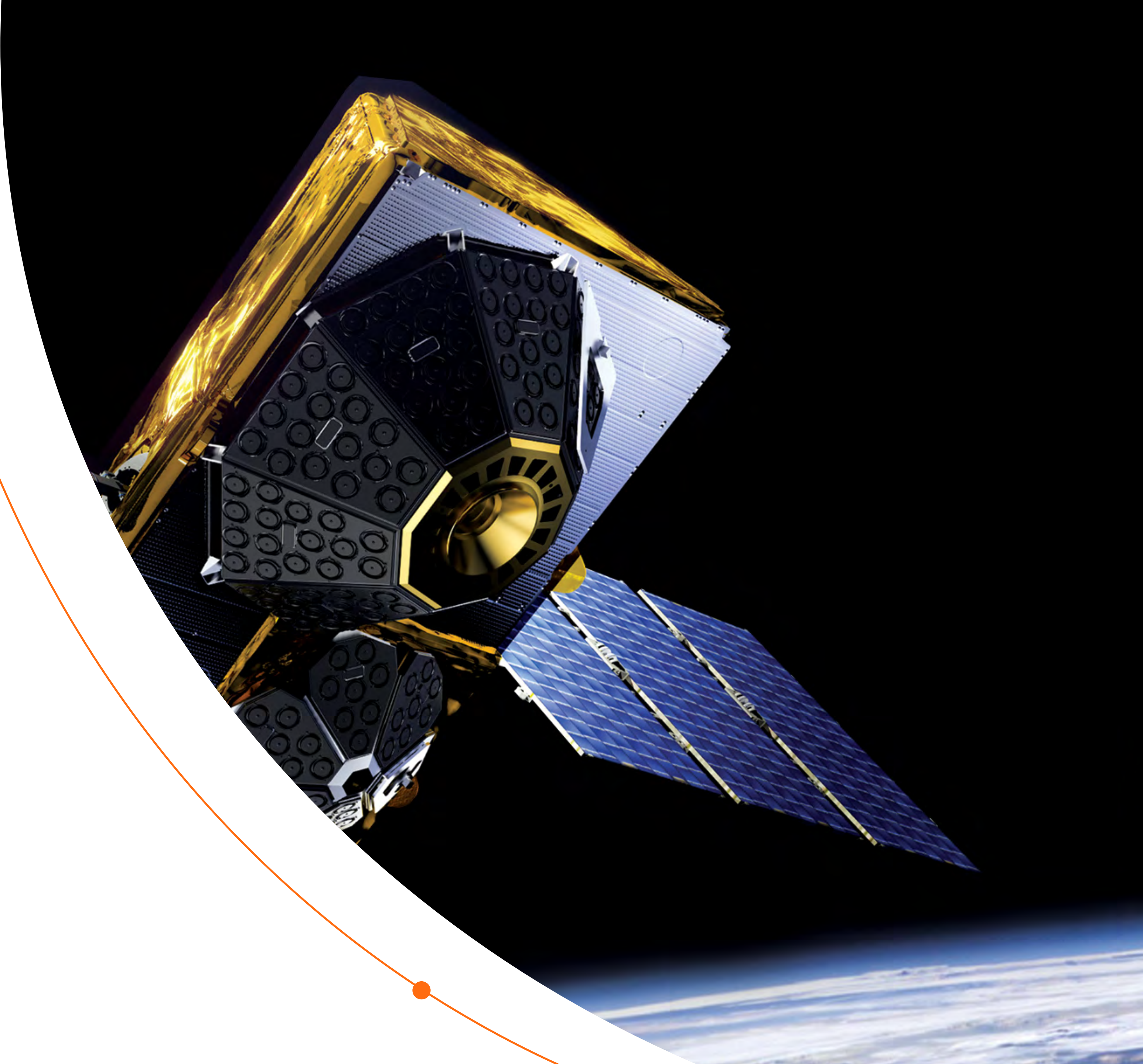# Globalstar™

EBOOK

How Space Will Transform IoT and Mobility in 2025

New LEO constellations are making the headlines. But innovation in proven LEO services will keep delivering the goods in 2025 and beyond.

In the 1990s, massive low-Earth-orbit (LEO) constellations from Iridium and Teledesic promised to change the world – but failed. Today, the unparalleled success of Starlink at delivering consumer and business broadband from space has written a new story, and much more is expected from Eutelsat OneWeb in 2025 and Amazon Kuiper in 2026 and beyond.

But for all the excitement the companies are generating, they are not the first one or the only ones to operate satellites in LEO. The broadband market they serve is not the only market where satellite connectivity is having a transformative impact here on Earth.

This eBook introduces you to the proven use of LEO in Internet of Things (IoT) applications and its new expansion into mobile communications.

The global IoT services market, which began to accelerate in 2008, is forecast to grow at double-digit rates to surpass $560 billion by 2029. Adding satellite connectivity to cellular services, though now in its infancy, is expected to generate nearly $17 billion in revenues in 2028. McKinsey estimates that IoT applications will have a total economic impact of up to $3.3 trillion by 2030.

The Power of the Message

For decades, Globalstar has been in the business of transmitting short bits of text over a network of satellites in low Earth orbit. Each message uses only a microscopic fraction of the capacity of the network – which means user devices and airtime can be very cost-effective. While small bits of transmitted data might not have a large impact on the network, they have a very large impact on the use cases leveraging this data.

Location, Location, Location

Information as simple as exact location can have high value. In the trucking industry, 3 million Class 8 big rigs pull 9-15 million trailers on North American roads. That's two to three trailers for every truck, which means that companies may have hundreds of unpowered trailers – most of them sitting in their yards or at a customer location – but not know exactly where each of them is. As a result, companies can potentially waste thousands of person-hours tracking them down and renting or purchasing additional trailers just to make sure they can meet customer needs.

One transportation company attached Globalstar solar-powered asset trackers to its trailers and used a web-based mapping application to track them. This data saved $100,000 per year over the cost of manually mapping the location and identity of its trailers. With exact location data in hand, the company went on to eliminate rental of 100 trailers costing it $900,000 per year and cancel a purchase order for another 40 trailers, saving $1.2 million.

Not bad for a short text message consisting of a device ID and numbers for latitude and longitude.

Watering the Herd

Most of us know little about the places where our food comes from. One of these is the ranch. Ranches are big because it takes one acre of land (0.4 hectares) to support a single cow, two sheep or up to three goats. Large herds may need hundreds or thousands of acres. They also need water: in hot weather, cattle that go without water for more than six hours see a measurable reduction in growth.

On most ranches, that water is stored in tanks, which are refilled by rainfall and by water pumped from underground aquifers. Those tanks are always at risk. Leaks in the tanks or pipes that supply them may drain them dry. Pumps can fail or local wells run dry. On a large property, ranchers can waste hundreds of hours a year simply driving to check on water levels in their tanks, let alone doing anything to fix the problems they find.

A company called Ranchbot integrates a Globalstar modem module into a solar-powered water level monitor that ranchers can buy online and install themselves in 15 minutes. The module periodically transmits the identity, location and water level of the tank to Globalstar, which translates that data for delivery to Ranchbot's customer platform.

One happy customer summed up the value this way:

"

Ranchbot has been one of the best tools we ever acquired. It has saved us countless hours, electricity bills and water. The ability to see how much water is in your tank, at any time of the day, and to receive alerts when you get a leak has been amazing.

"

From Your Hand...to Infinity!

The newest and potentially most exciting development in space-based communication is direct to device or D2D. That's shorthand for giving your mobile phone the ability to connect to a satellite many hundreds of miles overhead. In theory, it is the ultimate answer for eliminating cellular dead zones in places with few people and challenging terrain. D2D is just beginning to be put into practice, and Globalstar is leading the pack.

How is D2D possible?

The famed science-fiction writer and futurist Sir Arthur C. Clarke once wrote that "If an elderly but distinguished scientist says that something is possible, he is almost certainly right; but if he says that it is impossible, he is very probably wrong." D2D service is a prime example. Radio-frequency experts dismissed the idea that phones designed to connect to a cell tower a few miles away could ever exchange traffic with satellites hundreds or thousands of miles away in Earth orbit.

Then, at the end of 2023, it was announced that owners of the iPhone 14 or later models running IOS 18 would have free access to a D2D text service. If they found themselves outside cellular coverage, the little signal-strength bars would be replaced by the letters SOS to show that they had a satellite option for emergencies. D2D is not yet ready to handle voice calls, much less the data-intensive services we are used to running on our mobile phones.

But the people of our planet <u>send 23 billion text messages every day</u>. D2D service means that they never need to fear being completely without connectivity.

The satellite connection is provided by Globalstar over its network of 24 low-Earth-orbit satellites. In a deal announced in November 2023, Globalstar is building an additional 26 satellites to expand its ability to carry D2D traffic, which will begin launching in 2025. It took superb engineering on the space and terrestrial sides of the service to make it work, but it is available now, while other companies are still working to get their technology online.

But will it pay?

One of the big questions about D2D service is whether users will be willing to pay extra for it. <u>In a survey of 1,000 people in ten countries by the mobile association GSMA,</u> two out of five mobile subscribers said they would not pay extra for direct-to-satellite service. On the positive side, that means 60% of subscribers see enough value in the service to pay more, though half of them set the limit at a 5% increase.

But it may not matter to the mobile phone industry. If the availability of D2D service – and the increasing capacity it will offer in the future – persuades customers to upgrade their phones sooner than they would have otherwise, the extra sales can be worth a lot to handset makers. In that model, manufacturers and mobile network operators would need to control the costs of providing that D2D capability. By lowering the stakes, Globalstar is helping them experiment with meeting the market's evolving needs.

Spectrum Demand, Spectrum Supply

When space-based communication was reserved for giant antennas and big companies, there was plenty of radio-frequency spectrum to go around. But as applications like messaging, D2D and broadband have multiplied, there are rising concerns that available spectrum will not be enough.

On the ground, unlicensed spectrum in the form of Wi-Fi and Citizens Broadband Radio Service (CBRS) have come to the rescue, using technology that lets many users share the same frequencies. But even there, widespread deployment has led to rising interference that affects the performance of networks located in high-density areas.

Spectrum is Key

Since its founding, Globalstar has made reliable, interference-free access to spectrum a top priority. It has been 30 years since Globalstar was awarded exclusive mobile satellite service (MSS) licenses on our satellite spectrum, and the US FCC recently reaffirmed them for another 15 years. The S-band spectrum Globalstar uses to transmit signals from satellite to Earth is similarly protected.

More recently, Globalstar has commercialized Band 53 for 4G/LTE and Band n53, a rare swath of mid-band spectrum for 5G service not owned by a wireless operator. It offers integrators, enterprises, governments, carriers and cable companies a versatile, fully licensed channel to improve their customer's wireless connectivity across multiple geographies.

Band n53

Band 53 (LTE) and Band n53 (5G) are available to partners for the deployment of private networks requiring strong security, reliable performance and high capacity. Private networks using them provide easy-to-deploy, campus-wide wireless connectivity for voice, video, IoT, internet and push-to-X services for –

- Industrial and power plants

- Ports, warehouses and logistics facilities

- Critical infrastructure

- Offshore energy platforms

- Corporate, hospital and university campuses

- Entertainment venues, stadiums and shopping malls

- Mines and farms

For private networks, Band 53 (LTE) and Band n53 (5G) offer performance and value superior to both Wi-Fi and 4G/5G Citizens Band Radio Spectrum (CBRS). It is free from interference with unlicensed and licensed spectrum users, offers greater range and coverage than Wi-Fi with military-grade security, and provides more stable performance at 5G speeds and throughput.

For MNOs seeking to add true 5G service to their networks, Band n53 offers interference-free capacity for small-cell deployment in high-potential markets without overbuilding or interfering with existing service. Multiple technology partnerships at the chipset, device and RAN system levels support these targeted investments in next-gen service.

To learn more about Band n53, visit https://www.globalstar.com/en-us/terrestrial-wireless/band-n53.
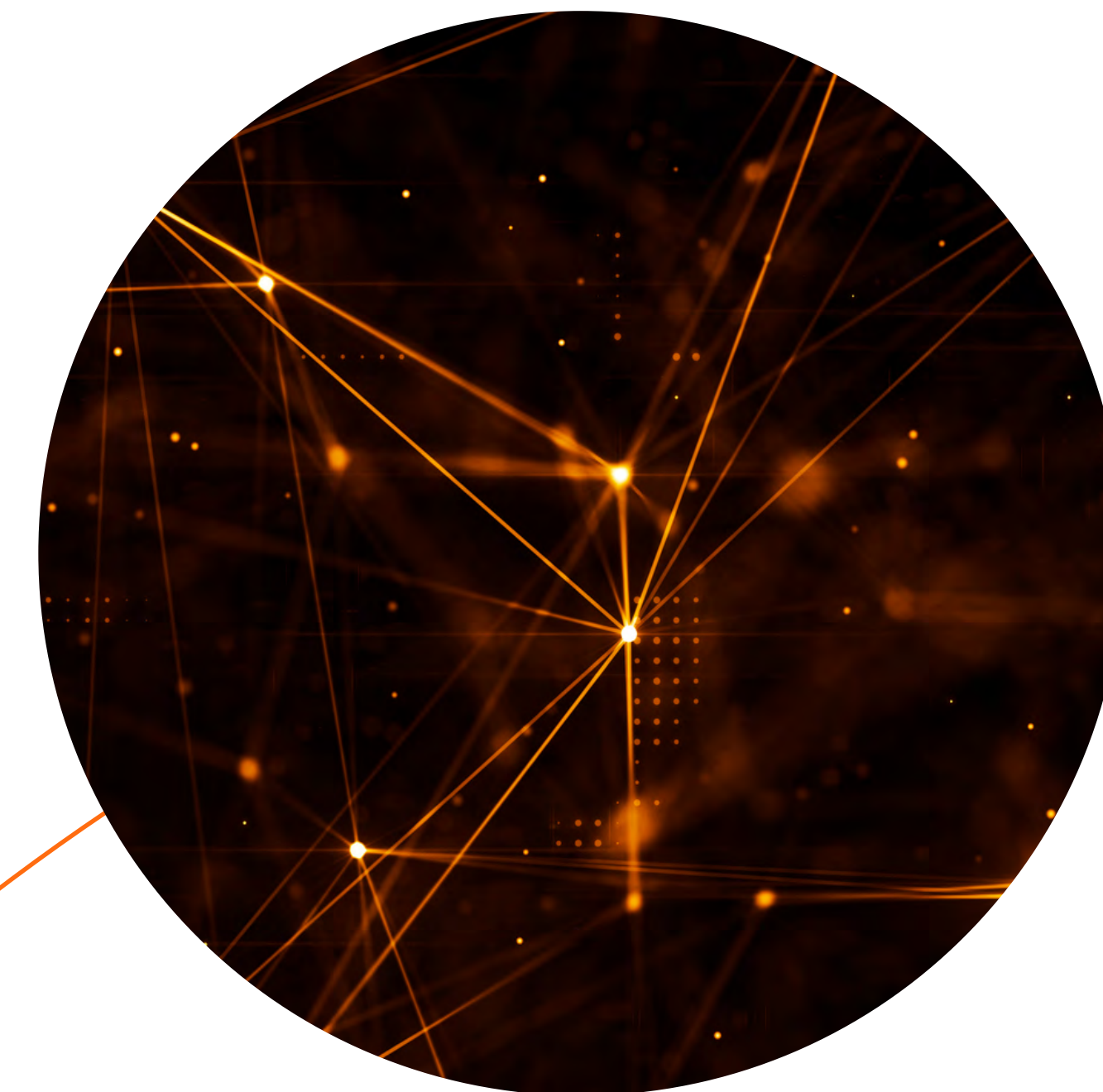
Helping Governments Cope

Governments at all levels are increasingly relying on satellite services to manage rising challenges, such as safety and security, climate change, and the delivery of services to citizens. At the military and national level, they are facing the reality that government-owned satellites cannot provide enough bandwidth to meet day-to-day requirements, let alone the surge capacity needed to deal with crisis. The commercial industry has stepped up to fill the gap.

National Security

Government-owned satellites will always dominate military and national security applications, but satellite-based IoT is handling everyday logistics needs, from asset tracking to predictive maintenance of vehicles and equipment. The US Coast Guard uses Globalstar trackers to tag abandoned vessels found at sea that can't be towed into a port. When aircraft crews or sailors report abandoned vessels they have seen, the Coast Guard can check the current location of tagged vessels and avoid launching search and rescue again for the same vessel, ensuring that SAR resources are available for real trouble.

Lone Workers

Many civilian government employees are lone workers conducting inspections, staffing remote locations and providing services in rural areas. For them and their employers, satellite messaging is a cost-effective but crucial link for safety and coordination of their work. The US Forest Services uses Globalstar messengers for its Search, Emergency Notification Devices (SEND) Program, which keeps field connected and protected during search and rescue missions.

Disaster Response

When disaster strikes, communications is vital to coordinating response and recovery. But telecommunications networks are usually crippled by disasters. Satellite messaging becomes a critical source of information and coordination for response teams in the field. Satellite-based IoT provides the location data on vehicles, generators, construction equipment, temporary housing and the thousand other things needed for effective response. In recent hurricanes striking the US Southeast and Gulf Coast, Globalstar solar-powered messengers not only offered the only reliable connectivity for field workers, they generated up-to-date location data that helped emergency managers save homes, lives and livelihoods.

Climate Change

Governments fund an army of researchers working to understand climate change, improve predictions and validate strategies to mitigate it.

One arctic research program tracks the movements of icebergs from the poles using Globalstar trackers to amass valuable data on polar melting. Their compact design and long battery life makes them practical to deploy via drone onto icebergs. They report GPS coordinates once per hour for display on our online digital mapping service, and their low cost makes it affordable to replace the devices whenever the rolling motion of bergs dumps them into the sea.

To learn more about Globalstar services for national, state/provincial and local government, visit https://www.globalstar.com/en-us/industries#industry-Government--Public-Safety.

Business Model Tested by Time

Beginning in 2020, private-sector investors began putting serious money into space ventures. According to Statista, total private investment in space ventures from 2000 to 2021 amounted to more than $52 billion. It went into everything from rocket launch and satellite constellations to in-orbit manufacturing and laser communications. For most of the companies, however, it took a decade or more for that funding to turn into products and services.

In the meantime, Globalstar launched its services in 2000 using an LEO constellation of 48 satellites and a "bent-pipe" architecture that enabled the satellites to be simple, robust and reliable, while the intelligence of the network was housed safely on the ground. Over the past quarter-century, Globalstar has validated a business model based on cost-effective services, technology flexibility and partnership with integrators and resellers who know their markets inside and out. That's how Globalstar technology is at work in places as diverse as ear tags on cattle, big rigs on the road, buoys drifting at sea, wellheads in the desert, and people doing hard jobs well in the midst of wildfires, on mountain slopes and farmland stretching as far as the eye can see.

To learn more about Globalstar, visit https://www.globalstar.com/en-us/about/our-technology.

Globalstar.com

Ready for Transformation?

The future of satellite connectivity in IoT is exciting and easily attainable. This eBook has explored how mobile communications are leveraging connectivity of the stars to enhance and expand services for their customers.

Some of those opportunities involve broadband and thousands of satellites, but others are about the power of small bits of data to achieve big things.

Ready to turn data into action? Reach out to learn how we can help transform your operations for the better with affordable, reliable and secure data from space, visit www.globalstar.com for more information.

Globalstar™