The IAEA on line: Closer links for the global nuclear community

iaeo@iaea1.iaea.or.at and *http://www.iaea.or.at/worldatom* are two signs of the IAEA's expanding electronic information services

by
Jerry Barton
and Lothar
Wedekind

A phenomenon without precedent, the worldwide computer network called Internet has gone from a little-known academic and research network to become the talk of cyberspace. Turn to any issue of any popular weekly journal. You will find an article about international computer communications and computers you can reach via the Internet. Vinton G. Cerf, president of the Internet Society, believes that a fertile mixture of high-risk ideas, stable research funding, visionary leadership, extraordinary grass-roots cooperation, and vigorous entrepreneurship has led to an emerging global information infrastructure unlike anything seen before.

Expectations run high, and opportunities are exciting. Yet as organizations are learning, reading about the Internet is easier than using it in a concerted, reliable, and professional way.

The IAEA started developing its Internet capabilities in 1993. (IAEA's Internet address: iaeo@iaea1.iaea.or.at) Further development is designed to improve capabilities for meeting internal information needs, and to expand access to the Agency's extensive range of databanks and information systems within its Member States.

Internet's origins. All electronic communications between computers rely on precisely defined structures of signals, called protocols , that define the contents of the message, where it came from, and where it is going. In the early 1970s, a protocol was developed at Stanford University in the United States that allows multiple networks to be interconnected in a flexible and dynamic way. This protocol, called TCP/IP, together with the USA's research network, was the basis for the Internet. A decision in the early 1980s supported the creation of regional networks that

would aggregate traffic and feed it to the backbone networks. Thus the ability to support global connections through local networks was born.

Over the past 12 years, the number of host computers on the Internet has increased from 200 to 2.5 million, an annual growth rate of 120%. Nearly 8 million people can use complete Internet services, and more than 27 million people can use it to exchange electronic mail.

Internet services range from relatively simple to highly sophisticated. The Agency uses a commercial electronic mail package for its in-house electronic mail. With the addition of a gateway computer linking this mail network to the Internet, IAEA staff can send and receive mail from any worldwide location via the Internet. They do not need to learn much more than how to code the receiver's electronic mail address. The Internet serves as the interchange medium so that messages originating in different systems can be understood. The next stage of Internet services is the direct connection to a remote computer. This connection can take two forms: either the ability to locate and copy files from the remote computer to your computer, or the ability to log on to the remote computer as a local terminal.

The Agency added these services in early 1994. Called FTP and TELNET respectively, they require special skills and software on each user's desktop computer. About 400 people in the Agency have these services. The IAEA also established an FTP computer for public access in early 1994, so that people worldwide could download publicly available Agency files. In some cases, organizations are allowed to deposit data onto the Agency's FTP computer for retrieval by IAEA staff. The highest levels of Internet services are the so-called "special servers" , namely Gopher and the World Wide Web, or WWW. These services, developed by the University of Minnesota in the United States and the European Centre for Particle Research (CERN) in Geneva respectively, add descriptive information to the files that are available, making

Mr. Barton is Head of the Computer Users Liaison Section of the IAEA's Division of Scientific and Technical Information. (E-mail: barton@nepo1.iaea.or.at). Mr. Wedekind is Chief Editor of IAEA Periodicals in the Division of Public Information. (E-mail: wedekind@adpo1.iaea.or.at)

their access easier for the user. Gopher is a text-based interface that does not require sophisticated computers. The WWW is a full multi-media graphical interface that includes the ability to jump between documents automatically by clicking on highlighted words, i.e. hypertext links. The WWW requires more communications bandwidth and more powerful desktop computers, but it is already the most heavily used Internet service. It is simple to use and the documents you find are displayed immediately on your screen and can be either copied or printed directly.

The IAEA and Information Technology: Tools for Efficiency

Information technology (IT) — the use of computers and networks to electronically collect, manipulate, and disseminate data in organized ways — is a common thread of IAEA programmes. About 10% of the IAEA's budget is earmarked for IT activities. Some activities deliver databases directly to Member States, while many others are directed towards increasing organizational efficiency. The Agency's IT capabilities have progressed significantly over the years.

1970s and 1980s: Process Automation. Most early uses of IT were to automate manual support processes, such as payroll, bookkeeping, and project tracking. These activities were characterized by well-defined procedures and reporting needs. The IAEA's Central Computer Services (CCS) operated two mainframe computers through a central group of computer professionals. One computer was used exclusively by the Department of Safeguards to ensure the confidentiality of inspection and verification data. By the mid-1980s, there were more than 100 computer systems on the two mainframe computers.

1980s: Text Processing and Personal Computers. By the 1980s, Agency staff needed more flexibility in the way data, text, and graphics were processed and used, and in responding promptly to inquiries. The Agency approved the use of personal computers (PCs) in 1984 to provide this flexibility and speed. Today about 2000 PCs are in use throughout the Agency. Purchases and applications are governed by standards and procedures to ensure cost effectiveness and compatibility with the Agency's computer network.

1990s: Move to Decentralize. By 1989, it had become obvious that mainframe computers, with central development and support, could not provide sufficient flexibility and local decision-making power. The needs of programme managers were changing too rapidly for traditional computer systems. The IAEA decided in 1989 to decentralize IT operations, giving responsibility for computing to each department, whose divisions now have IT Coordinators and, frequently, their own programming staff. The CCS was given the responsibility of overall support, providing a technical infrastructure for common networking, training, problem resolution, and guidance for technical development.

In 1991, the IAEA Board authorized US $5.5 million in a special allocation to help move IT activities towards the decentralized goal. An Agency-wide plan for networking was developed and implemented between 1991 and 1994. The central computer network today provides a highway along which each department can develop its services tailored to programmatic needs.

1990s: Support and Services. Working with IT Coordinators, the CCS today provides support for a broad portfolio of desktop productivity products. The support includes providing about 1000 hours of software training monthly to Agency staff; answering technical questions through a central help line; and evaluating technologies, new applications, and systems. Electronic mail and Internet services further are provided to the entire Agency. More than 250,000 messages are exchanged monthly via the in-house electronic mail service and about 30,000 messages are received from outside the IAEA via the Agency's connection to the Internet.

1995 and Beyond: Information Management. As computer systems move to local networks, the need for maintaining a coherent Agency-wide understanding and treatment of the data increases. Data must be shared where appropriate to avoid needless duplication and promote efficient operations. The Agency consequently is looking more closely at the need for managing information through technology, rather than just managing the technology.

Greater transfer of information will require an improved technical infrastructure. The network and database computers consequently will be upgraded in 1996. Applications also must be revised frequently to meet new programmatic requirements, requiring evaluation and selection of appropriate tools and expertise. Moreover, staff must be properly trained to apply new technologies for greater productivity at the workplace.

The IAEA has been recognized as one of the leading organizations in the UN family in terms of its use of technology to implement its programmes. Its strategy for the turn of the century bridges the established in-house IT partnerships with the development of well-established policies for information management. The efforts are fundamental elements for strengthening the IAEA's capabilities to efficiently apply information technologies for programme effectiveness and organizational productivity.—*Barbara Paul, Division of Scientific and Technical Information.*

The IAEA added WWW services to its spectrum of Internet services in early 1995, and most of the users of FTP, TELNET, and Gopher have now migrated to WWW. In June 1995, the Agency announced the worldwide availability of its WWW computer, and the *IAEA's World Atom* was opened to the public. *(See box.)*

The Web inside the IAEA. Agency staff need access to a wide range of information to do their jobs effectively. Much of this information is not available directly in-house, but comes from other sources. The Internet provides an efficient way of obtaining it. Almost all nuclear research institutes worldwide are connected to the Internet. Large institutes, such as the Los Alamos Laboratories in the United States, have significant collections of documents on-line that are searchable via WWW. The documents can be copied to a desktop in Vienna in a short time.

The Agency also needs a medium for making administrative information more readily available to all staff. The in-house use of the Internet provides this medium, reaching all parts of the IAEA despite the use of different network configurations. Material such as the administrative manual, Secretariat notes, and desk-to-desk circulars can be made available via WWW to the desktops. The technology was put into place in the second quarter of 1995, and now the procedures for its use are being established.

The UN and the Internet. Since 1990, United Nations organizations and specialized agencies have been working on ways to allow Member States more access to databases and documents electronically in a consistent, coordinated manner. The Information Systems Coordinating Committee (ISCC), which reports to the Advisory Committee on Coordination, is responsible for this task. Recently its Task Force on Information Access and Dissemination established a number of principles. Among them are the UN's reliance on the Internet as the primary (although not sole) means of computer communication with Member States; the need for all UN organizations to develop information access policies and procedures; and the use of the International Computing Centre in Geneva to provide a starting point for UN-wide information searches via the WWW.

The IAEA has started a pilot project to allow Member State missions in Vienna access to numerous Agency databases via connection to its network. It also is making documents electronically available to Member States in connection with the IAEA's General Conference in September 1995.

Internet issues. The IAEA's Central Computer Services are continuing to work on four issues that affect the public's use of the Internet. These concern questions of security, searching, document dissemination, and capacity.

The security issue is one of providing access to public information without putting the in-house network at risk. The solution now being used is based on establishing a special "firewall" computer between the publicly accessible computer and the protected in-house network. Agency staff can access the remote Internet computers through the firewall, but users of remote computers cannot gain access.

Searching for information is still a complex issue. Various commercial and university-created products exist. The Agency is using one such system to allow searching of bibliographic databases, and is investigating which products can provide good searching of all WWW information.

Document dissemination is a time-consuming task that needs to be automated as far as possible. Most IAEA documents are available in word processing form. Putting these documents onto the WWW computer requires translating these documents into the WWW's text processing language, the Hypertext General Mark-up Language, or HTML. Tools for this conversion are still being developed worldwide. Text that refers to other documents needs to be marked and the names of the links must be coded.

Finally, the issue of capacity means that the IAEA needs to watch the growth of the Internet worldwide and the demand for networking capacity closely. At usage rates that double annually, available networking bandwidth can be exhausted quickly, requiring additional investment to maintain quality. Today, the IAEA pays a flat annual fee for Internet access to a commercial company that links it to the Internet. Such fee systems may not be sufficient in the future, and many organizations, such as the Internet Society, are already discussing different charging modalities.

Expanding on-line services. Over the past four decades, the IAEA has developed a range of on-line databases for public and technical users. They include the Power Reactor Information System; the International Nuclear Information System; the International Information System for the Agricultural Sciences and Technology, jointly with the Food and Agriculture Organization (FAO); the Nuclear Data Information System; and the Atomic and Molecular Data Information System.

However Internet's future unfolds, the IAEA's acquired experience will prove invaluable in keeping up with rapid developments in the computer and telecommunications fields. As importantly, the work will guide ongoing efforts to reinforce the IAEA's capabilities for providing information more productively and efficiently. The next stages of development will help define the IAEA's role on the emerging global nuclear information highway.   □

Home Pages on the Web:
A Look at the *IAEA's World Atom*

World Wide Web sounds like a conspiracy from the pages of Ian Fleming. That it's a relatively harmless communications tool from the talented minds of the CERN scientific research centre in Geneva should not be too surprising. Born of frustration in electronically accessing and retrieving scientific data, reports, graphs, charts, models, and figures, the Web stands as one of science's latest successful transfers of technology. The welcome wizard and its system of "home pages" enable customized multi-media communications over the world's interlinked computer networks called the Internet.

The IAEA opened a set of home pages to public access in June 1995. The *IAEA's World Atom* today delivers information about the Agency and global nuclear development drawn from more than 1000 underlying, interconnected, and formatted documents and files. The system includes background information as well as more detailed reports about the status of nuclear power, nuclear safeguards and verification, global nuclear conventions, nuclear and radiation safety, and nuclear applications, for example. *World Atom* — a joint project of the IAEA's computer and public information services — also links users to selected other nuclear-related networks on the Web based in the IAEA's Member States and at organizations within the UN system.

Primarily intended for general audiences, *World Atom* is being designed for easy use. It is built around the concept of a magazine bound by seemingly endless numbers of electronic pages, which readers can flip through with the click of the mouse. Decisions about where the pages are, how they are linked and

designed, and what information they contain are part of the day-to-day production process. For the most part, links are topically oriented, in efforts to integrate *World Atom's* hundreds of underlying pages.

Still in its early stages, the system today is a skeleton of what it will become as the *World Atom* team prepares empty pages for production and brings future links on line. Envisaged is an integrated family of home pages customized to the particular information requirements of the Agency and its scientific, governmental, and public audiences.

GC/39 on line. One sign of the times appears in *World Atom* this September, in connection with the 39th Regular Session of the IAEA General Conference. For the first time, the Agency is placing key information from and about the Conference on line. Pages will feature the annotated agenda and related public reference documents; full texts of selected addresses, including the statement of the IAEA Director General; summaries of delegate statements; and press releases and background notes for the media. Information will be updated throughout the week-long Conference, as part of a wider IAEA computer exhibit to demonstrate its Internet-based services and capabilities.

Like other information about the Agency, the set of GC/39 pages can be found on the *IAEA's World Atom* at its Web address: **http://www.iaea.or.at/worldatom.** Selected pages, including the full set of GC resolutions and decisions, will stay on line for easy reference well after the Conference closes.—*Lothar Wedekind, Division of Public Information.*