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1130, 1140, 1200  
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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 1-Mar-95.

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 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. Gateway Requirements

This document reviews the specifications that apply to gateways and supplies guidance and clarification for any ambiguities. Gateway Requirements is RFC-1009. A working group of the IETF is actively preparing a revision.

#### 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. The RFCs and the MIL-STDs for IP and TCP differ in style and level of detail. It is strongly advised that the two sets

of documents be used together, along with RFC-1122 and RFC-1123.

The Internet and the DoD MIL-STD specifications for the FTP, SMTP, and Telnet protocols are essentially the same documents (RFCs 765, 821, 854). The MIL-STD versions have been edited slightly. Note that the current Internet specification for FTP is RFC-959 (as modified by RFC-1123).

Note that these MIL-STD are now somewhat out of date. The Gateway Requirements (RFC-1009) and Host Requirements (RFC-1122, RFC-1123) take precedence over both earlier RFCs and the MIL-STDs.

|                                      |              |
|--------------------------------------|--------------|
| Internet Protocol (IP)               | MIL-STD-1777 |
| Transmission Control Protocol (TCP)  | MIL-STD-1778 |
| File Transfer Protocol (FTP)         | MIL-STD-1780 |
| Simple Mail Transfer Protocol (SMTP) | MIL-STD-1781 |
| Telnet Protocol and Options (TELNET) | MIL-STD-1782 |

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, not recommended) cell.

|                       |       | S T A T U S |     |     |     |     |
|-----------------------|-------|-------------|-----|-----|-----|-----|
|                       |       | Req         | Rec | Ele | Lim | Not |
| S<br>T<br>A<br>T<br>E | Std   | X           | XXX | XXX |     |     |
|                       | Draft | X           | X   | XXX |     |     |
|                       | Prop  |             | X   | XXX |     |     |
|                       | Info  |             |     |     |     |     |
|                       | Expr  |             |     |     | XXX |     |
|                       | 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.

| *****                        |  |             |             |                |                |
|------------------------------|--|-------------|-------------|----------------|----------------|
| 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".

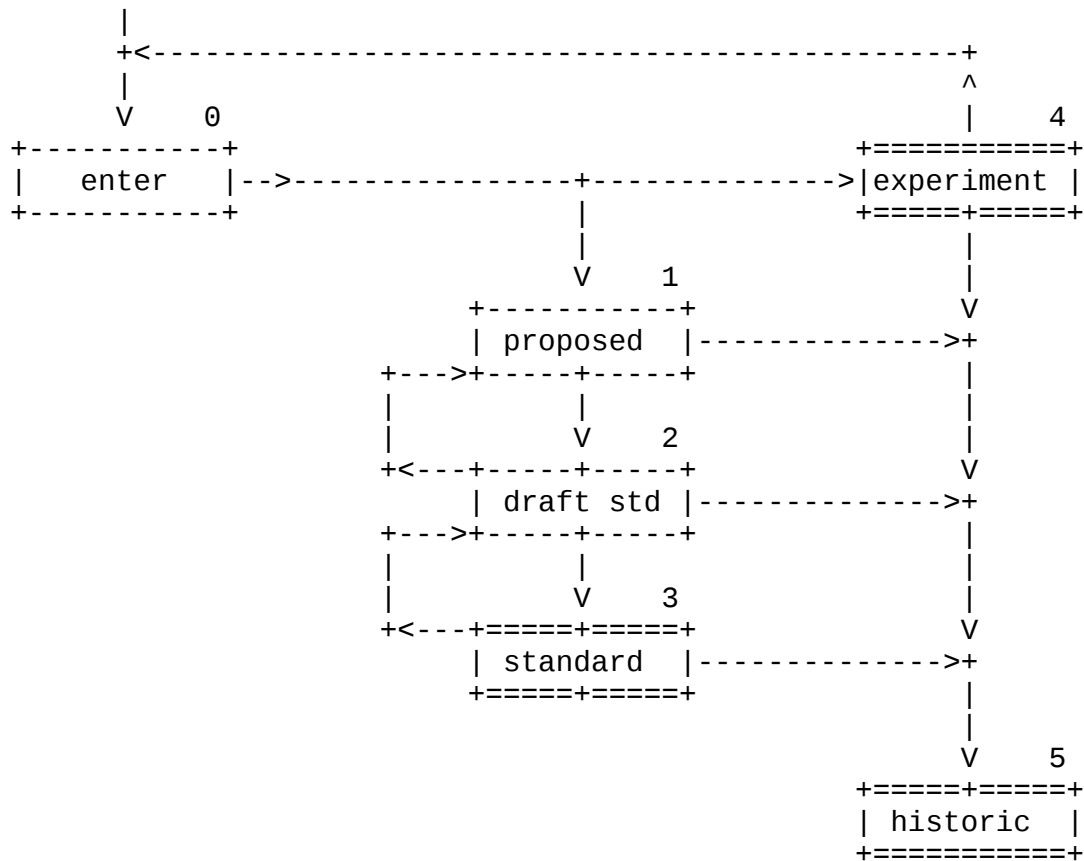
## 5.2. The Standards Track Diagram

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:

1725 - Post Office Protocol - Version 3

A Draft Standard protocol.

1724 - RIP Version 2 MIB Extension

A Draft Standard protocol.

1723 - RIP Version 2 - Carrying Additional Information

A Draft Standard protocol.

1722 - RIP Version 2 Protocol Applicability Statement

A Draft Standard protocol.

1721 - RIP Version 2 Protocol Analysis

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

1720 - Internet Official Protocol Standards

This memo.

1719 - Not yet issued.

1718 - The Tao of IETF - A Guide for New Attendees of the Internet Engineering Task Force

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

1717 - The PPP Multilink Protocol (MP)

A Proposed Standard protocol.

1716 - Towards Requirements for IP Routers

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

1715 - The H Ratio for Address Assignment Efficiency

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

1714 - Referral Whois Protocol (RWhois)

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

1713 - Tools for DNS debugging

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

1712 - DNS Encoding of Geographical Location

An Experimental protocol.

1711 - Classifications in E-mail Routing

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

1710 - Simple Internet Protocol Plus White Paper

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

1709 - K-12 Internetworking Guidelines

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

1708 - NTP PICS PROFORMA - For the Network Time Protocol Version 3

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

1707 - CATNIP: Common Architecture for the Internet

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

1706 - DNS NSAP Resource Records

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

1705 - Six Virtual Inches to the Left: The Problem with IPng

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

1704 - On Internet Authentication

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

1703 - Principles of Operation for the TPC.INT Subdomain: Radio Paging -- Technical Procedures

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

1702 - Generic Routing Encapsulation over IPv4 networks

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

1701 - Generic Routing Encapsulation (GRE)

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

1700 - Assigned Numbers

A status report on the parameters (i.e., numbers and keywords) used in protocols in the Internet community.

1699 - Not yet issued.

1698 - Octet Sequences for Upper-Layer OSI to Support Basic Communications Applications

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

1697 - Relational Database Management System (RDBMS) Management Information Base (MIB) using SMIV2

A Proposed Standard protocol.

- 1696 - Modem Management Information Base (MIB) using SMIV2  
A Proposed Standard protocol.
- 1695 - Definitions of Managed Objects for ATM Management Version 8.0 using SMIV2  
A Proposed Standard protocol.
- 1694 - Definitions of Managed Objects for SMDS Interfaces using SMIV2  
A Draft Standard protocol.
- 1693 - An Extension to TCP : Partial Order Service  
An Experimental protocol.
- 1692 - Transport Multiplexing Protocol (TMux)  
This is an information document and does not specify any level of standard.
- 1691 - The Document Architecture for the Cornell Digital Library  
This is an information document and does not specify any level of standard.
- 1690 - Introducing the Internet Engineering and Planning Group (IEPG)  
This is an information document and does not specify any level of standard.
- 1689 - A Status Report on Networked Information Retrieval: Tools and Groups  
This is an information document and does not specify any level of standard.
- 1688 - IPng Mobility Considerations  
This is an information document and does not specify any level of standard.

1687 - A Large Corporate User's View of IPng

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

1686 - IPng Requirements: A Cable Television Industry Viewpoint

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

1685 - Writing X.400 O/R Names

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

1684 - Introduction to White Pages Services based on X.500

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

1683 - Multiprotocol Interoperability In IPng

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

1682 - IPng BSD Host Implementation Analysis

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

1681 - On Many Addresses per Host

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

1680 - IPng Support for ATM Services

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

1679 - HPN Working Group Input to the IPng Requirements Solicitation

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

1678 - IPng Requirements of Large Corporate Networks

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

1677 - Tactical Radio Frequency Communication Requirments for IPng

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

1676 - INFN Requirements for an IPng

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

1675 - Security Concerns for IPng

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

1674 - Electric Power Research Institute Comments on IPng

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

1673 - Electric Power Research Institute Comments on IPng

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

1672 - Accounting Requirements for IPng

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

1671 - IPng White Paper on Transition and Other Considerations

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

1670 - Input to IPng Engineering Considerations

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

1669 - Market Viability as a IPng Criteria

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

1668 - Unified Routing Requirements for IPng

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

1667 - Modeling and Simulation Requirements for IPng

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

1666 - Definitions of Managed Objects for SNA NAUs using SMIV2

A Proposed Standard protocol.

1665 - Definitions of Managed Objects for SNA NAUs using SMIV2

A Proposed Standard protocol.

1664 - Using the Internet DNS to Distribute RFC1327 Mail Address Mapping Tables

An Experimental protocol.

1663 - PPP Reliable Transmission

A Proposed Standard protocol.

1662 - The Point-to-Point Protocol (PPP)

A Standard protocol.

1661 - The Point-to-Point Protocol (PPP)

A Standard protocol.

1660 - Definitions of Managed Objects for Parallel-printer-like Hardware Devices using SMIV2

A Draft Standard protocol.

- 1659 - Definitions of Managed Objects for RS-232-like Hardware Devices using SMIV2  
A Draft Standard protocol.
- 1658 - Definitions of Managed Objects for Character Stream Devices using SMIV2  
A Draft Standard protocol.
- 1657 - Definitions of Managed Objects for the Fourth Version of the Border Gateway Protocol (BGP-4) using SMIV2  
A Proposed Standard protocol.
- 1656 - BGP-4 Protocol Document Roadmap and Implementation Experience  
This is an information document and does not specify any level of standard.
- 1655 - Application of the Border Gateway Protocol in the Internet  
A Proposed Standard protocol.
- 1654 - A Border Gateway Protocol 4 (BGP-4)  
A Proposed Standard protocol.
- 1653 - SMTP Service Extension for Message Size Declaration  
A Draft Standard protocol.
- 1652 - SMTP Service Extension for 8bit-MIMEtransport  
A Draft Standard protocol.
- 1651 - SMTP Service Extensions  
A Draft Standard protocol.
- 1650 - Definitions of Managed Objects for the Ethernet-like Interface Types using SMIV2  
A Proposed Standard protocol.

- 1649 - Operational Requirements for X.400 Management Domains in the GO-MHS Community

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

- 1648 - Postmaster Convention for X.400 Operations

A Proposed Standard protocol.

- 1647 - TN3270 Enhancements

A Proposed Standard protocol.

- 1646 - TN3270 Extensions for LName and Printer Selection

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

- 1645 - Simple Network Paging Protocol - Version 2

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

- 1644 - T/TCP -- TCP Extensions for Transactions Functional Specification

An Experimental protocol.

- 1643 - Definitions of Managed Objects for the Ethernet-like Interface Type

A Standard protocol.

- 1642 - UTF-7 - A Mail-Safe Transformation Format of Unicode

An Experimental protocol.

- 1641 - Using Unicode with MIME

An Experimental protocol.

#### 6.1.2. Other Changes:

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

904 - Exterior Gateway Protocol

Moved to Historic.

## 6.2. Standard Protocols

| Protocol    | Name                                    | Status | RFC       | STD   | *     |
|-------------|-----------------------------------------|--------|-----------|-------|-------|
| =====       | =====                                   | =====  | =====     | ===== | ===== |
| -----       | Internet Official Protocol Standards    | Req    | 1720      | 1     |       |
| -----       | Assigned Numbers                        | Req    | 1700      | 2     |       |
| -----       | Host Requirements - Communications      | Req    | 1122      | 3     |       |
| -----       | Host Requirements - Applications        | Req    | 1123      | 3     |       |
| -----       | Gateway Requirements                    | Req    | 1009      | 4     |       |
| 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    |       |
| 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    |       |
| RIP         | Routing Information Protocol            | Ele    | 1058      | 34    |       |
| 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*   |       |

[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<br>===== | Name<br>=====                            | State<br>===== | RFC<br>===== | STD *<br>=== = |
|-------------------|------------------------------------------|----------------|--------------|----------------|
| 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-SMDS           | IP Datagrams over the SMDS Service       | Prop           | 1209         |                |
| 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    | Name                                    | Status      | RFC       |
|-------------|-----------------------------------------|-------------|-----------|
| =====       | =====                                   | =====       | =====     |
| 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-SIZE   | SMTP Service Ext for Message Size       | Elective    | 1653*     |
| SMTP-8BIT   | SMTP Service Ext or 8bit-MIMEtransport  | Elective    | 1652*     |
| SMTP-EXT    | SMTP Service Extensions                 | Elective    | 1651*     |
| 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      |
| BGP3        | Border Gateway Protocol 3 (BGP-3)       | Elective    | 1267,1268 |
| 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   |
|------------|---------------------------------------------|----------|-------|
| =====      | =====                                       | =====    | ===== |
| 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-MIB  | BGP-4 MIB                                   | Elective | 1657* |
| BGP-4-IMP  | BGP-4 Roadmap and Implementation            | Elective | 1656* |
| BGP-4-APP  | Application of BGP-4                        | Elective | 1655* |
| BGP-4      | Border Gateway Protocol 4                   | Elective | 1654* |
| -----      | 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  |
| CON-MD5    | Content-MD5 Header Field                    | Elective | 1544  |
| 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 | 1531  |
| SRB-MIB    | Source Routing Bridge MIB                   | Elective | 1525  |
| CIDR-STR   | 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 |
| X.500syn    | X.500 String Representation ...          | Elective | 1488 |
| X.500lite   | X.500 Lightweight ...                    | Elective | 1487 |
| STR-REP     | String Representation ...                | Elective | 1485 |
| OSI-Dir     | OSI User Friendly Naming ...             | Elective | 1484 |
| 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      | Manager-to-Manager MIB                   | Elective | 1451 |
| SNMPv2      | Management Information Base for SNMPv2   | Elective | 1450 |
| SNMPv2      | Transport Mappings for SNMPv2            | Elective | 1449 |
| SNMPv2      | Protocol Operations for SNMPv2           | Elective | 1448 |
| SNMPv2      | Party MIB for SNMPv2                     | Elective | 1447 |
| SNMPv2      | Security Protocols for SNMPv2            | Elective | 1446 |
| SNMPv2      | Administrative Model for SNMPv2          | Elective | 1445 |
| 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 |
| PPP-DNCP       | PPP DECnet Phase IV Control Protocol    | Elective | 1376 |
| 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 |
| RMON-MIB       | Remote Network Monitoring MIB           | Elective | 1271 |
| BGP-MIB        | Border Gateway Protocol MIB (Version 3) | Elective | 1269 |
| ICMP-ROUT      | ICMP Router Discovery Messages          | Elective | 1256 |
| OSPF-MIB       | OSPF Version 2 MIB                      | Elective | 1253 |
| IPSO           | DoD Security Options for IP             | Elective | 1108 |
| AT-MIB         | Appletalk MIB                           | Elective | 1243 |
| 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 |
| 802.5-MIB      | IEEE 802.5 Token Ring MIB               | Elective | 1231 |
| GINT-MIB       | Extensions to the Generic-Interface MIB | Elective | 1229 |
| PPP-EXT        | PPP Extensions for Bridging             | Elective | 1220 |
| 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.]

#### 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-SUP0   | 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   |
|------------|-------------------------------------------------------|-------|
| =====      | =====                                                 | ===== |
| 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      |
| ST-II      | Stream Protocol                        | 1190      |
| 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      |
| -----      | Mapping full 822 to Restricted 822     | 1137      |
| 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   |
|------------|---------------------------------------------------------|-------|
| =====      | =====                                                   | ===== |
| 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* |
| TMUX       | Transport Multiplexing Protocol                         | 1692* |
| SNPP       | Simple Network Paging Protocol - Version 2              | 1645* |
| 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   |
|------------|--------------------------------------------|-----|------------|-------|
| =====      | =====                                      |     | =====      | ===== |
| 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.

For example, the Network Time Protocol (NTP) [RFC 1119] is in its version 2 a full Standard, and in its version 3 is a Draft Standard [RFC 1305]. Once version 3 is a full Standard, version 2 will be made Historic.

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 | Std /Rec  | Network Time Protocol (Version 2)   |   |
| 1533 | obsoletes | 1497 | Draft/Rec | Bootstrap Protocol                  |   |
| 1331 | obsoletes | 1171 | Draft/Ele | Point to Point Protocol             |   |
| 1574 | obsoletes | 1139 | Prop /Ele | Echo for ISO-8473                   |   |
| 1573 | obsoletes | 1229 | Prop /Ele | Extensions to the Generic-IF MIB    |   |
| 1559 | obsoletes | 1289 | Prop /Ele | DECNET MIB                          |   |
| 1548 | obsoletes | 1331 | Prop /Ele | Point-to-Point Protocol (PPP)       |   |
| 1541 | obsoletes | 1531 | Prop /Ele | Dynamic Host Configuration Protocol |   |
| 1592 | obsoletes | 1228 | Exper/Lim | SNMP Distributed Program Interface  |   |
| 1528 | obsoletes | 1486 | Exper/Lim | An Experiment in Remote Printing    |   |
| 1320 | obsoletes | 1186 | Info /    | MD4 Message Digest Algorithm        |   |
| 1057 | obsoletes | 1050 | Hist /Not | Remote Procedure Call Version 1     |   |
| 1421 | obsoletes | 1113 | Hist /Not | Mail Privacy: Procedures            |   |
| 1422 | obsoletes | 1114 | Hist /Not | Mail Privacy: Key Management        |   |
| 1423 | obsoletes | 1115 | Hist /Not | Mail Privacy: Algorithms            |   |
| 1267 | obsoletes | 1163 | Hist /Not | Border Gateway Protocol             |   |
| 1268 | obsoletes | 1164 | Hist /Not | Border Gateway Protocol             |   |

Thanks to Lynn Wheeler of Britton Lee 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 "Gateway Requirements" (RFC-1009).

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

Contact:

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Marina del Rey, CA 90292-6695  
  
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RFC-Editor@ISI.EDU

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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