Arctic Fibre Project to Link Japan and U.K.

A 24-terabit-per-second undersea cable will connect Japan and the U.K. and also bring broadband to remote Arctic communities

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Posted 29 Dec 2014 | 16:00 GMT

Meter by meter, a slim vein of fiber-optic cable will soon start snaking its way across the bottom of three oceans and bring the world a few milliseconds closer together. The line will start near Tokyo and cut diagonally across the Pacific, hugging the northern shore of North America and slicing down across the Atlantic to stop just shy of London. Once the cable is live, light will transmit data from one end to the other in just 154 milliseconds—24 ms less than today’s speediest digital connection between Japan and the United Kingdom. That may not seem like much, but the investors and companies eager to send information—stock trades, wire transfers—are so intent on earning a fraction-of-a-second advantage (http://spectrum.ieee.org/computing/networks/the-microsecond-market) over competitors that the US $850 million price tag for the approximately 15,600-kilometer cable may well be worth it.

Arctic Fibre (http://arcticfibre.com/), the Toronto-based company building the cable, is the first to try to connect the globe’s economic centers by laying fiber optics through the long-sought Northwest Passage (http://en.wikipedia.org/wiki/Northwest_Passage)—the pinhole of open water that warmer temperatures have brought to the Arctic. British Telecom, China Unicom, Facebook, Google, Microsoft, and TeliaSonera are watching closely, but so are tens of thousands of Canadians and Alaskans who stand to gain a huge boost in Internet access.

Marine surveys will plot the cable’s route this summer, and the line will be custom built to the surveyors’ specifications. The installation is scheduled to start a year from now, and the cable could be in service by the end of 2016.

Along its route, the cable will pass directly through seven Alaskan communities and cross 25 more communities in Canada. Those connections will bring 57,000 Canadians and 26,500 Alaskans online, most of whom have never before had access to broadband.

“The thing about Alaska is, it’s so big,” says Katie Reeves, program coordinator with Connect Alaska, a broadband advocacy group based in Anchorage. “The distance between communities is hundreds of miles, and there might only be a few people there. They deserve Internet, but it’s hard for [local service provider] GCI or other carriers in the state to justify building out to those communities, because they don’t think they’re going to get a return on their investment.”

Though the United States’ Federal Communications Commission recommends access to download speeds of at least 4 megabits per second, the average download speed in rural areas of Alaska rarely tops 3 Mbps. Plus, there are still 21,000 households and 6,000 businesses without any access to broadband at all.

Across the border in northern Canada, the Internet is sent down from Anik F2, a telecommunications satellite owned by Telesat Canada. On paper, Anik F2 provides access at 5 Mbps, the minimum download speed recommended by Industry Canada, the nation’s economic development agency. But in reality, that connection is often plagued by long delays and poor reliability due to the distance the signal must travel. (In 2011, a technical problem with Anik F2 knocked out service for thousands of people in 39 communities.)

Doug Cunningham, president and CEO of Arctic Fibre, knows this misery all too well: Because upload speeds were too slow, he had to use a courier to send his 227-page environmental report on the cable to the review board in Cambridge Bay, a hamlet in Canada’s most northern province.

“The biggest benefit [of the cable] is really to those residents in communities in Alaska and to the Canadian Arctic who will be released from their satellite captivity,” he says. “For many people in the Canadian North, YouTube is a dream.”

Arctic Fibre, the cable’s owner, will not sell broadband directly to homes and businesses; it will provide only the backbone from which carriers will siphon these services. But the company predicts that prices could be slashed by 75 percent for equivalent service or that northern customers might receive six to seven times as much bandwidth for the current price.
The new broadband will easily transmit classes from the University of Alaska or permit researchers at the Canadian High Arctic Research Station to upload large data sets. Telematics (http://spectrum.ieee.org/tag/telematics) recently debuted at four healthcare systems, including the U.S. Department of Veterans Affairs in Alaska, and better broadband could keep patients from having to travel hundreds of kilometers to seek services. Access will also be a boon to rural businesses.

All of these benefits stem from a 4-centimeter cable. Barges will lay it along most of the route. But to prevent a 1,800-km detour by sea, there is a 51-km section that must cross the Boothia Peninsula, a roadless scrap of tundra in northern Canada. Cunningham says that laying this stretch will require stuffing four large reels of cable through the door of a Hercules aircraft, flying onto a remote airstrip, packing the cable onto sleds, and pulling it across a frozen lake. The crew must then snowmobile along the cable’s intended route, cutting a trench about 30 cm deep through permafrost to bury the line.

That’s all far more work than any company would do to just to serve rural communities in the far north. And with an end-to-end capacity of 24 terabits per second, it’s far more than Arctic residents need. After having so little access for so long, they will be awash in broadband. “The capacity is incredible. They’ll never use all of that capacity,” says Desiree Pfeffer of Quintillion Networks, the Alaska-based arm of Arctic Fibre.

Even though the main point of Arctic Fibre is to connect two of the world’s busiest hubs, Cunningham is pleased that his fellow Canadians will benefit from the project. “I’ve been building systems and financing them for over 20 years, and I’m 63 years old, so this is probably one of my last projects and certainly the largest one,” he says. “This is something I’ve come back to Canada to do.”

Subsea Sensors

A Canadian company called Arctic Fibre is planning to thread the Arctic with the region’s first fiber-optic cable. This summer, surveyors will use up to six types of sonar and mapping tools, each with a distinct role in deciding the cable’s perfect course. The sensors will gather data on seismic activity, identify seams of rock in the seafloor, and warn surveyors to steer clear of subsea hazards.

**Side scan**: Uses variations in the strength of echoes from the seafloor to sketch a black-and-white image that reveals crevasses or volcanoes to avoid.

**Single beam**: Measures depth to seafloor in a straight line by shooting a single beam of sound down from the ship. This records the exact depth for each inch of the cable’s intended course.

**Multibeam**: Measures depth to the seafloor in a wider swath than single-beam sonar does, which helps the survey team identify alternate paths (if the cable must be rerouted) and potential rock-slide risks.

**Sub-bottom**: Deploys a low-frequency sonar to detect patterns in the sediment below the seafloor. This data tells the crew whether to expect sand or rock when digging a 1-meter trench for the cable.

**Ultrashort base line**: Integrated into an underwater vehicle tethered to a ship. The vehicle is equipped with attitude sensors to detect pitch and roll and also a transceiver to send and receive acoustic signals. The tethered vehicle tracks the location of a remotely operated vehicle that digs the trench or inspects the cable.

**Magnetometer**: Measures the magnetic field of the seafloor and can help find abandoned pipelines or old cables that must be avoided.

*This article originally appeared in print as “Fiber Optics for the Far North.”*