



Cities of the Future

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About TELUS*

Population Covered by LTE

>97%

LTE Penetration

>90% of data traffic goes over LTE

Smartphones

>85% penetration

Population

~37 million

Area

10M Km²

Annual Revenue

\$13 billion+

Wireless Revenue

\$7 billion+

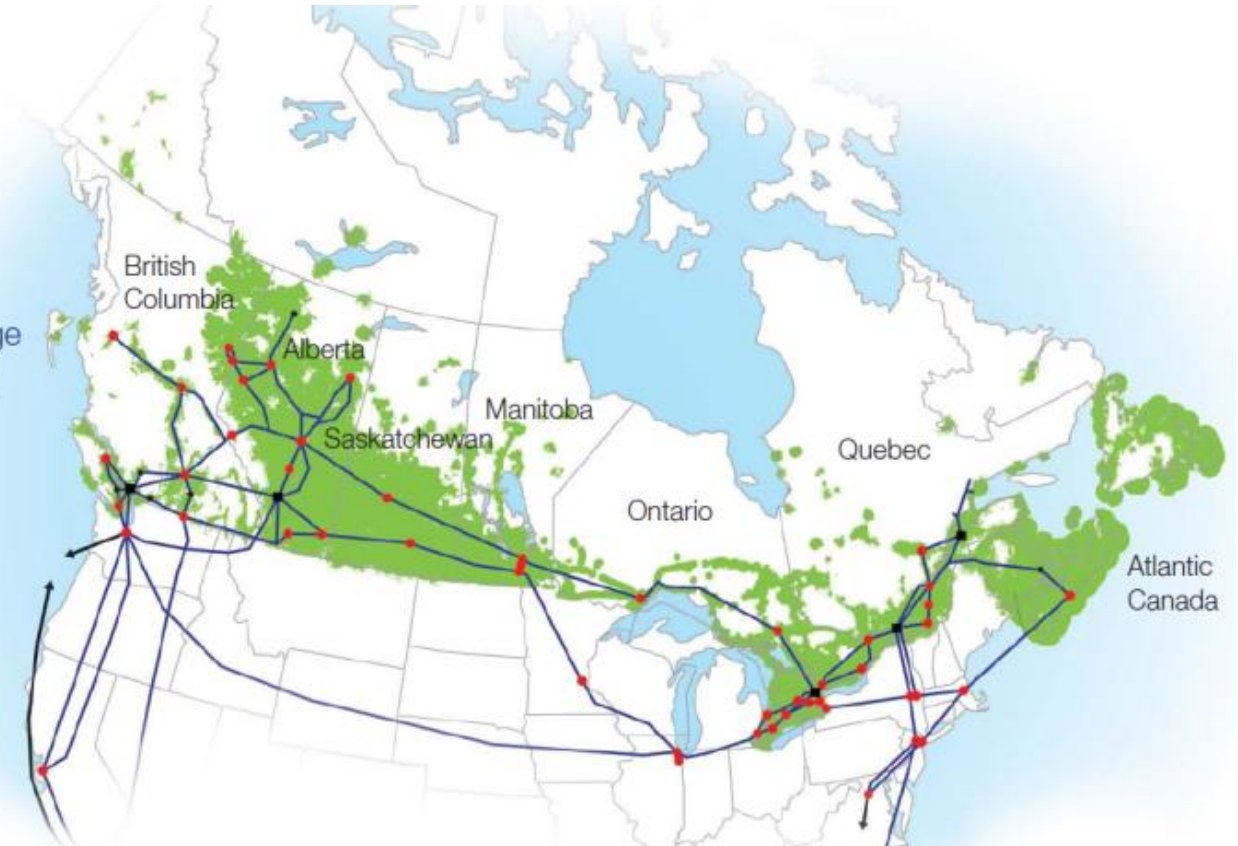
Wireless ABPU

>\$66.50 CAD

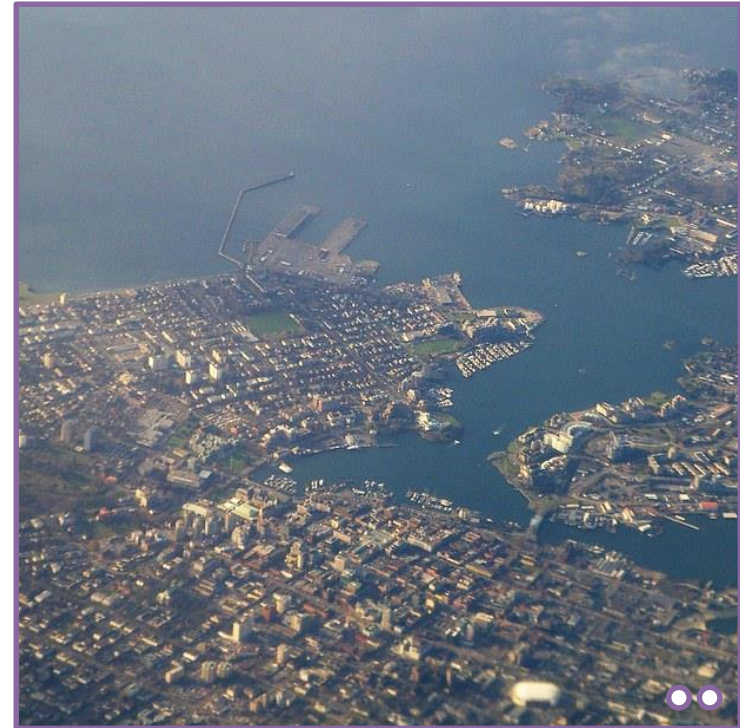
TELUS network coverage

- Wireless network coverage
- Optical and IP network
- Carrier interconnections
- Switching centres
- Internet data centres

Network infrastructure and coverage areas are approximate as of December 2012. Actual coverage and network services may vary and are subject to change. To see our wireless network coverage, visit telusmobility.com/coverage.



Industrial Revolution to the Digital Age



'The Problem'

2 Cities occupy 2% of planet's surface

50 Cities are home to >50% of the population

75 Cities are responsible for 75% of energy consumption

80 Cities account for 80% of carbon dioxide emissions

“ Smart Cities describes an *approach* to addressing *community issues* that *leverages data & connected technologies* – These include, but are not limited to, Smart City Application & Service enablement (level 1); IoT (Level 2); and large/complex enterprise deployments (level 3)”

Opportunity evaluations – ‘ideation through partnership’

Discovery

Insights / Data

Ideation

Experimentation

Strategy

Customer
Journey

Validation

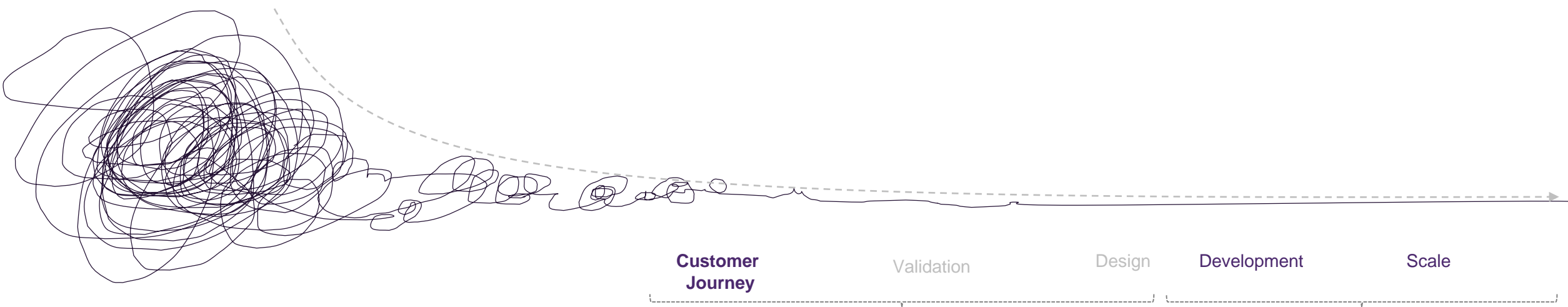
Design

Development

Scale

Design

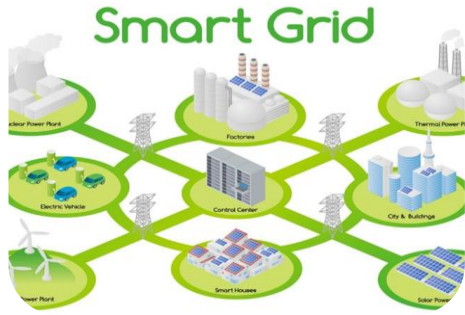
Project Delivery



Outcomes



Education



Energy



E-Government



Health



Buildings



Transportation



Water



Waste

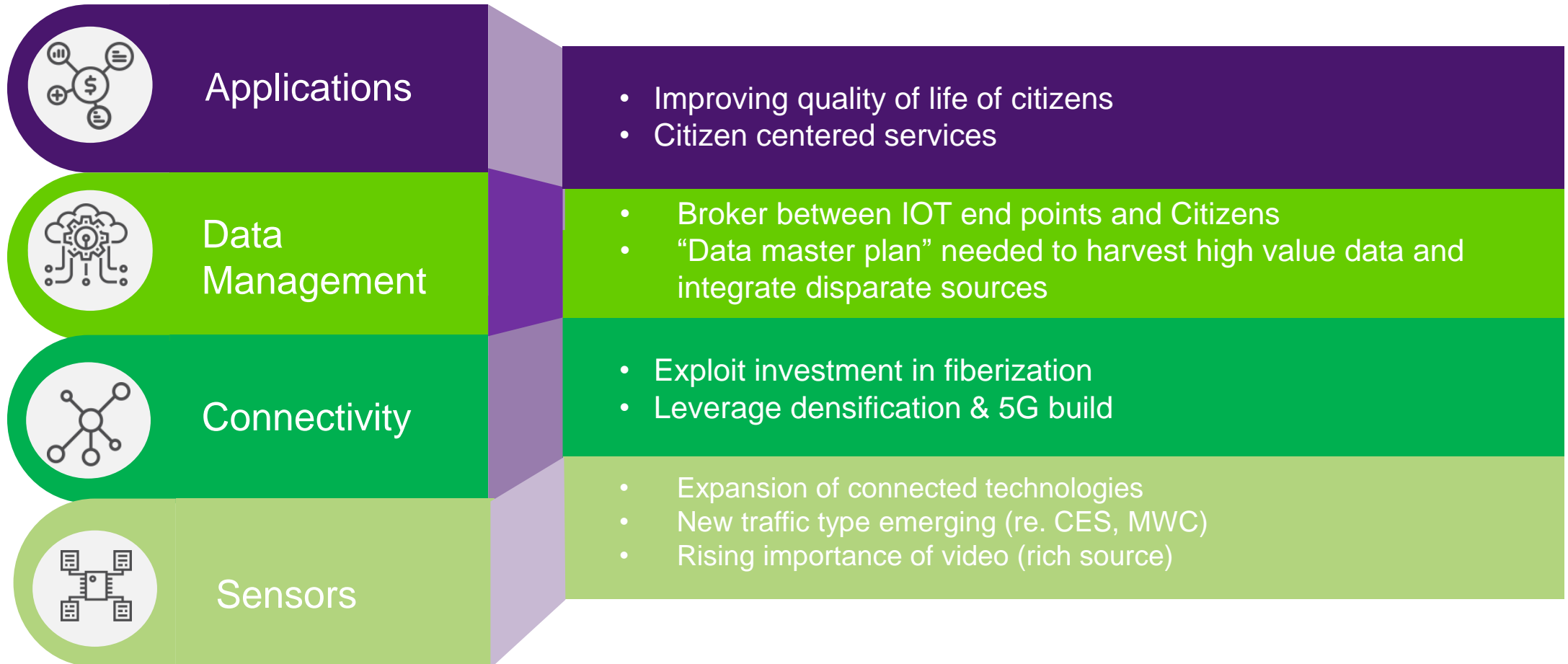


Public Safety



Others

Context: Smart Cities Opportunities



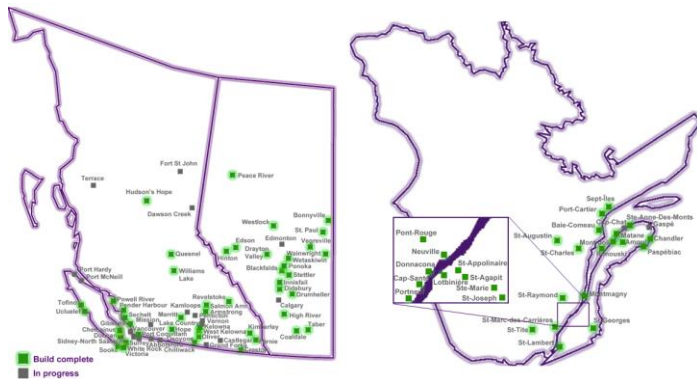
Enabling technologies



Connectivity Infrastructure

TELUS PureFibre

110+ communities across B.C., AB and QC
Over 50% of our Optik TV footprint now has PureFibre



5G Living Labs

TELUS has and continue to conduct 5G trials to ensure its leadership in 5G readiness

- Oct 2016 – Download speed of 29.3Gbps achieved through a lab test using 28GHz spectrum in Vancouver Living Lab
- Dec 2017 – Download speed at greater than 2Gbps achieved through a test using 3.5GHz spectrum conducted in suburban Edmonton
- 2018 – User trials underway to test 5G broadband for home use using 28GHz spectrum in Vancouver; On-Air, Vancouver based 5G Living Lab (3.5GHz & mmWave)

LPWA / LTE-M

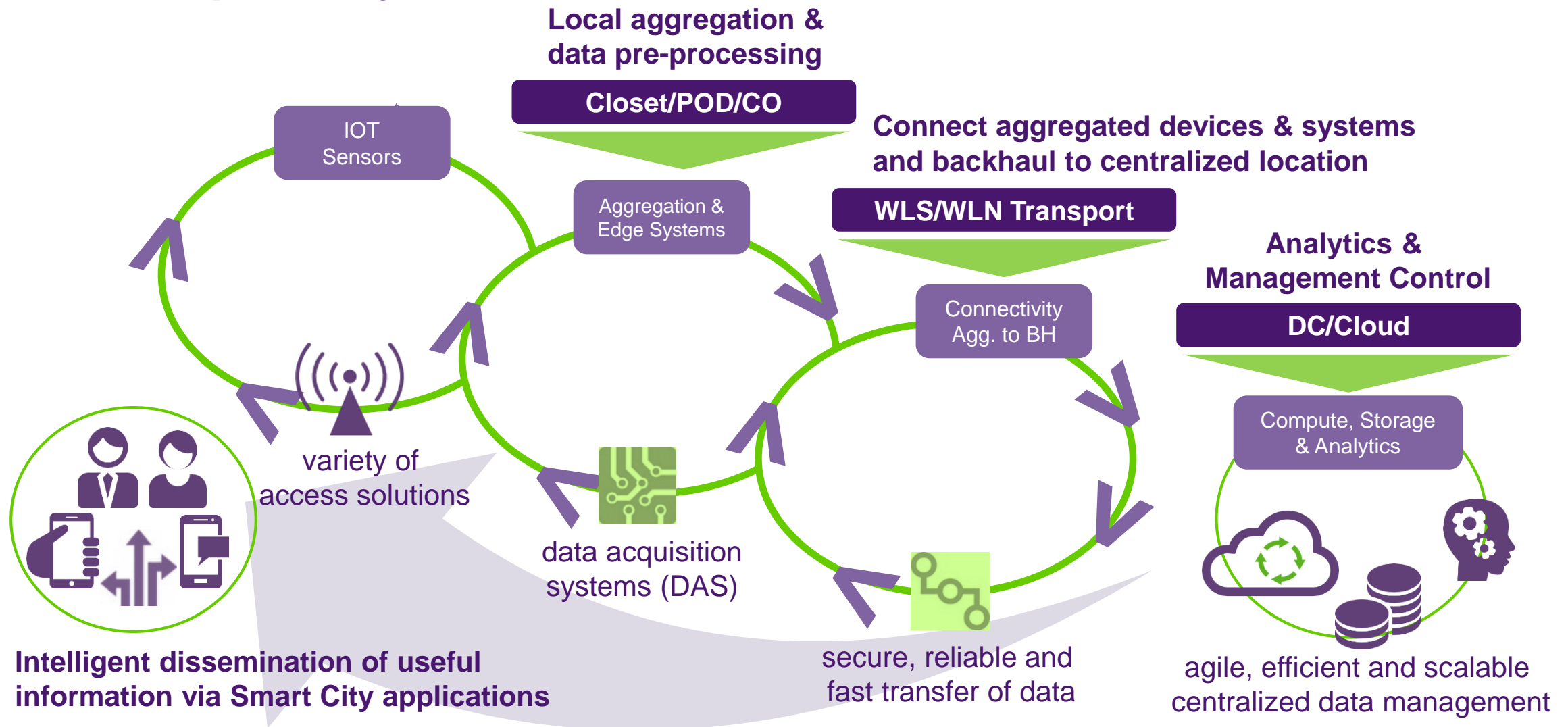
TELUS launched LTE-M low-power wide-area network with coverage across BC, Alberta, Ontario, Quebec and Atlantic Canada, plus major centres in Manitoba.



TELUS has also launched technology incubators to help foster innovation in IoT

Connectivity: End to End Eco-System

Closed loop eco-system



Connectivity Enabling Cloud Capabilities

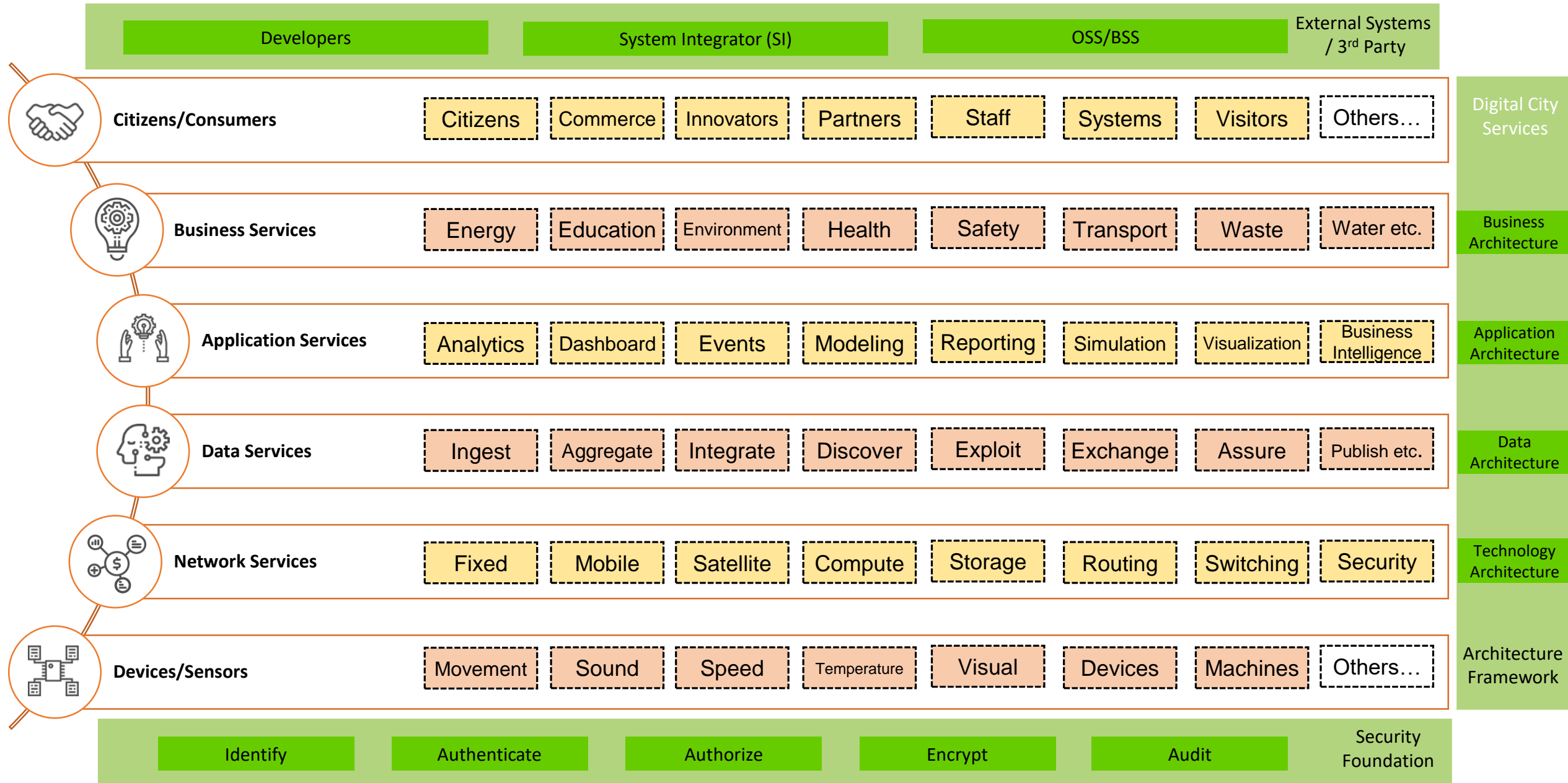


Extrinsic vs. Intrinsic Security

Add-on security vs. Security by Design

IT		IoT
“Open” Easy to install	<i>Openness</i>	“Closed” Not open to new software after device leaves factory
“3” (Mostly UDP, TCP, IP)	<i>Protocols</i>	Thousands of Protocols (Hundreds in each vertical)
“5” (Mostly Windows, Linux, OSX, iOS, Android)	<i>Operating Systems (OS)</i>	Dozens (Heavily fragmented by vertical)
20k seat enterprise (Typical Enterprise)	<i>Scale</i>	100M “things” (Typical Car Maker)
All verticals have <u>same</u> Hardware/OS supply chain	<i>Fragmentation</i>	Each verticals has <u>different</u> Hardware/OS supply chain
“2” X86 and x64 by Intel and AMD	<i>Chipset Architectures</i>	Many 8bit AVR, 16bit MCU, 32/64bit ARM, x86/64; 12+vendors

Reference Architecture



Smart Cities Pilots

Working with public bodies to improve efficiency and provide public benefit

5G-enabled Smart City Pilot for a Large Transportation Hub

Video Analytics and Management Pilot for Law Enforcement

Public Safety Initiative for a Tier-1 municipality

Fostering Innovation with Digital Technology Supercluster

Key Scope



- 5G Deployment
- Smart Parking
- VIP Customer Experience
- Analytics Solutions
- Cloud Hosting



- Fibre-enabled Video Network
- Video Feed Aggregation and Management
- Video Analytics for preventative and fast-response measures



- Developing Public Safety
- Communication service Requirements
 - Architecture to optimize wireless network performance
 - Network traffic and security management framework



- As one of the core founding members TELUS is committed to
- Making financial and resource investment available
 - Actively creating and funneling innovative projects
 - Sharing knowledge with the partner ecosystem

Key Messages



Summary: Partnerships are Key

- Engagement & Common Goals
- Understand the building blocks and relationships
- Design for outcomes



Thank you!

