ONTARIO INSTITUTE FOR CANCER RESEARCH

Transforming Cancer Research with A New Network Model

CASE STUDY

CHALLENGE

Deploy a high-density, flexible network that can easily scale over time to support cancer research

SOLUTION

- Ruckus ICX 7750 Switches

BENEFITS

- Successfully deployed a high-capacity network that enables on-demand file transfer between storage and compute resources
- Enabled self-service research capabilities with high stability
- Maximized researchers' ability to easily study multiple patients in multiple scenarios

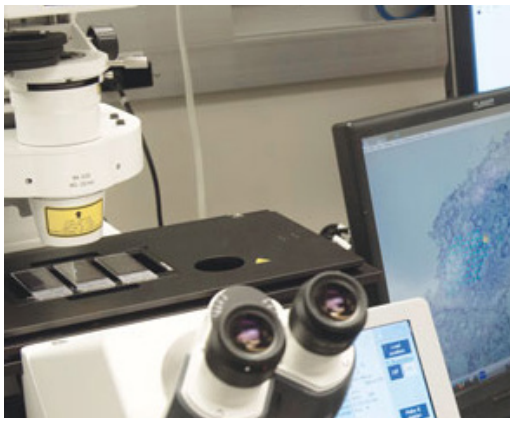
Curing cancer took a leap forward in 2003, when the Human Genome Project completed its goal of identifying and mapping the human genome. Since then, the genomic knowledge base has expanded exponentially, creating data files that are hundreds of gigabytes of data in size. To make this data more widely available, the Ontario Institute for Cancer Research (OICR), a translational cancer research institute based in Ontario, Canada, launched an academic research cloud known as the Cancer Genome Collaboratory. The Collaboratory houses the data of the International Cancer Genome Consortium—a global collaboration involving more than 70 projects and 40 countries—to sequence the genomes of 25,000 tumors and their matched normal tissues across 50 major cancer types. Collaboratory users have fast, easy access to this unique data set.

Before the cloud, scientists conducted research on High-Performance Computing (HPC) clusters. These powerful resources shared storage across large numbers of servers, making collaboration possible—but not easy. Scientists had to send and retrieve gigantic files. File transfers could take weeks, which was costly and slowed research progress, and scientists were often limited in their technology choices for developing their analysis algorithms.

Today's genome sequencing computers generate so much data that storage requirements and costs rise much faster than organizations can afford to support. It's not financially feasible to have identical data sets stored in multiple places. More research environments are moving to cloud computing, which allows users to create the precise environments they need for their experiments and to use the latest technologies.

By moving data to the cloud, cancer researchers are able to work more efficiently and more cost-effectively, and that helps them to bring their research to cancer patients sooner. The Collaboratory research cloud enables Data Access Compliance Office (DACO)-authorized scientists to run complex data and analysis operations across a large repository of cancer genome sequences and their associated patient clinical information. The DACO authorizes researchers to access controlled data from the International Cancer Genome Consortium (ICGC). OICR houses the Data Coordination Centre and Secretariat of the ICGC and has ICGC research projects underway in prostate and pancreatic cancers.

"In addition to the Collaboratory compute infrastructure, we're developing software solutions for efficiently searching and accessing ICGC-protected data," said Dr. Vincent Ferretti, OICR Senior Principal Investigator and Associate Director, Bioinformatics Software Development. "Using advanced metadata tagging, provenance tracking, and workflow management software, scientists can execute complex analytic pipelines, create reproducible traces of each computational step, and share methods and results."



"Ruckus ICX 7750 Switches give us stacking functionality, which allows us to group multiple switches together without links between them in a block state. They have the port density we wanted, with cost-effective copper connectivity, six uplink ports, and no extra licensing required. Not only that, the CLI was easy to work with, too."

GEORGE MIHAIESCU
Senior Cloud Architect
Ontario Institute for Cancer Research

"The network is critical in the Collaboratory's design," added George Mihaiescu, Senior Cloud Architect for OICR. "It had to have the capacity to move large datasets from storage to compute on demand. We needed high capacity with high port density because we operate in a small space. And we planned to scale, so cost-effectiveness was a requirement."

A HIGH-DENSITY, FLEXIBLE SOLUTION

The Collaboratory deployment was planned in multiple phases, so that infrastructure was only deployed as needed. When OICR chose the systems integrator for its project, the winning bid included Ruckus® ICX® 7750 Switches. The Ruckus ICX 7750 switch provides full line-rate, wire-speed data throughput up to 1.92 Tbps.

"Ruckus ICX 7750 switches give us stacking functionality, which allows us to group multiple switches together without links between them in a blocked state," said Mr. Mihaiescu. "They have the port density we wanted, with cost-effective 10GBase-T copper connectivity, six 40 GbE QSFP+ uplink ports, and no extra licensing required. Not only that, the CLI was easy to work with, too."

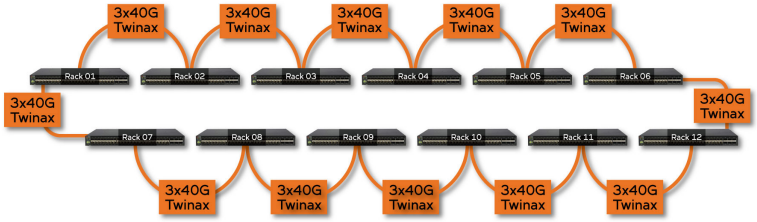


Figure 1: OICR HPC cluster Ruckus network ring.

The Collaboratory's network design includes 12 Ruckus ICX 7750 switches in a ring, with one switch per rack. This design delivers 15 petabytes of storage and 3,000 cores of compute capacity. Now, they can easily connect commodity storage servers to the Ruckus ICX 7750 switches in each rack—gaining more flexibility from their existing servers. Ruckus ICX 7750 switches can be easily added to the ring as the Collaboratory scales.

HIGH SATISFACTION AND COST SAVINGS

"The Collaboratory specializes in supporting genomic research," said Francois Gerthoffert, project manager at OICR. "We know the type of workloads that scientists run and problems they face. In the Collaboratory, researchers can do whatever they want inside their domains. The Collaboratory offers more elastic resources and that allows us to use our hardware more efficiently."

Instead of spending weeks or months downloading data from a central repository before they can analyze it, genomics researchers now have a powerful network with connectivity to huge datasets. Many research labs in Canada use the Collaboratory to accelerate their projects. For example, developing a working compute algorithm takes time and project data must be uploaded, which can take days or weeks. With the Collaboratory, researchers can develop their algorithms and just run them. This accelerates the pace of

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FRANCOIS GERTHOFFERT
Project Manager, OICR

cancer research and helps researchers bring the next generation of cancer diagnostics and therapies to patients sooner. Researchers' feedback has been positive—workloads complete faster and are more stable. The network is essential to delivering high satisfaction.

EXPANDING COLLABORATION

The Collaboratory conducts research on Indexing, Search & Compression, Variant Identification & Consequence, Tumor Heterogenity & Evolution, Drug Target identification, and Bioethics & Protection of Protected Health Information (PHI). Research findings are applied to the Collaboratory and can then be used by researchers.

"We coach researchers about how to maximize cloud resources," said Mr. Gerthoffert, "and they also tell us how they use the cloud for analysis. The Collaboratory allows them to set up their environments, and they can use new technology tools, increase efficiency, and fine-tune things the way they like."

With access to the Collaboratory, researchers can accelerate science, publish faster, receive more grants, approach more complex problems, and ultimately deliver on new solutions for cancer patients. In the past, they would look at the genome of one person with cancer. Now they can look at multiple patients from multiple countries—giving them more pieces of a complex puzzle and the power to compare vast data sets.

NEXT STEPS

The Collaboratory plans to open the environment to researchers worldwide. By transforming cancer research using Ruckus switches for its network model, the Collaboratory gives scientists a new advantage in the search for a cure.

For more information, visit www.ruckuswireless.com

For more information about OICR visit www.oicr.on.ca

For more information about ICGC visit www.icgc.org

For more information about the Collaboratory visit www.cancercollaboratory.org

RUCKUS™ an ARRIS company

350 West Java Dr., Sunnyvale, CA 94089 USA

www.ruckusnetworks.com

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