

Avril 2022

Industrie 4.0 & 5G

Visions 2022



Fresque réalisée par Jo Di Bona

Agenda

1



La 5G dans l'industrie



2



Exemple 1



3



Exemple 2



4



Bilan

4th industrial revolution powered by 5G

Massive

Connect everything



100x
Connected Devices

~15 years
Battery Life

1.000.000 /km²
Density of connected devices



Create digital twins and predictive maintenance



Critical

Cut the wires

99,999%
Data transmission reliability

10Gb/s
Extreme bandwidth

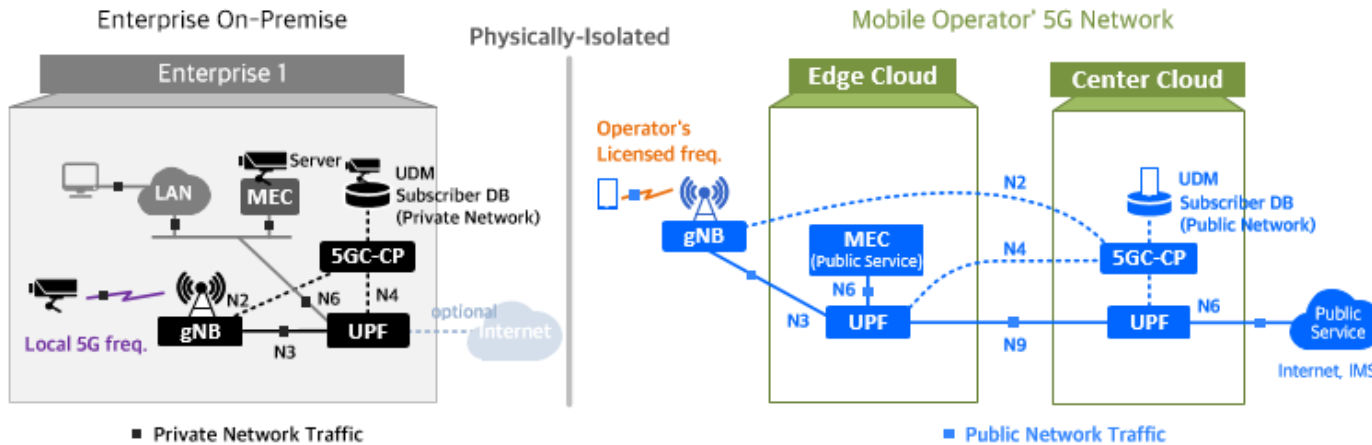
<10ms
Ultra low latency



Intelligence orchestration and remote control

Questions d'architectures 1/2

- 1) Isolated 5G LAN built by enterprise (Local 5G Frequency, Full Private, No-Sharing)
- 2) Isolated 5G LAN built by mobile operator (Licensed Frequency, Full Private, No-Sharing)
- 3) RAN sharing between private network and public network
- 4) RAN and Control Plane Sharing between private and public network



Cas 1

Pros: As there are independent 5G network full sets in the enterprise on premise,

Privacy and Security: The private network is physically separated from the public network, provides complete data security (data traffic generated from private network devices, subscription information and operation information of private network devices, all are stored and managed only within the enterprise. Internal data inside the enterprise is not leaked outside)

Ultra-Low-Latency: Since the network delay between the device and the application server is within several ms, URLLC application services can be implemented.

No optical fiber to the building: There is no need for a working backhaul to keep the local service running. 5G service can be immediately provided to the enterprises that do not have optical backhaul links, for example factories in rural area.

Even if a **mobile operators' 5G network failure** occurs: Even if the mobile operator's facilities burn down, the company's 5G private network works well.

Cons:

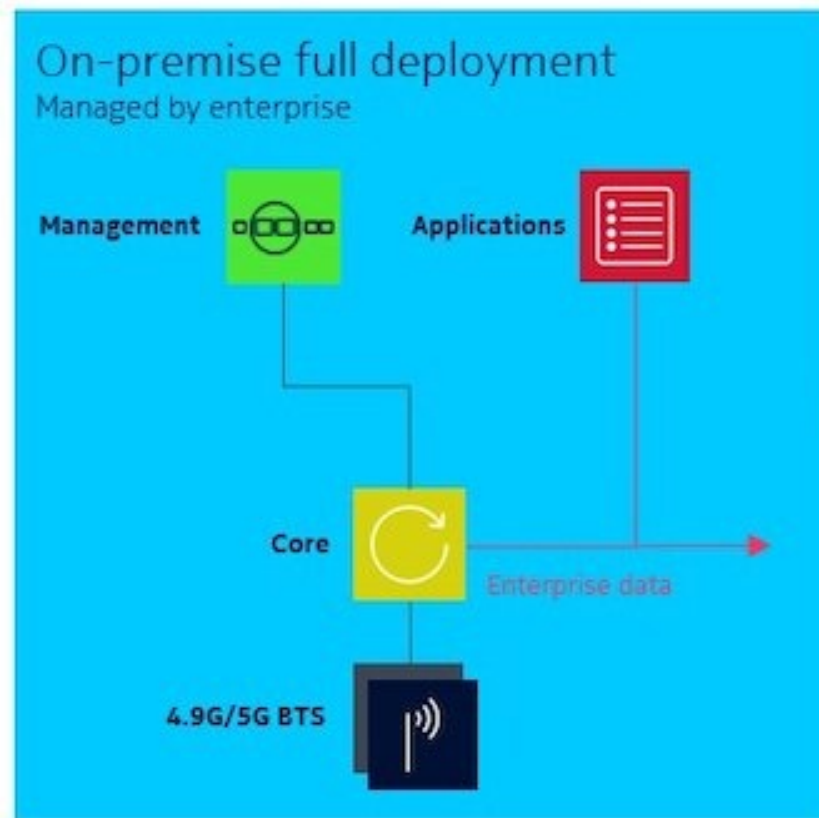
Deployment cost: It is not easy for an ordinary enterprise to buy and deploy a 5G network full set at its own expense. Especially for smaller enterprises.

Operational personnel: There is no know-how for existing private LAN (wired Ethernet LAN, wireless Wi-Fi LAN) operation team to build and operate 5G network. Enterprises need to have the right engineers.

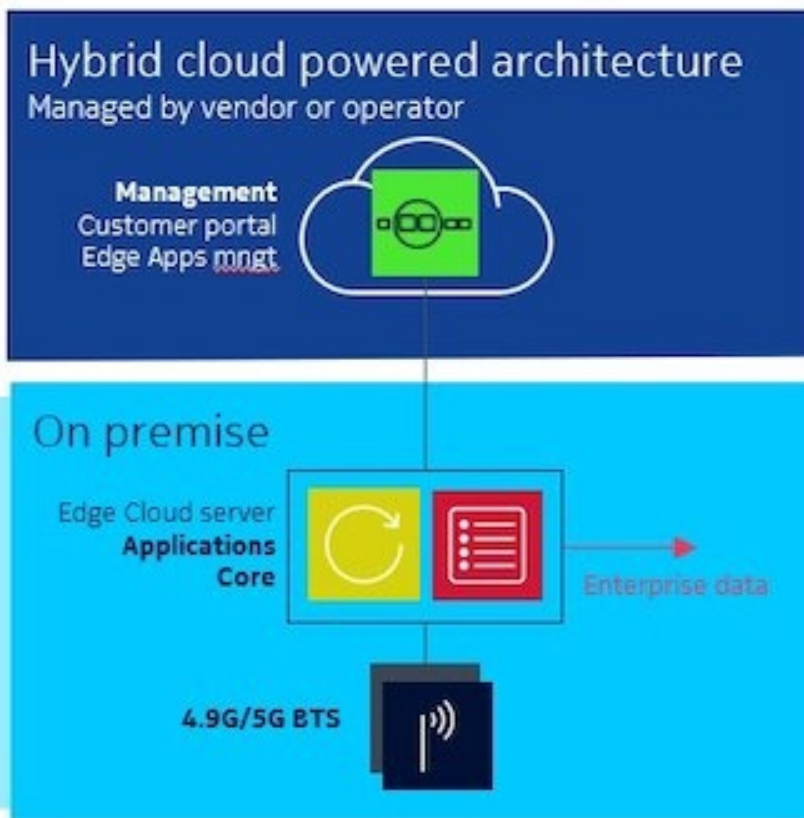
Terms to know
MultiAccess Edge
Computing
Radio access
network
User plane
Function
G NodeB

Choix d'architecture 2/2

Autonomous Private wireless



Private wireless as-a-Service



Core "Slicing"



Condition de succès (ou d'échec) : le TCO

Conditions d'optimisation du TCO

1 Site planning is much easier with private wireless



Siting **Wi-Fi** access points to avoid interference and ensure solid coverage is a major and expensive undertaking, especially in very large industrial sites, where many objects are stored and moved, and also need outdoor area coverage.

Private wireless 4.9G/LTE's increased penetration, pervasive coverage and ability to deliver reliable high-performance in interference-prone environments, makes the planning stage much easier, faster and more cost-effective.

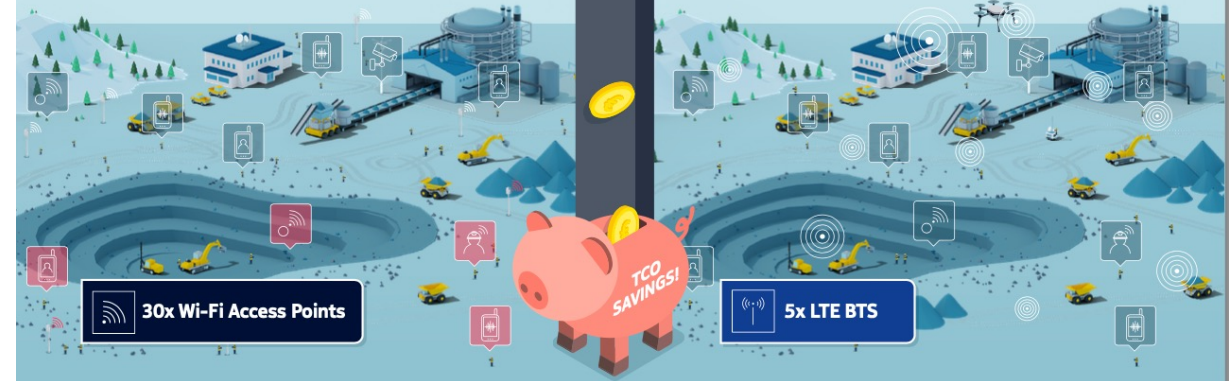


2 Wide-reaching coverage and high multi-user capacity comes as “standard” with private wireless



To cover the same area you need 10 times more **Wi-Fi** access points than a single 4.9G/LTE BTS small cell. Plus advanced radio schedulers in a 4.9G small cell can typically support 10-30x more users per access point than Wi-Fi 6.

Fewer **4.9G/LTE** access points means proportionally cheaper deployments, not just because of the total hardware CAPEX, but also due to the reduced costs for installation and wiring etc.



Condition de succès (ou d'échec) : le TCO

Conditions d'optimisation du TCO

3 Private wireless enables easier changes which reduces management and re-optimization costs



With a **Wi-Fi** deployment if you start adding or moving assets or machines, you often have to adjust or add access points to fill up new coverage holes or handle the new interference patterns.

10x Wi-Fi Access Points



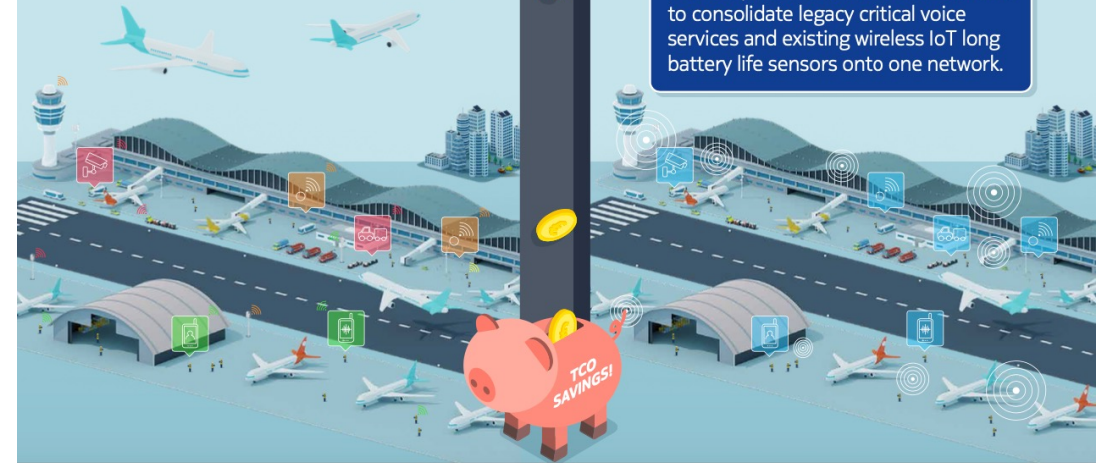
Better coverage from a **private wireless** solution means reduced OPEX, because the network can better handle changes in the radio environment.

5x LTE BTS

4 Private wireless means a single wireless network to support all traffic types



3-4 wireless networks (on top of **Wi-Fi**) to handle all use case types.



Unlike Wi-Fi, **4.9G/LTE** has been engineered to support all traffic types, and it is possible to use these networks to consolidate legacy critical voice services and existing wireless IoT long battery life sensors onto one network.

Exemple 1 : bon cas d'usage



Cas d'usage

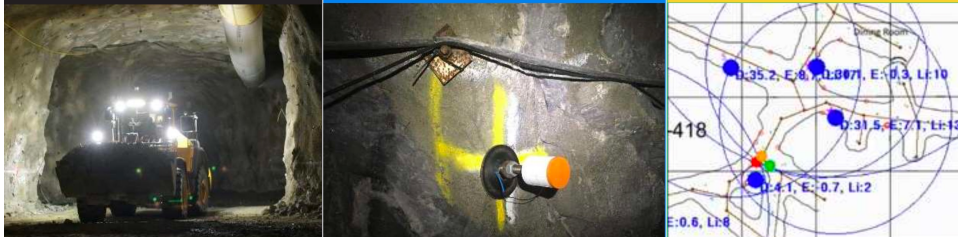
- Contrôle des véhicules en temps réel
- Détection incidents
- Mesure des paramètres roches
- Localisation dans la mine
- IA de stratégie pou creuser

5G enabled mining - IoT in the mine

"As a mine operator I want to secure good air quality for improved safety by more advanced control of ventilation"

"As responsible for mine safety I want to secure improved safety by understanding rock movements"

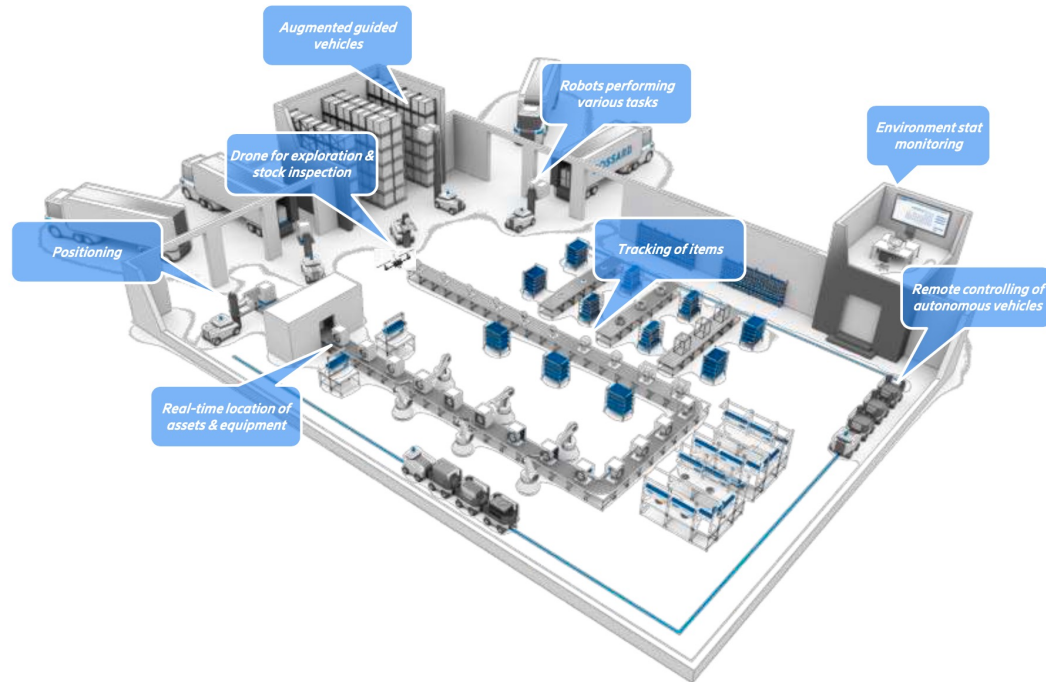
"As responsible for mine safety I want accurate positioning because it will improve safety"



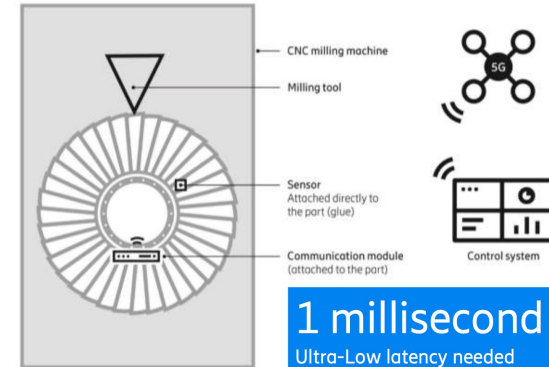
Bénéfices

- Pas de cablage
- Latence faible pour détection de problèmes gaz / feu / inondation
- Bande large pour data véhicule temps réels (5 Mo/s par véhicule)
- Ajout de capteurs à la volée

Exemple 2 : mauvais cas d'usage



The challenge:
25%
rework needed



EUR 360m
annual savings through
5G-enabled real-time
monitoring & control

16 million
metric tons potential
reduction
of global CO₂ emissions*

Cas d'usage

- Contrôle de plusieurs lignes actuellement monitorées via SCADA
- Ajout de contrôles temps réels de sécurité
- Mesure des paramètres roches
- Localisation dans la mine
- IA de stratégie pour creuser

Constats

- TCO importants pour améliorations business faibles
- Hausse importante du coût de la maintenance du réseau
- Complexification de l'architecture pour les anciennes machines
- Diminution du taux de disponibilité global usine

Bilan

Cas ou la 5G est intéressante

Nouvelles usines

Configuration complexe

Ajout des fonctionnalités
temps réels

Cas ou la 5G est à considérer avec
circonspection

Usines ou des réseaux
sont déjà disponibles

Architectures anciennes
ou non maîtrisées

Ajout de 1 ou 2 cas
fonctionnel sans impacts
majeurs

Annexe : Calcul du cout de la licence en fréquence

Spectrum for private 5G networks

Spectrum must be made available for the use of private networks. In Germany, the federal government has reserved 100 MHz bandwidth (from 3.7 to 3.8 GHz) for local use, such as in industrial companies.

That gives businesses in Germany the opportunity to lease spectrum for an annual fee and use it exclusively within their own business premises. Applications must be submitted to the Federal Network Agency (BNetzA).

The fee is broken down as follows:

fee = 1,000 + B x t x 5 (6a₁ + a₂), where

1,000: Basic fee of €1,000

B: Assigned bandwidth from 10 MHz to 100 MHz

T: Length of allocation in years or parts of a year, based on each month or part thereof

a₁: Coverage area in km² based on residential land and transport infrastructure

a₂: Coverage area in km² based on other types of land