

MECON

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Multi-Access Edge Computing (MEC) over NTN for beyond 5G & 6G

Non-Terrestrial Networks (NTNs) are essential to achieving the full potential of 5G and 6G, particularly in global coverage, reliability, and innovative services. Their role will expand with the growing demand for connectivity. This project will provide essential insights and explorations into how NTNs will deliver those promises and services. The market's growth hinges on various factors. According to "Technavio" reported in 2024, the 5G Non-Terrestrial Networks (NTN) Market size (Figure 1) is projected to increase by USD 18.34 billion, at a CAGR of 39.19% between 2023 and 2028, and reach 22.6 billion by 2028.



Figure 1: 5G Non-Terrestrial Networks (NTN) Market Analysis

Main focus

The MECON project's primary objective is the development of advanced technologies aimed at integrating satellite networks seamlessly into future Unified Networks. Addressing the on-demand cost-effective global coverage in crowded and unserved areas, guaranteeing trunking, backhauling, direct connectivity, energy efficiency, support for global IoT, high-speed mobility, and high-throughput services everywhere, anytime, decrease of site real estate, and instantaneous operation of coverage are the main outcomes of this project.

To achieve its ambitious goals, the MECON project will explore various deployment scenarios, including the utilization of drones for backhauling in areas with limited or no terrestrial infrastructure. This approach offers flexibility and rapid deployment capabilities, ensuring connectivity in challenging environments. Additionally, the project will investigate direct-

to-device connectivity, leveraging satellite communication to establish direct links with user equipment, thereby bypassing the need for intermediate terrestrial networks. Furthermore, the project will examine different gNB deployment strategies on satellites, optimizing resource allocation and network performance. These deployment scenarios are combined with innovative technologies and network architecture. (Figure 2)

Approach

The MECON project aims to revolutionize global connectivity by seamlessly integrating NTNs with 5G and future 6G systems. This multifaceted approach addresses immediate 5G needs while laying the groundwork for advanced 6G capabilities.

MECON's innovative solutions include:

- ◆ Native integration of air and space for enhanced efficiency and user experience, paving the way for complex 6G integration scenarios.
- ◆ AI-driven network optimization enhanced by Integrated Sensing and Communication (ISAC), zero-touch provisioning, and 3D mobility management, revolutionizing current network management and reducing operational costs.
- ◆ Significant reduction of end-to-end latency, enabling real-time services over NTN and URLLC services over dynamic terrestrial networks.

The project also explores multi-tenant O&M models and neutral host networking, creating new market opportunities for service providers. A distributed orchestrator will manage both NTN and terrestrial network services, ensuring autonomous operation across diverse environments.

To ensure interoperability and compatibility with existing and future networks, the project adheres to relevant standards from organizations like ETSI, TMF, MEF, and 3GPP. Additionally, the project's focus on real-world use cases, such as precision farming, remote monitoring, and eHealth, which will validate the project's effectiveness and its potential to bridge the digital divide in underserved areas.

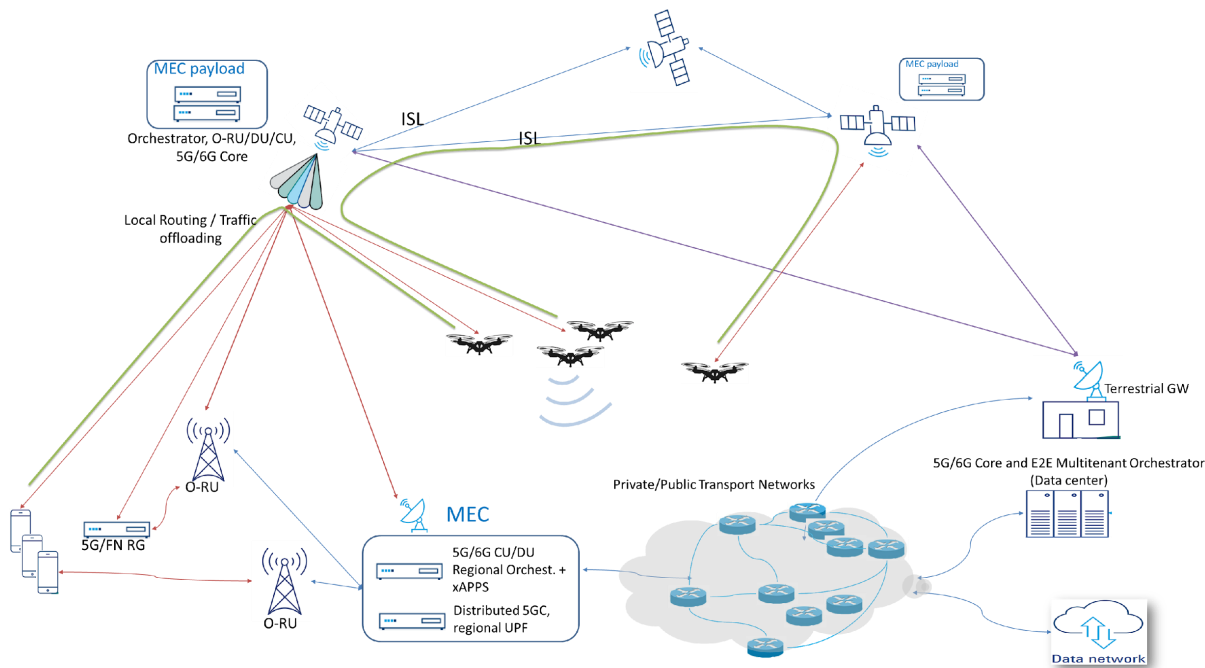


Figure 2: MECON deployment scenario architecture

Main results

The MECON project envisions a future of seamless integration between NTN and 5G/6G systems, enabling ubiquitous connectivity and innovative services. The project targets cost-effective global coverage, high-speed reliable connectivity, and reduced infrastructure costs. By unifying these networks, MECON aims to improve key performance indicators (KPIs) such as cost efficiency, broadband coverage, and user experience. The project will focus on decreasing latency, enabling global connectivity and critical real-time services, even in underserved areas.

Key innovations include native air and space integration, increased

MEC operation efficiency (power processing, steerable beams, automation), and self-organizing networks for automated network slicing and traffic steering. The project also focuses on optimizing end-to-end (E2E) network slicing, including 5G/6G and transport layers, for efficient traffic routing and steering over hybrid TN/NTN platforms. Additionally, MECON aims to decrease E2E delay and overhead for delay-sensitive services using AI/ML and smart configuration of network functions. MECON will leverage AI/ML models and a knowledge plane to automate, self-configure, and optimize NTN MEC resources and 5G/6G subsystems, along with intelligent bandwidth management strategies.

Real-world use cases, such as precision farming, remote monitoring, and rural eHealth, will validate the project's effectiveness and its potential to bridge the digital divide in underserved areas.

Impact

The MECON project aims to transform the rapidly growing satellite communication market, projected to reach USD 71.6 billion by 2030, by addressing the current limitations of siloed service providers through an innovative service orchestration platform that seamlessly integrates NTN with 5G/6G. MECON Solutions aims to influence over 8% of the NTN market, with an expected market share of around 2.8%.

This platform enables hybrid connectivity solutions, meeting the rising demand for reliable, on-demand communication in sectors like agriculture, shipping, and healthcare. By unifying NTN and terrestrial services, the platform creates a new marketplace, facilitating easier service discovery and provisioning for both providers and consumers. This integration fosters new market opportunities, especially with the introduction of a revenue-sharing business model where the platform operator benefits from each transaction.

Ultimately, MECON empowers satellite operators to expand their reach and offer innovative services, while consumers gain access to tailored, cost-effective connectivity solutions regardless of location.

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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