

Implementation of a Private 5G SA Network at the Port Authority of Valencia

Entity: Port Authority of Valencia (APV)

Scope: Digital Transformation in Critical Port Infrastructure

Tags: 5G, Private Network (SNPN), Edge Computing, AI (HPE + NVIDIA), Security, Drones, MCX, AR, Digital Twin, Cybersecurity ENS/ENS5G, IoT.

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1) Background

Valenciaport, a strategic node in the Mediterranean and along the TEN-T corridor, is modernizing a highly dynamic environment. Despite having an extensive fiber network, new needs are emerging that wired connectivity cannot fully address: guaranteed mobility, ultra-low latency, massive IoT connectivity, and real-time processing for security and operations.

The Port Authority of Valencia considers innovation to be key to port competitiveness, as well as to sustainability and the creation of wealth and employment in its areas of influence. Therefore, it seeks to continue fostering new ideas that help transform business models, making them more efficient, better connected, more secure, transparent, and responsible.

To enable this evolution, APV is deploying a fully private 5G SA network (SNPN), 100% hosted on its own infrastructure, using n40 spectrum and a geo-redundant core (2+2), integrating AI Edge capabilities for remote maintenance through augmented reality and digital twins. The project aligns with the European Digital Strategy, the 5G cybersecurity toolbox, and ENS/ENS5G (RD 334/2024), prioritizing data sovereignty and OT/IT resilience.

This initiative is co-funded by the European Commission under a European funding program, which provides up to 75% of the total eligible costs, within an overall project budget of €5.9M (~€6M), in accordance with the provisions established in the corresponding Grant Agreement.

The Fundación Valenciaport acts as the project coordinator with the European Commission, also providing technical support across the different phases of the project, including design, implementation, validation, and deployment of use cases.



The project has been awarded to ORANGE, which leads the overall integration, and is supported by Nokia's Radio Access Network (RAN) technology, a global benchmark in high-availability 5G infrastructure for critical environments.

The deployment is complemented by an AI Edge module from Hewlett Packard Enterprise (HPE), enabling real-time artificial intelligence processing for video analytics, security, predictive maintenance, and digital twin applications.

2) Challenges

- **Critical connectivity under public control:** Fully private SNPN, independent from MNOs, with full control over design, evolution, and operation.
- **Homogeneous coverage in a variable environment:** ≥ 15 radio sites, 100% coverage of priority operational areas and anchorage zones; overlap factor of 94%.
- **Deployment of a next-generation Artificial Intelligence platform**, pre-integrated and certified by Hewlett Packard Enterprise, capable of:
 - o Processing video at large scale in real time
 - o Running advanced computer vision models for security
 - o Accelerating critical inference workloads for maintenance and operations
 - o Operating entirely within the Port, ensuring data sovereignty
 - o Complying with cybersecurity standards aligned with ENS 5G, ISO 27001, and NIST
- **Security and compliance:** ENS/ENS5G, ISO 27001, NIST; dual firewall layer (PALO ALTO and FORTINET), zero trust model, governance and 24/7 operations.
- **OT/IT integration and critical services:** Genetec, COMDES/TETRA (TETRA 5G gateway), SOC, SCADA, APIs, digital twin.
- **Scalability and sustainability:** Replicable use cases, reduced travel (drones), and energy optimization.

3) Phases

1. **Deployment of a new dedicated fiber backbone** (≈ 25 km) for RAN/Core and high availability (HA).
2. **Full 5G SA Network (RAN + Core SNPN) by NOKIA**



- o n40 band (initial 30 MHz), ≥ 15 sites
- o RSRP ≥ -96 dBm ($\geq 80\%$ area)
- o 25 Gbps UPF core
- o 25,000 simultaneous users, scalable up to 500,000
- 3. **Service Platform: AI Edge HPE + Cybersecurity + NaaS**
 - o HPE GPU node with 4× NVIDIA L40S
 - o 1U control nodes
 - o HPE NVMe storage (≥ 105 TB)
 - o 100 GbE switching
 - o Unified SaaS-like management
 - o NVIDIA AI Enterprise + Blueprints
- 4. **Operations and Governance (24/7/365)**
 - o Strict SLAs (P1 response <5 min, P1 resolution <4 h)
 - o Monitoring and SOC integration
- 5. **Advanced Use Cases**
 - o 4K/8K surveillance on vehicles
 - o 5G drone with docking station
 - o MCX (voice/video/data) + TETRA gateway
 - o Remote maintenance with AR
 - o Digital twin
- 6. **Validation and Audits**
 - o Coverage, performance, interoperability
 - o Cyber resilience (BAS)
 - o Failover and high availability

4) New Services

A. Real-time Security and Surveillance (Computer Vision)

- Edge processing (HPE AI Edge) of 4K/8K video from patrol vehicles (360°), 5G drones, and CCTV (Genetec).
- Event, object, and anomaly detection with automatic alerts to the SOC and traffic prioritization via slicing/QoS.

B. Autonomous 5G Drone with Smart Dock



- 30x optical zoom, wind resistance, waypoint navigation, autonomous return, integrated 5G n40; perimeter inspections and monitoring of remote areas.

C. Unified Critical Communications

- MCPTT (MCX): mission-critical voice (PTT), video, and data; interoperable with TETRA via gateway.

D. Operational Digital Twin

- Real-time 2D/3D visualization of drones, vehicles, and 5G terminals; mission launch from the control center; immediate access to AI-supported evidence.

E. Remote Maintenance with Augmented Reality

- AR glasses and 5G tablets with expert guidance, contextual documentation, and AI-assisted diagnostics; faster and more accurate interventions.

F. Key Differentiators of the HPE AI Edge Module

- Pre-integrated and certified platform (HPE + NVIDIA).
- 4x NVIDIA L40S for advanced vision and high-performance NVMe storage.
- Hardware root of trust security (NIST SP 800-193), Secure Boot, unified SaaS management with on-prem control plane.
- Data sovereignty (no cloud dependency), ENS/ENS5G compliance.

7) Conclusions

APV is deploying one of the most advanced private 5G + AI Edge infrastructures in Europe, in partnership with a leading operator such as ORANGE, enhancing security, efficiency, and sustainability of public services.

The combination of NOKIA's 5G SNPN network with HPE's AI module provides technological sovereignty, real-time decision-making capabilities, and a strong foundation for future autonomous operations.

This is a replicable transformation case that positions Valenciaport as a national and international



benchmark.

