Message from Project Director

by Chris Barnes, Project Director

NEPTUNE Canada has just received a further $20 million towards the installation phase! Applications by UVic to the Canada Foundation for Innovation and the BC Knowledge Development Fund were each approved at $8M, with a further $4M of in-kind support from industrial partners, notably Alcatel Submarine Networks. We will continue to seek the latter $4M in cash from other sources over the next year. $20M is the amount needed to install the NEPTUNE Stage 1 array as originally proposed to the granting agencies, with about six instrumented nodes. With the delay of US funding among other factors that denied an opportunity for savings through larger scale and imposed significant non-recurring engineering costs on NEPTUNE Canada, we remained short about $20M.

We are now able to increase the scope of the infrastructure from two nodes and two branching units to five nodes and a branching unit to add a sixth node. In addition to the original two nodes at Barkley Canyon and Endeavour we will install node modules in the frames at ODP 889 and 1027, Folger Passage, and put in a branching unit and node base at Middle Valley. With a further $4M to replace in-kind support, we will convert Middle Valley to a sixth instrumented node. This new funding therefore increases the nodes/instruments/data by 250-300%, as well as increasing the scientific impact by having some experiments that are now plate-d wide. To say that we are exhilarated is an understatement and we are deeply appreciative of the granting agencies’ continued support.

The process to secure the new funding was complicated and extended over the last 18 months. CFI had no procedure for awarding supplementary funds and our request prompted a policy review, eventually a procedure and guidelines were approved, application was made, an external panel visit convened, a separate application was submitted to BCKDF for matching funds, discussions on specific conditions preceded final approval of the awards, with the public announcement made on 26 September. In the interim, we have reactivated the dormant, pre-approved science experiments; deployment details will be discussed with the PIs at Science and DMAS workshops in mid-November in Victoria/Sidney. The funding adds project scope for the nodes and extension cables, with Peter Phibbs leading a team to make those contractual arrangements with Alcatel. Likewise, enhancements to the data management and observatory controls are being handled by the DMAS group under Benoît Pirenne.

It is a pleasure to note that in July Kim Juniper moved from UQAM to accept a BC Leadership Chair in Ocean Ecosystems and Global Change at UVic. As such, he will be involved more in education/outreach activities but cannot devote half his time to NEPTUNE Canada as Co-Chief Scientist. This, together with the much enhanced science scope from the new funding, has led us to advertise nationally (see website) for a new full-time Associate Director Science. Brian Bornhold will continue to help manage the science experiments as Project Scientist. Other staff changes include the return of Fern Johnson as Manager of Finance and Administration, the appointment of Leslie Elliott as Project Coordinator, and new DMAS appointments (see New DMAS Organization) later in this publication. We now have a complement of about 24 staff including those positions being advertised.

The US NEPTUNE program is moving ahead, with the proposed US$309M/6 years funding for NSF’s Ocean Observatories Initiative presently before Congress for approval. The Joint Ocean Institutions (JOI) Office has issued RFPs for Implementing Organizations for both the Regional Cabled Observatory (US NEPTUNE) and Cyberinfrastructure. The white smoke heralding our US/IO partner for the bi-national NEPTUNE Project should rise in November. The proposal to fund the ESONET array around Western Europe is being led by Ifremer in France (c. $100M euros; through the EU 7th Framework Agreement); Kim Juniper and Benoit Pirenne visited Ifremer in Brest this summer to discuss collaborative opportunities.

NEPTUNE Canada is supporting the proposed Ocean Tracking Network project, being led by Dalhousie University (Ron O’Dor, PI) with its application to CFI for the residual $39M in the International Ventures Fund. OTN is one of three applications invited to submit full applications for the final competition this fall.

We continue to have discussions with a wide range of participating or potential partners and interested groups, and to make presentations at national and regional conferences and workshops. Since our March Newsletter, two meetings have been held with the US and Canadian navies and a Cybersecurity Committee established. Likewise, recent meetings with fishery associations and government departments have become formalized through establishment of a Fishery Advisory Committee. The new Science Advisory Committee had its first meeting in July. All three committees report to the Executive Committee, with the former also reporting to NSF/ORION.

Folger Rockfish Conservancy
As discussed in our March newsletter the consideration to change from 10/100 Ethernet over copper connectors on the nodes to hybrid copper and optical connectors (0-3) to allow increased reach of extensions using standard Ethernet protocols has been adopted by the project team and adjustments made to the Alcatel contract. This change has had implications on the functionality of the primary and secondary junction boxes. If you have any concerns about how decisions are made, or wish to have input, please send us an email at neptune@uvic.ca.

Details of pricing for the additional nodes and branching unit are being negotiated with Alcatel, based on the pricing included in the Supply Contract. We are also discussing any other effects on schedule, warranty and other related issues.

In June, we completed the Preliminary Design Review (PDR) with Alcatel in Goleta, CA with a review of the node module and associated equipment. A principle part of this review was the presentation by Texcel, who have replaced Satlantic as Alcatel’s subcontractor with responsibility for the low voltage equipment. While the project team is disappointed to lose Satlantic from Alcatel’s team, Texcel have come up to speed very fast, and at the project meeting in Greenwich early September showed us two sets of prototype boards for testing and technical demonstrations.

Suppliers have been selected and contracts are being finalized for wet mate connectors, cable terminations, and data backhaul from the shore station in Port Alberni to UVic. The RFP responses have been received for the selection of a contractor for the secondary junction boxes. We are considering invoking an option in the Alcatel contract for the supply of the primary junction boxes.

Working with our colleagues in the VENUS project team we are reviewing the responses to an RFP to select a supplier for two vertical profilers, one for VENUS and one for NEPTUNE Stage 1. We expect to select a supplier before the end of the year.

This summer we were able to take advantage of an offer by MBARI to use their AUV to gather survey data around Barkley Canyon – along the cable route and at the instrument sites. We also funded a survey cruise using the JOHN P. Tully and ROPOS to ground truth the acoustic survey data. However, following this summer’s cruises, we are left with 40km of survey in the ODP 889 area still to be collected. We need to complete this work before summer, so expect to collect the survey data in winter or in May 2007.

The fall will be busy as we issue RFPs for an instrument qualification contractor, outside plant contractor, and various suppliers of shore station equipment. In November we will attend the Alcatel Technical Demonstrations in the UK and France.
Primary and Secondary Junction Boxes
by Paul Hansen, Project Quality Assurance Manager

Primary and Secondary Junction Box Arrangements

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**Primary Junction Boxes** (PJB) connect to the nodes by extensions of up to 8km and provide power distribution and data aggregation at the specific science sites.

The PJB interfaces distribute downstream to Secondary Junction Boxes (SJB) and to 400 volt Ethernet capable instruments.

From the node to the PJB there will be a 0-3 interface consisting of gigabit optical Ethernet (data) and 400 VDC up to 9kW (power). Each PJB will have 8 interfaces of 100baseT Ethernet and 400 VDC up to the maximum input power. All power available can be applied to a single interface. PJB interfaces will be equipped with Remotely Operated Vehicle wet-mate connectors.

A **Secondary Junction Box** (SJB) provides a multi-port interface to science instruments by providing the appropriate voltage levels and communication protocols to instruments. The Junction Box also reports to the shore-based Data Management and Archiving System (DMAS) with internal diagnostics and provides isolation control and fault detection on all interfaces. SJBs will be configured for specific experiments and will not include extraneous interface connectors or adapters if there is no immediate need.

The SJBs will be individually configured but each can accommodate serial instruments (232, 422 and 485 protocols) as well as 100baseT Ethernet. There will be 5 SJBs each at Endeavour and Barkley Canyon.

**PJB & SJB Locations:**

Primary Junction Box Locations: Main Endeavour Field (3km from Endeavour node), Mothra Field (3.5 km from Endeavour node), Barkley Canyon near vertical profiler (7 km from Barkley Canyon (BC) node), Barkley Canyon at mid canyon (5 km from BC node).

Secondary Junction Box Locations; ODP 889 (at least one), IODP 1027 (at least one), and one at Folger Passage. Plans for SJB’s for ODP 889, IODP 1027, and Folger Passage are pending a workshop planned for October 2006.
Preliminary Design Review
On 23 June, DMAS’s current work and plans were presented to a Preliminary Design Review (PDR) panel. The recommendations resulting from the review are available on the NEPTUNE Canada web site, together with the group’s responses to them and the associated action items. The most important recommendations include: the strengthening of our software QA/QC team; the creation of a DMAS steering committee; the emphasis on science requirement input. We will address the three aspects above by adding one person to the QA/QC team, define the mandate and composition of a steering committee and organize workshops where scientists will be invited to share with us their vision on how to best define a system that will be most useful to them. Finally, it should be mentioned that we are planning to organize a Critical Design Review (CDR) meeting in December, refining the description of what was presented at the PDR in June.

Fall NEPTUNE Science Workshop
The purpose of this workshop is for us to gather more far-reaching “use cases” and user requirements. We are currently putting together an infrastructure that we believe will be flexible enough in its capabilities to support as yet unspecified questions, but we now would like to put it to the test and submit it to a reality check. We are therefore looking for the bigger picture of long term use of the underwater equipment and its data. We would like to hear about the ocean science questions that the community would like to address in the next 10 years with the help of the cabled observatories and, together, come up with data systems needs that, if they were to be implemented, would provide the answers. We would like to invite all interested scientists to join us for this one-day workshop that will take place at the Institute of Ocean Sciences in Sidney, BC on November 16. This meeting will follow immediately the 3-day science workshop that will determine the instrumentation that will be deployed at the 3 new NEPTUNE Canada nodes.

New DMAS Organization
The growing DMAS group is now organized in three teams; each team has a particular role and function in the DMAS project. Although each team member has expertise in a particular area they will be given the opportunity to work on many different sub projects.

TEAM 1 is responsible for designing and developing the DMAS software:
Eric Guillemot, Senior Software Architect - team lead
Yigal Rachman, Instrument Data Acquisition Developer - interface to the instruments
Darryl Bidulock, Observatory Resource Management Mgr.- interface with nodes, PJBs, SJBs, SIIMs
Maike Dulk, Java Programmer - data base, etc.
Karen Tang, Java Programmer - user interfaces
Craig Stuart, Co-op Student - Java programming
Leo Gong, Co-op Student - Java programming
VACANT, User Applications Developer

TEAM 2 is responsible for testing and QA of the products delivered by the developers:
Daisy Qi, Software Librarian - software testing and QA
VACANT, Software Quality Control Specialist - software testing and QA

TEAM 3 is responsible for dealing with operations and support:
Martin Hofmann, DMAS Development Systems Manager - operational systems and team lead
John Dorocicz, Systems Manager (25% staff position) - networks and security
Danny Roland, Systems Administrator - desktops
Current DMAS Activities
by Eric Guillemot, Senior Web Architect

After several months of intensive work, the DMAS team is putting the final touch on its new software infrastructure, which is the foundation that will help us support not only the acquisition and distribution of data but also host the scientific experiments. The modern architecture adopted by DMAS is the result of collaboration between the Canadian team and our US counterpart, with the help of organizations such as CANARIE and IBM Canada.

This architecture is implemented using public domain as well as commercial elements, or building blocks. Its most important piece, the Enterprise Service Bus, is a so-called middleware implemented using the IBM® WebSphere® MQ. It supports asynchronous point-to-point messaging and more importantly “publish and subscribe” messaging. On a service bus, the processing of information can be done at any location, in our case either at the shore station or at the data centre. This feature alone will enable, for example, the event detection and reaction to be performed at either location. A detection/reaction process which would trigger a change in the configuration of an instrument, such as changing the sample period, would obviously be better located at the shore station and would therefore be shielded from any major damage to our transmission lines caused for example by an earthquake.

Another key ingredient of our architecture is the Web Service capability. VENUS is already using a Web Service to display the latest instrument readings on its home page www.venus.uvic.ca. This is the first of a long series of Web Services to be developed over the next three months, which will allow scientists around the globe to tap into the vast amount of information collected by the VENUS observatory.

While building this infrastructure, the DMAS group has put in place a set of strict procedures to guide its process and ensure a much higher quality and predictability. For instance, newly developed code transits from the development environment to the test environment and from test to production after a number of verification stages. Each of these environments is under the responsibility of a different team within the group (see New DMAS Organization)

The DMAS group is now working on the improvement of its requirement gathering process. This process is less critical for infrastructure features but is of prime importance when dealing with users. A procedure has been defined and will be implemented at the beginning of October.

Starting mid-October, DMAS will focus mainly on user products such as event detection and reaction, and Web Services.

Current DMAS tools and services
Keep an eye on the evolution of the DMAS services and features (mostly for VENUS) by trying out http://dmas.uvic.ca/
With the additional new funding NEPTUNE Canada will be able to proceed with the development of some of the previously highly ranked science proposals at Sites ODP 889/ Bull’s Eye (Vancouver Island continental slope), at ODP 1027 and vicinity (abyssal plain) and at Folger Passage near the entrance to Barkley Sound. The proponents of these experiments, which had been placed on a standby list, were contacted and are now refining their scientific objectives and approaches, and will discuss them with NEPTUNE Canada staff. We have schedule technical meetings for these proposals for November 13, 14, 15 in Victoria and Sidney, BC.

Interest in the ODP Site 889 and the Bull’s Eye area is primarily in understanding the nature and evolution of gas hydrates below the seafloor. At ODP 1027 area the intent will be to network several of the CORKed drill holes in as part of a long-term study of crustal hydrology and the relationships between hydrological conditions in the seafloor and events (e.g. earthquakes) occurring elsewhere on or near the Juan de Fuca plate. The Folger Passage site lies within a Rockfish Conservation Area and will be an important coastal node for NEPTUNE Canada focusing on physical oceanography and biological productivity; its proximity to the Bamfield Marine Science Centre will allow frequent involvement by students and researchers in complementary studies in the area, and in capitalizing on the long-term NEPTUNE data series that will flow from the experimental site. It is hoped that seismometers, bottom pressure recorders (tsunami sensors) and hydrophones will be installed at many of the new and existing sites.

A one-week cruise of the CCGS John P. Tully was carried out between August 7 and 14, led by NEPTUNE Canada Co-Chief Scientists, Kim Juniper and Brian Bornhold. Using the Canadian Remotely Operated Vehicle ROPOS, we were able to inspect and survey many areas on the continental shelf and slope, including parts of the main cable route, proposed experimental sites, node and Primary Junction Box locations and cable routes for extension cables and spurs. Sites visited include: Barkley Canyon hydrate site; benthic ecosystem sites in and near Barkley Canyon; the proposed profiler site on the slope; Bull’s Eye and ODP 889 area; and, Folger Passage node site and nearby rock pinnacles. As well, profiles near the head and distal part of Barkley Canyon were undertaken. A full report on the cruise will be posted on the NEPTUNE Canada web site in October. Video and digital still photos from the cruise, together with imagery from Endeavour Segment are being compiled into a site characterization section that will also be posted on the NEPTUEN Canada web site.
Since the ORION Design and Implementation Workshop in March 2006, the ORION Program Office and members of the ORION advisory committees have worked on refining the Ocean Observatories Initiative (OOI) Conceptual Network Design (CND) through an iterative process, as revised cost estimates of the proposed infrastructure have been developed. This information formed the basis of a Conceptual Design Review (CDR) of the OOI, which was successfully completed in August 2006. The NSF’s Large Facilities Office requires several reviews of its large programs as one of the steps in moving towards the construction and implementation phase. For the OOI CDR a panel of 20 experts from the science, engineering, and education communities was convened to review the scientific merit and goals of the OOI, the technical feasibility and readiness of the CND, the proposed budget, schedule and milestones, the management plan, education and outreach plans, and a preliminary estimate of an operations budget. The panel noted that the OOI will transform the way oceanographic research will be carried out in the coming decades and concluded that the conceptual network design is credible and provides a good starting point for the next step in the development of the OOI.

One outcome of preparing for the CDR was obtaining more accurate estimates of operations and maintenance (O&M) costs. The current projected annual O&M costs for the ORION Program used by NSF in their budget planning was obtained from the National Academy of Sciences report, *Enabling Ocean Research in the 21st Century: Implementation of a Network of Ocean Observatories*, which represented the best estimate of O&M costs in 2003 when the report was published. ORION’s recently revised O&M estimates are higher than the 2003 value, as a result of improved information on the type and location of infrastructure, along with inflation in the intervening years. As many of you are aware fuel costs for ships, in particular, have dramatically increased in the past two years, as well as the enhanced role of ships resulting from demand for offshore exploration, drilling, and production. Based on anticipated inflation in the coming years, these O&M costs will likely be substantially higher by 2013 when the OOI is completed. The ORION community is very sensitive to the need to limit O&M and life cycle costs in order to protect the core science funds within the current NSF budget constraints. As a result, the ORION Office and advisory committee members will be re-evaluating and descoping the existing network design in the coming months to ensure that the OOI funds are spent wisely, that we meet the budget targets given to us by NSF, and that the goals of the MREFC account are met, namely that the facilities provide new and transformative technologies that will enable major advances in understanding ocean processes.

The Observatory Steering Committee (OSC) met September 13-15, and endorsed a set of high priority boundary conditions to guide the process of re-evaluating the observatory network design with respect to O&M costs. The Science and Technology Advisory Committee (STAC), augmented by members of the Engineering Committee, will meet in October to discuss and recommend re-baselining options for the observatory network design given the above conditions. With input from the STAC and the OSC, the ORION Office will develop a revised observatory network plan. This plan will be posted on the ORION website in early December for public comment. A new network plan will be completed in January 2007 in consultation with the NSF. This plan will be used as the basis for further, detailed cost estimates required for the Preliminary Design Review in fall 2007.

The OOI is a tremendous opportunity for the ocean sciences community to demonstrate the transformative nature of having a continual presence in the oceans through a network of interactive, distributed sensors. This facility will enable powerful new approaches for investigating complex processes and foster technological developments for several decades to come. In the next year, we will strive to ensure that the OOI provides unique capabilities at the frontiers of Ocean and Earth system science research to promote discovery, innovation, and learning.

Kendra Daly
Director, ORION Program

Bob Detrick
Chair, ORION Observatory Steering Committee
VENUS News

The past few months have seen a number of key milestones reached in the VENUS Project:

♦ Exceeded one million page views on the VENUS website www.venus.uvic.ca
♦ Array has now been deployed for over six months in Saanich Inlet
♦ Data is streaming into DMAS and through the data portal to our user community
♦ Successfully completed their first maintenance cycle on the deployed instruments in Saanich Inlet

Check out the August 2006: Forensic Investigations in Saanich Inlet
http://www.venus.uvic.ca/research/research_highlights.html

The VENUS Summer 2006 Newsletter
http://www.venus.uvic.ca/resources/documents/info/Summer%202006%20Newsletter4-1.pdf

Pressure plot collected by the SeaBird CTD that clearly displays the tidal cycles from the last week

NEPTUNE Canada in Port Alberni

The Port Alberni shore station is where the NEPTUNE Canada cable will come ashore. Information and images gathered by instruments far out at sea will flow instantly via the Internet to Port Alberni and then to UVic.

This summer a NEPTUNE Canada exhibit was on display in the Lighthouse Gallery (photo at right), located on the Harbour Quay in Port Alberni. Thanks to the Port Alberni Maritime Heritage Society for providing this great location for showcasing the NEPTUNE Canada Project.