Transportation Initiative

Vehicle Infrastructure Integration (VII)

Background and Recent Development

UDSOT 9 Initiatives 2004

Safety
- Integrated Vehicle Based Safety Systems
- Cooperative Intersection Collision Avoidance System
- Next Generation 9-1-1

Mobility
- Integrated Corridor Management Systems
- Mobility Services for All Americans
- Clarus
- Emergency Transportation Operations

Global Connectivity
- Universal Freight Manifest

Cross Cutting: Vehicle Infrastructure Integration

Clarus: Demonstration of a regional road weather observational data management and forecasting system
Convergence of Technology
Vehicle Infrastructure Integration (VII)

- Satellite to Vehicle GPS
- Vehicle to Vehicle DSRC
- Communication Hot Spot (WIFI) Vehicle to Celluar
- Vehicle to Roadside DSRC
- Traffic Management Center (TMC)
- Telematics Service Providers
- Private Sector Uses

DSRC=Automotive Safety Radio – High Availability – Low Latency

DSRC

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<th>Frequency - GHz</th>
<th>5.470</th>
<th>5.825</th>
<th>5.850</th>
<th>5.925</th>
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<td>Unlicensed UNII-WiFi WiMax</td>
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<td>DSRC</td>
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<td>172 174 176 178 180 182 184</td>
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<td>5.855 5.866 5.875 5.885 5.895 5.905 5.915</td>
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<td>Optional 20 MHz</td>
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<td>Control</td>
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</table>

*High Availability and Low Latency
Example Applications

- Pedestrian detection
- Collision warning
- Driving assistance

VII Use Cases

- Functional Wants were translated to 113 Use Cases
- VII applications will deliver functions and services in the following key areas:
  - Highway Safety
  - Vehicular Mobility
  - Consumer convenience
  - Public and private enterprise
- Let us look at more…
VII Use Cases

- 113 total Use Cases
  - 29 ranked High
    - 22 Safety, 7 Mobility
  - 28 ranked Medium
    - 16 Safety, 7 Mobility, 5 Other
  - 53 ranked Low
    - 14 Safety, 5 Mobility, 32 Other
    - 2 Not understood

Highway Safety

- Cooperative vehicle interaction with roadway environment to mitigate deaths, injuries and property damage
- Reduce vehicle related deaths
  - Currently 42,000 per year
- Primary approach
  - Intersection cooperation
  - Lane / road departure
  - Vehicle-to-vehicle cooperation
Safety Use Cases I

- Intersection collision avoidance
- Traffic signal violation warning
- Stop sign movement assistant
- Stop sign violation warning
- Highway-rail intersection safety
- In-vehicle signing
- Road condition warning

Safety Use Cases II

- Lane change/departure Warning
- Curve overspeed/rollover warning
- Work Zone Warning
- Commercial vehicle electronic clearance
- Commercial vehicle safety data
- Approaching Emergency Vehicle Warning
- Emergency vehicle ahead
Safety Use Cases III

- SOS services
- Crash data to public service answering Point
- Post-crash warning
- Vehicle-based road condition warning
- Vehicle probes for surface conditions data
- Vehicle probes provide weather data
- Vehicle-to-Vehicle road feature notification

Vehicle Mobility

- Cooperative information sharing to improve traffic flow and enhance driving experience
- Approach: Aggregate real-time probe data into map database and use to:
  - Provide driver advisories
  - Roadway incident observation and mitigation
  - Observe and monitor roadway conditions
  - Optimize signal phasing
Mobility Use Cases I

- Vehicles as traffic probes
- Incident information to vehicles
- Travel time data to vehicles
- Electronic payment
- Enhanced route guidance and navigation
- Crash data to TOC
- Origin and Destination (OD) data to TOC

Mobility Use Cases II

- In-vehicle Signage
- In-vehicle Travel Information
- En-route Alerts
- Traffic Advisories
- Navigation Assistance
- Weather Alert Notifications
- Icy Bridges Warnings
Mobility Use Cases III

- Roadway Incidence Assistance
- Full Assistance with Driver Vigilance
- Assisted Lateral Control
- Cooperative Adaptive Cruise Control
- Vehicle-Hwy Automation System
- ROW Planning
- Intersection Reservation
- Gap Creation for Merging

Mobility Use Cases IV

- Highway Infrastructure Planning
- Dynamic Int Control/Signal Timing
- Ramp Metering
- Congestion Maps
- Dynamic Routing
- Queue Management
- Individualized Traffic Flow Encouragement
- Intelligent Speed Advisory and Control
- VII-Enhanced Work Zone Operation
Mobility Use Cases V

- Incident observation and mitigation
- Emergency response / Evacuation
- Transit coordination
- Community Transit
- Dual Mode Automated Bus
- Dedicated Truckway or Busway
- Trucking Capacity Mgt and Dynamic Routing
- Hazardous material path enforcement
- Cargo management

Customer & Commercial

- Wireless communication enhances driving convenience, entertainment, and business opportunities
  - Can use but does not require Dedicated Short Range Communications (DSRC)
  - Enhances mobility services when sharing DSRC network
  - Media or data file downloads
  - Information services
  - Enterprise interaction with fleet
Customer Use Cases

- Parking Location Assistance
- Parking Access (security / payment)
- Food Drive-Through Payment
- Roadway Toll Payment
- Concierge Assistance
- Appointment Confirmation / Changes
- Download Data Files (MP3, games)
- Home Network Content Synchronization

Commerical Use Cases

- Software / Firmware Updates
- Remote Control
- Secure Access
- Just-In-Time Repair Notification
- Safety Recall Notification
- Remote Diagnostics
- Customer Relations Management
- Fleet Management
Who Lead VII?

- Working group in place.
- USDOT, AASHTO, auto companies
- 110 public and private use cases developed.
- Preliminary architecture defined.
- Standards nearing completion.
- DSRC prototype development underway.
6 Tracks of the Initiative

- Track 1: Technical Implementation
- Track 2: DSRC Prototype
- Track 3: Business Planning
- Track 4: Policy
- Track 5: Outreach
- Track 6: Test Program

Participating States

- California
- Idaho
- Indiana
- Minnesota
- New York
- Utah
- Washington
- Virginia
- Maryland
- Michigan

Mass Highway has not been part of it yet!

AASHTO – American Association of State Highway and Transportation Officials
Timeline

VII PROGRAM PLAN

For More Information

- VII @ USDOT
- VII @ ITSA
  - http://www.itsa.org/vii_meeting.html