Satellite provides a flexible fit for IoT's diverse connectivity demands

Two-way satellite communication at the edge is transforming how IoT use cases connect in real-time regardless of their location. Mark O'Connell, the general manager for EMEA and APAC at Globalstar, tells IoT Now how satellite connectivity has been transformed as low earth orbit (LEO) constellations have reduced costs and improved accessibility to satellite connectivity for IoT

IoT Now: How are the recent innovations in satellite connectivity improving affordability and accessibility for IoT use cases that utilise satellite connectivity? Is cost or coverage driving market uptake?

Mark O'Connell: Satellite connectivity has undergone a dramatic transformation, driven by the expansion of LEO constellations and advances in hardware miniaturisation. These innovations have significantly cut costs and made satellites more accessible for a broader range of IoT use cases. LEO networks reduce the distance data must travel, decreasing latency and enabling lower power consumption. This means devices can transmit data using simpler, less energy-intensive components, ideal for small sensors or battery-operated trackers.

On the hardware side, manufacturers are creating compact, cost-effective modules which eliminate the need for large antennas and complex deployments, making satellites more plug-and-play than ever. While coverage remains a core advantage, cost efficiency and ease of integration are now equally strong market growth drivers. As a result, satellite connectivity is no longer just a tool for niche applications but rather a central component of large-scale digital transformation strategies.

IoT Now: Please can you explain ways in which satellite connectivity can outperform cellular connectivity for IoT applications? Is satellite's winning argument still its ubiquitous coverage or are there specific IoT use cases where satellite wins for other reasons in addition?

MO'C: Cellular connectivity works well in urban and suburban areas, but it becomes unreliable – or entirely unavailable – in remote, rural or mobile environments. Satellite connectivity steps in where cellular drops off, offering ubiquitous coverage across land, sea and air. This makes it indispensable for industries like mining, maritime, logistics and emergency response.

But coverage isn't the only differentiator. Satellite also brings a level of resilience that cellular networks can't match. In times of disaster, when storms, fires or power outages disrupt terrestrial infrastructure, satellite networks continue to operate. Many satellite providers, including **Globalstar**, have built-in redundancies like multiple ground stations and multi-path capabilities to eliminate single points of failure.

Moreover, satellite connectivity excels in high-mobility scenarios, such as aviation or global cargo shipping, where a device must maintain communication across large, constantly shifting geographies. It also reduces complexity for cross-border operations, eliminating the need for roaming agreements or dealing with fragmented cellular coverage. In short, satellite wins not only where cellular fails, but where IoT applications require unbroken, reliable and borderless communication.

IoT Now: IoT devices do not necessarily have the same requirements as other enterprises or person-to-person communications. How can satellite communications support the flexibility IoT use cases need? For example, an asset tracking device in a desert might find satellite is the only available connectivity but it only needs to utilise satellite capacity at preset intervals to communicate relatively small payloads of data. However, a sensor on an oil pipeline is less predictable and may need to have guaranteed availability for safety reasons. How do modern satellite services accommodate the different demands?

MO'C: One of the strengths of modern satellite connectivity is its ability to adapt to a wide range of data and power requirements. Not all IoT applications are created equal. As you mentioned, myriad use cases have many different requirements, from high bandwidth to low power and beyond. The asset tracker in your example might only need to send one reading daily. In contrast, your sensor monitoring pressure in an oil pipeline may need to transmit real-time alerts to prevent catastrophic failure.

Today's satellite services are built to support both scenarios and everything in between. One-way satellite systems are designed for simple, low-data transmission. Small, lower-complexity satellite devices, for example, are ideal for asset tracking and environmental monitoring, using minimal power while maintaining years-long battery life.

On the other end of the spectrum, two-way satellite communication enables more complex use cases, such as remote control, diagnostics or dynamic sensor data. These systems support mission critical operations, ensuring that data is sent and that commands or responses can be received in real-time. For the oil pipeline monitoring scenario, the monitoring device can act in near real-time to stop the issue to avoid failure – removing the need to deploy field technicians.

The combination of low-power hardware and variable bandwidth options allows businesses to tailor their ▶

satellite deployment to each use case's demands. This flexibility makes satellite an excellent fit across diverse IoT environments – from livestock tracking to critical infrastructure.

IoT Now: Mass-scale IoT demands connectivity infrastructure that can scale up in line with device uptake. Is satellite ready for the demands of mass-market IoT?

MO'C: Absolutely. Satellite infrastructure has matured rapidly to meet the growing scale of IoT deployments. The emergence of LEO constellations has improved bandwidth capacity and latency, allowing satellite networks to handle high volumes of devices transmitting simultaneously across vast geographies. Satellite providers can offer reliable service with predictable costs and consistent performance, critical factors for enterprises managing thousands or millions of devices.

In many ways, satellite is more scalable than cellular. Scaling a cellular network to support widespread IoT requires extensive physical infrastructure: more towers, fibre, backhaul, gateways, routers. Each deployment often comes with high capital cost and long lead times, especially in rural or underdeveloped regions where infrastructure may be limited or entirely absent.

On the other hand, satellite connectivity does not rely strictly on ground-based infrastructure to expand coverage. Once a satellite constellation is in orbit, connectivity becomes instantly available across vast geographies. New devices can be added to the network easily. This dramatically reduces deployment time and cost, making satellite a more agile solution as IoT scales globally.

Satellite also offers centralised control and uniform service quality across its footprint, eliminating the complexity of managing multiple cellular networks or negotiating roaming agreements across regions. This predictability and operational simplicity are critical for mass-market IoT deployments.

IoT Now: What do you see as the main issues affecting satellite communications for IoT in the next 12 months?

MO'C: As satellite IoT adoption accelerates, several key challenges are coming into focus. First, regulatory complexity remains a friction point, especially for global deployments. While satellite offers advantages over cellular in avoiding roaming agreements, providers must still navigate varying national regulations and spectrum licensing requirements, which can delay or limit expansion in certain regions.

Second, as the number of connected devices increases, network congestion becomes a concern. Ensuring that critical communications maintain priority while managing millions of simultaneous transmissions will require ongoing innovation in traffic management and routing protocols. Providers must also develop strategies to ensure quality of service, particularly for time-sensitive or high-value data streams.

Interoperability is another major hurdle. Although many satellite systems now support standardised application programme interfaces (APIs), fragmentation still exists across platforms and device types. Continued progress in industry standardisation will be necessary to ensure smooth, multi-vendor deployments.

Lastly, cybersecurity cannot be overlooked. With more devices online and transmitting sensitive data, the threat landscape expands. Satellite providers must invest in robust encryption, authentication protocols and monitoring systems to defend against attacks.

Despite these challenges, the trajectory is overwhelmingly positive. Competition is growing and the market is expanding. Satellite is not only overcoming legacy limitations – it's rising to meet the complex demands of next-generation connectivity at scale. ■

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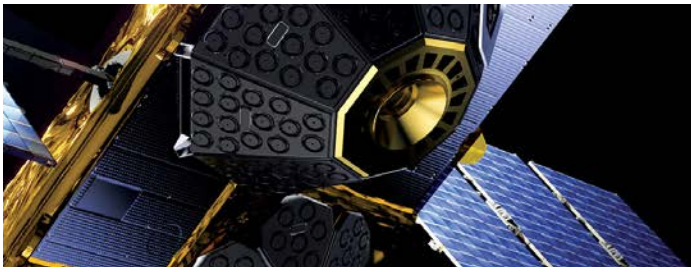
Satellite tackles the new digital frontier with ubiquitous coverage



While cellular networks (LTE and 5G) are widely utilised for IoT deployments, they fall short in remote, mobile or mission-critical environments

As industries explore new frontiers in automation, remote monitoring and intelligent operations, many are hitting a wall where cellular and Wi-Fi simply cannot reach. From offshore rigs and dense forests to sprawling farmland and disaster zones, the demand for reliable, global communication is skyrocketing. Once known for its complexity and cost, satellite technology has emerged as a key enabler of digital transformation across these challenging environments

Utility infrastructure, especially oil and gas pipelines, forms the backbone of modern industry

Historically, satellites were considered a last resort – bulky, expensive and difficult to integrate. Geostationary earth orbit (GEO) satellites, orbiting more than 35,000km from Earth, offered broad coverage but struggled with latency and required large infrastructure. That paradigm has shifted drastically with the rise of low-earth orbit (LEO) satellites.

Operating between 500 and 1,500 km above Earth, LEO satellites provide near real-time communication with lower latency. The reduced distance has enabled manufacturers to develop smaller, lower-power devices connecting to satellites without recharging batteries or requiring oversized antennas. This evolution has also slashed connectivity costs, bringing satellite technology into mainstream IoT and enterprise operations.

Why satellite operations outperform cellular in harsh environments

While cellular networks (LTE and 5G) are widely utilised for IoT deployments, they fall short in remote, mobile or mission-critical environments. Satellite connectivity offers a resilient, global alternative, especially valuable where terrestrial infrastructure is limited or disrupted.

Cellular relies on towers and fibre, which are concentrated in populated areas. This creates dead zones in deserts, oceans, rural sites and industrial locations like mines and pipelines. LEO satellite constellations, by contrast, deliver continuous, borderless coverage. Cellular connectivity often requires navigating complex roaming agreements and regional licensing. ▶

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Satellite bypasses this challenge. With a globally coordinated spectrum, satellite operators handle authorisation, not the end user, and offer predictable coverage and cost across borders.

Expanding cellular networks often means installing towers or laying fibre, which can be time-consuming and expensive. Satellite enables rapid, infrastructure-free scaling, letting businesses deploy anywhere with consistent performance.

How satellite powers essential industries

While the promise of digital transformation spans industries, its most urgent application is in sectors where operational downtime is costly, visibility is difficult and human safety is paramount. These are the environments where traditional connectivity fails and satellite-supported Internet of Things (IoT) has become helpful and essential.

Pipeline monitoring: utilities need eyes everywhere

Utility infrastructure, especially oil and gas pipelines, forms the backbone of modern industry. These systems often stretch across remote terrain, crossing deserts, mountains and regions with limited or no cellular connectivity. Monitoring this infrastructure is critical not only to protect against corrosion, leakage or pressure failure but also to comply with strict safety regulations and environmental standards.

Traditionally, operators relied on manual inspections and periodic maintenance, which introduced a significant lag between issue and response. IoT has changed that by allowing for continuous, real-time monitoring, but only if connectivity is constant. That's where satellite becomes a game-changer.

Globalstar and MOBILTEX: Keeping pipelines protected

MOBILTEX, a provider of cathodic protection monitoring, faced this exact challenge. Its CorTalk RMU1 system is designed to monitor pipeline health, but many of the locations where pipelines run are far from reliable cellular coverage. To ensure data could be transmitted regardless of location, MOBILTEX turned to **Globalstar**.

By integrating Globalstar's STX3 satellite modem, MOBILTEX enabled real-time communication from its CorTalk units, even in the most isolated regions. The result? Pipeline integrity data is now instantly available via the CorView cloud platform, alerting operators to irregularities before they become problems. This not only boosts safety and compliance, but drastically reduces the need for field inspections – saving time and money, and reducing risk.

Ocean research: Precision matters at sea

Scientific research, particularly in oceanography and climate science, depends on highly accurate, continuous environmental data. This data helps predict weather patterns, manage marine ecosystems and guide public safety responses, such as oil spill containment and search-and-rescue operations. As ocean activity increases – through wind farm development, shipping lanes, and offshore drilling – the need for precision has never been greater.

IoT has empowered researchers to capture real-world, real-time data with unprecedented frequency. But at sea, cellular is not an option, and even radio-based communications can be limited by range and interference. Satellite connectivity ensures that research can continue regardless of location or conditions.

Globalstar and WHOI: Mapping ocean currents in real-time

The **Woods Hole Oceanographic Institution** (WHOI) recently partnered with NOAA to better understand how ocean current radar signals are affected by offshore wind turbines. To validate radar models, WHOI launched a fleet of low-cost 'drifters' into the ocean, each equipped with Globalstar SmartOne C GPS trackers.

These devices transmitted location data in real-time, allowing researchers to compare actual drift patterns with radar-based predictions. This effort helped NOAA refine its radar systems and ensure that new offshore infrastructure wouldn't compromise data accuracy.

Globalstar's role was critical – without satellite, the data would have been delayed, incomplete, or simply inaccessible. In this case, IoT and satellite weren't just supporting science – they were actively enabling better environmental protection, maritime safety, and research accuracy.

Smart ranching: Data-driven agriculture in action

Agriculture is undergoing a digital revolution. As farmers face labour shortages, climate variability and growing demand for sustainable practices, IoT has emerged as a powerful tool for monitoring animal health, improving resource efficiency, and increasing productivity.

But much of the agricultural world exists beyond the bounds of reliable terrestrial networks. Livestock can roam for miles, equipment moves across remote pastures, and the need for mobile connectivity is constant. Satellite provides the link that cellular simply can't.

Globalstar and FindMy: Rethinking livestock management

FindMy, based in Norway, has developed a direct-to-satellite smart collar for livestock. These lightweight devices monitor an animal's location, movement and behaviour using onboard sensors and GPS – and it relies on Globalstar's STX3 chip for connectivity.

Unlike traditional systems that offer aggregate herd data, FindMy gives ranchers a granular view into individual animal health, feeding patterns and unusual behaviour, such as illness or injury. It also enables ranchers to geo-fence their livestock – essentially, defining an area in which they want their livestock to graze.

The combination of rugged hardware, intelligent data and reliable satellite connectivity gives ranchers the tools to work smarter, not harder – regardless of geography.

Across environments, one constant: Connectivity

Whether it's critical infrastructure, scientific researchor sustainable agriculture, the common thread is clear: modern operations require uninterrupted access to real-time data. That means connectivity can no longer be a constraint.

These case studies underscore the growing role of satellite in enabling industries to operate with greater safety, precision, and efficiency – far beyond the reach of fibre, Wi-Fi or cellular. And as satellite hardware gets smaller, cheaper and easier to integrate, the question is no longer "why satellite?" – it's "why not?"

Learn more about Globalstar and how satellite connectivity can power innovations from the ground to the stars. ■