



Fibre Infrastructure Strategy Annual Update

2016 October 13

Chief Financial Officer's Department - Information Technology

EXECUTIVE SUMMARY

The telecommunications environment is constantly evolving and it is important for municipalities to take a future-oriented and proactive approach to meeting the needs of City services and the community. Since Council approved the Fibre Infrastructure Strategy in 2015 September, Information Technology (IT) has been working diligently on implementing the recommended actions and this report will outline the progress made on all recommendations.

PROGRESS ON FIBRE INFRASTRUCTURE STRATEGY

The progress update to previous recommendations is below:

1. Canadian Radio-television and Telecommunications Commission (CRTC)

Administration continues to actively participate in CRTC engagement processes as appropriate to protect municipal interests and influence the direction of connectivity for the community. The following is a list of activities and outcomes:

- CRTC Policy (2015-326): Wholesale review decision - carriers have to open up parts of their networks for competitors.
- Bell appeals to Cabinet in opposition to 2015-326: City supports CRTC, final ruling is Cabinet supports CRTC.
- City supports Hamilton's application to CRTC: Mechanisms to hold Bell accountable – CRTC ruled in favor of Hamilton.
- Basic telecommunications services (2015-134): City did not participate but monitored and are awaiting decision.
- CRTC reviewing next-generation 9-1-1 (services (2016-116): City submitted response.

It is important to note, as of 2016 June, the United States Court of Appeals has ruled that high-speed internet service can be defined as a utility which is "a victory for consumers and innovators who deserve unfettered access to the entire web, and it ensures the internet remains a platform for unparalleled innovation, free expression and economic growth", as stated by Tom Wheeler, Federal Communications Commission Chairman.

2. Policy/Bylaw

The Municipal Rights-of-Way (ROW) Bylaw is coming forward to the Gas, Power & Telecommunications Committee in 2016 November, which assists in protecting The City's jurisdictional authority on municipal ROW and assist in managing the impacts of Fibre-To-The-Premise (FTTP) in Calgary.

3. Greenfield for City Services

The success of deploying City fibre in greenfield developments for future City services is dependent on The City joining the Four Party Shallow Utility Consortium governance agreement, which is currently being executed. This will allow The City to gain access to the trench when all other parties are installing conduit, resulting in 75% cost avoidance to connect future City services. The City's Fibre Team has submitted designs for 7 new developments (Mahogany x2, Savanna x2, Cornerstone, Walden, Carrington) to the ENMAX Power Services Corporation (EPSC). These submissions are waiting on contracts to be signed by EPSC before being able to initiate and move forward with construction.

4. Capital Budget

From 2001 to 2015, IT has been installing fibre infrastructure by leveraging capital works projects and using revenues to fund future builds. As a result of Council approving the Fibre Infrastructure Strategy in 2015 September, IT received new funding to augment the fibre business.

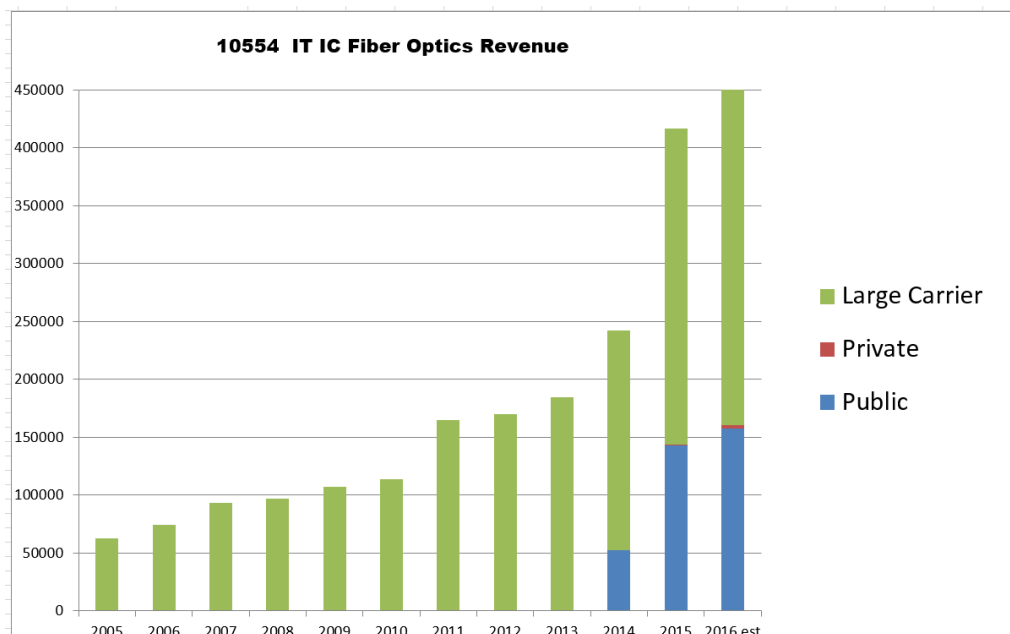
The first construction season using the new funding is underway and the budget is on track to spend in full. Three million dollars is dedicated annually to reach “stranded” City facilities. As part of the Accelerating Capital for Economic Resilience (ACER) program, three million dollars was moved forward to 2016 from the 2018 budget. Administration is working to identify funding sources for 2018, including using the IT Technology Reserve. Four million dollars annually was identified to build in greenfield communities. As part of the ACER program, four million dollars was moved forward to 2016 from the 2018 budget, then three and a half million dollars was moved back to 2018 as part of 2016 Budget Recast, due to delays in contract negotiations with the Four Party Shallow Utility Consortium.

The following table combines both the pre- and post-strategy project costs and funding sources for the current budget cycle.

The City of Calgary Fibre Network					
Project Cost & Funding Sources (\$000's)					
	Year	2016	2017	2018	Total
FUNDING REQUIRED					
Pre-Fibre Strategy Plan Construction-Legacy Program		\$ (953)	\$ (670)	\$ (800)	\$ (2,423)
Fibre Strategy Plan					
Stranded Facilities					
Fibre Strategy Plan-Original Approval		\$ (3,000)	\$ (3,000)	\$ (3,000)	\$ (9,000)
Work Plan Change-ACER		\$ (3,000)			\$ (3,000) Note 1
Greenfield					
Fibre Strategy Plan-Original Approval			\$ (4,000)	\$ (4,000)	\$ (8,000)
Work Plan Change-ACER		\$ (500)			\$ (500) Note 1
TOTAL FUNDING REQUIRED		\$ (7,453)	\$ (7,670)	\$ (7,800)	\$ (22,923)
FUNDING SOURCES					
Pre-Fibre Strategy Plan Budget Approval-Legacy Program		\$ 953	\$ 670	\$ 800	\$ 2,423
Budget Approved Through Fibre Strategy Plan (GP2015-0485)					
Stranded Facilities		\$ 3,000	\$ 3,000	\$ 3,000	\$ 9,000
Greenfield			\$ 4,000	\$ 4,000	\$ 8,000
Budget Changes Approved					
Budget Brought Forward-ACER-Stranded Facilities		\$ 3,000		\$ (3,000)	\$ - Note 1
Budget Brought Forward-ACER-Greenfield		\$ 500		\$ (500)	\$ - Note 1
TOTAL FUNDING SOURCES		\$ 7,453	\$ 7,670	\$ 4,300	\$ 19,423
FUNDING EXCESS/(SHORTAGE)		\$ -	\$ -	\$ (3,500)	\$ (3,500) Note 2
Note:					
1. As part of the Fall 2015 Council direction for Accelerating Capital for Economic Resilience, a portion of budget approved in 2018 was brought forward to 2016 to accommodate additional construction work carried out in 2016, this includes \$3 million for stranded facilities and \$500 thousand for greenfield.					
2. With a portion of 2018 approved budget being used to fund 2016 additional construction, this resulted in a \$3.5 million funding shortage in 2018. Administration is working to identify funding sources for 2018, including using the IT Technology Reserve.					

5. Revenue

IT has spoken with many organizations who are interested in licensing dark fibre to connect facilities including carriers, business, utilities and public sector agencies. These revenues will continue to be transferred to the IT Technology Reserve - Fibre Optic Program #751 to fund fibre deployments for City services and cover operating costs of the fibre plant.



6. Fibre Optic Provider

The City operates as a fibre optic provider and City IT licenses out excess fibre optic capacity to other public sector organizations, businesses and carriers. Web pages have been created on Calgary.ca (www.calgary.ca/darkfibre) and an intake request form has been created through 311.

7. Supporting Economic Resilience

As part of the Fall 2015 Council direction for Accelerating Capital for Economic Resilience, a net value of \$3.5M was moved from the 2018 budget (\$3M stranded facilities and \$500K from greenfield communities). This resulted in an increase in fibre optic deployment and the employment of approximately 23 people in 2016 (mostly external contractors).

8. General Progress Outline

Progress	2016 New Connections	Total
City buildings connected	19	<ul style="list-style-type: none"> 230 of 380 buildings connected Approx. \$171,000 annual cost avoidance (for the 19 connections in 2016)
City field assets connected	10	<ul style="list-style-type: none"> 40 total connected (help phones, cameras, pump, lift stations)
Traffic intersections, signs and sensors connected	80	<ul style="list-style-type: none"> 150 of 450 priority traffic intersections connected Approx. \$400,000 annual cost avoidance (for the 80 intersections in 2016)

9. Business Parks & Transit-Oriented Developments

IT has been collaborating with Real Estate & Development Services to develop a fibre optic deployment strategy and funding model. Aurora Business Park has been identified as a pilot to determine feasibility and funding models for future builds. IT has funded the Shawnessy transit-oriented development fibre infrastructure conduit as it is a short build from the existing fibre line.

10. Stakeholder Engagement, Research & Communication

Many stakeholders have been consulted in the first year of the Fibre Infrastructure Strategy implementation through presentations, conferences and meetings. These efforts are focused on education and future opportunities to collaborate on digital infrastructure needs.

These stakeholders include:

- Civic partners and agencies – Calgary Public Library, Calgary Municipal Land Corporation
- Public sector organizations – Alberta Health, Calgary Regional Partnership (contributed funding for a Regional Broadband Study through the Economic Prosperity Steering Committee), Cybera
- Education – all post-secondary institutions and school boards
- Municipalities – Edmonton, Medicine Hat, Lethbridge, Grande Prairie, Winnipeg, Ottawa, Mississauga, New Westminster and more
- Non-profit and partners – Calgary Economic Development, Innovate Calgary, Calgary Police Service, Calgary Stampede, Alberta Innovates
- Utilities – ENMAX, AltaLink
- Businesses – various carriers, service providers, innovative start-ups and entrepreneurs
- Speaking opportunities - Alberta Smart City Symposium, Digital Futures Symposium, Intelligent Communities Forum board member (international and Canada), Intelligent Transportation Systems Canada
- Internal – Real Estate & Development Services, Analytics Calgary, Civic Innovation, Calgary Analytics & Innovation (including Rights-of-Way Management), Planning & Development, Urban Strategy, Partnership Management.

A web presence has been created on The City's website (www.calgary.ca/darkfibre) for The City's fibre licensing opportunity, which includes the benefits of fibre, pricing, use cases, customer intake through 311 and more.

Several customer case study interviews have been conducted with existing customers with overwhelmingly positive feedback for service (see Appendix 1 – Customer Testimonials).

11. Annual Updates

This report serves as the first annual update and Administration will continue to provide annual updates on the progress of The City of Calgary's Fibre Infrastructure Strategy to the Gas, Power & Telecommunications Committee.

12. Updated Risk Assessment & Confidentiality

The risk assessment has been updated (see Attachment 2). There is a recommendation for this attachment to remain confidential pursuant to Section 24(1)(a) and (b) of the Freedom of Information and Protection of Privacy Act, and is subject to review every five years up to a limit of 15 years.

13. Updated Program Description

In order to update the Fibre Capital Project description to reflect the approval of the Fibre Infrastructure Strategy (GPT2015-0485), IT provided the updated wording to the budget office for documentation purposes. In summary, the previous wording focused on building fibre specifically for City facilities and services, and now the wording includes greenfield developments and The City being a fibre optic provider.

Updated wording for Program 751- Fibre Optic Network

This investment is for the implementation and execution of the Council-approved Fibre Infrastructure Strategy. This includes: providing communications infrastructure (fibre optic) to City facilities and devices (sensors), deploying fibre in greenfield developments, and acting as a fibre optic provider. All City essential services, such as Calgary Police Service and Calgary Transit, rely on fibre optics to serve the public. IT leverages opportunities to expand the fibre optic facility and save costs by placing fibre optics in the ground during existing construction projects such as road upgrades, LRT expansions and greenfield developments. The demand and growth of fibre optic has increased, driven by the increased use in high-bandwidth applications such as multimedia, GIS and cloud services combined with pervasive connectivity requirements for next generation municipal services.

14. Fibre License Rate Structure

The availability of dark fibre is new to Calgary and rates will need to be tested and evaluated for the first few years. The current pricing model was determined based on researching rates in other cities, uptake of service and changing market conditions including the regulatory environment. These rates are consistent with the Action Plan, based on cost recovery. It is important that Administration is able to adjust and adapt rates in this continually changing technology landscape. Rates will be adjusted, if required and appropriate, based on future market changes.

The current rate model strives to accomplish the following objectives:

- a) Produce revenues to meet the Fibre Infrastructure Strategy objectives
- b) Provide a simple and predictable rate for customers – accomplished via a flat rate model
- c) Provide a mechanism for customers to accelerate City fibre builds (capital rebate model).

The flat rate model is based on a customer's relative cost to license a strand of fibre between any two points for approximately \$1000 for one fibre strand per month.

The capital rebate model is required in certain situations where The City does not have fibre to the location the customer requests. Under these circumstances, the customer agrees to pay the capital to build the last mile of City fibre to the requested location. Even though the customer pays for this construction, The City retains 100% ownership of the asset and then reduces the license fee until the customer recovers an equivalent value to their original investment. Under this model, no City money is used to connect the customer and The City obtains a valuable asset.

15. Calgary Internet Exchange (YYCIX)

The burgeoning YYCIX will attract larger internet service and content providers to our community. Recognizing the importance and value of having an Internet Exchange (IX) in our community, The City of Calgary has been supporting the start-up of the YYCIX.

a) What is an IX?

An IX is a place where networks meet. They are an important aspect of the internet and allow various networks to interconnect and move vast amounts of information and data between networks quickly without an exchange of money. All users benefit from being connected together. In Canada, there is a large IX in Toronto (TORIX) along with a few smaller ones across Canada.

b) What are the benefits of an IX?

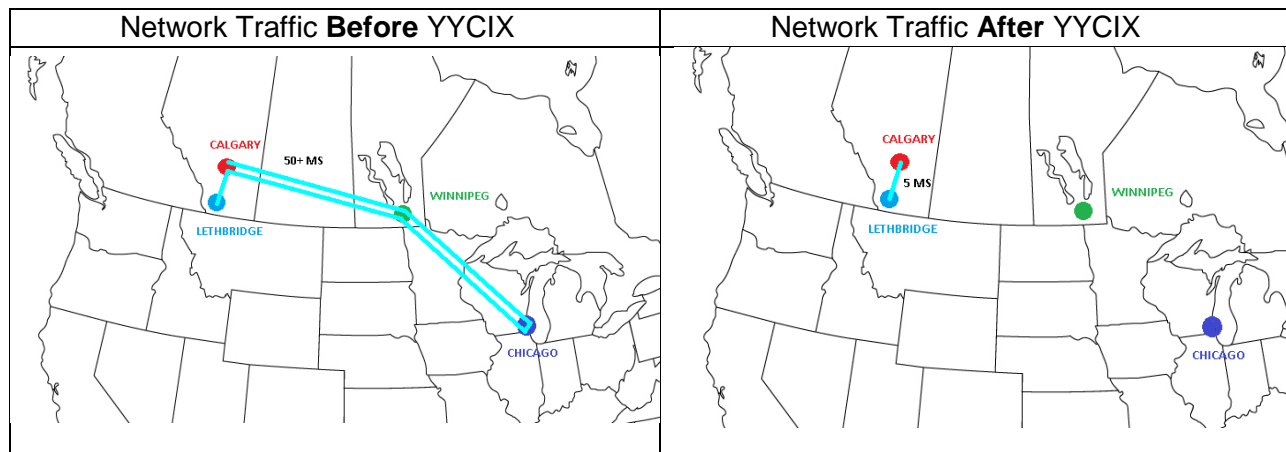
An entire community can benefit from having a local IX. It brings together many Internet Service Providers (ISPs), Content Providers (CPs) and businesses resulting in improved content service delivery for all. These benefits include improved internet experience, encouraging competition (including smaller ISPs), lower prices, enhanced security (because traffic stays local), and attracting large tech companies and content providers. Once an IX reaches the “critical mass point” and many companies are connected together, it can attract major internet players such as ISPs and content providers.

c) Why Calgary?

ISPs, independent network consultants and government agencies, such as the Canadian Internet Registration Association (CIRA), have recognized that another centralized IX in Western Canada is necessary. In response to this need, various industry organizations have been involved developing an IX in Calgary.

d) More about YYCIX

The YYCIX was established in 2013 and is steadily growing. It is a local, not-for-profit organization run by volunteers and has developed through a collaborative effort with industry organizations and The City. The goal of the YYCIX is to create an environment where networks can connect together. Without an IX, Calgary's local Internet traffic often routes through other IXs (as shown in the following image), such as Winnipeg, Toronto or Seattle which can lead to higher Internet costs and slower speeds.



e) What is The City of Calgary's role?

The YYCIX is in the start-up stage and The City of Calgary recognizes the importance and value of having an IX in Calgary. In 2013, The City peered with YYCIX. In 2015, The City provided fibre and allowed the YYCIX to create a presence in a City facility to enable direct access. This helps support City business as approximately 30-40% of City traffic goes through the IX (anti-virus, videos, patches, etc.) and that will continue to grow. This site assists the resiliency of the YYCIX while it establishes itself.

f) Other IXs

- Toronto (TORIX) founded 1997, ~ 200 members
- Seattle (SIX) founded 1997, ~ 200 members
- Vancouver (VANIX) founded 2015, ~ 80 members
- Halifax (NFXIX) founded 2015
- Winnipeg (MBIX) founded 2013, ~ 25 members
- New York (NYIIX) founded 1996, ~ 170 members
- Palo Alto (PAIX) founded 1996, ~139 members

APPENDIX 1

CUSTOMER TESTIMONIALS

Based on our completed customer case study interviews, the results are overwhelmingly positive. Customers appreciate the dark fibre service offering and align with The City's vision to serve Calgarians and the commitment to the greater good of the community. Words used to describe their experience with the fibre team to-date: friendly, efficient, collaborative, professional, responsive and highly competent.

1. Calgary Public Library



Calgary Public Library has been using The City of Calgary fibre network since 2013. Initially, the fibre network was used to move the Library data centres to The City's data centres after the 2013 floods. Since the initial installation, the fibre use has expanded to include the Village Square Library and most recently, the Nicolls Family Library at Westbrook Station.

"We have found the fibre network to be extremely reliable and The City staff excellent to work with. We continue to look for opportunities to further this partnership as we build new locations and fibre becomes available to existing facilities. We believe that this partnership is an excellent example of maximizing tax-payer investments, allowing for the best possible service to Calgarians." – Bill Ptacek, Chief Executive Officer, Calgary Public Library

2. Cybera



Cybera is a not-for-profit, technical agency that is helping Alberta advance its IT frontiers. CyberaNet is Alberta's publicly-funded, ultra-high-speed network that moves big data between the province's education institutions, researchers and IT entrepreneurs, and provincial, national and international research networks.

Cybera began utilizing The City's dark fibre infrastructure over 5 years ago to provide direct connectivity to the University of Calgary, Mount Royal University, Southern Alberta Institute of Technology, Bow Valley College, and the Calgary Catholic School District. This connectivity enabled them to reduce internet costs and gain access to new digital services and applications. Students and researchers can now carry out projects involving data intensive video/design projects and collaborate on more international research projects.

"It is very clear from our dealings with The City of Calgary that the public's interest is the main driver for this initiative. This aligns perfectly with Cybera's mandate, and makes our dealings run smoothly. For our peers and members, who all serve the public interest, there can be no better partner." – Robin Windsor, President & Chief Executive Officer, Cybera

Three words to describe The City's Fibre Team/service: friendly, collaborative and smart.

3. University of Calgary



The University of Calgary has a research team working on an encryption method that takes advantage of properties of light that must be described using quantum mechanics. This method is not vulnerable to improvements of computer technology and therefore outperforms currently used ways to encrypt electronic communications (email, e-banking, e-government, etc.) - an important feat in today's Information & Communications Technology (ICT)-dependent society. The researchers required dark fibre to test out quantum encryption in a "real world" environment, not just in a lab.

Through the Urban Alliance, the research team was excited to learn of The City's dark fibre to enable them to conduct the testing they required. The City donated access to dark fibre and provided space in some of our facilities for test equipment. This ability to test in the real world has created a lot of visibility for the University of Calgary and resulted in a publication "Quantum teleportation across a metropolitan fibre network" in the prestigious peer-reviewed Nature Photonics Journal. The success of this initiative may draw future research in this field.

"Being able to use The City's dark fibre has enabled our team to successfully test out our quantum encryption theories and we look forward to working with The City in the future. This has allowed us to reach a major milestone in our research that we couldn't have accomplished without access to dark fibre." - Wolfgang Tittel, Professor and Alberta Innovates Technology Futures - Strategic Research Chair in Quantum Secured Communication.

Three words to describe The City's Fibre Team/service: efficient, professional, pleasant.