Intelligent Transportation Systems
Joint Program Office
ITS Standards Program

US C-ITS Architecture and Standards Update,
EU-US Future Plans

March, 2015

Steve Sill
Program Manager, ITS Architecture and Standards
Intelligent Transportation Systems Joint Program Office
U.S. Department of Transportation (USDOT)
USDOT ITS Architecture and Standards Programs

Architecture Program
- Legislative direction to develop and maintain a US National Architecture
  - Regional architectures required to use US Federal funds
- Connected Vehicle Reference Implementation Architecture (CVRIA)
  - Multi-view architecture covering C-ITS
  - Identifies candidate interfaces for standardization
  - V1.0, mid-2015 release for v2.0, 2016 integration with National Architecture
    - www.iteris.com/cvria

Standards Program
- Legislative direction to work with Standards Development Organizations (SDOs)
  - Support SDO consensus processes as first choice
- Engaging governments, SDOs to harmonize internationally when in the public interest
  - Strategic input, funding, participation, and leadership in standards working groups (WG)
    - USDOT and volunteer expert participation
  - Participation in ITS research efforts around standards development
CVRIA Includes Multiple Views

- **Enterprise** - Describes the relationships between organizations and the roles those organizations play within the connected vehicle environment

- **Functional** - Describes abstract functional elements (processes) and their logical interactions (data flows) that satisfy the system requirements

- **Physical** - Describes physical objects (systems and devices) and their application objects as well as the high-level interfaces between those physical objects
  - Interfaces provide potential standardization points

- **Communications** - Describes the layered sets of communications protocols that are required to support communications among the physical objects that participate in the connected vehicle environment
IEEE Update

IEEE 802.11
- 802.11p published, incorporated into 802.11-2012, no changes currently envisioned
  - Following 802.11ai (Fast Initial Link Setup), 802.11 Reg. SC/Tiger Team

IEEE 1609 (Wireless Access in Vehicular Environments (WAVE) standards)
- 1609.0-2013 (Guide for WAVE — Architecture) - published
- 1609.2-2013 (WAVE Security Services for Applications and Management Messages)
  - v2 published, v3 underway: harmonize w. ETSI 103 097?; ASN.1, updates to support for NHTSA V2V rule
- 1609.3-2010 (WAVE — Networking Services) published, (Corrigendum 2, 2014)
  - ISO-FAST harmonization underway
- 1609.4-2010 (WAVE — Multi-Channel Operation) published, (Corrigendum 1, 2014)
- P1609.6 (Remote Management Services) in development
- 1609.11-2010 (WAVE— OTA Electronic Payment Data Exchange Protocol for ITS) published
- 1609.12-2012 (WAVE— Identifier Allocations) published
  - Plans to harmonize with ETSI, ISO, SAE
SAE Update

J2735 (DSRC Message Set Dictionary)/J2945 Performance Requirements
- J2735 v2 published November, 2009
- J2945 to address minimum performance requirements
  - J2945.?” to support V2V safety under development
- A draft J2735/J2945 Framework (“what applications go to what standards”) developed
- Balloted update to v2 covering Signal Phase and Timing (SPaT) (J2735 2014 version)
- J2735 2015 version covering SPaT and prioritization in development
  - Cooperation with ISO TC-204 WG18 re. ISO 19091 (messaging around signalized intersections)

J3067 (Candidate Improvements to SAE J2735v2 Using Systems Engineering)
- Published as SAE Information Report August, 2014
- Contents will support development of future J2735/J2945 revisions

Planned work
- Cooperation with ETSI on autonomous driving, platooning, Cooperative Adaptive Cruise Control
- Develop multiple J2945.x application(s) specific performance requirements standards
- Develop J2735 v3 as a data dictionary
- Publish ISO 19091 standard
**USDOT/NHTSA Decision on V2V**

- **Vehicles will broadcast basic safety data via 5.9 GHz DSRC**
  - Will enable diverse collision avoidance applications
    - Will facilitate mobility and environmental sustainability improvements
    - Privacy/anonymity remains protected, no tracking

- **Advance Notice of Proposed Rulemaking (ANPRM) published Aug., 2014**
  - “Vehicle-to-Vehicle Communications: Readiness of V2V Technology for Application” report published

- **Primary purpose is to enable collision warnings to drivers prior to a crash**
  - Supported by research results including the Safety Pilot model deployment in Ann Arbor, Michigan
Other Developments

Connected Vehicle Pilots Deployment

- Broad Agency Announcement (BAA) for concept development released Jan. 2015
- Sep. 2020 planned completion of a two-wave deployment
  - [www.its.dot.gov/pilots](http://www.its.dot.gov/pilots)

FCC Activity Regarding 5.9 GHz Spectrum

- Notice of Proposed Rulemaking (NPRM) approved Feb. 2013 to explore sharing DSRC spectrum with unlicensed devices
- FCC’s band plan for ITS DSRC Services as a co-primary user described at: [http://wireless.fcc.gov/services/index.htm?job=service_home&id=dedicated_src](http://wireless.fcc.gov/services/index.htm?job=service_home&id=dedicated_src)
- USDOT cooperation via established governmental processes
EU-US ITS INTERGOVERNMENTAL STANDARDS HARMONIZATION WORKING GROUP (HWG)

UPDATE AND FUTURE PLANS

Steve Sill, USDOT
March, 2015
EU-US Harmonization Action Plan (HAP)

Basis for EU-US work - five tracks:

Track 1. High-level assessment (“landscape”) – completed in 2011
Track 2. Agreement on governmental harmonization principles – complete
Track 3. Gap/overlap analysis for standards needs (“HTG7”) – future
Track 4. Facilitation of harmonization of specific standards – ongoing
Track 5. Planning future cooperation – underway

The Working Group welcomes participation from countries/regions wishing to join harmonization efforts
EU-US Harmonization Task Groups

Standards Harmonization Working Group (HWG)
(one of 8 current WGs within the EU-US Implementing Agreement for ITS Cooperation)

Harmonization Task Groups (HTGs)
(a flexible organizational construct to execute work)

Japan has formally joined this cooperative structure

<table>
<thead>
<tr>
<th>Activity</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTG2 BSM / CAM Harmonization</td>
<td>Completed and showcased at 2012 Vienna World Congress</td>
</tr>
<tr>
<td>HTG1 ITS Security</td>
<td>Completed early 2013 and being fed into standardization processes</td>
</tr>
<tr>
<td>HTG3 ITS Communications</td>
<td></td>
</tr>
<tr>
<td>HTG4/5 Infrastructure</td>
<td>In progress; executed through ISO TC-204 and CEN TC-278</td>
</tr>
<tr>
<td>HTG6 ITS Security Policy</td>
<td>In progress, mid-2015 completion; Australia is an equal participant</td>
</tr>
<tr>
<td>HTG7? Stds. Selection / Gap Analysis / Identifiers</td>
<td>Candidate Future Work Items Under Discussion</td>
</tr>
<tr>
<td>HTG8? Probe Data Standards</td>
<td></td>
</tr>
<tr>
<td>HTG9? Testing and Certification</td>
<td></td>
</tr>
</tbody>
</table>

Candidate Future Work Items Under Discussion

Standards Harmony
• Candidate harmonized security policies:
  – Recommendations on security policies for harmonization, where in the public interest
  – Guidance to implementers
  – Next steps recommendations for policy makers and standards-setting bodies

• Work began in January 2014, completion mid-2015
  – Multi-lateral governmental cooperation with Australia as an equal work-sharing participant along with the EU and US
• What standards needed for key interfaces in a complete C-ITS architecture?
  – Multiregional requirement ▶ cooperate and share workload
    • Also achieve harmonized results
• Most interfaces are not-ITS specific:
  – Recommend available standards to adopt
    • Include specific profiles of each standard when known
• ITS-unique interfaces:
  – Identify interfaces where adapting existing standards is best
  – Identify gaps where there is a need to create new content
    • Key opportunities for cooperative standards development
• Assure globally unique identifier for any C-ITS application/service
  – Current informal agreement needs to progress to formal inter-SDo arrangement
• Status: Work Item Description drafted, circulated for stakeholder review
  – Execution subject to reaching multi-regional agreement: Australia, EU, US
Full-scale interoperable Cooperative ITS deployment requires:

- A detailed architecture
  - Sufficiently flexible to meet unique regional needs
  - Sufficiently rigorous to assure multi-regional interoperability
- Standards/profiles for key interfaces within this architecture
  - For which interfaces must specific standards/profiles be mandated?
  - For which interfaces would it be beneficial to recommend standards/profiles?
  - For which interfaces are multiple standards/profiles and/or proprietary approaches acceptable?
- Unique identifiers for applications/services
  - Globally unique highly desirable, arguably essential
• Multiple architectures … varying approaches, stages of development
  – CVRIA, CALM, Australian C-ITS Business Architecture, other work underway
  – Many identical or similar interfaces
• Long-term vision fundamentally similar
  – Initial deployments approaches vary
    • V2V in US, V2I in EU
• Multiple SDOs working in C-ITS space
  – Multiple standards gap analyses underway
    • Varying levels of detail, timelines
    • Confined to specific SDOs interest areas
• **Meeting interface standardization needs:**
  – Adopt: Existing standard – adopt and specify profile
  – Adapt: Seek to alter existing standards to meet ITS needs
  – Create: Develop new standards content
    • Often part of existing standards family (e.g. SAE J2945, NTCIP)
  – Ignore: No public interest in assuring standardization across interface

• **Three primary categories of interfaces:**
  – ITS-unique, standard published or under development
  – ITS-unique, no standards available/under development ➤ ”gaps”
  – Network (non-ITS) interface – one or more standards available
For Tasks A through D below:

- Review and inventory existing interfaces
- Recommend specific standards/profiles when available
- Identify gaps and recommend suitable standards families where gap may be addressed

Task A: Architectural and Management
Task B: Communications
Task C: Data Exchanges
Task D: Support Functions

Task E: Application/Services Identifiers

- Governmental facilitation of cooperation among SDOs/stakeholders
- Seek agreement on a unified approach
- Develop registry and initiate procurement action to operate registry
• Multi-regional need
• Reduced development and deployment costs for each participant
  – Shared resources can speed completion time
  – Diversity of expertise can improve quality
• Benefits of harmonization accrue
  – Opportunities for common hardware/software, broader markets
• Results will likely accelerate deployments, cause them to evolve more similarly than they otherwise would
  – Ease harmonization on other topics
• Likely scope: Probe service and probe data service architecture?
• Status:
  – Possible initiation of in 2015?
  – “Landscape” analysis completed
  – Multiple SDO efforts underway
    • New work items introduced within ISO
• Approach:
  – Feasibility analysis underway
    • Further discussion needed on best role for the HWG
  – Interest from Europe, US, Japan
• Assess and harmonize C-ITS certification and testing processes
  – Substantial potential benefits:
    • Enhanced device interoperability
    • Test once for multiple markets?
    • Reduced deployment costs
• Status:
  – Feasibility evaluation during 2015
• Approach:
  – What areas (protocols, messages,…) are likely mutually agreeable initial targets?
  – Share “best practices” on conformance and interoperability testing, metrics
QUESTIONS?