UNITED STATES
DEPARTMENT OF TRANSPORTATION

Integrated Corridor Management: Analysis Modeling and Simulation (AMS)

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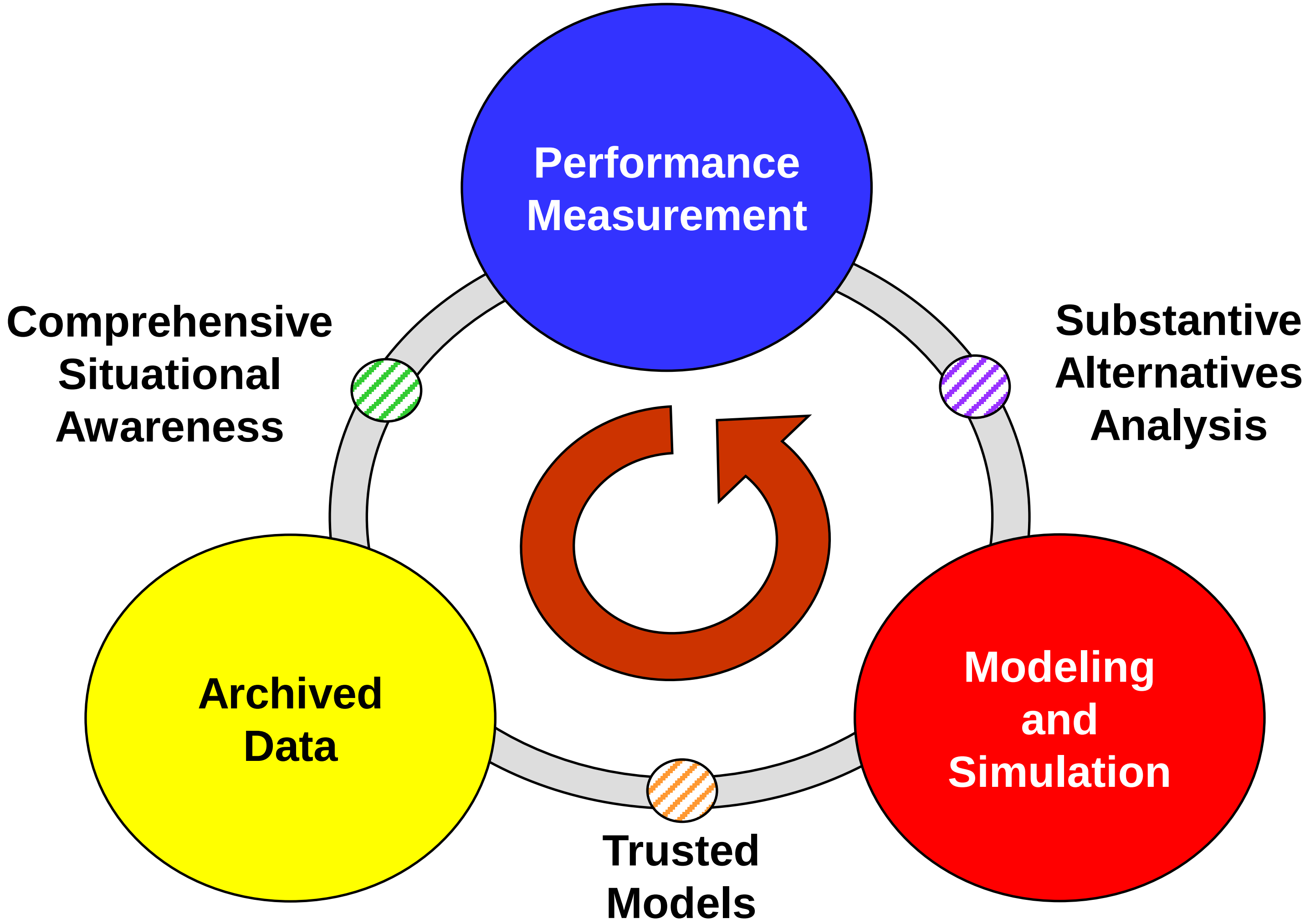
Overview

- AMS methodology
- Operational conditions analysis
- Performance measures
- Strategies modeled
- Analysis results

ICM AMS - A Process for Continuous Improvement

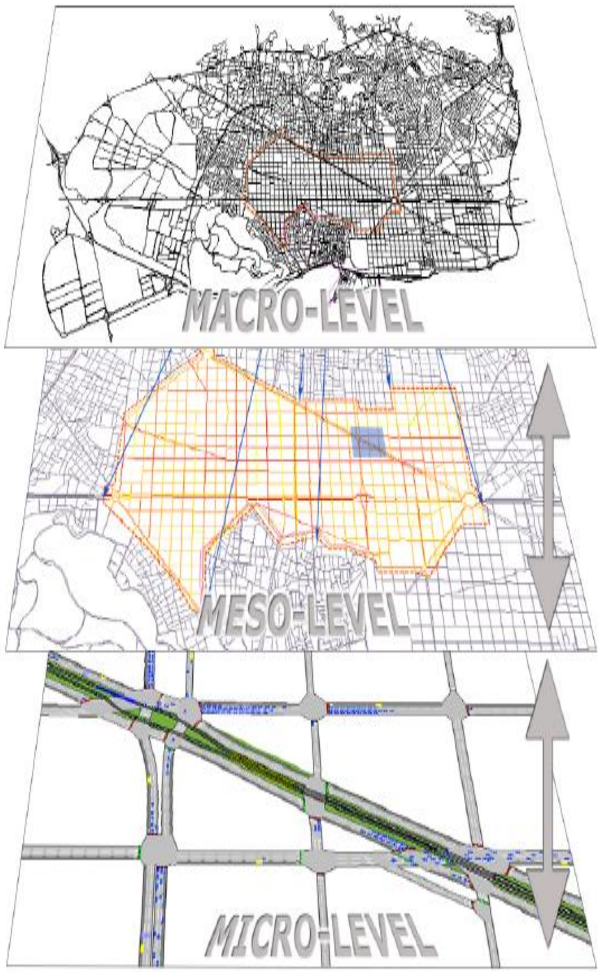


The Importance of Analysis

- **Invest in the right ICM strategies**
  - A predictive capability to help determine which combinations of strategies are likely to be most effective
  - Enables better, tangible understanding of ICM impacts and benefits
- **Invest with confidence**
  - Minimize conflicts or unintended consequences that would otherwise be unknowable before implementation
- **Improve the effectiveness/success of implementation**
  - Help identify problem areas
  - Help in building consensus among stakeholders
  - Optimize implementation staging
  - Provide insight to operators on how to refine ICM strategies in different operational conditions
- **Provide long-term capability to continually improve implementation based on experience**
  - Help evaluation effort focus on areas of highest impact

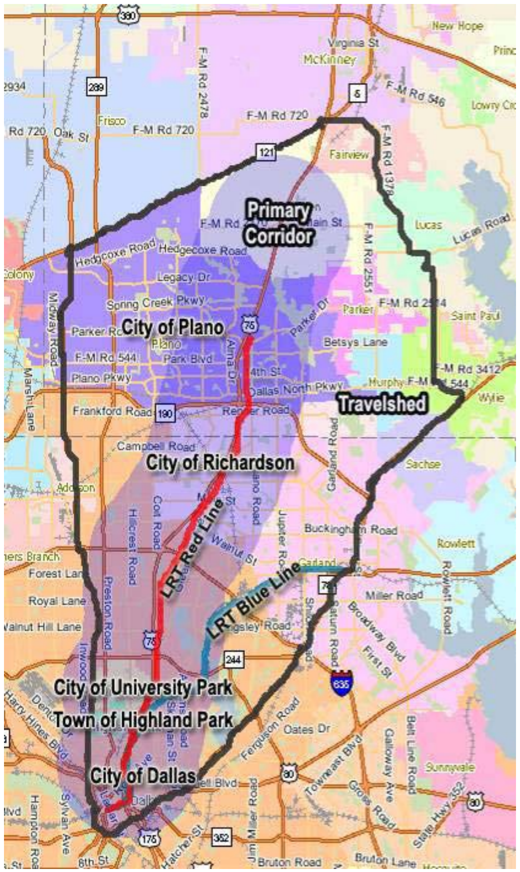
AMS Framework

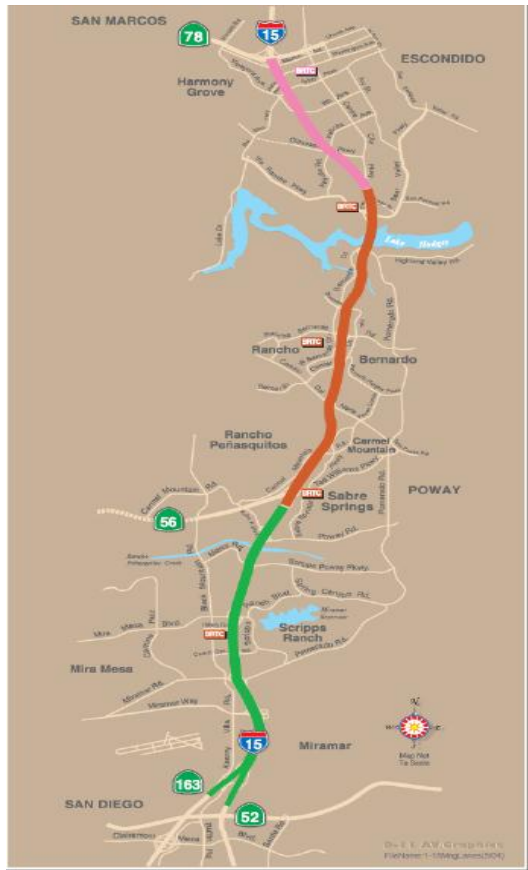
- Macroscopic travel demand models
  - Analysis of regional travel patterns and mode shift
- Mesoscopic simulation models
  - Analysis of regional diversion, traveler information, tolling, HOT lanes, and congestion pricing
- Microscopic simulation models
  - Analysis of traffic control strategies; e.g. ramp metering and arterial traffic signal coordination
- Meso and micro models are interchangeable depending on robustness and level of sophistication

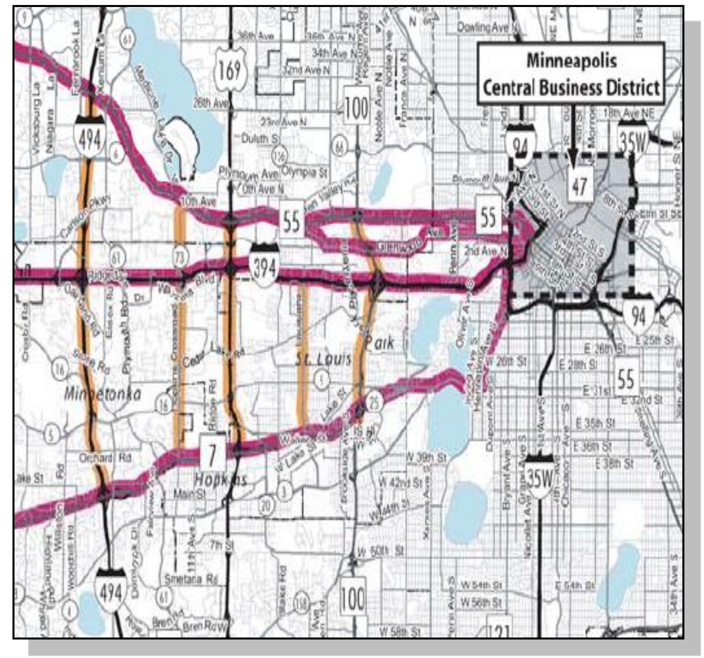


Three Stage 2 ICM AMS Corridors

U.S. 75, Dallas, TX; I-15, San Diego, CA; I-394, MSP, MN







Stage 2 AMS Site Models

Model Type	Minneapolis	Dallas	San Diego
Regional Travel Demand Model	Metro model in TP+	NTCOG model, TransCAD	TransCAD
Mesoscopic Simulation Model	DynusT – supported by U of Arizona	DIRECT – supported by SMU	
Microscopic Simulation Model			TransModeler Micro

Performance Measures

- Mobility
  - Describes how well the corridor moves people and freight
  - Travel time, throughput, delay
- Reliability
  - Captures the relative predictability of the public's travel time
  - Variability of travel time
- Emissions and Fuel Consumption
- Benefit-Cost

Strategies Modeled - 1

- Traveler Information
  - Earlier dissemination and information sharing between agencies
  - Comparative travel times (mode and route)
  - Parking availability at park and ride lots
  - Freeway, arterial and transit traveler information (pre-trip and en-route)
- Traffic Management
  - Reduced incident times
  - Incident signal retiming for arterials or frontage roads
  - Coordinated signal and ramp meter operation

Strategies Modeled - 2

- HOT/HOV Lanes
  - HOT lane (congestion pricing)
  - HOV lane (change minimum number of occupants)
  - Open to SOV during incidents
- Transit Management
  - Dynamic rerouting
  - Special events capacity expansion
  - Arterial signal priority
  - LRT smart parking system
  - Add parking
  - Physical priority to buses on arterials

ICM Strategies and Scenarios Summary – I-394 Minneapolis

Strategy/Scenario	Freeway Segment Closed	One Freeway General Purpose and Auxiliary Lane Blocked			Arterial Segment Closed
Incident Clearance Time (Minutes)	**80**	**80**	**30**	**45**	**65**
Incident Severity	Major	Major	Minor[1]	Minor[1]	Major
Traveler Information					
Earlier Dissemination	●	●	●	●	●
Comparative Travel Times (Mode and Route)	●	●	●	●	●
Parking Availability at Park-and-Ride Lots	●	●	●	●	●
Traffic/Incident Management					
Incident Signal Retiming Plans for Arterials	●	●			●
Predefined Freeway Closure Points	●				
HOT/HOV Lanes					
HOT Lane Open to All Traffic		●			
Transit Management					
Transit Signal Priority	●	●			

U.S. 75 Corridor - Modeled ICM Strategies and Operational Conditions

Scenario	Daily Operations – No Incident			Minor Incident			Major Incident		
Demand	**L**	**M**	**H**	**L**	**M**	**H**	**L**	**M**	**H**
Traveler Information									
Comparative, multimodal travel time information (pretrip and en-route)	●	●	●	●	●	●	●	●	●
Traffic Management									
Incident signal retiming plans for frontage roads[1]					●	●	●	●	●
Incident signal retiming plans for arterials[2]					●	●	●	●	●
Managed Lanes									
HOV lane[3]	○	○	○	○	○	○	○	○	○
Light-Rail Transit Management[4]									
Smart parking system								●	●
Red line capacity increase								●	●
Station parking expansion (private parking)								●	●
Station parking expansion (valet parking)								●	●

I-15 Corridor – Modeled Operational Conditions

Scenario	Year	Demand Class	Incident	DSS Operational	Probability (Percentage)
Baseline	2003	Typical Day	None	No	–
A	2012	High	None	No	34%
B	2012	Medium	None	No	16%
C	2012	Low	None	No	21%
D	2012	High	None	Yes	34%
E	2012	Medium	None	Yes	16%
F	2012	Low	None	Yes	21%
G	2012	High	Freeway	No	11%
H	2012	Medium	Freeway	No	6%
I	2012	Low	Freeway	No	8%
J	2012	High	Freeway	Yes	11%
K	2012	Medium	Freeway	Yes	6%
L	2012	Low	Freeway	Yes	8%
M	2012	High	Arterial	No	1.9%
N	2012	Medium	Arterial	No	0.9%
O	2012	Low	Arterial	No	1.2%
P	2012	High	Arterial	Yes	1.9%
Q	2012	Medium	Arterial	Yes	0.9%
R	2012	Low	Arterial	Yes	1.2%

Analysis Results - Summary

	San Diego	Dallas	Minneapolis
Annual Travel Time Savings (Person-Hours)	246,000	740,000	132,000
Improvement in Travel Time Reliability (Reduction in Travel Time Variance)	10.6%	3%	4.4%
Gallons of Fuel Saved Annually	323,000	981,000	17,600
Tons of Mobile Emissions Saved Annually	3,100	9,400	175
10-Year Net Benefit	$104M	$264M	$82M
10-Year Cost	$12M	$14M	$4M
Benefit-Cost Ratio	10:1	20:1	22:1

Red Line LRT and Parking Lot Utilization
Medium and High Demand, Major Incident

	Pre-ICM Medium Demand	Post-ICM Medium Demand	Pre-ICM High Demand	Post-ICM High Demand
Ridership	3,718	4,248	4,018	4,606
Transit Capacity	8,250			
% Utilization	45%	51%	49%	56%
Parking Lot Users	3,616	4,141	3,939	4,507
Park-and-Ride Capacity*	5,552	5,802	5,552	5,802
% Utilization	65%	71%	71%	78%

ICM AMS Stage 2 Results - Trends

- ICM improves mobility
  - Travel time, delay and corridor throughput are improved after ICM implementation
- ICM helps improve the reliability of travel time
- ICM helps reduce fuel consumption and mobile emissions
- ICM strategies produce more benefits
  - At higher levels of travel demand, and
  - During non-recurrent congestion
- The ICM AMS effort improved analysis tools and methods
  - New tools for analysis of transit, congestion pricing, HOT lanes, ramp metering, and active traffic management
  - Improved model calibration and data analysis methods