Connected Intersections: Solicitation for Letters of Interest

This is a solicitation of interest to public agencies (Agency) with deployed Connected Intersection (CI) test sites to participate or offer deployment guidance in validating and verifying the needs, requirements, and design specified in the CI Implementation Guide. Testing guidance and a test framework are also included in the CI Implementation Guide. Please note that aside from CI Implementation Guide assistance by the CI Committee, the Agency volunteering to participate as a CI test site is fully responsible for all resources required to prepare, implement, operate and maintain its CI infrastructure.

The objectives of this validation and verification phase of the CI Implementation Guide are to:

- Verify that the requirements and the design details in the CI Implementation Guide for broadcasting the SAE J2735 Signal Phase and Timing (SPaT) message, MAP message and RTCM message are unambiguous and complete for action by a Red-Light Violation Warning application installed on a vehicle.
- Document CI test site readiness and lessons learned regarding the Agency’s experience in the design, implementation, operation and maintenance of its CI infrastructure.
- If the Agency’s test site is not yet CI-ready per CI Implementation Guide, document the expected date of readiness and the technical and institutional challenges/lessons learned in preparing for CI deployment as follows:
  - As applies to the vehicle side of the RSU [meaning the "red arrow" which is the scope of the project, and not including the RSU itself]
  - As applies to the infrastructure side, including the pathways between a traffic controller to and including the RSU.

Background

The United States Department of Transportation (USDOT) ITS Joint Program Office (JPO) is sponsoring the development and publication of a Connected Intersection (CI) Implementation Guide that defines the key capabilities and interfaces that a connected signalized intersection must support to ensure nationwide interoperability with production vehicles for state and local infrastructure owner/operators (IOO). A connected signalized intersection is defined as an infrastructure system that broadcasts signal, phase and timing (SPaT), mapping information and position correction data to vehicles approaching the intersection. The CI Implementation Guide has employed a systems engineering process, referencing design elements from existing standards, and solidifying design content that crosses multiple standards development organizations (SDO). The result is harmonization of standards activities, some with a focus that is vehicle-centric together with other standards that have an infrastructure perspective. Project
progress and updates can be found here: https://www.ite.org/technical-resources/standards/connected-intersections/.

The project completed the requirements development phase in January 2021 and has progressed to the design phase, which is scheduled to be completed in April 2021. It is during the design phase that organizations selected to be validation sites will be brought on board to participate in the project. The period of performance for the development of the CI Implementation Guide ends mid-September 2021.

The associations actively participating in this effort are American Association of State Highway Transportation Officials (AASHTO), the Institute of Transportation Engineers (ITE), National Electrical Manufacturers Associations (NEMA), and SAE International.

Scope of Work

The CI Committee is planning to begin the validation and verification phase by early April 2021 and completed by end of June 2021. The scope of the work for each participating test site is as follows:

- **Needs and Requirements.** Implement and fulfill the mandatory user needs and requirements identified in the Needs to Requirements Matrix (NRTM) of the CI Implementation Guide for the SPaT, MAP, and RTCM correction Messages as defined in SAE J2735 (2016 or later).

- **Infrastructure-side Hardware/Software.** Make the necessary changes to the test site's software and hardware, including: traffic signal controllers, cabinets, and roadside units so the unit is conformant with corresponding portions of the CI Implementation Guide as mutually agreed upon prior to the validation and verification phase. That is, the CI Committee does not expect the software to be completely conformant with all the guidelines of the CI Implementation Guide at this time due to time constraints. No changes are expected at this time to any On-Board Units (OBUs) or Mobile Units (MUs).

- **Security Policies.** Update the test site's security policies so they are conformant with the guidelines in the CI Implementation Guide, as mutually agreed upon prior to the validation and verification phase. That is, the CI Committee does not expect the security for a CI to be completely conformant with all the guidelines of the CI Implementation Guide at this time due to time constraints. It is expected that the transmitted messages are digitally signed with appropriate security certificate as per the security policy.

- **Support Meetings.** The Agency will be asked to participate in the following meetings: a "kickoff" meeting (planned for the week of February 22), bi-weekly status meetings, and a close-out meeting to discuss findings. The Agency is also expected to participate in the design walkthrough meetings, tentatively scheduled the week of March 8, 2021.

- **Conduct tests.** CI-ready sites will conduct a series of tests that will be specified during the project’s design phase in cooperation with test site representatives. The test site will log data in a format conformant with SAE J2735 using JSON encoding rules. The CI Committee will assess the collected data for conformance as per the CI Implementation guide. If the Agency's supplied data are not conformant with the J2735 standard, the CI Committee will contact the Agency to recommend ways to improve data conformance.

- **Final Report.** Provide a written report (A sample report template will be provided at a later date) with the following sections:
A description of the initial setup of the test site (prior to the validation and verification phase). The description should include a list of the hardware used, the roadway geometry of the test site, the data elements of the V2I messages broadcasted.

A description of the changes made to the test site.

Comments and suggestions for improvements on the draft CI Implementation Guide.

Identify ambiguities and potential gaps for each user need and requirements in the CI Implementation Guide that was tested by the test site along with any recommendations.

Submit the final report to the CI Committee by end of July 2021.

The CI Committee may use multiple sites for its validation and verification phase, with each test site performing different aspects of the CI Implementation Guide to provide a complete picture, given the anticipated timeline. The CI Committee will negotiate which aspects to deploy based on each test site's current implementation (such as what communications technologies, what vendors are being used, capabilities to deploy (what mandatory optional data elements and messages are supported), security policies (e.g., participation with a SCMS provider), and ability to meet the schedule.

**Letters of Interest**

A letter of interest, on Agency letterhead and no more than two pages, shall be sent to the CI Committee at Standards@ite.org, with the subject line/Attention to: Connected Signalized Intersection Testing, along with a completed Field Test Site Request Form, which is attached with this solicitation letter, by **February 5, 2021**.

The purpose of the Field Test Site Request Form is to help the CI Committee understand the capabilities of the proposed test site. The CI Committee is interested in multiple test sites to validate and verify the CI Implementation Guide under different conditions and environments, and with different test tools. The Field Test Site Ranking Form is for information only.

A one-hour web conference is scheduled sometime between January 26-28, 2021 to review the request for letters of interest and to answer any questions. The link to the web conference will be posted at https://www.ite.org/technical-resources/standards/connected-intersections/.

All questions, including questions about the completing the Field Test Site Request Form, should be sent to Standards@ite.org.

Thank you.

Sincerely yours,

Roy Goudy, Nissan

John Thai, City of Anaheim

Co-chairs, Connected Intersections Committee
### Task Description:
Agency Request & Interest in offering testing site & participation in verifying initial V2X Connected Intersection Implementation Guidelines as part of USDOT's 2021 industry deliverable task.

### Agency:
<table>
<thead>
<tr>
<th>Name: [Insert]</th>
<th>POC: [Insert Name]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location: [Address]</td>
<td>POC Info: [Phone, Email]</td>
</tr>
</tbody>
</table>

### Agency Participating as:
- [ ] Involved Testing Partner
- [ ] In-kind Contributor
- [ ] Testing Observer Guideline Reviewer
- [ ] Other:

### Agency CI Offering:
- [ ] Involved Testing Partner
- [ ] In-kind Contributor
- [ ] Testing Observer Guideline Reviewer
- [ ] Other:

### Site includes:
- [ ] Bench (Testing Cabinet/Setup)
- [ ] Live Intersection (3 Min /4 Desired Lanes)
- [ ] Private Intersection
- [ ] Vehicles (OBU) & Drivers
- [ ] Field / Maintenance Support Staff
- [ ] Technical Support Staff
- [ ] Other: ____________________________________________

### Previous CI/CV/CITS Experience:
- [ ] Other:

### Existing Testing Tools / Components:
- [ ] RSUs / OBUs, Manufacturer:
- [ ] RF/GNSS:
- [ ] Data Acquisition / Decoding:
- [ ] Time / Location Measurements:

### Resources / Capabilities In-place:
- [ ] March 2021
- [ ] April 2021 (Desired)
- [ ] May 2021
- [ ] Later 2021: __________________________

### Additional Comments:

### V2X Communications:
- [ ] Stds Compliant: □ 4.1 (min) □ ITE 1.0 □ TS10
- [ ] Antennas: □ Integrated □ Detached
- [ ] Radio Technology: □ DSRC □ CV2X (LTE‐PCS)
- [ ] Decodable Data Files: □ TX/RX PCAPs □ JSON (Required)
- [ ] Industry Certified (Release [##])
- [ ] Location Source: □ RTCM □ GPS / GNSS
- [ ] Manufacturer(s):
- [ ] Other: ____________________________

### RSU Capabilities:
- [ ] Vehicle: □ Integrated/Can □ Adapted
- [ ] Roof Magnet Mount Antennas & Cabling
- [ ] Radio Technology: □ DSRC □ CV2X (LTE‐PCS)
- [ ] Decodable Data Files: □ TX/RX PCAPs □ JSON
- [ ] Other: ____________________________

### OBU Capabilities:
- [ ] Vehicle Technology: □ Integrated/Can □ Adapted
- [ ] Roof Magnet Mount Antennas & Cabling
- [ ] Radio Technology: □ DSRC □ CV2X (LTE‐PCS)
- [ ] Decodable Data Files: □ TX/RX PCAPs □ JSON
- [ ] Other: ____________________________

### V2X Messages/Applications:
- [ ] Stds Compliant (J2735): □ 2016 (Min) □ 2020
- [ ] Red Light Warning Violation Alert Application
- [ ] Signed Messages (security enabled)
- [ ] Manufacturer(s):
- [ ] Other: ____________________________

### Security & SCMS Capabilities:
- [ ] Common Root □ Certificate Top-off □ LCCF (Desired) □ New PSID(s) Needed

### Other Comments:

### Infrastructure:

#### Intersection Topography:
- [ ] Corridor: □ Urban □ Rural
- [ ] Quantity (one min.): [##]
- [ ] Lanes: □ 3 □ 4 □ ≥5

#### Lane Configuration:
- [ ] Conventional □ Unconventional □ Storage
- [ ] Width: □ Standard (10’) □ Other [##]
- [ ] Path: □ Left Only □ [##] Straight Only □ Shared / Allowed Maneuver □ Right Only

#### Lane Markings:
- [ ] Edge Quality: □ Yes □ Lines □ Markers □ Reflective

#### Intersection MAP:
- [ ] Data Source: □ Survey □ Lidar □ Internet
- [ ] Data Feedback Rate: [##] seconds
- [ ] Accuracy: [##] cm

#### Traffic Signal Light:
- [ ] Light Orientation: □ Vertical □ Horizontal
- [ ] Location: □ Center □ Lane □ Edge
- [ ] Light Type: □ LED □ Halogen
- [ ] Signal Operations: □ Pre-timed □ Actuated
- [ ] Manufacturer(s):

#### Traffic Controller:
- [ ] Type (ATC min.): [##]
- [ ] NEMA Stds Compliant: □ 1202v3 □ TSCBM
- [ ] Location: [##] RSUs(s) per Intersection
- [ ] Time / Location Measurements:

#### Message Generation & Signing:
- [ ] V2X HUB □ ATC □ Custom □ [##]
- [ ] Signing: □ Traffic Control Center □ ATC □ RSU

#### Monitoring System:
- [ ] Data Feedback Rate: [##] seconds
- [ ] Centralized Data Access: [Yes/No]
- [ ] Attribute Alerts: [Yes/No]
- [ ] Testing Access Available: [Yes/No]
### Field Test Site Request Form

**Date:** 11/06/2021

**Network:**

<table>
<thead>
<tr>
<th>Addressing:</th>
<th>□ IPv4</th>
<th>□ IPv6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interfacing:</td>
<td>□ SMIPv3</td>
<td>□ 1218</td>
</tr>
</tbody>
</table>

| Backhaul: | □ Wired (ethernet)  | □ Wireless |
| Timing Programs: | □ Peak, □ Off Peak |

**Additional Comments:**

**Testing Tools Available at Site:**

| Back Office to Traffic Controller: | □ Light Status Board |
| Traffic Controller to Traffic Signal: | □ V2X Hub □ V2X Generator/TCI |
| Traffic Controller to RSU: | □ Sniffer: □ OBU Radio Proxy & Logging |
| Message Generation & Signing: | □ Message Decoding (JSON Data Output): □ OBU Radio Proxy & Logging |
| Over-The-Air V2X (RSU to OBU): | □ Camera / Video of intersection(s) □ Traffic Cabinet Internet Access |
| Intersection Viewing: | □ Network Access (through Firewall)/Software □ Video / Data Recording |
| Monitoring & Data Analysis: | □ Centralize Capturing w/Coordinated Time Source □ Lane Positioning SW |

**Intersection View:**

**Network:**

| Over‐The‐Air V2X (RSU to OBU): |

**Testing Task Force (Roebuck)**

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Connected Intersection Field Test Site Ranking Form

Agency Request & Interest in offering testing site & participation in verifying initial V2X Connected Intersection Implementation Guidelines as part of USDOT’s 2021 industry deliverable task.

<table>
<thead>
<tr>
<th>Agency Participating:</th>
<th>5 5 2.5</th>
<th>□ Involved Testing Partner</th>
<th>□ In-kind Contributor</th>
<th>Other:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>□ Testing Observer Guideline Reviewer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agency CI Offering:</td>
<td>7 5 3.5</td>
<td>□ Pilot Testing (e.g. DSRC / CV2X)</td>
<td>□ Security Enabled</td>
<td>□ Deployment Intersections</td>
</tr>
<tr>
<td>Previous CI/CV/CITS Experience:</td>
<td>10 5 5</td>
<td>□ Evaluation/Development Project(s) to Leverage</td>
<td>□ FCC Experimental / Site License #</td>
<td></td>
</tr>
<tr>
<td>Existing Testing Tools / Components:</td>
<td>3 5 1.5</td>
<td>□ RSUs / OBU, Manufacturer:</td>
<td>BF/GNSS</td>
<td></td>
</tr>
</tbody>
</table>

Resources / Capabilities In-place: 5 5 2.5

V2X Communications:

RSU Capabilities: 10 5 5

OBU/Receive Capabilities: 5 5 2.5

V2X Messages/Applications: 7 5 3.5

Security & SCMS Capabilities: 5 5 2.5

Infrastructure:

Intersection Topography:

Lane Configuration:

Lane Markings:

Intersection MAP:

Traffic Signal Light:

Traffic Controller:

Message Generation & Signing:

Monitoring System:

Data Source: □ Survey □ Lidar □ Internet

Radio Technology: □ DSR □ CV2X (LTE-PCC)

Light Orientation: □ Vertical □ Horizontal

Light Type: □ LED □ Halogen

NEMA Stds Compliant: □ 1202v3 □ TSCBM □ 1217 □ 1218 □ Other _______

Radio Technology: □ DSRC □ CV2X (LTE-PCC)

Light Type: □ LED □ Halogen

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