	[SC3]
232.x.x.x	VMTP transient groups	[17,DRC3]

These addresses are listed in the Domain Name Service under MCAST.NET and 224.IN-ADDR.ARPA.

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 four assigned TOS values: low delay, high throughput, high reliability, and low cost; in each case, the TOS value is used to indicate "better". Only one TOS value or property can be requested in any one IP datagram.

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 (8 decimal, 1000 binary) or high throughput (4 decimail, 0100 binary).

The following are recommended values for TOS:

	----- Type-of-Service Value -----	
Protocol	TOS Value	
TELNET (1)	1000	(minimize delay)
FTP		
Control	1000	(minimize delay)
Data (2)	0100	(maximize throughput)
TFTP	1000	(minimize delay)
SMTP (3)		
Command phase	1000	(minimize delay)
DATA phase	0100	(maximize throughput)
Domain Name Service		
UDP Query	1000	(minimize delay)
TCP Query	0000	
Zone Transfer	0100	(maximize throughput)
NNTP	0001	(minimize monetary cost)

ICMP		
Errors	0000	
Requests	0000 (4)	
Responses	<same as request> (4)	
Any IGP	0010	(maximize reliability)
EGP	0000	
SNMP	0010	(maximize reliability)
BOOTP	0000	

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 the default TOS (0000).

(4) Although ICMP request messages are normally sent with the default TOS, there are sometimes good reasons why they would be sent with some other TOS value. An ICMP response always uses the same TOS value as was used in the corresponding ICMP request message.

An application may (at the request of the user) substitute 0001 (minimize monetary cost) for any of the above values.

IP TIME TO LIVE PARAMETER

The current recommended default time to live (TTL) for the Internet Protocol (IP) [45,105] is 64.

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	[PM1]

In the Internet (IN) class the following TYPEs and QTYPEs are defined:

TYPE	value and meaning	
A	1 a host address	[82]
NS	2 an authoritative name server	[82]
MD	3 a mail destination (Obsolete - use MX)	[82]
MF	4 a mail forwarder (Obsolete - use MX)	[82]
CNAME	5 the canonical name for an alias	[82]
SOA	6 marks the start of a zone of authority	[82]
MB	7 a mailbox domain name (EXPERIMENTAL)	[82]
MG	8 a mail group member (EXPERIMENTAL)	[82]
MR	9 a mail rename domain name (EXPERIMENTAL)	[82]
NULL	10 a null RR (EXPERIMENTAL)	[82]
WKS	11 a well known service description	[82]
PTR	12 a domain name pointer	[82]
HINFO	13 host information	[82]
MINFO	14 mailbox or mail list information	[82]
MX	15 mail exchange	[82]
TXT	16 text strings	[82]
RP	17 for Responsible Person	[172]
AFSDB	18 for AFS Data Base location	[172]
X25	19 for X.25 PSDN address	[172]
ISDN	20 for ISDN address	[172]
RT	21 for Route Through	[172]

NSAP	22 for NSAP address, NSAP style A record	[174]
NSAP-PTR	23 for domain name pointer, NSAP style	[174]
AXFR	252 transfer of an entire zone	[82]
MAILB	253 mailbox-related RRs (MB, MG or MR)	[82]
MAILA	254 mail agent RRs (Obsolete - see MX)	[82]
*	255 A request for all records	[82]

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] describes an addition to the Bootstrap Protocol (BOOTP).

Vendor Extensions are listed below:

Tag	Name	Data Length	Meaning
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-1157 [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-1155 [120], and the "Management Information Base for Network Management of TCP/IP-based Internets" (MIB-II) [121].

The SMI includes the provision for panrameters 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.

The network management object identifiers are under the iso (1), org (3), dod (6), internet (1), or 1.3.6.1, branch of the name space.

SMI Network Management Directory Codes:

Prefix: 1.3.6.1.1.

Decimal	Name	Description	References
all	Reserved	Reserved for future use	[IANA]

SMI Network Management MGMT Codes:

Prefix: 1.3.6.1.2.

Decimal	Name	Description	References
0	Reserved		[IANA]
1	MIB		[149,KZM]

Prefix: 1.3.6.1.2.1. (mib-2)

Decimal	Name	Description	References
0	Reserved	Reserved	[IANA]
1	system	System	[150,KZM]
2	interfaces	Interfaces	[150,KZM]

3	at	Address Translation	[150,KZM]
4	ip	Internet Protocol	[150,KZM]
5	icmp	Internet Control Message	[150,KZM]
6	tcp	Transmission Control Protocol	[150,KZM]
7	udp	User Datagram Protocol	[150,KZM]
8	egp	Exterior Gateway Protocol	[150,KZM]
9	cmot	CMIP over TCP	[150,KZM]
10	transmission	Transmission	[150,KZM]
11	snmp	Simple Network Management	[150,KZM]
12	GenericIF	Generic Interface Extensions	[151,163,KZM]
13	Appletalk	Appletalk Networking	[152,SXW]
14	ospf	Open Shortest Path First	[153,FB77]
15	bgp	Border Gateway Protocol	[154,SW159]
16	rmon	Remote Network Monitoring	[155,SXW]
17	bridge	Bridge Objects	[156,EXD]
18	DecnetP4	Decnet Phase 4	
19	Character	Character Streams	[165,BS221]
20	snmpParties	SNMP Parties	[177,KZM]
21	snmpSecrets	SNMP Secrets	[177,KZM]

Prefix: 1.3.6.1.2.1.10 (transmission)

Decimal	Name	Description	
7	IEEE802.3	CSMACD--like Objects	[157,JXC]
8	IEEE802.4	Token Bus-like Objects	[158,163,KZM]
9	IEEE802.5	Token Ring-like Objects	[159,163,KZM]
15	FDDI	FDDI Objects	[160,JDC20]
18	DS1	T1 Carrier Objects	[161,163,FB77]
30	DS3	DS3 Interface Objects	[162,163,TXC]
31	SIP	SMDS Interface Objects	[164,TXC]
32	FRAME-RELAY	Frame Relay Objects	[168,CXB]
33	RS-232	RS-232 Objects	[166,BS221]
34	Parallel	Parallel Printer Objects	[167,BS221]

SMI Network Management Experimental Codes:

Prefix: 1.3.6.1.3.

	Decimal	Name	Description	References
	0	Reserved		[JKR1]
	1	CLNS	ISO CLNS Objects	[GS2]
*	2	T1-Carrier	T1 Carrier Objects	[FB77]
*	3	IEEE802.3	Ethernet-like Objects	[JXC]
*	4	IEEE802.5	Token Ring-like Objects	[EXD]
*	5	DECNet-PHIV	DECNet Phase IV	[JXS2]
*	6	Interface	Generic Interface Objects	[KZM]
*	7	IEEE802.4	Token Bus-like Objects	[KZM]
*	8	FDDI	FDDI Objects	[JDC20]
	9	LANMGR-1	LAN Manager V1 Objects	[JXG1]
	10	LANMGR-TRAPS	LAN Manager Trap Objects	[JXG1]
	11	Views	SNMP View Objects	[CXD]
	12	SNMP-AUTH	SNMP Authentication Objects	[KZM]
*	13	BGP	Border Gateway Protocol	[SW159]
*	14	Bridge	Bridge MIB	[FB77]
*	15	DS3	DS3 Interface Type	[TXC]
*	16	SIP	SMDS Interface Protocol	[TXC]
*	17	Appletalk	Appletalk Networking	[SXW]
	18	PPP	PPP Objects	[FJK2]
*	19	Character MIB	Character MIB	[BS221]
*	20	RS-232 MIB	RS-232 MIB	[BS221]
*	21	Parallel MIB	Parallel MIB	[BS221]
	22	atsign-proxy	Proxy via Community	[RXF]
*	23	OSPF	OSPF MIB	[FB77]
	24	Alert-Man	Alert-Man	[LS8]
	25	FDDI-Synoptics	FDDI-Synoptics	[DXP1]
*	26	Frame Relay	Frame Relay MIB	[CXB]
*	27	rmon	Remote Network Management MIB	[SXW]
	28	IDPR	IDPR MIB	[RAW44]
	29	HUBMIB	IEEE 802.3 Hub MIB	[DXM5]
	30	IPFWDTBLMIB	IP Forwarding Table MIB	[FB77]
	31	LATM MIB		[TXC]
	32	SONET MIB		[TXC]
	33	IDENT		[MTR]
	34	MIME-MHS		[MTR]

* = obsoleted

SMI Network Management Private Enterprise Codes:

Prefix: 1.3.6.1.4.1.

Decimal	Name	References
0	Reserved	[JKR1]
1	Proteon	[JS28]
2	IBM	[VXC]
3	CMU	[SXW]
4	Unix	[KXS]
5	ACC	[AB20]
6	TWG	[KZM]
7	CAYMAN	[BP52]
8	PSI	[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	Timeplex	[LXB1]
17	Canstar	[SXP]
18	Wellfleet	[JCB1]
19	TRW	[HXL]
20	MIT	[JR35]
21	EON	[MXW]
22	Spartacus	[YXK]
23	Excelan	[RXB]
24	Spider Systems	[VXW]
25	NSFNET	[HWB]
26	Hughes LAN Systems	[KZM]
27	Intergraph	[GS91]
28	Interlan	[BXT]
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	[DXP1]
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	[DXM354]
61	Merit	[BXN]
62	FiberCom	[EXR]
63	Apple Computer Inc	[JXH1]
64	Gandalf	[HXK]
65	Dartmouth	[PXK]
66	David Systems	[KXD1]
67	Reuter	[BXZ]
68	Cornell	[DC126]
69	LMS	[MLS34]
70	Locus Computing Corp.	[AXS]
71	NASA	[SS92]
72	Retix	[AXM]
73	Boeing	[JXG]
74	AT&T	[RXB2]
75	Ungermann-Bass	[DXM]
76	Digital Analysis Corp.	[SXK]
77	LAN Manager	[DXK]
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]
91	LearningTree Systems	[JXG2]
92	Webster Computer Corporation	[RXE]
93	Frontier Technologies Corporation	[PXA]
94	Nokia Data Communications	[DXE]
95	Allen-Bradely Company	[BXK]
96	CERN	[JXR]
97	Sigma Network Systems, Inc.	[KXV]
98	Emerging Technologies, Inc.	[DXB2]
99	SNMP Research	[JDC20]
100	Ohio State University	[SXA1]
101	Ultra Network Technologies	[JXD]
102	Microcom	[AXF]
103	Martin Marietta Astronautic Group	[DR137]
104	Micro Technology	[MXE]
105	Process Software Corporation	[BV15]
106	Data General Corporation	[JXK]
107	Bull Company	[AXB]
108	Emulex Corporation	[JXF1]
109	Warwick University Computing Services	[IXD]
110	Network General Corporation	[JXD1]
111	Oracle	[JPH17]
112	Control Data Corporation	[NXR]
113	Hughes Aircraft Company	[KZM]
114	Synernetics, Inc.	[JXP1]
115	Mitre	[BM60]
116	Hitachi, Ltd.	[HXU]
117	Telebit	[MXL2]
118	Salomon Technology Services	[PXM]
119	NEC Corporation	[YXA]
120	Fibermux	[KH157]
121	FTP Software Inc.	[SXK1]
122	Sony	[TXH]
123	Newbridge Networks Corporation	[JXW]
124	Racal-Milgo Information Systems	[MXR]
125	CR SYSTEMS	[SXS2]
126	DSET Corporation	[DXS]
127	Computone	[BXV]
128	Tektronix, Inc.	[DT167]
129	Interactive Systems Corporation	[SXA2]
130	Banyan Systems Inc.	[DXT]
131	Sintrom Datanet Limited	[SXW]
132	Bell Canada	[MXF]
133	Crosscomm Corporation	[RXS1]
134	Rice University	[CXF]
135	T3Plus Networking, Inc.	[HXF]
136	Concurrent Computer Corporation	[JRL3]
137	Basser	[PXO]

138	Luxcom	[RXB]
139	Artel	[JXZ]
140	Independence Technologies, Inc. (ITI)	[GXB]
141	Frontier Software Development	[NXP]
142	Digital Computer Limited	[OXF]
143	Eyring, Inc.	[RH227]
144	Case Communications	[PXK]
145	Penril DataComm, Inc.	[KXH1]
146	American Airlines	[BXK1]
147	Sequent Computer Systems	[SXH1]
148	Bellcore	[KXT]
149	Konkord Communications	[KXJ]
150	University of Washington	[CXW]
151	Develcon	[SXM]
152	Solarix Systems	[PXA1]
153	Unifi Communications Corp.	[YXH]
154	Roadnet	[DXS]
155	Network Systems Corp.	[NXE]
156	ENE (European Network Engineering)	[PXC]
157	Dansk Data Elektronik A/S	[PXH]
158	Morning Star Technologies	[KXF]
159	Dupont EOP	[OXR]
160	Legato Systems, Inc.	[JXK1]
161	Motorola SPS	[VXE]
162	European Space Agency (ESA)	[EXX]
163	BIM	[BXL2]
164	Rad Data Communications Ltd.	[OXI]
165	Intellicom	[PXS]
166	Shiva Corporation	[NXL]
167	Fujikura America	[DXR]
168	Xlnt Designs INC (XDI)	[MA108]
169	Tandem Computers	[RXD3]
170	BICC	[DXB3]
171	D-Link Systems, Inc.	[HXN]
172	AMP, Inc.	[RXD4]
173	Netlink	[MXZ]
174	C. Itoh Electronics	[LXD1]
175	Sumitomo Electric Industries (SEI)	[KXT1]
176	DHL Systems, Inc.	[DXG2]
177	Network Equipment Technologies	[MXT1]
178	APTEC Computer Systems	[LXB]
179	Schneider & Koch & Co., Datensysteme GmbH	[TXR1]
180	Hill Air Force Base	[RXW]
181	ADC Kentrox	[BXK2]
182	Japan Radio Co.	[NXK]
183	Versitron	[MXH]
184	Telecommunication Systems	[HXL1]
185	Interphase	[GXW1]

186	Toshiba Corporation	[MXA]
187	Clearpoint Research Corp.	[FJK2]
188	Ascom Gfeller Ltd.	[AXS1]
189	Fujitsu America	[CXL]
190	NetCom Solutions, Inc.	[DXC]
191	NCR	[CXK]
192	Dr. Materna GmbH	[TXB]
193	Ericsson Business Communications	[GXN]
194	Metaphor Computer Systems	[PXR]
195	Patriot Partners	[PXR]
196	The Software Group Limited (TSG)	[RP211]
197	Kalpana, Inc.	[AXB3]
198	University of Waterloo	[RXW1]
199	CCL/ITRI	[MXC]
200	Coeur Postel	[PXK2]
201	Mitsubish Cable Industries, Ltd.	[MXH1]
202	SMC	[LXS]
203	Crescendo Communication, Inc.	[PXJ]
204	Goodall Software Engineering	[DG223]
205	Intecom	[BXP]
206	Victoria University of Wellington	[JXS3]
207	Allied Telesis, Inc.	[SXH2]
208	Dowty Network Systems A/S	[HXE1]
209	Protools	[GXA]
210	Nippon Telegraph and Telephone Corp.	[TXS1]
211	Fujitsu Limited	[IXH]
212	Network Peripherals Inc.	[CXC]
213	Netronix, Inc.	[JXR3]
214	University of Wisconsin - Madison	[DW328]
215	NetWorth, Inc.	[CXS]
216	Tandberg Data A/S	[HXH]
217	Technically Elite Concepts, Inc.	[RXD5]
218	Labtam Australia Pty. Ltd.	[MXP1]
219	Republic Telcom Systems, Inc.	[SXH3]
220	ADI Systems, Inc.	[PXL]
221	Microwave Bypass Systems, Inc.	[TXA]
222	Pyramid Technology Corp.	[RXR]
223	Unisys_Corp	[LXB2]
224	LANOPTICS LTD. Israel	[IXD1]
225	NKK Corporation	[JXY]
226	MTrade UK Ltd.	[PXD]
227	Acals	[PXC1]
228	ASTEC, Inc.	[HXF1]
229	Delmarva Power	[JXS4]
230	Telematics International, Inc.	[KXS1]
231	Siemens Nixdorf Informations Syteme AG	[GXK]
232	Compaq	[SXB]
233	NetManage, Inc.	[WXD]

234	NCSU Computing Center	[DXJ]
235	Empirical Tools and Technologies	[KA4]
236	Samsung Group	[HXP]
237	Takaoka Electric Mfg. Co., Ltd.	[HXH2]
238	Netrix Systems Corporation	[EXM]
239	WINDATA	[BXR]
240	RC International A/S	[CXD1]
241	Netexp Research	[HXB]
242	Internode Systems Pty Ltd	[SXH4]
243	netCS Informationstechnik GmbH	[OXK]
244	Lantronix	[RXL]
245	Avatar Consultants	[KH157]
246	Furukawa Electoric Co. Ltd.	[SXF]
247	AEG Electrcom	[RXN2]
248	Richard Hirschmann GmbH & Co.	[HXN1]
249	G2R Inc.	[KXH]
250	University of Michigan	[TXH1]
251	Netcomm, Ltd.	[WXS2]
252	Sable Technology Corporation	[RXT]
253	Xerox	[EXR3]
254	Conware Computer Consulting GmbH	[MXS2]
255	Compatible Systems Corp.	[JG423]
256	Scitec Communications Systems Ltd.	[SXL1]
257	Transarc Corporation	[PXB]
258	Matsushita Electric Industrial Co., Ltd.	[NXM]
259	ACCTON Technology	[DXR1]
260	Star-Tek, Inc.	[CXM1]
261	Codenoll Tech. Corp.	[DXW]
262	Formation, Inc.	[CXM2]
263	Seiko Instruments, Inc. (SII)	[YXW1]
264	RCE (Reseaux de Communication d’Entreprise S.A.)	[EXB]
265	Xenocom, Inc.	[SXW2]
266	AEG KABEL	[HXT1]
267	Systech Computer Corporation	[BXP1]
268	Visual	[BXO]
269	SDD (Scandinavian Airlines Data Denmark A/S)	[PXF]
270	Zenith Electronics Corporation	[DXL]
271	TELECOM FINLAND	[PXJ1]
272	BinTec Computersystems	[MXS3]
273	EUnet Germany	[MXS4]
274	PictureTel Corporation	[OXJ]
275	Michigan State University	[LXW]
276	GTE Telecom Incorporated	[LXO]
277	Cascade Communications Corp.	[CS1]
278	Hitachi Cable, Ltd.	[TXA1]
279	Olivetti	[MXF1]
280	Vitacom Corporation	[PXR1]
281	INMOS	[GXH]

282	AIC Systems Laboratories Ltd.	[GXM1]
283	Cameo Communications, Inc.	[AXB4]
284	Diab Data AB	[MXL1]
285	Olicom A/S	[LXP]
286	Digital-Kienzle Computersystems	[HXD]
287	CSELT(Centro Studi E Laboratori Telecomunicazioni)	[PXC2]
288	Electronic Data Systems	[MXH2]
289	McData Corporation	[GXL]
290	Harris Computer Systems Division (HCSD)	[DXR2]
291	Technology Dynamics, Inc.	[CXS1]
292	DATAHOUSE Information Systems Ltd.	[KXL]
293	DSIR Network Group	[TXP]
294	Texas Instruments	[BXS1]
295	PlainTree Systems Inc.	[PXC3]
296	Hedemann Software Development	[SXH5]
297	Fuji Xerox Co., Ltd.	[HXK1]
298	Asante Technology	[HXM]
299	Stanford University	[BXM]
300	Digital Link	[JXT1]
301	Raylan Corporation	[MXL2]
302	Datacraft	[AXL]
303	Hughes	[KZM]
304	Farallon Computing, Inc.	[SXS3]
305	GE Information Services	[SXB2]
306	Gambit Computer Communications	[ZXS]
307	Livingston Enterprises, Inc.	[SXW3]
308	Star Technologies	[JXM1]
309	Micronics Computers Inc.	[DXC1]
310	Basis, Inc.	[HXS]
311	Microsoft	[JXB1]
312	US West Advance Technologies	[DXH]
313	University College London	[SXC]
314	Eastman Kodak Company	[WXC1]
315	Network Resources Corporation	[KXW1]
316	Atlas Telecom	[BXK2]
317	Bridgeway	[UXV]
318	American Power Conversion Corp.	[PXY]
319	DOE Atmospheric Radiation Measurement Project	[PXK3]
320	VerSteeg CodeWorks	[BXV]
321	Verilink Corp	[BXV]
322	Sybus Corportation	[MXB2]
323	Tekelec	[BXG]
324	NASA Ames Research Center	[NXC]
325	Simon Fraser University	[RXU]
326	Fore Systems, Inc.	[EXC1]
327	Centrum Communications, Inc.	[VXL]
328	NeXT Computer, Inc.	[LXL]
329	Netcore, Inc.	[SXM1]

330	Northwest Digital Systems	[BXD]
331	Andrew Corporation	[TXT]
332	DigiBoard	[DXK2]
333	Computer Network Technology Corp.	[BXM1]
334	Lotus Development Corp.	[BXF1]
335	MICOM Communication Corporation	[DXB4]
336	ASCII Corporation	[TXO]
337	PUREDATA Research/USA	[BXF2]
338	NTT DATA	[YXK1]
339	Empros Systems International	[DXT1]
340	Kendall Square Research (KSR)	[DXH1]
341	Martin Marietta Energy Systems	[GXH1]
342	Network Innovations	[PXG]
343	Intel Corporation	[CXT1]
344	Proxar	[CXH]
345	Epson Research Center	[RXS2]
346	Fibernet	[GXS1]
347	Box Hill Systems Corporation	[TXJ]
348	American Express Travel Related Services	[JXC1]
349	Compu-Shack	[TXV]
350	Parallan Computer, Inc.	[CXD2]
351	Stratacom	[CXI]
352	Open Networks Engineering, Inc.	[RXB4]
353	ATM Forum	[KZM]
354	SSD Management, Inc.	[BXR1]
355	Automated Network Management, Inc.	[CXV]
356	Magnalink Communications Corporation	[DXK3]
357	TIL Systems, Ltd.	[GXM2]
358	Skyline Technology, Inc.	[DXW1]
359	Nu-Mega Technologies, Inc.	[DXS4]
360	Morgan Stanley & Co. Inc.	[VXK]
361	Integrated Business Network	[MXB3]
362	L & N Technologies, Ltd.	[SXL2]
363	Cincinnati Bell Information Systems, Inc.	[DXM4]
364	OSCOM International	[FXF]
365	MICROGNOSIS	[PXA2]
366	Datapoint Corporation	[LZ15]
367	RICOH Co. Ltd.	[TXW]
368	Axis Communications AB	[MG277]
369	Pacer Software	[WXT]
370	Axon Networks Inc.	[RXI]
371	Brixton Systems, Inc.	[PXE]
372	GSI	[PXB1]
373	Tatung Co., Ltd.	[CXC1]
374	DIS Research LTD	[RXC2]
375	Quotron Systems, Inc.	[RXS3]
376	Dassault Electronique	[OXC]
377	Corollary, Inc.	[JXG3]

378	SEEL, Ltd.	[KXR]
379	Lexcel	[MXE]
380	W.J. Parducci & Associates, Inc.	[WXP]
381	OST	[AXP1]
382	Megadata Pty Ltd.	[AXM2]
383	LLNL Livermore Computer Center	[DXN]
384	Dynatech Communications	[GXW2]
385	Symplex Communications Corp.	[CXA]
386	Tribe Computer Works	[KXF1]
387	Taligent, Inc.	[LXA]
388	Symbol Technology, Inc.	[JXC2]
389	Lancert	[MXH3]
390	Alantec	[PXV]
391	Ridgeback Solutions	[EXG]
392	Metrix, Inc.	[DXV]
393	Excutive Systems/XTree Company	[DXC2]
394	NRL Communication Systems Branch	[RXR1]
395	I.D.E. Corporation	[RXS4]
396	Matsushita Electric Works, Ltd.	[CXH1]
397	MegaPAC	[IXG]
398	Pilkington Communication Systems	[DXA]
440	Amnet, Inc.	[RM1]
441	Chase Research	[KXG]
442	PEER Networks	[TS566]
443	Gateway Communications, Inc.	[EXF]
444	Peregrine Systems	[EXO]
445	Daewoo Telecom	[SXO]
446	Norwegian Telecom Research	[PXY1]
447	WilTel	[AXP]
448	Ericsson-Camtec	[SXP1]
449	Codex	[TXM1]
450	Basis	[HXS]
451	AGE Logic	[SXL3]
452	INDE Electronics	[GXD1]
453	ISODE Consortium	[SH284]
454	J.I. Case	[MXO1]
455	Trillium Digital Systems	[CXC2]
456	Bacchus Inc.	[EXG]
457	MCC	[DR48]
458	Stratus Computer	[KXC]
459	Quotron	[RXS3]
460	Beame & Whiteside	[CXB1]
461	Cellular Technical Servuces	[GXH2]

SGMP Vendor Specific Codes: [obsolete]

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]

MILNET LOGICAL ADDRESSES

The MILNET 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]

MILNET LINK NUMBERS

The word "link" here refers to a field in the original MILNET 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]

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 MILNET 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 CLNS IS 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-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, (415) 813-7164.

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]
32790	8016	-	-	SGI bounce server	[AXC]
32793	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
   0080C2  IEEE 802.1 Committee
   0080D3  Shiva
   00AA00  Intel
   00DD00  Ungermann-Bass
   00DD01  Ungermann-Bass
   020701  Racal InterLan
   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
   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	
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 Lev. 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 Sys. 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 AB-00-03-FF-FF-FF	????	Reserved DEC through
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 Sys. 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 MILNET or Internet Datagrams on 10Mb Ethernet, and also protocol and type fields so one could encapsulate each kind of Datagram in the other.

lower \ upper	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
MILNET	Link 155 decimal	Link 152 decimal	Link 150 decimal

lower \ upper	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 Resolution 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)

POINT-TO-POINT PROTOCOL FIELD ASSIGNMENTS

PPP DLL PROTOCOL NUMBERS

The Point-to-Point Protocol (PPP) Data Link Layer [146,147,175] contains a 16 bit Protocol field to identify the the encapsulated protocol. The Protocol field is consistent with the ISO 3309 (HDLC) extension mechanism for Address fields. All Protocols MUST be assigned such that the least significant bit of the most significant octet equals "0", and the least significant bit of the least significant octet equals "1".

Assigned PPP DLL Protocol Numbers

Value (in hex)	Protocol Name
0001 to 001f	reserved (transparency inefficient)
0021	Internet Protocol
0023	OSI Network Layer
0025	Xerox NS IDP
0027	DECnet Phase IV
0029	Appletalk
002b	Novell IPX
002d	Van Jacobson Compressed TCP/IP
002f	Van Jacobson Uncompressed TCP/IP
0031	Bridging PDU
0033	Stream Protocol (ST-II)
0035	Banyan Vines
0037	reserved (until 1993)
00ff	reserved (compression inefficient)
0201	802.1d Hello Packets
0231	Luxcom
0233	Sigma Network Systems
8021	Internet Protocol Control Protocol
8023	OSI Network Layer Control Protocol
8025	Xerox NS IDP Control Protocol
8027	DECnet Phase IV Control Protocol
8029	Appletalk Control Protocol
802b	Novell IPX Control Protocol
802d	Reserved
802f	Reserved
8031	Bridging NCP
8033	Stream Protocol Control Protocol
8035	Banyan Vines Control Protocol
8037	reserved till 1993
80ff	reserved (compression inefficient

c021	Link Control Protocol
c023	Password Authentication Protocol
c025	Link Quality Report
c223	Challenge Handshake Authentication Protocol

Protocol field values in the "0---" to "3---" range identify the network-layer protocol of specific datagrams, and values in the "8---" to "b---" range identify datagrams belonging to the associated Network Control Protocol (NCP), if any.

It is recommended that values in the "02--" to "1e--" and "--01" to "--1f" ranges not be assigned, as they are compression inefficient.

Protocol field values in the "4---" to "7---" range are used for protocols with low volume traffic which have no associated NCP.

Protocol field values in the "c---" to "e---" range identify datagrams as Control Protocols (such as LCP).

PPP LCP AND IPCP CODES

The Point-to-Point Protocol (PPP) Link Control Protocol (LCP) [146] and Internet Protocol Control Protocol (IPCP) [147] contain an 8 bit Code field which identifies the type of packet. These Codes are assigned as follows:

Code	Packet Type
1	Configure-Request
2	Configure-Ack
3	Configure-Nak
4	Configure-Reject
5	Terminate-Request
6	Terminate-Ack
7	Code-Reject
8	* Protocol-Reject
9	* Echo-Request
10	* Echo-Reply
11	* Discard-Request
12	* RESERVED

* LCP Only

PPP LCP CONFIGURATION OPTION TYPES

The Point-to-Point Protocol (PPP) Link Control Protocol (LCP) specifies a number of Configuration Options [146] which are distinguished by an 8 bit Type field. These Types are assigned as follows:

Type	Configuration Option
1	Maximum-Receive-Unit
2	Async-Control-Character-Map
3	Authentication-Protocol
4	Quality-Protocol
5	Magic-Number
6	RESERVED
7	Protocol-Field-Compression
8	Address-and-Control-Field-Compression
9	FCS-Alternatives

PPP IPCP CONFIGURATION OPTION TYPES

The Point-to-Point Protocol (PPP) Internet Protocol Control Protocol (IPCP) specifies a number of Configuration Options [147] which are distinguished by an 8 bit Type field. These Types are assigned as follows:

Type	Configuration Option
1	IP-Addresses (deprecated)
2	IP-Compression-Protocol
3	IP-Address

PPP BRIDGING CONFIGURATION OPTION TYPES

The Point-to-Point Protocol (PPP) Extensions for Bridging specifies a number of Configuration Options [176] which are distinguished by an 8 bit Type field. These Types are assigned as follows:

Type	Configuration Option
1	Remote Ring Identification
2	Line Identification
3	MAC Type Selection
4	Tinygram Compression
5	LAN Identification

PPP BRIDGING MAC TYPES

The Point-to-Point Protocol (PPP) Extensions for Bridging [176] contains an 8 bit MAC Type field which identifies the MAC encapsulated. These Types are assigned as follows:

Type	MAC
0	Reserved
1	IEEE 802.3/Ethernet
2	IEEE 802.4
3	IEEE 802.5
4	FDDI

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	[JKR1]
12	LocalNet (IBM PCNet or SYTEK LocalNET)	[JXM]
13	Ultra link	[RXD2]
14	SMDS	[GXC1]
15	Frame Relay	[AGM]
16	Asynchronous Transmission Mode (ATM)	[JXB2]

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).

INVERSE ADDRESS RESOULUTION PROTOCOL

The Inverse Address Resolution Protocol (IARP) specified in RFC-1293 [173] has the following operation codes:

Assignments:

Operation Code (op)

8 InARP-Request
9 InARP-Reply

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]
DD	Network Monitoring	[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).

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	[SXA3]
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	2222-551-00652 60	CNUCE	[TC27]
014.000.000.043	2422-510-05900 00	Tollpost-Globe AS	[OXG]
014.000.000.044	2422-670-08900 00	Tollpost-Globe AS	[OXG]
014.000.000.045	2422-516-01000 00	Tollpost-Globe AS	[OXG]
014.000.000.046	2422-450-00800 00	Tollpost-Globe AS	[OXG]
014.000.000.047	2422-610-00200 00	Tollpost-Globe AS	[OXG]
014.000.000.048	2422-310-00300 00	Tollpost-Globe AS	[OXG]
014.000.000.049	2422-470-08800 00	Tollpost-Globe AS	[OXG]
014.000.000.050	2422-210-04600 00	Tollpost-Globe AS	[OXG]
014.000.000.051	2422-130-28900 00	Tollpost-Globe AS	[OXG]
014.000.000.052	2422-310-27200 00	Tollpost-Globe AS	[OXG]
014.000.000.053	2422-250-05800 00	Tollpost-Globe AS	[OXG]
014.000.000.054	2422-634-05900 00	Tollpost-Globe AS	[OXG]
014.000.000.055	2422-670-08800 00	Tollpost-Globe AS	[OXG]
014.000.000.056	2422-430-07400 00	Tollpost-Globe AS	[OXG]
014.000.000.057	2422-674-07800 00	Tollpost-Globe AS	[OXG]
014.000.000.058	2422-230-16900 00	Tollpost-Globe AS	[OXG]
014.000.000.059	2422-518-02900 00	Tollpost-Globe AS	[OXG]
014.000.000.060	2422-370-03100 00	Tollpost-Globe AS	[OXG]
014.000.000.061	2422-516-03400 00	Tollpost-Globe AS	[OXG]
014.000.000.062	2422-616-04400 00	Tollpost-Globe AS	[OXG]
014.000.000.063	2422-650-23500 00	Tollpost-Globe AS	[OXG]
014.000.000.064	2422-330-02500 00	Tollpost-Globe AS	[OXG]
014.000.000.065	2422-350-01900 00	Tollpost-Globe AS	[OXG]
014.000.000.066	2422-410-00700 00	Tollpost-Globe AS	[OXG]
014.000.000.067	2422-539-06200 00	Tollpost-Globe AS	[OXG]
014.000.000.068	2422-630-07200 00	Tollpost-Globe AS	[OXG]
014.000.000.069	2422-470-12300 00	Tollpost-Globe AS	[OXG]
014.000.000.070	2422-470-13000 00	Tollpost-Globe AS	[OXG]
014.000.000.071	2422-170-04600 00	Tollpost-Globe AS	[OXG]
014.000.000.072	2422-516-04300 00	Tollpost-Globe AS	[OXG]
014.000.000.073	2422-530-00700 00	Tollpost-Globe AS	[OXG]
014.000.000.074	2422-650-18800 00	Tollpost-Globe AS	[OXG]
014.000.000.075	2422-450-24500 00	Tollpost-Globe AS	[OXG]
014.000.000.076	2062-243-15631 00	DPT-BXL-DDC	[LZ15]
014.000.000.077	2062-243-15651 00	DPT-BXL-DDC2	[LZ15]
014.000.000.078	3110-312-00431 00	DPT-CHI	[LZ15]
014.000.000.079	3110-512-00135 00	DPT-SAT-ENG	[LZ15]
014.000.000.080	2080-941-90550 00	DPT-PAR	[LZ15]
014.000.000.081	4545-511-30600 00	DPT-PBSC	[LZ15]
014.000.000.082	4545-513-30900 00	DPT-HONGKONG	[LZ15]
014.000.000.083	4872-203-55000 00	UECI-TAIPEI	[LZ15]
014.000.000.084	2624-551-10400 20	DPT-HANOVR	[LZ15]
014.000.000.085	2624-569-00401 99	DPT-FNKFRT	[LZ15]

014.000.000.086	3110-512-00134 00	DPT-SAT-SUPT	[LZ15]
014.000.000.087	4602-3010-0103 20	DU-X25A	[JK64]
014.000.000.088	4602-3010-0103 21	FDU-X25B	[JK64]
014.000.000.089	2422-150-33700 00	Tollpost-Globe AS	[OXG]
014.000.000.090	2422-271-07100 00	Tollpost-Globe AS	[OXG]
014.000.000.091	2422-516-00100 00	Tollpost-Globe AS	[OXG]
014.000.000.092	2422-650-18800 00	Norsk Informas.	[OXG]
014.000.000.093	2422-250-30400 00	Tollpost-Globe AS	[OXG]
014.000.000.094-014.255.255.254		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. "IAB Official Protocol Standards" [62] 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]
36	Environment Option	[DB14]
37	Authentication Option	[DB14]
38	Encryption Option	[DB14]
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].

MIME TYPES

RFC-1341 [169] specifies that Content Types, Content Subtypes, Character Sets, Access Types, and Conversion values for MIME mail will be assigned and listed by the IANA.

Content Types and Subtypes

Type	Subtype	Description	Reference
text	plain		[169,NSB]
	richtext		
multipart	mixed		[169,NSB]
	alternative		
	digest		
	parallel		
message	rfc822		[169,NSB]
	partial		
	external-body		
application	octet-stream		[169,NSB]
	postscript		
	oda		
image	jpeg		[169,NSB]
	gif		
audio	basic		[169,NSB]
video	mpeg		[169,NSB]

Character Sets

Type	Description	Reference
US-ASCII	the default character set	[169,NSB]
ISO-8859-1	see ISO_8859-1:1987 below	[169,NSB]
ISO-8859-2	see ISO_8859-2:1987 below	[169,NSB]
ISO-8859-3	see ISO_8859-3:1988 below	[169,NSB]
ISO-8859-4	see ISO_8859-4:1988 below	[169,NSB]
ISO-8859-5	see ISO_8859-5:1988 below	[169,NSB]
ISO-8859-6	see ISO_8859-6:1987 below	[169,NSB]
ISO-8859-7	see ISO_8859-7:1987 below	[169,NSB]

ISO-8859-8	see ISO_8859-8:1988 below	[169,NSB]
ISO-8859-9	see ISO_8859-9:1989 below	[169,NSB]

Access Types

Type	Description	Reference
FTP		[169,NSB]
ANON-FTP		[169,NSB]
TFTP		[169,NSB]
AFS		[169,NSB]
LOCAL-FILE		[169,NSB]
MAIL-SERVER		[169,NSB]

Conversion Values

Conversion values or Content Transfer Encodings.

Type	Description	Reference
7BIT		[169,NSB]
8BIT		[169,NSB]
BASE64		[169,NSB]
BINARY		[169,NSB]
QUOTED-PRINTABLE		[169,NSB]

CHARACTER SETS

Character Set	Reference
ISO_646.basic:1983	[170,KXS2]
INVARIANT	[170,KXS2]
ISO_646.irv:1983	[170,KXS2]
BS_4730	[170,KXS2]
ANSI_X3.4-1968	[170,KXS2]
NATS-SEFI	[170,KXS2]
NATS-SEFI-ADD	[170,KXS2]
NATS-DANO	[170,KXS2]
NATS-DANO-ADD	[170,KXS2]
SEN_850200_B	[170,KXS2]
SEN_850200_C	[170,KXS2]
JIS_C6220-1969-jp	[170,KXS2]
JIS_C6220-1969-ro	[170,KXS2]
IT	[170,KXS2]
PT	[170,KXS2]
ES	[170,KXS2]
greek7-old	[170,KXS2]
latin-greek	[170,KXS2]
DIN_66003	[170,KXS2]
NF_Z_62-010_(1973)	[170,KXS2]
Latin-greek-1	[170,KXS2]
ISO_5427	[170,KXS2]
JIS_C6226-1978	[170,KXS2]
BS_viewdata	[170,KXS2]
INIS	[170,KXS2]
INIS-8	[170,KXS2]
INIS-cyrillic	[170,KXS2]
ISO_5427:1981	[170,KXS2]
ISO_5428:1980	[170,KXS2]
GB_1988-80	[170,KXS2]
GB_2312-80	[170,KXS2]
NS_4551-1	[170,KXS2]
NS_4551-2	[170,KXS2]
NF_Z_62-010	[170,KXS2]
videotex-suppl	[170,KXS2]
PT2	[170,KXS2]
ES2	[170,KXS2]
MSZ_7795.3	[170,KXS2]
JIS_C6226-1983	[170,KXS2]
greek7	[170,KXS2]
ASMO_449	[170,KXS2]
iso-ir-90	[170,KXS2]
JIS_C6229-1984-a	[170,KXS2]
JIS_C6229-1984-b	[170,KXS2]

JIS_C6229-1984-b-add	[170,KXS2]
JIS_C6229-1984-hand	[170,KXS2]
JIS_C6229-1984-hand-add	[170,KXS2]
JIS_C6229-1984-kana	[170,KXS2]
ISO_2033-1983	[170,KXS2]
ANSI_X3.110-1983	[170,KXS2]
ISO_8859-1:1987	[170,KXS2]
ISO_8859-2:1987	[170,KXS2]
T.61-7bit	[170,KXS2]
T.61-8bit	[170,KXS2]
ISO_8859-3:1988	[170,KXS2]
ISO_8859-4:1988	[170,KXS2]
ECMA-cyrillic	[170,KXS2]
CSA_Z243.4-1985-1	[170,KXS2]
CSA_Z243.4-1985-2	[170,KXS2]
CSA_Z243.4-1985-gr	[170,KXS2]
ISO_8859-7:1987	[170,KXS2]
ISO_8859-6:1987	[170,KXS2]
T.101-G2	[170,KXS2]
ISO_8859-8:1988	[170,KXS2]
CSN_369103	[170,KXS2]
JUS_I.B1.002	[170,KXS2]
ISO_6937-2-add	[170,KXS2]
IEC_P27-1	[170,KXS2]
ISO_8859-5:1988	[170,KXS2]
JUS_I.B1.003-serb	[170,KXS2]
JUS_I.B1.003-mac	[170,KXS2]
ISO_8859-9:1989	[170,KXS2]
KS_C_5601-1987	[170,KXS2]
greek-ccitt	[170,KXS2]
NC_NC00-10:81	[170,KXS2]
ISO_6937-2-25	[170,KXS2]
GOST_19768-74	[170,KXS2]
ISO_8859-supp	[170,KXS2]
ISO_10367-box	[170,KXS2]
latin6	[170,KXS2]
latin-lap	[170,KXS2]
JIS_X0212-1990	[170,KXS2]
DS_2089	[170,KXS2]
us-dk	[170,KXS2]
dk-us	[170,KXS2]
JIS_X0201	[170,KXS2]
KSC5636	[170,KXS2]
DEC-MCS	[170,KXS2]
hp-roman8	[170,KXS2]
macintosh	[170,KXS2]
IBM037	[170,KXS2]
IBM038	[170,KXS2]

IBM273	[170,KXS2]
IBM274	[170,KXS2]
IBM275	[170,KXS2]
IBM277	[170,KXS2]
IBM278	[170,KXS2]
IBM280	[170,KXS2]
IBM281	[170,KXS2]
IBM284	[170,KXS2]
IBM285	[170,KXS2]
IBM290	[170,KXS2]
IBM297	[170,KXS2]
IBM420	[170,KXS2]
IBM423	[170,KXS2]
IBM424	[170,KXS2]
IBM437	[170,KXS2]
IBM500	[170,KXS2]
IBM850	[170,KXS2]
IBM851	[170,KXS2]
IBM852	[170,KXS2]
IBM855	[170,KXS2]
IBM857	[170,KXS2]
IBM860	[170,KXS2]
IBM861	[170,KXS2]
IBM862	[170,KXS2]
IBM863	[170,KXS2]
IBM864	[170,KXS2]
IBM865	[170,KXS2]
IBM868	[170,KXS2]
IBM869	[170,KXS2]
IBM870	[170,KXS2]
IBM871	[170,KXS2]
IBM880	[170,KXS2]
IBM891	[170,KXS2]
IBM903	[170,KXS2]
IBM904	[170,KXS2]
IBM905	[170,KXS2]
IBM918	[170,KXS2]
IBM1026	[170,KXS2]
EBCDIC-AT-DE	[170,KXS2]
EBCDIC-AT-DE-A	[170,KXS2]
EBCDIC-CA-FR	[170,KXS2]
EBCDIC-DK-NO	[170,KXS2]
EBCDIC-DK-NO-A	[170,KXS2]
EBCDIC-FI-SE	[170,KXS2]
EBCDIC-FI-SE-A	[170,KXS2]
EBCDIC-FR	[170,KXS2]
EBCDIC-IT	[170,KXS2]
EBCDIC-PT	[170,KXS2]

EBCDIC-ES	[170,KXS2]
EBCDIC-ES-A	[170,KXS2]
EBCDIC-ES-S	[170,KXS2]
EBCDIC-UK	[170,KXS2]
EBCDIC-US	[170,KXS2]

MACHINE NAMES

These are the Official Machine Names as they appear in the Domain Name System HINFO 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-3B2
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 HINFO 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 three punctuation characters hyphen, period, and slash. It must start with a letter, and end with a letter or digit.

AEGIS	LISP	SUN OS 3.5
APOLLO	LISPM	SUN OS 4.0
AIX/370	LOCUS	SWIFT
AIX-PS/2	MACOS	TAC
BS-2000	MINOS	TANDEM
CEDAR	MOS	TENEX
CGW	MPE5	TOPS10
CHORUS	MSDOS	TOPS20
CHRYSALIS	MULTICS	TOS
CMOS	MUSIC	TP3010
CMS	MUSIC/SP	TRSDOS
COS	MVS	ULTRIX
CPIX	MVS/SP	UNIX
CTOS	NEXUS	UNIX-BSD
CTSS	NMS	UNIX-V1AT
DCN	NONSTOP	UNIX-V
DDNOS	NOS-2	UNIX-V.1
DOMAIN	NTOS	UNIX-V.2
DOS	OS/DDP	UNIX-V.3
EDX	OS/2	UNIX-PC
ELF	OS4	UNKNOWN
EMBOS	OS86	UT2D
EMMOS	OSX	V
EPOS	PCDOS	VM
FOONEX	PERQ/OS	VM/370
FUZZ	PLI	VM/CMS
GCOS	PSDOS/MIT	VM/SP
GPOS	PRIMOS	VMS
HDOS	RMX/RDOS	VMS/EUNICE
IMAGEN	ROS	VRTX
INTERCOM	RSX11M	WAITS
IMPRESS	RTE-A	WANG
INTERLISP	SATOPS	WIN32
IOS	SCO-XENIX/386	X11R3
IRIX	SCS	XDE
ISI-68020	SIMP	XENIX
ITS	SUN	

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 Ser and Prot 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
DMF-MAIL            - Digest Message Format for Mail
DOMAIN              - Domain Name System
ECHO                - Echo Protocol
EGP                 - Exterior Gateway Protocol
EHF-MAIL            - Encoding Header Field for Mail
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-CMPRS            - Compressing TCP/IP Headers
   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 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
```

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   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
   RE-MAIL-CK          - Remote Mail Checking 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
   TCP-ACO             - TCP Alternate Checksum Option
   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

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   DEC-VT61                          HP-2626
   DEC-VT62                          HP-2626A
   DELTA-DATA-5000                   HP-2626P
   DELTA-DATA-NIH-7000               HP-2627
   DELTA-TELTERM-2                   HP-2640
   DIABLO-1620                       HP-2640A
   DIABLO-1640                       HP-2640B
   DIGILOG-333                       HP-2645
   DTC-300S                          HP-2645A
   DTC-382                           HP-2648
   EDT-1200                          HP-2648A
   EXECUPORT-4000                    HP-2649
   EXECUPORT-4080                    HP-2649A
   FACIT-TWIST-4440                  IBM-1050
   FREEDOM-100                       IBM-2741
   FREEDOM-110                       IBM-3101
   FREEDOM-200                       IBM-3101-10
   GENERAL-TERMINAL-100A             IBM-3151
   GENERAL-TERMINAL-101              IBM-3179-2
   GIPSI-TX-M                        IBM-3180-2
   GIPSI-TX-ME                       IBM-3196-A1
   GIPSI-TX-C4                       IBM-3275-2
   GIPSI-TX-C8                       IBM-3276-2
   GSI                               IBM-3276-3
   HAZELTINE-1420                    IBM-3276-4
   HAZELTINE-1500                    IBM-3277-2
   HAZELTINE-1510                    IBM-3278-2
   HAZELTINE-1520                    IBM-3278-3
   HAZELTINE-1552                    IBM-3278-4
   HAZELTINE-2000                    IBM-3278-5
   HAZELTINE-ESPRIT                  IBM-3279-2
   HITACHI-5601                      IBM-3279-3
   HITACHI-5603                      IBM-3477-FC
   HITACHI-5603E                     IBM-3477-FG
   HITACHI-5603EA                    IBM-5081
   HITACHI-560X                      IBM-5151
   HITACHI-560XE                     IBM-5154
   HITACHI-560XEA                    IBM-5251-11
   HITACHI-560PR                     IBM-5291-1
   HITACHI-HOAP1                     IBM-5292-2
   HITACHI-HOAP2                     IBM-5555-B01
   HITACHI-HOAP3                     IBM-5555-C01
   HITACHI-HOAP4                     IBM-6153
   HP-2392                           IBM-6154
   HP-2621                           IBM-6155
   HP-2621A                          IBM-AED
   HP-2621P                          IBM-3278-2-E
   HP-2623                           IBM-3278-3-E
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   IBM-3278-4-E                          TEC
   IBM-3278-5-E                          TEKTRONIX-4006
   IBM-3279-2-E                          TEKTRONIX-4010
   IBM-3279-3-E                          TEKTRONIX-4012
   IMLAC                                 TEKTRONIX-4013
   INFOTON-100                           TEKTRONIX-4014
   INFOTON-400                           TEKTRONIX-4023
   INFOTONKAS                            TEKTRONIX-4024
   ISC-8001                              TEKTRONIX-4025
   LSI-ADM-1                             TEKTRONIX-4027
   LSI-ADM-11                            TEKTRONIX-4105
   LSI-ADM-12                            TEKTRONIX-4107
   LSI-ADM-2                             TEKTRONIX-4110
   LSI-ADM-20                            TEKTRONIX-4112
   LSI-ADM-22                            TEKTRONIX-4113
   LSI-ADM-220                           TEKTRONIX-4114
   LSI-ADM-3                             TEKTRONIX-4115
   LSI-ADM-31                            TEKTRONIX-4125
   LSI-ADM-3A                            TEKTRONIX-4404
   LSI-ADM-42                            TELERAY-1061
   LSI-ADM-5                             TELERAY-3700
   MEMOREX-1240                          TELERAY-3800
   MICROBEE                              TELETEC-DATASCREEN
   MICROTERM-ACT-IV                      TELETERM-1030
   MICROTERM-ACT-V                       TELETYPE-33
   MICROTERM-ERGO-301                    TELETYPE-35
   MICROTERM-MIME-1                      TELETYPE-37
   MICROTERM-MIME-2                      TELETYPE-38
   MICROTERM-ACT-5A                      TELETYPE-40
   MICROTERM-TWIST                       TELETYPE-43
   NEC-5520                              TELEVIDEO-910
   NETRONICS                             TELEVIDEO-912
   NETWORK-VIRTUAL-TERMINAL              TELEVIDEO-920
   OMRON-8025AG                          TELEVIDEO-920B
   PERKIN-ELMER-550                      TELEVIDEO-920C
   PERKIN-ELMER-1100                     TELEVIDEO-925
   PERKIN-ELMER-1200                     TELEVIDEO-955
   PERQ                                  TELEVIDEO-950
   PLASMA-PANEL                          TELEVIDEO-970
   QUME-SPRINT-5                         TELEVIDEO-975
   QUME-101                              TERMINET-1200
   QUME-102                              TERMINET-300
   SOROC                                 TI-700
   SOROC-120                             TI-733
   SOUTHWEST-TECHNICAL-PRODUCTS-CT82     TI-735
   SUN                                   TI-743
   SUPERBEE                              TI-745
   SUPERBEE-III-M                        TI-800
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   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
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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 J. Davin, "A Simple Network Management Protocol", RFC-1157, (Obsoletes RFC-1067, RFC-1098), SNMP Research, Performance Systems International, Performance Systems International, MIT Laboratory for Computer Science, May 1990.

[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-1280, Internet Activities March 1992.

[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. [NOTE: This document is replaced by "IAB Official Protocol Standards" [62].]

[119] Romano, S., M. Stahl, and M. Recker, "Internet Numbers", RFC-1166, SRI-NIC, May 1990.

[120] Rose, M., and K. McCloghrie, "Structure and Identification of Management Information for TCP/IP-based internets", RFC-1155, Performance Systems International, Hughes LAN Systems, May 1990.

[121] McCloghrie, K., and M. Rose, "Management Information Base for Network Management of TCP/IP-based internets: MIB-II", RFC-1213, Hughes LAN Systems, Performance Systems International, March 1991.

[122] Rose, M., "Post Office Protocol - Version 3", RFC 1225, PSI, May 1991.

[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.

[146] Simpson, W., "The Point-to-Point Protocol (PPP) for the Transmission of Multi-Protocol Datagrams Over Point-to-Point Links", RFC 1331, Daydreamer, May 1992.

[147] McGregor, G., "The (PPP) Internet Protocol Control Protocol (IPCP)", RFC 1332, Merit, May 1992.

[148] Woodburn, W., and D. Mills, " A Scheme for an Internet Encapsulation Protocol: Version 1", RFC 1241, SAIC, University of Delaware, July 1991.

[149] McCloghrie, K., and M. Rose, "Management Information Base for Network Management of TCP/IP-based internets", Hughes LAN Systems, Performance Systems International, May 1990.

[150] McCloghrie, K., and M. Rose, "Management Information Base for Network Management of TCP/IP-based internets: MIB-II", RFC 1213, Hughes LAN Systems, Performance Systems International, March 1991.

[151] McCloghrie, K., Editor, "Extensions to the Generic-Interface MIB", RFC 1229, Hughes LAN Systems, May 1991.

[152] Waldbusser, S., Editor, "AppleTalk Management Information Base", RFC 1243, Carnegie Mellon University, July 1991.

[153] Baker, F., and R. Coltun, "OSPF Version 2 Management Information Base", RFC 1253, ACC, Computer Science Center, August 1991.

[154] Willis, S, and J. Burruss, "Definitions of Managed Objects

for the Border Gateway Protocol (Version 3)", RFC 1269, Wellfleet Communications Inc., October 1991.

[155] Waldbusser, S., "Remote Network Monitoring Management Information Base", RFC 1271, Carnegie Mellon University, November 1991.

[156] Decker, E., Langille, P., Rijsinghani, A., and K. McCloghrie, "Definitions of Managed Objects for Bridges", RFC 1286, cisco Systems, Inc., DEC, Hughes LAN Systems, Inc., December 1991.

[157] Cook, J., Editor, Definitions of Managed Objects for the Ethernet-like Interface Types", RFC 1284, Chipcom Corporation, December 1991.

[158] McCloghrie, K., and R. Fox, "IEEE 802.4 Token Bus MIB", RFC 1230, Hughes LAN Systems, Inc., Synoptics, Inc., May 1991.

[159] McCloghrie, K., Fox, R., and E. Decker, "IEEE 802.5 Token Ring MIB", RFC 1231, Hughes LAN Systems, Inc., Synoptics, Inc., cisco Systems, Inc., May 1991.

[160] Case, J., "FDDI Management Information Base", RFC 1285, SNMP Research, Incorporated, January 1992.

[161] Baker, F., and C. Kolb, Editors, "Definitions of Managed Objects for the DS1 Interface Type", RFC 1232, ACC, Performance Systems International, Inc., May 1991.

[162] Cox, T., and K. Tesink, Editors, "Definitions of Managed Objects for the DS3 Interface Type", RFC 1233, Bell Communications Research, May 1991.

[163] Reynolds, J., "Reassignment of Experimental MIBs to Standard MIBs", RFC 1239, ISI, June 1991.

[164] Cox, T., and K. Tesnik, Editors, "Definitions of Managed Objects for the SIP Interface Type", RFC 1304, Bell Communications Research, February 1992.

[165] Stewart, B., Editor, "Definitions of Managed Objects for Character Stream Devices", RFC 1316, Xyplex, Inc., April 1992.

[166] Stewart, B., Editor, "Definitions of Managed Objects for RS-232-like Hardware Devices", RFC 1317, Xyplex, Inc.,

April 1992.

[167] Stewart, B., Editor, "Definitions of Managed Objects for Parallel-printer-like Hardware Devices", RFC 1318, Xyplex, Inc., April 1992.

[168] Brown, C., Baker, F., and C. Carvalho, "Management Information Base for Frame Relay DTEs", RFC 1315, Wellfleet Communications, Inc., Advanced Computer Communications, April 1992.

[169] Borenstein, N., and N. Freed, "MIME (Multipurpose Internet Mail Extensions): Mechanisms for Specifying and Describing the Format of Internet Message Bodies", RFC 1341, Bellcore, Innosoft, June 1992.

[170] Simonsen, K., "Character Mnemonics & Character Sets", RFC 1345, Rationel Almen Planlaegning, June 1992.

[171] Dorner, S., and P. Resnick, "Remote Mail Checking Protocol", RFC 1339, U. of Illinois at Urbana-Champaign, June 1992.

[172] Everhart, C., Mamakos, L., Ullmann, R., and P. Mockapetris, Editors, "New DNS RR Definitions", RFC 1183, Transarc, University of Maryland, Prime Computer, ISI, October 1990.

[173] Bradley, T., and C. Brown, "Inverse Address Resolution Protocol", RFC 1293, Wellfleet Communications, Inc., January 1992.

[174] Manning, B. "DNS NSAP RRs", RFC 1348, Rice University, July 1992.

[175] Simpson, W., "PPP Link Quality Monitoring", RFC 1333, Daydreamer, May 1992.

[176] Baker, F., Editor, "Point-to-Point Protocol Extensions for Bridging", RFC 1220, ACC, April 1991.

[177] McCloghrie, K., Davin, J., and J. Galvin, "Definitions of Managed Objects for Administration of SNMP Parties", RFC 1353, Hughes LAN Systems, Inc., MIT Laboratory for Computer Science, Trusted Information Systems, Inc., July 1992.

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Security Considerations

Security issues are not discussed in this memo.

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