Northern Connections
Broadband and Canada's Digital Divide

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The Public Policy Forum is an independent, not-for-profit organization dedicated to improving the quality of government in Canada through enhanced dialogue among the public, private and voluntary sectors. The Forum's members, drawn from business, federal, provincial and territorial governments, the voluntary sector and organized labour, share a belief that an efficient and effective public service is important in ensuring Canada's competitiveness abroad and quality of life at home.

Established in 1987, the Forum has earned a reputation as a trusted, nonpartisan facilitator, capable of bringing together a wide range of stakeholders in productive dialogue. Its research program provides a neutral base to inform collective decision making. By promoting information sharing and greater links between governments and other sectors, the Forum helps ensure public policy in our country is dynamic, coordinated and responsive to future challenges and opportunities.

ACKNOWLEDGEMENTS

OUR PARTNERS

* The views expressed in this report do not necessarily reflect those of the Government of Canada

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EXECUTIVE SUMMARY

Introduction

More than 120 years ago, in a small town in British Columbia, a railroad tycoon named Donald Smith hammered the last spike in the Canadian Pacific Railway, linking Canada from the Pacific to the Atlantic with a great ribbon of wood and steel. At the time, many said the project was folly: too expensive, too bold, too difficult. Yet the dreamers behind that tremendous feat of engineering never wavered in their vision of what the railway would achieve: the opening up of a continent, the end of geographic and economic isolation, and the physical uniting of a great nation. This vision moved closer to its realization some decades later, when a vast network of telephone wires, followed by a system of interprovincial highways and roads, further shrank the distances between farm, town, and city.

In the 21st century, high-speed Internet is removing the last remaining obstacles to the free flow of business and ideas, connecting not just east and west or south and north, but linking Canada to the rest of the world. Robust, reliable broadband — and a population that can access it with minimal barriers — allow innovation, creativity, and economic diversification to flourish. Better connectivity promotes equality, improves delivery of public services, enhances transparency and accountability, and reinforces democracy by opening communication channels between governments and their citizens. It exponentially increases the growth potential of sectors such as tele-health, distance education, and e-commerce.

Around the world, countries have implemented national broadband strategies to ensure that their people and companies are in the best possible position to compete in the global economy. In March 2014, Canada released its own digital strategy, which outlines federal government objectives to move towards more competitive prices, faster connectivity, better consumer choices, and support for Canadian businesses to adopt digital technologies. However, while connectivity in many parts of Canada is at an all-time high, economically disadvantaged and geographically remote areas are increasingly being left behind. Nowhere is this digital divide more glaring than in the North.

Despite the North's immense economic, political, and cultural value, it experiences significantly higher internet costs and slower connectivity speeds than the rest of Canada. The situation is exacerbated by infrastructure challenges that make many systems outdated, unreliable, and vulnerable.

Broadband is as important to our present and future as the railway was to our past. If Canada is going to realize its full potential, the digital divide between North and South must be bridged.

The importance of northern connectivity

Today, almost every aspect of social and economic development is inextricably linked to digital connectivity. This is especially true in geographically isolated communities, where the Internet provides vital social links and access to health services and education opportunities. Many of the solutions being proposed to develop the resources and address the chronic socio-economic issues of Canada's North rely on robust, high-speed Internet.

The causes and consequences of poor connectivity in the North are well understood. Several recent reports have documented the technological and economic challenges of improving broadband in Canada's three territories and other northern regions. Extensive public consultations by the Canadian Radio-television and Telecommunications Commission (CRTC) over the past two years have further focused attention on the North's telecommunications needs, including investment models. In its recently-completed "holistic review", the CRTC stated:

> *"Investing in transport upgrades is an important priority for telecommunications development in the north, and … such investment is required for economic development and to meet the growing demands of northern customers for access to services such as health care, education, government programs, and banking".*[1]

Connectivity can also be a great equalizer for Aboriginal Canadians. It can be a tool for First Nations, Inuit, and Métis people to spread awareness of issues critical to their communities, and to be involved and represented in decision-making beyond their immediate communities. It can also ensure that indigenous voices, cultures, languages, and history can be shared with all Canadians.

Our approach

To consider where stakeholders might best focus their attention and efforts to improve northern connectivity, Canada's Public Policy Forum convened two multi-sector, leadership-level roundtable discussions in Whitehorse and Iqaluit, followed by an executive briefing in Ottawa. Participants included leaders from the three territorial governments, the federal government, the private sector,

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[1] CRTC Telecom Regulatory Policy 2013-711, published December 18, 2013

The Internet can open doors to education, linking northern schoolchildren with classrooms and researchers in southern Canada, as in the *Connected North* pilot project │Photo: Cisco Canada

Aboriginal organizations, and other groups. They were asked to consider a few key questions, including:

- Considering the findings and recommendations of recent studies and reports, is there space for more collaboration among the private sector, regulators, governments, Inuit/First Nations/Métis organizations and communities?
- If yes, what might this collaboration look like? What organization(s)/departments is/are best suited to help lead these efforts? Is the current distribution of roles and responsibilities among various levels of government and entities efficient?

- Among the recommendations put forward in recent studies, which *specific* policies and actions from each of the sectors show the most promise for achieving greater broadband access in the North, in terms of cost, capacity and quality comparable to service enjoyed by most Canadians living in the south?

Throughout the discussions, we discovered a strong desire for authentic collaboration. Participants agreed on the value of working together, speaking with a common voice, and bringing attention and perspective to an issue that is critical to the long-term health and prosperity not only of our northern communities, but Canada as a whole. There was also consensus that any solutions, strategies, or action plans to improve broadband in the North will require stronger partnerships among all sectors.

CHALLENGES, PRIORITIES, AND RECOMMENDATIONS

Discussions at the roundtables and at the executive briefing were thoughtful and frank. Participants identified a few overarching challenges and agreed on several recommendations for consideration and action (summaries of the meetings in Whitehorse and Iqaluit can be found in the appendices):

Challenge: Canada urgently needs a clear, ambitious vision to improve high-speed Internet access and affordability in the North.

Recommendations:

- The recently-launched federal Digital 150 strategy highlighted the importance of broadband connectivity and laid out several promising initiatives. However, this vision could be expanded to encompass bolder aspirations. One goal could be to position Canada, including the North, as a place with world-class infrastructure to attract investment.

- Northern stakeholders at the territorial/provincial, municipal, and community level should explore and develop smaller-scale, local solutions that can feed into and bolster a broader Canadian vision.

Challenge: Because of its scale, the challenge of northern connectivity requires more concerted collaboration and investment from all sectors.

Recommendations:

- Participants agreed that the sheer scale of the northern connectivity challenge means that the best approach will be to tackle initiatives collaboratively, with private, public and community sector stakeholders leveraging and contributing their expertise. A first step would be a better understanding of what each sector can contribute.

- Adopting a "shopping-mall" strategy that identifies anchor tenants/heavy users, and obtaining long-term commitments from them, will provide a solid foundation for growth and investment.

- As the heaviest bandwidth users in the North, all levels of government need to clearly identify and explain to citizens how they can use broadband to improve services, the economy, health, and wellbeing. This will help providers better understand user requirements

and shape their partnership approaches accordingly. At the same time, participants noted that plans should be flexible and scalable to address tomorrow's unknown needs and possibilities.

- Peering—the practice of networks sharing an infrastructure backbone and exchanging user traffic freely and for mutual benefit—was cited as one promising approach that would balance the need for a collective "greater good" in the North with industry's imperative to remain competitive and profitable. Private sector leaders are encouraged to provide more clarity on what incentives and conditions could help facilitate peering. Open access arrangements, where fair access to the network backbone is provided at the wholesale level, could also be explored and evaluated.

- The public sector should consider reviewing various P3 models for applicability in the northern broadband context.

Challenge: Uncertainty and confusion around government policies and the regulatory framework need to be resolved, as they will have a significant impact on future options for connectivity initiatives in the North.

Recommendations:

- The federal government should work closely with all stakeholders to determine how the $305 million announced in the 2014 Federal Budget to improve Internet access will be allocated. Participants believed that this is also an opportunity for territorial/provincial and local governments to articulate their preferred parameters for the funds; for example, whether the allocation process needs to be competitive and "vendor-agnostic".

- It will be critical for the federal government to prioritize a short-term fix to address the upcoming end of several key programs for northern Internet initiatives. These funding "cliffs" are looming in 2016-17, so a solution needs to be in place soon to ensure stability and confidence in affected regions.

- The CRTC needs to review its Basic Service Obligation to include broadband. Building on recent work, it could also undertake further assessment of regulatory frameworks to support small and regional providers, ensuring a level playing field for all telecommunication companies.

- Natural resource companies should consider including broadband in their impact benefit agreements with Aboriginal groups.

- Access to computers and digital literacy present significant challenges for many northerners, especially in impoverished Aboriginal communities. Public policy solutions could consider options such as public access points, education and training, and subsidies for low-income users.

Challenge: A lack of clear leadership.

Recommendations:

- The federal government might consider identifying a single federal lead/champion for broadband. This would result in greater clarity around policy and funding responsibility, and would echo the single-window approach adopted for resource investments in the North. It would also provide the direction needed to promote and coordinate the desired collaboration among the many stakeholders. In addition, a single department/agency lead could realize efficiencies for the federal government in engaging with northern stakeholders on a broad range of issues.

- More needs to be done to engage First Nations, Inuit, and Métis organizations to take a leadership role on broadband issues in their communities. They understand best and have valuable knowledge about what their community or region actually needs. Broadband solutions and initiatives may also be more sustainable if indigenous leaders are engaged.

Challenge: An absence of data, benchmarks, and evidence that clearly demonstrate the social and economic impact and benefits of broadband on northern communities.

Recommendation:

- Identify reliable sources of statistics and non-anecdotal data to help stakeholders build strong business cases demonstrating the economic and social benefits of improved broadband access.

Conclusion

Canada is at a tipping point in technology development and adoption. Now is the time to be lofty in our goals and ambitious in our expectations, or we run the risk of being left behind in the global race for competitiveness.

Participants in this project made one thing clear: the advantages and benefits of improved broadband in the North will not only flow one way. As the lessons of history have taught us, we all prosper when we are able to access ideas, experiences, innovation, leadership, and talent from every part of the country. The North has as much to contribute to the wealth of the South as the other way around.

With collaboration, innovation, and a focused strategy, we can achieve improved outcomes not only for the North, but for Canada as a whole.

Connectivity in a cold climate: satellite dishes in Eureka, Nunavut | Photo: Wes Gill

Appendix 1 – Whitehorse Summary Report

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Whitehorse roundtable
February 13, 2014

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Overview

Canada's Public Policy Forum convened private, public, non-profit and academic sector leaders in Whitehorse to explore best practices, policy solutions, and collaborative actions that may help improve broadband access and affordability in the Territories. Public Policy Forum Vice President Julie Cafley moderated the discussion. Terry Hayden, Assistant Deputy Minister of Economic Development for the Government of Yukon, provided opening contextual remarks. Michèle Beck, Vice President of Telesat Canada, presented a wrap-up of the discussion.

Participants engaged in opinionated, insightful, and respectful dialogue on the following broad themes:

Demand aggregation and other approaches to stimulate private sector investment in broadband:

Participants agreed that relying on market forces alone won't solve the broadband challenges in the North, and therefore demand aggregation is seen as very important for the region.

Aggregation is already driving efficiency in some areas, particularly in satellite-dependent Nunavut. Most participants expressed their support for seeking ways to expand and enhance the practice of serving smaller communities by taking advantage of the demand in larger centres. However, many warned that introducing aggregation must be done carefully so as not to disrupt the market. Some participants noted that pooling demand can harm competition and limit consumer choice, and that the northern economy needs more diversification, not less. The question was asked why big players such as Telus, Shaw, and Cogeco are not in the North, and what would be needed to change their minds. On the other hand, achieving true competitive parity in the North is complex, and inconsistent aggregation practices could result in have and have-not communities.

Several participants spoke about the need to adopt a "shopping mall" approach to aggregation: secure a large anchor tenant to attract more development and investment. This anchor for broadband already exists, with government being the heaviest user in the North. Participants spoke of the need to sign long-term (minimum 10-year) internet-use contracts with government departments to create a stable, reliable foundation for further growth.

Most participants supported the principle of open-access broadband (whereby the incumbent company that owns the infrastructure backbone provides its competitors with access), but cautioned that subsidization may be required if this approach is to be sustainable over the long term.

Several participants noted that aggregation does not have to be limited to merging population centres. Bandwidth sharing, time zone and time-of-day aggregation, pooling the purchasing power of large anchor tenants such as governments and industry, and increasing and diversifying use of the CANARIE network, were all cited as other examples. Aggregating needs not only within the territories, or along the East-West axis, was also mentioned as a potential approach. For example, the digital landscape of Nunavut has much more in common with northern Quebec than with Yukon; it makes

sense to explore synergies North-South, between provincial and territorial regions with similar needs. Cultivating a vibrant northern IT sector, fostering its overall interests, and developing a more robust and diverse IT ecosystem—from ISPs to hardware suppliers—were also seen as an essential part of an overall aggregation vision.

Apart from competition issues, participants mentioned the sheer diversity of the North as another challenge to aggregation. Widely divergent digital literacy rates, income levels, access to computers, and the presence or not of schools and small businesses, were all cited as affecting aggregation interest and suitability among communities.

Finally, all participants said that, in the end, someone will have to pay for aggregation—but who that should be is not clear. There was hope expressed that the $305 million announced in Ottawa on February 11, 2014 in Budget 2014 to expand connectivity in rural and remote areas will include some federal funds to address aggregation.

Options for increasing collaboration among the private sector, regulators, governments, Inuit/First Nations/Métis organizations and communities:

Participants all agreed that the broadband problem is too big for one entity to solve by itself, and that collaboration is essential. It was repeatedly noted that broadband should not be viewed as the destination, but as a step on the journey towards a better economic and social future for the North. High-speed internet access is essential to education, quality healthcare, youth engagement, jobs, infrastructure, and overall quality of life. In general, people don't care about technology, but about what it can do to improve their day-to-day lives. This is why it is crucial to have all partners at the table.

Some remarked that the North has opportunities and advantages for collaboration that don't exist in the south, in part because partners and competitors are often the same. Some de-siloing is occurring, but more needs to be done to accelerate this process.

It was suggested that, at least in Yukon, First Nations groups have been too quiet on the issue, waiting for broadband infrastructure to come to them, and in some cases denying access to providers to their lands. Several participants, including some from First Nations communities, said that Aboriginal development corporations need to step up and take a more active role, as they hold significant capital and because technology and cost parity are important to First Nations communities.

There was a strong desire to see more engagement from small business, an important end-user for broadband. Participants suggested small business owners could advocate for improved broadband access through their local MP or MLA, chambers of commerce, and associations.

All the participants cited the lack of a national strategy or vision for broadband as one of the biggest stumbling blocks to solving connectivity issues in the North. There was some difference of opinion among participants over whether action would be more effective if initiated from the bottom up, or mandated from the top down. Some argued that interested parties in the territories should not wait for a federal strategy. For example, it was suggested that First Nations, municipalities, and small businesses could come together to develop local plans and communicate them from their MP up to the federal level. Needs could also be enunciated on a sectoral or regional basis. However, other participants indicated that there does not have to be any conflict between grassroots action and high-level strategy, and that a sustainable, long-term broadband solution needs both.

Participants emphasized the need for all sectors to collaborate on providing facts, leveraging strengths and identifying success stories, to counteract the impression many in the South have of the North as an unattractive place to invest. The collective narrative should focus on how connectivity can help attract more top global talent, human resources, and entrepreneurs to the North. Part of this story should be that the knowledge economy represents excellent return on investment: it experiences constant growth and doesn't cycle like mining or tourism. Another point that Northerners need to emphasize is how much wealth the region generates for the rest of Canada—the "social bargain" with the South is often forgotten.

A corollary was given of the push to bring long-distance telephone service to rural Canada in the 1920s. Telephones in the city became more valuable because they could connect to phones in small towns. To overcome public trepidation about potential costs, connectivity needs to be framed as being valuable to urban centres because it allows them to interact with rural and remote ones—the benefits do not only flow one way.

Again, participants agreed on the importance of building a healthy internet ecosystem, not just focusing on one technology or end-user.

The need for a federal champion for broadband--which organization/departments should lead these efforts?

There was broad consensus that advancing broadband policy and practices in the North would be greatly simplified if the issue had a designated "home" within the federal government. The number of federal departments involved in the issue, with none leading or coordinating, is seen as frustrating, inefficient and wasteful of resources, creating redundancy and confusion.

The example was given of how, in the 1990s, the federal department then known as Human Resources and Social Development became the home for HR issues in Canada, even though many other departments and organizations were involved. It was suggested that a similar model would help advance the broadband agenda, not only in the North but across the country.

Although nobody questioned the urgent need for a single federal champion, there was some debate as to which entity would be most appropriate. Many participants indicated their preference for CanNor and the Minister for the North to take the reins. However, some noted that not all of Canada's North lies within the territories, and that if this approach were adopted, many regions with almost identical challenges to those of the Yukon, NWT and Nunavut—for example, Labrador, northern Alberta and northern Manitoba—would be left behind because they do not fall under CanNor's mandate.

Some participants felt that the CRTC should lead, but others cautioned that it would be problematic for the regulator and the champion to be one and the same. Others mentioned the CRTC's limited powers: although it plays an important role, it does not traditionally develop or set policy.

Industry Canada was cited as another logical champion. There was broad support for Industry to eventually take over the broadband portfolio, as this would eliminate concerns over CanNor's region-specific focus and the CRTC's potential conflict of interest.

One participant remarked that at the provincial level, Quebec has placed its internet strategy under the responsibility of its Treasury Board. Many participants found this high-level approach intriguing, saying it might be worth exploring at the federal level.

Specific policies and actions that show promise for achieving greater broadband access in the North, on a level of cost, capacity and quality comparable to service enjoyed by Canadians living in the south:

The following solutions and actions received the broadest endorsement from participants:

- A national, 10-15 year digital strategy, one with a clearly enunciated vision and that invests in broadband at OECD levels.
    - Vision needs to go beyond individual consumers to larger economic and innovation ambitions, positioning Canada, including the territories, as a place with world-class infrastructure to attract investment.
    - Strategy should set policy objectives and national, per-household download/upload speed targets. Then assign one minister and several DMs to lead/coordinate. Plan can be implemented regionally or by sector (healthcare, education, resource development).
    - Plan needs to come first, then look at funding models, including P3s, money from resource sector, etc.
    - Ideal vision should also address internet literacy, to eliminate gap between tech haves and have-nots.

- Identify a federal lead/champion for broadband, whether exclusively for the North or pan-Canadian. Coordination can't continue piece by piece. Champion can facilitate identification of grassroots needs.

- Adopt the "shopping-mall" strategy: identify anchor tenants/heavy users (government departments, industry) and obtain long-term commitments. This will provide a solid foundation for growth and attract investment.

- As the heaviest user, the public sector needs to more clearly identify and explain its broadband needs and state its vision for the kind of society to which Northerners can aspire, to obtain buy-in from the public. The education sector has done a good job of this, but others, such as health and justice, have not. Too much of the conversation is happening at the IT level, not at the visionary level. The public needs to understand that the real value for money is in improving doctor services, for example, not social networking or streaming videos. These individual consumer benefits should be viewed as by-products of a digital strategy, not the end goal.

- Improve alignment and communication between territorial/municipal needs and federal focus. Stakeholders can provide inspiring stories for politicians to tell.

- Define parameters for how the $305 million announced in the federal Budget 2014 to improve connectivity will be spent. Stakeholders need to promote and explain their needs, as Ottawa will be looking for suggestions for allocation. This includes identifying savings, making business plans, and telling success stories.

- The CRTC recently announced a revision of the Basic Service Obligation. Need to define what the revisions seek to achieve, what are the desired economic development outcomes, etc.

- Review regulatory framework to better support small, regional providers.

- Promote closer collaboration between industry and government (including the regulator) to implement solutions.

- Include broadband in impact benefit agreements between natural resource companies and Aboriginal communities.

Appendix 2 – Iqaluit Summary Report

Iqaluit roundtable
March 13, 2014

Overview

Canada's Public Policy Forum convened private, public, and non-profit sector leaders in Iqaluit to explore best practices, policy solutions, and collaborative actions that may help improve broadband access and affordability in the Territories. Participants represented interests and organizations in Nunavut and the Northwest Territories (for a list of roundtable participants, see Appendix). Public Policy Forum Vice President Julie Cafley moderated the discussion. Dean Wells, Chief Information Officer for the Government of Nunavut, provided opening contextual remarks. Mike Aumond, Deputy Minister of Finance for the Government of the Northwest Territories, presented a wrap-up of the discussion. Participants engaged in opinionated, insightful, and respectful dialogue around the following broad themes:

A vision for northern broadband:

To launch the discussion, each participant was asked to describe what goals could be achieved for broadband access in the North. These opening statements were ambitious, and included:

- Northerners will enjoy broadband access at comparable service quality and rates as Canadians in the south.
    - The North will adopt a policy of open broadband access, allowing local market competition to flourish and leading to greater innovation and better pricing for communities.
    - Solutions will be sustainable, scalable, and designed not just for today, but for the future.

- The North will be a productive, full participant in the global digital economy:
    - Northerners will be able to easily import content while exporting their ideas, knowledge, human capital, creativity, innovation, and energy, enriching the national and global marketplace.
    - Small and medium enterprises will be able to maximize their potential.
    - The North, and by extension Canada, will attract more investment and be able to compete in international markets.

- Northerners will enjoy improved health and well-being through broadband.
    - In the near future, the North will be remote, but no longer isolated.
    - High-quality education and distance learning will become a reality.
    - Northern communities will see the elimination of financial and literacy barriers to internet adoption.

Opportunities/challenges around collaboration

Participants agreed that the broadband problem is too big for one sector or region to solve by itself, and that collaboration is essential. Northerners don't lack ideas for solutions, but success will be more likely if they can establish vigorous partnerships. Although the North has limitations, particularly in staffing and capacity, it also has tremendous strength in its capacity to draw on regional

commonalities and shared challenges to develop universal solutions. However, participants stated that more leadership is needed from all sectors to improve and advance collaboration.

Participants cited the lack of a national strategy or policy for broadband as one of the biggest stumbling blocks to solving connectivity issues in the North. A long-term plan for Canada is essential. At the same time, it was noted that the territorial governments need to be more proactive in identifying and articulating their needs and goals.

The following issues were discussed in greater detail:

Aggregation
Some participants agreed that more work can be done to identify and encourage "anchor tenants"— heavy users that accelerate aggregation by providing a stable base for other customers. Understanding the needs and behaviours of anchors, as well as knowing how much they are willing to pay, will allow for longer-term planning. It was suggested that building one or more regional data centres, potentially constructed as P3s between the territorial governments and industry, might create the right customer mix for more cost-effective aggregation. Under this scenario, anchors would have to buy into allowing their capacity to be directed to other users when they don't need it, for example during off-peak time periods. However, if governments are going to participate, they need to be confident that their data will remain secure. Some viewed aggregation as problematic. There were questions about how to obtain public access to private networks.

Industry peering
The lack of "peering" in the private sector was identified as a barrier to change and a source of frustration. Peering occurs when networks share an infrastructure backbone and exchange user traffic freely and for mutual benefit. When networks are interconnected, the system becomes much more powerful, and everyone benefits from increased redundancy, lower cost, and faster speeds. The reluctance of companies to undertake peering in the North appears to be rooted more in business culture than in concrete economic or technical impediments. The example of SaskTel peering with Bell in Saskatchewan, with both companies overcoming their competitive differences to jointly improve service for their customers, was cited as a good case study from which to learn.

A more active role for First Peoples
Participants felt strongly that more should be done to encourage First Nations, Inuit, and Métis organizations to help provide local communications services. They understand what is actually needed on the ground and bring valuable knowledge about what is appropriate for their community or region. In Nunavut, it was noted that more Inuit engagement and ownership is needed if broadband solutions are going to be sustainable.

The need for a federal champion: which organization/department should lead the broadband file?

There was broad consensus that advancing broadband policy and practices in the North requires a designated lead within the federal government. The "federal family" is perceived as being difficult to penetrate from the outside, and the lack of clarity around the federal government's broadband vision was once again mentioned as an impediment to progress. It was noted that although a lot of public money is being spent on various technology and broadband initiatives, it is often difficult to determine how, and to what effect. Northern stakeholders want a clearer policy framework for how funding is delivered.

Participants described the success of CanNor's Northern Projects Management Office (NPMO), which coordinates federal efforts around environmental and regulatory review processes for major resource development projects. NPMO serves as a "single window" to several federal departments and agencies, and has greatly simplified information-sharing and administrative processes for industry, communities, and territorial partners. A similar approach would be welcome for telecommunications issues.

Although nobody questioned the urgent need for a single federal champion, there was some debate as to which entity would be most appropriate. Some participants indicated their preference for CanNor. However, it was noted that not all of Canada's North lies within the territories, and that if this approach were adopted, many regions with almost identical challenges to those of the Yukon, NWT and Nunavut—for example, Labrador, northern Alberta, and northern Manitoba—would be left behind because they do not fall under CanNor's mandate.

Industry Canada was cited as another logical lead, as the department is perceived as the champion for promoting the role of technology and innovation in Canada's future. There was broad support for Industry to take over the broadband portfolio.

Designating Infrastructure Canada as the lead was seen as problematic for several reasons. The department's Strategic Infrastructure Fund, which supports broadband projects, will sunset in 2017. This Fund also invests in many different types of infrastructure, from wastewater to roads, and not just broadband, Northern communities feel they shouldn't be forced to choose between clean water and faster internet. Keeping broadband separate from other infrastructure funding is preferable.

Next steps: two opposing views

The discussion on how best to move forward was centered on two distinct approaches. Some participants said it is preferable to first consult with stakeholders to understand their broadband needs and desires, and then design and build a system based on their feedback. This is the "user requirements" approach commonly used in IT; it would include defining the current landscape of the Northern economy and identifying future goals and opportunities.

Others advocated for the "build it and they will use it" approach. This group noted that if you ask people what they want, they only consider their immediate needs. But if they are presented with advanced tools, they will find innovative, unpredictable ways to use them. An example was given of a Nunavut internet service provider that launched expecting to sign up 2,000 customers over several years, yet it achieved that target within a few months. It was also pointed out that broadband in the South wasn't built according to the results of a narrow needs assessment, and the North should not be treated differently. Any solution should be flexible and scalable enough to address tomorrow's unknown possibilities.

Promising policies and actions for achieving greater broadband access in the North:

The following solutions and actions received the broadest endorsement:

- Canada urgently needs a digital strategy, if not nationally then at least for the North. Territorial or regional strategies should not be developed in a vacuum. A plan for improving northern broadband would include roles and responsibilities, peering and collaboration, and an examination of subsidies that sustain competition.

- The Federal Government needs to work closely with the territories and provinces, Northern municipalities and communities, and industry to determine how the $305-million announced in the 2014 Federal Budget to improve internet access will be spent. Territorial and provincial governments must seize this opportunity to clearly articulate what they want. The funding allocation process needs to be competitive and vendor-agnostic.

- Designate a single federal department to take the lead on broadband issues. A single-window approach would provide greater clarity around policy and funding responsibility.

- Include broadband as part of the CRTC Basic Service Obligation.

- Funding for broadband in the three territories needs to be in excess of the infrastructure capital costs. Operating costs such as heating, electricity, repairs and maintenance are higher than in the rest of Canada.

- A long-term vision is required, but so is a short-term fix for the looming 2016 and 2017 "cliffs" for government funding programs. A post-2016 solution needs to be in place soon to ensure stability and confidence in the affected regions.

- While awaiting a national strategy, explore smaller-scale, local solutions. These should focus not only on making it easier to download content, but also to upload. The North has much to teach and share with the rest of Canada; the advantages of improving broadband do not only flow one way.

- Promote closer collaboration among industry, governments, communities, and local Aboriginal organizations to find and implement solutions that are sustainable, culturally appropriate, scalable, and designed with a view to the future. Stronger leadership and commitment are required from all the sectors to improve collaboration.

- Facilitate peering among telecom providers. This would be best achieved through incentives.

- Continue the dialogue through more frequent meetings similar to the Public Policy Forum roundtables. The federal government, the territorial governments and the private sector need to agree on a road map for action to improve broadband.

- Identify sources of statistics and data to help stakeholders build strong business cases demonstrating the economic and social benefits of improved broadband access.

Appendix 3: Background report

Introduction

Broadband connectivity is one of the greatest enablers for economic diversification, growth and service delivery, with enormous potential in sectors such as e-commerce, tele-health and distance education. A 2009 World Bank Study found that for every 10% increase in broadband penetration, there is a positive economic impact to gross domestic product (GDP) in the range of 1%. Higher internet speeds are also reported to increase positive economic impact by another 0.3%[1]. Several studies in developed and developing countries have validated the positive contribution of broadband to job creation[2].

Globally, many countries are embracing the opportunities presented by broadband and initiating national broadband strategies, acknowledging that if they are going to be competitive they need infrastructure in place now. This has translated into different approaches, from vast state-run and state-funded initiatives to public-private partnerships to the establishment of crown corporation-type entities.

In 2001, the National Broadband Taskforce mapped out a strategy for how Canada could provide broadband services to businesses and residents in every Canadian community by 2004, with a particular focus on First Nations, Métis, Inuit, rural, and remote communities. The report noted roles and responsibilities for government, the private sector and communities. Since then, significant progress has been made in connectivity through a combination of private sector investment, technological innovation, and targeted government funding programs (see below for examples). However, growth has been faster in urban areas, where it is much more economical for the private sector to invest.

As noted in a July 2013 report by the Working Group on ICT Development for the Senior Officials Working Group in the North, "services [in the North] tend to be unreliable, expensive for the consumer and the quality of service is often inferior to similar offerings in southern Canada."[3]

This connectivity gap is particularly worrisome when one considers the important contributions of the northern territories to Canada's economy and national sovereignty. A 2011 report by GE Canada notes that "given the ample evidence that businesses operating in remote communities are making an important contribution to Canada's total GDP, and offer uniquely powerful growth dynamics, many people felt that governments should revisit stereotypical views of the value for money of remote community infrastructure, in terms of net benefit to Canada's economy as a whole, and not only in the local communities"[4]. It is important to note many of the proposed solutions to help address isolation and socio-economic issues in Canada's North rely on robust higher-speed Internet.

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[1] Qiang, C. Z., & Rossotto, C. M. (2009). Economic Impacts of Broadband. In *Information and Communications for Development 2009: Extending Reach and Increasing Impact*, 35–50.Washington, DC: World Bank

[2] International Telecommunications Union (April 2012) *The Impact of Broadband on the economy*, Switzerland, ITU

[3] Working Group on ICT Development for the Senior Officials Working Group In the North (July 2013) *Pan-Northern Minimum Broadband Standard*

[4] GE Canada (2011) *Towards a Remote Communities Investment Strategy for Canada*, General Electric

The Northern broadband conundrum is increasingly being recognized. Recent reports have documented the various technological challenges and opportunities. Canadian Radio-television and Telecommunications Commission (CRTC) public consultations over the past two years have also focused attention on northern telecommunications needs. Existing investment models for the North do not come close to matching the rapid pace of increasing change and convergence in the South.

Indeed, to underscore this gap, in its recently completed "holistic review" of the North's communications needs, the CRTC stated in Telecom Regulatory Policy 2013-711 of December 18, 2013 ("TRP 2013-711"):

- *"Investing in transport upgrades is an important priority for telecommunications development in the North, and … such investment is required for economic development and to meet the growing demands of northern customers for access to services such as health care, education, government programs, and banking".*

As of December 2013, Canada remains the only G8 country without a national broadband plan. As a result, the territories have been developing solutions in isolation[5] or in a piece-meal fashion. The absence of a comprehensive communications infrastructure strategy, coupled with a lack of long-term funding (current public investment programs are scheduled to expire in 2016), is viewed by many stakeholders as a barrier to long-term planning.

If, as the OECD notes, 'all types of regions, not just urban, contribute to national performance[6]', we have a vested interest in acknowledging the impact unequal access is having on communities in the North, and what the public and private sectors can do to help close the gap.

Broadband infrastructure and policy in the three territories: an overview

Infrastructure and connectivity challenges are not uniform across, or even within, territories. The Northwest Territories (NWT) has a mixture of land-based (cable) and satellite services. In Yukon, all communities except one are served by cable. But while Whitehorse and Yellowknife have close to service parity with each other (in speed, latency and affordability), more remote communities have significantly poorer connectivity than the capitals. As a result, they also have limited access to e-health and distance education, which has a significant effect on social welfare. Meanwhile, Nunavut communities, including Iqaluit, are entirely satellite-dependent, with limited options for infrastructure development.

It is important to note that there is a difference between access, affordability and adoption. While many communities may have broadband access, bandwidth availability and affordability are separate, but critical, factors for a population to fully enjoy the benefits of the Internet. In addition, there are differences of opinion among stakeholders about how to decrease the cost of backbone connectivity and improve competitiveness in the Northern markets.

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[5] Northern Communications and Information Systems Working Group (2011) A Matter of Survival: Arctic Communication Infrastructure in the 21st Century, Government of Canada
[6] OECD (December 6 2011) *OECD Regional Outlook 2011: Building resilient regions for stronger economies*, OECD Publishing

Yukon

The Yukon is supported by a combination of fibre, microwave and satellite backbone links. For local access within communities, DSL (Digital Subscriber Line – over telephone lines) is available to over 90% of households. Despite the more advanced state of telecommunications technologies, particularly in the main population centres, available average Internet speeds have lagged behind the rest of Canada, and consumers pay more for services with less capability (40% more for 5 Mbps—the minimum download speed target set by the CRTC).

The structure of the network backbone in the Yukon hurts service reliability. All traffic flows through Whitehorse, and many communities are served by non-redundant links, meaning there is no backup in case of failure. A failure in Whitehorse can bring down service in the entire territory, as occurred in 2012[7].

Broadband speeds in the Yukon can support basic applications such as email, social networking, and online banking, but cost and available capacity become issues for data-heavy activities such as public service delivery, distance education and training, e-health, and research.

The Yukon, like the other territories, is serviced by a dominant provider of backbone connectivity services. This is seen by many as a barrier to affordability, accountability, and innovation.

Northwest Territories

In NWT communities that are served by a fibre backbone to the South, as of December 2013, DSL Internet was available at 5Mbps download and 512Kbps upload. Retail pricing is much higher than in Southern Canada. A one-month download limit of 80GB at 5Mbps costs $89.95, compared superior packages costing around $60.95 in the South.

The NWT also has 10 satellite-reliant communities which have no year-round road access, complicating availability of medical, education and government services. To assist in improving access, the Government of NWT has implemented certain measures and is considering additional options to provide improved satellite coverage (described on page 9).

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[7] http://yukon-news.com/news/phones-fail-across-territory

*Basic Service Objective: the minimum level of service that a provider should fulfill, mandated by the CRTC

Table 1: Territorial comparisons[8]

	Speeds available – 2012 (% of pop. with coverage)			Technology	Cost of monthly subscription*	Coverage – 2012 (%)		
Download speed range (Mbps)	1.5-4.9	5-9.9	10+			*Type*	*North*	*Canada*
Yukon	99	90	61	Fibre, microwave and satellite	$79.95 (90GB cap, 16Mbps/768Kbps)	Wireless	70.4	99.4
NWT	91	85	42-50	Some microwave and fibre 10 satellite reliant communities	$59.95 (20GB)	HSPA +	51.9	99.1
Nunavut	99	29	0	Satellite only	$80.00 (10GB, 1.5Mbps)	LTE	36.7	72.0

*As at January 16, 2014 - 100Mbps per month

Nunavut

Nunavut is the most disadvantaged of the territories in terms of telecommunications services, and the gap continues to widen. Nunavut is several generations behind the rest of the country in its telecommunications infrastructure. While much of Canada has access to 4G wireless services, few Nunavut communities have even 2G. Iqaluit recently saw a 4G launch, and the two other regional capitals, Rankin Inlet and Cambridge Bay, are also slated to upgrade to 4G.

Nunavut experiences network failures due to lack of redundancy. Only nine communities out of 25 have redundant access to a second satellite (Anik F3), should the primary satellite (Anik F1) fail (this is discussed in greater detail below).

Internet users in Nunavut suffer from chronically insufficient bandwidth and high pricing[9]. Availability and affordability of broadband service is important for consumers living in satellite-dependent communities[10]. The CRTC noted in TRP 2011-711 that *"… the cost of satellite transport is the single biggest impediment to affordable Internet services in satellite-served communities in the North."* Merely leaving connectivity expansion up to market forces is unlikely to ever meet Nunavut's needs. The high cost of doing business and low population density mean that a solution is unlikely without a broader Northern broadband strategy.

Current strategies to improve services in the North will not reinforce the overall network survivability and reliability in satellite service areas, which affects all of Nunavut, and promise to deliver only

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[8] Government of Canada (2013) CRTC Communications Monitoring Report 2013: http://www.crtc.gc.ca/eng/publications/reports/policymonitoring/2013/cmr.htm
[9] Nunavut Government (8 July, 2013) *Nunavut Final Argument to the CRTC Telecom Notice of Consultation 2012-669CRTC*
[10] Conference Board of Canada (2013) Mapping the Long-term options for Canada's North: Telecommunications and Broadband Connectivity, Conference Board of Canada, Canada
*Quality of Service indicators: the CRTC has 16 quality of service indicators which each federally regulated telephone company must adhere to. These standards, originally developed in 1982, ensure that telephone consumers receive an acceptable level of service from their telephone company.

1.5Mbps download/385 Kbps upload – well short of the CRTC's stated objective of 5 Mbps/1 Mbps for all Canadians by 2015[11].

Clearly, new strategies and approaches are needed to improve services in the North – to improve overall network survivability and reliability, and to deliver broadband service comparable to that enjoyed by Canadians in the South, at affordable rates.

Social and economic impact

Economic development and sustainability
Business development, training, financial transactions, collaborative research, and sourcing of goods are infinitely easier with fast connectivity. Northern operations of major mining, fisheries and oil and gas corporations need robust, reliable broadband to better communicate with global offices, transmit time-sensitive or confidential data, and manage logistics. Small businesses also need to develop their economic opportunities through expanded customer base and suppliers.

Access to the digital economy is not just necessary for operating businesses and organizations. It also has an impact on growth, competitiveness, and the development of a sustainable society. Tasks such as online shopping and personal banking, which the South takes for granted, are difficult in the territories. This can have an impact on attracting human capital, from miners and engineers to doctors and nurses, to remote communities. Talent is also leaving the territories for the South, with connectivity one of the contributing factors[12].

Finally, connectivity contributes to personal and community health and well-being. According to the Arctic Communications Infrastructure Assessment (ACIA) Report, there is a strong argument to be made that significant IT investment would do more than any other form of physical investment to develop the social economy and address the poverty, mental health, and sustainability challenges facing many Arctic communities[13].

Government services
Growing gaps between the North and South are exacerbated by the inability of the federal and local governments to effectively deliver services online. Northern public employees face challenges doing their jobs effectively. Government is the largest single Internet customer in the North, but government purchasing alone cannot cover the full cost of the required infrastructure upgrades. At the same time, both current and future government operations need additional, more robust communications infrastructure.

Security/public safety
The security and sovereignty of the Arctic is a critical issue for the Government of Canada. Effective telecommunications services in the Arctic are essential to advancing this priority, supporting researchers, emergency responders, military personnel and operations, and government employees. However, improved telecommunications infrastructure will also allow communities to continue to live

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[11] Telecom Regulator Policy, CRTC 2011-291, paragraphs 76-79

[12] ibid

[13] Northern Communications and Information Systems Working Group (2011) A Matter of Survival: Arctic Communication Infrastructure in the 21st Century, Government of Canada

and prosper in the remote and strategic communities that the government considers important to sovereignty claims[14].

Indigenous issues

The Arctic is home to many indigenous people who speak their native languages, maintain strong cultural traditions, and have a close relationship to the land and environment. A fundamental objective of communications and infrastructure services must be to preserve and build upon the unique character of the Arctic[15]. Indigenous communities are also experiencing greater economic engagement due to the growth of primary industries on traditional lands[16]. The networks and telecommunications solutions and practices developing among indigenous communities reflect a desire to engage fulsomely in economic development opportunities, which is facilitated by effective communications infrastructure.

Proposed solutions

In the absence of a national or pan-Northern strategy to improve connectivity, several initiatives are proposed or underway to meet individual territorial or regional challenges. The North's needs for connectivity are expanding at a much faster rate than what networks are able to provide with the funding models available. Below is an overview of projects proposed, underway or complete in the North.

There is a broad level of interest in connectivity among different parties. Federal and territorial governments, non-governmental organizations, and the private sector each have their own connectivity goals. Aggregating demand across all areas of interests could help achieve some progress towards each of these goals by stimulating further investment in the North.

Projects/programs

Federal government:

The federal government's contribution to broadband has been extensive over the years. It includes:

- In 2003, Industry Canada established the "Broadband Rural and Northern Development (BRAND) Pilot Program, with a mission to support the deployment of broadband to under or un-served communities. BRAND was followed in 2004 with Infrastructure Canada's $115-million National Satellite Initiative program, and in 2009 with Industry Canada's $225-million Broadband Canada Program – again for projects across Canada, not just in the North.

- Under the 2013 Federal Budget, broadband and connectivity infrastructure will continue to be an eligible category of investment under the Provincial-Territorial Infrastructure Component of the New Building Canada Fund (a $10 billion allocation-based fund for projects of national, regional and local significance), as well as under the Gas Tax Fund, which has been expanded to include new project categories, including broadband and connectivity.

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[14] Government of Canada (2009) *Canada's Northern Strategy: Our north, our heritage, our future* , Government of Canada

[15] Senator Patterson (8 July, 2013) *Senator Patterson Final Argument to the CRTC Telecom Notice of Consultation 2012-669CRTC*

[16] Public Policy Forum (2012) Building Authentic Partnerships: Aboriginal Participation in Major Resource Development Opportunities, Public Policy Forum

- CRTC's revenue-based National Contribution Fund, which continues to make important contributions to advancing Canada's broadband connectivity.

<u>Territorial governments</u>
- The NWT Government has issued an RFP for the "Mackenzie Valley Fibre Link" (MVFL) to construct a fibre cable facility connecting Inuvik and Tuktoyuktuk to the south in order to provide for high bandwidth connections for communities along the route and to the Inuvik Satellite Station Facility, which are currently inadequately serviced by the existing terrestrial microwave network.
    - The MVFL route proposed is from Inuvik and Tuktoyuktuk to Checkpoint Junction. The projects will be a public-private partnership.

- The Yukon Government has investigated backbone connections to more robust networks in Juneau and Anchorage, Alaska.

- Nunavut is looking at various models to enhance connectivity to the Territory, and is working with SSi Micro to take advantage of advancements in satellite-delivered services, through a satellite teleport and data centre located in Ottawa.

<u>Industry</u>
- SSi Micro, in partnership with Telesat, has upgraded satellite ground equipment in nine communities of Nunavut, in the Northwest Territories and at SSi's Ottawa Teleport to provide reliable access to Public Benefits Capacity on Telesat's Anik F3 satellite. The project, completed in 2013, also provides satellite redundancy and diversity of backhaul in the North. Other SSI projects include:
    - Enhanced wireless broadband technologies in its serving area;
    - Additional satellite capacity from existing and new satellite infrastructure;
    - Improved redundancy through the use of multiple satellites to deliver network services;
    - Greater radio-frequency signal efficiency through the use of satellite communication technologies;
    - Alternate terrestrial telecommunications infrastructure, where feasible; and,
    - Communication services such as IP-based videotelephony, virtual classrooms and tele-health.

- Northwestel is currently working with the CRTC on a revised modernization plan for its network, currently expected to provide around $233 million in network upgrades by 2017. In 2011, NorthwesTel identified a number of potential projects that would increase network diversity and add new facilities, including:
    - A Pacific Northwest fibre ring connecting to Alaska;
    - A regional ring through the Yukon and the Northwest Territories; and,
    - Connections to a proposed submarine cable to be placed across the Northwest Passage.

- Ice Wireless has committed to spend more than $12 million to upgrade its network in Yukon, NWT and Nunavut, to replace old technology and provide a faster wireless. The upgrade will benefit nine cities and towns across the three territories.

- Arctic Fibre proposes to run more than 15,000 km of submarine fibre optic cable between Tokyo and London via the Northwest Passage, providing high-speed internet access to several Nunavut and Nunavik communities en route. The project has an estimated price tag of $620 million. Arctic Fibre has stated it plans to begin construction in 2014 and complete the project by 2016.

- In order to meet ACIA goals, Telesat Canada committed to provide additional capacity to Nunavut, NWT and Yukon over legacy satellites, at a cost of approximately $160 million. This commitment, which would see Telesat provide a $40 million contribution, is contingent on the achievement of a public-private partnership with the federal government.

- New High Throughput Satellite (HTS) technology is seen as offering great potential for increased capacity in the North. The capacity provided by HTS is an order of magnitude greater than legacy satellites. Currently, HTS beams are not pointed towards the North. Dedicated HTS capacity for the North may require a minimum service commitment from an anchor tenant or collection of stakeholders to ensure viability.[17]

- Cisco Canada, in collaboration with SSi and Virtual Researcher on Call, is piloting a program called Connected North to provide remote education to schools, with the initial trial in Iqaluit.
   o Using SSi contributed satellite capacity, the program allows students to access researchers and experts, and, teacher mentoring and support via video;
   o The program is providing students with education opportunities that could otherwise only be accessed in southern Canada;
   o Cisco has begun to roll the pilot out to other schools in the North, and is already operational in Fort Providence, Northwest Territories.

Non-profit
- The Nunavut Broadband Development Corporation (NBDC) is a not-for-profit advocate and community champion that initiates and manages projects, leveraging federal investments in broadband services delivered through the private sector. NBDC was established in 2002 to secure funding from the Government of Canada to set up Internet infrastructure in all Nunavut communities. In 2003, NBDC conducted a comprehensive needs analysis and wrote a business plan to submit to Industry Canada's BRAND Program. As part of the business planning process, NBDC ran a public RFP and SSI Micro was selected to build and operate the network, All financing was secured by the spring of 2004, and Qiniq was launched in the summer of 2005. User uptake was very successful and Qiniq reached its nine-year user projections after just nine months. In 2008, NBDC signed a second funding agreement with the federal government to support, among other things, the growing Qiniq user base. While NBDC was instrumental in the creation of the Qiniq network, NBDC does not operate the network and does not generate any revenue from the network. Between 2003 and 2016, NBDC will have managed close to $66 million in broadband investments in Nunavut, coming predominantly from the federal government, debt financing organizations and the private sector.

Changes to policy and regulations
With the concerted focus on achieving solutions for improving connectivity in the North, several stakeholders have also recommended new policies or subsidies, or adjustments to existing frameworks. Recommendations include:

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[17] Salter Global Consulting study for Kativik Regional Government, *Pre Feasibility Telecommunications Study High Capacity Network Options in Nunavik* (September 2013)

- A holistic broadband strategy that would include connecting all Arctic communities to the required level of service;

- Identifying a federal government champion for Northern connectivity issues, providing a single body to lead and coordinate planning and implementation of northern broadband policies, programs, or strategies, which at present are spread across a variety of government departments;

Table 2: Breakdown of government roles/responsibilities

	Department	Responsibilities
Yukon	Economic Development	Works with the ICT sector, associations and service providers to support the provision of available, reliable and affordable telecommunications services.
Northwest Territories	Finance (Office of the CIO)	The OCIO provids government-wide guidance on technology developments, including promoting Northern interests (i.e. in CRTC deliberations). In the process of developing a broadband policy.
Nunavut	Community and Government Services	Works in partnership with community governments to build capacity and meet the needs of residents. Provids programs and funding that supports infrastructure development, including broadband.
Federal	CRTC	Determines basic service objectives for all Canadians and provides regulatory oversight of telecommunications services.
	Industry Canada	Invests in broadband as a means to improve conditions for investment and innovation performance, increase Canada's share of global trade and build an efficient and competitive marketplace.
	Infrastructure Canada	Provides funding through the Building Canada Fund for infrastructure investments considered to be strategic projects of national or regional significance. This includes public infrastructure that supports the rollout of broadband.
	AANDC	Supports initiatives that improve broadband connectivity and access for First Nations, Inuit and Métis communities, as a key enabler of economic development.
	CANNOR	Invests in projects to improve connectivity and communications infrastructure in the northern territories, to improve economic activity across the North, and to support small businesses, the resource sector and northern residents. One challenge is that Northern Canadian communities not in the three territories are not eligible for CANNOR funding.

- Strengthen or revise the regulatory framework to produce improve consumer choice, reliability, affordability, and innovation
  - Regulations should be "technology –neutral" but should focus on the minimum level of service;

- A backbone assistance program to allow service providers in the North to gain open and affordable access to satellite and terrestrial backbone connectivity. The proposal is for a competitive, neutral program that ties funding renewals to network investments and upgrades;

- Revise the existing local residential subsidy paid to Northwestel to meet the "Basic Service Objective", or BSO, in order to allow fair and equal access to any subsidies, and to include broadband as part of the BSO;

- Similar to the proposed BSO revisions, federal government consideration for a new subsidy for high-speed Internet service at or above CRTC target speeds, modelled on the existing residential local service subsidy. This would be portable between service providers.

Questions for consideration

Below are some key questions that you will be asked to consider during the roundtable sessions. To make the most of the time allotted for dialogue and discussion, we encourage you to reflect on the following questions prior to the roundtable.

- Considering the findings and recommendations of recent studies and reports in this area (see Appendix for a summary), is there space for more collaboration on this issue among the private sector, regulators, governments, Inuit/First Nations/Métis organizations and communities?

- If yes, what might this look like? What organization(s)/departments is/are best suited to lead these efforts? Is the current distribution of roles and responsibilities among various levels of government and entities efficient?

- Could successes in other Northern economic sectors, such as resource development, be leveraged towards enhancing telecom services in the North?

- Demand aggregation (regional pooling of the demand for services) is often considered in low population-density regions as a way to offer greater certainty to investors. What approaches can stakeholders adopt to stimulate private sector investment in the North?

- Among the many recommendations put forward in recent studies, which *specific* policies and actions from each of the sectors show the most promise for achieving greater broadband access in the North, on a level of cost, capacity and quality comparable to service enjoyed by Canadians living in the south?

Annex A: Summary of recent reports

A matter of Survival: Arctic Communications Infrastructure in the 21st Century, NCIS Working Group, April 2011

The ACIA report concluded that the Arctic must have affordable, robust communication services for the benefit of residents and all Canadians Recommendations include:

1. Commit to service parity among Northern communities, and set minimum connectivity standards that assure parity to Southern centers
2. Develop an Arctic specific strategy that articulates multi-year funding commitments for communications network development
3. Ensure redundant connection in every community to avoid gaps in the provision of essential services
4. Create an inventory of Arctic communications technology projects and services in order to share experiences, best practices, and lessons learned
5. Include provisions for the increasing rate of change, and the introduction of new services and devices, in any Arctic communication strategy
6. Investment models should allow for competing services to promote consumer and government choice
7. Government RFPs should focus on business outcome requirements to encourage innovation
8. Design applications and networks that allow effective remote service delivery

Mapping the Long-term options for Canada's North: Telecommunications and Broadband Connectivity, The Conference Board of Canada, August 2013

The Conference Board's report covered all of Northern Canada, including parts of Alberta and Quebec. Findings and recommendations include:

- The Arctic, from Yukon to Nunivak, has experienced multiple systemic failures in 21st century communications infrastructure, including terrestrial and satellite facilities and critical infrastructure required to support broadband. Even basic telecommunications (i.e. telephone landlines) in many regions of the North require renewal and reinvestment.
- While Northern residents and public services have a clear stake in the connectivity landscape, their needs are part of a broader continuum of demand that includes industries operating in the North As new Arctic shipping routes become available, next generation information systems for tracking and identifying shipments will become integral for assurance purposes and provide another interface between industry and public safety.
- Because of the high costs of building new regional infrastructure, government, industry, and community stakeholders must cooperate to create new investment strategies and solutions.
- Multi-stakeholder partnerships are crucial for enabling remote community access. But more emphasis is needed on planning for sustainable innovation, shared services, and common long-term development goals.
  - Northern governments (Aboriginal and non-Aboriginal) should lead by example with support from federal counterparts.
  - The Northern connectivity landscape is complex; one technology solution or business model does not fit all.

Pan-Northern Minimum Broadband Standard, Northern Development Minister's Forum, July 2013

The report proposes a pan-northern minimum broadband standard of 9Mbps across the North and the development of redundant capacity in every major community.

- The 9Mbps standard is based on the current and forecasted economic development needs of Northerners. It is currently adequate for accommodating multiple applications even in most usage-heavy fields, like health and education.
    - o 9Mbps compared with some international objectives: Finland: 100Mbps by 2015; Alaska: 100Mbps by 2020; the EU: 30Mbps by 2020.
- The lack of redundancy for broadband infrastructure makes the entire region extremely vulnerable to system failure

Yukon Telecommunications Development, Lemay-Yates, December 2012

The Lemay-Yates report was focused on Yukon telecommunications development. Although Yukon-centric, its recommendations can apply to other territorial governments:

1. Set community speed and capacity objectives, including upload, that are more consistent with reasonable community use: 30 Mbps universal access and 100 Mbps to the largest communities.
2. Government of Yukon could act as enabler of a new "utility" backbone project for capacity and diversity – either by acting as a promoter, by aggregating funding or by taking a direct stake in an initial project to build additional fibre links.
3. GY should actively monitor infrastructure projects to ensure that telecom needs are included in new projects.
4. GY and the CRTC should work more closely to address consumer pricing concerns.
5. GY should take a more direct role in the development of a national broadband policy
6. GY should take a role in identifying and scoping new enabling projects, even if they are not government projects, particularly to see which are large enough to have considerable direct impact as well as spin-off effects, i.e. a Yukon-based data centre.
7. In addition to specific projects, GY could promote development of new local access facilities and increased use of existing wireless licenses. Initiatives could be focused on opportunities for new parties (e.g. SSi Micro, Ice Wireless, or others) to build local access, or on development of community-based initiatives.
8. Develop policies and initiatives that might pave the way for future competition, e.g. facilitate access for third parties to government tower and power assets.
9. Define policy and regulatory objectives and priorities specific to and focused on digital economy developments, and related to projects and actions– broadband speed and capacity, "utility" backbone, infrastructure projects, community back-up, etc
10. Develop a community back-up and diversity plan, identifying the economic and societal impacts on a community-by-community basis, of losing connectivity, and evaluating possible solutions.

Northern Connectivity: Ensuring Quality Communications, NCIS Working Group, June 2013

- A digital economy strategy is required for Northern Canada
    - o Coverage does not equate to affordable, reliable and suitable access in the North. While the focus has been on access and coverage, the data obscure the affordability and availability reality. The available capacity is not sufficient to meet project growth
- The economics will never support investment in infrastructure that will meet the North's needs; at some point policy intervention is required.

- Northern users need more bandwidth than the South at this point. Greater applications are needed for remote delivery of government services
- Northern users should expect the same connectivity standards as the rest of Canada

Northern Connectivity: Ensuring Quality Communications, NCIS Working Group, January 2014

The report to the NCIS Working Group made a series of recommendations and conclusions to realise minimum connectivity requirements for Northern communities:

- The North needs a comprehensive strategy for broadband connectivity
    - This strategy – outlining roles, responsibilities, process, deliverables and an action plan – will provide the basis for sustainable connectivity development
    - As part of this strategy, stakeholders should establish a high level Broadband Implementation Taskforce, which would clarify joint federal and pan-territorial commitments and direct implementation
- A minimum speed of 9Mbps download and 1.5Mbps upload is required for communities to meet their needs – this is significantly higher than those currently available to users in most communities and CRTC's targets.
    - This speed is based on average requirements for various services, from basic administrative services on the low end, to health and education at the high end
    - Although the report recommends 9Mbps at this point, it notes that this requirement will continue to evolve and increase over time
- Governments (local, provincial, and federal) and private sector partners need to consider what financial model will support the required upgrades to territories' infrastructure
    - The financial resources of stakeholders in the territories are currently inadequate
    - Some kind of financial incentive will likely be required to attract the incumbent (or new operators) to invest in and operate the upgraded network
    - This incentive would need to be complemented by a household subsidy to offset the higher cost of broadband – the report estimates a household subsidy of $35.39 million from 2016-2023 (or $4.42 million annually)
- Enhanced northern broadband will realise significant economic and socio-economic impacts over the proposed timeframe (2016-2023)
    - The report estimates a notable increase in GDP (cumulative): NWT - $294.2 million; Yukon - $174.9 million; and, Nunavut - $133.1 million
    - Employment is expected to create between 249 and 636 new jobs, depending on the level of investment
    - Healthcare access and service quality will improve, with the greatest impact likely to be the ability of southern specialists to provide remote diagnoses
    - Distance education will also improve, including access to video-conferencing and course materials, which will improve northern educational outcomes
    - Government services will be impacted positively by access to higher bandwidth intensive applications as well as more functions in current applications
    - Enhanced connectivity would mean more competitive small and medium sized enterprises – both significant employers in the Territories
- The report also provided four options for backbone improvement, ranging from base network upgrade with no new redundancy, to a comprehensive network upgrade with full traffic redundancy. These options are not intended to be exhaustive but to provoke discussion about the various options available to northern communities.

Table 3: NCIS Working Group report recommendations

Estimated Financial Incentive Required	Option 1: Base Network upgrade (no redundancy)	Option 2: Base Network Upgrade (critical traffic redundancy)	Option 3: Base Network Upgrade (full traffic redundancy)	Option 4: Enhanced Network Upgrade (Option2 + new fibre builds)
Yukon	0	41,884,238	340,081,649	67,728,040
Northwest Territories	73,621,435	131,804,476	652,480,942	115,797,671
Nunavut	476,603,747	535,687,339	963,710,729	502,220,798 (Arctic fibre and costs to 7 communities not included)
Total	$547,225,182	$709,376,053	$1,956,273,320	$685,746,509

Digital Canada 150, Government of Canada, April 2014*

The strategy is built on five "pillars" for improving Canada's digital environment:
1. Connecting Canadians
   a. Target of 98% of Canadians having access to minimum download speeds of 5Mbps by 2017.
   b. More competitive pricing and increased choices for consumers.
2. Protecting Canadians
   a. Online transactions will be secured.
      i. Stronger *Personal Information and Electronic Documents Act.*
   b. Canadians will be protected from cyberbullying and other online threats.
3. Economic opportunities
   a. Canada will rank among world leaders in adopting digital technologies:
      i. The Business Development Bank (BDC) will allocate $200M to help businesses use more advanced technology. The BDC will invest an additional $300M in venture capital for companies in the ICT sector.
   b. Companies will use digital tools to boost productivity and capture growing markets.
      i. Support for the Canada Accelerator and Incubator Program will increase to $100M to help digital entrepreneurs develop their businesses.
4. Digital government
   a. The Government of Canada will be a leader in using technology to interact with Canadians.
      i. Improved online tools to provide quicker access to information and benefits.
   b. Government data will be easily usable and accessible
      i. Open access to publications and related data from federally funded research.
5. Canadian content
   a. Canadians will have easy online access to Canadian content.

*Added to the initial report following its release in April 2014

Annex B: International best practices

The following are some examples of broadband practices and policies in countries or regions facing similar challenges as Canada. Although these solutions may not all be practical within the Canadian context, they may provide some additional fodder for discussion.

Sweden

In the 1990s, the Swedish government began a significant initiative to encourage State-owned companies to build a national fibre backbone, acknowledging that at least 50% of the future users of internet services would be citizens and the public sector. The program was heavily subsidised by the government and resulted in a fibre presence across the country, including above the Arctic Circle. Current rules require the companies that own the fibre to provide open access to local operators to connect to the backbone. Most municipalities built local fibre networks and today, 85% are owned by municipalities who then sell capacity to Internet, TV and other service providers. Typical internet access speeds are available at 100Mbps.

United States

In 2011, the U.S. Federal Communications Commission (FCC) launched a major reform of its Universal Service Fund to include broadband, as indicated in the 2011 National Broadband Plan. Up to USD$15.5B will be devoted to broadband over the next decade. Universal speed target is 4 Mbps download /1 Mbps upload.

As the FCC noted in its rationale for the reform, "broadband has gone from being a luxury to a necessity for full participation in our economy and society – for all Americans. For that reason, the FCC has adopted comprehensive reforms of its Universal Service Fund (USF) and Intercarrier Compensation (ICC) systems to accelerate broadband build-out to the 18 million (in 2011) Americans living in rural areas who currently have no access to robust broadband infrastructure. This reform will expand the benefits of high-speed Internet to millions of consumers in every part of the country by transforming the existing USF into a new Connect America Fund (CAF) focused on broadband. Consumers everywhere – both urban and rural – will benefit. Reform will not only drive economic growth in rural America, but will expand the online marketplace nationwide, creating jobs and businesses opportunities across the country."

The National Telecommunications and Information Administration (NTIA) and the U.S. Department of Agriculture's Rural Utilities Service have received USD$7.2 billion to expand access to broadband services. Of those funds, $4.7 billion have been dedicated to support broadband infrastructure, enhance and expand public computer centers, encourage adoption of broadband service, and develop and maintain a nationwide public map of broadband service capability and availability. While the government is not building the infrastructure, its commitment to subsidizing broadband activities is based on the notion that broadband is fundamental to economic growth, job creation and competitiveness.

One of the NTIA's points of focus is improving connectivity in Native American communities. According to its website, "NTIA's Broadband Technology Opportunities Program (BTOP) has invested in more than 50 projects by building networks in areas that have historically lacked adequate telecommunications infrastructure. NTIA has also funded public computer centers, digital literacy classes and one-on-one Internet training programs in a number of Native American communities." Most recently, the Navajo Tribal Utility Authority received a USD$32-million BTOP grant to bring a modern wireless communications system to the Four Corners area of the Southwest, a desert region

where up to 60% of homes lack even basic landline telephone service, and where high-speed internet access is almost non-existent.

In 2012, President Barack Obama issued an Executive Order aimed at lowering governmental barriers to broadband infrastructure deployment on federal lands and along U.S. highways. Under the "Dig Once" initiative, federal agencies are required to facilitate broadband deployment activities where roads or other property are already under construction, allowing broadband to be deployed faster throughout the U.S.

In Alaska, the enhanced broadband capacity relative to population size is a mix of market competition and subsidy intervention. Alaska has three major telecommunications companies: AT&T Alascom, offering wireless and internet; Alaska Communication, offering wireline and wireless, which owns and operates two marine fibre cable to the lower 48 states; and GCI, which offers the full range of telecom services, including cable, and has its own fibre network, also connected to the mainland. These providers are complemented by smaller operations, primarily located in small communities.

Subsidies come from Connect Alaska, a partnership between Connect Alaska – a non-profit group organized to promote access to broadband – and the Alaska Department of Commerce. Funding (USD$6,378,198 since 2009[18]) is provided by the federal Department of Commerce and the NTIA. Connect Alaska oversees the Alaska Broadband Taskforce, which drives the strategic broadband plan and coordinates activities across agencies and organisations. The Taskforce has set a goal for 100Mbps broadband connectivity for every Alaskan by 2020. Alaska is currently ranked 49th of the 50 states in broadband adoption, network quality, and economic structure, with connectivity between 1 and 4Mbps.

Greenland

Greenland has a population of 57,000 and faces similar geography, market size, and climate challenges as northern Canada in providing broadband access. However, Greenland's broadband services were significantly enhanced in 2008 with the construction of a submarine communications cable system connecting Canada, Greenland, and Iceland. The submarine cable network was designed to provide international and domestic connectivity to meet growing bandwidth requirements. Despite their small population and isolation, most Greenland residents can access voice and network hubs, broadband internet, video conferencing and multimedia applications from Tele Greenland*, the primary telecom provider. According to Tele Greenland, about 80% of the population has access to internet although, as of 2012, only 64.9% of the population was actually accessing internet services[19]. All settlements with a population of more than 70 people have broadband and enjoy the same speeds at the same cost regardless of location. The submarine cable provides a much-improved broadband service compared to the country's previous reliance on satellite. As of December 1, 2013, residents have also been able to access the 4G network, initially only via dongles, but Tele Greenland is working to provide access through smartphones.

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[18] United States Government (2013) *State Broadband Initiative:* http://www2.ntia.doc.gov/SBDD
[19] ITU (2012) *Percentage of Individuals using the Internet 2000-2012:* http://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx
* Tele Greenland is 100% state-owned and is the monopoly provider of telecoms services for the country's 57,000 inhabitants.

Australia

Although its approach is unlikely to be adopted in Canada, Australia provides a case study for significant government investment in broadband connectivity. In 2007, the newly elected Australian Government committed to rolling out a national broadband capability, underlining that they considered the investment to be critical to Australia's international competitiveness. The project was budgeted at around AUD$43 billion, which included an $11 billion payment to the incumbent Telstra to decommission its existing copper network. The plan was to build an extensive network of fiber across the country to replace existing networks, and provide network direct to premises, with an objective of providing 90% of the population with 100Mbps service, and a minimum of 12Mbps to the final 10%.

Following the opposition's election win in 2013, the National Broadband Network was reviewed for timing and cost. The new government has committed to a national broadband network, but at a lower cost of $29.5 billion. The government has stated it will decrease costs by leveraging existing networks where possible and adopting a multi-technology approach, for example implementing more fibre to the node solutions rather than to the premise, as well as using satellite and the cable broadband network. The government hopes that by 2019, at least two-thirds of Australians will have access to download speeds of up to 100Mbps. Although slightly less ambitious than the previous objective, the proposed network will still provide significantly increased connectivity for most Australians.

Appendix 4: Project participants

Whitehorse roundtable –February 13, 2014

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Iqaluit roundtable –March 13, 2014

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Ottawa Executive Briefing –April 15, 2014

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