Outline

- Regulation Status
- Spectrum
- Deployments
  - Pilot Deployments
  - Smart Cities
  - SPaT Challenge and other regional deployments
  - Security
- Standards
  - US Standards
  - Harmonization
- Supporting resources
  - ARC-IT
  - Open Data Portal
I do not speak for or represent anyone other than OnBoard Security
This presentation makes use of USDOT public material but has not been reviewed by USDOT and I do not represent USDOT
Thanks to Tom Kurihara and Sue Bai for additional material
Notice of Proposed Rulemaking (NPRM) December 2016 / January 12 2017

- NHTSA proposes a new Federal Motor Vehicle Safety Standard (FMVSS) (No. 150) to require that all new light vehicles (passenger cars, multipurpose passenger vehicles, trucks, and buses) with a gross vehicle weight (GVW) rating of 10,000 pounds or fewer must be capable of transmitting and receiving a basic safety message (BSM) using DSRC.

- NHTSA presumes that the final rule will be adopted in 2019. A phase-in schedule will begin in 2021 with 50 percent of new light vehicles meeting the standard. In 2022, the requirement will increase to 75 percent. The phase-in is expected to be complete in 2023 with 100 percent of all new light vehicles required to comply that year and going forward.


Comments available from https://www.regulations.gov/docketBrowser?rpp=50&so=DESC&sb=postedDate&po=0&dct=PS&D=NHTSA-2016-0126
WASHINGTON (AP) — The Trump administration has quietly set aside plans to require new cars to be able to wirelessly talk to each other, auto industry officials said, jeopardizing one of the most promising technologies for preventing traffic deaths.

The Obama administration proposed last December that all new cars and light trucks come equipped with technology known as vehicle-to-vehicle communications, or V2V. It would enable vehicles to transmit their location, speed, direction and other information 10 times per second. That lets cars detect, for example, when another vehicle is about to run a red light or coming around a blind turn in time to prevent a crash.

The administration has decided not to pursue a final V2V mandate, said two auto industry officials who have spoken with White House and Transportation Department officials and two others whose organizations have spoken to the administration. The industry officials spoke on condition of anonymity so as not to jeopardize their relations with the administration.

The White House declined to comment, but the proposal has been dropped from the White House Office of Management and Budget’s list of regulations actively under consideration and instead has been relegated to its long-term agenda.
Status?

- APNewsBreak, 2017-11-01: Gov't won't pursue talking car mandate
  - https://apnews.com/9a605019eeba4ad2934741091105de42


V2V Statement Attributable to the Department of Transportation

November 8, 2017 | Washington, DC

“The Department of Transportation and NHTSA have not made any final decision on the proposed rulemaking concerning a V2V mandate. Any reports to the contrary are mistaken. In all events, DOT hopes to use the dedicated spectrum for transportation lifesaving technologies. Safety is the Department’s number one priority.”

In response to the proposal, NHTSA is still reviewing and considering more than 460 comments submitted and other relevant new information to inform its next steps. An update on these actions will be provided when a decision is made at the appropriate time, taking into consideration the rich comments received in response to the proposed action published in December 2016. While DOT withdrew or revised 13 rules this year, V2V is not one of them, and it remains on DOT’s significant rulemaking report.”
5.9 GHz 10 and 20 MHz Channels

Shared Public Safety/Private
- Control
- Med Rng Service
- Short Rng Service

Dedicated Public Safety
- Hi Av-Low Lat
- Intersections

Power Limit
- 43 dBm
- 40 dBm
- 33 dBm
- 23 dBm

Canadian Special License Zones*
- Uplink
- Downlink

Frequency (GHz)
- Public Safety Veh-Veh Ch 172
- Public Safety/Private Ch 174
- Public Safety/Private Ch 176
- Control Channel Ch 178
- Public Safety/Private Ch 180
- Public Safety/Private Ch 182
- Public Safety Intersections Ch 184

Power Limit
- 40 dBm
Connected Vehicle Deployment Locations

- King County, WA
- Macomb County, MI
- I-75 Connected Work Zone, MI
- Southeast MI
- Ann Arbor, MI
- Ypsilanti Township, MI
- Lansing, MI
- Chittenden County, VT
- Manhattan, NY*
- Brooklyn, NY*
- Long Island, NY (2)
- Niagara, NY*
- Buffalo, NY
- Pittsburgh, PA (3)
- Ross Township, PA
- Harrisburg, PA
- Penn DOT I-76
- San Francisco, CA
- Palo Alto, CA
- Salt Lake City, UT
- I-80 Corridor, WY*
- Las Vegas, NV
- Denver, CO
- I-70 Mountain Corridor, CO
- Los Angeles, CA (2)
- Maricopa County, AZ
- Tucson, AZ
- Greenville, SC
- Blacksburg, VA
- Orlando, FL
- Miami International Airport, FL

*Planned deployments in 2017
Source: Volpe - The National Transportation Systems Center (USDOT)

Number of Vehicles: 72,556
Number of Devices (V2V and V2I): 65,665
CV PILOT DEPLOYMENT SCHEDULE

Connected Vehicle Pilot Deployment (up to 50 months)

- Phase 1: Concept Development (COMPLETE)
  - Creates the foundational plan to enable further design and deployment
  - Progress Gate: Is the concept ready for deployment?

- Phase 2: Design/Deploy/Test (CURRENT PHASE - began September 1, 2016)
  - Detailed design and deployment followed by testing to ensure deployment functions as intended (both technically and institutionally)
  - Progress Gate: Does the system function as planned?

- Phase 3: Maintain/Operate
  - Focus is on assessing the performance of the deployed system
  - Post Pilot Operations (CV tech integrated into operational practice)

U.S. Department of Transportation
WYDOT Pilot Deployment Vision

- Traffic Management Center
- 122 VSL Signs
- Low Visibility / VSL
- Available Truck Parking
- 55 Parking Locations
- 402 Miles of I-80
- Daily Meteorology
- High Wind Warning Lifted
- Zero Trucks Blocked Over
- Over 30 Trucks
- High Wind Vehicles
- Interstate 80

400 Equipped Vehicles:
- 100 WYDOT Fleet
- 150 Integrated Commercial Trucks
- 25 Retrofit Vehicles
- 125 Basic Vehicles

Note: The number is a rough estimate for the concept development phase.
NYCDOT Pilot Deployment Vision

- 100 Vulnerable Road User Device
- 1,250 MTA Buses
- 353 RSU
- 500 Sanitation & DOT vehicles
- 5,850 Taxis
- 400 UPS Vehicles
- 11 PED Detection System

Note: The numbers are rough estimates for the concept development phase.
Tampa (THEA) Pilot Deployment
Proposed CV Applications & Devices

- 500 equipped pedestrians
- 10 equipped buses
- 10 equipped trolleys
- 40 intersections (I-SIG, TSP, PED-SIG)
- 1,600 vehicles equipped with OBU

Data exchange will use DSRC (Dedicated Short Range Communications) or other wireless media. SCMS (Security Credential & Management System) will be used where appropriate.

Note: The numbers are rough estimates for the concept development phase.
Smart Cities

Columbus Issues RFP for the Operating System to Run its Smart City ...

Government Technology - Feb 2, 2018

The city has issued an RFP to procure services to “design, build, test and implement” the operating system. Submissions are due Feb. 13. The city will then score the proposals and make a recommendation to the city council. The consultant is expected to be on board by April or May. “The (Smart Columbus ...

https://www.columbus.gov/smartcolumbus/projects/
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Smart City grant: Columbus buys first electric vehicles, adding more ...
Columbus Business First - Feb 22, 2018
The Smart Columbus grant has helped the city buy its first batch of electric vehicles and start installing charging stations in a pledge to green its fleet. City Council in November approved a $2 million lease-to-own deal for 93 electric vehicles that will replace aging cars in the fleet. City income taxes in a fund ...

https://www.columbus.gov/smartcolumbus/projects/
SPaT Challenge

- [https://transportationops.org/spatchallenge](https://transportationops.org/spatchallenge)
- Based on the specification in [https://transportationops.org/content/spat-challenge-verification-document](https://transportationops.org/content/spat-challenge-verification-document)
Securing the system

This DSRC link was abandoned due to the inability to get a chip set that would support DSRC; Amazon Cloud is now used to provide this information.
Security Credentials Management System

- Based on IEEE 1609.2
- Supports pseudonym and identified certificates, end-entity revocation, privacy against eavesdroppers and insiders, and addition of new applications via PSID
- Hardware / Software / OS Security Requirements near completion
- PROD / QA / Test / Commercial flavors operational and provisioning devices with certificates
- Ongoing governance and spec maintenance still open questions
- Not currently harmonized with EU design
IEEE 1609 standards

- The family of IEEE 1609 standards:
  - IEEE Std 1609.0™-2013, Architecture (being updated)
  - IEEE Std 1609.2™-2016 and 1609.2a-2017, Security Services for Applications and Management Messages
    - Recently adopted as the baseline for ETSI TS 103 097
  - IEEE Std 1609.3™-2016, Networking Services (being updated)
  - IEEE Std 1609.4™-2016, Multi-Channel Operation
  - IEEE Std 1609.11™-2010, Over-the-air Interface for Electronic Funds Collection (EFC)
  - IEEE Std 1609.12™-2016, Identifier Allocations

- Projects in Development: P1609.2b, P1609.2.1
  - Management of security configuration information
SAE DSRC TC Documents

- Supports interoperability
- Defines standardized message sets
- Defines formats for basic safety message set dictionary
- Being revised to meet new needs/applications

J2735 Message Set Dictionary
- Basic Safety Message (BSM)
- MapData (Map) message
- Signal Phase and Timing (SPaT)
- Personal Safety Message (for pedestrian and other vulnerable road users)
- Traveler Information Message (TIM)

- Specifies minimum communication performance requirements
- Defines message transmission rate, channel usage, optional data usage in various situations

- System engineering example
- Communication protocol
- Channel use
- V2X message/application priority
- ...

J2945/1 On-Board System Requirements for V2V Safety Communications
J2945/9 VRU (V2P) Safety Message Minimum Performance Requirements
J2945/2 Performance Requirements for V2V Safety Awareness
J2945/3 Requirements for V2I Weather Applications
J2945/4 V2I Road Safety (title TBD) Applications
J2945/6 CACC/Platooning Performance Requirements
J2945/10 Map/SPaT Related
J2945/11 Signal Preemption Related
J2945/12 Traffic Probe Use and Operation
SAE DSRC TC Document: J2945/1

- 1st edition of on-board system requirements standard for V2V safety communications
- Support interoperability and data integrity
- Largely referenced by USDOT’s V2V safety system NPRM
SAE DSRC TC Document: J2945/2

- Defines the performance requirements for V2V Safety Awareness Performance Requirements
  - Covers four applications: Emergency Vehicle Alert, Roadside Alert, Safety Awareness Alerts for Objects, Adverse Road Conditions
  - Includes needs and requirements, design, message and data (the message(s) defined in this document will be moved to J2735 at the next revision)
- Status: in final balloting
SAE DSRC TC Document: J2945/9

- Defines the safety message minimum performance requirements from pedestrian device (e.g. smartphone) to vehicles
- Protect pedestrians (including people with disabilities/special needs), cyclists, public safety workers
- Personal Safety message is defined in J2735
**SAE DSRC TC Documents: In Process (1)**

- Mostly V2I focus
- Support day-one benefit while V2V environment takes time to grow

**J2945/3**

**Requirements for V2I Weather Applications**
- Collect weather-related data from vehicles
- Distribute weather-sensitive information for safety and mobility. For example:
  - Enhanced maintenance decision support system
  - Weather advisory and warnings
  - Routing support for emergency responders
  - Weather-sensitive variable speed sign, ramp metering

**J2945/4**

**V2I Road Safety (title TBD) Applications**
- Infrastructure → Vehicle safety and mobility-related information
- Some of the candidate applications:
  - Curve speed warning
  - Reduced speed zone warning
  - More to add
- Flexible message structure with application-specific container

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**Images and Diagrams:**
- Ramp metering image
- Diagrams illustrating infrastructure and safety applications
SAE DSRC TC Documents: In Process (2)

J2945/6 Cooperative ACC Performance Requirements
- Enhance ACC with V22 V2I communication
- Include platooning as Phase 2

J2945/10 Map/SPaT Message Recommended Practice
- Explain and demonstrate how to use these messages
- Intended for developers/users

J2945/11 Signal Preemption Recommended Practice
- Explain and demonstrate how to use signal request and preemption messages

J2945/12 Traffic Probe Use and Operation Recommended Practice
- Provide guidance on automated vehicle probe data collection and distribution
Testing and Certification

- WAVE radio system testing and certification by OMNIAIR
- Concept of CV pilot operations developed by each location and project proposals submitted to US Department of Transportation
- Pilot sites uses local procurement process for radios and services
- Future equipment certification, deployment scenario, plans for more pilots, and QPLs are TBD
OMNIAIR Consortium

- Release 1 Conformance tests using 2016 standards (all identified in NHTSA NPRM)
  - IEEE 802.11 Physical Layer (802.11p amendment incorporated)
  - IEEE 1609.2 Security and Certificates
  - IEEE 1609.3 Network (including WSA)
  - IEEE 1609.4 Multi-Channel Operations
  - SAE J2945.1 V2V Basic Safety Messages (BSM)s Minimum Performance (laboratory setting)

- Message Interoperability (laboratory setting)

- RSU 4.1 Specification
Connected Vehicle Reference Implementation Architecture (CVRIA) / ARC-IT

- http://local.iteris.com/arc-it/

- **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 functional objects as well as the high-level interfaces between those physical objects

- **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
HTG7

- Extends CVRIA/ARC-IT to address EU / AUS use cases
- Identifies mechanisms for information flows
Resources

- Intelligent Transportation Systems Joint Program Office home page https://www.its.dot.gov/
- Pilot Deployments home page https://www.its.dot.gov/pilots/index.htm
- http://www.itsassets.its.dot.gov/ -- not C-ITS
Visualizations

https://www.its.dot.gov/data/visualizations/
Thank you!

- Questions?