5G&AI enabled services in Port operations tailored to logistics and safety applications

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Project aim

5G-LOGINNOV’s vision is to optimize freight and traffic operations at Ports and Logistics hubs via innovative concepts, applications and devices supported by 5G technology, the IoT, AI-enabled data analytics, next generation traffic management systems, Cooperative, Connected and Automated Mobility (CCAM).

Objectives

➢ Improve the efficiency of logistics operations, putting at the centre of attention the sustainability of the logistics supply chain
➢ Support the “Green” Port Industry vision by reducing the hub’s operation emissions
➢ Enhance safety and security operations

Expected Outcomes

➢ Improve the efficiency of logistics operations via 5G&AI enabled video analytics services related to port control, logistics and remote automation.
➢ 5G-enabled low carbon truck platoon mobility management (Green Light Optimum Speed Advisory, GLOSA)
➢ Involvement of new market actors (e.g., SMEs) in the innovation processes
5G-LOGINNOV Living Labs

Trans-European Transport Network (TEN-T)

Hamburg

Athens

Koper
Use Case Overview – Athens LL

- Truck Fleet Management Platform
- Predictive Maintenance
- 5G&AI enabled collision warning system
- 5G&AI enabled surveillance and monitoring
- 5G&AI enabled container seal detection

5G&AI video analytics with NFV-MANO support
Glimpse on Architecture & Services

Port IaaS

Live service monitoring

PCT Datacenter

NFVI Extreme-edge Compute

Port IaaS

Extreme-edge container scan
docker
ngrok

Extreme-edge human presence
detection
docker
ngrok

Critical Node (control plane)

NFVI Cloud Compute Nodes

NVIDIA RTX 2090

Inferred results DB

CNF Repository

CNF ML Docker Images

PCT Cloud System
5G Trials Area - (5G KPIs)

5G Drive Test

DL (peak, avg): 800Mbps, 500Mbps
UL (peak, avg): 150Mbps, 100Mbps
Ping (avg): 15ms

RRU AAU 5639w
5G&AI enabled container seal detection

Training Set: 50K -> 500K images
Validation: 30 hours
5G&AI enabled surveillance and monitoring

Area 1

Area 2

Trained Set: 10K Images
Validation: 30 hours

~20ms
5G&AI enabled collision warning system
5G & AI enabled collision warning system - cont.

Frame ID

Timestamp (t1)

Frame Network Delay (FND)

Frame Processing Delay (FPD)

Service Delay = FND + FPD

Satellite sync

Cloud

Frame ID

Timestamp (t2)

Frame ID

Timestamp (t3)
Predictive Maintenance

- A fleet of about 192-trucks (currently communicating over 4G and 5G)

- Telematics device installed on trucks
  - Telemetry data: CAN-Bus, GNSS, container presence sensors

- Applications
  - **UC7**: AI/ML predictive maintenance services
Hamburg Living Lab

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Thank you!

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