

Proofs of Concept (PoCs)

→ E2E small-scale proof-of-concept prototype to demonstrate performance and energy efficiency of ISAC

Build an end-to-end PoC prototype to demonstrate **performance and energy efficiency of ISAC** in a form of an operated RU, DU, and CU/UPF pools with a **real-time control fabric** providing sub-millisecond control loop over each network component

→ 6G CF-mMIMO PHY prototype with real-time control loop support

6G CF-mMIMO PHY prototype that supports real-time control loop. The algorithms related to this implementation will be deployed on top of representative real-time **SDR hardware** components to demonstrate the feasibility of the concept as well as achieving high network performance

→ 5G/6G Offline (online) Network Digital Twin

In the context of **5G/6G offline and online network digital twin**, the project will leverage a variety of WATs to **ingest cross-technology sensing, telemetry, and control** into the evolved 6G RIC. The goal is to enable efficient management and optimization of **heterogeneous networks with multiple WATs**

About 6G-SENSES

Start date: January 2024

Duration: 30 months

Overall budget: €3,810,062.50 €

Call:

HORIZON-JU-SNS-2023-STREAM-B-01-02

Consortium:



SAPIENZA
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SEamless integration
of efficient 6G wireless
tEchnologies for
Communication and
Sensing



6g-senses.eu

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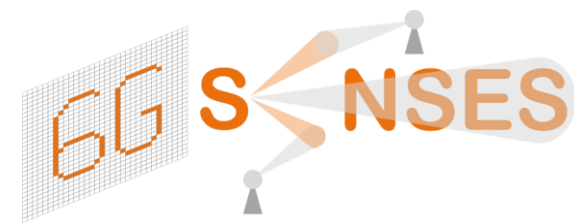
Main 6G-SENSES Proposition

6G-SENSES proposes the integration of novel 6G RAN technologies such as Cell-Free (CF) Massive Multiple-Input Multiple-Output (MIMO) and Joint Communication and Sensing (JCAS) to support the 6G vision that is sustained by the current (and future) architectural framework based on 3GPP and O-RAN. The project considers a multi-technology RAN ecosystem with technologies that are able to offer sensing functionalities.



Main Innovations

- **Development of a multi-technology RAN ecosystem** (3GPP 5G and non-3GPP) with technologies such as Sub-6, Wi-Fi, mmWave @ 60 GHz, 5G NR, which that are **able to offer sensing functionalities** and to **exploit distributed antenna schemes** from **CF and distributed MIMO architectures**.
-  **Use an RIS infrastructure** as one of the enablers for JCAS and CF-mMIMO
- **Design and fabrication of a scalable MIMO mmWave front-end**
- **Extension of the RIC and control-plane intelligence** to support 'cross-domain AI optimization',
- **AI/ML models** for network management, configuration (e.g. adaptive L1/L2 functions) and optimization



Key Objectives:

Provide use cases and scenarios that can prove the benefits of 6G-SENSES

Provide a Multi-WAT (Sub-6, mmWave, Wi-Fi and 5G NR technologies) ISAC platform

Design, develop and demonstrate a Cell-Free architecture able to offer ISAC services

Analyze synergies between 3GPP and O-RAN with regards to ISAC and CF-mMIMO

Design and development of an 'Intelligent Plane'

Maximize the project impact by actively contributing to the SNS program