



5G-LOGINNOV: Living Lab Koper

SIS 96, Hamburg 12th October
I.T.S World Congress 2021
dr. Janez Sterle | INTERNET INSTITUTE (ININ)

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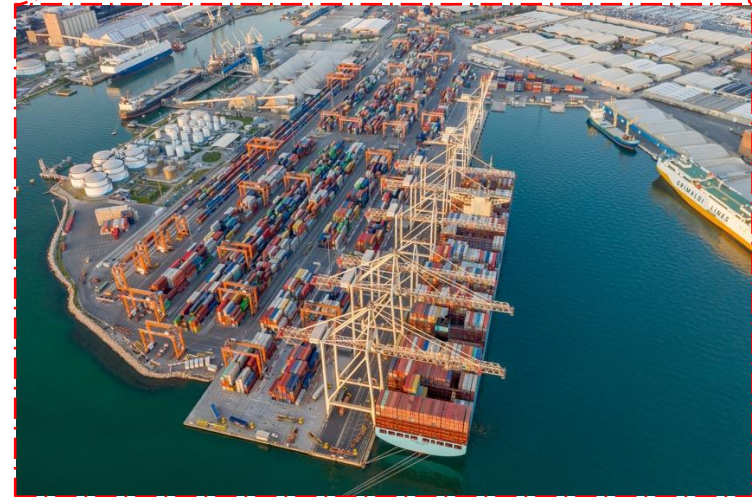
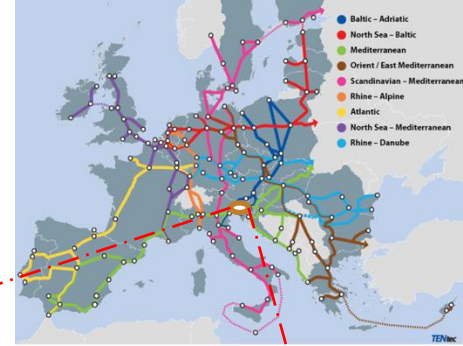
Port of Koper | Koper Living Lab (LL)

At-a-glance

- TEN-T core port
- Port and logistics services
- Private security & Fire services
- Railway & Highway connections
- Free zone area

12 specialized terminals

- Container and Ro-Ro
- Car terminal
- Fruit terminal
- Liquid cargo terminal
- Passenger terminal



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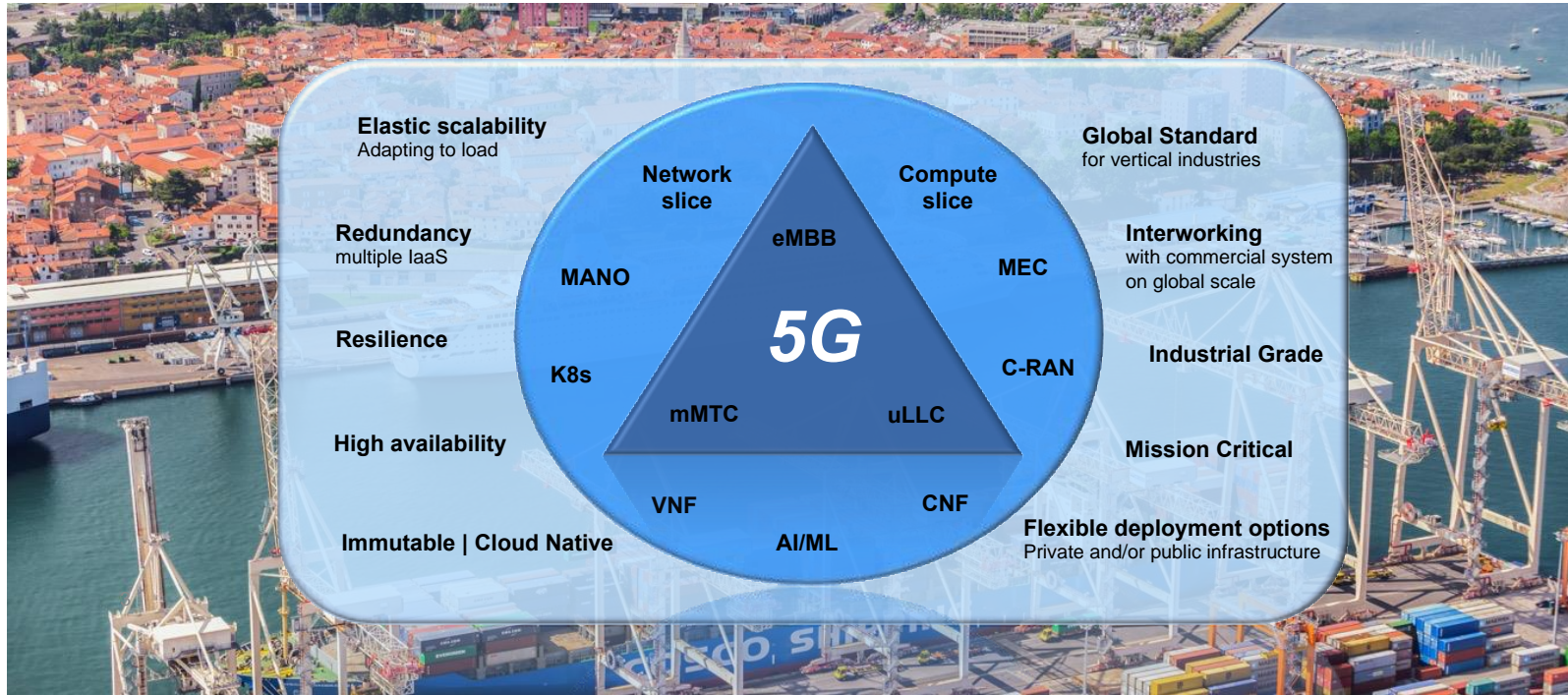


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5G for Ports



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Koper LL Partners

Luka Koper / Port of Koper

- Port Operator | Living lab facility

Telekom Slovenije

- National mobile operator | Public 5G infrastructure

INTERNET INSTITUTE

- SME | Private 5G infrastructure & Industrial IoT

Vicomtech

- Research centre | AI/ML-based video analytics

Continental

- Industry | Telematics & IoT



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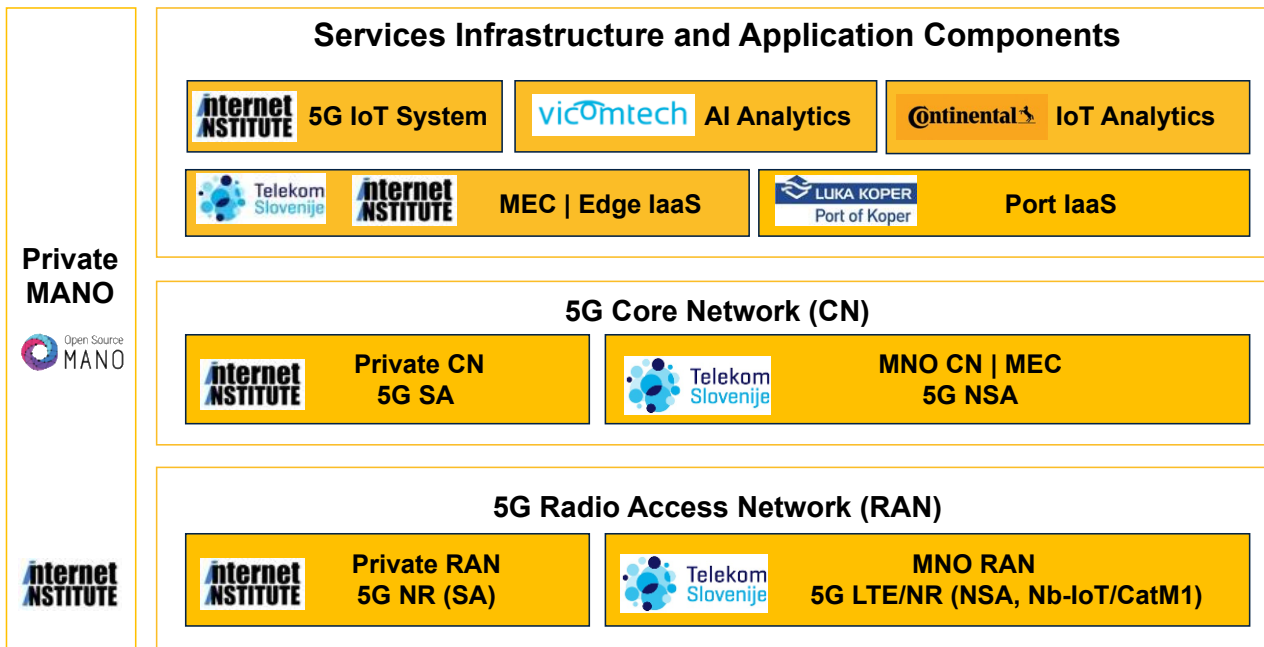


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Koper LL 5G Infrastructure and Application Ecosystem



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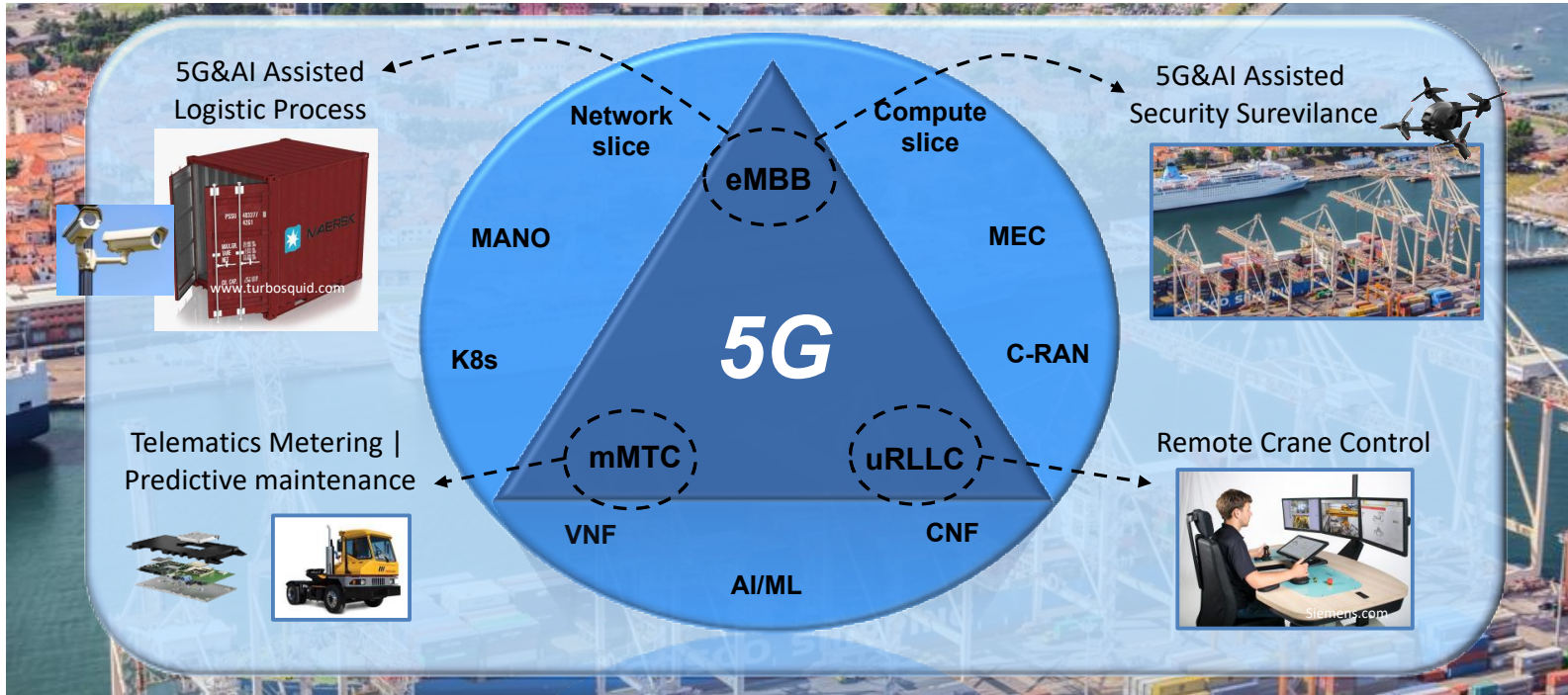


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5G Assured Use cases



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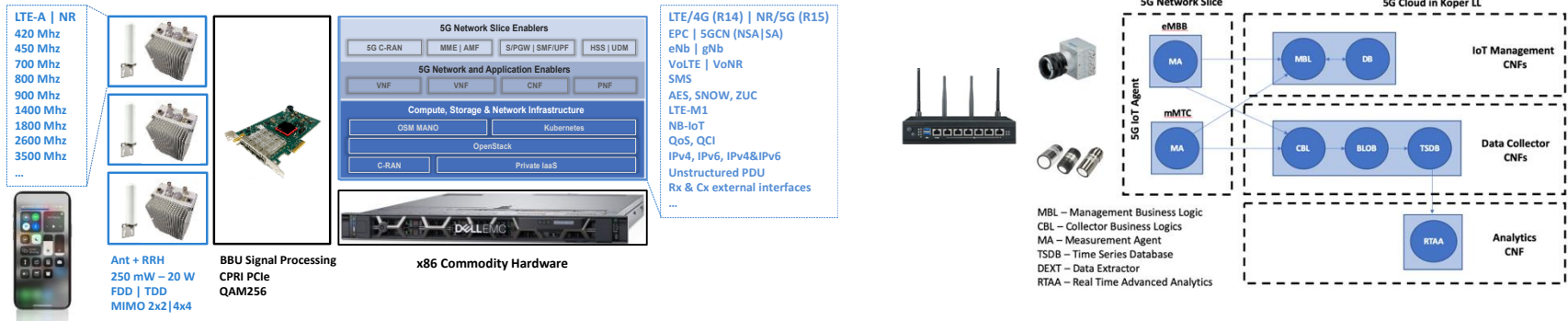
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UC1: 5G Network and Services Deployment Automation

Target 1: Automated deployment and life cycle management (OSM-based) of network and services VNF (Virtual Network Functions) and CNF (Cloud Native Functions) components tailored for the port operation

Target 2: 5G SA System (Private Core Network | Private Cloud RAN | 3.5Ghz/n78) and 5G IoT System (Industrial 5G IoT | cloud native | Management | Collector | Reporter)



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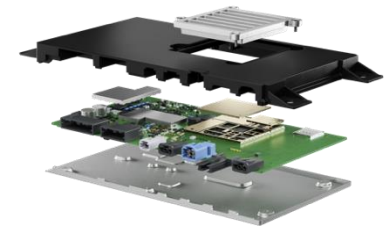


UC5: 5G and IoT Assisted Port Control and Logistics Process Operations

Target 1: Port control, logistics and remote automation (*port STS equipped with UHD cameras for transferring images over 5G to AI/ML analytics | identification of container markers | detection of structured damage*)

Target 2: Port infrastructure monitoring and remote metering with IoT for telematics (*operating machine monitoring by means of capturing and transfer of key telemetry information | positions, usage and other telematics metrics from operating terminal vehicles*)

5G&AI Assisted
Logistic Process



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UC5: 5G for Mission Critical Communications for the Port

5G&AI Assisted Security Surevillance



Target 1: A real-time video surveillance use case (*body-worn cameras | portable video surveillance cameras | drone-based surveillance*)

Target 2: private security operations management and support (*personnel/team status monitoring | positioning and triage operations support with dedicated mobile applications*)

Target 3: network reliability and resilience using public and private 5G infrastructure



```
gNb (n78 | TDD | BW 50 Mhz | 5G SA Mode)

janez@root@qoe-lbase: /home/qoe -- ssh qoe@10.154.104.41 -- 104x23
Press (return) to stop the trace
PMACH: cell=01 seq=7 ta=2 snr=21.2 dB

UL
UL_ID CL RNTI C cel r1 mcs retx txok brate snr punct mcs rxok rxok brate #Its phr pl ta
166 001 46a6 1 15 2 17.5 22 145 2304 44.2 - 26.0 0 250 156.70 1/1.0/3 38 47 -0.2
166 001 46a6 1 15 2 16.3 1 82 1554 44.0 - 26.0 0 165 11.20 1/1.0/3 38 53 -0.1
166 001 46a6 1 15 2 16.0 4 585 2.236 44.5 - 26.0 0 1765 1200 1/1.0/3 8 49 -0.1
166 001 46a6 1 15 2 15.9 9 916 2.080 46.1 - 26.0 0 2860 1990 1/1.0/3 8 49 -0.1
166 001 46a6 1 15 2 15.9 11 914 3.000 44.8 - 26.0 0 2774 1970 1/1.0/3 8 49 -0.0
166 001 46a6 1 15 2 15.7 1 370 1.140 44.1 - 26.0 0 1169 75.30 1/1.0/3 8 49 -0.0

DL
DL_ID CL RNTI C cel r1 mcs retx txok brate snr punct mcs rxok rxok brate #Its phr pl ta
167 001 46a7 1 15 2 19.4 16 159 9.208 46.8 - 26.1 0 72 3020 1/1.0/4 38 48 -0.2
167 001 46a7 1 15 2 28.4 1 1095 98.20 44.2 - 26.0 0 250 3934 1/1.0/4 38 47 -0.2
167 001 46a7 1 15 2 26.0 0 1150 1370 44.0 26.0 0 264 5154 1/1.0/4 28 52 -0.2
167 001 46a7 1 15 2 26.7 0 1150 1410 44.1 26.0 0 266 2664 1/2.0/3 26 55 -0.0
167 001 46a7 1 15 2 26.7 0 1150 1410 44.1 26.0 0 264 5224 1/1.0/3 38 50 -0.1

DL 130 Mbps

janez@root@qoe-lbase: /home/qoe -- ssh qoe@10.154.104.41 -- 104x23
Press (return) to stop the trace
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166 001 46a6 1 15 2 16.3 1 82 1554 44.0 - 26.0 0 165 11.20 1/1.0/3 38 53 -0.1
166 001 46a6 1 15 2 16.0 4 585 2.236 44.5 - 26.0 0 1765 1200 1/1.0/3 8 49 -0.1
166 001 46a6 1 15 2 15.9 9 916 2.080 46.1 - 26.0 0 2860 1990 1/1.0/3 8 49 -0.1
166 001 46a6 1 15 2 15.9 11 914 3.000 44.8 - 26.0 0 2774 1970 1/1.0/3 8 49 -0.0
166 001 46a6 1 15 2 15.7 1 370 1.140 44.1 - 26.0 0 1169 75.30 1/1.0/3 8 49 -0.0

DL
DL_ID CL RNTI C cel r1 mcs retx txok brate snr punct mcs rxok rxok brate #Its phr pl ta
167 001 46a7 1 15 2 19.4 16 159 9.208 46.8 - 26.1 0 72 3020 1/1.0/4 38 48 -0.2
167 001 46a7 1 15 2 28.4 1 1095 98.20 44.2 - 26.0 0 250 3934 1/1.0/4 38 47 -0.2
167 001 46a7 1 15 2 26.0 0 1150 1370 44.0 26.0 0 264 5154 1/1.0/4 28 52 -0.2
167 001 46a7 1 15 2 26.7 0 1150 1410 44.1 26.0 0 266 2664 1/2.0/3 26 55 -0.0
167 001 46a7 1 15 2 26.7 0 1150 1410 44.1 26.0 0 264 5224 1/1.0/3 38 50 -0.1

DL 130 Mbps

janez@root@qoe-lbase: /home/qoe -- ssh qoe@10.154.104.41 -- 104x23
Press (return) to stop the trace
PMACH: cell=01 seq=9 ta=2 snr=21.2 dB

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166 001 46a6 1 15 2 16.3 1 82 1554 44.0 - 26.0 0 165 11.20 1/1.0/3 38 53 -0.1
166 001 46a6 1 15 2 16.0 4 585 2.236 44.5 - 26.0 0 1765 1200 1/1.0/3 8 49 -0.1
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167 001 46a7 1 15 2 26.7 0 1150 1410 44.1 26.0 0 264 5224 1/1.0/3 38 50 -0.1

DL 130 Mbps
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5G as Enabler of Future EU Ports

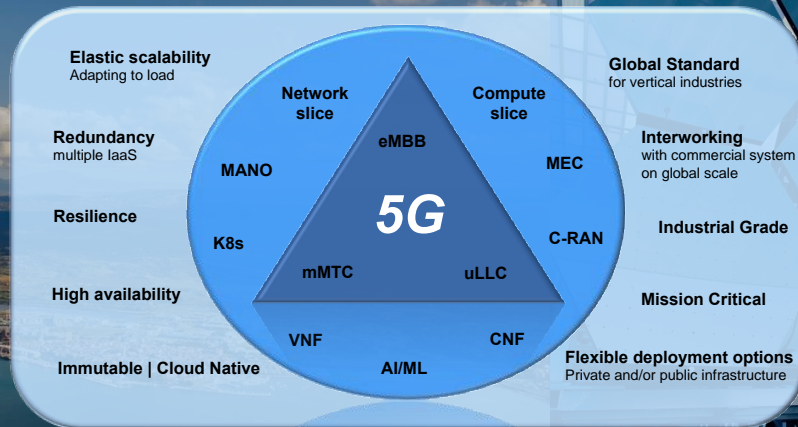
Connecting European Vertical Industries and Value Chains

Efficient

Resilient

Sustainable

Green



Manufacturing

Automotive

Transport

Logistics

Ports are a Key Engines of Trans-EU Transport Networks (TEN-T)

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Internet
INSTITUTE

dr. Janez Sterle
Founder and CEO
INTERNET INSTITUTE Ltd.
email: janez.sterle@iinstitute.eu

5G-LOGINNOV Project
<http://5g-loginnov.eu>

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