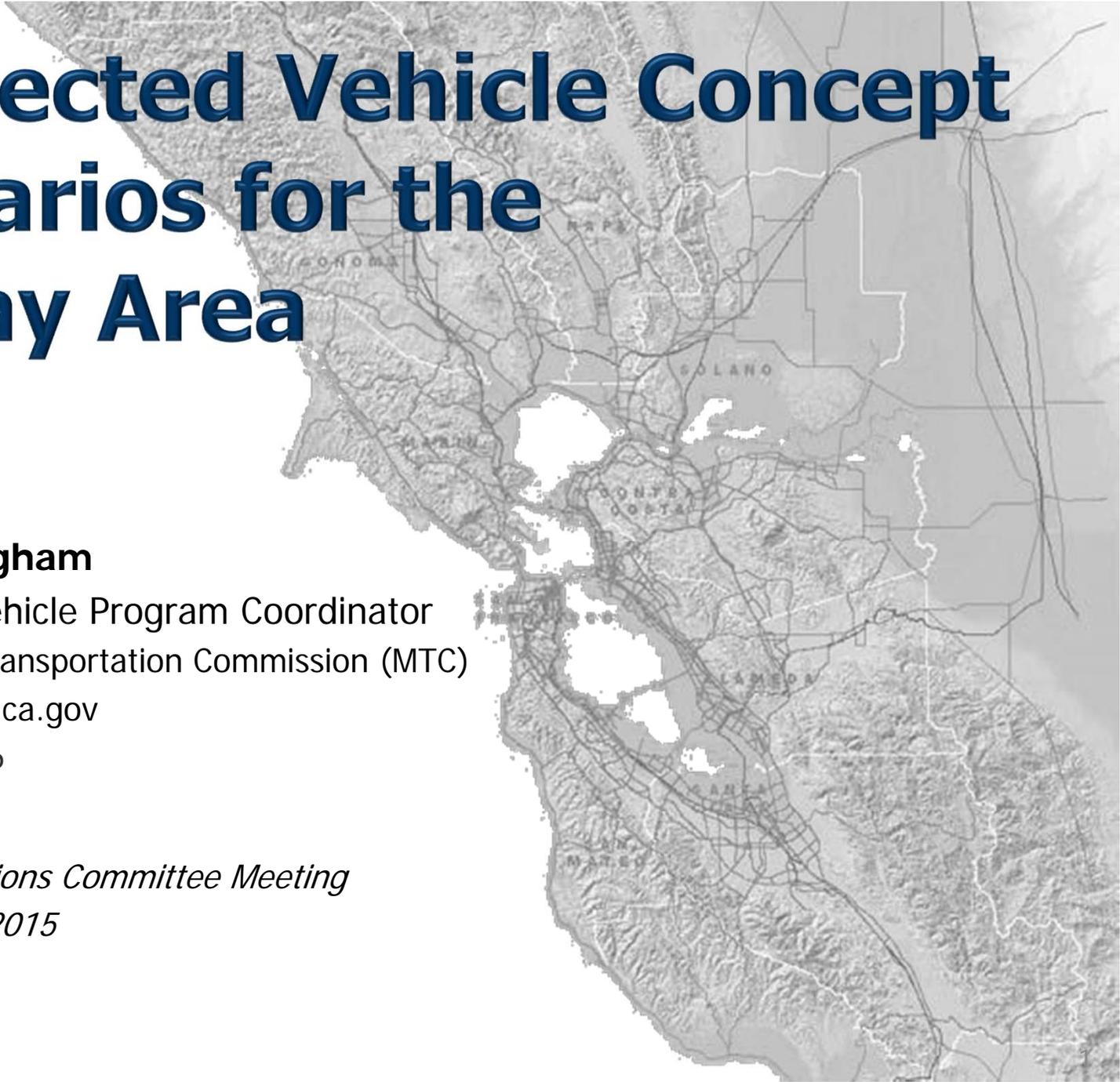


Connected Vehicle Concept Scenarios for the SF Bay Area



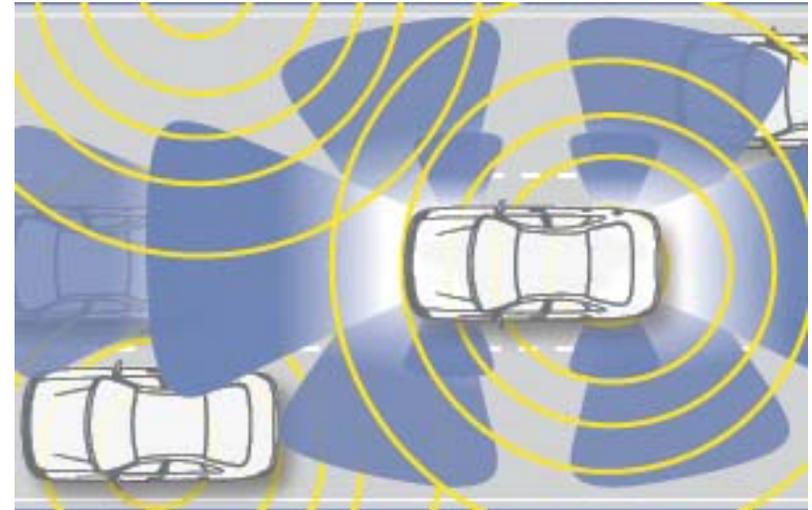
Virginia Lingham

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Metropolitan Transportation Commission (MTC)
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(510) 817-5826

*Arterial Operations Committee Meeting
September 8, 2015*



Objectives:



- 1) Review a sample of deployment concepts MTC has considered for the USDOT Connected Vehicle Pilot Deployment project and other programs.**
- 2) Explore known challenges with V2I deployments.**
- 3) Discuss local needs and challenges.**

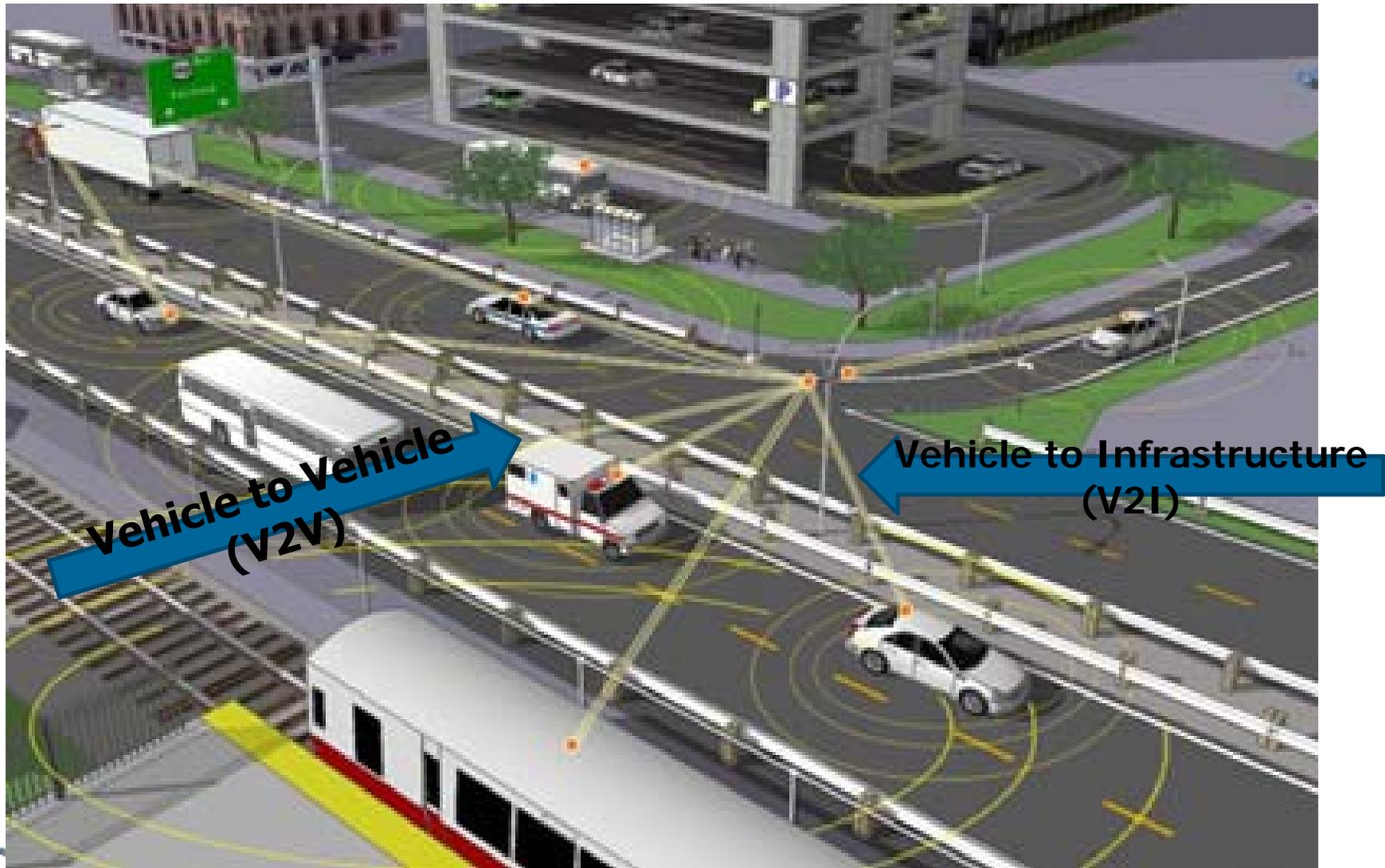


Connected Vehicle

- USDOT research program since early 2000's.
- Goals are to improve safety, mobility and reduce environmental impacts.
- Connects drivers, infrastructure and vehicles using wireless technology.
- Improves driver situational awareness.



Connected Vehicle Communication



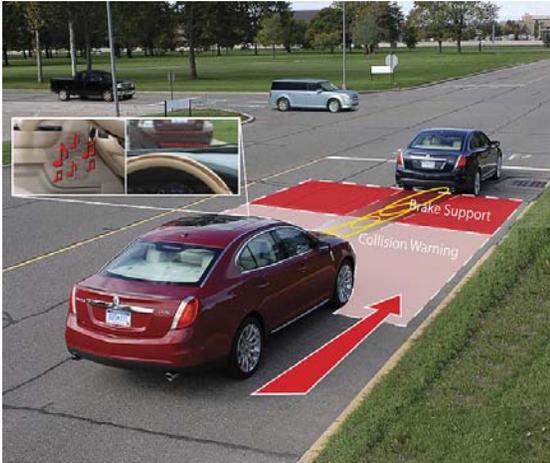
Connected Vehicle Technology

- **5.9 Ghz Dedicated Short Range Radio (DSRC)**
 - Similar to Wi-Fi, but adapted for vehicle environment
- **Dedicated FCC radio spectrum**
- **300m reliable range**
- **Basic Safety Message**
 - Vehicle Position
 - Speed
 - Heading
 - Acceleration

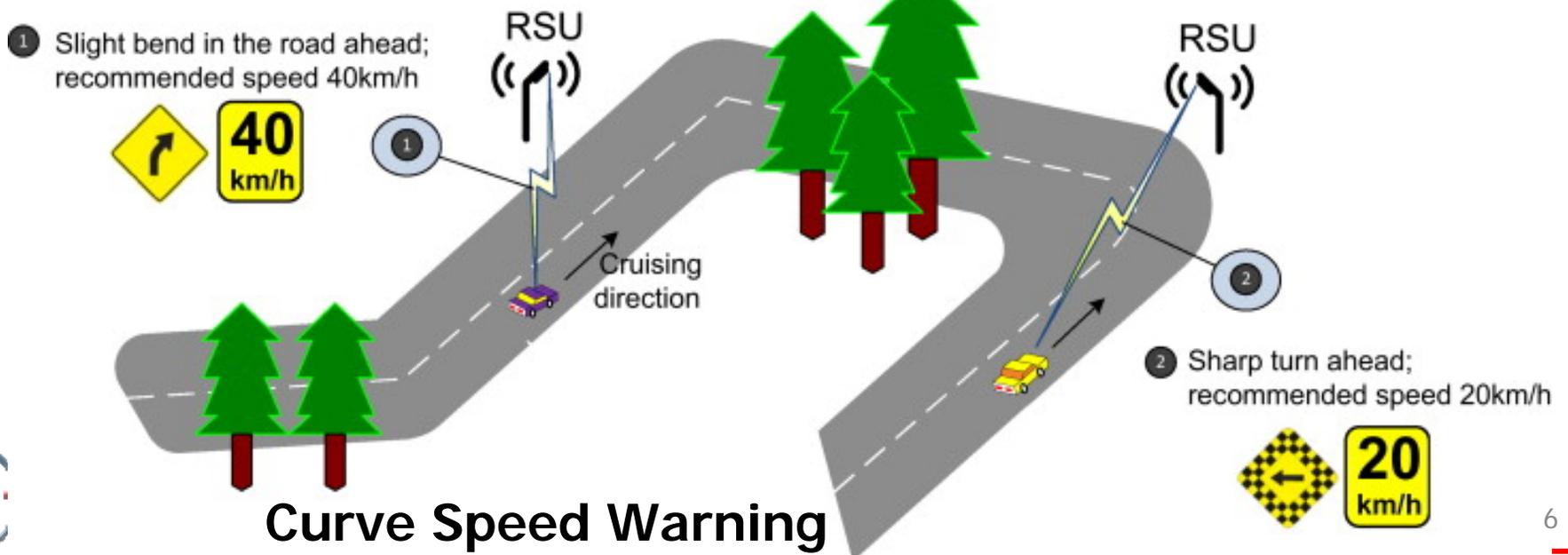
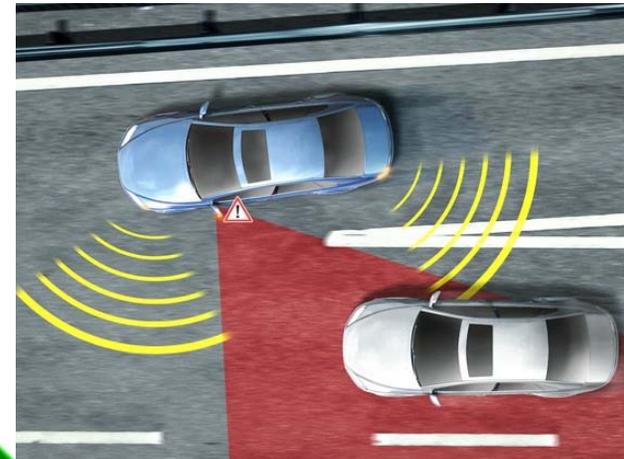


Example Safety Applications

Forward Collision Warning



Blind Spot Warning



Curve Speed Warning

Safety App: First Responder & Construction Worker Alert

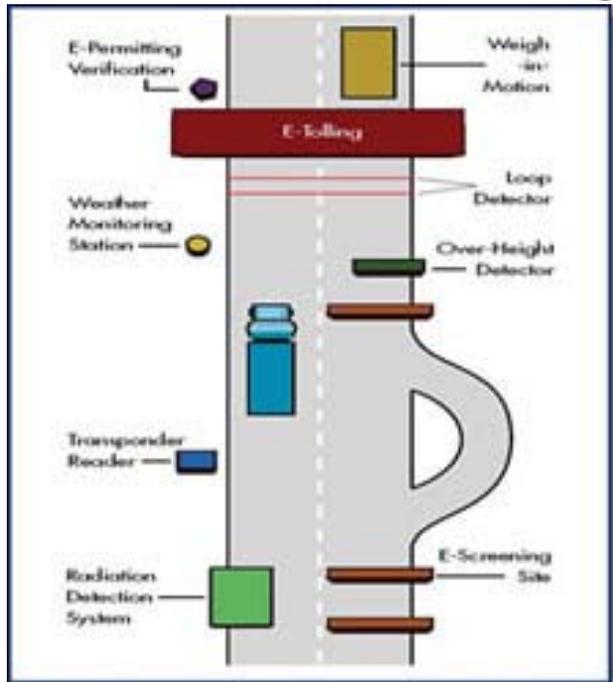
- Combines ever-shrinking radio sensors that construction workers can wear on or inside vests with connected vehicle technology that allows cars to “talk” to one another, roadside infrastructure, and personal electronics such as mobile phones.



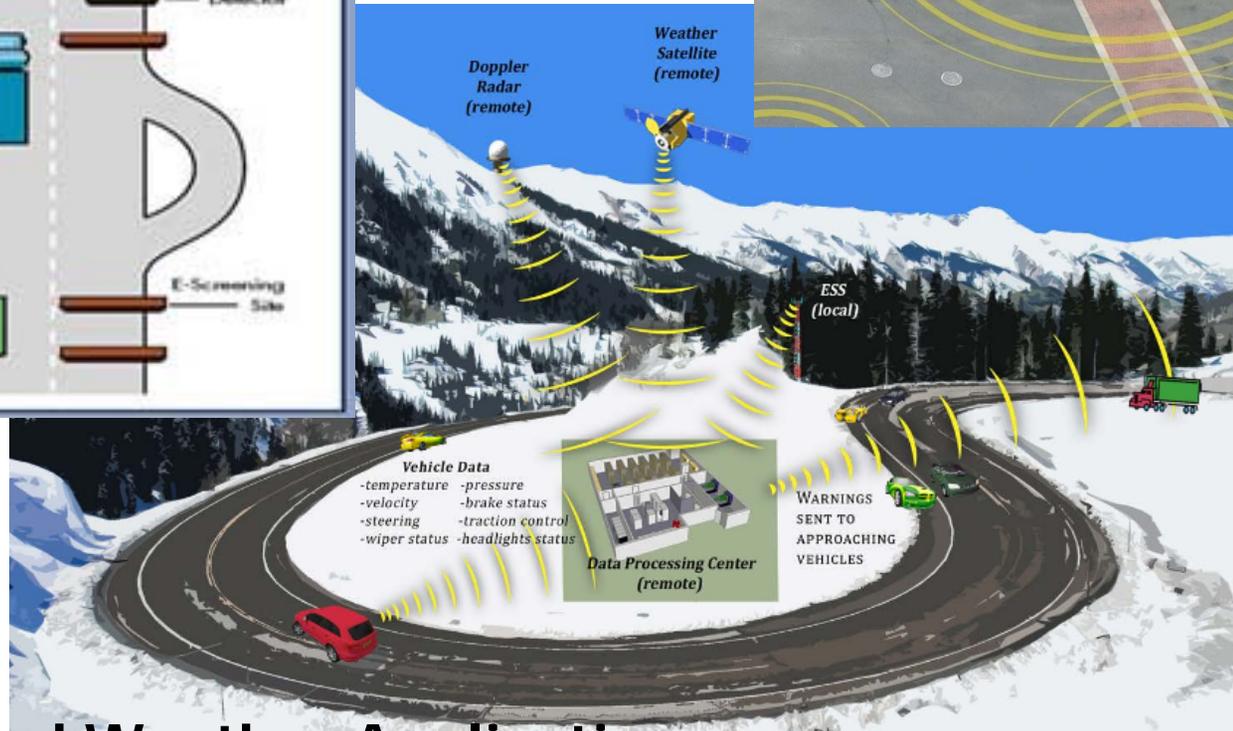
<http://www.vt.edu/spotlight/innovation/2015-08-31-beacon/safetyvests.html>

Example Mobility Applications

Smart Roadside (Freight)



TSP



Road Weather Application



EXAMPLE MOBILITY APPLICATIONS

➤ Advanced Traveler Information System

- Use CV data feeds to enhance existing 511 data feeds.
- Leverage existing dissemination platforms and users.
- Take corridor level traveler information to the next level with discrete personalized traveler info.
- Enhance multimodal traveler information and capabilities on 511.

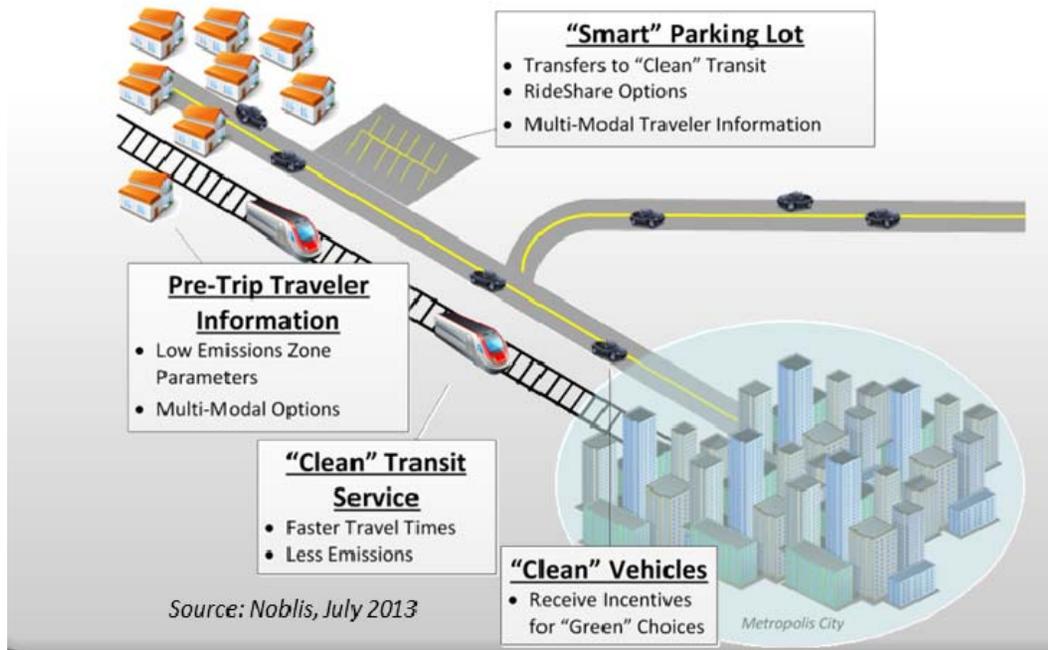


Your Bay Area travel guide.

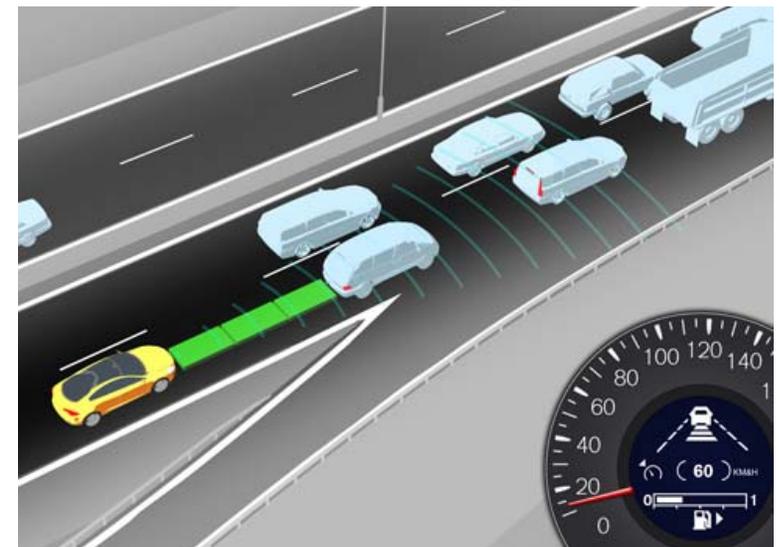


Example Environmental Applications

Low Emission Zone Strategies



Cooperative Adaptive Cruise Control Systems



Connected Vehicles Signal Phase and Timing (SPaT)



SF Bay Area Outreach (Nov 2014 - Feb 2015)

➤ Conducted Stakeholder Workshops

- South Bay
 - ✓ VTA, City of San Jose, C/CAG, City of Santa Clara, Santa Clara County, Prospect Silicon Valley
- San Francisco
 - ✓ SFCTA, SFMTA, SF City, SamTrans, Nissan
- East Bay
 - ✓ ACTC, ACT, PATH, CT HQ, CT D4

➤ Interviewed 15 Vendors



Deployment Scenario Concepts

➤ The concepts:

– Freeway & Arterial Operations

– *Congestion, travel delay and geographical constraints*

– Personal Mobility & Transit Performance

– *Increased pedestrian, transit, ridesharing, and bicycle use*

– *Mode shift to transit*

– Freight Advanced Traveler Information Systems

– *Increased freight movement, gridlocked conditions*



Freeway & Arterial Integrated Operations

➤ Potential CV applications

- Eco-Lanes Management
- Eco-Speed Harmonization
- Eco-Traveler Information
- Eco-Ramp Metering
- Dynamic Eco-Routing
- Eco-ICM Decision Support System
- Advanced Traveler Information System
- Dynamic Speed Harmonization (SPD-HARM)
- Queue Warning (Q-WARN)
- Electronic Tolling
- Vehicle-occupancy Detection
- *Signal Priority (Transit)
- *Intelligent Traffic Signal System (I-SIG)
- *Emergency Vehicle Preemption (PREEMPT)

*Indicates part of Multi-Modal Intelligent Traffic Signal Systems (MMITSS) applications bundle



Personal Connected Mobility and Transit Performance

➤ Potential CV applications

- Eco-Traveler Information
 - Eco-Ramp Metering
 - Dynamic Eco-Routing
 - Eco-ICM Decision Support System
 - Advanced Traveler Information System
 - *Transit signal priority (TSP)
 - Ped/bike safety applications
 - *Mobile Accessible Pedestrian Signal System (PED-SIG)
 - Connection Protection (T-CONNECT)
 - Dynamic Transit Operations (T-DISP)
 - Dynamic Ridesharing (D-RIDE)
 - Personal trip planning
- *Indicates part of Multi-Modal Intelligent Traffic Signal Systems (MMITSS) applications bundle



Freight Advanced Traveler Information System (FRATIS)

➤ Potential CV applications

- Freight Advanced Traveler Information System
- *Freight Signal Priority (FSP)
- Dynamic Scheduling
- Smart Truck Parking (Smart Roadside Initiative – SRI)

*Indicates part of Multi-Modal Intelligent Traffic Signal Systems (MMITSS) applications bundle



SF BAY AREA NEEDS

- Heavy Traffic Congestion
 - Transit Reliability
 - Enhanced Transit Connection Protection
 - Enhanced Traveler Information
 - Pedestrian-Transit Conflicts
 - Transit Schedule Flexing
 - Park and Ride Info
 - Emissions/Air Quality Hot Spots
- WHAT WE HEARD*
- congestion
 - Special Events Needs
 - Adaptive Ramp Meters
 - Adaptive Signals
 - Enhanced ridership information
 - Commercial Vehicle Parking
 - Transit Left turn assist
 - Need to capture better data



➤ ~~Wasted Fuel from Traffic~~

CV Pilot Deployment Program Goals

The infographic is divided into three main columns, each with a header and three sub-sections. The first column, 'Spur Early CV Tech Deployment', includes 'Wirelessly Connected Vehicles' (cars with signal waves), 'Mobile Devices' (a person using a smartphone), and 'Infrastructure' (a building with a globe icon). The second column, 'Measure Deployment Benefits', includes 'Safety' (a speed limit sign for 35 and a construction zone), 'Mobility' (a bus at a stop), and 'Environment' (cars with a recycling symbol). The third column, 'Resolve Deployment Issues', includes 'Technical' (a hand pointing to an 'ERROR' message on a tablet), 'Institutional' (a hand signing a document), and 'Financial' (money and a piggy bank).

Spur Early CV Tech Deployment

- Wirelessly Connected Vehicles
- Mobile Devices
- Infrastructure

Measure Deployment Benefits

- Safety
- Mobility
- Environment

Resolve Deployment Issues

- Technical
- Institutional
- Financial



➤ #1 Priority for USDOT in 2015-2019 ITS Strategic Research Plan

V2I Deployment Coalition

– Top Issues

1. V2X Applications
2. Alternate Communications to DSRC
3. Data Business Models
4. Patents-Intellectual Property
5. Security
6. V2I Outreach



V2I Deployment Coalition

– Top Issues (cont.)

- 7. Business Model for V2I Deployment**
- 8. V2I Standards**
- 9. Understanding V2I Liability Assignment**
- 10. V2I Synergies with other Emerging Technologies**
- 11. V2I Consumer Messaging**
- 12. V2I Multimodal Applications**



CONNECTED VEHICLE DEPLOYMENT GOALS

- **Addresses Regional Needs**
- **Scalable Over Multiple Locations**
 - Building from existing CA Affiliated CV Test Bed and facilities
 - Allows for refinement based on needs, assets and resources available
- **Leverage Existing Assets**
 - Communications (DSRC, fiber, cellular, WiFi, etc.)
 - Connected Vehicle Technology
- **Multimodal Opportunities**
 - Auto / Commuters
 - Transit Vehicles and Passengers
 - Pedestrians
 - Bicyclists
 - Freight and Commercial Vehicles (including Taxis/TNCs)



Local CV Deployment Discussion

- Needs?
- Challenges?
- Benefits?
- Barriers?



Thank you!



For More Information
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