Occupying the lowest latitude of all the satellites, LEO satellites deliver the quickest connection to ground infrastructure. Photo courtesy Speedcast ●●●

LEO satellites will change the world of remote connectivity

LEO satellites have been big news for the last decade or more, with increasing numbers of small satellites being launched into orbit more or less each year. With greater connectivity available, exciting new applications and services are coming into play across the globe.

Will Mudge, Vice President Engineering Operations, Speedcast

With the number of connected devices worldwide due to hit 50 billion by 2030, it is no secret that our connectivity demands are on the rise. Gone are the days when phones and computers are our only connected devices; we are now purchasing more wearable technology, connected gaming devices, and smart features for our homes and cars than ever before. But with so much buzz surrounding the possibilities of 5G, some might find it shocking that it isn't the only solution to every connectivity need. In the satellite world, the excitement is surrounding low Earth orbit (LEO) satellites, which are bringing unseen connectivity to the most remote portions of our globe.

The general assumption is that the more rural or challenging your location, the poorer your connectivity is likely to be. But thanks to the potential of LEO satellites, those on oil platforms or cruise ships out to sea, or at mines located miles from any town or city, will be able to experience connectivity as if they are sitting in their urban office, or in their living room at home. This could be a game-changing experience for those who rely on satellite connectivity for high bandwidth applications.

Existing satellite capabilities

Thanks to their size, and the extreme distance away from the Earth that they orbit, it only takes three Geosynchronous Equatorial Orbit (GEO) satellites to achieve complete coverage of the Earth's surface. Of course, there are many more than that now, in fact according to the UCS Satellite Database, as of 2021 there are now 562 operating GEO satellites.

But having now been around for over 50 years, it comes as no surprise that they are not without fault. Because of their large distance from the Earth, GEO satellites come with the burden of higher latency. They are also expensive to produce, and due to the Earth's curvature – coverage outside plus or minus approximately 70 degrees latitude isn't possible.

In terms of latency, medium Earth orbit (MEO) satellites often offer an advantage over GEOs. They orbit at a lower altitude, decreasing the time it takes for a signal to travel between the source and satellite, significantly increasing transmit speeds. In recent years, this has made MEO an excellent solution for applications such as high-speed telephone signals, safety monitoring, and other technologies that require lower latency than GEOs are able to provide.

That being said, our expectations for connectivity in recent years have soared. As cellular technology has progressed from 3G to 4G, to 4G LTE and now to 5G we have seen a growth in data rates available to users, prompting applications and usage that is ever-growing. This drives the development


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of enhancements within the satellite market, with LEOs poised to offer a comparable experience.

The potential of LEO

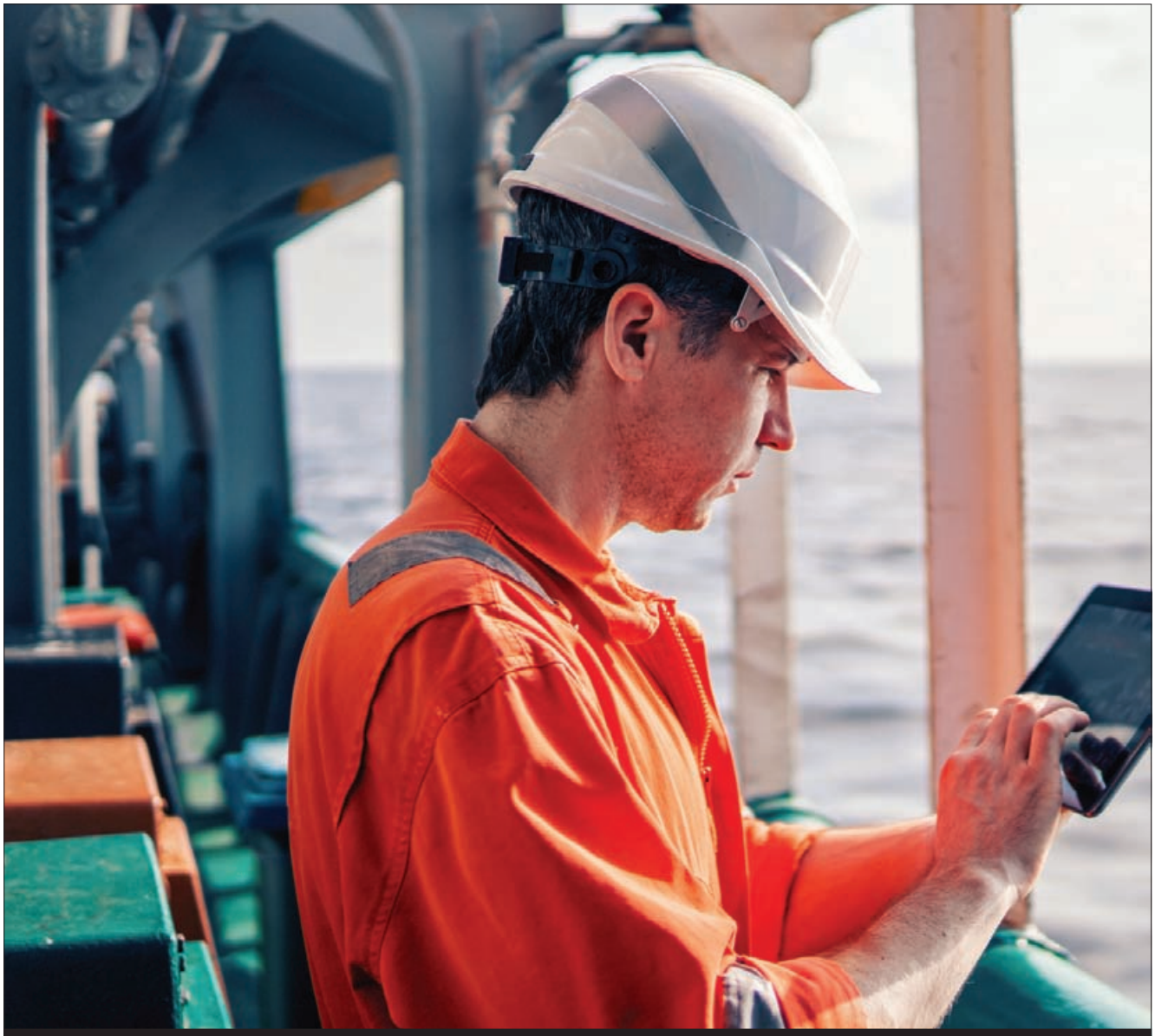
Occupying the lowest latitude of all the satellites, LEOs operate just 500-1,600km above the Earth's surface. Thanks to their proximity, LEO satellites offer a delay of just 0.05 seconds, making them ideal for cases that require super high-speed connectivity, like video conferencing, multi-player online gaming or high-frequency financial trading applications, that not only thrive off a real-time connection, but need it to function. Companies like Telesat, SpaceX and OneWeb have all begun putting these types of satellites into orbit, ready to bring their customers connectivity solutions with reduced latency that higher altitude satellites are not able to provide.

Their proximity to Earth does mean that many more are needed for adequate coverage; therefore, we are expecting tens of thousands to be deployed in the coming years, driving mass production of satellites which leads to more cost-efficiency per unit. They will form robust mega constellations in our skies with greater resiliency than GEO due to the fact that if one fails, another is not far away.

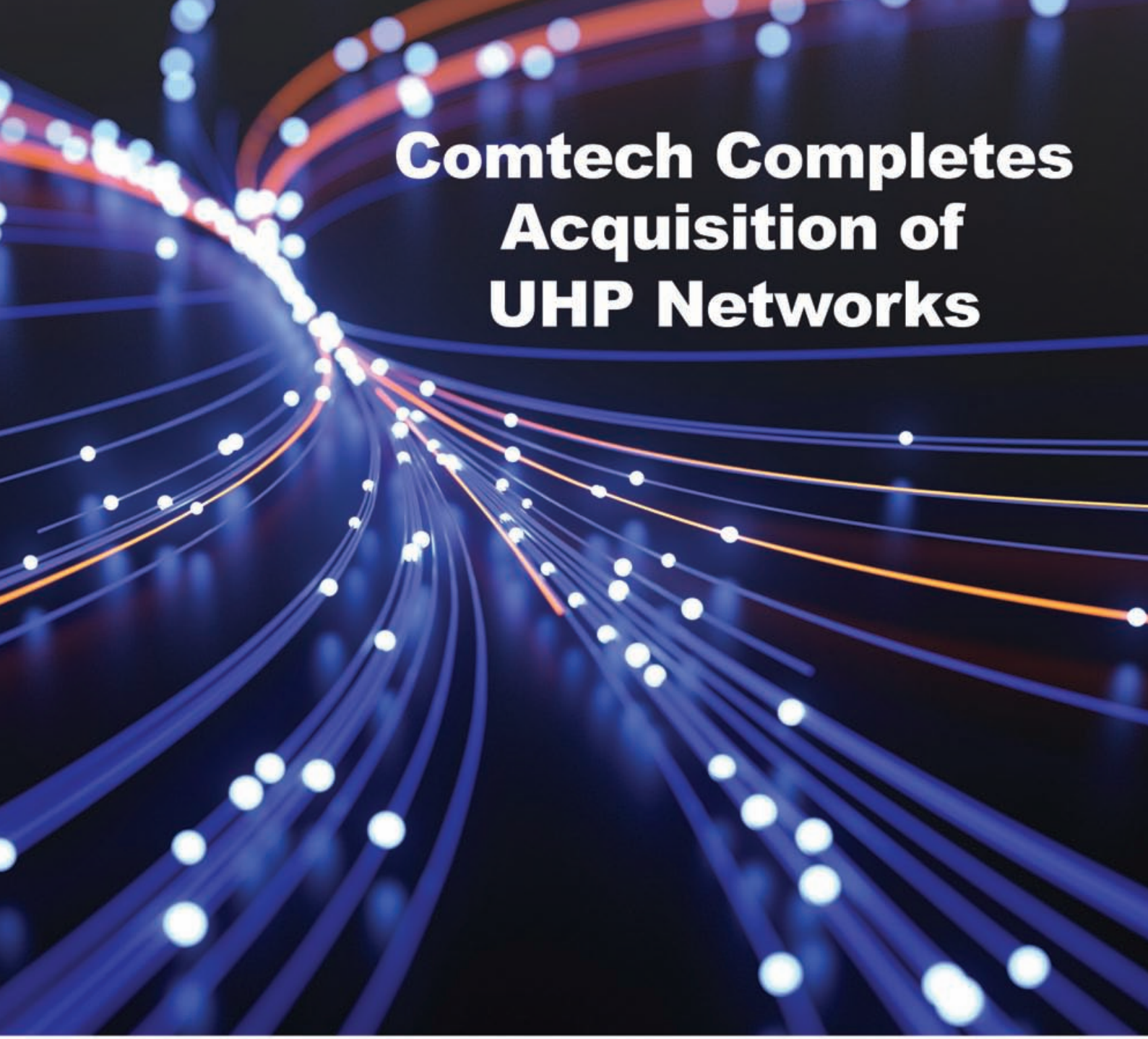
Not only will these satellites offer greatly reduced latency, but they will open doors for solutions which were not previously able to use satellite connectivity at all; latency isn't always just an inconvenience, for systems that need real-time connectivity, it's a deal-breaker. Those like ERP systems that often work in real-time, are designed for terrestrial networks, and simply will not work at all on GEO satellites. But when we're able to implement LEO satellites that can offer terrestrial level broadband connectivity to every corner of the globe, suddenly these systems can operate in regions previously unthinkable.

GEO, MEO and 5G complete the picture

The introduction of LEO satellites does not mean that GEO and MEO satellites won't still have their valued place in the market. Once truly available for industrial markets, LEO will be another technology that Speedcast leverages to design complete managed solutions that deliver the high quality of



Offshore locations are able to experience the same level of connectivity as urban setting. Photo courtesy Speedcast



The acquisition of UHP Networks fits perfectly with Comtech's strategy to build the most robust communication solutions for our global customers. By leveraging UHP's cost-effective, innovative and disruptive ground station technologies with our strength, stability and reliability, we are uniquely positioned to deliver solutions that meet our customers' needs. Let's explore how the combined team can deliver benefits for your network. **Contact us today.**

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service our customers require. This means it will join GEO, MEO, and other connectivity paths in our toolkit of dependable connectivity based on unique application, location, and other requirements.

Similarly, 5G plays a vital part in the final equation. 4G and 5G waveforms are based on Time Division Multiple Access (TDMA) architecture, which shares capacity between users through network slicing. This waveform has seen billions of pounds worth of investment, meaning it is very advanced, and when installed on a remote site for local connectivity it outperforms private LTE and Wi-fi. If your remote mine is situated in an area served by 5G, or your offshore platform is close enough to land where 5G is available, it will provide a boost in bandwidth greater than that of 4G or private LTE. That being said, 5G does not have the global reach that satellite can offer.

Organizations can get the best of both LEO satellites and 5G, by implementing software that seamlessly manages the transition between terrestrial and satellite technologies on any band and any orbit. By doing this, the complimentary technologies provide always-on connectivity wherever you are in the world.

Companies like Speedcast offer automated management technologies such as SIGMA or SD-WAN, which can make the right choice of network based on programmed priority parameters. When you're out of range from the cellular network, it will automatically select the LEO, MEO or GEO satellite that is right for your situation, and once 4G/LTE or 5G becomes available again, the software can automatically switch to the best available option, switching back to the always-on satellite connection if other connections fail or are out of range.

As networks and satellite connections grow, network management becomes crucial to ensure seamless business operations. While technology evolves, and more options are continuously offered to consumers, it is the duty of companies like Speedcast to keep customers up to date on the available alternatives and develop solutions which allow a seamless transition between the most appropriate technologies, ensuring they maximize their available bandwidth and application uptime while streamlining costs.

We are expecting tens of thousands of LEO satellites to be deployed in the coming years.. Photo courtesy Speedcast

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