



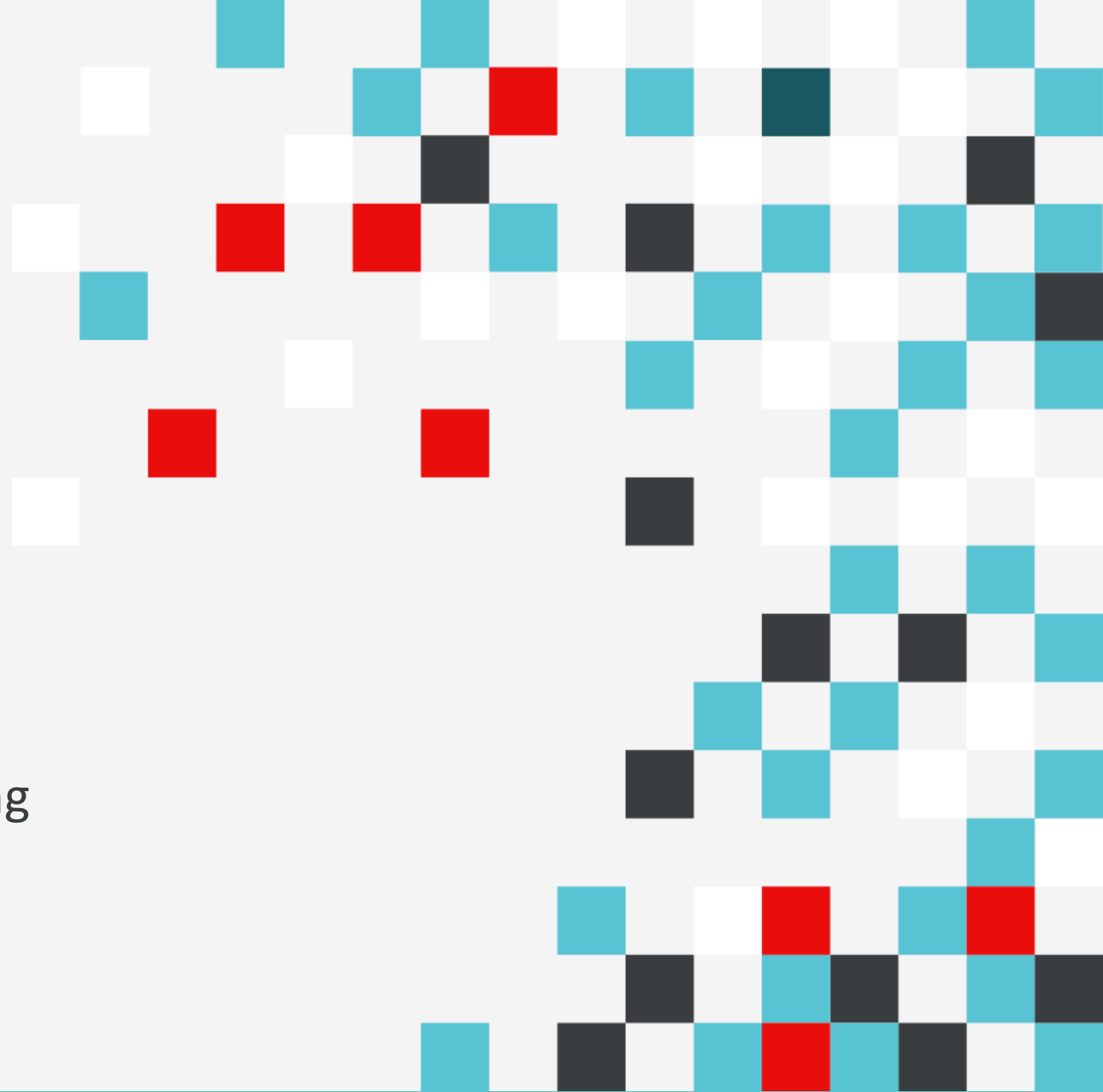
# CANARIE National Optical Line Systems

Thomas Tam | Chief of Network Engineering

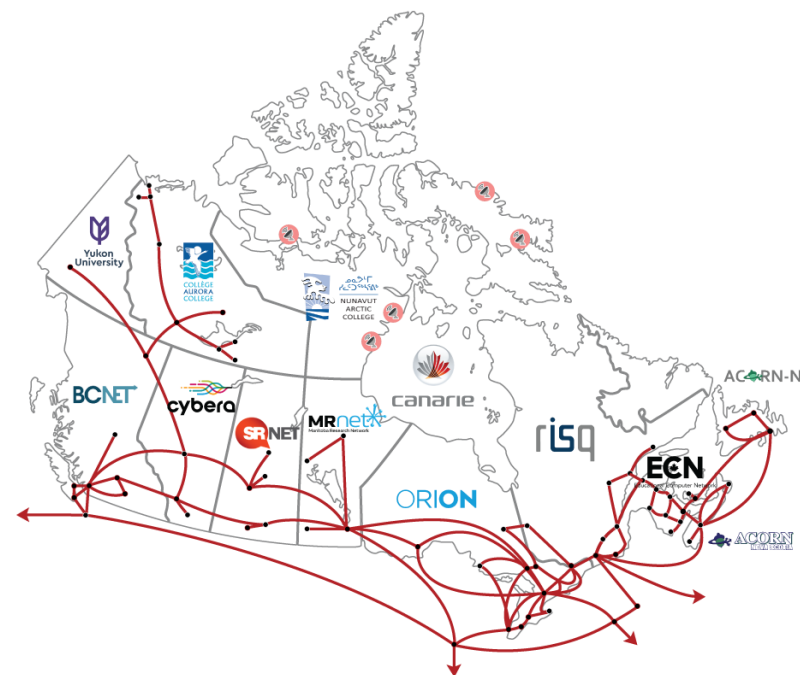
September 16, 2025

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6<sup>th</sup> Global Research Platform Workshop, Chicago



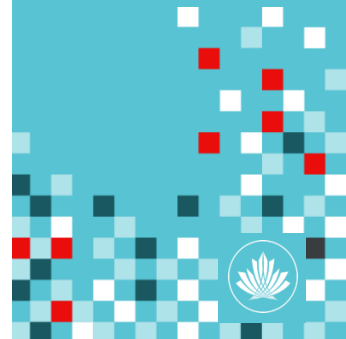
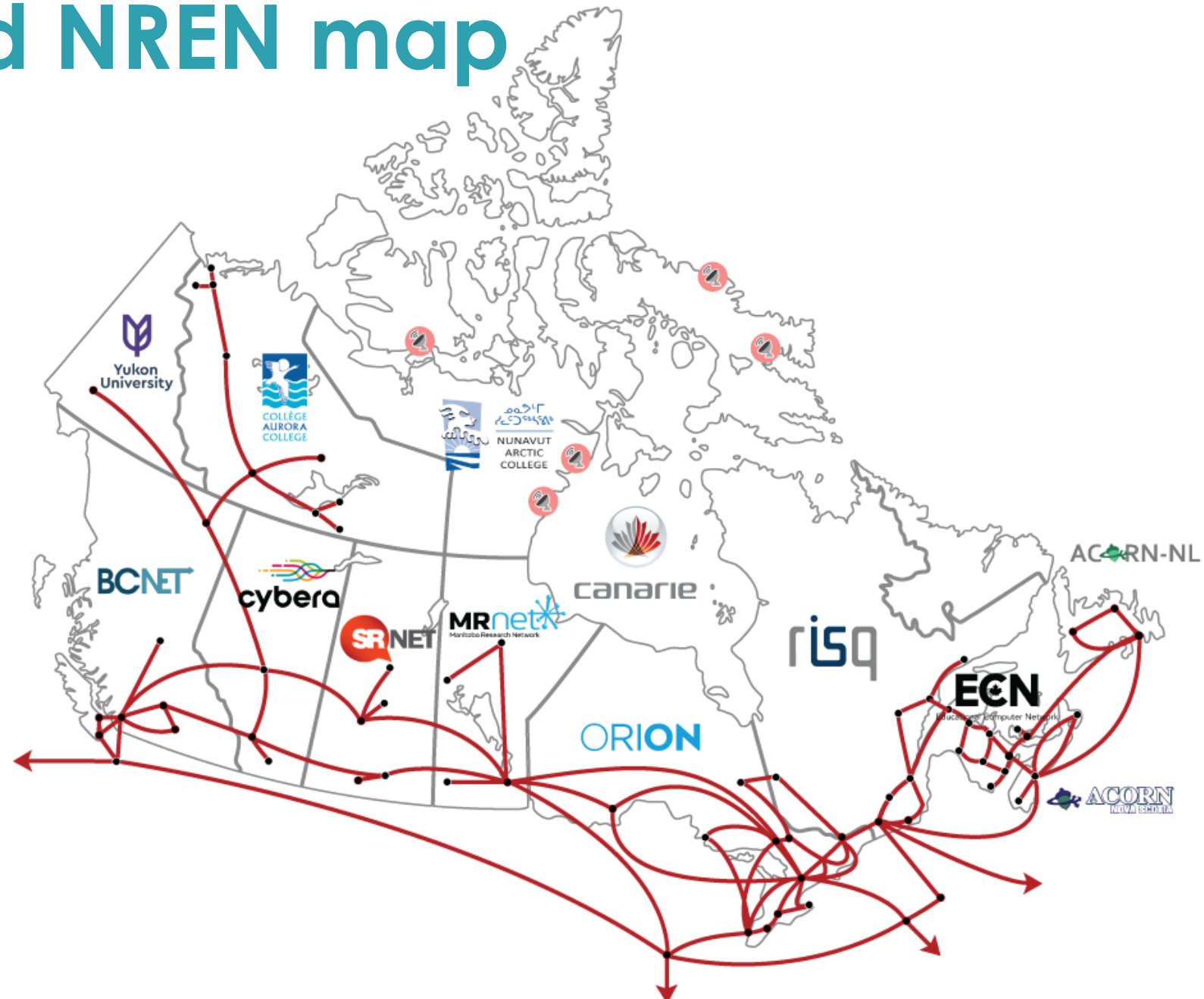
# About CANARIE



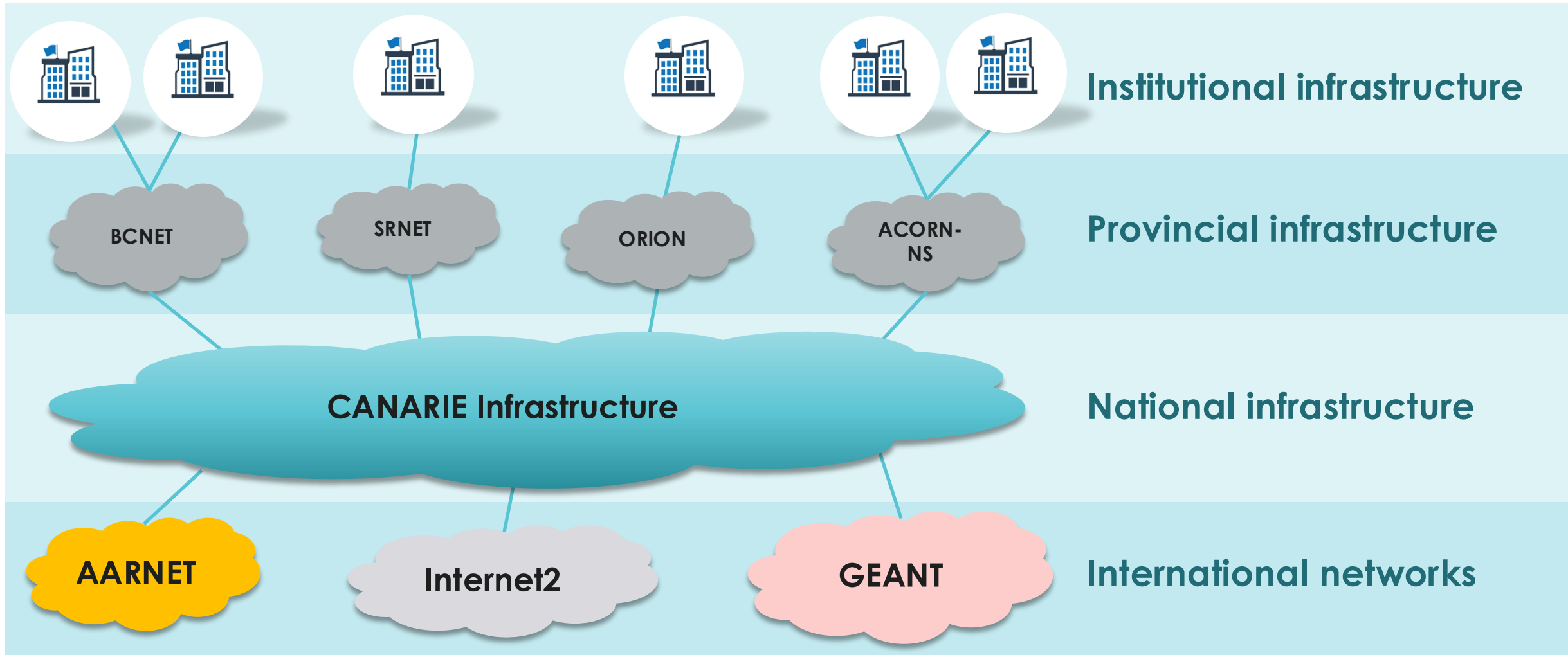
Together with our 13 provincial and territorial partners, CANARIE forms Canada's National Research and Education Network (NREN). This ultra-high-speed network securely connects Canada's researchers and educators to each other and to global data, technology, and colleagues.



# Simplified NREN map

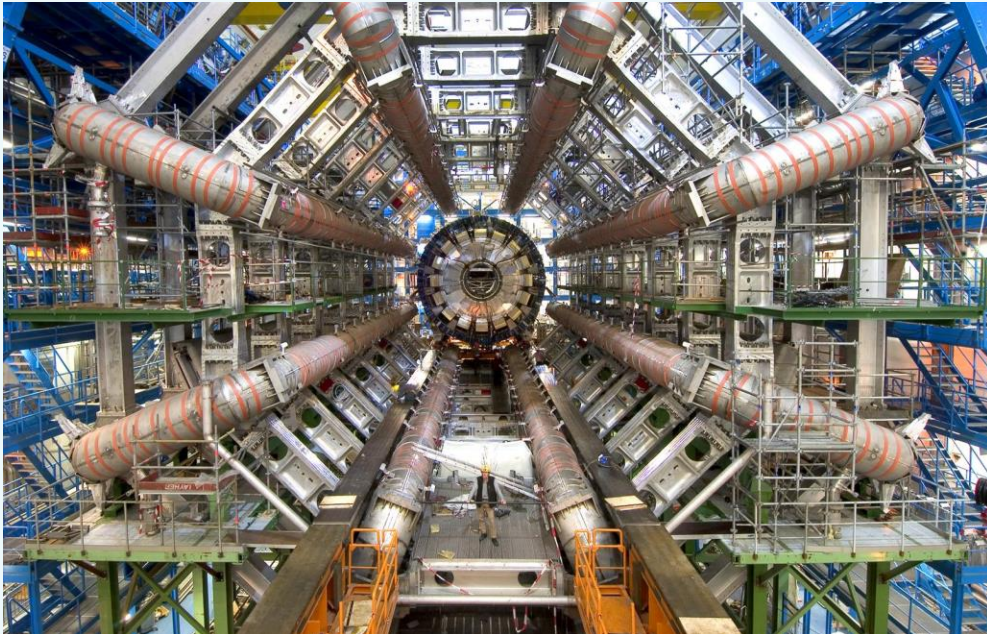


# NREN network infrastructure



# Supporting global research collaborations

## Large Hadron Collider (LHC) TRIUMF-CERN collaboration

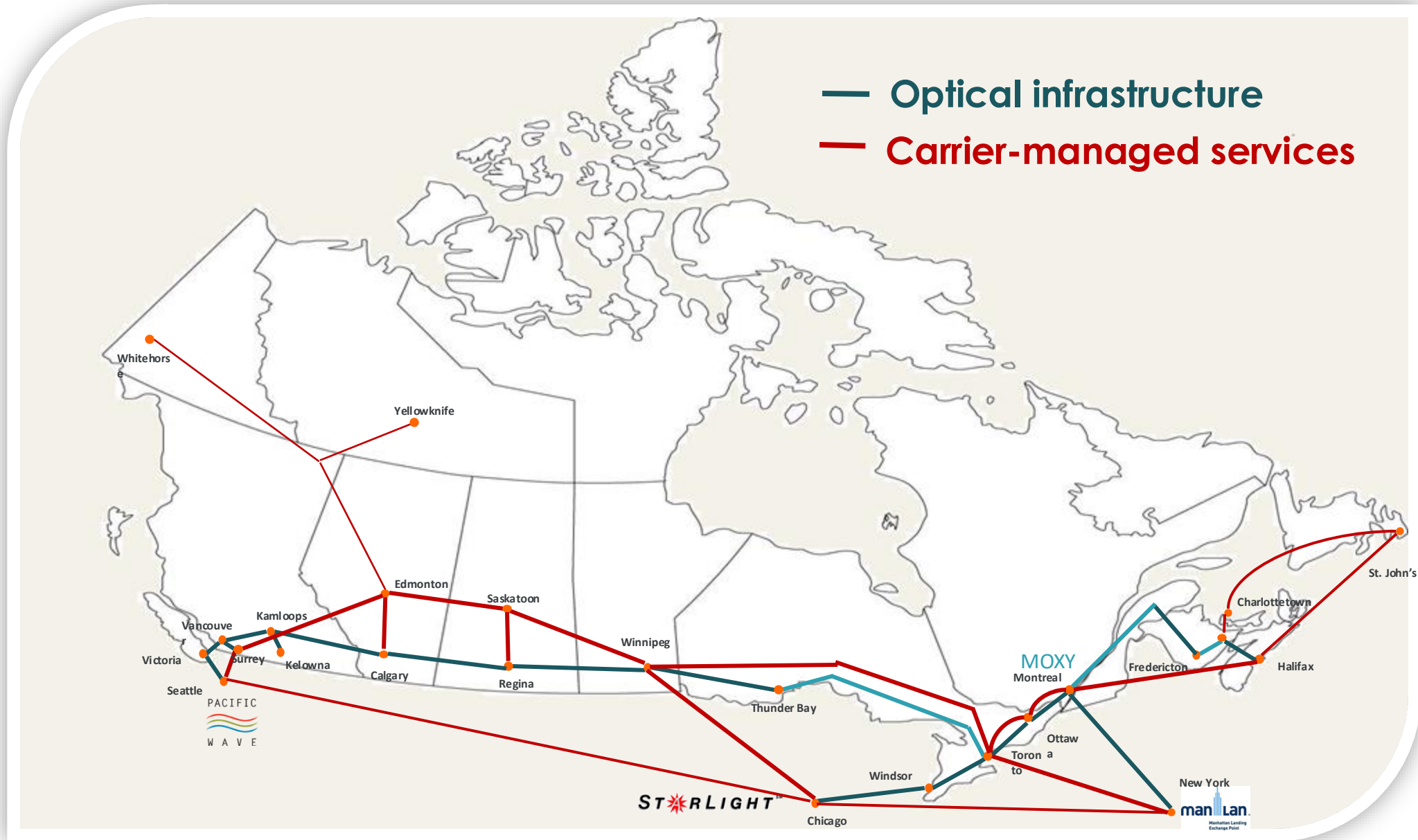


## Square Kilometre Array (SKA)





# Network design approach



# Building optical line systems in stages

## System information:

- ~ 9700KM of fibre route with different fiber terms
- Nortel Common Photonic Layer (CPL) or 6500 system
- Fixed Grid Systems – 50G or 100G spacing
  - Maximum wavelength speed of 200G
- Linking 4 North America R&E exchange points
- Sharing of optical systems



{ West System }  
2006

{ Central System }  
2013

{ Northern Ontario }  
2011

{ East System }  
2005

{ Atlantic System }  
2014



# Optical infrastructure sharing

Sharing of optical infrastructure to improve  
redundancy or service delivery





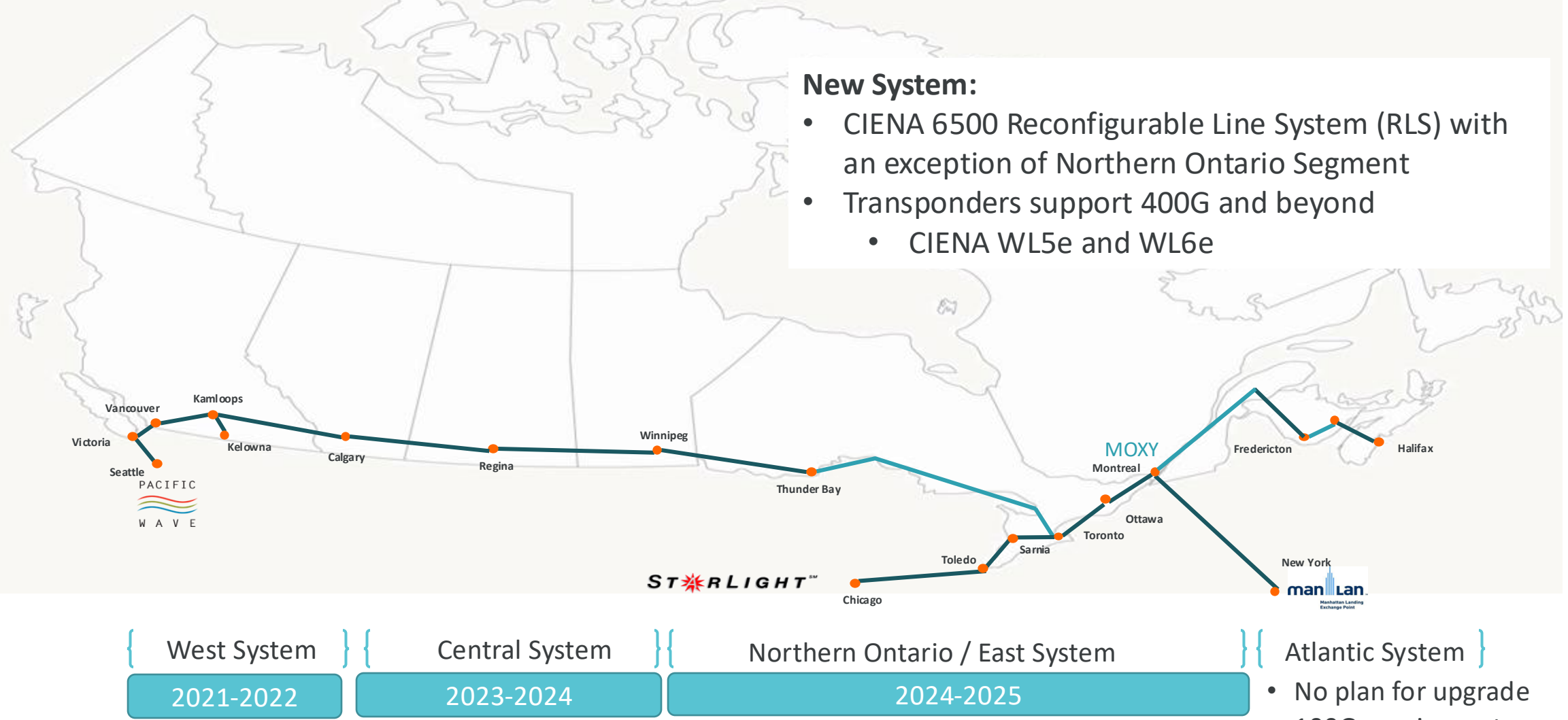
# Fibre systems refresh

- **New photonic system**
  - Flexible grid
  - Operating at C band
  - Raman amplification to improve reach
  - Supporting existing Coherent transponder HW
  - Foreign wavelength
- **Upgrading the photonic systems during fibre term renewals**
  - West, Central, and Northern Ontario
  - Shut down and rebuild
- **New East fibre system**
  - New fibre route - build and migrate instead of live upgrades
  - Newer fibre type, if available
  - Preferably Canadian carriers



# Optical infrastructure refresh

- New System:**
- CIENA 6500 Reconfigurable Line System (RLS) with an exception of Northern Ontario Segment
  - Transponders support 400G and beyond
    - CIENA WL5e and WL6e



- No plan for upgrade
- 100G spacing system

• Expected completion - October 2025

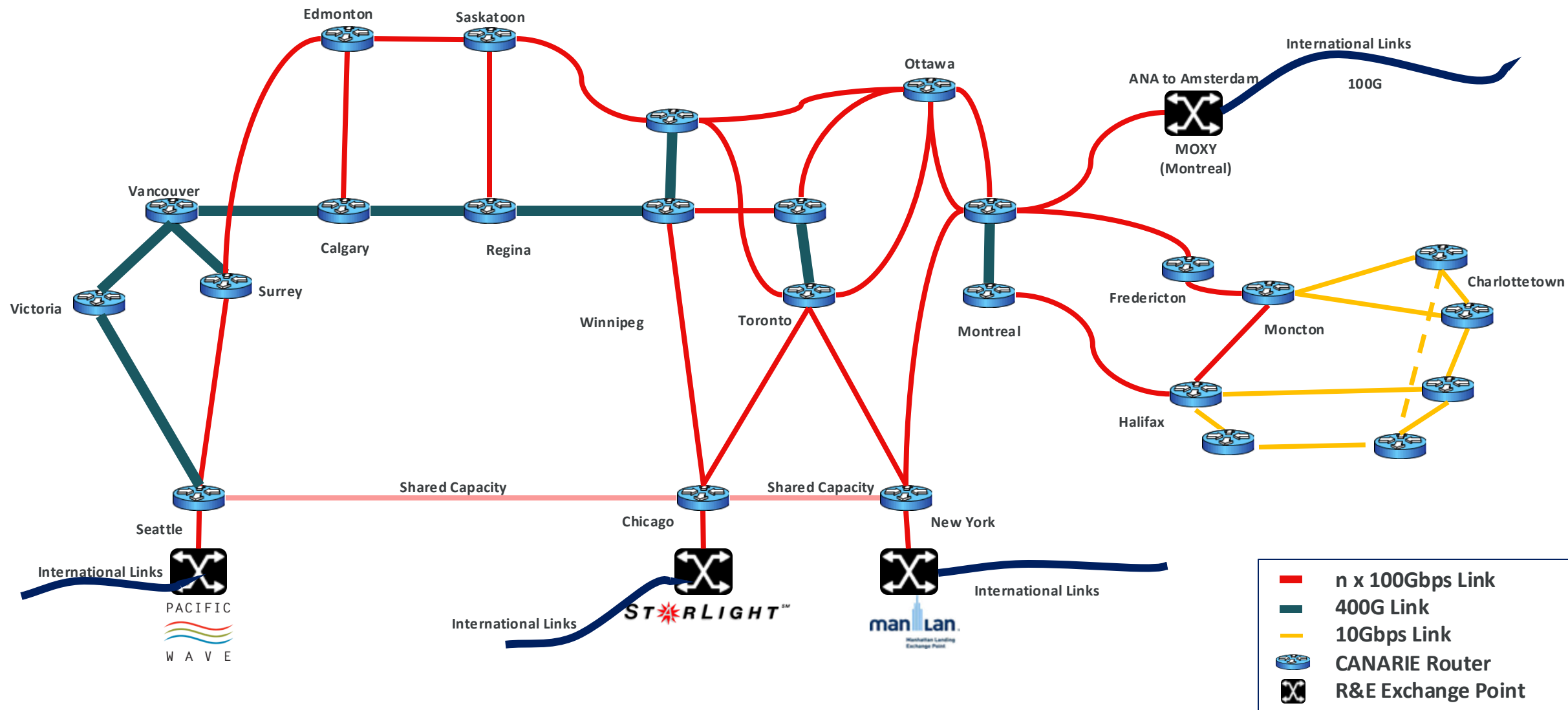


# What's next?

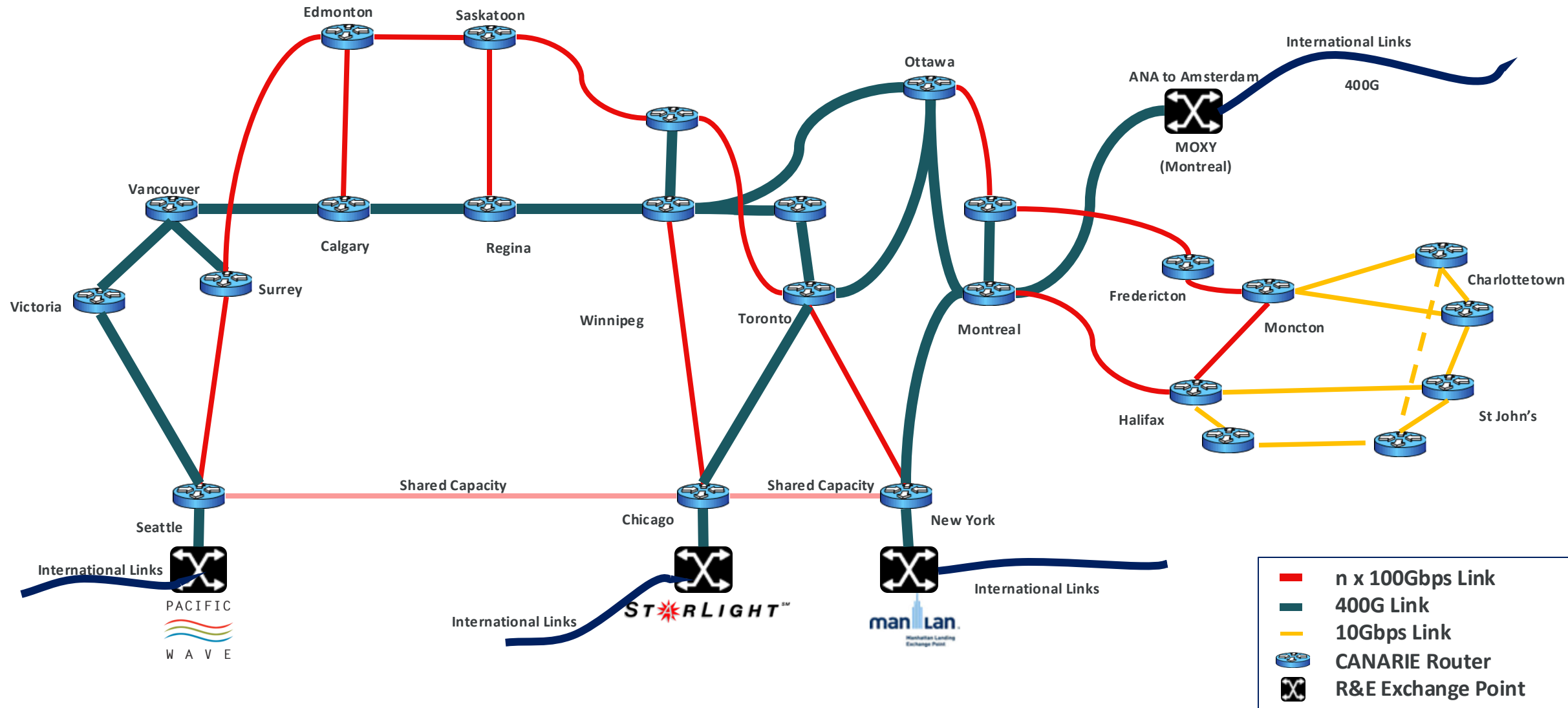
- Establishing 400G connections to the exchange points
  - PacificWave, Starlight, MANLAN and MOXY
- Provisioning 400G to support NA-REX, ANA, SC25(1.2T), etc..
- Experimenting 400G ZR+ coherent transceivers (IPoDWDM)
  - Wherever applicable
  - CIENA extended-reach mode PKT-MAX for their WaveLogic 5n coherent transceivers – 1300km span
  - 3<sup>rd</sup> party transceivers interoperative with routing platforms



# CANARIE IP Network: Today



# CANARIE IP Network: 2026





# Key takeaways

- CANARIE's recent optical upgrades are a significant step in ensuring that Canada's R&E community remains globally competitive, providing students and researchers seamless, high-speed access to critical resources both domestically and internationally.
- CANARIE continues to advance its network and services past 400G, addressing the increasing demands of data-intensive research.







canarie



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