



How a 'Zero Everything' Approach to Transportation Can Improve Your Community

MARKET TRENDS REPORT



Executive Summary

Public safety lies at the heart of the mission for most state and local transportation departments (DOTs). Their primary objective always is to minimize the risk of traffic injury or death. They're also looking to reduce congestion and make travel easier, while at the same time supporting state and local environmental goals by paring back the pollutants that drive climate change and impact public health.

To deliver effectively on this diverse mission, DOTs are looking to intelligent transportation systems, or ITS. These systems integrate advanced solutions into transportation infrastructure, leveraging a broad range of communications-based technologies.

ITS typically will depend on a wide array of Internet of Things (IoT) sensors to feed vital information to DOT teams. These devices, along with roadside cameras, generate data on traffic flows, road hazards, weather and other key metrics. Information flows both ways in the form of dynamic messaging and variable speed limit signs, alerting the public to real-time traveling conditions. All this data helps to drive the decision-making that supports improved traffic and enhanced public safety.

Given the need for seamless, real-time data delivery, intelligent transport demands robust communications. As road transportation systems evolve, IoT-ready network technology enables transportation departments to optimize their road systems in support of a safer, less congested, more eco-friendly future.

All this comes together in support of the “zero everything” vision for ITS: zero fatalities, zero carbon and zero-trust security.

To learn more about this vision, GovLoop developed this report in conjunction with Alcatel Lucent Enterprise, which provides communications, networking and cloud solutions. We look at the challenges of deploying ITS and explore the technological foundation that can help ITS solutions withstand the rigors of a transportation environment.

By The Numbers

2.8 trillion miles:

the distance traveled by Americans in 2020, even with the pandemic

9.6 per

1 million:

Tokyo's road-fatality rates, one of the world's lowest, thanks in part to a data-driven smart-transport system

Automation “has the potential to transform safety, mobility, energy, and environmental efficiency, as well as to increase productivity ... within America’s transportation system.”

– Office of the Assistant Secretary for Research and Technology, U.S. DOT

\$68 billion

the projected size of the global ITS market by 2026

39.1%:

The U.S. share of the global market, making it the largest regional market for ITS

38,824

lives were lost in U.S. traffic crashes nationwide in 2020

34 hours:

the average time an urban commuter spends stuck in traffic each year

29%

of greenhouse gases in the U.S. come from the transportation sector

Modern Networks Drive ‘Zero Everything’ Vision

Challenge: Rigorous ITS Requirements

A number of hurdles may stand in the way of DOT efforts to stand up advanced ITS solutions. These may include:

- **Environmental factors:** In transportation, “networking equipment needs to withstand extreme temperatures and other environmental hazards,” said Kevin Jennings, vice president of Sales at Alcatel-Lucent Enterprise (ALE), “but it also must exhibit a comprehensive approach to robustness of software feature set, reliability and resiliency.” Equipment that has not been ruggedized may fail or underperform, leading to expensive truck-rolls and interruption to both IoT data flows and mission-critical applications.
- **Inherent complexity:** ITS is inherently complex, given the vast distances and thousands of components involved, along with the need to engage a broad range of stakeholders. At a time when connectivity may be taken for granted, “the lack of a modernized network solution further complicates an already challenging task for ITS teams,” said Roch Muraine, who leads the global transportation business practice at ALE.
- **The ITS/IT challenge:** Increasingly, ITS staff, well-versed in traditional signaling-oriented technologies, is faced with an expanded role that requires information technology expertise. ITS departments often lack IT experience and IT departments in DOTs tend to lack ITS experience. ITS staff must navigate the waters of developing the requisite knowledge and IT skills to accommodate the burgeoning IoT device-centric, security-sensitive network under their care.
- **Outdated networking software:** It can be challenging to keep the software up to date on dozens or hundreds of widely dispersed devices, but outdated software can lead both to performance problems and security gaps.
- **Lack of stakeholder commitment:** DOT leaders need support from diverse stakeholders, including lawmakers, citizens and others. Yet with ITS, they may struggle to articulate the clear and coherent narrative needed to generate stakeholder buy-in and, ultimately, budgetary support for their efforts.

Solution: A Modern Network Foundation

To drive an effective ITS deployment, transportation managers can seek out environmentally hardened switches possessing a sophisticated array of IoT and network security features. They can look for modernized software solutions, and steer toward a “zero everything” concept.

The ‘Zero Everything’ Framework

It’s helpful for DOTs to frame the evolution of ITS through the lens of “zero everything” – again, that’s zero fatalities, zero carbon and zero-trust security. For transportation officials who need to demonstrate the value of ITS to their key stakeholders in government, and to citizens, this framing helps to simplify an otherwise complex message and clarifies the value proposition driving ITS.

“By talking about ‘zero everything,’ it makes something complex visibly simple,” Muraine said. “That, in turn, attracts funding, because people can see the money going to specific areas of concern.”

Hardened Switches

Switches need to operate in a wide range of conditions – from minus-40 to 70-plus degrees centigrade, and from wet to dusty. “Along the highways, you typically don’t have available air conditioning or heating in the cabinets where these devices are housed,” Jennings said.

Hardened or ruggedized switches have been engineered to withstand these extremes. Hardening encompasses resiliency in switch code behavior, connections between switches, fault-tolerance and fault recovery, and a multi-layered security framework.

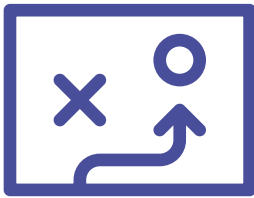
Modernized Software

Software plays a key role in a modernized networking solution: It helps ensure the sensor data needed to drive decision-making is relayed predictably and reliably.

For example, the operating system that drives the switch may incorporate advanced “self-healing” features, enabling the switch to diagnose and remediate issues as they arise, thus minimizing costly and time-consuming rollouts. Likewise, a backup of the operating system on a switch ensures that in the rare case when a switch fails, it can be restored automatically to its configuration for that particular location.

Best Practices in ITS Deployments

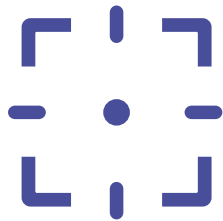
A number of key strategies can help DOTs advance their ITS ambitions. These may include ...



Be proactive

Too often, transportation officials find themselves in the position of having to put out fires. They're working in reactive mode, fixing things that are not working, rather than moving proactively toward a destination.

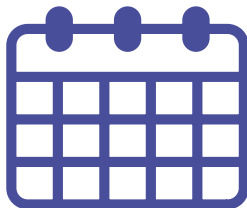
In transportation in general, and networking in particular, "you want to always be ahead of the game," Jennings said. "You always want to work toward having an infrastructure in place that is going to accommodate things as they come up, rather than waiting until they come up and then having to spend two to five years in search of a solution."



Define the scope of the problem

DOT leaders need stakeholder buy-in in order to generate budgetary support for their ITS efforts. Truck rollouts are expensive, and downtime impedes citizen service. By documenting the costs of a sub-par system, DOT leaders can build a strong financial and operational case for improvements.

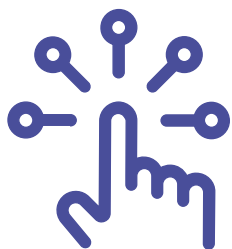
"You can track the time and money spent in sending techs out into the field," Jennings said. "There are metrics around reliability: mean time between failure, mean time to repair. The DOT should measure those things over time within their infrastructure."



Plan for the long term

Networking in support of transportation is, or should be, a long game. The solutions put in place today may support ITS for many years to come, and technology will continue to advance in that time. DOTs need to partner with vendors who take a long view of this effort.

"You are probably not going to change this switch or this network for a number of years," Muraine said. "That means you want to partner with a vendor who can commit for the long term to the availability of product and support, and the evolution of that product or solution."



Consider the digital divide

DOTs need to support government-wide efforts to deliver equitable solutions, yet in transportation, many will encounter a digital divide. Rural areas may lag behind cities in terms of their access to ITS solutions, and the level of ITS adoption may vary widely from one city to the next. DOTs need to work to close those gaps.

"Government needs to deliver mobility in the service of *all* the people," Jennings said. "DOTs have a responsibility to take equity into account as they look to develop not just smart cities, but entire smart states, from a transportation perspective."



Case Study: Nevada DOT Lays the Foundation for Next-Gen ITS

The Nevada Department of Transportation (NDOT) has authority over some 5,400 miles of highway and more than 1,000 bridges. “Safety first” is the agency’s main goal.

To that end, the agency looks to give drivers real-time information on road, traffic and weather conditions. In order to deliver on that promise, NDOT needed to harden its data network so that it could stand up to the harsh Nevada climate. At the same time, NDOT sought to lay the foundations for its next-generation intelligent transportation system, which would need to reliably connect to and manage a growing inventory of Internet of Things devices on the state’s highways.

The department adopted a modernized networking solution from Alcatel-Lucent Enterprise that includes hardened LAN switches in the non-environmentally controlled roadside cabinets and advanced high-speed and high-capacity LAN switches, featuring the same software operating system as in the edge switches, in

the aggregation and core layers of the network. The new switches support [shortest path bridging \(SPB\)](#), a key requirement for NDOT, and are backed by full access to the ALE design and engineering team.

Hundreds of these switches comprise the backbone of NDOT’s network, supporting future technology including next-gen sensors, status notification systems and reliable transport for connected-autonomous vehicles (CAVs). At the same time, the ITS team has been able to reduce the time it takes to deploy new devices, services and applications, thus freeing personnel to focus on other mission-critical tasks.

“The new solution makes it simpler to provide the best services throughout the 25 billion miles traveled by our road users annually, providing the right information for safe travel and ultimately reducing the time spent on the road,” said Gary Molnar, ITS Network Manager for the Nevada Department of Transportation.

Read an in-depth [NDOT case study here](#).

HOW ALE HELPS

Alcatel-Lucent Enterprise helps bring to life the modernized ITS networking vision, with heavy investments in transportation-related research and development, including hardened switches and modernized networking software and services.

Its tools enable transportation departments to operate their networks efficiently, even with limited staff. ALE delivers a high level of functionality, greater resilience and inherent network security, even in the challenging conditions that define the transportation environment.

ALE’s advanced hardened switches, for example, support mission-critical applications that need to operate in extreme temperatures and meet stringent electromagnetic interference and electromagnetic compatibility requirements. These rugged switches can be stacked to form a virtual chassis, and are specifically designed for transportation and traffic control systems.

“It’s all about having a high-level vision around bringing mobility to the people who need it. The technology that we provide helps DOTs to achieve that,” Muraine said. “We help our customers to connect everything in a smart environment.”

Conclusion

DOTs are tasked with meeting a complex and multi-faceted mission. They need to ensure public safety, reducing the risk of injury and fatality on the road. They must strive to reduce congestion, speeding travelers to their destination smoothly and easily. And they need to support environmental goals, helping fight climate change and reducing pollutants that drive negative public health impacts. All this must be accomplished without compromising data security.

ITS supports these varied goals, and modernized networking in turn can empower ITS, reliably and securely supporting the high data flows that derive from IoT deployments. Environmentally hardened switches can withstand the challenging transportation environment, while intelligent software ensures reliable performance and security.

Robust networking solutions deliver the seamless, real-time data flows needed to deliver on the promise of ITS, helping DOTs evolve toward a safer, greener future. With a “zero everything” vision in mind, DOTs can leverage their IoT-ready networking resources with an eye toward long-term, sustainable systems improvements.



ABOUT ALCATEL-LUCENT ENTERPRISE

Alcatel-Lucent Enterprise (ALE) delivers the customised technology experiences enterprises need to make everything connect.

ALE provides digital-age networking, communications and cloud solutions with services tailored to ensure customers' success, with flexible business models in the cloud, on premises, and hybrid. All solutions have built-in security and limited environmental impact.

Over 100 years of innovation have made ALE a trusted advisor to more than a million customers all over the world.

With headquarters in France and 3,400 business partners worldwide, ALE achieves an effective global reach with a local focus.

To learn more, visit: <https://www.al-enterprise.com/en/industries/government/usa-federal> or contact us: Federal@al-enterprise.com

ABOUT GOVLOOP

GovLoop's mission is to “connect government to improve government.” We aim to inspire public-sector professionals by serving as the knowledge network for government. GovLoop connects more than 300,000 members, fostering cross-government collaboration, solving common problems and advancing government careers. GovLoop is headquartered in Washington, D.C., with a team of dedicated professionals who share a commitment to connect and improve government.

For more information about this report, please reach out to info@govloop.com.



1152 15th St. NW Suite 800
Washington, DC 20005

P: (202) 407-7421 | F: (202) 407-7501

www.govloop.com
@GovLoop

