Example CV Pilot Deployment Concepts: Downtown Sunnyside
Downtown Sunnyside

Sunnyside’s central business district:
- Busy signalized network in Southern U.S.
- Complex, congested intersections
- Limited parking options
- Transit corridor
- High pedestrian traffic
- Poor localized “hot spot” air quality
Stakeholders Convene and Identify Key Transportation Challenges

- **Mobility**
  - Heavy congestion at peak times
  - Transit vehicles schedule reliability

- **Safety**
  - Pedestrian-vehicle conflicts
  - Crashes in unprotected left hand turns

- **Environment**
  - Emissions/Air Quality hot spots
  - Poor progression results in wasted fuel
## Stakeholder Set Three Key Improvement Targets

<table>
<thead>
<tr>
<th>Goal</th>
<th>Performance Measure</th>
<th>Performance Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase transit reliability</td>
<td>Transit schedule adherence</td>
<td>Transit vehicles on schedule 90% of the time</td>
</tr>
<tr>
<td>Improve pedestrian safety</td>
<td>Pedestrian-vehicle conflicts</td>
<td>Reduce pedestrian-vehicle conflicts by 50%</td>
</tr>
<tr>
<td>Improve hot spot air quality</td>
<td>Emissions</td>
<td>Reduce emissions by 20%</td>
</tr>
</tbody>
</table>
# Applications Considered for Improving Transit Reliability

## V2I Safety
- Red Light Violation Warning
- Curve Speed Gap Warning
- Stop Sign Gap Assist
- Spot Weather Impact Warning
- Reduced Speed/Work Zone Warning
- Pedestrian in Signalized Crosswalk Warning (Transit)

## V2V Safety
- Emergency Electronic Brake Lights (EEBL)
- Forward Collision Warning (FCW)
- Intersection Movement Assist (IMA)
- Left Turn Assist (LTA)
- Blind Spot/Lane Change Warning (BSW/LCW)
- Do Not Pass Warning (DNPW)
- Vehicle Turning Right in Front of Bus Warning (Transit)

## Environment
- Eco-Approach and Departure at Signalized Intersections
- Eco-Traffic Signal Timing
- Eco-Traffic Signal Priority
- Connected Eco-Driving
- Wireless Inductive/Resonance Charging
- Eco-Lanes Management
- Eco-Cruise Control
- Eco-Advanced Cruise Control
- Eco-Adaptive Cruise Control
- Eco-Signal Priority
- Queue Warning (Q-WARN)
- Low Emissions Zone Management
- AFV Charging / Fueling Information
- Eco-Smart Parking
- Dynamic Eco-Routing (light vehicle, transit, freight)
- Eco-ICM Decision Support System
- Eco-Approach and Departure at Signalized Intersections
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- Eco-ICM Decision Support System

## Mobility
- Advanced Traveler Information System
- Intelligent Traffic Signal System (I-SIG)
- Signal Priority (transit, freight)
- Mobile Accessible Pedestrian Signal System (PED-SIG)
- Emergency Vehicle Preemption (PREEMPT)
- Dynamic Speed Harmonization (SPD-HARM)
- Queue Warning (Q-WARN)
- Cooperative Adaptive Cruise Control (CACC)
- Incident Scene Pre-Arrival Staging Guidance for Emergency Responders (RESP-STG)
- Incident Scene Work Zone Alerts for Drivers and Workers (INC-ZONE)
- Emergency Communications and Evacuation (EVAC)
- Connection Protection (T-CONNECT)
- Dynamic Transit Operations (T-DISP)
- Dynamic Ridesharing (D-RIDE)
- Freight-Specific Dynamic Travel Planning and Performance
- Drayage Optimization

## Agency Data
- Probe-based Pavement Maintenance
- Probe-enabled Traffic Monitoring
- Vehicle Classification-based Traffic Studies
- CV-enabled Turning Movement & Intersection Analysis
- CV-enabled Origin-Destination Studies
- Work Zone Traveler Information

## Smart Roadside
- Wireless Inspection
- Smart Truck Parking

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# Applications Considered for Improving Pedestrian Safety

## V2I Safety
- Red Light Violation Warning
- Curve Speed Gap Warning
- Stop Sign Gap Assist
- Spot Weather Impact Warning
- Reduced Speed/Work Zone Warning

### Pedestrian in Signalized Crosswalk Warning (Transit)

## V2V Safety
- Emergency Electronic Brake Lights (EEBL)
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- Intersection Movement Assist (IMA)
- Left Turn Assist (LTA)
- Blind Spot/Lane Change Warning (BSW/LCW)
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- Vehicle Turning Right in Front of Bus Warning (Transit)

## Environment
- Eco-Approach and Departure at Signalized Intersections
- Eco-Traffic Signal Timing
- Eco-Speed Harmonization
- Low Emissions Zone Management
- AFV Charging / Fueling Information
- Eco-Smart Parking
- Dynamic Eco-Routing (light vehicle, transit, freight)
- Eco-ICM Decision Support System

### Pedestrian Vehicle Conflicts

## Mobility
- Advanced Traveler Information System
- Intelligent Traffic Signal System (I-SIG)
- Signal Priority (transit, freight)

### Mobile Accessible Pedestrian Signal System (PED-SIG)
- Emergency Vehicle Preemption (PREEMPT)
- Dynamic Speed Harmonization (SPD-HARM)
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## Environment
- Eco-Approach and Departure at Signalized Intersections
- Eco-Traffic Signal Timing
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### Applications Considered for Improving the Environment

#### V2I Safety
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#### Environment
- **Eco-Approach and Departure at Signalized Intersections**
- **Eco-Traffic Signal Timing**
  - Eco-Traffic Signal Priority
  - Connected Eco-Driving
  - Wireless Inductive/Resonance Charging
  - Eco-Lanes Management
  - Eco-Speed Harmonization
  - Eco-Cooperative Adaptive Cruise Control
  - Eco-Traveler Information
  - Eco-Ramp Metering
  - Low Emissions Zone Management
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#### Mobility
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Connected Vehicle Applications Selected in Performance-Driven Approach

**Improve Transit Reliability**
- Connection Protection (T-CONNECT)
- Transit Signal Priority

**Improve Pedestrian Safety**
- Mobile Accessible Pedestrian Signal System (PED-SIG)
- Pedestrian in Signalized Crosswalk Warning
- Intersection Movement Assist (IMA)

**Improve Hot Spot Air Quality**
- Eco-Approach and Departure at Signalized Intersections
- Eco-Traffic Signal Timing
Projected Synergies and Impacts from Transit Applications in the Deployment Concept

Projected Impacts:
- Fewer missed transit connections
- Transit vehicles on schedule 90% of the time; better transit reliability
- Reduced emissions from transit vehicles
- Higher transit ridership

Addition of Transit Apps
- Connection Protection (T-CONNECT)
- Transit Signal Priority
Projected Synergies and Impacts from Pedestrian Safety Apps in the Deployment Concept

Projected Impacts:
- 50% decrease in pedestrian-vehicle conflicts
- Improved mobility for pedestrians and vehicles
- Reduced emissions due to better traffic flow

Addition of Pedestrian Safety Apps
- Mobile Accessible Pedestrian Signal System (PED-SIG)
- Pedestrian in Signalized Crosswalk Warning
- Intersection Movement Assist (IMA)
Projected Synergies and Impacts from Environmental Apps in the Deployment Concept

Addition of Environmental Apps

- Eco-Approach and Departure at Signalized Intersections
- Eco-Traffic Signal Timing or Intelligent Traffic Signal System (I-SIG)

Project Impacts

- 20% decrease in vehicle emissions
- Improved overall intersection throughput
- 10% reduction in vehicle delay
- Sunnyside can optimize for mobility or environment depending on need
Integrated Concept for Downtown Sunnyside

Integration of a suite of applications results in additional benefits

Messages support several applications

Information from BSM generating devices and other vehicles

Integrated data from sensors and new technologies

Messages support several applications

Information from BSM generating devices and other vehicles

Integrated data from sensors and new technologies