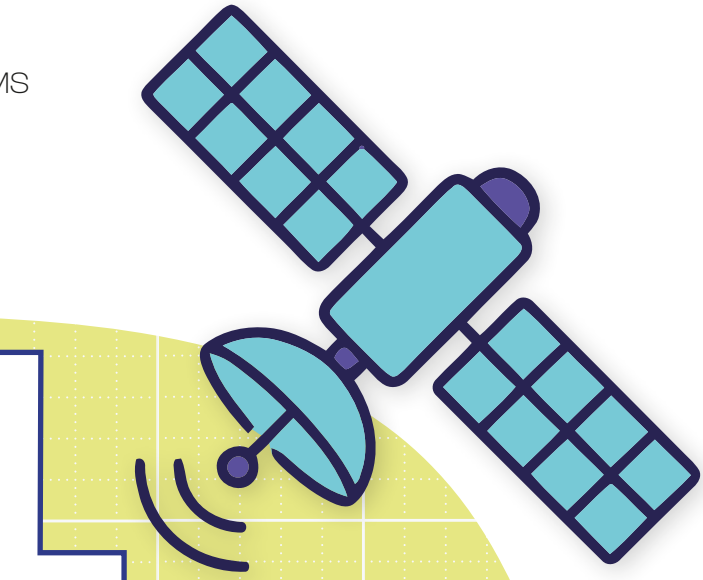
ALL MAPPED OUT







LAST MILE IS ONE OF THE COSTLIEST ASPECTS OF DELIVERY, AND GETTING IT RIGHT IS INCREASINGLY DEPENDENT ON GLOBAL NAVIGATION SATELLITE SYSTEMS. **PAUL WILLIS** DISCOVERS HOW THE TECHNOLOGY IS HELPING LOGISTICS OPERATORS SAVE TIME AND MONEY

According to recent statistics from WifiTalents' 2026 *Transportation Logistics* report, last-mile delivery eats up 53% of total e-commerce fulfillment costs, caused in part by rising fuel costs – which account for 30% of last-mile delivery expenses globally. And it is no wonder the cost of running a fleet is going up when the same report shows 30% of last-mile drivers face traffic delays daily.

Utilizing technology to help with better route optimization and visibility in the last mile is vital to keep costs down and ensure a better customer delivery experience, and many logistics operators are turning to global navigation satellite systems (GNSS) to do just that. In fact, WifiTalents' statistics show that 62% of companies use GNSS tracking for last-mile visibility.

"Over the last decade, GNSS has evolved from a handy navigation tool to a critical operational technology for the logistics sector," says Manuel Del Castillo, VP at GNSS software developer Focal Point Positioning. "Today, positioning data underpins almost every stage of the delivery process."

THE DANGERS OF SPOOFING AND JAMMING

The heavy reliance on GNSS technology in logistics poses an obvious concern – what if the system were to break down?

A UK government report designed to answer this question found that, as of 2023, the impact of a loss of GNSS for seven days was estimated to be £7.64bn (US$10.29bn), while the economic impact of a loss for just 24 hours was costed at £1.42bn (US$1.91bn).

"There's a very big, connected group of people who are relying on the accuracy of GPS," says Lisa Dyer, executive director of the GPS Innovation Alliance, which promotes the use of GPS and related technologies.

While the catastrophic failure of global GNSS seems unlikely, the system is nonetheless vulnerable to the impact of outside interference.

Dyer says that air freight companies carrying cargo internationally must take account of the threat posed by jamming and spoofing.

Both jamming, when a navigational signal is blocked, and spoofing, when a rogue signal imitates the real satellite signal, have become more of a concern because of the increase in global conflicts.

"One of the great benefits of GPS is it provides the most efficient route," comments Dyer. "Particularly as we're looking at fuel shortages and increased fuel prices, that's a huge benefit for companies. So, if a logistics provider suddenly doesn't know where they are and they're adding extra time and extra fuel to that delivery, that ultimately impacts the end customer."

These concerns are not just hypothetical. In 2024, Finnair temporarily stopped flights to eastern Estonia for one month after GNSS interferences twice forced its planes to turn back. Estonia claimed the interference was caused by Russian electronic warfare activity associated with the war in Ukraine.

Dyer meanwhile points out that a recent Notice to Airmen put out by US aviation authorities warned of potential GPS interference in southern Sweden because of the Russia-Ukraine conflict.

GNSS – the generic term for satellite systems that provide geospatial positioning, and which includes regional variants such as GPS – is integral to delivery location, route planning, fleet management, proof of delivery and customer tracking.

Much of GNSS investment is in the field of telematics – the combination of telecommunications technology and information systems. Telematics can be used to provide a parcel company with data about its fleet, including speed, fuel consumption, engine health and driver behavior.

Nearly every major postal service relies on the technology, with the United States Postal Service (USPS) using it to manage the movement of its fleet of more than 12,000 third-party contractor trucks carrying its bulk mail.

According to a study by the US Office of Inspector General, the postal company's watchdog, USPS uses GPS to measure trailer usage, provide location visibility, estimate time of arrival, optimize travel routes and improve service.

USPS spokesman Jim McKean explains, "USPS uses GPS technology to support day-to-day operations and improve service reliability. GPS data helps confirm that packages are delivered to the correct location by providing location context at the time of delivery, which can be useful for delivery verification and resolving customer inquiries.

RIGHT: USPS uses GNSS technology to track its fleet



Matt Gush – stock.adobe.com

"It also supports visibility into the location of USPS logistics trucks, enabling operational teams to monitor transportation movement and provide more timely, real-time updates when conditions change.

In addition, McKean adds, GNSS technology aids USPS with route planning and navigating to delivery points, noting that "GPS is one of several tools USPS uses to enhance situational awareness, improve efficiency and help ensure mail and packages reach the right destination."

Last-mile delivery accounts for 53% of e-commerce fulfillment costs

WiFiTalents

> "GPS IS ONE OF SEVERAL TOOLS USPS USES TO ENHANCE SITUATIONAL AWARENESS"
>
> **Jim McKean,** USPS

Impact of inaccuracies

According to Del Castillo, the dependence on GNSS has grown alongside the steady rise in e-commerce globally.

"As delivery volumes have increased, operators have become more reliant on technology that promotes both efficiency and cost control," he says. "Reliable positioning is no longer just about helping drivers find an address; it forms the foundation of many of the digital systems that support modern logistics operations."

While threats to the GNSS network from attacks by hostile actors lay bare the risk of this heavy dependence on the technology, a more immediate concern for parcel carriers is the economic impact of more localized inaccuracies.



"When positioning data is inaccurate, the effects can ripple through the entire delivery chain, impacting schedules, productivity and customer satisfaction," continues Del Castillo.

While most people think that GNSS data is largely accurate, the standards of accuracy required for delivery operations are much higher than for most use cases of the technology.

"For many consumers, GNSS appears to work reasonably well," Del Castillo asserts. "If a smartphone can guide someone to the right street or a nearby restaurant, the technology is generally considered accurate enough. However, logistics operators are often working to far stricter requirements.

"A positioning error of a few meters may be inconsequential for a consumer but can be highly significant when trying to locate a specific delivery point in a dense urban environment.

"In reality, GNSS performance can vary considerably depending on the environment. In open areas, accuracy can be excellent. In dense city centers, however, reflected signals, obstructions and interference can introduce errors that are largely invisible to the user," Del Castillo adds.

Built-up environments such as 'urban canyons', where tall buildings line streets, can negatively affect navigation accuracy and are "one of the biggest challenges facing GNSS performance today," according to Del Castillo.

In these environments, the satellite signals can be reflected by glass, steel and concrete before reaching the receiver, forcing it to process multiple reflected signals and leading to inaccuracies.

"For a delivery driver, that error might mean being directed to the wrong side of a building, arriving at a rear service entrance rather than the front door, or appearing on the navigation system to be somewhere different from their actual location," he explains. "These may seem like minor issues, but they cause delays that accumulate throughout the day.

"When you multiply those lost minutes across hundreds or thousands of vehicles, the operational impact becomes significant."

> **"RELIABLE POSITIONING ... FORMS THE FOUNDATION OF MANY OF THE DIGITAL SYSTEMS THAT SUPPORT MODERN LOGISTICS OPERATIONS"**
>
> **Manuel Del Castillo,** Focal Point Positioning



RIGHT: GNSS helps with more accurate route planning

BELOW: Reliable positioning data facilitates more efficient last-mile delivery

Fuel accounts for 30% of last-mile delivery expenses globally

WiFiTalents



Real-time corrections

In recent years, several companies have emerged to solve the problem of local inaccuracies, including Swift Navigation, a San Francisco-based tech company that develops high-precision positioning software.

The company's flagship product Skylark, a cloud-based service that corrects inaccuracies in GNSS, is used in the background in millions of applications around the world.

"GPS is far less accurate than you think it is," says Holger Ippach, chief operations officer at Swift. "If you take a standard positioning system you often get errors, typically in the range of several meters."

According to Ippach, Swift's software uses a cloud-based model that allows for devices to correct for errors in real time, bringing accuracy down to the centimeter level.

The company's technology is already used in hundreds of thousands of autonomous vehicles, with its high-accuracy GNSS providing a backup for visual navigation systems like lidar and onboard cameras.

While it does not publicize which OEMs it has contracts with, Swift says that its GNSS technology is integrated into the advanced driver systems of more than 20 leading automotive OEMs and Tier 1 suppliers, and is fitted to hundreds of thousands of commercial and industrial vehicles worldwide.

Swift has already partnered with several logistics companies, including most recently a pilot with the Singapore-based Grab, whose food delivery app is used extensively across Southeast Asia.



ABOVE: Some companies are building their own mapping solutions

The pilot, rolled out in collaboration with Oppo and Qualcomm, was designed to bring Swift's high-accuracy navigation services to Grab's urban food delivery and rideshare and taxi services in Singapore.

The partnership brought Swift's proprietary Skylark technology into Grab's mobile app. Skylark, which relies on a network of ground reference stations operated in partnership with network operators around the world, took GNSS data from the Singapore Land Authority's satellite positioning network to enable precise positioning for Grab's last-mile logistics operations in Singapore.

"We worked with Grab and Oppo to put precise positioning in Oppo handsets for use by Grab drivers, and the metrics we collected were able to provide more accurate ETAs and reduce cancellations," says Emily Pierce, Swift's VP of marketing.

The move to mapping

According to Pierce, many logistics companies looking to the future development of GNSS services in their operations are increasingly interested in mapping.

"When you start talking about delivery robots or systems that optimize delivery to the correct doorstep, you're no longer talking about just a map of the roadway, you're talking about maps that show where the entrance to a building is," explains Pierce. "These are maps that are being created now and are being made more precise."

Ippach adds, "Don't just think of maps as a graphical thing, but [as] a way of putting in objects and linking them to coordinates in some way – such as, knowing exactly where the entrance is to my home versus my neighbor's home.

"Some of the more advanced delivery companies, they're building that as proprietary data and proprietary knowledge for themselves, because it's not something that you can buy widely on the open market," he adds.

The global market for GNSS fleet tracking services will be worth

$9.34bn

by 2033

Coherent Market Insights

Further development

Going forward Del Castillo sees two important tasks facing the developers of GNSS in logistics – making the technology more accurate and combining it with other technologies to create more resilient delivery networks. He thinks the "future will almost certainly involve both," with the need for accurate positioning growing "as delivery networks become increasingly automated."

He continues, "We are already seeing technologies such as advanced signal processing, AI-driven correction techniques and sensor fusion being used to improve performance where conventional GNSS alone may struggle."

The goal is to ensure consistent and dependable positioning data regardless of the environment. "For logistics operators, the real opportunity lies in reducing the uncertainty within today's navigation systems," Del Castillo says. "More reliable positioning can help reduce delays, improve route efficiency and support the next generation of autonomous driving and delivery technologies."

The growing dependence on the technology is creating huge market opportunities for GNSS tech developers. A report produced this year by the market research firm Coherent Market Insights reveals a growing market for GNSS technology in logistics, with the global market for GNSS fleet tracking services and technologies estimated at US$4.61bn this year and expected to reach US$9.34bn by 2033.

"The whole field of asset tracking and mobile handsets is probably the newest for us," comments Swift's Pierce. "However, the traction that we've had in a short period of time has been significant, and we actually expect it to be probably the largest market."

Ippach concludes, "You have a whole spectrum of parcel delivery companies and fleets that are extremely forward thinking. We signed our first customer in that field many years ago and they're still our loyal customer. More companies are thinking in this direction. I see it as critical for being successful in this business." ■

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