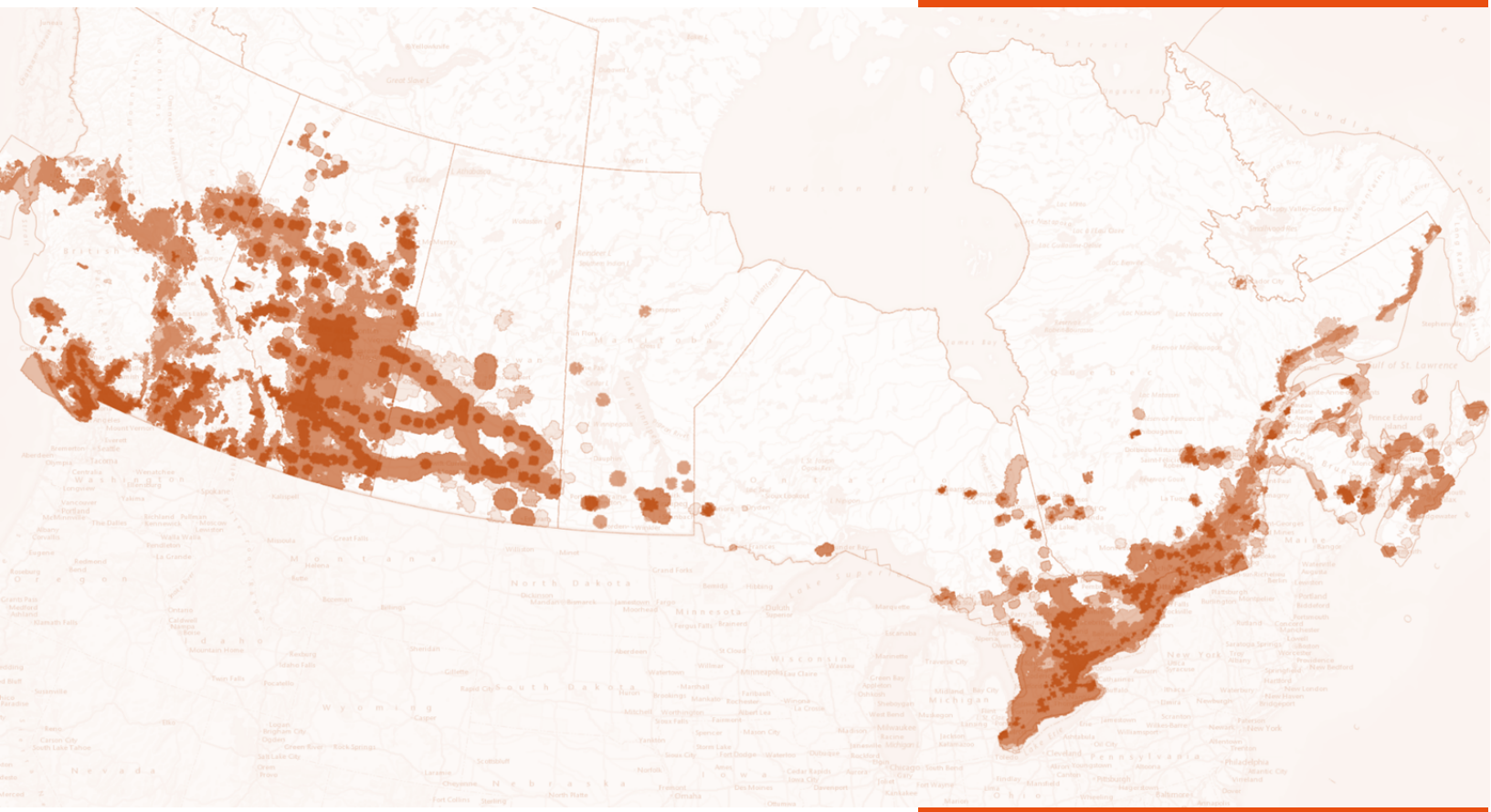
Canada's 5G Landscape - Expert Opinions

NGen



NGen 5G Advisory Group & Process

To better understand how NGen might help increase adoption of 5G across Canada, an informal advisory board was formed. The initial advisory group consisted of stakeholders involved in Canada's 5G ecosystem, see Table 1.

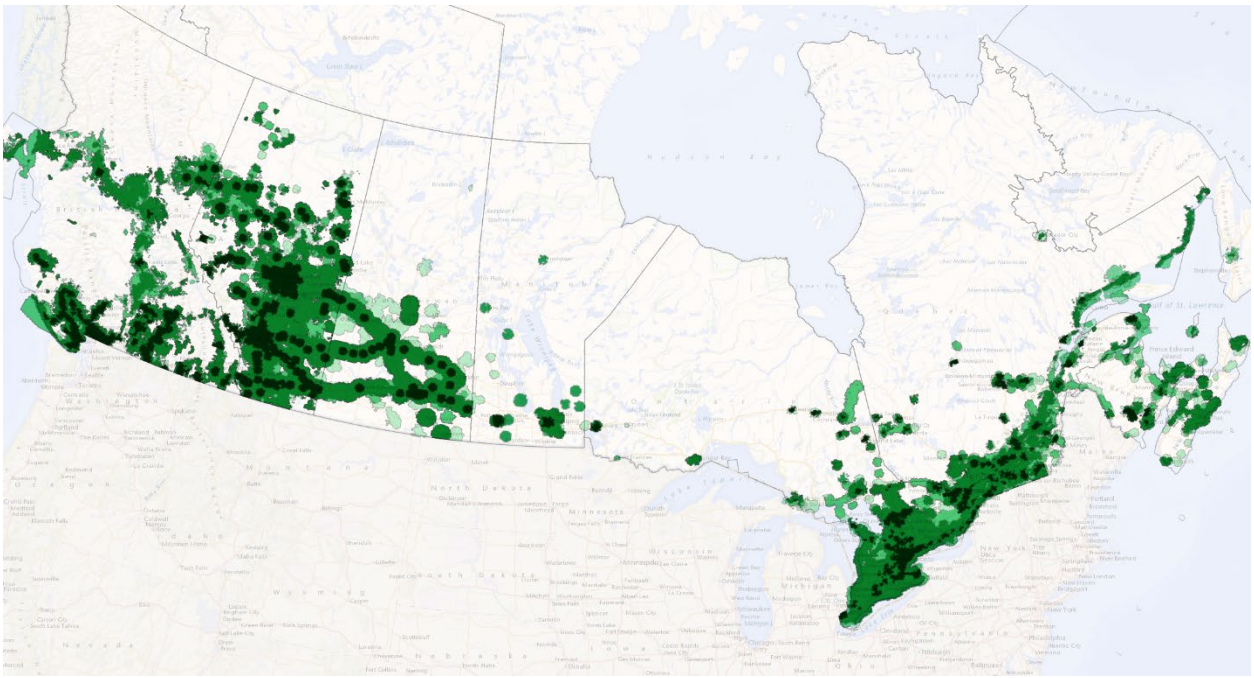
Bell – Peter Wilcox	**Rogers** - Shaun Mohammed
BlinQ Networks – Radu Selea	**Maya HTT** - Remi Duquette
AreaX.O - Divyanshu Kamboj	**Kaajenga** - David Melia
BTI – Ron Poulin	**Lemay AI** - Ryan Wallace
Ericsson – Chris Mercer	**Maya HTT** - Remi Duquette
ImagineQ – Colin Dhillon	**Wyred** - Paul Howarth
Khasm Labs – Jim Brisimitzis	**Shabodi** - Charles Nagy
NuPort Robotics - Raghavender Sahdev	**Cobionix** – Tim Lasswell
Shabodi - Harpreet Geekee	**Realogic Solutions** - Michael Richard
MetTel - Brian Baird	**Latence Tech** - Chloé Durand
Expeto - Jason Yacey	**Star Solutions** - Jack Mar
The River Coaching & Consulting - Tony Thellen	**Simply Embedded Inc. -** Chris Karaplis

Table 1 Members of NGen 5G advisory group

Two introductory virtual meetings were held (in October and November 2024). The advisory group members briefly described focus areas for their organisations. The group agreed that collaboration, as well as competition, could help increase industry adoption of 5G.

Given the diverse base of stakeholders it was decided that a survey would probably not provide useful data. Instead, one-on-one interviews, typically 30-45 minutes, were held to explore individual experiences, opinions, and any suggestions for action. This report provides brief background information (existing 5G publications could fairly be described as dense[1]) and reviews some of the findings from the advisory group interviews and discussions.

[1] The GSA (Global mobile Suppliers Association) a not-for-profit industry organization representing mobile suppliers, produced 160 reports in 2024 alone! Ericsson publishes reports regularly, as do many others in the ecosystem.



5G coverage growth across Canada from 2020-2023 (Darker is 2020, Lighter is 2023)

Executive Summary

Optimism that 5G could transform Canada's future is as uneven as cellular coverage is across the country. Government has auctioned the spectrum needed, for billions of dollars, to the big three – Bell, Rogers and Telus. Talk of the applications possible with 5G is everywhere – smart cities, autonomous vehicles, telemedicine – yet success stories while compelling are isolated, typically in mining. The cost and complexity of building, and operating, private 5G networks for industry SME's in Canada can be higher than expected based on their Wi-Fi consumer experience.

Despite these technological advancements, consumer uptake of 5G in Canada remains modest. Public perception often fails to recognize clear improvements over 4G, leading to limited demand and a lag in upgrading to 5G services. Bridging the gap between technical capability and perceived value will be critical for accelerating widespread adoption and unlocking the full benefits of the 5G ecosystem.

There was no disagreement on the unique capabilities of 5G technology. Specifically, 5G offers low latency and high speed while handling potentially millions of devices simultaneously and securely. However, there is still uncertainty about when and where these capabilities will prove irresistible either for consumers or enterprise.

“Nobody builds a private network for fun”

Background – 5G Use Cases

Three broad use cases for 5G were originally envisioned by the ITU (International Telecommunication Union, the UN agency for digital technologies) within its IMT-2020 (International Mobile Telecommunications) framework (see Figure 1).

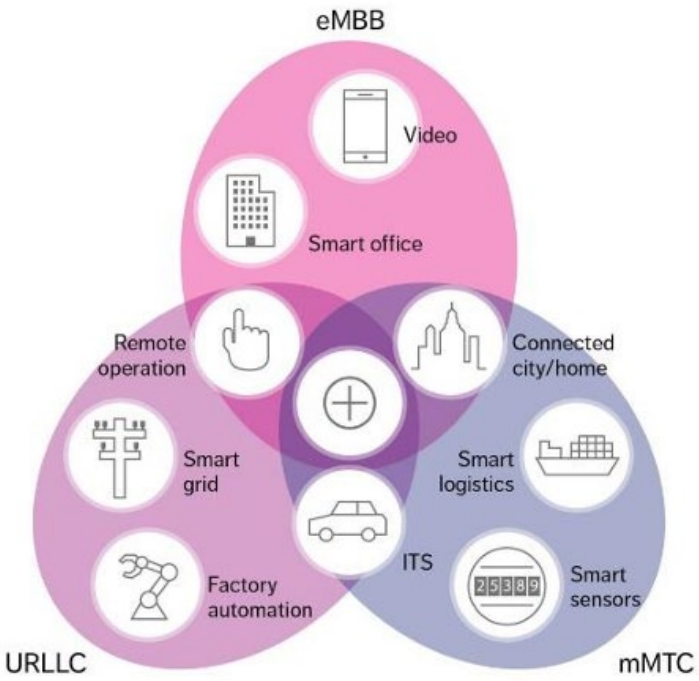


Figure 1Application areas for 5G (IMT-2020)

The first use area was Enhanced Mobile Broadband (eMBB), or immersive communication – an extension of what we do now with our mobile phones, but with even more data, faster. Think perhaps augmented reality/virtual reality as well as smart glasses vs smart phones.

The second use case is massive machine type communications (mMTC) – where everything is connected - from TV's, fridges and washing machines at home, to trains, planes and automobiles, as well as all forms of manufacturing equipment in factories. Predictive maintenance is one benefit this massive communication promises. Fed by data from IoT sensors, AI algorithms will reduce the cost of ownership and improve productivity. Think "Smart as the new Lean" for manufacturing. Higher efficiency and optimization insights

can provide competitive advantage for existing enterprises. There is also a significant opportunity for new startups to provide application development – a solution pipeline. Fundamentally new business models may emerge. Edge computing "on the premises" rather than constantly needing a bigger pipe to send all data to hyperscalers (like AWS) is a hardware and software opportunity.

The final use case in the IMT-2020 framework was Ultra reliable and low latency communication – where the speed of response and security is critical – think of vehicles and robots working alongside people where ensuring safety is paramount. This may be everything from material handling and assembly work, to coordinated fire fighting with swarms of vehicles on the ground and in the air.

The use cases have now been expanded in the IMT-2030 framework (with a note of caution that the 2020 framework use cases and technical performance parameters have yet to be fully realized.) AI appears explicitly for the first time, as part of the "connecting the unconnected" theme (see Figure 2).

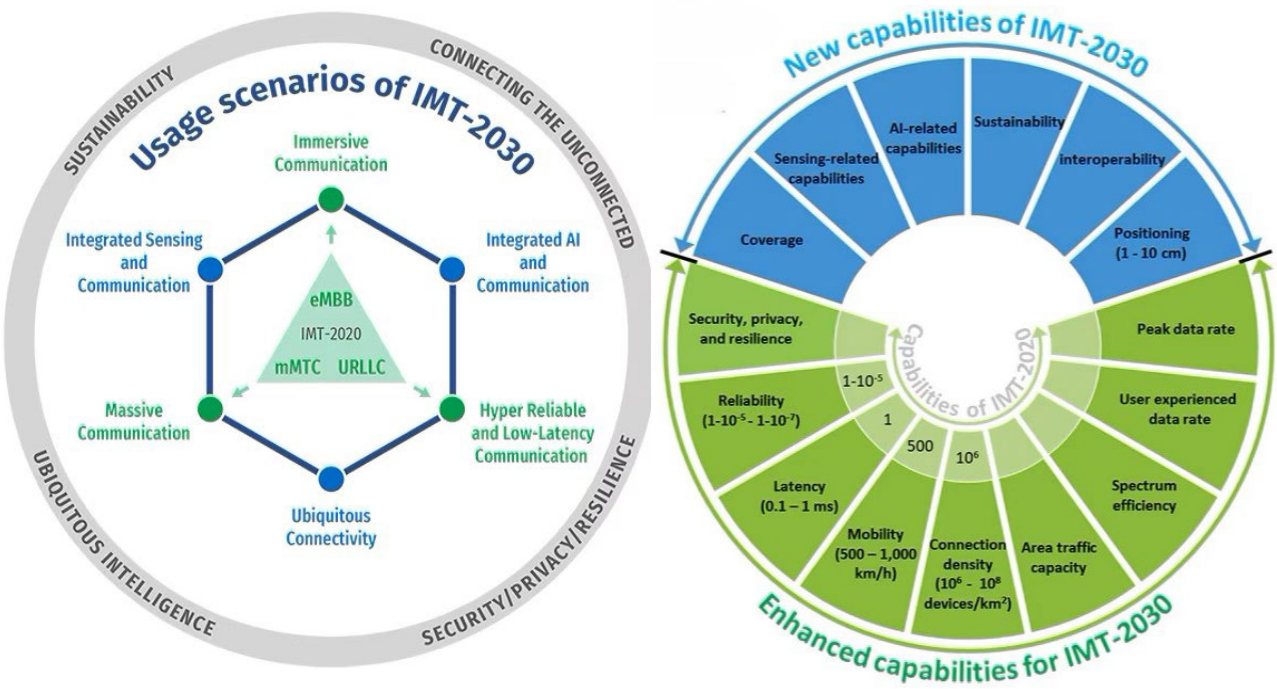


Figure 2 Expanded usage scenario for 5G (IMT-2030)

5G Adoption in Canada – By Consumers

5G may appear to offer no obvious consumer benefit - if my smartphone performance was fine before, then 5G just appears an added cost burden. The possibilities for innovation and disruption have not been well articulated, or sufficiently thought provoking.

As an example, 20 years ago we might have happily rented a DVD from Blockbuster, and streaming a movie on Netflix was only just possible – so why change? Fast forward and today why do I need even higher speeds and lower latency than 4G provides? If as consumers we do not experience the (technical) benefits of 5G then the natural assumption is that our businesses will also not need 5G. There is still an awareness gap and this a marketing weakness for 5G adoption (supported by those who argue that the Telco's focus and expertise is geared to selling more SIM cards and subscriptions to consumers.) Ericsson found in 2023 that even though 1 in 5 consumers in Canada had a 5G phone, most had not been convinced to upgrade to a 5G service.

5G network solutions for massive crowd events (sports and concerts) enable live betting and video streaming from thousands of devices. Rogers recently completed a $8m upgrade at the Rogers Centre in advance of the Taylor Swift Eras tour, to enable TB of data to be shared by fans.

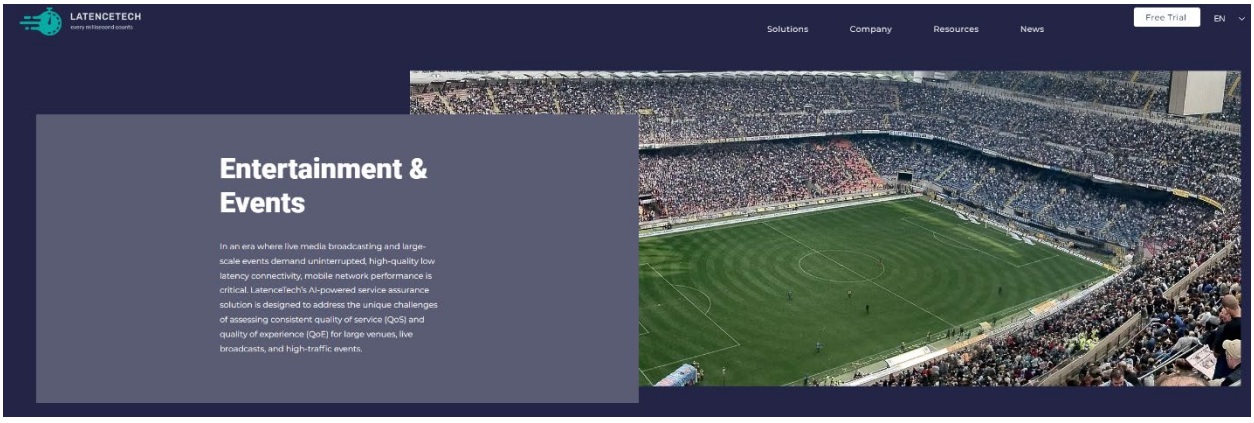


Figure 3 Huge crowd events require 5G to handle data sharing from fans

5G Adoption in Canada – By Industry

"A golden age in autonomy and AI?"

Remote control of vehicles or robotic devices requires fast feedback that Wi-Fi simply cannot provide, but where 5G excels. This is illustrated in the figure below (for a US site).

Figure 4 Wi-Fi vs Cellular comparison for 30acre industry site (Courtesy of Khasm Labs)

In Canada mining operations tend to be the poster child for 5G industry application, with drilling equipment and large trucks navigated, positioned and monitored over a 5G network. A mining operation may typically represent a $300,000/hour operation cost. Any interruption because of network blind spots or unavailability can bring the entire operation to a halt. The business case for an Ultra Reliable Low Latency 5G network is strong even with an upfront cost in excess of $1m.

"The mining industry [is] going through a major digital transformation. Since the introduction of 5G, the Canadian mining industry is leading the way in converting mines into smart mining operations," Dalia Merheb, Vice President, Head of Rogers Account, Ericsson Canada.

“For example, robots that have sensors to do LiDAR scans are sent into a mine after a blast. There are sensors on the robotic vehicle that can measure the air quality to make sure it's safe for humans to enter the mine. All this is done real time, saving lives, time, and resources. It’s sort of like the canary back in the old coal mines. If it comes out, it's safe to go in,” Merheb states.

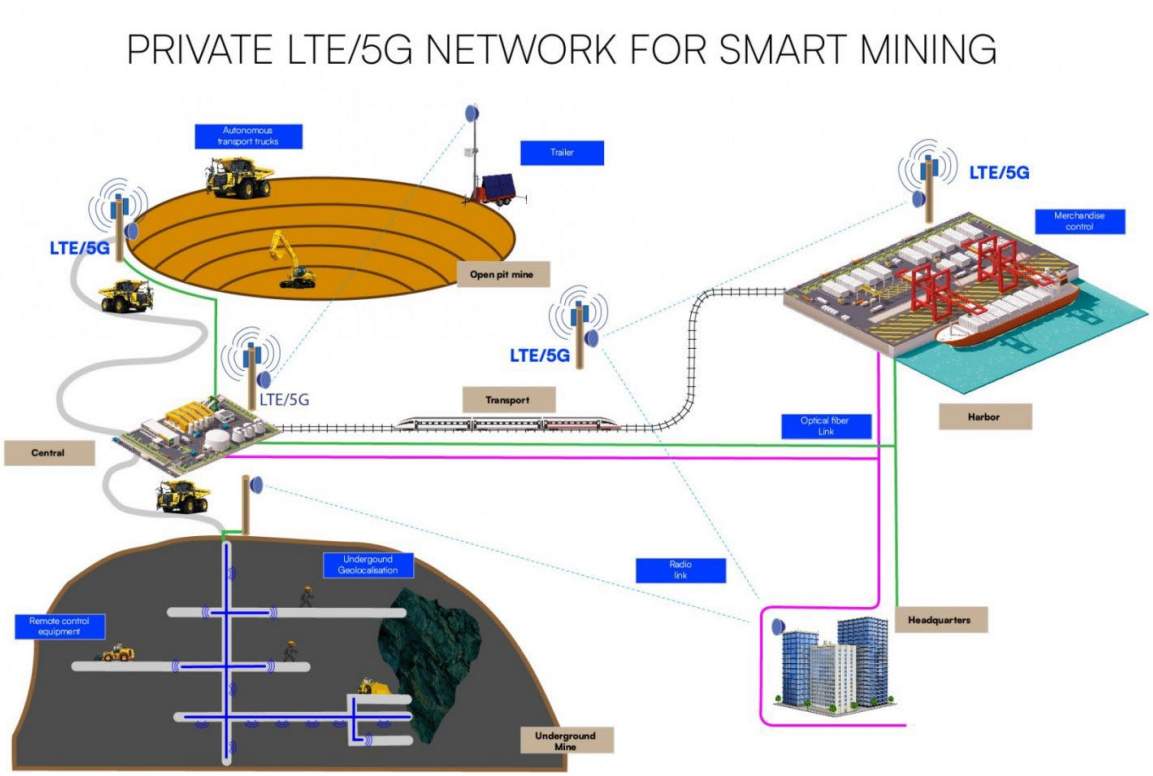


Figure 5 Illustration of 5G in mining (Courtesy of Ambra Solutions)

Mining has been a bright spot for 5G networks in Canada, so much so that Ericsson even have a cost calculator tool for this specific use case on their website!

Figure 6 Ericsson's smart mining value calculator

Many manufacturing operations take place in very large factories, with high ceilings. Installing many Wi-Fi access points quickly becomes expensive (typically $10-$15k/point) as well as disruptive with scissor lifts and electrical work for any configuration changes. For reference, a large manufacturing plant may have 1500 miles of wiring! One or two cell installations can often cover the entire plant, with security Wi-Fi can never match. Every device from a machining centre to an electric screwdriver can be connected to the 5G network with unique ID and chip-based security.

An auto manufacturer might look to use the 5G modem inside its vehicles on the production line to enable updates at different stages of the manufacturing process and based on evolution of its own software. The big stumbling block in Canada is that the manufacturer absolutely needs to control its network and the proprietary data on it. Industries like this cannot allow an external carrier to manage their network. Solutions exist within the ecosystem at both the hardware and software level, but without the right (spectrum) to manage their own networks few use cases exist.

Autonomous driving on private sites and ports is an emerging use case enabled by 5G. Trucks can autonomously maneuver around a site, accurately back up and dock to load and unload trailers, and park seamlessly, safely and efficiently. Another application is for the "middle mile" - the short-haul shuttle runs that semi-trucks make between distribution

centres, warehouses and terminals. Finally public highway autonomous operation is the current final frontier for autonomous vehicles. The Canadian trucking industry delivers 64 million shipments a year, generating more than $40 billion in revenue (Research, Statista, n.d.). At the same time, driver shortages continue to increase, with more than 60,000 trucking positions unfilled in 2019.

Figure 7 Autonomous truck with sensors (Courtesy of NuPort Robotics)

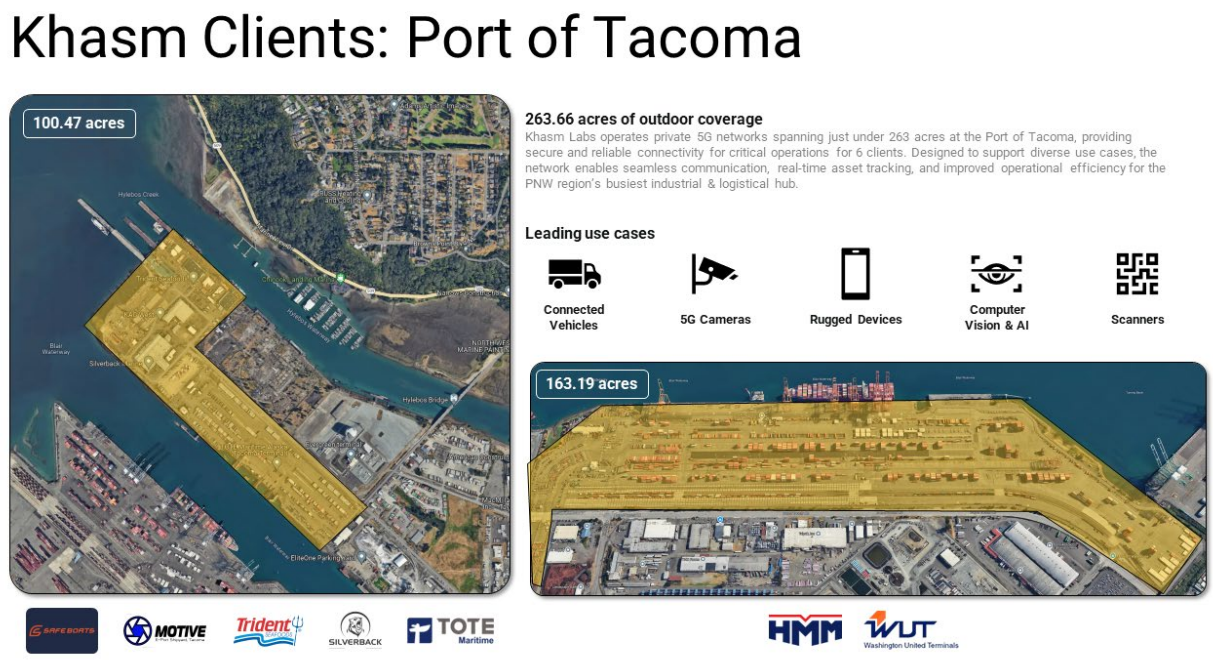


Figure 8 Port operation with private 5G network (Courtesy of Khasm Labs)

Autonomous vehicles inside distribution centres can quickly provide a big ROI providing they can efficiently operate alongside people. Material handling is perhaps the biggest driver for 5G adoption within industry. According to Interact Analysis, the market for autonomous mobile robots in manufacturing is expected to grow about 30% per year over the next five years, with an estimated market size of $6.2 billion by 2027.

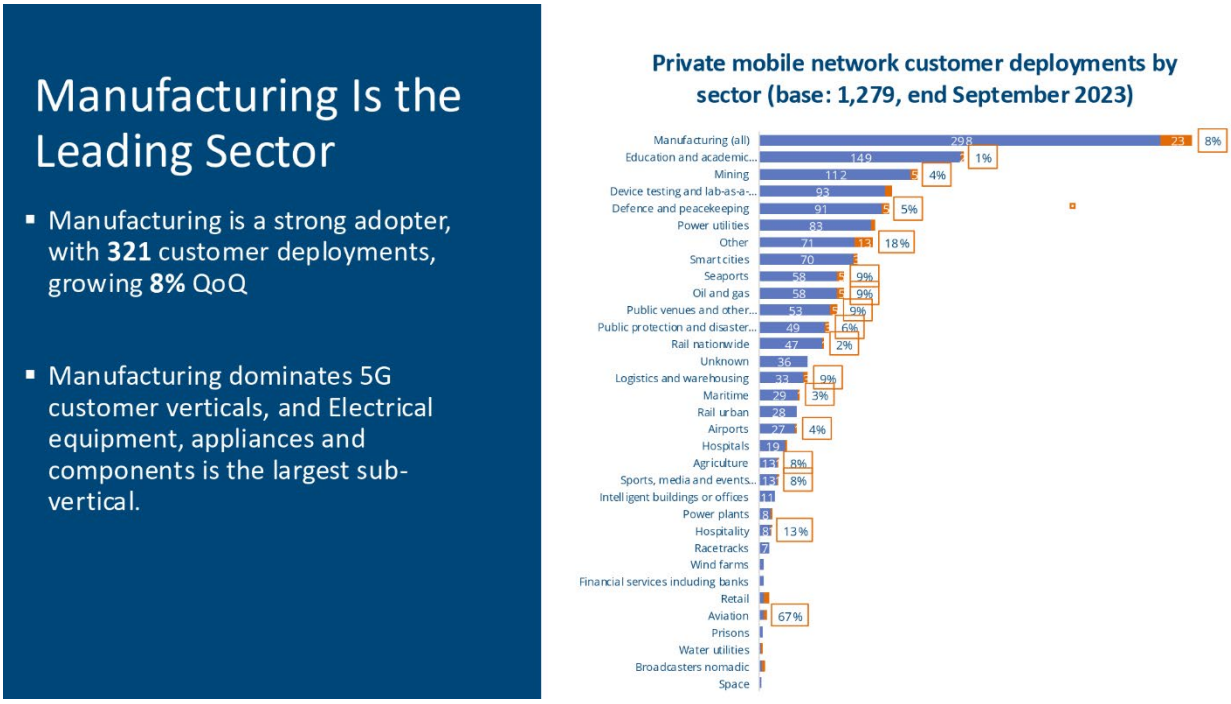


Figure 9 Private networks by sector (GSA 2024 5G roundup report)

5G for Healthcare

> *"Remote communities are underserved, they are like medical deserts"*

While the vision of everyone across Canada wearing smart health monitoring devices is still some way off (technically, economically and politically), the use of 5G to provide health care via remotely operated robots is already happening.

Cobionix is a Canadian company that has developed a robotic AI enabled platform, Codi, that can perform ultrasonic imaging in remote communities where patients might ordinarily have to be transported to another facility.

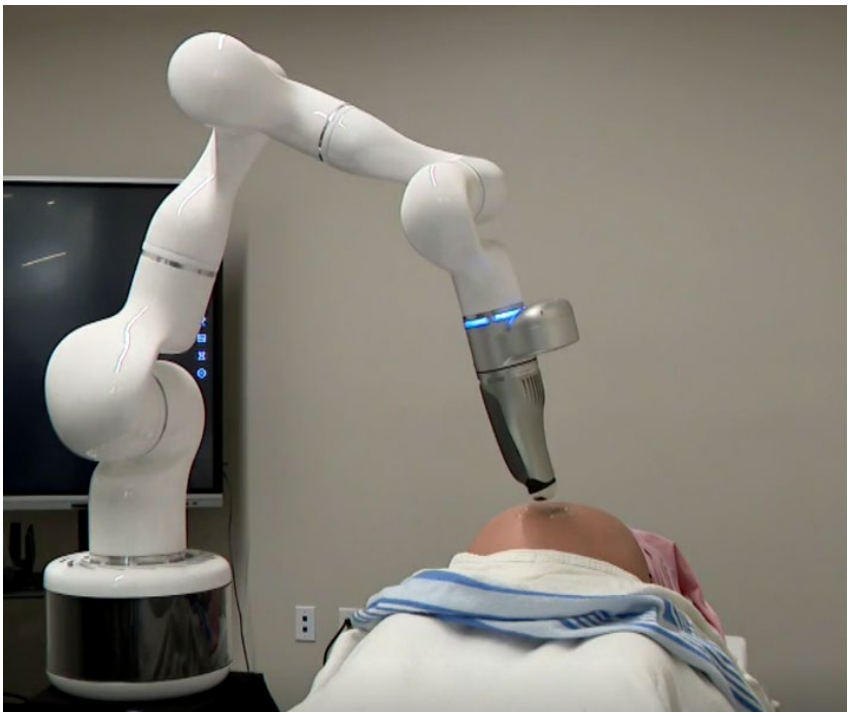


Figure 10 Medical robot capable of remote ultrasound examination (Courtesy of Cobionix)

Patient transport costs can represent a huge drain, for example Nunavut spends approximately 20% of its total budget, $25m pa, on patient transport. Remote communities will never have the breadth of expertise and equipment available in major cities. Telemedicine already allows patients to virtually conference with specialists. Telerobotics allows high impact, but low risk, procedures to be performed either autonomously or with a remote operator. The low latency of 5G is essential to provide near real time feedback from multiple devices, from cameras to force sensors. High situational awareness is now possible with the "Internet of Things" connected inside the consultation suite, with data displayed, analysed and interpreted remotely. The richness of this data is essential to build better automation and AI models that can help provide a solution to the critical shortage of trained healthcare workers. While this is a problem Canada must tackle, it is also an opportunity for our solutions to be exported. The US market is facing a massive labour shortage, so automation (productivity increase) will be essential. 5G enabled robots will allow staff to focus on higher added value tasks.

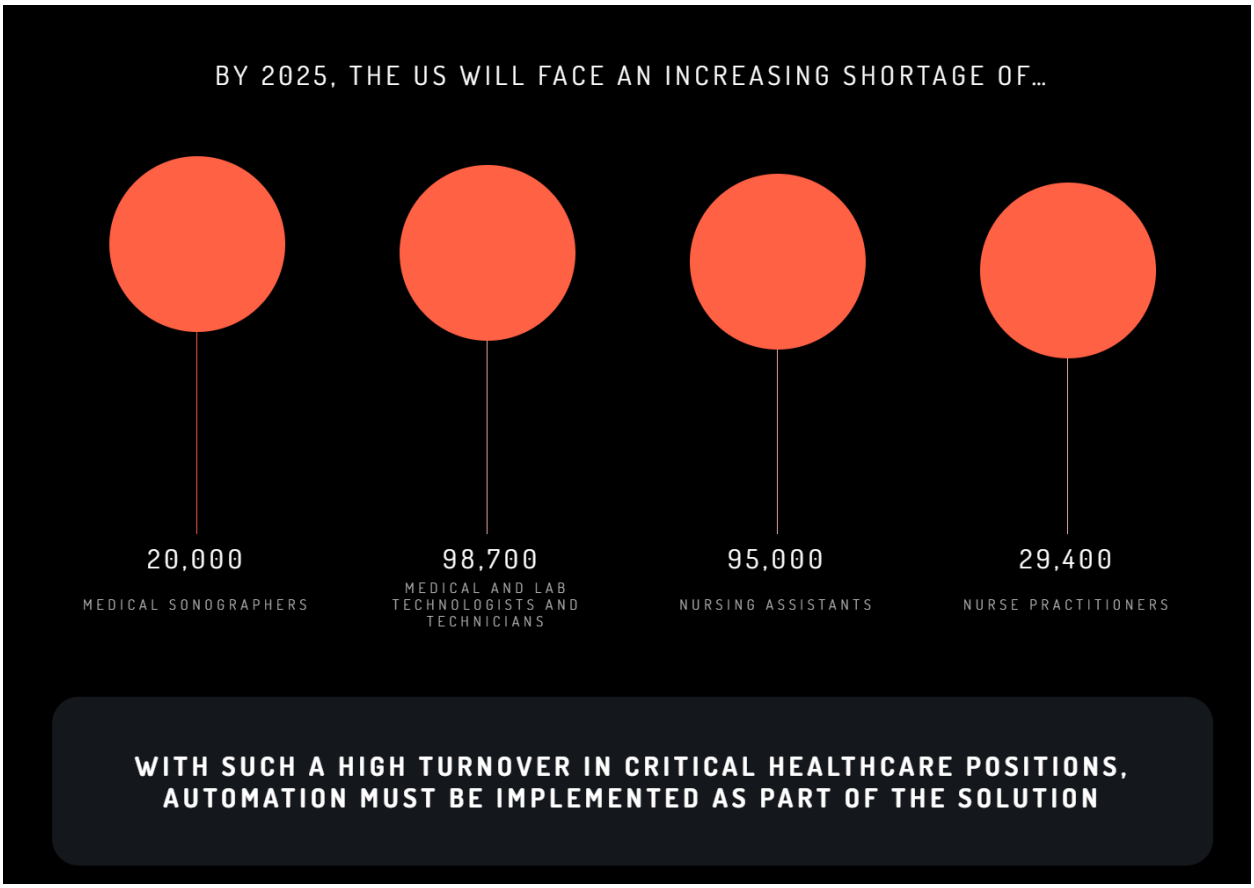


Figure 11 Predicted labour shortages in US medical sector (Courtesy of Cobionix)

Telesurgery was not regarded as a near term viable proposition due to the high risks involved and the need for many specialist support staff. Transporting robots from one remote community to another might solve utilisation issues. While these robots cannot drive themselves across country, autonomous vehicles are advancing rapidly in their capability.

Examining the 5G coverage of Canada shows that while most urban population centres have coverage, Nunavut for example has little 5G infrastructure, arguably where it is most needed to provide Telemedicine.

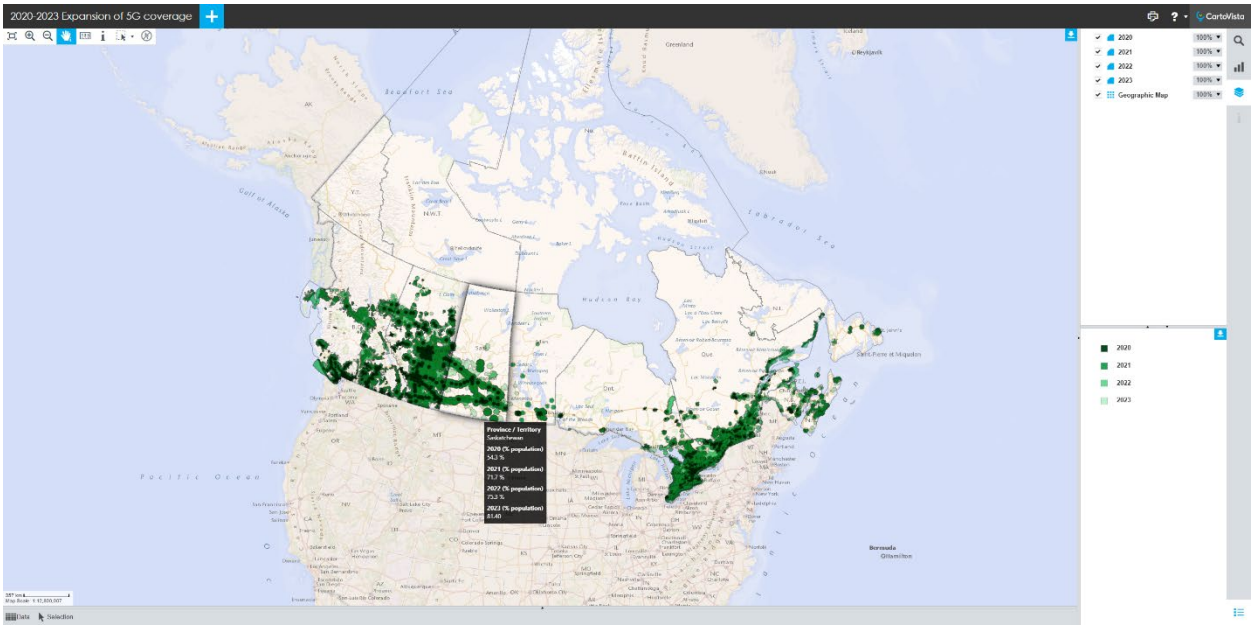


Figure 12 5G coverage is growing in most population centres (see Saskatchewan) but still sparse in remote communities

Recommendations

Short term (1-2 months)

- Release the NCLL spectrum in the 3900Mhz band (see May 14th launch date announcement below).
- Request that Canadian Numbering Administrator "CNA" release 999 99 | 999 999 as the PLMN standard for Private Networks in Canada in line with ITU-T E.212.
- Require new mobile devices provide support for PLMN 999 99 |999 999 as a condition of certification in Canada.

Medium term (3-6 months)

- Request RBAC review the technical specification to increase power limits for the use of NCL 3900Mhz. The current power limitations are too restrictive in rural and remote regions significantly reducing the number of industrial use cases
- Implement the Access Licensing framework across all Tier 5 regions that currently don't have active base station deployments.
- Change the decision on the use of 900Mhz to align with GSM Band 8 and a min channel size of 5Mhz. The current decision to follow the US standard and setting channel sizes to 3Mhz severely limits the devices and radios available to Canada.
- Establish funding and select an organization to test and certify devices for Private Network use cases.

5G Closing Thoughts

"Canadians are the worst advocators - with the best technology"

Some felt that innovation was predominantly driven by small and medium companies. Large companies could always afford to innovate, but often did not - until some disruptive event took place. The lack of competition in Canada between the big three Telcos, and the prices quoted for their 5G network solutions, were cited as barriers to adoption. An analogy offered was in the automotive market, where the established manufacturers were slow to develop electric vehicles until Tesla launched its products. However, it is unclear whether there is an EV equivalent disruption for Telcos (possibly AI is) much less "Who is the Tesla disruptor for Bell, Rogers and Telus?" Some expressed opinion that the large Telcos did not have the talent pool to exploit 5G technology, and that selling data, or simpler a bigger pipe, was not the right model. There was frustration that spectrum, "the oxygen of 5G" was not available, except for the NCL 3900Mhz band. One quote was that "The might of Canada's GDP must not come behind (Bell/Rogers/Telus) simply providing spectrum for iPhones". This echoes the White Paper from 2022 (Telus, 2022), which stated "Wasting spectrum is a cardinal sin of government spectrum management and an immense failure of policy".

Price skimming by spectrum owners means industry adoption will probably continue to be slow while the only solutions offered are complex, expensive and carrier managed. Noncompetitive licensing may offer some relief if it proves truly accessible and easy to use.

To accelerate adoption of IoT and 5G-enabled systems—particularly among early-stage solution providers—Stakeholders could explore innovative funding models that reduce upfront capital cost burden while enabling performance-based ROI over time. Many of these SME providers rely on up front spending to fund growth. They are not in a position to amortize the cost over time and this creates a cash-flow bottleneck that hinders their scalability and restricts adoption.

A creative solution could lie in the establishment of some form of public-private-partnerships where telcos, government bodies, and private funders co-develop financing programs tied to outcome-based metrics. Programs similar to those created by CIDA, The World Bank, BDC and EDC in Canada as well as Innovation Funds established to fund pioneering innovation.

These programs might include funding future payment streams, shared-savings models, or unearned revenue funding structures that defer major costs over time until optimization is achieved. By aligning incentives and distributing risk, such collaborative funding models could catalyze widespread industry adoption—particularly in regulated sectors, healthcare and smart infrastructure—where the promise of predictive maintenance, automation, and efficiency gains remains tantalizing but financially out of reach without such mechanisms.

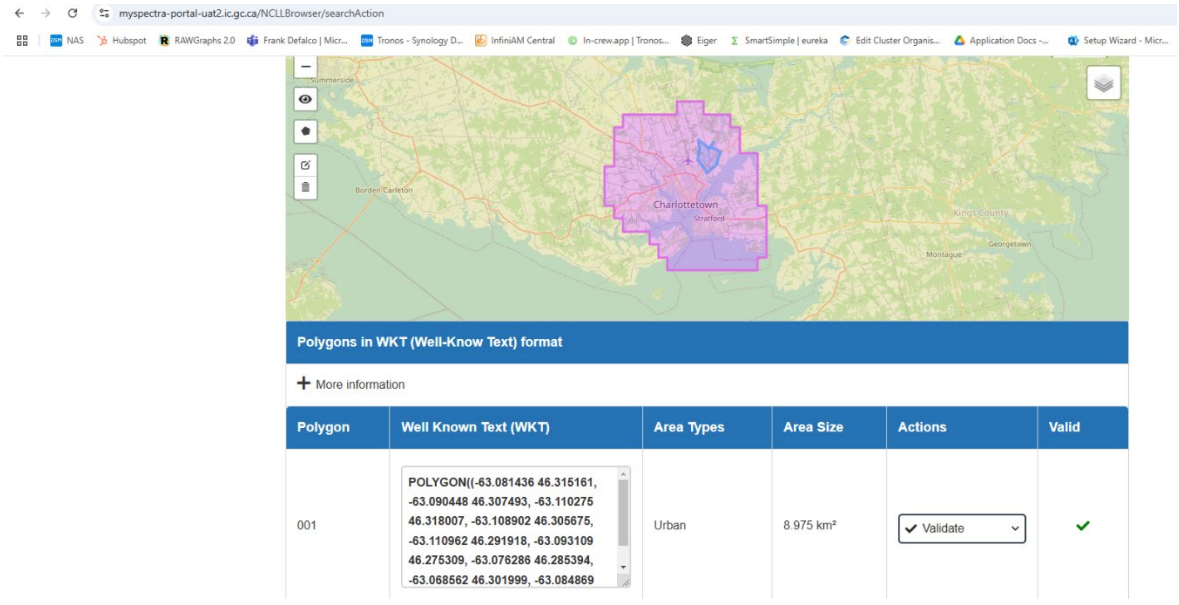


Figure 13 Beta version of Non-Competitive Licensing spectrum portal (Courtesy of ISED)

Smaller businesses being able to have a “slice of a 5G network” may be popular if it can be consumed as easily as the pizza image it conjures. But for now, the promise of 5G seems to be a glass half full story for Canada.

References

Research, Statista. (n.d.). *Trucking industry in Canada - statistics & facts*. Retrieved from Statista.com: https://www.statista.com/topics/5047/trucking-industry-in-canada/#topicOverview

Telus. (2022). *Reforming Canadian spectrum policy for 5G and beyond*.

Appendix

ISED – Spectrum Policy for Canada

Policy objective

“To maximize the economic and social benefits that Canadians derive from the use of the radio frequency spectrum resource.”

Enabling guidelines

a. Market forces should be relied upon to the maximum extent feasible.

b. Notwithstanding (a), spectrum should be made available for a range of services that are in the public interest.

c. Spectrum should be made available to support Canadian sovereignty, security and public safety needs.

d. Regulatory measures, where required, should be minimally intrusive, efficient and effective.

e. Regulation should be open, transparent and reasoned, and developed through public consultation, where appropriate.

f. Spectrum management practices, including licensing methods, should minimize administrative burden and be responsive to changing technology and marketplace demands.

g. Canada's spectrum resource interests should be actively advanced and defended internationally.

h. Spectrum policy and management should support the efficient functioning of markets by:

    - permitting the flexible use of spectrum to the extent possible;
    - harmonizing spectrum use with international allocations and standards, except where Canadian interests warrant a different determination;
    - making spectrum available for use in a timely fashion;
    - facilitating secondary markets for spectrum authorizations;
    - clearly defining the obligations and privileges conveyed in spectrum authorizations;
    - ensuring that appropriate interference protection measures are in place;
    - reallocating spectrum where appropriate, while taking into account the impact on existing services; and
    - applying enforcement that is timely, effective and commensurate with the risks posed by non-compliance.

Spectrum as an economic driver and enabler of Industry 4.0: Spectrum is essential in all aspects of life, from enabling the use of personal communication devices to playing a growing role in the Internet of Things (IoT). Spectrum is a key component of Industry 4.0's trend towards automation and massive data exchange in manufacturing technologies in order to increase productivity, improve process efficiencies and enhance decision making.

Competition and wireless affordability: Since 2008, the Government of Canada has advanced a number of initiatives to promote a more competitive wireless market that offers consumers a wider range of choices at more affordable prices. One such initiative is the use of pro-competitive measures in spectrum auctions to provide regional and smaller operators with the opportunity to acquire the spectrum they need in order to offer competitive wireless services. For example, the Government reserves a portion of the

spectrum available at auction for a certain subset of entities and/or limits the amount of spectrum a single provider can acquire in a given band or bands. These pro-competitive measures have been instrumental in supporting the emergence of strong regional competitors that provide Canadians with greater choice and more affordable mobile services.

ISED will continue to support competition so that Canadian consumers and companies can maximize the benefits they derive from wireless technologies.