Japan Aims to Link Islands of Science Information

Japan's science information infrastructure resembles its geography—scattered islands of data with few bridges linking one to another. Each research institute generates its own scientific information, which is often difficult for outsiders to access; the government provides paltry support for data networks; and there's little coordination among the various ministries that run the institutes. The result: Japanese scientists often find it easier to access information from halfway around the world than to get it from halfway across town.

This Balkanization of information has put Japan about a decade behind the United States in setting up a national science networking infrastructure, Japanese scientists reckon. In Japan, "the ministries all say basic research is important, but the education ministry [Monbusho] and the Science and Technology Agency [STA] each has its own science policy," says Minoru Kanehisa, a computational molecular biologist with joint posts at Kyoto University and the Human Genome Center at the University of Tokyo.

But there are signs that individual ministries are finally waking up to the need to improve networks—and there are even efforts to ensure that the scattered elements of Japan's information infrastructure can talk to one another. In 1993 and early 1994 the government bought more than 15 supercomputers for institutes across Japan. Monbusho's National Center for Science Information Systems (NACSIS) has put together a nationwide SINET, which links local-area networks (LANs) at 188 university institutes, and the University of Tokyo's TISN links 56 institutes around the country. Japanese researchers are increasingly tapping international networks, too: More than 72,000 computers in Japan were connected to the Internet as of July, according to the Internet Society of Reston, Virginia. While that is only 2% of worldwide host computers on the network, it's 69% more than were connected in January.

Leading the way are networks like GenomeNet, which is seen as a model because it links together researchers at different universities and national labs and provides access to other genome networks worldwide. "The Genome Project is changing the attitude of biologists and helping them to see the need to group together to get funding and political power," says Kanehisa, who is in charge of genome informatics for the Japanese effort. "We are a key driving force behind the establishment of computer networks in Japan." Even so, its success depends on overcoming bureaucratic barriers to such joint efforts.

Begun in 1991, the 512-kilobit-per-second GenomeNet connects nine nodes at major universities and medical research centers from Tokyo to Fukuoka using TISN. In addition to interlinking 20 databases of DNA sequences, GenomeNet has access to mapping data through the Japan node of the Johns Hopkins Genome Database, which is sponsored by STA. Linking up networks run by two separate agencies proved to be a problem. "Existing networks among the different ministries are not compatible, so we had to set up our own network with leased phone lines," says Kanehisa. This waste of resources "upset some of our people a lot."

The current proliferation of Japan's computer networks is a result of recent economic stimulus packages aimed at kick-starting domestic consumption. NACSIS, for example, received such a boost last year when its $35-million budget for SINET grew by 80%. "Before 1993, the government invested in only one LAN per year," says Hiroshi Inose, director general of NACSIS. "Last year, it invested in LANs for more than 100 universities and national labs."

The STA received $700 million to build a "network of networks" linking 80 institutes under a half-dozen ministries and tied into TISN and other university networks. The network is slated to start operating this fall.

But funding still falls short of need. Even with a 1994 budget of $46 million, NACSIS has been able to set up only 29 nodes to connect the 188 LANs, and the network transmits at the relatively slow speed of 6 megabits per second (MBPS). STA is pressing for a 60% budget increase for next year to upgrade the network from 6 MBPS to 45 MBPS, but funding looks doubtful.

Despite progress, there are still major potholes along Japan's data superhighways. Inadequate or incompatible software and databases, for example, remain critical obstacles to the flow of information. "The government spends a lot of money to buy supercomputers and set up networks, but not for software development," says Kanehisa. "I don't think this will change any time soon." Still, Japan's investments in electronic bridge-building are finally beginning to link some of the data islands in the country's scientific landscape.

–Lori Valigra

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MAJOR SCIENCE NETWORKS IN JAPAN

Network*	Operator (principal funder)	Connection	No. of users**	Started
GenomeNet	Human Genome Center (Monbusho)	Universities/ medical centers	9	1991
SINET	NACSIS (Monbusho)	National universities	88	1992
TISN	Univ. of Tokyo consortium (users)	Institutes, gov't labs	56	1989
WIDE	Keio University (users, industry)	Universities	100	1989
BITNET	Tokyo Science University (users)	Physicists and engineers	120	1985
STA	STA (universities)	Interministry labs	80***	Fall '94
JICST	STA	Gov't labs	N/A	mid-1980s
AISTNET	AIST (MITI)	MITI labs	15	mid-1980s

*SINET = Science Information Network; NACSIS = National Center for Science Information Systems (Monbusho affiliate); Monbusho = Ministry of Education, Science, and Culture; TISN = Todai International Science Network; WIDE = Widely Integrated Distributed Environment; STA = Science and Technology Agency; JICST = Japan Information Center for Science and Technology (STA affiliate); AIST = Agency of Industrial Science and Technology, a branch of the Ministry of International Trade and Industry (MITI).
**Users means the number of government and private laboratories and universities that access the network.
***The STA expects 80 institutes to connect to the interministerial network, but each institute and university may have multiple networks, so the total number of networks accessing the new STA network will be about 200.

SOURCE: SCIENCE AND TECHNOLOGY AGENCY, UNIV. OF TOKYO