USDOT Mobility on Demand Program: Standards and Specifications for MOD

Thursday, February 15, 2018
Today’s Agenda

- Purpose of this Webinar
  - To present Mobility on Demand and importance and examples of standards and specifications.

- Webinar Content
  - Intro to MOD; Open Trip Planner; GTFS-Flex; Multimodal payment; and SAE working group

- Webinar Protocol
  - Please mute your phone during the entire webinar
  - You are welcome to ask questions via chatbox at the Q&A Section
  - Questions will be answered in the order in which they were received
Trends/Setting the Stage
Societal Trends Driving MOD

• Redefining Longevity
  • By 2045, the number of Americans over age 65 will increase by 77%

• Population Growth & Urbanization
  • In 30 years, our population is expected to grow by about 70 million

Image Source: Thinkstock/USDOT
Technological Trends Driving MOD

- **Big Data & Analytics**
  - Transportation increasingly relying on data to drive decisions and to enable innovative travel options

- **Real-Time Travelers**
  - 72% of Americans own a smartphone, with access to up-to-the-minute traveler information

Image Source: Thinkstock/USDOT
Mobility & Environmental Trends Driving MOD

• Increasing Congestion
  • On average, Americans spend over 40 hours stuck in traffic each year, costing $121 billion

• Mobility Choices
  • There is growing popularity of shared mobility and shared modes, such as bikesharing, carsharing, and ridesourcing

Image Source: Thinkstock/USDOT
MOD and Shared Mobility

- Core & Incumbent Services
  - Car Rental
  - Liveries/Limos
  - Paratransit
  - Pedicabs
  - Public Transit
  - Shuttles
  - Taxis

- Innovative Services
  - Carpool
  - Vanpool
  - Casual Carpool
  - Bikesharing
  - Carsharing
  - Courier Network Services
  - e-Hail
  - High-Tech Company Shuttles
  - Microtransit
  - P2P Bikesharing
  - P2P Vehicle Sharing
  - Ridesourcing/TNCs
  - Scooter Sharing
Active Traffic and Travel Demand Management

How does it work?

- Travel choices
- Congestion reduction techniques
USDOT MOD Program
What is Mobility on Demand (MOD)?

An integrated and connected multi-modal network of safe, affordable, and reliable transportation options that are available to all.

- User-focused options to improve personal mobility and access to more destinations
- Promotes choice in personal mobility & optimizes the transportation system through Intelligent Transportation Systems
- Advances connected vehicles & automation applications
- Utilizes emerging technologies & data exchange to enable personal mobility
- Encourages multimodal connectivity & system interoperability
Guiding Principles of MOD

- Traveler Centric/Consumer Driven
  - MOD is defined by quality and carefree personal mobility choice for individuals
- Data Connected/Platform Independent
  - MOD (the end state) drives the technology.
  - Technology doesn’t change the MOD vision, it provides the capability to realize in an interoperable fashion
- Mode Agnostic/Multimodal
  - MOD embraces all modes and resources to support personal mobility choice in an integrated, connected and multimodal manner
User-centric Travel Options

Carsharing
Provides members with access to a car for short-term use

Bikesharing
Provides members with access to a bike for short-term use

Ridesharing
Carpooling, vanpooling, and real-time ridesharing services

TNCs and Taxis
Transportation Network Companies (TNCs) and Taxi Services

Car Rental
Conventional Rental Car Services

Public Transportation
Public Bus, Light Rail, Heavy Rail and other Public Transport Services

Integrated Payment
Allows users to pay for services using a smartphone app

Incentives
Rewards and incentivizes users for good travel choices

Smart Parking
Allows users to reserve and pay for parking using a mobile app

Trip Planning & Navigation Services

Real-Time Travel & Operations Data
Includes public agency and private sector traffic data
Holistic View and Enablers

Multimodal Transportation & Mobility Management

Marketplace Demand
- Delivery Request
- Time of ride request
- Origin-destination request
- User Needs/preferences
- Occupancy/vehicle type
- User Objectives

Marketplace Supply
- TSMO
- Public Transit
- Non-public transit
- Shared Use
- Goods Service Delivery
- Dynamic Capacity

System Availability

Operational Responses

User Needs/preferences
- Origin-destination request
- User Objectives

Goods

Travelers
Not just city center

CITY CENTER
High-density downtown/CBD employment centers and surrounding neighborhoods

SUBURBAN
Predominantly lower-density residential users with some segregated mixed uses

EDGE CITY
Medium-density employment centers outside of the urban core

EXURBAN
Very low-density residential uses on the urban fringe

RURAL
Typically unincorporated
MOD Enablers and Research Areas

- Mobile Devices
- Energy and Environmental Impacts
- Travel Behavior Impacts
- Economics Impacts
- Policy and Regulations
- Transportation Planning
- Multimodal Mobility Management
- Data Management, Sharing, and Standardization
- Social Equity and Environmental Justice
- Future of Mobility
- Transportation Planning
MOD Standards

- Similar to policies and regulations, standards help level the playing field, enabling interoperability, and encouraging compatibility in MOD. Standards also simplify product development and speed time-to-market.

- Standards development for MOD are critical in the following key areas:
  - Consistent Public and Private Sector Definitions:
  - Development of Metrics, Models, and Methodologies to Measure the Impacts
  - Standards to Facilitate Multimodal Integration
  - Privacy and Open Data Standards
  - Standardization for the Underlying Technologies Used in Different MOD Apps
  - Standardization of Mapping and Navigation Technologies
TriMet
Tri-County Metropolitan Transportation District of Oregon
2016 MOD Sandbox Grant Awardee
Bibiana McHugh, IT-GIS Manager
Key Project Partners

Cleared for Takeoff
Julian Simioni, Co-founder, Cleared for Takeoff, Inc
Pelias geocoder core team member

Conveyal
David Emory, Principal

IBI
Ritesh Warade, Director, Transit Data Team
Jon Campbell, Transit Data Specialist

moovel North America, LLC
Narayan Siva, Product Manager
Courtney Longfellow, Account Manager

Trillium Solutions, Inc.
Aaron Antrim, President,
Thomas Craig, General Manager
Problem
Solution

More comprehensive open trip planner offering transit integrated shared-use mobility options.
Strategy
Leverage open source software, open data, and open standards to facilitate widespread adoption.
Open Source Software (OSS)

Open Data

Open Standards
Open Source Software (OSS)
Define Requirements

Assess Solutions

Itemize Costs

Evaluate all software options including OSS & data solutions

Stability
Documentation
Strength of developer & user community
Core Technologies
License

OSS is NOT FREE!
Include short & long term implementation, support and ongoing maintenance fees
RDBMS

TriMet Enterprise Database

GIS
Scheduling System
CAD/AVL
Service Alerts

GTFS
Trip Planner
Web Services
On-Board Schedules
Auto-Stop Announcements etc., etc., etc...
Open Data Standards

GTFS
voluntary worldwide adoption
OpenStreetMap (OSM)
Worldwide Wikipedia-like seamless routable network
OpenTripPlanner (OTP)  
open source multimodal trip planner  
extended to integrate shared-use modes with transit
OTP uses open data and standards
OTP Worldwide Deployments
Pelias
Geocoder
Non-proprietary, non-restrictive option for address locating

geocode.earth
Full Planet Search
From the team behind the open-source Pelias geocoder
Cleared for Takeoff

Open Address Data
OpenAddresses
OpenStreetMap
Who’s on First
TIGER
Integrated Payment Plan
moovel will facilitate compatibility with planned booking and payment features in RideTap feature
Replicability

Open Source Software
Open Data
Open Standards
Collaboration
Innovation
MOD Sandbox Grant 2017 – 2019

TriMet’s OpenTripPlanner Shared-Use Mobility (OTP SUM) project will create a complete open platform for the integration of transit and shared-use mobility options. With an improved address locator, Mapzen’s Pelias geocoder, the open data, software and user interfaces, responsive on both web and mobile, will help customers make informed decisions about their mobility choices, including the critical first and last miles of transit trips where a bus or train alone doesn’t provide full access.

This dashboard provides a snapshot of the MOD Sandbox project’s progress. These key indicators help us track progress toward project deliverables and the budget. In addition, we will be sharing project updates and lessons learned through this dashboard.
Flexible transit trip planning

Adapting OpenTripPlanner to read GTFS-flex
ITS JPO webinar
February 15, 2018
How does public transit provide the “Uber experience”? 

We don’t have unlimited venture capital.

We need to serve the all markets and clients.

We aren’t a single corporation; we’re thousands of local agencies.
We have our willingness to collaborate and share.

- Standards
- Interoperability

Replicability
GTFS-flex extends the GTFS data standard

Incorporating

- Dial-a-ride (on-call service in an area)
- Hail-and-ride (flagging along a corridor)
- Route deviations (within a buffer from a route)

...Find out more at GTFSFlex.com
Traditional application-centric design makes technology complicated.

Replacing your journey planner means replacing 5 applications.
Standards allow interoperability

Interoperable technologies are modular, and can be replaced easily.
The results…

- Trip opportunities span majority of the state, instead of only along fixed-route corridors
- Travel times and walking distances are reduced
- Presents specialized trip options like deviations and monthly trips
New OTP-flex Results

### Option 1: departs approximately Feb 20th 2:57pm

<table>
<thead>
<tr>
<th>Rural Community Transportation</th>
<th>Dial-a-Ride</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Depart</strong></td>
<td><strong>From</strong></td>
</tr>
<tr>
<td>approximately Feb 20th</td>
<td>Spaulding Road</td>
</tr>
<tr>
<td>2:50pm to 3:04pm</td>
<td></td>
</tr>
<tr>
<td><strong>Arrive</strong></td>
<td><strong>To</strong></td>
</tr>
<tr>
<td>Feb 20th</td>
<td>St. Johnsbury Welcome Center/Transit Hub</td>
</tr>
<tr>
<td>3:14pm to 3:28pm</td>
<td></td>
</tr>
</tbody>
</table>

**Deviated Route**
- Call 802-748-8170 two days before your trip to request pickup. Priority given to elderly, disabled or Medicaid riders.
- Call 802-748-8170 two days before your trip to request your drop off. Priority given to elderly, disabled or Medicaid riders.

### Rural Community Transportation to Montpelier

<table>
<thead>
<tr>
<th>Depart</th>
<th>From</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feb 20th 3:50pm</td>
<td>St. Johnsbury Welcome Center/Transit Hub</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Arrive</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feb 20th 5:05pm</td>
<td>National Life</td>
</tr>
</tbody>
</table>

**1 min**
Current Google Maps Results

New OTP-flex Results

Option 1: departs at Feb 20th 4:07pm

<table>
<thead>
<tr>
<th>Depart</th>
<th>From</th>
<th>Flag Stop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feb 20th</td>
<td>Theodore Roosevelt Highway</td>
<td>Wait in a safe area along the route. Wave to the driver as bus approaches and wait for the vehicle to stop before boarding.</td>
</tr>
<tr>
<td>4:07pm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Arrive</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feb 20th</td>
<td>National Life</td>
</tr>
<tr>
<td>5:05pm</td>
<td></td>
</tr>
</tbody>
</table>
The next step is booking our trips.

Contact us to collaborate and travel together.
Multimodal Payment Integration (MPI): Program Overview and Data Integration/Standardization

U.S. DOT Webinar on Standards and Specifications for MOD
February 15, 2018

Murat Omay
Federal Transit Administration
Office of Research, Demonstration, and Innovation
Mobility Innovation Team
MPI Program: Highlights

• Demonstration-based research program to position FTA to understand the advanced and emerging technologies for payment systems

• Establish a framework to integrate payment into the broader goals and objectives of mobility systems currently being developed under the Mobility on Demand (MOD) initiatives

• Establish data harmonization, integration, and standardization guidelines and requirements for regional interoperability/integration of mobility and payment systems

• Develop support for FTA decisions for associated payment policies, models, data standards, and capital funding requirements
MPI Program: Goals

• Provide convenience for the system users and riders
• Increase efficiency of system operations
• Optimize service planning/delivery for increased effectiveness
• Promote sustainable financial structures and business models
• Provide opportunities for economic viability
• Improve the efficacy of transit/mobility benefits programs
• Align with broader FTA goals and objectives, as well as the overall vision for an integrated mobility system
MPI Program: Objectives

• Support the goals of Mobility on Demand (MOD)
• Provide seamless travel opportunities for all system riders
• Increase mobility system ridership for all Americans
• Increase mobility system coverage/options for all Americans
• Provide integration and optimization opportunities for mobility providers by enabling:
  • effective systemwide service planning/delivery
  • efficient systemwide operations
  • focused performance measurement opportunities for mobility as a system
  • measure the efficacy of government or employer benefit/incentive programs or policies
• Provide economic opportunities for transit agencies, mobility providers, and relevant transportation/non-transportation adjacencies
• Align and collaborate with crosscutting USDOT research programs
Current State of Payment Systems

• Technologies in payment systems, mobile payment applications, connected devices, mobility, and Internet of Things (IoT) are evolving rapidly

• Many entities (national and international) are exploring, researching, testing, deploying, and improving payment technologies and systems

Emerging Payment Technologies

- Mobile payments
- Peer-to-peer payments
- Push payments
- Tokenization and account keys
- Deep learning
- Machine learning
- Biometric scanning

- Contactless payment systems
- Open or closed-loop payment systems
- Account-based payment systems
- Frictionless payment environments
- Direct debit methods
- Artificial Intelligence
- Cryptocurrencies
Payment System Typology

System Design Attributes

- Single Agency
- Proprietary
- Card-Based
- Closed Payments
- Multiagency
- Standards Based
- Account Based
- Open Payments

Source: TCRP Report 177: Preliminary Strategic Analysis of Next Generation Fare Payment Systems for Public Transportation (2017)
Payment Integration and MOD

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Trip Planning & Navigation Services
Why Data standardization?

Table 1. Number of Public Transportation Systems by Mode, Report Year 2014

<table>
<thead>
<tr>
<th>Mode</th>
<th>Number of Systems, RY 2014 (a)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Urbanized Areas (b)</td>
</tr>
<tr>
<td>Aerial Tramway</td>
<td>2</td>
</tr>
<tr>
<td>Automated Guidedway Transit</td>
<td>7</td>
</tr>
<tr>
<td>Bus</td>
<td>700</td>
</tr>
<tr>
<td>Bus Rapid Transit</td>
<td>10</td>
</tr>
<tr>
<td>Cable Car</td>
<td>1</td>
</tr>
<tr>
<td>Commuter Bus</td>
<td>120</td>
</tr>
<tr>
<td>Commuter Rail</td>
<td>27</td>
</tr>
<tr>
<td>Demand Response (a)</td>
<td>688</td>
</tr>
<tr>
<td>Ferryboat</td>
<td>34</td>
</tr>
<tr>
<td>Heavy Rail</td>
<td>15</td>
</tr>
<tr>
<td>Hybrid Rail</td>
<td>5</td>
</tr>
<tr>
<td>Inlined Plane</td>
<td>4</td>
</tr>
<tr>
<td>Light Rail</td>
<td>23</td>
</tr>
<tr>
<td>Monorail</td>
<td>2</td>
</tr>
<tr>
<td>Publico</td>
<td>1</td>
</tr>
<tr>
<td>Streetcar</td>
<td>11</td>
</tr>
<tr>
<td>Transit Vanpool</td>
<td>78</td>
</tr>
<tr>
<td>Trolleybus</td>
<td>7</td>
</tr>
<tr>
<td>Total (f)</td>
<td>820</td>
</tr>
</tbody>
</table>

(a) Systems operating during Report Year 2014, all amounts are estimated.
(b) Some urban providers operate service into surrounding rural areas and rural providers operate service into nearby urban areas. Rural includes Indian Tribal services.
(c) May be either urbanized area or rural.
(d) Includes rural transit intercity bus service.
(e) Includes non-profit providers of service for seniors and persons with disabilities. Includes demand response taxi service.
(f) Total is not sum of all modes since many providers operate more than one mode.

Source: APTA, Public Transportation Fact Book, 2016
MPI Program Contact

**Murat Omay**
Program Manager
Federal Transit Administration
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Mobility Innovation Team

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• **Scope:**
A taxonomy describing the spectrum of shared mobility services and includes functional definitions for shared modes (e.g., carsharing, bikesharing, etc.) and related terms and definitions (i.e., one-way, roundtrip, etc.).

• **Rationale:**
Standardizing definitions will address discrepancies in terminology across various sectors, industries, and geographies.

• **Document Sponsor:** Susan Shaheen, PhD (UC Berkeley)

• **Estimated Draft Submission Date:** Spring 2018

• **Estimated Publication Date:** Summer 2018