Integrated Corridor Management (ICM) Overview

APTA TransITech Conference
Session 9: Integrated Corridor Management (ICM) Initiative
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Federal Highway Administration
What is ICM?

- The integrated management of freeway, arterial, transit, and parking systems within a corridor

- Management of the corridor as a system, rather than the more traditional approach of managing individual assets
ICM System (ICMS)

An ICMS is the set of procedures, processes, and information systems that support transportation system managers in making coordinated decisions involving the optimal performance of all transportation networks in a corridor.

- Achieve load balancing across the networks
  - Facilitate mode shifts
  - Facilitate route shifts
  - Facilitate departure/arrival time shifts

- Respond to events with coordinated multi-agency actions
  - Incidents
  - Construction
  - Special Events
  - Weather
Transit in ICM

- Transit offers additional corridor capacity
- Transit can assist in managing corridor demand
- ITS increases transit flexibility, efficiency, and coordination
Examples of Supporting ITS Technologies

- HOT lanes / congestion pricing
- Transit signal priority
- Multimodal traveler information / Actionable traveler information
- Real-time traffic signal coordination, timing, and control
- Adaptive ramp metering
- Integrated electronic payment
ICM Initiative

- Goals
  - Demonstrate and evaluate strategies and ITS technologies that help transportation operators efficiently and proactively manage corridors
  - Provide the necessary tools, knowledge, and guidance, for ICM
Eight Pioneer Sites

3 Stages for the Pioneer Sites:
- Stage 1 – Concept of Operations, Sample Data, and Requirements
- Stage 2 – Analysis, Modeling, and Simulation
- Stage 3 – Demonstration and Evaluation
## Pioneer Site Corridor Assets

<table>
<thead>
<tr>
<th>Corridor Assets to Be Integrated with ICM</th>
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<tbody>
<tr>
<td>Freeway</td>
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<tr>
<th>Pioneer Site Location</th>
<th>HOV</th>
<th>Tolling</th>
<th>Value Pricing</th>
<th>Real-Time Control</th>
<th>Fixed Route</th>
<th>Express Buses</th>
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<th>Commuter Rail</th>
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ICM Data Types and Performance Measures

- Arterial Performance Measures
  - Vehicle speed
  - Link speeds
  - Intersection approach volumes
  - Ramp queues
  - Link and ramp capacity

- Transit Performance Measures
  - Schedule adherence
  - Speed/travel time
  - Transit capacity utilization
  - Parking space utilization

- Associated Corridor Performance Measures
  - Travel time
  - Travel delay time and predictability
  - Incident duration and frequency
  - Fuel consumption and pollution reduction
  - Corridor capacity utilization (vehicle & traveler throughput)
ICM Transit and Arterial Data Requirements

- **Transit Networks** - We need data that represents the current situation
  - Vehicle location and speed every 30-120 seconds
  - Vehicle passenger count every pull-out
  - Parking lot utilization (spaces used/remaining) 30-300 seconds

- **Arterial Networks** – We need data that represents what is happening at the lane level
  - Vehicle volumes, by approach lane, collected every 1-5 seconds & reported every 30-300 seconds
  - Signal phase data, by approach lane, collected every 1-5 seconds & reported every 30-300 seconds
  - Link volumes and average speeds every 30-300 seconds
Transit Data Gaps

- Vehicle location data is improving, though most systems do not support the desired 30 second update rate.

- Passenger counting data is improving, though most systems still only collect count data at the end of the day.

- Parking information is improving, though it may not be feasible to monitor every lot we would like to monitor (e.g. shopping center lots associated with transit stops).

- Communications is the biggest barrier to collection of real-time data from the vehicles.

- Transit agencies are reluctant to invest in real-time monitoring because they are not sure they can make meaningful responses in real-time.
Arterial Data Gaps

- Most of the attention is focused on how to use signal systems as data collection tools
  - Most signal systems don’t collect data in the locations we need
  - Most signal systems don’t collect data at the rates we need
  - Most signal systems can’t export real-time data to other systems

- Modification of traffic signal systems to provide the desired data usually requires modifications to the sensor connections, to the controller, and to the controller software

- Speed and travel times are well suited to public dissemination, but speed and travel times do not predict capacity problems, they only identify the locations once the capacity failure has occurred

- Probe data is not likely to fill the gaps in the near future
ICM Analysis, Modeling, and Simulation (AMS)

- Traffic control strategies such as ramp metering and arterial traffic signal control
- Traveler information, HOT lanes, congestion pricing and regional diversion patterns
- Regional patterns and mode shift; Transit analysis capability
Pioneer Demonstration Sites

San Diego, CA

- Decision-Support System
- Actionable traveler information
  - 511 (phone and website)
  - Comparable travel times
- Managed lanes
- Rerouting of traffic
  - Coordinated timing and responsive signal operations
  - Coordinated ramp metering and traffic signals
- Mode shift
  - Bus rapid transit
  - Transit signal priority
  - Real-time transit information

Dallas, TX

- Decision-Support System
- Actionable traveler information
- IVR (511)
- Website
- Email alerts
- Comparable travel times
- Rerouting of traffic
  - Coordinated timing and adaptive signal control
- Mode Shift
  - Parking management
  - Real-time service adjustments
ICM Lifecycle Process

Evaluation and Performance Monitoring

Analysis, Modeling & Simulation

Implementation

Project Time Line
Demonstration Tasks

Task 1 - Project Management
Task 2 - Refinement of System Requirements
Task 3 - System Design
Task 4 - System Build
Task 5 - System Test Planning and Execution
Task 6 - Training
Task 7 - System Operation and Maintenance
Task 8 - Participation in the AMS of the System
Task 9 - Participation in the Evaluation of the System
Task 10 - Participation in Outreach Programs
Demonstration Schedule

- ICM Phase 3 Demonstration Kick-off – Jan. 2010
- Design and Development – 18 months
  - Includes Pre-deployment data collection period
- Operations and Maintenance – 18 months
  - Includes Post-deployment data collection period
The ICM Knowledgebase

- Guidance Documents
  - Ex: ICM Surveillance and Detection Requirements for Arterial and Transit Networks

- Studies/Analysis Results
  - Ex: Integrated Corridor Management Analysis, Modeling and Simulation (AMS) Methodology

- Lessons Learned
  - Ex: Integrated Corridor Management Systems Lesson Learned

- Sample Documents/Templates
  - Ex: System Requirement Specification for the I-15 Integrated Corridor Management System (ICMS) in San Diego, California

- Presentations
  - Ex: Integrated Corridor Management Presentation at ITS World Congress 2009

- Outreach Support Products
  - Ex: Integrated Corridor Management Presentation at ITS World Congress 2009

- Magazine Articles
  - Ex: Managing Congestion with Integrated Corridor Management – Mass Transit Magazine

Check-out the ICM Knowledgebase at: [http://www.its.dot.gov/icms/knowledgebase.htm](http://www.its.dot.gov/icms/knowledgebase.htm)
Coming Soon to the ICM Knowledgebase

- CONOPs and Requirements Lessons Learned
- AMS Site Model Calibration and Validation Reports
- AMS Site Analysis Plans
- AMS Results
- AMS Lessons Learned
- AMS Guide
- ICM Implementation Guide
- CONOPs and Requirements Lessons Learned Fact Sheet
- ICM Demonstration Site Fact Sheet

Sign-up for RSS feed to be notified when new content is added to the ICM Knowledgebase at: http://www.its.dot.gov/icms/knowledgebase.htm!
AMS Guide

- Recommend an approach to help conduct AMS successfully and effectively
- Clarify minimum level of data, knowledge, skill sets, tools to conduct successful AMS

Target audience
- Analysis and technical managers and modelers in metropolitan areas in the US, where ICM could be deployed

Key message
- AMS is an integral part of the ICM concept – an ongoing, continual improvement process

Step-by-step Guide

Cross-referenced with available, more detailed information on existing resources:
- Pioneer Site AMS Plans, Model calibration reports, Requirements documents, CONOPs documents, other existing publications in traffic analysis toolbox website such as calibration guidelines for simulation models, guideline on selecting the appropriate traffic analysis tools, etc.

Short, real-world examples
ICM Implementation Guide

- Provide guidance on how to plan, develop, deploy, operate and maintain an ICMS
  - Provide overall framework, activities, and recommended ICMS development products
  - Assist in the development CONOPs and requirements
- Target Audience
  - Agency project managers with responsibility for planning, implementing, and operating the ICMS in their area
- Step-by-step Guide
- Share lessons learned to date from the ICM Program
- Short, real-world examples
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