CONNECTED VEHICLE CERTIFICATION
FOR AFTERMARKET CONNECTED VEHICLE WORLD

Nov 1, 2016
GOALS / SCOPE

Goals
• To share information about Connected Vehicle certification
• To encourage those who are interested to seek further information

Scope
• What is Connected Vehicle certification
• Why certification is needed
• What devices are certified
• Who needs certification
• Who does certification
• How certification is conducted
• What resources available
Vehicle-to-vehicle communication allows cars to make decisions based on their surroundings and context, including distance, speed, and directional movement of other vehicles, underpinning self-driving and safety applications but also traffic management and driving efficiency use cases. Source: https://www.cbinsights.com/blog/auto-tech-startups/^

- Customer satisfaction depends on
  - Interoperability
  - Performance
  - Installation
  - Service
- 200,000,000 passenger vehicles in US
- Some years before OEM installed equipment gets to the market
- Over 100 Connected Vehicle applications for safety and mobility
- 360,000 roadside infrastructure points
The USDOT competitively selected three certification service providers (7Layers, Danlaw, and Southwest Research Institute (OmniAir)). All three work together through the Certification Operating Council (COC) to support certification testing for CV Pilots. Vision is to help the industry to organize and run a self-sustaining certification program supporting deployment of DSRC-based services.
Dedicated Short Range Communication is a wireless communication technology similar to WiFi optimized for vehicle-to-vehicle/infrastructure (V2X) communications.

Data Messages
- SAE J2945/1 Requirements for BSM
- Encoding (ISO ASN.1 UPER)
- Process Information (SAEJ2735)

Data Transmission
- Transport (IEEE1609.3 WSMP, IPv6)
- Security (IEEE 1609.2)
- Link (IEEE 1609.4)
- Physical (IEEE 802.11)
Security certificates (based on IEEE 1609.2 Standard) allow

- Exchange digitally signed unencrypted messages
- Protect message receiver from spoofing
- Hide persistent identity
- Encrypt communications to the back office
- With minimum impact on latency and smallest packet overhead
5.9GHZ DSRC TECHNOLOGY READY FOR PRIME TIME

DSRC technology can be integrated into:
- Rear view mirrors
- Center displays
- Cell phones
- Wearable devices
- Heavy equipment

In-vehicle equipment:
- V2X Radio
- Main Processor
- User Interface Control
- CAN Bus
- Vehicle System

Roadside equipment:

2017MY Cadillac CTS – 1st DSRC enabled vehicle
Confirmation of certain characteristics provided by external organization

- Applies to Connected Vehicle devices
- Skill sets (individual / organizations)
WHY CERTIFICATION

- Required by law (e.g. FCC)
- May be required by USDOT NPRM?

- Focuses on assurance of minimum quality standards
- Interoperable with OEM equipment
  - The same interpretation of technical standards
  - The same application configuration

- Required during procurement
- Required to obtain security certificates

- Conducted by independent neutral party
## V2X Test Specifications supporting device certification

<table>
<thead>
<tr>
<th>Test Specifications</th>
<th>Title / Scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAVE802.11-TSS&amp;TP</td>
<td>Test Suite Structure and Test Purposes for IEEE 802.11 (scope of DSRC)</td>
</tr>
<tr>
<td>WAVEMCO-TSS&amp;TP</td>
<td>Test Suite Structure and Test Purposes for Multi Channel Operation (IEEE 1609.4)</td>
</tr>
<tr>
<td>WAVENS-TSS&amp;TP</td>
<td>Test Suite Structure and Test Purposes for Network Services (IEEE 1609.3)</td>
</tr>
<tr>
<td>WAVESEC-TSS&amp;TP</td>
<td>Test Suite Structure and Test Purposes for Security Services (IEEE 1609.2)</td>
</tr>
<tr>
<td>J2945.1-TSS&amp;TP</td>
<td>Test Suite Structure and Test Purposes for J2945.1</td>
</tr>
<tr>
<td>Test System Interface</td>
<td>Test Command Interface protocol specification</td>
</tr>
<tr>
<td></td>
<td>Available on <a href="http://www.github.com">http://www.github.com</a></td>
</tr>
</tbody>
</table>
OUT OF SCOPE FOR CERTIFICATION TESTING

- Environmental: Temperature, Humidity, Vibration, Shock, Ingress Protection
- RF Emissions: FCC Part 90/95, Non-Intentional RF
- Power: Power Supply Conditioning, Power Consumption
- Network: CAN interface, Ethernet, WiFi, Bluetooth, GPS/GNSS
- Physical attributes
- System installation/integration testing
- Applications testing, field testing

All non-DSRC related functions
Total test cases developed 126: as follows:
- SAE J2735 – 41 Test Cases
- IEEE 1609.4 – 10 Test Cases
- IEEE 1609.3 – 34 Test Cases
- IEEE 1609.2 – 21 Test Cases
- IEEE 802.11- 2012 – 20 Test Cases

Summary
- Positive/negative behavior testing
- Protocol testing, message format and parameter testing
- Radio performance in transmit and receive mode
WHO IS DOING DEVICE CERTIFICATION

Pre-commercial phase (2016-2017)

- Managed by the Certification Operating Council (USDOT project)
- Test specifications available
- 1st USDOT Plugtests for device interoperability in Nov 2016, Novi MI

Commercial certification phase (after 2017)

- Industry certification managed by an industry trade association - OmniAir
Interoperability Plugfest focused on V2V conformance testing and core DSRC standards required for the CV Pilot projects

Proposed Plugfest Dates: November 15-18, 2016  
Location: Danlaw facilities in Novi, Michigan  
Organizers: 7layers, Danlaw, OmniAir/SwRI  
Participants: Device vendors, USDOT, Leidos, OmniAir, Test Equipment Vendors, and Test Labs  
Key Activity Tracks: V2V (BSM), Conformance Testing for core test specifications, interoperability testing among vendors  
Agenda: Day 1: public forum – open to everyone in person or via Web  
Day 2-4: open to device vendors  
Register: [https://goo.gl/forms/Y5CQ6wFRQTNlAzrw1](https://goo.gl/forms/Y5CQ6wFRQTNlAzrw1)
WHAT CERTIFICATION ENTAILS

Certification is similar to other certification schemes.

- in-vehicle modules (for OEM integration)
- aftermarket devices
- roadside devices

Device manufacturers pay for certification.

- Have device
- Contact Certification Organization
- Device tested by an authorized testing laboratory
- Report submitted to Certification Organization
- Device listed is certified
DEVICE INSTALLATION & SETUP

- Installation - similar to installation of other radio equipment
  - Antenna placement, cabling (RF, power, data), connectors
  - Radio testing
  - Setup with vehicle interfaces (power, CAN, USB, etc)

- System configuration
  - Security credential provisioning
  - Application configuration & testing

- Maintenance
  - Diagnostic & troubleshooting
CONNECTED VEHICLE PROFESSIONAL™ CREDENTIALING PROGRAM

- Professional credibility in the Intelligent Transportation System (ITS) Community
- Focused on connected vehicle and intelligent transportation best practices, in-vehicle safety, infrastructure, communication protocols, and security
- 3 courses:
  - Connected Vehicle Professional - Function, Protocols and Architecture
  - Connected Vehicle Professional II - Standards, Organizations, Programs, V2X
  - Connected Vehicle Professional III - Data, Markets, Policy and Regulations
- End-of-course learning assessment are awarded the SAE International/Connected Vehicle Trade Association Certificate of Competency.
WHERE TO GET MORE INFORMATION

**Certification Test specifications:**
http://www.its.dot.gov/research_archives/connected_vehicle/connected_vehicle_cert_progress.htm

**Certification Operating Council:**
certificationoperatingcouncil@gmail.com

**Connected Vehicle Certification via OmniAir:**
http://omniaircertified.org/

**Connected Vehicle Professional Certification Program:**
http://www.connectedvehicle.org/connected-vehicle-professional/
cvp@mobilecomply.com

**ITS ePrimer Presentation; Connected Vehicles**
### CONTACTS

**Dmitri Khijniak**  
dmitri.khijniak@7layers.com  
949-732-8022  
Automotive Technology Services  
Development Manager  
7layers - Irvine, California

---

#### NORTHERN AMERICA

<table>
<thead>
<tr>
<th>Location</th>
<th>Phone</th>
<th>E-Mail</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>+1.949.716.6512</td>
<td><a href="mailto:info.us@7layers.com">info.us@7layers.com</a></td>
</tr>
<tr>
<td>Sunnyvale, CA</td>
<td>+1.669.600.5293</td>
<td><a href="mailto:info.us@7layers.com">info.us@7layers.com</a></td>
</tr>
</tbody>
</table>

#### EUROPE

<table>
<thead>
<tr>
<th>Country</th>
<th>Location</th>
<th>Phone</th>
<th>E-Mail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>Ratingen</td>
<td>+49.2102.749.0</td>
<td><a href="mailto:info@7layers.com">info@7layers.com</a></td>
</tr>
<tr>
<td>Agency Spain</td>
<td>Bilbao</td>
<td>+34.634.507.296</td>
<td><a href="mailto:info@7layers.com">info@7layers.com</a></td>
</tr>
<tr>
<td>Agency France</td>
<td>Paris</td>
<td>+33.612.717.783</td>
<td><a href="mailto:info.fr@7layers.com">info.fr@7layers.com</a></td>
</tr>
</tbody>
</table>

#### ASIA

<table>
<thead>
<tr>
<th>Country</th>
<th>Location</th>
<th>Phone</th>
<th>E-Mail</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.R. of China</td>
<td>Beijing</td>
<td>+86.10.6805.0368</td>
<td><a href="mailto:info.cn@7layers.com">info.cn@7layers.com</a></td>
</tr>
<tr>
<td>Japan</td>
<td>Yokohama</td>
<td>+81.45.949.6020</td>
<td><a href="mailto:info.jp@7layers.com">info.jp@7layers.com</a></td>
</tr>
<tr>
<td>South Korea</td>
<td>Suwon</td>
<td>+82.70.8853.2301</td>
<td><a href="mailto:info.kr@7layers.com">info.kr@7layers.com</a></td>
</tr>
<tr>
<td>Agency Taiwan</td>
<td>New Taipei City</td>
<td>+886.2.2696.2828.237</td>
<td><a href="mailto:info.tw@7layers.com">info.tw@7layers.com</a></td>
</tr>
</tbody>
</table>

7layers is the wireless/smart world expert of Bureau Veritas  
- founded in 1999  
- worlds’ leading wireless group  
- located around the world with a strong footprint in Asia, Europe & North America.  
- with more than 300 employees  
- Independent test and validation services laboratory accredited to ISO 17025