telecon

design · build · connect

THE 2019 CANADIAN TELECOM SUMMIT

Toronto | June 2019

Building Converged Networks

Presented by Robert Pothier

Senior Vice President, Design

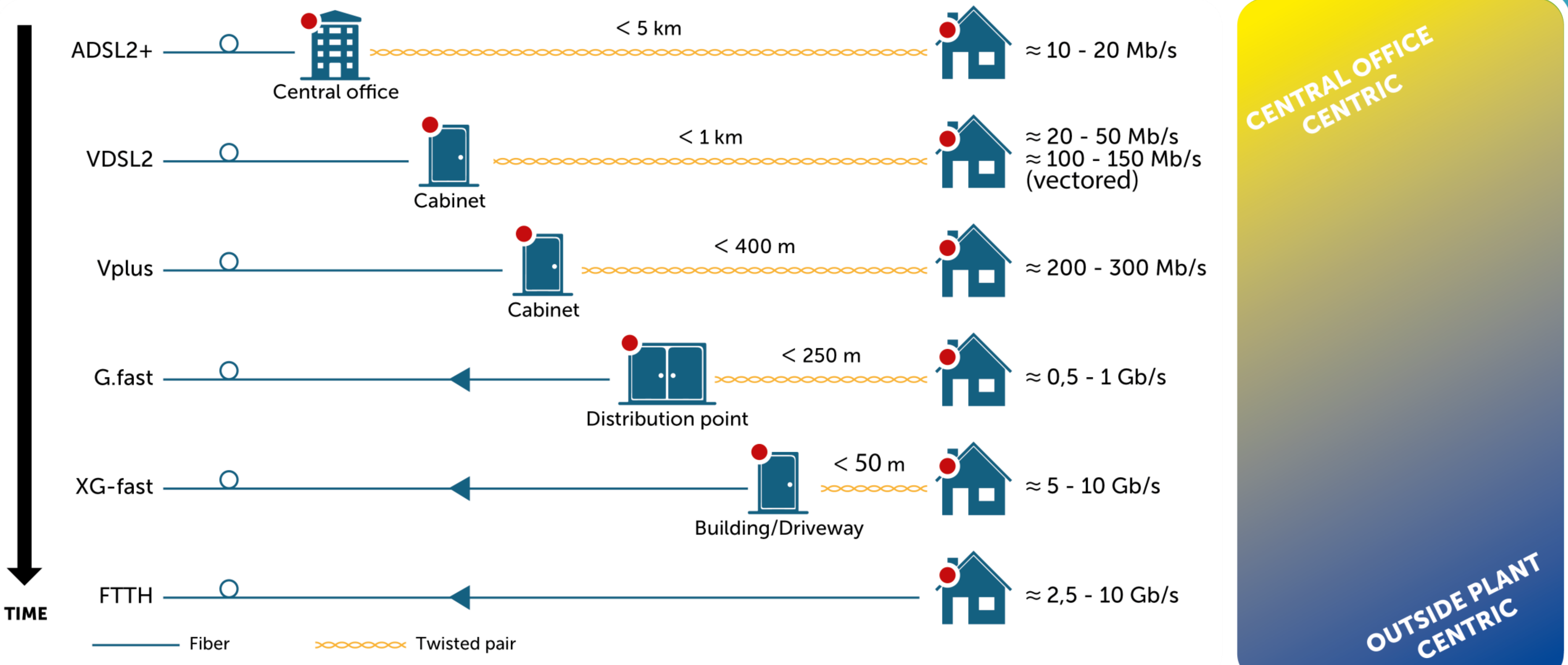
Telecon

50 Years of Technology Transformation

- ✓ Copper DSL
- ✓ Towers and Rooftops
- ✓ Pole Engineering
- ✓ Underground Structures & Locates
- ✓ Civil/construction
- ✓ HFC Deployments
- ✓ Street Furniture
- ✓ Small Cell and WiFi
- ✓ FTTx/PON/GPON
- ✓ Long-Haul Fiber
- ✓ PoE & Leaky Cable
- ✓ In Home Installation & Repair
- ✓ Sensors and Devices
- ✓ Radio dimensioning

Copper telephone lines → Introduction of broadband services → Introduction of mobile networks → Introduction of fiber optic networks → 5G

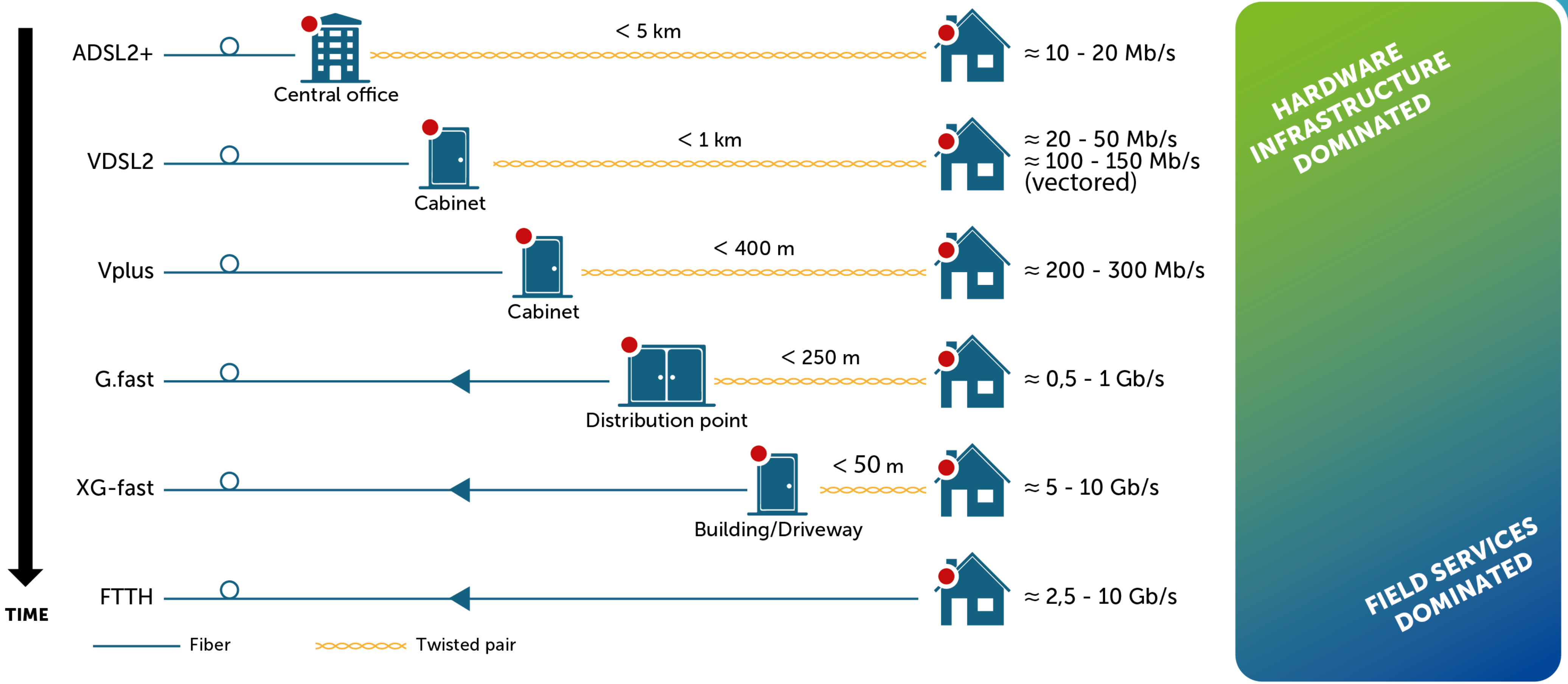
Broadband Access Evolution – Expansion of Deep Fiber



Higher data speeds require densification of network and expansion of network edge to outside plants

Source: The future X network, Weldon, Marcus K. 2016

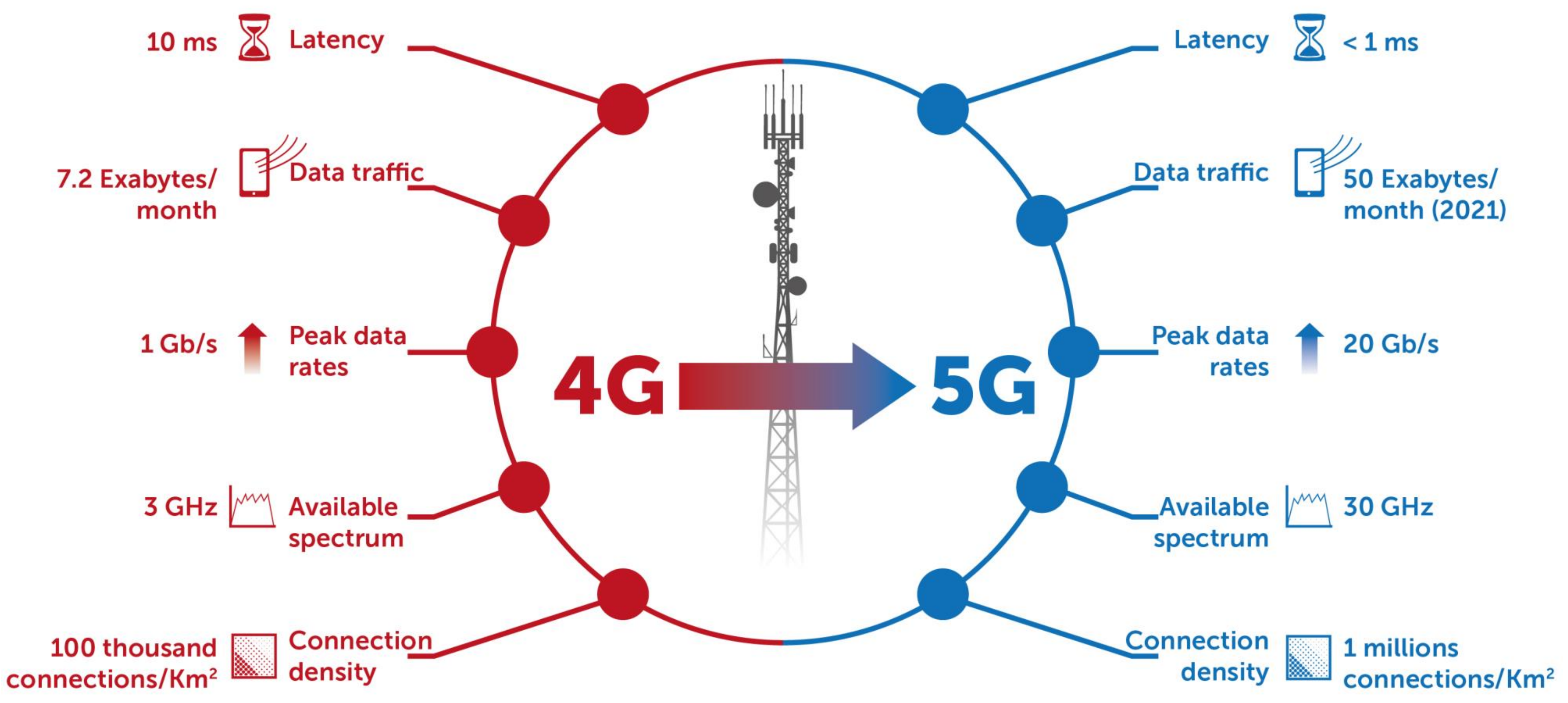
Broadband Access Evolution – Expansion of Deep Fiber



Higher data speeds require densification of network and expansion of network edge to outside plants

Source: The future X network, Weldon, Marcus K. 2016

Comparing 4G to 5G / connecting the edge



Agenda

- ✓ Locate, Safety first
- ✓ Sub Surface utility engineering
- ✓ Towers
- ✓ Pole engineering
- ✓ Connectivity
- ✓ About Telecon

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Locate, Safety first

Yellow Paint, not Rotten Eggs

- ✓ Safety First – Utility and Infrastructure companies priority
- ✓ There is a huge underground network of utilities that we do not see
- ✓ Damage prevention a key aspect but;
- ✓ Despite network redundancy hits to underground facilities will have an impact
- ✓ Locating a key part of building outside networks

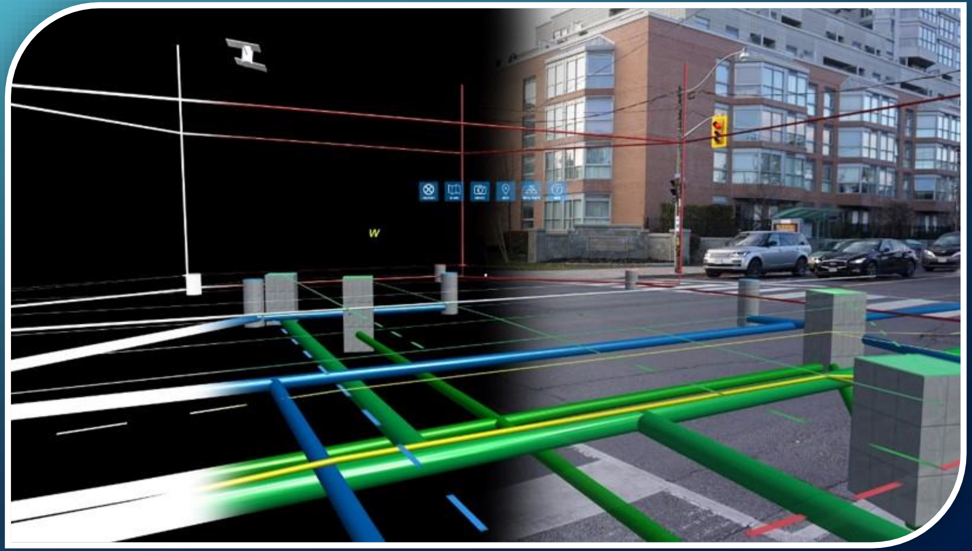
Guide
Paint marks colours on the ground

Blue:
Water

Red:
Electricity

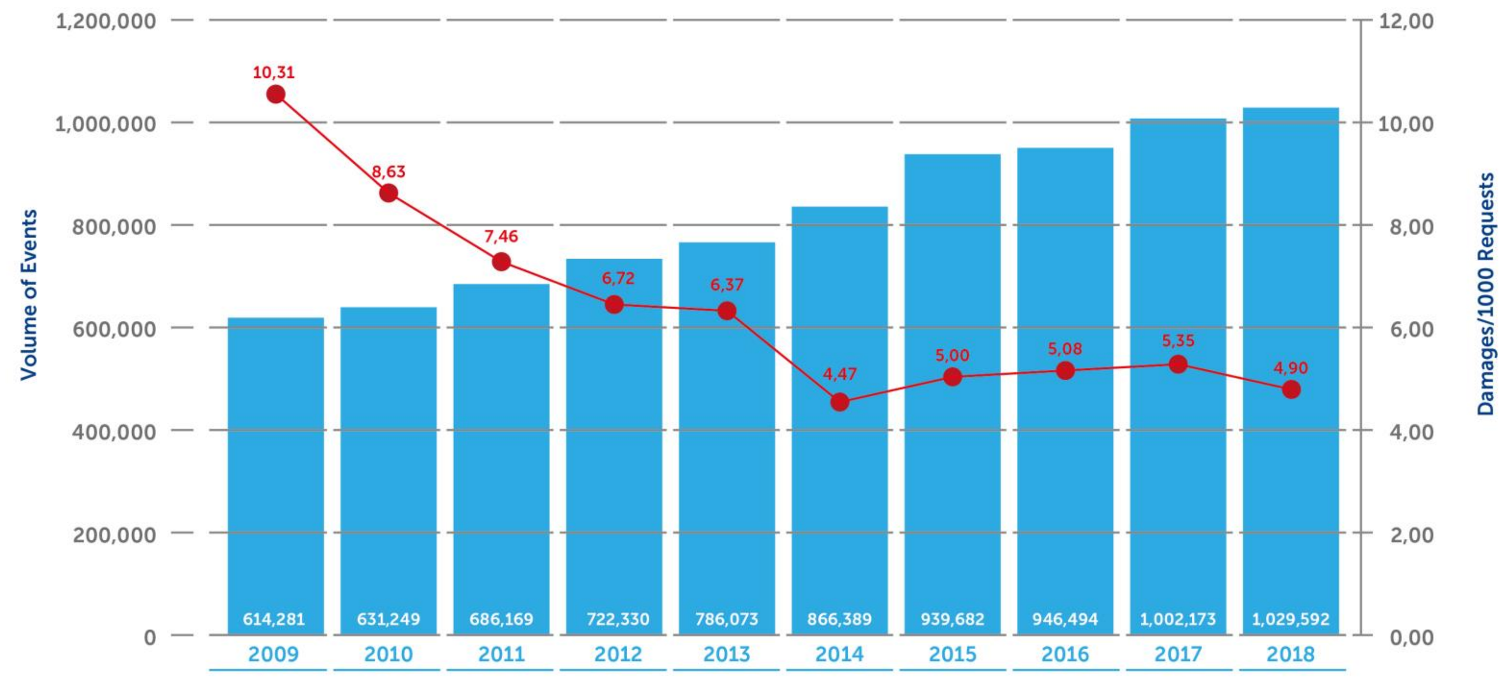
Orange:
Communications

Yellow:
Gas



Locate Requests: 10 Year Trend

Infrastructure is damaged less often when the locate request process is used.

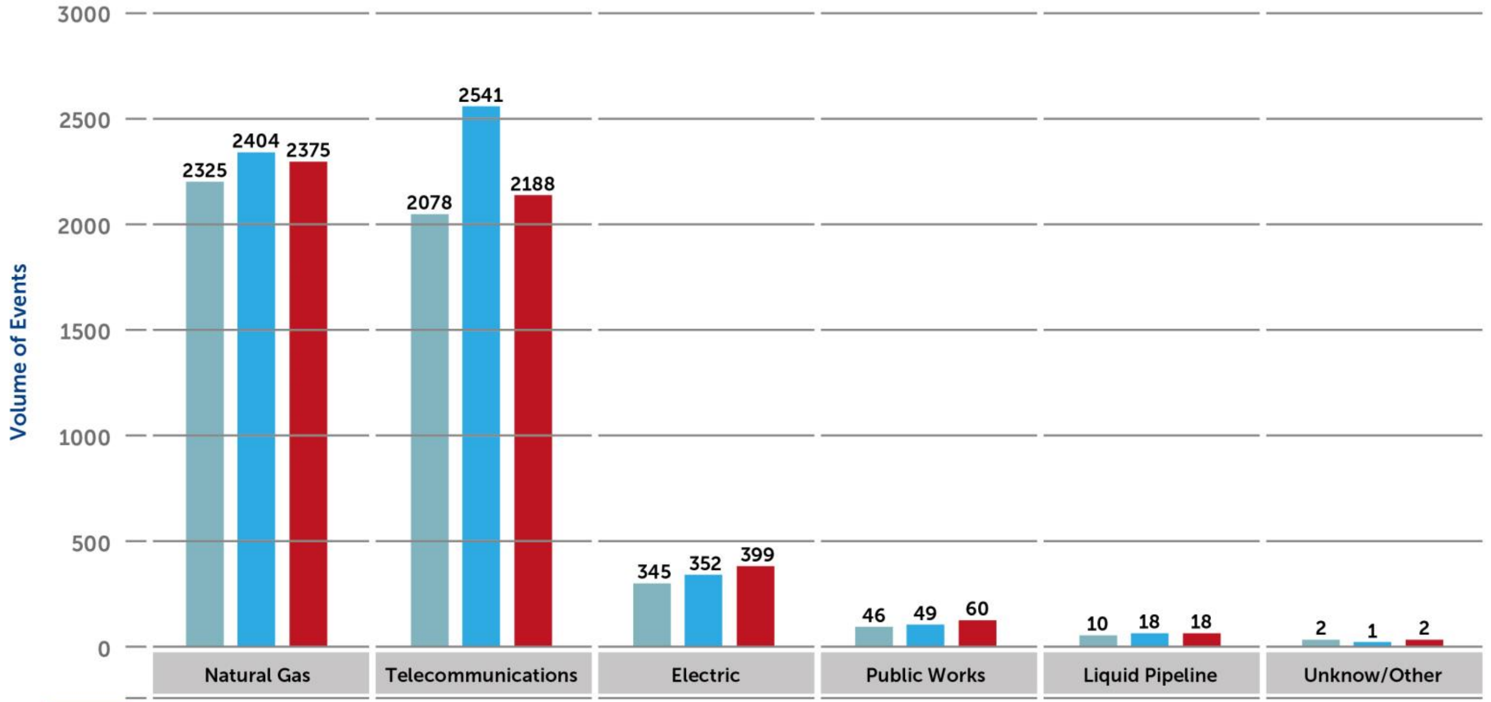


	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Requests	614,281	631,249	686,169	722,330	786,073	866,389	939,682	946,494	1,002,173	1,029,592
Construction Ratio	10,31	8,63	7,46	6,72	6,37	4,47	5,00	5,08	5,35	4,90

- ✓ Locate requests have almost doubled over the last 10 years
- ✓ Because the locate request process is being utilized more often, damages have significantly decreased over this period

Damages by Type of Infrastructure

Telecommunications and natural gas infrastructure damaged most often.

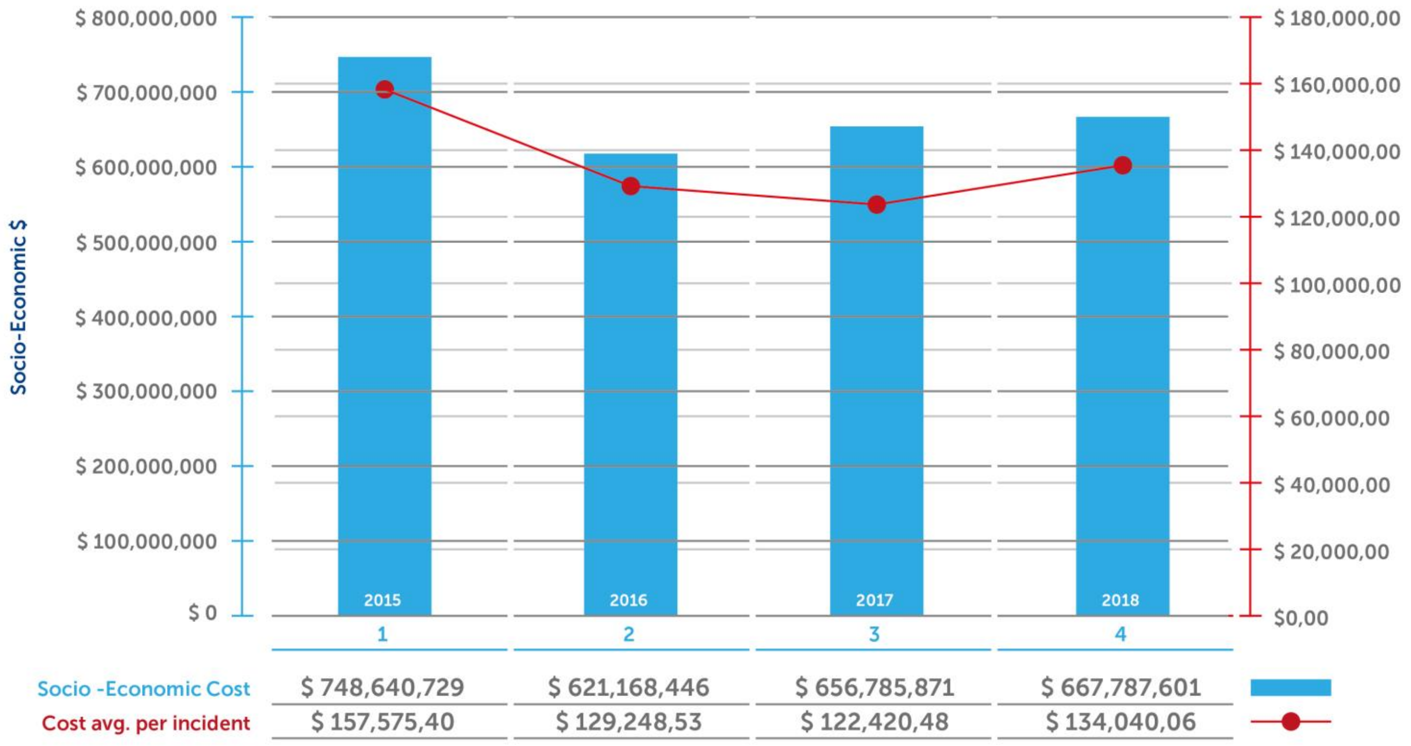


	Natural Gas	Telecommunications	Electric	Public Works	Liquid Pipeline	Unknow/Other
2016	2325	2078	345	46	10	2
2017	2404	2541	352	49	18	1
2018	2375	2188	399	60	18	2

- ✓ Of the infrastructure damaged over the last three years, both natural gas and telecommunications infrastructure damaged significantly more often than other utilities
- ✓ During this same time frame, the average incident cost exceed $140K per incident

The Cost of not Locating

Direct and indirect costs preventable with better processes and more accuracy: 600 to 750 million per year.



Type of Costs

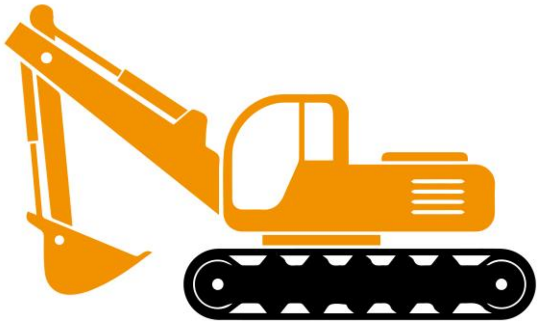
- ✓ Replacement materials used;
- ✓ Materials used;
- ✓ Labour;
- ✓ Administrative to rehabilitate damaged infrastructures.

Other consequences

- ✓ Service disruption;
- ✓ Intervention of emergency services
- ✓ Evacuation of businesses and residential sectors;
- ✓ Risk of injury or death
- ✓ Loss of product;
- ✓ Environmental impact;
- ✓ Economic impact on businesses and companies;
- ✓ Word delays;
- ✓ Administrative and legal costs;
- ✓ Negative impact for owner companies;
- ✓ Disturbances to neighbouring lands and infrastructures;
- ✓ Traffic disturbances.

Summary

- ✓ Call before you dig is essential & the law
- ✓ The GTA is seeing the highest volume of locates in history
- ✓ More underground plant is certain for the future
- ✓ The need to locate becomes more critical, avoiding outages on fiber and HFC
  - ✓ translates into avoiding outages on the 5G network – with more devices on the edge with more critical functions.



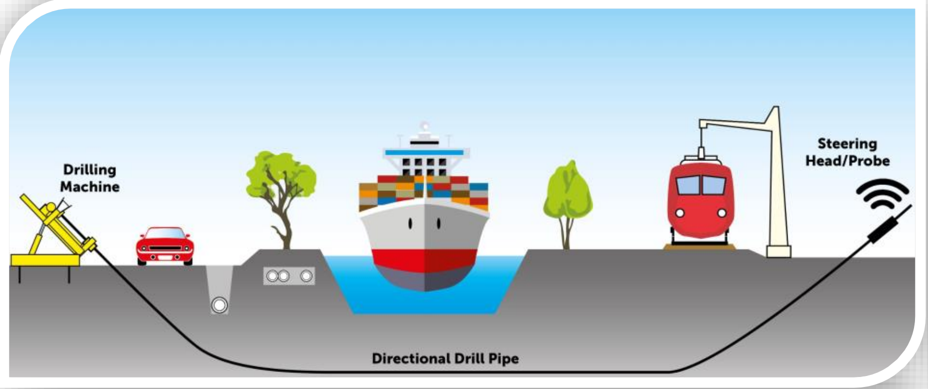
ON1CALL
CALL BEFORE YOU DIG
It's The Law!

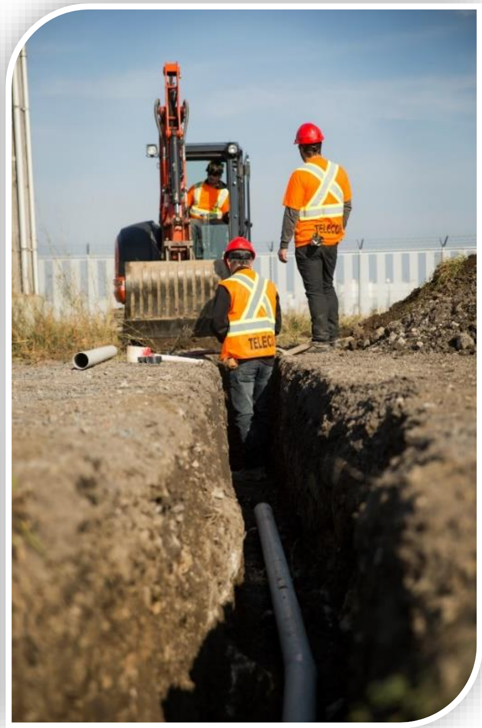
Sub Surface Utility Engineering

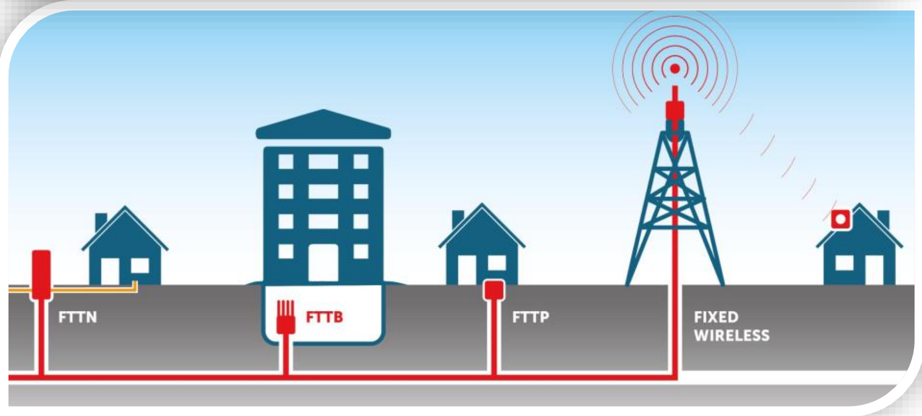
Underground is getting more complex

Canadian Market is going underground, low hanging fruit coming to an end – Aerial and MXU are more in the rural areas moving forward.

"Aerial – 7 year Buried 18 – 25 payback"







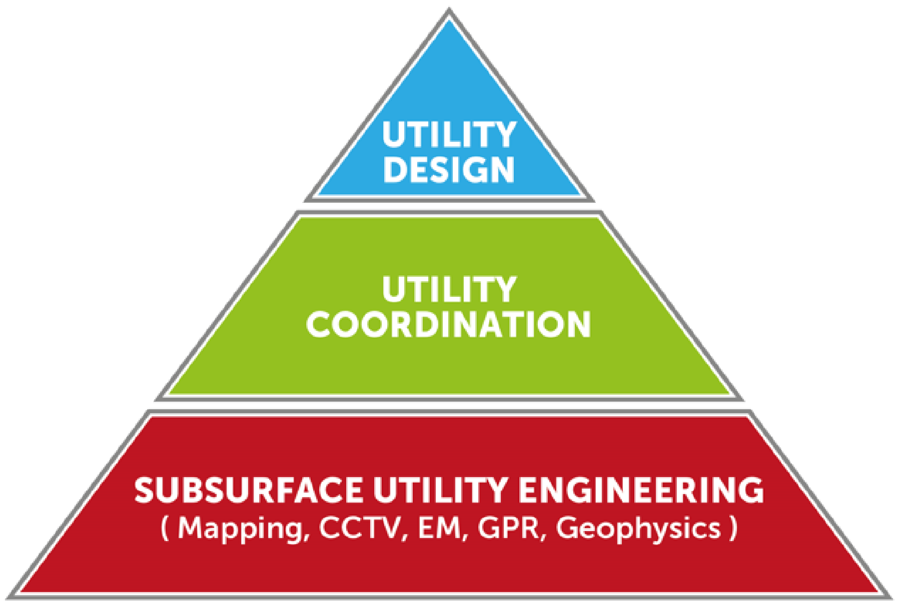
Last year, I spoke about civil construction, hydro vac's and directional drilling.

SUE is the next level.

What is SUE?

The Definition from CI/ASCE 38-02

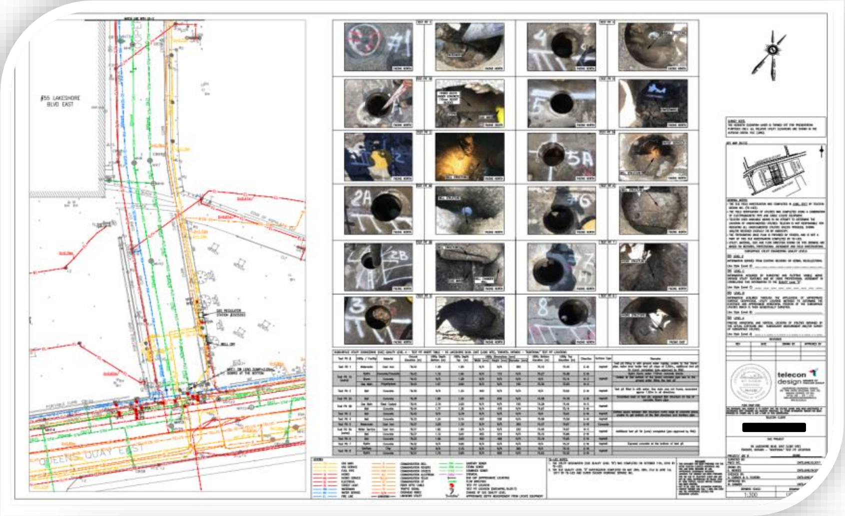
"A branch of engineering practice that involves managing certain risks associated with utility mapping at appropriate quality levels, utility coordination, utility relocation design and coordination, utility condition assessment, communication of utility data to concerned parties, utility relocation cost estimates, implementation of utility accommodation policies and utility design."



SUE is the base of a successful utility design.

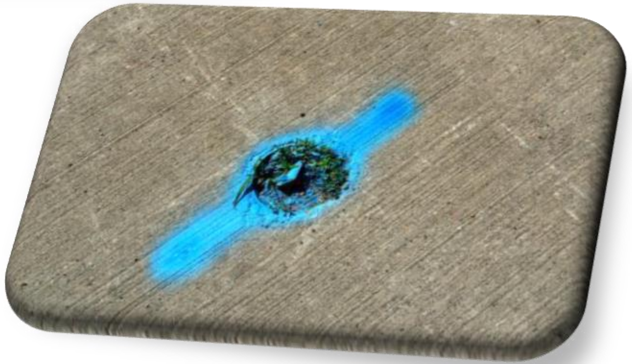
Examples – Underground congestion

Quality Level "D"
Records Research



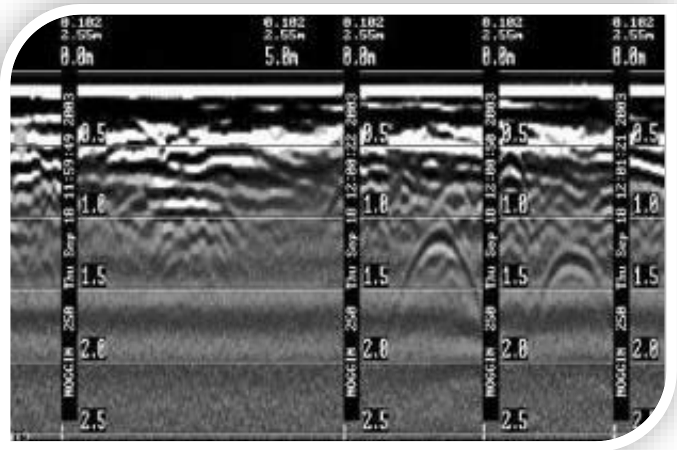
Quality Level "C"

Surveying Visible Features



Quality Level “B”

Designating (obtaining horizontal position)



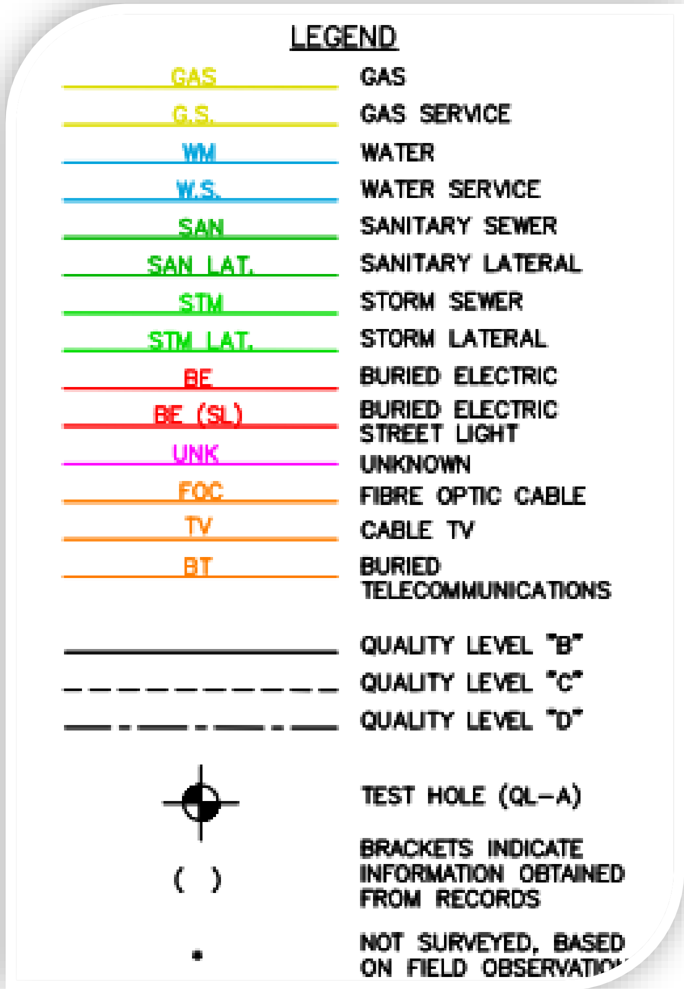
Quality Level "A"

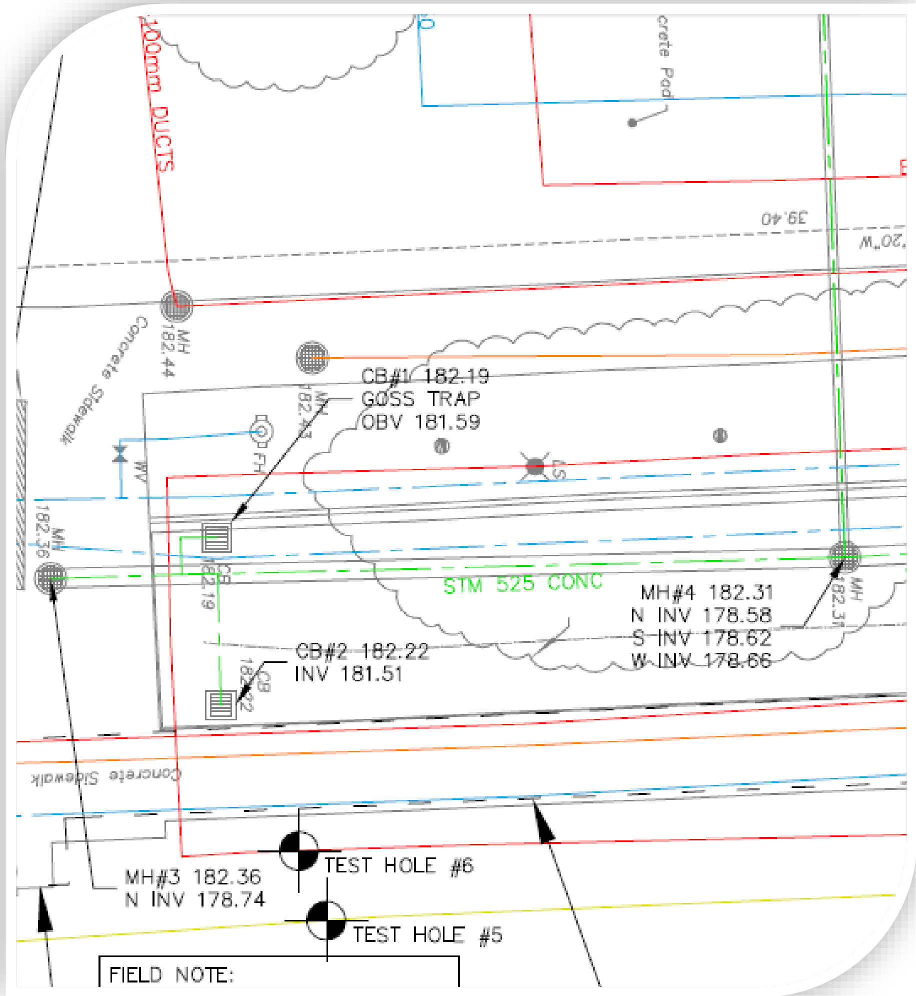
Locating

(obtaining exact horizontal and vertical position)

Usually using non-destructive excavation

Depicting Quality
Levels on Drawings



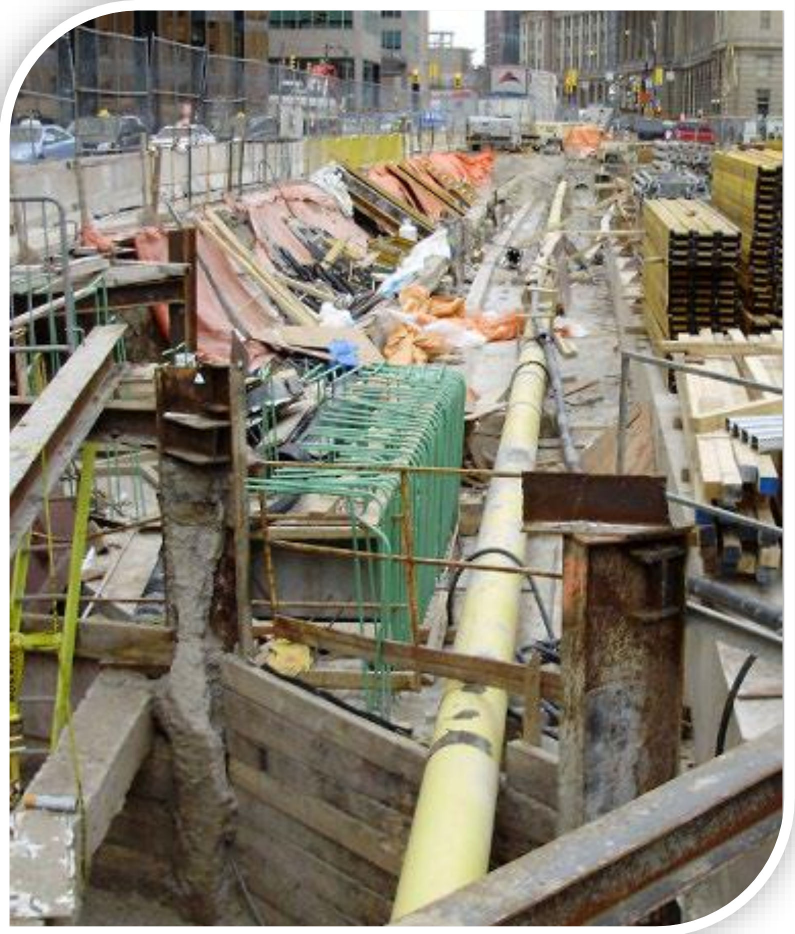


Utility Conflict

Low risk

Utility Conflict

High risk



Why Use SUE for FTTx Projects?

- ✓ Provides designers and engineers with valuable information during the design stage
  - ✓ Clearly defines utility conflicts
  - ✓ Reduces re-design costs be routing right first time
  - ✓ Contractors reduce their bid prices by reducing risk
  - ✓ Reduces project delays by reducing re-work
  - ✓ Improves project safety
- ✓ Avoids outages in the present and the future, wireline and wireless
- ✓ Price on the FTTH side heavily impacted by investigations, cheaper is our goal …

Towers

First phase of 5G – LTE uprades: Towers

- ✓ Approximately 13,000 towers across Canada.
- ✓ in the past these services were combined with the sale of metal, which is no longer the case and the Canadian market has a scarcity of tower labour
- ✓ Industry capacity unavailable to absorb large ramp-up – volumes are needed but not there - has slowed ability of tower owners to implement upgrades

The Move from Towers

- ✓ 5G standard has defined 3 use cases…
  1. Enhanced Mobile Broadband (eMBB)
  2. Ultra Reliable Low Latency Communications (URLLC)
  3. Massive Machine Type Communications (mMTC)
- ✓ Previous generations of wireless technologies had majority of edge-of-network equipment installed on towers/rooftops.
- ✓ We are seeing an increase of 5G readiness converging indoor, onto poles, with more devices (supertechs?)

Pole Engineering

Challenges for Aerial

Small Cell & 5G

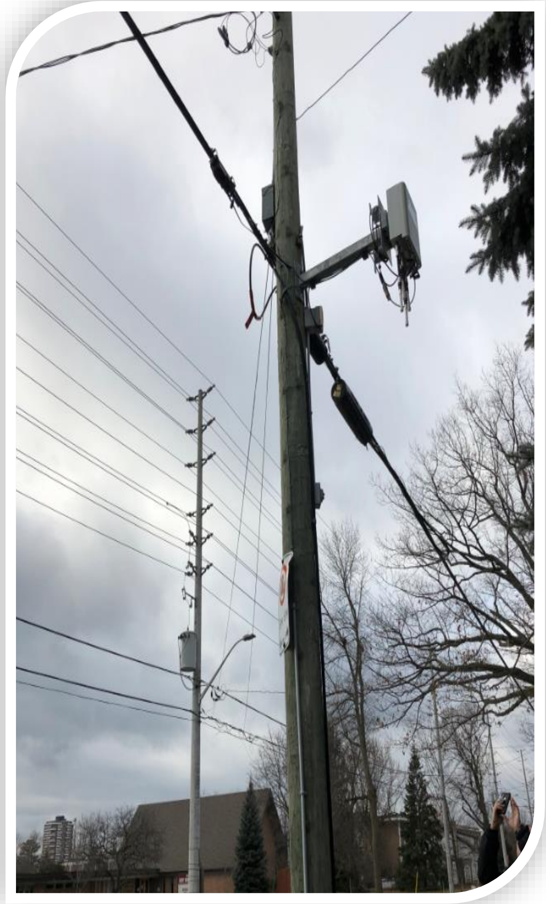
Electrical Distribution 3rd Party Permitting

- ✓ Resources limitations for permit review and approval - Processing time
- ✓ Higher Engineering Standards & Restrictions
- ✓ Potential for Excessive Make-Ready depending on infrastructure age and existing attachment placements
- ✓ Rural areas can have very large spans 65+m. As a result, excessive MR or Pole change outs may be required in order to meet requirements

Challenges for Aerial
Small Cell & 5G

Municipal Consent

- ✓ Many poles are owned by city's and towns. Their approval is required for attaching small cells to these poles.
- ✓ They can be aesthetically displeasing both for the Municipality's and the public.
- ✓ NIMFY – Not In My Front Yard.



Challenges for Aerial
Small Cell & 5G

- ✓ Locations chosen during FTTH design process
- ✓ Establish engineering guidelines with the municipality for small cell aesthetics, ensuring structural integrity and safety.
  - ✓ Design criteria will expedite permitting.
- ✓ – 3 hours to install but 3 months for a permit…..
- ✓ Wireless re-using all the processes and learnings from the wireline deployments – convergence in infrastructure

Connectivity – An example

Back-to-Basics

Enterprise and Building Management Solutions

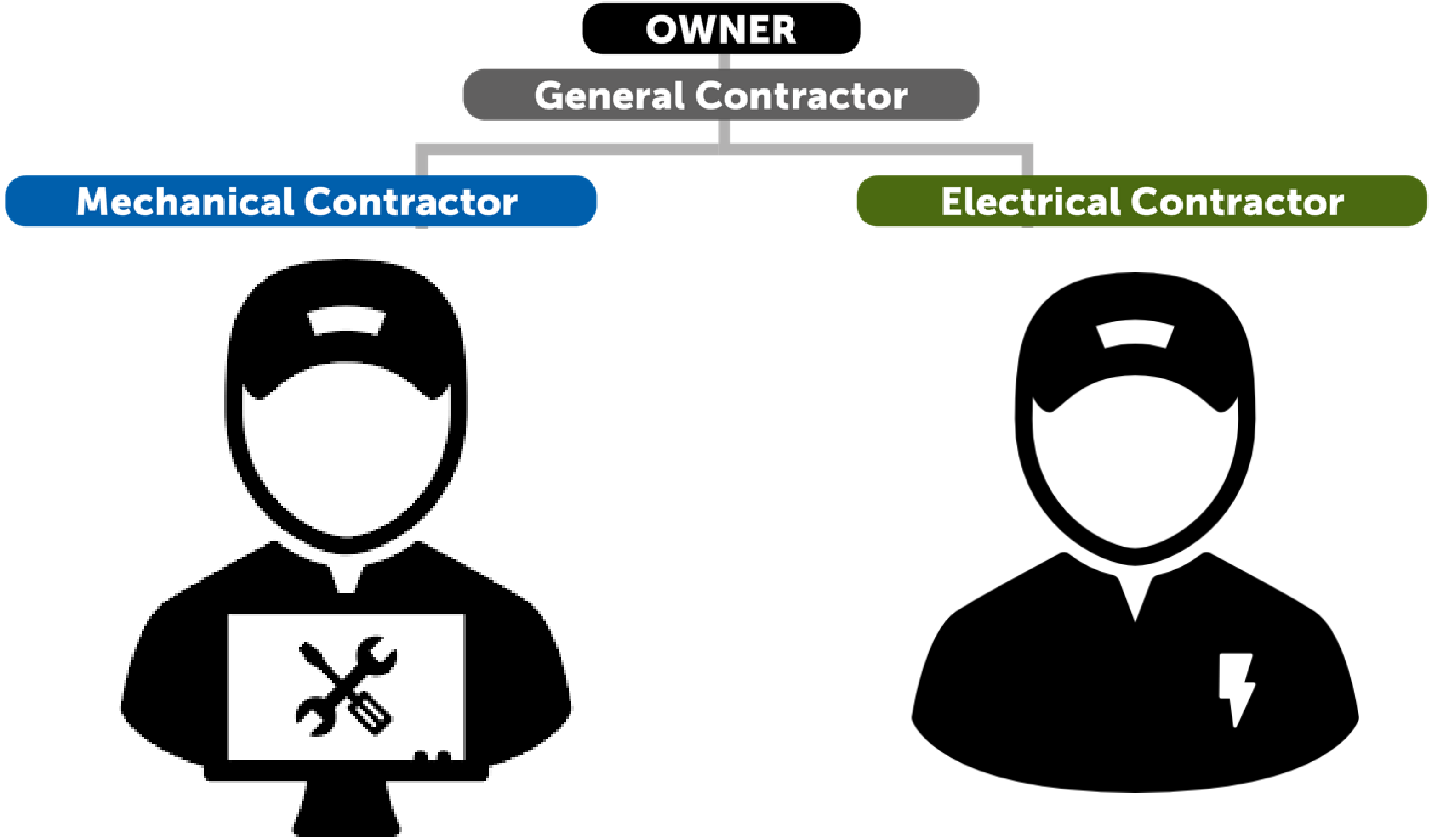
Ongoing transformation of traditional work environments to smart offices:

- North American Structured Cabling market valued at \$1.8B in 2015, expected to reach \$2.4B by 2022
- Global growth in IoT sensor deployments from \$242M in 2017 to \$1.3B in 2020
- HVAC Controls global market valued at \$13.6B (2018), expected to grow to \$27B by 2023
- 52% estimated global growth in Smart Lighting to reach \$1.6B in 2025
- IP Camera global market to surpass \$20B by 2024
- Global Wi-Fi market expected to grow from \$6B in 2017 to \$15.6B by 2022

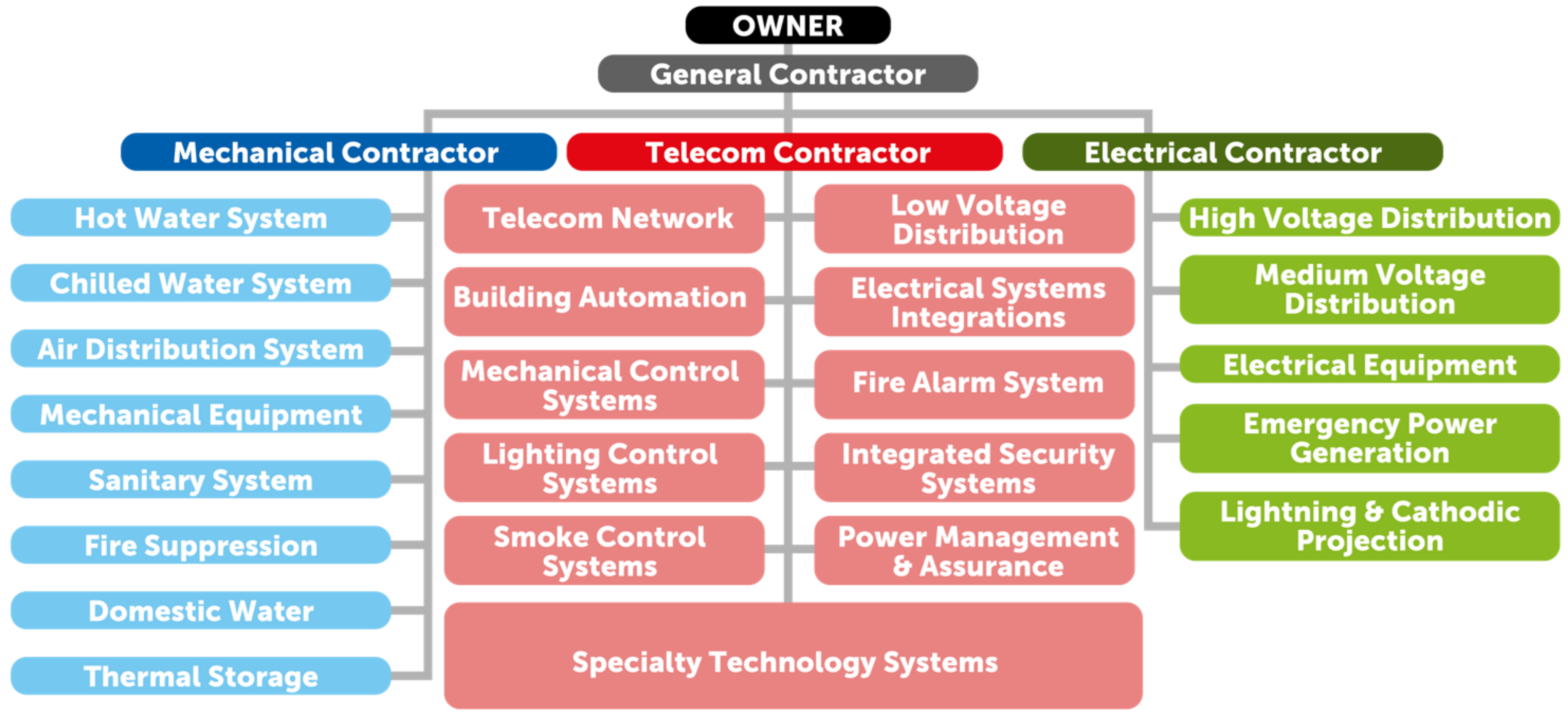
Figures presented in USD

Source: Cisco Digital Building Solution, 2016; Markets and Markets; Global Market Insights Articles; Smart Buildings: How IoT Technology Aims to Add Value for Real Estate Companies, Deloitte University Press

Traditional Model

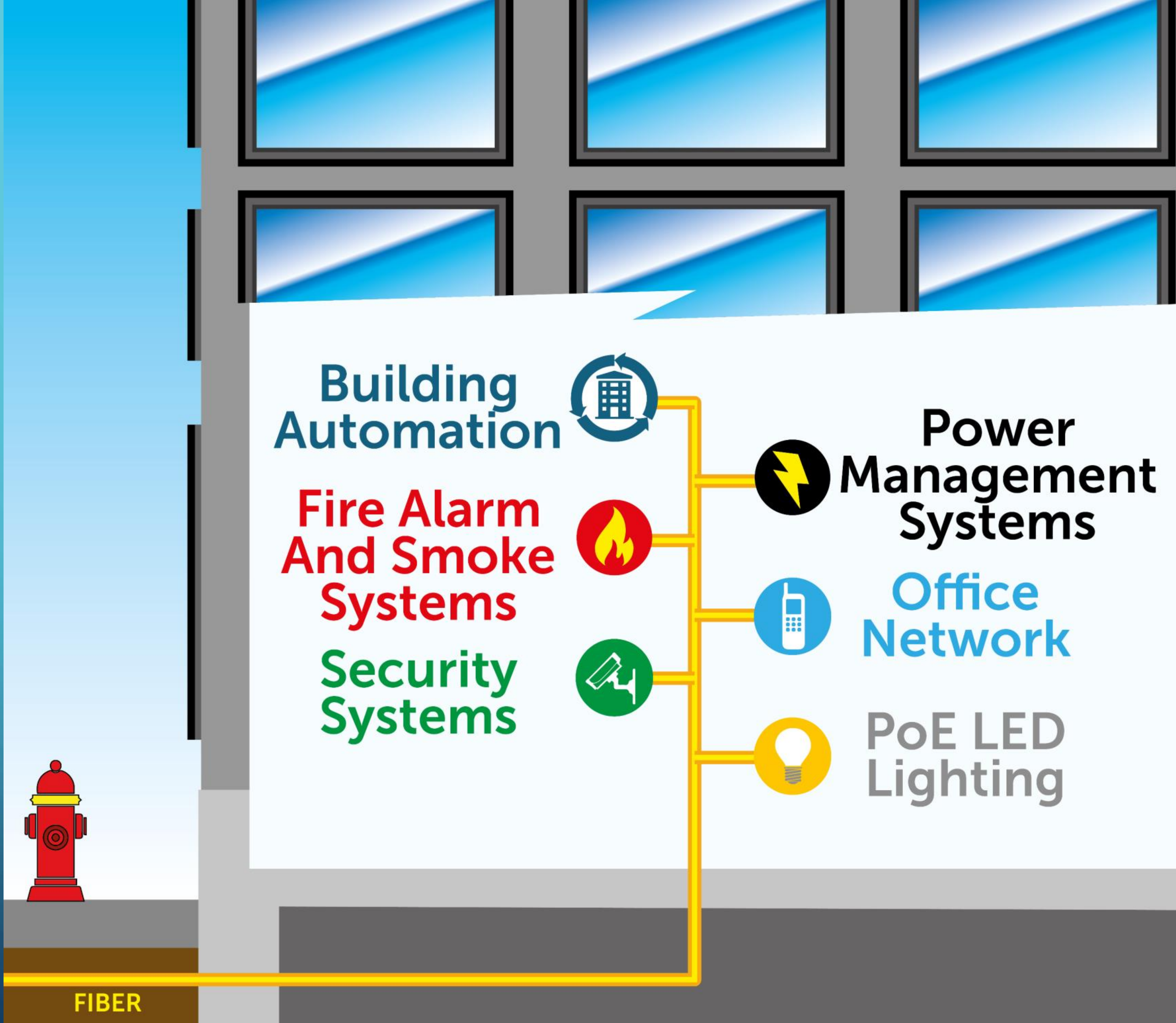


New Model with Telecom Contractor



Opportunity for new model for operators, building owners, general contractors & telecom services contractors

Can a single infrastructure serve everyone ?



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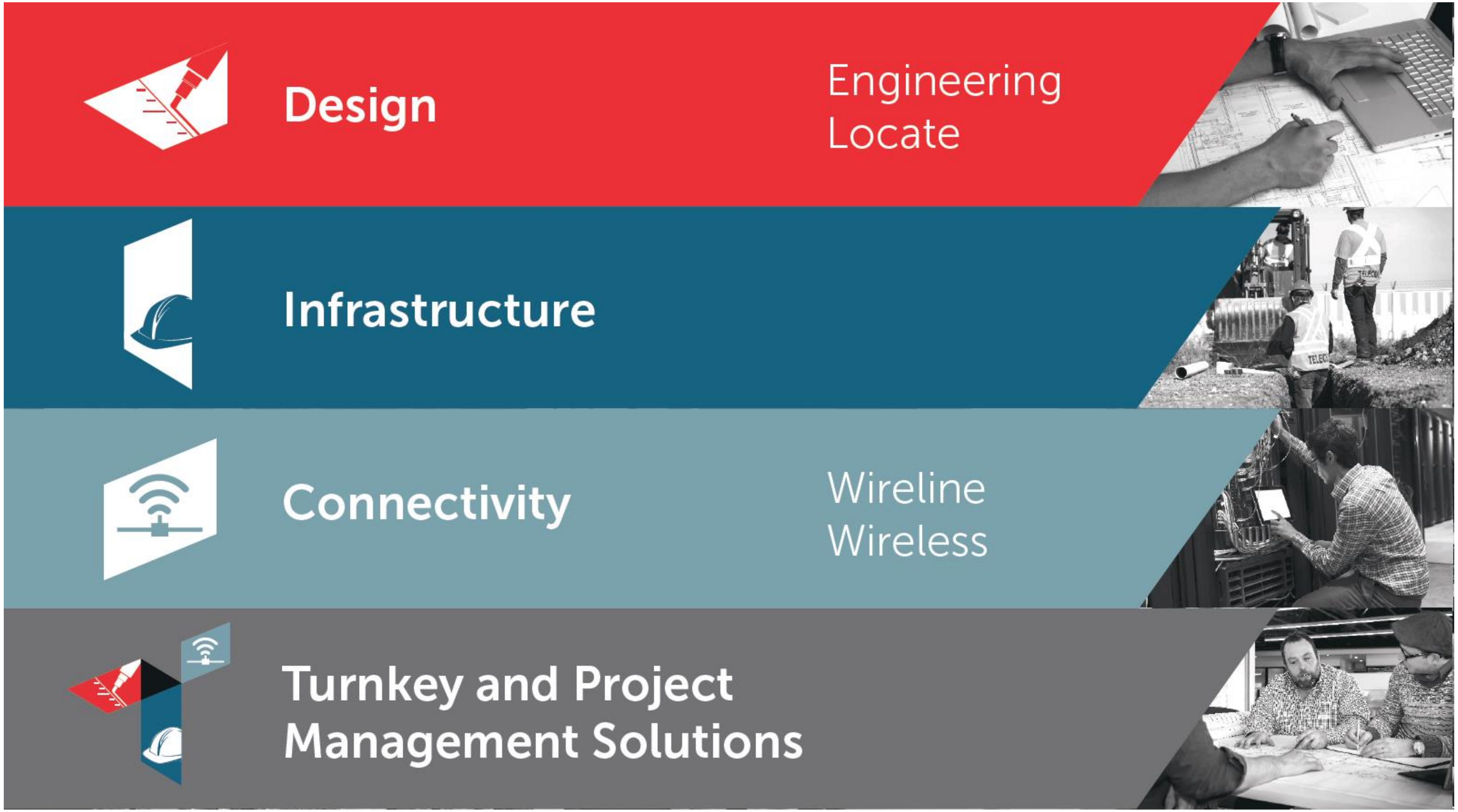
About Telecon

Presented by André Héroux

President and Chief Executive Officer

Telecon

Canada’s Leading Telecommunications Network Infrastructure Services Provider



Our Geographical Presence

65 offices in North America
4,000 highly skilled and engaged employees
An extensive network of strategic partnerships and specialized subcontractors

CANADA

British Columbia
Richmond

Alberta
Calgary
Edmonton
Fort McMurray
Red Deer

Saskatchewan
Regina
Saskatoon
Hamilton

Manitoba
Winnipeg

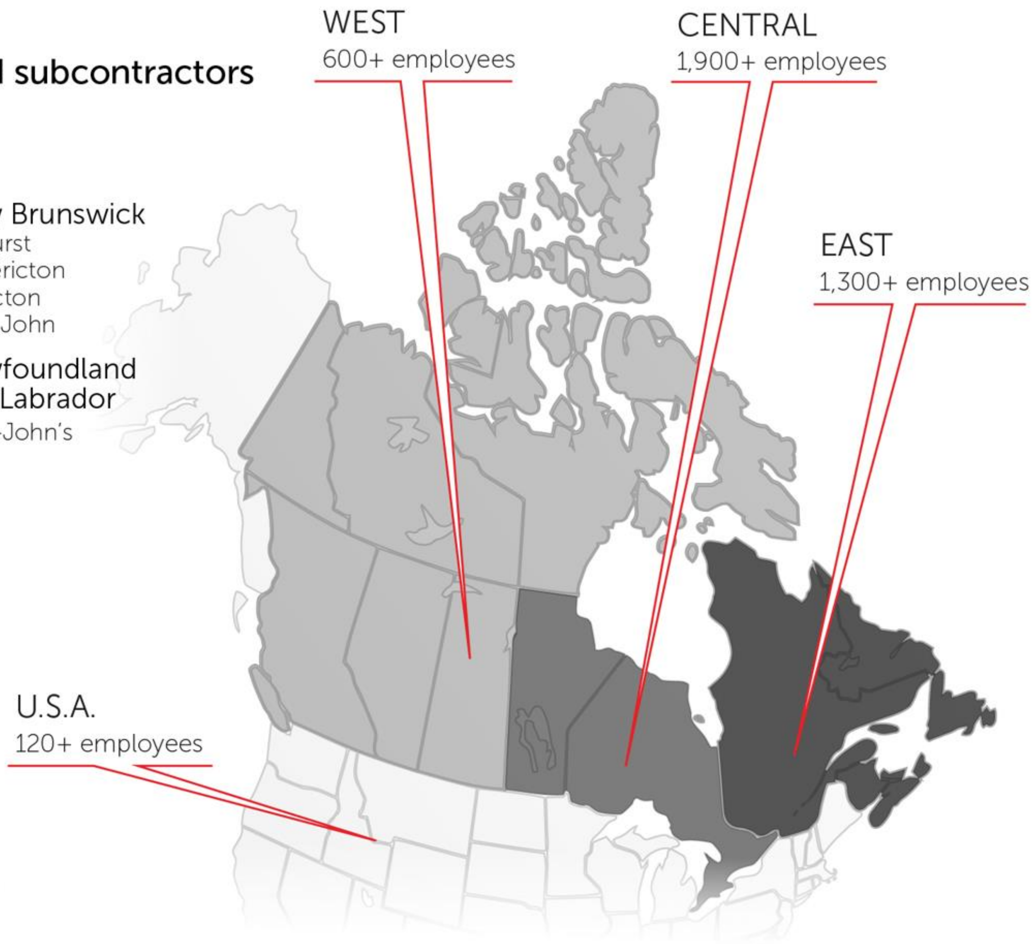
Ontario
Ajax
Barrie
Belleville
Brampton
Brockville
Cambridge
Carp
Cornwall
Holland Landing
Kingston
London
Markham
Oakville
Ottawa
Peterborough
Pembroke
Port Perry
Scarborough
Vaughan

Quebec
Chicoutimi
Gatineau
Lévis
Laval
Magog
Montréal
Saint-Laurent
Sainte-Thérèse
Québec
St-Augustin-de-Desmaures
St-Philippe
Trois-Rivières
Victoriaville

Nova Scotia
Bedford
Halifax
Sydney

New Brunswick
Bathurst
Frédéricton
Moncton
Saint John

Newfoundland and Labrador
Saint-John's



UNITED STATES

Engineering offices in Salt Lake City (Utah), Denver (Colorado) and Philadelphia (Pennsylvania).

Telecon's Service Offering

Customer Expectations

Predictability

Agility

Innovative Solutions

Quality

Continuous Cost Improvement

S Safety and Health

M Mastery of our line of business
Targeting excellence

A Agility

R Respect and integrity

T Teamwork

Telecon's Identity

MISSION
Be the industry leader
Offer turnkey solutions and targeted, dedicated services

VISION
Reach $1B by 2020
Deploying presence across Canada for all services and in the United States for design and engineering services.

IDENTITY
We are an experienced and results-oriented team, working in close collaboration to deliver best in-class solutions that delight our customers

LEADERSHIP BEHAVIOURS

SOUND GOVERNANCE	MOBILIZE AND ENGAGE	AMBASSADOR OF CHANGE	RESPONSIBILITY & ACCOUNTABILITY	TAKE THE LEAD

VALUES

SAFETY & HEALTH	MASTER OF OUR LINE OF BUSINESS, TARGETING EXCELLENCE	AGILITY	RESPECT & INTEGRITY	TEAMWORK

TELECON IS AN EMPLOYER OF CHOICE AND SAFEST EMPLOYER

Our History

1967
Telecon is founded in Trois-Rivières (Québec)
First telecommunications and cable networks implementd in Rimouski and Trois-Rivières.

1970's
Services expand to underground infrastructure construction and utility pole installtation. Diversification to TV cable distribution and telecommunications networks.

1990's
Telecon's expertise evolve with technology. Introduction of wireless technologies.

2000's
Telecon opens offices in Montréal and Québec, reaching 1,100 employees.

Promark telecon
Expercom

2011
Telecon is sold to Capital régional et coopératif Desjardins and Caisse de dépôt et placement du Québec.

2014
Telecon aquires NETRICOM

2015
Telecon aquires AGIR

2016
Telecon aquires plexus

2017
Clearspring Capital Partners becomes lead investor

2017
Telecon acquires marcomm

2018
Telecon Enterprise Portfolio launched

Telecon acquires CAM-TEL Line Locating

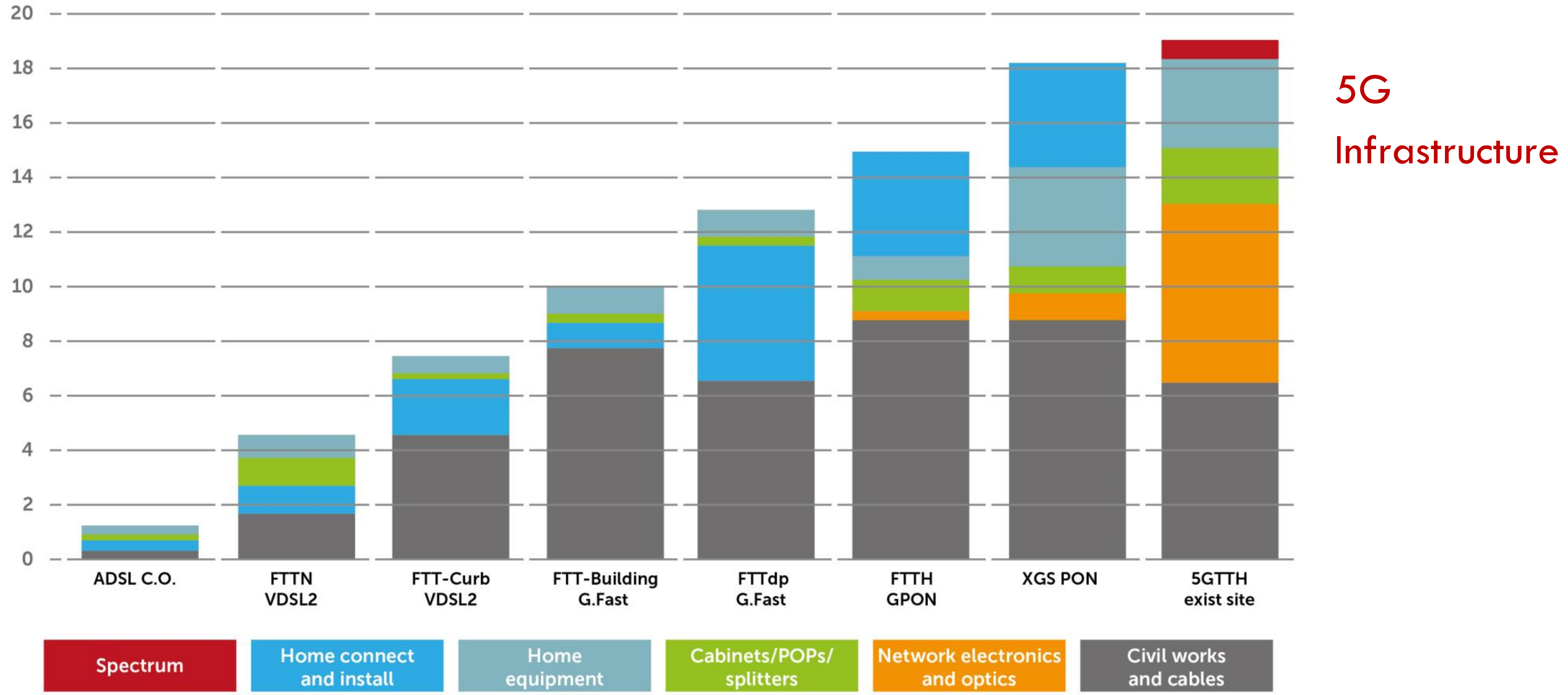
Telecon aquires unified systems group

2019
Telecon acquires SC360

Preparing sustainable 5G infrastructure

CAPEX Comparison of Various Access Technologies 5G increases civil+ optics/electronics

CAPEX spend per subscriber for a wide range of deployment models on a relative cost scale. Based on the assumption that all homes and businesses have an existing copper twisted pair connection, Asymmetric Digital Subscriber Line (ADSL) from the central office with no fiber investment as a cost baseline. Subscriber density 2500 households/square kilometer.



THANK YOU!