

Japan embarks on an academic computer network

Tokyo. In an unusual display of cooperation, Japan's science-related ministries and agencies are trying to work together to build a high-capacity computer network linking universities and national research institutes, providing them with access to scientific computer networks outside Japan. But it remains to be seen whether the planned network can bypass the bureaucratic walls that traditionally divide Japan's government research organizations.

Last week, ten Japanese officials from the Science and Technology Agency (STA) and the ministries of International Trade and Industry, of Education, Science and Culture and of Posts and Telecommunications visited Washington and New York to study computer networks in the United States. The outcome will be used to draw up plans and budget requests for submission to the

Ministry of Finance in August.

Japan's computer networks are "five years behind the United States", says Tateso Arimoto, director of STA's science and technology information division, who took part in the visit. Whereas the current capacity of NSF's backbone network is 45 megabits per second, Japanese networks operate at less than one hundredth of that speed and are in a much more primitive state of development.

The Japanese government has been very slow off the mark. Most of the initiative for developing networks has been that of individuals. In 1989, Tsuneyoshi Kamae and other researchers at Tokyo University established the Todai International Science Network (TISN) with a 64 kilobit-per-second link to the United States. That has since expanded to other institutes and universi-

ties, but without government backing. Similarly, the Widely Integrated Distributed Environment (WIDE) network for research and development of computer networks was established by Jun Murai of Keio University (*Nature* **356**, 550; 1992).

The National Centre for Science Information Systems (NACSIS) under the education ministry has been responsible for linking universities and establishing local area networks on university campuses. But some of the branches of this network have very low capacity, some parts still use a communications protocol that is incompatible with international systems, and only a handful of Japan's 98 national universities have local area networks.

Last month's supplementary budget to stimulate the economy provided a welcome influx of new funds to buy hardware both at universities and national research institutes (*see Nature* **363**, 5; 1993). The officials in the United States last week now hope to win more money in next fiscal year's budget to link newly purchased computers and local networks with the proposed new network.

But details of the network remain vague. The financial newspaper *Nikkei Shimbun* reported last week that there will be 30 access points or "hubs" at various locations throughout Japan and that the government will invest 50 billion yen (\$450 million) in the network over the next three years. But Arimoto says the number of hubs has not been fixed and that the budget has been over-estimated, despite the higher cost of domestic telecommunications in Japan than in the United States.

The network's capacity will be limited by the maximum capacity of Japan's domestic carriers, currently 6 megabits per second. But that may be upgraded to 45 megabits in the near future, Arimoto says.

Also to be resolved is the nature of the network's international connections. Kamae, who also heads an advisory committee to the government set up by the Japan Information Centre of Science and Technology under STA, favours for the international link a "neutral" access point in Tokyo not under the jurisdiction of any particular ministry or agency. The node, he says, could consist of an optical fibre loop of about 1 km radius allowing access to any of Japan's competing communications carriers.

Arimoto says that operation of the network should "ideally" be overseen by one organization funded by the various science-related ministries and agencies. But it seems likely that the ministry of education will try to maintain as much control as possible over the university part of the network.

The project has the backing of the ruling Liberal Democratic Party (LDP), which is trying to create a new category of budget for such infrastructure projects. But the Ministry of Finance is strongly resisting the suggestion, meaning that the network may have to be built out of existing resources.

David Swinbanks

Indo-US plutonium dispute flares up

New Delhi. India is heading towards a major diplomatic conflict with the United States over the reprocessing of spent fuel from the US built nuclear power plant at Tarapur, north of Bombay.

The Indian Atomic Energy Commission (AEC) wants to recover plutonium from the spent fuel to use in the Tarapur plant, which no longer gets enriched uranium from abroad. But an official at the US Embassy in Delhi has said that his government will not allow reprocessing unless India signs the nuclear non-proliferation treaty (NPT).

Spent fuel from the two 210-MW boiling water reactors has been accumulating since 1969, and is estimated to contain between 1,000 and 2,000 kg of plutonium. AEC says it belongs to India under the terms of the 1963 Indo-US agreement on Tarapur, and that India will be free to reprocess it after the agreement expires on 25 October. But the official said that permission would still be needed, and is unlikely to be granted under existing [US] law.

Tarapur has soured Indo-US relations since 1974, and the Indian nuclear test at Pokhran. Supplies of enriched uranium fuel were erratic after 1974, and were stopped completely in 1982, when the United States invoked its Nuclear Non-proliferation Act 1978, which prohibits the sale of fuel to countries that are not signatories to NPT. France took over the supply of fuel in 1983, but now says that it will not continue after October unless all Indian nuclear facilities are opened for international inspection. The Indian government is willing neither to sign the NPT nor to accept the French conditions

of full safeguards. It has also ruled out closure of the Tarapur plant, which is a major source of electricity to the power-starved states of Gujarat and Maharashtra.

The AEC says that the Tarapur reactors can be safely run for another 15 years with home-made alternative fuel: an oxide mixture of plutonium and natural uranium, or MOX. It has already set up a manufacturing facility and is waiting only for plutonium to come from its reprocessing plant. The US stand on reprocessing has now upset the calculations.

India's legal right to reprocess spent fuel is ambiguously defined by the 1963 agreement, which gives India ownership of the spent fuel and allows for its reprocessing and reuse at Tarapur. But another clause says that reprocessing requires a "joint determination", a phrase interpreted by the United States as "prior consent". US officials in India say that consent has not previously been given and will not now be given under the Nuclear Non-Proliferation Act.

The AEC, on the other hand, says that "joint determination" means only "approval of the design of the reprocessing plant from the point of safeguardability." In fact, according to AEC, the reprocessing plant was completed "at considerable cost" in 1975 only after the United States had agreed the design. But, despite reminders, the United States failed formally to complete the 'joint determination' exercise, thereby nullifying the crucial clause. In any case, Indian officials say, all obligations under the agreement became unenforceable after the expiry of the agreement.

K. S. Jayaraman