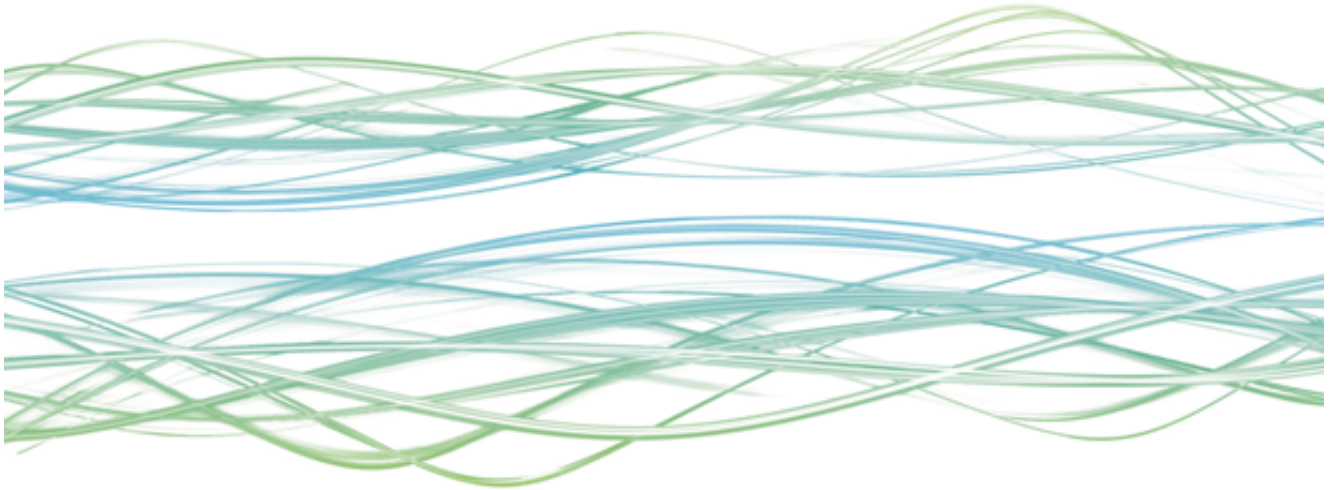
Community Networks 101



What is Broadband?

- ‘Connectivity’ not just ‘Internet’
- “Always-on, high capacity data transmission network”
- Download / Upload speeds important
- Asymmetrical / Symmetrical connections
- Wired / Wireless - ‘Fibre to the Antenna’

Community Broadband Benefits

- Economic Growth
- Business
- Agriculture
- Government
- Health
- Education
- Public Safety
- Transport
- Teleworking
- Entertainment
- Tourism

Planning for future use and demand

- Last 20 years - demand grows as devices, applications evolve
- Cisco:
  - Global Internet traffic to triple in next five years;
  - Number of connected devices to almost double by 2018;
  - Global streaming video in 2020 equivalent to 86 billion DVDs annually
- Internet of Things (IoT) - billions of networked ‘smart’ devices - buildings, agricultural equipment, medical devices, etc
- Need to develop **scalable** broadband systems
- Communities at different stages - develop their own solutions

Planning for Demand: Aggregating Service Levels

Individual = single connection/single device (ex. mobile phone)

Household = single connection/multiple devices (ex. Wi-Fi with computers)

Organization = single connection/multiple devices (ex. office network)

Community = single connection at community PoP (multiple homes/businesses)

Region = wholesale bandwidth shared among communities (K-Net; Tamaani)

Type	User Types	How it Works	Advantages	Disadvantages
Fixed Wireless	Transmission by tower to fixed points, using wireless spectrum	Costs include tower deployment and maintenance and radio antenna infrastructure	Less intrusive to deploy; doesn't require wired connections with each home/ business	Requires line of sight to receiver; can face capacity constraints with multiple users
DSL	Transmission over copper telephone lines	Requires access to copper telephone lines	Uses existing and ubiquitous infrastructure	Slowest of the wired broadband connection types; performance declines with distance
Coaxial Cable	Transmission over coaxial cable	Requires access to coaxial cable lines	Fastest of legacy wired connection types (copper and coaxial cable)	Performance declines with congestion from multiple users
Fibre	Transmission over fibre optic cables	Costs include fibre deployment (trenched or aerial); potentially electronics at ends of fibre cables	Fastest of all connection types; allows symmetrical connections (same upload and download speed)	Expensive to deploy at first (compared to fixed wireless towers)

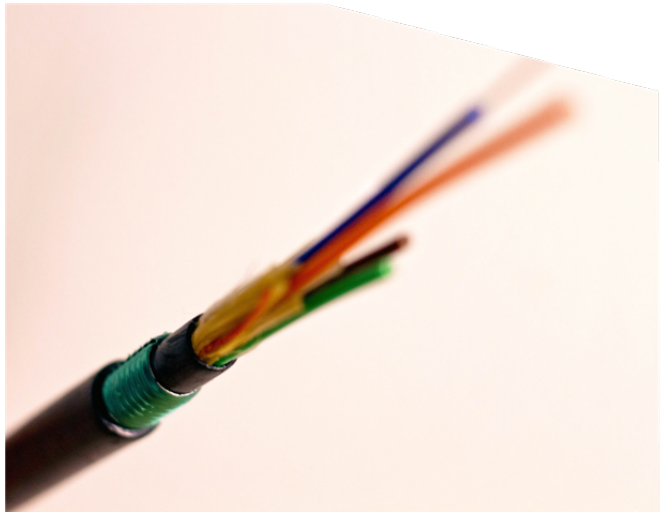
Fixed Wireless Access Technology (FWA)

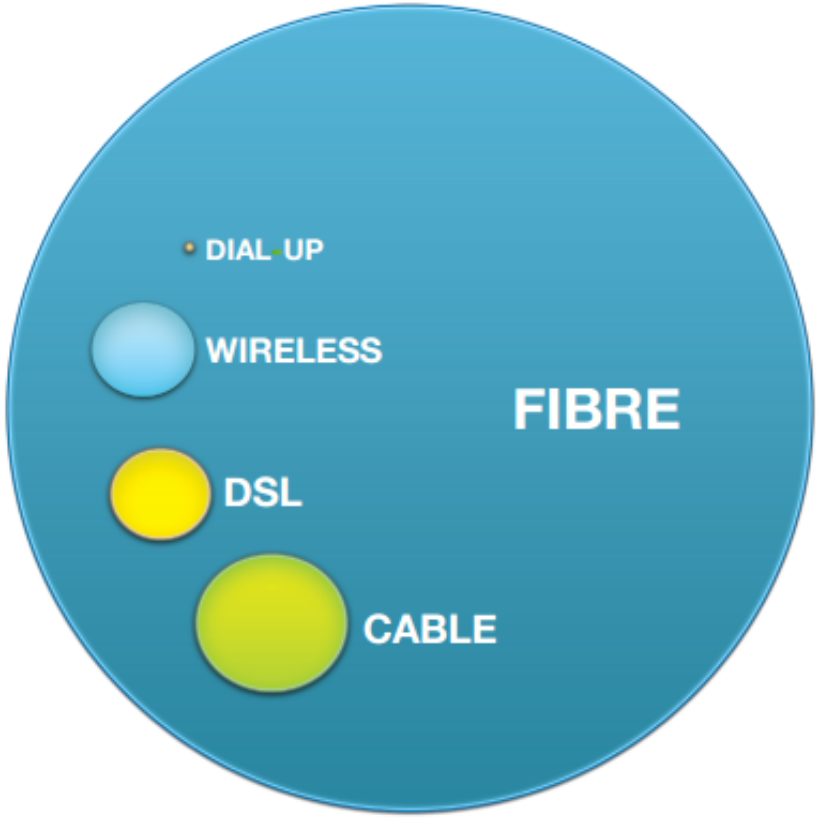
- Speed up to 100 Mbps in the aggregate (but impacted by download/ upload split and number of concurrent users)
- Typically slower than wired links but sometimes outperforms DSL
- Transmits information via radio waves from towers to fixed points
- Receiver must be within line-of-sight of the tower to connect
- Towers connect to backhaul infrastructure through microwave (more common) or by wired connections (ideally fibre) (less common)
- Ideal for remote and sparsely populated areas

Fibre Access Technology

‘Open’ or ‘Closed’

‘Lit’ or ‘Dark’





Fibre Technology Overview

- Fibre-to-the-home/business/premises (FTTH/B/P)
- Generally 1 Gbps (1000 Mbps), though up to 10 Gbps
- Signals travel through fibre optic cable
- Allows symmetrical (equal) upload and download speeds, but most implementations asymmetrical
- Speeds limited by electronics attached to fibre optic cables
- **BUT** - full scale deployment more expensive than fixed wireless

Benefits of Fibre

- Scalable - enough carrying capacity to meet foreseeable future demands, supported by ongoing technical innovation
- Once capital costs (including conduit deployment) are paid, fibre relatively cheap to install, maintain and upgrade
- Lasts quite a long time - up to 100 years
- Supports other forms of broadband, such as fixed wireless
- Distance not a barrier - data transfers quickly
- Allows for symmetric connections - equal upload/download

Network Deployment

Two types of connection:

1. **Backhaul**
    - To Internet infrastructure via Internet Exchange
    - Links your community to the world
2. **Last/Final Mile**
    - In community (households; businesses)
    - To backhaul via ‘Point of Presence’ / ‘Meet Me Facility’

Two Types of Connections

Technology Specific Considerations

Fibre networks

- ‘Open’ or ‘Closed’
- ‘Lit’ or ‘Dark’

Fixed wireless towers

- Tower sharing rules
- Licensed or unlicensed (license exempt) spectrum

Ensuring redundancy and security

Economics of Broadband

Technological Considerations - what type of technology do you want to use?

Ownership - who will own and maintain the infrastructure?

Service Provision - who will provide services over the infrastructure?

Business Model - what will be the revenue/cost model to support the broadband system?

Considerations: Technology

- Fixed wireless vs Fibre
- Fibre deployment: aerial vs trenched
- Wireless deployment: tower heights; connection to PoP
- Costs of electronic equipment
- Density, geographical spread and topography of your community
- Cost of crossings and rights-of-way (railway, pipelines, etc

Considerations: Costs

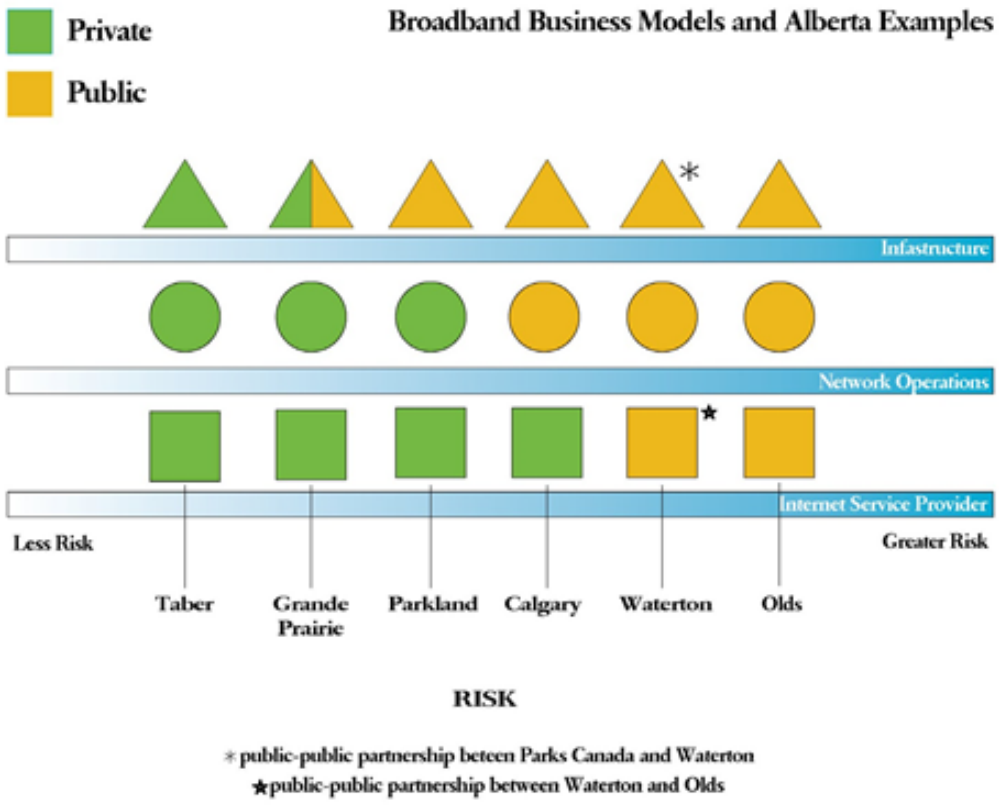
Capital Costs

- Procurement and installation of infrastructure
- Amortizing capital expense - 10 years, 15 years, 25 years?
- Infrastructure as a utility? (paid from local tax revenues)

Operations and Maintenance Costs

- Operating, maintaining, upgrading facilities (obsolescence?)
- Technical, administrative, marketing and support staff

Considerations: Layers of Ownership (and Risk)



Community Engagement

- Identify development goals
- Shape projects to enable widespread adoption and effective use
- ‘Whole Community’ approach - strategic planning on how bandwidth is paid for, distributed and managed
- Inform decisions on how infrastructure and bandwidth made available to deliver services such as e-health, e-learning, etc

Benefits of Community Engagement

- Supports leadership by providing information from constituents on local needs and priorities (political buy-in is key)
- Enables strategic planning, research and business support
- Helps build technical capacity and digital literacy through targeted training initiatives
- Educates residents on the benefits and uses of broadband
- Helps identify community champions

Engagement Process

- Whole community perspective addresses a diversity of users: individuals, businesses, organizations – and regional links
- Consider both social and technical components: underlying local and transport infrastructure along with various uses
- Consider: availability, price, quality of service, interoperability, ownership, and accessibility
- Engagement takes a variety of forms, including surveys, focus groups, and planning circles

Example: Citizen Planning Circle in Olds, AB

- Spring 2014; 13 diverse community members
- Participants heard background; contributed to policy
- Through facilitated discussions, developed action proposals to inform broadband in agriculture, business, education, and healthcare sectors
- Facilitated by Centre for Public Involvement (CPI) at the University of Alberta, supported by Alberta Agriculture and Rural Development, Olds Institute, and CPI.
- For more information, visit Olds Institute website: http://www.oldsinstitute.com/

Example: Axia Survey in Vulcan, AB

- Meetings with community leadership
- Engage citizens – demonstrate 30% of residents express interest
- Evaluation – Axia surveys town (roads, utility paths, permits)
- Design – of fibre network
- Construction
- Sign up
- Installation

Image Source:
https://www.axia.com/alberta

More info: https://www.axia.com/alberta

Challenges and Pitfalls in Broadband Planning

- Lack of Community “Buy-In” / Defining the “Why”
- Achieving a Proper Needs Assessment
- Implementation Costs
- Competition or Uncooperative ISPs
- Population/cost ratio: Small population = low capital / high O&M – and vice-versa (Average Revenue Per User)

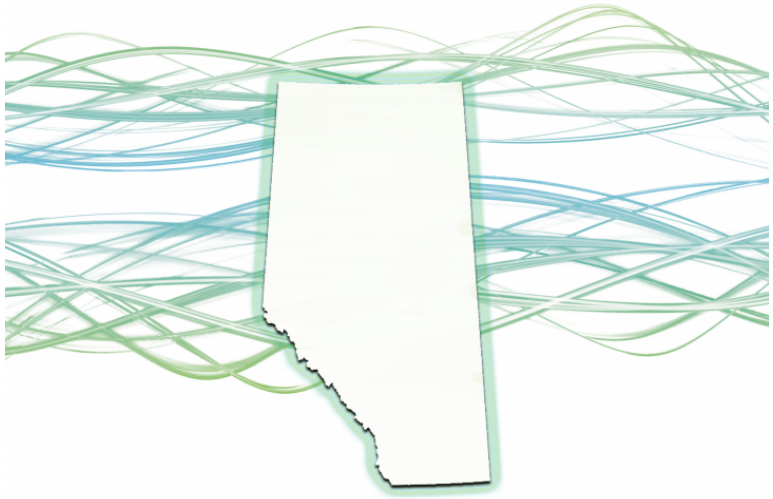
Geographic Considerations

- Distance to POP/availability of backhaul/connection to Internet Exchange Point
- Density and geographical spread
- Topology and line of site, climate (fixed wireless solutions)
- Trenching vs aerial deployment (fibre solutions)

Broadband Best Practices

- Dig Once
- Aerial Fibre Deployment
- Fibre Fed Towers
- Transition Planning
- Demand Aggregation
- Thinking and Working Regionally

Resources:



UNDERSTANDING COMMUNITY BROADBAND:
THE ALBERTA BROADBAND TOOLKIT