Active Transportation and Demand Management (ATDM)

Introduction

Name of Workshop

FHWA Office of Operations

Date
Presentation Topics

- Defining Active Management and the ATDM Concept
- Types of Active Management Deployments
- FHWA’s ATDM Program
SECTION 1: DEFINING ACTIVE MANAGEMENT AND THE ATDM CONCEPT
Characteristics of an Actively Managed Operations Culture

- Focuses on **now** rather than the future
- Recognizes **conditions vary** and may not be “typical”
- Orients toward **customers** and their service needs
- Focuses on performance **outcomes** not outputs
- Emphasizes **managing** rather than development
- Exists as a **24/7** service, not a 9-5 office
- Scales to **trip** – not just a jurisdiction
What is Active Management?

The fundamental concept of taking a dynamic approach to a performance based process.
Moving Towards Active Management

Transportation Agency Operators: Moving from Static to Proactive Management

- High complexity, high reward
- Emerging

- Low risk
- Proven

Proactive Management
- Respond to predicted changes in supply & demand
- Ability to delay or eliminate breakdowns

Responsive Management
- Respond to current conditions
- Account for traffic impacts due to conditions
- Reduce time of degraded operation

Static Management
- Time of day
- Set-it and forget it
- Will work when there is limited variability

Actively Managing Operations
Moving Towards Active Management: Shoulder Use Example

<table>
<thead>
<tr>
<th>Manage Flow by time of day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitor and Manage Existing Lanes (No shoulder use as a lane)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Adjust supply by time of day</th>
</tr>
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<tbody>
<tr>
<td>Temporary shoulder use during peak periods</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Adjust supply based on demand</th>
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</thead>
<tbody>
<tr>
<td>Responsive shoulder use based on demand</td>
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</table>

<table>
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<tr>
<th>Fully dynamic operations</th>
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<tr>
<td>24/7 current / predicted levels of traffic and incidents</td>
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Goal of ATDM Concept

- Attain the capability to dynamically monitor, control, and influence travel, traffic, and facility demand of the entire transportation system and over a traveler's entire trip chain.
ATDM approaches provide travelers with choices throughout the trip chain leading to network performance optimization and increased efficiency.

**Key Takeaway:** Active management occurs before, during, and at the end of the trip chain.
What does ATDM include?

Active Demand Management (ADM): A suite of strategies intended to reduce or redistribute travel demand to alternate modes or routes. Incentivizes drivers by providing rewards for travelling during off-peak hours with less traffic congestion.

Active Traffic Management (ATM): A suite of strategies that actively manage traffic on a facility.

Active Parking Management (APM): A suite of strategies designed to affect the demand on parking capacity.

Examples of ATDM Implementation Strategies

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADM</td>
<td>Comparative multi-modal travel times, dynamic ride-sharing, pricing, and incentive approaches.</td>
</tr>
<tr>
<td>ATM</td>
<td>Variable speed limits, dynamic shoulder use, queue warning, lane control.</td>
</tr>
<tr>
<td>APM</td>
<td>Parking pricing, real-time parking availability and reservation systems.</td>
</tr>
</tbody>
</table>
The ACTIVE and INTEGRATED Continuum

- Active, But Not Integrated
- Early in Active and/or Integrated Operations
- Integrated, But Not Active
- DESIRED END STATE: Active and Integrated
Integrated Corridor Management (ICM)

- ICM is the joint management of a transportation corridor as a complete system
  - Load balancing

- Corridor operates at optimal performance, given the available capacity of each network
  - ATDM needed to realize vision
ICM is built on the fundamental concepts of load balancing.

ATDM approaches need to be applied to realize the vision of ICM.
### Active Management in a Corridor

<table>
<thead>
<tr>
<th>Agency Type</th>
<th>Mode/Facilities</th>
<th>Individually optimized through ATDM approaches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transit Agencies</td>
<td></td>
<td></td>
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<tr>
<td>Freeway Agencies</td>
<td></td>
<td></td>
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<tr>
<td>Arterial Agencies</td>
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</tr>
</tbody>
</table>

ICM: Corridor Level Optimization and Operations
SECTION 2: TYPES OF ACTIVE MANAGEMENT DEPLOYMENTS
Scope Varies by Agency

Scale of implementation
(site-specific to regional)

Types of Implementation
(ADM, ATM, APM or a combination)

Examples:
- Active Demand Management (ADM)
  - Dynamic Ridesharing

- ATDM Implementation
  - Adaptive Ramp Metering
  - Variable Speed Limits

- Active Traffic Management (ATM)
  - Dynamic Pricing
  - Dynamic Parking Reservation

- Active Parking Management (APM)
Examples of Active Management Strategies

Active Demand Management

Active Traffic Management

Active Parking Management
Active Demand Management Example: Mobile Applications

Innovative Mobile Traffic Apps:

- **Goal:** manage demand by influencing driver choice over a longer period of time
- **How:** Encourage behavior change through incentives (e.g., bigger rewards during off-peak travel)
- **What:** Real-time trip predictions, route mapping, voice navigation and pre-trip alerts

Source: http://www.metropia.com/commuters
## Other ADM Deployments Include:

<table>
<thead>
<tr>
<th>Project</th>
<th>Location(s)</th>
<th>ADM Strategy(ies)</th>
<th>Active Technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-10 Katy Expressway</td>
<td>Houston, TX</td>
<td>Dynamic pricing</td>
<td>Dynamic pricing of HOT lanes and incentives for transit and HOV usage</td>
</tr>
<tr>
<td>I-35W HOT Lanes</td>
<td>Minneapolis, MN</td>
<td>Dynamic pricing</td>
<td>Dynamic pricing of HOT lanes and incentives for transit and HOV usage</td>
</tr>
<tr>
<td>Congestion and Parking Relief Incentives (CAPRI)</td>
<td>Palo Alto, CA</td>
<td>Dynamic Parking Pricing</td>
<td>Award credits for avoiding peak parking hours. Credits used for random cash drawings of $2.00 – $50.00. Transponders used to detect when cars park.</td>
</tr>
<tr>
<td>Messaging Infrastructure for Travel Time Estimates to a Network of Signs (MITTENS)</td>
<td>San Francisco, CA</td>
<td>Predictive Traveler Information</td>
<td>Real-time highway and scheduled transit travel time displayed to induce in-route mode shift.</td>
</tr>
<tr>
<td>Predict-a-Trip</td>
<td>San Francisco, CA</td>
<td>Predictive Traveler Information</td>
<td>Predictive travel times using historical data to inform pre-trip travel decisions</td>
</tr>
<tr>
<td>I-55 Bus-on-Shoulder Demonstration</td>
<td>Chicago, IL</td>
<td>Hard shoulder running, temporary shoulder use</td>
<td>Roadway sensors, dynamic message signs</td>
</tr>
</tbody>
</table>
Active Traffic Management Example: VA I-66’s Active Traffic Management System

NOVA’s I-66 Active Traffic Management System:

- Intended to improve safety and incident management.
- Includes new sign gantries, shoulder and lane control signs, speed displays, incident and queue detection, and increased traffic camera coverage.

## Other ATM Deployments Include:

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<th>Active Technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adaptive ramp metering</td>
<td>Los Angeles, CA / Minneapolis, MN / Portland, OR / Houston, TX</td>
<td>Adaptive ramp metering</td>
<td>Roadway sensors, ramp meter signals, TMC algorithms, TMC control</td>
</tr>
<tr>
<td>Weather Responsive Speed Limits</td>
<td>Mobile County, AL / Flagstaff, AZ / Portland, ME / Truckee River, NV / Pittsburgh, PA / Knoxville, TN / Cheyenne, WY</td>
<td>Dynamic Speed Limits</td>
<td>Traffic management center (TMC) control, variable speed limit signs, atmospheric sensors, visibility sensors, pavement conditions sensors, dynamic message signs</td>
</tr>
<tr>
<td>I-5 Active Traffic Management</td>
<td>Seattle, WA</td>
<td>Dynamic lane use control, dynamic speed limits, queue warning, adaptive ramp metering</td>
<td>Roadway sensors, lane control/dynamic speed limit signals, dynamic message signs, TMC algorithms and control</td>
</tr>
<tr>
<td>I-70 West Rolling Speed Harmonization</td>
<td>Silverthorne, CO</td>
<td>Dynamic speed limits</td>
<td>Roadway sensors, ramp meters, law enforcement control</td>
</tr>
<tr>
<td>Variable Speed Limits on I-285</td>
<td>Atlanta, GA</td>
<td>Dynamic speed limits</td>
<td>Roadway sensors, dynamic message signs, dynamic speed limit signals, TMC algorithms and control</td>
</tr>
<tr>
<td>Midtown in Motion</td>
<td>Manhattan, NY</td>
<td>Adaptive Traffic Signal Control</td>
<td>Roadway sensors, dynamic message signs, TMC algorithms and control</td>
</tr>
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Active Parking Management Example: San Francisco’s SFpark System

SFpark:

- Periodically adjusts meter and garage pricing to match demand.
- Reduces demand in overused areas by encouraging drivers to park in underused areas and garages.
- Redjusts parking patterns throughout San Francisco to make parking easier to find.

http://sfpark.org/about-the-project/
Other APM Deployments Include:

<table>
<thead>
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<th>Location(s)</th>
<th>ADM Strategy(ies)</th>
<th>Active Technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>PARK Smart</td>
<td>New York, NY</td>
<td>Dynamically priced parking</td>
<td>Demand-responsive pricing, upgraded smart meters</td>
</tr>
<tr>
<td>Congestion and Parking Relief Incentives (CAPRI)</td>
<td>Palo Alto, CA</td>
<td>Dynamically priced parking</td>
<td>RFID tags for system users, behavioral based pricing schemes</td>
</tr>
<tr>
<td>QuickPark</td>
<td>San Diego, CA</td>
<td>Dynamically priced parking, dynamic parking reservations</td>
<td>Parking space sensors, parking lots sensors, real-time parking availability information</td>
</tr>
</tbody>
</table>
SECTION 3: FHWA’S ATDM PROGRAM
ATDM Program Goal

- Enable agencies to improve trip reliability, safety, and throughput of the surface transportation systems by **dynamically managing** and controlling travel and traffic demand, and available capacity, based on **prevailing and anticipated conditions**, using one or a combination of real-time operational strategies.
ATDM Program Objectives

- Increase awareness and understanding of ATDM.
- Develop, test, and evaluate strategies.
- Provide tools and methods for performance analyses.
- Provide tools and methods for benefit/cost analyses.
- Train agencies to deploy effective ATDM systems.
- Provide guidance to FHWA Division Offices.
Genesis of the ATDM Program (2009 – 2011)

- Stakeholder feedback and needs
- ATDM Program formulation

Key points:
- Break silos
- Encourage an *operating philosophy* not just strategy
- Focus on both supply and demand
Initiation Phase (2011 – 2013)

1. Program Goals
   - Define and promote the program
   - Encourage early adopters through focused technical assistance and peer exchanges
   - Identify research needs and establish a roadmap

2. Program Tracks and Activities
   - Research
     - ATDM HCM Research
     - ATDM Analysis, Modeling, and Simulation (AMS)
     - Shoulder Lane Usage
   - Tools Development and Guidance
     - Guidebooks (e.g., ATM, Freeway Management and Operations)
     - Info. Briefs (e.g., ADM, APM, ATM)
     - Primers (e.g., Dynamic Pricing)
   - Outreach and Education
     - Workshops (KTT, ICM, HCM)
     - Peer Exchange
     - Webinars
     - Outreach Toolkits

3. Program Accomplishments
   - Broad outreach to DOTs (Over 400 professionals included in ATDM workshops)
   - Several agencies are considering implementation – VA, OR, NY, NV
   - Creation of the ATDM Website
   - Research and other foundational elements initiated
ATDM Program Components: Research Completed

- ATDM Foundational Research
  - ATDM Operational Concept and Program Development Workshops
  - Analysis, Modeling, and Simulation (AMS) Concept of Operations, Capabilities Assessment, and Analysis Plan

- AMS Testbed Planning for ATDM and Dynamic Mobility Applications (DMA)

- ATDM HCM Analysis Methodology
  - Guidance for Highway Capacity and Operational Analysis of ATDM

- Shoulder Lane Usage Analysis (Phase 1)

- HOV Managed Use Lane Pooled Fund Study
  - Design and Operational Elements of Dynamic Shoulder Use
  - Evaluation of ATM Lane Control Signage

- NCHRP Synthesis 447, ATM for Arterials
ATDM Program Components: Research Underway

- ATDM AMS Testbed Project
- Shoulder Research Projects
- ATM Traffic Control Devices Study
- ATDM Tools for Tactical and Strategic Decision Making for Operations
- Tools for Predicting Performance
- Tools for Tactical and Strategic Decision Making for Operations
- Traffic Management Capability Maturity
  - Developing several maturity frameworks to enable advancing capabilities in Operations
- Trajectory Level Validation
  - Collecting data and developing a methodology to enable Simulation tools to be validated based on detailed vehicle trajectory level data
- NCHRP 3-114, ATM Planning and Evaluation
  - Developing a guide to planning and evaluating ATM for recurrent and non-recurrent conditions
ATDM Program Components:
Guidance and References Available

Guidance, Primers, and Case Studies

- ATM: The Next Step in Congestion Management (FHWA-PL-07-012)
- Synthesis of ATM Experiences in Europe and the United States (FHWA-HOP-10-031)
- Operations Benefit/Cost Analysis Desk Reference (FHWA-HOP-12-028)
- Designing for Transportation Management and Operations: A Primer (FHWA-HOP-13-013)
- Guide for Highway Capacity and Operations Analysis of ATDM Strategies (FHWA-HOP-13-042)
- The ATDM Program: Lessons Learned (FHWA-HOP-13-018)

- Dynamic Parking Pricing Primer (FHWA-HOP-12-026)
- Ramp Metering Primer (FHWA-HOP-14-020)
- Integrating Demand Management into the Transportation Planning Process: A Desk Reference (FHWA-HOP-12-035)
ATDM Program Components:
Guidance and References Underway

- Freeway Management & Operations Handbook update
- Shoulder Guidance
- ATM Screening and Feasibility
- Active Demand Management Primer
- Traffic Management Capability Maturity Framework
- Capability Maturity Frameworks for Managing Non-Recurrent Congestion
- Dynamic Pricing Primer
ATDM Program Components: Outreach and Training

- Knowledge and Technology Transfer (KTT) Tools
  - Informational Briefs
  - Public Relations Resources Guide
  - Regional Workshops/Peer Exchanges (19 total from 2011-present)
  - NHI ATDM Webinar Series
  - ATDM Executive Video
    - https://www.youtube.com/watch?v=qd8xy0ozSXI
FHWA ATDM Website

- Clearinghouse for ATDM Knowledge and Technology Transfer
- Publications, Briefs, Videos, Webinars, Lessons Learned, External Resources, etc.

http://ops.fhwa.dot.gov/atdm/about/program.htm
Summary

- ATDM represents next evolutionary step in Transportation Systems Management & Operations (TSM&O).
- Based on real time and predicted information and dynamic actions.
- Performance driven.
- Demand management much more prominent than historically in Operations.
- Several FHWA ATDM Program activities underway.
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