▶ *USER STRATEGIES*

LAN users look to microwave links

BY LAURA DIDIO
Senior Editor

BOSTON — Boston University (BU), Harvard University and Massachusetts General Hospital last year faced the same problem: finding a high-speed, cost-effective way to link remote Ethernets.

All three of the Boston-based users found an answer in microwave bypass technology. The organizations implemented microwave local network extensions that operate at Ethernet's 10M bit/sec speed.

Using a data-link-layer Ethernet extender from Cambridge, Mass.-based Microwave Bypass Systems, Inc., a

LAN users try microwave links

privately held firm, Harvard connected an Ethernet segment at one of its facilities to another Ethernet at a BU site.

Mass General implemented the same system to connect Ethernets at its headquarters and its Cardiac Computer Unit in Charlestown, Mass.

The Ethernet at Mass General actually includes four cable segments at the Charlestown building and 10 more in the hospital. But according to David Murphy, systems and network manager for the hospital, the microwave system runs at full Ethernet speeds and makes the network look like one large network. "We wanted the link to be invisible to the user," Murphy said.

The two Mass General facilities support roughly 350 to 370 devices on the extended Ethernet.

The main campuses of Harvard and BU are located within two miles of each other. Both universities have numerous local networks that are interconnected within their own campuses. Existing links from school to school, however, were relatively low-speed connections. Transmissions between BU's and Harvard's nets had been at 56K bit/sec and 9.6K bit/sec over leased lines.

Mikhail Orlov, network system engineer for BU's distributed computing and communications department, felt that running dedicated coaxial cable or fiber to link the BU and Harvard Ethernets was not really an option. "One solution would have been fiber," he said. "But since we had the Charles River [separating the campuses] and government and city regulations to contend with, plus the tremendous cost, we decided against it."

According to Orlov, when BU installed a fiber-optic network supporting one part of the campus last year, the cost of the cable and labor alone was about $125,000. "To put a fiber-optic cable connection between Harvard and BU would easily cost $1 million," he said.

Meanwhile, at Mass General's Cardiac Computer Unit, Murphy was wrestling with a similar problem. The hospital had moved the research portion of its facilities from hospital headquarters in downtown Boston to a site in Charlestown. A scant mile separates the two facilities, but that mile covers the heavily trafficked old North End of Boston.

"We had originally installed Ethernet at Mass General about three years ago to connect the research, administrative and clinical computer facilities to two VAX-11/780s and a DEC Pro/350. It's since grown to 110 DECnet nodes, 250 DEC terminal servers and about eight other types of nodes, including several Unix systems," Murphy said. "We needed to extend the Mass General Ethernet to the Charlestown facility, preserving the full bandwidth of the Ethernet because of the heavy data sharing between different departments on the network."

Neither Orlov, who has a Ph.D. in computer science from the Electro Technical Institute in Leningrad, USSR, nor Murphy, a self-professed technical whiz "who has been playing with VAXes since college," was familiar with the concept of microwave bypass technology as a tool for extending local networks.

But when they saw Microwave Bypass Systems' advertisements and contacted David Theodore, the company's president and founder, both became convinced the technology could work.

"A lot of people know about microwave bypass technology, but, amazingly, very few users have chosen to implement it for local networks," Orlov observed. "We spent $50,000, and that covered everything: cable installation, hardware, antennas and licenses. The installation took less than a week to complete," the BU system engineer said.

Microwave's the answer

Mass General's Murphy agreed. "Microwave was infinitely more cost-effective than a fiber-optic solution, because we don't have a right of way. We'd like to get fiber in here eventually as a backup, and we're still trying to find an alternate path, other than phone company conduits, between the hospital and our Charlestown building."

The local network extension that Mass General installed is a "dual link that's completely redundant; we have two microwave dishes next to each other at both facilities," Murphy said. The link connects virtually every department in the hospital.

Both Orlov and Murphy said they have experienced no problems in the six to eight months that they have used the bypass links. Microwave is generally considered to be susceptible to the vagaries of the weather, but both men said they have not had any weather-related outages.

Murphy said, "The only thing I really worry about is lightning directly hitting the roof of Mass General, where the two microwave dishes are. A direct hit would take everything down."

Orlov said the 10M bit/sec speed of the microwave link means Harvard and BU can transmit huge amounts of data within seconds. "If you use 9.6K bit/sec or 56K bit/sec, it takes minutes and sometimes hours, and you have noise and breakup, so you have to incur some retransmission. With microwave we can send data at higher speed and without interruptions," he said.

Additionally, Orlov said, "You can go up to five miles without a repeater before you start to exceed the propagation delay that is inherent in the Ethernet specification. You can't do that with any other technology."

Another advantage of microwave bypass technology is that it is protocol-independent, Murphy said. "What that means to me, the user, is that I can run anything across the link."