

Network Working Group
Request for Comments: 2200
Obsoletes: 2000, 1920, 1880, 1800, 1780,
1720, 1610, 1600, 1540, 1500, 1410, 1360,
1280, 1250, 1200, 1140, 1130, 1100, 1083
STD: 1
Category: Standards Track

Internet Architecture Board
J. Postel, Editor
June 1997

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.

Table of Contents

Introduction	2
1. The Standardization Process	3
2. The Request for Comments Documents	5
3. Other Reference Documents	6
3.1. Assigned Numbers	6
3.2. Gateway Requirements	6
3.3. Host Requirements	6
3.4. The MIL-STD Documents	6
4. Explanation of Terms	7
4.1. Definitions of Protocol State (Maturity Level)	8
4.1.1. Standard Protocol	8
4.1.2. Draft Standard Protocol	8
4.1.3. Proposed Standard Protocol	8
4.1.4. Experimental Protocol	8
4.1.5. Informational Protocol	9
4.1.6. Historic Protocol	9
4.2. Definitions of Protocol Status (Requirement Level)	9
4.2.1. Required Protocol	9
4.2.2. Recommended Protocol	9
4.2.3. Elective Protocol	9
4.2.4. Limited Use Protocol	9
4.2.5. Not Recommended Protocol	9
5. The Standards Track	10
5.1. The RFC Processing Decision Table	10
5.2. The Standards Track Diagram	11
6. The Protocols	13
6.1. Recent Changes	13

6.1.1. New RFCs	13
6.1.2. Other Changes	17
6.2. Standard Protocols	18
6.3. Network-Specific Standard Protocols	20
6.4. Draft Standard Protocols	21
6.5. Proposed Standard Protocols	22
6.6. Telnet Options	28
6.7. Experimental Protocols	29
6.8. Informational Protocols	32
6.9. Historic Protocols	33
6.10. Obsolete Protocols	35
7. Contacts	35
7.1. IAB, IETF, and IRTF Contacts	35
7.1.1. Internet Architecture Board (IAB) Contact	35
7.1.2. Internet Engineering Task Force (IETF) Contact	36
7.1.3. Internet Research Task Force (IRTF) Contact	37
7.2. Internet Assigned Numbers Authority (IANA) Contact	37
7.3. Request for Comments Editor Contact	38
7.4. Network Information Center Contact	38
7.5. Sources for Requests for Comments	39
8. Security Considerations	39
9. Author's Address	39

Introduction

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

This memo is intended to be issued approximately quarterly; please be sure the copy you are reading is current. Current copies may be obtained from the Network Information Center (INTERNIC) or from the Internet Assigned Numbers Authority (IANA) (see the contact information at the end of this memo). Do not use this edition after 15-Oct-97.

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

1. The Standardization Process

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

2. The Request for Comments Documents

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

Notice:

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

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

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

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

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

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

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

3. Other Reference Documents

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

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

3.1. Assigned Numbers

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

3.2. Requirements for IP Version 4 Routers

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

3.3. Host Requirements

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

3.4. The MIL-STD Documents

The 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".

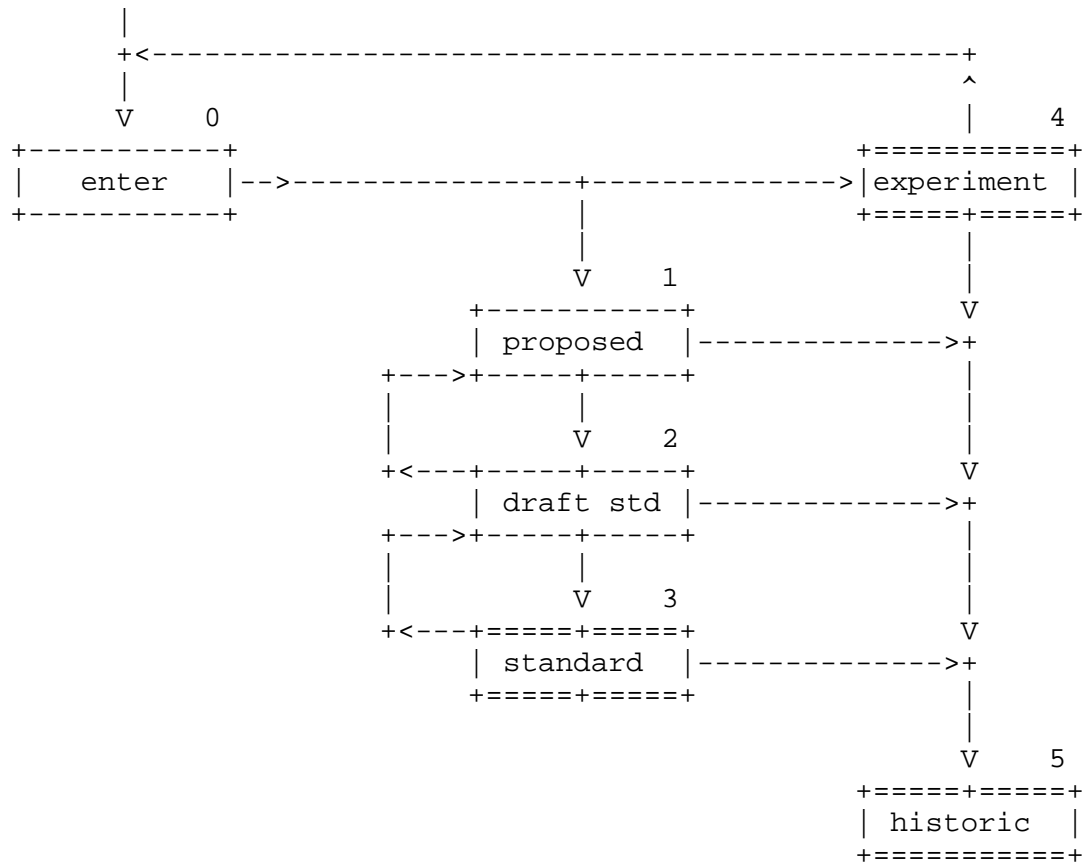
5.2. The Standards Track Diagram

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:

2153 - PPP Vendor Extensions

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

2152 - UTF-7

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

2151 - Not yet issued.

2150 - Not yet issued.

2149 - Multicast Server Architectures for MARS-based ATM multicasting

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

2148 - Not yet issued.

2147 - TCP and UDP over IPv6 Jumbograms

A Proposed Standard protocol.

2146 - U.S. Government Internet Domain Names

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

2145 - Use and Interpretation of HTTP Version Numbers

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

2144 - The CAST-128 Encryption Algorithm

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

2143 - Encapsulating IP with the Small Computer System Interface

An Experimental protocol.

2142 - Mailbox Names for Common Services, Roles and Functions

A Proposed Standard protocol.

2141 - URN Syntax

A Proposed Standard protocol.

2140 - TCP Control Block Interdependence

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

2139 - RADIUS Accounting

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

2138 - Remote Authentication Dial In User Service (RADIUS)

A Proposed Standard protocol.

2137 - Secure Domain Name System Dynamic Update

A Proposed Standard protocol.

2136 - Dynamic Updates in the Domain Name System (DNS UPDATE)

A Proposed Standard protocol.

2135 - Internet Society By-Laws

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

2134 - Articles of Incorporation of Internet Society

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

2133 - Basic Socket Interface Extensions for IPv6

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

2132 - DHCP Options and BOOTP Vendor Extensions

A Draft Standard protocol.

2131 - Dynamic Host Configuration Protocol

A Draft Standard protocol.

2130 - The Report of the IAB Character Set Workshop held 29 February - 1 March, 1996

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

2129 - Toshiba's Flow Attribute Notification Protocol (FANP) Specification

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

2128 - Dial Control Management Information Base using SMIPv2

A Proposed Standard protocol.

2127 - ISDN Management Information Base using SMIPv2

A Proposed Standard protocol.

2126 - ISO Transport Service on top of TCP (ITOT)

A Proposed Standard protocol.

2125 - The PPP Bandwidth Allocation Protocol (BAP), The PPP Bandwidth Allocation Control Protocol (BACP)

A Proposed Standard protocol.

2124 - Cabletron's Light-weight Flow Admission Protocol Specification

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

2123 - Traffic Flow Measurement: Experiences with NeTraMet

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

2122 - VEMMI URL Specification

A Proposed Standard protocol.

2121 - Issues affecting MARS Cluster Size

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

2120 - Managing the X.500 Root Naming Context

An Experimental protocol.

2119 - Key words for use in RFCs to Indicate Requirement Level

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

2118 - Microsoft Point-To-Point Compression (MPPC) Protocol

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

2117 - Not yet issued.

2116 - X.500 Implementations Catalog-96

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

2115 - Not yet issued.

2114 - Data Link Switching Client Access Protocol

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

2113 - IP Router Alert Option

A Proposed Standard protocol.

2112 - The MIME Multipart/Related Content-type

A Proposed Standard protocol.

2111 - Content-ID and Message-ID Uniform Resource Locators

A Proposed Standard protocol.

2110 - MIME E-mail Encapsulation of Aggregate Documents, such as HTML (MHTML)

A Proposed Standard protocol.

2100 - The Naming of Hosts

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

2099 - Request for Comments Summary - RFC Numbers 2000-2099

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

2094 - Not yet issued.

2093 - Not yet issued.

2076 - Common Internet Message Headers

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.

1542 - Clarifications and Extensions for the Bootstrap Protocol

Elevated to Draft Standard.

1534 - Interoperation Between DHCP and BOOTP

Elevated to Draft Standard.

6.2. Standard Protocols

Protocol	Name	Status	RFC	STD	*
=====	=====	=====	=====	=====	=====
-----	Internet Official Protocol Standards	Req	2200	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	

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

Applicability Statements:

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

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

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

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

6.3. Network-Specific Standard Protocols

All Network-Specific Standards have Elective status.

Protocol	Name	State	RFC	STD	*
=====	=====	=====	=====	=====	=====
IP-ATM	Classical IP and ARP over ATM	Prop	1577		
IP-FR	Multiprotocol over Frame Relay	Draft	1490		
ATM-ENCAP	Multiprotocol Encapsulation over ATM	Prop	1483		
IP-TR-MC	IP Multicast over Token-Ring LANs	Prop	1469		
IP-FDDI	Transmission of IP and ARP over FDDI Net	Std	1390	36	
IP-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
=====	=====	=====	=====
BOOTP	DHCP Options and BOOTP Extensions	Recommended	2132*
DHCP	Dynamic Host Configuration Protocol	Elective	2131*
-----	Clarifications and Extensions BOOTP	Elective	1542*
DHCP-BOOTP	Interoperation Between DHCP and BOOTP	Elective	1534*
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
BGP-4-MIB	BGP-4 MIB	Elective	1657
RIP2-MIB	RIP Version 2 MIB Extension	Elective	1724
RIP2	RIP Version 2-Carrying Additional Info.	Elective	1723
RIP2-APP	RIP Version 2 Protocol App. Statement	Elective	1722
SIP-MIB	SIP Interface Type MIB	Elective	1694
-----	Def Man Objs Parallel-printer-like	Elective	1660
-----	Def Man Objs RS-232-like	Elective	1659
-----	Def Man Objs Character Stream	Elective	1658
SMTP-8BIT	SMTP Service Ext or 8bit-MIMEtransport	Elective	1652
OSI-NSAP	Guidelines for OSI NSAP Allocation	Elective	1629
OSPF2	Open Shortest Path First Routing V2	Elective	1583
ISO-TS-ECHO	Echo for ISO-8473	Elective	1575
DECNET-MIB	DECNET MIB	Elective	1559
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
=====	=====	=====	=====
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*
MIME-RELAT	MIME Multipart/Related Content-type	Elective	2112*
CIDMID-URL	Content-ID and Message-ID URLs	Elective	2111*
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
IMAPPOPAU	IMAP/POP AUTHorize Extension	Elective	2095
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

IPV6-UNI	IPv6 Provider-Based Unicast Address	Elective	2073
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
RTP-MPEG	RTP Payload Format for MPEG1/MPEG2	Elective	2038
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
IPENCAP	IP Encapsulation within IP	Elective	2003
MOBILEIPSUP	IP Mobility Support	Elective	2002
TCP-SLOW	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
ONE-PASS	One-Time Password System	Elective	1938
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-Addr	IPv6 Addressing Architecture	Elective	1884
IPV6	IPv6 Specification	Elective	1883
HTML	Hypertext Markup Language - 2.0	Elective	1866
SMTP-Pipe	SMTP Serv. Ext. for Command Pipelining	Elective	1854
MIME-Sec	MIME Object Security Services	Elective	1848
MIME-Encyp	MIME: Signed and Encrypted	Elective	1847
WHOIS++	Architecture of the WHOIS++ service	Elective	1835
-----	Binding Protocols for ONC RPC Version 2	Elective	1833
XDR	External Data Representation Standard	Elective	1832
RPC	Remote Procedure Call Protocol V. 2	Elective	1831
-----	ESP DES-CBC Transform	Ele/Req	1829
-----	IP Authentication using Keyed MD5	Ele/Req	1828
ESP	IP Encapsulating Security Payload	Ele/Req	1827
IPV6-AH	IP Authentication Header	Ele/Req	1826
-----	Security Architecture for IP	Ele/Req	1825
RREQ	Requirements for IP Version 4 Routers	Elective	1812
URL	Relative Uniform Resource Locators	Elective	1808
CLDAP	Connection-less LDAP	Elective	1798
OSPF-DC	Ext. OSPF to Support Demand Circuits	Elective	1793
TMUX	Transport Multiplexing Protocol	Elective	1692
TFTP-Opt	TFTP Options	Elective	1784
TFTP-Blk	TFTP Blocksize Option	Elective	1783
TFTP-Ext	TFTP Option Extension	Elective	1782
OSI-Dir	OSI User Friendly Naming ...	Elective	1781
MIME-EDI	MIME Encapsulation of EDI Objects	Elective	1767
Lang-Tag	Tags for Identification of Languages	Elective	1766
XNSCP	PPP XNS IDP Control Protocol	Elective	1764
BVCP	PPP Banyan Vines Control Protocol	Elective	1763
Print-MIB	Printer MIB	Elective	1759
ATM-SIG	ATM Signaling Support for IP over ATM	Elective	1755
IPNG	Recommendation for IP Next Generation	Elective	1752
802.5-SSR	802.5 SSR MIB using SMiv2	Elective	1749

SDLCSMiv2	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
SNANAU-MIB	SNA NAUs MIB using SMiv2	Elective	1666
PPP-TRANS	PPP Reliable Transmission	Elective	1663
-----	Postmaster Convention X.400 Operations	Elective	1648
TN3270-En	TN3270 Enhancements	Elective	1647
PPP-BCP	PPP Bridging Control Protocol	Elective	1638
UPS-MIB	UPS Management Information Base	Elective	1628
AAL5-MTU	Default IP MTU for use over ATM AAL5	Elective	1626
PPP-SONET	PPP over SONET/SDH	Elective	1619
PPP-ISDN	PPP over ISDN	Elective	1618
DNS-R-MIB	DNS Resolver MIB Extensions	Elective	1612
DNS-S-MIB	DNS Server MIB Extensions	Elective	1611
FR-MIB	Frame Relay Service MIB	Elective	1604
PPP-X25	PPP in X.25	Elective	1598
OSPF-NSSA	The OSPF NSSA Option	Elective	1587
OSPF-Multi	Multicast Extensions to OSPF	Elective	1584
SONET-MIB	MIB SONET/SDH Interface Type	Elective	1595
RIP-DC	Extensions to RIP to Support Demand Cir.	Elective	1582
-----	Evolution of the Interfaces Group of MIB-II	Elective	1573
PPP-LCP	PPP LCP Extensions	Elective	1570
X500-MIB	X.500 Directory Monitoring MIB	Elective	1567
MAIL-MIB	Mail Monitoring MIB	Elective	1566
NSM-MIB	Network Services Monitoring MIB	Elective	1565
CIPX	Compressing IPX Headers Over WAM Media	Elective	1553
IPXCP	PPP Internetworking Packet Exchange Control	Elective	1552
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
Mapping	MHS/RFC-822 Message Body Mapping	Elective	1495

Equiv	X.400/MIME Body Equivalences	Elective	1494
IDPR	Inter-Domain Policy Routing Protocol	Elective	1479
IDPR-ARCH	Architecture for IDPR	Elective	1478
PPP/Bridge	MIB Bridge PPP MIB	Elective	1474
PPP/IP MIB	IP Network Control Protocol of PPP MIB	Elective	1473
PPP/SEC MIB	Security Protocols of PPP MIB	Elective	1472
PPP/LCP MIB	Link Control Protocol of PPP MIB	Elective	1471
X25-MIB	Multiprotocol Interconnect on X.25 MIB	Elective	1461
SNMPv2	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
-----	Mapping between X.400(1988)	Elective	1327
TCP-EXT	TCP Extensions for High Performance	Elective	1323
FRAME-MIB	Management Information Base for Frame	Elective	1315
NETFAX	File Format for the Exchange of Images	Elective	1314
IARP	Inverse Address Resolution Protocol	Elective	1293
FDDI-MIB	FDDI-MIB	Elective	1285
-----	Encoding Network Addresses	Elective	1277
-----	Replication and Distributed Operations	Elective	1276
-----	COSINE and Internet X.500 Schema	Elective	1274
BGP-MIB	Border Gateway Protocol MIB (Version 3)	Elective	1269
ICMP-ROUT	ICMP Router Discovery Messages	Elective	1256
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:

OSPF - RFC 1370 is an applicability statement for OSPF.

6.6. Telnet Options

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

Protocol	Name	Number	State	Status	RFC	STD
=====	=====	=====	=====	=====	=====	=====
TOPT-BIN	Binary Transmission	0	Std	Rec	856	27
TOPT-ECHO	Echo	1	Std	Rec	857	28
TOPT-RECN	Reconnection	2	Prop	Ele	...	
TOPT-SUPP	Suppress Go Ahead	3	Std	Rec	858	29
TOPT-APRX	Approx Message Size Negotiation	4	Prop	Ele	...	
TOPT-STAT	Status	5	Std	Rec	859	30
TOPT-TIM	Timing Mark	6	Std	Rec	860	31
TOPT-REM	Remote Controlled Trans and Echo	7	Prop	Ele	726	
TOPT-OLW	Output Line Width	8	Prop	Ele	...	
TOPT-OPS	Output Page Size	9	Prop	Ele	...	
TOPT-OCRD	Output Carriage-Return Disposition	10	Prop	Ele	652	
TOPT-OHT	Output Horizontal Tabstops	11	Prop	Ele	653	
TOPT-OHTD	Output Horizontal Tab Disposition	12	Prop	Ele	654	
TOPT-OFD	Output Formfeed Disposition	13	Prop	Ele	655	
TOPT-OVT	Output Vertical Tabstops	14	Prop	Ele	656	
TOPT-OVTD	Output Vertical Tab Disposition	15	Prop	Ele	657	
TOPT-OLD	Output Linefeed Disposition	16	Prop	Ele	658	
TOPT-EXT	Extended ASCII	17	Prop	Ele	698	
TOPT-LOGO	Logout	18	Prop	Ele	727	
TOPT-BYTE	Byte Macro	19	Prop	Ele	735	
TOPT-DATA	Data Entry Terminal	20	Prop	Ele	1043	
TOPT-SUP	SUPDUP	21	Prop	Ele	736	
TOPT-SUPO	SUPDUP Output	22	Prop	Ele	749	
TOPT-SNDL	Send Location	23	Prop	Ele	779	
TOPT-TERM	Terminal Type	24	Prop	Ele	1091	
TOPT-EOR	End of Record	25	Prop	Ele	885	
TOPT-TACACS	TACACS User Identification	26	Prop	Ele	927	
TOPT-OM	Output Marking	27	Prop	Ele	933	
TOPT-TLN	Terminal Location Number	28	Prop	Ele	946	
TOPT-3270	Telnet 3270 Regime	29	Prop	Ele	1041	
TOPT-X.3	X.3 PAD	30	Prop	Ele	1053	
TOPT-NAWS	Negotiate About Window Size	31	Prop	Ele	1073	
TOPT-TS	Terminal Speed	32	Prop	Ele	1079	
TOPT-RFC	Remote Flow Control	33	Prop	Ele	1372	
TOPT-LINE	Linemode	34	Draft	Ele	1184	
TOPT-XDL	X Display Location	35	Prop	Ele	1096	
TOPT-ENVIR	Telnet Environment Option	36	Hist	Not	1408	
TOPT-AUTH	Telnet Authentication Option	37	Exp	Ele	1416	
TOPT-ENVIR	Telnet Environment Option	39	Prop	Ele	1572	
TOPT-TN3270E	TN3270 Enhancements	40	Prop	Ele	1647	
TOPT-AUTH	Telnet XAUTH	41	Exp			

TOPT-CHARSET Telnet CHARSET	42	Exp		2066
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
=====	=====	=====
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
MIME-VP	Voice Profile for Internet Mail	1911
SNMPV2SM	User-based Security Model for SNMPv2	1910
SNMPV2AI	SNMPv2 Administrative Infrastructure	1909
SNMPV2CB	Introduction to Community-based SNMPv2	1901
-----	IPv6 Testing Address Allocation	1897
DNS-LOC	Location Information in the DNS	1876
SGML-MT	SGML Media Types	1874
CONT-MT	Access Type Content-ID	1873
UNARP	ARP Extension - UNARP	1868
-----	Form-based File Upload in HTML	1867
-----	BGP/IDRP Route Server Alternative	1863
-----	IP Authentication using Keyed SHA	1852
ESP3DES	ESP Triple DES Transform	1851
-----	SMTP 521 Reply Code	1846
-----	SMTP Serv. Ext. for Checkpoint/Restart	1845
-----	X.500 Mapping X.400 and RFC 822 Addresses	1838
-----	Tables and Subtrees in the X.500 Directory	1837
-----	O/R Address hierarchy in X.500	1836
-----	SMTP Serv. Ext. Large and Binary MIME Msgs.	1830
ST2	Stream Protocol Version 2	1819
-----	Content-Disposition Header	1806
-----	Schema Publishing in X.500 Directory	1804

-----	X.400-MHS use X.500 to support X.400-MHS Routing	1801
-----	Class A Subnet Experiment	1797
TCP/IPXMIB	TCP/IPX Connection Mib Specification	1792
-----	TCP And UDP Over IPX Networks With Fixed Path MTU	1791
ICMP-DM	ICMP Domain Name Messages	1788
CLNP-MULT	Host Group Extensions for CLNP Multicasting	1768
OSPF-OVFL	OSPF Database Overflow	1765
RWP	Remote Write ProtocolL - Version 1.0	1756
NARP	NBMA Address Resolution Protocol	1735
DNS-DEBUG	Tools for DNS debugging	1713
DNS-ENCODE	DNS Encoding of Geographical Location	1712
TCP-POS	An Extension to TCP: Partial Order Service	1693
-----	DNS to Distribute RFC1327 Mail Address Mapping Tables	1664
T/TCP	TCP Extensions for Transactions	1644
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
MAP-MAIL	X.400 Mapping and Mail-11	1405
TRACE-IP	Traceroute Using an IP Option	1393
DNS-IP	Experiment in DNS Based IP Routing	1383
RMCP	Remote Mail Checking Protocol	1339
TCP-HIPER	TCP Extensions for High Performance	1323
MSP2	Message Send Protocol 2	1312
DSLCP	Dynamically Switched Link Control	1307
-----	X.500 and Domains	1279
IN-ENCAP	Internet Encapsulation Protocol	1241
CLNS-MIB	CLNS-MIB	1238
CFDP	Coherent File Distribution Protocol	1235
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
=====	=====	=====
PPP-EXT	PPP Vendor Extensions	2153*
UTF-7	UTF-7	2152*
CAST-128	CAST-128 Encryption Algorithm	2144*
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 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
RWHOIS	Referral Whois Protocol	1714
DNS-NSAP	DNS NSAP Resource Records	1706
RADIO-PAGE	TPC.INT Subdomain: Radio Paging -- Technical Procedures	1703
GRE-IPv4	Generic Routing Encapsulation over IPv4	1702
GRE	Generic Routing Encapsulatio	1701
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
=====	=====		=====	===
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.

Contacts:

Abel Winerib
 Executive Director of the IAB
 Intel, JF2-64
 2111 NE 25th Avenue
 Hillsboro, OR 97124

1-503-696-8972

AWeinrib@ibeam.jf.intel.com

Brian E. Carpenter
Chair of the IAB
IBM United Kingdom Laboratories
Hursley Park
Winchester
Hampshire SO21 2JN

+44 1962 816833

brian@hursley.ibm.com

7.1.2. Internet Engineering Task Force (IETF) Contact

Contacts:

Fred Baker
Chair of the IETF
cisco Systems, Inc.
519 Lado Drive
Santa Barbara, CA 93111

1-805-681-0115

fred@cisco.com

Steve Coya
IESG Secretary
Corporation for National Research Initiatives
1895 Preston White Drive, Suite 100
Reston, VA 22091

1-703-620-8990

scoya@IETF.ORG

Steve Coya
Executive Director of the IETF
Corporation for National Research Initiatives
1895 Preston White Drive, Suite 100
Reston, VA 22091

1-703-620-8990

scoya@IETF.ORG

7.1.3. Internet Research Task Force (IRTF) Contact

Contact:

Abel Winerib
Chair of the IRTF
Intel, JF2-64
2111 NE 25th Avenue
Hillsboro, OR 97124

1-503-696-8972

AWeinrib@ibeam.jf.intel.com

7.2. Internet Assigned Numbers Authority Contact

Contact:

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

1-310-822-1511

IANA@IANA.ORG

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

Contact:

Jon Postel
RFC Editor
USC/Information Sciences Institute
4676 Admiralty Way
Marina del Rey, CA 90292-6695

1-310-822-1511

RFC-Editor@ISI.EDU

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

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

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

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

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

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

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

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

Contact: admin@ds.internic.net

7.5. Sources for Requests for Comments

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

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

help: ways_to_get_rfcs

8. Security Considerations

Security issues are not addressed in this memo.

9. Author's Address

Jon Postel
USC/Information Sciences Institute
4676 Admiralty Way
Marina del Rey, CA 90292

Phone: 310-822-1511
Fax: 310-823-6714

Email: Postel@ISI.EDU

