CENGN

CANADIAN STARTUPS PUSH THE LIMITS IN CENGN'S CLOUD, POWERED BY A PROGRAMMABLE JUNIPER NETWORK

Summary

Company:
Centre of Excellence in Next-Generation Networks (CENGN)

Industry:
Technology

Business Challenges:
Enable Canadian innovators to test and validate promising technologies, accelerating product commercialization and growth.

Technology Solution:
- *QFX10000 and QFX5200 Switches*
- *MX204 Universal Routing Platform*

Business Results:
- *Hosted more than 100 technology validation projects, resulting in the creation of 2000 jobs and contributing $195 million to Canada's GDP*
- *Created a fully programmable, multisite data center fabric to deliver deterministic performance, even under peak demand*
- *Instantiated services 75 percent faster due to programmability and automation*
- *Enabled more innovation with an impressive 70/30 ratio for planned/unplanned activities*

Accelerating innovation is key to a strong economy and national competitiveness. In Canada, that mission falls to CENGN, the Centre of Excellence in Next-Generation Networks. CENGN provides entrepreneurs and startups with cloud-based infrastructure to validate their solution technology and accelerate the commercialization of their products. CENGN's testbed cloud runs on Juniper Networks switching.

"CENGN was set up with a grant from the Canadian federal government to aid the advancement and commercialization of small and medium enterprises," says Richard Waterhouse, vice president of business development and marketing at CENGN. "CENGN offers infrastructure, expertise, and an ecosystem to help small and medium-size companies commercialize their products or services."

Proof-of-concept projects running on CENGN's cloud are as diverse as smart cities, sustainable farming, smart mining, and specialized computing for equity exchanges. Most recently, it launched a collaboration with the Province of Ontario to validate solutions addressing the COVID-19 pandemic. A focus on 5G and optical networks, IoT, AI, analytics, cloud, and cybersecurity is commonplace with projects across key Canadian verticals like mining, agriculture, transportation, government, and education.

CENGN has hosted more than 100 projects. Accelerating commercialization has resulted in the creation of more than 2000 jobs and contributed $195 million to Canada's GDP. To date, CENGN has trained more than 1300 professionals and 150 university interns.[1]

"With a programmable network, we have seen a shift from 70/30 planned/unplanned activities to 85 percent planned activities and only 15 percent of our time reacting to the unexpected."

- Boris Mimeur, vice president of engineering operations, CENGN

[1]"CENGN Annual Report Fiscal Year 2019" https://www.cengn.ca/wp-content/uploads/2020/03/Annual-Report-FY19.pdf

An Agile Proving Ground

"Our clients innovate in many different ways," Waterhouse says. "It's very important for CENGN to create services that are flexible to meet each customer's different needs."

To support the work of dozens of one-of-a-kind innovators, the CENGN engineering team took a DevOps approach to its cloud platform. It provides OpenStack cloud services, container-based NFVi, and carrier-grade Infrastructure as a Service (IaaS). With a network-as-code service, compute, storage, and network resources can be fluidly and immediately available as needed.

"We describe what we do as 'network crafting,'" says Boris Mimeur, vice president of engineering operations at CENGN. "Modern integration, programmability, and automation have always been our focus."

A Fully Programmable Cloud Foundation

To realize its vision for a completely programmable network, CENGN created a fully meshed fabric across its four data center sites. Workloads can move easily to ensure that resources are deterministically available to customers.

The multisite fabric uses industry-standard Ethernet VPN/Virtual Extensible LAN (EVPN/VXLAN) for the overlay network and Juniper Networks® QFX Series Switches for the underlay network. The Juniper Networks QFX10000 line of Switches serves as the spine, while Juniper Networks QFX5200 Switch is used for the leaf nodes, working together to provide a scalable and versatile foundation for the cloud test bed. The Juniper Networks MX204 Universal Routing Platform is used at the edge.

CENGN's multisite data fabric is designed to scale, testing the limits of next-generation AI, analytics, networking, and IoT systems. Network slicing creates a resilient multitenant environment. Companies can run test traffic even at very high loads without impacting the experience of others using the CENGN cloud.

"We have seen a 75 percent reduction in time to instantiate a service."

- Boris Mimeur, vice president of engineering operations, CENGN

"With a network fabric, we don't have to worry about the impact of one project's slice impacting another project," Mimeur says. "Zero oversubscription is important because many of our customers are performance-testing their products and that can really hammer a network."

A programmable network enables CENGN to flex resources to fit customers' needs. "We have deterministic and consistent resources across all sites, because of the Juniper underlay network and automation," Mimeur says. "Now we can transparently take advantage of unused capacity without worrying about the underlying complexity of network configuration."

A flexible, programmable network has allowed CENGN to accelerate innovation. "Now that we can push code based on the services we've defined, we have seen a 75 percent reduction in time to instantiate a service," Mimeur says. "But a 75 percent time savings is nothing compared to what you can't measure. Having a deterministic network that is consistently implemented through configuration templates saves you from interruption and reliability issues."

Less time spent on troubleshooting and maintenance means more time for innovation. "With a programmable network, we have seen a shift from 70/30 planned/unplanned activities to 85 percent planned activities and only 15 percent of our time reacting to the unexpected," Mimeur says.

Automation Enables Agility

CENGN operations run lean, and automation delivers essential operational efficiency. To create a network-as-code, the team created a repository of configuration templates so that resources can be quickly and consistently delivered to support customer projects. Dozens of projects may be running at the same time.

"Templates are implemented through code, so when we need to send traffic from one project from our one data center to another data center, we do it programmatically," Mimeur says.

Red Hat Ansible is the team's primary automation framework, but they also use Network Configuration Protocol (NETCONF) and Yang. "We try to be as standard as possible with automation tools," Mimeur says.

Juniper's openness is critical to giving the CENGN team the flexibility to use the best automation framework for the task. The Junos® operating system, which runs across Juniper's portfolio of routing, switching, and security products, automates network operations with streamlined precision.

"With Juniper, we didn't have to use a proprietary framework," Mimeur says. "The Junos OS automation framework is industry-friendly."

Developing Student Talents

CENGN also plays an important role in developing the next generation of tech talent. Historically, many graduates from Canadian colleges and universities who have science, technology, engineering, and math degrees opt to work outside the country.

"I want our next generation of professionals to interact with the network in a programmatic way," Mimeur says.

CENGN provides internships for 50 college and university students each year and offers courses for both students and IT professionals that connect academic learning to the real world. CENGN interns, who develop both professional and technical skills, are in high demand, with 95 percent employed after the program.

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Bringing the Digital Future to Fruition

CENGN makes a vital contribution across the nation—and ultimately our interconnected world. It works with technology vendors and communities in the rural and northern Ontario communities to improve residential broadband. Smart agriculture startup Ukko Agro accelerated testing of its IoT solution to help farmers predict pest and disease attacks. DocTalk stress-tested its collaborative platform to help physicians learn about new pharmaceuticals and clinical trials in an unbiased way. And Crypto4A stress-tested its cryptographic platform for autonomous cars and military applications.

With a steady flow of technology innovators, Mimeur is confident that its cloud infrastructure will scale gracefully and CENGN's investment is protected. "With an automated and programmable network, migrating to a 400-Gbps fabric spine is an incremental change," Mimeur says.

CENGN will be ready, helping startups innovate and digitally transform the world into a more sustainable place and preparing bright young minds to lead Canada's technology innovation.

For More Information

To find out more about Juniper Networks products and solutions, please visit www.juniper.net.

About Juniper Networks

Juniper Networks brings simplicity to networking with products, solutions and services that connect the world. Through engineering innovation, we remove the constraints and complexities of networking in the cloud era to solve the toughest challenges our customers and partners face daily. At Juniper Networks, we believe that the network is a resource for sharing knowledge and human advancement that changes the world. We are committed to imagining groundbreaking ways to deliver automated, scalable and secure networks to move at the speed of business.

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