                    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

   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
                  +-----+-----+-----+-----+-----+
         Std      |  X  | XXX | XXX |     |     |
     S            +-----+-----+-----+-----+-----+
         Draft    |  X  |  X  | XXX |     |     |
     T            +-----+-----+-----+-----+-----+
         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      |   IAB   |  IESG   |  IRSG   |  Other   |
    | Status       |         |         |         |          |
    +===============================================================+
    |              |         |         |         |          |
    | Standard     | Bogus   | Publish | Bogus   | Bogus    |
    | or           | (2)     | (1)     | (2)     | (2)      |
    | Draft        |         |         |         |          |
    | Standard     |         |         |         |          |
    +--------------+---------+---------+---------+----------+
    |              |         |         |         |          |
    |              | Refer   | Publish | Refer   | Refer    |
    | Proposed     | (3)     | (1)     | (3)     | (3)      |
    | Standard     |         |         |         |          |
    |              |         |         |         |          |
    +--------------+---------+---------+---------+----------+
    |              |         |         |         |          |
    |              | Notify  | Publish | Notify  | Notify   |
    | Experimental | (4)     | (1)     | (4)     | (4)      |
    | Protocol     |         |         |         |          |
    |              |         |         |         |          |
    +--------------+---------+---------+---------+----------+
    |              |         |         |         |          |
    | Information  | Publish | Publish |Discretion|Discretion|
    | or Opinion   | (1)     | (1)     | (5)     | (5)      |
    | Paper        |         |         |         |          |
    |              |         |         |         |          |
    +===============================================================+
```

   (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.

```
      |
      +<-------------------------------------------+
      |                                            ^
      V   0                                        |   4
 +----------+                             +==========+
 |  enter   |-->-------------+------------>|experiment |
 +----------+                |             +=====+=====+
                             |                   |
                             V   1               |
                      +----------+               V
                      | proposed |------------->+
                 +--->+-----+-----+              |
                 |          |                    |
                 |          V   2                |
                 +<---+-----+-----+              V
                      | draft std |------------->+
                 +--->+-----+-----+              |
                 |          |                    |
                 |          V   3                |
                 +<---+=====+=====+              V
                      | standard |------------->+
                      +=====+=====+              |
                                                 |
                                                 V   5
                                          +=====+=====+
                                          | historic  |
                                          +==========+
```
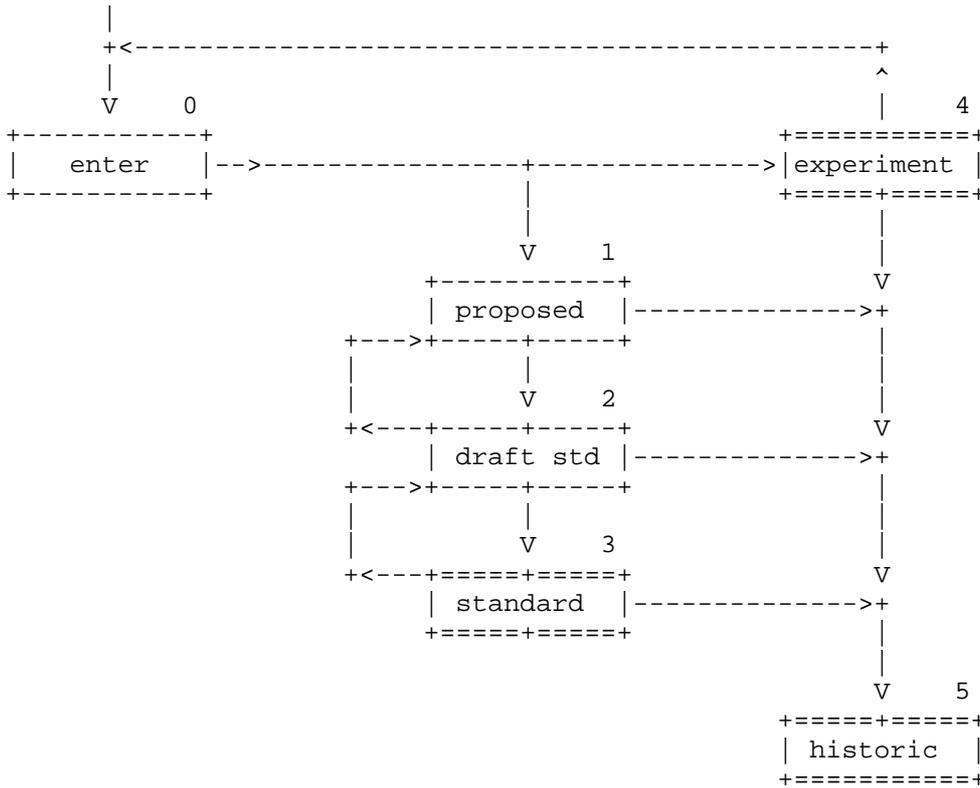
The transition from proposed standard (1) to draft standard (2) can
only be by action of the IESG and only after the protocol has been
proposed standard (1) for at least six months.

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 SMIv2

          A Proposed Standard protocol.

    2127 - ISDN Management Information Base using SMIv2

          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 devpeloping 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
MOBILEIPMIBMobile IP MIB Definition using SMIv2    Elective    2006
MOBILEIPAPPApplicability Statement for IP Mobility Elective    2005
MINI-IP     Minimal Encapsulation within IP        Elective    2004
IPENCAPIP   IP Encapsulation within IP             Elective    2003
MOBILEIPSUPIP Mobility Support                     Elective    2002
TCPSLOWSRT  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 Autoconfiguation 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
```

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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  1859
            over TCP RFC1006 extension
--------    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
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7.2.   Internet Assigned Numbers Authority Contact

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         Internet Assigned Numbers Authority
         USC/Information Sciences Institute
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         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

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