IAB 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 Activities Board (IAB).
   Distribution of this memo is unlimited.

Table of Contents

Introduction

    Discussion of the standardization process and the RFC document series
    is presented first, followed by an explanation of the terms.
    Sections 6.2 - 6.8 contain the lists of protocols in each stage of
    standardization. Finally come pointers to references and contacts
    for further information.

    This memo is intended to be issued quarterly; please be sure the copy
    you are reading is current. Current copies may be obtained from the
    Network Information Center or from the Internet Assigned Numbers
    Authority (see the contact information at the end of this memo). Do
    not use this edition after 30-Jun-91.

    See Section 6.1 for a description of recent changes. In the official
    lists in sections 6.2 - 6.8, an asterisk (*) next to a protocol
    denotes that it is new to this document or has been moved from one
    protocol level to another.

1. The Standardization Process

    The Internet Activities Board maintains this list of documents that
    define standards for the Internet protocol suite (see 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)). The IAB provides 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 majority of Internet protocol development and standardization
activity takes place in the working groups of the Internet
Engineering Task Force.

Protocols which are to become standards in the Internet go through a
series of states (proposed standard, draft standard, and standard)
involving increasing amounts of scrutiny and experimental testing.
At each step, the Internet Engineering Steering Group (IESG) of the
IETF must make a recommendation for advancement of the protocol and
the IAB must ratify it. If a recommendation is not ratified, the
protocol is remanded to the IETF for further work.

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

It is general IAB 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 the IAB may convene a special review committee
consisting of experts from the IETF, IRTF and the IAB with the
purpose of recommending an explicit action to the IAB.

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 the IAB believes 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
IAB encourages the documentation of such experimental work in the RFC
series, 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, and the IAB has approved
this step.

A few protocols have achieved widespread implementation without the
approval of the IESG and the IAB. For example, some vendor protocols
have become very important to the Internet community even though they
have not been recommended by the IESG or ratified by the IAB.
However, the IAB strongly recommends that the IAB standards process
be used in the evolution of the protocol suite to maximize
interoperability (and to prevent incompatible protocol requirements
from arising). The IAB reserves the use of the terms "standard",
"draft standard", and "proposed standard" in any RFC or other
publication of Internet protocols to only those protocols which the
IAB 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. For a proposed or
draft standard, however, the IAB will also endeavor to indicate the
eventual status this protocol will have after adoption as a standard.

Few protocols are required to be implemented in all systems; this is
because there is such a variety of possible systems, for example,
gateways, 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. In addition,
more detailed status information is 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).

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 both the IESG and the IAB. 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 "IAB 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 Network Information Center at SRI
International, 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 four other reference documents of interest in checking the
   current status of protocol specifications and standardization. These
   are the Assigned Numbers, the Annotated Internet Protocols, 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 3.5.

3.1. Assigned Numbers

   This 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-1060.

   Another document, Internet Numbers, lists the assigned IP network
   numbers, and the autonomous system numbers. Internet Numbers was
   most recently issued as RFC-1166.

3.2. Annotated Internet Protocols

   This document lists the protocols and describes any known problems
   and ongoing experiments. This document was most recently issued as
   RFC-1011.

3.3. 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.

3.4. 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.

3.5. 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 DCA and to
   the IAB. 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.

   The IAB 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).

           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. These five documents are included in the 1985 DDN Protocol
   Handbook (available from the Network Information Center, see Section
   7.4).

           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 STATE of standardization, one of "standard", "draft standard",
   "proposed standard", "experimental", "informational" or "historic".
   The second is the 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 and when possible, the IAB also
notes the status that the protocol is expected to have when it
reaches the standard state.

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 |  X  |     |
       A            +-----+-----+-----+-----+-----+
            Info    |     |  X  | XXX |  X  |  X  |
       T            +-----+-----+-----+-----+-----+
            Expr    |     |     |  X  | XXX |  X  |
       E            +-----+-----+-----+-----+-----+
            Hist    |     |     |     |  X  | 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 STATE of
standardization: "standard", "draft standard", "proposed standard",
"experimental", or "historic".

4.1.1. Standard Protocol

The IAB has established this as an official standard protocol for
the Internet. 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 IAB 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
IAB. 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 IAB 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 IAB, may
be published as RFCs for the convenience of the Internet community
as informational protocols. Such protocols may in some cases also
be recommended for use in the Internet by the IAB.

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 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 IAB 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       |          |          |  or RG   |           |
+==============================================================+
|              |          |          |          |           |
| Full or      | Publish  |  Vote    |  Bogus   |  Bogus    |
| Draft        |   (1)    |   (3)    |   (2)    |   (2)     |
| Standard     |          |          |          |           |
|              |          |          |          |           |
+--------------+----------+----------+----------+-----------+
|              |          |          |          |           |
|              | Publish  |  Vote    |  Refer   |  Refer    |
| Proposed     |   (1)    |   (3)    |   (4)    |   (4)     |
| Standard     |          |          |          |           |
|              |          |          |          |           |
+--------------+----------+----------+----------+-----------+
|              |          |          |          |           |
|              | Publish  | Notify   | Notify   | Notify    |
| Experimental |   (1)    |   (5)    |   (5)    |   (5)     |
| Protocol     |          |          |          |           |
|              |          |          |          |           |
+--------------+----------+----------+----------+-----------+
|              |          |          |          |           |
| Information  | Publish  |Discretion|Discretion|Discretion |
| or Opinion   |   (1)    |   (6)    |   (6)    |   (6)     |
| Paper        |          |          |          |           |
|              |          |          |          |           |
+==============================================================+
```

(1) Publish.

(2) Bogus. Inform the source of the rules. RFCs specifying
    Standard, or Draft Standard must come from the IAB, only.

(3) Vote by the IAB. If approved then do Publish (1), else do
    Refer (4).

(4) Refer to an Area Director for review by a WG. Expect to see
    the document again only after approval by the IESG and the
    IAB.

(5) Notify both the IESG and IRSG. If no protest in 1 week then
    do Discretion (6), else do Refer (4).

(6) 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 protest
in response to notifications (5) 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 be changed 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 four months for proposed standard, minimum
six 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 by action of the IAB; and may move from one state to
another along the track only on the recommendation of the IESG and by
action of the IAB. That is, it takes both the IESG and the IAB 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 (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  |
                                                      +===========+
```
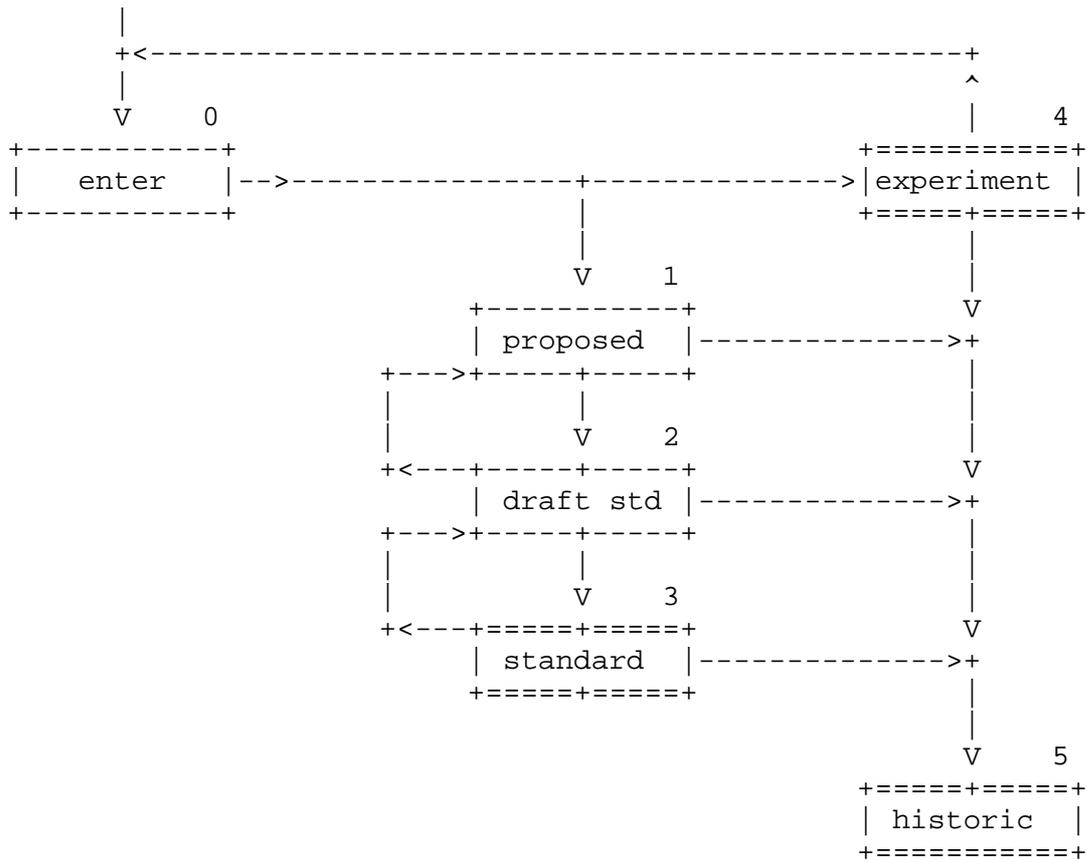
The transition from proposed standard (1) to draft standard (2) can
only be by action of the IAB on the recommendation of the IESG and
only after the protocol has been proposed standard (1) for at least
four months.

The transition from draft standard (2) to standard (3) can only be by
action of the IAB on the recommendation of the IESG and only after
the protocol has been draft standard (2) for at least six 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
IAB action.

Sometimes one protocol is replaced by another and thus becomes
historic, 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
   - 6.8 list the standards in groups by protocol state.

6.1. Recent Changes

6.1.1. New RFCs:

      1218 - Naming Scheme for c=US

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

      1217 - Memo from the Consortium for Slow Commotion Research (CSCR)

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

      1216 - Gigabit Network Economics and Paradigm Shifts

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

      1215 - A Convention for Defining Traps for use with the SNMP

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

      1214 - OSI Internet Management: Management Information Base

            A Proposed Standard protocol.

      1213 - Management Information Base for Network Management
             of TCP/IP-based internets: MIB-II

            Advanced to Draft Standard protocol.

      1212 - Concise MIB Definitions

            This is a new Proposed Standard protocol.

      1211 - Problems with the Maintenance of Large Mailing Lists

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

1210 - Network and Infrastructure User Requirements for
       Transatlantic Research Collaboration - Brussels,
       July 16-18, and Washington July 24-25, 1990

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

1209 - The Transmission of IP Datagrams over the SMDS Service

       This is a new Proposed Standard protocol.

1208 - A Glossary of Networking Terms

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

1207 - FYI on Questions and Answers - Answers to Commonly asked
       "Experienced Internet User" Questions

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

1206 - FYI on Questions and Answers - Answers to Commonly asked
       "New Internet User" Questions

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

1205 - 5250 Telnet Interface

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

1204 - Message Posting Protocol (MPP)

       This is a new Experimental protocol.

1203 - Interactive Mail Access Protocol - Version 3 (IMAP3)

       This is a new Experimental protocol.

1202 - Directory Assistance Service

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

1201 - Transmitting IP Traffic over ARCNET Networks

    A Proposed Standard protocol.

1200 - IAB Official Protocol Standards

    This memo.

1199 - <not issued yet>

1198 - FYI on the X Window System

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

1197 - Using ODA for Translating Multimedia Information

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

1196 - The Finger User Information Protocol

    A Draft Standard protocol. This edition corrects and
    clarifies in a minor way, RFC 1194.

1195 - Use of OSI IS-IS for Routing in TCP/IP and Dual
    Environments

    A Proposed Standard protocol.

1194 - The Finger User Information Protocol

    A Draft Standard protocol.

1193 - Client Requirements for Real-Time Communication Services

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

1192 - Commercialization of the Internet Summary Report

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

1191 - Path MTU Discovery (MTU)

    A Proposed Standard protocol.

1190 - Experimental Internet Stream Protocol, Version 2 (ST-II)

   A Limited-Use Experimental protocol.

1189 - The Common Management Information Services and Protocols
       for the Internet

   A Proposed Standard protocol.

1188 - A Proposed Standard for the Transmission of IP Datagrams
       over FDDI Networks

   A Draft Standard protocol.

1187 - Bulk Table Retrieval with the SNMP

   A new Experimental protocol.

1186 - The MD4 Message Digest Algorithm

   A specification of the MD4 Digest Algorithm. This is an
   information document and does not specify any level of
   standard.

1185 - TCP Extension for High-Speed Paths

   An Experimental protocol extension to TCP.

1184 - Telnet Linemode Option

   A Draft Standard protocol.

1183 - New DNS RR Definitions

   A new Experimental protocol.

1182 - <not issued yet>

1181 - RIPE Terms of Reference

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

1180 - A TCP/IP Tutorial

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

1179 - Line Printer Daemon Protocol

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

1178 - Choosing a Name for Your Computer

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

1177 - FYI on Questions and Answers - Answers to Commonly asked
        "New Internet User" Questions

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

1176 - Interactive Mail Access Protocol - Version 2 (IMAP2)

        This is a new Experimental protocol.

1175 - FYI on Where to Start - A Bibliography of
        Internetworking Information

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

1174 - IAB Recommended Policy on Distributing Internet Identifier
        Assignment and IAB Recommended Policy Change to Internet
        "Connected" Status

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

1173 - Responsibilities of Host and Network Managers: A Summary of
        the "Oral Tradition" of the Internet

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

1172 - The Point-to-Point Protocol (PPP) Initial Configuration
        Options

        A Proposed Standard protocol.

1171 - The Point-to-Point Protocol (PPP) for the
       Transmission of Multi-Protocol Datagrams
       Over Point-to-Point Links

       A Draft Standard protocol.

1170 - Public Key Standards and Licenses

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

1169 - Explaining the Role of GOSIP

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

1168 - Intermail and Commercial Mail Relay Services

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

1167 - Thoughts on the National Research and Education Network

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

1166 - Internet Numbers

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

1165 - Network Time Protocol (NTP) over the OSI Remote Operations
       Service

       An Experimental protocol.

1164 - Application of the Border Gateway Protocol in the Internet

       A Proposed Standard protocol.

1163 - A Border Gateway Protocol (BGP)

       A Proposed Standard protocol.

        1162 - Connectionless Network Protocol (ISO 8473)
               and End System to Intermediate System (ISO 9542)
               Management Information Base

               This memo does not specify a standard for the Internet
               community. However, after experimentation, if sufficient
               consensus is reached in the Internet community, then a
               subsequent revision of this document...

        1161 - SNMP over OSI

               An experimental means for running the Simple Network
               Management Protocol (SNMP) over OSI transports.

        1160 - The Internet Activities Board

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

        1159 - Message Send Protocol

               An Experimental protocol.

6.1.2. Other Changes:

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

        1213 - Management Information Base for Network Management
               of TCP/IP-based internets: MIB-II

               Advanced to Draft Standard protocol.

        1196 - The Finger User Information Protocol

               Advanced to Draft Standard protocol.

        1191 - Path MTU Discovery

               Advanced to Proposed Standard protocol.

        1189 - The Common Management Information Services and Protocols
               for the Internet

               Moved to Proposed Standard protocol.

        1188 - A Proposed Standard for the Transmission of
               IP Datagrams over FDDI Networks

               Advanced to Draft Standard protocol.

        1184 - Telnet Linemode Option

               Advanced to Draft Standard protocol.

        1171 - The Point-to-Point Protocol for the Transmission of
               Multi-Protocol Datagrams Over Point-to-Point Links

               Advanced to Draft Standard protocol.

        1163 - A Border Gateway Protocol (BGP)

               Advanced to Proposed Standard protocol.

6.2. Standard Protocols

Protocol	Name	Status	RFC
--------	Assigned Numbers	Required	1060
--------	Gateway Requirements	Required	1009
--------	Host Requirements - Communications	Required	1122
--------	Host Requirements - Applications	Required	1123
IP	Internet Protocol	Required	791
	as amended by:		
--------	IP Subnet Extension	Required	950
--------	IP Broadcast Datagrams	Required	919
--------	IP Broadcast Datagrams with Subnets	Required	922
ICMP	Internet Control Message Protocol	Required	792
IGMP	Internet Group Multicast Protocol	Recommended	1112
UDP	User Datagram Protocol	Recommended	768
TCP	Transmission Control Protocol	Recommended	793
SMI	Structure of Management Information	Recommended	1155
MIB	Management Information Base	Recommended	1156
SNMP	Simple Network Management Protocol	Recommended	1157
DOMAIN	Domain Name System	Recommended	1034,1035
TELNET	Telnet Protocol	Recommended	854
FTP	File Transfer Protocol	Recommended	959
SMTP	Simple Mail Transfer Protocol	Recommended	821
MAIL	Format of Electronic Mail Messages	Recommended	822
CONTENT	Content Type Header Field	Recommended	1049
EGP	Exterior Gateway Protocol	Recommended	904
ECHO	Echo Protocol	Recommended	862
NTP	Network Time Protocol	Recommended	1119
NETBIOS	NetBIOS Service Protocols	Elective	1001,1002
DISCARD	Discard Protocol	Elective	863
CHARGEN	Character Generator Protocol	Elective	864
QUOTE	Quote of the Day Protocol	Elective	865
USERS	Active Users Protocol	Elective	866
DAYTIME	Daytime Protocol	Elective	867
TIME	Time Server Protocol	Elective	868

Notes:

   IGMP -- The Internet Activities 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, SNMP -- The Internet Activities Board recommends that all
IP and TCP implementations be network manageable. At the current
time, this implies implementation of the Internet MIB (RFC-1156), the
MIB extension MIB-II (RFC-1158, a Draft Standard), and at least the
recommended management protocol SNMP (RFC-1157).

6.3. Network-Specific Standard Protocols

Protocol	Name	Status	RFC
ARP	Address Resolution Protocol	Elective	826
RARP	A Reverse Address Resolution Protocol	Elective	903
IP-ARPA	Internet Protocol on ARPANET	Elective	BBN 1822
IP-WB	Internet Protocol on Wideband Network	Elective	907
IP-X25	Internet Protocol on X.25 Networks	Elective	877
IP-E	Internet Protocol on Ethernet Networks	Elective	894
IP-EE	Internet Protocol on Exp. Ethernet Nets	Elective	895
IP-IEEE	Internet Protocol on IEEE 802	Elective	1042
IP-DC	Internet Protocol on DC Networks	Elective	891
IP-HC	Internet Protocol on Hyperchannel	Elective	1044
IP-ARC	Internet Protocol on ARCNET	Elective	1051
IP-SLIP	Transmission of IP over Serial Lines	Elective	1055
IP-NETBIOS	Transmission of IP over NETBIOS	Elective	1088
IP-FDDI	Transmission of IP over FDDI	Elective	1103
IP-IPX	Transmission of 802.2 over IPX Networks	Elective	1132

Notes:

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
========   ====================================   ==============   ====
FINGER     Finger Protocol                        Elective         1196*
IP-FDDI    Internet Protocol on FDDI Networks     Elective         1188*
TOPT-LINE  Telnet Linemode Option                 Elective         1184*
MIB-II     MIB-II                                 Elective         1213*
PPP        Point to Point Protocol                Elective         1171*
--------   Mail Privacy: Procedures               Elective         1113
--------   Mail Privacy: Key Management            Elective         1114
--------   Mail Privacy: Algorithms               Elective         1115
BOOTP      Bootstrap Protocol                     Recommended 951,1048,1084
RIP        Routing Information Protocol           Elective         1058
TP-TCP     ISO Transport Service on top of the TCP Elective        1006
NICNAME    WhoIs Protocol                         Elective          954
TFTP       Trivial File Transfer Protocol         Elective          783
```

Notes:

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

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

   MIB-II -- This memo defines a mandatory extension to the base MIB
   (RFC-1156) and is a Draft Standard for the Internet community. The
   extensions described here are currently Elective, but when they
   become a standard, they will have the same status as RFC-1156, that
   is, Recommended. See also the note on SMI, MIB and SNMP under
   Standards.

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-specific standard protocol state
in the future.

6.5. Proposed Standard Protocols

Protocol	Name	Status	RFC
========	=====================================	===============	====
OIM-MIB-II	OSI Internet Management: MIB-II	Elective	1214*
Concise-MIB	Concise MIB Definitions	Elective	1212*
IP-SMDS	IP Datagrams over the SMDS Service	Elective	1209*
IP-ARCNET	Transmitting IP Traffic over ARCNET Networks	Elective	1201*
IS-IS	Use of OSI IS-IS for Routing in TCP/IP and Dual Environments	Elective	1195*
IP-MTU	Path MTU Discovery	Elective	1191*
CMOT	Common Management Information Services and Protocol over TCP/IP	Elective	1189*
PPP-INIT	PPP Initial Configuration Options	Elective	1172*
BGP	Border Gateway Protocol	Elective	1163,1164*
IP-CMPRS	Compressing TCP/IP Headers	Elective	1144
--------	Echo for ISO-8473	Elective	1139
OSPF	Open Shortest Path First Routing	Elective	1131
TOPT-ENV	Telnet Environment Option	Elective	1116*
SUN-NFS	Network File System Protocol	Elective	1094
POP3	Post Office Protocol, Version 3	Elective	1081,1082
SUN-RPC	Remote Procedure Call Protocol	Elective	1057
PCMAIL	Pcmail Transport Protocol	Elective	1056
NFILE	A File Access Protocol	Elective	1037
--------	Mapping between X.400(84) and RFC-822	Elective	987,1026
NNTP	Network News Transfer Protocol	Elective	977
HOSTNAME	HOSTNAME Protocol	Elective	953
SFTP	Simple File Transfer Protocol	Elective	913
RLP	Resource Location Protocol	Elective	887
SUPDUP	SUPDUP Protocol	Elective	734

Notes:

IP-SMDS and IP-ARCNET -- These define methods of sending IP over
particular network types. It is anticipated that these will be
advanced to the network specific standard protocol state in the
future.

6.6. Experimental Protocols

Protocol	Name	Status	RFC
MPP	Message Posting Protocol	Limited Use	1204*
ST-II	Stream Protocol	Limited Use	1190*
SNMP-BULK	Bulk Table Retrieval with the SNMP	Limited Use	1187*
DNS-RR	New DNS RR Definitions	Limited Use	1183*
NTP-OSI	NTP over OSI Remote Operations	Limited Use	1165*
MSP	Message Send Protocol	Limited Use	1159*
EHF-MAIL	Encoding Header Field for Mail	Elective	1154
DMF-MAIL	Digest Message Format for Mail	Elective	1153
RDP	Reliable Data Protocol	Limited Use	908,1151
--------	Mapping between X.400(88) and RFC-822	Elective	1148
TCP-ACO	TCP Alternate Checksum Option	Not Recommended	1146
--------	Mapping full 822 to Restricted 822	Elective	1137
IP-DVMRP	IP Distance Vector Multicast Routing	Not Recommended	1075
TCP-LDP	TCP Extensions for Long Delay Paths	Limited Use	1072
IMAP2	Interactive Mail Access Protocol	Limited Use	1176,1064
IMAP3	Interactive Mail Access Protocol	Limited Use	1203*
VMTP	Versatile Message Transaction Protocol	Elective	1045
COOKIE-JAR	Authentication Scheme	Not Recommended	1004
NETBLT	Bulk Data Transfer Protocol	Not Recommended	998
IRTP	Internet Reliable Transaction Protocol	Not Recommended	938
AUTH	Authentication Service	Not Recommended	931
LDP	Loader Debugger Protocol	Not Recommended	909
NVP-II	Network Voice Protocol	Limited Use	ISI-memo
PVP	Packet Video Protocol	Limited Use	ISI-memo

6.7. Informational Protocols

Protocol	Name	RFC
SNMP-TRAPS	A Convention for Defining Traps for use with SNMP	1215*
DAS	Directory Assistance Service	1202*
-------	FYI on the X Window System	1198*
ODA	Office Document Architecture	1197*
MD4	MD4 Message Digest Algorithm	1186*
LPDP	Line Printer Daemon Protocol	1179*

6.8. Historic Protocols

Protocol	Name	Status	RFC
SGMP	Simple Gateway Monitoring Protocol	Not Recommended	1028
HEMS	High Level Entity Management Protocol	Not Recommended	1021
STATSRV	Statistics Server	Not Recommended	996
POP2	Post Office Protocol, Version 2	Not Recommended	937
RATP	Reliable Asynchronous Transfer Protocol	Not Recommended	916
THINWIRE	Thinwire Protocol	Not Recommended	914
HMP	Host Monitoring Protocol	Not Recommended	869
GGP	Gateway Gateway Protocol	Not Recommended	823
RTELNET	Remote Telnet Service	Not Recommended	818
CLOCK	DCNET Time Server Protocol	Not Recommended	778
MPM	Internet Message Protocol	Not Recommended	759
NETRJS	Remote Job Service	Not Recommended	740
NETED	Network Standard Text Editor	Not Recommended	569
RJE	Remote Job Entry	Not Recommended	407
XNET	Cross Net Debugger	Not Recommended	IEN-158
NAMESERVER	Host Name Server Protocol	Not Recommended	IEN-116
MUX	Multiplexing Protocol	Not Recommended	IEN-90
GRAPHICS	Graphics Protocol	Not Recommended	NIC-24308

7. Contacts

7.1. IAB, IETF, and IRTF Contacts

   7.1.1. Internet Activities Board (IAB) Contact

      Contact:

         Bob Braden
         Executive Director of the IAB
         USC/Information Sciences Institute
         4676 Admiralty Way
         Marina del Rey, CA 90292-6695

         1-213-822-1511

         Braden@ISI.EDU

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

7.1.2. Internet Engineering Task Force (IETF) Contact

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Phill Gross
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Corporation for National Research Initiatives (NRI)
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7.1.3. Internet Research Task Force (IRTF) Contact

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1-617-253-6003

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7.2. Internet Assigned Numbers Authority Contact

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Joyce K. Reynolds
Internet Assigned Numbers Authority
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4676 Admiralty Way
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The protocol standards are managed for the IAB by the Internet
Assigned Numbers Authority.

Please refer to the documents "Assigned Numbers" (RFC-1060) and
"Official Internet Protocols" (RFC-1011) 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 "IAB Official
   Protocol Standards" memo:

      The file "in-notes/iab-standards.txt" may be copied via FTP
      from the VENERA.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
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   Documents may be submitted via electronic mail to the RFC Editor for
   consideration for publication as RFC. If you are not familiar with
   the format or style requirements please request the "Instructions for
   RFC Authors". In general, the style of any recent RFC may be used as
   a guide.

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

      Contact:

         DDN Network Information Center
         SRI International
         Room EJ291
         333 Ravenswood Avenue
         Menlo Park, CA 94025

         1-800-235-3155
         1-415-859-3695

         NIC@NIC.DDN.MIL

The Network Information Center (NIC) provides many information
services for the Internet community. Among them is maintaining the
Requests for Comments (RFC) library.

RFCs can be obtained via FTP from NIC.DDN.MIL, with the pathname
RFC:RFCnnnn.TXT where "nnnn" refers to the number of the RFC. A list
of all RFCs may be obtained by copying the file RFC:RFC-INDEX.TXT.
Log in with FTP username ANONYMOUS and password GUEST.

The NIC also provides an automatic mail service for those sites which
cannot use FTP. Address the request to SERVICE@NIC.DDN.MIL and in
the subject field of the message indicate the file name, as in
"Subject: SEND RFC:RFCnnnn.TXT".

Some RFCs are now available in PostScript, these may be obtained from
the NIC in a similar fashion by substituting ".PS" for ".TXT".

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

      The file RFC:IAB-STANDARDS.TXT may be copied via FTP from the
      NIC.DDN.MIL computer following the same procedures used to
      obtain RFCs.

7.5. Other Sources for Requests for Comments

   7.5.1. NSF Network Service Center (NNSC)

      NSF Network Service Center (NNSC)
      BBN Laboratories, Inc.
      10 Moulton St.
      Cambridge, MA 02238

      617-873-3400

      NNSC@NNSC.NSF.NET

   7.5.2. NSF Network Information Service (NIS)

      NSF Network Information Service
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      University of Michigan
      1075 Beal Avenue
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      313-763-4897

      INFO@NIS.NSF.NET

   7.5.3. CSNET Coordination and Information Center (CIC)

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          617-873-2777

          INFO@SH.CS.NET

8. Security Considerations

    Security issues are not addressed in this memo.

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