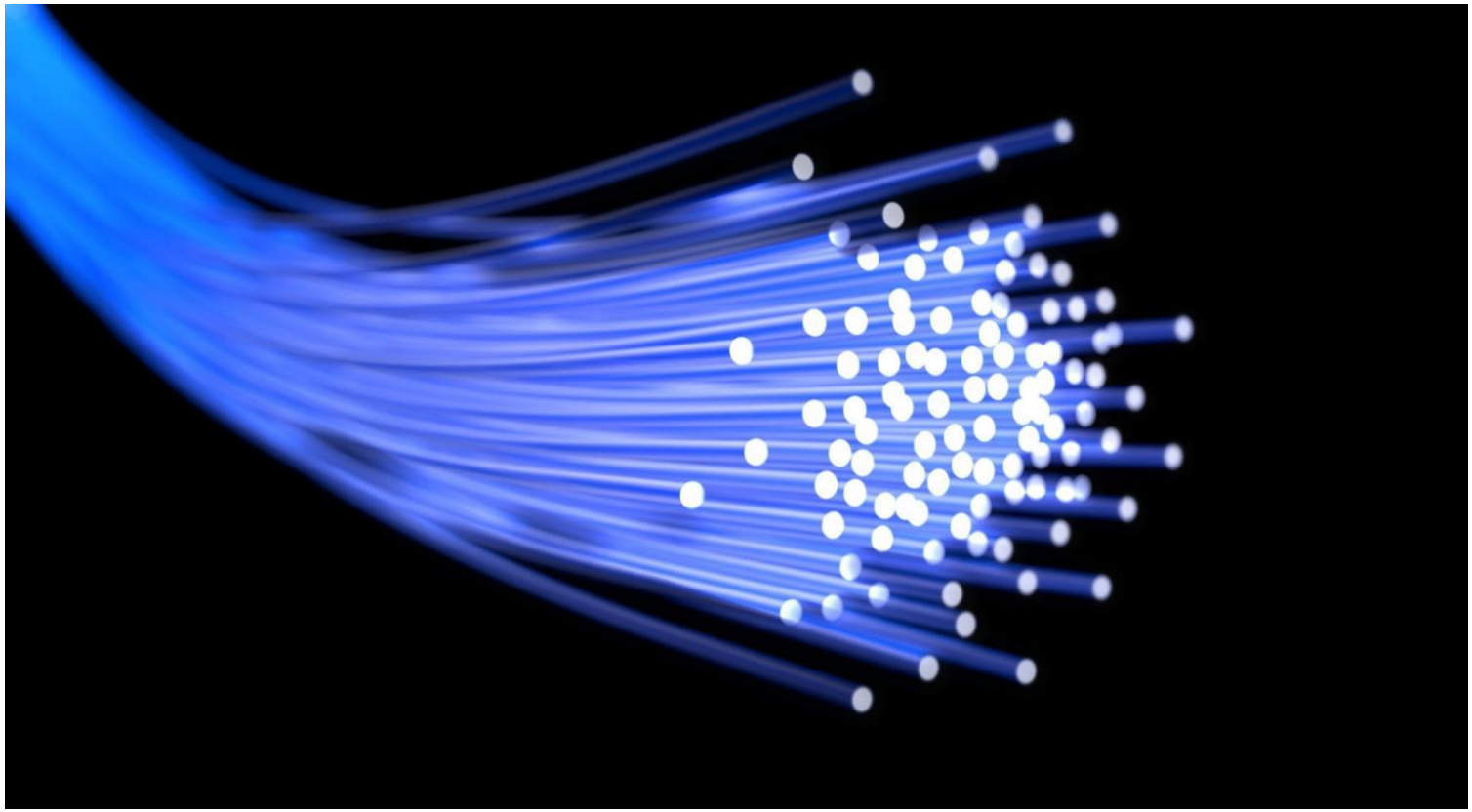
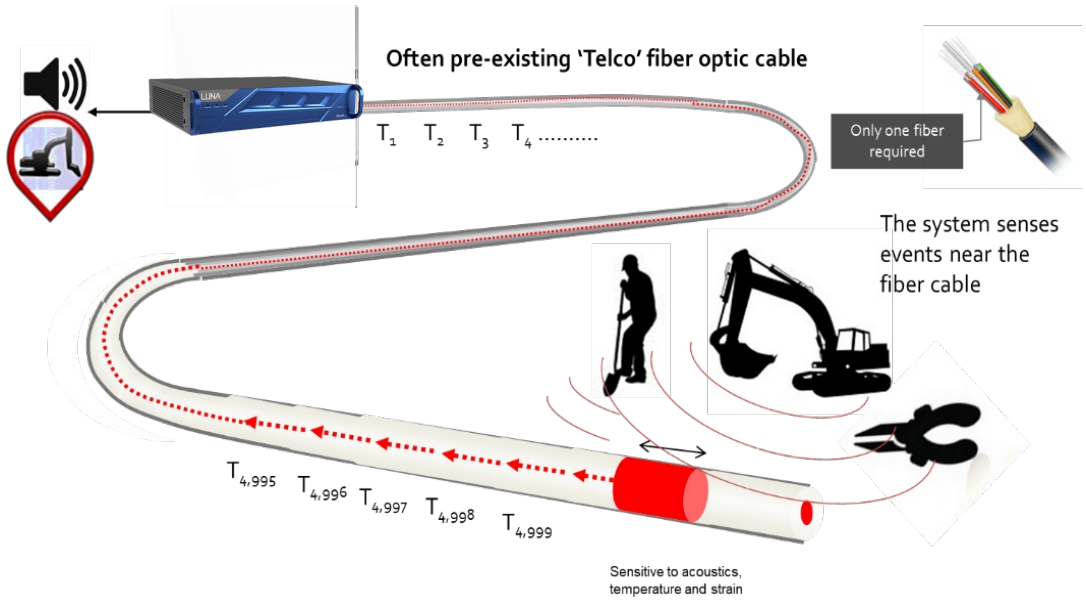
Optical Fiber is the Sensor!

Fiber Optic Sensing Association
Connect and Protect



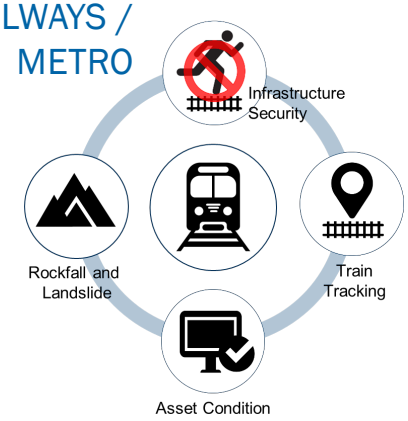
What is Distributed Fiber Optic Sensing Technology?

- Possible to use pre-existing communications fiber
- DFOS sends pulses of light down a fiber many times per second
- Both long distances and short distances monitored at high spatial resolution in real time
- Each small zone can behave as a thermocouple, strain gauge or accelerometer
- Monitors the return signal for vibrations, strain, and temperature around the fiber
- Uses signal processing to automatically detect threats, major developments in last decade including Machine Learning & Artificial Intelligence
- Reports to operators immediately with Geographic Information System (GIS)
- Actionable intelligence for response

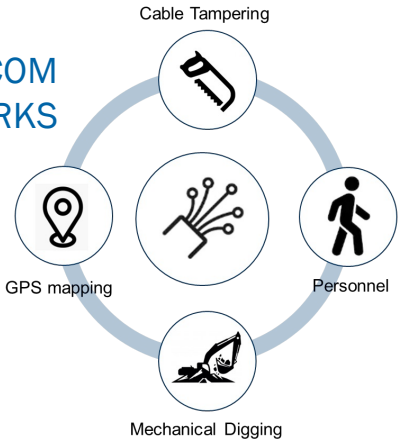


Wide suite of Proven Applications

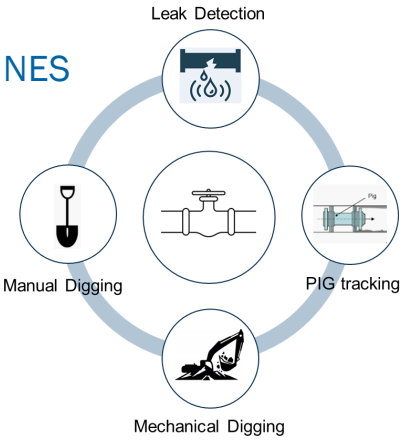
RAILWAYS / METRO



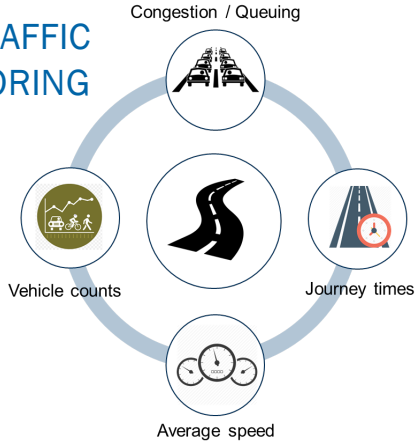
TELECOM NETWORKS



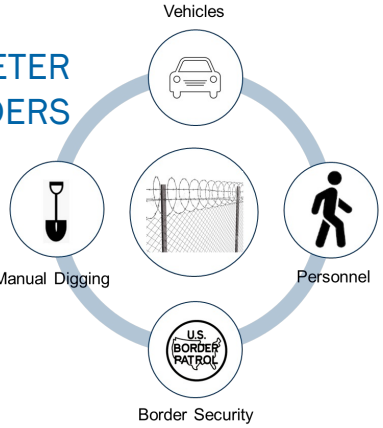
PIPELINES



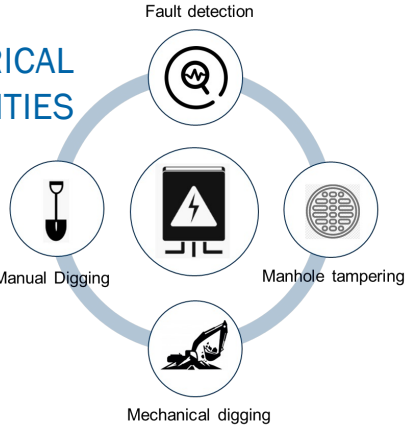
TRAFFIC MONITORING



PERIMETER SECURITY/BORDERS



ELECTRICAL UTILITIES



Types of Distributed Fiber Optic Sensing

- **Distributed Temperature Sensing (DTS)**
  - Raman back scatter signal
  - Fibers should be strain free as in Loose Tube cables
  - Temperature monitoring of pipelines, power lines, etc
- **Distributed Acoustic Sensing (DAS)**
  - Rayleigh back scatter (OTDR)
  - Fibers should experience strain as in tight buffered cables
  - Acoustic wave monitoring of external events
  - Ideal for secure perimeters, traffic monitoring, etc.
- **Distributed Strain Sensing (DSS/DTS)**
  - Brillouin back scatter
  - Structural health monitoring
  - Ground movement
  - Fibers should experience strain as in tight buffered cables.
- **Most DFOS systems incorporate multiple capabilities**
  - Reduces false positives

- **Distributed Acoustic Sensing (DAS)**
  - Rayleigh backscatter (OTDR)
  - Fibers should experience strain as in tight buffered cables
  - Acoustic wave monitoring of external events
  - This is a real-time, **EVENT BASED DETECTION** – ideal where response can be immediate
  - Ideal for secure perimeters, traffic and rail monitoring, etc.
  - DAS has been utilized for intrusion detection and security applications

Common Utility Problems – Communications, Gas, Water & Electric

- **External Sources of Damage**
  - Digging
  - Vandalism/Theft/Terrorism
  - Weather events
  - Seismic events
- **Internal Sources of Failure**
  - Pipe failure / leaks
  - Cable over heating
  - Environmental degradation (aging)
- **Other challenges**
  - Inefficient utilization

Mechanical Digging Classification

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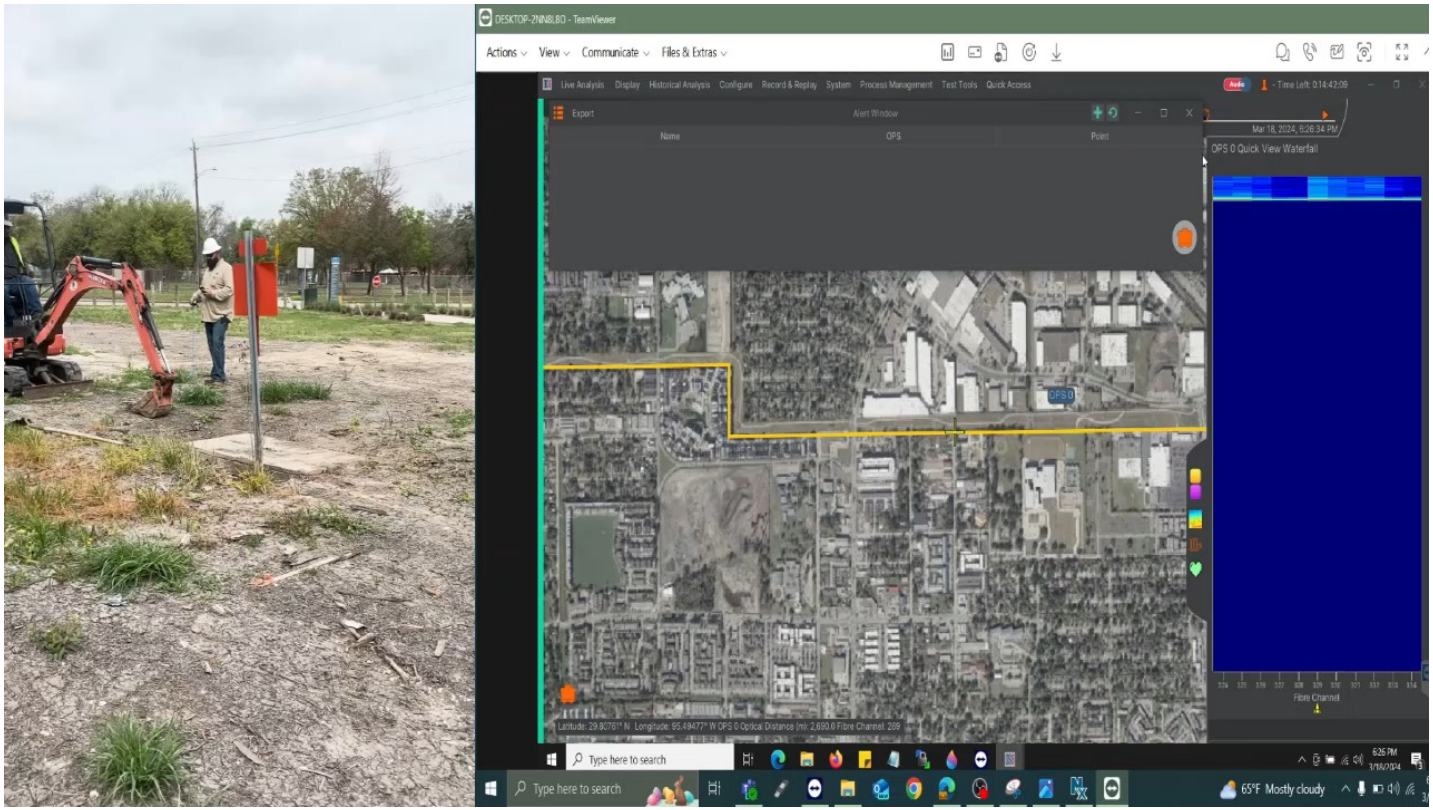
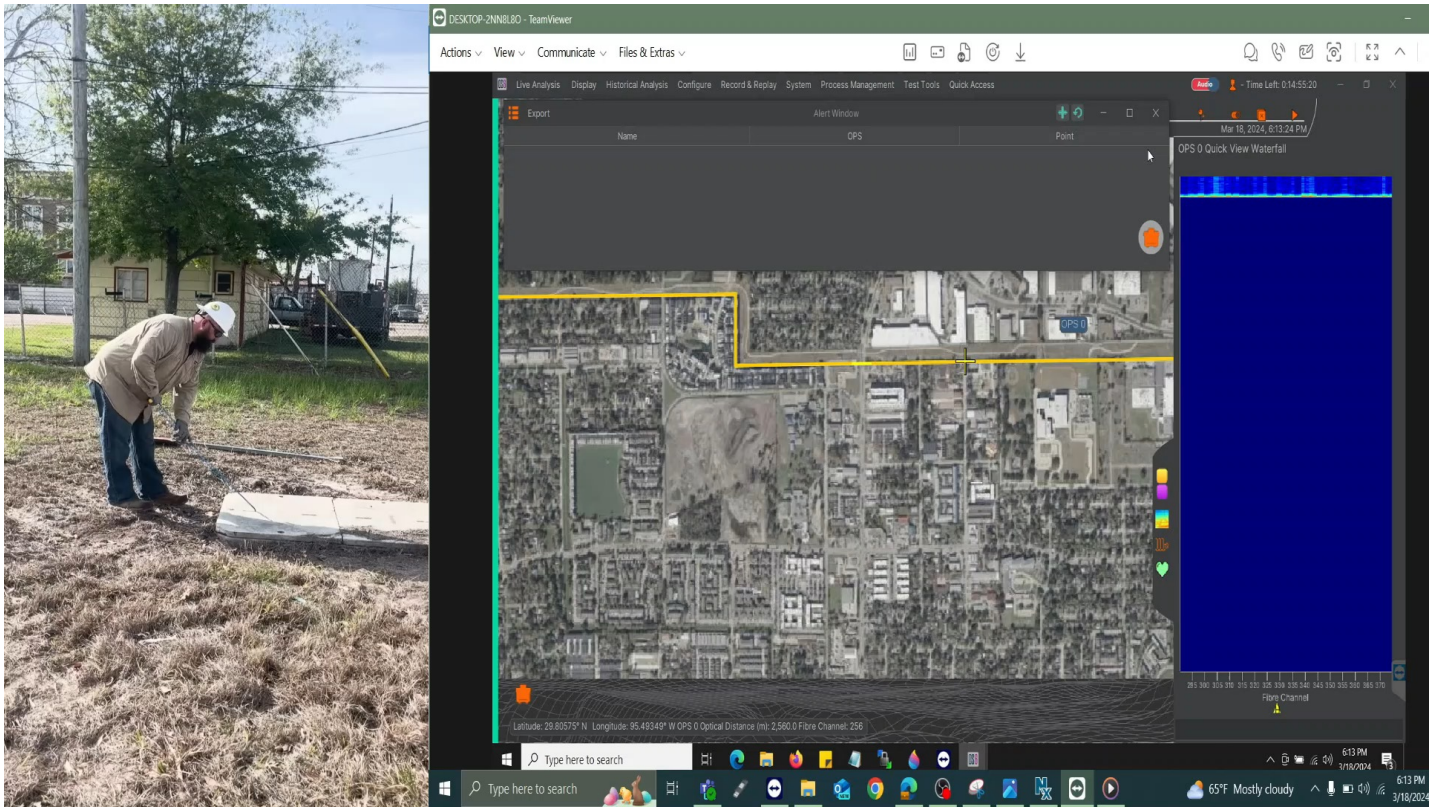
Connect and Protect



Vault Intrusion

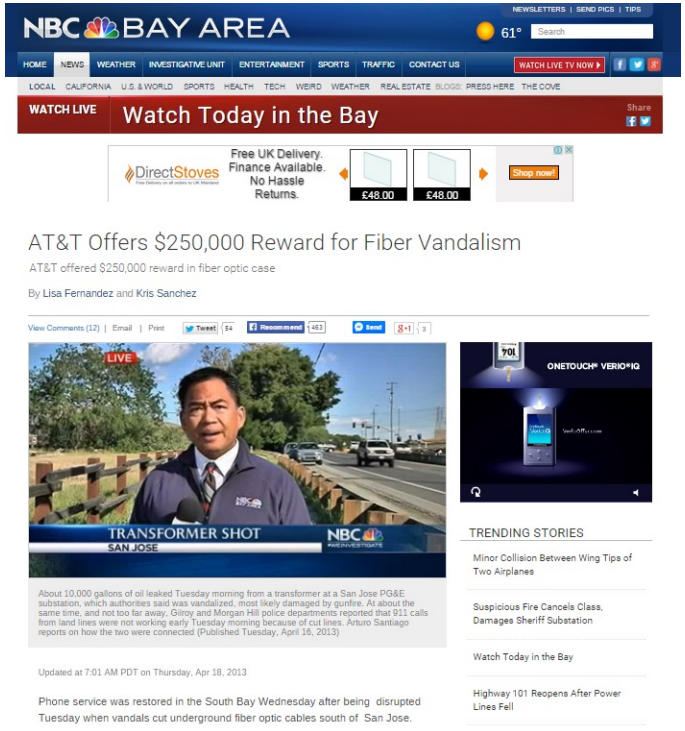
Fiber Optic Sensing Association
Connect and Protect

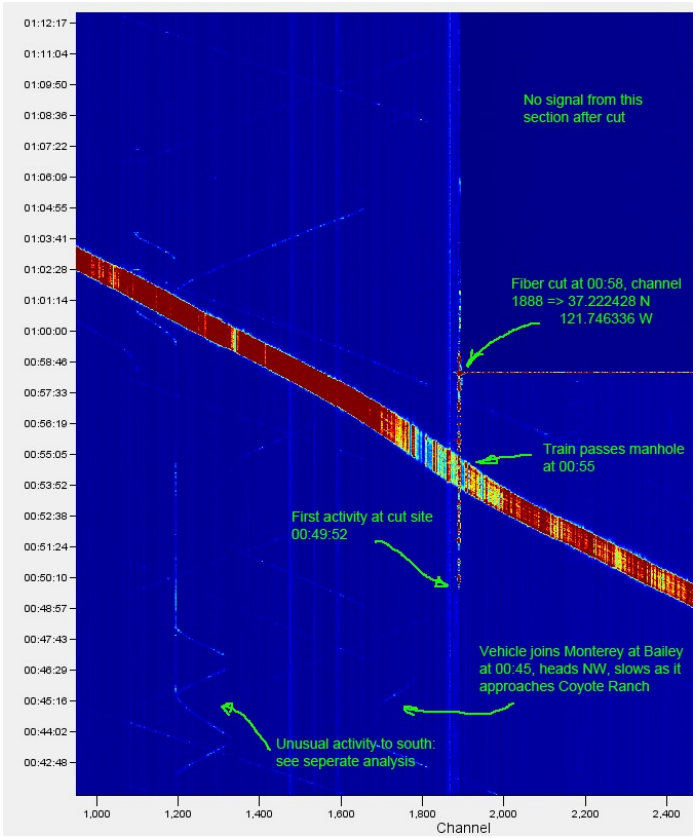


Telecoms and Power Utility Case Study

Rapid detection and location of cut at manhole

Fiber Optic Sensing Association
Connect and Protect





Fiber Optic Sensing Association
Connect and Protect

2

Texas811

Alert of excavation sent to Texas811

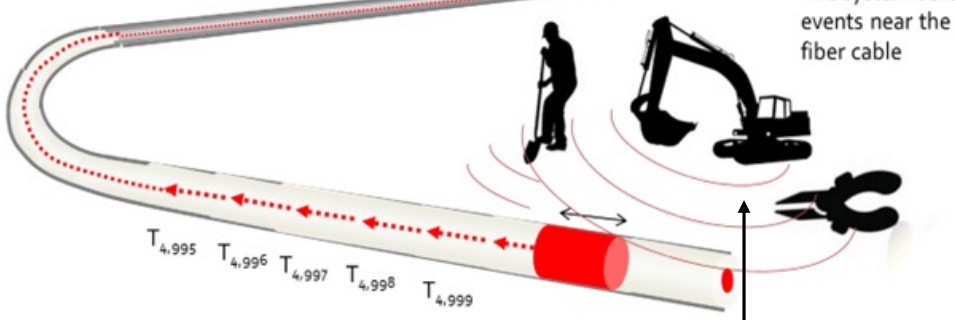
Often pre-existing 'Telco' fiber optic cable

T_1 T_2 T_3 T_4 .....

Only one fiber required

The system senses events near the fiber cable

1



Sensitive to acoustics, temperature and strain

3

811 Center looks for active one call tickets at site of excavation alert

Location of excavation alert

Fiber running alongside utilities

Active One-Call Ticket

Excavation alert is near underground utilities but is NOT covered by an active one call ticket. This means facility owners do NOT know about this unauthorized excavation activity.

Alerts are immediately sent out to facility operators alerting them of the unauthorized excavation near their facility.

4

ELECTRIC

Gas Company

TelecomCompany

WATER

Facility Operators respond to the excavation site to intervene and halt excavation before a damage occurs.

5

Canada's Rural & Remote Broadband Community (CRRBC)- West 2025 Conference

Free Space Optics Use Cases

November 2025

Sid Roberts
Solutions Architect
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+1 206 696 6663

Multi-technology and Multi-Frequency Connectivity Toolkit

Wired/Wireless* Ecosystem

- GEO and LEO Satellites
- TVWS (Television White Spaces) (470-602MHz)
- Mid-Band (2.4GHz, 3.xGHz, 5.xGHz)
- CBRS (Citizens Broadband Radio Service) (3.55-3.7GHz)
- Wi-Fi 6E on 6GHz
- Millimeter Waves (60-80GHz)
- **Free Space Optics (~196 THz)**
- Fiber/Cable

Frequency Bands

Lower frequencies
Less spectrum available
Less capacity
Longer propagation range

Higher frequencies
More spectrum available
More capacity
Shorter propagation range

5G & Cellular Bands

*Some bands are only available in some countries

The ATTOCHRON™ Difference

Free-space optical (FSO) communication is a wireless technology that uses light to transmit data through air, space, or water without the need for fiber optics or other optical systems. FSO systems use a laser to convert data into pulses that are then sent through a lens system. FSO research from 1998 to 2006 in the private sector totaled $407.1 million, divided primarily among four start-up companies. All four failed to deliver products that would meet telecommunications quality and distance standards

Attochron uses short coherence length (SCL) light sources, not the continuous wave (CW) lasers from all other FSOC companies

Attochron's disruptive and patented approach uses lasers with an extremely ***short coherence length*** (~100um) to avoid the barrier to ALL OTHER FSOC solutions, which is *air scintillation*, which results in poor signal availability and high bit error rates (BER)

ATTOCHRON™

WORLD'S ONLY CARRIER-GRADE
OPTICAL WIRELESS COMMUNICATIONS™

Use cases

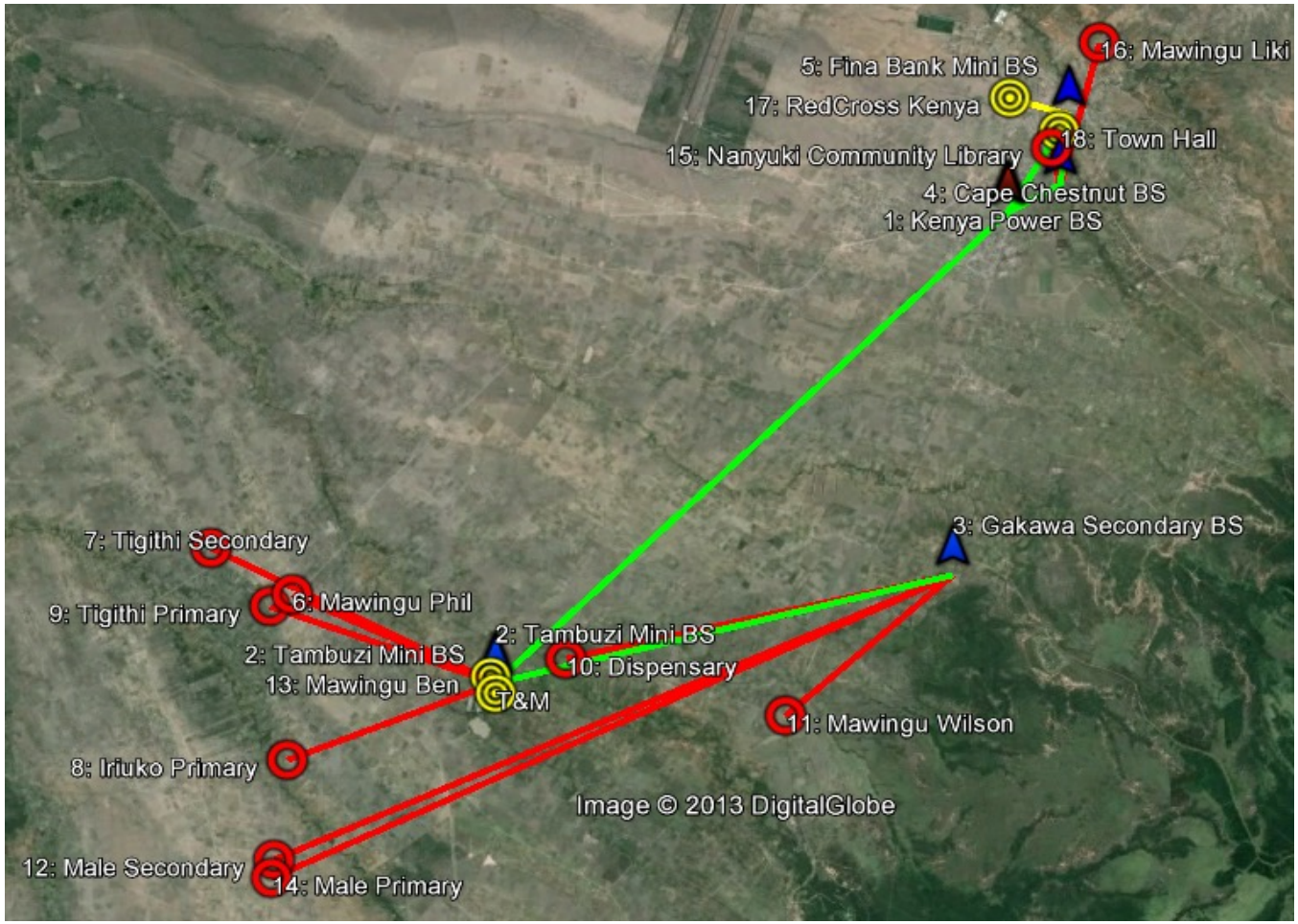
- "Last Mile" and "Middle Mile" connectivity
- Fiber back up
- RF link back up
- Tower backhaul
- Rural network extension
- Military applications
- Satellite communications
- Temporary installations
- Rapid installations
- Disaster recovery
- Healthcare applications

Contact:
Jim Olson, SVP, Sales & Marketing
Attochron, LLC
jimolson@attochron.com
+1 484-798-9021
Lexington, Virginia USA

Advantages

- Ease of deployment—both time and cost
- Operates on rooftops, towers or thru windows
- Can be used to power devices
- License-free long-range operation (in contrast with radio communication)
- High bit rates
- Low bit error rates (BER)
- Interference free
- Immunity to electromagnetic interference
- Full duplex operation
- Protocol transparency
- Increased security when working with narrow beam(s)
- Reduced size, weight, and power consumption compared to RF antennas
- Eye safe (meets ANSI Z136.1 standard

Remote Market Backhaul Use Case



Link Legend

- TVWS/UHF P2MP
- 5.8 GHz 4W EIRP P2P
- 5.4 GHz 1W EIRP P2MP

CORE
DATA CENTRES

What is Data Centre colocation?

It is a Data Centre operator that builds out a Data Centre facility (leased or owned) and leases raised floor space "WHITESPACE", power and cooling to end users who install servers /hardware in a cabinet.

CONTENTS

CORE
DATA CENTRES

AI Optimized Data Centres

DATA CENTRE INFORMATION IN BC

- The local data centre industry supports multiple Billion Dollar technology-based industries in over 30+ data centres across BC today and growing with majority in the Vancouver area.
- Drivers for data centre adoption include costs and risks due to market trends including technology complexity, security, the Internet of Things (``IoT``), Big Data, AI, Data Privacy and Total Cost of Ownership.
- **Types of Data Centres**
  - Hyperscaler's (Cloud players – Google, Microsoft "Azure", Amazon "AWS"
  - Colocation sites and carrier hotels – 55 Hastings, Cologix, eStruxture, Equinix
  - AI Data Centres demanding more power in a smaller footprint – Average cabinet density is 75-150 kW

Data Centres in British Columbia

Operating
(selected examples)

Provider	Facility	City
eStruxture	VAN-3	Burnaby
Multiple operators (harbur hotel)	Harbour Centre /555 W. Hastings	Vancouver
Vancouver metro	~30 facilities	

• Roll-ups vary by methodology, count: B.C. has ~30-35 operating data centres with Vancouver holding the majority.

Under development / announced
planned or announced

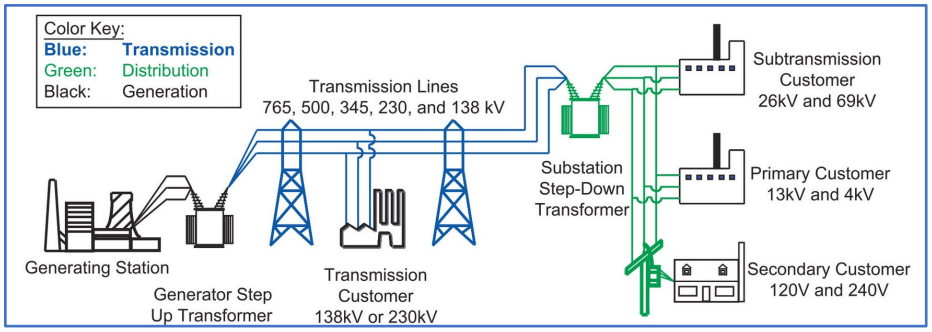
Sponsor	Project
Bell	six-site AI DC supercluster
	Kamloops & Merritt, B.C.
Townsite Planning Inc.	Nanaimo Data Centre (East Wellington Rd.) Nanaimo

• Planned or announced data centres; pc = prospective

DATA CENTRE SITE SELECTION?

- **Data Centre Overview**

  When selecting a Data Centre site, here are some key items developers and operators look for to ensure the site will work for their business case. Typically, sites are selected in different regions for data privacy reasons and to solve for various business drivers such as disaster recovery, attracting clients in that region, to be closer to end users for latency reasons.

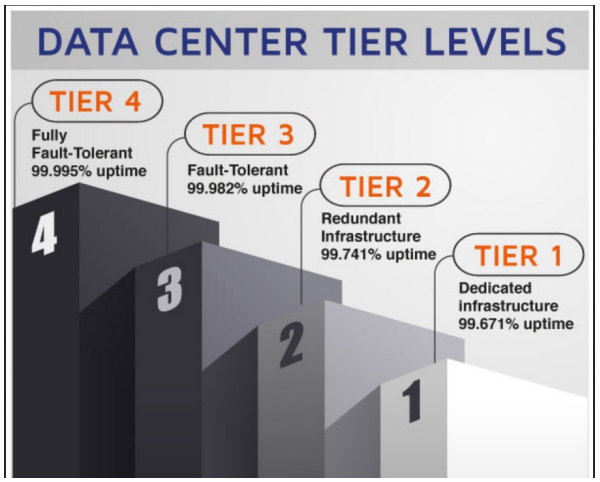


- **Data Centre Checklist**

  - ✓ Abundant power for growth reasons (bottom-line they need to hit number for the business model to make sense)
  - ✓ Power must be achievable within 2 years
  - ✓ Cost of power
  - ✓ Power reliability
  - ✓ Colder climate lowers PUE
    - 10-20 megawatts is the new ask
    - 50-100 megawatts for AI & Cloud players
  - ✓ Site risks – chemical plants, flight paths etc. no go!
  - ✓ Connectivity from multiple carriers
  - ✓ Light industrial zoning works for data centres
  - ✓ Extra land for generators and mechanical plants to support the data centre

DATA CENTRE QUALIFICATIONS

- Typical Data Centre Certifications:
  - Tier 1, 2, 3 and 4 by the Uptime Institute and applies to both design and operations
    - Most operators are designing and building to Tier 3 standards ONLY!
  - LEED – Leadership in Energy & Environmental Design
- Tenants will typically certify operations to:
  - **SOC2 Type 2** (Physical infrastructure security audits)
  - PCI-DSS (Credit Card Security Audit, PCI Security Council)
- Data Centre Commissioning
  - Done by a third-parties to certify data centre from end-to-end, to ensure design and installations quality is met to support a 100 % uptime



CORE DATA CENTRES

WHAT IS AI DATA CENTRE?

"AI isn't just changing what's inside the data centre — it's reinventing how we design, power, and cool them."

1. High-Density AI Racks
- 30–150 kW per rack to support GPU clusters
- Dense power distribution with redundant busways
- AI-optimized layouts for minimal latency

2. Advanced Cooling Technologies
- Direct-to-chip liquid cooling and immersion tanks
- Hybrid dry cooler + heat reuse systems
- Smart chillers using AI for thermal management

3. Intelligent Energy Management
- Dynamic load balancing for GPU-heavy workloads
- Integration with renewables and on-site microgrids
- Real-time PUE optimization using AI models

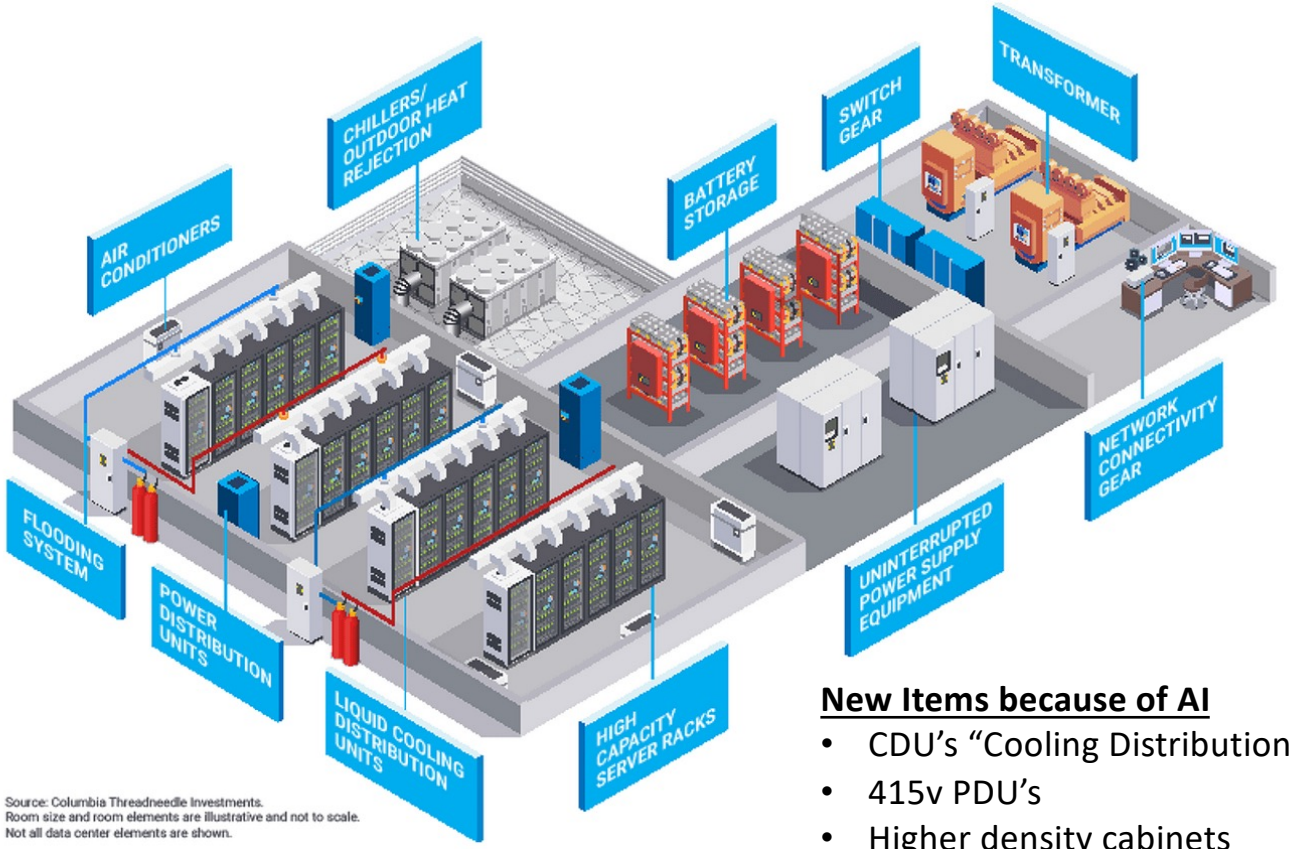
4. Modular & Scalable Construction
- Factory-built 2.5–5 MW prefabricated pods
- Tier III design, rapid deployment, flexible expansion
- Optimized for AI, HPC, and cloud environments

5. Network & Data Fabric Innovation
- 100-800 Gbps optical interconnects for GPU fabrics
- Edge AI nodes and low-latency mesh architecture
- SOC 2 Type 2 & PCI-compliant design

6. Sustainability & Circular Design
- Heat recovery for district systems
- Closed-loop water and refrigerant-free cooling
- Carbon-neutral energy sourcing

CORE DATA CENTRES

AI DATA CENTRE INFRASTRUCTURE



Source: Columbia Threadneedle Investments.
Room size and room elements are illustrative and not to scale.
Not all data center elements are shown.

New Items because of AI

- CDU's "Cooling Distribution Units"
- 415v PDU's
- Higher density cabinets
- Little to no Air being used to cool a Data Centre

DATA CENTRE COSTS/REVENUES

Data Centre Build Costs Overview

- $ 375 / SF – Budgeted for Building the Shell / Interior
  - Bricks and mortar
  - Heavy floor loading
  - Main power to the building (average costs is $350k- $500k per megawatt to secure power
- $12.5 Million per megawatt for Critical equipment
  - Generators, UPS, Cooling plant, Switchgear, power and cooling distribution (Tier III design N+1)
- Operating Costs (Facility Costs)
  - Estimated cost for a 50,000 SF Data centre estimated around $2 Million for operational costs for operating a 5 megawatts (includes staff and preventative maintenance costs)

End Users / Operators Revenue Models

- Tier III offerings range from $400 per kW per month (retail) all in monthly. 1 cabinet is usually 5-10 kW per cabinet = $ 2,000 - $4,000 per month. Wholesale is discounted by 40%.
- Tier III offerings range from $200 per kW per month (wholesale) plus **power usage and PUE** monthly. Utility fee is average of .05-.08 cents per kWh.
- **Power Density**
  - Low 1-3 kW
  - Med 4-7 kW
  - High 8-15 kW
  - AI Density – 30-150 kW

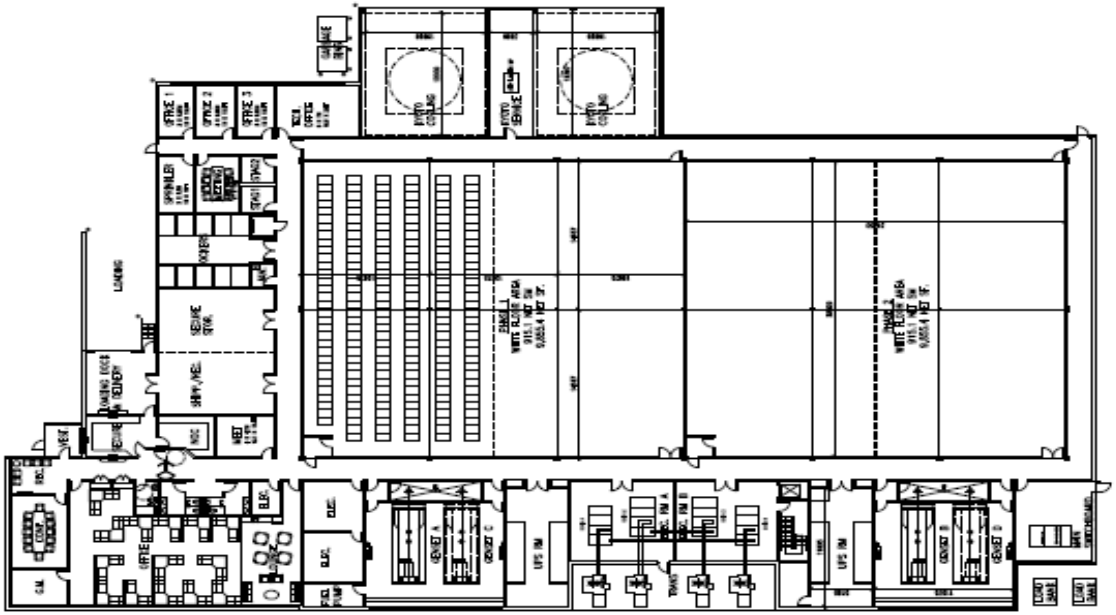
CORE DATA CENTRES

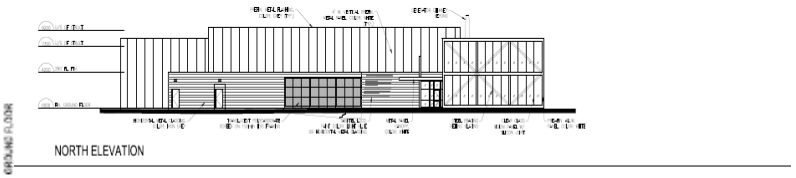
DATA CENTRE FLOOR DESIGN

Example Floor 3D Data Hall

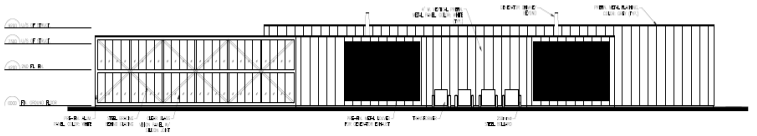
CORE DATA CENTRES

EXAMPLE FLOOR PLAN





NORTH ELEVATION



WEST ELEVATION

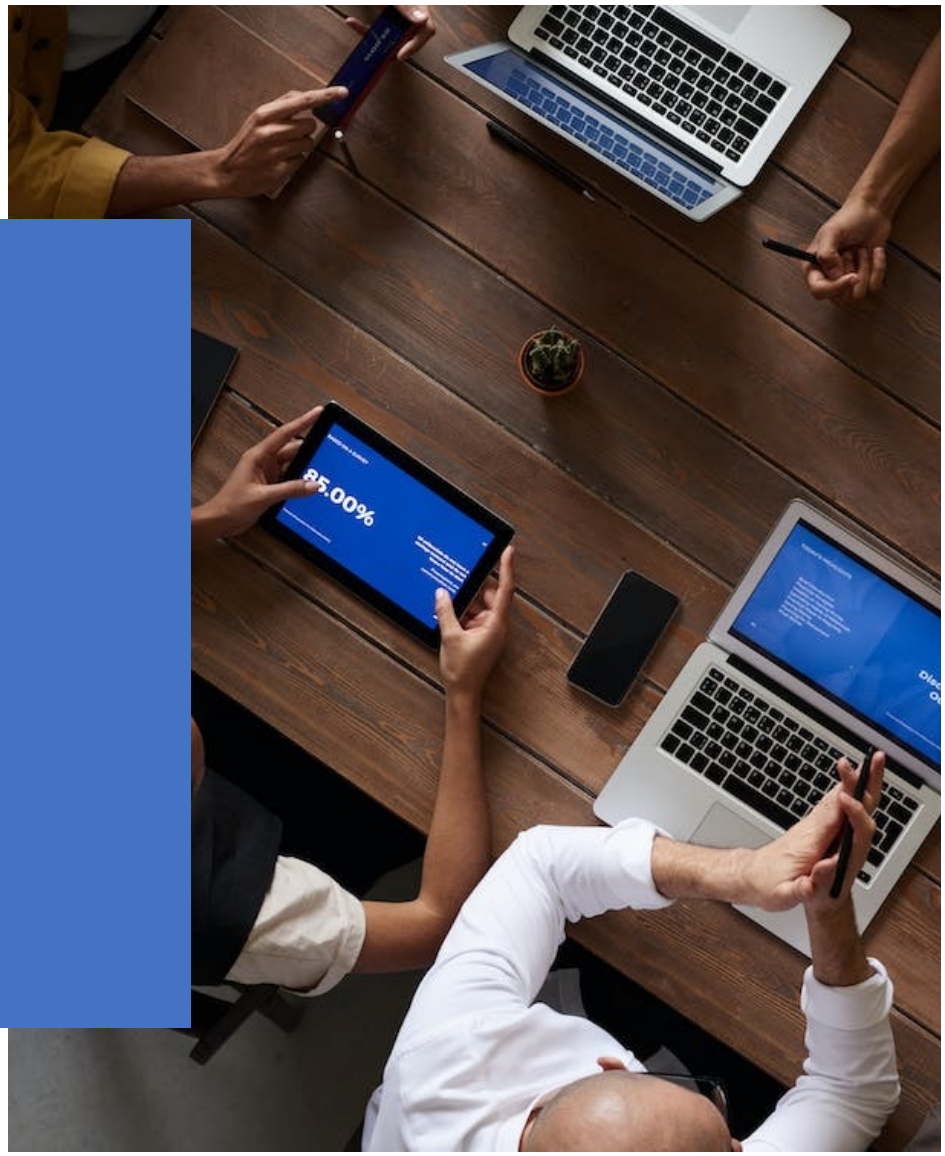
THANK YOU!

We are looking forward in doing business with you

Bill.Henneberry@coredatacentres.com

+1 (416)-613-3610

www.coredatacentres.com



About Us

Communication Service providers, infrastructure developers, and Emerging Tech companies often face challenges to scale and grow, to turn complex opportunities into measurable growth. Verity Aptus helps leaders cut through this complexity to enter and expand markets, grow sales, and execute strategic initiatives.

We partner with service providers, technology providers, governments, investors, and stakeholders to move projects from idea to impact through market development, business development, and strategic technology and business advisory.

Backed by deep industry knowledge and a strong network across Canada, the United States and beyond, we combine insight with execution to deliver measurable outcomes.

verity**aptus** helps municipalities, utilities, and technology firms move from concept to implementation. We align strategy, technology, funding, and partnerships to deliver measurable results.

Explore how fiber-sensing and digital-twin strategies can strengthen your infrastructure portfolio at **http://www.verityaptus.ca/**

Contact: Jason Presement, Jason.Presement@verityaptus.ca | (m) 647.283.4769

verityaptus

About Us

CONNECT

Enter New Markets With Confidence

Breaking into new markets is hard. You need more than ambition; you need access, credibility, and strategic alignment.

I help you open the right doors, connect with key stakeholders, and position your business and technology for lasting traction.

Are you an emerging tech company looking to enter the Canadian market?

Looking for Partnerships with communication service providers?

Need market access and first deals?

SCALE

Accelerate Revenue and Partnerships

If your growth has stalled or you're unsure where to go next, I help you get unstuck.

I bring proven sales leadership, sharp market insight, and a hands-on approach to unlocking new revenue.

Are you a growing ISP business?

Need help expanding into new markets?

Seeking a no-nonsense Go-to-market strategy and service innovation?

BUILD

Expand Your Footprint. Build Your Presence

Infrastructure plays. Markets expand. Data Centres power futures. Space provides connectivity. Fiber sensing reveals opportunity. What's next? And none of it happens on autopilot.

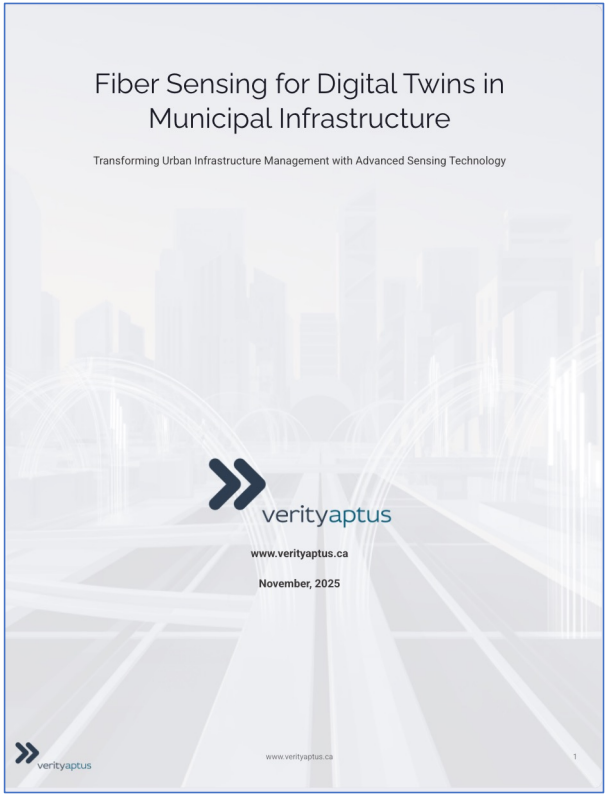
I help you do it with clarity and presence, helping you engage your stakeholders and move ideas forward.

Looking for expert guidance on tech Infrastructure projects?

Need to ensure successful deployment of new technologies?

Looking to make a long-term investment in networks and facilities?

Additional Resources



https://www.verityaptus.ca/insights