



European Industry Partnerships – Lighthouses to Thrive in the New Digital Age

Brussels, 5 November 2019

5G for Smart Manufacturing

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Production research from the cutting edge to 5G - Yesterday



Georg Schlesinger
(1874-1949)

“The dividends sit on the cutting edge of the steel, but the speed of these cutting edges is a function of the machines that move them.” (1911)

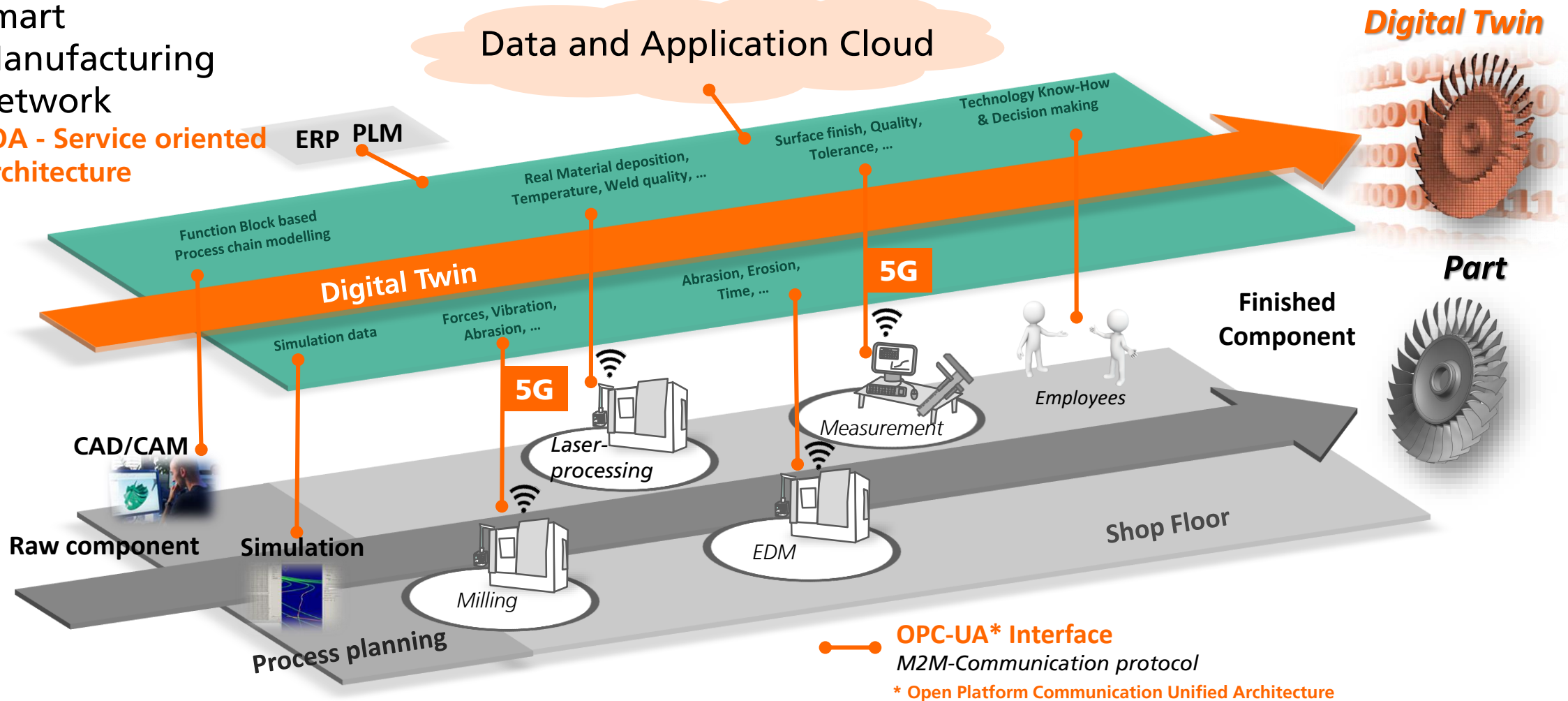


Value creation starts
with producing chips!

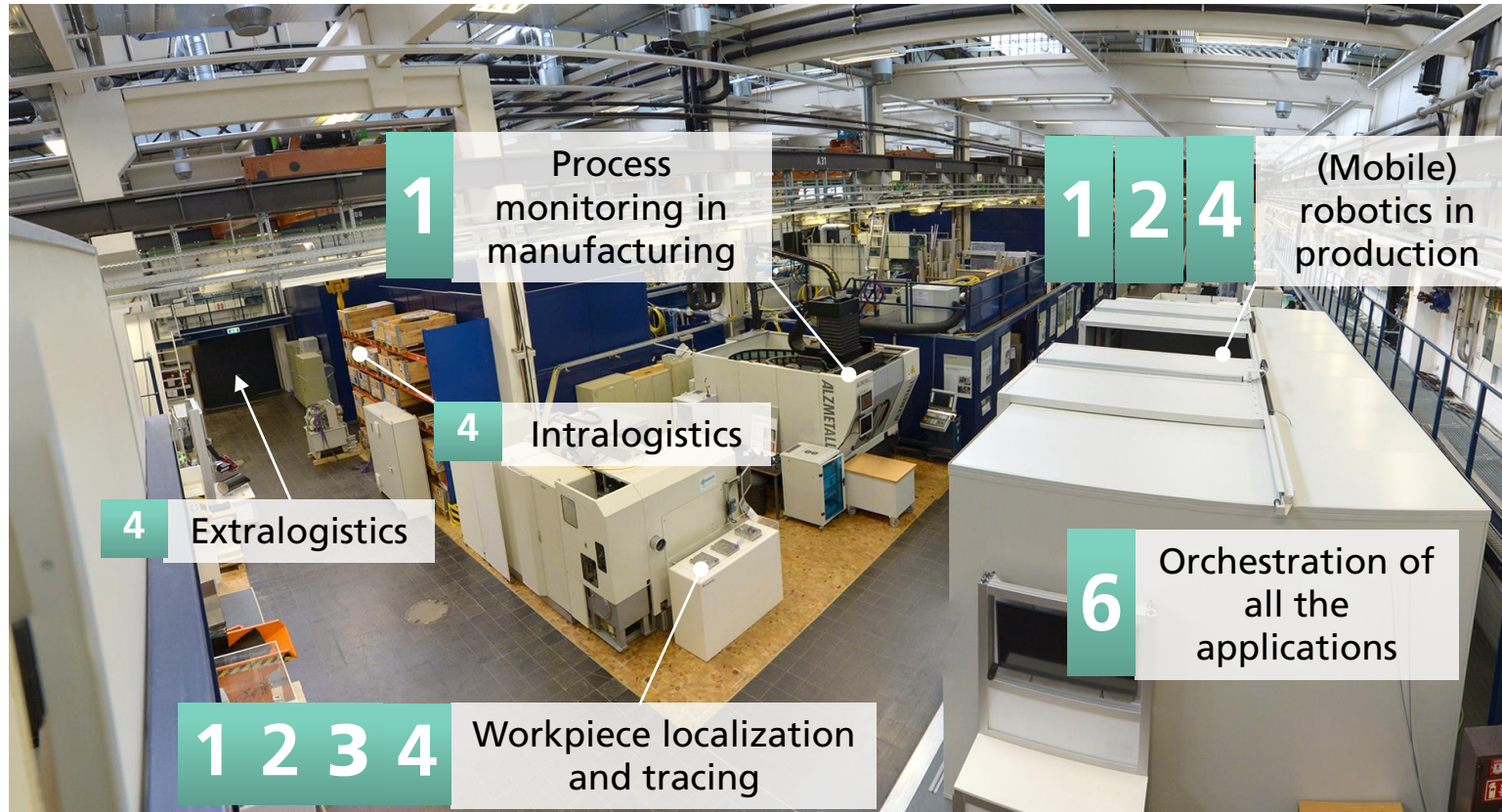
Target Architecture: Smart Manufacturing Network

Smart
Manufacturing
Network

SOA - Service oriented
Architecture



Use case scenarios for 5G in production



1 Ultra-reliable low latency communication (URLLC)

2 Enhanced mobile broadband (eMBB)

3 Massive machine-type communication (mMTC)

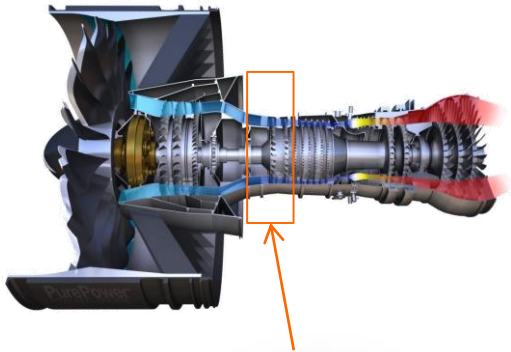
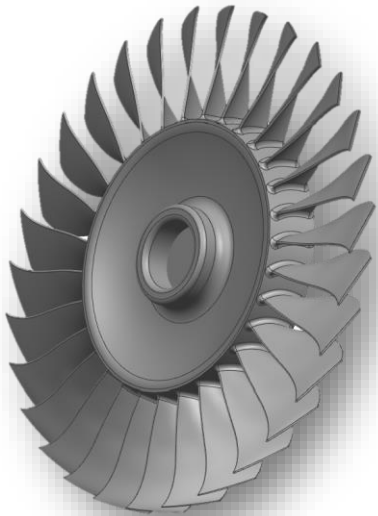
4 Localization

5 Cross-site end-to-end communication

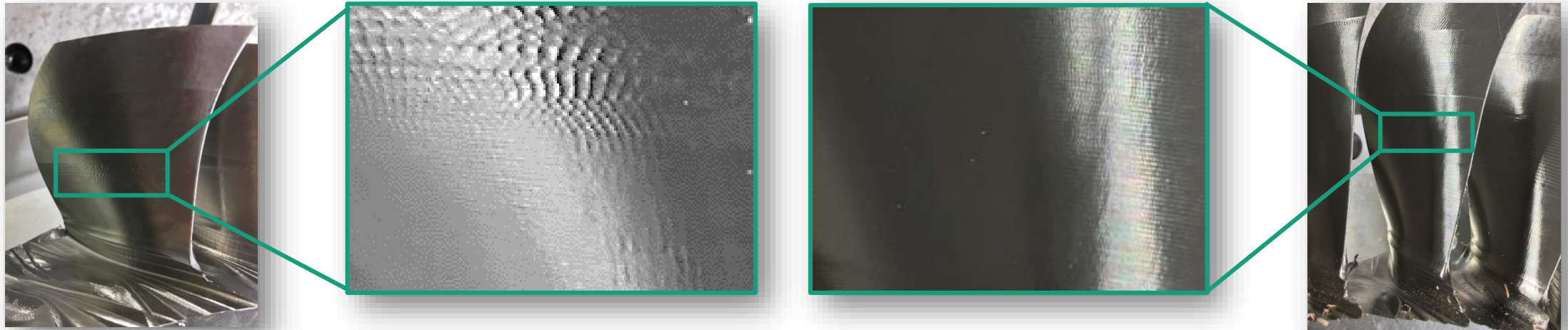
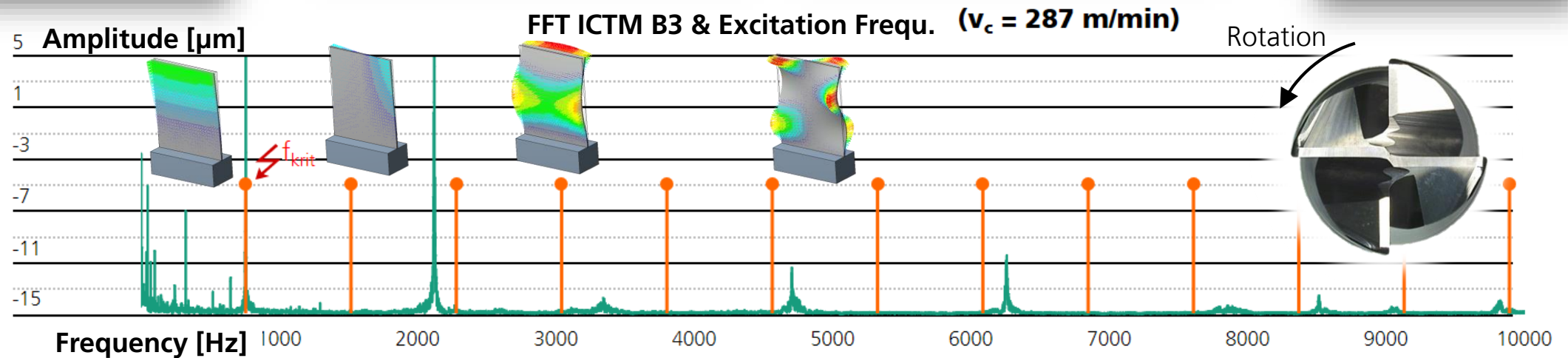
6 Slicing

5-axis milling of BLISKs

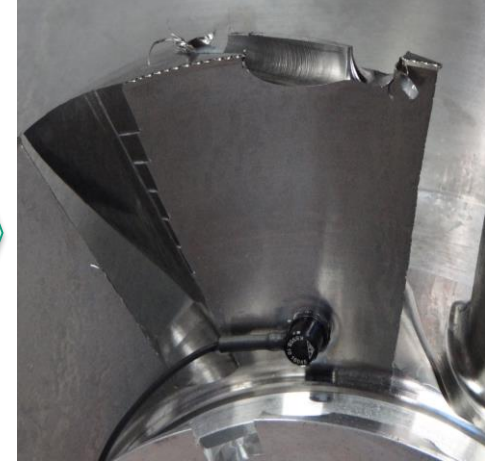
**Pratt & Whitney
PW1100G Engine**



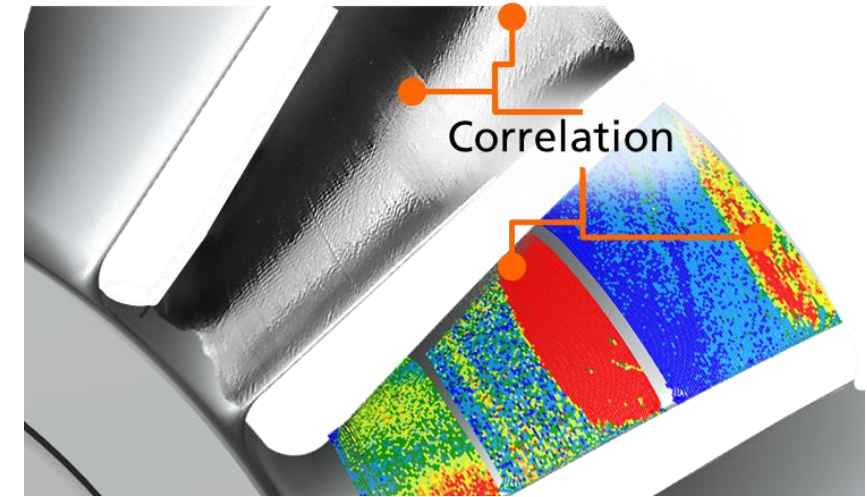
Stability Indication from FFT



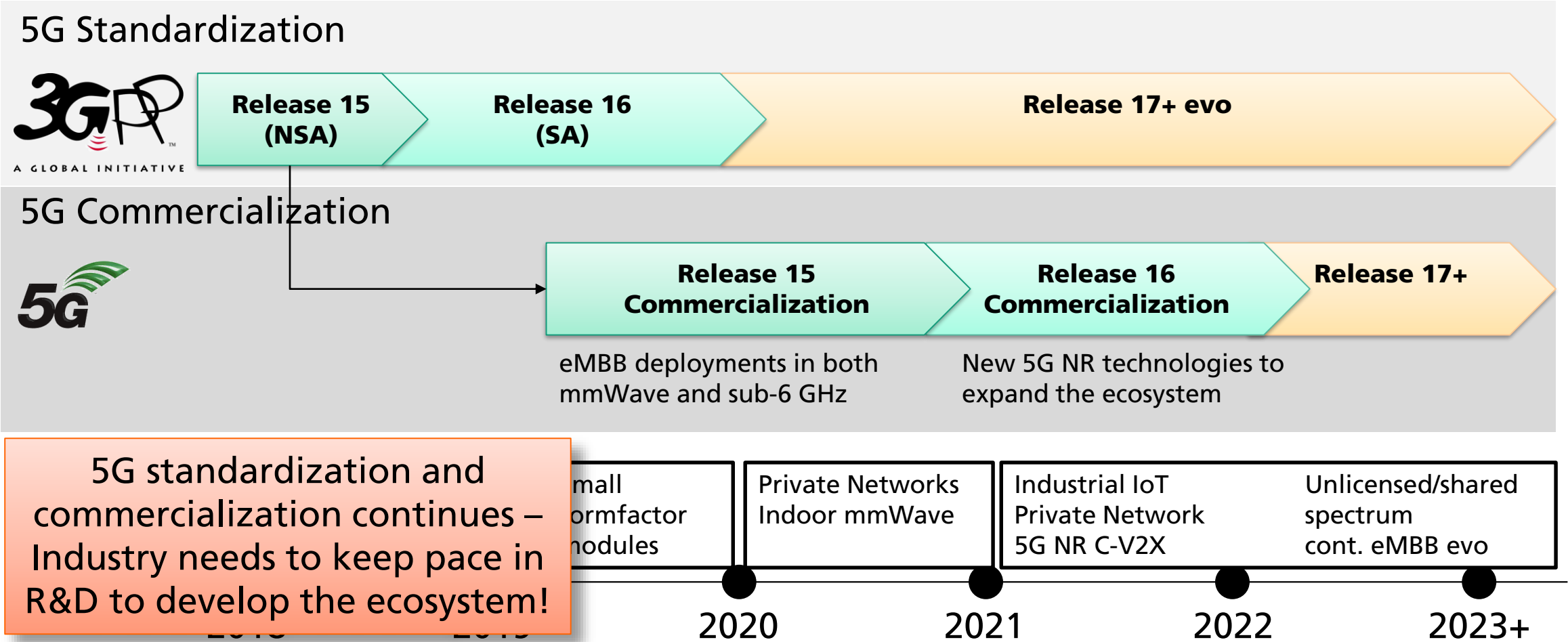
5G Use Case Blisk Manufacturing



- Blisks (= blade integrated disks) are integral parts of modern turbomachines
- Manufacturing is mainly done by different milling process steps
- Manufacturing needs to be monitored to avoid flaws (e.g. vibration marks using acceleration sensor)
- 5G transmission of sensor data enables real-time process control



Convergence of 5G and production

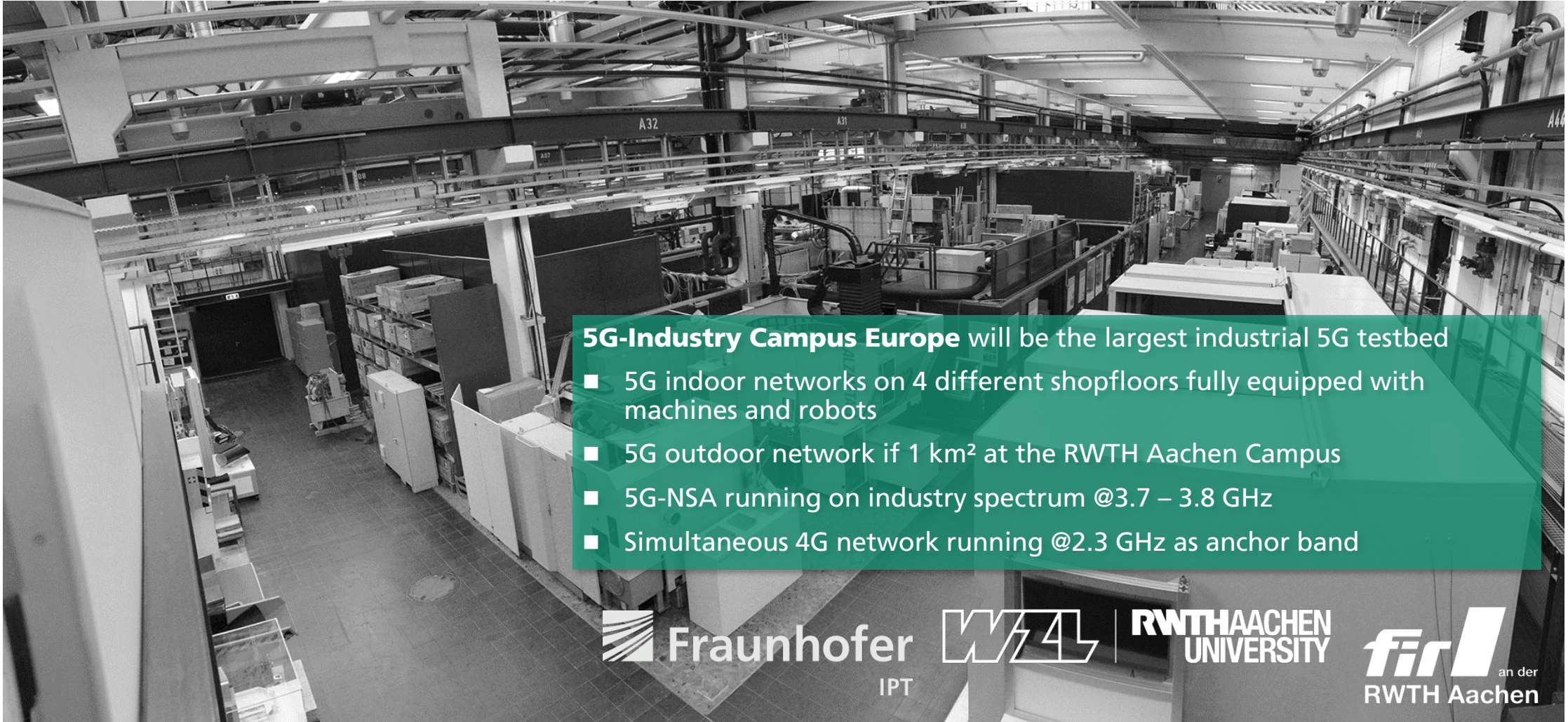


CREATING THE
5G-MANUFACTURING
ECOSYSTEM

5G INDUSTRY
CAMPUS
EUROPE

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Fraunhofer Institute for Production Technology IPT

Project for build-up and establishing 5G-Industry Campus Europe



5G-Industry Campus Europe will be the largest industrial 5G testbed

- 5G indoor networks on 4 different shopfloors fully equipped with machines and robots
- 5G outdoor network of 1 km² at the RWTH Aachen Campus
- 5G-NSA running on industry spectrum @3.7 – 3.8 GHz
- Simultaneous 4G network running @2.3 GHz as anchor band

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Implementation projects 5G-Industry Campus Europe

5G-AE Sensor

- development of wireless acoustic emission (AE) sensor
- detection of tool breakage and wear

5G-Logistics

- AGV navigation
- transition from indoor to outdoor network
- remote navigation

5G-Multisensor

- multi-sensor platform
- workpiece monitoring and localization
- machine condition monitoring

5G-Blockchain

- data economy for multiple data streams
- connected to blockchain operations

5G-Robotics

- mobile robotics
- sensor guided operation with centralized data processing

5G-Cockpit

- production cockpit with 5G remote machine and sensor connectivity
- digital twin visualization

5G-3D

- wireless optical 3D laser scanner
- seamless machine and robot integration and synchronization

5G-Edge-Cloud

- integration of on-premise edge-cloud
- low-latency data analytics for closed-loop operations

The background image shows a laboratory or industrial environment. On the right, a large white machine with a glass-enclosed work area is visible, labeled 'AgieCharmilles' and 'GF'. To its left is a smaller white unit on wheels, also labeled 'ERICSSON'. A semi-transparent blue box containing contact information is overlaid in the center. The floor is dark and reflective, and the ceiling has industrial lighting and pipes.

Thank you for your attention!

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