Mobile Private Networks – 5G/6G trends Research Projects

Dr. Daniele Munaretto, R&I Director
daniele.Munaretto@athonet.com

athonet

index

(1) Industrial Research

chapter

The core solutions

Athonet's software provides a complete mobile-network-in-a-box that looks and feels like Wi-Fi
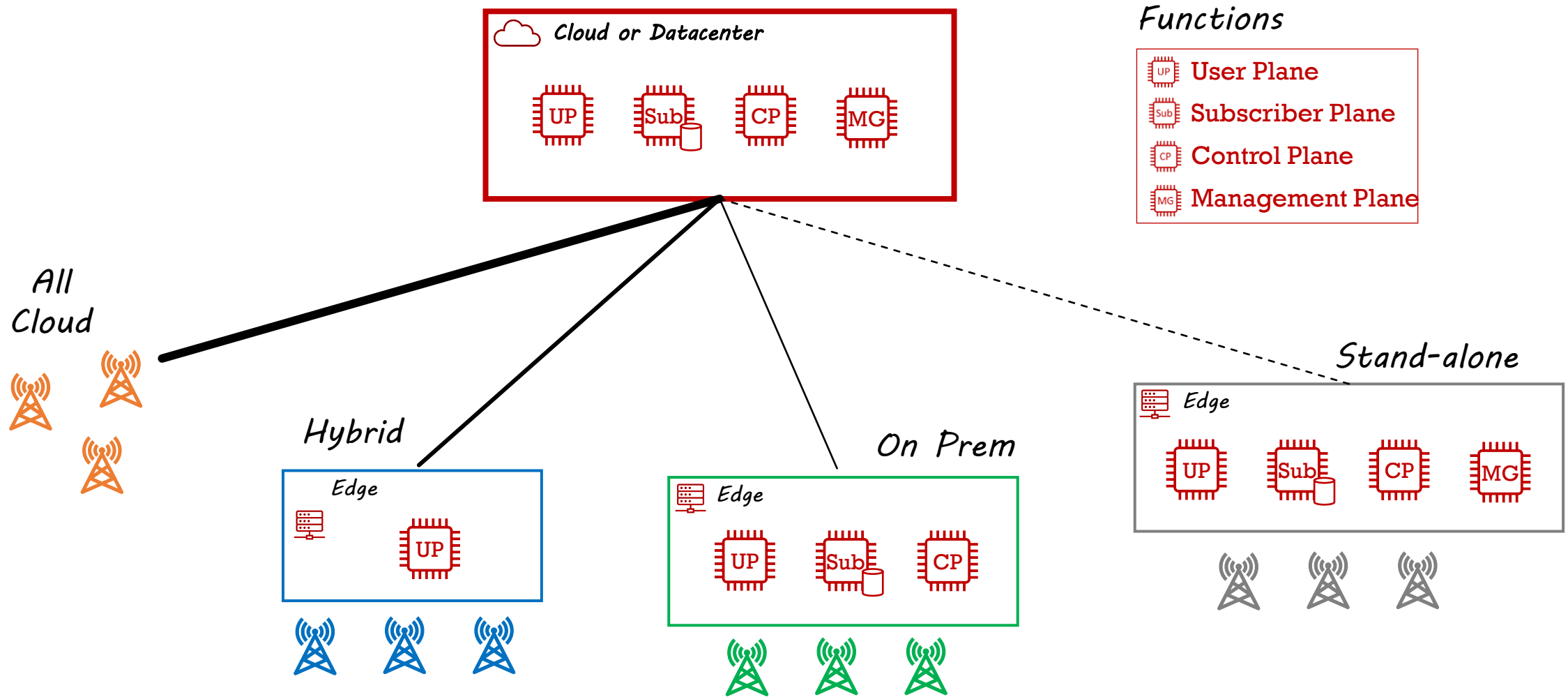
Cloud	Hybrid Cloud	On site

Any IT professional can simply instantiate a network, manage it, provision SIMs and connect it to their IT applications and systems.

Full flexibility in the deployment models

Deployment Options

CLOUD (FULL OR HYBRID) OR DATACENTER

Cloud & Hybrid

aws

Google Cloud

Datacenter

vmware®

KVM

ATHONET REFERENCE NETWORK DESIGN

Unified Network Platform

Single Server

Redundancy N+1
(incl. Geo-redundancy)

Provide Radio Package with Radio partner

TRANSPORTABLE

BACKPACK 1
RT PROXIMITY
1 SECTOR 1W

BACKPACK 2
RT INTERVENTION
1 SECTOR 5W

CUBE
RT EVENT
3 SECTORS 20w

NETWORK MANAGEMENT

SERVICES

CORE NETWORK

RADIO NETWORK

Trends 5G+ towards 6G

**Automation &
Zero-touch Management**

Ultra-reliability

Trustworthiness

**Edge-cloud
Continuum**

Connected Intelligence

Data Ownership

AI-ML

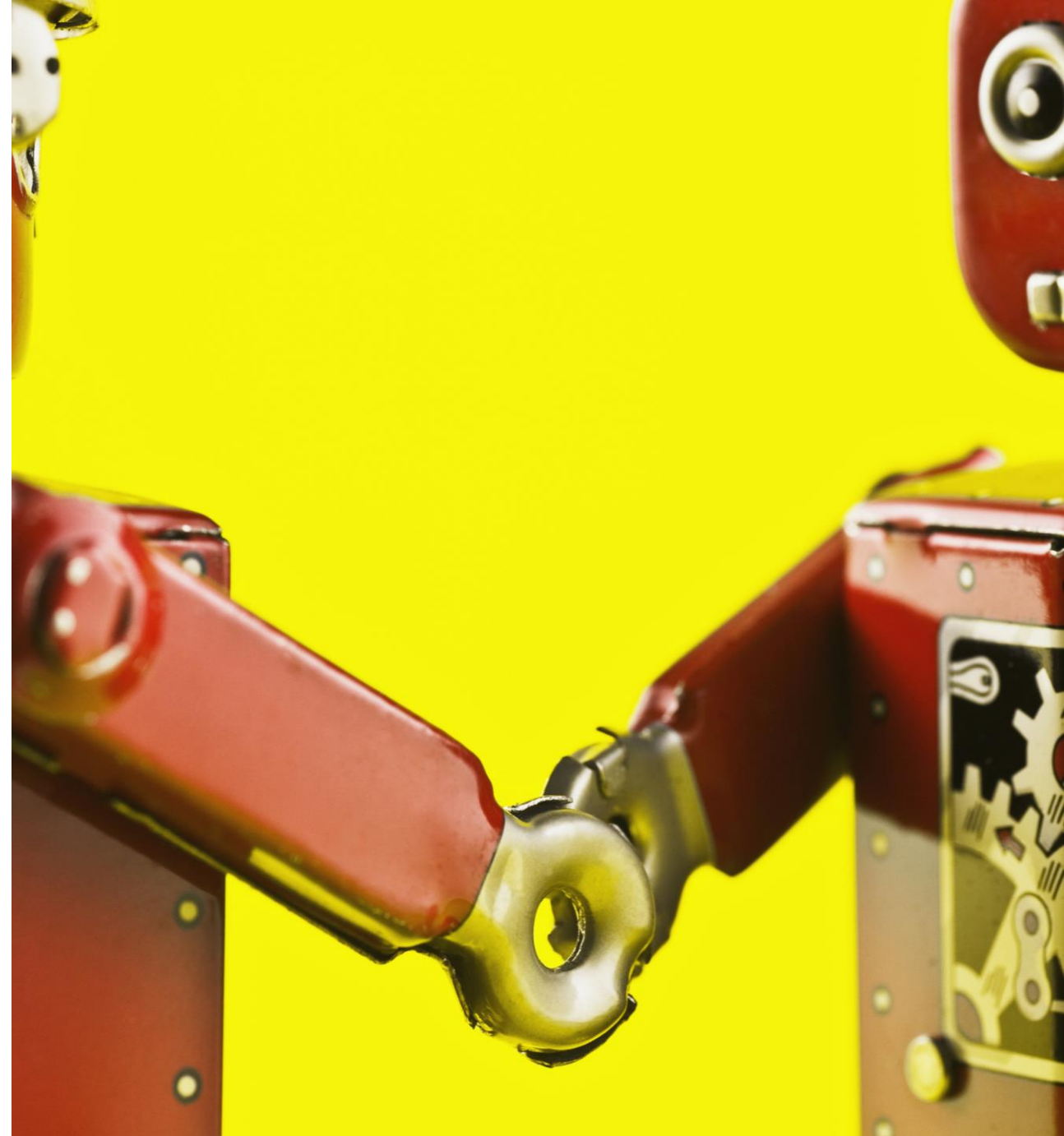**Sustainability**

Accuracy - Location services

Automation

The private network ecosystem is scaling out rather than up: not larger networks, but another order of magnitude of "small" networks

For a 5G network provider, this means

- Increased number of instances
- Variety of architectures
- Need for rapid deployment
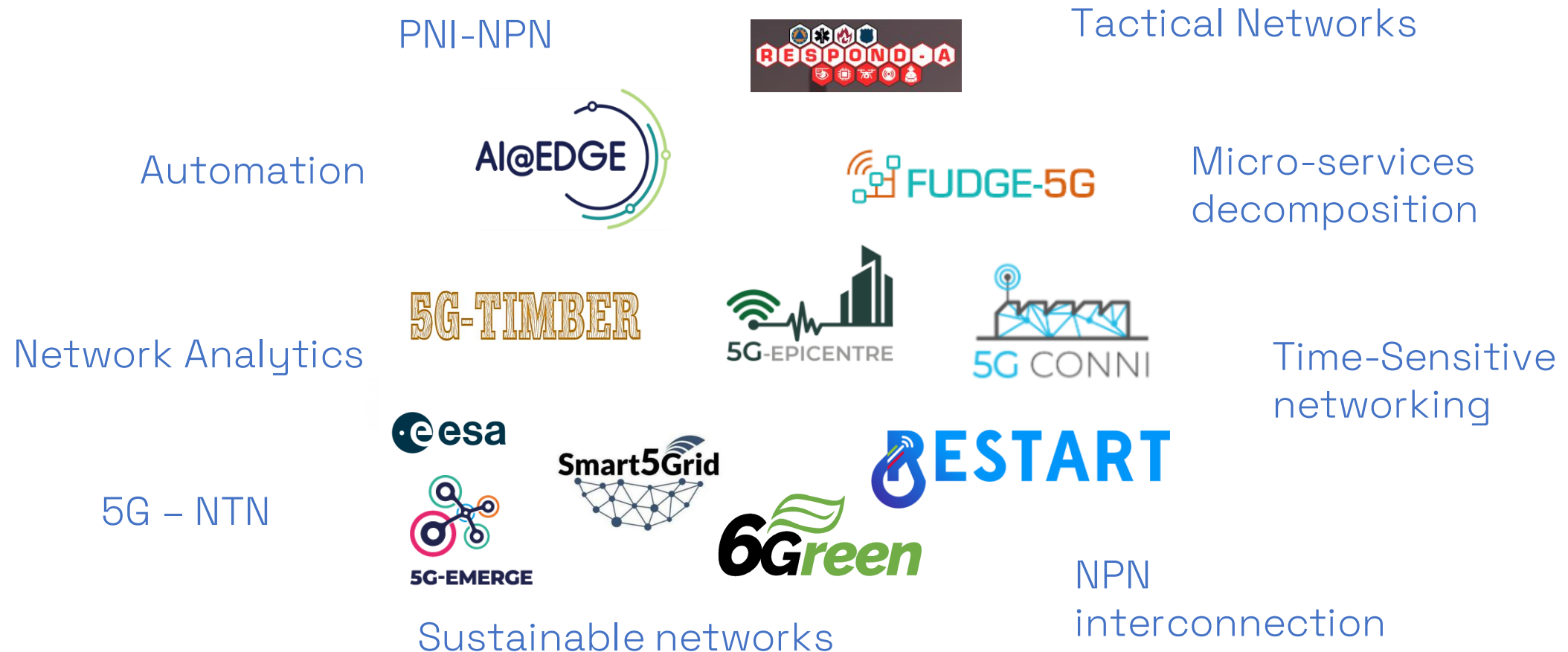- Abstraction from different IT environments

② Research Projects

5/6G-Oriented Scopes of the Calls for Project Proposals

- Quick uptake of advanced **5G technologies**

- Greater exploitation of **data,** increased resilience and cybersecurity by design of communications and industrial processes

- Focus on **5G private networks** and on innovative approaches to **simplify their deployment and operation**

- **New business models** for private 5G networks

- Sustainability, positive societal, environmental, and health impacts

Leading 5GC in EU and National research

PNI-NPN

Tactical Networks

Automation

Micro-services decomposition

Network Analytics

Time-Sensitive networking

5G – NTN

NPN interconnection

Sustainable networks

SNPN for smart industry

- A Digital Twin is a 3D representation of a factory floor that captures real-time activities and movements

- 5G-enabled:
  - It leverages eMBB, mMTC, and URLLC communications
  - It requires surveillance devices (cameras/radar) and real-time indoor positioning/tracking
  - It exploits 5G Time Sensitive Networking to synchronize the captured data, and to synchronize machines/robots/devices

- The digital twin is generated at the edge, together with AI/ML real-time analytics, and can also send commands back to the factory floor

- SNPN development of a 5G smart factory demonstrator that incorporates one manufacturing facility of Bosch (Germany) and the Intelligent Machine Tools Center (IMTC) of ITRI (Taiwan).
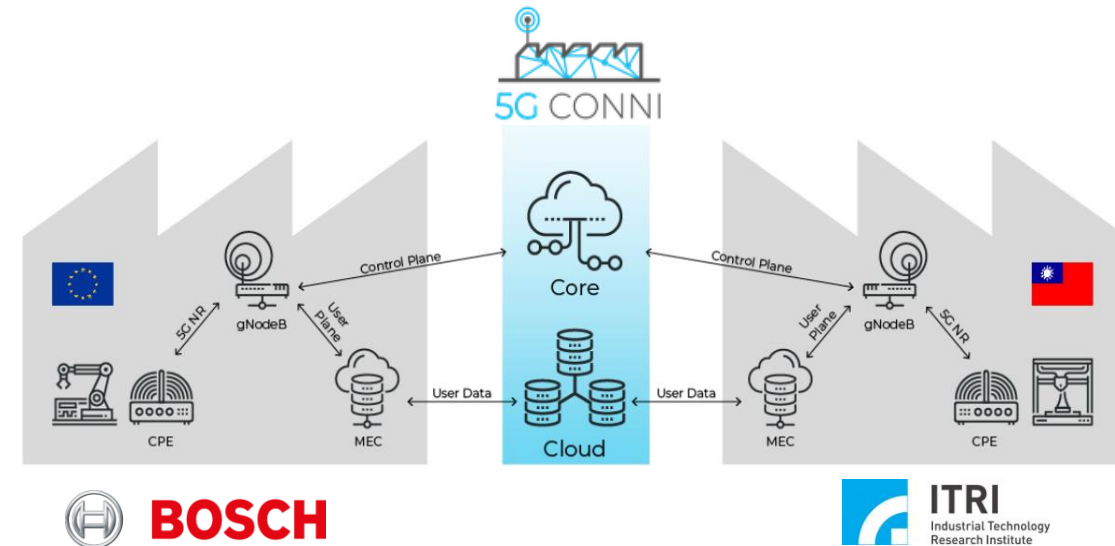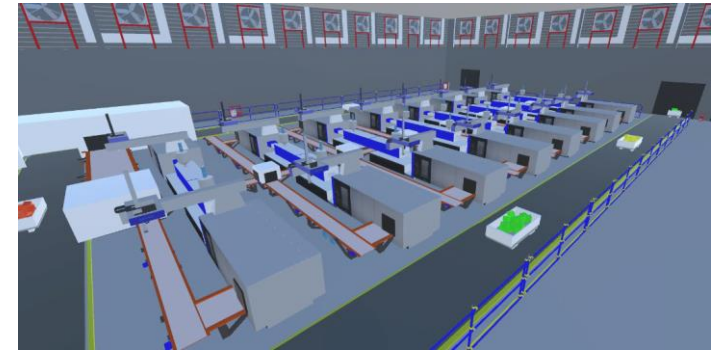
PPDR use case

athonet
5G core
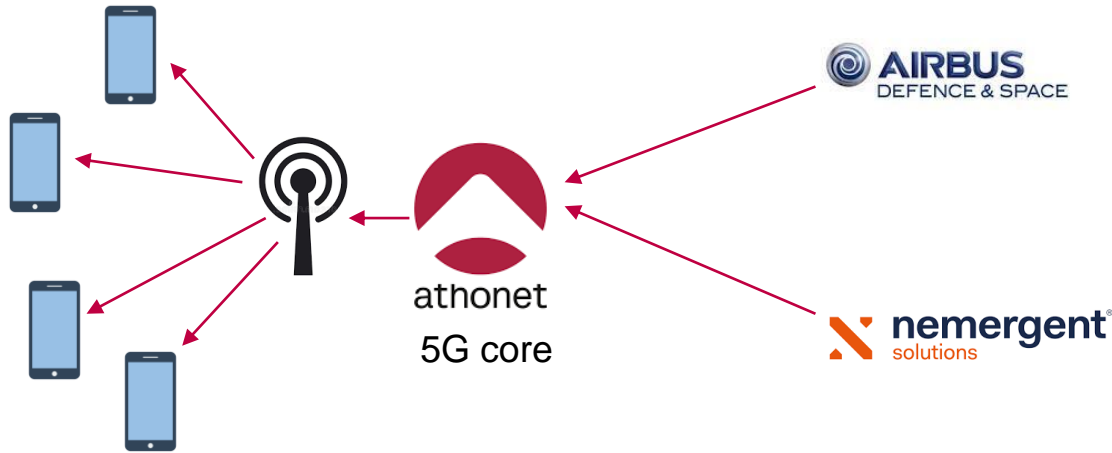
Supporting mission-critical (MC) services by

- Nemergent and

- Airbus

Goal:
- Allowing Airbus and Nemergent's MCX applications (running on real devices) to ask for and obtain dedicated 5QIs* for their QoS flows.
- AF – PCF interaction over N5

*5QIs = 5G Quality-of-service Identifiers; they identify quality-of-service patterns with specific characteristics

Tactical and edge-cloud

Objective: Design and deployment of cloud-native private mobile networks for multimedia content delivery and public safety.

❑ 5GC installed in high-capacity **ruggedized servers and on-cloud**

❑ Integrated with Huawei, Nokia

❑ More solutions deployed over time (different HW, including **AWS Snowball Edge**)

❑ Utilized to test third party MCX application via **N5 interface**

❑ Multi-vendor integration over **N4 interface** for Media use case
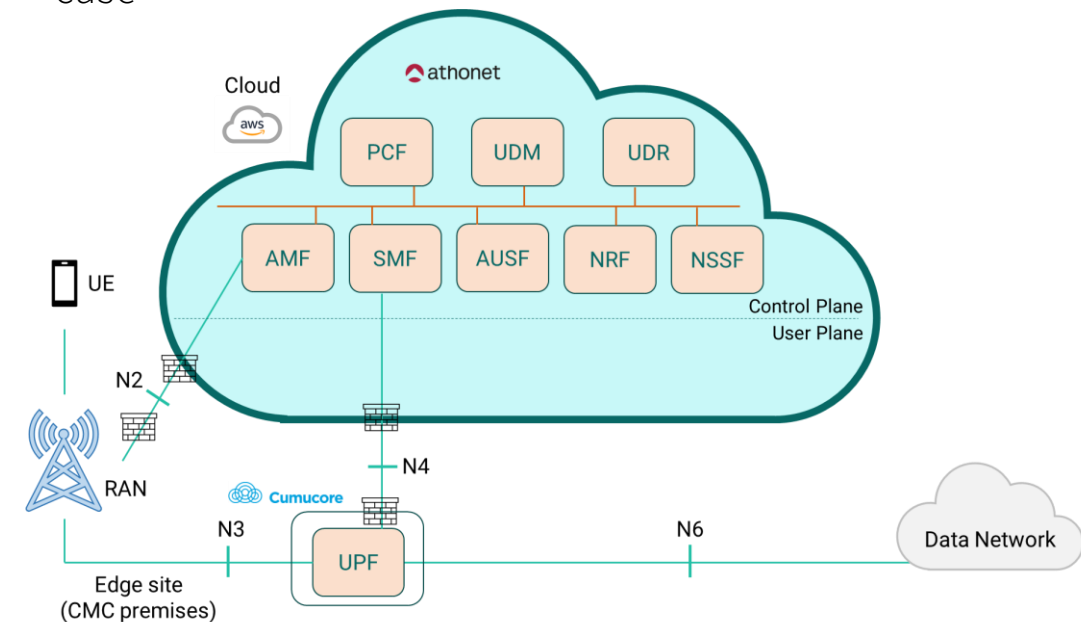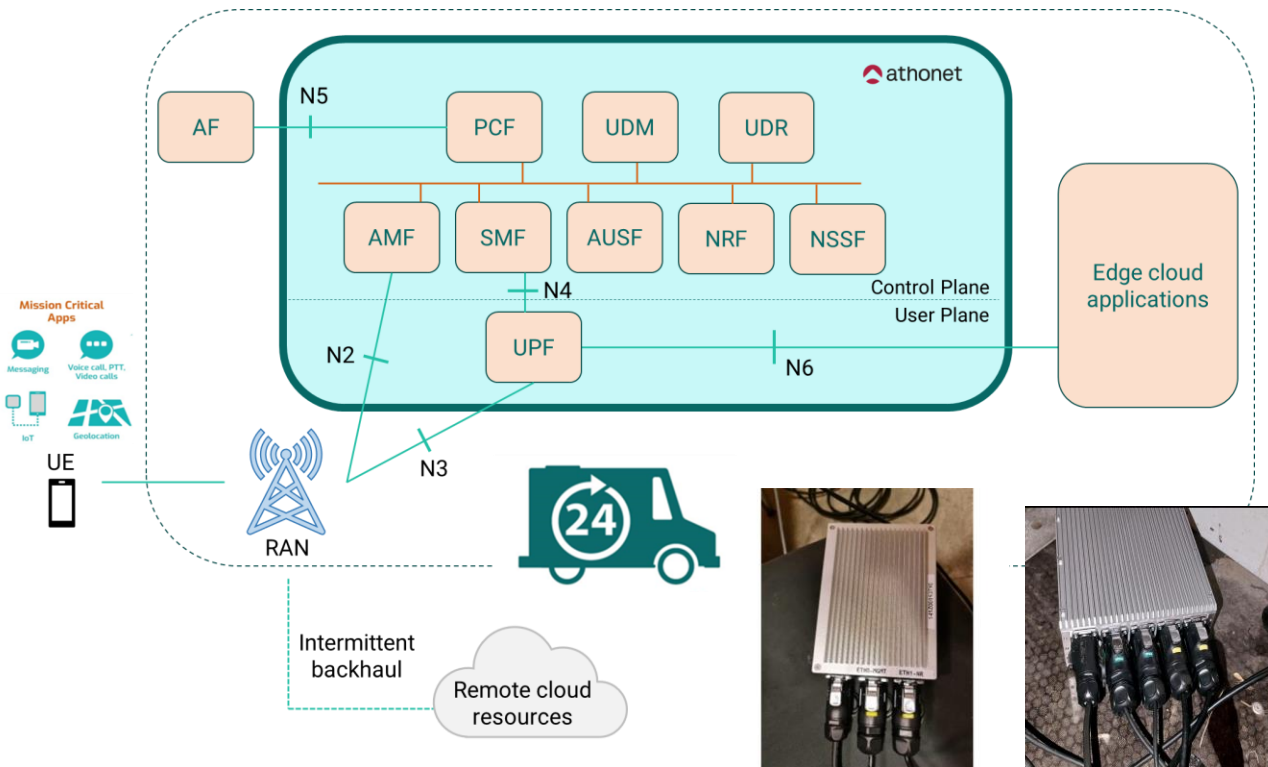
PNI-NPN (2 slices)
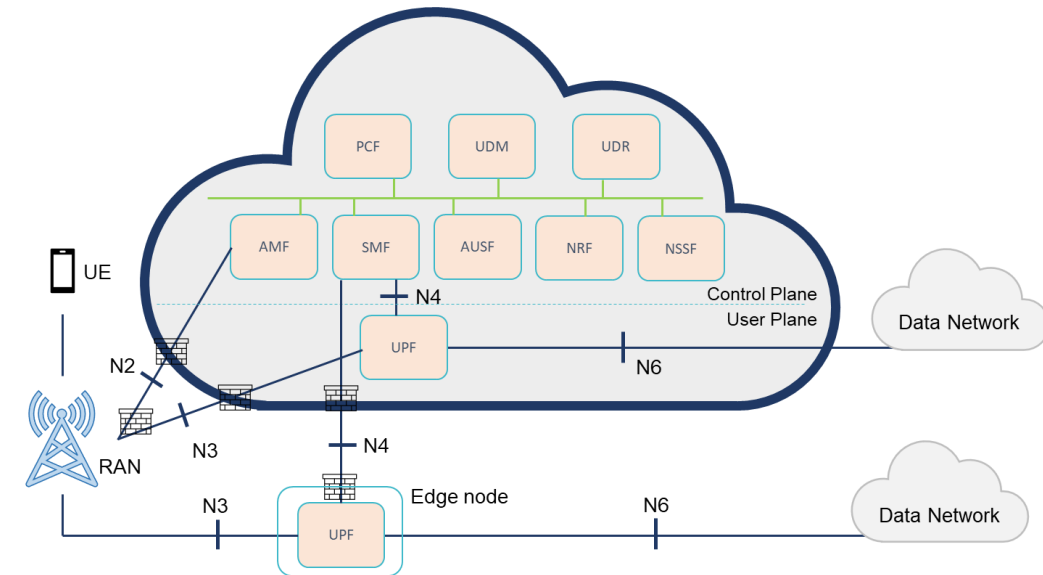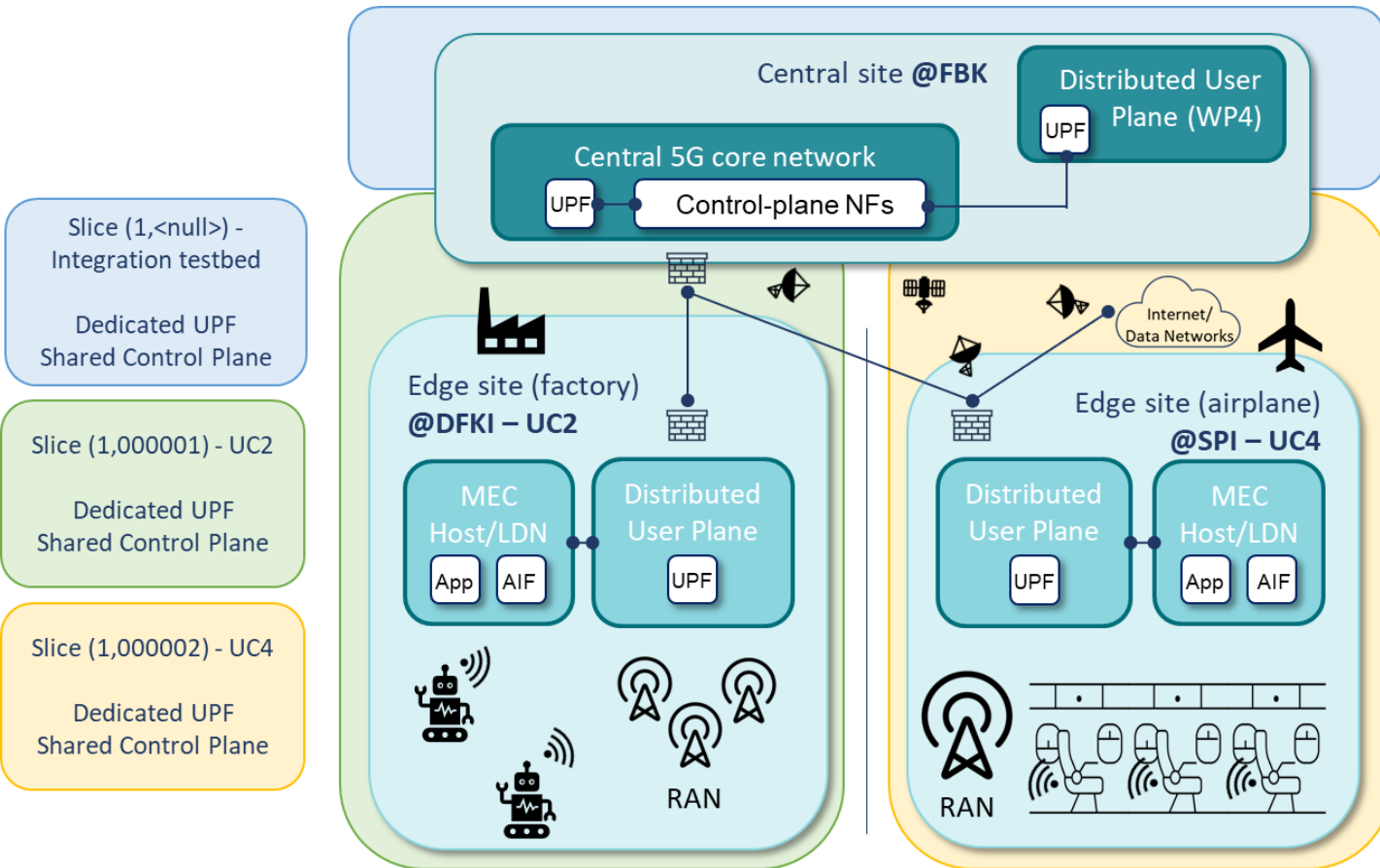
# Localization, DT and production efficiency: wood industry

- Objectives:
  - Implementation and demonstration of data driven solutions for **material waste reduction** and **production efficiency**
  - Exploitation of **edge computing**, **artificial intelligence**
  - **Reduction of the fine wood material waste**, increased **productivity**, and improvement of production **safety**

- Use cases:
  - Data driven material handling for wood waste reduction
  - Precise 5G localization for indoor logistics and human safety
  - 5G supported remote machinery maintenance and fault prediction
  - Augmented reality assisted production in wooden house factories

Sustainable and automated 5-6G

- 6Green aims at evolving the 5/6G SBA towards three main ground-breaking innovations that represent the **foundation** of the 6Green vision

- These innovations will permit the **smooth** and **rapid reconfiguration** of the ecosystem towards more energy- and carbon-efficient configurations, by

- assessing the indirect energy/carbon footprint induced by any stakeholders on the infrastructure

- allowing more responsible and sustainable practices
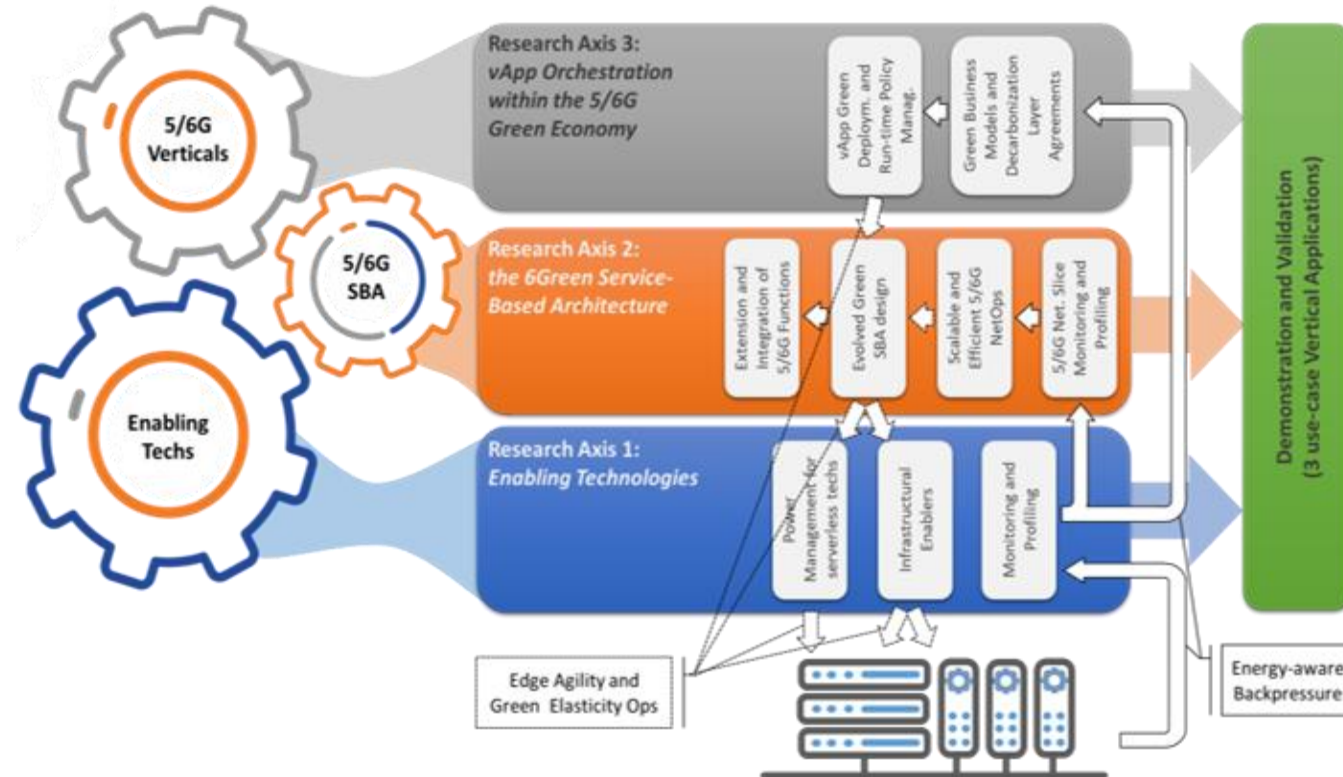
Edge Agility

Green Elasticity

**Energy-aware backpressure**

Edge-cloud for Energy industry

The **Smart5Grid** project aims to investigate the potential of 5G-based Edge-Cloud Computation in the Energy industry.

5G network helps to improve the performance of automatic fault detection and restoration functionality (called real-time self healing)

The project testbeds are now available for third-parties' experimenters, fostering the creation of a new market-segment for Network Apps
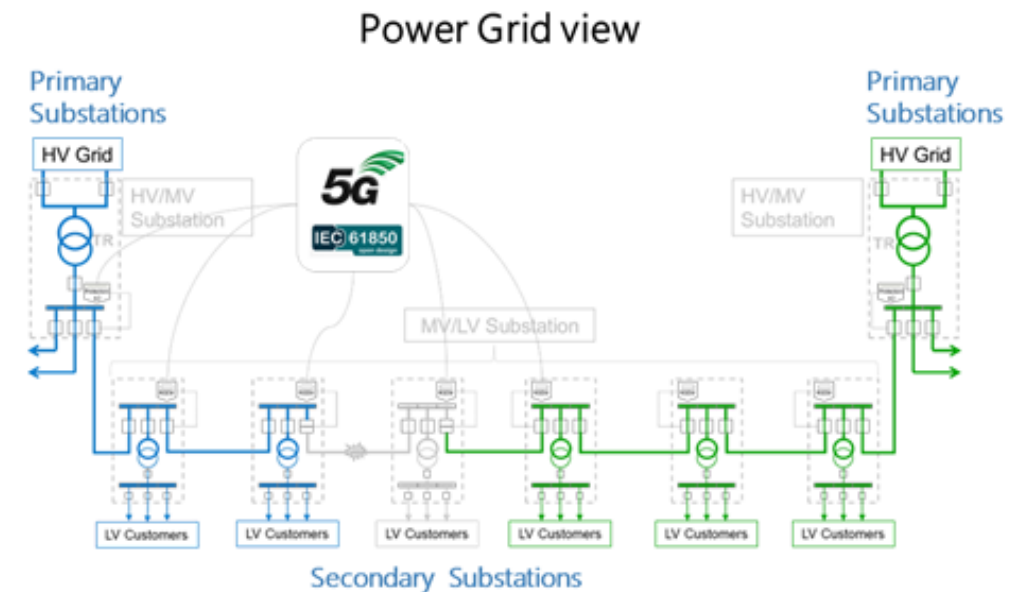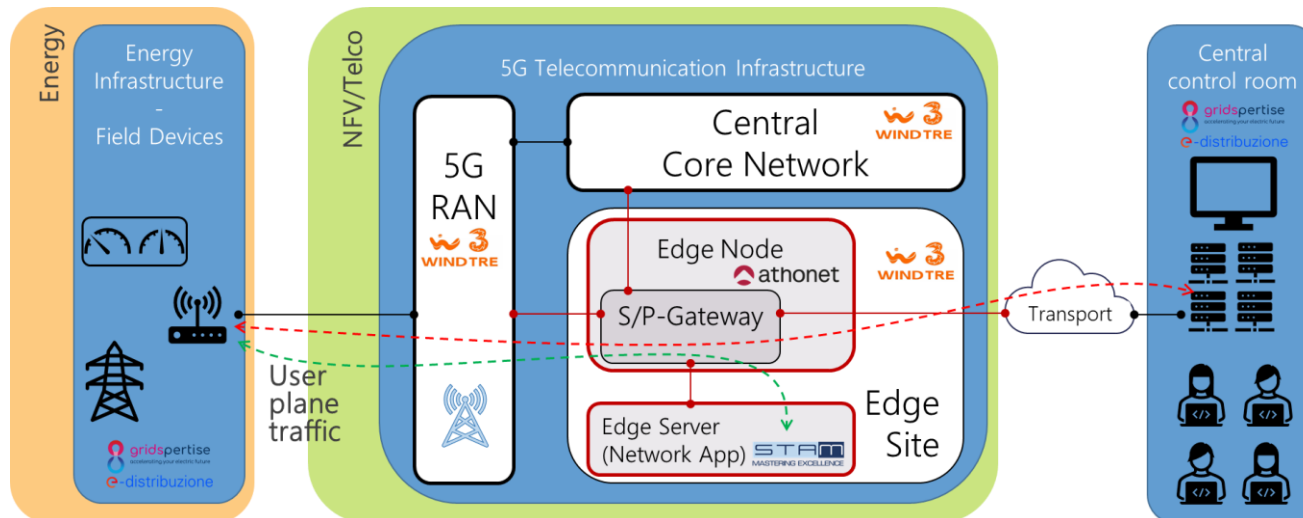
5G-NTN

The project aims to develop an integrated satellite and terrestrial system to enable high-quality content distribution services.

Three main stages considered, as follows:

1. Popular content, with popularity based on real-time requests (reactive) and personalization preferences (pre-loading), is broadcast over a region (shown in #1, 2 and 3).

2. Optimized terminals for static or moving, home and professional use cases receive content and prepare it for playout (shown in #4, 5 and 6).

3. Standard playout devices make use of the (5G) network capabilities that are enhanced by the 5G-EMERGE ecosystem (#7)
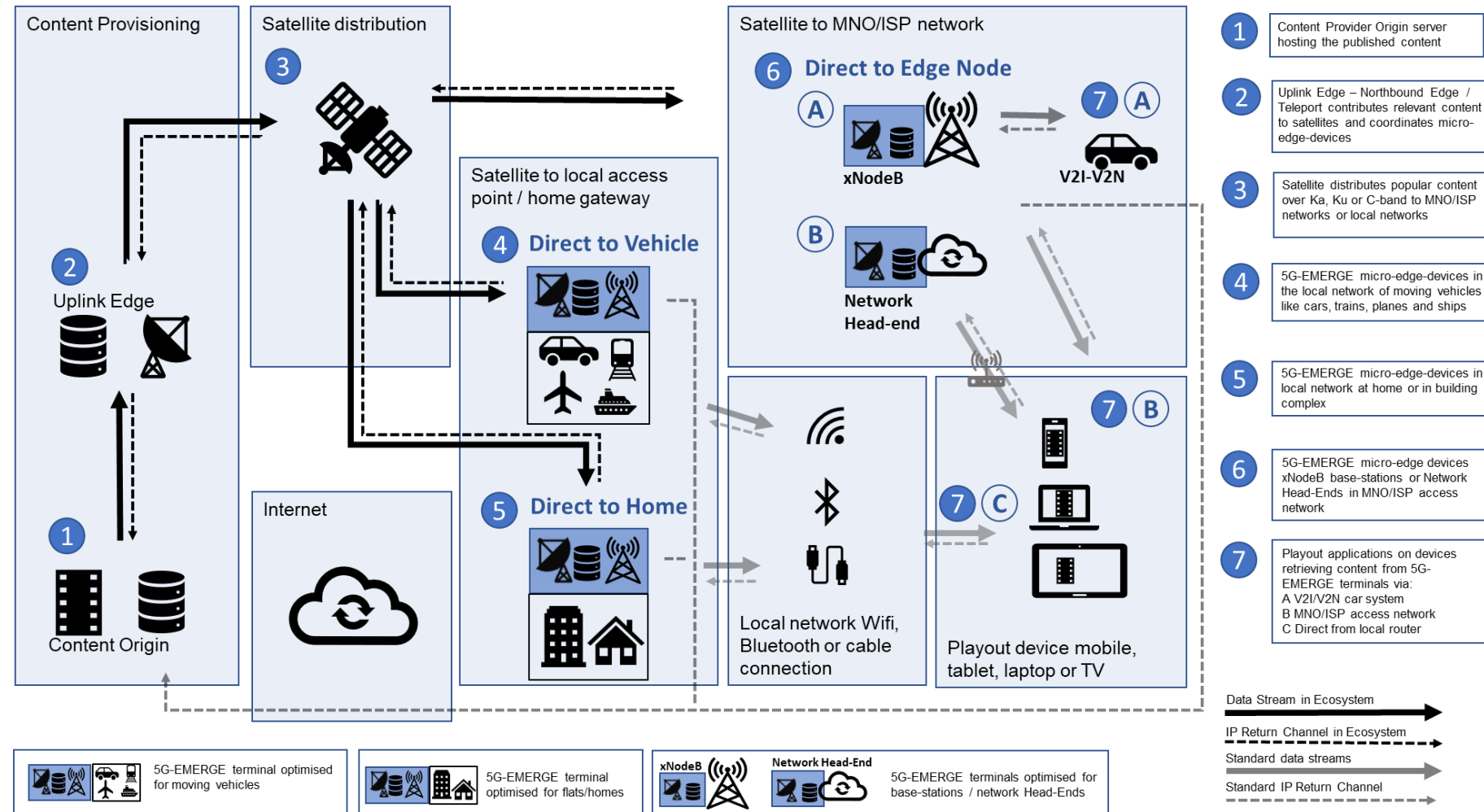
Reinvent TLC in Italy

athonet

thank you for your attention

Visit our website www.athonet.com
or follow us on Linkedin