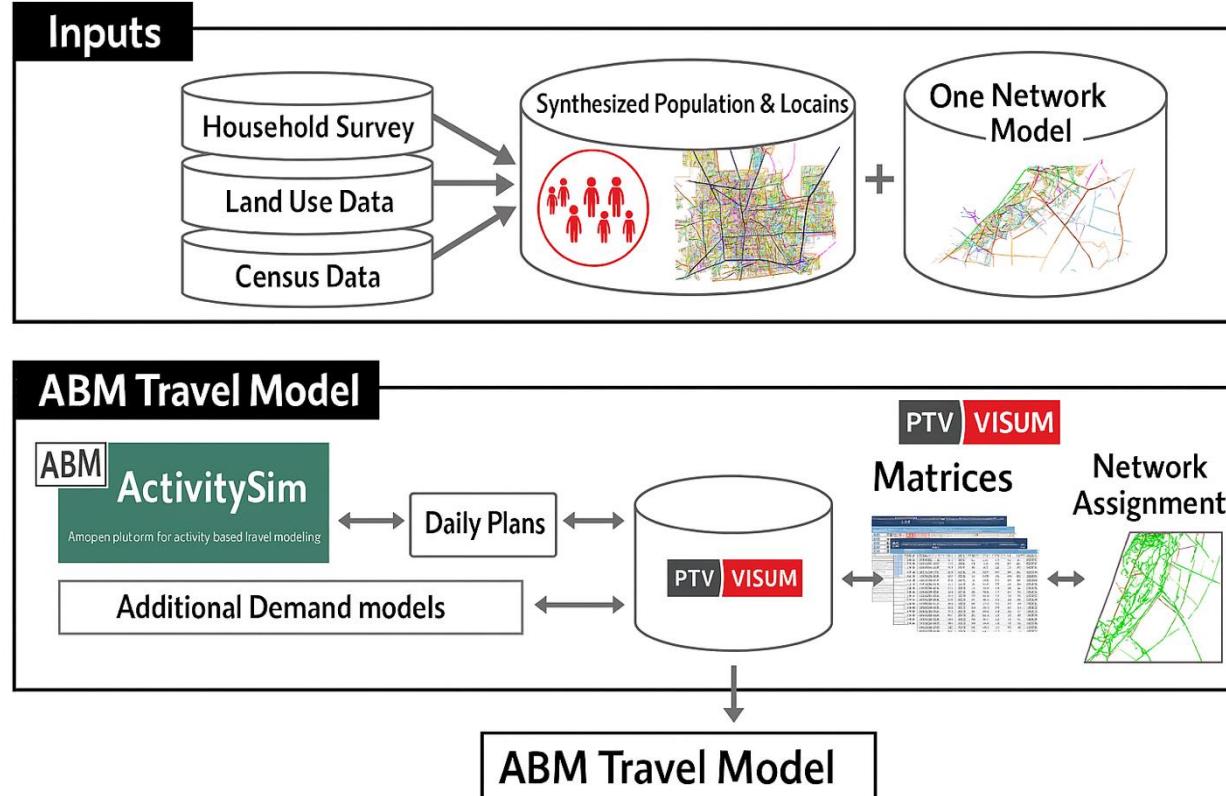


# ABM Data Integration and Analysis



Modeling Mobility 2025  
Minneapolis, MN

# Interfaces with ABM - Overview



## Population Synthesis

Household and person-level data generation (e.g., via PopulationSim)

## Network Skimming in Visum

Assigns trips to network using detailed skims and routing

## Activity-Based Simulation

Activity generation, scheduling, mode and destination choice

## Trip Matrix Export

ABM outputs converted to origin-destination matrices

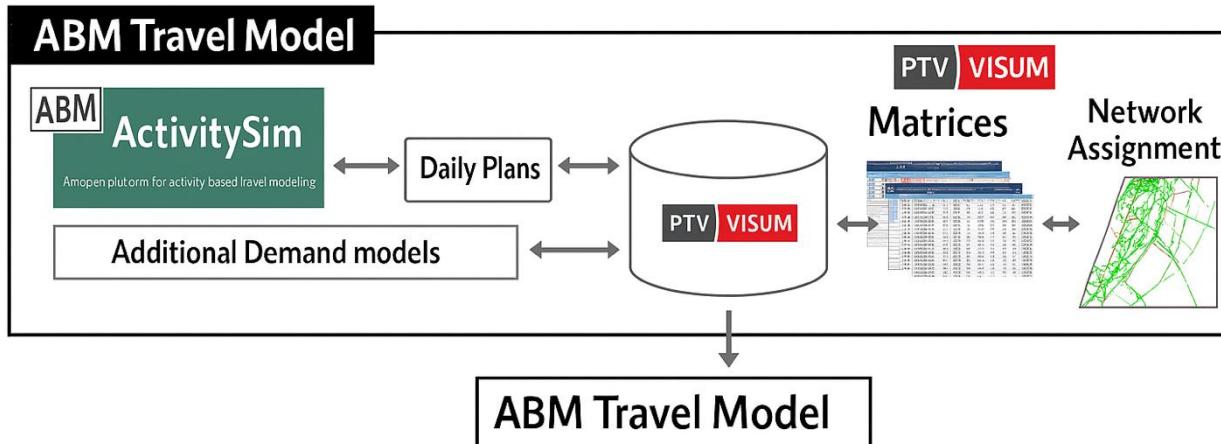
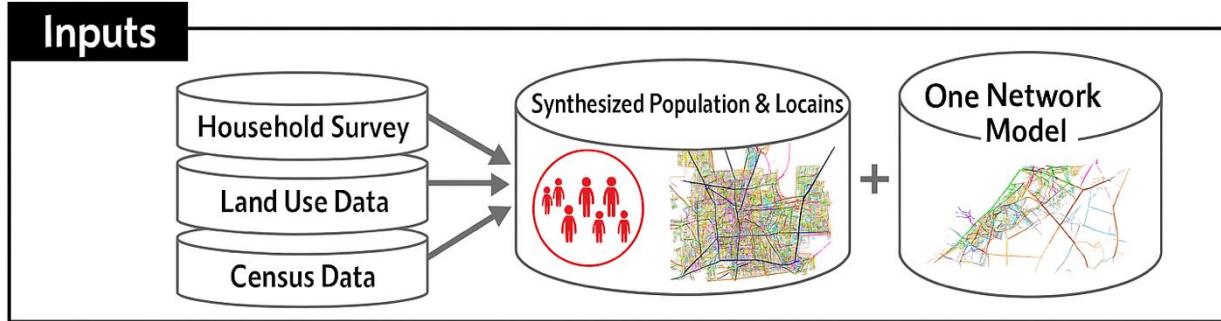
## Network Assignment in Visum

Assigns trips to network using detailed skims and routing

## Feedback Loop (-max)

Updated skims inform next ABM iteration

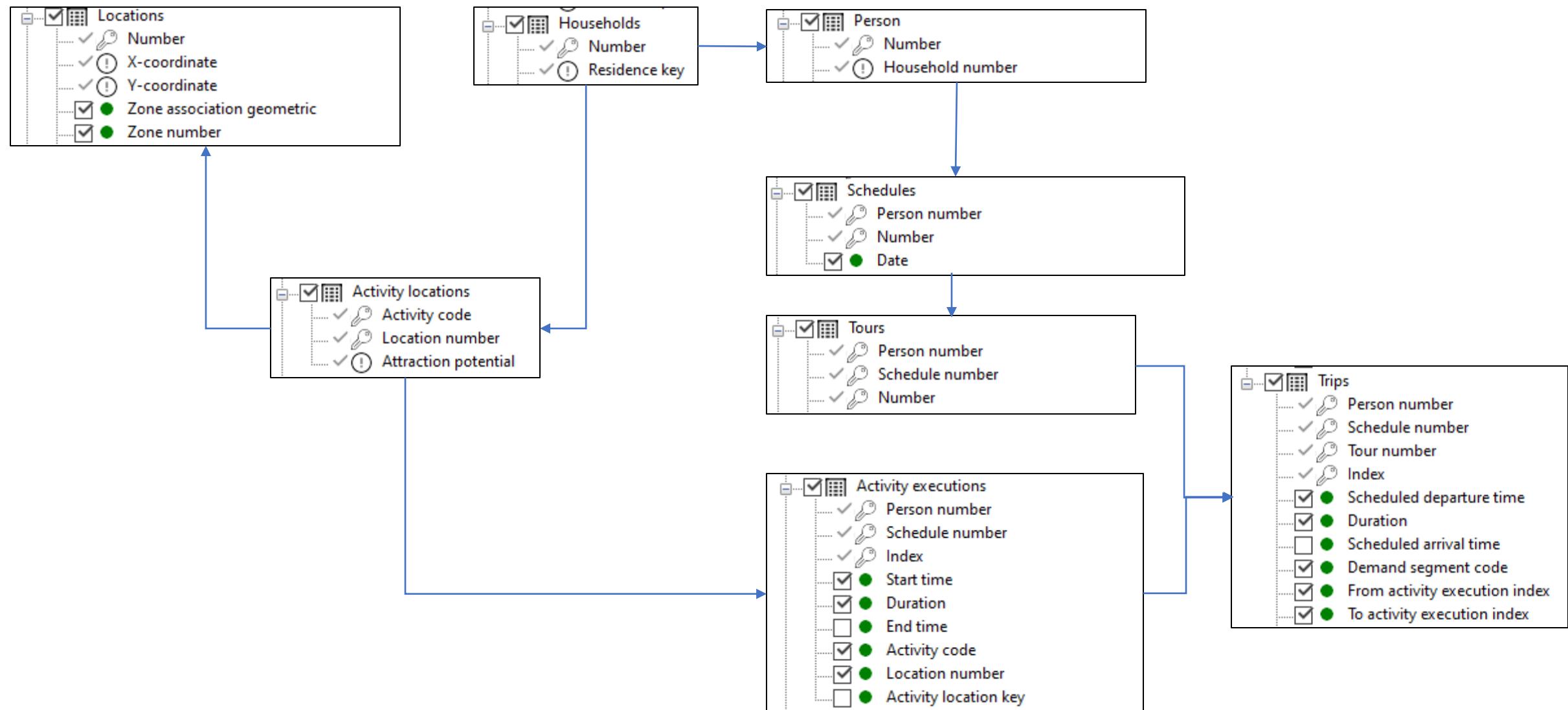
# Interfaces with ABM - Overview



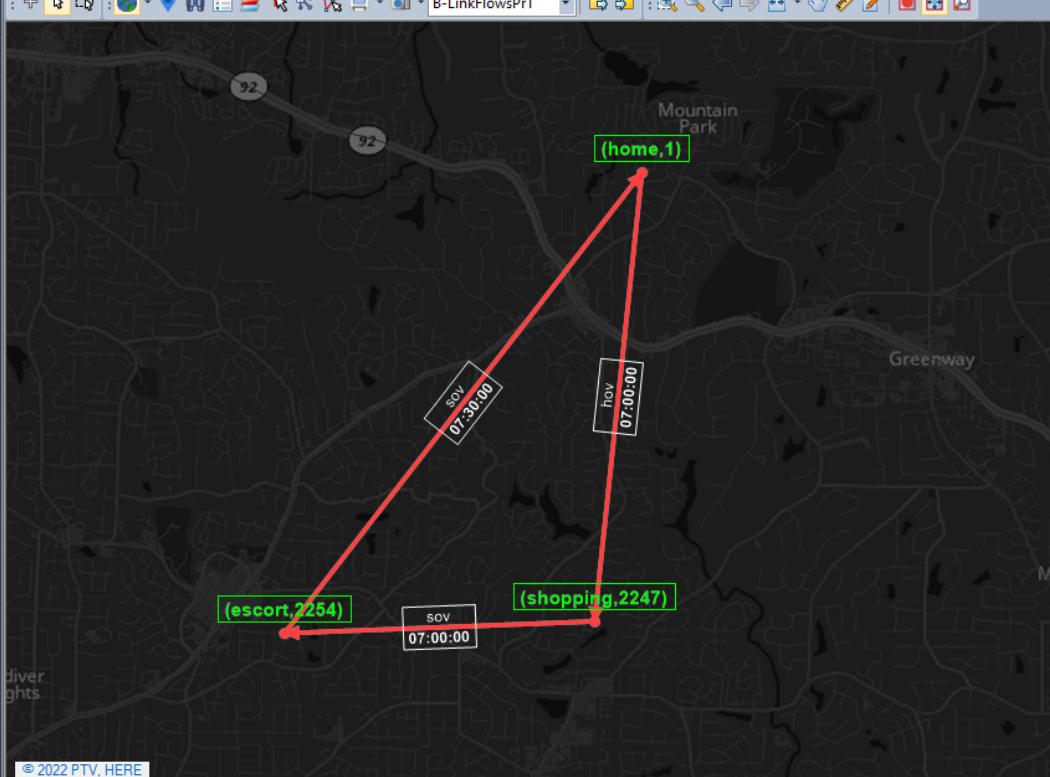
## Several ABM Variants:

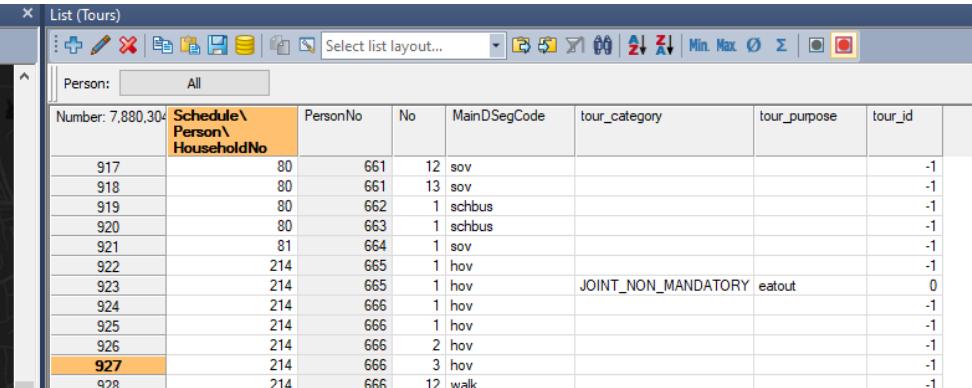
- Custom-made: SBB (Swiss National Model)
- CT-RAMP
- DaySim
- TourCast
- ActivitySim
- ...

# Generalized Relational ABM Data Structure

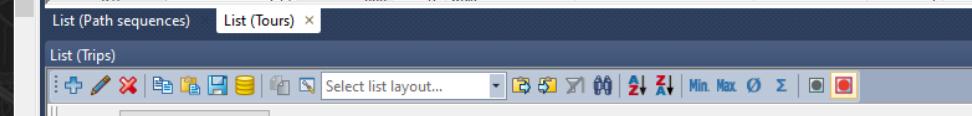


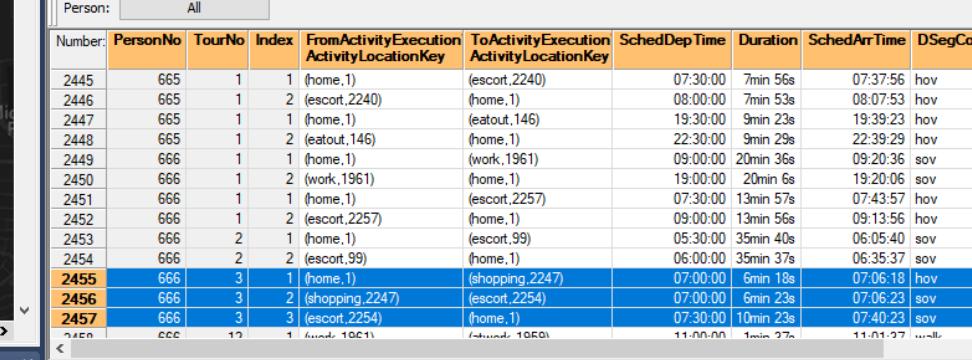
# Generalized Relational ABM Data Structure

Network editor (Show marked Tours) 

List (Tours) 

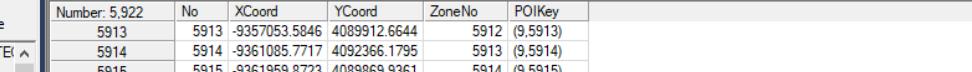
Number	Schedule\Person\HouseholdNo	PersonNo	No	MainDSegCode	tour_category	tour_purpose	tour_id
917	80	661	12	sov			-1
918	80	661	13	sov			-1
919	80	662	1	schbus			-1
920	80	663	1	schbus			-1
921	81	664	1	sov			-1
922	214	665	1	hov			-1
923	214	665	1	hov	JOINT_NON_MANDATORY	eatout	0
924	214	666	1	hov			-1
925	214	666	1	hov			-1
926	214	666	2	hov			-1
927	214	666	3	hov			-1
928	214	666	12	walk			-1

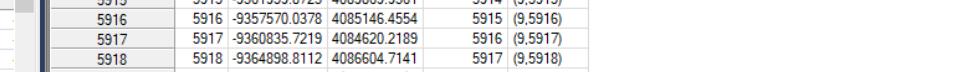
List (Path sequences) 

List (Trips) 

Number	PersonNo	TourNo	Index	FromActivityExecutionActivityLocationKey	ToActivityExecutionActivityLocationKey	SchedDepTime	Duration	SchedArrTime	DSegCode
2445	665	1	1	(home,1)	(escort,2240)	07:30:00	7min 56s	07:37:56	sov
2446	665	1	2	(escort,2240)	(home,1)	08:00:00	7min 53s	08:07:53	hov
2447	665	1	1	(home,1)	(eatout,146)	19:30:00	9min 23s	19:39:23	hov
2448	665	1	2	(eatout,146)	(home,1)	22:30:00	9min 29s	22:39:29	hov
2449	666	1	1	(home,1)	(work,1961)	09:00:00	20min 36s	09:20:36	sov
2450	666	1	2	(work,1961)	(home,1)	19:00:00	20min 6s	19:40:06	sov
2451	666	1	1	(home,1)	(escort,2257)	07:30:00	13min 57s	07:43:57	hov
2452	666	1	2	(escort,2257)	(home,1)	09:00:00	13min 56s	09:13:56	hov
2453	666	2	1	(home,1)	(escort,99)	05:30:00	35min 40s	06:05:40	sov
2454	666	2	2	(escort,99)	(home,1)	06:00:00	35min 37s	06:35:37	sov
2455	666	3	1	(home,1)	(shopping,2247)	07:00:00	6min 18s	07:06:18	hov
2456	666	3	2	(shopping,2247)	(escort,2254)	07:00:00	6min 23s	07:06:23	sov
2457	666	3	3	(escort,2254)	(home,1)	07:30:00	10min 23s	07:40:23	sov

List (Households) 

List (Person) 

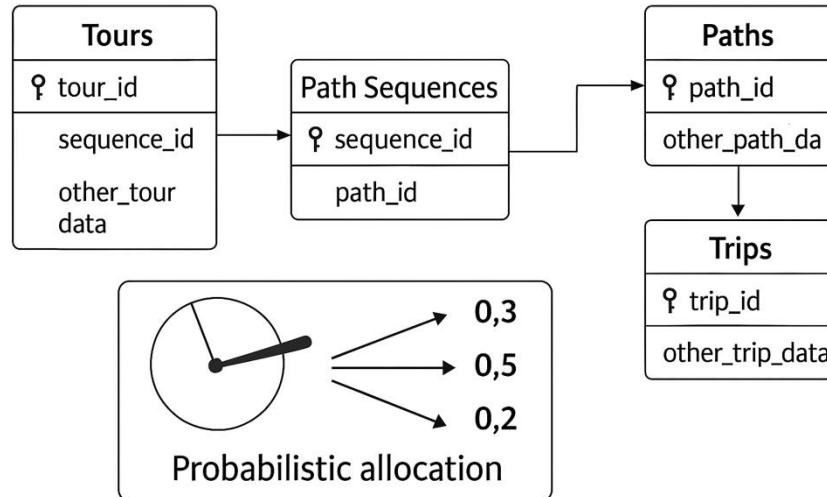
List (Locations) 

Number	No	XCoord	YCoord	ZoneNo	POIKey
5913	5913	-9357053.5846	4089912.6644	5912	(9,5913)
5914	5914	-9361085.7717	4092366.1795	5913	(9,5914)
5915	5915	-9361959.8723	4089869.9361	5914	(9,5915)
5916	5916	-9357570.0378	4085146.4554	5915	(9,5916)
5917	5917	-9360835.7219	4084620.2189	5916	(9,5917)
5918	5918	-9364898.8112	4086604.7141	5917	(9,5918)
5919	5919	-9368472.2251	4088975.8108	5918	(9,5919)
5920	5920	-9373903.3016	4091910.2913	5919	(9,5920)
5921	5921	-9374611.8774	4098610.7416	5920	(9,5921)
5922	5922	-9365854.1370	4099411.4347	5921	(9,5922)

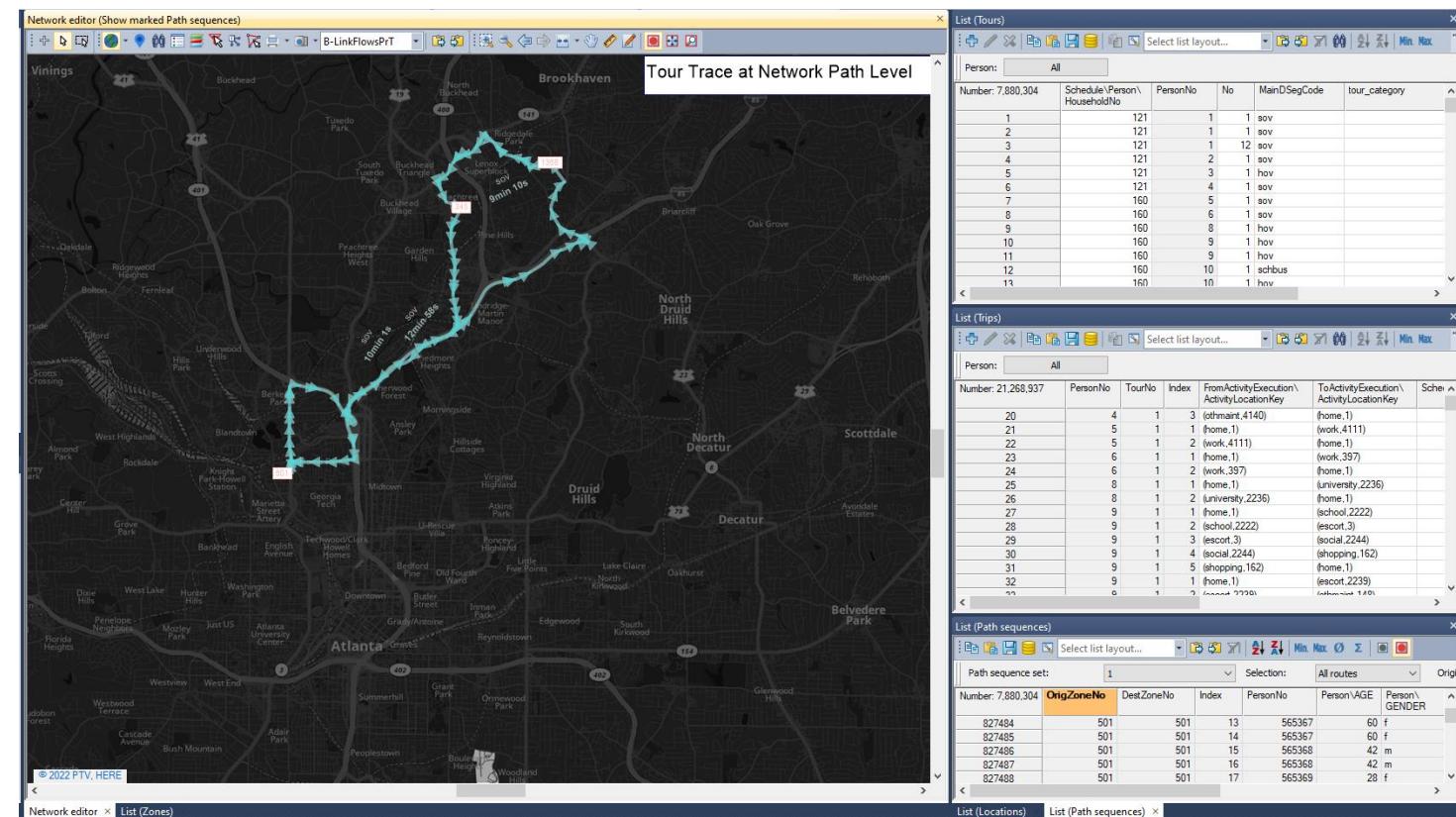
1:49456 -9381331.4253 4033750.5073

# Data Model Extension to Connect Tour, Trips and Network Assignment

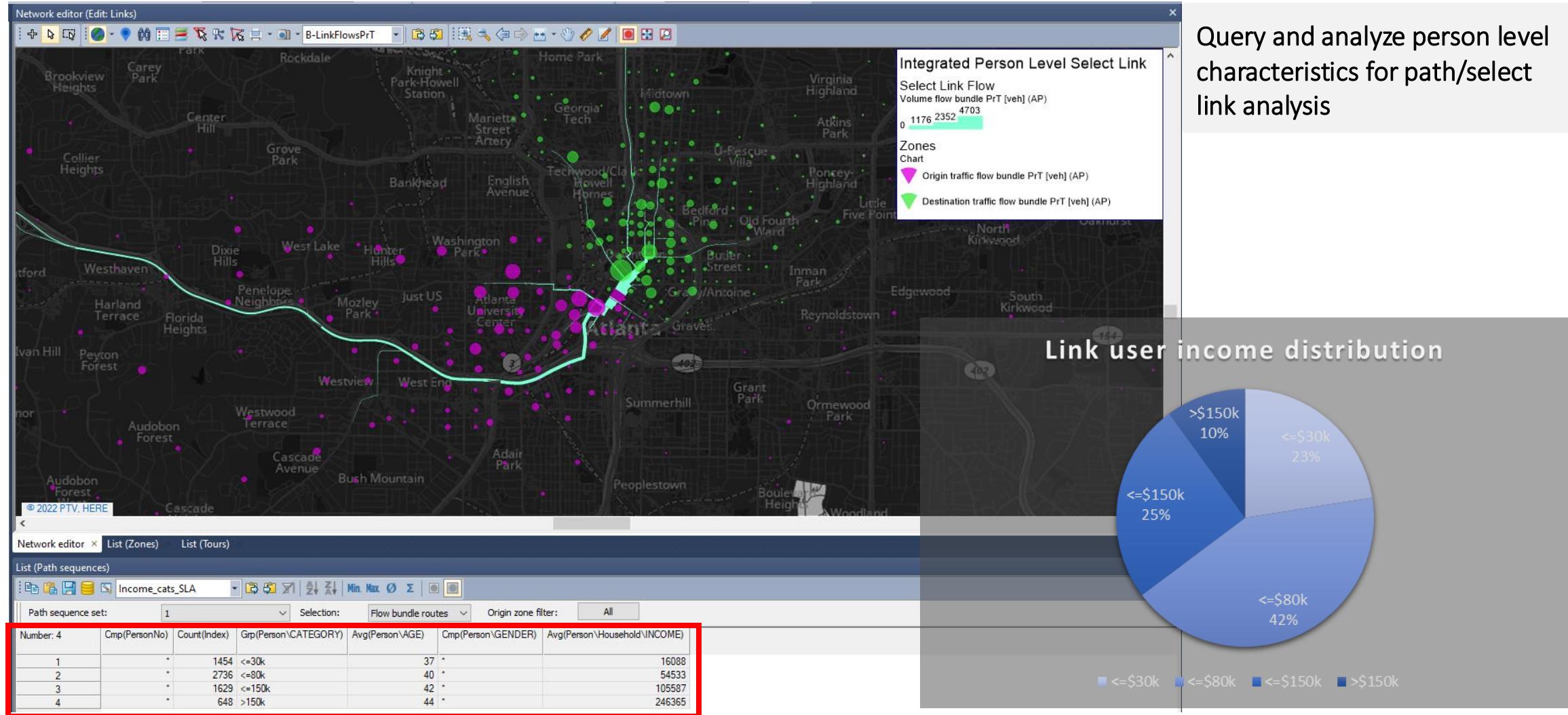
## Extended Data Model for Path Analysis



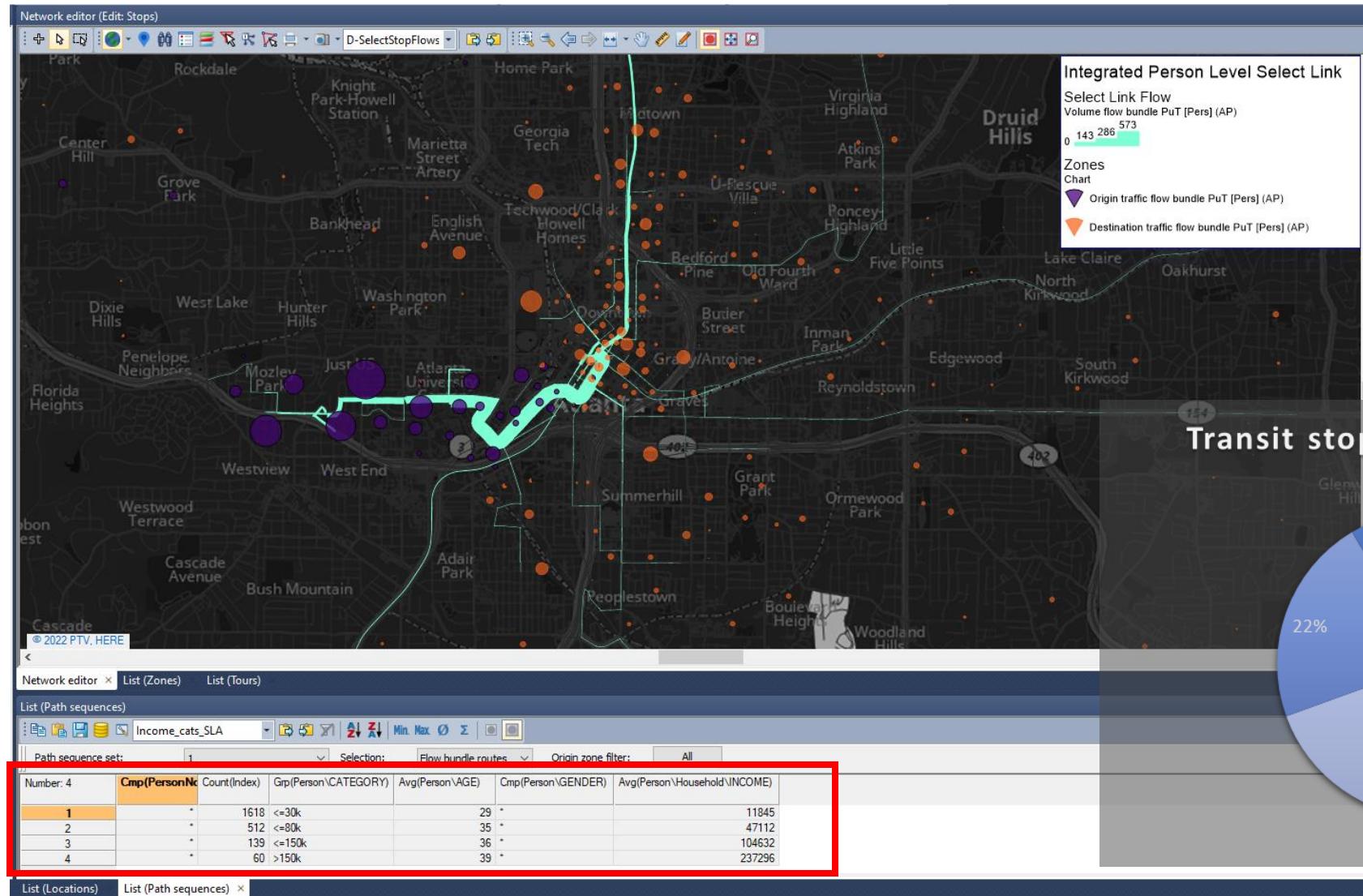
- Tour and Trip entities encode daily activity plans.
- Spatial links to Locations enable feature mapping.
- Path Sequences support select link analysis.
- Multimodal tours are structurally supported.



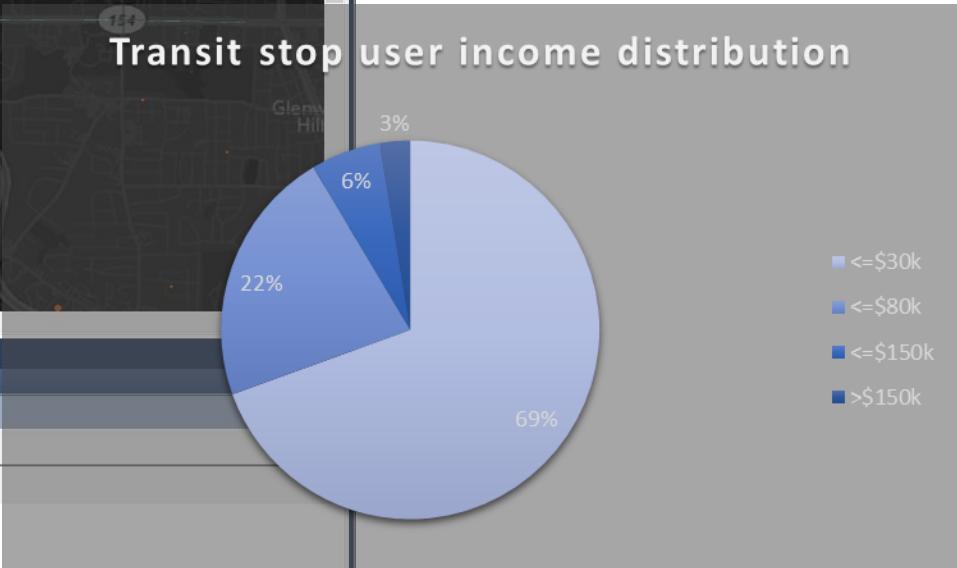
# Path Tracing – Average Income Distribution (CT-RAMP)



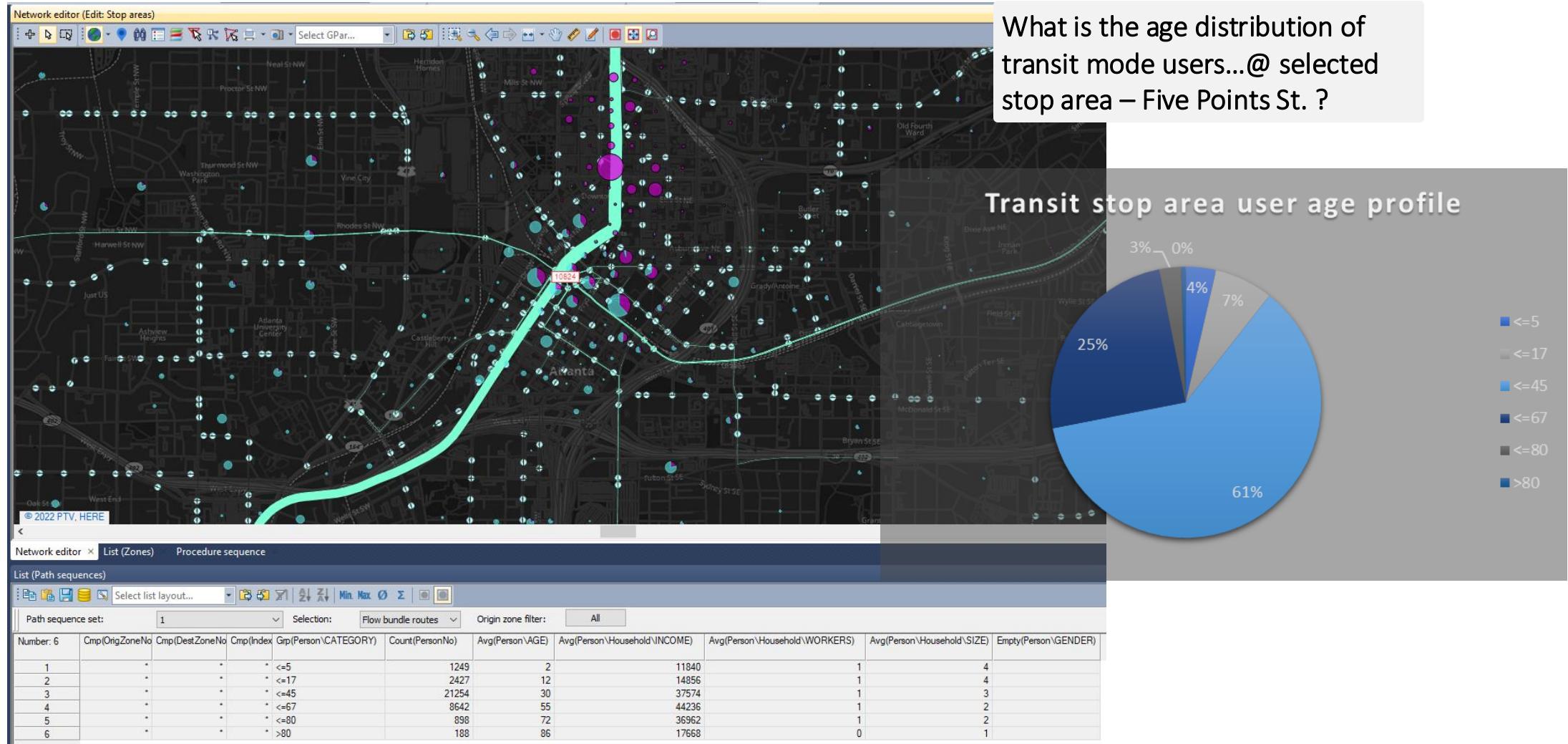
# Path Tracing – Average Income Distribution (CT-RAMP)



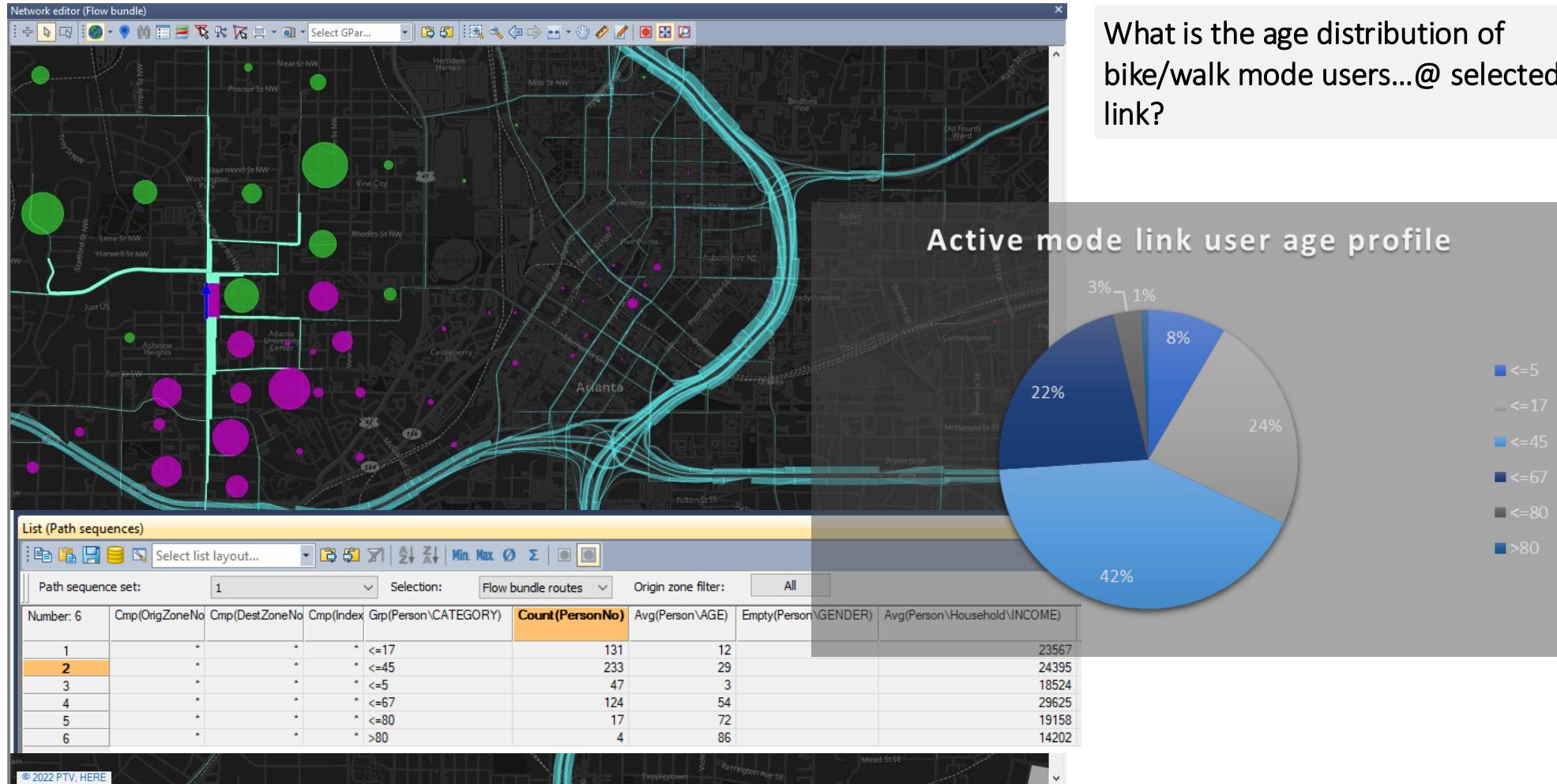
Select stop (link) path analysis:  
PEACHTREE ST SW @ MITCHELL ST SW



# Path Tracing – Transit Rider Age Profile (CT-RAMP)



# Path Tracing – Active Mode Age Profile (CT-RAMP)



# Path Tracing – Average Income Distribution (ActivitySim)

Network: SERPM\_PROTOTYPE\_E.ver\* - PTV Visum Expert 2024 (SP 1-5) - [List (Path sequences)]

File Edit View Lists Filters Calculate Graphics Network Demand Scripts Windows Help List (Path sequences)

Network editor (Flow bundle)

Trace of Paths

Link bars  
Volume flow bundle PrT [veh] (AP)  
0 9074 18148 36296

Network tools (Flow bundle)

Term type: PrT

Network object type: Link

Insert link bars if required:

Alternative routes:

Calculate for analysis time intervals:  Nothing (only AP and AH)

Selected conditions:

Combination	Condition
1	First Link 28409 ...

Flow bundle

Turn volumes

Isochrones

Shortest path search

Desire line

Paths projection

Global layout files Filter files 300

List (Path sequences)

Path sequence set: 2 Resident Tours Selection: Flow bundle routes Origin zone filter: All

Number	Cmp(PersonNo)	Cmp(ScheduleNo)	Cmp(TourNo)	Gp(Person\Household\HINCCAT1)	Avg(Person\Household\HINC)	Sum(Vol)
1	•	•	•	1	16206	7052.000
2	•	•	•	2	41773	9373.000
3	•	•	•	3	73913	9076.000
4	•	•	•	4	114648	5938.000
5	•	•	•	5	246430	5082.000

Average Income Profile of Link User

\$16,206 \$41,773 \$73,913 \$114,648 \$246,430

Auto Mode Users

# Path Tracing – Average Income Distribution (ActivitySim)

Network: SERPM\_PROTOTYPE\_F.ver\* - PTV Visum Expert 2024 (SP 1-5) - [List (Path sequences)]

File Edit View Lists Filters Calculate Graphics Network Demand Scripts Windows Help List (Path sequences)

Network editor (Edit: Territories)

Trace of Paths

Link bars  
Volume flow bundle PuT [Pers] (AP)  
8104  
0 2026 4052 8104

Number: 5 Cmp(PersonNo) Cmp(ScheduleNo) Cmp(TourNo) Grp(Person\Household\HINCCAT1) Avg(Person\Household\HINC) Sum(Vol)

Number	Cmp(PersonNo)	Cmp(ScheduleNo)	Cmp(TourNo)	Grp(Person\Household\HINCCAT1)	Avg(Person\Household\HINC)	Sum(Vol)
1	.	.	.	1	15873	1090.000
2	.	.	.	2	40855	554.000
3	.	.	.	3	73614	358.000
4	.	.	.	4	113015	156.000
5	.	.	.	5	253156	113.000

Average Income Profile of Transit Stop User

Income Range	Percentage
\$15,873	7%
\$40,855	24%
\$73,614	48%
\$113,015	16%
\$253,156	5%

Transit Mode Users

Network X Matrices

Graphics tools

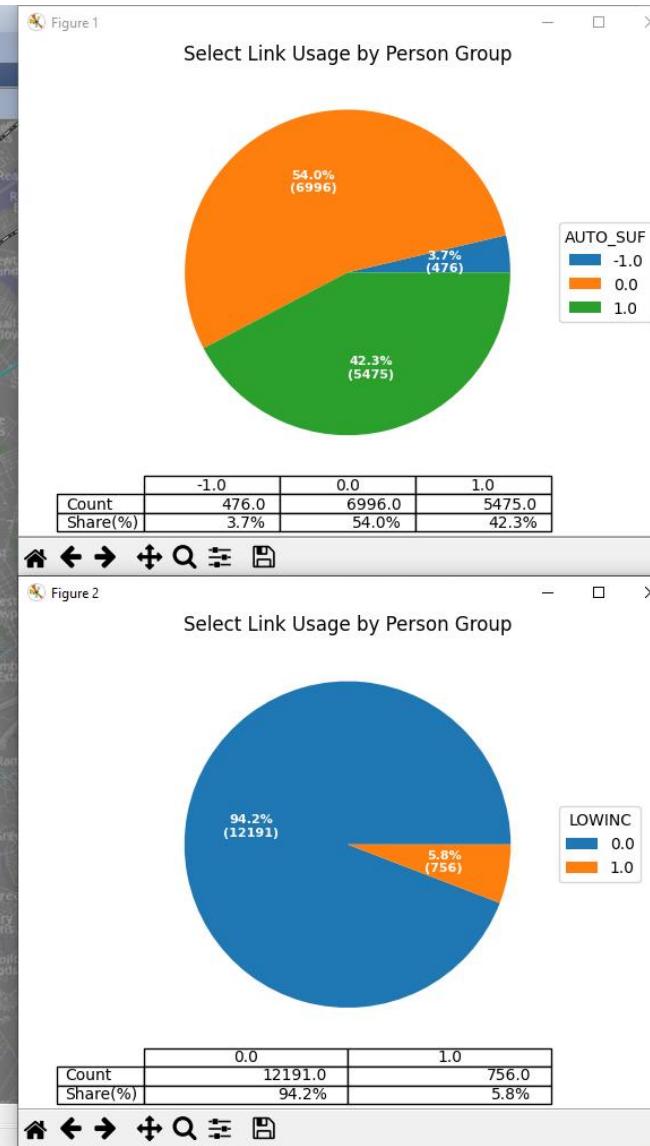
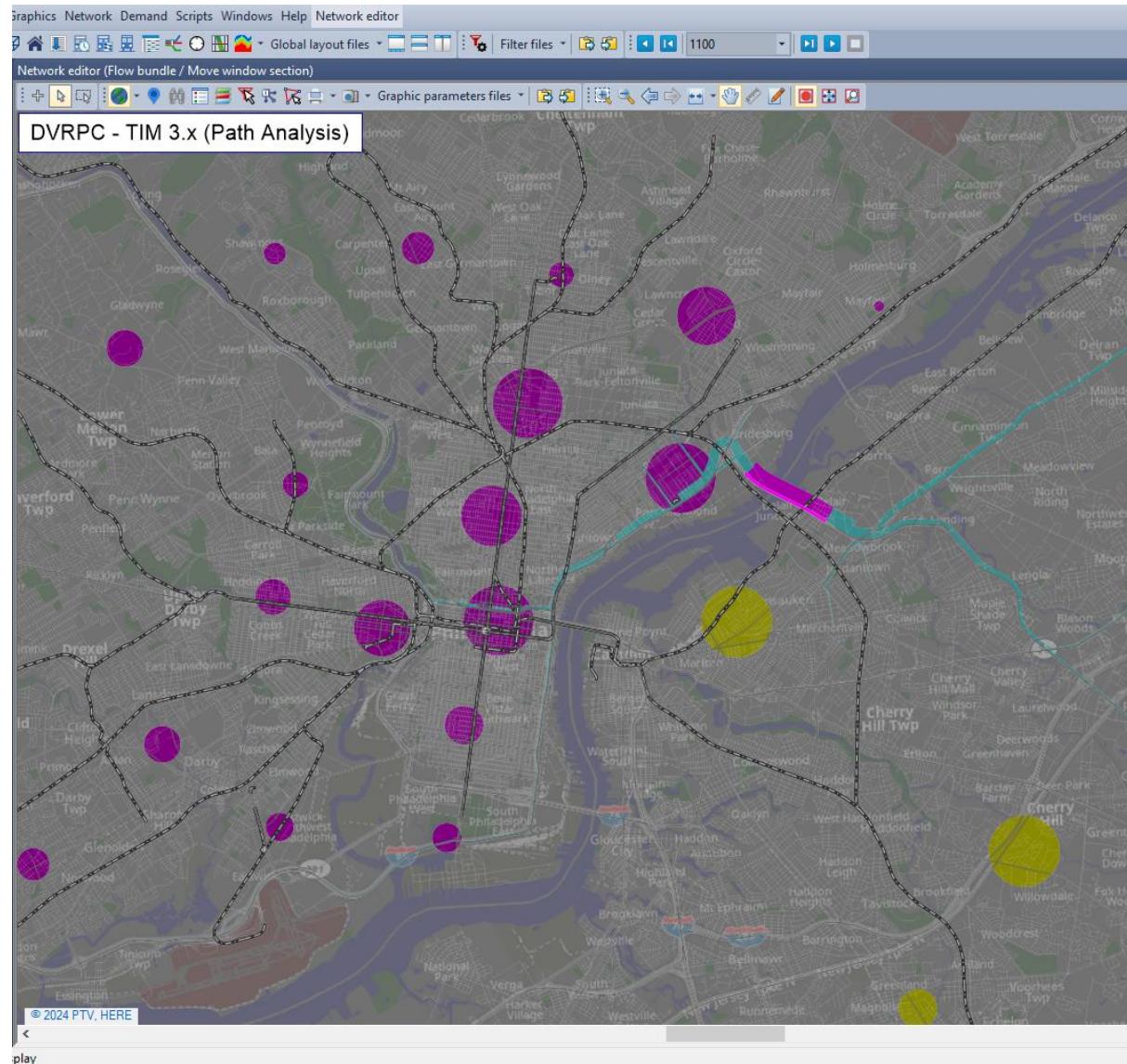
Flow bundle  
Turn volumes  
Isochrones  
Shortest path search  
Decide line

Marking Quick view (Territories)

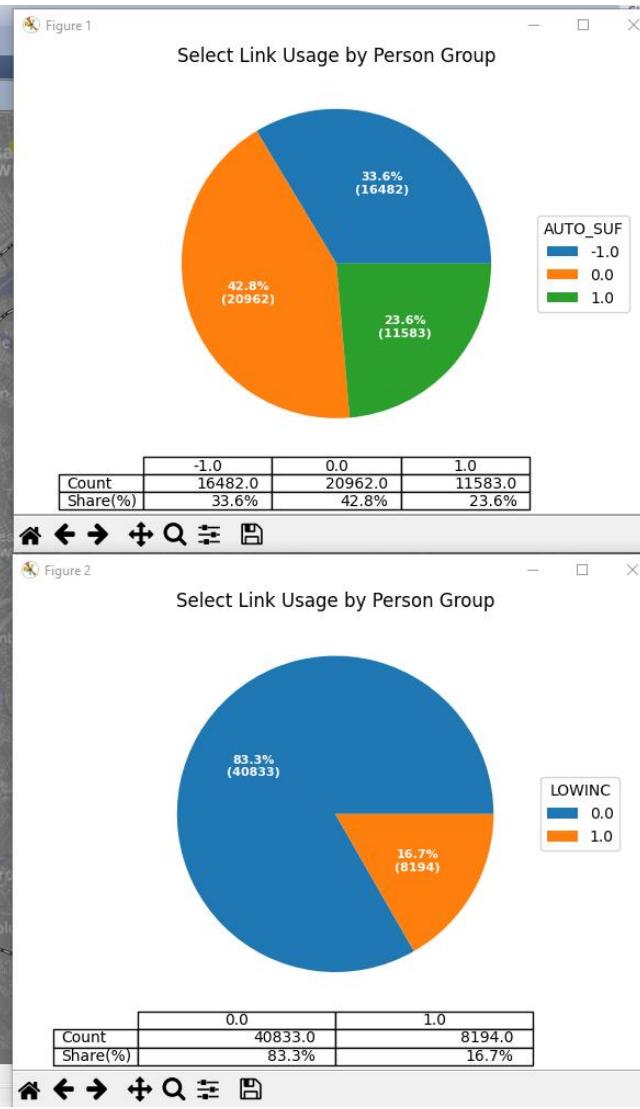
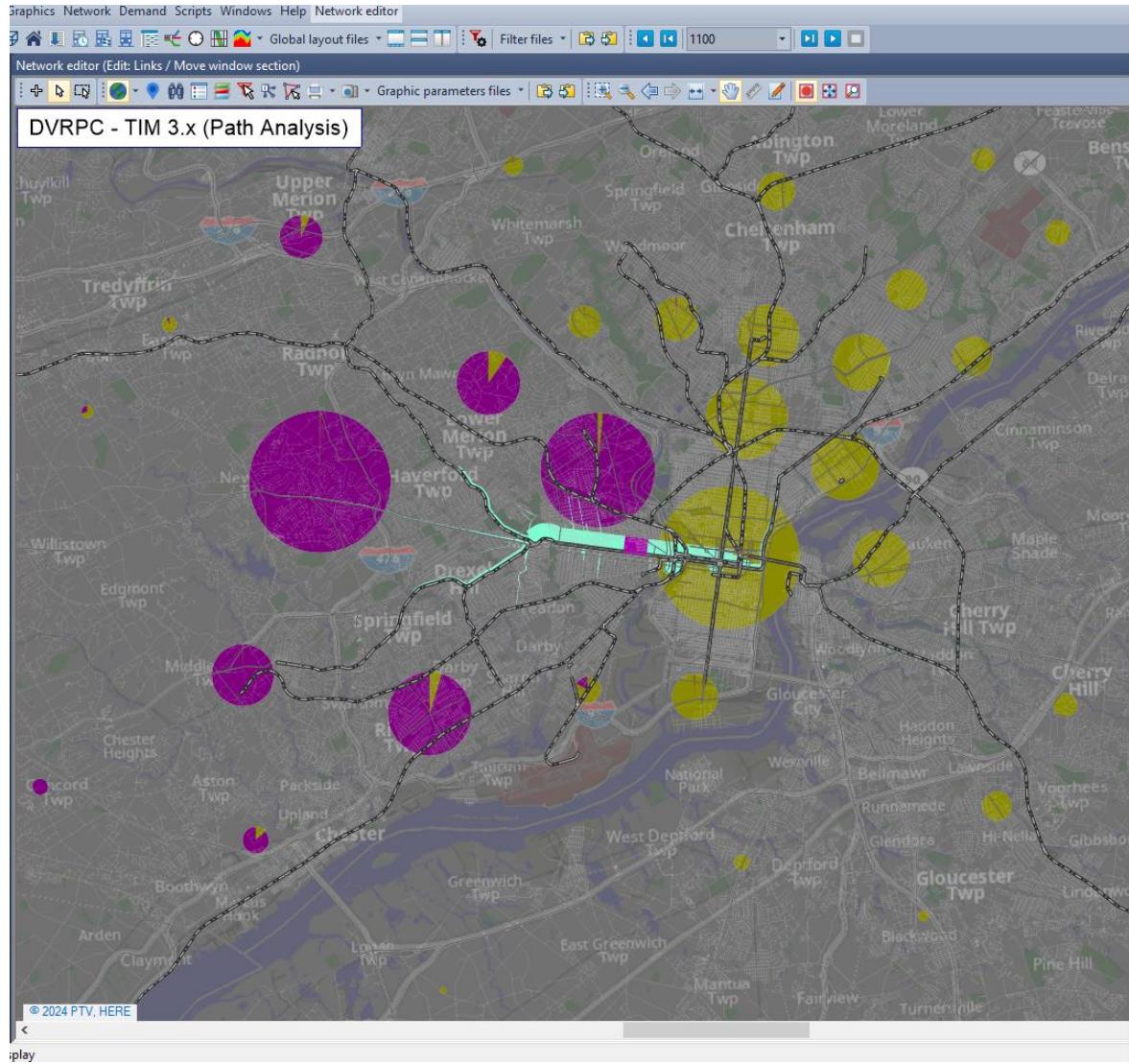
Network editor List (Lines) List (Line routes) Procedure sequence List (PuT assignment statistics) List (Stop areas)

1:64852 927755.7785 531729.6586

# Path Tracing – Bridge Select Link User Profile (DaySim)



# Path Tracing – Transit Rider Auto Sufficiency (DaySim)



# Extras – Trip Analysis(DaySim)

Network: TIM32\_TIM25\_2019-2050Base\_Import\_V5.ver\* - PTV Visum Expert 2024 (SP 1-4) - [Network editor]

File Edit View Lists Filters Calculate Graphics Network Demand Scripts Windows Help Network editor

Network editor (Edit: Links)

DVRPC - TIM 3.x (Trip Analysis)

Nodes

Links

Turns

Zones

Connectors

Main nodes

Main turns

Main zones

Territories

OD pairs

Main OD pairs

PrT paths

POIs: MAZ (10) and subcat

GIS objects

Locations

Screenlines

Count locations

Detectors

Restr traffic areas

Sharing stations

Stop points

Stop areas

Stops

Network Matrices

Quick view (Links)

No

FromNodeNo

ToNodeNo

TypeNo

TSysSet

Length

CapPrT

VOPT

VolVehPrT(AP)

VolPersPrT(AP)

TOLL\_INDEX

SPD\_Overwrite

Toll\_PrTSys(Car)

NumLanes

Area\_Tune

Quick view (Links) Marking

Link: Select by mouse-click.

Network editor (Edit: Links)

Graphic parameters files

Global layout files

Filter files

1100

List (Trips)

Person: All

Number	PersonNo	ScheduleNo	TourNo	Index	SchedDepTime	Duration	SchedArrTime	DSegCode	FromActiv
1	1	1	11	1	11:02:00	5min 4s	11:07:04	Car	
2	1	1	11	2	12:48:00	5min 4s	12:53:04	Car	
3	1	1	12	1	18:02:00	29min 40s	18:31:40	Car	
4	1	1	12	2	19:49:00	21min 50s	20:10:50	Car	
5	2	2	21	1	07:29:00	23min 20s	07:52:20	Car	
6	2	2	21	2	17:13:00	25min 19s	17:38:19	Car	
7	2	2	21	3	17:54:00	7min 31s	18:01:31	Car	
8	2	2	22	1	19:55:00	6min 3s	20:01:03	Car	
9	2	2	22	2	20:11:00	6min 3s	20:17:03	Car	
10	3	3	31	1	08:01:00	8min 22s	08:09:22		
11	3	3	31	2	16:51:00	8min 22s	16:59:22		
12	4	4	41	1	08:27:00	1min 32s	08:28:32	Car	
13	4	4	41	2	15:48:00	1min 32s	15:49:32	Car	
14	5	5	51	1	07:49:00	13min 47s	08:02:47	Car	
15	5	5	51	2	15:42:00	13min 56s	15:55:56	Car	
16	5	5	52	1	18:00:00	13min 23s	18:13:23	Car	

Trip Analyst

Classifier: Autos

Run Exit

Mode share by person AUTO\_SUF

94.0%

91.0%

39.0%

26.0%

7.0%

29.0%

5.0%

3.0%

1.0%

2.0%

0.0%

3.0%

Car

TW

Bik

Pd

Duration(min)

Distance(mi)

No-Car

Auto-Insuff

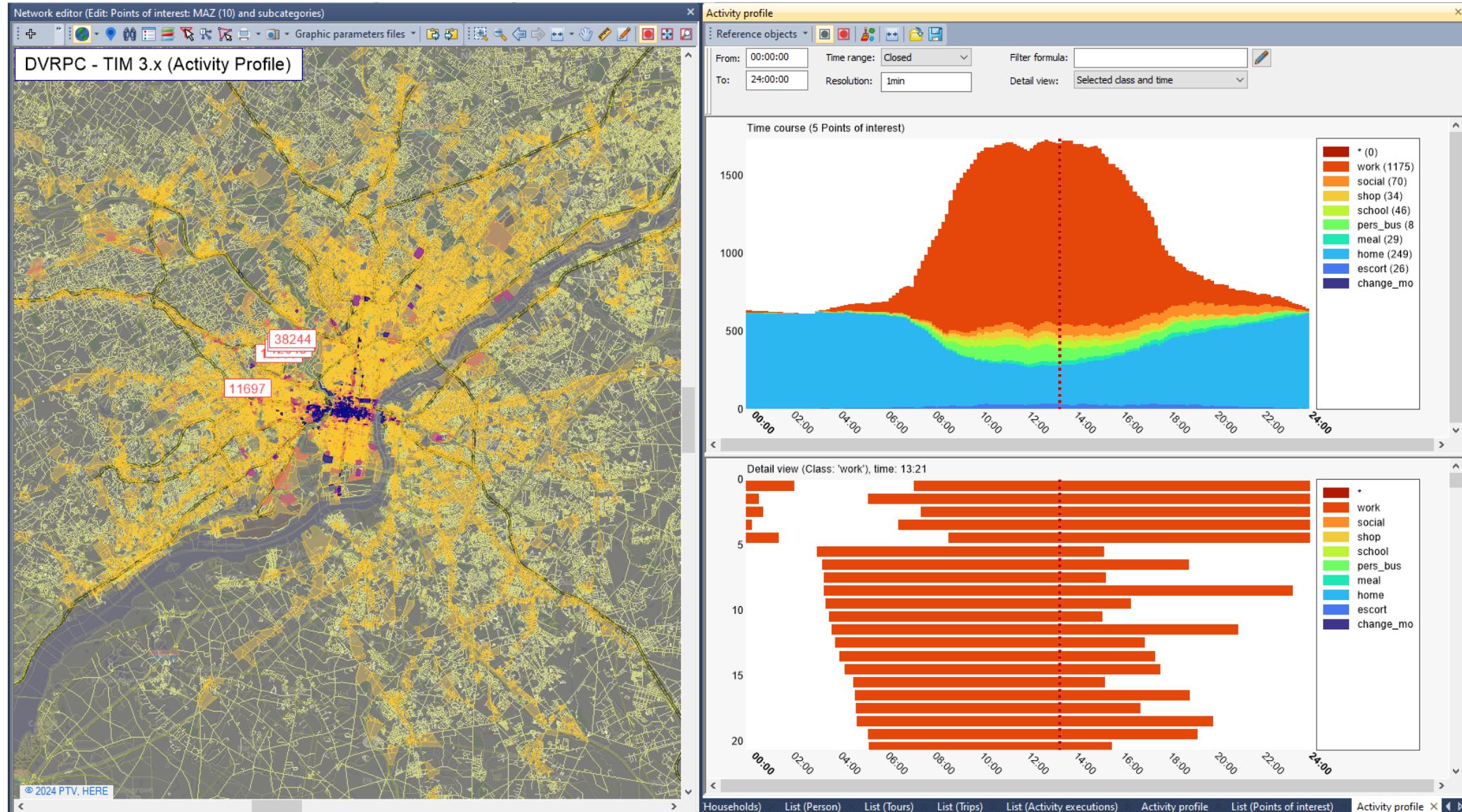
Auto-Suff

Duration(min)	Distance(mi)	No-Car	Auto-Insuff	Auto-Suff
18.4	3.5	91.0%	3.0%	2.0%
16.5	5.9	39.0%	1.0%	0.0%
17.5	6.7	26.0%	5.0%	3.0%

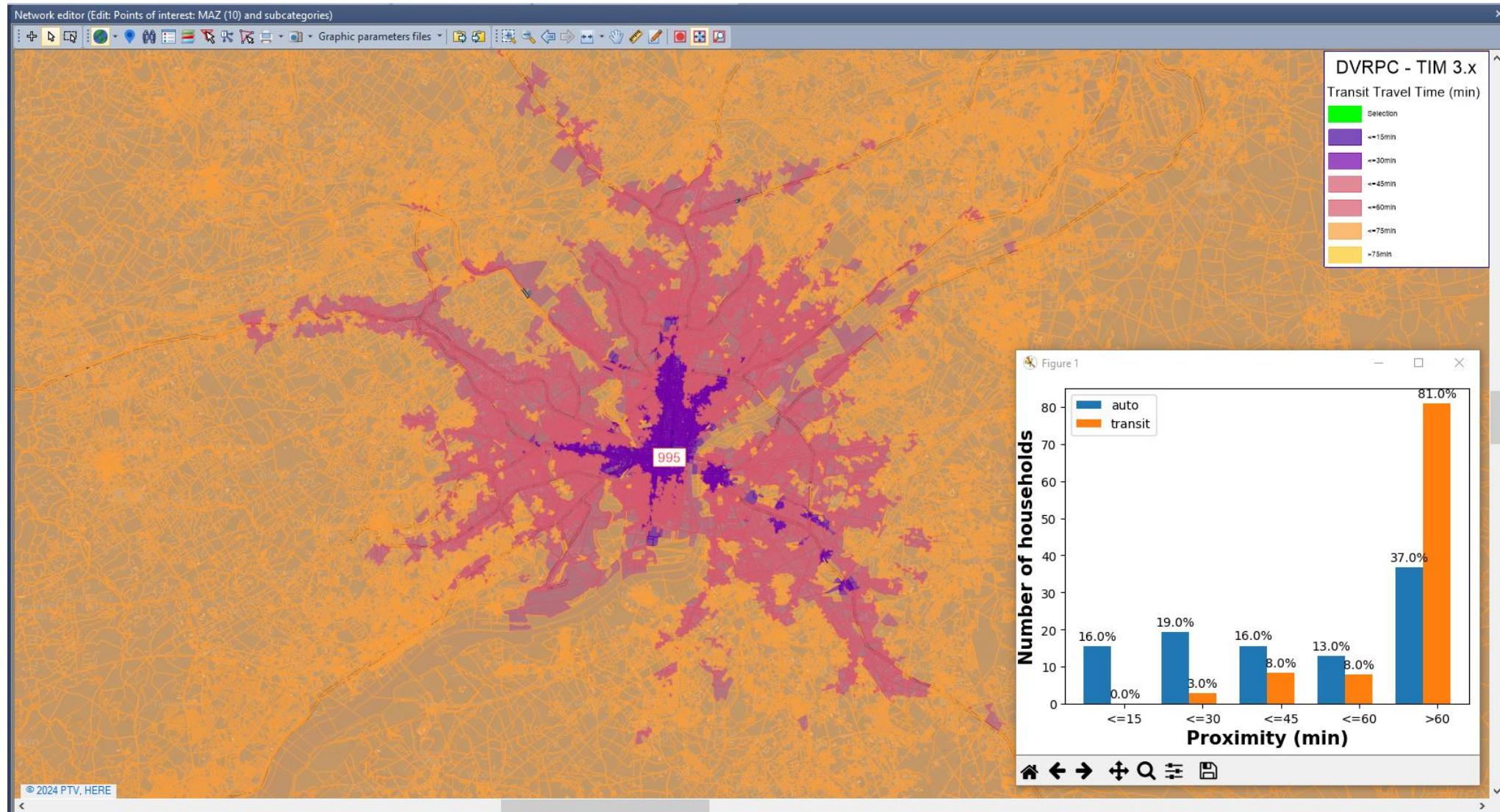
List (Households) List (Person) List (Tours) List (Trips) List (Activity executions) Activity profile List (Points of interest)

1:274182 2683823.4372 -161796.2551

# Extras – Activity and Time Use Profiles (DaySim)

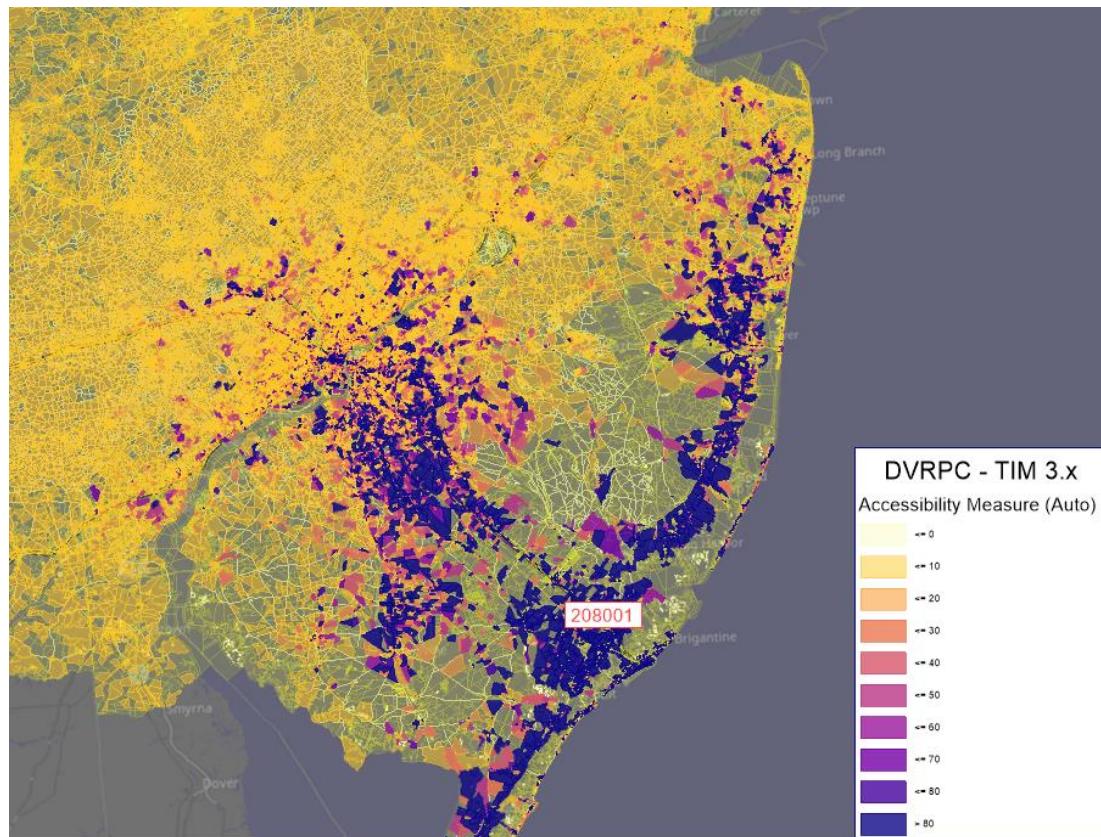


# Extras – Comparative Proximity Analysis (DaySim)

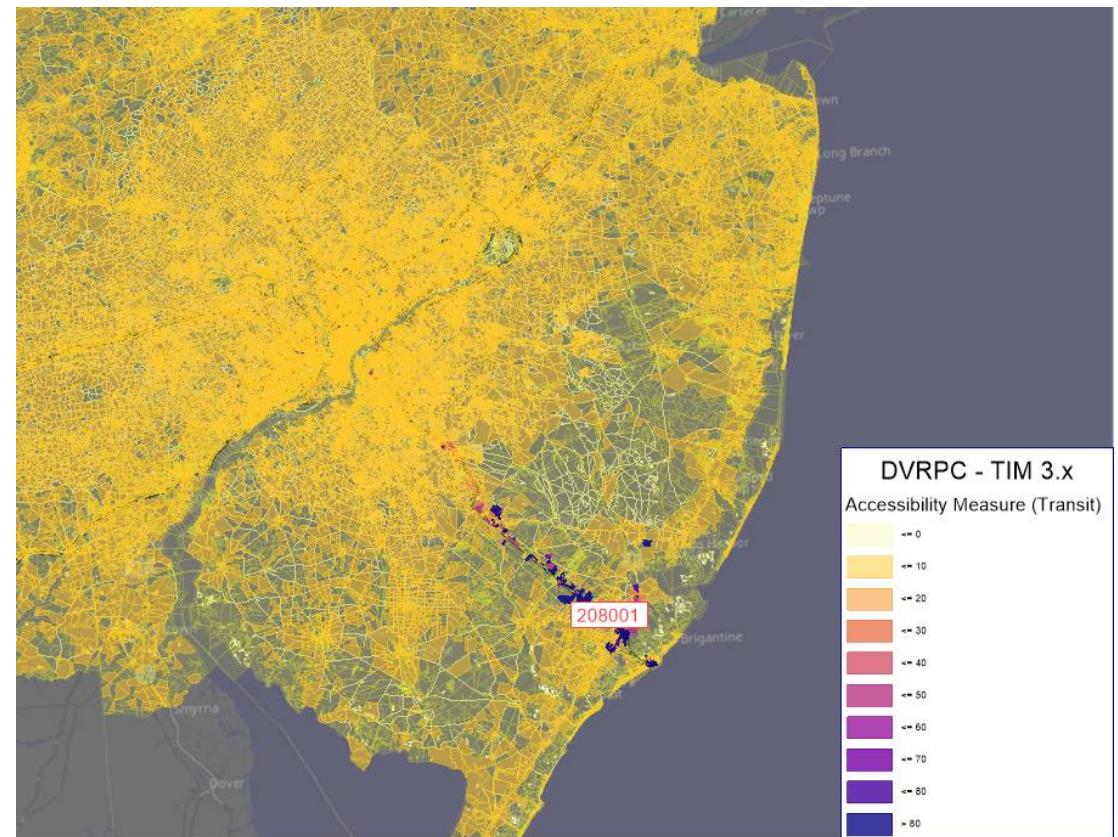


# Extras – Comparative Resource {Jobs} Access (DaySim)

Auto

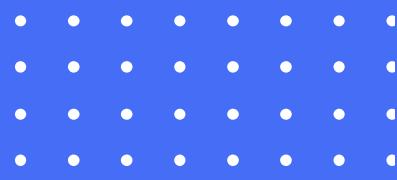


Transit



## Some Challenges...

- Support for simultaneous analysis of multiple TOD
- I/O performance with batching large amount of text data
- Nested subtours need some special handling with Activity Executions



PTV GROUP

# Discussion / Questions?



Thank you!

<https://www.myptv.com/en/mobility-software>