A Signal for Innovation

Business Case to Improve Mobile Broadband in Eastern Ontario

EXECUTIVE SUMMARY

EOWC
Eastern Ontario Wardens' Caucus

EORN
EASTERN ONTARIO
REGIONAL NETWORK

Executive Summary

People increasingly access the internet – and connect to the world – through smartphones, tablets and other mobile broadband devices. They expect to access online content anywhere, anytime, and on any device. In order to participate in this universally connected world, rural Eastern Ontario needs a robust network of both fixed and mobile broadband. Today nearly one-sixth of rural Eastern Ontario is in a cellular "dead zone" – meaning there are homes, businesses and major roadways with no cell service at all. In 2014 the Eastern Ontario Wardens' Caucus tasked the Eastern Ontario Regional Network (EORN) to investigate the requirements to address this cell gap.

In response, EORN is proposing a $213 million public-private initiative that would build on its high-capacity, fibre-optic backbone network to help close the gap in cellular services. This will keep products and services that create prosperity moving across the region and keep Eastern Ontarians connected to the world – at home, at work and on the road.

In addition, EORN is proposing to combine the commercial infrastructure build with construction of a dedicated cell network for first responders, for a combined project value of $299 million. Combining a Public Safety Network with the regional commercial cell gap project will save $47 million compared to building them separately.

The Eastern Ontario Warden's Caucus (EOWC) passed a resolution on January 6th 2017 to identify the cell gap project as its number one priority for 2017: "Supporting the improvement of cell networks to ensure mobile broadband services and increased public safety." See additional Municipal Council resolutions of support in Appendix G.

Meeting Cell Needs – Today and the Future

Mobile broadband demand is growing by leaps and bounds. More people are using devices to run apps that require greater bandwidth, such as streaming HD video. Globally, mobile broadband services grew by 20% in 2014, faster than any other information and communication technology.[1] Data traffic from smartphones, tablets, mobile PCs and routers is forecast to increase nine-fold between now and 2020.[2]

To assess cellular needs, EORN commissioned four independent studies, including: an engineering cell gap analysis, costing study, cell market analysis and economic impact study. These studies looked at current services as well as forecasted growth by existing carriers, including their plans to expand the 700 MHz spectrum.

Even with forecasted growth, EORN's research demonstrates that not only is there a gap in geographic coverage, but existing and planned networks aren't robust enough to meet increased demand from mobile broadband activity. **Eastern Ontario needs both coverage and capacity** to thrive as a region.

[1] http://www.broadbandcommission.org/documents/reports/bb-annualreport2014.pdf pg. 19.

[2] June 2015 Ericsson Mobility Report, pg. 17.

The Impact

Investments in cellular infrastructure offer a range of benefits to the communities in Eastern Ontario, including:

Creating jobs and private sector business growth:

- Potential jobs: Over 10 years, about 3,000 full-time job equivalents.
- Potential revenues: $420 million in private sector business revenues.

Supporting key priorities of the region's Economic Development Strategy:

- Creating an integrated and intelligent transportation system.
- Supporting technological integration and innovation.

The Cell Gap

Currently in areas where there are homes, businesses or major roadways

- **18% do not have cell coverage from any existing networks**
- **40% don't have enough capacity**

By 2018

- **65% will not have sufficient capacity**

Creating stronger, more connected communities:

- **Better public services:** Delivering government and community services to sparsely populated regions is all the more difficult and costly. The use of mobile apps for service delivery, payments and the sharing of vital information such as road work, weather conditions and traffic issues can vastly improve services provided to rural residents.
- **Improved public safety:** Cell gaps are not just inconvenient – they can be dangerous in remote areas and along main transportation arteries. When an emergency strikes, communications with emergency services is critical and potentially life-saving.
- **Improved social connectivity:** Whether friends and family live next door, across town or across the world, people depend on the internet to connect to one another via social media, as well as one-to-one communications enabled by the internet via cellphones and tablets.

An engineering gap analysis, and a design and costing study, were conducted to understand the problem and develop preliminary costing estimates to address the gap. The analysis was validated by a major cell service provider through a Request for Information process, as well as a coverage drive test throughout the region.

The market analysis concluded that without significant public funding, mobile service providers would be unwilling to invest in additional infrastructure to address the gaps in coverage and capacity identified in Eastern Ontario.

EORN's proposed project design would provide coverage to a significant part of the region, and reduce the projected 2018 capacity gap to approximately 5%.

The proposed network design would cost approximately $168M to address the coverage gap, with an additional $35M to address the future capacity gap, and $10M (about 5%) for EORN management costs, for a total project cost of $213M.

While EORN's design analysis has focused on the deployment of LTE technologies, we recognize that newer technologies and methodologies including 5G may be introduced during the timeframe of the proposed project. We expect our partners to introduce these potential evolutions into the network when appropriate.

In addition, we hope to be able to leverage and participate in work being proposed by the Governments of Ontario and Québec in their proposed 5G-next generation networks initiative. Part of the Memorandum of Understanding[3] for this program references "support the building of infrastructure for a next-generation functional network over the next 5 years in the provinces of Ontario and Québec".

Public Safety Broadband

The Government of Canada has identified the need for a national Public Safety Broadband Network and has allocated a block of 700 MHz spectrum. There is potential synergy for a combined commercial and public safety broadband network build. Design for a standalone network in Eastern Ontario will cost approximately $133M, but if combined with a commercial build could result in savings of $47M.

As part of our analysis, EORN has identified four major players in the Public Safety Broadband environment:

- the **Regulators** – responsible for defining the governance and licensing conditions for a Canadian Network, such as Innovation, Science and Economic Development Canada (ISED)
- the **Network Infrastructure** – the builders and potentially owners of the physical infrastructure (Regional Access Network- RAN) required to provide the services of PSBN
- the **Operators** – those who will operate the PSBN as defined by the governance models and conditions of license
- the **Users** – those who will use the PSBN including but not limited to Fire, Police, Paramedic, Public Works, and potentially Utilities

There are many factors in play with the Public Safety Network as discussed later in this document, and as such EORN is recommending a phased approach to the build, with Phase 1 completing the Commercial Cell Gap project. Once some of the public safety variable factors stabilize, we would start on Phase 2 adding on a mobile infrastructure for a Public Safety Broadband Network. This combined project would cost approximately $299M.

This project can only successfully address the coverage and capacity gaps if there is a combination of public and private funding. It is also expected that a significantly higher percentage of public funding will be required for the Public Safety component, as there is little to no return on investment for the private carriers.

[3] Memorandum of Understanding Regarding a Common Engagement in Building the 5G-Next Generation Networks. October 26,2016

Recommended Solution

Given the importance of the commercial mobile project to Eastern Ontario, the synergy with a Public Safety Broadband infrastructure build, and the short-term ambiguity associated with governance and service delivery, EORN is recommending a two-phase approach. Phase 1 would consist of a commercial build addressing first coverage and capacity. Phase 2 would build of the Regional Access Network part of a PSBN and would commence once the factors affecting governance and service delivery have been addressed.

This project can only be successful in addressing the coverage and capacity gaps if there is a combination of public and private funding, with contributions from federal, provincial and municipal governments. It is also expected that the public safety component will need a higher percentage of public funding, as there is little to no return on investment for the private carriers.

Phase 1: Commercial Cell Network Addressing the Gap

Phase 1 would focus on improved mobile coverage and capacity targeted at residents and businesses. This would be done in two parts, with an initial build (Phase 1A) focused on coverage of the designated populated areas for both major carriers of Rogers and Bell. The second part would focus on capacity. The second part (Phase 1B) would begin after we reach the majority of our coverage goal and complete a subsequent capacity analysis that focuses on actual coverage and current demand.

EORN's experience with its previous fixed broadband project was that both industry and EORN underestimated the actual demand that would be in place four years after the project had completed. It would have been useful to have had funds to address this gap. This is why we are planning the cell project in two parts.

Additionally, as part of our lessons learned, it is important to be flexible with respect to the changes in technology. In our original backbone project, the use of WDM technology, introduced early in the design and build process, instead of the original quoted technology saved more than $12M. The introduction of LTE technology as part of the last builds in our fixed wireless access allowed earlier introduction to some customers of the speeds over twice that originally planned for the network. We must be prepared to introduce 5G or other technologies into the project as they become available.

From a funder's point of view, the second part of funding could be released after a pre-defined stage of Phase 1A has been completed.

As part of this phase, assuming that a Public Safety Network will eventually be built, the network design will accommodate public safety requirements, including potential allocation of space on vertical real estate, use of multi-band antennas, and redundant architectures. Building a robust commercial network will provide data capability for Public Safety users until a PSBN can be implemented.

The capacity costing assumes a 100:1 OSR, but this could be reviewed after we reach the majority of our coverage goal.

Cell Gap	Funding
Phase 1A Coverage	$167,794,223
Phase 1B Capacity	$35,029,536
EORN Costs	$10,141,188
Total	**$212,964,947**

Phase 2: Public Safety Broadband Network

Once the factors affecting the Public Safety Broadband Network governance and associated issues have been resolved, and if it was still appropriate, EORN would start the addition of the Public Safety specific infrastructure to the overall build.

On the assumption of Phase 1 being completed or underway, there are no new tower builds just for the Public Safety Network. The potential exception here may be the 15% contingency replacement of existing public safety towers that are structurally inadequate to handle public safety infrastructure.

The funding for Phase 2 assumes Phase 1 is fully funded.

Phase 2 : PSBN	Funding
Phase 2	$81,983,020
EORN Costs	$4,099,151
Total	**$86,082,171**

Total Project Funding Summary

In summary for a full project build:

EORN Project	Funding
Phase 1A Coverage	$167,794,223
Phase 1B Capacity	$35,029,536
Phase 2	$81,983,020
EORN Costs	$14,240,339
Total	**$299,047,118**

We expect a public private partnership, with contributions from all parties. One potential model sees an equal one-third contribution from each for the Phase 1 Commercial Cell project broken down as below:

Partners	Phase 1 Contributions
Canada	$71 M
Ontario	$71 M
Mobile Carriers	$71 M
Total	**$213 M**

With the addition of the Phase 2 PSBN project, we see Federal and Provincial governments taking on the significant part of the PSBN overlay with contributions as below:

Partners	Phase 1 & 2 (PSBN) Contributions
Canada	$114 M
Ontario	$114 M
Mobile Carriers	$71 M
Total	**$299 M**

Conclusion

The Eastern Ontario Regional Network has developed a thoroughly researched and evidence-based solution to address the pressing gap in cellular services across the region.

It's critical to take action, given the exponential growth in the use of high-speed internet, more often accessed by mobile data plans. Cellular dead zones are an economic threat and a public safety risk. Eastern Ontario cannot compete and succeed without this basic and essential telecommunications service.

The market failure in Eastern Ontario is well-established. Private sector cellular carriers can't and won't invest in expansions that do not deliver sufficient financial returns. Unless governments step forward to change the economics of rural broadband access, these regions will be left behind.

In addition, EORN recommends economies of scale that would make a Public Safety Broadband Network more affordable and feasible. Current public safety communication systems across the region are aging and need replacement at significant cost. Providing a regional solution is logical from both a financial and interoperability basis. Across North America, the need for first responders to communicate in real-time and seamlessly is widely understood.

EORN's solution is based on the strong foundation it built with its initial broadband network – both the physical networks it created, and the professional and technical expertise it gained in leading a successful public-private partnership. That original partnership eventually generated a total $264 million in public and private investment and increased access to more than 90% of the region. EORN will apply the strategic planning and management lessons learned from that project to this new initiative. It is also leveraging the 5,500-kilometre fibre optic backhaul network that was the backbone of its first project to further expand mobile data.

The CRTC has recognized that high-speed internet, both fixed and mobile, is a basic service that should be accessible to all Canadians. EORN's proposal can serve a key role in helping to achieve these goals.