

Network Working Group
Request for Comments: 1578
FYI: 22
Category: Informational

J. Sellers
NASA NREN/Sterling Software
February 1994

FYI on Questions and Answers
Answers to Commonly Asked "Primary and Secondary School Internet User"
Questions

Status of this Memo

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

Abstract

The goal of this FYI RFC, produced by the Internet School Networking (ISN) group in the User Services Area of the Internet Engineering Task Force (IETF), is to document the questions most commonly asked about the Internet by those in the primary and secondary school community, and to provide pointers to sources which answer those questions. It is directed at educators, school media specialists, and school administrators who are recently connected to the Internet, who are accessing the Internet via dial-up or another means which is not a direct connection, or who are considering an Internet connection as a resource for their schools.

Table of Contents

1. Introduction.....	2
2. Acknowledgments.....	2
3. Questions About the Internet in an Educational Setting.....	3
4. Questions About School Support for an Internet Connection.....	5
5. Questions About Implementation and Technical Options.....	10
6. Questions About Security and Ethics.....	12
7. Questions About Educational Collaboration, Projects, and Resources.....	15
8. Suggested Reading.....	18
9. Resources and Contacts.....	21
10. References.....	35
11. Security Considerations.....	35
12. Author's Address.....	35
Appendix A: Examples of Projects Using the Internet.....	36
Appendix B: How To Get Documents Electronically.....	43
Appendix C: Glossary of Terms Used in This Document.....	47

1. Introduction

The elementary and secondary school community of teachers, media specialists, administrators, and students is a growing population on the Internet. In general, this group of users approaches the Internet with less experience in data network technology and fewer technical and user support resources than other Internet user groups. Many of their questions are related to the special needs of the community, while others are shared by any new user. This document attempts first to define the most frequently asked questions related to the use of the Internet in pre-university education and then to provide not only answers but also pointers to further information. For new user questions of a more general nature, the reader should get FYI 4, "FYI on Questions and Answers: Answers to Commonly Asked 'New Internet User' Questions" [1]. For information on how to get this document, see Appendix B.

It is important to remember that the Internet is a volatile and changing virtual environment. I have tried to include only the most stable of network services when listing resources and groups for you to contact, which is a good solution to the problem of changing offerings on the Internet, but by no means a fool-proof one. This constant change also means that there is a lot out there that you will discover as you begin to explore on your own.

Future updates of this document will be produced as Internet School Networking working group members are made aware of new questions and of insufficient or inaccurate information in the document. The RFC number of this document will change with each update, but the FYI number (22) will remain the same.

2. Acknowledgments

The author wishes to thank for their help and contributions to this document the members of the Consortium for School Networking, Kidsphere, and Ednet electronic mailing lists, Ronald Elliott, Science and Technology Center; Klaus Fueller, Institute for Teacher Training of the German federal state of Hesia (HILF), and educator; Ellen Hoffman, Merit Network, Inc.; William Manning, Rice University; and Anthony Rutkowski, CNRI. Special thanks go to Raymond Harder, Microcomputer Consultant, and Michael Newell, NASA Advanced Network Applications, who not only made contributions but also kept a steady stream of feedback flowing. Extra special thanks go to the remarkable Ms. April Marine of the NASA Network Applications and Information Center for her contributions to the document, her expert advice, and her unparalleled support.

3. Questions About the Internet in an Educational Setting

3.1 What is the Internet?

The Internet is a collection of more than 10,000 interconnected computer networks around the world that make it possible to share information almost instantly. The networks are owned by countless commercial, research, governmental, and educational organizations and individuals. The Internet allows the more than 1.5 million computers and 10 millions users of the system to collaborate easily and quickly through messaging, discussion groups, and conferencing. Users are able to discover and access people and information, distribute information, and experiment with new technologies and services. The Internet has become a major global infrastructure for education, research, professional learning, public service, and business and is currently growing at the rate of about ten percent per month.

The Internet Society serves as the international organization for Internet cooperation and coordination. See Section 9, "Resources and Contacts".

For a more complete basic introduction to the Internet, see FYI 20, "What is the Internet?" [2]. Instructions on retrieving FYI documents can be found in Appendix B.

3.2 What are the benefits of using the Internet in the classroom?

The Internet expands classroom resources dramatically by making many resources from all over the world available to students, teachers, and media specialists, including original source materials. It brings information, data, images, and even computer software into the classroom from places otherwise impossible to reach, and it does this almost instantly. Access to these resources can yield individual and group projects, collaboration, curriculum materials, and idea sharing not found in schools without Internet access.

Internet access also makes contact with people all over the world possible, bringing into the classroom experts in every content area, new and old friends, and colleagues in education. With access to the Internet, your site can become a valuable source of information as well. Consider the expertise in your school which could be shared with others around the world.

The isolation inherent in the teaching profession is well-known among educators. By having access to colleagues in other parts of the world, as well as to those who work outside of classrooms,

educators able to reach the Internet are not as isolated.

A hands-on classroom tool, the use of networks can be a motivator for students in and of itself, and their use encourages the kind of independence and autonomy that many educators agree is important for students to achieve in their learning process. Because class, race, ability, and disability are removed as factors in communication while using the Internet, it is a natural tool for addressing the needs of all students; exactly how this is done will vary from district to district as schools empower individual teachers and students.

School reform, which is much on the minds of many educators today, can be supported by the use of the Internet as one of many educational tools. See the answer to Question 4.1 for more specifics.

3.3 How can educators incorporate this resource into their busy schedules?

Most educators learn about the Internet during the time they use to learn about any new teaching tool or resource. Realistically, of course, this means they "steal" time at lunch, on week-ends, and before and after school to explore resources and pursue relationships via the Internet. Those who do so feel that it is well worth the rich rewards. It's important that computers used to access the Internet are readily available and not so far away physically as to make using the resource impossible for educators and others.

Many features of the Internet, such as the availability of online library catalogs and information articles, will actually end up saving considerable time once an instructor learns to use them, and there are new tools being developed all the time to make Internet resources more easily accessible.

As the value of the Internet as an educational resource becomes more evident, school systems will need to look toward building the time to use it into educators' schedules.

- 3.4 I'm already using the National Geographic Kids Network (or PBS Learning Link or FrEdMail or _____). Does this have anything to do with the Internet? Is the Internet different from what I'm already using?

Since the Internet is a network of many different networks, you may be using one of the networks which is connected to the Internet. Some commercial programs for schools use networks and provide value-added service, such as curriculum software, technical support, project organization and coordination, etc. Some provide value-added service, but don't allow for all basic Internet services. Networks like FrEdMail (Free Educational Electronic Mail), FidoNet, and K12Net are bulletin board and conferencing systems linked via the Internet which provide inexpensive access to some Internet services. If you can use interactive computer access (Telnet) and electronic file transfer (FTP), as well as electronic mail, you are probably "on" the Internet. If you have questions about the specific service you're currently using, ask its support personnel if you have Internet access, or call the InterNIC. See Section 9, "Resources and Contacts" for how to reach the InterNIC, FrEdMail, FidoNet, and K12Net.

4. Questions About School Support for an Internet Connection

- 4.1 Where does my school get the money for connecting to the Internet?

Although school budgets are impossibly tight in most cases, the cost of an Internet connection can be squeezed from the budget when its value becomes apparent. Costs for a low end connection can be quite reasonable. (See the next question.)

The challenge facing those advocating an Internet connection sometimes has less to do with the actual cost than it has with the difficulty of convincing administrators to spend money on an unfamiliar resource.

In order to move the Internet connection closer to the top of your school's priority list, consider at least two possibilities. First, your school may be in the process of reform, as are many schools. Because use of the Internet shifts focus away from a teacher-as-expert model and toward one of shared responsibility for learning, it can be a vital part of school reform. Much of school reform attempts to move away from teacher isolation and toward teacher collaboration, away from learning in a school-only context and toward learning in a life context, away from an emphasis on knowing and toward an emphasis on learning, away from

a focus on content and toward a focus on concepts [3]. The Internet can play an integral part in helping to achieve these shifts.

Second, to demonstrate the value of a connection, actual Internet access is more useful than words. While this may sound like a chicken-and-egg situation (I have to have Internet access to get Internet access), some organizations will provide guest accounts on an Internet-connected computer for people in schools who are trying to convince others of the value of an Internet connection.

Contact local colleges, universities, technology companies, service providers, community networks, and government agencies for both guest accounts and funding ideas. For alternatives to your own school's budget or for supplements to it, look for funding in federal, state, and district budgets as well as from private grants. Work with equipment vendors to provide the hardware needed at low or no cost to your school, and consider forming a School/Community Technology Committee, or a joint School District/School/Community Technology Committee.

The Educational Resources Information Center (ERIC) has information on grants and funding. Ask for the AskERIC InfoGuide called "Grants and Funding Sources". Two network services, one maintained by the United States Department of Education's Office of Educational Research and Improvement (OERI) and one maintained by the US National Science Foundation, also have information about grants and funding. Grants can be a way for you to acquire the initial money to demonstrate the value of telecommunications in the classroom, and since these monies are often awarded on a short-term basis, should probably be looked at as temporary means of funding your activities. For information on these organizations and their services, see Section 9, "Resources and Contacts". (Note: The funding services mentioned are primarily US based.)

- 4.2 How much does it cost to connect to the Internet, and what kind of equipment (hardware, software, etc.) does my school need in order to support an Internet connection?

The cost of an Internet connection varies tremendously with the location of your site and the kind of connection that is appropriate to your needs. In order to determine the cost to your school, you will need to answer a number of questions. For help in learning what the questions are and getting answers to them, begin asking at local colleges, universities, technology companies, government agencies, community networks (often called "freenets"), local electronic bulletin board systems (BBS), network access

providers, or technology consultants.

To give you an idea of possible equipment needs, here are three sample scenarios, based on possible solutions found in the United States. Keep in mind that these are very general examples and that there are many solutions at each level. See also the answer to Question 5.5.

Low-end: You could subscribe to some kind of Internet dial-up service. This may be provided by a vendor at a cost, by a local university gratis, or as a part of a public access service like a community network. You will need a computer which allows terminal emulation, terminal emulation software, and a modem which is compatible with your dial-up service. The approximate cost, not including the PC or the cost of the phone call, is US \$100 to US \$800 plus a monthly fee of approximately US \$30.

Mid-range: You could subscribe to a dial-up service that provides Serial Line Internet Protocol (SLIP) or Point to Point Protocol (PPP), allowing your computer to effectively become a host on the Internet. You will need a computer with SLIP or PPP software, telecommunications applications software (to allow you to use telnet and FTP - File Transfer Protocol), and a modem which is compatible with your dial-up service. The approximate cost, not including the PC or the cost of the phone call, is US \$100 to US \$800 plus a monthly fee of approximately US \$60.

High-end: Your school or department could subscribe to a service that provides a full Internet connection to the school or department's local area network. This allows all the computers on the local area network access to the Internet. You will need a router and a connection to a network access provider's router. Typically the connection is a leased line with a CSU/DSU (Channel Service Unit/Data Service Unit). A leased line is a permanent high speed telephone connection between two points; this allows you to have a high quality permanent Internet connection at all times. A local area network, which may consist only of the router and a PC, Macintosh, or other computer system, is also needed, and your computer(s) will need some special software: a TCP/IP (Transmission Control Protocol/Internet Protocol) stack, as well as TCP/IP based communications software such as Telnet and FTP. The approximate cost, not including the computers, is US \$2,000 to US \$3,000 plus a monthly fee of at least US \$200.

- 4.3 What is required in terms of personnel to support an Internet connection? (Will it require extra staff, training, more time of teachers and librarians?)

Any plan for implementing technology in schools must consider staff development. Training is often the most neglected aspect of a technology plan, and a lack of training can lead to failure of the plan. In the case of the Internet, all users will need some kind of training, whether they are teachers, librarians, students, administrators, or people fulfilling other roles in the school.

The train-the-trainer model, in which a group of people are trained in a subject or tool and each individual in turn trains other groups, is a good model for Internet training. A small group of motivated teachers can be provided with training and can then educate their colleagues. One advantage is that the initial group is able to target the specific needs of the other teachers in the school.

Depending on the hardware involved, there may be a need for technical support. Finding this kind of support, which schools will certainly need because it is not usually in place, may be tricky. Some districts are beginning to provide it at the district level. Some schools are able to use volunteers from business, industry, or government agencies. Much of this type of support can be done over the network itself, which makes it possible for someone located off-site to maintain the equipment with only occasional trips to the school. Additionally, vendors often provide some support, perhaps a help desk for basic questions.

- 4.4 How do I convince the people who do the purchasing in our school system to spend money on this?

Most people become convinced with exposure. One excited individual in the school who is able to show proof of concept by starting a pilot program can be the catalyst for a school or an entire district. If you can get an Internet account (as suggested above) and use it for instruction in your classroom, you can make presentations at faculty, school/community, and school board meetings.

The National Center for Education Statistics in the Office of Educational Research and Improvement at the United States Department of Education has released a 17-minute video targeted at school administrators entitled "Experience the Power: Network Technology for Education". It uses interview clips of students, teachers, and policy makers in the United States to educate about

what the Internet is and to encourage support for the use of telecommunications in primary and secondary schools. The NASA NREN (US National Aeronautics and Space Administration National Research and Education Network) K-12 Initiative has produced an 11-minute video describing the benefits to schools in using the Internet. The video is entitled, "Global Quest: The Internet in the Classroom", and it tells the story through interview clips with students and teachers who have experienced the power of computer networking. For further information on the two videos, see "National Center for Education Statistics", and "NASA Central Operation of Resources for Educators" under "Organizations" in Section 9, "Resources and Contacts".

4.5 Where do I go for technical support and training?

Much technical support and training can be found by using the Internet itself. You can send questions to people in the know and join discussion lists and news groups that discuss and answer questions about support and training. One such list is Tipsheet, the Computer Help and Tip Exchange, the purpose of which is to provide a supportive setting where people can ask questions or discuss products. Other lists are the education-related lists mentioned in Question 7.2. All of these are listed in Section 9, "Resources and Contacts".

Network News, or Usenet News, is a world-wide bulletin board system with discussion groups on various topics, including computer science, general science, social and cultural themes, recreational interests, etc. By sending questions to an appropriate news group you can receive answers from people experienced with your particular problem. Specific news groups to look for are those beginning with "comp", for "computer", and followed by the type of operating system, hardware, or software you have a question about. For example, comp.os.unix or comp.os.msdos.apps. To understand the culture and etiquette of Usenet News, read the group news.announce.newusers.

Your local community may also have resources that you can tap. These are again colleges and universities, businesses, computer clubs and user groups, technology consultants, and government agencies.

Your network access provider may offer training and support for technical issues, and other groups also offer formal classes and seminars. For those schools who have designated technical people, they are good candidates for classes and seminars.

There are some documents for further reading and exploration that

you may want to peruse. See Section 8, "Suggested Reading". There are books on almost every specific subject in the computing world that may answer your questions. For new books, check your local library, bookstore, or booksellers' catalogs.

5. Questions About Implementation and Technical Options

5.1 How do I learn about options for getting my school connected?

In the United States, there are a number of state-wide educational networks, most of them with access to the Internet. To find out if there is a state education network in your area which gives accounts to educators and/or students, contact the Consortium for School Networking. The InterNIC has a list of regional and national network providers. Both the Consortium for School Networking and the InterNIC are listed in Section 9, "Resources and Contacts".

The global regional NICs such as the RIPE NCC in Europe can also provide a list of service providers. The APNIC in the Pacific Rim will have a similar list in the near future.

You can sometimes locate a person enthusiastic about the idea of using networks in schools and willing to help you who works as an independent consultant, in a local college or university, in a technology company, for a network access provider, at a community network, or in a government agency.

There are a number of books about the Internet and how to get connected to it. A few are listed in Section 8, "Suggested Reading", and more are being published every month. Check libraries, bookstores, and booksellers' catalogs.

5.2 How many of our computers should we put on the Internet?

You will probably want to make Internet *access* possible for as many of your school's computers as possible. If you are using a dial-up service, you may want a number of shared accounts throughout the school. If your school has a Local Area Network (LAN) with several computers on it, one dedicated Internet connection should be able to serve the whole school.

If you are going to connect a lot of computers to the network, you will need to make sure your line speed is adequate. Most dial-up systems available today support speeds up to 14.4 Kbs (kilobits per second), which is adequate for no more than a couple of network users, depending upon the network utilities (FTP, etc.) they are using. If you are planning to connect a large number of

users, you should probably consider a dedicated line of 56 Kbs or higher.

5.3 Should we set up a telecommunications lab or put networked computers in each classroom?

A computer lab is an easier maintenance set-up for the person in charge of keeping the equipment running and allows each individual (or pair) in an entire class to be using a computer at the same time; a computer located in the classroom is more convenient for both the teacher and the class. If you choose the lab option, you will probably want to get a commitment from specific teachers or media specialists to use the lab in the course of their teaching. You might also consider the other labs located throughout your school. For example, if you have a science or language lab, it may be the best place for your school to begin to use the Internet. And finally, remember that the library is a natural place for people to access network resources!

Networking all computers campus-wide can be expensive. You will need to consider the options--dial-up access, a dedicated line, or some other possibility--and weigh them against your school's needs and priorities. You may want to investigate having one lab, the library, and a few classrooms with modem access, assuming phone lines are available. As use of the Internet catches on, it will be more effective to create a campus-wide local area network that is routed to the Internet through a dedicated line than to keep adding modems in classrooms. Or you may want to consider the other options discussed in question 5.5 below.

5.4 Can people get on the Internet from home?

This depends on your network access provider. It is certainly a possibility and is probably desirable for the educators at your school if they happen to have the necessary equipment at home. You will need to discuss whether you want to make this option available to students even if it is possible technically. This is best discussed with the community your school serves in a public forum such as a school/community meeting. At issue is the shared responsibility of educators and parents to monitor student Internet use. (See also Question 6.2.)

5.5 What are some of the options for using Internet services without paying for a full, dedicated-line Internet connection?

It is possible to create a local, store-and-forward network using various implementations of the Unix to Unix Copy (UUCP) software suite, available as public domain (free) or shareware (small fee

which is often optional) software, which can run on many different platforms including Amiga, IBM, and Macintosh. The connections are via dial-up phone lines using local phone numbers. Usenet News and email are "stored" on a computer until the time appointed for that computer to contact the next one along the path to the final destination, at which time it is "forwarded" along its way. Most computers are set up to process outgoing requests at least every 30 minutes. With this type of system you will have access to as many Usenet News groups as your site agrees to carry, as well as email, which includes access to mailing lists and listservs such as those listed in Section 9, "Resources and Contacts". Many file servers also offer file transfer and other services via email.

There are a couple of important advantages to such a system. First, it is much more affordable since such networks provide more efficient use of telephone lines, making a connection only while data is actually being transferred. Second, it allows for filtering, which gives a school some control over what kind of information is available to its students.

The disadvantage to this type of Internet access is that you may be limited regarding the range of Internet applications you can use.

FrEdMail, FidoNet, and K12Net are store-and-forward systems. FidoNet, for example, is a network of amateurs and hobbyists which operates on personal computers and is publicly accessible by anyone with a microcomputer and a modem. Contact information for all three organizations can be found in Section 9, "Resources and Contacts".

6. Questions About Security and Ethics

6.1 Who should have access in the school, the teachers or the students?

Clearly the answer is that all educators, including administrators and media specialists or librarians, AND students should have access to the Internet. There's no reason why support staff should not also have access. In elementary schools, access for students may be more supervised than in the upper grades.

- 6.2 I've heard that there are files on the Internet that parents would not like their children to get. How can students be kept from accessing this objectionable material?

If your school has a direct Internet connection, and often even if it doesn't, it is not possible to use a technical solution to prevent students from accessing objectionable material. Everyone on the network, including students, is able to download files from public electronic repositories, some of which contain materials that just about anyone would consider objectionable for school-age children. The store-and-forward scenario described in Question 5.5 is one solution to filtering the information to which students have access, but if students are allowed to use email then it is possible for someone to send them objectionable material.

For this reason, it is important that schools develop clear policies to guide students' use of the Internet and establish rules, and consequences for breaking them, that govern behavior on the Internet. Additionally, schools should consider integrating issues around technology and ethics into the curriculum [4].

Another possibility is to control the times and opportunities that students have to access the Internet, and only allow access under supervision. This is a less desirable option than teaching the ethics of Internet access as a matter of course, but may be used in combination with other methods to ensure the integrity of the school, its students, and its educators.

In any case, schools need to exercise reasonable oversight while realizing that it is almost impossible to absolutely guarantee that students will not be able to access objectionable material.

- 6.3 How do we keep our own and other people's computers safe from student "hackers"?

In the language of computer folks, a "hacker" is someone who is excellent at understanding and manipulating computer systems. A "cracker" is someone who maliciously and/or illegally enters or attempts to enter someone else's computer system.

Computer security is unquestionably important, both in maintaining the security of the school's computers and in ensuring the proper behavior of the school's students (and others who use the network). In this area, not only school policy, but also state and national laws may apply. Two sources of information which you can read to help you sort through security issues are:

"Site Security Handbook" (FYI 8)

"Ethical Uses of Information Technologies in Education"
(Sivin & Bialo)

The full references for these documents can be found in Section 8, "Suggested Reading". The pamphlet "Ethical Uses of Information Technologies in Education" is more applicable to the laws of the United States than to those of other countries, but several of the ideas are shared in various cultures.

6.4 How do we keep viruses from attacking all our computers if we get connected to the Internet?

If you use the Internet to exchange data (such as text or pictures), virus infection is generally not a problem. The real concern is when you download software programs and run them on your own computer. Any program you download over the network and run could have a virus. For that matter, any program, whether on tape or a disk, even commercial software still in its original packaging, might possibly have a virus. For this reason, all computers should have virus protection software running on them.

Virus checking software is available free over the Internet via Anonymous FTP from the Computer Emergency Response Team (CERT), which is run by the US National Institute for Standards and Technology (NIST). The Anonymous FTP host computer is <ftp.cert.org>. (For information on using Anonymous FTP, see Appendix B.) Your hardware or software vendor, your network access provider, your technical support resources, or your colleagues on network mailing lists should be able to provide more specific information applicable to your site.

To help reduce the risk of downloading a virus with your program, try to use trusted sources. Ask someone you know or send the question to a mailing list or news group to find the most reliable sites for software access.

6.5 What are the rules for using the Internet?

When your Internet connection is established, your access provider should acquaint you with their Acceptable Use Policy (AUP). This policy explains the acceptable and non-acceptable uses for your connection. For example, it is in all cases unacceptable to use the network for illegal purposes. It may, in some cases, be unacceptable to use the network for commercial purposes. If such a policy is not mentioned, ask for it. All users are expected to know what the acceptable and unacceptable uses of their network

are. Remember that it is essential to establish a school-wide policy in addition to the provider's AUP.

7. Questions About Educational Collaboration, Projects, and Resources

7.1 How can I find specific projects using the Internet that are already developed?

There are a several resources on the Internet that are directed specifically at the primary and secondary school communities, and the number is growing. The InterNIC gopher server has a section on K-12 (Kindergarten through 12th grade) Education, the Consortium for School Networking maintains a gopher server, and NASA's Spacelink is directed at primary and secondary school educators. NYSERNet's Empire Internet Schoolhouse is an extension of its Bridging the Gap program. For access to these and others, see Section 9, "Resources and Contacts".

Many people on electronic mailing lists such as Ednet, Kidsphere, and the Consortium for School Networking Discussion List (cosndisc) post their projects and ask for partners and collaborators. The K12 hierarchy of Usenet News has several groups where educators post these invitations as well. For subscription to these and other electronic lists and for names of news groups, see Section 9, "Resources and Contacts". For news groups and mailing lists of special interest to educators, see the "Ednet Guide to Usenet Newsgroups" and "An Educator's Guide to E-Mail Lists", both of which are listed in Section 8, "Suggested Reading".

As you explore the Internet, there are some tools that will help you find projects that are already developed. A good overview of many of these resource discovery tools is the "Guide to Network Resource Tools" written by the European Academic Research Networks (EARN) Association. It explains the basics of tools such as Gopher, Veronica, WAIS, Archie, and the World Wide Web, as well as others, and provides pointers for finding out more about these useful tools. It is listed in Section 8, "Suggested Reading".

7.2 Where do I go to find colleagues who support networking and schools willing to participate in projects?

The electronic mailing lists and Usenet News groups in Section 9, "Resources and Contacts" are rich with people who want to collaborate on projects involving use of the Internet.

There are also a number of conferences you may want to look in to. The National Education Computing Conference (NECC) is held

annually, as is Tel-Ed, a conference sponsored by the International Society for Technology in Education (ISTE). ISTE maintains an online server which has a calendar of conferences all over the world in telecommunications for education. The INET conference is the annual conference for the Internet Society. See Section 9, "Resources and Contacts", for contact information for these organizations and for information on access to ISTE's online server.

7.3 What are some examples of how the Internet is being used in classrooms now?

Projects which use the Internet sometimes request sites from all over the world to contribute data from the local area then compile that data for use by all. Weather patterns, pollutants in water or air, and Monarch butterfly migration are some of the data that has been collected over the Internet. In Appendix A you will find several examples from the Kidsphere electronic mailing list, each from a different content area and representing different ways of using the Internet.

There are a number of specific projects you may find interesting. KIDS-94 (and subsequent years), managed by the non-profit KIDLINK Society, is one. It currently includes ten discussion lists and services, some of them only for people who are ten through fifteen years old. Another place to look is Academy One of the National Public Telecomputing Network (NPTN), which usually has between 5 and 10 projects running at a time. The International Education and Research Network (I*EARN), a project of the non-profit Copen Family Fund, facilitates telecommunications in schools around the world. Chatback Trust, initiated to provide email for schools in the United Kingdom and around the world with students who have mental or physical difficulty with communicating, and Chatback International, directed at any school on the Internet, maintain a network server that you may want to investigate. The European Schools Project involves approximately 200 schools in 20 countries and has as its goal building a support system for secondary school educators. For contact information on these groups and server access, refer to Section 9, "Resources and Contacts".

7.4 Is there a manual that lists sites on the Internet particularly useful for class exploration?

There are a number of resource guides, and so far only a couple are directed specifically at an education audience. "An Incomplete Guide to the Internet and Other Telecommunications Opportunities Especially for Teachers and Students K-12" is compiled by the NCSA Education Group and is available online. The

"Internet Resource Directory for Educators, Version 2" is also available online. It was prepared by a team of 46 teachers in Nebraska and Texas who were enrolled in telecomputing courses at two universities in 1992 and 1993. Ednet's "Educator's Guide to Email Lists" is available electronically, as is the "Ednet Guide to Usenet News Groups". ERIC offers several documents relating to telecommunications and education, including the ERIC Digest "Internet Basics", the ERIC Review "K-12 Networking", "Instructional Development for Distance Education", and "Strategies for Teaching at a Distance". Complete bibliographic information for these documents is listed in Section 8, "Suggested Reading". For help in retrieving the documents electronically, see Appendix B.

There are also printed guides to the Internet appearing along with the new books on the Internet. The problem with paper resource guides is that the Internet is a changing environment, so they become outdated quickly. Check libraries, bookstores, and booksellers' catalogs for these guides.

One answer to the problem of printed Internet guides is the newsletter. NetTEACH NEWS is a newsletter specifically for primary and secondary school educators interested in networking. It contains information on new services on the Internet that are of interest to educators, projects for collaboration, conferences, new books and publications, and includes "The Instruction Corner", which gives practical tutorials on using network tools and services. NetTEACH NEWS is published ten times a year, and is available both hardcopy and via email. Subscription information can be found in Section 9, "Resources and Contacts".

7.5 How can I add my own contributions to the Internet?

The network server operated by the Consortium for School Networking exists expressly for the sharing of ideas by the elementary and secondary school community. Educators are encouraged to submit projects, lesson plans, and ideas. A gopher server maintained by PSGnet and RAINet also accepts educator submissions for addition to the many sections of its menu tree devoted to elementary and secondary school interests. See Section 9, "Resources and Contacts" for information on reaching CoSN or submitting materials, and for access to the server maintained by PSGnet and RAINet. It is important to remember that anything you create should be updated for others as you make changes yourself in the course of your learning by experience.

The electronic mail lists and news groups mentioned are also places to share your knowledge and yourself as a resource, and as

you gain experience you may find you have the knowledge to put up an electronic server at your own site. A group of schools in Pittsburgh, Pennsylvania in the United States shares one such server, and there you could recently find and download to your own computer photographs and notes from an exhibit on the architecture of one of the elementary schools.

8. Suggested Reading

Those items marked with an asterisk (*) are available free online. For information on retrieving documents electronically, see Appendix B.

Dearn, D. The Internet Guide for New Users.
Washington, DC: McGraw-Hill, Inc., 1994.

*"Ednet Guide to Usenet Newsgroups"
online:
nic.umass.edu
pub/ednet/edusenet.gde

*"Educator's Guide to E-Mail Lists"
online:
nic.umass.edu
pub/ednet/educatrs.lst

Fraase, M. The Mac Internet Tour Guide. Chapel Hill, NC:
Ventana Press, 1993.

*FYI 4 "FYI on Questions and Answers: Answers to Commonly asked "New Internet User" Questions", Malkin, G.S. and A. Marine.
(fyi4.txt or rfc1325.txt)

*FYI 5 "Choosing a Name for Your Computer", Libes, D.
(fyi5.txt or rfc1178.txt)

*FYI 8 "Site Security Handbook", Holbrook, J.P. and J.K. Reynolds.
(fyi8.txt or rfc1244.txt)

*FYI 16 "Connecting to the Internet: What Connecting Institutions Should Anticipate", ACM SIGUCCS Networking Task Force.
(fyi16.txt or rfc1359.txt)

*FYI 18 "Internet Users' Glossary", LaQuey Parker, T. and G. Malkin.
(fyi18.txt or rfc1392.txt)

*FYI 19 "Introducing the Internet--A Short Bibliography of Introductory Internetworking Reading for the Network Novice",

Hoffman, E. and L. Jackson. (fyi19.txt or rfc1463.txt)

*FYI 20, "What is the Internet?" Krol, E. and E. Hoffman.
(fyi20.txt or rfc1462.txt)

The FYI series is online in the following locations. Choose the site nearest you from which to download the files:

United States
ds.internic.net (198.49.45.10)
fyi/fyi##.txt

Pacific Rim
munnari.oz.au (128.250.1.21)
fyi/fyi##.txt

Europe
nic.nordu.net (192.36.148.17)
fyi/fyi##.txt

*"Guide to Network Resource Tools", EARN Association. May 1993.
64 pp.

online:
naic.nasa.gov
files/general_info/earn-resource-tool-guide.ps and
earn-resource-tool-guide.txt

ftp.earn.net
pub/doc/resource-tool-guide.ps and
resource-tool-guide.txt

ns.ripe.net
earn/earn-resource-tool-guide.ps and
earn-resource-tool-guide.txt

ds.internic.net
pub/internet-doc/EARN.nettools.ps and
EARN.nettools.txt

via email:
send a message to...
...LISTSERV@EARNCC.BITNET
leave the subject blank and in the first line of the body,
enter...
...GET NETTOOLS TXT
for the plain ASCII text format, or
...GET NETTOOLS PS
for the PostScript version

*"Incomplete Guide to the Internet and Other Telecommunications Opportunities Especially for Teachers and Students K-12", NCSA Education Group. July, 1993.
online:
ftp.ncsa.uiuc.edu
Education/Education_Resources/Incomplete_Guide

To order a hardcopy, contact:

Valerie Sheehan
NCSA Education Group
605 E. Springfield Ave.
Champaign, IL 61820
vsheehan@ncsa.uiuc.edu

or:

Lisa Bievenue
NCSA Education Group
605 E. Springfield Ave.
Champaign, IL 61820
bievenue@ncsa.uiuc.edu

*Internet Resource Directory for Educators
online:
tcet.unt.edu
pub/telecomputing-info/IRD/IRD-telnet-sites.txt,
IRD-ftp-archives.txt, IRD-listservs.txt, and
IRD-infusion-ideas.txt

Kehoe, Brendan. Zen and the Art of the Internet: A Beginner's Guide.
Englewood Cliffs, NJ: Prentice-Hall, 1992.

Krol, E. The Whole Internet User's Guide & Catalog. Sebastopol,
CA: O'Reilly & Associates, Inc., 1992.

LaQuey, T. The Internet Companion: A Beginner's Guide to Global
Networking. Reading, MA: Addison-Wesley Publishing Company,
1992.

Marine, A., S. Kirkpatrick, V. Neou, and C. Ward. Internet:
Getting Started. Englewood Cliffs, New Jersey: Prentice-Hall,
1993.

Sivin, J.P. and Bialo, E.R. "Ethical Uses of Information
Technologies in Education", 1992. Washington, DC: U.S.
Department of Justice, Office of Justice Programs,
National Institute of Justice.

To order, call 800-851-3420 from within the United States or 301-251-5500 from outside of the United States.

Or write to:

U.S. Department of Justice
Office of Justice Programs
National Institute of Justice
Washington, DC 20531

*RFC 1480 "The US Domain", Cooper, A. and J. Postel. June 1993.
(rfc1480.txt)

This document will also be useful to people not in the United States. See the sites listed under the FYI documents for the location nearest you from which to download the file.

9. Resources and Contacts

CONFERENCES:

NECC and Tel-Ed

International Society for Technology in Education
1787 Agate Street
Eugene, Oregon 97403-1923
USA
phone: 503-346-4414 or 1-800-336-5191
fax: 503-346-5890
email: iste@oregon.uoregon.edu
(CompuServe: 70014,2117)
(AppleLink: ISTE)

Electronic access to a calendar of conferences all over the world and other information is available on the ISTE server. See "Network Servers" in this section.

INET

Internet Society
1895 Preston White Drive
Suite 100
Reston, Virginia 22091
USA
Phone: 703-648-9888
Fax: 703-620-0913
Email: isoc@isoc.org

ELECTRONIC MAIL LISTS:

Cosndisc (Consortium for School Networking Discussion List)

To subscribe, send a message to...
listproc@yukon.cren.org

Leave the Subject field blank, and in the first line of the body of
the message enter...
subscribe cosndisc YourFirstName YourLastName

To post, send a message to...
cosndisc@yukon.cren.org

Ednet

To subscribe, send a message to...
listserv@nic.umass.edu

Leave the Subject field blank, and in the first line of the body of
the message enter...
subscribe ednet YourFirstName YourLastName

To post, send a message to...
ednet@nic.umass.edu

Kidsphere

To subscribe, send a message to...
kidsphere-request@vms.cis.pitt.edu
Type any message asking to be added to the list.

To post, send a message to...
kidsphere@vms.cis.pitt.edu

KIDS-95/KIDLINK

To learn about KIDLINK projects, subscribe to the news service by
sending a message to...
listserv@vml.nodak.edu

Leave the Subject field blank, and in the first line of the body of
the message enter...
subscribe KIDLINK YourFirstName YourLastName

To receive a file of general information on KIDLINK, send email to
the same listserv address, leave the Subject field blank, and in
the first line of the body of the message enter...
get kidlink general

K12admin (A list for K-12 educators interested in educational administration)

To subscribe, send a message to...
listserv@suvvm.syr.edu

Leave the Subject field blank, and in the first line of the body of the message enter...

subscribe k12admin YourFirstName YourLastName

To post, send a message to...
k12admin@suvvm.syr.edu

LM_NET (A list for school library media specialists worldwide)

To subscribe, send a message to...
listserv@suvvm.syr.edu

Leave the Subject field blank, and in the first line of the body of the message enter...

subscribe LM_NET YourFirstName YourLastName

To post, send a message to...
LM_NET@suvvm.syr.edu

SIGTEL-L (A list for the Special Interest Group for Telecommunications, a service of the International Society for Technology in Education)

To subscribe, send a message to...
SIGTEL-L@unmvma.unm.edu

Leave the Subject field blank, and in the first line of the body of the message enter...

subscribe SIGTEL-L YourFirstName YourLastName

To post, send a message to...
SIGTEL-L@unmvma.unm.edu

Tipsheet (Computer Help and Tip Exchange)

To subscribe, send a message to...
listserv@wsuvml.csc.wsu.edu

Leave the Subject field blank, and in the first line of the body of the message enter...

subscribe tipsheet YourFirstName YourLastName

NETWORK SERVERS:

Chatback Trust and Chatback International network server

via telnet...
telnet rdz.stjohns.edu
login: student
(Follow login instructions on screen.)

via gopher...
sjuvm.stjohns.edu (port 70)
Choose "Rehabilitation Resource Center" from first menu.
Choose "SJU Unibase Bulletin Board and Conference System" from
menu which then comes up.

Consortium for School Networking gopher server

via gopher...
cosn.org (port 70)

via telnet...
telnet cosn.org
login: gopher
(no password)

Educational Resources Information Center (ERIC) Digests Archives are available

via telnet...
telnet bbs.oit.unc.edu
login: launch
(Follow directions on screen for registration. At the main menu,
choose number 4, "Topical Document Search (WAIS)", and move to
eric-digests. For help in WAIS, type a question mark.)

via FTP...
ftp ericir.syr.edu
login: anonymous
password: your_email_address
cd pub

via email...
mail askeric@ericir.syr.edu
(In your message ask for the topic you're interested in. A human
will answer you.)

via gopher...
ericir.syr.edu (port 70)

Empire Internet Schoolhouse

via gopher...
nysernet.org (port 70)

via telnet...
telnet nysernet.org
login: empire
(no password)

International Society for Technology in Education (ISTE) gopher server

via gopher...
gopher.uoregon.edu (port 70)

via telnet...
telnet gopher.uoregon.edu
login: gopher
(no password)

Once connected via either of these two methods, use the menu item "Search Titles in This Gopher Server" and enter ISTE when asked what to search for.

InterNIC gopher server

via gopher...
is.internic.net (port 70)

via telnet...
telnet is.internic.net
login: gopher
(no password)

KIDS Gopher, a KIDLINK service

via gopher...
kids.duq.edu (port 70)

via telnet...
telnet kids.duq.edu
login: gopher
(no password)

NASA Spacelink

```
via telnet...
telnet spacelink.msfc.nasa.gov
login: newuser
password: newuser
(Follow registration instructions on screen.)
```

To find information on the NASA Teacher Resource Center Network or for a NASA Select television schedule, enter "g" for GO TO, then enter either "TRC" or "NASA Select".

```
via FTP...
ftp spacelink.msfc.nasa.gov
```

National Science Foundation's (United States) Science and Technology Information System (STIS)

```
via telnet...
telnet stis.nsf.gov
login: public
Follow instructions on screen.
```

```
via gopher...
stis.nsf.gov (port 70)
```

Office of Educational Research and Improvement (US Department of Education) gopher server

```
via gopher...
gopher.ed.gov (port 70)
```

The OERI gopher server contains educational research and statistics, as well as information about the United States Department of Education and its programs.

PSGnet and RAINet gopher server

```
via telnet...
telnet gopher.psg.com
login: gopher
(no password)
```

```
via gopher...
gopher.psg.com (port 70)
```

NEWS GROUPS:

alt.education.distance
alt.kids-talk
comp.security.announce
k12.chat.elementary
k12.chat.junior
k12.chat.senior
k12.chat.teacher
k12.ed.art
k12.ed.business
k12.ed.comp.literacy
k12.ed.health-pe
k12.ed.life-skills
k12.ed.math
k12.ed.music
k12.ed.science
k12.ed.soc-studies
k12.ed.special
k12.ed.tag
k12.ed.tech
k12.edu.life-skills (especially for school counselors)
k12.euro.teachers (in Europe)
k12.lang.art
k12.lang.deutsch-eng
k12.lang.esp-eng
k12.lang.francais
k12.lang.russian
k12.library
k12.sys.projects
misc.education
misc.education.language.english
misc.kids
misc.kids.computer
news.announce.newusers
pubnet.nixpub (where a list of open access Unix sites is often posted,
for those looking for access to Usenet News and email only)

NEWSLETTER:

NetTEACH NEWS

Published monthly from August to March and bi-monthly April/May and June/July, NetTEACH NEWS is written for both the novice and the experienced networking teacher.

Annual hardcopy subscription costs are:

US \$22.00 for individuals in the US
US \$25.00 for individuals in Canada
US \$30.00 for individuals outside the US and Canada
US \$30.00 for institutions

Annual ASCII electronic copy costs are:

US \$15.00 for individuals

Add \$5.00 to hardcopy costs to receive both ASCII and hardcopy.

Site licensing is available for public primary and secondary education networks. Discounts are available for school district multiple sub-subscriptions.

For a subscription form, questions, or to submit materials, contact:

Kathy Rutkowski, Editor
Chaos Publications
13102 Weather Vane Way
Herndon, VA 22071
USA
Phone: 703-471-0593
EMail: info@netteach.chaos.com

ORGANIZATIONS:

AskERIC
ERIC Clearinghouse on Information Resources
Center for Science and Technology
Syracuse University
Syracuse, New York 13244-4100
USA
Phone: 315-443-9114
Fax: 315-443-5448
EMail: askeric@ericir.syr.edu

According to a recent electronic brochure, "The Educational Resources Information Center (ERIC) is a federally-funded national information system that provides access to an extensive body of education-related literature. ERIC provides a variety of services and products at all education levels."

Another portion of the electronic brochure states, "AskERIC is an Internet-based question-answering service for teachers, library media specialists, and administrators. Anyone involved with K-12 education can send an e-mail message to AskERIC. Drawing on the extensive resources of the ERIC system, AskERIC staff will respond with an answer within 48 working hours." Educators may have questions about primary and secondary education, learning, teaching, information technology, or educational administration which AskERIC can answer. Parents AskERIC is a new service for parents looking for information to better facilitate their children's developmental and educational experiences. Use the email address listed above.

Chatback International
Dr. R. Zenhausern, Executive Director
Psychology Department
St. Johns University
SB 15, Marillac
Jamaica, NY 11439
USA
Phone: 718-990-6447
Fax: 718-990-6705
EMail: drz@sjvm.stjohns.edu

The Chatback Trust
Tom Holloway, UK Director
25 Clemens Street
Royal Leamington Spa
Warwickshire, CV31 2DP
Phone: +44-926-888333
Fax: +44-926-420204
EMail: t.holloway@warwick.ac.uk

The Chatback Trust is the organization which was originally concerned primarily with school children with various types of language disorder. Chatback International is the expansion of that project onto the Internet and is concerned with the use of networks to educate all children.

Consortium for School Networking
P.O. Box 65193
Washington, DC 20035-5193
USA
Phone: 202-466-6296
Fax: 202-872-4318
EMail: info@cosn.org

According to a recent brochure, "The Consortium for School Networking is a membership organization of institutions formed to further the development and use of computer network technology in K-12 education." To join CoSN, request an application at the above address. To contribute your ideas, lesson plans, projects, etc., for others to access over the Internet, send to email to:
ferdi@digital.cosn.org

European Schools Project
University of Amsterdam
CICT/SCO
Grote Bickerrstraat 72
1013 KS Amsterdam
The Netherlands
Contact: Dr. Pauline Meijer or Dr. Henk Sligte
Phone: +31-20-5251248
Fax: +31-20-5251211
EMail: risc@esp.educ.uva.nl

The European Schools Project is "a support system for secondary schools to explore applications of educational telematics."

FidoNet
1151 SW Vermont Street
Portland, OR 97219
USA
Contact: Janet Murray
Phone: 503-280-5280
EMail: jmurray@psg.com

FidoNet is a dial-up, store-and-forward messaging system which takes advantage of late night phone rates to send and receive email and conferences.

FrEdMail Foundation
P.O. Box 243,
Bonita, CA 91908
USA
Contact: Al Rogers
Phone: 619-475-4852
EMail: arogers@bonita.cerf.fred.org

International Education and Research Network (I*EARN)
c/o Copen Family Fund
345 Kear Street
Yorktown Heights, NY 10598
USA
Contact: Dr. Edwin H. Gragert
Phone: 914-962-5864
Fax: 914-962-6472
EMail: edl@copenfund.igc.apc.org

According to Dr. Gragert, "The purpose of the I*EARN Network is to create low-cost telecommunications models to demonstrate that elementary and secondary students can make a meaningful contribution to the health and welfare of people and the planet. We want to see students go beyond simply being "pen-pals" to use telecommunications in joint student projects as part of the educational process." I*EARN works with international service and youth organizations to add telecommunications to existing partnerships.

KIDLINK Society
4815 Saltrod
Norway
Phone: +47-370-31204
Fax: +47-370-27111
EMail: opresno@extern.uio.no
Contact: Odd de Presno

KIDLINK is the organization that runs the yearly KIDS projects, KIDS-94, KIDS-95, etc. For information on getting files related to KIDS-NN/KIDLINK, see "Electronic Mail Lists" in this section. For access to the KIDS Gopher, see "Network Servers" in this section.

K12Net
1151 SW Vermont Street
Portland, OR 97219
USA
Phone: 503-280-5280
Contact: Janet Murray
EMail: jmurray@psg.com

K12Net is a collection of conferences devoted to curriculum, language exchanges with native speakers, and classroom-to-classroom projects designed by teachers in K-12 education. The conferences are privately distributed among FidoNet-compatible bulletin board systems on five continents and are also available as Usenet Newsgroups in the hierarchy "k12." More information about K12Net is available from gopher.psg.com.

via telnet...
telnet gopher.psg.com
login: gopher

via gopher...
gopher.psg.com (port 70)

NASA Central Operation of Resources for Educators (CORE)
Lorain County Joint Vocational School
15181 Route 58 South
Oberlin, OH 44074
USA
Phone: 216-774-1051, x293/294
Fax: 216-774-2144

For a copy of the video "Global Quest: The Internet in the Classroom" released by the NASA NREN K-12 Initiative contact the above address. The fee for the video is cost plus shipping and handling. You may also make a copy yourself by taking a blank copy to the nearest NASA Teacher Resource Center or by taping from NASA Select television. For information on the NASA Teacher Resource Center Network or on NASA Select, contact your nearest NASA facility or log in to NASA Spacelink. (See NASA Spacelink in "Network Servers".)

National Center for Education Statistics
555 New Jersey Ave N.W., R.410 C
Washington DC 20208-5651
USA
Phone: 202-219-1364
Contact: Jerry Malitz
EMail: ncesinfo@inet.ed.gov
Fax: 219-1728

For a copy of the video "Experience the Power: Network Technology for Education" released by NCES contact the above address. If you contact them via email to order a video be sure that you send your mailing address.

InterNIC Information Services
General Atomics
P.O. Box 85608
San Diego, California 92186-9784
USA
Phone: 800-444-4345
619-455-4600
Fax: 619-455-3990
EMail: info@internic.net

The InterNIC is a (United States) National Science Foundation funded group tasked with providing information services to the United States research and education networking community. The Reference Desk is in operation Monday through Friday, from 6:00 a.m. to 6:00 p.m. Pacific Time.

Internet Society
1895 Preston White Drive
Suite 100
Reston, Virginia 22091
USA
Phone: 703-648-9888
Fax: 703-620-0913
EMail: isoc@isoc.org

The Internet Society is an international membership organization for individuals and organizations that support its goals of promoting the use of the Internet:

- A. To facilitate and support the technical evolution of the Internet as a research and education infrastructure, and to stimulate the involvement of the scientific community, industry, government and others in the evolution of the Internet;
- B. To educate the scientific community, industry and the public at large concerning the technology, use and application of the Internet;
- C. To promote educational applications of Internet technology for the benefit of government, colleges and universities, industry, and the public at large;
- D. To provide a forum for exploration of new Internet applications, and to stimulate collaboration among organizations in their operational use of the global Internet.

Reseaux IP Europeens Network Coordination Centre (RIPE NCC)
Kruislaan 409
NL-1098 SJ Amsterdam
The Netherlands

Phone: +31 20 592 5065
Fax: +31 20 592 5090
EMail: ncc@ripe.net

The RIPE NCC assists European Internet operators and refers users to appropriate operators.

Services include:

- delegated registry for network and Autonomous System numbers
- whois database at whois.ripe.net
- document store at ftp.ripe.net (also accessible via gopher and wais)
- interactive information service (via telnet at info.ripe.net)

Asia Pacific Network Information Center
c/o University of Tokyo, Computer Center
2-11-16 Yayoi, Bunkyo-ku, Tokyo 113
Japan
Phone: +81-3-5684-7747
Fax: +81-3-5684-7256
EMail: hostmaster@apnic.net

The APNIC is a cooperative organization of national network information centers in the Asia Pacific region operating under the auspices of the Asia Pacific Coordinating Committee for Intercontinental Research Networks. APNIC is tasked with providing information and registration services to networking organizations throughout the Asia and Pacific Rim regions.

10. References

- [1] Malkin, G., and A. Marine, "FYI on Questions and Answers: Answers to Commonly Asked 'New Internet User' Questions", FYI 4, RFC 1325, Xylogics, SRI, May 1992.
- [2] Krol, E., and E. Hoffman, "What is the Internet?" FYI 20, RFC 1462, University of Illinois, Merit Network, Inc., May 1993.
- [3] "Restructuring Schools: A Systematic View" in Action Line, the newsletter of the Maryland State Teachers Association, a National Education Association Affiliate. R. Kuhn, Editor. No. 93-6. June, 1993.
- [4] Sivin, J. P. and E. R. Bialo (1992) "Ethical Uses of Information Technologies in Education." Washington, DC: U.S. Department of Justice, Office of Justice Programs, National Institute of Justice.
- [5] Hoffman, E. and L. Jackson, "Introducing the Internet--A Short Bibliography of Introductory Internetworking Reading for the Network Novice", FYI 19, RFC 1463, Merit Network, Inc., NASA, May 1993.

11. Security Considerations

General security considerations are discussed in Section 6 of this document.

12. Author's Address

Jennifer Sellers
NASA NREN
700 13th Street, NW
Suite 950
Washington, DC 20005
USA

Phone: 202-434-8954
EMail: sellers@quest.arc.nasa.gov

APPENDIX A: EXAMPLES OF PROJECTS USING THE INTERNET

The following examples of projects using the Internet appeared on the Kidsphere electronic mailing list during the 1992-93 school year. The messages have been edited in the interest of space and because many of the details about how to participate are dated, but the information presented can give you a feel for the types and range of projects that happen today.

=====
 Example One, "Middle School Math Project"
 =====

This is the official invitation to participate in "Puzzle Now!". "Puzzle Now!" is an interdisciplinary project using educational technology as a tool to integrate the curriculum. "Puzzle Now!" provides teams of mathematics and language arts teachers and students with thematic puzzle problems via VA.PEN.

PROJECT : Puzzle Now!

SUBJECT AREA : Mathematics/Language Arts

GRADE LEVEL : 6 - 8

DURATION : This project will consist of eight - one week cycles.

PROJECT GOALS :

- to increase student motivation for math problem solving;
- to emphasize the importance of addressing problems in a clear, concise, and logical manner;
- to provide students with opportunities for developing skills in written expression;
- to familiarize students with computer and modem as tools for problem solving projects.

PROJECT DESCRIPTION:

The puzzles presented in this project are no mere entertainment. These puzzles will help the student reason logically, develop thinking skills, and will assist in the understanding of many practical disciplines, such as geometry.

IT IS VERY IMPORTANT to remember that getting the correct answer isn't as important as figuring out how to find it.

DO THE SOLUTIONS HAVE TO BE SUBMITTED IN A PARTICULAR FASHION? Yes, the solution format requires that the group/team/individual first 1) restate the puzzle/problem; 2) explain the strategy, or strategies used in finding the answer; 3) state the answer.

Your team/class may turn in only one solution. That means you must work together to develop one solution to be examined by the "Puzzlemeister".

=====
 Example Two, "Poetry Contest, Grades 9-12"
 =====

National Public Telecomputing Network

--

Academy One Project Announcement

FIRST ANNUAL INTERNET POETRY CONTEST
 FOR SECONDARY STUDENTS GRADES 9-12

FEATURED FORM: THE SONNET

First Place Award: \$50.00

Second Place Award: \$25.00

Honorable Mentions: \$10.00

The first annual Internet Poetry Contest invites entries from students in grades 9-12 for original sonnets written within the last 3 years. The purpose of the contest is to encourage young creative writers to practice the discipline needed to write in a particular poetic form, in this case, the sonnet form. (The sonnet is defined and examples are given below.) Sonnets may be submitted in any recognized sonnet form including Petrarchan, Shakespearean, Miltonic, or Spenserian.

Students submitting entries must include a form (given below) certifying that each sonnet entered in the contest is original and written within the last 3 years. The deadline for mailing entries is April 30, 1993. Winners will be notified individually and winning entries will also be announced via Academy I on the Internet.

Judges for the contest are current or retired English instructors throughout the United States.

=====
Example Three, "Tracking Monarch Butterflies"
=====

Our school has begun a study of monarchs using Nova's Animal Pathfinders. After working through these lessons, which will give us the necessary background information, we will design the format for collecting the data on sighting monarchs. We will send information on the format to any school who wishes to participate in the project. Our fifth grade students will begin this project and we hope that students from kindergarten through twelfth grade will get involved. We hope that schools from south to north along the migratory flyways will be interested in joining and collecting data about first sightings and population counts. We still have not found the lepidopterists who did the initial research but will keep looking. Hope to hear from you soon.

=====
Example Four, "Simulated Space Mission"
=====

National Public Telecomputing Network
--
Academy One Program Announcement

SPECIAL EVENT: NESPUT 24-HOUR CENTENNIAL SPACE SHUTTLE
SIMULATED MISSION ON APRIL 27, 1993

SCHOOLS, TEACHERS, STUDENTS, SPACE ENTHUSIASTS:

The April 27 simulated and telecommunicated space shuttle mission is a mostly real-time 24 hour mission involving numerous activities in space. Your school could be involved for an entire 24 hour period or for a much lesser amount of time (say just your school day or even a few hours). During that 24 hour period, schools will be linked to share information via telecommunications and a variety of activities will be going on via telecommunications and in the classroom--most of them created by the schools and students involved. The space shuttle Centennial at University School in Shaker Heights, Ohio, a real and permanent simulator, will act as itself and use its mission control area as Houston. Reports on the progress of our real student

astronauts will be posted on the listserv and via the menus on NPTN affiliate systems carrying Academy One. Your school can act as any one of the following:

- A second American shuttle.
- A second Russian shuttle.
- A weather reporting station for your area.
- One of NASA's alternate landing sites.
- A science station posing questions and problems for all astronauts in simulated space.
- An information station, posting interesting information of interest about the space shuttle and the space program.
- A graphics station, sending GIF files to other schools (especially good if you have a scanner for your computer).
- Any other type of space related station or activity you can imagine.

=====
 Example Five, "Equinox Experiment and Calculation"
 =====

ATTENTION - MARCH 20, 1993 IS THE EQUINOX

A WORLDWIDE SCIENCE AND MATH EXPERIMENT

ERATOSTHENES EXPERIMENT

Eratosthenes, a Greek geographer (about 276 to 194 B.C.), made a surprisingly accurate estimate of the earth's circumference. In the great library in Alexandria he read that a deep vertical well near Syene, in southern Egypt, was entirely lit up by the sun at noon once a year. Eratosthenes reasoned that at this time sun must be directly overhead, with its rays shining directly into the well. In Alexandria, almost due north of Syene, he knew that the sun was not directly overhead at noon on the same day because a vertical object cast a shadow. Eratosthenes could now measure the circumference of the earth (sorry Columbus) by making two assumptions - that the earth is round and that the sun's rays are essentially parallel. He set up a vertical post at Alexandria and measured the angle of its shadow when the well at Syene was completely sunlit. Eratosthenes knew from geometry that the size of the measured angle equaled the size of the angle at the earth's center between Syene and Alexandria. Knowing also that the arc of an angle this size was 1/50 of a circle, and that the distance between Syene and Alexandria was 5000 stadia, he multiplied 5000 by 50 to find the earth's circumference. His result, 250,000 stadia (about 46,250 km) is quite close to modern

measurements. Investigating the Earth, AGI, 1970, Chapter 3, p. 66.

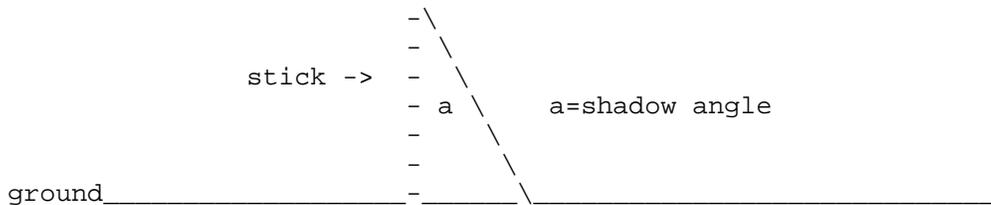
The formula Eratosthenes used is:

$$\frac{D}{d} = \frac{A}{a}$$

d=distance between Syene and Alexandria
 A=360 degrees assumption of round earth
 a=shadow angle of vertical stick
 D=to be determined (circumference)

Are you interested in participating?

All you need to do is place a vertical stick (shaft) into the ground at your school and when the sun reaches it's highest vertical assent for the day (solar noon), measure the angle of the shadow of the stick.



By doing this experiment on the equinox we all know that the vertical rays of the sun are directly over the equator, like the well at Syene. Using a globe or an atlas the distance between your location and the equator can be determined and the circumference can be calculated.

But how about sharing your shadow angle measurement with others around the real globe.

Send your measurement of the shadow angle_____degrees

Send your location city _____

Send your location country _____

Send your latitude _____

Send your longitude _____

We will compile all the data and send you a copy to use in your classroom to compare the various locations and angles.

If you're interested send us your data. We will compile and return it to you.

=====
Example Six, "Famous Black Americans"
=====

Project Name: Who Am I?: Famous Black Americans

Subject Area: Social Studies, Research Skills

Grade Level: Grades 4-12

Project Description: The goal of this project is to assist students in increasing their knowledge of American black history. Each week, on Monday Morning, a set of three or four clues will be sent to your account. The same will occur on Tuesday, Wednesday, and Thursday mornings. At any time, through the end of the day on Friday, your students may send their answer (the name of the famous American identified by the clues) to the following online address:

whoami@radford.vak12ed.edu

A class should send only one answer each week. If two are sent, the sponsors will assume that the first of the answers is the one intended to be submitted.

The sponsor will collect all answers, compile a listing of classes who send the correct answers, and will forward this list to all participants via email by early on the following Monday morning. On that morning, in addition, the sponsor will send all classes a new problem.

This project lasts five weeks, with clues each week being given for a different famous person in American history.

Project Length: Five Weeks

Awards: Every Monday morning, participating classes will receive an online message from the sponsor congratulating those who have sent correct answers during the previous week. At the end of the five weeks, attractive certificates will be awarded to all participating classes (sent by way of the Postal Service). In addition, classes which have participated in each of the five weeks will receive a separate style of certificate for their school or class.

APPENDIX B: HOW TO GET DOCUMENTS ELECTRONICALLY

The traditional way to access files available online on the Internet is via a program based on the File Transfer Protocol (FTP). Many information sites have hosts that allow "anonymous" FTP, meaning you don't need to already have an account on the host in order to access the files it makes public. This appendix will describe obtaining files via anonymous FTP and describe obtaining files via the Internet Gopher program.

The online files sited in Suggested Reading can all be retrieved via anonymous FTP. (Most can also be retrieved via Gopher.) In most cases, when you see a reference to a file available for FTP, the reference will give you both a computer hostname and a pathname. So, for example, the ASCII text version of the EARN Resource Tool Guide is on the host naic.nasa.gov in the /files/general_info directory as earn-resource-tool-guide.txt.

Many online files are mirrored on more than one host. RFC files, for example, are so popular that several hosts act as repositories for them; so, when they are cited, rarely is a hostname given. To find out all about getting RFCs and FYIs, send a message to rfc-info@isi.edu and in the body of the message, type 'help: ways_to_get_rfc'. RFCs are available both via electronic mail and via Anonymous FTP, as well as via many Gophers.

Anonymous FTP

Some of this information about transferring files based on text from the access.guide file referenced in FYI 19 [5] and written by Ellen Hoffman and Lenore Jackson.

If you are on a computer connected to the Internet and can use FTP, you can access files online. If your VM/CMS, VAX/VMS, UNIX, DOS, Macintosh, or other computer system has FTP capability, you can probably use the sample commands as they are listed. If your computer doesn't work using the sample commands, you may still have FTP access. You will need to ask your system administrator or local network consultant. If you don't have FTP, you may be able to get files via electronic mail.

If you are using a UNIX machine, you can use FTP directly from a system prompt. For other computers, there are commercial and public domain programs that will allow you to use FTP. (For example, there is a very easy-to-use shareware program called "Fetch" for the Macintosh.)

Once you establish that you have FTP access, you will need to send a series of commands to reach the host computer with the file you want, connect to the appropriate directory, and have the file transferred to your computer. A typical FTP session is described here, but not all software is exactly alike. If you have problems, check your software's documentation ('man' page) or contact your local help-desk.

This session uses the EARN Guide to Network Resource Tools in its naic.nasa.gov home as an example file to be transferred.

Here's what you can do:

- (1) Tell your computer what host you are trying to reach:
ftp naic.nasa.gov
- (2) Log in to the computer with the username "anonymous". You will be prompted for a password; most often it is preferred that you use your complete email address as your password.
- (3) Navigate through the directory to find the file you need. Two useful commands for doing so are the one to change directories ('cd'), which you can use to step through more than one directory at a time:

```
cd files/general_info
```

and the command which shows you the files and subdirectories within a directory:

```
dir
```

- (4) Give a command to have the file sent to your computer:
get earn-resource-tools.txt
- (5) Quit FTP:
quit

RFC Repositories:

Following is a list of hosts that are primary repositories for RFCs, and, for each host, the pathname to the directory that houses these files:

```
- ds.internic.net      rfc
- nis.nsf.net          internet/documents/rfc
- nisc.jvnc.net        rfc
- venera.isi.edu       in-notes
```

- wuarchive.wustl.edu info/rfc
- src.doc.ic.ac.uk rfc
- ftp.concert.net /rfc

RFCs are in the file format you see in the Suggested Readings section, e.g., rfc####.txt, with #### being the number of the RFC. To retrieve an RFC, then, you would FTP to a host above, log in as anonymous, cd to the directory noted, and retrieve the RFC you want. The file ways_to_get_rfcs, mentioned above, explains which sites make RFCs available for electronic mail retrieval, and provides directions for doing so.

Remember that FYI documents, such as this one, are also RFCs, so the information about RFCs applies to FYIs as well. You can usually retrieve FYIs either by their RFC number, or by their FYI number. FYI numbers are in the format fyi##.txt, where ## is the number of the FYI.

Gopher

A relatively new method of viewing and retrieving information is the Internet Gopher. A Gopher server presents information to a users via a series of menus. By choosing menu items, the user is led to files or to other services available on the Internet. Gopher can also retrieve files for the user because it has an interface to the File Transfer Protocol. So you can use Gopher to obtain files rather than FTP. Once you have located a file you want, you also have the option of mailing it electronically.

Several Gopher servers are listed in the Network Servers portion of Section 9 "Resources and Contacts". The InterNIC gopher, for example, is one that provides access to the RFCs.

Normally, the best way to access a Gopher server is by running a Gopher client on your own host or network. However, if you do not have that software, many Gophers are accessible via Telnet (see the addresses in Section 9). To Telnet to a host, most often you would give the command "telnet" and the hostname, for example:
telnet naic.nasa.gov.

Unlike FTP repositories, which are accessible over the network but which you have to access one at a time, many Gophers are linked together over the Internet. Therefore, if you have access to one Gopher, you usually have access to hundreds more. This huge network of gophers and the vast amount of information they serve is referred to as "gopherspace". You can use a service within Gopher called "Veronica" to search gopherspace to see if there is more information out there of a particular type you are interested

in finding. From within Gopher, look for a menu item such as "Search Gopherspace Using Veronica" to find out more information about using the Veronica service.

APPENDIX C: GLOSSARY OF TERMS USED IN THIS DOCUMENT

The following is a short glossary of terms used in this document. For a more complete glossary of Internet terms, refer to FYI 18 (RFC 1392), "Internet Users' Glossary". These definitions are largely excerpted from that glossary. (See Section 8, "Suggested Reading", above.)

Anonymous FTP

Accessing data via the File Transfer Protocol using the special username "anonymous". This was devised as a method to provide a relatively secure way of providing restricted access to public data. Users who wish to acquire data from a public source may use FTP to connect to the source, then use the special username "anonymous" and their email address as the password to log into a public data area.

Cracker

A person who uses computer knowledge to attempt to gain access to computer systems and/or maliciously damage those systems or data.

Dial-in (also dial-up)

A connection, usually made via modems, between two computers (or servers) over standard voice grade telephone lines.

Download

To copy data from a remote computer to a local computer. The opposite of upload.

DSU/CSU (Data Service Unit/Channel Service Unit)

The digital equivalent of a modem. A Channel Service Unit connects to a telephone company-provided digital data circuit, and a Data Service Unit provides the electronics required to connect digital equipment to the CSU. Paired together a DSU/CSU allows computer equipment to be connected into the telephone digital service for highly conditioned, high speed data communications.

Electronic Bulletin Board System (BBS)

A computer, and associated software, which typically provides electronic messaging services, archives of files, and any other services or activities of interest to the bulletin board system's operator. Although BBSs have traditionally been the domain of

hobbyists, an increasing number of BBSs are connected directly to the Internet, and many BBSs are currently operated by government, educational, and research institutions.

E-Mail (Electronic Mail)

A system whereby a computer user can exchange messages with other computer users (or groups of users) via a communications network.

FidoNet

A network of computers interconnected using the FIDO dial-up protocols. The FIDO protocol provides a means of "store and forward" file transfer similar to UUCP.

FTP (File Transfer Protocol)

A protocol which allows a user on one host to access, and transfer files to and from, another host over a network. Also, FTP is usually the name of the program the user invokes to execute the protocol.

FYI (For Your Information)

A subseries of RFCs that are not technical standards or descriptions of protocols. FYIs convey general information about topics related to TCP/IP or the Internet. See also: RFC (Request for Comments).

Gopher

A distributed information service that links many types of information from all around the Internet and presents it to the user in a series of menus. Because hundreds of Gopher servers cooperate in providing access to information and services, the user sees a single, uniform interface to information that actually resides on different host computers. The Gopher interface is very easy to use, and public domain versions of the clients and servers are available.

Hacker

A person who delights in having an intimate understanding of the internal workings of a system, computers and computer networks in particular. The popular media has corrupted this term to give it the pejorative connotation of a person who maliciously uses computer knowledge to cause damage to computers and data. The proper term for this type of person is "cracker".

Internet Engineering Task Force (IETF)

The IETF is a large, open community of network designers, operators, vendors, and researchers whose purpose is to coordinate the operation, management and evolution of the Internet, and to resolve short-range and mid-range protocol and architectural issues. It is a major source of protocol proposals and standards.

InterNIC

A Network Information Center (NIC), funded by the National Science foundation, that provides information about the Internet. The InterNIC is a team of three contractors, each of which focuses on a particular network support task. The three tasks are: Information Services (the task most often cited in this document), Registration Services, and Directory and Database Services.

Kbs (Kilo-Bits per Second)

A data transmission rate expressed in 1000 bit per second units. For example, 56Kbs is $56 \times 1000 = 56,000$ bits per second.

LAN (Local Area Network)

A data network intended to serve an area of only a few square kilometers or less. Since such are networks relatively small they can usually be directly controlled by the users and operate at relatively high speeds (up to 100Mb/s [10 million bits per second]) over inexpensive wiring.

Leased line

A leased line is a special phone company permanent connection between two locations. Leased lines are generally used where high-speed data (usually 960 characters per second and higher) is continually exchanged between two computers (in the Internet, generally between routers). A leased line is billed at the same rate per month independent of how much the line is used and can be cheaper than using dial modems depending on the usage. Leased lines may also be used where higher data rates are needed beyond what a dial modem can provide.

Listserv (mailing list server)

An automated program that accepts mail messages from users and performs basic operations on mailing lists for those users. In the Internet, listservs are usually accessed as "listname@host"; for example, the list server for the hypothetical list

"newsreports@acme.org" would be called "listserv@acme.org". Sending email to "newsreports@acme.org" causes the message to be sent to all the list subscribers, while sending a message (to subscribe or unsubscribe, for example) to "listserv@acme.org" sends the message only to the list server. Not all mailing lists use list servers to handle list administration duties.

Mailing Lists

A list of email addresses. Generally, a mailing list is used to discuss certain set of topics, and different mailing lists discuss different topics. A mailing list may be moderated, that is messages sent to the list are actually sent to a moderator who determines whether or not to send the messages on to everyone else. Many mailing lists are maintained by a "listserv" (list server) program that automatically handles operations such as adding new people to the list. (See above.) In the Internet, for those mailing lists maintained by a human, rather than by a listserv, you can generally subscribe to a list by sending a mail message to: "listname-REQUEST@host" and in the body of the message enter a request to subscribe. To send messages to other subscribers, you will then use the address "listname@host".

Modem (MODulator/DEModulator)

A device that converts the digital signals used by computers into analog signals needed by voice telephone systems. Modems can be "dial" or "leased line" type. Dial type modems are used on normal telephone lines to call remote computers, and usually operate at speeds between 120 to 1,920 characters per second.

Network Access Provider (Network Service Provider)

Any organization that provides network connectivity or dial-up access. Service providers may be corporations, government agencies, universities, or other organizations.

Network News

Another name for "Usenet News".

NIC (Network Information Center)

A central place where information about a network within the Internet is maintained. Usually NICs are staffed by personnel who answer user telephone calls and electronic mail, and provide general network usage information and referrals, among other possible tasks. Most network service providers also provide a NIC for their users.

Port

TCP/IP assigns at least one address to a host computer, but applications such as FTP must talk to a corresponding server application on the host. The "port" is the way TCP/IP designates the remote application. Most common Internet servers have specific port numbers associated with them. For example, Telnet uses port number 23. These are known as "well known ports" and allow application programmers to write standard applications (such as Telnet, FTP, etc.) that "know" where the corresponding server is on a particular host.

PPP (Point to Point Protocol)

A protocol used to establish TCP/IP connections using serial lines such as dial-up telephone lines. Similar to SLIP (see below), PPP is a later standard that includes features such as demand dial-up, compression, better flow control, etc.

Protocol

A formal description of message formats and the rules two computers must follow to exchange those messages. Protocols can describe low-level details of machine-to-machine interfaces (e.g., the order in which bits and bytes are sent across a wire) or high-level exchanges between allocation programs (e.g., the way in which two programs transfer a file across the Internet).

Protocol Stack

A series of protocols linked together to provide an end-to-end service. For example, the File Transfer Protocol uses the Transmission Control Protocol, which uses the Internet Protocol, which may use the Point to Point protocol, to transfer a file from one computer to another. The series FTP->TCP->IP->PPP is called a protocol stack.

RFC (Request for Comments)

The document series, begun in 1969, which describes the Internet suite of protocols and related experiments. Not all (in fact very few) RFCs describe Internet standards, but all Internet standards are written up as RFCs. The RFCs include the documentary record of the Internet standards process.

Router

A computer which forwards traffic between networks. The forwarding decision is based on network layer information and routing tables, often constructed by routing protocols.

SLIP (Serial Line Internet Protocol)

A protocol used to establish TCP/IP connections using serial lines such as dial-up telephone lines. Small computers, such as PCs and Macintoshes, can use SLIP to dial up to servers, which then allow the computer to act as a full Internet node. SLIP is generally used at sites with a few users as a cheaper alternative than a full Internet connection. SLIP is being replaced by PPP at many sites.

TCP/IP (Transmission Control Protocol/Internet Protocol)

TCP/IP is named for two of the major communications protocols used within the Internet (TCP and IP). These protocols (along with several others) provide the basic foundation for communications between hosts in the Internet. All of the service protocols, such as FTP, Telnet, Gopher, use TCP/IP to transfer information.

Telnet

Telnet is the Internet standard protocol for remote terminal connection service. The name "telnet" also is used to refer to programs that allow interactive access to remote computers, as well as the action of using said programs. For example, the phrase "Telnet to host xyzzy." means to interactively log into host "xyzzy" from some other host in the Internet.

Upload

To copy data from a local computer to a remote computer. The opposite of download.

Usenet News

An electronic bulletin board system created originally by the Unix community and which is accessible via the Internet. Usenet News forms a discussion forum accessible by millions of users in almost every country in the world. Usenet News consists of thousands of topics arranged in a hierarchical form. Major topics include "comp" for computer topics, "rec" for recreational topics, "soc" for social topics, "sci" for science topics, etc. Within the major topics are subtopics, such as "rec.music.classical" for classical music, or "sci.med.physics" for discussions relating to the physics of medical science.

UUCP (Unix-to-Unix CoPy)

This was initially a program run under the UNIX operating system that allowed one UNIX system to send files to another UNIX system via dial-up phone lines. Today, the term is more commonly used to describe the large international network which uses the UUCP protocol to pass news and electronic mail.

Virus

A program which replicates itself on computer systems by incorporating itself into other programs which are shared among computer systems.

WAIS (Wide Area Information Server)

A distributed information service which offers simple natural language input, indexed searching for fast retrieval, and a "relevance feedback" mechanism which allows the results of initial searches to influence future searches. Public domain implementations are available.

WWW (World Wide Web)

A hypertext-based, distributed information system created by researchers at CERN in Switzerland. Users may create, edit or browse hypertext documents. The clients and servers are freely available. The WWW servers are interconnected to allow a user to traverse the Web from any starting point; in addition, many other servers such as WAIS and Gopher have been incorporated into the WWW servers.