

## V2I Deployment Coalition Spring 2016 Meeting – TWG 4 Breakout Session Minutes

April 20, 2016 – Detroit, MI

### Actions

1. Faisal Saleem: Work with Steve Lockwood and USDOT to arrange follow-up discussion between TWG 4 and USDOT regarding Deployment Guidance comments. *It was suggested that this discussion take place during the October or November meetings for TWG 4. The action will remain open until USDOT identifies a publication date for the Deployment Guidance.*
2. Faisal Saleem/Ginny Crowson: Following approval by TWG chairs and co-chairs, submit summaries of Issue 6: V2I Outreach and Issue 11: V2I Consumer Messaging to USDOT. *Summaries will be submitted with Tech Memo 4 for the full V2I DC.*
3. Faisal Saleem/Navin Katta/Ginny Crowson: Discuss how TWG 4 can best review and comment on products that will be issued to support V2I Deployment Guidance.
4. All: Review con ops excerpts for four priority apps and provide feedback on potential questions for pre-deployment guidance to Jonathan Walker by April 30.

### Attendance

|                                |                            |  |
|--------------------------------|----------------------------|--|
| 1. Faisal Saleem (Chair)       | Maricopa Co., AZ           | <a href="mailto:faisalsaleem@mail.maricopa.gov">faisalsaleem@mail.maricopa.gov</a>           |
| 2. Navin Katta (Co-Chair)      | Savari Inc.                | <a href="mailto:navin@savarinetworks.com">navin@savarinetworks.com</a>                       |
| 3. Gary Piotrowicz             | RCOC                       | <a href="mailto:gpiotrowicz@rcoc.org">gpiotrowicz@rcoc.org</a>                               |
| 4. Emil Wolanin                | Montgomery Co., MD         | <a href="mailto:emil.wolanin@montgomerycountymd.gov">emil.wolanin@montgomerycountymd.gov</a> |
| 5. Virginia Lingham            | MTC (Bay Area)             | <a href="mailto:vlingham@mtc.ca.gov">vlingham@mtc.ca.gov</a>                                 |
| 6. Jonathan Walker             | USDOT                      | <a href="mailto:jonathan.b.walker@dot.gov">jonathan.b.walker@dot.gov</a>                     |
| 7. Shel Leader                 | Private Consultant-Telecom | <a href="mailto:shel@sleader.com">shel@sleader.com</a>                                       |
| 8. Naveen Lamba                | Grant Thornton             | <a href="mailto:naveen.lamba@us.gt.com">naveen.lamba@us.gt.com</a>                           |
| 9. Martha Morecock Eddy        | Timmons Group              | <a href="mailto:martha.eddy@timmons.com">martha.eddy@timmons.com</a>                         |
| 10. Mohammed Hadi              | Florida Intl University    | <a href="mailto:hadim@fiu.edu">hadim@fiu.edu</a>   |
| 11. Robert Taylor              | PA Turnpike Commission     | <a href="mailto:robtaylo@paturndpike.com">robtaylo@paturndpike.com</a>                       |
| 12. George Webb                | Palm Beach Co., FL         | <a href="mailto:gwebb@pbcgov.org">gwebb@pbcgov.org</a>                                       |
| 13. Cliff Heise                | Iteris                     | <a href="mailto:cdh@iteris.com">cdh@iteris.com</a>   |
| 14. Scott Shogan               | PB                         | <a href="mailto:shogan@pbworld.com">shogan@pbworld.com</a>                                   |
| 15. Chris Stanley              | Iteris                     | <a href="mailto:stanley@battelle.org">stanley@battelle.org</a>                               |
| 16. Jim Katsafanas             | Michael Baker              | <a href="mailto:jkatsafanas@mbakerintl.com">jkatsafanas@mbakerintl.com</a>                   |
| 17. Kyle Garrett               | Synesis Partners           | <a href="mailto:kyle.garrett@synesis-partners.com">kyle.garrett@synesis-partners.com</a>     |
| 18. Ginny Crowson<br>(Liaison) | Athey Creek Consultants    | <a href="mailto:crowson@acconsultants.org">crowson@acconsultants.org</a>                     |

## Welcome and Introductions

Faisal Saleem welcomed members to the second in-person meeting for TWG 4. He reviewed the agenda for the full-day breakout session, noting that the originally planned V2I Deployment Guidance discussion will instead focus on an overview of two guidance support products. Faisal also noted that TWG 2 would be joining the afternoon discussions regarding Issues 7 and USDOT outreach.

## Introduce V2I Deployment Guidance Products (Issue 6: V2I Outreach)

Jonathan Walker explained that the V2I Deployment Guidance is still under review and the release date is still uncertain. He added that there are concerns about references in the Guidance to the V2V rulemaking from NHTSA. There is concern that references to the mandatory nature of the V2V rulemaking could be confusing in contrast to the voluntary nature of V2I deployment covered by the Guidance.

Jonathan reminded the group that a series of support products will also be released with the Guidance and USDOT would also welcome stakeholder feedback on the products. As such, he introduced two of the products – Connected Vehicles and the Planning Process, and Near Term Transition and Planning.

### *Connected Vehicles and the Planning Process*

The study associated with this product aimed to facilitate consideration of Connected/Autonomous Vehicles (C/AV) in transportation planning processes and products used by agencies. A copy of [Connected Vehicle Impacts on Transportation Planning: Technical Memorandum #3 Analysis of the Need for New and Enhanced Analysis Tools, Techniques and Data](#) from the project was emailed to TWG 4 in advance of meeting. In addition to looking at existing planning products and processes (e.g. sketch planning, models) the study also reviewed education and training, as well as legal compliance issues. The Study identified gaps and proposed a research roadmap for addressing the gaps. The roadmap proposes 19 research topics including, for example, methods and algorithms for modeling macroscopic impacts of C/AV strategies for application to TDM and HCM tools.

Jonathan added that the study referenced the levels of automation described by NHTSA to describe levels of vehicle automation with level 0 focused on driver warning systems and level 4 consisting of fully autonomous operation. USDOT has been focused on levels 0 and 1 but it is starting to identify how to will approach level 4. George Webb noted confusion regarding the term “connected” because OEMs are discussing connected in terms of mobile applications and Wi-Fi vs. agency references to connected in relation to infrastructure. Scott Shogan asked if study explored how planning processes and products could potentially address human behavior impacts resulting from C/AV. Jonathan didn’t believe so. Virginia Lingham noted that MTC routinely asks her for information about C/AV in relation to long-range planning so having current content is critical for them. Jonathan added that there will be several additional tech memos released for this effort. George Webb commented that it would be useful if this effort could provide agencies with guidance to modify content within their own tools such as regional models. He also noted that some agencies are having their assumptions about upcoming projects questioned in terms of what they are hearing in the media about C/AV and its impacts on transportation and land-use decisions.

TWG 4 will need to plan for how best to review products like this one which will ultimately consist of several tech memos. Naveen Lamba also asked how Guidance will be maintained when publication cycles are lengthy and information is constantly changing. Faisal suggested that associations like AASHTO could potentially serve as resources for issuing interim guidance.

### *Near Term Transition and Planning*

There are three tools to the Near Term Transition and Planning:

1. App Prioritization
2. Infrastructure Planning
3. Life-Cycle Cost Model

Jonathan demonstrated the App Prioritization tool showing an example to improve mobility to address highway safety issues. Robert Taylor asked if app assumes that you have tried all other approaches first (e.g. enhanced signing). Shel Leader noted that comparisons between DSRC and cellular need to be handled carefully because there are limitations to both depending on the application.

The Infrastructure Planning tool was reviewed next with an example of restricted lane warnings using cellular. The tool takes basic inputs on funding available and deployment details to generate estimated planning costs and replacement cycles. Jonathan emphasized that content within tool can also be modified by user as needed.

The Life-Cycle Cost Model tool takes information from previous tools and provides additional detail on estimated life-cycle costs.

George Webb asked who USDOT envisions using these tools. Jonathan replied that the tools provide a framework for agency planners and ops staff to begin answering questions about potential C/AV apps that could be used, how much to deploy, how much it might cost, etc. Gary Piotrowicz asked when products will be available. Jonathan said that four of the eight are ready but they are being held until the V2I Deployment Guidance is released. Faisal Saleem asked if and how USDOT would like input from TWG 4 on the Guidance products. Jonathan replied that he would like to get feedback from TWG 4 as the group continues.

### *Review V2I Deployment Guidance Products*

Jonathan explained that warrants (later renamed planning guidance) were originally developed for several ITS applications by the ENTERPRISE pooled fund program. USDOT asked ENTERPRISE to develop similar pre-deployment planning guidance for CV apps. Guidance was developed for two CV apps – Reduced Speed Zone Warning and Advanced Traveler Information Systems. Jonathan briefly reviewed the Reduced Speed Zone Warning example noting the two levels of questioning to help users first determine the need for installation and then the supporting system requirements and other considerations. Jonathan then noted the con ops excerpts for the four priority apps identified by the V2I DC. He asked the group to individually review the con ops excerpts for each app and provide feedback on the potential questions that could be used for future pre-deployment guidance. Individual feedback may be shared directly with Jonathan by April 30 and TWG 4 will further discuss this topic as a group at future meetings. It was also suggested that TWG 4 could serve as an input point when additional pre-deployment guidance is further developed. Gary Piotrowicz noted that ITE also has an outreach task force that may be able to offer feedback the new Guidance products.

### *Discuss Issue 7: Understanding the Benefits and Costs of V2I Deployment*

Navin Katta, Savari, opened this session with an overview of how the V2I DC defined Issue 7: Understanding the Benefits and Costs of V2I Deployment:

“The potential benefits of V2I applications have been researched and identified through a number of deployment initiatives. Benefits include increased safety, improved mobility, and cost savings to transportation agencies. As transportation agencies begin to plan for long-term sustained deployment of V2I applications, it is inevitable that the need will arise for a business model to emerge and facilitate decision-making. Analyses of the benefits and costs and prioritization of specific applications are just some of the discussions that would fold into an eventual business model. Each transportation agency will face the challenge of prioritizing V2I application deployments and weighing the benefits to the costs. If no additional funding sources are available, V2I application deployments may compete with other infrastructure deployments and operations. **This issue will review how agencies can assess benefits and costs** to prioritize V2I applications and accelerate deployment in accordance with a business plan.”

Navin then reviewed what each TWG has or is planning to contribute to issue 7, highlighting the contributions from TWG 2 and TWG 4 to set the stage for the meeting’s discussion. Navin then explained in more detail the work that has been completed by TWG 1 and TWG 3. TWG 1 hosted two webinars in November and December featuring two new benefit/cost analysis resources.

1. Desk Reference Tools for Estimating Local, Regional and Statewide Economic Development Benefits of CV Infrastructure (benefit tool)
2. Near Term V2I Transition and Planning: Life Cycle Cost Model (cost tool)

The benefit tool is a desk reference and analysis tool that supports sketch planning level analysis, similar to the TOPS-BC tool. The tool has been developed as an Excel workbook and although it focused on benefits only, there are links to the cost tool. The apps featured in the benefits tool are taken directly from the CVRIA and benefits are estimated from theoretical to steady state based on assumed deployment maturity. The benefit content is all based on available research which is included in a flat file database to allow continued additions of benefit information. The group identified the following details associated with the benefit tool that should be considered during review of the V2I Deployment Guidance:

- How to modify content in tool?
- How to continue identifying additional benefit info that can be added to tool?
- How to use tool framework to calculate benefits in absence of relevant content?
- How to factor benefits into business planning?
- Is there a Federal plan for maintaining content?

Faisal Saleem reiterated earlier idea to explore if and how associations like AASHTO could maintain content for tools that support the V2I Deployment Guidance. Navin emphasized that the products are closely tied to the Guidance and both will need to be reviewed and commented on by V2I DC.

The group then reviewed benefit related details, many of which were noted as the benefit tool was developed, that could be further addressed by research for TWG 2:

- Identifying benefits when so little is still known due to limited deployment – especially quantifiable benefits
- Aggregating benefits of multiple apps
- Distributing benefits to users – multiple users, conflicting user benefits
- Timing recognizing benefits near vs. long-term

- User and economic benefits identified but economic development benefits unclear

Rob Bertini mentioned flat files have been used to establish crash modification factors to allow for changes as new information becomes available but the data may not always be statistically valid. TWG 2 should determine if and to what extent the CV pilots have been required to evaluate their deployments to produce statistically valid information about benefits. Ray Derr asked if tools considered ranges vs. absolute values. Kyle Garrett acknowledged that they did for some mobility apps but there still isn't a lot of information available. When no information was available, the contractor team did not try to create estimates or speculate on benefits. Jonathan Walker also noted that USDOT strives to connect tool content to statistically valid data and references to ensure consistency.

Navin briefly reviewed the cost tool as it was already presented by Jonathan Walker earlier in the meeting. The tool estimates all costs associated with installation, maintenance, customization and operation. Costs are estimated over a 20-year period and provided in annual and aggregate set of individual component costs. The cost tool works with the benefit tool and the App Prioritization Tool. Similar to the benefit tool, content is based on available research and may be revised. Costs are available for approximately 70 apps.

The group discussed cost related details that should be considered during review of V2I Deployment Guidance:

- Are four priority apps identified by V2I DC (intersections, queue warning, work zone management and curve warning) included?
- Similar issues noted for benefit tool (e.g. modify tool content in tool, identifying additional cost info, factoring costs in business planning, Federal plan to maintain)

As for cost related details that could be further addressed by research and TWG 2, the group noted the challenge with identifying accurate costs when so little is still known due to limited deployment. Rob Bertini also shared that Florida International University has customized a version of USDOT benefit/cost tool for Florida, and Mohammed Hadi explained that costs were adjusted based on Florida's use of the tool and that information was fed back to USDOT based on their experience.

Navin next explained that TWG 3 has been talking with owners, operators and OEMs to understand how they value V2I apps in relation to benefit/cost analysis. The draft summary of TWG 3's work to-date covers Reduced Speed Zone Warning and Red Light Violation Warning. General concepts for both apps are presented and known benefits are noted. Known benefits are primarily related to safety and it is acknowledged that there may be additional mobility and environmental benefits. Benefits for the Reduced Speed Zone Warning are primarily based on RESCUME INC-ZONE modeling and simulation results, while benefits for the Red Light Violation Warning reference various NHTSA studies, the Footprint Analysis and a Wisconsin intersection crash study. Known costs are also highlighted for infrastructure and vehicles. TWG 3 is expected to finalize their summary in the coming months.

### [Conduct V2I Deployment Focus Group \(Issue 6: V2I Outreach\)](#)

Iteris and Global-5 Communications, under contract to USDOT, conducted a focus group session with TWG 2 and TWG 4 to gather input on the outreach plan being developed for USDOT regarding V2I deployment. Similar focus groups were also conducted in conjunction with the CAMP demos. Group feedback was requested on a variety of topics related to the outreach plan, including:

- V2I deployment steps (e.g. KTT, long-range planning, project planning, etc.)

- Audiences (e.g. USDOT partners, industry, elected officials, public agencies, etc.)
- Proposed mechanisms for outreach (e.g. website, weekly/monthly news, webinars, etc.)
- Products to support outreach (e.g. presentations, photos, images, videos, etc.)
- Outreach products for media relations (e.g. news releases, editorial calendars, new conferences, etc.)
- Outreach strategies (e.g. branding, identity, special events, etc.)
- Outreach performance measures (e.g. number of funding requests, website tracking, etc.)

Feedback will be used by Iteris and Global-5 Communications as they complete the outreach plan. TWG 4 will continue to receive updates on the outreach plan and activities executed in relation to the plan through Karen Timpone at USDOT.

### Review Remaining and Potential Future Work

Faisal Saleem reviewed the TWG 4 work plan to highlight work that has been completed, work that is underway and work that will begin in the next several weeks. Reviewing the V2I Deployment Guidance is a major necessity for TWG 4 to complete the activities originally identified in the work plan. Faisal reminded the group that USDOT was unable to address several original comments on the previous version of the Guidance because of where things were at in the publication process. These comments, in addition to the details that TWG 4 has noted about other issues, will all need to be reviewed when the new Guidance is issued.

Naveen Lamba noted that USDOT may continue to be limited in what they publish and how quickly they can release new versions of the Guidance. Emil Wolanin added that also need to be aware that the Guidance will be in a continuous state of revision due to the rapidly changing nature of the content. Faisal asked if reviews should be done in smaller groups. Virginia Lingham replied that smaller groups might be needed simply because of how much will need to be reviewed but it wouldn't be preferred. Faisal, Navin and Ginny will further discuss the review process with Jonathan to clarify how TWG 4 should review and comment on Guidance and products once they are available.

For potential future work, the following ideas were noted:

- Combine reviews of new Guidance products with outreach effort to share information with other V2I DC TWGs
- Consider surveying agencies that did not receive deployment funding to determine which are proceeding with deployments anyway
- Periodically review consumer messaging to see if and how it is changing
- Review and support outreach to V2I DC on Guidance products, including:
  - Systems Engineering Guide
  - Connected Vehicles and the Planning Process
  - Guide to Licensing
  - V2I Message Lexicon
  - Pre-Deployment Guidance for V2I Safety Applications
  - Estimating Benefits and Economic Impacts
  - Near Term Transition and Phasing
  - Connected Vehicle Training Resources

- Develop further guidance for four priority applications if needed after review of new V2I Deployment Guidance
- Identify varying operating philosophies for V2I among state and local transportation agencies
- Develop standards for maintaining roadside infrastructure
- Identify lessons learned from key deployments such as CV Pilots and Smart Cities

These ideas will be shared with the V2I DC Executive Committee and with further discussed once USDOT feedback is received on the V2I DC business plan.

#### Next Steps for TWG 4

Additional meeting notices have been sent by Ginny Crowson for the following dates and topics will be determined as the meeting dates approach.

- May 18, 11:00-12:30 (Eastern)
- June 8, 11:00-12:30 (Eastern)

## TWG 4 Work Plan Summary and Status

| <b>V2I Deployment Issues</b>   | <b>Anticipated TWG 4 Actions</b>   | <b>Anticipated Completion Date</b>   |
|--|--|--------------------------------------|
| <b>Issue 1: V2X Applications</b>                                       | <ul style="list-style-type: none"> <li>Identify relevant content from this issue that should be included in the overall outreach in Issue 6 based on TWG 3 findings.</li> </ul>  | <b>Q1-2016 Underway</b>              |
| <b>Issue 2: Complementary Communications to DSRC</b>                   | <i>No action planned</i>   |                                      |
| <b>Issue 3: V2I Data</b>   | <i>No action planned</i>   |                                      |
| <b>Issue 4: Patents-Intellectual Property</b>                          | <i>No action planned</i>   |                                      |
| <b>Issue 5: Security</b>   | <i>No action planned</i>   |                                      |
| <b>Issue 6: V2I Outreach</b>   | <ul style="list-style-type: none"> <li>Provide input to USDOT on V14 of Deployment Guidance.</li> </ul>  | <b>6-29-2015 Completed</b>           |
|  | <ul style="list-style-type: none"> <li>Identify outreach that may be needed to increase awareness and support of V2I among transportation agencies.</li> </ul>   | <b>Q3-2015 Completed and Q2-2016</b> |
|  | <ul style="list-style-type: none"> <li>Provide input to USDOT on additional content for next version of Deployment Guidance.</li> </ul>  | <b>Q4-2015</b>                       |
| <b>Issue 7: Understanding the Benefits and Costs of V2I Deployment</b> | <ul style="list-style-type: none"> <li>Identify relevant content related to calculating the benefits and costs of V2I applications based on work by TWG 1 that should be included in overall outreach in Issue 6.</li> </ul> | <b>Q2-2016</b>                       |
| <b>Issue 8: V2I Standards</b>  | <i>No action planned</i>   |                                      |
| <b>Issue 9: Understanding V2I Liability Assignment</b>                 | <ul style="list-style-type: none"> <li>Identify relevant content related to V2I liability assignment that should be included in overall outreach in Issue 6 based on TWG 2 findings.</li> </ul>                              | <b>Q2-2016</b>                       |
| <b>Issue 10: V2I Synergies with Other Emerging Technologies</b>        | <i>No action planned</i>   |                                      |
| <b>Issue 11: V2I Consumer Messaging</b>                                | <ul style="list-style-type: none"> <li>Develop a description of the type of content and guidelines that are needed to be developed to enable consistent, accurate consumer messaging related to V2I applications.</li> </ul> | <b>Q4-2015 Completed</b>             |
| <b>Issue 12: V2I Multimodal Applications</b>                           | <i>No action planned</i>   |                                      |
| <b>Issue 13: Infrastructure Processes as V2I Obstacles</b>             | <ul style="list-style-type: none"> <li>Identify relevant content related to infrastructure processes based on work completed by TWG 1 and TWG 3 that should be included in overall outreach in Issue 6.</li> </ul>           | <b>Q1-2016 Underway</b>              |
| <b>Issue 14: Federal V2I Policy Statement</b>                          | <ul style="list-style-type: none"> <li>Identify relevant content related to a Federal V2I policy statement based on work done by TWG 1 that should be included in feedback on the V2I Guidance documents.</li> </ul>         | <b>Q4-2015 Underway</b>              |
| <b>Issue 15: Maintaining V2I Infrastructure</b>                        | <i>No action planned</i>   |                                      |