INSTINCT

Joint Sensing and Communications for
Future Interactive, Immersive, and Intelligent
Connectivity Beyond Communications

INSTINCT Introduction

14.03.2024

Padmanava Sen
Barkhausen Institut

6GSNS

Co-funded by the European Union

INSTINCT – Snapshot

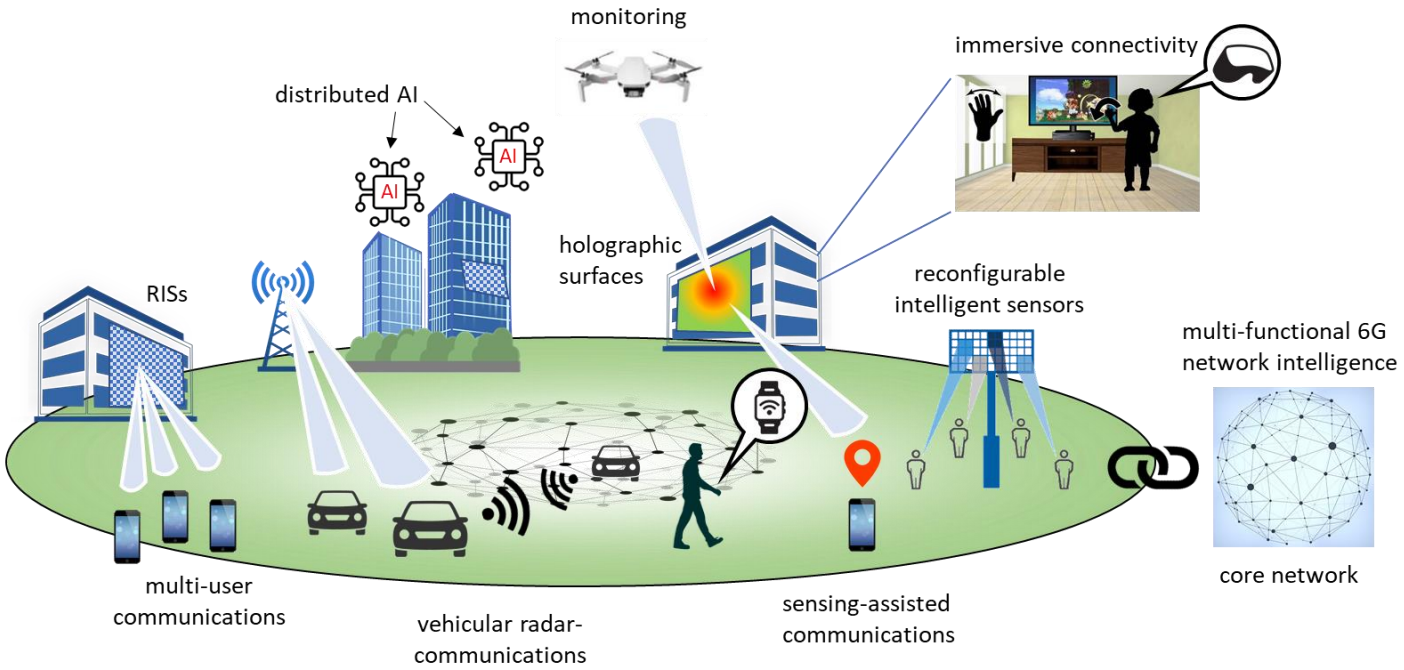
Partners

- Joint Sensing and Communications for Future Interactive, Immersive, and Intelligent Connectivity Beyond Communications
- **HORIZON-JU-SNS-2023-STREAM-B-01-02**
- **36 Months (01.01.2024 – 31.12.2026)**
- **Total Partners = 13**
  - **Operators, vendors, SMEs, Academia (univ. and institutes)**

6GSNS

Co-funded by the European Union

INSTINCT System Concept



INSTINCT Objectives

- Objective-1: **Interactive and Agile Sensing-aided Connectivity** based on the fusion between communication and sensing, exploiting various frequency bands and enabling new 6G applications.
- Objective-2: **Immersive and Resilient Sensing-enabled Connectivity** for reliable, reconfigurable, self-healing, energy and spectrum efficient, and tenable sensing-as-a-service introduction, leveraging RIS, LIS and Cell Free/ Network MIMO technologies.
- Objective-3: **Co-design of Communications and Sensing for Intelligent Connectivity** by means of innovative sensing, intelligent surfaces and AI/ML architectures and tailored microelectronics solutions at RF, Baseband, DSP to support future 6G RANs.

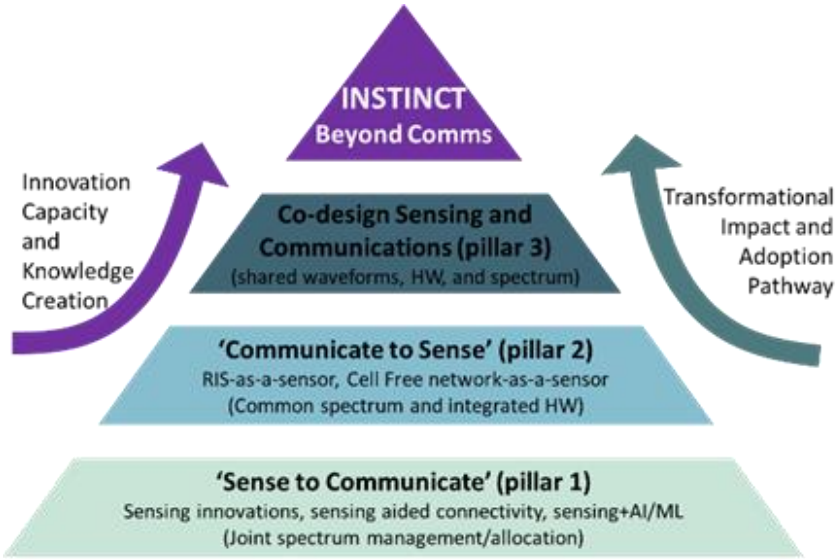
RIS = Reflective Intelligent Surface, LIS = Large Intelligent Surface, MIMO = Multiple-input-multiple-output, AI = Artificial Intelligence, ML = Machine Learning, RAN = Random Access Networks, DSP = Digital Signal Processing

INSTINCT Pillars and Enablers

- PILLAR I – **"Sense-to-communicate"**: sensing-assisted communications to substantially **improve radio spectrum usage** by leveraging sensing information for supporting of 'beyond communications' use cases.
- PILLAR II – **"Communicate-to-sense"**: Communications with sensing, localization and mapping capabilities, by means of RIS, LIS and massive MIMO architectures, is expected to transform the wireless network into **a smart 'sense the world' platform, capable of providing JCAS-as-a-service**.
- PILLAR III – **Multi-functional JCAS Network Intelligence**: AI based optimization of JCAS systems leveraging the reconfigurability of intelligent materials, and Sensing Intelligence based on situational awareness, offer the **'brains' for the co-design** of sensing-assisted communications and communications-enabled sensing.

RIS = Reflective Intelligent Surface, LIS = Large Intelligent Surface, MIMO = Multiple-input-multiple-output, AI = Artificial Intelligence, JCAS = Joint Communications and Sensing

INSTINCT Impact



INSTINCT Scenarios

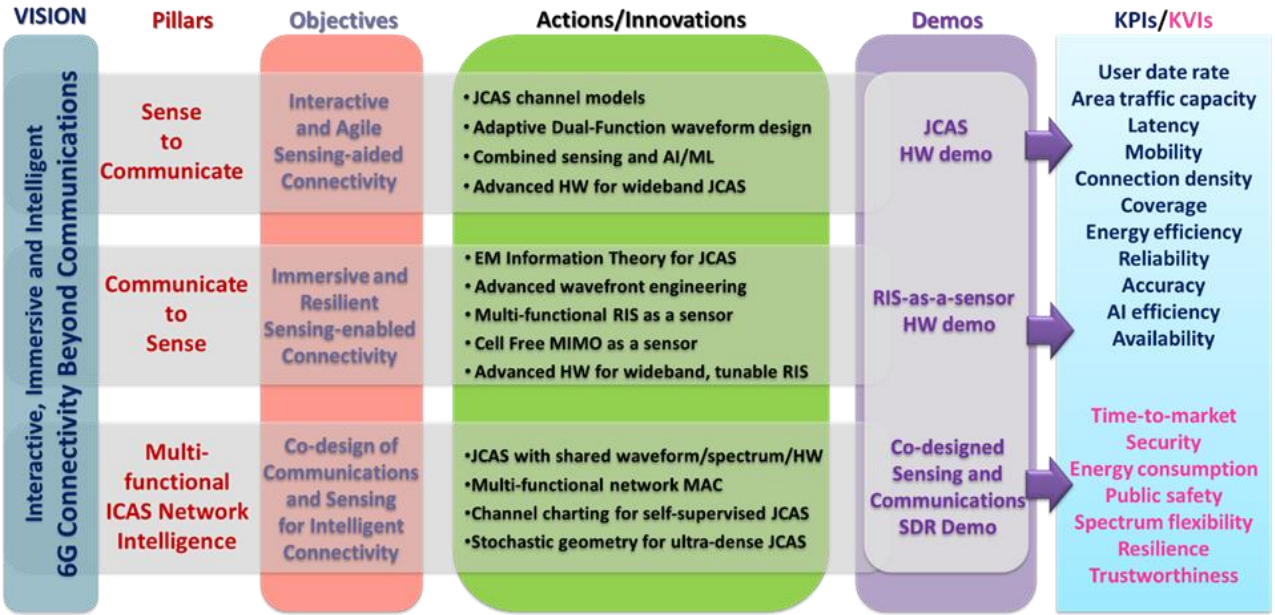
I3 (Interactive, Immersive and Intelligent)

Usage Scenario 1: I3 mobility
(Localization, tracking and traffic management for automotive/drones)

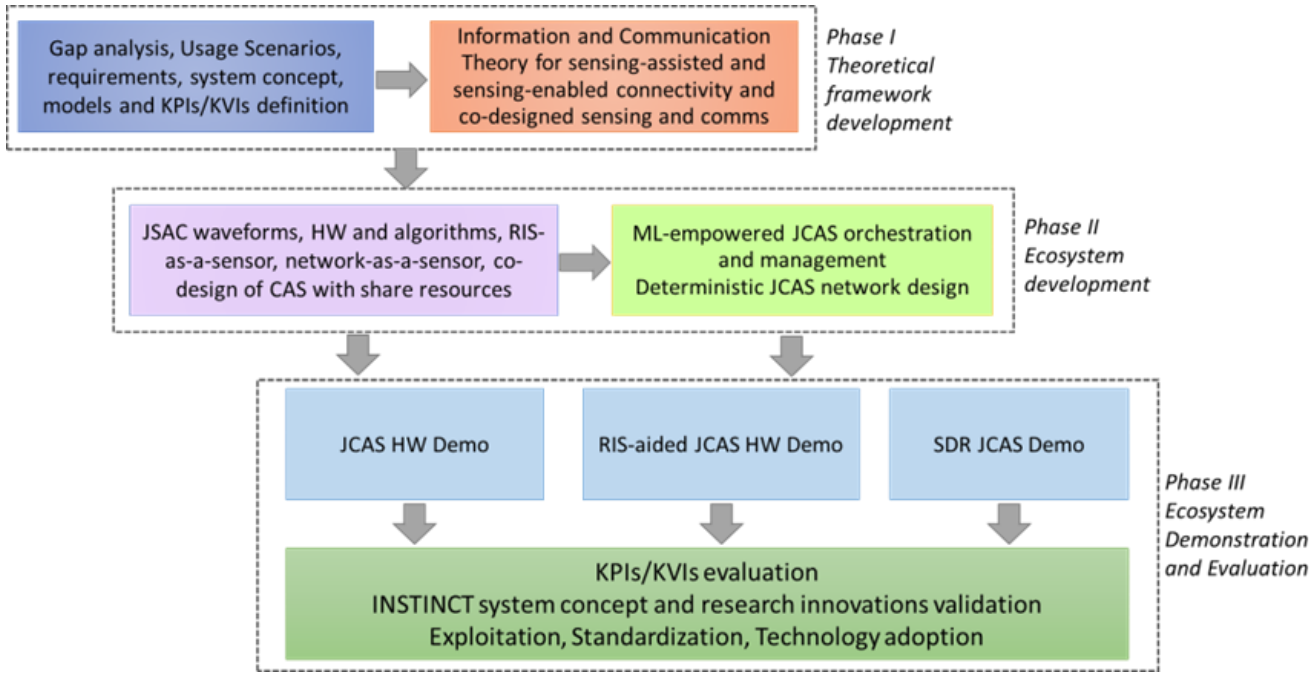
Usage Scenario 2: I3 environment monitoring
(localization/positioning/imaging/radio environment mapping/ surveillance)

Usage Scenario 3: I3 Internet of Senses
(augmented human sensing, well-being monitoring, user interfaces, gaming)

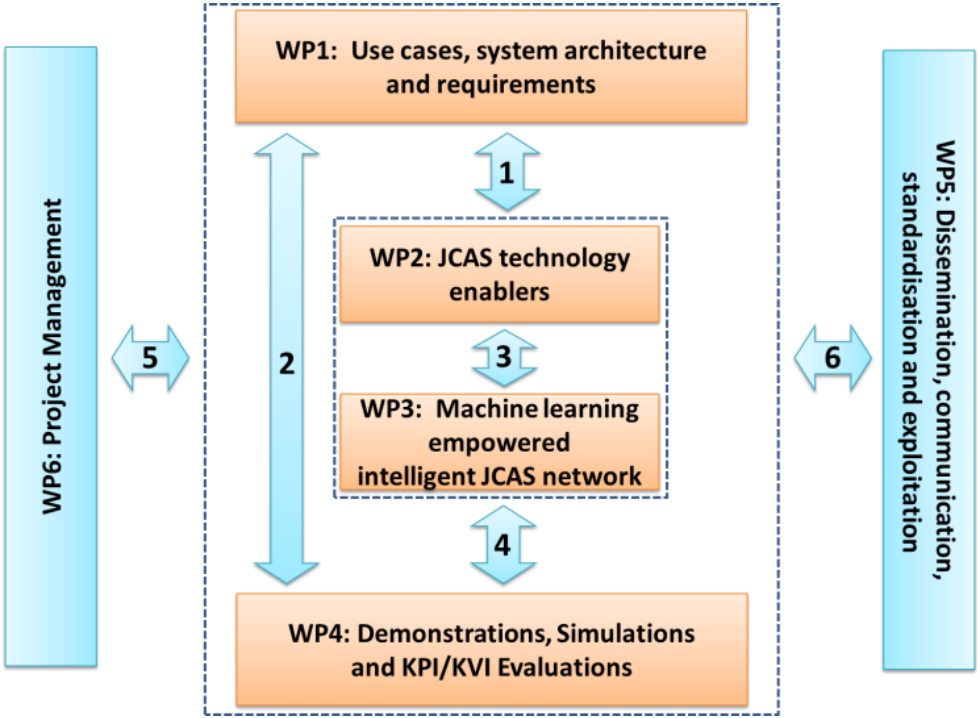
INSTINCT Pillars and Objectives



INSTINCT Methodology



INSTINCT WPs

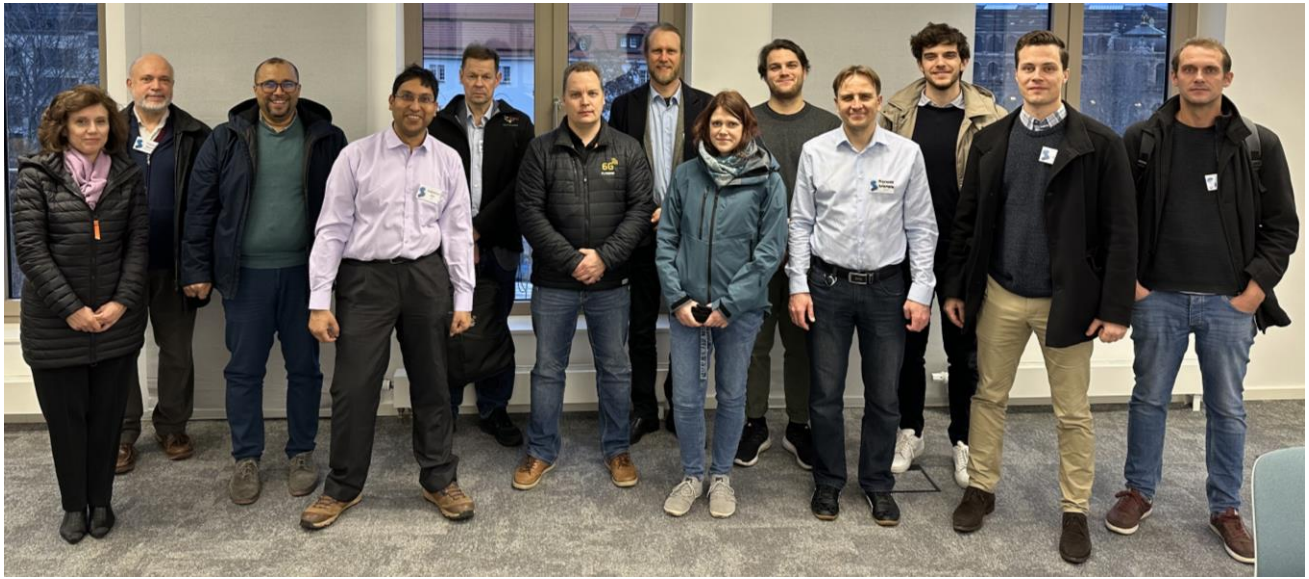


Engagements so far!

- SNS
  - Annual report contribution
- Others
  - EU collaborations
    - Hexa-XII joint workshop in October 2024
    - 6G-SENSES early discussions
  - Dissemination
    - WMC 2024
    - JC&S 2024 (Tutorial, Demo planned)
    - Smart Antenna Workshop (Demo planned)
    - .....

INSTINCT Kick-off

- Online kick-off on 9th January
- In-person kick-off 7th – 8th March in Dresden



INSTINCT

Joint Sensing and Communications for Future Interactive, Immersive, and Intelligent Connectivity Beyond Communications

LinkedIn

Email

Website

Acknowledgements

- Angeliki Alexiou (UPRC)
- Consortium Partners

6GSNS

Co-funded by the European Union