Industrial 5G With Siemens

Hva skal til for att 5G er klart for Industrien

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The evolution of cellular networks in Industry – from the first commercial network to the network of the future

1G

Released: 1979

Standards:
NMT, AMPS & TACS

Capabilities:
Analog voice

0.0024 Mbit/s Industry Impact

No impact on industrial applications

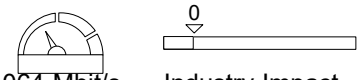
2G

Released: 1991

Standards:
GSM & CDMA

Capabilities:
- Digital voice
- Encrypted communication
- Limited roaming
- SMS & MMS

Extensions:
- GPRS (2.5G)
- CDMA2000 (2.5G)
- EDGE (2.75G)



0.064 Mbit/s Industry Impact

- Remote control/Telecontrol
- Text messages from and to remote machines

3G

Released: 2002

Standards:
UMTS & EV-DO

Capabilities:
- Mobile broadband
- Locating services
- Multimedia streaming
- Seamless global roaming

Extensions:
HSPA+ (3.5G)

42 Mbit/s Industry Impact

- Video monitoring
- Remote Access to machines (e.g. for teleservice)
- Remote Condition Monitoring

4G

Released: 2009

Standards: LTE

Capabilities:
- High Speed mobile Internet
- IP-based packet switching
- HD multimedia streaming
- Seamless global roaming

Extensions:

Feature extension through new category/releases

1,000 Mbit/s Industry Impact

- Mobile service Technicians
- Service via smart phone
- Wireless Backhaul

5G

Released: 2019

Standards: G5

Capabilities:
- Private networks (local use frequency)
- (I)IoT Ready
- Massive Machine-Type communication
- Ultra-low-latency
- Ultra-high reliability
- Millimeter wave support

Extensions:

Feature extension through new categories/releases

10,000 Mbit/s Industry Impact

- Autonomous Logistics Autonomous Machines
- Assisted Work
- Wireless Backhaul
- Edge Computing
- Mobile Equipment

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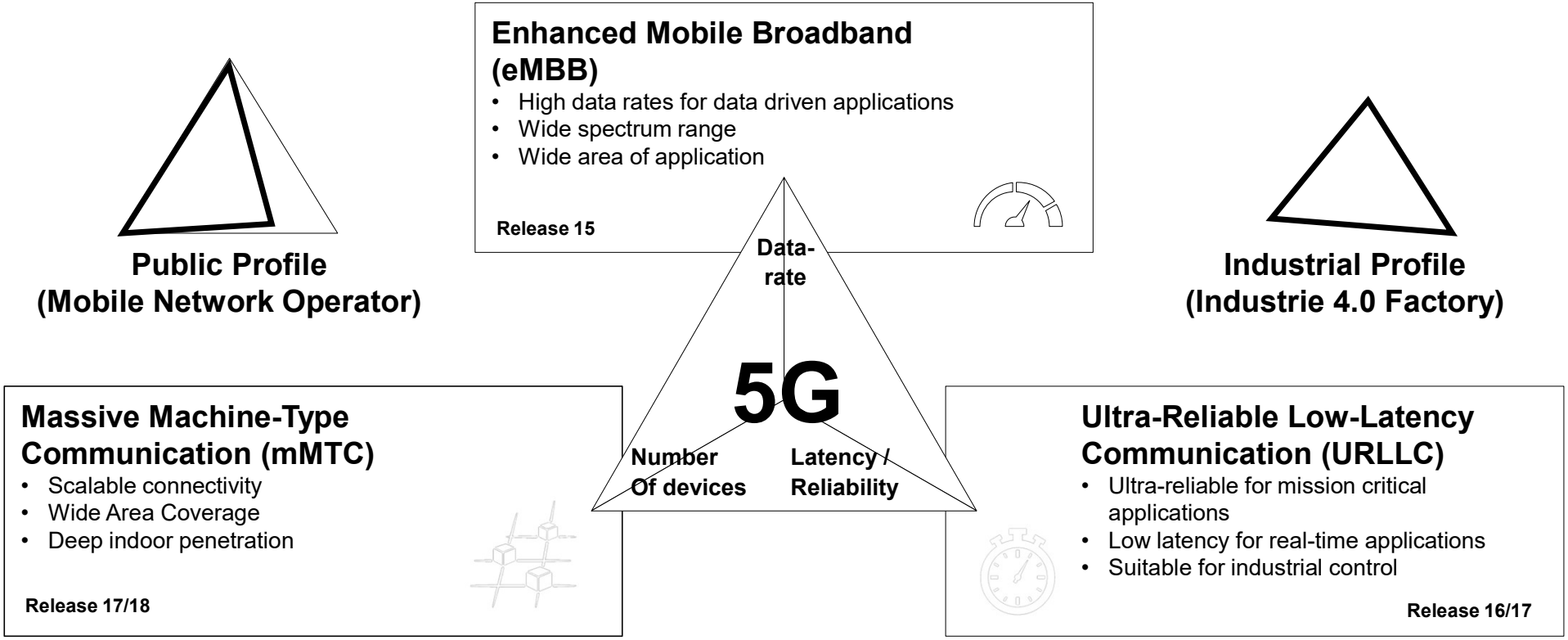
5G addresses 3 application scenarios, but there is no “one-fits-all” scenario for everything



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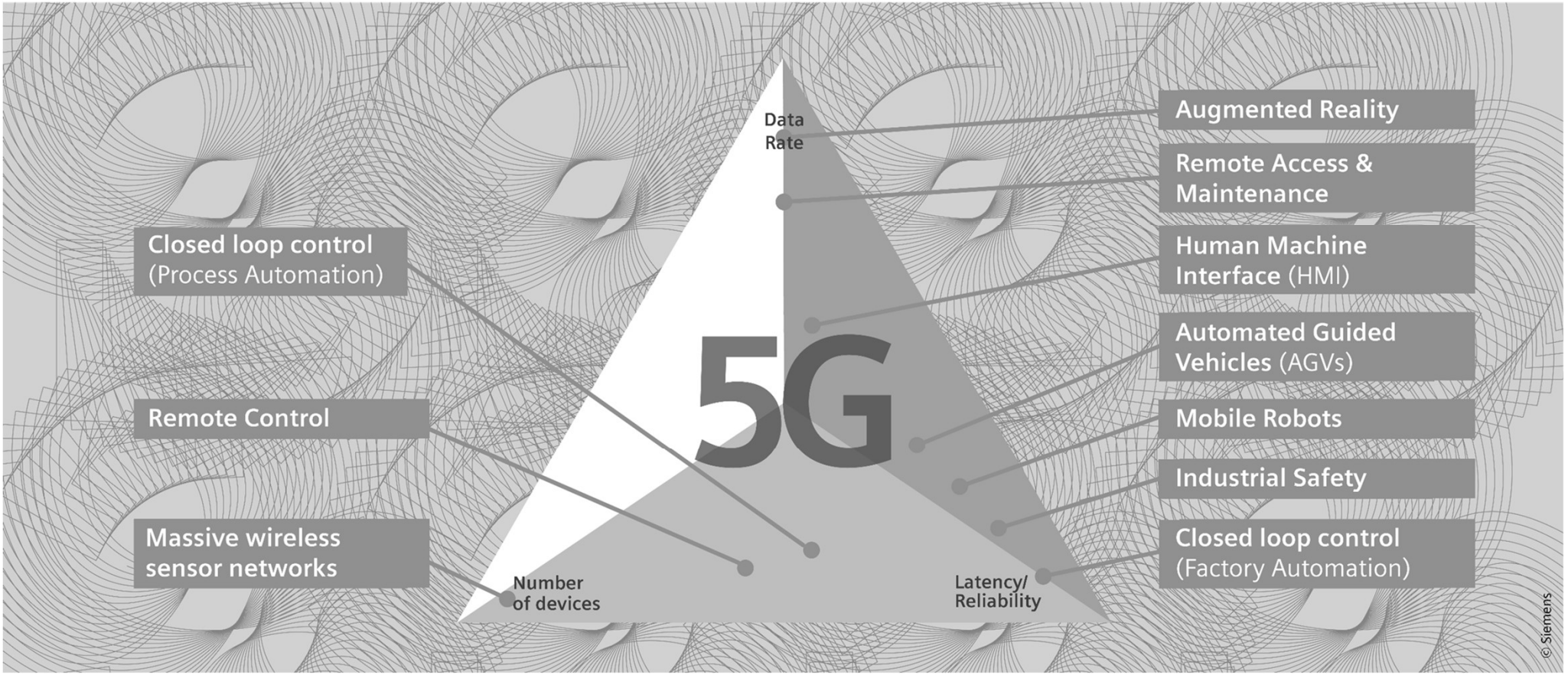
Industrial 5G. Use it right.



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Industrial 5G. Which infrastructure is right for your application?

Public deployment

Flexibility: Very limited, depends on provider
Privacy: Insufficient w/o additional precaution
Latency: Cannot be guaranteed
Network: Depends on implementation of provider

Semi public deployment

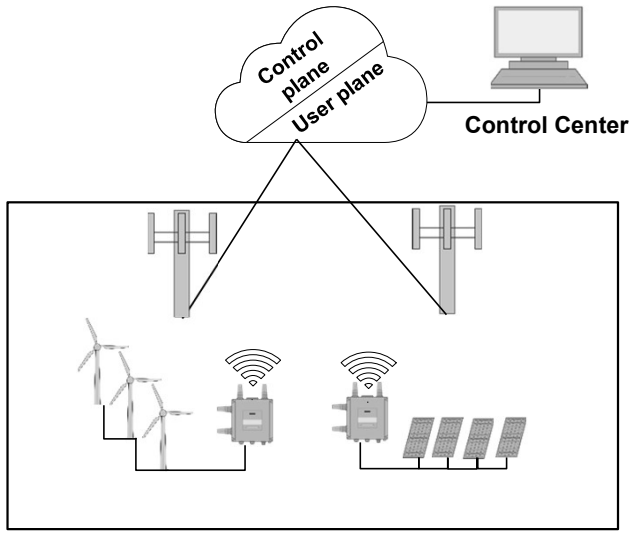
Flexibility: Limited, depends on provider
Privacy: UEs are authenticated in the public MNO
Latency: Best effort
Network: Based on network slicing, depends on provider

Private deployment

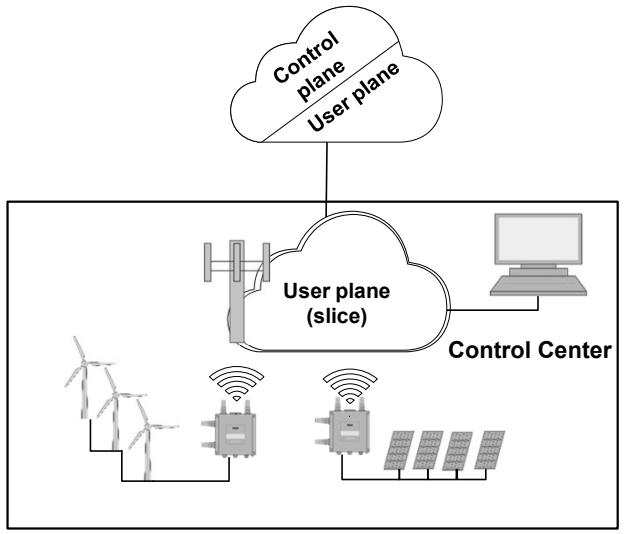
Flexibility: Unlimited
Privacy: Optimal
Latency: Optimal
Network: This scenario is possible with access to private spectrum

Public

Private

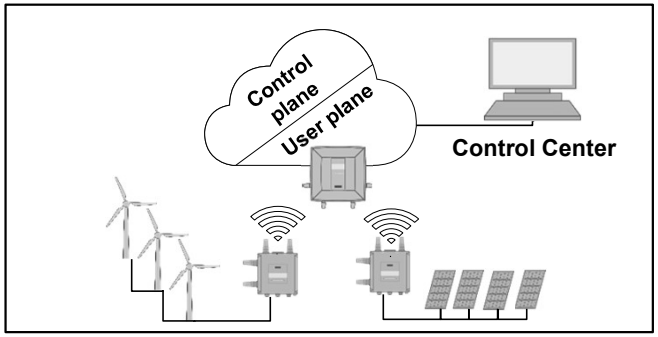


Use public mobile operator frequency



Use public mobile operator frequency

Industrial 5G



Use privately owned frequencies

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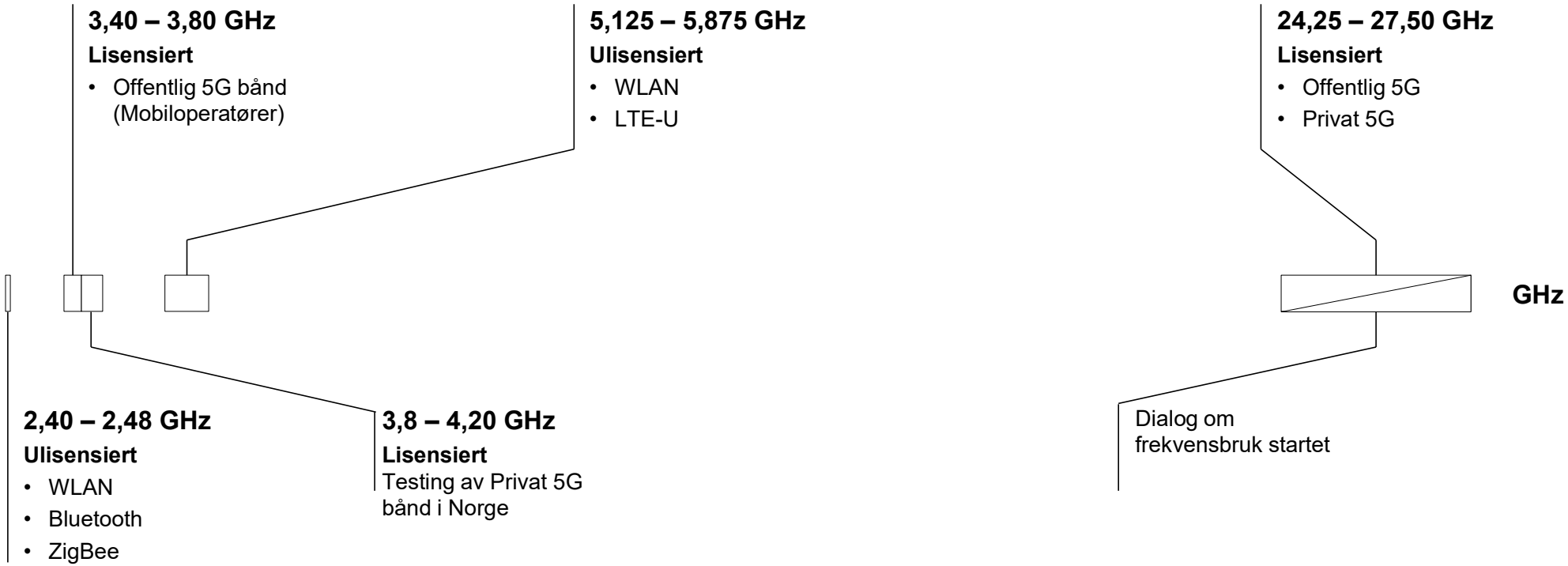
Private frekvenser er nødvendig.
Nå har vi endelig fått muligheten til å søke.



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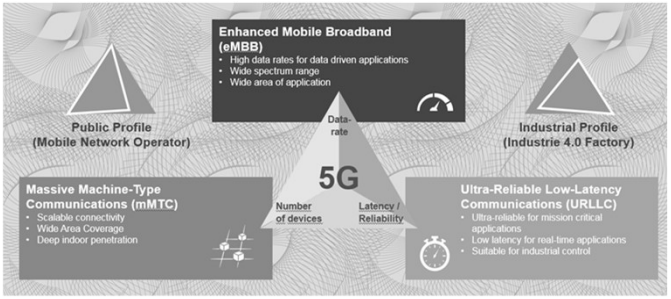
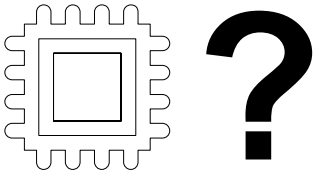
What needs to be done until we can say 5G is fit for industry?

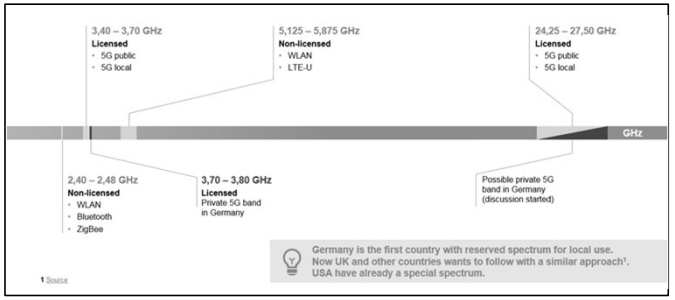
Release 16



Hardware-Availability



Local / Industrial Frequency



+ Support industrial protocols

- PROFINET
- OPC UA
- Engineering

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SCALANCE MUM85x-1
Highlights

Very high bandwidth for remote access, e.g., for importing large files (firmware updates) remotely or for video transmission

Connectivity via 4G/3G if 5G is not available (seamless fallback and high data rates with 4G)

Rugged hardware for optimal use in industrial applications

Easy VPN remote access with the SINEMA Remote Connect management platform

Connection to public and private* 5G networks

The same form factor of the wireless devices makes it possible to choose flexibly between communication technologies (WLAN/ 5G) when installing them in machines (e.g., at OEMs)

DI/DO and Sleep Mode for Optimal support of mobile, battery-powered objects (AGVs, ...)

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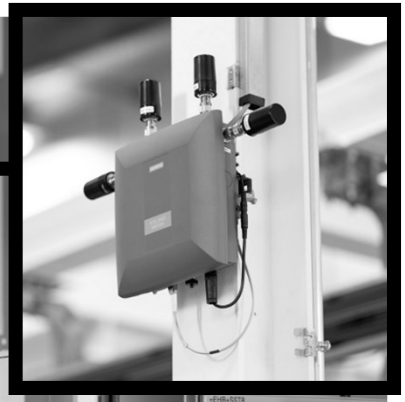
Siemens Private 5G Infrastructure based on Release 15
Test setup in the Siemens Automotive Center

Radio Unit
An active radio device connected to the distributed unit, responsible for converting the digital radio signal into an analog

Distributed Unit
Dedicated hardware component responsible for translating the digital radio signal which is send and received to radio units.

5G Core & Central Unit (Software)
5G Core and the Central Unit as software. The Core manages the complete network, the CU controls the radio equipment.



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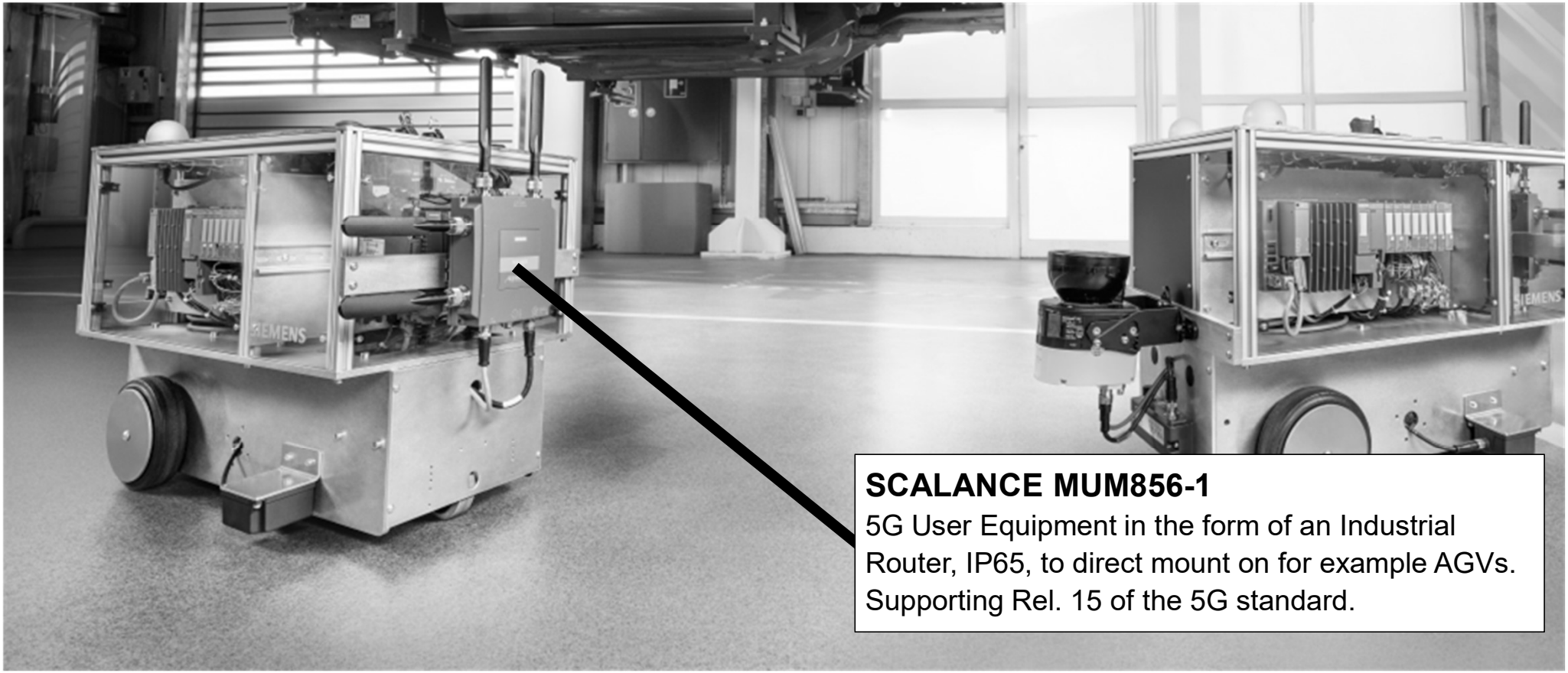
Siemens Private 5G Infrastructure based on Release 15
SCALANCE MUM856-1 direct mounted on a SIMOVE AGV



SCALANCE MUM856-1

5G User Equipment in the form of an Industrial Router, IP65, to direct mount on for example AGVs. Supporting Rel. 15 of the 5G standard.

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5G Use Cases
Transmission of Layer 2 packets via a Layer 3 network with 5G

Task

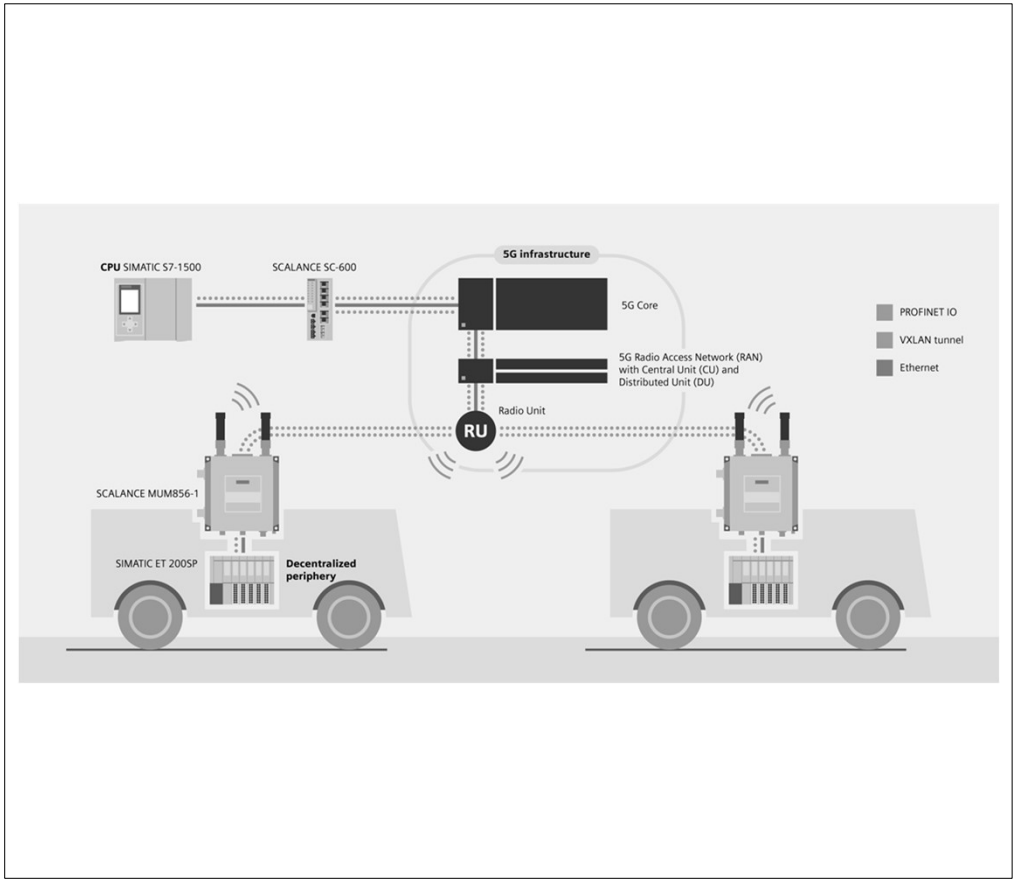
- Ensure real-time wireless communication with PROFINET IO over 5G networks for mobile participants moving across networks or between different subnets.

Solution

- With the use of VXLAN virtualization technology, PROFINET IO can already be used today in 5G networks (Rel. 15). This enables, for example, the real-time transmission of control commands from a central controller to many decentralized mobile participants. The Siemens routers use VXLAN technology to encapsulate Layer 2 packets and transmit them over Layer 3 networks.

Benefits

- By using a central CPU to which several decentralized participants are connected, the costs for hardware, engineering and maintenance can be optimized.
- Weight and space savings for mobile participants, as the CPU no longer has to be mounted on the participant itself.



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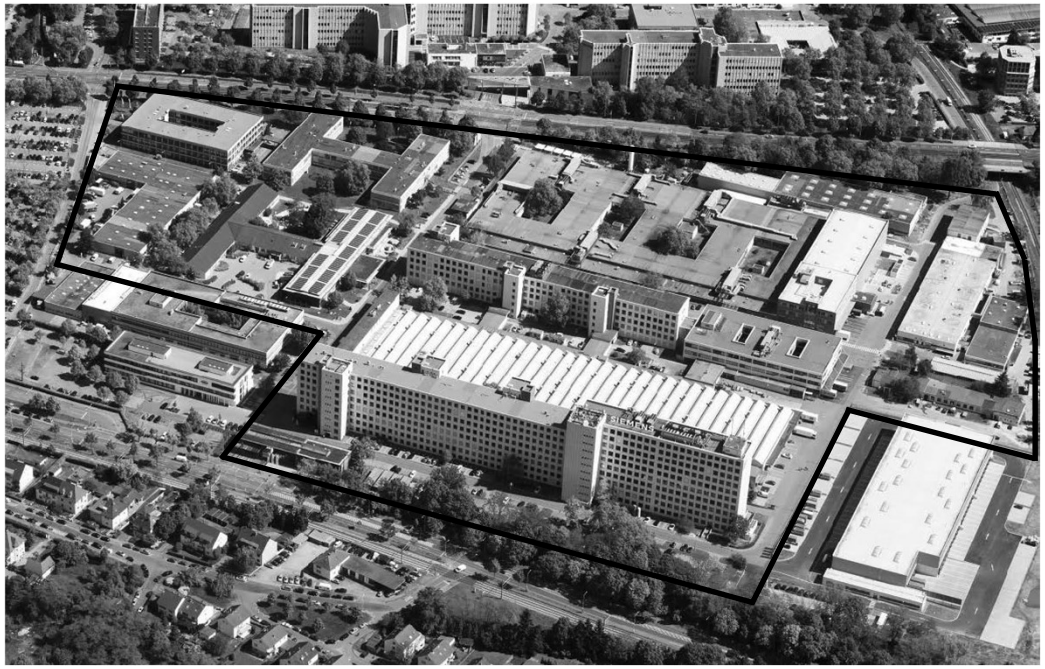
5G spectrum fees for local use in Germany
Example: Siemens Factory Karlsruhe (South)

Formula to calculate the fee:

$$1000 + B \cdot t \cdot 5\,(6a_1 + a_2)$$

The fee comprises the following elements:

- A base amount of **1.000 €**
- Planned bandwidth (**B**): 100 MHz
- Planned term (**t**): 10 years
- Surface area covered in square kilometers
  - (**a1 Land and transport infrastructure**)**:** 0,141 km^2
  - (**a2 Other types of land**)**:** 0 km^2



1.000 € + 100 Mhz · 10 Year · 5 € (6 · 0,141 km^2 + 0) = 5.230 € for 10 years

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Contact

Felix Stussi
Sales specialist
RC-NO DI PA
Østre Aker vei 88
0596 Oslo
Norway

Mobile +47 476 64 865

E-mail felix.stussi@siemens.com

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