Connectivity in Motion:

Intelligent Transportation Infrastructure

An industry use case guide

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INTRODUCTION

Connecting the Future of Transportation

Driven by electrification, automation, data, and the growing demand for efficient, sustainable mobility, the transportation landscape is undergoing a profound transformation. At the heart of this evolution is connectivity, enabling real-time communication, coordination, and control across a vast array of transportation systems and services.

This guide explores how connected solutions are powering the next generation of intelligent transportation systems (ITS), from autonomous and connected vehicles to smart intersections and street lighting, and how secure, reliable, and scalable wireless networks are essential to making transportation systems safer, more efficient, and more accessible.

Real-world use cases from industry leaders highlight how connected solutions enable:

+ **Autonomous and connected vehicles,** which rely on continuous, low-latency communication to operate safely and efficiently
+ **Electric vehicle (EV) charging infrastructure,** where real-time data exchange supports grid responsiveness and uptime
+ **Intelligent traffic systems** that process data at the edge to optimize traffic flow and reduce congestion
+ **Last-mile delivery solutions** that improve logistics and cut emissions in densely populated urban zones

As cities, states, and private operators invest in future-ready mobility systems, cellular networks—both public and private—are proving to be critical enablers of:

+ **Mobility platforms and fleet management tools** that harness cellular data to enhance decision-making and service delivery
+ **Safe and efficient streets** where edge computing and AI work together to detect hazards and dynamically manage resources
+ **Smart intersections** that adapt to traffic patterns and enhance safety for all users of the road
+ **Smart lighting systems** that both reduce energy consumption and form the backbone of a city's sensor-based infrastructure

Read on for a roadmap to understanding, implementing, and scaling these innovations, with a focus on interoperability, resilience, and long-term value.

Autonomous & Connected Vehicles

Advanced connected solutions are helping autonomous vehicles (AVs) and vehicle-to-everything (V2X) systems redefine safety, efficiency, and accessibility in transportation.

Whether navigating a busy intersection or coordinating with surrounding vehicles and infrastructure, V2X systems rely heavily on seamless, real-time communication. That's where cellular V2X (C-V2X) technology comes in, providing the low-latency, high-reliability connectivity that vehicles, including AVs, can use to make split-second decisions and interact with their environments.

Cellular networks enable vehicles to communicate with each other and with traffic signals, roadside units, cloud platforms, and emergency management systems. The C-V2X solution deployed at a traffic light, for example, can dynamically optimize traffic flow and improve emergency response times.

Cellular-enabled AVs and connected vehicles are at work right now
They are helping communities reduce congestion, increase safety, and expand mobility for all, especially as community leaders recognize the importance of building AV systems that are safe, inclusive, and equitable for underserved and mobility-impaired populations.

As transportation agencies look to the future, robust and interoperable cellular infrastructure will provide a foundation for scalable, intelligent vehicle systems nationwide.

AVs Drive Major Mobility Improvements

Detroit, Michigan

Connectivity fabric: LiDAR, radar, and camera data

SCENARIO

Despite Detroit's long history as the center of the automotive industry, some parts of the city lack sufficient transportation options. A longtime emphasis on personal car ownership has left residents without reliable public transportation, making it difficult for people who cannot afford their own cars and the 128,000 residents of Detroit who have disabilities to get around the city.

To solve this transportation problem, the City of Detroit's Mobility Innovation Office launched the Michigan Mobility Collaborative.

SOLUTION

Working with a $7.5 million grant from the U.S. Department of Transportation, the Michigan Mobility Collaborative launched Accessibili-D, AV services tailored for seniors and disabled riders.

An important first step was ensuring safety and reliability. AVs from May Mobility underwent testing at the American Center for Mobility and Mcity at the University of Michigan, a 32-acre proving ground with a full-scale outdoor laboratory that can simulate the roadside variables vehicles encounter in urban and suburban environments.

Deloitte, which manages Accessibili-D's project management office, developed a "Car to Cloud Data Platform" for data analysis. Working in tandem with May Mobility's patented Multi-Policy Decision Making (MPDM) technology, this platform ingests data from LiDAR, radar, and camera sensors on vehicles to help researchers optimize safety and comfort.

The Accessibili-D pilot deployed three May Mobility AVs, including two wheelchair-accessible vehicles, to provide service across an 11-square mile area of Detroit. A 68-stop AV service route, developed through community engagement, connects residents to specific, pre-vetted locations such as healthcare, parks, and other essential services. The service operates on demand, with riders booking trips via phone or mobile app.

RESULTS

Accessibili-D has demonstrated significant positive impact on both riders and the broader transportation ecosystem. The program reported zero safety incidents and a 100% satisfaction rate, and over 70% of riders had become repeat users of the service as of the end of 2024.

This collaboration between federal, state, and city government along with universities, automotive companies, local Detroit organizations, and Deloitte demonstrates the capabilities and value of AVs for accessible smart mobility.

Since Accessibili-D launched, service in Detroit has increased its operational hours and expanded to 110 stops, and Deloitte and May Mobility have been using Deloitte's IndustryAdvantage™ framework to adapt the data platform and AV services for other cities.

Boosting Delivery Efficiency for the Long Haul

Texas, statewide

Connectivity fabric: advanced sensors, long-range LiDAR, high-resolution cameras, radar

SCENARIO

As the freight industry faces driver shortages, high demand, and the need for greater efficiency across long-haul routes, DHL Supply Chain identified an opportunity: Use autonomous trucking to address these challenges and more.

Such a solution not only eases the burden of long-haul driver shortage but also lays the groundwork for scalable, technology-driven freight operations that can adapt to evolving smart transportation demands.

SOLUTION

Partnering with Volvo Autonomous Solutions (V.A.S.) and self-driving freight innovator Aurora, the company deployed self-driving Class 8 (18-wheeler "big rig") trucks. Powered by the Aurora Driver system, these vehicles are equipped with advanced sensors such as proprietary long-range LiDAR, high-resolution cameras, and radar to enable safe and consistent autonomous operation on highways, with a 360-degree field of awareness.

During this pilot phase, safety drivers have been present in the cab while the system collects data and learns from this information. The long-term goal is to remove the need for a human driver and operate the vehicles entirely autonomously across designated freight corridors.

RESULTS

Since deployment began, the autonomous trucks have demonstrated reliable driving behavior and consistent performance across long-haul routes, helping DHL maintain on-time delivery schedules and reduce the fuel variability associated with human driving patterns.

A successful pilot on DHL's Dallas-to-Houston route prompted DHL and its partners to expand operations across Texas, including a route to El Paso. Human drivers continue to oversee operations as the system gradually expands and matures, with a focus on safety and continuous learning.

Traffic Signal C-V2X Solutions Save Time and Lives

Peachtree Corners, Georgia

Deployed on 5G networks

SCENARIO

In the growing city of Peachtree Corners, which sits between two major traffic arteries in the Atlanta metropolitan area, vehicles need to flow smoothly to both minimize congestion and ensure that first responders such as police, fire crews, and medical personnel can get to their destinations in the fastest and most efficient manner.

The city found an answer in T-Mobile-powered C-V2X communication, where 5G connectivity enables solutions such as autonomous shuttles, traffic light optimization, safety messages for pedestrians, and public safety communications for law enforcement.

This specific deployment focuses on priority and preemption technology, which optimizes traffic management during peak commute times and is critically important for first responders during an emergency.

SOLUTION

In Peachtree Corners' implementation, intersections equipped with Bosch cameras provide video data in real time. On-board units (OBUs) in vehicles and roadside units (RSUs) in traffic cabinets at intersections communicate in both directions, in real time, over a T-Mobile 5G network that provides data resiliency, fast speeds, and low latency for this mission-critical application. Connected to the signal phase timing of traffic lights via 5G, RSUs control countdowns to changes in traffic lights and walkway signals. Vehicles equipped with OBUs meanwhile communicate with the RSUs, receiving data in areas like when the light is turning red.

An OBU-equipped vehicle can also speak to an RSU to maintain a green light and priority access to an intersection. This is the priority and preemption technology that ensures the traffic lights stay green for autonomous shuttles and first responder vehicles like ambulances and fire trucks.

This C-V2X technology can be deployed to optimize traffic flows. Lights can be programmed to stay red for different lengths of time, for example, and can be proactively managed by city operations to change at specific points of the day, such as peak traffic times.

The solution also includes an app that gives drivers audible alerts about an upcoming green light or the potential of running a red light.

RESULTS

"We had the world's first traffic signal pre-emption of an autonomous vehicle over a 5G network," said Peachtree Corners City Manager Brian Johnson. "By providing signal preemption for the autonomous shuttle, we were able to save three minutes on the dedicated route, allowing our constituents to arrive to their destination sooner."

"The last and middle mile connections have been a challenge for public transportation systems for decades," he added. "When providing a low-speed, last-mile connection, it is important that it runs as efficiently as possible, and the C-V2X preemption allows us to do that."

"By providing signal preemption for the autonomous shuttle, we were able to save three minutes on the dedicated route, allowing our constituents to arrive to their destination sooner."

Peachtree Corners City Manager Brian Johnson

Real-Time Alerts Enhance School Bus Safety

Reston, Virginia

Deployed on C-V2X direct communications

SCENARIO

In communities across America, school buses are a regular fixture of daily life. For the drivers who share the roads with these buses, visibility challenges like curves, hills, and blocked lines of sight can make it hard to spot these vehicles and the students boarding and disembarking from them. Meanwhile, school bus drivers need to know if approaching vehicles are slowing down as required when preparing to let their young passengers exit.

With many traditional vehicle alerts, cloud processing introduces delays that limit drivers' reaction time. C-V2X direct mode connections address this challenge by enabling real-time communication between vehicles. In fact, direct C-V2X allows vehicles to communicate 10 times per second and up to 400 yards away.

SOLUTION

To improve school zone safety, Audi partnered on a C-V2X direct communications solution with Georgia-based Applied Information, a leading innovator in connected traffic control systems, and with International Trucks, a Volkswagen Group company that owns the nation's largest school bus manufacturer in IC Bus.

Drivers of Audi vehicles receive an in-cabin alert when they're approaching a school bus with an extended "stop" arm, even if the bus is hidden from view. School bus drivers get a warning if a vehicle is approaching too fast or looks like it may not stop—giving them time to pause before they open the bus doors or let children cross.

When each vehicle shares data like location, speed, and direction, then those drives can make safer, more informed decisions in real time.

RESULTS

This test project demonstrated the power of direct mode C-V2X technology to:

+ **Prevent collisions,** with real-time alerts that help drivers avoid potential accidents
+ **Give drivers more time to react,** through early warnings that extend reaction time and improve situational awareness
+ **Support more cautious behavior and safer operations** by delivering bus drivers better insight into approaching traffic

Continuous, low-latency communication between vehicles reduces the risk of accidents in school zones, enhancing overall road safety. For overall sustainability, traffic signal prioritization improves fuel efficiency for buses with internal combustion engines and range for those with electric power.

The technology's impact extends beyond school transportation, with similar benefits demonstrated for protecting cyclists, construction workers, and other vulnerable road users—illustrating the potential of C-V2X solutions to transform road safety across a broad range of use cases and environments.

Using Existing Infrastructure to Enhance Driver Awareness

Lack of situational awareness contributes to a wide variety of avoidable accidents, including rear-end collisions, multi-vehicle pileups, and crashes at intersections. The Federal Highway Administration (FHWA) states that approximately one-quarter of all traffic fatalities and about one-half of all traffic injuries in the United States occur at or near intersections.

While Advanced Driver Assistance Systems (ADAS) and maps are foundational pillars for automotive safety, they have limitations. ADAS relies on onboard sensors (radar, cameras, etc.) that are constrained by line-of-sight and cannot detect hazards beyond the vehicle's immediate surroundings. Maps provide static navigation data and lack real-time context and actionable insights. Vehicle-to-network (V2N) applications can complement ADAS and maps.

V2N technology, a scalable, cloud-based method to enhance situational awareness, addresses these gaps with timely, context-aware information. Leveraging telematics infrastructure and existing 4G and 5G cellular networks, V2N-based solutions enable timely digital alerts to the right vehicles. Alerts for hard braking, wrong-way drivers, intersection hazards, and dynamic traffic conditions are pushed to the vehicle before the driver or ADAS can detect them. These alerts are action-oriented, helping drivers make safer decisions without taking their eyes off the road.

V2N applications also operate over commercial cellular networks. V2N and cellular vehicle-to-everything (C-V2X) are complementary architectures, with C-V2X handling low-latency, safety-critical scenarios like collision avoidance and V2N supporting non-safety and safety-enhancing use cases like traffic alerts. With the ability to use existing in-vehicle analytics hardware, specialized hardware is not required. This makes V2N:

+ **More convenient,** as systems can be deployed via software updates to millions of connected vehicles, including those already on the road
+ **More flexible,** as alerts can be delivered in real time and tailored to location, driving conditions, and road topology
+ **More cost-efficient,** as these solutions avoid the need for new hardware investments

V2N in action: Emergency electronic brake light (EEBL)

Danger ahead! The emergency electronic brake light (EEBL) system, showcased by HARMAN, alerts drivers to vehicles that suddenly and unexpectedly brake in front of them, even when those vehicles are outside of the driver's line of sight, creating a high-risk collision zone for approaching vehicles that may not have enough time to react.

The extended range and time-sensitive connectivity are a result of V2N communications. Data from a braking vehicle is sent over 4G or 5G cellular networks to the cloud, where it is processed and selectively shared to relevant nearby vehicles. Such an approach makes time-sensitive hazard warnings possible—working around any curves, hills, or city buildings that stand in the way.

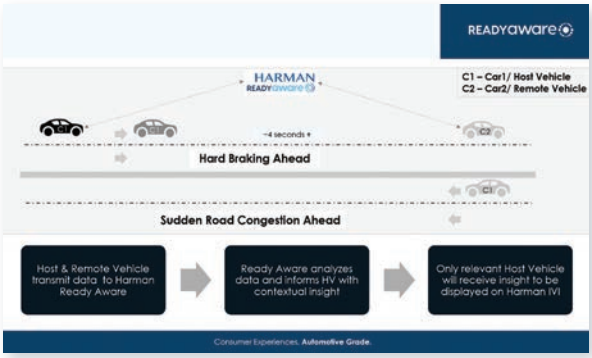
The EEBL solution operates through:

+ **Cloud-based applications and digital twins** that model vehicle behavior and road context, determining which nearby vehicles should receive alerts

+ **A thin software-based implementation** that does not require additional connectivity hardware and can be deployed through a software update to Linux or Android-based systems with an extremely light footprint in the vehicle

+ **Latency-sensitive communication,** with effective alerts delivered in less than one second

The EEBL deployment highlights how cloud-native V2N services can scale across vehicle platforms, regions, and use cases, supporting automakers' safety goals while giving DOTs and transportation planners new tools to reduce crashes and improve traffic flow.



HARMAN Automotive supports a variety of V2N use cases to improve safety, reduce driver anxiety, and enable smarter driving decisions. Specific use cases include alerts: object on road, wrong-way driver, time-to-green, and more.

Key takeaways for public sector and ITS professionals

V2N complements existing map and ADAS technologies, offering a path to more connected, responsive, and scalable road safety strategies.

With the ability to deliver real-time, relevant safety alerts via cellular networks, transportation departments and agencies can:

+ **Improve safety outcomes** without additional roadside infrastructure

+ **Support connected vehicle programs** with vehicles already on the road

+ **Prepare for evolving safety regulations** like upcoming driver assistance protocols for the European New Car Assessment Programme

Scalable, Network-Based Platforms for Safer, Smarter Mobility

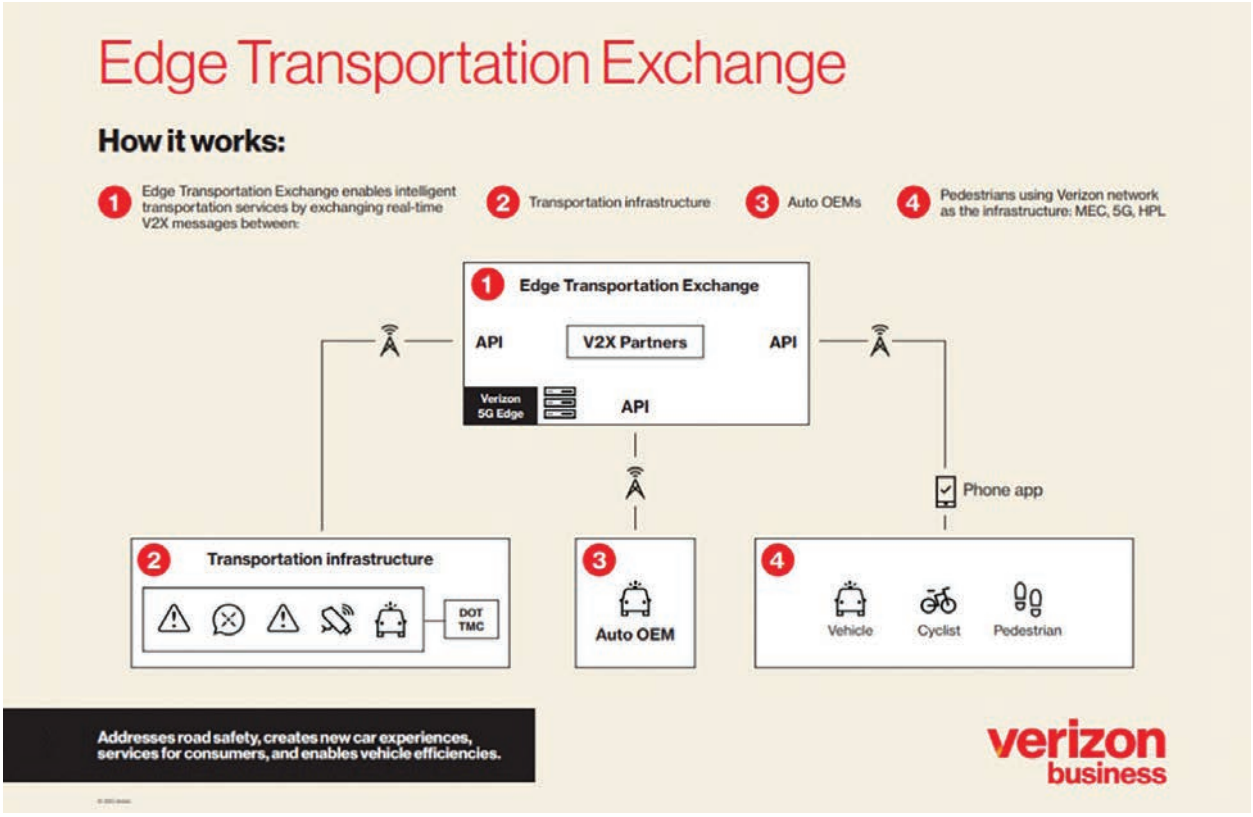
The V2X systems enabling roadway safety and traffic efficiency too often rely on fixed roadside units and specialized vehicle hardware, making deployment and maintenance challenging for public agencies.

Cloud-based cellular V2X (C-V2X) systems address these challenges, bringing together:

+ **Mobile edge computing (MEC)** to reduce latency and enable rapid decision-making
+ **Geospatial intelligence,** to deliver alerts informed by real-time location data, for contextual accuracy
+ **Widespread 4G/5G coverage,** which eliminates the need for dedicated short-range communication infrastructure

Because cloud-based C-V2X platforms virtualize many functions traditionally handled by physical infrastructure, they make deployments more flexible, scalable, and cost-efficient. This approach also supports interoperability across vehicle manufacturers and transportation systems—an important consideration as connected vehicle adoption grows.

Cloud-based C-V2X systems can deliver alerts to drivers, pedestrians, and roadside systems for a wide range of hazards, including slippery roads, stopped vehicles, and flooded roadways. They can also be used in intersections for traffic signal optimization and beyond.



Cellular networks and MEC in action: The Verizon Edge Transportation Exchange

The Verizon Edge Transportation Exchange is a C-V2X platform designed to deliver low-latency, location-specific alerts over Verizon's 5G and LTE networks and MEC infrastructure.

Rather than relying on fixed roadside hardware, this virtualized system allows transportation agencies to define geofenced "zones of interest" such as intersections, school zones, or work areas. The system then pushes relevant safety messages to connected vehicles and users in real time.

Verizon is piloting the platform in collaboration with:

+ **Volkswagen Group of America,** which is testing V2X applications like pedestrian alerts and payment applications for expedited tolling
+ **Delaware DOT,** which is evaluating the platform's potential for red-light warnings and roadway water conditions
+ **Arizona agencies,** who are piloting notifications for geofenced work zones and pedestrian crossings
+ **Rutgers University CAIT,** which is integrating a smart mobility testbed onto the platform for ongoing research

As federal funding and vehicle connectivity requirements evolve, network-based V2X solutions offer transportation agencies a viable, future-ready path for deploying intelligent transportation applications at scale.

Electric Vehicle Charging Infrastructure

Electric vehicles (EVs) are a cornerstone of global efforts to reduce greenhouse gas emissions, improve air quality, and build a more sustainable transportation system.

Yet these benefits can only be fully realized if the supporting infrastructure for EVs, including charging stations, is smart, scalable, and efficient. Cellular connectivity plays a crucial role in moving this vision forward, enabling real-time monitoring, control, and coordination of EV charging networks across urban, suburban, and rural landscapes. Reliable wireless connectivity ensures uptime and efficient service delivery for EV charging networks, especially in hard-to-wire or remote areas.

Furthermore, as EV adoption accelerates, utilities and operators must manage supply and demand of an increased electrical load and ensure charging availability, especially during peak periods. Cellular networks provide the communication backbone for these efforts, allowing chargers to exchange data with grid management systems to detect faults, push firmware updates, and optimize energy use in real time.

Within the broader energy ecosystem, cellular connectivity enables EV charging stations to integrate with distributed energy resources and smart grid solutions, to maintain grid stability while supporting decarbonization goals.

Robust cellular networks make EV charging more reliable and accessible while enabling smarter, more sustainable energy use in transportation systems.

This is a benefit for long-term planning as well

By synchronizing with solar, wind, and battery storage systems, cellular-enabled EV infrastructure supports renewable energy integration. These systems can dynamically adjust charging speeds based on renewable generation volumes or local grid constraints, cutting emissions through the system's lifecycle while reducing reliance on fossil fuels overall.

In short, building a clean transportation future depends not only on increased EV adoption, but on connecting and optimizing the infrastructure that powers these vehicles.

Using Connectivity to Amp Up At-Home EV Charging

San Jose, California

Connectivity fabric: Itron's Gen5 Network

SCENARIO

A Level 2 home EV charger is up to 15 times faster than plugging into a standard wall outlet, allowing an all-electric vehicle to power up from empty overnight. But one big obstacle impedes widespread adoption: Such a charger requires 200-amp service, and many customers—roughly half of the homes in PG&E's service area, for example—only have 100-amp service. Upgrading to 200 amps can cost customers thousands of dollars of technology enhancements that can take months to complete.

How can EV drivers charge their vehicles at home without costly electric panels and service upgrades? PG&E is working with Itron on a customer-focused pilot to find answers, developing and testing the management of EV charging loads in real time as part of its efforts to modernize its electric meter network.

SOLUTION

A new managed charging program funded through the Electric Program Investment Charge (EPIC) program—specifically EPIC project number 4.02—is a collaboration between PG&E, Itron, and PG&E's EV solution provider to offer a safe and affordable alternative for high-powered at-home charging.

Here's how: EV chargers with typical cloud-only software-based integrations exchange information only a few times a day. EV Connect, by contrast, uses distributed intelligence DI edge computing that operates directly on a customer's electric meter. This enables a customer to install and operate Level 2 EV charging at home—no panel or service upgrades required. The on-meter application connects to, and coordinates with, the customer's EV charger to keep charging within panel and utility grid limits.

A first of its kind, the program combines consumer engagement, advanced edge computing, and broad industry collaboration together into a secure end-to-end solution that is cost-effective and consumer-friendly. PG&E's customers receive increased access to EV charging while PG&E benefits from grid reliability and deferred spending of the capital investment needed for transportation electrification.

RESULTS

In its pilot stage, the program will initially support up to 1,000 residential customers who are seeking to add Level 2 charging at home but have limited electrical service. PG&E will replace their existing meters with Riva models from Itron, enabling them to immediately install and use the program's Level 2 chargers without a service upgrade.

After this initial launch, PG&E will evaluate lessons learned for making the program broadly available on an ongoing basis.

Unleashing Charging Stations' Power and Potential

Nationwide

Deployed on 5G networks

SCENARIO

Unreliable public charging networks have been a major obstacle for EV adoption and a challenge for network operators, vehicle manufacturers, and the retailers offering services at these stations.

For years, EV owners have suffered from "range anxiety," the fear that they might run out of battery power before reaching their destination. Today, the concern is "charger anxiety," trepidation that the next public charging station will be occupied, out of service, or in a remote, undesirable location, or that service will be patchy and unreliable, with poor support and unacceptable downtime. Internet connectivity, or lack thereof, causes charging sessions to fail and impedes critical software updates and reboots.

It is clear to see that wider EV adoption depends on charging stations with robust, exceptionally reliable internet connections. Yet traditional wire lines can be costly to install, potentially adding thousands of dollars to the construction of a new charging station and weeks or months to installation times as trenches are dug and rights of way negotiated.

Piggybacking on nearby Wi-Fi services presents its own obstacles. Wi-Fi connections may be overwhelmed by users taking advantage of a free connection or unreliable if the Wi-Fi owner's access point goes down.

SOLUTION

Fixed wireless from T-Mobile for Business addresses the coverage challenge with a hybrid ultra-capacity 5G network for business internet combined with an extended range 5G network. This solution can cover hundreds of square miles, for more reliable connectivity in rural areas, remote locations, and problem spots like underground parking lots.

The 24/7 connectivity of fixed wireless means that the status of a charging station is always available to network operators, partners, and drivers, for real-time notification of charging station outages or problems connecting vehicles. Information can be immediately relayed to network operators and OEMs to quickly fix outages, boost uptime, and increase customer satisfaction.

These benefits extend to ongoing business operations. For EV drivers, constant connectivity supports payments via apps and tap-and-go technology. For charging providers, it is a way to deliver firmware and software updates over-the-air (even as drivers charge their vehicles), keeping stations current and able to accommodate new EV models, partnerships, and apps as they are introduced.

Curious about innovative technologies for EV charging? This lab has tested them

At the Peachtree Corners' Curiosity Lab, recent technologies from self-driving cars to pedestrian warning systems get a workout on the streets of a 500-acre smart city. Here T-Mobile is working with embedded SIMs, Siemens charging stations, and partners LG and i-charging to demonstrate that charging stations can be more than just places for EV drivers to plug in. With fixed wireless, they can be turned into ad-supported digital kiosks that pay for themselves—no retail or municipal investment required.

The Peachtree Corners Curiosity Lab has been running a cellular-based charging network for over 12 months, giving T-Mobile more than a year's experience coordinating charging networks with hardware providers and local government network operators and installing stations in locations from City Hall to basement parking spaces in public garages.

"We've learned that cellular is more reliable and creates fewer headaches," said Brian Johnson, city manager of Peachtree Corners.

This is especially true when trenching for extra lines is not financially practical. "There's no reason you should be pulling a hard line into a charging station," Johnson said.

To help municipalities get up and running with solutions that are turnkey and simple to install, Siemens delivers stations pre-packaged with a T-Mobile SIM and 500 MB of free data.

Embedded SIM technology enables visibility and insight. The system transmits all the data the municipality requires, such as power consumption, geolocation, and wait times, in real time via an open protocol and platform. This gives city leaders a view of kilowatt consumption, so they can manage load sharing at stations and plan for the megawatt demands of the future.

"Reliability is the number one priority, because we look at our charging stations as smart devices that run like IoT devices–they can't afford any downtime," said Wes Sheldon, senior business developer for Siemens eMobility.

The future of EVs and the vehicle-charging experience

While growth of the EV market depends on many factors, including vehicle availability at different price points, fixed wireless connectivity on charging networks can go a long way in increasing adoption through addressing customer concerns about charging availability and reliability.

For the network operators, automakers, and municipalities who support EV customers, fixed wireless services at public charging points support rapid deployment, improve customer satisfaction, and offer an opportunity for market differentiation.

What will EV use and public charging networks look like in the future? Some stations will become high-tech retail destination spots. Meanwhile, demand is growing for streaming entertainment.

OEMs can continue to improve the customer experience by delivering feature enhancements and repair/warranty updates "over the air," and network operators can obtain valuable usage data to improve their services and infrastructure. Fixed wireless solutions provide the foundation for all these use cases and more.

In terms of infrastructure, fixed wireless can be implemented without the trenches required by a cable solution. In areas with wired lines already in place, fixed wireless offers supplemental coverage, providing failover if those other connections drop out.

Throughout, T-Mobile SASE (Secure Access Service Edge), an industry-first offering with SIM-based authentication, is helping protect charging stations and their users against cyberattacks.

RESULTS

Charging stations served by T-Mobile for Business fixed wireless now have more uptime and capacity (from 72 Mbps to 245 Mbps) to support operations from payments to software updates. The multi-spectrum, hardware-agnostic solution works across locations and stations nationwide, and wireless hardware installed in hours—or even minutes.

Connected public EV charging stations are a multifaceted marketing opportunity

Automakers can send out targeted materials along with software updates, while gathering analytics that can affect further EV development. Charging network operators can maximize station use and user satisfaction by alerting drivers to charger availability and expected wait times. For local retailers, they are an opportunity to digitally share specials and marketing offers with their customers.

Intelligent Traffic Systems & Smart Intersections

Modern transportation networks are only as efficient as the systems that manage traffic flow.

As congestion increases and roadway safety becomes a growing concern, cities are turning to intelligent traffic systems (ITS) and smart intersections to reduce delays, enhance safety, and enable real-time response to dynamic conditions.

While these systems bring in an array of sensors, signals, cameras, and edge computing devices, cellular networks provide the necessary connectivity. By enabling real-time data exchange between infrastructure and traffic management centers, they help:

+ **Optimize signal timing**
+ **Identify congestion hotspots**
+ **Support adaptive responses** to changing traffic patterns

Cellular-enabled smart intersections facilitate the multimodal safety that protects pedestrians, cyclists, and vehicles alike. Wireless connectivity overall empowers communities to analyze traffic trends in real time, so leaders can make data-driven decisions and coordinate systems across multiple corridors.

This equips communities to implement capabilities like vehicle detection, transit signal prioritization, emergency preemption, and remote system diagnostics to improve operational efficiency, while laying the groundwork for broader connected vehicle ecosystems. Through interfacing with AVs, mobility platforms, and community-wide safety systems, smart intersections can serve as key nodes in future-ready ITS architectures.

Today and tomorrow, intelligent traffic systems and smart intersections powered by scalable, secure cellular connectivity are transforming roadside infrastructure into a proactive, adaptive platform for managing mobility, reducing emissions, and keeping roadways safe.

An AI-Powered Platform Keeps Campus Traffic Flowing

Vancouver, British Columbia

Deployed on 5G networks

SCENARIO

When traffic congestion at campus intersections caused challenges with pedestrian delays and greenhouse gas emissions, the University of British Columbia (UBC) turned to an AI-powered traffic management platform to help improve mobility and reduce environmental impact.

SOLUTION

UBC deployed NoTraffic's AI Mobility platform, which uses predictive modeling to anticipate traffic scenarios, reduce unnecessary stops, improve safety at intersections, and maintain consistent traffic flow.

Built with edge AI devices, accelerated computing, and the AI stack, the solution processes data locally from sensors embedded on traffic poles, minimizing latency and data transfer. Rogers Communications' 5G network enables fast and reliable communication.

This setup allows traffic data to be analyzed in real time, to support dynamic signal adjustments and the prioritization of road users. The platform's edge-based architecture enhances scalability and performance across the UBC campus.

RESULTS

With the AI Mobility platform deployed at seven intersections, UBC saw measurable improvements in both traffic efficiency and environmental impact.

Pedestrians experienced an up to 40% reduction in delays and enjoyed significantly improved campus walkability and accessibility. Notable decreases in vehicle wait times helped to ease congestion during peak hours.

Each year, the platform contributes to a 74-ton reduction of carbon dioxide emissions, supporting UBC's broader sustainability goals and demonstrating smart infrastructure's potential to deliver tangible environmental benefits.

Collecting Intelligence for More Efficient Logistics and Operations

Midwest United States

Deployed on 4G LTE networks

SCENARIO

The organization responsible for managing a 24-acre open market district in a busy metropolitan area sought to improve transportation and supply chain operations throughout the market's large neighborhood.

These improvements require data on the traffic and freight moving in and out of the market area, along with an understanding of how long delivery vehicles remain at loading docks. With such insights, the market could make critical, informed decisions on traffic management and construction planning.

SOLUTION

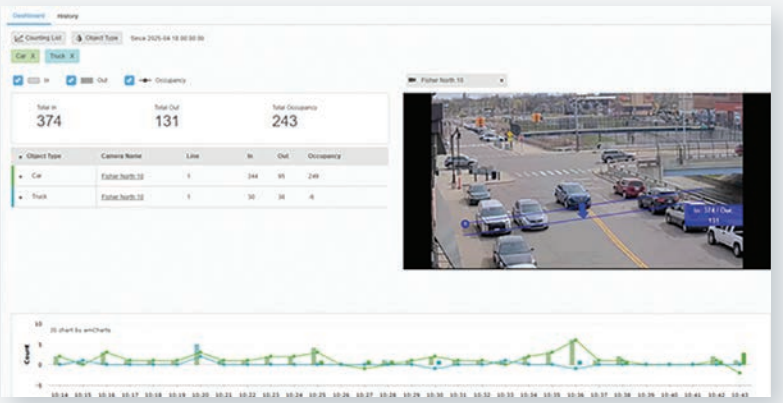
The market partnered with AT&T on an LTE-enabled video intelligence and analytic solution featuring cameras and video routers with network-aware and data compression technologies. Cameras and video routers installed at strategic locations collect information about car and truck traffic, with real-time analytics counting vehicles as they enter and exit the market and capturing how long they wait at warehouse docking areas.

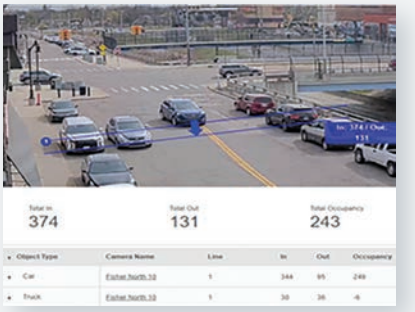
Such analysis provides visibility into traffic volumes and flows and objects and dwell times in loading bays.

RESULTS

The insights gained from six months of data collection will position the market to introduce innovative solutions that improve operational efficiency, reduce waste, and add value for long-term sustainability.

Through collecting data and studying traffic patterns, the market will be able to prepare for upcoming road construction work, identify areas for safety and traffic flow improvements, and plan contributions to related neighborhood and city projects.





A Turnkey Solution Streamlines Traffic Signals and ITS Management

Northeast United States

Deployed on AT&T FirstNet cellular network

SCENARIO

A U.S. metropolitan area needed a citywide communication backbone for ITS devices like traffic cameras, variable message services, vehicle detection devices, and traffic signals. But getting there required upgrading outdated infrastructure for signal control and field equipment connectivity that was challenging to manage and operate.

SOLUTION

AT&T Integrated Solutions and Consulting replaced the legacy system with a turnkey solution, implementing new high-speed connectivity services with network priority and preemption for cellular services on the FirstNet network.

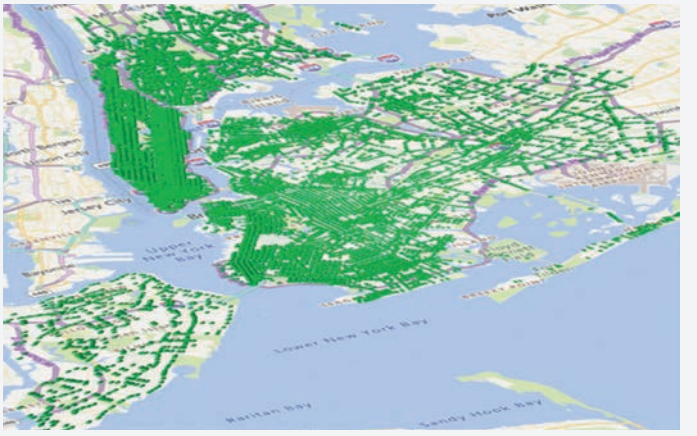
The solution features Digi routers, FirstNet SIM cards, and a dual-carrier design for redundancy, along with managed services to streamline operations, make them more efficient, and provide 99.99% communication reliability.

Specific to field operations, the solution provides visibility, reporting, and alerts for signals, cameras, and equipment that have lost connectivity. This data feeds into field service management systems that generate work orders for contractors.

RESULTS

Across the metropolitan area, 14,000 traffic signals were deployed and configured in less than nine months—under budget. Overall, the new solution lowered network maintenance and operation costs, reduced congestion, and improved public safety.

The Intelligent Transportation Society of New York recognized the initiative as Outstanding ITS Project of the Year - Traffic Management Systems.



Mobility Platforms & Data Management

As transportation systems grow more complex, it's more important than ever to be able to collect, analyze, and act on data in real time.

Mobility platforms powered by cellular connectivity are empowering transportation agencies to do just that, with granular, dynamic, actionable data that enhances their ability to manage fleets, monitor infrastructure, and deliver smarter, more personalized services.

As one example, solutions equipped with fleet telematics, sensor feeds, and analytics on user behavior are guiding informed, proactive decisions about routing, scheduling, and safety interventions. Such real-time insights make it possible for agencies to optimize traffic patterns, adjust signal timing based on live congestion levels, and more effectively deploy resources such as road crews or transit support—all while making operations more cost-effective and services more reliable.

At the same time, as airports, train stations, and mobility exchanges become digitally connected environments, cellular-powered internet solutions are redefining the passenger experience. Supporting everything from real-time navigation and alerts to streaming entertainment and video calls, these high-bandwidth transit hubs help travelers stay connected to loved ones and services that reduce stress and make travel more efficient.

Such solutions are also instrumental in bridging the digital divide
From mapping to navigate a new city to tools for accessing paratransit services and emergency updates, cellular-powered mobility platforms are connecting users to the information and resources they need, when they need them most, across devices and data plans.

Mobility platforms and data management tools are turning raw transportation data into real-world benefits, empowering agencies to work smarter and travelers to move more confidently through increasingly connected environments.

Wireless Connectivity Upgrades the Airport Experience

Phoenix, Arizona

Connectivity fabric: high-density wireless network and Passpoint® technology

SCENARIO

As travel gateways for residents and visitors alike, airports are uniquely positioned to demonstrate how strategically deployed technology can transform transportation. Phoenix Sky Harbor International Airport (PHX)—where more than 52 million passengers pass through each year—aimed to use intelligent transportation systems (ITS) to elevate the passenger experience.

The high volume of passengers demanded exceptionally reliable connectivity to support what had become an essential travel companion—the smartphone, relied on for everything from mobile boarding passes and digital wallets to rideshare apps, emails, and streaming content.

SOLUTION

PHX partnered with Boingo Wireless to design and deploy network infrastructure for a user-friendly, high-performance wireless experience that scales with traveler expectations and supports next-generation airport services.

Analysis of independent performance data and traveler behavior led the team to a high-density wireless network featuring Wi-Fi 6 and Passpoint® technology.

Passpoint automatically connects mobile devices to Wi-Fi, streamlining the experience for users and connecting them to a verified, secure network. Passpoint offers wireless carriers a roaming solution where they can offload mobile traffic to secure Wi-Fi networks at high-trafficked locations like airports, to better accommodate rising data usage while maintaining service quality.

Boingo's innovative offering delivers ultra-fast speeds, increased capacity, and the reliability required for bandwidth-heavy applications such as streaming, mobile ticketing, digital signage, and smart facility operations.

RESULTS

Today, the PHX airport network ranks among the nation's fastest, with Wi-Fi download speeds topping 150 Mbps, according to independent analysis by Ookla®.

"Smart transportation starts with smart connectivity. At Phoenix Sky Harbor, we've built a wireless foundation that supports passenger journeys and next-gen airport operations," said Boingo Wireless CEO Mike Finley. "By combining Wi-Fi 6, Passpoint, and real-time performance data, we're delivering the kind of connected experience today's travelers expect—and tomorrow's infrastructure demands."

Smarter Fleet Management Boosts School Safety and Savings

Eugene, Oregon

Deployed on 4G LTE networks

SCENARIO

The Three Rivers School District manages a large fleet of school vehicles over a sprawling and often remote geographic area. Poor access to reliable, real-time data meant that vehicles were not always serviced on time, increasing costs and putting safety at risk.

SOLUTION

To maximize resources and support informed decision-making, the district deployed GPSTrackit®, a GPS-based fleet management solution powered by UScellular over an LTE network.

This solution turns real-time vehicle tracking into enhanced operational efficiency through features such as route optimization, smart maintenance alerts, and driver monitoring for behaviors that support energy conservation and safety.

RESULTS

GPSTrackit® has helped Three Rivers School District achieve significant improvements in efficiency and cost savings.

Inspired by the successful GPSTrackit deployment, the district embarked on phase two: equipping the vans that transport students to afterschool activities with Cradlepoint® LTE-enabled routers, powered by UScellular. This initiative brings reliable internet access to students who live in areas with little to no connectivity, ensuring that learning continues beyond the classroom.

+ **Reduced fuel consumption by 15%**
+ **Reduced idle time by as much as 35%**
+ **Saved $50,000-$100,000 each year, money that can be reinvested into classroom education**

Managing Smart Transportation Infrastructure at Scale

As smart transportation technologies like EV chargers, intelligent signals, connected crosswalks, and solar-powered streetlights become more widespread, transportation agencies face new challenges.

Managing a growing and diverse ecosystem of 4G/5G-enabled infrastructure, across multiple locations and use cases, often introduces:

+ **Delayed detection of issues** due to a lack of real-time monitoring and alerts
+ **Inefficient use of resources,** as field teams struggle to coordinate across departments or asset types
+ **Missed opportunities for optimization,** such as adaptive lighting or proactive charger maintenance
+ **Fragmented operations,** where each device type or vendor has its own platform or process

In terms of data, smart transportation systems often generate large volumes of information across siloed platforms, each with its own maintenance schedule, service-level requirements, and communications protocols. Lack of a centralized approach puts visibility, efficiency, and reliability at risk as deployments scale.

All these issues are particularly pressing for cities aiming to deploy infrastructure equitably, reduce emissions, and improve roadway safety.

This is where operations management platforms come in. By integrating data from multiple transportation technologies into a single interface, these platforms help agencies with several key functions: monitoring asset status in real time, automating maintenance schedules and alerts, tracking performance metrics across departments and jurisdictions, and facilitating data-driven decisions to improve system efficiency and safety.

All of these issues are particularly pressing for cities aiming to deploy infrastructure equitably, reduce emissions, and improve roadway safety.

Key takeaways for ITS and public sector professionals

For DOTs and municipalities pursuing cellular-enabled solutions, centralized operations platforms offer:

+ **Scalability,** with one system managing many use cases across a city or region
+ **Resilience,** leveraging real-time insights to quickly address service disruptions
+ **Efficiency,** reducing costs and staffing burdens over time
+ **Equity and planning,** with data tools that prioritize maintenance and guide future investments in underserved areas

In today's increasingly connected infrastructure environment, software-driven management is more than helpful. It's essential. Agencies upgrading legacy systems or planning new deployments should evaluate how centralized tools can support long-term reliability, safety, and sustainability.

Centralized management tools in action: TerraGo

Software providers like TerraGo are supporting platform deployments nationwide with flexible tools that can integrate diverse assets.

The City of Chicago, for example, uses the TerraGo software platform to manage its connected lighting network and advanced traffic systems. Duke Energy applies a similar approach to the maintenance and expansion of its EV charging stations. In San Antonio, Dalkia Energy Solutions utilized TerraGo software to test solar streetlights and smart crosswalks in a lab environment prior to deployment.

In all cases, commercial 4G and 5G cellular networks enable real-time monitoring and control.

Such deployments of centralized management tools have demonstrated:

+ **Energy savings** via connectivity-enabled adaptive lighting control
+ **Improved system uptime** through the proactive identification of maintenance needs
+ **Enhanced safety** through activities like crosswalk monitoring and smart traffic signals
+ **Faster scaling,** without added operational burden, as cities expand infrastructure

Some of these deployments have received widespread recognition, including World Smart City and Smart 20 Awards, for the powerful outcomes made possible by cohesive operations.

In all cases, commercial 4G and 5G cellular networks enable real-time monitoring and control.

Last-Mile Delivery

The “last mile” of a product’s journey—the final leg between distribution hub and destination—is one of the most critical, and costly, segments in the logistics chain.

Last-mile delivery can account for over half of total shipping expenses due to inefficiencies, unpredictability, and complexities related to traffic congestion, failed delivery attempts, and manual labor costs.

Cellular-enabled solutions are stepping in to help. Real-time tracking, route optimization, and vehicle coordination have tremendous potential to improve the timing of deliveries, reduce fuel use, and enhance customer satisfaction. The wireless communication technologies enabling such solutions also give logistics providers full visibility across delivery networks, even in dense or shifting traffic conditions, so they can monitor fleets and adjust routes on the fly.

Cellular networks are also enabling the next generation of automated, last-mile solutions, including delivery robots, drones, and electric cargo bikes. These innovations rely on low-latency, high-reliability networks to safely navigate around obstacles on sidewalks and communicate with traffic systems in real time. Powered by 5G and edge computing, these autonomous systems can process data locally and operate with greater precision, making deliveries more efficient while reducing operational costs.

Finally, predictive analytics and dynamic dispatching solutions powered by real-time cellular data enable clustered deliveries. This reduces idling and carbon emissions, supporting broader sustainability goals while solving logistical bottlenecks.

Thanks to cellular innovation, last-mile delivery is undergoing a vital transformation from a historically inefficient cost center to a valuable layer of technology-driven services.

As communities continue to grow and e-commerce expands, these solutions will be essential for building smarter, more sustainable logistics ecosystems, especially in densely populated, high-traffic environments.

Improving Efficiency for Last-Mile Deliveries

Peachtree Corners, Georgia

Deployed on 5G networks

SCENARIO

As labor shortages and logistical challenges make last-mile deliveries more difficult, consumers increasingly face the prospect of rising costs being passed along to their wallets. At the same time, companies are challenged to hire and train drivers and delivery personnel who are in short supply.

Peachtree Corners, Georgia is using robotics, T-Mobile's 5G network, and edge computing to turn this situation around, bringing speed, efficiency, and cost-effectiveness to an important part of the transportation ecosystem.

SOLUTION

An agile mobile robot uses LiDAR and software coordinates to deliver packages to specific stops, with human interaction providing data around when and where a package is dropped, the package's condition, and environmental conditions of the neighborhood.

Robots are designed to tackle complex real-world situations, like navigating gated communities and making multiple deliveries at an individual location, while seamlessly co-existing with pedestrians, cyclists, and other potential obstacles on city sidewalks.

RESULTS

This proof-of-concept demonstration is showing how 5G-powered robots can help companies save time and money during a critical stage of package delivery. It is also setting the stage for organizations involved in complementary areas, such as drones and security, to come to Peachtree Corners to test technologies and uncover their own use cases.

Safe & Efficient Streets

To reduce traffic fatalities, improve walkability, and ensure that transportation networks serve everyone, including the most vulnerable users, cities need more than pavement and signage. They require the real-time data that advanced sensing technologies, edge intelligence, and robust, low-latency cellular networks can deliver.

Cellular connectivity is enabling this new generation of street-level safety tools, from AI-powered cameras and sensors to edge computing platforms that analyze traffic and environmental conditions in real time. High-resolution visual sensors, for example, can securely transmit data over cellular networks to monitor traffic incidents, identify risks, and support rapid response—all while reducing bandwidth demands.

A particularly powerful advancement in this space is cellular to V2X (C-V2X) technology, enabling direct communication between vehicles, traffic infrastructure, and even pedestrians' mobile devices.

In high-risk areas such as school zones, crosswalks, and intersections—places where speed, distraction, and lack of visibility can quickly lead to tragedy—C-V2X systems enable communities to:

+ **Alert drivers** when a pedestrian is entering a crosswalk, even if visibility is poor or the pedestrian is beyond the line of sight
+ **Deliver warnings of potential red-light violations** to both drivers and nearby traffic infrastructure, helping prevent collisions at intersections
+ **Automatically trigger reduced speeds or alerts** in school zones, when children are present or during designated hours
+ **Preempt traffic signals** so emergency vehicles can travel faster and more safely

These capabilities help cities shift from reactive to proactive mode, anticipating risks before incidents occur and adjusting traffic systems dynamically to prevent harm. Combined with traditional safety programs, such cellular-enabled technologies are advancing the goal of global movement Vision Zero: eliminating traffic fatalities and severe injuries while increasing safe, healthy, equitable mobility for all.

Cellular connectivity, AI, and C-V2X are empowering transportation leaders to build these streets, optimizing traffic flow and actively protecting both drivers and pedestrians.

> **The ITS vision is clear: Safe and efficient streets are no longer just about infrastructure—they're about intelligence.**

Sensors Strengthen Safety on The Ray Highway in West Georgia

LaGrange and West Point, Georgia

Deployed on 4G LTE networks

SCENARIO

Along highways like I-85 in West Georgia, crash cushions, guardrails, cable barriers, end terminals, and other roadside safety devices play a vital role in protecting motorists during collisions. But even minor crashes can compromise the devices' protective function.

Historically, damage detection has relied on manual inspections or incidental discovery by law enforcement or road crews. Without visible damage or formal incident reports, assets can remain unrepaired for weeks or even months.

This approach leaves gaps in safety and poses a challenge for The Ray Highway, an 18-mile stretch of I-85 designed as a proving ground for transformative ideas and technologies for transportation infrastructure.

SOLUTION

The Ray, a national nonprofit, and its partners at the Georgia Department of Transportation (GDOT) oversaw the deployment of an Impact Detection System, featuring pi-lit® connected roadway products, along high-risk segments of I-85.

The team installed lightweight, battery-powered sensors directly onto crash cushions and other safety assets—each deployed in under a minute without tools or specialized hardware. These sensors detect impact events and transmit alerts via a local mesh radio network to a centralized cellular gateway, providing real-time visibility into the condition of roadside safety equipment.

RESULTS

The I-85 deployment by The Ray and GDOT demonstrates how quickly officials can bring smart infrastructure online to expedite response and repair times and ultimately reduce the risk of secondary crashes. With each $15,000 crash cushion now monitored for less than $1 per day, and with sensor battery life of up to four years, the new system provides a cost-effective alternative to manual inspections.

The solution is scalable as well, integrating with state monitoring and transportation management systems, dispatch systems, and cloud platforms such as Waze and Google Maps.

Future-Focused Security and Parking Management

Peachtree Corners, Georgia

Deployed on 4G LTE and 5G networks

SCENARIO

Peachtree Corners' growing pains included the full parking lots and public safety issues that come with an expanding community.

To make operations like event parking more efficient while protecting citizens, the municipality joined forces with its technology partners.

SOLUTION

The deployment began with more than 80 5G-powered Bosch IoT camera sensors to collect live data, which is condensed in transit across 5G networks.

Ericsson Cradlepoint R1900 5G routers are deployed side by side in a Panorama 5-in-1 dome antenna, allowing data to run over the network in real time. A visualization management suite feeds city staff valuable analytics to improve daily operations.

For traffic safety, the solution monitors data like the number of cars passing pedestrians in a crosswalk, vehicle types, and traffic law and speeding violations. It can also be used to monitor for theft and license plate recognition.

To manage parking in the busy Town Center, the 5G gateway connects to cameras that track available spaces, including those in a five-story concrete garage. Shoppers and restaurant-goers can track openings via an app, while police monitor activity through live video feeds.

For ensuring public safety during Peachtree Corners' many community events, the city hitches solar-powered mobile trailers with Ericsson Cradlepoint routers and Bosch cameras to city trucks, which are moved around for special events and into areas that have seen an increase in criminal activity.

Overall, the system runs more than seven applications via edge computing, which locates computing solutions closer to the source for faster processing.

RESULTS

Local police now have real-time information and visuals, as well as a cache of historical video data, to use in their investigative work. These tools led to the apprehension of three individuals involved in the tragic death of a Peachtree Corners' resident and the recovery of over $3 million in stolen property over just one year, a six-fold increase from a similar period before the solution was deployed.

Workers, visitors, and residents benefit from real-time parking space alerts and information on overflow lots through the community's app. For local businesses, the city has shared data on parking and vehicle dwell times to help them build their staffing plans.

Implementing the technology over the city's public 5G network, which is seven times faster than 4G and powerful enough to accommodate edge processing, was a cost-effective move, as this solution didn't require new wired infrastructure. The city estimates it saved over $100,000 in installation costs and will continue to save thousands on ongoing connectivity costs when compared to potential alternate deployments.

Finally, edge computing eliminates the network congestion that often comes with raw video streaming.

"Edge computing is debunking the belief that real-time video is huge data that we can't afford," said T-Mobile Program and Business Development Director Tiana McNeil. "Condensing data at the edge allows for minimal data over the network, which allows commercial data plans to use this."

> **"Condensing data at the edge allows for minimal data over the network, which allows commercial data plans to use this."**
>
> T-Mobile Program and Business Development Director Tiana McNeil

Optimized Highway Monitoring Increases Safety and Savings

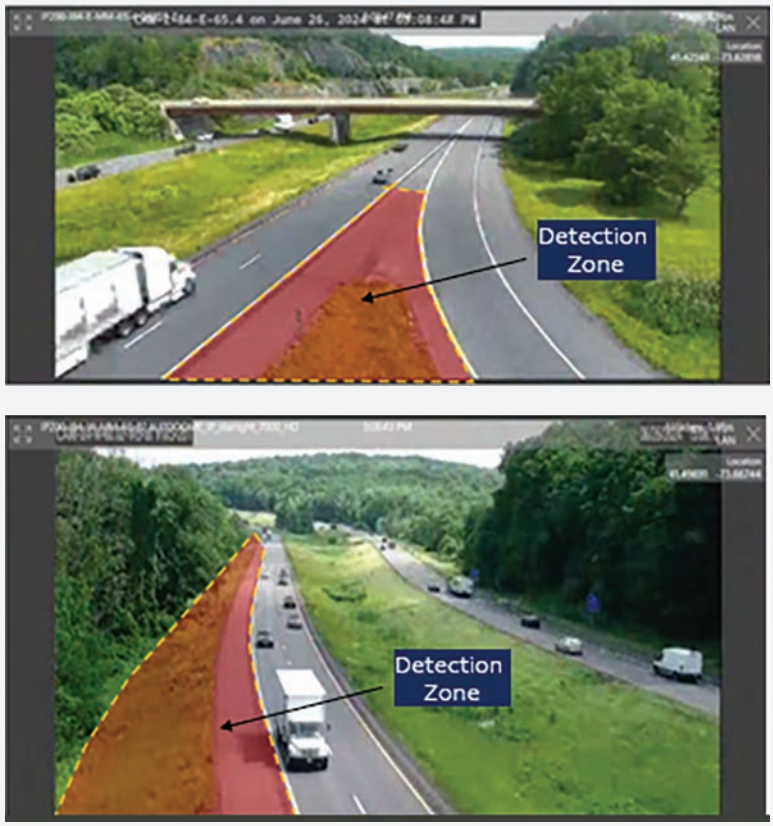
Northeast United States

Deployed on AT&T FirstNet cellular network

SCENARIO

A driver crosses the median for an illegal U-turn. A vehicle stalls on the shoulder in need of help. In these dangerous highway situations, situational awareness facilitates the quick response that keeps everyone safe. Transportation departments also need situational awareness for routine activities that enhance safety, like confirming that authorized vehicles are on site for repairing streets and cutting grass.

For the DOT of a city in the northeastern U.S., legacy network solutions were holding these important monitoring efforts back. Video quality and alert capabilities were poor, and high data overages were resulting in more costly than necessary cellular bills.



SOLUTION

The DOT moved its infrastructure into the future by installing AT&T's IoT Video Intelligence, which enables more efficient monitoring and management of transportation environments, over a cellular network.

Designed to work well in poor or changing network conditions, the solution connects a video compression encoder at the edge with remotely managed cameras enabled for analytics.

AT&T and the city established geofenced areas and rules to notify authorities of specific behaviors—if a vehicle stops in a restricted area or performs a maneuver like an illegal U-turn, for example. A central command center manages monitoring and compliance, with alerts sent in real time to authorized personnel.

Unique codec compression technology means that the solution uses less data when streaming video, reducing operational costs.

RESULTS

With automated, real-time alerts, roadway incidents are now detected and addressed within minutes—reducing risks for stranded motorists, deterring dangerous maneuvers, and ensuring work crews are visible and protected. The improved situational awareness helps prevent secondary accidents, keeps traffic flowing more smoothly, and strengthens compliance with roadway laws.

Unique codec compression technology means that the solution uses less data when streaming video, reducing operational costs.

Enhancing Road Safety with 5G, MEC, and Virtual RSUs

Phoenix, Arizona

Deployed on 4G LTE and 5G with public multi-access edge computing (MEC)

SCENARIO

As drivers use routing apps to get to their destinations swiftly and safely, agencies like the Arizona Department of Transportation (ADOT) are challenged to deliver timely notifications about conditions such as dangerous curves, impassable roads, or sudden slowdowns due to work zones or traffic queues.

Communication methods like dynamic message signs and traffic apps are limited in their ability to reach drivers everywhere. Delayed driver notifications, along with incomplete views of traffic safety, impact commuters, first responders, and overall road safety, especially during severe weather or work zone incidents.

SOLUTION

Through its Emerging Technology Program, the Maricopa Association of Governments (MAG) facilitated a pilot project between ADOT and Verizon to cost-effectively deliver life-saving alerts.

The project brought together a virtual roadside unit (RSU) powered by Verizon's Edge Transportation Exchange, a V2X communication platform powered by mobile networks, and public MEC infrastructure.

This V2X model enables complex computations and data routing closer to the traffic source. The virtual RSU flexibly integrated with ADOT's Operations Center via APIs and links with the range of cloud, data center, and IoT devices, enabling integration for cameras and sensors on vehicles and in connected infrastructure.

The pilot project tested and validated:

+ **Back-of-queue alerts:** ADOT aggregated third-party roadway speed data to dynamically define geofenced areas of congestion. Test vehicles entering these geofences received real-time back-of-queue alerts via a smartphone app, proving the successful integration of disparate systems.

+ **Curve speed alerts:** ADOT identified locations with existing curve speed advisories, information the virtual RSU used to send test vehicles timely warnings before sharp curves.

+ **Work zone alerts:** Empowered by edge data processing, the solution sent audio alerts to test drivers' phones, enabling drivers to react safely without needing to glance at a screen.

Leveraging existing cellular networks, this software-centric approach enabled V2X messaging for timely smartphone alerts and established a foundation for a cost-effective, scalable digital roadway infrastructure.

RESULTS

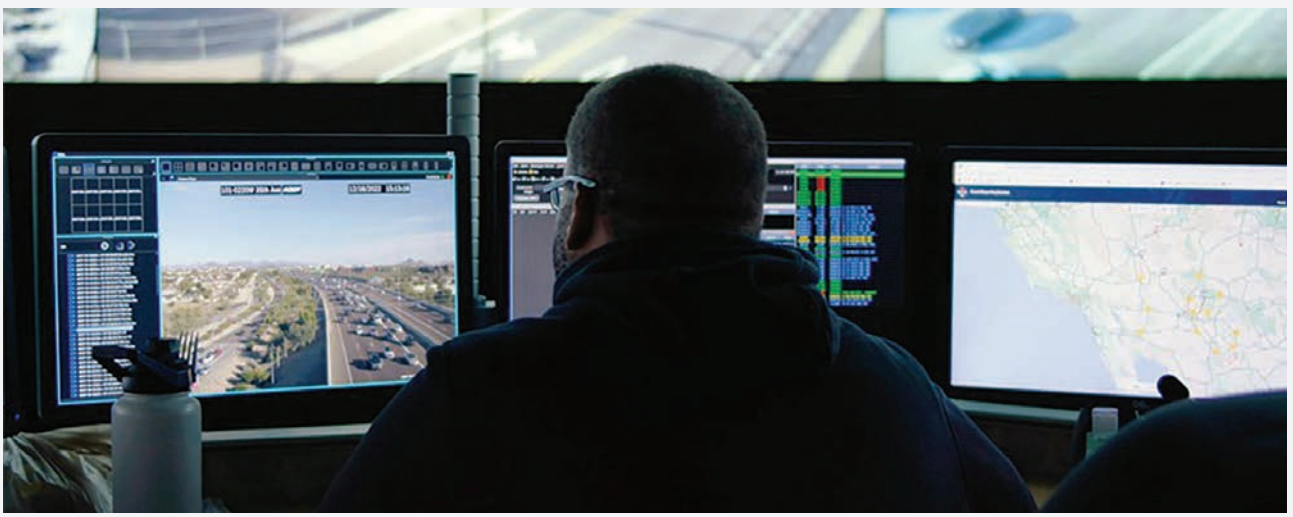
Promising initial results demonstrate the power of collaboration between ADOT and MAG and a significant move forward for traffic safety and smart transportation in Arizona.

With a crucial proof of concept established, the virtual RSU platform, using public MEC and ubiquitous cellular communications, offers a more cost-effective method for disseminating timely roadway information to drivers.

ADOT is now implementing the solution in a cloud environment for faster scalability. The next step involves load testing with a larger number of cellphones and exploring the system's integration with traffic signals, which are critical areas for determining future viability.

Following the ADOT deployment and a successful joint demonstration with the 5G Automotive Association, Verizon's Edge Transportation Exchange is now being adopted across multiple municipalities and transportation agencies.

The Delaware Department of Transportation, Rutgers University's Center for Advanced Infrastructure and Transportation, and Volkswagen Group of America have all begun using the platform as part of their connected vehicle efforts—growing momentum that underscores the platform's ability to support scalable, real-time V2X communications across a range of transportation environments.



Smart Lighting & Connected Infrastructure

In the era of smart connected infrastructure serving communities, a streetlight's role has evolved from serving the single purpose of illumination to acting as an essential platform for connectivity and digital services.

From public safety to air quality monitoring to connectivity, smart streetlights are becoming a foundation for broader smart city functions. Moreover, these systems align with community emission reduction and sustainability goals, reducing idling, improving traffic flow, minimizing wasted energy, and enabling the shift to electric and connected transportation options.

In today's world, smart lighting is more than an illumination upgrade
It is a gateway to broader smart city transformation. With cellular 5G embedded into lighting poles, communities can build a connected foundation that supports economic growth, environmental resilience, and digital inclusion—all while making streets brighter, safer, and smarter.

With 5G nodes and IoT sensors, cities and towns are turning streetlights into networks of critical infrastructure:

+ **Supporting connected traffic systems** such as adaptive signal controls, smart parking, and real-time traffic monitoring, without additional roadside installations
+ **Enabling advanced mobility services** that depend on reliable wireless communication at the street level, such as C-V2X, AV navigation, and micromobility hubs
+ **Enhancing public safety** through integrated cameras, sensors, and environmental monitoring tools that feed data back to public works or emergency management systems in real time
+ **Extending high-speed wireless coverage,** especially in lower-income neighborhoods, rural regions, and underserved corridors, by using these lighting assets to scale connectivity
+ **Lowering energy costs and emissions** through smart lighting systems with LEDs and dimming schedules and through automated maintenance alerts that optimize performance

Transforming Streetlight Management and Maintenance

Washington, District of Columbia

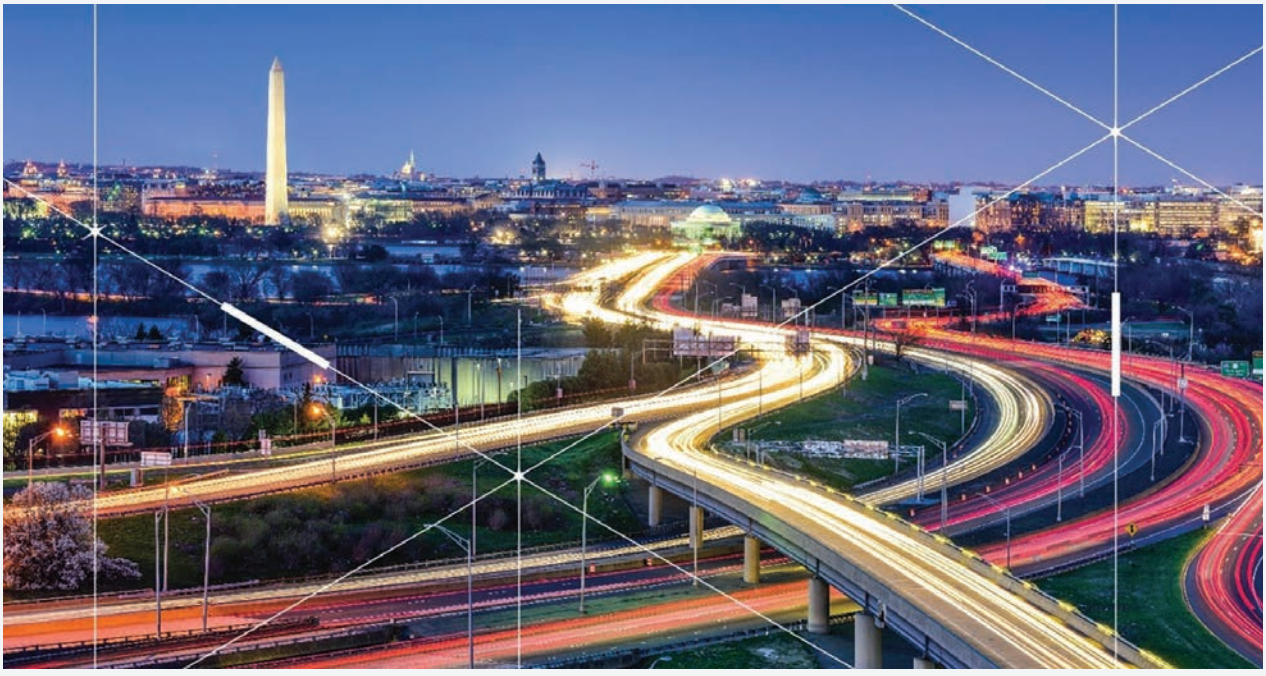
Deployed on LTE-based low-power wide-area networks (LPWAN): NB-IoT and LTE-M

SCENARIO

As Washington, D.C., faced growing challenges with its public lighting infrastructure, the city sought to revolutionize the way it was managed, especially in the areas of maintenance and energy efficiency.

Municipal leaders had ambitious goals for what a new technology solution needed to do: enable remote management and intelligent planning across the entire lighting network, provide real-time insights into network operations, alert city authorities to issues like electrical grid integrity, lamp failures, or pole damage, resolve these issues in a timely manner, and optimize maintenance operations through automated workflows.

The solution also had to seamlessly integrate with existing maintenance platforms and align with the city's sustainability goals of reducing energy consumption and promoting environmentally friendly practices.



SOLUTION

The District Department of Transportation selected Flashnet's inteliLIGHT® smart street lighting solution.

The project deployed 75,000 inteliLIGHT FRE-220-NEMA controllers across the city's lighting network, powered by innovative 4G NB-IoT/LTE-M cellular technology and 15 years of prepaid connectivity.

Compatible with a wide range of lighting fixtures and designed for plug-and-play installation, these compact controllers offer capabilities for streetlight monitoring and management. They collect detailed data on the controller, lamp, pole, power grid, and communication network, including electrical parameters such as voltage, current, power, and energy consumption. A tilt sensor detects pole damage and a "last gasp" alert notifies authorities of power outages, even when the system is no longer powered.

The inteliLIGHT® StreetLight Control software serves as the central platform and data repository for managing the city's lighting network. As ON/OFF scheduling and dynamic dimming optimize operations and energy consumption, the platform delivers real-time updates on lamp status, electrical parameters, and potential pole damage.

This precise data enables swift issue resolution and streamlined maintenance activities, increasing efficiency while reducing downtime and operational costs. Seamless integration with the municipality's other management systems ensures that all stakeholders can access the data they need.

The system relies on NB-IoT with fallback to LTE-M to ensure elevated levels of availability, bandwidth, coverage, reliability, and support for high data flows and real-time response.

RESULTS

Through this combination of advanced hardware, intuitive software, and reliable communications, Washington, D.C., is benefiting from a future-proof smart street lighting solution that enhances safety, energy efficiency, and city management while turning public lighting infrastructure into a cutting-edge smart grid.

The modernization project, which combined energy-efficient LED technology with the inteliLIGHT® remote management solution, has reduced energy consumption by 50%, lowering both operational costs and carbon emissions. Real-time alerts and reliable lighting across all neighborhoods have improved public safety, while automated workflows and detailed data collection have enabled more efficient maintenance and faster, more precise repairs, reducing downtime and extending equipment lifespans.

Seamless integration with existing platforms has ensured smoothly coordinated, effective operations, and the system's scalable infrastructure makes it ready to support future smart city initiatives like extended public internet coverage and IoT-enabled services.

One of the largest streetlight modernization efforts in the U.S., the project reflects Washington, D.C.'s commitment to innovation, sustainability, and a brighter, more connected future for its residents. It sets a benchmark for intelligent urban lighting and smart city solutions.

Smart Transportation Best Practice Insights & Opportunities

Modern Transportation Starts with Connectivity Mapping

As cities and agencies deploy the next generation of intelligent transportation systems (ITS), one critical question often determines success: Is the connectivity there to support it?

Today's mobility technologies—adaptive signal controls, connected vehicles, pedestrian safety systems, real-time transit information, and beyond—depend on secure, reliable, low-latency wireless networks. Coverage gaps, outdated infrastructure, and inconsistent access within and across neighborhoods can limit the reach and impact of ITS solutions.

At the same time, ITS deployments must also be able to scale with evolving connectivity demands. For example, how can networks remain secure and reliable as performance needs, such as low latency, continue to advance?

All of this makes connectivity mapping a foundational step in any modern transportation strategy.

Connectivity mapping transforms ITS from a promising concept into a practical, equitable, and scalable reality, enabling leaders to take a proactive, strategic approach to smart transportation and mobility deployments.

Simply put: Before you build it, map it. Whether you obtain connectivity data from public or private sources, understanding your coverage footprint is essential to making these strategic decisions that drive successful deployments.

1. **Connectivity is foundational to smart ITS deployment**
   Mapping existing connectivity helps transportation agencies deploy ITS technology where it can perform reliably and deliver the greatest benefit.

2. **Visualizations of network readiness reveal strategic opportunities**
   Mapping cellular coverage, network types such as 4G LTE, 5G, and LPWA, and infrastructure assets such as poles, cabinets, and fiber backhaul allows agencies to:

   + **Identify connectivity gaps** in school zones, emergency corridors, underserved neighborhoods, and other critical areas

   + **Layer in available technologies,** to maximize the impact of the ITS investment

   + **Spot opportunities for shared infrastructure** across use cases such as EV charging, parking, and public transit

3. **Connectivity mapping supports smarter, more equitable decision-making**
   Essential tools for ensuring transportation equity, connectivity maps help agencies ensure that ITS technologies reach:

   + Communities disproportionately impacted by traffic crashes

   + Areas with historically underinvested infrastructure

   + Locations where mobility challenges limit access to jobs, healthcare, and education

4. **Connectivity mapping enables phased, targeted deployments**
   Agencies can phase investments based on readiness and deploy pilots where infrastructure exists. Looking ahead, future buildouts can proceed in parallel with broadband expansion, 5G small cell rollouts, and the evolving connectivity requirements of ITS use cases

5. **Connectivity mapping focuses efforts on key ITS use cases**
   Sometimes the most challenging part of an ITS project is knowing where to start. Should a solution tackle traffic signals and intersections or pedestrian and micromobility zones? Should it prioritize transit stops and corridors or zones for parking and curb management?

   A map of network connectivity helps agencies focus on the areas of greatest readiness, opportunity, and impact.

Connectivity Mapping Makes School Zones Safer

Smart signs equipped with 4G/5G connectivity can bring dynamic scheduling, compliance monitoring, and real-time fault alerts to school zones.

Without sufficient, reliable cellular connectivity, these signs default to basic cycles and lose critical functionality.

Too many departments of transportation (DOT) deploy other connected safety infrastructure without first asking: Can these devices connect when and where we need them most?

Tools like the Ookla® Speedtest Insights™ help DOTs answer this question by evaluating mobile network performance before installation, at the pole level.

With this data, agencies can:

+ Position smart signs based on evidence, guided by 25-meter coverage grids around school approaches
+ Use real-world signal strength, upload speeds, and latency in carrier selection
+ Incorporate overlays of Title I school zones, crash data, and infrastructure inventory into planning

What Connectivity Mapping Could Reveal: A School-Zone Example

Connectivity mapping can provide powerful insights during the planning and deployment of ITS technologies. In one modeled school-zone scenario, connectivity analysis suggests it could:

+ Increase scheduling reliability to over 95% by choosing the strongest carrier
+ Restore full connectivity without trenching by repositioning signage, based on Speedtest® data
+ Improve signal strength for remote functionality with the addition of a small panel antenna
+ Reduce technician truck rolls by up to 89%
+ Raise compliance with school-zone speed limits from 61% to 88%

Key Takeaways

A “map first, deploy second” strategy gives DOTs confidence that every connected asset—from a beacon to a traffic camera—will function as designed. It enables communities to achieve measurable safety gains without added infrastructure costs, while ensuring that taxpayer dollars support operational, connected, and impactful deployments.

The Importance of Connectivity Maturity

Installing new equipment and wireless nodes is just the beginning of a successful ITS deployment. These systems are only as effective as the networks they run on: 4G LTE, 5G, and beyond.

As transportation networks become more data-driven and decentralized, it is critical to know the maturity of a solution's connectivity infrastructure. This involves understanding where connectivity is strong, where it is vulnerable, and where strategic investment will yield the greatest returns in terms of safety, efficiency, sustainability, and equity.

A Roadmap for Making Every Deployment Count

With federal funding flowing into digital infrastructure and mobility, the next steps need to be fast and smart. The Smart Transportation Connectivity Maturity Assessment equips decision-makers with the clarity for both, ensuring that wireless connectivity accelerates, not impedes, smarter, safer, and more equitable transportation systems.

For cities and transportation agencies preparing for funding opportunities and new innovations, a structured assessment process provides the insight needed to turn promising ideas into strategic, impactful deployments. It also encourages cross-department collaboration, bringing traffic engineering, IT, public safety, and planning together into a shared vision of what a truly connected transportation system can achieve.

Read on to learn about the Smart Transportation Connectivity Maturity Assessment, then get started by scanning this QR code.

The Smart Transportation Connectivity Maturity Assessment:
A targeted framework for modern transportation

Part of CTIA's Wireless Maturity Model, the Smart Transportation Connectivity Maturity Assessment gives transportation leaders the insight they need to deploy solutions where they will make the greatest impact.

The assessment consists of 24 structured questions across the following transportation domains:

1. **Intelligent traffic systems and intersections:** These questions evaluate a network's ability to support adaptive signal control, connected vehicle infrastructure, and data sharing between signal cabinets, roadside units , and cloud-based platforms. When connectivity is mature, solutions are better able to improve traffic flow, safety, and emergency response.

2. **Micromobility (pedestrians, scooters, bicycles):** These questions assess how well wireless infrastructure supports real-time alerts, curbside management, and safe integration of pedestrians and micromobility users into multimodal environments. When connectivity is mature, solutions are better able to reduce crashes, improve accessibility, and ensure vulnerable road users are protected.

3. **Parking:** These questions explore the current and potential use of cellular-connected sensors, dynamic signage, and real-time data for curbside and off-street parking. When connectivity is mature, solutions are better able to improve compliance, reduce idling emissions, and support demand-based pricing and enforcement.

4. **Public transportation:** These questions determine systems' readiness to support cellular-based fleet management, passenger information systems, and intermodal coordination. When connectivity is mature, solutions are more equipped to enable more reliable service, greater equity, and integration with shared mobility systems.

To determine the current state of readiness for ITS deployments, the assessment evaluates wireless connectivity in each of the following dimensions:

1. **Data communications:** Are ITS assets able to exchange data in real time reliably and securely?

2. **Connectivity access:** Is wireless access available and consistent across the transportation network?

3. **Infrastructure:** Are the necessary physical and digital components, such as signal cabinets, poles, fiber, and backhaul, available to support new deployments?

4. **Resilience:** Are systems able to handle disruptions, scale with demand, and continue operations during crises?

5. **Security:** Are devices and data protected with certified, standards-aligned cybersecurity practices?

6. **Equity:** Are ITS improvements being deployed equitably across neighborhoods and user groups?

After completing the assessment, agencies receive a customized Maturity Report giving each focus area and capability a score of "yesterday," "today," or "tomorrow." This helps agencies identify where they are at and where to start with new ITS deployments, so they can pinpoint high-impact technologies and prioritize and align investment opportunities, while justifying these infrastructure upgrades and the importance of technology adoption.

Funding ITS Innovation

With the convergence of technological maturity and public demand for more connected, resilient infrastructure, ITS innovation is at a unique—and advantageous—moment in 2025.

Legislation like the Infrastructure Investment and Jobs Act (IIJA) and American Rescue Plan and targeted innovation programs like SMART Grants and Safe Streets and Roads for All (SS4A) unlocked historic levels of investment aimed at improving safety, reducing emissions, and boosting efficiency through technology.

What type of projects have received funding?

Cellular-connected ITS align with frequent government priorities around safety, efficiency, and innovation—reducing roadway incidents, enhancing security monitoring and emergency response, and keeping traffic and supply chains moving, all with the cost and speed benefits of being able to be retrofitted into existing streetscapes.

Connected intersections, real-time transit data, C-V2X systems, and adaptive traffic management are considered particularly well-aligned with these objectives, as are projects that are data-driven and cross-modal.

At the same time, 5G- and edge computing-powered capabilities like autonomous delivery, dynamic curb management, and AI-based traffic analysis are all exciting uses of cutting-edge innovation.

Where have transportation agencies and communities looked for funding?

+ Grants through SS4A and the U.S. DOT's SMART program
+ HUD appropriations
+ IIJA solicitations (through 2026)
+ Tech-related funding streams outside of transportation, especially around safety, security, and preparedness
+ Planning grants that have already been awarded, offering support in the next step of implementation

How can transportation agencies and cities improve their chances for funding success?

When planning ITS projects:

+ Align goals to federal priorities
+ Design for interoperability
+ Identify best-fit funding sources
+ Build relationships with decision-makers inside federal and state DOTs

When drafting proposals, presentations, and reports:

+ Clearly articulate the problem your technology addresses and how it will solve it, with a focus on cost savings and public benefit
+ Emphasize the data and cross-modal aspects of the deployment
+ Craft responses that hone exactly to funding and reporting requirements
+ Rigorously double-check (and triple-check) all the above before hitting "send." Especially in today's funding environment, it's easier to spend this time and effort up front before documents are submitted than appeal a rejection or noncompliance decision afterward

Throughout, show how ITS projects can serve as models for improving safety, efficiency, and digital innovation.

Ensuring Secure, Future-Ready Deployments

Especially in public safety and mobility use cases that depend on real-time communications, the ITS devices deployed on cellular networks must be trusted, standardized, and interoperable.

Achieving this means seeking out certification programs that verify device compatibility with 4G, 5G, and LPWA cellular networks and use NIST/ETSI-aligned standards to evaluate device cybersecurity. Transportation agencies and communities should prioritize programs that streamline compliance with government regulations and support cyber-resilient deployments across the ITS ecosystem, from edge devices to cloud platforms.

Device certification advances the success of ITS initiatives through:

+ **Faster procurement:** Pre-certified devices can accelerate deployment timelines and reduce the need for costly retesting.

+ **More cyber-resilient streets:** Certification ensures devices play well within broader mobility systems—improving operational continuity, user safety, and data protection.

+ **Trust across the ITS ecosystem:** Through standards-aligned certification, ITS vendors show their public partners that their devices have met rigorous testing qualifications on commercial network infrastructure.

IoT Network Certified for Smart Connected Infrastructure™

Drawing on proven standards and specifically crafted for the needs of mission critical infrastructure devices, IoT Network Certified for Smart Connected Infrastructure™ is the first program of its kind verifying the readiness of devices, including cybersecurity protections, to connect to cellular IoT networks. By completing this certification, ITS solution providers demonstrate that their devices operate reliably in live cellular network environments, meet strong cybersecurity standards, and can be deployed at scale.

The program was developed by CTIA Certification along with Ericsson's Device and Application Verification Services team, a leading technology partner in mission-critical 4G/5G networks across the globe.

Certification has strong benefits for ITS IoT devices, particularly in the areas of smart intersections, connected vehicle technologies and communications, adaptive traffic signal control, and real-time pedestrian safety systems, as well as traffic camera and sensor integration and EV charging infrastructure.

While the scope of certification testing is determined by device type and intended use, the process overall evaluates:

+ **Device performance,** checking how devices will perform when deployed in the field
+ **Cybersecurity,** demonstrating that IoT devices in the transit areas of RSUs, OBUs, and traffic systems meet established industry standards
+ **Network interoperability,** ensuring that ITS devices like sensors, cameras, and signal controllers work seamlessly with public and private 4G/5G networks

Steps to A Network-Certified Device

To improve their chances of getting a device IoT Network Certified for Smart Connected Infrastructure, ITS manufacturers should:

+ Incorporate certified cellular-enabled modules into solution design, to ensure network interoperability and performance
+ Verify operator needs for deployment regions
+ Check compliance with government regulations, especially in target markets

From here, the steps involved in certification itself involve:

+ Submitting a certification request to CTIA Certification
+ Selecting a CTIA Authorized Test Lab to coordinate the testing process
+ Undergoing device testing

Once all requirements are met, the device will receive certification confirming network readiness and cybersecurity compliance.

Invest Strategically. Design Securely. Deploy with Confidence.

Through all types of intelligent transportation systems—connected and autonomous vehicles, adaptive traffic signals and smart intersections, EV charging infrastructure, and mobility platforms—cellular connectivity and wireless technology are transforming how people and goods move through our communities.

What unites these advancements is the growing importance of collaboration. Teamwork through a strong ITS ecosystem is essential for delivering innovative functionality, securing critical infrastructure, and accelerating responsible, resilient deployments. So are certification standards that ensure devices are interoperable, secure, and network-ready for safe integration into multimodal environments.

Whether reducing emissions through EV infrastructure, improving pedestrian safety with C-V2X, streamlining last-mile delivery, or empowering data-driven traffic systems, this moment represents more than a wave of innovation.

It is a call to action for communities, agencies, and private partners to work together and leverage the power of cellular connectivity to build a transportation system that is resilient, equitable, and ready for the future.

Learn more and take the next step at Town Square.

About CTIA

CTIA represents the U.S. wireless communications industry and companies throughout the mobile ecosystem. Our members provide the wireless networks, devices, equipment, and solutions that make smart cities possible. This includes the connectivity solutions behind smart transportation deployments. CTIA members are also drivers of 5G, the next generation of wireless. As advanced networks roll out across the nation, 5G will allow up to 100 times more simultaneous connections, up to 100 times faster connectivity, and lower latency, which is key for innovations like intelligent transportation systems. Due to the tremendous amount of private investment necessary to bring advanced networks to life, collaboration between industry and the public sector is paramount. As we look ahead to the exciting possibilities of smart cities technologies, CTIA is committed to helping communities of all sizes become the cities of the future.

Acknowledgments

This guide was created in collaboration with:

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