

EuCNC 2021

# 5G-ACIA: Shaping the Industrial 5G Revolution

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5G-ACIA WG1 Vice-Chair

# Major Objectives



## OT Industry



## ICT Industry



- 1 Establish a common language btw. ICT & OT
- 2 Reflect OT needs in standardization & regulation
- 3 Analyze how 5G may enhance the Industrial IoT

- 4 Identify relevant certification & testing needs
- 5 Develop a sustainable Industrial 5G ecosystem
- 6 Promote Industrial 5G worldwide

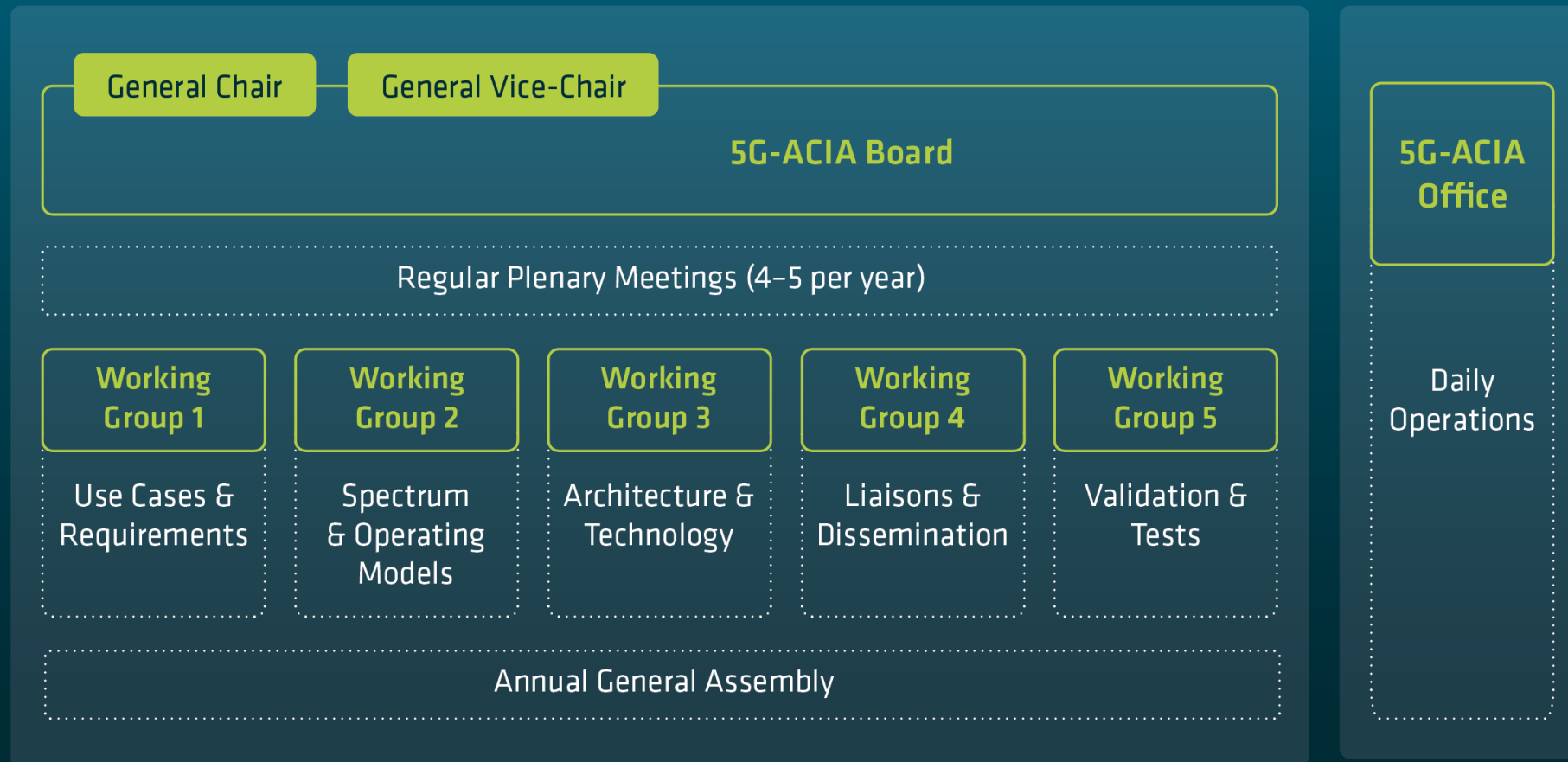
**5G-ACIA as the globally leading organization for driving and shaping Industrial 5G**

# Members




Status: April 2021

# Working Group Structure



Main technical discussions take place in virtual working group meetings. Approvals in plenary meetings.

# Selected Achievements



## Use Cases and Requirements Analysis



## 3GPP Market Representation Partner

### 5G for future industry

November 9, 2018

This week, the 5G Alliance for Connected Industries and Automation (5G-ACIA) has been approved as a Market Representation Partner (MRP) in 3GPP.

The 5G-ACIA membership base includes a number of industrial equipment suppliers and end-users as well as ICT companies; with the automotive, energy, industrial manufacturing and production sectors all represented.

As 3GPP technology is now being applied to a diverse number of 'verticals', this is the best possible time for the 5G-ACIA to bring a coordinated industry based approach to the standards process, one that will help to align 3GPP to the 5G-ACIA vision to bring the "best possible applicability of 5G technology and 5G networks for the manufacturing and process industries".

After the formal approval process, by the seven 3GPP Organizational Partners (National and Regional SDOs), 5G-ACIA has been accepted as a 3GPP Market Representation Partner, as of November 2, 2018.



5G-ACIA is the voice of the automation industry towards 3GPP (and vice versa)

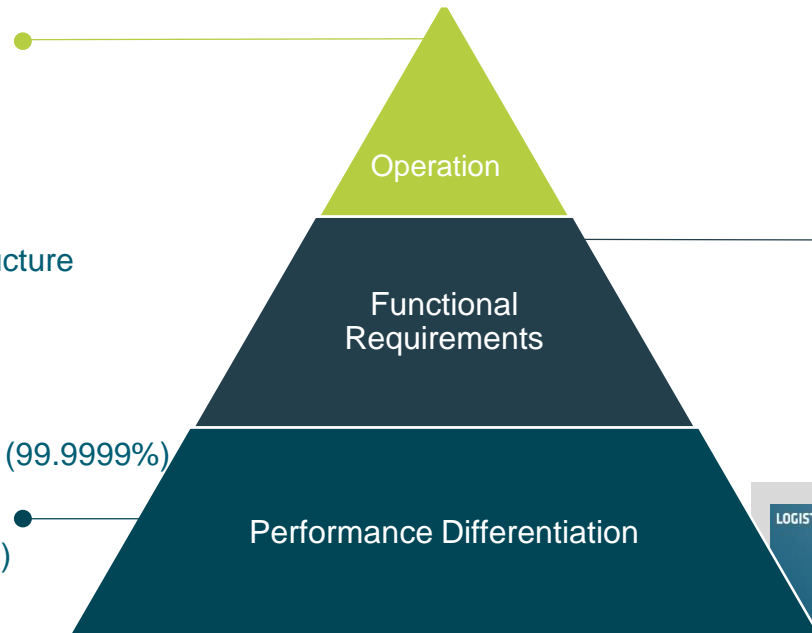
# Multi- dimensional Industrial 5G Requirements

## Requirements / Challenges

- high flexibility and versatility
- increasing number of mobile assets
- service guarantees and 24/7 operation
- ease of use
- integration of installed network infrastructure

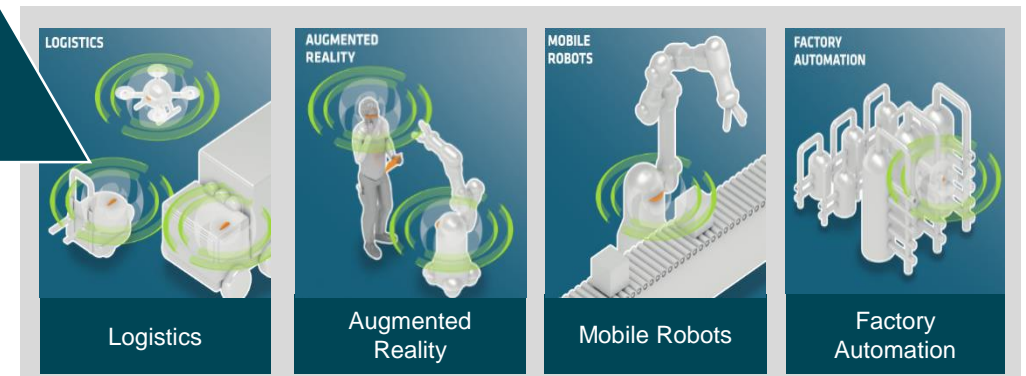
## Key Performance Indicators

- high communication service availability (99.9999%)
- ultra-low latency (< 1..10 ms)
- cyclic traffic (transfer interval 1..250 ms)
- transmission rate
- typical service area (~1..1000 m<sup>2</sup>)



## Functional Requirements

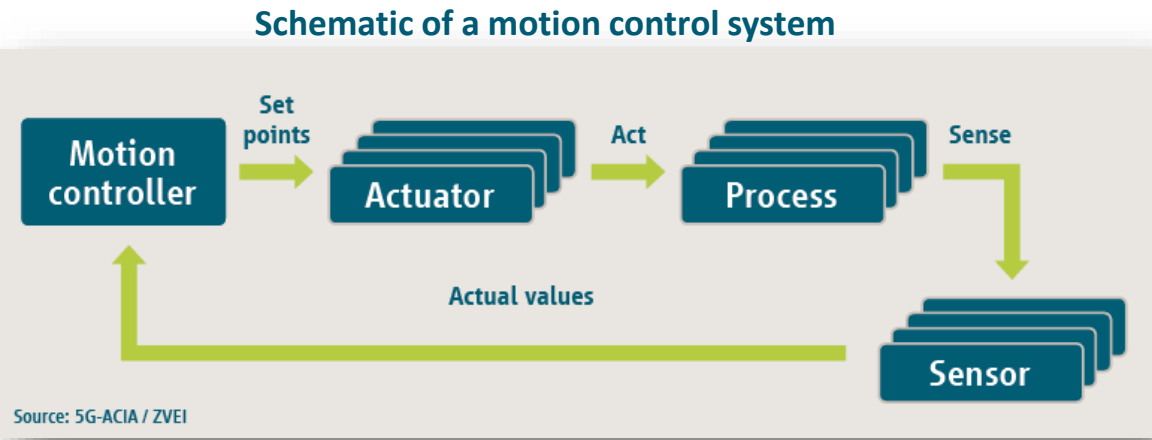
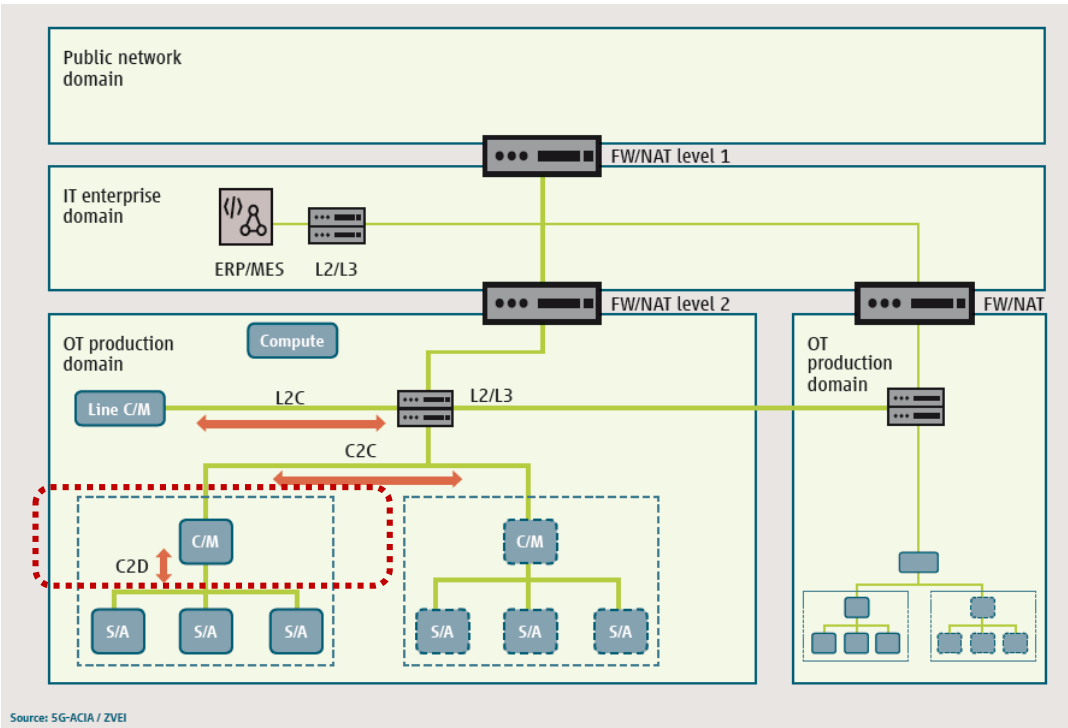
- Non-public operation (NPN)
- Security (e.g. non-3GPP credentials)
- Time synchronization ( $\pm 1 \mu s$ )
- Integration with existing industrial communication networks
- Support of time-sensitive networking (TSN)
- Communication Service Interface / API for operations and management by vertical
- QoS Monitoring
- Positioning



Source: 5G-ACIA/ZVEI

# Example Use Case and Requirements (1/2)

## Motion Control



- Line controller-to-controller (L2C) and controller-to-controller (C2C) communication
- Controller-to-device (C2D) communication

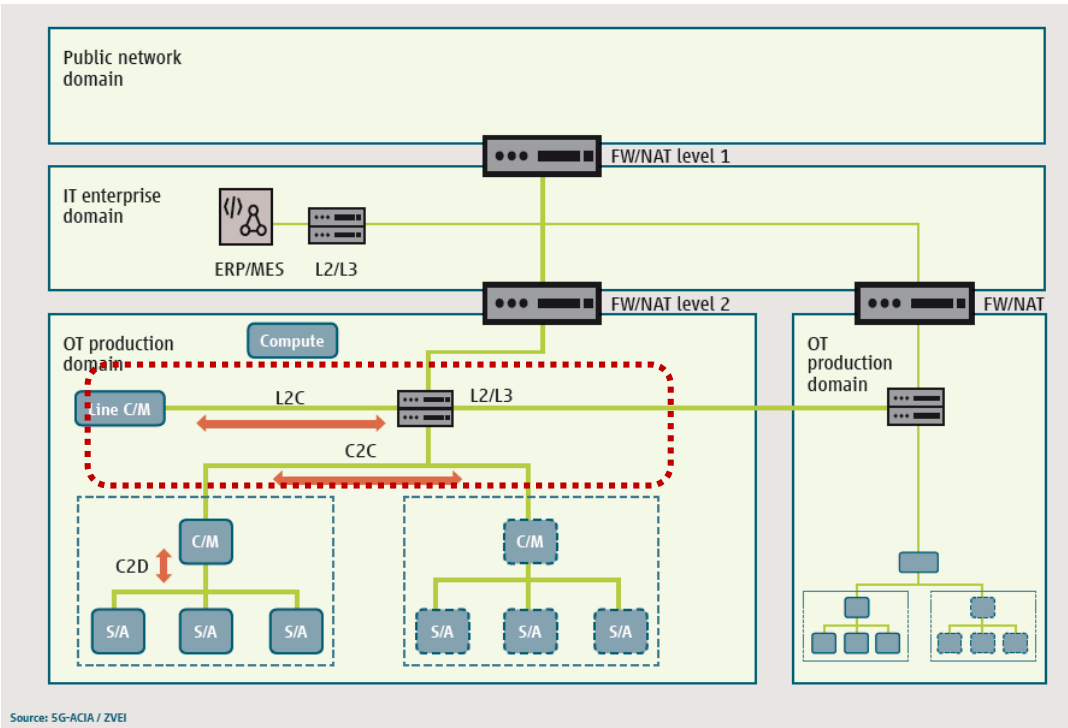
CSA: Communication service availability  
CSR: Communication service reliability  
MTBF: Mean time between failures

Use case (high level)		CSA (%)	CSR (MTBF)	Transfer interval	Survival time	Message size (byte)	# of devices	Typical service area
Motion Control	Printing machine	>=99.9999	~ 10 years	< 2 ms	2 ms	20 bytes	>100	50 m x 10 m x 10 m
	Machine tool	>=99.9999	~ 10 years	< 0.5 ms	0.5 ms	50 bytes	~20	50 m x 10 m x 10 m
	Packaging machine	>=99.9999	~ 10 years	< 1 ms	1 ms	40 bytes	~50	50 m x 10 m x 10 m



# Example Use Case and Requirements (2/2)

## Control to Control



Source: Siemens AG

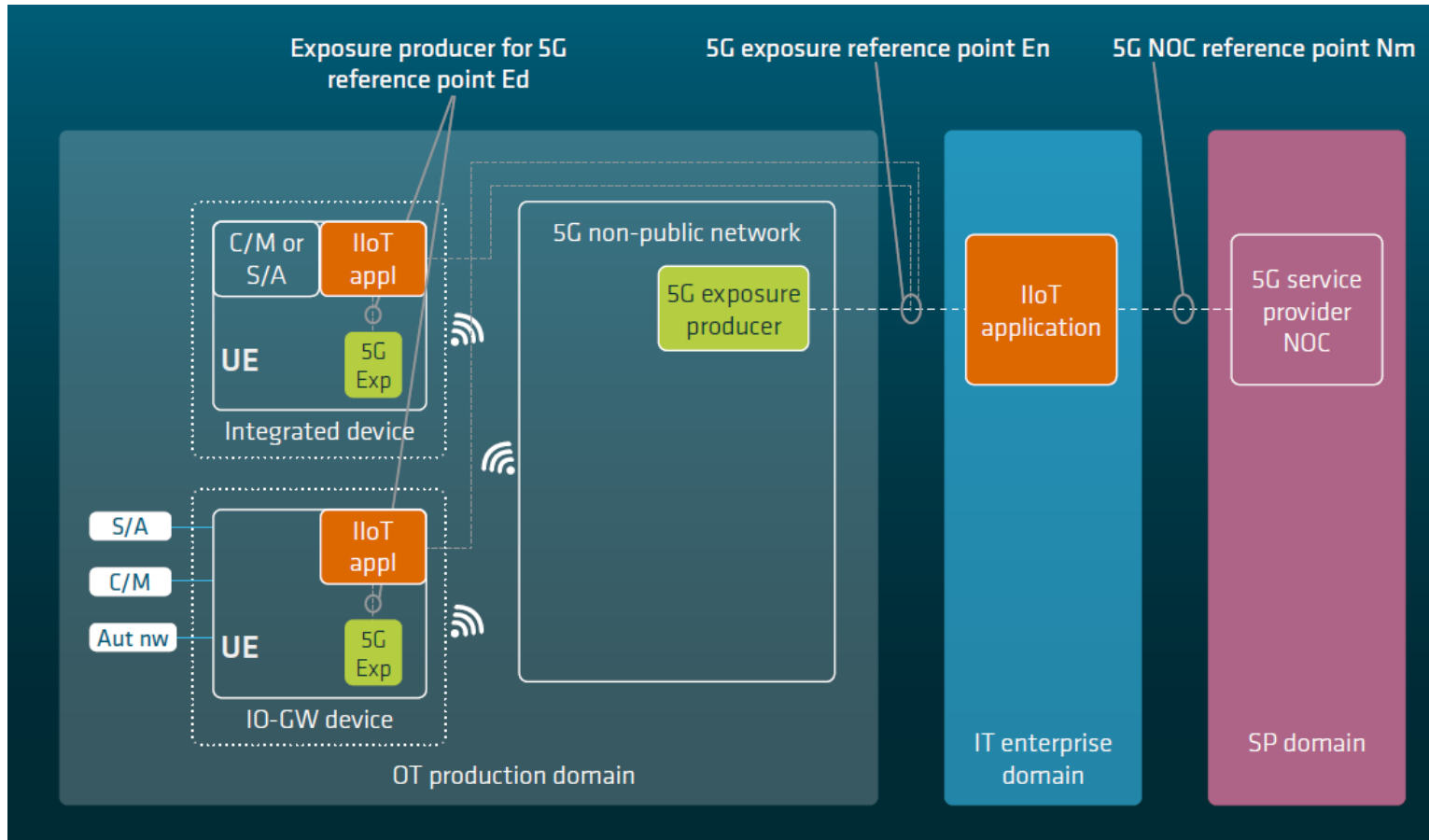
- Line controller-to-controller (L2C) and controller-to-controller (C2C) communication
- Controller-to-device (C2D) communication

CSA: Communication service availability  
CSR: Communication service reliability  
MTBF: Mean time between failures

Use case (high level)		CSA (%)	CSR (MTBF)	Transfer interval	Survival time	Message size (byte)	# of devices	Typical service area
Control to Control	Large Printing machine	≥ 99.9999	~ 10 years	≤ 10 ms	10 ms	1 k	5 to 10	100 m x 30 m x 10 m
	Machines in an assembly line	≥ 99.9999	~ 10 years	≤ 50 ms	50 ms	1 k	5 to 10	1000 m x 30 m x 10 m



# 5G Capabilities Exposure Interface



## • Device management

- Device identity management
- Device provisioning and onboarding
- Device connectivity management
- Device connectivity monitoring
- Device group management
- Device location information

## • Network management

- Network monitoring
- Network configuration and maintenance

## What is a Non-Public 5G Network?



A Standard-Compliant  
5G Network



Only for a  
Restricted Set  
of Users



Local  
Deployment  
(e. g. Factory)



### Motivation

Performance / QoS<sup>1</sup>

Security

Isolation

Accountability

<sup>1</sup>Quality of service

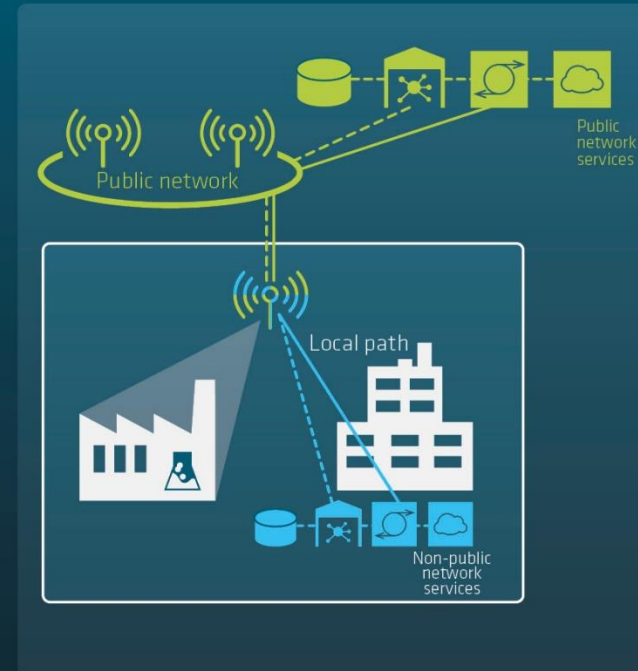
# Non-Public Networks

## Different Deployment Options

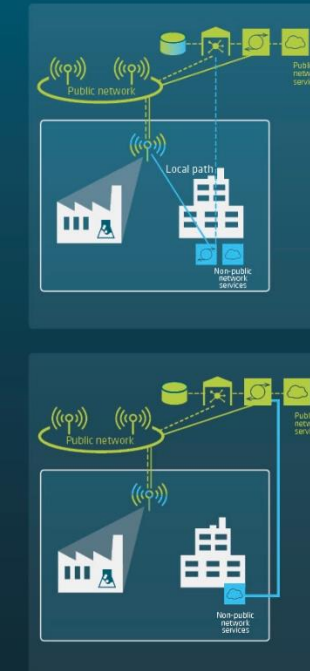
Example 1: Standalone Non-Public Network



Example 2: Shared Radio Access Network



Further Options



→ The world is not black and white – many flavors of non-public networks exist!

Global connectivity

Data privacy through isolation

Service continuity

Control and management  
Privacy through isolation

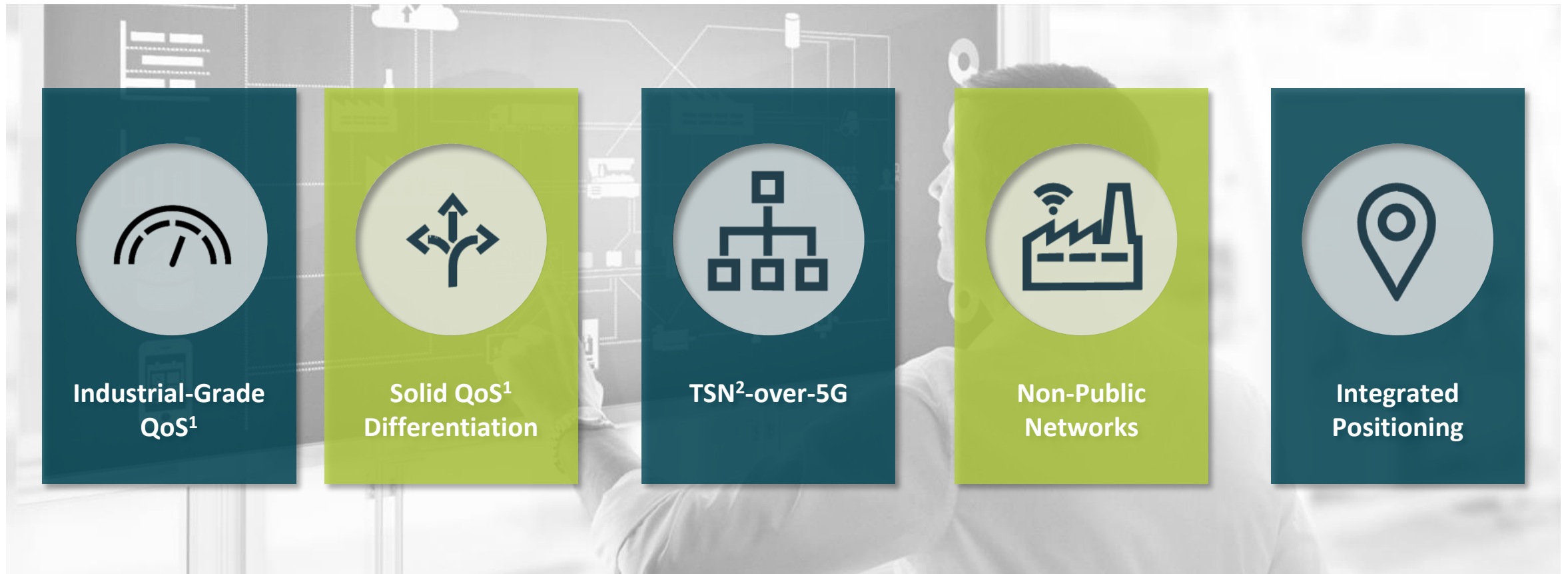
Latency and availability

Flexibility in choice of security mechanisms

Access to monitoring data and O&M functions

Global availability of security mechanisms

# Important Enablers for Industrial 5G



(1) Quality-of-Service (2) Time-Sensitive Networking

Image: BOSCH

# Selected Ongoing Activities



## Use Cases and Requirements

Constant updates and collecting input to 3GPP SA1 Service level specification (SLS) for IIoT



## Industrial 5G Devices

Aligned view on how to build an Industrial 5G device (e.g. general architecture)



## Integration with OPC UA

How to combine OPC UA with 5G in an efficient manner?



## Market Study

Accurate assessment and tracking of the overall Industrial 5G market



## Device Certification

Is there a need for new / additional certification schemes or is the status quo sufficient?



## IIoT 5G Capabilities

Analyze and explain specific features of 5G that are particularly relevant for the IIoT

# Summary



- 1** 5G-ACIA leads the discussions on use cases & requirements for Industrial 5G
- 2** 5G-ACIA works on common understanding and terminology of networking topics between ICT/OT
- 3** 5G-ACIA provides its understanding on Non-Public Networks (from theory to deployment)
- 4** 5G-ACIA will continue working on the technical and non-technical challenges of Industrial 5G.
- 5** 5G-ACIA has strengthened its position as the globally leading think tank and forum for driving and shaping Industrial 5G.





# Thank you!

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