Critical Review and Second Generation Recommendations

Rick Donnelly & Pat Costinett

Parsons Brinckerhoff Quade & Douglas, Inc.

J.D. Hunt

University of Calgary

and

Paul Waddell

University of Washington

Tranus: What has gone well

- We were able to implement a model without developing software
- State-of-the-art in integrated land use-transport modeling
- Consistent macroeconomic modeling framework
- Logit-based path building and assignment works well with aggregate networks
- User interface easy to use
- Useful interim modeling capability

Tranus: Focus for improvement

- Zone system design
  - Hierarchical zone system necessary
  - Avoid large zones encompassing small urbanized areas
  - Economic activities can be more aggregate than other activities

Tranus: Focus for improvement

- Network design
  - Ability to reflect differences in external extent between passenger and freight trips
  - Highly abstracted networks cause problems related to accuracy, capacity definition, and presentation
  - Averaging of more detailed network and zone system would have yielded more appropriate intrazonal cost values

Tranus: Focus for improvement

- Economic Transactions
  - Stick to readily interpretable units
  - Balancing of production and demand in subregions
  - Household and employment-based production reflecting different productivity levels on a geographic basis

Tranus: Focus for improvement

- Activity Distribution Model
    - More control over the calibration process
    - Data visualization techniques desperately needed
    - Ability to specify intrazonal cost factors by sector or by zone
    - Alternatives to/interpretation of Logit scaling
    - Ability to handle different activities at a spatial resolution appropriate to them
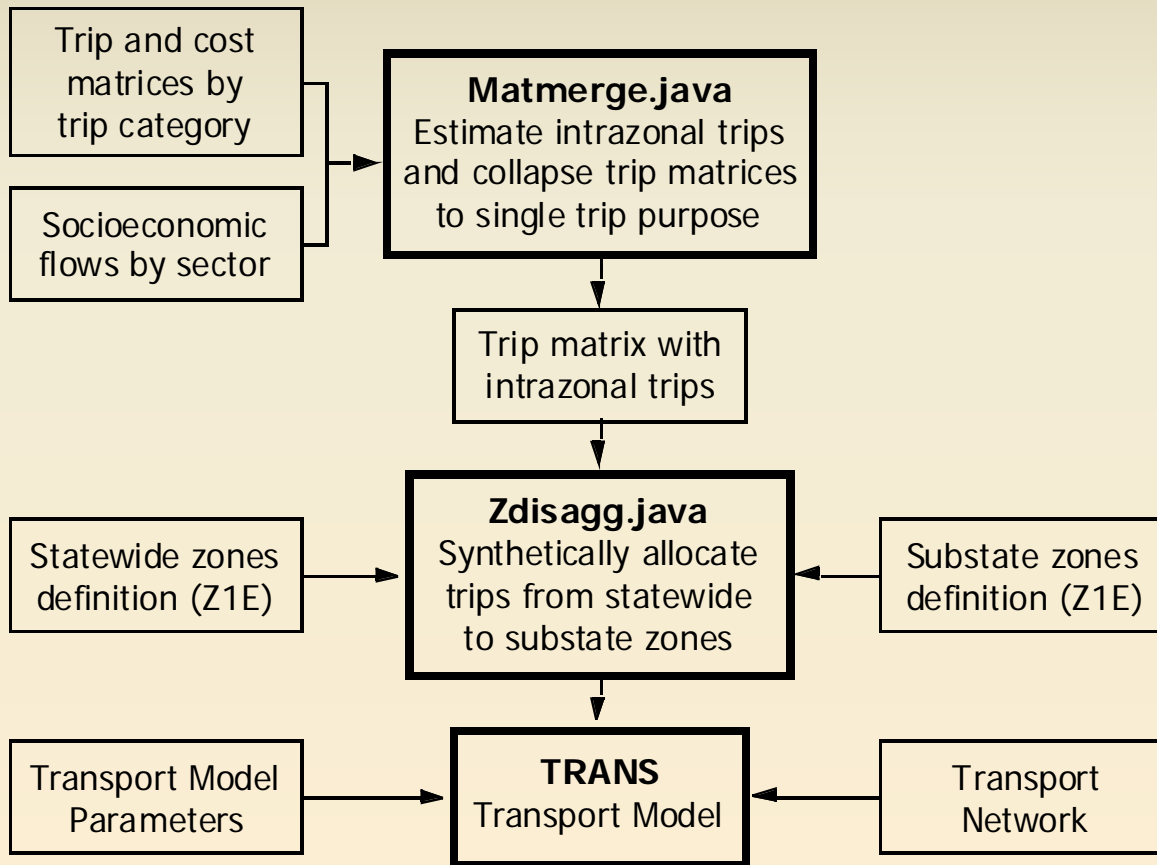
Tranus: Focus for improvement

- Land Market Simulation
  - Structuring of the land demand functions to ease parameter estimation and interpretation
  - Data problems most prevalent in this area
  - Introduce occupational classification to clarify land demand?
  - Demand substitution structure of employing ASCs instead of or in addition to penalty factors
  - Segmentation which avoids aggregate sectors that span large and diverse activities or land areas

Tranus: Focus for improvement

- Transport Model
  - Addition of ASCs
  - Ability to specify vehicle occupancy by trip category and economic class
  - Dampening factor mechanism for tuning convergence
  - Inclusion of intrazonal flow representation

Substate Model Structure

Trip and cost matrices by trip category

Socioeconomic flows by sector

Matmerge.java
Estimate intrazonal trips and collapse trip matrices to single trip purpose

Trip matrix with intrazonal trips

Statewide zones definition (Z1E)

Zdisagg.java
Synthetically allocate trips from statewide to substate zones

Substate zones definition (Z1E)

Transport Model Parameters

TRANS
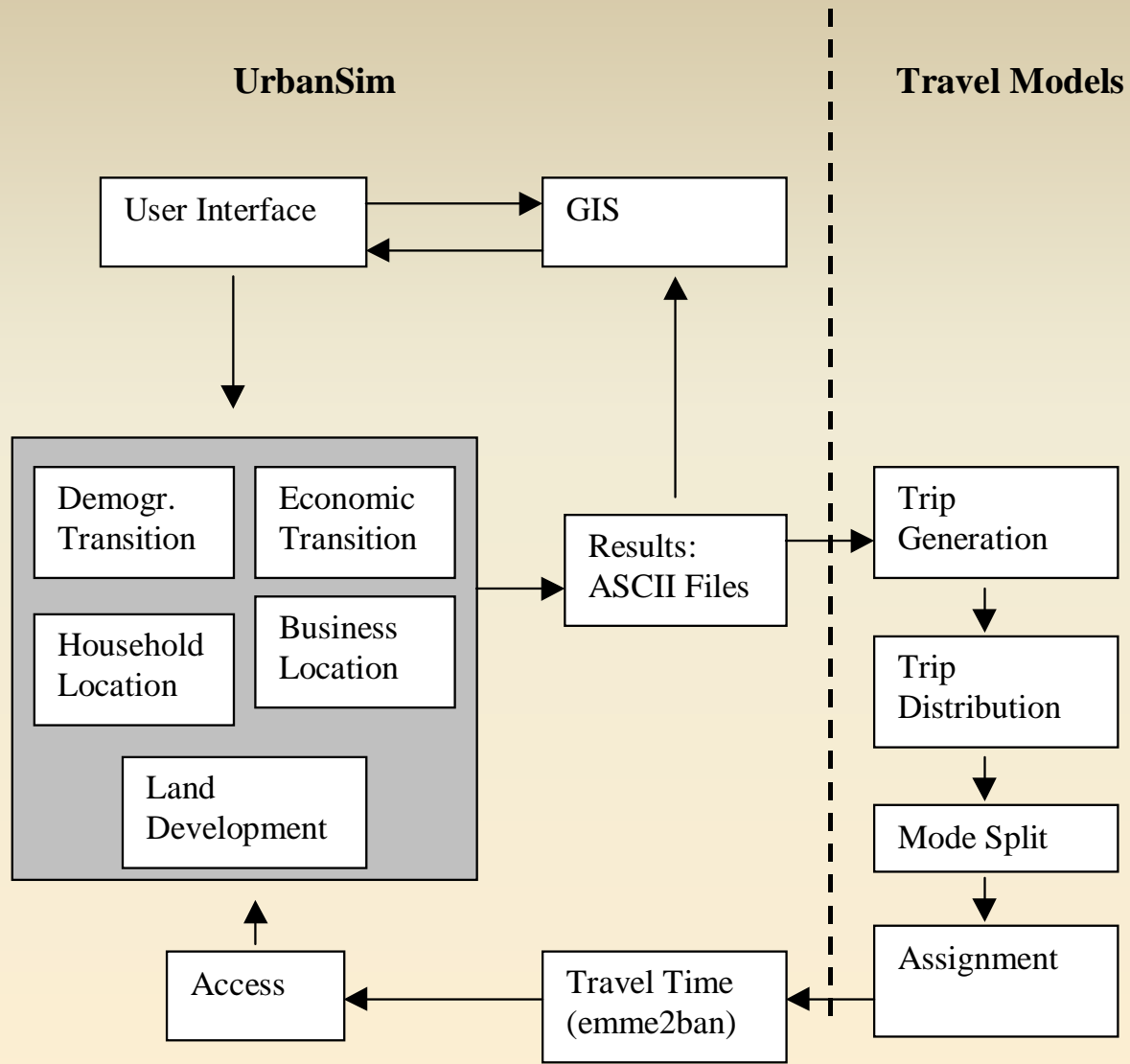Transport Model

Transport Network

UrbanSim: What has gone well

- Generally performed well and according to specifications

- Open framework that has proven amenable to modification

- Does a good job with household valuation (willingness to pay) and location choice in cross-sectional calibration

- Data has been there to support it, most already in electronic format

UrbanSim: Focus for improvement

- Data limitations required us to collapse sectors

- Some data required considerable cleanup and editing

- Business location valuation and choice model didn't perform as well as household model

- Greater consistency between activity interaction and trip distribution model

UrbanSim

Travel Models

User Interface → GIS

Demogr. Transition

Economic Transition

Household Location

Business Location

Land Development

Results: ASCII Files

Trip Generation

Trip Distribution

Mode Split

Assignment

Travel Time (emme2ban)

Access

UrbanSim: Focus for improvement

- Employment specified in terms of occupation instead of SIC

- Approximating willingness-to-pay

- Use of logsum for each zone instead of average price

UrbanSim: Data and computer constraints

- Data on business location transactions very scarce

- Fairly substantial data mining and cleaning requirements

- Java is conceptually great but performance is slow

General Observations

- Statewide and substate model don't operate at a spatial scale appropriate for many analyses

- Metropolitan model does operate at useful transport analysis scale but difficult to implement on a statewide basis

- Successful prototypes are useful discovery and research tools and for interim modeling capabilities

Second Generation Recommendations

- A single modeling framework (both horizontal and vertical integration)

- Heavily influenced by original model design

- Maintain consistency between location and travel choice models, based upon discrete choice modeling and random utility theory

- Nested or hierarchical representation of economic activities and land use

- Ability to construct and implement synthetic models to substitute for behavioral ones
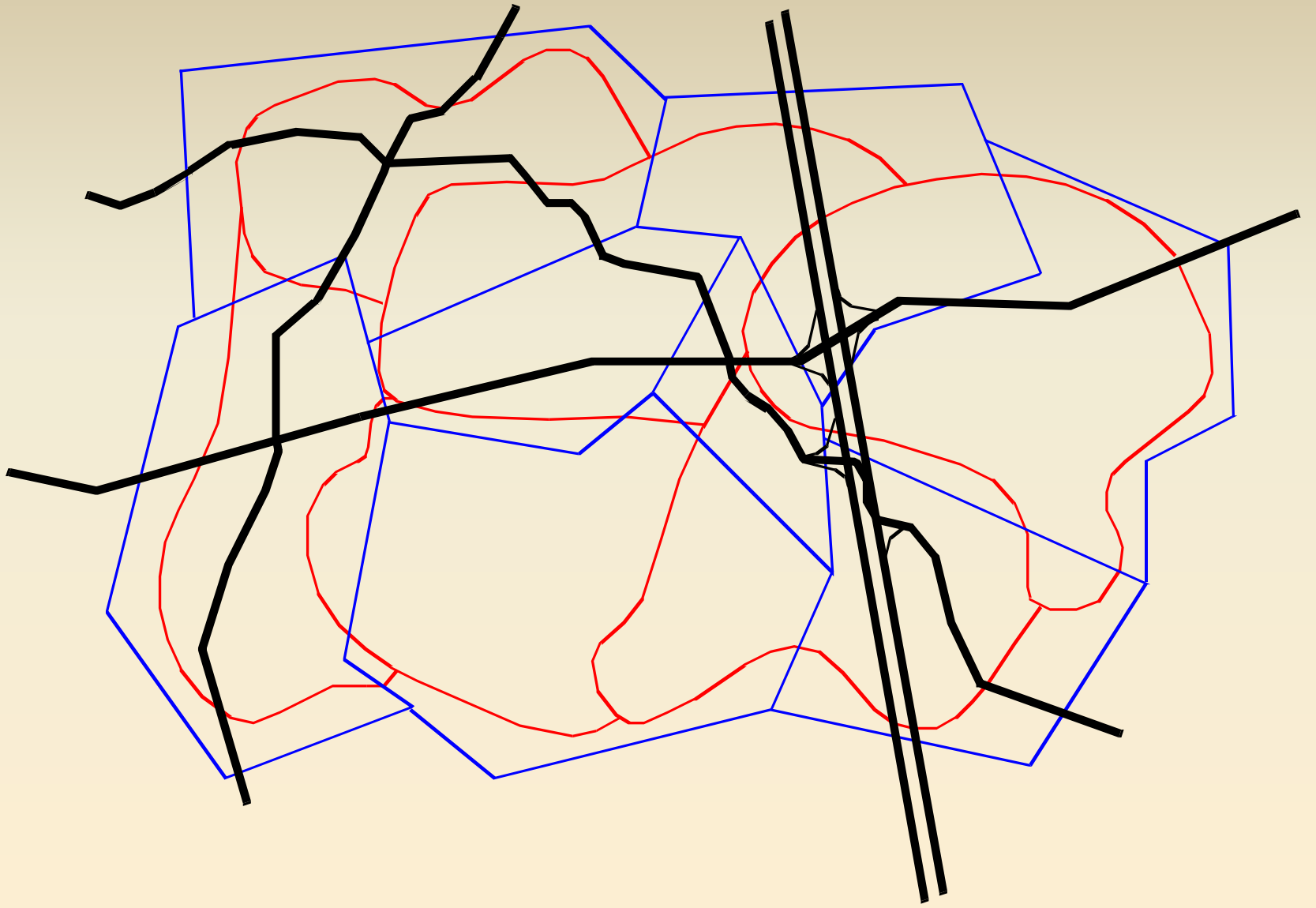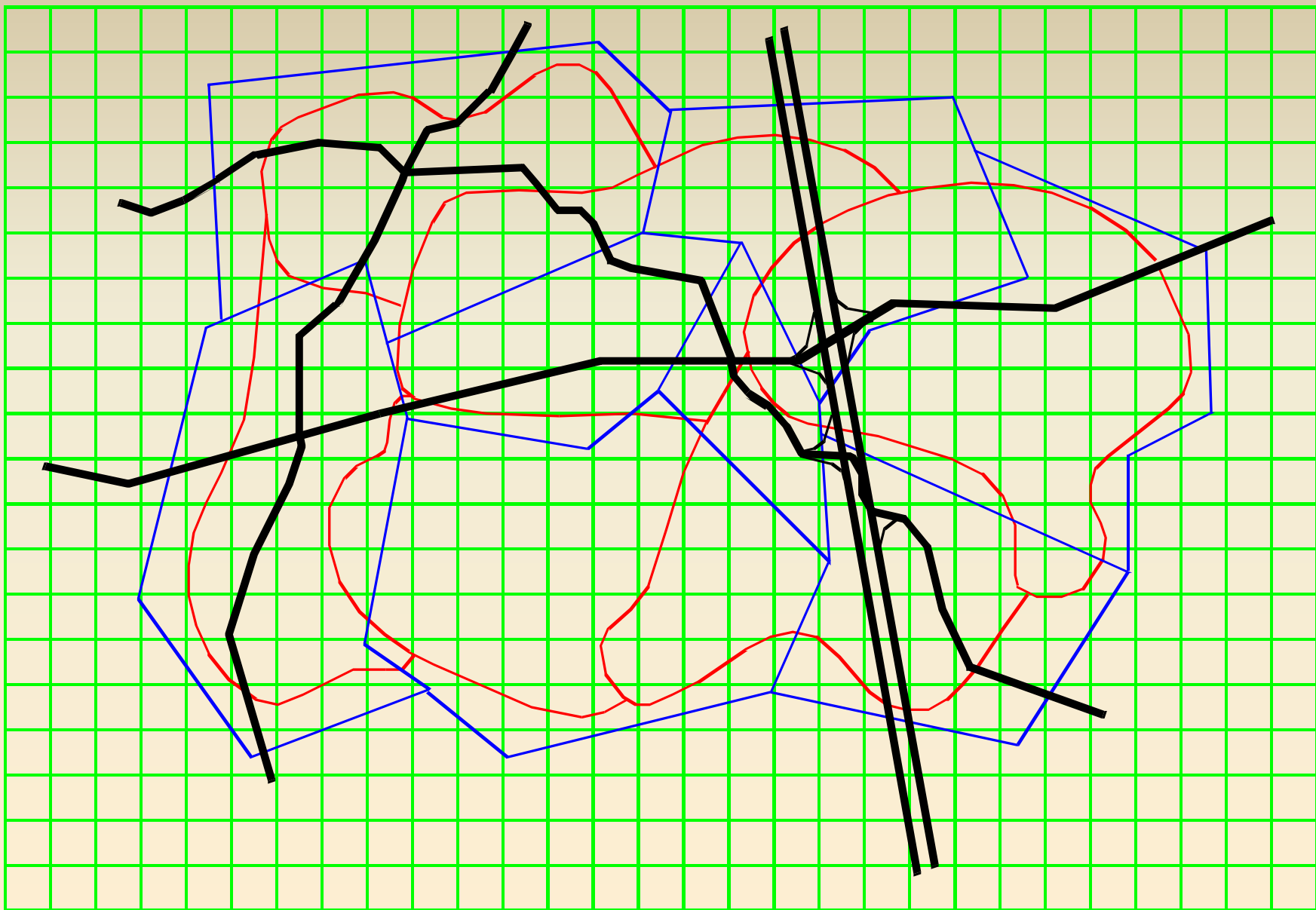
Horizontal and Vertical Integration
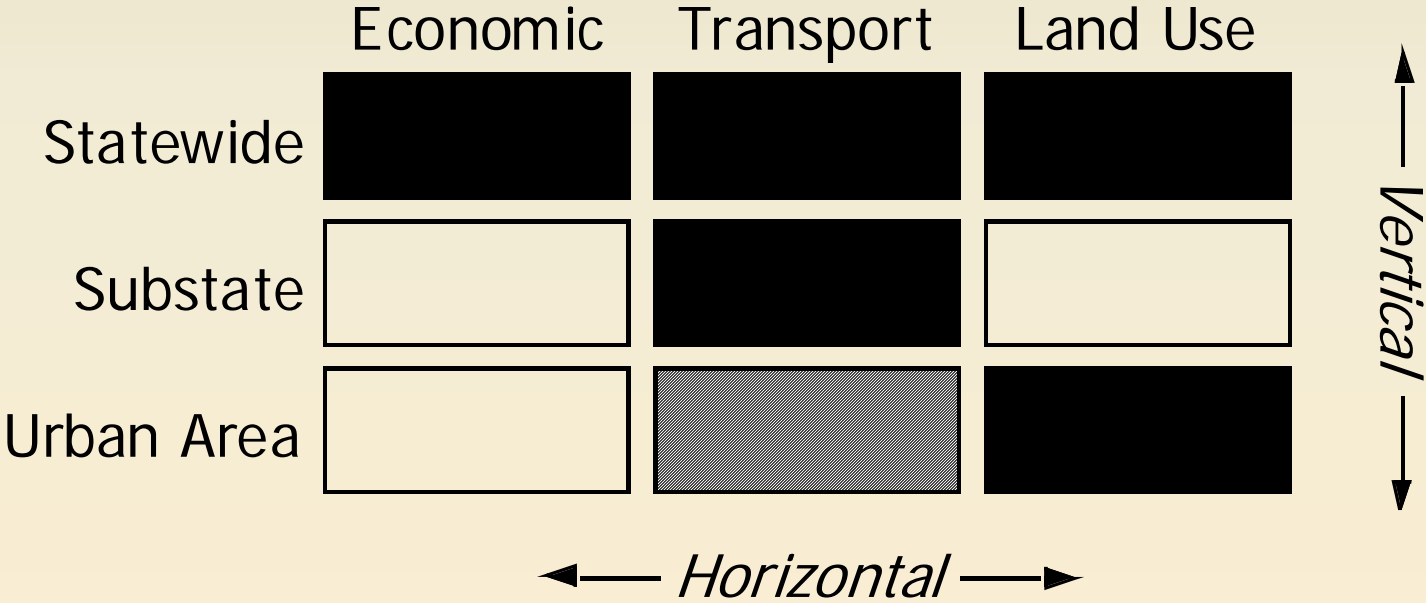
Second Generation Recommendations

- A single modeling framework (both horizontal and vertical integration)

- Heavily influenced by original model design

- Maintain consistency between location and travel choice models, based upon discrete choice modeling and random utility theory

- Nested or hierarchical representation of economic activities and land use

- Ability to construct and implement synthetic models to substitute for behavioral ones

Second Generation Recommendations

- Ability to apply the model in either an aggregate or disaggregate manner (scale and data dependencies)

- Accommodate varying qualities and extent of coverages

- Grid-based modeling backplane

- A single transportation network representation

- Expansion to include rail passenger and freight modes of transport

Second Generation Recommendations

- Ability to apply the model in either an aggregate or disaggregate manner (scale and data dependencies)

- Accommodate varying qualities and extent of coverages

- Grid-based modeling backplane

- A single transportation network representation

- Expansion to include rail passenger and freight modes of transport

Second Generation Recommendations

- Object-oriented programming using Java
- Open source code (GNU public license)
- Robust facilities for scenario manipulation and comparison

DESPAIR

DESPAIR

Disaggregate **E**stimator of **S**patial **P**atterns of **A**ctivity **I**nteraction, **R**evisited