NMFECC Networking Activities

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The networking gang at NMFECC has been very busy lately going to meetings, generating software, going to meetings, installing hardware, and going to meetings—and we have been just a bit remiss in generating informational articles (with the possible exception of that well known bard Barry Howard). In an appropriate spirit of repentance, I plan, in this article, to give a brief overview of some of the major activities the networking groups have been engaged in recently, including a synopsis of current status and some of our plans for the coming year. I intend (assuming that this spirit of repentance does not appreciably wane) to follow up in future *Buffer* articles with more focus on some of the individual activities.

As with any human endeavor of any major consequence, one of the initial and basic requirements is to establish a set of acronyms and, even more importantly, a set of committees. And we have been no exception. A general understanding of both may be helpful to you.

Acronyms

We are essentially engaged in two network efforts simultaneously and although there is a great deal of overlap, it has proven useful to distinguish between the two:

MFEnet II: I assume this acronym is well known, at least to *Buffer* readership. MFEnet II represents a major upgrade of the existing MFEnet technology and protocols. This upgrade will support a much larger address space and will provide a foundation for higher performance and additional capabilities, while maintaining the current user interface as much as possible.

ESnet: The Energy Sciences network is intended to provide a common network service to the five major programs in the Department of Energy's Office of Energy Research. It has evolved in concept to its current status, whereby it is viewed as a carrier or backbone for other networks, including MFEnet II and HEPnet (the High Energy Physics NETwork).

Committees

ESSC: Since ESnet is expected to serve the needs of five different programs, the ESSC (ESnet Steering Committee) was formed with representatives of each program to identify program needs and requirements, and help establish implementation goals and priorities.

ESCC: The ESCC (ESnet Coordinating Committee) was more recently formed in recognition of the fact that ESnet does not supply end-to-end services. Effective implementation, planning, and operation requires on-going coordination with user site personnel. The ESCC comprises the individuals (typically one per site) designated to be the key contact for a given site.

EDWG: ESnet will be capable of supporting a variety of networking protocol families, including DECnet. This gave rise to interest in the possibility of establishing an Energy Research wide DECnet connected together by ESnet. The EDWG (ER Decnet Working Group) was established to study this issue and others associated with forming such a large DECnet.

Priorities

As the scope of our job to provide network support continued to expand, it became clear that time was working against us, and that we would have to prioritize our efforts. The following list represents (very nearly) the current categorization by priority as established by the ESSC:

1. ITER communications support
2. X.25 backbone
3. ESnet/MFEnet initial phase
4. T1 (1.5 megabits per second) backbone
5. European networking
6. Japanese networking
7. Improved NMFECC access

ITER Communications Support

In late 1987, we were requested to provide communications support, on a priority basis, to the U.S. team of the ITER (International Thermonuclear Experimental Reactor) design project located near Munich, West Germany. We initially provided terminal access to NMFECC using the international Public Data Networks, also known as TYMNET. We have since installed a VAX gateway between MFEnet and TYMNET which provides electronic mail, terminal connections, and a basic file transfer capability between the home centers for the European, U.S., and Japanese design teams.

We plan to install a 64-kilobits-per-second satellite link between the U.S. and the ITER international design center by early 1989. We will install enhanced capabilities, including ISO-OSI (International Standards Organization Open Systems Interconnect) X.400 electronic mail, and will consider enhanced file transport capability. We will also review bringing up an MFEnet II node at the design center to facilitate better NMFECC and MFEnet access.

X.25 Backbone Installation

We have completed installation and initiated operation of an interim network using the X.25 protocol, commercial switches, and 56-kilobits-per-second links interconnecting seven U.S. sites (Brookhaven National Laboratory, Fermi National Accelerator Laboratory, Florida State University, Lawrence Berkeley Laboratory, Massachusetts Institute of Technology, NMFECC, and Stanford Linear Accelerator Center) and a 64-kilobits-per-second satellite link connecting the CERN High Energy Physics facility near Geneva, Switzerland.

We will review changing the satellite link to CERN to a fiberoptic trans-atlantic link to eliminate the inherent satellite delay. We will increase the bandwidth of the link if usage projections prove to be realistic.

We are reviewing moving this interim network onto the T1 backbone using a subchannel of the 1.5 megabits-per-second bandwidth of the T1 trunks. We will merge this X.25 capability with the ESnet IP backbone in the longer term.

We expect to enhance the management of the X.25 backbone by acquiring and installing an improved management capability (to be supplied by the vendor).

ESnet/MFEnet Initial Phase

We have completed installation of "Phase 1" of ESnet at eight U.S. sites (Argonne National Laboratory, Florida State University, GA Technologies, Inc., Los Alamos National Laboratory, Lawrence Berkeley Laboratory, NMFECC, Princeton Plasma Physics Laboratory, and the University of Texas at Austin) using 56 kilobits-per-second links to interconnect them. This is considered a test bed installation and usage is currently limited. We have developed the software for the micro-VAX based routers, and for the VAX host level software used during this phase. The network is also capable of supporting data communications using the TCP/IP protocol, which is used, for example, by UNIX computers.

We do not currently have the NMFECC Crays operational on ESnet. Although they are physically connected, the software changes in the operating system to support the IP protocol are not yet fully checked out.

We will continue to expand ESnet to new sites, and begin to move sites currently on MFEnet to this new network. We will install terminal and printer servers programmed to support the NSP protocol suite used by NMFECC Cray computers. We will also begin operation of a Network Control Center.

T1 (1.5 Megabits-per-second) Backbone

We have participated in the review of two proposals to supply a T3 (45 million-bits-per-second) trunk across the continental U.S. to be used by several federal research agencies for current operational network needs, and to do joint research in a multi-megabit shared trunk. This effort is called the Research Internet Backbone or "RIB."

We expect to receive acquistion approval and to install a T1 (1.5 megabits-per-second) backbone for ESnet using fixed subchannels of this T3 backbone. This will require incorporation of higher speed communications controllers in the network to handle the higher speeds as well as T1 "networking" multiplexors.

European Networking

We have worked with the DFN (German Research Network) to formulate plans for establishing connections to ten research facilities in West Germany.

Following installation of the 64 kilobits-per-second satellite link to the ITER design center, we will begin efforts to establish connections to the additional interested sites. This will be done initially using the West German public data network (DATEX-P), and during the last part of the year we will use the emerging "German Science Network"—a non-volume tariffed public data network supporting the West German research community.

Japanese Networking

We have established a new public data network connection to JAERI (Japanese Atomic Energy Research Institute) via a gateway computer at NMFECC. The Japanese anticipate installing a dedicated 9.6 kilobits-per-second link between JAERI and ESnet during this fiscal year. We will additionally upgrade some of the current data communication capability to OSI-compatible protocols.

Improved NMFECC Access

We have installed a gateway computer (CGW—also known as Cray GateWay) to support access to NMFECC Crays. In addition to the NSP protocol suite that supports NMFECC's implementation of CTSS, CGW uses protocols that include DECnet terminal connections and TCP/IP access.

We expect to bring the gateway up to full operation and begin exploring additional support of OSI protocols.