Vert**I**cal demos over **C**ommon large scale field **T**rials f**O**r **R**ail, energy and media **I**ndustries

"5G-VICTORI: Transforming Power Utilities into Smart Factories"

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https://www.5g-victori-project.eu/

About us

- IPTO (**Independent Power Transmission Operator**) is responsible for the operation, maintenance and development of the electricity transmission grid in Greece with over 11,000 km of system covering the whole of mainland Greece and a great number of facility sites.

- The operation and maintenance of such a system demands different services which can be mapped to Smart Grid and Industry 4.0 Use Cases:

    - Measurements synchronization among sites

    - Real-time Information exchange between IPTO and high-voltage customers (power quality, trip signals etc.)

    - Equipment fault awareness and security at remote locations

- IPTO participates at different Industry 4.0 research projects, acting as the vertical user and participating at the integration, validation and field trials of novel Smart Factory solutions at its premises.

ipto

INDEPENDENT POWER
TRANSMISSION
OPERATOR

5G-VICTORI conducts **large scale trials** for **advanced vertical use case verification** focusing on:

Transportation   Energy   Media   Factories of the future

Cross-vertical use cases

IPTO is participating in two use cases, including:

➤ **Factories of the Future**
  ▪ Smart Factory Services

Smart Factory Services

Three different services with diverse KPIs

Service #1: Predictive Maintenance	Service #2: Operation	Service #3: Security

- ❑ Support of different type of low power sensors and protocols
- ❑ Monitoring system and network able to transmit, process and store massive data

- ❑ Strict timing requirements: including sensing time, transmission, and processing time
- ❑ Zero-perceived downtime (availability), reliability, security etc.

- ❑ CCTV monitoring demands streaming of high-quality video
- ❑ Alarms: high availability, security.

Smart Factory – Facilities

- The facility spans two IPTO sites:
  - Antirrio
  - Rio

- Both facilities lie at each side of the Rio-Antirrio canal, separated by 4 km of sea

- A submarine fiber cable is used to transport measurements from the Antirrio site, while a mmWave connection is used for the connection of Rio site with the Cloud system hosted at the University of Patras

- Data from various sources are combined through a private 5G network for:
  - Network control (flexible configuration, security and data privacy)
  - Resource allocation for the support of specific KPIs (e.g. demanding industrial applications)
  - Coverage at remote locations
 - Support of independent architectures or integration to the public network

ADMIE-ANTIRRIO

ADMIE-RIO

Fiber link

UNIVERSITY OF PATRAS

10GBs link

- Mmwave links
- 5G gNodeB
- Fiber

Novelties

Creation and provisioning of network slices with different KPIs over a common 5G infrastructure

Demonstrate 5G NPN (Non-Public Network) capabilities

Smart Factory – 5G Architecture

- 5G Service Based Architecture (SBA)

- Decentralization and Flexibility of 5G Core

- Support of 5G disaggregated architecture – different possible deployment options

- Network and Service Orchestration over OSM & Openslice

- 5G NPN - Services can be accessed either from UoP cloud or locally at the facilities

- 5G slicing

- Mobile Edge Computing (MEC) capabilities
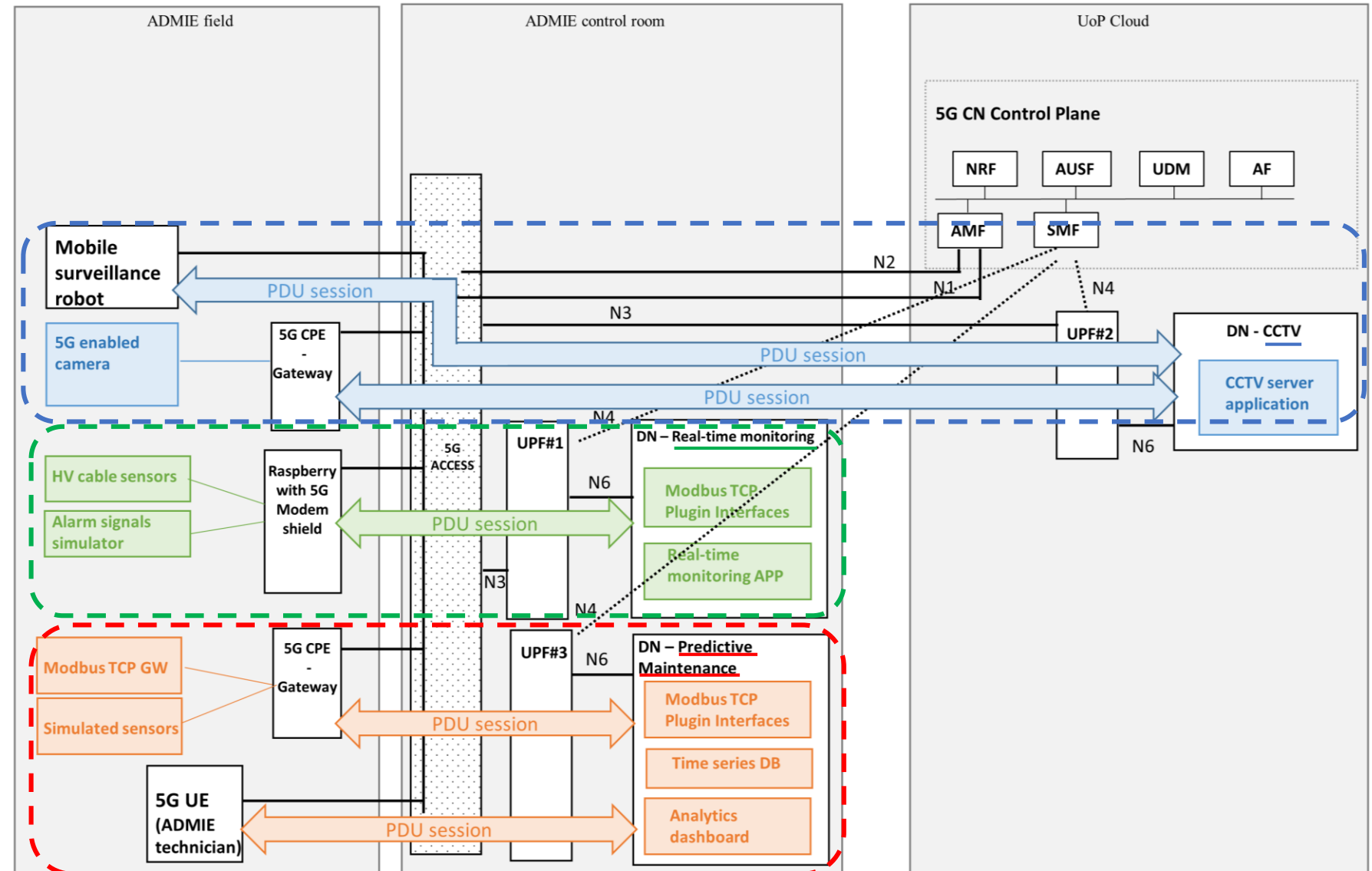
# Smart Factory – Equipment and Software

Patras 5G Autonomous Edge, is a mobile box, containing everything from the 5G New Radio and 5G Core, Network and Service Orchestrations including a Virtualized environment based on OpenStack technology. http://wiki.patras5g.eu/5g-autonomous-edge

A **mmWave link**, directly connecting ADMIE and UoP facilities, is the result of ADMIE, ICOM and UoP's common work on extending the 5G-VINNI infrastructure and, thus, enabling various vertical use cases, including the **Smart Factory vertical**
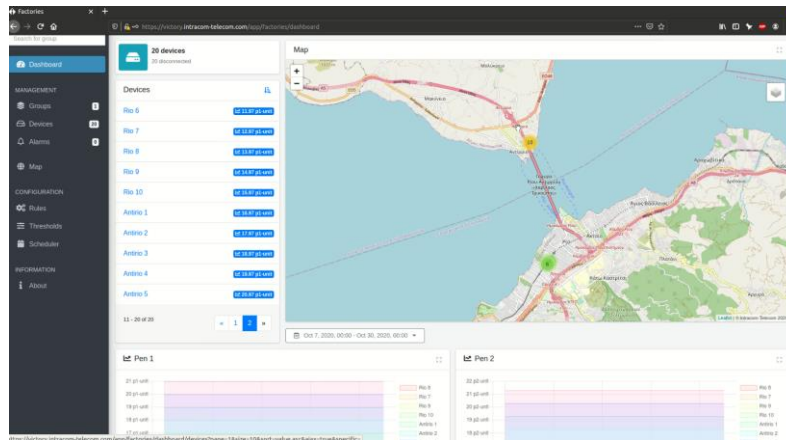

UiTOP Data Management Platform (ICOM)

- Cloud-hosted (Public, Private or Hybrid), multi-tenant solution
- Containerized micro-services based architecture, with processes overload & prioritization mechanism
- Core and optional modules enable flexible packaging to satisfy the different IoT providers' needs
- Core and optional modules can be executed on the cloud or at the edge

CCTV monitoring, Industrial & Networking Equipment

- Provision of advanced monitoring services over legacy equipment with no previous connectivity
- Providing UHD video livestreaming from the interior of the HV cable control room for security purposes (equipment monitoring, personnel safety etc.)
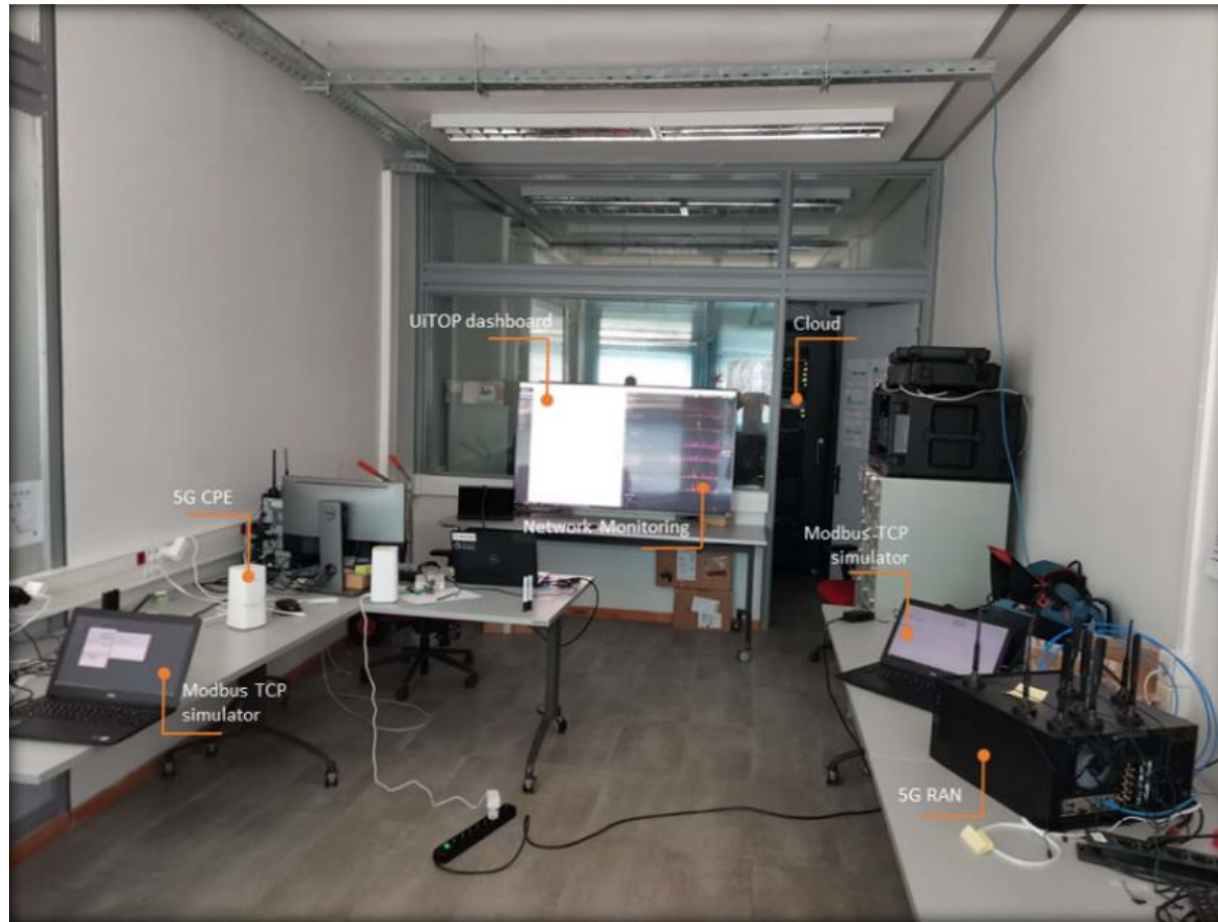
Findings

- ➤ Support of multiple network slices with different KPIs over the same 5G infrastructure

- ➤ Integration of legacy systems with 5G service-based architecture

- ➤ Ease of services' deployment

- ➤ By integrating 5G NPNs:

  - ❑ The vertical industry does not rely on a public network operator for the on-premise communications and is the only responsible for the operation, and maintenance of the network.

  - ❑ The vertical industry can control the network resources to support specific services KPIs. With proper resources allocation, services with different requirements can be supported simultaneously.

  - ❑ The use of virtualized hardware, wireless communications, and Network and Service Orchestration, leads to a flexible, easily managed, expandable and cost-effective solution.

  - ❑ Data privacy is ensured, as communication are performed through private channels. This is very important when dealing with sensitive information collected from Smart Factories.

Thanks for your attention!

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