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Internet Architecture Board  
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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, there are pointers to references and contacts for further information.

This memo is intended to be issued every one hundred RFCs; please be sure the copy you are reading is current. Current copies may be obtained from the Requests for Comments Editor (RFC-EDITOR) or from the Internet Assigned Numbers Authority (IANA) (see the contact information at the end of this memo).

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-2026.

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.

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 2223).

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 RFC-EDITOR, 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 DoD MIL-STD Internet specifications are out of date and have been discontinued. The DoD's Joint Technical Architecture (JTA) lists the current set of IETF STDs and RFCs that the DoD intends to use in all new and upgraded Command, Control, Communications, Computers, and Intelligence (C4I) acquisitions. A copy of the JTA can be obtained

from <http://www-jta.itsi.disa.mil>.

#### 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".

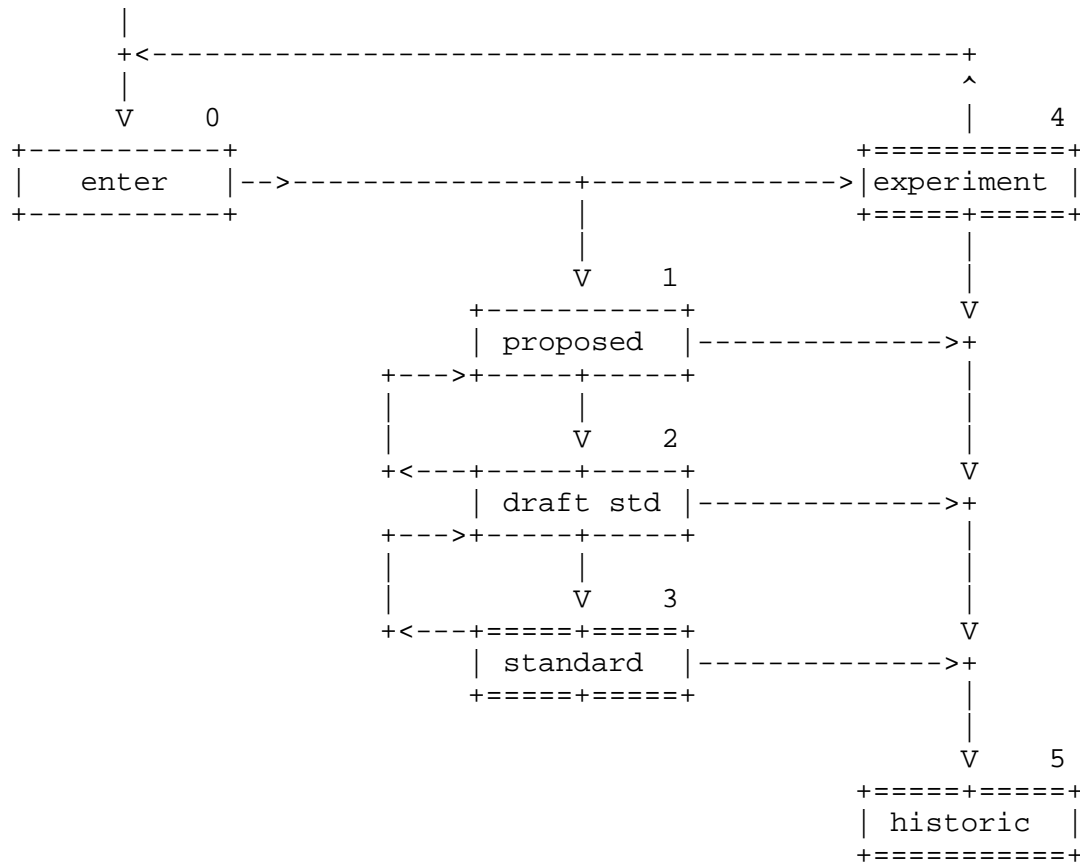
## 5.2. The Standards Track Diagram

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:

- 2428 - FTP Extensions for IPv6 and NATs  
A Proposed Standard protocol.
- 2427 - Multiprotocol Interconnect over Frame Relay  
A Standard protocol.
- 2426 - vCard MIME Directory Profile  
A Proposed Standard protocol.
- 2425 - A MIME Content-Type for Directory Information  
A Proposed Standard protocol.
- 2424 - Content Duration MIME Header Definition  
A Proposed Standard protocol.
- 2423 - VPIM Voice Message MIME Sub-type Registration  
A Proposed Standard protocol.
- 2422 - Toll Quality Voice - 32 kbit/s ADPCM MIME Sub-type Registration  
A Proposed Standard protocol.
- 2421 - Voice Profile for Internet Mail - version 2  
A Proposed Standard protocol.
- 2420 - The PPP Triple-DES Encryption Protocol (3DESE)  
A Proposed Standard protocol.

2419 - The PPP DES Encryption Protocol, Version 2 (DESE-bis)

A Proposed Standard protocol.

2418 - IETF Working Group Guidelines and Procedures

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

2417 - Definitions of Managed Objects for Multicast over UNI 3.0/3.1 based ATM Network

A Proposed Standard protocol.

2416 - When TCP Starts Up With Four Packets Into Only Three Buffers

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

2415 - Simulation Studies of Increased Initial TCP Window Size

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

2414 - Increasing TCP's Initial Window

An Experimental protocol.

2413 - Dublin Core Metadata for Resource Discovery

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

2412 - Not yet issued.

2411 - Not yet issued.

2410 - Not yet issued.

2409 - Not yet issued.

2408 - Not yet issued.

2407 - Not yet issued.

- 2406 - Not yet issued.
- 2405 - Not yet issued.
- 2404 - Not yet issued.
- 2403 - Not yet issued.
- 2402 - Not yet issued.
- 2401 - Not yet issued.
- 2400 - This memo.
- 2399 - Not yet issued.
- 2398 - Some Testing Tools for TCP Implementors
  - This is an information document and does not specify any level of standard.
- 2397 - The "data" URL scheme
  - A Proposed Standard protocol.
- 2396 - Uniform Resource Identifiers (URI): Generic Syntax
  - A Draft Standard protocol.
- 2395 - Not yet issued.
- 2394 - Not yet issued.
- 2393 - Not yet issued.
- 2392 - Content-ID and Message-ID Uniform Resource Locators
  - A Proposed Standard protocol.
- 2391 - Load Sharing using IP Network Address Translation (LSNAT)
  - This is an information document and does not specify any level of standard.
- 2390 - Inverse Address Resolution Protocol
  - A Draft Standard protocol.

- 2389 - Feature negotiation mechanism for the File Transfer Protocol  
A Proposed Standard protocol.
- 2388 - Returning Values from Forms: multipart/form-data  
A Proposed Standard protocol.
- 2387 - The MIME Multipart/Related Content-type  
A Proposed Standard protocol.
- 2386 - A Framework for QoS-based Routing in the Internet  
This is an information document and does not specify any level of standard.
- 2385 - Protection of BGP Sessions via the TCP MD5 Signature Option  
A Proposed Standard protocol.
- 2384 - POP URL Scheme  
A Proposed Standard protocol.
- 2383 - ST2+ over ATM Protocol Specification - UNI 3.1 Version  
This is an information document and does not specify any level of standard.
- 2382 - A Framework for Integrated Services and RSVP over ATM  
This is an information document and does not specify any level of standard.
- 2381 - Interoperation of Controlled-Load Service and Guaranteed Service with ATM  
A Proposed Standard protocol.
- 2380 - RSVP over ATM Implementation Requirements  
A Proposed Standard protocol.



## 2379 - RSVP over ATM Implementation Guidelines

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

## 2378 - Not yet issued.

## 2377 - Not yet issued.

## 2376 - XML Media Types

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

## 2375 - IPv6 Multicast Address Assignments

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

## 2374 - An IPv6 Aggregatable Global Unicast Address Format

A Proposed Standard protocol.

## 2373 - IP Version 6 Addressing Architecture

A Proposed Standard protocol.

## 2372 - Transaction Internet Protocol - Requirements and Supplemental Information

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

## 2371 - Transaction Internet Protocol Version 3.0

A Proposed Standard protocol.

## 2370 - The OSPF Opaque LSA Option

A Proposed Standard protocol.

## 2369 - The Use of URLs as Meta-Syntax for Core Mail List Commands and their Transport through Message Header Field

A Proposed Standard protocol.

2368 - The mailto URL scheme

A Proposed Standard protocol.

2367 - PF\_KEY Key Management API, Version 2

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

2366 - Definitions of Managed Objects for Multicast over UNI 3.0/3.1 based ATM Networks

A Proposed Standard protocol.

2365 - Administratively Scoped IP Multicast

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

2364 - PPP Over AAL

A Proposed Standard protocol.

2363 - PPP Over FUNI

A Proposed Standard protocol.

2362 - Protocol Independent Multicast-Sparse Mode (PIM-SM): Protocol Specification

An Experimental protocol.

2361 - WAVE and AVI Codec Registries

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

2360 - Guide for Internet Standards Writers

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

2359 - IMAP4 UIDPLUS extension

A Proposed Standard protocol.

- 2358 - Definitions of Managed Objects for the Ethernet-like Interface Types

A Proposed Standard protocol.

- 2357 - IETF Criteria for Evaluating Reliable Multicast Transport and Application Protocols

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

- 2356 - Sun's SKIP Firewall Traversal for Mobile IP

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

- 2355 - TN3270 Enhancements

A Draft Standard protocol.

- 2354 - Options for Repair of Streaming Media

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

- 2353 - APPN/HPR in IP Networks APPN Implementers' Workshop Closed Pages Document

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

- 2350 - Expectations for Computer Security Incident Response

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

- 2340 - Nortel's Virtual Network Switching (VNS) Overview

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

- 2336 - Classical IP and ARP over ATM to NHRP Transition

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.

2073 - An IPv6 Provider-Based Unicast Address Format

Moved to Historic.

1884 - IP Version 6 Addressing Architecture

Moved to Historic.

0658 - Telnet Output Linefeed Disposition

Moved to Historic.

0657 - Telnet Output Vertical Tab Disposition Option

Moved to Historic.

0656 - Telnet Output Vertical Tabstops Option

Moved to Historic.

0655 - Telnet Output Formfeed Disposition Option

Moved to Historic.

0654 - Telnet Output Horizontal Tab Disposition Option

Moved to Historic.

0653 - Telnet Output Horizontal Tabstops Option

Moved to Historic.

0652 - Telnet Output Carriage-Return Disposition Option

Moved to Historic.

## 6.2. Standard Protocols

| Protocol    | Name                                    | Status | RFC       | STD   | *     |
|-------------|---|--------|-----------|-------|-------|
| =====       | =====                                   | =====  | =====     | ===== | ===== |
| -----       | Internet Official Protocol Standards    | Req    | 2400      | 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    |       |
| POP3        | Post Office Protocol, Version 3         | Ele    | 1939      | 53    |       |
| OSPF2       | Open Shortest Path First Routing V2     | Ele    | 2328      | 54    |       |
| IP-FR       | Multiprotocol over Frame Relay          | Ele    | 2427      | 55*   |       |

[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".

OSPF -- RFC 1370 is an applicability statement for OSPF.

### 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  | 2225    |       |       |
| 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-X.25    | X.25 and ISDN in the Packet Mode         | Draft | 1356    |       |       |
| 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    |       |
| IP-HIPPI   | IP over HIPPI                            | Draft | 2067    |       |       |

[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       |
|------------|---|-------------|-----------|
| =====      | =====                                   | =====       | =====     |
| URI-GEN    | URI: Generic Syntax                     | Elective    | 2396*     |
| IARP       | Inverse Address Resolution Protocol     | Elective    | 2390*     |
| TFTP-Opt   | TFTP Options                            | Elective    | 2349      |
| TFTP-Blk   | TFTP Blocksize Option                   | Elective    | 2348      |
| TFTP-Ext   | TFTP Option Extension                   | Elective    | 2347      |
| ONE-PASS   | One-Time Password System                | Elective    | 2289      |
| SMTP-Pipe  | SMTP Serv. Ext. for Command Pipelining  | Elective    | 2197      |
| DHCP-BOOTP | DHCP Options and BOOTP Extensions       | Recommended | 2132      |
| DHCP       | Dynamic Host Configuration Protocol     | Elective    | 2131      |
| FRAME-MIB  | Management Information Base for Frame   | Elective    | 2115      |
| -----      | Clarifications and Extensions BOOTP     | Elective    | 1542      |
| DHCP-BOOTP | Interoperation Between DHCP and BOOTP   | Elective    | 1534      |
| BOOTP      | Bootstrap Protocol                      | Recommended | 951, 2132 |
| MIME-CONF  | MIME Conformance Criteria               | Elective    | 2049      |
| MIME-MSG   | MIME Msg Header Ext for Non-ASCII       | Elective    | 2047      |
| MIME-MEDIA | MIME Media Types                        | Elective    | 2046      |
| MIME       | Multipurpose Internet Mail Extensions   | Elective    | 2045      |
| PPP-CHAP   | PPP Challenge Handshake Authentication  | Elective    | 1994      |
| PPP-MP     | PPP Multilink Protocol                  | Elective    | 1990      |
| PPP-LINK   | PPP Link Quality Monitoring             | Elective    | 1989      |
| 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      |
| 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      |



|             |  |          |      |
|-------------|--|----------|------|
| BGP-4-MIB   | BGP-4 MIB                              | Elective | 1657 |
| SMTP-8BIT   | SMTP Service Ext or 8bit-MIMEtransport | Elective | 1652 |
| OSI-NSAP    | Guidelines for OSI NSAP Allocation     | Elective | 1629 |
| ISO-TS-ECHO | Echo for ISO-8473                      | Elective | 1575 |
| DECNET-MIB  | DECNET MIB                             | Elective | 1559 |
| 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 |
| 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   |
|------------|--|----------|-------|
| =====      | =====                                    | =====    | ===== |
| -----      | FTP Extensions for IPv6 and NATs         | Elective | 2428* |
| MIME-VCARD | vCard MIME Directory Profile             | Elective | 2426* |
| TXT-DIR    | MIME Content-Type for Directory Info     | Elective | 2425* |
| CONT-DUR   | Content-Duration MIME Header             | Elective | 2424* |
| MIME-VPIM  | VPIM Voice Message                       | Elective | 2423* |
| MIME-ADPCM | Toll Quality Voice - 32 kbit/s ADPC      | Elective | 2422* |
| MIME-VP2   | Voice Profile for Internet Mail V2       | Elective | 2421* |
| -----      | Multicast/UNI 3.0/3.1 based ATM MIB      | Elective | 2417* |
| DATA-URL   | "data" URL scheme                        | Elective | 2397* |
| CIDMID-URL | Content-ID and Message-ID URLs           | Elective | 2392* |
| FTP-FNEGO  | Feature negotiation mechanism for FTP    | Elective | 2389* |
| -----      | MIME Multipart/form-data                 | Elective | 2388* |
| MIME-RELAT | MIME Multipart/Related Content-type      | Elective | 2387* |
| -----      | Protection of BGP Sessions via TCP MD5   | Elective | 2385* |
| POP-URL    | POP URL Scheme                           | Elective | 2384* |
| -----      | Interoperation of CLS and GS with ATM    | Elective | 2381* |
| -----      | RSVP over ATM Imple. Requirements        | Elective | 2380* |
| -----      | IPv6 Aggreg. Global Unicast Addr. Format | Elective | 2374* |
| -----      | IPv6 Addressing Architecture             | Elective | 2373* |
| TIPV3      | Transaction Internet Protocol V3         | Elective | 2371* |
| OSPF-LSA   | OSPF Opaque LSA Option                   | Elective | 2370* |
| -----      | Use of URLs as Meta-Syntax...            | Elective | 2369* |
| URLMAILTO  | mailto URL scheme                        | Elective | 2368* |
| PPP-AAL    | PPP Over AAL                             | Elective | 2364* |
| PPP-FUNI   | PPP Over FUNI                            | Elective | 2363* |
| IMAP4UIDPL | IMAP4 UIDPLUS Extension                  | Elective | 2359* |
| -----      | Ethernet-like Interface Types MIB        | Elective | 2358* |
| MOBILIPREV | Reverse Tunneling for Mobile IP          | Elective | 2344  |
| IMAP4NAME  | IMAP4 Namespace                          | Elective | 2342  |
| VRRP       | Virtual Router Redundancy Protocol       | Elective | 2338  |
| NHRP-SCSP  | Distributed NHRP Service Using SCSP      | Elective | 2335  |
| SCSP       | Server Cache Synchronization Protocol    | Elective | 2334  |
| NHRP-APP   | NHRP Protocol Applicability Statement    | Elective | 2333  |
| NHRP       | NBMA Next Hop Resolution Protocol        | Elective | 2332  |
| UNI-SIG    | ATM Sig Support (IPOA) UNI Signalling    | Elective | 2331  |
| SDP        | Session Description Protocol             | Elective | 2327  |
| RTSP       | Real Time Streaming Protocol             | Elective | 2326  |
| IPOA-MIB   | Classical IP and ARP Over ATM MIB        | Elective | 2320  |
| DNS-NCACHE | Negative Caching of DNS Queries          | Elective | 2308  |
| SMFAX-IM   | Simple Mode of FAX Using Internet Mail   | Elective | 2305  |
| MINFAX-IM  | Minimal FAX addr format in Internet Mail | Elective | 2304  |
| MIN-PSTN   | Min. PSTN addr format in Internet Mail   | Elective | 2303  |
| TIFF       | Tag Image File Format                    | Elective | 2302  |
| FFIF       | File Format for Internet Fax             | Elective | 2301  |

|            |  |          |      |
|------------|--|----------|------|
| EMF-MDN    | Extensible Message Format for MDN        | Elective | 2298 |
| OR-ADD     | O/R Address hierarchy in X.500           | Elective | 2294 |
| SUBTABLE   | Tables and Subtrees in X.500             | Elective | 2293 |
| -----      | Mobile-IPv4 Config Opt for PPP IPCP      | Elective | 2290 |
| SLM-APP    | System-Level Managed Objects for Apps    | Elective | 2287 |
| PPP-EAP    | PPP Extensible Authentication Protocol   | Elective | 2284 |
| MEXT-BGP4  | Multiprotocol Extensions for BGP-4       | Elective | 2283 |
| RPSL       | Routing Policy Specification Language    | Elective | 2280 |
| UTF-8      | UTF-8 transformation format of ISO 10646 | Elective | 2279 |
| VACM-SNMP  | View-based Access Control Model for SMMP | Elective | 2275 |
| USM-SNMPV3 | User-based Security Model for SNMPv3     | Elective | 2274 |
| SNMPV3-APP | SNMPv3 Applications                      | Elective | 2273 |
| MPD-SNMP   | Message Processing & Dispatching SNMP    | Elective | 2272 |
| ARCH-SNMP  | Architecture Describing SNMP Frameworks  | Elective | 2271 |
| -----      | IEEE 802.12 Repeater MIB                 | Elective | 2266 |
| AGENTX     | Agent Extensibility Protocol             | Elective | 2257 |
| -----      | Summary of the X.500(96) with LDAPv3     | Elective | 2256 |
| LDAP-URL   | LDAP URL Format                          | Elective | 2255 |
| STR-LDAP   | String Rep of LDAP Search Filters        | Elective | 2254 |
| LDAP3-UTF8 | LDAPv3: UTF-8 String Rep                 | Elective | 2253 |
| LDAP3-ATD  | LDAP3-: Attribute Syntax Definitions     | Elective | 2252 |
| LDAPV3     | Lightweight Directory Access Protocol    | Elective | 2251 |
| RTP-MPEG   | RTP Payload Format for MPEG1/MPEG2       | Elective | 2250 |
| MAIL-MIB   | Mail Monitoring MIB                      | Elective | 2249 |
| NSM-MIB    | Network Services Monitoring MIB          | Elective | 2248 |
| -----      | Using Domains LDAP/X.500 Dist. Names     | Elective | 2247 |
| SASL-ANON  | Anonymous SASL Mechanism                 | Elective | 2245 |
| ACAP       | Application Configuration Access         | Elective | 2244 |
| OTP-ER     | OTP Extended Responses                   | Elective | 2243 |
| NETWAREIP  | NetWare/IP Domain Name and Information   | Elective | 2242 |
| DHCP-NDS   | DHCP Options for Novell Directory Serv.  | Elective | 2241 |
| MAUS-MIB   | IEEE 802.3 Medium Attachment Units MIB   | Elective | 2239 |
| HPR-MIB    | Definitions of Managed Objects for HPR   | Elective | 2238 |
| IGMP       | Internet Group Management Protocol V2    | Elective | 2236 |
| ABNF       | Augmented BNF for Syntax Specifications  | Elective | 2234 |
| INTERGRMIB | Interfaces Group MIB                     | Elective | 2233 |
| DLUR-MIB   | Definitions of Managed Objects for DLUR  | Elective | 2232 |
| MIME-EXT   | MIME Parameter Value & Encoded Word Ext  | Elective | 2231 |
| FTPSECEXT  | FTP Security Extensions                  | Elective | 2228 |
| -----      | Simple Hit-Metering, Usage-Limiting HTTP | Elective | 2227 |
| -----      | IP Broadcast over ATM Networks           | Elective | 2226 |
| SASL       | Simple Authentication and Security Layer | Elective | 2222 |
| IMAP4LOGIN | IMAP4 Login Referrals                    | Elective | 2221 |
| -----      | Schema for Internet White Pages Service  | Elective | 2218 |
| -----      | Characterization Parameters for ISNE     | Elective | 2215 |
| -----      | Integrated Services MIB Guar Serv Ext    | Elective | 2214 |
| -----      | Integrated Services MIB using SMIV2      | Elective | 2213 |
| GQOS       | Spec. of Guaranteed Quality of Service   | Elective | 2212 |

|            |  |          |      |
|------------|--|----------|------|
| -----      | Spec. of Controlled-Load Net Ele Serv    | Elective | 2211 |
| RSVP-IS    | Use of RSVP with IETF Integrated Serv    | Elective | 2210 |
| RSVP-MPR   | RSVP Messaging Processing Rules          | Elective | 2209 |
| RSVP-APP   | RSVP Applicability Statement             | Elective | 2208 |
| RSVP-IPSEC | RSVP Extensions for IPSEC Data Flows     | Elective | 2207 |
| RSVP-MIB   | RSVP Management Information Base         | Elective | 2206 |
| RSVP       | Resource ReSerVation Protocol V1         | Elective | 2205 |
| RPCSEC-GSS | RPCSEC_GSS Protocol Specification        | Elective | 2203 |
| RTP-RAD    | RTP Payload for Redundant Audio Data     | Elective | 2198 |
| IMAPPOPAU  | IMAP/POP AUTHorize Extension             | Elective | 2195 |
| IMAP4MAIL  | IMAP4 Mailbox Referrals                  | Elective | 2193 |
| IMAP-URL   | IMAP URL Scheme                          | Elective | 2192 |
| -----      | RTP Payload Format for H.263 Video ST    | Elective | 2190 |
| -----      | The Content-Disposition Header Field     | Elective | 2183 |
| DNS-CLAR   | Clarifications to the DNS Specification  | Elective | 2181 |
| IMAP4-IDLE | IMAP4 IDLE command                       | Elective | 2177 |
| SLP        | Service Location Protocol                | Elective | 2165 |
| -----      | X.500/LDAP Directory/MIXER Address Map.  | Elective | 2164 |
| DNS-MCGAM  | Using DNS to Distribute MCGAM            | Elective | 2163 |
| -----      | Carrying PostScript in X.400 and MIME    | Elective | 2160 |
| -----      | A MIME Body Part for FAX                 | Elective | 2159 |
| -----      | X.400 Image Body Parts                   | Elective | 2158 |
| -----      | Mapping between X.400 and RFC-822/MIME   | Elective | 2157 |
| MIXER      | Mime Internet X.400 Enhanced Relay       | Elective | 2156 |
| APPN-MIB   | Definitions of Managed Objects for APPN  | Elective | 2155 |
| IPv6-Jumbo | TCP and UDP over IPv6 Jumbograms         | Elective | 2147 |
| MAIL-SERV  | Mailbox Names for Common Services        | Elective | 2142 |
| URN-SYNTAX | URN Syntax                               | Elective | 2141 |
| RADIUS     | Remote Authentication Dial In Service    | Elective | 2138 |
| SDNSDU     | Secure Domain Name System Dynamic Update | Elective | 2137 |
| DNS-UPDATE | Dynamic Updates in the DNS               | Elective | 2136 |
| DC-MIB     | Dial Control MIB using SMIV2             | Elective | 2128 |
| ISDN-MIB   | ISDN MIB using SMIV2                     | Elective | 2127 |
| ITOT       | ISO Transport Service on top of TCP      | Elective | 2126 |
| BAP-BACP   | PPP-BAP, PPP-BACP                        | Elective | 2125 |
| VEMMI-URL  | VEMMI URL Specification                  | Elective | 2122 |
| ROUT-ALERT | IP Router Alert Option                   | Elective | 2113 |
| MHTML      | MIME E-mail Encapsulation                | Elective | 2110 |
| HTTP-STATE | HTTP State Management Mechanism          | Elective | 2109 |
| 802.3-MIB  | 802.3 Repeater MIB using SMIV2           | Elective | 2108 |
| PPP-NBFCP  | PPP NetBIOS Frames Control Protocol      | Elective | 2097 |
| TABLE-MIB  | IP Forwarding Table MIB                  | Elective | 2096 |
| RIP-TRIG   | Trigger RIP                              | Elective | 2091 |
| IMAP4-LIT  | IMAP4 non-synchronizing literals         | Elective | 2088 |
| IMAP4-QUO  | IMAP4 QUOTA extension                    | Elective | 2087 |
| IMAP4-ACL  | IMAP4 ACL Extension                      | Elective | 2086 |
| HMAC-MD5   | HMAC-MD5 IP Auth. with Replay Prevention | Elective | 2085 |
| RIP2-MD5   | RIP-2 MD5 Authentication                 | Elective | 2082 |

|             |  |          |      |
|-------------|--|----------|------|
| RIPNG-IPV6  | RIPng for IPv6                           | Elective | 2080 |
| URI-ATT     | URI Attribute Type and Object Class      | Elective | 2079 |
| GSSAP       | Generic Security Service Application     | Elective | 2078 |
| MIME-MODEL  | Model Primary MIME Types                 | Elective | 2077 |
| RMON-MIB    | Remote Network Monitoring MIB            | Elective | 2074 |
| HTML-INT    | HTML Internationalization                | Elective | 2070 |
| DAA         | Digest Access Authentication             | Elective | 2069 |
| HTTP-1.1    | Hypertext Transfer Protocol -- HTTP/1.1  | Elective | 2068 |
| DNS-SEC     | Domain Name System Security Extensions   | Elective | 2065 |
| IMAPV4      | Internet Message Access Protocol v4rev1  | Elective | 2060 |
| URLZ39.50   | Uniform Resource Locators for Z39.50     | Elective | 2056 |
| SNANAU-APP  | SNANAU APPC MIB using SMiv2              | Elective | 2051 |
| PPP-SNACP   | PPP SNA Control Protocol                 | Elective | 2043 |
| ENTITY-MIB  | Entity MIB using SMiv2                   | Elective | 2037 |
| RTP-JPEG    | RTP Payload Format for JPEG-compressed   | Elective | 2035 |
| SMTP-ENH    | SMTP Enhanced Error Codes                | Elective | 2034 |
| RTP-H.261   | RTP Payload Format for H.261             | Elective | 2032 |
| RTP-CELLB   | RTP Payload Format of Sun's CellB        | Elective | 2029 |
| SPKM        | Simple Public-Key GSS-API Mechanism      | Elective | 2025 |
| DLSW-MIB    | DLSw MIB using SMiv2                     | Elective | 2024 |
| IPV6-PPP    | IP Version 6 over PPP                    | Elective | 2023 |
| MULTI-UNI   | Multicast over UNI 3.0/3.1 based ATM     | Elective | 2022 |
| RMON-MIB    | RMON MIB using SMiv2                     | Elective | 2021 |
| 802.12-MIB  | IEEE 802.12 Interface MIB                | Elective | 2020 |
| IPV6-FDDI   | Transmission of IPv6 Packets Over FDDI   | Elective | 2019 |
| TCP-ACK     | TCP Selective Acknowledgement Options    | Elective | 2018 |
| URL-ACC     | URL Access-Type                          | Elective | 2017 |
| MIME-PGP    | MIME Security with PGP                   | Elective | 2015 |
| MIB-UDP     | SNMPv2 MIB for UDP                       | Elective | 2013 |
| MIB-TCP     | SNMPv2 MIB for TCP                       | Elective | 2012 |
| MIB-IP      | SNMPv2 MIB for IP                        | Elective | 2011 |
| MOBILEIPMIB | Mobile IP MIB Definition using SMiv2     | Elective | 2006 |
| MOBILEIPAPP | Applicability Statement for IP Mobility  | Elective | 2005 |
| MINI-IP     | Minimal Encapsulation within IP          | Elective | 2004 |
| IPENCAPIP   | IP Encapsulation within IP               | Elective | 2003 |
| MOBILEIPSUP | IP Mobility Support                      | Elective | 2002 |
| TCPSLOWERT  | TCP Slow Start, Congestion Avoidance...  | Elective | 2001 |
| BGP-COMM    | BGP Communities Attribute                | Elective | 1997 |
| DNS-NOTIFY  | Mech. for Notification of Zone Changes   | Elective | 1996 |
| DNS-IZT     | Incremental Zone Transfer in DNS         | Elective | 1995 |
| SMTP-ETRN   | SMTP Service Extension ETRN              | Elective | 1985 |
| SNA         | Serial Number Arithmetic                 | Elective | 1982 |
| MTU-IPV6    | Path MTU Discovery for IP version 6      | Elective | 1981 |
| PPP-FRAME   | PPP in Frame Relay                       | Elective | 1973 |
| IPV6-ETHER  | Transmission IPv6 Packets Over Ethernet  | Elective | 1972 |
| IPV6-AUTO   | IPv6 Stateless Address Autoconfiguration | Elective | 1971 |
| IPV6-ND     | Neighbor Discovery for IP Version 6      | Elective | 1970 |
| PPP-ECP     | PPP Encryption Control Protocol          | Elective | 1968 |

|            |  |          |      |
|------------|--|----------|------|
| GSSAPI-KER | Kerberos Version 5 GSS-API Mechanism     | Elective | 1964 |
| PPP-CCP    | PPP Compression Control Protocol         | Elective | 1962 |
| GSSAPI-SOC | GSS-API Auth for SOCKS Version 5         | Elective | 1961 |
| LDAP-STR   | String Rep. of LDAP Search Filters       | Elective | 1960 |
| LDAP-URL   | LDAP URL Format                          | Elective | 1959 |
| TRANS-IPV6 | Transition Mechanisms IPv6 Hosts/Routers | Elective | 1933 |
| AUTH-SOCKS | Username Authentication for SOCKS V5     | Elective | 1929 |
| SOCKSV5    | SOCKS Protocol Version 5                 | Elective | 1928 |
| 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       | IPv6 Specification                       | Elective | 1883 |
| HTML       | Hypertext Markup Language - 2.0          | Elective | 1866 |
| 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 |
| 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 |
| 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 |
| TMUX        | Transport Multiplexing Protocol             | Elective | 1692 |
| SNANAU-MIB  | SNA NAUs MIB using SMIV2                    | Elective | 1666 |
| PPP-TRANS   | PPP Reliable Transmission                   | Elective | 1663 |
| -----       | Postmaster Convention X.400 Operations      | Elective | 1648 |
| PPP-BCP     | PPP Bridging Control Protocol               | Elective | 1638 |
| UPS-MIB     | UPS Management Information Base             | Elective | 1628 |
| 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 |
| CIPX        | Compressing IPX Headers Over WAM Media      | Elective | 1553 |
| IPXCP       | PPP Internetworking Packet Exchange Control | Elective | 1552 |
| 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 |
| DASS        | Distributed Authentication Security...      | Elective | 1507 |
| -----       | X.400 Use of Extended Character Sets        | Elective | 1502 |
| HARPOON     | Rules for Downgrading Messages...           | Elective | 1496 |
| 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         | 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 |
| 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-IPCP       | PPP Control Protocol                     | Elective | 1332 |
| -----          | X.400 1988 to 1984 downgrading           | Elective | 1328 |
| TCP-EXT        | TCP Extensions for High Performance      | Elective | 1323 |
| NETFAX         | File Format for the Exchange of Images   | Elective | 1314 |
| 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 |
| 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 |
| 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:



## 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     | Hist  | Ele    | 652   | *     |
| TOPT-OHT     | Output Horizontal Tabstops         | 11     | Hist  | Ele    | 653   | *     |
| TOPT-OHTD    | Output Horizontal Tab Disposition  | 12     | Hist  | Ele    | 654   | *     |
| TOPT-OFD     | Output Formfeed Disposition        | 13     | Hist  | Ele    | 655   | *     |
| TOPT-OVT     | Output Vertical Tabstops           | 14     | Hist  | Ele    | 656   | *     |
| TOPT-OVTD    | Output Vertical Tab Disposition    | 15     | Hist  | Ele    | 657   | *     |
| TOPT-OLD     | Output Linefeed Disposition        | 16     | Hist  | 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-TN3270E | TN3270 Enhancements                | 40     | Draft | Ele    | 2355  | *     |
| TOPT-AUTH    | Telnet XAUTH                       | 41     | Exp   |        |       |       |

|               |                            |     |     |     |      |    |
|---------------|----------------------------|-----|-----|-----|------|----|
| TOPT-CHARSET  | Telnet CHARSET             | 42  | Exp |     | 2066 |    |
| TOPR-RSP      | Telnet Remote Serial Port  | 43  | Exp |     |      |    |
| TOPT-COMPORT  | Telnet Com Port Control    | 44  | Exp |     | 2217 |    |
| TOPT-SLE      | Telnet Suppress Local Echo | 45  | Exp |     |      | *  |
| TOPT-STARTTLS | Telnet Start TLS           | 46  | Exp |     |      | *  |
| TOPT-KERMIT   | Telnet KERMIT              | 47  | Exp |     |      | *  |
| TOPT-SEND-URL | Send-URL                   | 48  | Exp |     |      | *  |
| 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   |
|------------|---|-------|
| =====      | =====   | ===== |
| TCP-WIN    | Increasing TCP's Initial Window                       | 2414* |
| PIM-SM     | Protocol Independent Multicast-Sparse Mode            | 2362* |
| -----      | Domain Names and Company Name Retrieval               | 2345  |
| RTP-MPEG   | RTP Payload Format for Bundled MPEG                   | 2343  |
| -----      | Intra-LIS IP Multicast/Routers over ATM using PIM     | 2337  |
| -----      | Safe Response Header Field                            | 2310  |
| LDAP-NIS   | Approach Using LDAP as a Network Information Service  | 2307  |
| HTTP-RVSA  | HTTP Remote Variant Selection Algorithm               | 2296  |
| TCN-HTTP   | Transparent Content Negotiation in HTTP               | 2295  |
| -----      | Core Based Trees (CBT) Multicast Routing Architecture | 2201  |
| -----      | Core Based Trees (CBT version 2) Multicast Routing    | 2189  |
| -----      | Trivial Convention using HTTP in URN Resolution       | 2169  |
| -----      | Resolution of URIs using DNS                          | 2168  |
| MAP-MAIL   | X.400 Mapping and Mail-11                             | 2162  |
| MIME-ODA   | A MIME Body Part for ODA                              | 2161  |
| OSPF-DIG   | OSPF with Digital Signature                           | 2154  |
| GKMP-ARCH  | Group Key Management Protocol (GKMP) Architecture     | 2094  |
| GKMP-SPEC  | Group Key Management Protocol (GKMP) Specification    | 2093  |
| IP-SCSI    | Encapsulating IP with the SCSI                        | 2143  |
| X.500-NAME | Managing the X.500 Root Naming Context                | 2120  |
| TFTP-MULTI | TFTP Multicast Option                                 | 2090  |
| IP-Echo    | IP Echo Host Service                                  | 2075  |
| METER-MIB  | Traffic Flow Measurement Meter MIB                    | 2064  |
| TFM-ARCH   | Traffic Flow Measurement Architecture                 | 2063  |
| DNS-SRV    | Location of Services in the DNS                       | 2052  |
| URAS       | Uniform Resource Agents                               | 2016  |
| GPS-AR     | GPS-Based Addressing and Routing                      | 2009  |
| ETFTP      | Enhanced Trivial File Transfer Protocol               | 1986  |
| BGP-RR     | BGP Route Reflection                                  | 1966  |
| BGP-ASC    | Autonomous System Confederations for BGP              | 1965  |
| SMKD       | Scalable Multicast Key Distribution                   | 1949  |
| HTML-TBL   | HTML Tables   | 1942  |
| 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  |
| 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 |
| -----      | 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-ENCODE | DNS Encoding of Geographical Location              | 1712 |
| TCP-POS    | An Extension to TCP: Partial Order Service         | 1693 |
| T/TCP      | TCP Extensions for Transactions                    | 1644 |
| 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 |
| 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 |
| 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 |

|            |  |          |
|------------|--|----------|
| 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   |
|-------------|--|-------|
| =====       | =====  | ===== |
| -----       | ST2+ over ATM Protocol Spec - UNI 3.1 Version          | 2383* |
| -----       | Mapping Airline Reservation, Ticketing, Messaging      | 2351  |
| KOI8-U      | Ukrainian Character Set KOI8-U                         | 2319  |
| TEXT-CSS    | The text/css Media Type                                | 2318  |
| PKCS-7      | PKCS #7: Cryptographic Message Syntax Version 1.5      | 2315  |
| PKCS-10     | PKCS #10: Certification Request Syntax Version 1.5     | 2314  |
| PKCS-1      | PKCS #1: RSA Encryption Version 1.5                    | 2313  |
| SMIME-CERT  | S/MIME Version 2 Certificate Handling                  | 2312  |
| SMIME-MSG   | S/MIME Version 2 Message Specification                 | 2311  |
| TIFF        | Tag Image File Format F Profile for Facsimile          | 2302  |
| GSMP        | Ipsilon's General Switch Management Protocol           | 2297  |
| HSRP        | Cisco Hot Standby Router Protocol (HSRP)               | 2281  |
| RC2-ENCRP   | A Description of the RC2(r) Encryption Algorithm       | 2268  |
| SNQP        | Simple Nomenclator Query Protocol                      | 2259  |
| -----       | Japanese Character Encoding for Internet Messages      | 2237  |
| KEYX-DNS    | Key Exchange Delegation Record for the DNS             | 2230  |
| DSP         | A Dictionary Server Protocol                           | 2229  |
| NFS-URL     | NFS URL Scheme   | 2224  |
| APP-MARC    | The Application/MARC Content-type                      | 2220  |
| ODETTE-FTP  | ODETTE File Transfer Protocol                          | 2204  |
| ESRO        | AT&T/Neda's Efficient Short Remote Operations Protocol | 2188  |
| ICP         | Internet Cache Protocol Version 2                      | 2186  |
| IPV4-MAPOS  | IPv4 over MAPOS Version 1                              | 2176  |
| MAPOS-SONET | Multiple Access Protocol over SONET/SDH Version 1      | 2171  |
| RWHOIS      | Referral Whois Protocol                                | 2167  |
| PPP-EXT     | PPP Vendor Extensions                                  | 2153  |
| UTF-7       | UTF-7  | 2152  |
| CAST-128    | CAST-128 Encryption Algorithm                          | 2144  |
| RADIUS-ACC  | RADIUS Accounting                                      | 2139  |
| DLSCAP      | Data Link Switching Client Access Protocol             | 2114  |
| PNG         | Portable Network Graphics Version 1.0                  | 2083  |
| RC5         | RC5, RC5-CBC, RC5-CBC-Pad, and RC5-CTS Algorithms      | 2040  |
| SNTP        | Simple Network Time Protocol v4 for IPv4, IPv6 and OSI | 2030  |
| PGP-MEF     | PGP Message Exchange Formats                           | 1991  |
| PPP-DEFL    | PPP Deflate Protocol                                   | 1979  |
| PPP-PRED    | PPP Predictor Compression Protocol                     | 1978  |
| PPP-BSD     | PPP BSD Compression Protocol                           | 1977  |
| PPP-DCE     | PPP for Data Compression in DCE                        | 1976  |
| PPP-MAG     | PPP Magnalink Variable Resource Compression            | 1975  |
| PPP-STAC    | PPP Stac LZS Compression Protocol                      | 1974  |
| GZIP        | GZIP File Format Specification Version 4.3             | 1952  |
| DEFLATE     | DEFLATE Compressed Data Format Specification V. 1.3    | 1951  |

|            |   |      |
|------------|---|------|
| ZLIB       | ZLIB Compressed Data Format Specification V. 3.3                                  | 1950 |
| HTTP-1.0   | Hypertext Transfer Protocol -- HTTP/1.0   | 1945 |
| -----      | 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<br>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 |
| -----      | Data Link Switching: Switch-to-Switch Protocol                                    | 1795 |
| BGP-4      | Experience with the BGP-4 Protocol  | 1773 |
| SDMD       | IPv4 Option for Sender Directed MD Delivery                                       | 1770 |
| SNOOP      | Snoop Version 2 Packet Capture File Format  | 1761 |
| BINHEX     | MIME Content Type for BinHex Encoded Files  | 1741 |
| 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 |
| ADSNA-IP   | Advanced SNA/IP: A Simple SNA Transport Protocol                                  | 1538 |
| TACACS     | Terminal Access Control Protocol  | 1492 |
| MD4        | MD4 Message Digest Algorithm  | 1320 |
| SUN-NFS    | Network File System Protocol  | 1094 |
| SUN-RPC    | Remote Procedure Call Protocol Version 2  | 1057 |
| GOPHER     | The Internet Gopher Protocol  | 1436 |
| 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 |
| 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   |
|------------|--|----------|------------|-------|
| =====      | =====                                      |          | =====      | ===== |
| IPV6-UNI   | IPv6 Provider-Based Unicast Address        | Elective | 2073       | *     |
| IPV6-Addr  | IPv6 Addressing Architecture               | Elective | 1884       | *     |
| L2F        | Cisco Layer Two Forwarding Protocol        |          | 2341       |       |
| IPSO       | DoD Security Options for IP                | Elective | 1108       |       |
| 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 |   |

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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## 7.2. Internet Assigned Numbers Authority Contact

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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

RFCs can be obtained via FTP from FTP.ISI.EDU, with the pathname in-notes/rfcnnnn.txt (where "nnnn" refers to the number of the RFC). Login with FTP username "anonymous" and password "name@host.domain".

RFCs can also be obtained via electronic mail from ISI.EDU by using the RFC-INFO service. Address the request to "rfc-info@isi.edu" with a message body of:

Retrieve: RFC  
Doc-ID: RFCnnnn

(Where "nnnn" refers to the number of the RFC (always use 4 digits - the DOC-ID of RFC 822 is "RFC0822")). The RFC-INFO@ISI.EDU server provides other ways of selecting RFCs based on keywords and such; for more information send a message to "rfc-info@isi.edu" with the message body "help: help".

contact: RFC-Manager@ISI.EDU

### 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.

### 9. Authors' Addresses

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