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BROADBAND CONNECTIVITY IN RURAL CANADA
Brief to the House of Commons Standing Committee on
Industry, Science and Technology

Cybera Inc.
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WHAT CONSTITUTES AN ACCEPTABLE HIGH-SPEED SERVICE?

Rural residents and First Nations communities in Canada require access to the same quality of high speed internet service as that available to residents in cities. Per section 7(b) of the Telecommunications Act, Canadian telecom policy has an objective:

> "to render reliable and affordable telecommunications services of high quality accessible to Canadians in both urban and rural areas in all regions of Canada."[1]

After consulting with our community of interest, Cybera can confidently agree that rural residents need access to a reliable connection that supports streaming video and video conferencing, uploading and downloading large files, accessing distance learning tools, and accessing government services. The connection should also support multiple simultaneous users, without a data cap.

In 2016, the CRTC classified a broadband service offering of 50Mbps download and 10Mbps upload as a basic telecommunications service,[2] with prioritization for fixed broadband services to meet this objective.[3] This level of service satisfies the present-day upload and download requirements of most households - including access to video and videoconferencing. However, there are other indicators of service quality to be considered beyond simple upload and download speeds advertised to customers.

An internet user's connection type has a major impact on their quality of service - including speed and reliability. In cities, most internet users' modems are physically connected to a network operator's fixed terrestrial infrastructure via cable (historically used for cable television), Digital Subscriber Line (DSL, historically used for telephony), or fibre optic. Fibre optic is the next generation of terrestrial access infrastructure, currently capable of transmitting gigabits-per-second within access networks, and terabits-per-second in core and long-haul transmission networks.[4] Fibre optic is widely considered to be a future-proof transmission medium,[5][6][7] upgradable by changing optical equipment (lasers), or the amplification, multiplexing and modulation technologies.

Most rural residents in Canada do not have the option for a wireline internet connection.

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[1] Telecommunications Act, (S.C. 1993, c. 38) s. 7(b).

[2] CRTC. 2016. *Telecom Regulatory Policy CRTC 2016-496.* para. 80.

[3] CRTC. 2016. *Telecom Regulatory Policy CRTC 2016-496.* para. 64.

[4] Analysis Mason. 2010. Report to the UK Office of Communications. *Fibre capacity limitations in access networks. P.1. https://www.ofcom.org.uk/__data/assets/pdf_file/0023/27527/fibre.pdf*

[5] Ibid. p. 4.

[6] Abhinov, B & K Satyanarayana, K. 2014. International Conference on Recent Trends in Information Technology. *Recent trends in future proof fiber access passive networks: GPON and WDM PON. http://ieeexplore.ieee.org/document/6996129/*

[7] Iovanna, P et. al. 2016. IEEE/OSA Journal of Optical Communications and Networking http://ieeexplore.ieee.org/document/7830419/

Cable companies did not build their television network connections to include rural and remote premises. Fibre connections have not been extended to rural and remote dwellings. While most rural dwellings are served by telephone lines, the DSL infrastructure cannot carry high speed data signals over long distances.

Because of this lack of terrestrial infrastructure, rural and remote customers typically access the internet over a wireless connection. As a result, they experience a variety of broadband reliability and performance issues related to wireless access infrastructure, including:

- Poor signal strength due to distance from the tower
- Poor signal strength due to weather conditions
- Poor signal strength due to geography (e.g. hilly or mountainous terrain, obstructions by trees)
- Excess of subscribers on the internet service provider's wireless transmission equipment (high oversubscription ratio)
- High latency due to the distance of the satellite or wireless link

High rates of oversubscription are particularly problematic during peak usage times. For example, say a wireless internet service provider (WISP) has a link capable of transmitting 500Mbps. The WISP advertises a broadband service with a 50 Mbps download speed (which, theoretically, they could provide if only 10 customers are simultaneously accessing the internet). However, the ISP needs to sell more than 10 subscriptions in order to cover costs, let alone be profitable. Settling on an acceptable "oversubscription ratio" is a business decision and something of a "secret sauce" that varies from one ISP to another. If the WISP sets its oversubscription ratio at 15:1, problems arise if all 150 subscribers are online at the same time. The network becomes congested, and the 50Mbps service advertised to the customer is degraded to 3.3 Mbps. Oversubscription ratios are not regulated.

(SSI Micro, a rural/remote ISP, references problems related to oversubscription in its June 2017 submission to "CRTC Consultation 2017-112 - Development of the Commission's Broadband Funding Regime."[8])

Access to a low latency connection is also important. Network latency is an expression of how long a packet of data takes to get from one designated point to another. If the data round trip time is high, the user will experience slower loading times and degraded videos and graphics. Rural users with satellite connections encounter round trips roughly 20 times longer[9] than those with a terrestrial connection. The CRTC

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[8] SSI Micro. 2017. *CRTC Consultation 2017-112 - Development of the Commission's Broadband Funding Regime.* https://www.ssimicro.com/wp-content/uploads/2017/06/2017-06-intervention.pdf

[9] FCC. 2014. *A Report on Consumer Wireline Broadband Performance in the U.S.* https://web.archive.org/web/20140820123634/https://www.fcc.gov/measuring-broadband-america/2013/February

Interconnection Steering Committee (CISC) Network Technology Working Group (NTWG) is currently reviewing which quality of service metrics should be used to measure high quality broadband, including latency, as directed by the Commission in Telecom Regulatory Policy 2016-496.[10]

Rural users' needs and the CRTC's Basic Service Objective requirements will likely narrow the options for new installations of access technology to either next-generation LTE or fibre-to-the-home, in most areas.

FINANCIAL CHALLENGES OF IMPLEMENTING HIGH-SPEED SERVICES

The financial barriers to ubiquitous broadband access and adoption are numerous. Rural communities pose a challenge for the private sector model, and have seen far less investment than urban areas. Incumbent telcos and cable companies frequently contend that there is no business case to deploy infrastructure in low-density service areas. New and independent internet service providers have little ability to front the large capital expenditures required for a new broadband deployment. New entrants to the wireless market also face barriers, such as lack of access to spectrum and long delays, or a complete inability to colocate equipment on existing towers.

In the case of municipal or community broadband, sparsely populated municipalities, districts, and counties have a small tax base to draw from in order to fund infrastructure builds. Most local governments simply lack the interest, experience, or expertise required to architect and operate a network. There are examples of Canadian rural community leaders who have driven grassroots efforts that led to high quality, operational networks (e.g. Olds, AB and Coquitlam, BC), but these are exceptional cases. Finally, customers are unwilling or unable to pay the high subscription rates (often $100+) that accompany rural satellite or wireless broadband service, especially when the service entails a data cap and poor speed performance.

Improving broadband services for rural and remote residents is a costly endeavour. However, building out telephone lines to rural and remote residents was also a costly undertaking in the 20th century, requiring significant government and regulator intervention. High quality internet access is as essential today to social and economic development as the electrical or telephone connections of the 1900s. Terrestrial fibre infrastructure, in particular, is an asset that supports significant long-term use cases.

With landline telephone subscriptions dropping (18.5% between 2006 and 2016)[11] and cable television customers cutting the cord (subscriptions decreased by 3.8% between

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[10] CRTC. Telecom Regulatory Policy CRTC 2016-496. para 110.
[11] CRTC. 2016. Communications Monitoring Report.
http://www.crtc.gc.ca/eng/publications/reports/policymonitoring/2016/cmr2.htm

2015 and 2016),[12] content is increasingly being delivered to homes via a single internet connection.

Canada should not be building infrastructure that satisfies the service requirements of today, but rather, should aim to satisfy the service requirements of 20+ years from now. The short-term business case for rural wireline fibre-to-the-home is not lucrative, but the technology has a multi-decades long horizon. All levels of government must start thinking about internet access infrastructure as essential, long-term infrastructure, and implement funding programs accordingly.

REGULATORY CHANGES TO ENCOURAGE THE IMPLEMENTATION OF HIGH-SPEED SERVICES

To start, the Government of Canada should articulate its goals for the implementation of high-speed services through a national broadband strategy. The strategy must not rely solely on market forces or incumbent telcos and cable companies. Instead, the government should adopt an "all-hands-on-deck" approach that recognizes the need for a blend of business models in deploying essential broadband infrastructure in rural Canada. The government can assist in bridging the digital divide with targeted funding for rural communities that are traditionally neglected by private enterprise due to a lack of a business case.

One way to achieve this is to fund non-traditional network operators for whom the "business case" is less important - including co-operatives, non-profits, and local governments. Regulatory changes should be applied with a mind to future-proof any government investment, and avoid duplication of funding and effort in the future.

The next step will require reviews and changes to existing policy. In 2006, the former Minister of Industry Canada, Maxime Bernier, issued the first ever policy direction to the CRTC, under the Telecommunications Act. The policy direction required the CRTC to take a market-based approach to implementation of the Telecommunications Act.[13] It has been 11 years since the implementation of that policy direction. The Government of Canada should take another look at the policy direction to determine whether it is at odds with current goals for the improvement of rural broadband services.

The Government of Canada has also publicized its intentions to review the Telecommunications Act and the Broadcasting Act. It would be useful to include a review of spectrum management, the spectrum auction process, and spectrum licensing conditions, with a view to incentivizing wireless deployment in rural Canada. Spectrum

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[12] Ibid.

[13] Government of Canada. 18 December 2006. Canada's new government issues policy direction to CRTC that calls for greater reliance on market forces. https://www.canada.ca/en/news/archive/2006/12/canada-new-government-issues-policy-direction-crtc-that-calls-greater-reliance-market-forces.html?=undefined&wbdisable=true

is an essential resource for wireless internet service provision to rural and remote wireless internet customers.

Finally, regulatory changes to address affordability in rural Canada are required. As Minister of Heritage, Melanie Joly, said during the launch of Creative Canada in 2017[14]: " the affordability of internet and wireless are real issues for many." While this issue was repeatedly highlighted by intervenors during the CRTC's Basic Service Objective consultation, the Commission did not include actions to address affordability when Telecom Regulatory Policy 2016-496 was released.

SUMMARY

The CRTC's Basic Service Objective bandwidth targets of 50Mbps download and 10Mbps upload are an excellent starting point, but the government should anticipate bandwidth requirements to rise in the future. As the Government of Canada invests in broadband access infrastructure, it should pursue a "fibre-first" rural broadband strategy in order to future-proof its investment. Fibre optic access infrastructure satisfies these current and future needs.

Private sector network operators face several financial barriers to rural network deployment. First and foremost, they lack a short-term business case to connect sparsely populated areas. There is also a scarcity of leadership, expertise, and political will in most rural communities to pursue non-traditional network solutions. Finally, customers are often unwilling or unable to pay rates for broadband subscriptions that meet their internet usage requirements.

The Government of Canada should review the wide range of public and regulatory tools available to network operators to incentivize and aid rural broadband deployment and address affordability. First, the government must articulate its vision for rural broadband in a national broadband strategy. Second, funding and granting programs should be made open and accessible to non-traditional network operators, including co-operatives, non-profits, and local governments. And in addition to its review of the Telecommunications Act and the Broadcasting Act, the Government of Canada should also review spectrum allocation processes with an eye to incentivising rural broadband deployment. The government may also consider issuing a new policy direction to the CRTC.

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[14] Government of Canada. 28 September 2017. Speech by Minister of Canadian Heritage, Melanie Joly. *Launch of Creative Canada.*
https://www.canada.ca/en/canadian-heritage/news/2017/09/creative_canada_-avisionforcanadascreativeindustries.html?utm_content=buffer06bab&utm_medium=social&utm_source=facebook.com&utm_campaign=buffer

ABOUT CYBERA

Cybera is a technology-neutral, not-for-profit, and member-based organization with a mandate to accelerate technology adoption in Alberta. Cybera's core role is the operation of the Alberta component of the National Research and Education Network (NREN). This is the dedicated network for unmetered, not-for-profit traffic used by Alberta schools, post-secondary institutions, and business incubators to aid innovation, enterprise and ingenuity. Cybera receives provincial and federal government funding to spearhead pilot projects that improve efficiencies and the competitiveness of Canadian institutions and businesses, and support international level research.

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