Safety Pilot: Moving from Research to Implementation

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SOLVING TRANSPORTATION ISSUES THROUGH GREATER SITUATIONAL AWARENESS

Drivers/Operators

Connectivity

Vehicles and Fleets

Wireless Devices

Infrastructure
OPPORTUNITY FOR SAFER DRIVING

- Greater situational awareness
  - Your vehicle can “see” nearby vehicles and knows roadway conditions you can’t see
  - 360 degree “visibility”
- Reduce or even eliminate crashes thru:
  - Driver Advisories
  - Driver Warnings
  - Vehicle Control

Connected vehicles have the potential to address approximately 80% of vehicle crash scenarios involving unimpaired drivers
RESEARCH TOWARDS IMPLEMENTATION
KEY SAFETY PROGRAM OBJECTIVES

- 2013 Decision on Vehicle Communications for Safety (light vehicles)
- 2014 Decision on Vehicle Communications for Safety (heavy vehicles)
- 2015 Infrastructure Implementation Guidance
TECHNOLOGY FOR SAFETY – 5.9 GHZ DSRC

- **What it is**
  - Wi-fi radio product
  - Adapted for high speed environment
  - Cheap to produce in quantity

- **How the technology works**
  - Messages transmitted at 10 times/sec
    - Basic Safety Message (vehicle size, position, speed, heading acceleration, brake system status)
  - Operating range of 300 meters (line-of-sight)

- **Benefits of the technology**
  - Reduced Price
  - Less False Alarms → Delayed warnings
  - More Crash Scenarios → Increased performance
    - Can communicate “thru” other vehicles and blind intersections

- **Drawback of the technology** → Both vehicles need to be equipped
SAFETY PILOT OBJECTIVES

- User acceptance
- Estimating safety system effectiveness values
- How the system operates in a real world, concentrated environment
  - Applications
  - Security
- The role that aftermarket devices can play in accelerating benefits
- Any additional research gaps
US DOT OVERSIGHT
Light Vehicle Consortium

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.

KIA

VOLKSWAGEN
Group of America

Intelligent Transportation Systems
TEST CONDUCTOR TEAM

UMTRI

PARSONS BRINCKERHOFF

Mixon Hill

HNTB

AAA

escript

Embedded Security

MDOT

Michigan Department of Transportation

City of Ann Arbor

PURE MICHIGAN

Michigan Economic Development Corporation

Texas Transportation Institute

U.S. Department of Transportation
Driver Acceptance Clinic Vehicles

- 16 V2V equipped vehicles
  - 2 from each OEM
- 8 additional V2V equipped “template” vehicles
  - Available as spares for DAC if needed
  - Used for performance testing (have additional instrumentation)
- DAC vehicles are 16 of the 64 integrated vehicles that are deployed in Safety Pilot Model Deployment (Ann Arbor, MI)
USER ACCEPTANCE – DRIVER CLINICS

- 6 locations across the U.S. - began in August 2011
- Over 100 drivers per location
- Experienced crash warnings
  - Forward Crash Warning
  - Emergency Brake Light
  - Blind Spot Warning
  - Lane Change Warning
  - Intersection Assist
  - Do Not Pass Warning
- Feedback from drivers was overwhelmingly positive
  - ~90% of drivers expressed desire for such a system
SUMMARY OF SURVEY RESULTS

- **Desirability**
  - 91% of drivers surveyed would like to have this technology on their vehicles

- **Willingness to Pay**
  - 58% of the drivers surveyed would pay more than $250 to have this technology on their vehicles
INITIAL SUMMARY OF OVERALL REACTIONS

The illustration below demonstrates respondents’ most common reactions to this technology … that saving a life or many lives, far outweighs the potential drawbacks:
Key Site Elements:
- 75 miles of instrumented roadway
  - 27 roadside units
- ~3000 vehicles
  - Cars, trucks, buses
  - Integrated, aftermarket, and retrofit
- 1 year of data collection
# Model Deployment Fleet

<table>
<thead>
<tr>
<th></th>
<th>Integrated Vehicles</th>
<th>Retrofit/Aftermarket Devices</th>
<th>Vehicle Awareness Devices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Cars</td>
<td>64</td>
<td>300</td>
<td>2,215</td>
</tr>
<tr>
<td>Heavy Trucks</td>
<td>3</td>
<td>16</td>
<td>50</td>
</tr>
<tr>
<td>Transit</td>
<td>3</td>
<td>3</td>
<td>85</td>
</tr>
<tr>
<td>Medium Duty</td>
<td></td>
<td>100</td>
<td></td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>67</strong></td>
<td><strong>319</strong></td>
<td><strong>2,450</strong></td>
</tr>
</tbody>
</table>
MODEL DEPLOYMENT DATA

Numerical & Video Data

• In-vehicle dynamics
• GPS
• V2V (rel. positioning, alerts)
• External sensors
Interoperability Achieved

- 3 Stages of Testing Completed
  - Including bench and field testing
- 8 Vehicle manufacturers (CAMP)
- Multiple vendors included
  - Savari
  - Cohda
  - Denso
  - Arada

- Multiple vehicle platforms
  - Light, heavy, and transit vehicles

Interoperability has been achieved across all devices and vehicles participating in the Safety Pilot Model Deployment!
VEHICLES & DEVICES DEPLOYED

- 2,313 VADs
- 187 ASDs
- 64 Integrated Light Vehicles
- 19 Integrated / Retrofit Heavy Vehicles
- 3 Retrofit Transit Vehicles
- 27 RSEs

Over 91% of the vehicle fleet has been deployed and is operating in the Model Deployment!
### INTERACTIONS GENERATED

Even with the lower device deployment rate, still within 10% of the projected number of interactions by month 6.

<table>
<thead>
<tr>
<th>Month</th>
<th>Deployment (Actual)</th>
<th>Deployment (Planned)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Month 1</td>
<td>21%</td>
<td>34%</td>
</tr>
<tr>
<td>Month 2</td>
<td>44%</td>
<td>76%</td>
</tr>
<tr>
<td>Month 3</td>
<td>71%</td>
<td>100%</td>
</tr>
<tr>
<td>Month 4</td>
<td>86%</td>
<td>100%</td>
</tr>
<tr>
<td>Month 5</td>
<td>91%</td>
<td>100%</td>
</tr>
<tr>
<td>Month 6</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

**Total Number of Interactions (30m)**

- **Projected Interactions:**
  - Month 1: 2,259
  - Month 2: 7,308
  - Month 3: 13,933
  - Month 4: 20,558
  - Month 5: 27,183
  - Month 6: 33,808

- **Observed Interactions:**
  - Month 1: 984
  - Month 2: 3,790
  - Month 3: 9,404
  - Month 4: 16,026
  - Month 5: 23,111
  - Month 6: 30,938
DATA COLLECTED

- 3 Months of Data Collected
  - Integrated light vehicles
  - Light vehicle ASDs
  - Heavy vehicles

- Data Transferred to IE
  - Conducted preliminary analysis of system capabilities on dataset

- Data Transferred to Real-Time Data Capture Program
  - Archiving data for industry research – Research Data Exchange
LESSONS LEARNED

- Allowing additional time for end-to-end system testing
  - Increased maturity level of device developers
  - Identified ambiguous parts of specifications
- GPS antenna placement had a major impact on the performance
  - Internal placement was not viable
  - Viable external locations identified (truck, roof)
- Monitoring the data collection in real-time allows for rapid risk response
  - Implemented risk response plans for interactions
NHTSA Agency Decision

- NHTSA decision will consider all possible options
- Decision will be based on what the data can support

Pre-Model Deployment

Model Deployment Field Test

Evaluation

August, 21st

2012

2013

Decision
With its potential to save lives and prevent injuries, connected vehicle technology could be a real game-changer for vehicle safety.”
- NHTSA Administrator David Strickland

“The past several decades of auto safety have been dedicated to surviving crashes, but the future will be about avoiding crashes. That is what connected vehicles are all about.”
- RITA Deputy Administrator Greg Winfree
Questions

- Mike Schagrin – ITS JPO
  - Program Manager, Connected Vehicle Safety and Automation
  - Mike.Schagrin@dot.gov

- For more information:
  - http://www.its.dot.gov/presentations.htm