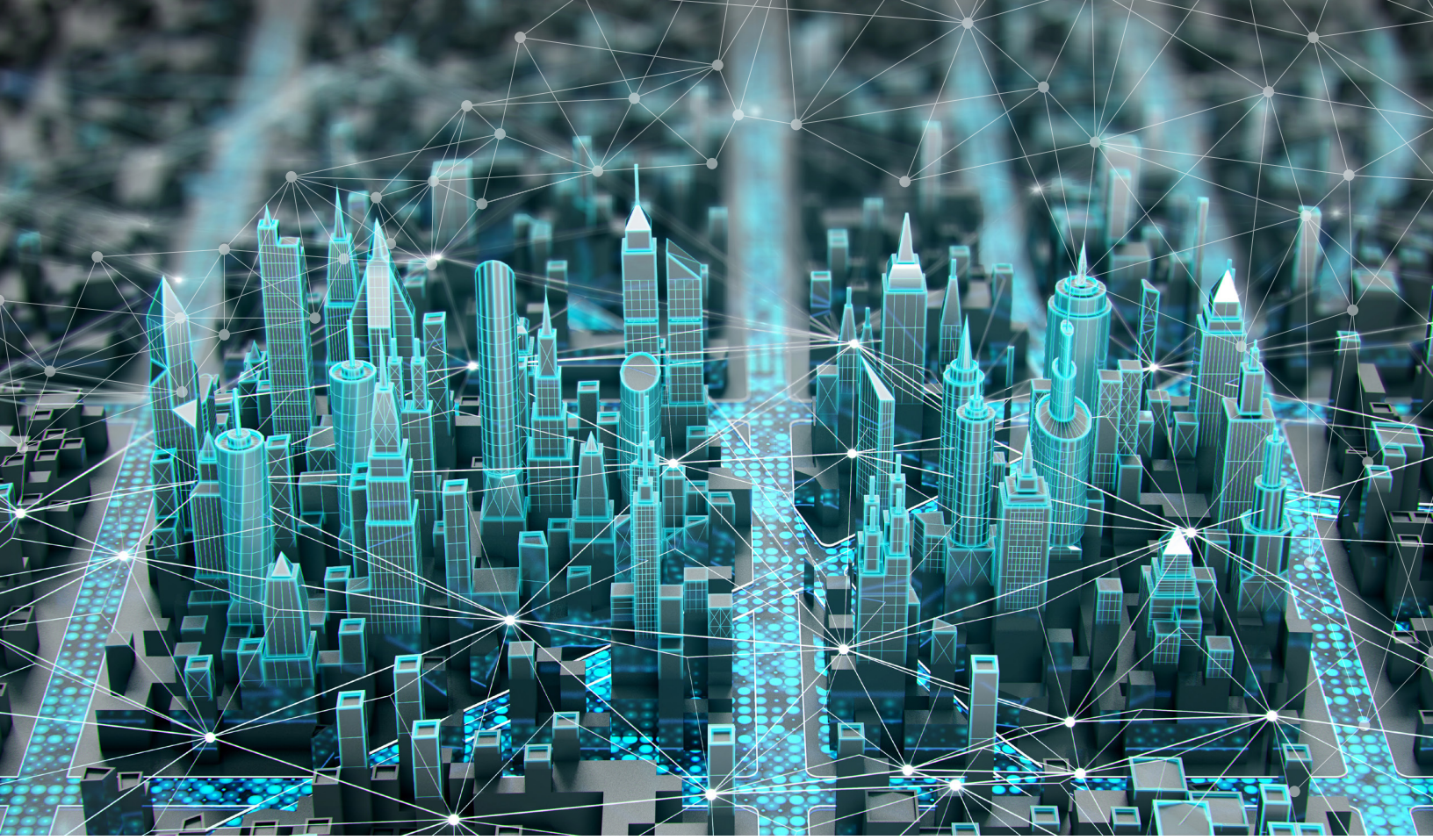
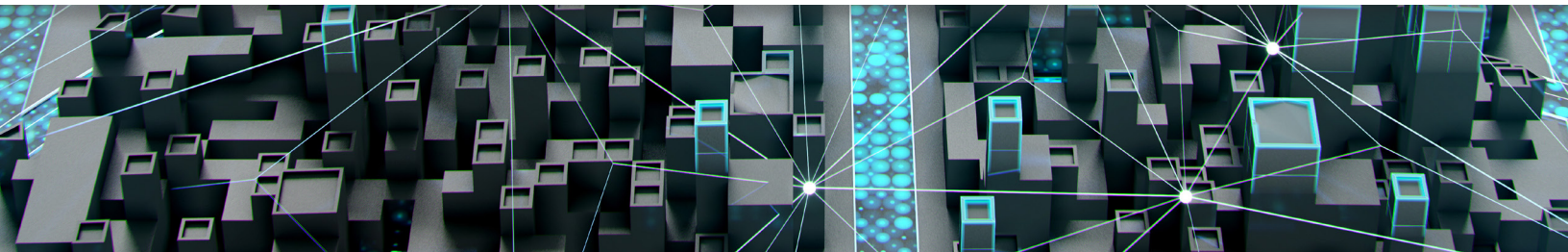


Smarter Transportation:

Intelligent Tools to Improve Mobility

Using a connected ecosystem approach, transportation agencies can improve travel safety and efficiency for all.



Introduction

With an influx of funding from the Infrastructure Investment and Jobs Act (IIJA) and the American Rescue Plan Act (ARPA), departments of transportation (DOTs) have a rare opportunity to build smart transportation infrastructure that enhances mobility for all constituents.

But implementing intelligent tools piecemeal can result in siloed technologies that don't easily integrate and fail to deliver maximum value. Instead, DOTs must create smart ecosystems in which tools work together to meet the mobility needs of the public more efficiently and effectively.

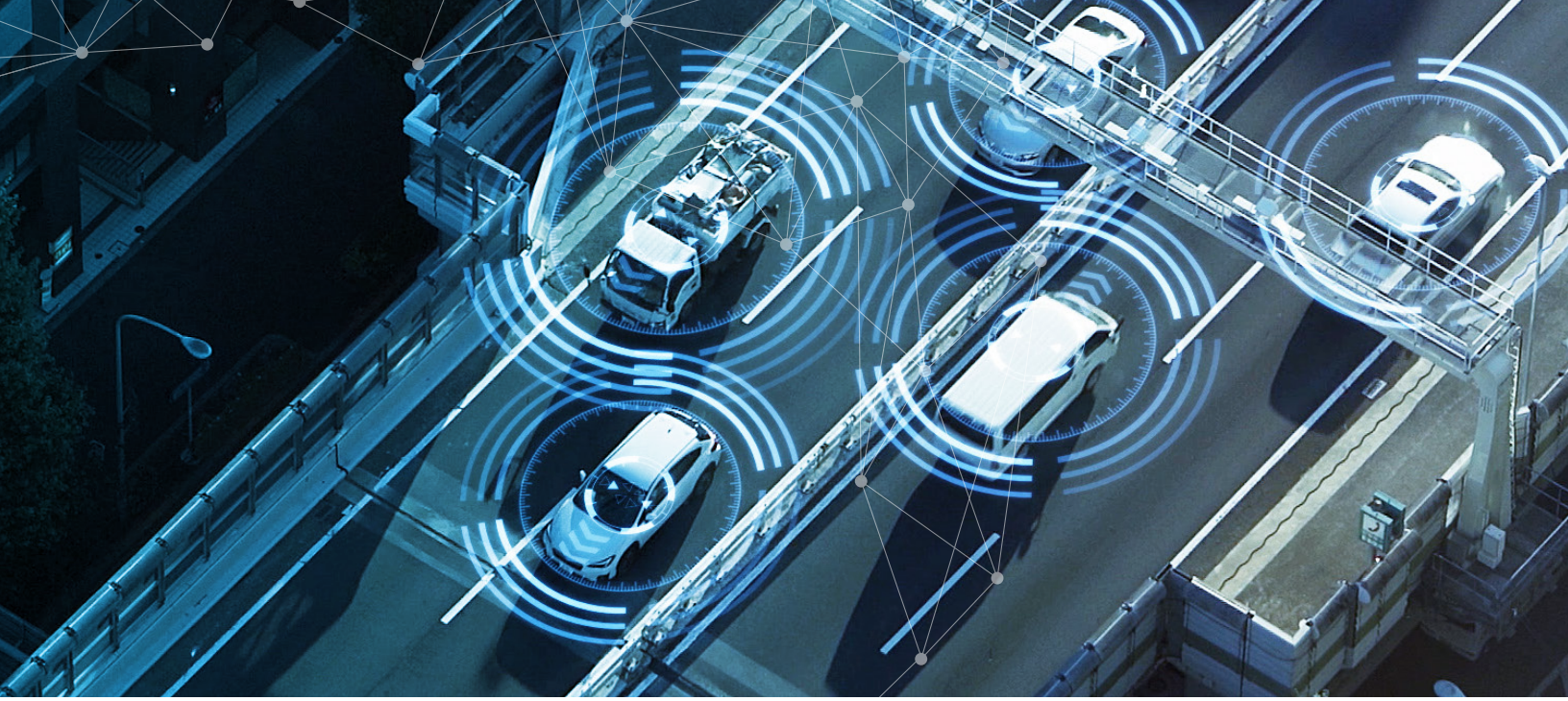
"The connected transportation environment has evolved in the past few years," says Gregory Slater, executive director and CEO of the Tampa Hillsborough Expressway Authority (THEA). "We have much greater data capabilities today, which allow transportation agencies to move toward a systems-based, holistic approach. Transportation leaders can not only create smart roadway systems that are safe and efficient, but they can also use real-time data to proactively manage those systems."

This systems approach to mobility requires DOTs to collaborate with other government agencies and private-sector partners. Agencies must also think about data holistically, collecting data across tools and offices to make the most of their investments.

Ultimately, interconnected transportation tools can help communities address critical transportation issues. "If a transportation agency creates a holistic plan, you can actually move the needle in a very significant way in a particular community and drastically improve the outcomes around your focused social concern," says Nitin Jain, head of corporate strategy for Conduent.

"We have much greater data capabilities today, which allow transportation agencies to move toward a systems-based, holistic approach."

Gregory Slater, *Executive Director and CEO, Tampa Hillsborough Expressway Authority*



One Step at a Time

The most effective way to create a smart transportation ecosystem is to establish a vision, start small and build incrementally. “DOTs should begin with the end goal in mind,” says Maureen Bock, chief innovation officer for the Oregon Department of Transportation (ODOT). “If you know where you are going, you can better understand what steps to take to reach that goal.”

Pilot projects can help DOTs test tools to see how they perform within connected vehicle environments. Beneficial tools or techniques can be adopted permanently and broadly.

For example, THEA collaborated with the U.S. Department of Transportation on a pilot program to see how connected vehicle technology could improve traffic flow and safety. “Our goal was to use technology to provide information to drivers so they could make smart choices when they travel,” Slater says.

Throughout the seven-year pilot, THEA developed connected vehicle applications for brake light, red light and pedestrian warnings used by more than 1,100 vehicles. These safety warnings prevented dozens of pedestrian accidents and vehicle collisions.

Although the pilot has ended, technology developed during the trial is now part of the expressway’s smart transportation environment. “The pilot allowed us to advance technology and then evolve that technology within our connected ecosystem,” Slater says.

> “If you know where you are going, you can better understand what steps to take to reach that goal.”

Maureen Bock, *Chief Innovation Officer, Oregon Department of Transportation*

An Equitable Digital Infrastructure

Smart transportation ecosystems require a robust, widely accessible digital infrastructure. Technologies ranging from traffic cameras to smart parking solutions need reliable high-speed connectivity to work effectively. Constituents also need broadband connectivity to use smart transportation tools like mobile apps for fare payment, trip planning and other functions.

One way DOTs can help expand broadband coverage is by joining public and private partnerships. For example, the California Department of Transportation (Caltrans) is part of the state's Middle-Mile Broadband Initiative.

Launched in 2021, the middle-mile initiative aims to expand high-speed broadband service in rural areas of the state. The initiative is creating a statewide open-access network that lets any type of network interconnect on equal economic and service terms, making it easier and less expensive for internet service providers to expand service to underserved communities. Caltrans is responsible for installing physical fiber-optic infrastructure along highways.

Transportation agencies are well positioned to play a role in these initiatives. "DOTs are already conducting physical highway construction, so the transition to digital infrastructure is a natural progression," says North Carolina CIO Jim Weaver.

Broadband expansion initiatives aimed at closing connectivity gaps also play a role in improving transportation equity. Reliable high-speed connectivity is fundamental to support both intelligent transportation ecosystems and the tools residents will use to access and manage mobility options.

"Broadband access is necessary for disadvantaged communities, from city centers to rural areas," says Mark Monroe, deputy director of the California Middle-Mile Initiative in the California Department of Technology. "Projects like California's Middle-Mile Broadband Initiative aim to make broadband as accessible as possible, thereby helping to close the digital divide."

> "Projects like California's Middle-Mile Broadband Initiative aim to make broadband as accessible as possible, thereby helping to close the digital divide."

Mark Monroe, *Deputy Director, California Middle-Mile Broadband Initiative*

Gathering Data Insights

Intelligent transportation ecosystems will generate massive amounts of data, which has huge potential to enhance safety, efficiency and equity. Agencies can gather data from IoT sensors, public transit systems, smart vehicles and other sources to improve transportation for residents of underserved communities in particular.

"Transportation data can be used as a proxy for socioeconomic and demographic data, which DOTs can then use to increase equity," says Jain. For example, agencies can use transportation data to identify and address dangerous intersections in lower-income neighborhoods, which often see more pedestrian fatalities than affluent areas.

To maximize the value from transportation data, DOTs must be able to easily capture, store, retrieve and evaluate that information. As smart transportation environments expand, DOTs have an opportunity to analyze data gathered from multiple tools. For example, when Oregon developed its connected vehicle ecosystem, the department integrated data from internal and external sources to improve information for travelers.

"We used to rely on just external data sources, like the National Weather Service, to help us notify constituents about changes in weather and impacts on roadways," says Bock. "By getting data directly from vehicles about how those vehicles are performing on the roads, and then marrying that information with weather service data, we can now provide real-time data to connected vehicles and on our various roadway signs."

ODOT also draws on connected vehicle data to provide drivers with information about crashes and other events that impact traffic conditions.

One challenge with gathering data across platforms is the cost of capturing and storing so much information. DOTs must be strategic about data policies to avoid spending money on unnecessary data storage. ODOT is moving toward transitory use of data, wherever possible. "For example, we don't need to capture and store weather data," Bock says. "We can use it in real time and move on to the newest information that is coming in."

Another hurdle for holistic data analysis is sharing data across solutions, platforms and siloed organizations. Open standards and open source technologies can help DOTs create interoperable platforms that make it easier to share and analyze data.

Communities of open source developers and users collaboratively refine and improve these solutions, creating applications that respond to evolving needs.

"With open standards and open source technology, solutions develop over time so that they are able to communicate with each other. This enhances the possibility of interoperability," says Francisco Ramirez, chief architect of state and local government for Red Hat. "When you are able to enhance siloed data by putting it together to build insights, that is when there is value for both the government and the public."

The Value of Collaboration

Building digital infrastructure to close equity gaps and support smart transporation ecosystems is often a joint endeavor involving multiple partners.

California's Middle-Mile Broadband Initiative includes Caltrans, the California Department of Technology, the California Public Utilities Commission and a third-party administrator. A Middle-Mile Advisory Committee monitors construction of the open-access network. Caltrans also collaborates with state regulatory agencies to streamline permitting processes and meet state deadlines.

North Carolina's middle-mile initiative is also taking advantage of collaborations. Under the state's "dig once" policy, internet providers must notify the state of upcoming trench excavations. The policy limits the number of excavation projects that can occur in a given area over time and promotes coordination between broadband installation and other construction projects, which minimizes traffic disruption and potentially reduces the cost of broadband installation.

Collaboration may even lead to revenue generation. North Carolina's DOT works with a private partner that operates, maintains and commercializes fiber, resulting in financial gain for the state. Better broadband coverage can also attract new businesses. "The result is a win for the entire state," says Weaver.

Finally, collaboration can take the form of communicating with and learning from peers in other state and local DOTs. Rarely will an agency be the first to try an initiative, so speaking to others who have tackled the same problem can save valuable time and energy.

> "DOTs are already conducting physical highway construction, so the transition to digital infrastructure is a natual progression."

Jim Weaver, *CIO, North Carolina*

Leading with Innovation

Perhaps the only certainty about the future of smart transportation is change. Disruptive events are happening at a faster pace. And technology itself is evolving quickly, requiring DOTs to respond and adapt.

"The planning horizon for transportation agencies is challenging today," says Slater. "Twenty-five years ago, you could adequately predict where transportation was heading. But our horizon has changed; we do not know what the next disruptor will be."

These challenges provide DOTs with an opportunity for innovation. Today's transportation agencies must be comfortable with continually evolving and improving smart transportation ecosystems to meet the needs of constituents and communities.

While innovation is critical, focus is also key. "Stay focused on what your DOT is trying to achieve," says Slater. "By nature, innovation is not a proven path."

By concentrating on their goals, DOTs can harness change and technology to make transportation evermore safe, efficient and equitable.

> "Twenty-five years ago, you could adequately predict where transportation was heading. But our [planning] horizon has changed; we do not know what the next disruptor will be."

Gregory Slater, *Executive Director and CEO, Tampa Hillsborough Expressway Authority*

Sponsors

Conduent Transportation is a leading provider of automated and analytics-based smart mobility solutions for government agencies. These solutions, spanning roadway charging and management, parking and curbside management, and advanced transit and public safety systems, enable streamlined and personalized services for citizens and travelers who use them. The company has been helping transportation clients for more than 50 years and operates in more than 20 countries.

Learn more at www.conduenttransportation.com

The adoption of open principles helps the U.S. government start, accelerate, and improve the art of digital transformation — people, process, and technology. As the world's leading provider of enterprise open-source solutions, Red Hat uses a community-powered approach to deliver reliable and high-performing Linux®, hybrid cloud, container, and Kubernetes technologies. Red Hat helps customers integrate new and existing IT applications, develop cloud-native applications, standardize on our industry-leading operating system, and automate, secure, and manage complex environments. Award-winning support, training, and consulting services make Red Hat a trusted adviser to the Fortune 500 and 100% of U.S. executive departments. As a strategic partner to cloud providers, systems integrators, application vendors, customers, and open-source communities, Red Hat can help organizations prepare for the digital future.

Learn more at www.redhat.com/gov

Produced by: CENTER FOR DIGITAL GOVERNMENT

The Center for Digital Government, a division of e.Republic, is a national research and advisory institute on information technology policies and best practices in state and local government. Through its diverse and dynamic programs and services, the Center provides public and private sector leaders with decision support, knowledge and opportunities to help them effectively incorporate new technologies in the 21st century.

www.centerdigitalgov.com