DSRC: An International Perspective

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Research & Development

RadComms08
Australian Communications and Media Authority
May 2nd, 2008
Europe and Japan suffer similar fatality numbers

Source: U.S. DOT, National Transportation Statistics 2006
Vehicle Safety – Autonomous Sensors

- Long range radar/lidar
- Front/Rear vision
- Front/Rear short range radar/lidar
- Side short-range radar/vision
- Side mid-range radar/vision
Vehicle Safety – Wireless Communication

V2V with GPS is a new type of all-around object detection sensor

- Reduced cost and complexity
- Extended range up to 300 meters
- Immune to false alarms and extreme weather conditions
- Enables new types of driver assistance features
GM North American Activities

Vehicle to Vehicle Communication (V2V)
- Fleet of 6 communicating vehicles
- Demonstration platform for DSRC-based active safety features
- Public demonstrations in more than 10 U.S. cities

Wireless Transceiver Devices
- Standalone Active, Passive and Personal devices
GM European Activities

Vehicle to Vehicle / Infrastructure Communication (V2X)

- Fleet of 4 communicating vehicles
- Demonstration platform for DSRC-based active safety features
- Public demonstrations in 8 European countries
GM V2X Applications

- Slow/Stopped Vehicle Ahead
- Emergency Electronic Brake Lamp
- Forward Collision Warning/Rear-end CHMSL
- Blind Spot/Lane Change
- Approaching Emergency Vehicle Warning
- Intersection Collision Warning/Avoidance
  - Straight Crossing Path (SCP)
- Work Zone Warning
- Visibility Enhancement (Pedestrians / Cyclists)
GM V2X Applications – Video
Crash Avoidance Metrics Partnership (CAMP) CICAS-V

- Cooperative Intersection Collision Avoidance System
  - Warns drivers of crash risk resulting from traffic signal and stop sign violations
  - 4 year project (December 2006 to June 2010)
Crash Avoidance Metrics Partnership (CAMP) VSC-A

- Vehicle Safety Communications – Applications
- Interoperable and scalable architectures that enable future deployment.
- Emphasis on resolving current communication and positioning issues
- 3 year project (December 2006 to November 2009)

- Emergency Electronic Brake Light
- Forward Collision Warning
- Intersection Movement Assist
- Blind Spot / Lane Change Warning
- Do-Not-Pass Warning
- Control Loss Warning
North American Activities – VII-C

Vehicle Infrastructure Initiative Consortium (VII-C)

- Founded in 2004
- Proof of Concept and Technical Viability Assessment during 2008
- Public / Private Applications
  - Traveler Information
  - Ramp Metering
  - In-Vehicle Signage
  - Parking / Tolling Payments

Safetrip-21

- Restructuring of VII program
- Demonstration of safety and congestion-reducing technologies which will be launched at the 2008 ITS World Congress
- System will be integrated into other test locations

Request for Information issued by U.S. government on April 4th, 2008

- Seeks potential business models for achieving VII
**European Activities**

**Car 2 Car Communication Consortium**

**Goal:** To standardize wireless interfaces and protocols between vehicles to enable interoperability between vehicles of different manufacturers and interoperability with road-side units.

Membership includes 8 vehicle manufacturers (including Opel).

Developing architecture to support 6 application classes:
- Vehicle-to-Vehicle Cooperative Collision Warning
- Vehicle-to-Vehicle Unicast Urgent Exchange
- Vehicle-to-Vehicle Decentralized Road Feature Notification
- In-vehicle Signage from Roadside Unit
- Secure Local Roadside Unit Connection
- Secure Internet Protocol Roadside Unit Connection

Major demonstration event in late 2008.
IEEE Standards – Current Status

• 1609.1-.4: Passed as ‘Trial Use’ standard in March 2007
  - Trial Use 1609.1-.4 standards are currently soliciting technical comments
  - Ballot of ‘Full Use’ standards will be occur between July 2008-Mar 2009. If passed, it will be formally ratified as IEEE ‘Full Use’ standard.

• IEEE 802.11p: Letter Ballot ongoing as of March 2008
  - Subject to the broader approval of the IEEE LAN/MAN subcommittee
SAE Standards – Current Status

SAE J2735: Dedicated Short Range Communications (DSRC)
Message Set Dictionary

<table>
<thead>
<tr>
<th>(I): Periodic Heartbeat Message (required)</th>
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<tbody>
<tr>
<td>(II): Variable Rate Message (optional)</td>
</tr>
<tr>
<td>a. Event Notifications</td>
</tr>
<tr>
<td>b. Vehicle Trail</td>
</tr>
<tr>
<td>c. Vehicle Path Prediction</td>
</tr>
<tr>
<td>d. Raw GPS</td>
</tr>
<tr>
<td>(III): Proprietary (optional)</td>
</tr>
</tbody>
</table>

- VSC-A actively involved in standard development regularly attend SAE meetings
- VSC-A is working with SAE DSRC Committee members to:
  - Ballot the next revision
  - Improve standard for trial testing
Staged Deployment Strategy

Deployment could be accelerated through:

- Federal Incentive (NCAP) / Federal Mandate
- Add-on Devices
- Partnership
### DSRC Spectrum Allocations

<table>
<thead>
<tr>
<th>Frequency (MHz)</th>
<th>ITU -R</th>
<th>Europe</th>
<th>North America</th>
<th>Japan</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>5,725</td>
<td>5,795</td>
<td>715</td>
<td>715</td>
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<tr>
<td>ISM Band</td>
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<td></td>
<td>5,815</td>
<td>725</td>
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<td>5,800</td>
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<tr>
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<td>5,905</td>
<td>5,925</td>
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<tr>
<td></td>
<td></td>
<td>(Allocated)</td>
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<tr>
<td></td>
<td></td>
<td>(Requested by ETSI*)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(To be allocated)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*ETSI Technical Reports TR 102 492-1, 2

Allocation of spectrum around 5.9 GHz will assist automakers in global deployment of DSRC systems.
Thank You!

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Australian Communications and Media Authority
May 2nd, 2008
Backup
IEEE Standards

• IEEE 1609.1: WAVE Resource Manager
  – Defines Resource Manager Application
    • Application data read/write protocol between RSU and OBU
    • First application available for testing purposes

• IEEE 1609.2: WAVE Security Services
  – Defines 5.9 GHz DSRC Security (formerly IEEE 1556)
    • Anonymity, Authenticity and Confidentiality

• IEEE 1609.3: WAVE Networking Services
  – Provides description and management of the DSRC Protocol Stack
    • Application interfaces
    • Network configuration management
    • WAVE Short Message (WSM) transmission and reception
IEEE Standards

- **IEEE 1609.4: WAVE Multi-Channel Operation**
  - Provides DSRC frequency band coordination and management
    - Manages Lower Layer usage of the seven DSRC channels
    - Integrates tightly with IEEE 802.11p

- **IEEE 802.11p: Wireless LAN Medium Access Control (MAC) and physical layer (PHY) specifications: Wireless Access in Vehicular Environments (WAVE)**
  - Defines the Lower Layers of the communications stack
    - Radio wave forms and wireless medium access procedures
Certification

Background

• OmniAir Consortium established in 2003 to enable the national deployment of interoperable 5.9GHz DSRC systems
• Member-defined certification program
• Provides for testing of hardware, protocol stack and over-the-air messages

Benefits

• Provides assurance for new technology
• Increased confidence in procurements
• Enables multi-supplier environment