



BIG ideas

Infinite possibilities Snapshot 2012

Our mission

ORION is dedicated to connecting and supporting every research, education and innovation organization in Ontario.

We are recognized as providing the leadership and critical infrastructure that allows our users to collaboratively engage in making Ontario a global leader in innovation.

We provide the world's fastest and most reliable research and education network, empowering our members and users to connect to a world of infinite possibilities.

By linking them through our network to a variety of strategic partners, we deliver value-added capabilities that enhance their pursuit of knowledge, social impact and economic outcomes every day.

ORION is Ontario's Backbone of Innovation.

The common thread linking all elements of ORION's mission statement is our users – over two million researchers, students and administrators in over a hundred organizations across Ontario. While many may never know who we are, we know they rely on us every single day to ensure they are connected to the world around them.

“Innovation is key to driving economic growth and development in Ontario. ORION provides Ontario's researchers and innovators with a world-class network that ensures their work is able to move at the speed and efficiency they require to achieve their goals and offers them an opportunity to collaborate with like-minded innovators. The work done by ORION further cements Ontario's position as a global innovation leader.”

The Honourable Brad Duguid, Minister of Economic Development and Innovation

We connect
people and
technology
to make
BIG ideas
possible.

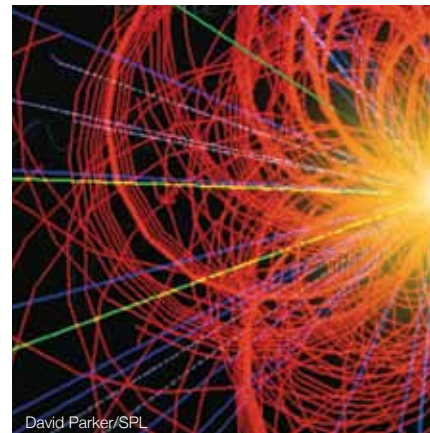
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2012: A year of **BIG** ideas



David Parker/SPL

1 Billion

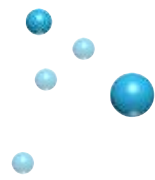
Large Hadron Collider
worldwide this year.



Discover^{ry}
Ontario Centres of Excellence **12**

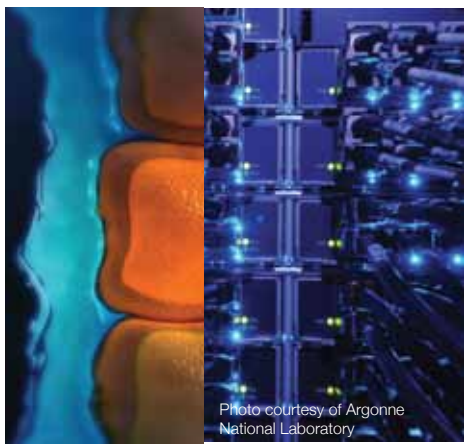
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SUMMIT 2012 YORK REGION





technology
cloud
summits
higgs
boson
HPC
social media
impact
platform
migration
petabytes
outreach
infinite possibilities
videoconferencing
gigabytes
carbon footprint
innovations
people
education
big ideas
research
results
vision
sponsorships
collaborations
thinkconference
answers

ion
(LHC) events



nk
conference



100Gb

per second live deployment of the
1830 Photonic Service Switch





Letter from the Chair ●●●

This past year has been an eventful one for ORION and for our member institutions.

Over the past twelve months ORION has implemented BIG upgrades to our network, to our service offerings, to our appearance and to accessibility for our members.

These upgrades help ensure that every student, researcher and innovative mind in the province has unlimited access to the information, tools, sharing and capabilities

that can make their next BIG idea a reality. This year the ORION network was the backbone that supported monumental research projects such as the ATLAS Project – leading to the discovery of the Higgs boson particle and other groundbreaking innovations. The completion of ORION's 100Gbps network and platform migration has opened the door to possibilities beyond our wildest dreams and will solidify Ontario's Research and Education communities' place on the global innovation stage.

We reached out to those communities and we listened to what they had to say. The results of those dialogues have guided our strategies and focused our energies. We share some of those conversations and results in this Snapshot and believe you'll be as excited as we are about the BIG ideas they've inspired.

ORION has always benefitted from strong leadership. This year we've further strengthened our organization with the addition of four new members to our Board. These dedicated volunteers have their fingers on the pulse of their respective communities. They come to us from research hospitals, connected institutions, education and technology. They are engaged, effective 'doers', who actively support our vision and strategic plans. I am confident that their insights, passion and connections will increase ORION's outreach and provide strong voices for our member communities going forward.

The ORION network is an incredible achievement. Over two million users rely on us every day to achieve their goals – reliably and consistently. That takes a lot of work from an incredibly dedicated team. I would like to personally thank Dr. Darin Graham for his commitment to research and innovation. This year he was honoured with the Queen's Diamond Jubilee Award – a distinction that's very well deserved.

I would also like to thank and congratulate the ORION team for another job well done in 2012. Our small staff seems able to move mountains; without them our success would not be possible.

And as always, we are motivated by the passion of our members and users – our most important asset. We look forward to a new year full of BIG ideas and infinite possibilities.



Anne Sado
Chair



Letter from the President ● ● ●

Ten years ago, ORION answered the province's call for help. We had a BIG idea: a world-class, lightning-fast optical network that would support Ontario's Research, Education and Innovation communities and connect them to a world of possibilities. We knew that to help Ontario in its goal to become a global leader in innovation, these communities needed virtually unlimited network connectivity. They needed unimaginable speed, absolute reliability, significant cost savings and a responsive, innovative not-for-profit organization that would be ready to meet their needs. We needed the technology and people to make it happen.



That first BIG idea inspired others to collaborate with us to make it a reality. The provincial government provided us with the initial funding necessary to purchase the critical fibre leases and communications infrastructure. ORION has since become a fully operationally self-sustaining not-for-profit organization and we now help support Ontario by contributing over \$140 million annually to its GDP.

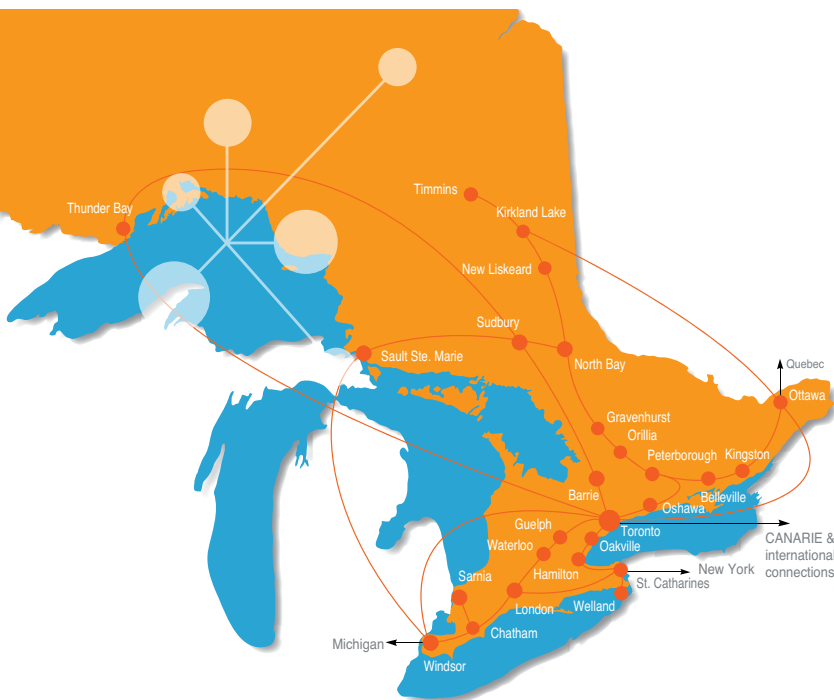
Strategic collaboration with our leading telecommunications providers, suppliers and IT vendors has allowed ORION to deliver the technology. We are grateful for their skills, knowledge, cooperation and ideas. Through these relationships, we are able to facilitate the delivery of high-level, innovative products and services and provide our members with value-added capabilities they could only dream of and not otherwise afford.

Our members and users have been the catalysts of our growth. This year, we asked them what they wanted from a network. They told us and we are committed to delivering solutions to meet their needs. Driven by their passion, we continue to expand, upgrade and improve our network to ensure that whenever they arrive at the next BIG idea, ORION is ready. We are one of the world's largest and fastest research and education networks and will maintain that leadership position.

ORION has achieved much over the past twelve months. We will continue to innovate and empower our members' and users' needs. We have used the face of ORION to share their ideas and give a voice to their success. We have applied BIG picture thinking to our collaborations and capabilities and have made BIG strides toward our goals. We have been inspired by the possibilities that our people and technology present and are proud to provide the essential infrastructure that has facilitated so many discoveries and achievements.

What BIG ideas will the future hold? The possibilities are infinite.

Darin PW Graham, PhD
President and CEO



1,000

times faster than commercial internet

Who we are

The Ontario Research and Innovation Optical Network (ORION) is an operationally self-sustaining, not-for-profit organization, dedicated exclusively to supporting and facilitating research, education, collaboration and innovation throughout Ontario.

ORION provides the critical infrastructure that enables researchers and users to network, share and collaborate using virtually unconstrained tools, bandwidth, capabilities and connections.

We are Ontario's Backbone of Innovation

ORION provides lightning fast connectivity – up to 1000 times faster than commercial high-speed internet – linking our member institutions to one another and to a global grid of Research and Education (R&E) networks. The benefits: high capacity, unlimited access and reduced operational costs.

Sharing BIG data and BIG ideas to create infinite possibilities

Every day, over two million researchers, scientists, faculty, teachers, students and innovative organizations transfer petabytes of data through the ORION network, unencumbered by bandwidth. They rely on us for unlimited connectivity and absolute reliability. Spanning over 5,800 kilometres, ORION connects people from every corner of Ontario to collaborative teams all over the world. Few jurisdictions in the world have a dedicated R&E infrastructure that rivals ORION's reach and capacity.

Connecting Ontario with each other and the rest of the world

ORION is one of the world's fastest and largest R&E networks. Hand in hand with other networks on the grid, ORION connects Ontario institutions to infinite possibilities for international collaboration, ensuring Ontario's leadership role in global research and innovation.

A focus on technology



The BIGGEST news is the completion of the 100Gbps-ready infrastructure. This strategic step made it possible for our members to transfer and share unimaginable amounts of BIG data and realize some incredible achievements. We're proud to share some of those BIG ideas in this report.

Our solution arose from successful collaborations with **Alcatel-Lucent** and **Cisco**. ORION's recent platform migration to their state-of-the-art equipment made it possible to deliver the same high speed connection our members have come to expect while reducing our power consumption by 50 percent.

This platform migration also provides the means to deliver an online learning management system, superior digitized content and transform the videoconferencing experience. While videoconferencing technology has allowed for increased collaboration for many years, it has been plagued by inconsistent video and sound quality. ORION's "real" videoconferencing provides a seamless face-to-face experience. It's ultra-fast, highly secure and so efficient that users don't even notice it's there. Our members save time, money and frustration.

We're continuing to upgrade our toolbox and capabilities

When you're dealing with BIG data, accurate measurement is essential, so ORION has added **NetFlow** to our toolbox. By the end of the year it will help every user count and manage their data usage, providing them with greater insights and data capture.

We are supporting IPv6, ensuring that there are IP numbers to meet future needs – regardless of device.

And of course, everyone is talking about High Performance Computing (HPC). ORION puts the power of these computer supercentres in the hands of our members.

**We made
the network
better, faster
and more
reliable**



s n a p s h o t 2 0 1 2



What we do: Providing more for less

Unparalleled peering and internet access continue to be our fundamental services. ORION has direct connections with over 40 organizations that help our members and users work better, faster and cheaper.

Email solutions

100 percent Canadian hosted

Data back-up and recovery

Secure storage of terabytes of data

Internet connectivity

Always reliable, 1,000 times faster than commercial internet and more cost effective

Video sharing and archiving

Specifically developed to meet our users' needs for rich media manipulation

Videoconferencing

With no audio or visual distortion

Collaboration tools

Including ORION O3

Educational content delivery

From internationally recognized partners

The ORION Nebula

Our users want more. More collaboration, more digital educational content, more hosting services, more interactive content management, more computing cycles, more vital data storage and more access.

So ORION collaborated with Ontario's leading service providers to connect our users to more of what they want, when they want it, wherever they are in Ontario.

The **ORION Nebula** is an ever-growing suite of cloud-based services that provides our users with fast, best-of services at better prices.

ORION continues to build new relationships, access more services and collaborate on new ones to give members what they want – now and in the future.



Collaborating in the cloud

ORION **O3** is a three-way collaboration between Ontario students, researchers and educators that makes it possible for them to research, meet, share, teach, dream and discuss their data and ideas – anywhere and everywhere.

They can collaborate on private and public portals without having to think about technical maintenance, speed, bandwidth, privacy, security, cost or geographic location. It's safe, it's simple to use and it works.

This ever expanding suite of tools is entirely on the cloud. It currently supports more than 100 initiatives by over 4,000 students, educators and academic administrators across the province. As their collaborations fuel possibilities, we are ready with the tools to help them. The **O3** toolbox is updated every 90 days with new widgets and functionality.

This year, ORION **O3** increased its membership by nearly 2,500 members. Via social media, we engaged the research and education community to get involved with the delivery of the platform. We identified a growing category of Community Managers and collaborated with them to increase the benefits of **O3** for our users. These people play a key role in helping us provide the kind of tools and functionality that will keep their communities on the leading edge of innovation. They have been the catalysts for print training materials, virtual training and desktop sharing support and driven a registration tool on which users can track their space requests. Through their strong administration, **O3** users can participate in e-learning programs, expanded academic research and educational outreach within a wider range of private and public group spaces.

We saw that the managers needed tools as well, so this year we set up the **Mobilizers' Guild** – a private group space where managers can access individual and group support on **O3** functions: support forums, blogs, wikis, hosted training videos, monthly seminars and a live chat mechanism that allows them to easily and efficiently respond to individual issues and requests within their own community spaces. The Guild provides valuable input as to the tools and functionality our users want from **O3** and have taken on the task of beta testing the proposed changes. The results will be a true community effort.

What does the future hold for O3? ORION will continue to empower our users to customize their sites, access a greater selection of applications and integrate with other software. ORION will also be implementing a frequent user program along with bi-monthly **O3** roundtables to celebrate community champions and share better collaboration and teaching methods.

O3 at work

BIG idea # 437
O3 saves Dr. Anne MacLennan time, money and hassle in her teaching and research projects – every day.

BIG idea # 854
O3 is central to MaRS' research, documentation and information sharing.

BIG idea # 285
O3 spawns its own sub-community to support Ontario Library College Services.

BIG idea # 172
O3's unique mix of wikis, polls and forums make remote editing possible.

BIG idea # 79
O3 will help power a public and private digital community for Public Health.

BIG idea # 1061
O3 connects academia to community service organizations.

Visit orion.on.ca to learn more about **O3** collaborations at work.



Photo courtesy of Argonne National Laboratory

High Performance Computing – Powering the future

Computers have reinvented everything we do. High Performance Computing (HPC), or 'supercomputing', is changing how research is conducted, how knowledge is acquired and how it is used.

Will we get the care we need in old age? Will we have clean energy and safe water? Will we be able to predict and halt the spread of pandemics? Will we be able to create more reliable economic forecasts? Will our businesses have a digital advantage in the global marketplace?

The answers to these questions depend on research. For the increasingly complex models and large datasets that research is demanding, that means HPC. As the world generates more data and complex models and as more and more data that was generated in the past is digitized, the only way to understand and use it is with HPC. The essential way to access and share that data is through ultra-fast, high performance, high efficiency networks like ORION.

If ORION is the 21st century equivalent of roads and railways, then HPC corresponds to the major cities that generate and use the products that flow on these transportation arteries. Together, they provide the power and connectivity to inspire infinite possibilities and help Ontario's researchers, educators, and innovators make the next BIG idea a reality. ORION's network and the highly qualified personnel who support it are an integral part and essential component of Canada's solid foundation of scientific and technological achievements.

Many systems can cost more than a million dollars making accessibility out of reach for most users.

ORION puts the power of these computer supercentres in the hands of our R&E members

50%

reduction in greenhouse gas emissions from aviation by 2050 using HPC

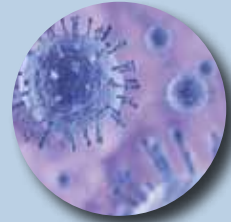
Facing the 'Grand Challenges'

Canada, as part of the global community, faces many research challenges such as those related to climate change, pandemics, and energy and water shortages. As defined in the U.S. High Performance Computing Act, Grand Challenge means “a fundamental problem in science or engineering, with broad economic and scientific impact, whose solution will require the application of HPC resources and multidisciplinary teams of researchers.” Ontario researchers depend on the availability of competitive HPC facilities and world-class networks like ORION to connect them. We make it possible for them to participate in addressing these ‘grand challenges’ as well as many other economic, social, and medical challenges in collaboration with researchers in Canada and around the world.

ORION will ensure that HPC has the digital infrastructure required to meet the capabilities and capacity of the supercomputing environment. We will continue to improve the speed, security and reach of our network and develop tools for researchers, educators and innovators to gain competitive access to the technology.

Providing solutions

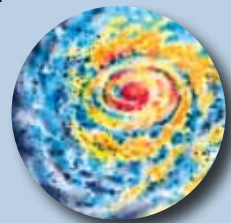
Pandemics. Computational models were used to simulate the rate and reach of the spread of the H1N1 virus on HPC. This modeling not only informs public health policy but the knowledge can keep workers in the workplace, reducing severe productivity losses that hurt business and our economy.



Age-related Diseases. More than 500,000 Canadians (one in every eleven seniors) suffer from dementia. As the baby boom generation ages, that number will have a marked increase – adding significant costs to our health care system. Using HPC, researchers are working on tools for early diagnosis and treatment.



Disaster Recovery. Models have been developed to advise and guide emergency management decisions for oil spills, hurricanes and other disasters. HPC is helping to significantly reduce costs and time for cleanup, minimize environmental damage and help disaster victims get back on the road to productivity.



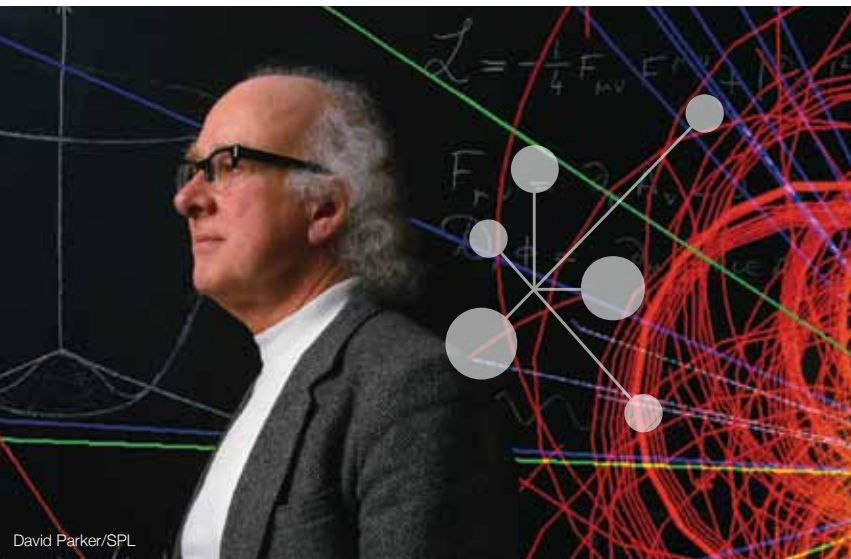
Feeding Canadians. Computational agriculture, remote sensing technology and databases mean that data can be recorded and monitored from a variety of resources to provide real-time reporting on variables such as weather, temperature, wind speed, soil moisture, fungus, and agrichemical usage. HPC is helping farmers manage their properties more efficiently and cost effectively using sound environmental methods.



Climate Change in Canada's North. HPC is used to turn field data into climate simulations that predict changes to the ice fields, as well as implications of sea level rise that have economic, cultural and sovereignty implications.



Research for these challenges is being conducted in universities, colleges and research organizations across Ontario, including: the Public Health Ontario & Cognitive Neuroscience Lab @ York University, the Sheridan Elder Research Centre @ Sheridan College, the Institute for Research and Innovation in Sustainability @ Niagara College, the Canadian Alliance for Community Service Learning @ Carleton University and the Global Suburbanisms Project @ York University.



1 Billion

LHC events produced worldwide this year

The Atlas Experiment: BIG data and the hunt for the God Particle

The Atlas Experiment is an international collaborative success story. In July 2008 scientists around the world were expecting terabytes of collision data to be transmitted to labs around the world from the Large Hadron Collider (LHC) Experiment in Geneva, Switzerland. The data was to be used to simulate collision events and analyze the myriad possibilities that might help to confirm the existence of Higgs boson – the “God particle” – the missing link in the Standard Model of particle physics.

The initial data expectations were a mere fraction of the actual data being conveyed, but four years later, on July 4, 2012, the discovery was confirmed. Scientists are 99.999% sure they have found a new particle – a momentous day for science, and for ORION. Its network figured BIG in the outcomes.

Local researchers working with BIG data

“Research now assumes big data intensive work,” says Dr. Robert Orr, Professor of High Energy Physics, University of Toronto (U of T). “Today even data summaries can be 100 terabytes in size or more. LHC produced two petabytes or more of data just this year. When it comes fully up to speed, we can anticipate up to three petabytes of data being transmitted and shared over the various world sites.”

Dr. Orr led the Canadian team of this global collaboration at U of T, operating the sophisticated detector known as ATLAS at the CERN LHC in Switzerland. A 7,000 tonne LHC assembly, built in part at U of T, ATLAS detected and measured the energy of particles emerging from the 40 million proton collisions per second taking place inside it – energy fluctuations that were thought to possibly indicate fragments of the Higgs boson particle. The Canadian ATLAS computing sites, located at TRIUMF, SciNet, WestGrid and CLUMEQ, handled upwards of 10 percent of the inconceivable amount of data generated by the LHC. They compiled, analyzed and derived findings, then shared the results around the globe.

ORION’s ultra-fast, high capacity, high performance optical research network helped to enable the unprecedented collaboration spanning 38 countries and 174 institutions, and transported the ATLAS data to Tier 1 and 2 sites around the world. In Dr. Orr’s view, the ORION network is *“extremely reliable... something like switching your lights on. It works.”*

Toronto's SciNet is Canada's largest supercomputer centre and facilitated most IT requirements for the LHC and ATLAS experiments. They relied on ORION to help make that happen.

The data was of such a magnitude that it could not possibly be stored and analyzed at a single site. Moving that amount of data, making it accessible and maintaining its integrity was critical. It also had to be accessible and adaptable in nearly real time, from remote locations anywhere in the world. *"The ORION system is so good," say SciNet technical leaders, "that the only time you would notice it is if it did not work."*

High Performance Computing (HPC)

Dr. Richard Teuscher, research scientist at the Canadian Institute for Particle Physics and Professor of Physics at U of T, was the Canadian lead for the ATLAS Experiment at CERN Switzerland. He managed the U of T research team of graduate and undergraduate students doing Higgs searches. Students and thousands of others analyzed the enormous amount of data produced and created ATLAS event simulations – powered by High Performance Computing (HPC), a central tool in the ATLAS Experiment.

HPC allows unfathomable amounts of data to be processed at lightning speed. In the ATLAS Experiment, it enabled users to get results that would have once taken years – in a matter of hours. It also enabled researchers to release the data in just two weeks and to be accepted for publication in just 24 hours – unheard of in the history of science. *"We could not have had this discovery without the HPC computing grid,"* said Teuscher.

BIG data: A BIG future

The need to process BIG data through networks like ORION will only grow. BIG data research is expanding at an incredible rate. ATLAS and Canada's role in the LHC experiment demonstrates our ability to work at that level. The ORION network is a critical technology that will allow Canada to be competitive in leading edge science innovation on the global stage.

LHC shuts down in early 2013 for refurbishing and will restart in 2014. Data generation at that time is projected to be 100 times greater.

ORION will be ready.

38

countries collaborating
in ATLAS

More staggering statistics:

- **10** The number of Tier 1 sites around the world.
- **70** The number of Tier 2 sites around the world.
- **10** The number of Canadian institutions providing hardware, expertise, analysis and computing.
- **1,500** The number of users on the grid for the ATLAS Experiment alone.
- **150** The number of Canadian scientists supported.
- **174** The number of institutions collaborating in ATLAS.
- **120,000** The number of jobs running at any moment, at the same time.
- **90** The percentage of these jobs that involve creating simulated event data.
- **10** The number of simulated events needed to compare against one real event.
- **30** The number of minutes to create a single simulated event.
- **3** The number of megabytes of data generated by a single event.
- **5-10** The percentage of the one billion LHC events produced was accounted for by ATLAS Canada.



How BIG data is growing Ontario farms

“It’s all about immediacy. Not only are we working with big data and big networks, but also big expectations.”

– Dr. Mike Duncan, NSERC Industrial Research Chair in Precision Agriculture and Environmental Technologies, Niagara College

For generations, farmers relied on many unpredictable data sources like the weather to determine optimal schedules for irrigation, planting, harvesting and crop maintenance, but agriculture is reaping the benefits of the digital age. Farmers today use GPS, genetics, plant science, advanced chemistry and other innovations. They are not just sitting on tractors anymore.

Dr. Mike Duncan is leading some of this exciting new research. As the Industrial Research Chair in Precision Agriculture and Environmental Technologies at Niagara College, he is focused on developing new ways to gather, process and disseminate the massive amounts of data gathered each day from Ontario farms, including the use of an experimental unmanned aerial vehicle (UAV) and field sensors. The challenge is in processing and translating the data into usable information.

The BIG idea at the heart of this research is the development of a system that can not only process the large datasets collected by the various sensors, but also display this data on a three-dimensional map directly to the farmer in real time. Real time data is optimizing farm operations and having a positive environmental impact. *“Farmers have seen a 20-30% decrease in their inputs (fertilizers, pesticides, and sprays) while producing the same crop yield,”* explains Duncan.

With the help of ORION's high-speed, high bandwidth network and its connection to High Performance Computing (HPC) clusters, farmers can use this system to make ongoing adjustments to their irrigation schedules, pesticide use and field planning based on current data from their individual fields and crops.

Innovative ideas like Dr. Duncan's shed light on the infinite possibilities that technology can have on the future of agriculture in Ontario, in Canada and on farms all over the world – behind and beyond the farm gate.

A focus on people

“ORION is supporting Ontario’s university and college researchers to reach their goals and be among the best in the world. By connecting all of Ontario’s colleges and universities to a world class research and education network, ORION is ensuring that our province’s institutions are able to collaborate on ground-breaking projects while maintaining their positions as world-class leaders in research and innovation.” – The Honourable Glen Murray, Minister of Training, Colleges and Universities

We talked to educators and students in K-12, colleges and universities. We asked scientists, hospitals, researchers and innovative organizations what they wanted from a network. While all of our members and users had individual needs, it was not surprising to learn that they also wanted the same things: unlimited speed, access, sharing and reliability with no fees, walls or borders. They want affordable last mile connectivity and the tools to make everything possible and they want it better, faster and cheaper. They want more for less. In short, they want it all.

ORION’s goal is to give it to them.



We asked What do our members and users want from a network?

everything



Online
learning

Seamless
video-
conferencing

Backroom
savings

Consistency
across all
universities
and colleges

Knowledge
mobilization

Colleges and Universities

The challenges: How do we do more with less? How do we leverage technology to get what we need cost effectively and efficiently? What is the best way to change how we manage IT? How do we get support in tough times? How can we streamline processes? How do we leverage what students want with reality?



ORION has built a collaborative environment, supported by innovative technology that makes it easier to learn, work and share regardless of device or location – all with total security, reliability and unimaginable speed. ORION connects every college and university in Ontario – to each other, to High Performance Computing (HPC) data centres and through the global network grid, to the rest of the world. We are a single source partner to the R&E communities with a transformative shared services model. **What's next?** ORION is planning a portal so that individuals can set up their own 10Gbps upgrades.

K-12 School Boards

The challenge: How do we give kids in every school in Ontario the opportunity to access HPC and make outdated computers work like new?

Kids today are motivated by technology and educators are excited about the possibilities technology can bring to the classroom. Connecting every K-12 school board through ORION will allow them access to HPC centres, **O3** and the ORION Nebula. The reliability and connectivity of ORION's high speed network would give 'dumb' terminals greater capabilities and accessibility to HPC – whenever and wherever it makes sense, such as studies in physics, statistics, biology and large research projects and could make online learning an affordable reality.



ORION connects approximately 40 percent of Ontario K-12 school boards and 60 percent of enrollment. We are working with the Ontario government to connect the rest.

Scientists and Researchers

The challenge: How do we handle unimaginable amounts of data?

A few short years ago, scientists around the world were concerned about the impact of transmitting terabytes of information. ORION's infrastructure easily handles petabytes of data for global mega-projects such as the Higgs boson discovery and the Human Genome Project. In fact, we facilitate hundreds of research projects every day.

Hospitals

The challenges: How do we make collaboration easier? How do we deal with the vast amounts of genomic and imaging data that is being collected and that needs to be stored and processed? How do we ensure patient privacy?

Health informatics and high-speed connectivity will transform the future of healthcare. Collaboration regionally, nationally and globally fosters partnerships in research and innovation that enables the ideas of the best and brightest healthcare professionals to bring world-class care to the bedside. ORION's connection to HPC supercentres and other ultra-high speed optical networks on the grid eliminates walls and borders. Critical data can be shared internationally in real time, as needed. Our recent platform migration and 100Gbps bandwidth ensures hospitals are well-positioned to share petabytes of data – securely, reliably and without concern for volume, peaks or valleys. ORION can give hospitals and health researchers unsurpassed speed, reliability, storage and secure computation in the cloud. As these challenges increase, ORION's role will become ever more critical.

Government

The challenges: How do we cost-effectively bolster Ontario's education community and ensure Ontario's research and technology sector maintains a leading role in innovation on the global stage?

ORION is one of the world's fastest research and education networks, but like time, innovation and ideas do not stand still. By early 2013, we will be testing a 400Gbps upgrade and exploring ways to remove any walls or barriers impeding innovation.

Cost effective last mile connectivity remains an issue for everyone. ORION is holding meaningful conversations with government and is in discussions with several service providers to help make this a reality. We are advocating for government to support ORION's infrastructure to centralize back office systems for our members.

We are ready for the future.

“Providing technologies to enable data intensive connectivity in a cloud computing environment not only enhances collaboration, it empowers patients, integrates them with care teams and facilitates preventive strategies that optimize the delivery of personalized care. ORION is creating the health advantage for Canadians.” — Dr. Dave Williams, President and CEO, Southlake Regional Health Centre



**Partners,
not vendors**

**Digitized
tracking**

**No walls
No borders**

Mobility

**Access
anywhere,
anytime**

**Affordable
last mile
connectivity**





A Radiant solution for cultural enrichment

24 hours a day, seven days a week, over 120,000 students and teachers across Canada have on-demand access to award-winning educational programming, thanks to **TFO's** innovative learning platform. The only French language multi-media network outside of Quebec, TFO complements the classroom experience and stimulates the enrichment of French language culture.

GRUPE MÉDIA



In 2010, TFO faced a number of challenges. Aging dedicated servers within each school board and unpredictable internet connections were creating service issues. Added to that was unexpected overhead arising from owning and maintaining private connections to their offices in Toronto, Ottawa and Sudbury.

TFO sought ORION's help in developing a Request for Proposal to find a collaborative partner that could deliver high-quality, immersive multimedia content to its audiences – effectively, efficiently and problem-free. Critical elements included core network and data centre services and domain expertise, technical knowledge of specific applications and skilled resources.

"We wanted to work with someone who shared our vision. ORION was there for us every step of the way, guiding us through the process and helping us choose the best option," explained TFO Chief Technology Officer Eric Minoli.

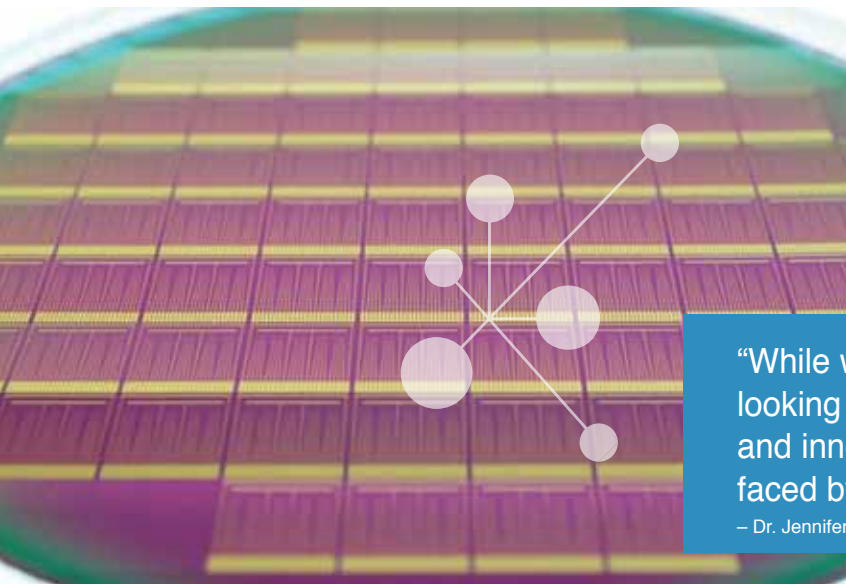
That "best option" proved to be Radiant Communications and their secure, enterprise-class Virtual Data Centre. Radiant's solution gave TFO full control over computing resources, without the need to own, manage and replace hardware themselves. TFO can now move confidently forward, extending their resources to include big data such as video streaming and expanding their user base across the province, knowing they can add capacity quickly and cost-effectively, on an as-needed basis.

ORION's ultra-high speed network has made a huge difference in the speed of file transfers between their three offices. They are now able to provide HD simulcast programming with full stereo, delivering clearer images and superior sound quality for video broadcasts.

"Without a doubt, we trust the team at ORION. We are deliriously happy."

– Eric Minoli, Chief Technology Officer, TFO

Problems solved. With ORION's network and Radiant's secure, scalable Virtual Data Centre solution, TFO is confident that their financial investment is being spent wisely and its high quality French language programming will continue to be accessible to all Ontario students and educators.



Breaking ground in diagnosis, detection and delivery

“While we’re pleased with our success, we’re busy looking forward to the next discovery and to finding cures and innovative treatments for the diseases and illnesses faced by our society.”

– Dr. Jennifer Flexman, Director of Research, Development and Commercialization, Kelley Labs

In the fast-paced and highly competitive world of medical research, one Ontario laboratory is making waves on the international stage.

The Kelley Group, led by University of Toronto Professor Dr. Shana Kelley, is a team of world-class researchers who are leading the way in developing new tools for medicine and medical research. Utilizing diverse disciplines ranging from biomolecular chemistry, molecular biology and cell biology to materials science and nanotechnology, they are developing new sensors and probes that will study biological function and provide early disease detection and diagnosis.

This past year has been a big one for Dr. Kelley and her team and we were proud to start it off. Dr. Kelley received the **ORION Leadership Award** in the E-Infrastructure category, recognizing her group’s groundbreaking cancer research. Since then, the Kelley Group has gained international acclaim for their publications including “An Ultra-sensitive Universal Detector Based on Neutralizer Displacement.” And, in February 2012, the Canadian Institutes of Health Research (CIHR) provided funding to support their work on a new drug delivery technology that could revolutionize how cancer patients are treated.

“One of the greatest challenges in anticancer research is overcoming resistance that tumours develop to anticancer drugs,” explains Dr. Jennifer Flexman, Director of Research, Development and Commercialization at Kelley Labs. *“We have come up with a new drug delivery vehicle that shuttles molecules to a compartment within the cell where they are able to trigger cell death, while remaining hidden from deactivating factors.”*

ORION’s ultra-fast network supports Kelley Labs in their day-to-day activities through the lab’s connection at the University of Toronto. ORION’s robust network infrastructure makes otherwise time and labour intensive computer simulations fast and effective and allows the team to work more efficiently online.

The research and work of Dr. Shana Kelley and her colleagues has the potential to change the lives of millions of people all over the world suffering from a wide range of diseases and illnesses. BIG ideas like this are revolutionizing the future and ORION is delighted to help make them a reality.



reaching out

Putting a face to
ORION and a voice
to our users' success

BIG events

2012 was a year of BIG events, BIG presence and BIG buzz as ORION reached out across the country. We took the lead with innovative events like the first ever ORION HPC workshop and the ORION **think**conference.



ORION'S first ever High Performance Computing (HPC) workshop, **Life Sciences in the Cloud**, helped us understand the needs of Life Sciences and Medical Researchers for computing in a cloud environment. It also allowed for the development of appropriate applications, interfaces, networking and support services. Delegates participated in content-relevant breakout sessions and heard from speakers including keynote Shawn Dolley, Vice-President and General Manager for Big Data Solutions, IBM.



ORION's inaugural **think**conference focused on inter-connectedness – the heart of collaboration and building community. By leveraging shared connections, organizations exchanged knowledge, shared best practices and developed ideas that led to innovative solutions. It also gave us great insight into what people really want from our network.

The conference was the optimal venue to present the **ORION Leadership Awards**. The Honourable Brad Duguid, Minister of Economic Development and Innovation, presented this year's awards to: Marshall Zhang (K-12 Schools), Sheridan College's John Helliker (Higher Education) and University of Toronto professor Dr. Shana Kelley (E-Infrastructure) in recognition of their leadership, hard work and dedication to research and innovation.



We built awareness for ORION and our mission with a concentrated web and social media presence. And we continued to build ORION's role as a world leader in research and education technology with key sponsorships, speaking engagements and social innovation.

BIG presence

ORION was proud to support the following events:

BACKBONE AlphaExchange Innovation Campaign

A national contest to boost Canadian technology entrepreneurs to the next level, inspiring innovation, helping businesses learn from one another and furthering Canada's overall competitiveness on the world stage.

Ontario Centres of Excellence's Discovery Conference

Once again, ORION sponsored the **Digital Zone**. As well, we brought social innovation to the event – for every business card received, ORION made a donation to **Little Geeks**.

Canadian Telecom Summit ORION President and CEO, Dr. Darin Graham joined Tom Jenkins, Executive Chairman and Chief Strategy Officer of OpenText Corporation, Sean Maskell, President of Cologix Canada, John Maduri, CEO of Xplornet Communications and Ron Styles, President and CEO of SaskTel as a guest panelist to discuss **"Building a Digital Canada."**

i-Canada Summit Leading thinkers, premiers, mayors, CEOs, business and social leaders met to address community economic sustainability and new social media financing. Dr. Graham spoke about the **"Need for Speed"** and was honoured at the event as a recipient of the **Queen's Diamond Jubilee Award**.

OCCIO Conference Dr. Graham led a lively discussion with Ontario Colleges on the potential for shared services to support and facilitate organizational goals in an era of increased economic constraint.

Higher Education Summit ORION'S **Innovation Zone** gave college students the opportunity to present their achievements and network with college Presidents, Vice-Presidents and senior government representatives.

ORION made further inroads with our audiences by supporting the **ABEL Summer Institute**, the **Data Effect**, the **ECNO Conference**, **MedEdge 2012**, the **OCUTINA Fall Conference**, **OUCC Conference** and the **Sanofi Pasteur Healthcare & Biotechnology Venture Challenge**.

BIG buzz

www.orion.on.ca: over

5,000

visitors in its first six months



#3

on Google

The constellation Orion holds the #1 and #2 spots



Social media is an important communications focus for ORION. We're talking to people and they are talking to us. We only began to blog, tweet and connect late in the year and already the results are significant. We look forward to continuing the conversations.

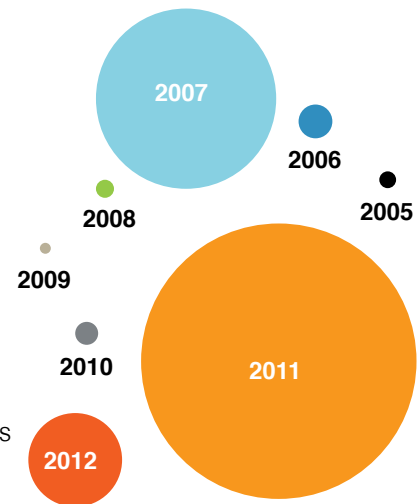


financials

ORION is proud to be a fully operationally self-sustaining not-for-profit organization.

ORION continues to focus its efforts on pursuing its strategic initiatives to support Ontario's Research and Education community and advance Ontario's innovation strategy. We continue to reinvest surplus to better our network infrastructure and capabilities, including upgrades and fibre leases.

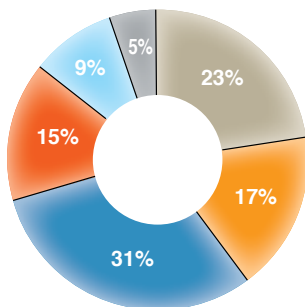
For the coming year, ORION will continue to invest heavily in our network.



Infrastructure investment (\$ millions)

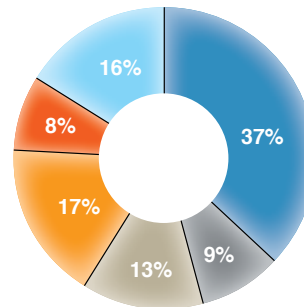
05 0.350 | 06 0.704 | 07 3.755
08 0.376 | 09 0.228 | 10 0.478
11 5.738 | 12 1.953

**2012 Revenues
\$4.255 million**



- Universities
- Colleges
- School boards
- Research/cultural
- Teaching hospitals
- Services, interest

**2012 Expenditures
\$4.095 million**



- Network management & operations
- Management & administration support
- Network contingency
- Marketing & communications
- Collaborations & business development
- Operational overhead

NEARLY
\$2million
 invested beyond the 100Gbps upgrade to make
 our network even better, faster and more reliable

ORION realized an increase in revenue of seven percent in 2012 and a decrease of seven percent in total expenses, while investing nearly \$2 million in network projects since last year.

95%

of our revenue comes from our members: universities, colleges, school boards, teaching hospitals, research and cultural institutions.

The remaining five percent comes from interest income and service fees, consistent with the prior year.

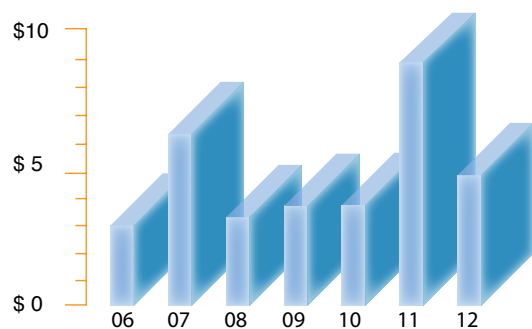
53%

of our resources are consumed by the network in additional platform migration and PoP upgrades, including a 16 percent network contingency. This is a 28 percent increase over 2011 arising from equipment maintenance, support and replacement.

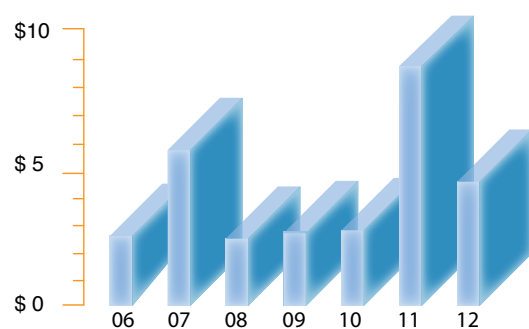
10%

savings on management and operational costs over last year, due to our new strategic direction.

**Revenue trends year over year
 (\$ millions)**



**Expenditure trends year over year
 (\$ millions) before depreciation**





(Left to right: Janet Bannister, Jim Garner, Alex Giosa, Anne Sado, Sara Diamond, Darin Graham, Lisa de Wilde, Michael Ridley, Khaled El Emam)

Meet the Board

Our Board is a dynamic group of high achievers. They are passionate, motivated, capable, effective and all bring valuable insight, ideas and solutions to the table. They volunteer their time because they believe in ORION and in our ability to facilitate transformative change in Ontario's research, education and innovation communities.

They are collaboration in action.

We are nothing without our people. They give of their time, their passion, their ideas and their expertise.

BIG thanks to our Board, staff, members, users and collaborative partners.

You make all things possible.

Anne Sado, President, George Brown College – **BOARD CHAIR**

"I joined ORION to support the innovation landscape in our province."

Janet Bannister, CEO, The Coveteur

"I joined ORION because it provides an extremely valuable service, which helps Ontario researchers and students achieve their full potential and have maximum positive impact in Canada and throughout the world."

Lisa de Wilde, CEO, TVO

"ORION is an essential part of the innovation ecosystem in Ontario. I joined because that is something I am committed to growing and strengthening."

Dr. Sara Diamond, President, OCAD University

"I joined ORION because I have an interest in HPC infrastructure, its potential, importance to research and learning and the possibilities of value-added services."

Dr. Khaled El Emam, Canada Research Chair, Electronic Health Information Associate Professor, Faculty of Medicine, **University of Ottawa**

"My world is all about data collection and management. ORION is the backbone for facilitating Ontario's BIG data analytics, so I knew I had to be involved."

Jim Garner, Executive Vice-President Corporate Services **Hospital for Sick Children**

"ORION plays an integral role in supporting the Ontario public service and is uniquely positioned to play an even broader role in the rapidly evolving and dynamic environment of high speed data transmission and storage. I am motivated to help ORION realize its full potential."

Alex Giosa, President and CEO, **Alcatel-Lucent Canada**

"ORION operates a world-class infrastructure. Coming from a world leading telecommunications company with a heritage of R&D and a vision for the potential of networking, there were natural synergies for me to get involved."

Dr. Darin Graham, President and CEO, **ORION**

"I joined the ORION network because it is an amazing asset in Ontario and offers a huge opportunity to impact innovation for the future of research and education."

Michael Ridley, Former Chief Information Officer (CIO) and Chief Librarian **University of Guelph**

"ORION is a platform for innovation and creativity. There are great challenges and opportunities ahead; participating on the Board allows me to contribute to the strategic directions of ORION and assist Ontario in advancing its knowledge agenda."

“In building Ontario’s world-class research and innovation strength, our province is fortunate to be able to draw on the support and expertise of organizations in the public, private and non-profit sectors. ORION — the Ontario Research and Innovation Optical Network — is part of that vital resource base and works to ensure that Ontario has the ability to innovate, compete and succeed in the global marketplace.”

– The Honourable Dalton McGuinty, Premier of Ontario

What does the future hold for ORION?

ORION will continue to innovate and lead. We will continue to move forward to make upgrades affordable, add new services and capabilities, build our collaborations, support our members and users and advocate with government on their behalf. We will listen, respond, support and facilitate to provide Ontario’s research, education and innovation organizations with a seamless infrastructure that makes infinite possibilities a reality.

When the next BIG idea comes, we’ll be there.





 infinite possibilities



We encourage you to share your feedback.

Ontario Research and Innovation Optical Network (ORION)

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