

NEPTUNE CANADA

BACKGROUND

The *Ile de Sein* Alcatel-Lucent's *Ile de Sein* is a purpose-built, 140-metre cable ship fully equipped with all the necessary equipment, tools and facilities to safely handle and install, join, test and power the submerged NEPTUNE Canada regional cabled ocean observatory system. The ship can hold 6,000 km of cable in its tanks and is designed for the installation of trans-oceanic cables in all weather.

The cable The 800 km NEPTUNE Canada cable system was loaded into circular cable tanks on the *Ile de Sein*. In order to withstand ship motion in stormy weather, the cable was laid tightly and packed by hand in horizontal layers by loading crews who worked in Calais, France, in two shifts usually 20 minutes on and 20 minutes off. The loading took about a week.

Several types of the powered, fibre-optic cable, ranging from 17 mm to 300 mm in diameter, will be used. The narrower cable will be laid in the deep-sea abyssal plain (flat sea floor areas) while the wider cable has added strengthening and protection for deployment in rough terrain or for burial. The cable system is designed with a life span of at least 25 years. Cables are always laid in compliance with government regulations and the existing regional environmental standards.

Powering the system Repeaters, required for cables longer than 400 km, use optical amplifiers to boost the transmitted light signal to enable it to go further. Depending on the length and capacity of the cable, the amplifier specifications are set and tested over a full range of temperatures before being housed in a thick steel casing which protects it at ocean depths of up to 8 km. The NEPTUNE Canada system will deploy five repeaters spaced between each of the nodes.

Installation Once out of the Alberni Inlet, the cable will be buried wherever suitable at about 1 m depth into the seabed, across the continental shelf and upper continental slope down to a water depth of about 1,500 m. A narrow trench, about 15 cm wide, is cut in the sediment using a 30-tonne plough comprised of two large steel plates. The cable, running between the two plates, drops to the bottom of the cut and the sediment closes back in to complete the burial.

The cable installation will follow a route that has been carefully assessed by NEPTUNE Canada to the requirements of Alcatel-Lucent. Canada's remotely-operated vehicle ROPOS and other remotely operated vehicles from the Woods Hole Oceanographic Institution in Massachusetts were used over several summers to map the seabed and take geotechnical measurements. The University of Washington, the Department of Fisheries and Oceans and the Geological Survey of Canada also assisted with ship

time and survey data to determine the routing over a variety of complex subsea terrains.

Branching the cable At node locations, the cable must be divided by a branching unit that deflects the cable power and high bandwidth communications along a spur cable (up to 20 km in length) to a 6.5-tonne node. **Port Alberni Shore Station** The UVic shore station is an essential part of the NEPTUNE Canada observatory. It houses the equipment required to provide power to the submerged system and communicate with the instruments and recover data. The two ends of the 800-km cable loop will terminate at the shore station. The building was constructed for a trans-Pacific telecommunications system and will be used for scientific research and student programs related to NEPTUNE Canada. **Equipment installation** Alcatel-Lucent has designed, manufactured and will now install the submarine cable system over the next seven weeks. The high bandwidth communication from the instruments to control the subsea observatory is made possible by using dense wavelength division multiplexing (DWDM) technology, where many light paths are used simultaneously on the same fibre. Additionally, Alcatel-Lucent will supply its own specialized software (such as their 1696 Metrospan [MS] system, 7450 Ethernet Service Switch [ESS] and 1350 management suite) to control and monitor this entire network through the Internet.

Post installation After the cable is laid, the *Ile de Sein* or a sister ship will deploy a remotely operated vehicle to inspect burial areas that had been noted as possibly incomplete during installation. Once it is complete an "as laid" position list will be generated by Alcatel-Lucent and distributed to the fishing community, Transport Canada, the Canadian Hydrographic Survey, Fisheries and Oceans Canada, and other interested parties. Details will be made available through the NEPTUNE Canada website www.neptunecanada.ca.