



Harnessing the Power of Ocean Data to Address Some of Our Greatest Global Challenges

Imagine the ability to better predict tsunamis and take immediate actions that save lives...to better understand food chain processes and their impact on fishing...to see the impact of global warming on the oceans. Canadian scientists are searching the depths of the oceans as they pursue these and other goals.

Oceans represent perhaps the most powerful and life-giving forces on earth—and a critical area of research. The world below the ocean surface is dynamic and bustling with activity that can alter our very existence, from changing currents to thriving plankton and wildlife and shifting layers of the earth's crust. Underwater events such as tsunamis can have devastating impacts on people, wildlife and landscapes in neighbouring countries.

NEPTUNE Canada, a pan-Canadian research initiative that aims to expand the boundaries of ocean science, has launched the world's largest cabled seafloor observatory in the northeast Pacific Ocean. It features sophisticated scientific instruments that allow scientists to peer into the depths of our oceans and gather world-first data that could help to unlock some of their greatest mysteries. But researchers face a key challenge: how to effectively manage and analyze a flood of information so vast it could fill an ocean?

Today, scientists at the University of Victoria, together with collaborators from Memorial University of Newfoundland and McGill University, are capitalizing on the advanced networking capability provided by CANARIE and BCNET, the organization that manages British Columbia's Optical Regional Advanced Network, to meet this challenge. A team of oceanographers, computer scientists and engineers have developed a Web-based environment that will allow researchers to collect, access and analyze very large volumes of data produced by NEPTUNE's scientific instruments in, on and above the ocean floor, and to use this data to help predict and respond to earthquakes and underwater volcanic eruptions, plankton blooms, and changes in ocean chemistry and climate.

It will also enable scientists to control cameras and underwater vehicles remotely during experiments and other coastal to deep sea exploration activities. With a direct 10 gigabit connection from the University of Victoria to the shore station valued at \$3 million, and an injection of \$1.3 million from its Network-Enabled Platforms (NEP) program, the NEPTUNE team truly relies on CANARIE each day.

"NEPTUNE provides the instrumentation we need to better understand the ocean," says Dr. Chris Barnes, Project Director of NEPTUNE and Professor Emeritus at the University of Victoria. "This platform enables scientists across the country and around the world to access and exchange data from NEPTUNE. This creates new opportunities for our researchers and leverages Canada's investment in this \$100 million underwater observatory."

The project will also stimulate increased research collaboration, and create invaluable new training opportunities for future oceanographers and other scientists. The platform features a host of databases and social networking applications, such as online calendars, blogs and Twitter, enabling scientists to engage in live discussions, review findings as a team, and share tools for analyzing a tremendous amount of ocean data and imagery.

"The volume of data that we are collecting from our seafloor observatory is massive, often exceeding dozens of gigabytes each day," says Benoit Pirene, Associate Director of Information Technology at NEPTUNE. "Researchers across Canada simply could not process or exchange this information without the advanced networking capability provided by CANARIE." These advanced networking technologies are virtually bringing scientists 'under the sea' to mine the wealth of rich data it possesses.