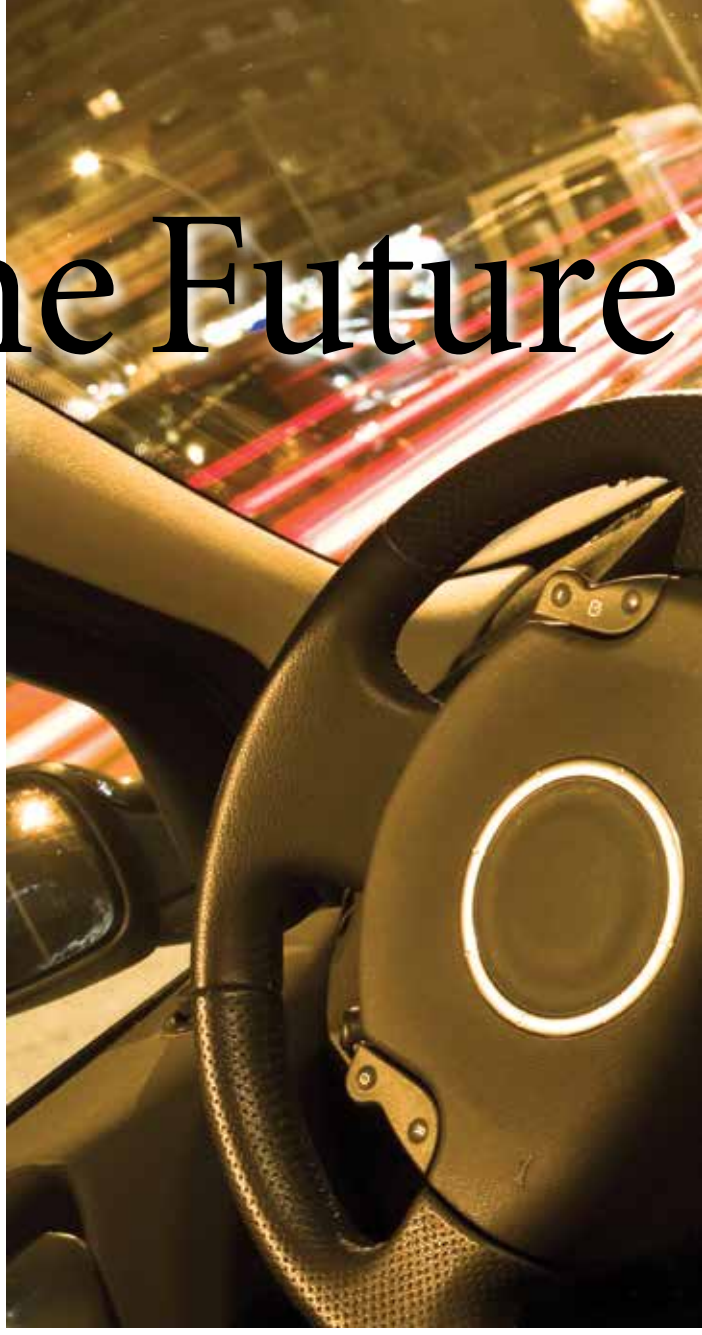
Driving the Future

Self-driving cars and smart phones that help you catch a bus are not as far-fetched as you may think.



BY ANNE TEIGEN, ALICE WHEET AND JAIME RALL

The proliferation of wireless technology has transformed American life—from flipping through an old book to scrolling through an ebook on a tablet, from calling mom for directions to grandma's to finding her with an app on your cell phone.

Technology is also changing the way we move from place to place, bringing not only convenience and safety advances, but also a few privacy questions and safety concerns.

Let Your Car Do the Driving

Most people would rather spend 45 minutes relaxing, listening to music or reading a book than spending time commuting in traffic. What if you could do both? What if you could read a book and wind down after a long day while your car drives itself? It may be possible in the near future with the development of autonomous, or self-driving, vehicles.

"Autonomous technology is not science fiction."

—SENATOR ALEX PADILLA (D) CALIFORNIA

Nevada became the first state to authorize the operation of these vehicles on its roadways in 2011. The law defines an autonomous vehicle as one that "uses artificial intelligence, sensors and global positioning system coordinates to drive itself without the active intervention of a human operator." California and Florida followed Nevada's lead in 2012, while four other states debated, but did not pass, similar legislation.

Nevada issued the first license for an autonomous vehicle to be tested on public roads to Google, the first company to file an application. Google's self-driving prototype has also been successfully tested in California. In addition, the U.S. Department of Defense, auto manufacturers and universities have tested driverless cars with varying degrees of success.

Proponents of these smart cars note that approximately 35,000 highway fatalities annually and 95 percent of automobile accidents are caused at least in part by driver error. California Senator Alex Padilla (D), who sponsored the bill there, is an advocate for the driverless technology. "Autonomous vehicle technology has the potential to reduce traffic accidents and save lives," he says.

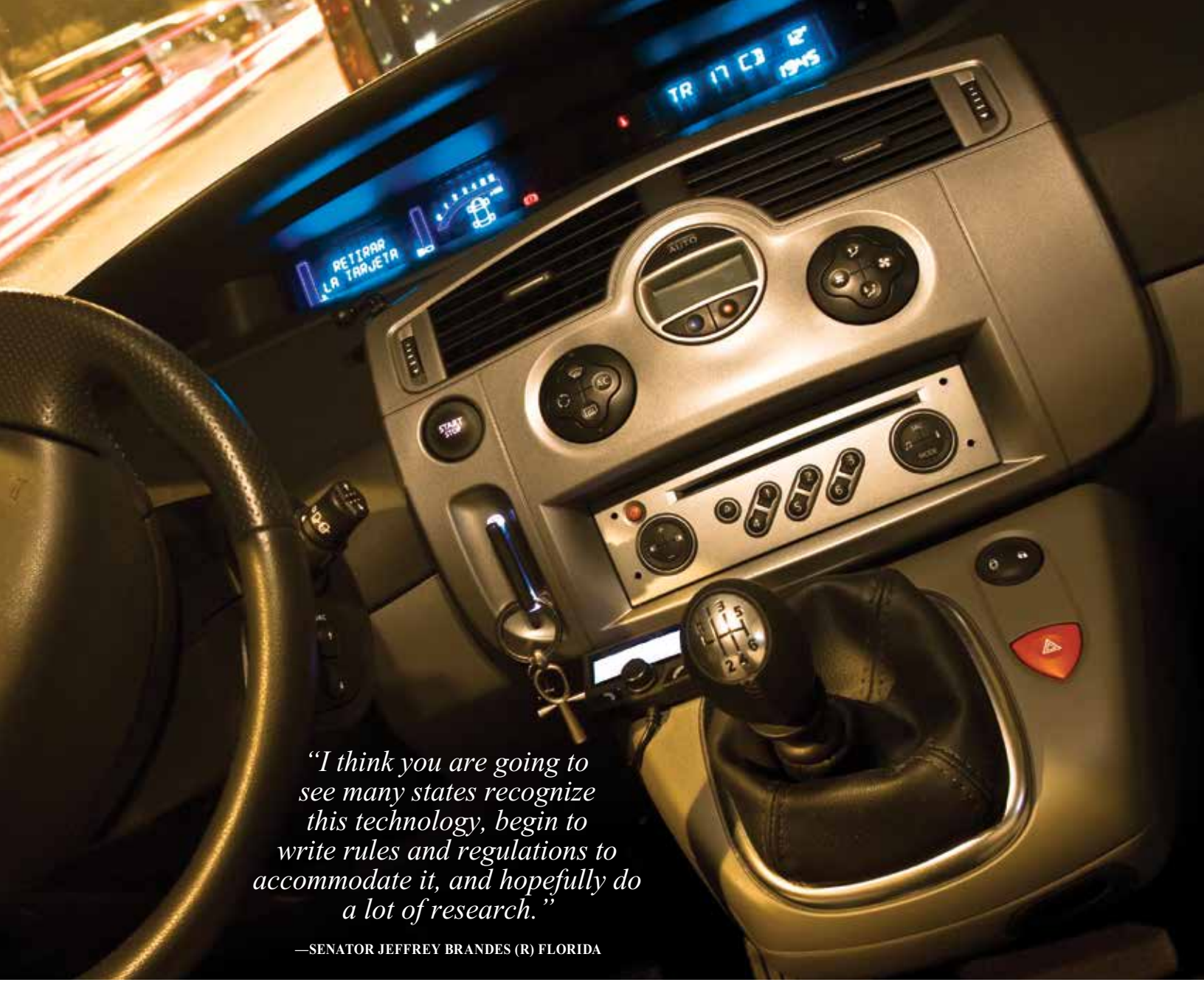
Senator Alex Padilla (D) California

Self-driving cars are designed to remove human error, in part by recognizing objects, other cars and hazards and choosing the best route to reach a destination. In fact, Google's 12 vehicles have completed more than 300,000 miles of testing in a wide range of traffic conditions without a single accident.

Big Questions to Answer

Autonomous vehicles may be the cars of the future but there are plenty of legal roadblocks to pass through. Laws in every state on operating motor vehicles, driving while impaired and insuring cars all make one big assumption—that a human is behind the wheel of a moving vehicle.

Anne Teigen, Alice Wheet and Jaime Rall cover transportation issues for NCSL.



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—SENATOR JEFFREY BRANDES (R) FLORIDA

In self-driving cars, who's going to be at fault in an accident—the person riding in the car or the developer of the vehicle's software? Who should get the ticket when the police pulls the car over—the rider or the car?

How will auto insurance premiums work? Who should carry the auto insurance and what should it cover? And what if someone hacks into the car's computer or a virus attacks it or a worm wiggles in?

Then there's distracted driving to consider. Is it acceptable for a person in a car that drives itself to use a cell phone or tablet? What about texting?

Nevada lawmakers answered a couple of these questions when they passed legislation—in the same year they authorized the autonomous cars—allowing the use of wireless devices while legally operating a self-driving vehicle. The legislation also prohibited those activities while driving. As this technology spreads, states with distracted driving laws will also have to address these issues.

Get Ready for Reality

Senator Jeffrey Brandes (R) Florida

"I think you are going to see many states recognize this technology, begin to write rules and regulations to accommodate it, and hopefully do a lot of research," says Florida Senator Jeffrey Brandes (R).

For now, a few states are paving the way. In Michigan, the DOT conducted an online survey of companies involved in the industry to find out what is needed for a successful testing environment. Many in southeast Michigan hope it will be considered as a location for the autonomous vehicle industry. California's law requires the Department of Motor Vehicles (DMV) to establish safety regulations for driverless vehicles before January 2015. Florida's law requires a report from the DMV and Department of Highway Safety detailing the legislative action needed for autonomous vehicles by February 2014.

"Autonomous technology is not science fiction," says Califor-

Capturing New Revenues: There's an App for That

Smart phones have GPS technology that helps us navigate to our destinations, whether by car, by bus or on foot. Now, the Oregon Department of Transportation is trying out a smart phone app that can report vehicle mileage for billing purposes. It's part of a potential future trend in collecting user fees that may eventually replace the gas tax.

States are looking for new ways to fund transportation projects in light of declining gas taxes and rising construction costs. One widely discussed possibility is a Vehicle Miles Traveled (VMT) fee, which would charge users based on miles driven instead of gallons of fuel consumed. No state has established a broad VMT fee, but at least 18 have conducted pilot projects on the concept. A new phase of Oregon's well-known pilot project, which began in the fall of 2012, has four payment options, including a smart phone app.

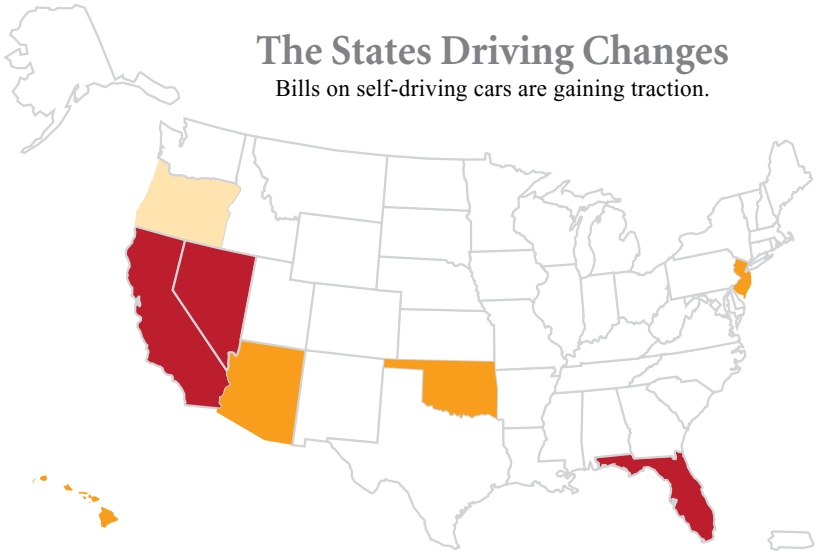
Senator Bruce Starr (R) Oregon

"As well as the gas tax has served the road needs of Oregonians in the past, it has become a declining revenue source," says Senator Bruce Starr (R), chair of Oregon's Road User Fee Task Force. "Oregon will be well served in finding a solution to this concern before it becomes an emergency." A report to the legislature was due in February.

Federal officials are looking into a Vehicle Miles Traveled option as well. U.S. Representative Earl Blumenauer (D) from Oregon introduced a bill (H.R. 6662) last December to require a study of a national VMT fee. The idea reportedly has bipartisan support.

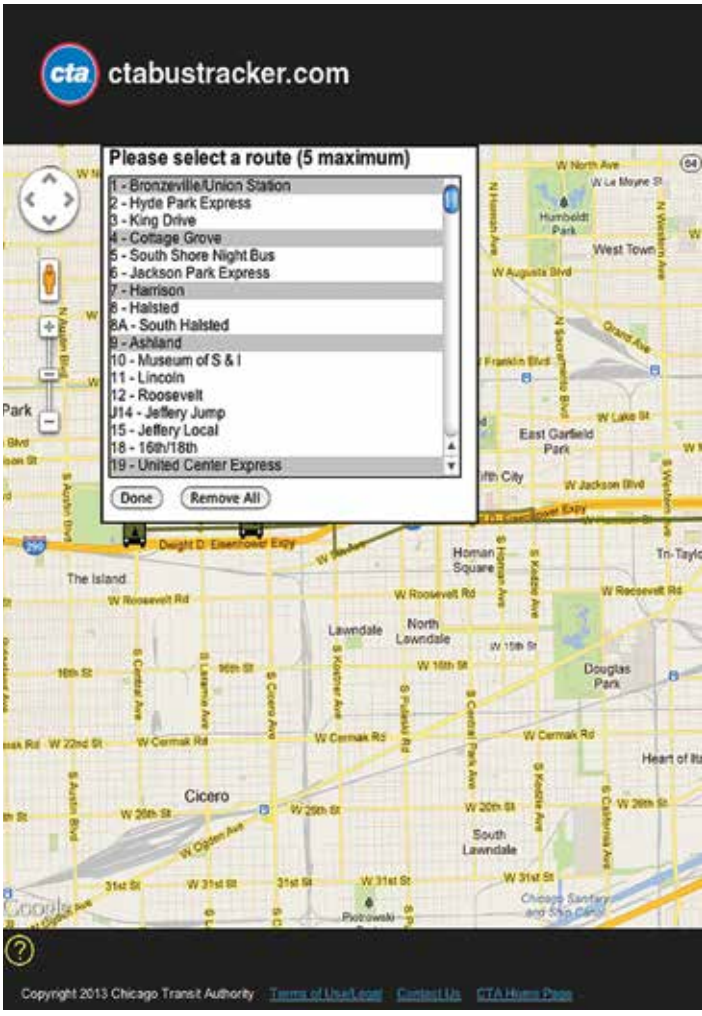
The States Driving Changes

Bills on self-driving cars are gaining traction.



Have passed autonomous vehicle laws
Have considered legislation in the past two years
Are considering legislation this session

Source: NCSL, January 2013.



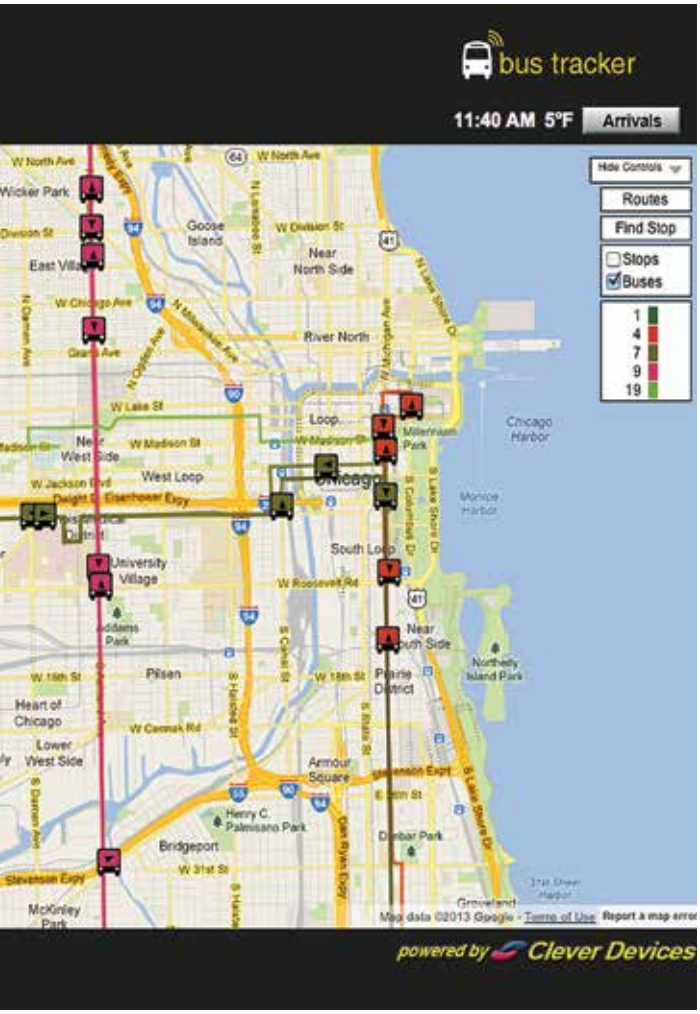
nia's Padilla. "We are living in the era of Moore's Law, where every two years we double our computer processing speeds. This is allowing us to make exponential leaps in advanced technology. To a large extent, that progress has made self-driving cars possible sooner, rather than later."

Putting Smart Phones to Work

Each day, buses and trains take millions of Americans to work and back. These riders include people who may have few other options because of a disability or lack of income. Many others love the idea of being able to work, read or enjoy the sights while "somebody" else worries about parking spots, rush-hour traffic and the price of gas.

Today, transit agencies, state transportation departments and private companies are using new technologies to make public transit more user-friendly. In some American cities, transit riders can use their smart phones to know exactly when the next bus or train will arrive at their stop. Transit systems are using social media and computerized displays at transit stops to share travel information.

The Chicago Transit Authority now has a real-time information system—called "CTA Bus Tracker"—that follows city buses with GPS and displays their locations and expected arrival times on its website, in emails or text message updates,



and via smart phone apps.

In 2011, the transit authority also launched audio announcements on electronic signs at 400 bus stops to make real-time, GPS-powered bus information available to people who don't have cell phones, or who have visual impairments.

Many of these new technologies are developed by private companies and used by transit agencies and local governments. States can also help spur development, for example, by collecting and sharing the needed data.

Massachusetts' Department of Transportation openly offers data on its website to developers. The licensing agreement allows individual citizens and companies to use the real-time and static information to build mobile applications for travelers. As a result, more than 50 applications are available in Massachusetts, and residents are using them to find convenient public transportation.

"Where there is valuable, customer-relevant data owned or maintained by state or local governments, it's good practice to make it public," says Josh Robin, director of Innovation and Special Projects at the Massachusetts Bay Transportation Authority. "It helps government and it helps citizens," he says.

Nationwide, public transit ridership was up 5 percent in early 2012 from the year before, and the number of passenger-miles traveled by 16- to 34-year-olds increased by 40 percent from 2001 to 2009. The availability of real-time information may be one reason for the trend.

According to a national survey, 45 of 276 transit agencies provide some information on mobile devices, and 15 of these offer the information to riders in real-time. But departments of transportation and transit agencies face challenges with these advanced technologies. Web pages and other interactive media require ongoing staff time and expertise, as well as attention to cyber security and privacy issues.

We Can Only Imagine

A mere 40 years ago, the thought of riding safely in a car that steers itself would have been, for most people, not only absurd, but unimaginable. And the idea that you could find instant answers to just about any question with a swipe of a finger across a device that fits in a pocket would have been laughable.

But now, knowing that you can send cries for help from that same little device if a crash sends your car into a ravine or that you can avoid the accident altogether because your car is driving itself, are no longer mildly amusing possibilities, but seriously wonderful realities.

And for those who were not yet around 40 years ago, who may already be taking this technology for granted, imagine—if you can—what might lie ahead. It's mind-boggling.

Yesterday's Science Fiction, Today's Traffic Efficiency

Cars that drive themselves and phones that tell you where your bus is? Even though these technologies are taking off, they still seem like science fiction. But just a few decades ago, some of the transportation technologies we now take for granted were also cutting-edge. Known as intelligent transportation systems, these advanced systems are now widespread, offering cost-effective strategies that help ease traffic jams and keep us safe on the road. Here are a few examples.

Electronic Tolling. Remember when pitching change into toll baskets was the only option? Today, almost every toll agency in the country uses an electronic system to collect tolls through transponders—and often you don't even have to slow down.

Dynamic Message Signs. They didn't even exist until the mid-1980s, yet it's as if they've always been there: portable or permanent electronic signs with amber-colored texts that let you know when you need to slow down, when accidents or icy roads lie ahead, or how long it will take to get to your exit.

High-Tech Traffic Signals. Tired of getting stuck at every stoplight? In many cities, traffic signals are now coordinated to improve traffic flow or to respond to real-time traffic conditions. Another common sight is traffic signals at on-ramps that pace how quickly vehicles get onto the freeway.

Traffic Management Centers. Behind the scenes, high-tech "nerve centers" called traffic or transportation management centers allow crews nationwide to monitor highways 24-7 using traffic cameras and other data so they can keep traffic moving and respond quickly to emergencies.