MODELING IN TRANSIMS

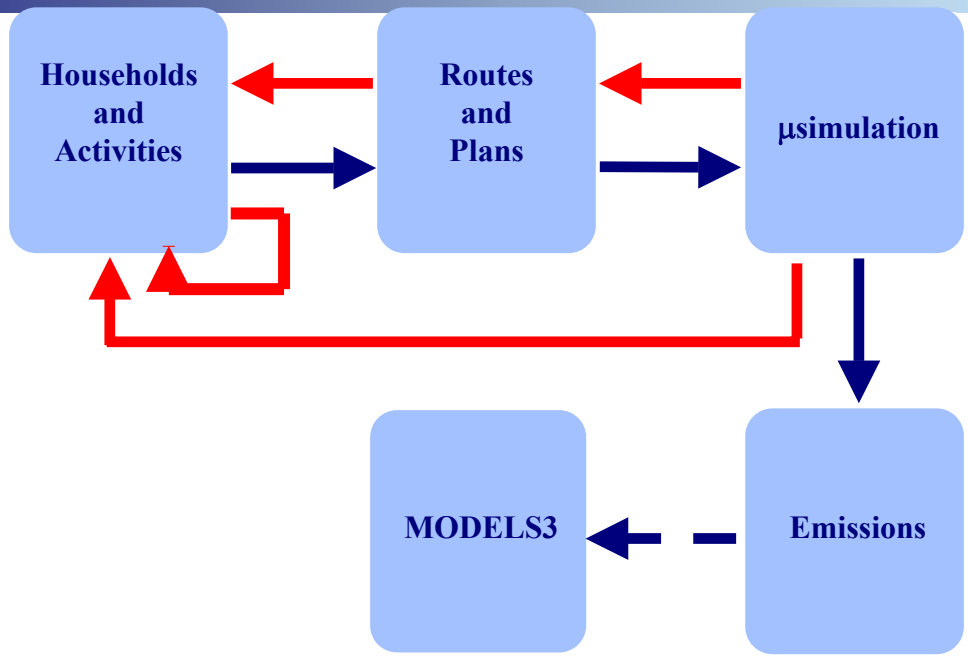
TMIP Workshop

Jan. 13, 2002

Outline

1. TRANSIMS Technology
2. TRANSIMS FRAMEWORK
   - Network
   - Population
   - Activities
   - Routes
   - Microsimulation
3. Meta-Methods, Methods, Calibration, Models
4. Modeling Tools
   - Activity Regenerator
   - Collator
   - Stratifier
   - Selector
5. Calibration, Application, Forecasts
6. Calibration Methods
   - Survey Household Weights
   - School Buses
   - Shared Rides
   - Trip Length
   - Bridge Crossings
   - Modes
7. Summary

What TRANSIMS Is (Isn't)



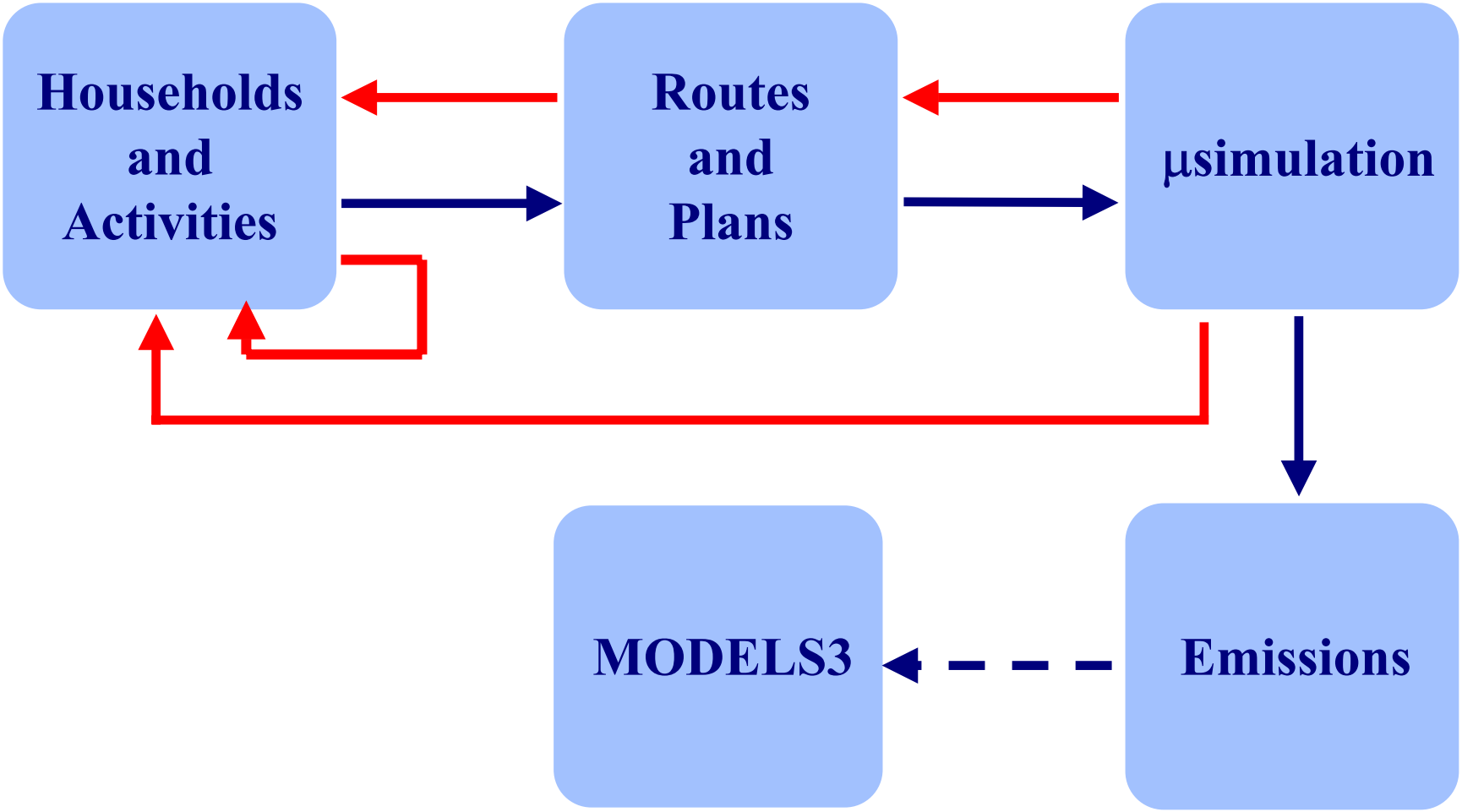
- **TRANSIMS is a modeling system.**

  It is an integrated system that allows the modeler to keep track of and modify the behavior of each individual in a population.

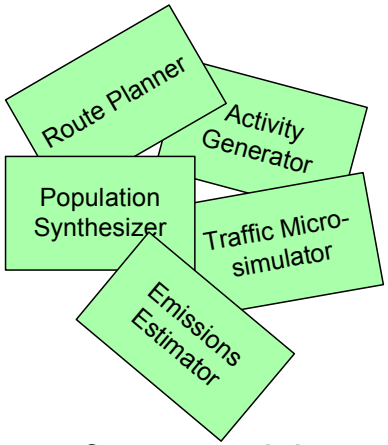
- **TRANSIMS is not a model.**

  Models are built using TRANSIMS technology

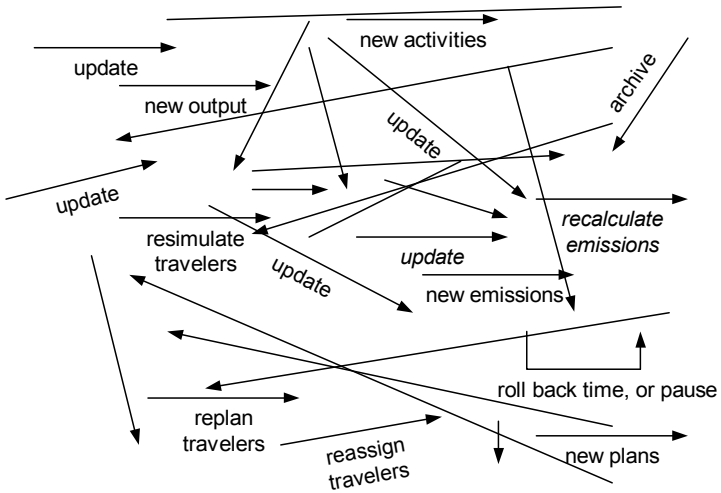
TRANSIMS Technology



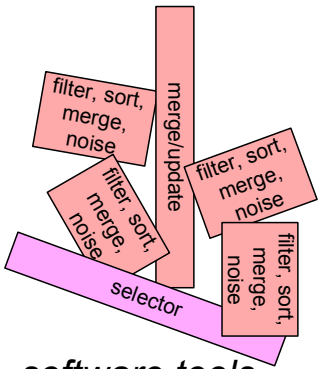
TRANSIMS Technology



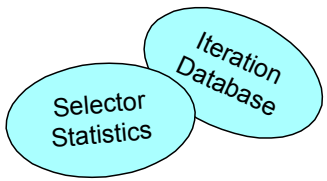
software modules



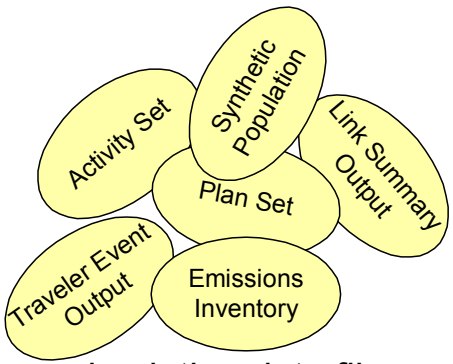
data flows



software tools

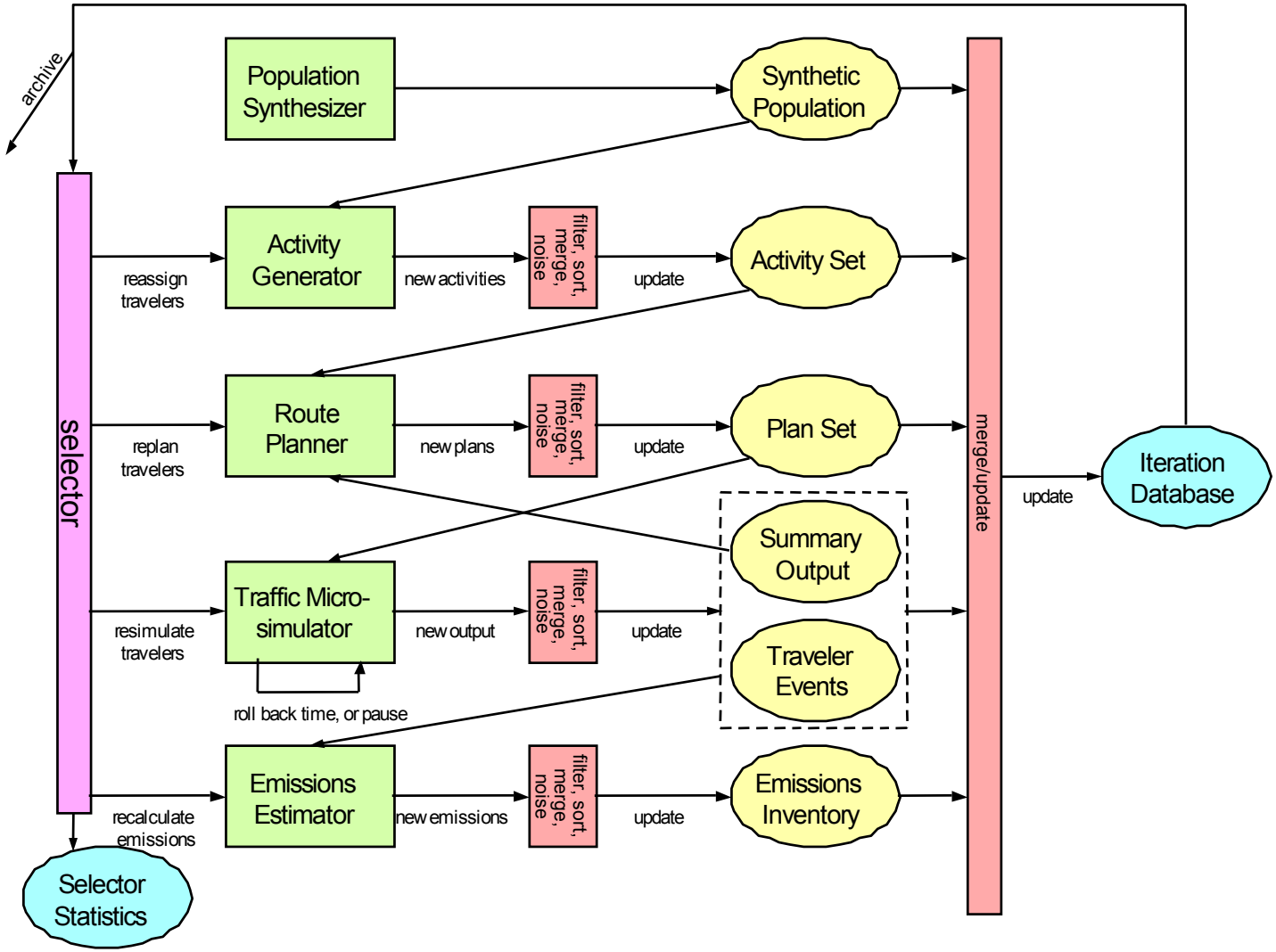


iteration data files



simulation data files

TRANSIMS Framework



Sample Configuration Keys

TO RUN CODES:
<PROGRAM NAME> <CONFIGURATION FILE >

PART OF A CONFIGURATION FILE:

```
##################### NETWORK PARAMETERS ####################

NET_DIRECTORY                /home/jpsmith/ToyNet/network/
NET_NODE_TABLE               Toynet_Node_Table
NET_LINK_TABLE               Toynet_Link_Table


##################### SYNTHETIC POPULATION PARAMETERS
####################

POP_NUMBER_HH           1000
POP_BASELINE_FILE       /home/jpsmith/ToyNet/output/toynet.basepop
POP_LOCATED_FILE        /home/jpsmith/ToyNet/output/toynet.locpop
POP_STARTING_VEHICLE_ID 100000
##################### ACTIVITY GENERATOR PARAMETERS
####################

ACT_FULL_OUTPUT          /home/jpsmith/ToyNet/output/toynet.activities
ACT_FEEDBACK_FILE        /home/jpsmith/ToyNet/output/toynet.actfeed

##################### OUTPUT PARAMETERS #####################

OUT_DIRECTORY               /home/jpsmith/ToyNet/output

OUT_SNAPSHOT_NAME_1         toynet.snapshot
OUT_SNAPSHOT_TYPE_1         VEHICLE
```

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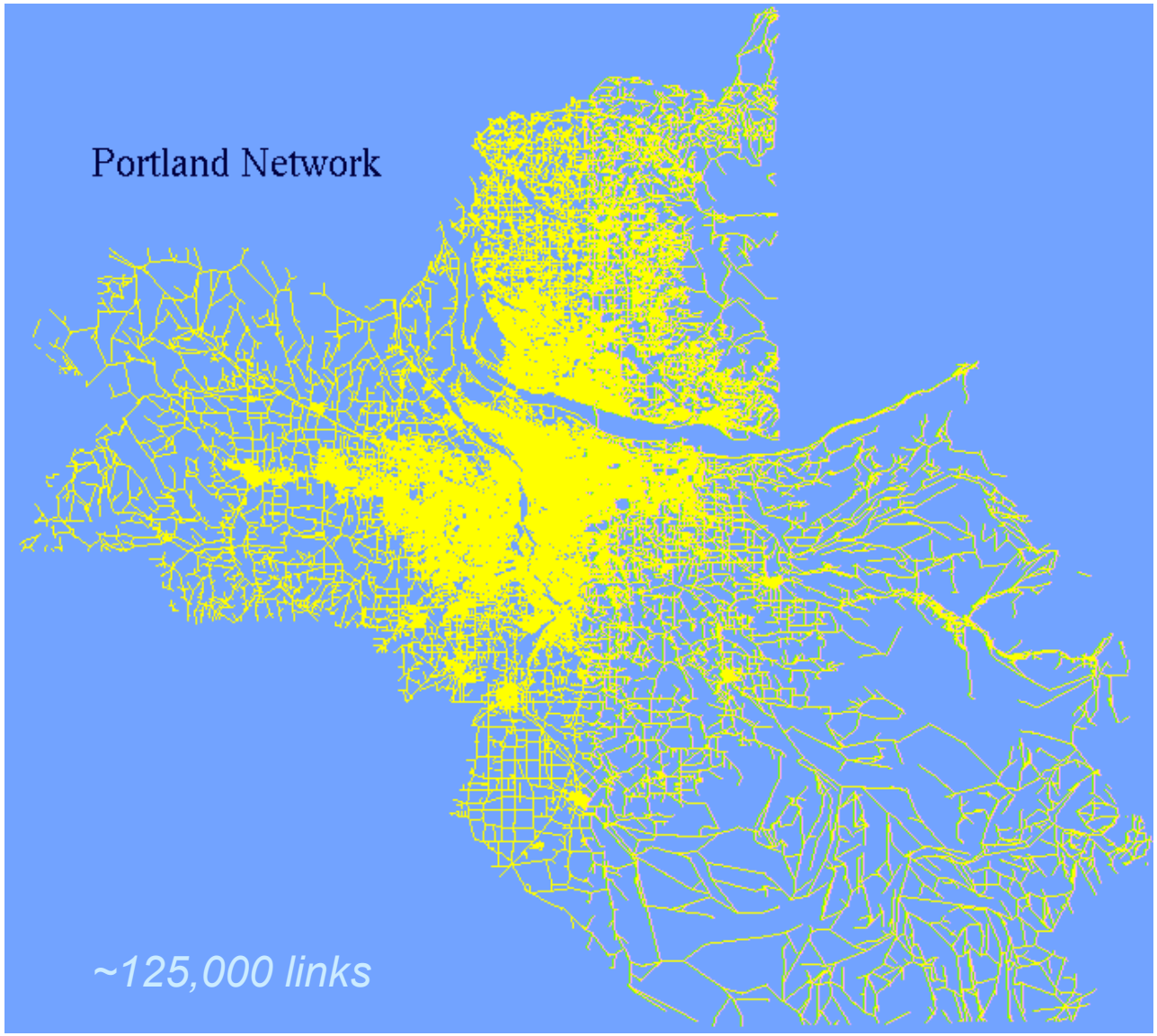
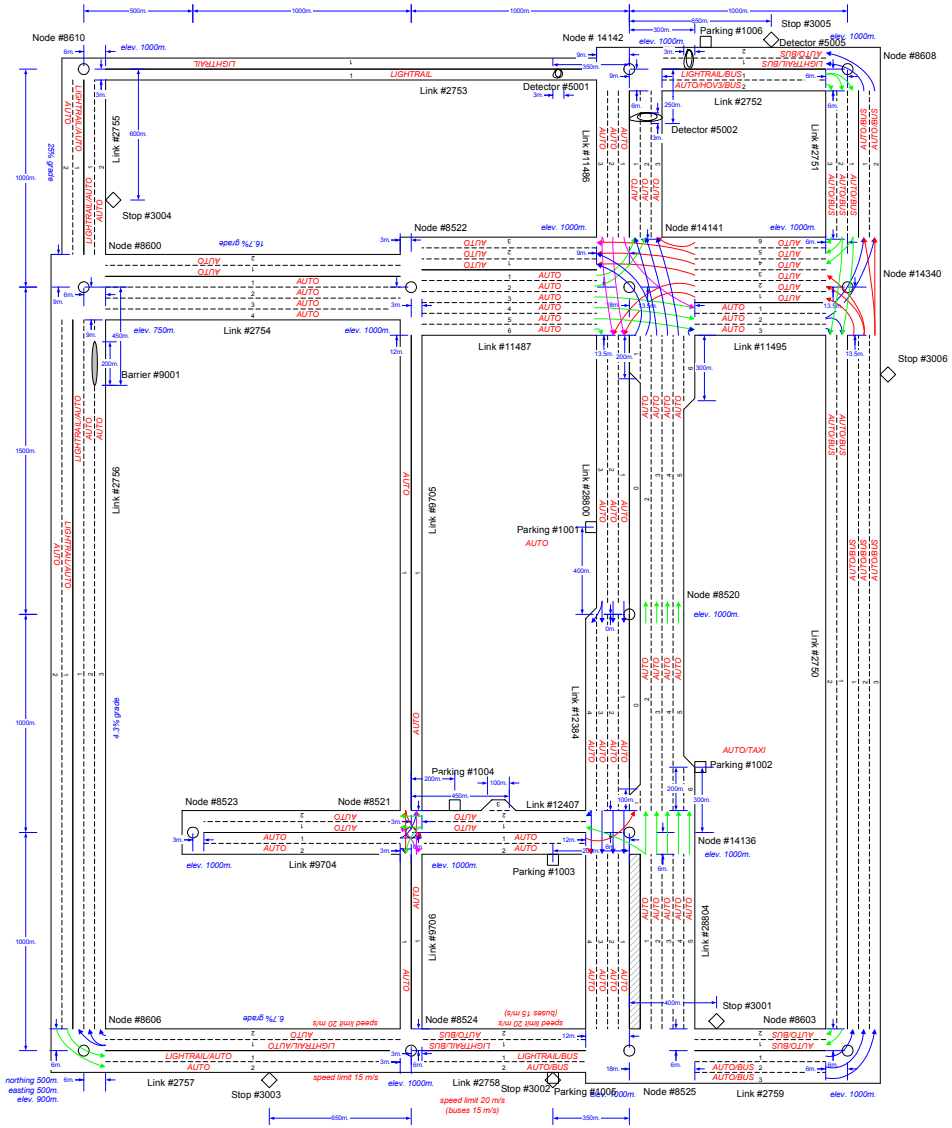
Network for Portland, Oregon

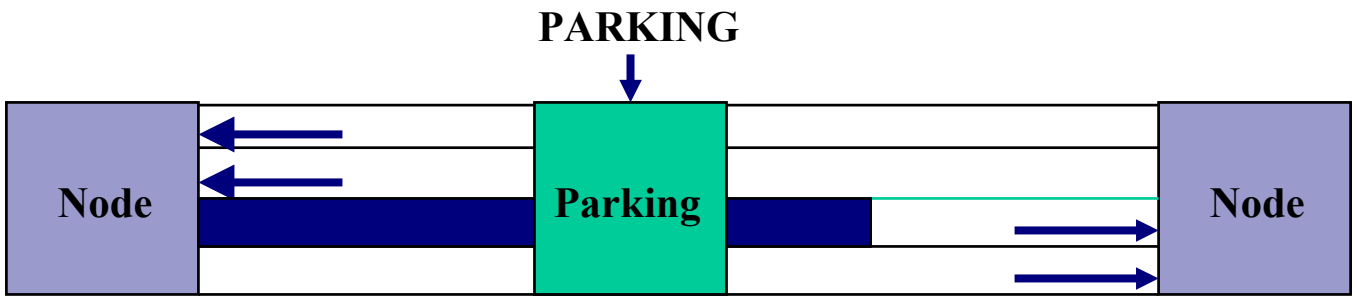


TRANSIMS Network Data



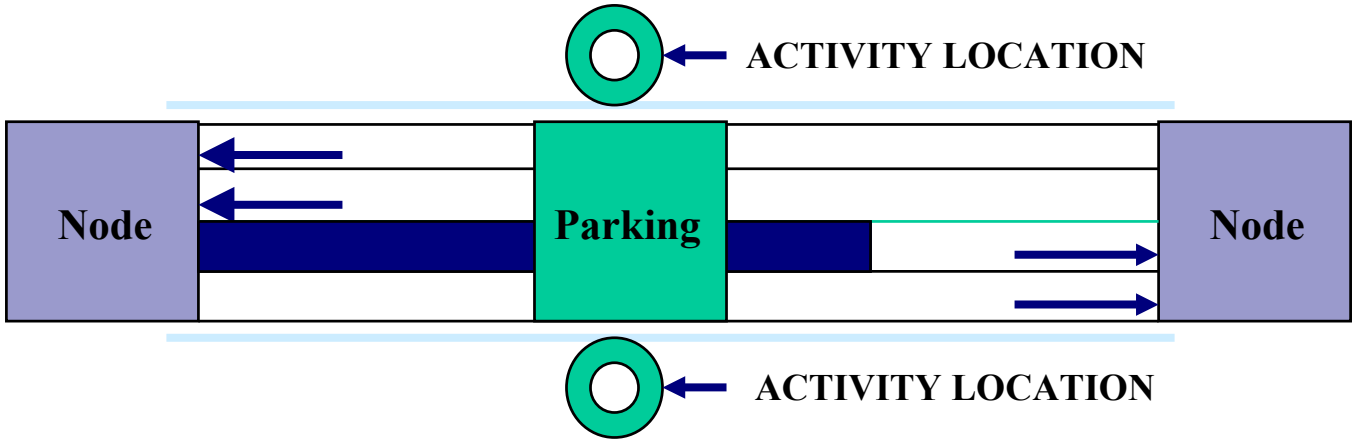
- nodes
- links
  - grade
  - mode
  - functional class
- lanes
  - restrictions
  - connectivity
- intersections
  - setbacks
  - signs
  - signals (rings, entries)
- parking places
- transit stops
- activity locations
  - land use
  - employment
- “process” links

Parking



- Vehicles Enter/Exit Links at Parking Locations
- Parking Locations Are Bi-directional
- Links May Contain None or Many Parking Locations
- One Location May Represent All Parking on the Link

Activity Locations



- **Activity Locations Have x,y,z Coordinates**
- **All Activities Occur at Activity Locations**
- **Activity Locations Are Associated With a Link**
- **Activity Locations Are on a Link "Layer" (Walk, Drive)**
- **Activity Locations Have Associated "Land-Use":**
  - **Census block group**
  - **Total employees**
  - **Total households**
  - **etc.**

Activity Location File

ID	NODE	LINK	OFFSET	LAYER	EASTING	NORTHING	ELEVATIC	TAZ **	TRACT **	BLOCKGROUP**
1	7826	219310	304.9	WALK	490844.1	5069530	595.3	270	32700	3
2	7940	219310	304.9	WALK	490836.6	5069549	612.3	270	32700	3
3	7814	219311	106.4	WALK	490563	5069540	611.7	270	32700	3
4	7940	219311	105.9	WALK	490544.9	5069532	612.3	270	32700	3
5	7658	219312	759.4	WALK	481259.5	5068943	367.9	271	33400	2
6	8590	219312	759.4	WALK	481240.8	5068936	368.8	271	33400	2
7	8152	219313	518.2	WALK	481761.4	5068519	329.2	271	33400	2
8	8673	219313	518.2	WALK	481742.6	5068526	363	271	33400	2
9	8590	219314	68.5	WALK	481572.2	5068216	368.8	271	33400	2

Required
****TRANSIMS Population and Activity Generator**

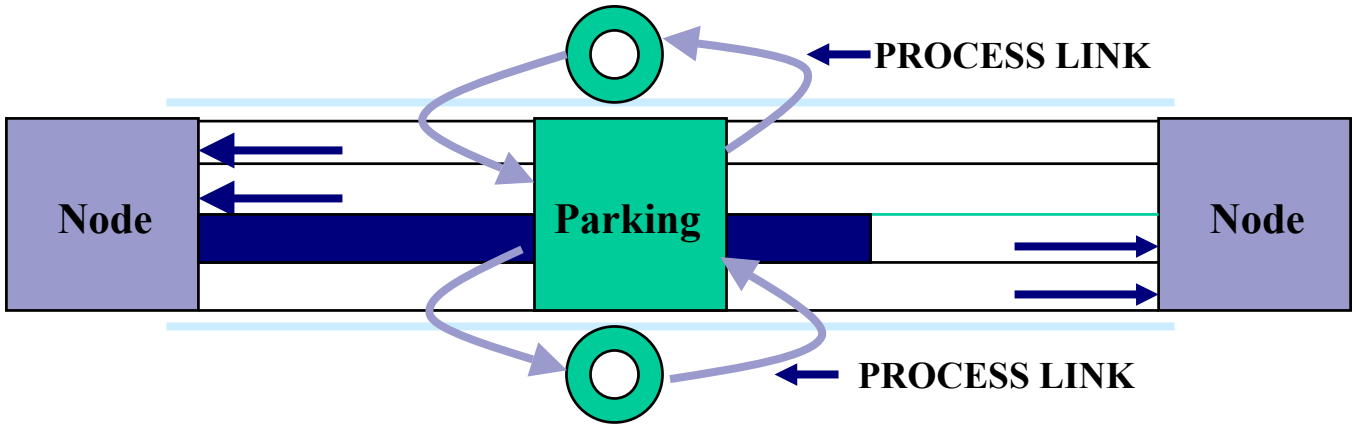
Home	School	Work	Shop	Visit	Social	Other	Serve	College	HH_Acre
2.1	0	0	0.91	0.92	0.94	0.5	0.92	0	0.04
2.1	0	0	0.91	0.92	0.94	0.5	0.92	0	0.04
2.1	0	0	0.91	0.92	0.94	0.5	0.92	0	0.04
2.1	0	0	0.91	0.92	0.94	0.5	0.92	0	0.04
2.3	0	0	0.9	0.91	0.94	0.46	0.91	0	0.02
2.3	0	0	0.9	0.91	0.94	0.46	0.91	0	0.02
2.3	0	0	0.9	0.91	0.94	0.46	0.91	0	0.02
2.3	0	0	0.9	0.91	0.94	0.46	0.91	0	0.02
2.3	0	0	0.9	0.91	0.94	0.46	0.91	0	0.02

Attractors

Tran_Dist	T_Orig	T_Dest	River_Zone	URBAN_T	PARKING_	Zones_8	NOTES
39016.2	1	1	2	3	0	2	NONE
39042.7	1	1	2	3	0	2	NONE
39307.8	1	1	2	3	0	2	NONE
39317.9	1	1	2	3	0	2	NONE
38097.6	1	1	2	3	0	2	NONE
38109.3	1	1	2	3	0	2	NONE
37171.7	1	1	2	3	0	2	NONE
37197.5	1	1	2	3	0	2	NONE
37057.9	1	1	2	3	0	2	NONE

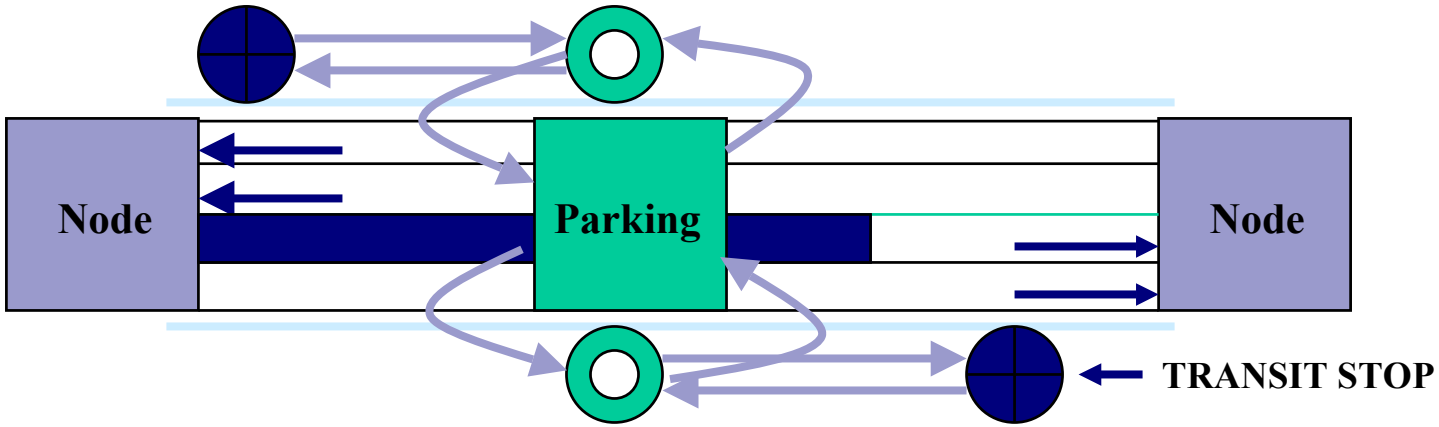
Other

Process Links



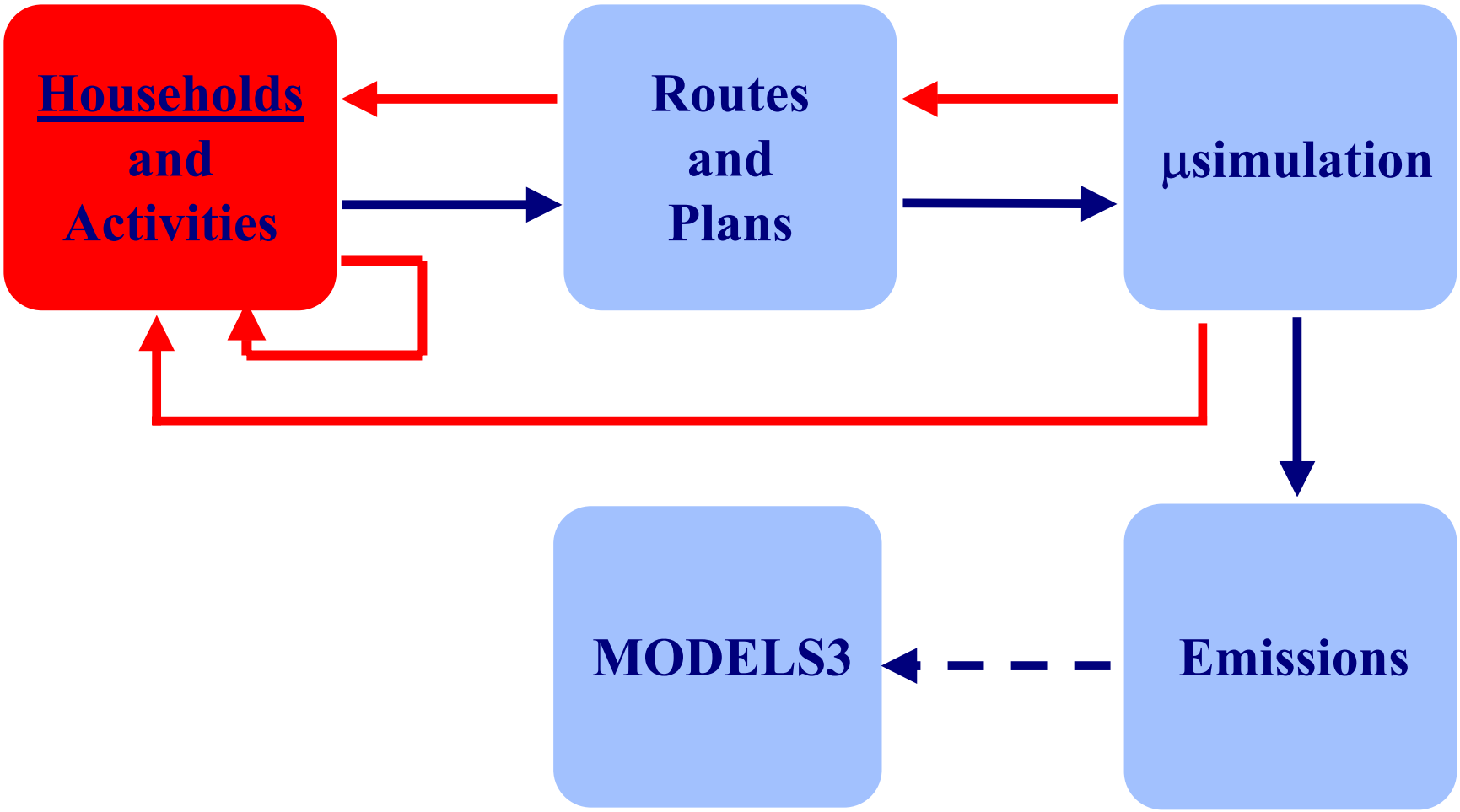
- They Allow for Traveler Movement Between:
  - Parking locations
  - Activity locations
  - Transit stops
- They Are Directional
- They Are Viewed As a Walk Link
- They Have Associated Delays and Costs

Transit Stops

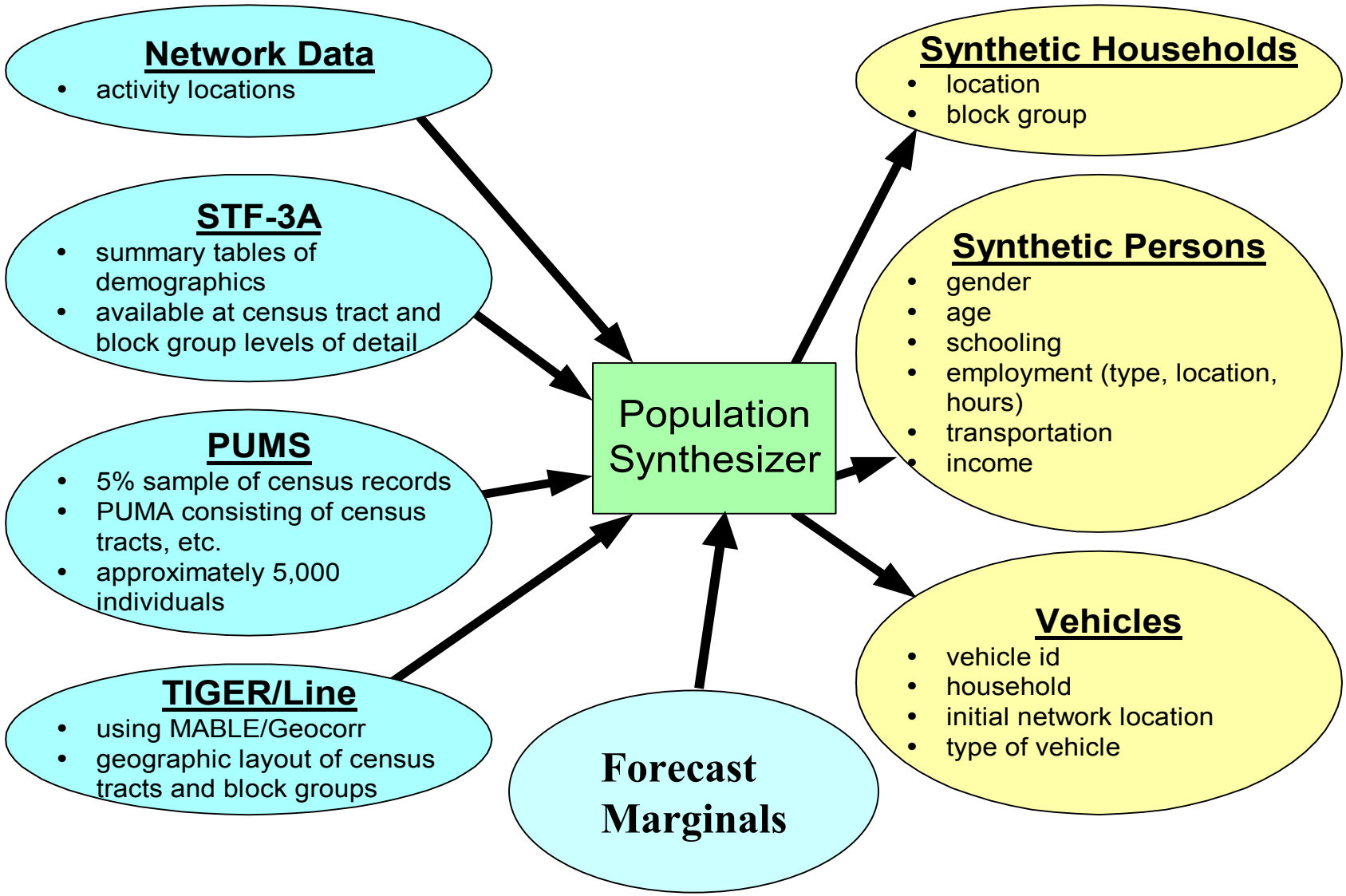


- Where Passengers Board/Leave Transit Vehicles
- They Are Associated With a Link
- They Have a Location on the Link
- They Are Directional
- Multiple Transit Lines May Use the Same Transit Stop
- They Are Connected by Process Links to:
  - Activity locations
  - Parking locations
  - Other transit stops

TRANSIMS Technology



Population Synthesizer:



STF-3A to PUMS

PUMS

PUMS Sample				
	No. of workers			
Age of H. Holder	0	1	2	≥3
15-24	4	13	41	1
25-34	7	113	254	11
35-44	11	173	354	88
45-54	7	82	247	127
55-64	35	114	137	50
65-74	119	84	45	9
≥75	66	17	4	0

STF-3A Block Group-1					
	No. of workers				
Age of H. Holder	0	1	2	≥3	**Totals**
15-24	?	?	?	?	**33**
25-34	?	?	?	?	**87**
35-44	?	?	?	?	**159**
45-54	?	?	?	?	**276**
55-64	?	?	?	?	**201**
65-74	?	?	?	?	**95**
≥75	?	?	?	?	**6**
Totals	**77**	**255**	**400**	**125**	

Population Summaries

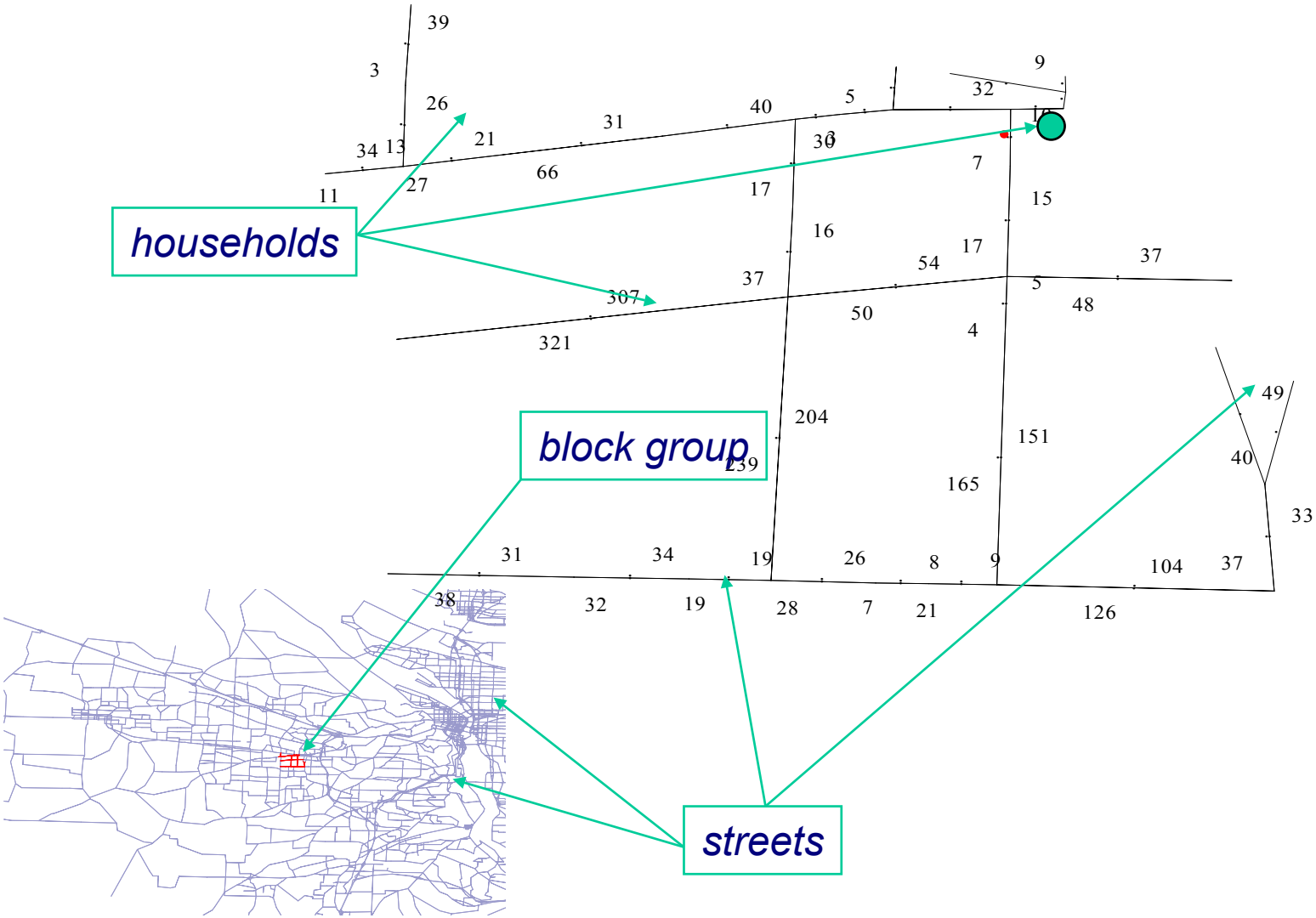
Example Household

Age	26	26	7
Income	$27k	$16k	$0
Status	worker	worker	student
Automobile			

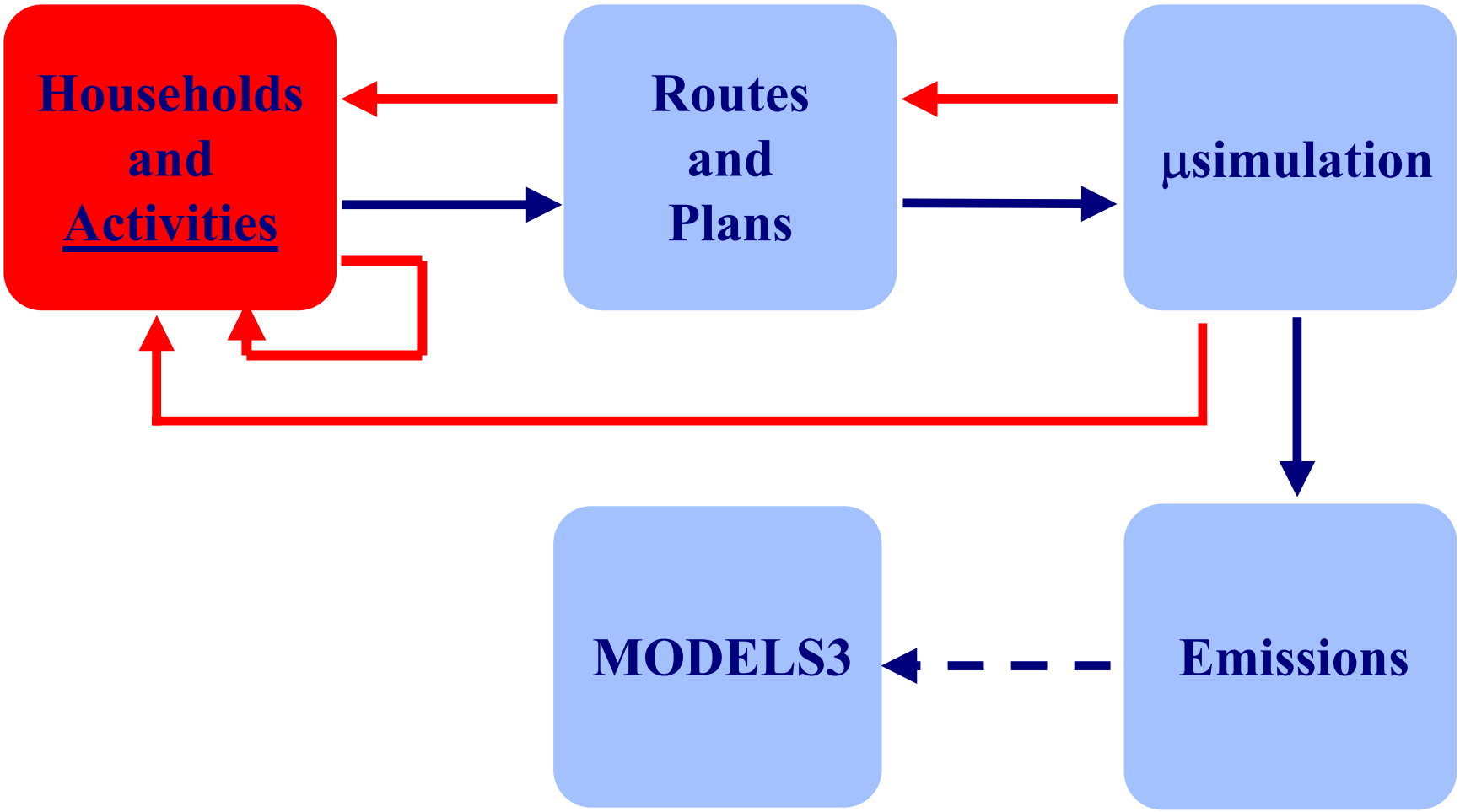
A Generated Household

Household	Dems:	Tract	BG		HHID	Persons	vehicles	Location	HHSIZE	INCOME	ALT5	A5TO17	A26TO45	HHAGE	VORKERS	HDENSTY
		30502	1	H	13028	4	3	858164	4	11	0	2	2	40	2	4.04686
Person	Dems:	HHID		PERID	RELATE	WORK	GENDER	AGE								
		13028	P	13086	1	1	2	40								
		13028	P	13087	2	2	2	15								
		13028	P	13088	2	2	2	15								
		13028	P	13089	1	1	1	39								
					2=Child	1=Worker	1-M, 2=F									
										1	0	$5K	8	$35K	$40K	
										2	$5K	$10K	9	$40K	$45K	
										3	$10K	$15K	10	$45K	$50K	
										4	$15K	$20K	11	$50K	$55K	
										5	$20K	$25K	12	$55K	$60K	
										6	$25K	$30K	13	>$60K		
										7	$30K	$35K				

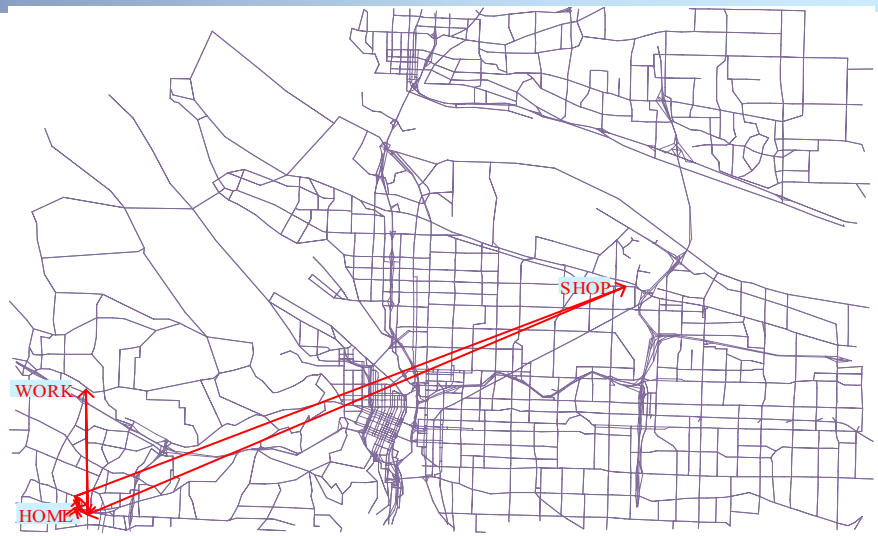
Located Population



TRANSIMS Technology

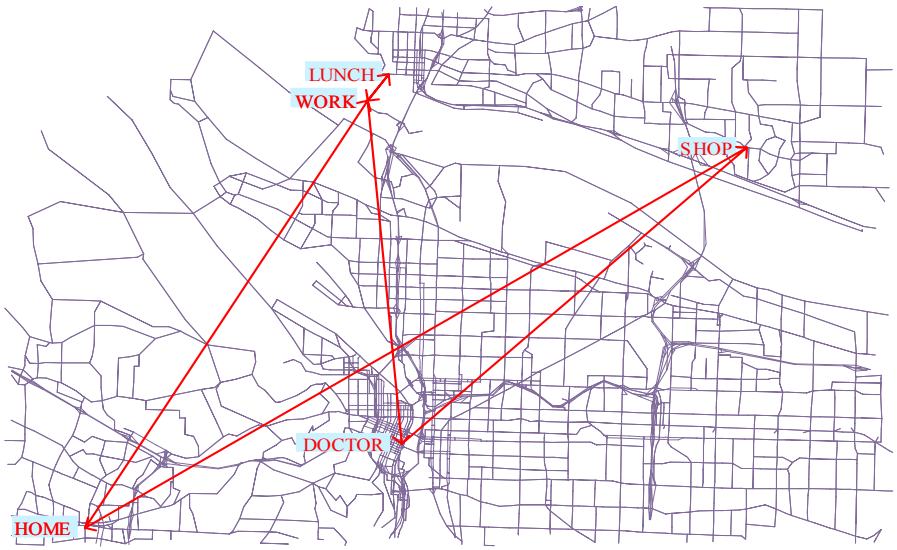


Example Activities

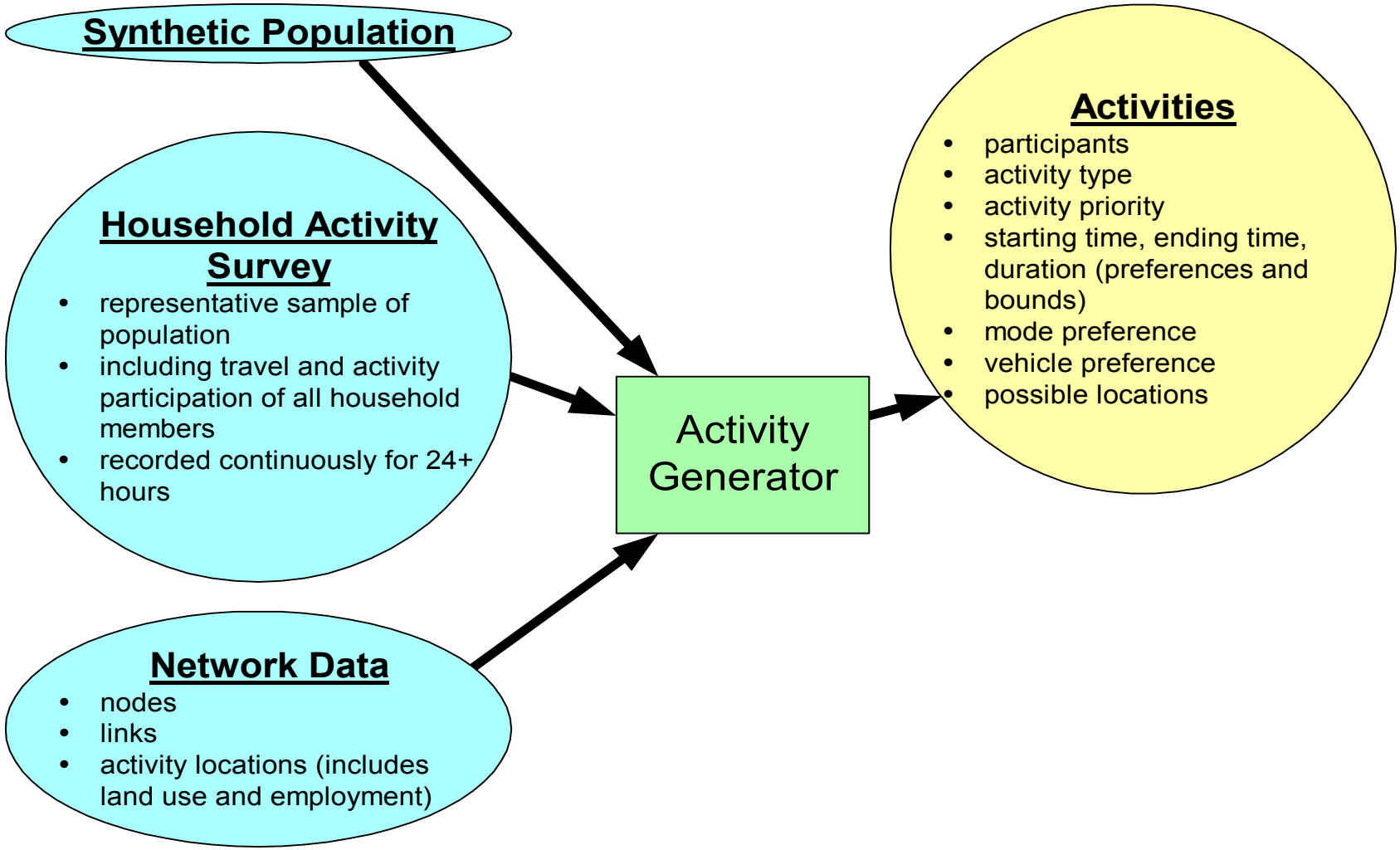


second person in household

first person in household

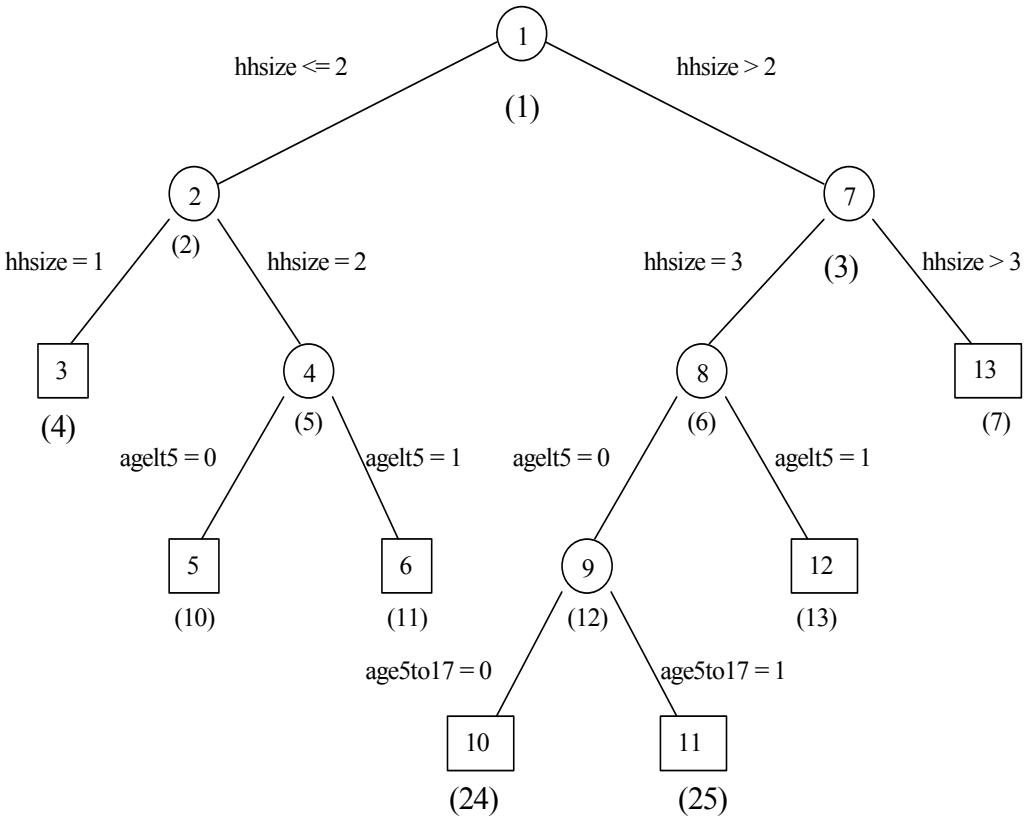


Activity Generator



Simple Binary Tree

hhsize	household size
agelt5	number in household aged less than 5
age5to17	number in household aged from 5 to 17



Classification Tree

WORKERS=0

HHSIZE=1
- HHAGE<38.5 **(34)(34,0)**
- HHAGE>38.5 **(319)(319,0)**

HHSIZE=2
- HHAGE<53.5
  - INCOME<5.5 **(25)(12,13)**
  - INCOME>5.5 **(15)(12,3)**
- HHAGE>53.5 **(268)(267,1)**

HHSIZE>2 (32)(8,24)

WORKERS=1

HHSIZE=1 (705)(705,0)

HHSIZE=2
- A5-15=0 **(304)(291,13)**
- A5-15>0 **(48)(0,48)**

HHSIZE=3
- A5-15<=1
  - HHAGE<29.5 **(18)(1,17)**
  - HHAGE>29.5 **(89)(36,53)**
- A5-15>1 **(24)(0,24)**

HHSIZE=4
- A5-15<=1 **(73)(4,69)**
- A5-15>1 **(49)(0,47)**

HHSIZE>4
- A5-15<=2 **(40)(1,39)**
- A5-15>2 **(27)(0,27)**

WORKERS=2

HHSIZE=2 (677)(677,0)

HHSIZE=3 (248)(78,170)

HHSIZE=4
- ALT5=0
  - A26-45=0 **(21)(8,13)**
  - A26-45>0 **(134)(7,127)**
- ALT5>0 **(69)(0,69)**

HHSIZE>4
- A5-15<=2 **(49)(1,48)**
- A5-15>2
  - HHDensity<1.29 **(18)(0,18)**
  - HHDensity>1.29 **(19)(0,19)**

WORKERS>2

HHSIZE=3 (75)(75,0)

HHSIZE=4
- HHAGE<46.5 **(28)(17,11)**
- HHAGE>46.5 **(24)(18,6)**

HHSIZE>4 (43) (10,33)

KEY
(32)(8,24)
32 households
8 with no nondriving children
24 with nondriving children

Age Matching

MATCHING RULES

- **In each of 4 age groups sort survey and synthetic households by age.**
- **Match synthetic and survey by age.**
- **If more survey persons than synthetic persons drop youngest survey persons.**
- **If more synthetic persons repeat the youngest survey person.**
- **If a survey category is empty, combine the adults (or children).**
- **If no survey household can be found with children, leave the synthetic children at home.**

AGE GROUPS

Adults (Drivers)	Kids (Non Drivers)
Greater Than 18	5 to 15
16 to 18	Under 5

Survey Household Match

							SYNTHETIC HOUSEHOLD 13028									
Household	Dems:	Tract	BG		HHID	Persons	vehicles	Location	HHSIZE	INCOME	ALT5	A5TO17	A26TO45	HHAGE	VORKERS	HDENSTY
		30502	1	H	13028	4	3	858164	4	11	0	2	2	40	2	4.04686
Person	Dems:	HHID		PERID	RELATE	WORK	GENDER	AGE								
		13028	P	13086	1	1	2	40								
		13028	P	13087	2	2	2	15								
		13028	P	13088	2	2	2	15								
		13028	P	13089	1	1	1	39								
					2=Child	1=Worker	1-M, 2=F									
										1	0	$5K	8	$35K	$40K	
										2	$5K	$10K	9	$40K	$45K	
										3	$10K	$15K	10	$45K	$50K	
										4	$15K	$20K	11	$50K	$55K	
										5	$20K	$25K	12	$55K	$60K	
										6	$25K	$30K	13	>$60K		
										7	$30K	$35K				
							SURVEY HOUSEHOLD 219186									
Household	Dems:	Tract	BG		HHID	Persons	vehicles	Location	HHSIZE	INCOME	ALT5	A5TO17	A26TO45	HHAGE	VORKERS	HDENSTY
		0	0	H	219186	4	4	-1	4	13	0	2	2	41	2	2.5638
Person	Dems:	HHID		PERID	RELATE	WORK	GENDER	AGE								
		219186	P	6545	1	1	2	41								
		219186	P	6546	1	1	1	41								
		219186	P	6547	2	2	2	8								
		219186	P	6548	2	2	1	10								
							SURVEY HOUSEHOLD 200120									
Household	Dems:	Tract	BG		HHID	Persons	vehicles	Location	HHSIZE	INCOME	ALT5	A5TO17	A26TO45	HHAGE	VORKERS	HDENSTY
		0	0	H	200120	4	2	-1	4	13	0	2	2	40	2	5.5721
Person	Dems:	HHID		PERID	RELATE	WORK	GENDER	AGE								
		200120	P	69	1	1	1	40								
		200120	P	70	1	1	2	42								
		200120	P	71	2	2	2	9								
		200120	P	72	2	2	2	6								

Survey Keys

ACTID		AT HOME		WERE THERE		MODE		DRIVER	
0	Home	1	Yes	1	Yes	0	No Move	0	No Movement
1	Work	2	No	2	No	1	Walk	1	Driver
2	Shop					2	Personal Auto	2	Passenger
3	School					3	Transit		
4	Visit					4	Lt. Rail		
5	Other					5	P&R Out		
6	Serve Pass.					6	P&R In		
~~7~~	~~College~~					7	Bike		
7	School					8	Magic Move		
8	College					9	School Bus		

Survey Match

SAMPNO	PERNO	ACTNO	ACT ID	AT_HOME	WERE_TH	MODE	DRIVER	NUMVEH	ST_TIME	END_TIME	GEO_X	GEO_Y
219186	1	0	0	1	2	1	0	0	0	470	7649348	642814.3
219186	1	1	1	2	2	2	1	1	470	750	7643286	680220.1
219186	1	2	5	2	2	8	2	0	765	825	7661572	689868
219186	1	3	1	2	2	8	2	0	840	1020	7643286	680220.1
219186	1	4	5	1	2	2	1	1	1050	1110	7649348	642814.3
219186	1	5	5	1	1	1	0	0	1110	1150	7649348	642814.3
219186	1	6	5	1	1	1	0	0	1150	1200	7649348	642814.3
219186	1	7	0	1	1	1	0	0	1200	1230	7649348	642814.3
219186	1	8	0	1	1	1	0	0	1230	1620	7649348	642814.3
219186	2	0	0	1	2	1	0	0	0	490	7649348	642814.3
219186	2	1	6	2	2	2	1	2	490	491	7655438	643633.3
219186	2	2	1	2	2	2	1	1	505	715	7652497	656807.8
219186	2	3	5	1	2	2	1	1	730	770	7649348	642814.3
219186	2	4	1	2	2	2	1	1	780	1020	7652497	656807.8
219186	2	5	6	2	2	2	1	1	1030	1031	7655438	643633.3
219186	2	6	5	1	2	2	1	2	1040	1110	7649348	642814.3
219186	2	7	5	1	1	1	0	0	1110	1150	7649348	642814.3
219186	2	8	5	1	1	1	0	0	1150	1180	7649348	642814.3
219186	2	9	0	1	1	1	0	0	1180	1330	7649348	642814.3
219186	2	10	0	1	1	1	0	0	1330	1620	7649348	642814.3

Survey Match (Cont.)

SAMPNO	PERNO	ACTNO	ACT ID	AT_HOME	WERE_TH	MODE	DRIVER	NUMVEH	ST_TIME	END_TIME	GEO_X	GEO_Y
219186	3	0	0	1	2	1	0	0	0	490	7649348	642814.3
219186	3	1	3	2	2	2	2	2	490	1000	7655438	643633.3
219186	3	2	0	1	2	2	2	2	1040	1110	7649348	642814.3
219186	3	3	5	1	1	1	0	0	1110	1150	7649348	642814.3
219186	3	4	0	1	1	1	0	0	1150	1620	7649348	642814.3
219186	4	0	0	1	2	1	0	0	0	480	7649348	642814.3
219186	4	1	0	1	1	1	0	0	480	520	7649348	642814.3
219186	4	2	5	2	2	7	0	0	520	580	7649372	642827.3
219186	4	3	5	1	2	7	0	0	600	720	7649348	642814.3
219186	4	4	5	2	2	8	2	0	765	900	7651311	687141.7
219186	4	5	4	2	2	8	2	0	915	975	7651383	687189.9
219186	4	6	5	1	2	7	0	0	985	990	7649348	642814.3
219186	4	7	0	1	1	1	0	0	990	1050	7649348	642814.3
219186	4	8	5	1	1	1	0	0	1050	1110	7649348	642814.3
219186	4	9	5	1	1	1	0	0	1110	1150	7649348	642814.3
219186	4	10	5	1	1	1	0	0	1150	1200	7649348	642814.3
219186	4	11	0	1	1	1	0	0	1200	1260	7649348	642814.3
219186	4	12	0	1	1	1	0	0	1260	1620	7649348	642814.3

Household Activities

hhid	perid	actno	acttype	actpriority	st time-lb	st time-ub	st time-a	st time-b	end time-lb	nd time-ub	end time-a	end time-b
13028	13086	1	0	0	0	0	-1	-1	7.4167	8.9167	1	1
13028	13086	2	6	4	7.6667	8.6667	1	1	7.6833	8.6833	1	1
13028	13086	3	1	2	8.1667	8.6667	1	1	11.6667	12.1667	1	1
13028	13086	4	5	8	11.4167	12.9167	1	1	12.0833	13.5833	1	1
13028	13086	5	1	2	12.75	13.25	1	1	16.75	17.25	1	1
13028	13086	6	6	4	16.6667	17.6667	1	1	16.6833	17.6833	1	1
13028	13086	7	5	8	16.5833	18.0833	1	1	48	48	-1	-1
13028	13087	8	0	0	0	0	-1	-1	7.9167	9.4167	1	1
13028	13087	9	5	8	8.1667	9.1667	1	1	9.1667	10.1667	1	1
13028	13087	10	5	8	9.25	10.75	1	1	11.25	12.75	1	1
13028	13087	11	5	8	12.25	13.25	1	1	14.5	15.5	1	1
13028	13087	12	4	4	14.75	15.75	1	1	15.75	16.75	1	1
13028	13087	13	5	8	15.6667	17.1667	1	1	48	48	-1	-1
13028	13088	14	0	0	0	0	-1	-1	7.4167	8.9167	1	1
13028	13088	15	3	3	7.9167	8.4167	1	1	7.9333	8.4333	1	1
13028	13088	16	0	0	16.5833	18.0833	1	1	48	48	-1	-1
13028	13089	17	0	0	0	0	-1	-1	7.0833	8.5833	1	1
13028	13089	18	1	2	7.5833	8.0833	1	1	12.25	12.75	1	1
13028	13089	19	5	8	12.25	13.25	1	1	13.25	14.25	1	1
13028	13089	20	1	2	13.75	14.25	1	1	16.75	17.25	1	1
13028	13089	21	5	8	16.75	18.25	1	1	48	48	-1	-1
duration-lb	duration-ub	duration-a	duration-b	mode	veh-id	#loc	location	assengers	driver	pass-1	me priority	atching hh
7.4167	8.9167	1	1	1	-1	1	858164	0			1	219186
0.0117	0.0217	1	1	2	13084	1	838235	2	13086	13088	1	219186
3.25	3.75	1	1	2	13084	1	835401	0			3	219186
0	1.6667	1	1	2	13084	1	858164	0			0	219186
3.75	4.25	1	1	2	13084	1	835401	0			3	219186
0.0117	0.0217	1	1	2	13084	1	838235	0			1	219186
29.9167	31.4167	1	1	2	13084	1	858164	2	13086	13088	0	219186
7.9167	9.4167	1	1	1	-1	1	858164	0			1	219186
0.7	1.3	1	1	7	-1	1	846445	0			0	219186
1	3	1	1	7	-1	1	858164	0			0	219186
1.575	2.925	1	1	8	-1	1	847153	0			0	219186
0.7	1.3	1	1	8	-1	1	837203	0			5	219186
30.8333	32.3333	1	1	7	-1	1	858164	0			0	219186
7.4167	8.9167	1	1	1	-1	1	858164	0			1	219186
0	0.2667	1	1	2	13084	1	838235	1	13086		3	219186
29.9167	31.4167	1	1	2	13084	1	858164	1	13086		2	219186
7.0833	8.5833	1	1	1	-1	1	858164	0			1	219186
4.4167	4.9167	1	1	2	13085	1	864606	0			3	219186
0.7	1.3	1	1	8	-1	1	843663	0			0	219186
2.75	3.25	1	1	8	-1	1	864606	0			3	219186
29.75	31.25	1	1	2	13085	1	858164	0			0	219186

Activity Generation Rules

- **Location**

  Anchor

$$p(L) = \frac{\exp(a(L) + b_m t(H, L))}{\sum_{L'} \exp(a(L') + b_m t(H, L'))}$$

  Non-Anchor

$$p(L_1) = \frac{\exp(b_{m1} t(L, L_1) + a(L_1, v) + b_{m2} t(L_1, H))}{\sum \exp(b_{m1} t(L, L_1') + a(L_1', v) + b_{m2} t(L_1', H))}$$

- **Mode**

  Same as survey

- **Time**

  Cascade Times

  Don't Cascade Times

Location Choice Variables

$$\exp(a(L)+b_m t(H,L)) = a^*(L)\exp(b_m t(H,L))$$

Anti-Log* Attractors:

ID	Home	School	Work	Shop	Visit	Social	Other	Serve	College	HH_Acre
1	2.1	0	0	0.91	0.92	0.94	0.5	0.92	0	0.04
2	2.1	0	0	0.91	0.92	0.94	0.5	0.92	0	0.04
3	2.1	0	0	0.91	0.92	0.94	0.5	0.92	0	0.04

$$\exp(a(L)+b_m t(H,L))$$

Mode Coefficients:

Coefficient	Activity Type	Mode	
-0.129	1	1	
-0.057	1	2	
-0.098	1	3	
-0.098	1	4	
-0.080	1	5	
-0.080	1	6	
-0.098	1	7	
-0.057	1	8	
-0.057	1	9	

Activity Type		Mode	
0	Home	0	No Move
1	Work	1	Walk
2	Shop	2	Auto
3	School	3	Transit
4	Visit	4	Lt. Rail
5	Other	5	P&R Out
6	Serve Pass.	6	P&R In
7	College	7	Bike
		8	Magic Move
		9	School Bus

Travel Times

Location Choice

$$p(L) = \frac{\exp(a(L) + b_m t(H,L))}{\sum_{L'} \exp(a(L') + b_m t(H,L'))}$$

Travel Times

Three Options

1. Scaled Distance
2. Zone to Zone Travel Time Matrix

   Format: <zone1> <zone2> <mode> <interval> <travel time> <#data points> <variance>

3. Travel Time Function

```
// Get the travel time for the given mode using the function
// supplied in the method. Returns travel time in seconds.

REAL TTravelTimeFunction::getTravelTime(int mode, REAL time,
TZone& ZoneFrom, TZone& ZoneTo, REAL fromX, REAL fromY, REAL toX,
REAL toY,TLog& logstream, TRandom& randomstream, vector<double>& params)
                                        ⋮
the_time += params[0]
return the_time
```

Activity Problem File

PROBLEMS DETECTED

1) failed to find driver for shared ride
2) failed to match synthetic household with survey household
3) arrived too late at this activity
4) failure to adjust times for shared ride activity
5) unable to assign a vehicle for a driving trip
6) incomplete match between survey household and synthetic household
7) activity has underage driver, where driving age is defined as equal to or older than the age specified by the configuration file key `ACT_ADULT_MINIMUM_AGE`
8) activity is school activity and person's age is not within school age ranges specified by configuration file keys

FORMATS

Format for types 1, 5, 7, and 8 is

```
<type> 3<HH Id> <Person Id> <Activity Id>
```

Format for types 2 and 6 is

```
<type> 1 <HH Id>
```

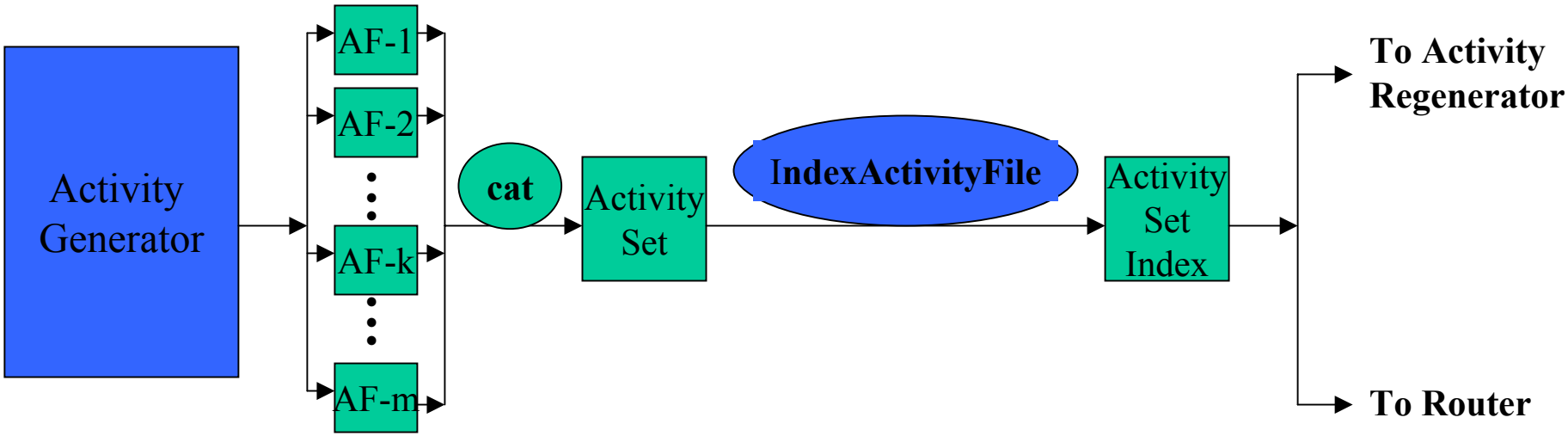
Format for types 3 and 4 is

```
<type> 5 <HH Id> <Person Id> <Activity Id> <Start Time> <End Time>
```

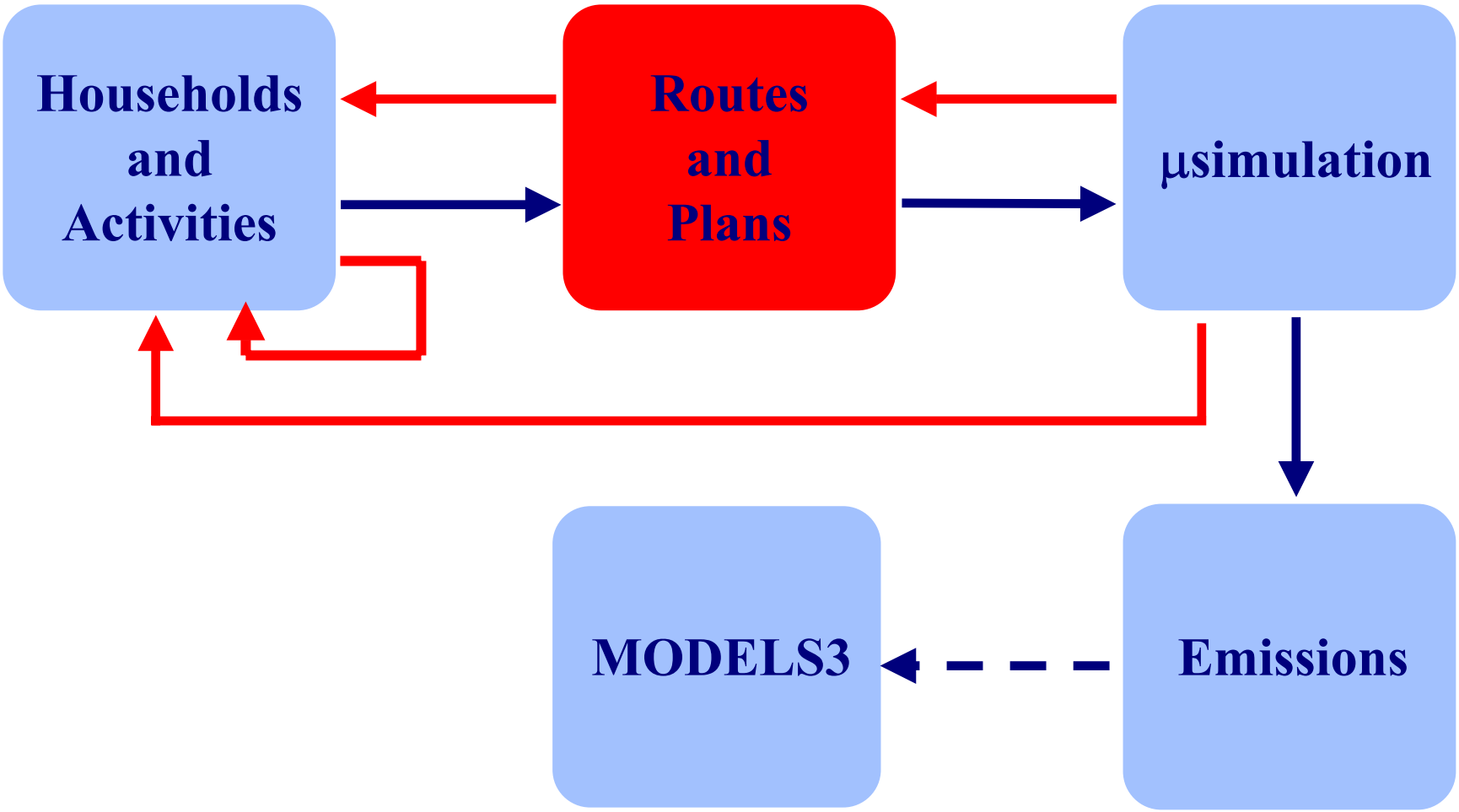
FILE

```
3 5 13003 13012 9 11.6667 12.3333
1 3 13012 13040 35
1 3 13012 13040 36
1 3 13014 13050 35
1 3 13014 13050 36
3 5 13025 13082 10 12.6667 13.0833
3 5 13028 13092 4 12 12.5
3 5 13030 13097 5 12.4167 13.3333
3 5 13031 13098 10 12.0833 12.3333
3 5 13031 13098 11 12.5 12.6667
3 5 13036 13117 6 12.0833 12.4167
3 5 13036 13118 11 12.0833 12.4167
3 5 13066 13228 5 14.5333 14.5833
3 5 13076 13255 3 12.1667 13
```

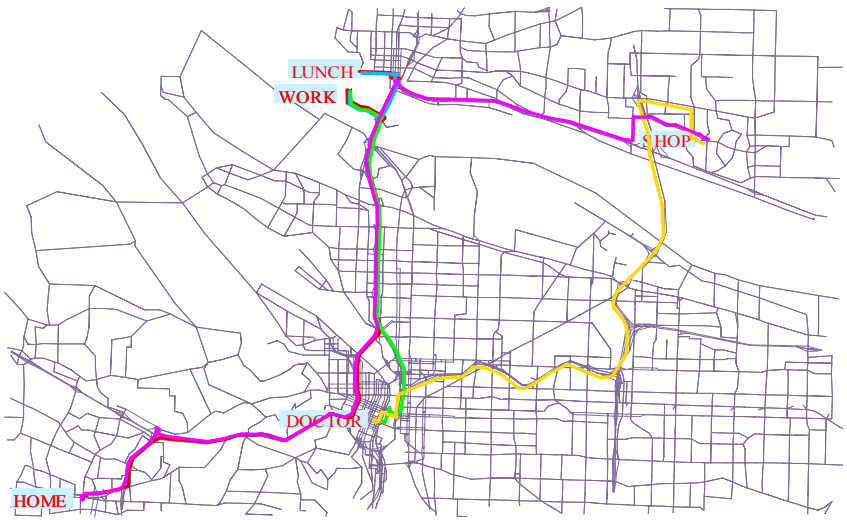
TRANSIMS Technology



TRANSIMS Technology

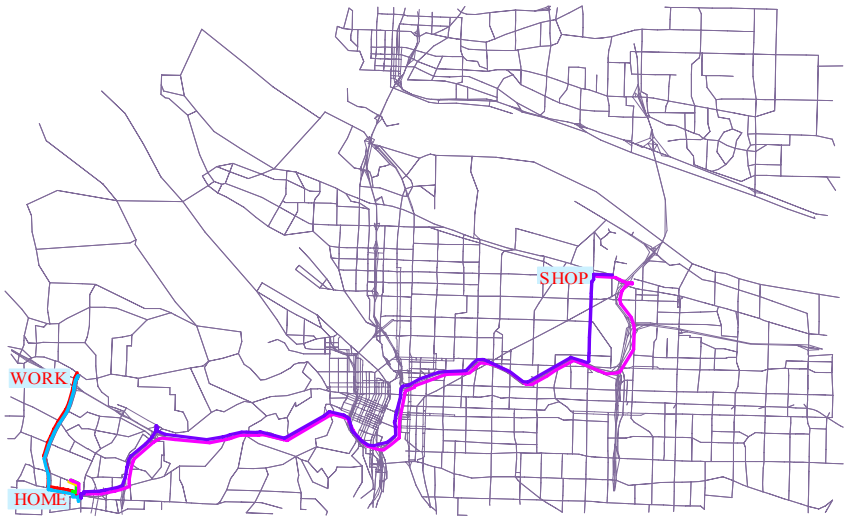


Example Route Plans

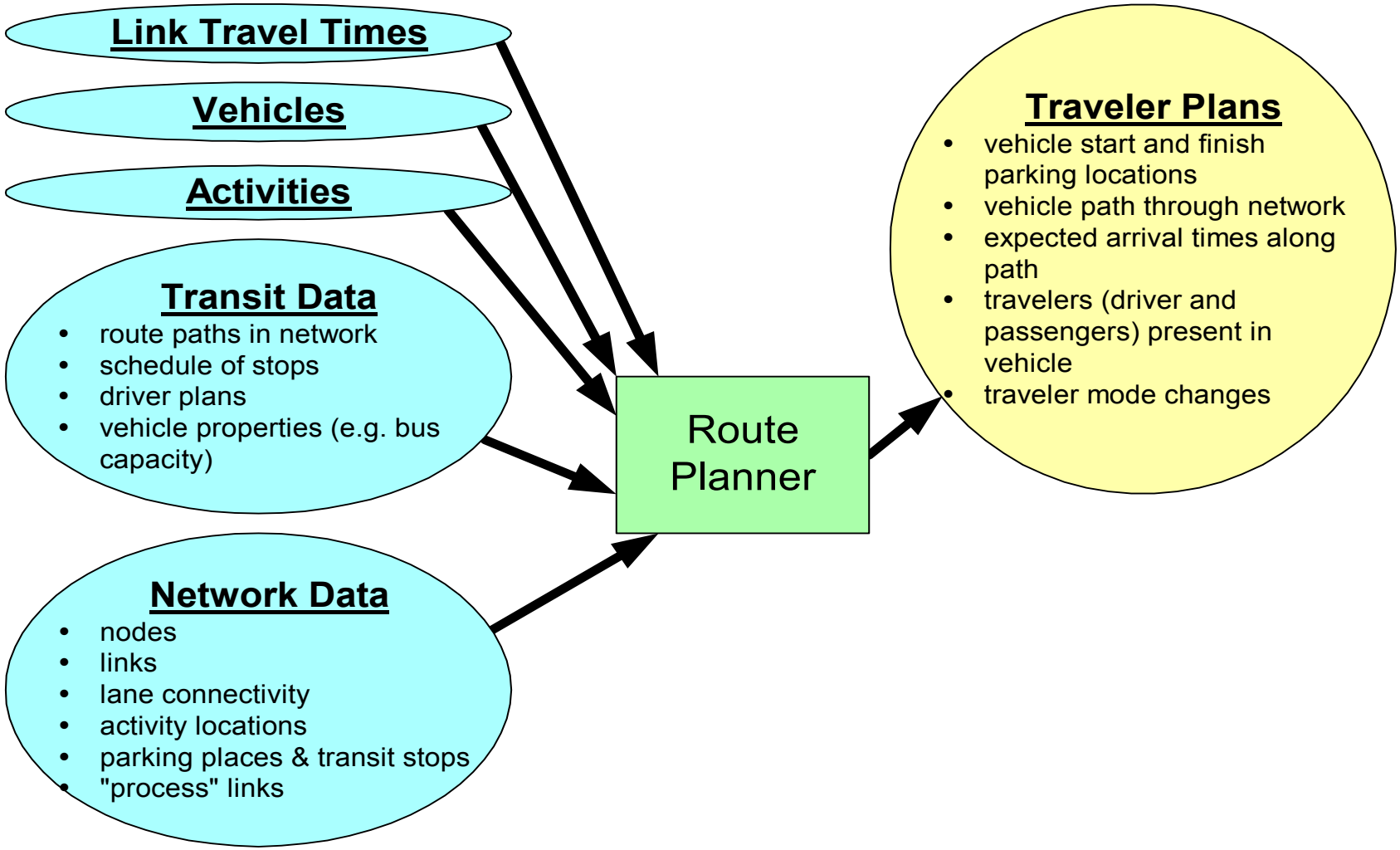


first person in household

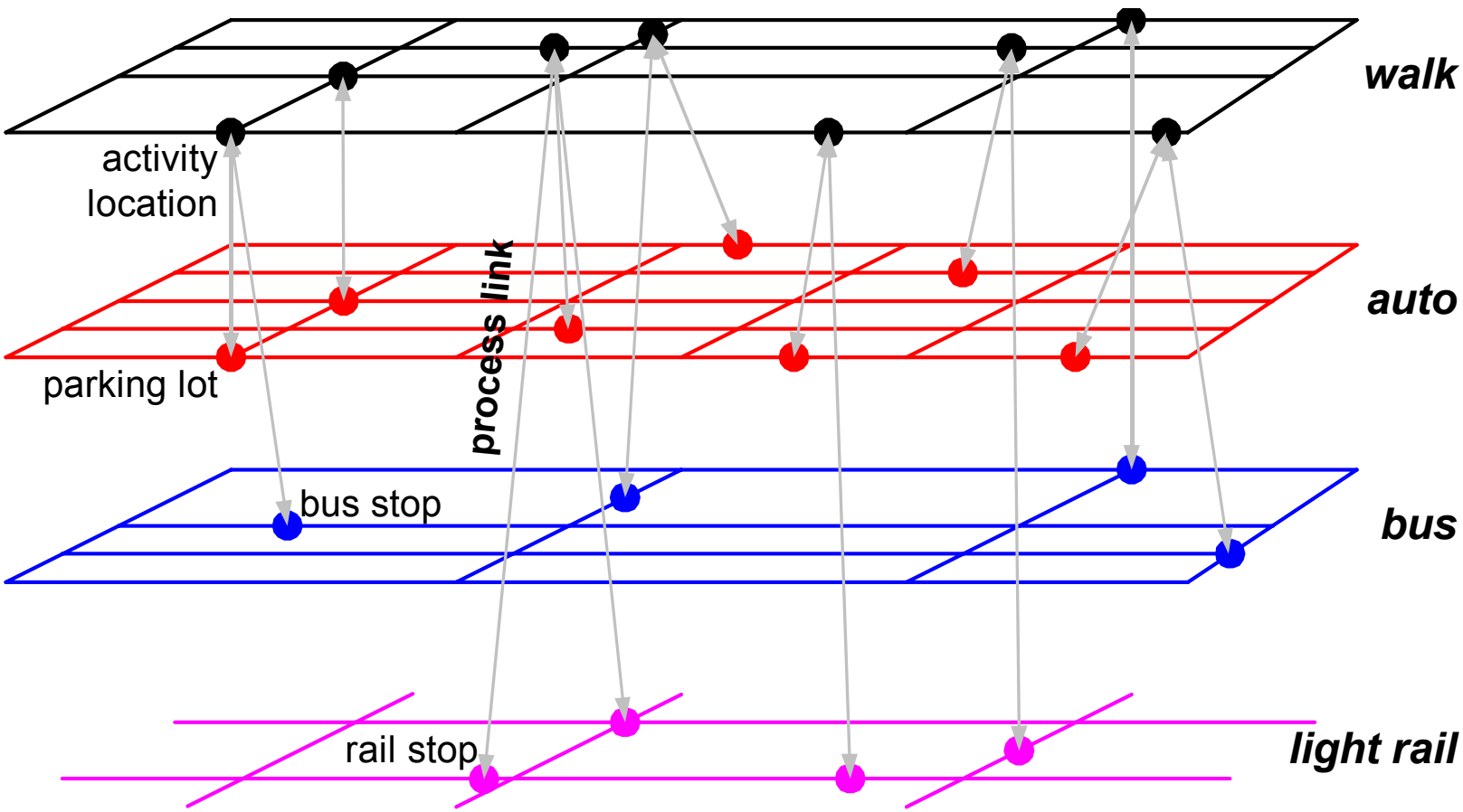
second person in household



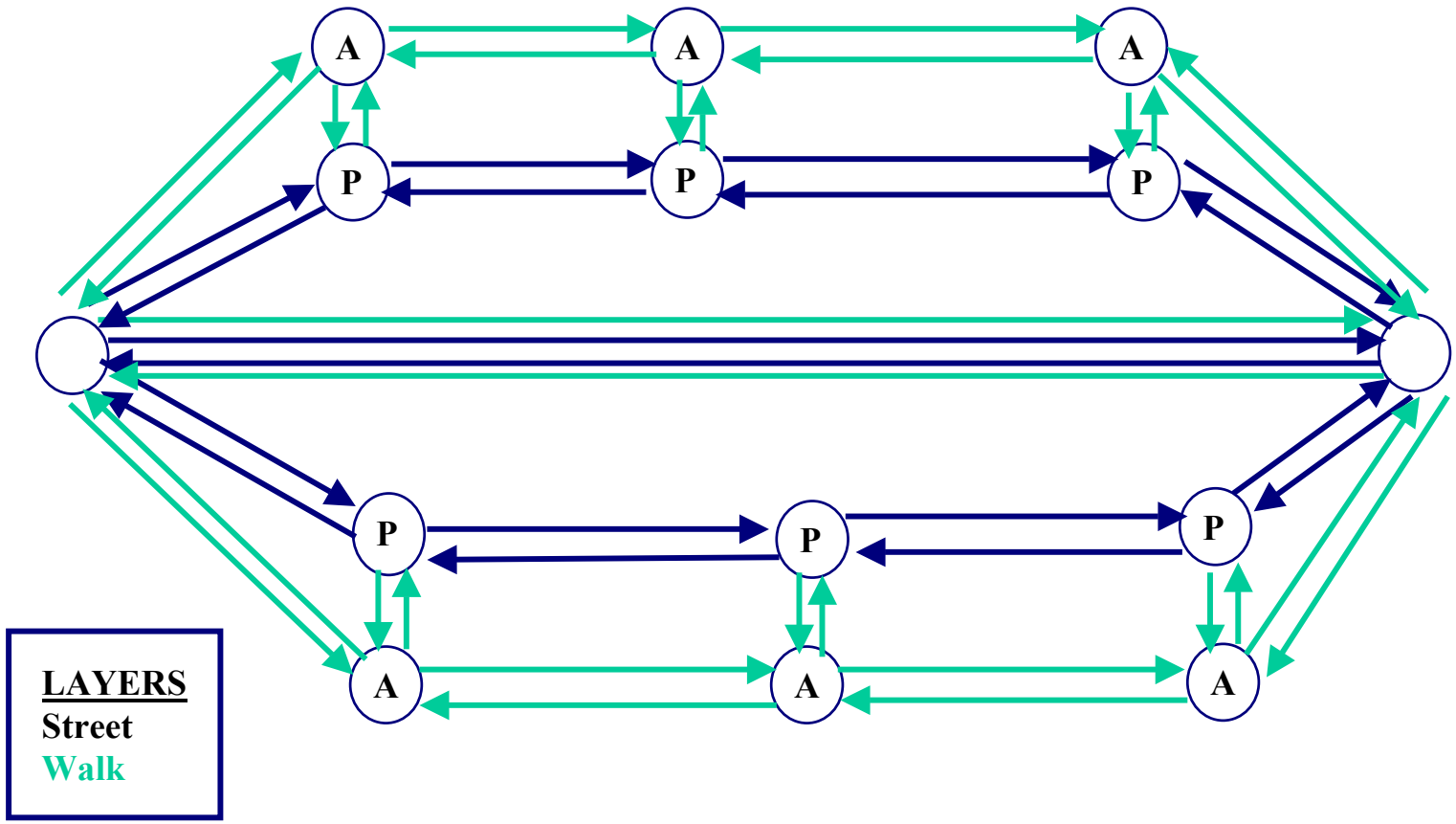
Route Planner



The Router


walk
activity
location
auto
process link
parking lot
bus stop
bus
rail stop
light rail

Router Walk/Street Network



Plan File Format

Column Name	Description	Allowed Values
`Traveler (Person) ID`	Each person is given a unique ID in the population file.	integer
`User Field`	Available to the user to set as desired. Its value is not used internally by the Traffic Microsimulator, but is passed to the output system for use in filtering.	integer
`Trip ID`	Numbers the trips for the traveler sequentially from 1. The trip ID is not used by the Traffic Microsimulator.	unsigned 16-bit integer
`Leg ID`	Numbers the legs within a trip sequentially from 1.	integer
`Activation Time`	The earliest time the simulation needs to worry about this leg. It is generally the starting time (estimated by the Route Planner) for a leg. For a transit leg, however, it represents the arrival time of the passenger at the transit stop, rather than the arrival time of the transit vehicle.	integer: seconds since midnight
`Start Accessory ID`	Denotes the network accessory ID of the starting location for this leg.	unsigned long integer
`Start Accessory Type`	Denotes the type of accessory of the corresponding location. It is necessary because the IDs are not globally unique over accessories. It should be one of: 1) `activity location` 2) `parking` 3) `transit stop` as defined in **`TNetAccessory::EType`** of *NET/Accessory.h*.	integer enumeration

Plan File Format (Cont.)

`End Accessory ID`	As above, except it is for the destination rather than the starting accessory.	unsigned long, integer
`End Accessory Type`	As above, except it is for the destination rather than the starting accessory.	unsigned long, integer
`Duration`	In conjunction with `Stop Time` and `Max Time Flag`, specifies how long this leg is expected to take.	integer: seconds
`Stop Time`	In conjunction with `Stop Time` and `Max Time Flag`, specifies an absolute ending time for this leg.	integer: seconds since midnight
`Cost`	Monetary cost of the trip, in cents.	integer
`GCF`	Generalized Cost Function. This is the value that the Route Planner attempts to minimize when planning travelers. Currently the same as duration.	integer
`Max Time Flag`	If true, the end of this activity is best estimated as *max(start time + duration; stop_time).* Otherwise, use the minimum instead. In the simulation, the actual start time is used, rather than the estimated activation time.	boolean
`Driver Flag`	True, if the traveler is driving a vehicle on this leg.	boolean
`Mode`	Mode of travel. This, together with the driver flag, determines the interpretation of the mode-dependent data following the header. Currently, it must be one of: 0 - `car` 1 - `transit` 2 - `pedestrian` 3 - `bicycle` 4 - `non-transportation activity` as defined in the **`TPlan::ETravelMode enum`** of *PLAN/Plan.h*.	integer, enumeration
`Number of Tokens`	Number of white-space-separated tokens in the mode-dependent data block (not including this field itself).	integer

Mode Dependent Plan Data

. Mode-dependent data for a car driver.

Data	Description	Allowed Values
Vehicle ID	Each vehicle (with its ID) available in the simulation is listed in the vehicle database.	integer
Number of Passengers	The number of passengers, not including the driver, on this leg.	integer
List of Node IDs	The nodes (in order) through which the driver's route will pass.	integer
List of Passenger IDs	The traveler ID of each passenger to be carried on this leg.	integer

. Mode-dependent data for a car passenger.

Data	Description	Allowed Values
Vehicle ID	Each vehicle (with its ID) available in the simulation is listed in the vehicle database.	integer

Mode Dependent Plan Data (Cont.)

Mode-dependent data for a transit driver.

Data	Description	Allowed Values
Schedule Pairs	Number of (stop ID, depart time) pairs	Integer
Vehicle ID	Each vehicle (with its ID) available in the simulation is listed in the vehicle database.	Integer
Route ID	Route IDs are specified in the transit route file. Only one route ID is allowed per leg.	Integer
List of Node IDs	The nodes (in order) through which the driver's route will pass.	Integer
List of Schedule Pairs	Each pair consists of a stop ID and a depart time. When a transit driver arrives at a transit stop whose ID is given in this list, the driver will remain at that stop until the depart time.	Integer, integer

Mode-dependent data for a transit passenger.

Data	Description	Allowed Values
Route ID	Traveler will board any transit vehicle whose driver's plan matches this Route ID.	integer

Mode-dependent data for a pedestrian.

Data	Description	Allowed Values
List of Node IDs	The nodes (in order) through which the traveler's route will pass.	integer

Part Of A Plan

```
13086 0 1 1
0 858164 1 858164 1
30906 0 1 0 0
0 4
0
```

At home
Activity location 858164
Start time=0
End time=26158 (8.6 am) 30906

```
13086 0 2 1
31201 858164 1 768164 2
28 31201 1 0 0
0 2
0
```

Move to parking location 768164
Total time=28 sec

```
13086 0 2 2
31229 768164 2 738235 2
257 31229 1 0 1796
1 0
14
13084 1
38165 38166 38167 38260 38230 38240 48241 48242 48243 38244
48245
13088
```

Vehicle ID, 1 passenger

} Nodes

Passenger 13088

Drive to parking location 738235
Time=257 sec (4.3 min)

```
13086 0 2 3
31486 738235 2 838235 1
10 31486 1 0 0
0 2
0
```

Move to activity location 838235

```
13086 0 3 1
31496 838235 1 838235 1
1 31496 1 0 0
0 4
0
```

1 sec. activity at activity location 838235

Plan With Transit

```
13015 0 1 1
0 848111 1 848111 1
26348 0 1 0 0
0 4
0
```

At home

```
13015 0 2 1
26348 848111 1 868130 1
450 26348 1 0 0
0 2
0
```

Walk to activity location 868130

```
13015 0 3 1
26798 868130 1 868130 1
14901 26798 1 0 0
0 4
0
```

Stay at activity location 868130

```
13015 0 4 1
43464 868130 1 458102 3
728 43464 1 0 0
0 2
0
```

Walk to transit stop 458102

```
13015 0 4 2
44192 458102 3 458402 3
1263 44192 1 0 0
0 1
1
58
```

Ride bus on route 58
from transit stop 458102
to transit stop 450402

```
13015 0 4 3
45455 458402 3 2 3
23 45455 1 0 0
0 2
```

Router Problem File

Field	Description
HouseholdId	ID of the anomalous household.
TravelerId	ID of the anomalous traveler.
ActivityId	ID of the anomalous activity.
TripId	ID of the trip generated by this activity.
LegId	ID of the first leg generated by this activity.
ProblemType	Type of anomaly: 1 = *No Path* 2 = *Invalid Time* 3 = *Invalid Shared Ride* 4 = *Invalid Shared Ride Time*
Problem Subtype	Subtype of an anomaly, type dependent.
Number of data fields	Number of remain fields, varies by anomaly type.

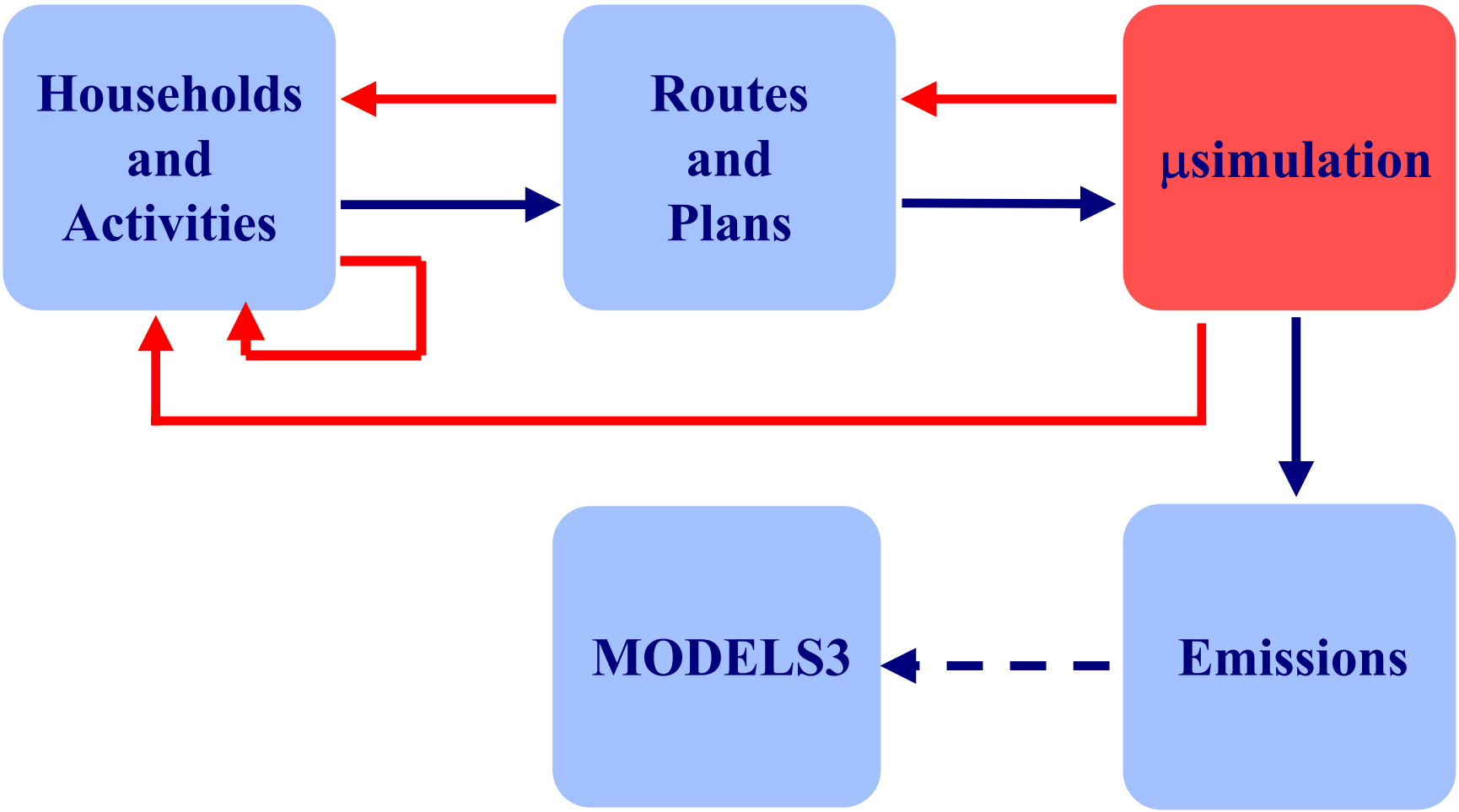
No Path fields.

Field	Description
SourceLocation	The source location of the anomaly trip.
SourceType	The source location type of the anomaly trip.
DestinationLocation	The destination location of the anomaly trip.
DestinationType	The destination location type of the anomaly trip
Mode	The travel mode of the anomaly trip
StartTime	The time the anomaly trip should start.

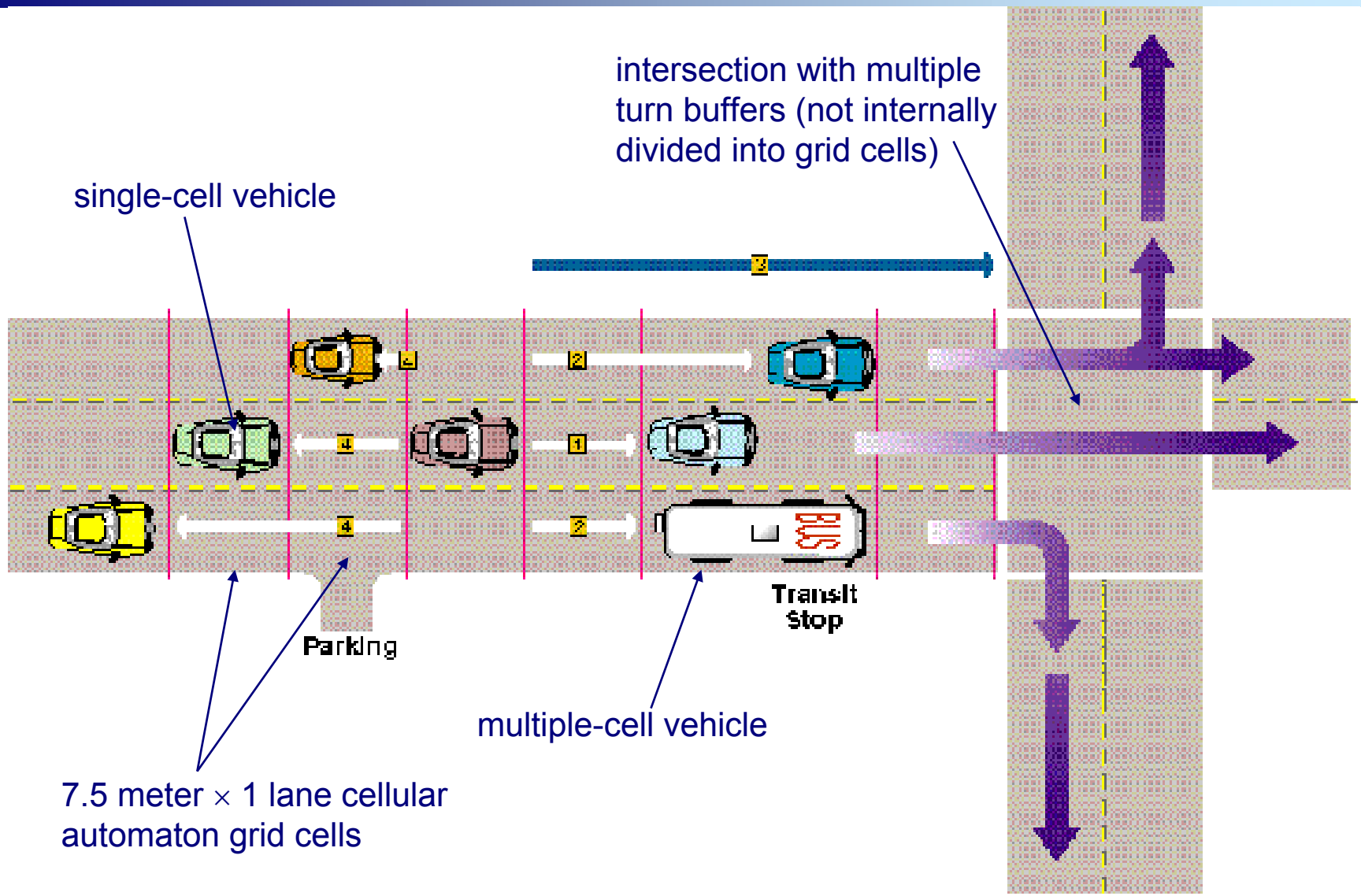
FILE

```
1 13005 8 9 1 4 3 3 60188 -1 57358
1 13005 9 11 1 4 3 3 69910 -1 69557
3 13011 2 2 1 2 0 3 28800 30600 31885
3 13012 8 -1 -1 1 2 6 868140 1 867315 1 wiw 30298
2 13006 2 2 1 2 0 3 26399 28199 26000
2 13007 5 2 1 2 0 3 32699 34499 36335
2 13007 5 2 1 2 1 3 33599 35399 36336
2 13007 6 4 1 2 0 3 33000 36600 36879
2 13007 6 4 1 2 2 3 630 1170 279
```

TRANSIMS Technology



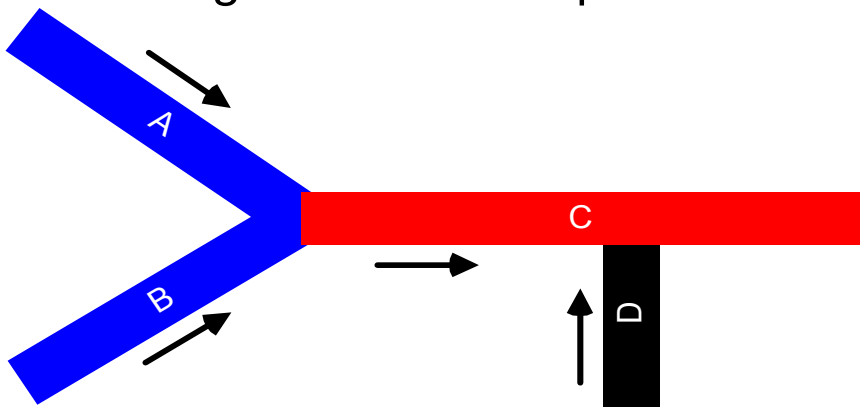
Microsimulation



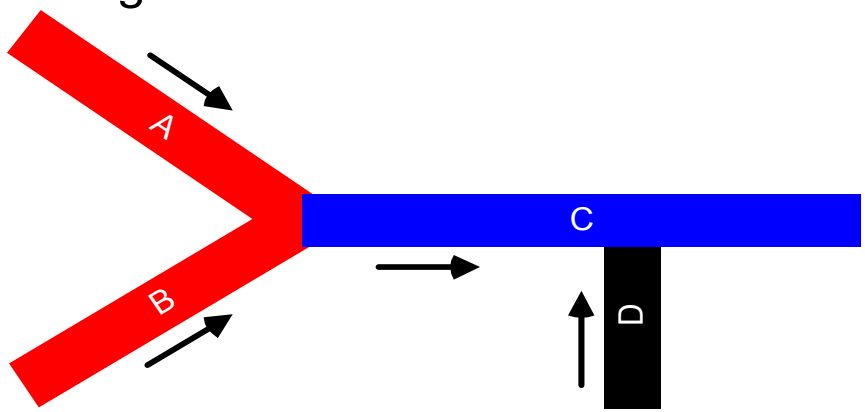
Why Microsimulation?

- The route planner only “sees” link capacities and travel time delays.
- The traffic microsimulation accounts for intersection impedances and other vehicle interactions in addition to link capacities.
- Feedback of link travel time delays output from the traffic microsimulation into the route planner is necessary in order to generate realistic traveler plans.
- Example: Without microsimulation feedback, the planner would think that link *C* is congested and not route any traffic through link *D* onto link *C*.

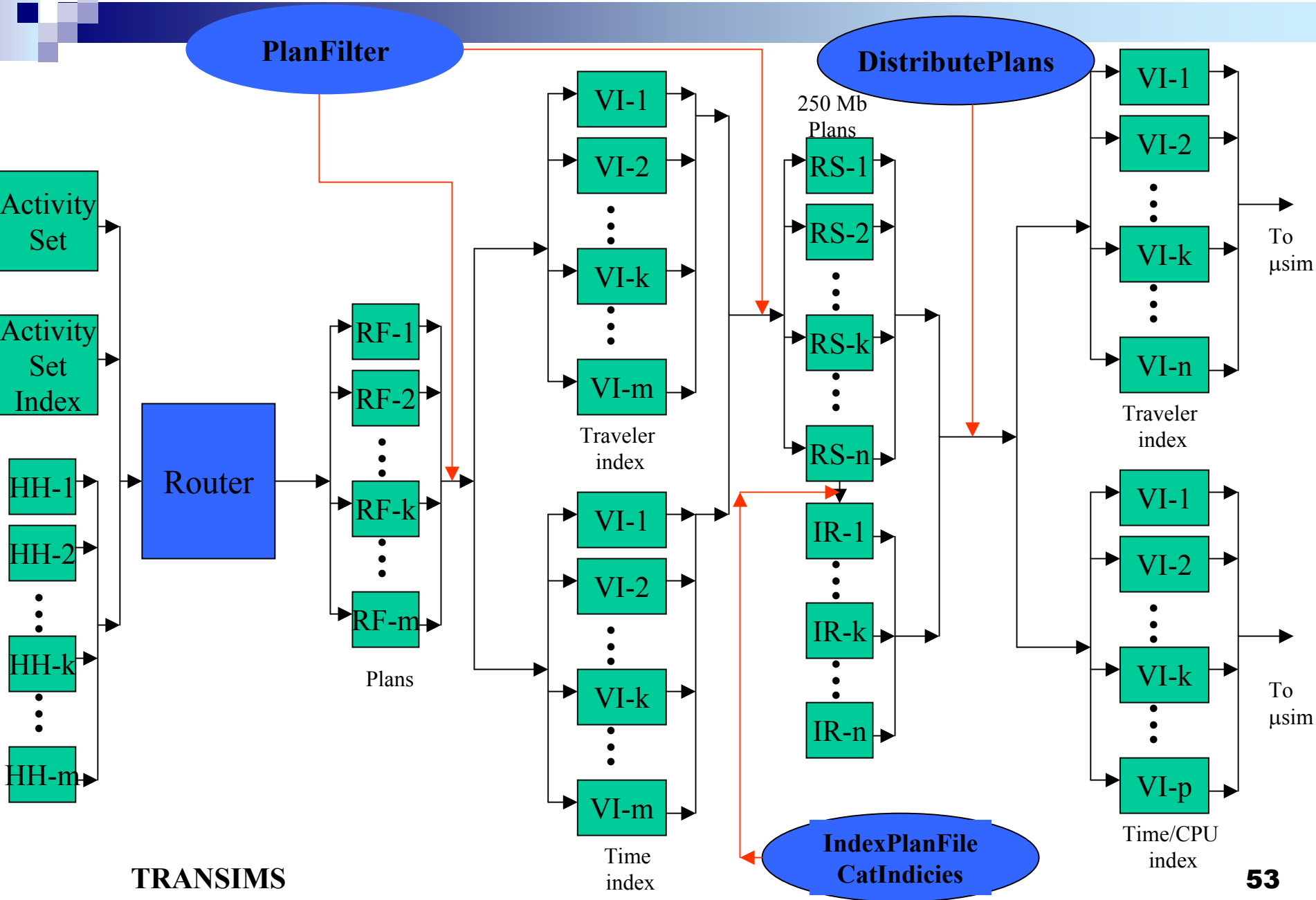
congestion in route planner



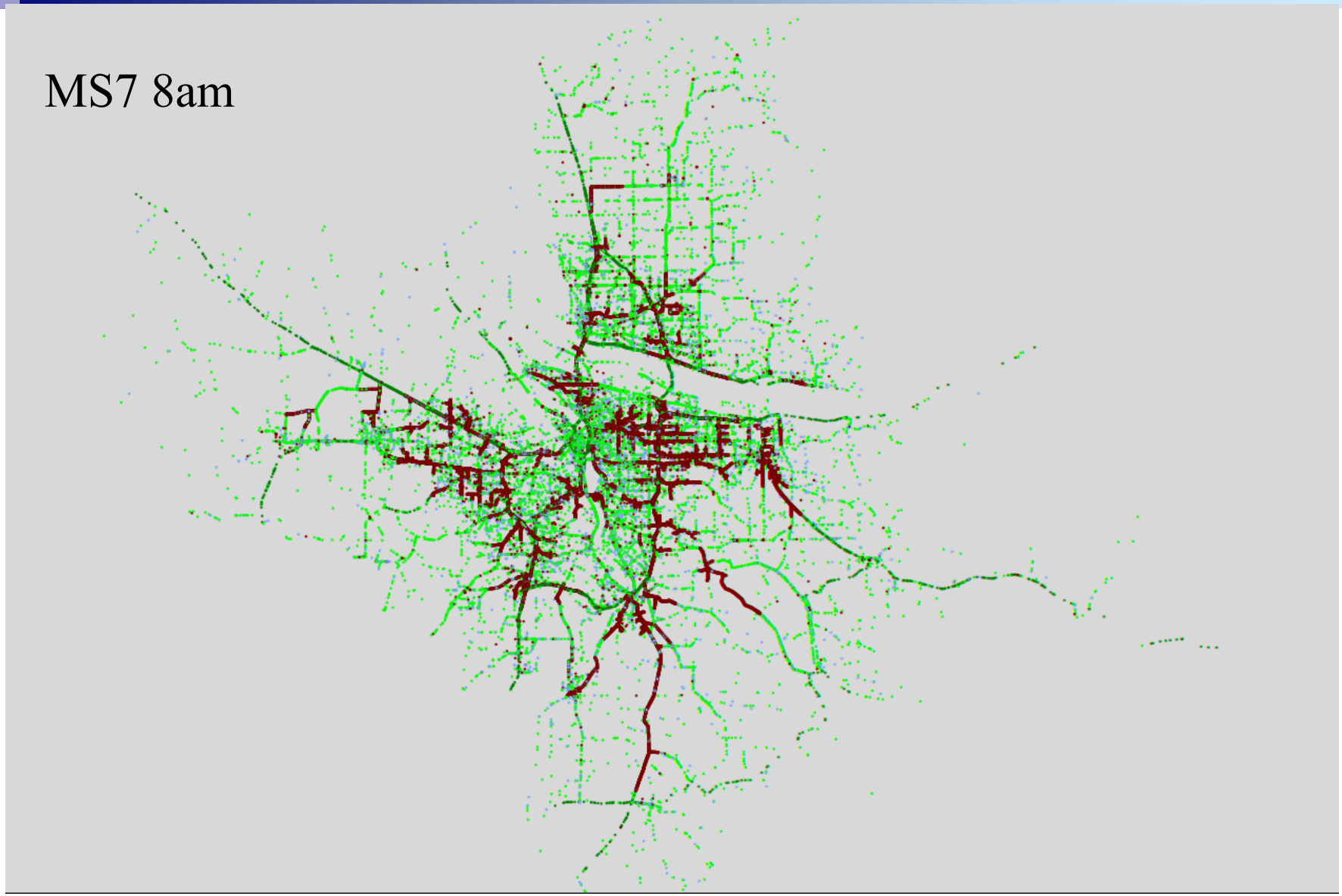
congestion in traffic microsimulation



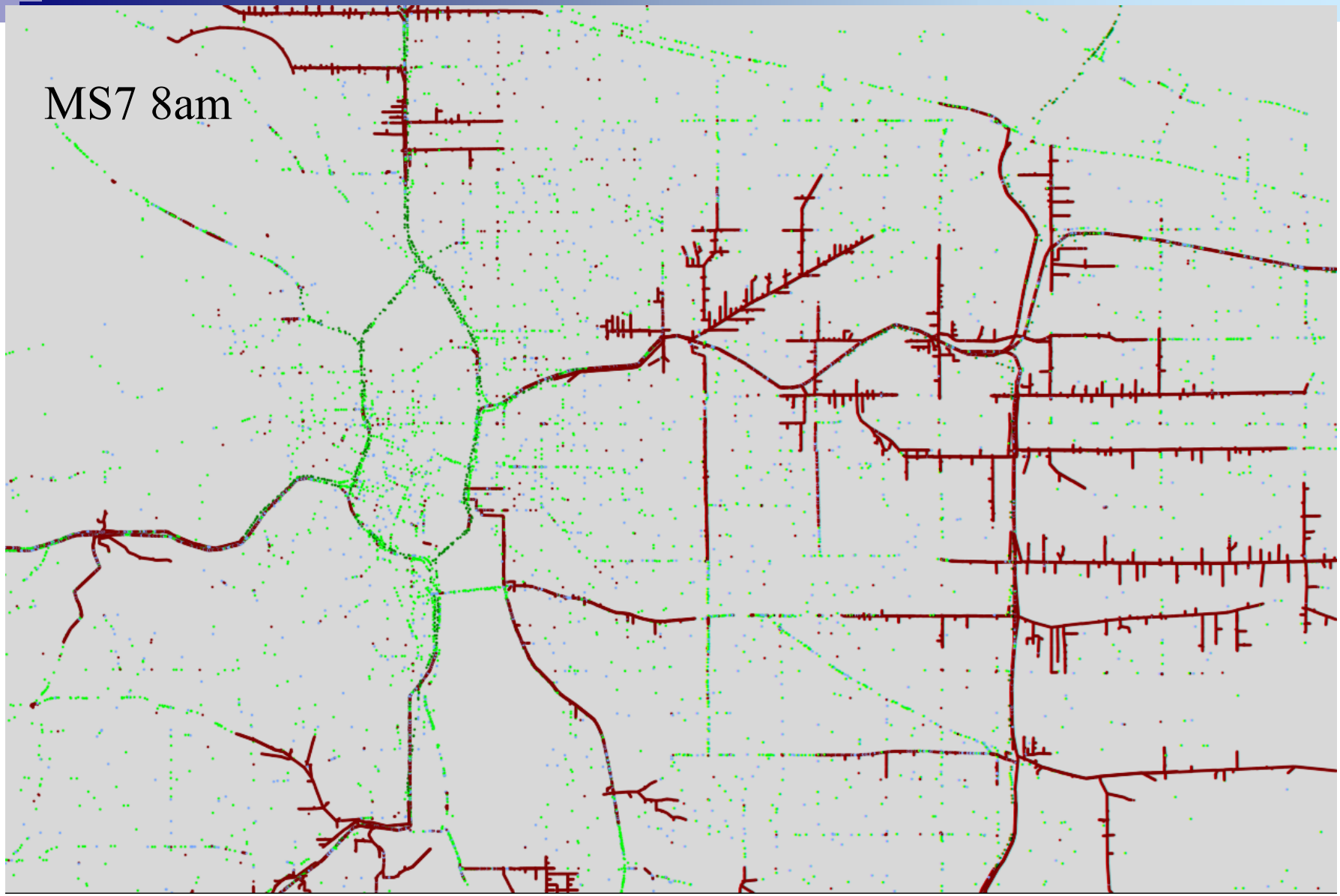
TRANSIMS Technology



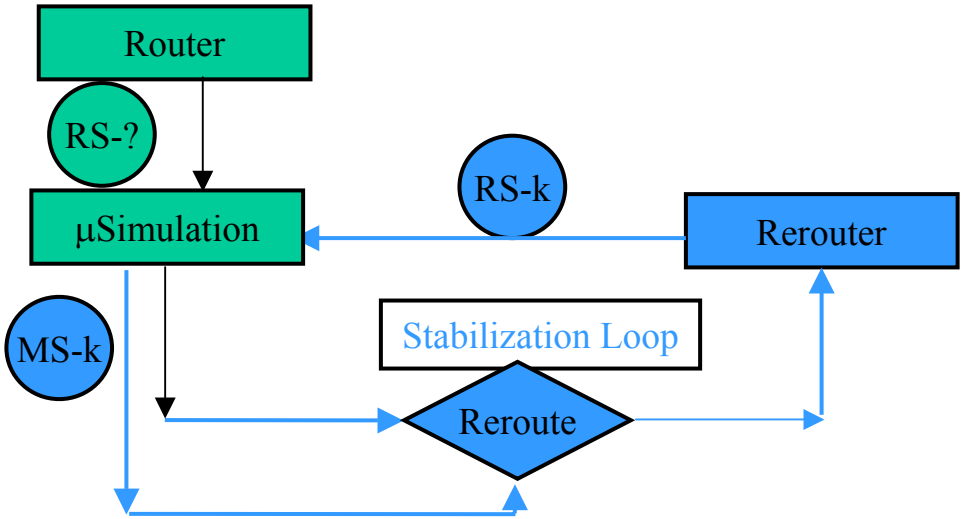
Stabilization



Stabilization

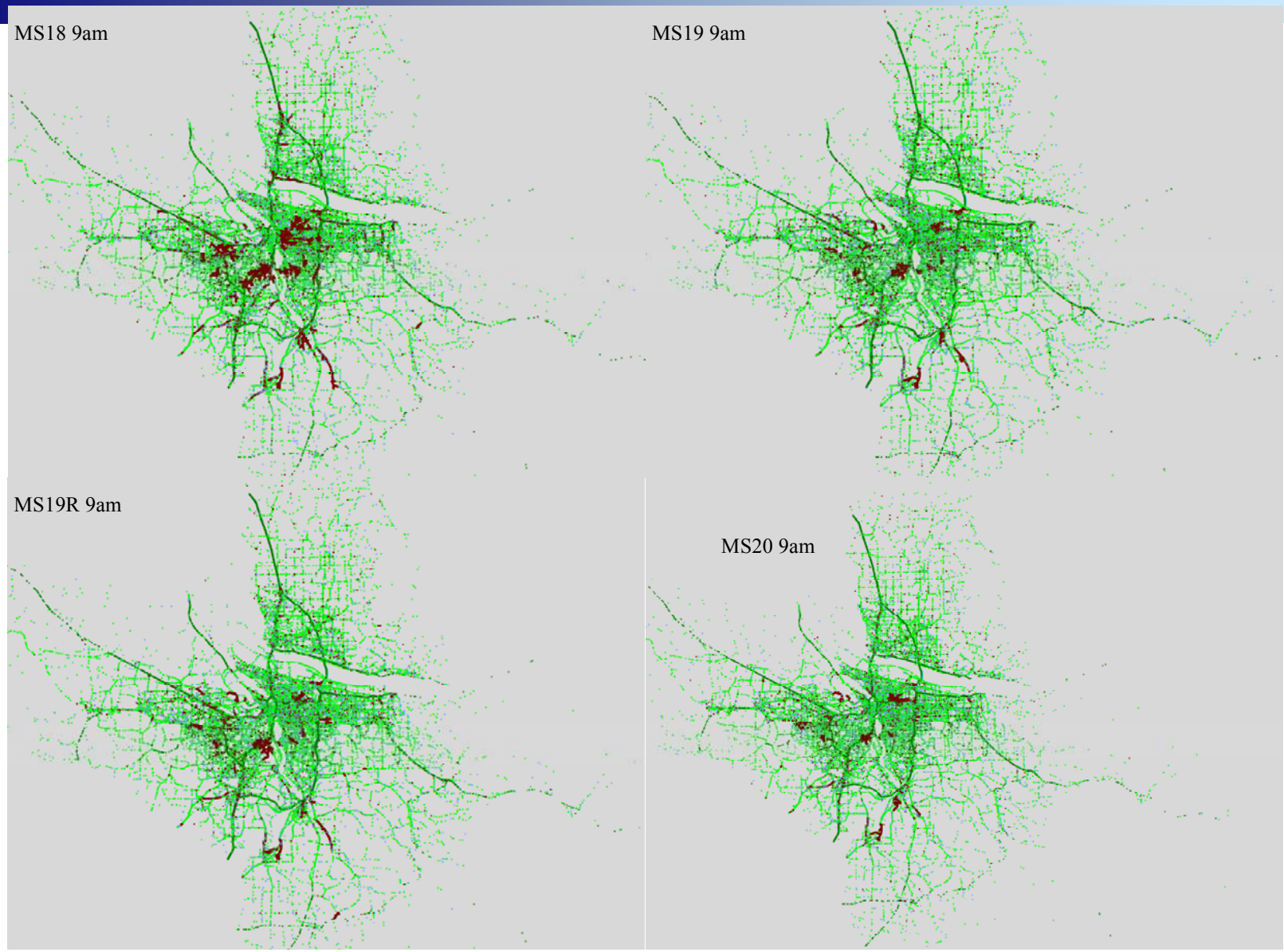


Stabilization

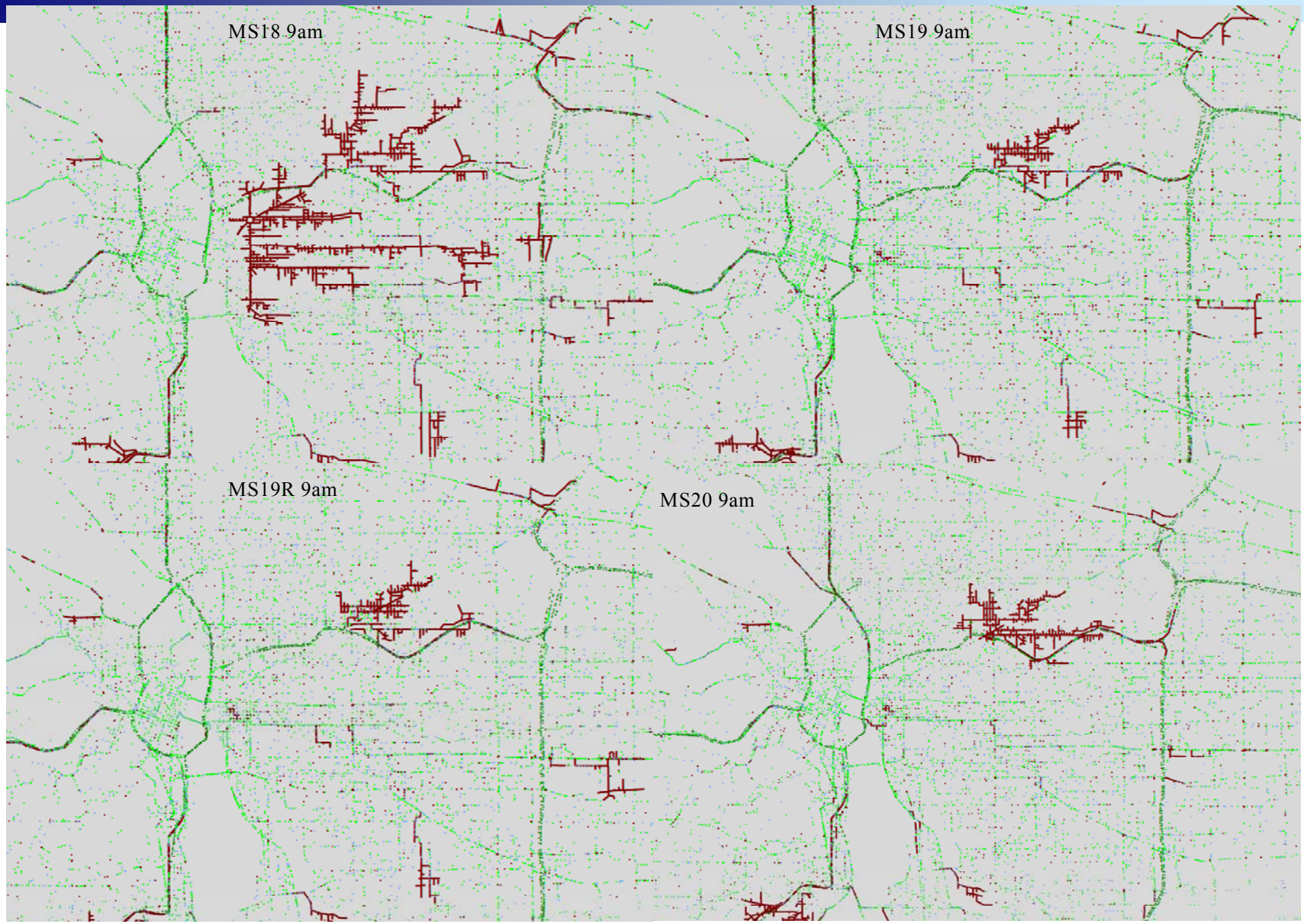


1. Route each traveler without regard to other travelers
2. Compute link delays for each 15 minute time period
3. Reroute a random sample of the travelers
4. Judge convergence
5. If no convergence go to step 2

Stabilization



Stabilization



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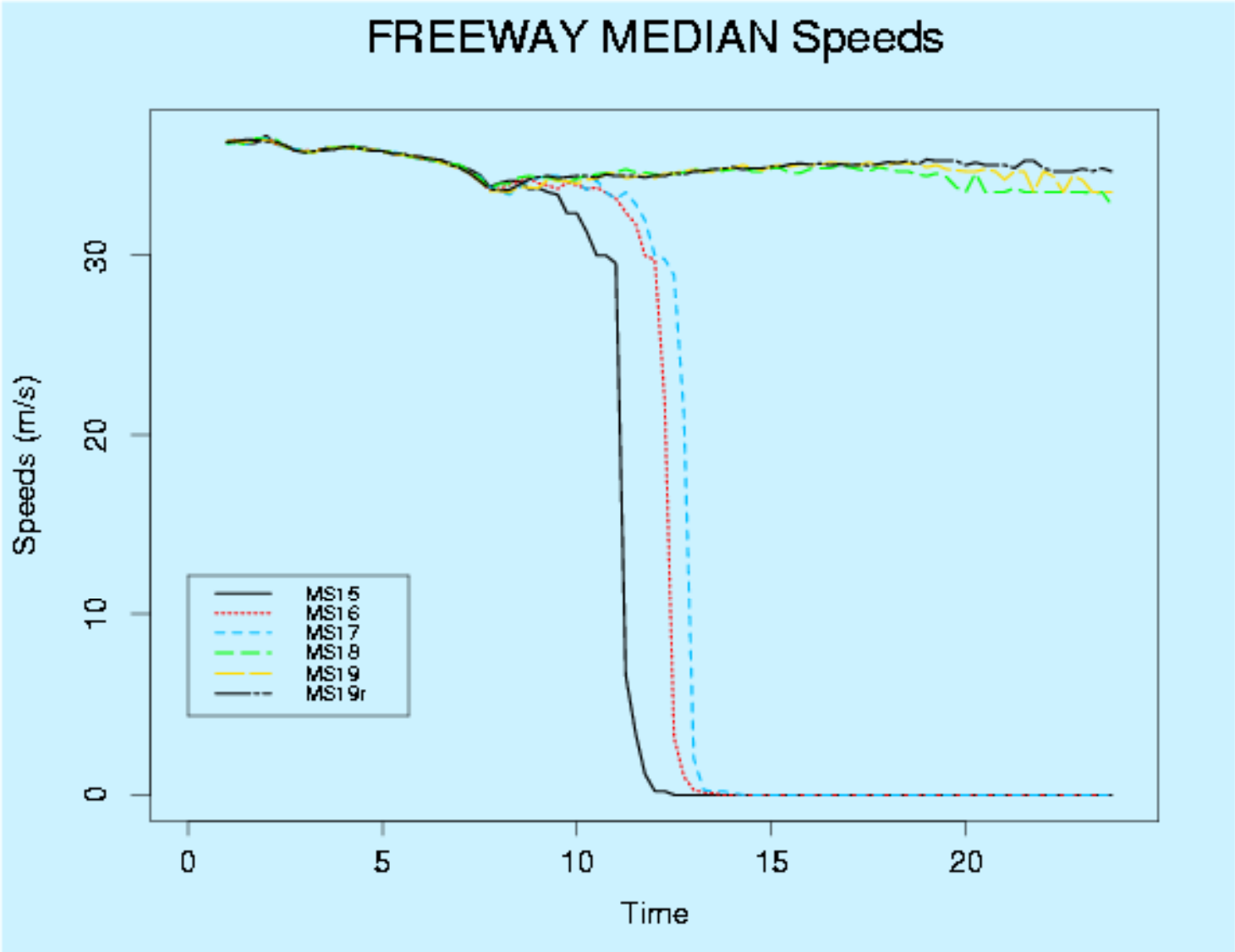

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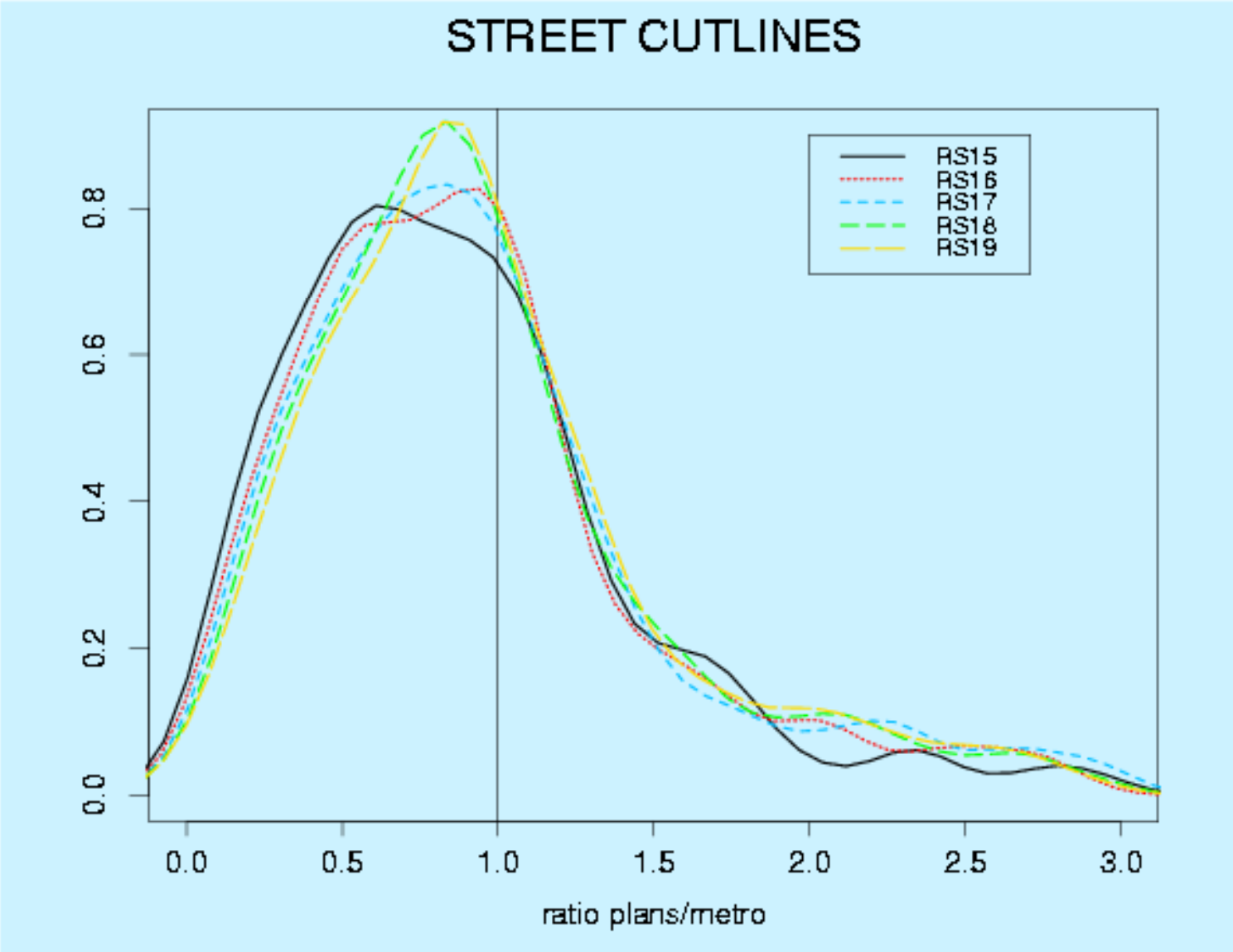

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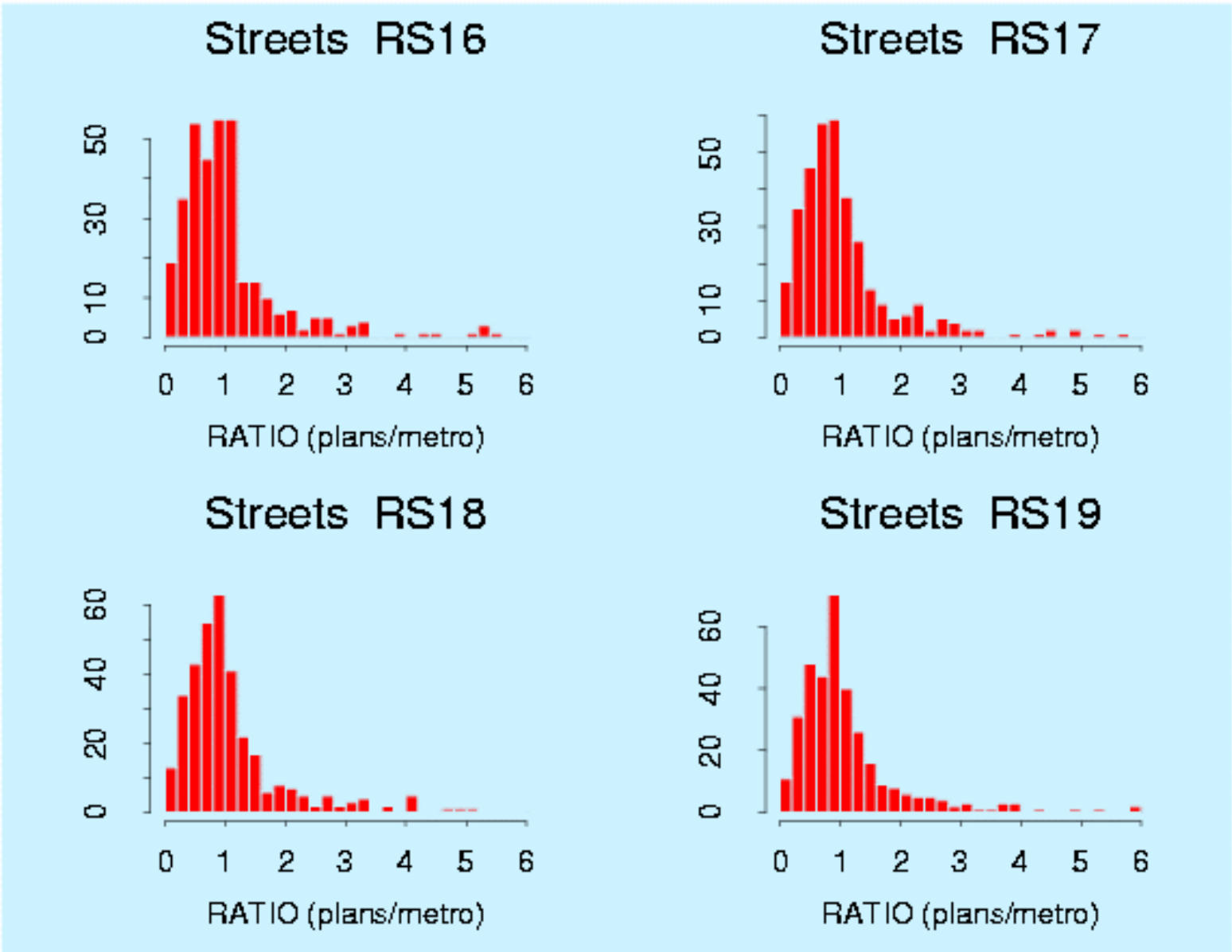
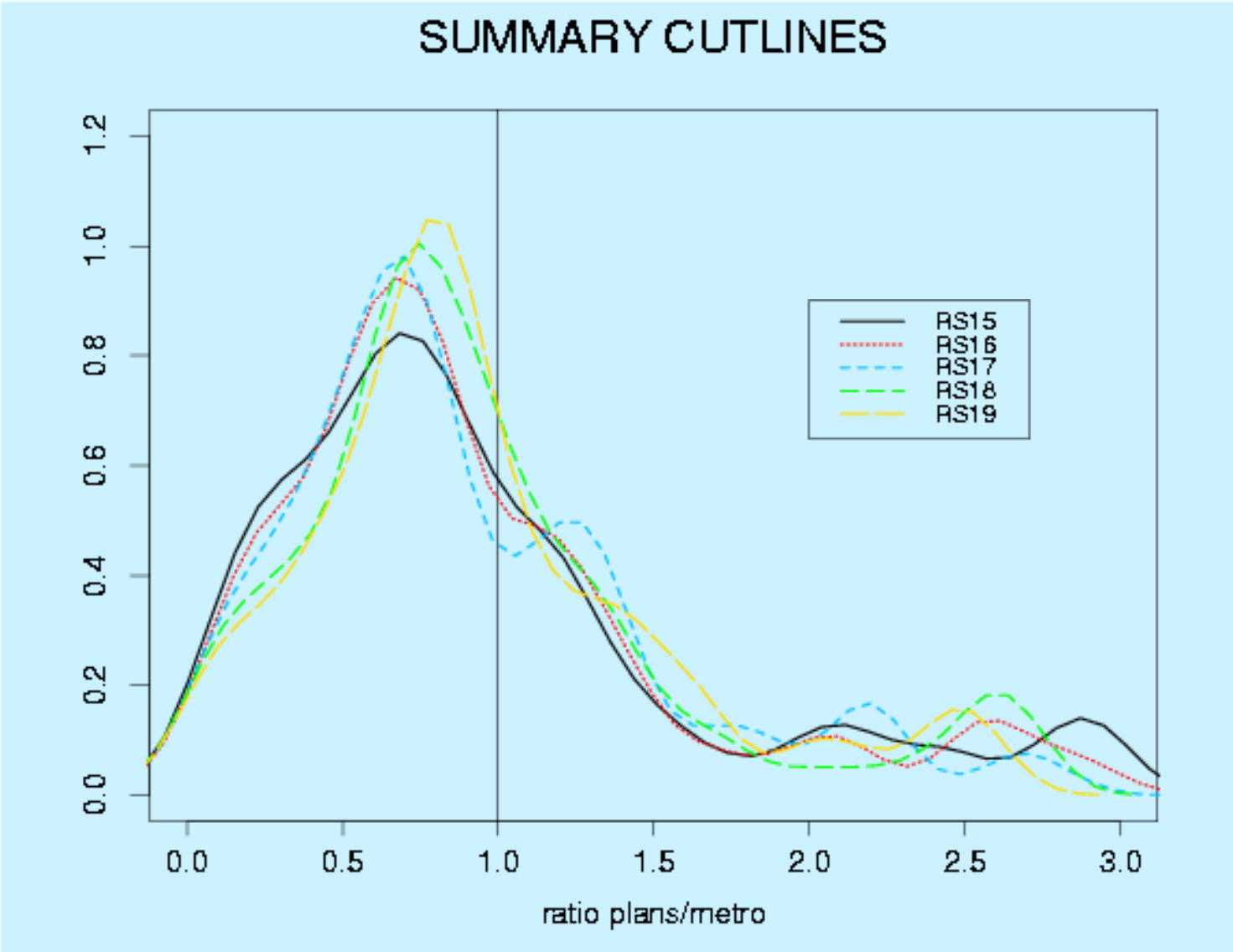
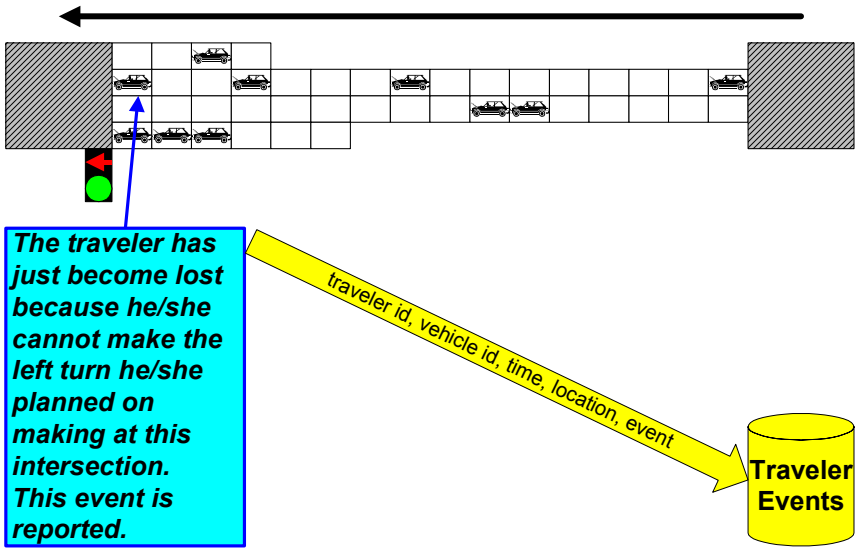
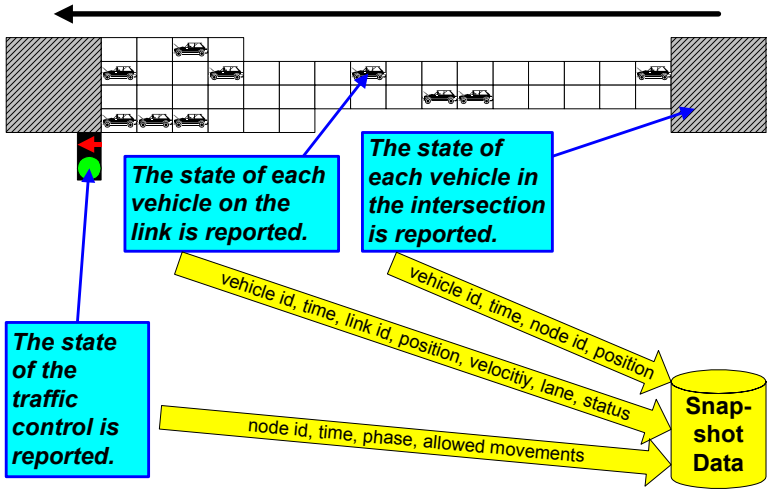


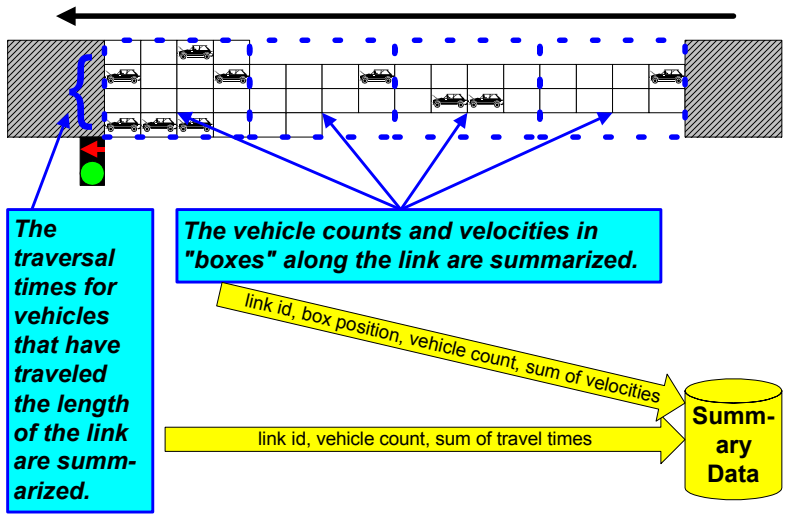
Stabilization



Microsimulation: Output Types







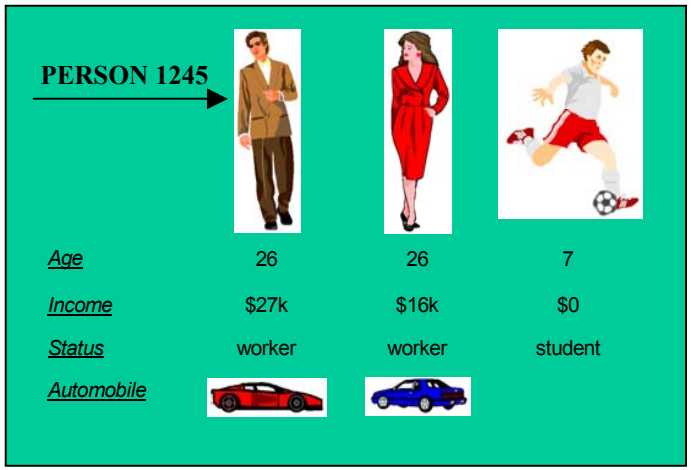
An Event File

DISTANCE	LEG	LINK	LOCATION	NODE	STATUS	TIME	TIMESUM	TRAVELEI	TRIP	VEHICLE
0	1	128164	858164	0	67108924	0	0	13086	1	0
0	1	128164	858164	0	67108920	30906	0	13086	1	0
0	1	128164	858164	0	67108924	30906	0	13086	2	0
0	1	128164	768164	0	16424	30934	0	13086	2	0
0	2	128164	768164	0	16396	30934	0	13086	2	0
0	2	128164	768164	0	28676	30935	0	13086	2	0
135	2	128164	768164	0	21252	30935	0	13086	2	13084
135	2	128164	768164	0	23812	30935	0	13086	2	13084
0	2	128164	768164	0	25860	30935	0	13086	2	13084
270	2	128164	0	128164	1286	30940	5	13086	2	13084
495	2	128165	0	128165	1286	30956	21	13086	2	13084
720	2	128166	0	128166	1286	30972	37	13086	2	13084
945	2	128167	0	128167	1286	30987	52	13086	2	13084
1170	2	318250	0	318250	1286	30997	62	13086	2	13084
1395	2	318240	0	318240	1286	31007	72	13086	2	13084
1620	2	228240	0	228240	1286	31020	85	13086	2	13084
1845	2	228241	0	228241	1286	31034	99	13086	2	13084
2070	2	228242	0	228242	1286	31050	115	13086	2	13084
2295	2	228243	0	228243	1286	31065	130	13086	2	13084
2520	2	228244	0	228244	1286	31082	147	13086	2	13084
2407.5	2	118235	0	118235	1286	31088	153	13086	2	13084
2407.5	2	118235	738235	0	18692	31088	153	13086	2	13084
2407.5	2	118235	738235	0	16900	31088	153	13086	2	13084
2407.5	2	118235	738235	0	16392	31088	153	13086	2	0
0	3	118235	738235	0	16428	31088	0	13086	2	0
0	3	118235	838235	0	67108920	31098	0	13086	2	0
0	1	118235	838235	0	67108924	31098	0	13086	3	0
0	1	118235	838235	0	67108920	31099	0	13086	3	0
0	1	118235	838235	0	67108924	31099	0	13086	4	0

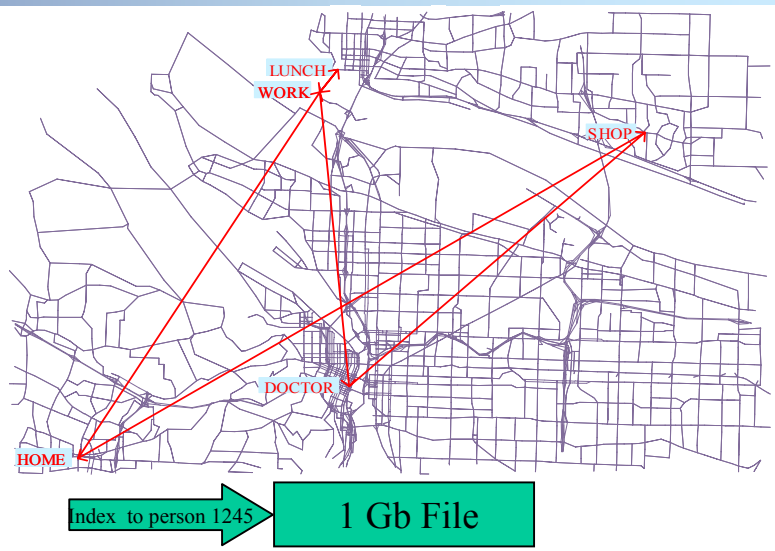
Status Bits

Time	TravID	Vehicle	Route	Interpretation
0	13086	0	0	begin leg,begin trip,non-motorized, at activity #858164
30906	13086	0	0	end leg,end trip,non-motorized, at activity #858164
30906	13086	0	0	begin leg,begin trip,non-motorized, at activity #858164
30934	13086	0	0	end leg,non-motorized,at parking #768164 on link #128164
30934	13086	0	0	begin leg,at parking #768164 on link #128164
30935	13086	13084	-1	on leg,in vehicle,driving,end waiting,at parking #768164 on link #128164
30935	13086	0	0	on leg,begin waiting,at parking #768164 on link #128164
30935	13086	13084	-1	on leg,enter vehicle,waiting,at parking #768164 on link #128164
30935	13086	13084	-1	on leg,in vehicle,begin driving,waiting,at parking #768164 on link #128164
30940	13086	13084	-1	leave link #128164 at node #128164,on leg,in vehicle,driving
30956	13086	13084	-1	leave link #128165 at node #128165,on leg,in vehicle,driving
30972	13086	13084	-1	leave link #128166 at node #128166,on leg,in vehicle,driving
30987	13086	13084	-1	leave link #128167 at node #128167,on leg,in vehicle,driving
30997	13086	13084	-1	leave link #318250 at node #318250,on leg,in vehicle,driving
31007	13086	13084	-1	leave link #318240 at node #318240,on leg,in vehicle,driving
31020	13086	13084	-1	leave link #228240 at node #228240,on leg,in vehicle,driving
31034	13086	13084	-1	leave link #228241 at node #228241,on leg,in vehicle,driving
31050	13086	13084	-1	leave link #228242 at node #228242,on leg,in vehicle,driving
31065	13086	13084	-1	leave link #228243 at node #228243,on leg,in vehicle,driving
31082	13086	13084	-1	leave link #228244 at node #228244,on leg,in vehicle,driving
31088	13086	0	0	begin leg,non-motorized,at parking #738235 on link #118235
31088	13086	13084	-1	leave link #118235 at node #118235,on leg,in vehicle,driving
31088	13086	13084	-1	on leg,leave vehicle,at parking #738235 on link #118235
31088	13086	13084	-1	on leg,in vehicle,end driving,at parking #738235 on link #118235
31088	13086	0	0	end leg,at parking #738235 on link #118235
31098	13086	0	0	begin leg,begin trip,non-motorized, at activity #838235
31098	13086	0	0	end leg,end trip,non-motorized, at activity #838235
31099	13086	0	0	end leg,end trip,non-motorized, at activity #838235

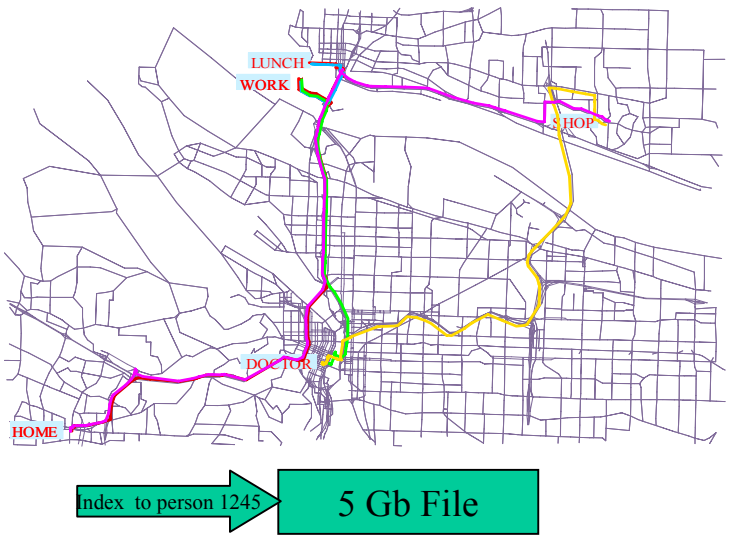
Indexed Files



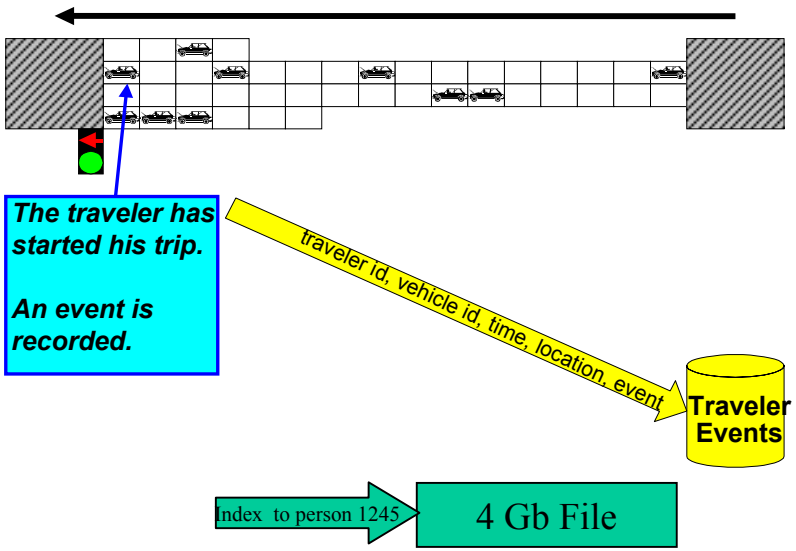
POPULATION FILE



ACTIVITY FILE



ROUTE FILE



EVENT FILE

TRANSIMS

Indexed Files

Data File Type	Extension	Major, Minor Sort Keys	Creator(s)	User(s)
Population file	*.hh.idx*	Household ID	Activity Generator/ Regenerator, Collator, IndexPopulationFile	Activity Generator/ Regenerator, Route Planner, Iteration Database
Population file	*.hm.idx*	Home Location	Activity Generator/ Regenerator Collator, IndexPopulationFile	Iteration Database
Activity file	*.hh.idx*	Household ID, Person ID	Activity Generator, IndexActivityFile	Route Planner, Iteration Database
Activity file	*.trv.idx*	Person ID, Household ID	Activity Generator, IndexActivityFile	Traffic Microsimulator, Iteration Database
Plan file	*.trv.idx*	Traveler ID, Activation Time	Route Planner, IndexPlanFile	Traffic Microsimulator, Iteration Database
Plan file	*.tim.idx*	Activation Time, Traveler ID	PlanFilter, IndexPlanFile	Traffic Microsimulator
Vehicle file	*.veh.idx*	Vehicle ID, Household ID	Population Synthesizer, IndexVehicleFile	Activity Generator/ Regenerator, Route Planner, Traffic Microsimulator
Vehicle file	*.hh.idx*	Household ID, Vehicle ID	IndexVehicleFile	Activity Generator/ Regenerator
Travel Time file	*.zn.idx*	Zone 1 Number, Zone 2 Number	Activity Generator/ Regenerator, IndexTravelTimeFile, Zone Travel Time Generator	Activity Generator/ Regenerator, Zone Travel Time Generator
Event Output	*.trv.idx*	Traveler ID, Trip ID	IndexEventFile	Iteration Database
Event Output	*.loc.idx*	Location ID, Traveler ID	IndexEventFile	Iteration Database

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1. TRANSIMS Technology
2. TRANSIMS FRAMEWORK
   - Network
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3. Meta-Methods, Methods, Calibration, Models
4. Modeling Tools
   - Activity Regenerator
   - Collator
   - Stratifier
   - Selector
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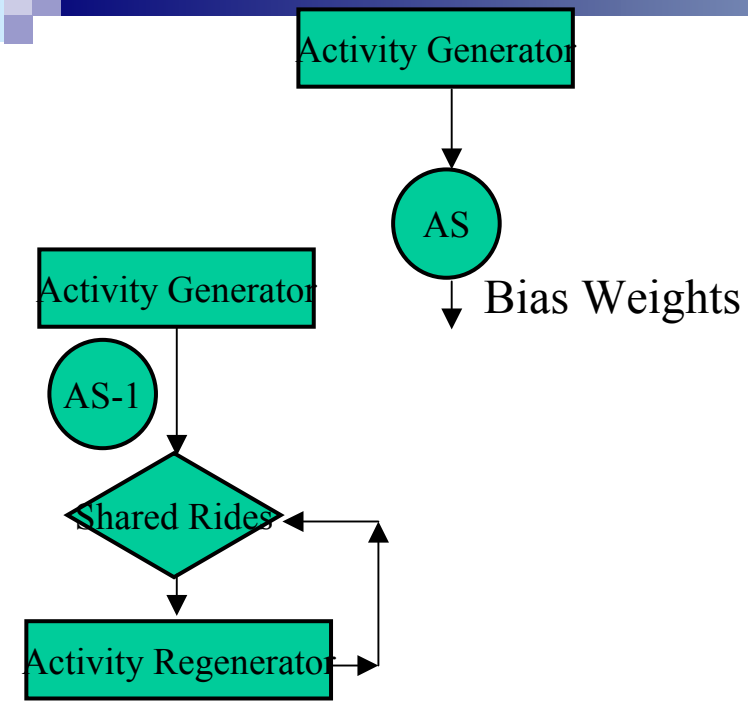
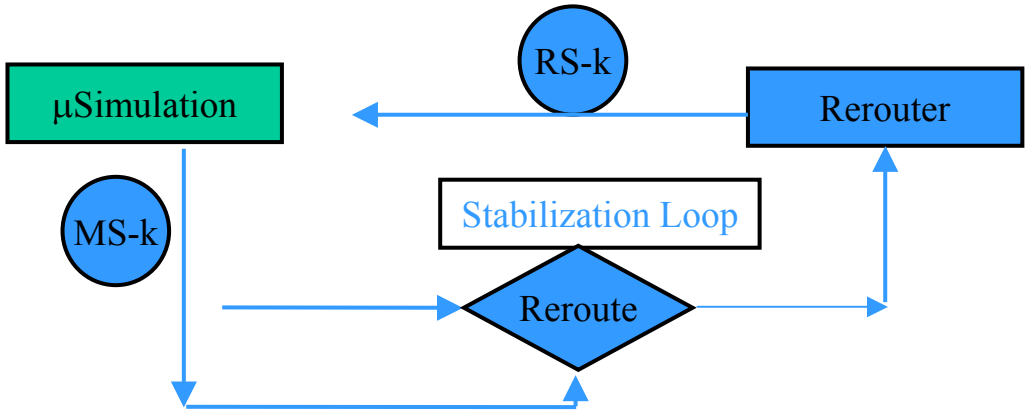
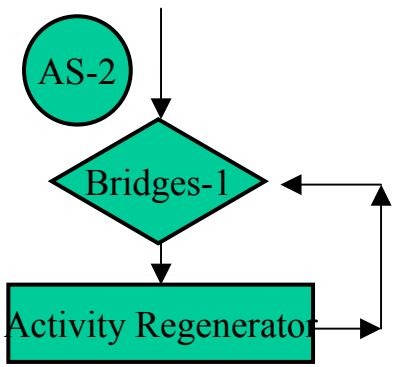
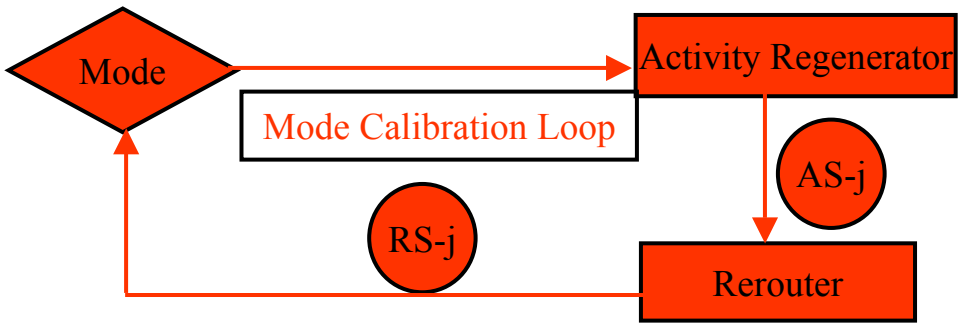
   - Survey Household Weights
   - School Buses
   - Shared Rides
   - Trip Length
   - Bridge Crossings
   - Modes
7. Summary

Meta-Methods Using TRANSIMS

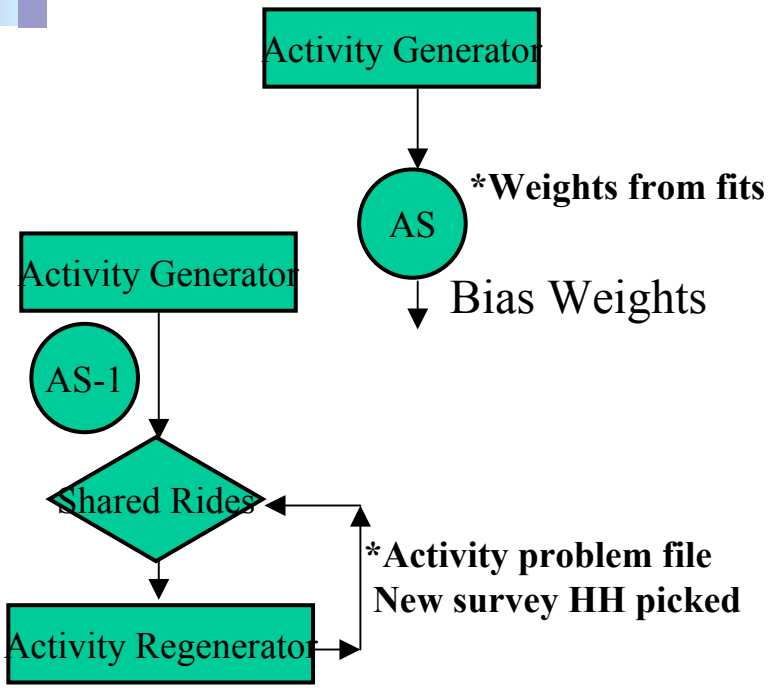


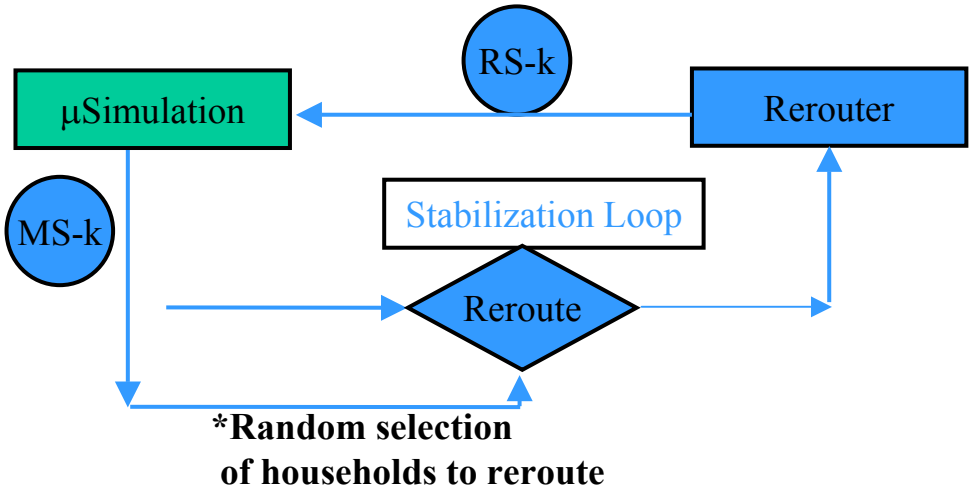


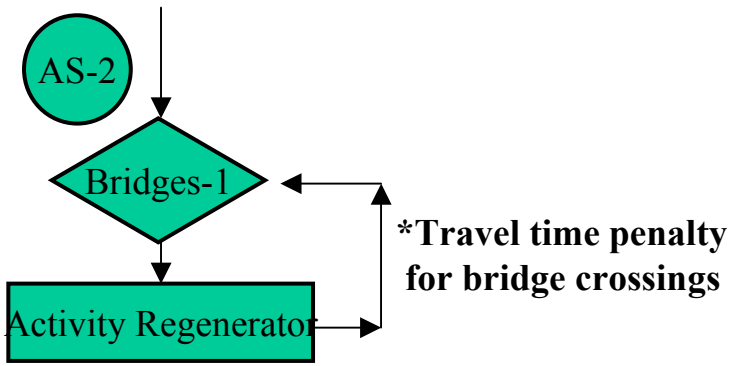


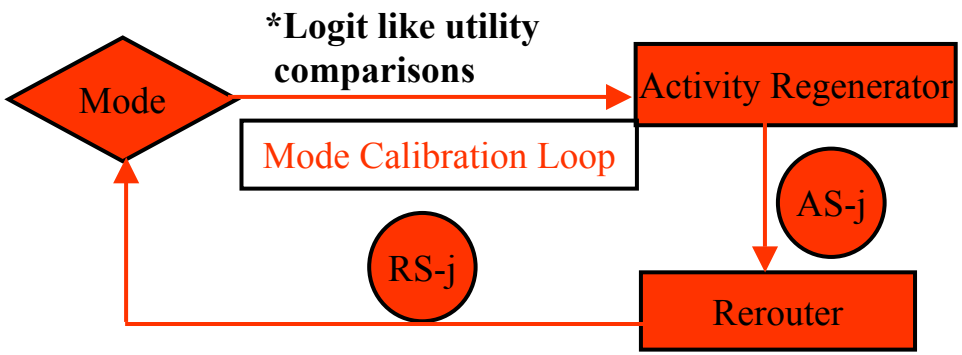


Methods Using TRANSIMS



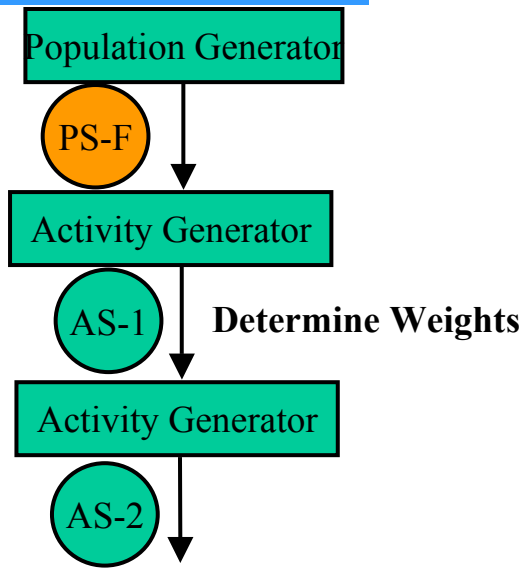






Calibration In TRANSIMS

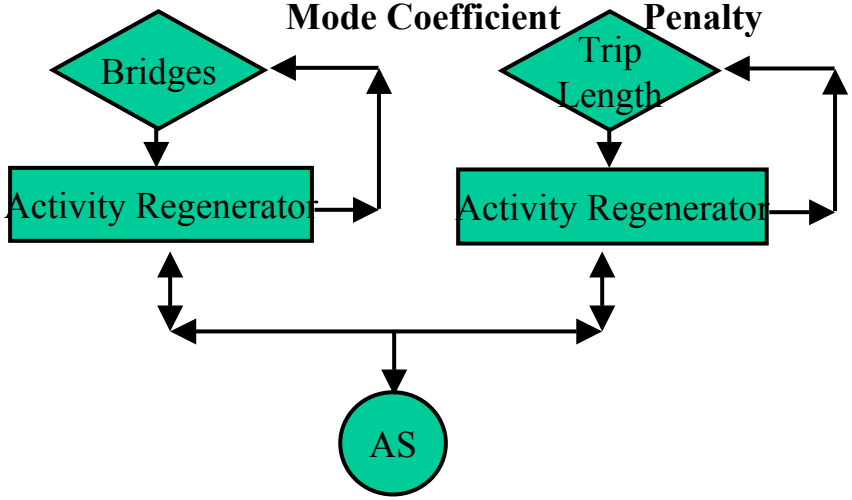
Determine Survey Household Weights



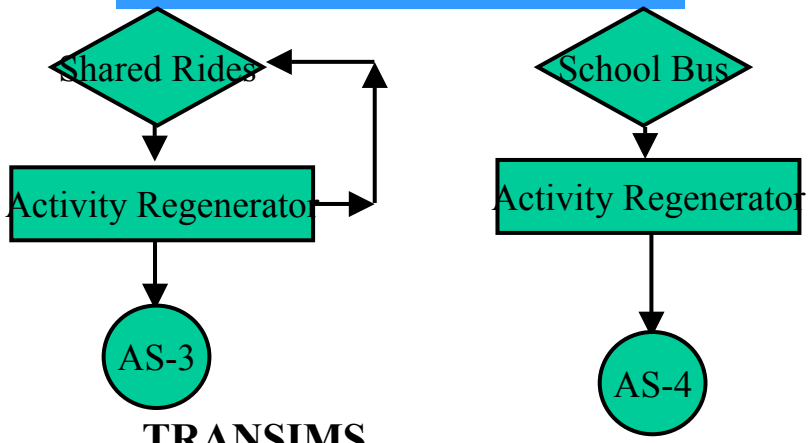
Determine Location Choice Parameters in the Equation

$$\exp(a(L) + b_m(t(H,L) - c))$$

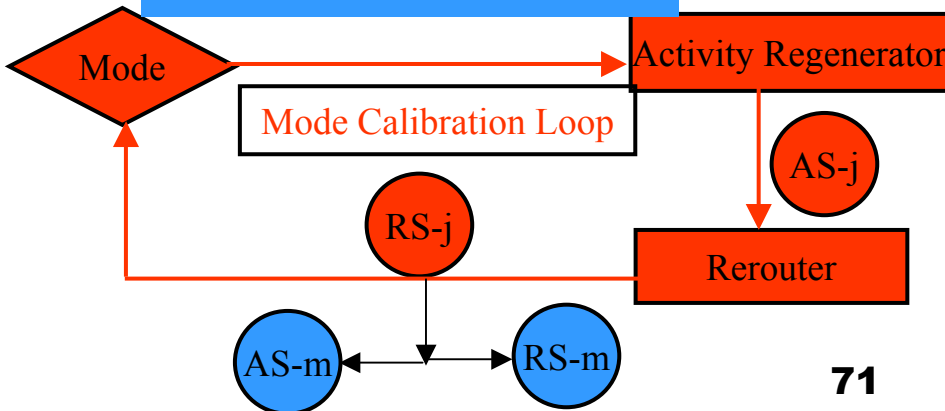
Mode Coefficient Penalty



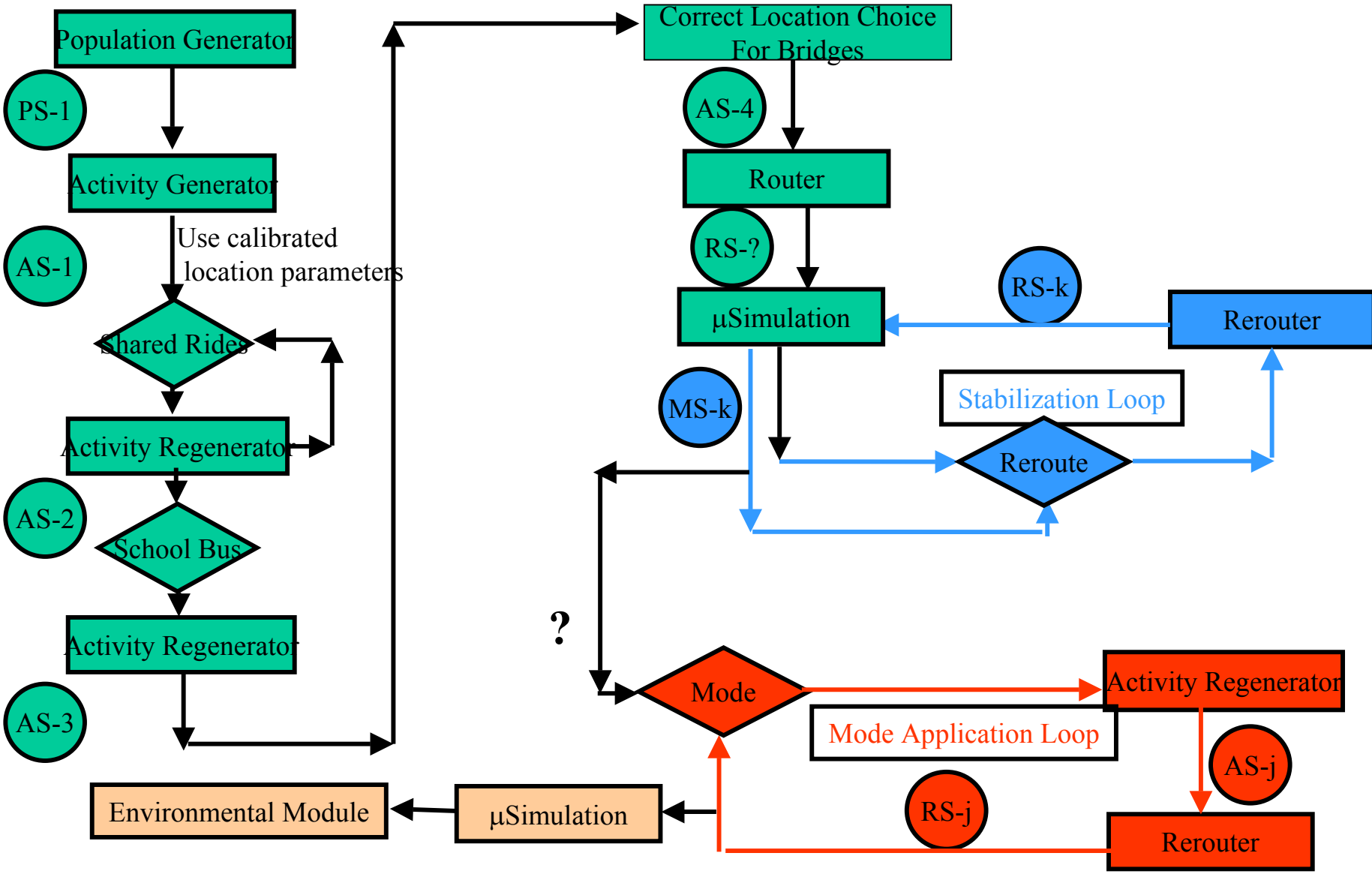
Some "Fix It" Procedures



Determine Mode Choice Parameters/Functions



A Forecast Year Model



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Modeling Tools In TRANSIMS

Activity Regenerator, Collator, Stratifier and Selector

Collator

The iteration database:

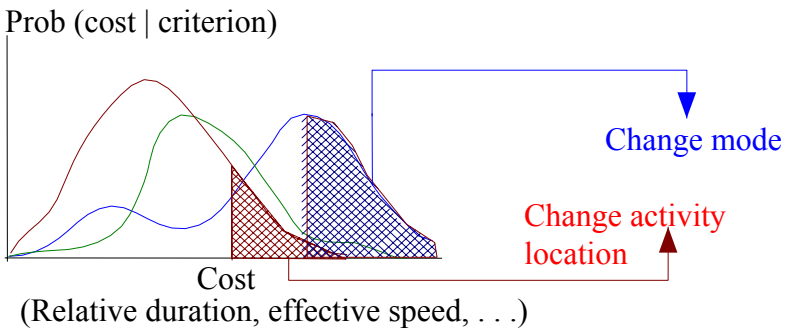
Traveler	Income	Mode	>1 hour?	Cross river?	Relative duration	. . .
291362	$25K	bus	no	yes	1.2	. . .
291363	$34K	car	yes	no	1.6	. . .
291364	$42K	car	no	yes	1.1	. . .
291365	$ 0K	walk	no	no	1.0	. . .
291366	$38K	car	yes	yes	2.3	. . .
291367	$45K	bus	yes	no	1.4	. . .
291368	$30K	car	yes	yes	1.3	. . .

Stratifier

"Bins" lines in the iteration database with similar characteristics

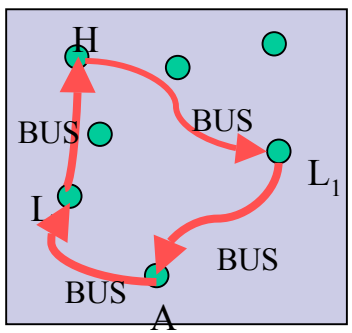
Selector

Selection criterion:	Selects travelers:
bus trips with income >$40K	291367
short trips crossing the river	291362 291364
long car trips not crossing the river, relative duration > 1.3	291363

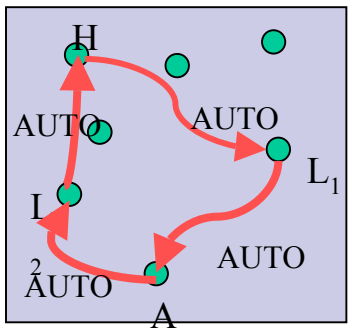


Activity Regenerator

Changes entries in activity lists
Writes partial activity files

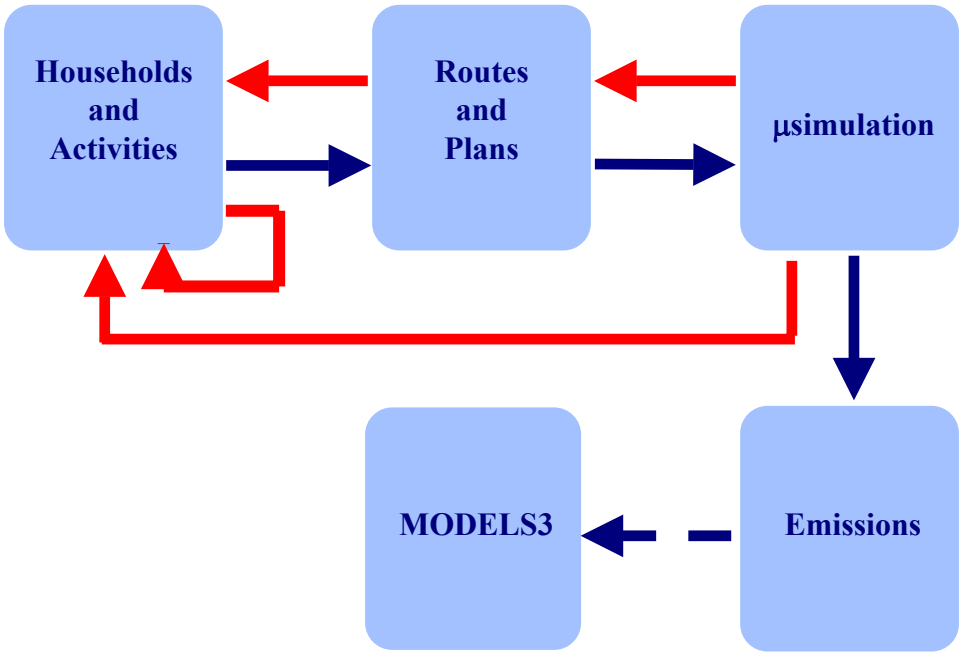


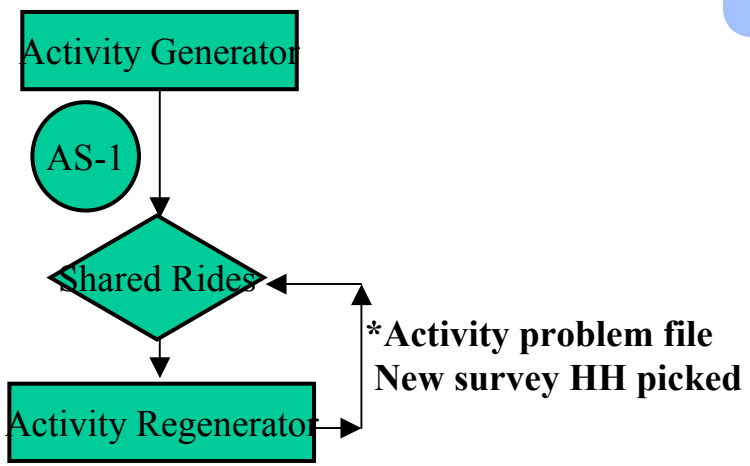
Base Case



After Mode Change

Activity Regenerator





Why Activity Regenerator?

- Simple Input
- Correct Output Format
- Uses Index File
- Shared Rides Maintained

Activity Regenerator

The Activity Regenerator Modifies The Activity List

Usage:

ActivityRegenerator <Configuration File>

Configuration File:

Configuration File Key	Description
ACT_FEEDBACK_FILE	The file containing a list of travelers and associated commands for activity regeneration.
ACT_PARTIAL_OUTPUT	The file that contains the requested activities.

Command Format:

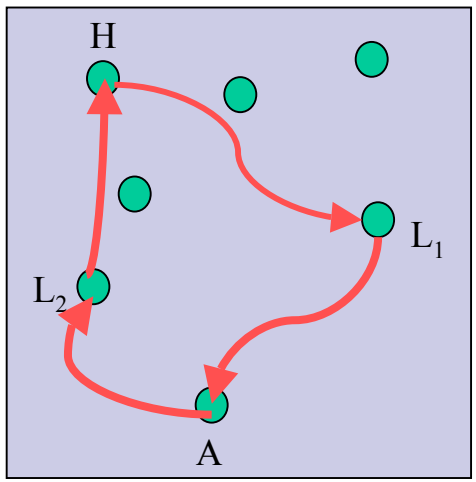
<Household Id> <Activity Id> <Command> [<command parameters>]

Activity Regenerator Commands

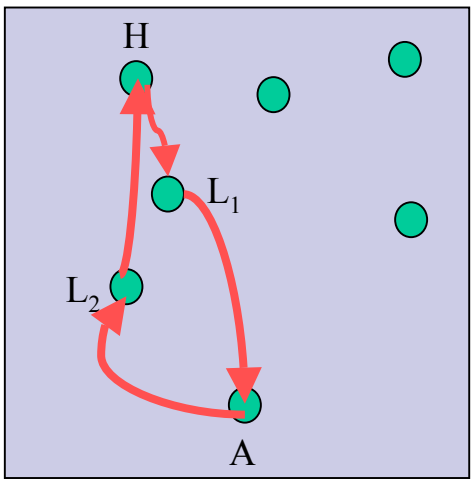
Location Change

`L [<mode coefficient multiplier]` – change the location for the activity. Other activities may also be affected by the location change of an anchor activity as specified by the activity type. The mode coefficient in the location choice methods will be multiplied by the optional command parameter.

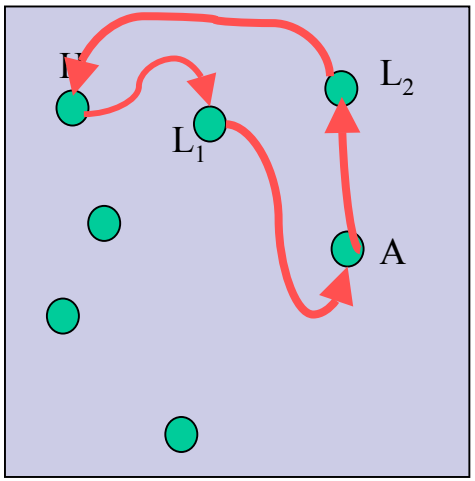
$$\exp(a(L) + \alpha b_m t(H, L))$$



Base Case



Change L_1



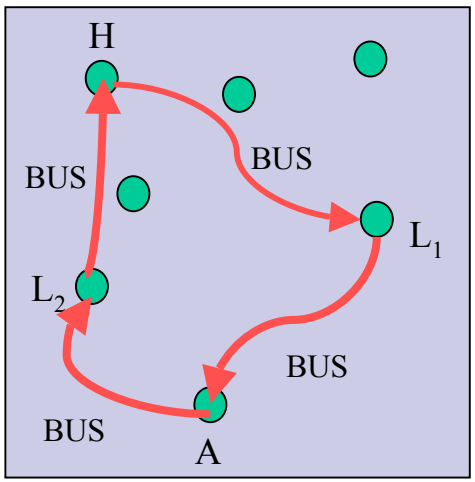
Change Anchor

Activity Regenerator Commands

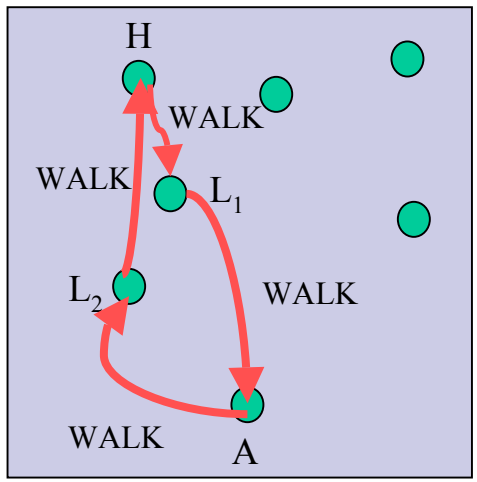
Location and Mode Change

`LM <mode value>` – change the mode for the activity to the mode value and then change the location for the activity. Action is identical to those of the combined M and L commands.

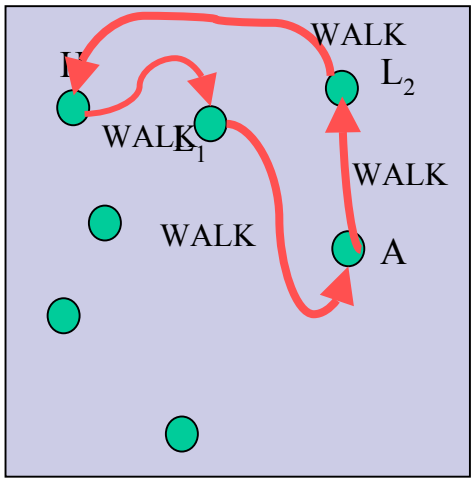
$$\exp(a(L) + b_{m^*} t(H, L))$$



Base Case



Change L_1



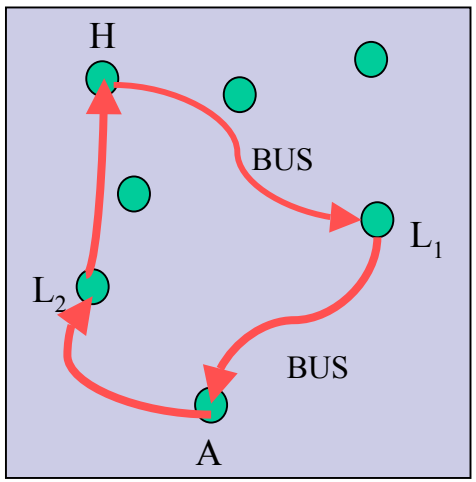
Change Anchor

Activity Regenerator Commands

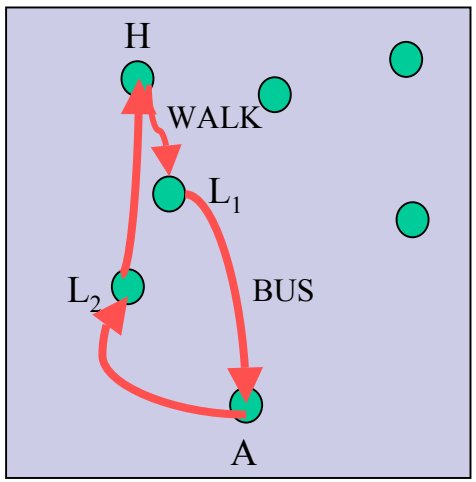
Location and Mode Change

`LMS <mode> [mode coefficient multiplier]` – change the mode to the specified mode then choose a new location for the specified activity. Other activities in the activity list are not changed by this command.

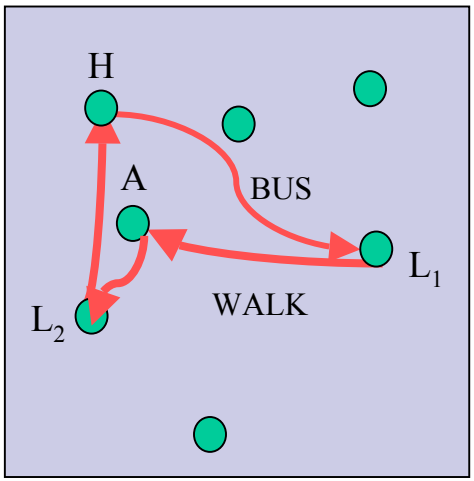
$$\exp(a(L) + b_{m^*} t(H, L))$$



Base Case



Change L_1



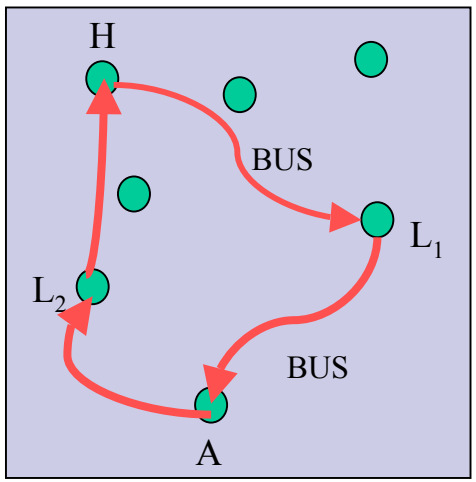
Change Anchor

Activity Regenerator Commands

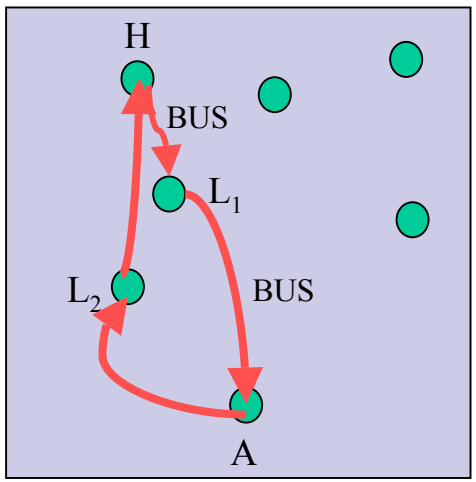
Location Change

`LS [mode coefficient multiplier]` – change the location of a single activity. No other activities in the person's activity list will be changed.

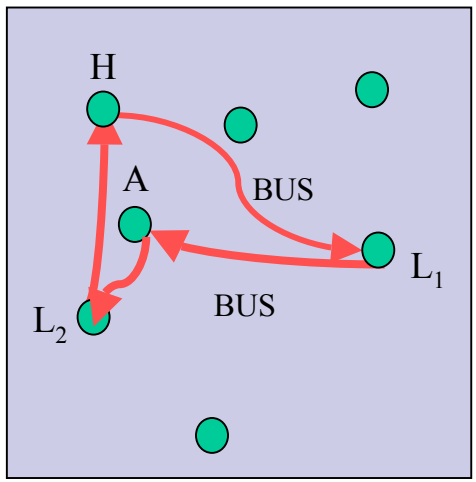
$$\exp(a(L) + \alpha b_m t(H, L))$$



Base Case



Change L_1



Change Anchor

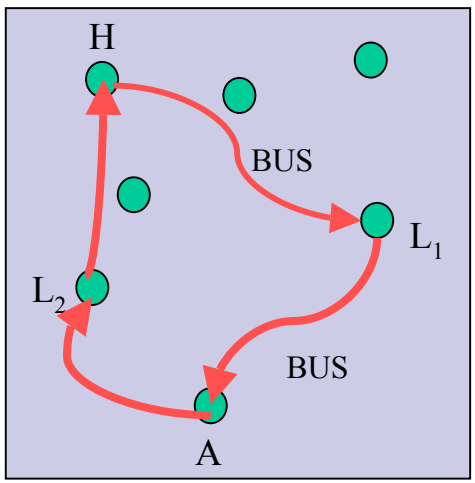
Activity Regenerator Commands

Location Change

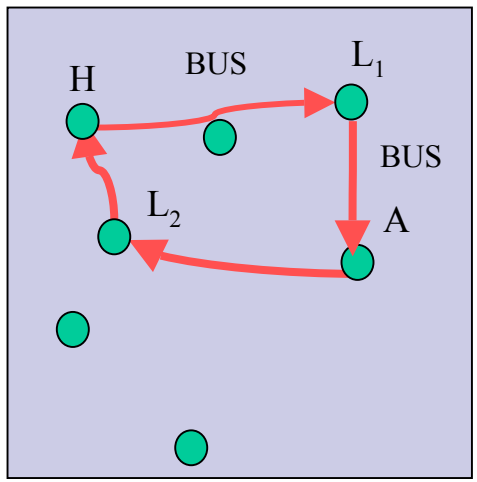
`LTR <starting activity id> [mode coefficient multiplier]` – change the locations of all activities within a tour. A tour is all activities between the specified starting activity and the end of the tour. The end of the tour is determined by the first occurrence of the following:

- another activity with the same location as the start activity,
- an activity at the home location, or
- the last activity in the traveler's activity list.

$$\exp(a(L) + \alpha b_m t(H, L))$$



Base Case



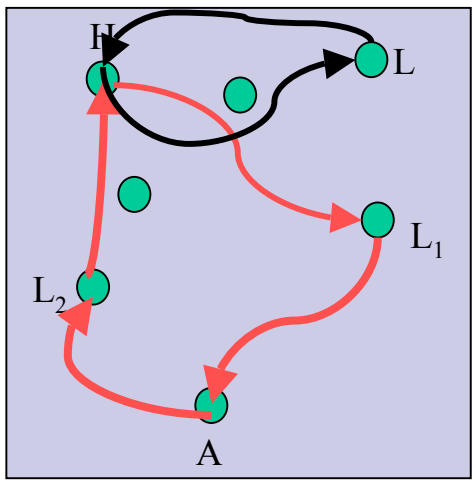
Change Tour Locations

Activity Regenerator Commands

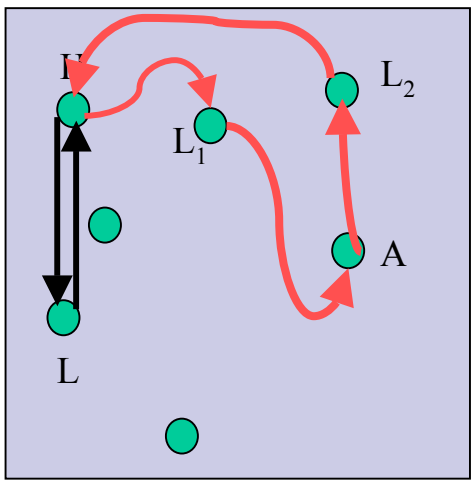
Location Change

`LH [mode coefficient multiplier]` – change the locations of all of the household's activities except activities located at home.

$$\exp(a(L) + \alpha b_m t(H, L))$$



Base Case



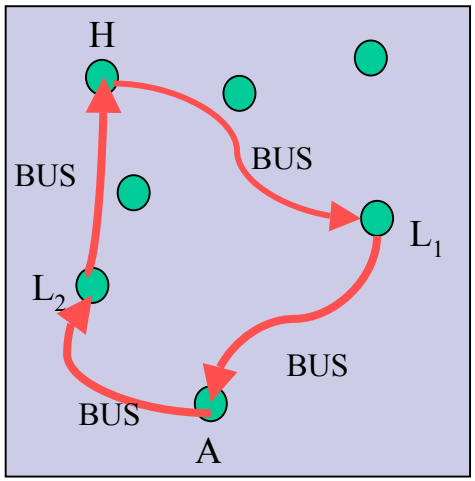
Change All

Activity Regenerator Commands

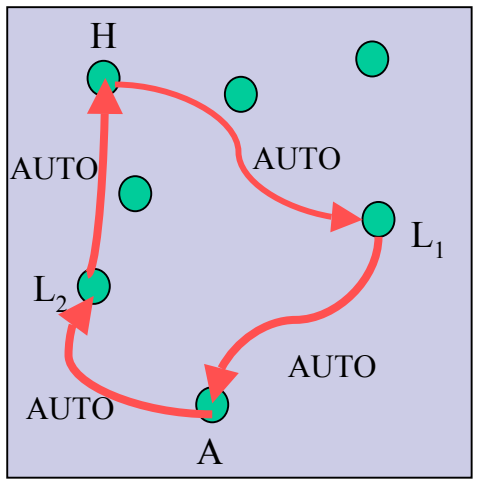
Mode Change

`M <mode value> [replacement mode list]` – change the mode for the activity to the integer mode value and make other activities on this home-to-home tour consistent with the new mode choice.

No Location Changes



Base Case



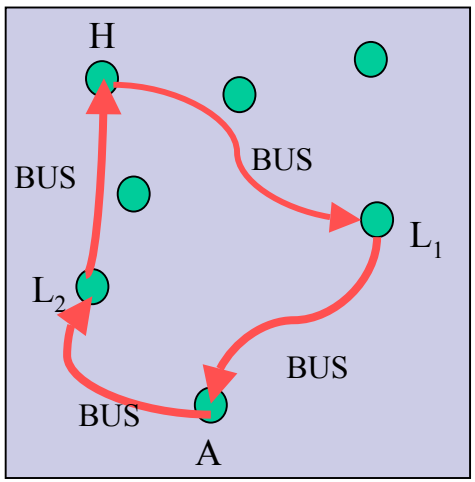
After Mode Change

Activity Regenerator Commands

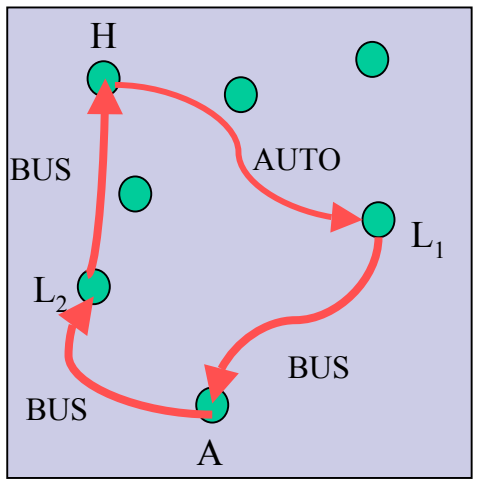
Mode Change

`MS <mode value>` -- change the mode for the activity to the integer mode value. Modes to other activities are unchanged.

No Location Changes



Base Case



After L_1 Mode Change

Activity Regenerator Commands

`AP <priority>` – change the priority of the activity

`LTYS <type> [mode coefficient multiplier]` – change the activity type to the specified type then chose a new location for the activity. Other activities in the activity list are not changed by this command.

`T <start time> [<end time>] [<alpha parameter>] [<beta parameter>]` – change the time for the activity to start time and if specified, end time with alpha and beta parameters on the time range.

`TY <activity type>` – change the type for the activity to the specified type.

`U` – update the activity times for the household. Activity times will be adjusted based on the latest travel time information.

`TP <priority>` – change the time priority of the activity.

Activity Regenerator Commands

R – regenerate the entire activity list for the household by rematching with a survey household.

WORKERS=0

HHSIZE=1
- HHAGE<38.5 **(34)(34,0)**
- HHAGE>38.5 **(319)(319,0)**

HHSIZE=2
- HHAGE<53.5
  - INCOME<5.5 **(25)(12,13)**
  - INCOME>5.5 **(15)(12,3)**
- HHAGE>53.5 **(268)(267,1)**

HHSIZE>2 (32)(8,24)

WORKERS=1

HHSIZE=1 (705)(705,0)

HHSIZE=2
- A5-15=0 **(304)(291,13)**
- A5-15>0 **(48)(0,48)**

HHSIZE=3
- A5-15<=1
  - HHAGE<29.5 **(18)(1,17)**
  - HHAGE>29.5 **(89)(36,53)**
- A5-15>1 **(24)(0,24)**

HHSIZE=4
- A5-15<=1 **(73)(4,69)**
- A5-15>1 **(49)(0,47)**

HHSIZE>4
- A5-15<=2 **(40)(1,39)**
- A5-15>2 **(27)(0,27)**

WORKERS=2

HHSIZE=2 (677)(677,0)

HHSIZE=3 (248)(78,170)

HHSIZE=4
- ALT5=0
  - A26-45=0 **(21)(8,13)**
  - A26-45>0 **(134)(7,127)**
- ALT5>0 **(69)(0,69)**

HHSIZE>4
- A5-15<=2 **(49)(1,48)**
- A5-15>2
  - HHDensity<1.29 **(18)(0,18)**
  - HHDensity>1.29 **(19)(0,19)**

WORKERS>2

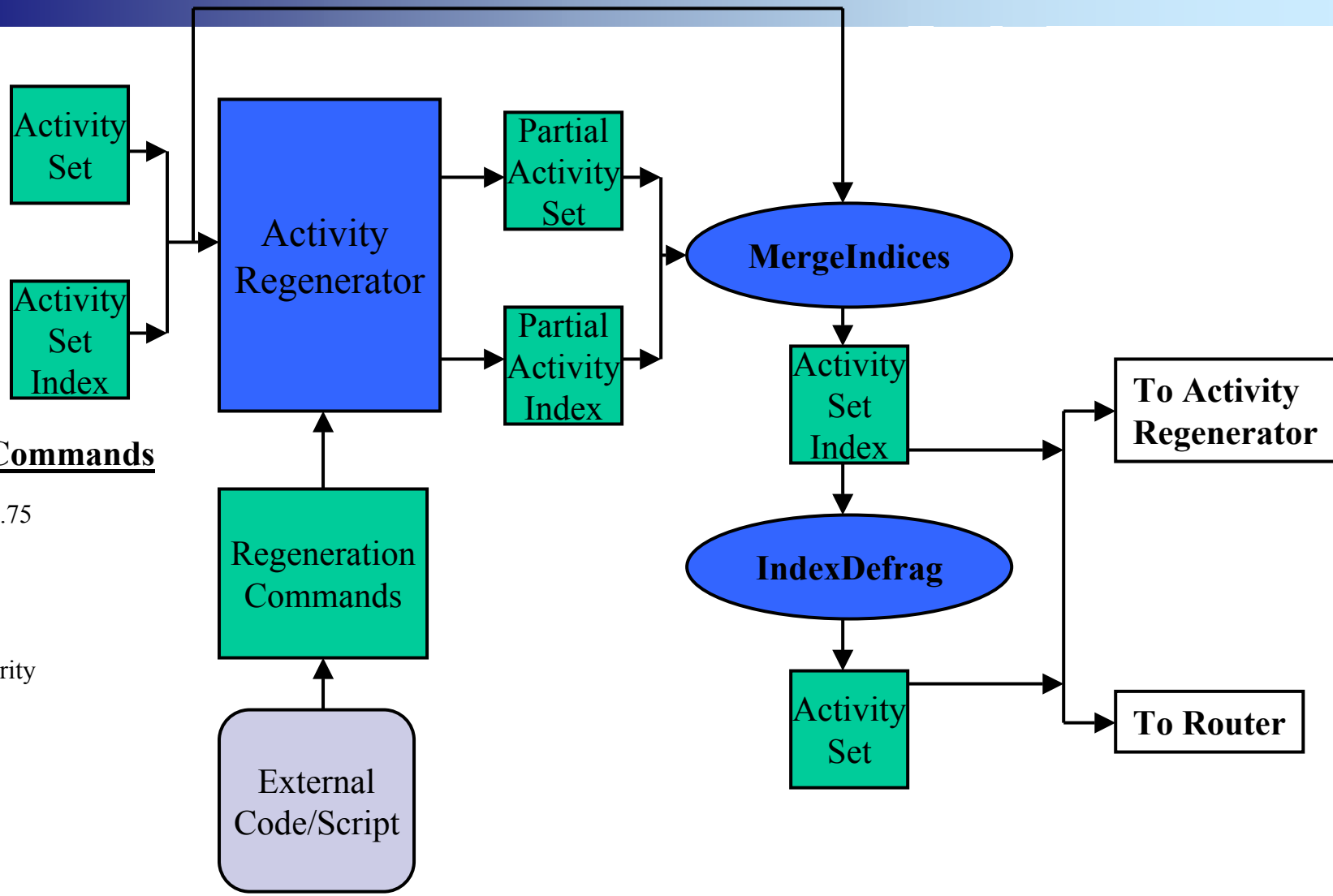
HHSIZE=3 (75)(75,0)

HHSIZE=4
- HHAGE<46.5 **(28)(17,11)**
- HHAGE>46.5 **(24)(18,6)**

HHSIZE>4 (43) (10,33)

KEY
(32)(8,24)
32 households
8 with no nondriving children
24 with nondriving children

TRANSIMS Technology



Regenerator Commands

10275 4 LM .75

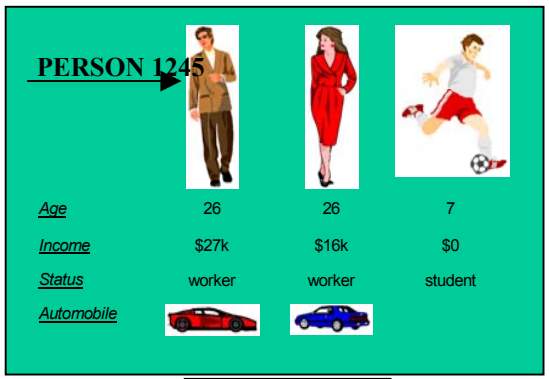
Single
- mode
- location*
- activity priority
- time

Tour
- locations
- modes
- travel times

Every thing
- get a new activity list

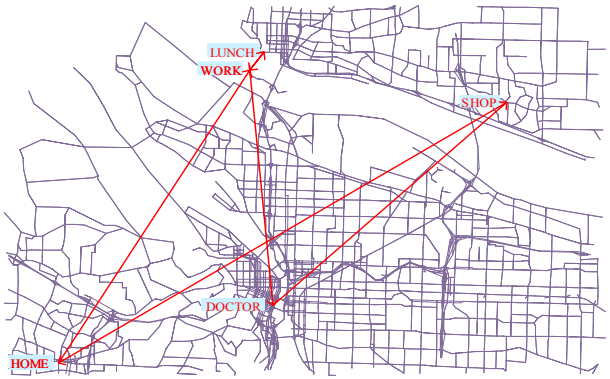
Collator

Collator Combines Data From TRANSIMS Output and Network Files



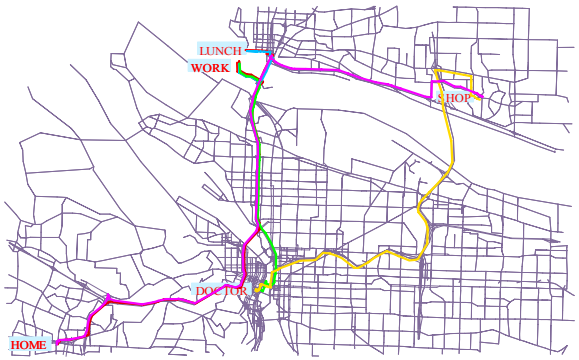
Index to person 1245 → 120 Mb File

POPULATION FILE



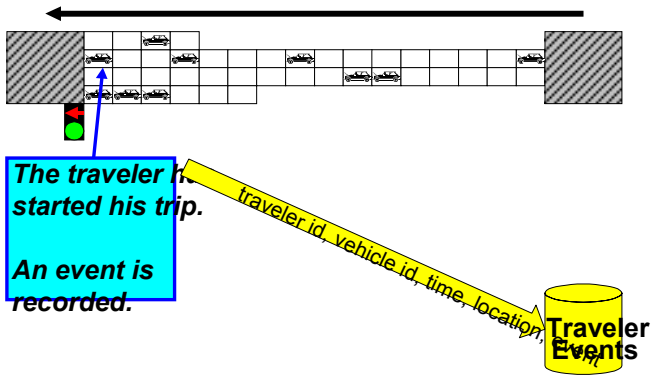
Index to person 1245 → 1 Gb File

ACTIVITY FILE



Index to person 1245 → 5 Gb File

ROUTE FILE



Index to person 1245 → 4 Gb File

EVENT FILE

Command:
Collator <config file>

Example Collator Commands

Command:
Collator <Configuration file>

Configuration Keys

SEL_UAZ_FILE_1 $TRANSIMS_ROOT/network/rivers.polygons **External polygon file delineates rivers**

1 SEL_USE_AGE 1 **Age from the population file**

2 SEL_USE_START_IN_REGION 1, 1 **Start in region 1 of polygon set 1?**

3 & 4 SEL_USE_END_IN_REGION 1, 2; 1, 3 **End in region 2 or region 3 of polygon set 1**

5 SEL_USE_START_REGION 1 **Origin polygon**

6 SEL_USE_END_REGION 1 **Destination polygon**

7 SEL_USE_CROSS_BOUNDARY 1 **Are origin and destination in different polygons?**

8 SEL_USE_DURATION 1 **Duration of activity or trip from Router**

9 & 10 SEL_USE_T_MODE w; c **Travel time (Router) for car and for walk**

11 SEL_USE_RATIO T_MODE_c, T_MODE_w **Ratio of travel time (Router) for car and travel time for walk**

12 SEL_USE_AND START_IN_REGION_1_1, END_IN_REGION_1_2; **Start in region 1, end in 2 of polygon set 1?**
13 START_IN_REGION_1_1, END_IN_REGION_1_3 **Start in region 1, end in 3 of polygon set 1?**

Example Iteration Database

HH	TRAV	TOUR	SUBTOUR	TRIP	START_ACT_ID	END_ACT_ID	1 AGE	2 START_IN_REGION_1_1	3 END_IN_REGION_1_2	4 END_IN_REGION_1_3
2	4	0	0	1	1	1	59	TRUE	FALSE	FALSE
2	4	1	0	2	1	2	59	TRUE	TRUE	FALSE
2	4	1	0	3	2	2	59	FALSE	TRUE	FALSE
2	4	1	0	4	2	3	59	FALSE	FALSE	FALSE
2	4	1	0	5	3	3	59	TRUE	FALSE	FALSE
2	4	2	0	6	3	4	59	TRUE	FALSE	FALSE
2	4	2	0	7	4	4	59	TRUE	FALSE	FALSE
2	4	2	0	8	4	5	59	TRUE	FALSE	FALSE
2	4	2	0	9	5	5	59	TRUE	FALSE	FALSE
2	5	0	0	1	6	6	56	TRUE	FALSE	FALSE
64	198	0	0	1	1	1	63	TRUE	FALSE	FALSE
64	198	1	0	2	1	2	63	TRUE	FALSE	FALSE
64	198	1	0	3	2	2	63	TRUE	FALSE	FALSE
64	198	1	0	4	2	3	63	TRUE	FALSE	FALSE

5 START_REGION_1	6 END_REGION_1	7 CROSS_BOUND_1	8 DURATION	9 T_MODE_w	10 T_MODE_c	11 *RATIO_T	12 AND_START_IN*(1)	13 AND_START_IN*(2)
1	1	FALSE	28688	0	0	NA	FALSE	FALSE
1	2	TRUE	1012	46	966	21	TRUE	FALSE
2	2	FALSE	31385	0	0	NA	FALSE	FALSE
2	1	TRUE	1018	46	972	21.13043	FALSE	FALSE
1	1	FALSE	4672	0	0	NA	FALSE	FALSE
1	1	FALSE	581	46	535	11.63044	FALSE	FALSE
1	1	FALSE	2479	0	0	NA	FALSE	FALSE
1	1	FALSE	583	46	537	11.67391	FALSE	FALSE
1	1	FALSE	57900	0	0	NA	FALSE	FALSE
1	1	FALSE	99242	0	0	NA	FALSE	FALSE
1	1	FALSE	27197	0	0	NA	FALSE	FALSE
1	1	FALSE	410	46	364	7.913044	FALSE	FALSE
1	1	FALSE	36222	0	0	NA	FALSE	FALSE
1	1	FALSE	408	46	362	7.869565	FALSE	FALSE

*RATIO_T_MODE_c_T_MODE_w

*(1) AND_START_IN_REGION_1_1_END_IN_REGION_1_2

*(2) AND_START_IN_REGION_1_1_END_IN_REGION_1_3

Collator Population Commands

Configuration File Key	Description
SEL_USE_<pop_file header field>	If set, directs the Collator to add the corresponding demographic variable from the population file to the output Iteration Database.
SEL_USE_BLOCK_GROUP	If set, directs the Collator to add the BLOCK_GROUP field from the population file to the output Iteration Database.
SEL_USE_HH_ID	If set, directs the Collator to add the HH_ID field from the population file to the output Iteration Database.
SEL_USE_HOME_LOCATION	If set, directs the Collator to add the HOME_LOCATION field from the population file to the output Iteration Database.
SEL_USE_NUMBER_PERSONS	If set, directs the Collator to add the NUMBER_PERSONS field from the population file to the output Iteration Database.
SEL_USE_NUMBER_VEHICLES	If set, directs the Collator to add the NUMBER_VEHICLES field from the population file to the output Iteration Database.
SEL_USE_PERSON_ID	If set, directs the Collator to add the PERSON_ID field from the population file to the output Iteration Database.
SEL_USE_TRACT	If set, directs the Collator to add the TRACT field from the population file to the output Iteration Database.

Some Collator Activity Commands

Configuration File Key	Description
SEL_USE_END_ACT_LOCATION	If set, directs the Collator to add the first of the possible locations from the activity file for the ending activity for the trip to the output Iteration Database
SEL_USE_END_ACT_TYPE	If set, directs the Collator to add the activity type from the activity file for the ending activity for the trip to the output Iteration Database
SEL_USE_END_MODE_PREF	If set, directs the Collator to add the mode preference from the activity file for the ending activity for the trip to the output Iteration Database
SEL_USE_START_ACT_ID	If set, directs the Collator to add the activity ID from the activity file for the starting activity for the trip to the output Iteration Database.
SEL_USE_START_ACT_LOCATION	If set, directs the Collator to add the first of the possible locations from the activity file for the starting activity for the trip to the output Iteration Database.
SEL_USE_START_ACT_TYPE	If set, directs the Collator to add the activity type from the activity file for the starting activity for the trip to the output Iteration Database.

Some Collator Router Commands

Configuration File Key	Description
SEL_USE_COST	If set, directs the Collator to add the cost from the Plan file for the trip to the output Iteration Database. Note that there are multiple legs in a trip, each of which contains a value for this field. The Collator will use the sum over all legs.
SEL_USE_DEP_TIME	If set, directs the Collator to add the departure time from the Plan file for the trip to the output Iteration Database. Note that there are multiple legs in a trip, each of which contains a value for this field. The Collator will use the first leg.
SEL_USE_DRIVER	If set, directs the Collator to add the driver flag from the Plan file for the trip to the output Iteration Database. The Collator will fill this field with NA, since there are multiple possible values per trip.
SEL_USE_DURATION	If set, directs the Collator to add the (expected) duration from the Plan file for the trip to the output Iteration Database. Note that there are multiple legs in a trip, each of which contains a value for this field. The Collator will use the sum over all legs.
SEL_USE_MODE	If set, directs the Collator to add the mode from the Plan file for the trip to the output Iteration Database. The Collator will fill this field with NA, since there are multiple possible values per trip.
SEL_USE_TRIP_ID	If set, directs the Collator to add the value in the user field from the Plan file for the trip to the output Iteration Database.

Some Collator µSim Commands

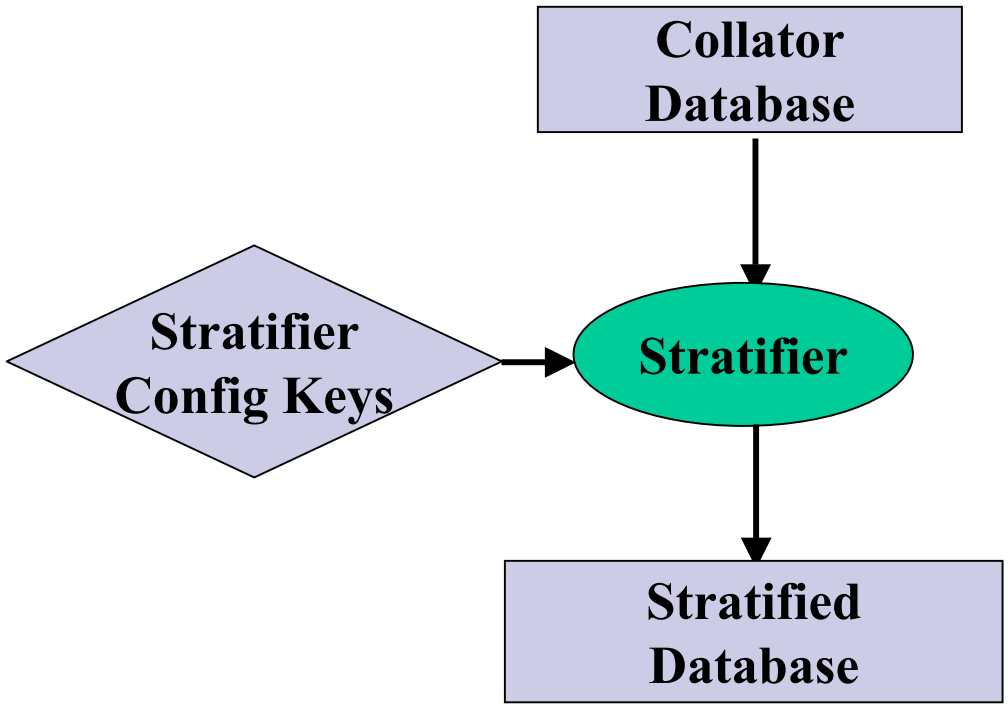
Configuration File Key	Description
SEL_USE_ANOMALY	If set, directs the Collator to add the ANOMALY field from the Traffic Microsimulator event output data to the output Iteration Database. Note that this gives only the value for the last event of the trip.
SEL_USE_DISTANCE_SUM	If set, directs the Collator to add the DISTANCE_SUM field from the Traffic Microsimulator event output data to the output Iteration Database. This value is summed across events from every leg of the trip.
SEL_USE_EVENT_TRIP_ID	If set, directs the Collator to add the TRIP field from the Traffic Microsimulator event output data to the output Iteration Database.
SEL_USE_TIME_SUM	If set, directs the Collator to add the TIME_SUM field from the Traffic Microsimulator event output data to the output Iteration Database. This value is summed across events from every leg of the trip.

General Collator Commands

Configuration File Key	Description
SEL_USE_AND	Directs the Collator to include a field (for each pair) which is the logical AND between the values of the two fields. The argument is a semicolon separated list of comma-separated Iteration Database field names.
SEL_USE_CROSS_BOUND	Adds a field to the output Iteration Database which is true if the starting and ending activity locations for the trip are in different polygons. The argument is a comma-separated list of UAZ ID, as above, but without the polygon identifier. The value of this field is true if the starting and ending activity locations for the trip are in different polygons.
SEL_USE_DRIVES_PASSENGER	Directs the Collator to include a field which is true if, on any leg of the trip, the Plan file specifies that the traveler drives a vehicle with passengers. Does not apply to transit vehicle drivers.
SEL_USE_END_ACT_USER_DATA	Directs the Collator to include a field giving the value of any user-specified field in the Activity Location network table for the activity location at the end of the trip. The argument is a semicolon-separated list of field names.
SEL_USE_T_TOTAL	Directs the Collator to include a field giving the total time spent on this trip as found from the difference in the TIME field between the last and first events for this trip. The event output file should capture events with "change on trip" status.
SEL_USE_T_WAIT	Directs the Collator to include a field giving the total time spent waiting as found by summing over the times between "begin waiting" and "end waiting" events in the event output file. The event output file must capture these events and must not filter out the TIME field.
SEL_USE_T_WALK	Directs the Collator to include a field giving the total time (in seconds) spent walking on this trip, as found from the expected duration of walk legs in the Plan file.

Stratifier

Stratifier Creates Binned Data From The Collated Data



Example Stratifier Commands

Command:
Stratifier <Configuration file>

Configuration Keys

1
SEL_BIN_NAME_0 duration_bin
SEL_BIN_FIELD_0 DURATION
SEL_BIN_BOUNDS_0 1200

Duration <= 1200 ⇒ 0
> 1200 ⇒ 1

2
SEL_BIN_NAME_1 1_to_2
SEL_BIN_FIELD_1 AND_START_IN_REGION_1_1_END_IN_REGION_1_2

No ⇒ 0, Yes ⇒ 1

3
SEL_BIN_NAME_2 1_to_3
SEL_BIN_FIELD_2 AND_START_IN_REGION_1_1_END_IN_REGION_1_3

No ⇒ 0, Yes ⇒ 1

4
SEL_BIN_NAME_3 age_bin
SEL_BIN_FIELD_3 AGE
SEL_BIN_BOUNDS_3 18

Age <= 18 ⇒ 0
> 18 ⇒ 1

SEL_STRAT_BINS 0, 1; 0, 2; 3

7

Age <= 18 ⇒ 0
> 18 ⇒ 1

6

1 to 3	Duration 0	Duration 1
0	0	1
1	2	3

5

1 to 2	Duration 0	Duration 1
0	0	1
1	2	3

Example Stratifier Database

HOUSE	TRAVELER	TRIP	STARTACT	ENDACT	duration_bin (1)	1_to_2 (2)	1_to_3 (3)	age_bin (4)	STRAT_0 (5)	STRAT_1 (6)	STRAT_2 (7)
2	4	1	1	1	1	0	0	1	1	1	1
2	4	2	1	2	0	1	0	1	2	0	1
2	4	3	2	2	1	0	0	1	1	1	1
2	4	4	2	3	0	0	0	1	0	0	1
2	4	5	3	3	1	0	0	1	1	1	1
2	4	6	3	4	0	0	0	1	0	0	1
2	4	7	4	4	1	0	0	1	1	1	1
2	4	8	4	5	0	0	0	1	0	0	1
2	4	9	5	5	1	0	0	1	1	1	1
2	5	1	6	6	1	0	0	1	1	1	1
64	198	1	1	1	1	0	0	1	1	1	1
64	198	2	1	2	0	0	0	1	0	0	1
64	198	3	2	2	1	0	0	1	1	1	1

STRAT_0

1 to 2 \ Duration	0	1
0	0	1
1	2	3

STRAT_1

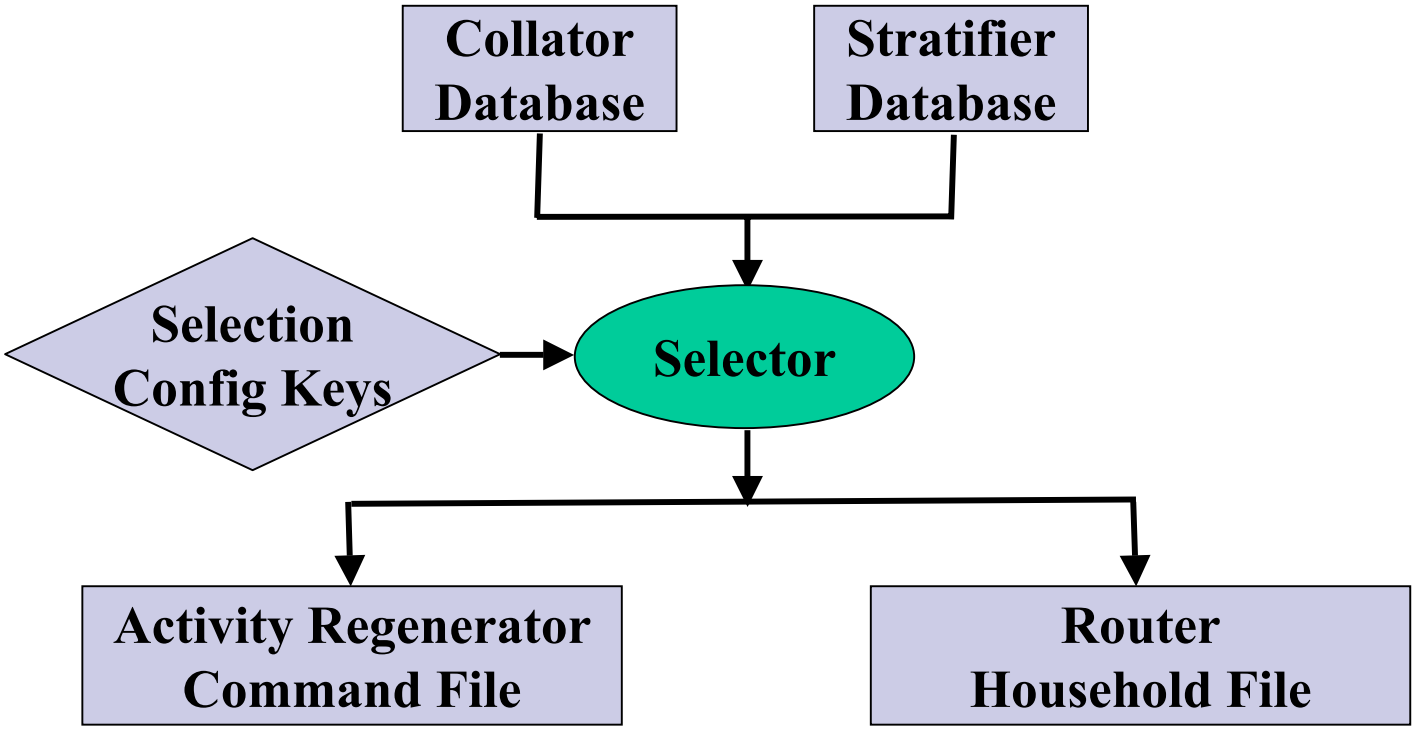
1 to 3 \ Duration	0	1
0	0	1
1	2	3

STRAT_2

Age <= 18 ⇒ 0
> 18 ⇒ 1

Selector

Selector Picks Households/Activities for Rerouting/Regeneration



Selector

Some Selector Config Keys

Configuration File Key	Description
SEL_BIN_SEL_ALGO	A semicolon-separated list of names of algorithms to use in selecting trips from within the chosen cell of the stratification. Possible values are: RANDOM, TAIL, or ALL. There must be one algorithm supplied for each name in the SEL_COST argument. The RANDOM value takes two optional parameters: the first is the fraction of elements to select; the second is the absolute number of elements to select, which overrides the first if it is smaller. For example: RANDOM, 0.2, 100; TAIL takes one required and three optional arguments. The first is 0 if the lowest cost tail is to be selected and non-zero otherwise; the second is the fraction of trips to select; the third is an absolute threshold to apply; and the last is an absolute number of elements to select.
SEL_COST	A comma- or semicolon-separated list of names of columns in the input Iteration Database to associate with stratifications for use by the Selector in selecting trips. One selected set will be created for each name.
SEL_GOAL	The Activity Regenerator command to be associated with the selected set of trips. One goal must be supplied for each name in the SEL_COST argument. The entire goal string is written to the Activity Generator feedback file after each selected traveler ID.

Selector Example

Collator Database

HH	TRAV	TOUR	TRIP	START_ACT_ID	END_ACT_ID	T_MODE_w	T_MODE_c	*RATIO_T
2	4	0	1	1	1	0	0	NA
2	4	1	2	1	2	46	966	21
2	4	1	3	2	2	0	0	NA
2	4	1	4	2	3	46	972	21.13043
2	4	1	5	3	3	0	0	NA
2	4	2	6	3	4	46	535	11.63044
2	4	2	7	4	4	0	0	NA
2	4	2	8	4	5	46	537	11.67391
2	4	2	9	5	5	0	0	NA
2	5	0	1	6	6	0	0	NA

Stratifier Database

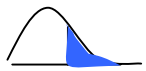
HOUSE	TRAVELER	TRIP	STRAT_0	STRAT_1	STRAT_2
2	4	1	1	1	1
2	4	2	2	0	1
2	4	3	1	1	1
2	4	4	0	0	1
2	4	5	1	1	1
2	4	6	0	0	1
2	4	7	1	1	1
2	4	8	0	0	1
2	4	9	1	1	1
2	5	1	1	1	1

Config Keys

SEL_USE_STRATIFICATION 1 0; 2 2 **STRAT_0 and STRAT_2 are used (Two selections)**

SEL_ALGORITHM PICK_1CELL 2; PICK_2CELL 1 **Use STRAT_0=2 for first, STRAT_2=1 for second**

SEL_COST 1HH; RATIO_T_MODE_2c_T_MODE_w **HH (used with ALL) is first cost, Ratio of travel times second cost**

SEL_BIN_SEL_ALGO 1ALL; TAIL, 1, 2, , 15.1 **Select all for first, select**  **for second**

SEL_GOAL LS 1 0.01; 2REROUTE **Activity Regenerator file command "LS 0.01" , Reroute**

Selection-1 Output

Activity Commands	Router Commands
2 2 LS 0.01	2
⋮	⋮

Selection-2 Output

Activity Commands	Router Commands
2 3 REROUTE	2
⋮	⋮

Outline

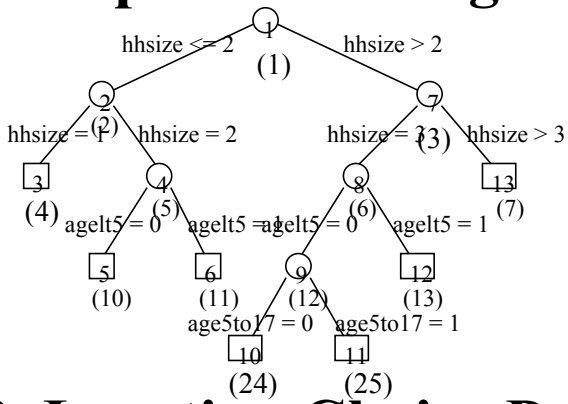
1. TRANSIMS Technology
2. TRANSIMS FRAMEWORK
   - Network
   - Population
   - Activities
   - Routes
   - Microsimulation
3. Meta-Methods, Methods, Calibration, Models
4. Modeling Tools
   - Activity Regenerator
   - Collator
   - Stratifier
   - Selector
5. Calibration, Application, Forecasts
6. Calibration Methods
   - Survey Household Weights
   - School Buses
   - Shared Rides
   - Trip Length
   - Bridge Crossings
   - Modes
7. Summary

Modeling In TRANSIMS

Modeling Has Two Stages

Calibration

1. Population Weights

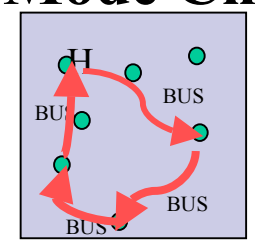


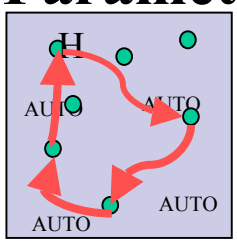
2. Location Choice Parameters

$$\exp(a(L) + b_m(t(H,L) - c))$$

Mode Coefficient **Penalty**

3. Mode Choice Parameters





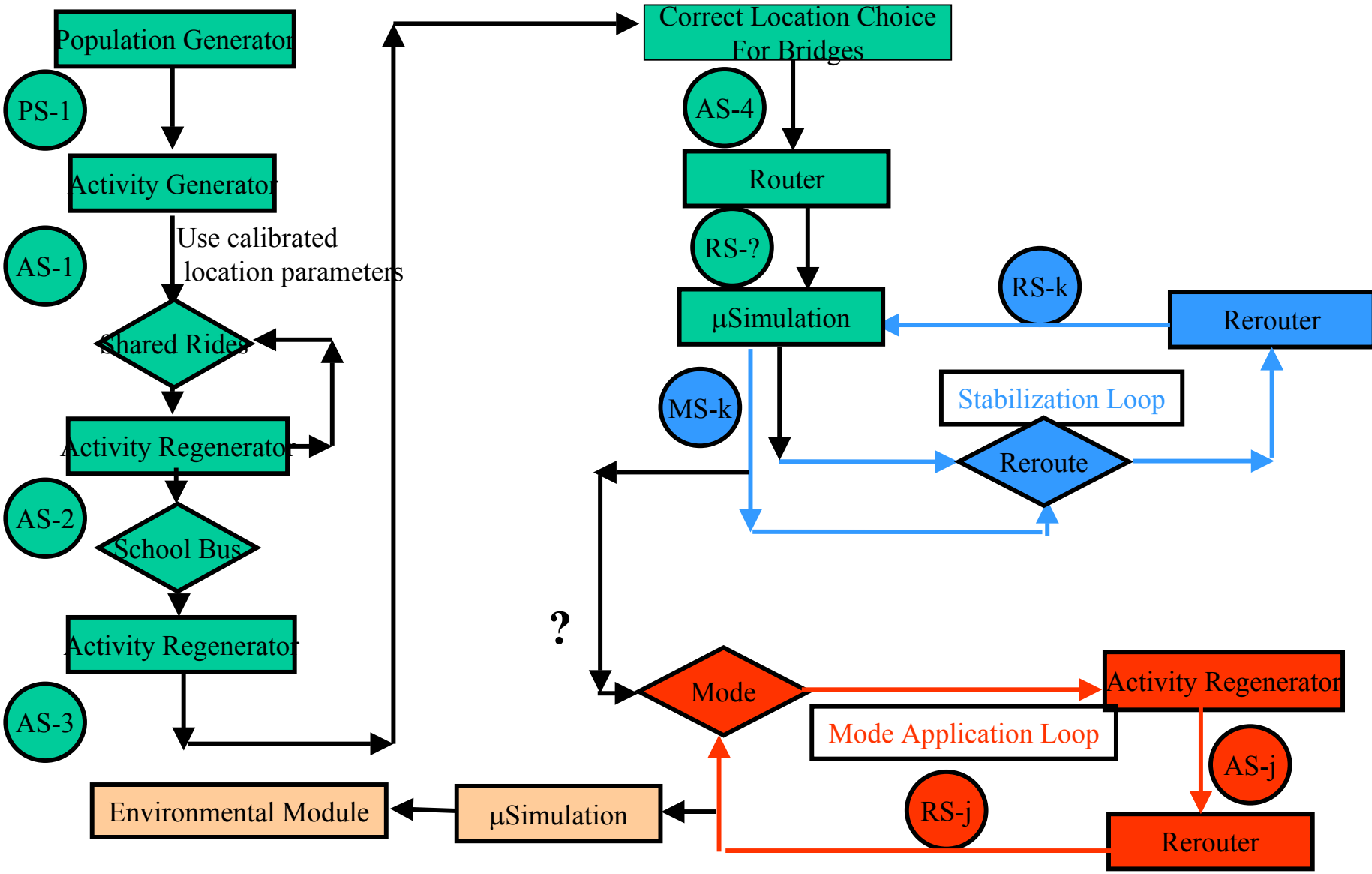
TRANSIMS

Application

Calibration Parameters Used In Forecast

1. **Generate the forecast population**
   Use forecast marginal distributions
2. **Generate the activities with locations**
   Use calibration location choice parameters
3. **"Fix" small problems**
   Shared rides
   Long walks/bikes to school
4. **Assign modes?**
   Use calibration mode choice parameters
5. **Stabilize Microsimulation**
   Feedback travel times
6. **Assign modes ?**
   Use calibration mode choice parameters

A Forecast Year Model



Outline

1. TRANSIMS Technology
2. TRANSIMS FRAMEWORK
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   - Bridge Crossings
   - Modes
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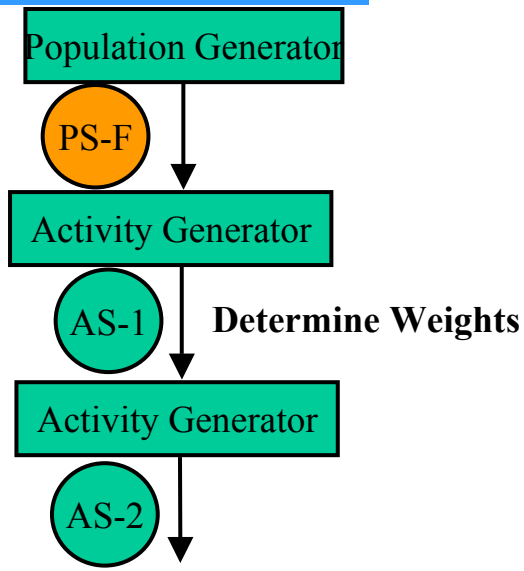
Calibration In TRANSIMS

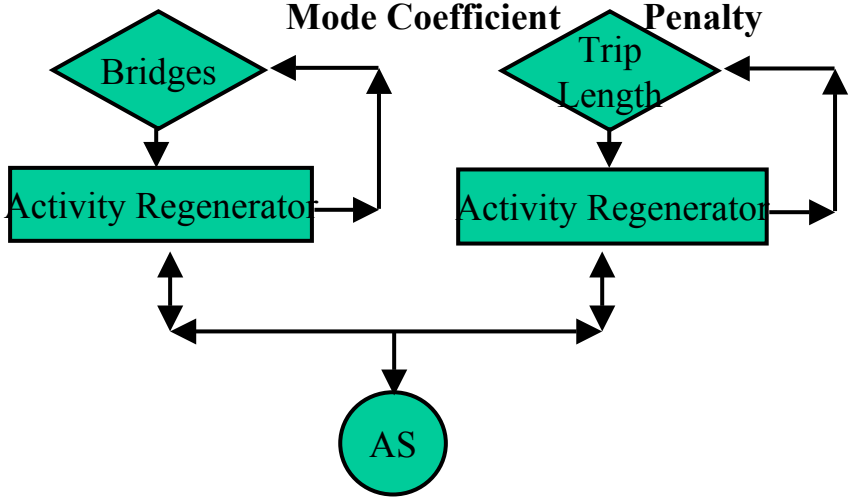
Determine Survey Household Weights



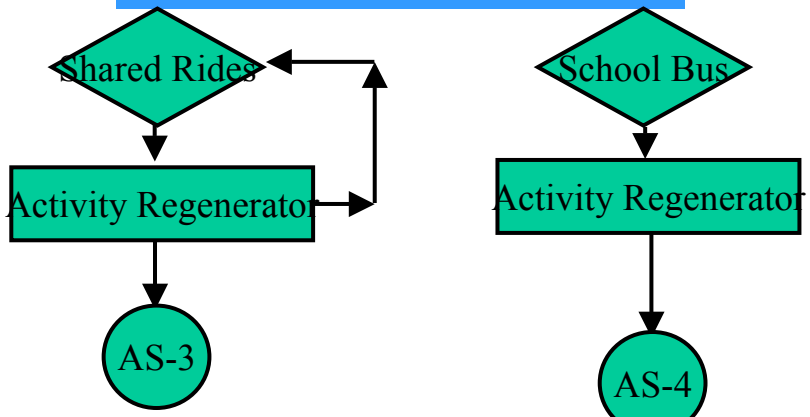
Determine Location Choice Parameters in the Equation

$$\exp(a(L) + b_m(t(H,L) - c))$$

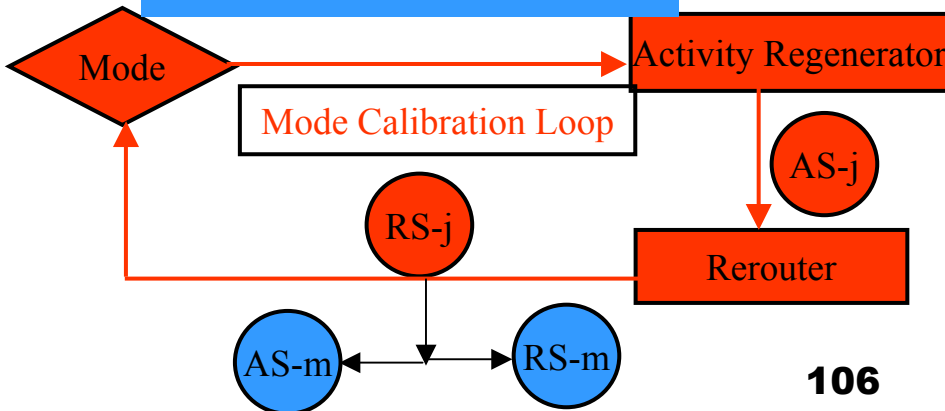
Mode Coefficient Penalty



Some "Fix It" Procedures

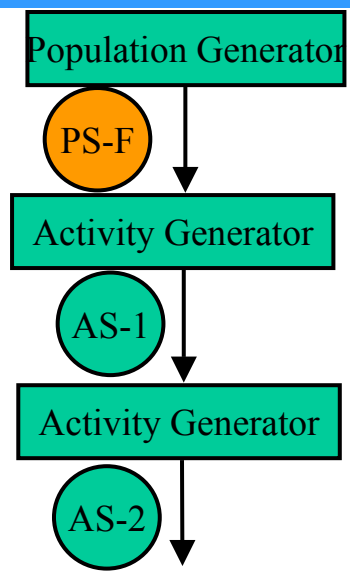


Determine Mode Choice Parameters/Functions



Survey Household Weights

Determine Survey Household Weights



Problem:

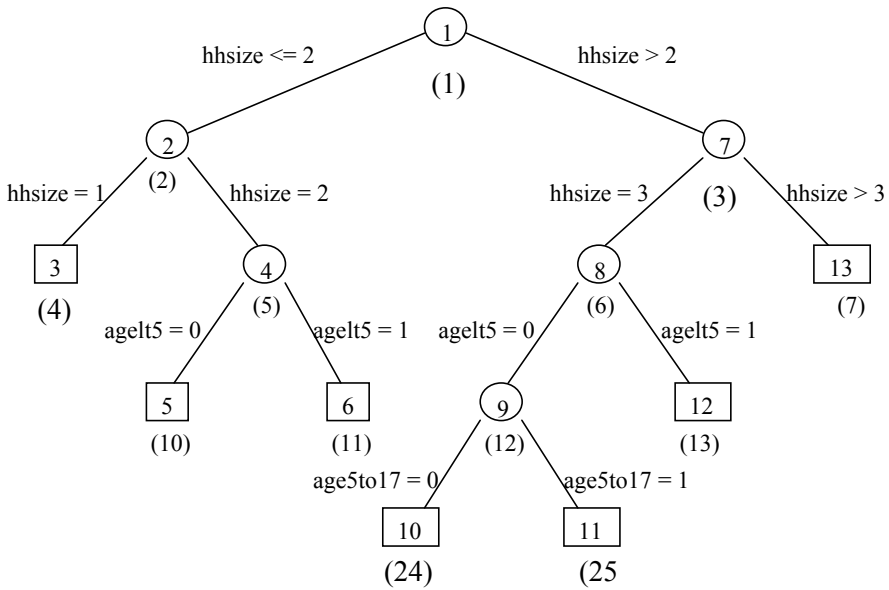
- Activity Generator Assigns 4.77M Auto & Transit Trips
- Base Year Has 6.22M Auto & Transit Trips (23% More)

Procedure:

- Find New Weights For Survey Households

Assumption:

- Households With The Most Trips Are Under Reported



Survey Household Weights

WORKERS=0

HHSIZE=1
- HHAGE<38.5 **(34)(34,0)**
- HHAGE>38.5 **(319)(319,0)**

HHSIZE=2
- HHAGE<53.5
  - INCOME<5.5 **(25)(12,13)**
  - INCOME>5.5 **(15)(12,3)**
- HHAGE>53.5 **(268)(267,1)**

HHSIZE>2 (32)(8,24)

KEY
(32)(8,24)
32 households
8 with no nondriving children
24 with nondriving children

WORKERS=1

HHSIZE=1 (705)(705,0)

HHSIZE=2
- A5-15=0 **(304)(291,13)**
- A5-15>0 **(48)(0,48)**

HHSIZE=3
- A5-15<=1
  - HHAGE<29.5 **(18)(1,17)**
  - HHAGE>29.5 **(89)(36,53)**
- A5-15>1 **(24)(0,24)**

HHSIZE=4
- A5-15<=1 **(73)(4,69)**
- A5-15>1 **(49)(0,47)**

HHSIZE>4
- A5-15<=2 **(40)(1,39)**
- A5-15>2 **(27)(0,27)**

WORKERS=2

HHSIZE=2 (677)(677,0)

HHSIZE=3 (248)(78,170)

HHSIZE=4
- ALT5=0
  - A26-45=0 **(21)(8,13)**
  - A26-45>0 **(134)(7,127)**
- ALT5>0 **(69)(0,69)**

HHSIZE>4
- A5-15<=2 **(49)(1,48)**
- A5-15>2
  - HHDensity<1.29 **(18)(0,18)**
  - HHDensity>1.29 **(19)(0,19)**

WORKERS>2

HHSIZE=3 (75)(75,0)

HHSIZE=4
- HHAGE<46.5 **(28)(17,11)**
- HHAGE>46.5 **(24)(18,6)**

HHSIZE>4 (43) (10,33)

Survey Household Weights

Workers=0, HHSIZE=1 HHAGE>38.5:

- Has 319 Survey Households
- Initial Weights $w_i^* = 1$

Let The Number Of Auto & Transit Trips In This Cell Be:

$$n_1, n_2 \ldots n_{319}$$

The Average Number Of Trips Is:

$$\bar{n} = \sum n_i / 319$$

Find w_i So That:

$$\sum w_i n_i / \sum w_i = X\bar{n} \qquad X = 6.22 / 4.77 = 1.3$$

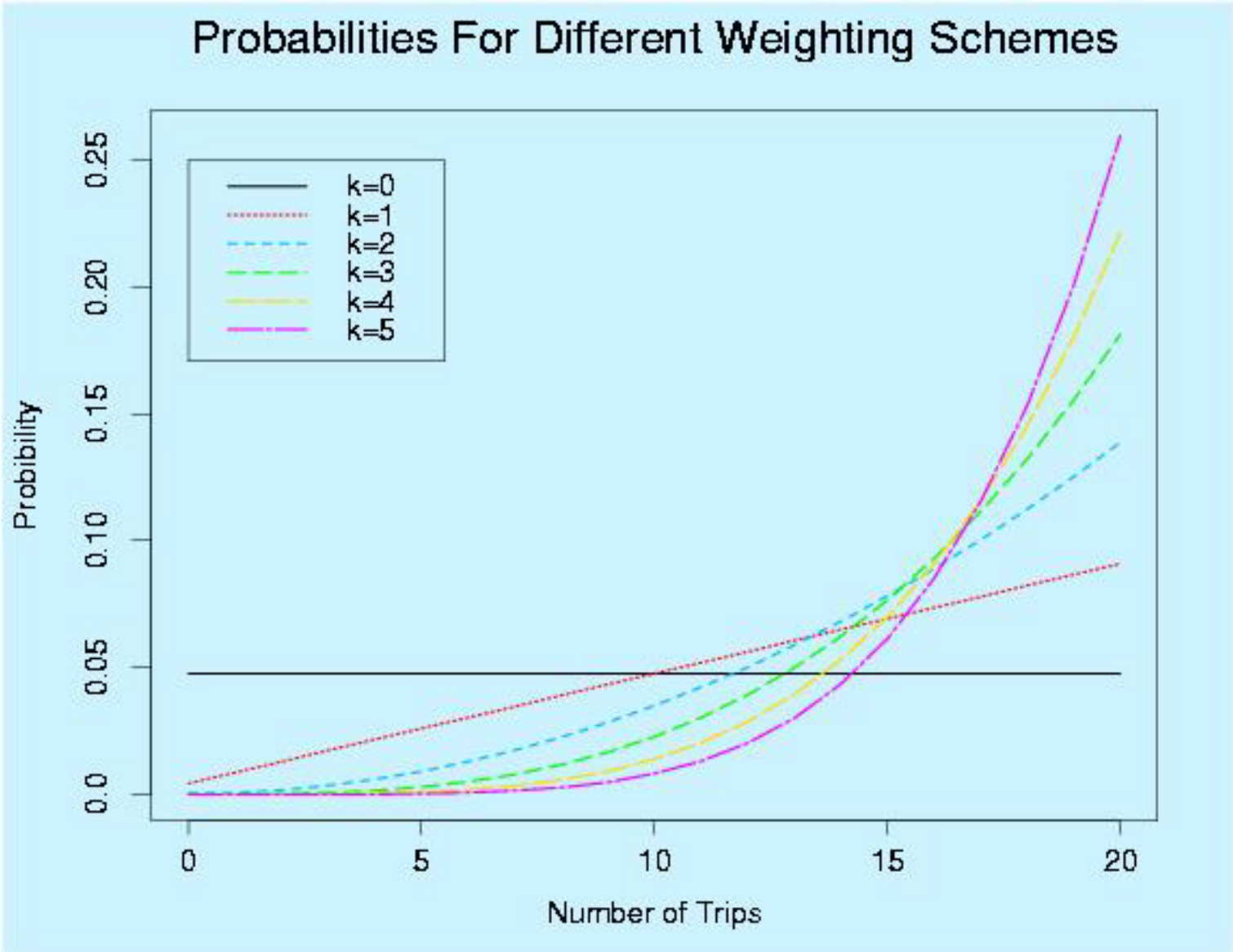
Let w_i Have The Form:

$$w_i = (1 + \beta n_i^k)$$

For Fixed k The Solution Is:

$$\beta = 319(X - 1)\bar{n} / [\sum n_i^{k+1} - X\bar{n} \sum n_i^k]$$

Survey Household Weights



Survey Household Weights

Some Values Of *k*

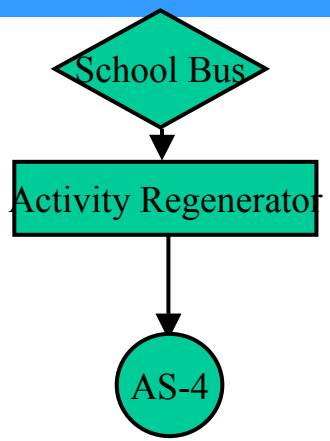
DEMO-1	DEMO-2	DEMO-3	DEMO-4	CHILDREN	#SURVEY	*K*	
Workers=0	HHSIZE=1	HHAGE<38.5		No	34	1	
Workers=0	HHSIZE=1	HHAGE>38.5		No	319	1	
Workers=0	HHSIZE=2	HHAGE>53.5		No	267	2	
Workers=0	HHSIZE=2	HHAGE<53.5	INCOME<5.5	No	12	1	
Workers=0	HHSIZE=2	HHAGE<53.5	INCOME>5.5	No	12	1	
Workers=0	HHSIZE=2	HHAGE>53.5		Yes	1	-1	
Workers=0	HHSIZE=2	HHAGE<53.5	INCOME<5.5	Yes	13	1	
Workers=0	HHSIZE=2	HHAGE<53.5	INCOME>5.5	Yes	3	-1	
Workers=0	HHSIZE>2			No	8	2	
Workers=0	HHSIZE>2			Yes	24	1	

Results

	Weights=1		**Weights Computed**	
Mode	**Trips**		**Mode**	**Trips**
Walk	542,077		Walk	479,160
Drive	4,573,938		Drive	6,039,928
Transit	167,673		Transit	156,736
MAX	29,315		MAX	28,504
Bike	68,385		Bike	47,847
Magic Move	292,464		Magic Move	306,119

School Buses

Some "Fix It" Procedures



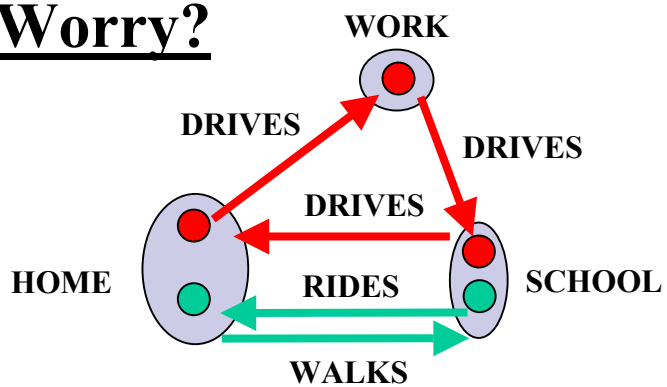
Activity Generator Procedure:

Assign Kids To Closest School
Keep Mode The Same As Survey

Problem:

Closest School May Be Too Far
To Walk Or Bike

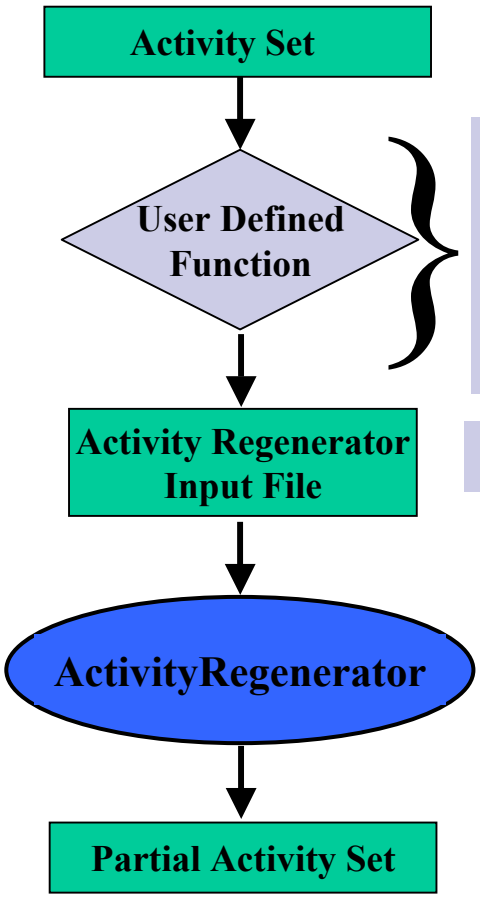
Why Worry?



Procedure:

Find Long Walks/Bikes And Change
Mode To School Bus

School Buses

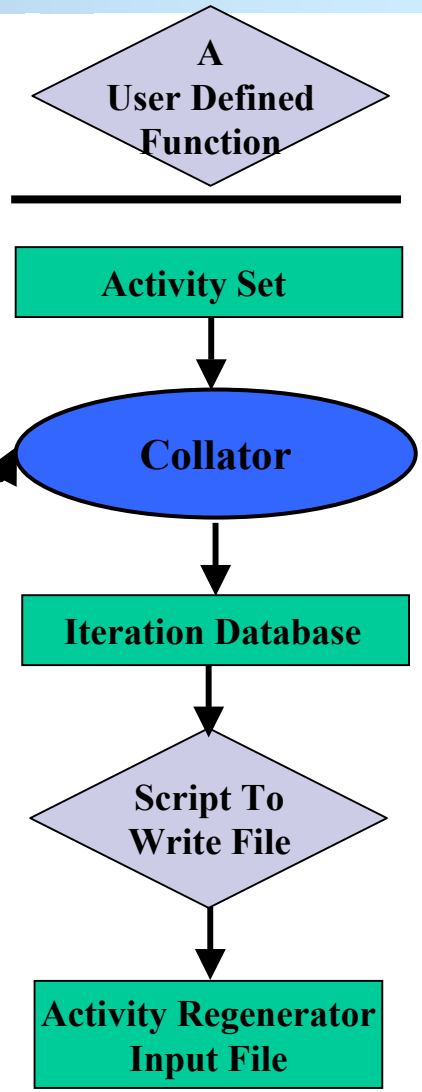


Finds Long Walks/Bikes To School. Writes "Change Modes" to School Bus Activity Regenerator Commands

<hhid> <activity id> MS 9

Collator Commands

```
SEL_USE_START_ACT_TYPE,
SEL_USE_START_ACT_LOCATION,
SEL_USE_START_MODE_PREF,
SEL_USE_END_MODE_PREF,
SEL_USE_END_ACT_TYPE,
SEL_USE_END_ACT_LOCATION,
SEL_USE_EUCLID.
```



School Buses

Collator (Iteration) Database

HH	TRAV	TOUR	JBTOUR	TRIP	START_ACT_ID	END_ACT_ID	START_ACT_TYPE	START_MODE_PREF	START_ACT_LOCATION	END_ACT_TYPE	END_MODE_PREF	END_ACT_LOCATION	EUCLID
28521	77831	0	0	1	1	1	0	1	36817	0	1	36817	0
28521	77831	1	0	2	1	2	0	1	36817	1	2	25213	19787.99
28521	77831	1	0	3	2	2	1	2	25213	1	2	25213	0
28521	77831	1	0	4	2	3	1	2	25213	4	2	36817	19787.99
28521	77831	1	0	5	3	3	4	2	36817	4	2	36817	0
28521	77832	0	0	1	4	4	0	1	36817	0	1	36817	0
28521	77832	1	0	2	4	5	0	1	36817	1	2	112097	49549.38
28521	77832	1	0	3	5	5	1	2	112097	1	2	112097	0
28521	77832	1	0	4	5	6	1	2	112097	4	2	24246	59006.29
28521	77832	1	0	5	6	6	4	2	24246	4	2	24246	0
28521	77832	1	0	6	6	7	4	2	24246	2	2	36817	13251.14
28521	77832	1	0	7	7	7	2	2	36817	2	2	36817	0
28521	77832	2	0	8	7	8	2	2	36817	2	1	36818	0
28521	77832	2	0	9	8	8	2	1	36818	2	1	36818	0
28521	77832	2	0	10	8	9	2	1	36818	4	1	36817	0
28521	77832	2	0	11	9	9	4	1	36817	4	1	36817	0
28521	77833	0	0	1	10	10	0	1	36817	0	1	36817	0
28521	77833	1	0	2	10	11	0	1	36817	7	1	41146	6842.658
28521	77833	1	0	3	11	11	7	1	41146	7	1	41146	0
28521	77833	1	0	4	11	12	7	1	41146	7	1	36817	6842.658
28521	77833	1	0	5	12	12	7	1	36817	7	1	36817	0
28521	77833	1	0	6	13	13	4	1	36817	4	1	36817	0
28521	77833	1	0	7	14	14	4	1	36817	4	1	36817	0
28521	77834	0	0	1	15	15	0	1	36817	0	1	36817	0
28521	77834	1	0	2	15	16	0	1	36817	7	7	41146	6842.658
28521	77834	1	0	3	16	16	7	7	41146	7	7	41146	0
28521	77834	1	0	4	17	17	7	7	41146	7	7	41146	0
28521	77834	1	0	5	17	18	7	7	41146	4	7	36817	6842.658
28521	77834	1	0	6	18	18	4	7	36817	4	7	36817	0
28521	77835	0	0	1	19	19	0	1	36817	0	1	36817	0
28521	77835	1	0	2	19	20	0	1	36817	7	7	41146	6842.658
28521	77835	1	0	3	20	20	7	7	41146	7	7	41146	0
28521	77835	1	0	4	20	21	7	7	41146	2	7	36817	6842.658
28521	77835	1	0	5	21	21	2	7	36817	2	7	36817	0

School Buses

Part of the Activity List

hhid	perid	act_id	act_type	mode	veh	act_loc
28521	77831	1	0	1	-1	36817
28521	77831	2	1	2	81778	25213
28521	77831	3	4	2	81778	36817
28521	77832	4	0	1	-1	36817
28521	77832	5	1	2	81779	112097
28521	77832	6	4	2	81779	24246
28521	77832	7	2	2	81779	36817
28521	77832	8	2	1	-1	36818
28521	77832	9	4	1	-1	36817
28521	77833	10	0	1	-1	36817
28521	77833	11	7	1	-1	41146
28521	77833	12	7	1	-1	36817
28521	77833	13	4	1	-1	36817
28521	77833	14	4	1	-1	36817
28521	77834	15	0	1	-1	36817
28521	77834	16	7	7	-1	41146
28521	77834	17	7	7	-1	41146
28521	77834	18	4	7	-1	36817
28521	77835	19	0	1	-1	36817
28521	77835	20	7	7	-1	41146
28521	77835	21	2	7	-1	36817

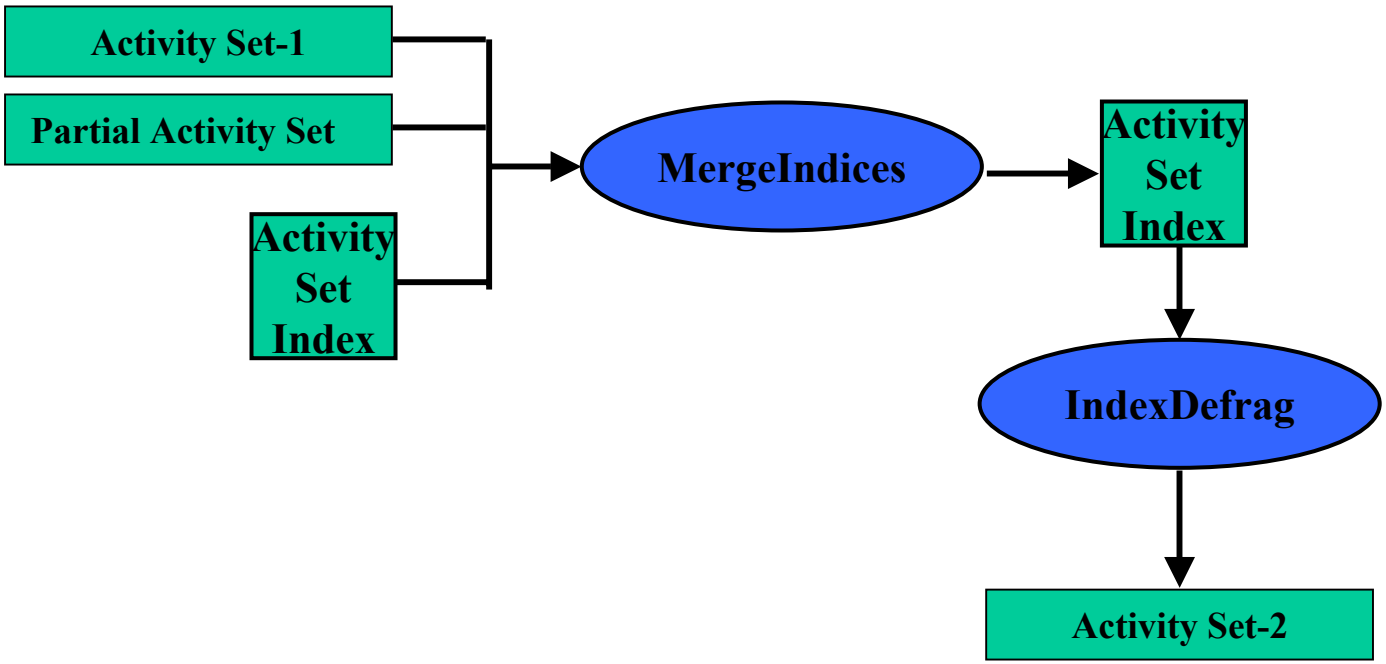
Change Mode
To 9 (School Bus)

Regenerator Commands

HHID	ACT_ID	Command	Par
25561	18	MS	9
25561	23	MS	9
28241	14	MS	9
28241	15	MS	9
28241	18	MS	9
28521	11	MS	9
28521	12	MS	9
28601	18	MS	9
28601	19	MS	9
28601	23	MS	9
28601	24	MS	9

School Buses

PUT THE FILES TOGETHER



Shared Rides

WORKERS=0

HHSIZE=1
- HHAGE<38.5 **(34)(34,0)**
- HHAGE>38.5 **(319)(319,0)**

HHSIZE=2
- HHAGE<53.5
  - INCOME<5.5 **(25)(12,13)**
  - INCOME>5.5 **(15)(12,3)**
- HHAGE>53.5 **(268)(267,1)**

HHSIZE>2 **(32)(8,24)**

WORKERS=1

HHSIZE=1 **(705)(705,0)**

*

HHSIZE=2
- A5-15=0 **(304)(291,13)**
- A5-15>0 **(48)(0,48)**

HHSIZE=3
- A5-15<=1
  - HHAGE<29.5 **(18)(1,17)**
  - HHAGE>29.5 **(89)(36,53)**
- A5-15>1 **(24)(0,24)**

HHSIZE=4
- A5-15<=1 **(73)(4,69)**
- A5-15>1 **(49)(0,47)**

HHSIZE>4
- A5-15<=2 **(40)(1,39)**
- A5-15>2 **(27)(0,27)**

WORKERS=2

HHSIZE=2 **(677)(677,0)**

HHSIZE=3 **(248)(78,170)**

HHSIZE=4
- ALT5=0
  - A26-45=0 **(21)(8,13)**
  - A26-45>0 **(134)(7,127)**
- ALT5>0 **(69)(0,69)**

HHSIZE>4
- A5-15<=2 **(49)(1,48)**
- A5-15>2
  - HHDensity<1.29 **(18)(0,18)**
  - HHDensity>1.29 **(19)(0,19)**

WORKERS>2

HHSIZE=3 **(75)(75,0)**

HHSIZE=4
- HHAGE<46.5 **(28)(17,11)**
- HHAGE>46.5 **(24)(18,6)**

HHSIZE>4 **(43) (10,33)**

KEY
(32)(8,24)
32 households
8 with no nondriving children
24 with nondriving children

Population Household

Person	age	worker
1	35	yes
2	14	no
3	10	no
4	6	no

Shared Rides

Population Household

Person	age	worker
1	35	yes
2	14	no
3	10	no
4	6	no

*

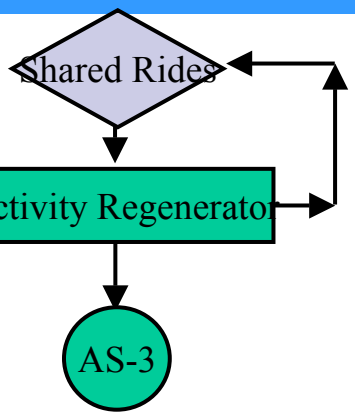
Assigned Survey Household

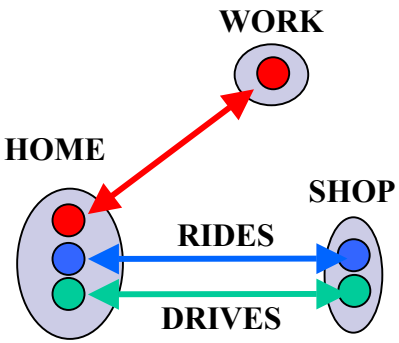
Person	age	worker
1	38	yes
2	36	no
3	12	no
4	10	no

Person Matches

Population	Survey
1	1
2	3
3	4
4	4

Some "Fix It" Procedures





Shared Rides

Usage:

ActivityGenerator(Regenerator) <Configuration File>

*

(Partial) Activity Set

Activity Problem File

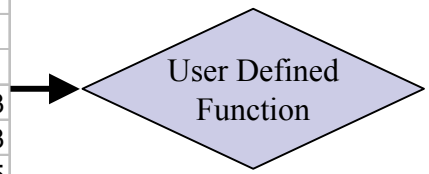
Configuration File Key	Description
ACT_LOG_FILE	The name of the logfile for the Activity Generator and Regenerator. Default = *ActivityGenerator.log*
ACT_PROBLEM_FILE	The name of the file where information about problems that occurred during activity generation will be written. Default = *act.problems*
ACTIVITY_FILE	The name of the TRANSIMS activity file for the household.

Shared Rides

Activity Generator Problem File

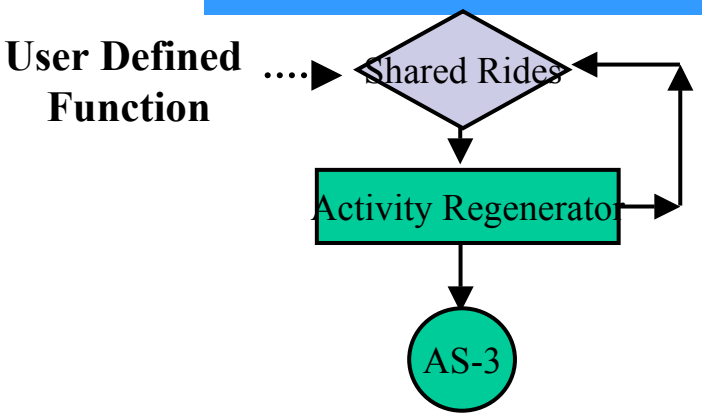
TYPE	N	HHID	PERID	ACT. ID		
3	5	13003	13012	9	11.6667	12.3333
3	5	13005	13015	4	18.75	22
1	3	13012	13040	35		
1	3	13012	13040	36		
1	3	13014	13050	37		
1	3	13014	13050	38		
3	5	13043	13145	7	9.93333	10.0333
3	5	13043	13145	10	12.5	14.2333
3	5	13043	13145	11	14.25	15.25
1	3	13046	13157	20		
3	5	13050	13176	32	18.75	19.5
3	5	13053	13184	4	12.0833	12.9167
1	3	13115	13374	5		
1	3	13115	13374	9		

*TYPE=1: failed to find driver for shared ride

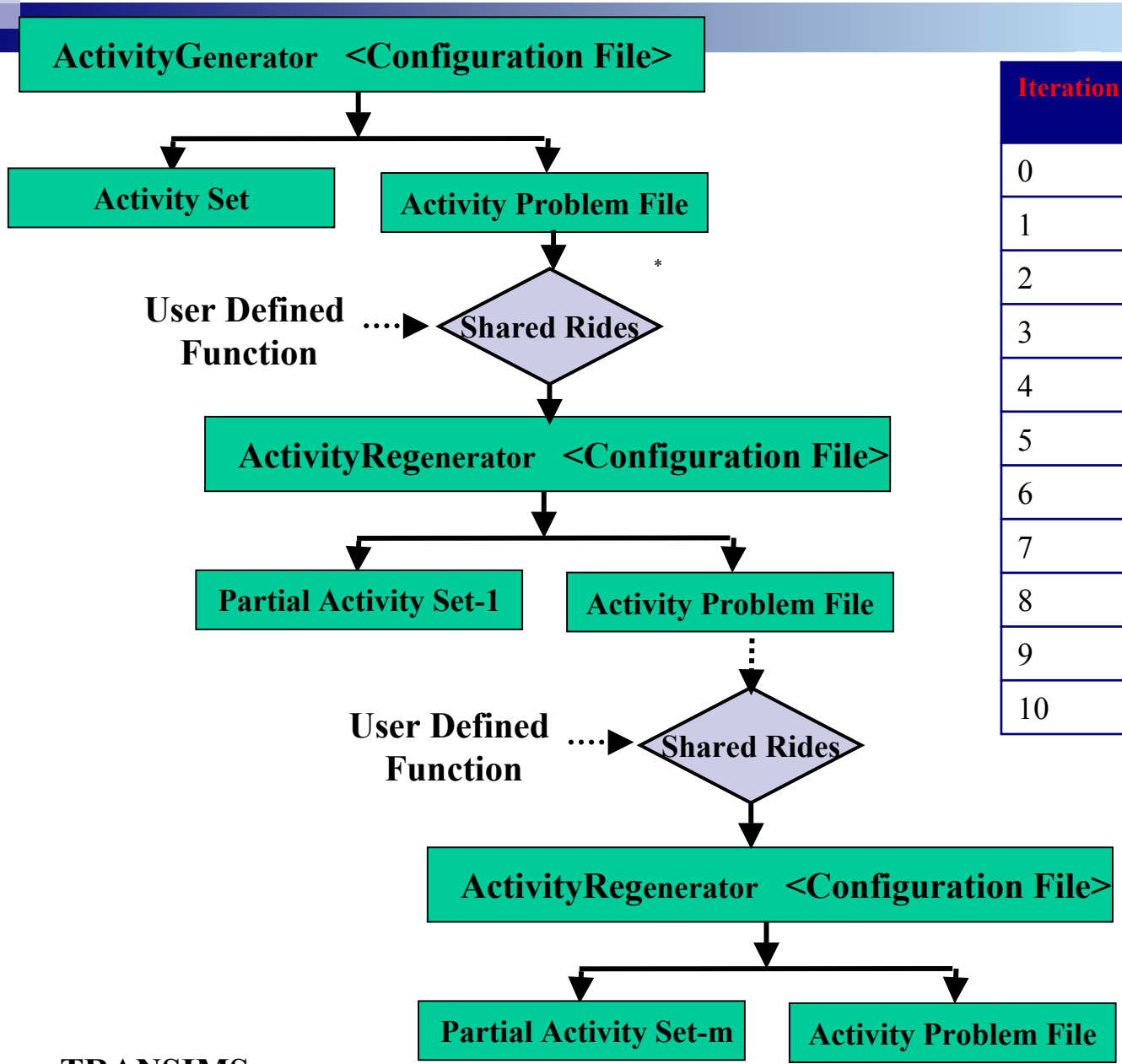


HHID	Command
13012	R
13014	R
13046	R
13115	R

Some "Fix It" Procedures



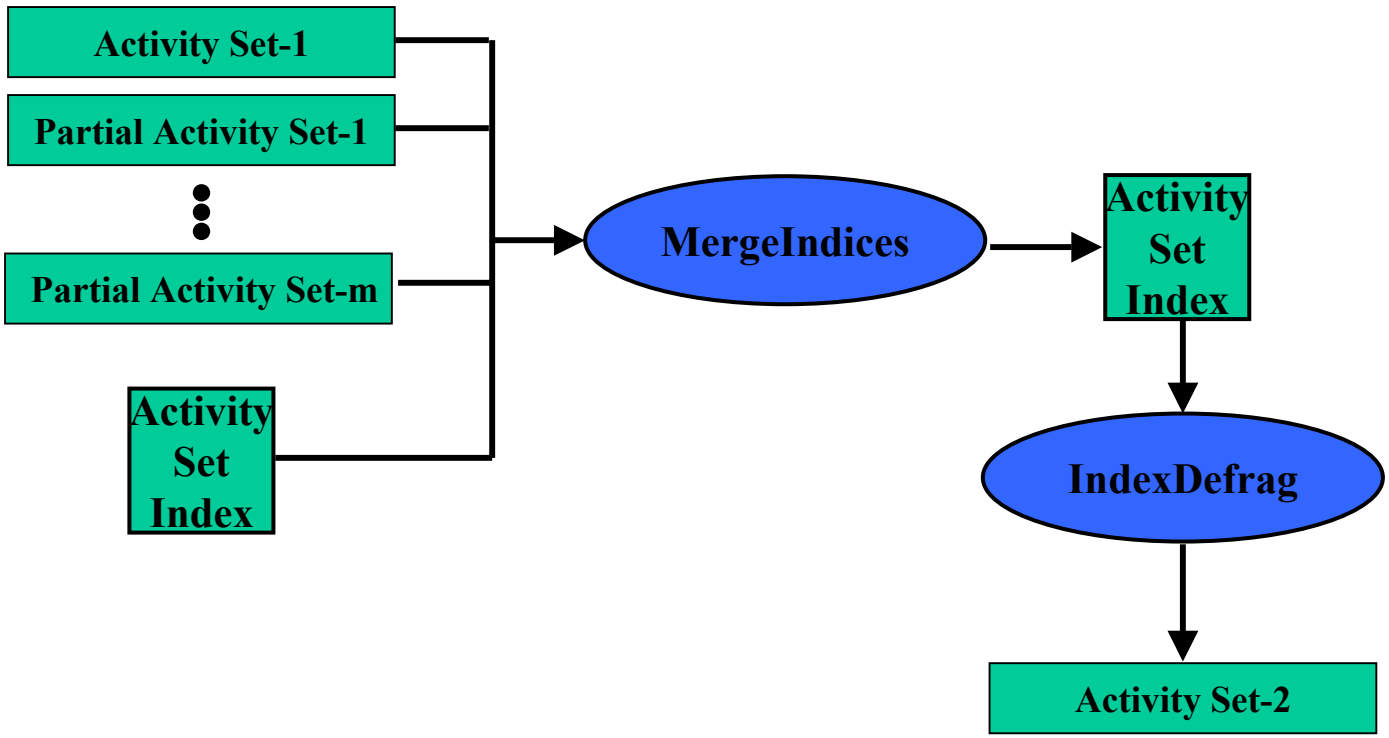
Shared Rides



Iteration	Number Problem Households
0	11941
1	3752
2	2012
3	1327
4	972
5	735
6	603
7	476
8	406
9	346
10	294

Shared Rides

PUT THE FILES TOGETHER



Calibrating Location Choice

STEP 1

Initial Discrete Choice Fit To Survey Data

$$\exp(a(L) + b_m t(H, L))$$

STEP 2

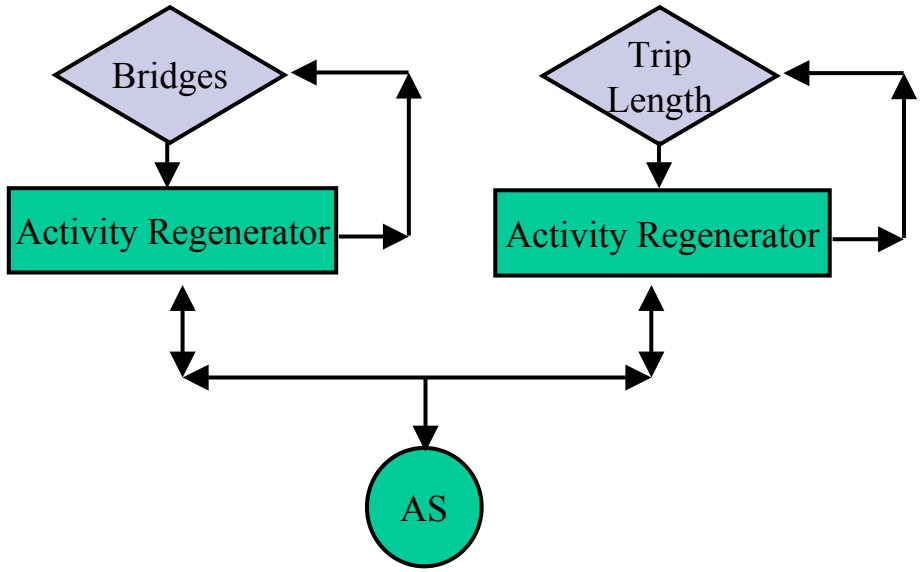
Refine Location Choice Parameters In The Function

$$\exp(a(L) + b_m (t(H, L) - c))$$

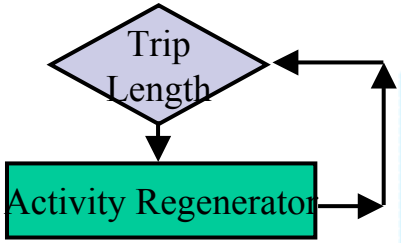
Mode Coefficient **Penalty**

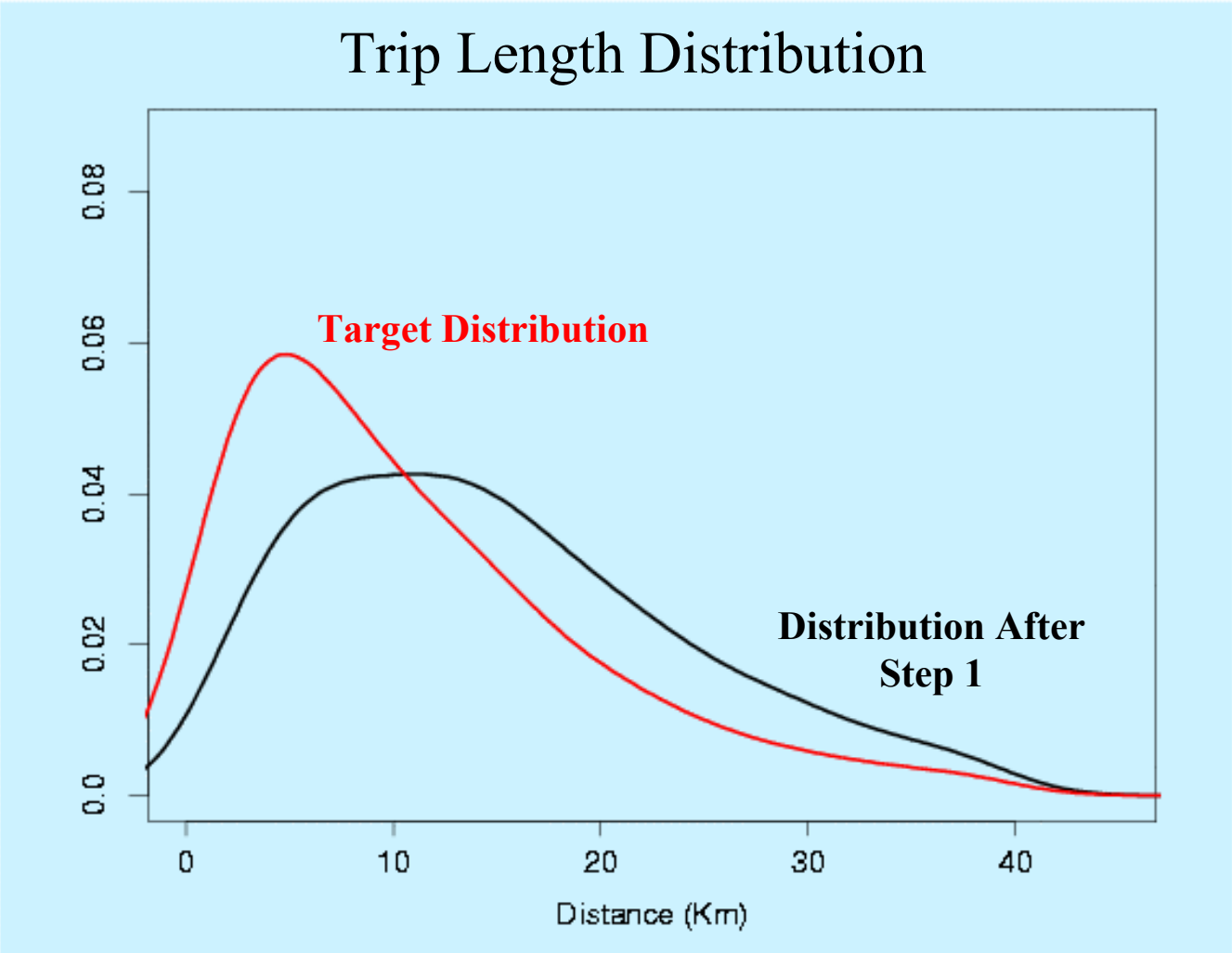
Mode Coefficients:

Coefficient	Activity Type	Mode	
-0.129	1	1	
-0.057	1	2	
-0.098	1	3	
-0.098	1	4	
-0.080	1	5	
-0.080	1	6	
-0.098	1	7	
-0.057	1	8	
-0.057	1	9	

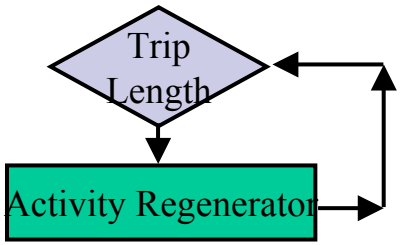


Location Choice: Trip Length





Location Choice: Trip Length



Coefficient	Activity Type	Mode
-0.129	1	1
-0.057	1	2
-0.098	1	3
-0.098	1	4
-0.080	1	5
-0.080	1	6
-0.098	1	7
-0.057	1	8
-0.057	1	9

Procedure

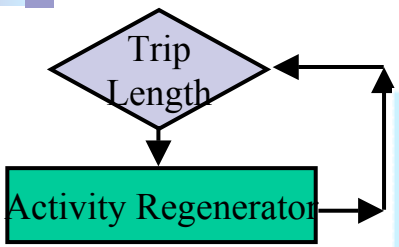
- Select mode and activity type to be calibrated
- Sample trips/tours of correct mode to be relocated
- Relocate the activities using the function

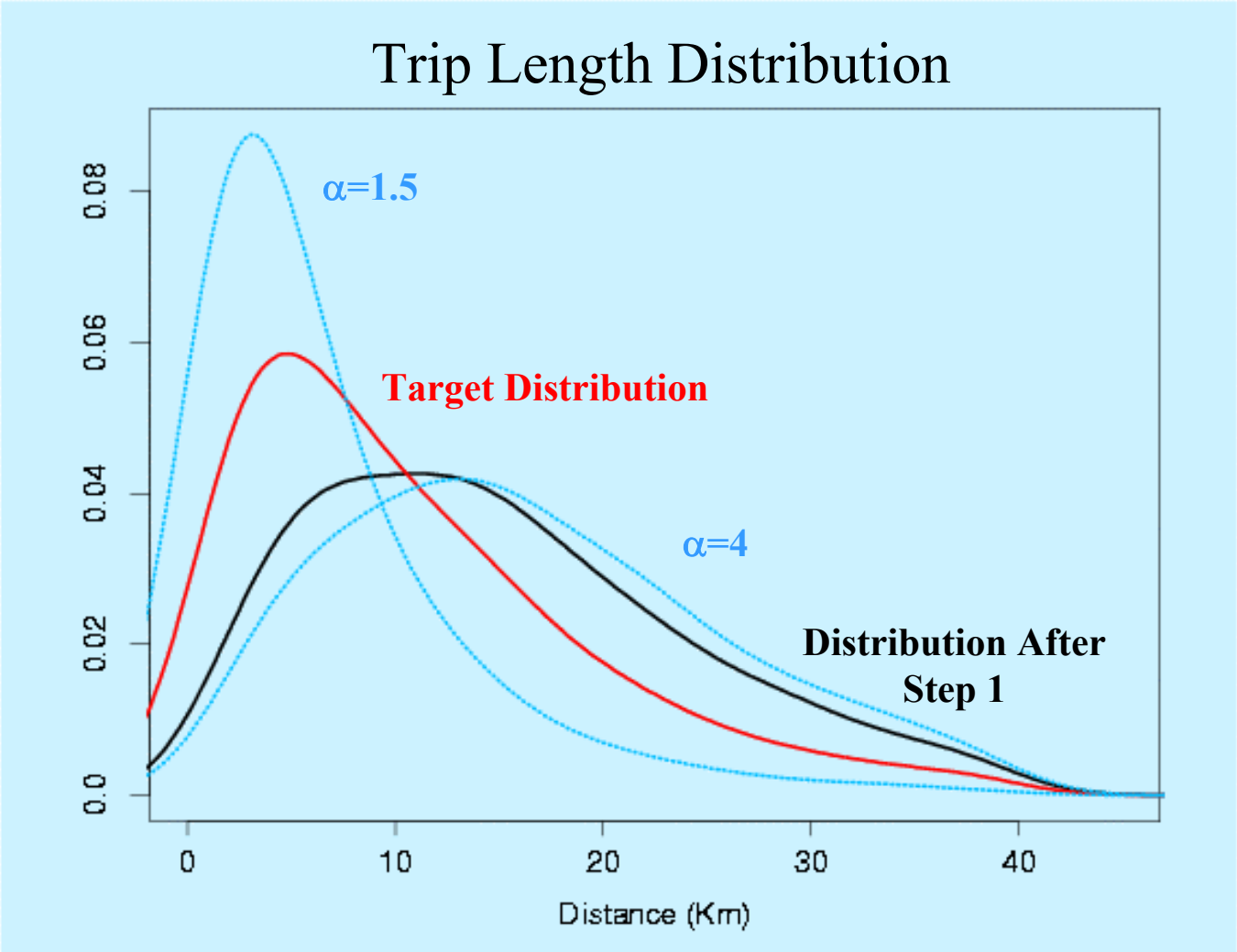
$$\exp(a(L)+\alpha b_m t(H,L))$$

for some value of α

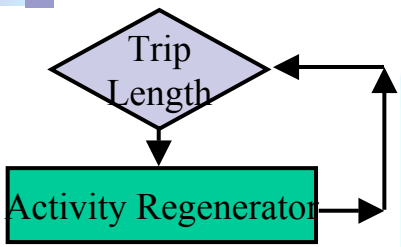
- Compute trip length distribution
- If new trip length does not match relocate with new α
- If the trip length does match the new mode coefficient for the activity type is: $\alpha\beta_m$

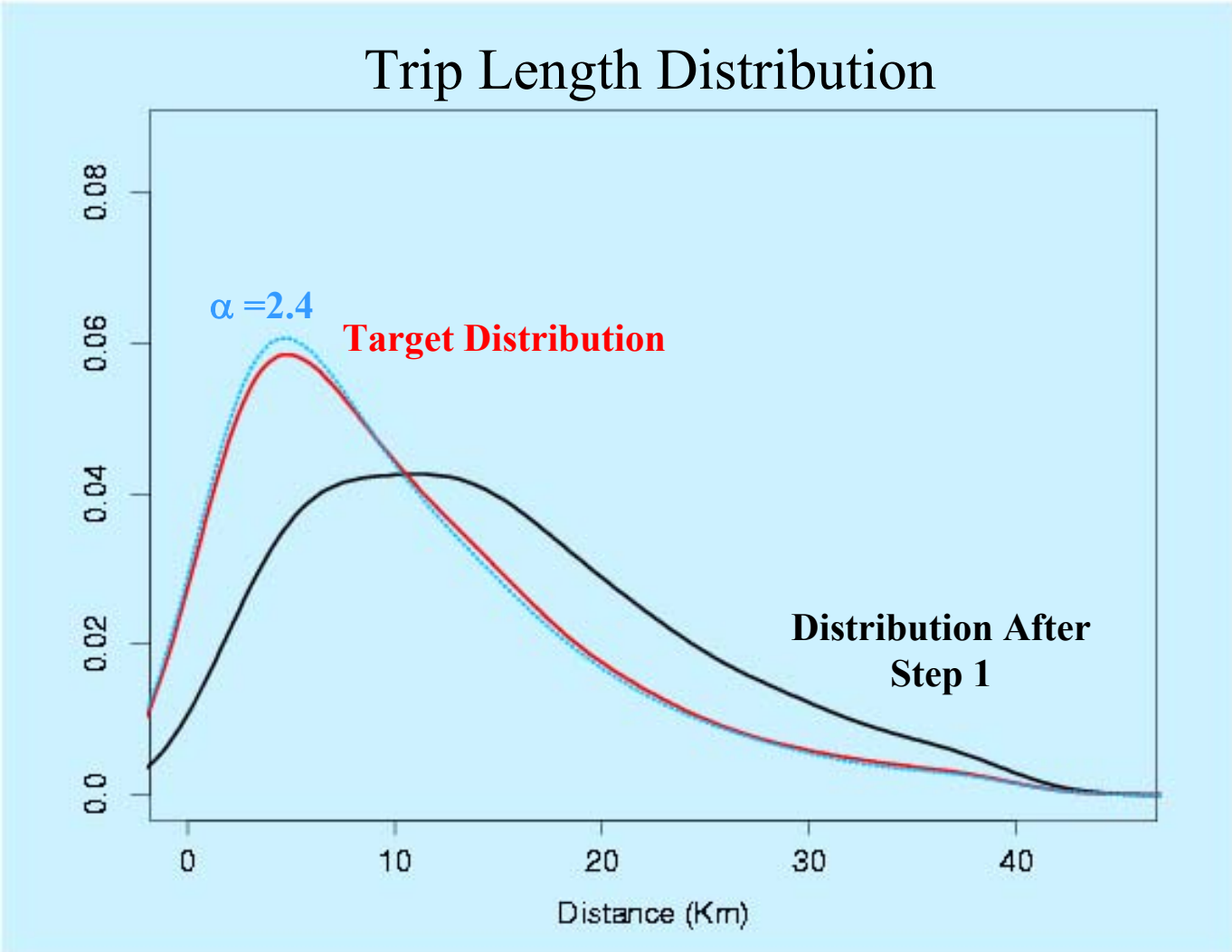
Location Choice: Trip Length



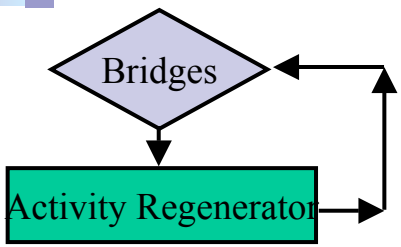


Location Choice: Trip Length

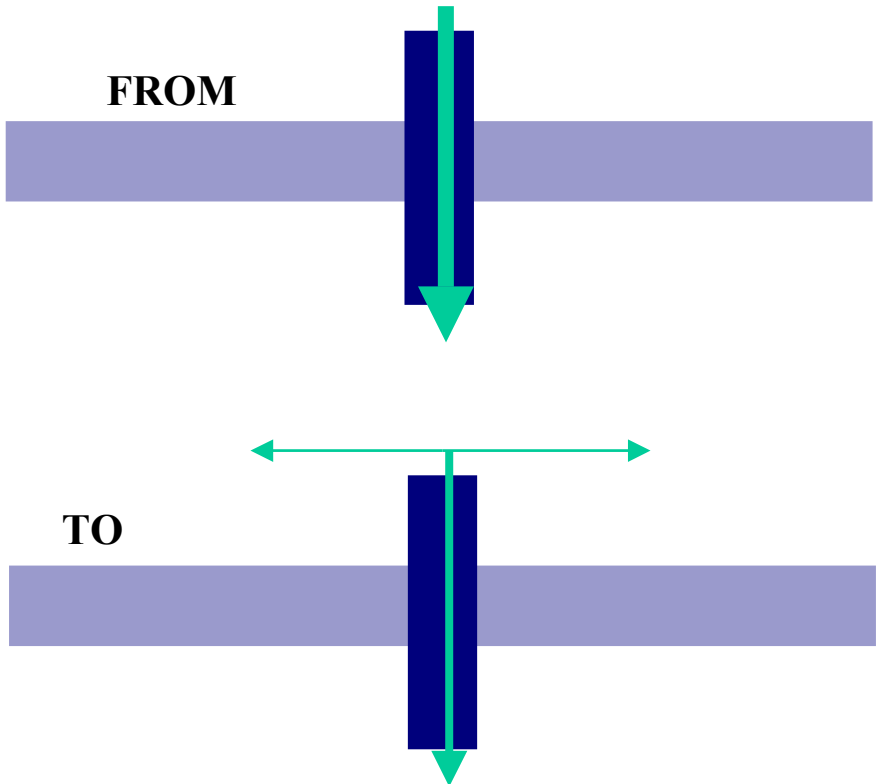




Location Choice: Bridge Crossing



- **Rivers are a barrier beyond the link impedance on a bridge.**
- **Activity locations must be changed to account for the reduced auto traffic on the bridges.**
- **Tuning methods exist to accomplish this using TRANSIMS.**



Location Choice: Bridge Crossing

Tuning Methods (β and c Tuning Constants)

Method-1: Coefficient Changes (Parameters apply to every trip)

$$P_L \propto (AT)Exp(\beta b \max(t+c,0)^{1/2})$$

Method-2: Probability Changes (Parameters apply to river crossings)

$$P_L \propto (AT)Exp(\beta^* b \max(t+c^*,0)^{1/2})$$

where

$\beta^* = \beta$ if the origin and destinations are in different river zones

$\beta^* = 1$ if the origin and destinations are in the same river zones

and/or

$c^* = c$ if the origin and destinations are in different river zones

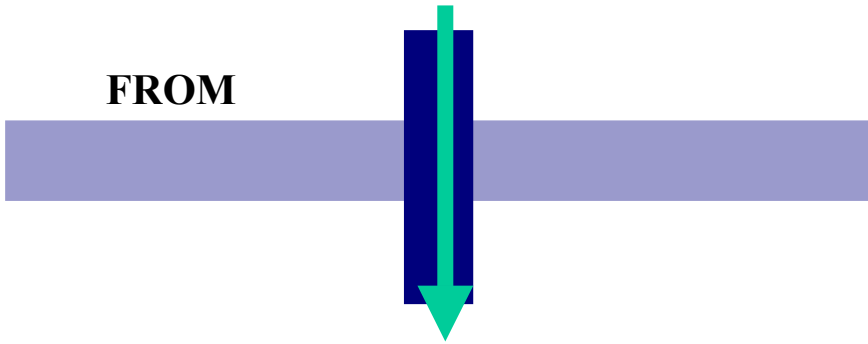
$c^* = 0$ if the origin and destinations are in the same river zones

Location Choice: Bridge Crossing

Which Travelers To Tune?

Original Data Set:

- **Did Cross The River**
- **Did Not Cross The River**



Travelers To Tune:

- **Only Those That Cross The River In The Original Set**
- **All Travelers On That Side Of The River.**

REMEMBER: This is a calibration procedure. Anything done here will have to be done in the forecast year.

Location Choice: Bridge Crossing

Possible Models

Travelers To Tune:

- **Only Those That Cross The River In The Original Set**
- **All Travelers On That Side Of The River.**

Methods:

Method-1: Coefficient Changes (Parameters apply to every trip)

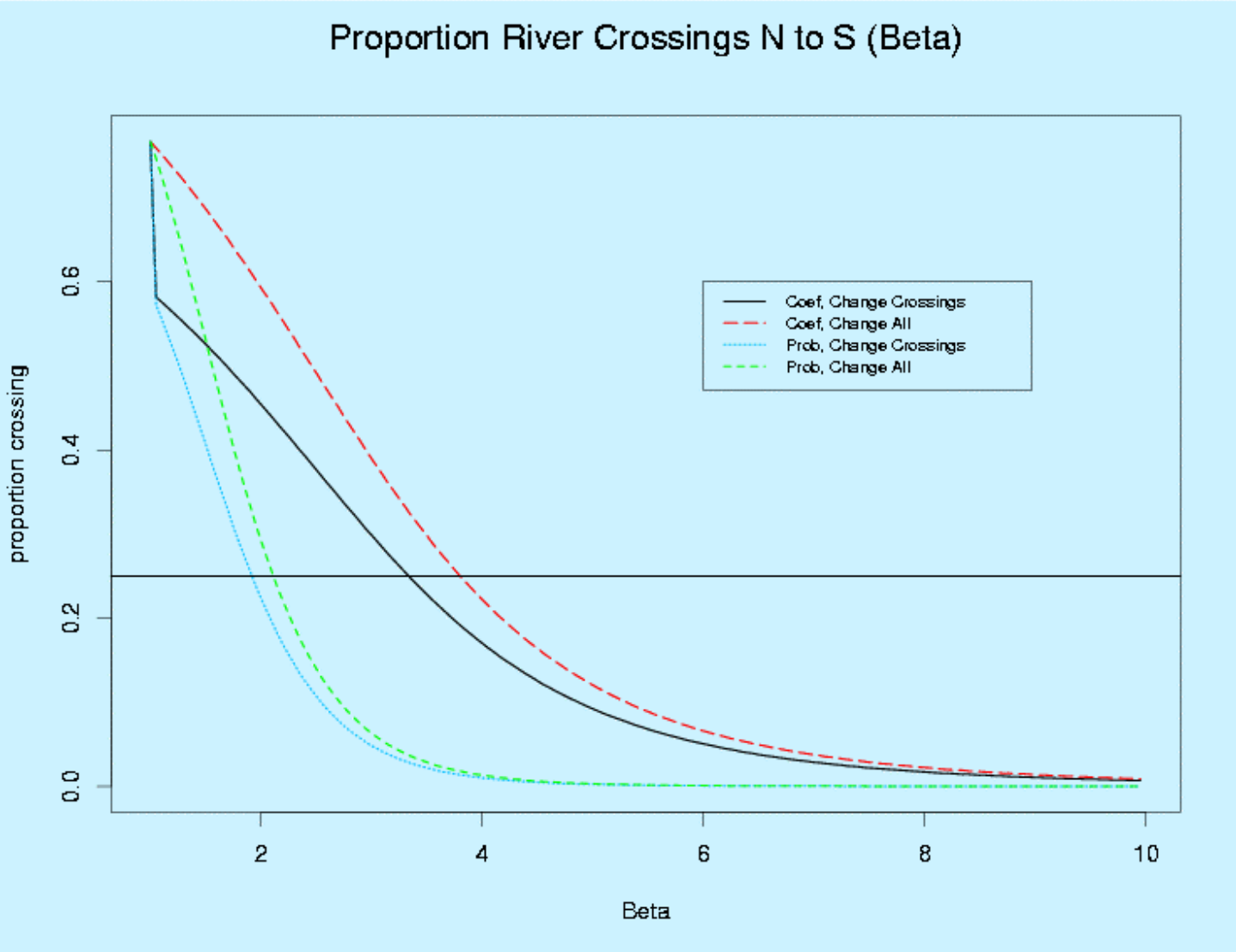
Method-2: Probability Changes (Parameters apply to river crossings)

Parameters:

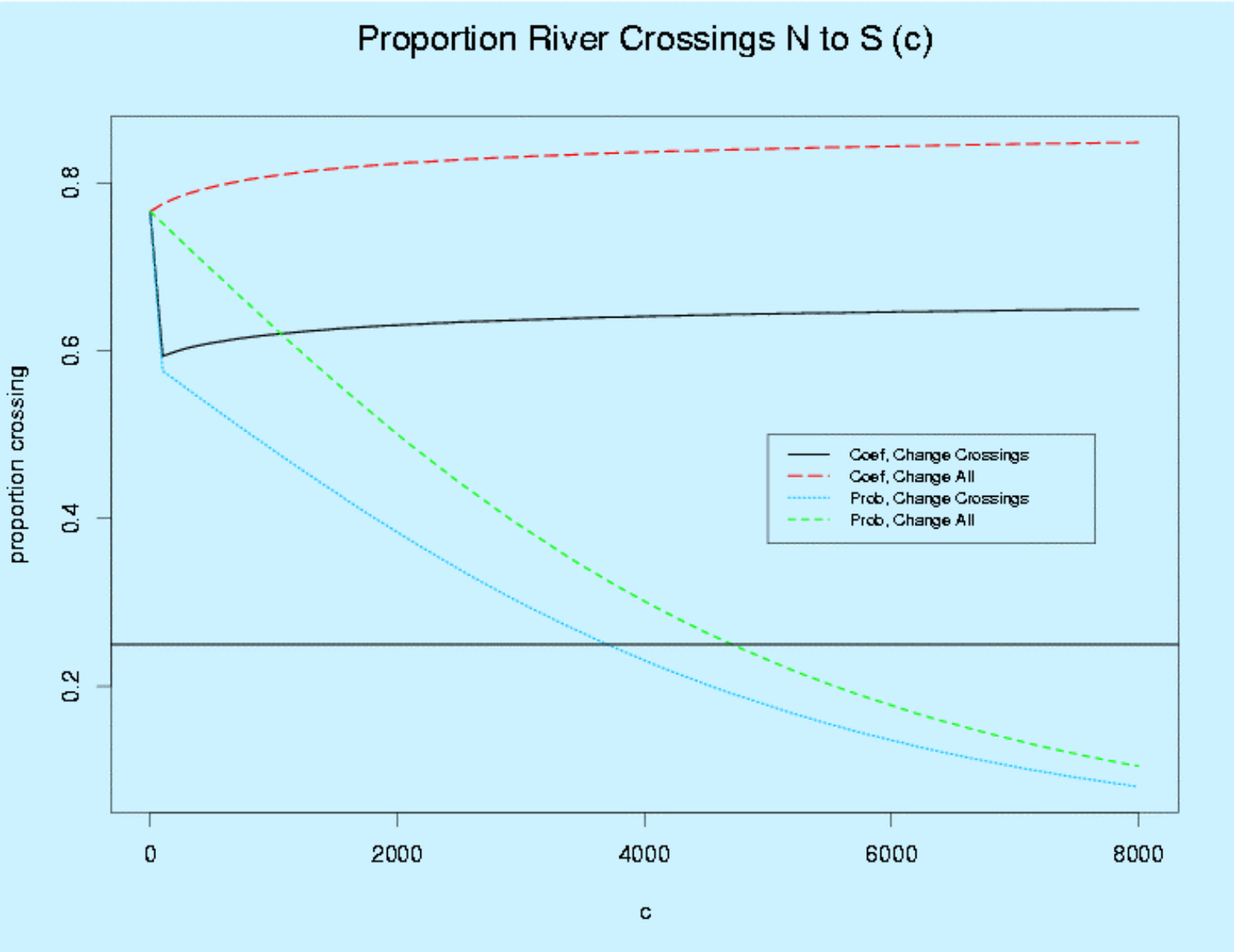
β or c in

$$P_L \propto (AT)Exp(\beta b \max(t+c,0)^{1/2})$$

Location Choice: Bridge Crossing

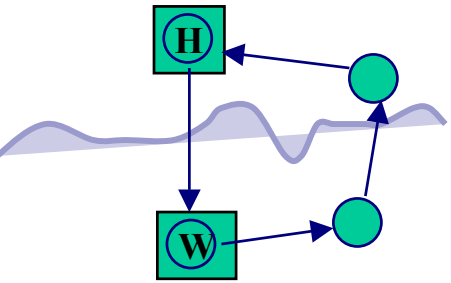


Location Choice: Bridge Crossing



Location Choice: Bridge Crossing

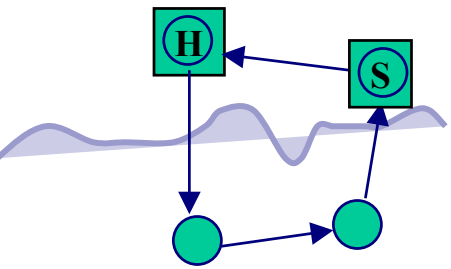
Tour Types



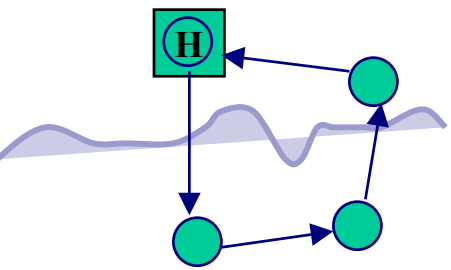
WORK

Tours Defined For The Study

- **Work:** A work activity
  ON THE OTHER SIDE OF THE RIVER!!!
- **Shop:** At least one shop but no work activity
- **Other:** No work or shop activity on tour



SHOP (NO WORK)



OTHER (NO WORK OR SHOP)

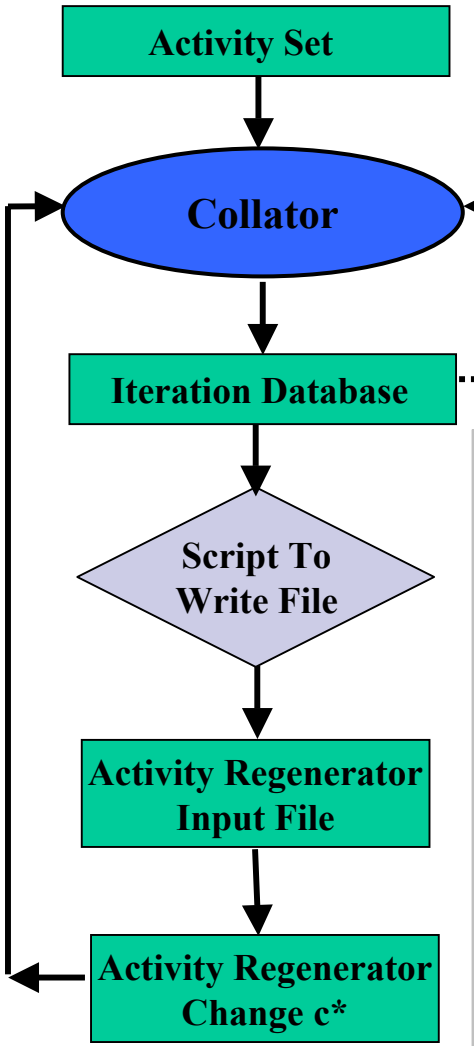
Location Choice: Bridge Crossing

CALIBRATION PROCEDURES

- Identify all tours of the specified type (e.g. work tours with the home North of the Columbia) from the latest activity set.
- Count the number of river crossings in these tours. Assume here that there are more tours crossing the river than the target value.
- Choose a value of c to be used in the calibration function.
- Compute new locations for each of the activities on the tour using the travel time function with c* added to the travel times.
- Count the number of tours that cross the river.
- Change the value of c by a binary search.
- Go to "compute new locations" or exit.
- Merge the activity set generated in this way with the original activity data set, and calibrate the next tour type starting over at step 1.

Location Choice: Bridge Crossing

CALIBRATION PROCEDURES



Collator Commands

```
SEL_USE_END_ACT_LOCATION
SEL_USE_END_ACT_TYPE
SEL_USE_END_MODE_PREF
SEL_USE_END_OTHER_PARTICIPANTS
SEL_USE_END_ACT_USER_DATA      River_Zone
SEL_USE_DRIVES_PASSENGER
```

HH	TRAV	TOUR	END_ACT_TYPE	END_MODE_PREF	OTHER_PARTICIPANT	DRIVES_PASSENGER	River_Zone
524791	1313002	0	0	1	0	FALSE	3
524791	1313002	1	1	2	1	FALSE	2
524791	1313002	1	1	2	1	FALSE	2
524791	1313002	1	5	2	1	FALSE	3
524791	1313002	1	5	2	1	FALSE	3
524791	1313002	2	4	2	1	FALSE	1
524791	1313002	2	4	2	1	FALSE	1
524791	1313002	2	0	2	1	FALSE	3
524791	1313002	2	0	2	1	FALSE	3
524791	1313003	0	0	1	0	FALSE	3
524791	1313003	1	1	2	2	TRUE	2
524791	1313003	1	1	2	2	TRUE	2
524791	1313003	1	5	2	2	TRUE	3
524791	1313003	1	5	2	2	TRUE	3
524791	1313003	2	4	2	2	TRUE	1
524791	1313003	2	4	2	2	TRUE	1
524791	1313003	2	0	2	2	TRUE	3
524791	1313003	2	0	2	2	TRUE	3

Location Choice: Bridge Crossing

$$P_L \propto (AT)Exp(\beta^* b \max(t + c^*, 0)^{1/2})$$

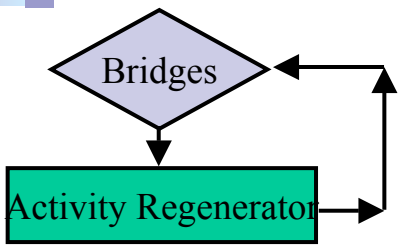
`LTR <starting activity id> [mode coefficient multiplier]` – change the locations of all activities within a tour. A tour is all activities between the specified starting activity and the end of the tour. The end of the tour is determined by the first occurrence of the following:

- another activity with the same location as the start activity,
- an activity at the home location, or
- the last activity in the traveler's activity list.

<hhid> LTR <starting activity id> 1

ACT_TRAVEL_TIME_FUNCTION_MODES	Specifies the modes for which the travel time function is valid. Modes are specified as a semicolon-separated list of integer mode values. Example: ACT_TRAVEL_TIME_FUNCTION_MODES 1;2;9
ACT_TRAVEL_TIME_FUNCTION_PARAMETERS	Specifies optional user-defined parameters to the travel time function. Parameters are specified as a semicolon-separated list of floating-point values. If specified, the values are passed into the travel time function as a vector of doubles. Example: ACT_TRAVEL_TIME_FUNCTION_PARAMETERS 0.2;4.1;-.00025

Location Choice: Bridge Crossing



Results

North/South work tours, desired crossings = 58757.

Iteration	C	Crossings
0	0	110003
1	5000	45576
2	3000	67966
3	4000	55876

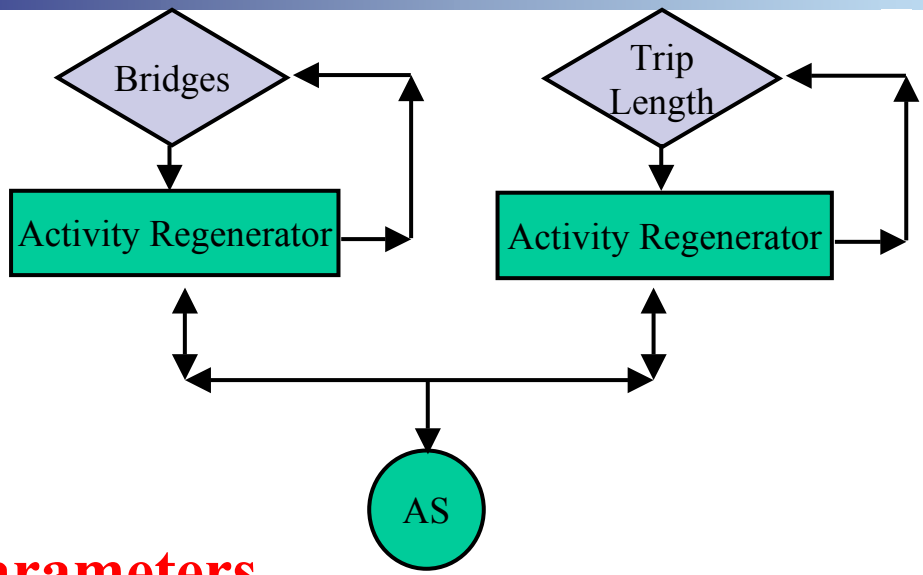
North/South shopping tours, desired crossings = 17761.

Iteration	C	Crossings
0	0	13470
1	-100	17347

North/South other tours, desired crossings = 49266.

Iteration	C	Crossings
0	0	22415
1	-300	44561
2	-350	51368

Location Choice: Iterations



Calibration parameters

$$P_L \propto (AT)Exp(\underline{\beta}b\max(t+\underline{c}^*,0)^{1/2})$$

Trip length distributions

$$P_L \propto (AT)Exp(\underline{\beta}bt^{1/2})$$

River Crossings

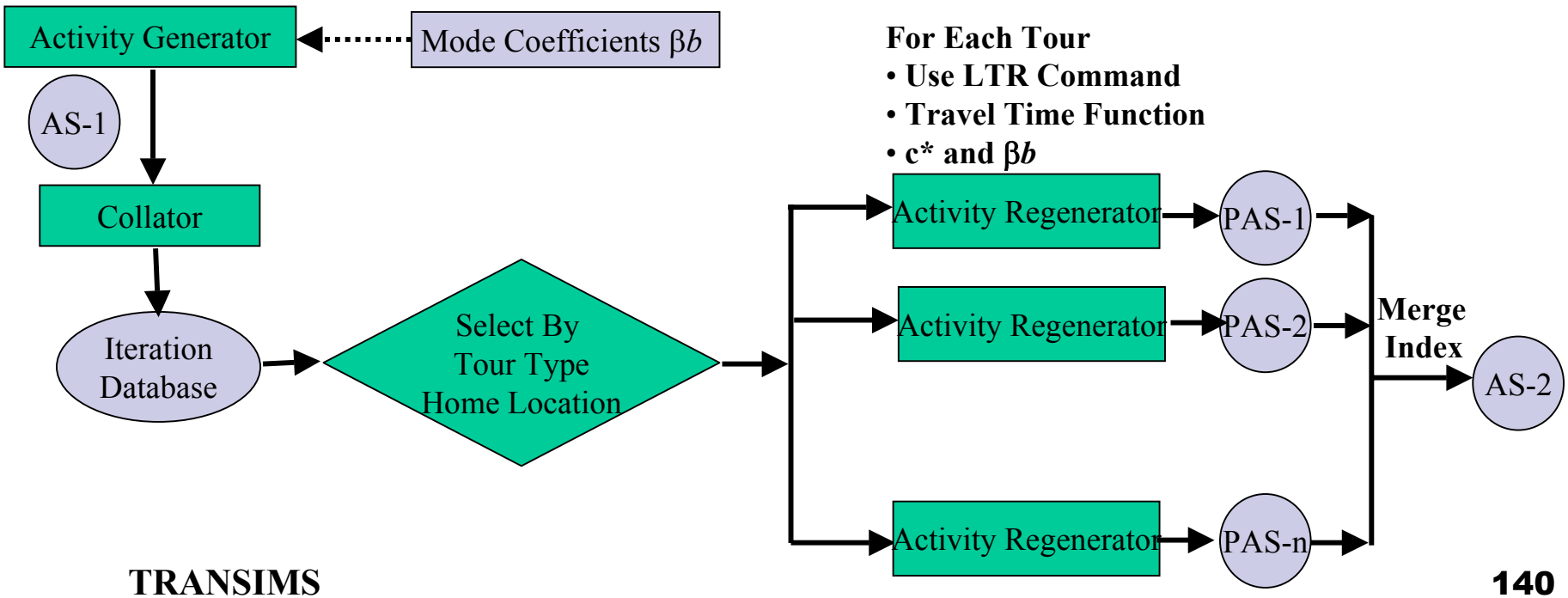
$$P_L \propto (AT)Exp(b\max(t+\underline{c}^*,0)^{1/2})$$

Location Choice: Bridge Crossings

Application In A Forecast Year

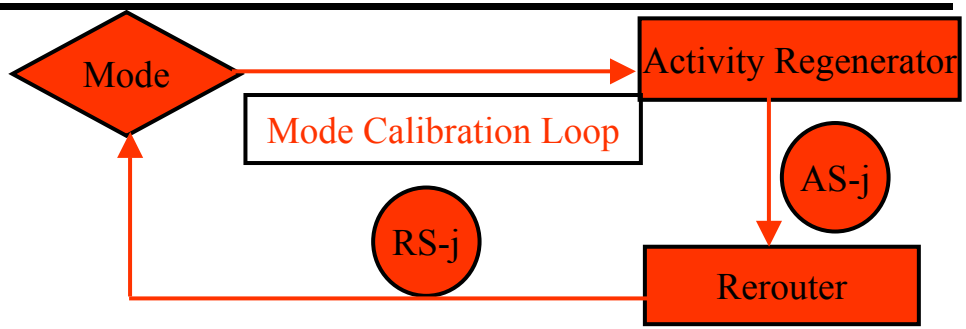
$$P_L \propto (AT)Exp(\beta b \max(t + c^*, 0)^{1/2})$$

- βb depends on mode and activity type
- c* depends on home location and tour types



Mode Choice

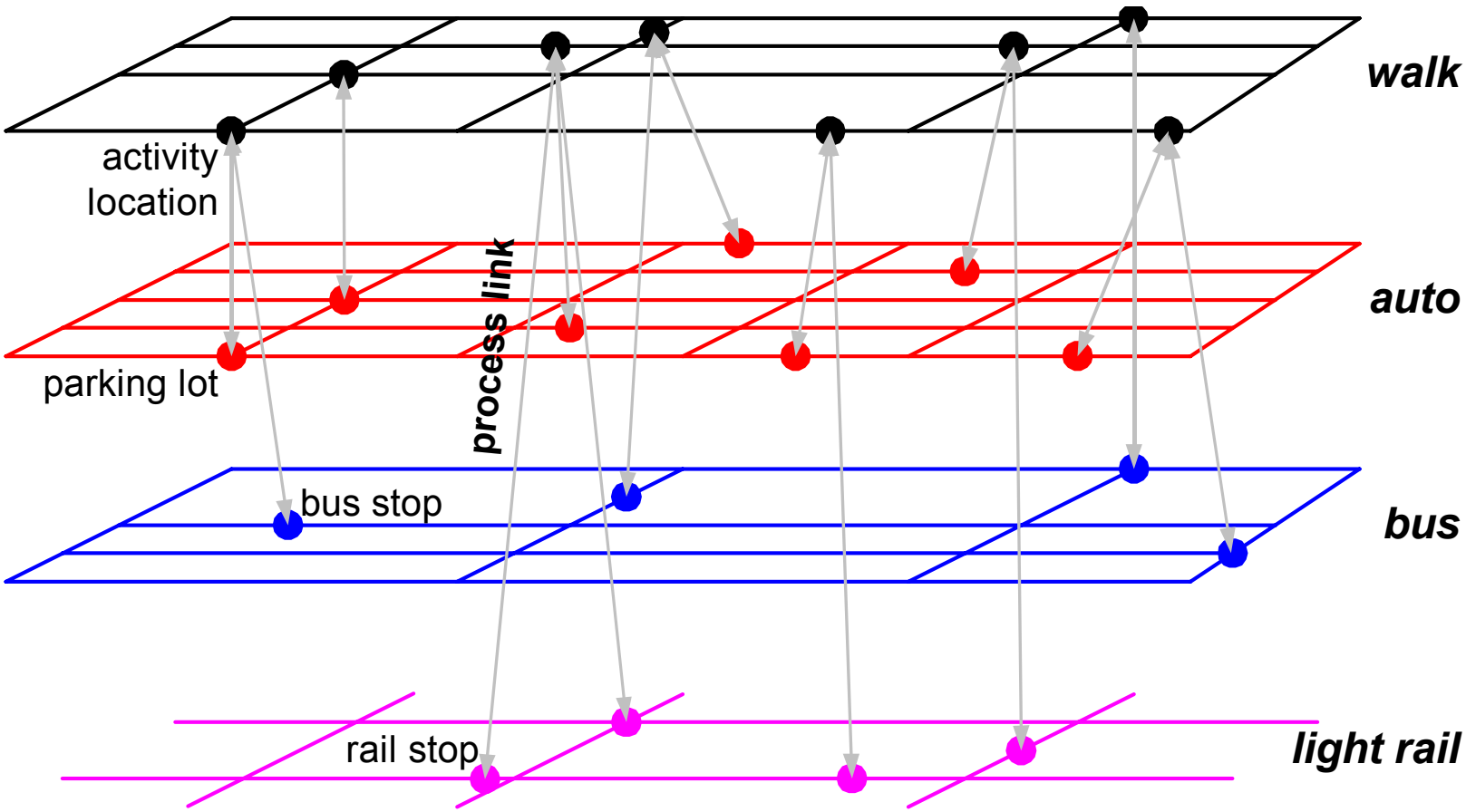
MODE CHOICE and the ROUTER



THREE STEPS FOR MODE CHOICE:

- **Calibration:**
  Match Base Year Counts
- **Application:**
  Mode Selection for Forecast Synthetic Population
- **Iteration:**
  Remove Mismatches (Aggregate vs. Individual)

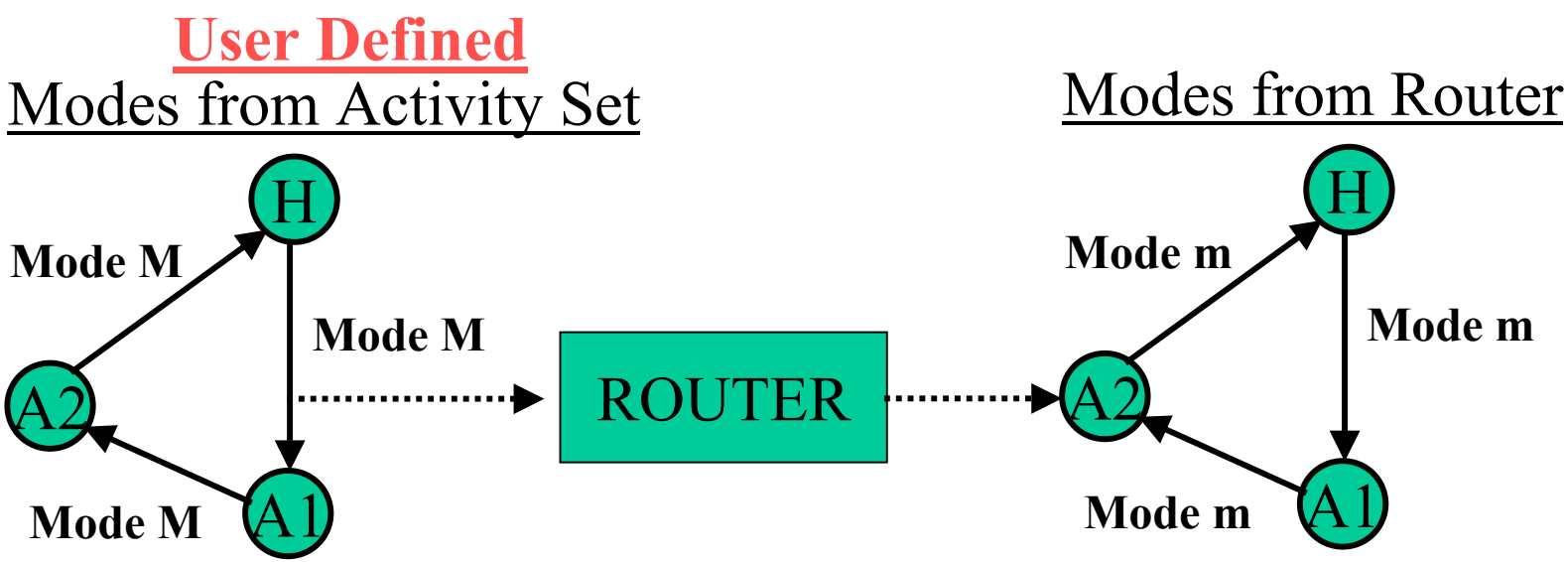
The Router and Mode Choice



Calibrating Mode Choice

MODE CHOICE and the ROUTER

Activity Mode	Router Result
walk	walk, "not possible"
drive	walk, walk-car-walk, "not possible"
transit	walk, any combination of
	walk..bus..light rail..walk, "not possible"
light rail	walk, walk-light rail-walk, "not possible"



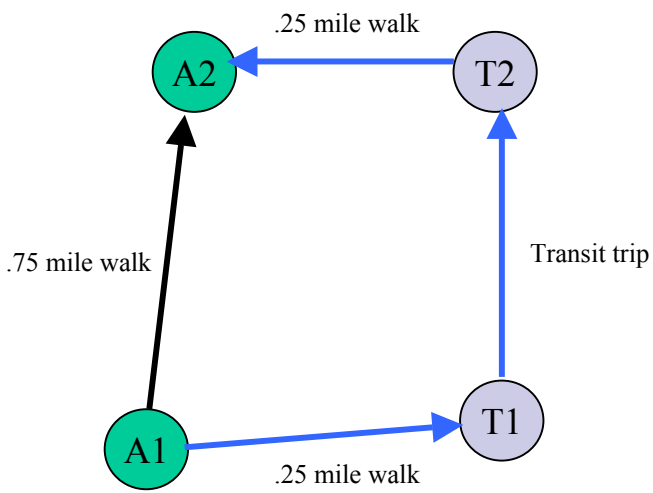
Calibrating Mode Choice

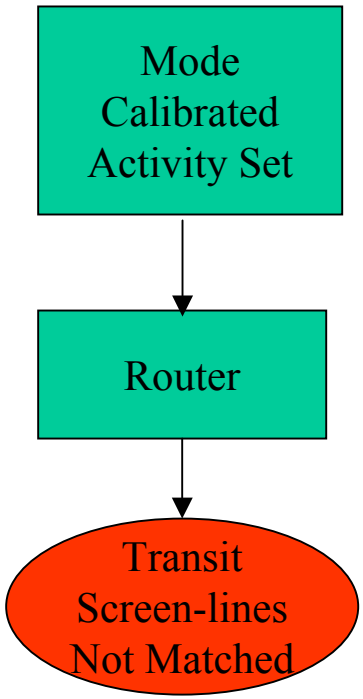
MODE CHOICE and the ROUTER

Router Behavior

Activity Mode	Router Result
walk	walk, "not possible"
drive	walk, walk-car-walk, "not possible"
transit	walk, any combination of
	walk..bus..light rail..walk, "not possible"
light rail	walk, walk-light rail-walk, "not possible"

NOTE: 1/2 of the transit trips in the simple calibration we did were walks.





Calibrating Mode Choice

MODE CALIBRATION and the ROUTER

Router Behavior

Activity Mode	Router Result
walk	walk, "not possible"
drive	walk, walk-car-walk, "not possible"
transit	walk, any combination of
	walk..bus..light rail..walk, "not possible"
light rail	walk, walk-light rail-walk, "not possible"

Modes in TRANSIMS

$$P_T(m|I) = \sum_M P_R(m|M,I)P_U(M|I)$$

$P_T(m|I)$ **Probability TRANSIMS mode is *m* for a person with characteristics *I*.**

$P_U(M|I)$ ***User defined*** **probability of mode *M* in activity list for a person with characteristics *I*.**

$P_R(m|M,I)$ **Probability Router gives mode *m* given activity mode *M* for a person with characteristics *I*.**

Calibrating Mode Choice

Router Behavior

Route Symbol (*m*)	Activity Symbol (*M*)	Router Modes Given the Activity Mode
w	*W*	Walk
a	*A*	Auto, Possible walk
NA	*T*	Any combination of walk, bus, light rail
*b**	*B*	Any combination of walk, bus
*l**	*L*	Any combination of walk, light rail
bi	*BI*	Bike
m	*M*	Inter-household shared ride
s	*S*	School bus
NA	*X*	Any of the symbols *w, a, t, b, l*

*b**: At Least one bus leg, *l**: at least one light rail leg, but no bus legs

Modes in TRANSIMS

$$P_T(m|I) = \sum_M P_R(m|M,I)P_U(M|I)$$

$P_R(m|M,I)$ **Probability Router gives mode m given activity mode M for a person with characteristics *I*.**

Special Cases

$P_R(m|M,I) = 0$

m=	M=
a	Not A
bi	Not BI
m	Not M
s	Not S

$P_R(m|M,I) = 1$

m=	M=
bi	BI
s	S
m	M
w	W

Calibrating Mode Choice

Router Behavior

Route Symbol (*m*)	Activity Symbol (*M*)	Router Modes Given the Activity Mode
w	*W*	Walk
a	*A*	Auto, Possible walk
NA	*T*	Any combination of walk, bus, light rail
*b**	*B*	Any combination of walk, bus
*l**	*L*	Any combination of walk, light rail
bi	*BI*	Bike
m	*M*	Inter-household shared ride
s	*S*	School bus
NA	*X*	Any of the symbols *w, a, t, b, l*

*b**: At Least one bus leg, *l**: at least one light rail leg, but no bus legs

Modes in TRANSIMS

$$P_T(m|I) = \sum_M P_R(m|M,I)P_U(M|I)$$

$P_R(m|M,I)$ **Probability Router gives mode m given activity mode M for a person with characteristics *I*.**

For Autos:

$$P_T(m=a|I) = \sum_M P_R(m=a|M,I)P_U(M|I)$$

$$= (1 - P_R(m=w|M=A,I))P_U(M=A|I)$$

$$\approx P_U(M=A|I)$$

Calibrating Mode Choice

Router Behavior

Route Symbol (*m*)	Activity Symbol (*M*)	Router Modes Given the Activity Mode
w	*W*	Walk
a	*A*	Auto, Possible walk
NA	*T*	Any combination of walk, bus, light rail
*b**	*B*	Any combination of walk, bus
*l**	*L*	Any combination of walk, light rail
bi	*BI*	Bike
m	*M*	Inter-household shared ride
s	*S*	School bus
NA	*X*	Any of the symbols *w, a, t, b, l*

*b**: At Least one bus leg, *l**: at least one light rail leg, but no bus legs

For Walks:

$$P_T(m=w|I)=\sum_M P_R(m=w|M,I)P_U(M|I)$$

$$=P_R(m=w|M=W,I)P_U(M=W|I)+P_R(m=w|M=B,I)P_U(M=B|I)+$$

$$P_R(m=w|M=L,I)P_U(M=L|I)+P_R(m=w|M=T,I)P_U(M=T|I)+$$

$$P_R(m=w|M=A,I)P_U(M=A|I)$$

For Buses:

$$P_T(m=b|I)=\sum_M P_R(m=b|M,I)P_U(M|I)$$

$$=P_R(m=b|M=T,I)P_U(M=T|I)+(1-P_R(m=w|M=B,I))P_U(M=B|I)$$

Calibrating Mode Choice

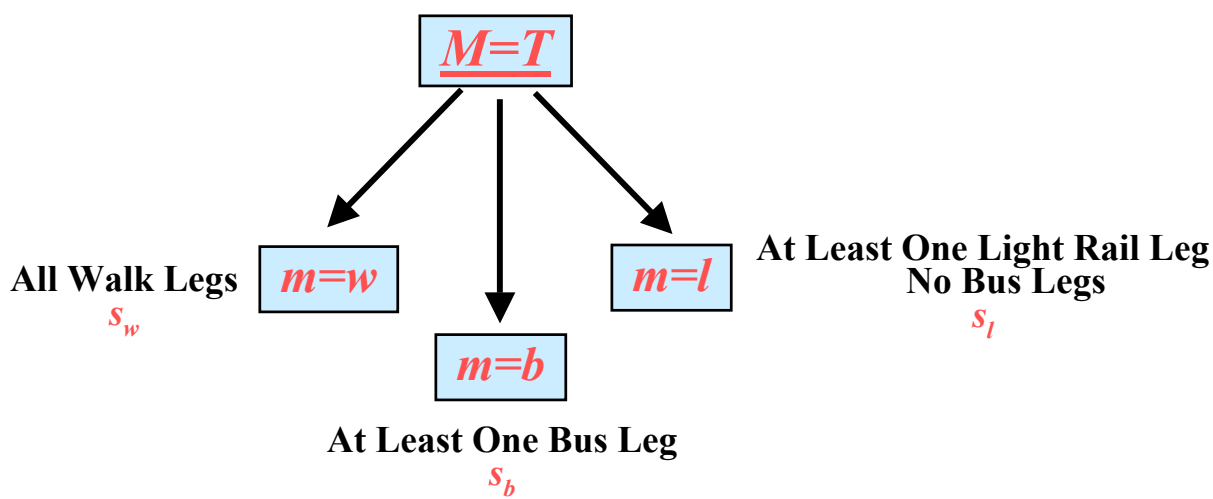
Router Behavior

Route Symbol (*m*)	Activity Symbol (*M*)	Router Modes Given the Activity Mode
w	*W*	Walk
a	*A*	Auto, Possible walk
NA	*T*	Any combination of walk, bus, light rail
*b**	*B*	Any combination of walk, bus
*l**	*L*	Any combination of walk, light rail
bi	*BI*	Bike
m	*M*	Inter-household shared ride
s	*S*	School bus
NA	*X*	Any of the symbols *w, a, t, b, l*

*b**: At Least one bus leg, *l**: at least one light rail leg, but no bus legs

The General Transit Mode *T*

$$P_R(m \mid M = T, I)$$



Calibrating Mode Choice

$P_U(M|I)$ User Defined Activity Set Mode Choice Function

What if: $P_U(M=W|I) = P_U(M=B|I) = P_U(M=L|I) = 0$?
(All M=W, M=B, M=L replaced with M=T)

For Walks: $P_U(M=W|I) = P_U(M=B|I) = P_U(M=L|I) \neq 0$

$$P_T(m=w|I) = \sum_M P_R(m=w|M,I)P_U(M|I)$$
$$= P_R(m=w|M=W,I)P_U(M=W|I) + P_R(m=w|M=B,I)P_U(M=B|I) +$$
$$P_R(m=w|M=L,I)P_U(M=L|I) + P_R(m=w|M=T,I)P_U(M=T|I) +$$
$$P_R(m=w|M=A,I)P_U(M=A|I)$$

$$P_U(M=W|I) = P_U(M=B|I) = P_U(M=L|I) = 0$$

$$P_T(m=w|I) = \sum_M P_R(m=w|M,I)P_U(M|I)$$
$$= P_R(m=w|M=T,I)P_U(M=T|I) + P_R(m=w|M=A,I)P_U(M=A|I)$$
$$\approx P_R(m=w|M=T,I)P_U(M=T|I)$$

Calibrating Mode Choice

$P_U(M|I)$ User Defined Activity Set Mode Choice Function

What if: $P_U(M=W|I) = P_U(M=B|I) = P_U(M=L|I) = 0$?
(All M=W, M=B, M=L replaced with M=T)

For Buses: $P_U(M=W|I) = P_U(M=B|I) = P_U(M=L|I) \neq 0$

$$P_T(m=b|I) = \sum_M P_R(m=b|M,I)P_U(M|I)$$
$$= P_R(m=b|M=T,I)P_U(M=T|I) + (1-P_R(m=w|M=B,I))P_U(M=B|I)$$

$$P_U(M=W|I) = P_U(M=B|I) = P_U(M=L|I) = 0$$

$$P_T(m=b|I) = \sum_M P_R(m=b|M,I)P_U(M|I)$$
$$= P_R(m=b|M=T,I)P_U(M=T|I)$$

Calibrating Mode Choice

MODE CALIBRATION and the ROUTER

$$P_T(m|D) = \sum_M P_R(m|M,D)P_U(M|D)$$

The Calibration Problem:

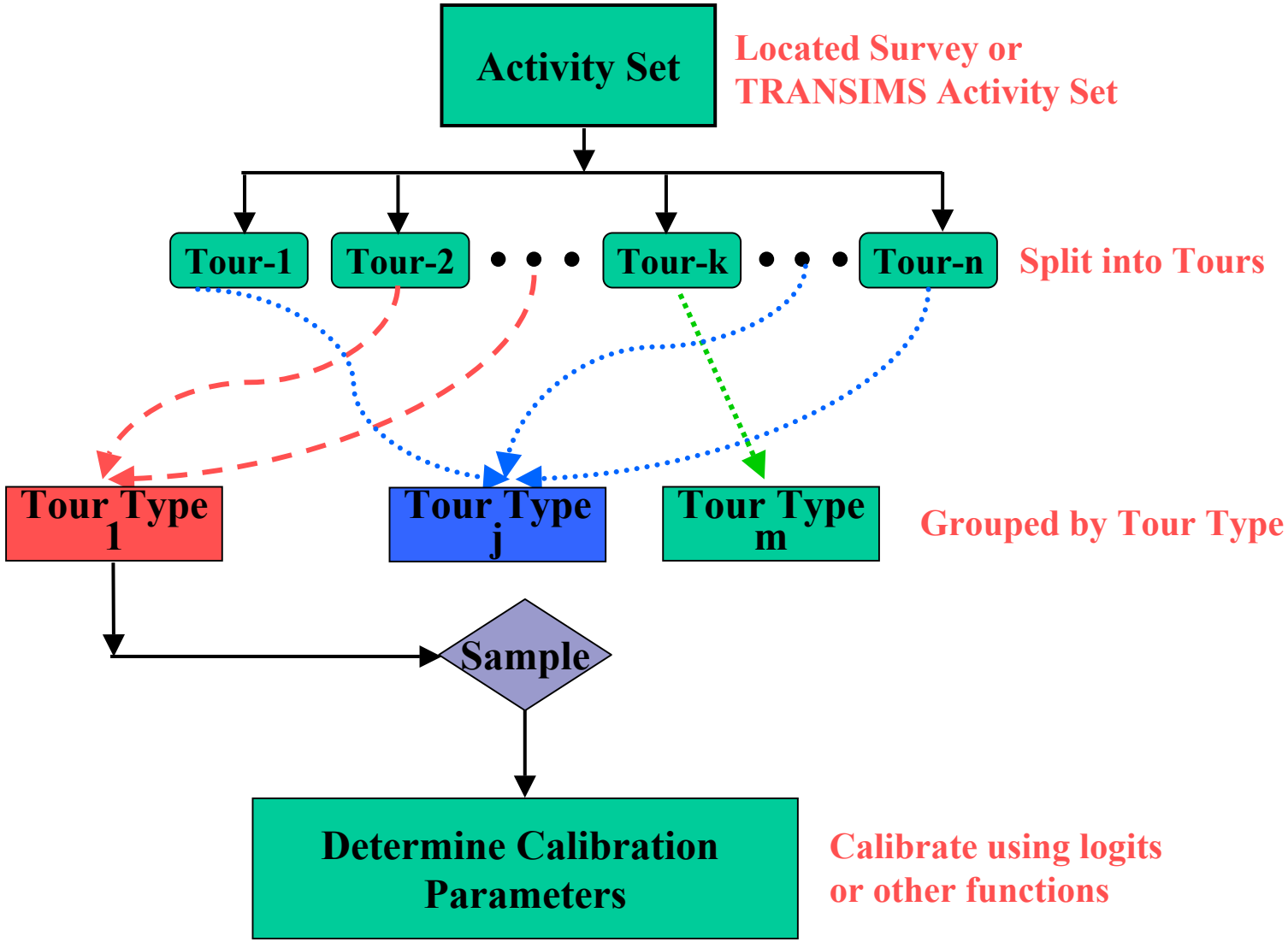
Using Previous Equations, Determine: $P_U(M|D)$

So That: $_{obs}(\quad|D) = P_T(m|D)$ ***(Here D represents an aggregated population)***

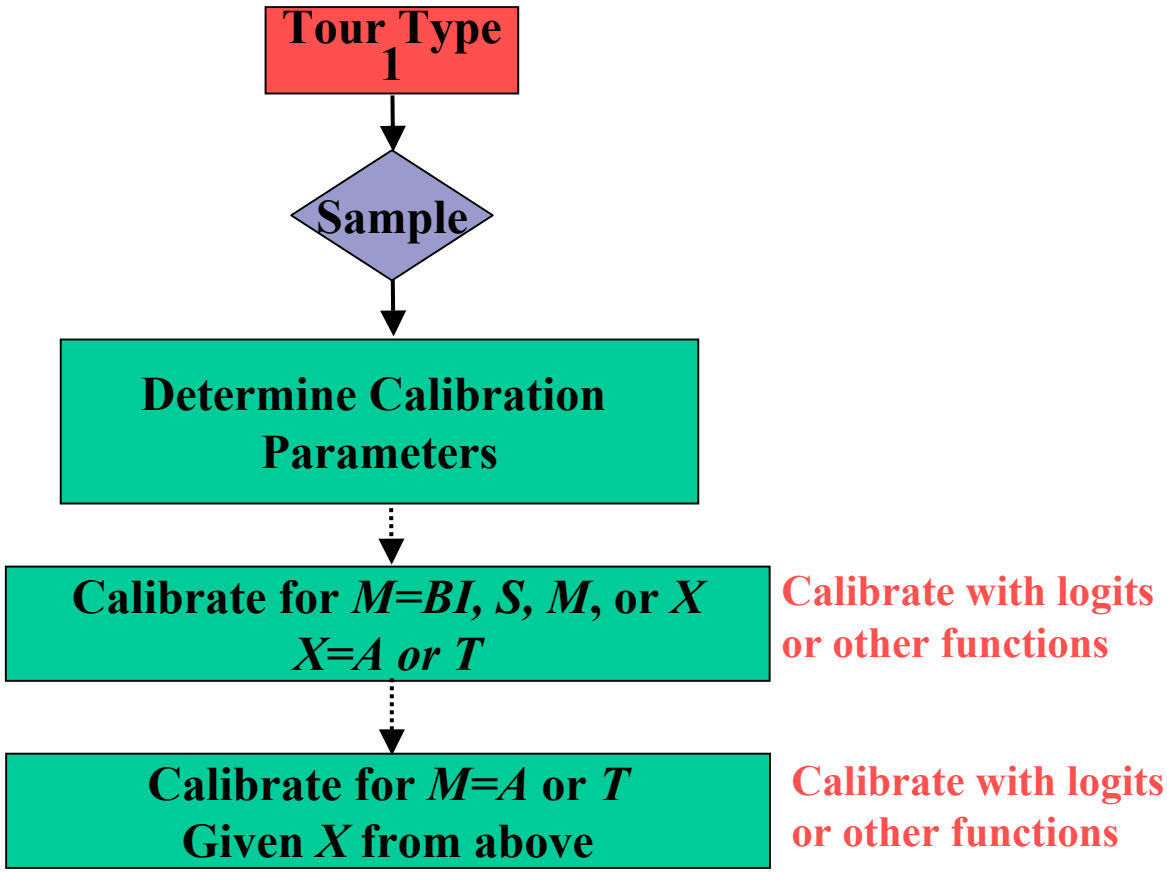
A Two Step Procedure:

- Calibrate $P_U(M|D)$ for *M=BI, S, M* or *X*
  X=A, or *T.*
- Calibrate a second function
  for a choice between *m=a, w, b or l*
  given that *M=X*

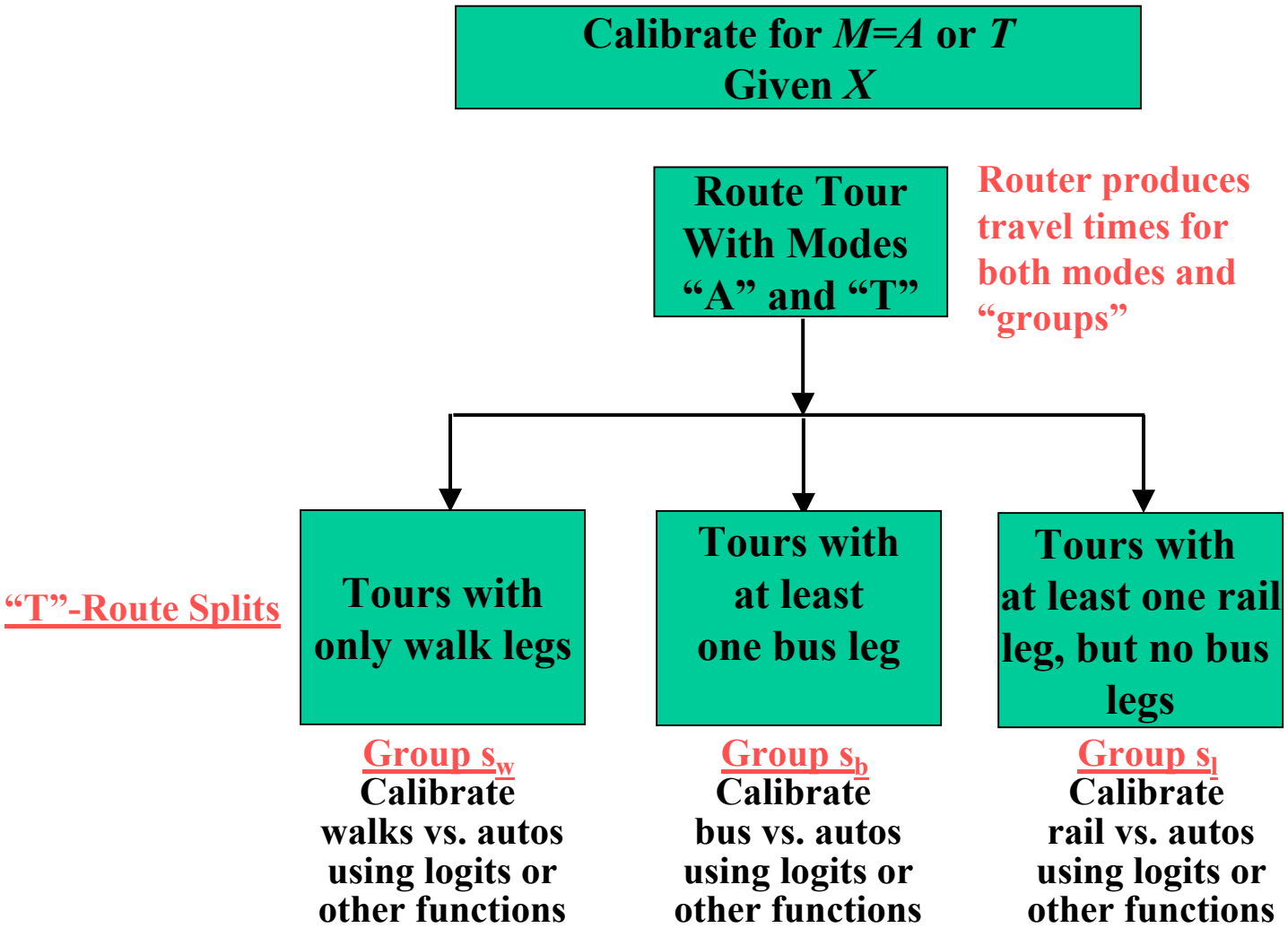
Calibrating Mode Choice



Calibrating Mode Choice

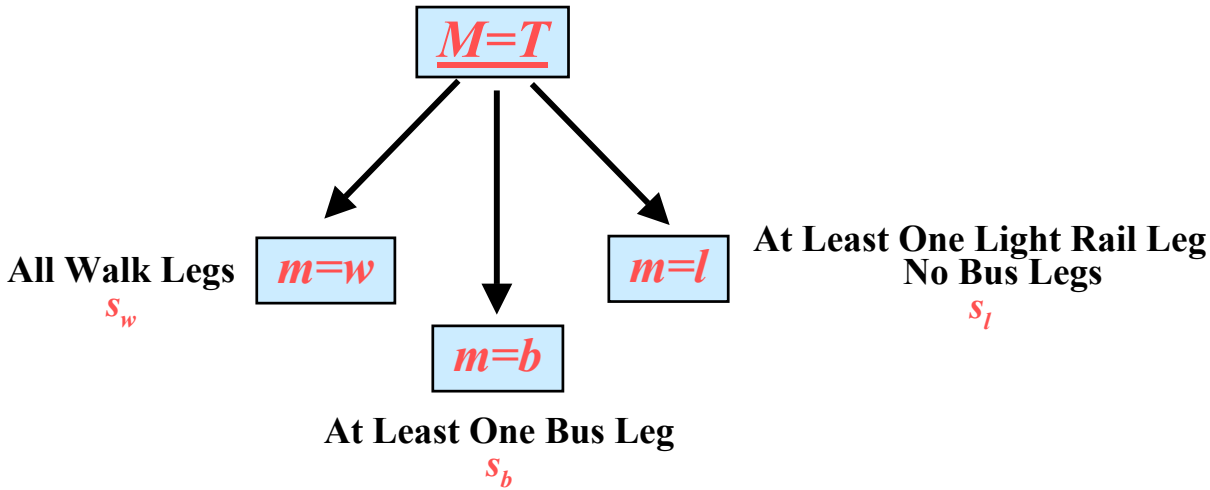


Calibrating Mode Choice



Calibrating Mode Choice

A MODE CALIBRATION METHODOLOGY



$$P_U(M|D) = P_U^{(1)}(M_1|D) \text{ for } M_1 = BI, M, S$$

$$P_U(M = A|D) = P_U^{(2)}(M_2 = A|M_1 = X, D)P_U^{(1)}(M_1 = X|D)$$

$$\begin{aligned} P_U^{(2)}(M_2 = A|D) = {} & P_U^{w}(M_2 = A|s_w, D)P_R(m = w|M = T, D) + \\ & P_U^{b}(M_2 = A|s_b, D)P_R(m = b|M = T, D) + \\ & P_U^{l}(M_2 = A|s_l, D)P_R(m = l|M = T, D) \end{aligned}$$

Calibrating Mode Choice

A MODE CALIBRATION METHODOLOGY

$$P_U^{(2)}(M_2 = A|D) = P_U^w(M_2 = A|s_w, D)P_R(m = w|M = T, D) + P_U^b(M_2 = A|s_b, D)P_R(m = b|M = T, D) + P_U^l(M_2 = A|s_l, D)P_R(m = l|M = T, D)$$

$p_R^k = P_R(m = k|M = T, D)$ are estimated using the numbers in the groups s_w, s_b and s_l

To calibrate:

$$P_U^w(M_2 = A|s_w, D) = 1 - \frac{w_c}{(a_c + w_c + b_c + l_c)p_R^w}$$

$$P_U^b(M_2 = A|s_b, D) = 1 - \frac{b_c}{(a_c + w_c + b_c + l_c)p_R^b}$$

$$P_U^l(M_2 = A|s_l, D) = 1 - \frac{l_c}{(a_c + w_c + b_c + l_c)p_R^l}$$

a_c, w_c, b_c, and l_c are the calibration counts.

Calibrating Mode Choice

A NON-LOGIT MODE CALIBRATION METHOD

(1) Taken directly from the activity generator assignments

$$P_U(M|D) = P_U^{(1)}(M_1|D) \text{ for } M_1 = BI, M, S, X$$

(2) Based on generalized cost functions

$$P_U(M = A|D) = P_U^{(2)}(M_2 = A|M_1 = X, D)P_U^{(1)}(M_1 = X|D)$$

$$\begin{aligned} P_U^{(2)}(M_2 = A|D) = {} & P_U^{w}(M_2 = A|s_w, D)P_R(m = w|M = T, D) + \\ & P_U^{b}(M_2 = A|s_b, D)P_R(m = b|M = T, D) + \\ & P_U^{l}(M_2 = A|s_l, D)P_R(m = l|M = T, D) \end{aligned}$$

Calibrating Mode Choice

A NON-LOGIT MODE CALIBRATION METHOD

THE VARIABLES:

(a) Work Tours (w) Non-Work Tours (~w)

(b) Origin Urbanization (ou) Destination Urbanization (du)

(c) Origin Transit Distance (od) Destination Transit Distance (dd)

(d) Income (i), Parking Costs (p), Transit Fares (f)

(e) Travel Time Transit (Tt) Travel Time Auto (Ta)

(f) Calibration Parameters (α)

METHOD to determine $P_U(M|I)$

- Keep modes *BI, M* and *S* from activity list
- Assign mode "*X*" to walk, transit and auto modes in the activity list
- Build a calibration function for transit and auto

  f((w), (ou), (du), (od), (dd), i, p, f, (Tt), (Ta), (α))

Calibrating Mode Choice

The Calibration Function:
f((w), (ou), (du), (od), (dd), i, p, f, (Tt), (Ta), (α))

Two Parts:

Stratification Variables:

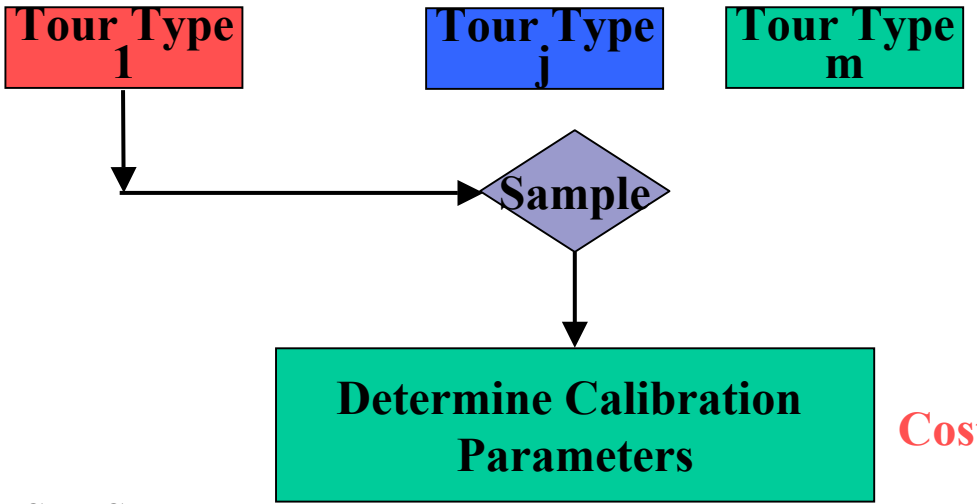
(a) Work Tours (w) Non-Work Tours (~w)

(b) Origin Urbanization (ou) Destination Urbanization (du)

(c) Origin Transit Distance (od) Destination Transit Distance (dd)

Cost Function Variables/Form:

$$c_i = \alpha \cdot \log_{10}(1.01 + \min(0, Income)) \cdot Time_i + DollarCost_i$$



Stratification Variables

Cost Function Variables/Form

Calibrating Mode Choice

The Generalized Cost Function

$$c_i = \alpha \log_{10}(1.01 + \min(0, Income))Time_i + DollarCost_i$$

The Transit (Bus) Cost:

$$c_T = \alpha \log_{10}(1.01 + \min(0, Income))Time_T + TransitCost$$

The Auto Cost:

$$c_A = \alpha \log_{10}(1.01 + \min(0, Income))Time_A + ParkingCost$$

Choose Auto If:

$$c_A < c_T$$

or

$$\alpha(Time_A - Time_T) < (TransitCost - ParkingCost) / \log_{10}(1.01 + \min(0, Income))$$

α is the calibration parameter

Calibrating Mode Choice

Generalized Cost Function Is Sensitivity to Parking/Transit Costs

$$c_i = \alpha \log_{10}(1.01 + \min(0, Income))Time_i + DollarCost_i$$

It's Too Sensitive!!

(1) Assume Tt > Ta, so Tt - Ta > 0

(2) The probability of picking transit is

$$P_U(M = T \mid I) = P(\alpha(Tt - Ta) < (p - f)/F(i) \mid I)$$

(3) To make the probability of picking transit > 0, p must be bigger than f. The probability is very sensitive to parking costs.

(4) Activity locations and parking costs:

	Parking Cost	
Urban.	$0	>$0
1	3334	1695
2	25214	54
3	211009	2117

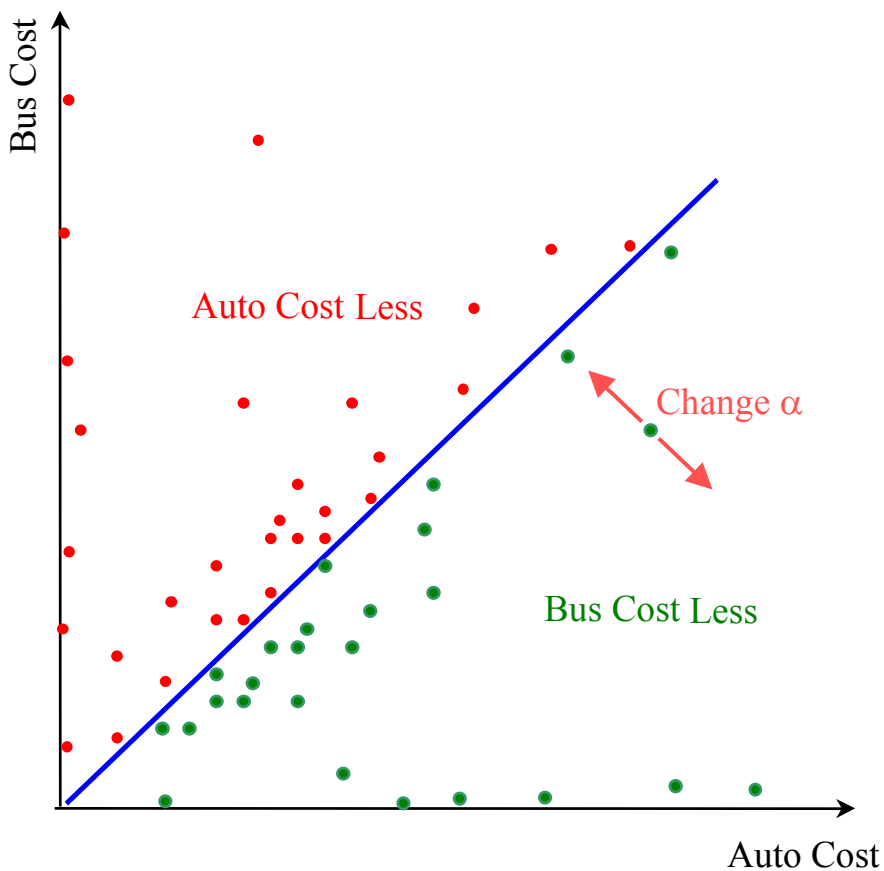
Calibrating Mode Choice

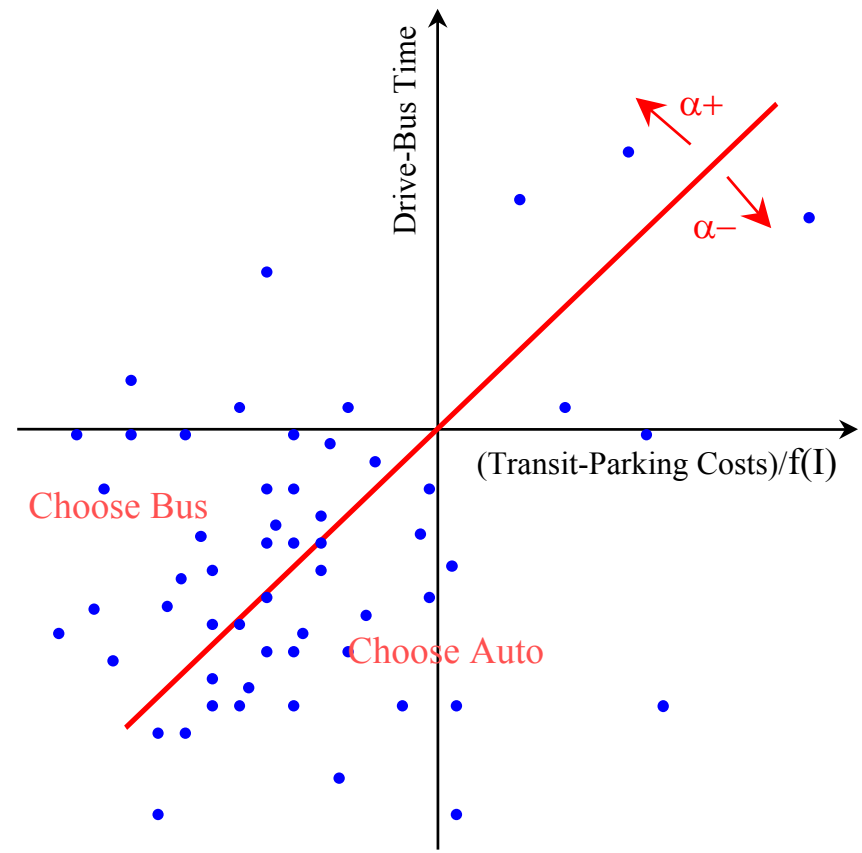
Choose Auto If:

$$c_A < c_T$$

or

$$\alpha(Time_A - Time_T) < (TransitCost - ParkingCost) / \log_{10}(1.01 + \min(0, Income))$$





Calibrating Mode Choice

Route Tour With Modes "*A*" and "*T*"

Router produces travel times for both modes and "groups"

Tours with only walk legs

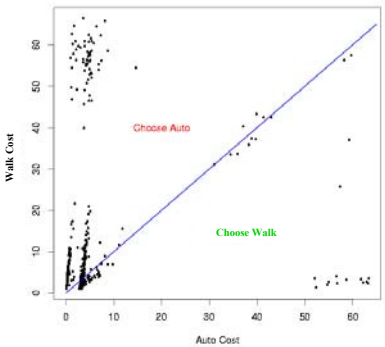
Tours with at least one bus leg

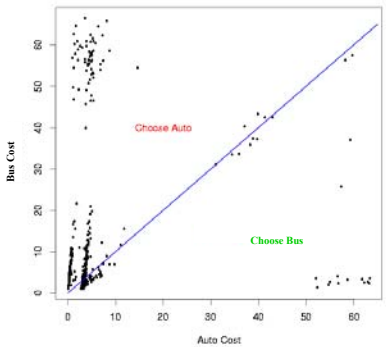
Tours with at least one rail leg, but no bus legs

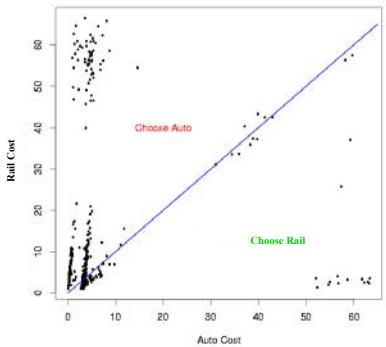
Group s_w
Calibrate

Group s_b
Calibrate

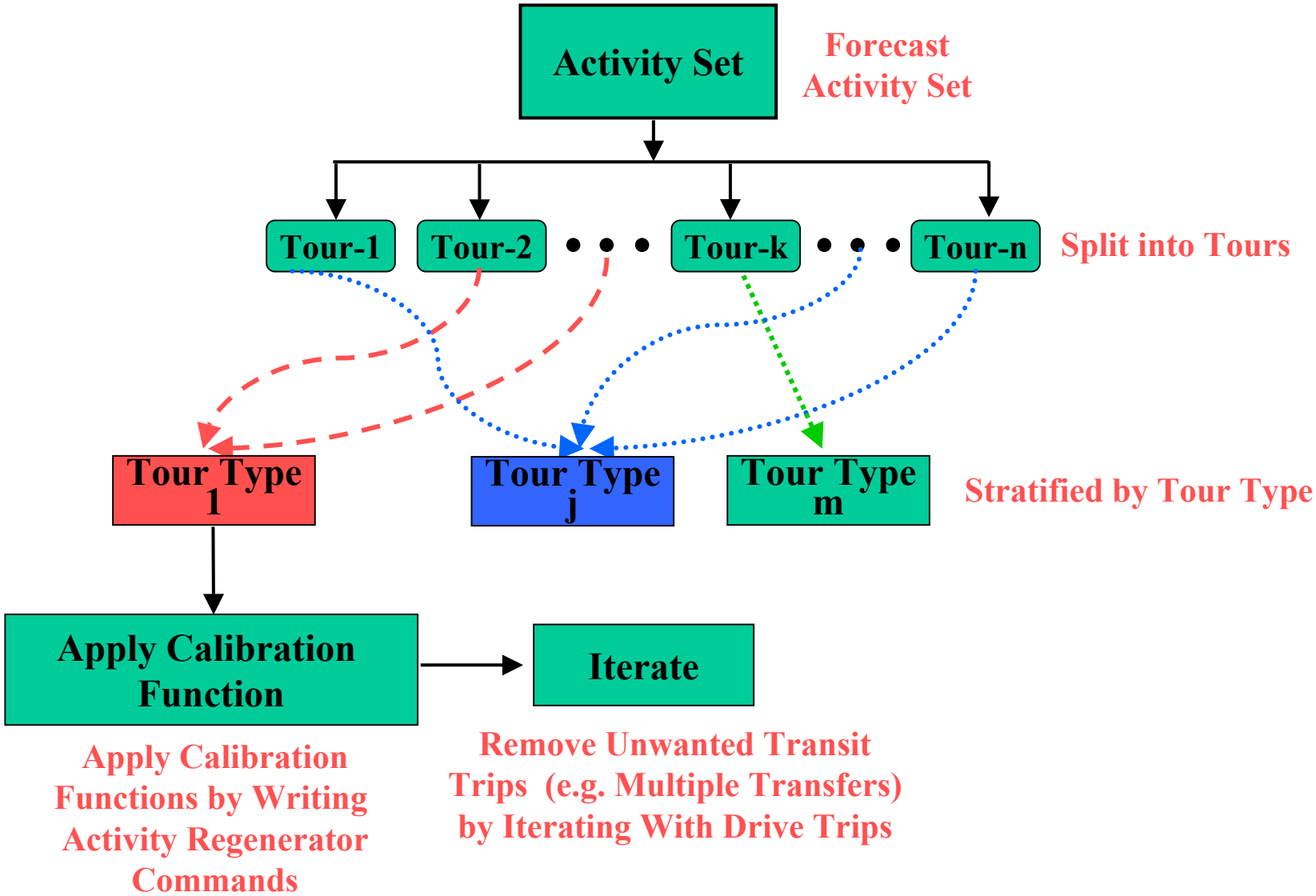
Group s_l
Calibrate







Applying Mode Choice



Applying Mode Choice

Tour Type 1

Apply Calibration Function

Route All "*X*"Tours With Modes "*T*" and/or "*A*"

Router produces travel times for both modes and "groups"

Tours with only walk legs

Tours with at least one bus leg

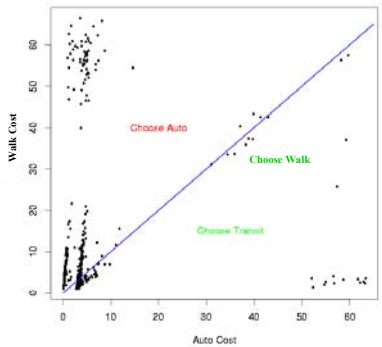
Tours with at least one rail leg, but no bus legs

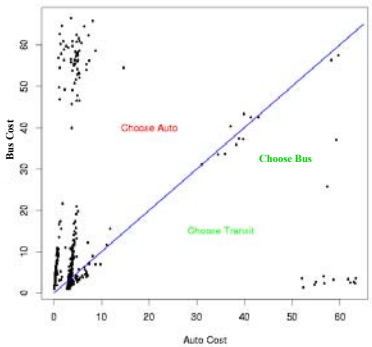
Group s_w
Assign walks or autos using calibrated functions

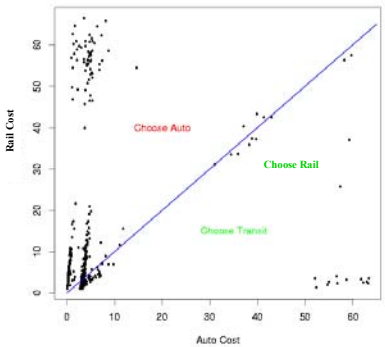
Group s_b
Assign bus or autos using calibrated functions

Group s_l
Assign rail or autos using calibrated functions

All non-auto modes are assigned "*T*"







Applying Mode Choice

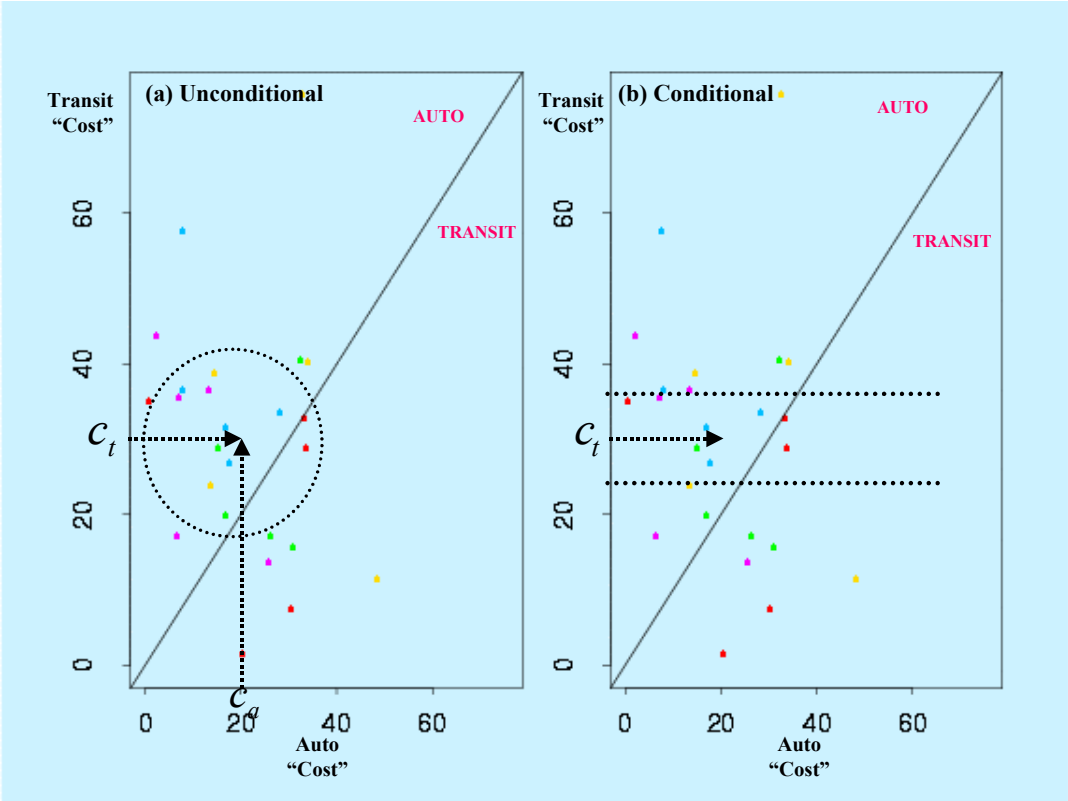
Stochastic Assignment in Non-logit Methods

(a) Unconditional

- Sample "X" mode tours
- Route sample with both "*A*" and "*T*"
- Compute both c_A and c_T for sample
- Route tour with both "*A*" and "*T*"
- Compute both c_A and c_T for tour
- Compute the proportion, p, of "auto" points in area around (c_A, c_T)
- Assign mode "*A*" with probability p

(b) Conditional

- Sample "X" mode tours
- Route sample with both "*A*" and "*T*"
- Compute both c_A and c_T for sample
- Route tour with "*T*"
- Compute c_T for tour
- Compute the proportion, p, of "auto" points in area around c_T
- Assign mode "*A*" with probability p



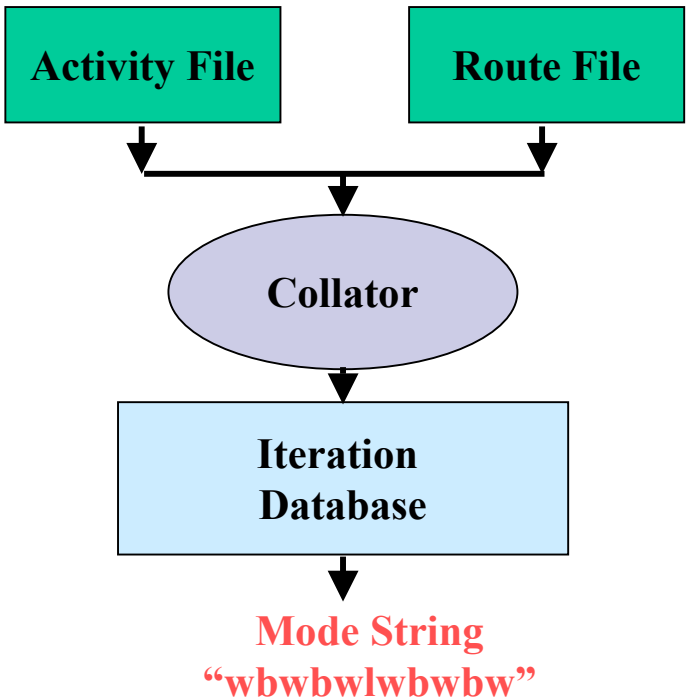
NOTE: A variant of the conditional method could be used with a logit.

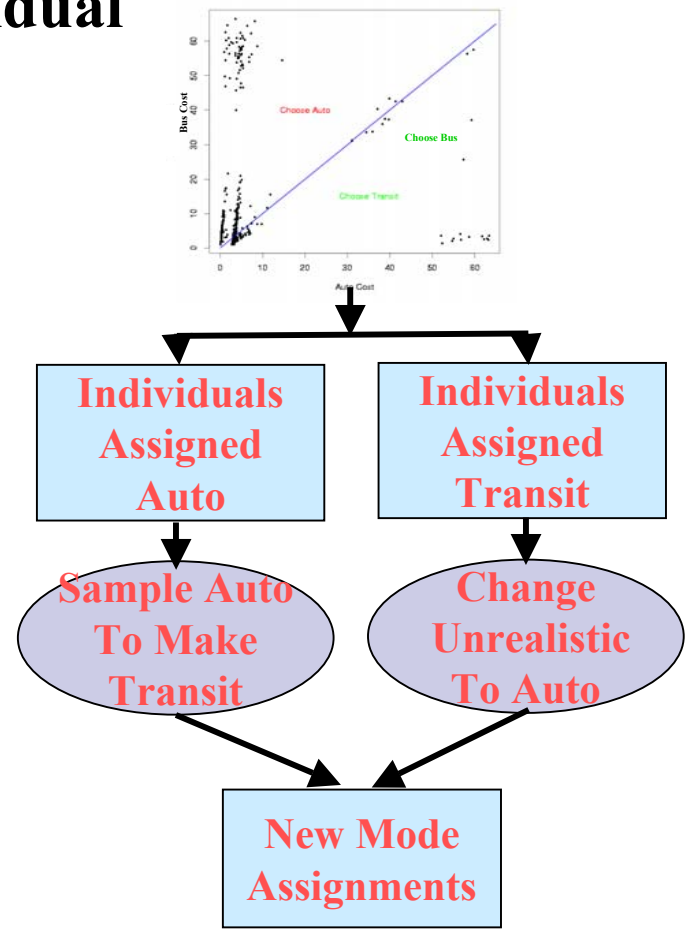
Applying Mode Choice

Iteration in Both Logit and Non-logit Methods

Some Transit Trips May Be Unrealistic

Aggregate vs. Individual





Mode Choice Summary

A Two Step Procedure:

- Calibrate $P_U(M|D)$ for M=BI, S, M or X
  X=A or T.

$$P_T(m|I) = \sum_M P_R(m|M,I)P_U(M|I)$$

- Calibrate a second function
  for a choice between m=a, w, b or l
  given that M=X

$$P_U(M = A|D) = P_U^{(2)}(M_2 = A|M_1 = X, D)P_U^{(1)}(M_1 = X|D)$$

NOTES

- **All calibration functions are user defined**
- **All functions may be calibrated using logits**
- **This is not the only calibration scheme possible**

Summary

- **TRANSIMS is a modeling system.**

  It is an integrated system that allows the modeler to keep track of and modify the behavior of each individual in a population.

- **TRANSIMS is not a model.**

  Models are built using TRANSIMS technology

- **Modeling tools are available for:**

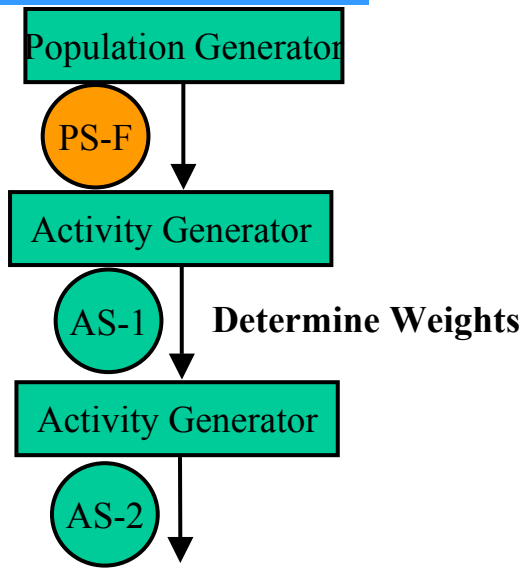
  1. Calibration of base year
  2. Modeling forecast year

Outline

1. TRANSIMS Technology
2. TRANSIMS FRAMEWORK
   - Network
   - Population
   - Activities
   - Routes
   - Microsimulation
3. Meta-Methods, Methods, Calibration, Models
4. Modeling Tools
   - Activity Regenerator
   - Collator
   - Stratifier
   - Selector
5. Calibration, Application, Forecasts
6. Calibration Methods
   - Survey Household Weights
   - School Buses
   - Shared Rides
   - Trip Length
   - Bridge Crossings
   - Modes
7. Summary

Calibration In TRANSIMS

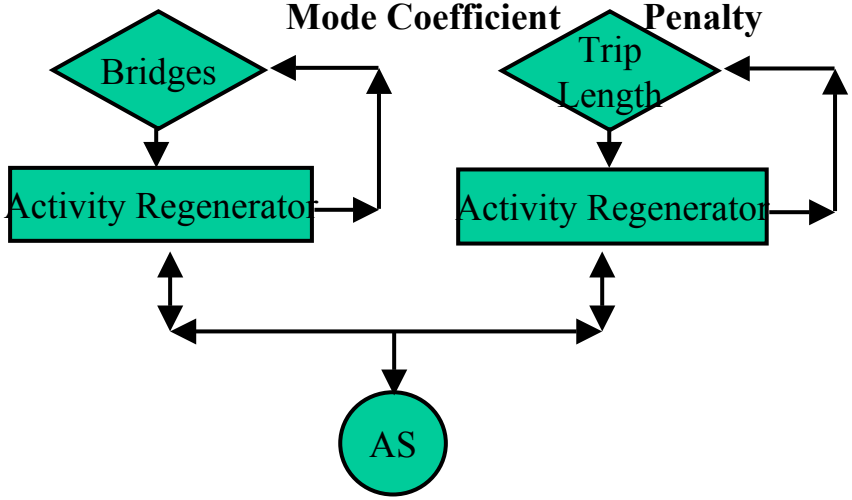
Determine Survey Household Weights



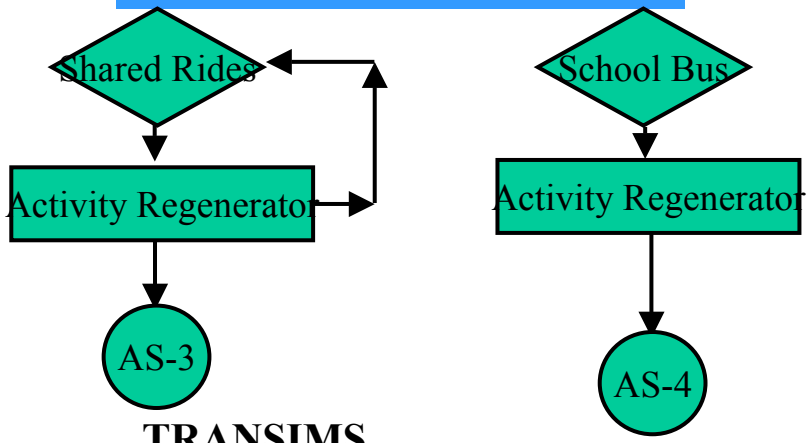
Determine Location Choice Parameters in the Equation

$$\exp(a(L) + b_m(t(H,L) - c))$$

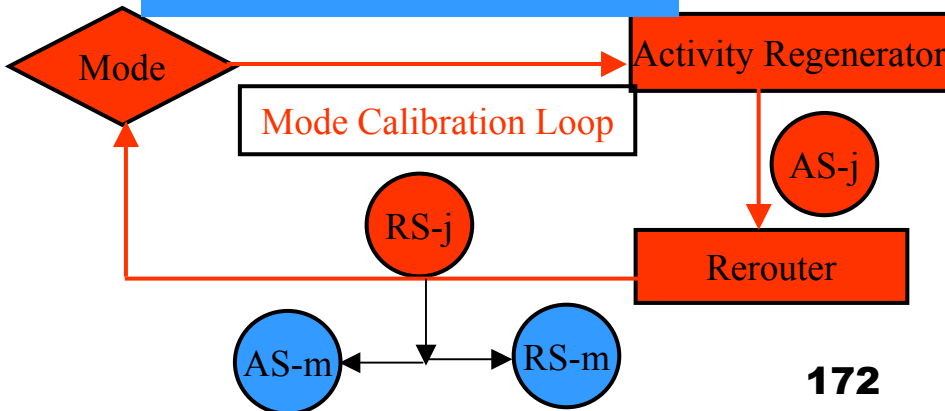
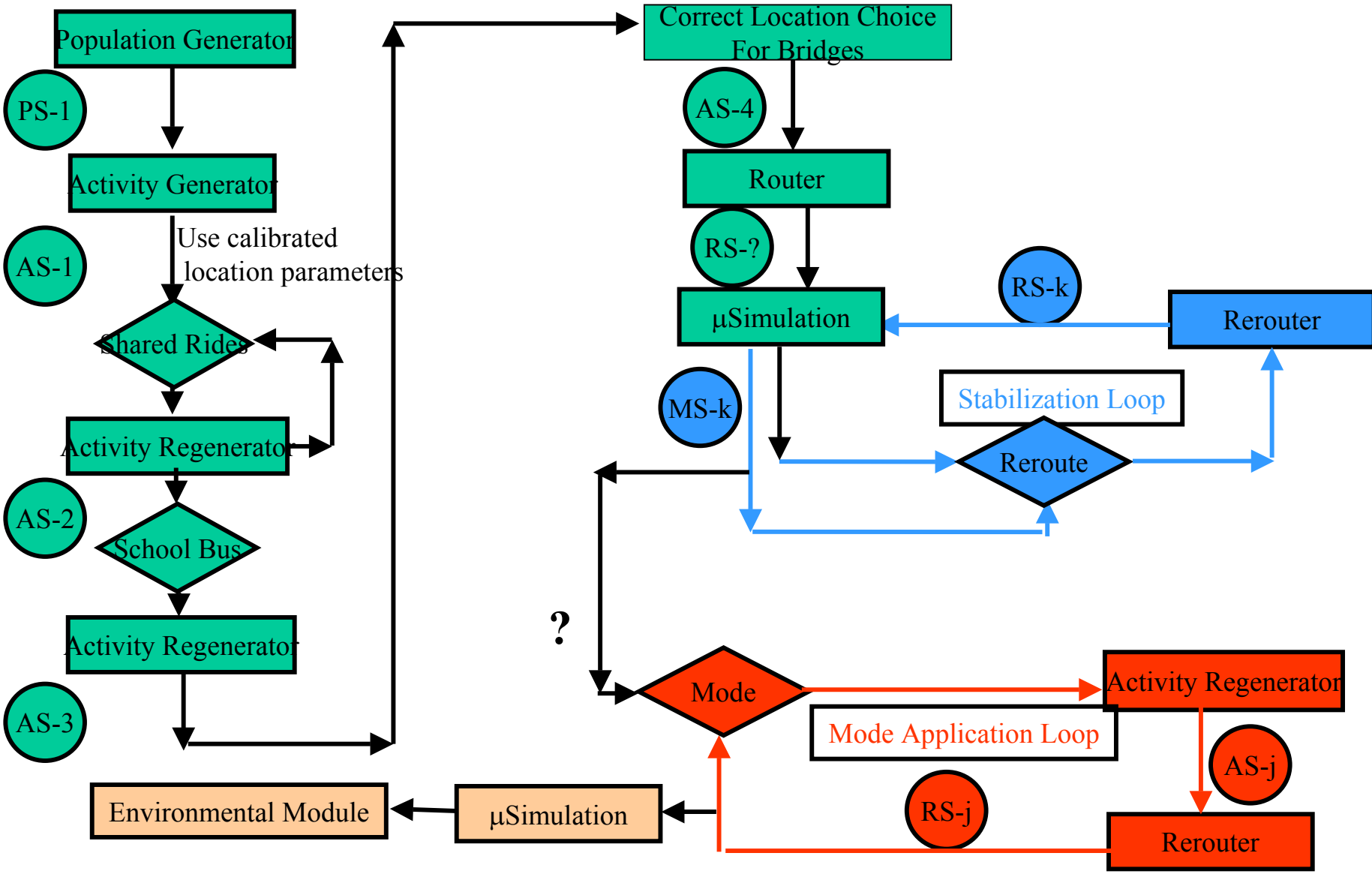
Mode Coefficient Penalty



Some "Fix It" Procedures



Determine Mode Choice Parameters/Functions



A Forecast Year Model