



*UNITED STATES*  
**DEPARTMENT OF TRANSPORTATION**

# **Dynamic Mobility Applications (DMA) Program Overview**

Kate Hartman, ITS JPO

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Bob Rupert, FHWA

Mobility Workshop 2012

May 24, 2012

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# **Kate Hartman**

## **ITS-JPO**

# Overview

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- Introduction
  - Key Concepts
  - Program Roadmap
- Current Projects and Products
  - Overview of DMA Bundles
  - Open Source Portal
  - Transformative Mobility Impacts
- Nomadic Devices
- Stakeholder Q&A



# Dynamic Mobility Applications Program

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## Vision

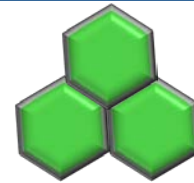
- Expedite development, testing, commercialization, and deployment of innovative mobility application
  - maximize system productivity
  - enhance mobility of individuals within the system

## Objectives

- Create applications using frequently collected and rapidly disseminated multi-source data from connected travelers, vehicles (automobiles, transit, freight) and infrastructure
- Develop and assess applications showing potential to improve nature, accuracy, precision and/or speed of dynamic decision
- Demonstrate promising applications predicted to significantly improve capability of transportation system
- Determine required infrastructure for transformative applications implementation, along with associated costs and benefits

## Project Partners

- Strong internal and external participation
  - ITS JPO, FTA, FHWA R&D, FHWA Office of Operations, FMCSA, NHTSA, FHWA Office of Safety

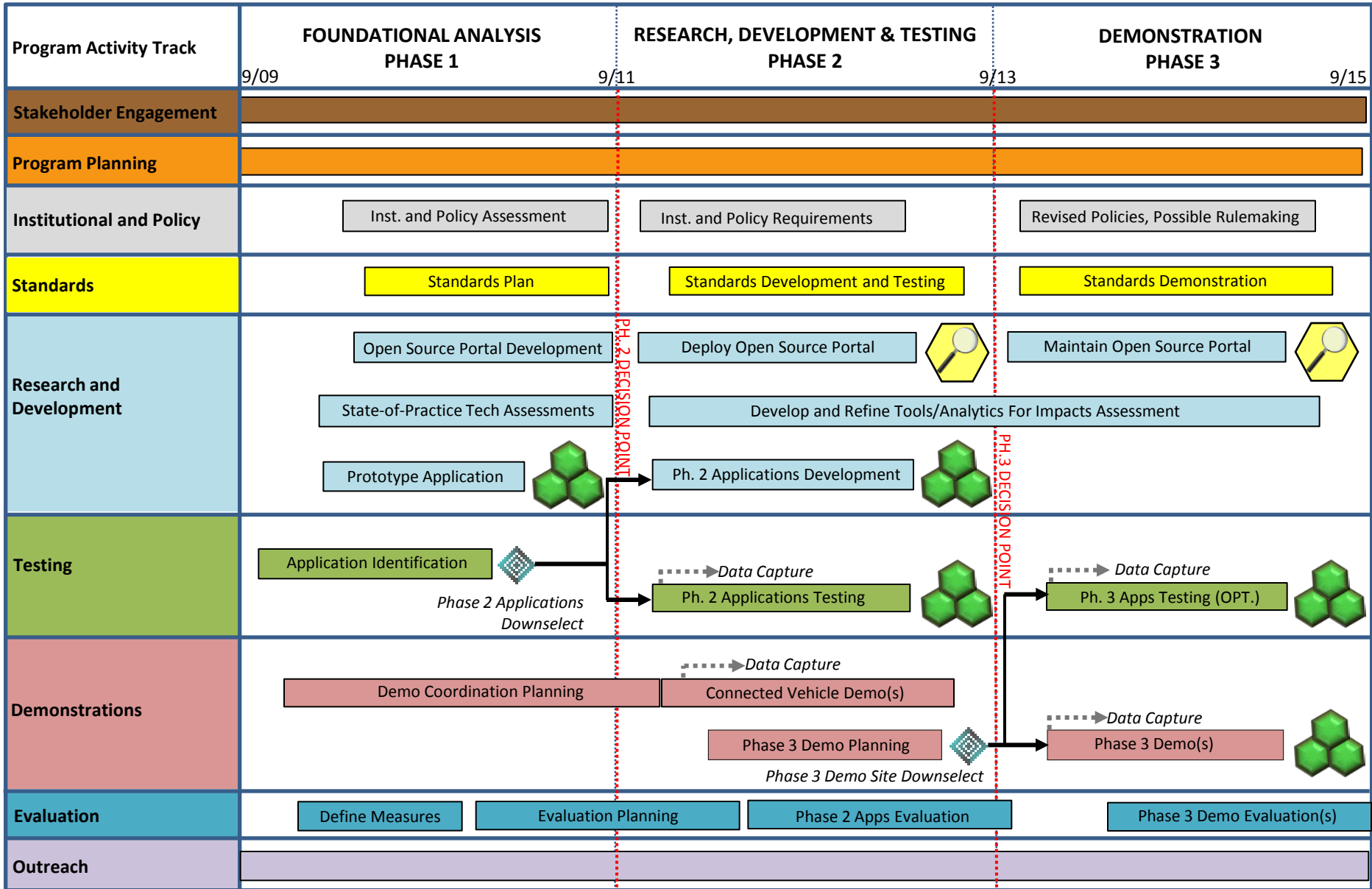


## Transformative Mobility Applications

*(May have more impact when BUNDLED together)*



# Dynamic Mobility Applications Program





PH. 2 DECISION POINT

PH. 3 DECISION POINT

Do the candidate applications show enough promise to be tested?  
 Do these applications address key performance measures?  
 Do we understand the communications requirements of these applications?

Are there clear and compelling arguments for deployments showing significant benefits?

**LEGEND:**

-  Decision point
-  Program Activity
-  Data Capture
-  Data Feed
-  Open Source Applications
-  Open Source Portal

# Dynamic Mobility Applications Program: Application Development Process

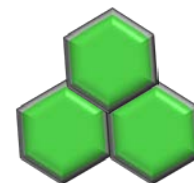
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- **Current Focus:**

- Create, develop, and demonstrate applications utilizing multi-source data

- **Transformative Application Bundles**

- 9-month process to engage stakeholders and make a decision
  - collected innovative, transformative ideas
  - prioritized stakeholder and federal interest
- Identified the most promising applications to pursue in Phase 2 (Announced at TRB 2011)
- Initiated Concept of Operations and System Requirements development efforts in 2011 that are currently ongoing



- **Open Source Portal**

- Foundational capability to share and coordinate application development
- Concept of operations completed
- Implementation underway



# Dynamic Mobility Application Bundles

## M-ISIG:

Multimodal Intelligent Traffic Signal System



**Ben McKeever**

Cooperative Transportation Systems:  
University of Arizona/PATH

## INFLO:

Intelligent Network Flow Optimization



**Mohammed Yousuf**

SAIC/Delcan

## R.E.S.C.U.M.E.:

Response, Emergency Staging and Communications,  
Uniform Management, and Evacuation



**Linda Dodge**

Battelle

## Enable ATIS:

Enable Advanced Traveler Information Systems



**Bob Rupert**

CS/Kimley-Horn

## FRATIS:

Freight Advanced Traveler Information Systems



**Randy Butler**

CS

## IDTO:

Intelligent Dynamic Transit Operations



**Ron Boenau**

SAIC

**Other Programs:**

**ICM  
ATDM**



**Weather**



# Dynamic Mobility Applications Program: Key Recent Accomplishments

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- Completed four application bundle Concepts of Operations/Operational Concepts
  - FRATIS, EnableATIS, IDTO, INFLO
  
- M-ISIG bundle development effort initiated by Cooperative Transportation System (CTS) Pooled Fund Study (Virginia DOT, lead), 2/27
  
- Initiated Open Source Portal implementation effort, 3/12
  - ConOps and Systems Requirements effort completed, 12/1
  
- Continued program of extensive stakeholder engagement
  - 19 bundle-specific stakeholder workshops and other events
  
- Completed BSM Assessment white paper Ver. 1, 2/12





# Next Phase in Application Development

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## How will we be learning more about application bundles?

- **Phase 2 will be answering key questions:**
  - What are the required data and communication needs for mobility apps?
  - What is the role of the BSM in supporting mobility applications?
  - What are the expected impacts from DMA application deployment?

## How will this be accomplished?

- **Phase 2 Integrated Research Plan:** A coordinated set of research, prototyping and impacts analysis activities over the period 6/12-12/13
  - Cellular-Augmented BSM (Parts 1 and 2): Mobility-Focused Research
    - Cross-cutting tests (e.g., role of cellular BSM)
    - Development of nomadic platform (mobile device) capabilities
  - Application Prototyping
    - Application development and prototype testing
  - Impact Assessment
    - Applications and Bundles in isolation
    - Integrated impact at the regional and national level over time



# Key Next Steps in Phase 2

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- **Stakeholder Engagement**
  - Maintain stakeholder engagement throughout prototyping/testing
- **Mobility Applications Development and Testing**
  - Initiate application prototyping (staggered start)
  - Nomadic Device Prototyping
    - Cross-cutting testing
- **Open Source Portal**
  - Portal Development and Enhancement
- **Analytical Tools**
  - Tool enhancement for DMA-focused regional integrated impacts estimation, coordinated with ATDM/ICM test beds
  - Application/bundle impacts analysis assessment coordinated with prototyping
- **Program Evaluation and Performance Measures**
  - Program Evaluation and national-level DMA-bundle impacts assessment, including uniform assumptions on technology evolution
- **Standards**
  - Training and coordination

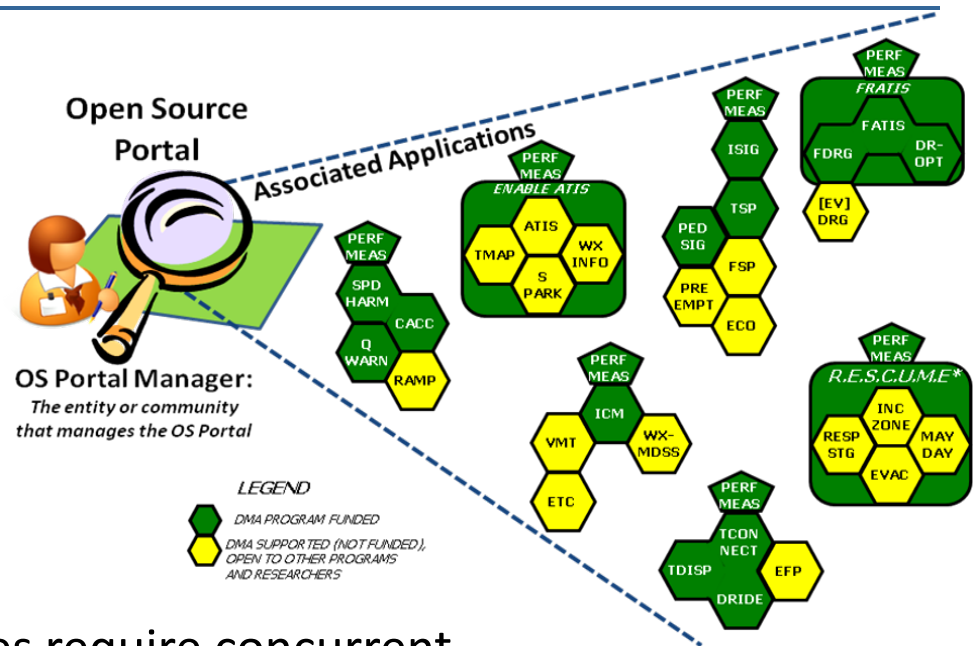
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# **Randy Butler**

## **FHWA**

# Open Source Applications Portal

- **Purpose:** Develop, operate, and maintain an open source portal that will enable multiple stakeholders to collaborate on application development



- **Coordination:** Application bundles require concurrent, collaborative development
  - E.g., in the M-ISIG bundle, pedestrian signal phases in the PED-SIG application must be coordinated with applications providing priority or pre-emption services
  - This coordination extends to both DMA-funded application development and research conducted at UTCs, other organizations
- **Transparency:** the Open Source Portal provides the mechanism to ensure application development is transparent and broadly available



# Open Source Portal Goals and Outcomes

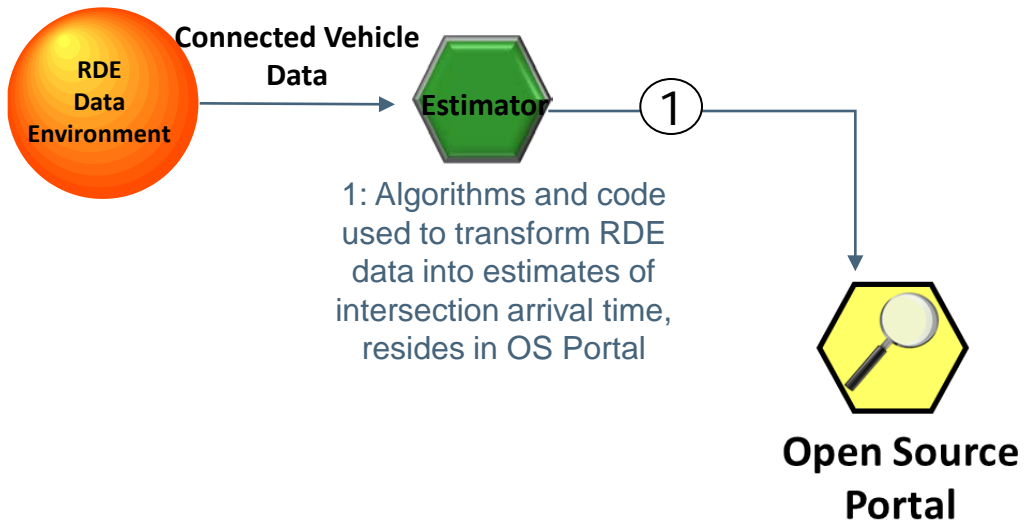
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- Open Source Portal supports:
  - Configuration management of core assets
  - Creation of new projects by stakeholders
  - Submission of new applications and corresponding benchmark test data sets, test procedures and documentation to a project
  - Collaboration among stakeholders interested in inter-related projects
  - Recognition of contributors of core assets
  
- Open Source Portal outcomes:
  - Portal governance development and licensing agreement
  - Well-documented and accessible core assets
  - Deployment of secure portal infrastructure
  - Promote collaboration and preserve intellectual capital
  - Engage partners from academia and industry who may not be directly involved in funded applications development and testing

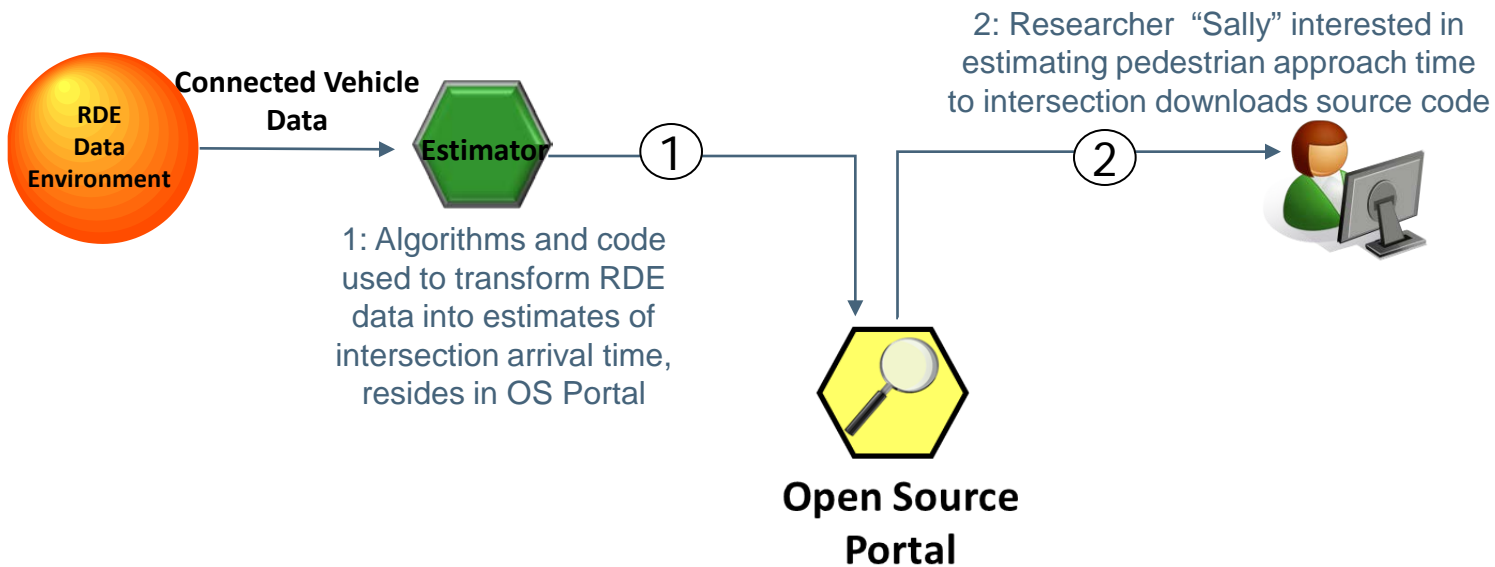


# Open Source Portal Use Case

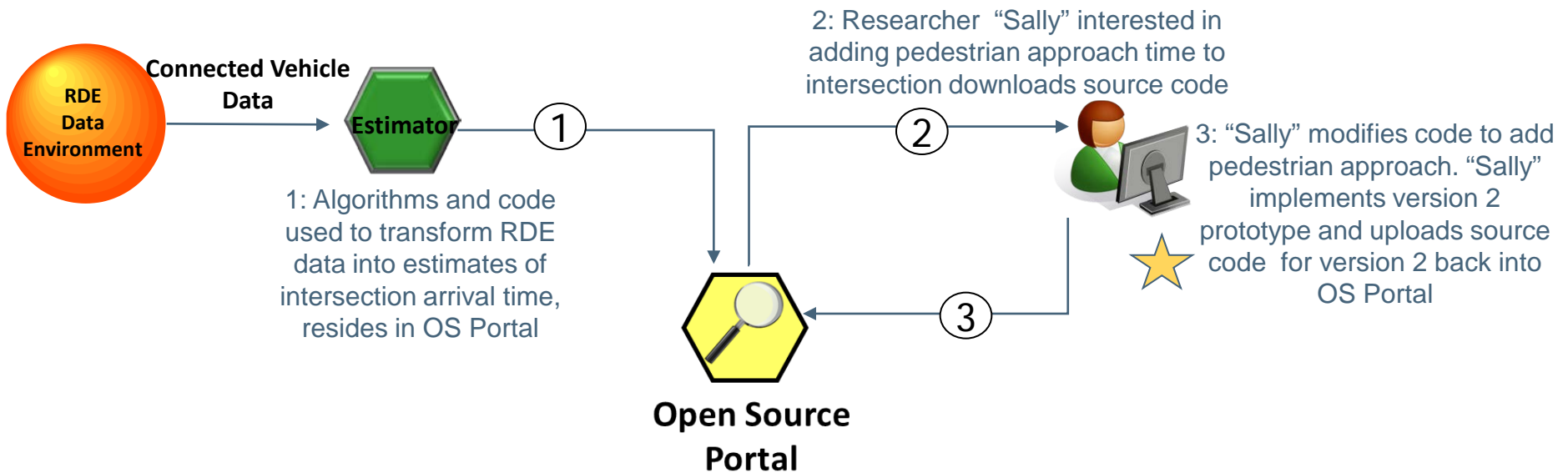
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# Open Source Portal Use Case



# Open Source Portal Use Case



Version 1

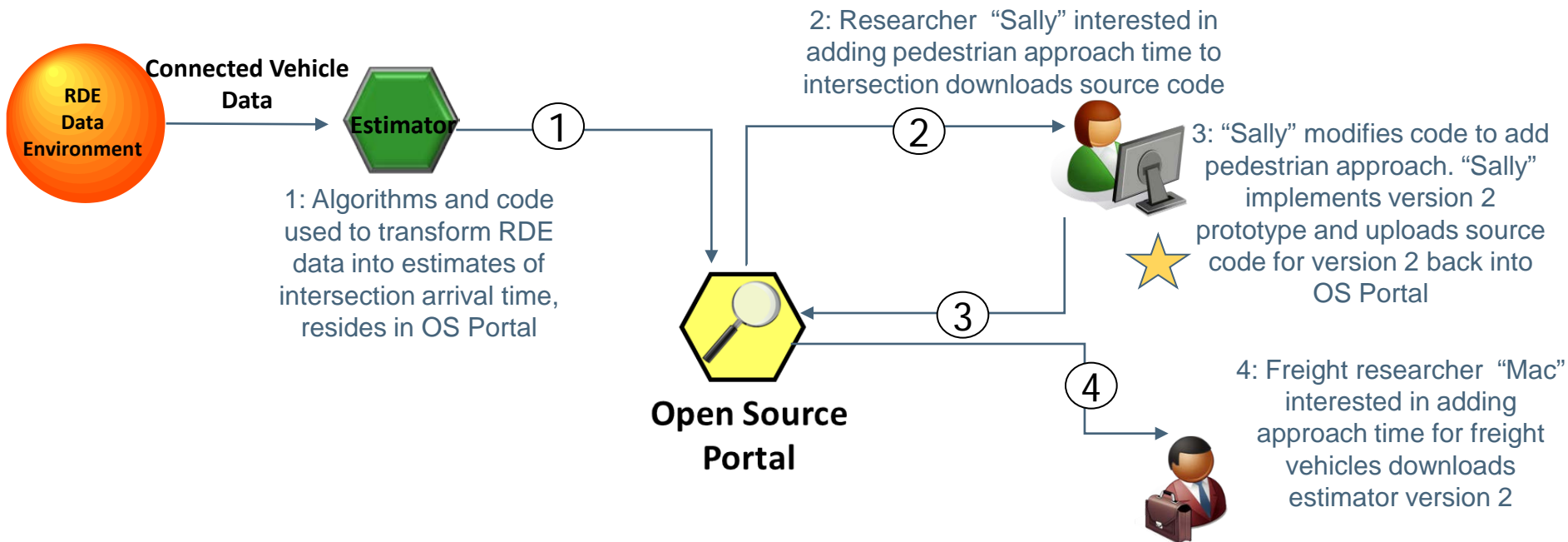


Version 2





# Open Source Portal Use Case



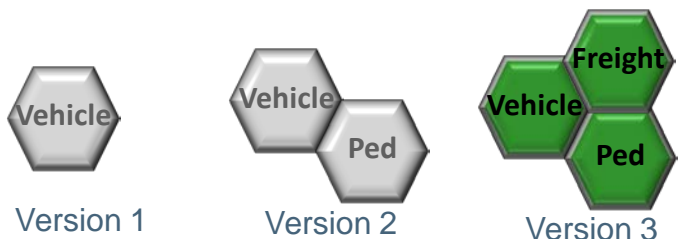
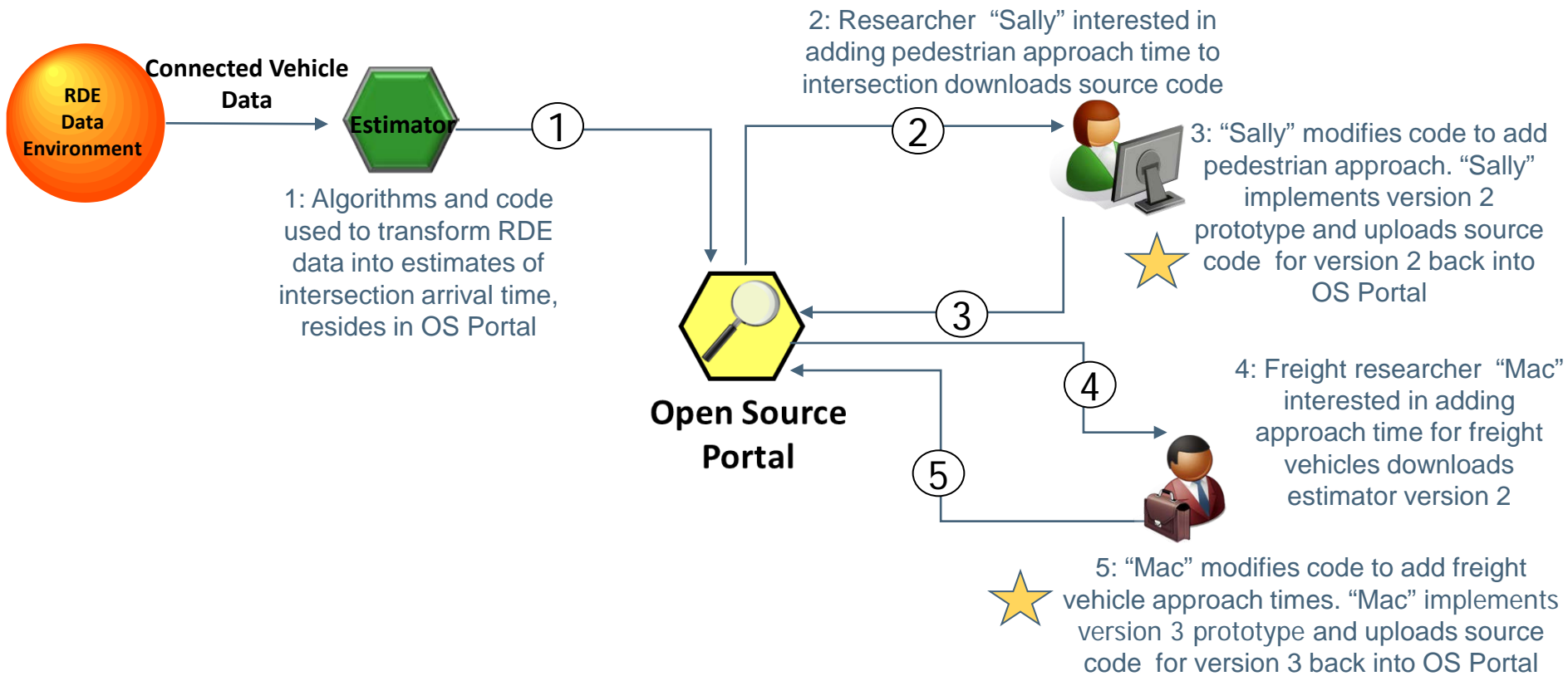
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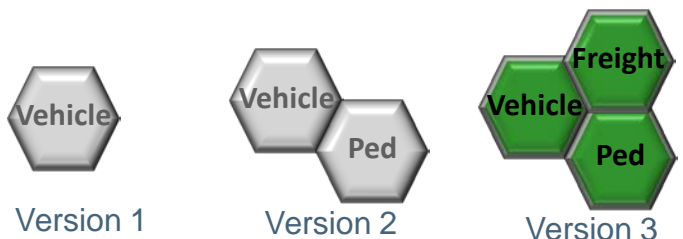
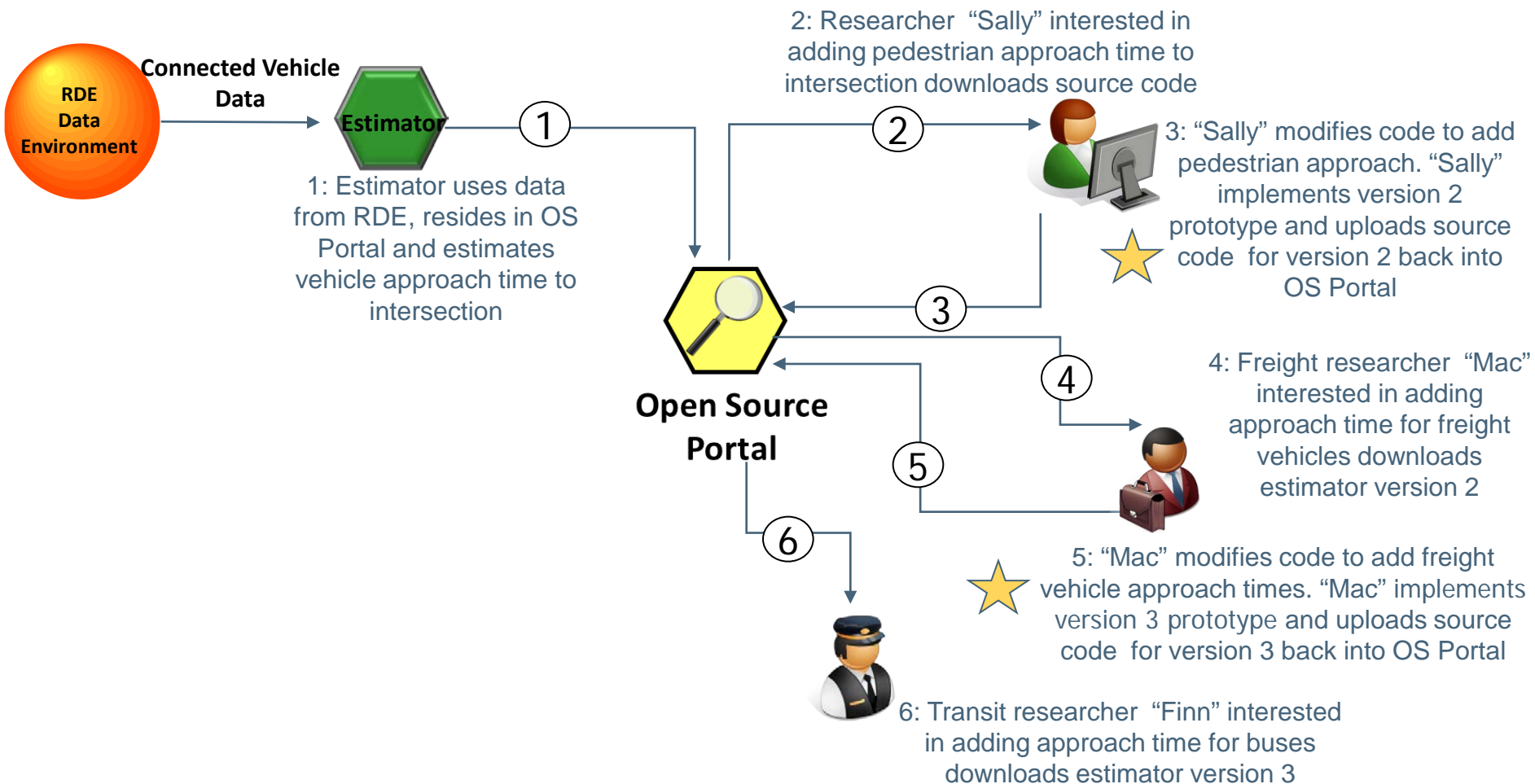
Version 2



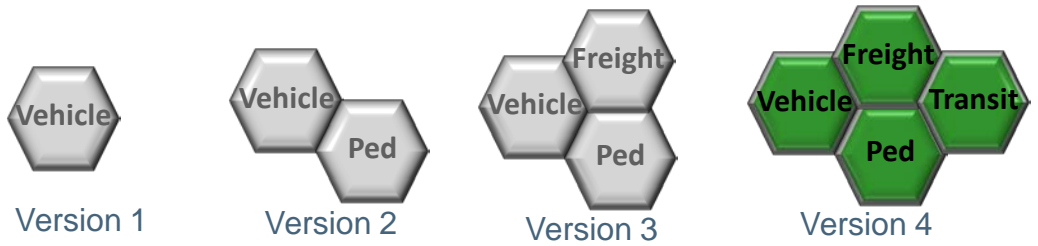
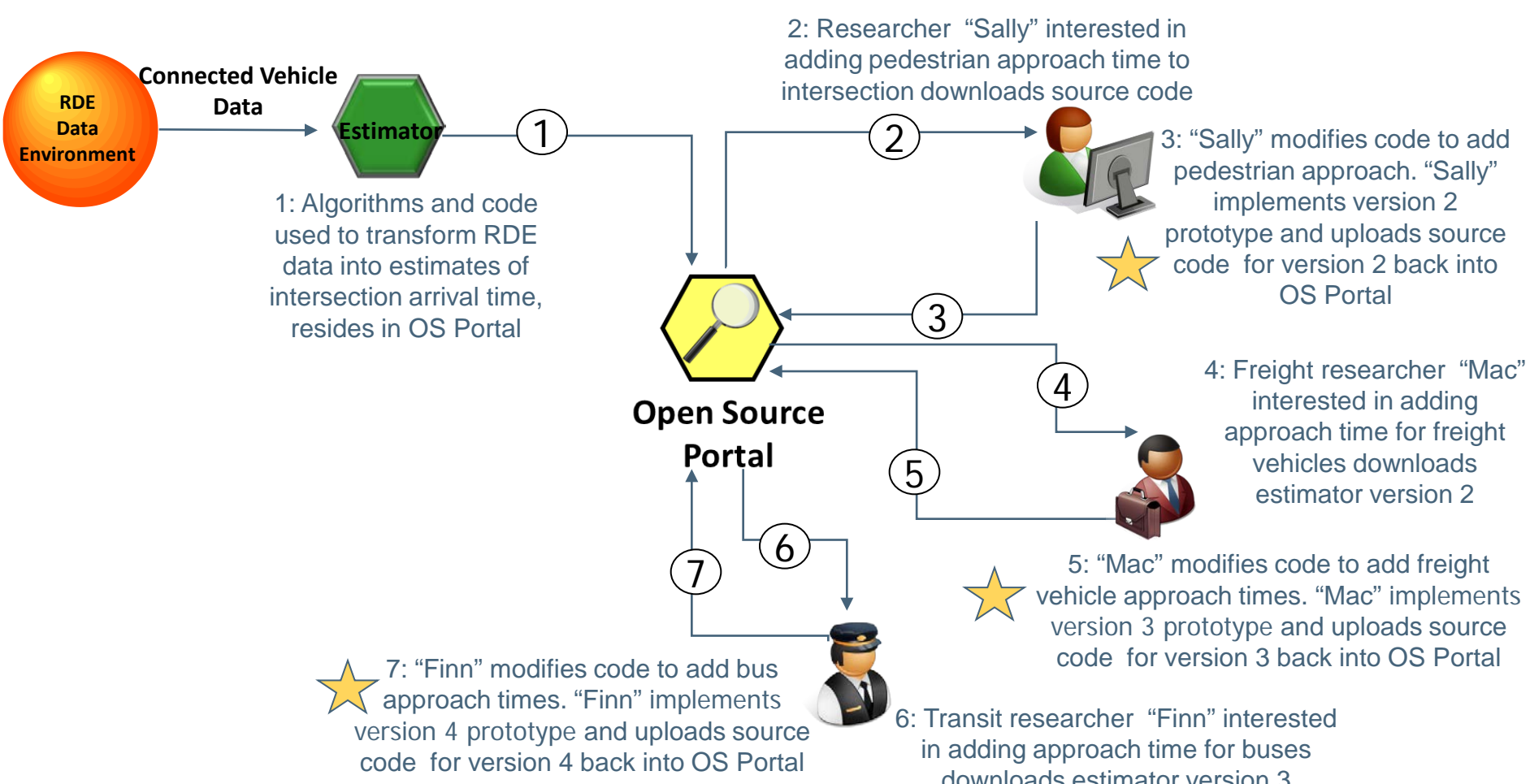
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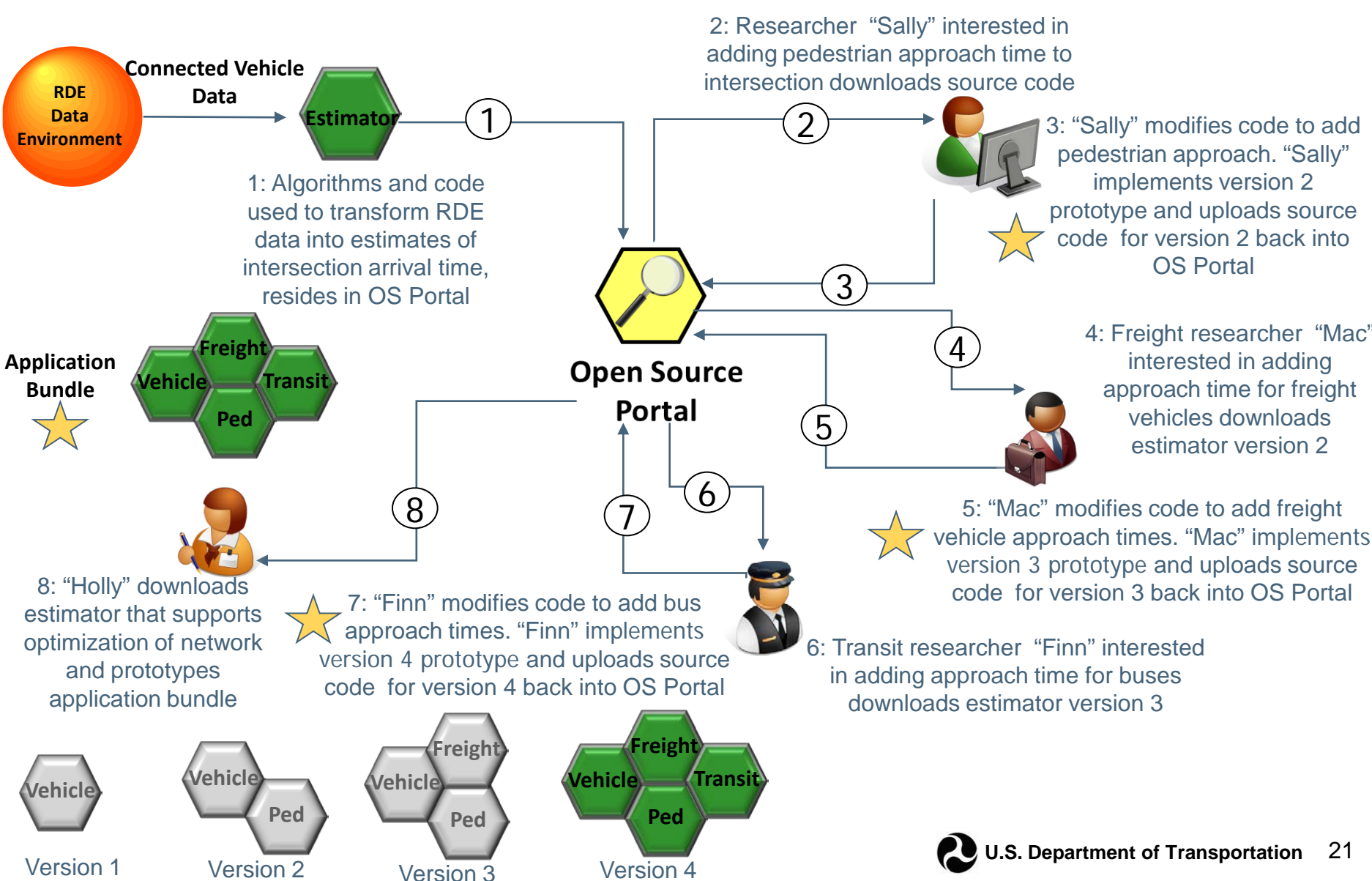
# Open Source Portal Use Case



# Open Source Portal Use Case



# Open Source Portal Use Case



# Open Source Portal Schedule

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- Architecture and High-level Design – May 2012
- Release & Configuration Management Plans – July 2012
- Prototype Development – Begins June 2012
- Prototype Open Source Portal goes live – September 2012
  - Performance Measures Application to OS Portal
  - Other Mobility Applications to OS Portal
- Open Source Portal Updates - 2013



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# **Bob Rupert**

## **FHWA**

# Defining Mobility Impacts

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- What do we mean by mobility?
- How do we measure it?
- How can connected vehicle and traveler data transform mobility measurement as well as mobility?
- Performance Measure Application (to be posted to Open Source Portal)
  - Source code and documentation on calculating travel time, delay and reliability measures from a mix of fixed sensor and probe data
  - Mode-independent approach identifies trip-level measures rather than relying on aggregation of facility measures

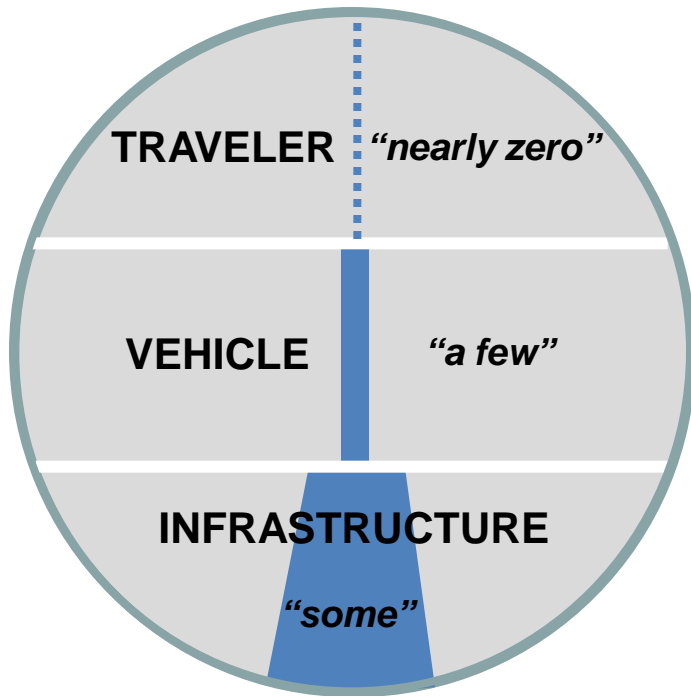




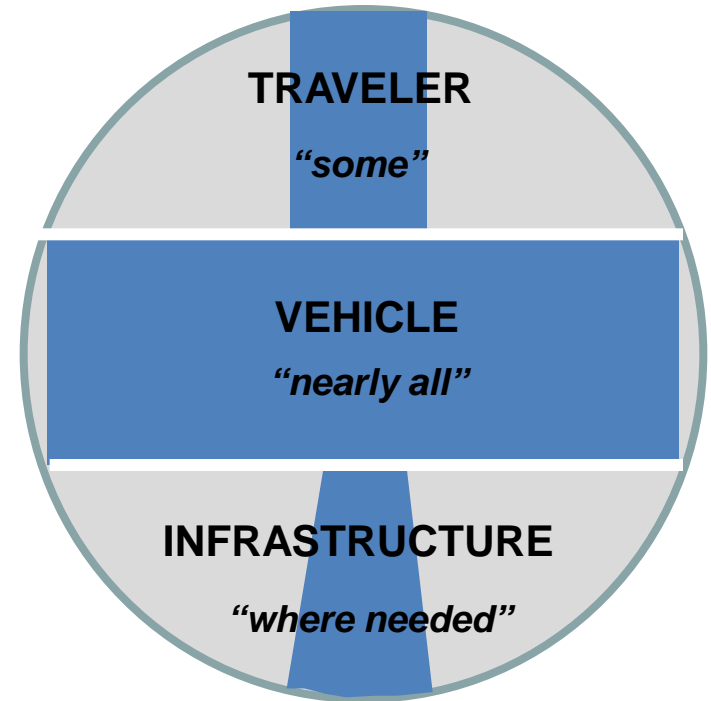
# Data Available to Mobility Applications Evolution

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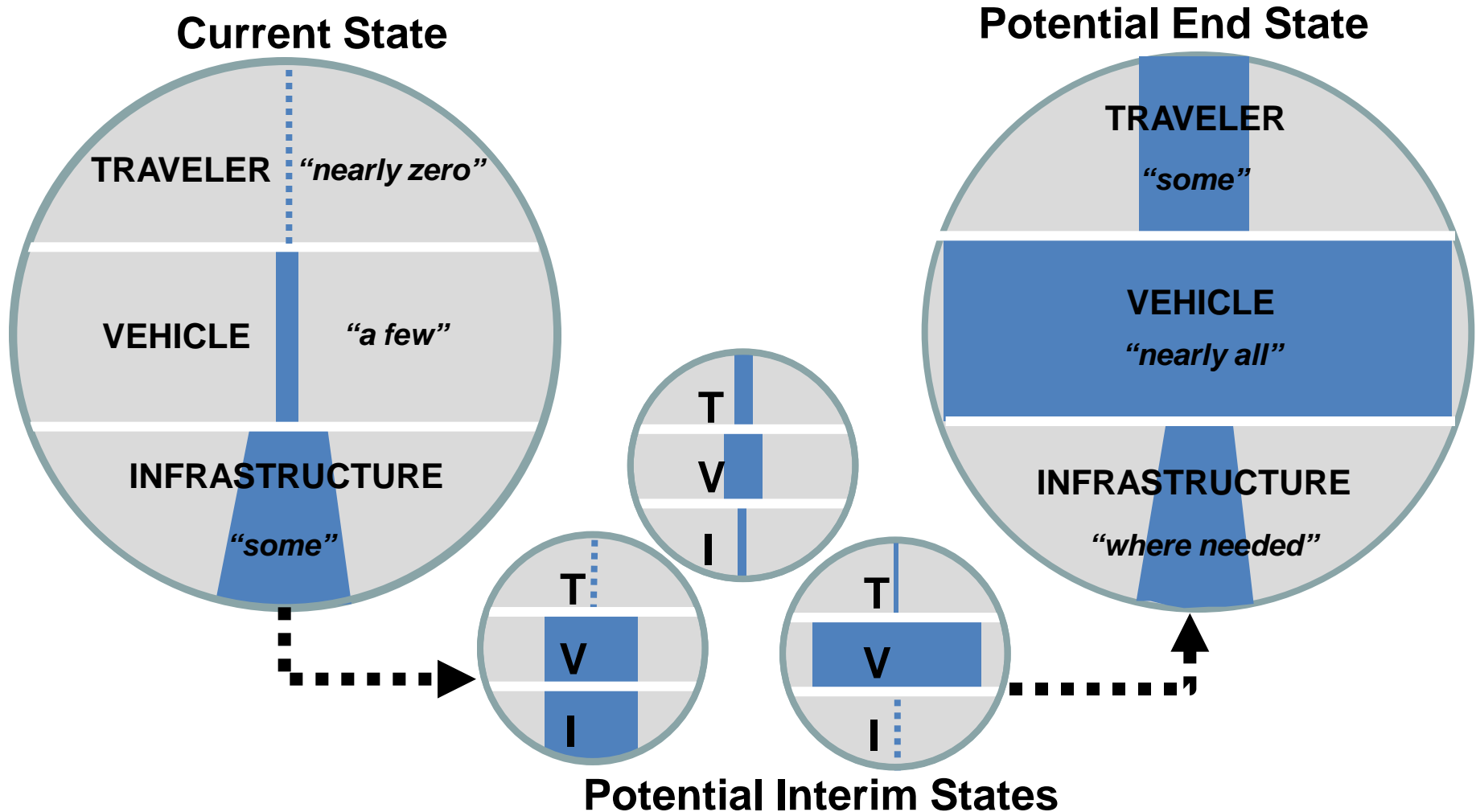
**Current State**



**Potential End State**

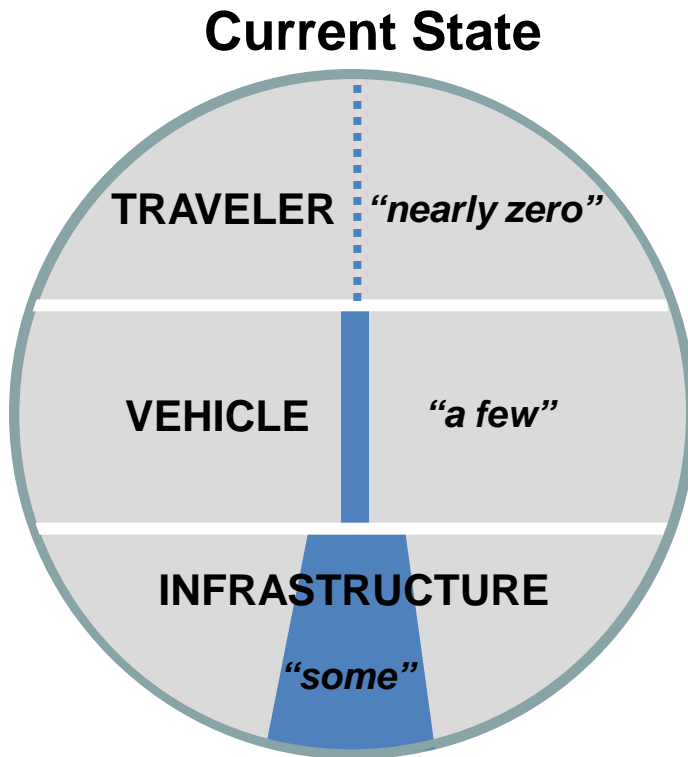


# Data Available to Mobility Applications Evolution



# Near-term Impacts

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## Possible Applications:

- Traveler information
- Priority and preemption signal control
- Coordinated incident management
- Transit and fleet management
- Weather

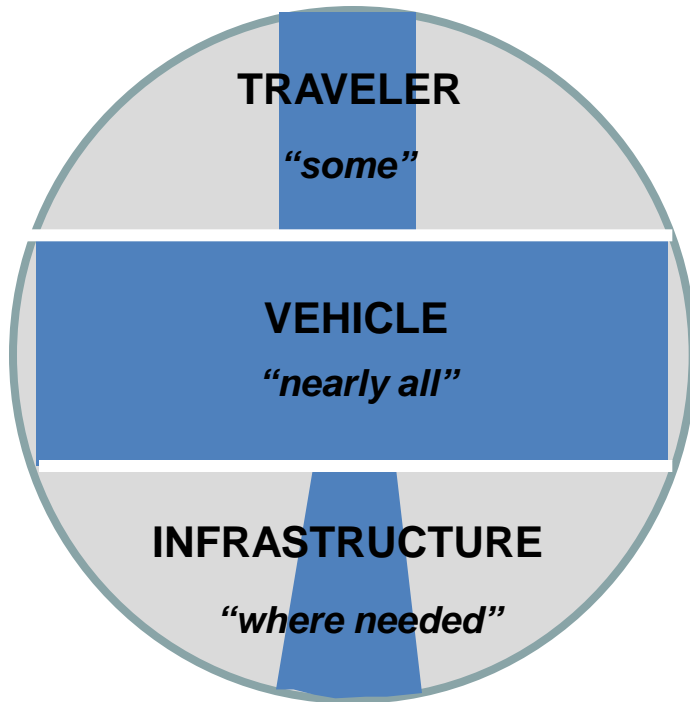
## Potential Impact:

- Transform user, fleet and responder performance

# End-state Impacts

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## Potential End State



## Possible Applications:

- Integrated transit, signal and freeway optimization
- Integrated corridor response
- Real-time bottleneck flow management

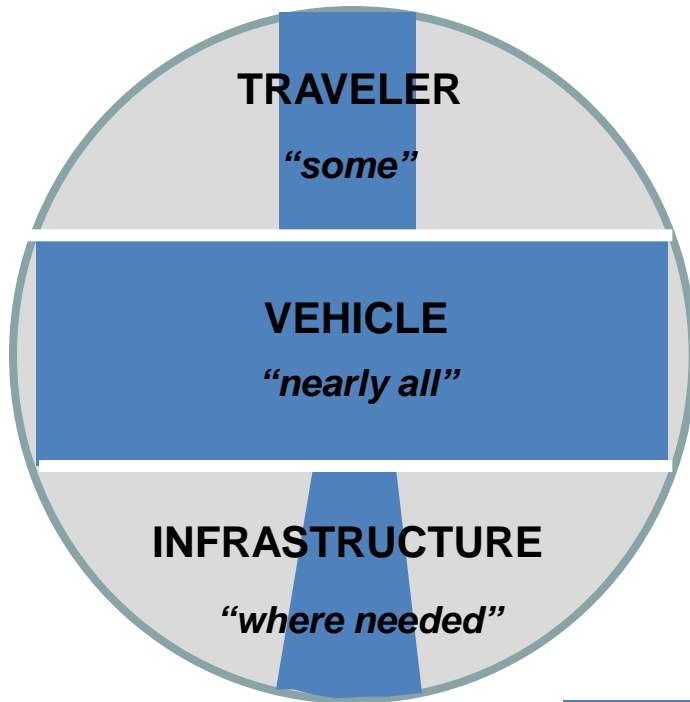
## Potential Impact:

- Transform system performance
- Transform user experience



# End-state Impacts

## Potential End State



## Possible Applications:

- Integrated transit, signal and freeway optimization
- Integrated corridor response
- Real-time bottleneck flow management

## Potential Impact:

- Transform system performance
- Transform user experience

## Cross-cutting needs to understand the traveler:

- Explore use of BSM capable mobile device data
- Examine vehicle-device integration



# Nomadic Platform Concept Explores Role of Mobile Devices and the Connected Traveler

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## ▪ **Cross-Cutting Need to Consider Mobile Devices**

- Bundle development efforts have noted the need to explore the potential value of BSM-capable mobile devices (DSRC, cellular and dual-mode), e.g.,
  - PED-SIG pedestrian safety/mobility application (M-ISIG)
  - INC-ZONE temporary work zone for responders (R.E.S.C.U.M.E)
  - Crowdsourcing traveler data for EnableATIS (itinerary data)
  - Flexible transit service matching and ridesharing (IDTO)
- Devices may obtain or infer vehicle status data when carried into a vehicle (e.g., obtain external temperature by using a camera to read dashboard display)

## ▪ **Nomadic Platform Concept**

- Explore the potential of mobile devices and supporting technologies to meet critical application and data needs for both connected vehicles and travelers

## ▪ **Next step:** Prototyping

## ▪ **Further discussion during exercises:**

- Need your feedback on most critical issues/opportunities with mobile devices
- Breakout sessions will use the following assumptions



# DSRC and Cellular Vehicle-Centric Devices: Strawman Configurations and Capabilities

| Vehicle Type | Comm. Technology | Data Generated                                     | Frequency   |
|--------------|------------------|--|-------------|
| V1           | DSRC             | BSM Part 1   | 0.1 seconds |
| V2           | Cellular         | BSM Part 1 + Weather Data + Vehicle Itinerary Data | 180 seconds |

- Weather Data and Vehicle Itinerary Data:
  - Provided as an element of an opt-in personalized traveler information service (business model includes aggregation and re-purposing of non-PII (Personally Identifiable Information) derived from these data)
  - Possible weather data elements:
    - Ambient air temperature, wiper status, traction control system status
  - Possible vehicle itinerary data elements:
    - Origin, destination, departure time, desired arrival time, purpose
  - Possible transit vehicle itinerary data elements:
    - Schedule delay, occupancy, # of empty seats, # of empty bike rack slots
- DSRC Range: 300 meters



# Dual-Mode Vehicle-Centric Devices: Strawman Configuration and Capabilities

| Vehicle Type | Comm. Technology            | Data Generated                        | Frequency            |   |
|--------------|-----------------------------|---------------------------------------|----------------------|---|
|              |                             |                                       | In Range of an RSE   | Not in Range of an RSE                                  |
| V3           | DSRC + Cellular (Dual Mode) | BSM Part 1                            | 0.1 seconds via DSRC | 0.1 seconds via DSRC<br>AND<br>180 seconds via Cellular |
|              |                             | Weather Data + Vehicle Itinerary Data | 180 seconds via DSRC | 180 seconds via Cellular                                |



# Cellular and Dual-Mode Traveler-Centric Devices: Strawman Configurations and Capabilities

| Mobile Device Type | Comm. Technology            | Data Generated                             | Frequency            |   |
|--------------------|-----------------------------|--|----------------------|---|
|                    |                             |  | In Range of an RSE   | Not in Range of an RSE                                  |
| M1                 | Cellular                    | Position + Speed + Traveler Itinerary Data | 180 seconds          | 180 seconds   |
| M2                 | DSRC + Cellular (Dual Mode) | Position + Speed                           | 0.1 seconds via DSRC | 0.1 seconds via DSRC<br>AND<br>180 seconds via Cellular |
|                    |                             | Traveler Itinerary Data                    | 180 seconds via DSRC | 180 seconds via Cellular                                |

- Traveler Itinerary Data:
  - origin, destination, departure time, desired arrival time, purpose, transit special request (e.g., need for bike rack, wheelchair)
  
- Mobile Devices:
  - Can support a range of mobility and safety applications
  - DSRC Range: 50 meters

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***Questions?***