NOKIA

Private Wireless

Ready 4.0 anything

#NoBoundaries

Enabling digitization and automation
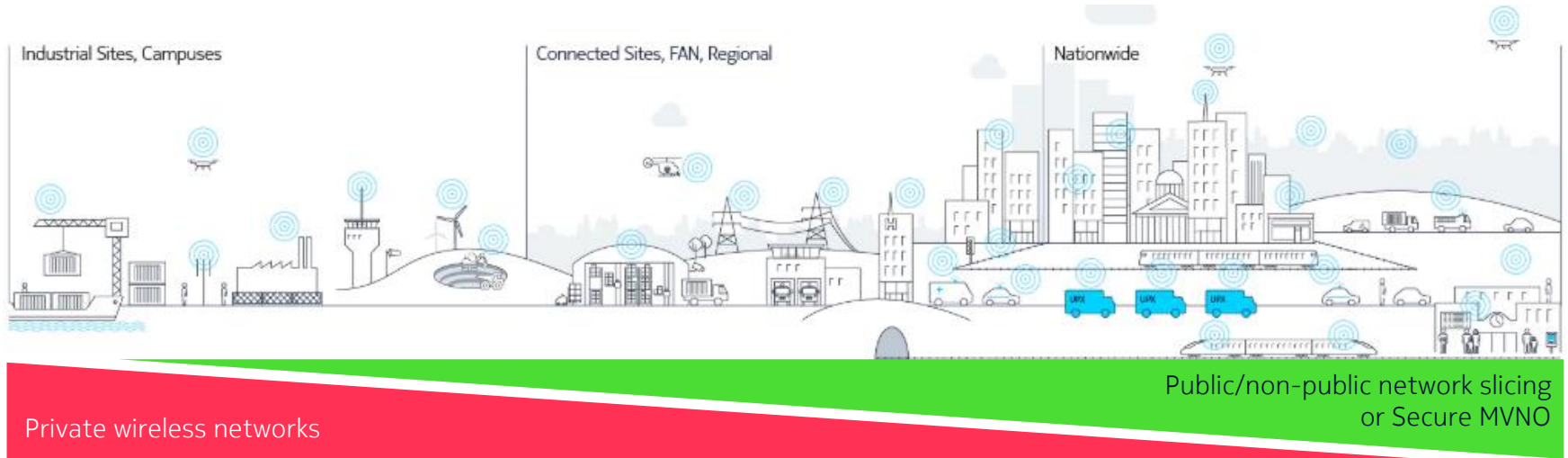
Lázár, Zoltán

Nokia Enterprise

29.09.2023, Budapest

Private Wireless Network

Dedicated connectivity for critical use cases

4.9G/LTE or/and 5G wireless network focused solely on enterprises' OT critical needs with tailored coverage & dedicated capacity to reliably and securely connect industrial assets and workers

Industrial Sites, Campuses   Connected Sites, FAN, Regional   Nationwide

Private wireless networks

Public/non-public network slicing or Secure MVNO

- Dedicate capacity and tailored coverage
- Maximum availability and reliability
- Full data privacy (even control channel traffic)
- Full control

- Large coverage
- Support for all RAT & LPWAN
- International roaming
- Lower upfront cost

NOKIA

Private networks with local enterprise spectrum provide better quality of service, network management and security for industrial-grade use cases

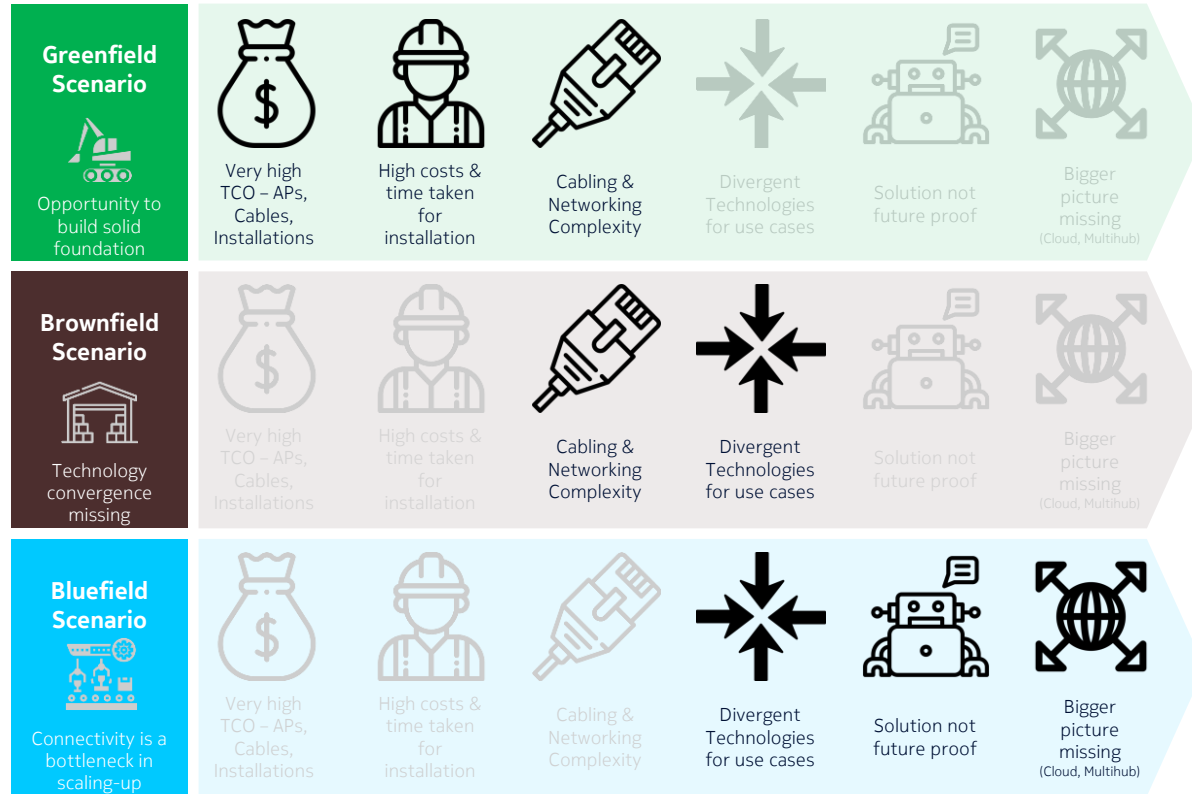|	Public network or network slice with operator spectrum	Private network with local enterprise spectrum
Critical connectivity need	Consumer devices & connectivity, smart venues (slice), logistics in transit	Factories, warehouses, power plants, airports, ports, rail, mines, public safety
Quality of service (QoS)	Sub-set of public spectrum with restricted performance parameters	Full capacity network with industrial-grade capabilities
Network management	Dependency on operator's network and release management	Full network control and high planning reliability
Security	Shared public authentication and shared network infrastructure	Dedicated SIM authentication and physical network separation
Data Storage & Processing	Centralized, shared core with public network	Local edge core capabilities, tailored to industrial needs

NOKIA

5G solutions can address networking challenges of sites with different digitization maturity

Greenfield Scenario — Opportunity to build solid foundation	Very high TCO – APs, Cables, Installations	High costs & time taken for installation	Cabling & Networking Complexity	Divergent Technologies for use cases	Solution not future proof	Bigger picture missing (Cloud, Multihub)
Brownfield Scenario — Technology convergence missing	Very high TCO – APs, Cables, Installations	High costs & time taken for installation	Cabling & Networking Complexity	Divergent Technologies for use cases	Solution not future proof	Bigger picture missing (Cloud, Multihub)
Bluefield Scenario — Connectivity is a bottleneck in scaling-up	Very high TCO – APs, Cables, Installations	High costs & time taken for installation	Cabling & Networking Complexity	Divergent Technologies for use cases	Solution not future proof	Bigger picture missing (Cloud, Multihub)

How does 5G solution help?

- Number of **WiFi APs compared to pWLS APs** in a **greenfield** deployment is a **6-10 to 1 ratio**.

- Higher no of APs also means more cables, switches, routers and more installation work – **WiFi TCO significantly higher than pWLS TCO**

- Compared to 1000s of meters of traditional and complex cabling, **Passive Optical LAN solution simplifies and reduces the cabling complexity**.

- Instead of WiFi (Data), Private Mobile Radio (Voice), LoRa/Sigfox (IoT) and another WiFi (Automation), **pWLS converges all use cases under one connectivity umbrella**

- pWLS has **an evolution path (5G!) for ultra-low latency, huge UL/DL bandwidth and precise positioning** – ideal for many future use cases such as AR/VR, AGV localization etc.

- **pWLS integration to AWS, MS Azure and 3rd party cloud solutions** ensures cloud-native IT landscape for supply chain organizations

NOKIA

Use Cases in more detail

Nokia Oulu Factory/Warehouse driving Industrial automation and digitization

Background, challenges and drivers

- Testers connected to LAN cannot easily be brought where needed. Kilometers of cables in fixed location prevents dynamic changes in production layout.
- Robots did not function well when connected over Wi-Fi
- The amount of sensors and data exceeded the capacity of the network
- Too high latency for video analytics.

Solution

- Wireless production: The production layout can be flexibly changed

- To robots: Transfer of coordinate and gripper attitude data

- Mobile robots: Telepresence and material transport to the production line

- IoT devices: Multiple sensors utilize the private network for communication

- Video analytics assisted quality assurance: Camera records assembly, the video stream is analyzed, a live feed is presented to operator via tablets or AR glasses

Video: Breaking the chains with pervasive wireless connectivity

Press release: Nokia's digitization of its 5G Oulu factory recognized by the World Economic Forum as an "Advanced 4th Industrial Revolution Lighthouse" 3 Jul, 2019

© 2022 Nokia

NOKIA

Nokia helps Alibaba connect 100s of AGVs over private wireless network in Cainiao operated Warehouse in China

What are Alibaba?

Alibaba is a Chinese multinational company specializing in eCommerce, retail, internet and technology

Cainiao Network is a smart logistics network and data platform of Alibaba to meet Alibaba's logistics vision of fulfilling customer orders

What was the project?

In Oct 2018, Cainiao opened one of it's largest warehouse with over 700 AGVs working in 30000 sqm area, run with IoT applications, big data, edge computing and AI.

Nokia helped **setup a private wireless mobile network at the premise over unlicensed spectrum to** <u>**connect over 100 AGVs**</u>.

How was the impact?

- Communication delay reduced from 40-1000ms to 12-20ms
- Bit error rate reduced form 3% to zero
- Meanwhile, 90% wireless AP saved (vs. WiFi AP in main area).

NOKIA

5G network to be used for high bandwidth use cases for Lufthansa Technik shop-floor

Use Case 1: Remote Table Inspection

Customer's clients would like to do remote inspection of shop floor using high definition video

- Reliable/Robust Connectivity
- High throughput requirement (capacity)

Use Case 2: Virtual Cabin Modification

Customer would like to modify cabin design virtually with VR/AR to fit client's requirements and specifications

- Reliable Connectivity in metal environment
- Very high throughput requirement (capacity)

Press Release

NOKIA
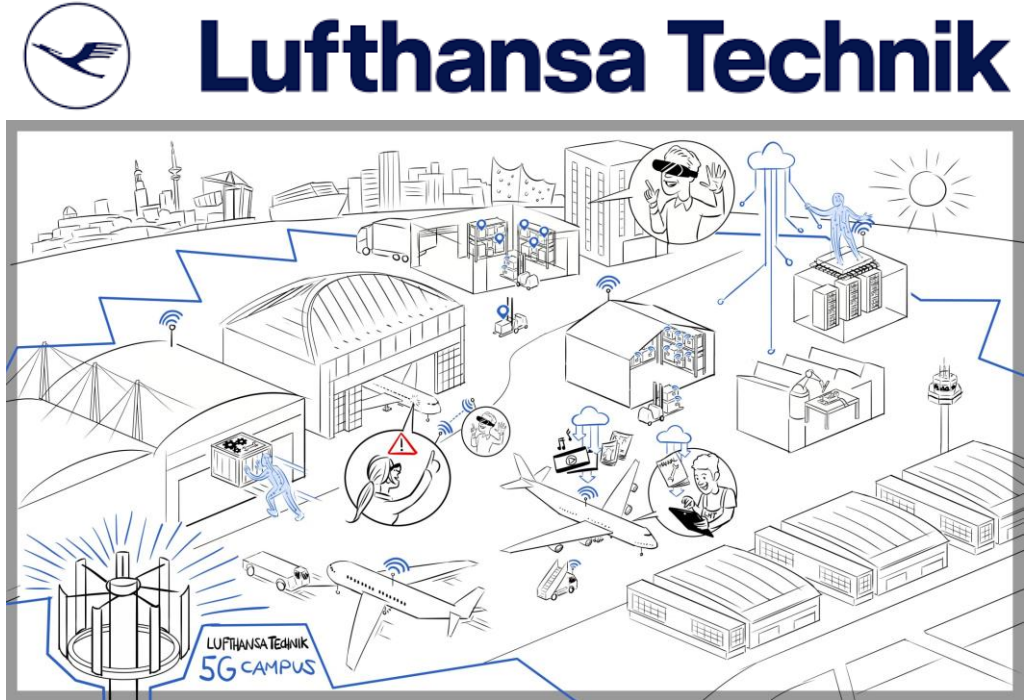
Arena 2036: Highly flexible research platform for future of mobility and manufacturing

What is ARENA2036?

ARENA2036 is the largest and the leading research platform for mobility in Germany.

It pioneers innovations in the lab that can be deployed in factories in the future.

Nokia Engagement and Partnership

- Providing the complete eco-system with cutting edge **5G NSA technology deployed**

- Developing 5G based precise positioning which would be instrumental in automation optimization/efficiency

- Validating smooth functioning of AGVs over private wireless networks

- Work with manufacturing and logistics industry on identifying and solving real pain points/use cases

NOKIA

NOKIA

The networking solution for the new age of industry