                   The Internet Activities Board

Status of this Memo

   This RFC provides a history and description of the Internet
   Activities Board (IAB) and its subsidiary organizations. This memo
   is for informational use and does not constitute a standard.
   Distribution of this memo is unlimited.

1. Introduction

   In 1968, the U.S. Defense Advanced Research Projects Agency (DARPA)
   initiated an effort to develop a technology which is now known as
   packet switching. This technology had its roots in message switching
   methods, but was strongly influenced by the development of low-cost
   minicomputers and digital telecommunications techniques during the
   mid-1960's [BARAN 64, ROBERTS 70, HEART 70, ROBERTS 78]. A very
   useful survey of this technology can be found in [IEEE 78].

   During the early 1970's, DARPA initiated a number of programs to
   explore the use of packet switching methods in alternative media
   including mobile radio, satellite and cable [IEEE 78, IEEE 87].
   Concurrently, Xerox Palo Alto Research Center (PARC) began an
   exploration of packet switching on coaxial cable which ultimately led
   to the development of Ethernet local area networks [METCALFE 76].

   The successful implementation of packet radio and packet satellite
   technology raised the question of interconnecting ARPANET with other
   types of packet nets. A possible solution to this problem was
   proposed by Cerf and Kahn [CERF 74] in the form of an internetwork
   protocol and a set of gateways to connect the different networks.
   This solution was further developed as part of a research program in
   internetting sponsored by DARPA and resulted in a collection of
   computer communications protocols based on the original Transmission
   Control Protocol (TCP) and its lower level counterpart, Internet
   Protocol (IP). Together, these protocols, along with many others
   developed during the course of the research, are referred to as the
   TCP/IP Protocol Suite [LEINER 85, POSTEL 85, CERF 82, CLARK 86, RFC
   1100].

   In the early stages of the Internet research program, only a few
   researchers worked to develop and test versions of the internet
   protocols. Over time, the size of this activity increased until, in

1979, it was necessary to form an informal committee to guide the
technical evolution of the protocol suite. This group was called the
Internet Configuration Control Board (ICCB) and was established by
Dr. Vinton Cerf who was then the DARPA program manager for the
effort. Dr. David C. Clark of the Lab for Computer Science at
Massachusetts Institute of Technology was named the chairman of this
committee.

In January, 1983, the Defense Communications Agency, then responsible
for the operation of the ARPANET, declared the TCP/IP protocol suite
to be standard for the ARPANET and all systems on the network
converted from the earlier Network Control Program (NCP) to TCP/IP.
Late that year, the ICCB was reorganized by Dr. Barry Leiner, Cerf's
successor at DARPA, around a series of task forces considering
different technical aspects of internetting. The re-organized group
was named the Internet Activities Board.

As the Internet expanded, it drew support from U.S. Government
organizations including DARPA, the National Science Foundation (NSF),
the Department of Energy (DOE) and the National Aeronautics and Space
Administration (NASA). Key managers in these organizations,
responsible for computer networking research and development, formed
an informal Federal Research Internet Coordinating Committee (FRICC)
to coordinate U.S. Government support for and development and use of
the Internet system. The FRICC sponsors most of the U.S. research on
internetting, including support for the Internet Activities Board and
its subsidiary organizations.

At the international level, a Coordinating Committee for
Intercontinental Research Networks (CCIRN) has been formed which
includes the U.S. FRICC and its counterparts in North America and
Europe. The CCIRN provides a forum for cooperative planning among
the principal North American and European research networking bodies.

2. Internet Activities Board

The Internet Activities Board (IAB) is the coordinating committee for
Internet design, engineering and management. The Internet is a
collection of over a thousand packet switched networks located
principally in the U.S., but also includes systems in many other
parts of the world, all interlinked and operating using the protocols
of the TCP/IP protocol suite. The IAB is an independent committee of
researchers and professionals with a technical interest in the health
and evolution of the Internet system. Membership changes with time
to adjust to the current realities of the research interests of the
participants, the needs of the Internet system and the concerns of
the U.S. Government, university and industrial sponsors of the
elements of the Internet.

IAB members are deeply committed to making the Internet function
effectively and evolve to meet a large scale, high speed future. All
IAB members are required to have at least one other major role in the
Internet community in addition to their IAB membership. New members
are appointed by the chairman of the IAB, with the advice and consent
of the remaining members. The chairman serves a term of two years.

The IAB focuses on the TCP/IP protocol suite, and extensions to the
Internet system to support multiple protocol suites.

The IAB has two principal subsidiary task forces:

    1) Internet Engineering Task Force (IETF)

    2) Internet Research Task Force (IRTF)

Each of these Task Forces is led by a chairman and guided by a
Steering Group which reports to the IAB through its chairman. Each
task force is organized by the chairman, as required, to carry out
its charter. For the most part, a collection of Working Groups
carries out the work program of each Task Force.

All decisions of the IAB are made public. The principal vehicle by
which IAB decisions are propagated to the parties interested in the
Internet and its TCP/IP protocol suite is the Request for Comment
(RFC) note series. The archival RFC series was initiated in 1969 by
Dr. Stephen D. Crocker as a means of documenting the development of
the original ARPANET protocol suite [RFC 1000]. The editor-in-chief
of this series, Dr. Jonathan B. Postel, has maintained the quality
of and managed the archiving of this series since its inception. A
small proportion of the RFCs document Internet standards. Most of
them are intended to stimulate comment and discussion. The small
number which document standards are especially marked in a "status"
section to indicate the special status of the document. An RFC
summarizing the status of all standard RFCs is published regularly
[RFC 1100].

RFCs describing experimental protocols, along with other submissions
whose intent is merely to inform, are typically submitted directly to
the RFC Editor. A Standard RFC starts out as a Proposed Standard and
may be promoted to Draft Standard and finally Standard after suitable
review, comment, implementation, and testing.

Prior to publication of a Proposed Standard, Draft Standard or
Standard RFC, it is made available for comment through an on-line
Internet-Draft directory. Typically, these Internet-Drafts are
working documents of the IAB or of the working groups of the Internet
Engineering and Research Task Forces. Internet Drafts are either

submitted to the RFC Editor for publication or discarded within three months.

The IAB performs the following functions:

    1)   Sets Internet Standards,

    2)   Manages the RFC publication process,

    3)   Reviews the operation of the IETF and IRTF,

    4)   Performs strategic planning for the Internet, identifying
         long-range problems and opportunities,

    5)   Acts as a technical policy liaison and representative for the
         Internet community, and

    6)   Resolves technical issues which cannot be treated within the
         IETF or IRTF frameworks.

To supplement its work via electronic mail, the IAB meets quarterly to review the condition of the Internet, to review and approve proposed changes or additions to the TCP/IP suite of protocols, to set technical development priorities, to discuss policy matters which may need the attention of the Internet sponsors, and to agree on the addition or retirement of IAB members and on the addition or retirement of task forces reporting to the IAB. Typically, two of the quarterly meetings are by means of video teleconferencing (provided, when possible, through the experimental Internet packet video-conferencing system).

The IAB membership is currently as follows:

          Vinton Cerf   - Chairman
          David Clark   - IRTF Chairman
          Phillip Gross   - IETF Chairman
          Jonathan Postel   - RFC Editor
          Robert Braden   - Executive Director
          Hans-Werner Braun   - Member
          Barry Leiner   - Member
          Daniel Lynch   - Member
          Stephen Kent   - Member

3. The Internet Engineering Task Force

    The Internet has grown to encompass a large number of widely geo-
    graphically dispersed networks in academic and research communities.
    It now provides an infrastructure for a broad community with various

interests. Moreover, the family of Internet protocols and system
components has moved from experimental to commercial development. To
help coordinate the operation, management and evolution of the
Internet, the IAB established the Internet Engineering Task Force
(IETF).

The IETF is chaired by Mr. Phillip Gross and managed by its Internet
Engineering Steering Group (IESG). The IAB has delegated to the IESG
the general responsibility for making the Internet work and for the
resolution of all short- and mid-range protocol and architectural
issues required to make the Internet function effectively.

The charter of the IETF includes:

   1) Responsibility for specifying the short and mid-term
      Internet protocols and architecture and recommending
      standards for IAB approval.

   2) Provision of a forum for the exchange of information within the
      Internet community.

   3) Identification of pressing and relevant short- to mid-range
      operational and technical problem areas and convening of
      Working Groups to explore solutions.

The Internet Engineering Task Force is a large open community of
network designers, operators, vendors, and researchers concerned with
the Internet and the Internet protocol suite. It is organized around
a set of eight technical areas, each managed by a technical area
director. In addition to the IETF Chairman, the area directors make
up the IESG membership. Each area director has primary
responsibility for one area of Internet engineering activity, and
hence for a subset of the IETF Working Groups. The area directors
have jobs of critical importance and difficulty and are selected not
only for their technical expertise but also for their managerial
skills and judgment. At present, the eight technical areas and
chairs are:

                1) Applications   - TBD
                2) Host Services   - Craig Partridge
                3) Internet Services   - Noel Chiappa
                4) Routing   - Robert Hinden
                5) Network Management   - David Crocker
                6) OSI Coexistence   - Ross Callon and Robert Hagens
                7) Operations   - TBD
                8) Security   - TBD

The work of the IETF is performed by subcommittees known as Working

Groups. There are currently more than 20 of these. Working Groups
tend to have a narrow focus and a lifetime bounded by completion of a
specific task, although there are exceptions. The IETF is a major
source of proposed protocol standards, for final approval by the IAB.

The IETF meets quarterly and extensive minutes of the plenary
proceedings as well as reports from each of the working groups are
issued by the IAB Secretariat, at the Corporation for National
Research Initiatives.

4.   The Internet Research Task Force

To promote research in networking and the development of new
technology, the IAB established the Internet Research Task Force
(IRTF).

In the area of network protocols, the distinction between research
and engineering is not always clear, so there will sometimes be
overlap between activities of the IETF and the IRTF. There is, in
fact, considerable overlap in membership between the two groups. This
overlap is regarded as vital for cross-fertilization and technology
transfer. In general, the distinction between research and
engineering is one of viewpoint and sometimes (but not always) time-
frame. The IRTF is generally more concerned with understanding than
with products or standard protocols, although specific experimental
protocols may have to be developed, implemented and tested in order
to gain understanding.

The IRTF is a community of network researchers, generally with an
Internet focus. The work of the IRTF is governed by its Internet
Research Steering Group (IRSG). The chairman of the IRTF and IRSG is
David Clark. The IRTF is organized into a number of Research Groups
(RGs) whose chairs are appointed by the chairman of the IRSG. The RG
chairs and others selected by the IRSG chairman serve on the IRSG.

These groups typically have 10 to 20 members, and each covers a broad
area of research, pursuing specific topics, determined at least in
part by the interests of the members and by recommendations of the
IAB.

The current members of the IRSG are as follows:

            David Clark   - Chairman
            Robert Braden   - End-to-End Services
            Douglas Comer   - Member at Large
            Deborah Estrin   - Autonomous Networks

                    Stephen Kent   - Privacy and Security
                    Keith Lantz   - User Interfaces
                    David Mills   - Member at Large

5. The Near-term Agenda of the IAB

   There are seven principal foci of IAB attention for the period 1989 -
   1990:

       1) Operational Stability
       2) User Services
       3) OSI Coexistence
       4) Testbed Facilities
       5) Security
       6) Getting Big
       7) Getting Fast

   Operational stability of the Internet is a critical concern for all
   of its users. Better tools are needed for gathering operational
   data, to assist in fault isolation at all levels and to analyze the
   performance of the system. Opportunities abound for increased
   cooperation among the operators of the various Internet components
   [RFC 1109]. Specific, known problems should be dealt with, such as
   implementation deficiencies in some version of the BIND domain name
   service resolver software. To the extent that the existing Exterior
   Gateway Protocol (EGP) is only able to support limited topologies,
   constraints on topological linkages and allowed transit paths should
   be enforced until a more general Inter-Autonomous System routing
   protocol can be specified. Flexibility for Internet implementation
   would be enhanced by the adoption of a common internal gateway
   routing protocol by all vendors of internet routers. A major effort
   is recommended to achieve conformance to the Host Requirements RFCs
   which are to be published early in the fourth quarter of calendar
   1989.

   Among the most needed user services, the White Pages (an electronic
   mailbox directory service) seems the most pressing. Efforts should
   be focused on widespread deployment of these capabilities in the
   Internet by mid-1990. The IAB recommends that existing white pages
   facilities and newer ones, such as X.500, be populated with up-to-
   date user information and made accessible to Internet users and users
   of other systems (e.g., commercial email carriers) linked to the
   Internet. Connectivity with commercial electronic mail carriers
   should be vigorously pursued, as well as links to other network
   research communities in Europe and the rest of the world.

   Development and deployment of privacy-enhanced electronic mail
   software should be accelerated in 1990 after release of public domain

software implementing the private electronic mail standards [RFC 1113, RFC 1114, and RFC 1115]. Finally, support for new or enhanced applications such as computer-based conferencing, multi-media messaging and collaboration support systems should be developed.

The National Network Testbed (NNT) resources planned by the FRICC should be applied to support conferencing and collaboration protocol development and application experiments and to support multi-vendor router interoperability testing (e.g., interior and exterior routing, network management, multi-protocol routing and forwarding).

With respect to growth in the Internet, architectural attention should be focused on scaling the system to hundreds of millions of users and hundreds of thousands of networks. The naming, addressing, routing and navigation problems occasioned by such growth should be analyzed. Similarly, research should be carried out on analyzing the limits to the existing Internet architecture, including the ability of the present protocol suite to cope with speeds in the gigabit range and latencies varying from microseconds to seconds in duration.

The Internet should be positioned to support the use of OSI protocols by the end of 1990 or sooner, if possible. Provision for multi-protocol routing and forwarding among diverse vendor routes is one important goal. Introduction of X.400 electronic mail services and interoperation with RFC 822/SMTP [RFC 822, RFC 821, RFC 987, RFC 1026] should be targeted for 1990 as well. These efforts will need to work in conjunction with the White Pages services mentioned above. The IETF, in particular, should establish liaison with various OSI working groups (e.g., at NIST, RARE, Network Management Forum) to coordinate planning for OSI introduction into the Internet and to facilitate registration of information pertinent to the Internet with the various authorities responsible for OSI standards in the United States.

Security Considerations

Finally, with respect to security, a concerted effort should be made to develop guidance and documentation for Internet host managers concerning configuration management, known security problems (and their solutions) and software and technologies available to provide enhanced security and privacy to the users of the Internet.

REFERENCES

[BARAN 64] Baran, P., et al, "On Distributed Communications", Volumes I-XI, RAND Corporation Research Documents, August 1964.

[CERF 74] Cerf V., and R. Kahn, "A Protocol for Packet Network

Interconnection", IEEE Trans. on Communications, Vol. COM-22,
No. 5, pp. 637-648, May 1974.

[CERF 82] Cerf V., and E. Cain, "The DoD Internet Protocol
Architecture", Proceedings of the SHAPE Technology Center
Symposium on Interoperability of Automated Data Systems,
November 1982. Also in Computer Networks and ISDN,
Vol. 17, No. 5, October 1983.

[CLARK 86] Clark, D., "The Design Philosophy of the DARPA
Internet protocols", Proceedings of the SIGCOMM '88 Symposium,
Computer Communications Review, Vol. 18, No. 4, pp. 106-114,
August 1988.

[HEART 70] Heart, F., R. Kahn, S. Ornstein, W. Crowther, and D.
Walden, "The Interface Message Processor for the ARPA Computer
Network", AFIPS Conf. Proc. 36, pp. 551-567, June 1970.

[IEEE 78] Kahn, R. (Guest Editor), K. Uncapher, and
H. Van Trees (Associate Guest Editors), Proceedings of the
IEEE, Special Issue on Packet Communication Networks,
Volume 66, No. 11, pp. 1303-1576, November 1978.

[IEEE 87] Leiner, B. (Guest Editor), D. Nielson, and
F. Tobagi (Associate Guest Editors), Proceedings of the
IEEE, Special Issue on Packet Radio Networks, Volume 75,
No. 1, pp. 1-272, January 1987.

[LEINER 85] Leiner, B., R. Cole, J. Postel, and D. Mills,
"The DARPA Protocol Suite", IEEE INFOCOM 85, Washington, D.C.,
March 1985. Also in IEEE Communications Magazine, March 1985.

[METCALFE 76] Metcalfe, R., and D. Boggs, "Ethernet:
Distributed Packet for Local Computer Networks", Communications
of the ACM, Vol. 19, No. 7, pp. 395-404, July 1976.

[POSTEL 85] Postel, J., "Internetwork Applications Using the
DARPA Protocol Suite", IEEE INFOCOM 85, Washington, D.C.,
March 1985.

[RFC 821] Postel, J., "Simple Mail Transfer Protocol", RFC 821,
USC/Information Sciences Institute, August 1982.

[RFC 822] Crocker, D., "Standard for the Format of ARPA Internet
Text Messages", RFC 822, University of Delaware, August 1982.

[RFC 987] Kille, S., "Mapping between X.400 and RFC 822",
University College London, June 1986.

     [RFC 1000]   Reynolds, J., and J. Postel, "The Request for
     Comments References Guide", USC/Information Sciences Institute,
     RFC 1000, August 1987.

     [RFC 1026]   Kille, S., "Addendum to RFC 987: (Mapping between
     X.400 and RFC 822)", RFC 1026, University College London,
     September 1987.

     [RFC 1100]   Postel, J. (Editor), "IAB Official Protocol
     Standards", RFC 1100, April 1989.

     [RFC 1109]   Cerf, V., "Report of the Second Ad Hoc Network
     Management Review Group", RFC 1109, NRI, August 1989.

     [RFC 1113]   Linn, J., "Privacy Enhancement for Internet
     Electronic Mail: Part I -- Message Encipherment and
     Authentication Procedures", RFC 1113, IAB Privacy Task
     Force, August 1989.

     [RFC 1114]   Kent, S., and J. Linn, "Privacy Enhancement for
     Internet Electronic Mail: Part II -- Certificate-based Key
     Management", RFC 1114, IAB Privacy Task Force, August 1989.

     [RFC 1115]   Linn, J., "Privacy Enhancement for Internet
     Electronic Mail: Part III -- Algorithms, Modes and Identifiers",
     RFC 1115, IAB Privacy Task Force, August 1989.

     [ROBERTS 70]   Roberts, L., and B. Wessler, "Computer Network
     Development to Achieve Resource Sharing", pp. 543-549,
     Proc. SJCC 1970.

     [ROBERTS 78]   Roberts, L., "Evolution of Packet Switching",
     Proc. IEEE, Vol. 66, No. 11, pp. 1307-1313, November 1978.

     Note: RFCs are available from the Network Information Center at
     SRI International, 333 Ravenswood Ave., Menlo Park, CA 94025,
     (1-800-235-3155), or on-line via anonymous file transfer from
     NIC.DDN.MIL.

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