NEPTUNE Canada
Transforming Ocean Science

Upcoming Events

AGU/GAC/CGU Joint Assembly
Special Observatories Session
Toronto, ON - May 23 - 27, 2009

CMOS
Halifax, NS - May 31 - June 4, 2009

Science Writers Association
Sudbury, ON - May 25, 2009

GeoTec
Vancouver, BC - June 1 - 4, 2009

Sidney Marine Centre Opening
Sidney, BC - June 20, 2009

GLOBEC
Victoria, BC - June 22 - 26, 2009

NEPTUNE Canada Installation Activities
July 1 - September 20, 2009

Director's Report

by Chris Barnes

NEPTUNE Canada staff, consultants and contractors are being hard pressed at present to complete all the detailed components and their final integration work for the marine programs this summer: the installation of the nodes by Alcatel-Lucent Submarine Networks (ASN) from 1 July to 17 August and the installation of the extension cables, junction boxes and instruments from 20 August to 20 September. Details and challenges of the ongoing testing are presented in several articles in this issue.

The node deployment will use the C/S Lodbrog and the *R/V Atlantis* hosting the CSSF ROPOS ROV as the support vessel; the *R/V Thompson*, with ROPOS will be used for the instrument deployment. The slippage into the early summer of the marine program will result in all or part of the instrument installation at the Endeavour site being completed in the 2010 weather window. After a few weeks of commissioning work by ASN, the ownership of the wet plant system will be turned over to the University of Victoria (UVic). Approximately 4-6 weeks of additional commissioning and testing time will be required by NEPTUNE Canada, especially the Data Management and Archive (DMAS) group, and also for the Canadian and US navies dealing with national security issues. We therefore expect to see the start of the scientific and public release of the NC data beginning about mid-November.

In order to publicize these final phases of installation and the transition to full operating phase, we are making extra efforts to present papers and exhibits at recent and upcoming conferences and workshops through 2009. These will include an invitation for scientists to join the program, to add instruments and for commercial companies to participate in a variety of ways. Please meet with NEPTUNE Canada representatives or visit our exhibit booth to learn more about our future developments and opportunities and pass on your requests or ideas for participation.

We are planning an event to celebrate the start of the marine installation program on 3 July at Esquimalt Dock in Victoria. Further details will appear later on our website at http://neptunecanada.ca and by invitations which will be issued in early June.

MAY 2009 1 Volume 6, Number 1

Science

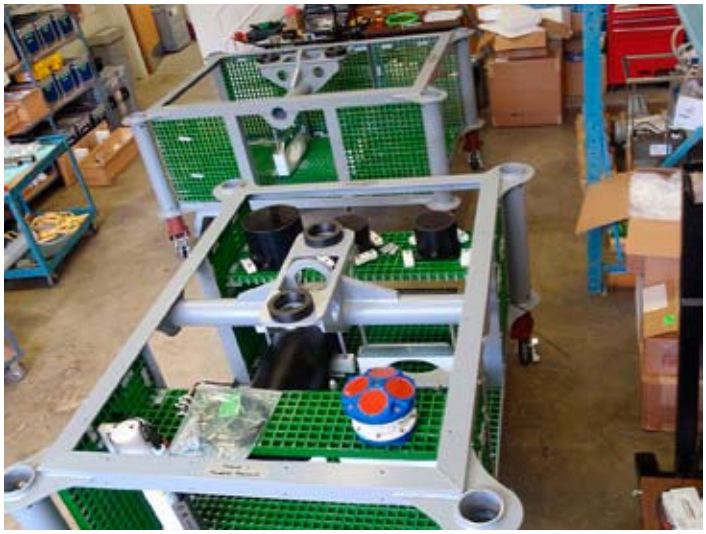
by Mairi Best

Preparations for a busy summer are now in full tilt. Many physical and organizational components are coming together and will continue to do so over the next few months as our intermeshed hardware, software, and people networks are launched in the form of NEPTUNE Canada.

Framing the marine program schedule for this summer is the node deployment, followed by the instrument deployment cruise scheduled on the *R/V Thompson* for August 20th to September 20th. Some initial cable laying and junction box placement are also planned for the *R/V Atlantis* when time allows between node deliveries. The order of instrument installation is currently planned as: ODP 1027 and 889, Barkley Canyon, Folger Passage, and finally if time allows, the main cable and some of the instruments at Main Endeavour Field. We expect to provide video and daily logs of our installation work on the *R/V Thompson* via our website at http://neptunecanada.ca.

In order for integrated platforms to be tested and ready for loading, and extension cables spooled on to the ROCLS drums for cable laying by ROPOS (see below). An expanding team is working hard at our Marine Technology Centre in Sidney to pull together the individually tested components.

Frames are built and being populated with instruments (see image below). Once a frame, junction box, and its associated instruments are fully integrated, the assembly is then re-tested both dry and inside our saltwater test tank. Engineering and scientific data are collected to confirm normal operation, and to provide a future baseline. The vertical profiler testing currently underway is a special case of this process (see adjacent article). The scientists involved with each platform are helping review the placement of instruments and the quality of the data as we go through these final preparations.

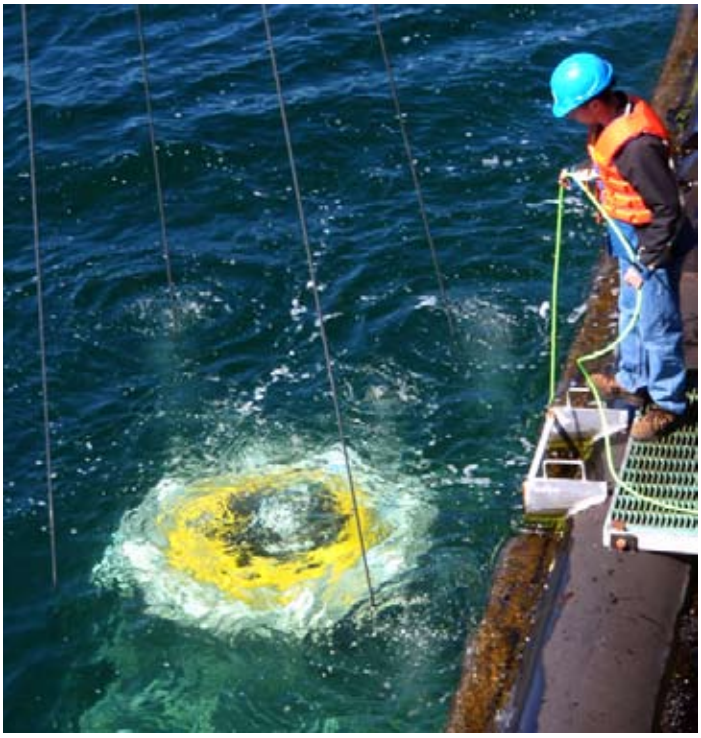


The science community is gearing up for dealing with the imminent firehose of data and expanding the existing suites of instruments. Components of our Oceans 2.0 webspace are taking shape which will help in analysis and collaboration. Proposals continue to be submitted and funded around the world for the addition of instruments to NEPTUNE Canada, contact us for help in joining the wave! http://neptunecanada.ca

Vertical Profiler Wet Test

by Reece Hasanen, Steve Lentz, and Dwight Owens

After a flurry of recent activity, NEPTUNE Canada's eagerly anticipated Vertical Profiler System (VPS) took its first bath in 7m of water off the Institute for Ocean Sciences (IOS) dock, Sidney, BC (see image below). The platform was fully instrumented and reported test data from all instruments. With one exception, all mechanical and electrical systems operated without faults. The float was successfully deployed to the surface by the platform winch, but there was a hitch with recovery and docking, which Nichiyu Giken Kogyo (NGK) engineers have determined a solution to resolve. Wet testing of the VPS is ongoing, with actual deployment to Barkley Canyon planned for August-September.



VPS science instruments:

- upwelling irradiometer (Satlantic)
- downwelling irradiometer (Satlantic)
- Nitrate sensor (Satlantic)
- CTD (Seabird)
- Oxygen sensor (Aanderaa)
- CO2 sensor (Pro-Oceanus)
- Fluorometer/turbidity sensors (WET Labs)
- Hydrophone (Naxys)
- ADCP (Nortek)
- Echosounder (ASL)

This round of testing was set in motion by the arrival of the NGK technical team from Saitama, Japan (see image below). The crew set to work assembling and instrumenting the VPS at NEPTUNE Canada's Marine Technology Centre (MTC). On 27 April 2009, a hired crane transported the system from the MTC parking lot, trucked it across the street to IOS, and lowered it into the water for its maiden dip into Pacific waters.

The following morning, the float was deployed to the surface when the docking problem was discovered (see team trouble shooting below). The platform base was tilted, due to an uneven seafloor, and a moderate current forced the float to dock at a high angle. The NGK team worked with NEPTUNE Canada scientists and technicians to troubleshoot the problem. NGK has agreed to make modifications to the cable guides, to be implemented in early summer.

NGK is also working to further minimize possible redox (reduction-oxidation) currents and galvanic corrosion on the VPS platform with its many components and instruments. For our part, NEPTUNE Canada will attach feet to the platform base (to keep if off the seabed), install the wet-mate connector and a grab bar for deployment by ROPOS, attach a recovery beacon to the float and test, test, test.

Node-Junction Box Integration Testing

by Rob Jones, Network Engineer

Alcatel-Lucent Submarine Networks (ASN) has developed the node on the NEPTUNE cabled observatory. The node steps down the 10kV primary voltage on the backbone cable to 400V through the Medium Voltage Converter (MVC), and changes communications protocol from IP over SONET on the backbone cable to optical Gb Ethernet for the secondary network downstream from the Node.

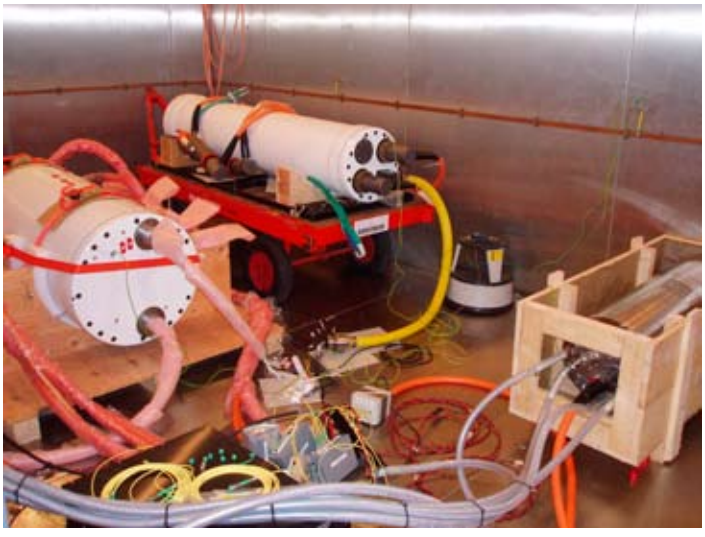
In parallel to the ASN development, OceanWorks International in Vancouver has developed the Junction Box (JB), which is the device that takes 400V from the node and controls and distributes 400V and lower voltage power to instruments and other junction boxes. The JB also manages communications between the instruments and the nodes.

The interface requirements between the node and JB was specified in detail at the design phase of the project. However, the only way to be sure that the two devices will perform as a system is to connect them together and simulate actual deployment configurations.

Initial integration testing was performed at ASN's facility in Greenwich, UK in August 2008, using an ASN prototype MVC and a Low Voltage Communications (LV-Comms) test bench, connected to a JB through an electrical interface. These tests focused primarily on validating the power compatibility between the node and the JB. The testing demonstrated that the node and JB will work well together, with only one problem being identified related to the ability of the system to continue operating in the presence of a ground fault.

ASN has subsequently modified the node to address that issue, as well as to improve the performance of the MVC. ASN has also completed a prototype LV-Communications module.

Environmental Test Chamber (with MVC, LV-Comms and JB, from left to right)



Meanwhile OceanWorks has completed production of junction boxes with optical uplink interfaces, which are the connection between the node and the JB. In order to verify that the previous problems had been addressed, as well as to fully test the communications compatibility between the node and the JB, a second round of integration testing was undertaken at ASN's facility in Greenwich, London (UK).

The testing took place over a period of three days in April. The MVC, LV-Comms prototype and JB were housed in an environmental chamber, where the temperature was kept constant at 0°C to ensure that the equipment remained within its design operating temperature range. Needless to say, there was no dawdling when making changes to the hardware configuration!

Basic power compatibility tests were performed to verify that the system performed within expected limits, using the previous tests as a benchmark.

Once the basic operation of the two systems had been validated, our consultant, Steve Lentz of Lentz Telecommunications Strategies performed rigorous testing of all of the communications compatibility between them. Initially, the optical link between the Node and JB did not come up when connected; after some trouble-shooting, it was established that a feature called "auto-negotiation" needed to be enabled within the Node. It took a few hours to identify and resolve this problem in the lab, but it would have certainly taken a lot longer to troubleshoot and fix had this issue only been discovered during installation.

Upon completion of the communications tests, further power testing was performed and no further problems were encountered with compatibility between the node and JB. The results of these integration tests will serve as a valuable benchmark against which operational data during deployment and operation can be validated, as well as provide a high level of confidence that the NEPTUNE Canada observatory will meet expectations.

Shore Station Network Simulator

Seaproof Solutions - Cable Terminations

by Paul Hansen, Project Quality Assurance Manager

ODI Wetmatable ROV Connectors

NEPTUNE Canada issued a request for proposals (RFP) in late 2005 for the provision of underwater mateable ROV connectors (see above image) and associated cable termination equipment and services. The winning bidders were Ocean Design Inc (ODI) of Florida for the connector portion and Seaproof Solutions AS of Bergen Norway for the extension terminations.

The terminations are machined from titanium.

Potting compound applied to the prepared polyurethane jacket. The polyethylene outer jacket is sealed by mechanical means.

Seaproof Solutions, an ISO 9001 registered company, started operations in April 1989 supporting the North Sea oil industry and Norway's NATO involvement with equipment related to Norway's submarine fleet. http://www.seaproof.com

Two different cable types were manufactured: at Tyco, New Hampshire for lighter cable; and, Nexans, Norway for heavy cable. After awarding the contract to Nexans two 10km armoured cable extensions for Barkley Canyon were added to the requirements.

Seaproof Terminations

The terminations are of two main types:

- Optical terminations are on those extensions connected directly to the nodes where the power and fibre passes from ODI oil filled hose to polyurethane/polyethylene jacketed fibre optic cable. These contain no electronics and are at ambient pressure - 19 terminations. e.g. extensions between nodes and the JB

- Media converter type extensions are connected to Junction Box ports on 12 way copper connectors. Media converters are housed at each end to allow 100baseT Ethernet to be transmitted over fibre -- 17 terminations. e.g JB to JB or JB to instrument

There are an odd number of terminations because the short period seismic instrument at Endeavour connects directly to the node but uses a media converter at the instrument end so there is one of each type of termination on that extension.

The heavy terminations used on the two 10km lengths of armoured cable for Barkley will be assembled at the Nexan cable factory in Norway and loaded onto freighter for transit through the Panama Canal. (see below).

DMAS

by Benoît Pirenne

NEPTUNE Installation Preparations

In April, NEPTUNE Canada Systems and Operations staff attended sessions organized by Alcatel-Lucent (A-L) in Port Alberni to review the operation of the underwater system, with emphasis on the network portion. Follow-up sessions focusing on the power side of the system will take place in September. The sessions have both theoretical aspects as well as hands-on sessions to enable the smooth transfer of responsibility of the entire underwater system to NEPTUNE Canada after A-L has completed system commissioning.

In the final phase before deployment we are now well into integration testing at our Marine Technology Centre. The Vertical Profiler System (VPS) is the first instrument package to be fully tested in saltwater. These tests allowed us to verify the behavior of all the instruments connected to it – for many the first time in water – with our data acquisition system. There are numerous different aspects to be verified such as. Can we access each device from shore? Can we get data? Can data make it to the archive without a hitch? Does the data make scientific sense? Even with the best software testing practices, a number of issues are typically found with integration tests.

The DMAS team are also organizing the activities that will take place on- and off-shore during the instrument installation beginning 20 August. Tight coordination of basic instrument functionality tests between DMAS on land, and the ROPOS and science crews, on board the *R/V Thomson* will be required. As ROPOS connects an instrument platform to its host node or junction box, we need to be able to attempt a power up of everything on the platform before the vessel and ROPOS moves on to perform the next job. Standard Operating Procedures (SOP) are being written to make this step as efficient as possible. As part of this exercise, we are trying to accelerate the transfer of "as-installed" instrument metadata by having a direct link between the ROPOS logging system and the DMAS database. This will allow observatory stakeholders to follow the progress of the installation from the web site. We also intend to broadcast live videos from the installation on the NEPTUNE Canada website whenever technically possible.

Still under the general topic of preparedness for the installation, another major meeting with representatives of the Canadian DND and US Navy took place in April. Its purpose was for the military to learn about the installation schedule and prepare their own system sensitivity verification and for us to make sure that disruptions to the data flow would be kept to a minimum.

We are working together toward acceptable compromises that will balance national security interests and the need of scientists to receive a continuous data stream from the underwater sensors.

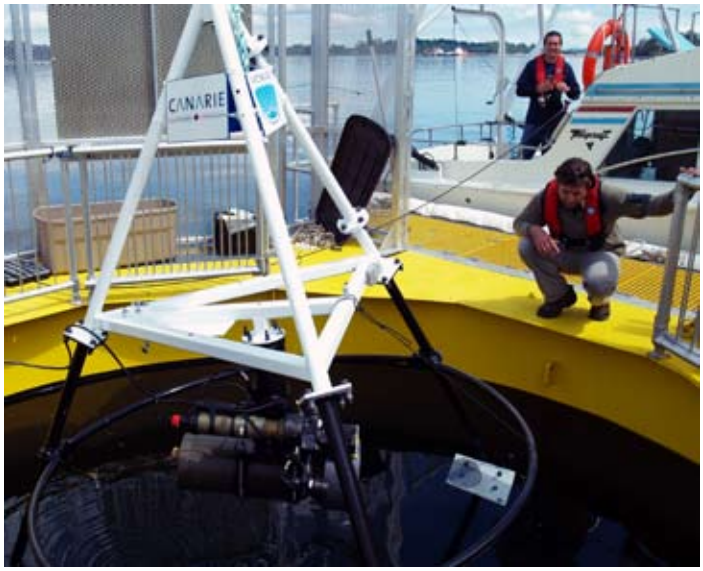
Collaboration with Partners

At the invitation of the project manager for the US Ocean Observatory Initiative (Cyber Infrastructure Implementation Organization), this author attended a meeting in April at the University of Washington (UW) in Seattle where topics of data visualization and workflow systems were discussed with representatives from UW and Microsoft.

Oceans 2.0 Progress

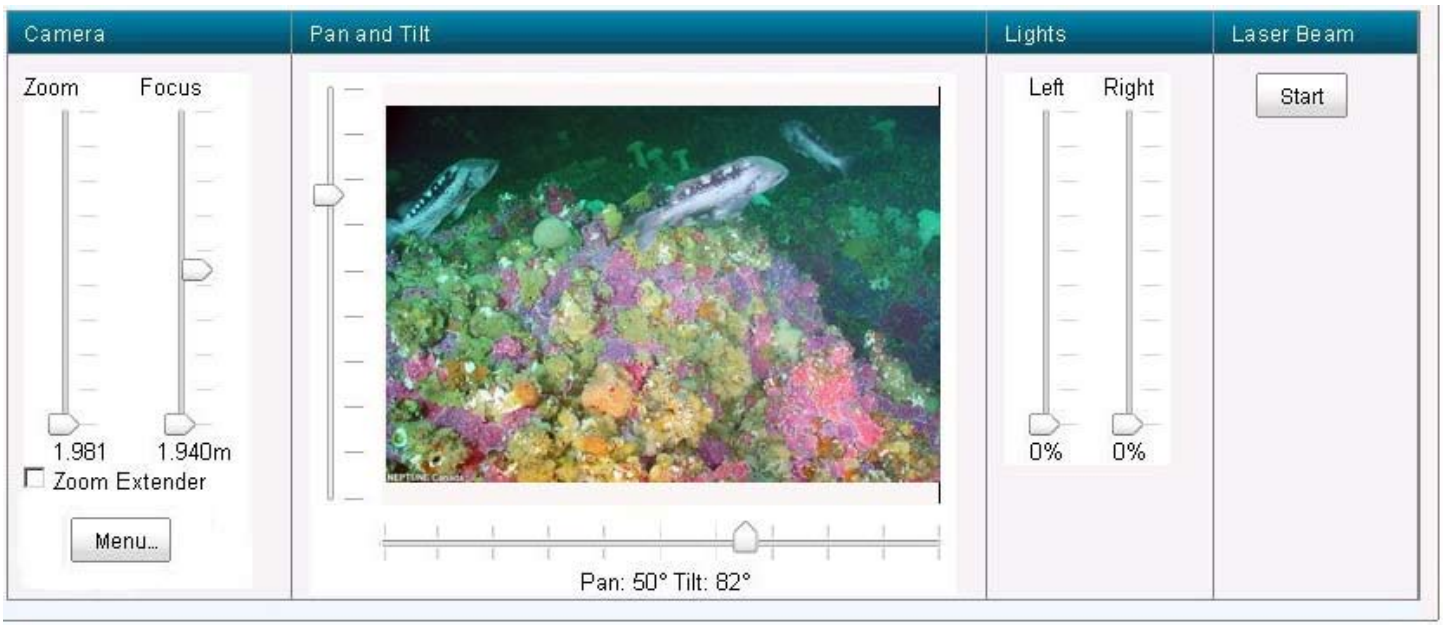
A test deployment of the HDTV camera within the Ocean Technology Test Bed ring buoy (OTTB: http://web.uvic.ca/~lacir/ocean/ottb.php) in the Saanich Inlet took place recently. The camera will be fully deployed around the end of May, when crab fishermen will have recovered their traps left at the location of the deployment.

Image below shows the camera and its tripod descending through the centre of the doughnut-shape buoy.



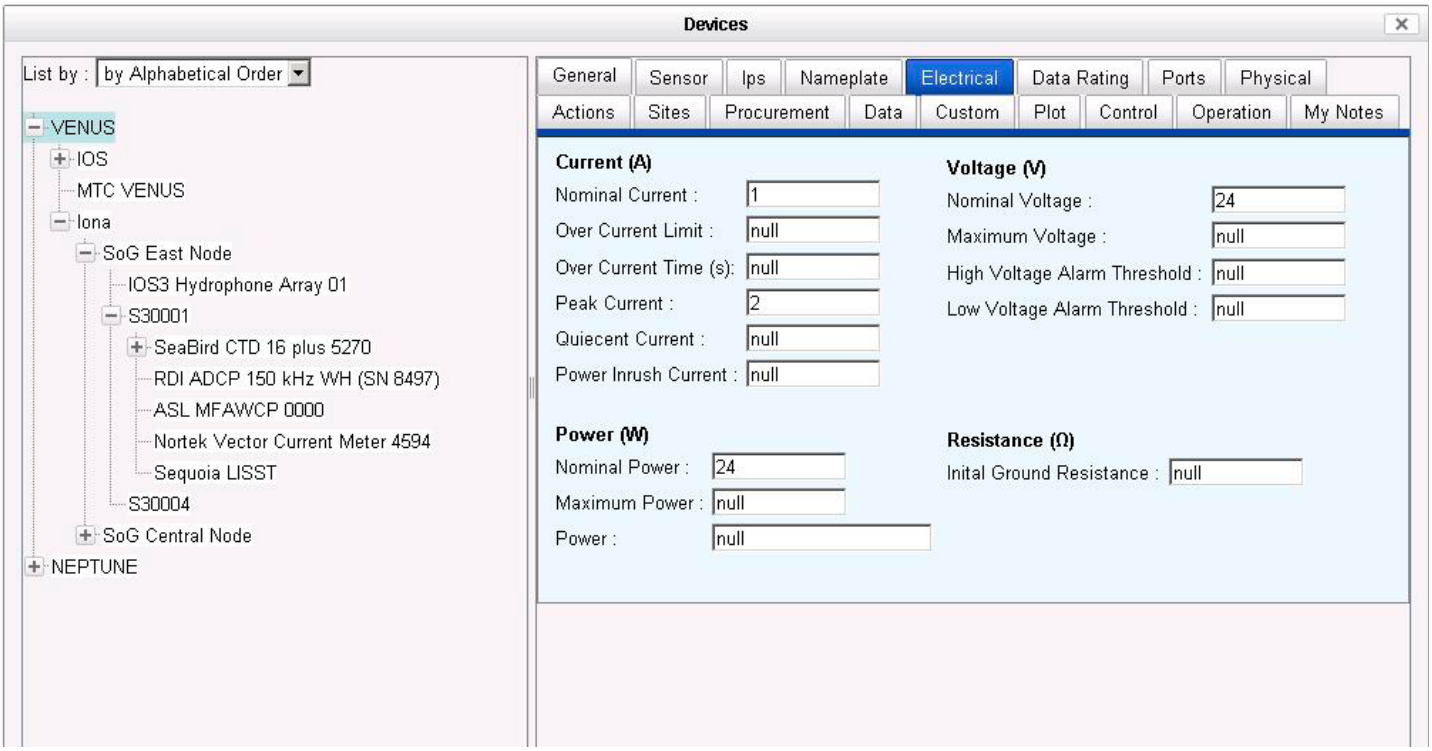
The HDTV Camera, part of the Oceans 2.0 project undergoes a test deployment in the Saanich Inlet, through UVic's Ocean Technology Test Bed ring buoy.

The image below shows a screen shot of the new web-based camera control panel, developed for this project. The novelty here consists of providing controls of underwater instruments through a unique web page thereby not requiring any software installation or bothersome VPN access to a remote computer. We hope to adapt this interface to other NEPTUNE Canada cameras in the near future.



The other components of the Oceans 2.0 project are also moving ahead and include further functionality added to the web environment. The new features were demonstrated recently at a CANARIE workshop in Winnipeg.

Work in progress currently involves the following "Topology View" that, when complete, will allows browsing of the NEPTUNE Canada and VENUS networks and instrumentation hierarchy. Below shows a screenshot of this interface that will also serve as a command centre for the observatory data flow, serving both the needs of the Operations and Engineering teams.



Ocean Networks Canada

by Anne Bateman, Executive Assistant

Ocean Networks Canada (ONC) is brimming with news this month with the birth of our new federal Centre of Excellence in Commercialization and Research, the Ocean Networks Centre for Enterprise and Engagement (ONCEE). March 16th saw the official ONCEE announcement event at UVic with senior level representatives on hand, led by Andrew Saxton, MP for North Vancouver and Parliamentary Secretary to the Treasury Board for the federal government, Chad Gaffield, President of SSHRC for the NCE Executive Committee, David Fissell, President and CEO of ASL Environmental Sciences for the our industry partners, and David Turpin, President of the University of Victoria. A podcast of the event is on the ONC website (www.oceannetworks.ca).

With the funding of ONCEE comes the hiring of new staff, especially the senior business development officer and the portfolio managers (see the website for the job postings), and the creation of the ONCEE Advisory Board, reporting to the ONC Board of Directors. The ONCEE Advisory Board will be chaired by Charles Randell, President and CEO of C-CORE in St John's, Newfoundland (and an ONC Board member), and will contain key industry leaders from across Canada.

This month the ONC President and CEO, Martin Taylor, shared this excitement on the international stage at the IEEE Oceans '09 conference in Bremen, Germany, where he presented a paper on the development of ONCEE. This conference focused on new methods and technologies in ocean exploration. The conference provided numerous networking and participation opportunities for ONCEE via its international marine technology exhibit.

While Bremen Oceans 09 will strengthen our international ties, our partnership with our US colleagues remains a particular focus, and to that end Martin Taylor will be attending the meetings of the Consortium for Ocean Leadership in Washington, DC at the end of May. This will be an especially important meeting given the critical stage of development of the NSF Ocean Observing Initiative (OOI) program and anticipated major funding announcement.

Ocean Networks Canada has been working hard this past month to prepare a display on the NEPTUNE Canada and VENUS ocean observatories along with the University of Victora for the Sidney Marine Centre. Be sure to check it out this summer in Sidney, BC; the official opening is 20 June 2009. http://newmarinecentre.ca/

All in all, May and June 2009 promise to be a very exciting time for ONC as we continue to build our assets and reach out to share our experiences globally as a leader in cabled ocean observing systems.

NEPTUNE Canada
Transforming Ocean Science

University of Victoria
PO Box 1700 STN CSC
Victoria, BC V8W 2Y2
Phone: (250) 472-5400
Fax: (250) 472-5370
E-mail: neptune@uvic.ca
www.neptunecanada.ca