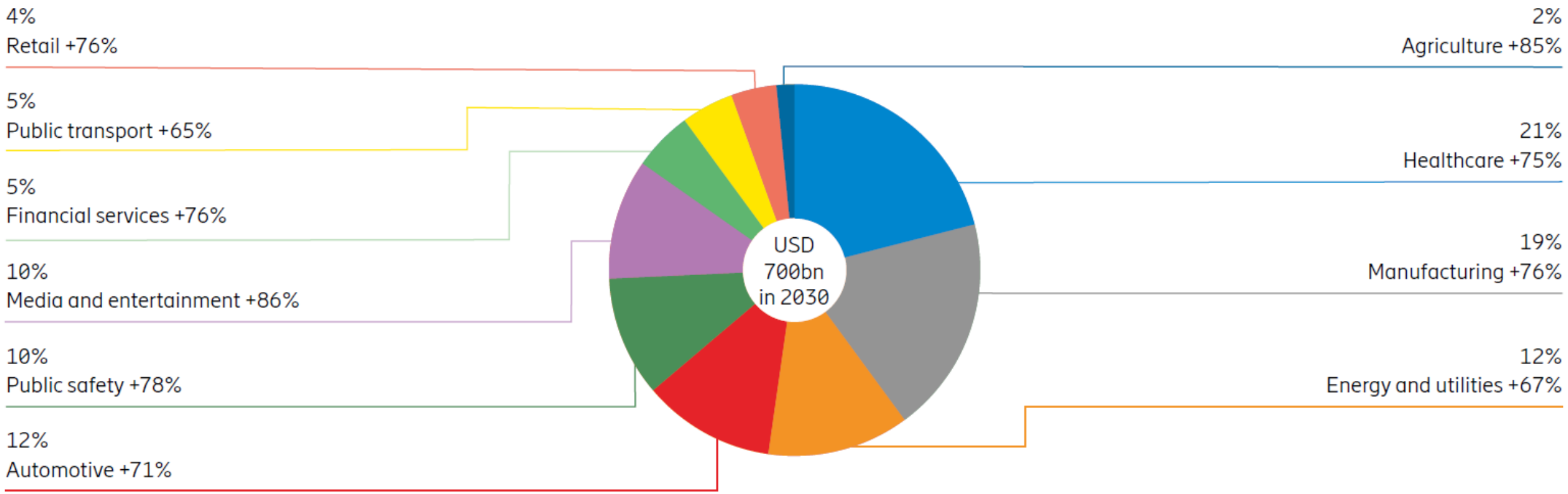
산업용 셀룰러 IoT

박동주 테크니컬 디렉터

5G-enabled revenue potential across 10 industries

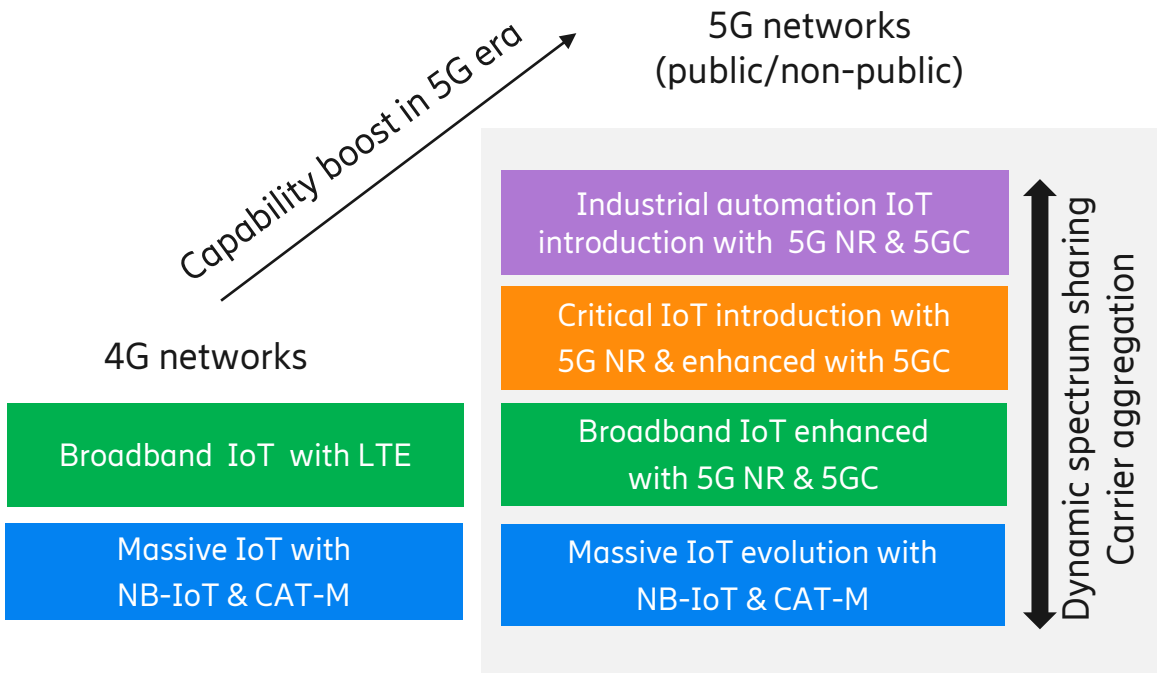


Global service creator, 5G for business addressable market, 2030 share, 2020-2030 CAGR

Source: Ericsson and Arthur D. Little

One 5G Network with Four Multi-purpose IoT Segments

Massive IoT	Broadband IoT	Critical IoT	Industrial automation IoT
Low cost devices Small data volumes Extreme coverage	High data rates Large data volumes Low latency (best effort)	Bounded latencies Ultra-reliable data delivery Ultra-low latency	Ethernet protocols integration Time sensitive networking Clock synchronization service



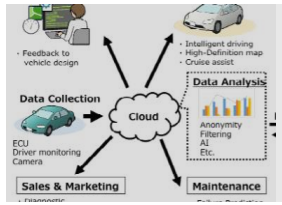
Industry Digitalization with Cellular IoT

Entertainment	● ● ●	Transportation	● ● ●
Automotive	● ● ●	Smart city	● ● ●
Railways	● ● ●	Ports	● ● ● ●
Manufacturing	● ● ● ●	Education	● ● ●
Mining	● ● ● ●	Healthcare	● ● ●
Utilities	● ● ● ●	Construction	● ● ●
Forestry	● ● ●	Oil & gas	● ● ● ●
Agriculture	● ● ●	Warehousing	● ● ●
Public safety	● ● ●	Media production	● ● ●

Example: Automotive & road transport

Connectivity for road infrastructure

Coverage
Capacity



Vehicle-centric OEM and after market services (incl telematics,...)

Capacity
Coverage

Vehicle as sensor for general third party applications (weather, maps,...)

Capacity

Logistics, connected goods

Coverage

Cellular Connectivity

Capacity
Coverage
Latency

Convenience and infotainment services

Coverage
Capacity
Latency
Reliability

Fleet management incl remote assistance of autonomous vehicles

Coverage
Latency
Reliability

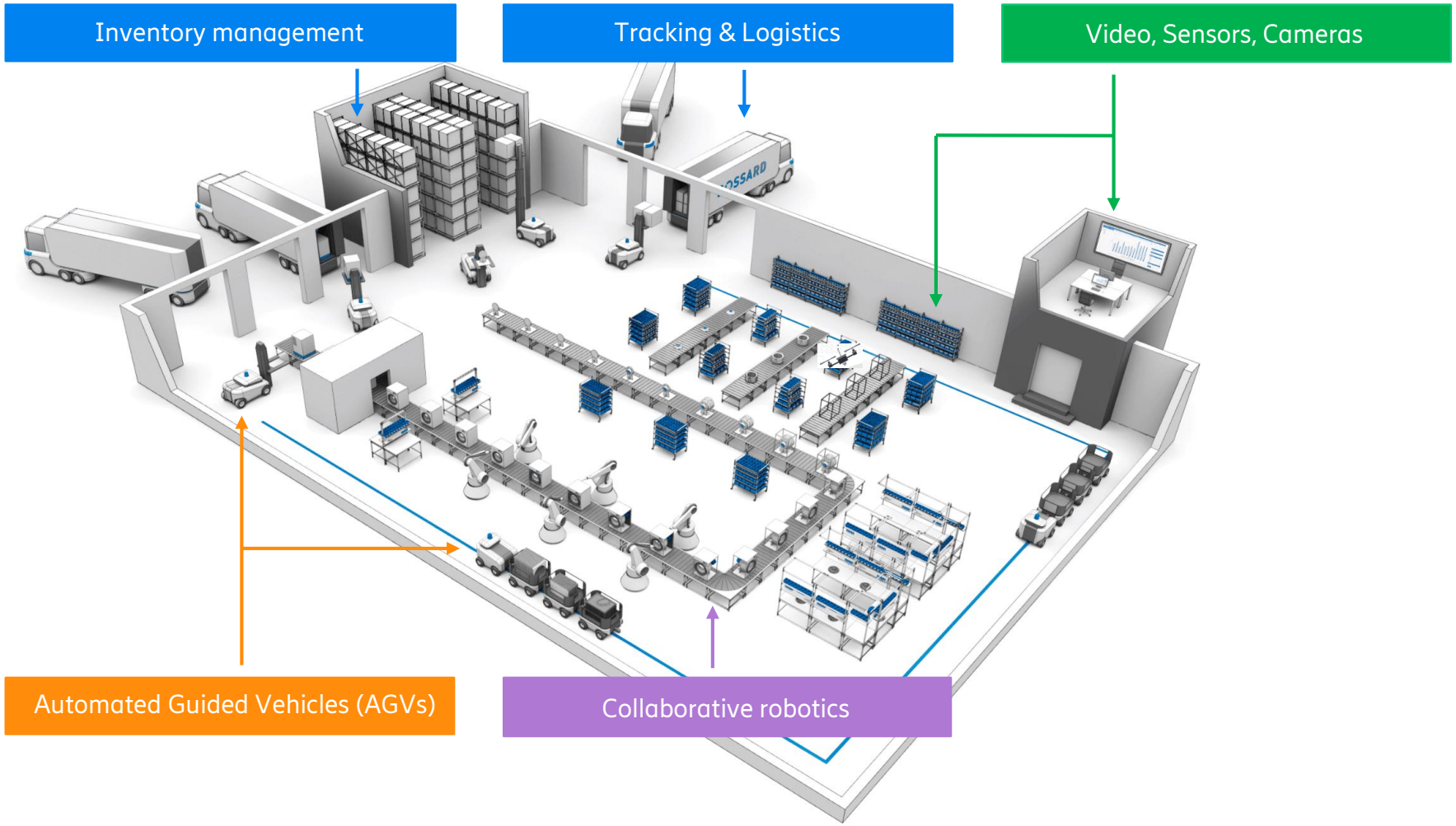
OEM Advanced driver assistance systems (ADAS)

Coverage
Latency
Reliability

Regulated Cooperative-Intelligent Transport Systems (C-ITS)

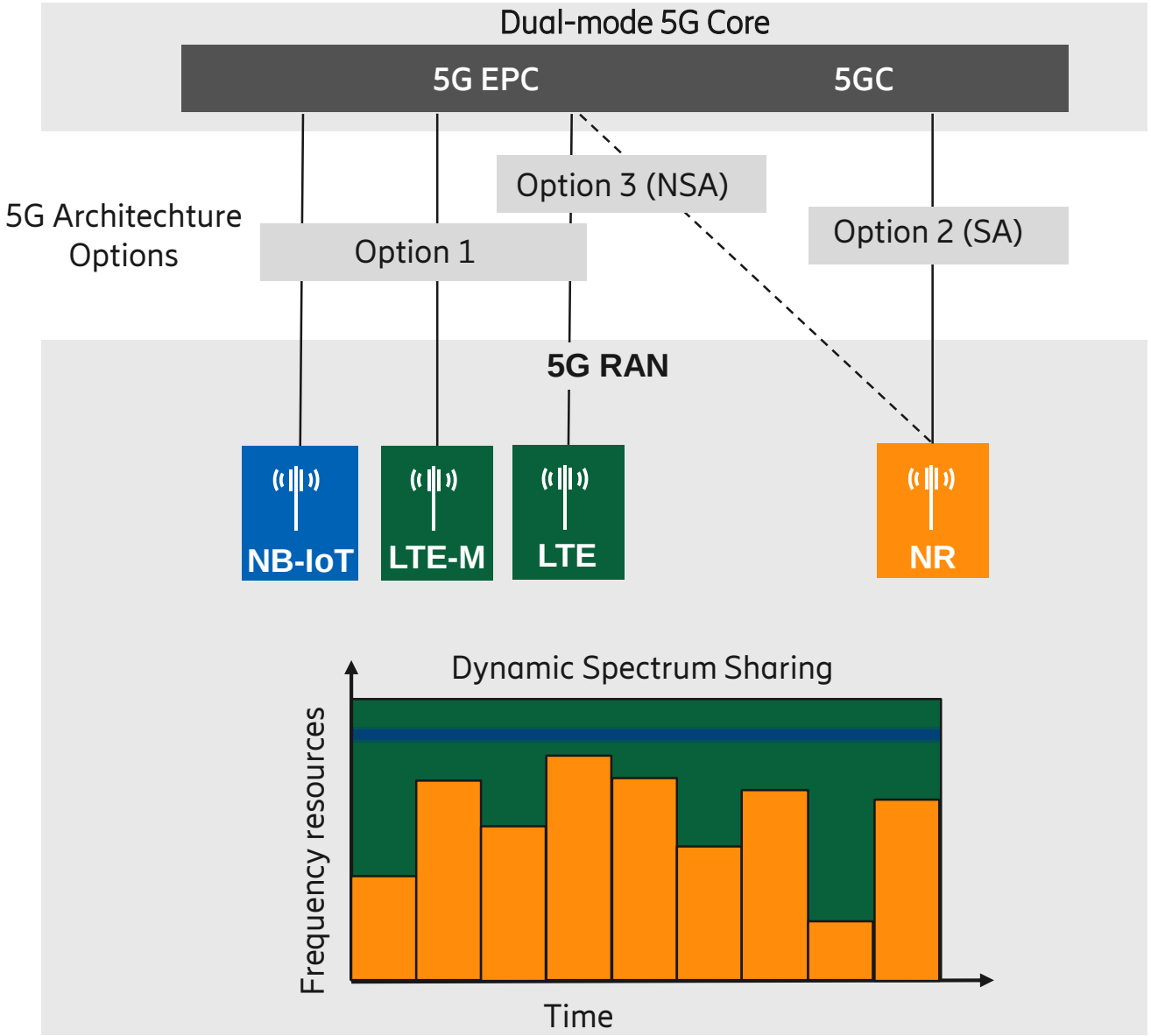
Massive IoT | Broadband IoT | Critical IoT

Example: Smart Factory

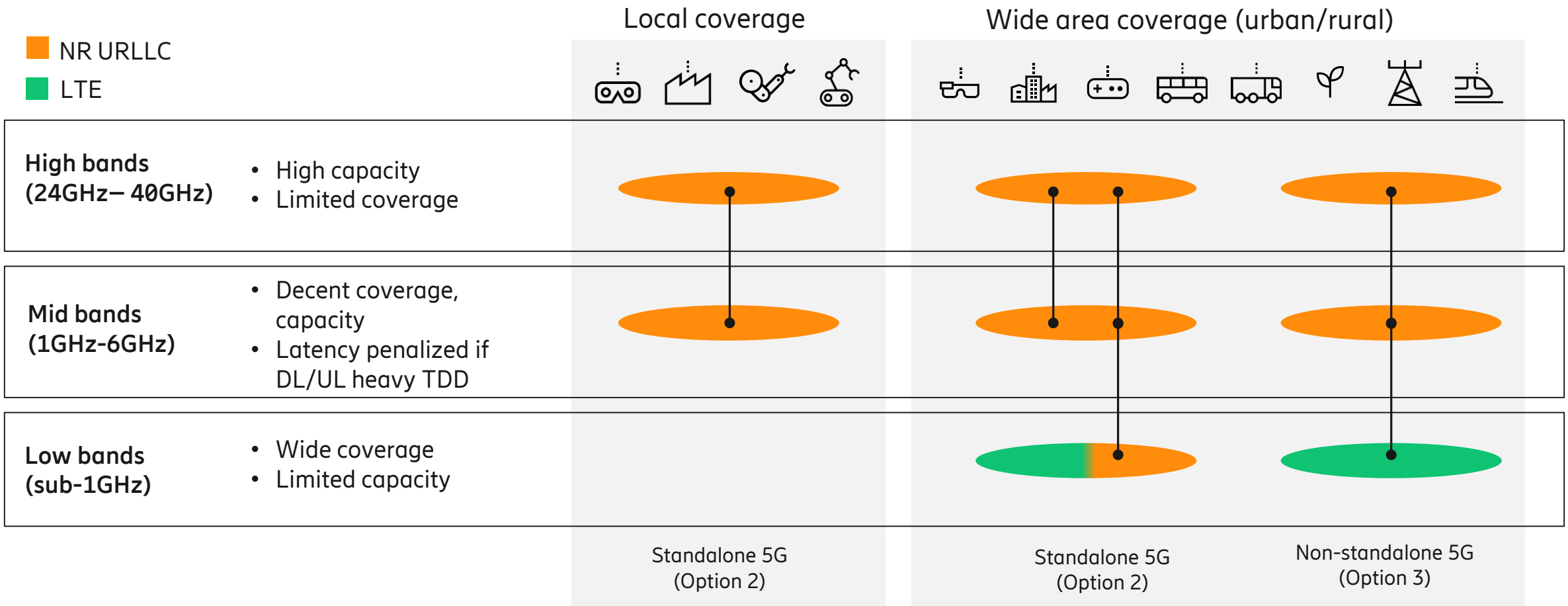


CAT-M1/NB-IoT in 5G era

- CAT-M/NB-IoT are 5G!
- Smooth and future proof evolution with DSS and dual mode core!



5G NR enables Critical IoT in all its frequency bands



Towards Zero – Utilizing C-V2X to create safer road

Partner: Telstra

It's very important to be able to use the cellular network that's already deployed by the operator. And if we can create the infrastructure needed by using the cellular network, there are of course huge efficiency gains for the road authorities."

Håkan Eriksson, CTO, Telstra

Most accidents on the road are caused by human error; automating driving processes will save lives.

As part of the Towards Zero initiative, VicRoads and the Victorian Government awarded a grant to Telstra and Lexus Australia to trial C-ITS use cases.

Telstra's optimized version of 4G for low latency, formed by creating a high-performance QoS link for connected vehicle traffic prioritization

Ericsson's C-V2X platform to run the trials of different use cases, connecting cars to traffic management centers, and to the VicRoads' real-time traffic data

<50ms

E2E latencies of less than 50ms were seen in 95 percent of trials.

Virtual RSUs (enabled by the C-V2X platform) deployed over the existing 4G network have the potential to make huge impacts on the costs and TTM of C-ITS solutions.

Australia's first C-V2X trials

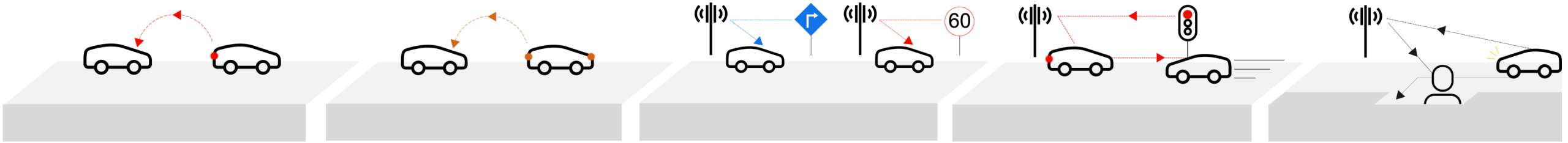
01 Electric emergency brake light (V2V, V2N2V)

02 Slow/stoppeed vehicle warning (V2V, V2N2V)

03 In-vehicle speed advisory. Curve-speed warning (I2N2V)

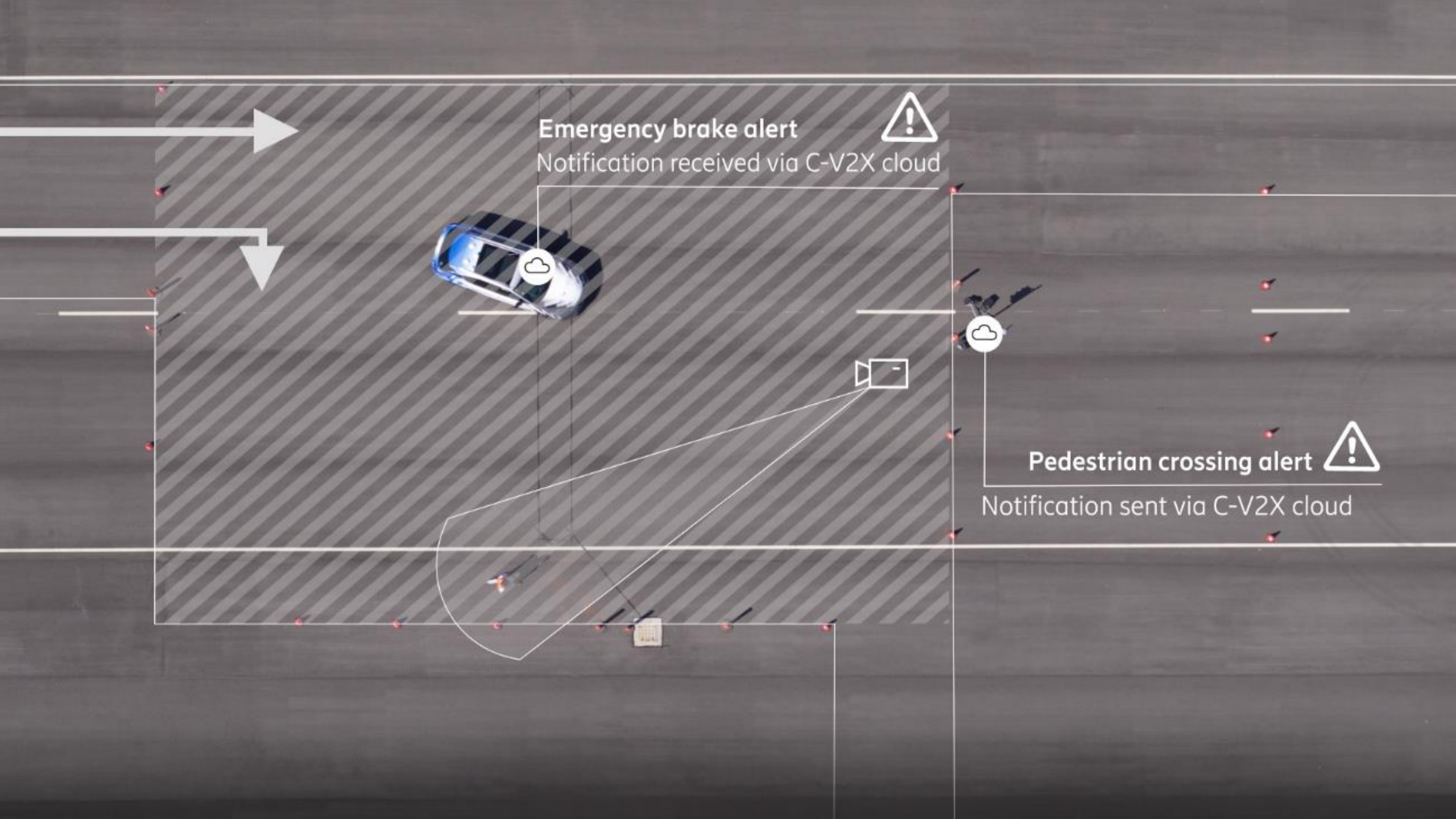
04 Red-light violation warning (I2N2V, V2V, V2N2V)

05 Pedestrian warning/ Right turn assist (I2N2V)



All use cases implemented over Uu (network) interfaces - Uu for I2N2V and V2N2V

Uu optimized for V2X low-latency over the commercial public 4G network


Emergency brake alert
Notification received via C-V2X cloud
Pedestrian crossing alert
Notification sent via C-V2X cloud

Network solution for the trials

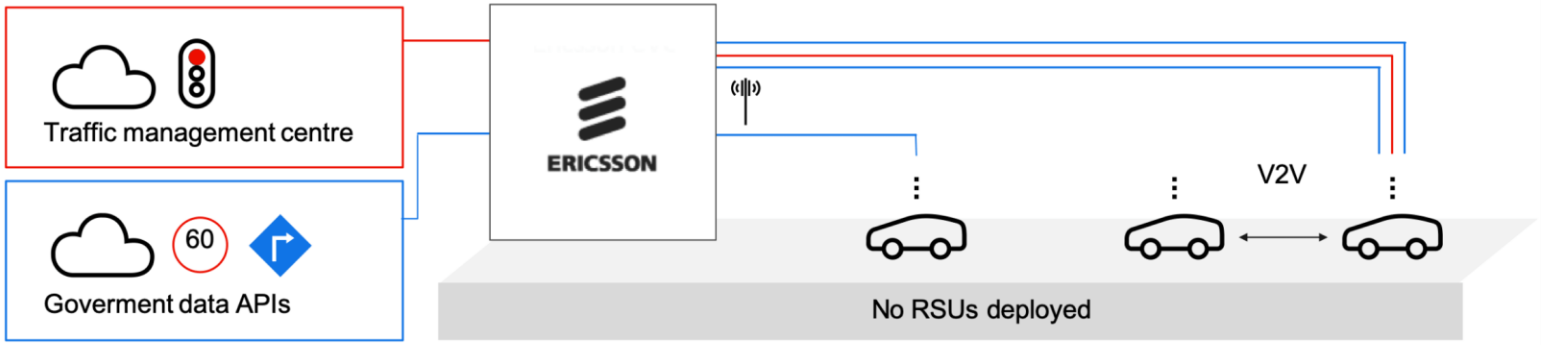
"Virtual RSU" Architecture

Ericsson C-V2X platform

V2X Cloud as " virtual RSU" providing traffic light timing, MAP information, speed limits, pedestrian status...

Telstra 4G Network

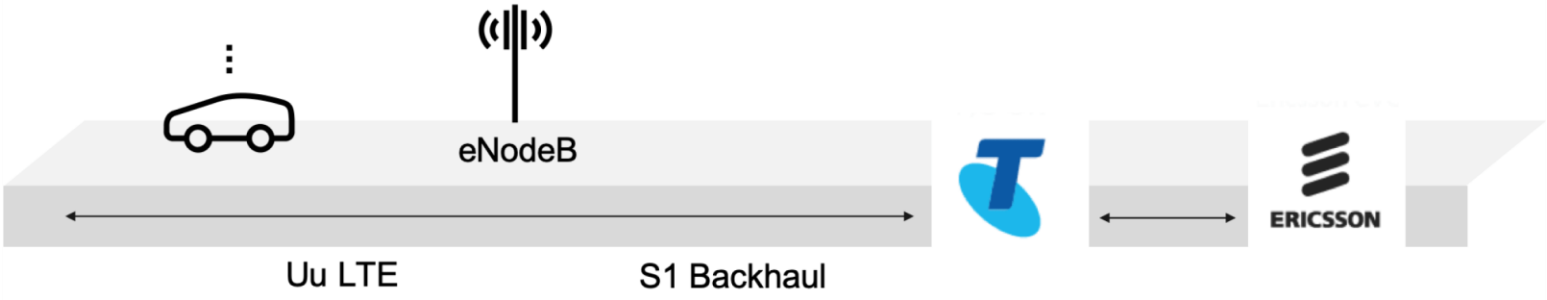
99.2% 4G population coverage of major road network.



Uu optimized for V2X

V2N2V latency –50 ms (Round trip)

I2N2V latency –30 ms (One way)



Automotive 5G manufacturing production

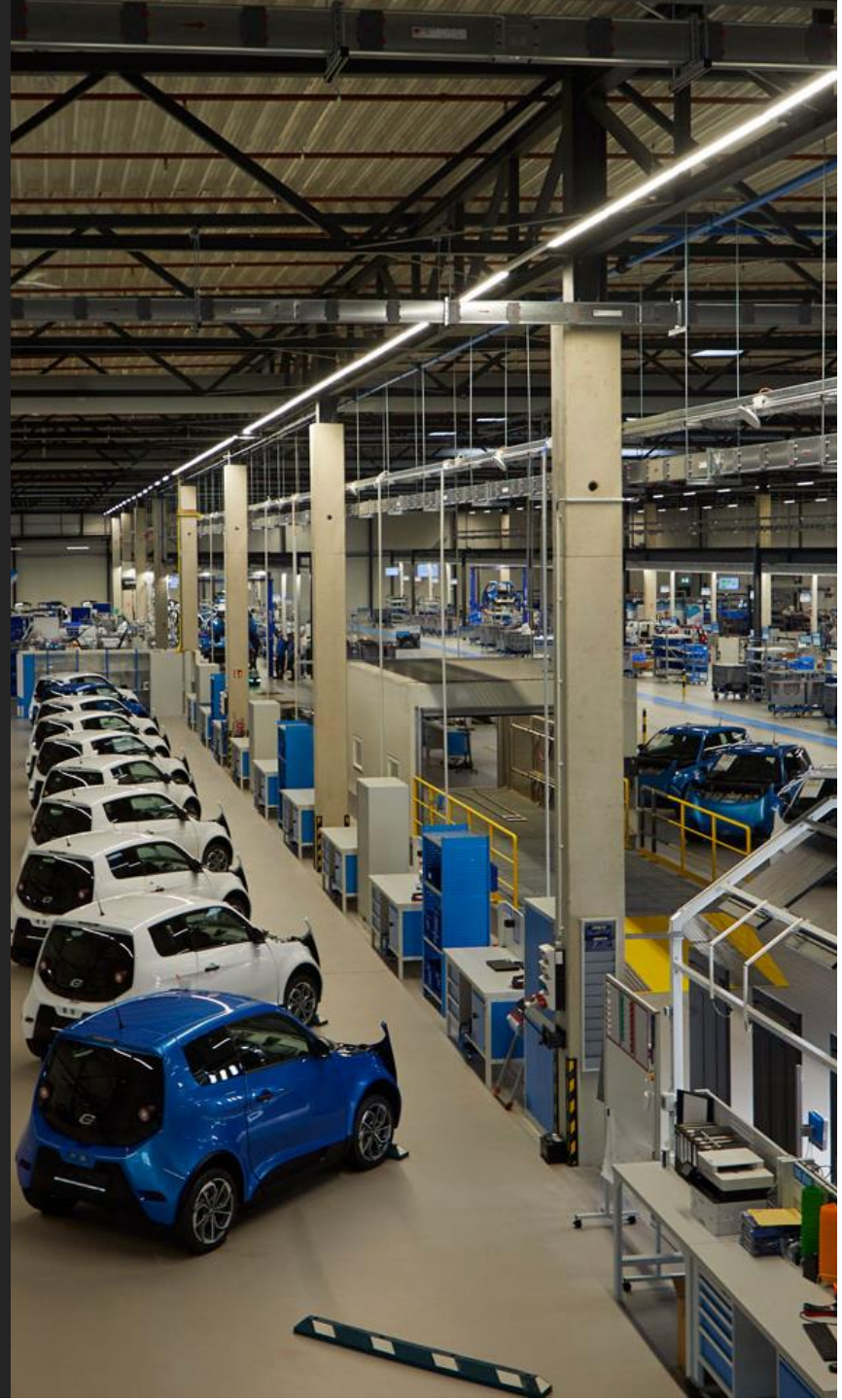
Case: eGO

The Challenge

Increasing number of assembly processes and production material put huge demand on the system to process data safely, reliable and quickly. Faster and more secure implementation of processes. Guaranteed real-time access to relevant data at all times allowing immediate intervention.

"5G network will deliver faster and more reliable production with constant access to relevant information. The assembly plant for e.GO Life is a true Industry 4.0 factory. In other words, it is fully networked in terms of information technology. Connectivity links the physical and the digital world."

Günther Schuh, CEO, e.GO Mobile AG



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The Solution

- Ericsson Private Network including 4G/5G Core and 4G/5G Radio solutions
- Network slicing and mobile edge compute

Onsite network spans 36 antennas in the 16,000 sqm facility

The delivered results

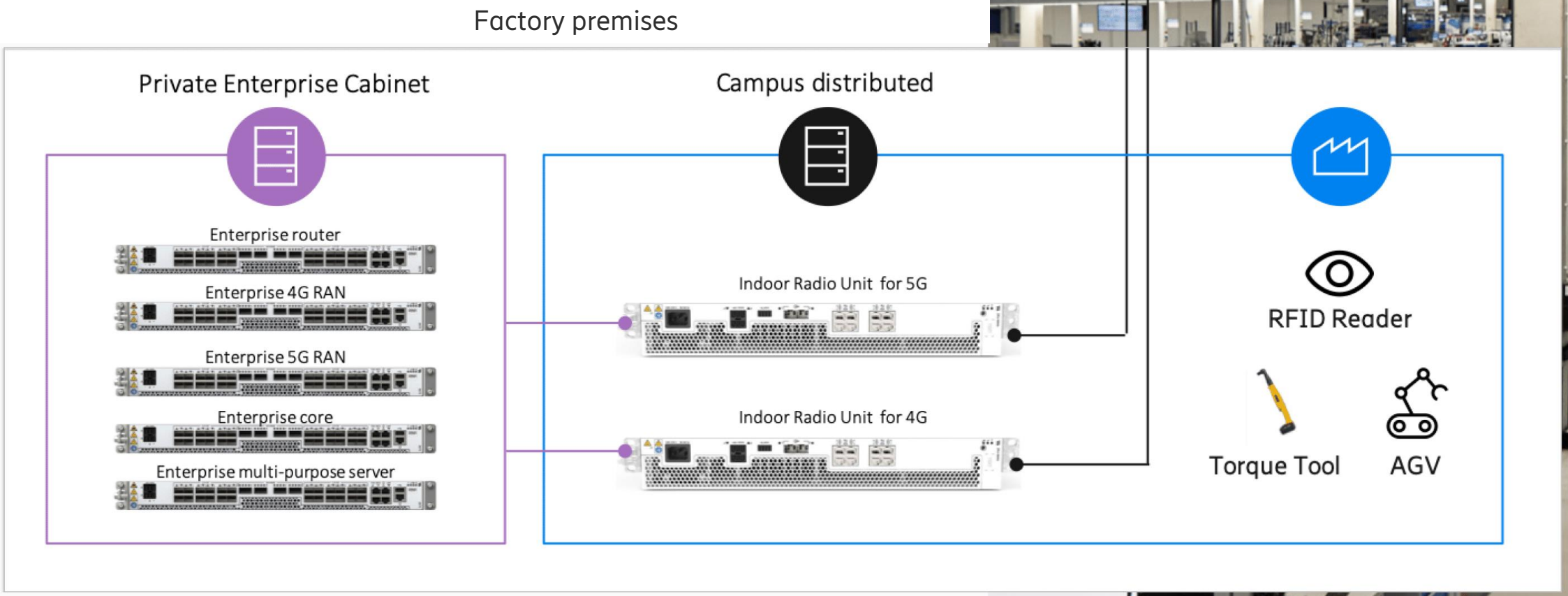
- Secure automatic identification and reliable delivery of production materials to each specific vehicle
- Fully autonomous vehicles replacing traditional production line to increase operational speed and efficiency

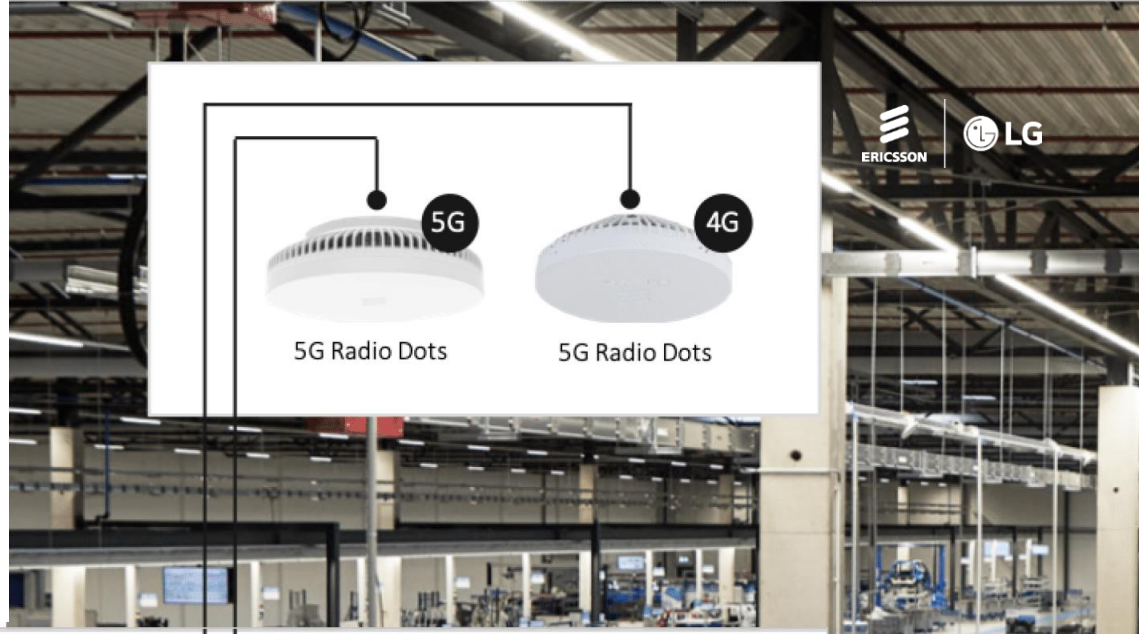
Partners

- Vodafone Gemany
- eGO

e.GO – Private 4G/5G network solution

Ericsson Private 4G/5G Network including 72x Radio Dots providing seamless coverage and high-performance, low-latency connectivity solution for the 16,000 square-meter facility.





5G for Vehicle Production

Customer: Audi

The Challenge

Current WiFi solutions do not fulfil requirements regarding reliability, device handling and handover. Ethernet cables are inflexible and need regular maintenance to avoid service interruption.

The Solution

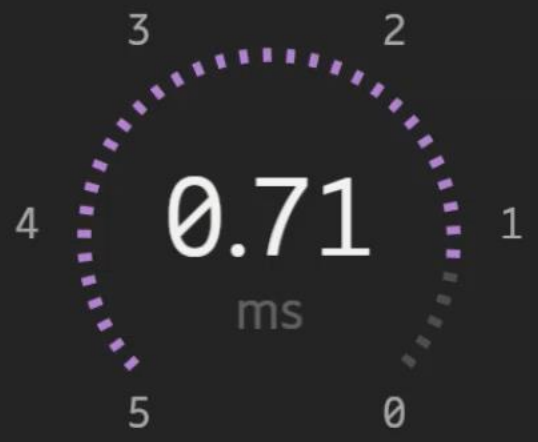
Private 5G deployment in Band n78 (3.4-3.8GHz), AIR 6488, RDS 4479, eOSS and integration into factory mission critical ICT infrastructure and Manufacturing Execution System (MES).

The expected results

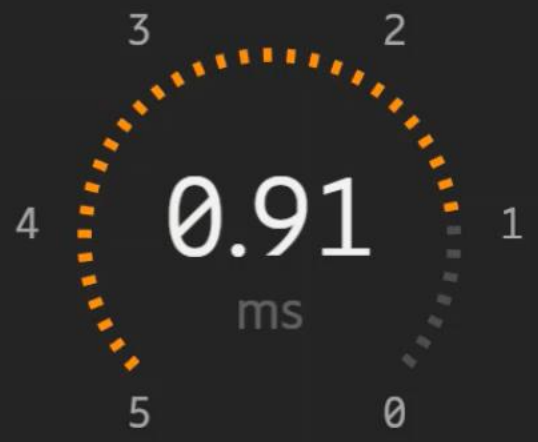
5G non-public network for industries implemented at a shop floor, will enable controlling of robots, steering of AGVs, firmware download to vehicles and connecting a large amount of devices with pervasive connectivity and low latency

Partners

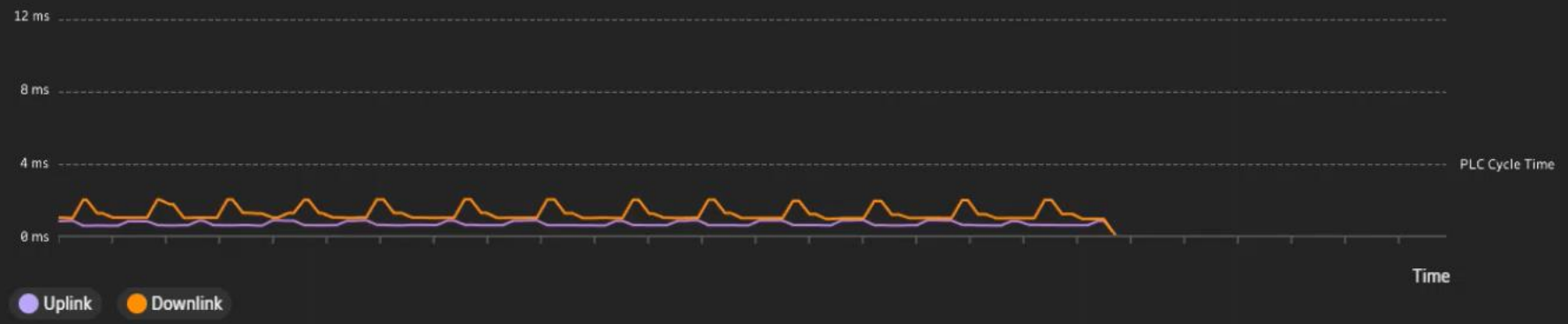
- Audi



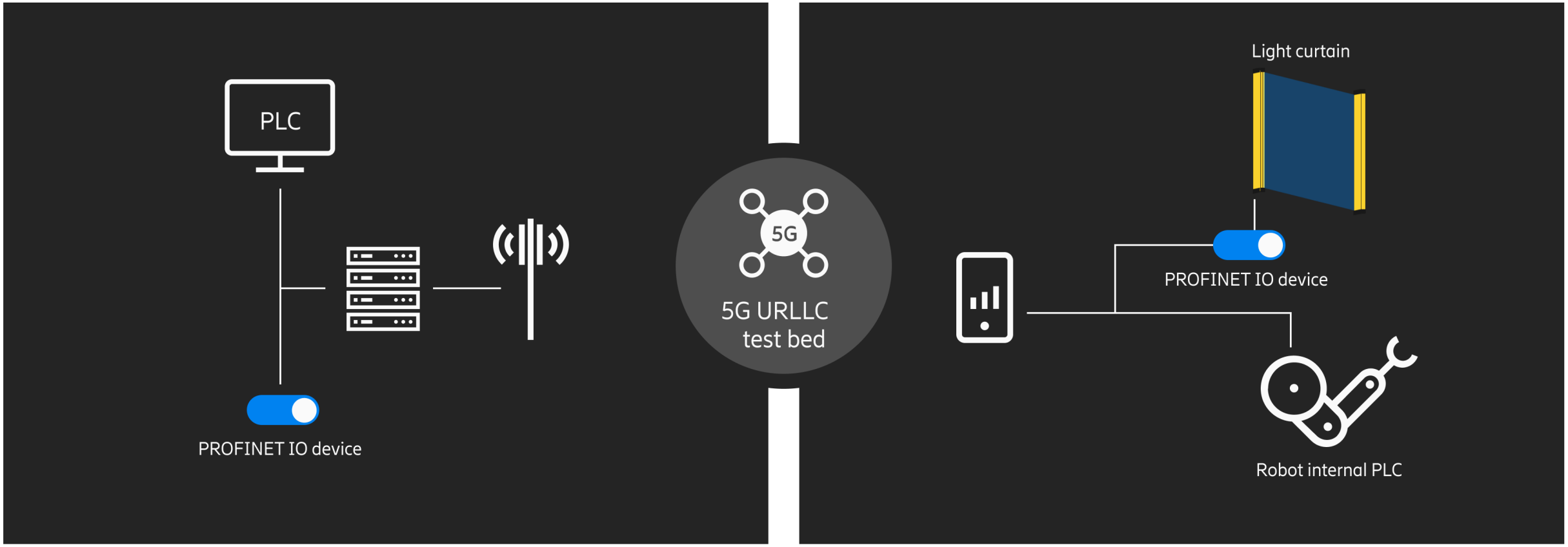
Uplink latency



Downlink latency



E2E architecture



Market trend of power grids

Global policies drive towards more sustainable and renewable power sources

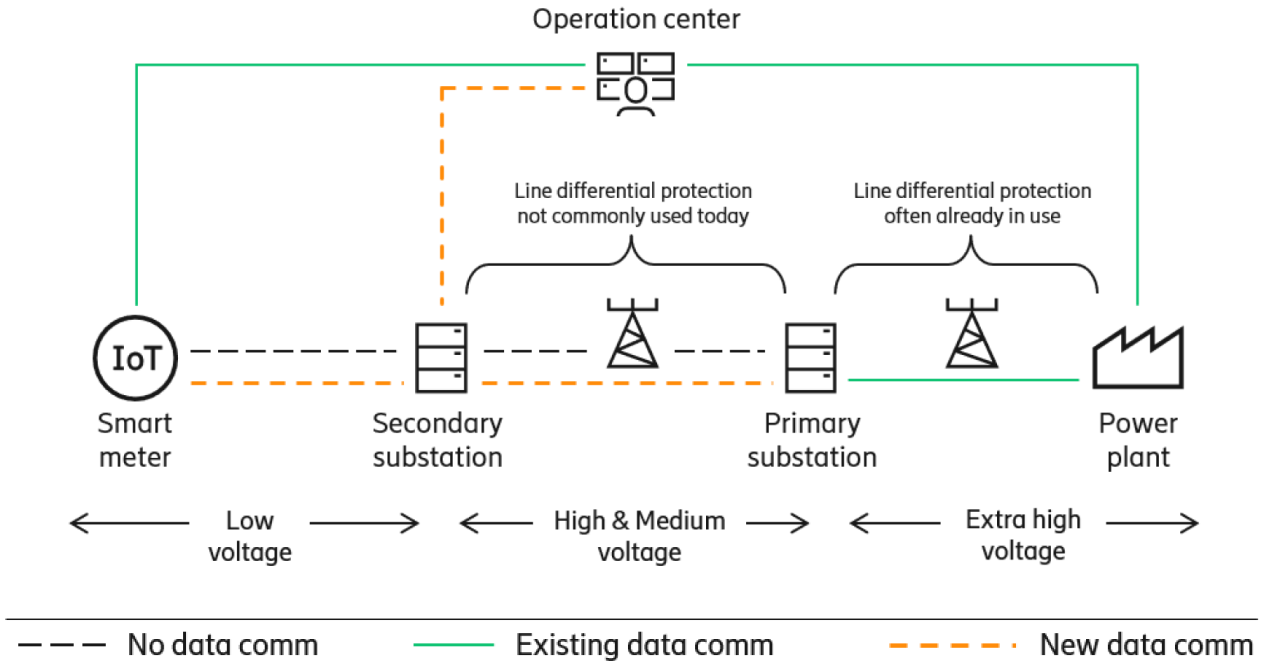
Consumers are becoming “prosumers”, with house owners encouraged to sell back unutilized electricity

A balance between production and consumption is vital and may cause a higher number of error sources and distribution network issues

The economic values of adding connectivity

In Sweden:

- 40 000 fault events on overhead power lines per year
- Cost of power outage to society of EUR 150 million per year
- Damaged substation may generate costs in the range of 100 000€



By adding connectivity, Distribution System Operators (DSOs) gain control of the edge of the network and can better anticipate, prevent, control and even automate power grid protection

50-75%

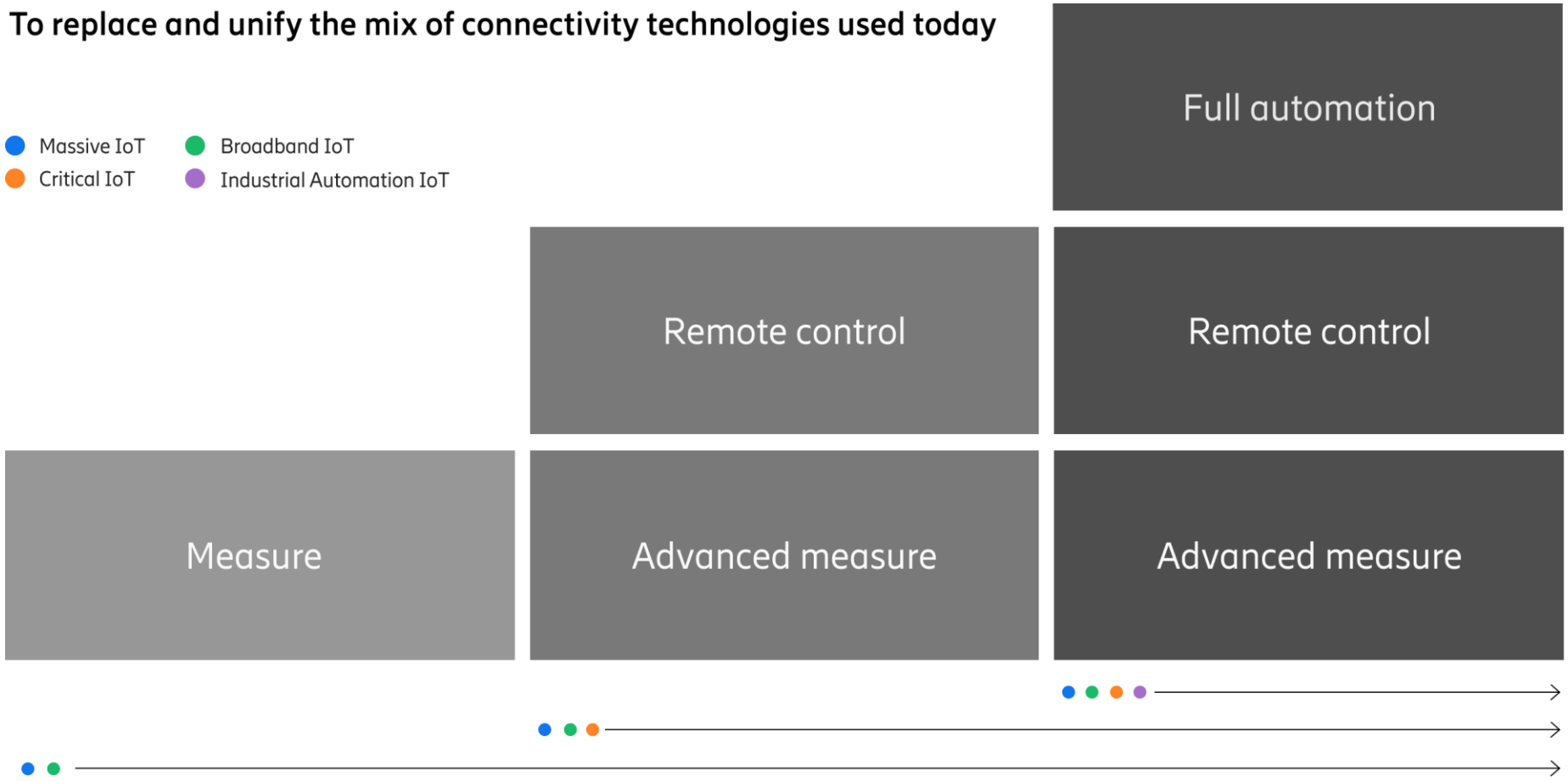
Reduced interruption durations with ICT

40 M €

Resulting annual value for a single DSO in the Swedish market

Steps to evolve the power grid network

To replace and unify the mix of connectivity technologies used today



The role of cellular networks

- An important enabler for new power grid architecutres and operational models
- Power grid protection as well as remote control can be implemented using 4G LTE
- 5G will be required for demanding cases such as automated protection

Summary

Cellular IoT

New segments, new opportunities

One Network

Multiple use cases across different industries

Start today

Enhance with 4G, expand with 5G

Industrial automation IoT introduction with 5G NR & 5GC

Critical IoT introduction with 5G NR & enhanced with 5GC

Broadband IoT enhanced with 5G NR & 5GC

Massive IoT evolution with NB-IoT & CAT-M

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