Infrastructure Preparation for Connected Vehicles

Real-World Applications showing Public Agency Benefits of V2I & V2V Project Funding

Donald Shupp, Western Pacific Signal
Chris Peddie, Trafficware
Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) data transmission supports: driver advisories, driver warnings, and vehicle and/or infrastructure controls.

Defined by USDOT, which had AASHTO form a team in 2012 to conduct a “Footprint Analysis”, and timeline.

Task order proposal narrowed in April 2014 to either:
- Dynamic Speed Harmonization (SPD-HARM)
- Queue Warning (Q-WARN)
This presentation will focus on the **Dynamic Speed Harmonization (SPD-HARM)** element of collecting data to detect impending congestion; generating appropriate target speed strategies for upstream traffic; and communicating the recommendations to the affected vehicles, using either I2V or V2V communication.

The **SPD-HARM** concept reflects decisions made at a Traffic Management Center (TMC), and then communicated to the affected traffic.
Pipe Dream or Reality?

Although various standards in flux, known variables related to support infrastructure and real-world performance have been proven.

In January 2014, Several Global Auto Mfg. showcased Connected Vehicle (CV) technology at the Consumer Electronics Show (CES), in Las Vegas.
Las Vegas was the perfect venue to showcasing a live CV demonstration. The City had recently upgraded the central TMC, using ATMS.now software.

Audi successfully integrated a real-time signal interface stream to a 20-intersection grid around the LV convention center. The live data was broadcast to several demonstration vehicles driving Las Vegas Blvd.
How Did They Do It?

- System uses positioning data from GPS and cellular signals to provide vehicle orientation in relation to signal.
- When motorist stops at a red light, the system provides a visual indicator that counts down to the green phase.
- Las Vegas has some very long phases, so UI would max at 90 sec., indicating 90"+.
Las Vegas involved a middleware vendor, **Green Driver**, to provide a one-way data stream interface from **ATMS.now**, to Audi’s central system, for radio transmission to the field vehicles.

Vehicle data exchange ultimately by **Dedicated Short Range Comm. (DSRC) radios**.
CV System Benefits

Value to motorist
• Relaxes the driving experience
• More productive navigating signals
• Improved Driver Safety

Value to agency
• Enhanced Driver Attention
• Reduced fuel consumption
• Reduced vehicle emissions
• Improved traffic flow & travel times
• Potential for red-light running notification
• Guidance for motorist can stay in the green-band
CV Standards are still in flux, so wake me when it’s here…

- Funded project rollout will likely be prioritized to urban local agencies who have prepared and upgraded their field infrastructure in advance
- Planning should begin now, to allow ample time for project completion

When the Funding opportunity arrives, you already must be “Shovel ready”

- TIGER (ARRA) stimulus funded project awards had little or no reaction time to prepare for planned project eligibility.
What project? What Needs?

▲ Assess Infrastructure for adequate per-lane vehicle & bicycle detection treatments (at least 64-channels)
▲ Upgrade or plan procurement of modern ATC or 2070-based TS2 controllers and local intersection software that supports 64-channel detection.
▲ Evaluate cabinet assembly size, age, and overall suitability for addition equipment (radio, CPU, data backup) needed to support V2I
▲ Develop a Layer 3 managed Local Area Network extending to either field hub locations, or critical intersection cabinets.
What Else Do We Need?

- Broadband Communications in the cabinet! High Speed Ethernet over fiber or existing copper SIC cable
- Voice and Video grade Ethernet service over multiple links
- CCTV
Previous CA Stimulus funding for roads projects totaled about $2.5B.

“Past performance is no guarantee of future results”. However, we all reside within a well-funded public marketplace.

CV funding for V2I infrastructure won’t be announced until standards are published.

2015.. 2016..? Stay tuned…
When the standards and funding roll out, top urban candidate locations will be prioritized on readiness and infrastructure preparation.

Not having a vision, or planning to upgrade neglected traffic control equipment is an assured method to have your public agency skipped over the first initial project rounds of funding.
Examine real-world case studies, such as this CES field demonstration, to prepare a project map on what upgrade treatments are most needed within your specific agency.

Obtain idea verification and guidance from key “hands on” sources, who share practical field experience:
- In-house Engineering & Electrical Field Staff
- Traffic Engineering Consultants
- Software System Integration & Equipment Vendors
- Neighboring Agencies & Stakeholders
- Automotive Manufacturers & Producers
- Local Councils of Governments (COGS)

Preparedness for the needs of this future CV technology is the key. It’s coming to town sooner than you think. Now your CV infrastructure project is truly a “Shovel Ready” candidate venue!
▲ Special Thanks to the City of Las Vegas, Audi, and Green Driver for their participation in the successful CV field demonstration of V2I technology at the 2014 Vegas CES.