

5G ecosystems will be key to the seamless integration of satellite and terrestrial networks

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Low-Earth orbit (LEO) satellite constellations (which orbit at an altitude of between 160 and 2000 kilometres above the earth) are potentially an attractive solution for expanding 5G connectivity to isolated, underserved and remote geographies where terrestrial coverage is absent.

Analysys Mason's [Low-Earth orbit satellite tracker](#) provides details of global LEO satellite providers and gives information about launch dates and target use cases. Our most-recently published tracker includes a total of 24 LEO satellite providers and 28 examples of partnerships between LEO satellite providers and telecoms operators. It also provides additional information regarding ecosystem involvement.

The number of LEO satellite communication propositions in the telecoms market is increasing, which is leading to a growing need for more interaction between open and standardised ecosystems on both sides, such as SAT 5G (a European Union-backed 5GPPP project) and MEF. This will help telecoms operators and LEO satellite providers to integrate their services more effectively and flexibly, to create a secure, heterogeneous satellite and terrestrial 5G network. Working within ecosystems that support standard-based frameworks will also help operators to address the greater complexity of these network systems.

The number of projects to extend 5G connectivity via LEO satellites is increasing, and ecosystems and standardisation are a growing focus

Until recently, all cellular networks were confined to the earth, but non-terrestrial networks (NTN) provide significant potential for expanding coverage. This is particularly beneficial for the development of global 5G connectivity and for fulfilling a wide range of emerging enterprise-class 5G use cases. The latest 5G specification (Release 17) from the 3rd Generation Partnership (3GPP) includes, for the first time, support for satellite-based NTNs. In the past, 5G standards had fallen short of supporting the integration of satellite and terrestrial networks because 3GPP's remit was not, at least initially, to integrate key technical enablers beyond the 5G network (such as edge computing or AI) as an inherent part of the architecture.

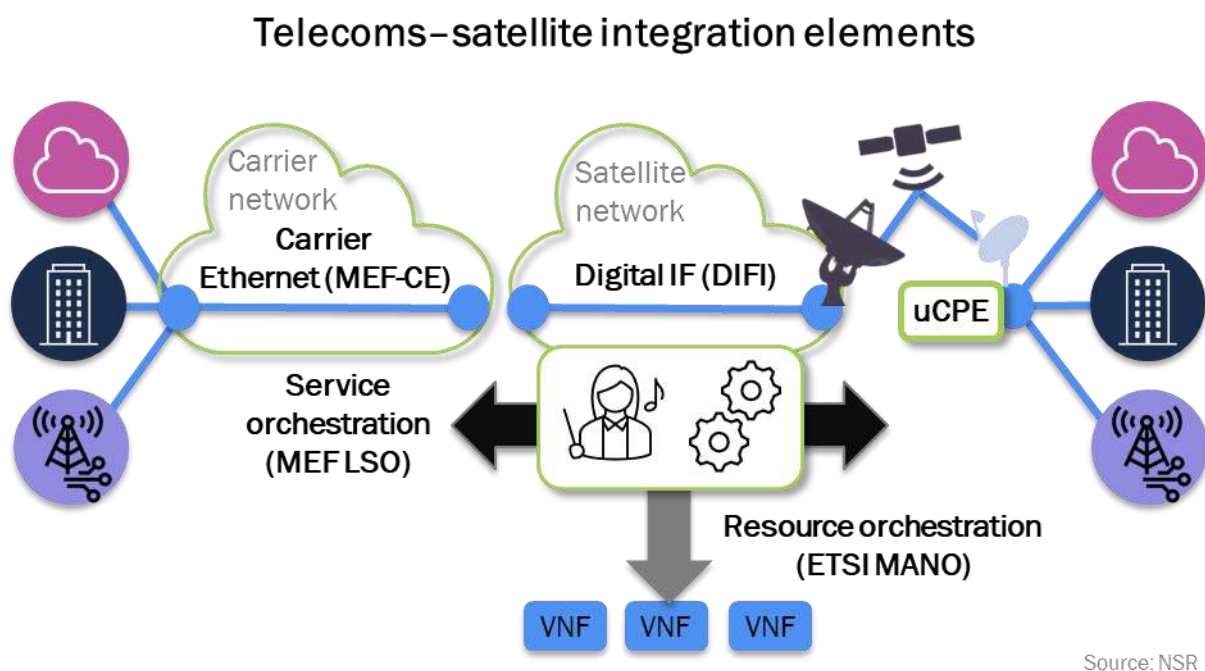
However, that has changed, and full interoperability between satellite and telecoms network control systems will be a necessary first step towards the more-expansive goal of full satellite support for 5G. Progress towards these goals will be accelerated if stakeholders on both sides come together and co-operate in ecosystems based on agreed standards.

The EU-funded project, Satellite and Terrestrial Network for 5G (SaT5G), is a key example of an ecosystem that is supporting the development of a standardised and integrated 5G and satcom network architecture. SaT5G will support the development of key 5G technologies by utilising satellite capabilities such as virtualised

network function (VNF) delivery, in addition to its established collaborations with key industry partners.¹ Luxembourg-based LEO satellite provider SES S.A. is a participant in SaT5G, and in September 2022 it announced that it was committed to building a European LEO satellite constellation, funded by the European Space Agency (ESA), as well as establishing an ecosystem to create Europe's first space-based quantum key distribution satellite system, EAGLE-1. This project is due to launch in 2024 and aims to create a highly secure, satellite-based connectivity system for the EU.

MEF, which has defined over 80 Carrier Ethernet standards to support digital transformations, is at the centre of a significant ecosystem initiative for LEO satellite providers. This is because MEF helps to facilitate the interoperability of satellite and terrestrial networks (see Figure 1) at the orchestration level, as well as establishing important standards that are required to support 5G technology. LEO satellite providers such as Intelsat, SES, Telesat and OneWeb have all become participants in the MEF ecosystem.

Figure 1: Key technology elements that are necessary for satellite/carrier integration²



Partnerships between LEO satellite providers and operators are important for exploring new and emerging NTN use cases

Alliances between satellite providers and telecoms operators help to bridge the connectivity gaps faced by mobile subscribers in out-of-coverage zones. The recent wave of new partnerships between major telecoms operators and active LEO satellite players, as reported in Analysys Mason's *Low-Earth orbit satellite tracker*, points to the importance of such alliances for the development and launch of emerging NTN use cases, including satellite-to-device propositions and expanding IoT services. These partnerships can expand the satellite business model, while reducing the threat that satcom players may pose to telecoms operators if they

¹ European Commission (2020), *Satellite and Terrestrial Network for 5G*.

² NSR (March 2022), *Telecom–Satcom Digital Network Integration*.

directly compete for the same broadband customer base. Recent examples of partnerships between LEO satellite providers and telecoms operators include the following.

- **Starlink and T-Mobile.** In August 2022, T-Mobile US and Starlink announced a technology partnership to develop a direct satellite-to device proposition, which is expected to launch by 2024. Satellite-to-device is believed to be one of the largest opportunities in satcom's history, with the market forecast to generate over USD60 billion in revenue over the next 10 years.³ Starlink will face competition from other LEO satellite providers in the market, including Lynk Global, which announced in September 2022 that it was testing the first 5G base station in space to provide a 5G signal to a standard mobile device.
- **Omnispace and Smart (PLDT).** In August 2022, US-based Omnispace announced its collaboration with the Philippines' mobile operator Smart (a subsidiary of PLDT) to explore interoperability between Smart's 5G network and Omnispace's LEO satellites, using 3GPP-compliant 5G NTN standards. This came after Omnispace launched its LEO satellite, Spark-2, in April 2022. This collaboration creates an important opportunity to enable 5G connectivity in rural areas, in addition to using IoT devices for expanding network coverage for disaster relief in the Philippines.
- **Satelite and Telefónica.** In July 2022, Telefónica Spain announced a partnership with Satelite to integrate 5G LEO satellite connectivity with Telefónica Tech's 3GPP standardised NB-IoT network called Kite. This will offer extended IoT connectivity for Telefónica's customers in remote areas and will therefore benefit a range of businesses in the agriculture, shipping and wind farm sectors.

³ NSR (July 2022), *Global Satellite Capacity Supply and Demand, 19th Edition*.