Wireless Broadband Webinar

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FortisAlberta acknowledges that its operations and facilities occur on the traditional territories, meeting grounds and travelling routes of the Indigenous Peoples of Treaty 6, 7 and 8, and Métis people in Alberta.

We make this acknowledgement as an act of reconciliation and gratitude to those whose territory we reside on or are visiting.

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Wireless Broadband Webinar

Connect

Cambium Networks™

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Facilitated by Jennifer Shillam, Advisor – FortisAlberta Inc.

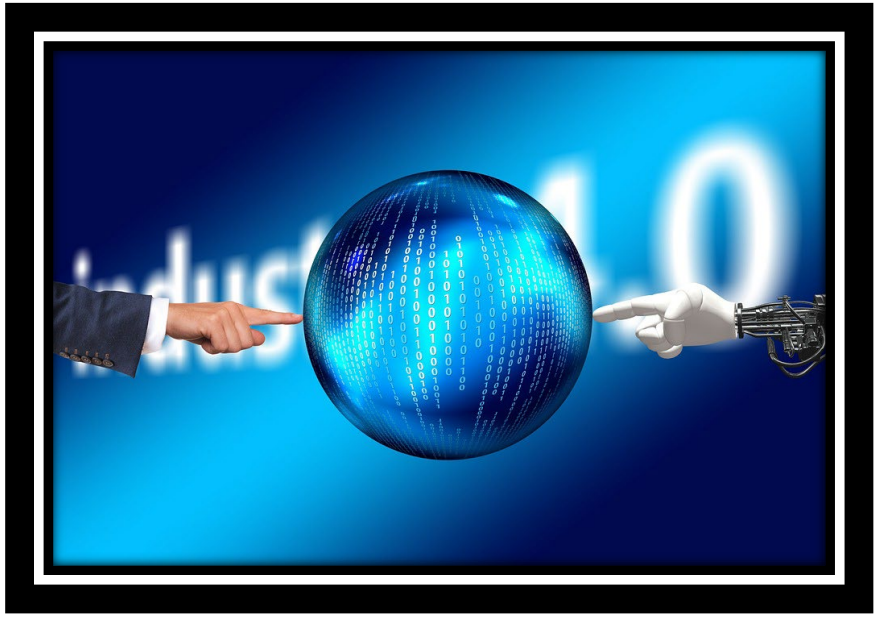
Broadband – A Rural Sustainability Solution

Caroline McAuley, MBA

Current Municipal Challenges

- Reduced funding
- Infrastructure deficits
- Rural to Urban migration
- Workforce retention challenges
- Global trends impacting rural communities

Why Broadband?



Why is it important?

- What is broadband?
- Bringing the world to our community
- Rural sustainability
- COVID

The Vermilion Story

WHAT DID WE DO?

Opportunities for Municipalities

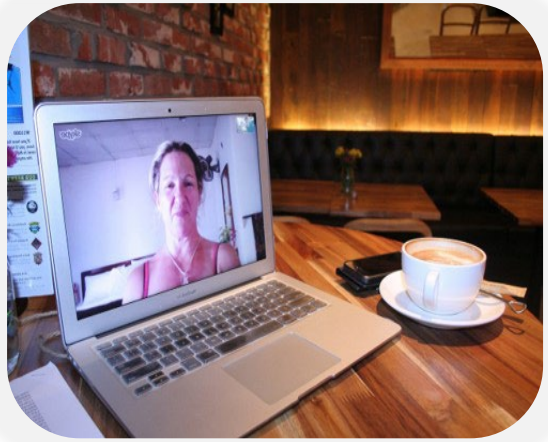
- Attract / retain talent for municipality
- Engage citizens
- Drive economic growth and innovation
- Increasing tax revenue
- Revitalization
- Service delivery
- Efficiencies from a “smart” community

Opportunities for Business

- Retail transactions & online presence
- Access to online training
- Security infrastructure
- Industry support – collaboration, payroll etc.
- Agriculture and AI

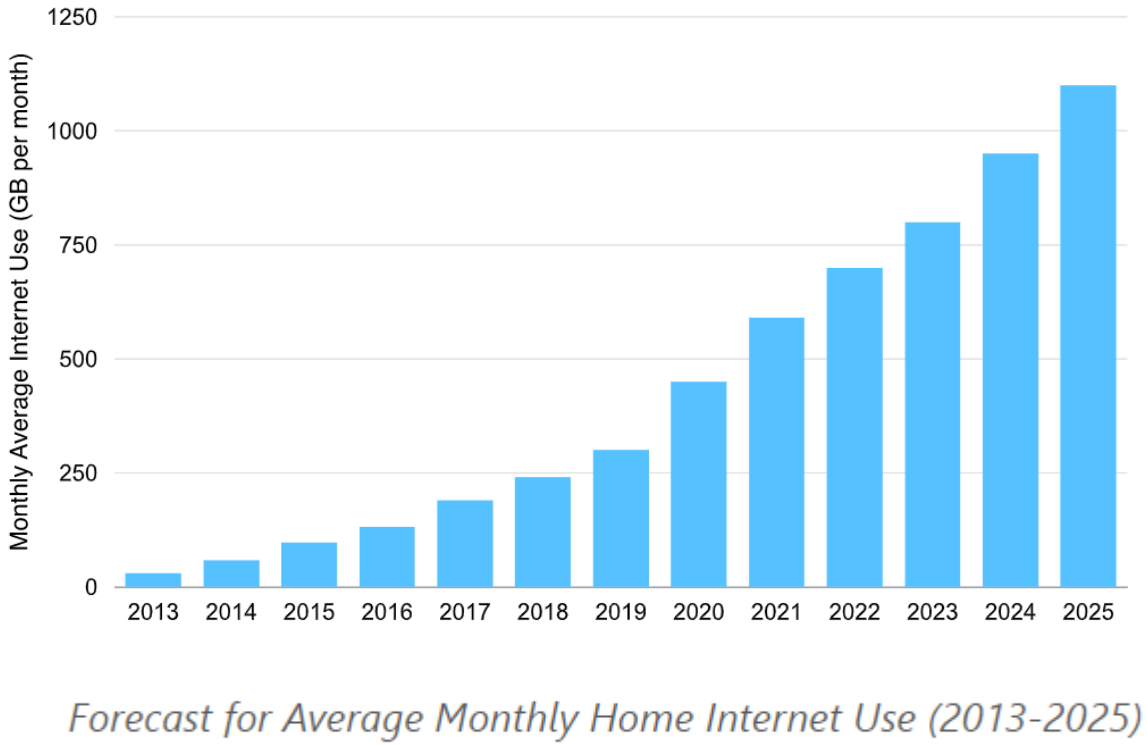
Opportunities for Residents

- COVID and working/learning at home
- Connecting with family
- Enhanced quality of life - lower cost of housing
- Access to the world economy
- Smart home increased home value



What will be your community's story?

Appetite for High-Capacity Broadband Accelerating



Forecast for Average Monthly Home Internet Use (2013-2025)

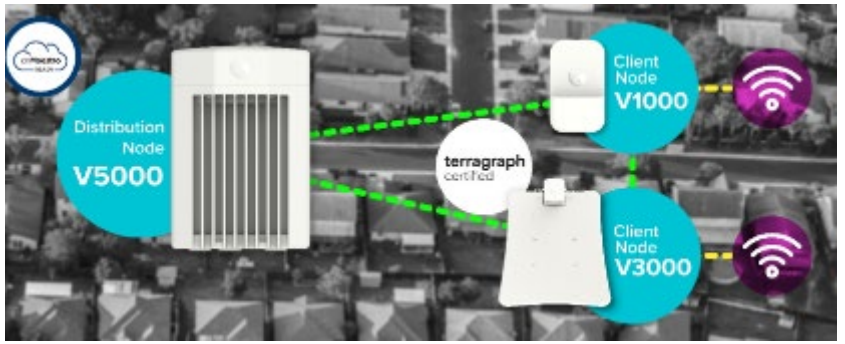
- **Monthly residential/business data consumption growing dramatically**
- **Average household requirement expected to surpass 1 TB by 2025**
- **Driven by video streaming, remote meetings, IIoT devices, enhanced services**
- **Remote Workers can live anywhere! But they need reliable ultra-fast broadband**
- **Trend will continue**
  - Ultra HD 4k streaming from providers such as Netflix
  - YouTube streaming on multiple devices
  - family video conferencing
  - Video surveillance / Home automation
  - more people working from home.
  - Enhanced VR gaming & services

What is cnWave?

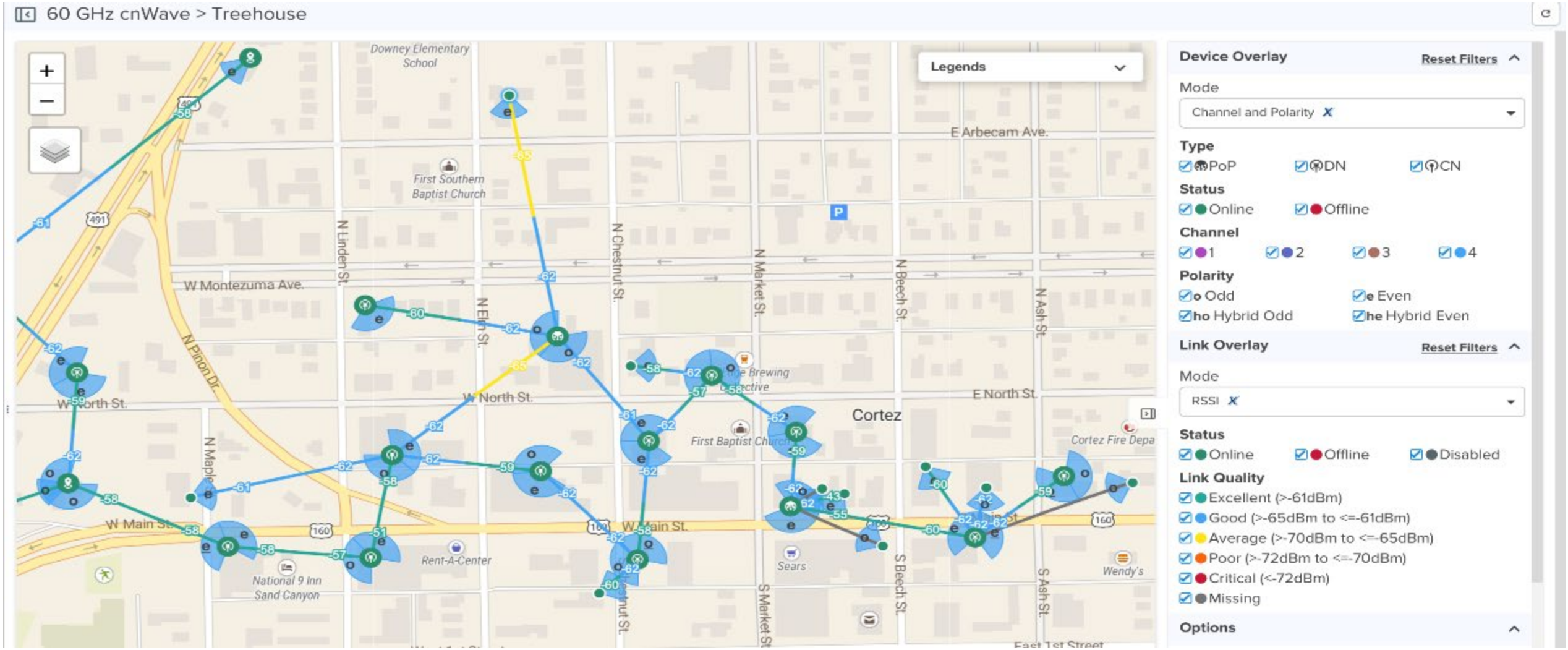
Cambium Networks™

An **innovative** wireless platform which provides **fast, reliable, cost-effective, and quick-to-deploy** wireless gigabit connectivity for communities

- A true alternative to fiber.
- Specially designed radios create a mesh network, connecting multiple nodes in a self-organizing network.
- Supports speeds of conventional fiber and faster
- Highly reliable: Distributed network with sophisticated routing protocols, can self-heal because nodes have multiple paths to the internet
- Uses compact “distribution nodes" (installed on power poles) to form the wireless mesh, and smaller client nodes installed on homes
- cnWave is MUCH lower in cost compared to traditional fiber and VERY fast to deploy. It can be brought to market in a matter of weeks!



Flexible Deployment Options / Realtime Monitoring



cnWave Platform

Cambium Networks™

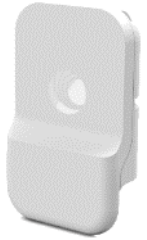
Distribution Node

V5000
Dual Sector

Client Nodes

V3000
High Gain

V2000
Flexible
Mid-Range



V1000
Small
Form-Factor

All 60 GHz cnWave products include:

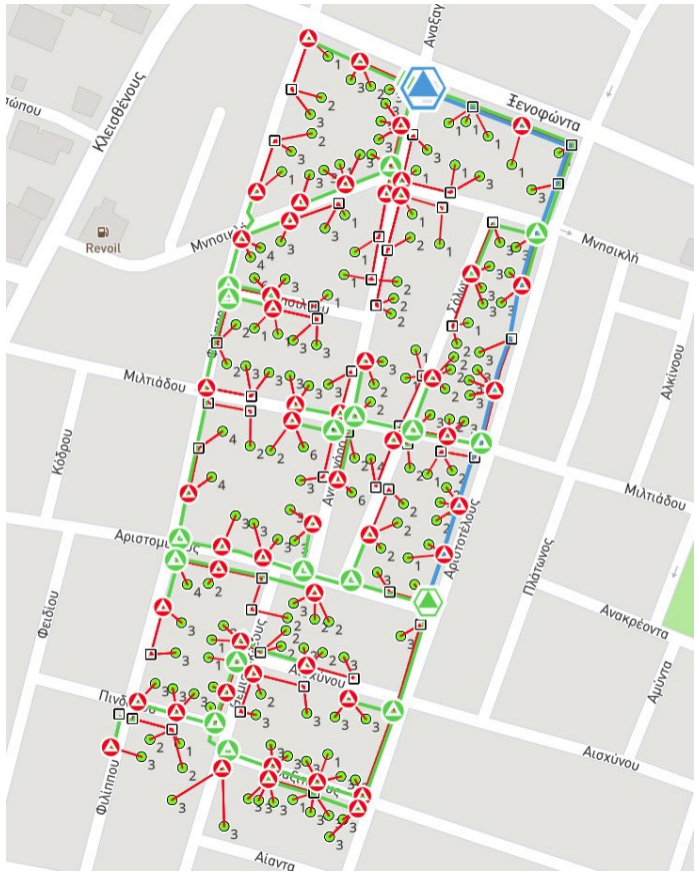
- Cloud or on-premises network management with cnMaestro™
- Network planning capabilities with cnHeat, LINKPlanner, and ANP
- On-board or Remote e2e Controller
- Layer 2 or layer 3 network connectivity
- IPv4 or IPv6 networking protocols
- Security with HTTPS interfaces and 128-bit AES encryption

cnWave Networks Are Popping Up Everywhere

cnWave vs. Fiber to the Home

Fiber

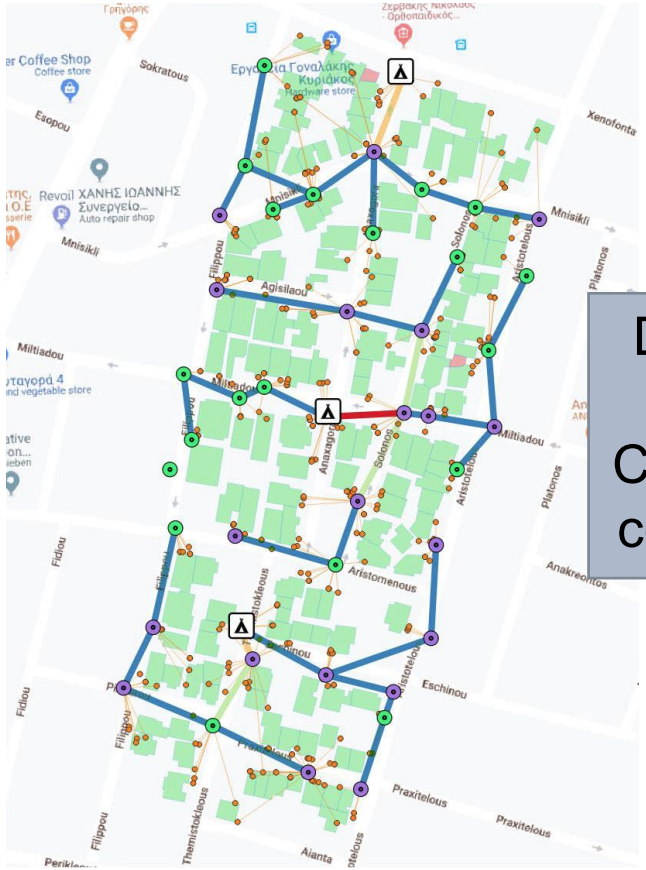
Trenches, Closures, Cabinets, Splice Points, Underground Cable, Digging = **Time + Disruption**



cnWave

Wireless

DNs installed on power poles, client nodes on homes = **Quick-to-deploy, much lower cost**



Deploys in weeks

Cost = 10% to 40% compared to FTTH

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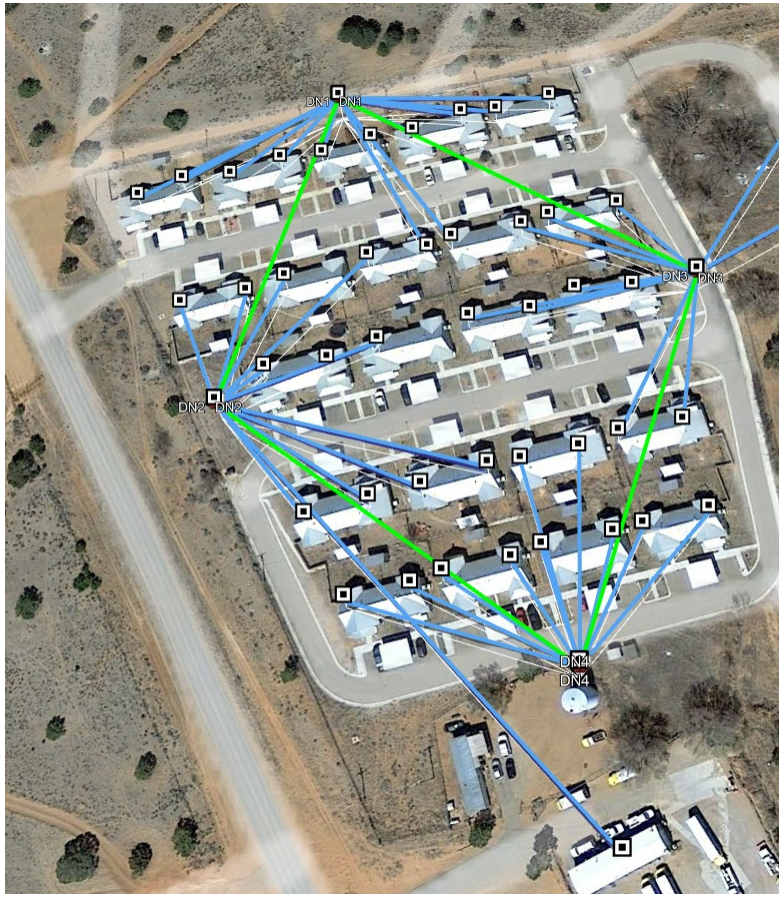
Example: Fiber vs. cnWave in small network

The Challenge:
Deploy broadband to all homes

- Blue= Existing Fiber, Orange= Existing Copper
- **Estimated $150K+** project to deploy Fiber to all homes
- Fiber too expensive and will take too long!

The Solution:
cnWave Wireless Mesh



- Est. $15K for cnWave including poles and solar power
- Deployed in days, not months

Network Planning, Design, & TCO

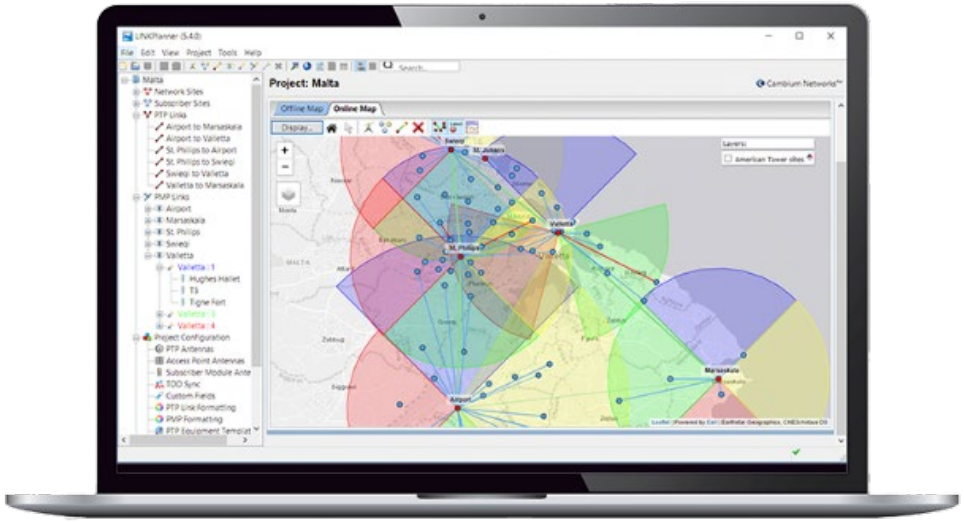
- Determine area and number of buildings to be covered
- Determine number of potential subscribers; take rate; QoS tiers; over-subscription
- PoP provisioning – Fiber (or) Microwave
- Power Pole / Streetlamp (or) Rooftop (or) Hybrid deployment

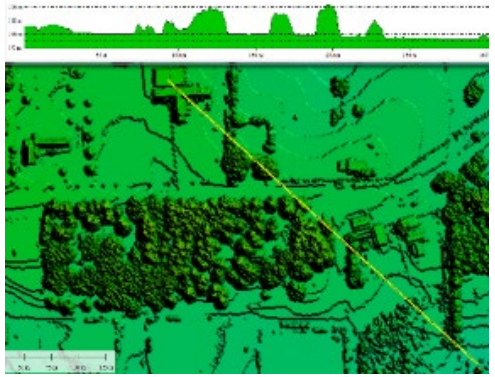
- Distribution Node (DN) sites identification & preparation – poles (or) rooftops
- Line-of-sight identification & optimization
- DN Installation & Provisioning
- **Calculate TCO/CAPEX for home passed**

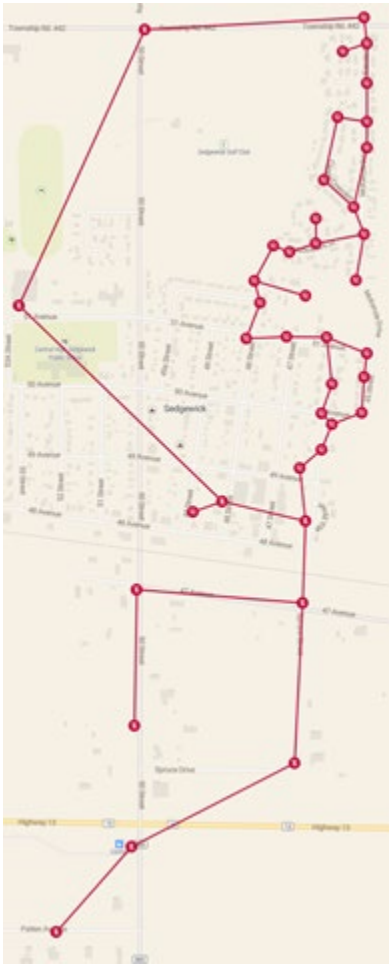
- Dedicated Client Node (CN) per subscriber (or) shared CN per building
- CN installation – rooftop (or) building side
- Connect consumer in premise equipment & provisioning
- **Calculate TCO/CAPEX for home connected**

Network Planning Tools & Process

- **Cambium's LINKPlanner Software**
  - Support PTP/PMP configuration with BOM creation
- **cnHeat**
  - Using LiDAR data to create precise coverage plans
- **Advance Network Planning**
  - Site identification and preparation
  - LOS identification & optimization
  - TCO/CAPEX calculations







Connect Mobility – Village of Standard

Cambium Networks™

CASE STUDY

Cambium Networks™

The Village of Standard Achieves Gig Speed in 21 Days

"The internet speeds our residents and businesses are receiving meet their current needs, and larger data plans are available if required. Our community is thrilled to have access to a network that will serve them for years."

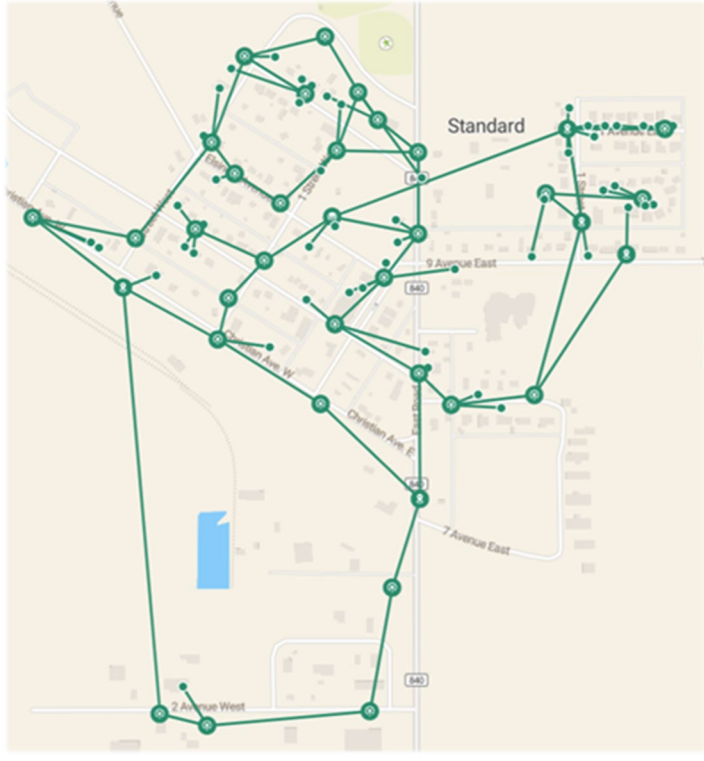
YVETTE APRIL
CAO
VILLAGE OF STANDARD

Overview

SMALL TOWNS AND VILLAGES CAN'T WAIT FOR FIBER. The Village of Standard in Alberta, Canada and Connect Mobility, Inc. (Connect) created a unique partnership to connect its 376 residents in 190 homes and businesses. This high-speed internet project using 60 GHz cnWave technology from Cambium Networks proves that fixed wireless can reliably and efficiently extend the fiber core to deliver gigabit speeds to business and residential locations.

The Challenge

OVER THE YEARS, the Village of Standard had received many promises regarding internet speeds. Each time, they ended up with subpar services. Some residents in the center of the village received great service while others on the outer edges of the



"Fast deployment of 60 GHz cnWave has extended the village's fiber core to connect every business and resident. Adding the ePMP 3000 Wide Area Network was an excellent choice to support local families living on acreages and farms. Its proven architecture made it a great choice for Standard, Alberta."

Merle Isaacson
Owner/Operator
Connect Mobility Inc

Connect

The Results

CONNECT MOBILITY COMPLETED THE INSTALLATION and turn-up of 38 sites in just 21 days, including the 60 GHz cnWave and ePMP 3000 devices.

Connect can provide residents up to 1 Gbps of download speed, a dramatic improvement compared to the village's previous service speeds, and comparable to the capabilities of fiber. Cambium

Enabling Reliable, Affordable Broadband for YOUR town

What makes this possible?

1. Dramatic technology advancements now enable reliable, scalable, & cost-effective gigabit networks for municipalities.
   - New 802.11ay & Terragraph Tech
   - Cambium Networks innovations
   - Comprehensive network management platform
2. FortisAlberta allowing and enabling access to power poles throughout communities.
3. Expertise & experience of Connect Mobility to deploy, manage, and maintain.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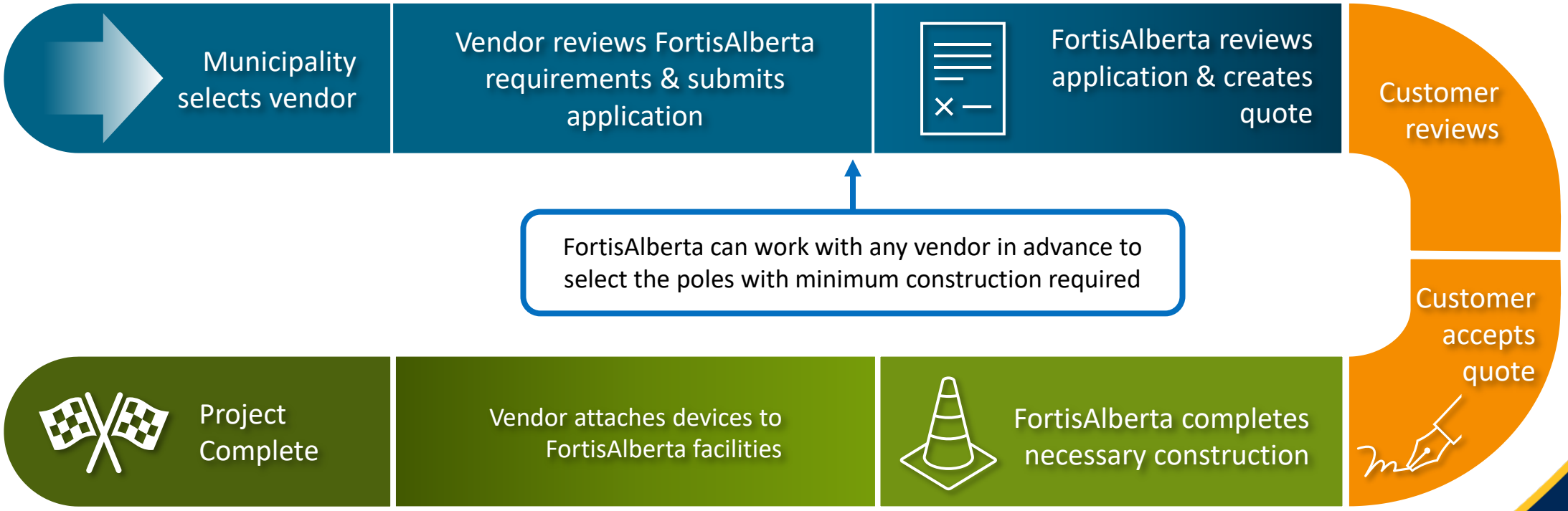
Connection Process



Know the Costs

FortisAlberta Construction Costs

One Time Application Fee

Annual Licensed Occupancy Fee

Monthly FortisAlberta Rate 41D (Small Connected Devices)

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Rate 41D Small Connected Devices Rate:
A Game Changer for Wireless Broadband Devices

Previous rate…

1. Every device on a separate bill
2. Minimum 3 kW charge for each device
3. Separate bill for each device from retailer with an administrative charge

Current amalgamation option…

1. Multiple devices on a single bill
2. Minimum 3 kW charge for multiple devices
3. Single bill from retailer with one administrative charge
4. Multiple devices on single bill lowering the per device cost

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Eligibility

All eligible devices must be within a single municipal boundary

All devices must be of same type (e.g., weather station and antenna can not be mixed)

The consumption of such devices should be very small and stable

The device must be attached to FortisAlberta facility

Additional devices can be added to the service in future

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CONNECT MOBILITY INC | Providing Rural Communities Internet Service
HOME
ABOUT US
SERVICES
BLOG
CONTACT US
FAQ
Providing Rural Canada Reliable Internet For Every Home and Business
Connect participates in funding, building, and operating the Internet with revenue sharing.

Village of Standard: UBF Funding Application

Connect Mobility applied for the Universal Broadband Fund (UBF) and the Village was not awarded funding

New UBF funding will be available soon through the Alberta and Federal Government

Connect can help you apply and determine if your community can qualify

Connect

Village of Standard: Internet Concerns

- Local Internet Service Provider (ISP) were bought out by other ISPs and Standard lost contact and local support from providers
- Data speeds were slow and inconsistent
- Service times were up to two weeks and a service call fee of $230

Connect

Municipal Control

The Village of Standard wanted input with their internet investment:

- To be part of managing the bandwidth so residents receive the data speeds they purchased
- Input with Internet data pricing and price increases
- Revenue sharing
- Hire locally and train for service calls/installation

Connect

Village of Standard Partnership

- Council used funds from the Wheatland County Infrastructure Grant funding.
- Village pays for the antenna and installation.
- The village advertises on their Facebook page and publishes the airtime rates.
- Standard has a neon sign on the curling rink advertising the service.

Heart of Wheatland
Standard
Alberta

Connect

Solution to Implement New Technology

- Connect completed the design using Link Planner then worked with the Cambium team and built the network design.

- We contacted FortisAlberta and they sent their team to work with Standard and Connect

- cnWave 60 GHz technology offers data speeds comparable to fiber at a fraction of the cost of a fiber to the home deployment

Connect

Connect's Solution

- Connect creates a unique plan for every community
- Connect satisfied every issue brought to us by Standard
- Connect invests with the town and manages the network with the community

Connect

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Questions & Answers

Q: How does cnWave work with other unlicensed 60 GHz radios?

A: The cnWave platform is built on the latest 60 GHz chipset standard which is 802.11ay. 802.11ay introduced many enhancements compared to the older standard 802.11ad. While the chipsets in cnWave are of the latest 60 GHz standard, the various manufacturers' radios presently do not interoperate with one another. Cambium Networks' innovations in cnWave, particularly as related to the distributed mesh capability and management, far exceed that of competing solutions which do not support much of the functionality of cnWave.

Q: With the mesh design, what happens if one device goes down? Does it affect all other devices/users?

A: No. As long as the network is designed for redundant connections between nodes. cnWave distributed mesh networking is unique and allows for multiple data paths. Even the client nodes can connect themselves to alternate distribution nodes if the primary DN goes down.

Q: Who is the contact person to discuss this further.

A: At FortisAlberta please feel to reach out to Ken Davis (ken.davis@fortisalberta.com) or the municipality's designated Stakeholder Relations Manager.

Connect Mobility, Merle Isaacson (merle.isaacson@connectmobility.ca)

Cambium Networks, John Seaman (john.seaman@cambiumnetworks.com)

Caroline McAuley, Canary Strategic Consulting (caroline.mcauley61@gmail.com)

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Questions & Answers

Q: What kind of pricing should a residential customer expect for unlimited service?

A: Here is an example of the rates we've offered in three communities. Connect Mobility designs the rates with the communities we work with.

High Speed (HS) Internet Plans for Homes and Businesses. The upload and download are never exactly the same. There is some overhead required for operating the network.

Plan	Download Mbps	Upload Mbps	Cost
HS 1	150	130	$149.95
HS 2	100	90	$129.95
HS 3	75	70	$99.95
HS 4	50	40	$89.95
HS 5	25	20	$59.95
HS 6 (day rate)	50	30	$9.95/day

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Questions & Answers

Q: If sightlines are required, what is the impact of weather like heavy snowfall and winds? Likewise, can high speeds still be delivered during times of peak usage?

A: Great question. cnWave mesh networks are proven to be reliable in all types of weather provided the network design is done correctly. We design networks such that the devices are all close enough together to ensure connectivity even during heavy rain and snowstorms. cnWave is deployed in many of the coldest and hottest areas around the globe.

Q: Thank you! One more on this thought line, what if new development, trees, etc. occur that interrupts the current sightlines?

A: cnWave operates in the millimeter wave (mmWave) spectrum of 60 GHz. The great thing about mmWave frequencies is huge bandwidth and low transmit power/power consumption. The downside to mmWave frequencies is that transmission range is short and can not transmit through obstructions. This is why mesh network design is important. An obstruction such as a new tree will block the signal. The mesh topology helps mitigate these types of issues since data/traffic can take a different route back the internet.

A: When we design a cnWave network, we make sure that we keep our line of sight within the town easement so we can go back and clear branches when required. We stay away from going over residential property lines. Connect partners with the town and works with their operations team and the CAO to check with every resident before we cut down tree branches. We check every fall to see if anything has overgrown.

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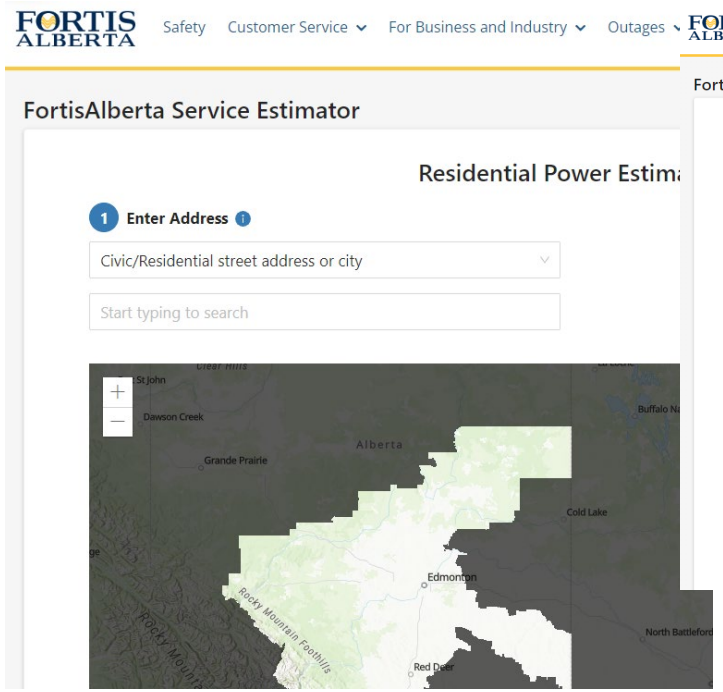
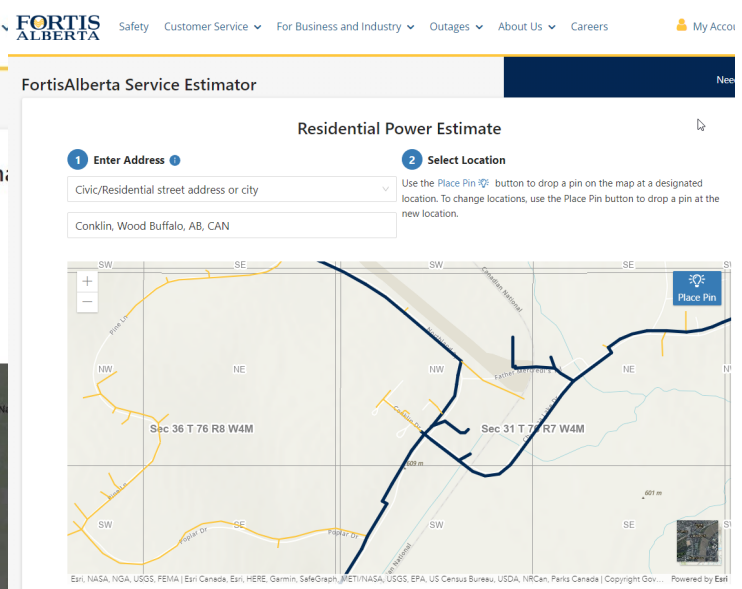
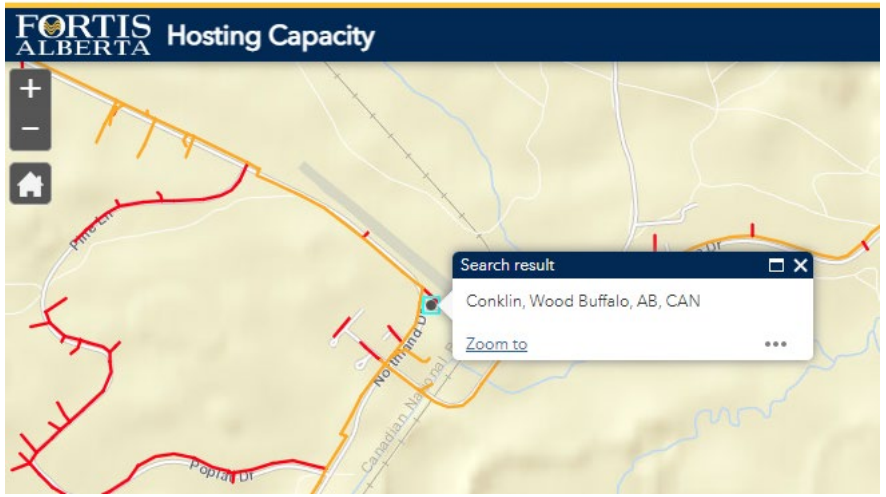
Questions & Answers

Q: Can you confirm if FortisAlberta has infrastructure north of Conklin within the RMWB?

A: FortisAB facilities north of Conklin are limited. For public use, we offer the Hosting Capacity Map (for generation) and FortisAlberta's Service Estimator (FASE). FASE shows the service territory boundary, but in more rural locations does not always capture all available facilities as the Hosting Capacity Map does. If you would like further details, please contact your Stakeholder Relations Manager.







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Questions & Answers

Q: Would municipalities be required to have contracts with power companies to use their existing power poles?

A: The owner of the devices that are attached to FortisAlberta poles will be required to have a Licensed Occupancy Agreement with FortisAlberta. If the municipality is not the owner of the device then no agreement is required between the municipality and FortisAlberta.

Q: What were the costs incurred by Vermillion to move forward with the wireless project?

A: After lobbying with governments at both of the provincial (MLA and Minister of Service Alberta) and federal (MP and senators) levels we were not able to access any funding. As a result, the Town of Vermilion contracted a contractor to advise us on systems to support building a broadband network. The Town of Vermilion took on the task to work with partners to collaborate to build a wireless network. In addition, many businesses provided access to infrastructure to support the wireless infrastructure. Additional costs were incurred operationalizing the system. Franchise fees from current utilities were used to offset these costs.

Q: What are the typical speeds for download and upload in MBPS?

A: Most customers request the 100 Mbps to 150 Mbps down plan with a number of children at home. Seniors typically request the 25-down plan. Gamers ask for the 150-down plan. We have not had anyone ask for larger plans yet but can be added at any time.

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Questions & Answers

Q: Can we get an estimate for rentals on poles: cost per pole rental, power, and installation

A: The fees outlined in the presentation are as follows:

FortisAlberta Construction Costs: Unique to each project based on telecommunication service providers' requirement of the infrastructures and the abilities of the existing infrastructures to meet that criteria.

One Time Application Fee: $135 per pole identified by the broadband vendor evaluated by FortisAlberta for compatibility and design. Potential for new device and breaker box connection fees as well,

Annual Licensed Occupancy Fee: The wireless small cell attachment fee is $29.45 + GST per individual telecommunication equipment per year, to be billed monthly in equal installments.

Additional details on both are outlined in the following documents, you may refer to Schedule 5 under "FortisAlberta External Joint Use Process V6.3" to understand further of the fees involved from FortisAlberta.com:

FortisAlberta External Joint Use Process V6.3

FortisAlberta External Joint Use Small Connected Devices D08-08.3

Monthly FortisAlberta Rate 41D (Small Connected Devices): Used to capture the connected devices' power consumption. Allows multiple devices on a single bill, minimum 3kW charge. Additional information on FortisAlberta's rate sheet Option D flat fees.

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Questions & Answers

Q: What would the costs be to sign up for services? Are there different rate plans available? Different speeds based on cnWave device type?

A: The antenna and cabling is $450/home and the install is $150/home.

Plan	Download Mbps	Upload Mbps	Cost
HS 1	150	130	$149.95
HS 2	100	90	$129.95
HS 3	75	70	$99.95
HS 4	50	40	$89.95
HS 5	25	20	$59.95
HS 6 (day rate)	50	30	$9.95/day

A: The overall cnWave network will provide up to 1000 Mbps or one gig to every home/business.

Q: Is this not a hybrid model? (Specific to Cambium and Slide 21 Fibre vs. cnWave)

A: Most networks are indeed hybrid in the sense that the wireless network requires connection to fiber transport network. cnWave is highly flexible and allows for fiber connectivity at multiple fiber POPs (point of presence). Connecting the cnWave network to fiber backbone at multiple POPs enhances network capacity and resiliency.

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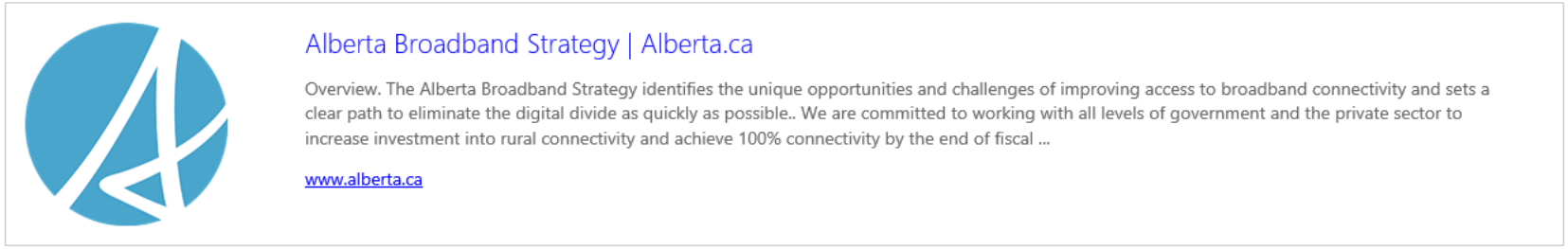
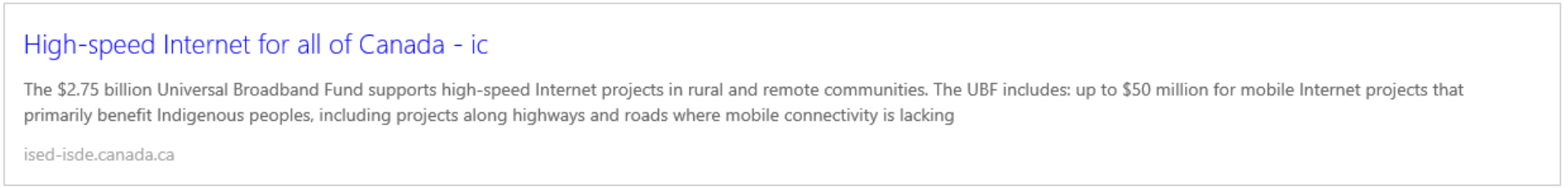
Links & References

https://www.alberta.ca/alberta-broadband-strategy.aspx



https://ised-isde.canada.ca/site/high-speed-internet-canada/en



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Links & References

https://pm.gc.ca/en/news/news-releases/2022/11/08/connecting-canadians-high-speed-internet-new-brunswick-and-across

Connecting Canadians with high-speed Internet in New Brunswick and across Canada | Prime Minister of Canada - pm.gc.ca

The Prime Minister, Justin Trudeau, today announced a $475 million top-up to the Universal Broadband Fund (UBF). The top-up will help connect an additional 60,000 rural homes across Canada to help achieve our goal of providing every community, in every province and territory, with high-speed Internet access.

pm.gc.ca

Type your community name into the National Broadband Internet Service Availability Map. If you think your community should qualify for funding, please contact Connect and we can help you apply and show you how to challenge the map results.

https://www.ic.gc.ca/app/scr/sittibc/web/bbmap?lang=eng#!/map

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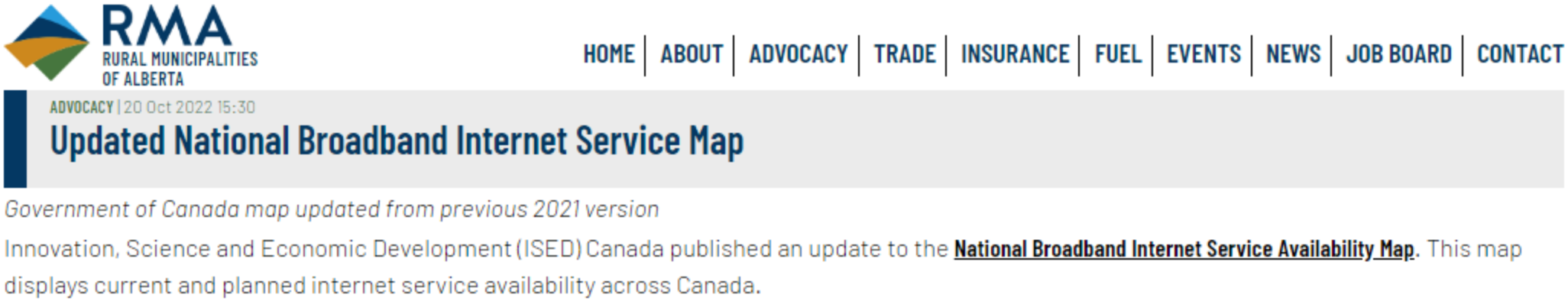
Links & References

https://www.ic.gc.ca/app/sitt/bbmap/hm.html?lang=eng



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