

Enabling Trust and Deployment Through Verified Connected Intersections

Utah DOT SMART Grant Update

CV PFS In-Person Meeting April 30-May 1, 2024

Why Are We Talking About This Today?

- Outreach efforts for IOO feedback and consensus was identified as a priority in the Utah SMART Grant
- *Today's Agenda:*
 - Hear your understanding of CI validation and this project,
 - Introduce this project and what we are trying to accomplish, and
 - Understand your interest in validating CIs as part of a Stage 2 effort

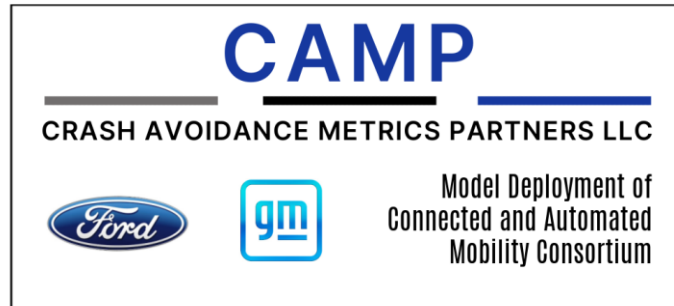
Current Approach for CI Validation

Today we want to confirm the items below as the current baseline

- Technology deployment and development of tools and processes in this effort will be compared to this current, pre-deployment baseline status
1. *CIs nationwide* – No CI deployments meet the full spectrum of requirements outlined in the CTI 4501 (ITE/SAE) effort, and no CI deployments are recognized by OEMs or SCMS Manager as fully validated.
 2. *CI validation processes* – Despite several significant testing activities conducted by the CV PFS and member states, there is still not a complete set of information available to IOOs about what specifically is needed to fully achieve SCMS and OEM trust in their CIs, including what the process consists of, the tools available, and estimated costs to accomplish it.

Grant Overview

- Strengthening Mobility and Revolutionizing Transportation (SMART) Grants Program
- FY2022 award to Utah DOT in July 2023
- Being conducted in partnership with:
 - Crash Avoidance Metrics Partners (CAMP), LLC
 - Security Credential Management System (SCMS) Manager, LLC



UDOT SMART Grant - Project Objectives

1. Complete a successful reference implementation corridor.
2. Develop a process for OEMs to trust CIs to have accurate, consistent, reliable, secure messages.
3. Establish ongoing collaboration between IOOs, OEMs, and Security Credential Management System (SCMS) Manager.
4. Conduct targeted outreach and work with other deploying IOOs.
5. Make test tools, procedures, and validation processes publicly available and/or refer to reports and deliverables published by established standards bodies, such as SAE, and other organizations.

Project Location - UDOT Corridors

- SR-224 near Park City (a rural community) with Intelight controllers and Kapsch C-V2X roadside units (RSUs).
- US-89 in American Fork (a mid-sized community) with Econolite controllers and Kapsch CV2X RSUs.
- SR-68 (Redwood Road) in Salt Lake City (a large community) with Intelight controllers and Commsignia C-V2X RSUs.

Overview of Validation Needs

Roadside Unit (RSU) Device
Certification

OmniAir Consortium Certification
Process

- Identification of Certified Products

Connected Intersection
Validation

Primary Focus of UDOT SMART Grant

SPaT, MAP, RTCM Validation Process

- Issuance of recognized SCMS
Certificates for RLVW Applications

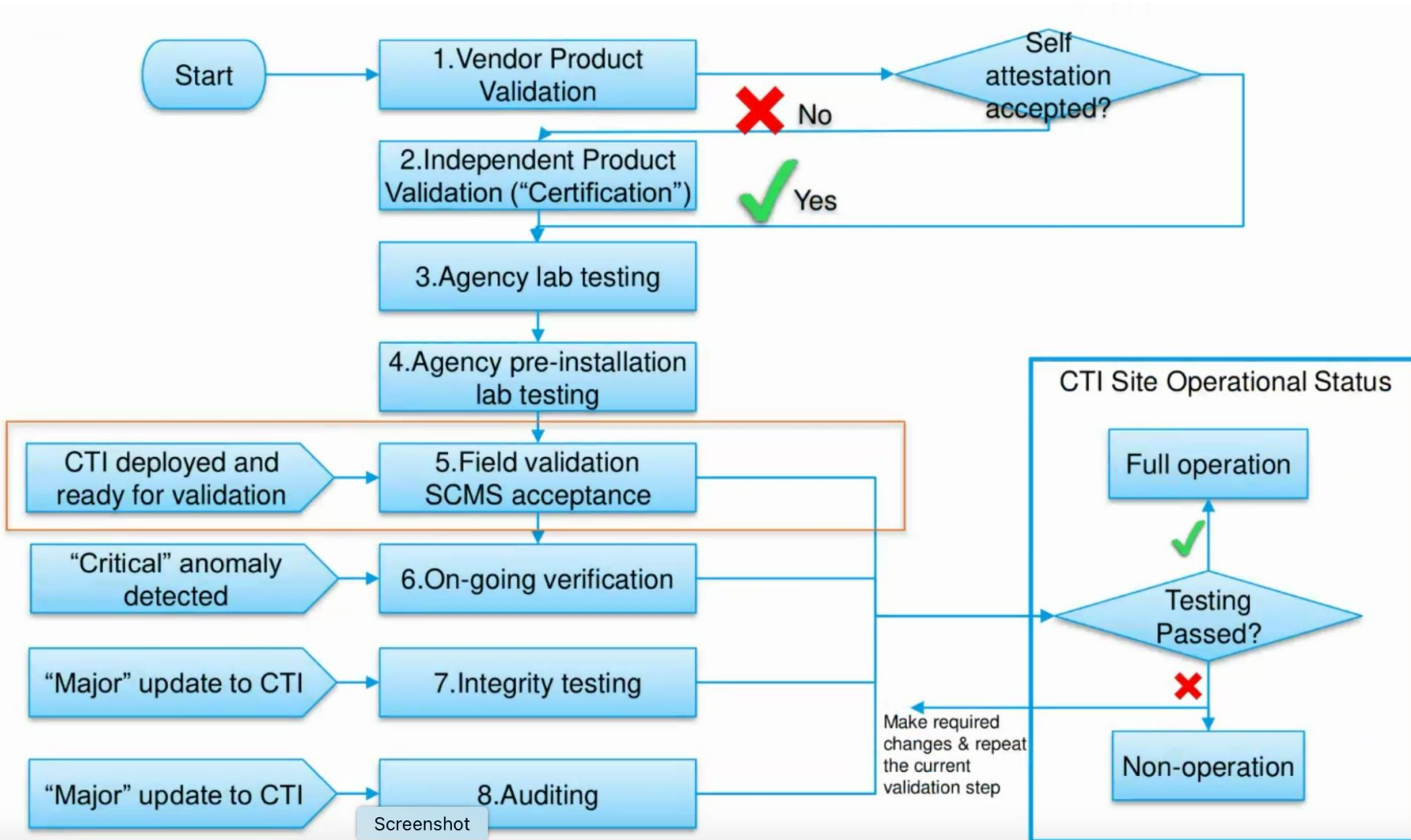
Connected Intersection
Operations Monitoring
(Ongoing)

Procedures for planned and unplanned
impacts to CIs:

- Connected Intersection Message
Monitoring System (CIMMS) being explored

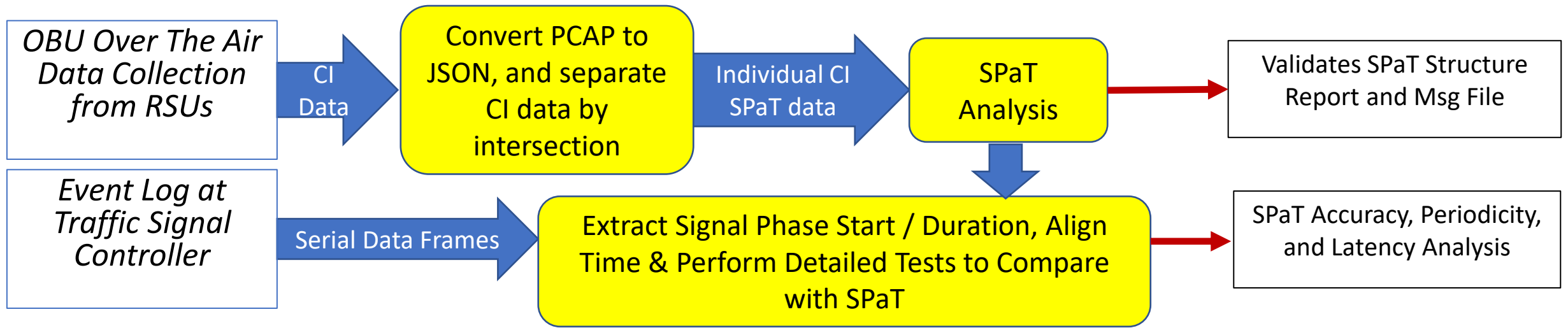
Secondary Focus of UDOT SMART Grant

CI Validation: Process Flow (source: SAE CTI 4501 working group)



Overview SPaT Validation Approach

- Upgrade UDOT hardware and firmware as needed for CTIC compliance
- Finalize tools and procedures needed to assess if the corridor(s) SPaT Broadcasts are acceptable to OEMs
- Collect SPaT data, Analyze with SPaT Tool, Generate Validation Reports
- Produce documentation of testing methods/tools and share with other IOOs
 - Not yet known if these will be web hosted, downloaded locally, etc.



Overview of MAP Validation Approach

- Current plan that is being tested involves:
 - Use of road scanning survey service (e.g., LiDAR vehicle) to collect accurate lane edges and stop line data
 - A common specification will be created and tested for reuse by other IOOs
 - A MAP software tool (created by CAMP) to process road scan outputs and calculate:
 - Lane centers – to be compared with the lateral position of MAP node points
 - Location of (or distance to) stop line – to be compared with first node point of ingress lanes
 - The MAP software tool would compare the road scan outputs and MAP message to identify node points that are not accurate within CTIC requirements
 - MAP Message will be updated if needed to match road scan outputs

Overview of RTCM Evaluation

- Additional work is being conducted by CAMP to:
 - To understand the value of remote sources of RTCM (e.g., Networked Transport of RTCM via Internet Protocol (Ntrip)) and if these are accurate enough to support validated RTCM broadcasts
 - To understand the validation needs of RTCM broadcasts
 - If validation needs exist:
 - To identify validation approaches
 - To develop tools to perform RTCM validation

SCMS Manager Approach

- Develop a process whereby SCMS Manager (& SCMS Providers) can accept verification results as report outputs from the developed CAMP tools to authorize the issuance of security certificates to IOOs with a PSID-SSP indicator to signify validation
 - This will not specifically be tied to all CTIC requirements
- Document the verification process and share with other IOOs
- Initiate development of V2I misbehavior detection procedures to be further advanced in the national V2X deployment, possibly using CIMMS
- Determine what is needed for recertification after an intersection falls out of compliance

Project Outcomes

- A major outcome at the end of this project is to have a set of tools and procedures used to validate SPaT and MAP messages that are ready for other IOOs to trial in their locations
 - That the tools and procedures are repeatable, achievable, and affordable for IOOs
 - Increase OEM trust in the accuracy of SPaT and MAP messages at validated intersections
- These tools and procedures form a basis for looking ahead...

Looking Ahead...

- A broader goal of this effort is to use the developed tools and procedures from this effort in other corridors and agencies to validate more CIs
 - Increase IOO readiness for OEM safety applications in production vehicles
 - Move toward critical mass of CIs equipped to broadcast data for safety applications
- ***A goal for this project*** is that at least three additional IOOs confirm interest in (e.g., commitment within a year) testing and validating existing CIs

Stage 2 SMART Grant Opportunity

- A Stage 2 SMART Grant application is expected to be released in Summer 2024
- Open to SMART FY 2022 recipients to implement “at-scale”
- A goal for this would be to expand use of the validation process to more CI corridors in Utah **and additional IOOs** to confirm, refine, and enhance the validation process, as needed

Are other IOOs interested in partnering with Utah DOT on a Stage 2 SMART Grant for “at-scale” implementation to validate CIs?

What's Next?

- *Coming months:*
 - Identify interested IOOs and conduct planning efforts for a Stage 2 effort
 - Collaborate with interested IOOs to develop and submit a Stage 2 proposal
- *Fall in-person CV PFS meeting:*
 - Update CV PFS Members on the Utah Reference Implementation Corridor, the process for validating CIs, and test tools available
 - Confirm the testing and validation process is accomplishable within reasonable budgets and timeframes