Integrated Communication & Sensing – The Killer Feature of 6G?

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5G – A Reality Check

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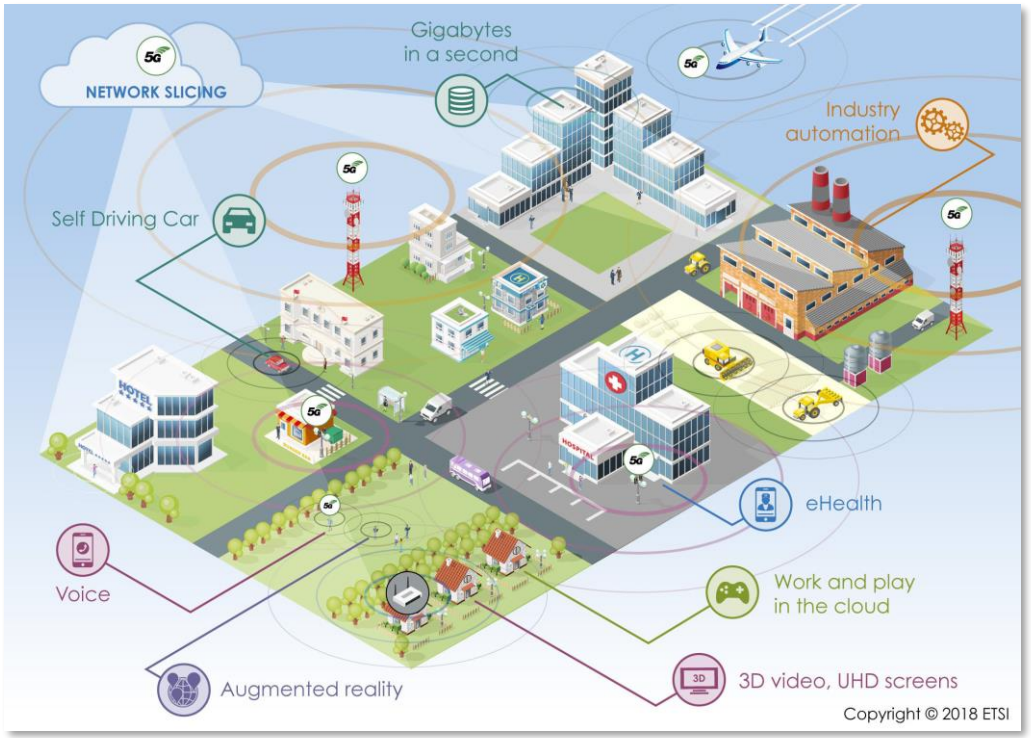
5G Reality Check



The Vision

(Source: ETSI, 2018)

The Reality

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Why?

Integrated Communication & Sensing - The Killer Feature of 6G?

Why is 5G for verticals not a general reality yet?

Late Start

Vertical industries started to get engaged (much) later than the ICT industry & have to catch up from scratch.

Features Pending

Many 5G features that make a difference to verticals come only with 3GPP Rel-16 and beyond (e.g., URLLC[1]).

Major challenge

Business Cases

Strong business cases are not a no-brainer. It takes time to find a sweet spot for adequate pricing, etc.

Device Ecosystem

An ecosystem of vertical-specific devices is required and we are often facing a chicken-egg challenge.

More than New KPIs[2]

It takes more than a better air interface to succeed (e.g. private networks, new business models, etc.)

With 5G as we have it today, it is still hard to come up with a solid business case!

[1]Ultra-reliable low-latency communication [2]Key performance indicators

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The 6G Promise

The Vertical Industry Guy

So why should I bother about 6G then?

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Possible ways to address the business case challenge

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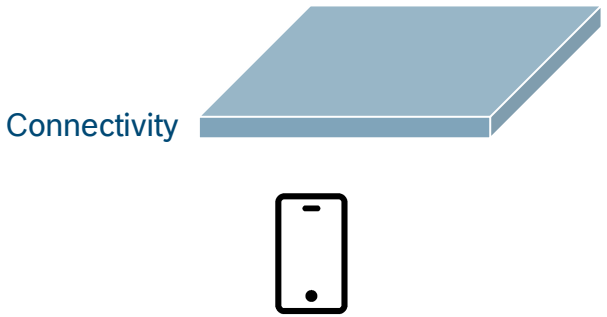
What‘s in 6G for Verticals?

1G – 4G

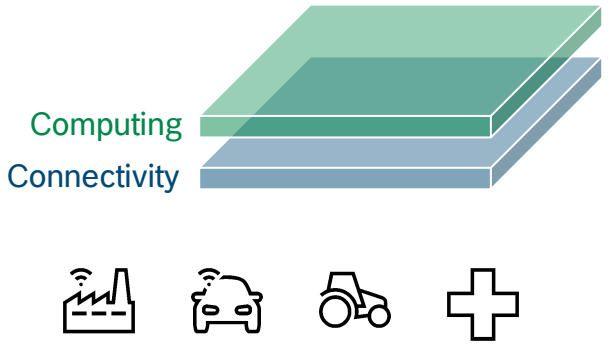
„Infrastructure-as-a-Service“



Phones

5G

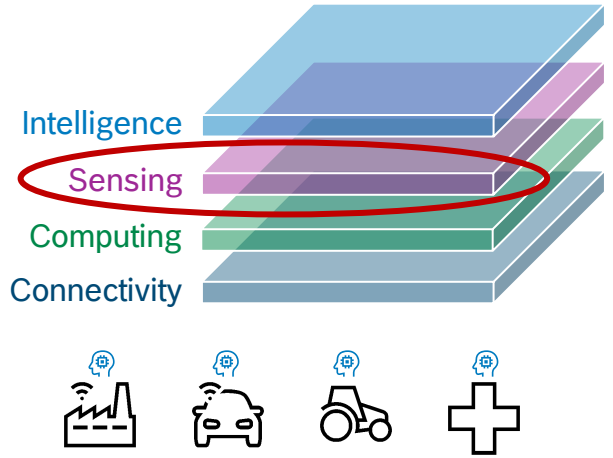
„Infrastructure-as-a-Service“



Things

6G

„Everything-as-a-Service“



Intelligent Things

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Different Flavors of Integrated Comunication & Sensing

Today

Separate sensing & communication

Separate devices, separate spectrum, no interaction

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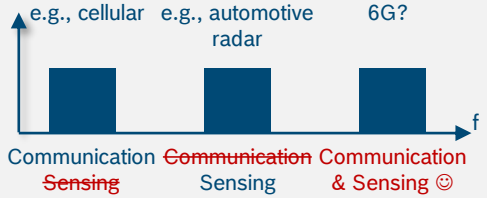
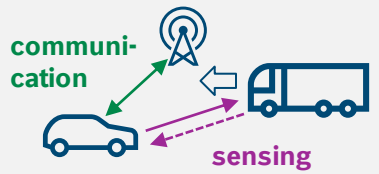
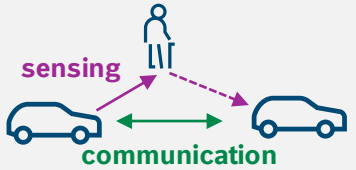
1. **Coexistence in same frequency bands**



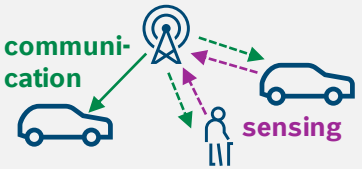
2. **Sensing-assisted communication**



3. **Communication-assisted sensing**



4. **Joint communication and sensing**



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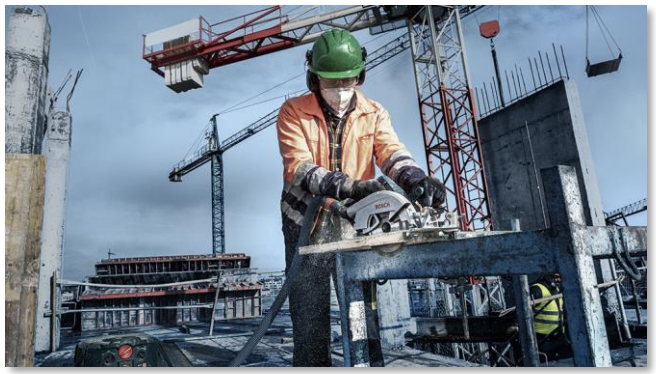
Exemplary Application Domains of ICAS

Industrial

Automotive

Building



Construction

Smart City

Agriculture

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SELECTED USE CASES

SMART FACTORY

ICAS will lead to a significant value-add of the network infrastructure

[1]Simultaneous Localization and Mapping [2]Automated Guided Vehicles

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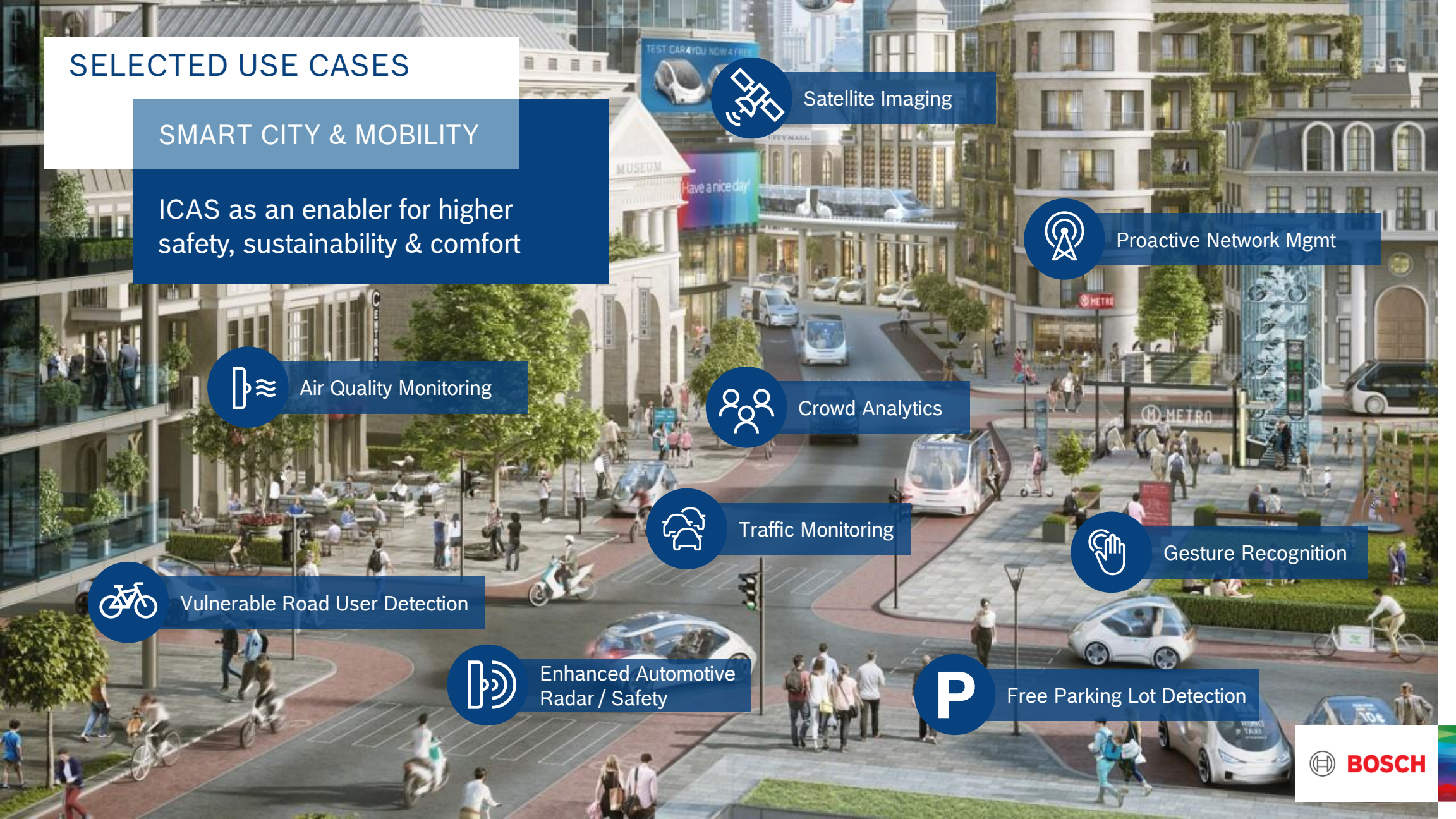
SELECTED USE CASES
SMART CITY & MOBILITY
ICAS as an enabler for higher safety, sustainability & comfort
Satellite Imaging
Proactive Network Mgmt
Air Quality Monitoring
Crowd Analytics
Traffic Monitoring
Gesture Recognition
Vulnerable Road User Detection
Enhanced Automotive Radar / Safety
Free Parking Lot Detection
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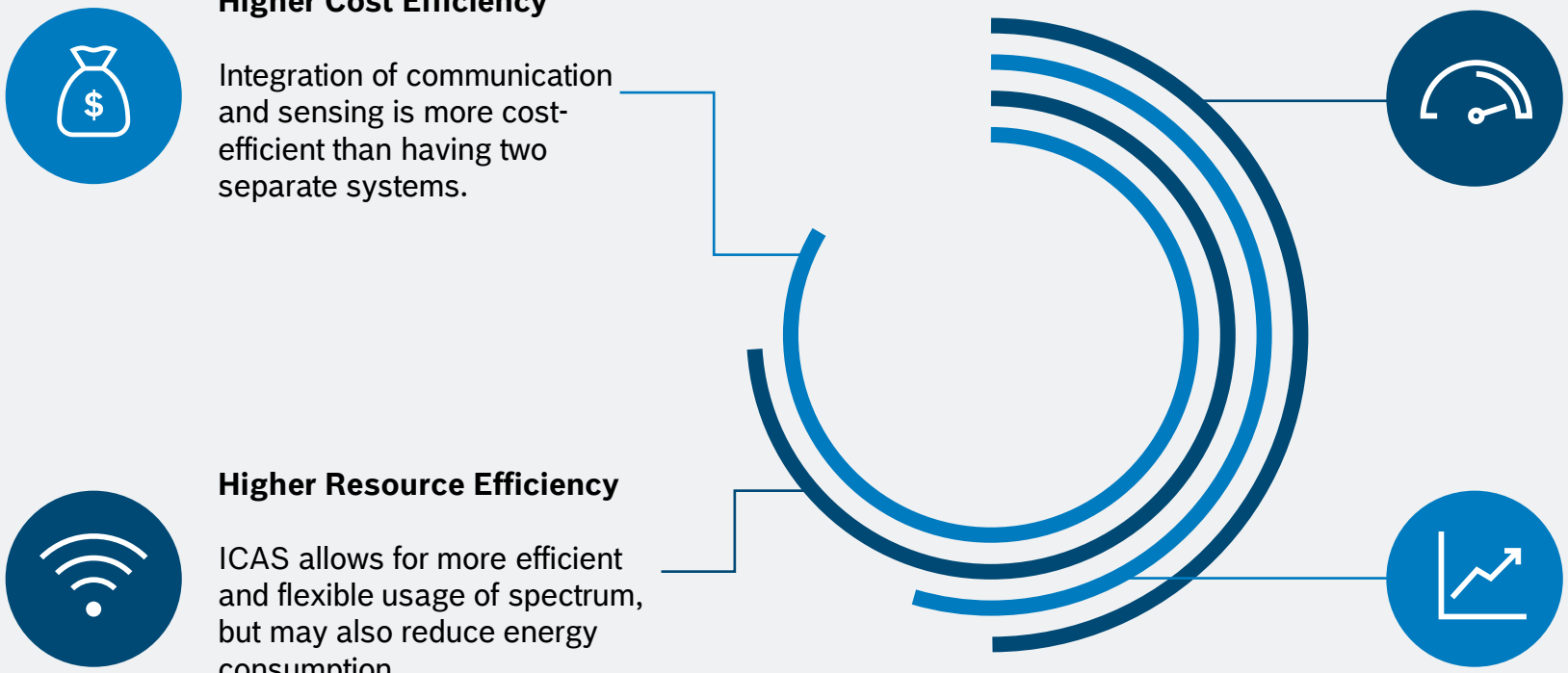
Major Promises of ICAS



Higher Cost Efficiency

Integration of communication and sensing is more cost-efficient than having two separate systems.

Better Performance

Collaborative sensing (e.g., multi-static radar) may lead to better performance compared to isolated systems.

Higher Resource Efficiency

ICAS allows for more efficient and flexible usage of spectrum, but may also reduce energy consumption.

Higher Value-Add

ICAS will make it easier for vertical industries to come up with a positive RoI[1] and to justify investments in 5G/6G.

[1]Return-on-invest

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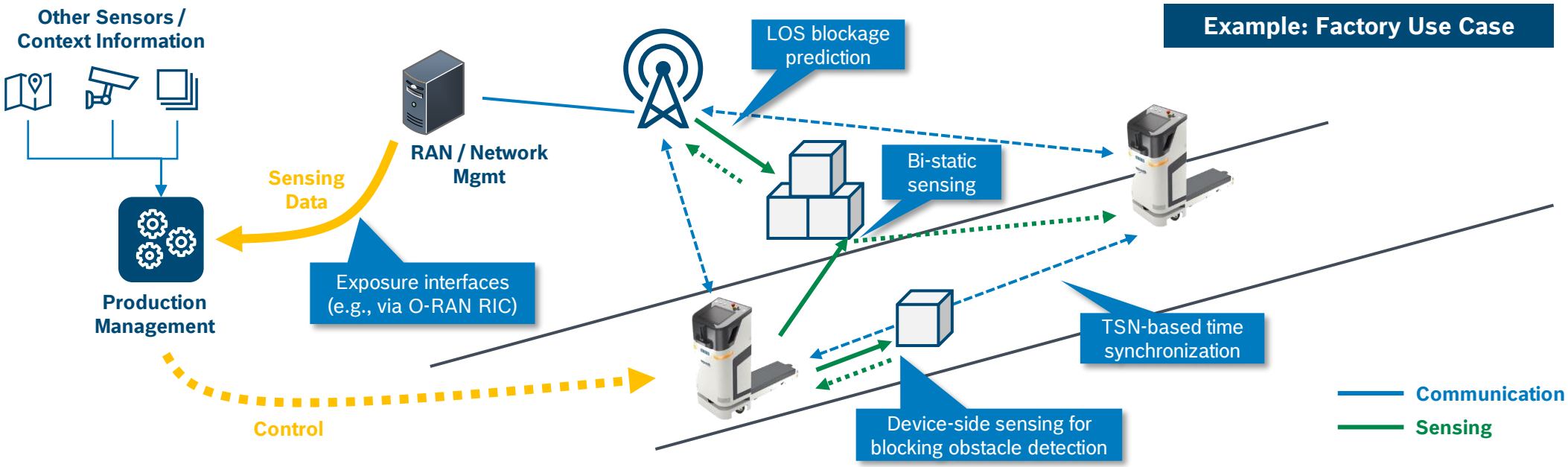
It's a Team Effort – Important Related Technologies

ICAS | Sub-THz | TSN | Vertical Applications | Private Networks | Open RAN | Sidelink



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The Need for an Open Social Dialogue

There might be **societal concerns** regarding:

- **Privacy** (→ surveillance society?)
- **Electromagnetic radiation** (→ increasing?)
- **Security** (→ how to protect data & systems?)

No matter whether one agrees with these concerns or not, they have **to be taken seriously**
→ Prerequisite for wide **social acceptance**

A **close & open social dialogue** should be established in order to address these concerns early on
→ Do not blindfoldedly focus only on technology
→ **Transparency & enlightment** are key
→ Try to address such concerns also in **system design**

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Conclusion

1. **ICAS as one of the key technologies on the way to 6G**
2. **ICAS may significantly add value in many vertical domains**
3. **Promises: Cost & resource efficiency, performance, value-add**
4. **A wide variety of open challenges exist** (technical, business, regulatory)
5. **Mutual benefits: Radar may improve communication and vice versa**

A close collaboration between the ICT industry & relevant vertical industries is key to make ICAS become a major success!

„We have come to stay!“

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