Private 5G networks, multi-access edge compute (MEC), and managed Internet of Things (IoT) connectivity services allow transportation and logistics organizations to reduce inefficiencies, enhance safety, and improve compliance and risk mitigation.

Wireless Technology Helps Transportation Companies Alleviate Supply Chain Constraints

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Introduction

Transportation and logistics (T&L) markets are adapting to a new normal with persistent elements of congestion and volatility. Improved visibility across logistics networks is a top priority for organizations to become more agile in the face of future disruption and serves as a tool to intelligently address the uncertainties that exist across extended global supply routes.

The most successful T&L teams are implementing wireless technology solutions to help solve many of their biggest challenges.

Private 5G Networks and Edge Compute

T&L organizations have a need to secure and capitalize on the data generated from their operations in a near-real-time environment. Determining the best network to provide critical connectivity for mobile assets across the logistics market is essential for organizations. A cellular-based hybrid or private network offers several advantages, including network flexibility, control, and security, that many transportation companies require compared with other connectivity solutions. These networks are also more robust than Wi-Fi networks, allowing an organization to control its data and other critical features such as security and coverage. For companies that lack the resources to build and manage a private network, working with a telco that has advanced 5G infrastructure can provide the ability to leverage the advantages of 5G without the cost of private infrastructure.

There are a variety of 5G private network models. A 5G private network can be fully owned by the business, allowing the transportation provider to solely control access, security, and other network features. A service provider can also own the 5G private network and lease the network to the customer usually for a monthly fee through a managed services model. Further, 5G private networks can be established using a hybrid ownership approach, whereby the company controls the on-premises infrastructure but connects to a public network for wide area coverage as necessary.

AT A GLANCE

KEY TAKEAWAYS

» Wireless technologies are helping transportation companies track goods and achieve business results.

» Private 5G networks, multi-access edge compute, and managed IoT connectivity services work well together to address supply chain and operational constraints.

» Selecting the best managed services partner is critical to successful digital transformation, allowing transportation companies to deliver greater resilience, improved efficiency, and better visibility and agility.

Combining managed, customized 5G networks with multi-access edge compute (MEC) offers even more possibilities and supports a new set of low-latency use cases reliant on edge compute. The deployment of edge compute with private networks will provide the necessary ingredients, namely high bandwidth, ultra-low latency, and compute capacity, to support real-time applications such as intelligent logistics, shipment tracking, and robotics.

The Internet of Things and Cellular Connectivity

Internet of things (IoT) solutions comprise hardware, software, connectivity, and services that can be applied to a range of vertical markets and use cases. IoT connectivity, essentially how an IoT device or sensor transmits data from the device to the IoT platform where it is analyzed, is critical to an IoT project.

The value of connectivity to IoT projects cannot be overstated. Cellular IoT connectivity is one type of IoT connectivity that leverages commercial cellular networks integrating generational cellular technology standards such as 4G (LTE) and 5G using licensed radio spectrum for both wide area coverage and private networks.

Managed IoT connectivity services are offered by mobile network operators (MNOs) and mobile virtual network operators (MVNOs) as well as other third-party providers. Typically, vendors and mobile operators offer capabilities for enterprises and organizations to integrate these solutions with other systems — such as a customer service application — as well as create custom rule sets.

IoT connectivity management platforms (CMPs) are part of managed IoT connectivity services and help keep cellular-oriented IoT deployments up and running. These products provide data on IoT network connectivity and device status, allowing transportation organizations to effectively monitor, manage, and secure IoT device rollouts. Managed IoT connectivity services help reduce the complexity for IoT projects by allowing transportation organizations to manage an IoT deployment through a single pane of glass.

Business Internet

Fixed wireless access (FWA) service provides a reliable and cost-effective option for a business' internet connectivity requirements. FWA, in conjunction with 5G technology, is a scalable high-speed broadband option (typically referred to as fixed wireless broadband). Most FWA service speeds are more than sufficient to support a transportation company, or the service can be used as a backup connection to ensure 24 x 7 connectivity. FWA service can be set up by a company employee in less than an hour. In addition, most FWA providers offer unlimited data plans, which allow organizations to control costs and avoid unexpected charges. Generally, there is no up-front hardware cost, only the monthly service plan charge.

Transportation's Changing Dynamics

Many trends in transportation and logistics portend a continued and increasing reliance on wireless technology, most notably the push to increase resilience while generating efficiencies and improving sustainability. Advancing these initiatives requires visibility into assets as they operate in the field, individually and in aggregate, to produce a holistic view of the transportation networks on which businesses rely.

Within these efforts across the T&L landscape, organizations are placing emphasis on creating and synchronizing data streams across end-to-end (E2E) supply chain operations to gain a full picture of risks, mitigate future disruption, and uncover opportunities for growth (see Figure 1).

FIGURE 1: *Mitigating Supply Chain Risks*

Q *What steps are you taking to mitigate risk in your supply chain?*

n = 508

Note: Respondents are from North America.

Source: IDC's Supply Chain Survey, 2022

This synchronization is a particular challenge in the highly fragmented T&L industry, where beneficial cargo owners (BCOs) rarely own or operate the assets in the field on which their goods move. As a result, real-time visibility is being demanded by those procuring services from logistics service providers.

Providing data and insights around mobile assets such as tractors, trailers, and containers, as the accompanying cargoes move across the end-to-end supply chain, offers a distinct competitive advantage to asset owners/operators looking to secure future business and solidify long-term partnerships. Across dedicated fleets and contract carriers, through warehouses and terminals, improved visibility is being prioritized by BCOs and more frequently becoming a qualifier for securing logistics service contracts.

Under stress of general macroeconomic conditions, T&L organizations are keeping a close eye on generating efficiencies while recent history has increased the focus on cultivating supply chain resilience. IDC defines supply chain resilience as visibility plus analytics intelligence plus agility. Organizations require operational data to "see" what is happening across their transportation networks, the capabilities to quickly cultivate intelligence from this data, and the ability to quickly act on insights to impact the business in a timely and meaningful manner.

Indeed, when organizations were asked about the most problematic gaps that exist across the supply chain if not addressed, the top response was the lack of supply chain visibility and agility to see the necessary changes and react to them effectively (IDC's *Supply Chain Survey*, 2022; n = 1,109). In an environment where the next major disruption is potentially just around the corner, the ability to identify and react to possible disruption more effectively is top of mind,

accompanied by the desire to improve asset utilization across complex networks. Predictive capabilities can optimize asset deployments and maintenance schedules, reduce maintenance costs, and prevent unexpected downtime, which in turn can create a distinct competitive advantage for T&L operators.

## How Technology Helps Transportation Organizations

Private mobile networks, MEC, and IoT are powerful technologies to help navigate the transportation landscape and allow sector-specific solutions. Connecting IoT devices via mobile networks provides a critical element in generating E2E supply chain visibility while efficiencies gained by improving asset utilization, reducing safety incidents, and optimizing service cycles contribute to sustainable and profitable operations.

Data feeds network optimization models, reduces inefficiencies, and supports dynamic routing to avoid bottlenecks such as weather and traffic. In addition to optimizing logistics networks, benefits can include supporting driver electronic logging devices (ELDs) compliance for calculating hours of service, monitoring driver behavior to improve safety and reduce fuel consumption, and supporting geofencing to better align logistics activities with warehouse, receiving, and production teams.

Organizations deploying IoT technologies across their logistics networks report experiencing a number of improvements (see Figure 2). Notable among them are overall supply chain visibility, accurate and timely shipment tracking including cold chain monitoring, compliance and risk mitigation, customer service, and machine maintenance efficiencies.

FIGURE 2: *IoT Advantages for Supply Chain*

Q *What benefits have you seen from IoT deployments in your supply chain?*

■ Transportation/logistics (n = 100)   ■ All respondents (n = 1,032)
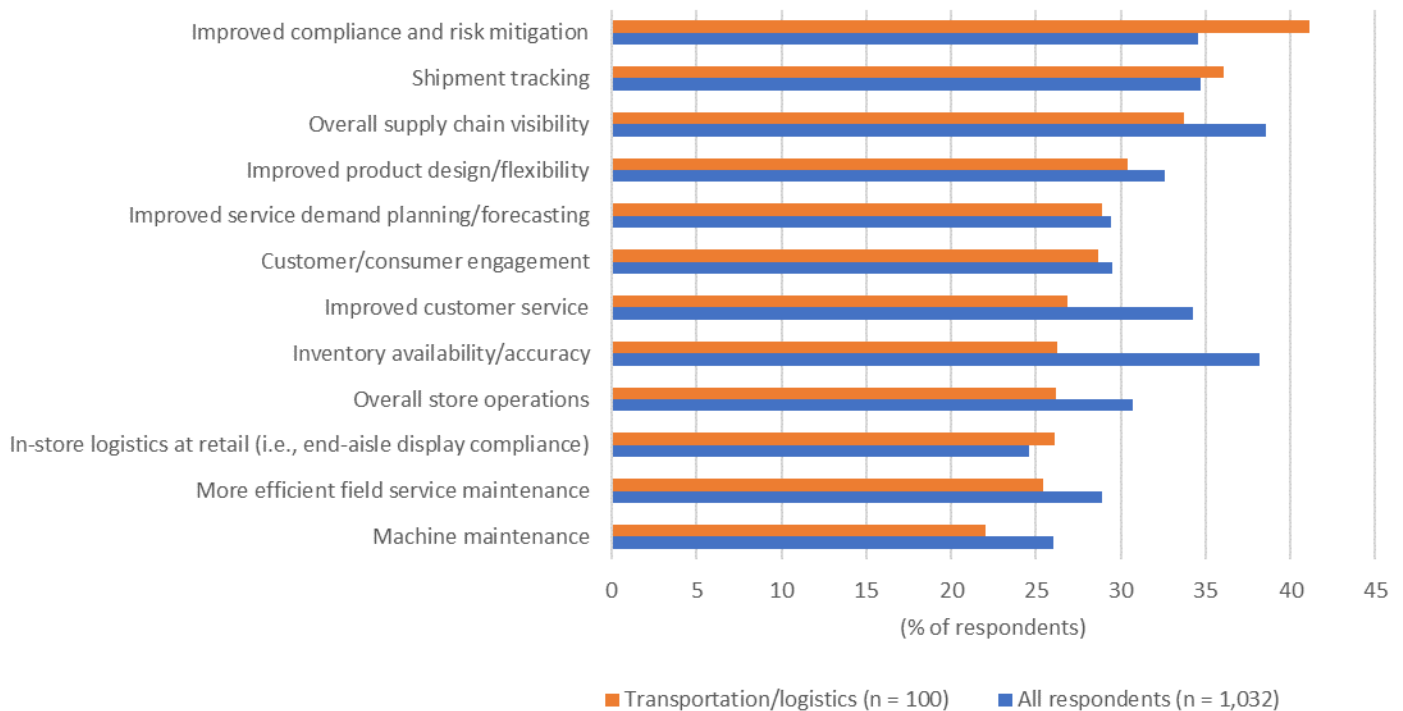
Source: IDC's Supply Chain Survey, 2022

Specific areas of impact in T&L include:

» **Fleet operations.** IoT-enabled fleets open the door to address inefficiencies that previously went undetected. Addressing suboptimal driver behaviors can improve asset efficiency, reduce fuel consumption, and improve safety. Automated ELDs improve compliance with hours-of-service regulations while digital twin enables optimization of maintenance schedules and costs, reducing downtime and increasing overall asset utilization.

» **Supply chain optimization.** Real-time visibility into T&L provides insights into mobile inventory optimization and can support live shipment diversion when unexpected demand materializes. Cold chain monitoring helps ensure compliance with requirements of temperature-sensitive shipments such as vaccines or food, reducing waste due to spoilage. Significant improvements in cargo security can also be realized when organizations can detect shipments that experience route deviations or if a breach has occurred when door or light detection devices are triggered.

» **High-precision asset tracking.** IoT devices allow T&L organizations to monitor assets in the field to generate efficiencies by dynamically predicting ETAs to accommodate changing conditions on the ground. Real-time visibility into in-transit inventories smooths material delivery into production by supporting geofencing capabilities. Direct-to-consumer retailers can improve the customer experience by proactively communicating a delivery time to a waiting customer, setting expectations before customer sentiment sours.

» **Worker safety and hazard detection.** Front- and driver-facing cameras in trucks provide organizations with the tools to help identify and correct risky driver behaviors. They serve as the first line of defense for drivers when an incident occurs and provide teams with the opportunity to promote examples of good practice by highlighting their use in future coaching sessions. Site cameras can also be used to ensure compliance with personal protective equipment (PPE) by employees and external contractors.

» **Smart City mobility management.** In this IoT use case, freight signal priority helps cities optimize traffic flows to reduce congestion and pollution while improving operational efficiencies by extending lights as trucks and other vehicles approach intersections in high-density geographies.

» **Autonomous operations.** Labor shortages are a long-standing and growing concern in the T&L industry. Autonomous vehicles can help address a shortage of long-haul truckers as the industry struggles to attract and retain talent. Decision automation helps free T&L operations from rote tasks, allowing practitioners to focus on more strategic initiatives that deliver more value to the organization and increase job satisfaction.

» **Business internet.** Moving and truck rental companies often use business internet for small office or satellite office connectivity where there is a need for fast and easy setup for either primary connectivity or even backup failover.

Managed Services Providers Reduce Complexity in Transportation

Mobile network operators have deep-rooted experience working with businesses to address their needs, often using managed services models. Managed services providers (MSPs) have developed comprehensive vendor ecosystems that allow transportation companies to select different hardware and software vendors to build their networks. The service provider can then deliver an end-to-end network incorporating all the tools the transportation company requires with one bill and support point.

Managed services providers can also assist in managing who has access to the network, issuing SIM cards, and monitoring network performance to identify and correct potential problems before those problems impact network performance. They can also provide managed IoT connectivity services to track IoT devices and ensure the best network connectivity and pricing models.

Transportation and Logistics Solutions from T-Mobile for Business

T-Mobile offers a portfolio of solutions to address connectivity needs for transportation and logistics firms. The mobile network operator provides solutions tailored for the transportation industry that allow carriers to connect virtually anywhere across its network for end-to-end monitoring of employees, fleets, and cargo. By integrating innovative technologies including 5G and LTE, multi-access edge compute, and IoT, T-Mobile is uniquely positioned to source and manage critical connectivity, compute, devices, and applications for fleets and enterprises within the transportation sector.

> Mobile network operators have deep-rooted experience working with businesses to address their needs, often using managed services models.

Challenges

Some organizations may choose to deploy a managed Wi-Fi network instead of a private mobile network. Wi-Fi networks are less expensive and less complex than private 5G networks. In addition, unlicensed and licensed CBRS spectrum is available in the United States. While transportation and logistics firms can take advantage of this unlicensed spectrum to deploy their own private mobile network working directly with an equipment provider, they need to ensure that this type of network configuration provides comparable level of standards, including security, that are required by enterprises. Private 5G mobile networks, for example, are more robust and offer distinct advantages in terms of built-in authentication, encryption, and network slicing capabilities.

Conclusion

The transportation and logistics market will continue to face challenges as the economy and supply chain needs constantly change. Wireless technologies, including private 5G networks, MEC, and cellular IoT connectivity, are tools that T&L firms can leverage to gain advantages over their competitors while improving safety and the overall customer experience. Managed services offer a cost-effective and nonintrusive way for organizations to take advantage of available wireless solutions. T-Mobile for Business can be a trusted partner to firms looking to mobile services as an option to turn the logistics challenges of today into opportunities for growth and resilience.

About the Analysts

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Sandra Wendelken is a Senior Research Analyst for IDC's Telecom and Mobility team focusing on mobile and IoT services. Her research covers the mobile operator market in the United States and globally. She provides detailed analysis on IoT connectivity services, public safety and first responder communications service offerings, managed private mobile networks, and other emerging service trends in the mobility market.

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Fastest: Based on median, overall combined 5G speeds according to analysis by Ookla® of Speedtest Intelligence® data 5G download speeds for Q2 2023. See 5G device, coverage, and access details at T-Mobile.com.

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