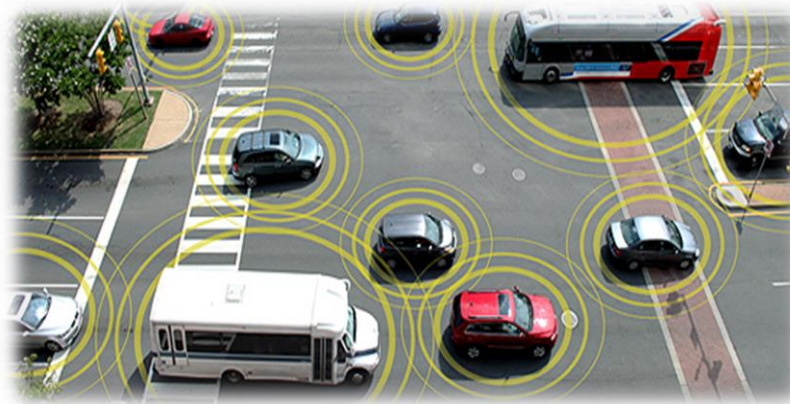




The Future of Transportation: Autonomous and Connected Vehicles



**Tokyo Motor Show
November 26, 2013**



We live in an increasingly connected world

Google




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 Beat theTraffic®
Beat the Traffic

 STREETLINE
Connecting the Real World



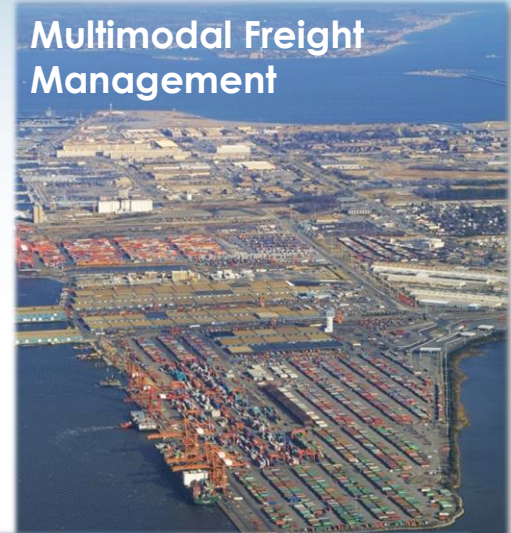
Connectivity is changing how we think about transportation



Bike Sharing



Connected Vehicle technology



Multimodal Freight Management



Bus Rapid Transit



Electronic tolling



Big data is driving the future of roadway safety

The future of transportation lies increasingly in the continued investment and use of real-time information to make our infrastructure smarter, including enabling vehicles to communicate with each other and with the world around them.



Harnessing Big Data for
Better Transportation Decisions

[learn more...](#)

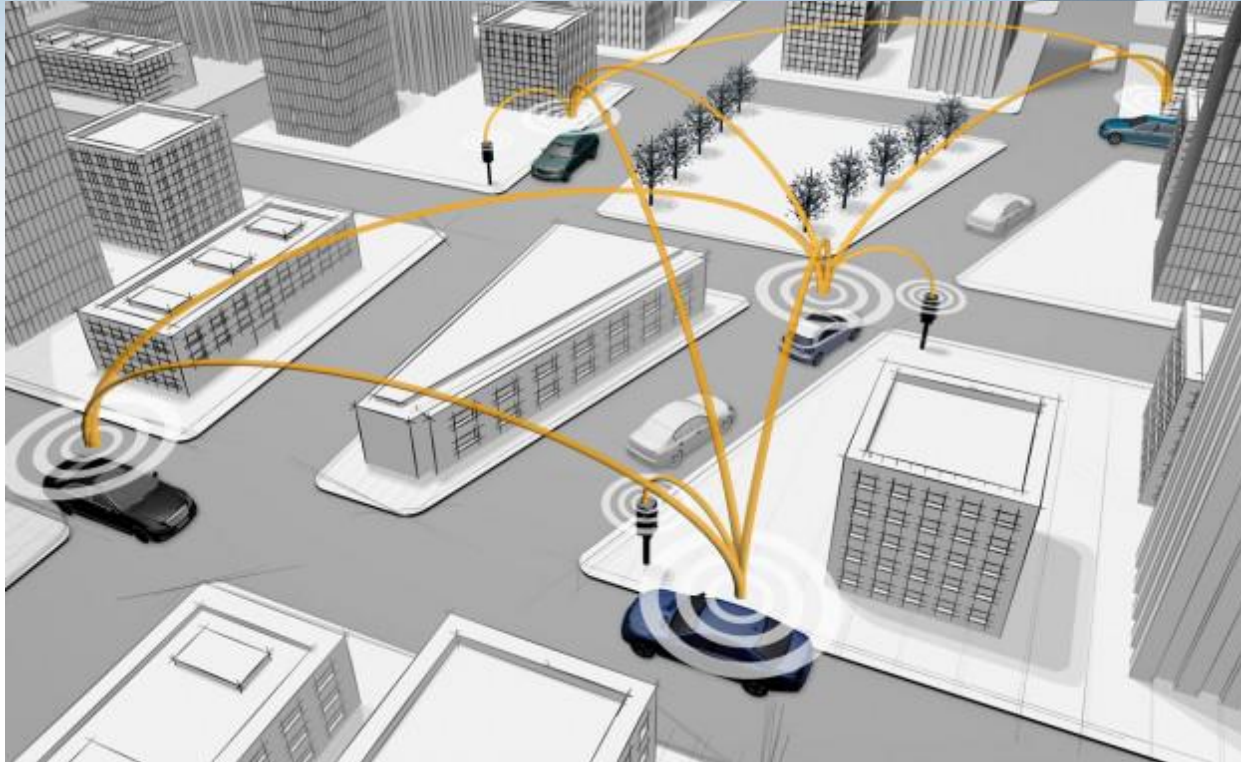
According to U.S. DOT, **nine out of 10 drivers** would like to have vehicle-to-vehicle safety features in their own vehicles and believe the technology would be useful in improving driver safety overall.



Connected vs. Automated Vehicles



**Vehicle-to-Vehicle Communications using 5.9 GHz DSRC
Vehicles and In-Vehicle Apps Connected to the Internet
Autonomous and Semi-Autonomous Vehicles**



Dedicated Short Range Communications (DSRC)

Short-to-medium range wireless communications protocol that permits very low latency data transfer critical in communications-based active safety applications



DSRC is the backbone of the connected vehicle program

- Basic Safety Message (BSM) sent 10 times per second (every 100 milliseconds)
- Message communicates vehicle position, trajectory and operational data
- Cars process information and warn driver as necessary





DSRC safety applications

Communications between Vehicle and Infrastructure

- Blind Merge Warning
- Curve Speed Warning
- Emergency Vehicle Signal Preemption
- Highway/Rail Collision Warning
- Intersection Collision Warning
- In-Vehicle Amber Alert
- In-Vehicle Signage
- Just-in-Time Repair Notification
- Left Turn Assistant
- Low Bridge Warning
- Low Parking Structure Warning
- Pedestrian Crossing Information at Intersection
- Road Condition Warning
- Safety Recall Notice
- SOS Services
- Stop Sign Movement Assistance
- Stop Sign Violation Warning
- Traffic Signal Violation Warning
- Work Zone Warning

Communications between Vehicles

- Approaching Emergency Vehicle Warning
- Blind Spot Warning
- Cooperative Adaptive Cruise Control
- Cooperative Collision Warning
- Cooperative Forward Collision Warning
- Cooperative Vehicle-Highway Automation System
- Emergency Electronic Brake Lights
- Highway Merge Assistant
- Lane Change Warning
- Post-Crash Warning
- Pre-Crash Sensing
- Vehicle-Based Road Condition Warning
- Vehicle-to-Vehicle Road Feature Notification
- Visibility Enhancer
- Wrong Way Driver Warning



What is the Safety Pilot?

- Model for a national deployment of the connected vehicle technology
- Designed to determine the effectiveness of the safety applications at reducing crashes
- Designed to determine how real-world drivers will respond to the safety applications
- 1-year deployment began Aug 21, 2012
- Extended to focus on vehicle-to-infrastructure and commercial vehicle applications



Largest connected vehicle pilot in the World

- More than 2,836 cars, commercial trucks, and transit vehicles
- A variety of different devices
 - Vehicle Awareness Devices
 - Aftermarket Safety Devices
 - Integrated Safety Systems
 - Retrofit Safety Devices
 - Roadside Equipment
- 73 lane-miles of roadway instrumented with 27 roadside-equipment installations



Schedule moving forward

- 2013: U.S. DOT decision on light duty vehicles
- 2014: U.S. DOT decision on heavy duty vehicles
- 2015: U.S. DOT guidance on infrastructure



Challenges remain

- Protecting the spectrum
- Developing and funding a security network
- Day one applications
- Role of the aftermarket
- Funding infrastructure
- Privacy



Significant Activity Related to Autonomous Vehicles

- OEMs rolling out product that include increasing level of automation
- OEMs and others testing fully automated vehicles
- Multiple state passing automated vehicle testing laws
- Test beds under development



Levels of vehicle automation

U.S. DOT in May 2013 defined vehicle automation using five levels:

Level 0: No-Automation: Driver is in complete control of the primary vehicle controls (braking, steering, throttle, and motive power) at all times.

Level 1: Function-Specific Automation: Automation involves one or more specific control functions (electronic stability control, pre-charged brakes, etc.)

Level 2: Combined Function Automation: Automation of at least two primary control functions designed to work in unison to relieve the driver of control of those functions.

Level 3: Limited Self-Driving Automation: Drivers can cede full control of all safety-critical functions under certain traffic or environmental conditions and rely heavily on the vehicle to monitor for changes that require a transition back to driver control.

Level 4: Full Self-Driving Automation: The vehicle is designed to perform all safety-critical driving functions and monitor roadway conditions for an entire trip. Such a design anticipates that the driver will provide destination or navigation input, but is not expected to be available for control at any time during the trip.



Barriers to deployment remain:

- Cost
- Liability
- Security
- Technical
- Societal

21st World Congress on Intelligent Transportation Systems



DETROIT
2014

INTELLIGENT TRANSPORT SYSTEMS

Cobo Center

September 7-11, 2014



Our Theme and Program

- The theme: *Reinventing Transportation in Our Connected World*
- Major program events: Policy Roundtable, High Level Plenaries, CTO Summit, Executive, Special and Technical Sessions, Opening and Closing Ceremonies, Special Awards

Anchor Sponsors



Our Exhibition

- Sales are underway and filling up fast
- More than 300,000 square feet of exhibit space
- Working TMC on exhibit floor
- Entrepreneurial Village
- Youth Connections

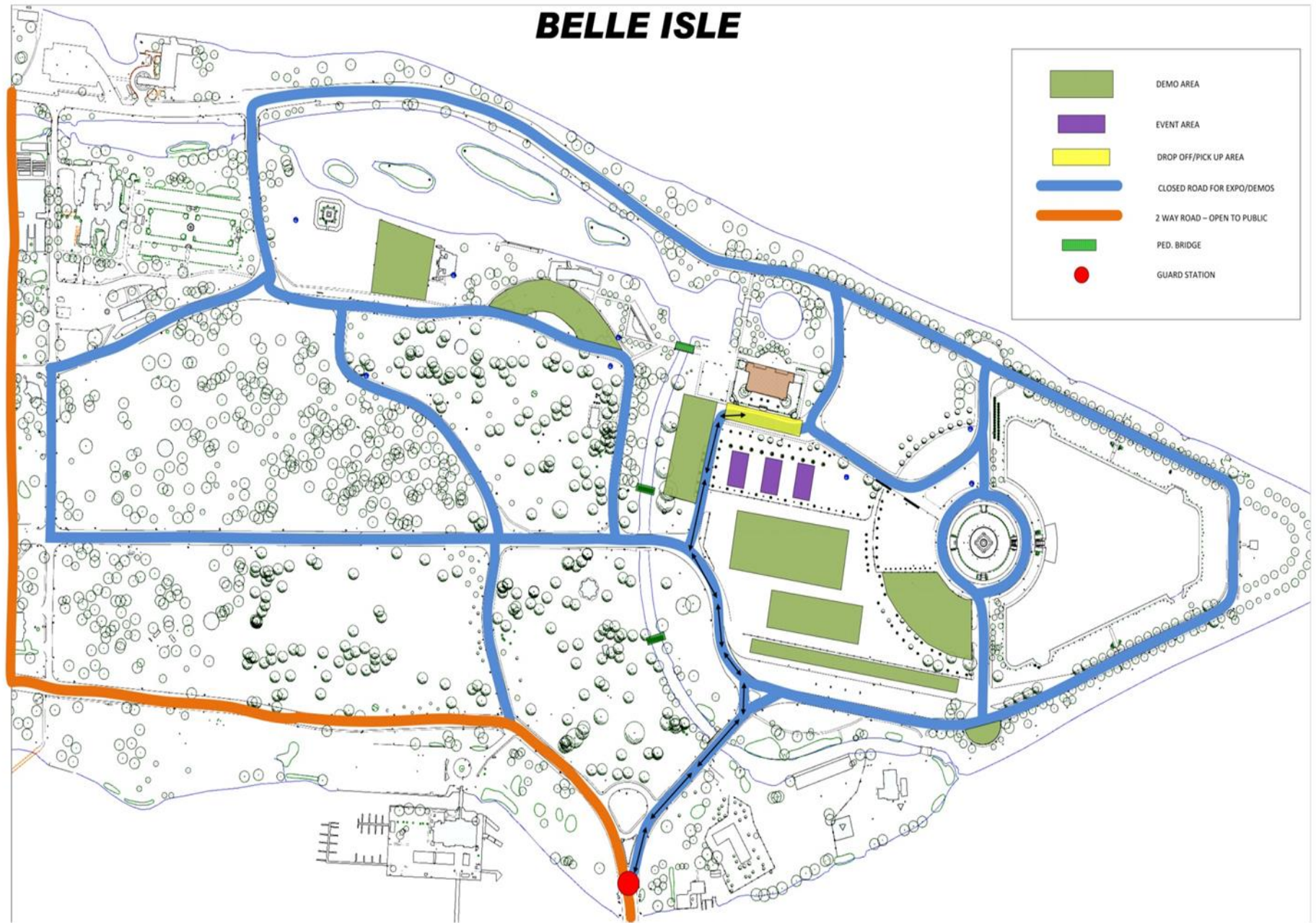
Our Technology Showcase

- Primary showcase will take place on Belle Isle, a 983 acre island
- Variety of additional demonstration venues including inside the Cobo Center
- More than 30 demonstrations already being considered
- Theme areas include: Electric Vehicles, Connected Vehicles, Autonomous Vehicles, Day in the Life, Goods Movement, TMC of the Future, Mileage Based User Fees

Cobo Center -- \$270 Million Rebuilding



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Reinventing
Transportation in
Our Connected World

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