

# 6G-MUSICAL PROJECT OVERVIEW

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SNS webinar "Introducing the Call 2 SNS projects."

14-03-2024



# Outline

6G-MUSICAL

- 6G-MUSICAL Data and Consortium
- Motivation, Mission and Vision
- Project Objectives
- Conclusions





# 6G-MUSICAL - Data

- Call: HORIZON-JU-SNS-2023
- Type of Action: HORIZON-JU-RIA
- Number: 101139176
- Start Date: 01 Jan 2024
- Duration: 36 months

- Total Budget: €4.9M
- Total Effort: 435 PM
- Number of Partners: 11
  - 7 EU Beneficiaries
    - 7 Countries
  - 4 Associated Partners
    - 3 Countries



6G-MUSICAL

# 6G-MUSICAL - Consortium

Affiliates



- 11 Partners
- 2 affiliates from ERICSSON Limited

Instituto de Telecomunicações (IT)

ERICSSON Limited

SODIRA Connect

University College London

Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e. V.

eBOS Technologies Limited

OULUN Yliopisto

Interuniversitair Micro-electronica Centrum

Orange Romania SA

WASEDA University

Menhir Photonics AG





# 6G - MUSICAL Motivation / Vision I

## The Past

- Two Services over Radio Technologies
  - **Localization and Tracking:** Radar
    - Users: Big organisations
  - **Communication:** the xGs
    - Massified and democratised
    - **Internet Everywhere to the masses**





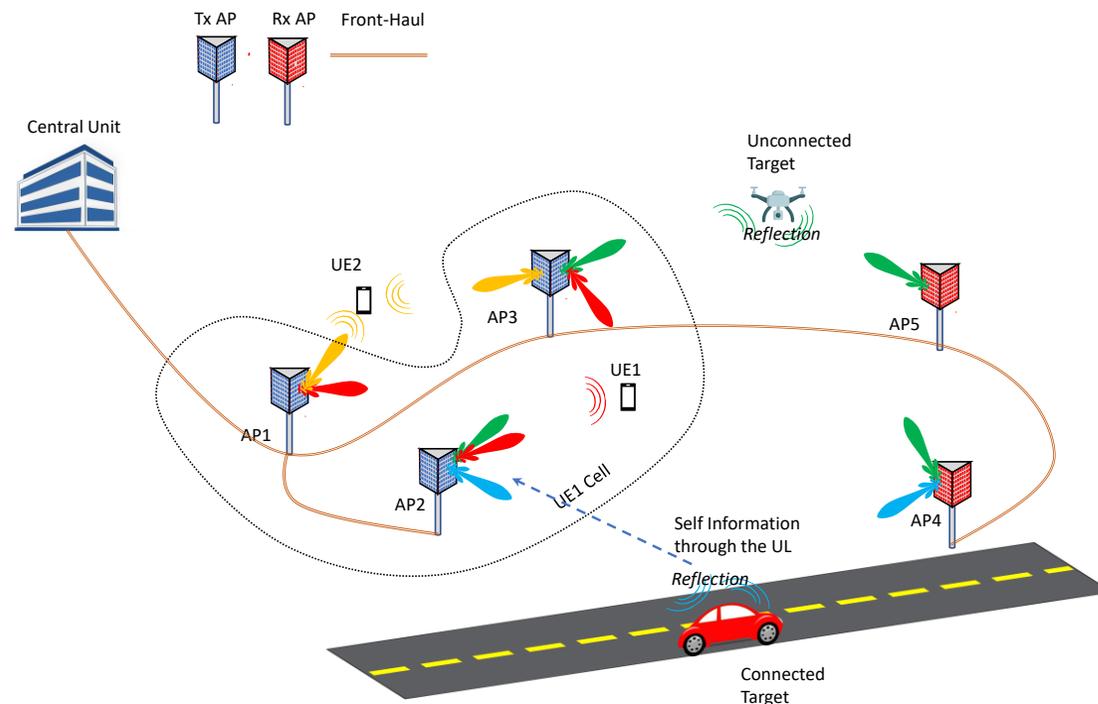
# 6G - MUSICAL Motivation / Vision II

## The Motivation: A future different from the past

### What the Future (6G) Demands?

- **Convergence of Services Over a Unified Network**
- **Radio- Sensing embedded in 6G**
- **What does it bring?**
  - Radio-sensing in a globally deployed network
    - **Sophisticated, localisation, tracking services**
      - Now accessible to the commons
    - Massification will spur innovation
    - High-resolution 3D imaging, object reconstruction

## The vision: Integrated Radio Sensing and Communications





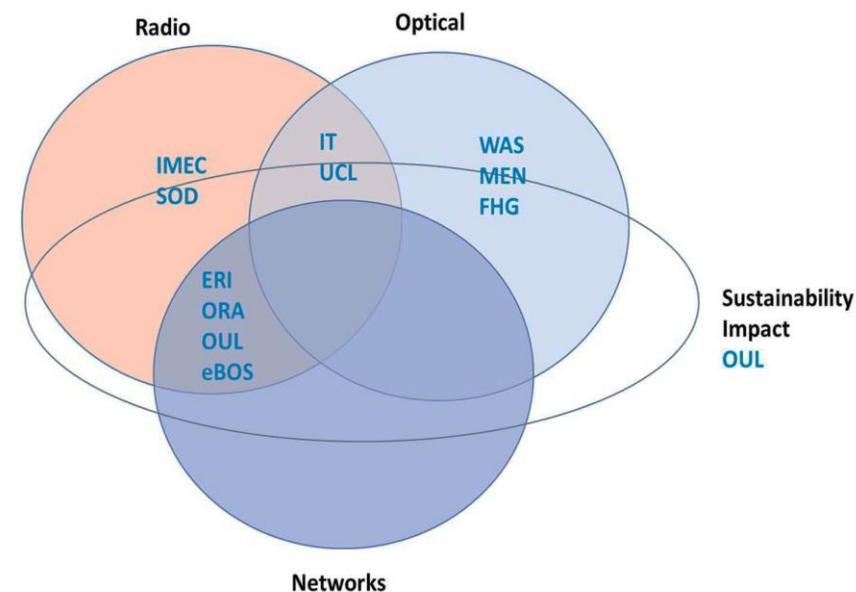
# 6G-MUSICAL – The Difference

## Where does 6G-MUSICAL stand out?

- **Tight integration**
  - Joint waveforms
  - Joint resource allocation
  - Massive levels of cooperation between edge nodes
- **Considers both connected and unconnected objects**
- **Accurate synchronisation among the edge nodes**
  - High accuracy in positioning or high resolution in 3D imaging
    - nodes perfectly synchronised



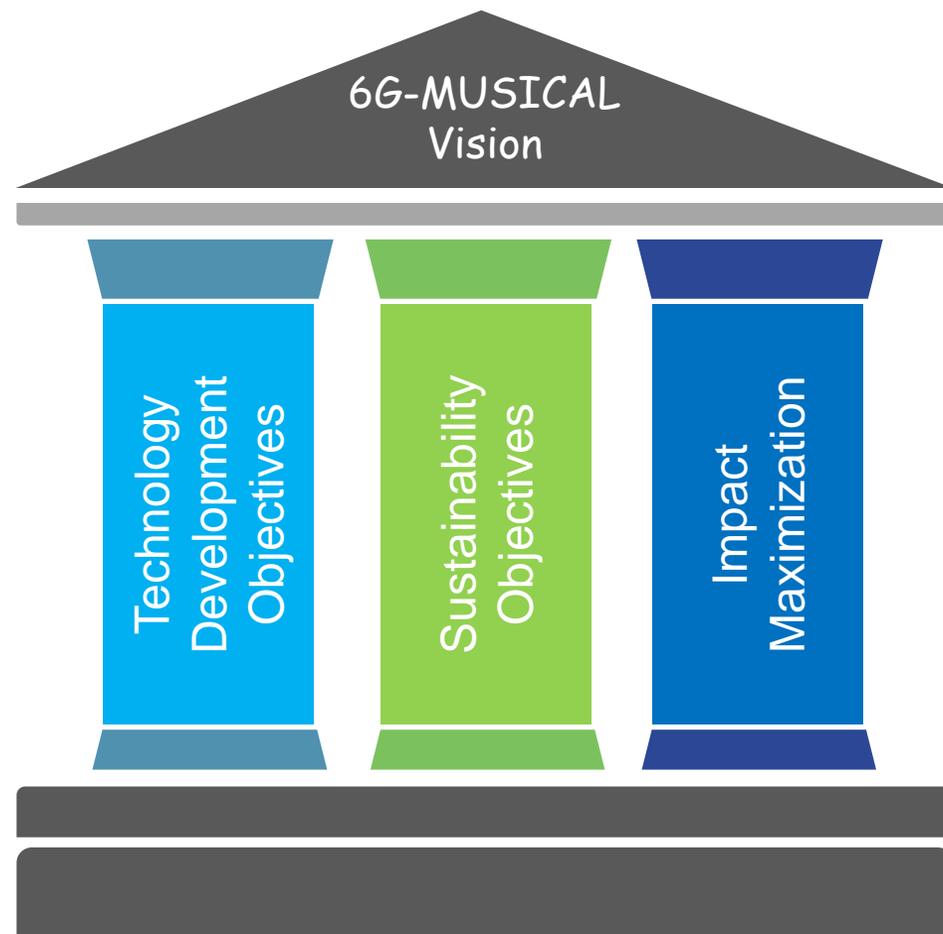
*Merging of optical and wireless technologies*





# 6G-MUSICAL - The Objectives I

- **Main objective - Vision**
  - Equip the edge infrastructure nodes of 6G with an integrated radar-based radio-sensing component that works in tandem with the communication component.
- **Three main pillars to achieve the vision**
  - Technology
  - Sustainability
  - Impact



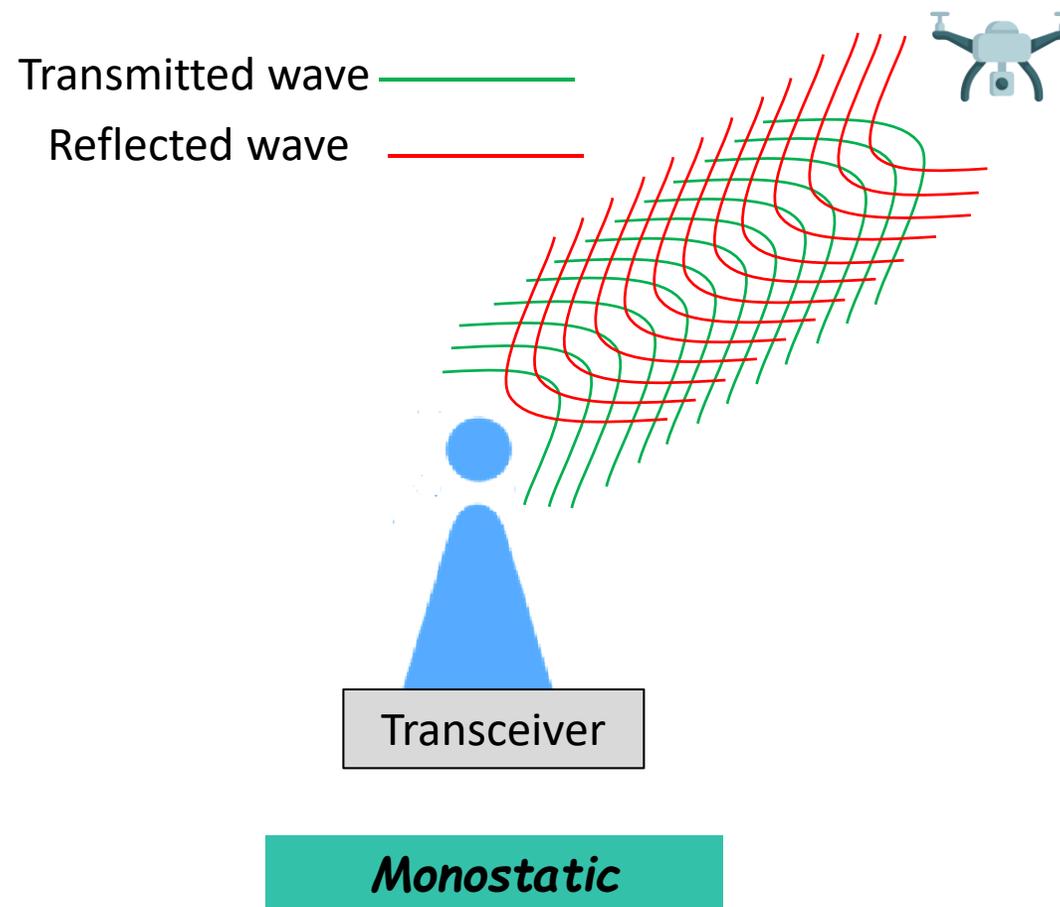


# 6G-MUSICAL - Preliminary Definitions I

- Concept and general architecture

- Analyzed concepts:

- **Monostatic** (conventional) radar
  - transmitted signal directed towards the target, and reflection of the signal from the target detected by the same antenna.
- Bistatic radar
- Multistatic radar



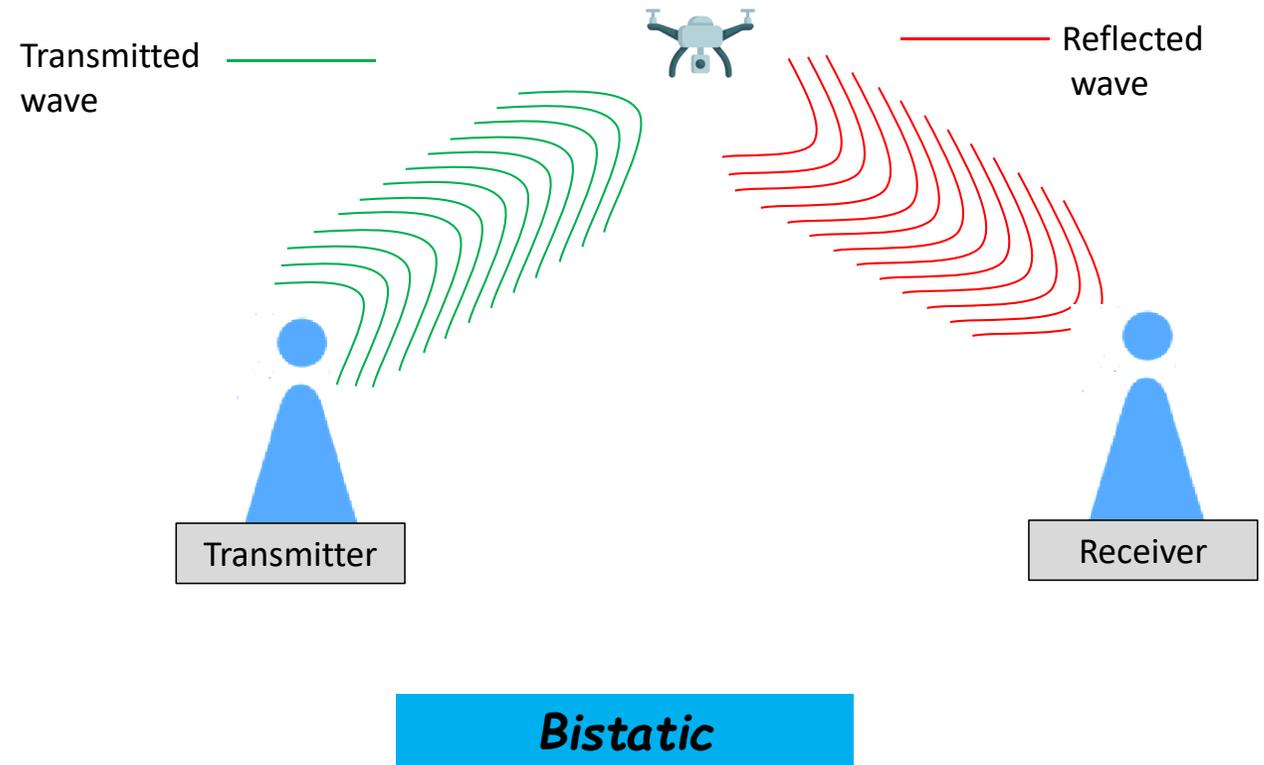


# 6G-MUSICAL - Preliminary Definitions II

- Concept and general architecture

- Analyzed concepts:

- Monostatic radar
    - **Bistatic** radar
      - Transmitter and receiver placed at separate locations
      - Transmitted signal reflected off the target and received at the receiver site
    - Multistatic radar



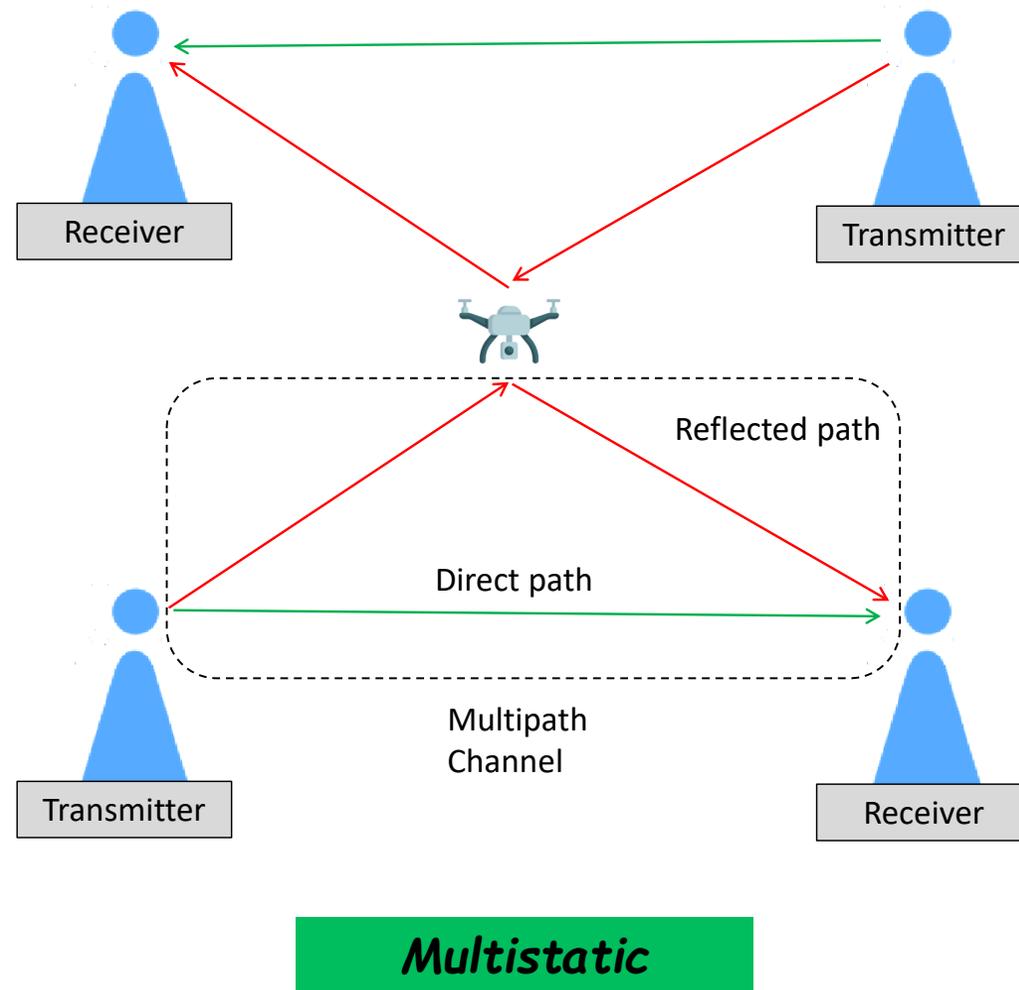


# 6G-MUSICAL - Preliminary Definitions III

- Concept and general architecture

- Analysed concepts:

- Monostatic radar
- Bistatic radar
- **Multistatic** radar
  - Generalization of bistatic





## *Five Specific Technology Objectives*

1. Definition of **physical and logical network architecture**;
2. **PHY waveforms** for communication and radio sensing;
3. **Cooperative MIMO multi-static sensing algorithms** for high accuracy and high resolution;
4. Low-noise and **highly-stable reference sources** for carrier and timing synchronisation;
5. Design of **dynamic resource allocation schemes** for optimisation of power and spectrum usage;

## *One wide objective*

- **Business Cases and Sustainability**
  - Define and validate the business cases and sustainability issues associated with integrated communication and sensing in 6G

## *Use Cases*

- **Sensing as a Service** provided by the edge infrastructure for:
  - 3D object reconstruction
  - Identification of faults in roads and other infrastructures
- Distribution of highly precise clocks



- **The Synchronization Challenge**

- *The accuracy and resolution of positioning, tracking, and object imaging cooperative algorithms, which utilise multiple nodes, ultimately depend on the phase and timing differences at these nodes*



- **Merging of optical and wireless technologies**

- Usage of **optical frequency comb technology**

- Able to support highly precise clocks.
- Act as precision optical synthesizers from which radio clocks are derived, keeping the original purity.

*The time is out of joint.  
Oh, cursed spite that I was  
ever born to set it right.  
Hamlet, Act 1, Scene 5*



# Conclusions

- 6G-MUSICAL has proposed an ambitious project targeting the integration of Communications and radio sensing.
- We are confident that we have the talent, competence, and ambition, and now that we have the resources, it is our task to make ideas a reality.

A banner image showing a city skyline with a prominent communication tower in the center. The sky is blue with white clouds. Overlaid on the image are green and blue lines and circles, suggesting a network or signal. The text is overlaid on the right side of the banner.

**6G-Multiband Wireless  
and Optical Signalling**  
for Integrated Communications,  
Sensing and Localisation

**Thank you**



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