FUTURE COMMUNICATION NETWORKS RESEARCH GROUP

The 6G-SANDBOX Ecosystem

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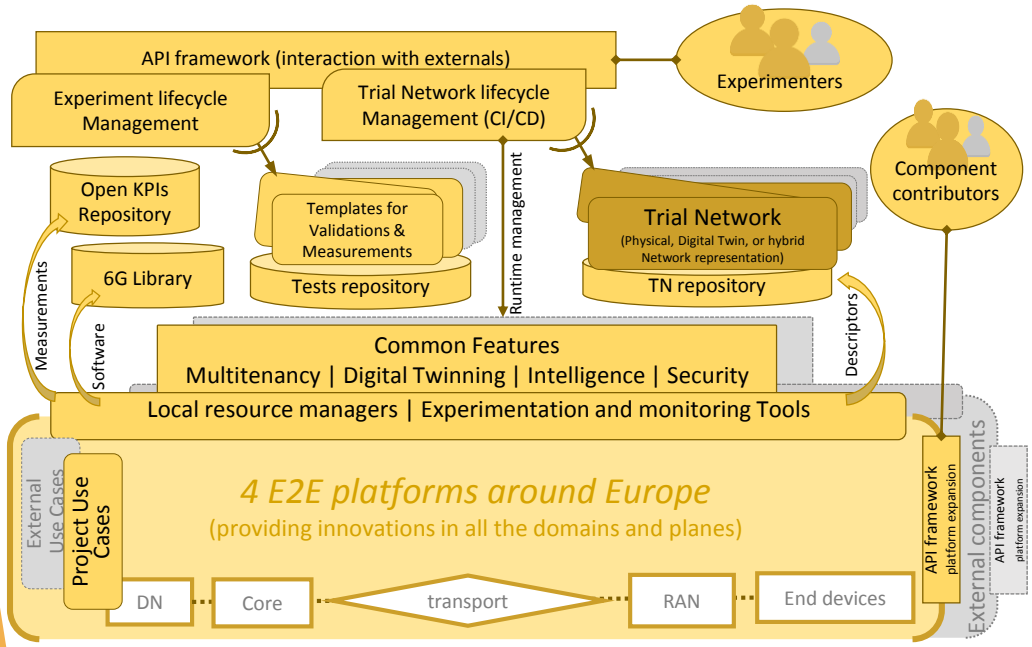
Quick overview of the project (concept, status, key milestones)



The 6G-SANDBOX facility: The full set of 6G-SANDBOX components that are offered as a pan-European testbed for testing. The testing procedures can be for 6G technology validations and for 6G KPI measurements. The facility is expected to include the implementation of all the components that will be structured around the 6G-SANDBOX reference architecture.

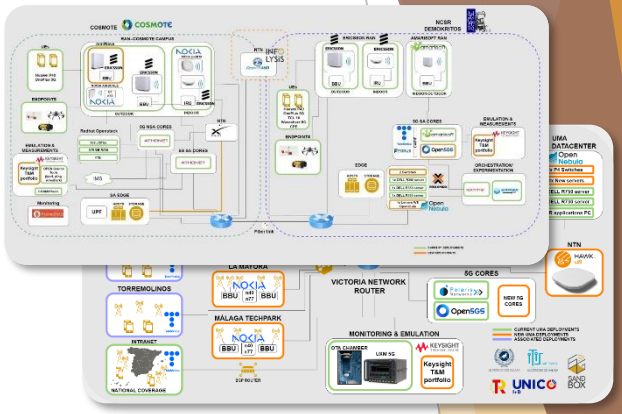
The (6G-SANDBOX) Trial Network: fully configurable, manageable and controllable network which *combines digital and physical nodes* and provides services for 6G *technology validation* and 6G *KPI measurements*

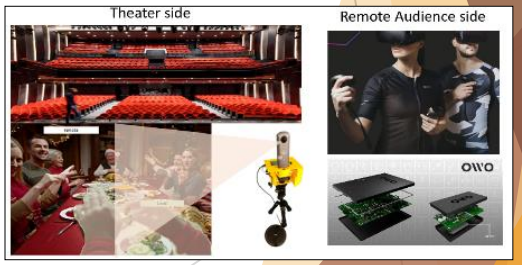
- Instances of Trial Networks might be offered targeting specific network domains and technologies
- End-to-end Trial Networks will be offered by the four experimentation platforms within 6G-SANDBOX project

Components, Resources, and Experiment definitions from Open calls, Stream D projects, and other 3rd parties

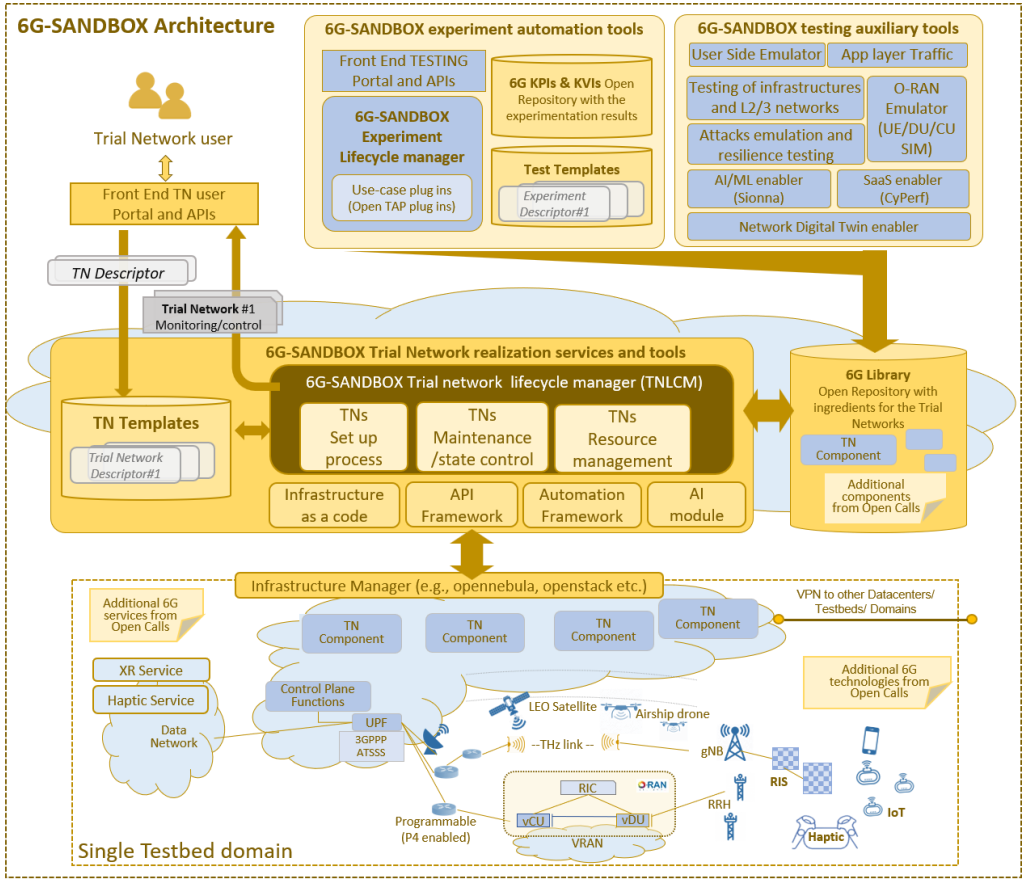
Quick overview of the project

- **6G Candidate technologies**
  - Open Ran (ORAN)
  - Reconfigurable intelligence Surfaces (RIS)
  - NTN/B5G/fixed integration
  - Deterministic communications
  - Security and AI/ML
- **6G-SANDBOX Trial Networks fundamental ingredients**
  - Trial networks manager
  - Infrastructure as a code & templates
  - Emulation of components/E2E networks (Digital Twins of network elements)
  - Evolving Platforms/ TN hosts: Malaga, Berlin, Athens, Oulu
- **Testing and Measurement toolbox**
  - Experimentation framework as a service on trial networks (Keysight tools + Genesis suite)
  - KPIs & KVIs evaluation
  - 6G use cases
    - Enablers for XR
    - Enablers for Haptic communications
    - Demo “Bringing the touch sense in remote audience”
- **Open Calls**
  - (OC1) bringing 6G components
  - (OC2/3) conduct experiments/ new use cases
- ***And more***
  - Standardised APIs manager – homogenised API exposure from all the components to the TN user
  - Open software and data (6G Library & KPI repository)
  - Liaison JU SNS with Streams B and D, 5GPPP and national programs on 6G
  - Follow-up and/or federation in JU SNS call 2023 or 2025





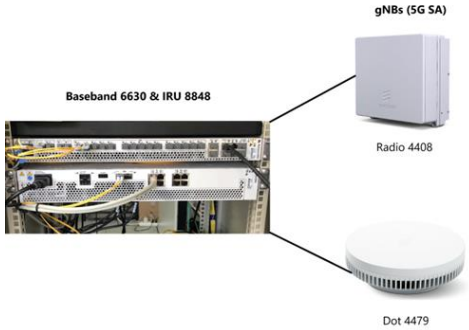
6G-SANDBOX Architecture



Athens platform Telco Infrastructure

5G Core Networks

- Open5GS (with NEF/CAPIF)
- Amarisoft 5G SA Core
- Athonet 5G SA Core



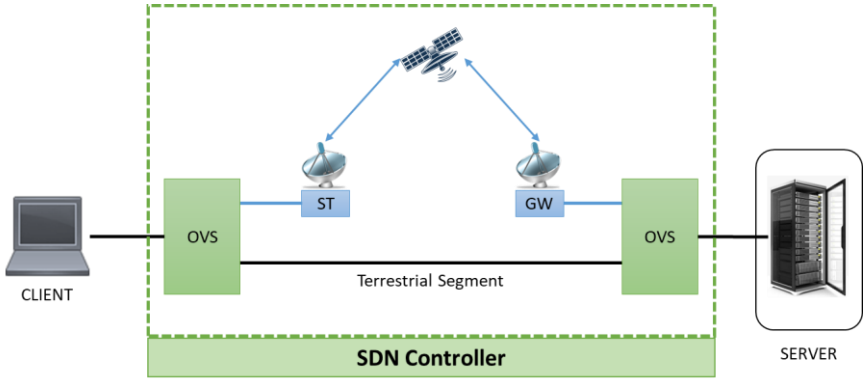
5G RAN (Indoor-Outdoor)

- Ericsson 5G RAN
- Amarisoft 5G RAN
- Nokia
- mmWave (to be deployed)

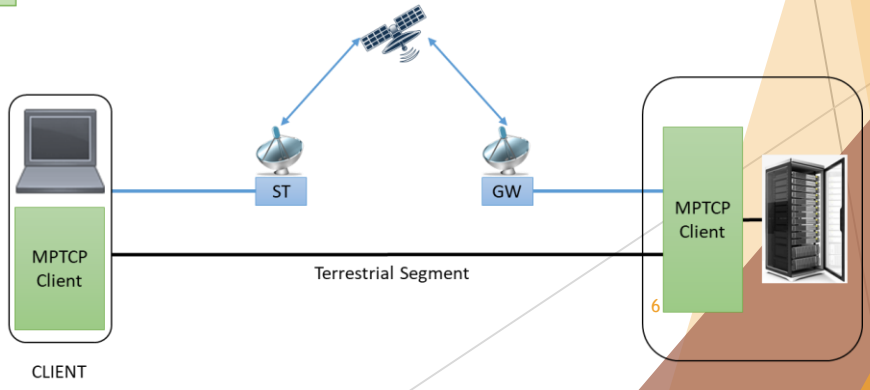
POWERED BY COSMOTE DEMOKRITOS

Emulated NTN Integration

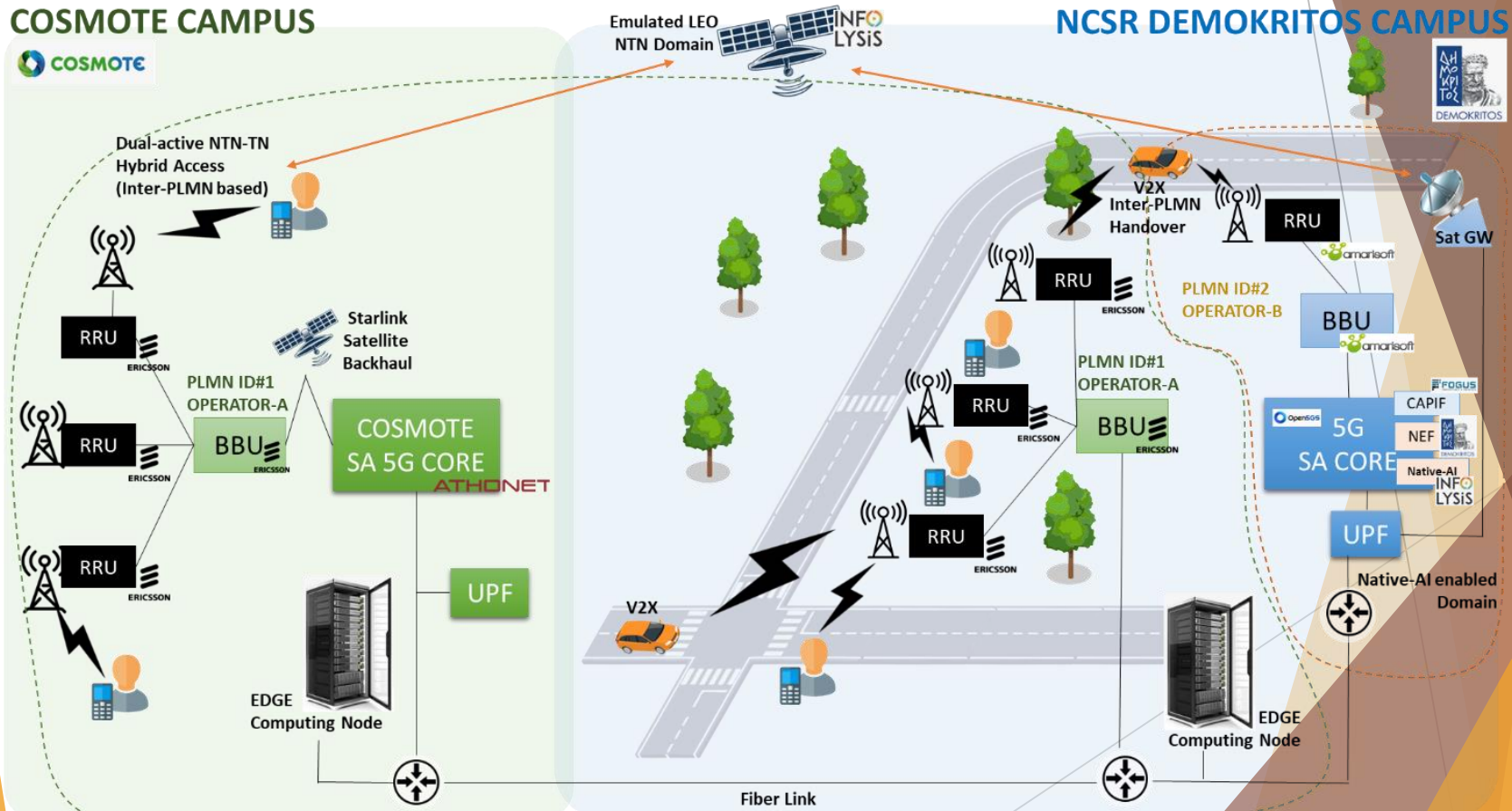
SDN Controlled



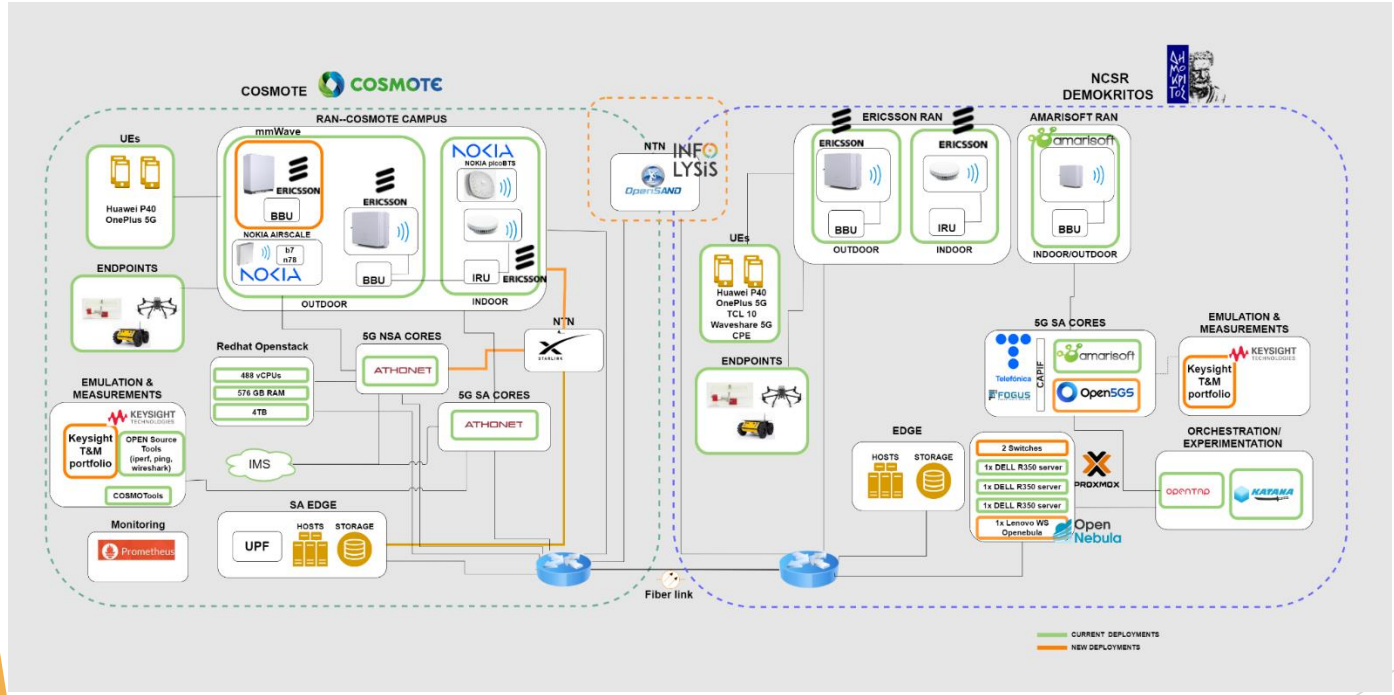
MPTCP



Athens platform topology



Athens platform architecture



Network Openness of Athens Platform EVOLVED-5G Service Pack

The EVOLVED-5G Service Package it is a wholesome of all developments carried out in EVOLVED-5G related to Network Applications. This VM is composed by the following elements:

- **CAPIF**, it is a complete 3GPP API framework that covers functionality related to, on-board and off-board API invokers, register and release APIs that need to be exposed, discovering APIs by third entities, as well as authorization and authentication
- **NEF**, it implements the standardized NEF APIs in a configurable emulated environment, where the user can define specific simulation environments (e.g., number and type of UEs, position of gNBs etc.).
- **TSN**, it is a set of standards with the intention to provide deterministic connectivity (e.g., bounded latency) over Ethernet networks. TSN Application Function, is a key component to ensure the quality through the end-to-end connectivity that enables the 5G network to act as a transparent TSN Bridge.
- **SDK**, it is composed by two main tools i) CLI tool, creating a repository in GitHub as well as locally, performing the Network App' configuration, i.e., file and folder structure, by means of the Network App Template and ii) SDK libraries, set of Python classes that provide abstraction towards the 5G APIs and enhance Network Apps with 5G capabilities
- **Dummy Network App**, it is a non-functional piece of software designed to reproduce behavioral functionalities an actual Network App must have in the EVOLVED-5G project. It has connectivity with all the exposure services (CAPIF, NEF and TSN).

The EVOLVED-5G Service Package ease and allows developers to initiate in the development of Network Applications. Within this VM, the developer can interact with the Dummy Network App to understand how a Network App does the network communication with NEF and TSN through CAPIF.

https://wiki.evolved-5g.eu/en/service-pack

Questions?

- Thank you