Network Microsimulation Extension to Activity-Based Travel Model

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CMAP's Need

GO TO 2040 recommends several approaches to strategic investment in future transportation improvements.

- Transportation management
- Operational
- Major capital projects

Evaluation relies on quality projections of future travel and transportation system performance.

CMAP's ABM

Key Shortcoming

ABMs rely on skims from static assignments.

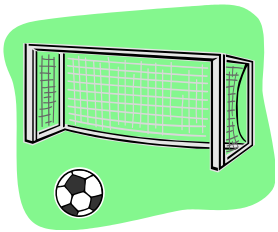
- Can’t provide information on real-time conditions
- Thus limits model’s predictive powers

CMAP's Goal

Extend ABM capabilities to include dynamic sensitivity to multi-modal network conditions.

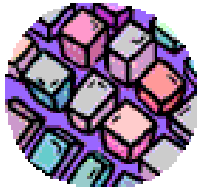
To get there:

- Regional multi-modal network simulation
- Integrate microsimulation with ABM



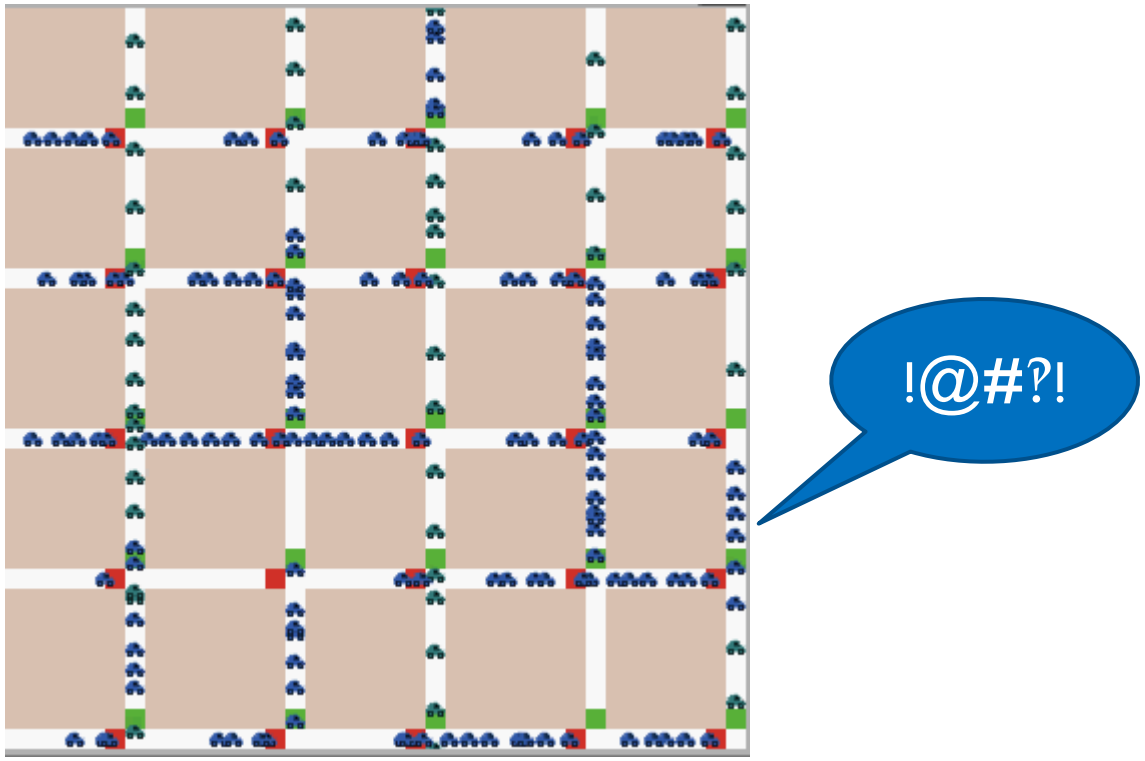
Regional Network Microsimulation

- Travelers using auto/bus/bicycle modes
- Interface with rail passenger and walk modes



Integrate Microsimulation with ABM

- *En route* knowledge from microsimulation used by ABM



Consultant Team

Parsons Brinckerhoff

with

Northwestern University Transportation Center

PARSONS BRINCKERHOFF

Northwestern University Transportation Center

Multi-Modal Network Microsimulation

DYNASMART-P platform

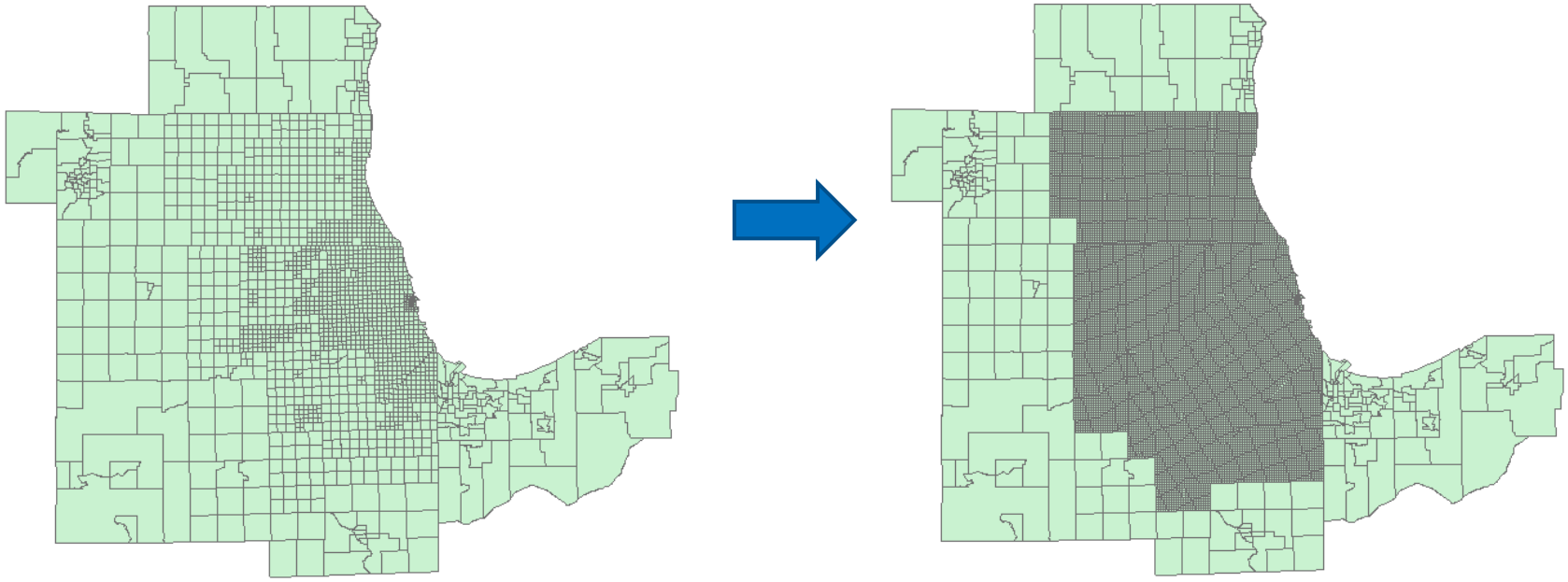
- Individual agents as decision-makers
- Different information availability states for agents
- Flexibility in loading network
- Heterogeneous user preferences in path-finding
- Algorithms for equilibration of large-scale networks

Microsimulating Alternative Modes

- Bus transit/intermodal transit
  - *Vehicular movements simulated along with auto*
- Rail Transit
  - *Modeled as scheduled mode*
- Bicycle
  - *Average roadway speed or sidewalk-riding conditions*
- Pedestrian
  - *Average speed for walk links*

Enhanced Spatial Resolution

Implement microsimulation as MAZ-to-MAZ trips

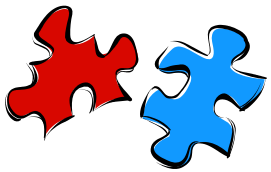


DTA-ABM Integration LOS Issue

DTA feedback doesn't meet LOS needs of ABM.

Pre-Sample trip destinations

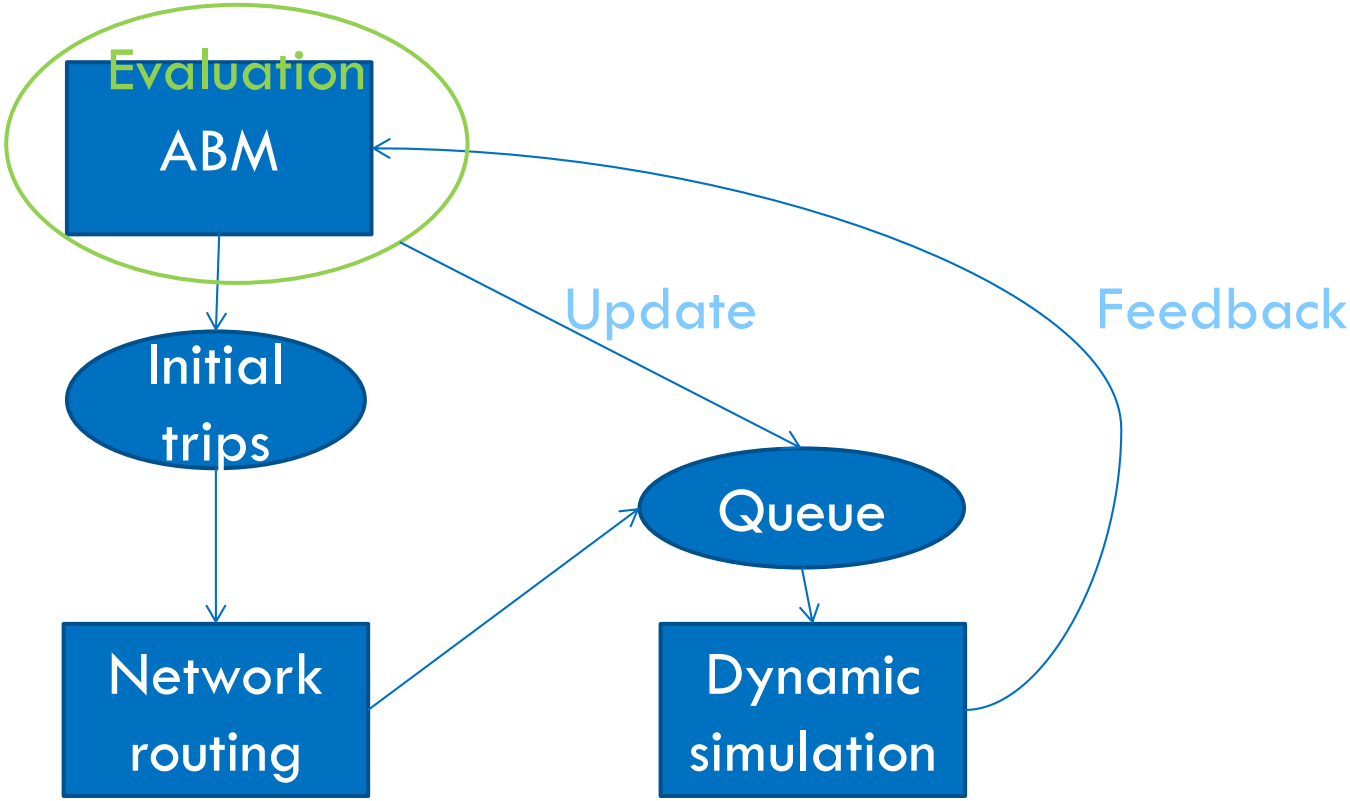
- Primary tour destinations
  - 400 for each origin & travel segment
  - 40 of 400 for each individual & travel segment
- Secondary stop locations
  - 400 for each OD pair & travel segment
  - 40 of 400 for each individual, primary destination & travel segment



Daily Level Integration

- Entire day ABM run
- Entire day microsimulation
- No substantial change to ABM or DTA

Trip/Activity Level Integration



Real-Time Level Integration

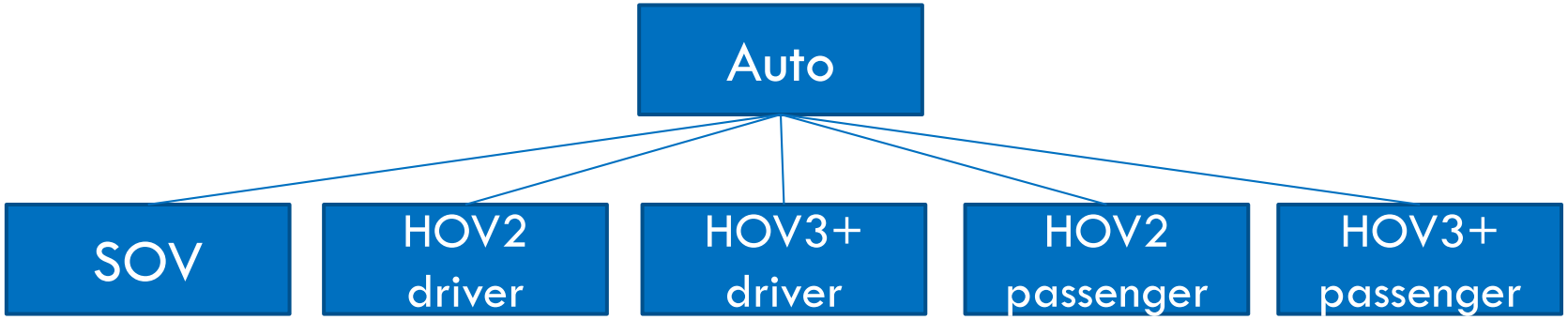
- Feedback to ABM before end of trip
- Flexible re-routing in DYNASMART
- Extend feature to re-plan remaining trips

ABM Modifications

- Finer temporal resolution for trip departure

  5 minutes

- Auto occupancy and explicit driver-passenger roles



Project Timeframe

- Task 1. Design Analysis Framework
  (Mar. – Jun. 2013)
- Task 2. Produce a Multi-Modal Network Microsimulation
  (Jul. 2013 – Jun. 2014)
- Task 3. Integrate Network Microsimulation with ABM
  (Jul. 2014 – Mar. 2015)
- Task 4. Final Documentation and Wrap-Up
  (Apr. 2015 – Jun. 2015)

Thank You!

Any Questions?