THE FUTURE OF FLEET MANAGEMENT: EXPANDING USE CASES AND CONNECTIVITY REQUIREMENTS

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INTRODUCTION

The fleet management market has undergone a rapid digital transformation. The industry has evolved from simple location-based tracking to an ecosystem of advanced IoT applications that require cutting-edge cloud and communication technology. Advanced use cases, including video monitoring for driver safety, are quickly becoming standard in the industry, paving the way for the highly-anticipated future applications of commercial vehicle electrification and autonomous driving. These future use cases will drive even greater demand for advanced Internet of Things (IoT) devices, data management platforms, and, perhaps most importantly, an unprecedented level of localized global connectivity.

As fleet managers prepare for this future, many find that their internal infrastructure and connectivity services are underperforming. Many fleet operations still depend on manual processes, and many fleet management use cases continue to rely on Low Power Wide Area (LPWA) networks, even as video-based applications and other future fleet management use cases demand the throughput of 4G and eventually 5G networks. Given these developments, fleet managers in the future will require a completely different type of network and connectivity service provider, one that can offer a range of highly available networks and a connectivity management platform designed for advanced IoT applications. Local connectivity on a global scale is going to be a boon for the demands of low latency, battery-optimized connectivity that meets the increasing regulatory requirements of data sovereignty, privacy, and roaming restrictions. Choosing a connectivity service provider equipped for the future will be integral to enterprises as the fleet management market prepares for another wave of innovation and use case expansion.

USE CASE EXPANSION

The telematics space is at a unique convergence of tried-and-true use cases that will remain pivotal within the industry. In contrast, newer use cases arise, creating the opportunity to develop technologies and more accessible hardware and connectivity costs.

Traditional Use Cases

These familiar use cases will continue to have a stronghold in the industry, supporting a range of benefits from efficiency, cost-saving, and regulatory compliance adherence:

Track and Trace: Track and trace is a baseline use case for fleet management and a building block for the most advanced fleet application technologies today. At its most basic, Track and trace refers to using Global Positioning System (GPS) technology to track vehicles and assets in transit. Track and trace is a legacy use case, first made possible by the commercial introduction of GPS in 1993. By the early 2000s and with the removal of Selective Availability (SA), major companies began to rely on GPS and Fleet Management Systems (FMSs) to receive remote updates from their fleets on the road, ushering in a new age of enterprise telematics.

Improvements in cloud services, Machine-to-Machine (M2M) communications, and edge compute have greatly improved track and trace technology since its early adoption at the turn of the century. Fleet managers now have unprecedented, granular visibility into a vehicle's performance, allowing for insight into individual components of the car and a holistic understanding of the vehicle, its route, and the driver at its helm.

Regulatory Compliance: Enterprises must navigate various state and federal regulations that require fleet managers to log vehicle maintenance, driver hours of service and behavior, load weight, and more. Failure to comply with these reporting standards can lead to heavy fines or harsh penalties.

Fleet management technology can offload these data collection and analysis activities to sensors and fleet management platforms. Many fleet managers rely on LPWA networks like LTE-M to send sensor-based compliance data to FMSs that can package it into ready-made reports. This process eliminates the manual reporting tasks these regulations previously required.

Asset Tracking and Protection: Like those used to prevent vehicle theft, GPS sensors on assets can track fleet cargo movements in real time, assuring asset managers that goods are moving on their designated routes. Additionally, Condition-Based Monitoring (CBM) sensors can track a trailer's condition to protect environmentally-sensitive assets, typically using LPWA networks to relay important data points like moisture levels and trailer temperatures back to fleet managers.

Emerging Use Cases

These communication and technology advancements have created a range of cutting-edge fleet management use cases that build on the foundational principles of track and trace.

Vehicle Theft Prevention: Vehicle theft is an ever-present threat to enterprises and is increasingly likely as incidents of carjacking climb. The National Insurance Crime Bureau (NICB) in the United States recently reported that over 1 million cars were stolen nationwide in 2023, stating that vehicle

thefts have steadily grown since 2019. GPS-based sensors and FMSs that track vehicles and cargo at all times on a virtualized map are critical tools to protect company assets. GPS tracking also enables enterprises to employ geofencing, which sets virtual boundaries for a vehicle. Geofencing technology can help fleet teams stay vigilant against suspicious movements by sending real-time alerts to the proper teams if a vehicle exits the virtualized perimeter.

Driver Safety: The Federal Motor Carrier Safety Administration's (FMCSA) most recent *Large Truck and Bus Crash Facts* report reveals how truck driver behavior impacts the safety of those on the road. According to the 2021 report, at least one driver-related factor, like speeding and distracted driving, "was recorded for 32% of the large truck drivers in fatal crashes." Driver safety is a critical fleet management use case, requiring various technologies to monitor both a driver's physical state and their behavior on the road. FMS solutions often feature driver scorecards based on telematics data from sensors that monitor their average speed, lane changes, and braking. The scorecard can help coach drivers and ensure they are not driving aggressively and putting themselves or others at risk.

Telematics data can also help alleviate fatigue, a common risk factor for professional drivers. Fleet management solutions often collect relevant data to determine the most efficient routes of travel, playing a crucial role in ensuring drivers are not on routes that are too long or accident-prone.

Video Surveillance: In both driver safety and vehicle theft prevention, use cases offer a significant opportunity to integrate video capabilities. More robust connectivity through cellular as primary or failover creates a chance to mobilize video surveillance and lower hardware costs, making implementation much more possible. In both these use cases, video monitoring capabilities can capture surroundings to provide detailed insights. In driver safety, unsafe behavior can be flagged. In theft monitoring, real-time and historical data can help track down culprits and help recover equipment.

Business Process Integration: Fleet business operations have historically been forced to rely on inefficient manual processes. Yard management, for example, has been plagued by manual gatekeeping and documentation, leading to costly congestion and transport delays. According to ABI Research, 80% of transportation delays occur because of yard inefficiencies, with experts predicting that the situation could worsen as global supply chains and distribution networks become more complex.

Fleet telematics are critical in streamlining yard management and other operational processes. GPS technology, sensors, and LPWA and 4G communication enable vehicles to transmit vital data from the road to the yard, such as alerting yard managers to potential delays or cargo movements within the yard. These insights can prevent stockouts and improve the efficiency of the yard and the supply chain.

IoT APPLICATIONS, DEVICES, AND TECHNOLOGIES

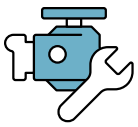
Sensor technology and wireless communication advancements have transformed commercial vehicles into epicenters of IoT innovation. A single truck can now incorporate an entire ecosystem of devices and sensors, giving fleet managers access to the workings of individual vehicle components like engines, tires, and trailers. The section below explores how IoT devices have improved remote monitoring use cases and led to new, advanced fleet management applications incorporating video.

Sensor-Based Monitoring

Many fleet management use cases require sensors to collect and send crucial performance and condition-based data to FMSs. The sensors—often placed on fallible components like tires—usually use Bluetooth® to send these data to the vehicle's Telematics Control Unit (TCU), the On-Board Diagnostics (OBD) system, or a gateway. The TCU, the OBD, and the gateway will likely use an LPWA or 4G cellular network to ferry the sensor data to a cloud-based application.

Most engine diagnostic and GPS location data go through the TCU, which is built into the vehicle by the Original Equipment Manufacturer (OEM). Other data that need to be aggregated, like data from the tires, fuel lodge, or camera system, will likely go through either a gateway, the TCU, or both.

Tires: Monitoring tire health is a crucial task for fleet managers. Using sensor data sent through a cellular connection, an FMS can alert relevant maintenance teams if a tire requires maintenance, allowing fleet managers to plan for potential downtime before an unexpected event like a flat tire or blowout occurs. Such unexpected incidents usually result in expensive in-field maintenance that can keep a vehicle out of commission for a while. According to one 2016 survey, the average fleet experiences around 97 flat tires per year, each costing around US$338.42 for downtime and replacement. This would mean that fleets spend approximately US$32,800 on flat tires annually. As a result, companies are increasingly investing in sensor-based solutions that can predict tire incidents before they happen. Geotab estimates that businesses can save 10% to 20% on maintenance costs with data-driven, predictive maintenance solutions. These solutions often work best when backed by a strong connectivity partner that can facilitate real-time diagnostic data transfers from the road.



Engines: Sensor-based solutions and telematics data can digitalize engine monitoring, saving engineers' time from the manual processes of the past. For example, an hour meter is a sensor that counts the hours an engine has been running. The sensor signals to fleet managers when maintenance is required based on the hours it records. Collecting the hour information from the meters was historically a clunky process. Staff had to log the hours from the sensor manually and only had access to the meter when the vehicle was stopped. Modern fleet management solutions and improved LPWA coverage have simplified this process, with hour meters now sending automatic hour logs to maintenance software as the vehicle runs.

Fuel: Remote fuel management gives fleet managers access to information once reserved for drivers. In the past, business owners did not have much visibility into vehicle fuel levels or the fueling process. Now, fuel sensors can send relevant data to remote teams, giving fleet managers insight into fuel levels and sending alerts if low fuel or abnormal fuel usage is detected. Telematics solutions predominately used for driver safety can also monitor for driving behaviors that waste fuel, such as speeding. Some studies have shown that fleet managers can save up to 20% on fuel and maintenance costs by investing in connected fleet management solutions. Cost savings in this area have become even more important as fuel prices rise. According to a recent American Transportation Research Institute (ATRI) report, average fuel costs per mile for fleets rose almost 54% from 2021 to 2022, the largest increase of all fleet cost centers.

Video Monitoring

Video telematics represents a leap forward in fleet management technology. New gateway technology and better cellular coverage enable vehicles to send video footage from the field to remote teams, giving rise to a new category of telematics use cases that require reliable, high-throughput connectivity. According to ABI Research, commercial video telematics solution shipments will reach 17.8 million units by 2030, with shipments growing almost 24% from 2020 to 2030.

A video telematics system typically includes a deployment of road-facing, load monitoring, back-up, or driver-facing cameras. Unlike other track and trace-related use cases that predominantly rely on LPWA networks, the use of video will require more fleets to leverage highly available, high-bandwidth networks. A fleet's camera system typically connects to a vehicle's diagnostics port or telematics gateway through Wi-Fi, Bluetooth®, or a wired connection. The chosen gateway will then likely leverage a 4G network to send relevant footage to the cloud.

Two main video monitoring applications in fleet management include asset loading and unloading monitoring and driver supervision. Both use cases escalate a fleet's connectivity and coverage requirements.

Asset Loading: Load monitoring cameras monitor employees as they load and unload cargo from a vehicle's trailer. These cameras are increasingly popular, as they can monitor cargo movements and ensure that cargo is not damaged or stolen in the docking process. The footage can also serve as evidence to exonerate employees and enterprises from any potential accusations of damage or stealing.

Driver Safety: In the past, dashcams in commercial vehicles were passive instruments, capturing footage that could only be reviewed after an incident occurred. Now, smart dashcams equipped with video analytics and Artificial Intelligence (AI) can recognize predefined events in real time. For example, AI-enabled driver-facing dashboard cameras can monitor drivers and autonomously recognize pre-defined prohibited behavior, including smoking or mobile phone use. If concerning behavior is detected, the cameras will automatically begin recording and can alert the proper teams. Forward-facing cameras can have similar triggers, recognizing potentially dangerous road conditions. Advanced Driver-Assistance Systems (ADAS) enabled by video can take driver coaching even further through real-time, in-cab alerts like forward collision or lane departure warnings.

Having footage of driver behavior and the areas surrounding the vehicle can be particularly helpful in the case of accidents. According to the U.S. Department of Transportation, 162,529 large trucks were involved in crashes in 2023. Video monitoring systems can help prevent such accidents and also protect drivers and companies from false claims should a crash occur. According to ASIS International, businesses with connected telematics solutions like in-cab dash cams can reduce insurance claims by at least 25% and crashes by around 50%. To maximize cost savings and minimize accidents, fleet managers need a reliable connectivity partner to support the throughput and coverage requirements of such advanced, video-led applications.

Shared Mobility

The shared and micro-mobility market, featuring rental rideshares, e-bikes, and e-scooters from companies like Uber and Lyft, is a relatively new fleet management vertical with unique connectivity considerations. Micro-mobility devices like rental e-scooters and e-bikes require high-uptime connectivity, as customers expect to pay for these devices through a mobile app and gain immediate access to them. This real-time transaction requires low-latency connectivity, often in urban areas crowded with other connected devices. These connected e-devices also must provide constant, real-time location data so micro-mobility companies can accurately track their scattered fleets. Locating every e-scooter and e-bike in dense urban areas requires resilient connectivity and wide-area coverage—poor connectivity or inaccurate location data could lead to missing units and loss of revenue.

These companies' shared vehicle services similarly depend on reliable mobile connectivity to complete customer transactions. The importance of flexible and reliable connectivity to this market is showcased by the recent news that Uber could potentially offer in-app Embedded Subscriber Identity Module (eSIM) solutions in the future to facilitate transactions, even in areas where customers have no mobile data.

FLEET CONNECTIVITY CHALLENGES BY VERTICAL

TRUCKING

Fleets consist of semi-trucks used for either long-haul or short-haul journeys.

LONG-HAUL TRUCKING FLEETS travel for long periods without predetermined routes.

CONNECTIVITY NEED
Given the length and complexity of their routes, these fleets rely on cross-country and international connectivity to send vehicle performance data to remote teams.

SHORT-HAUL TRUCKING FLEETS typically travel regionally.

CONNECTIVITY NEED
Though the routes are shorter, these fleet also require resilient connectivity to improve vehicle and driver productivity.

HEAVY INDUSTRIES

Fleets include vehicles in mining, oil & gas, and heavy construction.

CONNECTIVITY NEED:
These fleets depend on remote diagnostics and asset tracking to monitor the performance and location of expensive equipment, driving demand for resilient connectivity, particularly in remote areas.

NON-TRUCKING

Fleets primarily include smaller commercial and public vehicles like fleets for local delivery, utilities and services, municipalities and governments, and emergency services.

LOCAL DELIVERY FLEETS provide services within a residential or municipal region.

CONNECTIVITY NEED
These fleets require consistent connectivity to provide real-time updates on package location and delivery times to customers.

UTILITY AND SERVICE FLEETS provide telephone, cable, and utility services in local communities.

CONNECTIVITY NEED
These fleets must often immediately send a vehicle and create an efficient route once an order is received, requiring quick and reliable communications and connectivity from the road.

MUNICIPAL AND GOVERNMENT FLEETS are dispatched to accomplish a range of government business.

CONNECTIVITY NEED
Government fleets must comply with strict safety regulations, increasing the adoption of video-based driver safety use cases that require more advanced connectivity.

EMERGENCY SERVICES FLEETS include ambulances, police cars, and fire trucks.

CONNECTIVITY NEED
These fleets must have accurate navigation and routing, even in rural areas, driving demand for hyper-available networks like satellite.

SHARED MOBILITY MARKETS feature ride-share vehicles and micro-mobility devices like rental e-bikes and e-scooters.

CONNECTIVITY NEED
Micro-mobility devices require high uptime, as customers expect to pay through a mobile app and gain immediate access to a bike or scooter. Ride-share companies like Lyft similarly depend on reliable mobile connectivity to complete customer transactions.

Implementation Struggles for Advanced Fleet Management Use Cases

Fleet management use cases like asset tracking and protection, tire and engine monitoring, and video monitoring can greatly enhance a company's fleet operations and efficiency. However, like all digital transformation projects, several implementation roadblocks can slow a solution's time to market, impacting a fleet manager's ability to adopt the latest fleet management use cases.

A primary concern of fleet managers when implementing a new fleet management technology is cost. In one survey conducted by ABI Research, 45% of enterprises with fleets cited cost as their biggest barrier to tech implementation. Many also cited a lack of internal infrastructure as the biggest challenge in becoming a more data-driven organization. Purchasing the necessary infrastructure for advanced fleet management use cases—like new dashcams or thousands of new battery-powered sensors—can be a costly endeavor for enterprises that is hard to justify.

Additionally, fleet managers often do not know where to begin when trying to digitalize their fleet, with some relying on trusted System Integrators (SIs) for guidance. Vendor ecosystem confusion can also lead to vendor lock-in, as some fleet managers would prefer to have one solution vendor for tire, engine, fuel, and video monitoring use cases. Though this reduces the complexity of an FMS, it can limit a customer's choices and capabilities.

FUTURE FLEET APPLICATIONS

Fleet management applications have undergone unprecedented digital transformation in the last two decades. Use cases quickly graduated from simple location tracking to real-time vehicle performance monitoring. The fleet management industry is now preparing for another wave of innovation as fleet electrification, autonomous driving, and Vehicle-to-Everything (V2X) communication demand even better data management and wireless connectivity capabilities.

Electrification Considerations

The transportation industry is in the midst of an electric revolution. Commercial fleets are transitioning to Electric Vehicles (EVs), with forecasts predicting that 3 million commercial EVs will be on the road worldwide by 2030. Fleet operators who have yet to make the switch are preparing for this approaching transition by collecting reams of data from their diesel or gasoline-run vehicles, seeking to understand their fleet's average mileage, fuel capacity, and fuel consumption to anticipate how their routes will change when adopting EV vehicles. Fleet operators must also collect and analyze data about fleet engine health and vehicle lifecycles to determine the best time to retire their fuel-based vehicles. Fleet electrification has, therefore, created enormous amounts of telematics data, driving demand for advanced cloud applications that can do this type of analysis.

Low latency in EVs is crucial for enhancing the responsiveness and reliability of real-time communication. This includes reducing data transmission errors, ensuring data integrity, and enabling vehicle systems to react quickly to changes in the environment, potential malfunctions, and road safety situations. By improving latency, EVs can better manage critical functions like adaptive driving assistance, collision avoidance, and other safety systems, thereby improving overall vehicle performance and safety.

Autonomous Driving

Creating autonomous trucking and commercial fleets has become a significant strategic goal for vehicle OEMs like Volvo. While fully autonomous vehicles are nowhere near the point of mass adoption, glimpses of a driverless future can be gleaned from current ADAS solutions with semi-autonomous features like automated steering. Categorized as Level 1 or Level 2 automation, these current ADAS solutions already require a complex array of sensor, video, and computing technology to partially aid the driver. Levels 3, 4, or 5 automation, where a vehicle can monitor and respond to the exterior environment without much or any human supervision, will require even more advanced technologies and will create an unprecedented influx of telematics data for fleet managers to use. In the future, enterprises will require ultra-reliable connectivity for the anticipated levels of data transmission.

V2X Communication

V2X is a communication technology that enables a vehicle to transmit data to different devices in its environment, including infrastructure like road signs and other vehicles. The V2X communication vision is ambitious and predicated on an unprecedented level of connected things sharing the same communication protocols. If established, V2X communications would improve road safety and result in more efficient traffic coordination. Seen as a major use case for smart cities, V2X has the potential to transform the entire transportation market.

Connectivity is the cornerstone of future V2X endeavors. Vehicles will need the support of widespread, low-latency cellular networks to communicate with each other and surrounding connected elements. V2X use cases will necessitate widespread 4G or 5G connections, with 5G's advanced speed and low latency likely providing better support to the large-scale use cases envisioned by V2X proponents.

CONNECTIVITY IS KING IN THE FUTURE OF FLEET MANAGEMENT

All future fleet management use cases—including the near-term electrification of vehicles or the far-off V2X vision—will result in a massive increase in telematics data. Funneling that data from vehicle gateways to cloud applications will require wireless communication companies that can provide uninterrupted connectivity.

Traditional approaches simply cannot fulfill the demands of next-generation telematics use cases. Mobile Network Operators (MNOs) deliver critical network services, but the scope of MNOs is severely geographically limited. IoT Mobile Virtual Network Operators (MVNOs) have been uniquely equipped for the tasks of more agile connectivity services by delivering more consistent coverage through a more globalized, agnostic approach, but can also be limited by dependency on MNOs, technology and logistical hurdles, and a lack of infrastructure ownership.

What emerges is a new kind of IoT Software-as-a-Service (SaaS)-based service provider that leverages a unique, core network-owned infrastructure that is cloud-based that extends coverage from MNOs across the world through local Points of Presence (PoPs) for localized global connectivity. Advanced cloud-based connectivity management platforms give flexibility and cut the ties of legacy Connectivity Management Platforms (CMPs) to empower organizations to have real-time insights and control over deployed devices.

ABI Research forecasts that data and analytics services revenue in the fleet management market will reach nearly US$75 billion in 2030, underscoring the need for strong connectivity partners that can support the industry's data-driven ambitions.

Network Types & Requirements

4G LTE networks are a dominant connectivity choice for fleet management use cases, especially as 2G and 3G networks are now being sunset around the world. The wide adoption of 4G, its consistent coverage, and versatile throughput options can support a range of higher-throughput fleet management use cases like cargo tracking, fuel management, and video-based use cases like driver behavior monitoring. LPWA networks like LTE-M and Narrowband IoT (NB-IoT) are a cost-effective choice for low-data asset tracking and remote monitoring use cases.

However, LPWA and 4G networks can seem limiting for fleet applications when compared with 5G networks. 5G networks have exponentially faster data speeds than 4G networks and ultra-low-latencies, but its slow adoption and inconsistent geographical coverage has limited its impact on the fleet management market. However, it can be easier to adopt this developing connectivity technology through a network provider that owns the core network infrastructure as a more direct approach. The piecemeal rollout of 5G can create hurdles when trying to tie together an approach that leverages multiple network providers or MVNOs. A robust network provider can provide service using multiple MNOs within a region—in a sense, aggregating the 5G rollout of each one to maximize 5G coverage nationwide and globally.

5G adoption will slowly grow in the near term when more network rollouts occur and advanced fleet use cases like video monitoring and autonomous driving make headway in the market. Satellite connections will also steadily increase in the fleet management market, as being connected continues to be critical for fleets in remote areas with limited cellular coverage.

Importance of Coverage and eSIM

Commercial trucking fleets often traverse geographical areas that offer varying levels of cellular coverage. Fleets can travel through rural and metropolitan areas and across borders, entering and exiting regions with different national operators and 4G, 5G, or LPWA coverage and availability. These vehicles must have connectivity throughout, as many fleet management use cases require uninterrupted, real-time insights into the vehicle's location, health, and performance.

Given these requirements, it is natural that MVNOs would be fleet management partners. MVNOs specialize in aggregating operator profiles on a single Subscriber Identity Module (SIM) and aggregating connectivity from different operators' networks on a single profile. This enables a device to seamlessly move between carrier networks, creating an uninterrupted chain of connectivity across various regions and countries.

Cross-carrier connectivity has become even more flexible as MVNOs have transitioned to eSIM. eSIM allows customers to remotely provision SIM cards after the point of manufacturing, meaning that customers can activate devices, and provision them with new carrier profiles, Over-the-Air (OTA) and, ergo, remotely. The technology eliminates physical SIM swapping, and network profile lock-in, allowing users and their MVNO suppliers to dynamically change networks depending on their needs. Fleet managers can now easily change their devices' network profiles depending on a fleet's route, or uniformly administer remote updates to a large group of devices.

This "touchless," single-Stock Keeping Unit (SKU) approach to global connectivity is not only capable of switching networks OTA, but can also support adherence to data sovereignty and localized access, while removing dependency on roaming.

What combines the strengths of an Embedded Universal Integrated Circuit Card (eUICC) with remote, automatic switching on networks is a Multiple International Mobile Subscriber Identity (multi-IMSI) approach that leverages eUICC. A multi-IMSI technology solution is all managed through a single connectivity provider, which holds the existing relationships with multiple network operators, each providing its international mobile subscriber identities, and then held in a single SIM. When devices need additional coverage or a network fault is detected, these profiles can be switched OTA, allowing for remote SIM provisioning of the new IMSI, in real time.

This easy management and uninterrupted coverage will become even more impactful as fleet management use cases require more real-time data processing and decision-making. As a result, more fleet managers will seek out a partner with nationwide coverage and a global footprint that supports connectivity in as many countries as possible across all network types, including 2G, 3G, 4G, 5G, NB-IoT, and LTE-M network coverage.

CONNECTIVITY AND PLATFORM PROVIDERS

Enterprises can take several approaches when crafting a connectivity strategy for their fleets. Companies can purchase connectivity and a CMP separately, or they can buy a bundled connectivity and CMP offering from an operator or MVNO. Each approach has advantages, but purchasing both elements separately, or buying from an MNO, can be limiting for fleet managers when facing a new range of applications that require guaranteed connectivity and uniform management.

Purchasing Connectivity and Platform Separately

Purchasing connectivity and a CMP from two separate suppliers is an approach that can be leveraged in the industry. If an enterprise has specific demands for both its connectivity and management

platform, and is aware of all the available suppliers, it can feel empowered to handpick the two offerings it believes are best for its company goals. Companies that purchase the two separately typically lean on SIs to guide and integrate their purchases.

Purchasing connectivity and a CMP from two separate suppliers leaves enterprises in a scenario where the dependency on SIs to guide and integrate their purchases can arise. Only a limited number of companies choose this option, as merging a connectivity offering with a separate connectivity platform requires an immense amount of time and money, and has a great risk of failing if the wrong supplier is chosen or the systems are not tightly integrated. An enterprise that chooses this option must integrate different operator connectivity profiles on a single, third-party platform to ensure device visibility and control across networks and coverage areas. These integrations would be extremely complex and time consuming.

As a result, this option is mostly reserved for large companies with a strong incentive to control every part of their connectivity and platform system, and may simply have been an inconvenient necessity in the early days of fleet management when no end-to-end suppliers existed. Today, however, most companies choose an end-to-end supplier that typically provides a bundled connectivity and CMP offering.

Particularly when leveraging a company that specializes in CMPs, especially one that can provide customers with SIMs (either multi-IMSI or eUICC), this creates a streamlined, fast time to market approach. In addition, when selecting a provider, being able to "bring your own connectivity" enables customers to bring their own IMSIs to integrate into the provider's SIM profile and CMP. In doing so, there is no need for an external SI.

Purchasing Connectivity and a Platform from an MNO

MNOs are often large organizations with an extensive history of providing connectivity to a range of enterprises and consumers. Fleet managers might look to an MNO's experience and be enticed by their bundled connectivity and platform options, particularly if a fleet is expected to stay in the home country of a national MNO. MNOs have also traditionally promoted themselves on the grounds of longevity, as they have been in business for so long. They are, therefore, likely to be in the market to support a fleet manager for the duration of their vehicles' lifetimes.

However, there are several drawbacks to this approach, especially when considering fleet management use cases that require uninterrupted connectivity across various regions and networks. MNOs do not typically have roaming agreements with other operators domestically, meaning fleet managers who choose an MNO as their connectivity and CMP supplier would be locked into a single operator's network for all national deployments. Additionally, an operator's global connectivity is typically dictated by its roaming agreements with international partners, potentially leaving coverage gaps in key international areas. It is also more difficult for customers to achieve the same Quality of Service (QoS) and platform functionality from an MNO when operating on its international partner's network. These disadvantages could have severe implications for fleet management use cases that require continuous coverage and uniform connectivity management across borders.

Purchasing Connectivity and a Platform from an MVNO

Enterprises can also purchase a bundled CMP and connectivity offering from an MVNO. As connectivity resellers, MVNOs can aggregate many operator networks on a single SIM and create a global coverage portfolio. MVNOs also combine these networks together into a single platform and can offer the same platform features, performance, and user interface across regions and network

connectivity types. Virtual operators can guarantee this international connectivity and connectivity management at a regulated price point that is not subjected to complicated roaming fees or shifting partnerships.

For MNOs, connectivity is frequently the end game, with their existing platforms allowing customers to manage connectivity for the sake of selling IoT tariff plans. For MVNOs, connectivity is just the starting point and is the building block on which they create value through the guaranteed continuity of service availability, at a predictable price point, and often with specific vertical- or application-specific experience. MVNOs are in the business of conducting all the back end "plumbing," so that their customers do not have to, and can purchase services that they know will "just work."

Many current fleet managers already benefit from MVNOs' carrier-agnostic platforms and connectivity services. But future fleet management use cases will require something even greater. As the fleet management market evolves to include more advanced use cases, fleet managers will require a next-generation connectivity provider—merging the best of both MNO and MVNO worlds—that can deliver ultra-low latencies and effective localized, yet global performance across different networks, countries, and device types.

Next-Generation Connectivity and Platforming

The right MVNO partner for fleet managers in the future must establish a unique global presence in the IoT industry by building a network of highly resilient connectivity with a maximal number of local PoPs around the world. This arrangement results in fast local connectivity, globally. This type of "localized global" footprint will enable MVNOs to lead the way in supply-side provisioning for fleet management by guaranteeing the effectiveness of applications, including video monitoring, that increasingly require low-latency data communications. This, in combination with eSIM for ultra-flexible connectivity around the world, will provide the back end support that fleet managers need as they prepare their vehicles to travel into and out of new areas around the world and in different networks.

However, fully redundant, highly available, and high-performance connectivity is only really usable in combination with a cutting-edge CMP designed to oversee large-scale fleets of devices on the move. Granular visibility will be necessary across a range of device types, monitoring data usage, device behavior, and connectivity performance, while managing OTA configurations and administering continual security checks and tests. A full breadth of connectivity, monitoring, and security services will be needed to allow fleet managers to receive real-time insights into their fleets around the world, and is necessary to optimize the performance of those devices that enable business-critical use cases; for example tire, engine, and fuel monitoring. Such an offering will be a necessary support system today in order for enterprises to prepare for the next wave of fleet management innovation.

A key consideration in fleet telematics is the need to balance capturing real-time information with battery optimization. Latency is a crucial element in this balance, particularly when considering low-power telematics use cases, where the expectation is that the battery lasts the entire device lifecycle. Locally derived connectivity significantly decreases latency, compared to roaming, and can shorten data communication time by a third. While this might not seem like much at first glance, this can ultimately double the lifecycle of a device's battery—just through latency alone. Other technologies like Extended Discontinuous Reception (eDRX) and Power Saving Mode (PSM) when implemented alongside LPWA networks can deliver on the balance of pertinent data insights, while also optimizing battery life.

CASE STUDY: A COMPETITIVE EDGE IN AUTOMOTIVE IoT WITH FLOLIVE

AutoMobility is a leading distributor and manufacturer of automotive aftermarket electronics. Its extensive product portfolio includes dash cameras, app-based remote vehicle starters, security features, and more. The company has innovated its products as customer demand for connected devices has grown. For example, the company has integrated its remote vehicle starter capabilities into a smartphone application that also measures vehicle metrics. This solution requires resilient mobile communications between sensors, the vehicle, and the user's smartphone(s). With floLIVE, AutoMobility could offer its customers consistent global coverage for seamless user experience and simplified management. Additionally, by using floLIVE's integrated platform, alongside its connectivity services, AutoMobility accelerated its time to market and now has comprehensive visibility into its devices and network behavior. What AutoMobility gained from this partnership specifically is:

Robust Connectivity: floLIVE offers a large IMSI library supported through UICC, eUICC and Multi-IMSI, which offers both a single-SKU SIM approach for streamlined logistics and allows AutoMobility to achieve worldwide connectivity through a wide choice of network operators.

Single SKU: Instead of going from provider-to-provider to source connectivity, AutoMobility can leverage floLIVE and have access to a global connectivity library supported on floLIVE's own mobile core network infrastructure—and all profiles are available on a single SIM, removing the complexities associated with managing multiple SKUs.

Application Programming Interface (API) Integration: For increased flexibility and interoperability, floLIVE exposes its API for back end integration across technologies and hardware.

Visibility and Management: floLIVE's connectivity management platform makes it possible for AutoMobility to achieve granular visibility in device and network behavior for comprehensive support and management.

SUMMARY

The fleet management market has matured from simple track and track use cases to advanced video-based monitoring and autonomous applications. Ushered in by improvements in IoT and wireless communication technologies, this new era of innovation will call for even greater advancements in sensors, cloud services, and connectivity technology.

Each fleet management vertical will undergo some digital transformation as new FMSs and wireless communication networks like 5G and satellite become more available. As fleet managers assess connectivity and CMP suppliers for the future, they will choose a partner that can offer uniform management across a fleet of devices and facilitate the quick, global connectivity that will be foundational to fleet management's evolution.

Published August 2024
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