Enabling V2I-based Rural Applications – Part 2

Jeff Brummond
Principal Systems Architect
Iteris, Inc.
703-925-3813
jab@iteris.com
Changing Landscape

- Federal VII Initiative overhaul
- Highway Trust Fund being depleted
- Initial idea of a big centralized VII network has been nixed
- Islands of VII coverage
- Multiple open standardized protocols
- V2V applications pulling ahead of V2I
- DSRC 5.9GHz still moving forward
What does this mean to Rural VII Applications?

- VII rural environment analysis
  - Avoided Long-Range Communications between Vehicles and Remote Service Providers
  - Localized
  - Isolated
  - Traveler Safety and Security Focus
  - Limited/No Command and Control

- Further Analyzed FHWA List of VII Use Cases and SAE J2735
Potential VII Changes in National ITS Architecture

- **Version 6.1**
  - Refine to better support VII
    - Clarify Communications Options
      - Evolution in communications to more inclusive framework
      - Better aligns with National ITS Architecture
      - Architecture updates to refine broader range of vehicle communications options
  - Improve Additional VII Applications Support
    - Use cases beyond Day 1
Proposed Support for Communications

* Rename for Version 6.1. Was: “Dedicated Short Range Communications”
Additional VII Applications

- 93 VII Use Cases analyzed
  - Covered by ITS User Services
    - 75 VII Use Cases
  - 18 VII Use Cases
    - Private services
    - Beyond User Service scope of architecture

- 75 VII Use Case candidates
  - Compared to National Architecture Definition
  - Changes identified
    - Highest priority changes: those with merit regardless of VII Program direction
      - Primarily changes addressing inconsistencies or gaps in existing architecture definition
Additional VII Applications

- 32 VII Use Case prioritized for Version 6.1

<table>
<thead>
<tr>
<th>Use Case</th>
<th>Description</th>
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<tbody>
<tr>
<td>HS-01</td>
<td>Access Control</td>
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<tr>
<td>HS-10</td>
<td>Pedestrian Crossing Information at Designated Intersections</td>
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<td>HS-16</td>
<td>Limited Height Warning</td>
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<tr>
<td>HS-16</td>
<td>Limited Height Warning</td>
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<tr>
<td>IP-07</td>
<td>Hazardous Material Cargo Tracking</td>
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<td>IP-15</td>
<td>Dynamic Interactive Emissions Tests</td>
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<td>IP-16</td>
<td>Emergency Vehicle Initiated Traffic Pattern Change</td>
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<td>IP-31</td>
<td>Origin &amp; Destination (OD) Data to TOC</td>
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<tr>
<td>IP-44</td>
<td>Electronic Payments</td>
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<tr>
<td>IP-45</td>
<td>Concierge Services</td>
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<tr>
<td>IP-48</td>
<td>Interactive Emission Testing/Reporting</td>
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<td>IP-55</td>
<td>Parking Spot Locator</td>
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<tr>
<td>PD-06</td>
<td>Enhanced Route Guidance, Navigation and Traffic Information</td>
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<tr>
<td>PD-22</td>
<td>Traffic Management</td>
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## Additional V2I Applications

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>PT-01</td>
<td>Gap Assistance for Merging</td>
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<tr>
<td>RF-01</td>
<td>Stop Sign Violation Warning</td>
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<tr>
<td>VI-03</td>
<td>Highway/Rail Collision Warning</td>
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<td>VI-04</td>
<td>Intersection Collision Warning</td>
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<td>VI-07</td>
<td>Traffic Signal Violation Warning</td>
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<td>VI-08</td>
<td>Transit Vehicle Priority at Traffic Signal</td>
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<tr>
<td>VI-12</td>
<td>Intelligent Traffic Flow Control - Vehicle Occupant count</td>
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<tr>
<td>VI-13</td>
<td>Speed Limit Assistant</td>
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<tr>
<td>VI-14</td>
<td>Wrong Way Driver Warning</td>
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<tr>
<td>VI-15</td>
<td>Icy Bridge Warning and More Generally, Weather Information</td>
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<tr>
<td>VI-18</td>
<td>Commercial Vehicle Advisory</td>
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<tr>
<td>VI-21</td>
<td>Mainline Screening</td>
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<tr>
<td>VI-23</td>
<td>Transit Vehicle Refueling Management</td>
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<tr>
<td>VV-03</td>
<td>Cooperative Adaptive Cruise Control (ACC)</td>
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<tr>
<td>VV-04</td>
<td>Cooperative Forward Collision Warning</td>
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<td>VV-10</td>
<td>Emergency Vehicle at Scene Warning</td>
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<td>VV-14</td>
<td>Left turn assistant</td>
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<td>VV-18</td>
<td>Road Condition Warning to Other Vehicles</td>
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<tr>
<td>VV-19</td>
<td>Stop Sign Movement Assistance</td>
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</tbody>
</table>
What about Rural VII Applications?

- **Road Safety (Vehicle to Roadside to Vehicle)**
  - Limited Height Warning
    - Low Bridge – Alternative Routing
  - Access Control
    - Gates
    - Commercial Vehicle Clearance
    - Border Crossing
- Weigh Station Clearance
- Highway / Rail Collision Warning
- Incident Notification via Relay
- Work Zone Information
What about Rural VII Applications?

- Road Safety (Vehicle to Roadside to Vehicle)
  - Curve Speed Warning (Rollover Warning)
  - Stop Sign Violation Warning
  - Intersection Collision Warning
  - Traffic Signal Violation Warning
  - Speed Limit Assistant
  - Wrong Way Driver Warning
  - Weather Information (Icy Bridge)
  - Lane Departure Warning (internal to vehicle)
What about Rural VII Applications?

- Road Safety (Vehicle to Vehicle)
  - Visibility Enhancer
  - Cooperative Forward Collision Warning
  - Cooperative Glare Reduction
  - Emergency Electronic Brake Warning
  - Emergency Vehicle Approaching Warning
What about Rural VII Applications?

- Road Safety (Vehicle to Vehicle)
  - Lane Change Warning
  - Post Crash Incident Warning
  - Pre-Crash Sensing
  - Road Condition Warning to Other Vehicles
  - Incident Notification via Relay
What about Rural VII Applications?

- Others (not part of identified 93 use cases)
  - Wildlife Crossing Information / Warning
  - Passing Vehicles on Two Lane Road
  - Approaching Top of Single Lane Hill
  - ...

Challenges

- US could become more like the ISO (European) CALM (Communications Access for Land Mobiles) framework
  - Media Independent Handover (MIH)
    - Cellular
    - DSRC
    - InfraRed
    - Microwave
    - Mobile Wireless Broadband
    - etc

- However, No US effort to replicate/utilize CALM framework

- Other technologies (i.e., mesh networks)
Challenges

- Automotive OEMs create their own “VII” networks working with their fleet (like GM’s OnStar)
- Interoperability?
- Security?
- How do applications get to the vehicle?
- Can we have a decentralized approach?
Thank You!

Contact Info:

Jeff Brummond
Principal Systems Architect
Iteris, Inc.
703-925-3813
jab@iteris.com