

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

J. Reynolds  
J. Postel  
ISI  
July 1992

## ASSIGNED NUMBERS

### Status of this Memo

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

### Table of Contents

|  |    |
|--|----|
| INTRODUCTION.....  | 2  |
| Data Notations.....                                      | 3  |
| Special Addresses.....                                   | 4  |
| VERSION NUMBERS.....                                     | 6  |
| PROTOCOL NUMBERS.....                                    | 7  |
| WELL KNOWN PORT NUMBERS.....                             | 9  |
| REGISTERED PORT NUMBERS.....                             | 23 |
| INTERNET MULTICAST ADDRESSES.....                        | 27 |
| IANA ETHERNET ADDRESS BLOCK.....                         | 29 |
| IP TOS PARAMETERS.....                                   | 30 |
| IP TIME TO LIVE PARAMETER.....                           | 32 |
| DOMAIN SYSTEM PARAMETERS.....                            | 33 |
| BOOTP PARAMETERS.....                                    | 35 |
| NETWORK MANAGEMENT PARAMETERS.....                       | 36 |
| MILNET LOGICAL ADDRESSES.....                            | 49 |
| MILNET LINK NUMBERS.....                                 | 50 |
| MILNET X.25 ADDRESS MAPPINGS.....                        | 51 |
| IEEE 802 NUMBERS OF INTEREST.....                        | 53 |
| ETHERNET NUMBERS OF INTEREST.....                        | 54 |
| ETHERNET VENDOR ADDRESS COMPONENTS.....                  | 57 |
| ETHERNET MULTICAST ADDRESSES.....                        | 60 |
| XNS PROTOCOL TYPES.....                                  | 62 |
| PROTOCOL/TYPE FIELD ASSIGNMENTS.....                     | 63 |
| PRONET 80 TYPE NUMBERS.....                              | 64 |
| POINT-TO-POINT PROTOCOL FIELD ASSIGNMENTS.....           | 65 |
| ADDRESS RESOLUTION PROTOCOL PARAMETERS.....              | 69 |
| REVERSE ADDRESS RESOLUTION PROTOCOL OPERATION CODES..... | 70 |
| DYNAMIC REVERSE ARP.....                                 | 70 |
| INVERSE ADDRESS RESOLUTION PROTOCOL.....                 | 70 |
| X.25 TYPE NUMBERS.....                                   | 71 |

|                                  |     |
|----------------------------------|-----|
| PUBLIC DATA NETWORK NUMBERS..... | 72  |
| TELNET OPTIONS.....              | 75  |
| MAIL ENCRYPTION TYPES.....       | 76  |
| MIME TYPES.....                  | 77  |
| CHARACTER SETS.....              | 79  |
| MACHINE NAMES.....               | 83  |
| SYSTEM NAMES.....                | 87  |
| PROTOCOL AND SERVICE NAMES.....  | 88  |
| TERMINAL TYPE NAMES.....         | 92  |
| DOCUMENTS.....                   | 96  |
| PEOPLE.....                      | 109 |
| Security Considerations.....     | 139 |
| Authors' Addresses.....          | 139 |

## INTRODUCTION

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

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

Phone: (310) 822-1511

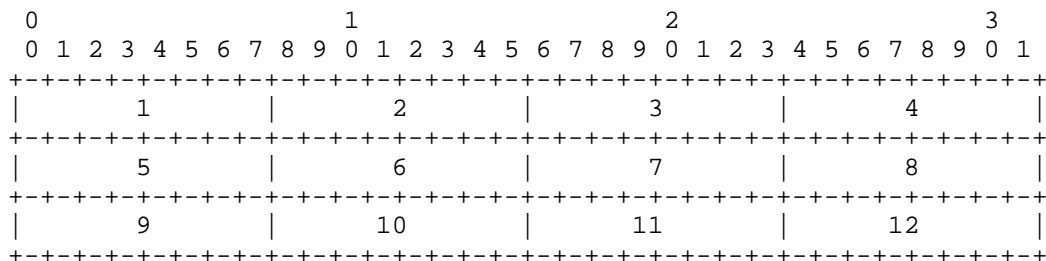
Electronic mail: IANA@ISI.EDU

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

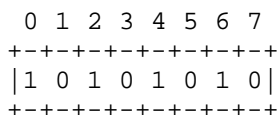
In the entries below, the name and mailbox of the responsible individual is indicated. The bracketed entry, e.g., [nn,iii], at the right hand margin of the page indicates a reference for the listed protocol, where the number ("nn") cites the document and the letters ("iii") cites the person. Whenever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

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.



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).



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.

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.

```

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

or

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

```

(a)  $\{0, 0\}$

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

(c)  $\{-1, -1\}$

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

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

[ Page 4 ]

(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<br>----- | Decimal<br>----- | Description<br>-----         | References<br>----- |
|------------------|------------------|------------------------------|---------------------|
|                  | 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]     |
| gotd     | 17/tcp | Quote of the Day             | [100,JBP] |
| gotd     | 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]   |
| cfdpkt     | 120/tcp | CFDPKT                            | [JXO3]     |
| cfdpkt     | 120/udp | CFDPKT                            | [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                             | [JX01] |
| ocbinder    | 183/udp | OCBinder                             | [JX01] |
| ocserver    | 184/tcp | OCServer                             | [JX01] |
| ocserver    | 184/udp | OCServer                             | [JX01] |
| 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         | [JX02] |
| irc         | 194/udp | Internet Relay Chat Protocol         | [JX02] |
| 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  |           |
| faterv    | 347/tcp | Fatmen Server   |           |
| faterv    | 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;<br>authentication performed using<br>passwords and UNIX loppgin names   |           |
| biff      | 512/udp | used by mail system to notify users<br>of new mail received; currently<br>receives messages only from<br>processes on the same machine  |           |
| login     | 513/tcp | remote login a la telnet;<br>automatic authentication performed<br>based on priviledged port numbers<br>and distributed data bases which<br>identify "authentication domains"   |           |
| who       | 513/udp | maintains data bases showing who's<br>logged in to machines on a local<br>net and the load average of the<br>machine  |           |
| cmd       | 514/tcp | like exec, but automatic<br>authentication is performed as for<br>login server  |           |
| syslog    | 514/udp |   |           |
| printer   | 515/tcp | spooler   |           |
| printer   | 515/udp | spooler   |           |
| talk      | 517/tcp | like tenex link, but across<br>machine - unfortunately, doesn't<br>use link protocol (this is actually<br>just a rendezvous port from which a<br>tcp connection is established) |           |
| talk      | 517/udp | like tenex link, but across<br>machine - unfortunately, doesn't<br>use link protocol (this is actually  |           |

|            |         |  |
|------------|---------|--|
|            |         | just a rendezvous port from which a<br>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);<br>uses variant of Xerox NS routing<br>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   |

|              |         |                                   |        |
|--------------|---------|-----------------------------------|--------|
| 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 |                                   |        |
| rx           | 761/tcp |                                   |        |
| rx           | 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 |                                   |        |

|                 |          |                                   |
|-----------------|----------|-----------------------------------|
| 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 convenience 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<br>----- | Decimal<br>----- | Description<br>-----          | References<br>----- |
|------------------|------------------|-------------------------------|---------------------|
| blackjack        | 1025/tcp         | network blackjack             |                     |
| blackjack        | 1025/udp         | network blackjack             |                     |
| hermes           | 1248/tcp         |                               |                     |
| hermes           | 1248/udp         |                               |                     |
| bbn-mmhc         | 1347/tcp         | multi media conferencing      |                     |
| bbn-mmhc         | 1347/udp         | multi media conferencing      |                     |
| bbn-mmxc         | 1348/tcp         | multi media conferencing      |                     |
| bbn-mmxc         | 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/dddtp |                                     |
| rfa             | 4672/tcp   | remote file access server           |
| rfa             | 4672/udp   | remote file access server           |
| complex-main    | 5000/tcp   |                                     |
| complex-main    | 5000/udp   |                                     |
| complex-link    | 5001/tcp   |                                     |
| complex-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 management server            |
| afs3-volser     | 7005/udp   | volume management 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               | OSPFGRP OSPFGRP All Routers        | [83,JXM1] |
| 224.0.0.6               | OSPFGRP OSPFGRP 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 assignments 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 decimal, 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<br>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<br>checks           |
| 14      | Merit Dump File |             | Client to dump and name<br>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 Identification 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 parameters or codes to indicate experimental or private data structures. These parameter assignments are listed here.

The older "Simple Gateway Monitoring Protocol" (SGMP) RFC-1028 [37] also defined a data structure. The parameter assignments used with SGMP are included here for historical 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      | Ulane                      | [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.                   | [SXX]    |
| 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.                     | [SXX1]  |
| 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                       | [P XK]  |
| 145 | Penril DataComm, Inc.                     | [KXH1]  |
| 146 | American Airlines                         | [B XK1] |
| 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                               | [B XK2] |
| 182 | Japan Radio Co.                           | [NXX]   |
| 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                           | [PXX2]  |
| 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 | Protocols                              | [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 Sytème 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 Electric 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      | [P XK3] |
| 320 | VerSteeg CodeWorks                                 | [BXV]   |
| 321 | Verilink Corp                                      | [BXV]   |
| 322 | Sybus Corporation                                  | [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 octets 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 representation 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                      | Internet |         |                        |            |
| binary                    | 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 Industrier 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 Hardware                    | (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<br>DECNET      |

## ETHERNET MULTICAST ADDRESSES

| Ethernet<br>Address                     | Type<br>Field | Usage  |
|---|---------------|--|
| Multicast Addresses:                    |               |  |
| 01-00-5E-00-00-00-<br>01-00-5E-7F-FF-FF | 0800          | Internet Multicast (RFC-1112) [43]   |
| 01-00-5E-80-00-00-<br>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<br>(All bridges)  |
| 09-00-2B-01-00-01                       | 8038          | DEC LanBridge Hello packets<br>(All local bridges)<br>1 packet per second, sent by the<br>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-                      | ????          | Stanford reserved  |
| 09-00-56-FE-FF-FF                       |               |  |
| 09-00-56-FF-00-00-                      | 805C          | Stanford V Kernel, version 6.0   |
| 09-00-56-FF-FF-FF                       |               |  |
| 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<br>(MOP) Dump/Load Assistance   |
| AB-00-00-02-00-00  | 6002  | DEC Maintenance Operation Protocol<br>(MOP) Remote Console<br>1 System ID packet every 8-10 minutes,<br>by every:<br>DEC LanBridge<br>DEC DEUNA interface<br>DEC DELUA interface<br>DEC DEQNA interface<br>(in a certain mode) |
| AB-00-00-03-00-00  | 6003  | DECNET Phase IV end node Hello<br>packets 1 packet every 15 seconds,<br>sent by each DECNET host   |
| AB-00-00-04-00-00  | 6003  | DECNET Phase IV Router Hello packets<br>1 packet every 15 seconds, sent by<br>the DECNET router  |
| AB-00-00-05-00-00  | ????  | Reserved DEC through   |
| AB-00-03-FF-FF-FF  |       |  |
| AB-00-03-00-00-00  | 6004  | DEC Local Area Transport (LAT) - old   |
| AB-00-04-00-xx-xx  | ????  | Reserved DEC customer private use  |
| AB-00-04-01-xx-yy  | 6007  | DEC Local Area VAX Cluster groups<br>Sys. Communication Architecture (SCA)   |
| CF-00-00-00-00-00  | 9000  | Ethernet Configuration Test protocol<br>(Loopback)   |
| Broadcast Address: |       |  |
| FF-FF-FF-FF-FF-FF  | 0600  | XNS packets, Hello or gateway search?<br>6 packets every 15 seconds, per XNS<br>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<br>search?<br>1 packets every 30 seconds, per VALID<br>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<br>1001<br>octal  | Type<br>1000<br>octal  | Type<br>3000<br>octal  |
| -----          | -----                  | -----                  | -----                  |
| 10 Mb Ethernet | Type<br>0800<br>hex    | Type<br>0200<br>hex    | Type<br>0600<br>hex    |
| -----          | -----                  | -----                  | -----                  |
| MILNET         | Link<br>155<br>decimal | Link<br>152<br>decimal | Link<br>150<br>decimal |
| -----          | -----                  | -----                  | -----                  |

| lower \ upper | DoD IP                | PUP                       | NS IP                     |
|---------------|-----------------------|---------------------------|---------------------------|
| -----         | -----                 | -----                     | -----                     |
| DoD IP        | X                     | Protocol<br>12<br>decimal | Protocol<br>22<br>decimal |
| -----         | -----                 | -----                     | -----                     |
| PUP           | ?                     | X                         | ?                         |
| -----         | -----                 | -----                     | -----                     |
| NS IP         | Type<br>13<br>decimal | Type<br>12<br>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                    | [PXX]      |
| 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 RESOLUTION 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 recommendations (such as X.29)
- 01 - Reserved for use by "national" administrative authorities
- 10 - Reserved for use by international administrative authorities
- 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 | DFVLR SUN-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-HANOV         | [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<br>---- | Subtype<br>-----                           | Description<br>----- | Reference<br>----- |
|--------------|--|----------------------|--------------------|
| text         | plain<br>richtext                          |                      | [169,NSB]          |
| multipart    | mixed<br>alternative<br>digest<br>parallel |                      | [169,NSB]          |
| message      | rfc822<br>partial<br>external-body         |                      | [169,NSB]          |
| application  | octet-stream<br>postscript<br>oda          |                      | [169,NSB]          |
| image        | jpeg<br>gif                                |                      | [169,NSB]          |
| audio        | basic                                      |                      | [169,NSB]          |
| video        | mpeg                                       |                      | [169,NSB]          |

## Character Sets

-----

| Type<br>---- | Description<br>-----      | Reference<br>----- |
|--------------|---------------------------|--------------------|
| 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             | DEC-1080           |
| ALTOS-6800       | DEC-1090           |
| AMDAHL-V7        | DEC-1090B          |
| APOLLO           | DEC-1090T          |
| ATARI-104ST      | DEC-2020T          |
| ATT-3B1          | DEC-2040           |
| ATT-3B2          | DEC-2040T          |
| ATT-3B20         | DEC-2050T          |
| ATT-7300         | DEC-2060           |
| BBN-C/60         | DEC-2060T          |
| BURROUGHS-B/29   | DEC-2065           |
| BURROUGHS-B/4800 | DEC-FALCON         |
| BUTTERFLY        | DEC-KS10           |
| C/30             | DEC-VAX-11730      |
| C/70             | DORADO             |
| CADLINC          | DPS8/70M           |
| CADR             | ELXSI-6400         |
| CDC-170          | EVEREX-386         |
| CDC-170/750      | FOONLY-F2          |
| CDC-173          | FOONLY-F3          |
| CELERITY-1200    | FOONLY-F4          |
| CLUB-386         | GOULD              |
| COMPAQ-386/20    | GOULD-6050         |
| COMTEN-3690      | GOULD-6080         |
| CP8040           | GOULD-9050         |
| CRAY-1           | GOULD-9080         |
| CRAY-X/MP        | H-316              |
| CRAY-2           | H-60/68            |
| CTIWS-117        | H-68               |
| DANDELION        | H-68/80            |
| DEC-10           | H-89               |
| DEC-1050         | HONEYWELL-DPS-6    |
| DEC-1077         | HONEYWELL-DPS-8/70 |

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

|                    |                |
|--------------------|----------------|
| SGI-IRIS-2500      | SUN-3/50       |
| SGI-IRIS-3010      | SUN-3/60       |
| SGI-IRIS-3020      | SUN-3/75       |
| SGI-IRIS-3030      | SUN-3/80       |
| SGI-IRIS-3110      | SUN-3/110      |
| SGI-IRIS-3115      | SUN-3/140      |
| SGI-IRIS-3120      | SUN-3/150      |
| SGI-IRIS-3130      | SUN-3/160      |
| SGI-IRIS-4D/20     | SUN-3/180      |
| SGI-IRIS-4D/20G    | SUN-3/200      |
| SGI-IRIS-4D/25     | SUN-3/260      |
| SGI-IRIS-4D/25G    | SUN-3/280      |
| SGI-IRIS-4D/25S    | SUN-3/470      |
| SGI-IRIS-4D/50     | SUN-3/480      |
| SGI-IRIS-4D/50G    | SUN-4/60       |
| SGI-IRIS-4D/50GT   | SUN-4/110      |
| SGI-IRIS-4D/60     | SUN-4/150      |
| SGI-IRIS-4D/60G    | SUN-4/200      |
| SGI-IRIS-4D/60T    | SUN-4/260      |
| SGI-IRIS-4D/60GT   | SUN-4/280      |
| SGI-IRIS-4D/70     | SUN-4/330      |
| SGI-IRIS-4D/70G    | SUN-4/370      |
| SGI-IRIS-4D/70GT   | SUN-4/390      |
| SGI-IRIS-4D/80GT   | SUN-50         |
| SGI-IRIS-4D/80S    | SUN-100        |
| SGI-IRIS-4D/120GTX | SUN-120        |
| SGI-IRIS-4D/120S   | SUN-130        |
| SGI-IRIS-4D/210GTX | SUN-150        |
| SGI-IRIS-4D/210S   | SUN-170        |
| SGI-IRIS-4D/220GTX | SUN-386i/250   |
| SGI-IRIS-4D/220S   | SUN-68000      |
| SGI-IRIS-4D/240GTX | SYMBOLICS-3600 |
| SGI-IRIS-4D/240S   | SYMBOLICS-3670 |
| SGI-IRIS-4D/280GTX | SYMMETRIC-375  |
| SGI-IRIS-4D/280S   | SYMULT         |
| SGI-IRIS-CS/12     | TANDEM-TXP     |
| SGI-IRIS-4SERVER-8 | TANDY-6000     |
| SPERRY-DCP/10      | TEK-6130       |
| SUN                | TI-EXPLORER    |
| SUN-2              | TP-4000        |
| SUN-2/50           | TRS-80         |
| SUN-2/100          | UNIVAC-1100    |
| SUN-2/120          | UNIVAC-1100/60 |
| SUN-2/130          | UNIVAC-1100/62 |
| SUN-2/140          | UNIVAC-1100/63 |
| SUN-2/150          | UNIVAC-1100/64 |
| SUN-2/160          | UNIVAC-1100/70 |
| SUN-2/170          | 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 Mgmt 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 Hyperchannel           |
| 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 Resolution Protocol           |
| LDP        | - Loader Debugger Protocol                    |
| LEAF-1     | - Leaf-1 Protocol                             |
| LEAF-2     | - Leaf-2 Protocol                             |
| LINK       | - Link Protocol                               |
| LOC-SRV    | - Location Service                            |
| LOGIN      | - Login Host Protocol                         |
| MAIL       | - Format of Electronic Mail Messages          |
| MERIT-INP  | - MERIT Internodal Protocol                   |
| METAGRAM   | - Metagram Relay                              |
| MIB        | - Management Information Base                 |
| MIT-ML-DEV | - MIT ML Device                               |
| MFE-NSP    | - MFE Network Services Protocol               |
| MIT-SUBNET | - MIT Subnet Support                          |
| MIT-DOV    | - MIT Dover Spooler                           |
| MPM        | - Internet Message Protocol (Multimedia Mail) |
| MPM-FLAGS  | - MPM Flags Protocol                          |

|             |   |
|-------------|---|
| MPM-SND     | - MPM Send Protocol                             |
| MSG-AUTH    | - MSG Authentication Protocol                   |
| MSG-ICP     | - MSG ICP Protocol                              |
| MUX         | - Multiplexing Protocol                         |
| NAMESERVER  | - Host Name Server                              |
| NETBIOS-DGM | - NETBIOS Datagram Service                      |
| NETBIOS-NS  | - NETBIOS Name Service                          |
| NETBIOS-SSN | - NETBIOS Session Service                       |
| NETBLT      | - Bulk Data Transfer Protocol                   |
| NETED       | - Network Standard Text Editor                  |
| NETRJS      | - Remote Job Service                            |
| NI-FTP      | - NI File Transfer Protocol                     |
| NI-MAIL     | - NI Mail Protocol                              |
| NICNAME     | - Who Is Protocol                               |
| NFILE       | - A File Access Protocol                        |
| NNTP        | - Network News Transfer Protocol                |
| NSW-FE      | - NSW User System Front End                     |
| NTP         | - Network Time Protocol                         |
| NVP-II      | - Network Voice Protocol                        |
| OSPF        | - Open Shortest Path First Interior GW Protocol |
| PCMAIL      | - Pcmail Transport Protocol                     |
| POP2        | - Post Office Protocol - Version 2              |
| POP3        | - Post Office Protocol - Version 3              |
| PPP         | - Point-to-Point Protocol                       |
| PRM         | - Packet Radio Measurement                      |
| PUP         | - PUP Protocol                                  |
| PWDGEN      | - Password Generator Protocol                   |
| QUOTE       | - Quote of the Day Protocol                     |
| RARP        | - A Reverse Address Resolution Protocol         |
| RATP        | - Reliable Asynchronous Transfer Protocol       |
| 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       | DATAMEDIA-1521   |
| ADDS-REGENT-100       | DATAMEDIA-2500   |
| ADDS-REGENT-20        | DATAMEDIA-3025   |
| ADDS-REGENT-200       | DATAMEDIA-3025A  |
| ADDS-REGENT-25        | DATAMEDIA-3045   |
| ADDS-REGENT-40        | DATAMEDIA-3045A  |
| ADDS-REGENT-60        | DATAMEDIA-DT80/1 |
| ADDS-VIEWPOINT        | DATAPOINT-2200   |
| ADDS-VIEWPOINT-60     | DATAPOINT-3000   |
| AED-512               | DATAPOINT-3300   |
| AMPEX-DIALOGUE-210    | DATAPOINT-3360   |
| AMPEX-DIALOGUE-80     | DEC-DECWRITER-I  |
| AMPEX-210             | DEC-DECWRITER-II |
| AMPEX-230             | DEC-GIGI         |
| ANDERSON-JACOBSON-510 | DEC-GT40         |
| ANDERSON-JACOBSON-630 | DEC-GT40A        |
| ANDERSON-JACOBSON-832 | DEC-GT42         |
| ANDERSON-JACOBSON-841 | DEC-LA120        |
| ANN-ARBOR-AMBASSADOR  | DEC-LA30         |
| ANSI                  | DEC-LA36         |
| ARDS                  | DEC-LA38         |
| BITGRAPH              | DEC-VT05         |
| BUSSIPLEXER           | DEC-VT100        |
| CALCOMP-565           | DEC-VT101        |
| CDC-456               | DEC-VT102        |
| CDI-1030              | DEC-VT125        |
| CDI-1203              | DEC-VT131        |
| C-ITOH-101            | DEC-VT132        |
| C-ITOH-50             | DEC-VT200        |
| C-ITOH-80             | DEC-VT220        |
| CLNZ                  | DEC-VT240        |
| COMPUCOLOR-II         | DEC-VT241        |
| CONCEPT-100           | DEC-VT300        |
| CONCEPT-104           | DEC-VT320        |
| CONCEPT-108           | DEC-VT340        |
| DATA-100              | DEC-VT50         |
| DATA-GENERAL-6053     | DEC-VT50H        |
| DATAGRAPHIX-132A      | DEC-VT52         |
| DATAMEDIA-1520        | DEC-VT55         |

|                       |              |
|-----------------------|--------------|
| 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 |

|                                   |                    |
|-----------------------------------|--------------------|
| 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             |

TYCOM  
UNIVAC-DCT-500  
VIDEO-SYSTEMS-1200  
VIDEO-SYSTEMS-5000  
VOLKER-CRAIG-303  
VOLKER-CRAIG-303A  
VOLKER-CRAIG-404  
VISUAL-200  
VISUAL-55  
WYSE-30  
WYSE-50  
WYSE-60  
WYSE-75  
WYSE-85  
XEROX-1720  
XTERM  
ZENITH-H19  
ZENITH-Z29  
ZENTEC-30

## DOCUMENTS

- [1] Anderson, B., "TACACS User Identification Telnet Option", RFC-927, BBN, December 1984.
- [2] BBN, "Specifications for the Interconnection of a Host and an IMP", Report 1822, Bolt Beranek and Newman, Cambridge, Massachusetts, revised, December 1981.
- [3] BBN, "User Manual for TAC User Database Tool", Bolt Beranek and Newman, September 1984.
- [4] Ben-Artzi, Amatzia, "Network Management for TCP/IP Network: An Overview", 3Com, May 1988.
- [5] Bennett, C., "A Simple NIFTP-Based Mail System", IEN 169, University College, London, January 1981.
- [6] Bhushan, A., "A Report on the Survey Project", RFC-530, NIC 17375, June 1973.
- [7] Bisbey, R., D. Hollingworth, and B. Britt, "Graphics Language (version 2.1)", ISI/TM-80-18, Information Sciences Institute, July 1980.
- [8] Boggs, D., J. Shoch, E. Taft, and R. Metcalfe, "PUP: An Internetwork Architecture", XEROX Palo Alto Research Center, CSL-79-10, July 1979; also in IEEE Transactions on Communication, Volume COM-28, Number 4, April 1980.
- [9] Borman, D., Editor, "Telnet Linemode Option", RFC 1116, Cray Research, Inc., August 1989.
- [10] Braden, R., "NETRJS Protocol", RFC-740, NIC 42423, Information Sciences Institute, November 1977.
- [11] Braden, R., and J. Postel, "Requirements for Internet Gateways", RFC-1009, Obsoletes RFC-985, Information Sciences Institute, June 1987.
- [12] Bressler, B., "Remote Job Entry Protocol", RFC-407, NIC 12112, October 1972.
- [13] Bressler, R., "Inter-Entity Communication -- An Experiment", RFC-441, NIC 13773, January 1973.
- [14] Butler, M., J. Postel, D. Chase, J. Goldberger, and

- J. K. Reynolds, "Post Office Protocol - Version 2", RFC-937, Information Sciences Institute, February 1985.
- [15] Case, J., M. Fedor, M. Schoffstall, and 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 Microsystems, 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, "Nickname/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] Warriier, 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", XSI 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., Rijssinghani, 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, Rational 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.

## PEOPLE

|        |                       |                            |   |
|--------|-----------------------|----------------------------|---|
| [AB20] | Art Berggreen         | ACC                        | art@SALT.ACC.COM                                    |
| [ABB2] | A. Blasco Bonito      | CNUCE                      | blasco@ICNUCEVM.CNUCE.CNR.IT                        |
| [AD14] | Annette DeSchon       | ISI                        | DESCHON@ISI.EDU                                     |
| [AGM]  | Andy Malis            | BBN                        | Malis@BBN.COM                                       |
| [AKH5] | Arthur Hartwig        | UQNET                      | munari!wombat.decnet.uq.oz.au!ccarthur@UUNET.UU.NET |
| [ANM2] | April N. Marine       | SRI                        | april@nisc.sri.com                                  |
| [AW90] | Amanda Walker         | Intercon                   | AMANDA@INTERCON.COM                                 |
| [AXB]  | Albert G. Broscius    | UPENN                      | broscius@DSL.CIS.UPENN.EDU                          |
| [AXB1] | Amatzia Ben-Artzi     |                            | ---none---  |
| [AXB2] | Andre Baux            | Bull                       | baux@ec.bull.fr                                     |
| [AXB3] | Anil Bhavnani         | Kalpana, Inc.              | ---none---  |
| [AXB4] | Alan Brind            | Cameo Communications, Inc. | ---none---  |
| [AXC]  | Andrew Cherenson      | SGI                        | arc@SGI.COM   |
| [AXC1] | Anthony Chung         | Sytek                      | sytek!syteka!anthony@HPLABS.HP.COM                  |
| [AXF]  | Annmarie Freitas      | Microcom                   | ---none---  |
| [AXH]  | Arthur Harvey         | DEC                        | harvey@gah.enet.dec.com                             |
| [AXK]  | Anastasios Kotsikonas | Boston University          | tasos@cs.bu.edu                                     |
| [AXL]  | Alan Lloyd            | Datacraft                  | alan@datacraft.oz                                   |
| [AXM]  | Alex Martin           | Retix                      | ---none---  |
| [AXM1] | Ashok Marwaha         | Unisys                     | ---none---  |

|         |                      |                           |                             |
|---------|----------------------|---------------------------|-----------------------------|
| [AXM2]  | Andrew McRae         | Megadata Pty Ltd.         | andrew@megadata.mega.oz.au  |
| [AXP]   | Anil Prasad          | WilTel                    | wiltel!aprasad@uunet.UU.NET |
| [AXP1]  | A. Pele              | OST                       | ---none---                  |
| [AXS]   | Arthur Salazar       | Locus                     | lcc.arthur@SEAS.UCLA.EDU    |
| [AXS1]  | Andrew Smith         | Ascom                     | andrew@hasler.ascom.ch      |
| [AXS2]  | Anil Singhal         | Frontier                  | ---none---                  |
| [BA4]   | Brian Anderson       | BBN                       | baanders@CCQ.BBN.COM        |
| [BCH2]  | Barry Howard         | LLNL                      | Howard@NMFECCL.LNL.GOV      |
| [BCN]   | B. Clifford Neuman   | ISI                       | bcn@isi.edu                 |
| [BD70]  | Bernd Doleschal      | SEL                       | Doleschal@A.ISI.EDU         |
| [BH144] | Bridget Halsey       | Banyan                    | bah@BANYAN.BANYAN.COM       |
| [BJR2]  | Bill Russell         | NYU                       | russell@cmcl2.NYU.EDU       |
| [BK29]  | Brian Kantor         | UCSD                      | brian@UCSD.EDU              |
| [BKR]   | Brian Reid           | DEC                       | reid@DECWRL.DEC.COM         |
| [BM60]  | Bede McCall          | Mitre                     | bede@mitre.org              |
| [BP52]  | Brad Parker          | CAYMAN                    | brad@cayman.Cayman.COM      |
| [BS221] | Bob Stewart          | Xyplex                    | STEWART@XYPLEX.COM          |
| [BV15]  | Bernie Volz          | PSC                       | VOLZ@PROCESS.COM            |
| [BWB6]  | Barry Boehm          | DARPA                     | boehm@DARPA.MIL             |
| [BXA]   | Bill Anderson        | MITRE                     | wda@MITRE-BEDFORD.ORG       |
| [BXB]   | Brad Benson          | Touch                     | ---none---                  |
| [BXD]   | Brian Dockter        | Northwest Digital Systems | ---none---                  |
| [BXE]   | Brian A. Ehrmantraut | Auspex Systems            | bae@auspex.com              |

|        |                   |                                   |  |
|--------|-------------------|-----------------------------------|--|
| [BXE1] | Brendan Eich      | SGI                               | brendan@illyria.wpd.sgi.com              |
| [BXF]  | Bruce Factor      | Artificial Horizons, Inc.         | ahi!bigapple!bruce@uunet.UU.NET          |
| [BXF1] | Bill Flanagan     | Lotus Development Corp.           | bflanagan@lotus.com                      |
| [BXF2] | Bob Friesenhahn   | PUREDATA Research/USA             | pdrusa!bob@uunet.UU.NET                  |
| [BXG]  | Bob Grady         | Tekelec                           | ---none---                               |
| [BXH]  | Brian Horn        | Locus                             | ---none---                               |
| [BXH1] | Bill Harrell      | TI                                | ---none---                               |
| [BXK]  | Bill King         | Allen-Bradley Co.                 | abvax!calvin.icd.ab.com!wrk@uunet.UU.NET |
| [BXK1] | Bill Keatley      | American Airlines                 | ---none---                               |
| [BXK2] | Bruce Kropp       | ADC Kentrox                       | ktxc8!bruce@uunet.UU.NET                 |
| [BXL]  | Brian Lloyd       | SIRIUS                            | ---none---                               |
| [BXL1] | Brian Lloyd       | Telebit                           | brian@robin.telebit.com                  |
| [BXL2] | Bernard Lemercier | BIM                               | bl@sunbim.be                             |
| [BXM]  | RL "Bob" Morgan   | Stanford University               | morgan@jessica.stanford.edu              |
| [BXM1] | Bob Meierhofer    | Computer Network Technology Corp. | ---none---                               |
| [BXN]  | Bill Norton       | Merit                             | wbn@MERIT.EDU                            |
| [BXO]  | Brian O'Shea      | Visual                            | bos@visual.com                           |
| [BXP]  | Brad Parke        | Intecom                           | ---none---                               |
| [BXP1] | Brian Petry       | Systech Computer Corporation      | systech!bpetry@uunet.UU.NET              |
| [BXR]  | Bob Rosenbaum     | WINDATA                           | ---none---                               |

|        |                      |                              |   |
|--------|----------------------|------------------------------|---|
| [BXR1] | Bill Rose            | SSD Management, Inc.         | --none---                                     |
| [BXS]  | Bill Simpson         | ACS                          | bsimpson@vela.acs.oakland.edu                 |
| [BXS1] | Blair Sanders        | Texas Instruments            | Blair_Sanders@mcimail.com                     |
| [BXS2] | Bill Schilit         | Xerox PARC                   | schilit@parc.xerox.com                        |
| [BXT]  | Bruce Taber          | Interlan                     | taber@europa.InterLan.COM                     |
| [BXV]  | Bill Versteeg        | NCR                          | bvs@NCR.COM                                   |
| [BXW]  | Brent Welch          | Sprite                       | brent%sprite.berkeley.edu@GINGER.BERKELEY.EDU |
| [BXW1] | Bruce Willins        | Raycom                       | ---none---                                    |
| [BXZ]  | Bob Zaniolo          | Reuter                       | ---none---                                    |
| [CLH3] | Charles Hedrick      | RUTGERS                      | HEDRICK@ARAMIS.RUTGERS.EDU                    |
| [CMR]  | Craig Rogers         | ISI                          | Rogers@ISI.EDU                                |
| [CS1]  | Chikong Shue         | Cascade Communications Corp. | alpo!chi@uunet.uu.net                         |
| [CWL]  | Charles W. Lynn, Jr. | BBN                          | CLYNN@BBN.COM                                 |
| [CXA]  | Cyrus Azar           | Symplex Communications Corp. | ---none---                                    |
| [CXB]  | Caralyn Brown        | Wellfleet                    | cbrown%wellfleet.com@talcott.harvard.edu      |
| [CXB1] | Carl Beame           | Beame & Whiteside            | beame@ns.bws.com                              |
| [CXC]  | Creighton Chong      | Network Peripherals Inc.     | cchong@fastnet.com                            |
| [CXC1] | Chih-Yi Chen         | Tatung Co., Ltd.             | TCCISM1%TWNTTIT.BITNET@pucc.Princeton.EDU     |
| [CXC2] | Chuck Chriss         | Trillium Digital Systems     | 76675.1372@compuserve.com                     |
| [CXD]  | Chuck Davin          | MIT                          | jrd@ptt.lcs.mit.edu                           |

|        |                     |  |
|--------|---------------------|--|
| [CXD1] | Carl H. Dreyer      | RC International A/S<br>chd@rci.dk                         |
| [CXD2] | Charles Dulin       | Parallan Computer, Inc. ---none---                         |
| [CXF]  | Catherine Foulston  | RICE cathyf@rice.edu                                       |
| [CXH]  | Ching-Fa Hwang      | Proxar cfh@proxar.com                                      |
| [CXH1] | Claude Huss         | Matsushita Tokyo Research Labs<br>claude@trc.mew.mei.co.jp |
| [CXI1] | Clyde Iwamoto       | Stratacom cki@strata.com                                   |
| [CXL]  | Chung Lam           | Fujitsu ---none---   |
| [CXL1] | Christopher Leong   | DEC leong@kolmod.mlo.dec.com                               |
| [CXM]  | Charles Marker II   | MIPS marker@MIPS.COM                                       |
| [CXM1] | Carl Madison        | Star-Tek, Inc. carl@startek.com                            |
| [CXM2] | Carl Marcinik       | Formation, Inc. ---none---                                 |
| [CXM3] | Chuck McManis       | Sun Chuck.McManis@Eng.Sun.COM                              |
| [CXR]  | Cheryl Krupczak     | NCR<br>clefor@secola.columbia.ncr.com                      |
| [CXS]  | Craig Scott         | NetWorth, Inc. ---none---                                  |
| [CXS1] | Chip Standifer      | Technology Dynamics, Inc.<br>TDYNAMICS@MCIMAIL.COM         |
| [CXT]  | Christopher Tengi   | Princeton tengi@Princeton.EDU                              |
| [CXT1] | Chris Thomas        | Intel Corporation<br>---none--                             |
| [CXV]  | Carl Vanderbeek     | Automated Network Management, Inc.<br>---none--            |
| [CXW]  | Christopher Wheeler | UW cwheeler@cac.washington.edu                             |
| [CXW1] | Charles Watt        | SecureWare watt@sware.com                                  |
| [DAG4] | David A. Gomberg    | MITRE gomberg@GATEWAY.MITRE.ORG                            |

|         |                |                  |                                     |
|---------|----------------|------------------|-------------------------------------|
| [DB14]  | Dave Borman    | Cray             | dab@CRAY.COM                        |
| [DC126] | Dick Cogger    | Cornell          | rhx@CORNELL.CIT.CORNELL.EDU         |
| [DCP1]  | David Plummer  | MIT              | DCP@SCRC-QUABBIN.ARPA               |
| [DDC1]  | David Clark    | MIT              | ddc@LCS.MIT.EDU                     |
| [DG223] | Doug Goodall   | Goodall Software | goodall!doug@uunet.uu.net           |
| [DJK13] | David Kaufman  | DeskTalk         | ---none---                          |
| [DLM1]  | David Mills    | LINKABIT         | Mills@HUEY.UDEL.EDU                 |
| [DM28]  | Dennis Morris  | DCA              | Morrisd@IMO-UVAX.DCA.MIL            |
| [DM280] | Dave Mackie    | NCD              | lupine!djm@UUNET.UU.NET             |
| [DM354] | Don McWilliam  | UBC              | mcwillm@CC.UBC.CA                   |
| [DP4Q]  | Drew Perkins   | InterStream      | Drew.Perkins@ANDREW.CMU.EDU         |
| [DP666] | Don Provan     | Novell           | donp@xlnvax.novell.com              |
| [DR48]  | Doug Rosenthal | MCC              | rosenthal@mcc.com                   |
| [DR137] | David Rageth   | Martin Marietta  | DAVE@MMC.COM                        |
| [DRC3]  | Dave Cheriton  | STANFORD         | cheriton@PESCADERO.STANFORD.EDU     |
| [DT15]  | Daniel Tappan  | BBN              | Tappan@BBN.COM                      |
| [DT167] | Dennis Thomas  | Tektronics       | dennist@tektronix.TEK.COM           |
| [DW181] | David Wolfe    | SRI              | ctabka@TSCA.ISTC.SRI.COM            |
| [DW183] | David Waitzman | BBN              | dwaitzman@BBN.COM                   |
| [DW238] | Dave Windorski | UWisc            | DAVID.WINDORSKI@MAIL.ADMIN.WISC.EDU |
| [DXA]   | Dave Atkinson  | Kinmel Park      | ---none---                          |
| [DXB]   | Dave Buehmann  | Intergraph       | ingr!daveb@UUNET.UU.NET             |

|        |                   |                                 |  |
|--------|-------------------|---------------------------------|--|
| [DXB1] | Dan Bernstein     | NYU                             | brnstnd@stealth.acf.nyu.edu                            |
| [DXB2] | Dennis E. Baasch  | Emerging Technologies, Inc.     | etinc!dennis@uu.psi.com                                |
| [DXB3] | David A. Brown    | BICC                            | fzbicdb@uk.ac.ucl                                      |
| [DXB4] | Donna Beatty      | MICOM Communication Corporation | SYSAD@prime.micom.com                                  |
| [DXC]  | Dale Cabell       | NetCom                          | ---none---   |
| [DXC1] | Darren Croke      | Micronics Computers Inc.        | dc@micronics.com                                       |
| [DXC2] | Dale Cabell       | XTree                           | cabell@smtp.xtree.com                                  |
| [DXD]  | Dennis J.W. Dube  | VIA SYSTEMS                     | ---none---   |
| [DXE]  | Douglas Egan      | Nokia                           | ---none---   |
| [DXF]  | Dave Feldmeier    | Bellcore                        | dcf@thumper.bellcore.com                               |
| [DXG]  | David Goldberg    | SMI                             | sun!dg@UCBARPA.BERKELEY.EDU                            |
| [DXG1] | Don Gibson        | Aston-Tate                      | sequent!aero!twinsun!ashtate.A-T.COM!dong@uunet.UU.NET |
| [DXG2] | David B. Gurevich | DHL Systems                     | dgurevic@rhubarb.ssf-sys.dhl.com                       |
| [DXH]  | Donna Hopkins     | US West Advance Technologies    | dmhopki@uswat.uswest.com                               |
| [DXH1] | Dave Hudson       | Kendall Square Research (KSR)   | tdh@uunet.UU.NET                                       |
| [DXJ]  | David Joyner      | NCSU Computing Center           | david@unity.ncsu.edu                                   |
| [DXK]  | Doug Karl         | OSU                             | KARL-D@OSU-20.IRCC.OHIO-STATE.EDU                      |
| [DXK1] | Dwain Kinghorn    | Microsoft                       | microsoft!dwaink@cs.washington.edu                     |
| [DXK2] | Dror Kessler      | DigiBoard                       | dror@digibd.com  |

|        |                  |   |
|--------|------------------|---|
| [DXK3] | David E. Kaufman | Magnalink Communications Corporation<br>---none---                |
| [DXL]  | David Lin        | Zenith ---none---   |
| [DXL1] | Dave LeBlang     | Atria Software leglang@atria.com                                  |
| [DXM]  | Didier Moretti   | Ungermann-Bass ---none---   |
| [DXM2] | David Mittnacht  | Computer Protocol ---none---                                      |
| [DXM3] | Danny Mitzel     | Hughes dmitzel@whitney.hac.com                                    |
| [DXM4] | Deron Meranda    | Cincinnati Bell Info. Systems, Inc.<br>bem56094@ucunix.san.uc.EDU |
| [DXM5] | Donna McMaster   | SynOptics mcmaster@synoptics.com                                  |
| [DXN]  | Danny Nessel     | LLNL Livermore Computer Center<br>nessett@ocfmail.ocf.llnl.gov    |
| [DXP]  | Dave Preston     | CMC ---none---  |
| [DXP1] | David Perkins    | Synoptics dperkins@synoptics.com                                  |
| [DXP2] | Dave Presotto    | AT&T presotto@reseach.att.com                                     |
| [DXR]  | Debbie Reed      | Fujikura ---none---   |
| [DXR1] | Don Rooney       | ACCTON ---none---   |
| [DXR2] | David Rhein      | HCSD davidr@ssd.csd.harris.com                                    |
| [DXR3] | David Reed       | MIT-LCS ---none---  |
| [DXS]  | Dan Shia         | DSET dset!shia@uunet.UU.NET                                       |
| [DXS1] | Daisy Shen       | IBM ---none---  |
| [DXS2] | Dale Shelton     | Roadnet ---none---  |
| [DXS3] | Daniel Steinber  | SUN Daniel.Steinberg@Eng.Sun.COM                                  |
| [DXS4] | Dirk Smith       | Nu-Mega Technologies, Inc.<br>---none---                          |
| [DXT]  | Deepak Taneja    | Banyan<br>Deepak=Taneja%Eng%Banyan@Thing.banyan.com               |

|        |                           |   |
|--------|---------------------------|---|
| [DXT1] | David Taylor              | Empros Systems International<br>dtaylor@ems.cdc.com   |
| [DXV]  | D. Venkatrangan           | Metrix     venkat@metrix.com                          |
| [DXW]  | Dan Willie                | Codenoll Tech. Corp.   ---none---                     |
| [DXW1] | Don Weir                  | Skyline Technology, Inc.   --none---                  |
| [DY26] | Dennis Yaro               | SUN        yaro@SUN.COM                               |
| [EAK4] | Earl Killian              | LLL        EAK@MORDOR.S1.GOV                          |
| [EBM]  | Eliot Moss                | MIT        EBM@XX.LCS.MIT.EDU                         |
| [EP53] | Eric Peterson             | Locus      lcc.eric@SEAS.UCLA.EDU                     |
| [EXB]  | Etienne Baudras-Chardigny | RCE      ---none---                                   |
| [EXC]  | Ed Cain                   | DCA        cain@edn-unix.dca.mil                      |
| [EXC1] | Eric Cooper               | Fore Systems, Inc.   ecc@fore.com                     |
| [EXD]  | Eric Decker               | cisco      cire@cisco.com                             |
| [EXF]  | Ed Fudurich               | Gateway Communications, Inc.<br>---none---            |
| [EXG]  | Errol Ginsberg            | Ridgeback Solutions<br>bacchus!zulu!errol@uu2.psi.com |
| [EXM]  | Eldon S. Mast             | Netrix Systems Corporation<br>esm@netrix.com          |
| [EXO]  | Eric Olinger              | Peregrine Systems     eric@peregrine.com              |
| [EXR]  | Eric Rubin                | FiberCom   err@FIBERCOM.COM                           |
| [EXR1] | Efrat Ramati              | Lannet Co.   ---none---                               |
| [EXR2] | Edwards E. Reed           | Xerox      ipcontact.cin_ops@xerox.com                |
| [EXW]  | E. Wald                   | DEC        ewald@via.enet.dec.com                     |
| [EXX]  | Eduardo                   | ESA<br>EDUATO%ESOC.BITNET@CUNYVM.CUNY.EDU             |
| [FB77] | Fred Baker                | ACC        fbaker@acc.com                             |

|         |                     |                           |                                     |
|---------|---------------------|---------------------------|-------------------------------------|
| [FEIL]  |                     | Unisys                    | feil@kronos.nisd.cam.unisys.com     |
| [FJW]   | Frank J. Wancho     | WSMR                      | WANCHO@WSMR-SIMTEL20.ARMY.MIL       |
| [FXB1]  | Felix Burton        | DIAB                      | FB@DIAB.SE                          |
| [FXF]   | Farhad Fozdar       | OSCOM International       | f_fozdar@fennel.cc.uwa.edu.au       |
| [GAL5]  | Guillermo A. Loyola | IBM                       | LOYOLA@IBM.COM                      |
| [GB7]   | Gerd Beling         | FGAN                      | GBELING@ISI.EDU                     |
| [GEOF]  | Geoff Goodfellow    | OSD                       | Geoff@FERNWOOD.MPK.CA.US            |
| [GM23]  | Glenn Marcy         | CMU                       | Glenn.Marcy@A.CS.CMU.EDU            |
| [GS2]   | Greg Satz           | cisco                     | satz@CISCO.COM                      |
| [GS91]  | Guy Streeter        | Intergraph                | guy@guy.bll.ingr.com                |
| [GS123] | Geof Stone          | NSC                       | geof@NETWORK.COM                    |
| [GSM11] | Gary S. Malkin      | Xylogics                  | GMALKIN@XYLOGICS.COM                |
| [GXA]   | Glen Arp            | Protools                  | ---none---                          |
| [GXB]   | Gerard Berthet      | Independence Technologies | gerard@indetech.com                 |
| [GXC]   | Greg Chesson        | SGI                       | Greg@SGI.COM                        |
| [GXC1]  | George Clapp        | Bellcore                  | meritec!clapp@bellcore.bellcore.com |
| [GXC2]  | Gordon C. Galligher |                           | gorpong@ping.chi.il.us              |
| [GXD]   | Glenn Davis         | Unidata                   | davis@unidata.ucar.edu              |
| [GXD1]  | Gordon Day          | INDE Electronics          | gday@cs.ubc.ca                      |
| [GXG]   | Gil Greenbaum       | Unisys                    | gcole@nisd.cam.unisys.com           |
| [GXH]   | Graham Hudspith     | INMOS                     | gwh@inmos.co.uk                     |

|        |                    |  |
|--------|--------------------|--|
| [GXH1] | Gary Haney         | Martin Marietta Energy Systems<br>haneyg@ornl.gov    |
| [GXH2] | Greg Hummel        | Cellular Technical Servuces<br>---none---            |
| [G XK] | Gunther Kroenert   | Siemens Nixdorf Informationssysteme AG<br>---none--- |
| [GXL]  | Glenn Levitt       | McData Corporation<br>gpl0363@mcmail.mcdata.com      |
| [GXM]  | Gerald McBrearty   | IBM ---none---                                       |
| [GXM1] | Glenn Mansfield    | AIC Systems Laboratories Ltd.<br>glenn@aic.co.jp     |
| [GXM2] | Garry McCracken    | TIL Systems, Ltd. ---none---                         |
| [GXN]  | Gunnar Nilsson     | Ericsson ---none---                                  |
| [GXP]  | Gill Pratt         | MIT gill%mit-ccc@MC.LCS.MIT.EDU                      |
| [GXP1] | Greg Pflaum        | IRIS<br>iris.com!Greg_Pflaum@uunet.uu.net            |
| [GXS]  | Guenther Schreiner | LINK<br>snmp-admin@ira.uka.de                        |
| [GXS1] | George Sandoval    | Fibernet ---none---                                  |
| [GXT]  | Glenn Trewitt      | STANFORD trewitt@AMADEUS.STANFORD.EDU                |
| [GXT1] | Gene Tsudik        | USC tsudik@USC.EDU                                   |
| [GXW]  | Glenn Waters       | Bell Northern gwaters@BNR.CA                         |
| [GXW1] | Gil Widdowson      | Interphase ---none---                                |
| [GXW2] | Graham Welling     | Dynatech Communications<br>s8000!gcw@uunet.uu.net    |
| [HCF2] | Harry Forsdick     | BBN Forsdick@BBN.COM                                 |
| [HS23] | Hokey Stenn        | Plus5 hokey@PLUS5.COM                                |
| [HWB]  | Hans-Werner Braun  | MICHIGAN HWB@MCR.UMICH.EDU                           |

|        |                   |                                 |   |
|--------|-------------------|---------------------------------|---|
| [HXB]  | Henk Boetzkes     | Netexp Research                 | ---none---  |
| [HXD]  | Hans Jurgen Dorr  | Digital-Kienzle Computersystems | ---none---  |
| [HXE]  | Hunaid Engineer   | Cray                            | hunaid@OPUS.CRAY.COM                                |
| [HXE1] | Hartvig Ekner     | Dowty Network Systems A/S       | hj@dowtyns.dk                                       |
| [HXF]  | Harley Frazee     | T3Plus                          | harley@io.t3plus.com                                |
| [HXF1] | Hiroshi Fujii     | ASTEC, Inc.                     | fujii@astec.co.jp                                   |
| [HXH]  | Harald Hoeg       | Tandberg Data A/S               | haho%huldra.uucp@nac.no                             |
| [HXH1] | Howard C. Herbert | AES                             | ---none---  |
| [HXH2] | Hidekazu Hagiwara | Takaoka Electric Mfg. Co., Ltd. | hagiwara@takaoka.takaoka-electric.co.jp             |
| [HXK]  | Henry Kaijak      | Gandalf                         | ---none---  |
| [HXK1] | Hiroshi Kume      | Fuji Xerox Co., Ltd.            | Kume%KSPB%Fuji_Xerox@tcpgw.netg.ksp.fujixerox.co.jp |
| [HXL]  | Henry Lee         | TRW                             | henry@trwind.ind.trw.com                            |
| [HXL1] | Hugh Lockhart     | Telecommunication Systems       | ---none---  |
| [HXM]  | Hsiang Ming Ma    | Asante Technology               | ---none---  |
| [HXN]  | Henry P. Nagai    | D-Link                          | ---none---  |
| [HXN1] | Heinz Nisi        | Richard Hirschmann GmbH & Co.   | mia@intsun.rus.uni-stuttgart.de                     |
| [HXP]  | Hong K. Paik      | Samsung                         | paik@samsung.com                                    |
| [HXS]  | Heidi Stettner    | Basis, Inc.                     | heidi@mtxinu.COM                                    |
| [HXT]  | Hugh Thomas       | DEC                             | thomas@oils.enet.dec.com                            |
| [HXT1] | Hubert Theissen   | AEG KABEL                       | ---none---  |
| [HXU]  | Hiroataka Usuda   | Hitachi                         | ---none---  |

|         |                     |                                |                                 |
|---------|---------------------|--------------------------------|---------------------------------|
| [IEEE]  | Vince Condello      | IEEE                           | ---none---                      |
| [IXD]   | Ian Dickinson       | WUCS                           | vato@cu.warwick.ac.uk           |
| [IXD1]  | Israel Drori        | LANOPTICS LTD. Israel          | raanan@techunix.technion.ac.il  |
| [IXG]   | Ian George          | MegaPAC                        | ---none---                      |
| [IXH]   | Ippei Hayashi       | Fujitsu Limited                | hayashi@sysrap.cs.fujitsu.co.jp |
| [JAG]   | James Gosling       | SUN                            | JAG@SUN.COM                     |
| [JB478] | Jonathan Biggar     | Netlabs                        | jon@netlabs.com                 |
| [JBP]   | Jon Postel          | ISI                            | Postel@ISI.EDU                  |
| [JBW1]  | Joseph Walters, Jr. | BBN                            | JWalters@BBN.COM                |
| [JCB1]  | John Burruss        | BBN                            | JBurruss@VAX.BBN.COM            |
| [JCM48] | Jeff Mogul          | DEC                            | mogul@DECWRL.DEC.COM            |
| [JD21]  | Jonathan Dreyer     | BBN                            | Dreyer@CCV.BBN.COM              |
| [JDC20] | Jeffrey Case        | UTK                            | case@UTKUX1.UTK.EDU             |
| [JFH2]  | Jack Haverty        | Oracle Corporation             | jhaverty@ORACLE.COM             |
| [JFW]   | Jon F. Wilkes       | STC                            | Wilkes@CCINT1.RSRE.MOD.UK       |
| [JGH]   | Jim Herman          | BBN                            | Herman@CCJ.BBN.COM              |
| [JG423] | John Gawf           | Compatible Systems Corporation | gawf@compatible.com             |
| [JJB25] | John Bowe           | BBN                            | jbowe@PINEAPPLE.BBN.COM         |
| [JPH17] | John Hanley         | Oracle                         | jhanley@oracle.com              |
| [JKR1]  | Joyce K. Reynolds   | ISI                            | JKRey@ISI.EDU                   |
| [JR35]  | Jon Rochlis         | MIT                            | jon@ATHENA.MIT.EDU              |
| [JRL3]  | John R. LoVerso     | CCUR                           | loverso@westford.ccur.com       |

|        |                  |                                   |                                  |
|--------|------------------|-----------------------------------|----------------------------------|
| [JS28] | John A. Shriver  | Proteon                           | jas@PROTEON.COM                  |
| [JTM4] | John Moy         | Proteon                           | jmoy@PROTEON.COM                 |
| [JWF]  | Jim Forgie       | MIT/LL                            | FORGIE@XN.LL.MIT.EDU             |
| [JXB]  | Jeffrey Buffun   | Apollo                            | jbuffum@APOLLO.COM               |
| [JXB1] | John M. Ballard  | Microsoft                         | jballard@microsoft.com           |
| [JXB2] | John Burnett     | ATM                               | ---none---                       |
| [JXC]  | John Cook        | Chipcom                           | cook@chipcom.com                 |
| [JXC1] | Jeff Carton      | American Express Travel Rel. Ser. | jcarton@amex-trs.com             |
| [JXC2] | Joseph Chen      | Symbol Technology, Inc.           | ---none---                       |
| [JXD]  | Julie Dmytryk    | Ultra                             | Julie_Dmytryk.MKT@usun.ultra.com |
| [JXD1] | James Davidson   | NGC                               | ngc!james@uunet.UU.NET           |
| [JXE2] | Jeanne Evans     | UKMOD                             | JME%RSRE.MOD.UK@CS.UCL.AC.UK     |
| [JXF]  | Josh Fielk       | Optical Data Systems              | ---none---                       |
| [JXF1] | Jeff Freeman     | Emulex                            | ---none---                       |
| [JXG]  | Jerry Geisler    | Boeing                            | ---none---                       |
| [JXG1] | Jim Greuel       | HP                                | jimg%hpcndpc@hplabs.hp.com       |
| [JXG2] | Jeremy Greene    | LearningTree                      | taipan!greene@uunet.UU.NET       |
| [JXG3] | James L. Gula    | Corollary, Inc.                   | gula@corollary.com               |
| [JXH]  | Jeffrey C. Honig | Cornell                           | jch@gated.cornell.edu            |
| [JXH1] | Jim Hayes        | Apple                             | Hayes@APPLE.COM                  |
| [JXI]  | Jon Infante      | ICL                               | ---none---                       |
| [JXI1] | John Ioannidis   | Columbia                          | ji@close.cs.columbia.edu         |
| [JXK]  | Joanna Karwowska | DGC                               | karwowska@dg-rtp.dg.com          |

|        |                      |                               |                                       |
|--------|----------------------|-------------------------------|---------------------------------------|
| [JXK1] | Jon Kepecs           | Legato                        | kepecs@Legato.COM                     |
| [JXL]  | John Light           | GSS                           | johnl@gssc.gss.com                    |
| [JXM]  | Joseph Murdock       | Network Resources Corporation | ---none---                            |
| [JXM1] | Jim Miner            | Star Technologies             | miner@star.com                        |
| [JXO]  | Jack O'Neil          | ENCORE                        | ---none---                            |
| [JXO1] | Jerrilynn Okamura    | Ontologic                     | ---none---                            |
| [JXO2] | Jarkko Oikarinen     | Tolsun                        | jto@TOLSUN.OUU.FI                     |
| [JXO3] | John Ioannidis       | Columbia                      | ji@close.cs.columbia.edu              |
| [JXP]  | Joe Pato             | Apollo                        | apollo!pato@EDDIE.MIT.EDU             |
| [JXP1] | Jas Parmar           | Synernetics                   | jas@synnet.com                        |
| [JXP2] | John Pickens         | 3Com                          | jrp@3Com.com                          |
| [JXR]  | Jacob Rekhter        | IBM                           | Yakov@IBM.COM                         |
| [JXR1] | Jens T. Rasmussen    | CERN                          | jenst%cernvax.cern.ch@CUNYVM.CUNY.EDU |
| [JXR2] | James Rice           | Stanford                      | RICE@SUMEX-AIM.STANFORD.EDU           |
| [JXR3] | Jacques Roth         | Netronix, Inc.                | ---none---                            |
| [JXS]  | Jim Stevens          | Rockwell                      | Stevens@ISI.EDU                       |
| [JXS1] | John Sancho          | CastleRock                    | ---none---                            |
| [JXS2] | Jon Saperia          | DEC                           | saperia@tcpjon.enet.dec.com           |
| [JXS3] | Jonathan Stone       | Victoria University           | jonathan@isor.vuw.ac.nz               |
| [JXS4] | John K. Scoggin, Jr. | Delmarva Power                | scoggin@delmarva.com                  |
| [JXS5] | Jeremy Siegel        | 3COM                          | jzs@NSD.3Com.COM                      |
| [JXT]  | Jim Taylor           | Kodak                         | taylor@heart.epps.kodak.com           |
| [JXT1] | Jimmy Tu             | Digital Link                  | jimmy@dl.com                          |

|         |                  |                                  |  |
|---------|------------------|----------------------------------|--|
| [JXW]   | James Watt       | NNC                              | ---none---                               |
| [JXY]   | J. Yoshida       | NKK Corp.                        | ---none---                               |
| [JXZ]   | Jon Ziegler      | Artel                            | Ziegler@Artel.com                        |
| [KAA]   | Ken Adelman      | TGV, Inc.                        | Adelman@TGV.COM                          |
| [KA4]   | Karl Auerbach    | Empirical Tools and Technologies | karl@empirical.com                       |
| [KH43]  | Kathy Huber      | BBN                              | khuber@bbn.com                           |
| [KH157] | Kory Hamzeh      | Fibermux                         | ames!avatar.com!kory@harvard.harvard.edu |
| [KLH]   | Ken Harrenstien  | SRI                              | KLH@nisc.sri.com                         |
| [KR35]  | Keith Reynolds   | SCO                              | keithr@SCO.COM                           |
| [KSL]   | Kirk Lougheed    | cisco                            | LOUGHEED@MATHOM.CISCO.COM                |
| [KXA]   | Kannan Alagappan | DEC                              | kannan@sejour.enet.dec.comp              |
| [KXB]   | Keith Boyce      | Legent                           | ---none---                               |
| [KXC]   | Ken Chapman      | Stratus Computer                 | Ken_Chapman@vos.stratus.com              |
| [KXD]   | Kevin DeVault    | NI                               | ---none---                               |
| [KXD1]  | Kathryn de Graaf | David Systems                    | degraaf@davidsys.com                     |
| [KXF]   | Karl Fox         | MST                              | karl@MorningStar.Com                     |
| [KXF1]  | Ken Fujimoto     | Tribe Computer Works             | fuji@tribe.com                           |
| [KXG]   | Kevin Gage       | Chase Research                   |  |
| [KXH]   | Khalid Hireche   | G2R Inc.                         | ---none---                               |
| [KXH1]  | Keith Hogan      | Penril                           | keith%penril@uunet.uu.net                |
| [KXJ]   | Ken Jones        | KonKord                          | konkord!ksj@uunet.uu.net                 |
| [KXL]   | Kim Le           | DATAHOUSE                        | Information Systems Ltd.<br>---none---   |

|        |                  |                                |                              |
|--------|------------------|--------------------------------|------------------------------|
| [KXM]  | Kevin Murphy     | DEC                            | murphy@sevens.lkg.dec.com    |
| [KXR]  | Ken Ritchie      | SEEL                           | ---none---                   |
| [KXS]  | Keith Sklower    | Berkeley                       | sklower@okeeffe.berkeley.edu |
| [KXS1] | Kevin Smith      | Telematics International, Inc. | ---none---                   |
| [KXS2] | Keld Simonsen    | RAP                            | Keld.Simonsen@dkuug.dk       |
| [KXT]  | Kaj Tesink       | Bellcore                       | kaj@nvuxr.cc.bellcore.com    |
| [KXT1] | Kent Tsuno       | SEI                            | tsuno@sumitomo.com           |
| [KXV]  | Ken Virgile      | Sigma Net. Sys.                | signet!ken@xylogics.COM      |
| [KXW]  | Ken Whitfield    | MCNC                           | ken@MCNC.ORG                 |
| [KXW1] | Kathy Weninger   | Network Resources Corporation  | ---none---                   |
| [KZM]  | Keith McCloghrie | HLS                            | KZM@HLS.COM                  |
| [LL69] | Lawrence Lebahn  | DIA                            | DIA3@PAXRV-NES.NAVY.MIL      |
| [LLP]  | Larry Peterson   | ARIZONA                        | llp@ARIZONA.EDU              |
| [LS8]  | Louis Steinberg  | Rutgers                        | lou@ARAMIS.RUTGERS.EDU       |
| [LXA]  | Lorenzo Aguilar  | Taligent                       | lorenzo@taligent.com         |
| [LXB]  | Larry Burton     | APTEC Computer Systems         | ssds!larryb@uunet.UU.NET     |
| [LXB1] | Laura Bridge     | Timeplex                       | laura@uunet.UU.NET           |
| [LXB2] | Lawrence Brown   | Unisys                         | ---none---                   |
| [LXB3] | Larry Barnes     | DEC                            | barnes@broke.enet.dec.com    |
| [LXD]  | Larry DeLuca     | AT                             | henrik@EDDIE.MIT.EDU         |
| [LXD1] | Larry Davis      | C. Itoh Electronics            | ---none---                   |
| [LXE]  | Len Edmondson    | SUN                            | len@TOPS.SUN.COM             |
| [LXF]  | Larry Fischer    | DSS                            | lfischer@dss.com             |

|         |                    |                        |  |
|---------|--------------------|------------------------|--|
| [LXH]   | Leo Hourvitz       | NeXt                   | leo@NEXT.COM                             |
| [LXL]   | Lennart Lovstrand  | NeXT Computer, Inc.    | Lennart_Lovstrand@NeXT.COM               |
| [LXM]   | Louis Mamakos      | UMD                    | louie@sayshell.umd.edu                   |
| [LXO]   | Larry Osterman     | GTE Telecom            | larryo@gtetele.com                       |
| [LXP]   | Lars Povlsen       | Olicom A/S             | krus@olicom.dk                           |
| [LXS]   | Lance Sprung       | SMC                    | ---none---                               |
| [LXW]   | Lih-Er Wey         | MSU                    | WEYLE@msu.edu                            |
| [LZ15]  | Lee Ziegenhals     | Datapoint              | lcz@sat.datapoint.com                    |
| [MA]    | Mike Accetta       | CMU                    | MIKE.ACCTTA@CMU-CS-A.EDU                 |
| [MA108] | Mike Anello        | XDI                    | mike@xlnt.com                            |
| [MAR10] | Mark A. Rosenstein | MIT                    | mar@ATHENA.MIT.EDU                       |
| [MB]    | Michael Brescia    | BBN                    | Brescia@CCV.BBN.COM                      |
| [MBG]   | Michael Greenwald  | SYMBOLICS              | Greenwald@SCRC-STONY-BROOK.SYMBOLICS.COM |
| [MCSJ]  | Mike StJohns       | TPSC                   | stjohns@UMD5.UMD.EDU                     |
| [ME38]  | Marc A. Elvy       | Marble                 | ELVY@CARRARA.MARBLE.COM                  |
| [MG277] | Martin Gren        | Axis Communications AB | martin@axis.se                           |
| [MKL]   | Mark Lottor        | SRI                    | MKL@nisc.sri.com                         |
| [ML109] | Mike Little        | MACOM                  | little@MACOM4.ARPA                       |
| [MLS34] | L. Michael Sabo    | TMAC                   | Sabo@DOCKMASTER.NCSC.MIL                 |
| [MO2]   | Michael O'Brien    | AEROSPACE              | obrien@AEROSPACE.AERO.ORG                |
| [MRC]   | Mark Crispin       | Simtel                 | MRC@WSMR-SIMTEL20.ARMY.MIL               |
| [MS9]   | Marty Schoffstahl  | Nysernet               | schoff@NISC.NYSER.NET                    |
| [MS56]  | Marvin Solomon     | WISC                   | solomon@CS.WISC.EDU                      |

|        |                  |                                   |   |
|--------|------------------|-----------------------------------|---|
| [MTR]  | Marshall T. Rose | PSI                               | mrose@PSI.COM                               |
| [MXA]  | Mike Asagami     | Toshiba                           | toshiba@mothra.nts.uci.edu                  |
| [MXB]  | Mike Berrow      | Relational Technology             | ---none---                                  |
| [MXB1] | Mike Burrows     | DEC                               | burrows@SRC.DEC.COM                         |
| [MXB2] | Mark T. Dauscher | Sybus Corpotation                 | mdauscher@sybus.com                         |
| [MXB3] | Michael Bell     | Integrated Business Network       | ---none---                                  |
| [MXC]  | Ming-Perng Chen  | CCL/ITRI                          | N100CMP0%TWNITRI1.BITNET@CUNYVM.CUNY.EDU    |
| [MXC1] | Mark McCahill    | UMN                               | mpm@boombox.micro.umn.edu                   |
| [MXC2] | Matt Christiano  | Olivettti                         | globes@matt@oliveb.atc.olivetti.com         |
| [MXE]  | Mike Erlinger    | Lexel                             | mike@lexcel.com                             |
| [MXF]  | Mark Fabbi       | Bell Canada                       | markf@gpu.utcs.utoronto.ca                  |
| [MXF1] | Marco Framba     | Olivetti                          | framba@orc.olivetti.com                     |
| [MXF2] | Martin Forssen   | Chalmers                          | maf@dtek.chalmers.se                        |
| [MXH]  | Matt Harris      | Versitron                         | ---none---                                  |
| [MXH1] | Masahiko Hori    | Mitsubishi Cable Industries, Ltd. | ---none---                                  |
| [MXH2] | Mark Holobach    | Electronic Data Systems           | holobach@tis.eds.com                        |
| [MXH3] | Mark Hankin      | Lancert                           | ---none---                                  |
| [MXL]  | Mark L. Lambert  | MIT                               | markl@PTT.LCS.MIT.EDU                       |
| [MXL1] | Mats Lindstrom   | Diab Data AB                      | mli@diab.se                                 |
| [MXL2] | Mark S. Lewis    | Telebit                           | mlewis@telebit.com                          |
| [MXN]  | Mark Needleman   | UCDLA                             | mhnur%uccmvs.bitnet@cornell.cit.cornell.edu |

|        |                      |                            |   |
|--------|----------------------|----------------------------|---|
| [MXL2] | Mark Lenney          | Raylan Corporation         | ---none---                                    |
| [MXO]  | Mike O'Dowd          | EPFL                       | odowd@ltisun8.epfl.ch                         |
| [MXO1] | Mike Oswald          | J.I. Case                  | mike@helios.uwsp.edu                          |
| [MXP]  | Martin Picard        | Oracle                     | ---none---                                    |
| [MXP1] | Michael Podhorodecki | Labtam Australia Pty. Ltd. | michael@labtam.oz.au                          |
| [MXR]  | Maurice R. Turcotte  | RMIS                       | mailrus!uflorida!rm1!dnmrt%rmatl@uunet.UU.NET |
| [MXS]  | Mike Spina           | Prime                      | WIZARD%enr.prime.com@RELAY.CS.NET             |
| [MXS1] | Martha Steenstrup    | BBN                        | MSteenst@BBN.COM                              |
| [MXS2] | Michael Sapich       | CCCBS                      | sapich@conware.de                             |
| [MXS3] | Marc Sheldon         | BinTec                     | ms@BinTec.DE                                  |
| [MXS4] | Marc Sheldon         | EUnet Germany              | ms@Germany.EU.net                             |
| [MXT]  | Martyn Thomas        | Insignia Solutions         | ---none---                                    |
| [MXT1] | Mark Tom             | NET                        | marktom@tom.net.com                           |
| [MXW]  | Michael Waters       | EON                        | ---none---                                    |
| [MXZ]  | Mauro Zallocco       | Netlink                    | ---none---                                    |
| [NC3]  | J. Noel Chiappa      | MIT                        | JNC@XX.LCS.MIT.EDU                            |
| [NT12] | Neil Todd            | IST                        | mcvax!ist.co.uk!neil@UUNET.UU.NET             |
| [NXC]  | Nick Cuccia          | NASA Ames Research Center  | cuccia@nas.nasa.gov                           |
| [NXE]  | Nadya K. El-Afandi   | NSC                        | nadya@khara.network.com                       |
| [NXH]  | Nicola J. Howarth    | ANSA                       | njh@ansa.co.uk                                |
| [NXK]  | Nagayuki Kojima      | Japan Radio Co.            | nkojima@lab.nihonmusen.co.jp                  |

|        |                     |  |   |
|--------|---------------------|--|---|
| [NXL]  | Nik Langrind        | Shiva Corp.                              | nik@Shiva.COM                               |
| [NXM]  | Nob Mizuno          | Matsushita Electric Industrial Co., Ltd. | mizuno@isl.mei.co.jp                        |
| [NXP]  | Narendra Popat      | FSD                                      | ---none---                                  |
| [NXR]  | Nelluri L. Reddy    | CDC                                      | reddy@uc.msc.umn.edu                        |
| [OXC]  | Olivier J. Caleff   | Dassault                                 | caleff@dassault-elec.fr                     |
| [OXF]  | Osamu Fujiki        | DCL                                      | ---none---                                  |
| [OXG]  | Oyvind Gjerstad     | Tollpost-Globe AS                        | ogj%tglobe2.UUCP@nac.no                     |
| [OXI]  | Oft Israel          | Rad                                      | ---none---                                  |
| [OXJ]  | Oliver Jones        | PictureTel Corporation                   | oj@pictel.com                               |
| [OXK]  | Oliver Korfmacher   | netCS Informationstechnik GmbH           | okorf@bunt.netcs.com                        |
| [OXR]  | Oscar Rodriguez     | Dupont                                   | ---none---                                  |
| [PAM6] | Paul McNabb         | RICE                                     | pam@PURDUE.EDU                              |
| [PCW]  | C. Philip Wood      | LANL                                     | cpw@LANL.GOV                                |
| [PD39] | Pete Delaney        | ECRC                                     | pete%crcvax.uucp%germany.csnet@RELAY.CS.NET |
| [PHD1] | Pieter Ditmars      | BBN                                      | pditmars@BBN.COM                            |
| [PK]   | Peter Kirstein      | UCL                                      | Kirstein@NSS.CS.UCL.AC.UK                   |
| [PL4]  | Phil Lapsley        | BERKELEY                                 | phil@UCBARPA.BERKELEY.EDU                   |
| [PM1]  | Paul Mockapetris    | ISI                                      | PVM@ISI.EDU                                 |
| [PXA]  | Prakash Ambegaonkar | FTC                                      | ---none---                                  |
| [PXA1] | Paul Afshar         | Solarix Systems                          | paul@solar1.portal.com                      |
| [PXA2] | Paul Andon          | MICROGNOSIS                              | pandon@micrognosis.co.uk                    |

|         |                   |  |                            |
|---------|-------------------|--|----------------------------|
| [PXB]   | Pat Barron        | Transarc Corporation                             | Pat_Barron@TRANSARC.COM    |
| [PXB1]  | Pascal Bataille   | GSI  | pascal.bataille@gsi.fr     |
| [PXC]   | Peter Cox         | ENE  | ---none---                 |
| [PXC1]  | Patrick Cheng     | TRW  | pcheng@dill.ind.trw.com    |
| [PXC2]  | Paolo Coppo       | CSELT  | coppo@cz8700.cselt.stet.it |
| [PXC3]  | Paul Chefurka     | PlainTree Systems Inc.                           | chefurka@plntree.UUCP      |
| [PXD]   | Peter Delchiappo  | MTrade UK Ltd.                                   | ---none---                 |
| [PXE]   | Peter S. Easton   | Brixton Systems, Inc.                            | easton@brixton.com         |
| [PXF]   | Per Futtrup       | SDD (Scandinavian Airlines Data<br>Denmark A/S)  | ---none---                 |
| [PXG]   | Pete Grillo       | Network Innovations                              | pl0143@mail.psi.net        |
| [PXH]   | Per Bech Hansen   | DDE  | pbh@dde.dk                 |
| [PXJ]   | Prem Jain         | Crescendo  | prem@cres.com              |
| [PXJ1]  | Petri Jokela      | Telecom Finland                                  | ---none---                 |
| [P XK]  | Philip Koch       | Dartmouth  | Philip.Koch@DARTMOUTH.EDU  |
| [P XK1] | Peter Kumik       | Case Comm.                                       | ---none---                 |
| [P XK2] | Professor Kynikos | Special Consultant                               | ---none---                 |
| [P XK3] | Paul Krystosek    | DOE Atmospheric Radiation<br>Measurement Project | krystosk@eid.anl.gov       |
| [PXL]   | Paul Liu          | ADI Systems, Inc.                                | ---none---                 |
| [PXL1]  | Reter de Laval    | SECTRA   | pdl@sectra.se              |
| [PXM]   | Paul Maurer II    | STS  | ---none---                 |
| [PXM1]  | Patrick McNamee   | GE   | ---none---                 |

|         |                     |                                 |                             |
|---------|---------------------|---------------------------------|-----------------------------|
| [PX0]   | Paul O'Donnell      | Basser                          | paulod@cs.su.oz.au          |
| [PXR]   | Paul Rodwick        | Metaphor                        | ---none---                  |
| [PXR1]  | Parag Rastogi       | Vitacom Corporation             | parag@cup.portal.com        |
| [PXS]   | Paul Singh          | Intellicom                      | ---none---                  |
| [PXV]   | Paul V. Fries       | Alantec                         | pvf@alantec.com             |
| [PXY]   | Peter C. Yoest      | American Power Conversion Corp. | apc!yoest@uunet.uu.net      |
| [PXY1]  | Paul Hoff           | Norwegian Telecom Research      | paalh@brage.nta.no          |
| [RA11]  | Rick Adams          | UUNET                           | rick@UUNET.UU.NET           |
| [RAM57] | Rex Mann            | CDC                             | ---none---                  |
| [RAW44] | Robert A. Woodburn  | Sparta                          | WOODY@SPARTA.COM            |
| [RDXS]  | R. Dwight Schettler | HP                              | rds%hpcndm@HPLABS.HP.COM    |
| [RH6]   | Robert Hinden       | BBN                             | Hinden@CCV.BBN.COM          |
| [RH227] | Ron Holt            | Eyring, Inc.                    | ron@Eyring.COM              |
| [RHT]   | Robert Thomas       | BBN                             | BThomas@F.BBN.COM           |
| [RM1]   | Richard Mak         | Amnet, Inc.                     | mak@amnet.COM               |
| [RN6]   | Rudy Nedved         | CMU                             | Rudy.Nedved@CMU-CS-A.EDU    |
| [RP211] | Ragnar Paulson      | TSG                             | tsgfred!ragnar@uunet.UU.NET |
| [RTB3]  | Bob Braden          | ISI                             | Braden@ISI.EDU              |
| [RWS4]  | Robert W. Scheifler | ARGUS                           | RWS@XX.LCS.MIT.EDU          |
| [RXB]   | Ramesh Babu         | Luxcom                          | krbabu@btr.com              |
| [RXB1]  | Ron Bhanukitsiri    | DEC                             | rbhank@DECVAX.DEC.COM       |
| [RXB2]  | Rich Bantel         | AT&T                            | rgb@mtung.att.com           |
| [RXB3]  | Robert Woodburn     | SAIC                            | woody@cseic.saic.com        |

|        |                  |   |
|--------|------------------|---|
| [RXB4] | Russ Blaesing    | Open Networks Engineering, Inc.<br>rrb@one.com                |
| [RXC]  | Rob Chandhok     | CMU chandhok@gnome.cs.cmu.edu                                 |
| [RXC1] | Rick Carlos      | TI rick.ticipa.csc.ti.com                                     |
| [RXC2] | Ray Compton      | DIS Research LTD rayc@command.com                             |
| [RXD]  | Roger Dev        | Cabletron ---none---  |
| [RXD1] | Ralph Droms      | NRI rdroms@NRI.RESTON.VA.US                                   |
| [RXD2] | Rajiv Dhingra    | Ultranet rajiv@ULTRA.COM                                      |
| [RXD3] | Rex Davis        | Tandem ---none---   |
| [RXD4] | Rick Downs       | AMP ---none---  |
| [RXD5] | Russell S. Dietz | Technically Elite Concepts, Inc.<br>Russell_Dietz@Mcimail.com |
| [RXE]  | Robert R. Elz    | Webster Computer kre@munnnari.oz.au                           |
| [RXF]  | Richard Fox      | Synoptics rfox@synoptics.com                                  |
| [RXH]  | Reijane Huai     | Cheyenne sibal@CSD2.NYU.EDU                                   |
| [RXH1] | Russ Housley     | Xerox<br>Russ_Housley.McLean_CSD@xerox.com                    |
| [RXI]  | Robin Iddon      | Axon Networks Inc.<br>axon@cix.clink.co.uk                    |
| [RXJ]  | Ronald Jacoby    | SGI rj@SGI.COM  |
| [RXL]  | Rich Lyman       | Lantronix rich@alecto.gordian.com                             |
| [RXM]  | Robert Myhill    | BBN Myhill@CCS.BBN.COM  |
| [RXN]  | Rina Nethaniel   | RND ---none---  |
| [RXN1] | Russ Nelson      | Clarkson nelson@clutx.clarkson.edu                            |
| [RXN2] | R. Nurnberg      | AEG Electrcom ---none---                                      |
| [RXR]  | Richard Rein     | Pyramid Technology Corp.<br>rein@pyramid.com                  |

|         |                        |                         |                                |
|---------|------------------------|-------------------------|--------------------------------|
| [RXR1]  | R. K. Nair             | NRL                     | nair@itd.nrl.navy.mil          |
| [RXS]   | Ron Strich             | SSDS                    | ---none---                     |
| [RXS1]  | Reuben Sivan           | Crosscomm               | crossc!rsivan@uunet.UU.NET     |
| [RXS2]  | Richard Schneider      | Epson Research Center   | rschneid@epson.com             |
| [RXS3]  | Richard P. Stubbs      | Quotron Systems, Inc.   | richard@atd.quotron.com        |
| [RXS4]  | Rob Spade              | I.D.E. Corporation      | ---none---                     |
| [RXT]   | Ron Thornton           | GenRad                  | thornton@qm7501.genrad.com     |
| [RXT1]  | Rodney Thayer          | Sable                   | ---none---                     |
| [RXU]   | Robert Urquhart        | Simon Fraser University | quipu@sfu.ca                   |
| [RXW]   | Russell G. Wilson      | Hill AFB                | rwilson@oodis01.af.mil         |
| [RXW1]  | R. J. White            | Univ. of Waterloo       | snmp-tech@watmath.waterloo.edu |
| [RXZ]   | Rayan Zachariassen     | Toronto                 | rayan@AI.TORONTO.EDU           |
| [SAF3]  | Stuart A. Friedberg    | UWISC                   | stuart@CS.WISC.EDU             |
| [SB98]  | Stan Barber            | BCM                     | SOB@BCM.TMC.EDU                |
| [SC3]   | Steve Casner           | ISI                     | Casner@ISI.EDU                 |
| [SGC]   | Steve Chipman          | BBN                     | Chipman@F.BBN.COM              |
| [SH284] | Steve Hardcastle-Kille | ISODE Consortium        | S.Kille@isode.com              |
| [SHB]   | Steven Blumenthal      | BBN                     | BLUMENTHAL@VAX.BBN.COM         |
| [SH37]  | Sergio Heker           | JVNC                    | heker@JVNCC.CSC.ORG            |
| [SL70]  | Stuart Levy            | UMN                     | slevy@UC.MSC.UMN.EDU           |
| [SMB]   | Scott Bellew           | Purdue                  | smb@cs.purdue.edu              |
| [SRN1]  | Stephen Northcutt      | NSWC                    | SNORTH@RELAY-NSWC.NAVY.MIL     |

|         |                  |                               |  |
|---------|------------------|-------------------------------|--|
| [SS92]  | Steve Schoch     | NASA                          | SCHOCH@AMES.ARC.NASA.GOV                     |
| [STY]   | Shannon Yeh      | Netix                         | yeh@netix.com                                |
| [SW159] | Steven Willis    | Wellfleet                     | swillis@WELLFLEET.COM                        |
| [SXA]   | Susie Armstrong  | XEROX                         | Armstrong.wbst128@XEROX.COM                  |
| [SXA1]  | Shamim Ahmed     | OSU                           | ahmed@nisc.irc.ohio-state.edu                |
| [SXA2]  | Steve Alexander  | ISC                           | stevea@i88.isc.com                           |
| [SXA3]  | Sten Andler      | IBM                           | ---none---                                   |
| [SXB]   | Steve Briggs     | Compaq                        | steveb@se.hou.compaq.com                     |
| [SXB2]  | Steve Bush       | GEIS                          | sfb@ncoast.org                               |
| [SXC]   | Shaw C. Chuang   | University College London     | S.Chuang@cs.ucl.ac.uk                        |
| [SXD]   | Steve Deering    | Stanford                      | deering@PECASERO.STANFORD.EDU                |
| [SXD1]  | Steve Dorner     | U. of Illinois                | s-dorner@UIUC.EDU                            |
| [SXE]   | Simon Edwards    | Micro Focus UK                | ---none---                                   |
| [SXF]   | Shoji Fukutomi   | Furukawa Electoric Co. Ltd.   | kddlab!polo.furukawa.co.jp!fuku@uunet.UU.NET |
| [SXH]   | Steven Hunter    | LLNL                          | hunter@CCC.MFECC.LLNL.GOV                    |
| [SXH1]  | Scott Hahn       | Sequent                       | sdh@sequent.com                              |
| [SXH2]  | Scott Holley     | Allied Telesis, Inc.          | SCOTT_CLINTON_HOLLEY@cup.portal.com          |
| [SXH3]  | Steve Harris     | Republic Telcom Systems, Inc. | rtsc!harris@boulder.Colorado.edu             |
| [SXH4]  | Simon Hackett    | Internode Systems Pty Ltd     | simon@ucs.adelaide.edu.au                    |
| [SXH5]  | Stefan Hedemann  | Hedemann Software Development | 100015.2504@compuserve.com                   |
| [S XK]  | Skip Koppenhaver | DAC                           | stubby!skip@uunet.UU.NET                     |

|         |                     |                              |                               |
|---------|---------------------|------------------------------|-------------------------------|
| [S XK1] | Stev Knowles        | FTP                          | stev@vax.ftp.com              |
| [S XL]  | Sam Lau             | Pirelli/Focom                | ---none---                    |
| [S XL1] | Stephen Lewis       | Scitec                       | ---none---                    |
| [S XL2] | Steve Loring        | L & N Technologies, Ltd.     | ---none---                    |
| [S XL3] | Syd Logan           | AGE Logic                    | syd@age.com                   |
| [S XM]  | Sheri Mayhew        | Develcon                     | zaphod!sherim@herald.usask.ca |
| [S XM1] | Skip Morton         | Netcore, Inc.                | ---none---                    |
| [S X0]  | SeeYoung Oh         | Daewoo Telecom               | oco@scorpio.dwt.co.kr         |
| [S XP]  | Sanand Patel        | Canstar                      | sanand@HUB.TORONTO.EDU        |
| [S XP1] | Satish Popat        | Ericsson-Camtec              | ---none---                    |
| [S XS]  | Steve Silverman     | MITRE                        | Blankert@MITRE-GATEWAY.ORG    |
| [S XS1] | Susie Snitzer       | Britton-Lee                  | ---none---                    |
| [S XS2] | Soren H. Sorensen   | CR SYSTEMS                   | ---none---                    |
| [S XS3] | Steven Sweeney      | Farallon Computing, Inc.     | ---none---                    |
| [S XS4] | Simson L. Garfinkel | NeXt                         | simsong@next.cambridge.ma.us  |
| [S XW]  | Steve Waldbusser    | CMU                          | sw01+@andrew.cmu.edu          |
| [S XW1] | Simon van Winkelen  | SDL                          | ---none---                    |
| [S XW2] | Sean Welch          | Xenocom, Inc.                | welch@raven.ulowell.edu       |
| [S XW3] | Steve Willens       | Livingston Enterprises, Inc. | steve@livingston.com          |
| [TC27]  | Thomas Calderwood   | BBN                          | TCALDERW@BBN.COM              |
| [TN]    | Thomas Narten       | Purdue                       | narten@PURDUE.EDU             |
| [TS566] | Timon Sloane        | PeerNet                      | peernet!timon@uunet.UU.NET    |

|        |                       |                                |                                   |
|--------|-----------------------|--------------------------------|-----------------------------------|
| [TU]   | Tom Unger             | UMich                          | tom@CITI.UMICH.EDU                |
| [TXA]  | Tad Artis             | Microwave Bypass Systems, Inc. | ---none---                        |
| [TXA1] | Takahiro Asai         | Hitachi Cable, Ltd.            | ---none---                        |
| [TXB]  | Torsten Beyer         | Dr. Materna GmbH               | tb@Materna.de                     |
| [TXB1] | Tom Bereiter          | Tiviloi                        | ---none---                        |
| [TXC]  | Tracy Cox             | Bellcore                       | tacox@sabre.bellcore.com          |
| [TXD]  | "Tundra" Tim Daneliuk | Covia                          | tundraix!tundra@clout.chi.il.us   |
| [TXH]  | Takashi Hagiwara      | Sony                           | Hagiwara@Sm.Sony.Co.Jp            |
| [TXH1] | Tim Howes             | UMich                          | Tim.Howes@terminator.cc.umich.edu |
| [TXJ]  | Tim Jones             | Box Hill Systems Corporation   | tim@boxhill.com                   |
| [TXL]  | Tim Berners-Lee       | CERN                           | timbl@nxoc01.cern.ch              |
| [TXM]  | Trudy Miller          | ACC                            | Trudy@ACC.COM                     |
| [TXM1] | Thomas McGinty        | Codex                          | ---none---                        |
| [TXO]  | Toshiharu Ohno        | ASCII Corporation              | tony-o@ascii.co.jp                |
| [TXP]  | Tony van der Peet     | DSIR Network Group             | srghtvp@grv.dsir.govt.nz          |
| [TXR]  | Tim Rylance           | Praxis                         | praxis!tkr@UUNET.UU.NET           |
| [TXR1] | Thomas Ruf            | Schneider & Koch               | tom@rsp.de                        |
| [TXS]  | Ted J. Socolofsky     | Spider                         | Teds@SPIDER.CO.UK                 |
| [TXS1] | Toshiharu Sugawara    | NTTC                           | sugawara%wink.ntt.jp@RELAY.CS.NET |
| [TXS2] | Thomas M. Smith       | GE Aerospace                   | tmsmith@esc.syr.ge.com            |
| [TXT]  | Ted Tran              | Andrew Corporation             | ---none---                        |

|         |                     |                              |  |
|---------|---------------------|------------------------------|--|
| [TXT1]  | Terrence J. Talbot  | BU                           | lexcube!tjt@bu.edu                     |
| [TXV]   | Tomas Vocetka       | Compu-Shack                  | OPLER%CSEARN.bitnet@CUNYVM.CUNY.EDU    |
| [TXW]   | Toshio Watanabe     | RICOH Co. Ltd.               | watanabe@godzilla.rsc.spdd.ricoh.co.jp |
| [UB3]   | Ulf Bilting         | CHALMERS                     | bilting@PURDUE.EDU                     |
| [UXV]   | Umberto Vizcaino    | Bridgeway                    | ---none---                             |
| [UW2]   | Unni Warriier       | Netlabs                      | unni@NETLABS.COM                       |
| [VJ]    | Van Jacobson        | LBL                          | van@CSAM.LBL.GOV                       |
| [VXC]   | Vik Chandra         | IBM                          | vc@ralvm6.vnet.ibm.com                 |
| [VXD]   | Victor Dafoulas     | Wang Labs                    | ---none---                             |
| [VXE]   | Vince Enriquez      | Motorola                     | enriquez@sps.mot.com                   |
| [VXK]   | Victor Kazdoba      | Morgan Stanley & Co. Inc.    | vsk@katana.is.morgan.com               |
| [VXL]   | Vince Liu           | Centrum Communications, Inc. | ---none---                             |
| [VXS]   | Vinod Singh         | Unify                        | ---none---                             |
| [VXT]   | V. Taylor           | CANADA                       | vktaylor@NCS.DND.CA                    |
| [WDW11] | William D. Wisner   |                              | wisner@HAYES.FAI.ALASKA.EDU            |
| [WJC2]  | Bill Croft          | STANFORD                     | Croft@SUMEX-AIM.STANFORD.EDU           |
| [WJS1]  | Weldon J. Showalter | DCA                          | Gamma@MINTAKA.DCA.MIL                  |
| [WLB8]  | William L. Biagi    | Advintech                    | CSS002.BLBIAGI@ADVINTECH-MVS.ARPA      |
| [WM3]   | William Melohn      | SUN                          | Melohn@SUN.COM                         |
| [WXC]   | Wesley Craig        | UMICH                        | Wesley.Craig@terminator.cc.umich.edu   |
| [WXC1]  | W. James Colosky    | Eastman Kodak Company        | wjc@tornado.kodak.com                  |

|         |                                  |                                |   |
|---------|----------------------------------|--------------------------------|---|
| [WXD]   | William Dunn                     | NetManage, Inc.                | netmanage@cup.portal.com                      |
| [WXP]   | W.J. Parducci & Associates, Inc. | Bill Parducci                  | 70262.1267@compuserve.com                     |
| [WXS]   | Wayne Schroeder                  | SDSC                           | schroeder@SDS.SDSC.EDU                        |
| [WXS2]  | W.R. Maynard-Smith               | Netcomm, Ltd.                  | ---none---                                    |
| [WXT]   | Wayne Tackabury                  | Pacer Software                 | wft@pacersoft.com                             |
| [VXW]   | Val Wilson                       | Spider                         | val@spider.co.uk                              |
| [YXA]   | Yoshiyuki Akiyama                | NEC                            | kddlab!ccs.mt.nec.co.jp!y-akiyam@uunet.uu.net |
| [YXH]   | Yigal Hochberg                   | Unifi                          | yigal@unifi.com                               |
| [YXK]   | Yoav Kluger                      | Spartacus                      | ykluger@HAWK.ULOWELL.EDU                      |
| [YXK1]  | Yasuhiro Kohata                  | NTT DATA                       | kohata@rd.nttdata.jp                          |
| [YXW]   | Y.C. Wang                        | Network Application Technology | ---none---                                    |
| [YXW1]  | Yasuyoshi Watanabe               | Seiko Instruments, Inc. (SII)  | ---none---                                    |
| [XEROX] | Fonda Pallone                    | Xerox                          | ---none---                                    |
| [ZSU]   | Zaw-Sing Su                      | SRI                            | ZSu@TSCA.ISTC.SRI.COM                         |
| [ZXS]   | Zohar Seigal                     | Gambit Computer                | ---none---                                    |

## Security Considerations

Security issues are not discussed in this memo.

## Authors' Addresses

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

Phone: (310) 822-1511

Email: JKREY@ISI.EDU

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

Phone: (310) 822-1511

Email: POSTEL@ISI.EDU

