CELTIC-NEXT
eureka Cluster

Project Achievements

6G for Connected Sky (6G-SKY)

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LCA LOGISTIK CENTER Austria Süd GmbH
RED Bernard GmbH
twins GmbH

Germany

Airbus Defence and Space GmbH
Deutsche Telekom AG
Ericsson Antenna Technology
Fraunhofer Institut für Integrierte Schaltungen IIS
Meshmerize GmbH
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www.celticnext.eu/project-6g-sky

https://www.6g-sky.net/

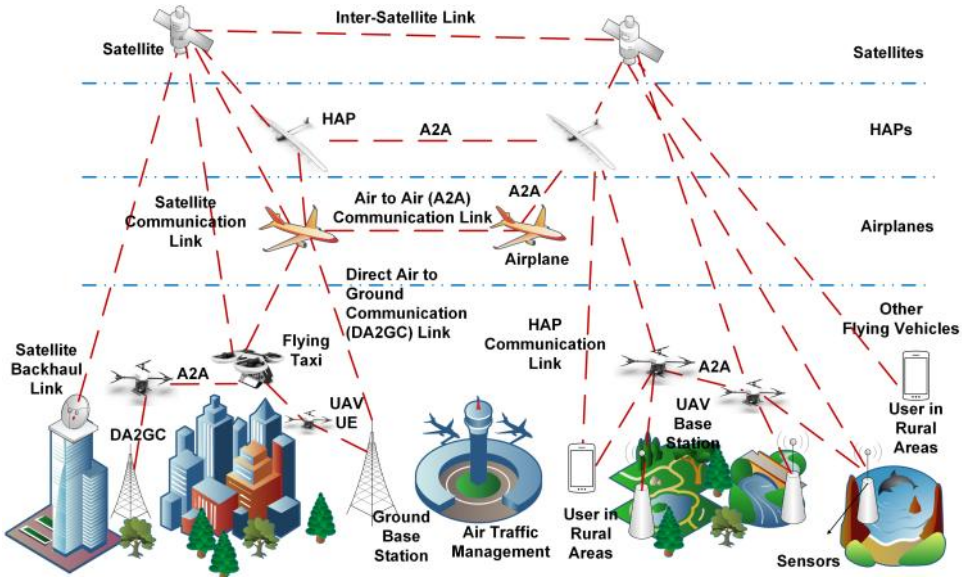
The 6G-SKY project focused on designing advanced and adaptive network architectures to deliver reliable connectivity for both aerial and ground users. By integrating satellites, high-altitude platforms, and direct air-to-ground communications, it aimed to enable applications such as urban air mobility and rural broadband. The project also introduced innovations in radio technologies, 3D network management, and low-latency links to meet the diverse needs of flying vehicles and terrestrial users.

Main focus

The 6G-SKY project set out to make future communications work seamlessly in the sky as well as on the ground. One of its key goals was to design new network solutions that connect satellites, high-altitude platforms, uncrewed aerial vehicles (UAVs), and ground users into a single reliable system. This was important because today's networks are not built to handle the fast-moving, complex needs of aerial vehicles or to provide coverage in remote and underserved areas. The project tackled problems such as weak connectivity for UAVs, safety and security risks, and the lack of common rules and standards. By testing new antennas, smarter use of radio signals, and AI-based decision making, 6G-SKY demonstrated how flying taxis, logistics UAVs, and even airplanes could benefit from strong and robust links. The results are expected to improve air traffic safety, bring broadband to rural communities, and help shape global 6G standards for the future.

Approach

The 6G-SKY project reached its objectives through a clear step-by-step process: starting with theoretical frameworks, followed by simulations, lab emulation, and finally real-world demonstrations. Early work defined a holistic 6G architecture combining terrestrial, aerial, and satellite networks, while also addressing regulatory challenges and aligning with European strategies such as SESAR's vision for a digital sky. Alongside the technical research, business modeling was carried out to study value chains, economic viability, and opportunities for commercialization. Several novel approaches characterized the project, including the use of explainable AI for UAV handovers, the design of ultra-large antenna arrays, and innovative multi-link connectivity across



satellites, high-altitude platforms, and ground stations. Practical demonstrations in different countries showcased UAV swarms, reliable terrestrial–non-terrestrial handovers, and safety solutions like collision avoidance. This structured approach, supported by strong collaboration between industry, academia, and regulators, ensured that 6G-SKY combined scientific innovation with practical validation.

The consortium complemented the technical work with extensive field data collection, detailed airspace modelling, and co-design with end users such as logistics operators and aviation stakeholders. Strong emphasis was placed on validating technologies under realistic operational conditions including obstacle-rich logistics centres, rural areas, and controlled airspaces, ensuring that the developed solutions are ready for deployment.

Achieved results

The 6G-SKY project has delivered significant advances toward seamless 3D connectivity by integrating terrestrial, aerial, and satellite networks into a holistic 6G framework. One major achievement was the definition of the Combined Airspace and Non-Terrestrial Networks (Combined ASN) architecture, providing an adaptive end-to-end system that supports use cases such as urban air mobility, rural broadband, and remote IoT. This framework integrates advanced features including sensing, security, and explainable AI.

Technical innovations include the design and prototyping of a scalable ultra-large antenna array with 768 elements for air-to-ground links, novel link-level designs using new frequency ranges, and improved solutions for mobility, interference, and resource management in mixed aerial–terrestrial environments. The project demonstrated self-organizing UAV swarms for logistics, collision-avoidance mechanisms, UAV detection and localization, and multi-technology handovers between terrestrial and non-terrestrial links. An explainable AI framework for UAV handovers was also developed and integrated into commercial offerings.

On the product side, partners enhanced platforms such as the twinFOLD GEO UAV, Ericsson's GNSS-free aerial localization, Skysense's counter-UAV system with U-space integration, Meshmerize's optimized mesh networking, and AITIA's QoS-based resource allocator. These results pave the way for new commercial services, including mission-critical connectivity with multi-link reliability.

The consortium actively contributed to 3GPP standardization on UAV and NTN integration, influencing the direction of future 6G standards. With prototypes, and real-world demonstrations, 6G-SKY provides both scientific breakthroughs and practical tools. Its expected impact includes safer air traffic management, enhanced rural connectivity, and strengthened European leadership in 6G innovation.

Impact

The results of 6G-SKY create lasting impact by combining technical breakthroughs with strong contributions to international standardization. Inputs provided to 3GPP on KPIs and use cases for verticals will guide the evolution of 6G standards and open pathways for commercial deployment. Validated prototypes and real-world demonstrations — such as multi-link UAV connectivity, explainable AI for UAV mobility, and advanced antenna systems — give companies a head start in developing new products and services in sectors like aviation, logistics, emergency response, and IoT. Business modeling and techno-economic analyses further highlight sustainable revenue models and market opportunities, helping industry actors reduce risk in early adoption.

The initiative paves the way for future European deployments, including upcoming HAPS-based service trials and integrated U-space operations. By sharing architectural models, datasets, and test results, 6G-SKY boosts cooperation between research, industry, and regulators. Partners have already launched follow-up R&D and pre-commercial activities based on antennas, AI modules, and multi-connectivity solutions developed in 6G-SKY. Its outcomes support European strategies such as SESAR's Digital Sky vision, connecting telecom and aerospace stakeholders with regulators and other public authorities. Bridging theory, lab validation, and real-world demonstrations, 6G-SKY ensures its innovations are ready to scale in both business and future research.

About CELTIC–NEXT

CELTIC-NEXT is the EUREKA Cluster for next-generation communications enabling the digital society. CELTIC-NEXT stimulates and orchestrates international collaborative projects in the Information and Communications Technology (ICT) domain.

The CELTIC-NEXT programme includes a wide scope of ICT topics based on new high-performance communications networks supporting data-rich applications and advanced services, both in the ICT sector and across all vertical sectors.

CELTIC-NEXT is an industry-driven initiative, involving all the major ICT industry players as well as many SMEs, service providers, and research institutions. The CELTIC-NEXT activities are open to all organisations that share the CELTIC-NEXT vision of an inclusive digital society and are willing to collaborate to their own benefit, aligned with their national priorities, to advance the development and uptake of advanced ICT solutions.

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