



THE 2018 CANADIAN TELECOM SUMMIT

Toronto | June 2018

Fiber Networks – A Generational Change

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Preparing for the Future of Connectivity

Daniel Robillard, Senior Vice President, Connectivity



telecon



design • build • connect

CANADA'S LEADING TELECOMMUNICATIONS NETWORK INFRASTRUCTURE SERVICES PROVIDER



Design

Engineering
Locate



Infrastructure



Connectivity

Wireline
Wireless



**Turnkey and Project
Management Solutions**

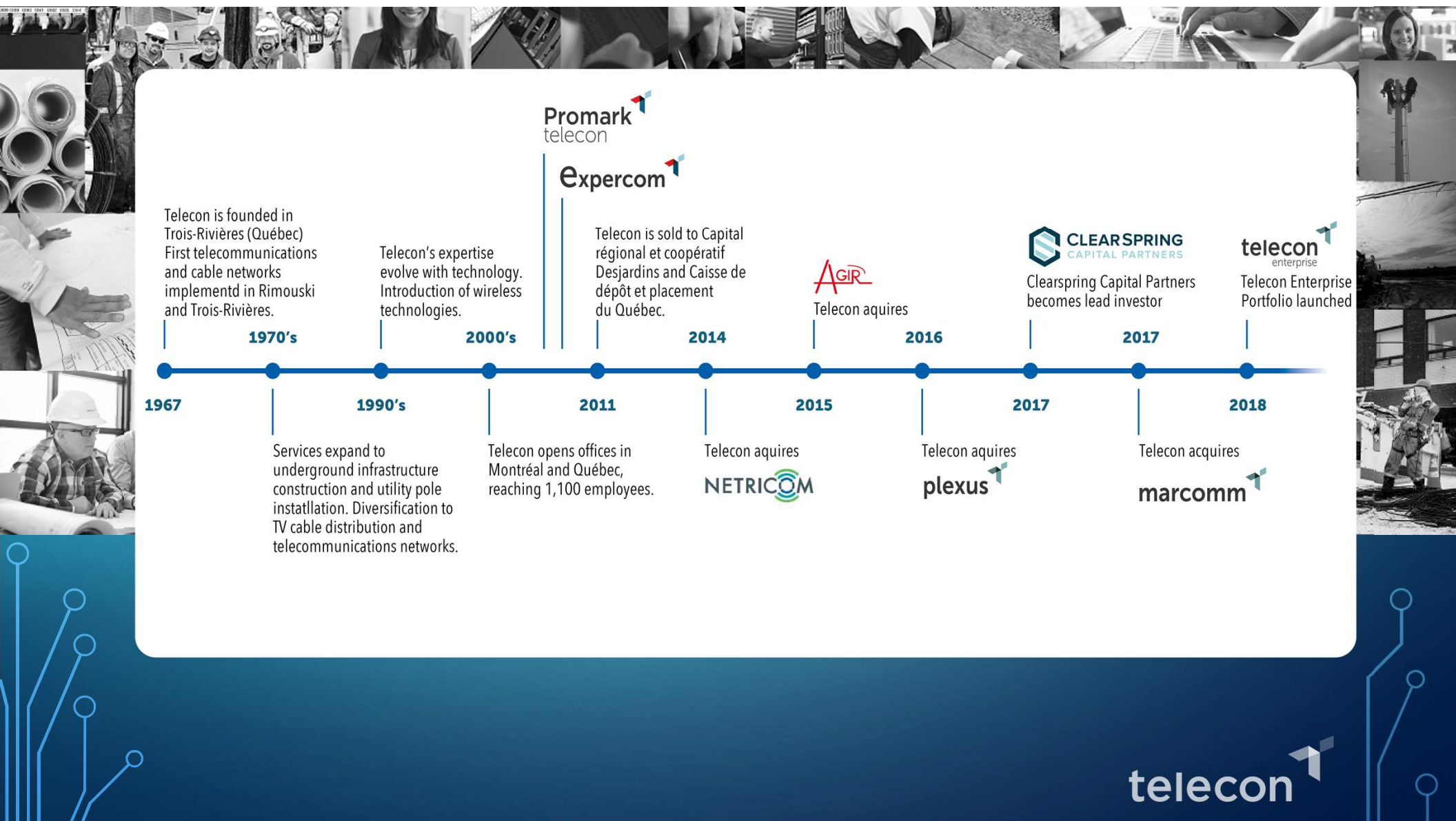
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50 years of Passion, Expertise and Innovation

Founded in 1967 and headquartered in Montréal, Québec, Telecon is Canada's leading telecommunications network infrastructure services provider. We leverage our national presence, network of 3,250 professionals, client relationships, and 50-year history to offer industry-leading design, infrastructure and connectivity solutions to telecommunications companies nationwide.

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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

OUR NATIONAL SCALE AND PRESENCE



Canada

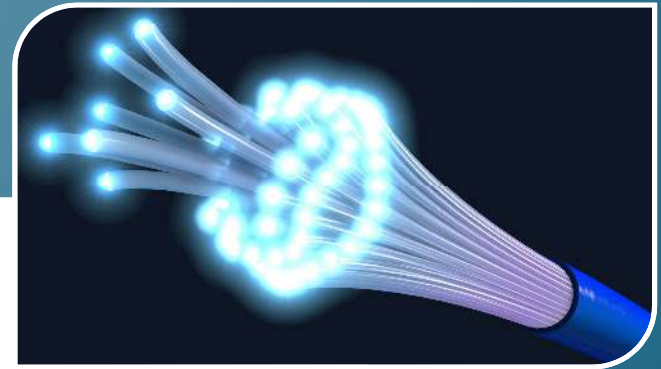
- 45 offices coast-to-coast
- More than 3,000 highly skilled employees
- Extensive network of strategic partnerships and specialized subcontractors
- 2,400 vehicles and specialized equipment

USA

- Denver, Colorado
- Philadelphia, Pennsylvania
- Salt Lake City, Utah

FIBER NETWORKS

A generational change



50 YEARS OF TECHNOLOGY TRANSFORMATION

- ✦ Copper DSL
- ✦ Pole Design
- ✦ Underground Structures & Locates
- ✦ Towers
- ✦ Safety Code 6
- ✦ HFC Deployments
- ✦ Small Cell and WiFi
- ✦ FTTx/PON/GPON
- ✦ Long-Haul Fiber
- ✦ Installation & Repair
- ✦ IoT Assessments

Copper
telephone
lines

Introduction
of broadband
services

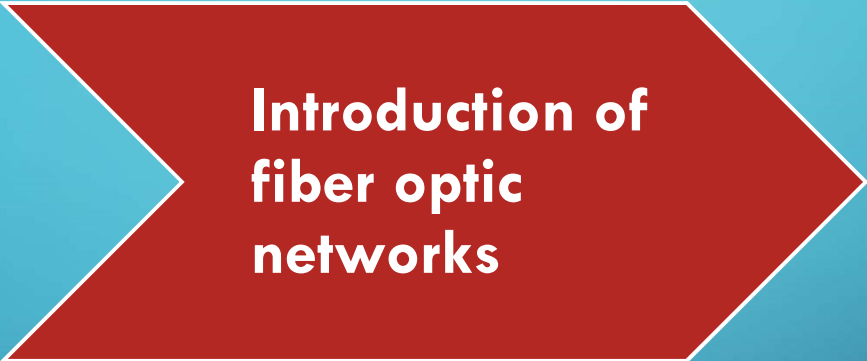
Introduction of
mobile networks

Introduction of
fiber optic
networks

5G

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50 YEARS OF TECHNOLOGY TRANSFORMATION

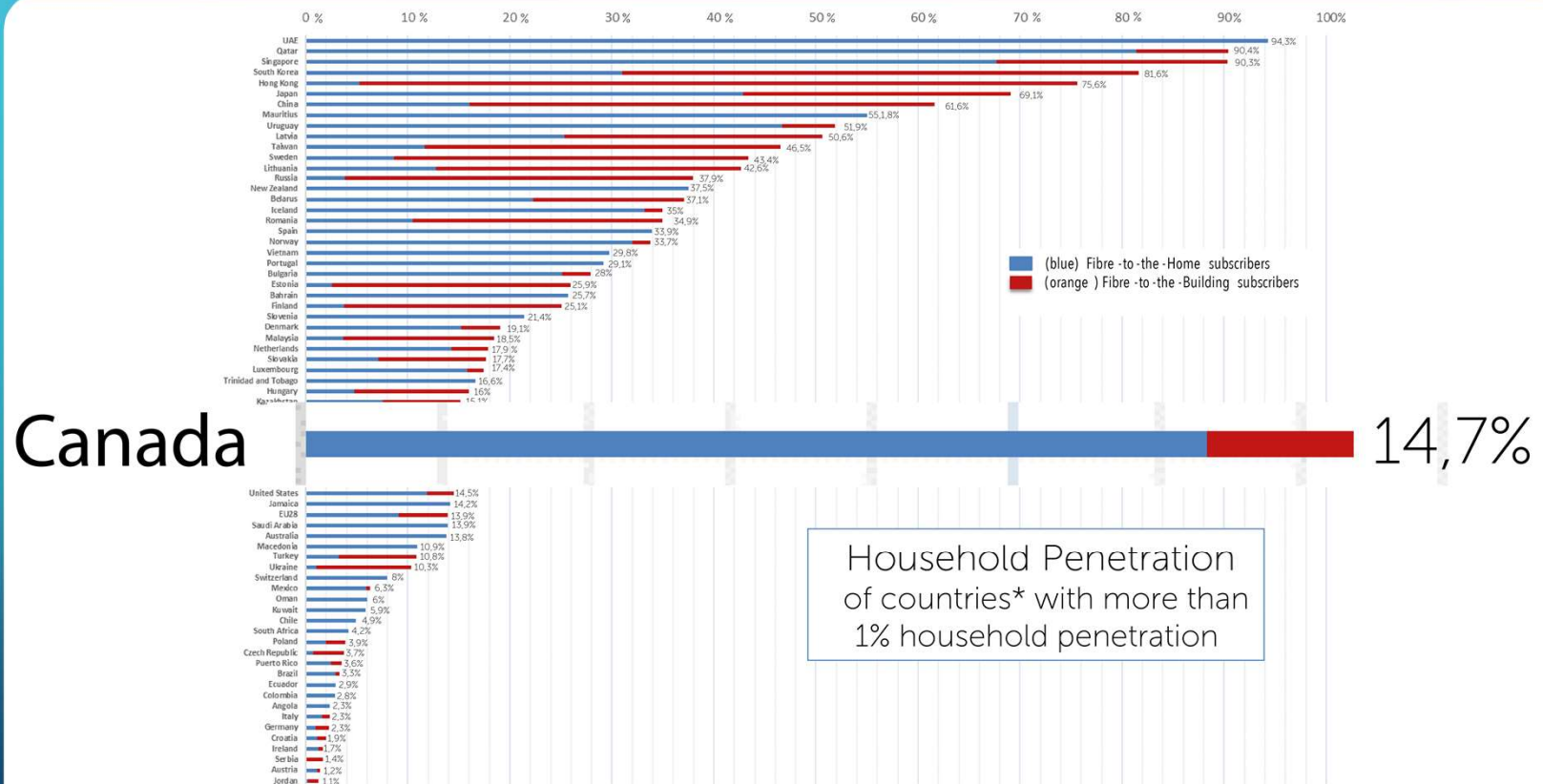


**Introduction of
fiber optic
networks**

**However, we are still in the early days of Fiber
deployment in Canada and the US**

FIBER IS A GENERATIONAL CHANGE

THE INDUSTRY HAS QUITE A LONG TAILWIND



Source: IDATE for FTTH Council Europe, February 2018

FIBER DEPLOYMENT

POSITIVE CONTRIBUTORS

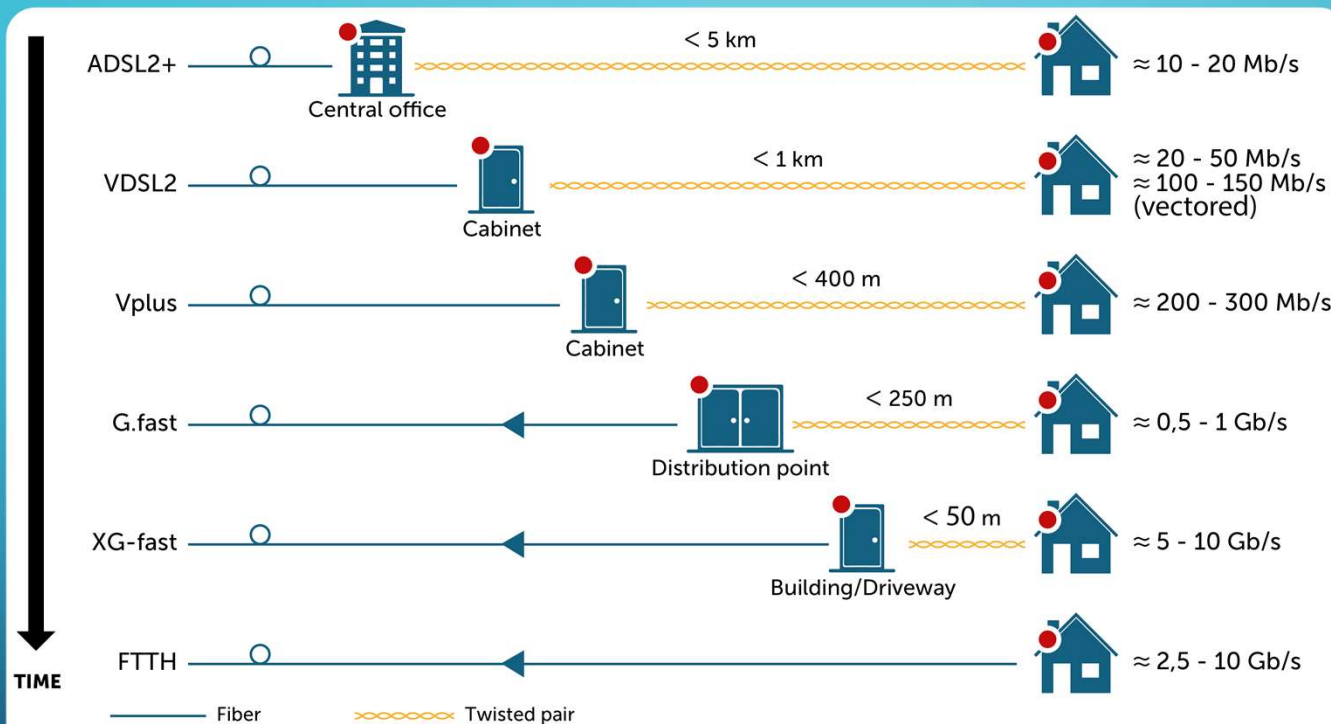
- Most incumbents have shifted strategy towards FTTH/HFC
- Long-term ownership of the customer considered key
- Speed requirements continue to rise steadily, pushing network operators towards HFC or FTTH; 4KTV, smart TVs, video. Streaming and device proliferation are also key factors
- Lowers the cost of ownership, drive for modernization
- Builds are speeding up due to increased knowledge, technology and innovation in deployments.
- Costs are lowering, predictability growing as the industry moves to turnkey

FIBER DEPLOYMENT

NEGATIVE CONTRIBUTORS

- Still no clear mass-market killer app for FTTH/HFC so the current triple/quad play must drive the business cases
- Aerial and MDUs are the low hanging fruit, buried to come
- Many municipal and utility builds have faltered, some announced and not moving, or behind schedule/on hold
- As penetration rises, the business case in rural areas more difficult – rural areas being forgotten but needed for economic development
- Resources are scarce for additional deployments
- Substitution by 5G may be seen as the way forward (still unclear)

BROADBAND ACCESS EVOLUTION - EXPANSION OF DEEP FIBER

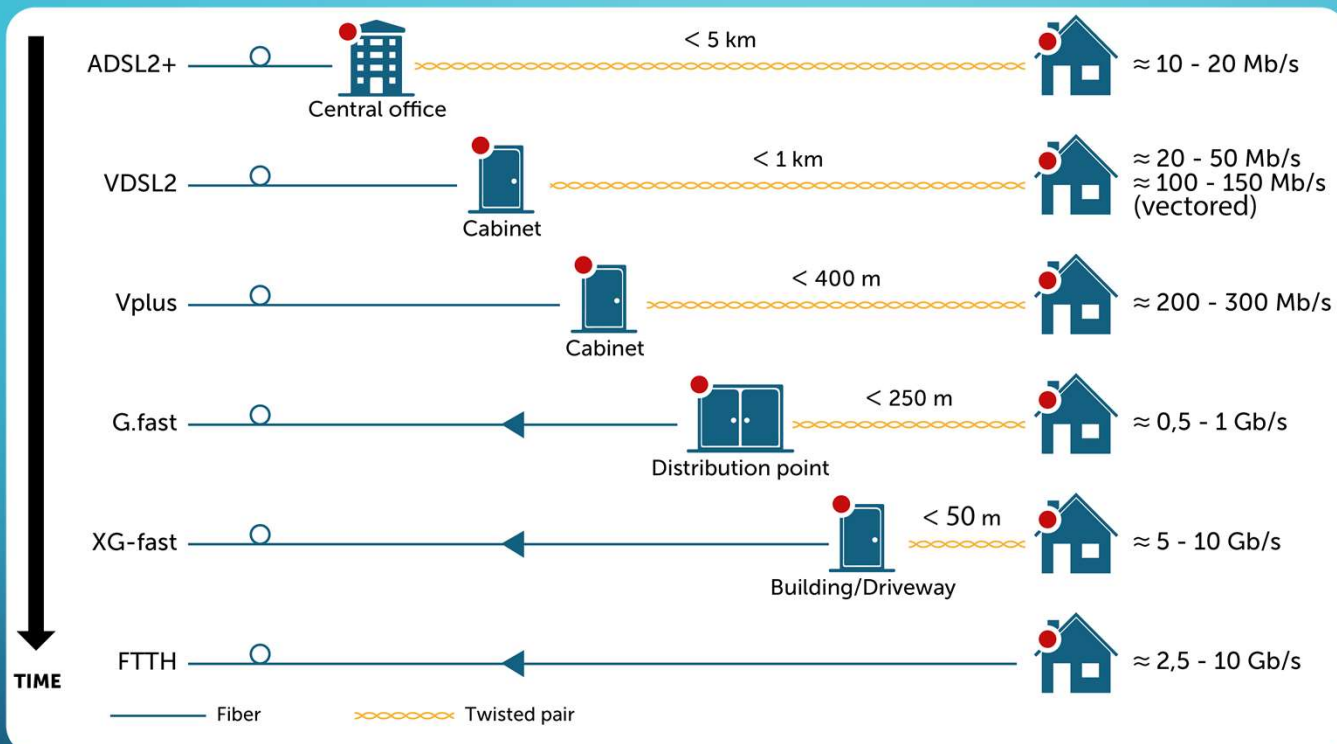


CENTRAL OFFICE
CENTRIC

OUTSIDE PLANT
CENTRIC

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

BROADBAND ACCESS EVOLUTION - EXPANSION OF DEEP FIBER



HARDWARE
INFRASTRUCTURE
DOMINATED

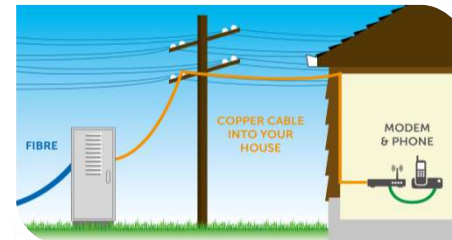
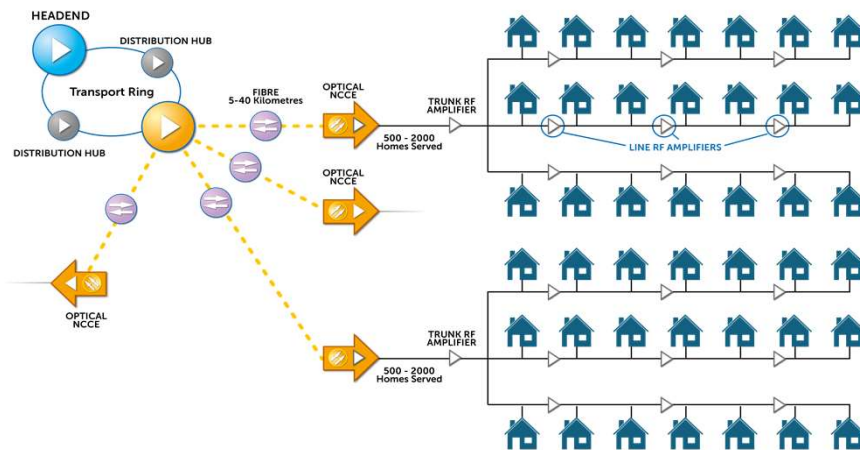
FIELD SERVICES
DOMINATED

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

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

ENGINEERING

- Community designs need to be executed in conjunction with construction teams to ensure that are cost effective
- Municipal relationships locally critical
- Nobody wants equipment sitting in front of their house for too long
- Understand where to leave fiber, MDUs, FDH's or at nodes – real estate a main issue, inventory it
- LIDAR starting up



YELLOW PAINT, NOT ROTTEN EGGS



- **Safety First**
- Underground network of utilities
- A blocker for FTTH/HFC
- New processes developed to increase efficiency
- New ways of working with the field, self locate transformation
- New technology being deployed to “see underground” – 5G
- Data points are the future
- Stop heavy digging automatically?

Guide

Paint marks colours on the ground

Blue: water

Red: electricity

Orange: communications

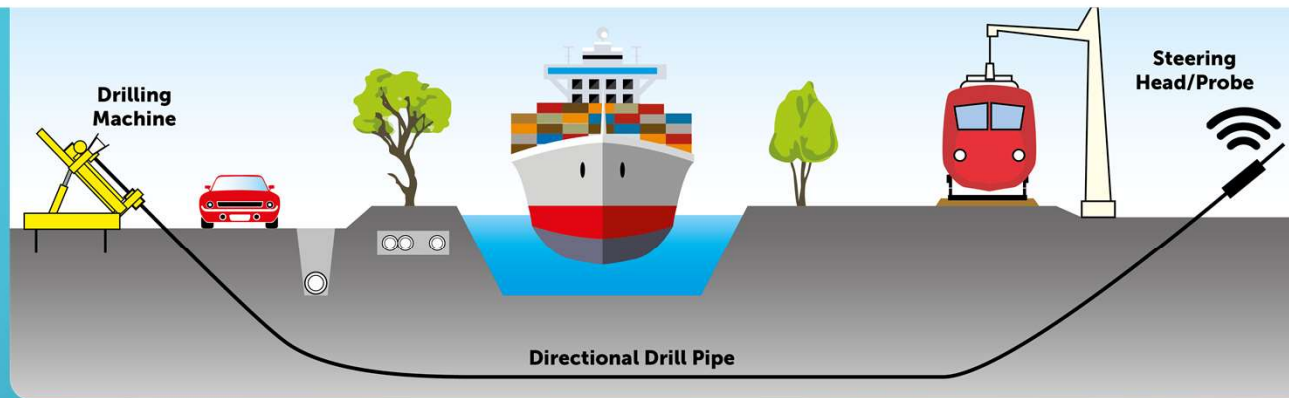
Yellow: gas



CIVIL



DIRECTIONAL DRILLING IS NOT NEW ...



The technology is changing, increasing productivity:

- Creates more accuracy
- “First time right” – CAPEX dollars are here
- Constructability reviews reduce re-do and waste/time
- Self Locate increases the speed to market



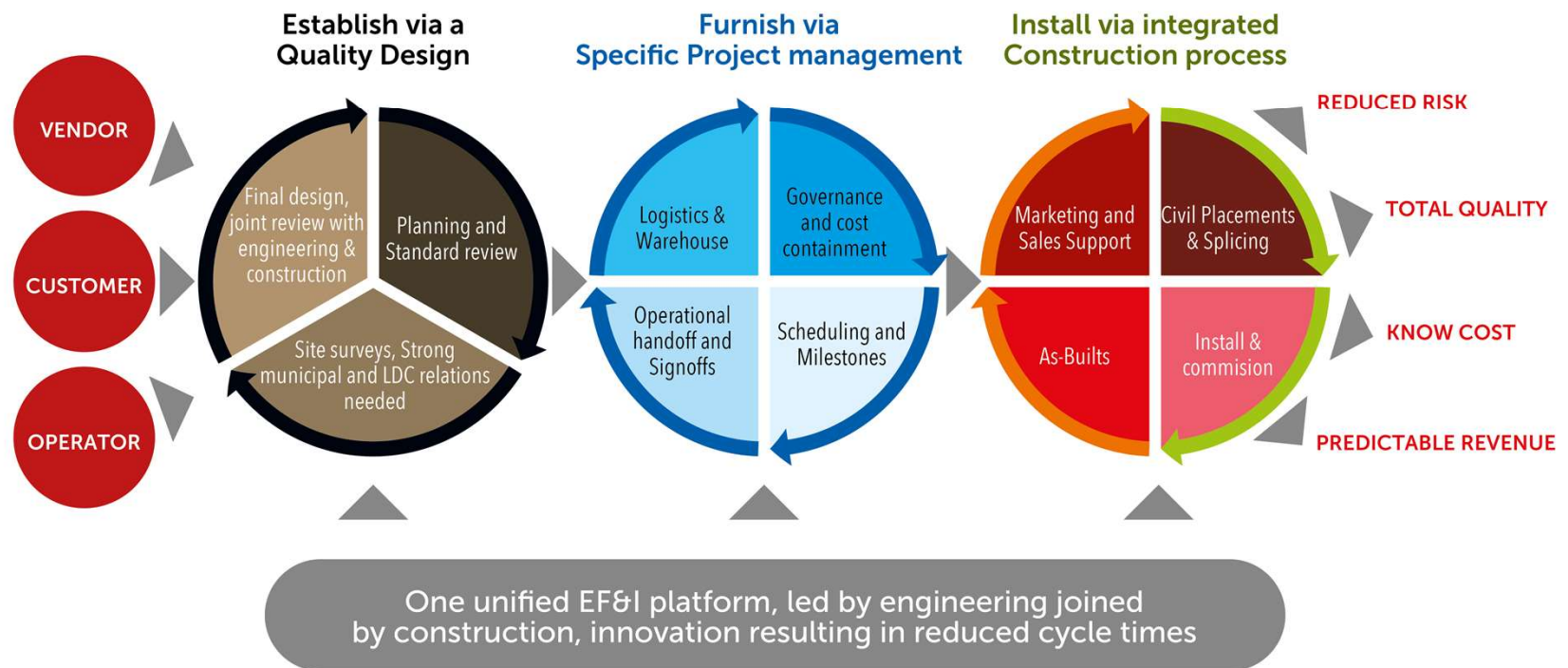
Getting smaller and more versatile. The radio technology to drive the fiber is getting more precise, they were originally designed for oil and gas, but the FTTH industry is changing the technology

CIVIL AND HYDROVAC

- **CAPEX** for Fiber projects significant in the field
- Hydrovacing originally design for mining, sewer cleaning and gas, now widely used for fiber projects
- The technology is changing, efficiency key combined with engineering and locates
- The industry needs these investments to be working full time, downtime can make or break fiber deployment projects

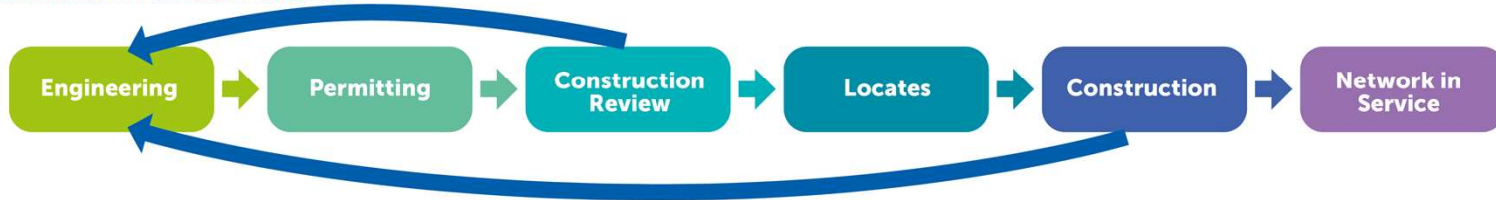


FIBER TURNKEY, EF&I INNOVATION



EF&I VALUE PROPOSITIONS

CONVENTIONAL MODEL

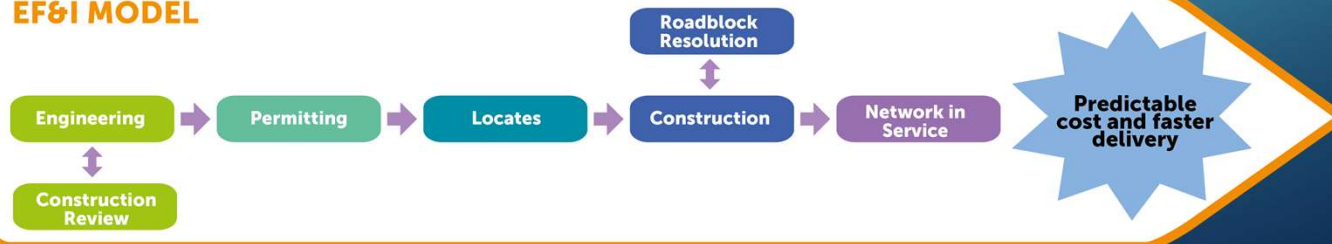


ENGINEERING LEADS THE PROCESS ENSURING BUFFERS THROUGHOUT

Cycle time kept to a minimum.
Re-Work is minimized
Delays reduced

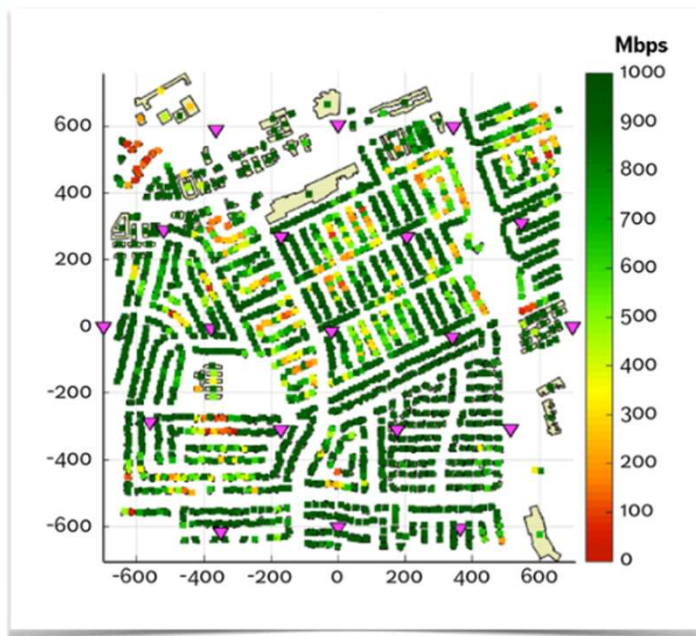
Efficient management of permitting & locate
Load levelling of construction crews
FAST TRACK resolution of field roadblocks

EF&I MODEL



“NOTHING MORE WIRED THAN A WIRELESS NETWORK”

Mass fiber deployment prepping for 5G



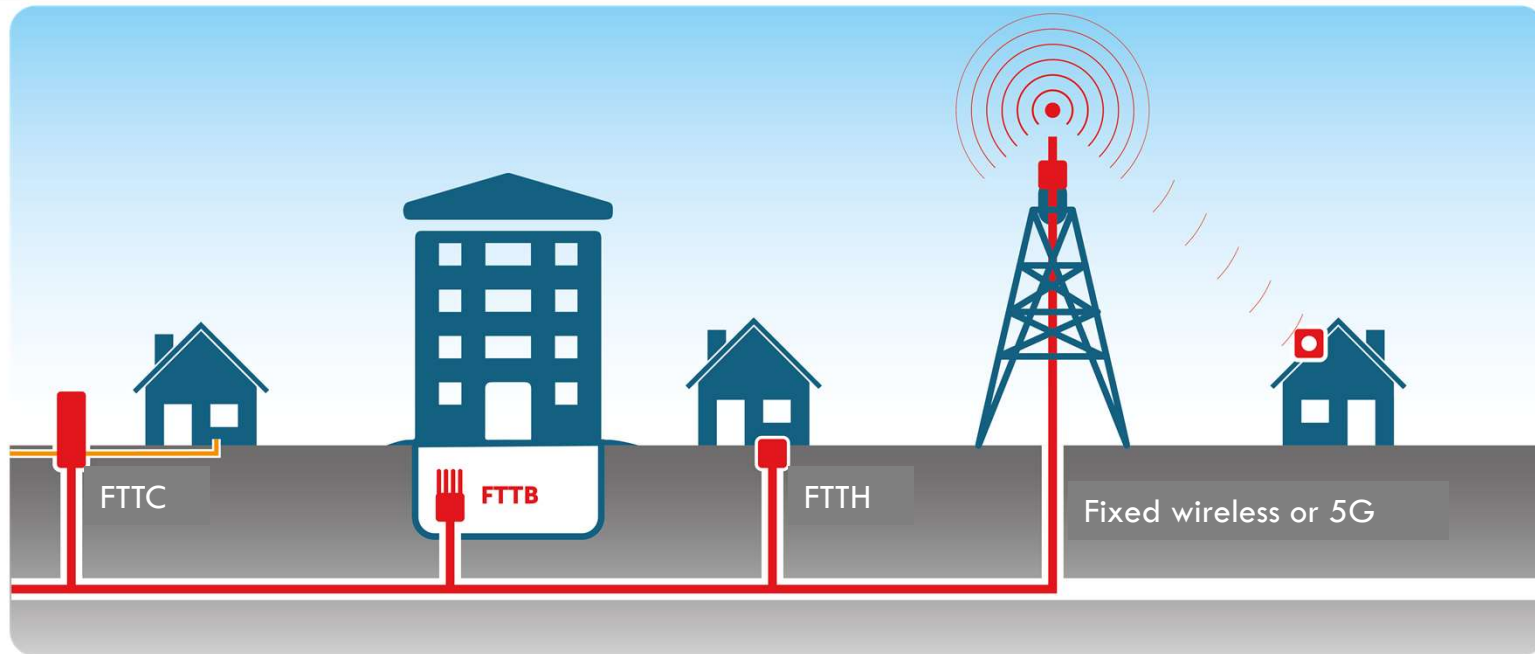
28GHz bandwidth of 200MHz, utilizing beamforming and MU-MIMO and antenna array of 8x12 cross-pole elements

5G Deployment

- ◆ **Network Densification of radio equipment needs more fiber**
- ◆ **Radio and Antenna Sites vs. fiber**
Design, permitting, aerial deployments, power, radio and antenna install, fiber location and amount key
- ◆ **Installation in MXU's**
During the design phase plan for extra fiber
- ◆ **5G Sites with Cable Nodes**
FTTC and FTTB – plan for 5G sites in parallel

Leverage FTTH and 5G Densification

FIBER IS A GENERATIONAL CHANGE WHETHER IT BE FOR A TELCO OR MSO



Going indoors, transforming and disrupting the traditional ecosystem up next

MASS FIBER DEPLOYMENT IS KEY FOR 5G PREPARATION...

*Prior to that, it's key to go indoors, transforming
and disrupting the traditional ecosystem.*

PREPARING FOR THE FUTURE OF CONNECTIVITY

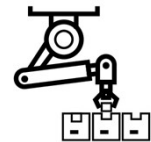


CONNECTIVITY

Context: IoT, Security, PoE, Automation and connected spaces

Need: Higher speed, bandwidth and qualified employees

Disrupting the ecosystem



CURRENT INDUSTRY TRENDS



**Customer expectations
of
connectivity,
mobility**



**New IoT
devices
driving new
experiences**



**Need to drive
operational
effectiveness
improvements**



**Sustainability
Drivers Save
energy, water,
reduce
environmental
impacts**



**Productivity
gains and
workplace of
tomorrow**

Back-to-Basics

Enterprise and building Management Solutions

Past



HVAC



Phone



IT Network

Present



Sensors



HVAC



Lighting



Phone



Security Cameras



Automated Elevators



IT Network



Badging Systems

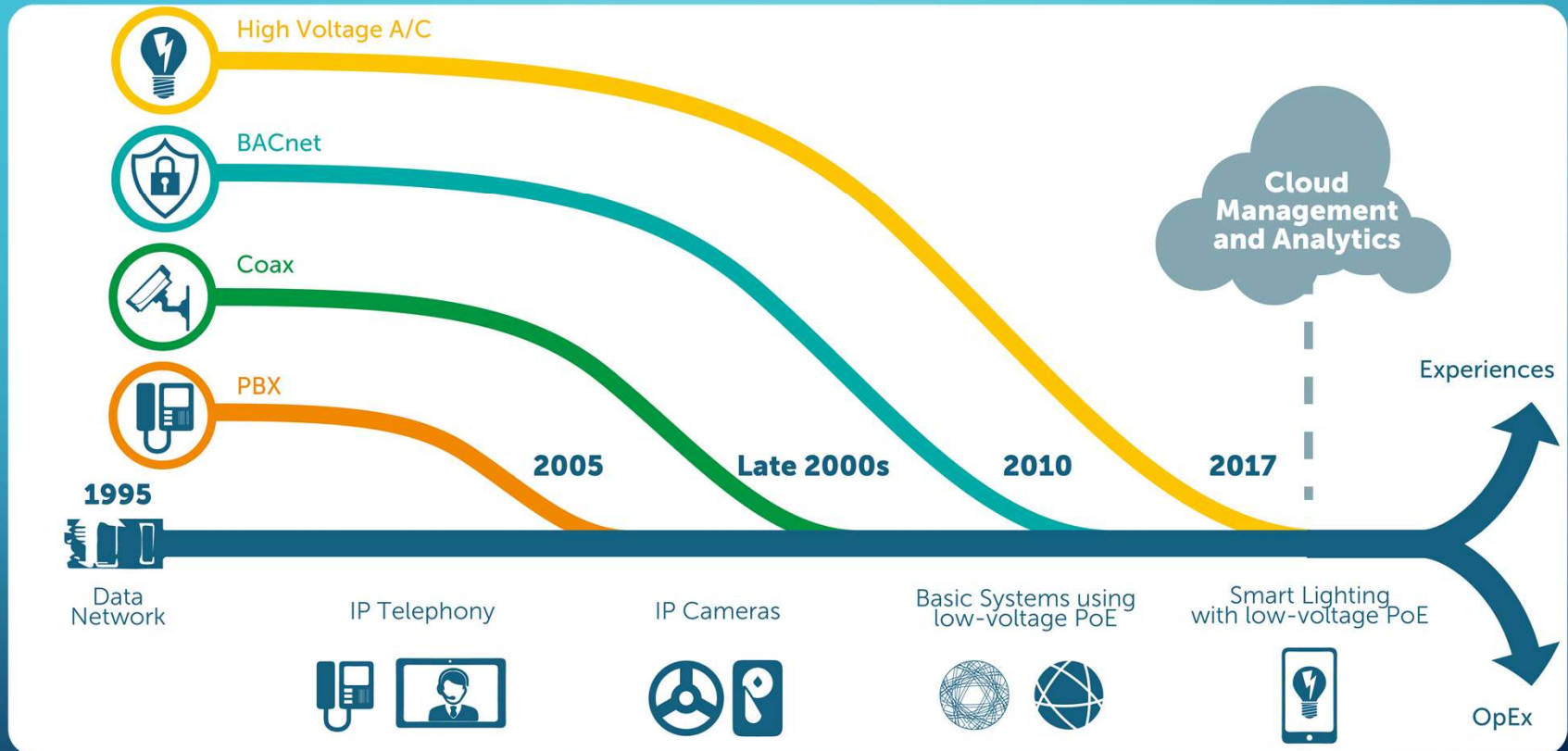
Ongoing transformation of traditional work environments to smart offices:

- 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

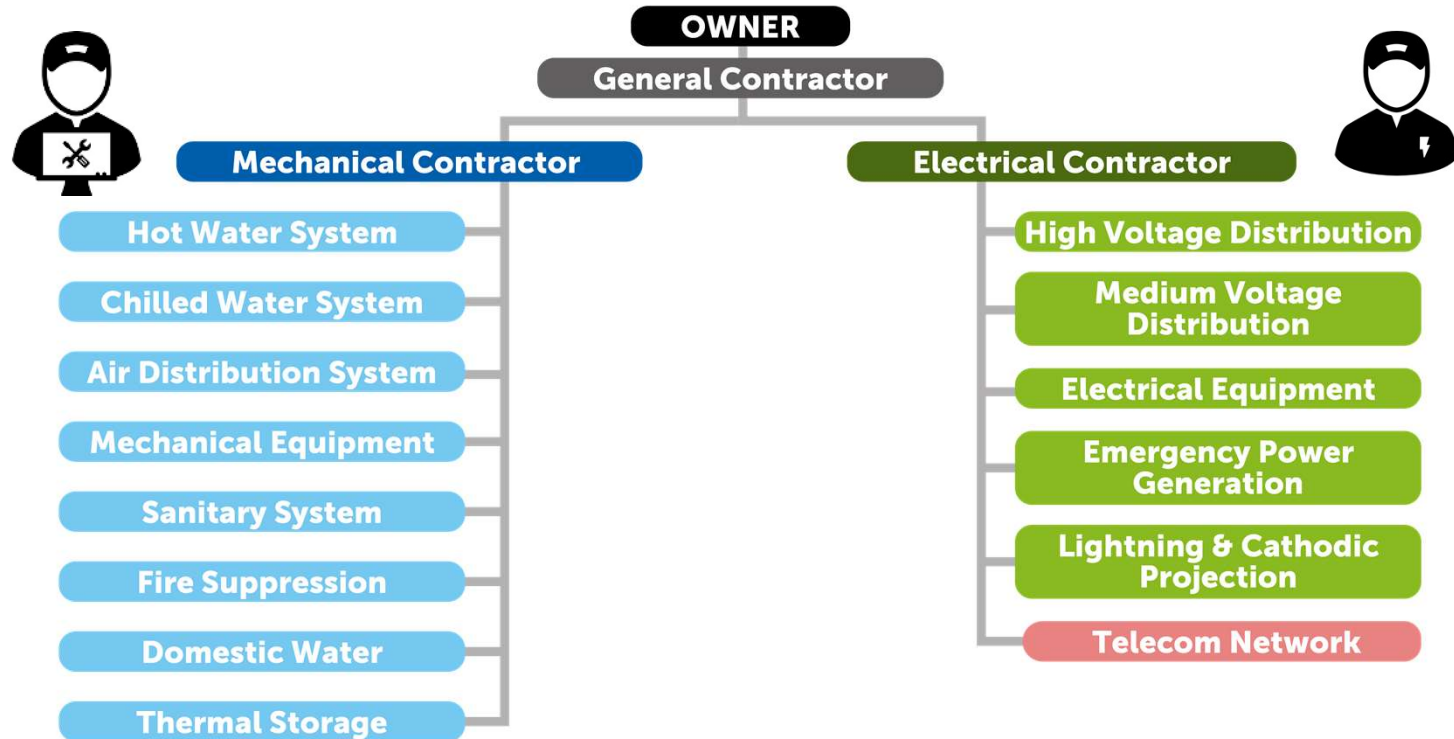
Figures presented in USD

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

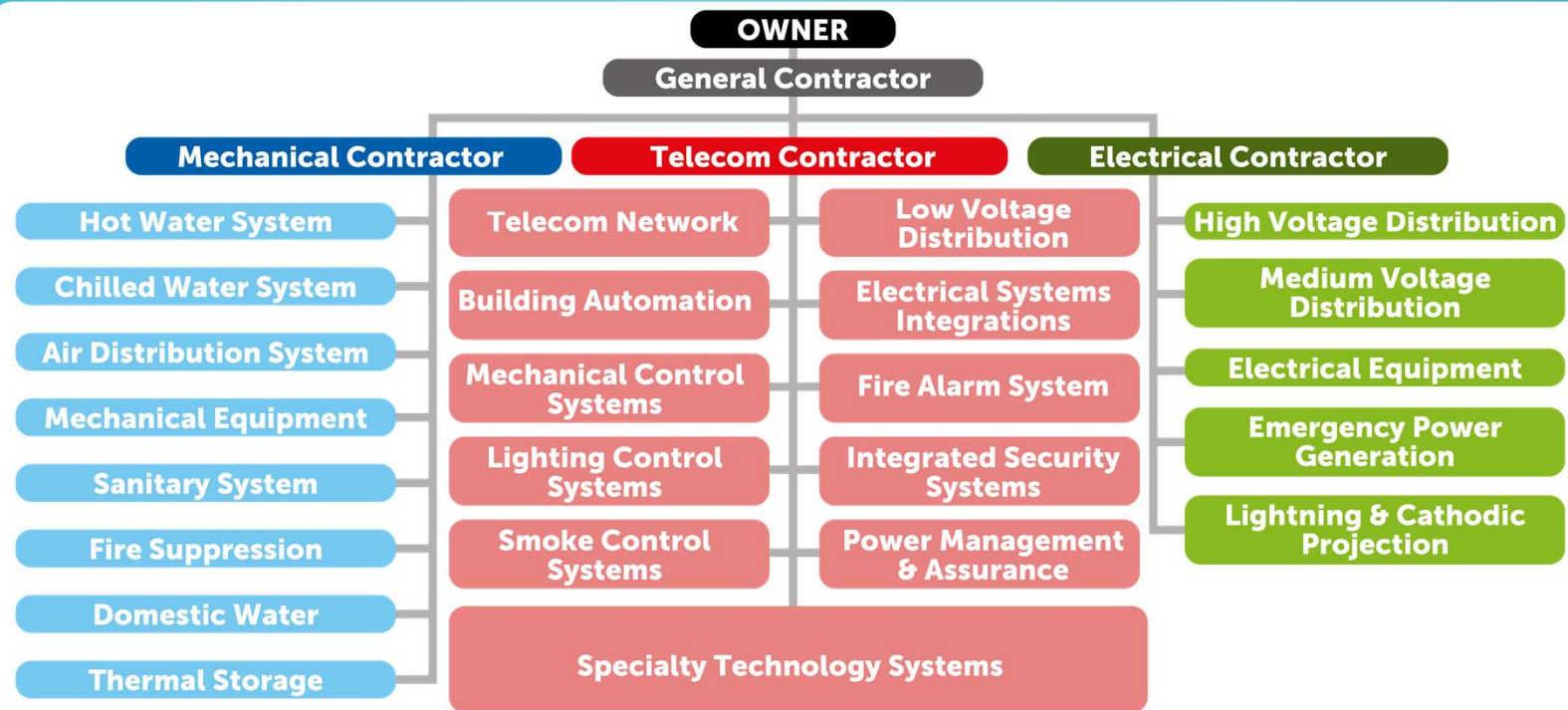
IP CONVERGENCE OF WORKPLACE SERVICES



TRADITIONAL MODEL



NEW MODEL WITH TELECOM CONTRACTOR



POE LED LIGHTING - A DISRUPTOR

STATISTICS - BUILDING LIGHTING

23%

of all global **electricity use** is commercial buildings (~60% HVAC, 15% lighting)

40%

of building **operational expense** is keeping the lights on

\$1
per ft²

of **energy savings** possible with LED's and advanced controls

30%

CAGR of building integration industry

\$100
per ft²

of **productivity gains** from better lighting, personal control

3rd

largest expense after salaries and COGS is Real Estate

60%

of typical **workstations unoccupied** during the day

POE LED LIGHTING – A DISRUPTOR



- 40% of electrical package in a building is lighting
- Low voltage cabling can now power lights
- Fixtures connected via connectors
- Cabling significantly reduced and simplified
- Integrated presence sensor solutions
- “In the box” analytics
- A light becomes “just another appliance”

SHIFTING FOCUS ON TELECOM

General Contractor

Mechanical Contractor

Telecom Contractor

Electrical Contractor

**Telecom taking more
dominant role in building
construction**

Distributors and Manufacturers

COMMScope®

BELDEN

PANDUIT™

EAT•N

CORNING



PHILIPS

**Cable is a commodity
Differentiating on
applications via
partnerships**

Workforce

**Union's
Skills
Tools**

**Workforce needs
to adapt to shift**

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

**Can a single
infrastructure serve
everyone ?**



FIBER

**Building
Automation**



**Fire Alarm
And Smoke
Systems**



**Security
Systems**



**Power
Management
Systems**



**Office
Network**



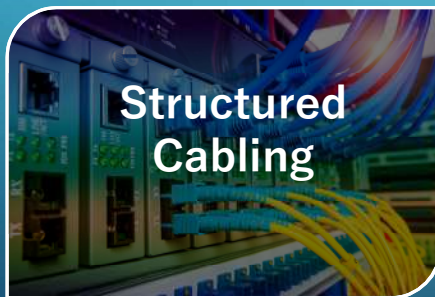
**PoE LED
Lighting**





Develop a powerful and efficient telecommunications infrastructure to benefit fully from technology.

OUR CONNECTIVITY SOLUTIONS



EXAMPLES OF RECENT SUCCESSES



Emera headquarters expansion: One of the largest POE lighting systems installation in North America.



Globe and Mail: The first large scale commercial deployment of fiber to the desk GPON technology in Canada. Over 1000 users.

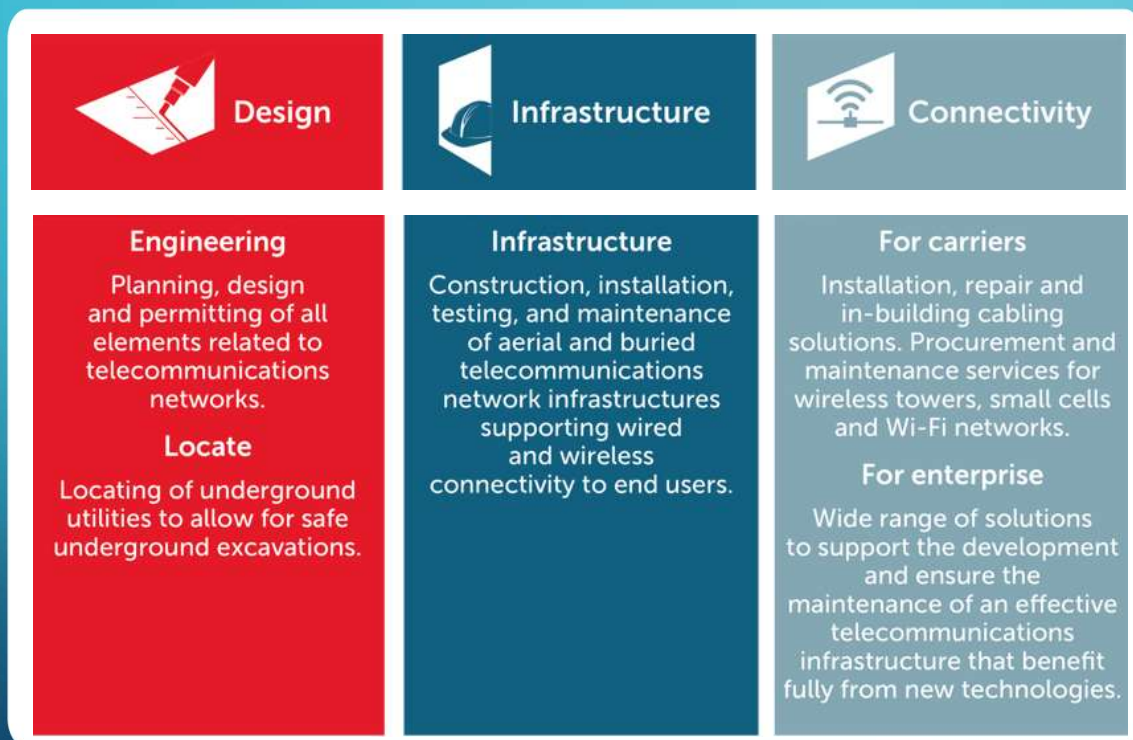


Providence Health Care (mental health facility): Turnkey infrastructure and “smart-hands” deployment services for all systems including: voice, data, AV, security, nurse call, BAS, RTLS.

**One of Canada's
largest grocery
retailers**

Grocery retailer: Installed a wireless mesh network to IP enable the inventory and machinery in store to monitor inventory and machine performance to ensure more accurate spending and reduces waste through analytics.

FULL LIFE CYCLE OF TELECOMMUNICATIONS NETWORK SERVICES



- ♦ Vertical integration of services, innovating and reducing costs
- ♦ End-to-end, turnkey integrated services, reducing cycle time
- ♦ Leverage deployment expertise, synergies and local presence
- ♦ Uniquely positioned as a portfolio complementing with infrastructure vendors and service providers' capabilities



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design • build • connect