

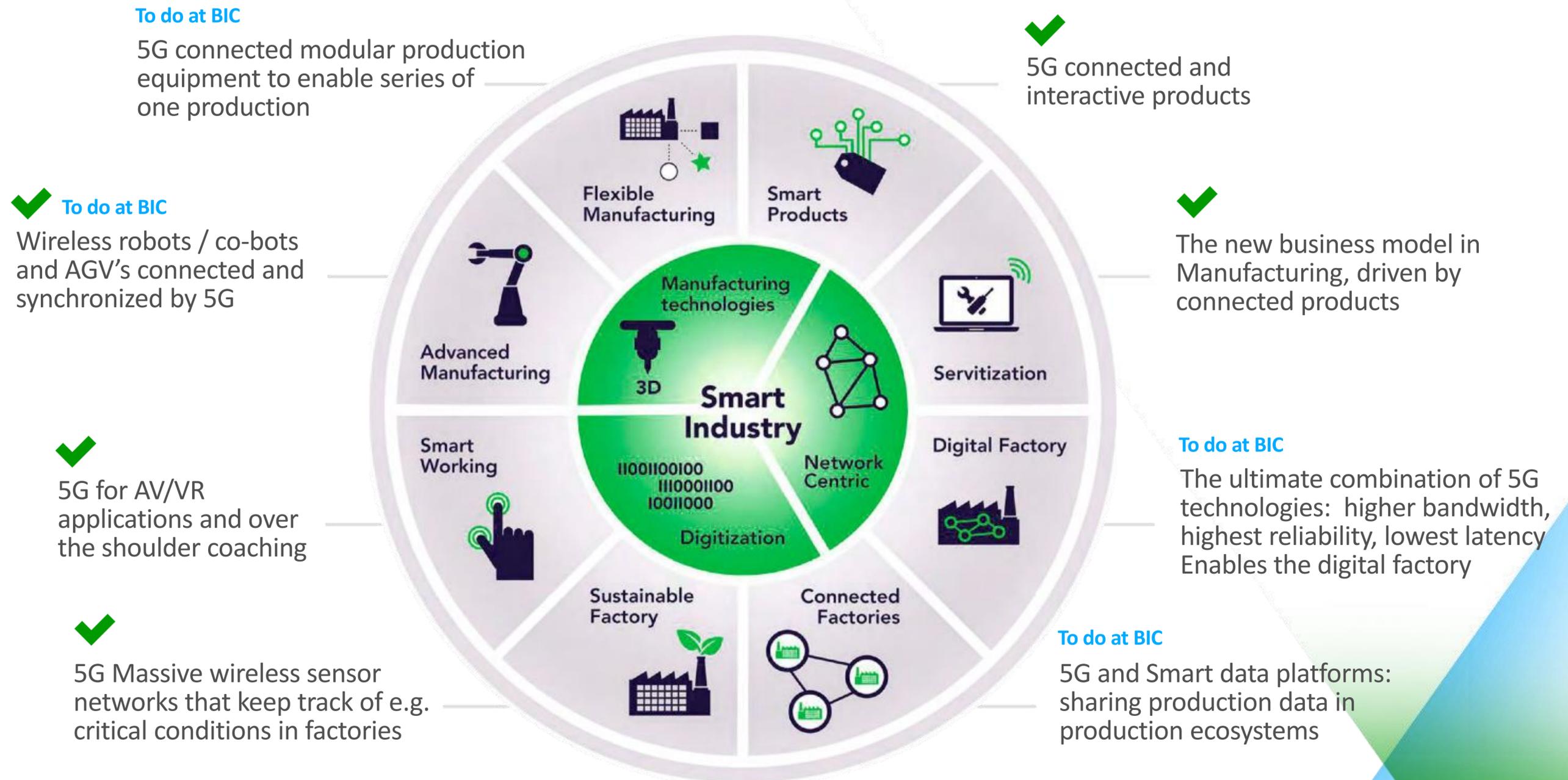
5G indoor opportunities for manufacturing

Paul Cobben, sector developer
manufacturing FHI 5G deepdive session

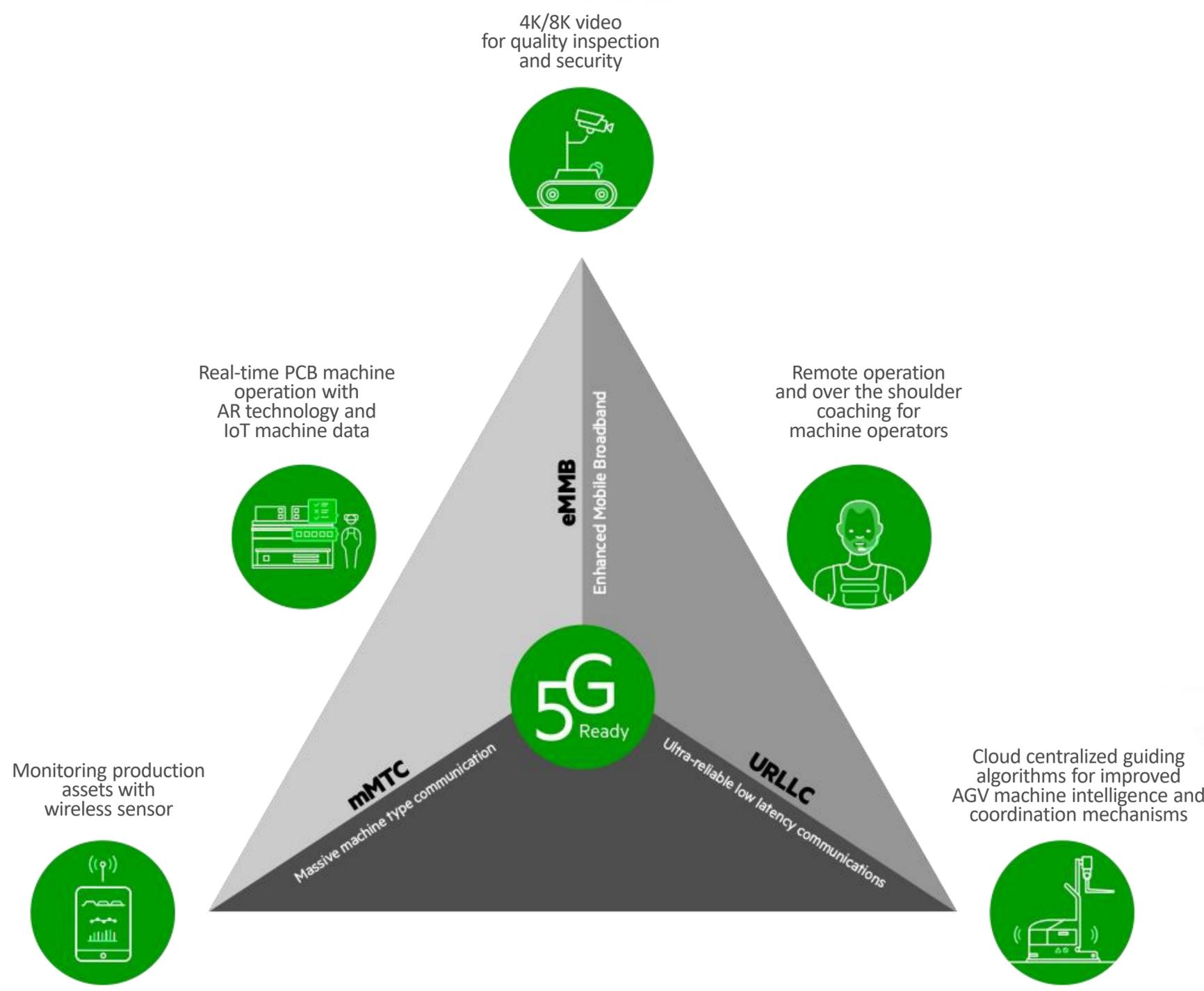
manufacturing

29th of September, 2020

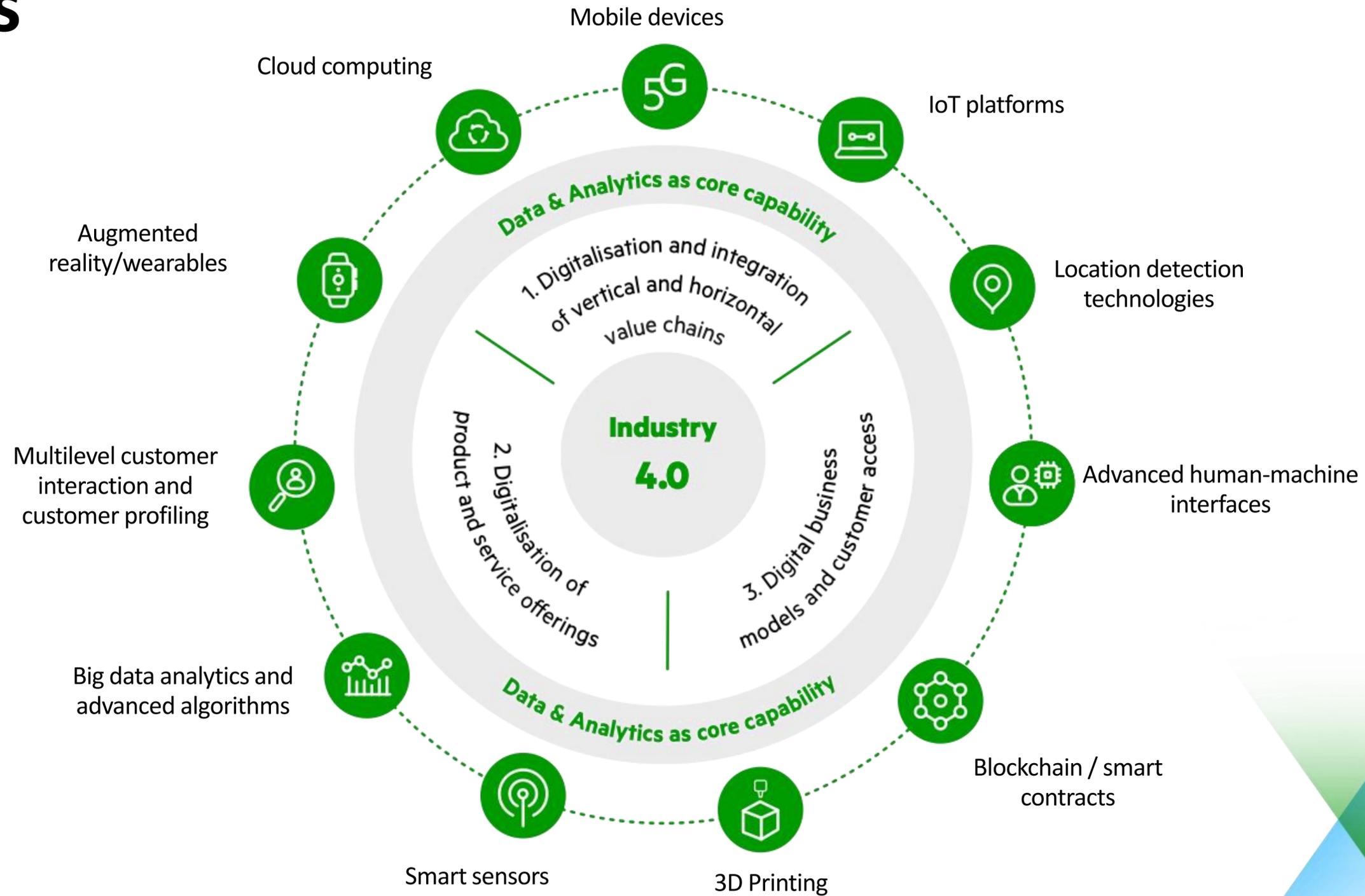
5G opportunities for Manufacturing



5G use cases for discrete manufacturing



Industry 4.0 technologies are enabled by wireless networks



1G

1980s
Analogue
speech

2G

1990s
100 kbps

3G

2000s
1 Mbps

4G

2010s
10 Mbps

5G
Ready

100x
faster

100x
more connected devices
(1 mln / km²)

20x
20x lower latency
(1 ms)

Ultra reliable
99,999%

Mass market driven

mission critical
communication
functions

slicing virtual
networks &
edge computing

Business market
driven

THE DIGITAL DUTCH
GOES DIGITAL



KPN will offer additional 5G services directly from 5G launch

KPN offers 3 additional services for 5G, right from launch of 5G, which are very relevant for process- and discrete manufacturing

1. Coverage on Demand

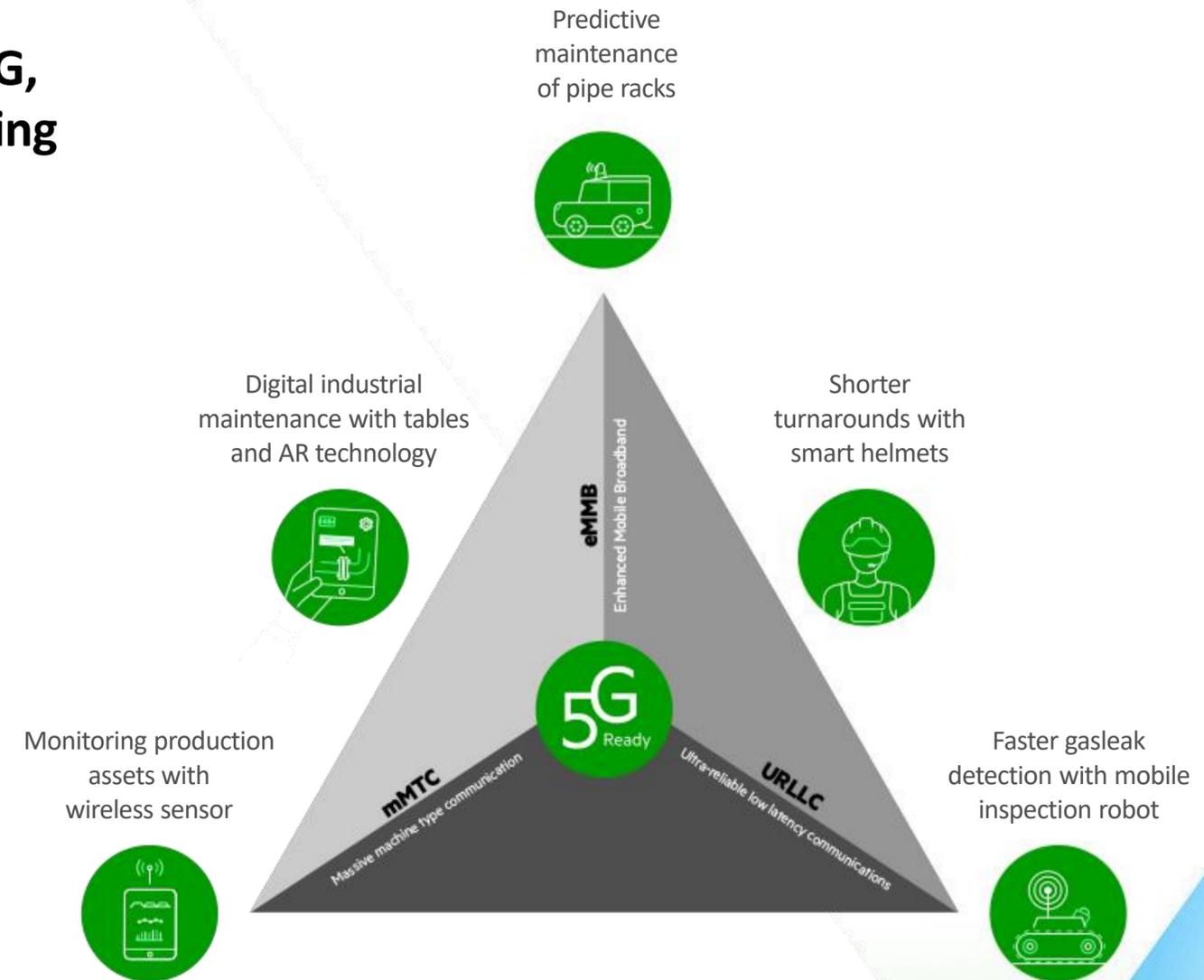
Offering consistent coverage on your plant or factories, essential for use cases like inspections with robots and maintenance with smart helmets

2. Guaranteed Bandwidth:

Offering a stable experience of (new) applications on your plant or factory, essential for use cases like augmented reality applications

3. Application priority

Will enable stable performance of light applications nationwide



Wireless factories; What, why and how?



What

Smart environment with many connected smart objects

A wireless factory is in essence a smart environment with many different types of smart objects in it. These smart objects continuously give information about themselves and their interaction with their surrounding, thus creating input for the digital twin of the physical factory floor. Wireless technology like 5G, LTE-M and UWB let all these smart objects connect and interact with each other

| Smart Object | Wireless technology | 5G feature | Important |
|--|---------------------------|---------------------------|----------------------------|
| Modular production equipment | 5G | Critical IoT | Ultra low latency |
| Production robot | 5G | Critical IoT | Ultra low latency |
| AGV | 5G | Critical IoT | Ultra low latency |
| Wireless sensors | LTE-M (Machine 2 Machine) | Massive IoT | High density |
| Connected products and assets | LTE-M (Machine 2 Machine) | Massive IoT | High density |
| Mobile camera / camera on helmet (like Realware) | 5G | Enhanced Mobile Broadband | High bandwidth |
| AR / VR device (like Hololens) | 5G | Enhanced Mobile Broadband | High bandwidth |
| UWB tags | UWB (Ultra Wide Band) | | Very accurate localization |

Why

From wired to “without wires”

Shift from traditional factory floor,

- Fixed production lines
- Fixed camera's
- Wired production robots

To a wireless shop floor, with:

- Flexible production floor
- Modular production equipment
- Autonomous AGV's
- Mobile camera's
- Wireless sensors
- AR / VR applications



Core benefits:

- Much more flexibility in production
- More efficient series of 1 production
- Seamless collaboration between intelligent machines
- Real-time production data to improve product quality and production uptime
- Enabling new data driven business models: connected products and (retrofitted) production assets

A wireless shop floor uses 3 key network

- Much more capacity
- Much lower latency
- Much more connected devices

Why is 5G relevant for wireless factories:

- 5G can accommodate all these network features
- 5G can also accommodate the variety of use cases that use a different mix of these features
- This is where 5G excels compared to other wireless networks like WiFi

How

Combine the right network technologies

LTE-M

Machine to Machine connectivity for:

- connected products
- asset tracking
- on and off the factory terrain

5G indoor

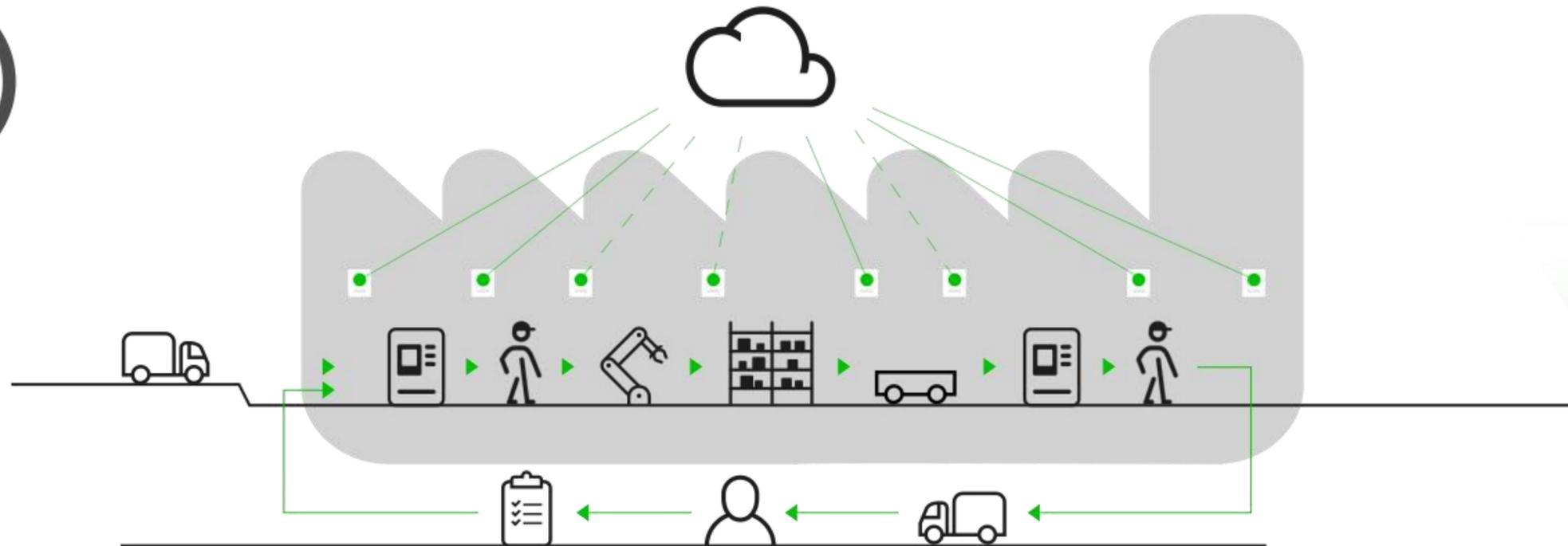
5G indoor connectivity for:

- 5G connected modular production equipment
- collaborating AGV's via 5G and powerful cloud driven steering algorithms
- AR technology via 5G for training, remote operation and real-time PCB machine operation
- 4K- 8K video applications via 5G for enhanced quality control and security

UWB

Ultra Wide Band for:

- specifically for very accurate positioning in intralogistics
- 30 cm horizontal and vertical accuracy
- tracking of people, products and assets inside and outside on the factory terrain



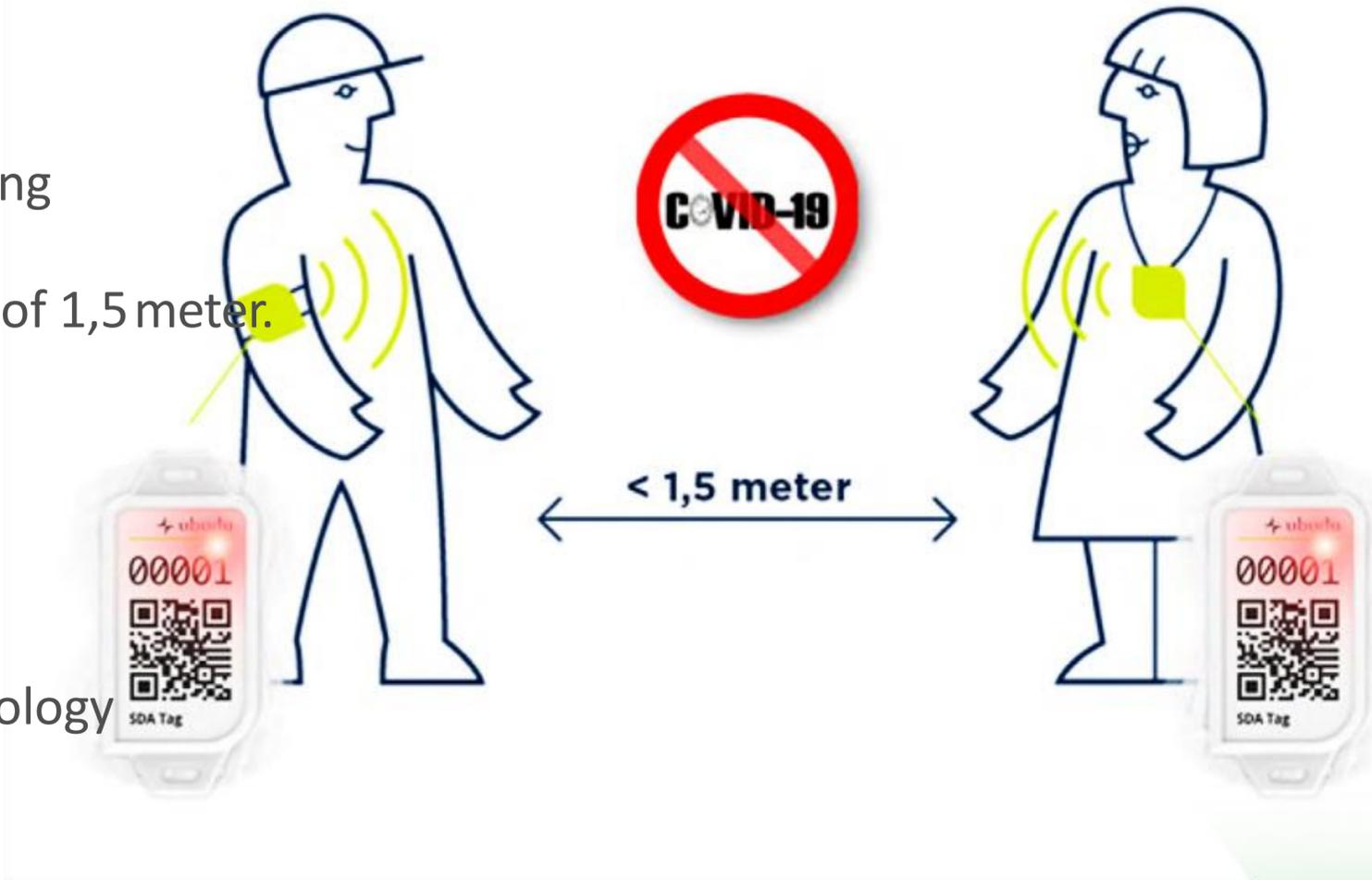
UWB solution for social distance – Covid Buzzer

How can you provide a safe and compliant workspace for your employees?

KPN provides a solution based on a tag or bracelet that will give each employee a warning via sound and vibration if someone comes within a distance of 1,5 meter.

Benefits:

- Fast and easy to use
- No privacy issues (GDPR compliant)
- No infrastructure required
- Very accurate solution based on UWB technology
- Rechargeable battery
- Made in EU



How

Integrate the core building blocks and technologies

Hardware / Appliances

- Sensors
- PLC's
- Industrial Computers
- Intelligent Machines
- Autonomous AGV's

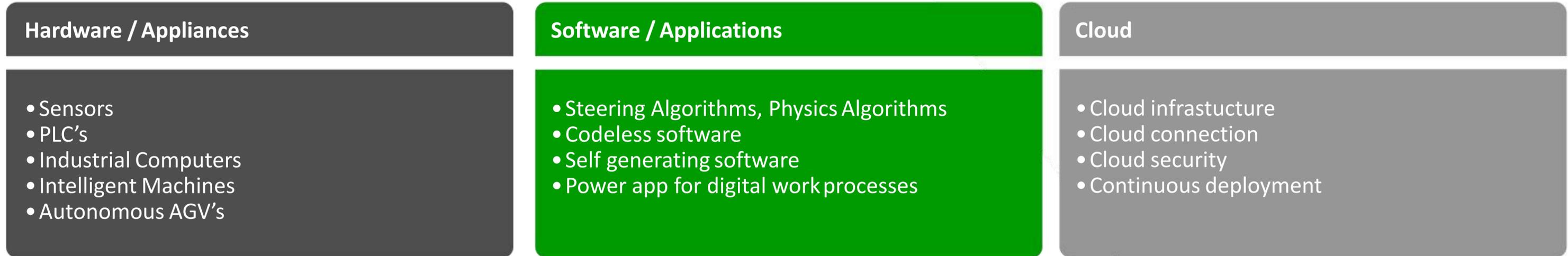
Software / Applications

- Steering Algorithms, Physics Algorithms
- Codeless software
- Self generating software
- Power app for digital work processes

Cloud

- Cloud infrastucture
- Cloud connection
- Cloud security
- Continuous deployment

What expertise can you deliver?



What do we ask from your organization:

- Willingness to explore new opportunities for your company e.g.:
 - product development
 - service development
 - process improvement
- Allocate a driven young professional to explore these opportunities with us, backed by senior management sponsorship

As of right now, 5G is available at Brainport Industries Campus



KPN has learned a lot about 5G applications from our 5G fieldlabs, that are based on business first, technology second.

We have seen the potential that 5G offers for the core sectors of the Dutch economy and therefore we have been engaged where the action takes place: agriculture, process industry, dense urban environments and mobility.

The Brainport Industries Campus is leading the digital transformation of manufacturing, the engine of the Dutch economy. KPN is convinced that especially being here at the centre of change, we can strengthen and accelerate the Smart Industry agenda with 5G and more important together with you!

**LET US REALIZE THE WIRELESS
FACTORY TOGETHER!**

THANKS FOR YOUR ATTENTION

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