


Embrace Industry 4.0 with digitalization

Amit Kumar Anand
CTO Enterprise Wireless Solution

The Nokia logo is displayed in white, uppercase letters within a dark teal circular area. The background of the slide features a large, stylized white 'C' shape on the right side, set against a green-to-teal gradient background.

Private Wireless Networks ->>> Accelerating Industries Digitization & Automation towards I4.0

Industry 4.0 will deliver massive increase in productivity & economic value creation



Enhance efficiency
with process automation



Increase agility
to meet fast changing requirements



Better decision making
via intelligent insights









Increase worker safety & productivity



Sustainability
efficiency helps lower environmental impact

...while maintaining asset heavy industries “Must-have” needs

Continuous operation	Efficiency & Safety	Security
 	 	 

Industry 4.0 transformation cycle

Understand

From information to knowledge

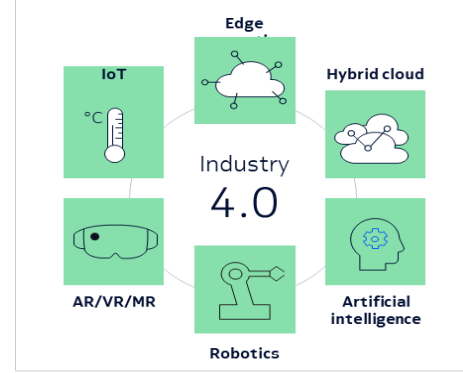
Real time data analysis for intelligence



Predict

From knowledge to wisdom

Prepare with predictive analysis



Edge



See

From physical to digital

Real time data generation of physical assets

Pre-requisite: Physical assets connectivity

Industrial grade Private Wireless

Autonomous Action

From wisdom to intuitive action

Controlled fully autonomous, self-learning and organizing systems

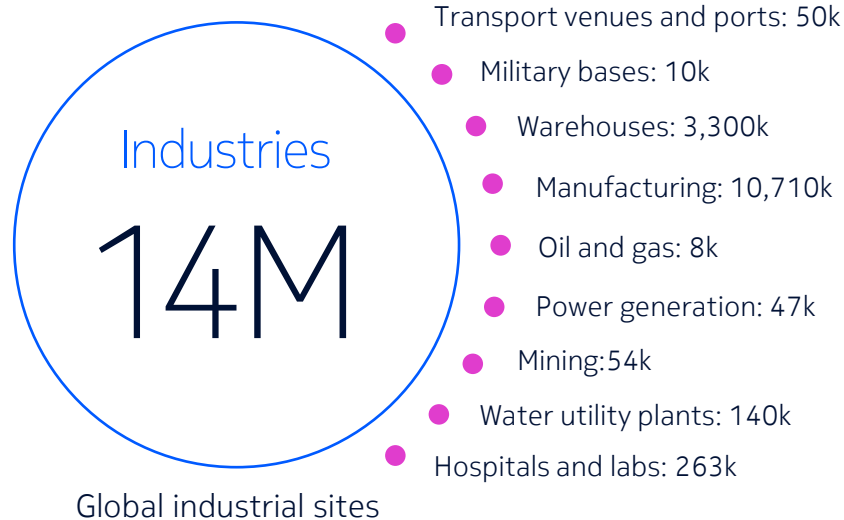
Pre-requisite: Digital control of physical assets



Industry 4.0

Full operational transformation enabling new business models

The market potential for Industry 4.0 is huge...



BUT

Requirements varies greatly

- Per (sub)-segment ecosystem
- Per (sub)-segment use cases

Enterprise's OT expects a solution

Why the industry is asking for private wireless networks



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 and resulting wear and tear

Drivers' **tiredness monitoring**

Increase safety with **remote drilling**

Introduce **wall-slope and environment sensors**



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

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

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



Real-time **work order system** for cranes and 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 and reliability issues**

Digital twin **machine connectivity**

Workers' **connected tools and safety**

"Lot-size one" manufacturing



Enhanced Group Communications including push-to-video and geo mapping

Better situational awareness with real time video from drones, vehicles and body cameras

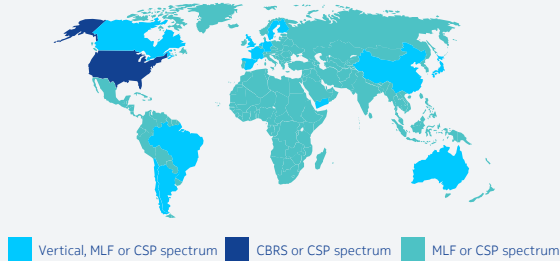
First responders' **bio-vital signs monitoring**

Eliminating the barriers to adoption

Industrial-strength private wireless is here today and easier than ever

Spectrum availability

- CSP
- Vertical
- Unlicensed



Simple & easy to use

2-3 elements + Plug and Play

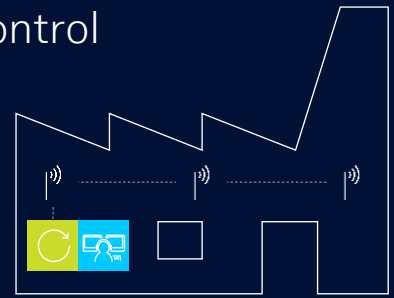


Ecosystem of LTE/4.9 / 5G industrial devices



...while keeping full control

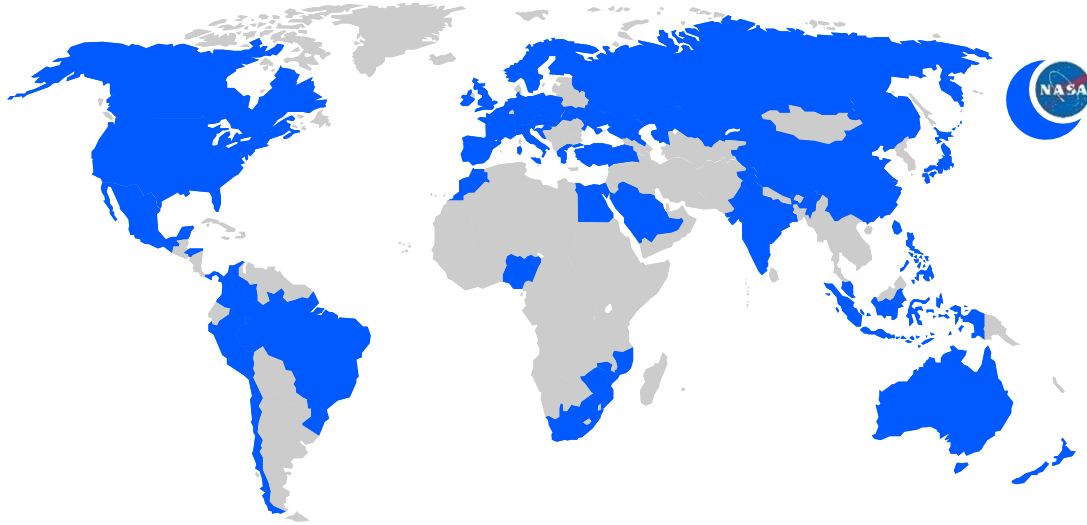
- Dedicated network
- Enterprise data stays local even in cloud architecture
- Full visibility and control from enterprise management interface



Private wireless 4.9G or 5G Nokia's making it happen

595+ private wireless customers

Uncontested market leader in private wireless*



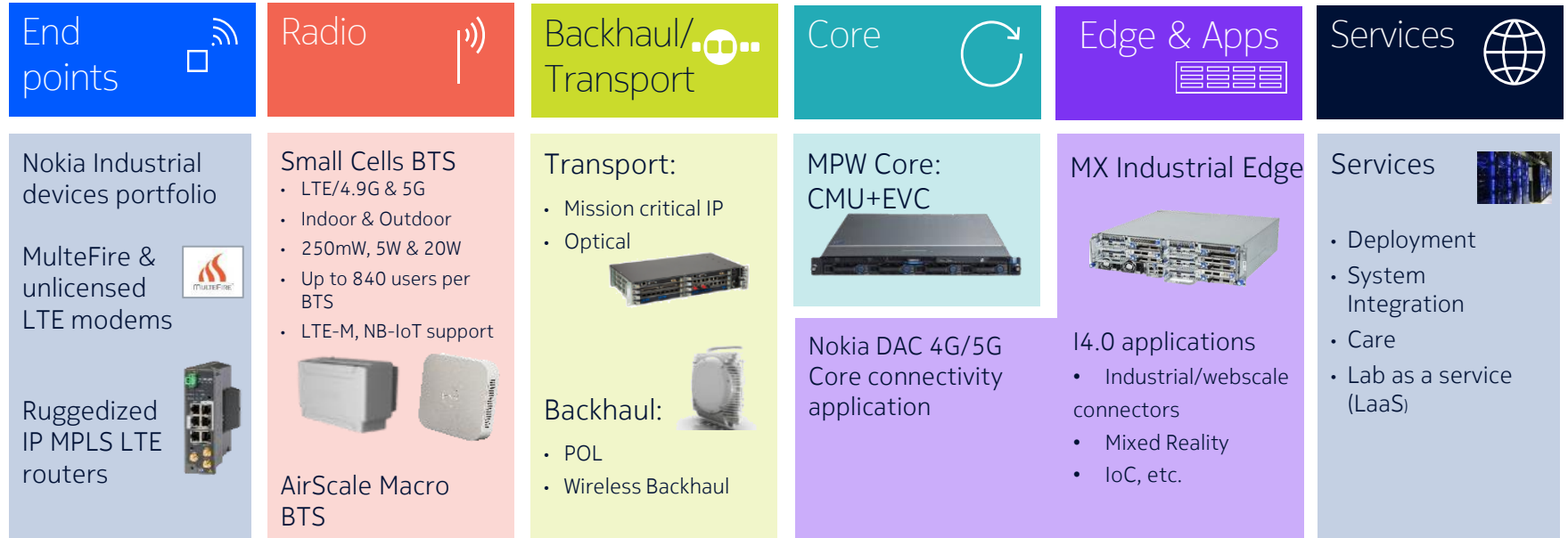
*Supported by latest publicly released data from key analysts firms

Public references



Comprehensive portfolio to support Industry4.0

Private wireless but end-to-end at the essence



Single end-to-end management and orchestration

Collaborating with entire ecosystem to drive Industry 4.0



Service provider partners

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



Industrial bodies and ecosystem partners

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

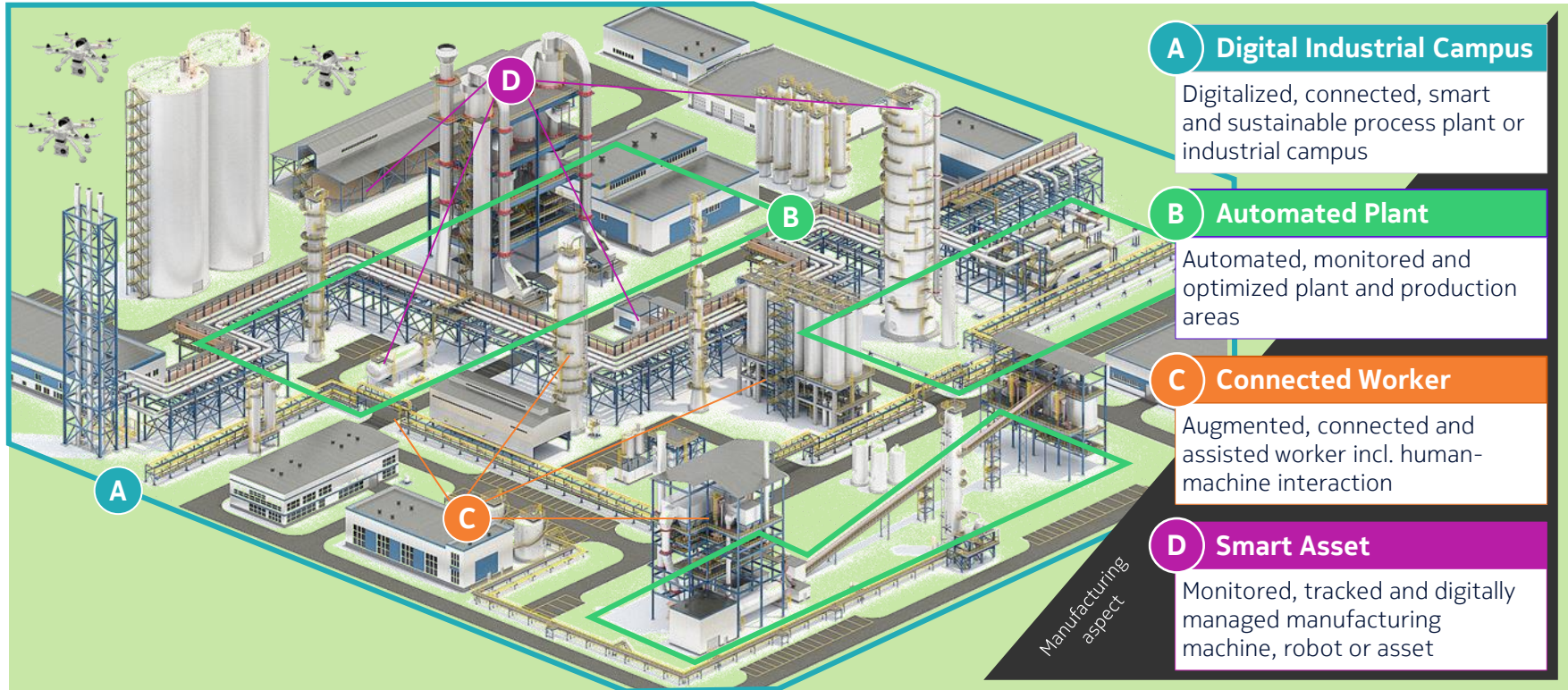


System integrators & Consulting

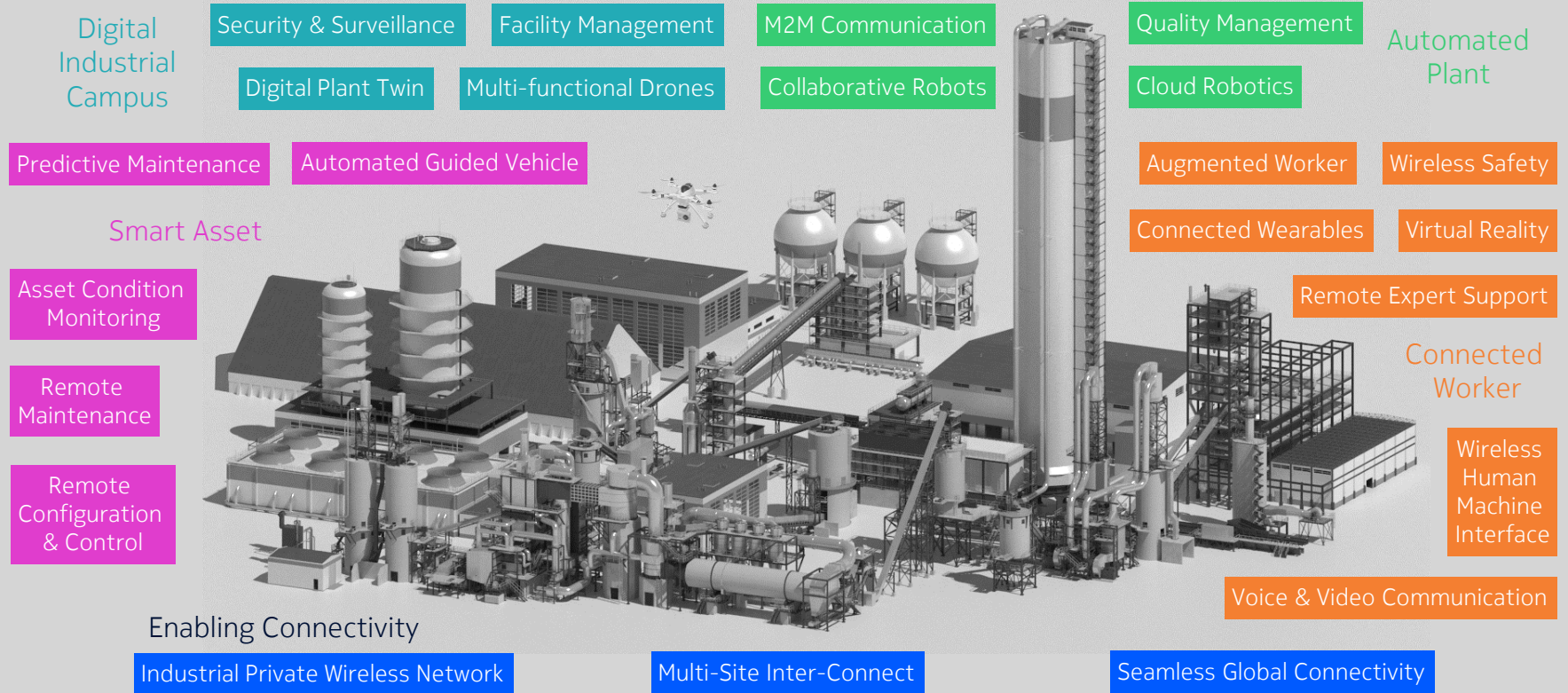
Deeper industry expertise and specialised channel to market
Broadening the sphere of influence



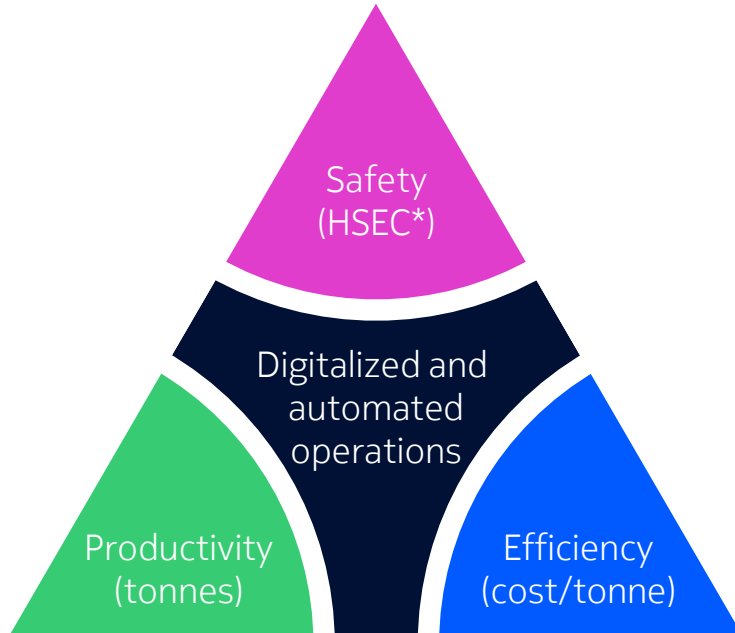
Industry 4.0 use cases can be categorized along their manufacturing aspect: From the industrial campus and plants, to working personnel and used assets



Industry 4.0 use cases apply in a variety of Manufacturing contexts



Mining KPIs and evolving needs are driving the adoption of digital technologies



* HSEC = Health, Safety, Environment and Community



Fast, reliable, and secure mobile data connectivity



Mission-critical voice and video communications



Real-time video streaming



Sensor networks, IoT, analytics and AI



Low-latency for extreme autonomy and automation



Asset monitoring and predictive maintenance



Geo-location, geo-tracking and geo-fencing



Robots, drones and digital twins



Augmented/Virtual Reality

Use cases for the connected digital mine

Geo-tracking and geo-fencing of people, vehicles and assets



Drone inspection of the mine site and stockpiles



Control of renewable energy resources, power stations and microgrids



Tire pressure and temperature monitoring



Autonomous drilling, loading and hauling



Camera surveillance, asset monitoring and video analytics



Wastewater management and tailing dam monitoring



Asset monitoring for predictive maintenance



Monitoring of environmental conditions with IoT sensors



Low-latency communications for autonomous vehicles and robots



Data analytics, AI-assisted decision making and digital twins



Digitalization and automation of business-critical processes



Digital PPE for worker health and safety



MC PTT/PTV for person-to-person and group communications



Tele-remote control and Integrated Operations Center



AR/VR for employee training and remote support assistance



Digital transformation is helping miners to save time, money and lives

~\$370 billion

economic impact of mining automation
by 2025 (McKinsey Global Institute)

30%

reduction in shovel hang time; trucks have
80% less idle time at the crusher (Komatsu)

12.4 liters

less fuel consumption per truck per hour;
CO₂ emissions reduced by 236 metric
tonnes per vehicle (a tier-1 mining operator, Australia)

15%

productivity and efficiency improvement
with AHS for 20% of operations
(a tier-1 mining operator, Australia)

6.25 hours per month

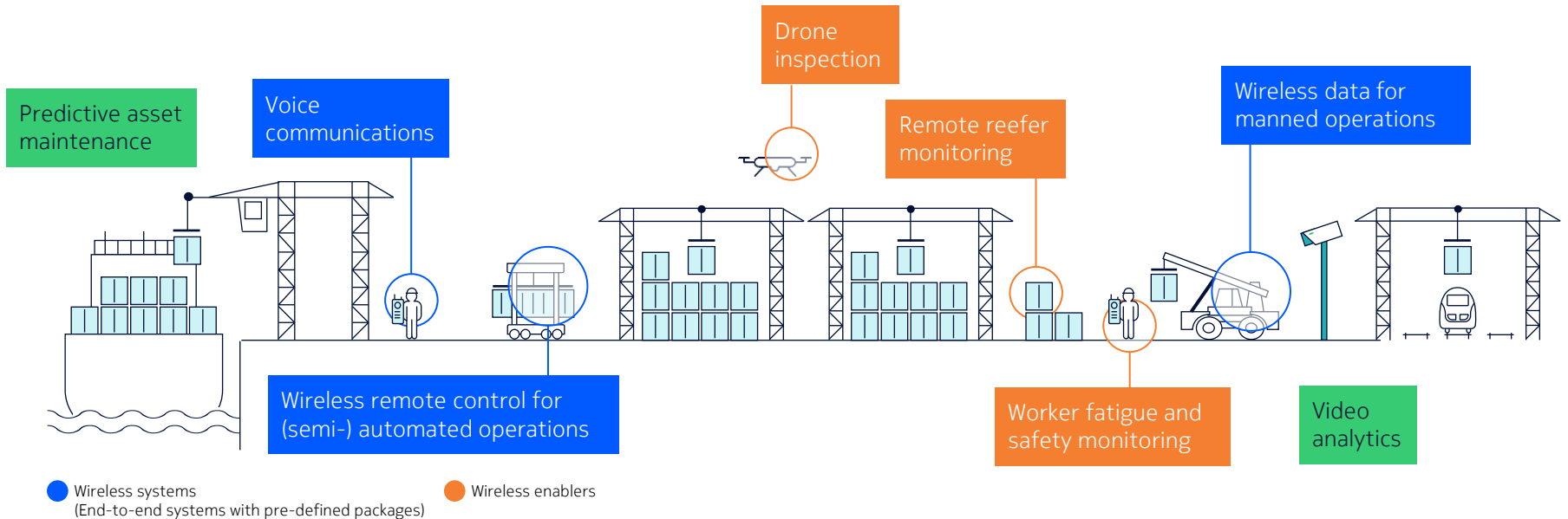
truck productivity increase on an average
of 75 h/year with 4G; saving ~\$300 million
on a single mine site (a tier-1 mining operator, Australia)

2.5 million hours

with Zero Lost Time Injuries through
automation, remote and autonomous
operation (Sandvik)

Digital transformation of PORT terminal operations

A portfolio of end-to-end wireless systems and wireless enabling blocks



NOKIA