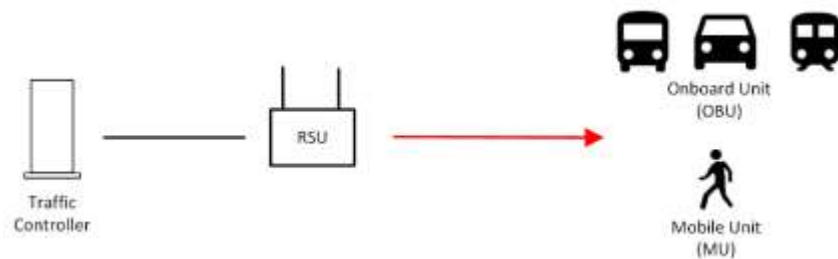


Connected Intersections: Solicitation for Letters of Interest

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:	Name: [Insert] Location: [Address]	POC: [Insert Name] POC Info: [Phone#, Email]
Agency Participating as:	<input type="checkbox"/> Involved Testing Partner <input type="checkbox"/> Testing Observer Guideline Reviewer	<input type="checkbox"/> In-kind Contributor <input type="checkbox"/> Other: _____
Agency CI Offering:	Site includes: <input type="checkbox"/> Bench (Testing Cabinet/Setup) <input type="checkbox"/> Private Intersection <input type="checkbox"/> Field / Maintenance Support Staff <input type="checkbox"/> Other: _____	<input type="checkbox"/> Live Intersection (3 Min /4 Desired Lanes) <input type="checkbox"/> Vehicles (OBU) & Drivers <input type="checkbox"/> Technical Support Staff
Previous CI/CV/CITS Experience:	<input type="checkbox"/> Pilot Testing (<input type="checkbox"/> DSRC / <input type="checkbox"/> CV2X) <input type="checkbox"/> Security Enabled <input type="checkbox"/> Evaluation/Development Project(s) to Leverage	<input type="checkbox"/> Deployment Intersections _____ <input type="checkbox"/> FCC Experimental / Site License In-place #: _____
Existing Testing Tools / Components:	[##] RSUs / [##] OBUs, Manufacturer: _____ Data Acquisition / Decoding: _____	RF/GNSS: _____ Time / Location Measurements: _____
Resources / Capabilities In-place:	<input type="checkbox"/> March 2021 <input type="checkbox"/> May 2021	<input type="checkbox"/> April 2021 (Desired) <input type="checkbox"/> Later 2021: _____
Additional Comments:		
V2X Communications:		
RSU Capabilities:	Stds Compliant: <input type="checkbox"/> 4.1 (min) <input type="checkbox"/> ITE 1.0 <input type="checkbox"/> TS10 Radio Technology: <input type="checkbox"/> DSRC <input type="checkbox"/> CV2X (LTE-PC5) <input type="checkbox"/> Industry Certified (Release [##]) Manufacturer(s): _____	Antennas: <input type="checkbox"/> Integrated <input type="checkbox"/> Detached Decodable Data Files : <input type="checkbox"/> TX/RX PCAPs <input type="checkbox"/> JSON (Required) Location Source: <input type="checkbox"/> RTCM <input type="checkbox"/> GPS / GNSS Other: _____
OBU Capabilities:	Vehicle: <input type="checkbox"/> Integrated/CAN <input type="checkbox"/> Adapted Radio Technology: <input type="checkbox"/> DSRC <input type="checkbox"/> CV2X (LTE-PC5) Manufacturer(s): _____	<input type="checkbox"/> Roof Magnet Mount Antennas & Cabling <input type="checkbox"/> Antenna Diversity <input type="checkbox"/> Meets ±1.5m Location Accy <input type="checkbox"/> Industry Certified (Release [##]) Other: _____
V2X Messages/Applications:	Decodable Data Files : <input type="checkbox"/> TX/RX PCAPs <input type="checkbox"/> JSON Stds Compliant (J2735): <input type="checkbox"/> 2016 (Min) <input type="checkbox"/> 2020 <input type="checkbox"/> Red Light Warning Violation Alert Application	Other: _____ <input type="checkbox"/> BSMS <input type="checkbox"/> SPaT <input type="checkbox"/> MAP <input type="checkbox"/> RTCM <input type="checkbox"/> Signed Messages (security enabled)
Security & SCMS Capabilities:	Std: <input type="checkbox"/> CAMP (min) <input type="checkbox"/> IEEE 1609.2.1 (desired) <input type="checkbox"/> Common Root <input type="checkbox"/> Certificate Top-off	SCMS Source: <input type="checkbox"/> Single (min) <input type="checkbox"/> Multiple (desired) <input type="checkbox"/> LCCF (Desired) <input type="checkbox"/> New PSD(s) Needed
Other Comments:		
Infrastructure:		
Intersection Topography:	Corridor: <input type="checkbox"/> Urban <input type="checkbox"/> Rural <input type="checkbox"/> Live <input type="checkbox"/> Private <input type="checkbox"/> Both	Quantity (one min.): [##] Lanes: <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> ≥5
Lane Configuration:	<input type="checkbox"/> Conventional <input type="checkbox"/> Unconventional <input type="checkbox"/> Stored Path: <input type="checkbox"/> Left Only <input type="checkbox"/> [##] Straight Only	Width: <input type="checkbox"/> Standard (10') <input type="checkbox"/> Other [#] <input type="checkbox"/> Shared / Allowed Maneuver <input type="checkbox"/> Right Only
Lane Markings:	Edge Quality: <input type="checkbox"/> Yes <input type="checkbox"/> Lines	<input type="checkbox"/> Markers <input type="checkbox"/> Reflective
Intersection MAP:	Data Source: <input type="checkbox"/> Survey <input type="checkbox"/> Lidar <input type="checkbox"/> Internet Generation Software: _____	<input type="checkbox"/> Computed Lanes Planned Accuracy: [##] cm <input type="checkbox"/> Verified & Authenticated
Traffic Signal Light:	Light Orientation: <input type="checkbox"/> Vertical <input type="checkbox"/> Horizontal Light Type: <input type="checkbox"/> LED <input type="checkbox"/> Halogen	Location: <input type="checkbox"/> Center <input type="checkbox"/> Lane <input type="checkbox"/> Edge [##] RSU(s) per Intersection
Traffic Controller:	Type (ATC min.): Model _____ NEMA Stds Compliant: <input type="checkbox"/> 1202v3 <input type="checkbox"/> TSCBM	Signal Operations: <input type="checkbox"/> Pre-timed <input type="checkbox"/> Actuated <input type="checkbox"/> 1217 <input type="checkbox"/> 1218 <input type="checkbox"/> Other _____
Message Generation & Signing:	<input type="checkbox"/> V2X HUB <input type="checkbox"/> ATC <input type="checkbox"/> Custom _____	Signing: <input type="checkbox"/> Traffic Control Center <input type="checkbox"/> ATC <input type="checkbox"/> RSU
Monitoring System:	Centralized Data Access: [Yes/No] Attribute Alerts: [Yes/No]	Data Feedback Rate: [##] seconds Testing Access Available: [Yes/No]

Network:	Addressing: <input type="checkbox"/> IPv4 <input type="checkbox"/> IPv6 Interfacing: <input type="checkbox"/> SMNPv3 <input type="checkbox"/> 1218	Backhaul: <input type="checkbox"/> Wired (ethernet) <input type="checkbox"/> Wireless Timing Programs: <input type="checkbox"/> Peak, <input type="checkbox"/> Off Peak
Additional Comments:		
Testing Tools Available at Site:		
Back Office to Traffic Controller:		
Traffic Controller to Traffic Signal:		
Traffic Controller to RSU:		
Message Generation & Signing:	<input type="checkbox"/> Light Status Board <input type="checkbox"/> V2X Hub <input type="checkbox"/> V2X Generator/TCI	
Over-The-Air V2X (RSU to OBU):	<input type="checkbox"/> Sniffer: _____ <input type="checkbox"/> Message Decoding (JSON Data Output): _____	<input type="checkbox"/> OBU Radio Proxy & Logging <input type="checkbox"/> Bench/Field Tools _____
Intersection Viewing:	<input type="checkbox"/> Camera / Video of Intersection(s) <input type="checkbox"/> Network Access (through Firewall)/Software	<input type="checkbox"/> Traffic Cabinet Internet Access <input type="checkbox"/> Video / Data Recording
Monitoring & Data Analysis:	<input type="checkbox"/> Centralize Capturing w/Coordinated Time Source	<input type="checkbox"/> Lane Positioning SW

Task Description:	Evaluation Ranking (1 None, 3 Partial, 5 Meets & 10 Exceeds)			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:	Important (1 3 5 7 10)	Given (1 3 5 7 10)	Weighted Total (10)	Name: [Insert] Location: [Address] POC: [Insert Name] POC Info: [Phone#, Email]
Agency Participating as:	5	5	2.5	<input type="checkbox"/> Involved Testing Partner <input type="checkbox"/> In-kind Contributor <input type="checkbox"/> Testing Observer Guideline Reviewer <input type="checkbox"/> Other: _____
Agency CI Offering:	7	5	3.5	Site includes: <input type="checkbox"/> Bench (Testing Cabinet/Setup) <input type="checkbox"/> Live Intersection (3 Min /4 Desired Lanes) <input type="checkbox"/> Private Intersection <input type="checkbox"/> Vehicles (OBU) & Drivers <input type="checkbox"/> Field / Maintenance Support Staff <input type="checkbox"/> Technical Support Staff <input type="checkbox"/> Other: _____
Previous CI/CV/CITS Experience:	10	5	5	<input type="checkbox"/> Pilot Testing (<input type="checkbox"/> DSRC / <input type="checkbox"/> CV2X) <input type="checkbox"/> Security Enabled <input type="checkbox"/> Deployment Intersections <input type="checkbox"/> Evaluation/Development Project(s) to Leverage <input type="checkbox"/> FCC Experimental / Site License In-place #: _____
Existing Testing Tools / Components:	3	5	1.5	[##] RSUs / [##] OBUs, Manufacturer: _____ Data Acquisition / Decoding: _____ RF/GNSS: _____ Time / Location Measurements: _____
Resources / Capabilities In-place:	5	5	2.5	<input type="checkbox"/> March 2021 <input type="checkbox"/> April 2021 (Desired) <input type="checkbox"/> May 2021 <input type="checkbox"/> Later 2021: _____
V2X Communications:				
RSU Capabilities:	10	5	5	Stds Compliant: <input type="checkbox"/> 4.1 (min) <input type="checkbox"/> ITE 1.0 <input type="checkbox"/> TS10 Radio Technology: <input type="checkbox"/> DSRC <input type="checkbox"/> CV2X (LTE-PCS) <input type="checkbox"/> Industry Certified (Release [##]) Location Source: <input type="checkbox"/> RTCM <input type="checkbox"/> GPS / GNSS Manufacturer(s): _____ Other: _____
OBU/Receive Capabilities:	5	5	2.5	Vehicle: <input type="checkbox"/> Integrated/CAN <input type="checkbox"/> Adapted Radio Technology: <input type="checkbox"/> DSRC <input type="checkbox"/> CV2X (LTE-PCS) Manufacturer(s): _____ Other: _____
V2X Messages/Applications:	7	5	3.5	Decodable Data Files : <input type="checkbox"/> TX/RX PCAPS <input type="checkbox"/> JSON Stds Compliant (J2735): <input type="checkbox"/> 2016 (Min) <input type="checkbox"/> 2020 <input type="checkbox"/> Red Light Warning Violation Alert Application <input type="checkbox"/> Meets ±1.5m Location Accy <input type="checkbox"/> Industry Certified (Release [##]) Other: _____
Security & SCMS Capabilities:	5	5	2.5	Std: <input type="checkbox"/> CAMP (min) <input type="checkbox"/> IEEE 1609.2.1 (desired) <input type="checkbox"/> Common Root <input type="checkbox"/> Certificate Top-off SCMS Source: <input type="checkbox"/> Single (min) <input type="checkbox"/> Multiple (desired) <input type="checkbox"/> LCCF (Desired) <input type="checkbox"/> New PSID(s) Needed
Infrastructure:				
Intersection Topography:	5	5	2.5	Cooridor: <input type="checkbox"/> Urban <input type="checkbox"/> Rural <input type="checkbox"/> Live <input type="checkbox"/> Private <input type="checkbox"/> Both Quantity (one min.): [##] Lanes: <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> ≥5
Lane Configuration:	7	5	3.5	<input type="checkbox"/> Conventional <input type="checkbox"/> Unconventional <input type="checkbox"/> Stored Width: <input type="checkbox"/> Standard (10') <input type="checkbox"/> Other [#']
Lane Markings:	1	5	0.5	Path: <input type="checkbox"/> Left Only [##] Straight Only <input type="checkbox"/> Shared / Allowed Maneuver <input type="checkbox"/> Right Only
Intersection MAP:	7	5	3.5	Edge Quality: <input type="checkbox"/> Yes <input type="checkbox"/> Lines <input type="checkbox"/> Markers <input type="checkbox"/> Reflective
Traffic Signal Light:	3	5	1.5	Data Source: <input type="checkbox"/> Survey <input type="checkbox"/> Lidar <input type="checkbox"/> Internet Generation Software: _____ Light Orientation: <input type="checkbox"/> Vertical <input type="checkbox"/> Horizontal RSU Location: <input type="checkbox"/> Center <input type="checkbox"/> Lane <input type="checkbox"/> Edge Light Type: <input type="checkbox"/> LED <input type="checkbox"/> Halogen [##] RSU(s) per Intersection
Traffic Controller:	10	5	5	Type (ATC min.): Model _____ Signal Operations: <input type="checkbox"/> Pre-timed <input type="checkbox"/> Actuated NEMA Stds Compliant: <input type="checkbox"/> 1202v3 <input type="checkbox"/> TSCBM <input type="checkbox"/> 1217 <input type="checkbox"/> 1218 <input type="checkbox"/> Other _____
Message Generation & Signing:	5	5	2.5	<input type="checkbox"/> V2X HUB <input type="checkbox"/> ATC <input type="checkbox"/> Custom _____ Signing: <input type="checkbox"/> Traffic Control Center <input type="checkbox"/> ATC <input type="checkbox"/> RSU
Monitoring System:	3	5	1.5	Centralized Data Access: [Yes/No] Attribute Alerts: [Yes/No] Data Feedback Rate: [##] seconds Testing Access Available: [Yes/No]
Network:	5	5	2.5	Addressing: <input type="checkbox"/> IPv4 <input type="checkbox"/> IPv6 Backhaul: <input type="checkbox"/> Wired (ethernet) <input type="checkbox"/> Wireless Interfacing: <input type="checkbox"/> SMN Pv3 <input type="checkbox"/> 1218 Timing Programs: <input type="checkbox"/> Peak, <input type="checkbox"/> Off Peak
Testing Tools Available at Site				
Back Office to Traffic Controller:	1	5	0.5	<input type="checkbox"/> Light Status Board <input type="checkbox"/> V2X Hub <input type="checkbox"/> V2X Generator/TCI <input type="checkbox"/> Sniffer: _____ <input type="checkbox"/> Message Decoding (JSON Data Output): _____ <input type="checkbox"/> Camera / Video of Intersection(s) <input type="checkbox"/> Network Access (through Firewall)/Software <input type="checkbox"/> Centralize Capturing w/Coordinated Time Source
Traffic Controller to Traffic Signal:	3	5	1.5	
Traffic Controller to RSU:	5	5	2.5	
Message Generation & Signing:	1	5	0.5	
Over-The-Air V2X (RSU to OBU):	5	5	2.5	
Intersection Viewing:	3	5	1.5	
Monitoring & Data Analysis:	1	5	0.5	<input type="checkbox"/> OBU Radio Proxy & Logging Bench/Field Tools _____ <input type="checkbox"/> Traffic Cabinet Internet Access <input type="checkbox"/> Video / Data Recording <input type="checkbox"/> Lane Positioning SW

Ranking by Section	Total Weighted Averages			Percentage Allowation (%)
Participating Agency (30%):	6.0	5.0	3.0	29.2
V2X Communications (30%):	6.8	5.0	3.4	32.8
Infrastructure (30%):	5.1	5.0	2.6	24.8
Testing Tools Available at Site (10%):	2.7	5.0	1.4	13.2
Total:	20.6	20.0	10.3	
Average	5.1	5.0	2.6	