

Uporaba tehnologije 5G za avtomatizacijo industrijskih procesov: študija primera pristanišča

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Company Profile

- Company facts
 - Startup established in 2014
 - Located in Ljubljana, Slovenia
 - 100% employee ownership
 - 100% IPR ownership
 - First employees Q4 2017 (6, +10 associates)
 - Trusted R&I partner in EU H2020
- Core Expertise: development, deployment and operation of telco grade Quality Assurance (QA) and Critical Communications Systems (CCS)
- Main technologies verticals
 - QA | Quality assurance of mobile, fixed and cloud systems | www.qmon.eu
 - CC | Solutions for 5G/IoT-based critical communications | 5gsafety.net



We Live 5G



matilda-5g.eu



5G LOGINNOV

5g-loginnov.eu



5gasp.eu



5G INDUCE

5g-induce.eu



5G INFIRE

5ginfire.eu



int5gent.eu



evolved-5g.eu



5g-iana.eu

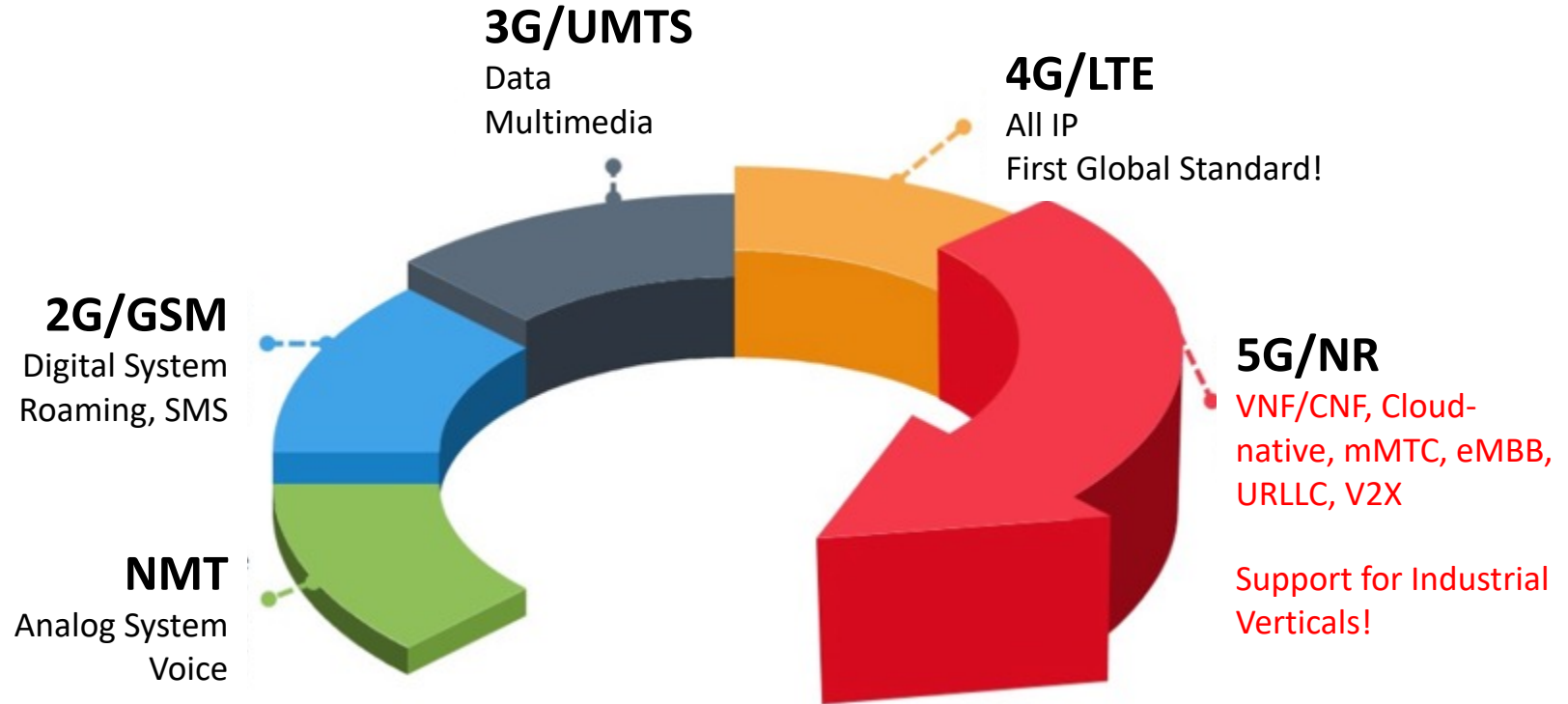


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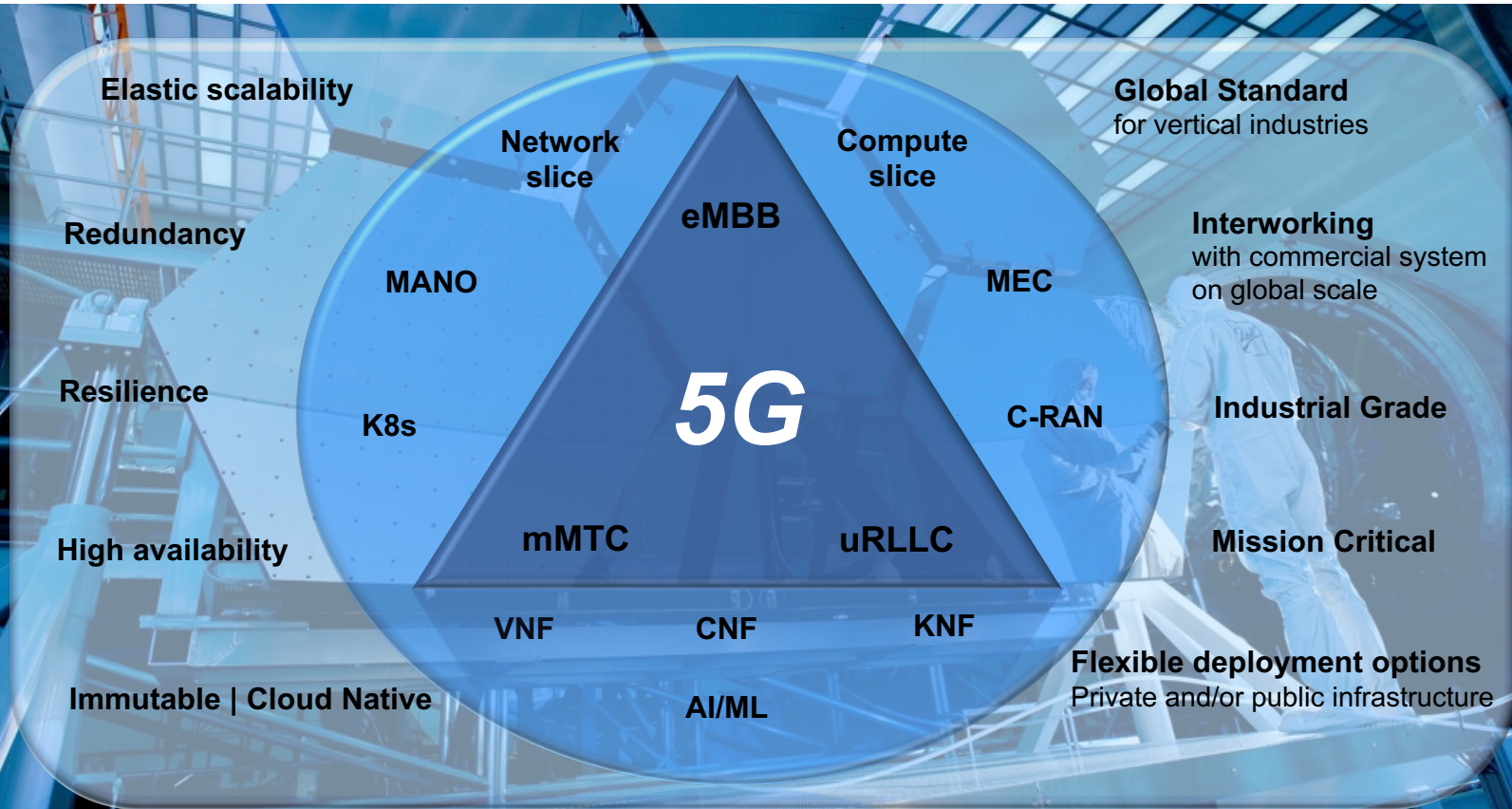
- Operational 5G Network | SA
- 5G qMON | 5G Test Automation
- 5G IoT System | NSA/SA

- Orchestrating 5G Network
- Orchestrating 5G Test Automation
- Orchestrating 5G IoT Backend

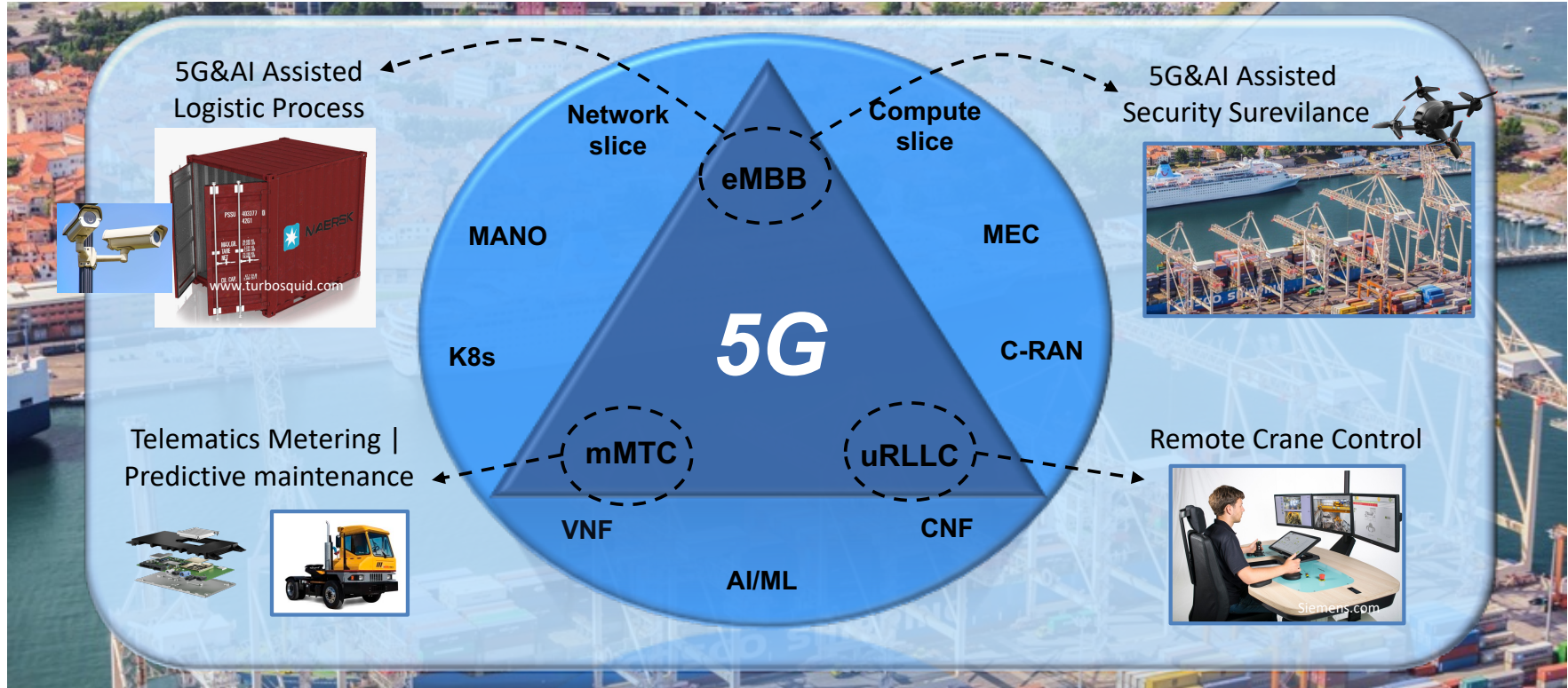
Mobile Technologies Evolution



5G Requirements for Industrial Verticals



5G Assured Use Cases – Ports Example 1/3



5G Assured Use Cases – Ports Example 2/3

- Port logistics process automation with 5G & AI/ML Analytics
 - port infrastructure (e.g. cranes) equipped with UHD cameras for transferring RT-images over 5G to AI/ML analytics located in port cloud
 - identification of container markers, detection of structured damage, seal detection
- Port trucks monitoring with 5G IoT for telematics
 - port terminal trucks equipped with 5G IoT devices
 - capturing and transfer (over the 5G) of telemetry information to analytics in port cloud
 - positions, usage and other telematics metrics from operating terminal vehicles

5G&AI Assisted
Logistic Process

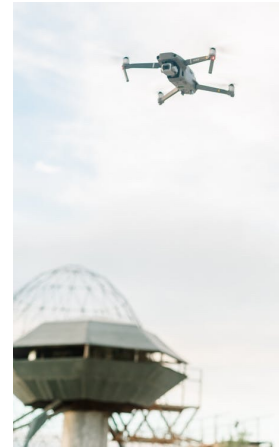


5G IoT Telematics

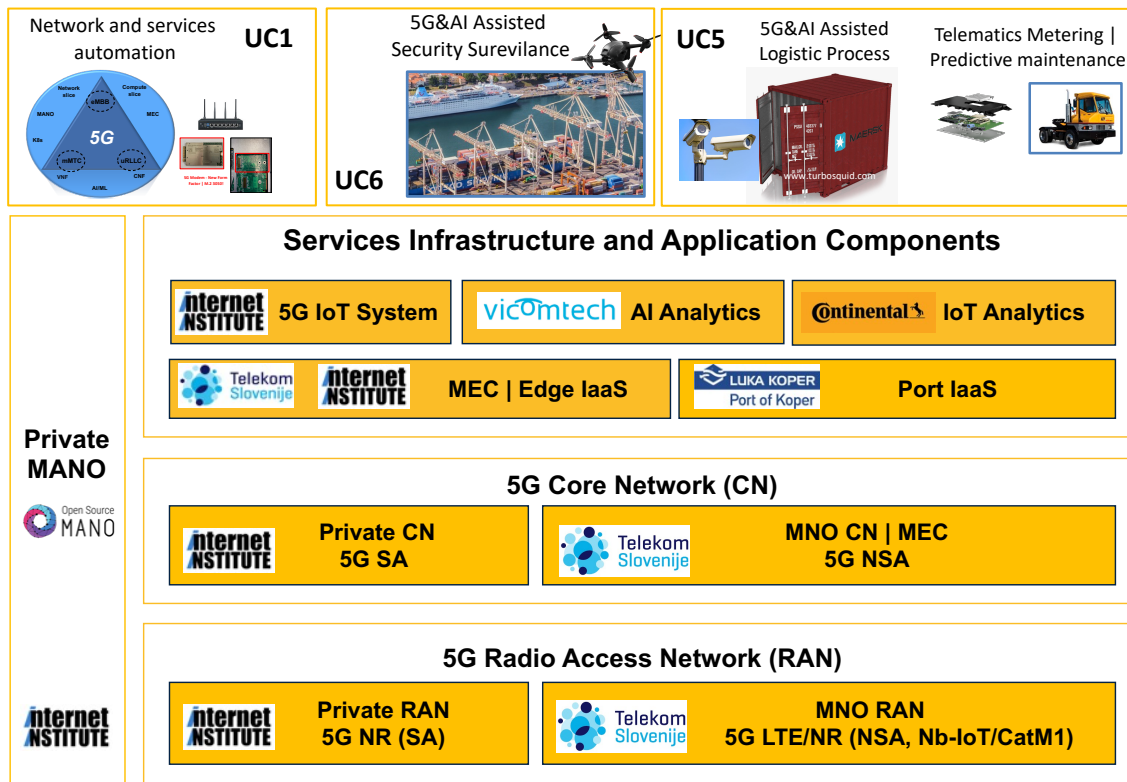


5G Assured Use Cases – Ports Example 3/3

- Real-time video streaming over 5G
 - body-worn cameras
 - drone-based surveillance
- Security process automation with AI/ML in port cloud
 - Presence detection
 - Object detection and classification



Ports 5G Infrastructure and Application Ecosystem



The Future of Mobile Networking

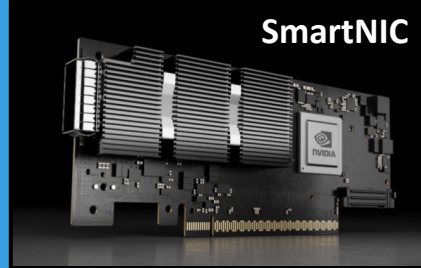
Application SW
VNF/CNF/KNF

5G NR
gNb/BBU

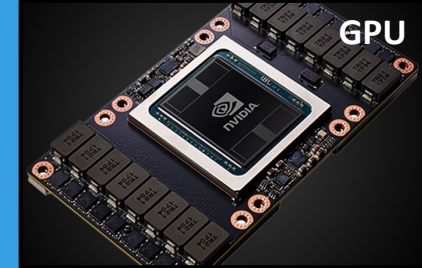


Dedicated HW
PCI-based

5G CN
AMF, SMF, UPF



AI/ML
SON



COTS HW
x86 Server



Private 5G Network | Building Blocks

LTE-A | NR

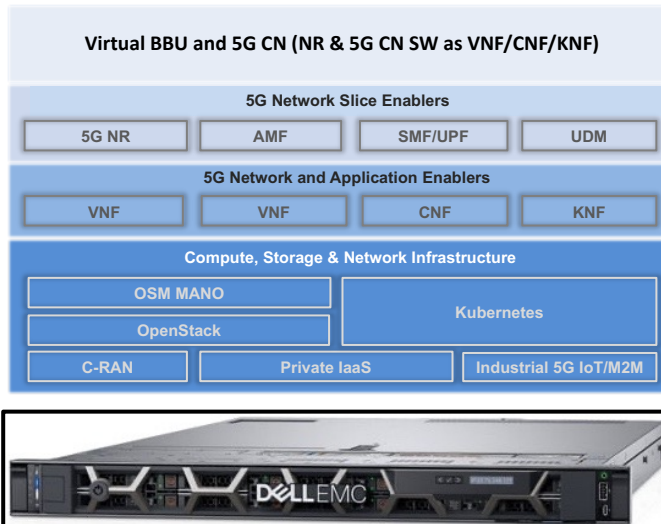
420 Mhz
450 Mhz
700 Mhz
800 Mhz
900 Mhz
1400 Mhz
1800 Mhz
2600 Mhz
3500 Mhz
...



Ant + RRH
250 mW – 20 W
FDD | TDD
MIMO 2x2 | 4x4



BBU Signal Processing
CPRI PCIe
QAM256



x86 Commodity Hardware

NR/5G (SA)
5GCN (SA)
gNb
VoNR
SMS
AES, SNOW, ZUC
QoS, QCI
IPv4, IPv6, IPv4&IPv6
Unstructured PDU
Rx & Cx external interfaces
...

Private 5G Network | Bare-metal View

PCIe-based 5G NR
Signal Processing
(CPRI)



COTS x86 HW
Portable IaaS



Integrated Private 5G
System COTS Server,
48V Modular Power
Supply



2 Port Omni
Directional
n78 Antenna



CPRI/eCPRI-based
RRU (n78, 50Mhz)



Weight 100 kg
Power (min) 220 W
Setup time 30 min



5G for Industrial Verticals | Today's Challenges

- Deployment model
 - Commercial vs Private network deployment
- Spectrum
 - Operator leased vs own spectrum
- *Frequencies & BW
 - Bands: 3800 – 4200 Mhz, 2300-2320 Mhz, 2390-2400 Mhz, 3400 – 3420 Mhz
 - BW: 400 Mhz, 20 Mhz,...
- Native support for industrial standards
 - SCADA, PROFINET, TSN,...
- Technology maturity
 - Industry grade devices availability
- Reliability & resilience
- Technology complexity
- Cyber Security
- Value for money (price)



Thank you!

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