National
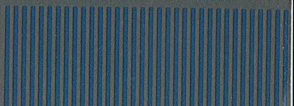# Magnetic
Fusion
Energy
Computer
Center

The Network

## A nationwide data communications network provides online access

Most researchers who use NMFECC's supercomputers are located at sites remote from the Center, some as far away as Germany and Japan. A data communications network, MFENET, allows them to use the Center's resources from their office—wherever it is—as easily as if the computers were in the next room. The MFENET (designed, installed, and operated by NMFECC) makes it possible for researchers to connect their terminals to any computer on the network willing to serve as a "host," including any of the supercomputers at NMFECC. MFENET also allows computers to send text, graphical, numeric, or binary (unstructured) data to each other, and ensures that the data is delivered without error.

More sophisticated uses of the network include:

- Electronic Mail—A researcher may type a message and then give it to the electronic mail system for delivery to the named recipient. This provides a quick and easy mechanism for all users on

The labeled sites (violet dots) are connected to NMFECC by high-bandwidth 56,000 bits/s links. The unlabeled violet dots indicate sites connected to these sites via lower bandwidth lines. Still, other sites, (small black dots) use alternate connections such as ARPANET, TYMNET, and commercial telephone lines.

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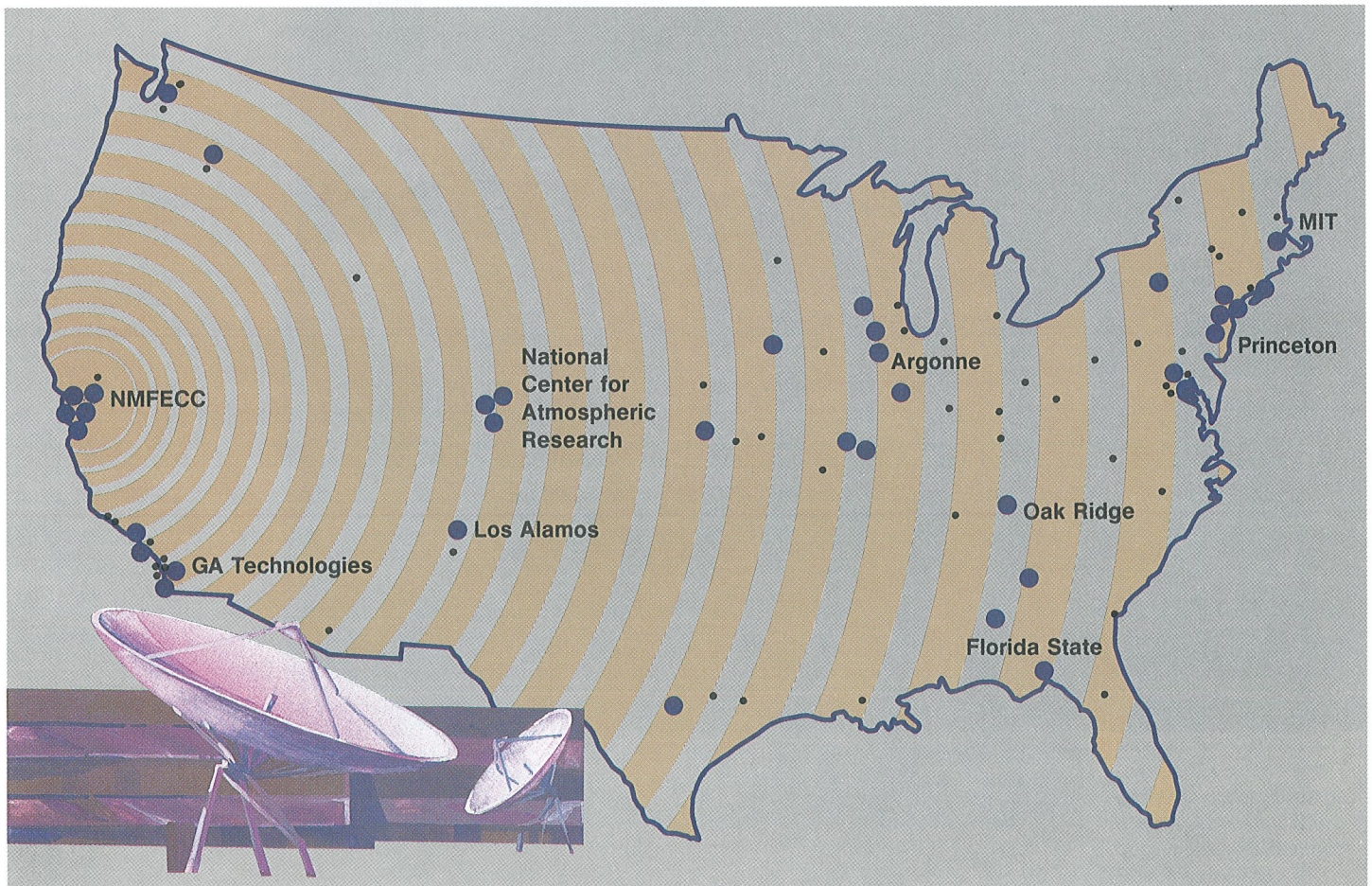
the MFENET to communicate with each other without the inherent inefficiencies in telephoning. Users can also use MFENET to send electronic mail through other networks, such as the ARPANET, BITNET, and SDSCNET. These networks are connected through "gateway computers." Users can send a message to Switzerland, for example, just as easily as they can send it to the downstairs office.

- Graphics Display—a file (a collection of data with a name) containing several graphics images may be sent through the network to a local display device, designed by NMFECC, which allows the researcher to view a "mini-movie" of computational results on a TV screen in their offices.

- Text Editing—a text editor has been developed that splits the editing job between a personal computer (PC) and a CRAY. Data and commands are exchanged between the two computers, giving the researcher the responsiveness of the PC and the power of the CRAY.

The MFENET is continually changing to meet user demands. Some of the dramatic changes that will be happening in the next few years include:

- Communication processors—the current minicomputers that handle the network data will be upgraded with newer communication processors that are faster and that can handle much more data.

- Protocols—the network protocols (rules for assuring that data is sent and received without errors) are always moving toward newer protocols that conform to international standards.

- The network structure is evolving into a more open architecture that permits network and supercomputer access with commercially available software. This allows access to a much wider community of users.

- Distributed Programs—NMFECC programmers are developing "distributed" programs or applications in which a piece of a job is handled by the workstation in a user's office and another piece of the job is executed on the Center's supercomputers. This, like distributed text editing, gives users the instant response of a workstation, coupled with the power of a supercomputer.

Super Networks

In response to the concept of internetworking, MFENET is evolving into a more generalized communications carrier. Internetworking joins existing networks into larger internetworks, which are in fact networks of networks. This will reduce costs in instances where duplication exists, but more importantly, it will provide access to resources and to new communities of researchers where such access would not otherwise be possible. MFENET is a major contributer to this "SUPERNET" effort.

Data streams between the national center and major centers across the United States. Dual satellites help NMFECC maintain its enviable record as a leader in speed, power, convenience, reliability, at a reasonable cost.