Applications and Data Environments Breakout Group I: Arterial Data Environment

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- Feedback materials provided in the breakout rooms
  - Application scorecards
  - 3 poker chips (for voting)
- Facilitators will brief assumptions about the data environment that applications can draw upon
- Facilitators will clarify application evaluation criteria
- Consider a set of (up to 12) IntelliDrive application concepts
  - Facilitators provide one slide that describes the application
  - Field questions and clarifying discussion
  - Individually, you rate the application (HIGH, MEDIUM, LOW) against the criteria on your scorecard
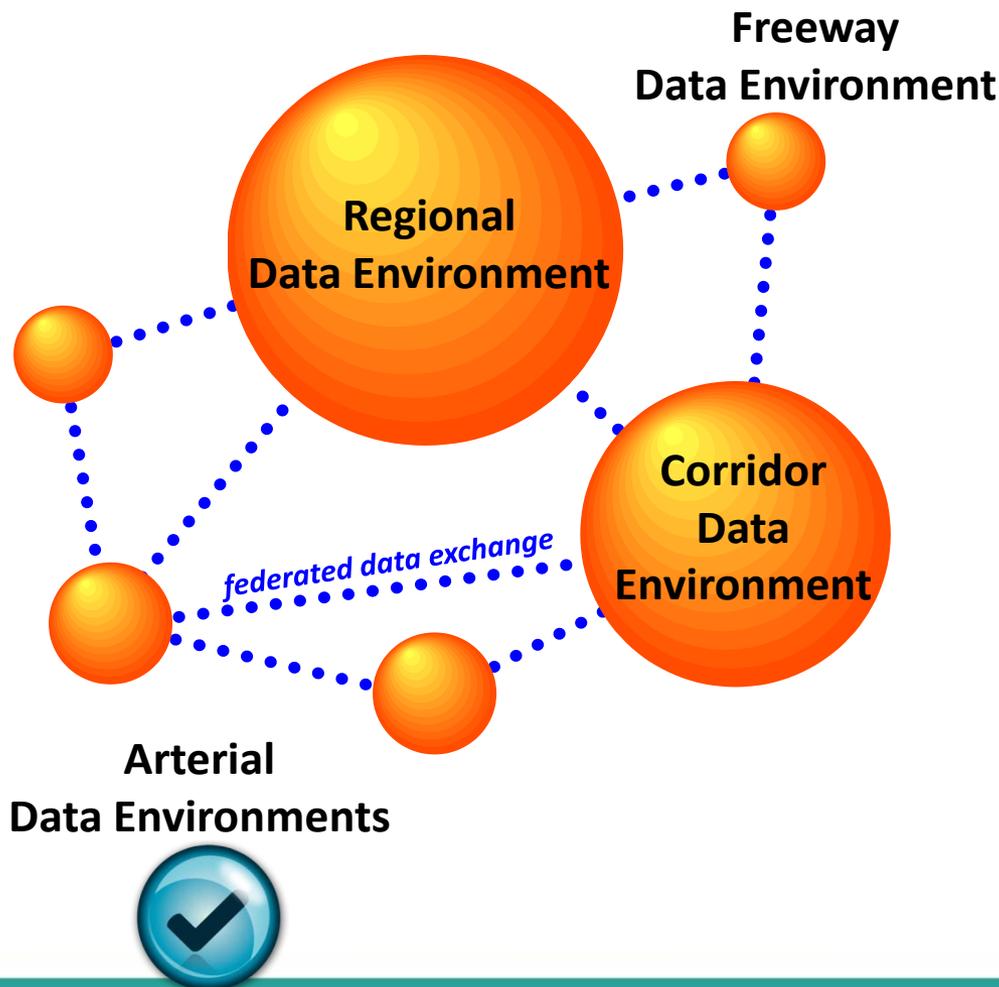
Today's Exercise (Part 2) Voting

- Once you have scored each application, each participant votes for the three most promising applications
  - "**Most promising**": strong potential for transformative impact, low deployment risk, and clear alignment with IntelliDrive program objectives
  - BLUE = 3 points (top priority)
  - RED = 2 points (second-highest priority)
  - WHITE = 1 point (third-highest priority)
  - Deposit your chips in the voting bins identified for each application (also turn in your scorecards)
- Quick break (5 minutes) to tabulate the results
- Reconvene to consider results within each breakout
  - Discuss the implications of your group process
  - Identify a presenter from your group for the breakout report at 3 PM

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Exercise Ground Rules

- For today's exercise, these items can't be changed
  - Evaluation criteria
  - Data Environment assumptions
  - Application concepts (no altering or adding new ones)
- Policy-related issues are <u>NOT in play for discussion</u>
  - Intellectual Property, Privacy, Access/Security, Meta-data, Quality, Aggregation, Standards, Financial/Business Models….
  - If these topics come up, we will park the discussion until tomorrow, when we have special session to deal with these in turn

Data Environment Assessment Scorecard Activity

Arterial Data Environment Description

IntelliDrive

Freeway Data Environment

Regional Data Environment

Corridor Data Environment

federated data exchange

Arterial Data Environments

- **Organizes multi-source data along a signalized arterial facility up to 10 miles in length**
  - Vehicles (light, transit, freight, non-motorized, public safety)
  - Mobile devices
  - Roadside/wayside infrastructure
- **Federated with related data environments**
  - Can pull in federated data to assist in local control decisions

- Single arterial facility, bi-directional in nature

- Data environment encompasses data from all approaches and intersections along the facility

- On-street metered parking allowed on some portions of the facility during specific times of day/week

- Bus-Only lanes, bike lanes and crosswalks may be present

- Significant truck and delivery vehicle traffic, some double-parking issues

- Travel demand is highly variable by time of day and day of week

- Periods of high pedestrian demand associated with events held at venues along the facility

- The facility is a designated snow emergency route and must be cleared of parked vehicles and passable during winter precipitation events
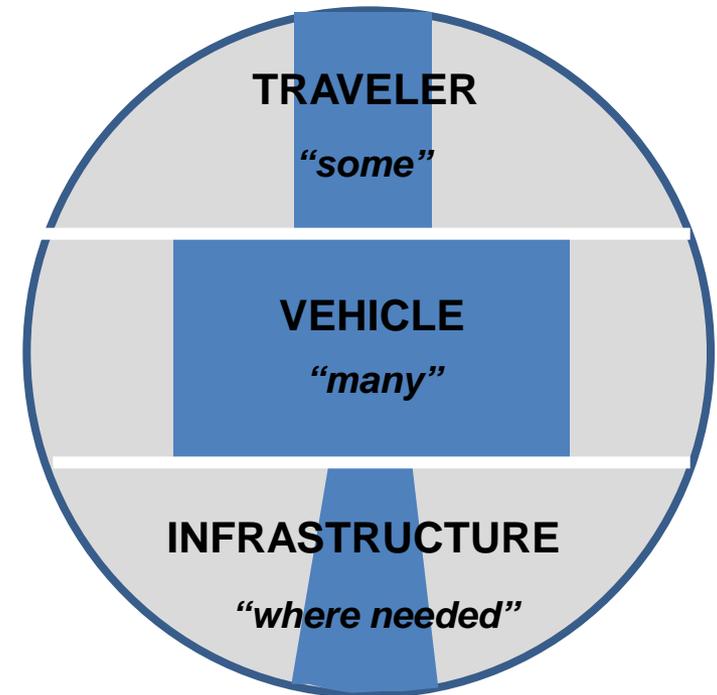
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- Nearly all travelers carry GPS-enabled mobile devices

- Some travelers opt-in to configure their mobile devices to contribute data regarding position, time and trip characteristics

- Many light vehicles opt-in to contribute data, some broadcast HIA messages

- Many transit vehicles contribute position, passenger count, and other data, some broadcast HIA

- Many freight vehicles provide data on position, credentials and other data, some broadcast HIA

- Most emergency vehicles broadcast HIA and vehicle type data

TRAVELER

"some"

VEHICLE

"many"

INFRASTRUCTURE

"where needed"

IntelliDrive
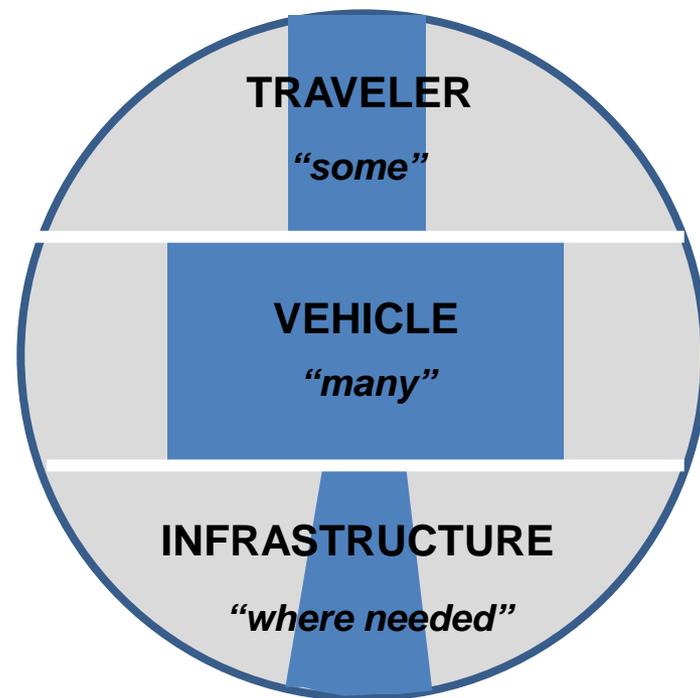
- **Road Weather sensors, loop detectors, other roadside sensors as currently deployed (2010 baseline)**

- **Many signalized intersections act as advanced intersections**

  - DSRC-capable roadside equipment for 2-way communication with enabled devices and vehicles

  - Broadcast Signal Phase and Timing (SPaT) data via DSRC

- **Some transit and curbside parking facilities provide utilization data (spaces used/remaining), every minute**

TRAVELER
"some"

VEHICLE
"many"

INFRASTRUCTURE
"where needed"

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Application Assessment Scorecard Activity

Application Evaluation Criteria

- **Next, we're going to go through application concepts that utilize data from the arterial data environment**

- **We will present each concept on a single slide**
  - You can ask clarifying questions, or offer suggestions about how data might be leveraged
  - But the concept itself cannot be altered, modified or enhanced in discussion
  - Please record notes or comments on each concept on your scorecard

- **You rate each application on three criteria (High, Medium, Low)**
  - **Potential Impact:** will this application have transformative impact?
  - **Deployment Readiness:** if we assume the data is available, can this application be developed, tested and widely deployed by 2025?
  - **Program Alignment:** does the application align with program objectives and is there a clear federal role in its development and deployment?

- **Cooperative adaptive cruise control**

- **Problem Addressed:**
  - Significantly improve throughput by increasing capacity and efficiency, and increase safety by minimizing the number of interactions between vehicles

- **Description**
  - A traffic manager sets a gap policy to form or break-up platoons of vehicles
  - Speeds are automatically adjusted by the vehicle based on communications from the traffic management center
  - *Ad hoc* or managed platoons of vehicles moving on the arterial
  - Management of gaps, flows and arrival rates
  - Systematically accounts for differing vehicle weight and performance

> **PARTICIPANTS: ON YOUR SCORECARDS, PLEASE RECORD NOTES/COMMENTS – CRITERIA RATING**

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- **Connected Eco Driving**

- **Problem Addressed:**
  - Improve fuel economy and reduce emissions by improving driver awareness of local road topography, signal status, and weather condition.

- **Description**
  - Modify vehicle operation to improve fuel economy and reduce emissions considering grade, predicted speed changes or braking, and real-time traffic
  - Adapts based on driver aggressiveness, energy/fuel consumption, brake regeneration, engine/drive torque-speed characteristics, other factors
  - Provide feedback to the driver (or electronic control signals to semi-autonomous systems) to keep the vehicle operating in target range

PARTICIPANTS: ON YOUR SCORECARDS, PLEASE RECORD NOTES/COMMENTS – CRITERIA RATING

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- **Freight Signal Priority**

- **Problem Addressed:**
  - Reduce delays and improve travel time reliability for commercial vehicles traversing signalized corridors with significant truck traffic

- **Description**
  - Give priority to freight vehicles at intersections near key facilities (ports, rail terminals, warehouses, distribution centers)
  - Signal timings may be adapted to dynamically changing commercial vehicle demand at intersections, or along the entire facility
  - Enhances safety and reduces environmental impacts on these facilities by reducing congestion and excessive idling

> **PARTICIPANTS: ON YOUR SCORECARDS, PLEASE RECORD NOTES/COMMENTS – CRITERIA RATING**

- **Mobile Accessible Pedestrian Signal System**

- **Problem Addressed:**
  - Many legacy pedestrian signals at traffic signals are not accessible to pedestrians with visual impairments, auditory systems have drawbacks

- **Description**
  - Mobile devices carried by visually impaired pedestrians receive SPaT data broadcast in signalized intersections
  - Orients intersection and crosswalk geometry, as well as intersection status
  - Mobile devices also broadcast messages to make enabled vehicles aware that a pedestrian is present in the case of blocked line-of-sight

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- **Curbside Parking Availability System**

- **Problem Addressed:**
  - Inform drivers about the availability of curbside parking, reducing congestion, emissions, and driver frustration

- **Description**
  - Monitor curbside parking availability either by using fixed sensors installed in parking meters or the road surface, or by a network of connected vehicles
  - Parking data relayed to a central manager for processing and broadcast
  - Inform travelers in real time the availability of parking spaces, the rate, type, and hours via the internet as well as mobile and in-vehicle devices

> **PARTICIPANTS: ON YOUR SCORECARDS, PLEASE RECORD NOTES/COMMENTS – CRITERIA RATING**

- **Emergency Vehicle Preemption with Proximity Warning**

- **Problem Addressed:**
  - Reduce congestion and risk of accidents for motorists and pedestrians resulting from emergency vehicles traversing multiple arterial intersections

- **Description**
  - Adjust preemption and signal recovery cycles to account for non-linear effects of multiple emergency responses
  - Broadcast proximity warnings as the vehicle traverses the facility
  - Support location-specific signage, alerts, and warnings to motorists and pedestrians of immediate emergency vehicle operations

PARTICIPANTS: ON YOUR SCORECARDS, PLEASE RECORD NOTES/COMMENTS – CRITERIA RATING

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- **IntelliDrive-Driven Traffic Signal System**

- **Problem Addressed:**
  - Improve the accuracy and timeliness of data used to control signal systems, reducing delays, costs and emissions while improving travel reliability

- **Description**
  - Utilize data from vehicles to accurately predict lane-specific platoon flow, platoon size, and other traffic characteristics
  - Reduce time and cost barriers to updating traffic signal timings, both periodic and real-time updates
  - Consider (freight/transit/light) vehicle mix in signal timing plans

PARTICIPANTS: ON YOUR SCORECARDS, PLEASE RECORD NOTES/COMMENTS – CRITERIA RATING

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IntelliDrive℠

- **Adaptive Speed Control for Efficient Traversal of Intersections**

- **Problem Addressed:**
  - Address under-utilization of the space-time resource within an intersection, reducing delays and improving emissions

- **Description**
  - Vehicles with adaptive cruise control coordinate with intersections
  - Each vehicle is assigned just the amount of space-time needed within the intersection to enable safe passage by an intersection manager agent
  - Target vehicle speeds through the intersection managed by an in-vehicle driver agent, although the driver may over-ride

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- **General Road User Traffic Signal Priority**

- **Problem Addressed:**
  - Give priority to general road users at urban intersections for a fee, resulting in reduced delays and increased travel time reliability

- **Description**
  - Subscribers can receive signal priority (like transit signal priority)
  - Application will facilitate vehicle progression along the facility
  - Service subscriptions would be based on specific routes/corridors and/or times of day
  - Generate revenue on traditionally non-revenue generating roadways

> **PARTICIPANTS: ON YOUR SCORECARDS, PLEASE RECORD NOTES/COMMENTS – CRITERIA RATING**

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- **Transit Signal Priority**

- **Problem Addressed:**
  - Due to a limited ability to make accurate predictions, traditional methods have resulted in poorly performing TSP schemes

- **Description**
  - Enable earlier detection of buses, and more accurate and continuous monitoring of the bus as it traverses the corridor
  - Establish low latency and ongoing communications with Priority Request Servers (PRS) at individual, or multiple, intersections
  - Consider new inputs (e.g. passenger loads) and criteria (e.g. type of service, peak direction, etc.) for generating priority requests

> **PARTICIPANTS: ON YOUR SCORECARDS, PLEASE RECORD NOTES/COMMENTS – CRITERIA RATING**

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- **Real-Time Route Specific Weather Information for Motorized and Non-Motorized Modes**

- **Problem Addressed:**
  - improve mobility and safety of users of motorized and non-motorized modes of transportation (e.g., automobiles, transit, freight, bicyclists, and pedestrians) by providing real-time, highly localized weather information

- **Description**
  - Fuse weather-related probe data generated by probe vehicles with weather data from traditional weather information sources
  - Develop highly localized weather and pavement conditions for specific roadways, pathways, and bikeways

PARTICIPANTS: ON YOUR SCORECARDS, PLEASE RECORD NOTES/COMMENTS – CRITERIA RATING

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Voting

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Breakout Exercise (Part 2) Voting

- Now that we've worked through all the applications, vote for the three most promising applications
    - "**Most promising**": strong potential for transformative impact, low deployment risk, and clear alignment with IntelliDrive program goals
    - BLUE = 3 points (top priority)
    - RED = 2 points (second-highest priority)
    - WHITE = 1 point (third-highest priority)
    - Deposit your chips in the voting bins identified for each application (also turn in your scorecards)
- We'll take a quick break (5 minutes) to tabulate the results
- One Bin, One Participant, One Chip rule
    - Do NOT dump all of your chips in a single bin
    - We want your individual priority of the top THREE applications

Quick Break

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Exercise Results

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- **Were similar or dissimilar applications selected during voting?**

- **Did the highest ranking applications align in the same quadrants of the impact/deployment readiness chart?**

- **Regarding the top 6 applications:**
  - **Are they highly overlapping? Or independent?**
  - **Do they require coordinated research?**
  - **Will they require coordinated deployment?**

- **Who would like to volunteer to report out the breakout group findings?**

Exercise Complete

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