
Qualcomm
@qualcomm
Nov 2019
Workshop 5G no Brasil
Brasília, Brasil
5G
Redes Privadas
Milene Franco Pereira
Gerente de Relações Governamentais, América Latina
Qualcomm

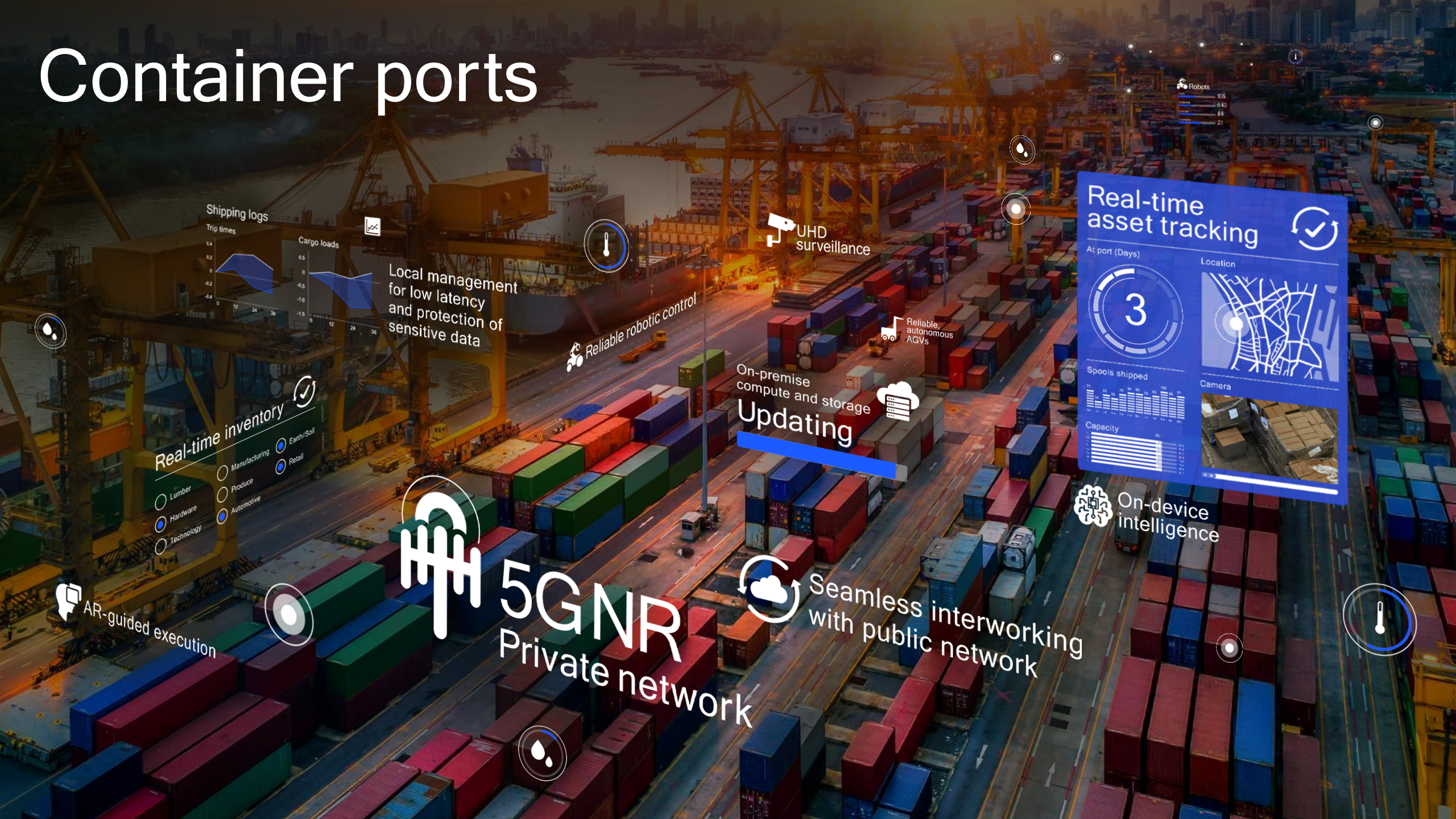
>$5 Trillion[1]

Global economic output in 2035 enabled by 5G in the following five categories

Manufacturing	Transport	Construction	Utilities	Mining
$3,364B	$659B	$742B	$273B	$249B

1. “The 5G economy: How 5G technology will contribute to the global economy” by IHS Economics / IHS Technology

Container ports




Turbine sensor
Blade sensors
Drone inspection
Environmental sensors
Vehicle tracking
Handheld computing

Wind farms

Revolutionizing manufacturing

5G

On-premise
edge cloud

Local control for ultra-low latency

Sensitive data stays on site, local analytics

The verticals announced by the Brazilian Government as priorities are among the most benefitted by private networks

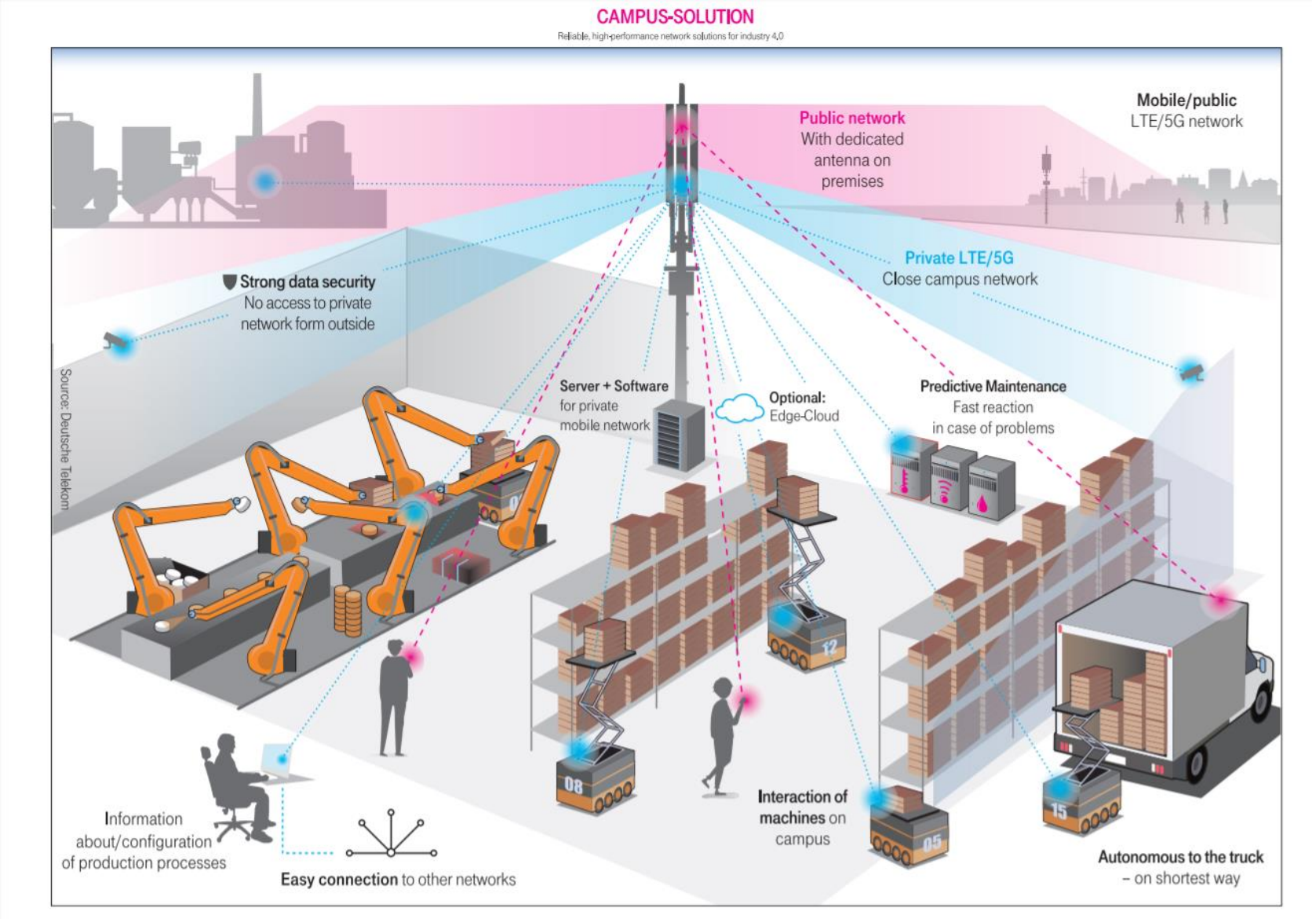
Mobile Private Networks

Or NPN (non-public networks), solution for industries

Coverage

Control

Performance



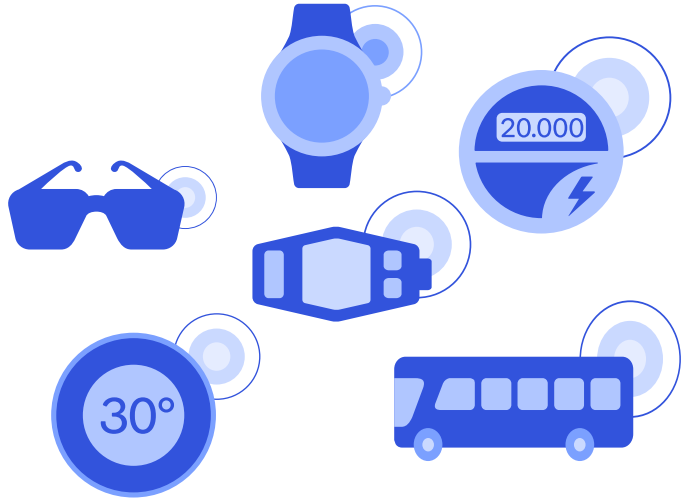
Source: [Deutsche Telekom]

Why private networks?

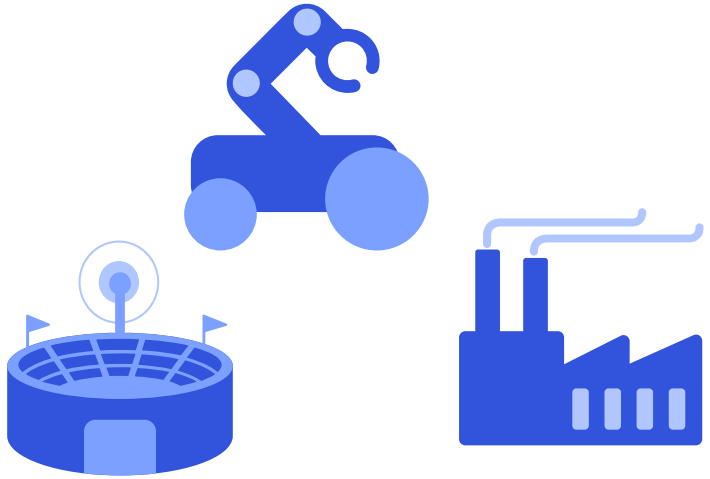
- Areas with complex coverage (indoor or difficult access)
- Verticals with very demanding requirements
- Lack of interest in the business model
- Verticals that want to maintain full control of operations for data security or cost
- Specific applications that are in permanent development

Types of Verticals

Aggregate demand for spectrum

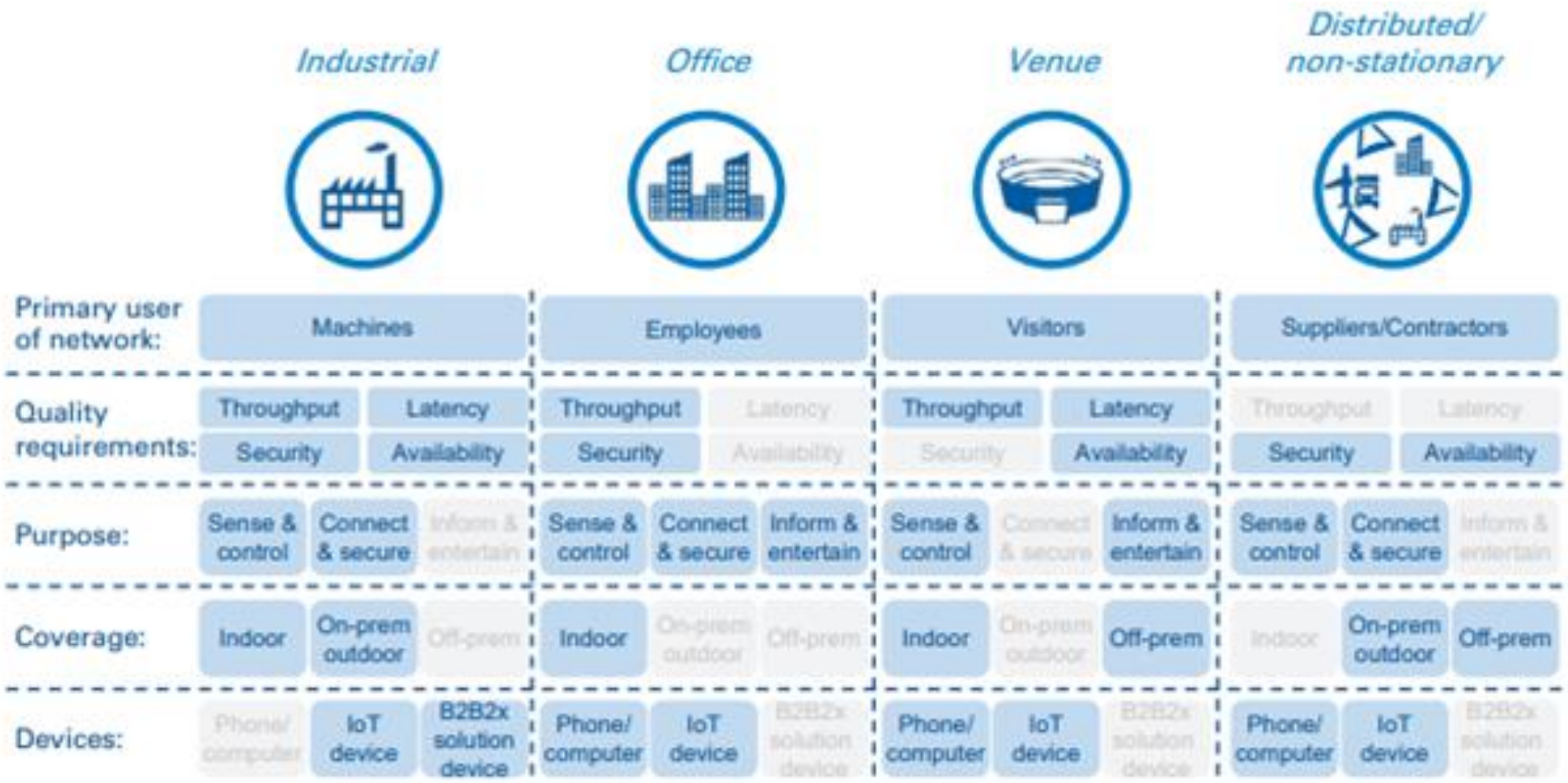


Fragmented demand for spectrum



Local licenses may attend 2 types of verticals

Campus Types



Source: Arthur D. Little

Private Campus Network Product Portfolio

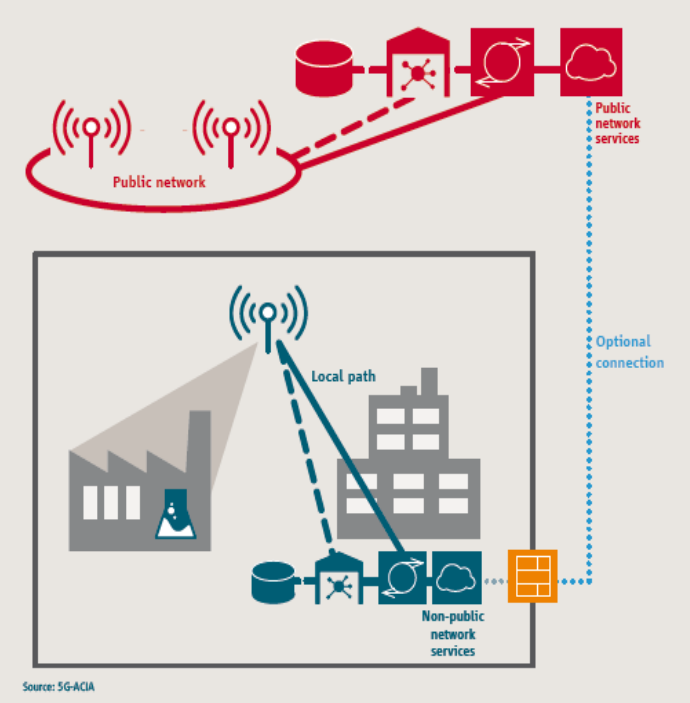
Spectrum	Infrastructure	Devices	Services	Management	Applications
Licensed spectrum	Base stations (Macro, micro, small cell/AP)	Chipsets	Managed voice & data	User & device mgmt.	IoT platform
Unlicensed spectrum	Transport network	CPEs	Computing	Network mgmt. & config.	Enterprise apps (ERP, CRM, etc.)
	Core network	BYOD CPEs	(Cloud) storage	Security & policy management	Security functions (firewalls, etc.)
	Protocol stack		Managed security	Service management	SD-WAN
			Lifecycle management		SaaS

Note: Spectrum can be sourced either from the regulator, an operator or from other types of service providers who may have access to spectrum and offer it. It may be allocated, leased, sliced, or provided as a service

Source: Arthur D. Little

Network Deployment Scenarios

Standalone NPN (isolated deployment)



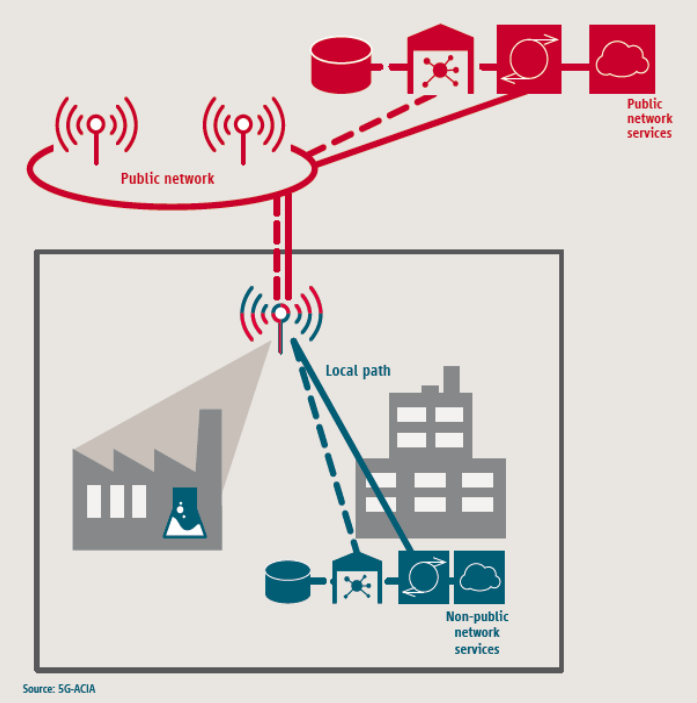
- Independent NPN
- Only communication is through firewall
- Factory is responsible for operation and services

Source: White paper: 5G-ACIA_White_Paper_5G_for_Non-Public_Networks_for_Industrial_Scenarios

Network Deployment Scenarios

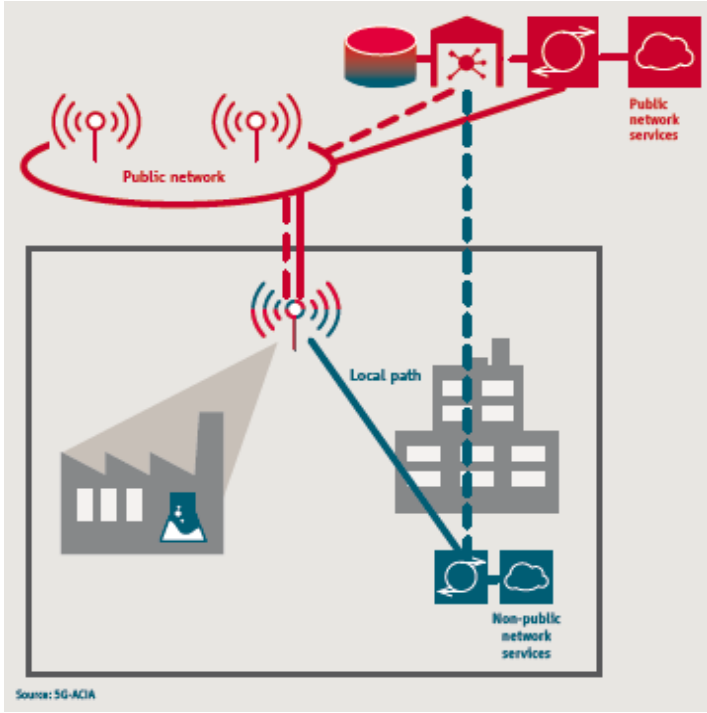
NPN in conjunction with PN

Shared RAN



- Shared RAN base station, but network functions in the factory are segregated
- NPN traffic kept inside the factory
- PN traffic transferred out

Shared RAN and control plane

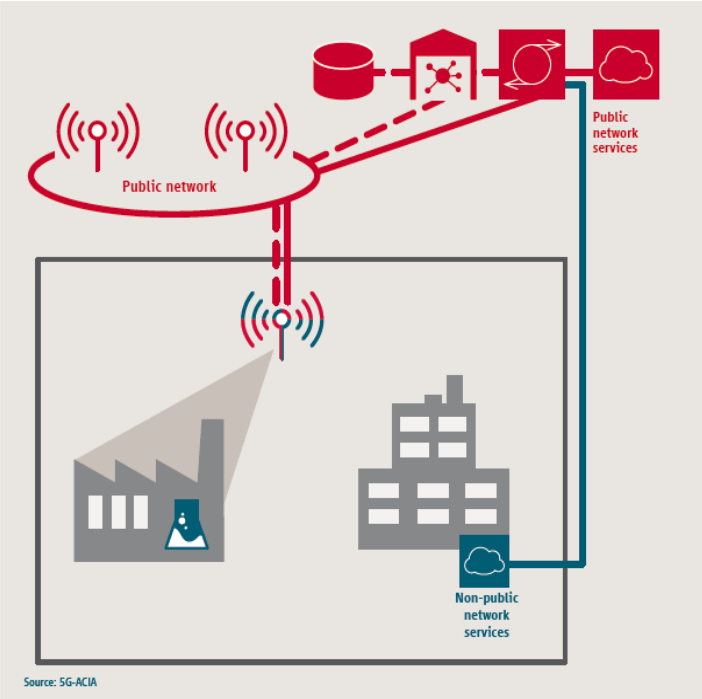


- Shared RAN base station, but network functions in the factory are segregated
- NPN traffic kept inside the factory
- PN traffic transferred out

Source: White paper: 5G-ACIA_White_Paper_5G_for_Non-Public_Networks_for_Industrial_Scenarios

Network Deployment Scenarios

NPN in public network



- NPN implemented as a public network function
- NPN and public network traffic treated as 2 networks, done by network virtualization

Source: White paper: 5G-ACIA_White_Paper_5G_for_Non-Public_Networks_for_Industrial_Scenarios

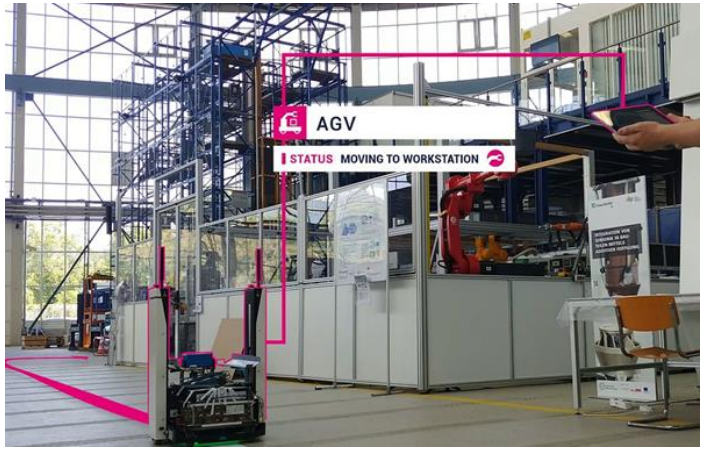
Mobile Private Networks

Use cases

MNO spectrum

Osram factory - Germany

- Deutsche Telecom (network + edge computing) with Ericsson and Gestalt Robotics for joint tests of automated guided vehicles (AGV).



Company interested in 5G license

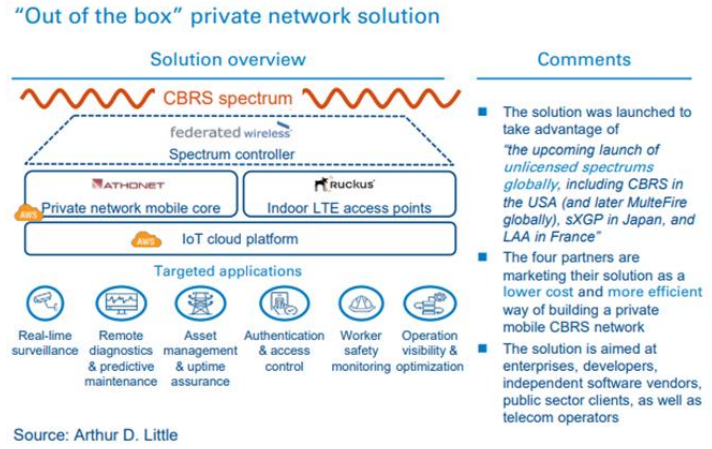
Audi factory - Germany

- Audi and Ericsson on a 5G app testing for automotive factory; close to 3.7-3.8 GHz
- Arms-Robot connected: currently with Wi-Fi, many interruptions due to high data flow; with 5G better performance expected

CBRS band shared use

Ruckus/Amazon/Athonet Solution

- The channel is free after use
- Federated Wireless Spectrum Controller allows access to the massive spectrum of shared CBRS for private 4G networks



KPN & Shell Industrial 5G Field Lab

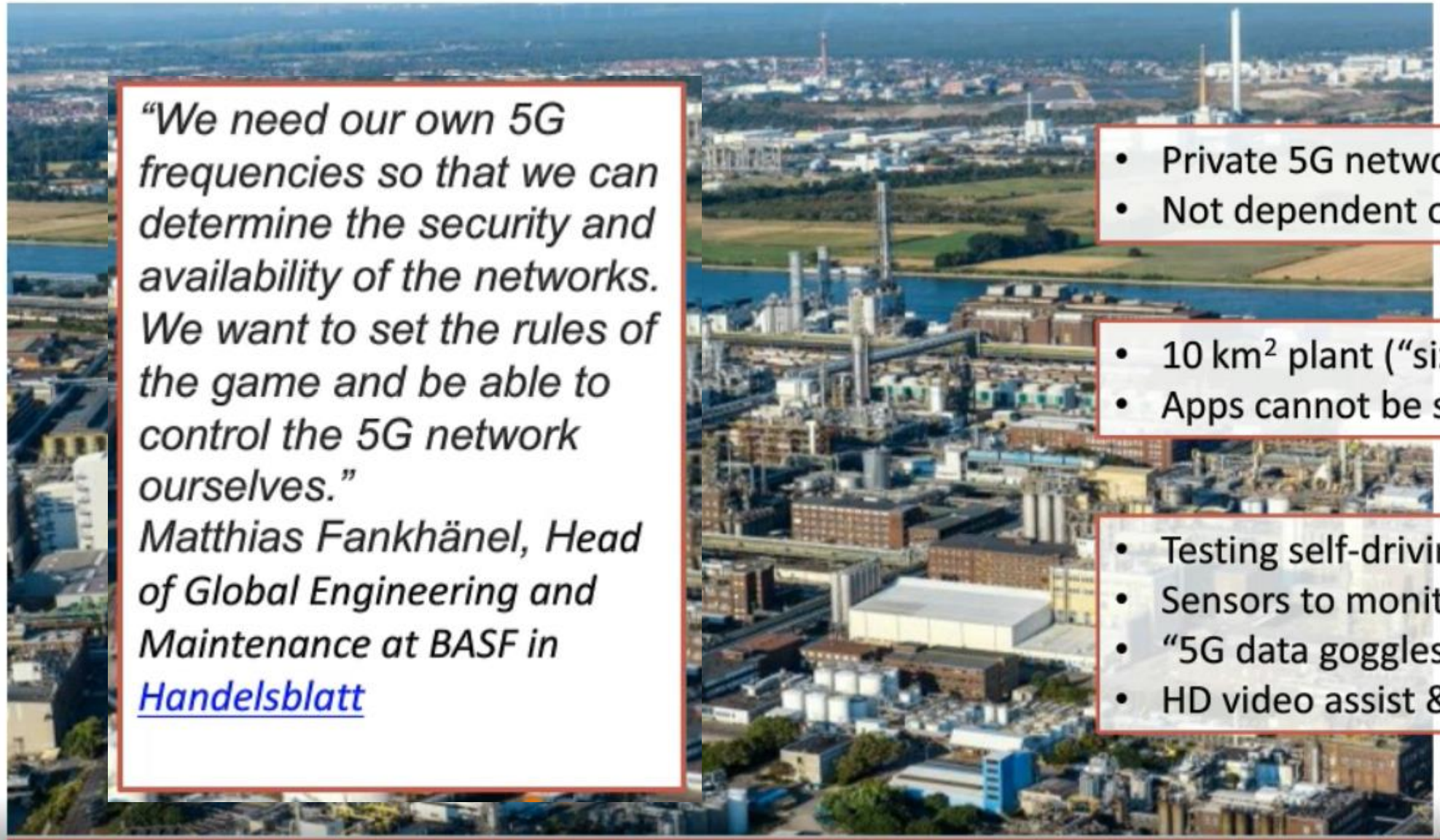
- Shell Refinery, NL
- 700MHz, 2.3GHz & 3.5GHz

- 5G “Smart Helmet” for remote assistance
- Predictive maintenance w/ UHD and ML
- Robotic mobile inspection for gas leaks

- Stringent SLAs
- Challenging RF conditions
- Metallized environment

Source: LightReading

BASF Chemical Plant, Germany



"We need our own 5G frequencies so that we can determine the security and availability of the networks. We want to set the rules of the game and be able to control the 5G network ourselves."
Matthias Fankhänel, Head of Global Engineering and Maintenance at BASF in [*Handelsblatt*]

- Private 5G network in 3.7-3.8 GHz
- Not dependent on operator

- 10 km^2 plant ("size of a small city")
- Apps cannot be supported on WiFi

- Testing self-driving fuel tanker (AGV)
- Sensors to monitor 30,000 pumps
- "5G data goggles" for AR
- HD video assist & monitoring

Source: LightReading

How it has been perceived

Deutsche Telekom

- *Strong interest in providing solutions to the industry demand*
- *Customers need public network and private network (for secure data management)*
- *Use of the same spectrum for both networks*

Audi

- *NPN managed by Audi or by an hired company. It is important that the data stays on the premises.*
- *No restrictions on MNO managing their network (with Audi spectrum), since it is not Audi's business to operate cellular network.*

KPMG

- *5G gives MNOs the chance to reinvent themselves, to seek new business in vertical areas*
- *Not clear yet weather private network will be managed by the MNO or by the enterprise themselves*

Sourde: https://enterpriseiotinsights.com/20190510/channels/fundamentals/industrial-network-management

Worldwide regulators moves

Country	Frequency Range	Last Moves	Obs
Australia	24.25-25.1 GHz	Paper with planning decisions, Apr 2019. Public consultation on the proposed introduction of a new “area-wide license” (AWL) for radiocommunications devices, Jun 2019.	The consultation paper specifically notes that the AWL type could be used for the authorization of IoT applications.
Chile	1.7 GHz/2.1 GHz, 3.5 GHz, 28 GHz	Public consultation, Oct 2019	Suggestions of other bands were requested by the Regulator
Germany	3.7-3.8 and 26 GHz	Published final draft for the allocation to the verticals (3.5 GHz), Jul 2019 Stakeholder input sought (26 GHz)	Siemens and Bosch reportedly installed the first 5G test network in some of their plants.
Hong Kong	400 MHz in 26/28 GHz	Announcement of the creation of the “localized wireless broadband services” - LWBS license. Jul 2019	Up to 50 square km. Assigned on a geographically shared basis, in locations such as university campuses, airports, and technology parks, and is referred to as shared spectrum.
Japan	4.6-4.8 and 28.2-29.1 GHz	These bands not assigned to MNOs in the beauty contest of April, 2019	Target legislation Jun 2020, bands will be available in limited area. Spectrum sharing with incumbent users is required
Korea	MNOs Spectrum	SKT leading Giga Korea smart factory project (CY2020)	MNOs actively developing IIoT network / service with their licensed spectrum
Netherlands	3.4-3.45, 3.75-3.8 and 26 GHz	Dutch mobile policy paper, Jun 2019	Included in sector policy.
Sweden	3.7-3.8 GHz	Investigating the issue of awarding local permits, Mar 2019	Forthcoming decision.
UK	3.8-4.2 GHz	Public consultation, Dec 2018, and Report, Feb 2019	Workshops throughout the second half of 2019.

Worldwide regulators moves

Hong Kong license announcement

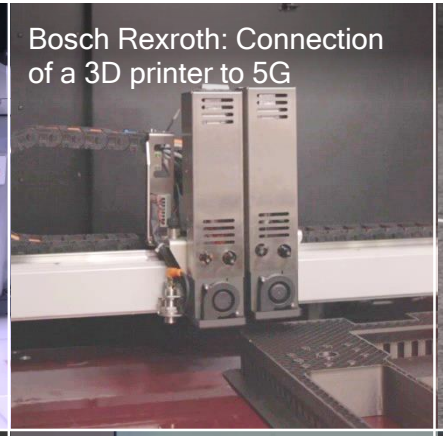
- On July 5th, Hong Kong's Communications Authority (CA) announced the creation of the Localized Wireless Broadband Service (LWBS) license.
- Frequency bands: This license was proposed in the CA's 26 GHz and 28 GHz plan for the licensing of 400 MHz of spectrum on a shared basis for deployment of 5G or other advanced technologies in small geographic areas.
- Location type: University campuses, industrial estates, the airport and technology parks were identified as potential locations where LWBS licenses could be used, noting that they could support fixed wireless access or smart city applications.
- Location size: A licensee's locations served under an LWBS license may not exceed an aggregate of 50 square kilometers.
- Expiration date: LWBS licenses will be valid for five years and may be extended for up to five additional years.
- Cost: Licenses will cost HKD 100,000 (USD 12,841) plus a variable fee based on the number of base stations and LWBS devices in use and the amount of spectrum assigned.
- Start date: An invitation for submission of license applications is to begin within a couple of weeks. In the meantime, a sample license is available on the CA website.

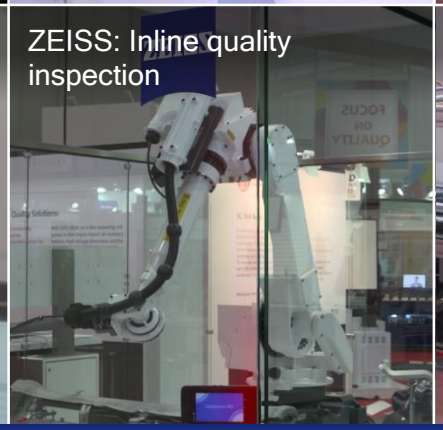
Worldwide regulators moves

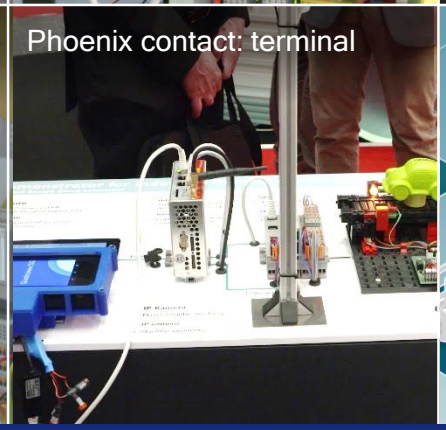
Germany allocation to the verticals

- BNetzA published the final draft for the allocation of 3.7-3.8 spectrum to the verticals ("Local Broadband Administrative Regulation" (VV 3.7 GHz)) in July 2019. The application procedure for local spectrum use is set to begin in the second half of this year as soon as a fee scheme is determined by the regulator.
- Frequency bands: Spectrum allocation in 3.7-3.8 will be done tech neutral
- Application: The applicant has to come up with and explain to the BNetzA a usage concept, a proof of a legitimate interest and has to demonstrate that he has sufficient relevant technical skills. Regarding the usage concept the applicant has - among others- to demonstrate what he intends to do with the spectrum, why the spectrum is needed, that there will be no interferences with other users, etc. A legitimate interest has the territory/property owner and someone who has a usage right on the property like a tenant.
- Neighboring property: Several users over neighboring properties shall jointly agree on and adjust the spectrum usage so that there will be no interferences. The BNetzA can give compulsory orders in this respect, if the parties fail to agree on a solution.
- Right to revoke: If the application is successful and the applicant fails to start the usage within one year after the usage right has been granted, then the BNetzA has the right to revoke the usage right

Strong industry collaboration around 5G Industrial IoT



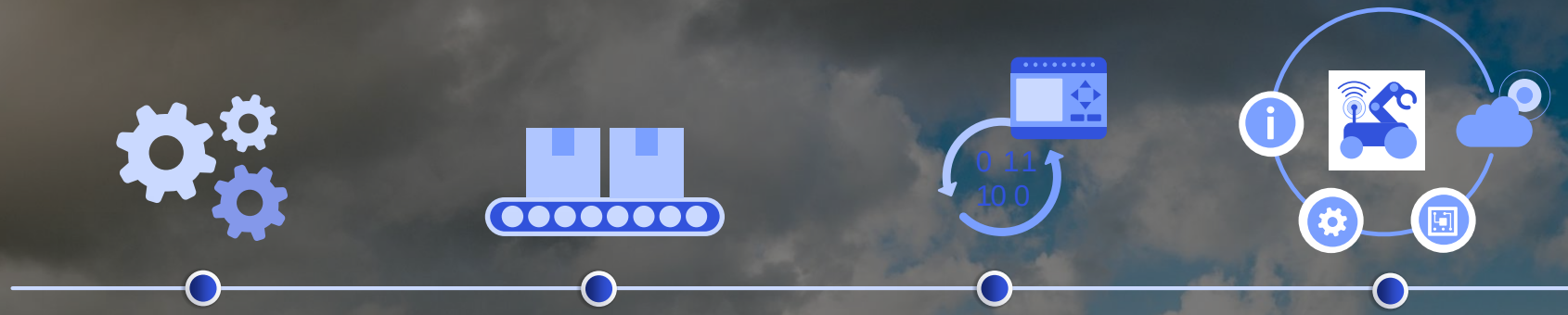




Kickstarted 5G for Industrial IoT with 10+ live ecosystem demonstrations at Hannover Messe 2019 based on Rel-15

Research collaboration with Bosch announced Feb. 2019

5G Alliance for Connected Industries and Automation (5G-ACIA)–advancing 5G for the industrial domain



Industry 1.0
Mechanization

Industry 2.0
Electrification

Industry 3.0
Digitalization

Industry 4.0
5G Connectivity

As the mobile industry is motivated
to expand the addressable market,

and verticals are motivated to take the opportunity
to redesign and optimize their processes,

Private 5G Mobile Networks are emerging as one of the
leading advanced 5G use cases

Qualcomm

Thank you!

Follow us on:

For more information, visit us at:

www.qualcomm.com & www.qualcomm.com/blog