INTEGRATING ACTIVITYSIM & DYNAMIC TRAFFIC ASSIGNMENT

FOR TOLEDO, OHIO

Caliper®

Transportation & Mapping Solutions

Maptitude • TransCAD • TransModeler

BACKGROUND ON CALIPER EFFORTS & GOALS

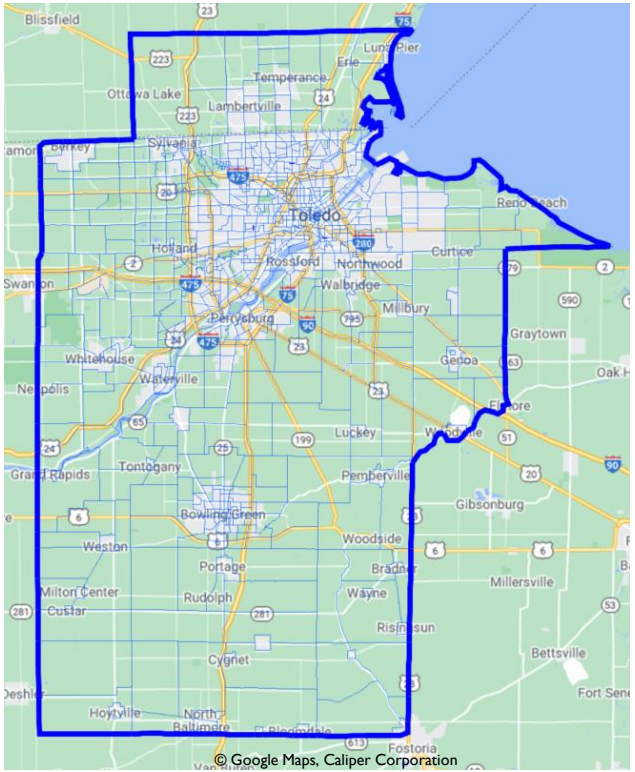
- One of multiple R & D projects to advance ABMs, DTA, and their integration.
- Take advantage of the unique TransCAD & TransModeler architectures to provide better support for ABM models in general and ACTIVITYSIM users in particular.
- Advance ABM-DTA integration to the next level.
- Fulfill a longstanding FHWA & ODOT desire to have a working and realistic ABM-DTA model example that runs fast enough to help explain concepts and explore issues.

PRIOR WORK

- TransCAD platform support for disaggregate models
- User interface creation for CC-ABM, a Caliper ABM.
- Numerous DTA projects with TransModeler.
- Establishment of DTA as routine in simulation studies.
- Extension of TransModeler DTA to respect the temporal constraints of activity schedules so that tours and trips cannot be made until after prior activities and their associated tours and trips have been completed.
- Regionwide deployment of an integrated ABM-DTA with a DAYSIM – TransModeler model of the 6 county North Florida TPO (Jacksonville) done in collaboration with RSG for FHWA.

TMACOG MODEL REGION

- Toledo Metro Area
  - Midwest, industrial
  - Previous TransModeler simulation of downtown area
- 600k People
- 922 Zones



INITIAL ACTIVITYSIM IMPLEMENTATION

BASICS

- Started from SEMCOG version of ActivitySim
  - Used native TransCAD population synthesizer (fast IPU)
    - Household and person controls at multiple levels of geography
    - Subarea re-synthesis
  - Limited transit modes for Toledo
  - Modified ActivitySim for half-hour dynamic skims
  - Calibrated to match survey results – key coefficients, ASCs
  - Otherwise, "standard" ActivitySim

- Existing Auxiliary Models
  - Trucks
  - Externals
  - Commercial

IMPLEMENTATION ISSUES / LESSONS LEARNED

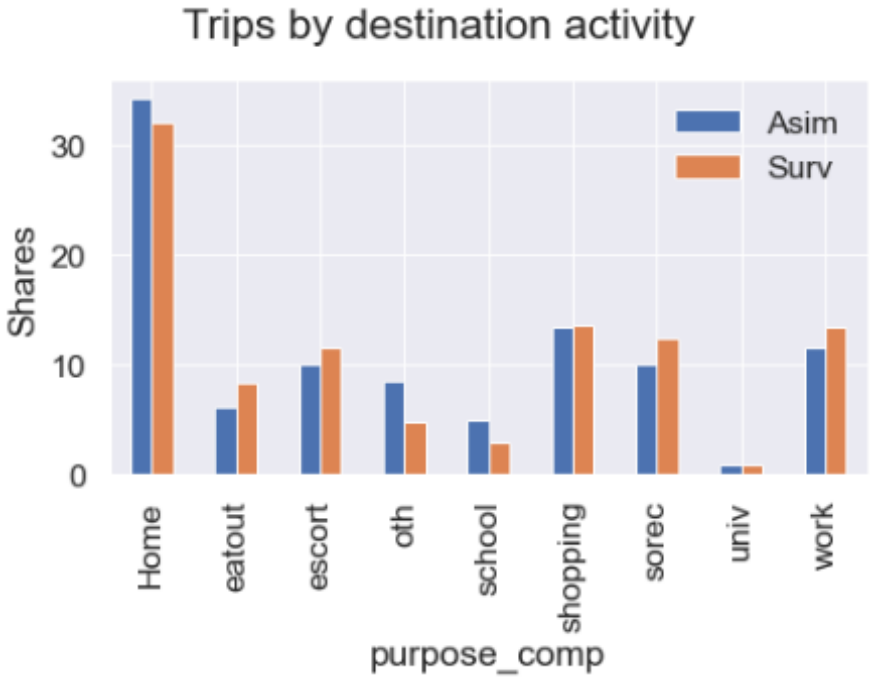
- Run configuration split across files (configs and configs_mp folders)

- A single model specification is spread over multiple files
  - Separate files for
    - Preprocessing variables in specification
    - Coefficients entering specification
    - Specification
  - Variables in logsum calculations are a "subset" of the full specification
  - E.g., Tour mode choice – 4 csv files, 1 yaml file
  - Makes understanding the effect of variables difficult
  - Some variable definitions and units were unclear

- Changing modes
  - Multiple interdependent files makes editing and changes challenging
  - Required trial and error

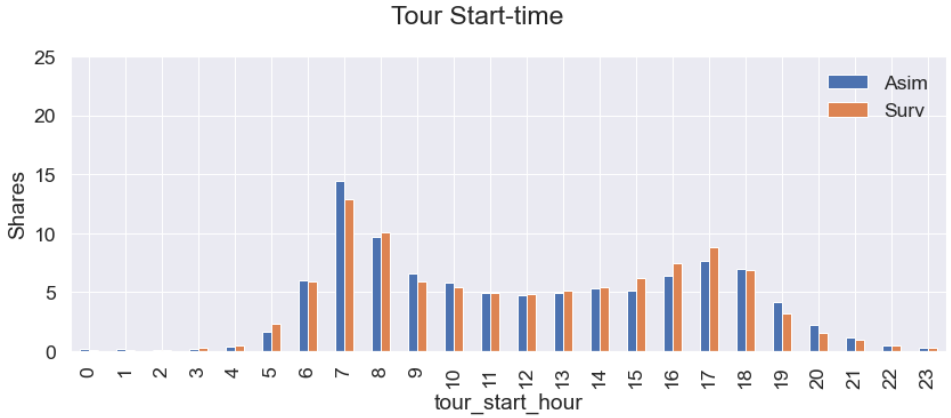
CALIBRATION RESULTS

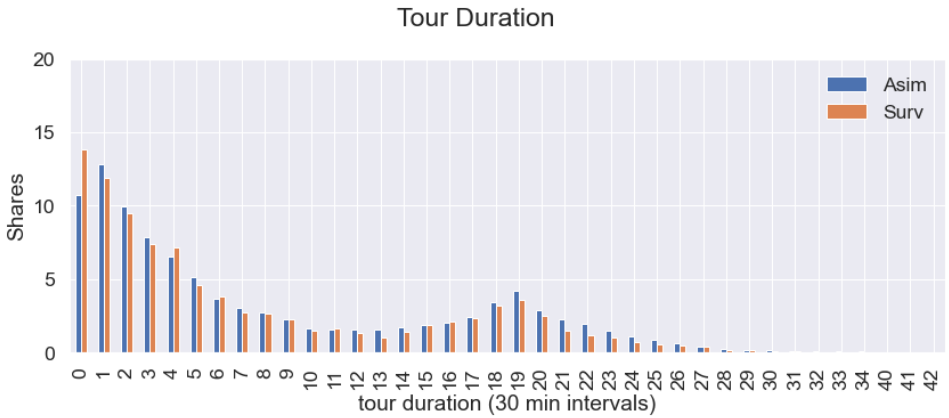
- ActivitySim vs. Travel Survey

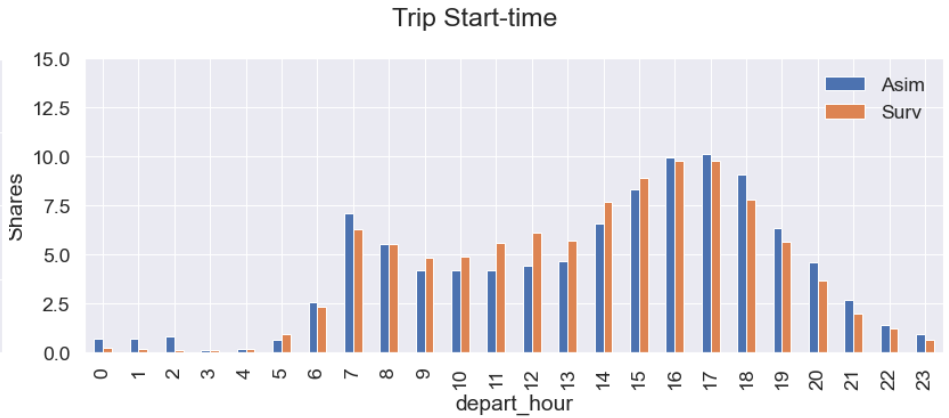


CALIBRATION RESULTS

- Tour start-time, tour duration, trip start-time - ActivitySim vs. Travel Survey

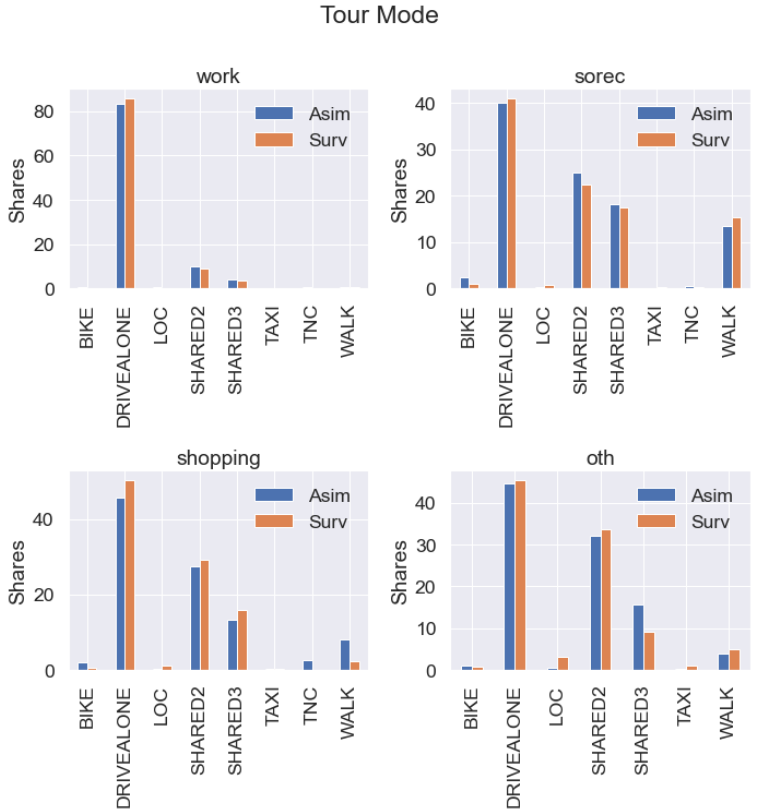






CALIBRATION RESULTS

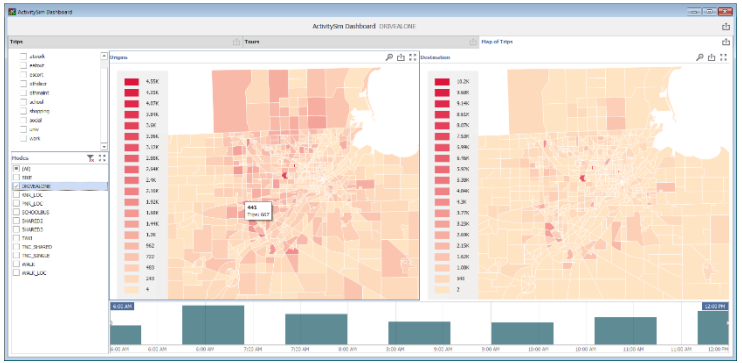
- Select mode shares by purpose, ActivitySim vs. survey



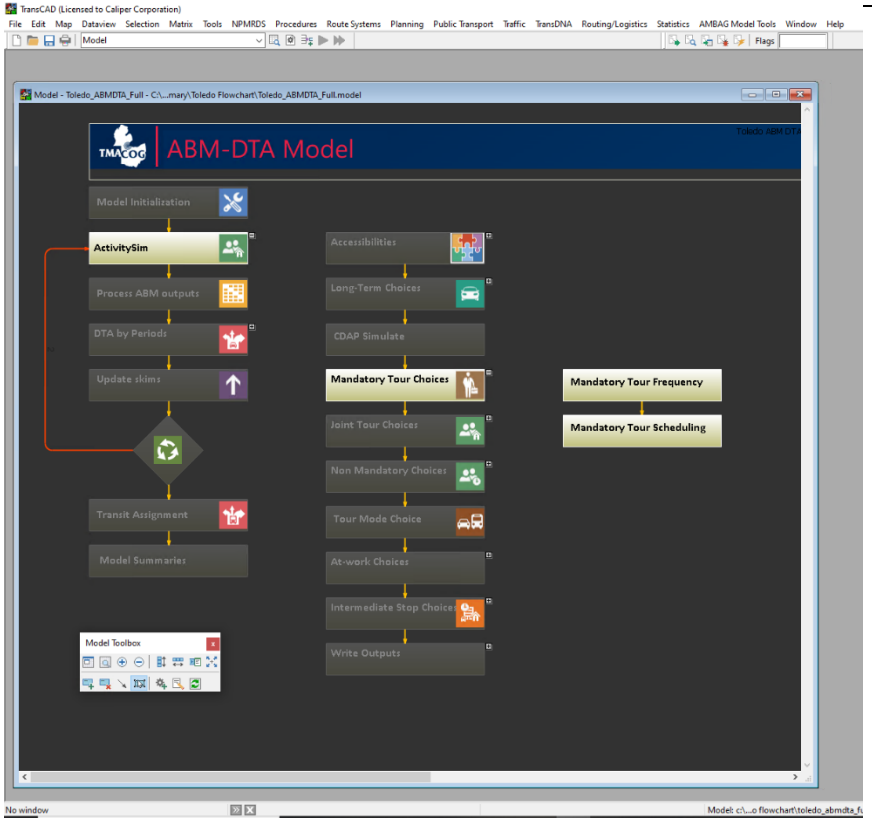
USABILITY IMPROVEMENTS & GRAPHICAL USER INTERFACE

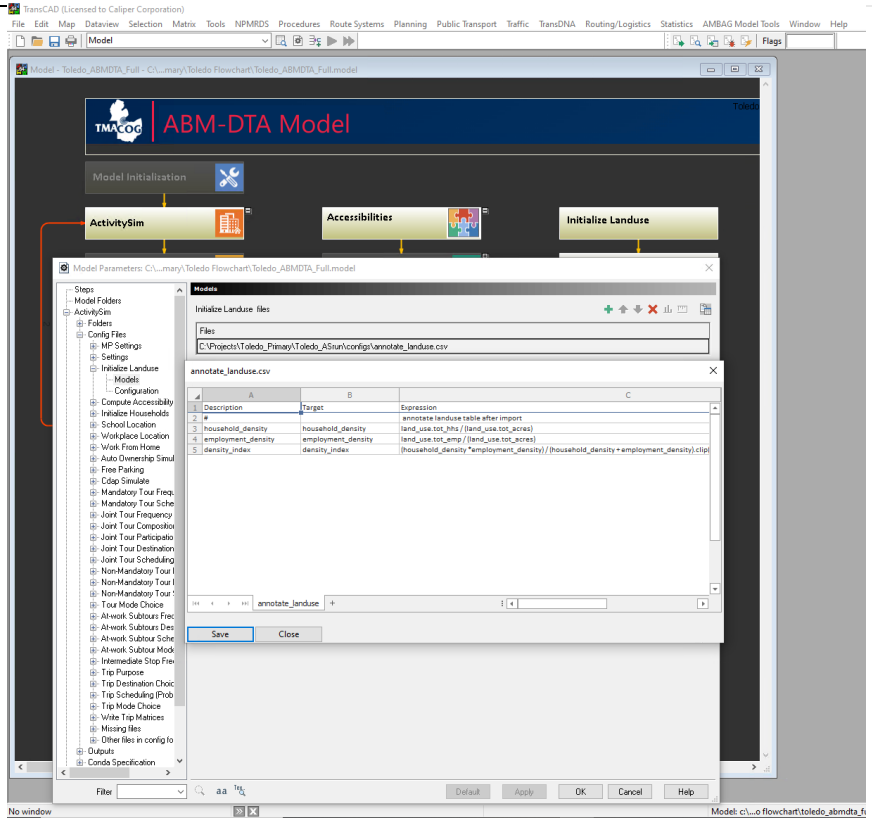
INTEGRATED INTERFACE

- Control pipeline execution of components via flowchart
  - e.g., non-mandatory only run for short-run impact scenario
- Organize and expose parameters for editing
- Scenario management
  - e.g., alternative future telework assumption
- Visualizations & reporting
  - Dashboards



ACTIVITYSIM FLOWCHART DEMONSTRATION





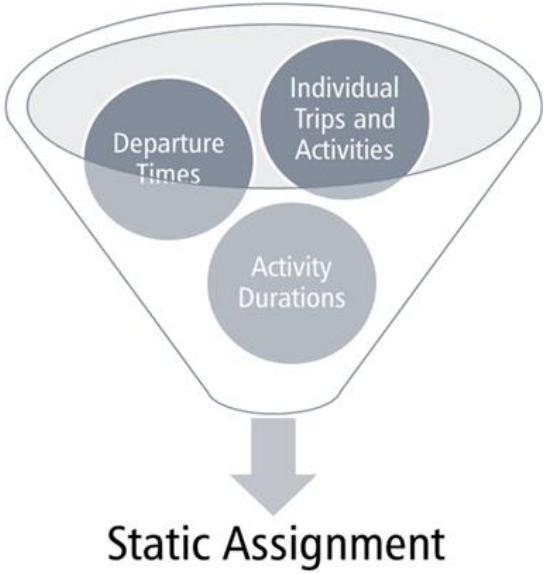
DTA INTEGRATION

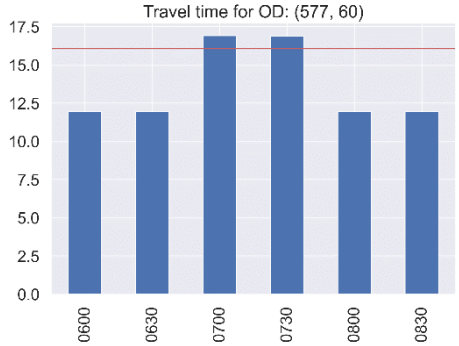
WHY DTA?

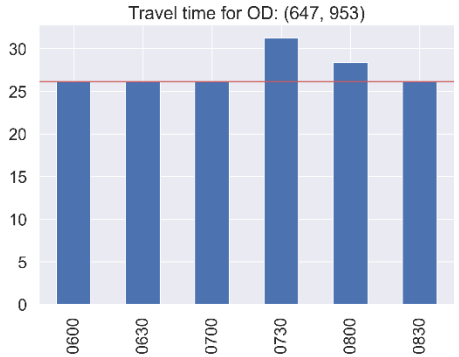
- Travel times vary considerably over short intervals
- Realistic queuing, spillback are crucial to project evaluation
- DTA can capture influence of travel time variability, queuing on route choice
- Route choice can be sensitive to individual characteristics, behaviors
- DTA Simulation can and should preserve order of trips and tours
- Support animation for analysis and stakeholder engagement

DYNAMIC SKIMS FOR ACTIVITYSIM

- Information loss in period-level skims
- Adapted ActivitySim to accept dynamic skims (30 min)

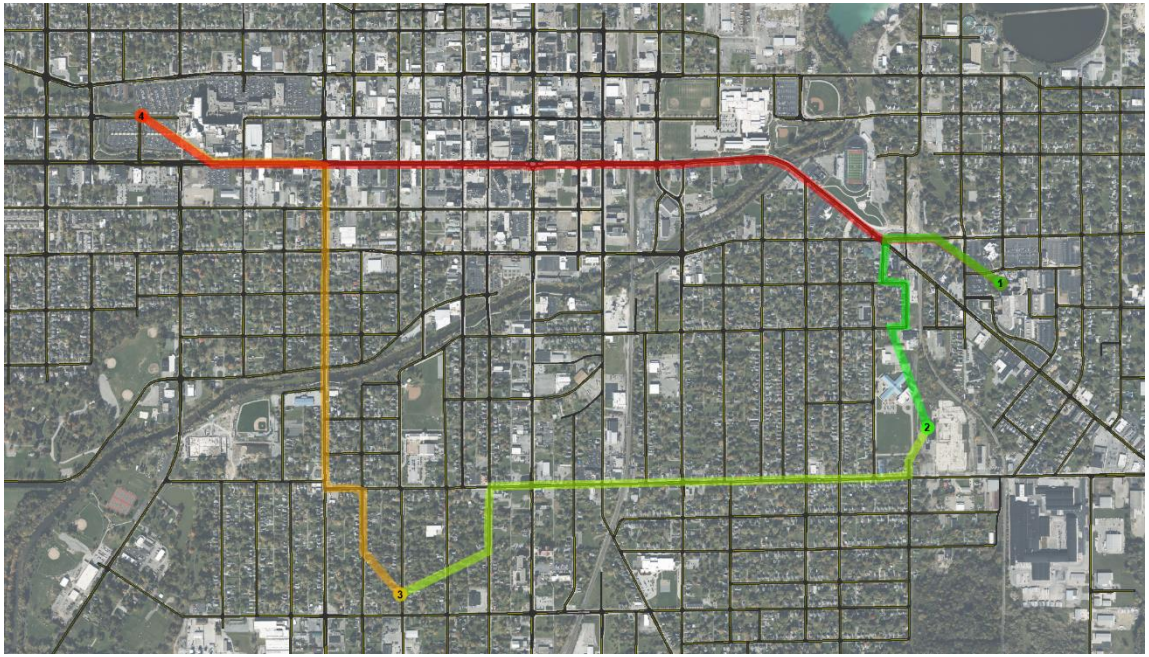






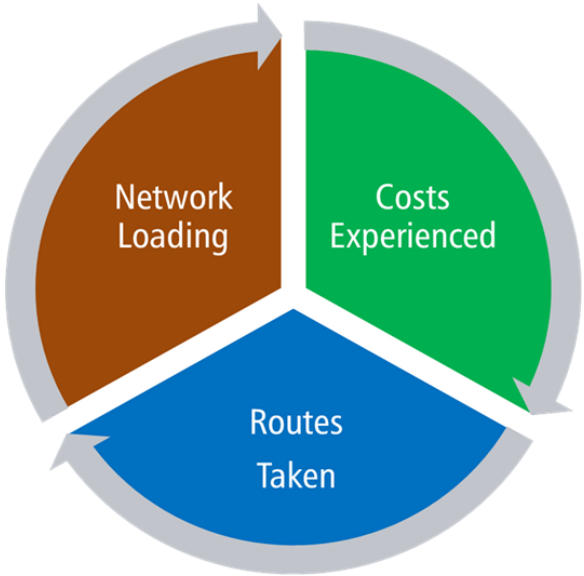
TOUR SIMULATION + VISUALIZATION

Trip	Departure Time	Purpose
1	8:00 AM	Home to school day care drop-off
2	8:05 AM	Day care to school drop-off
3	8:10 AM	School drop-off to work
4	5:00 PM	Work to home



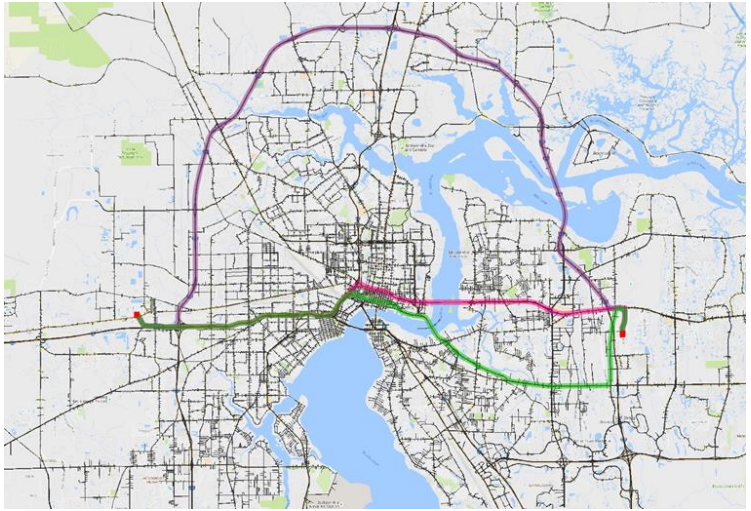
WHAT IS DTA?

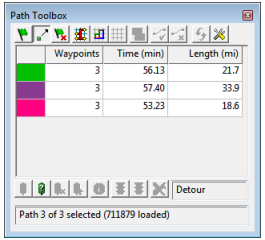
- A traffic assignment in which routes taken are motivated by *costs experienced* at the time of travel



ROUTE CHOICE

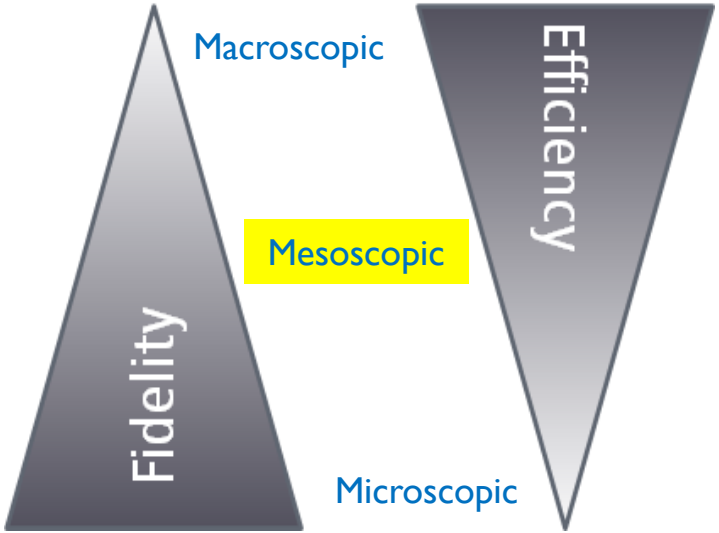
- Must be reasonable for a robust DTA
- Must be fast for a practical DTA
- Must be sensitive to occupants, VoT
- Must be auditable





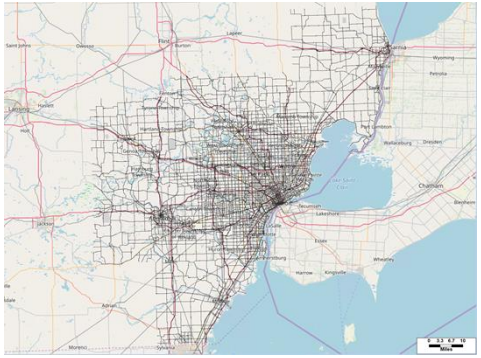
TIME DEPENDENT NETWORK LOADING

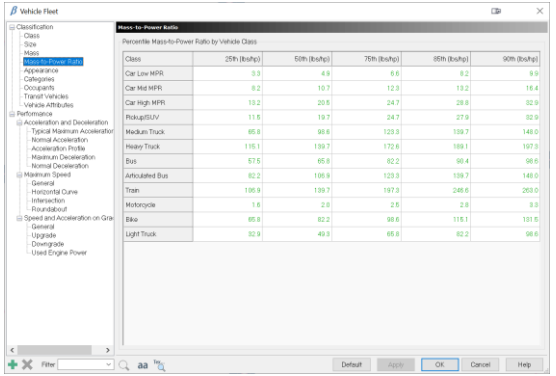
- Network loading can be macroscopic, mesoscopic, or microscopic

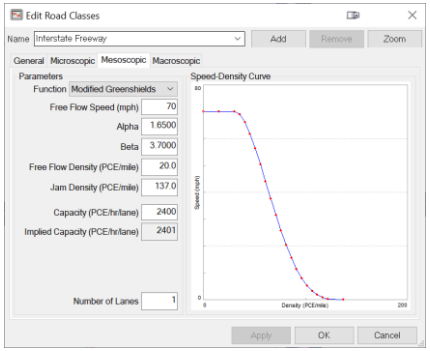


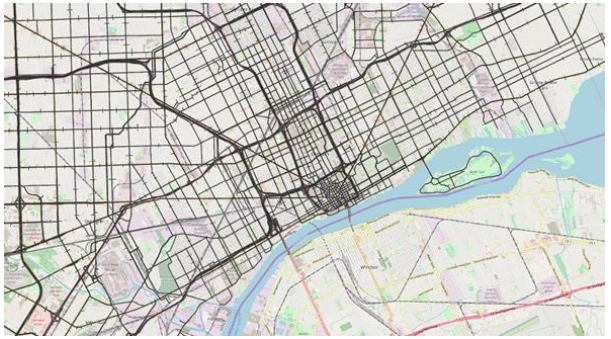
MESOSCOPIC DTAS VARY WIDELY

- Scalability
- Running time
- Level of detail
- Operational sensitivity
- Ease of use
- Compatibility with travel models
- TransModeler touches all the bases









TIME-DEPENDENT SIMULATION OF TRAFFIC DEMO

3D ANIMATION DEMONSTRATION

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