

APCO International Emerging Technology Forum

Emerging Vehicle to Vehicle, Vehicle to Infrastructure Communications

Cars talking to each other and talking to the supporting highway infrastructure

- **Create new Motor Vehicle Safety Standard**
 - No market incentives exist
 - Require all light vehicles to have V2V communication capability
 - Create minimum performance requirements for all devices, messages
- **V2V cars pass Basic Safety Messages to only neighboring cars < 300 feet**
- **Messages are completely anonymized alerts – no driver, no vehicle data**
- **If crash risk determined to be high, alert generated**

Critical Components of V2X

- Real-time exchange of anonymous speed and location data between vehicles, infrastructure, consumer devices
- DSRC in the 5.9 GHz band set aside by FCC
- On-board equipment requirements – new, retrofit
- Security certificate distribution,
Misbehavior detection
- V2X System Security and Privacy standards
- Vehicle based security
- State investment in infrastructure
- Consumer Acceptance/liability mitigation
- How to leverage this system for monetization, consumer benefits



Catalysts for V2V-V2I



- Highway fatalities/injuries have plateau-ed. Gains from improved crash worthiness harder to identify.
 - Need to move from crash response to crash avoidance
 - Need for fast, “local area” connectivity that warns drivers of impending danger at intersections, icy bridges, in traffic with many other speeding vehicles.
 - Enhance vehicle resident technologies.
- Need to better leverage technology for congestion mitigation, vehicle emissions reduction.
 - On the road to automated, autonomous driven vehicles
 - V2V – Led by USDOT (ITS-JPO, NHTSA)
V2I – Led by FHWA, AAHSTO



- **Communication security**
 - Common process for all information flows
 - Preserving “Privacy by Design”
- **Data flow and evolution**
 - Common processes, two types of data
 - Full round trip
- **Multiple communication media**
 - DSRC on all 7 channels
 - Other IP transport media
- **Tools**
 - *Consistent implementations*

**“The opportunity
for a common
experience.”**

- **Resources**: wired and wireless, the Internet
- 3,000 miles, 3,000 meters, 300 meters, 3 meters.



Requirements: Two types of data distribution:

- To all, To one.

Vehicle to Vehicle Communications

- Intersection Movement Assist
- Forward Collision Warning
- Left Turn Assist

Vehicle to Infrastructure Communications

- Red Light Violation,
- Reduced Speed Zone
- RR Crossing

Heavy Duty Vehicles Standards

V2P and V2M

- Vehicle to Pedestrian, Vehicle to Motorcycle

Mobility and Environmental

- Road weather, dynamic transit, eco-lanes.

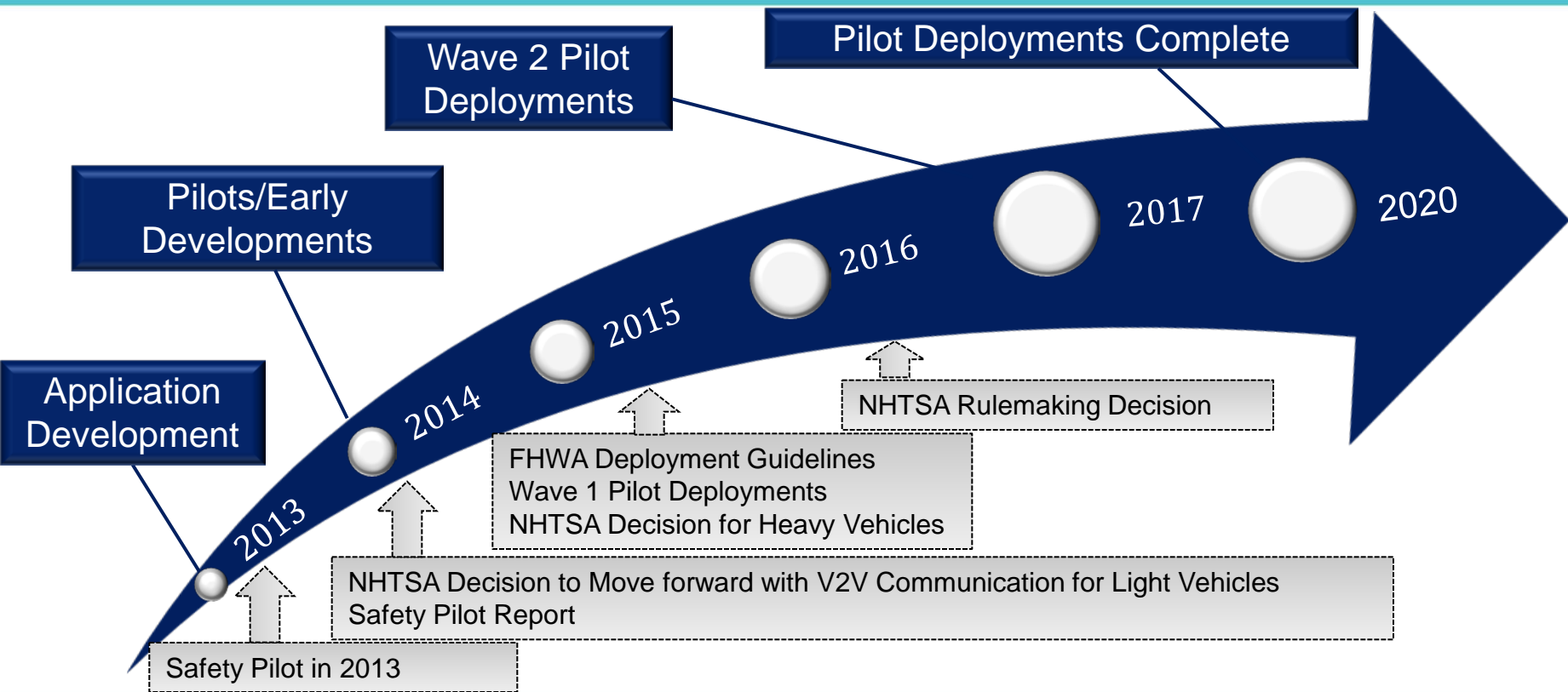


Government Steps

- 1999 Spectrum Allocation. The FCC allocated 75 MHz of spectrum at 5.9GHz for DSRC. 2004, FCC adopts DSRC rules to ensure interoperability.
- 2013 Safety Pilot in Ann Arbor
- Feb. 2014 NHTSA announces it will move forward with V2V technology for light vehicles
- August 18, 2014 USDOT Issues Advance Notice of Proposed Rulemaking ..Release of V2V Research Report
- November, 2014 USDOT RFI for Vehicle-to-Vehicle Security Credential Management System
- Announce Grants for Wave 1 Connected Vehicle Deployment Pilots .



Path to Deployment



Challenges

- Deployment of DSRC.....Faces the classic “chicken and egg” problem
- Estimating safety benefits, costs
- Spectrum sharing with other devices
- Privacy risk assessment
- Driver-vehicle interface performance
- Device certification, compliance infrastructure management
- Legal authority to mandate V2V
 - Automotive Aftermarket
 - Roadside Equipment
- DOT has never mandated a technology that has yet to be deployed

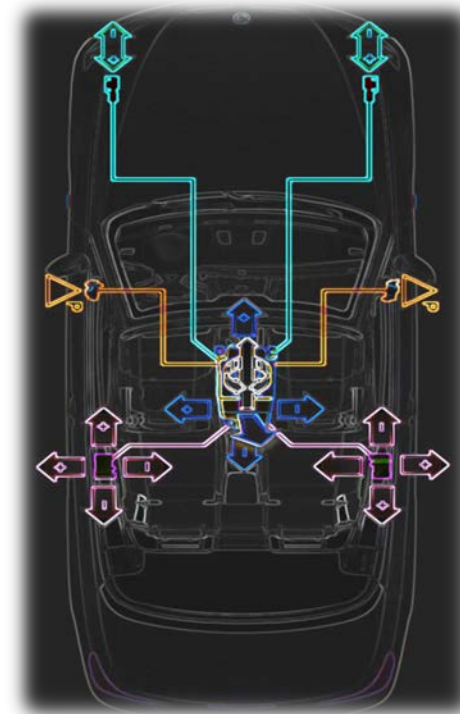


- **Location**

- Vehicles are becoming hyperaware of their location under all operating conditions (1.5m x,y,z)
- Equipment deployed for improved vehicle location awareness can be used for other mobile devices

- **Big data**

- Data provided to all, data contributed to all
- Establishing trust, protecting confidentiality
- New transport media



What Does The Future Hold

- V2I deployed in Japan, 2015 deployment in Europe
- USDOT to finalize V2V rulemaking by year end 2016
- Michigan to expand 3,000-vehicle Safety Pilot to 30,000 including V2I
- Takes years to turn over entire fleet accelerated thru retrofit, aftermarket
- Safety benefits can be realized with 10% market penetration and increase exponentially from there
- Once V2V is standard, V2I and aftermarket will grow opportunistically based on funding, market forces

Opportunity for Public Safety to Participate

- Priority Alerts to Vehicles
When Dispatched
Emergency Vehicle
Approaching
- Geo-fencing an area off
from traffic during police,
fire, EMS incident

Potential State Pilots

Michigan	California
Arizona	Minnesota
Iowa	Texas
Pennsylvania	New York
Florida	Georgia
Virginia	Utah



- **Walton Fehr US DOT**
 - walton.fehr@dot.gov
<http://www.its.dot.gov>