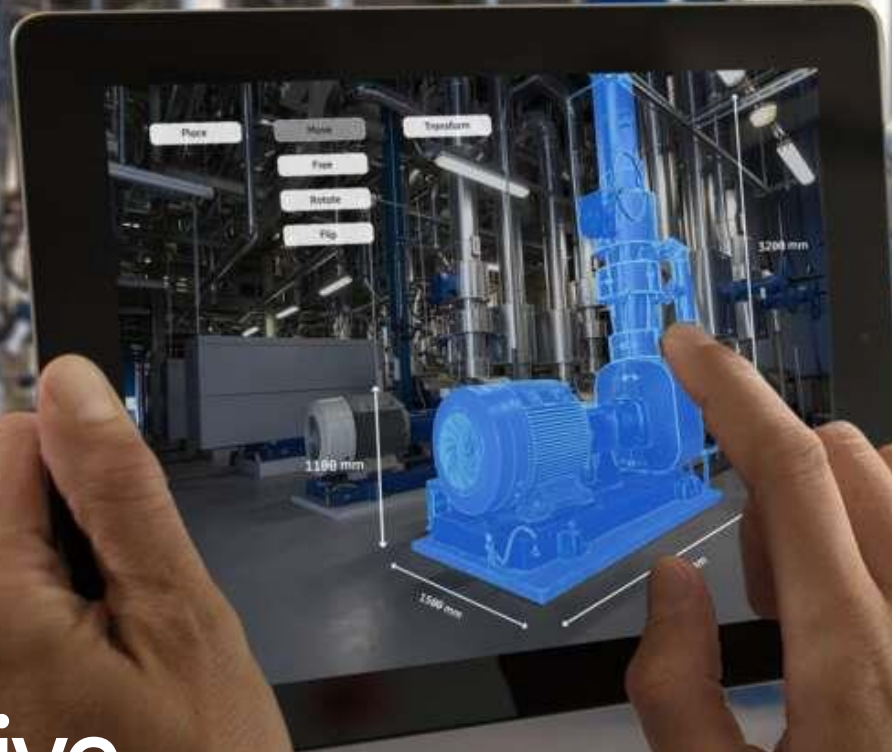


5G Industrial Use Cases



—

Smart Ports & Automotive



The value of 5G for consumers and industry

Consumer



In the near term, consumers expect 5G will offer benefits



Consumers see value in 5G use cases and are willing to pay

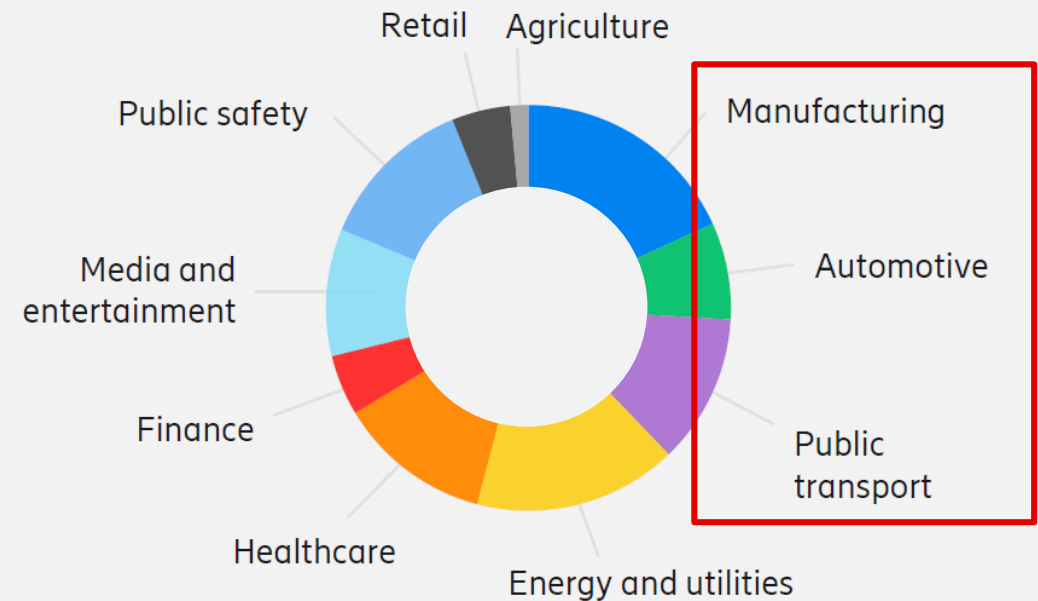


Consumers predict 10x data usage increase on 5G by 2025

Source: Ericsson ConsumerLab report, 5G consumer potential, May 2019

Industry

Industry digitalization potential
5G investment



Source: Ericsson and Arthur D. Little, The guide to capturing the 5G industry digitalization business potential, 2018

There is more value in 5G than just speed and latency



Speed/Latency

Built on mobility, and takes these characteristics to a new level

Reliability

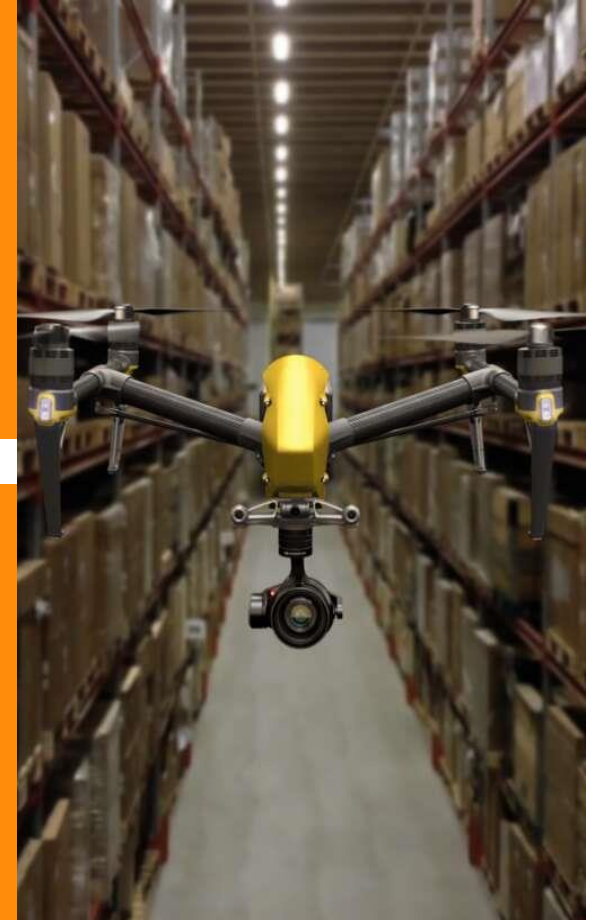
The business depends on the systems to work

Security

A pre-requisite for digitalization

Positioning

Locating equipment faster is productivity



Fast growing 5G ecosystem worldwide



2019: 5G took off

13M
subscriptions

High-end smartphones and pocket routers; ~USD 1,000



Coverage in major cities and highly populated areas by early movers



Smartphone-driven use cases



Non-standalone 5G; in one band



2020: 5G to scale up

190M
Subscriptions*

Volume devices, mid-tier smartphones <USD 300



Wide 5G coverage by early movers; 20-25% operators* to launch 5G



Consumer service bundling; trials continue for industries



Standalone 5G introduced; 5G in multiple bands



* [Ericsson Mobility Report](#) June 2020

* Ericsson analysis

Ericsson and 5G

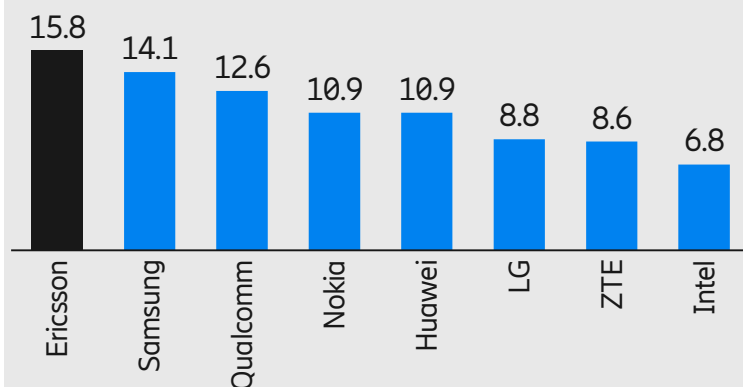


Innovation leadership

#1 essential patents
in 5G

▶ **15.8%**
declarations for essential 5G patents
results in Ericsson being on top

▶ Major contributors to 5G standards (%)



Source: Bird&Bird

Technology leadership

#1 leading performance in
live 5G network

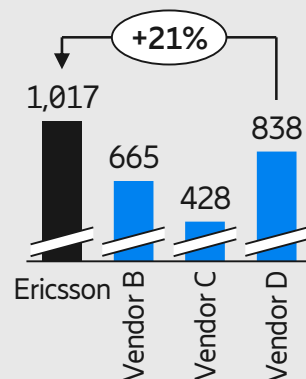
▶ **+21%**
better DL average
speed



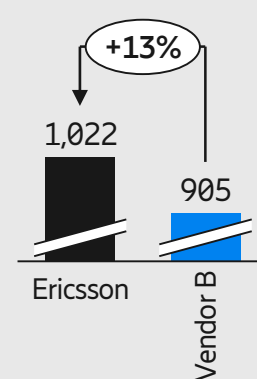
▶ **+13%**
better DL max
speed



▶ DL Mbps



▶ DL Mbps



Source: Ericsson field results

Market leadership

#1 accelerating 5G deployment

▶ **1st**
to launch live 5G on four continents; only
foreign end2end 5G vendor in China



▶ **113**
Commercial 5G Agreements

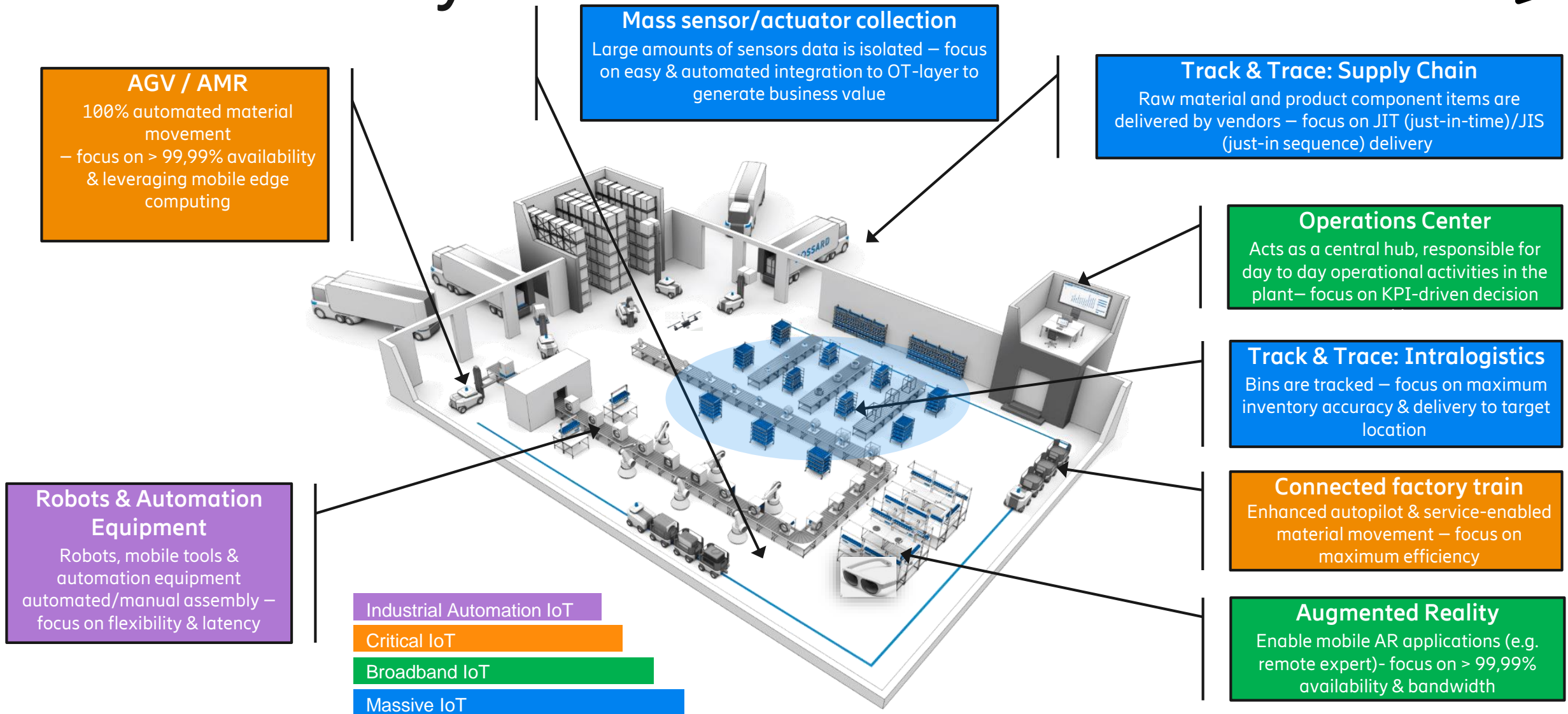
▶ **65**
Live 5G Networks

Source: Ericsson



Automotive Car Manufacturing

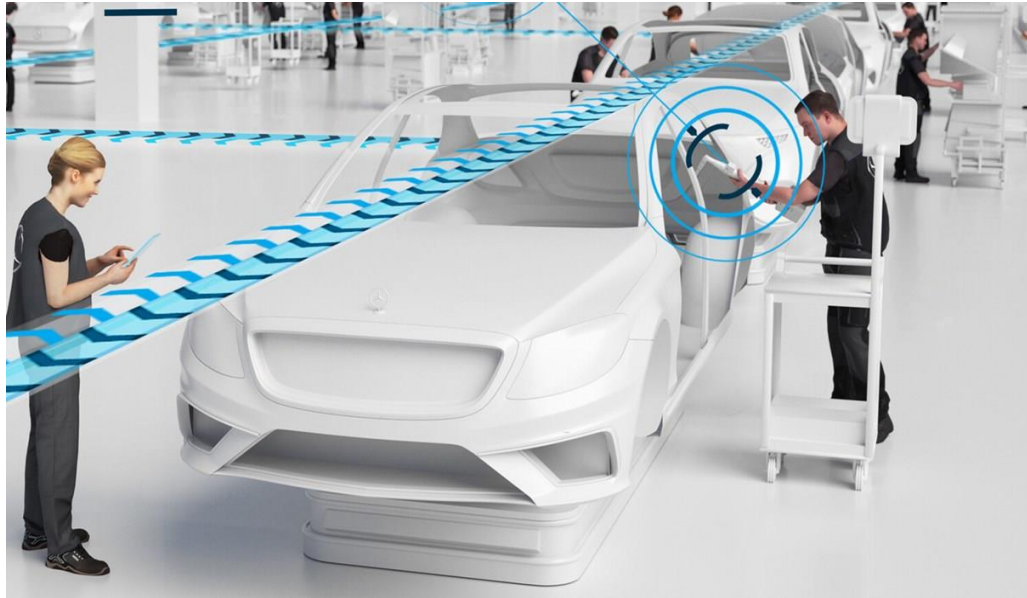
5G and Industry 4.0



5G in car manufacturing



5G network in Mercedes Factory 56



Mercedes-Benz



ERICSSON

Telefonica

Deutschland

5G network in German electric microcar company e.GO Mobile AG in Aachen



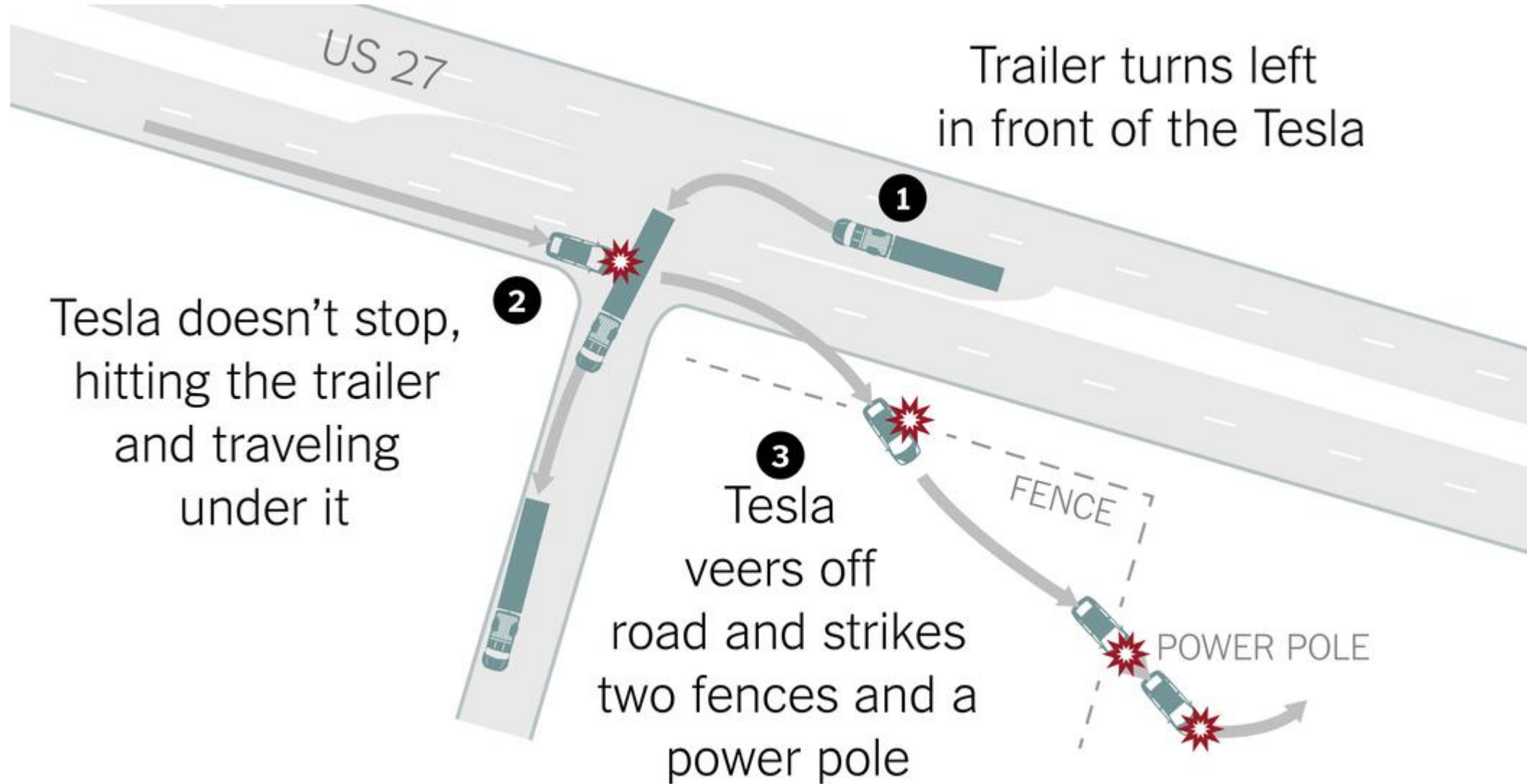
Multitude of use cases include:

- AGVs (Autonomous Guided Vehicles) delivery of production materials
- "Data Shower" (Load the SW in the car via 5G connect)
- Asset tracking, Connected Screwdrivers

Automotive Connected Cars



Anatomy of an autonomous vehicle's accident without 5G





Smart Ports



Port use cases



Precise real time assets localization

Vehicle mounted Terminals (VMT on trucks & cranes)

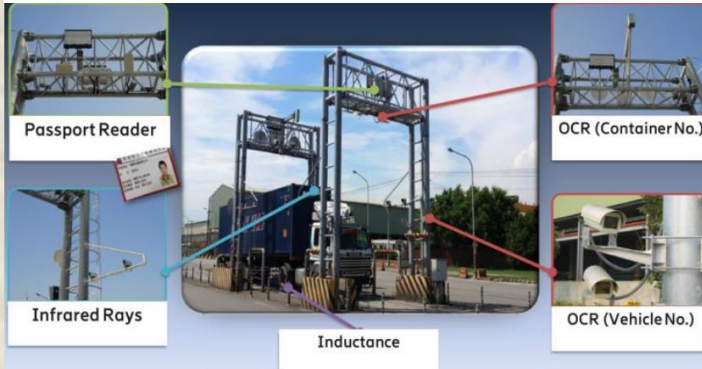
Group Communication

Video Surveillance



AGV: Automated Guided Vehicles

Automated Checkpoint System



5G Automated Port

The challenge

Automatic & remote operations are key to efficiency. Fiber is expensive and not flexible for moving cranes. Today WIFI and 4G cannot provide the needed bandwidth and latency features

The solution

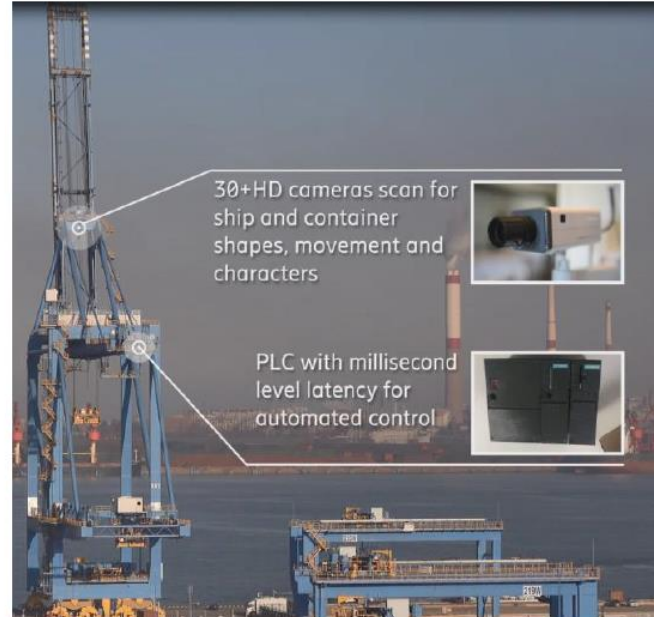
5G provides the needed low latency for PLC control and high bandwidth for video transmission from 30+ cameras on each crane. Fiber ruled out due to mobility restrictions.

The result

STS crane successfully connected by Ericsson 5G and container lifting performed over 5G from remote operation room in production port. 70% savings
World's first case.

The vision

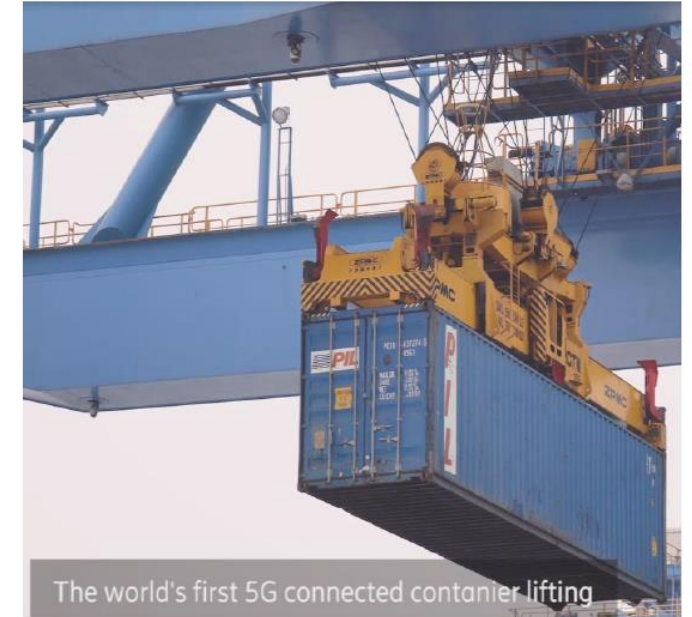
One 5G network to support all automatic port scenarios: STS crane, RTG crane, AGV, PTT, massive IoT, etc.



Hybrid transmission over 5G

- 30+ HD cameras in uplink
- PLC control traffic with <18ms low latency

Partners:



The world's first container lifting supported by 5G in production port

Ports & logistics selected customer cases



Port of Qingdao



Source: Video

Port of Livorno



Source: Video

Port of Rotterdam



Source: Video

Port of Panama



Safety & Surveillance

- Workers & visitors tracking
- Border monitoring

Operational efficiency

- Crane, AVG, and Gantry remote mgmt
- AR for forklift drivers
- RT data to optimize loading & off-loading

Logistics management

- RT location of all containers, trucks and all equipment
- Warehouse & docks capacity

Traffic management

- Ports vehicles
- Truck and visitors
- Transportation

Port of Livorno

H2020 COREALIS Project

- Livorno: 36 million tons of cargo and over 700,000 TEUs, +15,000 employees provide services to 9,000 ships/year
- Innovative technologies, including Internet of Things (IoT), data analytics and 5G networks, for cargo ports, to handle upcoming and future capacity, efficiency and environmental challenges.
- Project Time Span: from 01/05/2018 to 30/04/2021
- Implemented and tested in real operating conditions in 5 Living Labs: Piraeus, Valencia, Antwerp, Livorno and Haminakotka (Livorno Port is the only 5G connected environment)



The Livorno initiative is part of the 5G Corealis technological project, a pan-European EU Commission project addressing digital transformation in ports with final aim to secure competitiveness and sustainability

Connecting UN Sustainable Development Goals (SDG) and disruptive technology

Relevant Port Processes that are positively affected by 5G and digital technology:

- Warehouse management
- Gate-in/gate-out procedures
- Container terminal operations
- Verified Gross Mass (VGM) Management
- Ship practices, mooring, unmooring
- Goods practices, customs, single window
- Control Operations, Physical Controls
- Land transport and Smart Corridors

8 SDGs directly influenced by the 5G-enabled transformation of core port processes.

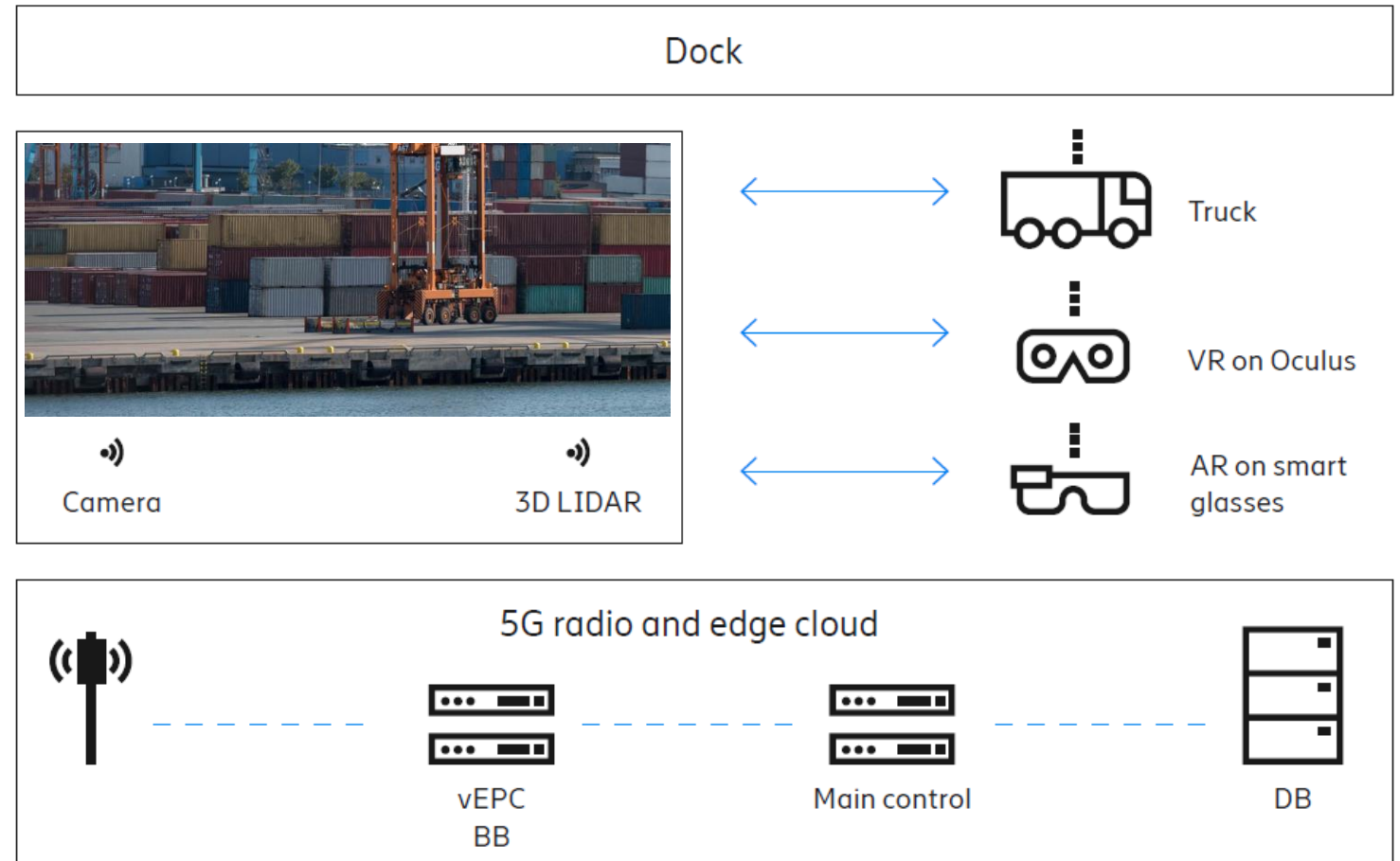


5G enables A/R applications and real time positioning

5G high bandwidth and low latency, enables:

- A/R to improve efficiency and safety in goods handling.
- real-time information from of sensors and feedbacks to operators.
- real-time positioning of vehicles and freights using cameras

Cameras for A/R and positioning check requiring high bandwidth (about 10 Mbps) and low latency (10 ms)



Port of Livorno – Example of Use Case



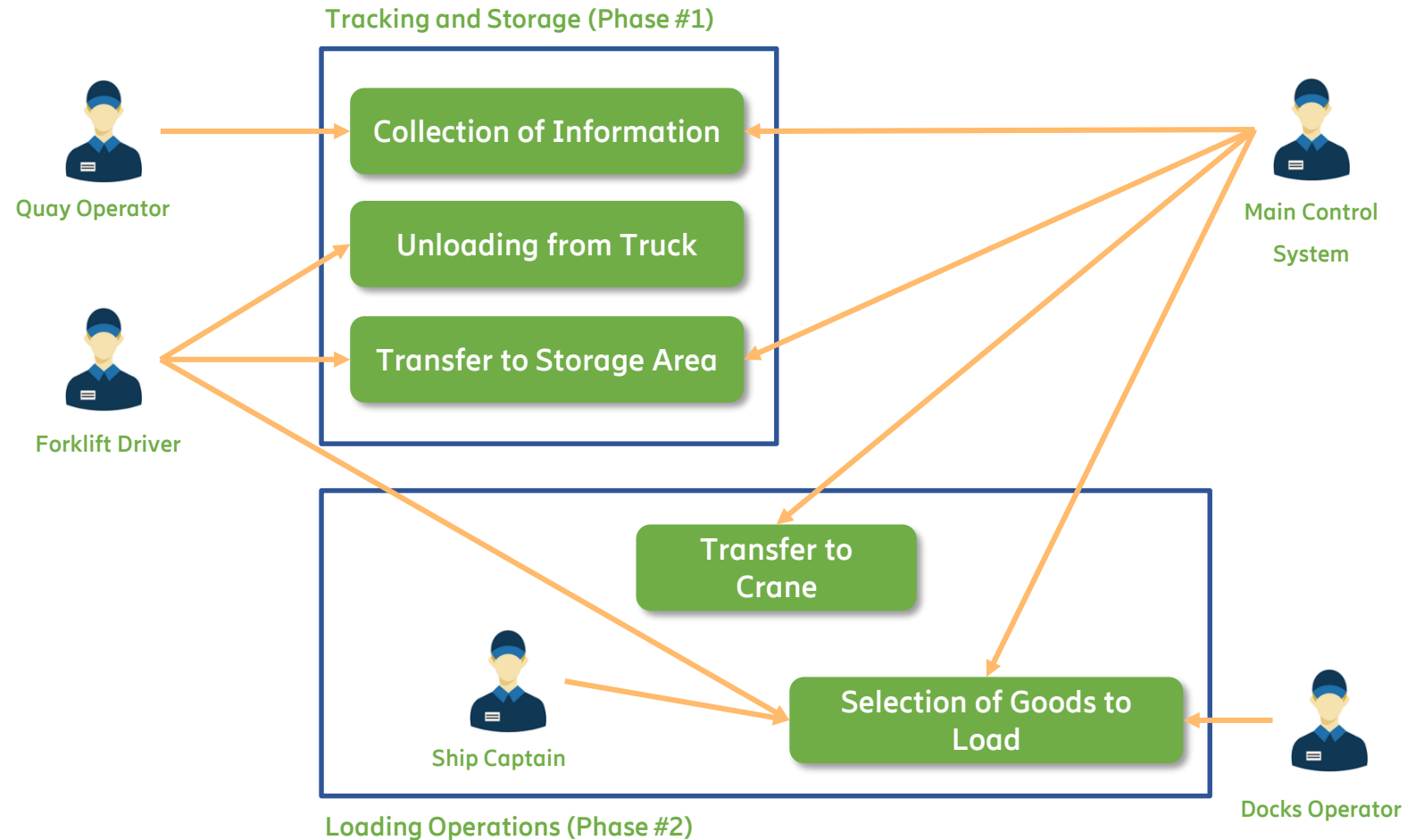
The general cargo logistics Use Case is divided in two main phases:

#1. Tracking and Storage

- Collection of information
- Unloading from truck
- Transfer to storage area

#2. Loading operations

- Selection of goods to load
- Transfer to crane



Port of Livorno - Economic benefit analysis



To assess the economic benefits of 5G deployment, the Port of Livorno focused on the three main operational areas:

1. Faster ship turnaround at the quay, leading to lower ship costs for shipping companies
2. Faster freight release through port gates, implying lower costs for haulers serving the terminal
3. Gantry and quay cranes controlled remotely through 5G telecommunication, enabling efficiency for terminal operators

8.2 %	There can be an 8.2 percent reduction in associated CO2 emissions per terminal operation
€2.5m	Optimizing vessel berthing can lead to a 20 percent average cost reduction per year, which is approx. EUR 2.5 million.
20-25%	Automated quay cranes increased productivity by 20–25 percent.

investment costs are not included in this analysis; only operational savings are considered

5G use cases: Automotive and Transport

An aerial photograph of a city street intersection. A large red building is on the left. A blue car is on the road, and a yellow car is in a parking lot. White lines and dots are overlaid on the image, representing 5G use cases for automotive and transport. The text '5G use cases: Automotive and Transport' is overlaid on the left side of the image.

The four megatrends in Automotive industry

CARE

Connected

Connected vehicles are in the center of the transportation ecosystem



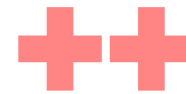
Automated

Self-driving vehicles are changing our cities and societies



Redefined

Business models are being created – now's your chance to act



Electric

Cleaner energy leads to cleaner transportation and cleaner cities



 Connectivity impact

(*) ACES: Automated, Connected, Shared, Electric

From the “object” vehicle towards “service” vehicle

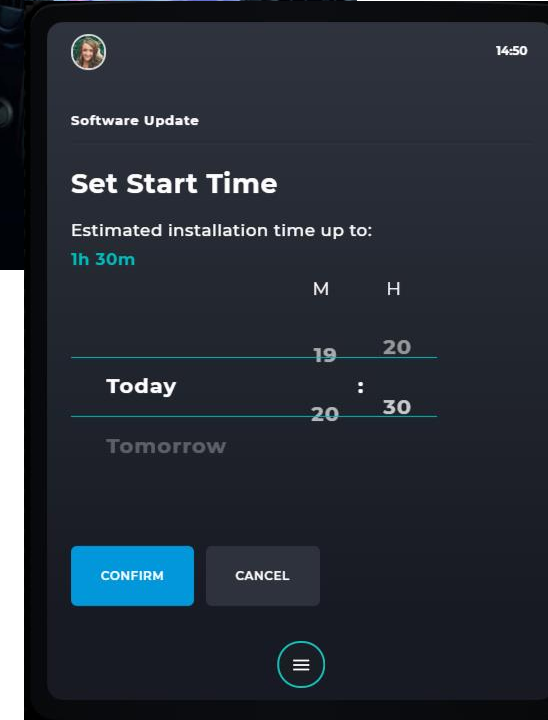
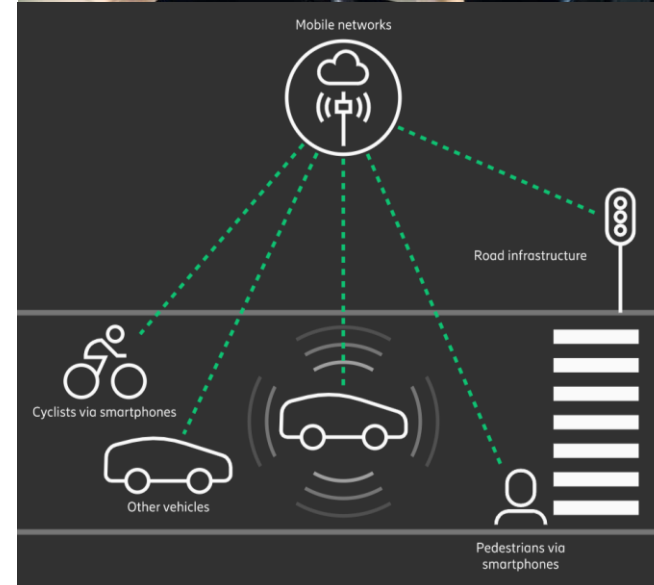
- Maintaining scalable global connected vehicle service
- Comply with regulations and standards
- Keep up to date with fast moving technologies
- Maintain and grow subscription-based revenue
- Evaluate business success, service uptake and market impact
- Manage market and brand specific service portfolio
- Fast market rollout of new connected vehicle services
- Global connectivity management for all markets



Connectivity is not an option but a must for Automotive

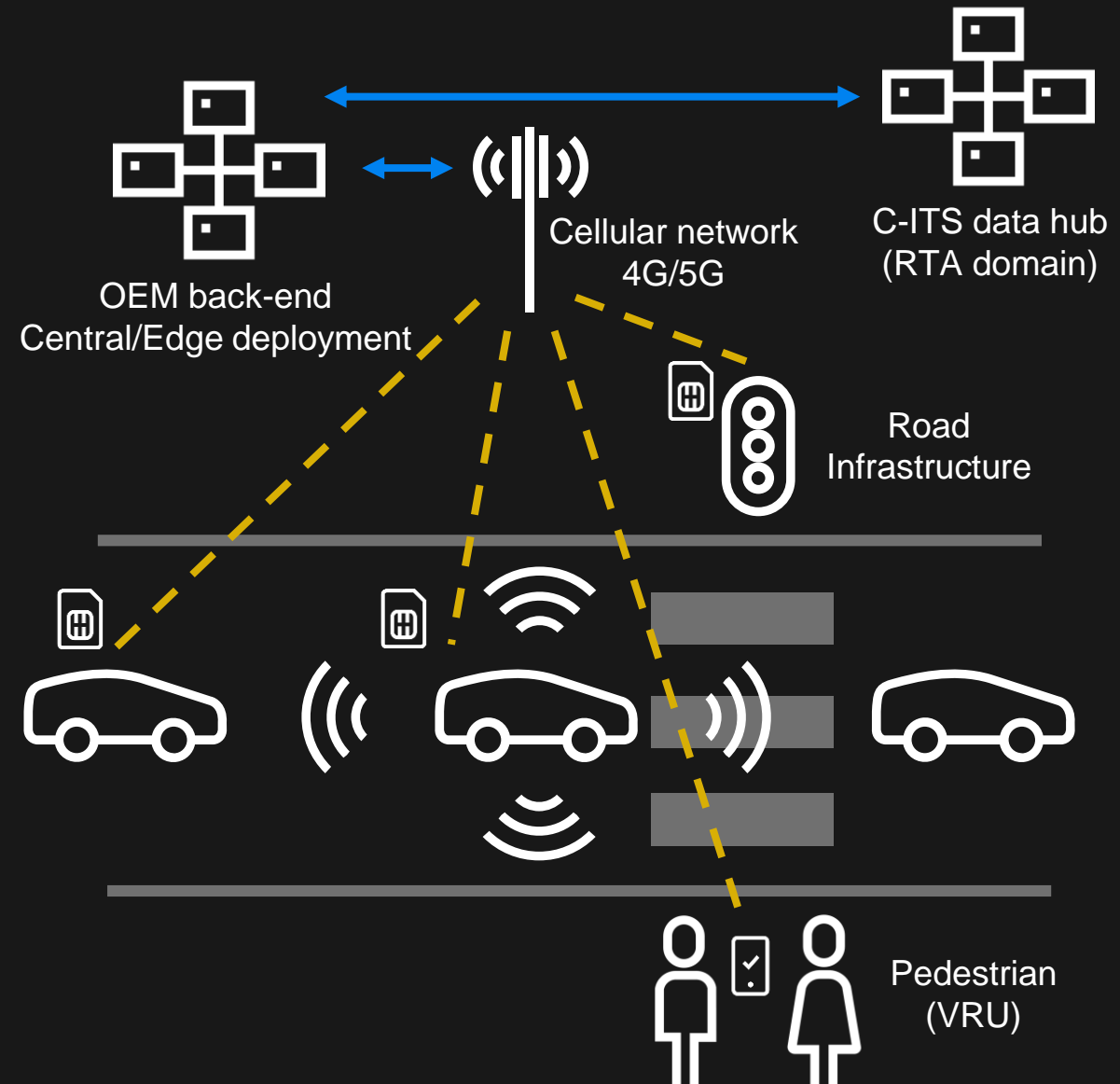


1. Passengers (and drivers) to enjoy communications while riding:
 - Vehicle is an extension of digital home and work space
 - Digital assets consumptions and conversational services
2. Vehicles need to be aware of the surrounding environment:
 - Traffic efficiency: C-ITS
 - Improving safety: Enhancing ADAS with C-V2X
3. Automotive OEMs to improve their services:
 - Gaining customer loyalty
 - Operational efficiency
 - Software defined vehicles: frequent OTA

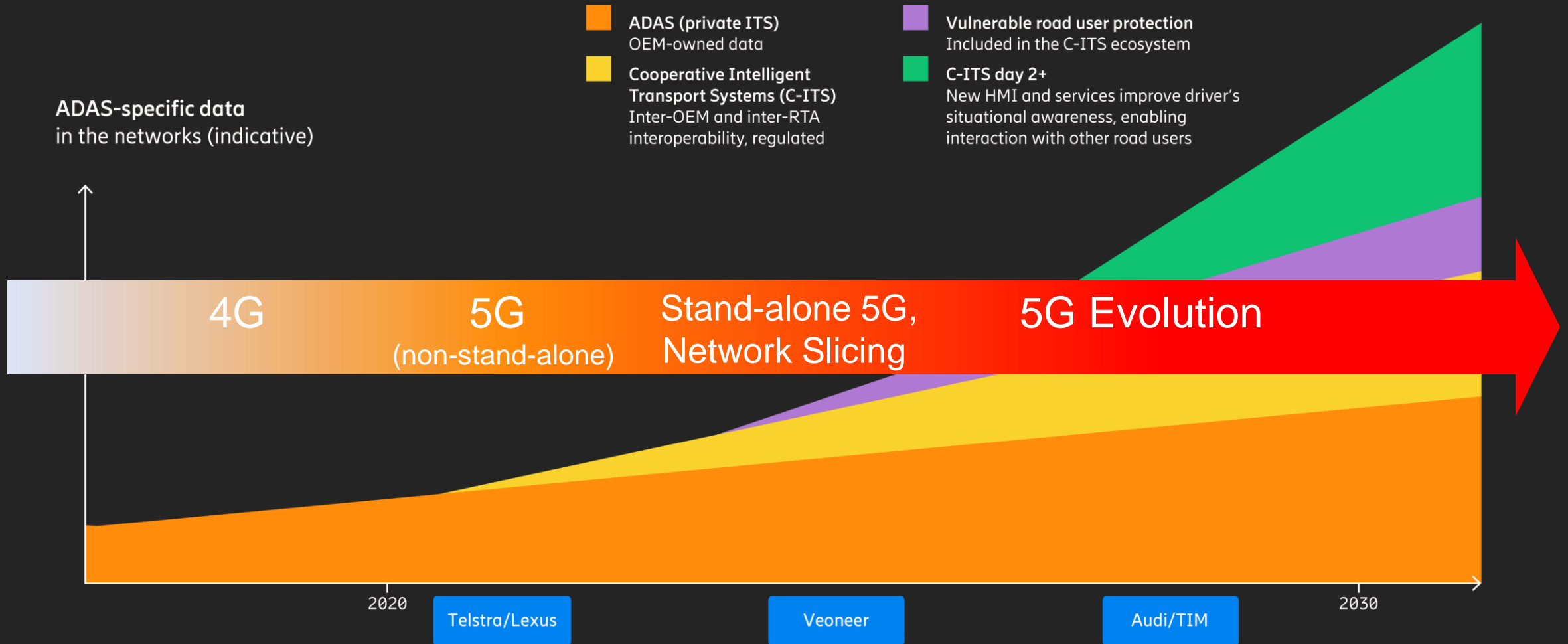


Enhancing ADAS with C-V2X: an ecosystem approach

- C-V2X will allow for enriched local information with data captured outside local sensors range:
 - Better knowledge of the environment:
 - Beyond LoS
 - “See around the corner”
 - Active relationships with pedestrian through smartphones
 - C-V2X is all about safety and traffic efficiency
- Automotive OEMs to expose their data to the traffic ecosystem pushed by RTAs:
 - Potential monetization flow
 - Efficient integration based on standards
- “Connectivity is a sensor as a camera or a radar”
(Ola Boström, VP Research at Veoneer)



Better networks will allow for more advanced services

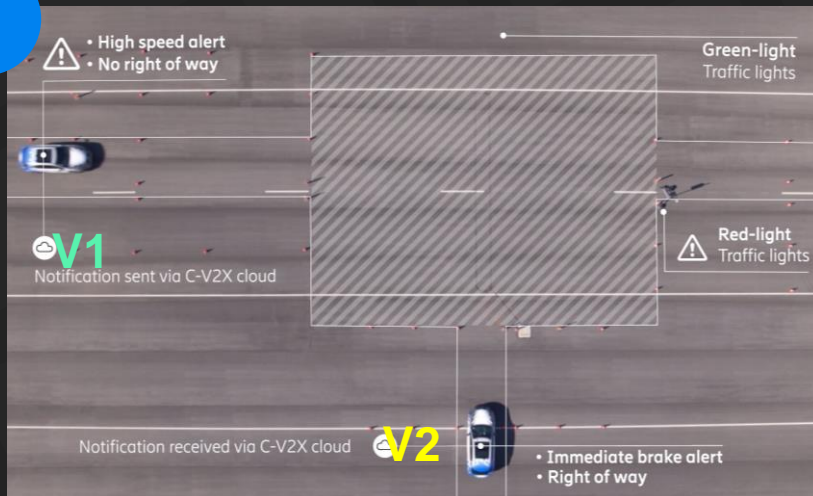


A real case in detail: reducing road fatalities

Ericsson, Telstra and Lexus Australia are collaborating with the Victorian Government, as part of the Towards Zero road safety initiative:

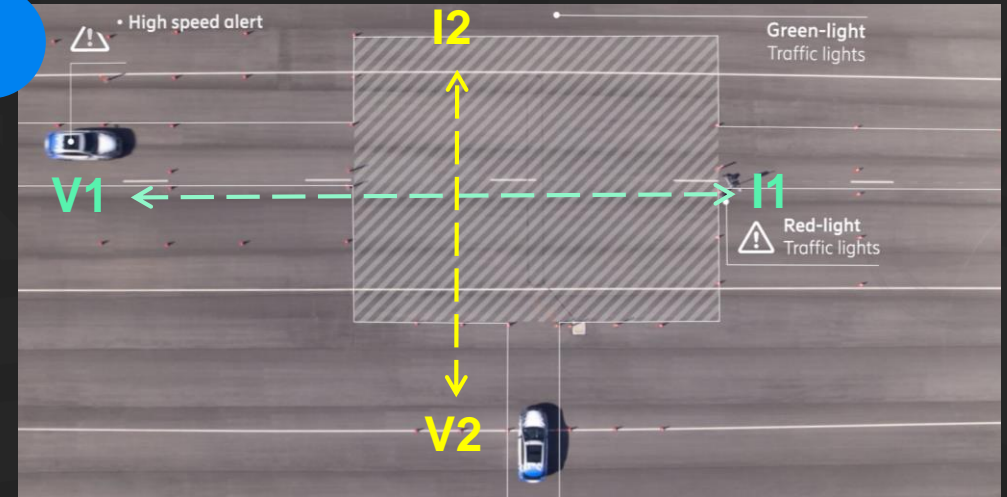
- Creating the first converged C-V2X network platform
- Demonstrating the power and advantage of roadside cellular technology today (4G)

2



V1 notifies the risk to C-V2X application server (cloud based)
C-V2X application server distributes the event to the affected area
V2 receives an “Immediate break alert” warning

1



V1 is approaching to I1 (traffic light, red) to high speed: risk of harsh braking
V2 is approaching to I2 (traffic light, green): crash risk

3



Upon reception of warning V2 displays a message in the dashboard (eventually take control)

... but this is not the only one



- NordicWays 2:
 - Emergency vehicle warning (<https://www.youtube.com/watch?v=gqN2aABeOPs&feature=youtu.be>)
 - Geofence (<https://www.youtube.com/watch?v=IRNbpBbyYXY&feature=youtu.be>)
 - Dynamic access control (https://www.youtube.com/watch?v=nXuf_RAVtVg&feature=youtu.be)
 - Traffic signals (https://www.youtube.com/watch?time_continue=2&v=qj77VTs8KpM&feature=emb_logo)
 - Works warning (https://www.youtube.com/watch?time_continue=5&v=s_MRUKw7D54&feature=emb_logo)
- 5GCar (https://www.youtube.com/watch?v=bSlf2kNczMw&feature=emb_logo)
 - Lane merging coordination ($\approx 00:45$)
 - See-through sensor sharing ($\approx 1:30$)
 - Long range sensor sharing ($\approx 2:10$)
 - VRU protection ($\approx 2:40$)
- 5GAA pilots and demos (<https://5gaa.org/5gaa-in-motion/news/>)

Connectivity accross the whole life of a car

- Age 1: In the factory
- Age 2: From the factory to the dealer: connected ports
- Age 3: The driver gets the car and he/she enjoys driving
 - Activating different services supported by connectivity
 - Taking part of a safe road (and streets) traffic ecosystem
 - Getting new features in your vehicle through OTA
- Age 4: Time for retirement ... and new beginnings



Watch the full story of HILDA here

<https://www.ericsson.com/en/blog/2020/6/discover-the-lifecycle-of-a-connected-car>

