Intelligent Transportation Systems
Joint Program Office

Open Source Application Development Portal Review

DCM/DMA  2013 Winter Webinar Series

Randy Butler
March 20, 2013
Overview of Webinar

- **Purpose**
  - Provide an update on DMA program status, and an introduction to the Open Source Application Development Portal

- **Agenda**
  - Introduction to the DMA Program
  - Open Source Application Development Portal Concept
  - Open Source Application Development Use Cases and Demo
  - Licensing on the OSADP
  - OSADP Roll-Out Schedule
  - Discussion
Mobility Program

Real-time Data Capture and Management

- Vehicle Status Data
- Weather Data
- Truck Data
- Transit Data
- Infrastructure Status Data
- Location Data

Data Environment

Dynamic Mobility Applications

- Reduce Speed 35 MPH
- Transit Signal Priority
- Weather Application
- Fleet Management/Dynamic Route Guidance
- Signal Phase & Timing Adjusts
- Real-Time Conditions
- Safety Alerts and Warnings

U.S. Department of Transportation
Mobility Program

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Dynamic Mobility Applications

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Dynamic Mobility Applications Program

Vision
• Expedite development, testing, commercialization, and deployment of innovative mobility applications
  — 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 decisions
• Demonstrate promising applications predicted to significantly improve the capability of the 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
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
  - For example, 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 and 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

- 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
  - Promotion of collaboration and preservation of intellectual capital
  - Engagement of partners from academia and industry who may not be directly involved in funded applications development and testing
Application Developer Example (without OSADP)

USDOT funds a developer to build a mobility application

Data for the application is collected and analyzed

Data is Stored

Application is coded and tested

New application delivered to the USDOT

Project Starts

Project Ends
Application Developer Example (without OSADP)

USDOT funds a developer to build a mobility application

But what happens to the Code?
But what happens to the Code?

It becomes orphaned code
Application Developer Example (without OSADP)

USDOT funds a developer to build a mobility application

Data for the application is collected and analyzed

Data is Stored

Application is coded and tested

New application delivered to the USDOT

But what happens to the Code?

Sometimes the developer doing the work holds on to the code

Sometimes the code is given to the government and never seen again

Sometimes the code is just deleted

It becomes orphaned code

In any case, no one knows how it works as time goes on
OSADP Architecture

Visitors
- Public Portal
  - High-level project information
  - Invitation to join community
- Community Portal
  - Download
  - Released Open Source Repository

Registered Users
- App
- Install/Use

Special Users
- Upload
- Source Code
  - Algorithm
  - Assets
  - Apps
- Staging Repository
- Technical Review
- Authorization/Approval

Offline
- App Development Environment
- Release Management
Preliminary Checklist for OSADP Submissions

- Submitter Information
- About the application
- Information about the files included in the release
- Software Documentation
  - README.txt
  - RELEASE-NOTES.txt
  - ATTRIBUTION.txt
  - LICENSE.txt
Licensing and the OSADP

- Draft plans (subject to change):
  - The Apache 2.0 license will be used as the default for contributions (whether paid for by USDOT or volunteered)
  - Exceptions using other open source licenses will be considered on a case-by-case basis
  - Depending upon individual contracts and grants, contributors may retain ownership and release the code under the open source license, or may transfer copyright ownership to USDOT, who will then release the code under the open source license
Application Developer Example (with OSADP)

USDOT funds the developer with the terms that the code must be shared under open source agreement.

- **Project Starts**
- Data is collected and analyzed
- Data is Stored
- Application is coded and tested
- **Project Ends**
Application Developer Example (with OSADP)

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But what happens to the Code?
Application Developer Example (with OSADP)

USDOT funds the developer with the terms that the code must be shared under open source agreement.

Data is collected and analyzed.

Data is stored.

Application is coded and tested.

But what happens to the Code?

The code is made available on the OSADP when the project is compete.

Open Source Portal
Open Source Portal Use Case

1: Algorithms and code used to transform RDE data into estimates of intersection arrival time, reside in OS Portal

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2: Researcher “Sally” interested in estimating pedestrian approach time to an intersection downloads source code.
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4: Freight researcher “Mac” interested in adding approach time for freight vehicles downloads estimator version 2
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4: Freight researcher “Mac” interested in adding approach time for freight vehicles downloads estimator version 2

5: “Mac” modifies code to add freight vehicle approach times. “Mac” implements version 3 prototype and uploads source code for version 3 back into OS Portal
Open Source Portal Use Case

1: Estimator uses data from RDE, resides in OS Portal and estimates vehicle approach time to intersection

2: Researcher “Sally” interested in adding pedestrian approach time to an intersection downloads source code

3: “Sally” modifies code to add pedestrian approach. “Sally” implements version 2 prototype and uploads source code for version 2 back into OS Portal

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5: “Mac” modifies code to add freight vehicle approach times. “Mac” implements version 3 prototype and uploads source code for version 3 back into OS Portal

6: Transit researcher “Finn” interested in adding approach time for buses downloads estimator version 3

Vehicle

Ped

Freight

Version 1

Version 2

Version 3
Open Source Portal Use Case

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6: Transit researcher “Finn” interested in adding approach time for buses downloads estimator version 3

7: “Finn” modifies code to add bus approach times. “Finn” implements version 4 prototype and uploads source code for version 4 back into OS Portal
Open Source Portal Use Case

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5: “Mac” modifies code to add freight vehicle approach times. “Mac” implements version 3 prototype and uploads source code for version 3 back into OS Portal

6: Transit researcher “Finn” interested in adding approach time for buses downloads estimator version 3

7: “Finn” modifies code to add bus approach times. “Finn” implements version 4 prototype and uploads source code for version 4 back into OS Portal

8: “Holly” downloads estimator that supports network optimization and builds a prototype application bundle

Application Bundle

Version 1

Version 2

Version 3

Version 4

RDE Data Environment

Connected Vehicle Data

Estimator

Open Source Portal

Estimated Vehicle

Pedestrian

Freight

Transit

Version 4

Version 3

Version 2

Version 1

U.S. Department of Transportation
OSADP Application Roll-Out Schedule

- FRATIS (FL, CA, TX)
- Multimodal Intelligent Traffic Signal System
- Intelligent Network Flow Optimization
- R.E.S.C.U.M.E.
- Enable ATIS
- Intelligent Dynamic Transit Operations
- Integrated Corridor Performance Measures
- Drayage Optimization
- Near-term Additions
- Future Research Data

- Users
- Data Environments
- Open Source Portal
- Data Environment
- Mobility Applications

- 03/13 Fall 2014
OSADP Potential New Features

- Repository support
- Additional user project control and updates
- Improved Code reviewing processes
- New methods to learn about OSADP activities
- Closer integration with the Research Data Exchange
For more information ...

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# Dynamic Mobility Application Bundles

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<thead>
<tr>
<th>Program</th>
<th>Description</th>
<th>Contact</th>
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<tbody>
<tr>
<td>M-ISIG:</td>
<td>Multimodal Intelligent Traffic Signal System</td>
<td>Ben McKeever</td>
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<tr>
<td>INFLO:</td>
<td>Intelligent Network Flow Optimization</td>
<td>Mohammed Yousuf</td>
</tr>
<tr>
<td>Enable ATIS:</td>
<td>Enable Advanced Traveler Information Systems</td>
<td>Bob Rupert</td>
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<tr>
<td>FRATIS:</td>
<td>Freight Advanced Traveler Information Systems</td>
<td>Randy Butler</td>
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<tr>
<td>IDTO:</td>
<td>Intelligent Dynamic Transit Operations</td>
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<tr>
<td>Other Programs:</td>
<td>ICM</td>
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<td></td>
<td>ATDM</td>
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<td>Weather</td>
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Key Research Questions for the Mobility Program

- What are the benefits of applications enabled by connected vehicle and connected traveler data?

- What testing is required to prepare applications for eventual demonstration and deployment?

- What are the cross-cutting data and communication needs among DMA bundles?

- What is the role of Basic Safety Message (BSM)?

- How do we successfully implement Open Data and Open Source concepts within the program?
Dynamic Mobility Applications Program: Application Development Process

- **Current Focus:**
  - Prototype and test applications utilizing multi-source data

- **Transformative Application Bundles**
  - Extensive stakeholder outreach effort to develop potential concepts
    - collected innovative, transformative ideas
    - prioritized stakeholder and federal interest
  - Identified the most promising applications to pursue in Phase 2
  - Concept of Operations and System Requirements development efforts - completed in early 2013
  - In September 2012, prototyping phase initiated with freight-related bundle, FRATIS
ITS Research Program Components

**Applications**
- Safety: V2V, V2I, Safety Pilot
- Mobility: Real Time Data Capture & Management, Dynamic Mobility Applications
- Environment: AERIS, Road Weather Applications

**Technology**
- Harmonization of International Standards & Architecture
- Human Factors
- Systems Engineering
- Certification
- Test Environments

**Policy**
- Deployment Scenarios
- Financing & Investment Models
- Operations & Governance
- Institutional Issues
Software Licensing Options in a Nutshell

- **Closed Source:**
  - Source code is generally not published, and cannot be used without an individual license from owner, if at all (and typically for a fee)

- **Permissive Open Source (multiple flavors):**
  - Minimal requirements on use, re-use, and distribution/redistribution (e.g., attribution may be required)
  - May be incorporated into proprietary works
  - Modifications can be proprietary

- **Reciprocal / "Copyleft":**
  - Anyone may reproduce, adapt or distribute the code, however:
  - Copies and modification are bound by the same licensing agreement – they must also be open source and copyleft, can’t be proprietary

- **Public Domain:** not a license, rather explicit relinquishment of all intellectual property rights with no restrictions on use
Licensing and the OSADP

- Considerations:
  - Goal of USDOT’s mobility research program is to accelerate deployment of useful applications
  - Many companies are reluctant to use “copyleft” software in their products, as it requires putting their enhanced versions out as open source.
- Software developed using Federal DMA funds will be made available for use under a *permissive open source* license (allowing for incorporation into proprietary products)