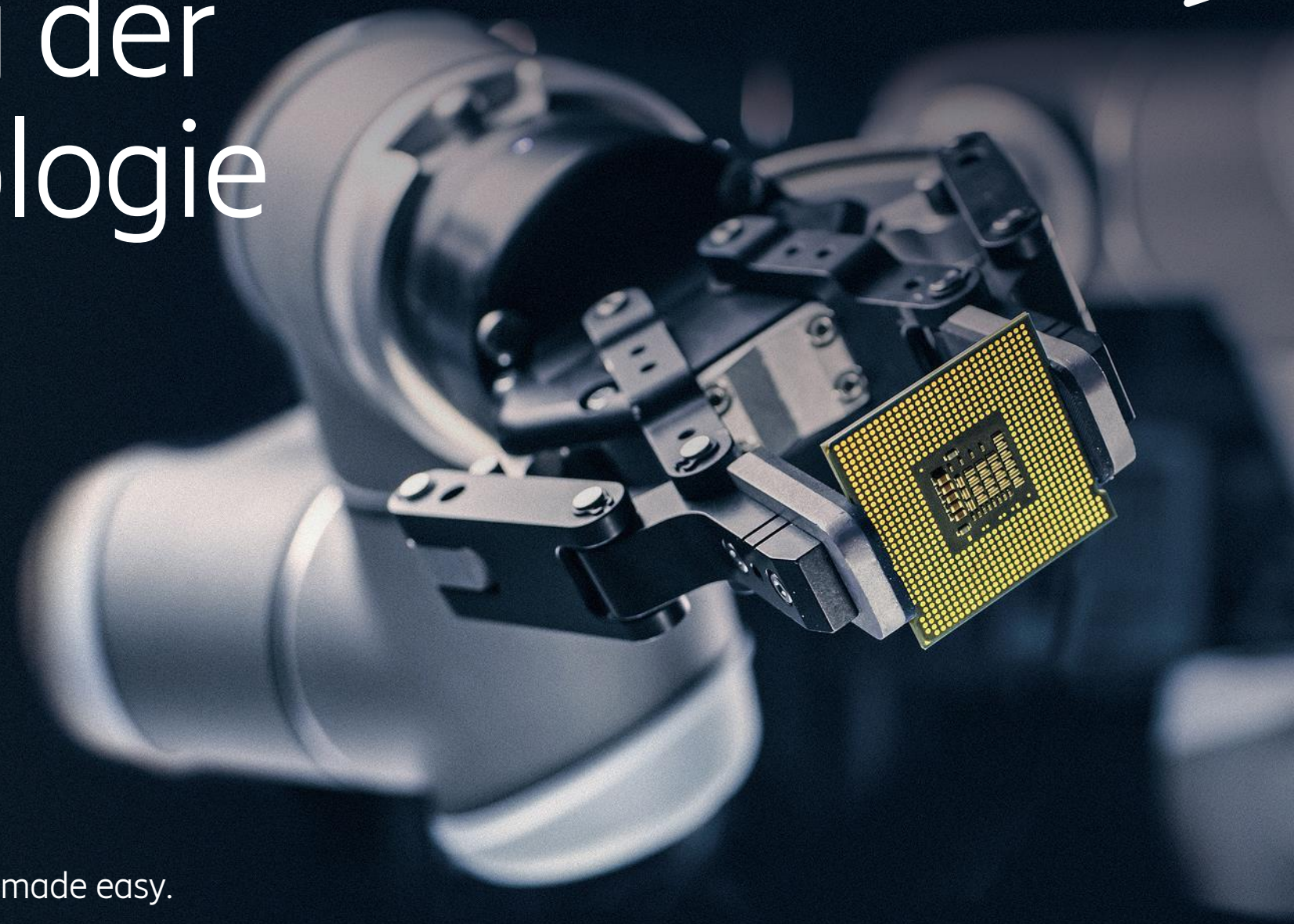
Vorstellung der 5G-Technologie



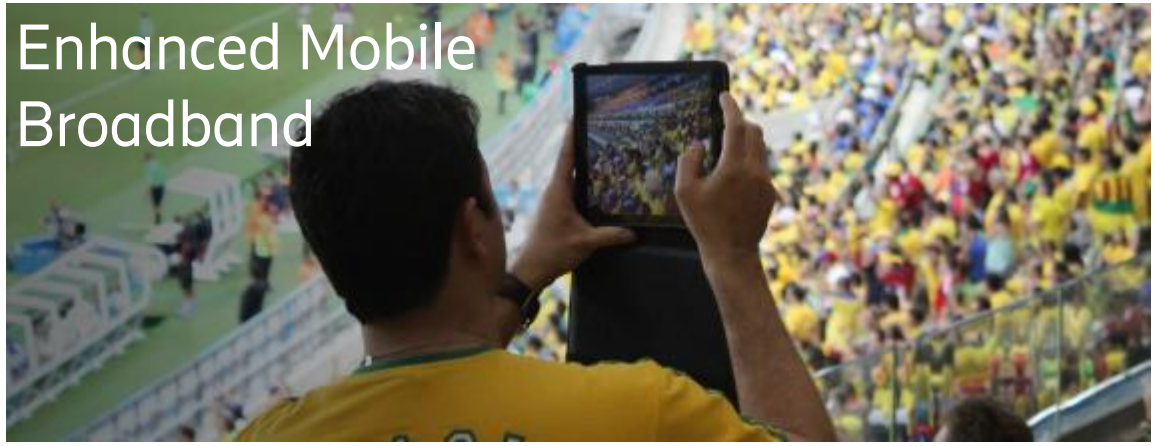
Dr.-Ing. Christoph Bach
20. November 2020

5G

Ericsson
The 5G switch made easy.

5G – what's it for?

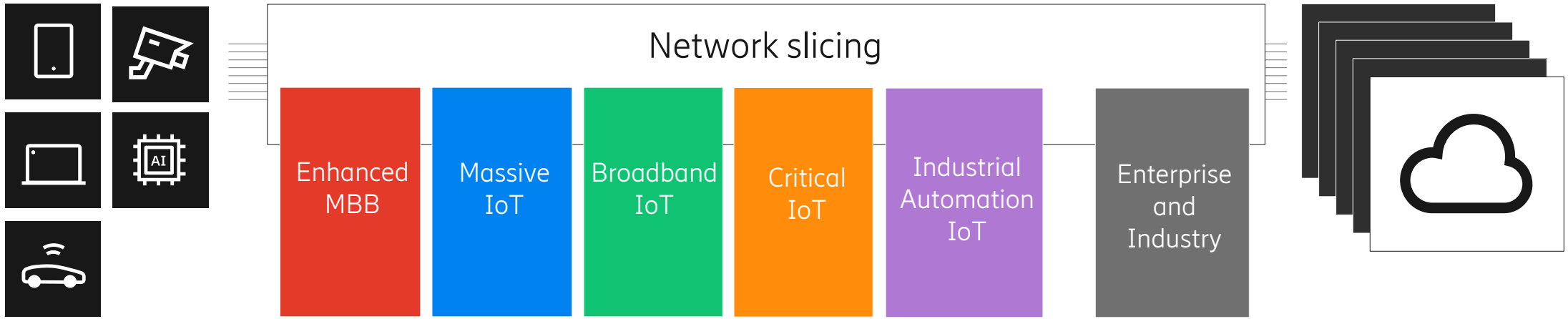
Industries



Consumers

5G - One network for multiple use case and industries

10-100x End-user data rates	5x Lower latency <1ms	99,999 % availability	100x More devices
1000x Data volumes >10Gbit/s	< 20 µs Reduced Jitter	3x Spectral efficiency	Higher Positioning accuracy < 1m



MBB = Mobile Broadband
IoT = Internet of Things

Technologies that drive industry changes

- Ingredients for building 5G networks -

Machine intelligence

- Cognitive technologies and deep learning
- Responsible machine intelligence
- Capsule networks

Automation

- Model driven
- Automated life cycle management
- Autonomous systems

Radio evolution

- mm Wave and massive antenna technologies
- Multi-purpose, multi-characteristic radio
- Flexible spectrum assignment and utilization

Programmable networks

- Software defined networking
- Network abstraction
- Network slicing

Cloud technologies

- Distributed cloud and edge computing
- Micro services and DevOps
- Virtualization, containers

Ericsson demonstrates industry first live C Band network with 5.4 Gbps throughput

Set-up

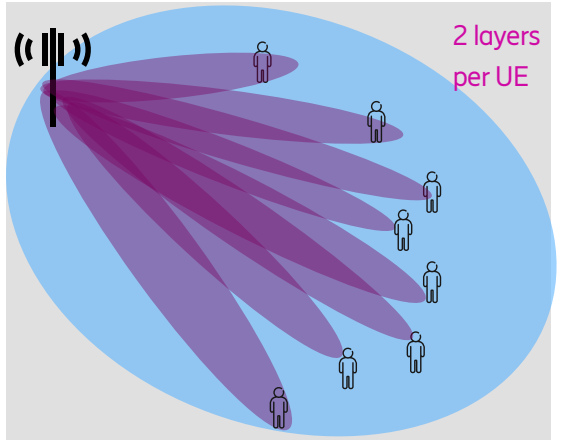
- 5G non-standalone
  5G AIR 6488 B43, C Band 100MHz, baseband 6630
  4G Radio 2203, 20MHz, baseband 5216
  Anchor band B66
- Test UEs from Gemtek
- TDD LTE aligned pattern

Link to Ericsson press release

Mobile World Live
Ericsson seeks slice of nascent US C-Band sector

Fierce Wireless
Ericsson hits 5.4 Gbps throughput in MU-MIMO C-band test

RCR Wireless News
Ericsson achieves 5.4 Gbps throughput on C Band network at Texas HQs



Up to **5.4Gbps**
NR Downlink peak cell throughput

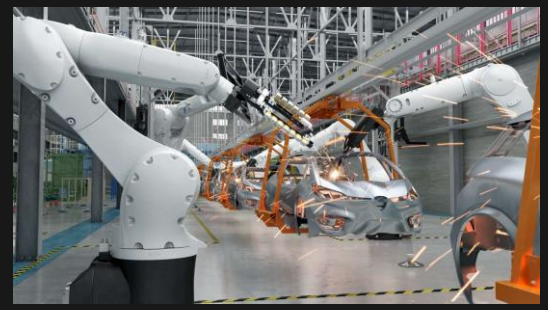
~**675Mbps**
NR Downlink average user throughput

8xUE
simultaneously
2 layers per UE

The 5G Network for digital Transformation of Industries

Connect things to the Network → **Collect** data through the Network → **Analyze** data retrieved from the Network → **Act** on decisions through the Network



The main Consequences:

- Network availability will increase
- High Quality Data will become a key asset
- Mobile Robot2x interactions will grow

Industry use case references powered by Ericsson

60+

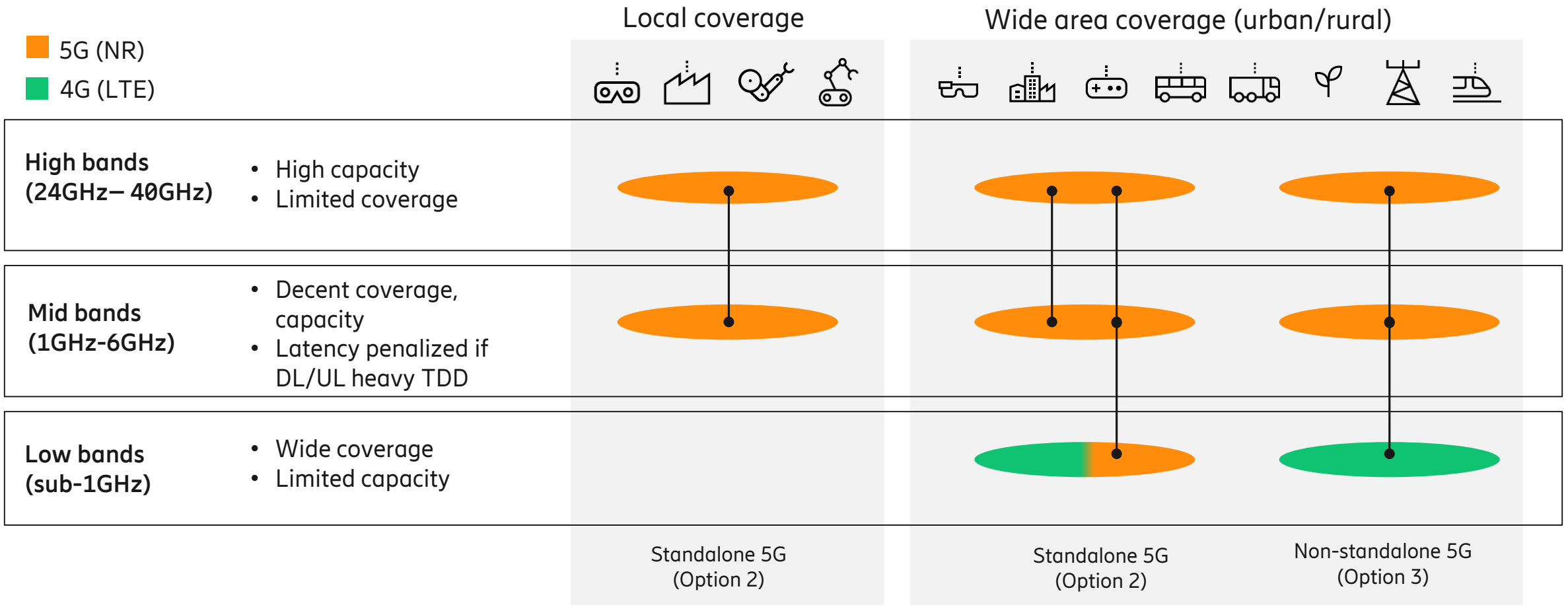
- Industry use case References

6 Industries

- Manufacturing
- Energy and Utilities
- Mining
- Ports
- Healthcare
- Networking Enterprises

Cosmote AGV for warehouses	**Hexagon** Smart Wireless Manufacturing	**Ambra Solutions** 5G-ready connectivity in Mines
Comau & TIM Comau factory of the future	**Atlas Copco** Smart Manufacturing AGVs	**Newcrest, Telstra** Lihir gold mine, Papua New Guinea
Comau VR Monitoring of production lines via Digital Twins	**Hitachi, Mobile Network Operator, Global System Integrator** Smart Manufacturing	**Boliden, ThingWave, LTU Business, Telia.** Narrowband IoT for Smart Rock bolts
BMW & Deutsche Telekom Automotive, 5G Manufacturing	**Hitachi, Mobile Network Operator** Ideal energy usage	**Port Qingdao, China Unicom, Shanghai Zhenhua Heavy Industries Co.** 5G Automated Port
Ericsson and Telia Tallinn Smart Factory	**Telenor Connexion, Grundfos** Connected Pumps	**Rotterdam World Gateway** AGVs
eGO, Vodafone Germany Automotive 5G manufacturing production: eGO	**Landis+Gyr, Telia, E.ON.** Driving rapid adoption of cellular IoT in smart meters	**Arkessa, Gemalto** Brighter is building a global healthcare IoT ecosystem
Mercedes Benz & Telefónica Germany Mercedes-Benz Cars increase efficiency and flexibility	**Hitachi, Mobile Network Operator, AI/ML Provider** Improved logistics for oil and gas	**Westenergie, 450connect** LTE 450 Proof of Concept
MTU Aero Engines, Fraunhofer IPT 5G monitored manufacturing of bladed disks	**Bell Canada, BeWhere** BeWhere delivers cost-effective cellular IoT asset tracking solution	**Verizon** Virtual Network Services for Enterprise business

5G NR in all its frequency bands



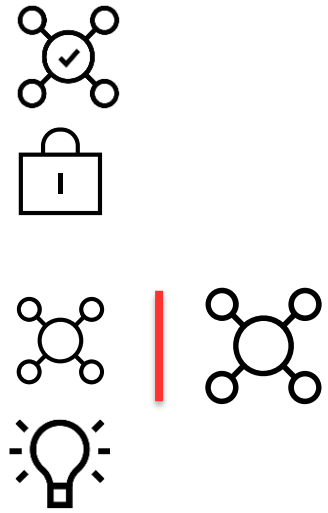
5G Campusnetzplaner: https://campusnetzplaner.kn.e-technik.tu-dortmund.de/

What is a Campus Network?

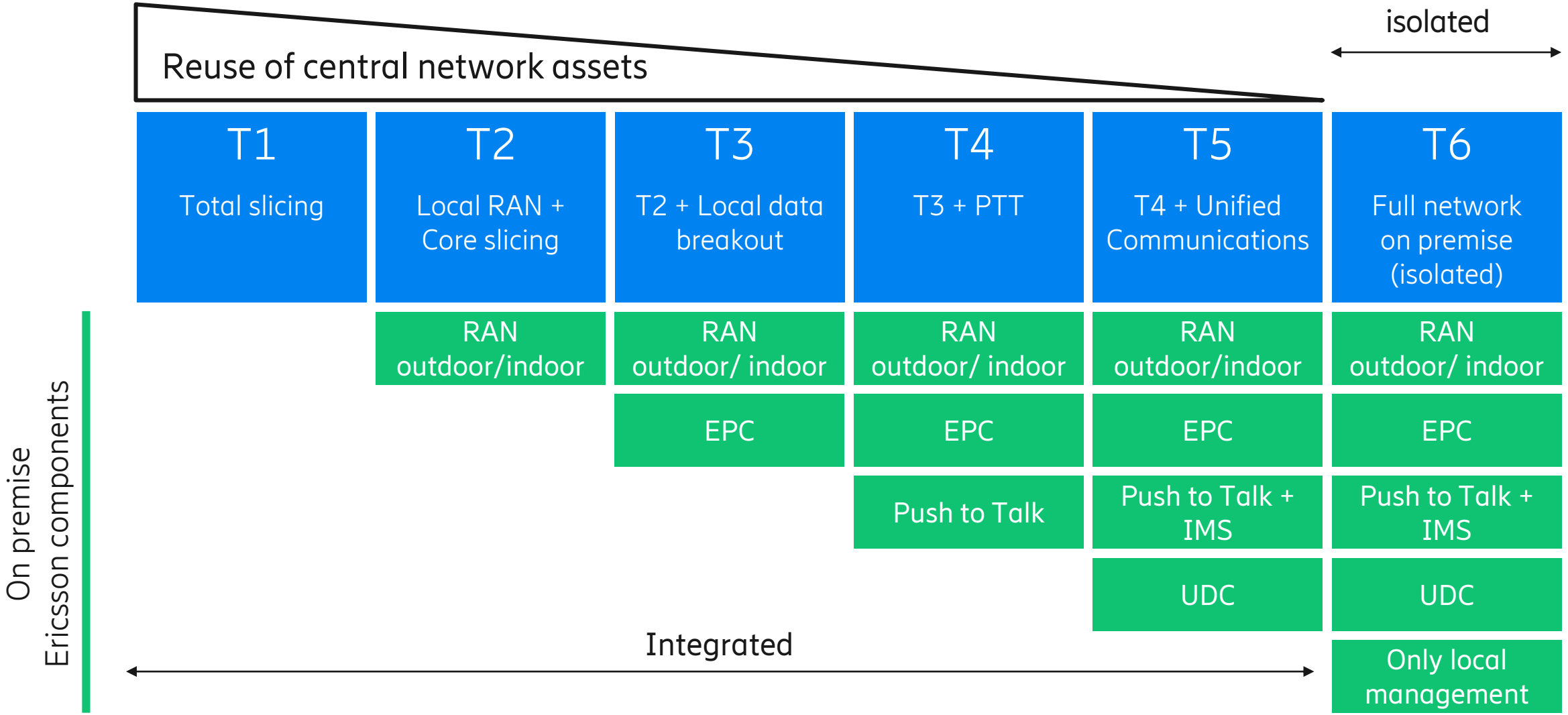
„A 5G non-public network (NPN, also sometimes called a private network) provides 5G network services to a clearly defined user organisation or group of organisations. The 5G non-public network is deployed on the organisation's defined premises, such as a campus or a factory." (5G-ACIA – definition)

Non-public networks can be desirable for several reasons:

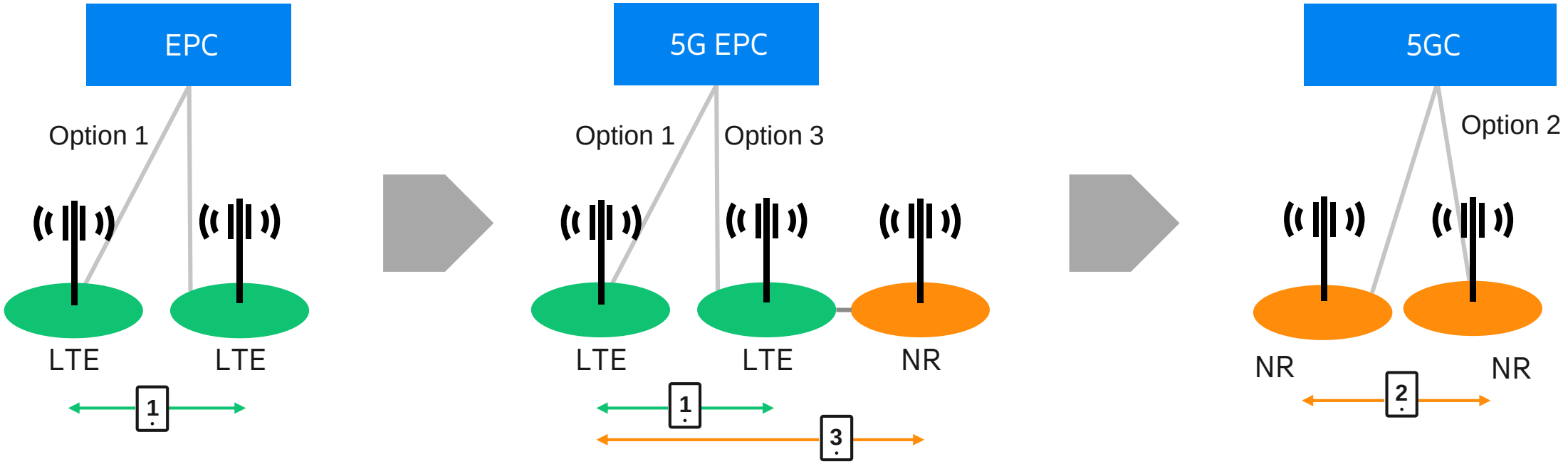
- High quality-of-service requirements
- High security requirements, met by dedicated security credentials
- Isolation from other networks, as a form of protection against malfunctions in the public mobile network.
- Accountability: A non-public network makes it easier to identify responsibility for availability, maintenance, and operation



Deployment Types to Address Private Networks
Ericsson approach



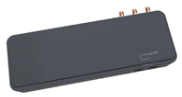
5G architecture evolution

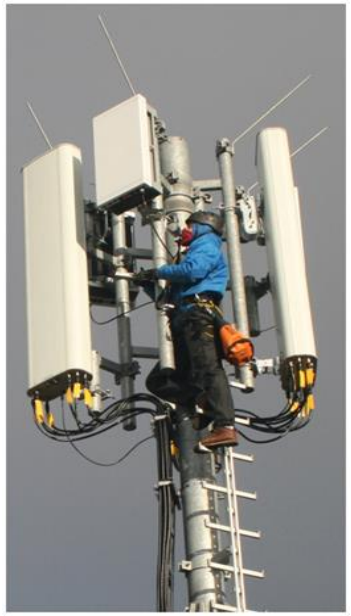


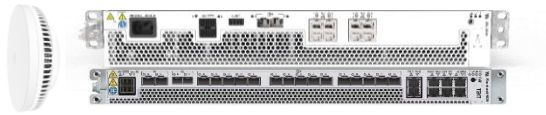
— Ultimate deployment is called “option 2” in 3GPP and also referred to as “Stand-alone” (SA)
— NAS control plane between UE 5GC and 5G Core require new UE chipsets => expected in H2/2020
— Initial NR deployments use option 3 aka Non-Standalone (NSA)

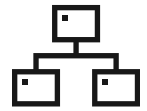
Ericsson 5G SA Network Architecture

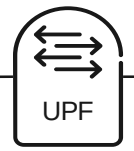










5G SA devices

Radio System components
5G NR capable

5G SA core

Customer Network

Industry 4.0 wireless ecosystem ericsson.com/industry4.0

Independent software vendors
Applications ecosystem
Application enablement Platforms
Manufacturing Execution Systems (MES)
Enterprise Resource planning System (ERP)

SAP, ignitarium, Xcrosser, ptc, HEXAGON, sas, eliko, Litum, Ubisense

Strategic OEMs
ABB, HEXAGON, Epiroc

Cellular Network 4G /5G (public, sliced, Private Network, Industry Connect)

Modules
QUECTEL, Telit, SIERRA WIRELESS, gemalto, SEQUANS

Cellular Gateways
Current loop
Ethernet
RS232
Analog I/O
Digital I/O

Machinery
Sensors
Actuators
Handhelds
Wearables

Wired via Gateway or Integrated Module, grid power ⟷ Integrated with Cellular Module or Chipset, battery

Device partners
Gateways
Sensors
Actuators
Handhelds
Wearables

inseego, SIERRA WIRELESS, amit, ZEBRA, WESTERMO, msi, TELTONIKA, ADVANTECH, ORing, CISCO, D-Link, AVI, FUJITSU, DIGI, cradlepoint, Beijer, robustel, MOXA, MULTITECH, Hongdian, AAEON, NavigateWorx, PHOENIX CONTACT, GE, HMS, OPTION, ADLINK, Hewlett Packard Enterprise, DELL EMC, EUROTECH, HCFA

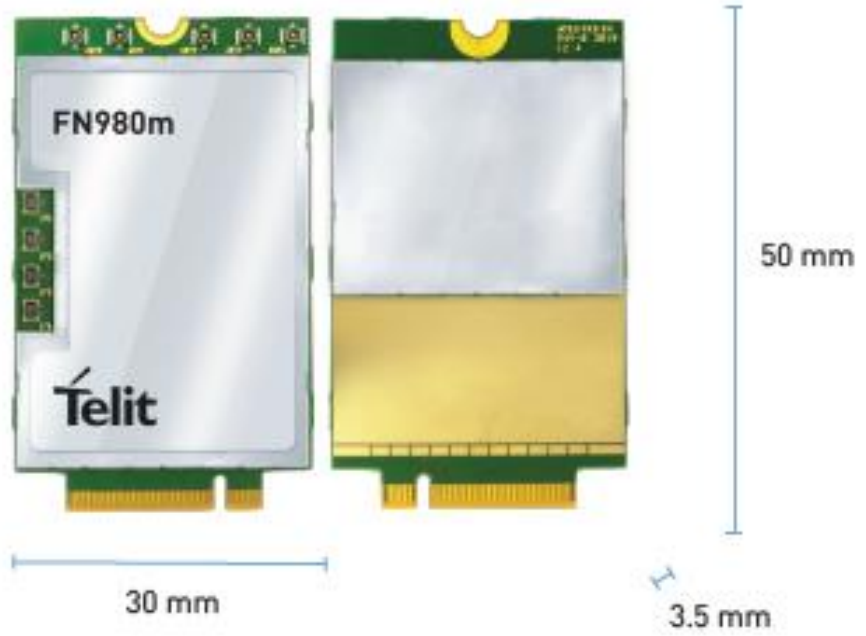
System Integrators & business advisors
AFRY, KPMG, umlaut, DXC.technology, Capgemini, ALTRAN, TILSON, FUJITSU, REJLERS, TATA CONSULTANCY SERVICES, CellAntenna

5G Gateways and Modules

- PHOENIX CONTACT Gateway
  - Quectel RM500Q (Qualcomm X55 chipset)
  - NSA and SA

- WNC Industry Router
  - Qualcomm X55 chipset
  - NSA and SA

- HMS Cellular Bridge
  - NSA and SA



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

Speed/Latency

URLLC with deterministic latency of less than 1ms

Security & Reliability

A pre-requisite for digitalization

Positioning

Time Sensitive Networking

Integrated Access Backhaul

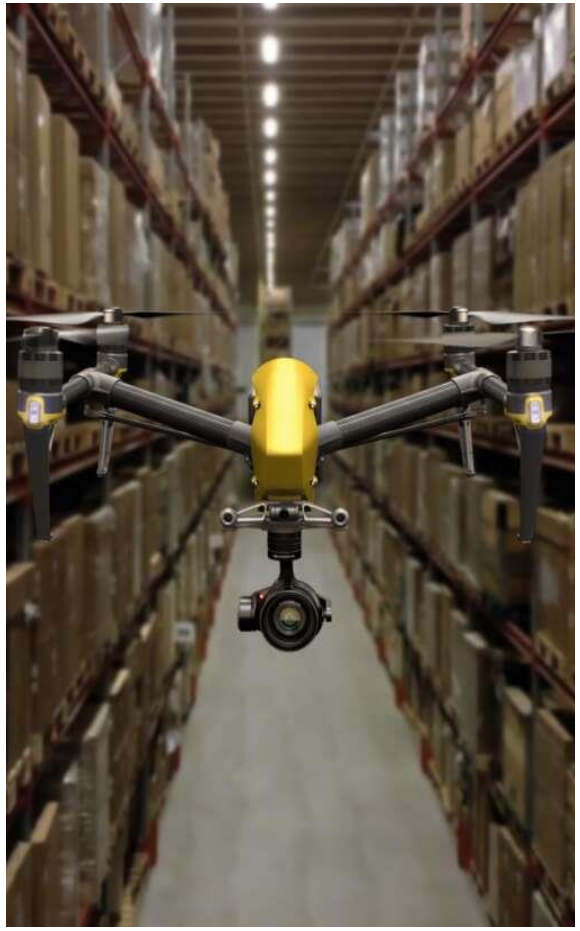
Sidelink - flexible extension of network

NR in unlicensed spectrum

mMTC – reduced capability NR devices

RAN Virtualisation

5G NR Operations up to 71 GHz



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