MISSIONE 4
ISTRUZIONE RICERCA

“RESEARCH AND INNOVATION ON FUTURE TELECOMMUNICATIONS SYSTEMS AND NETWORKS, TO MAKE ITALY MORE SMART”

TELECOMMUNICATIONS OF THE FUTURE

Finanziato dall'Unione europea NextGenerationEU
Ministero dell'Università e della Ricerca
Italiadomani PIANO NAZIONALE DI RIPRESA E RESILIENZA

Tematica

14. Telecommunications of the future

Obiettivi *(Sez A dell'Annex 1)*

Spokes	Goals
1 - Pervasive and Photonic Network Technologies and Infrastructures	a) Delivering innovative solutions for pervasive networking, addressing primarily the "edge and beyond-edge" segments of the Internet. b) Delivering radically new technologies and paradigms for ultra-fast optical transport in the metro-core network. c) Developing of programmable, green, and ultra-fast interconnections between sites supported by optical transport d) Design and fabrication of novel components and photonic integrated circuits for the optical networks domain
2 - Integration of Networks and Services	a) Design a 3D multi-layered communication architecture for integrated T/NT networks, supporting novel 6G-oriented use cases with specific QoS and energy requirements, b) Conceive and evaluate novel transmission techniques and advanced network and service orchestration frameworks for integrated T/NT networks, c) Study how emerging societal goals (inclusiveness, sustainability, trustworthiness) and regulation policies can be transformed into technological solutions for future telecommunication networks, d) Define the architecture principles, components, APIs, and tools that are needed to build advanced beyond-5G test platforms and validation instruments.
3 - Wireless Networks and Technologies	a) Redesign a new concept of network architecture that is specialized for smart radio environments. b) Develop new radio architectures that comply with the challenging constraints dictated by the high-frequency spectrum. c) Develop a new generation of high-frequency technology components (mixers, detectors, RF chips for highly integrated systems, radiating elements and arrays) d) Development of new and unconventional solutions for antenna array synthesis
4 - Programmable Networks for Future Services and Media	a) Deliver of a revolutionary, modular and scalable, software edge-device platform ensuring fulfillment of service level agreements, as well as authenticity and trustworthiness of service and multimedia content b) Definition of breakthrough techniques for accelerated, fully-automated and flexible mobile networks and services c) Design of radically new algorithmic solutions for the support and management of hyper-distributed, intelligent services and media delivery d) Creation of novel, semantically meaningful data representations for bandwidth and energy savings, enabling data-driven, sustainable support of user quality-of-experience
5 - Industrial and Digital Transition Networks	a) Identify new Industrial applications and use cases enabled by future wireless networks. b) Develop innovative methodologies for network planning and management of THz communications for the IIoT c) Design AI-based network architectures and systems for Industrial applications. d) Boost the National economic growth through the development of competence in the field of Industrial Networks and the digital transformation of manufacturing.
6 - Innovative Architectures and Extreme Environments	a) Design and development of new telecommunication architectures leveraging disruptive paradigms, such as Digital Twins and serverless computing. b) Devising architectural components and interfaces that enable added-value services that go beyond the administrative boundary of the network operators, supporting inter-domain cloud continuum services and targeting KVIs (e.g., security and sustainability) besides KPIs c) Definition of new channel/system models able to capture the characteristics of unconventional transmission media and the critical requirements of extreme environments. d) Design and development of full-stack architectures, algorithms, and technologies fitting extreme environments in terms of such KVI requirements as robustness, reliability, heterogeneity, and energy-efficiency.
7 - Green and Smart Environments	a) Reconfigure the Environment to direct the signals only toward the interested users, then improving quality of services along with reducing the EM exposure (Green). b) Introduce flexibility in the Environment so that lifespan of the radiating equipment is increased (Circular Economy). c) Integrate Sensing and Communication for reducing EM exposure, optimizing resources and saving energy. d) Develop foundations and concrete technological enablers for integrated sensing and communications toward an unprecedented wireless technology.
8 - Intelligent and Autonomous Systems	a) Merge AI and communication technologies to enable intelligent services operating at the edge of the network. b) Use IoT for monitoring and optimizing critical infrastructures. c) Predictive analysis, optimal dimensioning and real-time monitoring and adaptation of resource utilization of Cloud-Native Network Functions in "5G and beyond" networks. d) An advanced edge-computing architecture distributed on several geographically-distant sites, each site with an integrated edge-computing networking infrastructure (for in-network storage and processing services)

Partner

N TOTALE SOGGETTI: 25

Proponente: Università degli Studi di Roma "Tor Vergata"

Partecipanti:

SOGGETTI PUBBLICI

Università

- Università degli Studi di Roma Tor Vergata
- Alma Mater Studiorum Università di Bologna
- Politecnico di Bari
- Politecnico di Milano
- Politecnico di Torino
- Scuola Superiore Sant'Anna di Pisa
- Sapienza Università di Roma
- Università degli Studi Mediterranea di Reggio Calabria
- Università di Catania
- Università di Firenze
- Università di Napoli Federico II
- Università di Padova

Organismi di Ricerca

- Consiglio Nazionale delle Ricerche

SOGGETTI PRIVATI:

Organismi di Ricerca

- Consorzio Nazionale Interuniversitario per le Telecomunicazioni
- Fondazione Ugo Bordoni

Imprese

- Athonet s.r.l.
- Ericsson Telecomunicazioni S.p.A.
- Italtel S.p.A.
- Leonardo S.p.A.
- Open Fiber S.p.A.
- Prysmian S.p.A.
- TIESSE S.p.A.
- TIM Italia S.p.A.

- Vodafone Italia S.p.A.
- WIND Tre S.P.A.

Gli Spoke

Spoke n. 1 – Pervasive and Photonic Network Technologies and Infrastructures

Leader spoke: Consiglio Nazionale delle Ricerche

Affiliati allo spoke - Principal Investigators:

- Politecnico di Milano
- Scuola Superiore Sant'Anna di Pisa
- Sapienza Università di Roma
- Università di Napoli Federico II
- Ericsson Telecomunicazioni S.p.A.
- Open Fiber S.p.A.

Spoke n. 2 – Integration of Networks and Services

Leader spoke: Politecnico di Bari

Affiliati allo spoke - Principal Investigators:

- Università degli Studi di Roma Tor Vergata
- Università di Catania
- WIND Tre S.P.A.

Spoke n. 3 – Wireless Networks and Technologies

Leader spoke: Politecnico di Milano

Affiliati allo spoke - Principal Investigators:

- Politecnico di Torino
- Consiglio Nazionale delle Ricerche
- Vodafone Italia S.p.A.

Spoke n. 4 – Programmable Networks for Future Services adn Media

Leader spoke: Politecnico di Torino

Affiliati allo spoke - Principal Investigators:

- Politecnico di Milano
- Italtel S.p.A.

Spoke n. 5 – Industrial and Digital Transition Networks

Leader spoke: Alma Mater Studiorum Università di Bologna

Affiliati allo spoke - Principal Investigators:

- Alma Mater Studiorum Università di Bologna
- Università degli Studi Mediterranea di Reggio Calabria
- Ericsson Telecomunicazioni S.p.A.
- TIM Italia S.p.A.
- WIND Tre S.P.A.

Spoke n. 6 – Innovative Architectures and Extreme Environments

Leader spoke: Università di Catania

Affiliati allo spoke - Principal Investigators:

- Università degli Studi Mediterranea di Reggio Calabria
- Università di Catania
- Università di Padova
- Prysmian S.p.A.

Spoke n. 7 – Green and Smart Environments

Leader spoke: Università di Napoli Federico II

Affiliati allo spoke - Principal Investigators:

- Leonardo S.p.A.

Spoke n. 8 – Intelligent and Autonomous Systems

Leader spoke: Università degli Studi di Roma "Tor Vergata"

Affiliati allo spoke - Principal Investigators:

- Politecnico di Milano
- Sapienza Università di Roma
- Università di Napoli Federico II
- Open Fiber S.p.A.

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