Since the May 2008 newsletter, the last remaining condition has been removed to allow NEPTUNE Canada to access transitional operating funds over the next two years. The $13.2M was provided in equal contributions from the Natural Sciences and Engineering Research Council of Canada, the Canada Foundation for Innovation and the British Columbia Ministry of Advanced Education. Benoit Pirenne was also successful in a $1.4M application to the CANARIE Network-Enabled Platform program to develop new software applications for NEPTUNE Canada. Ocean Networks Canada was successful in the Letter of Intent stage of an application to the Centres of Excellence for Commercialization and Research program. If new funds are secured they will be applied to advancing ONC, NEPTUNE Canada and VENUS in commercialization opportunities, education and outreach, and public policy that are outside the eligibility of current funding.

Alcatel-Lucent continues its work on the final development of the medium voltage and low voltage converters for the node. The construction of six trawl resistant frames for the nodes, which together will weigh over 6 tonnes in air, is underway by its subcontractor L3 MariPro in Santa Barbara, California. A significant achievement was the production of the first set of the Junction Boxes by OceanWorks, Vancouver, and their successful interface with the node at a test in the UK. With node deployment by Alcatel-Lucent scheduled for May-early July 2009 and the installation of the junction boxes, extensions and instruments thereafter through September by NEPTUNE Canada, there is considerable planning underway for the necessary ship and ROV time and the coordination of the many complex activities within the May-September weather window.

The bench and initial wet testing of the 130 individual instruments is largely complete and the next phase is their integration with the junction boxes on research platforms and frames, along with DMAS connectivity, to support the various experiments near the main node sites. Highland Technologies has been contacted to undertake much of this work. More advanced wet testing will be undertaken using the Saanich Inlet node of the VENUS project and UVic’s associated Ocean Technology Test Bed that will be installed in January 2009. This will involve large items such as the 2-tonne Vertical Profiler System manufactured by NGK Ocean in Japan. In July, the crawler developed at Jacobs University, Bremen, Germany, was successfully tested using the ROPOS ROV at the Barkley Canyon gas hydrate site.

Nearly all the equipment additions and physical modifications at the Port Alberni Shore station, acquired for NEPTUNE Canada in 2004, have been completed and the 10Gbps connection to the UVic Data Centre fully tested. The DMAS group continues to expand and begin developing the Oceans 2.0 social network software with support from CANARIE. An international Interoperability Workshop was organized at UVic on 8-9 September, 2008.

NEPTUNE Canada was profiled in CANARIE’s 2008 Annual Report and NC staff published articles in the July 2008 issue of Sea Technology and the September 2008 issue of the Journal of Ocean Technology. Over the next two months, NEPTUNE staff will be providing conference presentations/posters/exhibits at MTS/IEEE Oceans ’08 in Quebec City, the BioMarine Conference at Marseilles/Toulon, the Ocean Innovation World Summit on Ocean Observing Systems in St. Johns, Newfoundland, and the Geological Society of America Annual Meeting in Houston, where we will be pleased to meet with those interested in learning more of the project, interested in adding scientific instruments or commercial instrument prototypes to the observatory, or expanding the range of experiments.
Engineering Update
by Peter Phibbs, Associate Director, Engineering & Operations

At the end of July we travelled with engineers from OceanWorks and an OceanWorks junction box to ASN’s facility in Greenwich, UK for a week of integration testing between the junction box and the ASN node. A more detailed report follows by Rob Jones, Network Engineer.

In the first week of August we met with ASN again, this time in California at the premises of ASN’s subcontractor responsible for the node modules and trawl-resistant frames (TRFs), L-3 MariPro. This meeting was also attended by representatives of the Canadian Scientific Submersible Facility (CSSF) who operate the ROPOS ROV. The meeting focused on deployment and ROV issues as they relate to the TRF and node module. ASN has been working closely with CSSF, and it seems that all issues have been taken into account and that the TRF and node meet the requirements for maintainability by ROV. During the course of these meetings it became clear that our decision in May to postpone installation until 2009 was the correct decision. ASN is making good use of the additional time for working through the final qualification tests of its equipment. We are also making use of the time to do additional integration tests of junction boxes, instruments and software to ensure as far as possible that the 2009 deployment goes smoothly.

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. The problem with the low voltage board has been isolated to a third party power supply. The manufacturer has duplicated the problem and is now working on identifying the cause. We expect that problem to be resolved in the next few months. The medium voltage wet mate connector continues to present challenges during its qualification tests, but all parties are working diligently towards a solution.

Meanwhile we have started taking delivery of the extensions and whips (cables between instrument and junction boxes) required for the test installation in Saanich at the end of September 2008. Cheryl Katnick has taken on the task of looking after cables and connectors, and will be touching base with science groups as we move forward.

The Saanich deployment will be a test run of our procedures for preparing equipment for deployment. Saanich requires most of the piece parts of next year’s NEPTUNE Canada deployment – an extension, an instrument frame, a junction box, and a variety of instruments and their associated whips. All the assembly and test procedures will be put through their paces in the next month, and the gaps will be identified and fixed.

Tyco’s C/V Global Sentinel returned to continue Post Lay Inspection and Burial operations (PLIB) on the cable in mid-June 2008. She completed much of the PLIB work outside territorial waters on this cruise.

We will soon begin migration of the GIS data that has been assembled for this project into DMAS. We hope to make georeferenced data available from the DMAS database in the early part of 2009.
At the end of July UVic organised to transport the first OceanWorks Junction Box to Alcatel-Lucent’s facility in Greenwich, UK for integration testing with an Alcatel node. Alcatel Submarine Networks very generously provided access to their power lab and support from their engineering team for these tests. Representatives from Alcatel-Lucent, Oceanworks and UVic ran more than 40 tests to simulate a wide variety of deployment scenarios and operating conditions. The purpose of these tests was to identify any potential problems that could not otherwise be anticipated by each vendor developing their respective systems in isolation. The results of the tests were very favourable and indicated that the two systems work well together. The only significant issue was a protection device that shut off a port after a single failure when it was designed to only shut off after two failures. Fine-tuning of the components that did not operate flawlessly will take place prior to launching the associated hardware in spring 2009.

NEPTUNE Canada’s first two production junction boxes were delivered by Oceanworks to the Marine Technology Centre (MTS) in Saanich on August 20. One of those units is going to be deployed in Saanich Inlet for about 6 months on the VENUS system, principally as a test for next year’s NEPTUNE Canada deployment but also to provide valuable underwater experience for the junction box and scientific data for analysis.

The Saanich Inlet junction box will now undergo several weeks of testing with power, communications and DMAS to verify the interfaces to both the junction box and the instruments that will be connected to it. During this time, the JB will be mounted to a frame with the instruments. By mid-September, testing will be completed and the junction box will be deployed in Saanich Inlet.

At the end of the trial period, the Saanich junction box will be recovered and analysed for any signs of wear or fatigue. A different set of instruments will be connected to it, prior to it being redeployed near Barkley Canyon during 2009.

Manufacture of the remaining 11 junction boxes will be completed by OceanWorks over the next two months, and they will be delivered in three more batches. Each delivery will be accompanied by a significant effort on the part of the scientists, engineers and programmers who are associated with the many disciplines involved in making this a successful exercise. The coming months promise to be a busy and exciting time for all!
As is appropriate for a multidimensional, multivariate project, the whole is much greater than the sum of the parts. We are now integrating modules of the whole:

**Test Platform to be Deployed on VENUS**

At the end of September a test platform of instruments will be deployed in Saanich Inlet, with power and communications provided by the VENUS node. This platform pulls together components from a number of sources: an OceanWorks Junction Box (see Junction Box section); a prototype frame built by Highland Technologies (see below); and extensions and whips including Falmat and ODI cables, and ODI, Seacon, Impulse, Subcon, and Burton connectors; a Kongsberg Mesotech 1071 Rotary Sonar, an RDI Workhorse Monitor ADCP, a Naxys Broadband Hydrophone, a Bottom Pressure Recorder, and a Nortek Aquadopp Single Point Current Meter. In addition, Ifremer’s TEMPO-MINI will be connected to the Junction box via an extension allowing deployment into microbial sediments; it includes a video camera with LED lights, an Aanderaa optode, temperature probes, and an antifouling system. This serves not only as a test of the components, but of the integrated system, including subsea hardware and the data handling and analysis systems being developed with DMAS and the scientific community.

**Website**

Our web team is working flat out to deliver phase one of the website rebuild in October – future phases will increasingly mesh with the growing functionality of Oceans 2.0 (see DMAS section). The team consists of Leslie Elliot (Coordinator), Dwight Owens (Content Manager), Tim Boesenkool (Web Developer), Murray Leslie (Quality Assurance), and Rocketday Arts (Visual Design) – with developer/Oceans 2.0 liaison from Eric Guillemot and Systems liaison from Martin Hofmann. We are excited with what is developing and look forward to inviting you into this webspace later this fall.

**Scientific Teams**

Over this year there is a great deal of work required to prepare for the full onslaught of data. Systems are being built within DMAS to enable data quality and calibration tracking, which require significant input from scientific and technical specialists for each instrument. Oceans 2.0 will grow to facilitate all facets of the scientific process – from raw instrument data to publication and dissemination. Planning is underway for videoconferences, workshops, conference short courses, and general meetings in order to shift into high gear in preparation for installation and data flow.
The world's first "Internet-operated deep sea crawler," created by a team of ocean scientists at Bremen's Jacobs University will help researchers study methane flux variations and gas hydrate dynamics at the Barkley Canyon hydrate outcrops by collecting data on temperature, salinity, methane content and sediment characteristics.

The crawler travels on dual tractor treads, which allow a full range of forward, backward and turning movements. Including its titanium frame, drive motors, sealed electronics chambers, wiring, lights, HD video camera, and sensors, the unit's out-of-water weight is 275 kg. With syntactic foam floatation blocks attached, this is reduced to an in-water weight of 40 kg. One unique feature is its control interface, which plugs directly into the Web. A live sea floor crawl will be posted on the NEPTUNE Canada website.

In June the crawler arrived from Germany and took its first dip into Pacific waters during a CGGS Tully cruise of Kim Juniper and Ross Chapman’s, lowered by crane into shallow water off the docks at Canada's Institute for Ocean Sciences in Sidney, British Columbia. Camera and motor controls were tested as well as sensor input. All systems worked flawlessly. The next test was an actual deep-sea crawl in Barkley Canyon, at a depth of 850 m. The crawler was deployed by ROPOS the remotely operated submersible that will be key in NEPTUNE Canada's installation and operations. A power and communications umbilical cord connected the two as the crawler explored areas of interest.
First and foremost, our “Oceans 2.0” project as described in our previous issue received funding approval in June. CANARIE Inc., the high-speed network provider for academia and research in Canada announced the successful applicants to its “Network-Enabled Platforms” portion of funding. Under the terms of this award, we have the ability to spend up to $1.4M on a project that will address three areas of development:

- Interoperability between VENUS and NEPTUNE Canada and a few other selected data types
- A Web 2.0 environment that will allow users to search and discover data, work with colleagues on-line on a scientific project involving ocean-related data and interact with instrumentation
- Set up and integrate an underwater HDTV camera with high-quality compression and with controls available in the Web 2.0 environment

Partly a consequence of the CANARIE funding, a number of hiring took place: Tony Lin, Kalpana Rawat, and Dmytro Draga joined DMAS as Java developers and Tim Boesenkool joined as a Web developer. A scientific programmer will be recruited in September.

On the technical side, an important milestone was reached in June with the availability of the backhaul line linking UVic to Port Alberni. This 10Gbps line provided to us as a 10-year lease by Shaw Business Solutions was connected and tested. It is a very high performance link, having the equivalent bandwidth of 1,000 home DSL connections!

Meanwhile, the shore station received all the equipment that ASN needs to run the cabled observatory: power feed equipment and laser-based communication systems. The equipment was tested and accepted. A number of DMAS staff attended ASN courses to help with management of this equipment.

DMAS equipment in support of observatory operations started to arrive: an order of about 25 servers was received and their installation started. The servers will soon be joined by storage for the database and the operational systems as well as by network switches. The conversion from Sybase to Oracle is also progressing.

Other technical news include the selection of a content management system for the Web site: the dotCMS system was adopted after a thorough review of available systems.

Last but not least we are now preparing for major new deployments of underwater equipment to take place at the end of September. DMAS challenges there include the simultaneous support of both VENUS and NEPTUNE assets at the same location. One of the important steps of this project was the reception and configuration of the first NEPTUNE Canada OceanWorks junction box.
The OOI’s newly formed Program Advisory Committee (PAC) will hold its first meeting September 11-12, 2008 in Dallas, with a focus on the project’s history, status, and short-term, long-term plans, challenges, and readiness for the OOI’s Final Design Review in November.

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**Autonomous underwater vehicle "eyes" sites for future ocean observatory**

Sentry is a state-of-the-art, free-swimming underwater robot that can operate independently, without tethers or other connections to a research ship. The autonomous underwater vehicle, or AUV, is pre-programmed with guidance for deep-water surveying, but it can also make its own decisions about navigation on the terrain of the seafloor.

The first scientific mission with Sentry, a newly developed robot capable of diving as deep as 5,000 meters (3.1 miles) into the ocean, has been successfully completed by scientists and engineers from the Woods Hole Oceanographic Institution (WHOI) and the University of Washington (UW). The vehicle surveyed and helped pinpoint several proposed deep-water sites for seafloor instruments that will be deployed in the National Science Foundation (NSF)’s planned Ocean Observatories Initiative (OOI). Working in tandem with sonar instruments on the UW-operated research vessel Thomas G. Thompson and with photo-mapping by WHOI’s TowCam seafloor imaging system, Sentry gathered the most precise maps to date of seafloor features known as Hydrate Ridge and Axial Volcano off the coast of Oregon and Washington.

Sentry is designed to swim like a fish or fly like a helicopter through the water. The sleek hydrodynamic design allows the vehicle to descend quickly from the sea surface to the depths (about 3,500 meters per hour). The novel shape also gives the vehicle tremendous stability and balance while cruising through bottom currents. The vehicle has thrusters built into its foils, or wings. Like an airplane, the foils allow the vehicle to gain lift or drag for directional momentum, as needed. When necessary, the AUV also can hover over the bottom for close-up inspections, navigational decision-making, and for rising up and down over rugged seafloor terrain. The design allows the vehicle to start, stop, and change directions, whereas many AUVs tend to travel in one direction.

Eventually, vehicles like Sentry and its successors will plug into and interact with the ocean observatory system, using the power charging systems and high speed communications delivered by the submarine networks.

"We are changing the way ocean science is done, launching a new era in which an ensemble of technologies will provide us with an increasing capacity for exploring and interacting with the global oceans," said John Delaney, chief scientist of the expedition and principal investigator for the UW-led regional observatory in the planned OOI.
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 three interactive laboratories, one installed and operational in Saanich Inlet and two installed and operational in the Strait of Georgia as of February 2008.

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

It’s just over a year since ONC was established as a not for profit society responsible for the governance and management of the NEPTUNE Canada and VENUS observatories. ONC is now on the eve of its fourth Board meeting and its first AGM. ONC’s strategic and business plan lays out five objectives to fulfill its vision of positioning Canada as an international leader in the S&T of ocean observing systems and of maximizing the associated economic and social benefits through commercialization and outreach programs. The ONC objectives are: supporting transformative science and technology; creating opportunities for commercial and economic development; promoting public education and outreach; informing evidence-based public policy; and demonstrating best practices in governance and management.

The commercialization and outreach mandate is linked directly to the current application for funding through the federal Centres of Excellence in Commercialization and Research program. ONC’s letter of intent has been approved and the full proposal is being prepared for the October 14th deadline. The proposed program is geared to commercialization initiatives in the areas of sensors and instruments, ocean technology systems, oceans ICT, and to supporting a public outreach program. Major complementary funding is being sought from Western Economic Diversification to support a senior business development officer for ONC.

ONC has let a contract to Think Tank, a new media company in Vancouver, to produce a promotional video that can be used in a wide variety of venues and for a broad range of audiences. The purpose is to stimulate interest and excitement in the NEPTUNE Canada and VENUS programs, to highlight their pioneering research, and to underline their importance for advancing our understanding of the oceans for the future benefit of our nation and our planet.

ONC continues to be actively engaged in international outreach through conferences and workshops which in the next few weeks include presentations at Oceans 08 in Quebec City, the Science and Technology Society meeting in Kyoto, and BioMarine 2008 in Toulon/Marseille.