Over the last year, we have been working to secure funds to take the NEPTUNE Canada Project through the transition from infrastructure development, to installation in three discrete phases (backbone cable/nodes/instruments), and into full operation. Through an interim arrangement, until Canada establishes a formal program to support Major Science Initiatives, Natural Sciences and Engineering Council of Canada (NSERC), the Canada Foundation for Innovation (CFI), and the BC Ministry of Advanced Education have agreed, with some conditions, to contribute equally to providing $13.2M over two years. All but one of the conditions has now been resolved, and the last one should be settled in the next month. We are deeply grateful for the flexibility and commitment of these agencies in supporting the project, and to the external review committee that gave such a positive evaluation which formed a key part of the agencies’ assessment.

The February Newsletter announced the award of $2.3M through the CANARIE Infrastructure Extension Program for the 10-year service agreement for the high bandwidth (10Gbps) data backhaul connection between the Port Alberni Shore Station and UVic. This connection will be completed by 31 May.

Earlier this spring, we were advised by Alcatel-Lucent, the primary infrastructure contractor, that it would be unable to complete the anticipated node development, testing, manufacture and installation in 2008, primarily due to technical difficulties in the design and testing of the medium voltage converter. These pushed the production and manufacturing schedule into the late summer resulting in insufficient time to complete installation before the good weather window closed at the end-September. We then worked towards an option of a partial installation of 2-3 nodes in September 2008, but the problems with the development schedule eventually eliminated this option. As explained in more detail in articles to follow the resulting plan is now to install all five nodes in May-June 2009 followed by the instruments in July-September 2009, subject to arranging the necessary ships and ROPOS ROV. We are now communicating this new schedule to various stakeholders, including recent meetings with representatives of the Canadian and US navies who serve on our Cybersecurity Committee and members of the Science Advisory Committee.

During this final phase and transition into the operating phase, we will share news of these exciting yet challenging developments as well as the lessons learned at conferences, workshops, and through invited lectures. Those include the Ocean Technology Conference, Houston in May; International Year of Planet Earth at the Canadian Society of Petroleum Geologists, Calgary, in May; the Chinese ocean observatories workshop, Shanghai, in May; the Canadian Hydrographic/National Surveyors Conference, Victoria, in May; the MTS/IEEE Oceans ’08, Quebec, in September, and the CCMC Oceans Innovation Conference, St. Johns, in October.
Infrastructure Installation Update
by NEPTUNE Canada Executive Committee

After a recent review of the progress made by Alcatel-Lucent in the development of technologies essential for the installation of the nodes, perhaps the most critical component of the underwater infrastructure, UVic and Alcatel-Lucent have decided that it is in the best interests of the NEPTUNE Canada project to allow additional time to fully qualify the node equipment prior to manufacturing and installation. Therefore, installation of nodes and instruments will commence in spring 2009 rather than fall 2008, recognising that installation can only safely be undertaken in the May-September good weather season.

Alcatel-Lucent will mobilize a ship to Victoria to complete installation of the five nodes in May-June 2009. NEPTUNE Canada will arrange deployment of extension cables, junction boxes and instruments between July and September 2009; the precise schedule of instrument deployment will depend on securing about 60 days of a suitable ship and the ROPOS ROV.

Alcatel-Lucent is in the last stage of the development and qualification of equipment required for this project. Underwater optical amplifiers have been qualified to accommodate 8 amps current, rather than the standard 1-2A. Branching units have been qualified to isolate any of three lines, rather than any of two. The subsea optical transmission system has been qualified to support terrestrial SONET equipment, Ethernet and 1588 precision timing protocols. Each of these developments has been classified as high risk in independent reports.

At the heart of the Alcatel-Lucent design is a subsea power converter that reduces 10kV DC to 400V DC. Alcatel-Lucent produced a housed P2B prototype of this device eighteen months ago. That prototype was sufficiently advanced for MBARI to select it for early installation on the MARS observatory in Monterey Bay, California. Alcatel-Lucent, in discussion with NEPTUNE Canada, determined that this particular model of the MV converter would not meet the NEPTUNE Canada goal of a 25-year design life. Since completion of that P2B prototype, Alcatel-Lucent, at its own cost, has designed and built a new prototype, P2C. The P2C prototype, and the final qualification model, P4, are currently undergoing qualification testing at Alcatel-Lucent’s factory in Greenwich, UK.

Both UVic and Alcatel-Lucent are keenly aware of the challenges of successfully building this long-term cabled ocean observatory, which is the first of its kind in the world. It is important to both fully qualify the design and to fully investigate and learn from recent failures. Partial installation in fall 2008, with weather conditions deteriorating, would incur unwarranted risks and jeopardize the progressive technical successes which have been achieved through A-L’s uncompromised quality control process that has been paramount to date.

As part of its commitment to this project and to help UVic to accommodate the costs of this delay, Alcatel-Lucent has agreed to cover NEPTUNE Canada’s staff costs through the fall-winter of 2008/09. Alcatel-Lucent and NEPTUNE Canada will work together to get instruments installed and operational as early as feasible in the 2009 summer weather window.

While this slip in completion of the NEPTUNE Canada system is disappointing, there is no question that it is the right decision and in the best interests of fulfilling NEPTUNE Canada's goal of providing unparalleled and uninterrupted observations of Earth/ocean processes off the west coast of Canada over the projected 25 year life span of the facility.
At the end of April 2008, I travelled to Greenwich, UK for a week of project meetings with our contractor, Alcatel Submarine Networks (ASN), a unit of Alcatel-Lucent. Besides the normal minutiae involved in the management of this major development project, the shared goal of the meeting was to review the risks involved in continuing to pursue a 2008 deployment date for the first nodes and instruments.

Also at the meeting for UVic were Steve Lentz (optical networking and subsea systems), Paul Hansen (quality assurance), Cheryl Katnick (permitting and marine) and Rob Jones (electrical and shore station). These four form the core of NEPTUNE Canada’s engineering expertise.

The tone of the meeting was positive – ASN has made huge strides towards qualifying all of the equipment needed to facilitate the vision of NEPTUNE Canada’s science community. ASN was able to show us the housed prototype of the 10kV to 400V medium voltage converter, and run it through some of its initial qualification tests. ASN used the low voltage power board to switch loads to the converter, and the converter showed stable and predictable reactions to loads being applied and shed. While full qualification of the MV converter will take several more months, everyone present was very impressed with ASN’s progress and the dedication of ASN’s personnel, project team and executive to providing a fully compliant piece of equipment.

ASN was also able to provide an update on the other two major development tasks still ongoing; the low voltage power board and the medium voltage wet mate connector. Both of these developments are in qualification testing, and are proceeding at a reasonable pace.

After spending the first day of the meeting in updates on progress, the morning of the second day was spent in a detailed joint review of the 2008 installation scenarios, and the risks attached to them. While ASN and UVic have both been pushing for a 2008 installation, the time required to complete development of the MV converter has reduced the scope to one node installed in 2008 before the weather closes in. Achievement of even that limited scope would require manufacturing of equipment before that equipment had completed qualification tests – a situation which, while possibly justifiable, is not normal practice for ASN, and adds risk to the process.

After a great deal of discussion and review by the engineering team, the recommendation was that, from a strictly engineering standpoint, the project would benefit from ASN having the extra time to complete its qualification work before manufacturing, rather than pushing ahead for a partial 2008 deployment. The additional time will be put to good use – not only will ASN be able to fully qualify equipment before manufacturing, but we will be able to do further tests of the junction box with the node equipment to ensure full compatibility.

Meanwhile we are continuing to define and order the cables and connectors that join each instrument through the junction boxes to the nodes. The bulk of the orders are now in place and final instrument whips are being confirmed now that Junction Box requirements are known.

Tyco’s C/V Global Sentinel is anticipated to return to continue Post Lay Inspection and Burial operations (PLIB) on the cable in mid-May 2008, provided she does not get called away on a repair again. We are optimistic that she can complete all the PLIB work outside territorial waters on this cruise.
Canada, like all maritime nations, faces a very real hazard from tsunamis along all of our shorelines. While the greatest likelihood of a devastating tsunami exists in the Pacific Ocean, from both distant and nearby sources, the Atlantic Ocean is not immune from such disasters; in 1929, a tsunami arriving from the Grand Banks killed 27 people living along the south coast of Newfoundland and created waves which were recorded as far away as Portugal.

Causes of tsunamis are diverse, but the two most common in the deep ocean are vertical fault rupture on the seafloor and large underwater landslides. While fault movements are commonly associated with great earthquakes (M > 9), even moderate to major earthquakes can trigger very large submarine and subaerial landslides, giving rise to highly destructive tsunamis. The Grand Banks tsunami of 1929 was an indirect consequence of a major earthquake (M = 7.2) triggering a huge underwater failure. Indeed, the most catastrophic tsunami in the world during the 20th Century occurred off Papua New Guinea in 1998 as the result of a nearby underwater landslide triggered by a M = 7.1 earthquake. The tsunami from this event killed about 2,200 people.

In the Pacific Ocean, seismically generated tsunamis have killed more than 50,000 people during the past century and the West Coast of Canada has experienced several damaging tsunamis in its recorded history. The best documented was associated with the Good Friday earthquake (M=9.2) in Alaska in 1964. While there were no deaths in Canada there was considerable destruction in Port Alberni and more than 120 deaths in Alaska and California. The most devastating tsunami documented on our coast occurred on January 26, 1700; severe damage was recorded in Japan and First Nations stories from British Columbia tell of tremendous destruction and loss of life along the outer coast of British Columbia and the U.S. Pacific Northwest. It is expected that such an event will occur again over the next 200 years and generate waves of up to 15 to 20 m along portions of the outer coast of Vancouver Island. As tsunamis can travel at several hundreds of kilometres per hour in deep water, the arrival time of a tsunami generated by a large earthquake off British Columbia could be as little as 10-15 minutes after the start of the earthquake for communities on the outer coast of Vancouver Island.

NEPTUNE Canada will install highly sensitive bottom pressure recorders at all of its sites of scientific interest in the northeast Pacific to record the occurrence of tsunamis. As well, a dedicated array of three widely spaced bottom pressure recorders will be placed on the abyssal plain in the vicinity of ODP site 1027; this array will allow precise determination of deep water tsunami amplitude, direction of propagation and speed. While not specifically designed as a tsunami warning system, the NEPTUNE Canada tsunami array, will contribute substantially to our understanding of tsunamis and their propagation off western North America.
Science Update
By Mairi Best, Associate Director, Science

In recent months many of us have spent some time on the road strengthening our national and international partnerships. As others from NEPTUNE Canada represented us at the March Ocean Sciences meeting in Orlando, I left for Japan to participate in a DONET sponsored workshop on cabled observatories, with costs kindly covered by JAMSTEC. This was followed by talks at the UBC Fisheries Centre and the BC Underwater Archeology “Shipwrecks” conference. In April I found myself in Edmonton presenting cabled observatory options to the international IPY Sustaining Arctic Observing Networks workshop. The diversity of these contacts underlines the breadth of appeal of this project.

Throughout this time instruments continue to arrive at our testing facility to be put through their paces. Some have then been shipped off to Japan for integration into our Vertical Profiler at NGK. Others remain here as they are taken through tests for basic operation, inrush current levels, lack of ground faults, and data quality. A number of these have issues arising from cabled use of instruments designed for batteries. Approximately half the drivers have already been developed through DMAS, including ongoing consultation with NEPTUNE scientists on issues of data quality assessment and calibration. Extension cables and connectors are now on order, and as they and eventually the junction boxes arrive in our testing facility, the components will be integrated and further tested prior to deployment.

The website committee has been busy shifting from the initial consulting phase to the detailed design, including the information architecture by UVic’s Faye Hoffman. This process has been very fruitful, and we can see the web environment of our imaginations starting to take shape. This is further boosted by our recent success in receiving CANARIE funding to support the development of an “Oceans 2.0” web environment. As outlined in the DMAS Update, this will include online resources for data analysis and workflows, collaboration, and interoperability with other data sources. With this funding there will be a lot of exciting work not only for our DMAS team, but for a growing Science team. We are currently hiring a Web Developer (DMAS), Web Content Manager, and a Scientific Data Specialist (see www.neptunecanada.ca for details) who will be key builders of this future web collaborative analytical environment.

Despite our earlier hopes, we will not manage to install some instruments before the 2008 weather window closes down on us. This is for all the right reasons, an investment in future infrastructure reliability. In the meantime, we have plenty to do integrating the instrument-infrastructure-DMAS-web environment systems so that they will be thoroughly tested and ready for deployment as soon as we hit the water in 2009!
DMAS Update
by Benoît Pirenne, Associate Director, Information Technology &
Murray Leslie, Software Quality Control Specialist

Work is progressing well on the development side of the DMAS team with already more than 20 different types of NEPTUNE Canada instruments having their software interfaces (drivers) ready.

Another major activity that is taking place is the migration to Oracle. So far, DMAS has been using the Sybase relational database management system with satisfaction. The move to Oracle is prompted by the fact that UVic has a site licence for that product and that it makes economic sense for us to adopt it as well. Moreover, on the technical side, going with the world leader in these kind of core systems is a reasonable move as their product can be can expected to last a very long time, no matter what happens to the company. The transition is happening now and we expect to have it completed within a couple of months.

Over the past few weeks, the DMAS QA team has migrated to a new development and support tracking system called Jira from Atlassian Systems. There are a number of benefits over the previous system, Bugzilla. The primary advantage of Jira is its ease of use, powerful search and reporting ability and customizable workflow. We are now using the software to track both the Operations & Systems Support as well as development/software QA issues which are often interdependent. Jira integrates email, RSS, wiki, release management, defect and systems tracking systems all in one integrated package. DMAS has expanded its development efforts to include budget planning, equipment procurement and acceptance testing, threaded discussion lists for scientists and digital asset management (e.g. underwater videos of cable route surveys). With the addition of Jira support tracking system, we now have an integrated system to monitor software, network and hardware issues.

The next challenge for DMAS is the upcoming VENUS September cruise. This cruise will be quite ambitious with the deployment of: the Strait of Georgia “Deep Node” and its associated VENUS Instrument Platform (VIP), a large set of new instruments for the Delta Dynamics Laboratory on the Strait of Georgia shallow node.

Beyond the “traditional” activities described above, NEPTUNE Canada is also about to start a major initiative called Oceans 2.0. This 2-year project will allow the diverse and distributed community of ocean scientists to work together on research projects aided by a dynamic and modern, web-based software system providing transparent access to distributed data sources and remote underwater assets. We intend to integrate an ocean data interoperability from multiple data providers in Canada and abroad; an on-line environment in which groups of individuals will form virtual organizations and in which team members will be able to interact, access data from different sources and perform data analysis and visualization. The virtual environment will moreover contain features to remotely control cameras and underwater vehicles. The project provides the first integrated, research-oriented social networking environment for marine science containing features specific to the exploitation, visualization and exchange of scientific data and facilitating the entire scientific process from inception to publication. The project outcomes will moreover provide laboratory asset controls from anywhere on the Internet and feature tremendous educational opportunities. The diagram above shows the diverse functionality that will be integrated with this project.
Port Alberni Shore Station Update  
by Rob Jones, Network Engineer

NEPTUNE Canada’s shore station in Port Alberni will see a flurry of activity this month and into June.

Alcatel-Lucent has delivered to the Port Alberni shore station the Power Feed Equipment (PFE) which will provide 10,000 VDC power to the submerged plant, and the telecommunications equipment which will monitor the system and transmit data to and from the instruments. The PFE itself arrived in three containers, each the size of a large shed and weighing 3 tons. The telecommunications equipment came in a further 17 crates. It was quite the event with two large trucks, cranes, and lots of manpower to offload, unpack and place this very large and heavy equipment into the shore station building. Along with the NEPTUNE Canada team, experts from Alcatel-Lucent will be busy installing and testing this equipment over the next several weeks.

In addition, Shaw Business Solutions will complete testing of the high bandwidth internet connection between the shore station and UVic by May 31st.

Together these critical components ensure our preparation for receiving live data in 2009. More updates on shore station activity to come.

NSF’s Ocean Observatories Initiative  
by Holly Given, Director of Ocean Observing Activities,  
The Consortium for Ocean Leadership

A comprehensive suite of design and management documents developed by the OOI Project Team for the Preliminary Design Review held by NSF in December is now available online. The documents, various presentations made throughout PDR, and additional supporting and background documents can be accessed at: http://www.oceanleadership.org/ocean_observing/initiative/planning/PDR_public_document_repository.

The overall conclusion of the NSF PDR Panel was extremely positive. The final PDR Panel Report contains 42 recommendations that will help with planning steps leading to the OOI Final Design Review in October/November 2008 and eventual submission of the program to the National Science Board for approval of the start of MREFC funding.

An ad hoc group of community representatives is serving as a nominating committee for a new Program Advisory Committee (PAC) for the OOI. The nominating committee is in its final stages and will forward names to Ocean Leadership and NSF, followed by invitations to serve on the PAC in May. The newly formed committee, which will take over the primary community advisory responsibility carried out by the interim Observatory Steering Committee, will meet to consider what further advisory subgroups are needed. Nominating committee members include: David Karl (U. Hawaii), and Margaret Leinen (Climos), Steve Lohrenz (U. Southern Mississippi), Susan Lozier (Duke), Mike Purdy (Lamont-Doherty), and Don Wright (Virginia Institute of Marine Sciences).
NEPTUNE Canada and VENUS
Collaborative Ocean Observatories

VENUS and NEPTUNE Canada, both led by the University of Victoria, and overseen by Ocean Networks Canada work side by side in the Technology Enterprise Facility on the University campus. The collaborative nature and physical closeness of these projects allows for many share benefits and opportunities.

VENUS, or the Victoria Experimental Network Under the Sea, is a coastal, cabled seafloor observatory and the world's first operational, real-time portal into the ocean. VENUS includes two interactive laboratories, one currently installed and operational in Saanich Inlet and a second in the Strait of Georgia to be installed and operational in early 2008.

For the latest news on VENUS visit their website at: http://www.venus.uvic.ca

Ocean Networks Canada
by Martin Taylor, President & CEO

Presentations at two recent international meetings – at MTS/IEEE Oceans '08 in Kobe, Japan, and at the 'Very Large Volume Neutrino Observatory Workshop' in Toulon, France - highlighted the role of Ocean Networks Canada (ONC) as the agency responsible for NEPTUNE Canada and VENUS. At both meetings, interest was high in the latest developments of the observatories and also in the ways in which the research can be applied in the areas of informing public policy, creating economic and commercial development opportunities, and promoting public education and outreach. ONC also exhibited at the Ocean Technologies Conference in Houston, Texas in early May.

Two major items for the upcoming ONC Board meeting on May 28th are the recommendations of a consultant’s report on the governance and management of NEPTUNE Canada and the review of the draft ONC business plan. The governance and management report was a condition of the recent operating funding award by CFI and NSERC to NEPTUNE Canada to determine that appropriate administrative structures, policies and procedures are in place. Coming at this still early stage of its development, the report provides timely guidance for incorporating best practices in governance and management into ONC’s operations. Board approval will be sought for the ONC business plan which sets out strategic objectives and priorities for the development of the observatories over the first few years of their operation. The UVic President, Dr. David Turpin, will make a presentation to the Board on the Pacific Institute for Climate Solutions (PICS), a major new initiative led by UVic, and supported by a $90M endowment from the BC Government, to advance climate change mitigation and adaptation.