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>
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<tbody>
<tr>
<td>Monitor and Manage Existing Lanes (No shoulder use as a lane)</td>
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</table>

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

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

<table>
<thead>
<tr>
<th>Examples of ATDM Implementation Strategies</th>
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<tbody>
<tr>
<td>ADM</td>
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<tr>
<td>ATM</td>
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<tr>
<td>APM</td>
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</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
ATDM Relationship to ICM

- 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>
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<tr>
<td>Freeway Agencies</td>
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<tr>
<td>Arterial Agencies</td>
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</tbody>
</table>
SECTION 2: TYPES OF ACTIVE MANAGEMENT DEPLOYMENTS
Scope Varies by Agency

Scale of implementation (site-specific to regional)

- Region
- Corridor
- Facility
- Site-Specific

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

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

- ATDM Implementation
  - Example: Dynamic Pricing
  - Dynamic Parking Reservation

- Active Traffic Management (ATM)
  - Example: Adaptive Ramp Metering
  - Variable Speed Limits

- 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.

http://www.virginiadot.org/projects/northernvirginia/i-66_atms.asp
Other ATM Deployments Include:

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<th>Active Technologies</th>
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<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>
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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.
- Readjusts parking patterns throughout San Francisco to make parking easier to find.

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

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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
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

International Scan on Demand Mgmt
Managing Demand Workshops
Emerging Active Demand Management practices
International Scans on ATM, Managed Lanes
Early adopters in Seattle, Minnesota
ICM
Spot-specific innovations like VSL for weather
UPA/CRD Demonstrations
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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