Overview of V2I Safety Applications

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FHWA Objectives for V2I Safety Applications

- Connected vehicle technology provides an opportunity to integrate roadside and vehicle data and messaging to
  - Obtain a richer information set for identifying potential driving hazards
  - Deliver more accurate and timely warnings to drivers of potentially unsafe conditions
  - Improve driver awareness of and response to potentially unsafe conditions
  - Improve highway safety over current practices
V2I Safety Applications - Application Selection

- Five applications were selected for systems engineering development based upon:
  - Stakeholder feedback
  - Number of potential infrastructure deployments
  - Availability of standards necessary for implementation
  - Capabilities of existing infrastructure
  - Technical feasibility
  - High level assessments of benefits and order of magnitude costs
V2I Safety Application - System Design

- V2I Safety Framework assumes two displays
  - Driver Infrastructure Interface (DII) – Roadside signs visible to everyone
  - Driver Vehicle Interface (DVI) – Tailored to driver in vehicle

- V2I Safety Application has two components:
  - Infrastructure application component
    - Issues generic advisory or warning message to approaching vehicles through DII
    - Utilizes connected vehicle platform to send message containing infrastructure data and DII message to vehicle application component
    - May capture vehicle BSMs to determine location, speed, and heading of approaching vehicles
  - Vehicle application component
    - Vehicle application component is developed and implemented by OEMs and aftermarket suppliers
    - Integrates and processes available infrastructure and vehicle data
    - Determines whether to deliver vehicle specific advisory/alert/warning through DVI
Red Light Violation Warning

- Roadside Equipment (RSE): broadcast Signal Phase and Timing (SPaT) message, map data, and GPS correction
- In-vehicle Device: determine if the vehicle is in danger of violating a red light
- Traffic signal logic may be evaluated to determine if extension of all-red phase is warranted to prevent crashes involving early violators

Image Courtesy of Battelle
Curve Speed Warning

- Roadside Equipment (RSE): broadcast geometric and weather information for use by in-vehicle device
- In-vehicle Device: determine appropriate speed for that particular vehicle. Warnings can be tailored to the specific vehicle capabilities
- Potentially could be linked to dynamic driver feedback signs until majority of vehicles are equipped

Image Courtesy of Battelle
Stop Sign Gap Assist

- Roadside sensors: detect on-coming traffic
- Roadside Equipment (RSE): broadcast traffic status
- In-vehicle Device: determine if there is any danger for vehicle on the minor leg

- Not designed to provide warnings of potential crashes due to stop sign violations!
Spot Weather Impact Warning

- Roadside Equipment (RSE): connection with TMC and other weather data collection sites/services
- In-vehicle Device: issues alert or warning to driver
- Weather events and locations broadcast to vehicles in real-time

Driver Infrastructure Interface (DII)
(static or dynamic sign)

Driver Vehicle Interface (DVI)
Examples

Image Courtesy of Battelle
Reduced Speed/Work Zone Warning

- Roadside Equipment (RSE): connection to TMC and/or local network in work zone
- In-vehicle device: issues alert to driver to reduce speed, change lanes, and/or prepare to stop
- Speed limit/work zone information provided to vehicle
Efforts for Transit Safety

- “Pedestrian vs. Turning Bus Warning” (V2I) currently under testing and evaluation as part of the Safety Pilot in Ann Arbor, Michigan
- Detailed transit bus crash analysis completed in February 2013
- A set of 12 Transit V2I applications (8 safety related) identified for near-term R&D consideration
- A stakeholder meeting (webinar) scheduled on October 9, 2013 to discuss/prioritize 12 candidate transit V2I applications
- Prototype development and testing of additional transit V2I applications planned to begin summer 2014
Next Steps

- V2I Safety Application Systems Engineering (in final stage of development)
  - Conduct walkthrough workshops for performance requirements (End of CY 2013)
- Application Development
  - Design documentation, prototyping, simulation/small-scale testing, refinement
  - Iterative process to refine V2I Safety Applications and prepare hardware and software for field operational tests and demonstrations
  - End product is revised design documentation and revised/new standards (if needed)
- Field operational tests in a real world environment and Connected Vehicle Multi-modal demonstrations in test beds
  - Testing in a real world environment of Safety, Mobility, and Environmental applications as well as Data Capture and Management for statistical analyses
  - End product is guidelines and recommendations
For More Information

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