# Municipal Broadband Toolkit

Alberta Municipalities
Strength In Members

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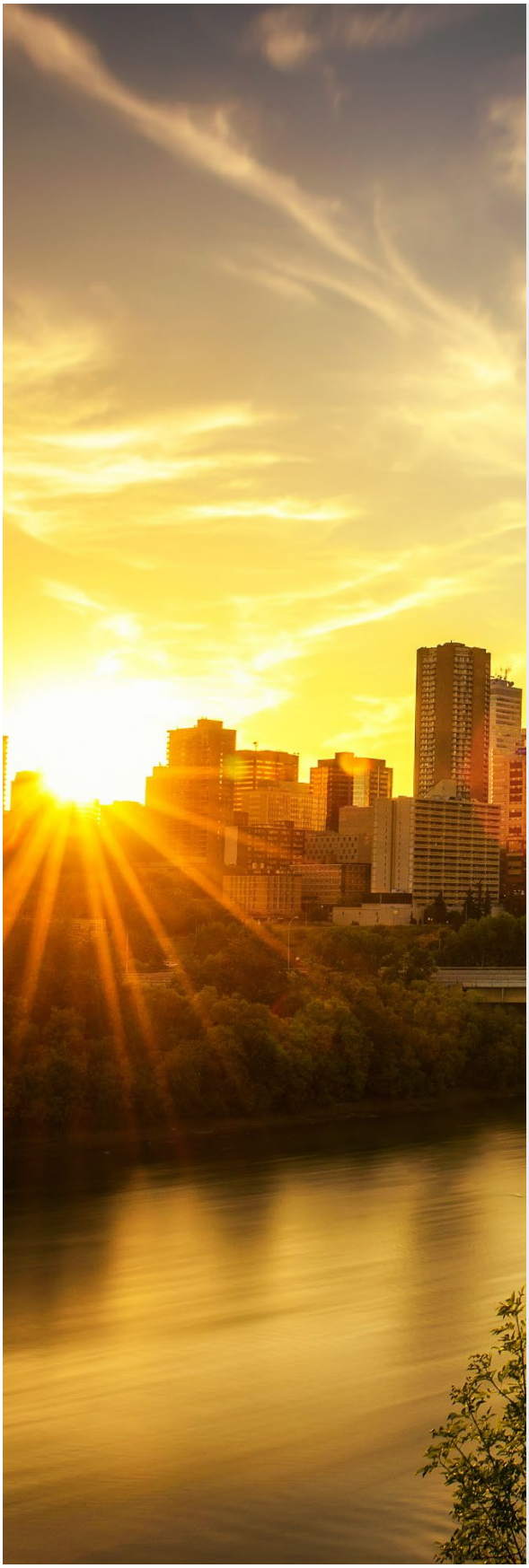


# Purpose

Today, internet connectivity is essential. We use it to access healthcare, education, public services, among many other areas of the economy. For municipalities across Alberta, access to internet services plays a significant role in:

- Economic sustainability;
- Resident attraction and retention; and
- Quality of life.

Alberta Municipalities developed this **Municipal Broadband Toolkit** to provide members with a current perspective on municipal broadband, along with key information and learnings, including:

- Foundational knowledge on broadband;
- An understanding of relevant governing bodies and funding sources;
- Important considerations and approaches to delivering municipal broadband projects; and
- Examples of municipalities that have successfully launched their own broadband service(s).

# WHAT IS BROADBAND?

# What is Broadband?

**Key takeaway** – it is important for municipal administrators and elected officials to be aware of the diverse interpretation of the term 'broadband' when exploring or navigating a broadband project. Not only has it become a blanket-term spanning a variety of internet-related concepts, but it can infer a variety of socio-economic benefits that may not be universally understood.

Colloquially, 'broadband' is commonly used to reference internet connectivity and accessibility to internet technology services. However, it is formally defined as:

- *"…an always-on, high-speed connection to the internet through the facilities of an internet service provider (ISP). The term commonly refers to internet access via cable, digital subscriber line (DSL), and wireless technologies, that provide download throughput…"* – Canadian Radio-television and Telecommunications Commission (CRTC)

- *"…the transmission of a wide ('broad') range of frequencies ('band') that enable messages or communications to be transmitted simultaneously…high-speed internet access that is faster than traditional analog and legacy technologies, and uses transmission technologies including DSL, cable, fibre, wireless, and satellite"* – Federal Communications Commission (FCC)

As the prior definitions indicate, 'broadband' refers to both a range of technologies and a mode of operation (including a performance standard). But the scope of its definition has widened to incorporate broader economic concepts – including its ability to enhance the delivery of public services and create opportunities for investment – for example:

- *Broadband as an enabler of public / government services:*
  - As government bodies and agencies are adopting and offering online technology services, broadband offers a range of benefits including greater citizen engagement, increased interaction and coordination between levels of government, and improved efficiency.
  - For health services, broadband can support the adoption of digital health records, enable access to medical services in remote areas, improve the speed and access to health information, among many other benefits.
  - For education providers, broadband can reduce costs related to updating and distributing materials, remove time and location constraints related to learning, improve the flexibility and accessibility of services, and facilitate student collaboration and interaction(s).
- *Broadband as an economic driver or enhancer*:
  - It can enable economic growth via investment attraction (e.g., investment from multi-national corporations typically require fibre-based high speed internet connectivity), attraction and retention of residents who can work remotely, the adoption of leading technology-based practices (e.g., online payments), and entrepreneurship.

# REGULATORY BODIES & FUNDING SOURCES

# Regulatory Bodies & Funding Sources

**Key takeaway:** it is critical for any municipality considering a broadband project to understand the broader regulatory and policy landscape – this is due to:

- Potential future requirements to navigate these levels of government and regulatory bodies should a broadband project be executed;
- Awareness and justification for why broadband and internet services cannot or is not treated as a provincial public utility or service; and
- Federal oversight requirements and publicly available municipal broadband project funding opportunities.

Telecommunication, which includes both broadband and telephony services (wired and wireless), falls exclusively under federal jurisdiction. In Section(s) 91, 92, and 92A of the *Constitution Act*, the Government of Canada does not enumerate ('cite') either telephone or broadband services – meaning it cannot be included in any provincial legislation as either a "public utility" or "utility service". Historically, some of Canada's broadband and telephony services have been delivered via provincially-owned entities, such as crown corporations (e.g., Manitoba Telecom Services – now owned by Bell). While there are still some exceptions today (e.g., Alberta's SuperNet), most of Canada's broadband and telecommunications services are supplied via the private sector.

Therefore, it is the sole responsibility of the Government of Canada to regulate and oversee the delivery of these services Canada-wide – which it performs via federal parliamentary functions and the Canadian Radio-television and Telecommunications Commission (CRTC).

The Federal Government announced Regulatory Policy Decision 2019-496 via the CRTC on December 21, 2016. This announcement established a universal service objective:

> *"Canadians, in urban areas as well as in rural and remote areas, have access to voice services and broadband Internet access services, on both fixed and mobile wireless networks. To measure the successful achievement of this objective, the Commission established several criteria, including that Canadian residential and business fixed broadband Internet access service subscribers should be able to access speeds of at least 50 megabits per second (Mbps) download and 10 Mbps upload, and to subscribe to a service offering with an unlimited data allowance."*

Along with addressing key decision points regarding accessibility, and consumer empowerment, the policy serves as the basis for eligibility for various broadband funding programs, such as the Universal Broadband Fund (UBF) which is administered by Innovation, Science and Economic Development Canada (ISED).

In Alberta, the provincial government's role in broadband is primarily its public-private partnership (PPP) of a provincial fibre-optic network called 'SuperNet'. Operated with Bell, this network connects 4,200+ schools, hospitals, libraries, and government offices (including municipal) in 429 communities across Alberta. While the Government of Alberta (GoA) does not and cannot regulate internet services, it can:

- Offer funding and support for municipal broadband projects (e.g., via existing municipal funding sources or programming specific to broadband development); and
- Influence internet utility via policies on infrastructure development, digital literacy, among other related areas of the Alberta economy it oversees.

# Canadian Radio-television and Telecommunications Commission (CRTC)

The Canadian Radio-television and Telecommunications Commission (CRTC) is the federal entity that regulates and supervises broadcasting and telecommunications in the public's interest. Created in 1976, it replaced and consolidated the prior regulatory bodies and agencies that were solely responsible for regulating telecommunication carriers.

As an administrative tribunal, the CRTC's role pertaining to broadband is based on their regulation and oversight of telecommunications companies ('telecoms') and Internet Service Providers ('ISPs') – they accomplish this by:

- Setting and enforcing rules for ISPs; notably to increase competition and protect consumers (note: the CRTC issues licenses for telecommunication providers and ISPs but it does not directly regulate rates, quality of service issues, or business practices);
- Measuring and reporting on the performance of broadband service in Canada, and ensuring ISPs disclose their traffic management practices to consumers;
- Implementing policy direction from the Government of Canada (which is led by Innovation, Science and Economic Development Canada): and
- Managing broadband funding programs, which includes the Broadband Fund which aims to:
  - Provide up to $675 million over five years beginning in 2020;
  - Support projects that build or upgrade access and transport infrastructure for fixed and mobile wireless broadband internet access service;
  - Provide fixed broadband internet service access of 50 megabits per second (Mbps) download and 10 Mbps upload and the latest generally deployed mobile wireless technology (this is currently LTE) to Canadian homes and businesses as well as along as many major transportation routes as possible; and
  - Benefit Canadians who live in areas that are underserved.

**Note**: the CRTC also enforces the ownership requirements stipulated in the *Telecommunications Act*. This limits foreign investment and drives the need for private investment in municipal broadband projects (see Municipal Use Cases section for more information)

# Innovation, Science and Economic Development Canada (ISED)

A department of the Government of Canada, Innovation, Science and Economic Development Canada (ISED) is responsible for improving conditions for investment, enhancing Canada's innovation performance, increasing Canada's share of global trade, and building a fair, efficient and competitive marketplace.

## Mandate

Regarding broadband, their mandate is to:

- Regulate and administer wireless spectrum auctions, which facilitate access to radio-frequency spectrum (used for internet and telecommunications purposes);
- Provide policy direction to the CRTC (which includes the establishment of the Universal Service Objective for broadband internet); and
- Administer the Universal Broadband Fund (UBF).

## Spectrum Auction

The Spectrum Auction facilitates the sale and usage of Canada's radio frequency spectrum through a competitive process that is fair, transparent, and based on economic merit. A finite public resource, radio frequency spectrum is used by wireless communications service providers to provide key services including (but not limited to):

- Television, radio broadcasting, and wireless mobile device services (e.g., 5G);
- Wireless Fidelity (Wi-Fi) communications systems for emergency services; and
- Satellite broadcasting and communications.

Through the auction, telecoms and ISPs can acquire rights to radio frequency spectrums ('spectrum') that allow them to provide wireless services to Canadians via existing infrastructure.

## Policy

From a policy perspective, ISED is subject to the Department of Industry Act which states:

"[it has] powers, duties and functions of...telecommunications...[and] the development and utilization generally of communication undertakings, facilities, systems and services for Canada".

And included in its portfolio of services are both the Radiocommunication Act and Telecommunications Act. Along with conducting research on broadband adoption, ISED maintains publicly available dashboards and maps regarding internet service availability and connectivity.

## Universal Broadband Fund

ISED also administers the Universal Broadband Fund (UBF) which will provide up to $3.225B in order to bring 50 megabytes per second (Mbps) download and 10 Mbps upload speeds to rural and remote communities across Canada. The funding includes:

- $50 million for mobile Internet projects that primarily benefit Indigenous peoples, including projects along highways and roads where mobile connectivity is lacking;
- $750 million for large, high-impact projects through a Rapid Response Stream for shovel-ready projects that can be completed quickly'; and
- Remaining funding will be processed through a general stream.

# Government of Alberta

As previously stated, the Government of Alberta does not have a regulatory or oversight role as it pertains to broadband.

But in 2022, the provincial government released its Broadband Strategy which provides a high-level roadmap for how the provincial government would like to see broadband rolled out across the province by the end of fiscal year 2027.

In tandem with its strategy, it allocated:

- $390 million in broadband funding to be rolled out via the Universal Broadband Fund – bringing the total funding available to projects in Alberta to $780M; and
- $36 million to the Alberta Broadband Fund to help bridge connectivity gaps left the by the Universal Broadband Fund (particularly in rural, remote, and indigenous households).

The Government of Alberta has stated that it will continue to advocate on behalf of Albertans for spectrum policy changes including:

- Ensuring that rural and urban regions are not managed in the same service areas for spectrum licensing purposes, to better support development in underserved rural, remote, and Indigenous communities;
- Strengthening and enforcing a “use it or lose it” framework for spectrum licensing that ensures spectrum is more readily available to providers who can demonstrate intent to provide services to the region; and
- Ensuring policies discourage the acquisition and resale of spectrum licenses as a financial asset, and that buyers have realistic plans to develop the spectrum region.

# BROADBAND TECHNOLOGIES

# Broadband Technologies

**Key takeaway –** it is important for a municipality to understand the broader technology landscape at the onset of a broadband project due to:

- The variety of technology solutions available to a municipality (including legacy), each with their own advantages and disadvantages; and
- Common requirements to which all broadband deployments must comply, which can impact their feasibility and complexity (i.e., first, middle, and last mile segments).

## *Legacy Technologies*

Spanning both wired and wireless options, the following table provides an understanding of various legacy broadband technologies:

| Technology | Mode of Operation | Advantages | Disadvantages |
|---|---|---|---|
| **Fixed Wireless (i.e., tower-based transmission)** | ▪ An antenna is installed on a fixed location, and garners internet connectivity via radio waves transmitted from a fixed tower(s) operated in the area<br>▪ Performance can range from 1 - 80+ Mbps | ▪ Ease of deployment, and less intrusive (comparatively)<br>▪ Wired connections not required (particularly between each household or building) | ▪ Generally requires 'line of sight' between the fixed location and tower<br>▪ Subject to capacity constraints and variable performance if multiple users are using the service |
| **Digital Subscriber Line (DSL)** | ▪ Using a modem, this internet service delivery method uses phone lines to transmit bandwidth and network traffic<br>▪ Service is garnered from a station(s) within the general area – performance tends to be 0.5 – 100 Mbps | ▪ Can use existing wire-based telephone infrastructure<br>▪ Modems are typically provided by the service provider | ▪ Performance is highly dependent on proximity to service station(s)<br>▪ Better at receiving data versus sending data<br>▪ Limited by the presence of infrastructure |

| | | | |
|---|---|---|---|
| **Coaxial Cable** | ▪ Using a modem, this internet service delivery method uses cable tv lines to transmit bandwidth and network traffic<br>▪ Performance tends to range from 50 – 250 Mbps | ▪ More readily available in various geographic area(s)<br>▪ Performance is not reliant on proximity to service station(s) | ▪ Legacy technology, compared to fibre-optic cables, which is not built to be compatible with future technologies<br>▪ Available bandwidth is typically shared – therefore performance can and does vary |

It is important to be aware of these legacy technologies and their implications, particularly because there are commercial vendors proposing the continued use of these solutions due to the availability of infrastructure. While there may be some value in these technologies in the short term, the market's continued evolution (along with rapidly changing technologies) would suggest there is risk in investing and adopting them as a long-term solution, as they are progressively being phased out in favour of low-latency solutions, like fibre-optic and 5G networks. Moreover, these technologies are often unable to provide municipalities with the socio-economic benefits they are seeking to achieve via the delivery of a municipal broadband project.

## *Fibre-optic Networks*

Also called 'fibre', this technology transmits data in the form of light across an infrastructural network of fibre-optic cables. Compared to legacy technologies that transmit data on networks made of copper wiring, fibre-optic networks can transmit data over significantly greater distances, at near the speed of light, with greater quality and efficiency. In addition to offering speeds of 100+ Gbps (gigabytes per second), this technology offers many other advantages including:

- Improved latency (i.e., limited to no interruptions);
- More consistent performance (including to residential households);
- Better reliability and less affected by weather conditions; and
- Greater flexibility and capability to integrate with new technologies (which assumes a lower total cost of ownership over its life span).

The challenges associated with fibre-optic networks are primarily related to their high cost, and limited availability. As previously mentioned, fibre-optic technologies are built with the future in mind (i.e., capable of supporting services beyond those offered today), making it an attractive and value-driven investment in the long-term. However, the cost to lay and operate a fibre-optic network in the short-term can be significant, especially for geographies with low population density, unforgiving terrain, among many other factors. The high upfront cost of implementing a fibre-optic network also leads to its limited availability. Densely populated (i.e., urban) areas in Canada typically have pre-existing access to fibre-optic internet services via telecoms and ISPs.

The presence of fibre-optic infrastructure can be a requirement to garner foreign investment, as it is reliable and high-performing to properly support the operation of international ('satellite') offices. There are some municipalities in Alberta that proceeded with a fibre-based broadband deployment to satisfy requirements from a foreign investor.

# Wireless Networks

Not to be confused with WiFi, wireless network infrastructure operates by using radio-towers to transmit internet services (i.e., send and receive data) via radio waves. It is also important to note that these radio waves operate using spectrum, which may need to be purchased and licensed from ISED via the Spectrum Auction. These technologies have rapidly improved over the last ten (10) years, advancing from third generation (3G) wireless services to the (current) fifth generation (5G). When compared to fibre-optic networks, wireless network technologies are:

- Lower performing (i.e., can provide service up to 20 Gbps);
- Constrained by proximity and range requirements (e.g., achieving speeds similar to a fibre-optic network can require being within a <200m radius of related technologies);
- Less consistent and less reliable service (i.e., are affected by environmental factors and weather conditions); and
- More intensive to operate and maintain.

However, wireless networks do offer advantages when compared to fibre-optic networks, including:

- Faster and less intensive implementation requirements;
- Lower implementation costs;
- More accommodating for wireless and internet-of-things (IoT) devices; and
- Greater ability to overcome environmental and topographical challenge(s).

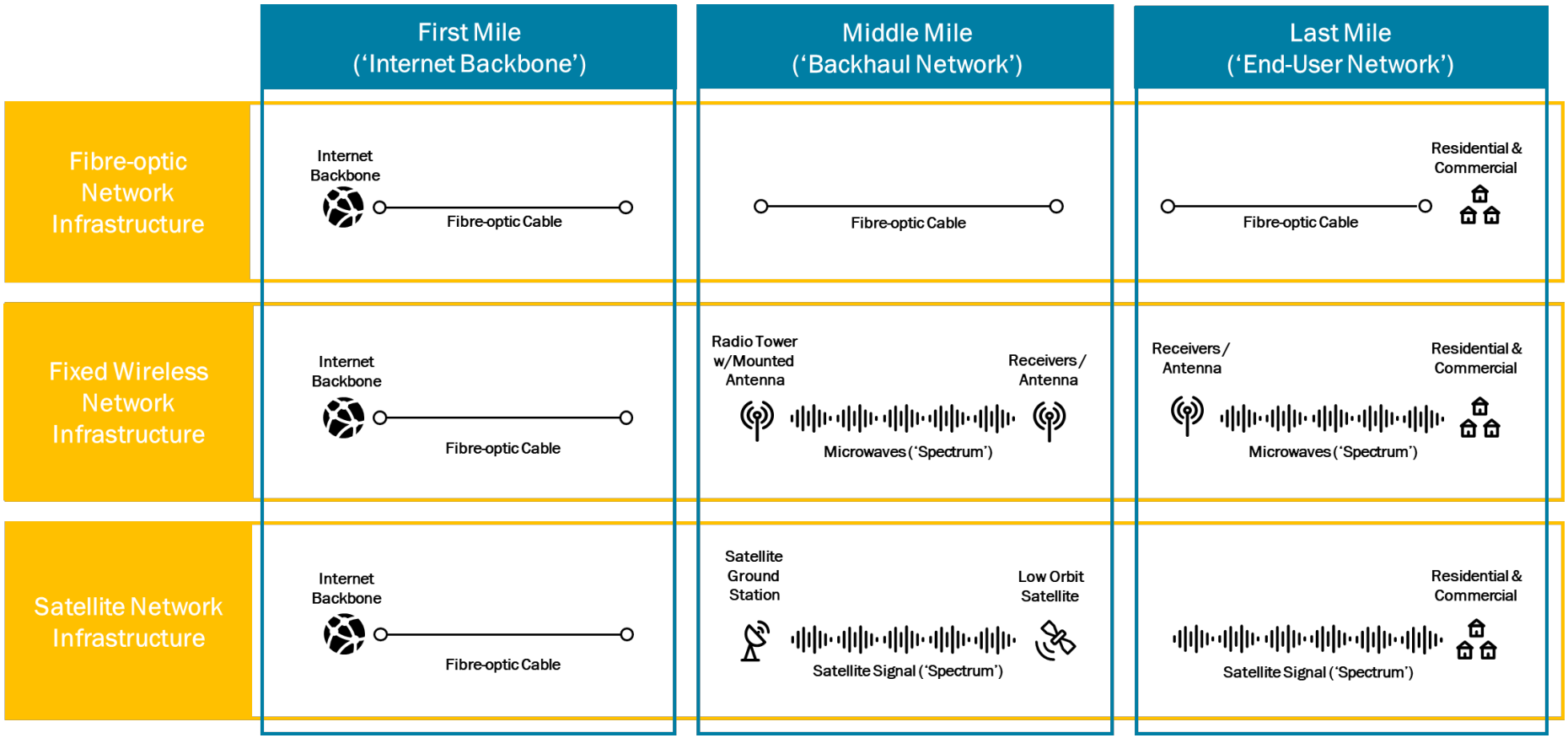
While physical fibre-optic deployments continue to be viewed as the most reliable and high-performing technology, the rapid evolution of wireless network technology provides optimism that it may be able to provide comparable levels of service in the not-too-distant future.

# Key Technology Considerations

It is important to have a high-level understanding of a broadband network in its totality. As end-users, our focus tends to be on the parts of a network that affect us the most (i.e., the parts that service our homes and workplaces). But there is a much 'bigger picture' when it comes to bringing internet services into a community. One of the most common conceptual models for network design is the 'Mile Model', made up of the following three (3) parts:

- First Mile ('Internet Backbone') – high-capacity networks that facilitate data transfer across countries and continents which enable the global public internet;
- Middle Mile ('Backhaul Network') – intermediate links between the first mile / internet backbone to the local networks at the regional level; and
- Last Mile ('End-User Network') – technologies that connect local communities, including homes and businesses, to the broader global public internet.

The following illustration provides a simplified visual understanding of the elements that make up the common broadband deployments and technologies:




Note(s):

- The above illustration provides a simplified view of the common broadband connection types and technologies. Variations of the above configurations exist (e.g., fibre-optic network infrastructure can make use of radio towers for its 'Middle Mile' network and then use fibre-optic cables for its 'last mile' connections).
- The model shown for Fibre-optic Network Infrastructure would apply for legacy technologies like DSL and Coaxial Cable, with the exception that copper wire would replace mention of fibre-optic cable infrastructure.
- Wireless, Fixed Wireless, and Satellite networks function in a very similar manner – the key difference is Wireless Networks provide more reliable and high-performing service for a geographic area, making them suitable to also supporting mobile technologies. Whereas Fixed Wireless and Satellite Infrastructure tend to be better suited to supporting fixed locations (e.g., a commercial building or residence).

### First Mile ('Internet Backbone')

Also commonly referred to as the 'Internet Backbone', the First Mile consists of the primary data routes that create the internet's fundamental and foundational infrastructure. It includes extensive systems that traverse nations and continents, managed by telecommunications entities which collectively form the 'internet backbone'.

For municipal broadband deployments, a common essential need, whether the technology employed is wired, wireless, or satellite-based, is the requirement to establish a physical link to the internet backbone. This is a vital component in all types of internet service provisions (as shown in the illustration on the previous page).

While ISPs and telecoms collectively manage and own the internet backbone, these entities are typically outside the scope of municipal broadband initiatives. Therefore, municipalities aiming to establish broadband services often need to partner with these providers to secure the necessary access ('connection') to the internet backbone.

### Middle Mile ('Backhaul Network')

This segment of a network plays a pivotal role in Canada's internet infrastructure by forming the bridge(s) between various local networks and the larger internet backbone. While approaches to connecting to this infrastructure can and will often vary, the following tends to be involved:

- **Installing physical infrastructure** – either wired or wireless, the development of this infrastructure will provide the essential linkage to the global internet backbone; and

- **Signing Internet Protocol (IP) Transit Agreement(s)** – intermediate networks typically intersect with other intermediate networks to eventually connect to the internet backbone; therefore, local internet traffic will need to traverse various third-party networks to eventually be transmitted globally. These agreements, are typically formed with ISPs (e.g., Bell, Rogers, Telus), network operators (e.g., SuperNet), or Internet Exchange Providers (IXPs), which are non-profit organizations that manage the network traffic between ISPs and the broader internet.

The best practice is to route network traffic in the most direct and efficient manner possible, ensuring high-performance internet service. However, constraints related to the availability of network infrastructure, IP Transit Agreements, and the financial implications of directing network traffic might necessitate less efficient routing paths.

### Last Mile ('End-User Network')

This is the final leg of the network, connecting end-users to the broader network. How a municipality approaches this segment of its broadband network is one of (if not the most) critical parts of a broadband project. Not only is it the part where performance issues can arise, but it is often the most expensive part of the network. When planning this part of a network, it is important to contemplate:

- **Technology type** – the choice between wired and wireless technologies is crucial, as each has its own tradeoffs between performance, cost, and ease of implementation;

- **Performance** – the process of providing internet services to each residence and commercial entity in a community is like splitting off branches from a main tree trunk. As more branches (or users) are added, the quality of service for each may lessen in terms of speed and reliability; and

- **Cost** – setting up the 'last mile' of a network can be costly. Wired setups provide great performance and future-readiness, but can be expensive, slow, and disruptive to install. Whereas wireless networks are quicker and easier to deploy but can require more complex setup and are maintenance-intensive due to a variety of factors (e.g., volume of connected devices, susceptibility to weather conditions).

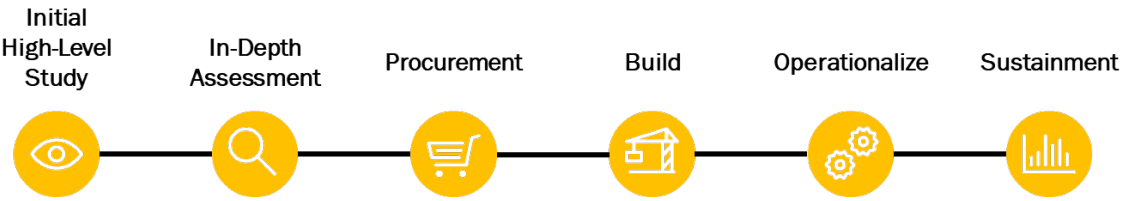
# APPROACHES TO BROADBAND

# Approaches to Broadband

**Key takeaway** – with over ten (10) municipal broadband networks currently in operation, and many more municipal broadband projects currently underway, a common approach to these projects is becoming evident in Alberta. In addition to being delivered by a blend of public and private sector entities, they are using innovative business models to overcome economic and financial barriers that often limit ISPs and privately-held telecoms from serving increasingly remote communities.

## *Common Approach*

While the outcome of each project may look different, there is an increasingly consistent set of steps municipalities are following to navigate and complete broadband projects – these are:




Detail information about each of these steps can be found in the table below:

| | |
|---|---|
| **Initial High-Level Study** | Conducted by either a group of municipalities, or a Regional Economic Development Agency (REDA) on behalf of entities in a regional geography, a high-level study typically provides an understanding of the impact(s) of bringing broadband into the region, technology options, along with various considerations specific to the area (e.g., economic, financial, technical, etc.).<br><br>A key outcome of these studies is whether there are opportunities for an aggregated or consortium-based approach to pursuing a broadband project – through this, entities in the area (including municipalities) can form strategic partnerships, or pursue projects independently. |
| **In-Depth Assessment** | Using the output(s) of the initial high-level study, a municipality (or consortium) will conduct its own in-depth assessment to accurately assess a future broadband project – including technologies, business models, economic and financial assessments, potential regulatory requirements, among the many other aspects of these projects (including what it will and will not outsource).<br><br>The outcome of these assessments will provide a clear understanding of 'what' and 'how' a broadband project should look, in order to prepare the organization for procuring in accordance with its expected approach. Another important item that should be covered in the assessment is a financial understanding of the project over its lifespan, and the role of the municipality and the business models (and partnerships) required in both the initial and long term(s). |

| | |
|---|---|
| **Procurement** | The procurement process will centre on:<br><br>(1) Identifying suitable vendors for the design, implementation, and operations of the broadband project (in alignment with the chosen approach); and<br><br>(2) Identifying and soliciting potential funding partners that will make the economics and financials of the projects viable for the municipality.<br><br>Securing competitive bids and finding vendors with the requisite experience can be a challenge, particularly for smaller or remote municipalities. More funding could be provided to aid municipalities in this process (there is an increasing trend in Alberta whereby winning vendors have a 'funding partner' to help make winning bid's more attractive and tenable for the municipality). |
| **Build** | This step is the most resource-intensive part of a broadband initiative. While there are existing funding programs targeting the implementation / build, they often do not fully account for the unique challenges faced by certain regions or types of projects, such as laying 'backhaul connecting' infrastructure in remote / topographically-challenging locations or using specialized technologies like low-Earth orbit satellites.<br><br>The building of the 'last mile' network is another exceptionally important and complex part of broadband initiatives. In addition to potentially laying infrastructure in areas where municipal infrastructure (e.g., roads, parks, water) may already exist, managing the disruption and coordinating it with other projects can present challenges. |
| **Operationalize** | This includes putting in place various operational capabilities and processes including network management, customer service, (potential) solicitation and management of ISPs, among many other things. While it will depend on the business model, a municipality should expect to add new services to their portfolio that they do not currently perform. |
| **Sustainment** | Depending on the business model:<br><br>▪ A municipality should expect to play an active role in the ongoing sustainment of the broadband network, including potential network infrastructure upgrades;<br><br>▪ Similar to other municipal assets, a broadband network will require ongoing planning, oversight, investment, active servicing, among other things; and<br><br>▪ The role of a municipality can vary from increasingly 'hands on' as they operate and manage their network with a partner(s), all the way to setting up a Municipally Controlled Corporation (MCC) whereby they are more of an oversight and governing party.<br><br>It is also important to note that the scope of a broadband deployment may change over time (e.g., serving a neighbouring municipality) which may have implications regarding sustainment of the network. |

# *Business Models*

For each and every broadband deployment, there is an underlying business model that will sustain its operations. In Alberta, a variety of business models are already being used by municipalities. These include privately-owned, publicly-owned, and blended ownership structures (e.g., Public Private Partnerships – PPPs). The development of a broadband business model is determined by the role it plays in the delivery of broadband services, which can be defined by the following three (3) layers.

**Network Infrastructure Layer ('Owns the network')**

This is the physical components that make up the broadband network – which may include fibre-optic cables, radio-towers, among various other parts of the network's infrastructure. This layer tends to be public-owned in Alberta, whereby municipalities have either leased 'dark' (i.e., not currently in operation) fibre-optic cables in their area, or they have installed their own.

**Responsibilities:**

- Ownership of the network
- Financing for construction and operations
- Contracts and pays Network Operator

**Network Operations Layer ('Operates the network')**

The operations and administration of the infrastructure layer – specifically, who controls the data flowing through the network, and who is responsible for ensuring its performance. This layer spans functions including: wholesale of network capacity to ISPs, network traffic prioritization, network issue management, liaising with network retailers in the event of performance issues, maintaining connectivity with backhaul networks, among many other things. Both public and private entities currently manage this layer for municipal broadband networks across Alberta.

**Responsibilities:**

- Overseeing the construction of network infrastructure
- Manages network infrastructure; including its availability and performance
- Facilitates the sale of wholesale network capacity to ISPs operating on the Retail Layer

**Retail Layer ('Provides retail services to residents')**

The layer of a broadband network that delivers services directly to consumers (i.e., residential and commercial) – within Alberta, this layer is serviced almost exclusively by private ISPs and telecoms.

**Responsibilities:**

- Purchases network capacity from Network Operator
- Sells and provides services to end users (i.e., residents and commercial entities)

While there is no 'one size fits all approach', municipalities in Alberta are progressively trending toward creating Open Access Networks (OANs) as their business model of choice. Among many reasons, it is a favourable business model to service rural areas with low population density because it removes the requirement for each ISP to build and service its own network (which is often a significant barrier to servicing these areas). In an OAN, a municipality typically builds and 'owns' a single network that is capable of servicing its region / community. It will either manage or contract out its network operations, and then invite various retail ISPs to use the municipal broadband infrastructure to deliver services to their community.

The key trait of this business model is the separation / segmentation at the Network Operations and Retail layers. By having different parties playing different roles on the different layers of the business model, the municipality creates an 'open market' whereby ISPs can and will compete to provide services. Moreover, by removing the requirement for ISPs to own, build, and operate their own network infrastructure, the municipality creates a more favourable business case for ISPs to service their community.

It is also important to acknowledge the 'financing' advantage municipalities have when creating a business model for broadband services. Unlike the private sector, which typically must operate with much shorter timelines when it comes to attaining profitability and realizing benefits, municipalities have the flexibility to explore and enter into longer-term financing agreements. This gives them the ability to finance what could be a substantial capital project over a very long period (e.g., 20 years), and enter into an 'innovative and alternative' business model that enables them to account for the unique requirements of their region.

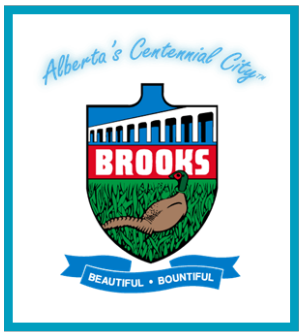
# MUNICIPAL USE CASES

# Municipal Use Cases

**Key takeaway** – this section provides a summary of four (4) distinct municipal broadband projects executed within Alberta. Each use case is intended to provide insightful and relatable information for any municipality contemplating initiating a broadband project – including 'how their project got started' and 'how their project was executed' (i.e., approach, business model, outcomes).

As more municipalities undertake broadband projects in the wake of increasing funding (i.e., Universal Broadband Fund, Alberta Broadband Fund), opportunities exist to glean insights and learnings from other local governments who have launched their own community broadband networks.

The following municipal broadband projects are featured in this document:



# *Use Case #1 – Red Deer County & Village of Delburne*

**How did the project start?**

In collaboration with the Central Alberta Economic Partnership (CAEP), Red Deer County and the Village of Delburne initiated a study to explore options for expanding and improving broadband connectivity in their region. This study not only helped them assess potential business models, but it also identified an opportunity for the County to take a leading role in paving the way for better internet connectivity for rural residents in the region.

Red Deer County committed to constructing a state-of-the-art backhaul fibre optic infrastructure – which now serves as 'the bridge' that links the region to the larger Internet Exchange Points (IXPs) in Edmonton and Calgary. This not only elevated the County's own network capabilities, but they also created a scalable model that adjacent communities could tap into.

Recognizing an opportunity, the Village of Delburne stepped forward to become the County's first municipal partner. This partnership provided Delburne with high-speed internet at a significantly lower cost compared to providing the service independently. Strategically, Delburne was a fitting choice for the first hub, given its geographical positioning. Its location enabled the facilitation of the fibre-optic network infrastructure, while also serving as a hub for potential future expansions.

**How was the project executed?**

- **Phased approach to expanding their fibre optic network** – the County prioritized building the network toward populated areas to facilitate future projects. This involved running fibre-optic cabling to buildings and households, as well as constructing wireless towers connected to the network, with the ultimate goal of providing comprehensive coverage to the entire region.

- **Established a municipally owned Open Access Network (OAN)** – Red Deer County retains ownership and control over the infrastructure, while partnering with a private-sector entity that specializes in network construction and management. Retail ISPs leverage the infrastructure to deliver internet services, fostering competition and choice for consumers.

- **Private-Sector Partnership** – Red Deer County contracts a private-sector partner to build and operate the broadband infrastructure. This partner is responsible for the construction, maintenance, and ongoing management of the network. They bring the expertise and resources required to ensure the network's efficient operation.

- **Internet Service Providers (ISPs)** – ISPs are the retail layer of the business model, who utilize the broadband infrastructure provided by Red Deer County to offer internet services to residents and businesses. These ISPs leverage the high-speed network to deliver internet connectivity, including various plans, packages, and pricing options, to end-users.

- **Creation of a Municipally Controlled Corporation (MCC)** – In 2023, Red Deer County unveiled plans to establish a municipally controlled corporation, Rural Connect Ltd. This initiative is a collaboration between the county, private sector partners, and other municipalities. While the corporation aims to broaden its customer base across the county with a keen focus on efficiency, it has garnered significant support from key private sector players, contributing start-up capital and technical expertise to manage fibre optic systems.

# *Use Case #2 – City of Brooks*

**How did the project start?**

The City of Brooks' broadband journey started with the discovery of 'dark fibre' (a pre-existing fibre line that was installed but not put into service). To further explore the potential utility of this infrastructure, the City of Brooks secured funding through the Community and Regional Economic Support (CARES) program.

Originally, the municipality considered connecting to Calgary's Internet Exchange Provider (IXP) via Medicine Hat and Lethbridge using this dark fibre. However, a cost analysis revealed that 'lighting' the dark fibre would be more expensive than utilizing existing cables from an Internet Service Provider (ISP). The City then began to explore a more cost-effective option – they would leverage the ISP's cables to be the backbone of their network, to transfer the data between Calgary and Brooks. But the City of Brooks would still need to construct a feeder network (i.e., move data between the backbone to different areas of the municipality) and the distribution network (i.e., move data between the feeder network and last mile infrastructure).

Recognizing the financial and technical complexities of their broadband project, the City of Brooks issued a Request for Proposals (RFP) to solicit innovative solutions. The successful bid came from a network consortium, comprising an engineering firm, an initial ISP, and a financial partner. This collaborative approach set the City of Brooks on a course toward establishing an open-access broadband network, now known as BrooksNet.

**How was the project executed?**

- **Identified existing network infrastructure ('dark fibre') and assessed its applicability –** the discovery of a dark fibre line in Southeast Alberta acted as a catalyst for the City to further explore broadband opportunities. Even though the municipality decided against utilizing this dark fibre, it underscored the importance of such an asset. For other communities, awareness of dark fibre infrastructure in their vicinity could offer both opportunity and advantages. Existing network infrastructure can potentially accelerate a broadband project, reduce initial capital expenditures, and offer a foundation upon which an expansive network can be built.

- **Creation of a municipally owned open-access fibre network** – by funding the foundational fibre infrastructure, the City effectively minimizes 'market entry' hurdles that typically impact ISPs. Specifically, ISPs can bypass the hefty capital expenditure usually required to lay down such infrastructure. The open-access market promotes healthy competition, since it enables various ISPs to participate and compete to serve the community's needs. Once BrooksNET is live, a charge of $10 per month will be applied for every customer that accesses the network, to help the municipality recoup its costs.

- **Public-Private partnerships** – Brooks solicited a consortium of companies to build a fibre-optic network, as well as provide retail-level internet service prover services in the community. In addition, a private equity partnership was created to bring in external investment funds to support the City's network operations and maintenance service needs.

# *Use Case #3 – Town of Vermilion*

**How did the project start?**

The Town of Vermilion embarked on a transformative journey to revitalize its downtown, actively investing to bolster economic and business growth, preserve historical landmarks, invigorate the community, amplify tourism, among other priorities. As part of this broader vision, the Town sought input from downtown businesses. A recurring concern was the need for better broadband infrastructure.

Historically, Vermilion had relied on a last mile network comprised of copper lines, coaxial cables, and fibre connections through the SuperNet – primarily catering to educational institutions and healthcare facilities. After failing to attract investment from the incumbent providers, the Town took matters into its own hands. Compounding this challenge, certain pockets of Vermilion already met or surpassed the 50/10Mbps standard set by the Canadian Radio-Television and Telecommunications Commission (CRTC), rendering them ineligible for most federal funding opportunities.

Rather than undertaking an immediate expansive deployment, the Town took a calculated approach of rolling out pilot tests. For example, the first pilot test was introduced at their local fair, offering vendors a chance to employ Point of Sale (POS) systems for a cashless transaction experience for attendees.

Encouraged by the initial success, the Town then initiated a more ambitious six-month pilot project, this time focusing on ten (10) local businesses. Again, the results were overwhelmingly positive, confirming that better broadband was a critical utility for business operations. This second successful pilot set the stage for the Town to delve deeper into researching various technology and funding avenues, thus continuing their ongoing commitment to a thriving and interconnected community.

**How was the project executed?**

- **Conducted a feasibility study** – in 2017, the Town of Vermilion, part of the Vermilion River Regional Alliance (VRRA), obtained a grant for a feasibility study of local internet services. The study's results prompted the Town to secure a license from the Canadian Radio-Television and Telecommunications Commission (CRTC) to become an ISP.

- **Executed a small-scale broadband pilot** – the Town used a $300,000 grant from the Municipal Sustainability Initiative (MSI) to run a pilot project with ten (10) local businesses to verify the need for improved broadband services. The successful pilot confirmed the municipality's potential to play a significant role in delivering broadband services, enabling the town to move forward with plans to establish a municipal broadband network.

- **Requested ISP partner(s) as part of the market solicitation** – the RFP (Request for Proposal) sought a proponent that would bring at least one ISP (Internet Service Provider), delivering an end-to-end solution to its residents and local businesses at the onset.

- **Established public-private partnerships** – working together with the Alberta Broadband Network and Primus Communications, the Town of Vermilion has been empowered to deliver Gigabit-level internet speeds and even more advanced services to its local residents. It leveraged an Open Access Network (OAN) design to facilitate wholesale service delivery and encourage competition among various service providers.

# *Use Case #4 – Town of Olds*

**How did the project start?**

The Town of Olds was the first municipality in its region to offer gigabit internet speeds through its community-owned and operated fibre-to-the-premises (FTTP) network called O-Net.

The Town began its broadband journey with a vision to create a connected community, offering technology services and experiences comparable to those in larger communities. In 2004, the Technology Committee of the Olds Institute for Community & Regional Development (OICRD) was formed, and it focused on building an Open Access Network (OAN) with the intention of attracting the incumbent telecommunications providers to enhance their services in the community. After two (2) years of unsuccessful negotiations with the ISPs, the Town pivoted to develop its own corporate entity capable of delivering internet services over its community-owned fibre network.

In 2010, the Committee borrowed funds from the Town, and combined it with grant money from the Government of Alberta, to develop O-Net – Alberta's first municipally-owned ISP. A true pioneer in the municipal broadband space, O-Net was capable of providing gigabit internet service (1,000 Mbps) to its residents for as little as $57 per month in 2013.

**How was the project executed?**

- **Created in response to the market** – as commercial ISPs refused to use leverage a network they had not built nor installed, the community developed and operated its own service. This approach ensured the needs and interests of residents were prioritized, particularly the affordability and accessibility of services.

- **Diverse service provider** – in addition to broadband, O-Net provided adjacent phone and televisions services to residents.

- **Municipally Controlled Corporation (MCC)** – while O-Net is fully owned by the Town of Olds, operating as a MCC created opportunity for the entity to operate more like a private entity. While it still operates under the laws and regulations of the Province of Alberta, it is able to operate independent of the local governments involved (i.e., hire staff, raise capital, among various other activities).

- **Partnership with Network Operations Provider** – in August 2022, O-Net indicated it had formed a partnership with two private companies to oversee the management and growth of its operations. This alliance is aimed at leveraging the partners' knowledge and skills to increase its customer base, and further secure the organization's long-term sustainability. Since 2022, the service continues to expand into other municipalities (e.g., Lethbridge) and neighbouring provinces (i.e., Saskatchewan).

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