FIBER TO THE HOME

As every Internet surfer knows, broadband is good, broader band is better

By Steven M. Cherry

HOLY GRAIL The broadest broadband, of course, is optical fiber, the only medium capable of moving data at multigigabit-per-second speeds. It's fiber that will ferry us into a future of thousands of television channels, videoconference telephony, movies on demand, distance learning, telemedicine, and a digital record of every sight and sound around us.

We've known this for two decades. Yet only rarely is an existing residential connection being refurbished with fiber. That will soon change—in fact, the pace of fiber installation is expected to pick up dramatically in the next few years.

This past summer the three largest U.S. telecommunications providers, Verizon, SBC, and BellSouth, agreed on a common set of standards for residential fiber-optic networks. That congruity is expected to lower costs and unleash a tidal wave of spending—Verizon alone reportedly has plans to embark on a 10- to 15-year US $20 billion to $40 billion upgrade of its fiber-to-the-premises networks.

The reason? Competition from cable companies, who already have more than three million customers in the United States getting telephone service as well as television over their cables. While coaxial cable can't match the gigabit potential of fiber in the long run, it's more than enough for the short term. Comcast Corp., in Philadelphia, the largest U.S. cable provider, is already upgrading some customers to a 3-Mb/s Internet service—roughly six times the speed of the phone companies' garden-variety digital subscriber line (DSL). That's in addition to the hundreds of television channels traveling down the same pipe.

One place to see telecom companies fight back is Iowa, a state where tiny telephone companies are the rule instead of the exception. Take the Huxley Communications Cooperative. Just a few years ago, the company, which provides telephone, cable television, and Internet access to one region of the state, upgraded the copper and coax of the eponymous town of Huxley,spending about $800 per home. But last year, it went with fiber all the way to the premises of every single customer in two neighboring towns, Slater and Kelley, despite an average cost of $2000.

The network upgrade has increased revenues, due to new cable and high-speed Internet accounts. It has also lowered maintenance costs. Yet an investment in fiber can still take as many as five additional years to be paid back. That's because, however puny, 1-Mb/s DSL or digital cable connections meet most customers' current needs—the gigabytes-of-content future is at least a few years away. Savvy telecom consumers aren't eager to spend more on the new connections without compelling applications running through them.

So a high-speed infrastructure is one thing, and high-speed service is another. Though the residents of Slater and Kelley now have the latest in pipes, their service is, for now, limited by their provider to classic DSL speeds. Still, as they say in Iowa, if you build it, the applications will come. ■

As it happens, when Taylor was ready to take on Alberta's digital divide, the province was flush with drilling royalties from the overheated economy of the mid- to late 1990s. "We were lucky," Taylor says. "We had the $193 million to invest."

SuperNet is just one aspect of Alberta's technocentric future—the province is funding research and development in a number of information technology areas—but it's the part that will benefit its citizens directly. Even the wireless sections will enjoy data rates exponentially greater than those of many wired networks elsewhere—155 Mb/s to start. That's enough bandwidth for 2000 simultaneous telephone calls, or tens of thousands of Internet customers.

In fact, the wireless portions of the network were the greatest concern. "Back in 1997, wireless technology wasn't as straightforward as it is today," Taylor says. "We knew that there were areas in the province where you couldn't run wires. We weren't sure they could be served at all." Serving them, though, was critical—without it, Taylor could have never gotten his legislative colleagues to share his vision. "One of the ways I sold SuperNet was as a rural development scheme," he says. As it was, it took almost two years to go from concept, to request for proposals, to legislative appropriation.

Even in 2004, SuperNet's wireless connections are no sure thing. They require the very latest in radio electronics and more. They are taxing Bell's civil engineering skills, as well as those of its prime subcontractor for the wireless legs, Morrison Hershfield Ltd., Toronto. Nowhere is that more evident than in the province's far northeast, where all the major connections are wireless. And the most taxing are a pair of wireless shots that bring the extended network to Fort Chipewyan, a swampy region of 1400 hardy denizens that claims to be the oldest nonnative settlement in Alberta.

Bringing Fort Chip, as people call it, into telecom's 21st century is proving to be hard for a geographical reason: water. The swamps and streams that flow in and out of nearby Lake Athabasca were a godsend for the trappers who first explored and settled the area, traveling, as they did, in bark canoes. All that water is anything but helpful, though, to SuperNet, or to the company that's designing and building its 3000 km of wireless connectivity. Basically, the ground is too soggy to efficiently install and maintain fiber in it.

Water isn't the only reason the network segment to Fort Chip is wireless. The town lies on the edge of Wood Buffalo National Park; construction within the park is prohibited. Even outside the park, environmentally sensitive marshlands are a breeding ground for sedges of whooping cranes, herds of bison, and other threatened species. Laying fiber is out of the question. So the radio link into Fort Chip comes from a promontory, Birch Mountains, 120 km away.

That 120-km wireless shot, probably the longest in North America—and perhaps anywhere else, at its capacity—would be a challenge even for a wired connection. The SuperNet design calls for the long-haul radios to be the network equivalent of a land network's optical carrier Level 3 (OC-3) data rate of 155 Mb/s.

The radios being used for these long SuperNet connections, from Alcatel SA, Paris, France, can handle that speed. Unfortunately, they were designed to transport data using the synchronous optical network (Sonet) protocol, not the Ethernet protocol that SuperNet uses. The two are, essentially, different protocols operating at the second-from-the-bottom level, the data-link layer, of the seven-layer network hierarchy.

Sonet (or the equivalent international standard, synchronous digital hierarchy) is the traditional protocol for digitized telephony.