

5G EVE project: A European Platform for Extensive Trials – Progress and Latest Development

George Agapiou, Ph.D. OTE Labs

Tilemachos Doukoglou, Ph.D. OTE Labs

Velissarios Gezerlis, Ph.D. OTE Labs

OTE Laboratories for Technology Evaluation Fixed and Mobile



Outline

- 5G EVE
 - Motivation and objectives
 - Architecture
 - Site facility
 - Use Cases
- Conclusion





Motivation

- Motivation
 - Define the **architecture** to implement innovative vertical use cases.
 - The proposed 5G EVE end to end facility will support the key **5G PPP network KPIs**.





Location

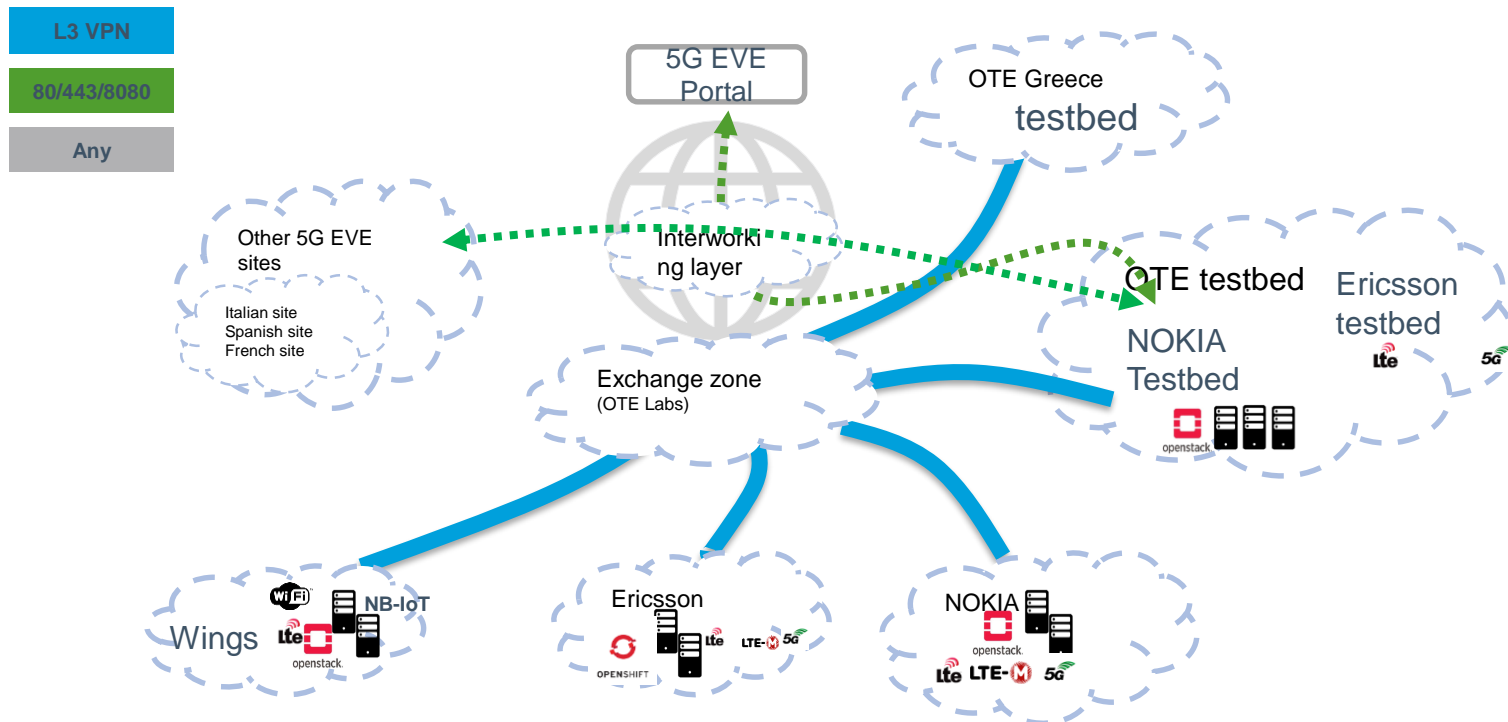


- The 5G EVE site facility is composed of a cluster of sites facilities in several countries
 - France - 4 nodes: Nokia Paris Saclay, b<>com Rennes, Eurécom Nice, Orange Paris
 - Greece: Athens with Ericsson, Nokia, Wings, OTE
 - Spain: Madrid with Ericsson, Nokia, UC3M, TID, Telcaria,
 - Italia: Turin with Ericsson, Networks, A2T, CNIT, TIM, NXW



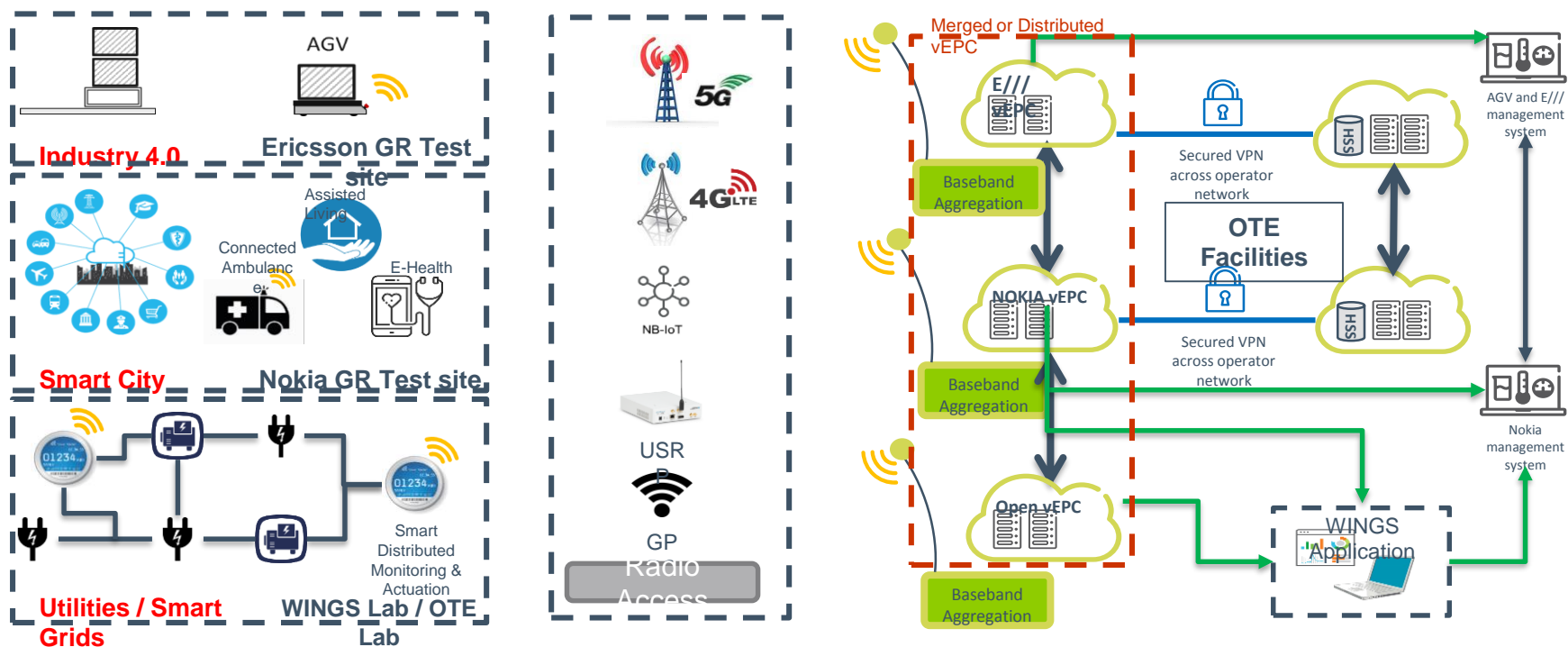


GREECE – Italy - Spain - French Site Facility Interconnection





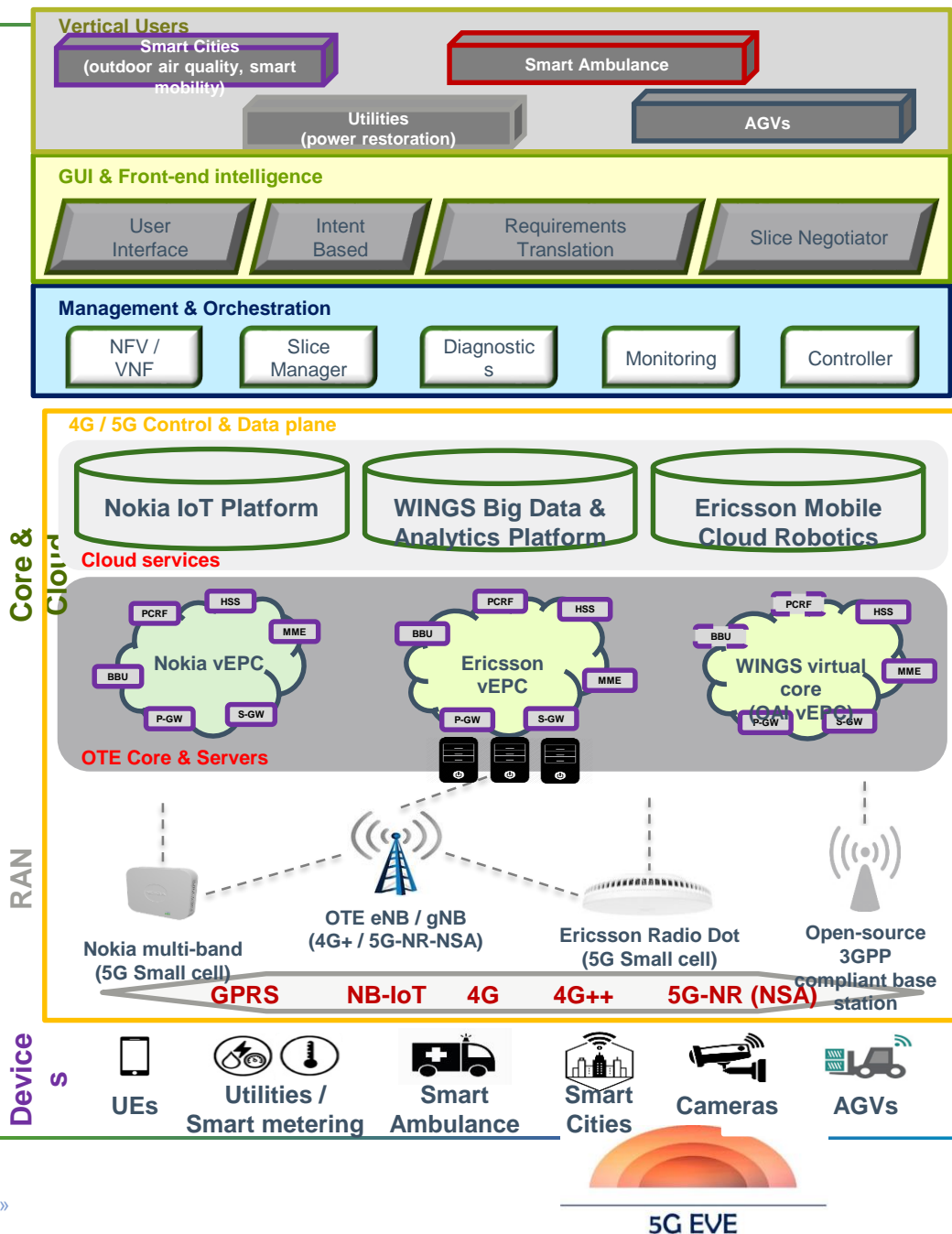
Current Testbed in Greek Site (Architecture)





Greek Site Architecture

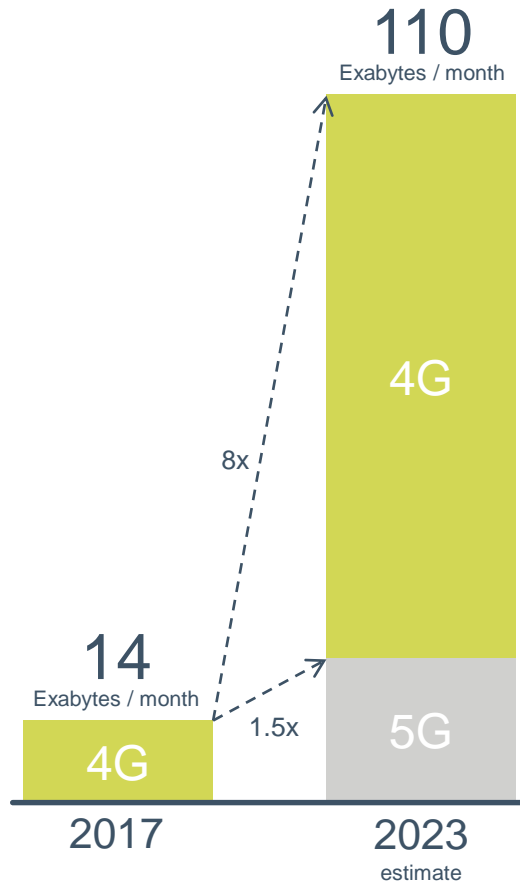
- The Greek 5G EVE site facility covers a region of Northern Athens, around the R&D site of the **Greek National Telecommunication Organization (OTE)** that manages and orchestrates the verticals deployment as well as the KPI collection
- **OTE, Ericsson GR, Nokia GR and WINGS** are responsible to prepare and upgrade the Greek site facility to be able to handle three **5G-oriented vertical use cases**
- The facility will be offered to vertical industries for execution and validation of pilots with full sets of 5G capabilities





Why 5G

Traffic Growth – Large number of connected devices on Network



Global mobile data traffic

8 x
Data traffic growth
between
2017 and 2023

6.5M/km² x
Device Connection
Density

1 ms
Latency

515 kmph
Mobility





Why 5G





Why 5G

5G is use case driven

Massive IoT



Smart meter



Tracking



Fleet management

Critical IoT



Industrial application & control

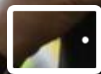


Traffic safety & control



Remote manufacturing

Enhanced Mobile Broadband (eMBB)



VR/AR



4K/8K UHD



Smartphones

Fixed Wireless Access (FWA)



Mobile / Wireless / Fixed



Enterprise















Home





What to expect from 5G

	Peak Data Rate	1 - 20 Gbps		Connection Density	10k - 1M devices / km ²		Reliability	99.999% (of packets)
	User Experienced Data Rate	10 - 100 Mbps		Network Energy Efficiency	×1 - ×100		Latency	1 - 10 ms
	Spectral Efficiency	×1 - ×3		Area Traffic Capacity	0.1 - 10 Mbps /		Battery life	10 years*
	Mobility	350 - 500 km/h		Availability	99.999% (of time)		Security	Strong subscriber authentication, user privacy and network security

Source: ITU-R, NGMN, 3GPP





5G TECHNOLOGY

Radio
Access
network

- Higher & bigger spectrum bands
- More efficient bit/Mhz (10-50%)
- **Low latency**
- New technologies like Massive MiMo, Beamforming, spectrum sharing



Mobile
Core
network

- **Distributed cloud architecture**
- **Network slicing**
 - Automation



OSS
& BSS

- Digital platform
 - Artificial intelligence and analytics
- Use case monetization



Devices

- **Multiple devices**
- Consumer
- Industries
- **Utilities**
- Automotive
- Manufacturing





5G ΕΝΑ ΔΙΚΤΥΟ- ΠΟΛΛΑΠΛΕΣ ΒΙΟΜΗΧΑΝΙΚΕΣ ΕΦΑΡΜΟΓΕΣ



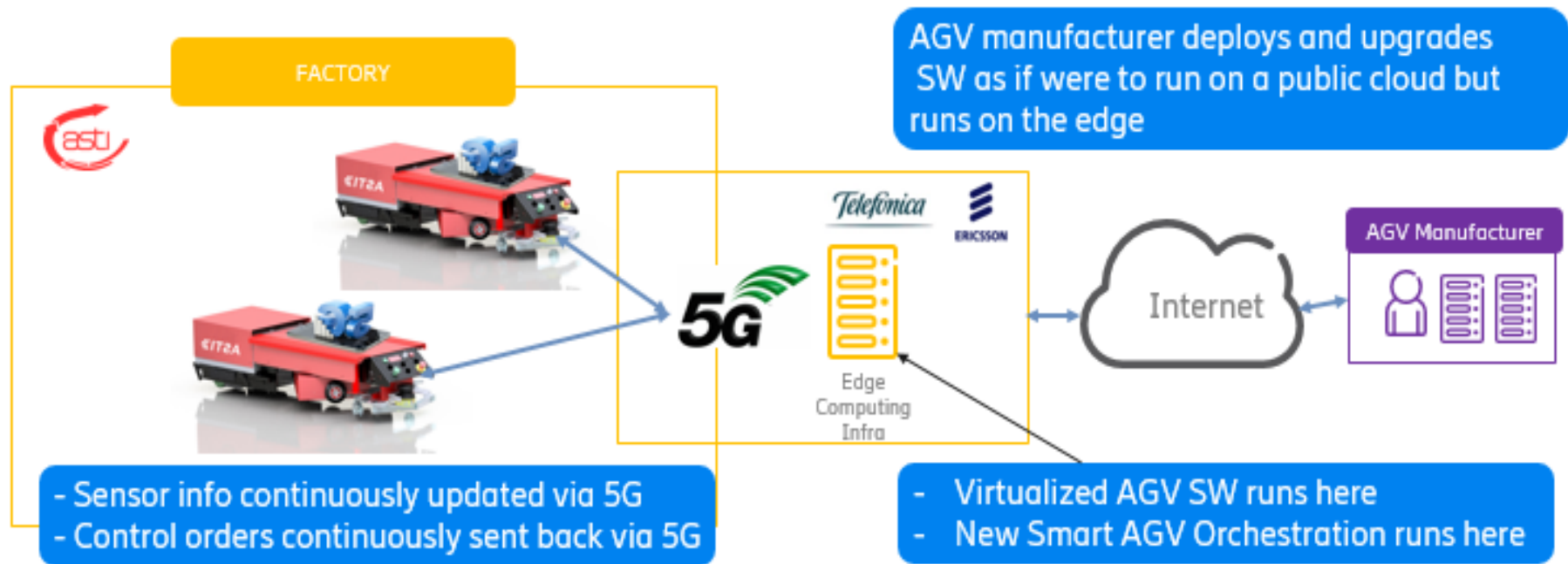


Industry 4.0: Autonomous vehicles in manufacturing

Scenario 1: Cloud robotics use case: AGVs for warehouse logistics – Greece Site facility (Ericsson - Hellas)

In this Use case AVGs for warehouse logistics will be implemented in Greece site facility with the following main characteristics.

Mobile Cloud Robotics (MCR) in a Smart Wireless Logistic (SWL) facility has been identified as an exciting 5G opportunity that will be exploited by Ericsson and development partners.





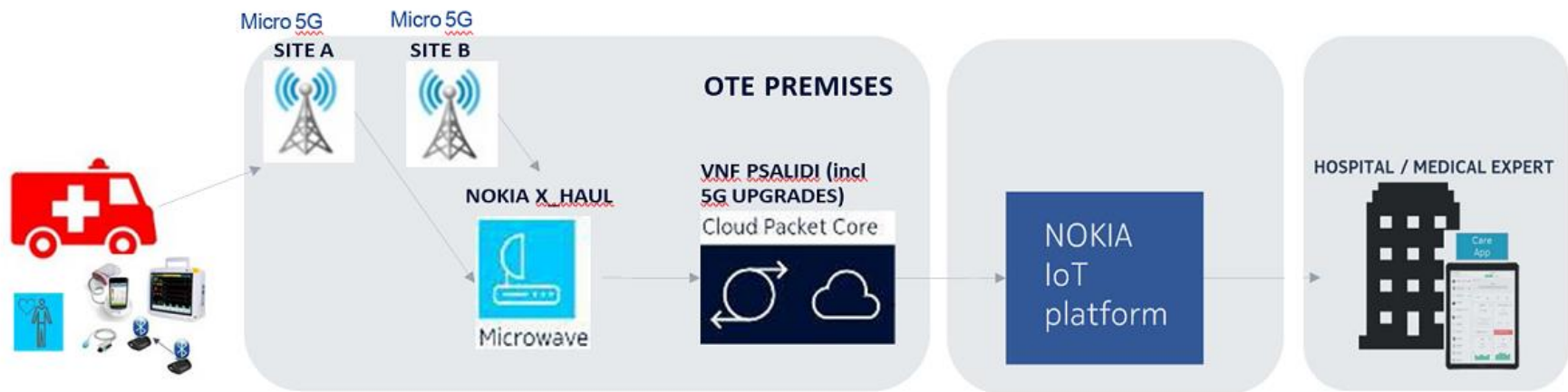
Smart cities: Safety and Environment

Scenario 2 - Connected Ambulance Greek Site Facility

The 5G “Connected Ambulance” concept will advance the **emergency ambulance services with their healthcare stakeholders** to help create improved experiences and outcomes for patients in their care.

Scenario 3 - Health Monitoring and Forecasting, Smart Mobility and Smart Home - Greek Site Facility

Western world population is ageing fast, supporting the automated indoor environment adaptation , the remote health monitoring and the smart mobility providing navigation instructions.

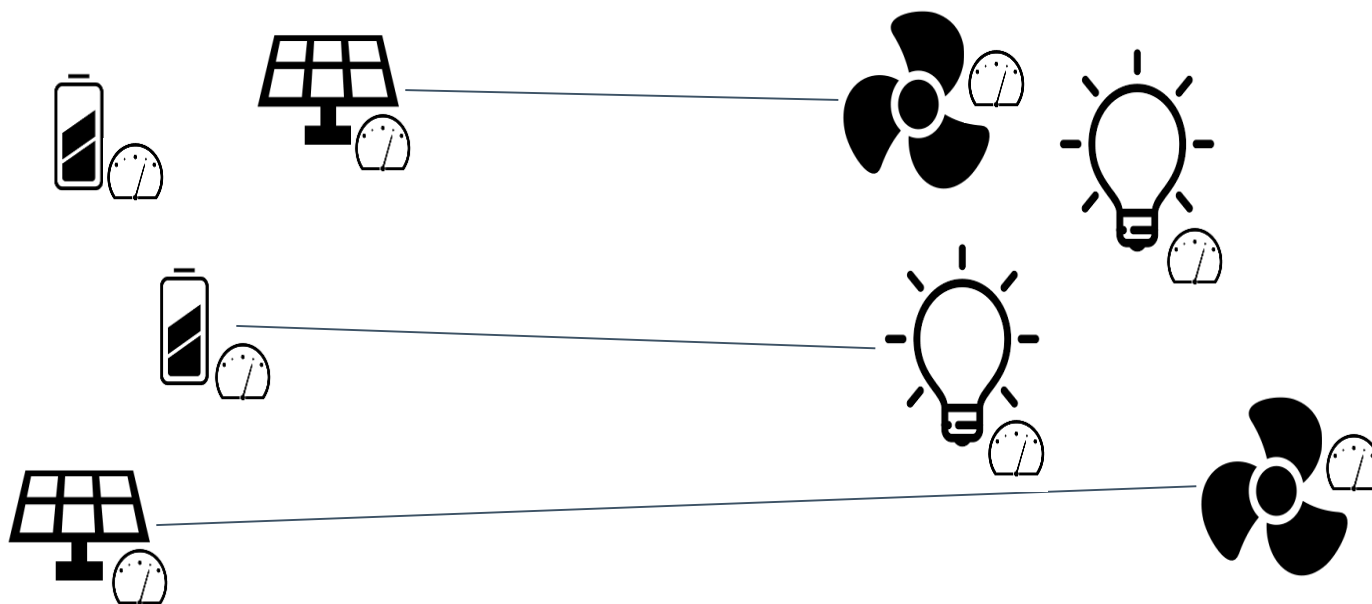




Utilities Smart Energy: Fault management for distributed electricity generation in smart grids

Scenario 1 - Fault management for distributed electricity generation in smart grids - Greek site facility (WINGS)

The use case considers the **small/medium scale representation of distributed electricity generation in smart grids**. For that purpose, the use case will target as first step a demonstration mockup (small scale representation) with actual distributed energy generation and consumption points as well as smart meters



Greek Site Facility at OTE premises

- ✓ 1st release of AGV, Smart City and Utilities platforms available
- ✓ Vertical end devices available, Smart city sensors and actuators, AGVs, Smart energy distributed producers /consumers, sensors, etc.
- ✓ GUI development with Intent-based functionality to support vertical users
- ✓ Nokia and Ericsson vEPCs (1st release) installed at OTE facilities
- ✓ Ericsson Radio-Dot installed at OTE facilities
- ✓ Implementation of “Umbrella” Greek site Orchestrator under way
- ✓ Greek site facility was part of 5G EVE demo booth at EuCNC 2019 (runner-up award for best demonstration booth)



Ericsson AGV



WINGS - Smart cities -



EuCNC 2019

OTE facilities

4th F2F meeting in Athens



NOKIA GR - Smart

Conclusion

- The 5G-EVE testbed will be used for validation of the three Greek use cases.
- The use cases will be assessed based on their performance
- The Greek Site will be used to be interconnected to the other sites and run use cases from other domains



Thank you

Q & A

