RISE-6G

Reconfigurable Intelligent and Sustainable Environments for 6G wireless networks

VISION, GOALS & OBJECTIVES

- Fundamental research on RIS modelling and characterisation of the capacity limits of RIS-empowered smart radio environments.
- Design, prototype, and trial radical RIS technologies with dynamic reconfiguration from sub6GHz to subTHz frequencies.
- Beyond 5G low EMF emissions, increased localisation accuracy, boosted EE, and secrecy guarantees.
- Minimal connect-compute network redesign and configuration costs.

RECONFIGURABLE INTELLIGENT SURFACES

Artificial surfaces comprised of hundreds or thousands of simple and ultra-low power circuitry elements with reconfigurable properties.

Can be used flexibly to coat objects in the signal propagation environment, such as walls, mirrors, ceilings, or appliances.

Perform as anomalous reflectors of impinging radio waves or as analogue processors of multipath scattering.

Can play the role of a transmitter/receiver/sensor when equipped with relevant active radio-frequency elements.

Support a wide variety of functionalities such as beamforming, range and position estimation, radio-frequency mapping and sensing, as well as obstacles and activity detection.

Particularly suitable for limiting EMF exposure, controlling wave propagation and channel geometry, reducing the transmission power at existing base stations and access points.

WIRELESS ENVIRONMENT AS A SERVICE

The design and implementation of intelligent and sustainable environments will empower future wireless networks with capabilities that exceed those of current RIS solutions, and will thus lead to research and innovation breakthroughs.

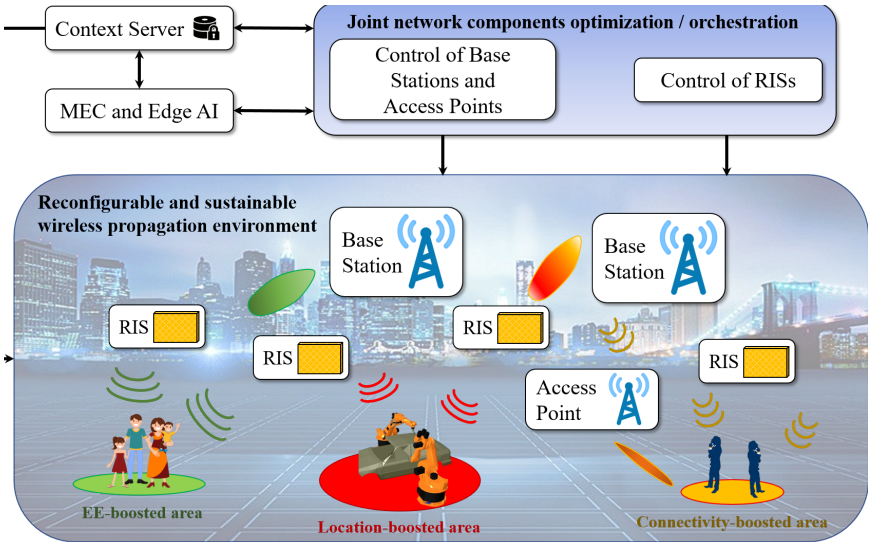
RISE-6G envisions the wireless environment as a service, a novel concept which offers dynamic wave propagation control in wireless communications. This connectivity paradigm is comprised of negligible-power consuming RISs and conventional network nodes. The mode of operation is aimed at jointly optimizing the radio wave propagation environment with the existing network infrastructure to realize highly concentrated (i.e., selective in time and space) service provisioning to intended end users, while removing energy from regions where accidental or unintended users are present .

/RISE-6G

https://rise-6g.eu/

HORIZON 2020

THE PROJECT AT A GLANCE



BENEFITS

- Enhanced Connectivity
- High Energy Efficiency
- Low EMF Exposure
- Improved Secrecy Rates
- Spatiotemporal Focusing
- Boosted Localisation

DISSEMINATION OUTPUT UP TO NOW

Over 100 Publications

Submitted, accepted, or published at top journals and conferences

Over 50 Dissemination Actions

Workshops, Special Sessions, Invited Talks, Tutorials, and more

Participation in Industry Standards

3GPP, ETSI RIS, ETSI MEC, O-RAN Alliance

BUDGET

€ 6.5 Million

100% EU-funded

DURATION

36 Months

01/01/2021 - 31/12/2023

TECHNICAL APPROACH

Work Package 2 - Definition of relevant use-cases scenarios and KPIs. Design of RIS-empowered network architectures, deployment strategies.

Work Package 3 - Modelling of RIS unit elements and RIS-empowered signal propagation. RIS hardware design, prototyping, and characterisation. Sounding of RIS-empowered wireless channels.

Work Package 4 - Design of network architectures, control signaling protocols, and algorithms for enhanced connectivity with RISs. Fundamental limits and multi-user multi-RIS communications. Design of AI-enabled joint communication and (edge) computing services.

Work Package 5 - Design of RIS-empowered network architectures, control strategies, and algorithms for localisation. Design of algorithms for RIS-enabled/RIS-boosted (active or passive) sensing and radio mapping.

Work Package 6 - Design of architectures for RIS-empowered networks targeting EE/low-EMF/secrecy-boosted areas. Design and performance assessment of RIS optimisation algorithms for performance-boosted areas.

Work Package 7 - Validation of RIS functional components and integration. Two field trials: (a) Demonstration of RIS-enabled extreme coverage enhancement at the SNCF train station in Rennes, France. (b) Demonstration of RIS-enabled accurate indoor localisation at Stellantis Centro Ricerche FIAT (CRF) in Turin, Italy.

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