Federal Highway Administration Report: Traffic Analysis Tools Current Activities

Transportation System Simulation Manual - The objective of this effort is to create a first Simulation Manual for the evaluation of transportation systems that delivers to the users the concepts, guidelines, and procedures of simulation modeling. This project will develop a draft framework of the manual. The ultimate goal of the manual itself is that it will address at a minimum: the differing scales of modeling; integration of models; model inputs and data formats; data summary and analysis; data storage and model reuse; calibration/validation of simulation; alternative analysis; post processing of model data and interpretation

Update to Volume III: Guidelines for Applying Traffic Microsimulation Modeling Software -This project will update the Guidelines in the Traffic Analysis Toolbox for microsimulation to include better calibration and validation techniques, and to incorporate new guidance on the use of simulation. Introducing Cluster Analysis into the process.

Tools for Tactical Decision Making and Advancing Methods for Predicting Performance - The objective of this study is to analyze the approaches and requirements for forecasting transportation conditions and predicting system performance to support real-time performance-based management. The concept is for the TMCs to have a comprehensive view of the transportation system in real time and use that view to predict how the system will behave (i.e., the performance of the transportation system) within, say, the next 20 minutes, 30 minutes, an hour. If the predicted performance over that time doesn't meet the desired performance target, the TMC operator/manager can pro-actively implement operational strategies/solutions or actions to influence and alter the future performance in a favorable manner to align with the performance objectives/goals. These actions may include providing real-time information about the predicted conditions to travelers, implementing operational strategies such as congestion pricing, parking information/restrictions, hard shoulder use, speed harmonization, ramp metering and control, optimizing traffic signal timing, changing transit frequency, adjusting the mix of transit services, etc.

ATDM Trajectory-Level Validation - The objectives of the project are to collect trajectory level data, develop a process and/or tool for enabling trajectory level AMS tool validation, and making the process/tool publicly available for use by others.

Traffic Bottleneck Identification and Diagnosis, Countermeasure Prioritization, and Innovative Solutions to Local/Systemic Problems- In addition to ITS applications mostly with connected vehicle technologies (e.g., ramp metering, active travel demand management, improved signal coordination, et al) it is our finding that short-term, relatively simple geometric and traffic control innovations continue to significantly relieve bottlenecks in cost-effective ways. However, there is little research that separates systemic causes from operational/localized ones, as they both fall under the umbrella of “recurring” congestion. The scope is to develop guidance solely for recurring congestion identification, vis-à-vis separating systemic and localized causes. Then to recommend how to focus on existing but cost-effective treatments to alleviate these two bottleneck categories and develop corresponding improvement recommendations based on land requirements and benefit/cost analysis. The next step is to develop or promote any innovative treatments, or conduct research using traffic simulation and driving simulator studies, to evaluate performance improvements, feasibility, human factors adjustments, and benefit/cost analysis. Finally, the last step is to develop guidelines that provide design and operational recommendations for low-cost or cost-effective innovative treatments.

Active Transportation and Demand Management (ATDM)/Dynamic Mobility Applications (DMA) Simulation Testbed –

Objectives
To create a framework that will allow agencies to evaluate the impacts of implementing ATDM concepts and strategies (dynamic management of the entire trip chain) in their regions.
To quantify the general benefits of ATDM and other Operations initiatives for incorporation into our program products (workshops, presentations, guidance documents, etc.).
To validate and improve other analytical tools being used today to create the foundation for a more proactive, integrated, performance-driven approach to operations.
To enable robust impacts assessment of DMA bundles to support future field demonstrations.
An AMS Testbed as envisioned here is a modeling framework - and the framework here is a blueprint or high-level design that gives directions on how the Testbed should be constructed. The Testbed will be able to replicate the effects of public agencies in a region implementing ATDM and DMA concepts and strategies. Once developed, this framework will be implemented in a laboratory setting (or a controlled environment) in that the modeling conducted will not be directly connected to the systems, algorithms, or TMC operators that make real-time traffic management decisions. However, it is the intent to make the Testbed as based in reality as possible by modeling an actual metro region's transportation system - including the road, transit, and parking networks, the transportation demand of vehicles and transit modes, and possibly other modes, and also modeling the impacts of applying ATDM concepts and DMA bundles (such as INFLO and EnableATIS) under different operational conditions (like bad weather or incidents).

ATDM Application of Tools for Tactical and Strategic Decision Making - The primary purpose of this task order is to help fill a gap in understanding traveler decision making, which is critical to the success of ATDM applications. A better fundamental understanding of driver behavior decisions and responses will lead to more effective and successful ATDM deployments that will in turn lead to more impactful benefits in mobility, safety, and the environment, particularly when needed most during non-recurring conditions. The objectives of this task order are to: better understand traveler strategic and tactical decision making, understand the motivation(s) behind traveler behaviors and decisions, develop approaches to overcome resistance to change, and enable the findings to be incorporated into ATDM guidance and outreach materials, as well as into Analysis, Modeling, and Simulation (AMS) tools. This project will develop a multi-objective Framework for tradeoff analysis. The Framework will contain the concept, high-level functional requirements, and the structure so that it can be used for future tool development.

SHRP 2 Implementations
L04 – Reliability in Simulation Models – This project will implement the L04 methodology in two new locations, Portland and Phoenix. The objectives of this project are to:

1. Assist public agencies such as state departments of transportation, metropolitan planning organizations (MPOs), and other public sector stakeholders in moving reliability into their business practices through the piloting of the SHRP 2 L04 products in the two sites.

2. Provide feedback to FHWA on the applicability and usefulness (benefits and value) of the products piloted and lessons learned. Suggest potential refinements and approaches for

implementation in other agencies.

L38- Reliability Data and Analysis Tools (L02/L05/L07/L08/C11)
This project is implementing part to this entire bundle in the states of Florida, Illinois, Kentucky, Maryland, Minnesota, North Carolina, Tennessee and Washington.
To improve travel-time reliability, transportation agencies need data monitoring, analysis, and planning tools to understand fluctuations in traffic and to identify effective strategies to reduce the variable and uncertain travel times caused by recurring and nonrecurring congestion. Traditionally, analysis tools have focused on average conditions and not the range of travel times and how they vary over time in response to various traffic, roadway, and weather conditions.
These tools help transportation agencies better identify and implement strategies to reduce the variability and uncertainty of travel times for commuters and other travelers as well as the freight industry.

Advanced Travel Analysis Tools for Integrated Travel Demand Modeling (C10/C04/C05/C16)
This project is implementing part of this bundle in the states of California, Georgia, Maryland, North Carolina, Ohio, Oregon and Pennsylvania.
The SHRP2 Capacity Advanced Travel Analysis Tools bundle provides approaches for developing integrated travel analysis models-that include traveler decision inputs-to better align the outcomes with real-world conditions. Frequent constraints for metropolitan travel forecasting models include limited feedback between supply and demand sides, limited inputs on traveler behavior related to pricing and congestion, and limited use and guidance about activity-based models and dynamic traffic assignment. Many transportation agencies already use some of these tools and tactics in their current business practices.
Integrated Corridor Management Analysis, Modeling, and Simulation (AMS) - The ICM initiative developed an Analysis, Modeling and Simulation (AMS) methodology, to assist corridor managers in forecasting and assessing the potential benefits and implications of ICM in their corridors of interest. The ICM AMS methodology is rooted firmly in the USDOT's established modeling guidelines and frameworks, as defined in the Federal Highway Administration's (FHWA) Traffic Analysis Toolbox and Traffic Simulation Guidelines. The ICM AMS is a comprehensive approach that analyzes different operational conditions across time and modes and across a large enough geographic area to absorb all impacts. One of the defining features of the ICM AMS methodology is that it enables agencies to understand system dynamics at the corridor level. The ICM AMS methodology uses corridor-level performance metrics rather than facility-level metrics to evaluate and understand corridor performance. The ICM AMS methodology accomplishes this through the combined use of multiple classes of available modeling tools. By combining aspects of microsimulation (ideal for analyzing traffic control strategies), mesosimulation (utilized to analyze regional strategies such as traveler information and pricing) and macrosimulation (i.e., Travel Demand Modeling [TDM], good for analyzing implications associated with mode shift), the ICM AMS methodology enables robust modeling of hypotheses under a range of operating conditions of interest to the corridor for more informed decision-making. This produces improved analysis as compared to travel demand models alone because the combined tools yield more accurate travel times and speeds through the corridor, more in-depth understanding of bottleneck locations and their root causes, and an understanding of the influences beyond the periphery of the corridor that underlie corridor demand.

Data Analysis Guide - Develop a Guide on data requirements for traffic analysis; how to conduct an experiment design before data is collected, how much data to collect, summarizing and analyzing data

(preparing data for analysis),capturing variability and uncertainty in data before conducting analyses, data for calibrating and validating tools, etc.

Traffic Analysis Tools Scoping Guide - Develop a Guide to help traffic engineers/managers effectively coordinate the analysis effort to ensure a cost-effective outcome to the study. The primary component of an effective management plan is the study scope, which defines the objectives, breadth, approach, tools, resources, and time schedule for the study. This study will capture the key components of an overall management plan for achieving a cost-effective analysis

HCM2010 Reference Guide - The intent of the guide is to support our FHWA Division staff on how to conduct proper review of various traffic studies and analyses.

Workshop on Foundations of Dynamic Traffic Assignment {DTA) - FHWA sponsored workshop providing participants with a solid grounding in the fundamentals of conducting traffic analyses using DTA techniques, knowledge on the appropriate use of DTA, and an understanding of both strengths and weaknesses inherent in DTA analyses. The workshop has a one-day format featuring lecture and interactive pen- and-paper class exercise elements. Hands-on computer exercises are NOT an element of the workshop. The workshop is intended to provide participants with the background to make informed decisions regarding the value and challenges of DTA analyses using a broad range of simulation tools. The target audience for the workshop is transportation and community planners within MPOs and local, county and state organizations, transportation engineers, traffic analysts and consultants.