Applications and Data Environments Breakout Group II: Freeway Data Environment

Gene McHale
Federal Highway Administration
Office of Operations Research and Development

Kate Hartman
ITS Joint Program Office

Mike McGurrin
Noblis

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Today's Exercise (Part 1) Scorecards

- 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

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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 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)
- 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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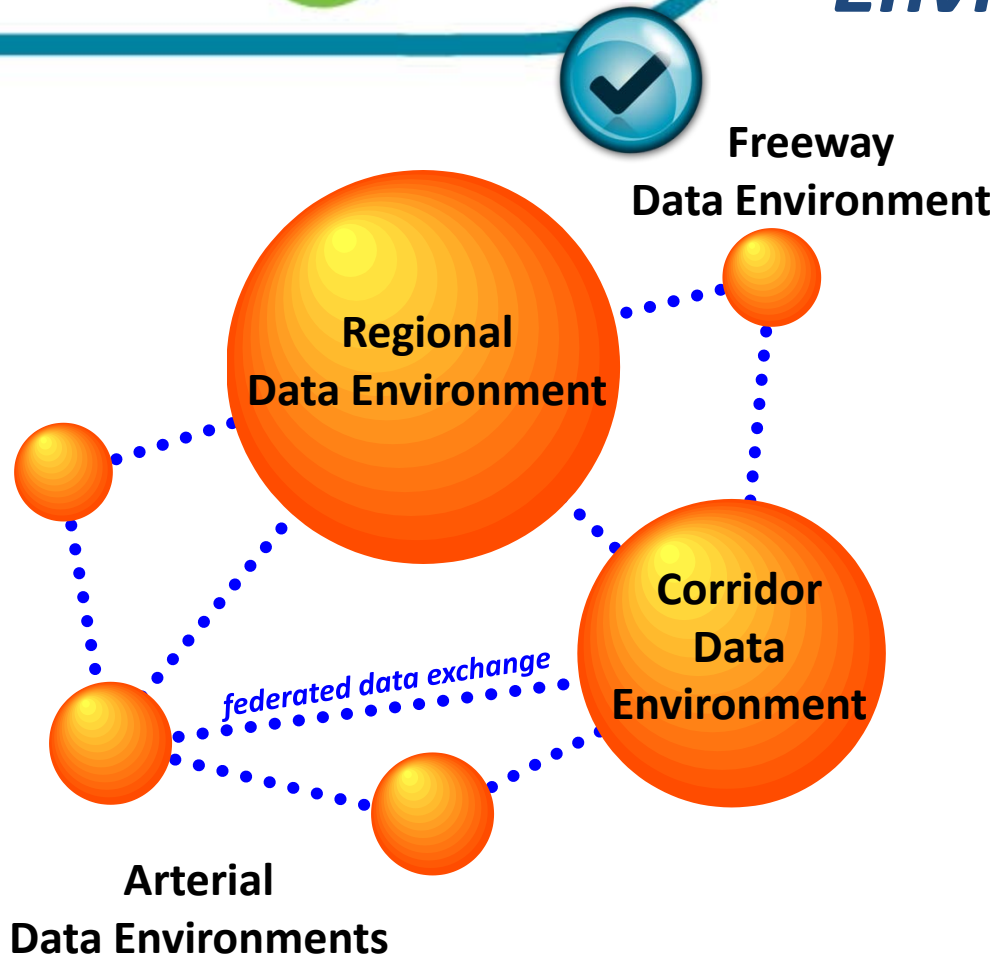# *Exercise Ground Rules*

- 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

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Freeway Data Environment

Regional Data Environment

Corridor Data Environment

federated data exchange

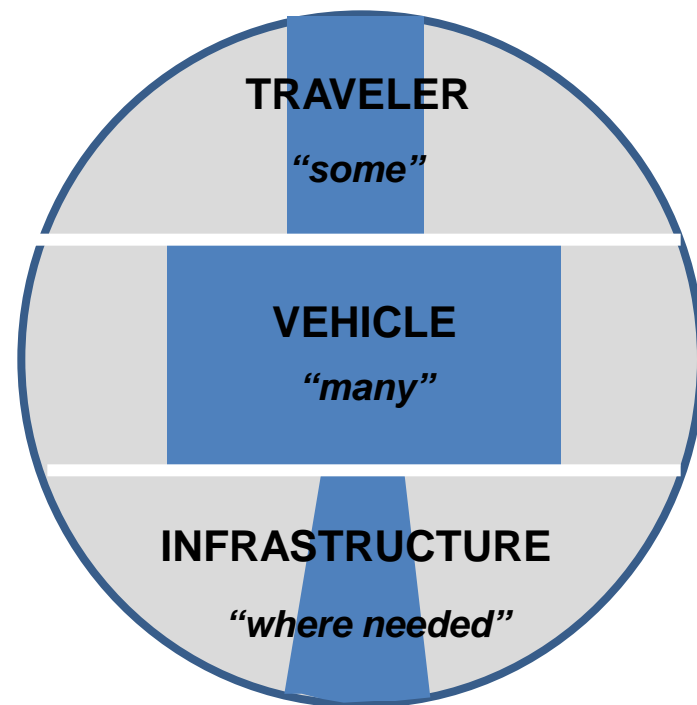Arterial Data Environments

- **Organizes multi-source data along a uninterrupted flow (freeway) facility up to 15 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 freeway facility, bi-directional in nature

- Data environment encompasses data from all interchanges along the facility, including ramps and arterial segments providing ramp access

- Lanes on the mainline facility may have access restrictions that may vary by time of day and day of week (e.g., HOV or Truck Only)

- Tolls may be collected on some or all lanes along the length of the facility

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

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

- Some sections of the freeway may experience partial or complete flooding during intense rain events

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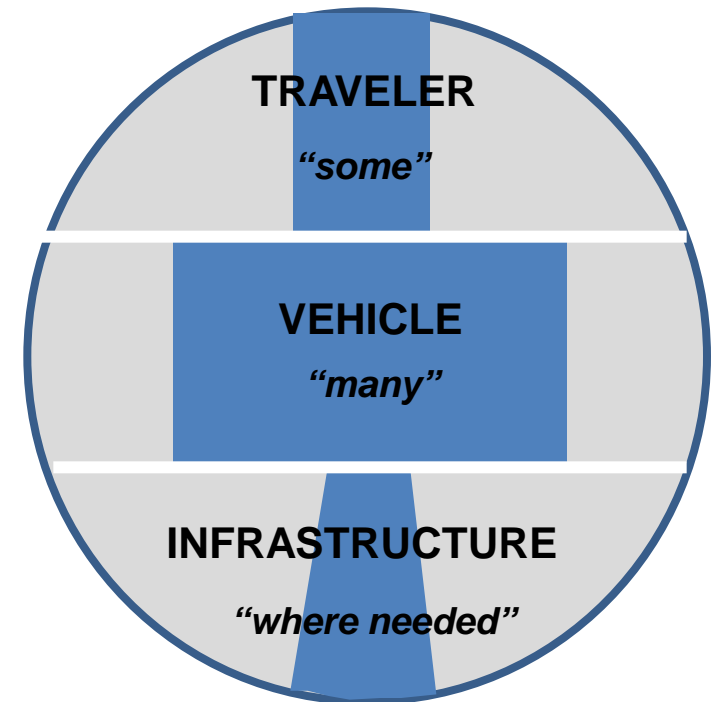Research and Innovative Technology Administration

Vehicle and Traveler Data Source Assumptions

- 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"

- **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"

Application Assessment Scorecard Activity

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

Application #1: SPD-HARM

- **Dynamic Speed Harmonization**

- **Problem Addressed:**
  - Improve throughput and reduce risk of collision by optimizing for lane-specific speed limits on a freeway facility

- **Description**
  - Monitor traffic and weather data captured from multiple sources, and calculate a target speed for vehicles
  - Target speeds may be advisory or enforced, and may vary by location, e.g., distance upstream of a recurrent bottleneck, and by lane
  - Communicate target speeds through overhead dynamic signage, via DSRC to enabled vehicles with range (I2V) and from vehicle to vehicle (V2V)

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

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- **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 facility
  - 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

Application #3: Q-WARN

- **Queue Warning**

- **Problem Addressed:**
  - Warn motorists of existing or imminent downstream queues or shockwaves to increase safety by reducing rear-end collisions (and resulting congestion)

- **Description**
  - Monitor traffic data to check for presence of a stopped or slow moving queue
  - Predict queue formation and shockwave propagation
  - Alert motorists to reduce speeds thereby avoiding abrupt stops
  - Possibly implemented in conjunction with speed harmonization to provide target speeds by lane in approach to congested area

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

- **Multi-modal Real-Time Traveler Information**

- **Problem Addressed:**
  - Improve precision and accuracy traveler information with respect to travel times, cost, or availability on alternate routes or modes

- **Description**
  - Considers real-time and historical travel conditions for the traveler's trip (pre-specified origin, destination, and time of departure)
  - Suggests potential routes and modes (e.g., HOV, general purpose, tolled lanes) with travel times, travel time reliability, and costs for each alternative
  - Predicts travel times based on existing and expected traffic patterns, weather conditions, incident locations, and work zone locations and timings

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

- **Electronic Toll Collection System**

- **Problem Addressed:**
  - Increase interoperability among ETC devices for vehicle-to-roadside communication using 5.9 GHz bandwidth

- **Description**
  - Current 915 MHz ETC systems rely on proprietary vehicle-to-roadside communications, limiting interoperability
  - Enable toll authority to accept electronic payments from vehicles equipped with electronic-payment services (EPS), regardless of EPS account ownership
  - Presents payment instructions to the driver, receives driver input, send payment authorization and display toll payment status to the driver
  - Could be implemented in conjunction with managed or HOT lane concepts

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

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- **Incident Scene Work Zone Alerts for Drivers and Workers**

- **Problem Addressed:**
  – Public safety work zones (e.g., incidents, traffic stops) are dynamic and confusing for drivers -- and are high risk areas for vehicle-worker collisions

- **Description**
  – Warns drivers of lane closings and unsafe speeds for the temporary work zones that surround any traffic incident or law enforcement traffic stop
  – In-vehicle messaging would also provide merging and speed guidance
  – Warn on-scene workers of vehicles with trajectories or speeds that pose high risk to their safety

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

- **IntelliDrive-Driven Ramp Metering System**

- **Problem Addressed:**
  - Improve current ramp metering systems capability to respond to changing traffic conditions in real time

- **Description**
  - Leverage new mobile source data to calculate optimal ramp metering rates resulting in improved throughput and reduced emissions
  - Broadcast timing information (analogous to SPaT data) allowing vehicles to decelerate or accelerate
  - Integrate with HOV bypass, arterial signal coordination and dynamic speed harmonization applications deployed in same interchange

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

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Application #8: WX-MDSS

- **Enhanced MDSS Communications**

- **Problem Addressed:**
  - Reduce reliance on (potentially expensive) commercial wireless networks to communicate with snowplows or other maintenance vehicles

- **Description**
  - MDSS equipped maintenance vehicles utilize DSRC hot spots to download treatment recommendations and upload recent maintenance activities
  - In many rural areas access to commercial networks is limited and/or expensive
  - Utilize DSRC hot spots to reduce costs and improve communications latency for state DOTs

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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Results Discussion

- **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