Driving the Future: Revolutionizing Road Travel with Intelligent Traffic Systems

WHITE PAPER

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Over the last decade, more cities, municipalities, state authorities and private-sector businesses are deploying intelligent traffic system (ITS) solutions to change the way society moves.

Through roadway monitoring, ITS solutions can be used to gather data about things like:

- Types of cars on the road
- Traffic levels
- Potential areas of congestion
- Where vehicles are going
- Environmental impacts of travel
- Road conditions
- Accidents or emergencies
- Toll usage and fees

This real-time information can then be used to improve traffic efficiency and reduce traffic issues.

Although many factors influence the need for ITS solutions, two important drivers stand out.

First, cars are getting smarter: New models include hundreds of sensors that can detect, track and share information and support innovation like journey planning, driver assistance and internet connectivity. They collect data from various sensors for decision-making purposes. To take advantage of everything smart cars offer, roadways must adapt to these changes.

Second, global funding opportunities are making large investments in ITS solutions possible. For example, in the United States, the $1.2 trillion Infrastructure Investment and Jobs Act (IIJA) and Inflation Reduction Act (IRA) authorizes up to $108 billion for public transportation—the largest-ever federal investment in public transportation.

In China and the UK, significant funds are earmarked for sweeping transportation infrastructure improvements, including new and updated rail and road infrastructure.

As a result of programs like these, the Global Infrastructure Outlook, published by the Global Infrastructure Hub, predicts $97 trillion in infrastructure investments by 2040.

Where ITS Is Used: Examples of Intelligent Traffic Systems in Action

Many times, smart roads—empowered by ITS solutions—are just one component of a smart city or smart region. They add another layer of connectivity and data to help intelligent environments improve efficiency, safety and quality of life. For example:

- Businesses can use ITS information to make decisions about locations along specific roadways based on traffic count.
- Cities, municipalities, state authorities and private entities can rely on ITS data to adjust traffic lights to improve flow, lower operating costs for tolling, remotely monitor conditions and report on repair needs, determine how to spend maintenance funds, enhance public transportation and reduce carbon emissions.
- Drivers can tap into ITS insights to access real-time navigation alerts, weather and road condition updates and parking availability.
- Emergency services can connect to up-the-second information about accidents and traffic disruptions so that they know how to respond safely and efficiently.

ITS systems are being deployed right now in many regions across the globe.

In U.S. vehicles and roadway systems, for example, Ford is investing in smart infrastructure that reads data from autonomous vehicles before they arrive at intersections. In Saline, MI, and Miami Beach, FL, infrastructure nodes are placed at a handful of intersections to offer a bird's-eye view of the area and relay information and additional context to self-driving vehicles. This provides another layer of information to the vehicles as they analyze surroundings at the street level.

Meanwhile, the New York City Department of Transportation (NYCDOT) is investing in connected infrastructure and adaptive signals at 10,000+ intersections to adjust the timing of green lights based on traffic patterns. As part of the city's Midtown in Motion (MiM) project, this initiative has improved travel time by 10% across the area it was first deployed. Due to its success, the NYCDOT is now expanding the system across other New York boroughs.

Coachella Valley, located in southern California, is connecting data from traffic in nine cities to improve travel and revolutionize how traffic is managed. Through data-gathering tools like sensors and cameras, its ITS solution coordinates traffic signal synchronization across 21 corridors.

In Southeast Asia, Singapore ran autonomous bus service along two routes to gather data and assess the viability of growing the on-demand service to improve passenger safety and service reliability and efficiency.

Sensors are used to collect data in Seoul, South Korea, to anticipate and prevent traffic congestion and advise on alternative routes in real time. By monitoring traffic conditions on major roads, the city can share road control and congestion information with the Seoul Police Agency and its traffic broadcasting system.

Overcoming Common ITS Deployment Challenges

While the benefits of ITS are clear, deployment isn't always easy or straightforward. Many cities, municipalities, state authorities and private entities face obstacles that stand in the way of making ITS a reality.

Let's discuss a few of those challenges, along with recommendations on how to overcome them.

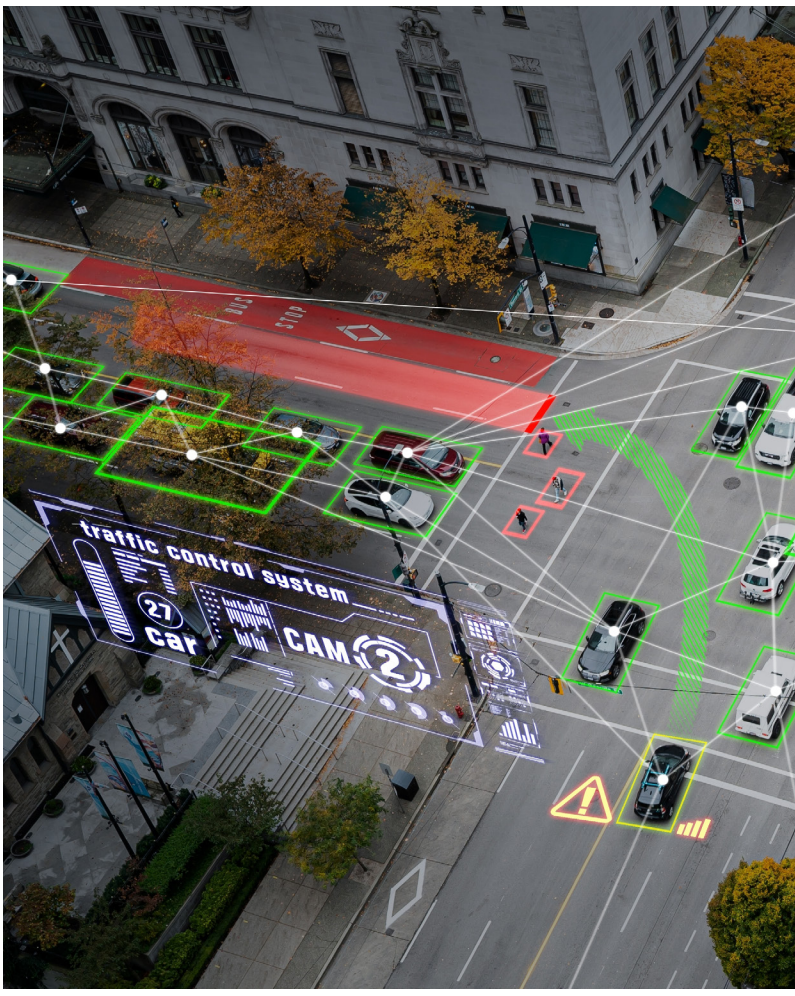
1. There is no framework for bringing intelligent roadways to life.

There's no single way to deploy ITS concepts and technologies, and the industry lacks consensus on standards or best practices to follow. This is partly because ITS is so new.

This may change in the future, but, for now, cities, municipalities, state authorities and private entities are left to figure out how to design, deploy and manage ITS on their own. As a result, many are still in the early stages of implementing ITS technologies and aren't sure which step(s) to take next to meet long-term objectives.

To overcome this hurdle, it's important to realize that you don't have to make ITS decisions alone—and it's not your job to understand everything about these emerging technologies and how they can be used.

Instead, find a trusted partner that understands ITS, can help align your needs with the right technology, explain what to expect in terms of ROI and help you deploy systems effectively to provide maximum benefit.



2. Outdated infrastructure prevents full ITS deployment.

Many emerging technologies on the horizon play well with ITS and will be required so it can achieve its full value:

- IPv6 will help vehicles communicate with highways and one another.
- V2X (vehicle-to-everything) uses sensors, cameras and wireless connectivity to connect cars to their drivers and surroundings.
- Edge computing processes sensor data closer to where information is generated for faster response times.
- 5G supports services like automated tolling and mobile, high-speed internet in vehicles for improved connectivity so that all kinds of devices can communicate.

But outdated or poor-performing networks can't support these bandwidth-intensive technologies. They also deliver inconsistent data, which can negatively impact the performance and reliability of ITS.

Some cities, municipalities, state authorities and private entities have experienced this first-hand as they attempt to deploy ITS solutions on their existing infrastructure. In one case, a city attempted to stream data from 1,000 cameras using a 100 Mb/s connection. It didn't take long to discover that this wasn't possible. Network infrastructure must be updated to support increasing bandwidth requirements and the Ethernet communications required for digitization.

If you plan to invest in intelligent traffic systems, then the first step you should take is to ensure that your network can support them—along with any other technology you may deploy down the road. A futureproof network is key to helping you achieve a solid ROI and making sure ITS technology functions as expected.

3. They lack the budget for full ITS implementation.

Investing in intelligent traffic systems isn't inexpensive. It can be financially overwhelming—or seemingly impossible—to completely transform your infrastructure all at once.

Instead of doing this, create a plan to transition in phases. Work with a trusted network infrastructure partner that can map out what you should do—and when you should do it. By taking the time to assess where you're at, where you want to go and the technology you currently have, you can identify gaps and pinpoint areas where legacy assets can be preserved. This allows you to make strategic investments based on where they're needed most.

When deployed correctly, ITS solutions offer fast ROI, which makes the upfront investment more practical. They reduce costs by providing a smarter way to troubleshoot and solve problems, plan and stage roadwork, divert traffic and respond to incidents, and support remote visibility and monitoring to maximize workers' time.

4. Transportation leaders don't understand the full capabilities of ITS.

With all the other tasks they're responsible for—creating policies and procedures, overseeing safety and equipment, and supervising employees, for starters—many transportation leaders don't have time to understand the value of ITS or what it enables. They're too bogged down in day-to-day operations. It can be a full-time job to simply keep up with technology in the transportation industry.

That's where the right partner comes into play. They should not only provide education on the value of ITS and what it can do, but also help you make a financial case so that everyone understands what's possible and nothing is lost in technology translation.

5. Lack of robust, in-house IT teams to manage intelligent traffic systems.

Worker shortages are impacting every industry, and transportation is no different. Nearly 96% of U.S. transportation agencies are experiencing workforce shortages, according to the American Public Transportation Association. This can make it difficult to recruit, hire, onboard, train and retain an in-house team to manage ITS solutions for you.

To get around this obstacle, solutions that offer simple deployment and ease of use are vital. In other words, look for systems that don't require IT expertise or engineering degrees in order to run or manage them. If you need help or have questions, your network infrastructure partner should always be there to lend a hand and provide answers.

Making Road Travel Smarter, Safer and More Efficient

Belden's ITS solutions empower cities and municipalities to accelerate digitization and improve traffic flow and safety.

We can act as your partner in creating network architecture that makes smart roads possible and supports huge volumes of data coming from multiple sources at once, such as cameras, detectors, lights, meters, sensors, apps and connected vehicles.

Our Customer Innovation Center has a team of in-house transportation system experts who have walked in your shoes, understand your challenges and can help you design, configure, deploy and maintain a vendor-agnostic network so that your transportation plans can thrive without constant—and costly—updates, upgrades and product changes. We provide expertise in the planning, design, implementation and operation of solutions that focus on maximizing system performance.

Belden can help you:

- Establish a strong and secure network backbone to power today's traffic and tolling systems, support continuous digitization and prepare for the mobility ecosystem of the future.
- Improve visibility and remote monitoring to improve safety and traffic flow, reduce travel times, shorten emergency response and enable smart, proactive maintenance.
- Drive cost efficiencies and revenue growth with a futureproof network built to support more cameras, more connectivity and greater autonomy.
- Support driver choices that are influenced by a diverse range of publication channels, such as mobile devices/in-car systems.
- Monitor road networks in real-time.

It all starts with an assessment to gauge where you are, where you want to go and what you need to do to get there. After evaluating your current state to determine what's working and what isn't, we present possible solutions to maximize the technology investments you've already made so you can make strategic investments where you need them most.

Our ITS solutions are easy to deploy and manage, which means your team can handle making changes and monitoring performance, even if they don't have years of experience or an IT or technology background.

Warranties that cover the entire system and guarantee performance in any environment mean you'll never have to worry about poor performance or downtime.

We're ready to help you embrace digital technologies that improve road travel today while laying the foundation for a more connected future. Are you ready to get started?