An Integrated Travel Demand, Mesoscopic and Microscopic Modeling Platform to Assess Traffic Operations for Manhattan, New York

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presented by

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Transportation leadership you can trust.

CAMBRIDGE SYSTEMATICS

NEW YORK CITY DOT

Manhattan Network Complexity

- Congestion
- Grid structure
- Parking
- Pedestrians and bikes
- Buses
- Taxis

NEW YORK CITY DOT CAMBRIDGE SYSTEMATICS

Manhattan Network Complexity (continued)

- Truck deliveries
- Traffic enforcement agents
- Managed-use lanes
- Traffic signal coordination
- Bridge and tunnel operations

Available Models

- The Regional Activity-Based Travel Demand Model (NYMTC's Best Practice Model (BPM))
- Other agency activity or four-step travel demand models
- Individual project-based microsimulation models that cover a subarea or an individual corridor

The Genesis of the Model

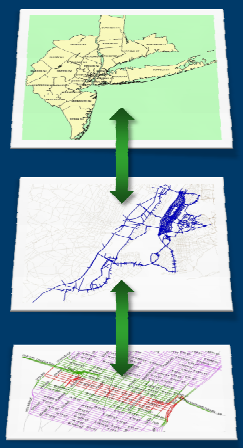
- Traffic stipulations historically were based on knowledge of the network and the anticipated impacts
- There are programmed and existing major construction projects throughout the network
- It became apparent to NYCDOT that there was a need for an analytical tool that would permit the assessment of network-wide cumulative impacts
- The first application is the proposed 34th Street Transitway

34th Street Transitway Modeling Goals and Objectives

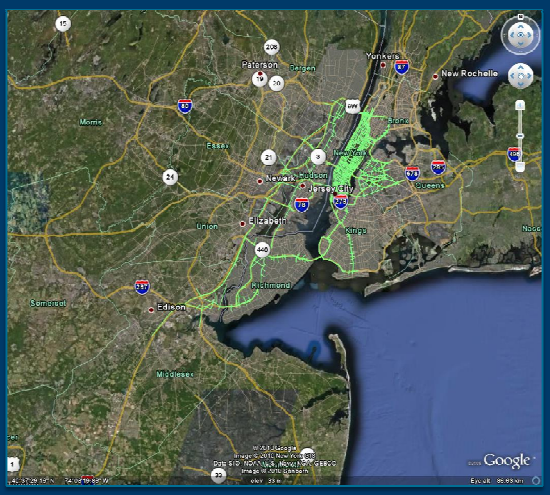
- Develop a modeling platform to assess operational conditions in the Manhattan CBD, emerging from the proposed 34th Street Transitway design
- Develop a modeling platform to assist in the refinement of proposed design for the 34th Street Transitway
- Develop a modeling platform that could be used in the assessment of cumulative impacts on other current/future regional and local projects
- Develop a base network that could be a cornerstone for future analyses and or expansion to other boroughs

Multiresolutional Model Benefits

- "Step-down" from the regional model (BPM)
- Link travel demand forecasting and traffic operations
- Align program and project development processes
- Better support robust and inform decisions
- Provide the basis for a decision-support system



Manhattan Traffic Model Geography



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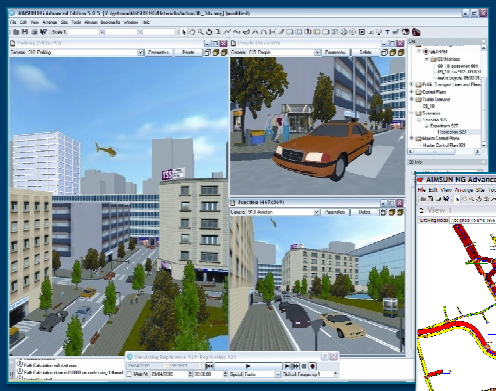
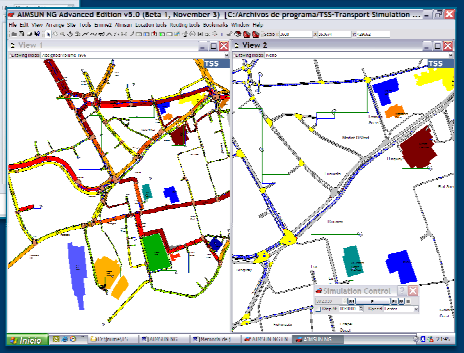


Integrated Transport Modeling
Macro, Meso, and Micro

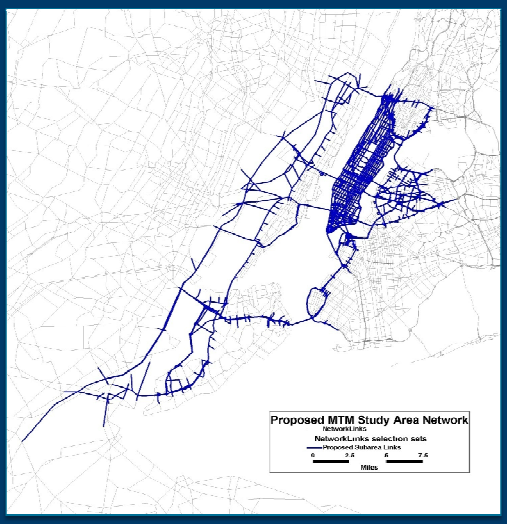


Simulation
Management
Forecasting

Planning
Control
Visualization

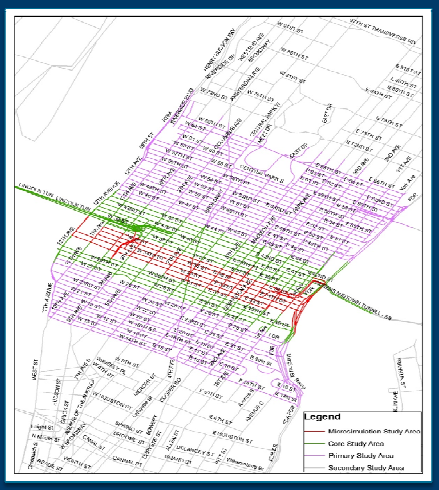
Large Scale Model Challenges

- Data availability
- Data collection
- OD matrices
- Model structure
- Coding procedures
- Temporal distribution



Large Scale Model Challenges (continued)

- Validation
- Calibration
- Mode shift
- Tunnel and bridge operations
- Impact of various scheduled projects



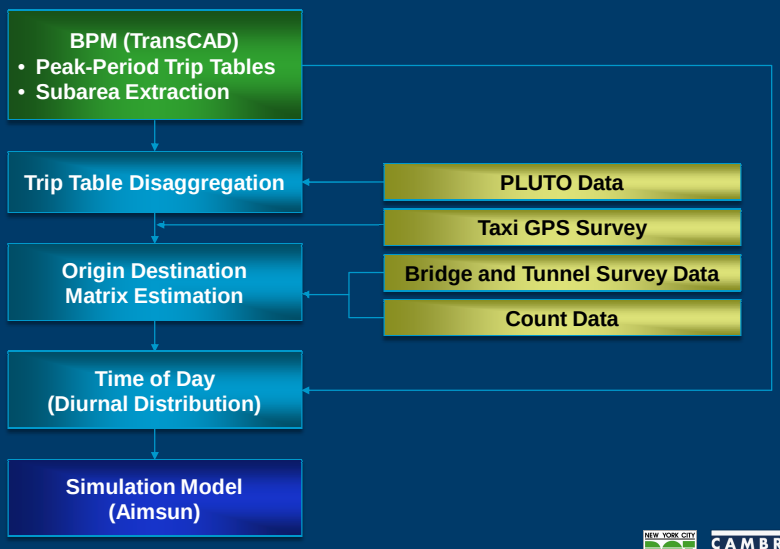
Analytical Issues

- Origin-destination (OD) matrix estimation
- Network geometry and coverage detail
- Duration of simulation
- Vehicle types to be modeled
- Level of validation (strategic versus local)
- Temporal distribution data source
- Software adaptation

Meso Trip Table Development

- Validation of NYMTC's BPM model at the boundaries of the mesoscopic study area
- Extracted trip table for meso model will need adjustment
- Origin-destination matrix estimation techniques (ODME)
- OD surveys to enhance "seed" table available
- Vehicle types (autos, taxis, and trucks)
- Taxi GPS data
- Initial temporal distribution based on the BPM

Manhattan Traffic Model
OD Trip Table Development



Calibration/Validation
Network, Data, and Routing Activities

- Migration of the regional travel demand highway and transit networks to the model proved to be more challenging than originally anticipated
- Field data and model traffic operations consistency
- Trip table adjustments
- Differentiating reaction times by study area
- Reconciliation of field observed turning movements and driver behavior

Calibration/Validation
Network, Data, and Routing Activities (continued)

- Incorporation of toll and distance variables in the Initial and Dynamic Cost function
- Development of Initial and Dynamic Cost functions by vehicle type
- Testing of route choices utilizing one or more previous travel-time intervals
- Testing a variety of values for the toll, distance, and capacity attractiveness coefficients in the cost functions
- Local look-ahead distance adjustments

Calibration/Validation
Model Application

- Testing the Dynamic User Equilibrium (DUE) with a variety of number of iterations (10-100)
- Testing One-Pass Dynamic Traffic Assignment (DTA)
- Testing combinations of DTA and DUE
- Testing one and multiclass assignments

Calibration/Validation
Software Adaptation

- Custom script development to deal with dynamic parking regulations
- Custom scripts to deal with dynamic lane connection (turning movements)
- Modified-lane distribution to better accommodate short and wide sections
- Custom view scripts
- Custom feedback of paths as an initial starting point for the DUE

Manhattan Traffic Model Team

- NYCDOT
- STV
- Cambridge Systematics, Inc.
- Transport Simulation Systems

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