CENGN

ANNUAL
REPORT

20
21

APRIL 1 2020 - MARCH 31 2021

Vision

Advancing global technology **innovation** for the **prosperity** of all **Canadians**.

Mission

CENGN, Canada's Centre of Excellence in Next Generation Networks, drives **technology innovation** and **industry growth** through our **testbed**, **technical expertise**, **talent development**, and **partner ecosystem**.

Accomplishments

145
SME Projects

1977
People Trained

258
Internships

21
Members & Partners

8113
Jobs Created*

$782.7M
Contributed to GDP*

Note: All numbers are since CENGN's inception, excluding Members & Partners figure.

*per Nordicity Group Limited

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Letter from the Chair

Over the past fiscal year, CENGN has continued making significant strides in growing Canada's advanced networking industry and pushing the country forward in tech innovation and adoption, working closely with government, industry, and academia. This annual report serves as a testament to both CENGN's resilience and the ability of the Canadian tech community to pull together and drive forward in times of change and difficulty.

Throughout the annual report, you will discover the major progress made over the year in delivering our key programs and the evolution of new capabilities in our services.

One of CENGN's most significant focal points of the year was the rapid increase in commercialization projects delivered, consolidating CENGN as a highly sought-after resource for start-ups and scale-ups looking to leverage cutting-edge infrastructure and technical expertise to validate their technology. Fiscal year 2021 saw CENGN double the number of projects conducted with Canada's most innovative technology providers in cloud solutions, IoT, artificial intelligence, cybersecurity, and vertical industry applications.

New partnerships were also a highlight of the year. The University of Ottawa joined our member ecosystem and has been a strong collaborator in our training program – CENGN Academy. The University of Ottawa is now offering CENGN Academy courses to Faculty of Engineering students and professionals via the university's Professional Development Institute. And, building on a proactive year, CENGN Academy launched three new courses and became entirely virtual, delivering all material and exams online.

This year also saw the advancement of our vertical industry Living Labs program. In partnership with DC Farms, CENGN is developing the Smart Greenhouse Living Lab to advance the testing and commercialization of innovative agriculture solutions. In addition, our Remote Broadband Program saw significant scaling in the past year. CENGN worked closely with remote communities and regional internet service providers to launch high-speed internet projects with eleven underserved communities in rural and northern Ontario and develop innovative blueprint solutions to broadband barriers across the country.

I want to thank our government funding partners, the Ontario Government and the Federal Government, for their support towards fulfilling our mission. Their engagement is pivotal for us to continue driving innovation and technology adoption across Canada, improving network connectivity, creating high-quality jobs, and enabling ICT industry growth.

I'd also like to highlight the importance of our members and thank them for their contributions and support that expand our reach and impact across Canada's technology sector.

Lastly, none of this would be possible without our CENGN staff. I want to thank all the organization's employees and student contributors, over this unprecedented year of change and pandemic, for embodying our mission and vision to drive innovation. With your expertise, dedication, and resilience, we continue to reach our goals and cultivate the progress we strive for in Canada's technology sector.

Tom Astle,
Chair of the Board of Directors

Letter from President & CEO

The Canadian economy faced many challenges brought by the COVID-19 pandemic. During this time, advanced networking and the innovations enabled by powerful connectivity and digital technologies have been a cornerstone of Canadian resilience, allowing businesses and communities to persevere over the hurdles of forced isolation and ever-shifting restrictions through an acceleration in digital transformation. Now, Canada is beginning to move past the pandemic, and attention is shifting to economic recovery. As a nation, we must act on the issues highlighted by COVID-19 and seize the opportunity for a new improved normal rather than a return to the pre-pandemic status quo. This shift will come from a focus on driving innovation and the adoption of new technologies.

During COVID-19, disruption of supply chains, business activity restrictions, and increased pressure on the healthcare system were significant sources of strain on Canada's economy and its efficiency in dealing with the crisis. COVID-19 imposed changes to the models we are accustomed to, forcing us to adapt and overcome. This exposure has led multiple sectors to rethink and transform how they function to attain sustainable economic growth.

According to the OECD, the Canadian economy will rebound strongly, growing over 6% in 2021 and around 4% in 2022 thanks to reduced COVID-19 restrictions and rising external demand. In the short term, Canada's ecosystem should remain firm in its resolve to support this recovery by enabling innovation through small business growth, becoming self-sufficient in critical industries, committing to ubiquitous rural broadband connectivity, and driving the digital transformation of our vertical industries.

Digital technology has a significant role to play. Leveraging advanced technologies such as IoT, artificial intelligence, cloud computing, and cybersecurity, Canada can improve business processes, streamline supply chains, increase the efficiency of the healthcare system, and connect Canadians nationwide. It will also provide the critical technology foundation to address the rising demand for innovation and change, allowing Canada to tackle the climate change challenge and enable the economic growth that will bring prosperity to all Canadians.

CENGN and our members and partners continue to make this our mission, fostering a solid innovation economy through talent development and enablement of tech providers in Canada. CENGN Academy continues to evolve, allowing professionals and students across Canada the opportunity to enhance skills, employment prospects, and improve their career paths.

Additionally, CENGN carries on working with Canadian enterprises, start-ups, and scale-ups, supporting the development of solutions that leverage advanced technologies to improve industry verticals and elevate the Canadian economy.

But technology doesn't stop at the innovator. CENGN is committed to ensuring all industries in Canada adopt new technologies, allowing them to increase their safety, efficiency, sustainability, and competitiveness through digital transformation.

Only together can Canada recover and become a leader. Thus, I want to thank all our contributors for their continuous support and invite those interested in being part of Canada's transformation to learn more and get involved.

Jean-Charles Fahmy,
President & CEO

Board of Directors

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Chair

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Vice Chair

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Regional Director Canada,
Enterprise, Juniper Networks

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Distinguished Architect,
Cisco

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Canadian Academies

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TELUS

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Jill Tipping
CEO, BC Tech Association

Peter Wilenius
VP, Business Development,
CANARIE

Members

CENGN's Member Ecosystem promotes collaboration among technology innovators and adopters to drive Canadian technology innovation and industry growth. Members are organizations that value the role CENGN has as a unifying technical voice between academia, government, and the Canadian tech sector. Ecosystem members help shape Canada's innovation programs and strengthen CENGN's mission. The member ecosystem enhances dynamic interaction between members across industry verticals and supports CENGN's vision of advancing global technology innovation for the prosperity of all Canadians.

Member Benefits

Governance and Community Engagement

- Engage and collaborate with other members
- Shape Canada's innovation programs and strengthen CENGN's mission

Talent Development and Resources

- Access CENGN Academy courses at a discount
- Gain access to highly educated and CENGN-trained students

Connect with Canada's Tech Innovators

- Receive early exposure and introductions to start-ups and scale-ups
- Direct promising businesses to CENGN for a commercialization project

Marketing and Communications

- Leverage CENGN as a platform for brand visibility

Student Program

CENGN collaborated with colleges and universities across Canada to host 57 student interns this year. Internships are offered in the fields of engineering, project management, marketing, human resources, finance, and administration to provide students with valuable hands-on experience. Throughout their term, each intern contributes greatly to CENGN's success, augmenting their academic learning to make a valuable impact on the industry while developing their professional skills.

258
Internships

97%
Employment Rate

Student Spotlights

Varsh Thaker
Lambton College
Solutions Engineering Student
Lambton College President's Award
Currently Employed at CENGN

Mark Mckessock
Carleton University
Cloud Infrastructure Engineering Student
Carleton University Co-op Student of the Year Award 2020 Nomination

Anja Nell
University of Ottawa
Content Writer Marketing Student
Currently Employed at Jombone, CENGN Project Alumni Company

Visit **cengn.ca/about/student-opportunities** to learn about becoming a student intern at CENGN

UNIVERSITY OF ALBERTA

ALGONQUIN COLLEGE

Ashbury COLLEGE

Brock University

UNIVERSITY OF CALGARY

Carleton UNIVERSITY

Concordia UNIVERSITÉ UNIVERSITY

DALHOUSIE UNIVERSITY
Inspiring Minds

Georgian

UNIVERSITY of GUELPH

Lambton College

UNIVERSITÉ LAVAL

McGill

McMaster University

Mitacs

OCI
Where Next Happens

RYERSON UNIVERSITY

SAVI

Seneca

UNIVERSITY OF TORONTO

uOttawa

University of Victoria

UNIVERSITY OF WATERLOO

WILLIS COLLEGE
BUSINESS • TECHNOLOGY • HEALTHCARE

YORK UNIVERSITÉ UNIVERSITY

Contact us at student-hr@cengn.ca to see how your organization can hire a CENGN student

CENGN Academy

CENGN Academy helps advance the global competitiveness of the Canadian ICT sector by arming professionals and students with cutting-edge skills in open-source cloud and intelligent networking technologies that move innovation forward. CENGN Academy focuses on self-paced training with hands-on labs, delivered with high-value learner support, and validated through digital badge and certification exams.

Training courses offered by CENGN:

CENGN Cloud System Specialist (CCSS) certification program

Docker + Kubernetes Basics

Infrastructure as Code

Introduction to DevOps

Machine Learning with Python

293 Learners in FY 2021

29 CENGN Cloud System Specialist Certified in FY 2021

Visit cengn.ca/services/cengn-academy for details on our course offerings and additional training opportunities.

FY 2021 Accomplishments

CENGN Academy made excellent progress in FY21, launching three new courses, enhancing training lab capacity, and building on remote access capabilities. Training deliveries continue to exceed NGNP delivery targets and have shifted almost entirely to CENGN-developed courses. Along with hiring two full-time training developers, here are the key highlights from FY21:

CENGN partnered with uOttawa, expanding our training delivery reach in two ways. First, uOttawa's Professional Development Institute is now an official provider of CENGN's self-paced courses. Second, CENGN and the Ottawa-Carleton Institute for Electrical and Computer Engineering created a for-credit graduate course based on the CCSS. This course kicked off with a full cohort of uOttawa and Carleton students in the winter 2021 semester.

As part of CENGN's response to the COVID-19 pandemic, CENGN offered the Docker + Kubernetes Basics course to affected university students at no charge.

CENGN grew its digital badging program, issuing 107 badges and seeing acceptance, share, and view rates substantially above industry benchmarks. Additionally, CENGN opened 24/7 exam session scheduling to better support learners who wish to take a badge exam.

FY 2022 Direction

In FY22, CENGN Academy will execute on three vectors. First, the continuous delivery of relevant training to highly qualified personnel through deepening our partnership with uOttawa and expanding to other universities and colleges. Second, the development of new training courses, including Docker + Kubernetes Advanced and Multi-Cloud Application Deployment, while adding new features across the portfolio to maximize learner engagement and retention. Lastly, augmenting our training program infrastructure to enrich the learner experience, improving training delivery and stakeholder reporting.

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Driving Innovation and Economic Growth Across Canada

CENGN's mission is supported by the Networks of Centres of Excellence's (NCE) CECR Program and the Government of Ontario's NGNP. Through both programs' support and funding, CENGN can provide its services to promising businesses in Ontario and across Canada.

The Centres of Excellence for Commercialization and Research (CECR) Program

CENGN's participation in the CECR Program fills the gap between innovation and commercialization in the ICT sector. With NCE's support and funding, CENGN continues to accelerate the commercialization of Canadian tech businesses and drive the continued development of advanced networking in Canada.

The Next Generation Network Program (NGNP)

NGNP, funded by the Ontario Government's Ministry of Economic Development, Job Creation and Trade, supports Ontario's innovation economy by focusing on expanding digital infrastructure across the province, developing talent and high-quality jobs, and overall enhancing Ontario's global competitiveness and economic strength. Partnering with OCI, CENGN works on behalf of the Ontario Government to supply services, expanding and improving all sectors through network technology.

The NGNP and CENGN CECR Program are designed to promote economic strength and growth in Canada's ICT sector. CENGN delivers services to start-ups and scale-ups and develops talent through student and industry training to increase tech commercialization while expanding Canada's pool of highly qualified professionals.

By enabling promising Canadian businesses and professionals to succeed, CENGN strengthens the innovation economy and develops job growth in Canada's tech sector.

Residential Broadband Program

The divide between remote communities and urban centres in Canada continues to widen in terms of connectivity. As of 2021, only 46% of rural households and less than 30% of Indigenous communities have access to high-speed internet. Despite this, Canadians from all communities rely on access to high-speed Internet for personal and professional communications, enabling business growth, jobs, online education, access to government services, and connecting with one another.

Through the NGNP, CENGN provides funding to local internet service providers (ISPs) to develop innovative projects across Northern and Rural Ontario. Each project demonstrates technology solutions that provide flexible, lower-cost, higher-performance residential broadband access for remote Ontario communities. The objective is to supply these communities, located in challenging geographies for internet access, with effective broadband solutions. These live technology projects offer two key benefits:

Cost-effective, reliable, self-configuring, high-speed internet connectivity for residents of the project's community.

Creation of deployment blueprints to be used by other communities facing similar barriers to broadband access.

Magnetawan and Ahmic Harbour

Provide reliable high-speed internet access for distances greater than 5km to residents across or around a large lake.

NetSpectrum will provide three new self-supporting towers, using fixed wireless access (FWA) technology to deliver up to 50/10 up/down speeds to these communities. With up to 50% cost savings over alternative deployment options, this project will serve as a model for service expansion across large lakes for other communities across the province.

Rural Milton Area of Halton Region

Extend internet access service distances of 5 – 10 km from a broadband point-of-presence PoP in a host community distributed across rolling hills of farmlands with moderate tree cover.

Mage Networks will implement a set of broadband internet access services of up to 100 Mbps up/down speeds to the residents of rural Milton. The project's use of existing utility poles instead of building new towers will produce a 75% increase in cost reduction and high-quality connection for over 300 underserved residences in the area.

Shelter Valley Road and Alnwick/ Haldimand Township

Extend internet access service distances of 10 km from a broadband PoP in a host community located in a long, deep, narrow valley.

Algonquin Fiber will install over 16 km of fibre to connect 150 homes with enhanced internet access. Using microduct technology to reduce cost and installation, the Shelter Valley Road area residents will have access to 100 Mbps up/down internet speeds.

Dawn-Euphemia Township

Extend internet access service distances of 5 – 10 km from a broadband PoP in a host community located across extensive flat farmlands with a limited number of trees.

MPVWifi worked with the community to support more network meshing options, installing a new 250ft tower, a 4km buried optical fibre ring, and a new 60GHz FWA network providing internet access service offerings up to 100 Mbps up/down speeds. The deployment included licensed and unlicensed FWA and fibre to the home solutions.

Holland Marsh and King Township

Extend internet access service distances of 10 km from a broadband (PoP) in a host community located in a wide, long valley with few trees.

Rogers Communications aims to provide enhanced internet access and cellular services. This project will feature 10Gbps E-band microwave radio backhaul and 5G high-capacity wireless residential distribution, supplying 25/5 and 50/10 up/down internet access to residents in the region supported by small footprint monopole towers.

Rural Canada's Internet Connectivity

only **34%** of rural households and **24%** of Indigenous communities have access to high-speed internet

54% of rural households lack access to 50/10 Mbps speeds

Canadians in rural areas experience download speeds **12x** slower and upload speeds **10x** slower than those in urban areas

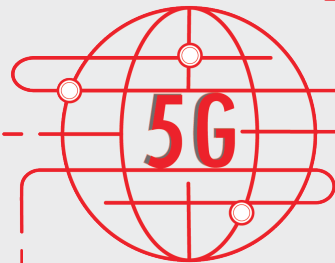over **1/3** of Canadians make sacrifices to afford home internet

The Move Towards 5G

5G towers reduce CO2 emissions up to **80%**

5G offers the tools to reduce greenhouse gas emissions by **20% by 2030** equivalent to removing 291 million cars from the roads

5G

Whitepaper: The Next-Generation Imperative

IDC Canada estimates that the Canadian wireless sector alone will spend almost C$27 billion between 2020–2025 to roll out 5G network infrastructure.

5G stations will save 2.3 billion kilograms in carbon emissions per year = 130 million trees

Canada's Tech Talent

5.1% of the Canadian workforce are in digital occupations

34% of tech companies face difficulty filling ICT positions

1 in 4 Canadian STEM graduates opt to work outside of Canada

2/3 software engineering graduates are leaving the country

Canadian tech sector's job growth rate has outpaced that of the U.S with its 2019 numbers, and projects that critical technology occupations will experience double-digit growth between 2018 and 2026

Canada's prosperity and competitiveness are linked to the digitalization of our economy and society.

By 2022, **65%** of global GDP will be based on digitalization

Despite the impact of the pandemic there are now nearly **100K** more jobs in STEM* disciplines than before COVID-19 *science, technology, engineering and math

Net tech employment increased by nearly **60K** positions in 2019 – **3.6%** growth over the previous year, and now totals an estimated **1.72M** workers

The Age of Tech

Smart Mining

expected to grow, globally, **150%**

From **9,3M** 2019 To **24,1M** 2027

Smart mining technologies are being introduced into the market to solve real problems

IoT

Tracking personnel and equipment
Detecting poisonous gases
Detecting abnormal sounds
Analyzing pulse/respiration rates

With a labour deficit of 120,000 workers expected in 2029, precision ag tech helps automate activities in the field to get the same crop yields

Buildings use up 42% of global energy consumption with lighting, heating, cooling, and other operations. By implementing simple IoT-based technologies, we can easily reduce these consumption rates up to 70%

As AI continues to grow, we'll see more machines diagnosing us than doctors and with better accuracy. A high proportion of mammograms yield false results, but the use of AI is enabling review and translation of mammograms 30 times faster with 99% accuracy, reducing the need for unnecessary biopsies.

The Need for More Innovation

Canada is **17th** worldwide on the Global Innovation The World Intellectual Property Organization rank

and **C** grade in innovation by the Conference Board of Canada

Cloud Transformation Services

CENGN is offering organizations industry-leading virtualization expertise and a robust commercial-grade network testbed to help accelerate cloud transformation. This is a powerful opportunity for a company evolving services or functions in their unique service infrastructure.

Services Include:

Integration
Optimization
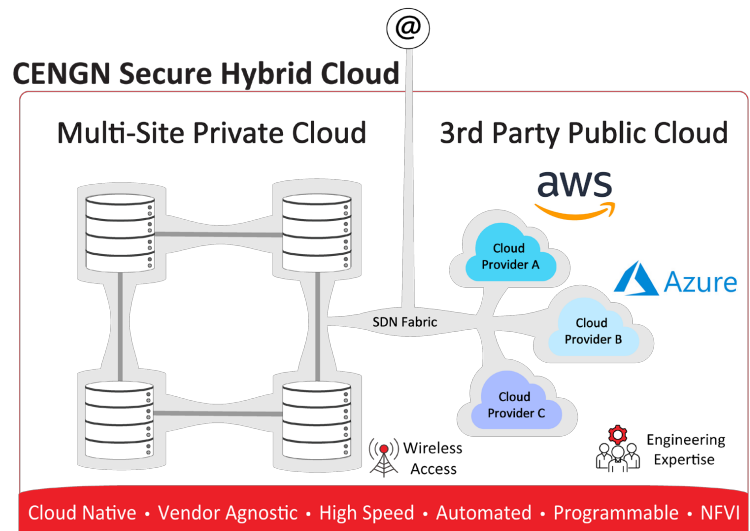
Validation
Benchmarking

Deployment
Onboarding

Contact us: professional.services@cengn.ca

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Note: All sources can be found on cengn.ca/resources/annual-reports

CENGN Testbed

All CENGN projects are carried out through the multisite CENGN Testbed. The testbed is made up of four data centres in Ontario: CENGN HQ (Kanata), Invest Ottawa (Ottawa), MaRS (Toronto), and Communitech (Waterloo), all leveraging ORION network connectivity. It employs interoperability between software, hardware, open-source technology, and a multitude of products from CENGN's many vendors. The unique hybrid-cloud environment, built around multi-vendor resources combined with public cloud services, enables companies to test and validate new and emerging SDN and NFV technologies, cloud-native applications, IoT deployments, and services before moving them to production.

CENGN Secure Hybrid Cloud

Multi-Site Private Cloud

3rd Party Public Cloud

aws

Cloud Provider A

Azure

SDN Fabric

Cloud Provider B

Cloud Provider C

Wireless Access

Engineering Expertise

Cloud Native · Vendor Agnostic · High Speed · Automated · Programmable · NFVI

Capacity Across 4 Sites:
- 6000 Cores
- 50TB RAM
- x100Gbps
- MPLS-SR Underlay
- Nvidia V100 GPU
- AWS and Azure
- Integration
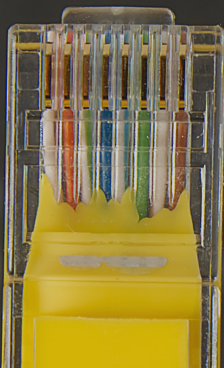
Our priority is your privacy and security

Mutual non-disclosure agreement

Intellectual property protection

Secure Infrastructure

All infrastructure within Canada, no data leaves national borders

Isolated project space, secure from other projects, members, and partners

CENGN Infrastructure Contributors

Open-Source Technology

ceph

cilium

kubernetes

openstack

ROOK

CLOUD NATIVE COMPUTING FOUNDATION

THE LINUX FOUNDATION

Infrastructure Organizations

ARISTA

CISCO

COMMUNITECH

eleven-x

F RTINET

Invest Ottawa | Investir Ottawa

MaRS

JUNIPer NETWORKS

NOKIA

ORION

paloalto NETWORKS

WNDRVR

Project Offerings

CENGN is committed to removing barriers to commercialization, accelerating product introduction to the market, as well as reducing product development time and costs for growing Canadian tech businesses. By working with CENGN's cutting edge infrastructure and expert engineers, our clients are able to undertake high-value market readiness projects that would otherwise be out of reach. The unique physical and virtualized offerings from CENGN enables companies to test, containerize, and validate new and emerging technologies.

Project Areas

Companies carrying out a CENGN project will have a solution or product related to network technology:

- SDN / NFV / SD-WAN
- IoT — Internet of Things
- Data Centre & Cloud
- Security
- Mobile Networks
- Network Transport
- Network Applications
- Artificial Intelligence

Project Types

Companies utilize CENGN's services for many different project objectives:

Interoperability Testing
Validating a product's ability to interoperate with new systems or components

Functionality Testing
Validating a product or one of its features is operational for market introduction

Load and Stress Testing
Determining system performance and resource requirements at given levels of load and determining what happens when maximum loads are exceeded

Demonstration
Demonstrating key product capabilities in a customer-like environment for the benefit of a specific strategic customer or partner

Service Offerings

While every client project is unique, they are built up from a common set of CENGN service offerings. Beyond infrastructure offerings, CENGN works with each of its customers to provide technical expertise as well as business exposure to its ecosystem of multinationals.
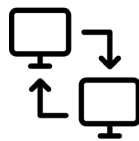
Traffic Generation
Tools for generating system loads

Cloud Tenancy
Virtual machines on CENGN's OpenStack cloud

Bare Metal
Fully dedicated high-performance servers

Hardware Hosting
Hosting client hardware in CENGN's data centres

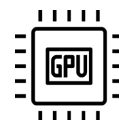**LoRaWAN Network**
Access to a nation-wide LoRaWAN network

Virtual Network Functions
CENGN provides VNFs from Cisco, Juniper Networks and others

Custom OpenStack
A fully dedicated OpenStack cloud based on Wind River Titanium Edge or OpenStack-Helm

GPU Testing
Highest performing data centre grade GPU, provisioned as part of bare metal or virtual machines

Validating **Facial Recognition** Offering as a **Multi-Tenant Cloud Solution**

📍Toronto, ON

AIH Technology focuses on developing computer vision technology with artificial intelligence (AI), aiming to solve the most significant challenges surrounding AI-enabled facial recognition applications. Believing this technology should be used ethically and responsibly for the betterment of all communities, AIH provides Facial Recognition as a Service™ (FRaaS), which works to counteract the racial bias in today's security AI algorithms.

PROJECT

Artificial Intelligence

AIH validated the scalability of FRaaS's new cloud architecture and tested data sets to confirm an absolute zero false-positive rate on ethnic group identification, maintaining an industry-leading accuracy. On average, this proved to be 6-16% more accurate than competitors.

Offering **Real-Time Data** for **Supply Chain Management**

📍Cambridge, ON

An Internet of Things leader, blueRover leverages sensor technology, data intelligence, and automation within a secure, scalable, and open-architecture platform to create and develop business solutions. Serving the pharmaceutical and food transportation industry, blueRover created SafeRx® & SafeFood® remote monitoring solutions to ensure accurate, real-time temperature measurement for critical products, such as vaccines or frozen goods.

PROJECT

Internet of Things

blueRover performed valuable product verification and load testing to ensure their platform's scalability. Simulating traffic levels up to thousands of sensors, blueRover identified and improved their software in a simulated real-world application. This testing is critical to ensure they can meet the processing needs of future customers.

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aoms.

AIH Technology

aquanty

ADAPSYN

AUDITMAP

Balance

BigBitBus

Betterworth

boss INSIGHTS

blueRover

Brave

BLUEBEAR

Cloudvisor
Get more. Make more.

CANADAWHEELS.ca

cosm®

driftscape™
TOUR. EXPLORE. DISCOVER.

esl
eco system
informatics inc.

enertics

GEO MATE

FORTRAN

GIATEC

GREENLAND
international consulting ltd.
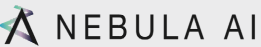
HYPERCARE

JICDESIGN

INNOVEXA

Intelense

Jombone

Joyride

KDMAnalytics

Enabling Informed **Decision Making** for **Agricultural Businesses**

📍 Saskatoon, SK

North Star Systems develops hardware and cloud-based collaboration software for the Industrial Internet of Things that provide real-time remote information on logistical efficiencies. Their hardware product, Tattle Systems™, digitizes data and represents it through a software platform. The data produced allows companies to make better decisions in the agriculture sector, leading to a proven 25% savings in logistical costs.

PROJECT

Data Centre and Cloud

North Star Systems monitored the behaviour of their platform to understand how increasing traffic on each function affects their solution. They proved their platform could scale exceptionally well and gained a clear understanding of their current capacity and improvement points to sustain high traffic.

Cloud Computing for a **Fraction** of the **Cost**

📍 Kingston, ON

Kings Distributed Systems (KDS) provides a cost-effective platform for optimized computing power. KDS's product, the Distributed Compute Protocol (DCP), was designed to be an environment-agnostic framework for cloud & edge. Its technology enables businesses to compute workloads at a fraction of the cost of a commercial cloud, with maximum security and composability. The objective is to aggregate global computational resources into one serverless network without relying on specific cloud offerings.

PROJECT

Network Applications

KDS sought to validate new functionalities and architectures of their DCP platform while advancing its performance to support their Looking Glass project. KDS obtained performance metrics that will contribute to solution pricing and informed business planning, as well as gathered insights that showed significant advantages of incorporating Graphics Processing Unit (GPU) capabilities into their solution.

Smart Agriculture and Smart Mining Programs

CENGN continues to support all industries in harnessing the potential of digital technology. By targeting network innovation in specific sectors, our company can accelerate the commercialization of new technology products and solutions in Canada, driving growth and sustainability in any industry. During FY2021, CENGN has contributed significantly to the agriculture and mining industries by providing tech solution companies in both sectors access to our commercial testing services.

Smart Agriculture Program

The agriculture sector accounts for **7.4%** of Canada's total GDP Provides Canadians over **2.3M** jobs

The agriculture sector is critical to Canada's economy, accounting for 7.4% of Canada's total GDP and providing Canadians with over 2.3 million jobs. Growth and success in this sector have an extensive impact on the lives of all Canadians. By connecting the innovations of the ICT sector with the substantial agriculture industry, we can supercharge Canada's farming revenue, efficiency, and environmental friendliness.

This year, CENGN selected the greenhouse DC Farms in Ruthven, Ontario, to set up a Smart Greenhouse Living Lab. The lab is designed and funded to support Canadian companies in the testing and commercialization of innovative agriculture solutions by providing them with a real greenhouse environment. Each company can deploy their solution's physical components in the greenhouse and send data directly to their cloud components deployed in the CENGN Cloud. This allows for complete end-to-end testing of their solution. In addition, this will enable proper scale testing and validation of game-changing agrotechnology, including complex AI processing and IoT deployments. These technologies are primed to revolutionize how the agriculture sector works, from production monitoring and harvest optimization to disease detection and AI video crop tracking.

Smart Mining Program

Canada ranks in the top 5 for the global production of 13 major minerals and metals, with Ontario having the most active mines of any province or territory. With a total impact of $109 billion, Mining represents 4.6% of Canada's GDP, proving crucial to Canada's economy. As this industry grows in Ontario, it has become a hotbed for new innovative technologies that optimize the sector's efficiency, sustainability, and worker safety.

The CENGN Smart Mining Living Lab, created in the NORCAT Underground Centre in Onaping, Ontario, with solutions from Nokia and Northern Light Technologies, provides Canadian businesses access to commercial-grade network infrastructure and state-of-the-art wireless communications within a working mine. It supports applications ranging from IoT sensor deployment and low-power sensor networks to Mission-critical push-to-talk (PTT)/ push-to-video (PTV) services and Low-latency edge computing for remote and automated operations.

This testing and validation environment will be pivotal to help companies bring to market new technologies for the mining industry, such as smart clothing and wearables, autonomous mining devices, and drone surveillance.

Event Highlights

April	2	Invest Ottawa Cloud Based Solutions Webinar 2020
	21-27	Docker and Kubernetes Overview - Communitech
	22	CENGN Northern & Rural ON Webinar
May	14-28	NVIDIA GTC Tech Conference 2020
	15	Container & Cloud Basics – Cambrian College
	20	Agritech Innovation
	26	uOttawa Make the Future Podcast 2020
	28	DockerCon Live 2020
June	1-3	NANOG 79
	2-3	Cisco Live 2020
	8-9	CRRBC Virtual June 2020
	10	Huron Shores Broadband
	16	Cloud Native Meetup
	22	IoT North ThingkFest 1.0
	22-25	Collision Conference 2020
	29	Open Source Summit North America 2020
July	7	Invest Ottawa Smart Buildings
	7	IEC Advanced Manufacturing Broadcast
	22	TechEx 2020
September	10	Food's Digital Future
	15	Making Sense of a Risky World Using AI
	23	Canadians Connected 2020
	28-29	Open Networking & Edge Summit North America 2020
October	1-2	Cyber Security Awareness Month
	7	Accelerating 5G in Canada 2020
	19-23	Edmonton Startup Week
	28	Robotics & the Future of Farming 2020
November	3-4	Canadian ISP Summit 2020
	12	CENGN Summit 2020
	17-19	Precision Agriculture Virtual Conference 2020
	27	CRRBC Bridging the Digital Divide
December	8	Juniper Elevate Awards Celebration 2020
January	25-26	ROMA Conference 2021
	28	Closing the Skills Gap 2021
February	17	Smart Ag Test Beds for ON Companies 2021
March	2	QPI/OCI Virtual Panel
	8	Smashing Barriers: Dare to Rise 2021
	11	HyperGlobal Webinar 2021
	27-28	BIT Olympics 2021
	30	Ag Robotics & Automation
	30-31	CANWisp 2021

Note: The list above is a sample of all events conducted throughout FY2021.

Fiscal Year 2021:

CENGN presented/ sponsored/exhibited at **111** events.
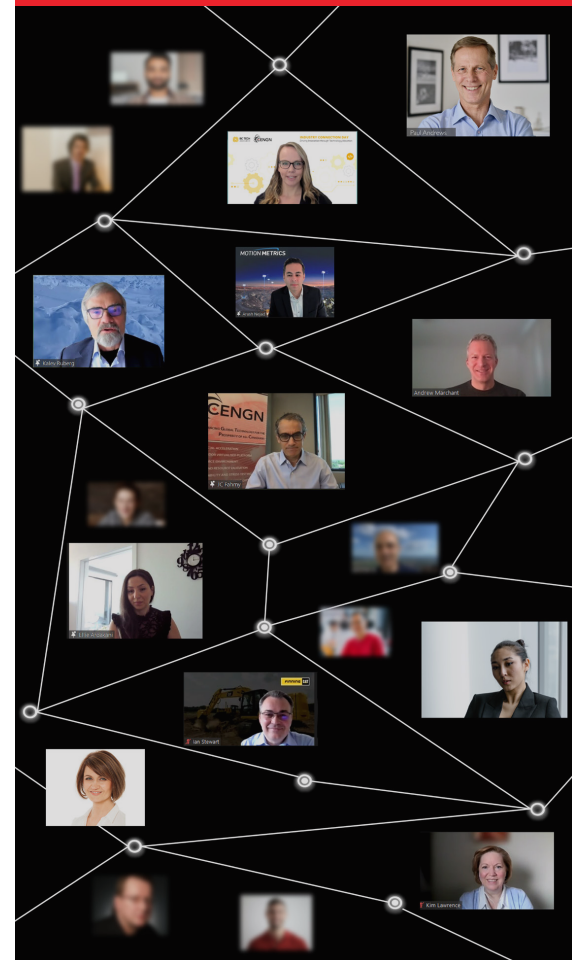
In addition to participating in tech events across the globe, CENGN continues to connect with Canada's innovation drivers and top talent. CENGN hosts info sessions to promote our services, as well as training events to grow talent in the tech sector.

Website & Social Media

CENGN's ecosystem of engaged innovators, professionals, and top talent continues to grow.

CENGN has experienced a consistent increase in interactions with the Canadian tech community since its founding.

In FY 2021, CENGN saw:

1.2M Twitter impressions

156K website visits

22% open rate from the +3700 newsletter subscribers during the year

Our platforms saw significant growth in engagement:

+72% Follower Growth

+209% Impression

+248% Reach

+18% View Growth

Media Coverage

During FY 2021, CENGN appeared in the media 136 times, being featured in articles from various provincial, national, and international sources.

> The Next Generation Network Program provides critical digital infrastructure across the innovation ecosystem and expands support for Ontario SMEs. When SMEs developing Made-In-Ontario solutions have access to emerging technologies, we can drive commercialization, support entrepreneurs to grow their companies, help local products find global markets and accelerate economic development opportunities across the province.
>
> **Dr. Claudia Krywiak** | CEO, OCI
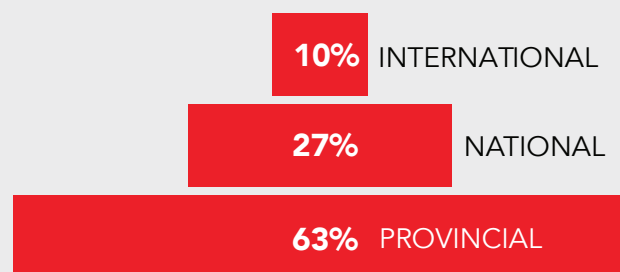> **ORION Networks** | August 2020

> Added to uOttawa's higher education leadership, CENGN Academy provides practical skills and industry credentials through engaging self-paced training with enhanced learner support. Learners will also have the unique opportunity to conduct hands-on labs on the commercial grade CENGN Testbed.
>
> **Isabelle Mailloux Pulkinghorn**
> Media Relations Manager
> **University of Ottawa** | January 2021

CENGN Recognized at Juniper Elevate Awards

> CENGN leverages Juniper switches and routers in its cloud-based infrastructure, reducing time to instantiate a service by 75 percent. CENGN enables organizations to test their products and services smoothly — and we celebrate their achievements.
>
> **Mike Marcellin** | CMO
> Juniper Networks
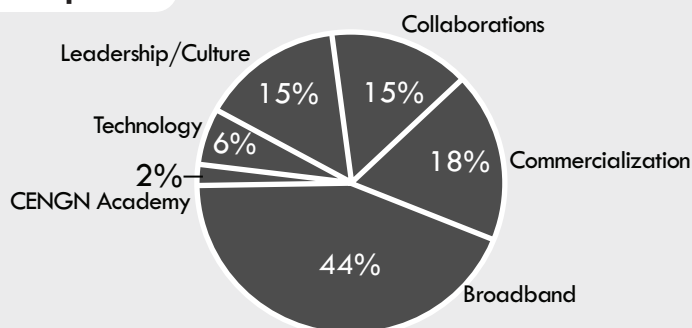> **Post Online Media** | December

> The CENGN opportunity was ". . . perfect timing for what we were doing: trying to design, build and deploy this solution in a pretty compressed timeline. This new cloud deployment strategy let us get up and running quicker and easier and across more sites at once and made it more possible to do this remotely as well, which is very important in these times.
>
> **Michael Tatham** | CEO, MAJiK
> **Communitech** | August 2020

Media Coverage Breakdown

- **10%** INTERNATIONAL
- **27%** NATIONAL
- **63%** PROVINCIAL

Topic

- Collaborations 15%
- Leadership/Culture 15%
- Technology 6%
- CENGN Academy 2%
- Broadband 44%
- Commercialization 18%
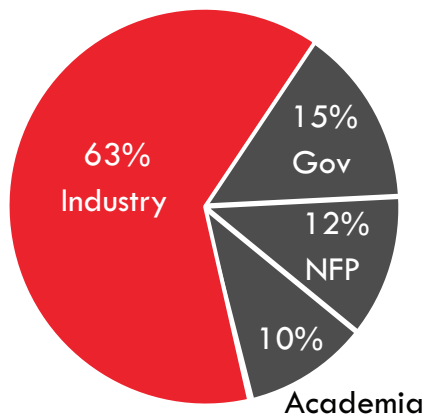
CENGN Summit 2020

The CENGN Summit is a full-day event for any business or technical professional looking to understand how the market is preparing for the oncoming wave of ultra-high-speed connectivity, smart cities, and the growth of disruptive network technology. It brings together an innovation ecosystem of multinational companies, start-ups and scale-ups, government, and academia to build partnerships and discuss the latest trends in the networking and ICT sectors.

CENGN Summit 2020 was CENGN's first-ever virtual Summit and saw 352 registrants. The event discussed essential topics trending in technology and addressed the impact of COVID-19 on how people and businesses use technology. The focus of the conversation hovered around the digital economy and the ICT industry's growth, the increased demand for edge computing, robust security, and cloud accessibility for all.

Summit 2020 Topics

- Open RAN and Its Effect on the Mobile Ecosystem

- The Wireless Industry: A Key Enabler for Canada's Economic Recovery

- Preparing for the Digital Transformation with Cloud Computing, 5G, and IoT

Attendance Breakdown

63% Industry
15% Gov
12% NFP
10% Academia

107 Organizations

352 Registrants

Join us on November 9 for the 6th annual

CENGN

SUMMIT 2021

Artificial Intelligence   **Cybersecurity**   **Internet of Things**

Introduction CENGN Summit 2021
Tuesday November 9th

Room A   Room B

Jean-Charles Fahmy
President and CEO, CENGN

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Click here to register to the CENGN Summit 2021

Interested in sponsoring?
Visit cengnsummit.ca

Recovering From the Pandemic

As optimism increases with the rollout of vaccines in Canada, we are gearing up for a phase of economic recovery. Technology was crucial in keeping the economy afloat during the pandemic, allowing many businesses to operate remotely and Canadians to work and study safely from home. Moving forward, we must ask ourselves how we can leverage the past year's tech growth to enable an even brighter future.

COVID-19 has changed the way we go about our daily activities. Also, it exposed points of improvement for Canada, such as cybersecurity on the network edge, healthcare crisis readiness, and broadband connectivity in rural areas. The road to economic recovery presents a clean slate to address these issues and to introduce new technology.

Canadians believe that technologies such as 5G, IoT, and sustainable energy solutions will significantly increase in upcoming years. These technologies will lead the way to digitally transforming our economy and becoming more sustainable. With these changes comes an opportunity for companies of all sizes to offer solutions to put Canada at the forefront of innovation in the technology race, creating homegrown products that leverage edge computing, virtualization, and artificial intelligence.

CENGN's team can be found working directly with start-ups and scale-ups to strengthen their tech solutions, collaborating to level up Canada's talent pool, or working with our members to drive tech innovation across industries.

To learn more about CENGN and our services, visit cengn.ca

Celebrating 5 Years

Congratulations to all CENGN staff who celebrated a half decade contributing to CENGN's success!
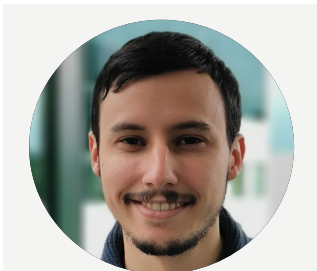
Eric Dupuis
Cloud Infrastructure Engineer
Started on April 7, 2015

Sameer Vij
Manager, Prog. Management Office
Started on April 20, 2015

Sandy O'Connor
Administration Manager
Started on March 7, 2016

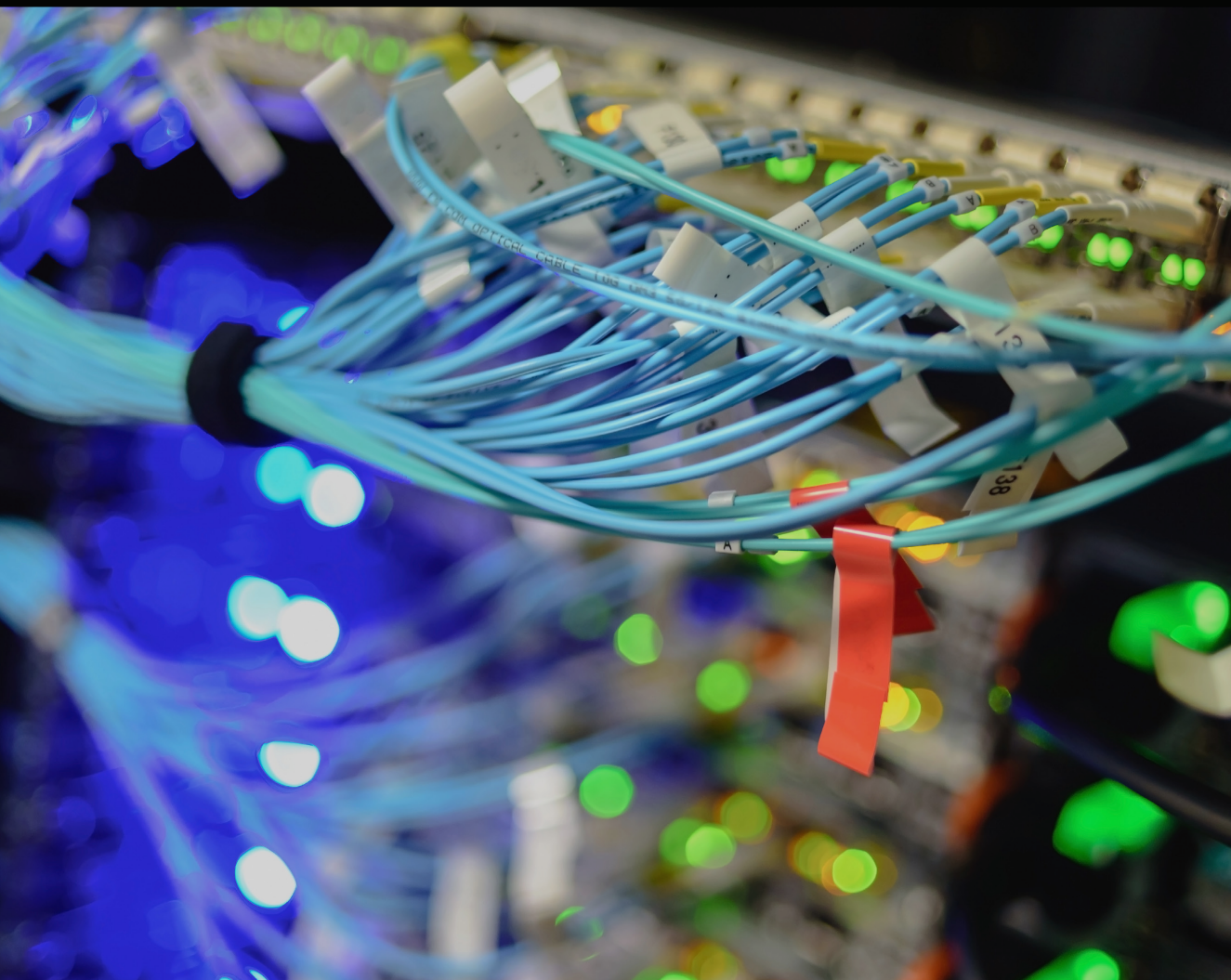**Interested in making an impact on Canada's innovation technology sector?**
Join our team: cengn.ca/about/careers

Canada's Centre of Excellence in Next Generation Networks

CENGN Headquarters
555 Legget Drive, Tower A, Suite 600
Ottawa, ON, Canada, K2K 2X3

Sources: cengn.ca/resources/annual-reports

All information pertaining to CENGN as of March 31, 2021