

New strategic council looks at high-performance computing



Just as two of Canada's top high-performance computing facilities joined Forces to better serve Ontario research needs, a new Strategic

Council has been created to look at SHARCNET's role in high performance computing both nationally and internationally.

The Shared Hierarchical Academic Research Computing Network (SHARCNET), based in London, and the High Performance Computing Virtual Laboratory (HPCVL), based in Kingston, two of Canada's foremost high performance computing facilities announced they are joining forces to better serve the Ontario research community.

Although they are distinct in operation and organization, HPCVL and SHARCNET share a

common mission to accelerate research results by providing state-of-the-art computational resources and services to researchers in a variety of disciplines.

The organizations issued a statement on Nov. 17 and announced an agreement to coordinate their activities in the provision of HPC resources and services.

The two HPC sites expect the agreement will result in more efficient and cost-effective solutions for members of both organizations, the Ontario research community and the country as well, said SHARCNET's Executive Director, Carmen Gicante.

"We are moving toward the creation of a provincial HPC research culture," he said. "Our

partnership with HPCVL will strengthen this initiative and greatly enhance the opportunities for Ontario researchers, and ultimately, Canadian industries and citizens as well."

Ken Edgecombe, Executive Director of HPCVL, agrees.

"The coordination of resources and services by HPCVL and SHARCNET is key to maintaining a strong and innovative research base in Ontario and in Canada. Having two of the leading providers of HPC resources coordinate to leverage public and private sector funded infrastructure will accelerate the pace of Canadian research. Our clients will benefit from access to these resources to push their research forward."

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U of T signs on to PlanetLab test-bed for global networks



The University of Toronto is participating in a global test-bed project involving research into Internet systems, which could lead to new advances, such as new protection from viruses and giving the Internet a "memory" of content many generations into the future.

"PlanetLab" is an open, globally distributed test-bed for developing, deploying and accessing planetary-scale network services.

There are currently more than 220 machines at 100 sites worldwide available to support both short-term experiments and long-running network services.

PlanetLab may lead to new ways of protecting the Internet from viruses and worms. It could also enable new capabilities, such as persistent storage, the idea of giving the Internet a "memory." For example, even though the original computer on which it was posted no longer exists, a piece of data could still be found 100 years from now.

To date, more than 200 research projects at top academic institutions including MIT, Stanford, UC Berkeley, Princeton and the University of Washington have used PlanetLab to experiment with such diverse topics as distributed storage, network mapping, peer-to-peer systems, distributed hash tables, and distributed query processing.

PlanetLab creates a unique environment in which to conduct experiments at Internet Scale. The most obvious is that network services deployed on PlanetLab experience all of the behaviors of the real Internet where the only thing predictable is unpredictability (latency, bandwidth, paths taken).

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The ORION Research and Discovery News is a monthly electronic publication providing news and information of interest to users of the Ontario Research and Innovation Optical Network and to the worldwide research and education community.



ORION assists in first Transatlantic Native 10 GbE connection



Researchers in Europe and North America have succeeded in creating the first transatlantic connection using native 10 Gigabit Ethernet technology.

In a demonstration involving Carleton University in Ottawa and CERN in Switzerland, through connections provided by ORION and CANARIE, recent tests have validated the viability of 10 Gigabit Ethernet technology running over long-haul networking infrastructure.

Demonstrated during the recent ITU Telecom World 2003 Exhibition, the first transatlantic native 10 Gigabit Ethernet marks the emergence of Ethernet into the traditional world of telecommunications.

At 10 Gigabits per second, the point-to-point lightpath is 100 to 1000 times faster than everyday networks used to inter-connect computers in businesses, schools, and homes. This opens the possibility of directly connecting scientists and researchers with remote instruments, data, and computational resources an ocean away in unprecedented ways.

The network consists of a SURFnet optical circuit between CERN and the StarLight facility in Chicago via Amsterdam and another optical circuit between StarLight and Carleton University in Ottawa, Canada provided by CANARIE and ORION.

The assembly of these circuits forms an end-to-end lightpath, a point-to-point optical link, between CERN and Carleton University.

10 Gigabit Ethernet devices were directly attached at the two end points of the lightpath to create the first inter-continental native 10 Gigabit Ethernet connection, effectively extending the span of an Ethernet network across countries and continents.

The lightpath is a realization of an emerging networking paradigm of several research networks (such as CA*net 4 and SURFnet5) for supporting data and computationally intensive research. This "optical bypass" provides a fast long wide pipe for ultra speed data transport, a fundamental requirement for large-scale scientific experiments and global scale Grids.

The end-to-end lightpath concept complements the classic Internet best effort approach by providing large amounts of dedicated bandwidth for demanding users.

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U of T signs on to PlanetLab

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A second advantage is that PlanetLab provides a diverse perspective on the Internet in terms of connection properties, network presence, and geographical location. The broad perspective on the Internet enables development and deployment of a new class of services that see the network from many different angles.

The Internet has been based on a small set of software protocols that direct routers inside the network to forward data from source to destination, while applications run on computers connected to the edges of the network. The simplicity of the software model enabled the Internet to rapidly scale into a critical global service; however, this success now makes it difficult to create and test new ways of protecting it from abuses, or from implementing innovative applications and services.

The PlanetLab concept was born when Intel researchers gathered a group of leading network and distributed systems researchers to discuss the implications of a new, emerging class of global services and applications on the Internet.

This new class of services is designed to operate as "overlay" networks, which have emerged as a way of adding new capabilities to the Internet. The concept of an overlay or "on top of" approach might be familiar from textbooks where additional details are added to an image by laying a transparent sheet containing new graphics on top of an existing page.

These applications are decentralized, with pieces running on many machines spread across the global Internet, they can self-organize to form their own networks, and include some form of application processing inside the network (instead of at the edges), adding new intelligence and capabilities to the Internet.

Although several Canadian researchers are already involved with PlanetLab, CANARIE and ORION would like to encourage more.

Intel Corp. has donated 12 PlanetLab servers to be located at CA*net 4 routing nodes across the country, and the systems are being installed.

University of Toronto PlanetLab researchers include Jiang Guo, Baochun Li, Ying Zhu, Brad Reid, Weihong Wang, Selwyn Yuen and Eric Chung. Find out more information at

www.planet-lab.org.



High-performance computing

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While Ontario's foremost HPC sites are looking forward to greater collaboration, a new group has been struck to look at SHARCNET's future within the national and international high-performance computing landscape.

The new SHARCNET High Performance Computing Strategic Council held its inaugural meeting in Toronto Nov. 22, to explore several issues that will have an impact on SHARCNET's strategic directions.

ORION President and CEO Phil Baker agreed to serve on the new council and join a group of 16 individuals representing a broad range of interests and expertise, including advanced networking, business, research and development, telecommunications, and science and technology, among others.

SHARCNET is looking to the strategic council to provide guidance and advice on the external environment for HPC and specific strategic issues facing SHARCNET as the organization moves forward.

For Phil Baker, the process will bring a broader perspective on the provision of high performance and distributing computing in Ontario, and how they can best serve Ontario's research community.

"Canada's HPC resources can be second to none in the world," said Baker. "The council is an ideal vehicle to start looking at how we can achieve a broader, more effective integration of all these resources, including funding sources and criteria for research involving distributed and high performance computing," he said.

"With enabling infrastructures like the ORION network, the potential of Ontario's HPC facilities is very exciting," he said.

ORION provides SHARCNET with a dedicated point-to-point one-gigabit connection linking SHARCNET's three main computational sites at the University of Western Ontario in London, the University of Guelph and McMaster University in Hamilton.

Both SHARCNET and HPCVL were established with support from federal and provincial granting agencies, namely the Canada Foundation for Innovation (CFI), the Ontario Innovation Trust (OIT), and the Ontario Research and Development Challenge Fund (ORDCF).





SNO leader wins top science prize

Dr. Arthur McDonald of Queen's University, the driving force for the Sudbury Neutrino Project, has been named winner of the 2003 Gerhard Herzberg Canada Gold Medal for Science and Engineering. The prize guarantees that Dr. McDonald will receive \$1 million in research funding from the Natural Sciences and Engineering Research Council (NSERC). "Thanks to his great abilities as a scientist, mentor, leader and coordinator, we have an amazing scientific facility in Sudbury, and Canada is recognized as a major training ground for particle, nuclear and astrophysicists from around the world," said NSERC President Tom Brzustowski. "We are thrilled that Art and the SNO team have been recognized with this tremendous Canadian honour," says Queen's Vice-Principal (Research) Kerry Rowe. For photos and more background information on all the award winners, visit www.nserc.ca/about/award_e.htm.

Laurentian kicks-off Advanced Networking Days

ORION and CA*net 4 kicked off their fall series of Advanced Networking Days in Sudbury earlier this month, setting the stage for a broad outreach campaign to Ontario's advanced research and education community. Several organizations sent representatives to the workshop, hosted by Laurentian University on Nov. 13. ORION Board

member and President of Contact North Maxim Jean Louis noted that "ORION is here, now, and it is operational. Our challenge is to move quickly to adapt to this new technology, and make the most use of this new gateway to research and discovery in Ontario, especially here in the north." Presentations included an overview of Laurentian University's research activity and a look at the types of advanced applications and collaborative research activities that are now made possible because of ORION and the CA*net 4 networks. The sessions continue in Toronto, Hamilton and London in December. For more information, visit the ORION – CA*net 4 Advanced Networking Days web site, at www.orion.on.ca/orioncanet4days.html.

New northern IT and VC network

New funding announced earlier this month will establish a regional information technology and video-conference network, linking northeast and northwest Ontario. The project, a partnership between St. Joseph's Health Centre (SJHC) in Sudbury and St. Joseph's Care Group (SJCG) in Thunder Bay, will receive FedNor funding of \$175,405. The project will enable the long-term care facilities to collaborate with each other and with Laurentian University, Thunder Bay Hospital, the NORTH Network, and the new Northern Ontario Medical School. The new network will also connect them with Lakehead University, the Northeastern Ontario Medical Education Corporation and the Centre for Rural and Northern Health Research, to provide educational and research opportunities for students and faculty and for SJHC and SJCG staff.

U.S. builds optical network similar to ORION

A group of U.S. universities recently announced plans to build a \$100-million infrastructure - similar to ORION - for experimental research on optical networks and other types of advanced scientific, engineering, and medical research. National LambdaRail Inc. is the non-profit consortium overseeing the project. It includes the Internet2 consortium and CENIC - the Corporation for Education Network Initiatives in California.

"For the first time, the research community has acquired a national dark fiber footprint that can concurrently support network research at the optical, switching, routing, middleware, and application layers. NLR is lighting the first fiber pair with an optical Dense Wavelength Division Multiplexing (DWDM) network capable of transmitting up to 40 simultaneous light wavelengths ('lambdas' or 'waves') each at 10 gigabits per second (Gbps)," said NLR in its announcement.

"Our colleagues in the U.S. are doing exactly what we have done here in Ontario," said Phil Baker, President and CEO of ORION. "NLR is an not-for profit, infrastructure-based research and education optical network. The difference is that we've nearly completed our network. Ontario is well ahead of the US in building an advanced network like ORION." Find out more on the NLR at www.nationallambdaRail.org.

Ontario researchers win 2003 John Charles Polanyi Prize



Five Ontario researchers, in fields ranging from chemistry to medicine, are the recipients of the 2003 John Charles Polanyi Prize. The awards, worth \$15,000 each, were announced recently by Ontario's Minister of Training, Colleges and Universities Mary Anne Chambers.

Established in 1986 the Polanyi Prizes recognize the achievement of Dr. John Charles Polanyi, of the University of Toronto, who received the 1986 Nobel Prize in Chemistry for his work in reaction dynamics.

"In celebrating the research excellence of one of Canada's most distinguished scientists, we are also recognizing the ongoing achievements of our most talented young researchers who are helping to establish Ontario's reputation as a centre of university research excellence," said Chambers. "Investing in research today not only encourages the best and brightest to stay here in Ontario, it contributes directly to a stronger Ontario - one prepared for success in the knowledge-based economy." Each year the Polanyi Prizes are awarded in the fields of Chemistry, Literature, Physics, Physiology or Medicine, and Economics to scholars and researchers planning to continue postdoctoral studies at an Ontario university.

The Polanyi Prize recipients for 2003 are:

Chemistry

Dr. Keith Fagnou, University of Ottawa, is an organic chemist who is researching ways of developing pharmaceuticals using environmentally friendly technologies. His research aims to develop new processes for improved chemical efficiency, including new synthetic methods to produce an important class of compounds whose synthesis was not previously possible.

Economic Science

Dr. Mark Stabile, University of Toronto, is specializing in health economics and the relationship between public finance and the health care system. His research concerns the effects of differences in health insurance coverage and in tax systems on health care systems, and considers such dimensions as socio-economic status and child health.

Literature

Dr. Deanne Williams, York University, works on a combination of literary textual study, cultural history and literary theory. Her research aims to provide us

with important new insights into the construction of English identity after the Norman conquest.

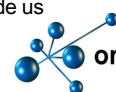
Physics

Dr. Joseph Thywissen, University of Toronto, works in the area of ultra-cold physics, which allows us to view the world of quantum mechanics more directly than before. His research will employ state-of-the-art lasers and microscopic magnetic traps to capture and cool neutral atoms in quantum gases.

Physiology/Medicine

Dr. Cécile Fradin, McMaster University, looks inside the cell and the workings of cellular tissue, to study the intracellular traffic of macromolecules such as proteins. Her research has the potential to aid our understanding of how defects in membrane composition and integrity are affected by disease, drugs and toxic substances.

The recipients will be honoured on November 28, 2003 at a reception at Massey College in Toronto in the presence of the Honourable James Bartleman, Lieutenant Governor of Ontario.



Lakehead and Western lead research on elderly drivers



A national research team led by Lakehead University and University of Western Ontario researchers will look into safety and driver training for elderly drivers.

The second leading cause of accidental death for older people is injuries due to motor vehicle crashes. When older vehicle occupants are injured, their recovery time is longer and less complete than younger people and can lead to a loss of independence and greater reliance on the health care and social service systems.

Dr. Michel Bédard, a Lakehead psychology professor specializing in aging and health, is coordinating the team, recently awarded funding of up to \$338,000 from the AUTO21 Network of Centres of Excellence and several industry supporters.

Dr. Jan Miller Polgar of the University of Western Ontario is the project's co-leader. Together, they will work with the team members from the University of Alberta, University of Manitoba, University of Ottawa, University of Waterloo and the University of Windsor.

Researchers will review the effectiveness of driver re-training programs developed for seniors to determine whether such drivers perform better in on-road evaluations than those who don't. "Participation in such programs may help decrease the crash risks for elderly drivers and other road users," says Dr. Bédard.

The team will also investigate how vehicle design can be enhanced to meet the needs of seniors. Previous studies show seniors have difficulty getting in and out of vehicles, using seatbelts and understanding the visual aspects of instrument panels. "Lakehead University recognized that research – the creation and transfer of knowledge – is of utmost importance in this world," said Dr. Harun Rasid, Associate Vice-President (Research) at Lakehead University. "We are pleased and excited to see Dr. Bédard's involvement in such innovative and significant research projects like this."

"The project provides an excellent training opportunity for nine students at the six universities to work with expert researchers and also collaborate with industry representatives," says Dr. Peter Frise, CEO and Program Leader of AUTO21.

The project is one of seven new research projects worth a total of \$6.5 million being supported by the AUTO21 Network of Centres of Excellence and industry.

AUTO21 is a federal program that supports 28 other auto-related R&D projects at 33 universities across Canada, with combined federal and industry funding of more than \$8 million per year. The new projects add 32 researchers and 53 student researchers to the AUTO21 investigative team. Over 250 university and industry researchers, and more than 250 graduate and post-graduate students are already part of the AUTO21 team. AUTO21 is funded by the Networks of Centres of Excellence.



Transatlantic Native 10 GbE connection

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This demonstration of an operating 10 GbE lightpath between CERN and Carleton University is an important step in establishing the technology for global Grid computing," said Gerald Oakham, Professor of Physics at Carleton University. "Future experiments in particle physics such as ATLAS, with its demand for global computing and high data transfer rates will be a direct beneficiary of these efforts."

"The data rates for the ATLAS experiment will be unprecedented in the natural sciences with the collaboration spread around the globe," noted Dr. Patricia Kalyniak, Chair, Department of Physics, at Carleton University. "Transfer of the data, about 1 Petabyte annually, equivalent to nearly 1.5 million data CDs, to all participants would not be viable without pushing the frontier of networking technology."

The live demonstrations utilized all available bandwidth over the connection, e.g. 9.24 Gbps, which is roughly equivalent to transmitting 1.5 data CDs every second.

Preliminary interpretation of the results indicates that both software and hardware limitations were responsible for the reduced transfer rate during the PC-to-PC tests. Finally, large amounts of experimental data from recently completed tests of the Forward Calorimeter components of the ATLAS detector being built at CERN for the upcoming Large Hadron Collider was transported back to Carleton University for analysis.

"This and future experiments exploring next generation networking paradigms for the global Research and Education communities is made possible through the vision and leadership of advanced networks such as CA*net 4, SURFnet5 and ORION; and optical internet exchange facilities such as StarLight and NetherLight," said Wade Hong of Carleton University

This experimental use of an end to end lightpath was conducted as part of the Carleton University led CA*net 4 International Grid Testbed, supported under CANARIE's Directed Research Program. Participating and collaborative institutions include the University of Alberta, University of Victoria, TRIUMF, University of Toronto and CERN.



orion research and discovery news

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About ORION

ORION is an advanced high-speed fibre optic network that connects research and education institutions to each other and to colleagues around the world. Spanning 3,700-kilometre to 21 cities throughout the Province of Ontario, ORION was created to bring leading-edge network capability to Ontario's publicly funded R&E community and to become a catalyst for creative and innovative next generation Internet applications.

For more information

ORION is owned and operated by the Optical Regional Advanced Network of Ontario (ORANO). For more information, visit our web site at <http://www.orion.on.ca>. Communicate directly with the Editor of the ORION Newsletter at info@orano.on.ca.

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