Activity-Based Models:
Approaches Used to Achieve Integration Among Tours and Trips Throughout the Day

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AB Modeling Objective

To more realistically predict the effect of land use and transport policy on travel behavior.

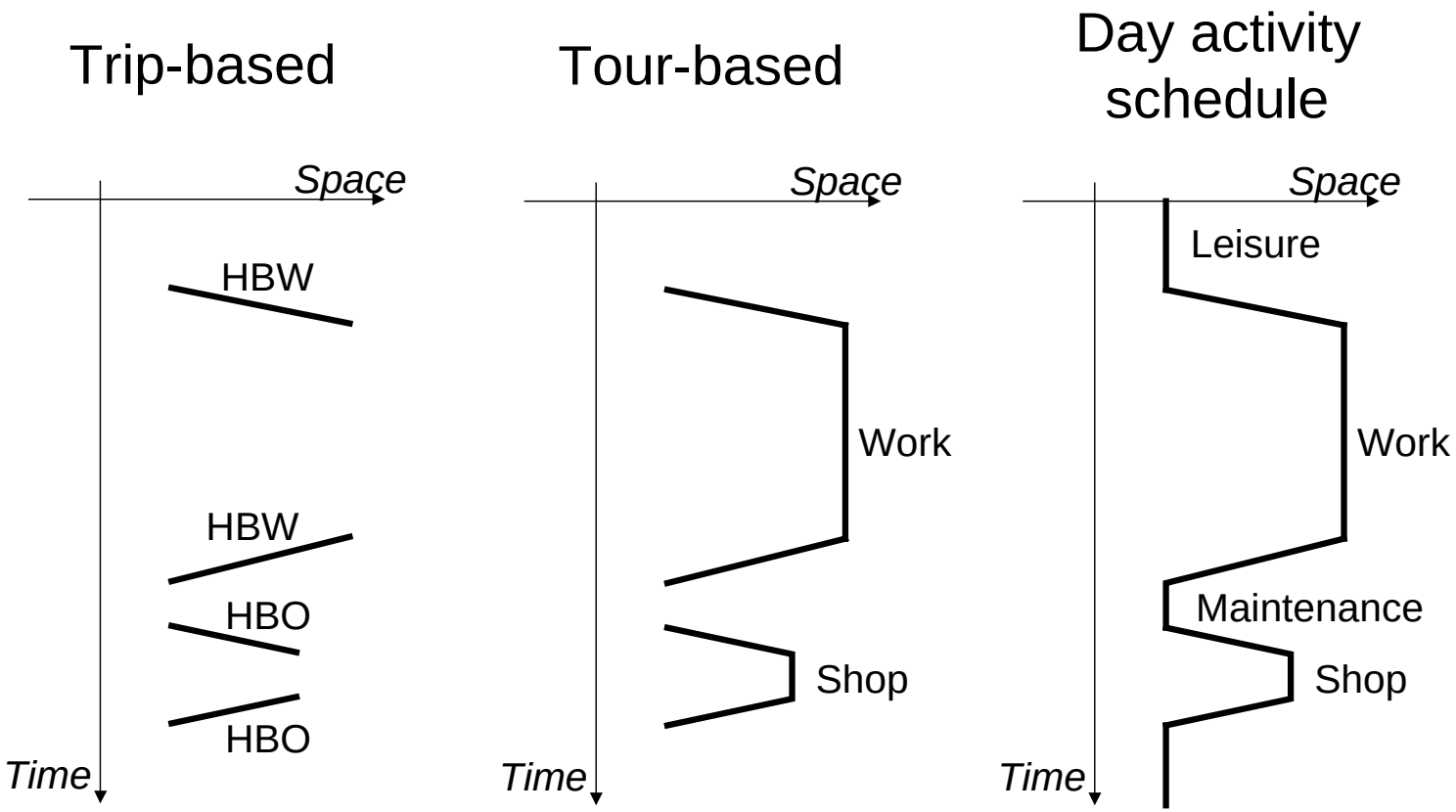
AB Modeling Approach

To more realistically predict the effect of land use and transport policy on travel behavior, through a more realistic representation of behavior.

Attempts at Behavioral Realism

- Model entire day of activity and travel as one integrated outcome

Model Entire Day



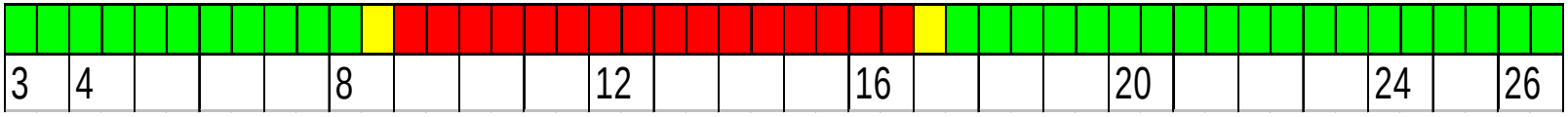
Attempts at Behavioral Realism

- Model entire day of activity and travel as one integrated outcome
- Include time-of-day models

Include Time-of-Day Models

- Tour TOD Model
  - arrival and departure periods (approximate duration)
  - 1716 arrival-departure choice alternatives

Tour scheduled:



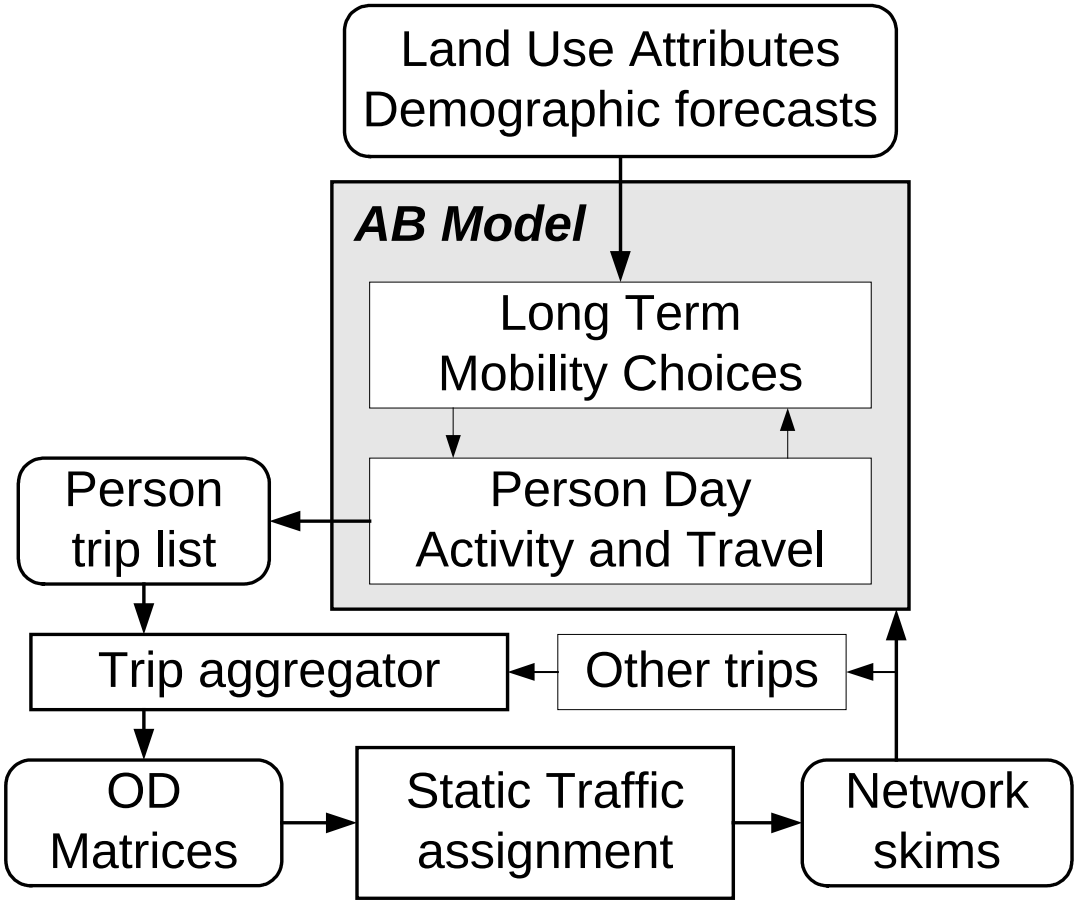
Attempts at Behavioral Realism

- Model entire day of activity and travel as one integrated outcome
- Include time-of-day models
- Include household aspects of personal travel

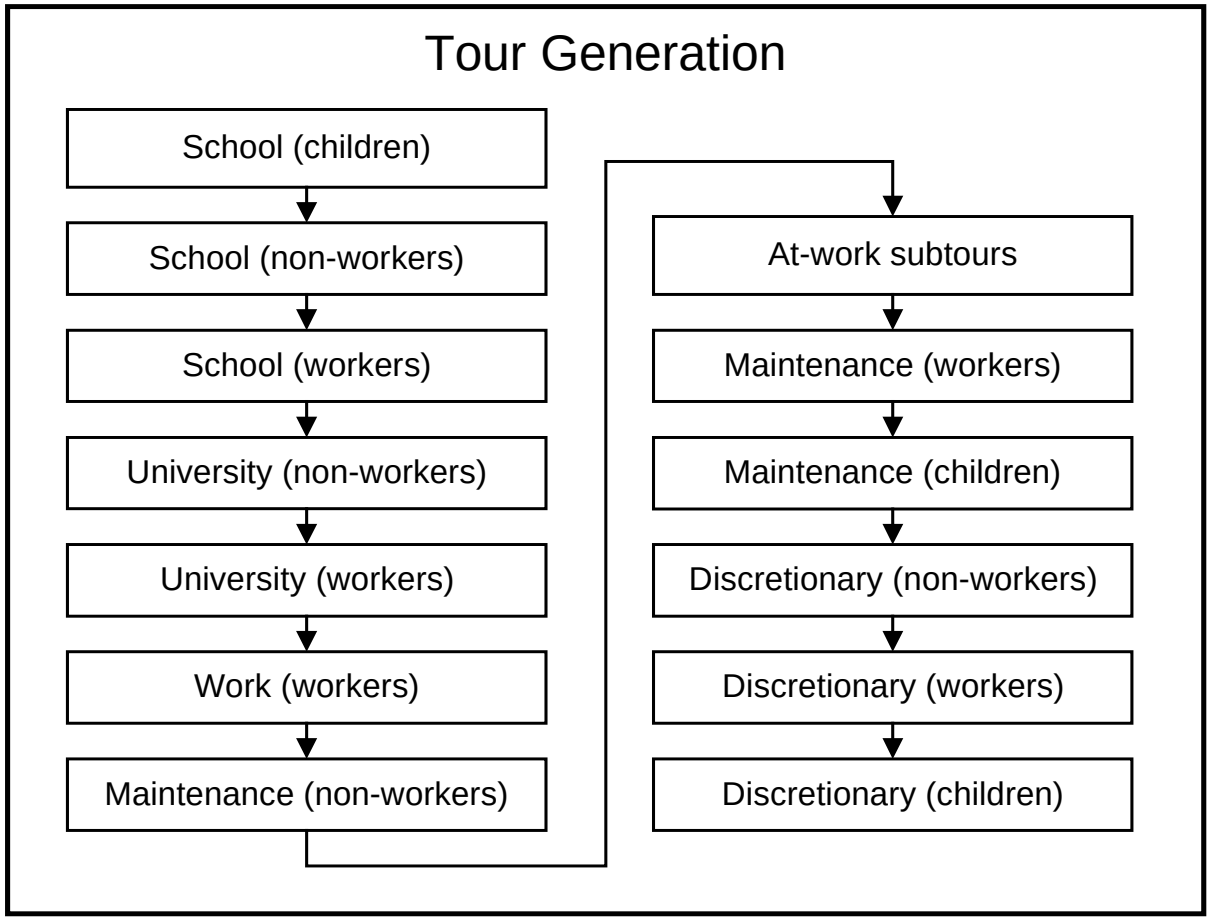
Include Household Aspects of Personal Travel

- Coordinated schedules
- Joint tours
- Allocated maintenance activity
- Pickup and drop-off trips

AB Model System



Sequentially Applied Models



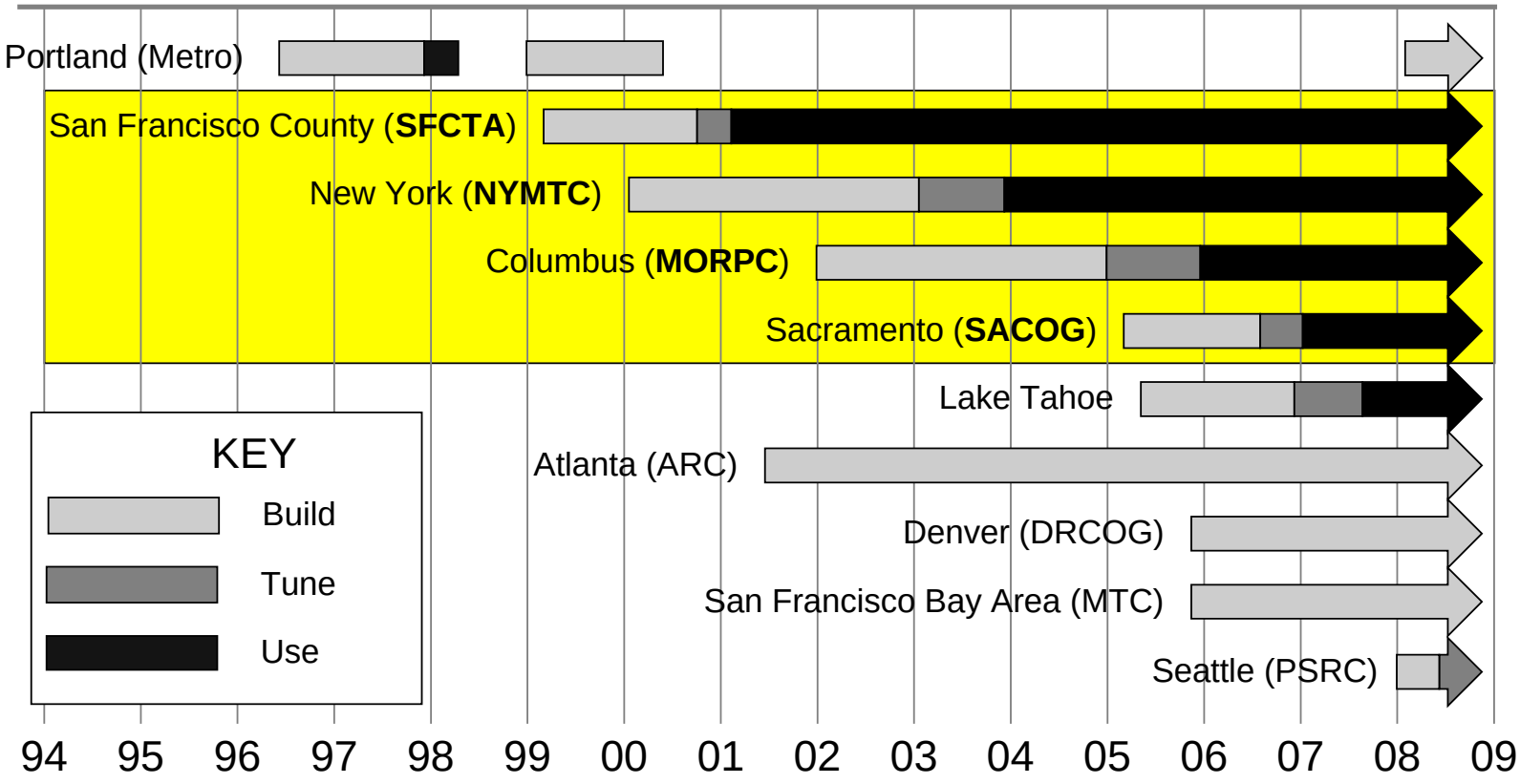
Attempts at Behavioral Realism

- Model entire day of activity and travel as one integrated outcome

Thesis

To more realistically predict the effect of land use and transport policy on travel behavior, through a more realistic representation of behavior, **activity-based model systems must be effectively integrated.**

Examined:
Four US AB Models in Active Use



Terminology

- Horizontal Integration
- Vertical Integration
  - Downward
  - Upward

Horizontal Integration

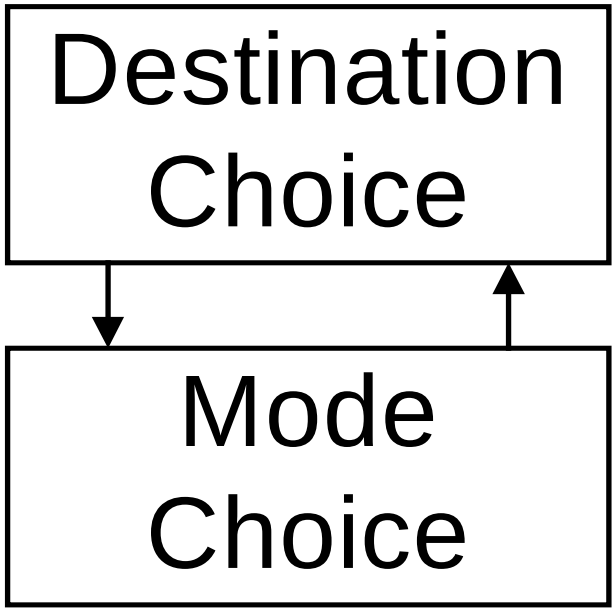
Joint model of two or more model components

Destination and Mode Choice

--MNL
--Nested Logit
--Cross-nested Logit
--etc

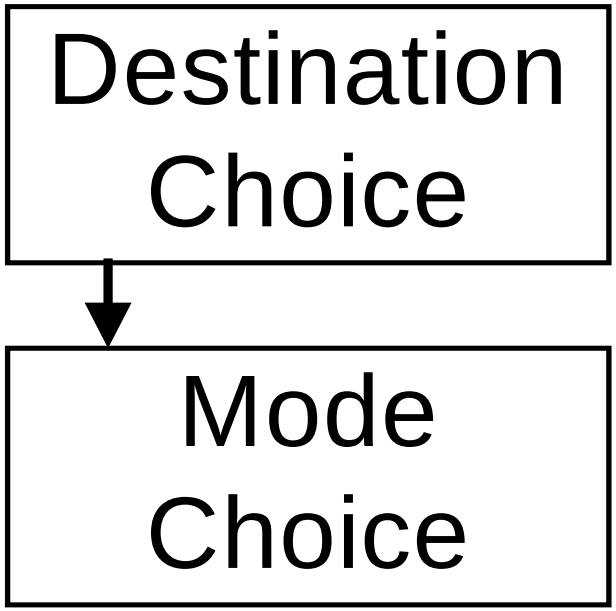
Vertical Integration

Relating two or more sequentially implemented model components



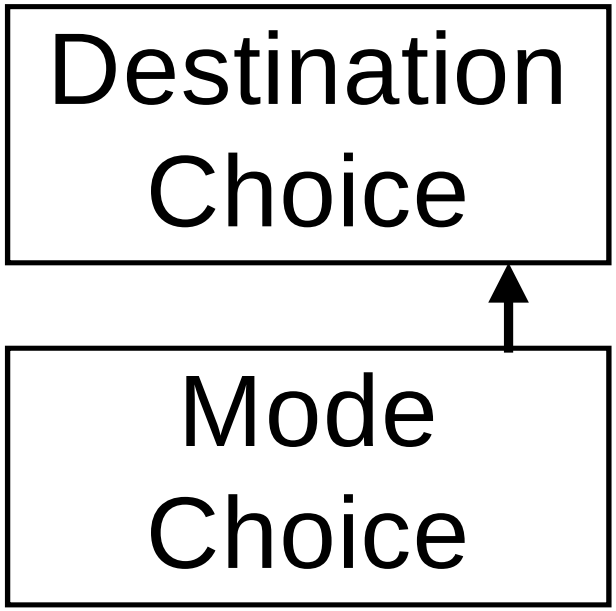
Downward Vertical Integration

Constraining subsequent model by the outcome of prior model



Upward Vertical Integration

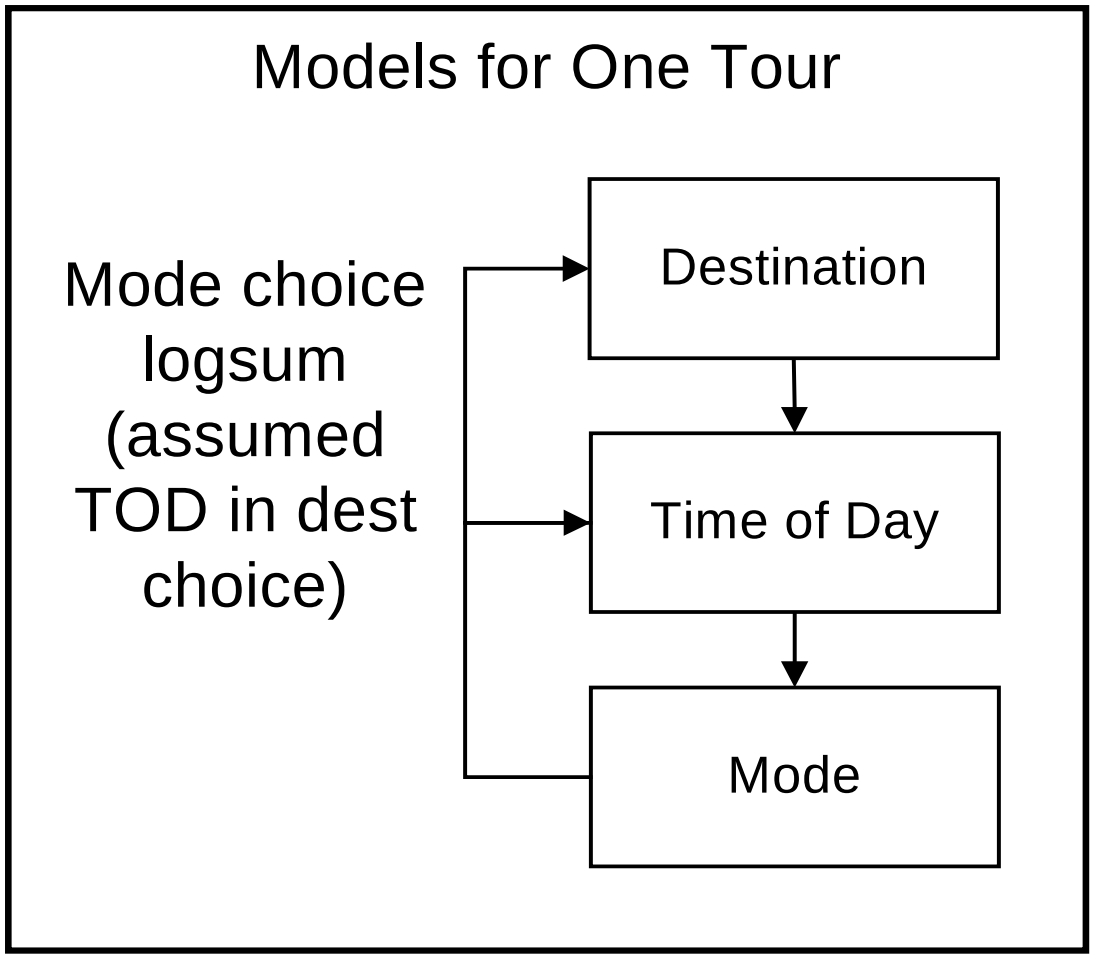
Accounting for the quality of alternatives in a subsequent model



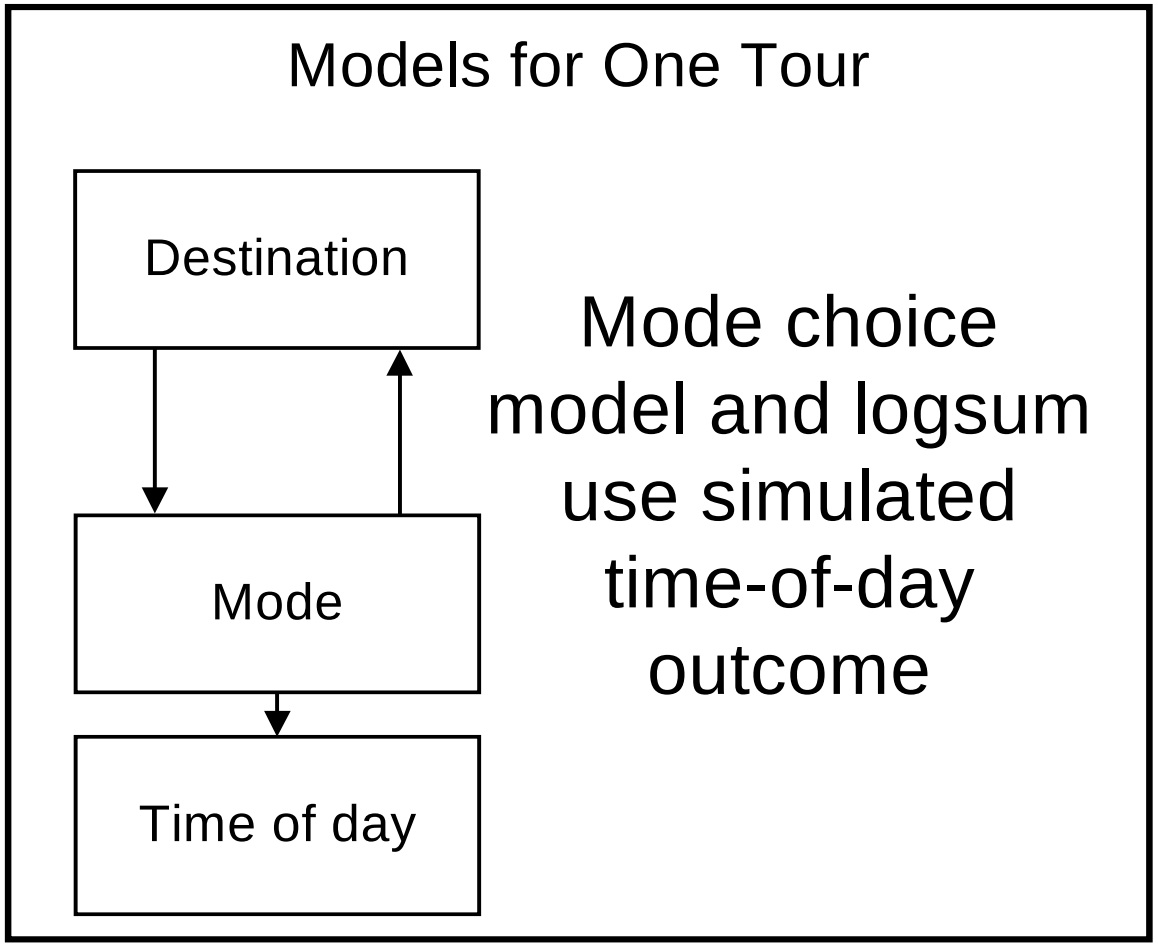
Five Aspects of Integration

- Tour destination, mode and time
- Long-term and within-day
- Downward among tours and stops
- Among household members
- Horizontal and upward among tours and stops

Tour destination, mode and time--**MORPC**



Tour destination, mode and time--**SACOG**



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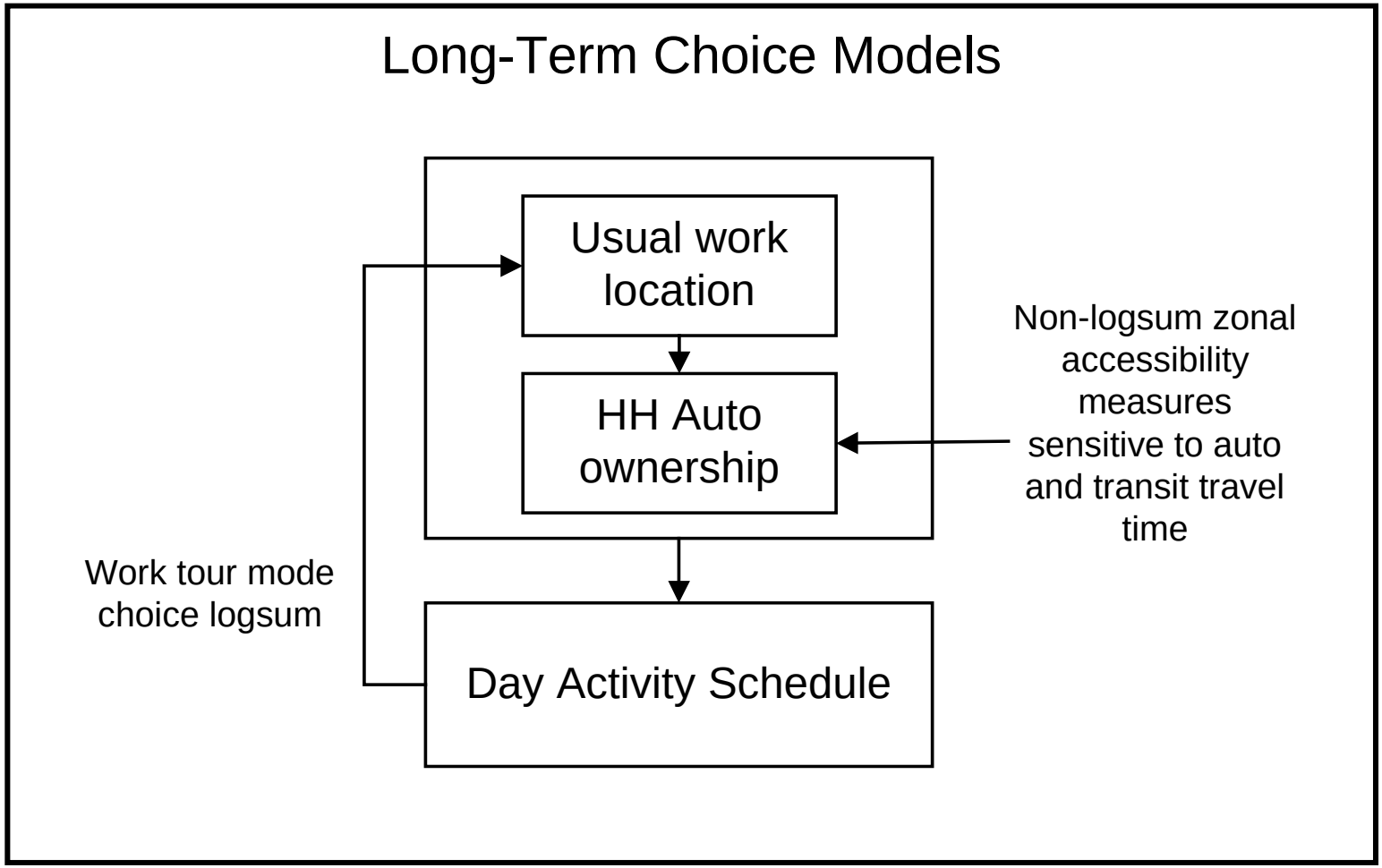
Long-term and within day-- **SFCTA**



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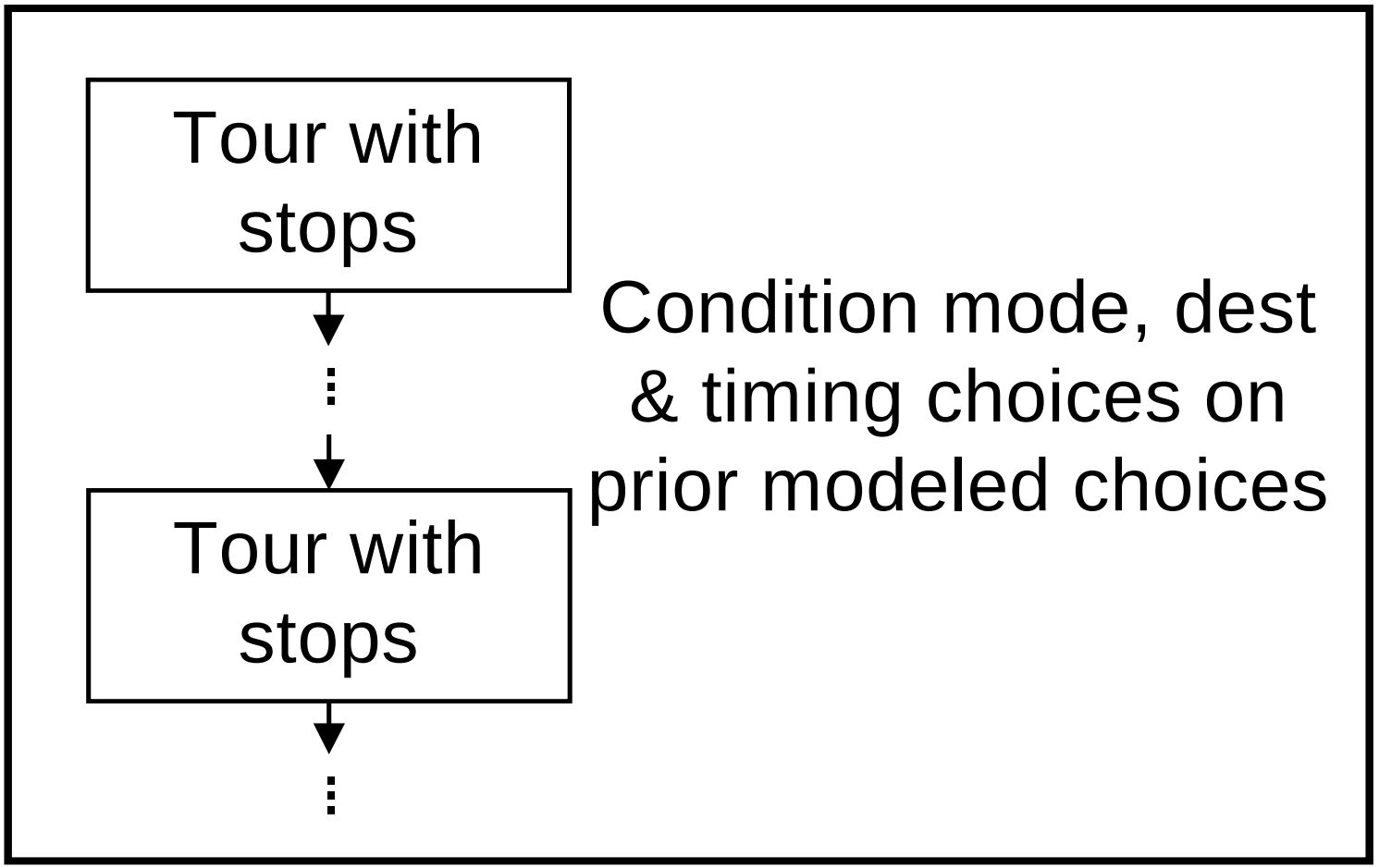
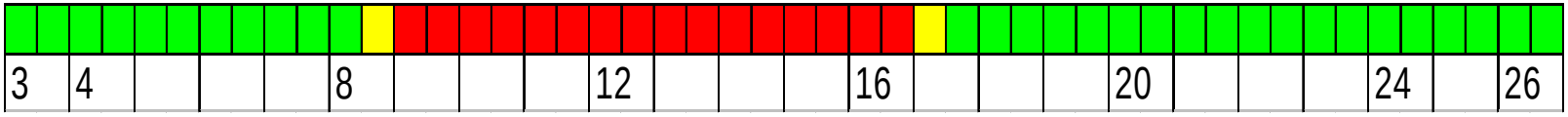
Downward among tours and stops



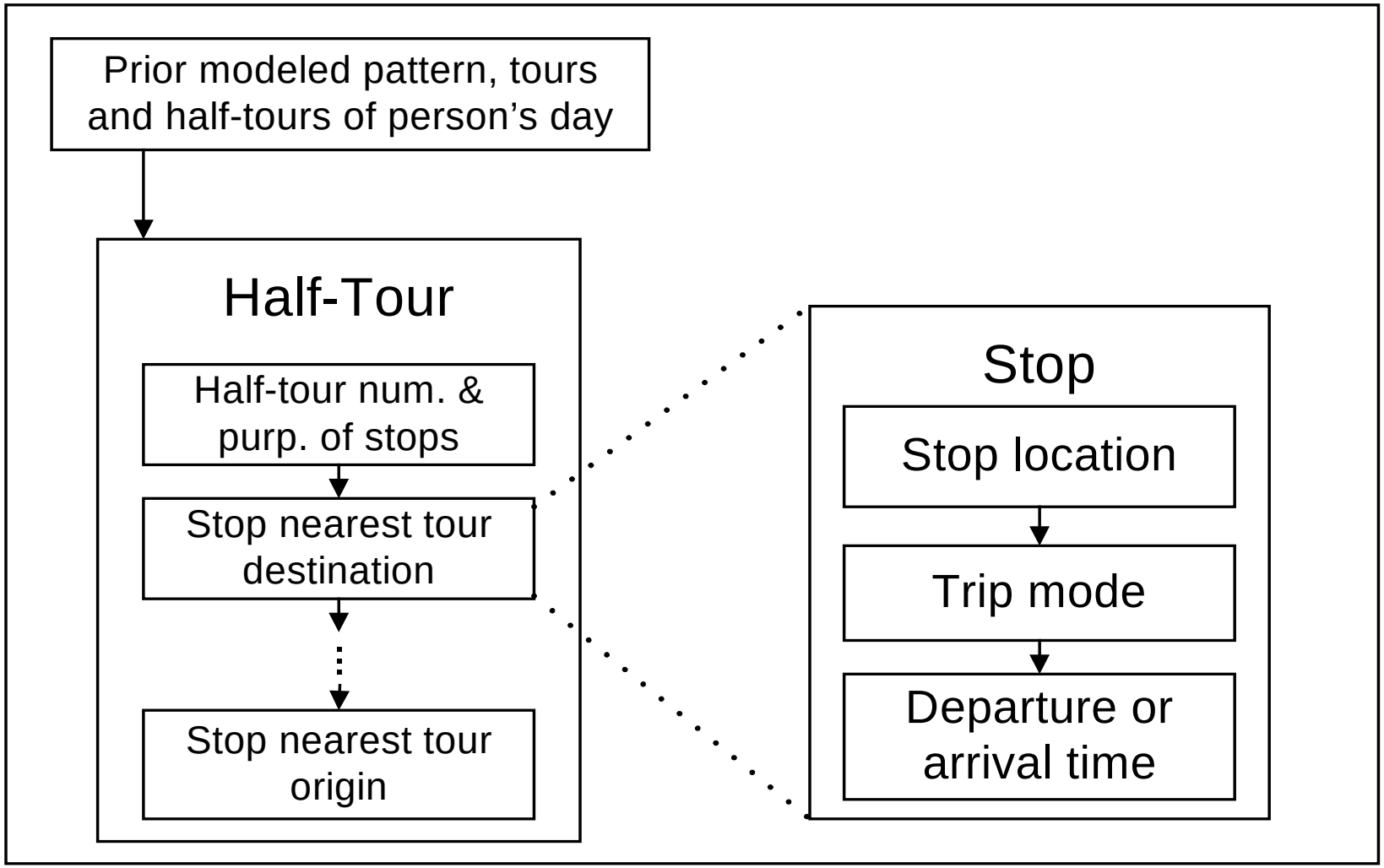
Available time accounting **MORPC** and **SACOG**

Time-constrain and condition subsequent choices after scheduling each tour and stop

Person-day:



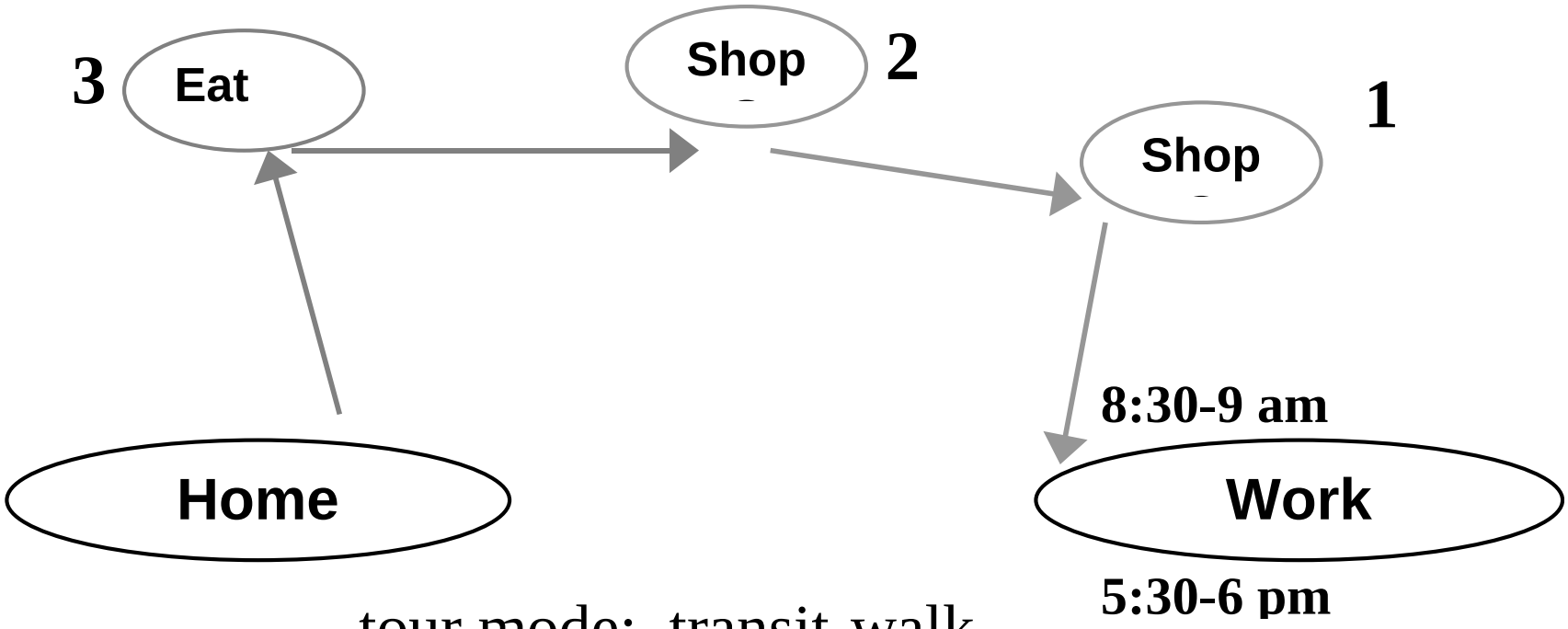
Half-tours and intermediate stops--**SACOG**



Modeling half-tour 1
before

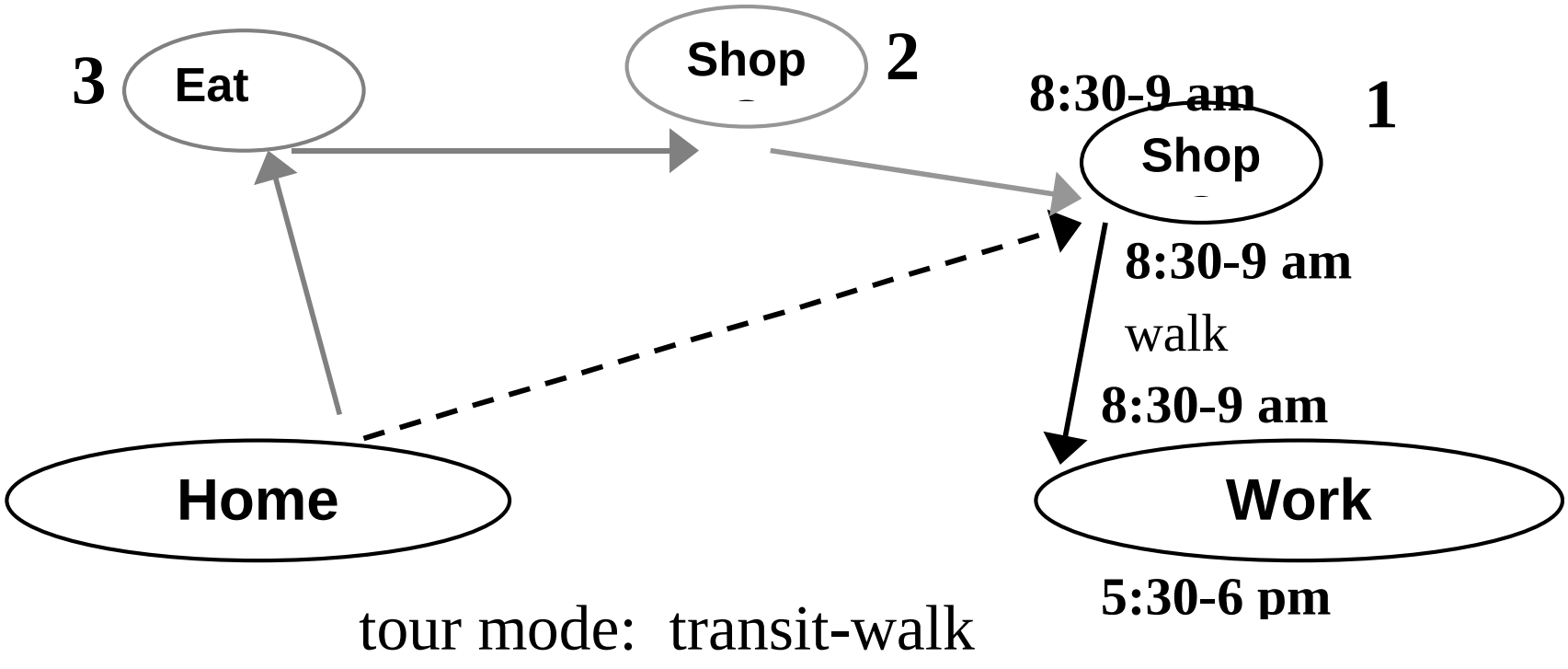
tour mode: transit-walk

Modeling half-tour 1
after num & purp of stops



tour mode: transit-walk

Modeling half-tour 1
after stop 1

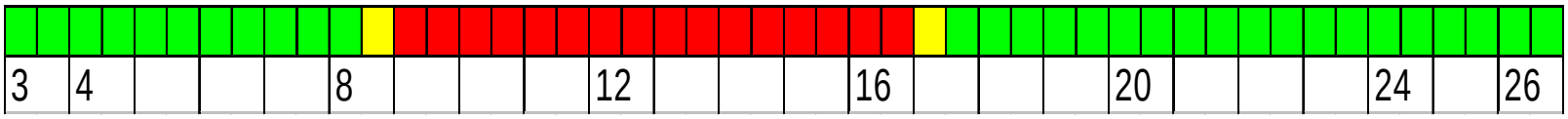


tour mode: transit-walk

Vehicle accounting
No current models

- Models
  - Vehicle type (long-term)
  - Vehicle for tour
- Accounting:

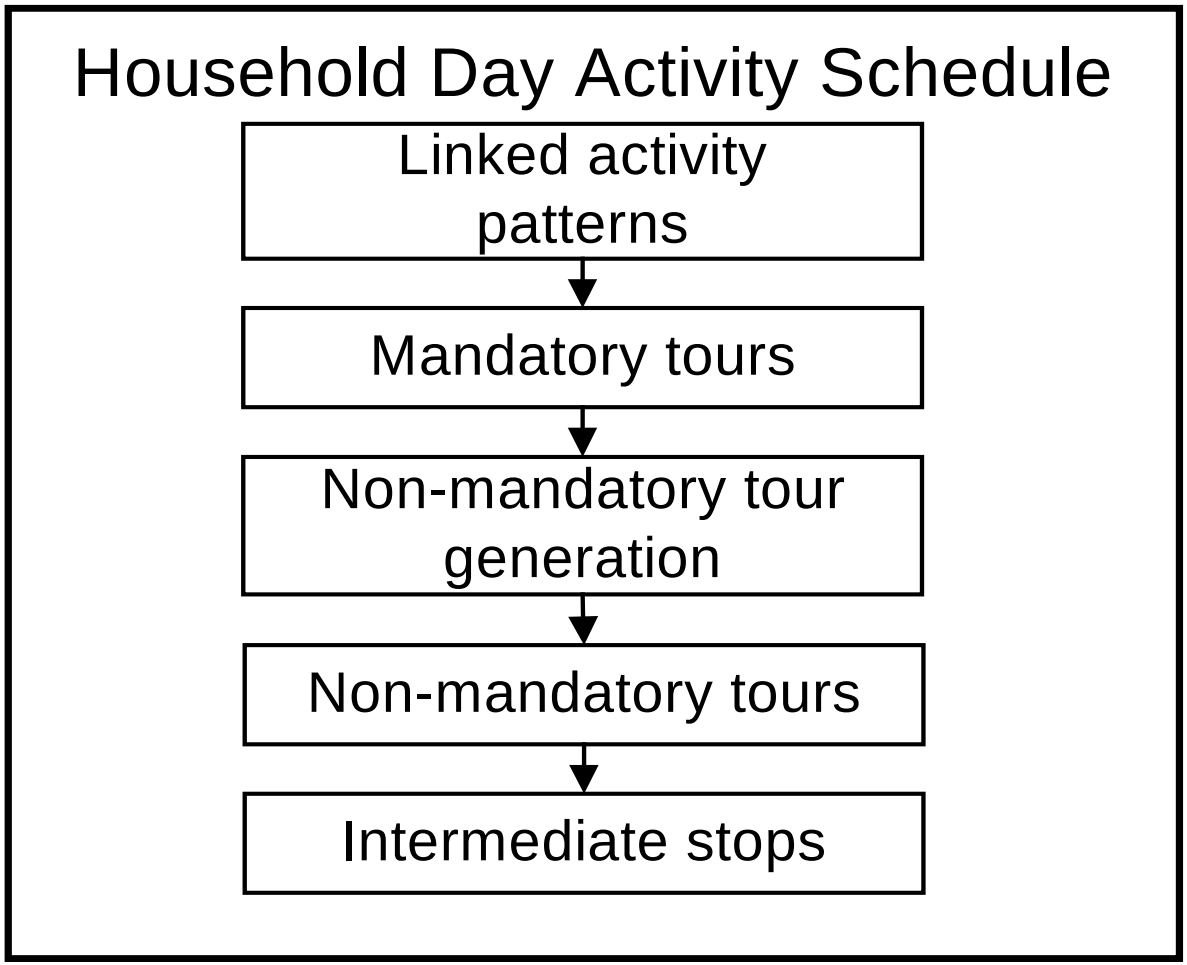
Vehicle scheduled for one tour



Five Aspects of Integration

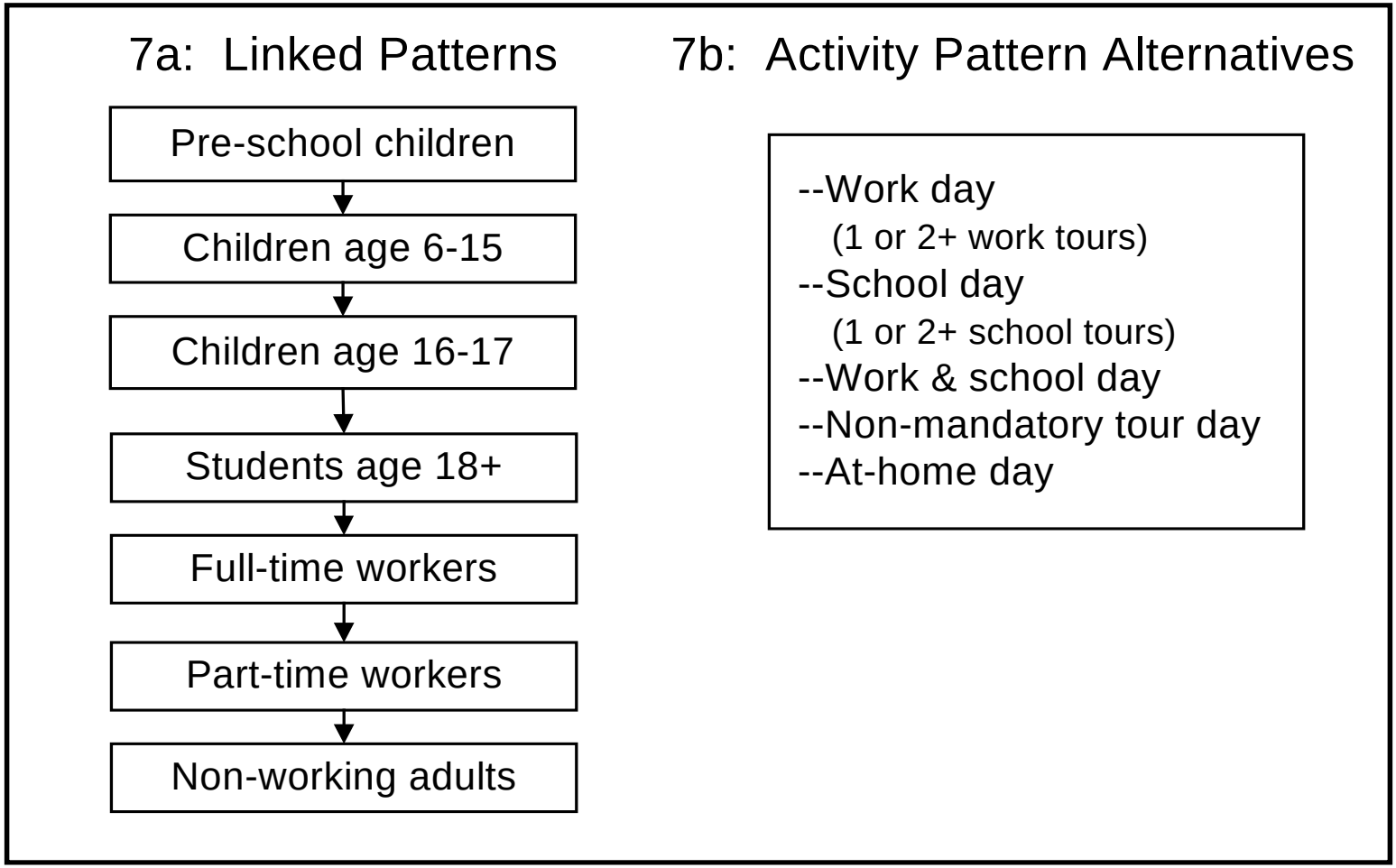
- Tour destination, mode and time
- Long-term and within-day
- Downward among tours and stops
- Among household members
- Horizontal and upward among tours and stops

Among household members
MORPC

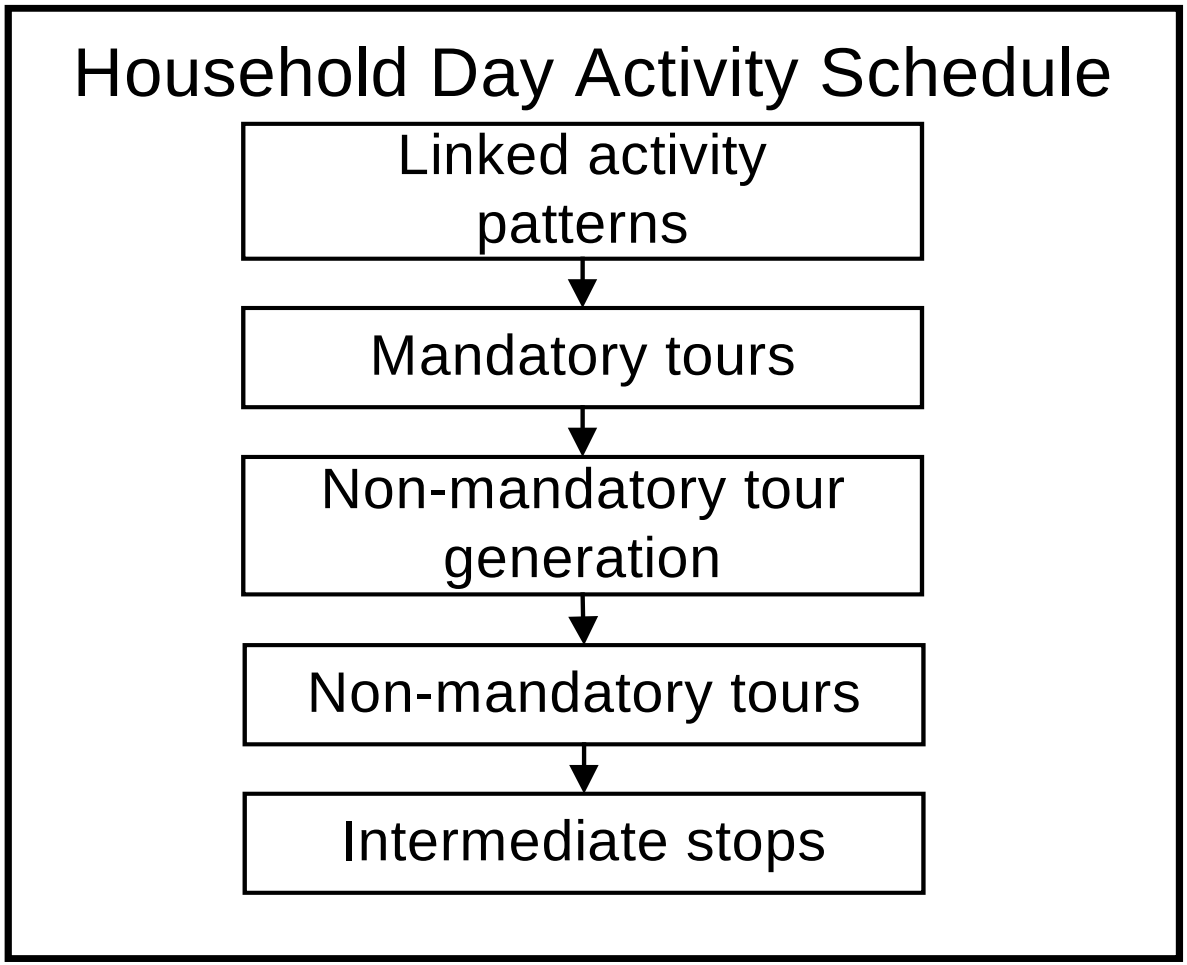


Among household members

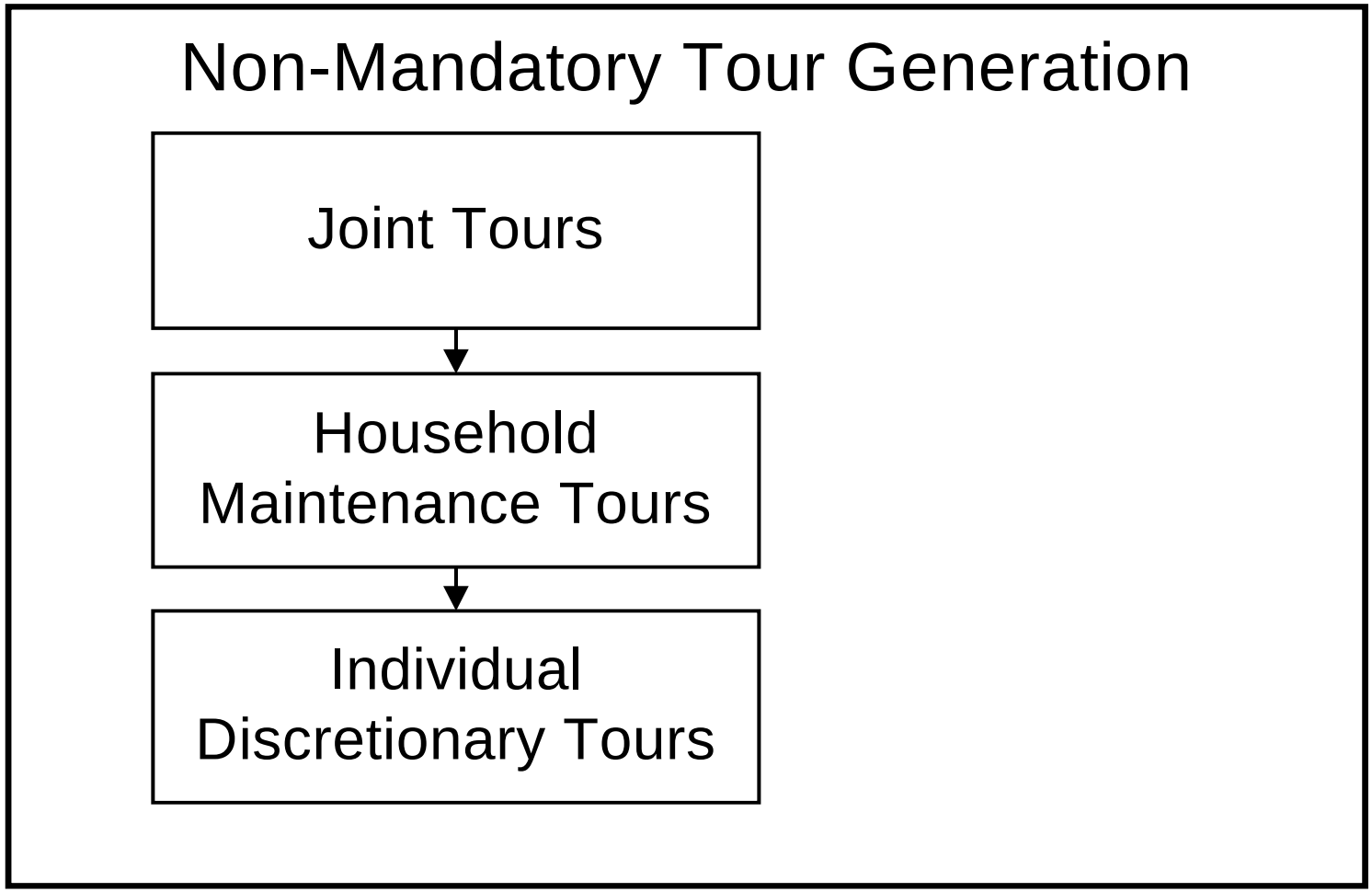
MORPC



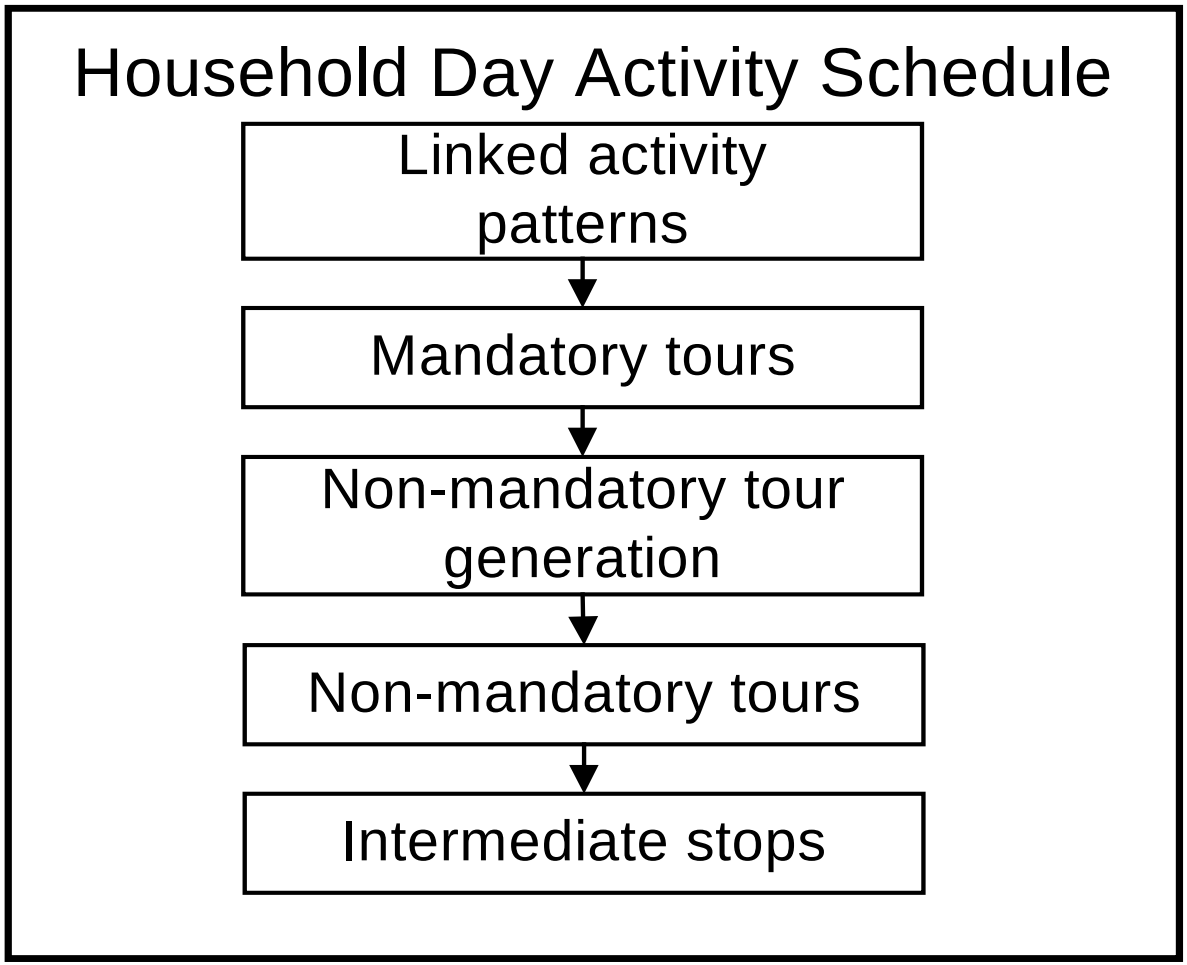
Among household members
MORPC



Among household members
MORPC



Among household members
MORPC



Among household members
No Current Models

- Horizontally integrated day activity patterns
- Shared partial tours

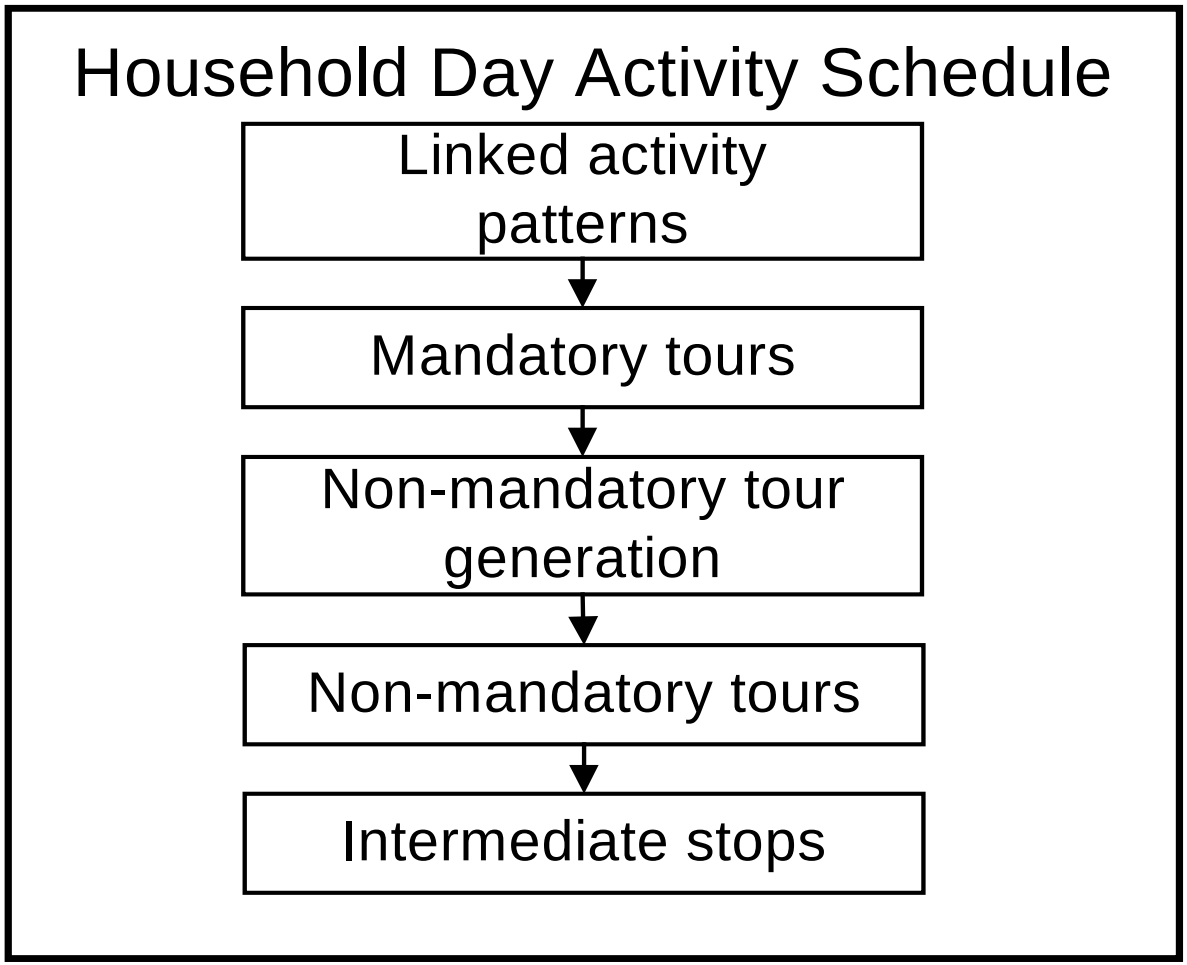
Five Aspects of Integration

- Tour destination, mode and time
- Long-term and within-day
- Downward among tours and stops
- Among household members
- Horizontal and upward among tours and stops

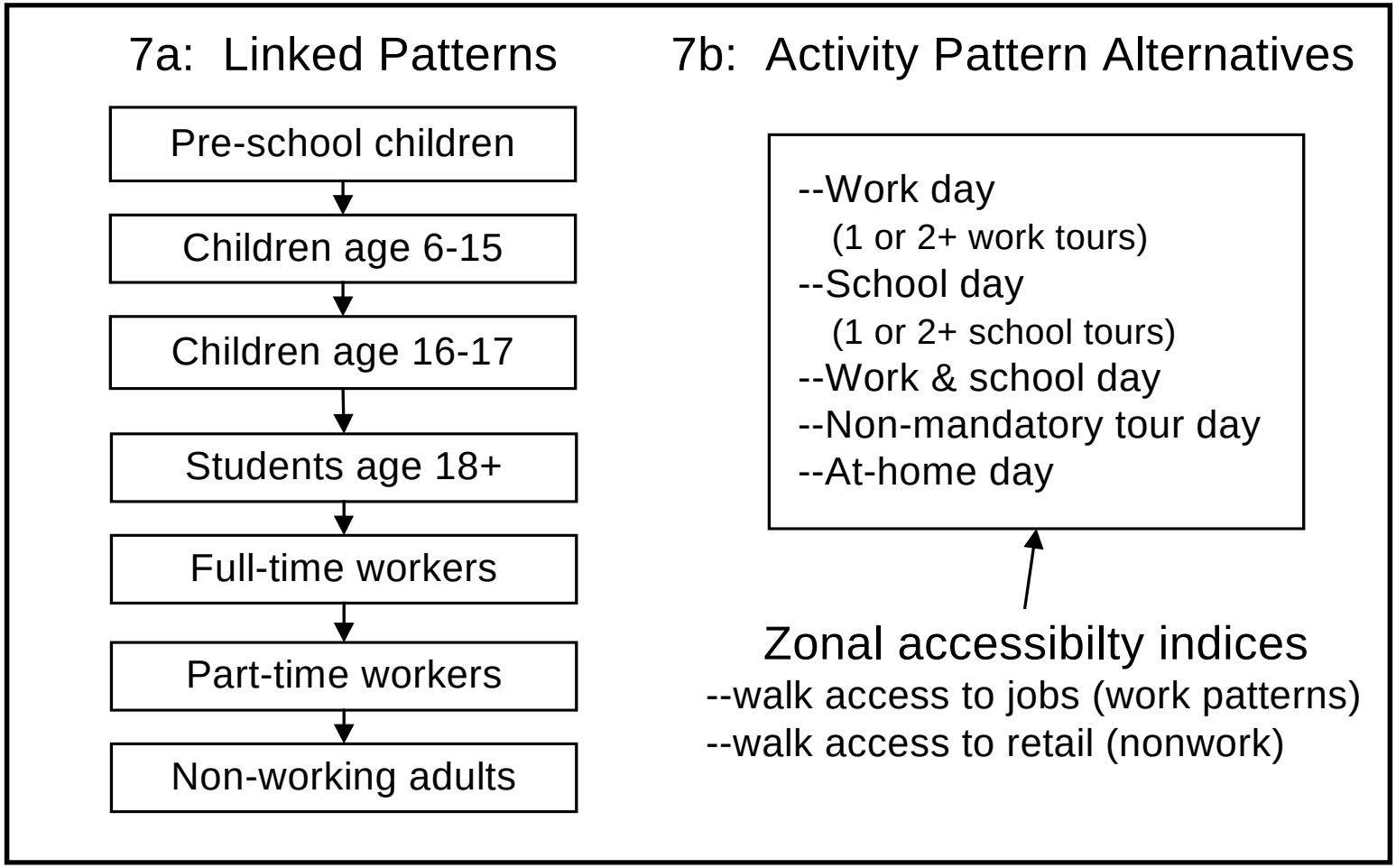
AB Modeling Objective

To more realistically predict the affect of land use and transport policy on travel behavior.

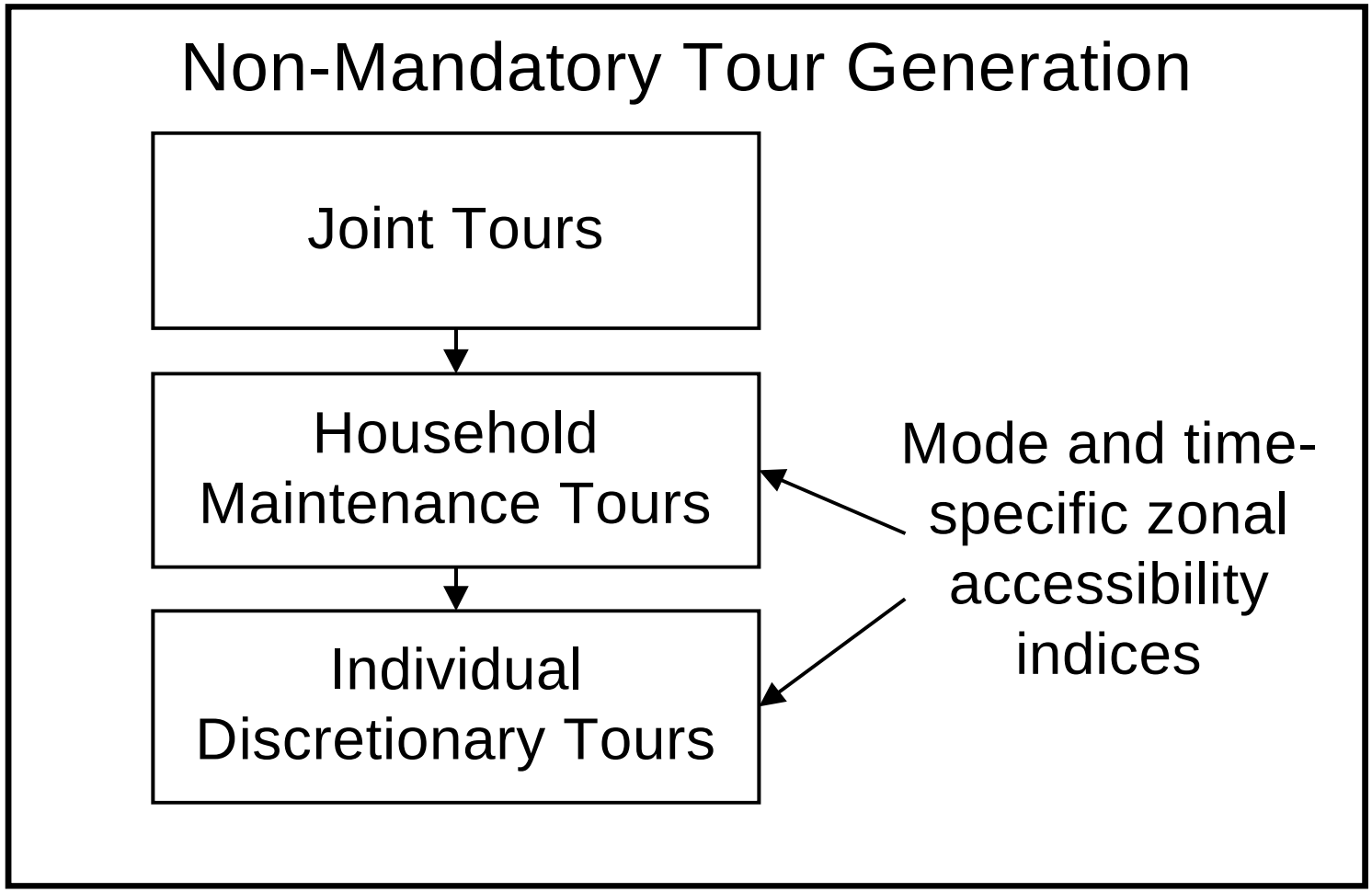
Horizontal and upward among tours and stops--**MORPC**



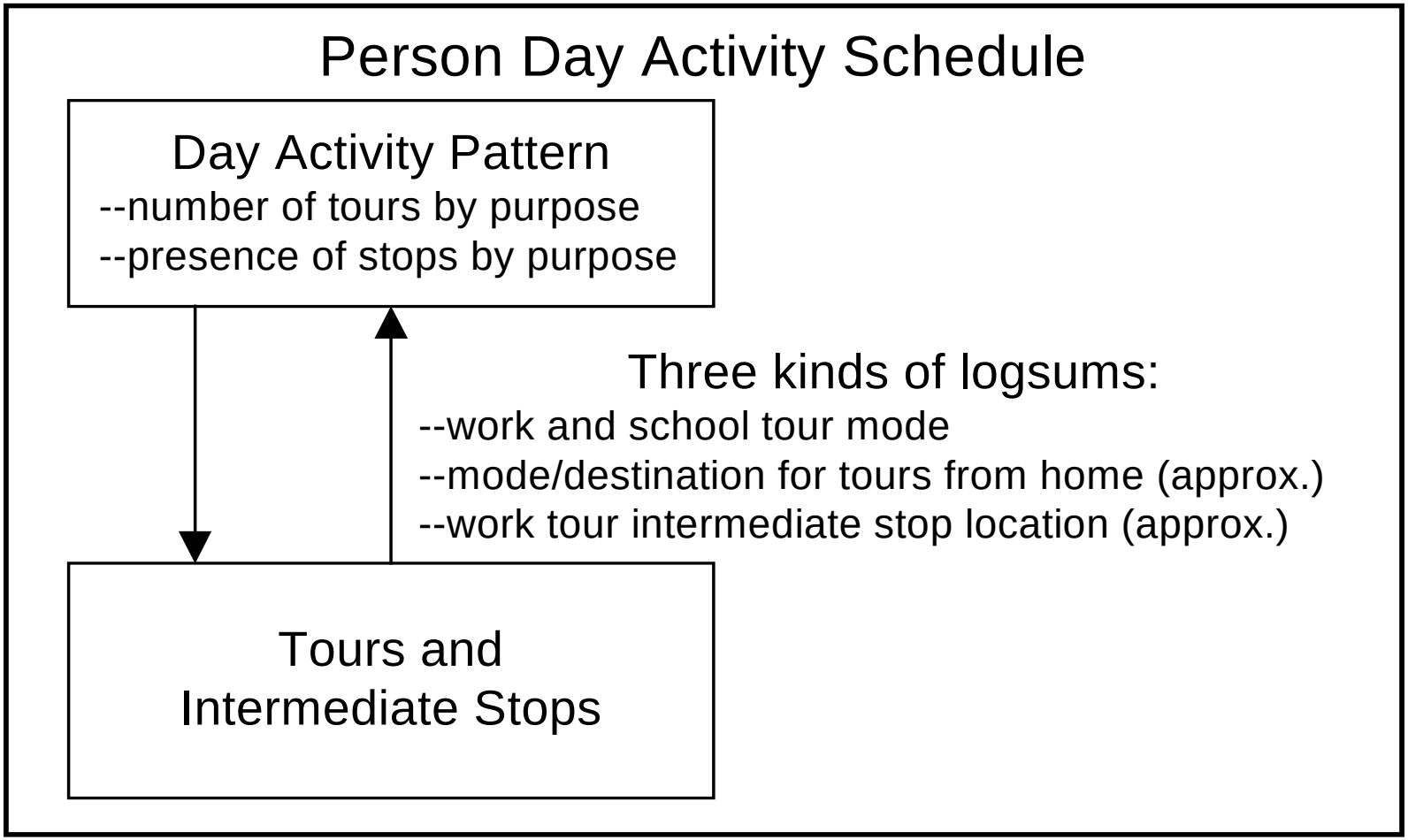
Horizontal and upward among tours and stops--**MORPC**



Horizontal and upward among tours and stops--**MORPC**



Horizontal and upward among tours and stops--**SACOG**



Horizontal and upward among tours and stops--**SACOG**

Tour/stop purpose			
work			
school			
escort			
pers. business			
shop			
meal			
social/rec.			

Horizontal and upward among tours and stops--**SACOG**

Tour/stop purpose	Work/school mode logsum	Mode/dest logsum	Stop logsum (to work loc)
work			
school			
escort			
pers. business			
shop			
meal			
social/rec.			

Horizontal and upward among tours and stops--**SACOG**

Tour/stop purpose	Work/school mode logsum	Mode/dest logsum	Stop logsum (to work loc)
work	to work		
school	to school		
escort			
pers. business			
shop			
meal			
social/rec.			

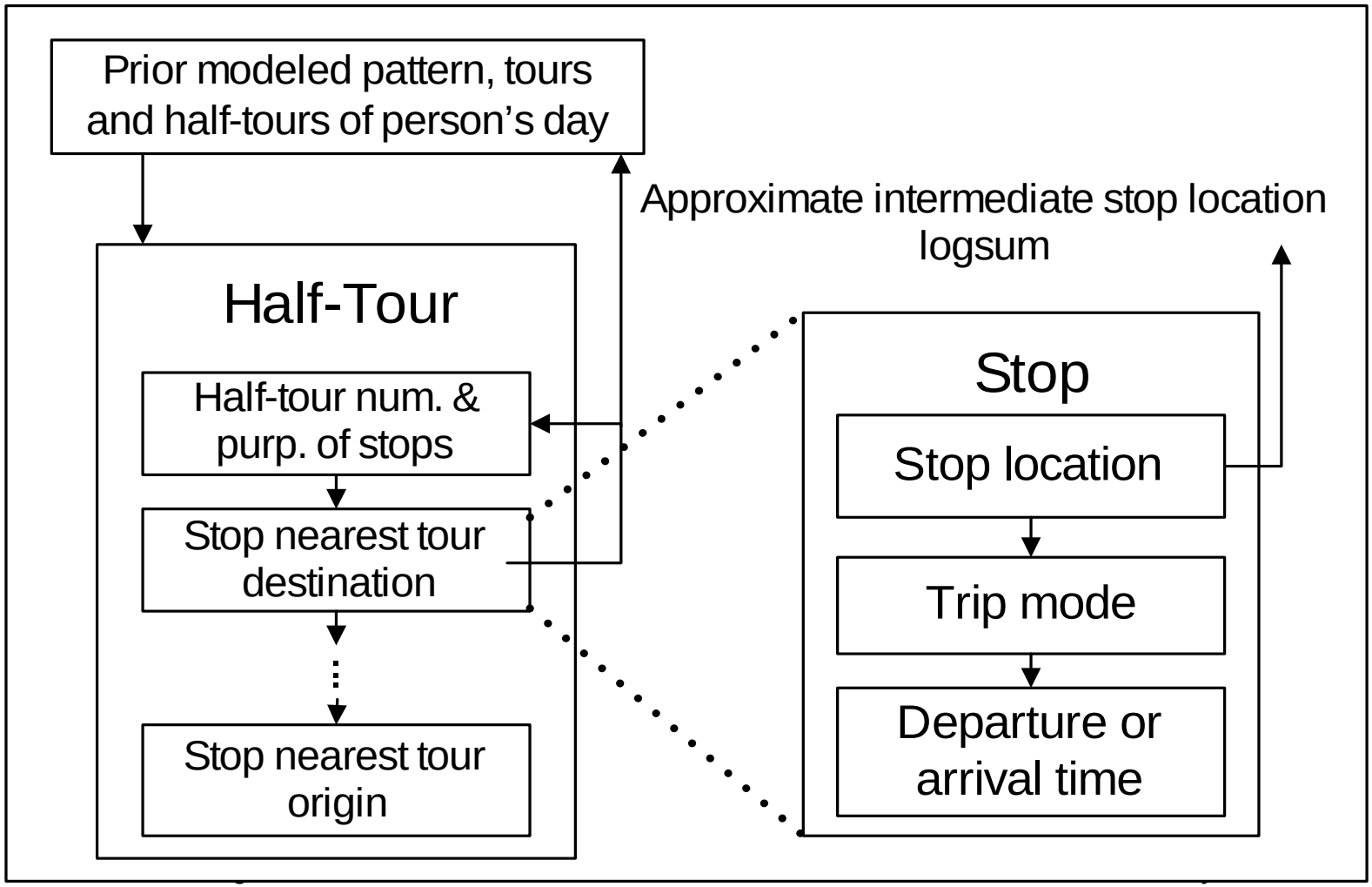
Upward Integration
Aggregate mode-dest logsums

- 84 pre-calculated per zone
  - 7 purposes
  - 4 car availability levels
  - 3 categories of origin parcel's proximity to transit

Horizontal and upward among tours and stops--**SACOG**

Tour/stop purpose	Work/school mode logsum	Mode/dest logsum	Stop logsum (to work loc)
work	to work	yes	
school	to school	yes	
escort		yes	
pers. business		yes	
shop		yes	
meal		yes	
social/rec.		yes	

Upward Integration
Intermediate stop logsums



Upward Integration
Intermediate stop logsums

- 4 pre-calculated per TAZ OD pair
  - 2 tour modes (auto & transit)
  - 2 times of day (peak & offpeak)

Horizontal and upward among tours and stops--**SACOG**

Tour/stop purpose	Work/school mode logsum	Mode/dest logsum	Stop logsum (to work loc)
work	to work	yes	
school	to school	yes	auto
escort		yes	auto
pers. business		yes	auto
shop		yes	
meal		yes	auto
social/rec.		yes	

Five Aspects of Integration

- Tour destination, mode and time
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Summary
Integration Priorities

1. Among tours and stops
2. Among household members

Priority 2--Integration among household members

- Horizontally integrated day activity patterns
  - with maintenance tours/stops
- Joint tours
- Shared partial tours

- But NOT at expense of integration among tours and stops

Priority 1--Integration among tours and stops

- Horizontal (day pattern)
  - among tours **and** stops
  - purpose-specific
- Upward to day pattern, accounting for:
  - differences among persons and purposes
  - available destinations, modes **and** times
- Downward, accounting for:
  - purposes, locations, modes and times
  - vehicles

AB Modeling Objective

To more realistically predict the effect of land use and transport policy on travel behavior.

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Five Aspects of Integration

- Tour destination, mode and time
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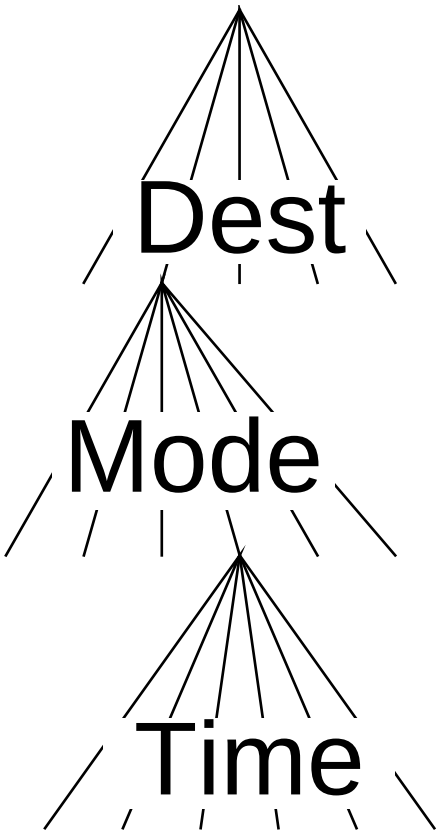
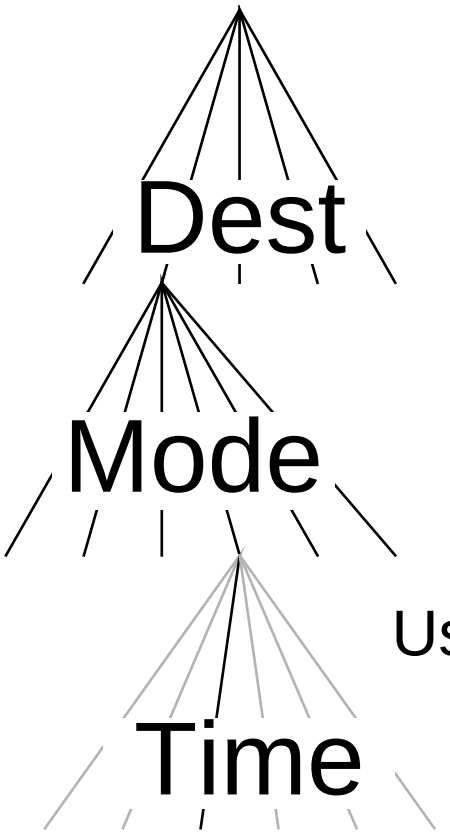
Upward Integration
Logsums with simulated TOD

Instead of this



Do this



Use simulated time