



INNOVATION ENCQOR

BUILDING AN INNOVATIVE 5G ECOSYSTEM IN CANADA

ACTIVITY
REPORT

APRIL 2019-MARCH 2020

STRONG FOUNDATIONS TO SUPPORT THE DEVELOPMENT OF A WORLD-CLASS 5G INNOVATION ECOSYSTEM IN CANADA

ENCQOR 5G

[ENCQOR](#) has built a 5G network to enable companies of all sizes, IT professionals, researchers from the public and private sectors and post grad students, to get early access to a state-of-the-art 5G development and test platform for prototyping new products and services. ENCQOR 5G now has five innovation hubs in Quebec and Ontario, located in Quebec City, Montreal, Ottawa, Toronto and Waterloo.

With potential speeds of up to 10 gigabits per second, increased network capacity and ultra-low latency of a few milliseconds, 5G will be critical to delivering a whole new generation of products and services to the marketplace, including connected and autonomous vehicles, remote healthcare, virtual solutions, smart cities, and new Internet of Things (IoT) applications.



A MESSAGE FROM THE CHAIRMAN OF THE BOARD



ENCQOR: A SPRINGBOARD FOR THE DIGITAL TRANSFORMATION OF COMPANIES

5G technology is of high strategic importance to Canada. It is critical that our companies get involved and make the leap into the 5G arena. The future success of our companies and the competitiveness of the Canadian economy depends on it. The pandemic that we are experiencing is accelerating this transformation, which will have structuring and lasting effects in a multitude of activity sectors. In particular, we can anticipate an increase in the pace of change in the telecommunications, Internet of Things, manufacturing, health and entertainment sectors. It is in this context that we must situate and understand the mission of ENCQOR 5G, a program that is now at its halfway point.

Some 450 SMEs Involved in ENCQOR 5G

For more than two years now, some 450 SMEs in Quebec and Ontario have been undertaking the 5G shift, supported in their work by ENCQOR's state-of-the-art infrastructure. This infrastructure is the only one in Canada allowing access to all 5G frequency ranges, within a high-performance interconnected network extending to five cities across Quebec and Ontario. Our testbed allows companies to develop and test new 5G solutions or applications in an environment capable of exploiting the full potential of the possibilities offered by this technology.

Thousands of High-Level Jobs

For their part, since the launch of the program, ENCQOR's five founding partners, CGI, Ciena, Ericsson, IBM and Thales, have carried out significant R&D work in several 5G application fields, mobilizing thousands of high-level researchers and developers within these companies, both in Quebec and Ontario. We can also count on the invaluable contribution of our partners in the academic community. Thanks to our internship programs, hundreds of graduates and dozens of professors from our universities in Quebec and Ontario can now lend a helping hand to companies in their 5G development projects. Through these various initiatives, ENCQOR 5G has become a true springboard for the acquisition of new 5G knowledge and expertise in Canada. By doing so, ENCQOR is fulfilling its primary mission, which is to contribute to the emergence of an innovative, dynamic and world-class 5G ecosystem in Canada.

Acknowledgements

I would also like to take this opportunity to thank the Canadian, Quebec and Ontario governments for their support and confidence. Your participation as partners of ENCOQR 5G is an essential key to the success of the program. I would also like to acknowledge the collaboration of our five founding partners, whose vision and commitment play a key role in the implementation of the program. As we embark on the final stretch of 2020, a year which has been unusual to say the least, ENCQOR 5G intends to relentlessly pursue its efforts to help Quebec and Ontario businesses continue their digital shift and position themselves advantageously in the face of a future that will be different and marked by many transformations. Thanks to the support of all its partners and the quality of its infrastructure, I can confidently say that ENCQOR 5G has all the assets needed to meet this challenge.

Germain Lamonde

Chairman of the Board
INNOVATION ENCQOR

A MESSAGE FROM THE GENERAL MANAGER



ENCQOR 5G: A TRANSFORMATIVE AND STRUCTURING PARTNERSHIP FOR THE CANADIAN ECONOMY

Despite the pandemic, the ENCQOR 5G program continues to successfully offer the opportunity to innovate using the possibilities that come with 5G technology. With the establishment of the first pre-commercial 5G broadband digital wireless telecommunications infrastructure corridor in the country covering all three frequency ranges, the testbed provides significant support to innovators involved in 5G projects in Quebec and Ontario. Led by five digital giants - CGI, Ciena, Ericsson, IBM Canada and Thales Canada - projects using the ENCQOR 5G program now involve not only more than 450 SMEs in Ontario and Quebec, but also hundreds of students and researchers from several public research centers and universities in these two provinces. Even with the COVID-19 crisis, the projects are thriving and beginning to magnify the potential uses of 5G in various fields, including health, safety, transportation, and other areas.

A Wide Range of Applications and Fields

In healthcare, taking advantage of safer and faster transmission capacities, ENCQOR 5G projects are exploring and testing various solutions involving remote medical services, anonymous traceability of infection cases, real-time remote analysis of medical imaging using artificial intelligence, the use of remote medical devices, autonomous motorized wheelchairs, assistance to patients with cognitive impairment, the use of drones to deliver health-related products, the use and real-time analysis of vital signs data to predict and prevent heart attacks, and very high-definition or 3D video communication between patients and their caregivers.

Security, Financial Technologies and Transportation

In security and financial technologies, ENCQOR 5G projects are looking into the use of 5G and advanced encryption technologies for processing financial transactions, the authentication of people by their facial features, the use of rescue robots in environments that are hostile or not easily accessible, the use of blockchain with 5G and smart ledgers, the transmission of 3D data in real time from the scene of an incident or disaster. In transportation, ENCQOR 5G projects target autonomous vehicles, remote UAV fleet management, information management for public transportation, real-time collision prevention systems, assistance in managing seaports, real-time data collection and analysis for bicycles, race cars, autonomous trucks, and management of vehicle fleets such as taxis, trucks, and buses.

Leveraging the Full Potential of 5G

While Canada has begun to implement 5G, there are still many opportunities to explore with respect to 5G applications that require features not yet available in Canada. ENCQOR 5G is here to bridge this current gap and help Canada's innovation ecosystem take advantage now of what will be deployed around the world in the years to come. Thanks to the contribution of all our partners, ENCQOR 5G has achieved several important milestones since its launch. We are very proud of the work done to date, despite the impacts of the pandemic. We intend to stay the course in the coming year by actively pursuing our development work and continuing to recruit a large number of new SMEs from Quebec and Ontario to the program. These are all achievements and efforts that will directly support the digital transformation of Canadian businesses and the Canadian economy.

Pierre Boucher

General Manager
ENCQOR INNOVATION

ENCQOR'S PROJECT PARTNERS



The ENCQOR project is a \$400 million transformative partnership that brings together five world leaders in digital technologies (Ericsson, Ciena Canada Inc., Thales Canada Inc., IBM Canada, and CGI) and the following implementation partners: Prompt, ADRIQ, and the Ontario Centres of Excellence (OCE).

This partnership is made possible in part through funding from the Government of Canada, the Government of Quebec and the Government of Ontario.

FOUNDING PARTNERS

ERICSSON 

ciena

THALES

IBM

CGI

GOVERNMENT PARTNERS

Canada 

Ontario 

Québec 

GOVERNMENT PARTICIPATION

CANADA

“Since the COVID-19 outbreak, Canadians have shifted their way of living. They’ve transitioned to working and engaging with one another virtually and are relying more than ever on technology. With the investment from Canada’s Strategic Innovation Fund (SIF), ENCQOR 5G has been providing Canadians with the ability to innovate by allowing them to test their products and services on 5G equipment. To continue to meet today’s challenges, we must be bold, visionary, and decisive – and ENCQOR 5G is doing just that.”



Canada

**THE HONOURABLE
NAVDEEP BAINS,**
Minister of Innovation,
Science and Industry

ONTARIO

“Too many people, especially those living in rural and Northern communities, do not have fast and reliable connectivity. The ENCQOR 5G program is an incredible opportunity for Ontario’s businesses to create and test innovative homegrown solutions for the benefit of our communities as we continue together on our path to a full economic recovery from the COVID-19 outbreak.”



Ontario

VIC FEDELI,
Minister
of Economic
Development,
Job Creation and Trade

QUEBEC

“The unprecedented period we are going through now encourages us to rely on innovation and digital communication technologies to relaunch our economy. 5G infrastructures represent a valuable asset for improving the productivity of our businesses, particularly in this context. ENCQOR 5G is a strategic project for Quebec, especially because of its undeniable advantage that allows our SMEs to stand out in a highly competitive international economic context.”



Québec

PIERRE FITZGIBBON,
Quebec's Minister
of Economy
and Innovation

TESTIMONIALS FROM OUR FOUNDING PARTNERS

“ENCQOR 5G has helped show small and medium enterprises in Canada what a 5G connected world will deliver. To accelerate ENCQOR 5G’s mission, we worked with leading academic institutions to build an ecosystem that combines mobile network services with cloud computing and data-driven artificial intelligence to solve real-world problems. We also successfully engineered and deployed the iPaaS testbed to examine how various applications will work in a 5G environment. We look forward to continuing our efforts with ENCQOR 5G and boosting the digital economy with the next generation of 5G-enabled services and technology.”

- Steve Alexander, Ciena’s Senior Vice President and Chief Technology Officer

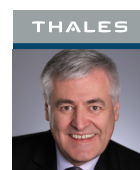
[Ciena](#)



“Thales is committed to Canadian innovation, working together with SMEs, academia and government. Our work with ENCQOR 5G is helping to create Canada’s first 5G communications superhighway, resulting in valuable new capabilities for Canadian industry to compete in the global marketplace. From safer communities to smarter cities, Thales is leveraging its significant investments in domestic R&D to drive the evolution of secure 5G connectivity across the country.”

- Mark Halinaty, President and CEO, Thales Canada

[THALES](#)



“Ericsson is at the forefront of bringing 5G to Canada and we continue to build momentum, bringing value for Canadians through our collaboration with ENCQOR 5G. The ENCQOR 5G network, comprised of Ericsson infrastructure equipment, is driving R&D efforts and innovation around 5G that will benefit all Canadian consumers and enterprises. We are proud to be part of the growing ENCQOR ecosystem and to support the drive for new 5G use cases and business opportunities in Canada.”

- David Everingham, Chief Technology Officer, Ericsson Canada

[ERICSSON](#)



“ENCQOR 5G lends critical support to an ecosystem driving 5G innovation in Quebec and Ontario by providing both a funding mechanism and a testbed for small and medium enterprises. As an ENCQOR 5G founding partner, CGI continues to contribute to the success of the program while also developing Smart Grid and Mobility solutions leveraging the power of 5G networks.”

- Frédéric Lesieur, Sector Vice President | Manufacturing, Logistics, Energy and Municipalities, CGI

[CGI](#)



“Our participation in the ENCQOR 5G ecosystem clearly represents, for IBM Canada and, in particular for the Bromont site, an essential catalyst to the development of packaging solutions for complex opto-electronic components that are designed to meet the growing needs of the emerging networks of the future. The ENCQOR 5G ecosystem has enabled us to accelerate the development of these assembly processes which better positions technologically the Bromont site to offer adapted solutions to our customers and therefore benefit to the Canadian economy of tomorrow.”

- Louis Labelle, Site Location Executive IBM Canada

[IBM](#)



IMPLEMENTATION PARTNERS

PROMPT

Prompt is the Industrial Research Regroupment for Information and Communication Technologies (ICT), Digital, Data Science, Artificial Intelligence and Cybersecurity in Quebec. Our mission is to propel and fund research and development with high potential for socio-economic benefits, coming from collaborative research partnerships, business, and public sector researchers working in these highly strategic sectors for Quebec.

[Prompt](#)

ONTARIO CENTRES OF EXCELLENCE

OCE maximizes the commercial impact of research developed in Ontario's colleges, universities, and research hospitals, and accelerates the commercialization of emerging technologies. A pan-provincial collaboration platform, with a broad and deep network across industry, academia and government, OCE initiates unparalleled partnership opportunities, develops and manages successful industry-academic collaborations, supports high-potential SMEs in commercializing ground-breaking research and provides hands-on training and skills development opportunities for the next generation of highly-skilled talent.

[OCE](#)

ADRIQ

ADRIQ addresses the main concerns and conveys the opportunities for research and innovation players in order to create favourable conditions for their success. Its mission is to support and promote research and innovation in Quebec in order to increase the competitiveness of businesses, both here and abroad. With the help of the various innovation players in Quebec, the association intends to maximize innovation efforts in order to offer its members a maximum return on their investment and accelerate the growth of their organizations.

[ADRIQ](#)



ENCQOR 5G

DIGITAL INNOVATION HUBS

CENTECH

Dedicated to high-tech (deep tech) companies with high growth potential, Centech is a world-class business incubator based in Montreal. Centech is a non-profit organization open to everyone and offers two support programs for startups: the ACCELERATION program (12 weeks), then the strongest potential is selected to get into the PROPULSION program (24 months). Centech performs particularly well in the fields of medical technology, manufacturing, telecoms and microelectronics and other intelligent objects. In 2019, Centech was recognized by UBI Global as one of the most successful university incubators in the world.

[Centech](#)

INSTITUTE INTELLIGENCE AND DATA

Inaugurated in January 2020, IID (Institute Intelligence and Data) at Université Laval brings together the driving forces of research and innovation in artificial intelligence and data valorization in the greater Quebec City area. From fundamental to applied research, including major ethical issues, IID members, collaborators and associate researchers are actively working today to develop methods, technologies and practices that will support the Quebec of tomorrow.

[IID](#)

INVEST OTTAWA

Invest Ottawa is the lead economic development agency for knowledge-based industries in Canada's Capital, facilitating economic growth and job creation in the City of Ottawa. Guided by a vision to help realize Ottawa's full potential as a globally recognized, innovative and future-ready city, and the best place to learn, work, live, and play, Invest Ottawa delivers venture development and global expansion programs and services that catalyze the growth and success of entrepreneurs and firms.

[Invest Ottawa](#)

COMMUNITTECH

Communittech was founded in 1997 by a group of entrepreneurs who came together to help one another build successful companies to help ensure the future prosperity of Canada. They created an organization to support the entire "Community of Tech" to help companies start, grow and succeed.

[Communittech](#)

MaRS DISCOVERY DISTRICT

MaRS, a centre based in Toronto, supports over 1,200 Canadian science and tech companies that are tackling some of society's greatest challenges, providing them with tailored resources at every stage of their growth, from startups to scale-up. We focus on the four sectors — cleantech, health, fintech and enterprise software — where the potential is greatest to build high-impact companies that strengthen the economy.

[MaRS](#)



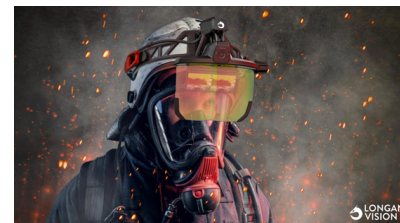
SMES AT THE SPEED OF 5G

LONGAN VISION : REVOLUTIONIZING FIREFIGHTING

This Hamilton-based company has developed the Fusion Vision System, an AR smart visor system that can be attached to a firefighter's helmet. By gaining access to the ENCQOR 5G testbed and technical support from the ENCQOR team, it has been provided with the opportunity to give edge computing devices more capabilities by allowing the company to test the workflow of data collection and computation done in the cloud and streaming the results back to the devices in real time.

The [Longan Vision](#) 5G project is designed to revolutionize firefighting. The enabling inter-device connection would allow the sharing of essential information with all members of a fire crew through the squad's network, allowing decisions based on thermal video and sensor data to be streamed through all firefighters' devices.

[Longan vision](#)

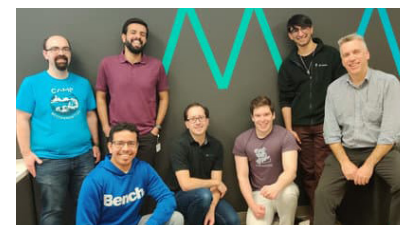


MASV : HIGH SPEED, LARGE FILE TRANSFER

MASV, an Ottawa-based company, has really big news for moving really big content. MASV offers a fast and secure way of moving enormous (20GB+) files over their cloud network, and their specialization in really big content sets it apart. MASV felt their customers should be able to 'add more internet' when they needed to make important transfers and is working to deliver Multipath 5G, a method of bonding multiple internet connections and sending files across all of them at once.

MASV saw the ENCQOR 5G program as a great opportunity to test its 5G capability – in fact, MASV saw it as essential, since the growth-stage company had no test kit and to build its own was a daunting task. The company knew that building on LTE would work – but wouldn't allow MASV to exploit the coming wave of 5G-driven growth. The company recently launched the app that will host their Multipath 5G capabilities and hopes to add more security features going forward to help larger companies and various levels of government take advantage of its service.

[MASV](#)



At the right, MASV CEO Greg Wood;
on the left, the rest of the MASV team

SMES AT THE SPEED OF 5G

CONNEXTICA : OFFERING INTERNET ACCESS TO THE GREATEST NUMBER OF PEOPLE

Even today, more than three billion people on the planet do not have access to the Internet and users far from major centres have difficulty getting a fast and reliable connection. Conventional ground-based infrastructure does not allow for offering internet to these users at a reasonable cost. To meet this demand, the market is turning to low earth orbit satellite constellations. The cost of each satellite must be drastically reduced for this solution to be viable and new approaches are needed to manufacture and test them in a mass production context.

Connektica was founded in 2019 by aerospace engineers **Jeremy Perrin and Jean-Mathieu Deschênes**. Thanks to its expertise in automation, radio frequency, data analysis and artificial intelligence, Connektica offers intelligent and mobile test solutions that significantly reduce the cost of radio frequency testing while maintaining the quality standards of the space industry. To develop the mobility of its stations, while ensuring high throughput and low latency for critical operations, Connektica uses ENCQOR's 5G infrastructure. "ENCQOR 5G gives Connektica the material and financial means to achieve our ambitions."

[Connektica](#)



OVA: AN IMMERSIVE ENVIRONMENT

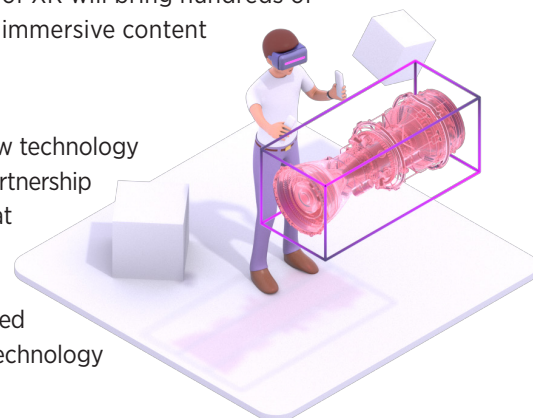
StellarX, created by OVA, is the best creation space for non-programmers wishing to develop their own immersive environments, simply by dragging and dropping. Just as Minecraft has enabled 70 million people to become creators of 3D content, OVA believes that the newest accessibility of XR will bring hundreds of millions of creators into the world. StellarX opens the door to fully accessible immersive content creation for both businesses and individuals.

5G Serving OVA

ENCQOR 5G has enabled OVA to forge links with the emerging players in this new technology that is 5G. Not only has ENCQOR 5G enabled OVA to accelerate the creation of a partnership with its collaborators Ellicom and LaSalle Colleges, but also with companies that are the carriers in this ecosystem, such as Ciena and Ericsson. The company's first deployments on the IPaaS platform and its first tests have already enabled it to gain a competitive edge. With these initial demonstrations, OVA has demonstrated its 5G expertise and also the capacity of the company's software to exploit this technology in the creation of immersive and collaborative environments.

Since the beginning of this project, apart from the initial collaborators with whom OVA has already started other projects, the domino effect that ENCQOR 5G brings to OVA is beneficial beyond the current project. Presently, we are in discussions and in the final stages of signing a contract with a client who would use their 5G system to promote our software to their users. This opportunity would not have happened without the showcase and expertise that ENCQOR 5G has given OVA.

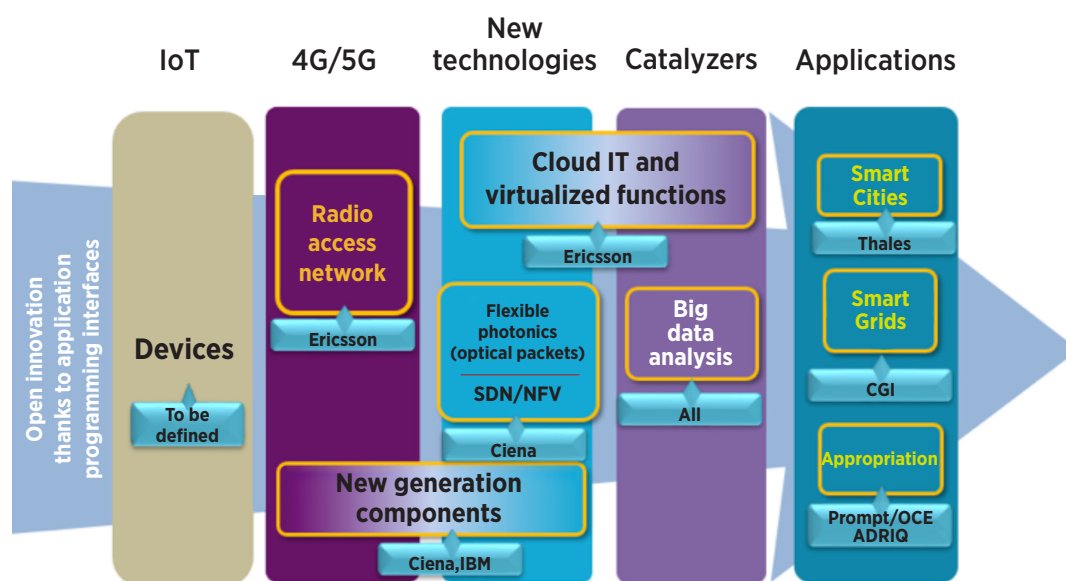
[OVA](#)



SIGNIFICANT WORK IN 5G RESEARCH AND DEVELOPMENT

A COLLABORATIVE TECHNOLOGICAL DEVELOPMENT APPROACH

ENCQOR's partners are carrying out research and development activities on 5G technologies used for the creation of an open and on-demand innovation platform IPaaS (Innovation Platform as a service).



The diagram above illustrates the collaborative approach of the partners on the basis of the technical domains solicited for the realization of the project. The research and innovation effort of each partner during this period focused

New generation applications used for smart cities and grids and other sectors require access to several technologies to make the most of the features offered by these new networks. Many of these applications can use devices that include different types of sensors or devices made of next generation components. These devices can also utilize a wireless connection using Radio Access Network (3G/4G/5G), or wired with flexible photonics.

Data from these devices can be transmitted through a network of communications services providers who use EPC (Evolved Packet Core), utilized today for cellular networks. Finally, this data can be distributed through other specialized network functions. These functions can all be “virtualized” in various data centres, which operate in cloud mode (virtualized functions). Once the data is routed, it can be collated and analyzed (big data analytics) to provide relevant information to applications such as smart grids, smart cities, or for use in certain sectors, such as transportation, Industry 4.0, education and other sectors of activity.

SIGNIFICANT WORK IN 5G RESEARCH AND DEVELOPMENT

MULTIPLE 5G FIELDS OF ACTIVITY

Starting on the left side of the diagram, shown on the previous page, several of the partners, in particular Thales and Ericsson, continued their work on the Internet of Things, sensors and various hardware and software platforms that can be used in 5G in a variety of devices, from tests with autonomous vehicles, cameras, the use of augmented reality glasses, to new 5G smartphones from different suppliers.

For its part, Ericsson continued the development of 5G radios at its Ottawa center. These radios are now being deployed at ENCQOR 5G sites.

Ciena continued the development of software-controlled optical switches (flexible photonics) using SDN/NFV standards.

Meanwhile, IBM Bromont and Ciena have collaborated on the development of component assemblies that can be used for 5G. Ericsson and Ciena have also done a great deal of work in cloud computing and cybersecurity related to the management of data centres used for 5G networks.

All partners have worked on big data analysis projects. What characterizes Year 3 is the introduction of artificial intelligence in this analysis and in the various functions related to 5G networks.

Thales has developed prototypes that can be used with a 5G network for smart cities, while CGI has developed its application used for smart power grids, an application that can use 5G.

CGI: DEVELOPING A DISPATCHING SOLUTION FOR SMART POWER GRIDS

In addition, CGI has begun the fourth phase of distribution in SaaS Web mode (software as a service on the Web) of its Pragma solution, with design and architecture work that will continue until the end of the ENCQOR 5G program in 2022. Pragma is a dispatching service solution for smart power grids that will be able to use 5G. The impacts of the pandemic have been used to enhance Pragma's cloud-based deployment approach.

In addition, design work on intelligent fault location through power grid analysis (a tool to identify the location of grid problems) also continued in 2019-2020. The management of Service Level Agreements (SLAs - a tool for managing network problems and outages) and the Video Collaboration Tool are also in the development phase, with an exploration of the different technologies that will be integrated to enable this collaboration. The development of the PragmaGEO Re-architecture project (video collaboration across 5G networks to help dispatch teams dedicated to fault management work) has also continued over the last year.

SIGNIFICANT WORK IN 5G RESEARCH AND DEVELOPMENT

ERICSSON: A GREAT DEAL OF 5G DEVELOPMENT WORK

For its part, Ericsson continued its development of new radio (NR) mid-band technology respecting the various protocols required by the communication standards used in 5G networks. The company has also developed a new platform for radio systems that support not only 5G but also previous generations (2G/3G/4G). Ericsson has also carried out work on radio solutions integrated into 5G antennas.

In addition, the company continued its research and development efforts in cybersecurity for 5G networks in collaboration with Quebec-based universities. The company also developed environments for 5G application developers, improved messaging systems applied to 5G, and introduced artificial intelligence in the management of 5G networks with the help of its new artificial intelligence group based in Montreal.

Ciena: MAJOR PROGRESS IN THE DEVELOPMENT OF NEW SOLUTIONS

Over the past year, Ciena has successfully continued the development of next generation solutions (optics/packages, the network management and orchestration software suite including 5G slicing Blue Planet, in addition to new services & intelligent tools), as well as the integration and validation of these innovative solutions.

The development in collaboration with IBM Bromont of the new silicon components is progressing rapidly and the first production batches for testing purposes have been completed. Ciena has also finalized the architecture and design of the ENCQOR Compute solution (higher storage/compute/GPU capacity with OpenStack open architecture) and signed an agreement with CloudOps to ensure its implementation. ENCQOR Compute allows remote access through the ENCQOR 5G network to computing resources similar to those found in computers.

In addition, Ciena has upgraded its 5G innovation lab at its Montreal R&D facilities, which is accessible to selected university collaborators and SMEs. The company has also made progress at all levels in the Self-Optimizing Fabric (SOF) strategic research project with the establishment of an international research ecosystem including academia and SMEs. The SOF platform enables seamless integration of computing resources from multiple data centres for users.

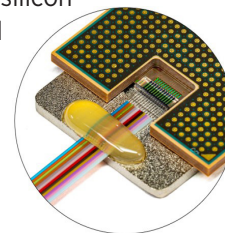
SIGNIFICANT WORK IN 5G RESEARCH AND DEVELOPMENT

IBM: ACHIEVEMENTS ON MANY FRONTS

In terms of its development work, IBM achieved numerous milestones regarding the process development of edge coupling using fiber arrays in v-grooves. Among IBM's main results, are the process development and successful assembly of optical switch prototypes using photonic integrated circuits with 24 fiber interconnections mounted on organic substrates. Optimization of flip chip electrical interconnects and optical components placement processes was achieved. IBM also obtained positive reliability results according to industry standards and specifications.

IBM also completed design and prototype assembly planning in order to highlight and overcome packaging challenges for future photonic and functional electronic chip optical engines. For the adiabatic coupling approach using a polymer ribbon process, IBM's work enabled the assembly of prototypes using newly designed O-Band polymeric waveguides and a photonic integrated circuit interface. It also demonstrated a significant insertion loss reduction.

To achieve a low cost and high volume automated manufacturable process, significant effort has been invested in new tooling and equipment development in order to meet the challenging technical requirements of silicon photonic packaging. Different capabilities such as operating interfaces optical component handling and high precision vision systems for process stability and repeatability have been developed on these automated tools.



THALES: SEVERAL CYBERSECURITY AND INTELLIGENT MOBILITY PROJECTS

During the last year, Thales continued to deploy the ENCQOR 5G ecosystem by promoting the innovative « design thinking » development approach. Thales provided training for partners in the principles of this development method. The company also held the first Smart City boot camps, using software developed by Thales in image processing and data cross-analysis.

The deployment of cybersecurity lab activities, mainly for IoT (research on connected objects and secure communications) has enabled the launch of equipment that will enable, among other things, communications and security analysis. This equipment will be used for all projects carried out by Thales.

The company has also worked on a prototype for urban security and intelligent mobility by integrating artificial intelligence to enable better data visualization, which will facilitate decision-making in real-life situations. Thales is evaluating how to adapt the results of this work for remote patient monitoring using sensors for vital signs, such as heart rate. Thales has also started a 5G use case with the goal of reducing the response time of an autonomous vehicle to obstacles, even under the harsh conditions encountered in Canada.

Thales also pursued its development of train control systems. These systems enable, among other things:

- Train-to-train communications;
- Communications with railway signalling systems;
- Communications with train operators and railway maintenance crews;
- As well as communications from the train itself.

VALUABLE ACADEMIC SUPPORT FOR 5G DEVELOPMENT

CONCORDIA UNIVERSITY, ENCQOR 5G AND ERICSSON JOIN FORCES TO CREATE THE INDUSTRIAL RESEARCH CHAIR IN CLOUD AND EDGE COMPUTING FOR 5G AND BEYOND

Concordia University, ENCQOR 5G and Ericsson announced in June 2020 the creation of the new Industrial Research Chair (IRC) in Cloud and Edge Computing for 5G and Beyond.



ÉCOLE DE GÉNIE ET
D'INFORMATIQUE
GINA-CODY

The new chair will aim to increase the performance of the 5G network by relying on cloud and edge computing technologies and artificial intelligence. The creation of this new cutting-edge research team, which will have a five-year mandate, was made possible by a total investment of \$2.7 million.

The holder of the IRC will be the renowned Professor Roch Glitho of Concordia University, and cloud network expert.

Edge Computing is when processing tasks are distributed and processed closer to the source of the data on local servers, instead of all tasks processing in the cloud. It is faster than sending all the data back and forth to the cloud, with less chance of delays and/or dropped messages.

[Concordia University](https://www.concordia.ca)



VALUABLE ACADEMIC SUPPORT FOR 5G DEVELOPMENT

FRUITFUL PARTNERSHIP BETWEEN ROGERS AND THE UNIVERSITY OF WATERLOO

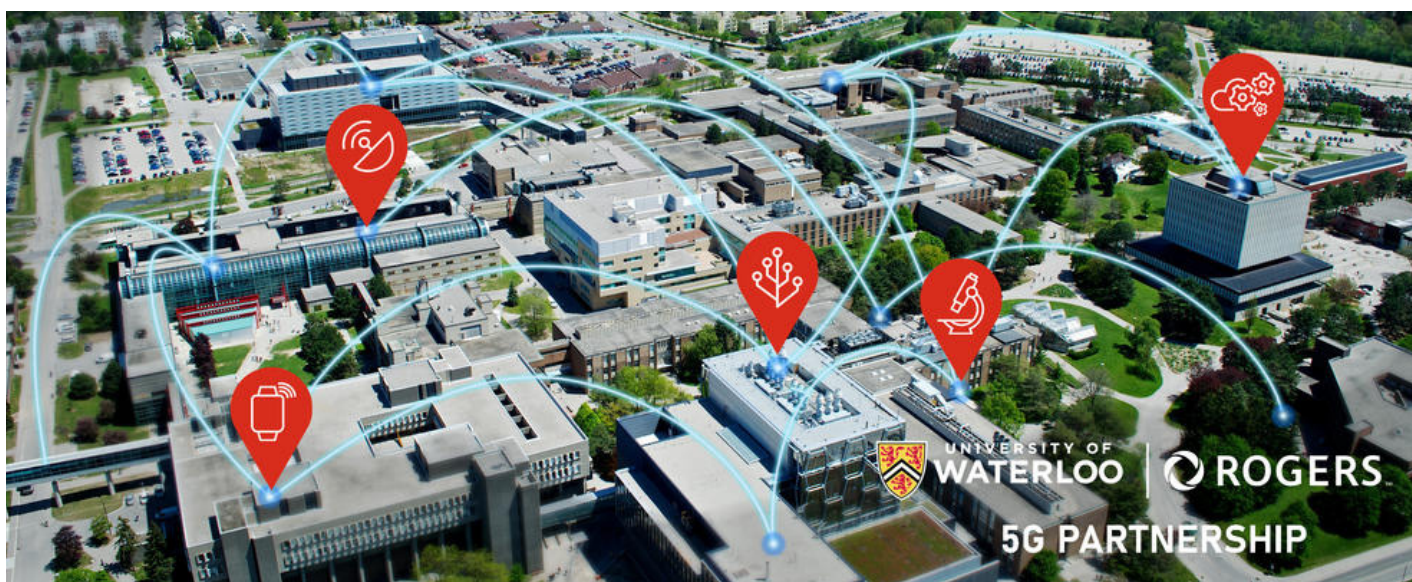
In December 2019, Rogers was the first wireless carrier to announce a partnership with ENCQOR 5G to support small and medium-sized enterprises as they work toward unlocking 5G innovations.

Rogers also partnered with the University of Waterloo to build the first 5G campus in central Canada to further advance 5G research in the Toronto-Waterloo tech corridor. Areas of 5G research include Smart City and Smart Infrastructure, Asset Tracking, 5G Network Design and Operations, Network Slicing, and Multi-Access Edge Computing. Since September, the campus has been lit up with Rogers 5G network that will test network infrastructure, frequencies and applications in a real world Canadian environment and provide access to the commercial 5G network for any company accepted into ENCQOR 5G.

To foster commercial 5G development in the Toronto Waterloo Region Corridor, the company has also opened Rogers Create: a 5G Lab at Communitech, focused on accelerating and launching 5G applications. Rogers Create Lab has supported the successful applications of some of the ENCQOR SMEs including SSIMWave. They have also launched an exciting challenge with ENCQOR 5G around 5G based asset tracking. Working with Rogers, ENCQOR will continue its work with and leverage the company's 5G network through the Rogers Create Lab and Waterloo Smart Campus.

These partnerships are a part of Rogers multi-year program to bring 5G to Canadians through network investments and strategic partnerships to research, incubate and commercialize made-in-Canada 5G technology.

[University of Waterloo](https://uwaterloo.ca)



HIGHLIGHTS OF THE YEAR

2019-2020

PERIOD FROM APRIL 1, 2019 TO MARCH 30, 2020

THE ENCQOR 5G TESTBED BECOMES FULLY OPERATIONAL

In 2019, ENCQOR 5G's five Digital Innovation Hubs became fully operational. A press release highlighting the achievement of this milestone was published in July 2019 on the sidelines of a meeting between the governments of Ontario and Quebec. The five hubs each have several 5G terminals and are all interconnected by a high-performance 5G network, allowing tests to be carried out using all 5G frequency ranges, the only testbed of its kind in Canada. In October 2019, ENCQOR 5G announced the launch of the first 5G mmWave service in Canada.

ENCQOR 5G OPEN INNOVATION PLATFORM



ENCQOR 5G PARTICIPATES IN KEY PROMOTIONAL EVENTS

The years 2019 and 2020 were marked by ENCQOR 5G's presence at key events. In particular, two events stand out during this period. At Discovery 2019, an event held in May 2019, three of the five founding partners of ENCQOR 5G actively participated through webinars on 5G and a presentation by a senior Ericsson executive.



Dr. Pernilla Jonsson Head of Consumer & Industry Lab, Ericsson

HIGHLIGHTS OF THE YEAR

2019-2020

PERIOD FROM APRIL 1, 2019 TO MARCH 30, 2020

A major open house event was held on October 28, 2019. The two ENCQOR 5G hubs in Quebec (located in Montreal and Quebec City) were brought together via a simultaneous videoconference, in the presence of Pierre Fitzgibbon, Quebec's Minister of Economy and Innovation, in Montreal, and various dignitaries in Quebec City. SMEs also set up booths on this occasion in Montreal and Quebec City to present their solutions and technologies that use 5G.



Centre, Pierre Fitzgibbon, Minister of Economy and Innovation, accompanied on his left by Mr. Pierre Boucher, General Manager of ENCQOR 5G, Luc Sirois, Executive Director, Prompt Innovation and Maxime-R Clerk, Senior Director, ENCQOR 5G Program Manager, Prompt Innovation

MEMORANDA OF UNDERSTANDING WITH SIX CANADIAN TELECOM SERVICE PROVIDERS

In February 2020, ENCQOR 5G announced the signing of Memoranda of Understanding (MOUs) for collaboration with six telecommunications service providers in Canada. Thanks to these agreements, ENCQOR 5G and the signatory companies can work closely with SMEs in Quebec and Ontario in the development of innovative solutions and services using the 5G pre-commercial test platform offered by ENCQOR 5G.



HIGHLIGHTS OF THE YEAR

2019-2020

PERIOD FROM APRIL 1, 2019 TO MARCH 30, 2020

ADRIQ BECOMES A PARTNER OF ENCQOR 5G

The Association pour le développement de la recherche et de l'innovation du Québec (ADRIQ) became a leading partner of ENCQOR 5G in Quebec through an agreement announced on March 3, 2020. In particular, this agreement aims to foster the adoption of 5G technology by Quebec companies and institutions. Under this agreement, ADRIQ is responsible for managing the processes of dissemination, application, and selection of adoption projects with the participating companies and institutions. As part of its mission, ADRIQ has developed a large ecosystem of companies and organizations dedicated to research and innovation.



SEVERAL INTERNATIONAL AGREEMENTS

During its fiscal year ended March 30, 2020, ENCQOR 5G entered into several collaborative agreements, including many with international partners. These partners include: Platforms for Advanced Wireless Research (PAWR) and Inseego Corp, both based in the United States; The Catapult Network in the United Kingdom; and the 5G Infrastructure Association in Europe. In Canada, ENCQOR 5G also signed partnership agreements with the Zù Innovation Cluster and the 5G laboratory LabVI, both located in Montreal; with the Institut de recherche en électricité du Québec (Hydro-Québec); and with CENGN in Ontario.

An agreement was later signed with the Ottawa-based L-SPARK Accelerator.

HIGHLIGHTS OF THE YEAR

2019-2020

PERIOD FROM APRIL 1 TO SEPTEMBER 30, 2020

MITACS AND ENCQOR 5G TEAM UP

ENCQOR 5G and Mitacs announced a partnership agreement on April 27, 2020. Through this agreement, Mitacs aims to connect 400 interns and supervising professors with small and medium-sized enterprises (SMEs) in Quebec and the industry in general in order to develop several projects under the ENCQOR 5G program.

This partnership agreement pairs companies with Doctoral or Masters student interns, as well as Postdoctoral researchers, to participate in research and innovation initiatives related to 5G technology and its use in projects that are part of the ENCQOR 5G program.

[Mitacs](#)



VIRTUAL 5G DEMO DAY IN TORONTO

Five SMEs had the opportunity to present their solutions and technologies during a 5G virtual demonstration day organized by the MaRS innovation site in June 2020 in Toronto. The event was attended by approximately 50 participants, with an audience of Canadian telecommunications companies, municipalities, government agencies, ENCQOR 5G representatives, and large corporations, including banking, insurance, and other sectors and manufacturers.

The MaRS 5G demonstration days in Toronto are a series of events where venture capital firms from various sectors present new technologies. These technologies are developed by exploiting the capabilities of the ENCQOR 5G wireless network. The MaRS 5G testbed offers companies a unique opportunity to create next-generation products and services.



NUMEROUS 5G SHARING AND ENGAGEMENT ACTIVITIES IN QUEBEC

ENCQOR 5G EVENTS IN QUEBEC 2019-2020

April 4-14, 2019

[Semaine numérique Québec](#)

ENCQOR 5G participated in Québec Digital Week

June 4-6, 2019

[MOVIN'ON Summit 2019](#)

ENCQOR 5G workshops on intelligent and sustainable mobility at the MOVIN'ON 2019 Summit

April 11, 2019

5G at the Montreal Museum of Fine Arts:

Launch of a project on the potential applications of 5G in the cultural sector

April 17, 2019

ENCQOR 5G booth

[Salon Connexion](#)

Participation of ENCQOR 5G at this event organized by the newspaper Les Affaires and focused on the digital transformation of businesses

May 27-28, 2019

5G Health and AI Sustainable Development

[MTL Connect](#)

MTL connect aims to approach the digital field in a transversal way, through its economic, social, cultural and environmental impacts in various activity sectors

September 17, 2019

[Centech](#)

Introduction 5G start-ups Centech

September and December, 2019

[Coopérathon](#)

The Coopérathon is the largest open innovation challenge in Canada. ENCQOR 5G had a booth and was one of the sponsors of the competition launch event at the Olympic Stadium. ENCQOR 5G supported the development of intelligent mobility projects that make use of 5G:

- October 2: Launch of the Coopérathon at the Montreal Olympic Stadium;
- October 4 to November 3: mentorship sessions;
- November 20: Grand finale and unveiling of the winning team.

October 28, 2019

ENCQOR 5G Inauguration

Inauguration of ENCQOR 5G in Quebec with the participation of Pierre Fitzgibbon, Minister of Economy and Innovation. Topics such as sustainable aerospace, future mobility and digital aviation as well as different 5G user sectors were discussed.

November 22 and December 13, 2019; January 17, February 7 and February 27, 2020.

[Parcours Découverte](#)

A unique opportunity for the SMEs that attended to discover the significant potential of 5G for their organizations.

December 10, 2019 and January 16, 2020

Quebec: Smart Cities Bootcamp at

[The Unité mixte de recherche en sciences urbaines \(UMRsu\) in Quebec City,](#)

Organization of two bootcamps by ENCQOR 5G and Prompt where more than 30 participants passionate about the theme of smart cities attended at each of the two events.

January 31, 2020

Montreal Bootcamp – Smart City 1

Organization of a bootcamp by ENCQOR 5G and Prompt where more than 30 participants passionate about the theme of smart cities attended.

February 18, 2020

Montreal Bootcamp – Smart City 2

The second Montreal edition of Bootcamp 5G was held at the Centech Innovation Centre.

NUMEROUS 5G SHARING AND ENGAGEMENT ACTIVITIES IN ONTARIO

ENCQOR 5G EVENTS IN ONTARIO 2019-2020

May 1, 2019

ENCQOR Webinar – 5G and SMEs: What Is It and Why Should My Company Be Paying Attention?

Webinar focussed on what 5G will mean for tech-driven small- and medium-sized enterprises (SMEs), and how it will provide a competitive advantage to SMEs developing the next generation of products and services. "

May 6, 2019

Introduction to the 5G ENCQOR Program and iPaaS Testbed

This was an introduction to the ENCQOR 5G Program and iPaaS Testbed at Invest Ottawa.

May 13-14, 2019

OCE Discovery Conference

Discovery is Canada's leading innovation-to-commercialization conference. Hosted by Ontario Centres of Excellence, Discovery (3,600 attendees and more than 550 exhibitors) brings together key players from industry, academia, government, the investment community as well as entrepreneurs and students to collaborate.

June 3-6, 2019

Canadian Telecom Summit

The Canadian Telecom Summit is Canada's leading ICT event, attracting the most influential people who shape the future direction of communications and information technology in Canada.

July 10, 2019

Access Canada's new ENCQOR 5G testbed and grow your business

Housed at MaRS, the ENCQOR testbed was Canada's first open access, pre-commercial 5G infrastructure.

September 19, 2019

Grand Opening of Thales Global Urban Rail Signalling Showroom

Thales shares how they are partnering with the government, through programs such as ENCQOR, and with SMEs, to create jobs and foster innovation to support next generation developments in urban rail control, operations technology, autonomy, cybersecurity, big data, and artificial intelligence.

September 25, 2019

Communitech Data Hub Sessions: 5G Security for the Present and the Future

Communitech Hub and OCE representatives discussed aspects of 5G security for the present and the future with SME participants.

November 5, 2019

Join ENCQOR 5G with MaRS, OCE and Ryerson

Through an information session at Ryerson University, attendees learned more about ENCQOR 5G's program benefits and offerings from corporate partners Ericsson and Ciena.

November 6, 2019

Join ENCQOR 5G with Spark Centre, Ontario Centres of Excellence and MaRS

This event was designed for SMEs building products and services related to smart cities.

November 29, 2019

How 5G and Next Generation Network Programs will Accelerate your Business

Information and networking session at Queen's University in Kingston to discuss how ENCQOR 5G and NGN programs can benefit SMEs.

December 11, 2019

ENCQOR 5G: Onboarding Workshop

The session provided a full 5G testbed onboarding session at Invest Ottawa. 5G experts from Ericsson were on-hand to help onboard company's IoT products or services directly onto the 5G testbed.

December 12, 2019

Communitech Sandbox Sessions: Playing with 5G

Communitech Hub Sandbox sessions offered participants the opportunity to visit the Data Hub and book time to test its world-class equipment and technological tools.

February 6, 2020

What is ENCQOR 5G – Introduction to the 5G Platform

Information session on the ENCQOR 5G Program at Invest Ottawa. Representatives from OCE, Ericsson and Ciena, offered information on to access the program, how to apply, and why the 5G iPaaS is important for your business today.

February 13, 2020

5G Layer 3 Network Webinar

Challenge Statement webinar for the SME stream of the Technology Development Program. Information session for SMEs to work with Ciena on the challenge statement, 5G Layer 3 Networking.

March 2, 2020

How 5G and Next Generation Networks Programs will Accelerate your Business

Funding program information session hosted in London for companies seeking support and partnerships for innovation.

ENCQOR 5G BY THE NUMBERS

as of March 31, 2020

316 As of March 31, 2020, 316 SMEs had joined ENCQOR 5G to develop and test technologies that use 5G. These SMEs come from a multitude of sectors, in particular telecommunications, Smart Cities, the media and entertainment industries, as well as transportation and mobility. In the months that followed, despite the pandemic, several more SMEs continued to get involved with ENCQOR 5G – so many that as of September 30, 2020 the number of SMEs registered in the program had surpassed 450.



1,800 The ENCQOR 5G program contributes to the maintenance or creation of more than 1,800 high-level research and development jobs in Quebec and Ontario. These researchers and developers work mainly within the five founding partner companies of ENCQOR 5G, and also with SMEs that have projects with ENCQOR.



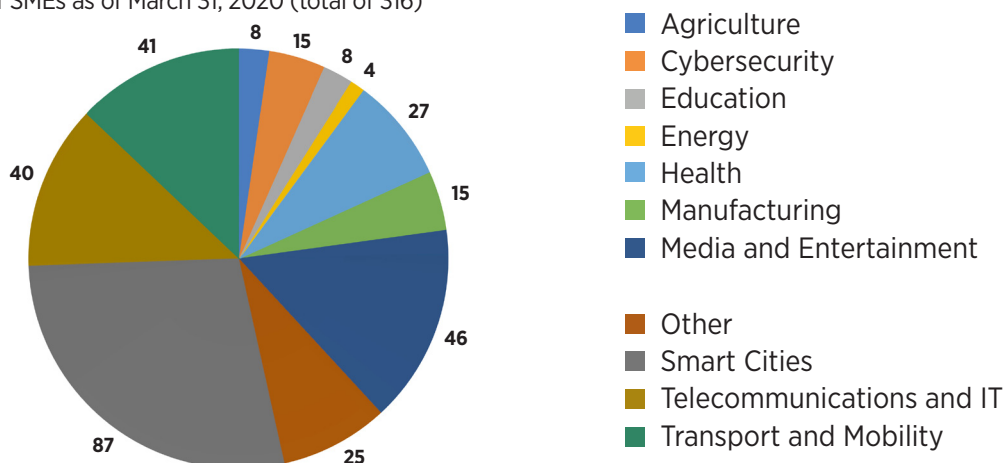
15 ENCQOR 5G currently has collaborative projects with some 15 higher education institutions in Quebec and Ontario. These universities institutions are in Ontario: University of Ottawa, Carleton, Ryerson, Queens, University of Toronto, Western and Waterloo. In Quebec they are: École de Technologie Supérieure (ETS), École Polytechnique de Montréal, INRS, UQAM and Université Laval, Université Sherbrooke, Concordia and McGill.



350 In Quebec and Ontario, there are more than 350 student internships that have been completed or are currently underway as part of the ENCQOR 5G program. These internships allow hundreds of graduate-level university students to participate in numerous 5G research and development projects, particularly in companies, with the support and guidance of supervising professors.

ENCQOR 5G BY SECTOR

Number of SMEs as of March 31, 2020 (total of 316)



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