Connecting to the Internet
What Connecting Institutions Should Anticipate

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 outlines the major issues an institution should consider
   in the decision and implementation of a campus connection to the
   Internet.

   In order to provide clarity to the reader, some specific information
   has been detailed. In doing so, the document has been directed
   toward U.S. academic institutions that have not yet connected to the
   Internet.

   However, the issues for which specific information has been provided
   can be generalized for any organization that wishes to participate in
   the world-wide Internet community. It will be necessary for those
   organizations to obtain the correct and detailed information from
   their local or national IP service providers. In addition, this
   document may be used as an evaluation checklist for organizations
   that are currently connected. Readers are expected to have general
   familiarity with networking concepts and terminology.

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1. Acknowledgements

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   Networking Taskforce. NETTF was created in 1989 under the direction
   of Martyne Hallgren and with the approval and support of the SIGUCCS
   Executive Board.

   The Networking Taskforce was created to increase awareness and
   understanding of the Internet, to disseminate information and
   research on development and use of the Internet, to promote
   innovative and appropriate use of Internet resources, and to initiate
   and encourage cooperation between the SIGUCCS membership and other
   organizations, such as the Internet Engineering Task Force (IETF),
   with similar goals towards networking.

2. Introduction

   The Internet is a world-wide network of networks with gateways
   linking organizations in North and South America, Europe, The Pacific
   Basin and other countries not previously included. The organizations
   are administratively independent from one another. There is no
   central, worldwide, technical control point. Yet, working together
   these organizations have created what to a user seems to be a single
   virtual network that spans the globe.

   The networks all use a common suite of networking protocols, TCP/IP.
   It is because of this commonality of protocols, this commonality of
   network functionality and interoperability that the networks provide
   what may appear to be a seamless, integrated virtual network,
   irregardless of the underlying heterogeneity of the underlying
   computer hardware or communications transport.

The most basic functions provided are electronic mail, access to
remote computational and informational facilities and file transfer.
The networking protocols were first deployed in the late 1960's in
the United States. For several years, they were only used for very
specific research activities and in some computer science
departments.

In 1985, at a meeting of National Science Foundation networking
specialists and higher educations representatives, a new national
data networking backbone, using these protocols, was outlined and
acted as a catalyst resulting in dramatic changes in data networking
technologies and usage.

Originally conceived to connect the six national supercomputing
centers that had been established, in the ensuing years, the NSFNet
backbone network and its associated mid-level networks have grown
dramatically. The networks built for mission and discipline specific
uses have also grown dramatically. More importantly, because of the
common technology, they have been able to be connected together,
increasing their reach and as a result, their usefulness to the user
community with very little additional expense. The end result is a
robust technology supporting the higher education and research
community. Its continued development and growth are essential to
maintaining excellence in education and research.

The use of the Internet has steadily and dramatically grown over the
past years. More and more sites have connected. Each site may have
more and more uses of the network, as existing users expand and new
users are added resulting in exponential growth of network traffic.
But even more dramatic are the explosions in growth due to the
innovative applications. Networks are having a dramatic effect on
everything from libraries to elementary schools, from sharing
expensive scientific instruments to using databases to access
atmospheric data to electronic publishing and interpersonal
collaborations building "workplaces without walls".

The number of organizations connected at present is constantly
growing. At present, the organizations that connect through the
Internet include universities and colleges, research laboratories,
government and private, libraries, specialized scientific centers,
state agencies, K-12 (Kindergarten-12th Grade) organizations,
individuals, and individual research labs. But no matter what kind
of organization it is, they all have the same need to understand what
it means to connect to the Internet.

An institution must anticipate and prepare for four critical phases
in the deployment of an Internet connection. The list of issues
discussed within this document is not exhaustive but rather the

information provided should alert decision makers to major concerns
they should address during the different phases of network
deployment.

As each issue is discussed, both soft and hard cost items will be
identified. Both must be considered when determining the real cost
of deploying an Internet connection. The hard cost items include
costs for which invoices are created. They include the costs for new
circuits or phone lines, the purchase of modems or csu's and routers,
network membership dues and upgrades to existing hardware to make it
network compatible. Soft costs are harder to quantify but no less
important. These costs include training and education of staff,
faculty, and students, modifications to support staffing and
structure, deployment of new network applications or network services
such as FTP servers, centralized electronic mail services, or
campus-wide information systems. It should also be recognized that
the soft costs involved also result in benefits that can easily be
seen as people investment and organizational investment.

The four phases of an Internet Connection deployment are:

    A.   Initial planning/Pre-Internet installation phase
    B.   Initial Implementation and Startup phase
    C.   Full Production/Maintenance phase
    D.   Evaluation/Upgrade phase

3.   Initial Planning/Pre-Internet Installation Phase

3.1 Ask the Vital Question

An institution must first address the question, "What does my
community/institution gain from participating in the Internet
community?".

Both commercial and non-profit education and research institutions
rightfully spend a great deal of high level effort to define their
mission and goals. Any introduction of new technology --
particularly one which involves new modes and methodologies of
communication -- should be assessed in light of the institution's own
mission and goals as well as the wants and needs of the user
community it serves.

Following, and as part of this evaluation, key institution decision
makers (at the highest levels of the organization) will require
information not only on the cost of connection, but more importantly
on the purpose and scope of participation in the Internet. The
decision to participate requires not only the strong commitment of
senior administration but also the support and endorsement of the

general institutional community. In the case of an educational
institution, it is critical to have the support and active interest
of the faculty. This decision will also involve a campus wide needs
assessment to determine the interest and support of the campus
community.

3.2 Reasons Why to Participate

The deployment of an Internet connection provides the impetus for the
development of a campus wide strategy for the use of information
technology which may otherwise never be accessible. It may be
difficult to quantify such benefits but they must be included in the
justification process. Many institutions have already done this and
are very likely already connected. An interested institution might
will consult with a nearby, connected organization to see what
benefit they have derived from the connection. An institution
looking at a connection for the first time must decide if a major
reason is simply to participate in a technology that has already
proven itself as being important to education; more importantly, it
may be a requirement now to compete with peer organizations.

This is especially important to consider when recruiting both new
faculty and students. New faculty will want to continue with their
research and academic collaborations which may require resources not
affordable to the institution. These resources can be made available
via the network. As a result, a university or college may be able to
recruit students and offer a new curriculum that demands access to
resources that would only be available via the network. The
potential gain in prestige, research participation and dollars is
well work the investment.

Many universities have also discovered economic efficiencies. Many
subscription services have traditionally required a dedicated and
expensive access method. More and more of these services are now
accessible via the Internet. This trend will undoubtedly continue as
more and more commercial companies make their services available.
While the subscription fee may not alter, the cost of the dedicated
connection may by used to finance an Internet connection; not only
will the availability of the particular service be greater but the
underlying access medium can be used for multiple functions.

Libraries, many already with automated catalogs, are looking at
various new applications to deal with the glut of information,
shrinking dollars and limited shelf space. Electronic journals,
image-based text, publishing on demand are all issues that are being
evaluated for the digital library. Universities are automating and
integrating a variety of activities and providing access to the
students and staff via a campus network. At some universities,

students are able to register for classes, look at their grades, and
check their bill from their dorm room instead of having to suffer
through long lines. Some universities are able to keep in contact
with their alumni, through a variety of on-line information
resources.

NSFNet was first created to facilitate access to five national
supercomputer centers, centers which still provide to researchers
leading edge computational technologies to support research in a
variety of areas, from black holes to pollution in the L.A. basin.
Today, researchers and students alike have access to a broad range of
computational, informational, and scientific instrumentation that can
be used remotely, with no loss of productivity. For some
organizations, this means that they now can recruit faculty with
research requirements that they themselves could never afford. It
means access to research funding. At the same time, it opens up the
opportunity to faculty and students to select their next institution
for reasons other than the hardware currently owned.

3.3 Connection Options

There are a variety of connection options. Factors besides costs may
be used to select the appropriate option or a series of options.
These factors include size and projected use (traffic) of the
connection, nature of the use and purpose of the enterprise driving
the effort.

There are three basic categories of IP service connection available
at this time. All three categories support essentially the same set
of functions. They support a variety of line speeds (which affects
total capacity of the connection) and will run on a variety of
hardware platforms. Performance depends on the line speed, the
hardware and software used, and the use.

The three basic connection categories are:

    a) dedicated connection
    b) dialup connection
    c) dialup access to a connection service

A dedicated connection requires a dedicated, point-to-point
telecommunications circuit and an IP router (a dedicated networking
device), linking the organization to the Internet. Line speeds range
from 9.6 Kb to 45 Mb, with the most common connection speeds being
56Kb and 1.54 Mb. A dedicated connection to the Internet most
commonly connects to a campus-wide network with several hosts and
workstations.

A dialup connection requires a workstation, which may or may not be
dedicated to networking, with appropriate networking software and an
attached modem. It uses a regular phone line. When a network
connection is needed, the workstation is used to establish a
connection over the modem and phone line. At the end of use, the
connection is broken. Line speeds range from 9.6Kb to 56Kb, with
lower speeds being most common. It can be used to connect a single
workstation or a LAN. However, if it is used to connect a LAN, the
workstation must provide some routing functionality.

Several IP service providers offer dialup access to a connection
service. Such a service provides only remote login capabilities or
other limited functions by calling a local phone number and setting
up a single function environment. A terminal emulator is used from a
MAC or a PC. The service can support speeds from 2.4Kb - 19.2 Kb.
Providers usually charge a flat-rate connection fee as opposed to a
connection fee and traffic charge.

As each type of connection alternative is examined, the organization
must consider the technical evolution and cost projections. The
appropriate campus agency (usually an information or
telecommunications area) should inventory the existing campus
networking. For those organizations that do currently have a campus
network, the inventory will provide valuable input to the development
of a short and long term technology evolution strategy.

If a campus network does not yet exist, the development of a campus
networking strategy may have the effect of an upgrade of technology
throughout the campus. In either case, the question of how to get
network connectivity to the workstations on the faculty and staff
desks, large user rooms, residence halls, libraries and campus stores
must eventually be addressed.

A connection to the Internet does not always imply the development of
a campus-wide network. In some cases, it may be appropriate for only
a small segment of the organization's community to have access to the
Internet. Often, organizations will use such a strategy as a way to
introduce the technology to a small group of enthusiastic customers
who become champions in their own right.

3.4 Connection Service Providers

There are several organizations, not-for-profit and commercial, that
now offer connectivity services to the Internet. Refer to Appendix A
for a partial list.

There is no hard and fast rule specifying to whom an organization
should approach for a connection. Historically, there has been a

tendency for an academic institution to become a member of the
closest mid-level network. The best approach, given the growing
number of IP service providers, is to consider all the providers that
offer services in the region, consider the variety and quality of
services offered within in the framework of the organization's
requirements and make an informed decision based on that information.

3.5 Sample Questions for Connection Services Providers

It is often hard to know what questions should be asked while
evaluating different service providers. The following set of
questions have been included at a starting point for any discussion
with an IP service provider.

3.5.1 Sample Questions

    a) What connection services do they offer? Please describe in
       detail (i.e., until you understand what they are talking
       about).

    b) What is the cost?

    c) What is included in the cost?
            -the circuit cost (installation and monthly charge)
            -the router (cost of onsite router, cost of offsite
             router)
            -hardware/software
            -maintenance, of what??
            -membership fee

    d) Is there any other kind of charge not included in the upfront
       cost?

    e) What are their support services?
            -NOC?
            -NIC?
            -What do they mean by either organization?

    f) Do they fix the router when it's broken?

    g) Do they require 24 hour access to the physical location?

    h) Do they require an onsite person be available to them to
       assist in problem diagnosis?

    i) What training is available? Is it included in above cost??

    j) Do they have an acceptable use policy?

   k) Is there an annual meeting?

   l) Do they have dedicated (i.e., full time), professional staff?

   m) Are there limitations to connecting to other parts of the
      Internet (i.e., can you everywhere you need to get?)?

   n) To whom else do they provide service?
          -references?

If any of this information is confidential, consider finding another
service provider.

3.6 Cost Assessment

An organization contemplating a connection to the Internet should be
careful to consider not only the physical connection and startup
costs but also the costs of supporting the resulting service
infrastructure. This infrastructure includes the development and
continued support of a campus-wide network. At some universities,
this network may only support data, but at many universities and
other organizations, the development of a campus-wide network must
evolve to consider data, voice, and video as the applications and
requirements of information technologies supported by internetworking
technologies expand.

The Internet provides access to a wide variety of resources and a
broad set of functions and services which may or may not have been
available locally. Support staff will require education and training
to support and in turn train the faculty, other staff, and students
in the use of the new technology and new resources made available.
This training may mean strategic re-orientation and deployment of
campus networking information services. The costs of such added-
value services should be planned for in advance.

Increased use of the campus network will make additional demands on
existing network technical staff. Areas of the institution not
currently participating in data network services will want to
participate. While not all of these services can be exactly
quantified in terms of costs, they must be anticipated and
incorporated into campus planning for an Internet connection. These
areas may include libraries, dormitories, student services, and data
depositories.

The implementation of an Internet connection provides the impetus for
the development of a campus-wide strategy for the use of information
technologies which may otherwise have never been accessible. It may
be difficult to quantify such benefits but they must be included in

the justification process. The benefits can include access to
expensive, scientific instruments such as computational services
(i.e., massively parallel supercomputers) or particle accelerators.
Clearly, this access means that the organization will have the use of
these facilities without the cost of buying one, thus provide an
effective recruiting tool for bright, young PHD's who require this
kind of resource.

4. Initial Implementation and Startup Phase

   Once the institution decides to connect to the Internet, several
   tasks should get underway. In rough terms, the tasks relate to
   policy, process definition, education, promotion, technical and
   fiscal issues. Several of these tasks should be addressed
   simultaneously.

4.1 Policy Issues

   The campus community should develop guidelines for acceptable use of
   the network. These guidelines not only include policies governing
   the use of the campus net, but now extend to guidelines for the
   appropriate use of the Internet as well. Appropriate use policy must
   include policies developed by the Internet community. NSF has an
   acceptable use policy which applies to use of the backbone networks
   they provide. See Appendix B. Each of the mid-level networks as
   well as other organizations with their own backbone networks have
   their own acceptable use policy, which may not be the same as that of
   NSF's. It is important to be aware of the limitations or lack of
   limitations when connecting and using various networks.

   The development of an acceptable use policy, in addition to providing
   protection to the institution provides an excellent opportunity to
   develop campus guidelines for privacy and security issues for
   computing in general. Guidelines about data available on the network
   and the proper use of that data and how data may be properly used and
   who may properly use it, issues of copyright and attribution
   requirements of FTP-able documents; all these topics should be
   considered.

   Ethical guidelines concerning the use and possible misuse of software
   and data banks available over the Internet must be carefully
   developed and published across the institution and in the hands of
   faculty, staff, and students. Considerable work has already been
   expended in developing several good references which can be used to
   guide the development of these policies. See FYI 8, RFC 1244, "Site
   Security Handbook" [1].

In order to maximize usage for the entire Internet community, the
campus community must learn proper etiquette in the use of the
network, including such issues as the management of large files, data
compression, and the efficient use of electronic mail. See RFC 1087,
"Ethics and the Internet" [2].

4.2 Connection to the Mid-level Network

By this time, the organization should have decided what type of
connection they want and with which service provider they will be
working. There are specific technical details which must be
addressed in the initial deployment of the connection. There is the
evaluation of hardware and software. The mid-level network or
institution providing the connection is often an excellent resource
to complement the on-campus group in determining the best
configuration. It is vital to understand before this time exactly
what items the organization will be required to purchase or that will
be provided at part of a fee-based service. (Refer back to the
sample set of questions.)

4.3 IP Addresses and Domain Names

Every organization connecting to the network must have a unique
identifier. This identifier is known as the campus IP network
address. In addition to a numerical identifier, most organizations
also get what is known as a domain name. It is through the numerical
address and the domain name that the organization's hosts will become
know throughout the Internet.

An organization must register with the authority that assigns a IP
addresses and for a domain name. The IP address is assigned by the
Internet Address Naming Authority (IANA). The Domain Name is picked
by the organization. A domain name is simply a character string that
maps to the IP address. It makes it easier for humans to remember
than a unique set of numbers. It is beyond the scope of this
document to include a tutorial on IP addresses and domain names. For
more information on IP addresses and domain names, refer to Doug
Comer's textbook, "Internetworking with TCP/IP: Principles,
Protocols, and Architectures" [3]. (See also FYI 5, RFC 1178,
"Choosing a Name for Your Computer" [4].)

There are different classes of Internet addresses, which correspond
to the number of hosts an organization anticipates connecting to its
networks. Thus the campus should carefully consider the planned
growth of its own network in applying for the appropriate class of
membership. The IP service provider is an excellent source of advice
in choosing a membership class.

At this time, there is no cost associated with registration for IP
addresses or domain names.

The actual procedure for applying for the IP address and domain name
should be explained and is often provided to the connecting
organization by the IP service provider.

4.4 Technical Issues

The installation itself should occur with with as little disruption
to the campus network as possible. To accomplish a such deployment,
the organization should develop a complete plan of action, which
would include the following steps (some may be simultaneous; some may
be done by the service provider; the list is not exhaustive):

   a) order, install, test circuit or phone line

   b) IP address and domain name registration

   c) hardware purchasing/delivery

   d) routing configurations/reconfig campus network

   e) bring up router, test end-to-end connectivity

   f) make available to campus

4.5 Support

Perhaps the most challenging task in the initial deployment of the
Internet connection is the resulting reorientation of network
technical and network information services. There are added
responsibilities for network management as well as added network
information services to support the connection. Cognizant
administrators must recognize, plan and budget for these added tasks.
Administration must also ensure that there is a clear delineation of
duties among technical and network information services staff to
avoid needless duplication of effort or conflict.

Concurrent with the deployment of the network, the education of the
user community is critical. This includes creation of documentation
on basic information about the Internet and specific campus resources
as well as details on remote resources (library catalogs, information
servers, etc) and how to use them.

Many organizations have already created excellent documentation that
they are willing to share. They generally only require attribution
in return for distribution rights (for educational purposes only).

4.6 Training

   Networking problems experienced by end-users are often the result of
   mis-information or campus-specific configurations as opposed to
   problems at the mid-level or backbone. An investment in staff and
   user training and documentation at the beginning of the network
   deployment is an investment that will show a clear return in the long
   term.

   User training is critical but depending on the size of the campus, it
   is impossible to expect the support staff to train users on an
   individual basis. Rather, it's important to consider developing and
   promoting a hierarchy of support personal, so the central support
   staff is actually training the trainers who then go out and support
   their particular group of users.

   The most critical course taught to users is on local information on
   the basic functions of the network, electronic mail, file transfer,
   and remote login. Good documentation will help promote the
   successful use of the network. Documentation should be clear,
   concise and to the point. During the training, it is important to
   address the most commonly asked questions first.

4.7 Promotion

   A network is only as successful as the users say it is. From the
   very beginning, the network must be presented to them as a useful
   tool. Promotion, through newsletters and other appropriate
   communication vehicles must be considered a required activity. An
   active promotion strategy will allow an organization to set the
   expectations of the users in regards to service and performance,
   especially important for a networking staff that is just learning.

   Faculty involvement from the very beginning is vital. It is
   important to gain their support and to build on it. Whether it is
   through faculty advisory committees or direct contact with
   individuals, their feedback and support can be a healthy measure of
   success.

5. Full Production/Maintenance

   As the campus community incorporates the Internet as part as its
   usual routine, those responsible for the campus network and the
   Internet connection must ensure the accessibility, reliability, and
   relative ease of use of the network. This ongoing maturation of the
   network constitutes a vital service to the user community.

As the network becomes a crucial tool in the user community's daily
routine, so does the interface between the operations, information,
and user services staffs and the end users gain in importance.
Responding to end-user problems with courtesy and accepting
responsibility for resolving the end-user concern (as opposed the
actual technical problem) creates a working environment of trust and
partnership.

5.1 Operation Services

There will be hardware and software support, including updating and
maintaining compatible software revisions, planned replacement and
maintenance of communications hardware to make use of new technology,
and routine network operations center activities. This includes IP
number administration, monitoring of the network to determine usage
patterns, optimal routing, continuous and accurate updates of known
problems as well as trouble shooting problem areas of the campus net.
The network staff will have to maintain its campus routing tables.
If the site serves as a backbone site, it may have to maintain tables
for its designated area.

It is important to continue to have a close relationship between the
operations staff and the engineering staff. The operations staff
must have a quick inroad to engineering to ensure quick responses to
the user community as problems are reported.

The scope of these technical activities depend upon the size of the
campus network and the level of campus responsibility for the
Internet connection. The responsibilities grow both in scale and
importance as the institution comes to rely on the services of the
network and its access to the Internet.

5.2 Information and User Services

The education, training and promotion activities associated with the
network continue but mature both in scope and the level of network
expertise. Documentation efforts continue. Documents are refined
and reviewed periodically for accuracy and completeness, but
individual consultation will change as network users become more
sophisticated and experienced in using the network. As more and more
consulting and information services are made available through the
network itself, network information staff will likely find themselves
increasingly involved in "training the trainers" or in individual
consultation and help sessions with faculty and researchers actively
involved in collaborative research over the network.

Promotion activities must also continue to involve new faculty and
staff, to promote and advertise major campus network activities and

projects, and to highlight new services and projects available on the
Internet. The continuing effort, which can include a campus
newsletter or periodic seminars on network services, is a necessary
and crucial part of recruiting new and innovative uses of the
Internet, which will act to justify continued development and
investment.

6. Evaluation Strategies

   A system as complex and ubiquitous as the campus data network
   requires periodic review and evaluation. As the campus network
   provides the primary access to the larger Internet community,
   evaluation strategies must include analyses of how and where the
   Internet is most heavily used and how campus data flows might
   optimize that traffic.

   Evaluation of network statistics provide key information on how the
   network is used and who is using it. In turn, this must lead to
   assessment mechanisms to gauge user satisfaction with the network and
   the tools used to make use of the network. At the base level, there
   are the tools provided within the network protocol itself -- Telnet,
   FTP, SMTP mail -- that provide fundamental access to the Internet.
   But as campus use of the network and the Internet matures, the campus
   network community itself will build on those tools to provide special
   "campus customized" tools used on the network. Network services
   should evaluate user needs and, where appropriate, design user
   friendly interface mechanisms especially suited to special campus
   area needs.

   While the use of quantitative methods of evaluation are important,
   they can not replace qualitative methods. If end-users are unhappy,
   if problems continue to be reported even though the statistics and
   technical monitors show few errors, organizations must recognize that
   serious problems do exist and take immediate action to resolve them.

   The use of the Internet itself and its impact on campus research and
   instruction goals must be reviewed and evaluated. The introduction
   of new technology inevitably involves reorientation and new means of
   communication. While this should be a benefit to the campus
   community as a whole, the new technologies may leave some segments of
   the community disoriented. A careful evaluation of the impact of
   this new technology should determine not only which areas of campus
   benefit from Internet participation, but also which areas are not
   benefitting from the new technology. Planning strategies should
   include special attention to areas not making use of network
   resources to make those areas aware of the potential benefits and to
   provide training in the use of the network. In summary,
   universities, schools, colleges and institutions in the Internet

community must incorporate a mechanism to evaluate both hidden
benefits as well as hidden costs of that participation.

7. Appendix A. Partial List of U.S. IP Service Providers

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8.   Appendix B. NSFNet Backbone Services Acceptable Use Policy

THE NSFNET BACKBONE SERVICES ACCEPTABLE USE POLICY - released
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GENERAL PRINCIPLE:

    (1)   NSFNET Backbone services are provided to support open research
          and education in and among US research and instructional
          institutions, plus research arms of for-profit firms when
          engaged in open scholarly communication and research. Use for
          other purposes is not acceptable.

SPECIFICALLY ACCEPTABLE USES:

    (2)   Communication with foreign researchers and educators in
          connection with research or instruction, as long as any network
          that the foreign user employs for such communication provides
          reciprocal access to US researchers and educators.

    (3)   Communication and exchange for professional development, to
          maintain currency, or to debate issues in a field or subfield of
          knowledge.

    (4)   Use for disciplinary-society, university-association,
          government-advisory, or standards activities related to the
          user's research and instructional activities.

(5) Use in applying for or administering grants or contracts for
     research or instruction, but not for other fundraising or public
     relations activities.

(6) Any other administrative communications or activities in direct
     support of research and instruction.

(7) Announcements of new products or services for use in research or
     instruction, but not advertising of any kind.

(8) Any traffic originating from a network of another member agency
     of the Federal Networking Council if the traffic meets the
     acceptable use policy of that agency.

(9) Communication incidental to otherwise acceptable use, except for
     illegal or specifically unacceptable use.

UNACCEPTABLE USES:

(10) Use for for-profit activities (consulting for pay, sales or
      administration of campus stores, sale of tickets to sports
      events, and so on) or use by for-profit institutions unless
      covered by the General Principle or as a specifically acceptable
      use.

(11) Extensive use for private or personal business.

This statement applies to use of the NSFNET Backbone only. NSF
expects that connecting networks will formulate their own use
policies. The NSF Division of Networking and Communications Research
and Infrastructure will resolve any questions about this Policy or
its interpretation.

9. References

[1] Holbrook, P., and J. Reynolds, Editors, "Site Security
     Handbook", FYI 8, RFC 1244, CICNet, USC/Information Sciences
     Institute, July 1991.

[2] Internet Activities Board, "Ethics and the Internet", RFC 1087,
     IAB, January 1989.

[3] Comer, Douglas, "Internetworking with TCP/IP: Principles,
     Protocols, and Architectures", Second Edition, Prentice Hall,
     Englewood Cliffs, N.J, 1991.

[4] Libes, D., "Choosing a Name for Your Computer", FYI 5, RFC 1178,
     Integrated Systems Group/NIST, August 1990.

10. Security Considerations

   Institutions who wish to connect to the Internet should be aware that
   the Internet network is, by nature, and open network. As such,
   connecting institutions must make sure that security mechanisms are
   in force on their own campus network to ensure that unauthorized or
   inappropriate use of campus resources is not exploited by either the
   internal campus or by the external Internet community. Moreover, it
   is incumbent on the institution to ensure that the campus community
   is aware of the proper use of the Internet. The institution bears
   the responsibility to educate its users on the appropriate use of
   campus systems within the context of proper and ethical use of the
   Internet.

   An assessment of security on the campus network prior to connecting
   to the Internet should ensure that all required security patches are
   installed on all campus connected systems as well as on the campus
   network. Systems with sensitive data or information should be
   physically secure as well as up to date with software security
   patches. In so far as possible, network addressable devices should
   be secure. Changes to these devices should only be effected by
   authorized network management personnel to avoid potential security
   risks.

   For more information on security issues, refer to FYI 8, RFC 1244,
   "Site Security Handbook" [1].

   In summary, it is only the cooperation and attention of each
   connecting institution on the Internet to security issues that will
   ensure the security of the Internet as a whole.

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