

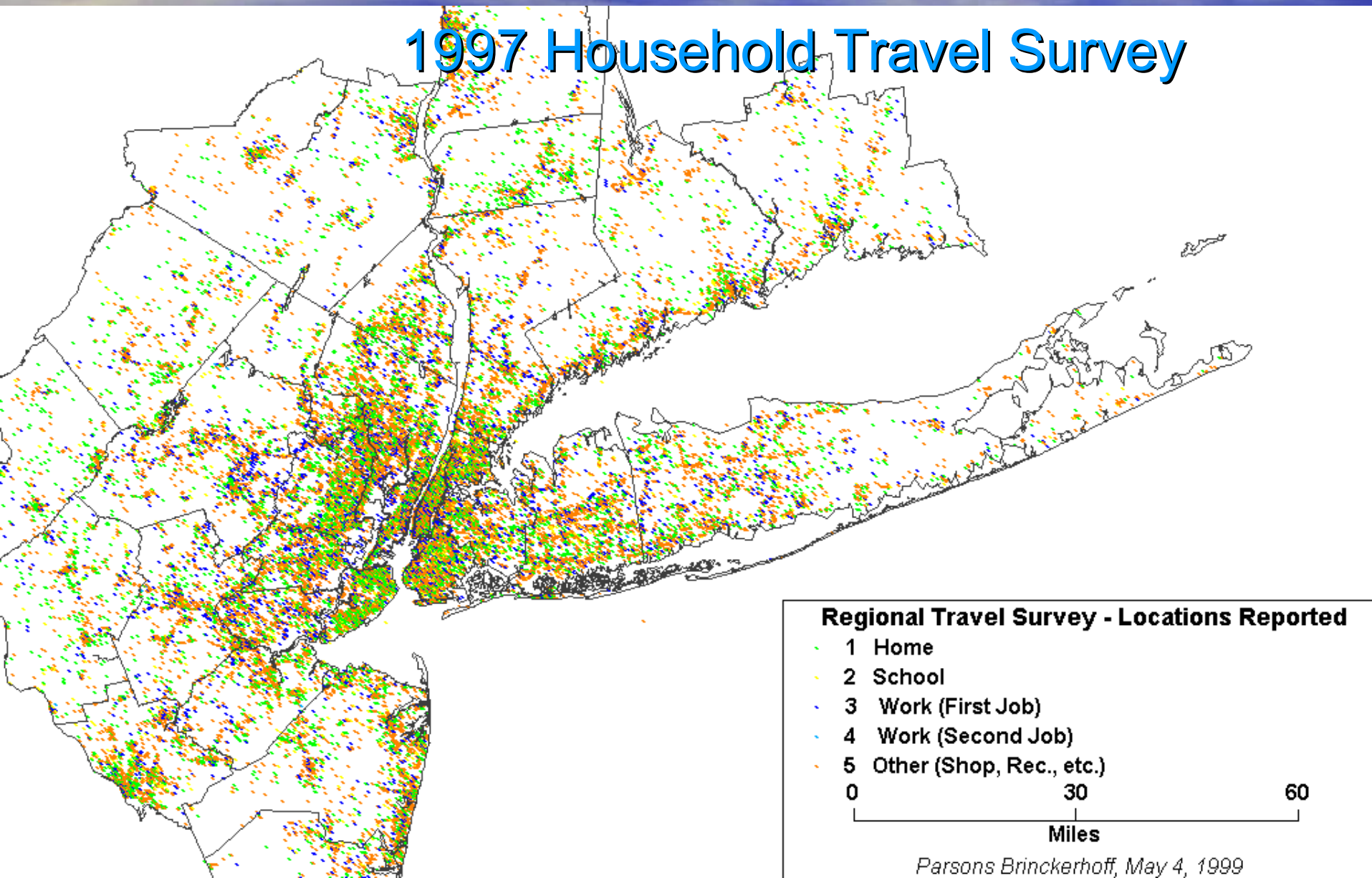
The Best Practice Model in New York

TMIP NCDOT Panel
Raleigh, NC

Kuo-Ann Chiao
Director of Technical Services
New York Metropolitan Transportation Council

Location Distribution

1997 Household Travel Survey



Highway Network

- Very large network
 - 52,794 links
 - 4,950 High-level facilities
 - 26,385 Arterials
 - 10,694 Centroid and external connectors
 - 10,765 Other
- Unidirectional / dualized coding
- Conflated the network geography
- GIS Network Developed in TransCAD Software
- SOV, HOV2, HOV3+, taxi, truck, other commercial
- Attributes include capacities, initial speeds, lanes, parking availability, truck restriction, signal spacing, Roadway Names, and functional class

GIS Street Base – TIGER (or LION)

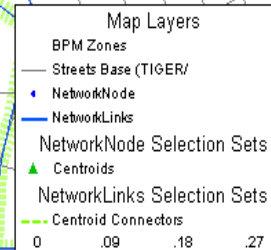
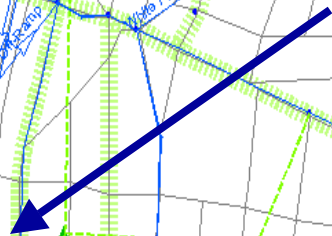


Map Layers
— Streets Base (TIGER/

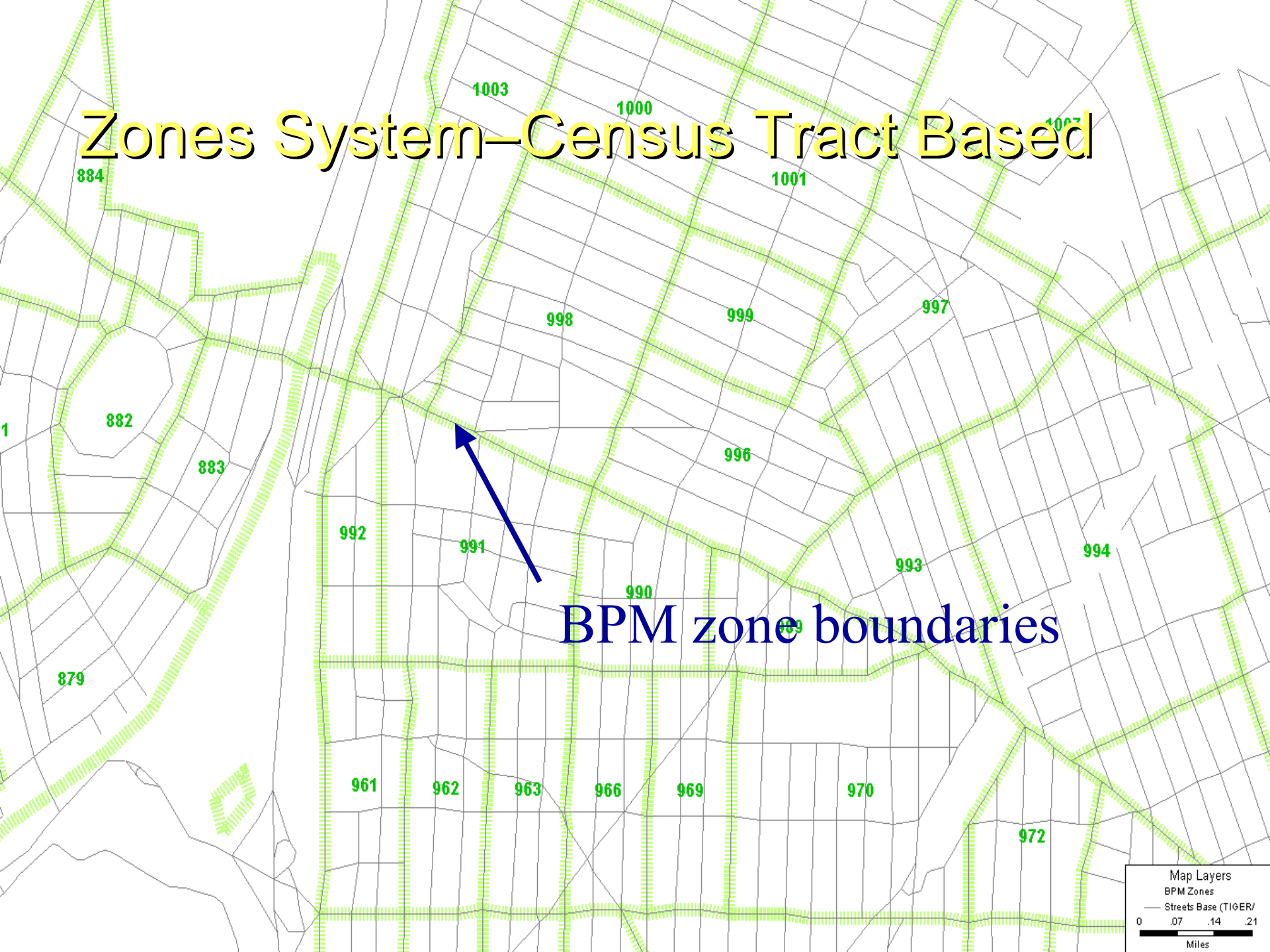
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Highway Network

Uni-directional coding
& / Ramps



Zones System—Census Tract Based

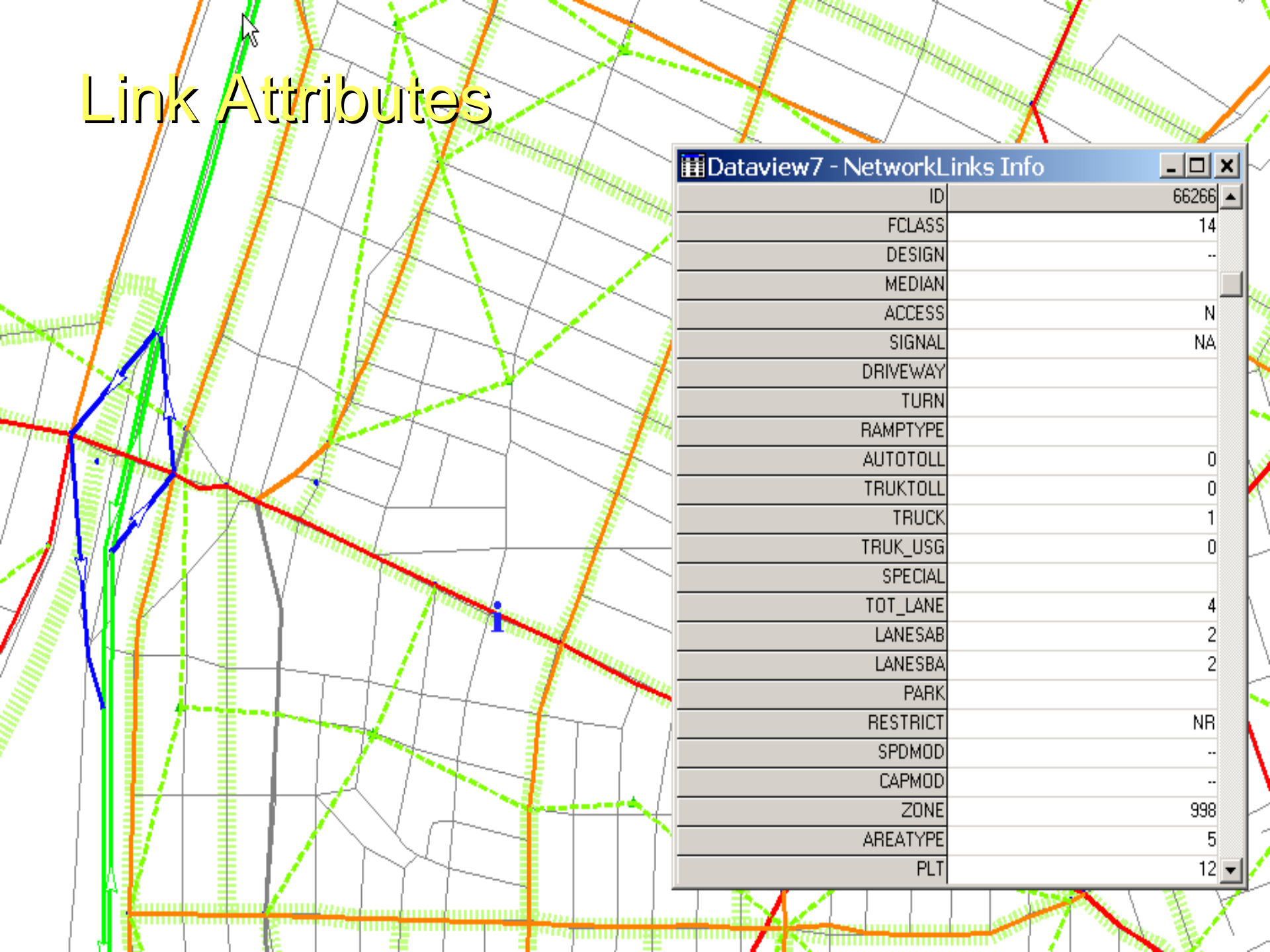


BPM zone boundaries

Map Layers
BPM Zones
Streets Base (TIGER)

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Miles

Link Attributes

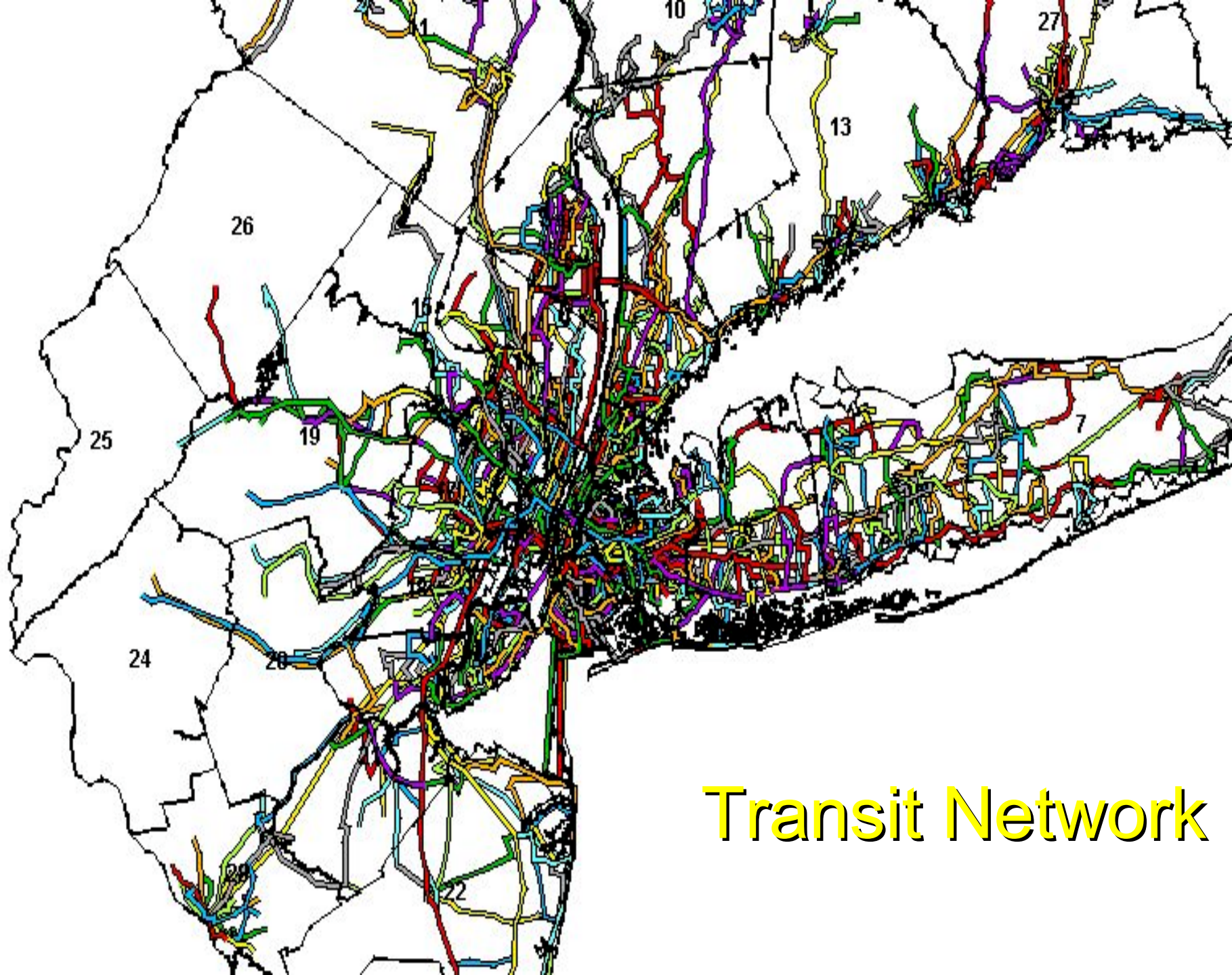


Dataview7 - NetworkLinks Info

ID	66266
FCLASS	14
DESIGN	--
MEDIAN	
ACCESS	N
SIGNAL	NA
DRIVEWAY	
TURN	
RAMPTYPE	
AUTOTOLL	0
TRUKTOLL	0
TRUCK	1
TRUK_USG	0
SPECIAL	
TOT_LANE	4
LANESAB	2
LANESBA	2
PARK	
RESTRICT	NR
SPDMOD	--
CAPMOD	--
ZONE	998
AREATYPE	5
PLT	12

Transit Network

- Extremely detailed transit coding based on information from MTA and NJ Transit
- Developed in TransCAD 4.0
- Each route variation coded as a distinct route:
 - 100 NYC subway routes
 - 900 Commuter rail routes
 - 2,300 bus routes
 - 50 ferry routes
 - Includes sidewalk network in Manhattan
 - Walk access/egress links
 - Park - and - Ride

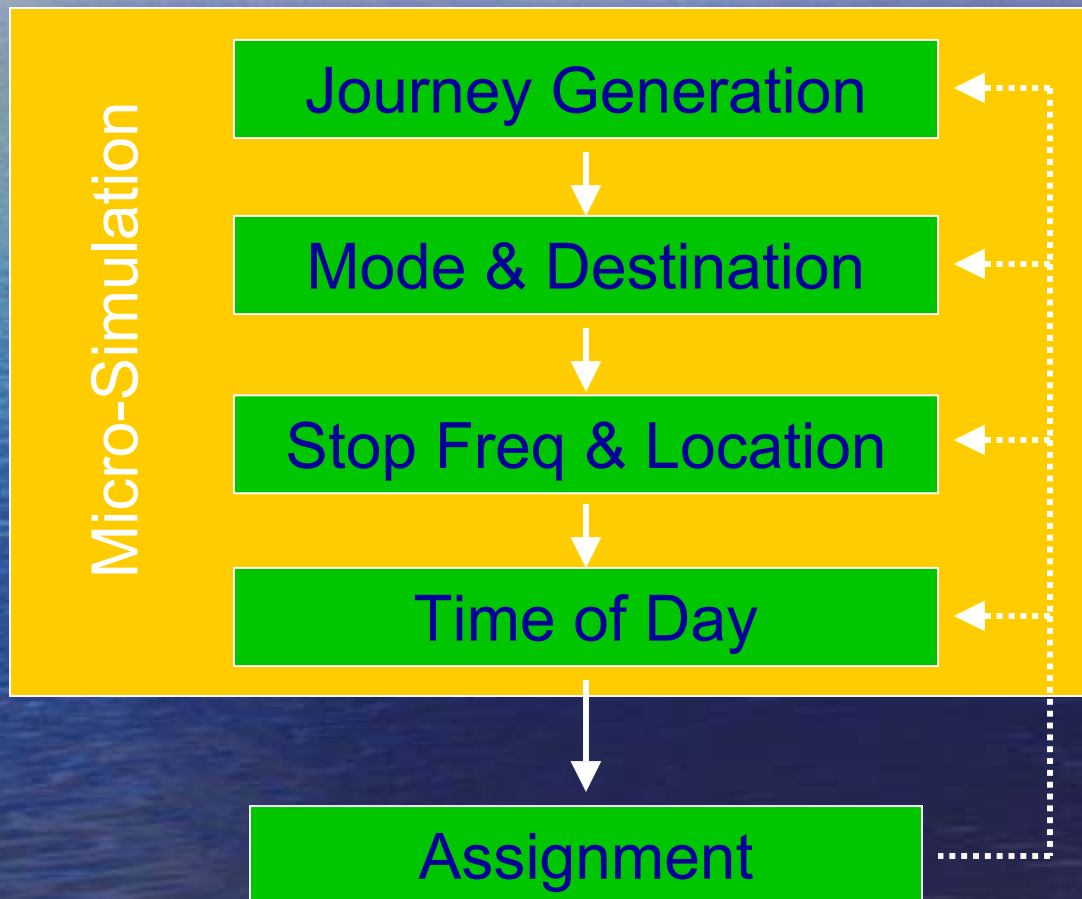


Transit Network

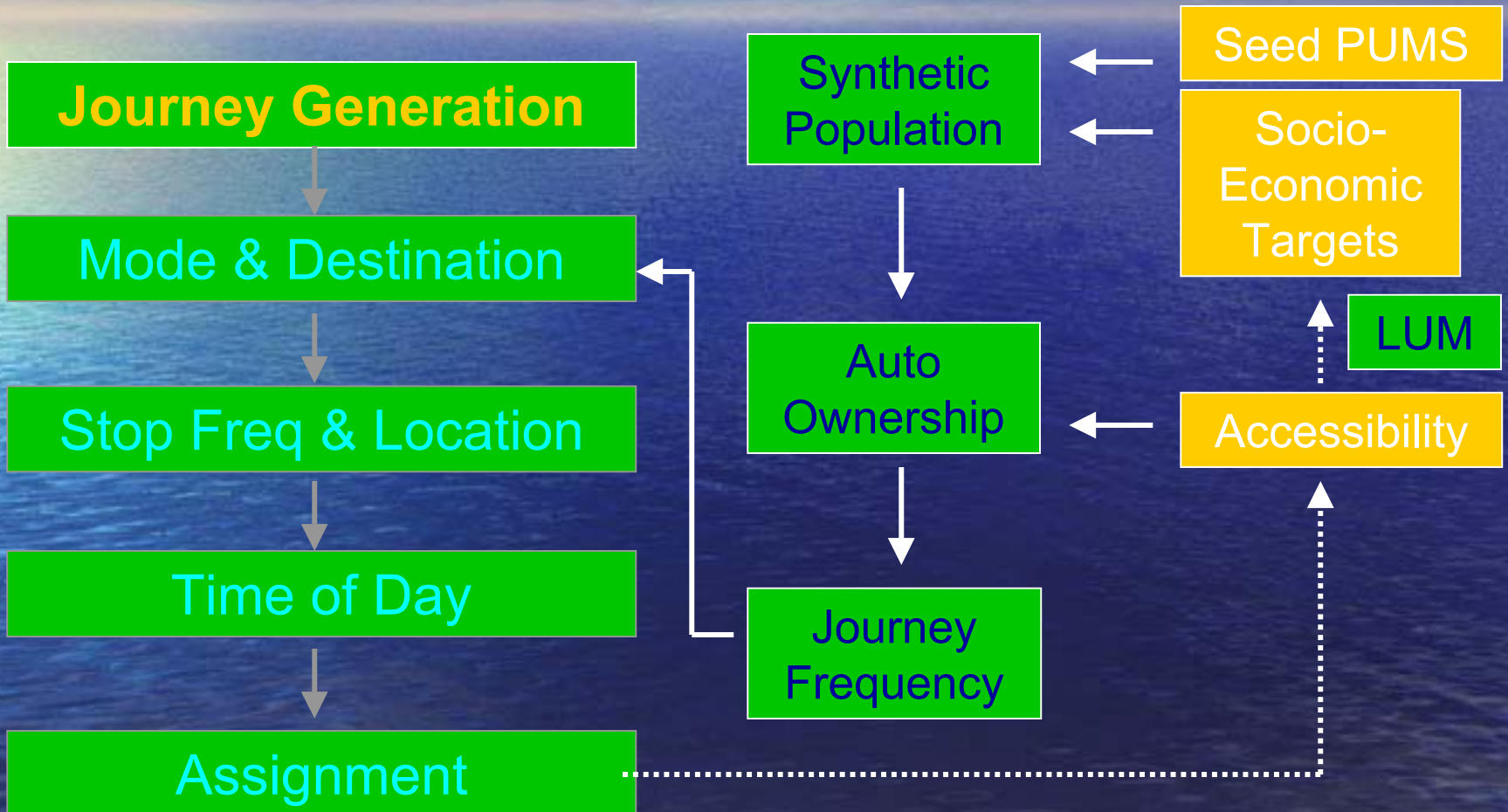
Highlights of NYBPM

- Micro-Simulation choice models
- Population synthesis and intra-household travel interactions
- Journey-based travel units modeled
- Non-motorized (pre-mode choice)
- Mode-Destination Choice (nested logit)
- Stop frequency and location sub-model
- Full multi-modal analysis / assignment

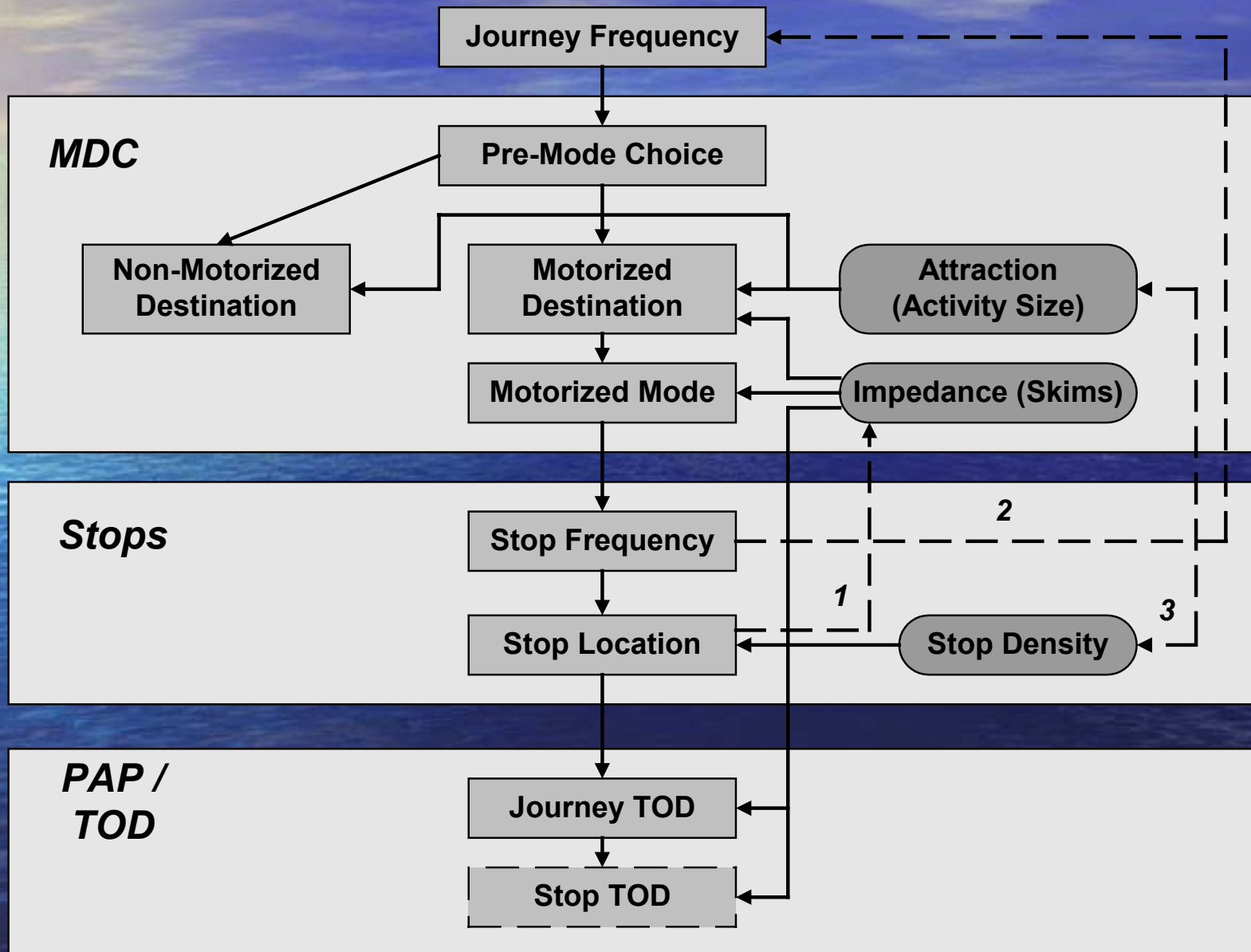
General Modeling Structure



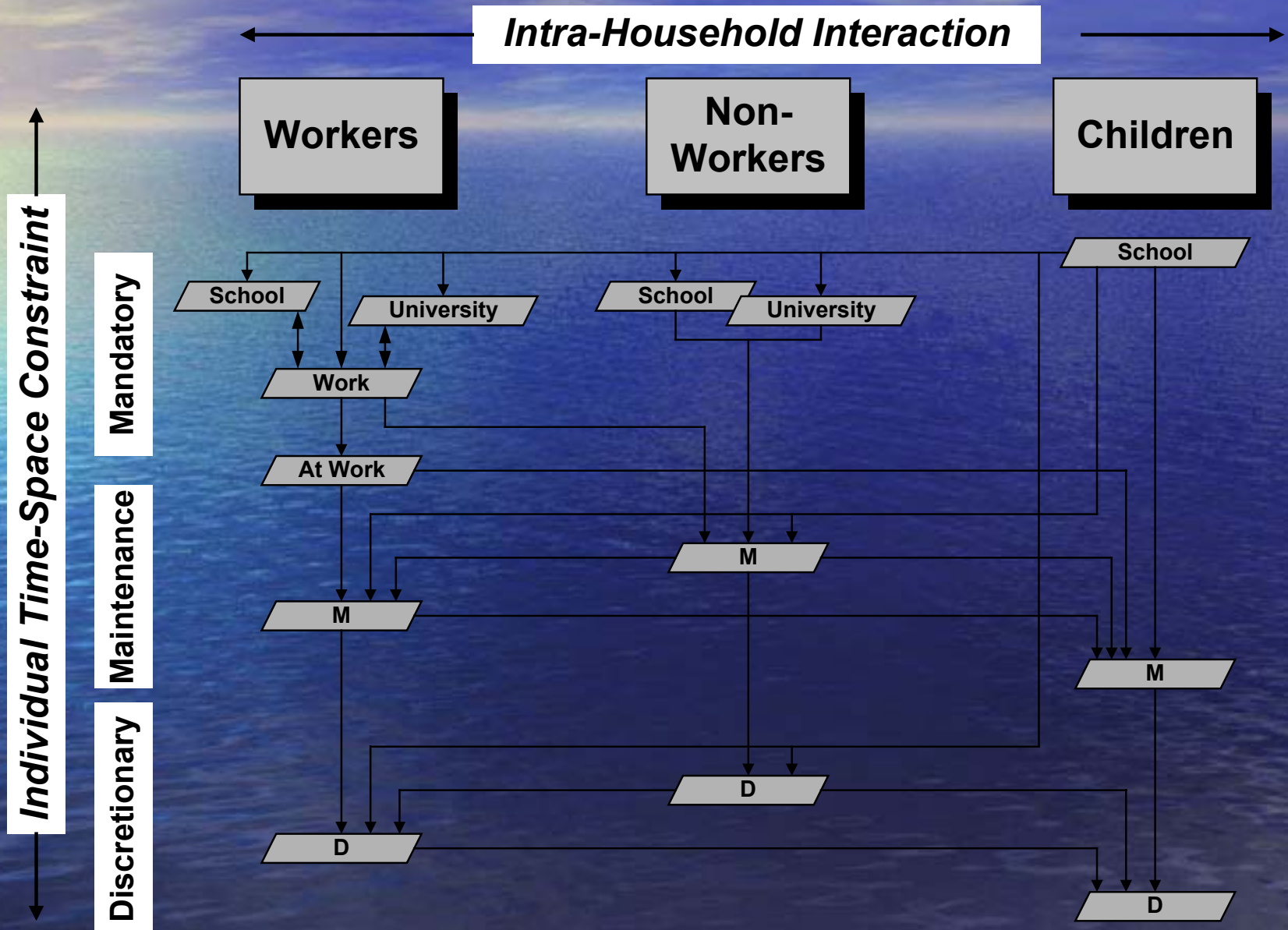
Journey Generation



Modeling Structure

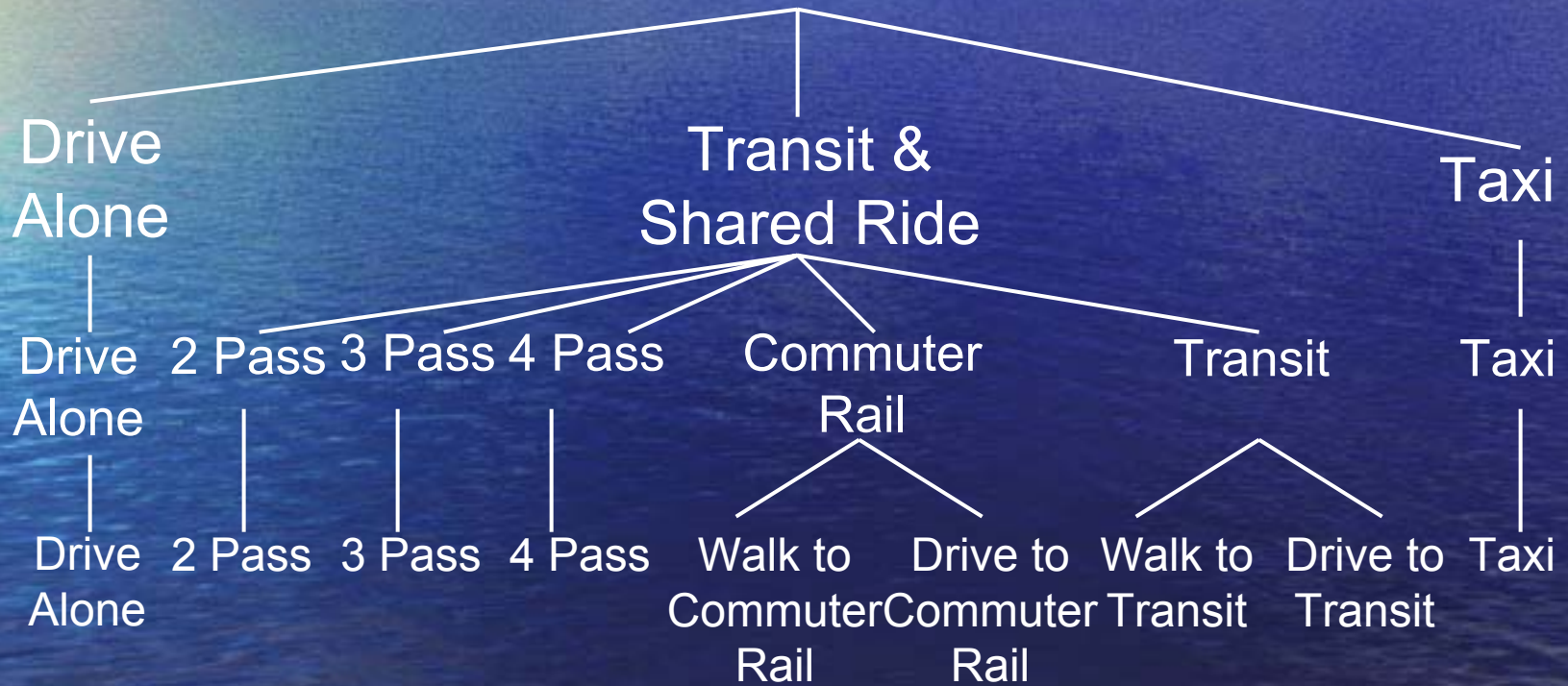


Journey Frequency Model



Mode Choice to Work

Nested Structure



Mode Choice to Work: Mode Availability

Characteristic	Modes Unavailable
No walk access to transit at origin	Walk to transit & commuter rail
No walk access to transit at destination	Walk & drive to transit & commuter rail
Zero INV time in skim	Walk & drive to transit & commuter rail
No cars in household	Drive alone

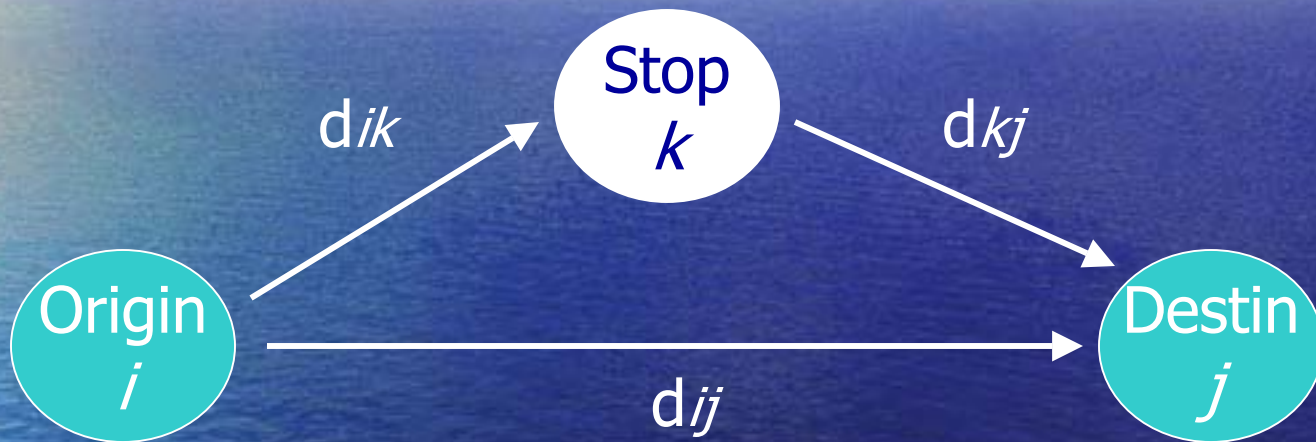
Destination-Choice Model: Utility Components

- Attraction-size variable
- Mode-choice log-sum
- 3 River-crossing dummies
- Intra-county dummy
- Distance-based term
- 4 To-Manhattan dummies
- County-to-county k-factors

Disaggregate
Calibration

Aggregate
Adjustment

Route-Deviation Concept

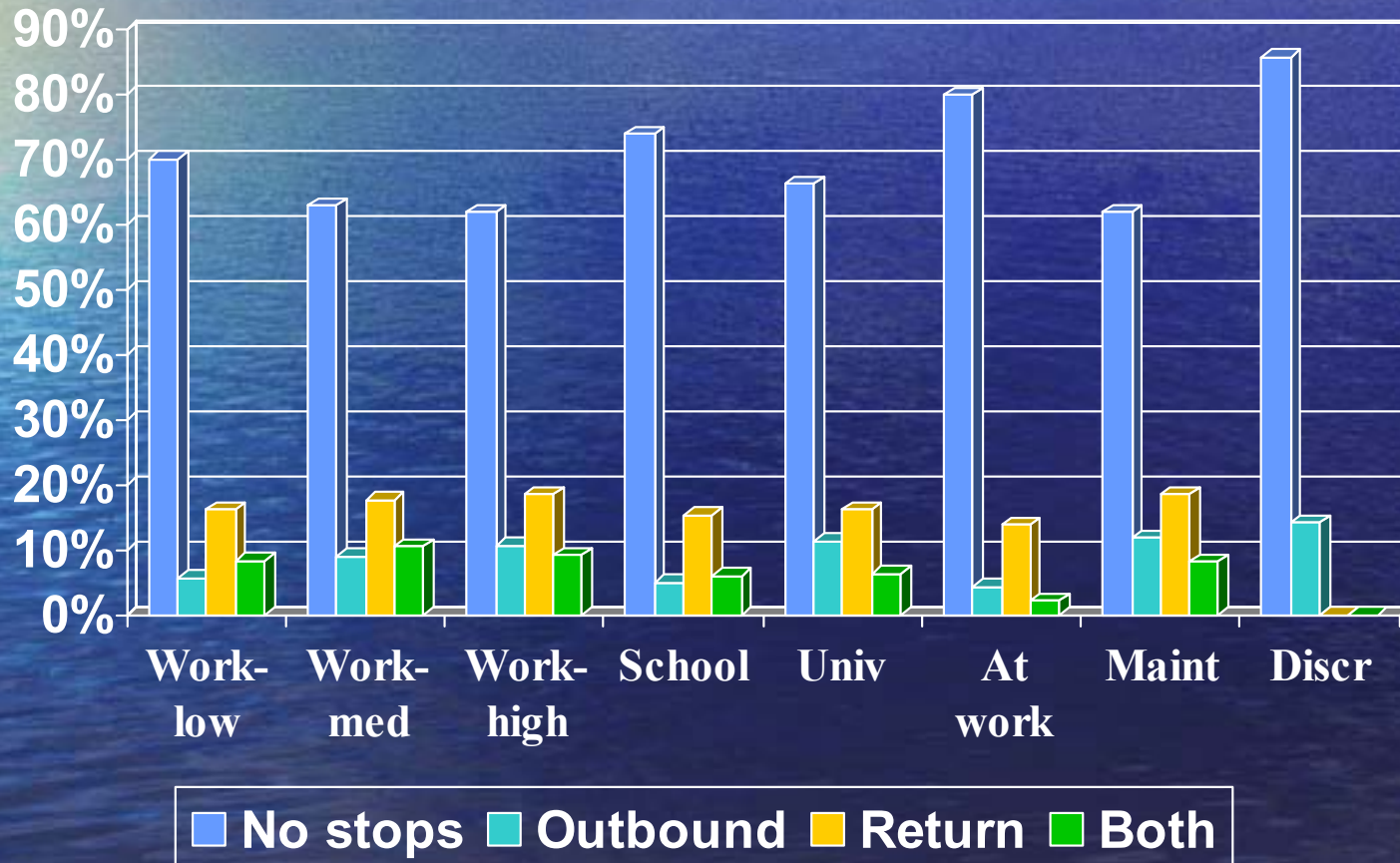


Combined impedance: $d_{ik} + d_{kj}$

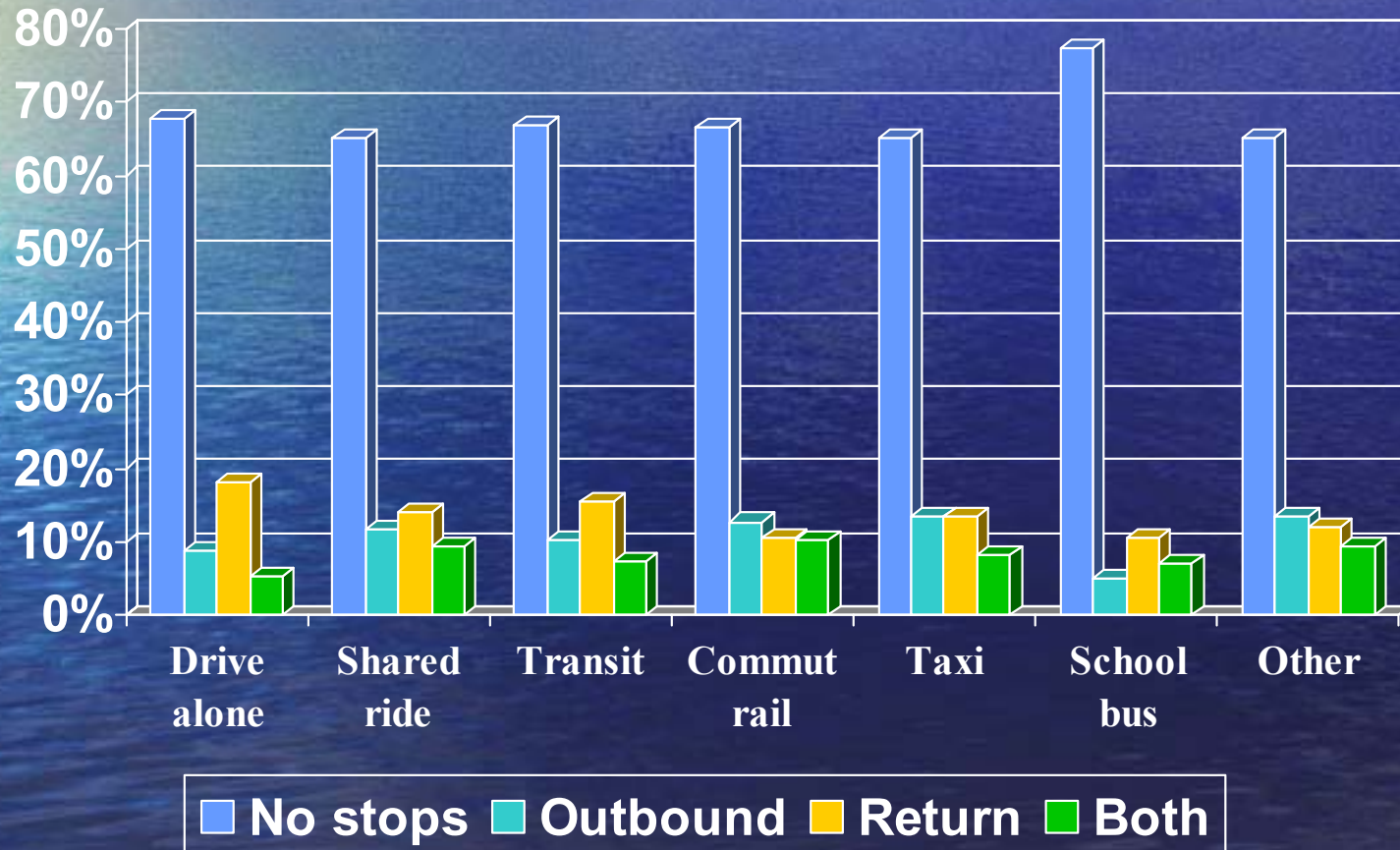
Absolute route deviation: $d_{ik} + d_{kj} - d_{ij}$

Relative route deviation: $(d_{ik} + d_{kj} - d_{ij}) / d_{ij}$

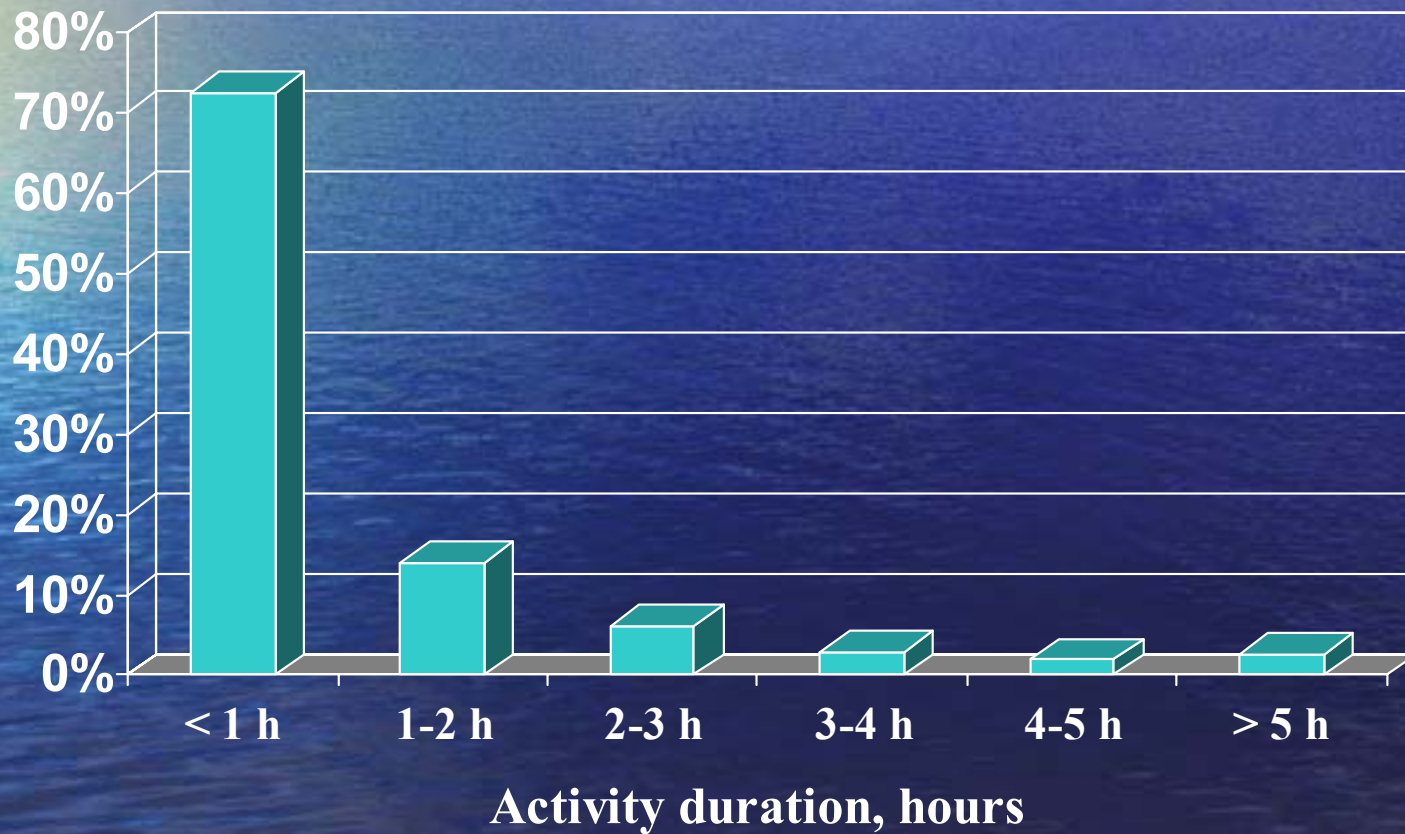
Stop Frequency by Purpose



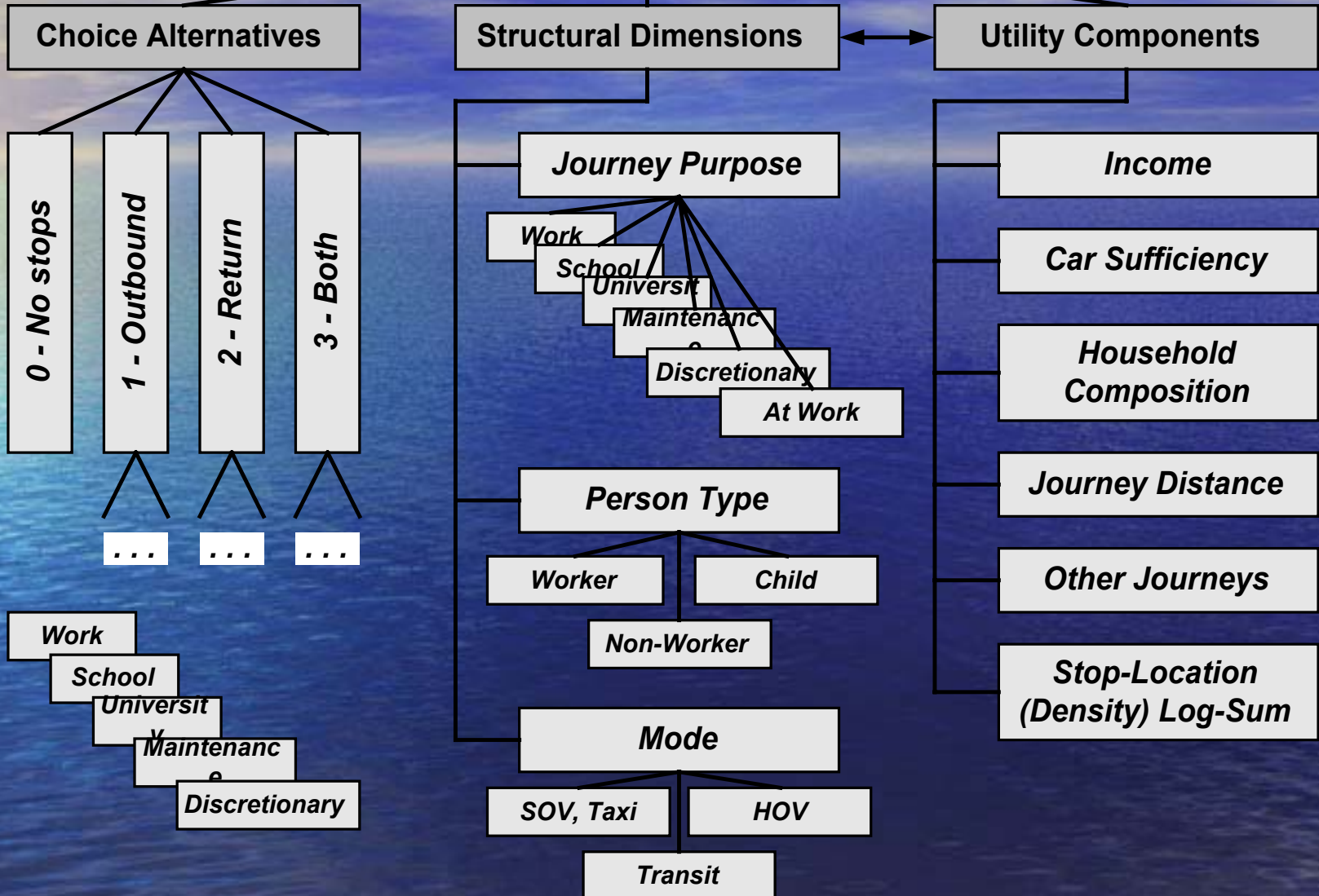
Stop Frequency by Mode



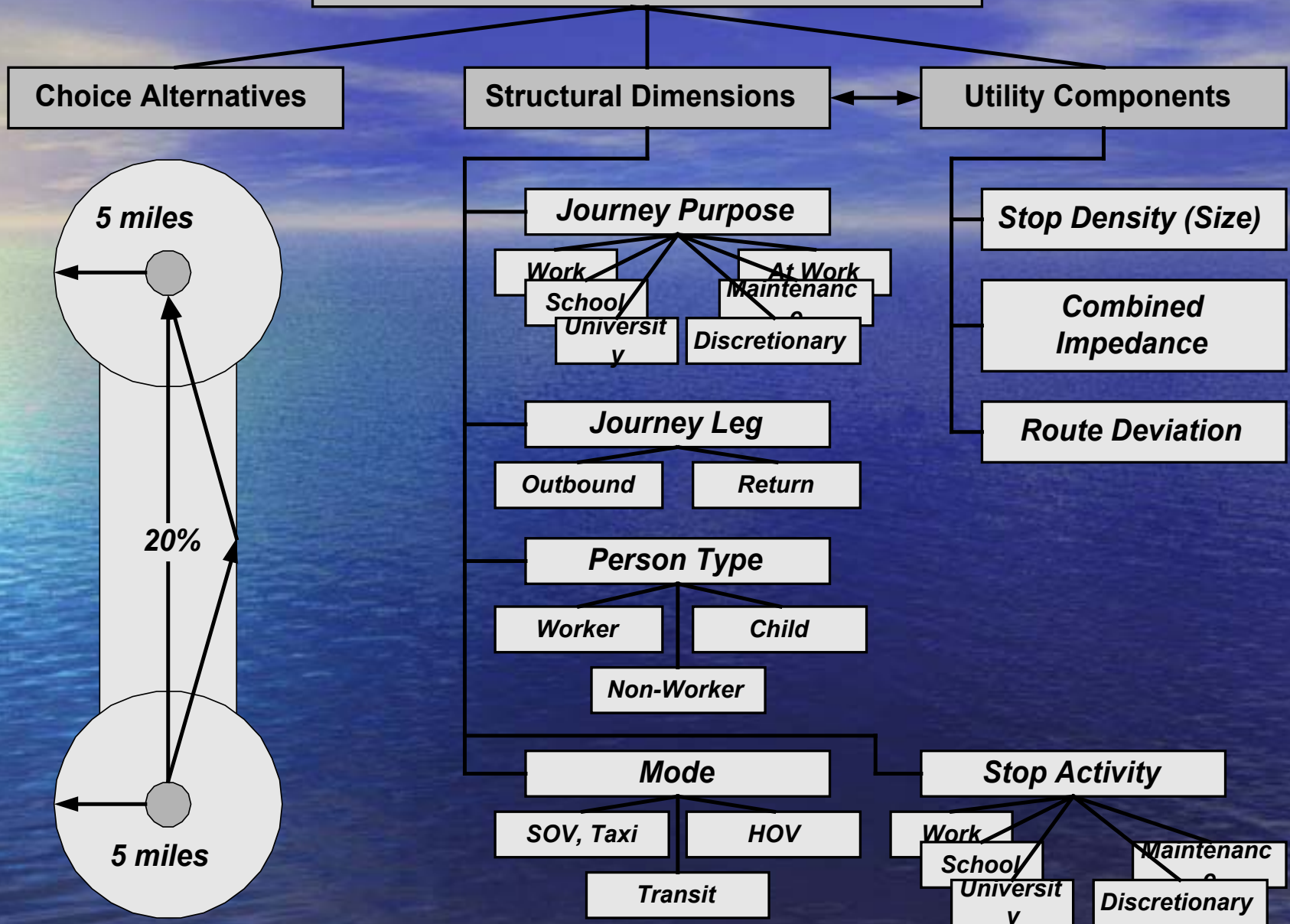
Stop Distribution by Duration



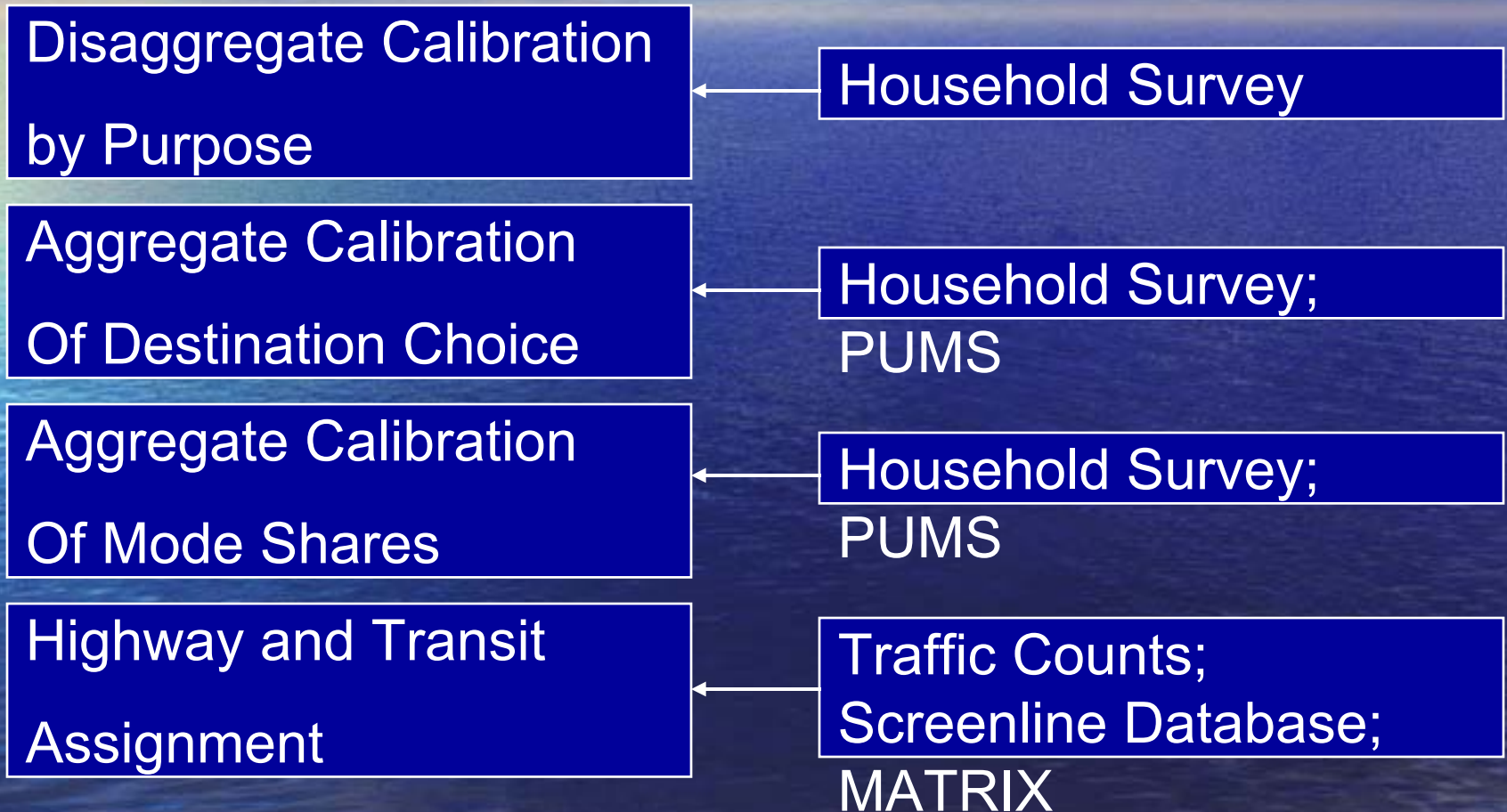
Stop-Frequency Choice Model



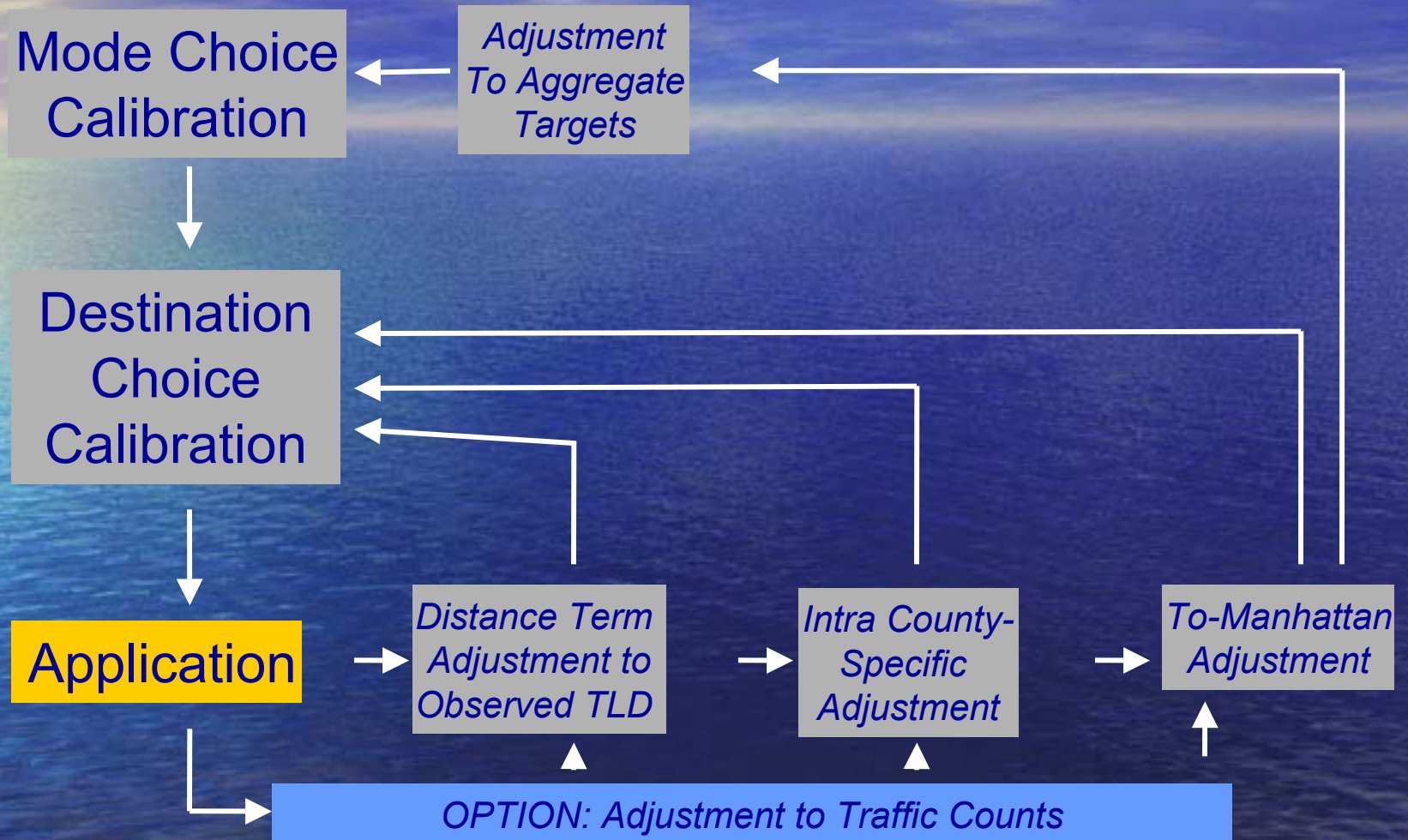
Stop-Location Choice Model



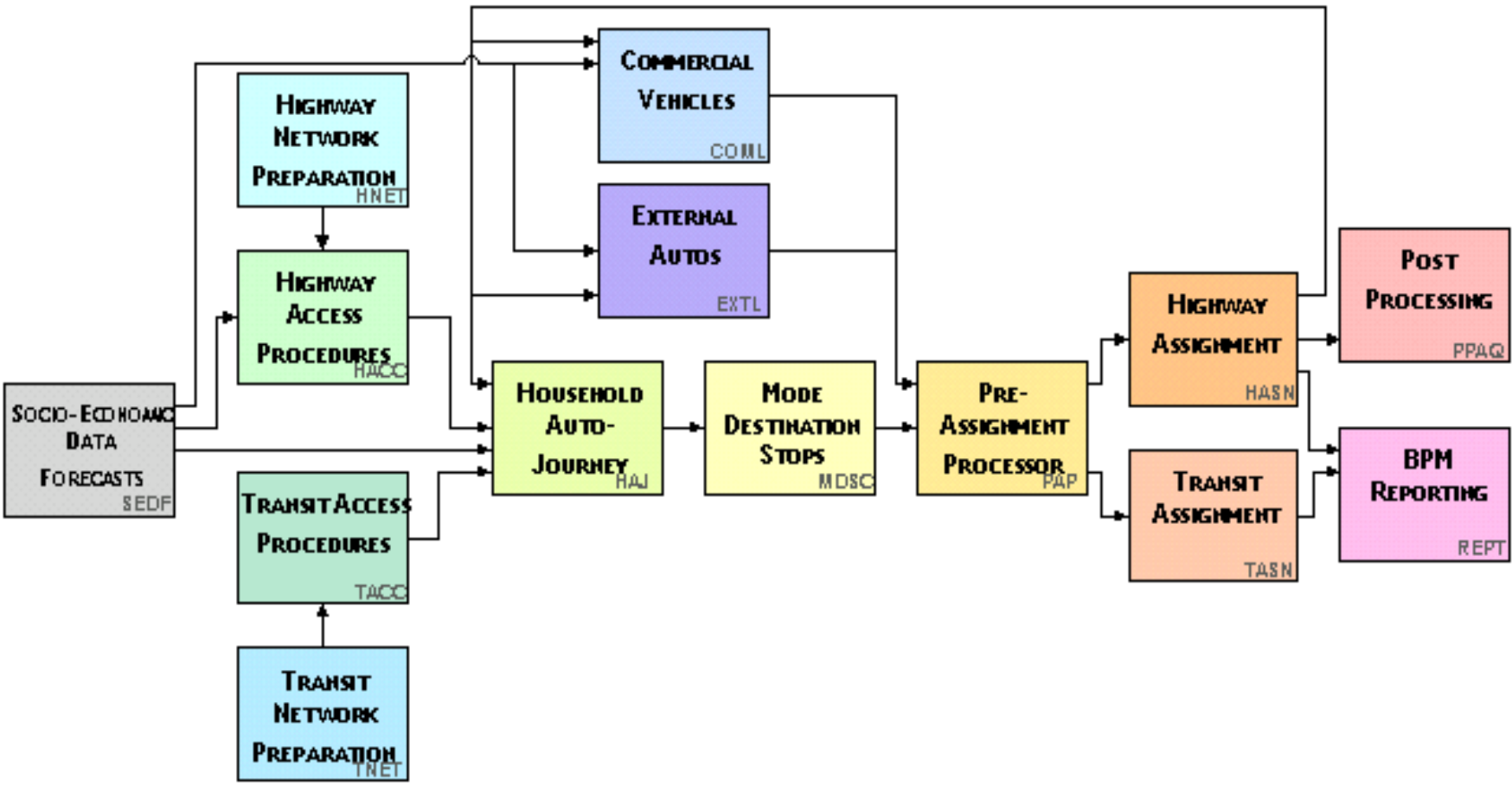
Stages of Calibration and Validation Sources



MDC Calibration Framework



BPM Structure – “GUI” for User Documentation



Procedures for Estimating Congestion

Updated
Traffic Data



Highway
Networks



Transit
Networks



Socio-
Economic
Data



*Best
Practice
Model*

*PPAQ /
PEQUEST*



County Level
Delays
- Person Hours
- Vehicle Hours



Congestion Maps
- Link Level
- Level-of-Service
Analysis



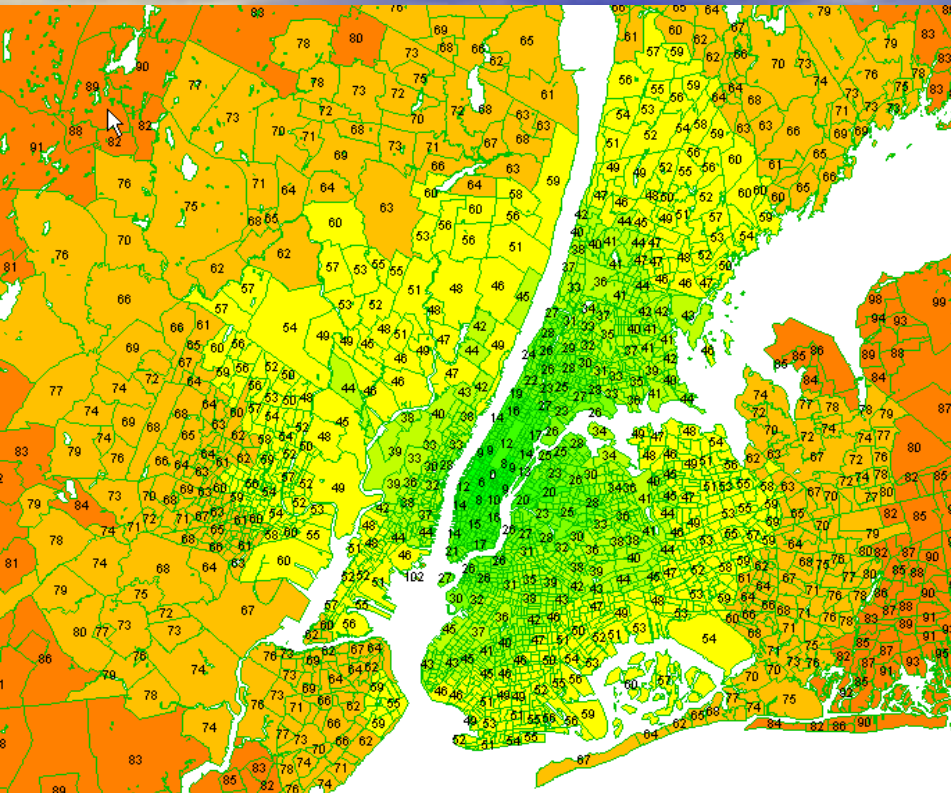
Reviews:
Agencies



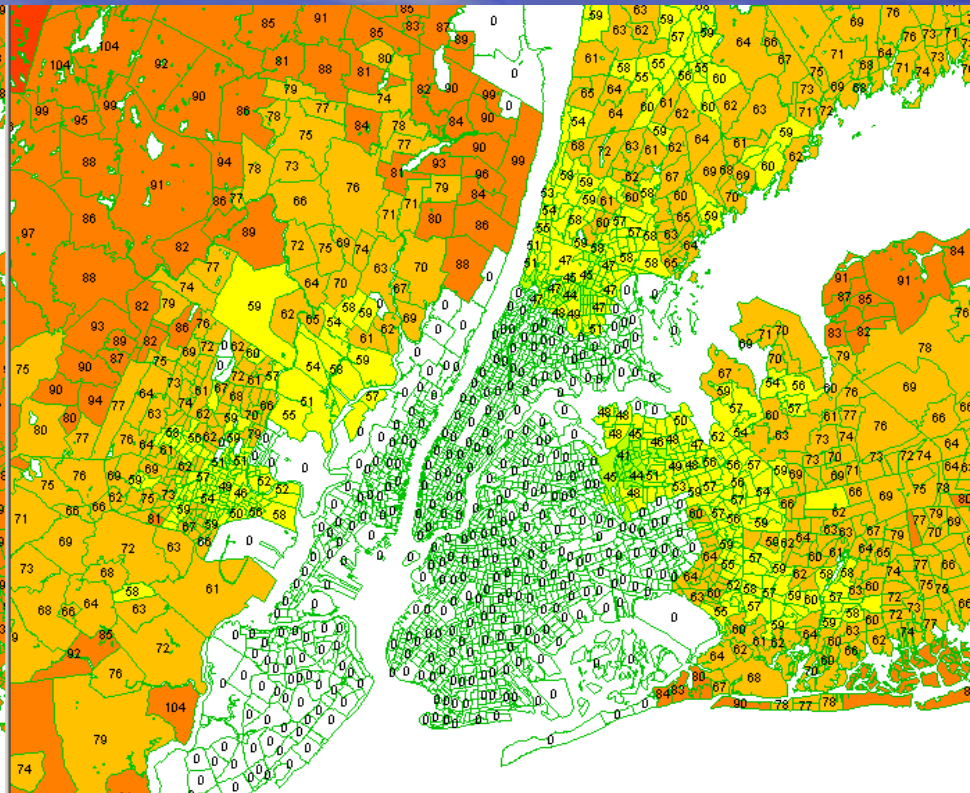
Public

Comparative Skims: Times to Midtown

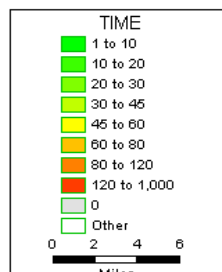
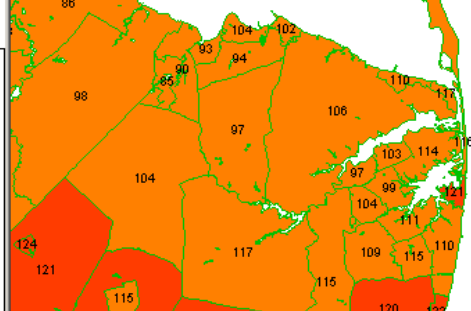
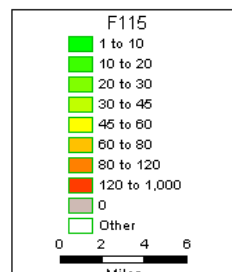
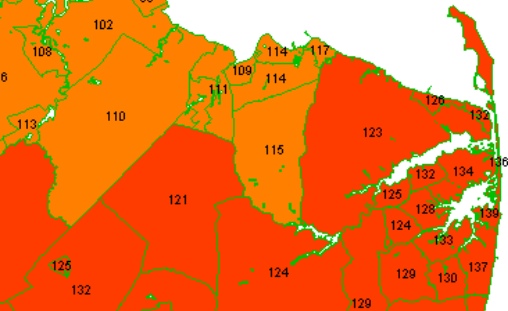
SOV vs. Commuter Rail



AM Peak Period: Times to Midtown - SOV



AM Peak Period: Times to Midtown - Commuter Rail



How is BPM Better than Other Models

Comparison of BPM versus Traditional Model

- GIS Based
- Journey versus trip
- Microsimulation - looks at each household and each journey
- Walk Trips Separated
- Travel Interaction
 - Auto Availability
 - Family Interaction
 - Time constraints

Applications of BPM .. NYMTC's Use

- Conformity Analysis
- Regional Transportation Plan
- Congestion Management Systems
- Testing Scenarios for emission reduction strategies
- Request for Data Manipulation and Runs from other agencies

Applications of BPM .. Projects

- Tappan Zee Bridge
- Gowanus Expressway
- Bronx Arterial Needs
- Bruckner Sheriden Expressway
- Long Island East Side Study
- Canal Area Transportation Study
- Lower Manhattan Development Corporation
- Southern Brooklyn Transportation Study
- Regional Freight Plan Study
- Hackensack Meadowland Development Corp.

Model Update

- Study of Post 9/11 Travel Pattern Changes
- New Set of Socioeconomic and Demographic Forecasts
- Collection of 2002 traffic and transit data
- Updated 2002 base year Model by January, 2004

What's Next

- Overcome the current problems
 - Very Complex Model – 9 million households, 25 million paired journeys, 8 trip purposes, 4 time periods, 10 travel modes
 - Long Running Time – More than 100 hours for a single scenario run.
 - Hardware Needs - 2 GB RAM / Dual Processor / 1.5 Ghz / 80+ GB Hardrive
 - Software problems – TransCAD version changed
 - High turnover at consultant end

Status of On-Going Improvements

- Speed up the running time
 - Memory Handling
 - allocated the memory only once, using a flag to determine if the memory had already been allocated
 - memory could be allocated in one block
 - Input/Output
 - Remove messages (one per 33 million lines in the HAJ trip file) to the screen, reduced processing time from 22 minutes to 20 seconds
 - Parameter Passing
 - Passing information of a pointer to a structure rather than an entire structure (e.g., the memory used to call about 260,000 times of one function with 92 bytes could be reduced significantly by passing a pointer to the structure that only requires 4 bytes)
 - In-lining Function Calls
 - Very short functions that are called frequently can cause bottlenecks (function consists of just a few lines (e.g., Calling a function, which was being called between 300,000 to 600,000 times, was taking up 10% of the total program time. In-lining the function reduced it to 0.3% of the total program time)
 - Additional optimization

Model Improvements

- Better Highway -Transit Connection – Bus Preload on highways
- Improve transit models
- Integrate BPM with the Land Use Model
- Web Applications
 - Model output analysis
 - Model runs
- Distributed Process
- Better GUI
- More project applications