

IntelliDrive

Connectivity and the Future of Surface Transportation

DSRC Enabled Devices Workshop
May 5, 2010

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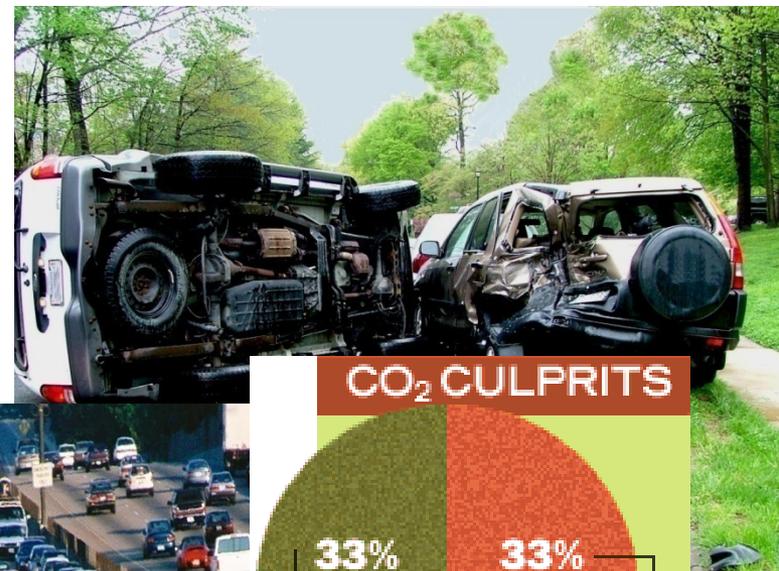
Workshop Agenda

- Background
 - Goal of IntelliDrive
 - Evolution from VII to IntelliDrive
 - V2V & Safety Pilot programs
- Discussion on Inclusion of DSRC in Nomadic Devices
 - Key questions/hurdles in moving towards deployment
 - What can the federal government do to help?
- Summary of Results from Interviews
- Facilitated Discussion

The Problem!!!

Safety

- 33,963 deaths/year (2009)
- 5,800,000 crashes/year
- **Leading cause of death for ages 4 to 34**



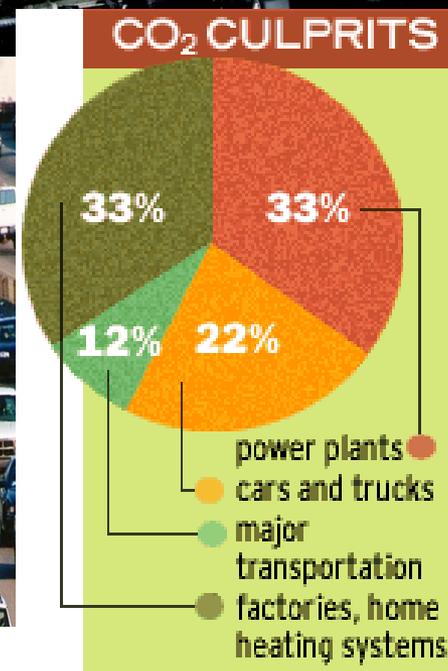
Mobility

- 4.2 billion hours of travel delay
- \$78 billion cost of urban congestion

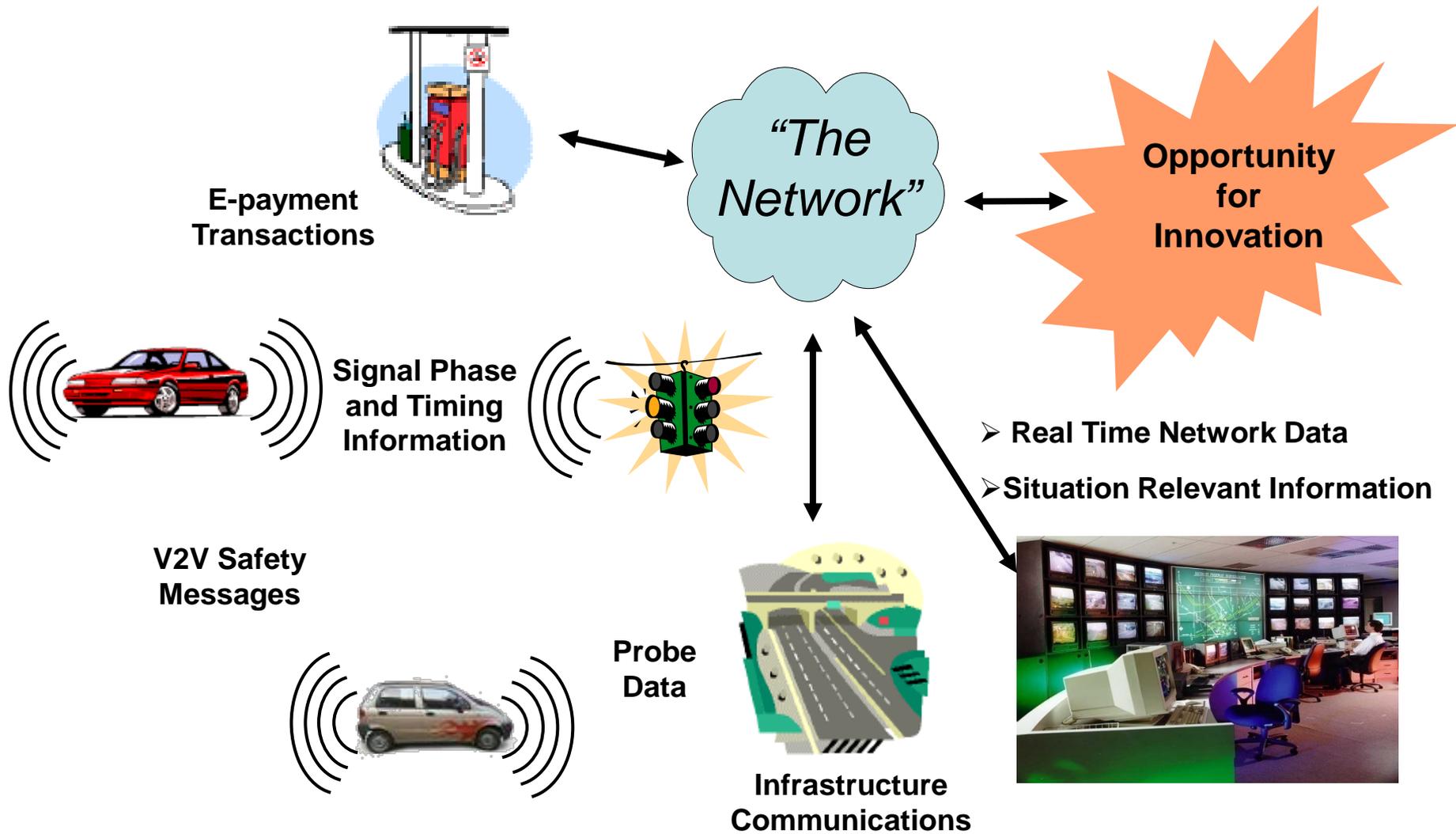


Environment

- 2.9 billion gallons of wasted fuel



It's All About Connectivity



Evolution of IntelliDrive

Original VII Deployment Model

- DSRC based for all applications
 - Infrastructure intensive using new DSRC technology
 - Vehicle turnover for embedded DSRC technology
- Start with V2I (for all application types) and evolve into V2V (safety)

US DOT's Current Perspective on IntelliDrive Deployment

- Non-safety (mobility, environment)
 - Leverage existing data sources & communications; include DSRC as it becomes available
 - Support development of key applications for public agencies using current data sources
- Safety → DSRC
 - Aggressively pursue V2V; leverage vehicle capability for V2I spot safety
 - Can leveraging of nomadic devices & retrofitting accelerate benefits?
 - Infrastructure requirement is still a TBD (security)

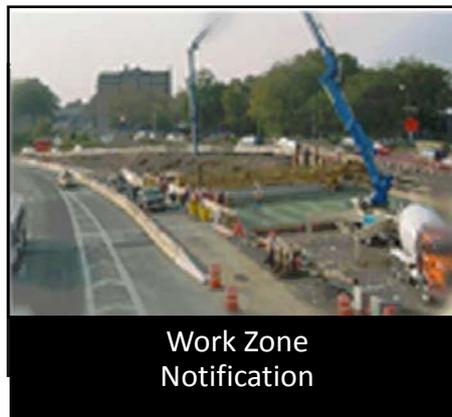
Opportunity for Safer Driving

➤ Greater situational awareness

- Your vehicle can “see” nearby vehicles and knows roadway conditions you can’t see

➤ Reduce or even eliminate crashes thru:

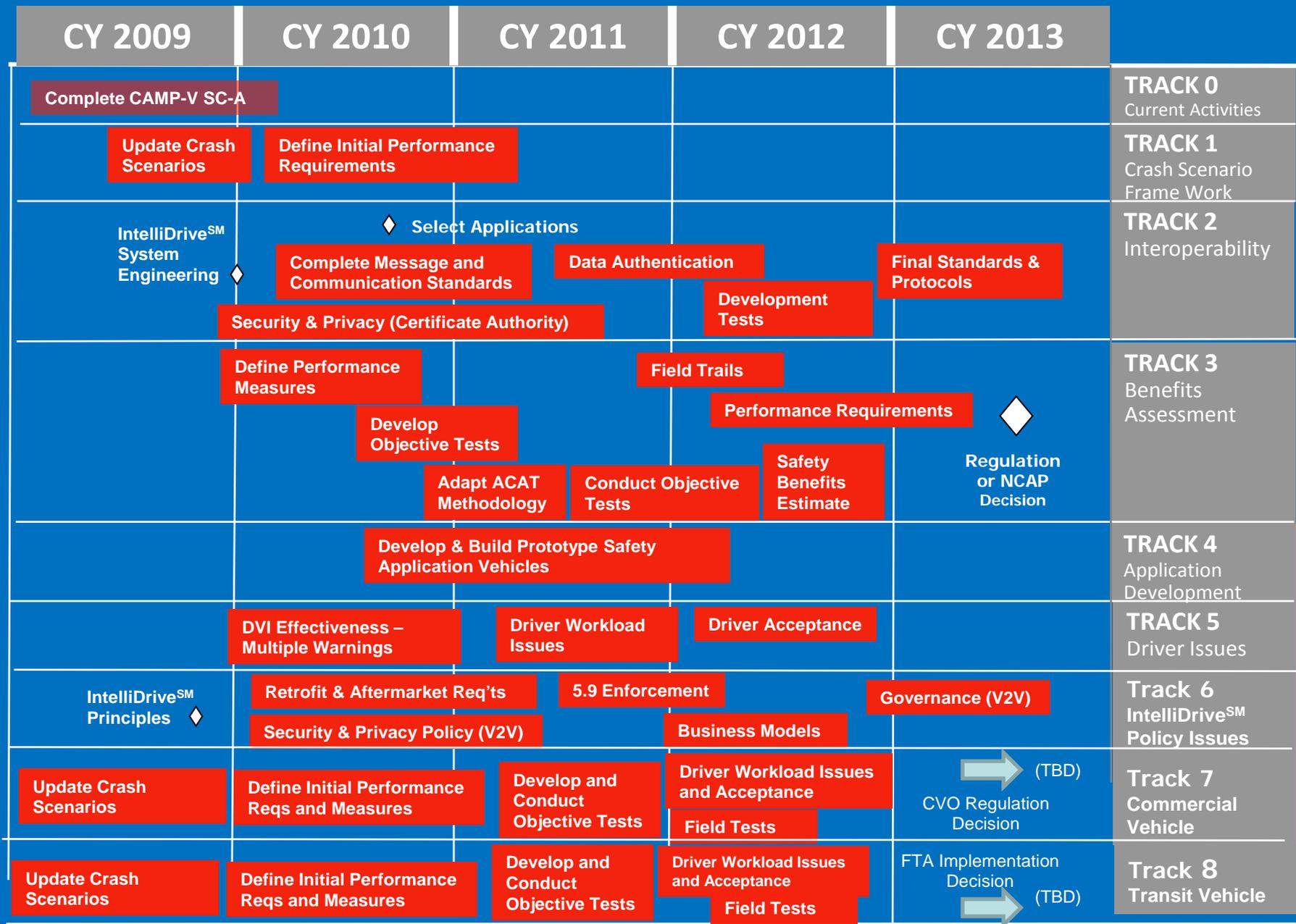
- Driver Advisories
- Driver Warnings
- Vehicle Control



IntelliDrive has the potential to address 82% of the vehicle crash scenarios involving unimpaired drivers

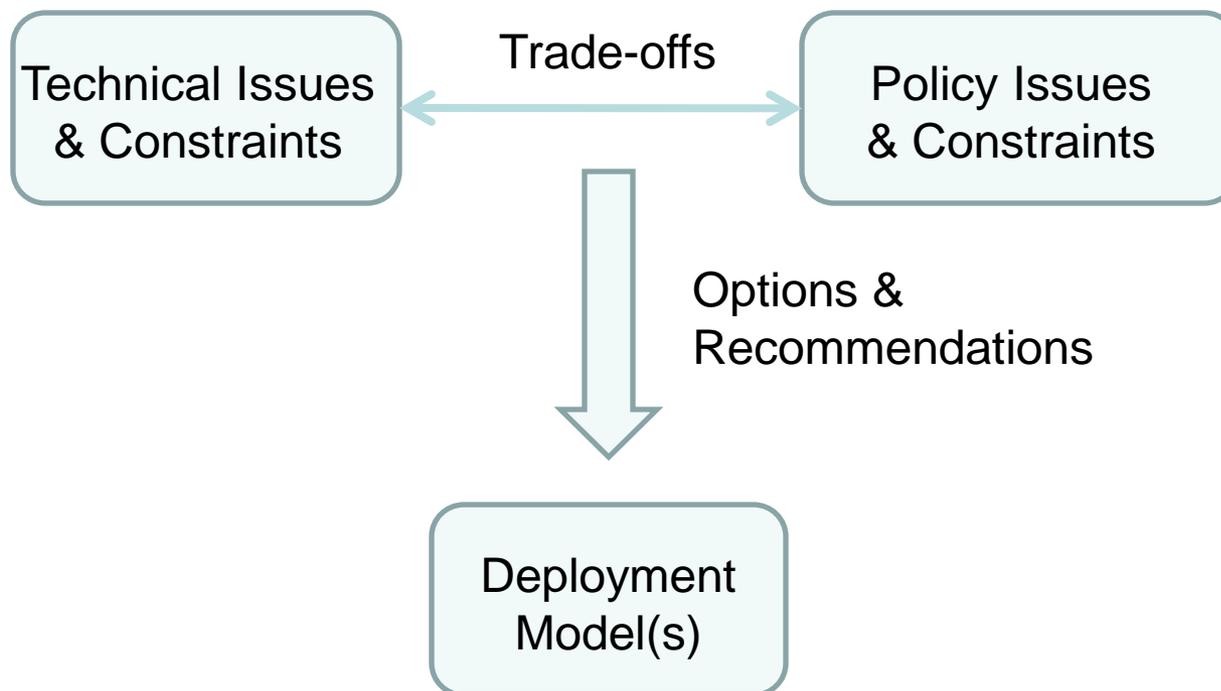


Vehicle to Vehicle Safety Application Research Plan



Technical and Policy Interactions

(For Example: Security vs Privacy Trade-offs)



➤ *Policy trade-offs will require senior level decisions.*

Outstanding Technical Issues

- Addressed under current CAMP Agreement
 - Independent technical peer review
 - Safety Pilot provides real-world implementation
- Penetration vs. Effectiveness
 - Driver Acceptance
 - Data Security
 - Positioning
 - Scalability
 - Channel Switching

Outstanding Policy Issues

- Critical V2V Policy Issues Being Defined
 - V2V Policy White Paper /Roadmaps Being Developed
 - Internal and External Stakeholder Engagement Being Defined
- How will tradeoffs between security, privacy and functionality be managed?
 - Operations
 - Who will monitor for misbehavior?
 - Who will operate the Security Certificate Authority?
 - Compliance & Enforcement
 - Who will enforce DSRC standards?
 - How will the rules of operation be developed and enforced?
 - How and who will certify DSRC devices?

Safety Pilot

Goals:

- *Support the 2013 Regulatory V2V Decision with Field Data*
- *Public Awareness & Acceptance*

Primary Objectives

- Demonstrate V2V real world implementation
 - Multiple vehicle types (cars, trucks, buses, rail, etc)
 - Obtain substantial empirical data
- Assess driver acceptance of vehicle based safety systems
- Explore opportunities for accelerating safety benefits through aftermarket devices and retrofit systems

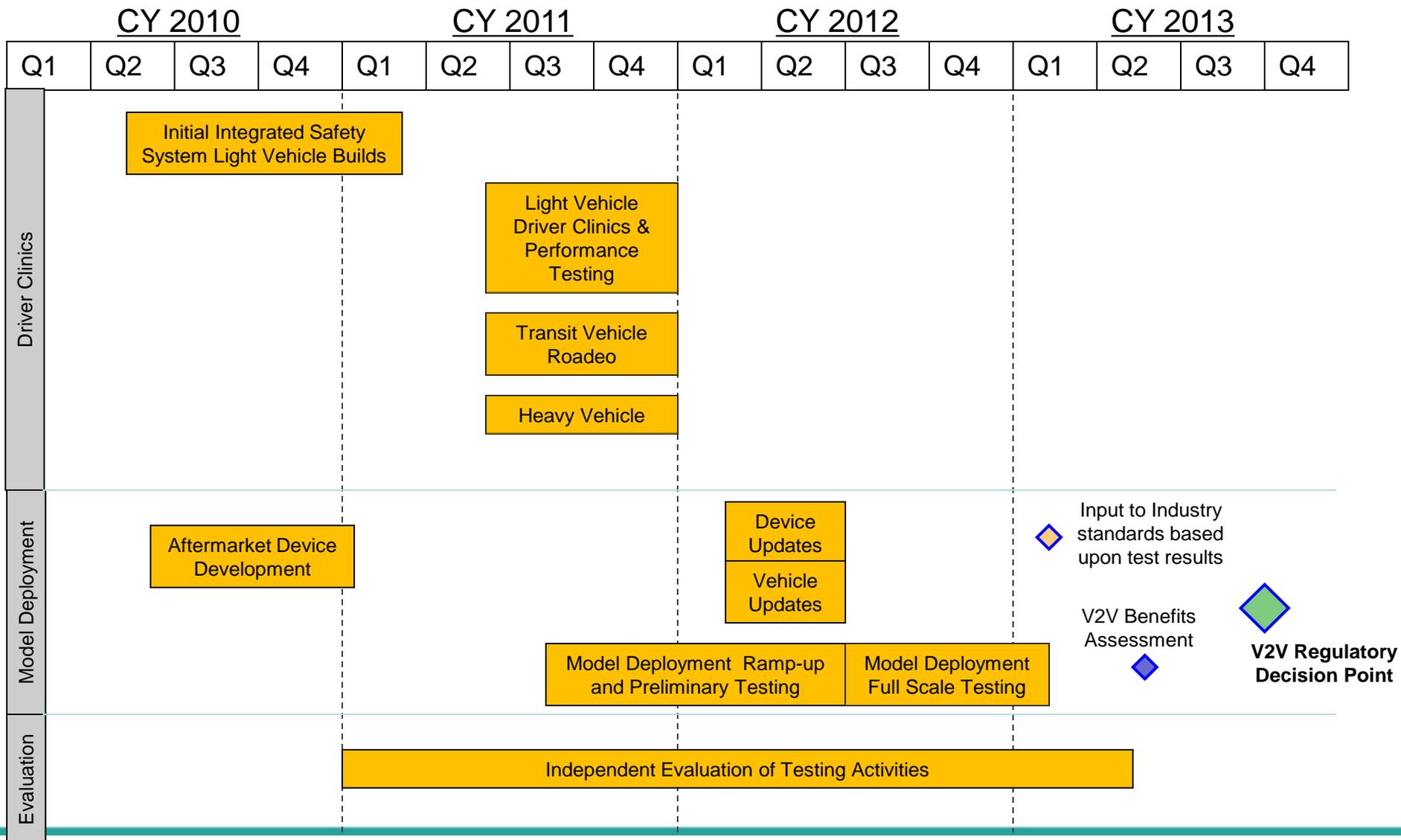
Secondary Objectives

- Enable vehicle-infrastructure (V2I) safety applications
- Leverage data for non-safety applications such as mobility, environment, and weather

Safety Pilot Activities

- Driver Clinics
 - Driver acceptance data from light vehicle driver clinics at various locations
 - Explore similar opportunities for other vehicle types
 - Performance testing in multiple geographic environments using small numbers of light vehicles and nomadic devices at same locations
- Model Deployment
 - Critical Mass/Exposure testing → large number of vehicles and devices creating a “highly saturated” operating environment
 - Mixture of integrated safety systems with nomadic devices
 - Cars, trucks, buses, fleets, rail crossings
 - Lots of vehicles, limited infrastructure

Safety Pilot Roadmap (rev 14)



Sources Sought Notice (SSN) – DTFH61-10-R-00026

- SSN issued on April 29, 2010 in Fed Biz Opps: www.fbo.gov
 - Market research on potential 5.9 GHz device suppliers
 - Open for 30 days
- Next Steps:
 - Issue solicitation for device procurements for testing and qualification against acceptance requirements
 - Issued to respondents from SSN and others who are known potential sources
 - Small number of units to be used for qualification testing
 - Would require devices by late 2010/early 2011
 - Critical factor is that respondents are already well underway with product development
 - Establish qualified products list (QPL)
 - Procurement of devices for supporting larger Safety Pilot model deployment
 - Vendors listed on QPL will be considered for future procurement under Safety Pilot
 - Larger volume deliveries starting middle of 2011
 - Procurement from multiple vendors

DTFH61-10-R-00026, Appendix A

- Production of Dedicated Short Range Communications at 5.9 GHz 'Here I Am' Nomadic Devices
- Here I Am Device General Needs

Basic Safety Message

Each class of device must be capable of transmitting a valid, signed **Basic Safety Message (BSM)** and receiving BSMs.

- The “Here I Am” message is the BSM (subset) of SAE J2735 conveyed in the 5.9GHz DSRC medium according to IEEE 802.11p and 1609.2 - 1609.4.
- The primary information conveyed in the message is the location of a vehicle at a particular time.
- Other data items are included as well.
- The message is properly signed so that receivers can check authenticity.

Provisioning/Test Interface

Each class of device must have a provisioning/test interface that enables the device to receive and load new versions of software, new configurations and credentials, and instructions to perform logging functions and download log messages to an external device.

- This interface is intended to be used at time of manufacture, installation, and update.
- The interface may be used during operation if data logging is needed.

Vehicle/Device Interface

Each class of device may be physically mounted in a vehicle, although mounting methods will vary by device.

- The main purpose of the device is to transmit information about a vehicle's operation.
- Since the main information transmitted is the location of the vehicle, the device will have to know the relationship between it and the center of the vehicle.
- In some cases, the device may obtain power from the vehicle.

Device Classes

- **Class 1** – This is a **consumer grade** device (such as a smart cell phone or personal navigation device) that can be **carried into** a vehicle by one or more of that vehicle's occupants. To function properly, the device need not be physically attached to the vehicle, but must be kept in a stable position relative to the vehicle's center, varying no more than 5 centimeters in any direction (laterally, longitudinally, or vertically) while in use.
- **Class 2** – this is a **purpose-designed** device intended for **temporary installation** in a vehicle. The device must be physically attached to the vehicle during its temporary installation. It may use the vehicle's power couplers for its operation.
- **Class 3** – this is a **purpose-designed** device intended for **permanent installation** in a vehicle. The device must be physically attached to the vehicle during its installation. It may use the vehicle's power for its operation.

Standards References

Each class of device must be capable of transmitting **J2735** (version 2009-11)-conformant **Basic Safety Messages** (BSMs) over a Dedicated Short Range Communications (DSRC) 5.9 Gigahertz (GHz) wireless network using the protocol stack and other standards associated with DSRC for vehicular communications. These include: **IEEE 802.11p**, **IEEE 1609-1 through 1609-4**, and J2735 (2009-11 version) and a performance standard under development by the automobile industry.

SAE www.sae.org

- http://www.sae.org/technical/standards/J2735_200911
- <http://www.sae.org/standardsdev/dsrc/DSRCImplementationGuide.pdf>

IEEE www.ieee.org

Supplemental information will be provided in the solicitation

Engagement of Industry to Accelerate Market – Summary of Input to Date

- **Goal:**
 - Discuss ways to accelerate the market for DSRC-enabled devices for V2V
 - Began input in early April 2010 – still collecting input and seeking input today

Summary of Input to Date (continued)

- **Technology Issues and Challenges**
 - **Existing, proven communications technologies are available**
 - *Why DSRC when other communications exist (4G, Wi-Max, Wi-Fi, etc)?*
 - **Frequency issues**
 - *What is capacity in large scale situations?*
 - *What is probability for interference?*
 - **Security issues**
 - *Time to authenticate users needs to be shorter and data overhead smaller*
 - *What is proposed for oversight? Does this level of security and authentication create cost-prohibitive elements for mobile devices and products?*
 - **Interoperability**
 - *What are the issues for device manufacturers? We need to better understand.*

Summary of Input to Date (continued)

- **Business Challenges**

- **Compelling business case for private sector not there**
 - *Public won't pay for safety*
 - *Most enthusiastic companies interested in mobility data – can sell the public on faster, cheaper, and convenience*
- **Production timing for enabling devices**
 - *Typical business process to modify device is between 2-5 years*
- **Limited DSRC chip manufacturers worldwide**
 - *More than one – what is issue that needs to be resolved? We need to better understand.*

Summary of Input to Date (continued)

- **Cultural Challenges**

- **Dialogue about the technology, business model, and standards felt closed under the VII process**
 - *Some stakeholders have expressed negative experience with VII.*
 - *Want to see the process more open, in particular with standards development*
- **Pace of deployment has been too slow**
 - *Too much research*
- **Serious cultural differences among each of the entities involved**
 - *Companies would like Federal government to require OEMs to provide data*
 - *Major questions around liability*
 - *What data do device manufacturers want (specifically)? We need to understand.*

Biggest Issue

Need to see Federal government commitment to DSRC!

Are the messages provided this week – statement of commitment by Administrators, SSN, upcoming tests and model deployment – the right signs of commitment?

DOT Actions and Responses to Challenges

Technical Challenges

| Issue | Challenge | DOT Response |
|--|---|--|
| Range of available communications technologies | Desire to see a comparison to prove that DSRC is needed | DOT analysis (see chart) |
| Frequency issues | Capability in large scale situations Interference | Doing scalability testing under V2V program |
| Security Issues | Authentication, overhead, oversight, costs | <ul style="list-style-type: none"> • Work underway on technical side with security experts on authentication process • On policy side, developing a roadmap to identify and resolve issues |
| Interoperability | Need to explore problem | V2V Track 2 addresses technical interoperability issues |

Business Challenges

| Issue | Challenge | DOT Response |
|-------------------------|---|---|
| Business Case | Public will not buy safety | <ul style="list-style-type: none"> • DOT will conduct economic impact analysis as part of regulatory decision • DOT will work with industry to examine opportunities for accelerating deployment through aftermarket and retrofit – analysis will look at incentives and potential barriers |
| Production Timing | Internal company decisions to make major changes can be 2-5 year time frame | <ul style="list-style-type: none"> • Sources Sought Notification to move development along faster • Safety Pilot to demonstrate capability and determine what works most effectively |
| DSRC chip manufacturing | Limited market | <ul style="list-style-type: none"> • Need to explore problem |

Cultural Challenges

| Issue | Challenge | DOT Response |
|-----------------------------------|--|--|
| Negative experience with VII | Process felt closed, especially with Standards development | <ul style="list-style-type: none"> • Commitment to public working group meetings • Standards meetings are open to those interested in participating |
| Pace of deployment | Too slow | <ul style="list-style-type: none"> • Focus on V2V and clear goals within 4 year time frame • Engaging industry on steps to move forward with SSN and model deployment in near-term |
| Cultural disconnect among players | Data sharing Liability | <ul style="list-style-type: none"> • DOT would like to explore what data is desired from device manufacturers and apps developers • DOT will explore boundaries of data and liability • DOT will facilitate discussion with industry and OEMs |

Questions

- Are these appropriate actions for Federal government to take?
- We are not going to develop business models for you....what information or input do you need to develop business models that are viable?
- Are there other areas of research, testing, and demonstration that are needed beyond the Safety Pilot?
- Are there other actions that are needed to explore and develop policy recommendations?
- Who are other stakeholders that need to be involved in order to accelerate DSRC into the market?

Further Information

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