CONNECTED VEHICLE INFRASTRUCTURE DEPLOYMENT CONSIDERATIONS

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REINVENTING TRANSPORTATION

- **Demographic** – Rapid urbanization, aging population, Millennials
- **Transportation**
  - Operations/Policy – Performance driven, operations focus, alternative funding
- **Technology** – *Transformation driven by connectivity*

**DISRUPTIVE FORCES**

- CONNECTED VEHICLE TECHNOLOGY
- SAFETY PILOT MODEL DEPLOYMENT
- GETTING READY
Every business or technological disruption creates opportunity
CONNECTED VEHICLE TECHNOLOGY
CONNECTED VEHICLES
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Vehicles have 360 degree awareness of surroundings

Communicate with other vehicles 10 times per second

“Basic Safety Message” (J2735 standard)

- Location, heading, speed (Part 1)
- Air temperature, lighting, ABS, traction control, wiper status (Part 2)
SAFETY PILOT MODEL DEPLOYMENT
GAME-CHANGER: CONNECTED VEHICLE TECHNOLOGY

SAFETY PILOT

A model deployment of connected vehicles.

- University of Michigan Transportation Research Institute
- United States Department of Transportation
Purpose of Model Deployment:

- Test the effectiveness of connected vehicle safety applications for reducing crashes
- Show how drivers respond to these technologies while operating a vehicle in a real-world, multimodal environment
- Evaluate the feasibility, scalability, security and interoperability of DSRC technology
- Support possible agency decision
AUTO INDUSTRY SUPPORT

CAMP

VEHICLE SAFETY COMMUNICATIONS 3

Mercedes-Benz
Research & Development North America, Inc.

GM

TOYOTA

HONDA
Honda R&D Americas

Ford

NISSAN

HYUNDAI · KIA MOTORS
Hyundai · Kia America Technical Center, Inc.

VOLKSWAGEN
GROUP OF AMERICA

Intelligent Transportation Systems
Connected vehicle technology installation:

- 2,800 cars, trucks, buses, motorcycles and bicycles
- Roadside equipment was deployed along 73 lane-miles of arterial streets and limited access highways
- Facilities deployed to process the resulting data used to evaluate connected vehicle safety benefits
Connected vehicle device types:

- Vehicle Awareness Devices (VAD) – transmit only
- Aftermarket Safety Devices (ASD) – demonstrate aftermarket possibilities
- Retrofit Safety Devices (RSD) – like ASD, but collects sensor data
- Integrated Safety System (ISD) – fully integrated vehicles
Connected vehicle device types:

- Roadside Unit (RSU) – V2I capabilities
- SPaT interface module – device used to translate J2735 message for communication with traffic signal controller
USDOT SAFETY PILOT MODEL DEPLOYMENT
Connected vehicle applications:

- Forward Collision Warning (FCW)
- Emergency Electronic Brake Light (EEBL)
- Blind Spot Warning (BSW)
- Do Not Pass Warning (DNPW)
- Intersection Movement Assist (IMA)
- Left Turn Across Path (LTAP)
- Curve Speed Warning (CSW)
- Right Turn in Front Warning
- Pedestrian Detection
Data collected during the pilot has given us a more accurate, detailed understanding of the potential safety benefits of connected vehicle technologies.

Automakers and government agencies are now acting to implement connected vehicle technology within the next few years.
CONNECTED VEHICLE TECHNOLOGY

SAFETY PILOT MODEL DEPLOYMENT

GETTING READY
CONNECTED VEHICLES: CURRENT STATE

- Advance notice of proposed rulemaking on August 18, 2014
- Final rule on V2V expected in 2016
- AASHTO “Footprint Analysis” for infrastructure applications
- In September 2014, GM announced they would offer connected vehicles in the 2017 model year (two years from now)
- Connected Vehicle Pilot Deployment program now underway
CONNECTED VEHICLES WILL REINVENT TRANSPORTATION

- Connected vehicle technology could address **more than 80% of vehicular crash scenarios** involving unimpaired drivers

- Yet, most public agencies are uncertain about the role of infrastructure in a connected vehicle environment
CONNECTED VEHICLES WILL REINVENT TRANSPORTATION

- Connected vehicles technology will revolutionize the U.S. automotive and infrastructure industries
- However, many challenges must be overcome to realize the benefits of this promising technology
Safety is at the top of the list of benefits for connected vehicle technology

- V2V provides the most immediate safety benefits
- V2I safety benefits increase as the number of connected vehicles increase

Until there is a scaled growth of equipped vehicles, the need for V2I seems low
Most public agencies want basic vehicle probe information for improved system performance

- Real-time data for:
  - Traffic signal control strategies
  - Corridor management
  - Active traffic management
  - Weather and event management
TECHNICAL CHALLENGES

- **RSU-deployed roadside units were prototypes**
- **Environment viewed as unstable**
- **Concern over technical obsolescence**

Not street-ready

Agencies should proceed cautiously with deployment based on the results of Safety Pilot

Timeframe is long enough to suggest that other, more robust or advanced technologies may emerge

Early adopters may be penalized for jumping in early
TECHNICAL CHALLENGES

- The maturity level of connected vehicle equipment
- Interoperability and standards
- Implementation of specific applications
- Applications support
- Data management
- Communications and network management
- Local network security
- Network optimization

Most agencies are confident they can install and maintain the equipment
Public agencies face six major institutional challenges:

1. Funding shortfalls that impact their ability to deploy

2. Lack of staff with new technology skills needed

3. Lack of benefit and cost information to support deployment decisions

4. Data – how to access it, who owns it, how do they support it

5. Agencies have no control over what auto manufacturers do

6. Not enough information to build a business model for deployment
INSTITUTIONAL CHALLENGES

Resources and security dominate the challenges

- For most agencies, resources are already strained
  - Adding more equipment with new maintenance requirements will make matters worse

- Security management is a universal concern
  - Trust the information/sender
  - Trust how the information will be used
  - Certificates
Uncertainties prevail at this time:

- Rapidly advancing technologies
- Difficulty in choosing the right path
- Lack of clarity from a policy perspective
- Infrastructure deployment will lag without guidance on data management/ownership, standards, business models and funding
The world is on the verge of a transformational era in transportation safety driven by connectivity

- Besides safety, we can expect other benefits including enhanced mobility, environmental sustainability and possibly even a new funding mechanism

- Deployment is challenging due to technical issues and public misconceptions
Ultimately, connected vehicle technology could be the game-changer envisioned by U.S. DOT and the auto makers more than a decade ago…but only if we can adapt!

Integration of connected vehicle technology into the existing operations environment will be challenging

Engineering and operational concepts, performance measures, algorithms, the transportation workforce, and traffic control systems will need to adapt

Adaptation will be hard – especially with limited resources

The book is being rewritten.
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