

From Now to Next

Accelerating industries digitalization to Industry 4.0
with Industrial-Grade Private Wireless Networking

5G Standalone
is here

MINING

PORTS

UTILITIES

MANUFACTURING

AIRPORTS

- HD to 4K
- Reliable low latency
- Time sensitive networking

Francesca Sartori

Principal Solution Architect

Standardization & Research Nokia Bell Lab

Five ways 5G will change your life

🕒 Mon 30 Sep 2019 | [Alex Gledhill](#)



https://www.youtube.com/watch?v=6rGr2tZ_YxA

What our customers are asking for help with Today



Automated falling conductor disconnect to avoid fire

Maintain **grid reliability** with growing **distributed renewables / storage**

Wind turbine monitoring for predictive maintenance

FAN convergence and automation



Fix Wi-Fi related **autonomous truck crashes**, downtime & resulting wear & tear

Drivers' **tiredness monitoring**

Increase safety with **remote drilling**

Introduce **wall-slope & environment sensors**



Connectivity inside the plane (pilots, crew, workers, etc..)

Plane departure time prediction using **cameras & analytics**

Replace Wi-Fi and PMR for reliable **airfield marshal work-orders & PTT**



Real-time **work-order system** for cranes & AGV drivers

Automated site access system and parameter **security**

Reefer monitoring

Remote control, autonomous cranes and AGV



Legacy assets digitalization for predictive maintenance

Fix **AGV Wi-Fi imposed low speed & reliability issues**

Digital twin **Machine connectivity**

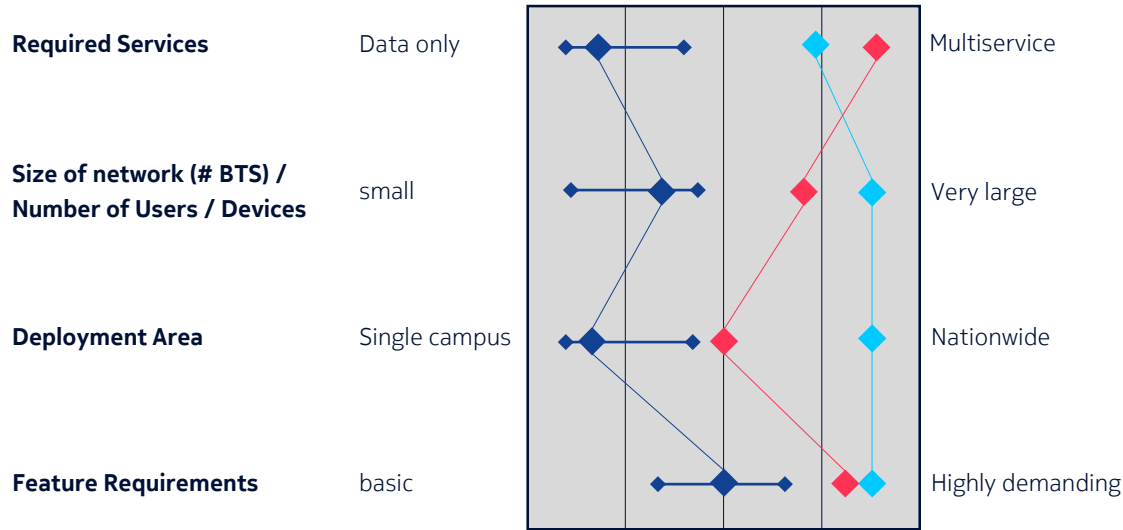
Workers' **connected tools & safety**

"Lot-size one" manufacturing

Requirements: Richness, Performance, Ease of Use

Private Wireless Connectivity Requirements

What Enterprises need is very diverse – between vertical segments, but even within

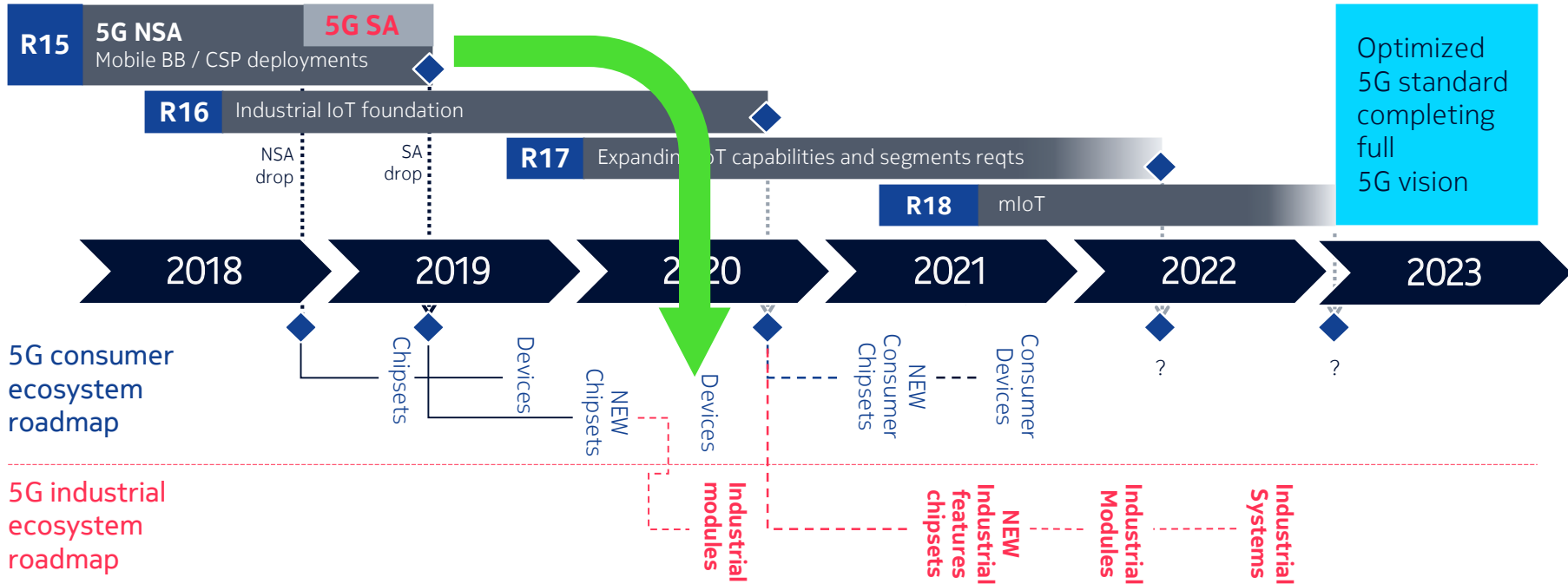


- Customer requirement assessment of our sub-segments
- Sub-Segments require quite diverse network characteristics
- Also customers within one sub-segment are quite different

3GPP standardization timeline

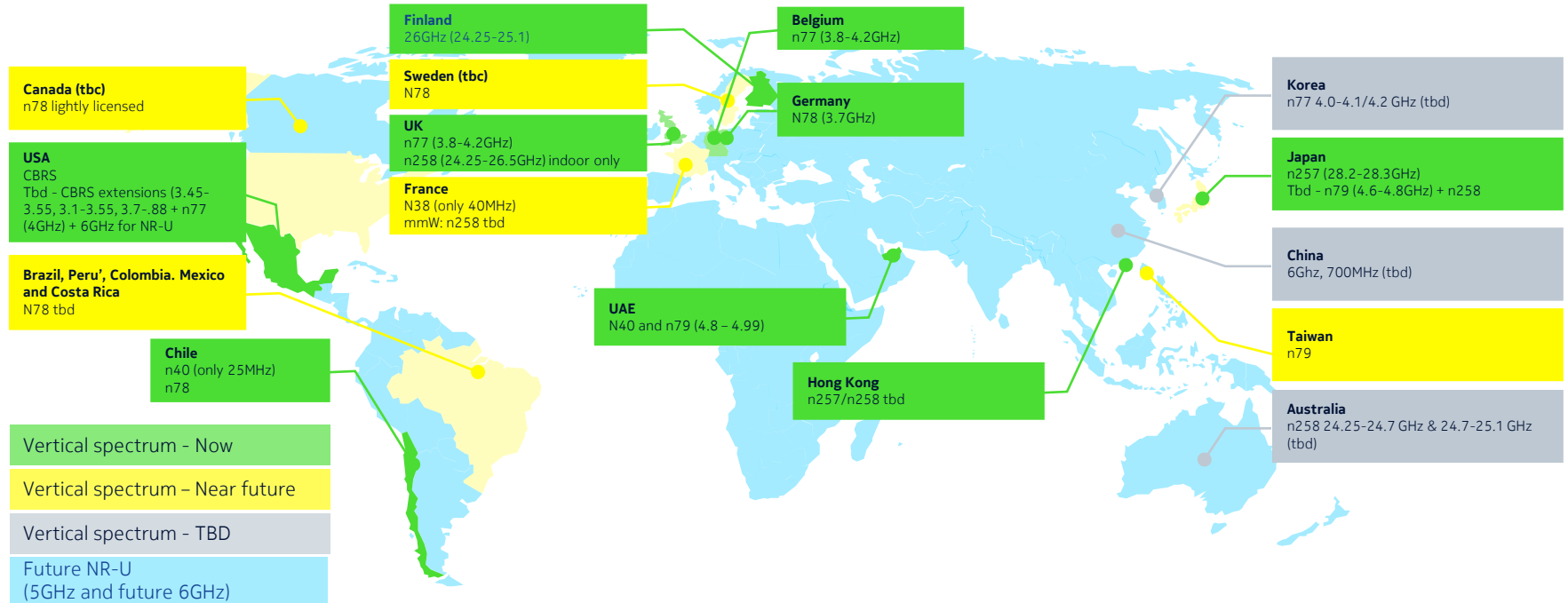
Early CSP 5G deployments with R15, Vertical capabilities starting R16, completing in R18

5G standard releases roadmap



5G today

Local/vertical spectrum for enterprises sites



Mobile operators large range of 3GPP licensed spectrum can be leased* or leveraged by CSP for private wireless deployments.

**depending on country's spectrum regulation*

Portfolio expansion to support diverse needs

Private wireless but end-to-end at the essence



Enterprises that start/evolve their digitalization journey with 5G



Lufthansa Technik

Germany, maintenance, repair, and overhaul (MRO) services for aircraft (21 facilities worldwide)

- Save customer time and travel to Hamburg by offering virtual engine parts inspection using 4K cameras to decide on repair/replace

Wi-Fi replacement for reliable high speed very wide area (large repair hangars) and deep coverage (in and around plane)

Deployment in Hamburg site hangar



Sweden, Underground mine machine manufacturer

Complement existing 4.9G network to validate technology to enable the future of mining machine innovation

- Remote operation of autonomous loaders and trucks
- Real-time monitoring of premises to keep people and equipment safe
- Remote machine diagnostics and predictive maintenance

Deployment in Sandvik underground test mine in Tempere, Finland



Japan, Largest car manufacturer & System integrator

Help accelerate digital transformation & factory automation

- Validate 4.9G and 5G performance
- Integrate next-generation manufacturing use cases & design innovative production processes for global manufacturing sites

Deployment in TEPC, Toyota Production Engineering facility in Fukuoka, Japan



German rail operator

Validation of Advanced Vital Vehicle Operation (AVVO)

- Validate fully automated, driverless shunting of empty trains
- Drivers on board to keep safety responsibility

Track coverage at and around Bergedorf station, Hamburg

Collaborating with entire ecosystem to drive Industry 4.0



Service provider partners

Expertise in building & operating mobile network or public clouds, spectrum partners



Industrial ecosystem partners

Kick starting the industry with more LTE and future 5G industrial connected things



System integrators & Consulting

Deeper industry expertise and specialised channel to market
Broadening the sphere of influence



Industry 4.0: The time is now

All stars align (digitalization needs, spectrum, ecosystem, solutions) to start NOW

Enablers availability

Vertical, CBRS, Service providers' spectrum
Ecosystem of industrial devices

Industrial-grade solutions

Reduce complexity while
maintaining flexibility & control



Go Allwhere.

Networking solutions for the new age of industry.