



USDOT Connected Vehicle PlugFest Final Report

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Table of Contents

Contents

1	Scope.....	3
2	Event Summary.....	3
3	Event Details.....	3
3.1	Session-1 (November 15, 2016):	3
3.1.1	Session 1 feedback	4
3.2	Session 2 (November 16,17,18, 2016).....	4
3.2.1	Certification and Test Control Interface Feedback.....	4
3.2.2	Common Device Feedback.....	5
3.2.3	General Feedback	5
4	Vendor Survey	6
5	Appendix A – Vendor List.....	7
6	Appendix B – Exit Questionnaire	8
7	Appendix C – Session 2 Questionnaire.....	10
8	Appendix D – Event Agenda	11
9	Revision History	12

1 Scope

This document is the final report arising from the USDOT Connected Vehicle PlugFest held in Novi Michigan Nov 15-18, 2016.

2 Event Summary

The Plugfest provided a venue for vendor-to-vendor connected vehicle device testing and provided an opportunity for vendors to test their equipment against the test systems developed by the members of the Certification Operating Council (COC) – Danlaw, 7Layers and SwRI.

Testing focused on verifying conformance to current baseline standards (i.e., SAE J2945/1, IEEE 802.11, IEEE 1609.2, IEEE 1609.3, and IEEE 1609.4.) developed for vehicle-to-vehicle (safety) and vehicle-to-infrastructure applications.

Event feedback was requested for both sessions and vendors were asked to record and submit the results of the interoperability testing they performed. The COC members recorded the results of the testing they performed and a summary of those results is provided in this document.

3 Event Details

3.1 Session-1 (November 15, 2016):

Session 1 was a day of presentations designed to communicate the general state of the connected vehicle landscape and to provide specifics on several topics:

91 people attended in person with an additional 30 joining the web session.

Speaker	Topic
Kevin Gay (ITS JPO)	Connected Vehicle Deployments & Device Certification
Ariel Gold (ITS JPO)	Early Deployer Technical Assistance
John Harding (NHTSA)	Secure Credential Management System (SCMS) Proof of Concept (PoC) Overview
Dean Therriault – (GM/CAMP)	Security and privacy for a connected vehicle environment SCMS Overview End Entity Requirements and Interfaces
Andrew Donaldson (Danlaw)	Certification Overview – Common Testing Methodology
Dmitri Khijniak (7layers)	Test Control Interface overview
Mostafa Kassem (Danlaw)	Danlaw Test System Overview
George Liu (7Layers)	7Layers Test System Overview
John Liming (SwRI)	SwRI Test System Overview
Senate Majority Floor Leader Mike Kowall	Legislative Update on Autonomous Vehicles

3.1.1 Session 1 feedback

Informal feedback provided orally was excellent and participants commented on how useful both the update had been and how valuable the provided networking opportunities had been.

The following additional topics are requested by those that completed a feedback form for inclusion in the next PlugFest.

- Security & Certification
- SCMS 1609.2
- Overall Test Strategy
- Over-The-Air (OTA) update of security certificates
- Automotive OEM Perspective

A summary of all feedback received is provided in section 4 of this document.

3.2 Session 2 (November 16,17,18, 2016)

Session 2 provided opportunities for both vendor-vendor testing and for vendors to test their system against the Danlaw, 7layers and SwRI Certification Test Systems.

62 people attended representing 22 device vendors plus test equipment suppliers and other support organizations.

Informal feedback was again excellent with vendors finding value in both the interoperability sessions and the COC test sessions. Detailed feedback is provided under the following headings:

- Certification and Test Control Interface
- Common Device Feedback
- General

3.2.1 Certification and Test Control Interface Feedback

1. Most vendors implemented at least some of the TCI and come prepared for testing with the COC test systems. However, implementation of the device TCI was inconsistent
2. Vendors requested examples to be included in the COC test specifications
3. Some additions to the TCI are suggested
4. Vendors had confusion about the units used in the TCI
5. Request to link TCI messages to Test Procedures in the Test Specifications
6. Vendors had not implemented the TCI message "Check System Availability", which prevented automated test sequences running on the Danlaw test system. There is a need to clarify the TCI spec.
7. No vendor was ready for certification using automated testing, most informed us that they do intend to support this.

8. Most vendors had to manually run separate software stacks to run their TCI control, which often led to different behavior in the BSMs generated by their "production" BSM generation stack.
9. ChangeSpeed and ChangeHeading in TC12945 need negative values to represent their delta (For example, lower the speed).
10. Change Speed and Change Heading lack matching Set commands

3.2.2 Common Device Feedback

1. Everyone except 1 vendor had valid UPER encoded messages; the one exception vendor had 2009 encoded and knew it
2. Confusion of when to send "Unavailable" and when to send an actual value for BSM elements
3. A few devices had issues simply transmitting BSMs
4. Most of the vendors focused on testing the Wave Short Message format
5. No vendors tested IEEE 1609.2 security for BSM and other messages
6. No vendors have found a way to use the security certificates provide by the USDOT. Vendors commented that they are missing private keys for the provided certificates
7. 2 vendors were ready to test WSAs
8. No vendors tested IPv6 connectivity
9. No vendor requested 1609.4 testing
10. All devices that supported the TCI and attempted the 802.11 RF Transmit tests passed
11. Only 1 device vendor requested 802.11 RF Receive tests
12. Most vendors were using the old 802.11 LLC header modified in 2016 version of the IEEE 1609.3 standards
13. Only one vendor had a valid path history for a stationary device. Approximately 1/3 of vendors incorrectly attempted path history, 2/3 did not attempt

3.2.3 General Feedback

1. Issues were discovered regarding 2 data elements in J2735, the COC will inform the working group
2. Vendors were making code changes as tests were being run
3. Not enough time was available for each vendor to spend with each of the COC test systems.
4. The interoperability test specifications were not available far enough in advance of the PlugFest for vendors to prepare

4 Vendor Survey

All participants were requested to complete an exit questionnaire – refer to section 0 for the full questionnaire.

Vendor Survey Results:

Overall Plugfest Experience Session 1: **4**

Overall Plugfest Experience Session 2 Interoperability : **4**

Overall Plugfest Experience Session 2 Certification: **4**

Would you participate in another PlugFest: **95%**

When is the ideal time for the next plugfest: **June (10%), April (53%), February (37%)**

When do you expect to be ready for device certification **Q1 2017 (32%), Q2 2017 (47%), Q3 2017 (21%)**

List any presentation topics of interested for future plugfests: **Security & Certification, SCMS 1609.2, Overall Test Strategy, OTA update of security certificates, Automotive OEM Perspective**

Additional Comments

Longer test sessions

Involve editors of governing standards

Need details of SCMS certificates

Can COC support remote testing

5 Appendix A – Vendor List

3M	Genvict Technology Inc.
ALPS	Hitachi
Aricent	ITRI
Autotalks	Lear
Chemtronics	Marben
Cohda Wireless	Panasonic
Commsignia	Robert Bosch
Danlaw	Savari Inc.
Delphi	Sirius XM
Denso	Valeo
eTransSystems	Wayties

In addition to the above equipment vendors, the following test companies were represented:

Anritsu
Rohde & Schwarz
Spirent

6 Appendix B – Exit Questionnaire

2016 USDOT Plugfest

Exit Questionnaire

Name: _____ Company: _____

1. Participated in sessions (check all which apply) Session 1 Session 2

2. Please rate your overall plugfest experience – Session 1 (Low) 1 2 3 4 5 (High)

Please explain if 1 or 2 is selected: _____

3. Please rate your overall plugfest experience – Session 2 - Interoperability (Low) 1 2 3 4 5 (High)

Please explain if 1 or 2 is selected: _____

4. Please rate your overall plugfest experience – Session 2 - Certification (Low) 1 2 3 4 5 (High)

Please explain if 1 or 2 is selected: _____

5. Would you participate in another plugfest Yes No Other _____

6. When is the ideal time for the next plugfest (circle earliest) Feb '17 / April '17 / June '17 /
Specify: _____

7. When do you expect to be ready for device certification Q1'17 / Q2'17 / Q3'17 / Q4'17

8. Rate your interest in Session 1 speakers

a. USDOT presentations (Low) 1 2 3 4 5 (High)

b. CAMP / SCMS (Low) 1 2 3 4 5 (High)

c. Test Control Interface (Low) 1 2 3 4 5 (High)

d. Test Systems overview (Danlaw, 7layers, SwRI) (Low) 1 2 3 4 5 (High)

9. List any presentation topics of interested for future plugfests

Please provide any additional comments

7 Appendix C – Session 2 Questionnaire

For planning session 2, the following questionnaire was requested from all equipment vendors.

Plugfest Session 2 Questionnaire

To maximize the opportunities for matching your certification and Interoperability test needs we ask that one representative from each equipment supplier completes this questionnaire. This information will be used to schedule slots with the certification companies and to pair your equipment with other equipment that supports similar tests.

We ask also that each group appoints a single representative to speak for that group in any additional planning sessions, this should ensure that things progress as expeditiously as possible. An initial schedule will be available when you arrive on Wednesday morning, please set-up at your assigned numbered table.

Please complete the following:	
Company Name:	
Assigned Team Representative: Name	
Email:	
Product Type (s):	
In-vehicle device	
Roadside device	
Other specify	

Certification Requests:		
Note: All the test procedures for all certifications systems require that the device under test supports the Test Control Interface (TCI). Please do not complete this section if you do not support this interface		
Please indicate the Certification tests that you would like to run		
Certification System	Test Specification	Check this column
SwRI	J2945/1	
7Layers	SAE 1609.3	
7Layers	SAE 1609.2	
7Layers	IEEE 802.11	
Danlaw	IEEE 802.11	
Danlaw	SAE 1609.4	
Danlaw	SAE 1609.3	

Interoperability Testing:		
Please indicate which of the interoperability tests that you support		
Group Name and Test Numbers	Supported Yes / No	Note Exceptions by Test Number
2016 WSM Packet Validation: TC1 – TC6		
2016 BSM: TC7 – TC13		
2016 WSA: TC14 – TC18		
IPv6: TC19 – TC20		
Support 1609.2 security credentials and signing of BSM and WSA		
My device only supports 2012 version of WSM / BSM / WSA		

8 Appendix D – Event Agenda

TUESDAY, NOVEMBER 15	
Time	Activity
08:00 – 09:00	Check-in
09:00 – 09:15 am	Welcome and Introductions <Danlaw>
9:15 – 10:45 am	PlugFest Overview – Guest Speakers <USDOT> <ul style="list-style-type: none"> • Kevin Gay (ITS JPO) • Ariel Gold (ITS JPO) • John Harding (NHTSA)
10:45 – 11:00 am	Mid-morning Break
11:00 – 12:00 pm	SCMS POC End Entity Interface Overview <CAMP>
12:00 – 1:15 pm	Lunch (Provided on-site) - Sponsored by UL
1:15 – 2:00 pm	Certification Overview – Common Testing Methodology <COC>
2:00 – 2:45 pm	Test Control Interface Description, Questions and Answers <7Layers>
2:45 – 3:15 pm	Pre-Certification Testing Overview <Danlaw>
3:15 – 3:45 pm	Pre-Certification Testing Overview <7 Layers>
3:45 – 4:00 pm	Mid- afternoon Break
4:00 – 4:30 pm	Pre-Certification Testing Overview <SWRI>
4:30 – 5:00 pm	Wrap-up & Questions
5:00 – 5:15 pm	Special Guest: Senate Majority Floor Leader Mike Kowall - Legislative Update on Autonomous Vehicles
5:15 – 7:00 pm	Networking Event – Sponsored by Danlaw

Session 2 - Breakout Sessions (Private Forum)

- **Date:** November 16-18, 2016
- **Location:** Danlaw Facility, Building 3, 41131 Vincenti CT, Novi, MI 48375.

WEDNESDAY, NOVEMBER 16	
Time	Activity
9:00 – 9:30 am	Testing Overview and Sign-up
9:30 – 12:00 pm	Testing Breakout – Testers will work with the certification team’s test stations during their scheduled time.
12:00 – 1:00 pm	Lunch (Provided on-site) – Sponsored by OmniAir
1:00 – 5:00 pm	Continued Testing
THURSDAY, NOVEMBER 17	
Time	Activity
9:00 – 12:00 pm	Testing Breakout – Testers will work with the certification team’s test stations during their scheduled time.
12:00 – 1:00 pm	Lunch (Provided on-site) – Sponsored by 7Layers
1:00 – 4:00 pm	Continued Testing
4:00 – 5:00 pm	Testing Wrap-up & Final comments
FRIDAY, NOVEMBER 18	
Time	Activity
9:00 – 12:00 pm	Additional Testing upon request

9 Revision History

V0.1	Nov 21, 2016	Andrew Donaldson	Initial Draft
V1.0	Nov 21, 2016	Andrew Donaldson	Updated after review. Submitted to USDOT

■ End of Document ■