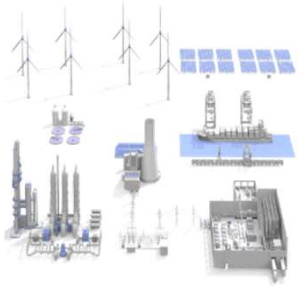
5G mobile radio standard



Communication Interfaces – Overview 2021



Products



Application references

NearFi Technology
Designed by Phoenix Contact

PROFIBUS

TRUSTED WIRELESS

Technologies

PoE

HART

5G

"PAVE THE WAY FOR FUTURE BUSINESS"
by addressing relevant trends

SPE & APL

5G

TSN

OPC UA

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Technologies

HART Technology

PoE Power over Ethernet

TRUSTED WIRELESS

Remote communication

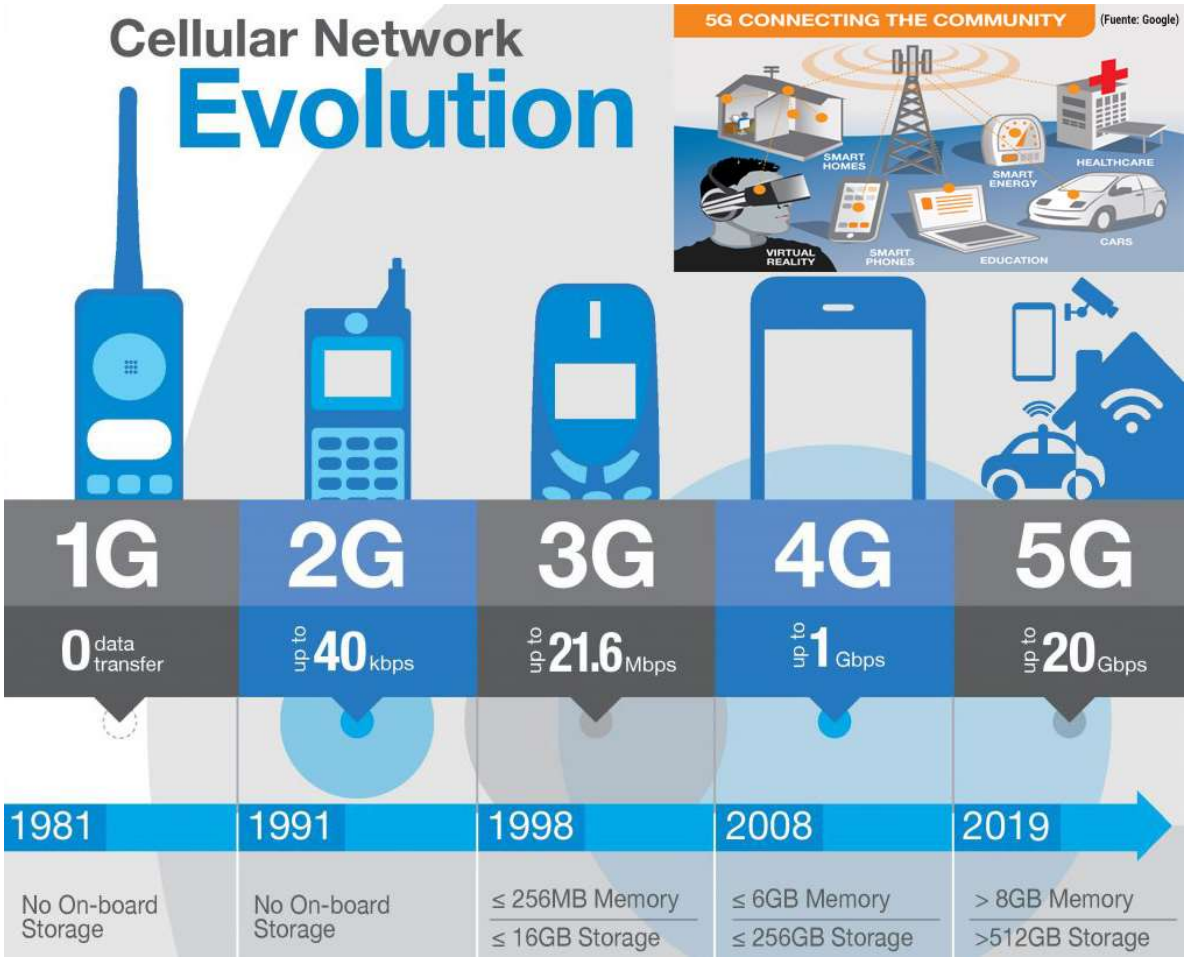
PROFIBUS

5G

new

NearFi Technology
Designed by Phoenix Contact

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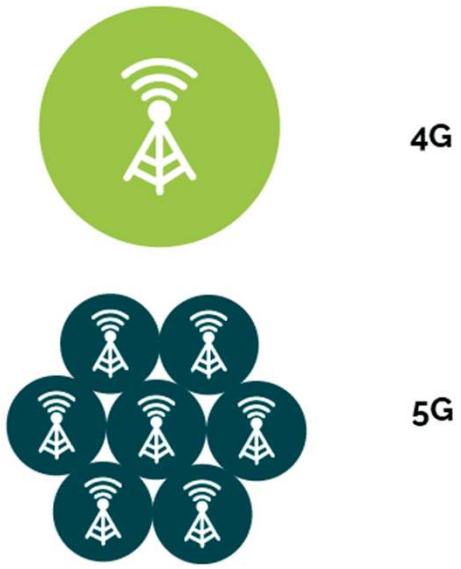


Fuente Google

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Células pequeñas

Las celdas pequeñas son clave para la funcionalidad de las redes 5G porque proporcionan la capacidad de datos aumentada que exige 5G. Ayudan a los proveedores a reducir costos al eliminar costosos sistemas de techo y costos de instalación. Los usuarios pueden esperar un mejor rendimiento y una mayor duración de la batería de los teléfonos móviles, ya que se requiere menos energía para transmitir datos a algo cercano.



Fuente Red 5G y cómo se compara con antiguas redes - Bismark Colombia

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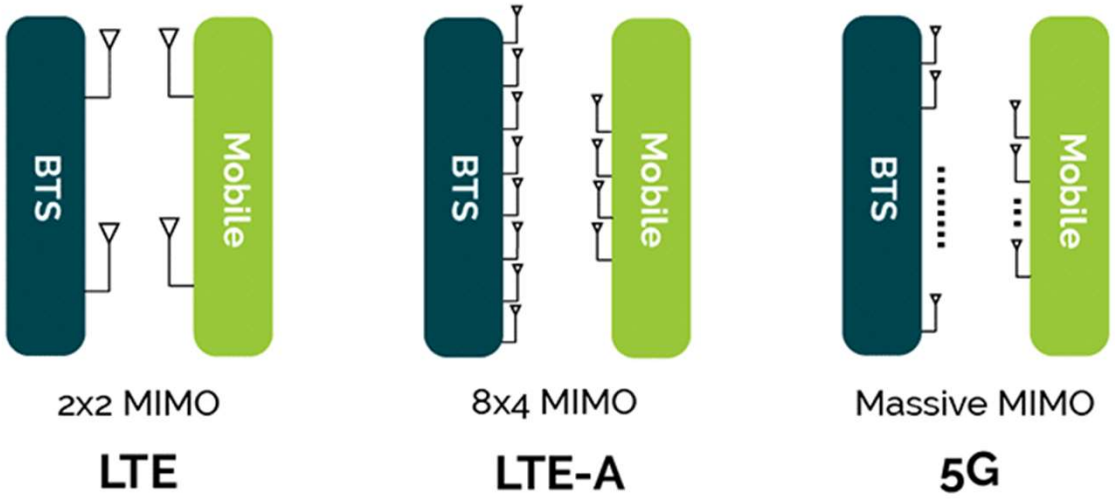
Features	4G	5G
3GPP Release	Rel.8 ~14	Rel.15 ~
Speed	100Mbps	10Gbps ~
Carrier Bandwidth	20 Mhz	1000Mhz
MIMO	8	256
Latency	100ms	1ms
Mobility	350 KM/h	500KM/h
Connection Density	10,000	1,000,000

Fuente Red 5G y cómo se compara con antiguas redes - Bismark Colombia

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MIMO masivo

Las antenas masivas MIMO (entrada múltiple y salida múltiple) aumentan el rendimiento del sector y la densidad de capacidad al usar un gran número de antenas y MIMO multiusuario (MU-MIMO). Cada antena se controla individualmente y puede incorporar componentes de radio transmisor-receptor.



Fuente [Red 5G y cómo se compara con antiguas redes - Bismark Colombia]

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What does 5G offer to the industry?

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5G –

stepping into a new era



New mobile radio standard with advanced features for

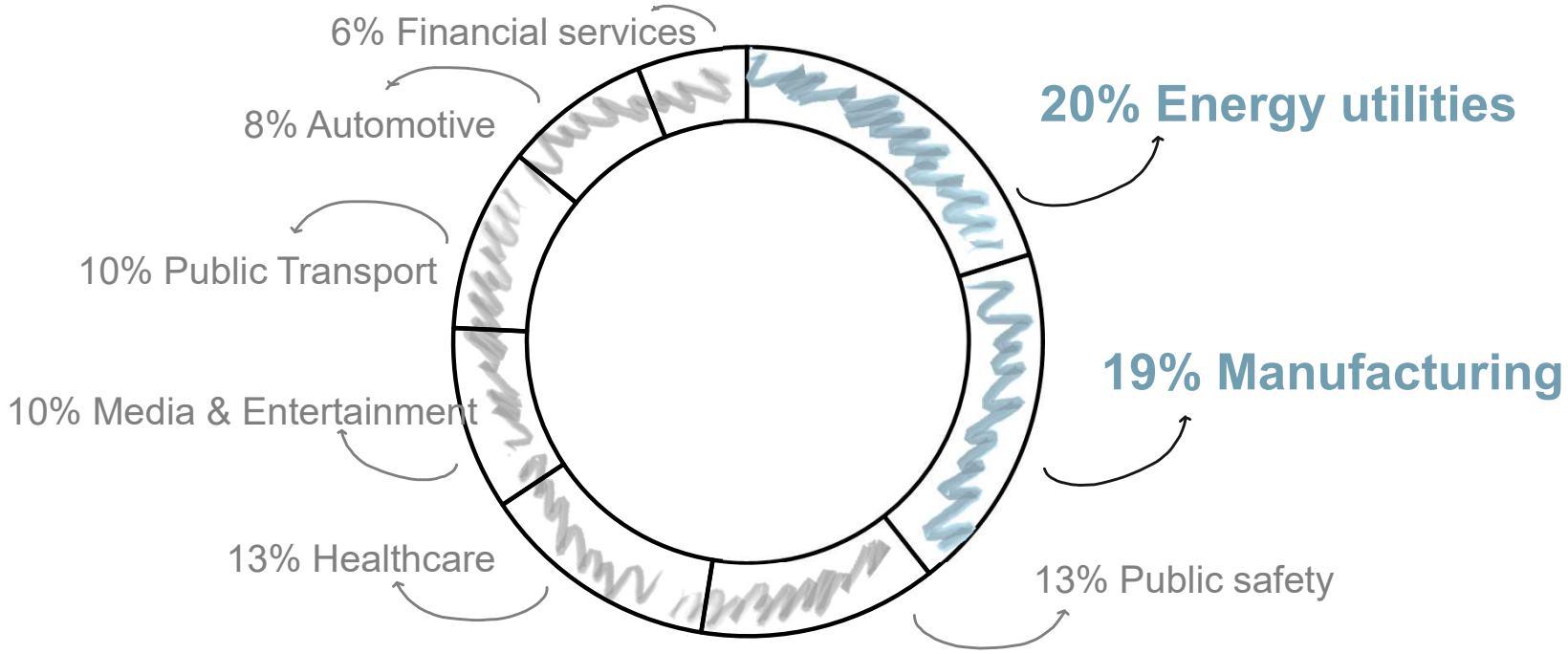
real-time, low latency, high bandwidth and high-density type applications.

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Where is it being used?

POTENTIAL FOR 5G IN INDUSTRIAL APPLICATIONS

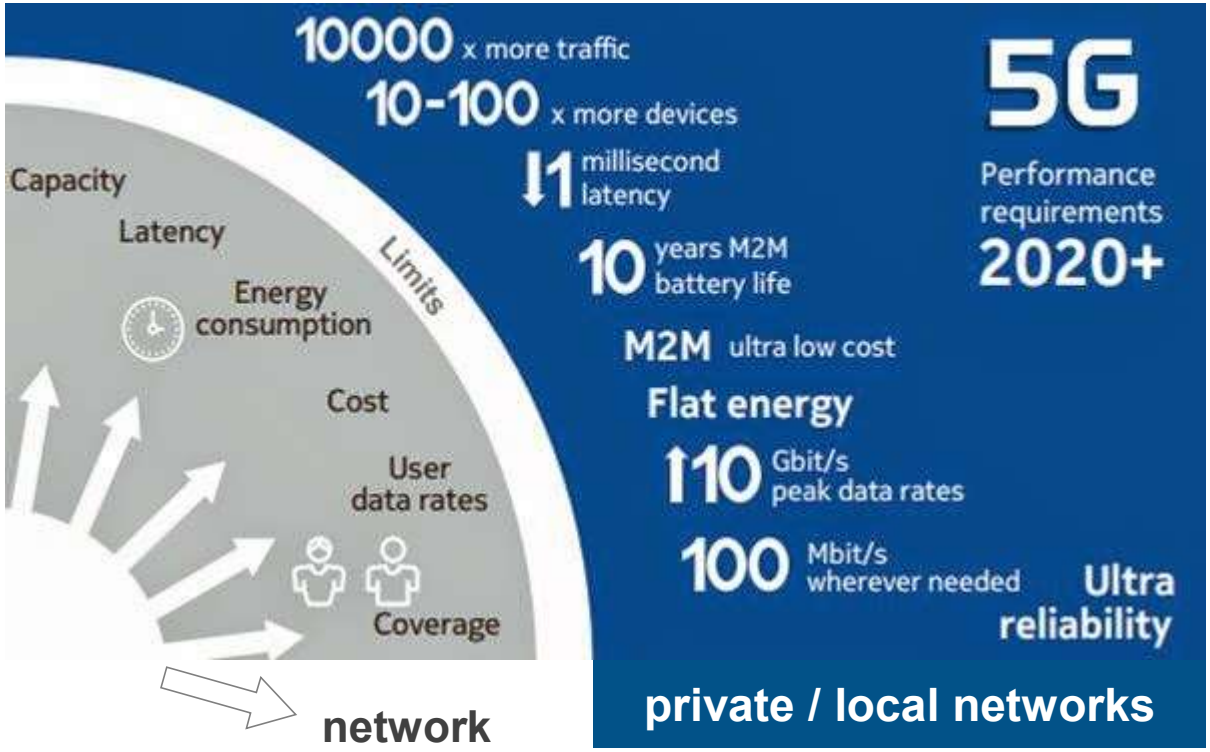


Source: Ericsson and Arthur D. Little

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5G – stepping into a new era

What 5G promises the industrial automation world



Source: Nokia

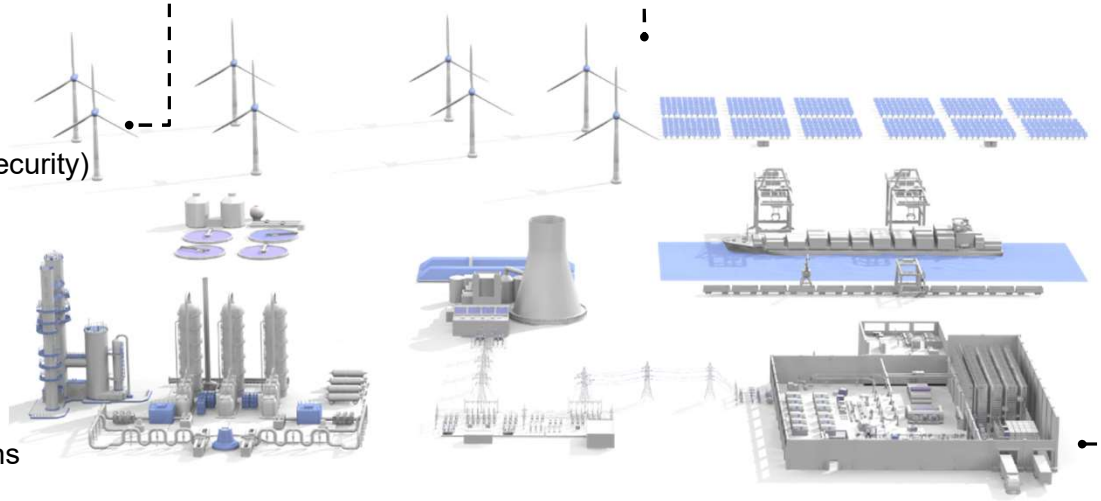
APPLICATIONS FOR 5G IN AUTOMATION?

Infrastructure

- ✓ Monitoring in Water/ Wastewater networks
- ✓ Monitoring and Control in distributed traffic networks
- ✓ Traffic signaling
- ✓ Video Surveillance (public security)

Process-automation

- ✓ ✓ Preemptive maintenance
- ✓ ✓ Asset tracking
- ✓ ✓ Monitoring plant conditions
- ✓ ✓ Product monitoring
- ✓ ✓ Augmented reality
- ✓ ✓ Plant Asset management
- ✓ ✓ Remote service
- ✓ ✓ Fire & Gas Alarms



Energy

- ✓ Monitoring and switching in distributed energy grids

Factory-automation

- ✓ Remote service
- ✓ Electric monorail conveyers
- ✓ AGVs & Shuttles
- ✓ Robots & Cranes
- ✓ Handlings-Machines
- ✓ Packaging machines
- ✓ Moving/rotating Machine parts

✓ Local Communication ✓ Global Communication

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INSPIRING INNOVATIONS

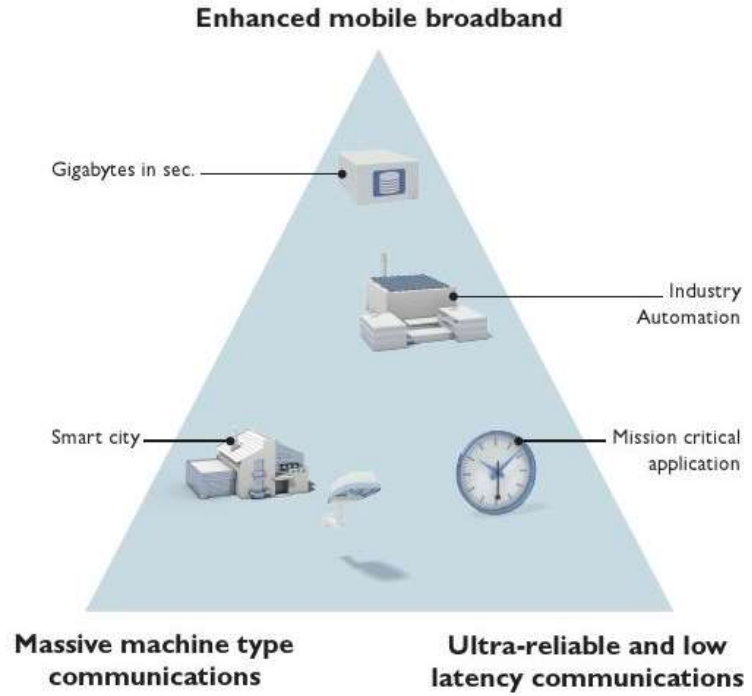


Advantages and features

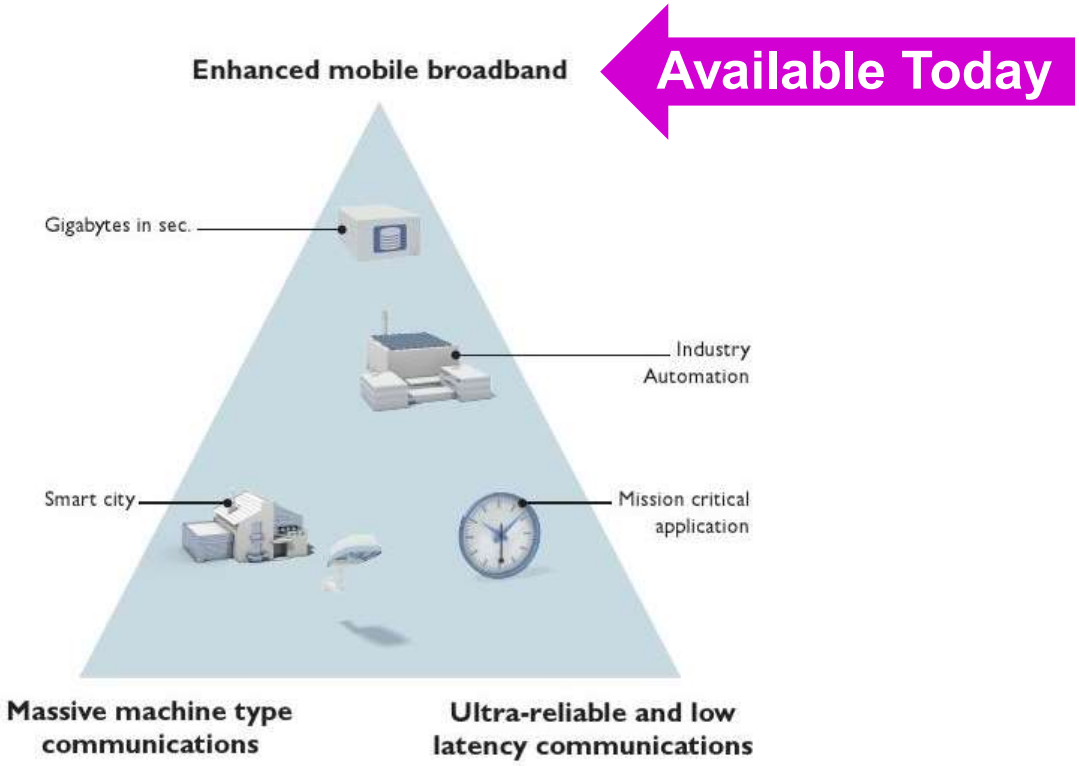
5G FEATURES

- ✓ low latency
- ✓ high connection density
- ✓ high bandwidth
- ✓ comprehensive IIoT connectivity
- ✓ higher flexibility
- ✓ …

→ **not at once, but assignment to the respective application areas**



5G COMES IN STEPS



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Special feature: private networks

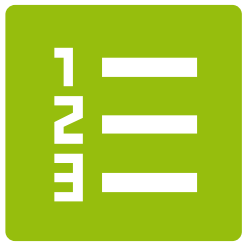
MOTIVATION TO USE 5G IN A PRIVATE NETWORK



One infrastructure for many use cases



Each use case can get **individual** (guaranteed) **resources**



Applications can be prioritized by plant / factory owner





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5G IN A PRIVATE NETWORK



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What do we offer?



The **first industrial 5G Router** for private networks

Designed by Phoenix Contact

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1st INDUSTRIAL 5G ROUTER FROM PHOENIX CONTACT

QUECTEL



Radio module

1st 5G Radio module vendor on the market



Snapdragon X55 chip
Qualcomm

ERICSSON

Tailor-made 5G Private Networks

- 5G-SA core network competency
- Testlab in Aachen with 5G capability



5G Router
5G SA (Rel. 15)

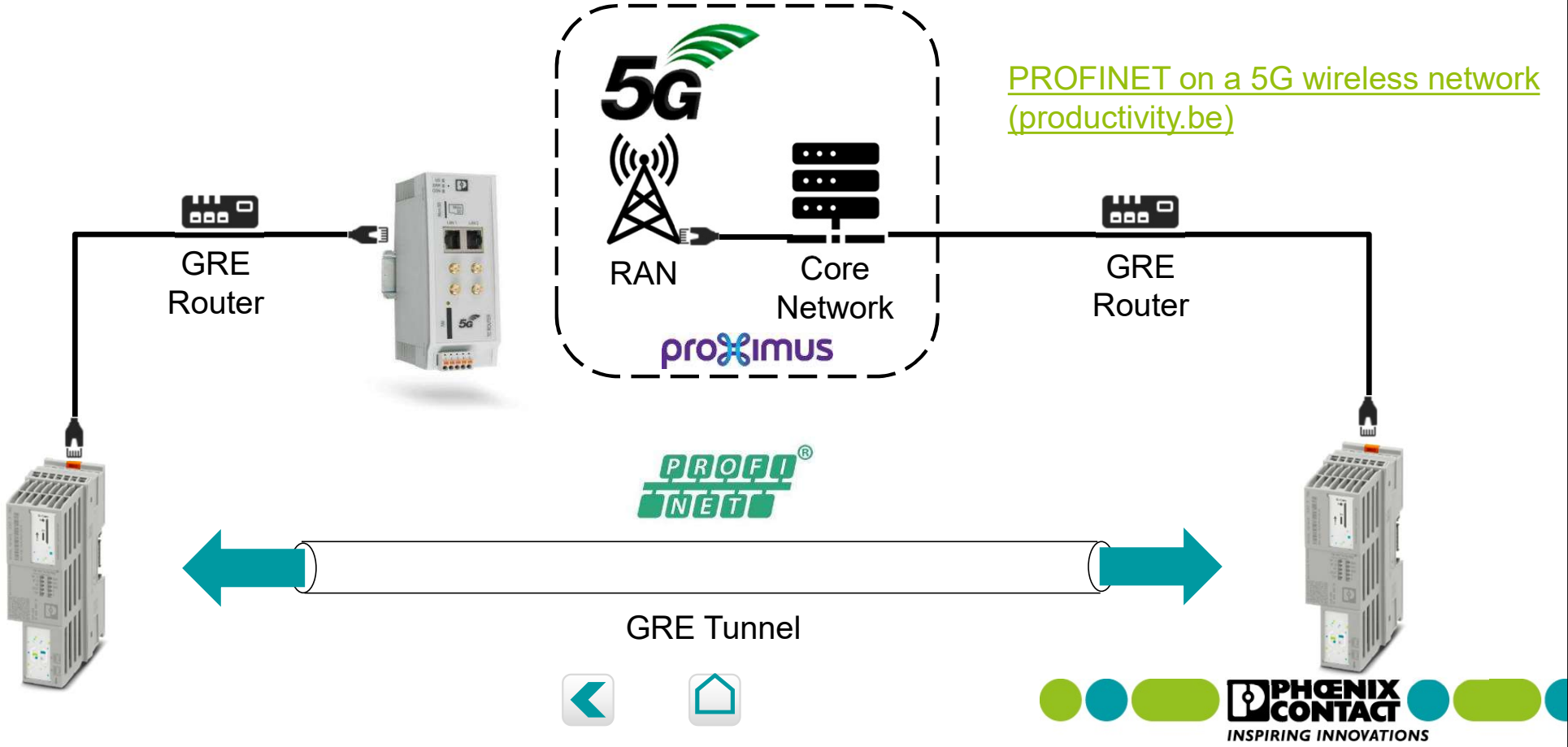
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- Expertise in wireless communication for industrial automation
- 15 years expertise in cellular routers for industrial automation

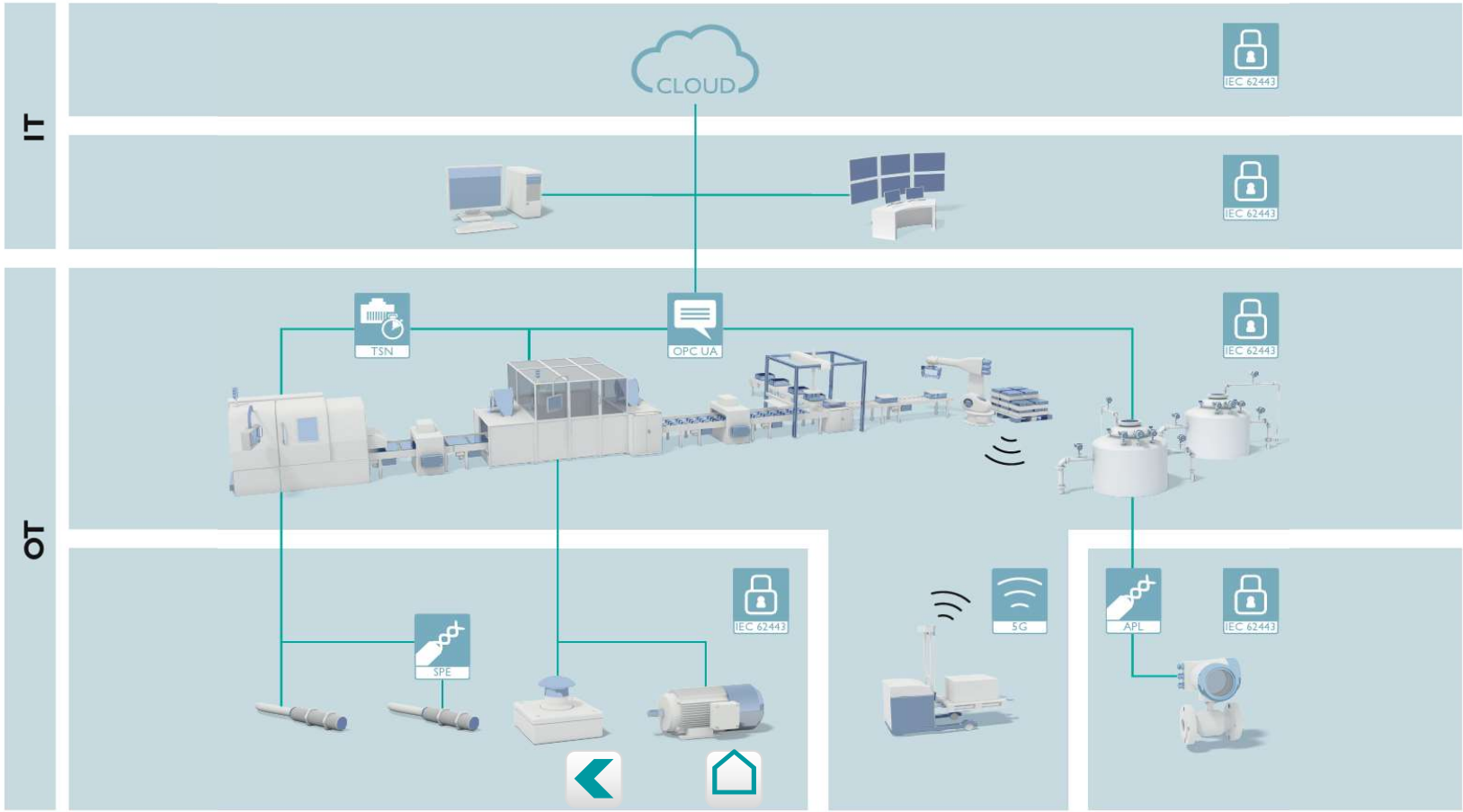
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SUCCESS STORY BELGIUM

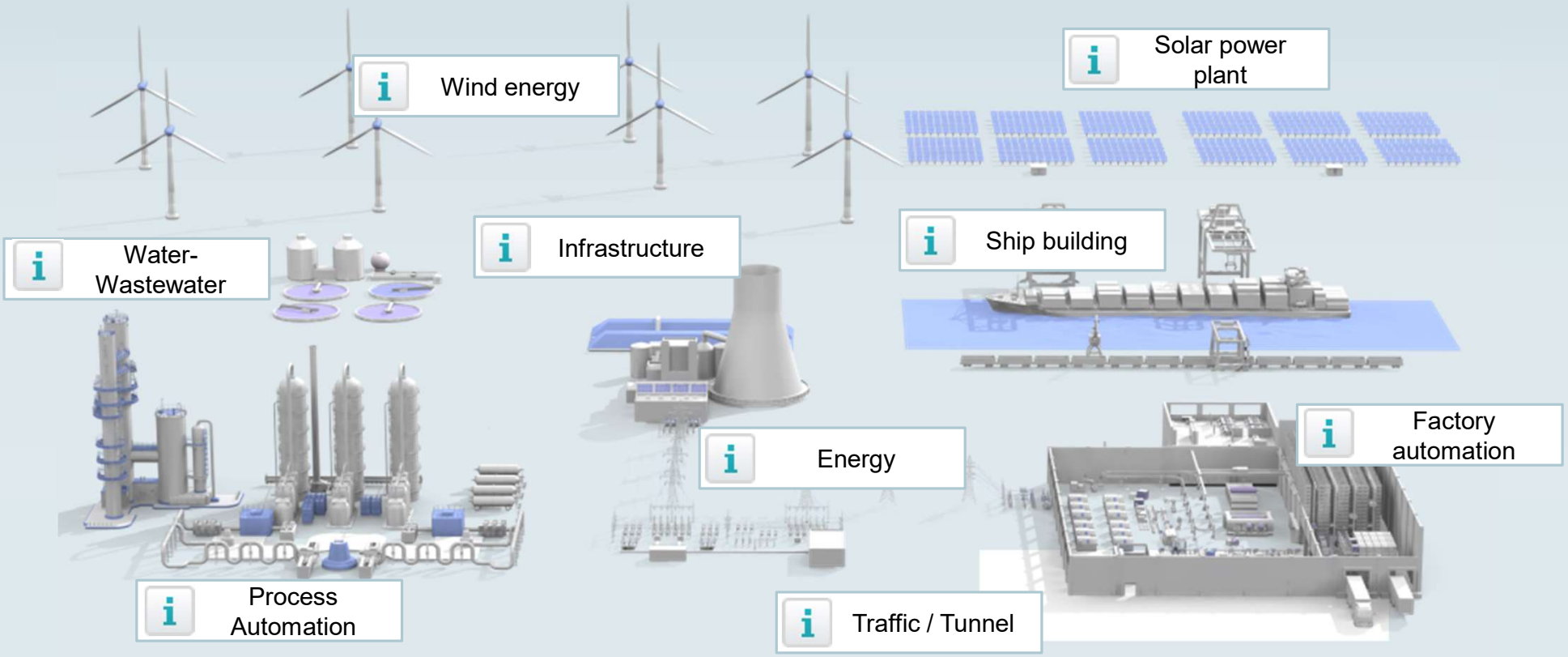


PROFINET on a 5G wireless network (productivity.be)

SEAMLESS COMMUNICATION FROM THE SENSOR TO THE CLOUD



Application references



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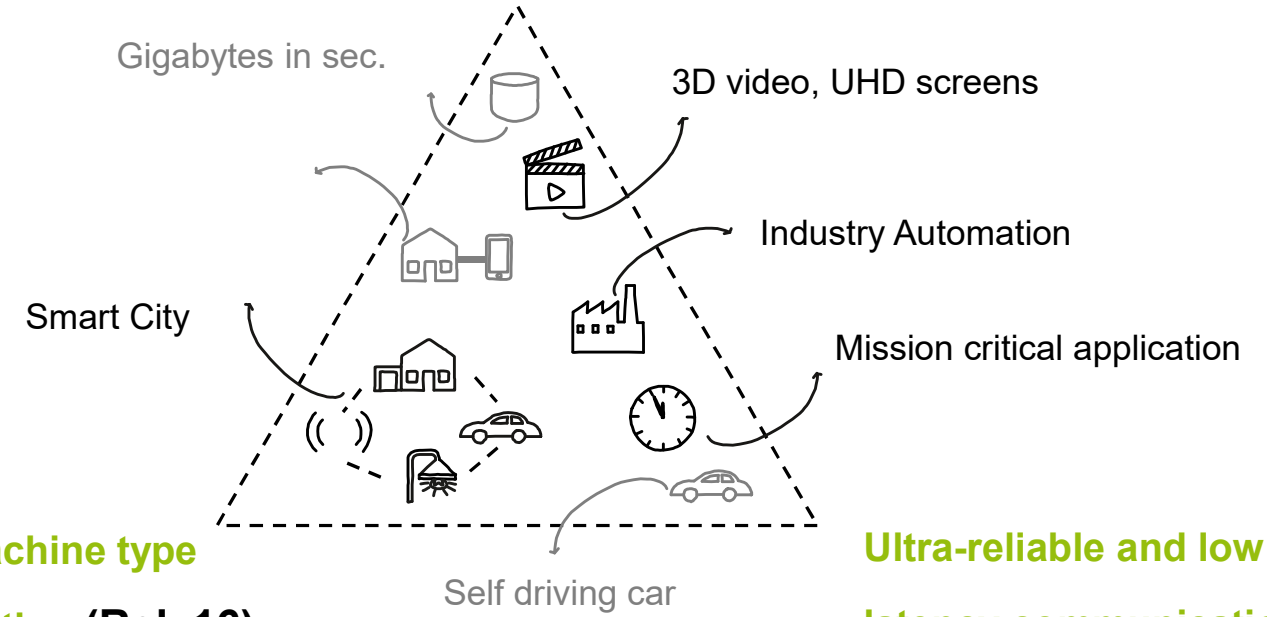
5G – what is that?

- New mobile radio standard
- Should achieve the required flexibility of production in times of Industry 4.0
- supports new advanced features in radio and network communication for realtime, low latency, high bandwidth and high density type applications.
- 5G will be based on a complete new radio technology running on new frequency bands while obtaining good technologies from the LTE era.



5G comes in steps

Enhanced mobile broadband (Rel. 15)

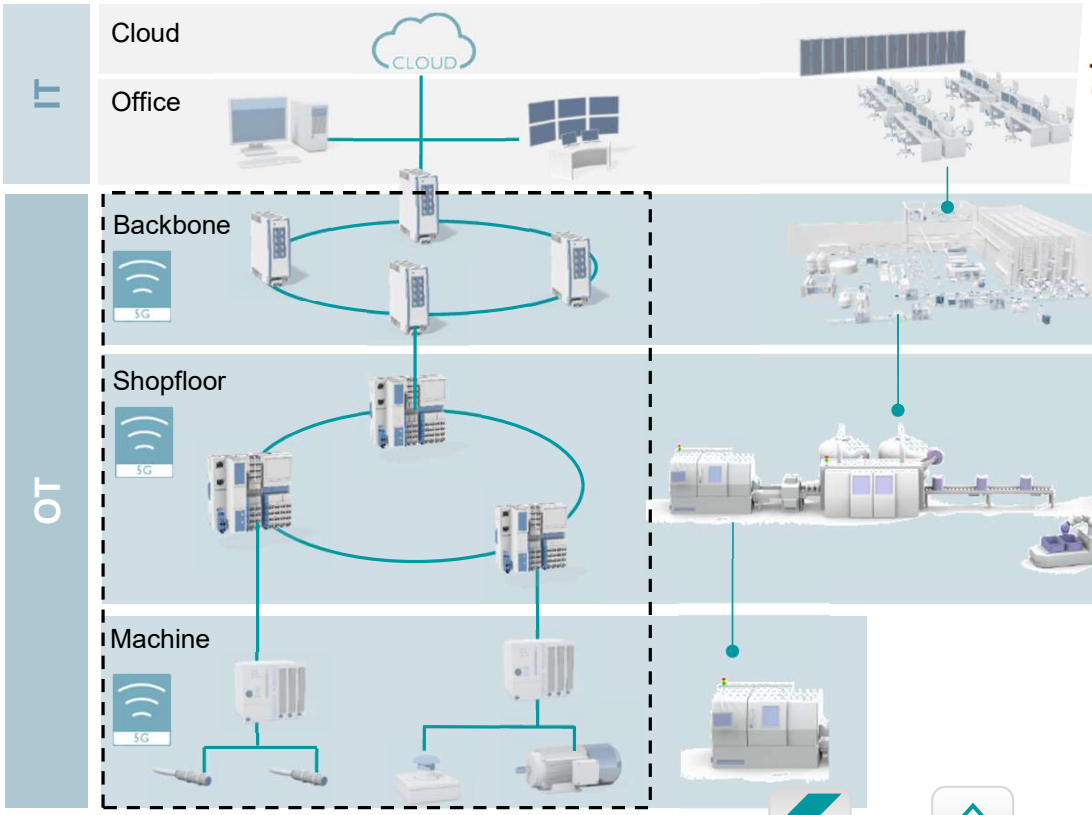


Massive machine type communication (Rel. 16)

Ultra-reliable and low latency communications (Rel. 16 + 17)

5G – stepping into a new era

The potential of 5G – a new communication backbone



5G: The backbone of an economic future where data is the new oil

Information and Technology Council @ictc_ctic

Published: December 7th, 2018

Canada

December 21, 2016 by Noah Rachdi from SMART INDUSTRY FORUM

Will 5G Networks be The Backbone of The Internet of Things?

5 industries to gain the most from 5G

By Caroline Dowling July 31, 2017 Business from Caroline Dowling, Business Group President, Flex

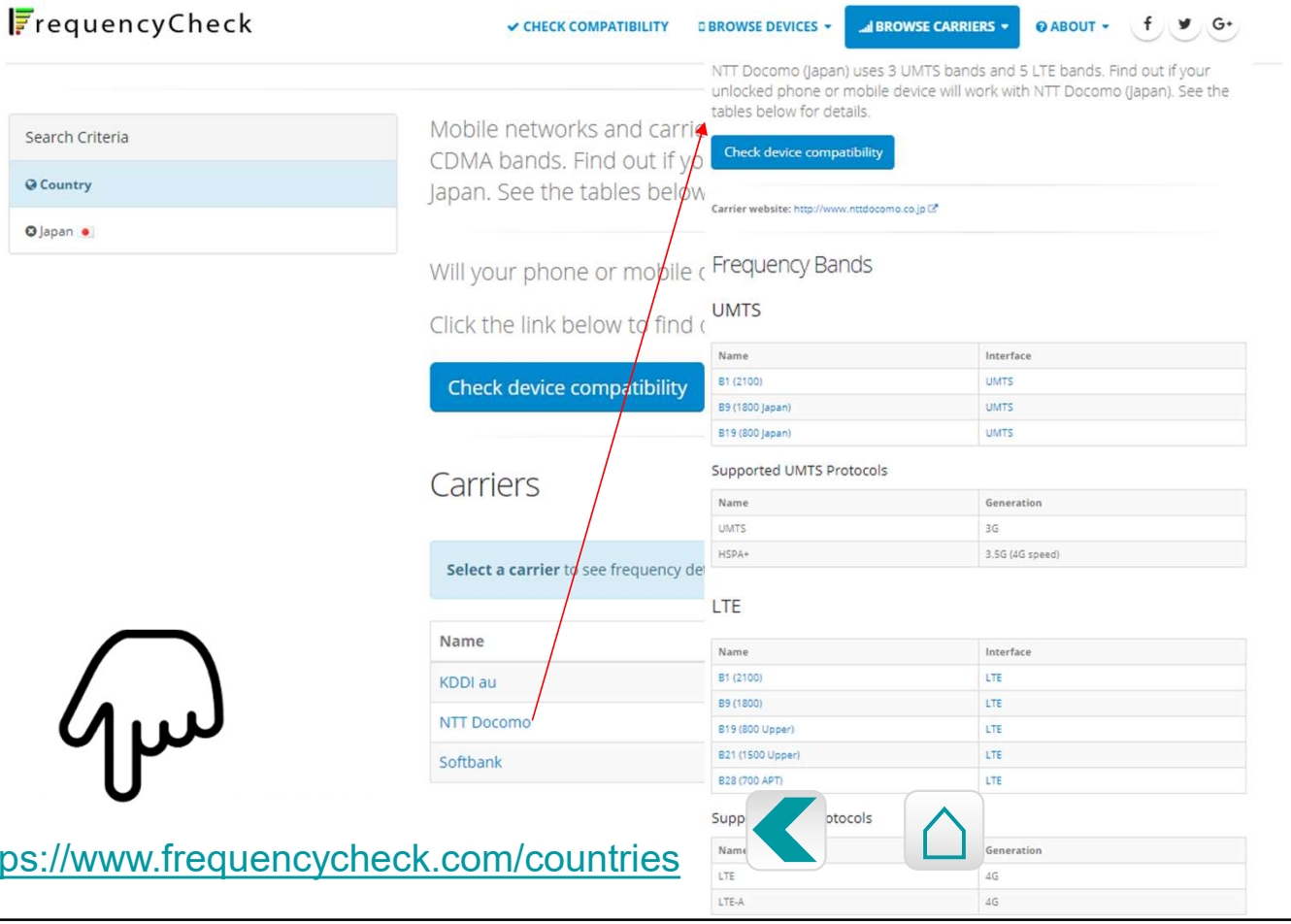
Manufacturing

The 4th industrial revolution is powered by robotics, artificial intelligence, the Internet of Things, 3D printing, Augmented Reality and Cloud technologies, all of which will use 5G technology to allow machine to machine communication. This will become the backbone of manufacturing and related services in the future.

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5G – stepping into a new era

Carriers & Frequency Bands – Which bands in your country?



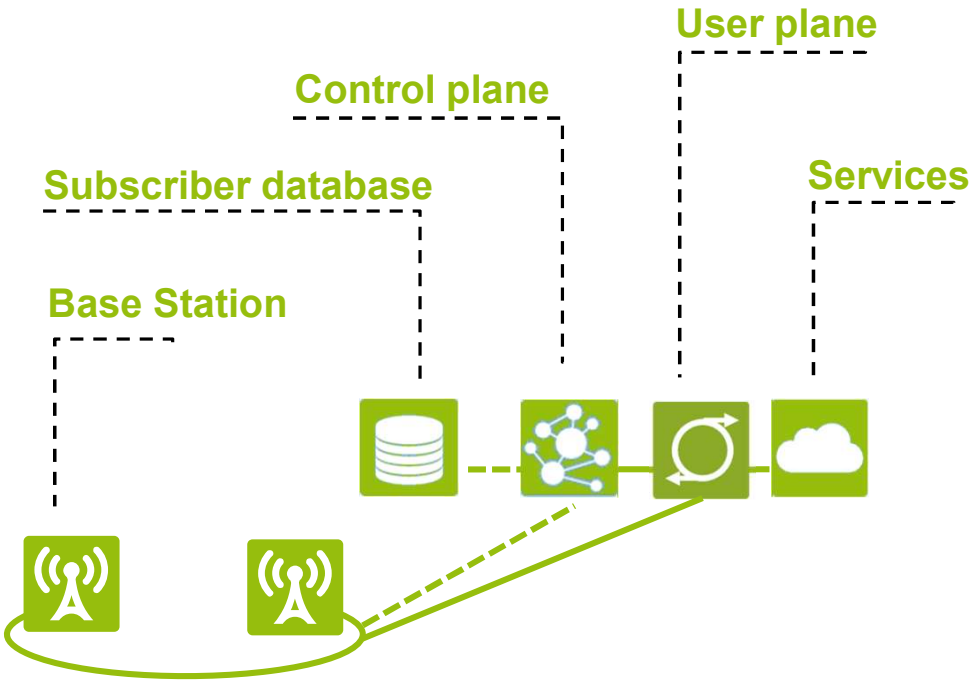


https://www.frequencycheck.com/countries

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5G – stepping into a new era

Public 5G network



Base station: Where the radio network (RAN) begins

Control plane: Management of the devices

Subscriber database: Registration of the devices

User plane: Runs the data traffic

Services: E.g. voice, data, SMS, MMS, etc.

NSA = non stand alone

5G

4G

SA = stand alone

5G

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5G – stepping into a new era

Private 5G network (non-public-network NPN)

Public cellular networks as well as WIFI networks often don´t fulfill all requirements in regards to:

- Coverage
- Availability
- Reliability
- Manageability
- Security
- Quality of service
- Transparency



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5G – stepping into a new era

Motivation to use 5G in a private network



- One infrastructure for many use cases
- Use cases can range from anything to everything
- More uses cases, more benefit



- Network resources are managable
- Each use case can get individual (guaranteed) resources
- Quality of service = guaranteed



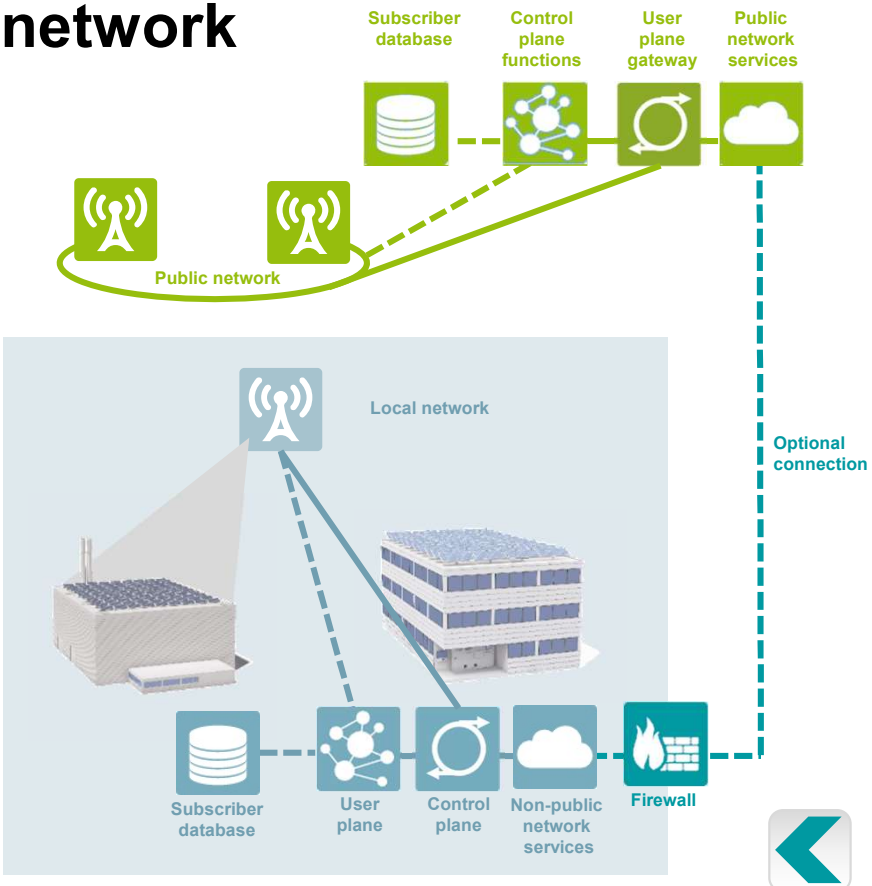
- Applications can be prioritized by plant / factory owner





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Private 5G network, non-public-network (NPN), or campus network



Two physically isolated networks

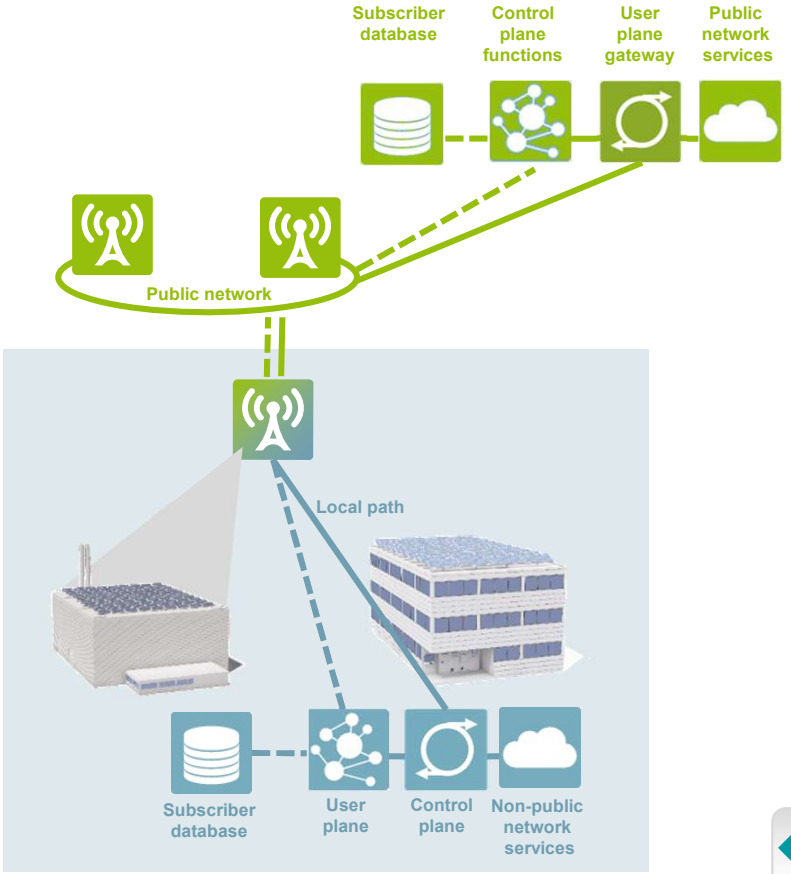
- isolated deployment
- most likely diverged frequency bands (e.g. GER, UK, JP, …)
- owner has full control
- different network IDs

You want to know all details about private networks? Please download the 5G-ACIA brochure „Non-public-networks for industrial scenarios“ from www.5g-acia.org

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5G – stepping into a new era

More non-public-networks – Shared RAN



Base station is part of both networks (private and public)

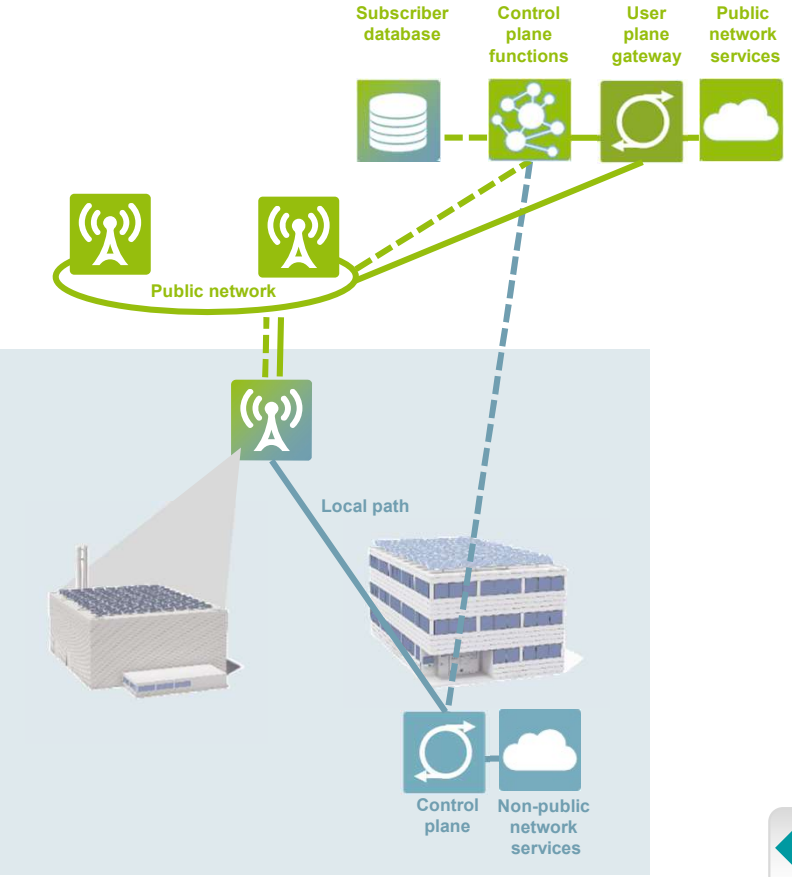
- Supports services, which are pure locally and services which are part of the public network (e.g. voice)

You want to know all details about private networks? Please download the 5G-ACIA brochure „Non-public-networks for industrial scenarios“ from www.5g-acia.org

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5G – stepping into a new era

More non-public-networks – Shared RAN and control plane



Base station is mainly part of public network

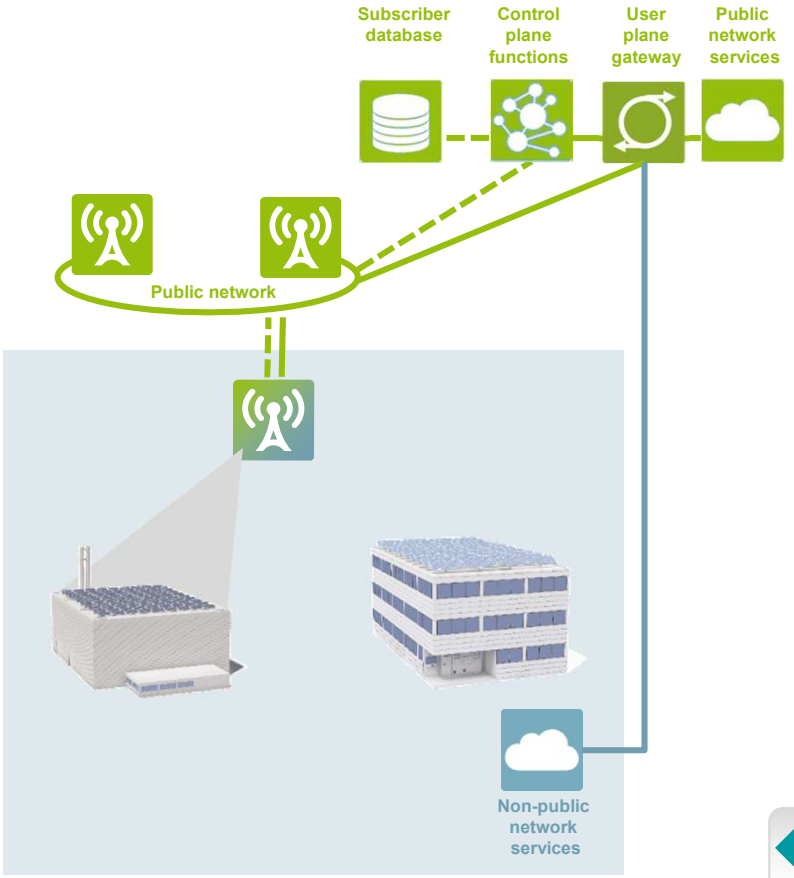
- Physical communication into public network for control & management
- Connection of BS into company network for process data
- Virtual „private Network“ e.g. by means of network slicing

You want to know all details about private networks? Please download the 5G-ACIA brochure „Non-public-networks for industrial scenarios“ from www.5g-acia.org

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5G – stepping into a new era

More non-public-networks – NPN deployed in public network



Base station is totally integrated into public network

- Physical communication into public network
- Not only control but also process data runs through public network
- Virtual „private Network sources“ e.g. by means of network slicing

You want to know all details about private networks? Please download the 5G-ACIA brochure „Non-public-networks for industrial scenarios“ from www.5g-acia.org

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5G – stepping into a new era

1st industrial 5G Router from Phoenix Contact

QUECTEL



Radio module



Snapdragon X55 chip
Qualcomm

1st 5G Radio module vendor on the market

ERICSSON

Tailor-made 5G Private Networks

- 5G-SA core network competency
- Testlab in Aachen with 5G capability



5G Router
5G SA (Rel. 15)

PHOENIX CONTACT



- Expertise in wireless communication for industrial automation
- 15 years expertise in cellular routers for industrial automation

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5G – stepping into a new era

Our focus: SA-networks

- Focus on SA-networks (private networks – totally isolated – separate spectrum)
- Focus on time-to-market
- Focus on connectivity – not highest bandwidth or shortest latency



Customers want to test and try

- A 5G private network – how does it work?
- Can I operate it? Do I need a specialist? Outsourcing, or self operated?
- How to manage the applications?
- How to prioritize?
- etc.

Phoenix Contact wants to

- discuss with customers on „real“ needs for private networks, but not on power point only
- learn what the „real“ use cases are, to develop our portfolio accordingly

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5G – stepping into a new era

TC 5G PRIVNET ROUTER



Integrated logbook

Web-based management or **microSD** card for configuration

Two local Ethernet connections

Fallback to 4G (LTE FDD+ TDD), **cat16** and **3G** (UMTS/HSPA)

5G mobile router
5G NR Rel. 15
NSA and SA networks
FDD + TDD

- Mobile communication via 5G New Radio – Rel. 15
- Non stand alone (NSA) and stand alone (SA) operation mode
- IPsec and OpenVPN
- Up to three VPN tunnels simultaneously
- VPN remote start via call or SMS
- Stateful inspection firewall for dynamic filtering

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5G – stepping into a new era

TC 5G PRIVNET ROUTER



Status LEDs
for instant diagnostic

Micro SD Slot
to load configuration

4 MIMO antennas
for best signal reception

Energy Saving Mode
Deactivation of the communication interfaces for max. energy saving

SIM slot for rugged industrial mini SIM card

Switching inputs and outputs

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5G – stepping into a new era

TC 5G PRIVNET ROUTER



Switching inputs and outputs

Two configurable **switching inputs** for following functions:

- SMS can be sent, even to multiple recipients
- E-Mail can be sent, even to multiple recipients
- Controlling an Output at a remote station via SMS
- Restart the router
- Start or stop a mobile data connection
- Switching the Ipsec or OpenVPN connection
- Automatically loading a configuration from a microSD card
- Activating energy-saving mode

One configurable **switching output**, activated by

- Activation by the input at a remote station
- SMS
- Web-based management
- Incoming call
- Connection abort
- Status of the mobile network connection, mobile data link and VPN connection

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5G ACIA

5G Alliance for Connected Industries and Automation

PHOENIX CONTACT

- has initiated the foundation of 5G-ACIA in 2018/2019 together with other OT and ICT companies
- is member from the beginning
- is member of the board from the beginning

Copyright: 5G-ACIA/ZVEI

5G Alliance for Connected Industries and Automation

Initial Members at Hannover 2018



Image: 5G-ACIA/ZVEI



Visit us on www.5g-acia.org

5G Alliance for Connected Industries and Automation

Current Member Overview (66)

5G ACIA
5G Alliance for Connected Industries and Automation



5G Alliance for Connected Industries and Automation
Publications of 5G-ACIA



31.07.2019

5G Non-Public Networks for Industrial Scenarios (White Paper)

This paper describes four industrial (IIoT) deplo defined 5G non-public networks. The paper als particular service attributes that can help to...

Read more



31.07.2019

5G for Automation in Industry (W

This white paper examines how the 3GPP-defi impact industry, in particular process and discr describes the most relevant use cases, and the

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29.03.2019

Selected Testing and Validation Considerations for Industrial Communication with 5G Technologies (White Paper)

The deployment of 5G technologies for industrial automation will bring new challenges for all parties. This document aims to clarify the role and the focus of 5G-ACIA with regard to testing and...

Read more



28.02.2019

5G for Connected Industries and Automation (White Paper -Second Edition)

In this second edition of our 5G-ACIA White Paper, we provide an overview of 5G's basic potential for connected industries, in particular the manufacturing and process industries, and outline...

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Webpage Technologies

Industrial 5G – Wireless networking for efficient processes



5G technology's features and characteristics

Industrial 5G offers users a level of performance that is many times higher in comparison with previous cellular standards. Alongside characteristics such as low latency times (ultra-reliable low-latency communication, URLLC) high connection density (massive machine type communication, mMTC), and bandwidth (enhanced mobile broadband, eMBB), the technology features properties such as comprehensive IIoT connectivity and a higher level of flexibility.

Industrial 5G does not, however, provide all of these superlatives at once. Instead, enables precisely these properties to be assigned to the respective fields of application, and individual resources to be attributed in a private 5G network. It thus offers a triangle of functions that can be used depending on the application.

In other words: Today various wireless technologies (WLAN, WirelessHART, GSM, LTE, etc.) or even wire-based media are used due to differing require future, it will be possible to set up consistent private 5G networks that are adapted to the application.

Private networks – An opportunity for the industrial sector

For industry, the ability to build private networks and thus to be able to control the proper the 5G network itself is 5G technology's special feature. Here, private networks are consic from public networks. They are therefore also known as non-public networks (NPN) or loc

In a private 5G network, several antennas are connected to a 5G base station in order to or private property, for example. This means that the communication infrastructure is con The wireless devices in the application will connect to the independent wireless network r public cellular network.

In the future, Industrial 5G will enable reliable, wireless networking with high data speeds, high numbers of participants, and extremely low latency times. It provides the foundation for scenarios of the future, including Industry 4.0 and the All Electric Society, in which comprehensive networking and smart factories are standard. 5G, the 5th generation of wireless broadband technology, enables users to establish reliable connectivity, which in turn enables flexible, autonomous, and efficient processes from production to logistics.

What exactly is Industrial 5G?

5G is a new cellular standard that, depending on requirements, promises enormous bandwidth in the gigabit range, real-time capability, and high numbers of participants, while offering high-level reliability and security at the same time.

In contrast to previous cellular generations such as 3G and 4G, for the first time 5G also satisfies the industrial sector's demands, meaning that intelligent wireless communication between machines and applications can be

More information? Click here:

Link to Webpage

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“PAVE THE WAY FOR FUTURE BUSINESS”

by addressing relevant trends



SPE & APL



5G

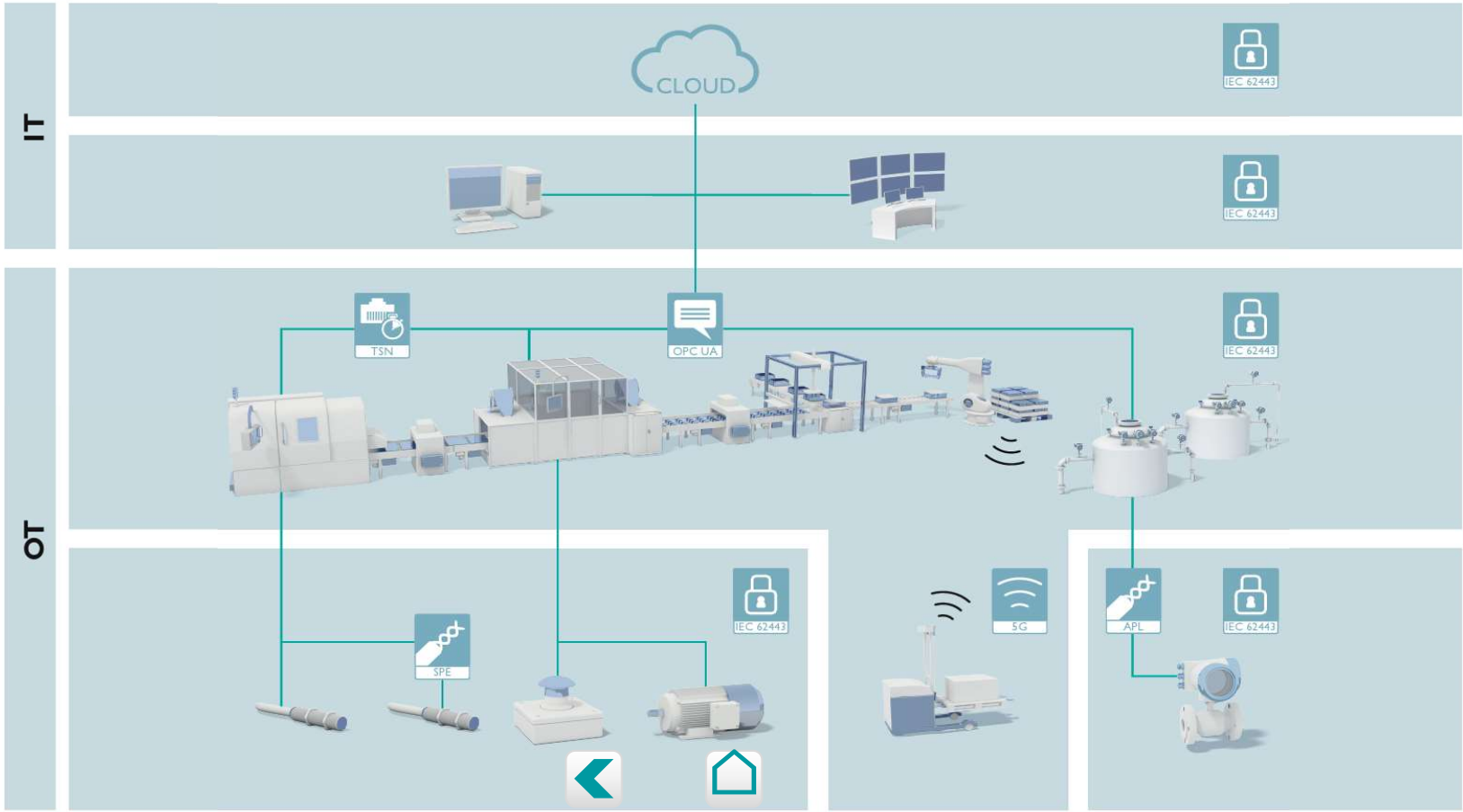


TSN



OPC UA

SEAMLESS COMMUNICATION FROM THE SENSOR TO THE CLOUD

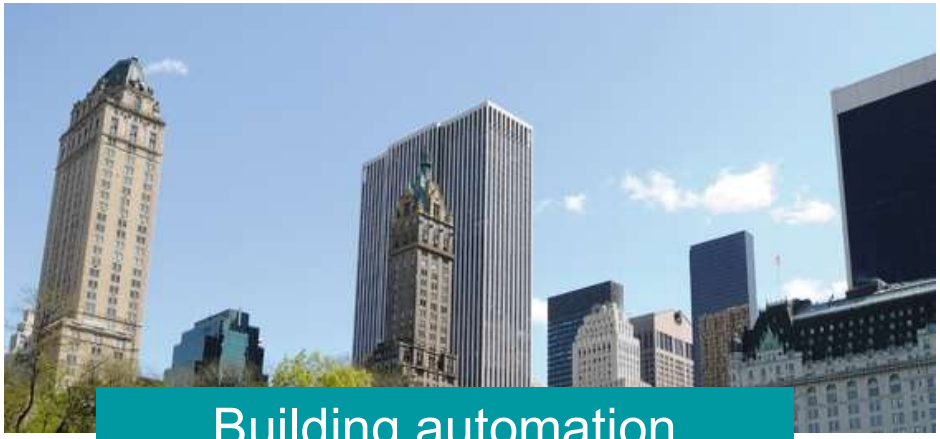




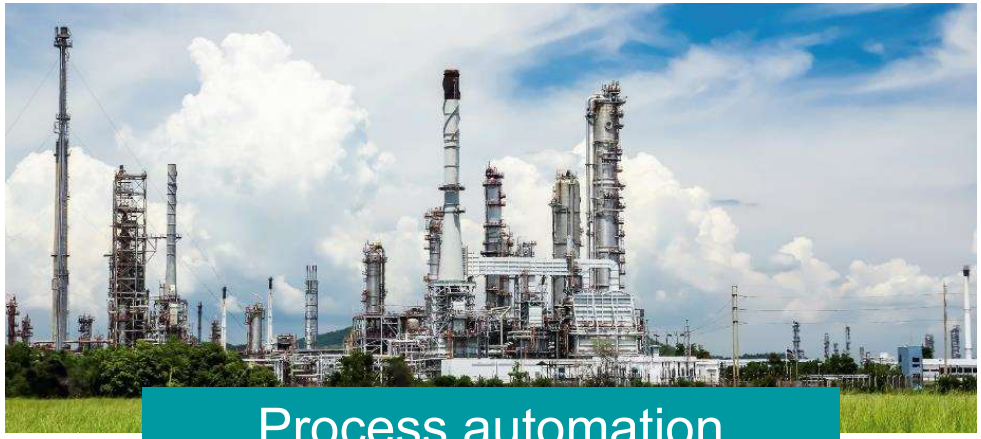
Factory automation



Automotive



Building automation



Process automation

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Automatización de fábrica con 5G privado

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