               Building a Network Information Services Infrastructure


Status of This Memo

   This memo provides information for the Internet community.  It does
   not specify an Internet standard.  Distribution of this memo is
   unlimited.

Abstract

   This FYI RFC document is intended for existing Internet Network
   Information Center (NIC) personnel, people interested in establishing
   a new NIC, Internet Network Operations Centers (NOCs), and funding
   agencies interested in contributing to user support facilities.  The
   document strives to:

      - Define a basic set of essential services that Network
        Information Centers (NICs) will provide to Internet users,
        including new mechanisms that will facilitate the timely
        dissemination of information to the Internet community and
        encourage cooperation among NICs.

      - Describe existing NIC services as an aid to Internet users
        and as a model for organizations establishing new NICs.

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1. PURPOSE

   The purpose of this document is to define the role of NICs in the
   Internet and establish guidelines for new and existing NICs regarding
   the user services they provide.  This document is also a move toward
   standardizing NIC services, which will aid in the development of an
   overall information infrastructure that will allow NICs to easily and
   routinely cooperate in assisting users.

   NICs for networks that are part of the Internet may be called upon to
   serve users of the greater Internet as well as those of their own
   networks.  This responsibility brings with it the added challenge of
   coordinating services with other NICs to better serve the general
   Internet community.  Toward that end, this document also proposes
   some easily implemented changes to facilitate the exchange of
   information and services between NICs.

2. DEVELOPMENT GUIDELINES

   The NISI working group observed several guidelines when developing
   this FYI RFC.

   1.  While recognizing that the new infrastructure should be built
   on existing services, programs, and technology, the working group
   did not want to limit its thinking to the present, preferring to
   consider new approaches and to think toward the future.  The goal
   is to move in the direction of an information services
   infrastructure for the National Research and Education Network
   (NREN).

   2.  The working group recognizes that a user support system must
   accommodate a diverse user population, from novice to network
   sophisticate.

   3.  The working group recognizes that not all NICs are interested
   in providing service at the Internet level nor in providing service
   directly to end users.  Some NICs have special areas of interest
   and serve a more limited community.  Many campus NICs, for example,
   restrict the scope of their efforts to campus computing activities.
   Therefore, an Internet NIC must have policies, procedures, and
   delivery mechanisms in place to serve not only end-users, but to
   aid other information providers and user support agencies.

3.  DEFINITION OF A NIC AND OF A NOC

   A Network Information Center is an organization whose goal is to
   provide informational, administrative, and procedural support,
   primarily to users of its network and, secondarily, to users of the
   greater Internet and to other service agencies.

   A Network Operations Center (NOC) is an organization whose goal is to
   oversee and maintain the daily operations of a network.  Although
   sometimes one organization may fulfill the duties of both a NIC and a
   NOC, this document assumes NIC functions to be separate from NOC
   functions and addresses NIC functions only.  Obviously, however, a
   NIC must work closely with its NOC to ensure users get the best
   service possible.

4.  HISTORY

   When the original Advanced Research Projects Agency Network (ARPANET)
   was formed, SRI was assigned the essential administrative task of
   registering every host on the network and maintaining the Official
   Host Table.  This host table was needed to interconnect the hosts
   into a network.  SRI also became the repository for the RFCs, most of

which were only available in paper copies because a file transfer
protocol had yet to be specified.  Because of its role as a central
information repository in these ways, SRI became the natural place
for users to call with questions, and the first NIC was born.

In 1984, the original network split into two networks: the ARPANET
and the MILNET.  The ARPANET was laid to rest in 1990, and the
original NIC became the Defense Data Network NIC (DDN-NIC).  This NIC
was sometimes referred to as the "SRI-NIC" or sometimes simply as
"the NIC".  Today this NIC is maintained by Government Systems, Inc.,
and provides information services to the MILNET portion of the DDN,
as well as performing several administrative duties that serve the
entire Internet community.  SRI continues to provide general Internet
information services and maintains an FTP repository.

The days of having just one or two networks are long gone.  Today,
the Internet is an international collection of thousands of networks
interconnected with the TCP/IP protocols.  Users of any one of these
networks can use the network services provided by TCP/IP to reach any
of the other networks.

There are other major wide area networks, such as BITNET and DECnet
networks, that are not based on the TCP/IP protocols and are thus not
considered part of the Internet itself.  However, users can
communicate between these networks and the Internet via electronic
mail, so Internet NICs often answer questions regarding these
networks.

NICs exist for many of the networks that make up today's Internet.
For example, in addition to the MILNET, in the United States there
are the National Science Foundation Network (NSFNET), the Energy
Science Network (ESnet), and the NASA Science Internet (NSI).  All of
these networks provide NICs.

BITNET is a non-TCP/IP network that is accessible to the Internet via
electronic mail.  Its administrative organization, the Corporation
for Research and Educational Networking (CREN), supports NIC services
for BITNET users.

Many networks in countries other than the United States also provide
NIC services.  For example, such services exist for NORDUnet, which
connects national networks in the Nordic countries, and JANet, the
Joint Academic Network in the United Kingdom.  The BITNET
counterparts in Europe and Canada are the European Academic and
Research Network (EARN) and NetNorth, respectively.

5.  ESSENTIAL NIC FUNCTIONS

   Network Information Centers exist to provide services that make using
   the network easier and more attractive to users.

   To help meet this goal, four essential NIC functions have been
   identified as those that every Internet NIC should perform.  These
   are the basic functions that define the minimum level of Internet
   information service.  Each Internet NIC should:

      - Provide information resources.
      - Support end-users through direct contact.
      - Collect and maintain NIC referral information.
      - Support the NIC infrastructure.

   The level of each service and the exact mechanisms for providing
   these services depend on the needs of the particular network user
   community.  Funding, staffing, and implementation issues related to
   these functions are left up to individual NIC organizations.

   Presently, only the first two functions, providing information
   resources and directly supporting end-users, are routinely performed
   by Internet NICs.  The variety of ways in which these services are
   provided is described more fully in the section on, "Examples of
   Present NIC Services".

   The last two functions, collecting information about other NICs and
   supporting the NIC infrastructure, are new roles that have evolved as
   the Internet community and the number of NICs have grown.

   Each of these four essential functions is discussed in some depth in
   this section.

5.1  Provide Information Resources

   Information resources refers to both online and hard-copy resources,
   such as online files, marketing information, and newsletters.  NICs
   help users gain access to relevant information in several ways.

      - Obtain information online from other sites and store
        it at the local NIC where users may access it.

      - Refer users to information stored at other locations
        around the Internet.  This option requires that each
        NIC maintain up-to-date information regarding such

Internet resources.

   - Create information, such as newsletters, marketing
     information, tutorial files or documents, and make
     it available to users.  In this case, the "creating
     NIC" is solely responsible for the content and
     accuracy of the information provided.

In all of the cases above, users need a way to verify the
authenticity and currentness of the information.  Accordingly, each
NIC should provide the following information for everything it makes
available to its users and the Internet community: 1) a time stamp,
2) a revision number, and 3) the name of the NIC that produced the
document.  The NIC should also maintain contact information regarding
the source of a file, but does not necessarily have to include such a
contact in the online file.

5.2  Support End-Users

A NIC serves as the principle source of network information for its
end users.  NICs field a variety of user inquiries, such as requests
for how to get connected to the Internet, how to locate and access a
particular application on the network, how to determine an e-mail
address, and how to solve operational problems.  Each NIC must take a
best effort approach to responding to these inquiries and take
responsibility for a user inquiry until it is resolved in some way.
Resolution may be answering the question, referring the user to the
appropriate information source, or coordinating with a NOC to resolve
a user connectivity problem.

To facilitate this role of information provider, the following
delivery mechanisms are used:

   - Telephone "hotline" support.  All NICs need to be
     available to answer phone inquiries during the
     business day.

   - Electronic mail.  An electronic mail address acts as
     an electronic help desk.  For consistency, the
     electronic mail address should be of the form
     NIC@domain (e.g., NIC@DDN.MIL).  Such a common
     addressing convention will move toward
     standardization of these "electronic help desks" and
     will increase the chance that users will know where
     to ask for help.  In addition, a user inquiry to a
     NIC e-mail address should either produce a human
     response or an up-to-date machine response that
     performs a triage function by advising the user

where to go for particular categories of problems.
For example, a message to NIC@NSF.NET could return a
message alerting the user to the NNSC@NNSC.NSF.NET
and the NSFNET-INFO@MERIT.EDU mailboxes, both of
which provide information for NSFNET.

- Electronic information transfer.  NICs should
  provide information in electronic form, and make it
  available across the Internet through mechanisms
  such as anonymous file transfer, electronic mail,
  and remote databases.

5.3  Collect and Maintain NIC Referral Information

With the recent dramatic increase in the number of networks, users,
and applications accessible via the Internet, it is impossible for
any one NIC to maintain comprehensive, up-to-date information of all
the services and information available.  Because such information is
distributed among many NICs, it is essential for each NIC to be aware
of other NICs and their areas of expertise.  Such shared information
among NICs ensures that Internet users will be referred promptly to
the correct information resource.

In an effort to gather data about NICs and their resources,
information will be solicited from each NIC and placed in a database
called "nic-profiles".  This database will be available to all NICs.
Such shared information among NICs ensures that Internet users will
be referred promptly to the correct information resource.  For
information regarding joining or using the nic-profiles database,
send a message to nic-forum-request@merit.edu.

5.4  Support the NIC Infrastructure

It is essential that each NIC take an active part in supporting the
NIC/Internet infrastructure.  Two means of providing such support are
suggested here.

- Attend the IETF User Services Working Group (USWG).
  NICs are encouraged to participate in the USWG, an
  ongoing working group of the IETF, which is
  chartered to identify, discuss, and recommend
  solutions to user service issues.  The group meets
  regularly at the IETF meetings.  (Information about
  IETF meeting schedules, etc., is available for
  anonymous FTP from nnsc.nsf.net.  The directory is
  ietf.)  The USWG has spawned a variety of working
  groups dealing with specific user service topics.
  To join the USWG mailing list send an e-mail request

         to uswg-request@nnsc.nsf.net.

      - Participate in nic-forum.  An electronic mailing
        list, "nic-forum", will provide NIC personnel with a
        means of soliciting information from other NICs,
        offering solutions to common problems, and posting
        information of general interest.  A NIC can register
        in the nic-forum, as well as provide information for
        the nic-profiles database, by sending a message to
        nic-forum-request@nsf.net.

6. EXAMPLES OF PRESENT NIC SERVICES

   There are a variety of ways through which existing NICs fulfill the
   basic requirements previously indicated under "Essential NIC
   Functions".

   Today's Internet NICs provide network users with a wide array of
   value-added services.  The types and levels of services vary for any
   particular NIC depending on a number of issues such as funding,
   audience served, available resources, and mission of the network
   organization.

   An overview of some of the services offered today by Internet NICs is
   listed below.  This overview provides examples of the essential
   services recommended earlier, and also gives a flavor of the many
   avenues through which value-added user services are provided.  This
   section provides examples, not recommendations.

6.1  Direct User Support

   The main objective of a Network Information Center is to provide
   support for network users.  Most NICs provide both telephone and
   electronic mail hotlines for convenient user access.  Existing NICs
   also often serve as intermediaries between users and the technical
   experts who provide specific information.  Because NICs interact
   directly with end-users, they can frequently evaluate their services,
   and modify them to accommodate changing user needs.

6.1.1 Referrals.  Today's NICs are aware of other Internet resources
      and keep such referral information as up-to-date as possible.

6.1.2 User-to-User Communication.  NICs can facilitate interactions
      between network users.  Often this is done through conferencing
      or electronic mail.  For example, a NIC can set up a computer
      conference dealing with a specific discipline or perhaps a
      specific topic so that users can share ideas and information
      with each other.  Some NICs establish special interest groups and

hold in-person meetings to promote the exchange of information
between their users.

6.1.3 Application Support.  NICs often provide user support for
      specific host applications in addition to providing information
      and support about the network to which the host is attached.

6.1.4 Technical Support.  Technical experts are available at NIC
      locations or elsewhere to trouble shoot user problems.  The range
      and variety of technical expertise varies with the organization.

6.1.5 Emergency Services.  Most NICs provide immediate notification to
      users of impending events that may affect their network usage.
      This is often done through electronic mail bulletins which state
      the particular event, its impact, and its duration.

6.2  User Training Services

   NICs sponsor seminars, classes, and training workshops intended to
   assist users in understanding the network environment.  These
   training events range from general "what is the Internet" to
   workshops on specific topics such as how to use a super-computer
   application.

6.3  Marketing and Public Relations Services

6.3.1 Newsletters.  Some Internet NICs publish newsletters which are
      used to inform subscribers about network developments and tools,
      and as marketing documents to try to get more organizations to
      attach to the network.

6.3.2 Other Publications.  Many NICs also produce a variety of
      general purpose brochures and "how-to" documents which are
      distributed to potential network users.

6.3.3 PR Activities.  NICs may be involved in a variety of public
      relations activities from writing and distributing press releases
      about new network developments to holding press conferences to
      announce significant technological events.

6.4  Information Repository Services

   An important activity of NICs is producing and/or collecting
   information of interest to their users.  Most NICs provide
   hardware to store such information online and distribute the
   information to their users both electronically and in hard-copy
   form.

6.5  Administrative Services

   Many NICs perform registration services, such as registering user
   information in a white pages database, keeping a record of hosts on
   their networks, or keeping a record of contacts for hosts, networks,
   or domains.

7. EXAMPLES OF PRESENT INFORMATION DELIVERY MECHANISMS

   Information is delivered to network users via a wide variety of
   mechanisms.  The most common methods are electronic mail and file
   transfer protocol (FTP); however, information is also relayed via the
   telephone, FAX machines, U.S. mail, and in-person seminars, as well
   as via electronic bulletin boards and remote database access.  NICs
   are always looking for ways of making information broadly accessible
   so that the maximum number of network users can use it effectively.

   The following table lists the various information delivery methods
   used in the Internet today, and notes the kind of information
   distributed using each method.

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               Table 1: AVAILABLE INFORMATION AND DELIVERY MECHANISMS


   Delivery Mechanism                   Type of Information Available
   -------------------------------------------------------------------

   FTP                                  Network maps, functional specs,
                                        draft RFCs, newsletters,
                                        protocols, any information in
                                        a file: ASCII, binary, etc.

   electronic mail                      General information, newsletters,
                                        announcements, security alerts,
                                        network status information

   bulletin board                       General information, announcements,
                                        source code

   hard copy                            Newsletters, user guides, resource
                                        guides, press releases, promotional
                                        information

| | |
|---|---|
| presentations/seminars | Network applications, technology trends, technical overviews, general information about Internet environment, TCP/IP overviews |
| Telnet | Remote systems, applications |
| person-to-person | Answers to specific questions, contact information, referrals |
| electronic conference | Other users, discipline-specific information |
| information services | General information, promotional information, local interest information |
| directory services | Phone book information (white pages, and eventually yellow pages) |
| library services | Bibliographies, full text, references |
| phone | Specific requests, contacts, referrals, connecting assistance |
| U.S. mail | Newsletters, user guides |
| FAX | Variety of printed material |
| Finger, whois | User data |

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8. DATABASE ACCURACY ISSUES

   As has been mentioned elsewhere in this paper, NICs often are the
   sites of databases of various types of information, which are
   maintained for various reasons.  It is recommended that NICs
   emphasize the importance of keeping such data as accurate as
   possible.  In addition, it is important to allow people some control
   over personal information about them that may reside in a NIC
   database, especially if the information will be available publicly.

   It is recommended that, as part of the process of collecting
   information for a database, a NIC should disclose the following
   information to those supplying data:

- Why the information is being collected and how it will be used.
- What the consequences are of not providing the asked for data or
  of revoking data in a database.
- Which information asked for is mandatory and which is optional.
- Which information will be made public.
- How the data can be updated and who may provide updates.
- How and how often the NIC will solicit for data updates.

A NIC should actively seek updates to its data at least once a year.
The date publicly available data was last updated should be part of
the public information available about that data.  In general, users
should know when personal information about them is available in a
public database, and have the opportunity to change it or revoke it.

9. SECURITY CONSIDERATIONS

Because NICs interact directly with network users, they will have to
deal with network and host security issues at times.  NICs should be
aware of those agencies and groups on the Internet that have the
responsibility of handling security incidents so that users can be
properly referred when necessary, and so the NICs themselves have
resources to call on should a major incident occur.  NICs should be
aware of security issues and security information resources, such as
network mailing lists and the Site Security Handbook (FYI 8, RFC
1244), and advocate the importance of security considerations to
their users.  NICs should have explicit procedures in place to follow
in the event of a security incident.  Such procedures will probably
include the means of interacting with both response centers and NOCs,
as well as with users.

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