Activity 2 of TWG 3 of the V2I Deployment Coalition

The primary objective of Activity 2 was to identify, define and prioritize data issues for both Automotive OEM's and Infrastructure owners and operators in V2I Deployment. The approach to this task is as follows:

1. Facilitate discussions with DOTs and OEMs to identify data issues
2. Focus the discussion on the 4 focus areas
   - Intersections (signalized & non-signalized)
   - End of Queue Warnings
   - Work Zone Management
   - Curve Warning Systems
3. Prioritize the identified issues

The attachment was sent to potential DOTs and OEMs to help frame the discussion. The results of these discussions are summarized in this document.

DOT discussion

On Thursday, December 3rd, a conference call was held with a group of DOT and agency representatives who were participating in a pooled fund study meeting. Represented were:

Virginia DOT
Minnesota DOT
New York State DOT
Caltrans
Utah DOT
Pennsylvania DOT
Road Commission for Oakland County (MI)
Arizona DOT
Maricopa County DOT (AZ)
FHWA
Transport Canada
Texas DOT
Wisconsin DOT
Michigan DOT

Discussion centered around their data needs from the OEMs to implement the 4 focus areas above.

It was determined that the data concerns for DOTs/Agencies are primarily with the mobility and "agency benefit" type of applications, rather than the safety-focus areas identified. For the most part, infrastructure owners/operators don't seem to need data as part of the safety applications identified, therefore to summarize:

- For the 4 identified focus areas, agencies don't need data from the vehicles. This changes when looking at mobility agency-specific applications, which should be a focus of this Technical Working Group after the March/April timeframe of our current deliverables.

OEM discussion

After considerable outreach to the OEM community, feedback on data needs for the 4 focus areas was obtained from CAMP, and individually from Volkswagen and Nissan.

Intersections (signalized & non-signalized)

OEMs indicated that, for intersections of both types, SPaT and MAP data is needed. These include elements such as signal phase and timing, intersection geometry, operational status, approaching vehicle information, road friction, location of signs, and road geometry and markings.

End of Queue Warnings

End of queue warnings necessitate a combination of data elements, including information regarding the speed and position of the queue and the affected lanes. If an intersection is involved, the information necessary for intersections is needed as well. If dynamic message, variable speed limit, or dynamic lane signs or control devices are present, their location and status are also necessary.

Work Zone Management

For a work zone, the information necessary for end of queue applies. Additionally, needed information includes the location, direction and length of the work zone, lanes leading to the work zone, lane closures and their position, speed limit information, and an indication of the presence of workers.

Curve Warning Systems

Curve warning systems require information on Roadway characteristics, weather conditions, field equipment, and traffic status as follows:

- Roadway characteristics – friction, roadway geometry such as curve entry point, curve radius, banking angle
- Weather conditions should preferably be measured by road surface sensors and can include surface temperature, subsurface temperature, moisture/precipitations, icing, treatment status and visibility
- Field equipment may include dynamic messaging and variable speed limit signs.
- Traffic status includes information on approaching vehicles, such as speed and location.

Summary

Information needed for all three focus areas included roadway geometry, with road condition information needed for most. Therefore, these two data element categories should be prioritized for V2I deployment activities in the four focus areas identified for this exercise.

What is Activity 2 of Technical Working Group 3 of the V2I Deployment Coalition?

Activity 2's primary task is to identify, define and prioritize data issues in V2I Deployment. The approach to this task is as follows:

1. Facilitate discussions with DOTs and OEMs to identify data issues
2. Focus the discussion on the 4 focus areas
   - Intersections (signalized & non-signalized)
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3. Prioritize the identified issues

For today's discussion:

1. Discuss each focus area and what data needs might be
2. Identify data elements needed for each focus area
3. Discuss challenges in obtaining, analyzing and/or using each data element

Note: the data elements on the following two pages were taken from the Michigan DOT-sponsored report **Connected v. Automated Vehicles as generators of Useful Data**, authored by Qiang Hong and Richard Wallace of CAR, and Gregory Krueger of Leidos.

Who is on the phone?

Melissa S. Tooley, PhD, PE
Director of External Initiatives
Director, Southwest University Transportation Center
Texas A&M Transportation Institute
The Texas A&M University System
3135 TAMU | College Station, TX 77843-3135
Tel 979.845.8545
m-tooley@tti.tamu.edu

tti.tamu.edu | **Saving Lives, Time and Resources**

		Focus Areas			
		Intersections (sig & non-signalized)	End of Queue Warnings	Work Zone Mgmt	Curve Warning Systems
Vehicle Data	Type and Characteristics				
	Time Stamp				
	Speed and heading				
	Acceleration and yaw rate				
	Turn signal status				
	Brake status				
	Stability control status				
	Driving Wheel angle				
	Vehicle Steering				
	Tire pressure				
	Traction Control State				
	Wiper status and run rate				
	Exterior lights				
	GPS Status and Vehicle Position (long, lat, elev)				
	Obstacle Direction				
	Obstacle distance				
	Road friction				
	Current and avg. fuel consumption				
	Vehicle Emissions Data				
	Air temp and pressure				
	Weather information				
	Electronic Stability Control				

			Focus Areas			
			Intersections (signalized & non-signalized)	End of Queue Warnings	Work Zone Management	Curve Warning Systems
Infrastructure Data	Roadway Characteristics	Friction				
		Road geometry and markings				
	Road Conditions	Surface temp				
		Subsurface Temp				
		Moisture				
		Icing				
		Treatment Status				
	Road Surface Weather Conditions	Air temp				
		Wind Speed				
		Precipitation				
		Visibility				
	Intersection Status	Current operational status				
		Signal Phase and timing				
		Intersection Geometry				
		Approaching vehicle information				
	Field Equipment Status	Dynamic Message Signs				
		Variable Speed Limit Signs				
		Dynamic lane signs or control devices				
		Ramp meters				
	Parking Information	Location of parking facilities				
		Spaces available				