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-Jul-95.

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

1. The Standardization Process

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

2. The Request for Comments Documents

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

Notice:

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

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

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

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

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

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

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

3. Other Reference Documents

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

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

3.1. Assigned Numbers

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

3.2. Gateway Requirements

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

3.3. Host Requirements

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

3.4. The MIL-STD Documents

The Internet community specifications for IP (RFC-791) and TCP (RFC-
793) and the DoD MIL-STD specifications are intended to describe
exactly the same protocols. Any difference in the protocols
specified by these sets of documents should be reported to DISA and
to the IESG. The RFCs and the MIL-STDs for IP and TCP differ in
style and level of detail. It is strongly advised that the two sets

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

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

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

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

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

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

4. Explanation of Terms

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

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

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

At any given time a protocol occupies a cell of the following matrix.
Protocols are likely to be in cells in about the following
proportions (indicated by the relative number of Xs). A new protocol
is most likely to start in the (proposed standard, elective) cell, or
the (experimental, not recommended) cell.

```
                            S T A T U S
                      Req   Rec   Ele   Lim   Not
                    +-----+-----+-----+-----+-----+
         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
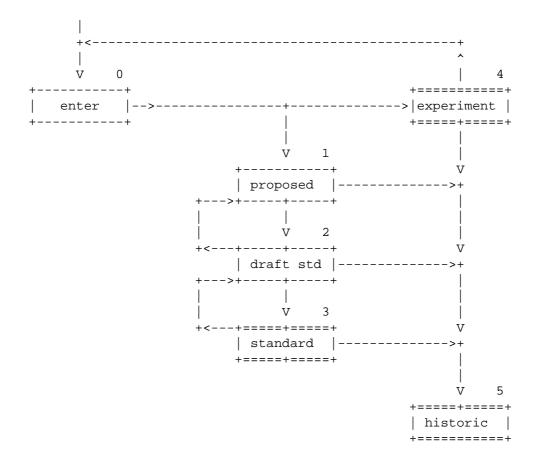   way as documents from "other".

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              |
                            +----------+                |
                            | 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:

      1786 - Representation of IP Routing Policies in a Routing Registry
             (ripe-81++)

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

      1785 - TFTP Option Negotiation Analysis

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

      1784 - TFTP Timeout Interval and Transfer Size Options

             A Proposed Standard protocol.

      1783 - TFTP Blocksize Option

             A Proposed Standard protocol.

      1782 - TFTP Option Extension

             A Proposed Standard protocol.

      1781 - Using the OSI Directory to Achieve User Friendly Naming

             A Proposed Standard protocol.

      1780 - Internet Official Protocol Standards

             This memo.

      1779 - A String Representation of Distinguished Names

             A Draft Standard protocol.

      1778 - The String Representation of Standard Attribute Syntaxes

             A Draft Standard protocol.

1777 - Lightweight Directory Access Protocol

  A Draft Standard protocol.

1776 - Not yet issued.

1775 - To Be "On" the Internet

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

1774 - BGP-4 Protocol Analysis

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

1773 - Experience with the BGP-4 protocol

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

1772 - Application of the Border Gateway Protocol in the Internet

  A Draft Standard protocol.

1771 - A Border Gateway Protocol 4 (BGP-4)

  A Draft Standard protocol.

1770 - IPv4 Option for Sender Directed Multi-Destination Delivery

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

1769 - Simple Network Time Protocol (SNTP)

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

1768 - Host Group Extensions for CLNP Multicasting

  An Experimental protocol.

1767 - MIME Encapsulation of EDI Objects

  A Proposed Standard protocol.

1766 - Tags for the Identification of Languages

        A Proposed Standard protocol.

1765 - OSPF Database Overflow

        An Experimental protocol.

1764 - The PPP XNS IDP Control Protocol (XNSCP)

        A Proposed Standard protocol.

1763 - The PPP Banyan Vines Control Protocol (BVCP)

        A Proposed Standard protocol.

1762 - The PPP DECnet Phase IV Control Protocol (DNCP)

        A Draft Standard protocol.

1761 - Snoop Version 2 Packet Capture File Format

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

1760 - The S/KEY One-Time Password System

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

1759 - Printer MIB

        A Proposed Standard protocol.

1758 - NADF Standing Documents: A Brief Overview

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

1757 - Remote Network Monitoring Management Information Base

        A Draft Standard protocol.

1756 - Remote Write ProtocolL - Version 1.0

        An Experimental protocol.

   1755 - ATM Signaling Support for IP over ATM

          A Proposed Standard protocol.

   1754 - IP over ATM Working Group's Recommendations for the ATM
          Forum's Multiprotocol

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

   1753 - IPng Technical Requirements Of the Nimrod Routing and
          Addressing Architecture

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

   1752 - The Recommendation for the IP Next Generation Protocol

          A Proposed Standard protocol.

   1751 - A Convention for Human-Readable 128-bit Keys

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

   1750 - Randomness Recommendations for Security

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

   1749 - IEEE 802.5 Station Source Routing MIB using SMIv2

          A Proposed Standard protocol.

   1748 - IEEE 802.5 MIB using SMIv2

          A Draft Standard protocol.

   1747 - Definitions of Managed Objects for SNA Data Link Control
          (SDLC) using SMIv2

          A Proposed Standard protocol.

   1746 - Ways to Define User Expectations

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

1745 - BGP4/IDRP for IP---OSPF Interaction

        A Proposed Standard protocol.

1744 - Observations on the Management of the Internet Address
        Space

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

1743 - IEEE 802.5 MIB using SMIv2

        A Draft Standard protocol.

1742 - AppleTalk Management Information Base II

        A Proposed Standard protocol.

1741 - MIME Content Type for BinHex Encoded Files

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

1740 - MIME Encapsulation of Macintosh Files - MacMIME

        A Proposed Standard protocol.

1739 - A Primer On Internet and TCP/IP Tools

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

1738 - Uniform Resource Locators (URL)

        A Proposed Standard protocol.

1737 - Functional Requirements for Uniform Resource Names

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

1736 - Functional Recommendations for Internet Resource Locators

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

    1735 - NBMA Address Resolution Protocol (NARP)

          An Experimental protocol.

    1734 - POP3 AUTHentication command

          A Proposed Standard protocol.

    1733 - Distributed Electronic Mail Models In IMAP4

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

    1732 - IMAP4 Compatibility with IMAP2 and IMAP2bis

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

    1731 - IMAP4 Authentication Mechanisms

          A Proposed Standard protocol.

    1730 - Internet Message Access Protocol - Version 4

          A Proposed Standard protocol.

    1729 - Using the Z39.50 Information Retrieval Protocol

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

    1728 - Resource Transponders

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

    1727 - A Vision of an Integrated Internet Information Service

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

    1726 - Technical Criteria for Choosing IP The Next Generation
          (IPng)

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

      1719 - A Direction for IPng

            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.

      1657 - Definitions of Managed Objects for the Fourth Version of
             the Border Gateway Protocol (BGP-4) using SMIv2904 -
             Exterior Gateway Protocol

             Elevated to Draft Standard.

      1009 - Gateway Requirements

             Moved to Historic.

6.2. Standard Protocols

```
Protocol    Name                                   Status    RFC STD *
========    ===================================    ======== ==== === =
--------    Internet Official Protocol Standards    Req       1720   1
--------    Assigned Numbers                        Req       1700   2
--------    Host Requirements - Communications      Req       1122   3
--------    Host Requirements - Applications        Req       1123   3
IP          Internet Protocol                       Req        791   5
             as amended by:--------
--------     IP Subnet Extension                    Req        950   5
--------     IP Broadcast Datagrams                 Req        919   5
--------     IP Broadcast Datagrams with Subnets    Req        922   5
ICMP        Internet Control Message Protocol       Req        792   5
IGMP        Internet Group Multicast Protocol       Rec       1112   5
UDP         User Datagram Protocol                  Rec        768   6
TCP         Transmission Control Protocol           Rec        793   7
TELNET      Telnet Protocol                         Rec    854,855   8
FTP         File Transfer Protocol                  Rec        959   9
SMTP        Simple Mail Transfer Protocol           Rec        821  10
MAIL        Format of Electronic Mail Messages      Rec        822  11
CONTENT     Content Type Header Field               Rec       1049  11
NTPV2       Network Time Protocol (Version 2)       Rec       1119  12
DOMAIN      Domain Name System                      Rec  1034,1035  13
DNS-MX      Mail Routing and the Domain System      Rec        974  14
SNMP        Simple Network Management Protocol      Rec       1157  15
SMI         Structure of Management Information     Rec       1155  16
Concise-MIB Concise MIB Definitions                 Rec       1212  16
MIB-II      Management Information Base-II           Rec       1213  17
NETBIOS     NetBIOS Service Protocols               Ele  1001,1002  19
ECHO        Echo Protocol                           Rec        862  20
DISCARD     Discard Protocol                        Ele        863  21
CHARGEN     Character Generator Protocol            Ele        864  22
QUOTE       Quote of the Day Protocol               Ele        865  23
USERS       Active Users Protocol                   Ele        866  24
DAYTIME     Daytime Protocol                        Ele        867  25
TIME        Time Server Protocol                    Ele        868  26
TFTP        Trivial File Transfer Protocol          Ele       1350  33
RIP         Routing Information Protocol            Ele       1058  34
TP-TCP      ISO Transport Service on top of the TCP Ele       1006  35
ETHER-MIB   Ethernet MIB                            Ele       1643  50
PPP         Point-to-Point Protocol (PPP)           Ele       1661  51
PPP-HDLC    PPP in HDLC Framing                     Ele       1662  51
```

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

Applicability Statements:

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

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

   RIP -- The Routing Information Protocol (RIP) is widely implemented
   and used in the Internet. However, both implementors and users
   should be aware that RIP has some serious technical limitations as a
   routing protocol. The IETF is currently 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-HIPPI   IP and ARP on HIPPI                   Prop    1374
IP-X.25    X.25 and ISDN in the Packet Mode      Draft   1356
IP-SMDS    IP Datagrams over the SMDS Service    Draft   1209
IP-FDDI    Internet Protocol on FDDI Networks    Draft   1188
ARP        Address Resolution Protocol           Std      826    37
RARP       A Reverse Address Resolution Protocol Std      903    38
IP-ARPA    Internet Protocol on ARPANET          Std BBN1822     39
IP-WB      Internet Protocol on Wideband Network Std      907    40
IP-E       Internet Protocol on Ethernet Networks Std     894    41
IP-EE      Internet Protocol on Exp. Ethernet Nets Std    895    42
IP-IEEE    Internet Protocol on IEEE 802         Std     1042    43
IP-DC      Internet Protocol on DC Networks      Std      891    44
IP-HC      Internet Protocol on Hyperchannel     Std     1044    45
IP-ARC     Transmitting IP Traffic over ARCNET Nets Std  1201    46
IP-SLIP    Transmission of IP over Serial Lines  Std     1055    47
IP-NETBIOS Transmission of IP over NETBIOS       Std     1088    48
IP-IPX     Transmission of 802.2 over IPX Networks Std   1132    49
```

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

Applicability Statements:

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

6.4. Draft Standard Protocols

```
Protocol   Name                                 Status         RFC
========   ===================================  ============== =====
STR-REP    String Representation ...             Elective       1779*
X.500syn   X.500 String Representation ...       Elective       1778*
X.500lite  X.500 Lightweight ...                 Elective       1777*
BGP-4-APP  Application of BGP-4                  Elective       1772*
BGP-4      Border Gateway Protocol 4             Elective       1771*
PPP-DNCP   PPP DECnet Phase IV Control Protocol  Elective       1762*
RMON-MIB   Remote Network Monitoring MIB         Elective       1757*
802.5-MIB  IEEE 802.5 Token Ring MIB             Elective       1748*
BGP-4-MIB  BGP-4 MIB                             Elective       1657*
POP3       Post Office Protocol, Version 3       Elective       1725
RIP2-MIB   RIP Version 2 MIB Extension           Elective       1724
RIP2       RIP Version 2-Carrying Additional Info. Elective     1723
RIP2-APP   RIP Version 2 Protocol App. Statement Elective       1722
SIP-MIB    SIP Interface Type MIB                Elective       1694
-------    Def Man Objs Parallel-printer-like    Elective       1660
-------    Def Man Objs RS-232-like              Elective       1659
-------    Def Man Objs Character Stream         Elective       1658
SMTP-SIZE  SMTP Service Ext for Message Size     Elective       1653
SMTP-8BIT  SMTP Service Ext or 8bit-MIMEtransport Elective      1652
SMTP-EXT   SMTP Service Extensions               Elective       1651
OSI-NSAP   Guidelines for OSI NSAP Allocation    Elective       1629
OSPF2      Open Shortest Path First Routing V2   Elective       1583
ISO-TS-ECHO Echo for ISO-8473                    Elective       1575
DECNET-MIB DECNET MIB                            Elective       1559
-------    Message Header Ext. of Non-ASCII Text Elective       1522
MIME       Multipurpose Internet Mail Extensions Elective       1521
802.3-MIB  IEEE 802.3 Repeater MIB               Elective       1516
BRIDGE-MIB BRIDGE-MIB                            Elective       1493
NTPV3      Network Time Protocol (Version 3)     Elective       1305
IP-MTU     Path MTU Discovery                    Elective       1191
FINGER     Finger Protocol                       Elective       1288
BGP3       Border Gateway Protocol 3 (BGP-3)     Elective  1267,1268
BOOTP      Bootstrap Protocol                    Recommended 951,1497
NICNAME    WhoIs Protocol                        Elective        954
```

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

Applicability Statements:

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

6.5. Proposed Standard Protocols

```
Protocol    Name                                  Status         RFC
========    ====================================  ============== =====
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*
IMAP4       Internet Message Access Protocol V4   Elective       1730*
PPP-MP      PPP Multilink Protocol                Elective       1717
RDBMS-MIB   RDMS MIB - using SMIv2                Elective       1697
MODEM-MIB   Modem MIB - using SMIv2               Elective       1696
ATM-MIB     ATM Management Version 8.0 using SMIv2 Elective      1695
SNANAU-MIB  SNA NAUs MIB using SMIv2              Elective       1665
PPP-TRANS   PPP Reliable Transmission             Elective       1663
BGP-4-IMP   BGP-4 Roadmap and Implementation      Elective       1656
--------    Postmaster Convention X.400 Operations Elective      1648
TN3270-En   TN3270 Enhancements                   Elective       1647
PPP-BCP     PPP Bridging Control Protocol         Elective       1638
UPS-MIB     UPS Management Information Base        Elective       1628
AAL5-MTU    Default IP MTU for use over ATM AAL5  Elective       1626
PPP-SONET   PPP over SONET/SDH                     Elective       1619
PPP-ISDN    PPP over ISDN                         Elective       1618
DNS-R-MIB   DNS Resolver MIB Extensions           Elective       1612
DNS-S-MIB   DNS Server MIB Extensions             Elective       1611
FR-MIB      Frame Relay Service MIB               Elective       1604
PPP-X25     PPP in X.25                           Elective       1598
OSPF-NSSA   The OSPF NSSA Option                  Elective       1587
OSPF-Multi  Multicast Extensions to OSPF          Elective       1584
SONET-MIB   MIB SONET/SDH Interface Type          Elective       1595
RIP-DC      Extensions to RIP to Support Demand Cir. Elective    1582
--------    Evolution of the Interfaces Group of MIB-II Elective 1573
PPP-LCP     PPP LCP Extensions                    Elective       1570
```

```
X500-MIB    X.500 Directory Monitoring MIB         Elective    1567
MAIL-MIB    Mail Monitoring MIB                     Elective    1566
NSM-MIB     Network Services Monitoring MIB         Elective    1565
CIPX        Compressing IPX Headers Over WAM Media   Elective   1553
IPXCP       PPP Internetworking Packet Exchange Control Elective 1552
CON-MD5     Content-MD5 Header Field                Elective    1544
DHCP-BOOTP  Interoperation Between DHCP and BOOTP    Elective   1534
DHCP-BOOTP  DHCP Options and BOOTP Vendor Extensions Elective   1533
BOOTP       Clarifications and Extensions BOOTP     Elective    1532
DHCP        Dynamic Host Configuration Protocol     Elective    1531
SRB-MIB     Source Routing Bridge MIB               Elective    1525
CIDR-STRA   CIDR Address Assignment...              Elective    1519
CIDR-ARCH   CIDR Architecture...                    Elective    1518
CIDR-APP    CIDR Applicability Statement            Elective    1517
--------    802.3 MAU MIB                           Elective    1515
HOST-MIB    Host Resources MIB                      Elective    1514
--------    Token Ring Extensions to RMON MIB       Elective    1513
FDDI-MIB    FDDI Management Information Base         Elective    1512
KERBEROS    Kerberos Network Authentication Ser (V5) Elective   1510
GSSAPI      Generic Security Service API: C-bindings Elective   1509
GSSAPI      Generic Security Service Application...  Elective   1508
DASS        Distributed Authentication Security...  Elective    1507
--------    X.400 Use of Extended Character Sets    Elective    1502
HARPOON     Rules for Downgrading Messages...       Elective    1496
Mapping     MHS/RFC-822 Message Body Mapping        Elective    1495
Equiv       X.400/MIME Body Equivalences            Elective    1494
IDPR        Inter-Domain Policy Routing Protocol    Elective    1479
IDPR-ARCH   Architecture for IDPR                   Elective    1478
PPP/Bridge MIB Bridge PPP MIB                       Elective    1474
PPP/IP MIB  IP Network Control Protocol of PPP MIB  Elective    1473
PPP/SEC MIB Security Protocols of PPP MIB           Elective    1472
PPP/LCP MIB Link Control Protocol of PPP MIB        Elective    1471
X25-MIB     Multiprotocol Interconnect on X.25 MIB  Elective    1461
SNMPv2      Coexistence between SNMPv1 and SNMPv2   Elective    1452
SNMPv2      Manager-to-Manager MIB                  Elective    1451
SNMPv2      Management Information Base for SNMPv2   Elective    1450
SNMPv2      Transport Mappings for SNMPv2           Elective    1449
SNMPv2      Protocol Operations for SNMPv2          Elective    1448
SNMPv2      Party MIB for SNMPv2                    Elective    1447
SNMPv2      Security Protocols for SNMPv2           Elective    1446
SNMPv2      Administrative Model for SNMPv2         Elective    1445
SNMPv2      Conformance Statements for SNMPv2       Elective    1444
SNMPv2      Textual Conventions for SNMPv2          Elective    1443
SNMPv2      SMI for SNMPv2                          Elective    1442
SNMPv2      Introduction to SNMPv2                  Elective    1441
PEM-KEY     PEM - Key Certification                 Elective    1424
PEM-ALG     PEM - Algorithms, Modes, and Identifiers Elective   1423
PEM-CKM     PEM - Certificate-Based Key Management  Elective    1422
```

```
PEM-ENC     PEM - Message Encryption and Auth      Elective      1421
SNMP-IPX    SNMP over IPX                          Elective      1420
SNMP-AT     SNMP over AppleTalk                    Elective      1419
SNMP-OSI    SNMP over OSI                          Elective      1418
FTP-FTAM    FTP-FTAM Gateway Specification         Elective      1415
IDENT-MIB   Identification MIB                     Elective      1414
IDENT       Identification Protocol               Elective      1413
DS3/E3-MIB DS3/E3 Interface Type                   Elective      1407
DS1/E1-MIB DS1/E1 Interface Type                   Elective      1406
BGP-OSPF    BGP OSPF Interaction                   Elective      1403
--------    Route Advertisement In BGP2 And BGP3   Elective      1397
SNMP-X.25   SNMP MIB Extension for X.25 Packet Layer Elective    1382
SNMP-LAPB   SNMP MIB Extension for X.25 LAPB       Elective      1381
PPP-ATCP    PPP AppleTalk Control Protocol         Elective      1378
PPP-OSINLCP PPP OSI Network Layer Control Protocol  Elective     1377
TABLE-MIB   IP Forwarding Table MIB                Elective      1354
SNMP-PARTY-MIB Administration of SNMP              Elective      1353
SNMP-SEC    SNMP Security Protocols                Elective      1352
SNMP-ADMIN SNMP Administrative Model               Elective      1351
TOS         Type of Service in the Internet        Elective      1349
PPP-AUTH    PPP Authentication                     Elective      1334
PPP-LINK    PPP Link Quality Monitoring            Elective      1333
PPP-IPCP    PPP Control Protocol                   Elective      1332
-------     X.400 1988 to 1984 downgrading         Elective      1328
-------     Mapping between X.400(1988)            Elective      1327
TCP-EXT     TCP Extensions for High Performance    Elective      1323
FRAME-MIB   Management Information Base for Frame   Elective      1315
NETFAX      File Format for the Exchange of Images Elective      1314
IARP        Inverse Address Resolution Protocol    Elective      1293
FDDI-MIB    FDDI-MIB                               Elective      1285
-------     Encoding Network Addresses             Elective      1277
-------     Replication and Distributed Operations Elective      1276
-------     COSINE and Internet X.500 Schema       Elective      1274
BGP-MIB     Border Gateway Protocol MIB (Version 3) Elective     1269
ICMP-ROUT   ICMP Router Discovery Messages         Elective      1256
OSPF-MIB    OSPF Version 2 MIB                     Elective       1253
IPSO        DoD Security Options for IP            Elective      1108
OSI-UDP     OSI TS on UDP                          Elective      1240
STD-MIBs    Reassignment of Exp MIBs to Std MIBs   Elective      1239
IPX-IP      Tunneling IPX Traffic through IP Nets  Elective      1234
GINT-MIB    Extensions to the Generic-Interface MIB Elective     1229
IS-IS       OSI IS-IS for TCP/IP Dual Environments  Elective     1195
IP-CMPRS    Compressing TCP/IP Headers             Elective      1144
NNTP        Network News Transfer Protocol         Elective       977
```

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

Applicability Statements:

     OSPF - RFC 1370 is an applicability statement for OSPF.

6.6. Telnet Options

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

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

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

6.7. Experimental Protocols

All Experimental protocols have the Limited Use status.

```
Protocol    Name                                       RFC
========    ===================================        =====
CLNP-MULT   Host Group Extensions for CLNP Multicasting 1768*
OSPF-OVFL   OSPF Database Overflow                      1765*
RWP         Remote Write ProtocolL - Version 1.0        1756*
NARP        NBMA Address Resolution Protocol            1735*
DNS-DEBUG   Tools for DNS debugging                     1713
DNS-ENCODE  DNS Encoding of Geographical Location       1712
TCP-POS     An Extension to TCP: Partial Order Service  1693
-------     DNS to Distribute RFC1327 Mail Address Mapping Tables  1664
T/TCP       TCP Extensions for Transactions             1644
UTF-7       A Mail-Safe Transformation Format of Unicode 1642
MIME-UNI    Using Unicode with MIME                     1641
FOOBAR      FTP Operation Over Big Address Records      1639
X500-CHART  Charting Networks in the X.500 Directory    1609
X500-DIR    Representing IP Information in the X.500 Directory  1608
SNMP-DPI    SNMP Distributed Protocol Interface         1592
CLNP-TUBA   Use of ISO CLNP in TUBA Environments        1561
REM-PRINT   TPC.INT Subdomain Remote Printing - Technical 1528
EHF-MAIL    Encoding Header Field for Internet Messages 1505
REM-PRT     An Experiment in Remote Printing            1486
RAP         Internet Route Access Protocol              1476
TP/IX       TP/IX: The Next Internet                    1475
X400        Routing Coordination for X.400 Services     1465
DNS         Storing Arbitrary Attributes in DNS         1464
IRCP        Internet Relay Chat Protocol                1459
TOS-LS      Link Security TOS                           1455
SIFT/UFT    Sender-Initiated/Unsolicited File Transfer  1440
DIR-ARP     Directed ARP                                1433
TEL-SPX     Telnet Authentication: SPX                  1412
TEL-KER     Telnet Authentication: Kerberos V4          1411
MAP-MAIL    X.400 Mapping and Mail-11                   1405
TRACE-IP    Traceroute Using an IP Option               1393
DNS-IP      Experiment in DNS Based IP Routing          1383
RMCP        Remote Mail Checking Protocol               1339
TCP-HIPER   TCP Extensions for High Performance         1323
MSP2        Message Send Protocol 2                     1312
DSLCP       Dynamically Switched Link Control           1307
--------    X.500 and Domains                           1279
IN-ENCAP    Internet Encapsulation Protocol             1241
CLNS-MIB    CLNS-MIB                                    1238
```

```
CFDP       Coherent File Distribution Protocol              1235
SNMP-DPI   SNMP Distributed Program Interface               1228
IP-AX.25   IP Encapsulation of AX.25 Frames                 1226
ALERTS     Managing Asynchronously Generated Alerts         1224
MPP        Message Posting Protocol                         1204
ST-II      Stream Protocol                                  1190
SNMP-BULK  Bulk Table Retrieval with the SNMP               1187
DNS-RR     New DNS RR Definitions                           1183
IMAP2      Interactive Mail Access Protocol                 1176
NTP-OSI    NTP over OSI Remote Operations                   1165
DMF-MAIL   Digest Message Format for Mail                   1153
RDP        Reliable Data Protocol                       908,1151
TCP-ACO    TCP Alternate Checksum Option                    1146
--------   Mapping full 822 to Restricted 822               1137
IP-DVMRP   IP Distance Vector Multicast Routing             1075
VMTP       Versatile Message Transaction Protocol           1045
COOKIE-JAR Authentication Scheme                            1004
NETBLT     Bulk Data Transfer Protocol                       998
IRTP       Internet Reliable Transaction Protocol            938
LDP        Loader Debugger Protocol                          909
RLP        Resource Location Protocol                        887
NVP-II     Network Voice Protocol                       ISI-memo
PVP        Packet Video Protocol                        ISI-memo
```

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

6.8. Informational Protocols

Information protocols have no status.

```
Protocol   Name                                             RFC
=======    ===================================            =====
SDMD       IPv4 Option for Sender Directed MD Delivery     1770*
SNTP       Simple Network Time Protocol                    1769*
SNOOP      Snoop Version 2 Packet Capture File Format      1761*
BINHEX     MIME Content Type for BinHex Encoded Files      1741*
RWHOIS     Referral Whois Protocol                         1714
DNS-NSAP   DNS NSAP Resource Records                       1706
RADIO-PAGE TPC.INT Subdomain: Radio Paging -- Technical Procedures 1703
GRE-IPv4   Generic Routing Encapsulation over IPv4         1702
GRE        Generic Routing Encapsulatio                    1701
TMUX       Transport Multiplexing Protocol                 1692
SNPP       Simple Network Paging Protocol - Version 2      1645
IPXWAN     Novell IPX Over Various WAN Media               1634
ADSNA-IP   Advanced SNA/IP: A Simple SNA Transport Protocol 1538
AUBR       Appletalk Update-Based Routing Protocol...      1504
TACACS     Terminal Access Control Protocol                1492
```

```
SUN-NFS    Network File System Protocol                       1094
SUN-RPC    Remote Procedure Call Protocol Version 2           1057
GOPHER     The Internet Gopher Protocol                       1436
-------    Data Link Switching: Switch-to-Switch Protocol     1434
LISTSERV   Listserv Distribute Protocol                       1429
-------    Replication Requirements                           1275
PCMAIL     Pcmail Transport Protocol                          1056
MTP        Multicast Transport Protocol                       1301
BSD Login  BSD Login                                          1282
DIXIE      DIXIE Protocol Specification                       1249
IP-X.121   IP to X.121 Address Mapping for DDN                1236
OSI-HYPER  OSI and LLC1 on HYPERchannel                       1223
HAP2       Host Access Protocol                               1221
SUBNETASGN On the Assignment of Subnet Numbers                1219
SNMP-TRAPS Defining Traps for use with SNMP                   1215
DAS        Directory Assistance Service                       1202
MD4        MD4 Message Digest Algorithm                       1186
LPDP       Line Printer Daemon Protocol                       1179
```

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

6.9. Historic Protocols

All Historic protocols have Not Recommended status.

```
Protocol   Name                                         RFC   STD
=======    ===================================          ===== ===
--------   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.

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

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

```
RFC             RFC    Status     Title                                *
====            ====   ========   ================================= =
1305 obsoletes 1119   Std  /Rec   Network Time Protocol (Version 2)
1533 obsoletes 1497   Draft/Rec   Bootstrap Protocol
1331 obsoletes 1171   Draft/Ele   Point to Point Protocol
1574 obsoletes 1139   Prop /Ele   Echo for ISO-8473
1573 obsoletes 1229   Prop /Ele   Extensions to the Generic-IF MIB
1559 obsoletes 1289   Prop /Ele   DECNET MIB
1548 obsoletes 1331   Prop /Ele   Point-to-Point Protocol (PPP)
1541 obsoletes 1531   Prop /Ele   Dynamic Host Configuration Protocol
1592 obsoletes 1228   Exper/Lim   SNMP Distributed Program Interface
1528 obsoletes 1486   Exper/Lim   An Experiment in Remote Printing
1320 obsoletes 1186   Info /       MD4 Message Digest Algorithm
1057 obsoletes 1050   Hist /Not   Remote Procedure Call Version 1
1421 obsoletes 1113   Hist /Not   Mail Privacy: Procedures
1422 obsoletes 1114   Hist /Not   Mail Privacy: Key Management
1423 obsoletes 1115   Hist /Not   Mail Privacy: Algorithms
1267 obsoletes 1163   Hist /Not   Border Gateway Protocol
1268 obsoletes 1164   Hist /Not   Border Gateway Protocol
```

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

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

7. Contacts

7.1. IAB, IETF, and IRTF Contacts

   7.1.1. Internet Architecture Board (IAB) Contact

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

      Contacts:

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

         1-503-696-8972

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         France

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   7.1.2. Internet Engineering Task Force (IETF) Contact

      Contacts:

         Paul Mockapetris
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         USC/Information Sciences Institute
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         Marina del Rey, CA 90292-6695

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         Reston, VA 22091

         1-703-620-8990

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    7.1.3. Internet Research Task Force (IRTF) Contact

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         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@ISI.EDU

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

   Please refer to the document "Assigned Numbers" (RFC-1700) for
   further information about the status of protocol documents. There
   are two documents that summarize the requirements for host and
   gateways in the Internet, "Host Requirements" (RFC-1122 and RFC-1123)
   and "Gateway Requirements" (RFC-1009).

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

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

7.3. Request for Comments Editor Contact

          Contact:

               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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