ORION LAUNCHES CANADA'S FIRST OPERATIONAL 100G NETWORK

ALCATEL-LUCENT TRANSPORT SOLUTION CONNECTS OVER 1.8 MILLION ORION MEMBERS WITH THE WORLD'S FIRST RESEARCH & EDUCATION 100G PRODUCTION NETWORK

CASE STUDY   MARKET: **NATIONAL RESEARCH AND EDUCATION NETWORK**   REGION: **NORTH AMERICA**

The Ontario Research and Innovation Optical Network (ORION) is an advanced technology, ultra-fast, high capacity fibre optic network that links researchers, scientists, teachers, and students. Headquartered in Toronto, Ontario ORION is a not-for-profit organization dedicated to supporting and advancing new research, learning, and innovation. Faced with exponential growth in network use, ORION turned to Alcatel-Lucent for a complete solution based on single-carrier 100G coherent technology.

CHALLENGES

- 50 percent increase in year-over-year traffic growth driven by video, mobile broadband data and enterprise applications
- Goal to grow membership base from 1.8 to 3 million users over three years
- New value added cloud-based services will put even more strain on the network
- Need for continuous cost-and-power-per bit improvements: push more bits per wavelength

SOLUTION

- Alcatel-Lucent 100G transport solution based on the purpose-built 1830 Photonic Service Switch (PSS)
- Best combination of scalability, high performance, and low Total Cost of Ownership (TCO)
- Ability to upgrade to 100G at any pace leveraging existing fibre plant
- Ultra-fast, highly integrated electro-optics engine with coherent detection based on Bell Labs innovations

BENEFITS

- Members enjoy an un-throttled backbone with high-capacity transport circuits
- Establishes a technological backbone with capacity that can be fully leveraged to support new and innovative ways of enabling advanced research, innovation, and scientific discovery
- 100G dedicated transport circuits available on the edge enable special collaboration projects with huge bandwidth
- 100G readiness throughout the entire network

- Enables real-time virtual collaborative work on high-bandwidth applications such as highly-complex simulation modeling
- Optimized transport efficiency and resource utilization with less complexity and lowest TCO
- Increased confidence in ORION and its ability to be at the forefront of innovation and technology

THE CHALLENGES

ORION is the largest and most technologically advanced provincial Research & Education (R&E) network in Canada. The all fibre network is roughly 6,000 kilometres long and provides the critical infrastructure to connect research and education institutions to one another and to partners and colleagues across Canada and around the world. Members include universities, colleges, and research hospitals — and a growing number of kindergarten to Grades 12 school boards across the entire province.

A number of drivers motivated ORION to make a generational leap from a 10G to a 100G network to meet the needs of researchers and teachers. Relentless growth in backbone traffic was at the top of the list – with traffic growing about 50 percent per year. Widespread use of multimedia applications and cloud-based applications were added to bandwidth challenges.

Peak bandwidth utilization on the busiest ORION corridor was already at 9 Gbps. "We simulated what the traffic could be 3 years from now and we determined that we would reach about 30 Gig," comments Emmanuel Lebel, Senior Network Transport Engineer, ORION.

Aggressive membership growth was also a driver for leapfrogging to a 100G network. As a result of these collective drivers, ORION chose early in the capacity planning process to move to a 100G network. "Anything less than that [100G] and we would be putting in something that would be overwhelmed in the next three years," Darin Graham, President and CEO, ORION.

Required was a solution partner to drive changes to the network's core architecture and deliver a complete commercial 100G single-carrier coherent solution — optimized for scalability, high performance and lowest TCO.

WHY ALCATEL-LUCENT?

The Alcatel-Lucent 100G optical transport solution was selected following a lengthy and comprehensive review process. "As you can imagine there were a lot of vendors submitting their response [to our RFP]," says Lebel. "After we studied them we determined that Alcatel-Lucent had the most technologically advanced solution for us. They met all of our requirements. And very importantly, at the time they were the only vendor to have a 100G solution commercially available using single-carrier coherent technology."

While the ability to gain raw capacity was critical, Alcatel-Lucent also brought a solution focus to the challenges of the ORION network. The network is about enabling innovation and collaboration — and meeting the expectations of educators and researchers. "We're trying to not only expand the network to 100G, but expand the usability and monitoring of the network," comments Graham. "And Alcatel-Lucent's solution provided that."

The ability to provide a market leading vision for 100G supported by a detailed, aggressive product roadmap with a strategic evolution was also a significant factor in ORION's decision. "Alcatel-Lucent is always at the leading edge of developing those products," says Graham. "We figured it was a perfect partnership not just for today, but leading into the future."

THE ALCATEL-LUCENT SOLUTION

Alcatel-Lucent equipped ORION with the first operational 100G network in Canada – an upgrade that involved more than 30 network connection points. This is also the first R&E network in the world to deploy 100G.

The Alcatel-Lucent solution for ORION uses emerging 'next-generation coherent' optical technology to carry a single-carrier 100 gigabit per second signal on a wavelength. The solution:

- Couples coherent detection with advanced digital signal processing algorithms and optimized multi-level modulation formats, improving performance with near-constant signal amplitude.
- Can simultaneously handle native 10G, 40G and 100G — on existing and new routes
- Is characterized by best adaptability to network reconfigurations
- Delivers best-in-class transmission reach, dispersion tolerance, and resilience to non-linear effects

The foundation for the ORION 100G solution is the purpose-built Alcatel-Lucent 1830 PSS platform, a new-generation core optical switch that supports dense wave division multiplexing (DWDM) and a terabit optical transport network (OTN) switch.

Physical installation began in mid-February and finished in March 2011. Integration and migration was completed by May 2011.

THE BENEFITS

The Alcatel-Lucent 100G solution gives ORION far greater capacity while preserving bandwidth efficiency and mimics the flexibility, automation and rapid time-to-service capabilities of electrical-based transport networks. The primary benefit realized by the Alcatel-Lucent solution is for ORION's members: Ontario researchers, scientists, students, teachers and staff. Increased capacity translates into better support for crucial research and commercialization, advanced teaching and learning, public and private sector partnerships; and global-scale science and research collaborations. Universities and college researchers have been quick to capitalize on ORION's new 'un-throttled' capacity. In a research partnership with Ontario's vineyards, researchers are supplying real-time weather forecast information based on regional data sources. This collaboration uses newly developed, bandwidth intensive sensor technology that continuously reports on variables such as temperature and humidity in each participating vineyard.

Each individual vine in each vineyard has been GPS located, tagged and recorded into a comprehensive database of a research system developed by Niagara Research at Niagara College. Large datasets are collected by sensors and three-dimensionally mapped. Information is shared in real-time over the ORION network with researchers at other institutions who are using these massive datasets to better manage and control operations, inputs and yields. This is one example of the new data-intense, real-time collaboration that is now enabled by ORION's state-of-the-art 100G network.

"THE PARTNERSHIP BETWEEN ORION AND ALCATEL-LUCENT WAS A GREAT AND FANTASTIC EXPERIENCE."

Emmanuel Lebel, Senior Network Transport Engineer, ORION

"Moving to 100G is a generational leap in capabilities and a significant technological milestone," says Graham. "It helps move Ontario to the head of the pack in terms of having an extraordinary backbone in place to support new and innovative ways of enabling advanced research, innovation and scientific discovery."

The forward looking solution also anticipates the upsurgence in video teleconferencing, video for online learning, and the use of cloud computing by members. "They [members] are starting to access the cloud for cloud applications," says Graham. "We see that's an area of growth for applications for members. In order to access the cloud, you need more bandwidth, and ORION will provide that bandwidth with 100G."

On a technical level, the Alcatel-Lucent solution is ROADM-based throughout with an intelligent GMPLS-aware backplane. "ROADM allows us to carry an optical signal across the network from edge-to-edge with no signal regeneration what so ever," comments Lebel. "It stays in the optical domain, which is good for researchers and performance," he adds.

Total cost of ownership is also a highly valued benefit resulting from the Alcatel-Lucent solution. "The [Alcatel-Lucent] solution allowed us to reuse the existing fibre plant, reduce our equipment footprint and reduce power consumption, which is very important to us," confirms Lebel.

BUSINESS PARTNER

Going from 10G to 100G is a bold and impressive accomplishment. Furthermore, this network upgrade was accomplished in a remarkably short period of time – a matter of months. "We couldn't have done it without the partnership of Alcatel-Lucent," says Graham.

Planning and provisioning a project of this magnitude is not without its challenges. Alcatel-Lucent is able to draw on its deep global experience to quickly identify solutions. "It's the way we work with Alcatel-Lucent to overcome those problems that made it shine even more as we accomplished this unbelievable task," says Graham. "The entire project with Alcatel-Lucent has been a great learning experience… we've learned a lot about our network and capabilities, and the new technology," he adds.

"The partnership between ORION and Alcatel-Lucent was a great and fantastic experience," says Lebel. "It allowed us to deploy a very advanced network that will serve the purpose of research and education across Ontario and benefit all of our members."

SUMMARY

The ORION 100G network is all about supporting speeds hundreds of times faster than the Internet to drive Canada's innovation-building capacity. A rapidly growing base of 1.8 million members can now count on ORION to enable their research collaborations and ground breaking discoveries in physics, global-scale cancer research, environmental science and multiple other disciplines. "From an ORION perspective, the 100G transport network upgrade has allowed us to become the world leader in the research and education space," says Graham.

The ORION project also demonstrates a commercially successful solution that other research and education networks around the world can adopt with confidence. "They've been waiting for us to be the experiment and see what happened," says Graham. "And because of the great success with Alcatel-Lucent in developing this network, they're starting to get on board and are laying plans for their future upgraded networks."

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