LEO, MEO, GEO: Operators Chart the Multi-Orbit Path Forward

Satellite operators and service providers are investing big in multi-orbit services. How quickly these bets will generate lucrative returns is still uncertain.

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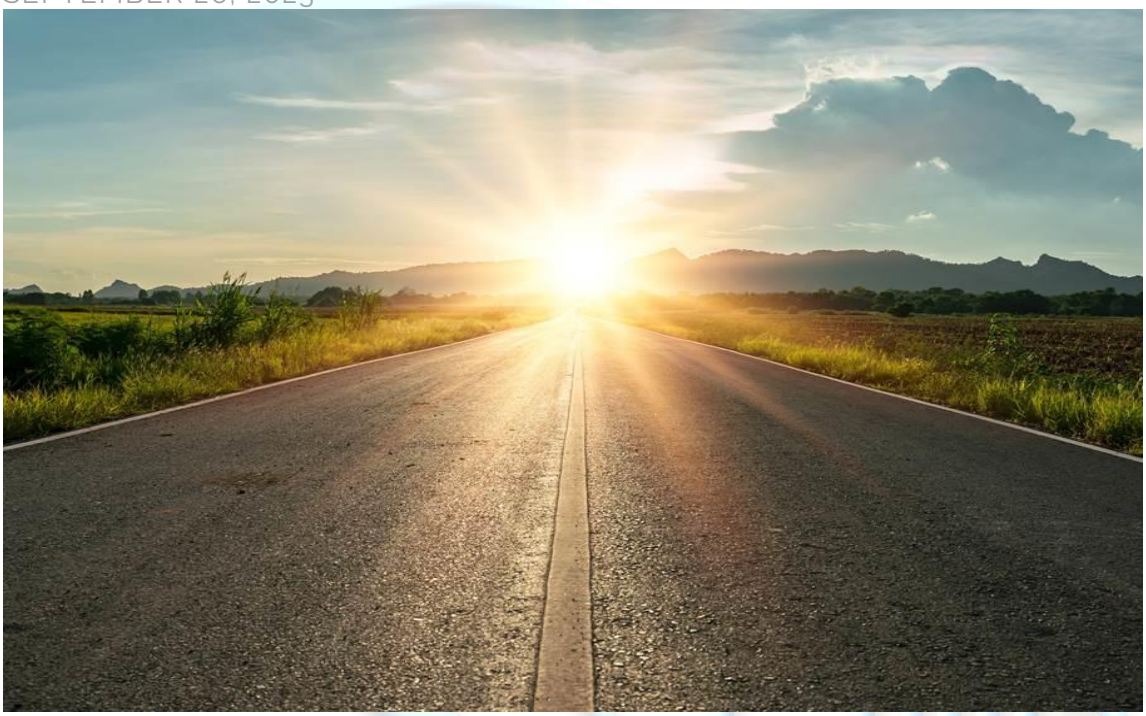

Deep-water drilling is often a $10 million a day, mission-critical operation. If a signal drops, and an oil rig engineer can't track their machinery for more than a few seconds, they have to shut down operations — or risk the safety of their crew. Safety is a priority — but that's a lot of money down the drain.

With the importance of connectivity at the forefront, more and more oil, gas, and other industry players are relying on satellites to beam high-speed internet services to the job sites. Yet while satellite has been traditionally viewed as a backup to fiber, its role is starting to shift into a first line of defense.

As such, satellite service providers like Houston-based Speedcast, one of the world's largest global connectivity providers specializing in managed communications for business and enterprise networks, are unveiling service offerings that blend signals from multiple orbits across Low-Earth Orbit (LEO), Medium-Earth Orbit (MEO), and Geostationary Orbit (GEO), as well as terrestrial networks. The company says this is the best way to ensure connectivity is truly seamless when dollars are at stake.

"If something goes down, an energy operator has to shut down the drilling operation because they're running things remotely, all the way back in Houston or Aberdeen and the operation might be 300 kilometers off the coast of Angola," says Speedcast CEO Joe Spytek. "That's why they have always been willing to pay a premium for high-quality, high-availability services."

Spytek says the concept of 100 percent uptime is now a reality. "We weave together the largest global footprint of GEO capacity, while also integrating mPOWER links or a Starlink terminal, blending all the connectivity paths together so if one were to go down, the customer still maintains their network communications," he says.

When Spytek took the helm of Speedcast in 2021 as the company emerged from bankruptcy, he set out to transform how Speedcast did business, positioning the company for a multi-orbit future of software-defined networks.

One of Speedcast's more recent moves was a partnership with SpaceX's Starlink constellation. Speedcast was the first announced integrator for Starlink. As the demand for multi-orbit, or "multipath" satellite connectivity — between GEO, MEO and LEO — Spytek says his inbox is loaded with inbound queries from organizations with land, maritime, energy and government operations.

"With access to LEO constellations now, we've been able to access whole new customer segments," says Spytek. "A Starlink terminal is more like a terrestrial LTE service than a satellite service in some respects. When you pair Starlink with a customer's existing terrestrial service, you can actually offer a very highly reliable network. We've already added hundreds of new customers on the back of some of these LEO offerings. That's really one area where we're seeing very strong growth."

There's plenty of room for other winners, it seems, as the industry migrates toward an expanded vision of satellite connectivity, driven by the ability for satellites in different orbits to communicate with each other. As operators merge and adopt more sophisticated ground terminals that can relay signals across multiple constellations, it's clear the industry is on a multi-orbit trajectory. All of this raises questions about the new market opportunities and use cases for this next level of seamless satellite connectivity.

The Big Picture

The rollout of multi-orbit satellite networks seems to have happened overnight, but the process actually happened gradually in response to increasing demand for high-speed, low-latency, reliable satellite connectivity. Today, operators and service providers are looking for ways to differentiate themselves, while evaluating the ground equipment partnerships that will enable them to truly support connectivity across multiple orbits.

NSR, an Analysys Mason company, estimates that the non-GEO share of total high-throughput capacity demand will grow from approximately 21 percent in 2022 to about 52 percent in 2032. Valour Consultancy expects global shipments of communications on the move (COTM) flat panel antennas to grow from a very low base of just below 3,000 to approximately 100,000 units by 2030, at a CAGR of 57 percent.

The conversation around satellite service connectivity has shifted, says Maxime Puteaux, principal advisor for Euroconsult.

"Compared to a few years ago, when there were debates about LEO versus GEO, the answer [now] is actually 'in between and multi-orbit,'" says Puteaux. He says many operators now consider GEO, MEO, and LEO together as there is no one single solution that fits all of their needs.

"There is a shift from end user use cases from pure broadcast, or a one-way signal, to more data-centric use cases which require two-way communications. Operators are moving and are diversifying towards an architecture which is by far more complex, but which is more suitable for their needs," he adds.

As the first multi-orbit terminals that can speak to satellites in different orbits are in development now, Blane Boynton, vice president of Product Development for Intelsat, says we can expect to see a handful enter the market at the end of 2023 or early 2024.

"The first-generation terminals will be capable of talking to one orbit at a time and will employ fast switching to move between satellite networks," Boynton tells Via Satellite. "We believe this fast switching can be transparent to customer use cases. Second generation terminals will take advantage of innovation in electronically steered array technology and will utilize intelligent network routing in the form of edge virtual network functions to achieve simultaneous connectivity into both orbits and networks."

When these capabilities are realized, he adds, use cases and traffic can be optimized in real time to intelligently route traffic to the network of best service.

"Imagine if streaming media traffic could transit a GSO link while highly interactive traffic like live video conferencing was making use of a lower-latency NGSO network," says Boynton. "Here you get the best of both worlds. [We] believe this is a key differentiator of the multi-orbit strategy."

Mission-Critical Services

As the cost of blending multiple orbits for seamless connectivity is technically complex, and it's costly as well. For these reasons, the initial applications for multi-orbit services support high-stakes use cases — where seamless connectivity is imperative.

In addition to mission-critical energy industry use cases, government and military applications are markets ripe for multi-orbital offerings, says Puteaux.

"Trunking is a good and significant opportunity — blending into ground networks. 5G is supposed to make things easier," says Puteaux. "Government connectivity definitely is something of interest, and so is maritime and aircraft. If someone needs to fit a specific solution into specific needs, multi-orbit is a way to go. At the end of the day, it needs to fit in with their cost structure so the system remains affordable, which is not so easy to do."

Mike Pigott, executive vice president of Connectivity at Anuvu, said that as new LEO services and existing GEO markets evolve, Anuvu expects to flex into new markets.

"We think the customers that will want multi-orbit solutions are those who want the best available and most consistent performance over the entire globe," Pigott says. "Beyond any particular market, we think most mobility connectivity customers want those things today and will want them even more in the future."

John-Paul Szczepanik, CTO of All.Space, noted that multi-orbit networks offer the benefit of enhanced network resilience — and assurance of uninterrupted services—which is paramount for government clients like the U.S. Department of Defense. He highlights other potential use cases like telecommunications and high-speed internet access to remote, underserved areas, as well in-flight internet services, maritime, and Earth observation.

He spoke to the benefits for national security: "The advent of near-peer rivals in space has revolutionized how we approach space communications and security," Szczepanik says. "Multi-orbit services are emerging as game-changers in this rapidly evolving landscape, offering many benefits across various industries and markets. Multi-orbit services guarantee the uninterrupted operation of command-and-control networks, which is critical for national security."

From the Ground Up

The importance of ground equipment and integration cannot be overemphasized to enable multi-orbit connectivity. A handful of equipment manufacturers are making news for rolling out technology that supports hybrid networks.

Anuvu, for example, recently tapped Telesat to provide antennas and ground station infrastructure to support its multi-orbit network, as enterprise customer needs evolve beyond GEO and LEO connectivity. Anuvu has ordered eight MicroGEO satellites from Astranis, which are smaller than a traditional GEO satellite. Anuvu also has an agreement with Telesat to utilize its Lightspeed LEO constellation in the future.

Pigott says the company strongly believes multi-orbit solutions will be the global norm in the next five to 10 years.

"We have a long history in serving global mobility customers with GEO satellites and our new Anuvu constellation comprised of MicroGEOs will continue our efforts to utilize new technology," said Pigott. "We have adopted a multi-orbit strategy and believe Telesat's Lightspeed LEO constellation is going to serve that future as well. Hybrid multi-orbit networks simply make the most sense for what we think will be core requirements of customers for their mobility networks — high performance high reliability, flexibility of service, and ultimately a superior quality of experience."

All.Space, meanwhile, is focusing on enabling multi-orbit services from the ground up, with its 'smart terminal' range.

Across the Globe

Japanese satellite communication provider Sky Perfect JSAT is also eyeing a multi-orbit future, with the launch of a joint venture with Japanese telco NTT called Space Compass.

The company is in strategic discussions with LEO satellite companies to explore partnership opportunities, says Hiroyuki Yagihashi, general manager of Sky Perfect JSAT's NTN Business Division, Business Innovation Group, Space Business Unit.

"Regarding our potential partnership, it's important to note that our mission is not just to resell internet access service, but to enhance the user experience with multi-orbit infrastructure," Yagihashi says.

In multi-orbit services, it is important to offer not only communications services, but also value-added solutions to solve customer problems, he added.

"Partnerships with solution providers for security features and vertical applications will be necessary," says Yagihashi, "In addition, it is important to work with partners that provide distribution channels to reach global markets.

Like other stakeholders, Yagihashi believes adoption of multi-orbit is still in its infancy, with SD-WAN technology performing traffic control and multi-orbit services. But JSAT sees a large adoption in the future, and integration into 5G.

“We believe that multi-orbit will be widely adopted in 10 years, because a robust and ubiquitous network is the strongest demand from users and MNOs around the world, and multi-orbit is the only method to solve the aforementioned needs,” said Yagihashi. “We believe that in the long term, multi-orbit control will be realized using 3GPP specification technology, which will be standardized as ‘5G-Advanced’ by 2026.” VS

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#GEO orbit # LEO orbit #MEO orbit #satellite orbit #satellite

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