



A N A L Y S T C O N N E C T I O N



Mark Zannoni

Research Director, Smart Cities and Transportation

How State and Local Governments Can Prepare for Autonomous Vehicles

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Autonomous vehicles (AVs), frequently called "driverless" cars, are becoming a reality. AV implementation is not simply a technological issue, though the technology and connectivity are quintessential for its realization. Numerous legal and political considerations need to be considered as well. How much appetite is there for risk? How safe is safe enough? Defining an acceptable number of accidents or fatalities is not easily done nor politically judicious. However, transport technology only improves iteratively — through adoption and development. We've witnessed significant safety improvements and lives protected compared with earlier decades in modes we openly embrace today, such as aviation, rail, and passenger cars, each of which witnessed heavy human tolls in their early days. Successful implementation of AVs will yield notable safety benefits, along with other societal improvements from the transformation of mobility for people and goods worldwide.

The following questions were posed by Cisco to Mark Zannoni, research director for Smart Cities and Transportation, IDC Government Insights, on behalf of Cisco's customers.

Q. By 2021, autonomous vehicles will be on our nation's roads. What should city, county, and state officials be doing now to prepare?

A. There are six levels of "automated vehicles," as defined by the Society of Automotive Engineers (SAE) and officially adopted by USDOT's National Highway Traffic Safety Administration (NHTSA) — from no driving automation (Level 0) to full driving automation (Level 5). We will achieve some level of automation by 2021, but it may not be Level 5.

As we move toward Level 5, pilot programs and innovation will advance apace. There are several steps states and cities should take today to prepare — for example, ensuring traffic command centers are smart (connected) and that networks can handle the information and network load required to enable connected vehicles (CVs) and autonomous vehicles. At the very minimum, cities/states should remain engaged with the technical community, as developments in the private sector will occur more quickly than in government and will continue to push the envelope of innovation in the public sector.

Communities should also be looking at funding sources to support local CV/AV preparations. Some could come from existing sources — for example, funds for transportation system management and operations provided by the federal aid highway program. Under the FAST

Act, funds may be used by state departments of transportation (with sub-allocations to cities and MPOs) for reconstruction, rehabilitation, and performance management, as well as for intelligent transportation systems (ITSs) on highways, expressways, and arterials. These same funds may be used to improve system performance today while enabling future autonomous vehicles. In addition, the FAST Act established the Advanced Transportation and Congestion Management Technologies Deployment Program to further innovative transportation developments including CV technologies and applications. Under this program, \$60 million will be authorized in each fiscal year from 2016 to 2020. Grants totalling \$57 million were announced to eight grantees this past October.

New funding sources could include a penny or two increase in gas taxes at the state level dedicated to CV/AV compatibility upgrades, such as smart traffic signals. (The federal gas tax is not a likely source since it has not been increased since 1994 and would face steep political hurdles.) As an example, at current driving volumes and fuel efficiencies, a \$0.02 increase would result in annual approximate revenue of \$100 million in New York State, \$87 million in Ohio, and \$256 million in California. For perspective, New Jersey just raised its fuel tax \$0.23/gallon to \$0.375 cents, effective January 1, 2017. Another revenue source for consideration is the new potential revenue from the data produced by mobility innovations, discussed further in the next question.

Q. What is the value of the data collected from automated vehicles?

A. The concept of the "data economy" in transport is still emerging. It is essentially characterized by the collaboration and aggregation among different types of participants in the mobility market — both providers and users of data, including vehicle manufacturers, service providers, road and infrastructure owners, governments, and individuals who use any mode of transportation — to extract value from the data produced to benefit society and the economy (e.g., less traffic congestion, improved air quality, fewer accidents, stronger economies, and greater efficiencies). New data types and data sources are emerging and this information has great intrinsic value. But that value is dependent on its use and by who is using the data. For example:

- For vehicle OEMs, location and usage data on vehicles help them stay closer to customers while obtaining data for new features, warranty validations, and design improvements based on driver behavior and safety factors.
- Cities and counties could learn where people are going, when, for how long, and so forth and could use such data to develop traffic protocols or incentives for transit accordingly. Safety applications could be developed — for example, tying weather/fog data in a micro-location to a vehicle that is quickly approaching that area of the road.
- Transit agencies could leverage valuable origin-destination data, including routes travelled, intermediate stops, duration of stops, and time and day of week of travel, as well as demographic profiles of those using and not using transit for their trips.
- Retailer/consumer product companies (Target, Coca-Cola, Starbucks, etc.) would better understand consumer behaviors. This could include driving patterns and routes, by demographic profile and frequency, enabling them to better target their advertising efforts. This category of data user might pay generously for such data. If cities are the owners or brokers of this data, monetization of this data could be a very lucrative revenue source for them.

But who owns and controls the data? Certainly, cities will have some data, vehicle manufacturers will have other data, and other parties will have different data. The

aggregation of data is what makes it particularly useful. And what rights do citizens have since an individual's data is implicitly personal with an assumed (and often legal) right to privacy? Part of this issue could be addressed through anonymization of data, though this may lower its monetary value to some potential users. The privacy and usage rights are ongoing societal and legal questions, the answers of which will strongly impact the potential of the data economy in the United States. In addition to privacy, data security is a top concern among stakeholders and includes issues around data collection, storage, aggregation, transfer, sharing and, of course, usage.

Q. What are other countries doing to implement autonomous vehicles?

A. Countries are moving forward with implementation of AVs as rapidly as they are able. Activities and developments outside the United States include:

- **European Union (EU):** The EU, like the United States with individual states creating their own laws, faced the possibility of individual countries passing their own laws that may differ or conflict with those of a neighboring country, possibly hindering the development or deployment of new innovations. Accordingly, the EU committed research funding for autonomous vehicles with the goal of developing a uniform set of guidelines for all EU members, including technology evaluations and relevant legal issues to include OEM liability, traffic laws, privacy laws, and data security.
- **Germany:** The German Ministry of Transport and Digital Infrastructure (BMVI) is hoping to transform Germany into the leader of Europe's automated traffic systems and vehicles. BMVI has found sections of law that require modification to accommodate autonomous vehicles, such as revising the definition of "driver" from a person to include "systems with full control over a vehicle," which relate to liability issues in the event of an accident and permitting connected driving systems to operate in general traffic.
- **United Kingdom:** The United Kingdom is developing a "Code of Practice" outlining preliminary standards for using automated vehicles on public roads for technology companies wishing to test their vehicles on public roads. Similar to a proposed rule by NHTSA, all data obtained during testing would be used to enhance regulations. Regarding the testing of automated vehicles on the street, the United Kingdom determined the testing of such technologies is permissible today if a driver is present and takes responsibility for safe operation of the vehicle and that the vehicle is compatible with existing traffic laws.
- **Japan:** Beginning in September 2017, the Japanese government will host a series of tests on AV systems on specific public streets and highways in and around Tokyo, spanning approximately 300km of roadway. The government is inviting collaboration with foreign OEMs as well as Japanese manufacturers, suppliers, universities, and others. The amount of public roadway open for testing, in crowded Tokyo no less, is notable.
- **United Nations:** The Vienna Convention on Road Traffic is followed by 73 countries. In March 2014, the Convention was amended to allow automated driving technologies in traffic, transferring driving tasks to the vehicle, provided these technologies are in conformity with the United Nations' vehicle regulations or can be overridden or switched off by the driver. Autonomous driving is a recognized topic and is currently under active discussion within the Convention's working groups.

Q. Given the clear safety and economic benefits of autonomous vehicles, what are the barriers keeping governments from moving?

A. There are indeed benefits to society, including:

- **Safety:** While the rate of fatalities and injuries was steadily declining from 2000 to 2011, in 2012, the rates had increased and the preliminary numbers for 2015 are higher for both fatalities and injuries. The 2015 fatality rate hasn't been as high since before 2010; the injury rate has regressed to the same rate as 2008, and the rate of crashes was higher than it was in 2006. The number of fatalities hit a nadir in 2011 at 32,479. By 2015, this number had increased by 8% to 35,092, while the amount of vehicle miles travelled during this time increased only 5%. As over 90% of all accidents are caused by human error and given the explosive increase in texting while driving, which can be expected to increase as more young people become of driving age, there is a clear safety benefit of autonomous vehicles if they work as designed.
- **Economic benefits:** Autonomous vehicles, connected with real-time congestion and speed data across all roads in a network, can guide a vehicle to the most efficient route from origin to destination. Thus time in transit for both personnel and goods is minimized, positively affecting payrolls, efficiency, transport tariffs, fuel costs, vehicle maintenance costs, and inventory costs. Furthermore, individuals' time may be used for a higher economic use than driving or sitting in traffic. Autonomous vehicles combined with historical data from previous trips and other congestion data may be used for predictive analysis for goods movement, improving the reliability of freight movements, thus allowing for companies to have increased efficiency and control over operations.
- **Improved passenger/traveller experience:** In addition to a safer trip, it can be one that is faster, with less stress, and with the opportunity to use the commuting time to perform other tasks.

Regarding government barriers to AV adoption, in modern society we have accepted — and even mandated — that a role of government is to keep citizens safe from potential harm. Accordingly, we have various agencies that do just that. A good example is the FDA, which helps to ensure proper testing of pharmaceutical drugs before they are allowed on the market. Similarly, we have assigned government the role to make sure our roads are safe, including allowing the designation of speed limits and the adoption and enforcement of traffic laws. In this spirit, government, through USDOT's NHTSA, is charged with ensuring autonomous vehicles are safe for everyone (would-be drivers, passengers, other road and sidewalk users such as bicyclists and pedestrians, and roadside properties).

The NHTSA also outlined a distinction between federal and state responsibilities for regulation of highly automated vehicles. Hence the concern that autonomous vehicles be a viable transportation technology is a central tenant in the progress of adopting autonomous vehicles. That said, the U.S. government is highly supportive of the technology, fully cognizant of the safety and economic benefits that may be realized, and thus providing monetary support via grants and other funding, as it works toward the goal of making Level 5 automated vehicles truly viable.

However, at the state level, support and laws for AVs are inconsistent and a growing patchwork of proposed and enacted state-level legislation is creating complications for OEMs and their partners. Moreover, the number of state bills is increasing. Some of the state legislation is reflective of the general public's concern that AVs are not or will not be a safe mode of transport.

Q. **What should city and state governments look for when searching for a reliable and trusted advisor to help them with the implementation of autonomous vehicles?**

- A. City and state governments could consult their peer cities and states. But many cities and states are in a similar situation — trying to determine how best to prepare for AVs; determining what legislation or regulations, if any, should be enacted; and how best to maximize the opportunities of AVs for their cities and their economies. Therefore, cities and states should turn to a trusted consultant or technical advisor.

The selected consultant or advisor should possess a full understanding of autonomous vehicles, including technical, legal, and commercial considerations, as well as an understanding of the greater context in which they will operate. As such, a multidisciplinary expertise is required, as follows:

- **Technology and networks:** AV implementation and operations are not something that we can "build" or "civil engineer" our way out of. Organizations must consider how AVs operate in terms of data transfer, networks, architecture, connectivity, data interoperability, system reliability, data privacy, and security.
- **Transportation systems:** It is important to understand how AVs operate and their integration with other vehicles and/or modes and the state of innovation within these other modes. It is equally important to understand the full mobility landscape for people and freight, as well as transport principles and how AVs will communicate with other systems, such as traffic lights, emergency vehicles, weather data, or accident and congestion data.
- **Economics:** An understanding of freight and logistics includes their operations and cost structure; the state of innovation within these systems/networks; intermodal operations and technologies, employment, and demographics; and economic cooperation and competitiveness.
- **Legal and regulatory contexts:** Such contexts at the federal, state, and local levels include the limitations and opportunities afforded that directly (e.g., defining "autonomous vehicle") or indirectly (e.g., privacy laws) affect AV implementation, the need for creating new or repealing existing laws, and the development of policies and guidance within these frameworks.

ABOUT THIS ANALYST

Mark Zannoni is research director for Smart Cities and Transportation within IDC's Government Insights group, focusing on global transportation issues and key and emerging transportation technologies in the Smart City ecosystem. Zannoni's core research areas include mass transit, smart parking, connected vehicles, V2X and transportation infrastructure in the context of transportation innovation, unmanned aerial vehicles (UAVs), global trends, economic development, and regulatory issues. His work covers all modes of transportation and their strategic application as they relate to Smart Cities worldwide.

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Global Headquarters: 5 Speen Street Framingham, MA 01701 USA P.508.872.8200 F.508.935.4015 www.idc-gi.com