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Internet Architecture Board  
J. Postel, Editor  
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## INTERNET OFFICIAL PROTOCOL STANDARDS

### Status of this Memo

This memo describes the state of standardization of protocols used in the Internet as determined by the Internet Architecture Board (IAB). This memo is an Internet Standard. Distribution of this memo is unlimited.

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## Introduction

A discussion of the standardization process and the RFC document series is presented first, followed by an explanation of the terms. Sections 6.2 - 6.10 contain the lists of protocols in each stage of standardization. Finally are pointers to references and contacts for further information.

This memo is intended to be issued approximately quarterly; please be sure the copy you are reading is current. Current copies may be obtained from the Network Information Center (INTERNIC) or from the Internet Assigned Numbers Authority (IANA) (see the contact information at the end of this memo). Do not use this edition after 15-July-96.

See Section 6.1 for a description of recent changes. In the official lists in sections 6.2 - 6.10, an asterisk (\*) next to a protocol denotes that it is new to this document or has been moved from one protocol level to another, or differs from the previous edition of this document.

## 1. The Standardization Process

The Internet Architecture Board maintains this list of documents that define standards for the Internet protocol suite. See RFC-1601 for the charter of the IAB and RFC-1160 for an explanation of the role and organization of the IAB and its subsidiary groups, the Internet Engineering Task Force (IETF) and the Internet Research Task Force (IRTF). Each of these groups has a steering group called the IESG and IRSG, respectively. The IETF develops these standards with the goal of co-ordinating the evolution of the Internet protocols; this co-ordination has become quite important as the Internet protocols are increasingly in general commercial use. The definitive description of the Internet standards process is found in RFC-1602.

The majority of Internet protocol development and standardization activity takes place in the working groups of the IETF.

Protocols which are to become standards in the Internet go through a series of states or maturity levels (proposed standard, draft standard, and standard) involving increasing amounts of scrutiny and testing. When a protocol completes this process it is assigned a STD number (see RFC-1311). At each step, the Internet Engineering Steering Group (IESG) of the IETF must make a recommendation for advancement of the protocol.

To allow time for the Internet community to consider and react to standardization proposals, a minimum delay of 6 months before a proposed standard can be advanced to a draft standard and 4 months before a draft standard can be promoted to standard.

It is general practice that no proposed standard can be promoted to draft standard without at least two independent implementations (and the recommendation of the IESG). Promotion from draft standard to standard generally requires operational experience and demonstrated interoperability of two or more implementations (and the recommendation of the IESG).

In cases where there is uncertainty as to the proper decision concerning a protocol a special review committee may be appointed consisting of experts from the IETF, IRTF and the IAB with the purpose of recommending an explicit action.

Advancement of a protocol to proposed standard is an important step since it marks a protocol as a candidate for eventual standardization (it puts the protocol "on the standards track"). Advancement to draft standard is a major step which warns the community that, unless major objections are raised or flaws are discovered, the protocol is likely to be advanced to standard in six months.

Some protocols have been superseded by better ones or are otherwise unused. Such protocols are still documented in this memorandum with the designation "historic".

Because it is useful to document the results of early protocol research and development work, some of the RFCs document protocols which are still in an experimental condition. The protocols are designated "experimental" in this memorandum. They appear in this report as a convenience to the community and not as evidence of their standardization.

Other protocols, such as those developed by other standards organizations, or by particular vendors, may be of interest or may be recommended for use in the Internet. The specifications of such protocols may be published as RFCs for the convenience of the Internet community. These protocols are labeled "informational" in this memorandum.

In addition to the working groups of the IETF, protocol development and experimentation may take place as a result of the work of the research groups of the Internet Research Task Force, or the work of other individuals interested in Internet protocol development. The the documentation of such experimental work in the RFC series is encouraged, but none of this work is considered to be on the track for standardization until the IESG has made a recommendation to advance the protocol to the proposed standard state.

A few protocols have achieved widespread implementation without the approval of the IESG. For example, some vendor protocols have become very important to the Internet community even though they have not been recommended by the IESG. However, the IAB strongly recommends that the standards process be used in the evolution of the protocol suite to maximize interoperability (and to prevent incompatible protocol requirements from arising). The use of the terms "standard", "draft standard", and "proposed standard" are reserved in any RFC or other publication of Internet protocols to only those protocols which the IESG has approved.

In addition to a state (like "Proposed Standard"), a protocol is also assigned a status, or requirement level, in this document. The possible requirement levels ("Required", "Recommended", "Elective", "Limited Use", and "Not Recommended") are defined in Section 4.2. When a protocol is on the standards track, that is in the proposed standard, draft standard, or standard state (see Section 5), the status shown in Section 6 is the current status.

Few protocols are required to be implemented in all systems; this is because there is such a variety of possible systems, for example,

gateways, routers, terminal servers, workstations, and multi-user hosts. The requirement level shown in this document is only a one word label, which may not be sufficient to characterize the implementation requirements for a protocol in all situations. For some protocols, this document contains an additional status paragraph (an applicability statement). In addition, more detailed status information may be contained in separate requirements documents (see Section 3).

## 2. The Request for Comments Documents

The documents called Request for Comments (or RFCs) are the working notes of the "Network Working Group", that is the Internet research and development community. A document in this series may be on essentially any topic related to computer communication, and may be anything from a meeting report to the specification of a standard.

Notice:

All standards are published as RFCs, but not all RFCs specify standards.

Anyone can submit a document for publication as an RFC. Submissions must be made via electronic mail to the RFC Editor (see the contact information at the end of this memo, and see RFC 1543).

While RFCs are not refereed publications, they do receive technical review from the task forces, individual technical experts, or the RFC Editor, as appropriate.

The RFC series comprises a wide range of documents, ranging from informational documents of general interests to specifications of standard Internet protocols. In cases where submission is intended to document a proposed standard, draft standard, or standard protocol, the RFC Editor will publish the document only with the approval of the IESG. For documents describing experimental work, the RFC Editor will notify the IESG before publication, allowing for the possibility of review by the relevant IETF working group or IRTF research group and provide those comments to the author. See Section 5.1 for more detail.

Once a document is assigned an RFC number and published, that RFC is never revised or re-issued with the same number. There is never a question of having the most recent version of a particular RFC. However, a protocol (such as File Transfer Protocol (FTP)) may be improved and re-documented many times in several different RFCs. It is important to verify that you have the most recent RFC on a particular protocol. This "Internet Official Protocol Standards"

memo is the reference for determining the correct RFC for the current specification of each protocol.

The RFCs are available from the INTERNIC, and a number of other sites. For more information about obtaining RFCs, see Sections 7.4 and 7.5.

### 3. Other Reference Documents

There are three other reference documents of interest in checking the current status of protocol specifications and standardization. These are the Assigned Numbers, the Gateway Requirements, and the Host Requirements. Note that these documents are revised and updated at different times; in case of differences between these documents, the most recent must prevail.

Also, one should be aware of the MIL-STD publications on IP, TCP, Telnet, FTP, and SMTP. These are described in Section 3.4.

#### 3.1. Assigned Numbers

The "Assigned Numbers" document lists the assigned values of the parameters used in the various protocols. For example, IP protocol codes, TCP port numbers, Telnet Option Codes, ARP hardware types, and Terminal Type names. Assigned Numbers was most recently issued as RFC-1700.

#### 3.2. Requirements for IP Version 4 Routers

This document reviews the specifications that apply to gateways and supplies guidance and clarification for any ambiguities. Requirements for IP Version 4 Routers is RFC-1812.

#### 3.3. Host Requirements

This pair of documents reviews and updates the specifications that apply to hosts, and it supplies guidance and clarification for any ambiguities. Host Requirements was issued as RFC-1122 and RFC-1123.

#### 3.4. The MIL-STD Documents

The Internet community specifications for IP (RFC-791) and TCP (RFC-793) and the DoD MIL-STD specifications are intended to describe exactly the same protocols. Any difference in the protocols specified by these sets of documents should be reported to DISA and to the IESG. It is strongly advised that the two sets of documents be used together, along with RFC-1122 and RFC-1123.

Note that these MIL-STD are now somewhat out of date. The Requirements for IP Version 4 Routers (RFC-1812) and Host Requirements (RFC-1122, RFC-1123) take precedence over both earlier RFCs and the MIL-STDs.

2045-13501 Internet Routing between Autonomous Systems

2045-14502-01 Internet Transport Profile for DoD Communications, Part 1: Transport and Internet Services

2045-14502-04 Internet Transport Profile for DoD Communications, Part 4: LAN Media-Independent Requirements

2045-14503 Internet Transport Service Supporting OSI Applications

2045-44500 Tactical Communications

2045-17503-01 Internet Message Transfer Profile for DoD Communications Part 1: Simple Mail Transfer Protocol

2045-17503-02 Internet Message Transfer Profile for DoD Communications Part 2: Format of Text Messages

2045-17504 Internet File Transfer Profile for DoD Communications

2045-17505 Internet Domain Name Service (DNS) Profile for DoD Communications

2045-17506 Internet Remote Login (RLOGIN) Profile for DoD Communications

2045-17507 Internet Network Management Profile for DoD Communications

2045-38000 DoD Network Management for DoD Communications

These documents are available from the Naval Publications and Forms Center. Requests can be initiated by telephone, telegraph, or mail; however, it is preferred that private industry use form DD1425, if possible.

Naval Publications and Forms Center, Code 3015  
5801 Tabor Ave  
Philadelphia, PA 19120  
Phone: 1-215-697-3321 (order tape)  
1-215-697-4834 (conversation)

#### 4. Explanation of Terms

There are two independent categorization of protocols. The first is the "maturity level" or STATE of standardization, one of "standard", "draft standard", "proposed standard", "experimental", "informational" or "historic". The second is the "requirement level" or STATUS of this protocol, one of "required", "recommended", "elective", "limited use", or "not recommended".

The status or requirement level is difficult to portray in a one word label. These status labels should be considered only as an indication, and a further description, or applicability statement, should be consulted.

When a protocol is advanced to proposed standard or draft standard, it is labeled with a current status.

At any given time a protocol occupies a cell of the following matrix. Protocols are likely to be in cells in about the following proportions (indicated by the relative number of Xs). A new protocol is most likely to start in the (proposed standard, elective) cell, or the (experimental, limited use) cell.

|   |       | S T A T U S |     |     |     |     |
|---|-------|-------------|-----|-----|-----|-----|
|   |       | Req         | Rec | Ele | Lim | Not |
| S | Std   | X           | XXX | XXX |     |     |
|   | Draft | X           | X   | XXX |     |     |
|   | Prop  |             | X   | XXX |     |     |
| A | Info  |             |     |     |     |     |
| T | Expr  |             |     |     | XXX |     |
| E | Hist  |             |     |     |     | XXX |

What is a "system"?

Some protocols are particular to hosts and some to gateways; a few protocols are used in both. The definitions of the terms below will refer to a "system" which is either a host or a gateway (or both). It should be clear from the context of the particular protocol which types of systems are intended.



#### 4.1. Definitions of Protocol State

Every protocol listed in this document is assigned to a "maturity level" or STATE of standardization: "standard", "draft standard", "proposed standard", "experimental", or "historic".

##### 4.1.1. Standard Protocol

The IESG has established this as an official standard protocol for the Internet. These protocols are assigned STD numbers (see RFC-1311). These are separated into two groups: (1) IP protocol and above, protocols that apply to the whole Internet; and (2) network-specific protocols, generally specifications of how to do IP on particular types of networks.

##### 4.1.2. Draft Standard Protocol

The IESG is actively considering this protocol as a possible Standard Protocol. Substantial and widespread testing and comment are desired. Comments and test results should be submitted to the IESG. There is a possibility that changes will be made in a Draft Standard Protocol before it becomes a Standard Protocol.

##### 4.1.3. Proposed Standard Protocol

These are protocol proposals that may be considered by the IESG for standardization in the future. Implementation and testing by several groups is desirable. Revision of the protocol specification is likely.

##### 4.1.4. Experimental Protocol

A system should not implement an experimental protocol unless it is participating in the experiment and has coordinated its use of the protocol with the developer of the protocol.

Typically, experimental protocols are those that are developed as part of an ongoing research project not related to an operational service offering. While they may be proposed as a service protocol at a later stage, and thus become proposed standard, draft standard, and then standard protocols, the designation of a protocol as experimental may sometimes be meant to suggest that the protocol, although perhaps mature, is not intended for operational use.

#### 4.1.5. Informational Protocol

Protocols developed by other standard organizations, or vendors, or that are for other reasons outside the purview of the IESG, may be published as RFCs for the convenience of the Internet community as informational protocols.

#### 4.1.6. Historic Protocol

These are protocols that are unlikely to ever become standards in the Internet either because they have been superseded by later developments or due to lack of interest.

### 4.2. Definitions of Protocol Status

This document lists a "requirement level" or STATUS for each protocol. The status is one of "required", "recommended", "elective", "limited use", or "not recommended".

#### 4.2.1. Required Protocol

A system must implement the required protocols.

#### 4.2.2. Recommended Protocol

A system should implement the recommended protocols.

#### 4.2.3. Elective Protocol

A system may or may not implement an elective protocol. The general notion is that if you are going to do something like this, you must do exactly this. There may be several elective protocols in a general area, for example, there are several electronic mail protocols, and several routing protocols.

#### 4.2.4. Limited Use Protocol

These protocols are for use in limited circumstances. This may be because of their experimental state, specialized nature, limited functionality, or historic state.

#### 4.2.5. Not Recommended Protocol

These protocols are not recommended for general use. This may be because of their limited functionality, specialized nature, or experimental or historic state.

## 5. The Standards Track

This section discusses in more detail the procedures used by the RFC Editor and the IESG in making decisions about the labeling and publishing of protocols as standards.

### 5.1. The RFC Processing Decision Table

Here is the current decision table for processing submissions by the RFC Editor. The processing depends on who submitted it, and the status they want it to have.

| *****                        |             |             |                |                |  |
|------------------------------|-------------|-------------|----------------|----------------|--|
|                              |             | S O U R C E |                |                |  |
| Desired Status               | IAB         | IESG        | IRSG           | Other          |  |
| Standard or Draft Standard   | Bogus (2)   | Publish (1) | Bogus (2)      | Bogus (2)      |  |
| Proposed Standard            | Refer (3)   | Publish (1) | Refer (3)      | Refer (3)      |  |
| Experimental Protocol        | Notify (4)  | Publish (1) | Notify (4)     | Notify (4)     |  |
| Information or Opinion Paper | Publish (1) | Publish (1) | Discretion (5) | Discretion (5) |  |

(1) Publish.

(2) Bogus. Inform the source of the rules. RFCs specifying Standard, or Draft Standard must come from the IESG, only.

- (3) Refer to an Area Director for review by a WG. Expect to see the document again only after approval by the IESG.
- (4) Notify both the IESG and IRSG. If no concerns are raised in two weeks then do Discretion (5), else RFC Editor to resolve the concerns or do Refer (3).
- (5) RFC Editor's discretion. The RFC Editor decides if a review is needed and if so by whom. RFC Editor decides to publish or not.

Of course, in all cases the RFC Editor can request or make minor changes for style, format, and presentation purposes.

The IESG has designated the IESG Secretary as its agent for forwarding documents with IESG approval and for registering concerns in response to notifications (4) to the RFC Editor. Documents from Area Directors or Working Group Chairs may be considered in the same way as documents from "other".

## 5.2. The Standards Track Diagram

There is a part of the STATUS and STATE categorization that is called the standards track. Actually, only the changes of state are significant to the progression along the standards track, though the status assignments may change as well.

The states illustrated by single line boxes are temporary states, those illustrated by double line boxes are long term states. A protocol will normally be expected to remain in a temporary state for several months (minimum six months for proposed standard, minimum four months for draft standard). A protocol may be in a long term state for many years.

A protocol may enter the standards track only on the recommendation of the IESG; and may move from one state to another along the track only on the recommendation of the IESG. That is, it takes action by the IESG to either start a protocol on the track or to move it along.

Generally, as the protocol enters the standards track a decision is made as to the eventual STATUS, requirement level or applicability (elective, recommended, or required) the protocol will have, although a somewhat less stringent current status may be assigned, and it then is placed in the the proposed standard STATE with that status. So the initial placement of a protocol is into state 1. At any time the STATUS decision may be revisited.



The transition from proposed standard (1) to draft standard (2) can only be by action of the IESG and only after the protocol has been proposed standard (1) for at least six months.

The transition from draft standard (2) to standard (3) can only be by action of the IESG and only after the protocol has been draft standard (2) for at least four months.

Occasionally, the decision may be that the protocol is not ready for standardization and will be assigned to the experimental state (4). This is off the standards track, and the protocol may be resubmitted to enter the standards track after further work. There are other paths into the experimental and historic states that do not involve IESG action.

Sometimes one protocol is replaced by another and thus becomes historic, or it may happen that a protocol on the standards track is in a sense overtaken by another protocol (or other events) and becomes historic (state 5).

## 6. The Protocols

Subsection 6.1 lists recent RFCs and other changes. Subsections 6.2 - 6.10 list the standards in groups by protocol state.

### 6.1. Recent Changes

#### 6.1.1. New RFCs:

1920 - Internet Official Protocol Standards

This memo.

1918 - Address Allocation for Private Internets

This is a Best Current Practices document and does not specify any level of standard.

1917 - An Appeal to the Internet Community to Return Unused IP Networks (Prefixes) to the IANA

This is a Best Current Practices document and does not specify any level of standard.

1916 - Enterprise Renumbering: Experience and Information Solicitation

This is an information document and does not specify any level of standard.

1915 - Variance for The PPP Connection Control Protocol and The PPP Encryption Control Protocol

This is a Best Current Practices document and does not specify any level of standard.

1914 - How to Interact with a Whois++ Mesh

A Proposed Standard protocol.

1913 - Architecture of the Whois++ Index Service

A Proposed Standard protocol.

1912 - Common DNS Operational and Configuration Errors

This is an information document and does not specify any level of standard.

- 1911 - Voice Profile for Internet Mail  
An Experimental protocol.
- 1910 - User-based Security Model for SNMPv2  
An Experimental protocol.
- 1909 - An Administrative Infrastructure for SNMPv2  
An Experimental protocol.
- 1908 - Coexistence between Version 1 and Version 2 of the  
Internet-standard Network Management Framework  
A Draft Standard protocol.
- 1907 - Management Information Base for Version 2 of the Simple  
Network Management Protocol (SNMPv2)  
A Draft Standard protocol.
- 1906 - Transport Mappings for Version 2 of the Simple Network  
Management Protocol (SNMPv2)  
A Draft Standard protocol.
- 1905 - Protocol Operations for Version 2 of the Simple Network  
Management Protocol (SNMPv2)  
A Draft Standard protocol.
- 1904 - Conformance Statements for Version 2 of the Simple Network  
Management Protocol (SNMPv2)  
A Draft Standard protocol.
- 1903 - Textual Conventions for Version 2 of the Simple Network  
Management Protocol (SNMPv2)  
A Draft Standard protocol.
- 1902 - Structure of Management Information for Version 2 of the  
Simple Network Management Protocol (SNMPv2)  
A Draft Standard protocol.

1901 - Introduction to Community-based SNMPv2

An Experimental protocol.

1900 - Renumbering Needs Work

This is an information document and does not specify any level of standard.

1899 - not yet issued.

1898 - CyberCash Credit Card Protocol Version 0.8

This is an information document and does not specify any level of standard.

1897 - IPv6 Testing Address Allocation

An Experimental protocol.

1896 - The text/enriched MIME Content-type

This is an information document and does not specify any level of standard.

1895 - The Application/CALS-1840 Content-type

This is an information document and does not specify any level of standard.

1894 - An Extensible Message Format for Delivery Status Notifications

A Proposed Standard protocol.

1893 - Enhanced Mail System Status Codes

A Proposed Standard protocol.

1892 - The Multipart/Report Content Type for the Reporting of Mail System Administrative Messages

A Proposed Standard protocol.

1891 - SMTP Service Extension for Delivery Status Notifications

A Proposed Standard protocol.



1890 - RTP Profile for Audio and Video Conferences with Minimal Control

A Proposed Standard protocol.

1889 - RTP: A Transport Protocol for Real-Time Applications

A Proposed Standard protocol.

1888 - not yet issued.

1887 - An Architecture for IPv6 Unicast Address Allocation

This is an information document and does not specify any level of standard.

1886 - DNS Extensions to support IP version 6

A Proposed Standard protocol.

1885 - Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6)

A Proposed Standard protocol.

1884 - IP Version 6 Addressing Architecture

A Proposed Standard protocol.

1883 - Internet Protocol, Version 6 (IPv6) Specification

A Proposed Standard protocol.

1882 - The 12-Days of Technology Before Christmas

This is an information document and does not specify any level of standard.

1881 - IPv6 Address Allocation Management

This is an information document and does not specify any level of standard.

1879 - Class A Subnet Experiment Results and Recommendations

This is an information document and does not specify any level of standard.

## 1878 - Variable Length Subnet Table For IPv4

This is an information document and does not specify any level of standard.

## 1877 - PPP Internet Protocol Control Protocol Extensions for Name Server Addresses

This is an information document and does not specify any level of standard.

## 1876 - A Means for Expressing Location Information in the Domain Name System

An Experimental protocol.

## 1875 - UNINETT PCA Policy Statements

This is an information document and does not specify any level of standard.

## 1874 - SGML Media Types

An Experimental protocol.

## 1873 - Message/External-Body Content-ID Access Type

An Experimental protocol.

## 1872 - The MIME Multipart/Related Content-type

An Experimental protocol.

## 1865 - EDI Meets the Internet Frequently Asked Questions about Electronic Data Interchange (EDI) on the Internet

This is an information document and does not specify any level of standard.

## 6.1.2. Other Changes:

The following are changes to protocols listed in the previous edition.

## 1451 - Manager to Manager Management Information Base

Moved to Historic.

1447 - Party MIB for version 2 of the Simple Network Management Protocol (SNMPv2)

Moved to Historic.

1446 - Security Protocols for version 2 of the Simple Network Management Protocol (SNMPv2)

Moved to Historic.

1445 - Administrative Model for version 2 of the Simple Network Management Protocol (SNMPv2)

Moved to Historic.

1058 - Routing Information Protocol

Moved to Historic.

## 6.2. Standard Protocols

| Protocol    | Name                                    | Status | RFC       | STD   | *     |
|-------------|---|--------|-----------|-------|-------|
| =====       | =====                                   | =====  | =====     | ===== | ===== |
| -----       | Internet Official Protocol Standards    | Req    | 1920      | 1     |       |
| -----       | Assigned Numbers                        | Req    | 1700      | 2     |       |
| -----       | Host Requirements - Communications      | Req    | 1122      | 3     |       |
| -----       | Host Requirements - Applications        | Req    | 1123      | 3     |       |
| IP          | Internet Protocol                       | Req    | 791       | 5     |       |
|             | as amended by:-----                     |        |           |       |       |
| -----       | IP Subnet Extension                     | Req    | 950       | 5     |       |
| -----       | IP Broadcast Datagrams                  | Req    | 919       | 5     |       |
| -----       | IP Broadcast Datagrams with Subnets     | Req    | 922       | 5     |       |
| ICMP        | Internet Control Message Protocol       | Req    | 792       | 5     |       |
| IGMP        | Internet Group Multicast Protocol       | Rec    | 1112      | 5     |       |
| UDP         | User Datagram Protocol                  | Rec    | 768       | 6     |       |
| TCP         | Transmission Control Protocol           | Rec    | 793       | 7     |       |
| TELNET      | Telnet Protocol                         | Rec    | 854,855   | 8     |       |
| FTP         | File Transfer Protocol                  | Rec    | 959       | 9     |       |
| SMTP        | Simple Mail Transfer Protocol           | Rec    | 821       | 10    |       |
| SMTP-SIZE   | SMTP Service Ext for Message Size       | Rec    | 1870      | 10    |       |
| SMTP-EXT    | SMTP Service Extensions                 | Rec    | 1869      | 10    |       |
| MAIL        | Format of Electronic Mail Messages      | Rec    | 822       | 11    |       |
| CONTENT     | Content Type Header Field               | Rec    | 1049      | 11    |       |
| NTPV2       | Network Time Protocol (Version 2)       | Rec    | 1119      | 12    |       |
| DOMAIN      | Domain Name System                      | Rec    | 1034,1035 | 13    |       |
| DNS-MX      | Mail Routing and the Domain System      | Rec    | 974       | 14    |       |
| SNMP        | Simple Network Management Protocol      | Rec    | 1157      | 15    |       |
| SMI         | Structure of Management Information     | Rec    | 1155      | 16    |       |
| Concise-MIB | Concise MIB Definitions                 | Rec    | 1212      | 16    |       |
| MIB-II      | Management Information Base-II          | Rec    | 1213      | 17    |       |
| NETBIOS     | NetBIOS Service Protocols               | Ele    | 1001,1002 | 19    |       |
| ECHO        | Echo Protocol                           | Rec    | 862       | 20    |       |
| DISCARD     | Discard Protocol                        | Ele    | 863       | 21    |       |
| CHARGEN     | Character Generator Protocol            | Ele    | 864       | 22    |       |
| QUOTE       | Quote of the Day Protocol               | Ele    | 865       | 23    |       |
| USERS       | Active Users Protocol                   | Ele    | 866       | 24    |       |
| DAYTIME     | Daytime Protocol                        | Ele    | 867       | 25    |       |
| TIME        | Time Server Protocol                    | Ele    | 868       | 26    |       |
| TFTP        | Trivial File Transfer Protocol          | Ele    | 1350      | 33    |       |
| TP-TCP      | ISO Transport Service on top of the TCP | Ele    | 1006      | 35    |       |
| ETHER-MIB   | Ethernet MIB                            | Ele    | 1643      | 50    |       |
| PPP         | Point-to-Point Protocol (PPP)           | Ele    | 1661      | 51    |       |
| PPP-HDLC    | PPP in HDLC Framing                     | Ele    | 1662      | 51    |       |
| IP-SMDS     | IP Datagrams over the SMDS Service      | Ele    | 1209      | 52    |       |

[Note: an asterisk at the end of a line indicates a change from the previous edition of this document.]

## Applicability Statements:

IGMP -- The Internet Architecture Board intends to move towards general adoption of IP multicasting, as a more efficient solution than broadcasting for many applications. The host interface has been standardized in RFC-1112; however, multicast-routing gateways are in the experimental stage and are not widely available. An Internet host should support all of RFC-1112, except for the IGMP protocol itself which is optional; see RFC-1122 for more details. Even without IGMP, implementation of RFC-1112 will provide an important advance: IP-layer access to local network multicast addressing. It is expected that IGMP will become recommended for all hosts and gateways at some future date.

SMI, MIB-II SNMP -- The Internet Architecture Board recommends that all IP and TCP implementations be network manageable. At the current time, this implies implementation of the Internet MIB-II (RFC-1213), and at least the recommended management protocol SNMP (RFC-1157).

RIP -- The Routing Information Protocol (RIP) is widely implemented and used in the Internet. However, both implementors and users should be aware that RIP has some serious technical limitations as a routing protocol. The IETF is currently developing several candidates for a new standard "open" routing protocol with better properties than RIP. The IAB urges the Internet community to track these developments, and to implement the new protocol when it is standardized; improved Internet service will result for many users.

TP-TCP -- As OSI protocols become more widely implemented and used, there will be an increasing need to support interoperation with the TCP/IP protocols. The Internet Engineering Task Force is formulating strategies for interoperation. RFC-1006 provides one interoperation mode, in which TCP/IP is used to emulate TP0 in order to support OSI applications. Hosts that wish to run OSI connection-oriented applications in this mode should use the procedure described in RFC-1006. In the future, the IAB expects that a major portion of the Internet will support both TCP/IP and OSI (inter-)network protocols in parallel, and it will then be possible to run OSI applications across the Internet using full OSI protocol "stacks".

### 6.3. Network-Specific Standard Protocols

All Network-Specific Standards have Elective status.

| Protocol   | Name                                     | State | RFC     | STD   | *     |
|------------|--|-------|---------|-------|-------|
| =====      | =====                                    | ===== | =====   | ===== | ===== |
| IP-ATM     | Classical IP and ARP over ATM            | Prop  | 1577    |       |       |
| IP-FR      | Multiprotocol over Frame Relay           | Draft | 1490    |       |       |
| ATM-ENCAP  | Multiprotocol Encapsulation over ATM     | Prop  | 1483    |       |       |
| IP-TR-MC   | IP Multicast over Token-Ring LANs        | Prop  | 1469    |       |       |
| IP-FDDI    | Transmission of IP and ARP over FDDI Net | Std   | 1390    | 36    |       |
| IP-HIPPI   | IP and ARP on HIPPI                      | Prop  | 1374    |       |       |
| IP-X.25    | X.25 and ISDN in the Packet Mode         | Draft | 1356    |       |       |
| IP-FDDI    | Internet Protocol on FDDI Networks       | Draft | 1188    |       |       |
| ARP        | Address Resolution Protocol              | Std   | 826     | 37    |       |
| RARP       | A Reverse Address Resolution Protocol    | Std   | 903     | 38    |       |
| IP-ARPA    | Internet Protocol on ARPANET             | Std   | BBN1822 | 39    |       |
| IP-WB      | Internet Protocol on Wideband Network    | Std   | 907     | 40    |       |
| IP-E       | Internet Protocol on Ethernet Networks   | Std   | 894     | 41    |       |
| IP-EE      | Internet Protocol on Exp. Ethernet Nets  | Std   | 895     | 42    |       |
| IP-IEEE    | Internet Protocol on IEEE 802            | Std   | 1042    | 43    |       |
| IP-DC      | Internet Protocol on DC Networks         | Std   | 891     | 44    |       |
| IP-HC      | Internet Protocol on Hyperchannel        | Std   | 1044    | 45    |       |
| IP-ARC     | Transmitting IP Traffic over ARCNET Nets | Std   | 1201    | 46    |       |
| IP-SLIP    | Transmission of IP over Serial Lines     | Std   | 1055    | 47    |       |
| IP-NETBIOS | Transmission of IP over NETBIOS          | Std   | 1088    | 48    |       |
| IP-IPX     | Transmission of 802.2 over IPX Networks  | Std   | 1132    | 49    |       |

[Note: an asterisk at the end of a line indicates a change from the previous edition of this document.]

#### Applicability Statements:

It is expected that a system will support one or more physical networks and for each physical network supported the appropriate protocols from the above list must be supported. That is, it is elective to support any particular type of physical network, and for the physical networks actually supported it is required that they be supported exactly according to the protocols in the above list. See also the Host and Gateway Requirements RFCs for more specific information on network-specific ("link layer") protocols.

## 6.4. Draft Standard Protocols

| Protocol<br>===== | Name<br>=====                           | Status<br>===== | RFC<br>===== |
|-------------------|---|-----------------|--------------|
| COEX-MIB          | Coexistence between SNMPV1 & SNMPV2     | Elective        | 1908*        |
| SNMPv2-MIB        | MIB for SNMPv2                          | Elective        | 1907*        |
| TRANS-MIB         | Transport Mappings for SNMPv2           | Elective        | 1906*        |
| OPS-MIB           | Protocol Operations for SNMPv2          | Elective        | 1905*        |
| CONF-MIB          | Conformance Statements for SNMPv2       | Elective        | 1904*        |
| CONV-MIB          | Textual Conventions for SNMPv2          | Elective        | 1903*        |
| SMIV2             | SMI for SNMPv2                          | Elective        | 1902*        |
| CON-MD5           | Content-MD5 Header Field                | Elective        | 1864         |
| OSPF-MIB          | OSPF Version 2 MIB                      | Elective        | 1850         |
| STR-REP           | String Representation ...               | Elective        | 1779         |
| X.500syn          | X.500 String Representation ...         | Elective        | 1778         |
| X.500lite         | X.500 Lightweight ...                   | Elective        | 1777         |
| BGP-4-APP         | Application of BGP-4                    | Elective        | 1772         |
| BGP-4             | Border Gateway Protocol 4               | Elective        | 1771         |
| PPP-DNCP          | PPP DECnet Phase IV Control Protocol    | Elective        | 1762         |
| RMON-MIB          | Remote Network Monitoring MIB           | Elective        | 1757         |
| 802.5-MIB         | IEEE 802.5 Token Ring MIB               | Elective        | 1748         |
| BGP-4-MIB         | BGP-4 MIB                               | Elective        | 1657         |
| POP3              | Post Office Protocol, Version 3         | Elective        | 1725         |
| RIP2-MIB          | RIP Version 2 MIB Extension             | Elective        | 1724         |
| RIP2              | RIP Version 2-Carrying Additional Info. | Elective        | 1723         |
| RIP2-APP          | RIP Version 2 Protocol App. Statement   | Elective        | 1722         |
| SIP-MIB           | SIP Interface Type MIB                  | Elective        | 1694         |
| -----             | Def Man Objs Parallel-printer-like      | Elective        | 1660         |
| -----             | Def Man Objs RS-232-like                | Elective        | 1659         |
| -----             | Def Man Objs Character Stream           | Elective        | 1658         |
| SMTP-8BIT         | SMTP Service Ext or 8bit-MIMEtransport  | Elective        | 1652         |
| OSI-NSAP          | Guidelines for OSI NSAP Allocation      | Elective        | 1629         |
| OSPF2             | Open Shortest Path First Routing V2     | Elective        | 1583         |
| ISO-TS-ECHO       | Echo for ISO-8473                       | Elective        | 1575         |
| DECNET-MIB        | DECNET MIB                              | Elective        | 1559         |
| -----             | Message Header Ext. of Non-ASCII Text   | Elective        | 1522         |
| MIME              | Multipurpose Internet Mail Extensions   | Elective        | 1521         |
| 802.3-MIB         | IEEE 802.3 Repeater MIB                 | Elective        | 1516         |
| BRIDGE-MIB        | BRIDGE-MIB                              | Elective        | 1493         |
| NTPV3             | Network Time Protocol (Version 3)       | Elective        | 1305         |
| IP-MTU            | Path MTU Discovery                      | Elective        | 1191         |
| FINGER            | Finger Protocol                         | Elective        | 1288         |
| BOOTP             | Bootstrap Protocol                      | Recommended     | 951,1497     |
| NICNAME           | WhoIs Protocol                          | Elective        | 954          |

[Note: an asterisk at the end of a line indicates a change from the previous edition of this document.]

## Applicability Statements:

PPP -- Point to Point Protocol is a method of sending IP over serial lines, which are a type of physical network. It is anticipated that PPP will be advanced to the network-specifics standard protocol state in the future.

## 6.5. Proposed Standard Protocols

| Protocol   | Name                                    | Status   | RFC   |
|------------|---|----------|-------|
| =====      | =====                                   | =====    | ===== |
| WHOIS++M   | How to Interact with a Whois++ Mesh     | Elective | 1914* |
| WHOIS++A   | Architecture of Whois++ Index Service   | Elective | 1913* |
| DSN        | Delivery Status Notifications           | Elective | 1894* |
| EMS-CODE   | Enhanced Mail System Status Codes       | Elective | 1893* |
| MIME-RPT   | Multipart/Report                        | Elective | 1892* |
| SMTP-DSN   | SMTP Delivery Status Notifications      | Elective | 1891* |
| RTP-AV     | RTP Audio/Video Profile                 | Elective | 1890* |
| RTP        | Transport Protocol for Real-Time Apps   | Elective | 1889* |
| DNS-IPV6   | DNS Extensions to support IPv6          | Elective | 1886* |
| ICMPv6     | ICMPv6 for IPv6                         | Elective | 1885* |
| IPV6-Addr  | IPv6 Addressing Architecture            | Elective | 1884* |
| IPV6       | IPv6 Specification                      | Elective | 1883* |
| HTML       | Hypertext Markup Language - 2.0         | Elective | 1866  |
| SMTP-Pipe  | SMTP Serv. Ext. for Command Pipelining  | Elective | 1854  |
| MIME-Sec   | MIME Object Security Services           | Elective | 1848  |
| MIME-Encyp | MIME: Signed and Encrypted              | Elective | 1847  |
| WHOIS++    | Architecture of the WHOIS++ service     | Elective | 1835  |
| -----      | Binding Protocols for ONC RPC Version 2 | Elective | 1833  |
| XDR        | External Data Representation Standard   | Elective | 1832  |
| RPC        | Remote Procedure Call Protocol V. 2     | Elective | 1831  |
| -----      | ESP DES-CBC Transform                   | Ele/Req  | 1829  |
| -----      | IP Authentication using Keyed MD5       | Ele/Req  | 1828  |
| ESP        | IP Encapsulating Security Payload       | Ele/Req  | 1827  |
| IPV6-AH    | IP Authentication Header                | Ele/Req  | 1826  |
| -----      | Security Architecture for IP            | Ele/Req  | 1825  |
| RREQ       | Requirements for IP Version 4 Routers   | Elective | 1812  |
| URL        | Relative Uniform Resource Locators      | Elective | 1808  |
| CLDAP      | Connection-less LDAP                    | Elective | 1798  |
| OSPF-DC    | Ext. OSPF to Support Demand Circuits    | Elective | 1793  |
| TMUX       | Transport Multiplexing Protocol         | Elective | 1692  |
| TFTP-Opt   | TFTP Options                            | Elective | 1784  |
| TFTP-Blk   | TFTP Blocksize Option                   | Elective | 1783  |
| TFTP-Ext   | TFTP Option Extension                   | Elective | 1782  |
| OSI-Dir    | OSI User Friendly Naming ...            | Elective | 1781  |
| MIME-EDI   | MIME Encapsulation of EDI Objects       | Elective | 1767  |
| Lang-Tag   | Tags for Identification of Languages    | Elective | 1766  |
| XNSCP      | PPP XNS IDP Control Protocol            | Elective | 1764  |



|            |   |          |      |
|------------|---|----------|------|
| BVCP       | PPP Banyan Vines Control Protocol           | Elective | 1763 |
| Print-MIB  | Printer MIB                                 | Elective | 1759 |
| ATM-SIG    | ATM Signaling Support for IP over ATM       | Elective | 1755 |
| IPNG       | Recommendation for IP Next Generation       | Elective | 1752 |
| 802.5-SSR  | 802.5 SSR MIB using SMIV2                   | Elective | 1749 |
| SDLC-SMIV2 | SNADLC SDLC MIB using SMIV2                 | Elective | 1747 |
| BGP4-IDRP  | BGP4-IDRP for IP/OSPF Interaction           | Elective | 1745 |
| AT-MIB     | Appletalk MIB                               | Elective | 1742 |
| MacMIME    | MIME Encapsulation of Macintosh files       | Elective | 1740 |
| URL        | Uniform Resource Locators                   | Elective | 1738 |
| POP3-AUTH  | POP3 AUTHentication command                 | Elective | 1734 |
| IMAP4-AUTH | IMAP4 Authentication Mechanisms             | Elective | 1731 |
| IMAP4      | Internet Message Access Protocol V4         | Elective | 1730 |
| PPP-MP     | PPP Multilink Protocol                      | Elective | 1717 |
| RDBMS-MIB  | RDMS MIB - using SMIV2                      | Elective | 1697 |
| MODEM-MIB  | Modem MIB - using SMIV2                     | Elective | 1696 |
| ATM-MIB    | ATM Management Version 8.0 using SMIV2      | Elective | 1695 |
| SNANAU-MIB | SNA NAUs MIB using SMIV2                    | Elective | 1665 |
| PPP-TRANS  | PPP Reliable Transmission                   | Elective | 1663 |
| BGP-4-IMP  | BGP-4 Roadmap and Implementation            | Elective | 1656 |
| -----      | Postmaster Convention X.400 Operations      | Elective | 1648 |
| TN3270-En  | TN3270 Enhancements                         | Elective | 1647 |
| PPP-BCP    | PPP Bridging Control Protocol               | Elective | 1638 |
| UPS-MIB    | UPS Management Information Base             | Elective | 1628 |
| AAL5-MTU   | Default IP MTU for use over ATM AAL5        | Elective | 1626 |
| PPP-SONET  | PPP over SONET/SDH                          | Elective | 1619 |
| PPP-ISDN   | PPP over ISDN                               | Elective | 1618 |
| DNS-R-MIB  | DNS Resolver MIB Extensions                 | Elective | 1612 |
| DNS-S-MIB  | DNS Server MIB Extensions                   | Elective | 1611 |
| FR-MIB     | Frame Relay Service MIB                     | Elective | 1604 |
| PPP-X25    | PPP in X.25                                 | Elective | 1598 |
| OSPF-NSSA  | The OSPF NSSA Option                        | Elective | 1587 |
| OSPF-Multi | Multicast Extensions to OSPF                | Elective | 1584 |
| SONET-MIB  | MIB SONET/SDH Interface Type                | Elective | 1595 |
| RIP-DC     | Extensions to RIP to Support Demand Cir.    | Elective | 1582 |
| -----      | Evolution of the Interfaces Group of MIB-II | Elective | 1573 |
| PPP-LCP    | PPP LCP Extensions                          | Elective | 1570 |
| X500-MIB   | X.500 Directory Monitoring MIB              | Elective | 1567 |
| MAIL-MIB   | Mail Monitoring MIB                         | Elective | 1566 |
| NSM-MIB    | Network Services Monitoring MIB             | Elective | 1565 |
| CIPX       | Compressing IPX Headers Over WAM Media      | Elective | 1553 |
| IPXCP      | PPP Internetworking Packet Exchange Control | Elective | 1552 |
| DHCP-BOOTP | Interoperation Between DHCP and BOOTP       | Elective | 1534 |
| DHCP-BOOTP | DHCP Options and BOOTP Vendor Extensions    | Elective | 1533 |
| BOOTP      | Clarifications and Extensions BOOTP         | Elective | 1532 |
| DHCP       | Dynamic Host Configuration Protocol         | Elective | 1541 |
| SRB-MIB    | Source Routing Bridge MIB                   | Elective | 1525 |
| CIDR-STRA  | CIDR Address Assignment...                  | Elective | 1519 |

|             |  |          |      |
|-------------|--|----------|------|
| CIDR-ARCH   | CIDR Architecture...                     | Elective | 1518 |
| CIDR-APP    | CIDR Applicability Statement             | Elective | 1517 |
| -----       | 802.3 MAU MIB                            | Elective | 1515 |
| HOST-MIB    | Host Resources MIB                       | Elective | 1514 |
| -----       | Token Ring Extensions to RMON MIB        | Elective | 1513 |
| FDDI-MIB    | FDDI Management Information Base         | Elective | 1512 |
| KERBEROS    | Kerberos Network Authentication Ser (V5) | Elective | 1510 |
| GSSAPI      | Generic Security Service API: C-bindings | Elective | 1509 |
| GSSAPI      | Generic Security Service Application...  | Elective | 1508 |
| DASS        | Distributed Authentication Security...   | Elective | 1507 |
| -----       | X.400 Use of Extended Character Sets     | Elective | 1502 |
| HARPOON     | Rules for Downgrading Messages...        | Elective | 1496 |
| Mapping     | MHS/RFC-822 Message Body Mapping         | Elective | 1495 |
| Equiv       | X.400/MIME Body Equivalences             | Elective | 1494 |
| IDPR        | Inter-Domain Policy Routing Protocol     | Elective | 1479 |
| IDPR-ARCH   | Architecture for IDPR                    | Elective | 1478 |
| PPP/Bridge  | MIB Bridge PPP MIB                       | Elective | 1474 |
| PPP/IP MIB  | IP Network Control Protocol of PPP MIB   | Elective | 1473 |
| PPP/SEC MIB | Security Protocols of PPP MIB            | Elective | 1472 |
| PPP/LCP MIB | Link Control Protocol of PPP MIB         | Elective | 1471 |
| X25-MIB     | Multiprotocol Interconnect on X.25 MIB   | Elective | 1461 |
| SNMPv2      | Coexistence between SNMPv1 and SNMPv2    | Elective | 1452 |
| SNMPv2      | Management Information Base for SNMPv2   | Elective | 1450 |
| SNMPv2      | Transport Mappings for SNMPv2            | Elective | 1449 |
| SNMPv2      | Protocol Operations for SNMPv2           | Elective | 1448 |
| SNMPv2      | Conformance Statements for SNMPv2        | Elective | 1444 |
| SNMPv2      | Textual Conventions for SNMPv2           | Elective | 1443 |
| SNMPv2      | SMI for SNMPv2                           | Elective | 1442 |
| SNMPv2      | Introduction to SNMPv2                   | Elective | 1441 |
| PEM-KEY     | PEM - Key Certification                  | Elective | 1424 |
| PEM-ALG     | PEM - Algorithms, Modes, and Identifiers | Elective | 1423 |
| PEM-CKM     | PEM - Certificate-Based Key Management   | Elective | 1422 |
| PEM-ENC     | PEM - Message Encryption and Auth        | Elective | 1421 |
| SNMP-IPX    | SNMP over IPX                            | Elective | 1420 |
| SNMP-AT     | SNMP over AppleTalk                      | Elective | 1419 |
| SNMP-OSI    | SNMP over OSI                            | Elective | 1418 |
| FTP-FTAM    | FTP-FTAM Gateway Specification           | Elective | 1415 |
| IDENT-MIB   | Identification MIB                       | Elective | 1414 |
| IDENT       | Identification Protocol                  | Elective | 1413 |
| DS3/E3-MIB  | DS3/E3 Interface Type                    | Elective | 1407 |
| DS1/E1-MIB  | DS1/E1 Interface Type                    | Elective | 1406 |
| BGP-OSPF    | BGP OSPF Interaction                     | Elective | 1403 |
| -----       | Route Advertisement In BGP2 And BGP3     | Elective | 1397 |
| SNMP-X.25   | SNMP MIB Extension for X.25 Packet Layer | Elective | 1382 |
| SNMP-LAPB   | SNMP MIB Extension for X.25 LAPB         | Elective | 1381 |
| PPP-ATCP    | PPP AppleTalk Control Protocol           | Elective | 1378 |
| PPP-OSINLCP | PPP OSI Network Layer Control Protocol   | Elective | 1377 |
| TABLE-MIB   | IP Forwarding Table MIB                  | Elective | 1354 |

|                |   |          |      |
|----------------|---|----------|------|
| SNMP-PARTY-MIB | Administration of SNMP                  | Elective | 1353 |
| SNMP-SEC       | SNMP Security Protocols                 | Elective | 1352 |
| SNMP-ADMIN     | SNMP Administrative Model               | Elective | 1351 |
| TOS            | Type of Service in the Internet         | Elective | 1349 |
| PPP-AUTH       | PPP Authentication                      | Elective | 1334 |
| PPP-LINK       | PPP Link Quality Monitoring             | Elective | 1333 |
| PPP-IPCP       | PPP Control Protocol                    | Elective | 1332 |
| -----          | X.400 1988 to 1984 downgrading          | Elective | 1328 |
| -----          | Mapping between X.400(1988)             | Elective | 1327 |
| TCP-EXT        | TCP Extensions for High Performance     | Elective | 1323 |
| FRAME-MIB      | Management Information Base for Frame   | Elective | 1315 |
| NETFAX         | File Format for the Exchange of Images  | Elective | 1314 |
| IARP           | Inverse Address Resolution Protocol     | Elective | 1293 |
| FDDI-MIB       | FDDI-MIB                                | Elective | 1285 |
| -----          | Encoding Network Addresses              | Elective | 1277 |
| -----          | Replication and Distributed Operations  | Elective | 1276 |
| -----          | COSINE and Internet X.500 Schema        | Elective | 1274 |
| BGP-MIB        | Border Gateway Protocol MIB (Version 3) | Elective | 1269 |
| ICMP-ROUT      | ICMP Router Discovery Messages          | Elective | 1256 |
| IPSO           | DoD Security Options for IP             | Elective | 1108 |
| OSI-UDP        | OSI TS on UDP                           | Elective | 1240 |
| STD-MIBs       | Reassignment of Exp MIBs to Std MIBs    | Elective | 1239 |
| IPX-IP         | Tunneling IPX Traffic through IP Nets   | Elective | 1234 |
| GINT-MIB       | Extensions to the Generic-Interface MIB | Elective | 1229 |
| IS-IS          | OSI IS-IS for TCP/IP Dual Environments  | Elective | 1195 |
| IP-CMPRS       | Compressing TCP/IP Headers              | Elective | 1144 |
| NNTP           | Network News Transfer Protocol          | Elective | 977  |

[Note: an asterisk at the end of a line indicates a change from the previous edition of this document.]

[Note: Ele/Req indicates elective for use with IPv4 and required for use with IPv6.]

#### Applicability Statements:

OSPF - RFC 1370 is an applicability statement for OSPF.

## 6.6. Telnet Options

For convenience, all the Telnet Options are collected here with both their state and status.

| Protocol    | Name                               | Number | State | Status | RFC   | STD   |
|-------------|------------------------------------|--------|-------|--------|-------|-------|
| =====       | =====                              | =====  | ===== | =====  | ===== | ===== |
| TOPT-BIN    | Binary Transmission                | 0      | Std   | Rec    | 856   | 27    |
| TOPT-ECHO   | Echo                               | 1      | Std   | Rec    | 857   | 28    |
| TOPT-RECN   | Reconnection                       | 2      | Prop  | Ele    | ...   |       |
| TOPT-SUPP   | Suppress Go Ahead                  | 3      | Std   | Rec    | 858   | 29    |
| TOPT-APRX   | Approx Message Size Negotiation    | 4      | Prop  | Ele    | ...   |       |
| TOPT-STAT   | Status                             | 5      | Std   | Rec    | 859   | 30    |
| TOPT-TIM    | Timing Mark                        | 6      | Std   | Rec    | 860   | 31    |
| TOPT-REM    | Remote Controlled Trans and Echo   | 7      | Prop  | Ele    | 726   |       |
| TOPT-OLW    | Output Line Width                  | 8      | Prop  | Ele    | ...   |       |
| TOPT-OPS    | Output Page Size                   | 9      | Prop  | Ele    | ...   |       |
| TOPT-OCRD   | Output Carriage-Return Disposition | 10     | Prop  | Ele    | 652   |       |
| TOPT-OHT    | Output Horizontal Tabstops         | 11     | Prop  | Ele    | 653   |       |
| TOPT-OHTD   | Output Horizontal Tab Disposition  | 12     | Prop  | Ele    | 654   |       |
| TOPT-OFD    | Output Formfeed Disposition        | 13     | Prop  | Ele    | 655   |       |
| TOPT-OVT    | Output Vertical Tabstops           | 14     | Prop  | Ele    | 656   |       |
| TOPT-OVTD   | Output Vertical Tab Disposition    | 15     | Prop  | Ele    | 657   |       |
| TOPT-OLD    | Output Linefeed Disposition        | 16     | Prop  | Ele    | 658   |       |
| TOPT-EXT    | Extended ASCII                     | 17     | Prop  | Ele    | 698   |       |
| TOPT-LOGO   | Logout                             | 18     | Prop  | Ele    | 727   |       |
| TOPT-BYTE   | Byte Macro                         | 19     | Prop  | Ele    | 735   |       |
| TOPT-DATA   | Data Entry Terminal                | 20     | Prop  | Ele    | 1043  |       |
| TOPT-SUP    | SUPDUP                             | 21     | Prop  | Ele    | 736   |       |
| TOPT-SUPO   | SUPDUP Output                      | 22     | Prop  | Ele    | 749   |       |
| TOPT-SNDL   | Send Location                      | 23     | Prop  | Ele    | 779   |       |
| TOPT-TERM   | Terminal Type                      | 24     | Prop  | Ele    | 1091  |       |
| TOPT-EOR    | End of Record                      | 25     | Prop  | Ele    | 885   |       |
| TOPT-TACACS | TACACS User Identification         | 26     | Prop  | Ele    | 927   |       |
| TOPT-OM     | Output Marking                     | 27     | Prop  | Ele    | 933   |       |
| TOPT-TLN    | Terminal Location Number           | 28     | Prop  | Ele    | 946   |       |
| TOPT-3270   | Telnet 3270 Regime                 | 29     | Prop  | Ele    | 1041  |       |
| TOPT-X.3    | X.3 PAD                            | 30     | Prop  | Ele    | 1053  |       |
| TOPT-NAWS   | Negotiate About Window Size        | 31     | Prop  | Ele    | 1073  |       |
| TOPT-TS     | Terminal Speed                     | 32     | Prop  | Ele    | 1079  |       |
| TOPT-RFC    | Remote Flow Control                | 33     | Prop  | Ele    | 1372  |       |
| TOPT-LINE   | Linemode                           | 34     | Draft | Ele    | 1184  |       |
| TOPT-XDL    | X Display Location                 | 35     | Prop  | Ele    | 1096  |       |
| TOPT-ENVIR  | Telnet Environment Option          | 36     | Hist  | Not    | 1408  |       |
| TOPT-AUTH   | Telnet Authentication Option       | 37     | Exp   | Ele    | 1416  |       |
| TOPT-ENVIR  | Telnet Environment Option          | 39     | Prop  | Ele    | 1572  |       |
| TOPT-EXTOP  | Extended-Options-List              | 255    | Std   | Rec    | 861   | 32    |

[Note: an asterisk at the end of a line indicates a change from the previous edition of this document.]

## 6.7. Experimental Protocols

All Experimental protocols have the Limited Use status.

| Protocol   | Name  | RFC   |
|------------|---|-------|
| =====      | =====   | ===== |
| MIME-VP    | Voice Profile for Internet Mail                       | 1911* |
| SNMPV2SM   | User-based Security Model for SNMPv2                  | 1910* |
| SNMPV2AI   | SNMPv2 Administrative Infrastructure                  | 1909* |
| SNMPV2CB   | Introduction to Community-based SNMPv2                | 1901* |
| -----      | IPv6 Testing Address Allocation                       | 1897* |
| DNS-LOC    | Location Information in the DNS                       | 1876* |
| SGML-MT    | SGML Media Types                                      | 1874* |
| CONT-MT    | Access Type Content-ID                                | 1873* |
| RELAT-MT   | Multipart/Related                                     | 1872* |
| UNARP      | ARP Extension - UNARP                                 | 1868  |
| -----      | Form-based File Upload in HTML                        | 1867  |
| -----      | BGP/IDRP Route Server Alternative                     | 1863  |
| -----      | IP Authentication using Keyed SHA                     | 1852  |
| ESP3DES    | ESP Triple DES Transform                              | 1851  |
| -----      | SMTP 521 Reply Code                                   | 1846  |
| -----      | SMTP Serv. Ext. for Checkpoint/Restart                | 1845  |
| -----      | X.500 Mapping X.400 and RFC 822 Addresses             | 1838  |
| -----      | Tables and Subtrees in the X.500 Directory            | 1837  |
| -----      | O/R Address hierarchy in X.500                        | 1836  |
| -----      | SMTP Serv. Ext. Large and Binary MIME Msgs.           | 1830  |
| ST2        | Stream Protocol Version 2                             | 1819  |
| -----      | Content-Disposition Header                            | 1806  |
| -----      | Schema Publishing in X.500 Directory                  | 1804  |
| -----      | X.400-MHS use X.500 to support X.400-MHS Routing      | 1801  |
| -----      | Class A Subnet Experiment                             | 1797  |
| TCP/IPXMIB | TCP/IPX Connection Mib Specification                  | 1792  |
| -----      | TCP And UDP Over IPX Networks With Fixed Path MTU     | 1791  |
| ICMP-DM    | ICMP Domain Name Messages                             | 1788  |
| CLNP-MULT  | Host Group Extensions for CLNP Multicasting           | 1768  |
| OSPF-OVFL  | OSPF Database Overflow                                | 1765  |
| RWP        | Remote Write ProtocolL - Version 1.0                  | 1756  |
| NARP       | NBMA Address Resolution Protocol                      | 1735  |
| DNS-DEBUG  | Tools for DNS debugging                               | 1713  |
| DNS-ENCODE | DNS Encoding of Geographical Location                 | 1712  |
| TCP-POS    | An Extension to TCP: Partial Order Service            | 1693  |
| -----      | DNS to Distribute RFC1327 Mail Address Mapping Tables | 1664  |
| T/TCP      | TCP Extensions for Transactions                       | 1644  |
| UTF-7      | A Mail-Safe Transformation Format of Unicode          | 1642  |
| MIME-UNI   | Using Unicode with MIME                               | 1641  |

|            |  |           |
|------------|--|-----------|
| FOOBAR     | FTP Operation Over Big Address Records             | 1639      |
| X500-CHART | Charting Networks in the X.500 Directory           | 1609      |
| X500-DIR   | Representing IP Information in the X.500 Directory | 1608      |
| SNMP-DPI   | SNMP Distributed Protocol Interface                | 1592      |
| CLNP-TUBA  | Use of ISO CLNP in TUBA Environments               | 1561      |
| REM-PRINT  | TPC.INT Subdomain Remote Printing - Technical      | 1528      |
| EHF-MAIL   | Encoding Header Field for Internet Messages        | 1505      |
| REM-PRT    | An Experiment in Remote Printing                   | 1486      |
| RAP        | Internet Route Access Protocol                     | 1476      |
| TP/IX      | TP/IX: The Next Internet                           | 1475      |
| X400       | Routing Coordination for X.400 Services            | 1465      |
| DNS        | Storing Arbitrary Attributes in DNS                | 1464      |
| IRCP       | Internet Relay Chat Protocol                       | 1459      |
| TOS-LS     | Link Security TOS                                  | 1455      |
| SIFT/UFT   | Sender-Initiated/Unsolicited File Transfer         | 1440      |
| DIR-ARP    | Directed ARP                                       | 1433      |
| TEL-SPX    | Telnet Authentication: SPX                         | 1412      |
| TEL-KER    | Telnet Authentication: Kerberos V4                 | 1411      |
| MAP-MAIL   | X.400 Mapping and Mail-11                          | 1405      |
| TRACE-IP   | Traceroute Using an IP Option                      | 1393      |
| DNS-IP     | Experiment in DNS Based IP Routing                 | 1383      |
| RMCP       | Remote Mail Checking Protocol                      | 1339      |
| TCP-HIPER  | TCP Extensions for High Performance                | 1323      |
| MSP2       | Message Send Protocol 2                            | 1312      |
| DSLCP      | Dynamically Switched Link Control                  | 1307      |
| -----      | X.500 and Domains                                  | 1279      |
| IN-ENCAP   | Internet Encapsulation Protocol                    | 1241      |
| CLNS-MIB   | CLNS-MIB   | 1238      |
| CFDP       | Coherent File Distribution Protocol                | 1235      |
| SNMP-DPI   | SNMP Distributed Program Interface                 | 1228      |
| IP-AX.25   | IP Encapsulation of AX.25 Frames                   | 1226      |
| ALERTS     | Managing Asynchronously Generated Alerts           | 1224      |
| MPP        | Message Posting Protocol                           | 1204      |
| SNMP-BULK  | Bulk Table Retrieval with the SNMP                 | 1187      |
| DNS-RR     | New DNS RR Definitions                             | 1183      |
| IMAP2      | Interactive Mail Access Protocol                   | 1176      |
| NTP-OSI    | NTP over OSI Remote Operations                     | 1165      |
| DMF-MAIL   | Digest Message Format for Mail                     | 1153      |
| RDP        | Reliable Data Protocol                             | 908, 1151 |
| TCP-ACO    | TCP Alternate Checksum Option                      | 1146      |
| IP-DVMRP   | IP Distance Vector Multicast Routing               | 1075      |
| VMTP       | Versatile Message Transaction Protocol             | 1045      |
| COOKIE-JAR | Authentication Scheme                              | 1004      |
| NETBLT     | Bulk Data Transfer Protocol                        | 998       |
| IRTP       | Internet Reliable Transaction Protocol             | 938       |
| LDP        | Loader Debugger Protocol                           | 909       |
| RLP        | Resource Location Protocol                         | 887       |
| NVP-II     | Network Voice Protocol                             | ISI-memo  |

PVP            Packet Video Protocol

ISI-memo

[Note: an asterisk at the end of a line indicates a change from the previous edition of this document.]

## 6.8. Informational Protocols

Information protocols have no status.

| Protocol   | Name   | RFC   |
|------------|--|-------|
| =====      | =====  | ===== |
| CYBERCASH  | CyberCash Credit Card Protocol Version 0.8                                     | 1898* |
| -----      | text/enriched MIME Content-type  | 1896* |
| -----      | Application/CALS-1840 Content-type   | 1895* |
| -----      | PPP IPCP Extensions for Name Server Addresses                                  | 1877* |
| SNPP       | Simple Network Paging Protocol - Version 2                                     | 1861  |
| -----      | ISO Transport Class 2 Non-use Explicit Flow Control over TCP RFC1006 extension | 1859  |
| -----      | IP in IP Tunneling   | 1853  |
| -----      | PPP Network Control Protocol for LAN Extension                                 | 1841  |
| TESS       | The Exponential Security System  | 1824  |
| NFSV3      | NFS Version 3 Protocol Specification   | 1813  |
| -----      | A Format for Bibliographic Records   | 1807  |
| SDMD       | IPv4 Option for Sender Directed MD Delivery                                    | 1770  |
| SNTP       | Simple Network Time Protocol   | 1769  |
| SNOOP      | Snoop Version 2 Packet Capture File Format                                     | 1761  |
| BINHEX     | MIME Content Type for BinHex Encoded Files                                     | 1741  |
| RWHOIS     | Referral Whois Protocol  | 1714  |
| DNS-NSAP   | DNS NSAP Resource Records  | 1706  |
| RADIO-PAGE | TPC.INT Subdomain: Radio Paging -- Technical Procedures                        | 1703  |
| GRE-IPv4   | Generic Routing Encapsulation over IPv4  | 1702  |
| GRE        | Generic Routing Encapsulatio   | 1701  |
| IPXWAN     | Novell IPX Over Various WAN Media  | 1634  |
| ADSNA-IP   | Advanced SNA/IP: A Simple SNA Transport Protocol                               | 1538  |
| AUBR       | Appletalk Update-Based Routing Protocol...                                     | 1504  |
| TACACS     | Terminal Access Control Protocol   | 1492  |
| SUN-NFS    | Network File System Protocol   | 1094  |
| SUN-RPC    | Remote Procedure Call Protocol Version 2                                       | 1057  |
| GOPHER     | The Internet Gopher Protocol   | 1436  |
| -----      | Data Link Switching: Switch-to-Switch Protocol                                 | 1434  |
| LISTSERV   | Listserv Distribute Protocol   | 1429  |
| -----      | Replication Requirements   | 1275  |
| PCMAIL     | Pcmail Transport Protocol  | 1056  |
| MTP        | Multicast Transport Protocol   | 1301  |
| BSD Login  | BSD Login  | 1282  |
| DIXIE      | DIXIE Protocol Specification   | 1249  |
| IP-X.121   | IP to X.121 Address Mapping for DDN  | 1236  |
| OSI-HYPER  | OSI and LLC1 on HYPERchannel   | 1223  |
| HAP2       | Host Access Protocol   | 1221  |
| SUBNETASGN | On the Assignment of Subnet Numbers  | 1219  |
| SNMP-TRAPS | Defining Traps for use with SNMP   | 1215  |
| DAS        | Directory Assistance Service   | 1202  |
| MD4        | MD4 Message Digest Algorithm   | 1186  |



LPDP Line Printer Daemon Protocol

1179

[Note: an asterisk at the end of a line indicates a change from the previous edition of this document.]

## 6.9. Historic Protocols

All Historic protocols have Not Recommended status.

| Protocol   | Name                                       |          | RFC        | STD   |
|------------|--|----------|------------|-------|
| =====      | =====                                      |          | =====      | ===== |
| SNMPv2     | Manager-to-Manager MIB                     | Elective | 1451       | *     |
| SNMPv2     | Party MIB for SNMPv2                       | Elective | 1447       | *     |
| SNMPv2     | Security Protocols for SNMPv2              | Elective | 1446       | *     |
| SNMPv2     | Administrative Model for SNMPv2            | Elective | 1445       | *     |
| RIP        | Routing Information Protocol               | Ele      | 1058       | 34 *  |
| -----      | Mapping full 822 to Restricted 822         |          | 1137       |       |
| BGP3       | Border Gateway Protocol 3 (BGP-3)          |          | 1267, 1268 |       |
| -----      | Gateway Requirements                       | Req      | 1009       | 4     |
| EGP        | Exterior Gateway Protocol                  | Rec      | 904        | 18    |
| SNMP-MUX   | SNMP MUX Protocol and MIB                  |          | 1227       |       |
| OIM-MIB-II | OSI Internet Management: MIB-II            |          | 1214       |       |
| IMAP3      | Interactive Mail Access Protocol Version 3 |          | 1203       |       |
| SUN-RPC    | Remote Procedure Call Protocol Version 1   |          | 1050       |       |
| 802.4-MIP  | IEEE 802.4 Token Bus MIB                   |          | 1230       |       |
| CMOT       | Common Management Information Services     |          | 1189       |       |
| -----      | Mail Privacy: Procedures                   |          | 1113       |       |
| -----      | Mail Privacy: Key Management               |          | 1114       |       |
| -----      | Mail Privacy: Algorithms                   |          | 1115       |       |
| NFILE      | A File Access Protocol                     |          | 1037       |       |
| HOSTNAME   | HOSTNAME Protocol                          |          | 953        |       |
| SFTP       | Simple File Transfer Protocol              |          | 913        |       |
| SUPDUP     | SUPDUP Protocol                            |          | 734        |       |
| BGP        | Border Gateway Protocol                    |          | 1163, 1164 |       |
| MIB-I      | MIB-I                                      |          | 1156       |       |
| SGMP       | Simple Gateway Monitoring Protocol         |          | 1028       |       |
| HEMS       | High Level Entity Management Protocol      |          | 1021       |       |
| STATSRV    | Statistics Server                          |          | 996        |       |
| POP2       | Post Office Protocol, Version 2            |          | 937        |       |
| RATP       | Reliable Asynchronous Transfer Protocol    |          | 916        |       |
| HFEP       | Host - Front End Protocol                  |          | 929        |       |
| THINWIRE   | Thinwire Protocol                          |          | 914        |       |
| HMP        | Host Monitoring Protocol                   |          | 869        |       |
| GGP        | Gateway Gateway Protocol                   |          | 823        |       |
| RTELNET    | Remote Telnet Service                      |          | 818        |       |
| CLOCK      | DCNET Time Server Protocol                 |          | 778        |       |
| MPM        | Internet Message Protocol                  |          | 759        |       |

|            |                              |           |
|------------|------------------------------|-----------|
| NETRJS     | Remote Job Service           | 740       |
| NETED      | Network Standard Text Editor | 569       |
| RJE        | Remote Job Entry             | 407       |
| XNET       | Cross Net Debugger           | IEN-158   |
| NAMESERVER | Host Name Server Protocol    | IEN-116   |
| MUX        | Multiplexing Protocol        | IEN-90    |
| GRAPHICS   | Graphics Protocol            | NIC-24308 |

[Note: an asterisk at the end of a line indicates a change from the previous edition of this document.]

## 6.10. Obsolete Protocols

Some of the protocols listed in this memo are described in RFCs that are obsoleted by newer RFCs. "Obsolete" or "obsoleted" is not an official state or status of protocols. This subsection is for information only.

While it may seem to be obviously wrong to have an obsoleted RFC in the list of standards, there may be cases when an older standard is in the process of being replaced. This process may take a year or two.

Many obsoleted protocols are of little interest and are dropped from this memo altogether. Some obsoleted protocols have received enough recognition that it seems appropriate to list them under their current status and with the following reference to their current replacement.

| RFC  |           | RFC  | Status    | Title                                 | * |
|------|-----------|------|-----------|---------------------------------------|---|
| ==== |           | ==== | =====     | =====                                 | = |
| 1305 | obsoletes | 1119 | Stan/Rec  | Network Time Protocol version 2       |   |
| 1390 | obsoletes | 1188 | Draf/Elec | Transmission of IP and ARP over FDDI* |   |
| 1533 | obsoletes | 1497 | Draf/Rec  | BOOTP Vendor Information Extensions   |   |
| 1542 | obsoletes | 1532 | Prop/Elec | Extensions for Bootstrap Protocol     | * |
| 1573 | obsoletes | 1229 | Prop/Elec | Ext. to the Generic-Interface MIB     |   |
| 1773 | obsoletes | 1656 | Prop/Elec | BGP-4 Protocol Document               | * |
| 1902 | obsoletes | 1442 | Prop/Elec | SMI for SNMPv2                        | * |
| 1903 | obsoletes | 1443 | Prop/Elec | Textual Conventions for SNMPv2        | * |
| 1904 | obsoletes | 1444 | Prop/Elec | Conformance Statements for SNMPv2     | * |
| 1905 | obsoletes | 1448 | Prop/Elec | Protocol Operations for SNMPv2        | * |
| 1906 | obsoletes | 1449 | Prop/Elec | Transport Mappings for SNMPv2         | * |
| 1907 | obsoletes | 1450 | Prop/Elec | MIB for SNMPv2                        | * |
| 1908 | obsoletes | 1452 | Prop/Elec | Coexistence between SNMPv1 & SNMPv2   | * |
| 1320 | obsoletes | 1186 | Info/     | The MD4 Message Digest Algorithm      |   |
| 1529 | obsoletes | 1486 | Expe/Limi | An Experiment in Remote Printing      | * |
| 1592 | obsoletes | 1228 | Expe/Limi | SNMP Distributed Protocol Interface   | * |
| 1057 | obsoletes | 1050 | Hist/Not  | RPC: Remote Procedure Call Protocol   |   |
| 1158 | obsoletes | 1156 | Hist/Not  | Management Information Base - I       | * |
| 1267 | obsoletes | 1163 | Hist/Not  | A Border Gateway Protocol (BGP)       |   |
| 1268 | obsoletes | 1164 | Hist/Not  | Border Gateway Protocol 3 (BGP-3)     |   |
| 1421 | obsoletes | 1113 | Hist/Not  | PEM - Part I                          |   |
| 1422 | obsoletes | 1114 | Hist/Not  | PEM - Part II                         |   |
| 1423 | obsoletes | 1115 | Hist/Not  | PEM - Part III                        |   |
| 1655 | obsoletes | 1268 | Hist/Not  | Application of the BGP                | * |
| 1716 | obsoletes | 1009 | Hist/Not  | Towards Requirements for IP Routers   | * |

Thanks to Lynn Wheeler for compiling the information in this subsection.

[Note: an asterisk at the end of a line indicates a change from the previous edition of this document.]

## 7. Contacts

### 7.1. IAB, IETF, and IRTF Contacts

#### 7.1.1. Internet Architecture Board (IAB) Contact

Please send your comments about this list of protocols and especially about the Draft Standard Protocols to the Internet Architecture Board care of Abel Winerib, IAB Executive Director.

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The protocol standards are managed by the Internet Assigned Numbers Authority.

Please refer to the document "Assigned Numbers" (RFC-1700) for further information about the status of protocol documents. There are two documents that summarize the requirements for host and gateways in the Internet, "Host Requirements" (RFC-1122 and RFC-1123) and "Requirements for IP Version 4 Routers" (RFC-1812).

How to obtain the most recent edition of this "Internet Official Protocol Standards" memo:

The file "in-notes/std/std1.txt" may be copied via FTP from the FTP.ISI.EDU computer using the FTP username "anonymous" and FTP password "guest".

### 7.3. Request for Comments Editor Contact

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Documents may be submitted via electronic mail to the RFC Editor for consideration for publication as RFC. If you are not familiar with the format or style requirements please request the "Instructions for RFC Authors". In general, the style of any recent RFC may be used as a guide.

### 7.4. The Network Information Center and Requests for Comments Distribution Contact

RFC's may be obtained from DS.INTERNIC.NET via FTP, WAIS, and electronic mail. Through FTP, RFC's are stored as rfc/rfcnnnn.txt or rfc/rfcnnnn.ps where 'nnnn' is the RFC number. Login as "anonymous" and provide your e-mail address as the password. Through WAIS, you may use either your local WAIS client or telnet to DS.INTERNIC.NET and login as "wais" (no password required) to access a WAIS client. Help information and a tutorial for using WAIS are available online. The WAIS database to search is "rfcs".

Directory and Database Services also provides a mail server interface. Send a mail message to mailserv@ds.internic.net and include any of the following commands in the message body:

|                           |  |
|---------------------------|--|
| document-by-name rfcnnnn  | where 'nnnn' is the RFC number<br>The text version is sent.    |
| file /ftp/rfc/rfcnnnn.yyy | where 'nnnn' is the RFC number.<br>and 'yyy' is 'txt' or 'ps'. |
| help                      | to get information on how to use<br>the mailserver.            |

The InterNIC directory and database services collection of resource listings, internet documents such as RFCs, FYIs, STDs, and Internet Drafts, and publicly accessible databases are also

now available via Gopher. All our collections are WAIS indexed and can be searched from the Gopher menu.

To access the InterNIC Gopher Servers, please connect to "internic.net" port 70.

Contact: admin@ds.internic.net

#### 7.5. Sources for Requests for Comments

Details on many sources of RFCs via FTP or EMAIL may be obtained by sending an EMAIL message to "rfc-info@ISI.EDU" with the message body "help: ways\_to\_get\_rfcs". For example:

To: rfc-info@ISI.EDU  
Subject: getting rfcs

help: ways\_to\_get\_rfcs

#### 8. Security Considerations

Security issues are not addressed in this memo.

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