CONNECTED VEHICLE PILOT Deployment Program

Fundamental Privacy Concepts for the Connected Vehicle Deployments

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ITS Joint Program Office
Purpose of this Technical Assistance Webinar Series
- To assist not only the three selected sites, but also other early deployers of connected vehicle technologies to conduct Concept Development activities.

Webinar Content
- Connected Vehicle Pilot Deployment Program Overview
- Fundamental Privacy Concepts
- Stakeholder Q&A
- How to Stay Connected

Webinar Protocol
- Please mute your phone during the entire webinar
- You are welcome to ask questions via chatbox at the Q&A Section
- The webinar will be recorded except the Q&A Section
- The webinar recording and the presentation material will be posted on the CV Pilots website within a week
Reduce the number and severity of adverse weather-related incidents in the I-80 Corridor in order to improve safety and reduce incident-related delays.

Focused on the needs of commercial vehicle operators in the State of Wyoming.

Improve safety and mobility of travelers in New York City through connected vehicle technologies.

Vehicle to vehicle (V2V) technology installed in up to 10,000 vehicles in Midtown Manhattan, and vehicle to infrastructure (V2I) technology installed along high-accident rate arterials in Manhattan and Central Brooklyn.

Alleviate congestion and improve safety during morning commuting hours.

Deploy a variety of connected vehicle technologies on and in the vicinity of reversible express lanes and three major arterials in downtown Tampa to solve the transportation challenges.
**Deployment Schedule**

- **Overall Deployment Schedule**
  - **Phase 1: Concept Development**
    - Creates the foundational plan to enable further design and deployment
  - **Phase 2: Design/Deploy/Test**
    - Detailed design and deployment followed by testing to ensure deployment functions as intended (both technically and institutionally)
  - **Phase 3: Maintain/Operate**
    - Focus is on assessing the performance of the deployed system
  - Post Pilot Operations (CV tech integrated into operational practice)

- **Public webinars to share the concept development activities from the three sites**
  - Concept of Operations Webinar (February – March 2016)
  - Performance Measurement Webinar (May – June 2016)
  - Deployment Plan Webinar (August 2016)
WHAT ARE CONNECTED VEHICLES (CV)?

**Vehicle Data**
- Position & Vector
- Speed
- Acceleration
- Steering Angle
- Brake Status
- Vehicle Size

**Infrastructure Data**
- Traffic Signal Data
- Maneuver Assistance
- Speed Limit
- Parking Availability
- Road Weather Data
PROBLEMS WHERE CV CAN HELP

Safety
- 33,561 highway deaths in 2012
- 5,615,000 crashes in 2012
- Leading cause of death for ages 4, 11-27

Mobility
- 5.5 billion hours of travel delay
- $121 billion cost of urban congestion

Environment
- 2.9 billion gallons of wasted fuel
- 56 billion lbs. of additional CO₂

2011 Annual Urban Mobility Report, Texas Transportation Institute (Feb 2013)
Basic CV Technologies

- **Radio**
  - 5.9 GHz for safety and mobility
    - Vehicle Radio – On Board Units (OBU)
    - Infrastructure Radio – Road Side Units (RSU)
  - Integrated and retrofit options

- **Standards**
  - IEEE 802.11p - Radio
  - IEEE 1609.x - Authentication
  - SAE J2735 - Data Vocabulary
ROLE OF PRIVACY

- Connected Vehicle success depends on public acceptance
  - Show Personally Identifiable Information (PII) are protected
  - Show safety information and warning can be trusted

- Improvements to Safety, Mobility, and Environmental Impact only happens when CV technologies are used

- Privacy, security, and operational choices have to be balanced
HOW IS PRIVACY PROTECTED?

- Privacy is protected through the use of Security Controls
  - Physical protection of devices
  - Technical protection of information
  - Policy guides organizational procedure and processes; for instance, access controls, policies on acceptable uses of data
PERSONALLY IDENTIFIABLE INFORMATION

- **Non-PII**
  - This data cannot be traced back to an individual. This includes time zone, traffic count information, general trends on network conditions, date and time.

- **Potential-PII**
  - These data elements cannot be linked to an individual unless combined with other data sources. This includes internet cookies, IP addresses, and vehicle characteristics (size, color, and make/model)

- **Actual-PII**
  - This is information that can be tracked back to an individual. Basic information includes Names, Addresses, Telephone numbers, and Vehicle Identification Numbers (VIN).

- **Locational-PII**
  - This includes information that can be used to track an individual at a particular location. This includes GPS tracking information (Lat./Long.), Roadway Video Data, Video of faces, in-vehicle video.

- **Sensitive-PII**
  - This data, if lost can pose a significant risk of economic or physical harm to the individual. Examples are: Medical Records, Social Security Numbers, Bank Account Numbers, and Passport Numbers.
ANONYMITY OR PRIVACY?

- **What is Anonymity?**
  - The Quality or state of being unknown to people

- **What is Privacy?**
  - The state of being away from people

<table>
<thead>
<tr>
<th>Identified</th>
<th>Potential Identifiable Information</th>
<th>Actual Identifiable Information</th>
</tr>
</thead>
</table>
| Not Anonymous | • Make  
 |                     | • Model | • Make  
 |                     | • Model | • License Plate |
| Not Anonymous | Not Anonymous | Not Anonymous |
STANDARDS BASED APPROACH

- NIST SP 800-53 for Federal Government

- National Association of State CIOs (NASCIO) offer State-based best practices

- FTC’s Fair Information Practice Principles (FIPP)
  - Transparency
  - Individual Participation
  - Purpose Specification
  - Data Minimization
  - Use Limitation
  - Data Quality and Integrity
  - Security
  - Accountability and Auditing
Privacy Policy and Operations

- Federal Policies
  - CV systems will be operated by State and Municipalities
  - Limits to what Federal Privacy Protection must be adopted

- Commercial Practices
### Basic Safety Message (BSM)
- 38 Bytes of data
- SCMS overhead is not included in this

### Information used to improve Safety
### Information used to improve mobility

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>Description</th>
<th>Byte Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSGCnt</td>
<td>MsgCount within a stream</td>
<td>1</td>
</tr>
<tr>
<td>ID</td>
<td>Temporary ID</td>
<td>4</td>
</tr>
<tr>
<td>SEC Mark</td>
<td>Dsecond (0-60999 ms)</td>
<td>2</td>
</tr>
<tr>
<td>LAT</td>
<td>Latitude (-90 to +90 in 1/10 microdegree units)</td>
<td>4</td>
</tr>
<tr>
<td>LONG</td>
<td>Longitude (-180 to +180 in 1/10 microdegree units)</td>
<td>4</td>
</tr>
<tr>
<td>ELEV</td>
<td>Elevation (-409.5 to 6143.9 meters in 10cm increments)</td>
<td>2</td>
</tr>
<tr>
<td>ACCURACY</td>
<td>Positional Accuracy (semi-minor and semi-major at 0.05m units)</td>
<td>4</td>
</tr>
<tr>
<td>SPEED</td>
<td>TransmissionAndSpeed</td>
<td>2</td>
</tr>
<tr>
<td>HEADING</td>
<td>Heading (WSG-84 north reference at 0.0125 degree units)</td>
<td>2</td>
</tr>
<tr>
<td>ANGLE</td>
<td>Steering Wheel Angle (-189 to +189 degrees in 1.5 degree units)</td>
<td>1</td>
</tr>
<tr>
<td>ACCEL SET</td>
<td>AccelerationSet4Way (long, lat, vert, yaw rate, per SAE-J670)</td>
<td>7</td>
</tr>
<tr>
<td>BRAKES</td>
<td>BrakeSystemStatus</td>
<td>2</td>
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<tr>
<td></td>
<td>wheelBrakes</td>
<td>4 bits</td>
</tr>
<tr>
<td></td>
<td>wheelBrakesUnavailable</td>
<td>1 bits</td>
</tr>
<tr>
<td></td>
<td>spareBit</td>
<td>1 bits</td>
</tr>
<tr>
<td></td>
<td>traction control state</td>
<td>2 bits</td>
</tr>
<tr>
<td></td>
<td>antilock brake status</td>
<td>2 bits</td>
</tr>
<tr>
<td></td>
<td>stability control status</td>
<td>2 bits</td>
</tr>
<tr>
<td></td>
<td>brake boost applied</td>
<td>2 bits</td>
</tr>
<tr>
<td></td>
<td>auxiliary brake status</td>
<td>2 bits</td>
</tr>
<tr>
<td>SIZE</td>
<td>VehicleSize – 1cm units</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>VehicleWidth</td>
<td>10 bits</td>
</tr>
<tr>
<td></td>
<td>VehicleLength (front to rear bumper)</td>
<td>14 bits</td>
</tr>
</tbody>
</table>
REAL TIME DATA PROTECTION

- **Identification and authentication using secured credentials**
  - Very short live span credentials
  - Used in a randomized manner

- **Structural protection of Credential Management Authorities**
  - Structured to obfuscate requests for credentials
  - Divide stored data at an institutional level to ensure that no one database is comprehensive

- In a CV environment, data does not contain PII.

- Institutional authorities are designed to obfuscate possible PII correlation and provides structural resiliency.
No Personally Identifiable Information is broadcasted, but there is little to no trust in the information.
- A secure credential system allows the receiver to authenticate the broadcasted information.
- This creates a mechanism for trust.
- Time based expiration of credential prevents tracking using the credentials.

- PII is compromised only if third party correlate able information are available.
• Information used to improve regional mobility

• Information used to measure environmental impact and conditions

• Characteristics of probe data
  □ Event triggers base reporting – state changes that can indicate changes in roadway conditions
  □ Start from a stop event based reporting
  □ Time and speed based reporting between Roadside Unit
Experiment with vehicle data from Safety Pilot Model Deployment

Results are begin analyzed for:
- Maximize usefulness of data while preventing release of PII.
- Better understand vulnerabilities

Samples available
- [https://www.its-rde.net](https://www.its-rde.net)
- Most recent update – January 19, 2016
- Two months of data from Safety Pilot Model Deployment
FOR MORE INFORMATION

Connected Vehicle Program Privacy Officers:

- Dale Thompson: Dale.Thompson@dot.gov
- Claire Barrett: Claire.Barrett@dot.gov
- Suzanne Sloan: Suzanne.Sloan@dot.gov
STAKEHOLDER Q&A

- Please keep your phone muted
- Please use chatbox to ask questions
- Questions will be answered in the order in which they were received
- This Q&A section will not be recorded, nor posted to the website
Contact for CV Pilots Program: Kate Hartman, Program Manager
Kate.hartman@dot.gov

Join us for the Getting Ready for Deployment Series
- Discover more about the 2015 CV Pilot Sites
- Learn the Essential Steps to CV Deployment
- Engage in Technical Discussion

February 2016 Webinars

Technical Assistance Webinars
- 2/1/2016, 11:00 – 12:30 pm EST
  Preparing a Privacy Concept for Connected Vehicle Deployments
- 2/9/2016, 2:00 – 3:00 pm EST
  Preparing a Performance Measurement Plan for Connected Vehicle Deployments
- 2/10/2016, 2:30 – 4:00 pm EST
  SCMS Proof-of-Concept Interface Requirements for Connected Vehicle Deployments

Public ConOps Webinars
- 2/5/2016, 1:00 – 2:00 pm EST: ICF/Wyoming
- 2/8/2016, 2:00 – 3:00 pm EST: Tampa (THEA)

Please visit the CV pilots website for the recording and the briefing material of the previous webinars.

Website: http://www.its.dot.gov/pilots
Twitter: @ITSJPODirector
Facebook: https://www.facebook.com/DOTRITA