Status and Outlook of the U.S. ITS Program

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Overview

- Our Transportation Challenges
- US DOT Multimodal Collaboration
- Where We Are Headed
  - Connected Vehicles
  - Automated Vehicles
  - Smart Cities
- Key Issues
  - Security
  - Spectrum
Today’s Transportation Challenges

**Safety**
- 35,092 highway deaths in 2015
- 6.3 million crashes in 2015
- Leading cause of death for ages 5-24

**Mobility**
- 6.9 billion hours of travel delay
- $160 billion cost of urban congestion

**Environment**
- 3.1 billion gallons of wasted fuel
- 56 billion lbs of additional CO₂

Data Sources:
Imagine a Transportation System in which VEHICLES CAN SENSE & COMMUNICATE Things That You Can’t.

Achieving the Vision—U.S. DOT Perspective

- ITS Joint Program Office (JPO) supports ITS deployment across US Department of Transportation surface modes
  - Enable efficient, interoperable, secure and cost-effective ITS infrastructure, connected vehicle and automated vehicle deployments across North America.
  - Legislative mandate to (1) maintain an ITS National reference architecture and (2) to cooperate with standards organizations to develop standards in support of ITS deployment.

- **Architecture** provides a framework to guide planning and interoperable deployment of ITS, identifies interfaces for standardization.

- **Standards** define interfaces within architectures to enable required interoperability and support efficient, non-proprietary ITS deployment.

- **International Harmonization** seeks to leverage global resources and expertise to (1) maximize commonality of ITS deployments, (2) share labor resources and (3) access best-available expertise in order to facilitate ITS deployment and open markets.
Architecture and Standards for ITS

- **USDOT maintains a National Reference Architecture for ITS**
    - Integrated in to the National ITS Architecture during 2017
  - Multi-view, communications view identifies standards at high level
    - Detailed standards/profile specifications are being developed ([https://www.standards.its.dot.gov/](https://www.standards.its.dot.gov/))

- **Architecture evolves with technology and ITS needs**

- **Supports multiple communications technologies:**
  - 5.9 GHz DSRC for universal interoperability of safety
  - Universal, no-cost public access for safety, mobility, sustainability services
    - Does not preclude complementary approaches
Architecture and Standards for ITS

- **Connected Vehicle Reference Architecture**
  - Reference supports customized regional architectures
    - (Required to use Federal funds for ITS)
  - Multiple views serve different stakeholders
    - Business relationships and user expectations
    - Performance measures, user services and system goals
    - Functionality, security, interface characteristics
  - Views are tightly linked
    - Follow a standards-based approach in their specification
    - Linkages between architecture databases and graphical artifacts throughout

- **Architecture evolves with technology and ITS needs**
  - Cooperation on Europe and Australia underway to recommend standards, identify gaps underway now (HTG7) using an architecture superset
  - EU: Successful information exchange with CONVERGE, C-MobILE upcoming

http://www.cvria.org/
**HTG7: Standards Recommendations/Gaps, Identifiers**

- Which standards and profiles required to satisfy all interfaces in a complete C-ITS architecture?
  - Multi-regional cooperation, work sharing
    - Also achieve harmonized results
  - When must specific standards/profiles be specified to assure interoperability or meet public purpose?
  - When are multiple approaches acceptable or beneficial?

- Most standards requirements are not ITS-unique:
  - Recommend available standards to **adopt**, include profiles when known

- ITS-unique requirements:
  - Identify interfaces where **adapting** extant standards is best
  - Identify gaps where there is a need to **create** new content
    - Key opportunities for cooperative standards development

- Assure **globally unique** identifiers for any C-ITS application/service
  - Current informal agreement needs to progress to formal inter-SDO arrangement
Connectivity Unleashes the Full Potential of Automated Vehicles

**Connected Vehicle**
Communicates with nearby vehicles and infrastructure; Not automated

**Connected Automated Vehicle**
Leverages autonomous automated and connected vehicles

**Autonomous Vehicle**
Operates in isolation from other vehicles using internal sensors
HTG6: Candidate Harmonized Policies for C-ITS Security Implementation

- Objective: to develop an end-to-end security policy framework to support a multi-regional trust architecture

- Facilitate C-ITS (termed “connected vehicle” in the US) security system harmonization across multiple systems
Connected Vehicle Pilot Deployment Sites

ICF/Wyoming

- Reduce the number and severity of adverse weather-related incidents in the I-80 corridor in order to improve safety and reduce incident-related delays.
- Focused on the needs of commercial vehicle operators in the State of Wyoming.

New York City

- Improve safety and mobility of travelers in New York City through connected vehicle technologies.
- Vehicle-to-vehicle (V2V) technology installed in up to 10,000 vehicles in Midtown Manhattan, and vehicle-to-infrastructure (V2I) technology installed along high-accident rate arterials in Manhattan and central Brooklyn.

Tampa (THEA) Tampa Hillsborough Expressway Authority

- Alleviate congestion and improve safety during morning commuting hours.
- Deploy a variety of connected vehicle technologies on and in the vicinity of reversible express lanes and three major arterials in downtown Tampa to solve the transportation challenges.

Multiple Additional Deployments Underway
Advancing into the Future
USDOT ITS and Automation Initiatives

- Multi-modal Automation Research

- NHTSA’s Federal Automated Vehicles Policy Guidance
  (http://www.nhtsa.gov/About+NHTSA/Press+Releases/dot-initiatives-accelerating-vehicle-safety-innovations-01142016)

- Automation Proving Ground Pilot Program
  (https://www.transportation.gov/fastlane/dot-seeks-proposals-automated-vehicle-technology-“proving-grounds”)

- FAST ACT: Advanced Transportation and Congestion Management Technologies Deployment Initiative
  - Advanced Transportation and Congestion Management Deployment (ATCMTD) Program Grant Winners
    (http://transportation.house.gov/fast-act/technology-grants.htm)
Advanced Technologies – Urban ITS
Technology convergence will revolutionize transportation, dramatically improving safety and mobility while reducing costs and environmental impacts

Connected Vehicles
Vehicle Automation
Internet of Things
Machine Learning
Big Data
Sharing Economy

Benefits
• Order of magnitude safety improvements
• Reduced congestion
• Reduced emissions and use of fossil fuels
• Improved access to jobs and services
• Reduced transportation costs for gov’t and users
• Improved accessibility and mobility

Evolving into the Future

- **5.9 GHz DSRC:**
  - Through extensive research, it has been shown that DSRC meets the technical, user, and institutional requirements for certain transportation applications

- **Opportunities on the Horizon:**
  - 5G, 60 GHz
  - Software defined radios
  - New forms of Wi-Fi

- **USDOT Research:**
  - USDOT researching these opportunities with respect to DSRC to define their capability to support cooperative transportation uses
  - Tracking/participating in standards fora – ITU, ISO, IEEE 802.11/1609, 3GPP
  - Monitoring oneM2M; evaluating greater engagement
5G Requirements Timeline:

IMT-2020 Standardization Process: Where We Are and What Is Ahead

- Development Plan
- Market/Services View
- Technology/Research Kick Off
- Vision & Framework
- Name IMT-2020
- <6GHz Spectrum View
- >6GHz Technical View
- Process Optimization
- Spectrum/Band Arrangements (post WRC-15)
- Technical Performance Requirements
- Evaluation Criteria
- Invitation for Proposals
- Sharing Study Parameters (IMT_WRC-19)
- Sharing Studies (WRC-19)
- Proposals
- Evaluation
- Consensus Building
- CPM Report (IMT-WRC-19)
- Sharing Study Reports (WRC-19)
- Spectrum/Band Arrangements (WRC-19 related)
- Decision & Radio Framework
- Detailed IMT-2020 Radio Interface Specifications
- Future Enhancement/Update Plan & Process

Timeline & phasing

There will be **two phases** for the normative work
- The first release of the 5G specification will be completed by Sep. 2018/Release-15, addressing the more urgent subset of the commercial needs
- The second release of the 5G specification to be completed by Mar. 2020/Release-16, for the IMT 2020 submission and to address all identified use cases & requirements

With the following, tentative, release timing

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Note: dates above refer to official 3GPP release freeze (ANS.1 freeze)