Summary of August 18-19, 2014 CVRIA Workshop Focused on Connected Vehicle Standards Analysis

Overall Results

- Approximately 65 people registered; 40+ participated. In general, participation was high in both the general and breakout sessions

- Participants offered a variety of feedback on:
  - Process and approach to interface/exchange analysis – participants were positive, overall, about the approach but voiced some concerns and alternative options
  - Preliminary results – mixed reactions to the prioritization results, which resulted in greater scrutiny of the process and approach
  - Next Steps – recommendations in line with feedback from previous workshops

Key Observations: General Session

- Initial feedback/response to content and approach was positive
  - High degree of interest, high degree of engagement in the opening General Session

- Participants reviewed the application prioritization process and noted:
  - A desire for broader stakeholder input into the process
  - Comments on some areas for improvement
  - A desire to ensure that the CVRIA team notes the principle of reusing standards as much as possible
  - Some concern about duplication of exchanges and expansion of the range of exchanges that have resulting impact on standards. Options include:
    - Too restrictive of a message set vs
    - Too many individual "atomic" data elements vs
    - Too many application-specific messages

Breakout Session #1: Validation of Process and Preliminary Findings

- **Level of attendance resulted in two breakout groups for Breakout Session #1**

- **Each Breakout Group Addressed:**
  - The Process
  - Application Scores
  - Information Exchange Scores

- **Each Breakout Group Sought to Discuss:**
  - What requires elaboration or clarification?
  - What are initial reactions?
  - Do the application scores reflect the highest priority applications?
  - What would you have done differently, and why?
  - Is there anything missing from the analysis?
  - Are there any missing applications?
  - Do the process or results overly constrain new technologies, emerging innovation, or novel implementations?
  - What are some opportunities and challenges that you can identify with regards to approaching Connected Vehicle standardization?

Synthesis of Breakout Session #1 Discussions

- Extensive and active discussions in both breakout groups
- Participants offered numerous questions and comments about prioritization, including questions about the definition of the "complexity" metric and why it was included
- Participant suggestions for alternative prioritization metrics included:
  - Special interests (border crossings for border states)
  - Relative benefits provided by application
  - Number of applications that use an exchange
  - Applications that can only be achieved by CV
  - Major known technical issues
  - Based on CV Pilot projects
- Participants also asked about the range of the stakeholders included in prioritization process and whether it should be broader. Most agreed that it is a complex process that doesn't easily allow for broad inputs.

Breakout Session #2: Mapping of Exchanges/Interfaces to Standards

- **Attendance at Day 2 resulted in a combined breakout session**
- **The Breakout Group Addressed:**
  - The definition of exchanges and interfaces
  - The mapping of exchanges and interfaces to standards
  - Missing standards or mappings
  - New and emerging standards as applicable to Connected Vehicle applications
  - Need for new standards
- **The Breakout Group Sought to Discuss:**
  - What requires elaboration or clarification?
  - What are your initial reactions?
  - Is the process valid? What would you have done differently, and why?
  - With which current mappings do you disagree, and why?
  - What additional mappings would you suggest to fill gaps?
  - Do the mappings overly constrain implementation of CV?
  - Are any mappings high-risk due to the current or projected state of the standards?
  - What are challenges and opportunities for driving standards development?

Synthesis of Breakout Session #2 Discussion

- Participants confirmed that data exchanges should be designed for the communications environment for which they are intended and offered opinions about what should and should not be included. For example:
  – Some participants felt that vehicles should not be required to support SNMP (e.g., for weather data)
  – An observation was that XML is rather verbose and might not be the most effective use of the V2X bandwidth.
  – Another observation was that V2X (which can include DSRC), will most likely use different communication technology that traditional Center-to-Center or Center-to-Roadside (backhaul) communications.
  – Participants looked for assurances that data elements used for the different links should be as consistent as possible.

Breakout Session #3: Impacts on Standardization and Deployment

- **The Breakout Group Addressed:**
  – The impact of these results on deployment
  – Challenges and opportunities for implementation and deployment
  – Key incentives for facilitating more efficient and effective deployments
  – Missing factors in developing the standards plan

- **The Breakout Group Sought to Discuss:**
  – What requires elaboration or clarification?
  – What are your initial reactions? Suggestions?
  – How well do the results reflect key needs?
  – Do the results support an effective standards plan? How? How do they not?
  – What are additional key drivers for approaching standardization not captured here?
  – What are key activities necessary to pursue effective standardization?
  – What resources are available to pursue those?
  – What policy, time, technological, or other constraints will pose challenges?
  – What issues of scope and system/technology integration do you anticipate?

Synthesis of Breakout Session #3 Discussion

- In the last session, there was extensive group discussion about alternative ways to address exchanges

- Some participants expressed concern that each CVRIA "flow" and/or "exchange" would be interpreted to require a unique standardized message
  - Many standards (e.g., SAE J2735) have developed a small number of messages that can address a large number of defined flows.
  - The CVRIA team believes that this many-to-one mapping is the intent of the CVRIA, but it needs to be made clearer.

- Through discussion, the CVRIA team and participants identified "core exchanges/functionalities" that appear to serve a wide variety of applications without multiplying the number of message standards (see next slide, #10, for list)

- Core exchanges appear to also align with Michigan test bed work
  - Focused on time and space needs
  - Provide basic static and dynamic information for most road/vehicle based situations
  - Do NOT appear to support transactional applications

- Participants encouraged the CVRIA team to create a specific focus on these core exchanges as the team takes the next step in finalizing the analysis

Core Exchanges

Exchange Type	Temporality	Spatiality	Examples/Comments
Mobile Entity Local State	Immediate	Local	Speed, direction, mode/type, etc. All mobile entities
Mobile Entity Global State	Current	Regional	Origin/Destination
Roadway Local Dynamic Extrinsic State	Immediate	Local	Signal Information
Roadway Local Current Extrinsic State	Current	Local	Road surface conditions, transient hazards, localized traffic (e.g. queues)
Roadway Local Intrinsic State	Static	Local	Road geometry, fixed hazards
Roadway Global Current Extrinsic State	Current	Regional	Regional traffic conditions, link travel times, etc
Roadway Global Intrinsic State	Static	Regional	Road network topology

Supporting Functionalities

- Last, in breakout session #3, the CVRIA team and participants identified and discussed a set of additional functionalities that will have their own exchanges that are not associated with direct application functions but are needed to carry out operations:

  - Security Management

  - Roadside Equipment Management

  - Mobile Terminal Management

  - CV Equipment Lifecycle Management

CVRIA Team Takeaways/Proposed Actions

- CVRIA Team members left the workshop with a set of options for addressing concerns voiced with the process:
  - Option #1: Re-address the application prioritization using new/modified metrics
    - Concern: This is a large volume of work and it is unclear if alternative metrics are "better" than existing metrics, will provide any new results, or might introduce new biases into the results.
  - Option #2: Refocus analysis on core exchanges
    - Concern: These core exchanges do not necessarily enable some of the key day-one applications that deliver day-one benefits.
  - Option #3: Hybrid approach

- Going forward, CVRIA Team has developed a hybrid approach
  - Team will use current process as baseline (which reflects the workshop's overall feedback that is offers a viable place to start). Team will engage with additional stakeholders to understand whether more input changes the nature of the results (will do a sensitivity analysis).
  - Team will provide a specific focus on core exchanges in the analysis

Proposed Actions

- With regard to discussion points on scope:
  - Team will manually scrub applications to identify obvious outliers and only include applications that have a CV component
  - Team will perform a sensitivity analysis on prioritization and examine the impact of deleting the "complexity metric"
  - Team will also identify applications directly related to Pilot projects (near-term) and will identify those with known, significant standards gaps
  - Team will identify the most frequently used exchanges (in all of CVRIA) to see if any of these are not addressed and if adding them will help complete other applications (i.e., low hanging fruit)
  - Team will clearly define each prioritization metric
  - Team will group high priority exchanges into "core exchange" bins as appropriate allowing standards groups to avoid "atomization" of messages

Timeline

- October 2014:
  - Perform actions as part of completing analysis
  - Map standards needs/gaps to existing standards
- December 2014:
  - Finalize analysis
- March 2015:
  - Develop report
  - Internal USDOT vetting of report
  - Develop materials in support of stakeholder review/engagement
- Early 2015:
  - Next public workshop

> Note the parallel effort during this time to update the Architecture to produce CVRIA Version 2.0 with new inputs + security exchanges. The CVRIA team will note potential impacts of these Phase 2 revisions.