6GSNS

Smart Networks & Services
Joint Undertaking

SNS JU Top-10 Key Achievements

Showcasing Major Milestones and Transformative
Innovations from Funded Projects

January 2026

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Forewords

Thibaut Kleiner

Chair of the SNS JU Governing Board, Director for Future Networks at the European Commission (DG CONNECT)

"In case there was any doubt, the repository from the Smart Networks and Services Joint Undertaking demonstrates the depth and quality of EU research and innovation in the field of 6G connectivity. This initiative underscores the crucial role of the SNS JU in pioneering cutting-edge advanced connectivity solutions and ensuring Europe's leading position in this domain."

Colin Willcock

Vice-Chair of the SNS JU Governing Board, Vice-Chair of the ETSI Board, and Head of Radio Network Standardisation at Nokia Networks

"These outstanding results show the impact of the Smart Networks and Services Joint Undertaking in creating the future 6G world. It demonstrates the hard work and excellence of the many research projects and validates the extensive and early public funding to make this possible."

Erzsébet Fitori

SNS JU Executive Director

"Key Achievements are a great tool to illustrate what European research and innovation projects, funded by the SNS JU programme, accomplish and deliver. These new technology solutions are examples of the real life impact EU funded research can make in areas like sustainable future networks or advanced industrial applications, while also identifying areas for further exploration."

Executive Summary

Europe's ambition to lead the next era of connectivity is embodied in the **Smart Networks and Services Joint Undertaking (SNS JU)**, a flagship public-private partnership guiding the continent's **strategic journey toward 6G**.

By mobilising a broad ecosystem of industry leaders and research institutions, the SNS JU is shaping a forward-looking research and innovation agenda that reinforces Europe's technological sovereignty and accelerates readiness for next-generation networks.

With several funding calls already launched and resulting in **79 projects** and **more than 500 unique beneficiaries**, the SNS JU has reinforced Europe's capacity to demonstrate how research efforts translate into concrete technological developments.

This publication presents the **SNS JU Top-10 Key Achievements** from projects funded under SNS JU's Calls 1 and 2, highlighting the challenges addressed, the solutions developed, and the opportunities they create for Europe's industrial and technological landscape.

The results emerging from the first waves of projects show that Europe has not only a dynamic and ambitious research agenda, but also a growing set of tangible outcomes that strengthen its competitive position.

In recent months, the SNS JU, the SNS JU Technical Board and the 6G Smart Networks and Services Industry Association (6G-IA) have identified the most significant achievements from the projects funded under the first two SNS JU calls. These results illustrate the potential impact of the developed technologies across the telecom sector and a wide range of industries.

SNS JU Key Achievements: Overview & Online Repository

188
Key Achievements

63
Projects

CATEGORY 1
Significant Technology Developments

CATEGORY 2
Experimentation

CATEGORY 3
Vertical Solutions & Trials

CATEGORY 4
Impactful Standards Contributions

CATEGORY 5
Sustainability Solutions

The Smart Networks and Services Joint Undertaking (SNS JU) has identified **188 Key Achievements** for 2025 across its funded projects of the first 2 calls (**63 projects in total**), representing Europe's most significant advancements in 5G and 6G research and innovation. These achievements span the full spectrum of technological development, encompassing hardware and network architectures, software platforms, industrial applications, and solutions that advance sustainability and societal benefits. Together, they illustrate the tangible outcomes of SNS JU-supported research and Europe's growing capabilities in next-generation networks.

To showcase these results, the SNS JU launched the **SNS Key Achievements Repository**. The platform organises all 188 achievements into five well-defined categories, each representing a distinct dimension:
- **Significant Technology Developments** (Category 1)
- **Experimentation** (Infrastructure / Tools / Performance Evaluation – Category 2)
- **Vertical Solutions & Trials** (Business solutions / Market Impact – Category 3)
- **Impactful Standards Contributions** (Category 4)
- **Sustainability Solutions** (Category 5)

The SNS JU Key Achievements 2025 Repository offers a structured and transparent view of how SNS-funded research is translated into deployable technologies, validated infrastructures, industrial applications, standardisation contributions and sustainable innovations. It provides stakeholders, from policymakers and industry leaders to researchers and investors, with a comprehensive, navigable resource to **understand the state of 5G/6G progress in Europe** and identify the outputs that may shape the future of connectivity, industry, and societal infrastructures.

The SNS JU Key Achievements 2025 Repository also highlights the **Top-10 Key Achievements for 2025.** This curated selection celebrates the most impactful innovations in terms of technological advancement and potential to deliver industrial and societal benefits. This online tool is available on the SNS JU website to explore each achievement in detail.

By filtering results per category, sub-category or keyword, visitors can learn more about the innovative technologies and solutions and uncover further reference points for additional information.

By featuring these top achievements, the repository offers stakeholders a focused view of Europe's leading-edge developments in 5G and 6G technologies, illustrating the tangible outcomes of SNS JU-funded research and the continent's growing leadership in next-generation connectivity.

Explore the SNS JU Key Achievements Repository

SNS JU Top-10 Key Achievements

The SNS JU Top-10 Key Achievements for 2025 showcase the most significant and tangible outcomes from SNS JU-funded projects. Each submission has been thoroughly reviewed based on clear criteria by an **Evaluation Committee,** comprising experts from the SNS JU community, the SNS JU Office, and the European Commission.

The criteria for selection included: added value for beyond-5G (B5G) and 6G technologies, impact of each key achievement in their respective sector, maturity level of the achievement, use of novel technologies, innovation and market prospects.

The purpose of this selection was to:
- **Track the most significant outcomes of SNS JU projects**
- **Provide an overview of the technological and experimental contributions**
- **Highlight the impact of the SNS JU work**
- **Celebrate the excellence in EU research and innovation**

These achievements highlight Europe's excellence in research and innovation, demonstrating the impact, maturity, and technological relevance of SNS JU work across the five achievement categories. This selection provides a focused view of the innovations that have made the greatest contribution to next-generation networks, serving both as a benchmark of progress and as inspiration for further advancements.

CATEGORY 1 **Significant Technology Developments**	CATEGORY 2 **Experimentation**	CATEGORY 3 **Vertical Solutions & Trials**	CATEGORY 4 **Impactful Standards Contributions**	CATEGORY 5 **Sustainability Solutions**
Time Modulated Arrays supporting both Receive and Transmit	**The 6G-SANDBOX Experimentation Infrastructure as a Service (ElaaS) Toolkit**	**Advanced XR capabilities over B5G during live events @26 GHz**	**In-X architecture integration into 6G networks (3GPP) Standards**	**Sustainable 6G Use Case Families & 6G Connectivity for Zero Energy Devices**
High-Capacity Point-to-Multipoint (P2MP) Transmission to Enable Next-Generation B5G/6G Mobile Transport	**Multiple Holographic communications integrated into 6G-XR testbed**	**Real-World Validation of (B)5G Capabilities for Port Operations**		
Reconfigurable Multi-mode IoT System With Scalable electronic components for future sustainable IoT sensor nodes	**6G Federated Portal for Experimentation**			

SNS JU Top-10 Key Achievements

While a vast body of excellent work is being carried out across SNS JU projects, this Top-10 selection represents a fraction of that effort. It captures the most tangible achievements as of 2025 and lays the foundation for further research, experimentation, and innovation in Europe's 5G and 6G ecosystem.

The three main **technology developments** selected include:
1) Time Modulated Arrays that support smarter, energy-efficient hardware combining communication and sensing, ideal for autonomous systems and AI-driven networks.
2) High-Capacity P2MP Transmission introducing a cost-effective optical network design to enhance Europe's 6G transport sustainability and scalability, and
3) reconfigurable Multi-Mode IoT System offers battery-free IoT devices powered by light and radio energy, enabling sustainable connectivity across sectors like smart cities and healthcare.

For **experimentation**, the three key advancements include:
1) the ElaaS Toolkit, an open platform enabling remote testing of 6G innovations, accelerating collaboration in Europe,
2) Multiple Holographic Communications in the 6G-XR Testbed, marking the first holographic calls over a 6G network, unlocking new XR services, and
3) a 6G Federated Portal, connecting 14 European testbeds, simplifying experimentation and fostering innovation.

The two key **Vertical solutions** feature:
1) real-world trials of 5G capabilities in port operations, enhancing safety and efficiency through real-time monitoring and AI, and
2) advanced XR capabilities during live events showcase high-speed, low-latency 5G, enriching fan experiences and safety.

The most impactful contribution to **standards** refers to In-X Architecture integrating small, autonomous subnetworks in vehicles, factories, and classrooms, contributing to 3GPP standards for improved industrial applications.

Finally, the **sustainable solution** selected highlights sustainable 6G Use-Case Families and zero-energy devices, defining sustainability principles and opening commercial opportunities across sectors leveraging greener 6G technologies.

6G-REFERENCE

CALL 2

Time Modulated Arrays Supporting both Receive and Transmit

The time-modulated MIMO array (TMA) enables 6G use cases such as distributed MIMOs, where one fixed distributed unit can use TMA to simultaneously communicate with multiple radio units with low-latency, which further connect with multiple mobile devices or sensors in advanced manufacturing. Another application is to use TMA for MIMO radars to rapidly sense the surroundings for situation awareness and track multiple targets. On technology impacts, the time-modulated MIMO array opens the door to time-varying MIMOs that combine wireless electronics with signal processing and Artificial Intelligence (AI) assisted optimization.

Chip-2 Measurements in A Non-Line-of-Sight (NLOS) Channel
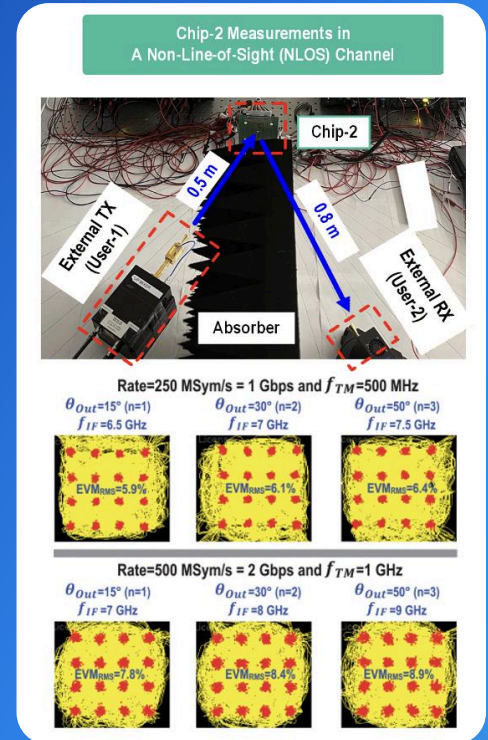
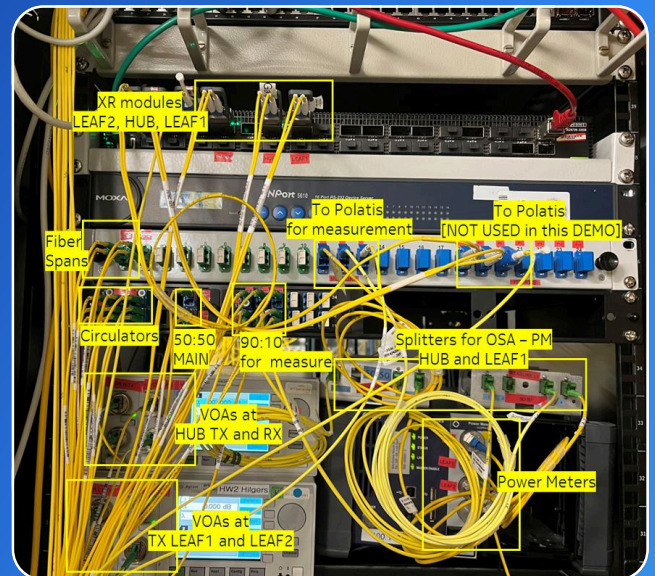| Technological Area	6G hardware / micro-electronics enabling Integrated Communication and Sensing (ISAC/JCAS)
Key Innovation	Time-modulated MIMO arrays dynamically control antenna elements to support multiple users simultaneously with far lower power, cost, and complexity
Problem Solved	Overcomes scalability and energy-efficiency limits of current 6G hardware while maintaining high performance
Opportunities Created	• Smart manufacturing, autonomous systems, and situational awareness in complex environments • AI-driven adaptive networks with reconfigurable, energy-efficient hardware • Cross-disciplinary innovation and training in hardware, signal processing, and AI
Market Potential	Foundational enabler for large-scale 6G networks, industrial IoT, and intelligent sensing boosting Europe's leadership in advanced wireless technology

SEASON

CALL 1

High-Capacity Point-to-Multipoint (P2MP) Transmission to Enable Next-Generation B5G/6G Mobile Transport

The solution advances next-generation mobile transport by deploying high-speed point-to-multipoint (P2MP) coherent transceivers equipped with DSCM1,2,3. It delivers flexible network management, mitigates both distributed and discrete reflections, reduces capital expenditure (CAPEX), and enables cost-efficient bidirectional transmission over a single fibre, laser, or wavelength.

Technological Area	Mobile–Optical Convergence for next-gen B5G/6G transport
Key Innovation	High-speed point-to-multipoint (P2MP) coherent transceivers with power-based optimization to mitigate reflections enabling single-fibre/single-laser BiDi at 200–400 Gb/s.
Problem Solved	• Cuts network cost and complexity by removing fibre pairs & extra components • Handles AI/edge data growth with higher capacity and efficiency • Improves resilience and sustainability via simplified design & faster recover
Opportunities Created	• Flexible, scalable point-to-multipoint (P2MP) architecture for adaptive 6G transport • Wider coverage & better economics for mobile operators • Builds EU leadership in sustainable optical networking
Market Potential	• Proven >40% CAPEX savings, strong OPEX reduction • Scales to 400 Gb/s+ links for operators & data centres

SUPERIOT

CALL 1

Reconfigurable Multi-Mode IoT System with Scalable Electronic Components for Future Sustainable IoT Sensor Nodes

The solution introduces a novel and holistic approach to sustainable IoT for the 6G era, combining light and radio technologies with environmentally friendly materials and energy autonomous design to enable scalable, adaptable, and environmentally responsible IoT operation including communication, sensing, processing, and positioning.
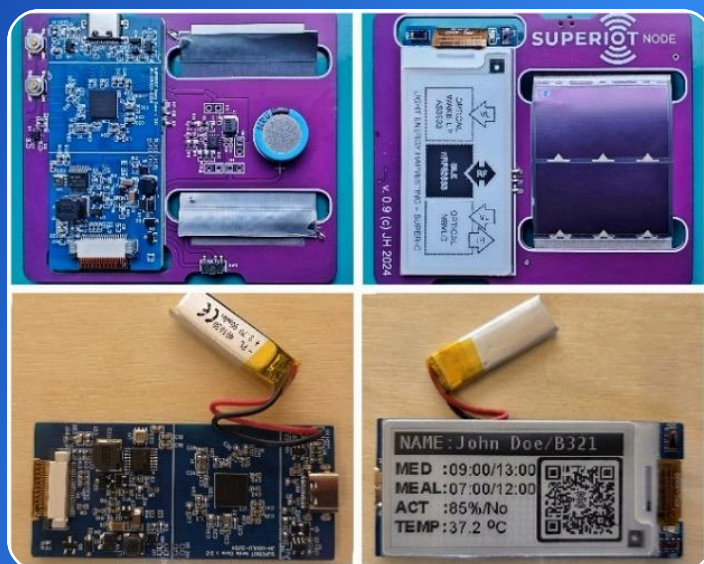
Two experimental IoT devices developed in SUPERIOT

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Technological Area	• Sustainable Internet of Things (IoT) for the 6G era, Integration of light & radio technologies, energy harvesting, and printed electronics
Key Innovation	• Battery-free, energy-autonomous IoT devices that switch seamlessly between optical and radio links • Built using printed, eco-friendly electronics (solar cells, transistors, antennas) for fully recyclable and low-impact operation
Problem Solved	• Eliminates battery dependency and e-waste • Enables self-powered, flexible, and adaptive IoT across diverse environments (industry, healthcare, logistics) • Combines communication, sensing, and positioning in a single sustainable platform
Opportunities Created	• Paves the way for scalable, eco-conscious IoT deployments in smart cities, agriculture, and environmental monitoring • Supports EU sustainability and digital sovereignty goals • Drives convergence of microelectronics, photonics, and green ICT
Market Potential	• Prototype proven; next step: fully printed, sticker-like IoT devices • Potential for mass-market, low-cost IoT adoption with minimal environmental footprint

6G-SANDBOX

CALL 1

The 6G-SANDBOX Experimentation Infrastructure as a Service (ElaaS) Toolkit

The 6G-SANDBOX ElaaS Toolkit accelerates telecommunications innovation by providing a flexible, on-demand environment for testing new ideas, dramatically reducing the time and effort required to move from concept to trial. It allows to validate services on realistic networks without building dedicated infrastructure, democratizing access to advanced experimentation previously limited to large telecom players or well-funded labs. By enabling wide participation, collaborative testing, and rapid validation of next-generation network technologies, the toolkit fosters an open innovation ecosystem.
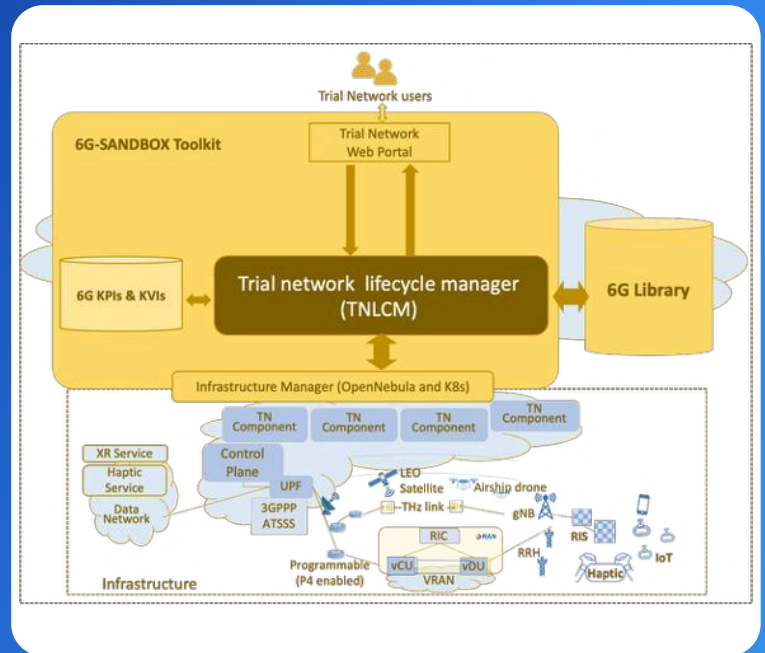
6G-SANDBOX Architecture

Technological Area	Open and disaggregated 5G/6G networks, digital twins, deterministic TSN, and virtualized test environments.
Key Innovation	• An open, modular software platform that enables "Trial Networks on demand", combining real and virtual components • Trial Network Lifecycle Manager (TNLCM) automates setup, monitoring, and resource sharing — no telecom expertise required
Problem Solved	• Removes barriers to testing new 6G concepts — no need for expensive labs or complex setup • Accelerates innovation cycles from concept to trial • Allows parallel, remote experiments on shared infrastructure
Opportunities Created	• Democratizes access to advanced network experimentation for startups, academia, and SMEs • Builds an open, collaborative EU innovation ecosystem • Supports faster validation of future services including satellite and Open RAN technologies
Market Potential	• Enables low-cost global experimentation and cross-border research • Key enabler for rapid 6G development and commercialization in Europe

6G-XR

CALL 1

Multiple Holographic Communications Integrated into 6G-XR Testbed

The 6G-XR project developed two real-time holographic pipelines. AR via IMS delivers 3D holograms directly to smartphone dialers, achieving the world's first network-native holographic call. VR via OTT uses edge nodes and cloud-native functions to process VR scenes and 3D holograms, ensuring scalability and reducing end-device processing, demonstrating accessible next-generation holographic communication.

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Technological Area	6G networks, extended reality (XR), cloud-native & edge computing, holographic communications.
Key Innovation	• First demonstration of network-native holographic calls delivered over standard 6G infrastructure. • Use of dual pipelines: AR via IMS (direct to smartphone) and VR via OTT with edge/cloud processing for scalability
Problem Solved	• Enables real-time holographic calls without additional apps. • Supports scalable multiuser XR experiences, reducing device processing needs. • Demonstrates 6G network-native delivery of immersive communication
Opportunities Created	• New digital services and business models for telecoms, AR/VR devices, and cloud providers. • Improved accessibility and inclusion in XR experiences
Market Potential	• Mass-market deployment of holographic communications once 6G is standardized. • Growth opportunities in consumer, professional, and industrial XR applications.

6G-SUNRISE

CALL 2

6G Federation Solution for Experimentation and Vertical Deployment

SUNRISE-6G streamlines 6G experimentation across 14 federated testbeds with a single platform. Its web-based tenant portal simplifies experiment setup, management, and data visualization, while the Open Operator Platform, the first open-source GSMA OPG implementation, enables platform-agnostic deployment of vertical applications and provides simplified CAMARA APIs to access 3GPP network capabilities.
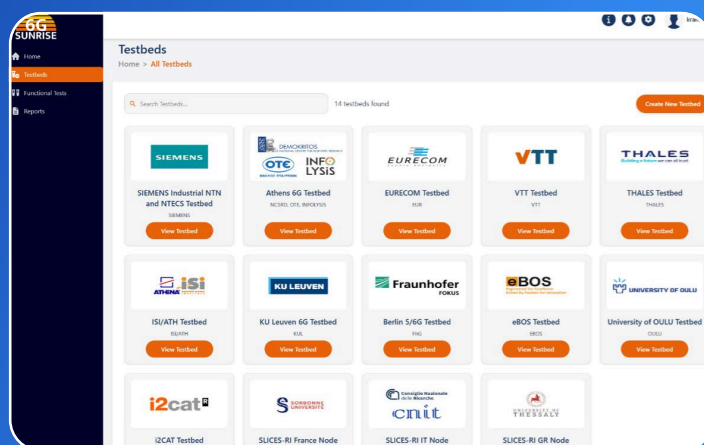
Technological Area	6G experimentation and testbed federation (Open/disaggregated networks, management & orchestration, cloud/edge computing)
Key Innovation	• First open-source, standards-compliant federation framework for 6G testbeds (Open Operator Platform). • Unified web-based experimentation portal providing easy access, management, and data visualization across 14 federated 6G testbeds
Problem Solved	• Simplifies multi-testbed 6G experimentation for researchers and developers. • Enables platform-agnostic deployment of vertical applications across diverse testbeds. • Provides standardized, accessible APIs to abstract complex 3GPP network functions for application developers
Opportunities Created	• Promotes innovation and collaboration among academia, SMEs, and industry. • Opens the door for hackathons, third-party integrations, and experimentation of new 6G enablers. • Facilitates rapid testing and development of 6G applications • Enables SMEs and startups to leverage 6G capabilities without large infrastructure investments
Market Potential	Accelerates adoption of standardized, open-source 6G federation frameworks in Europe and beyond.

IMAGINE-B5G

CALL 1

Real-World Validation of (B)5G Capabilities for Port Operations

IMAGINE-B5G deployed next-generation 5G at the Port of Valencia and demonstrated five real-operation pilots: enhancing monitoring with drones and AR, enabling remote repairs, supporting uncrewed vessels for inspection and rescue, testing remote boat control across networks, and coordinating a complex emergency drill. Together, these trials proved 5G's reliability for mission-critical port operations and strengthened the case for a full private 5G rollout.

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Technological Area	Network slicing, AI/ML-enabled operations, management & orchestration, edge computing.
Key Innovation	• First real-world demonstration of 5G capabilities in a busy, operational port supporting multiple simultaneous critical applications. • Integration of AI/ML, AR, drones, remote vehicles, and network slicing to make port operations safer, faster, and greener.
Problem Solved	• Improves safety & reduces downtime and emissions through real-time monitoring, remote rescue and remote-guided maintenance. • Ensures continuous connectivity for mobile assets, enabling smooth operations across private and public 5G networks.
Opportunities Created	• Facilitates autonomous operations and digital twins for transport and logistics. • Provides a blueprint for safer, faster, and greener operations, transferable to other critical infrastructure sectors
Market Potential	• Accelerates adoption of private 5G networks for transport and logistics. • Opens new business models for smart ports and autonomous vehicles • Positions European ports as leaders in next-generation operational technology, supporting competitiveness and sustainability.
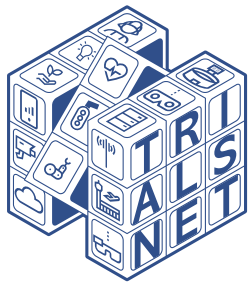
TrialsNet

CALL 1

Advanced XR Capabilities over B5G during Live Events @26 GHz

In March 2025, TrialsNet deployed a 5G Standalone private network at Madrid's Movistar Arena using the 26 GHz band to enable fully wireless, high-throughput, low-latency services during a live event. The trials demonstrated how advanced connectivity can enhance security, entertainment, and user engagement in dense environments while replacing previously wired or localized solutions. By testing AI-enabled, end-to-end architectures under real conditions and handling heavy traffic loads, the initiative generated insights and datasets that will guide the design and optimisation of future 6G networks.

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Technological Area	• High-frequency 5G/6G networks, AI/ML, edge computing, multi-connectivity. • Live event operations, security, and immersive media delivery.
Key Innovation	• First end-to-end 5G Standalone (SA) deployment at 26 GHz for live events in Europe, demonstrating high-throughput, ultra-low latency wireless services. • Integration of AI-powered crowd monitoring and immersive VR/360° fan engagement for real-time applications in crowded environments.
Problem Solved	• Enables real-time monitoring of large crowds for safety and rapid response to incidents. • Delivers immersive, multi-angle fan experiences both in-venue and remotely, transforming live event engagement.
Opportunities Created	• Enhances public safety and operational efficiency in stadiums, concert halls, and other venues. • Opens new business models for immersive media, live event production, and remote fan experiences. • Provides a blueprint for wireless, high-frequency deployments in other high-density, mission-critical applications
Market Potential	• Accelerates adoption of private 5G networks for live events and entertainment. • Supports AI and immersive media services as commercial offerings in sports, concerts, and large gatherings.

6G-SHINE

CALL 1

In-X Architecture Integration into 6G Networks (3GPP) Standards

6G-SHINE developed the architectural foundation for in-X subnetworks, short-range, low-power wireless cells inside vehicles, robots, industrial modules, or classrooms, enabling ultra-low latency, high reliability, and autonomous operation. Its solution defines the key subnetwork elements, procedures for autonomy, inter-subnetwork coordination, and seamless integration with a parent 6G network.

This blueprint supports scalable, resilient subnetworks for safer in-vehicle networks, smarter factories, and adaptive learning environments. Notably, 6G-SHINE's in-vehicle subnetwork use case was adopted in 3GPP TR 22.870, marking the first formal recognition of subnetwork concepts for 6G.
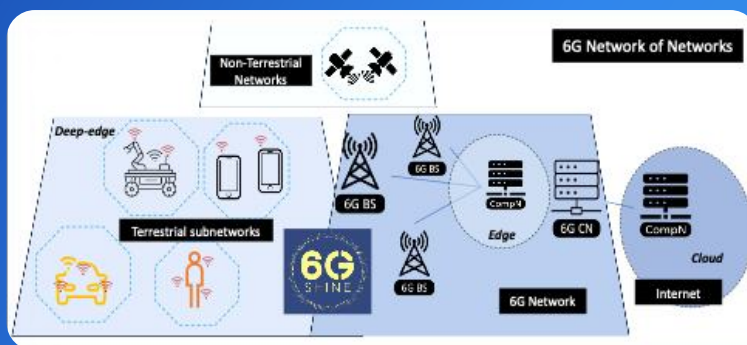
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Technological Area	6G network architecture, network slicing, edge computing, and autonomous subnetworks
Key Innovation	• Introduction of in-X subnetworks, short-range, low-power wireless cells inside vehicles, robots, classrooms, or industrial modules. • Enables autonomous operation with seamless integration into a larger 6G network, supporting ultra-low latency, high reliability, and service continuity.
Problem Solved	• Provides high-performance local connectivity for sensors, actuators, and controllers. • Supports resilient, autonomous operation even when disconnected from the public network. • Allows inter-subnetwork coordination for compute distribution and seamless services
Opportunities Created	• Enables safer and more efficient transportation systems and industrial operations. • Establishes a standardized architectural blueprint, recognized in 3GPP, guiding future 6G deployment
Market Potential	• Positions Europe as a leader in next-generation network architecture for industrial, automotive, and educational sectors. • Lays the foundation for commercial deployment of in-vehicle, factory, and classroom subnetworks in the coming 6G era.

HEXA-X-II

CALL 1

Sustainable 6G Use Case Families & 6G Connectivity for Zero Energy Devices

Hexa-X-II developed a methodology to assess 6G use cases across environmental, social, and economic pillars, distinguishing between sustainable 6G and 6G for sustainability.

Twenty use cases were grouped into six families, each represented by a key use case (RUC), with sustainability impacts evaluated across lifecycles. The approach enables iterative assessments to maximize benefits and minimize negative effects, guiding 6G development toward sustainability.

Hexa-X-II's research, including early insights on ZEDs, contributed 16 inputs to 3GPP Ambient IoT standardization.
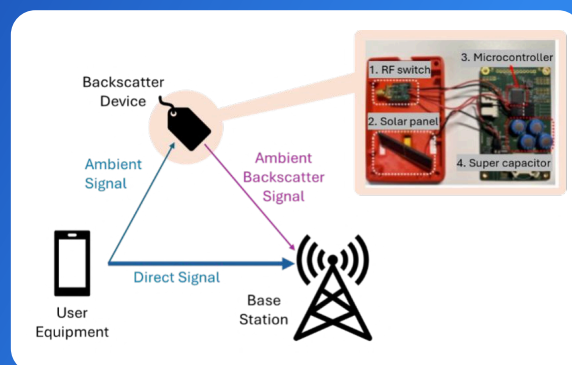
Technological Area	Sustainability in digital services and energy-efficient device design
Key Innovation	• Definition (and adoption by 3GPP) of six sustainable 6G use case families demonstrating environmental, social, and economic benefits across sectors. • Introduction and proof-of-concept for Zero-Energy Devices (ZEDs): IoT devices that harvest ambient energy, enabling maintenance-free, eco-friendly operation.
Problem Solved	• Provides methodology to evaluate sustainability of 6G use cases, ensuring positive environmental, social, and economic impacts. • Reduces energy consumption in IoT devices with ZEDs, supporting long-term, maintenance-free deployments. • Demonstrates high-accuracy indoor localization and backscatter communication with minimal infrastructure
Opportunities Created	• Enables greener, safer, and more inclusive applications across industrial, educational, transport, healthcare, and XR sectors. • Supports new business models and cost reductions from low-energy, self-sustaining IoT. • Guides standardization and development of Ambient IoT in 6G, influencing 3GPP
Market Potential	• Positions Europe as a leader in energy-efficient, zero-energy IoT innovation. • Opens commercial opportunities in smart cities, logistics, XR, industrial automation, and other sectors leveraging sustainable 6G technologies.

What's next

The SNS JU Top-10 Key Achievements of 2025 represent the most prominent and tangible outcomes of SNS JU-funded projects, highlighting Europe's excellence in 5G and 6G research and innovation. By documenting and celebrating these leading achievements, SNS JU not only underscored the quality and relevance of European Research and Innovation but also provided benchmarks and inspiration for ongoing and future projects.

Looking ahead, SNS JU-funded projects are expected to generate further tangible outcomes that will expand the Key Achievements Repository. The Repository will continue to serve as a comprehensive, accessible platform, allowing stakeholders, researchers, industry partners, and policymakers to explore both the Top-10 and the broader set of documented results. This SNS JU tool will ensure that progress is visible, knowledge is shared, and Europe's advancements in next-generation networks are recognized and disseminated widely.

Building on the experience and lessons learned from the 2025 selection, the process for identifying and presenting SNS JU Top-10 Key Achievements will be further refined in the coming years. This will enhance the rigor and relevance of the selection, ensuring that future Top-10 achievements continue to highlight the most impactful technological, experimental, and societal contributions.

Through these continued efforts, SNS JU aims to strengthen Europe's technological leadership, accelerate the deployment of 5G and 6G, and inspire further innovation that benefits industry, society, and the broader digital ecosystem.

We look forward to presenting the next edition of outstanding achievements delivered by SNS JU-funded projects in 2026!

6GSNS

January 2026