Transitional Model – Transportation Models

Fourth Oregon Symposium on Integrating Land-use & Transportation Models

November 15-17, 2005

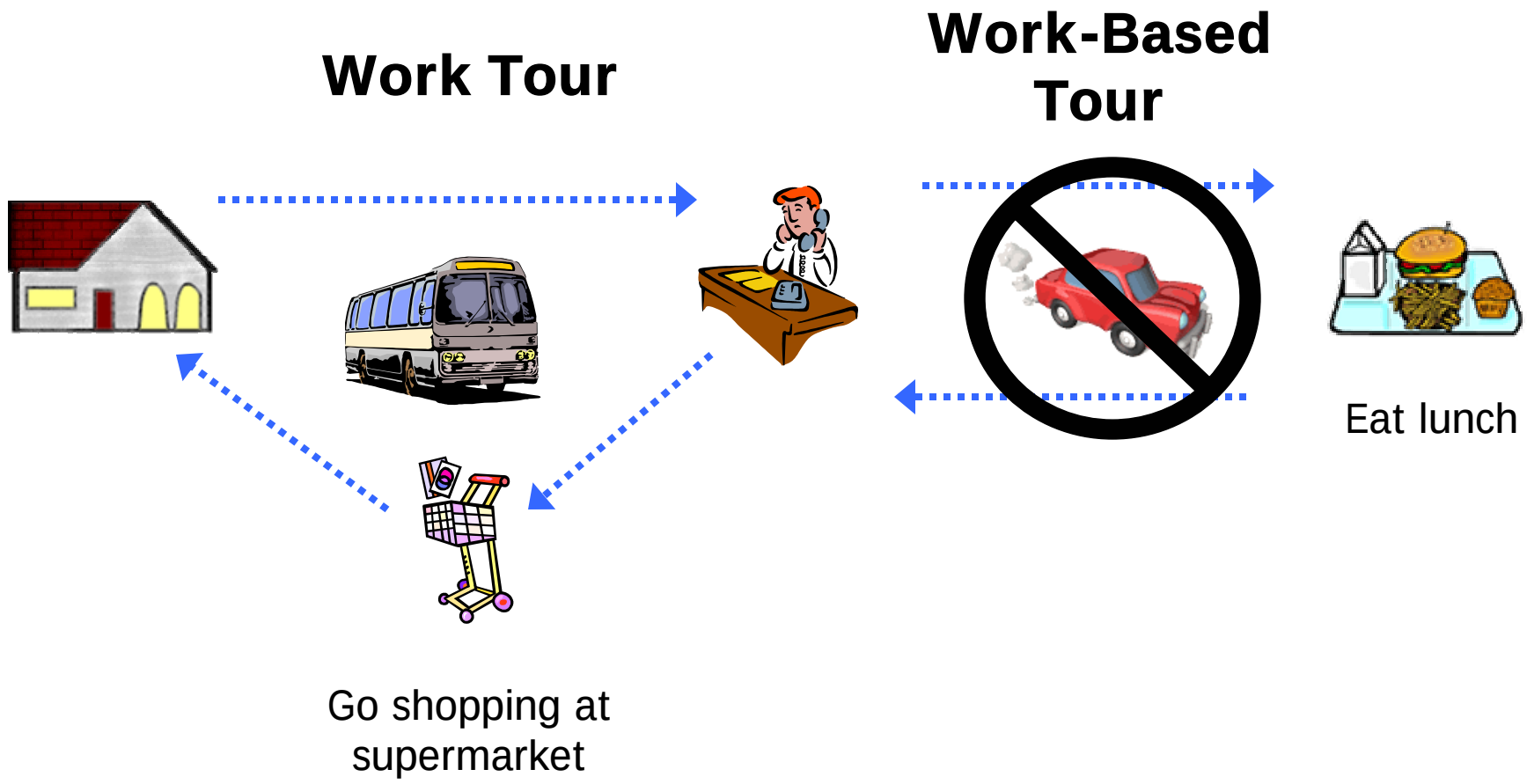
Today's presentation

- Changes in transport models required due to transitional model structure
- PT Application framework
- PT Calibration status
- CT Update - Rick
- Next steps

Transport Model Description

- "First generation" activity model
  - Explicit day-pattern generation – 'hwshrh'
  - Hazard-based duration models
  - Nested destination & mode choice models
  - Micro-simulation application paradigm

Tour-based Models



Workplace Location Choice

- Gen2 Model Specification
  - Household Allocation (HA) model to simultaneously predict household residential location and workplace location
- Transitional Model Specification
  - Workplace location choice within Person Travel (PT) component

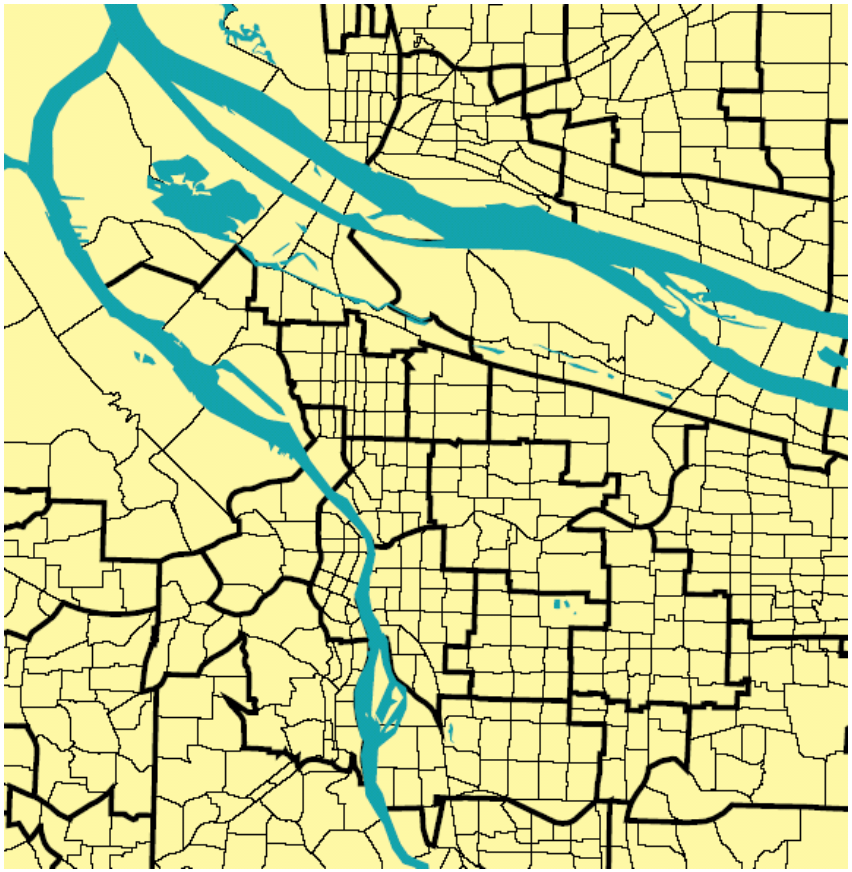
Workplace Location Choice

- Goals:
  - Predict workplace for every worker in population
  - Integrate model with aggregate labor flows from Production Interaction (PI) component
  - Consider all relevant mode and worker characteristics in impedance terms

Workplace Location Choice

- Matrix Expansion Process
  - Expand beta zone data to alpha zone data and convert to probability matrix for destination choice sampling
  - Work location choice probabilities vary by:
    - Occupation
    - Market segment (3 income classes, 3 auto sufficiency classes)
    - Residential location (alpha zone)

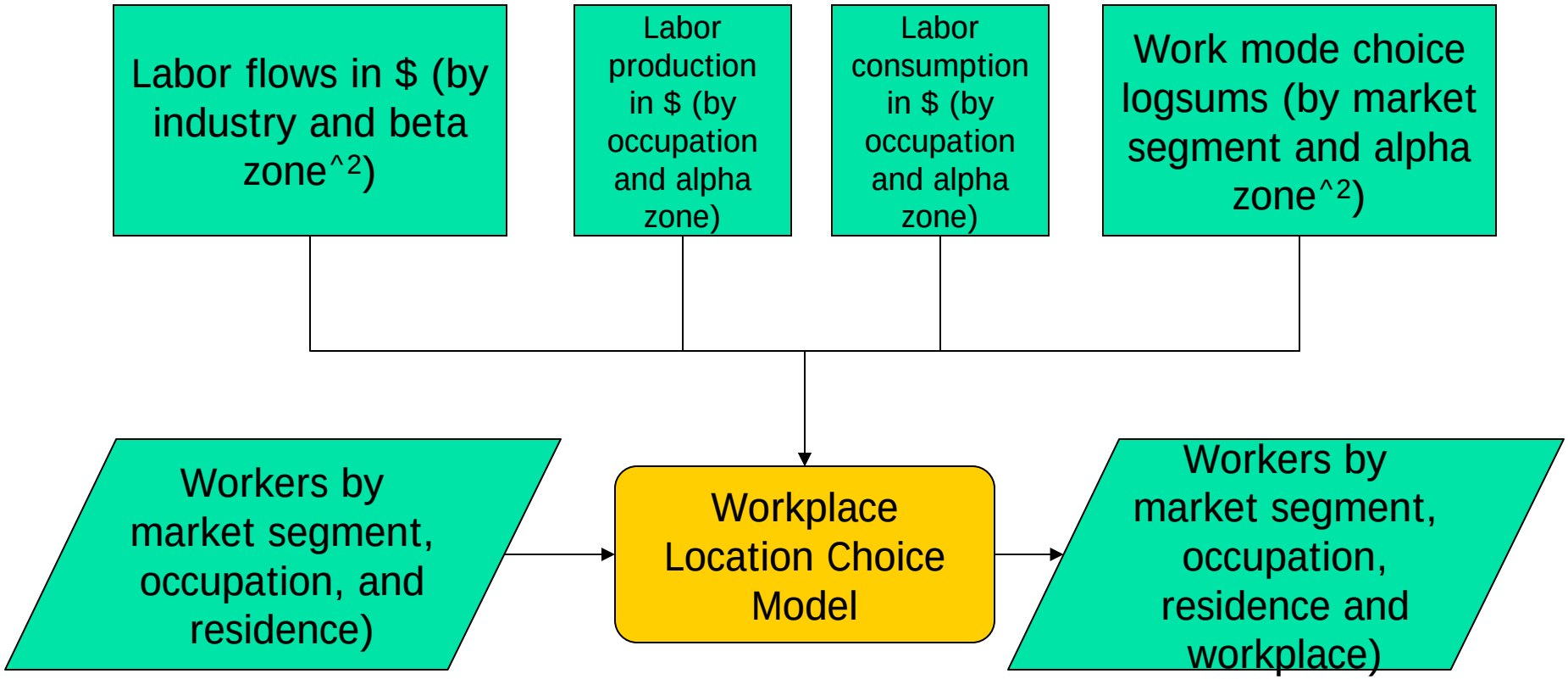
Alpha zone & Beta zone system



PI works at beta (aggregate) zone level

PT works at alpha (small) zone level

Workplace Location Choice



Matrix Expansion Process

$$F_{m,n} = F_{i,j} \cdot \frac{QP_m}{\sum_{m \in i} QP_m} \cdot \frac{QC_n}{\sum_{n \in j} QC_n} \cdot \frac{e^{\lambda Cm,n}}{\sum_{m \in i, n \in j} e^{\lambda Cm,n}}$$

Labor flows from PI (b)

Labor Production from PI (a)

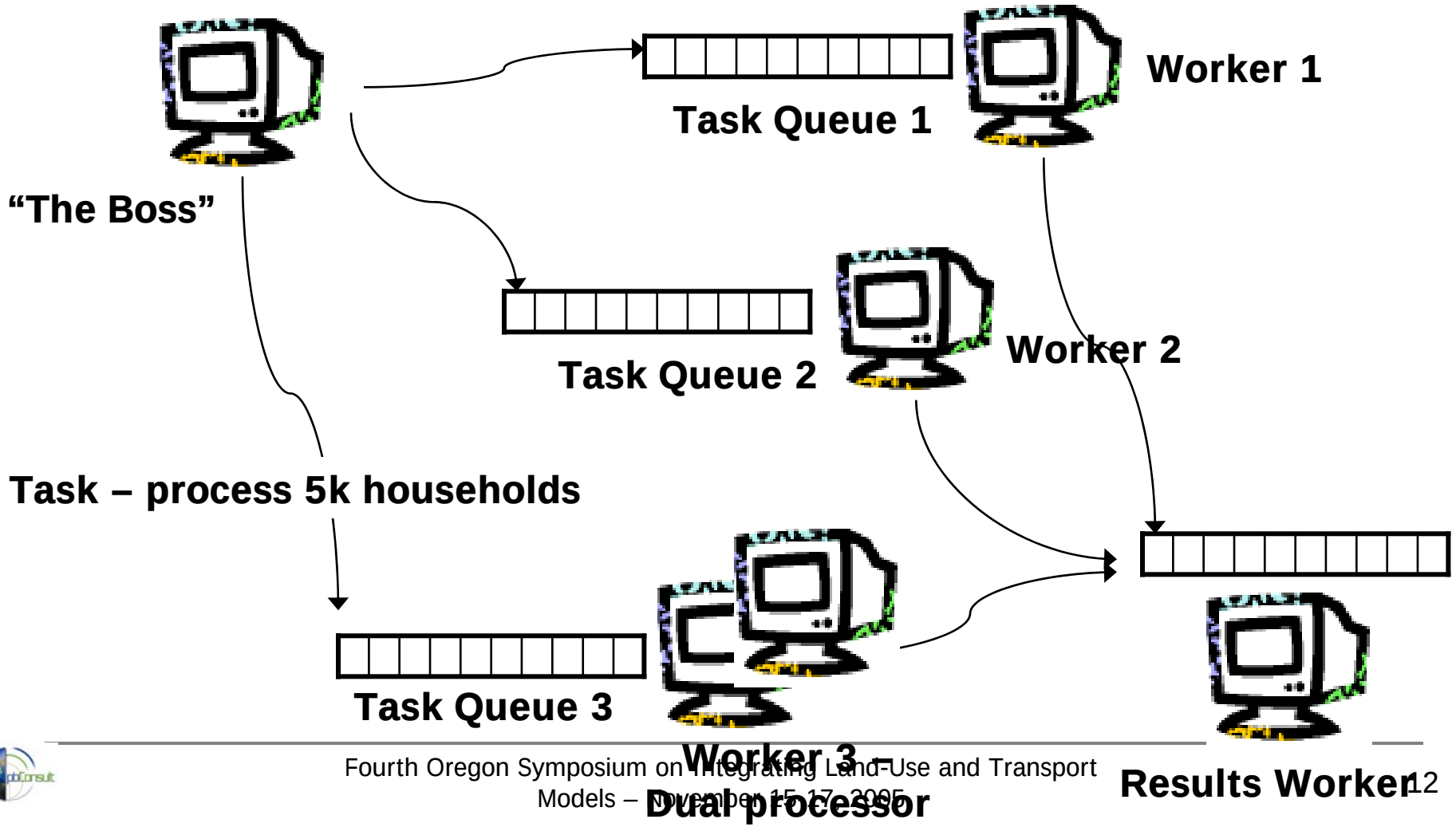
Labor Consumption from PI (a)

Composite Accessibility from PT (a)

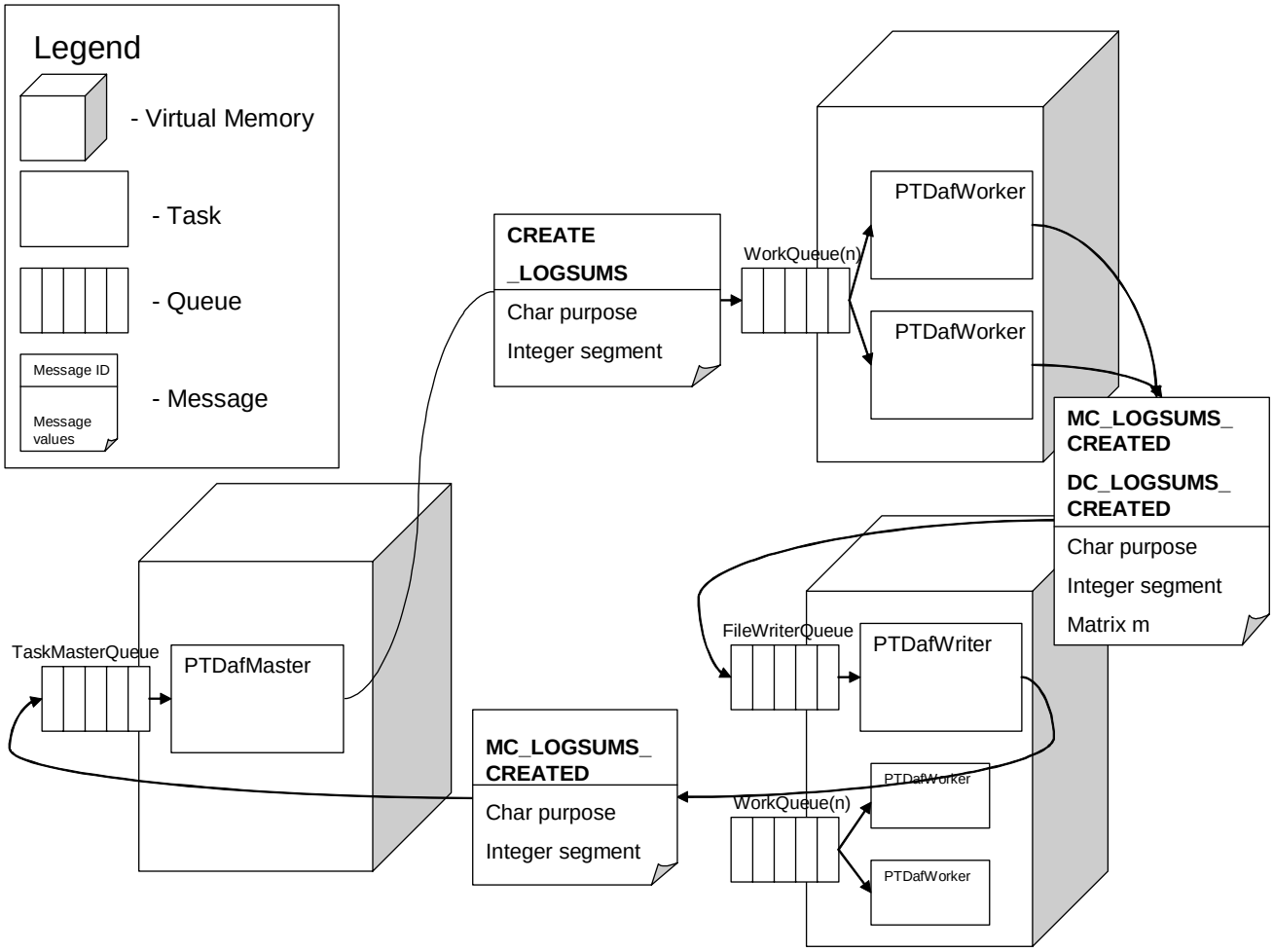
Distributed Application Framework (DAF)

- DAF provides a way to distribute tasks among multiple processors and computers
- Uses ethernet connection to send ‘messages’ to ‘workers’ to accomplish ‘tasks’
- Each worker is a java virtual machine (program) running on a processor

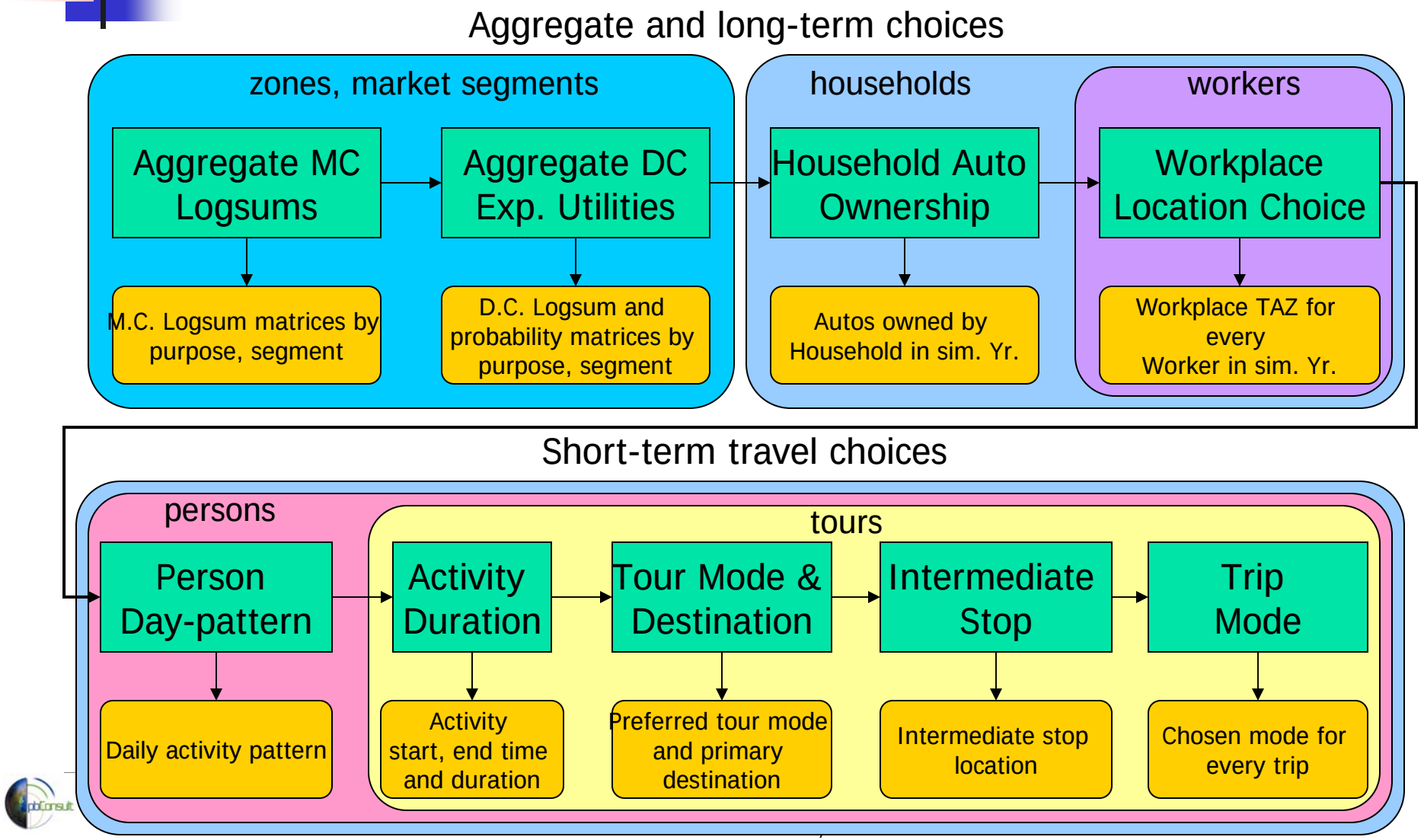
Distributed Application Framework (DAF)



Model Application – Create Aggregate Mode Choice Logsums



PT Application Process



PT Calibration

Number of Tours	Tours Per Pattern	
	Observed	**Estimated**
0	12%	10%
1	48%	45%
2	32%	35%
3	7%	9%
4	1%	1%
5	0%	0%
6	0%	0%
7	0%	0%
8+	0%	0%
Total	100%	100%

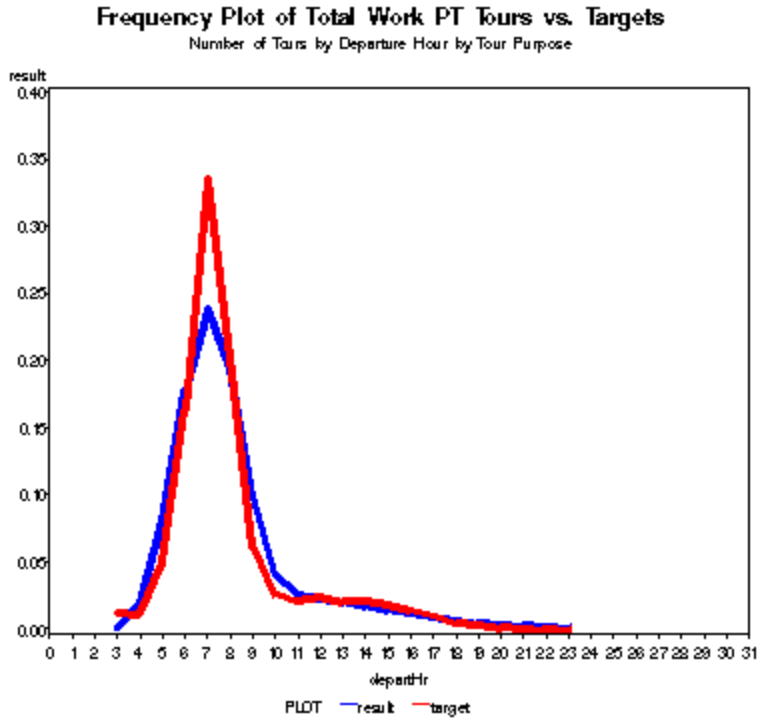
Number of Activities	Activities per Pattern	
	Observed	**Estimated**
1	12%	9%
3	19%	14%
4	19%	23%
5	17%	18%
6	15%	16%
7	11%	12%
8	4%	6%
9	1%	2%
10+	0%	0%
Total	100%	100%

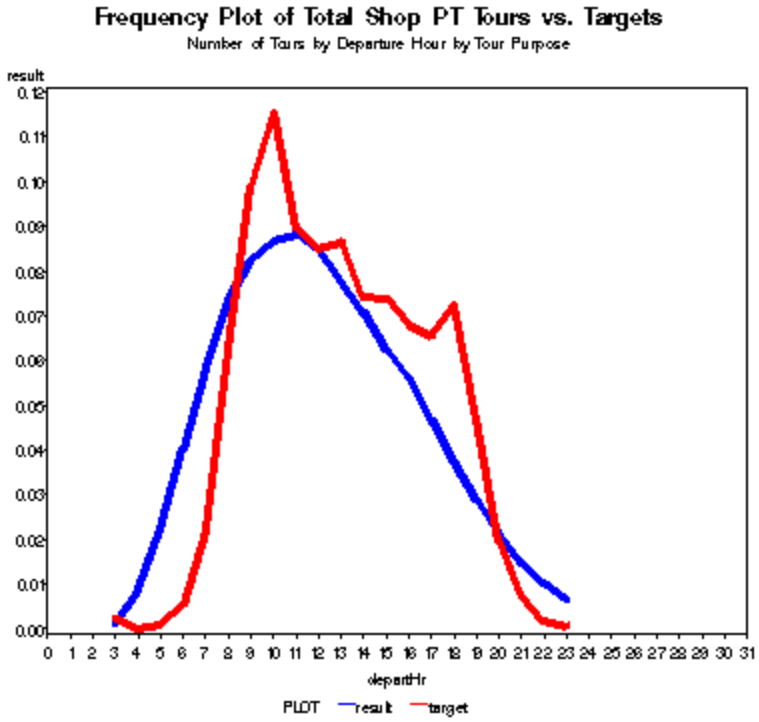
PT Calibration

Purpose	Tours By Purpose	
	Observed	Estimated
Work	25%	29%
College	1%	2%
K-12	13%	12%
Shop	18%	16%
Social/Rec	18%	18%
Other	20%	18%
Work-Based	5%	5%
Total	100%	100%

Purpose	Average Trip Rate per Tour By Purpose	
	Observed	Estimated
Work	1.64	1.81
College	-	-
K-12	2.70	3.04
Shop	2.59	2.94
Soc/Rec	2.36	2.43
Other	1.70	1.57
Work-Based	1.30	1.20
Total	2.19	2.30

PT Calibration – Depart Hour





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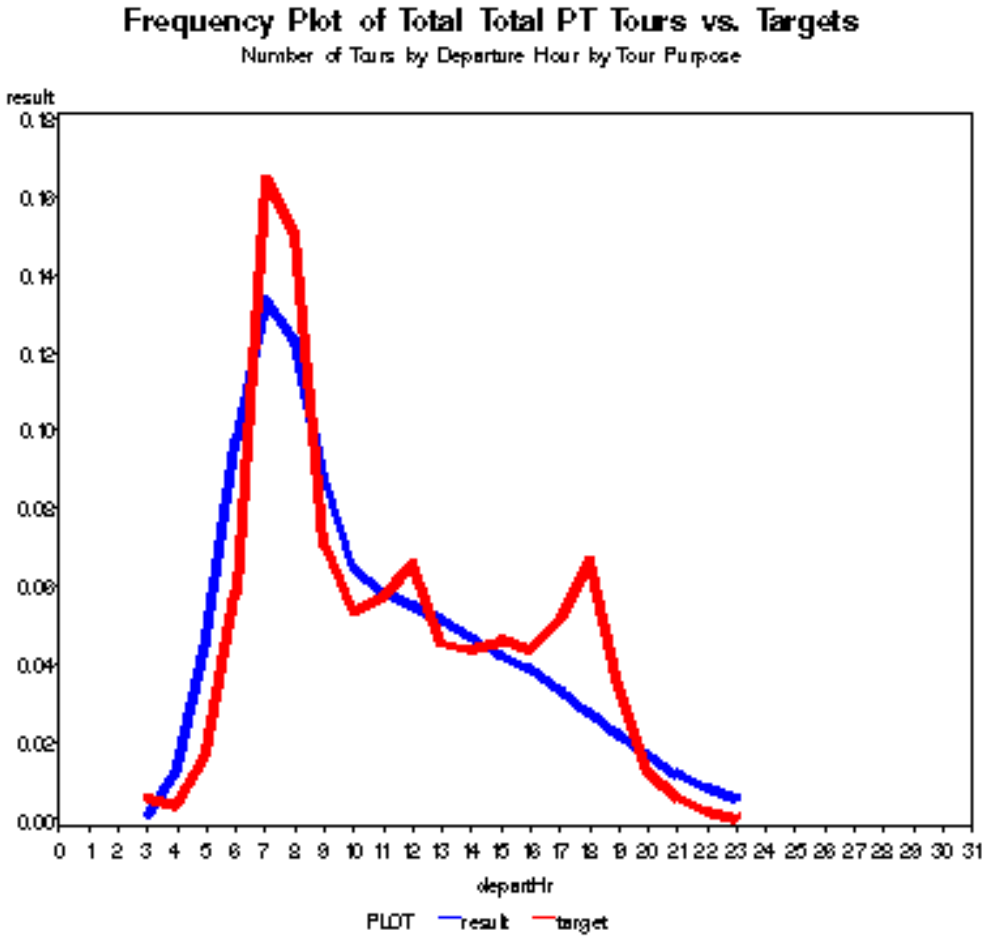
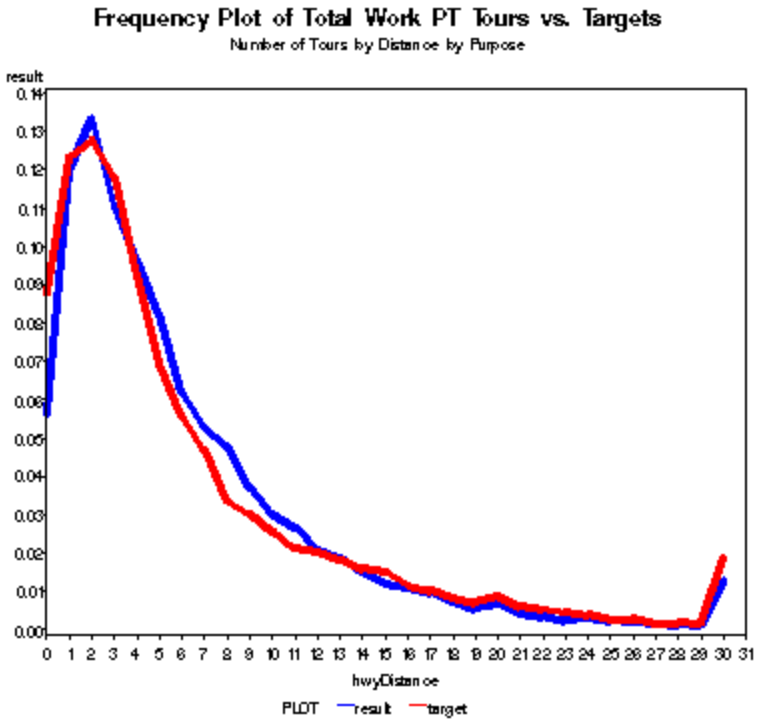
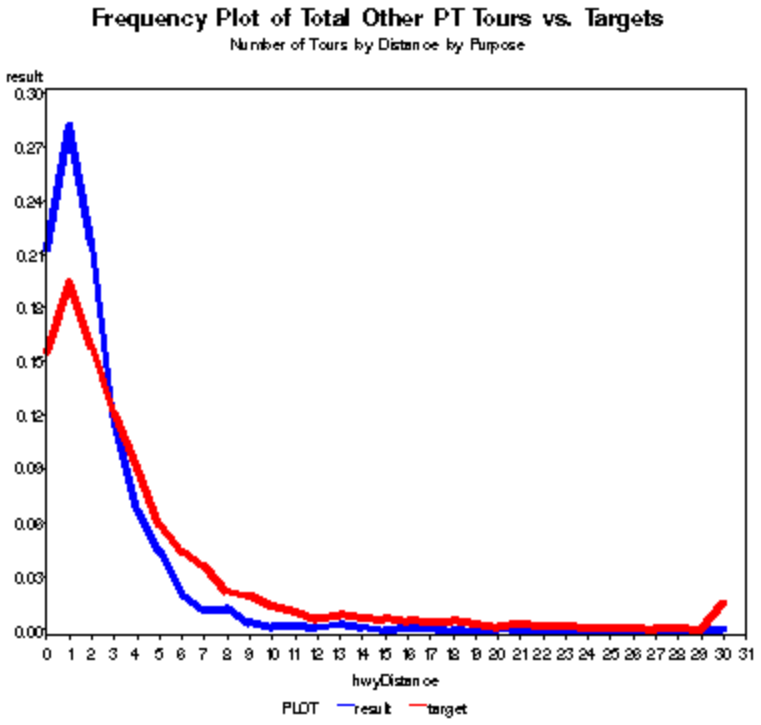
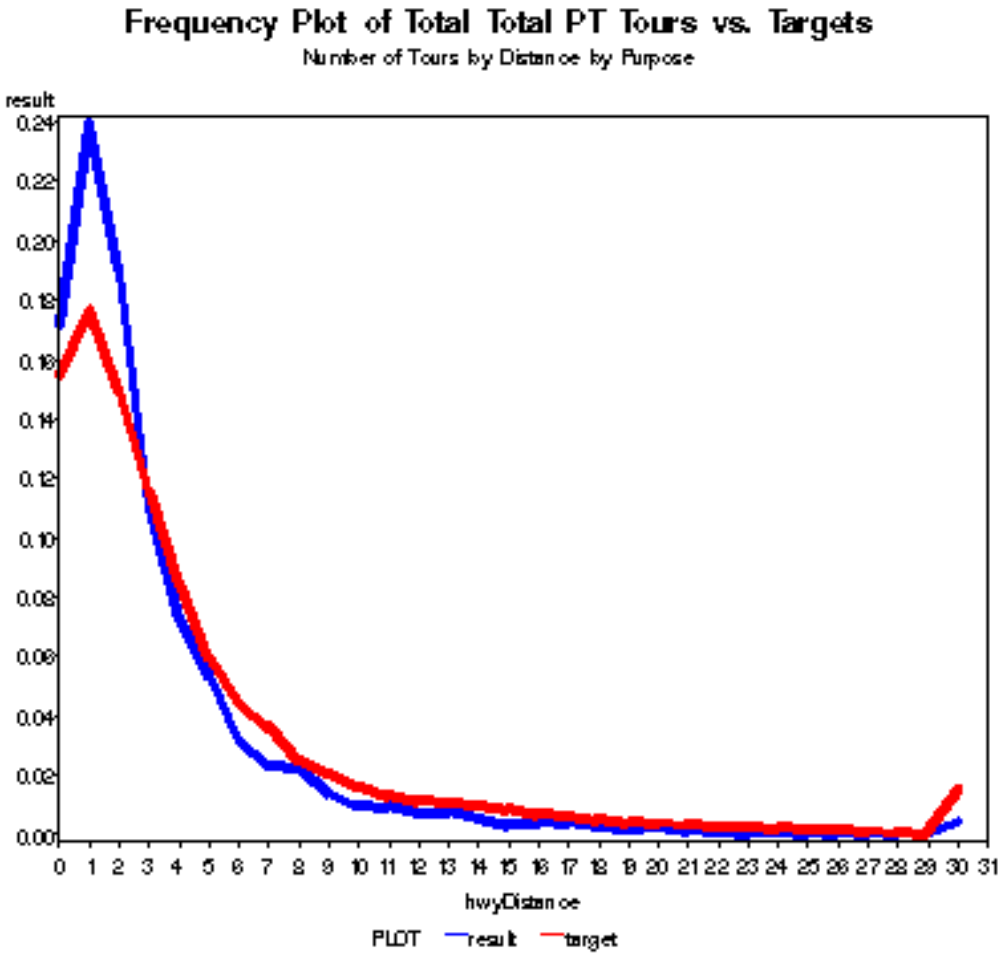


PT Calibration – Trip Length



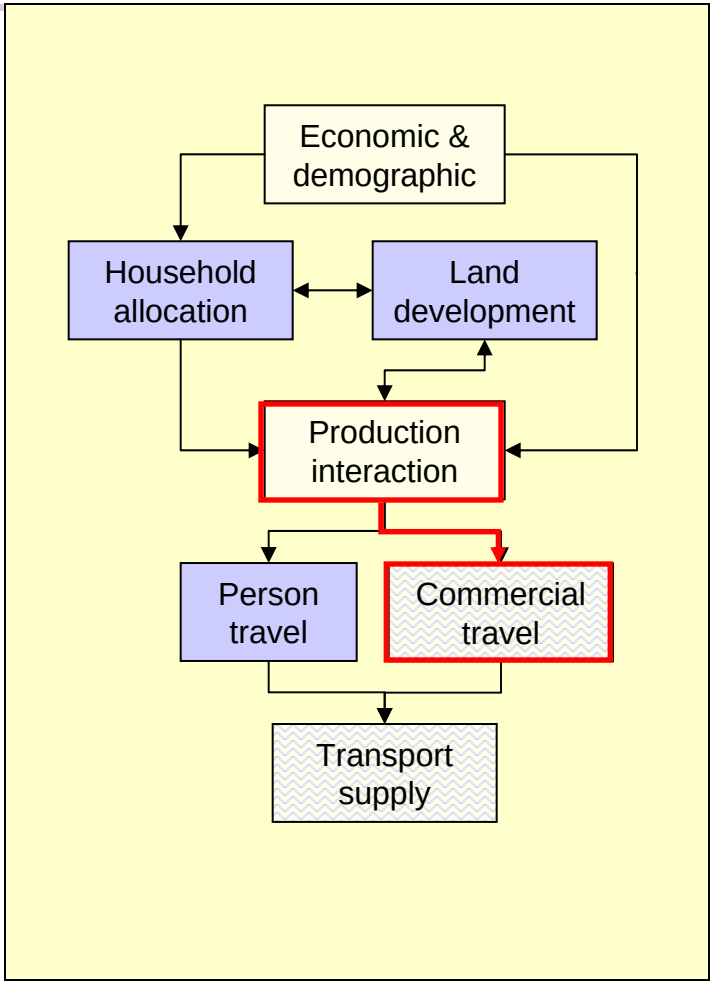


PT Calibration – Trip Length

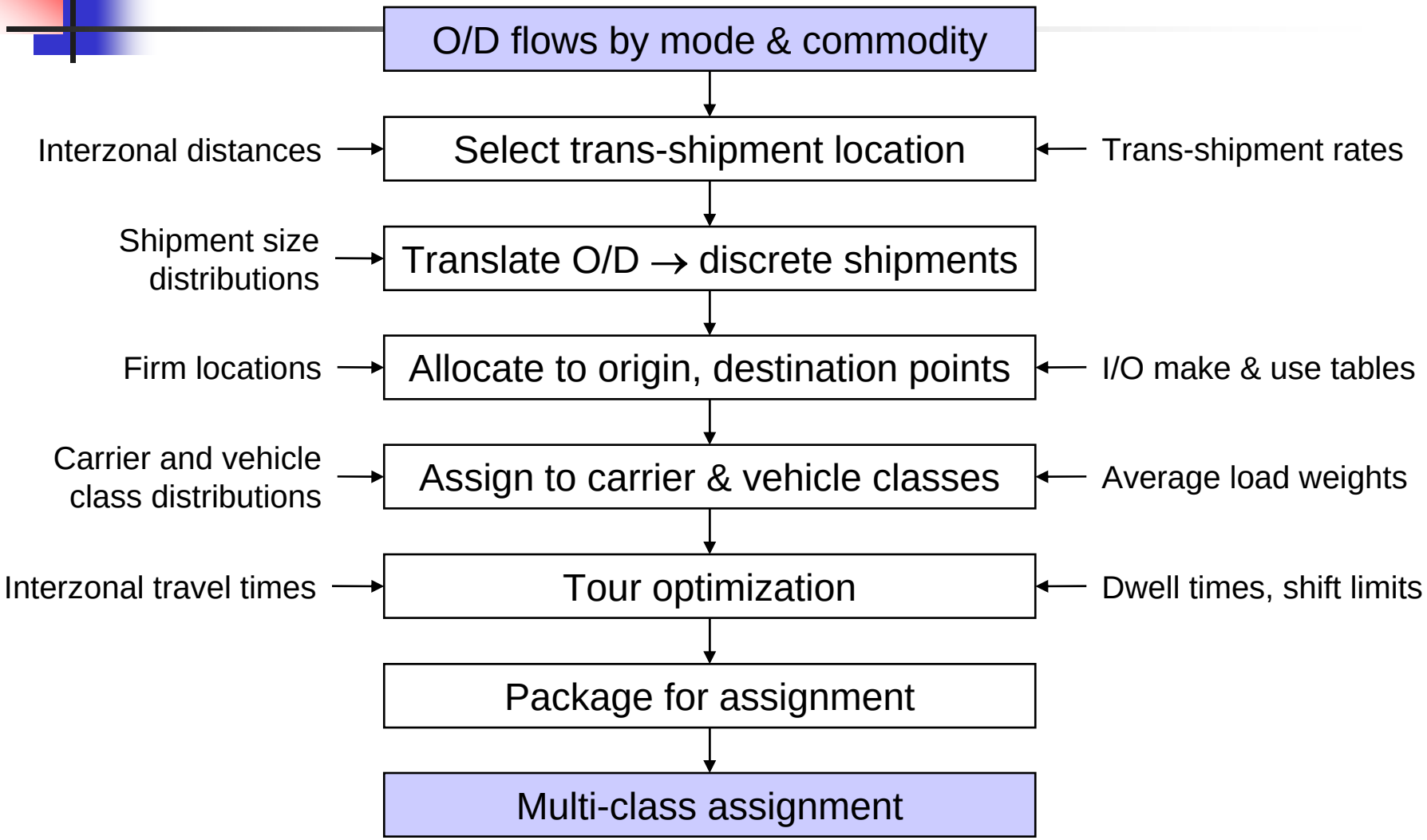


Commercial Transport (CT)

- Use production and consumption flows (annual $) to depict origins and destinations by commodity
- Use a microsimulation process to generate discrete shipments of tours
- Capture important dynamics:
  - Trans-shipment
  - Trip chaining
- Package those tours for network assignment
- Resemble reality



CT model structure



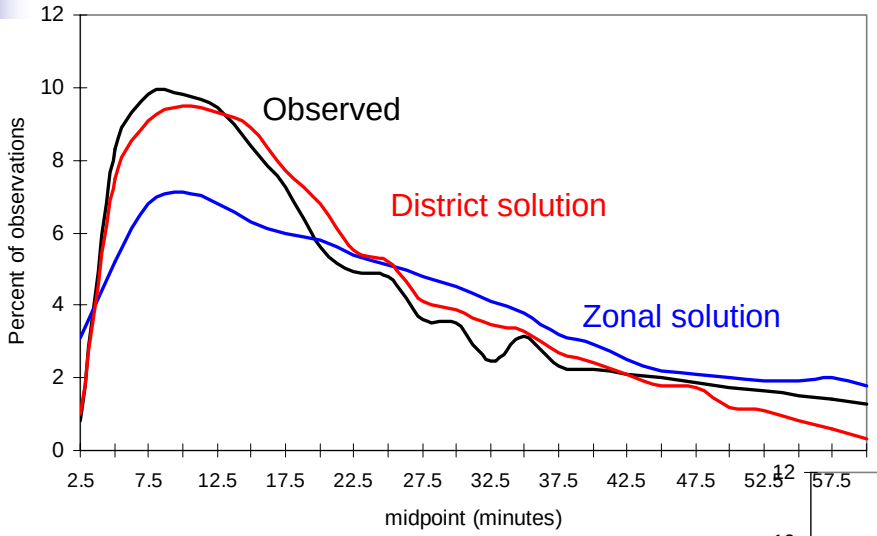
CT Validation Targets

For each commodity:

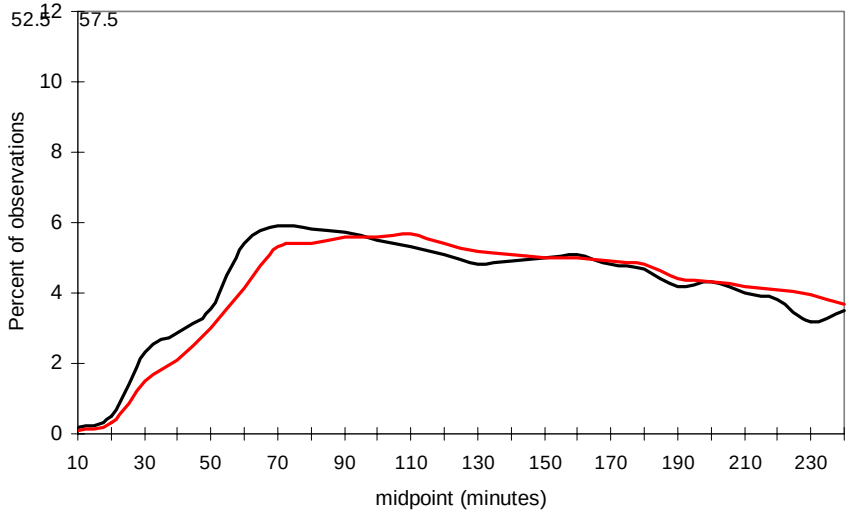
Measure	Target	Outcome
Conserves intersector flows from PI	Verification, In-sample validation	
Match observed mode shares		
Match average trip distance		
Matches percent of trips for trans-shipment		
Distribution of carrier type		
Distribution of vehicle type		
Matches payload weight distribution		
Matches Portland control totals	Out-of-type validation	
Matches observed daily truck counts		

CT Observed vs. simulated trip lengths

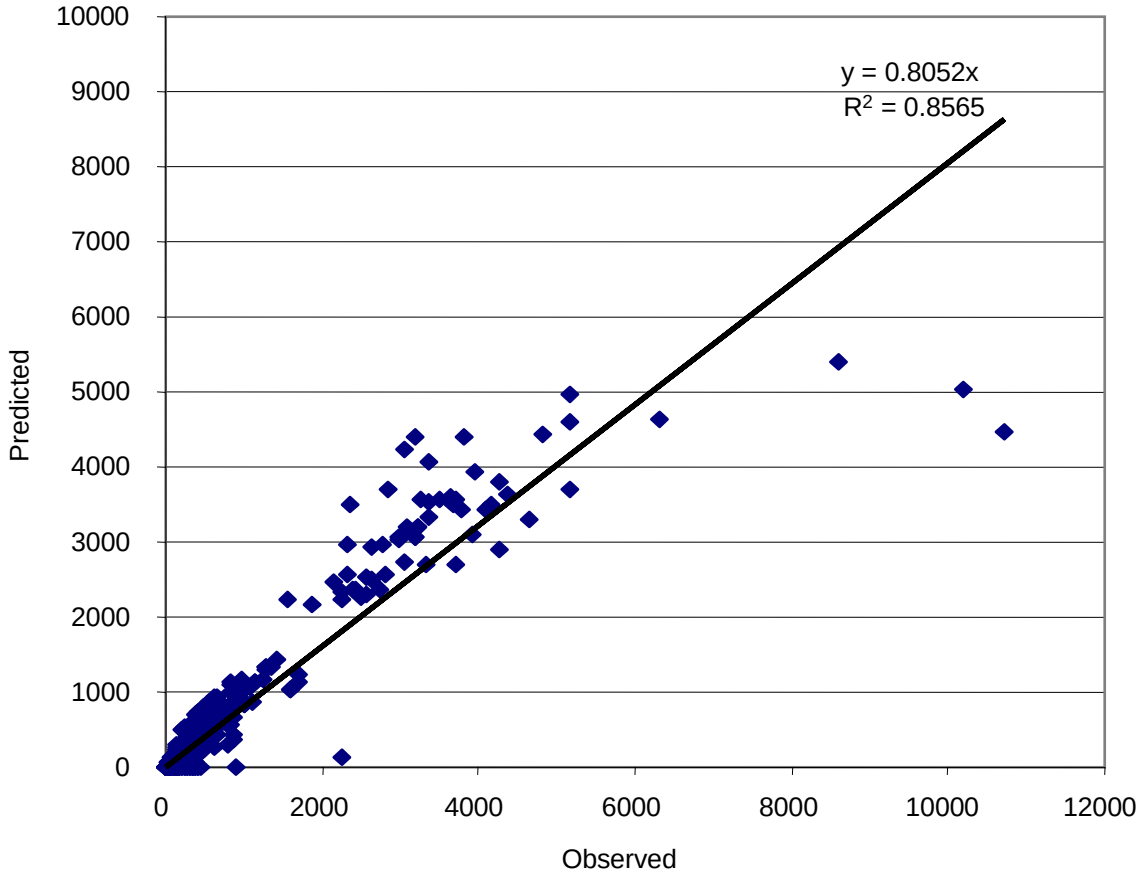
Single unit trucks



Articulated trucks



CT Predicted vs. estimated flows



Transport Supply (TS)

- Frank-Wolfe equilibrium capacity restraint highway assignment
- Multi-class assignment
- Strategic (Emme2) transit assignment
- Portland volume-delay functions

Conclusions & Next Steps

- Calibration is on-going but encouraging
  - May require additional segmentation for duration models, or replacement with logit framework and available time windows
  - Use CTPP date for work tour calibration
- Longer Term Enhancements
  - Move long-term decisions back to HA
  - Generalization or sampling of pattern types
  - Model long-distance travel (data!!)
  - Enhance reporting/visualization features