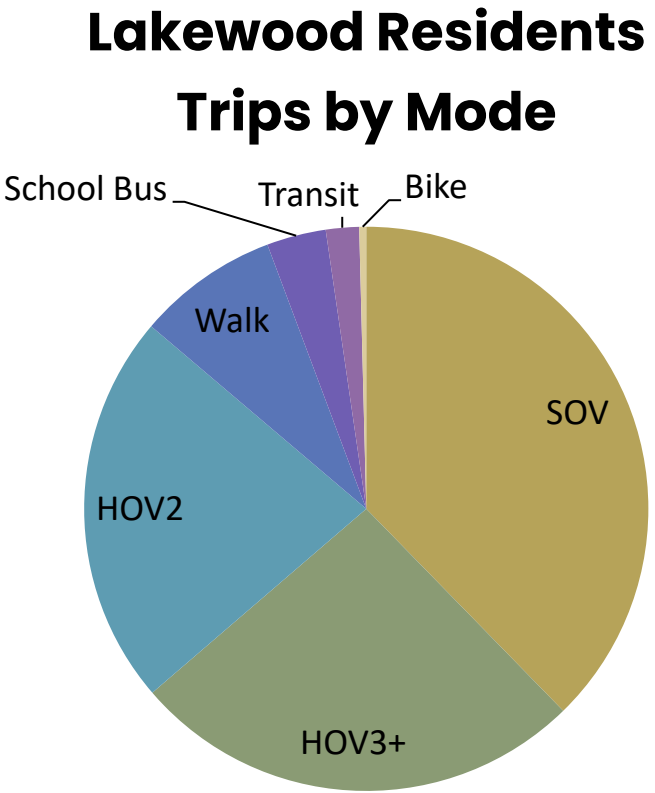
Soundcast: PSRC's Travel Demand Model

Puget Sound Regional Council

What is SoundCast?

SoundCast is PSRC's activity-based model (ABM) that predicts how individual people will conduct daily activities, where, for how long, and the travel choices they will make to complete them.

What is SoundCast?



- Allows PSRC to evaluate the effect of alternative transportation and land use policies on individual travel behavior at a high level temporal and spatial resolution
- Allows PSRC to use a potential wide range of performance indicators

What are the strengths of SoundCast?

Places

- Transit oriented development
- Regional Centers analysis

People

- Equity for disadvantaged communities
- Aging population

Mode Choices

- Walking and Biking
- Transit

Pricing

- Price and tolling sensitivity
- Impacts of increasing congestion

SoundCast Model Components

Household Demand (Daysim)
- Base year: synthetic population
- Future year: Urbansim

Truck Demand

External Trips

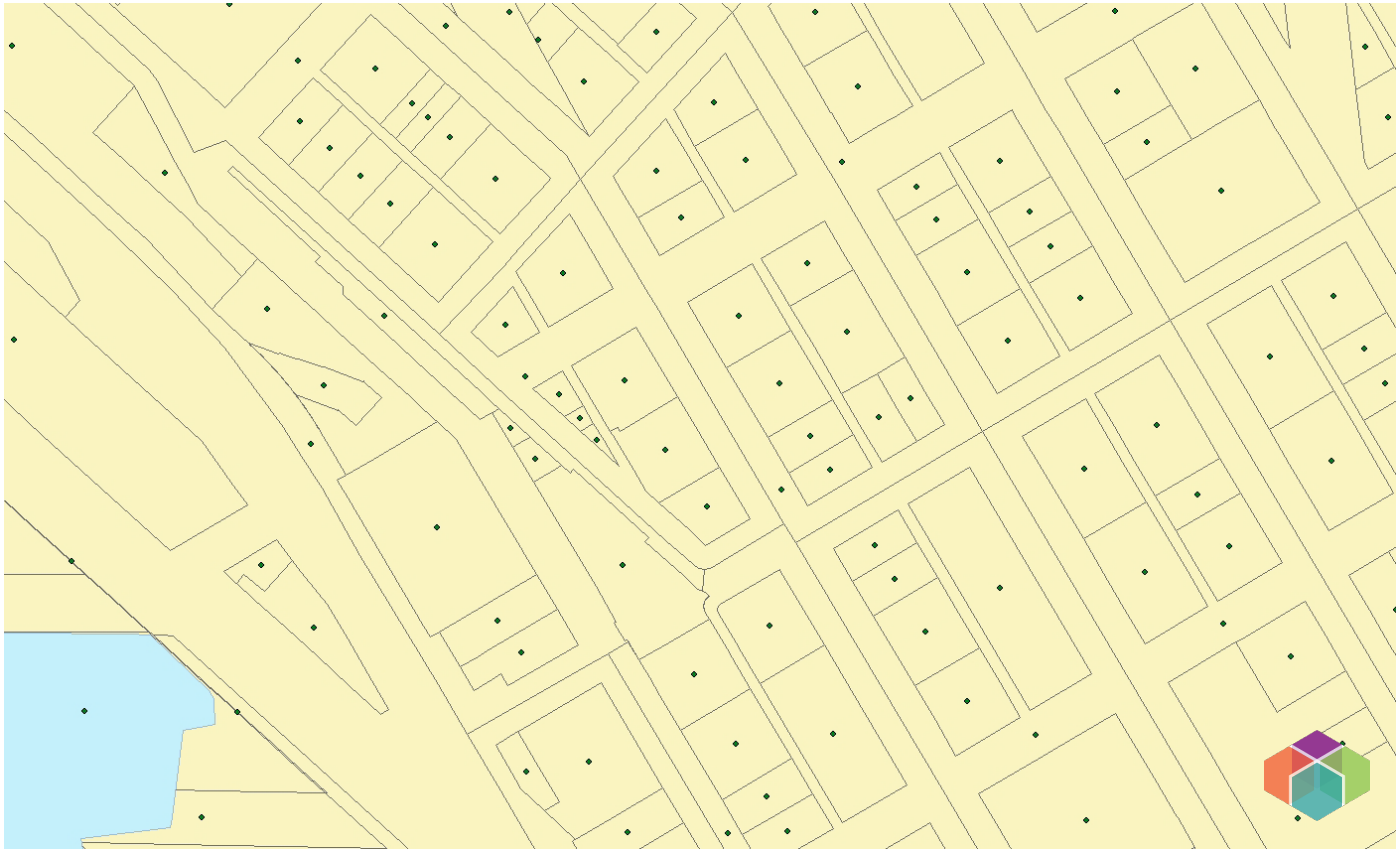
Bike Network

Airport Trips

Soundcast Geography

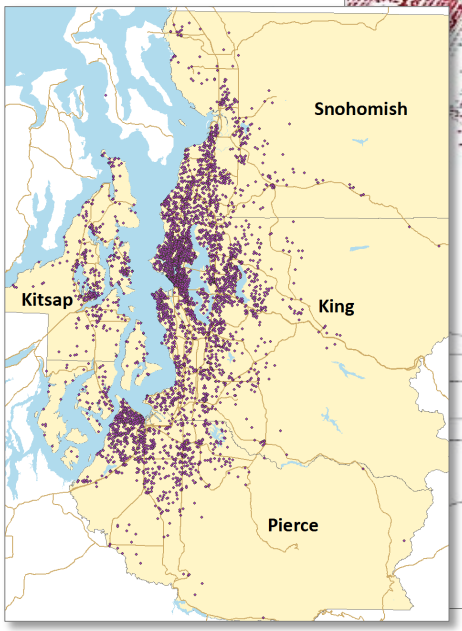
Parcel-based

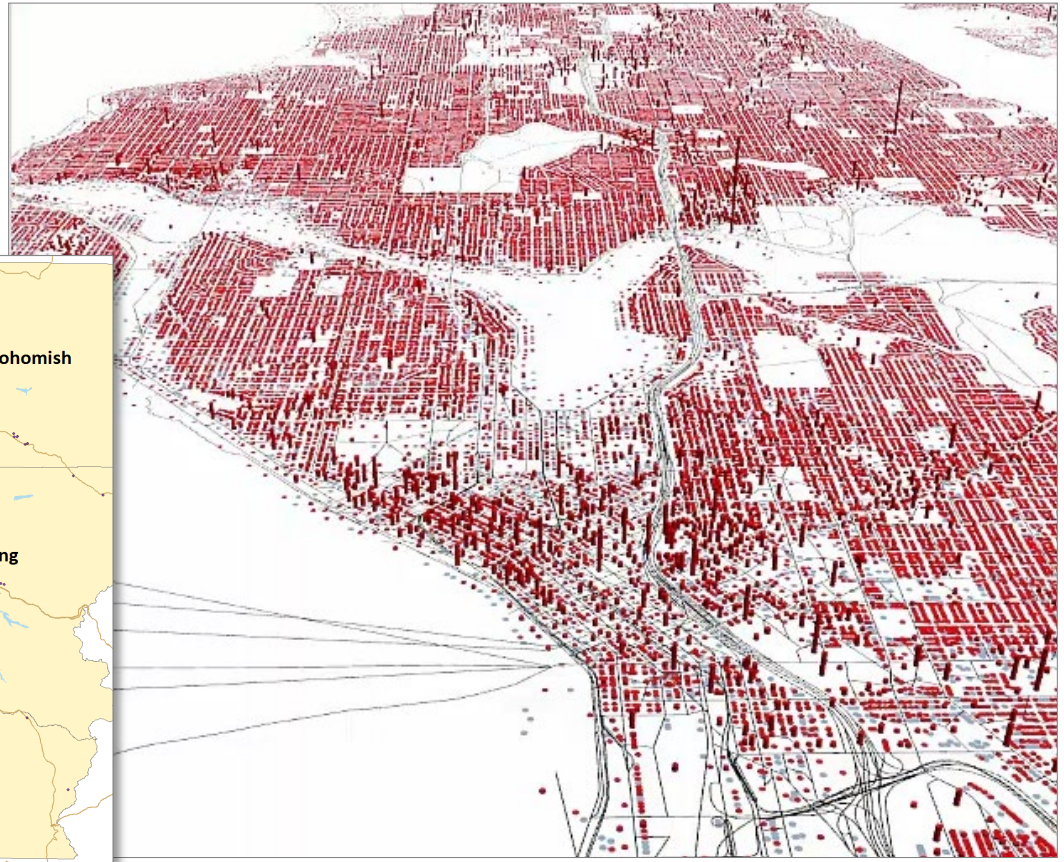
Parcels are represented by the centroid of their polygon



SoundCast creates…

A list of households and trips that looks like our household survey for the entire region





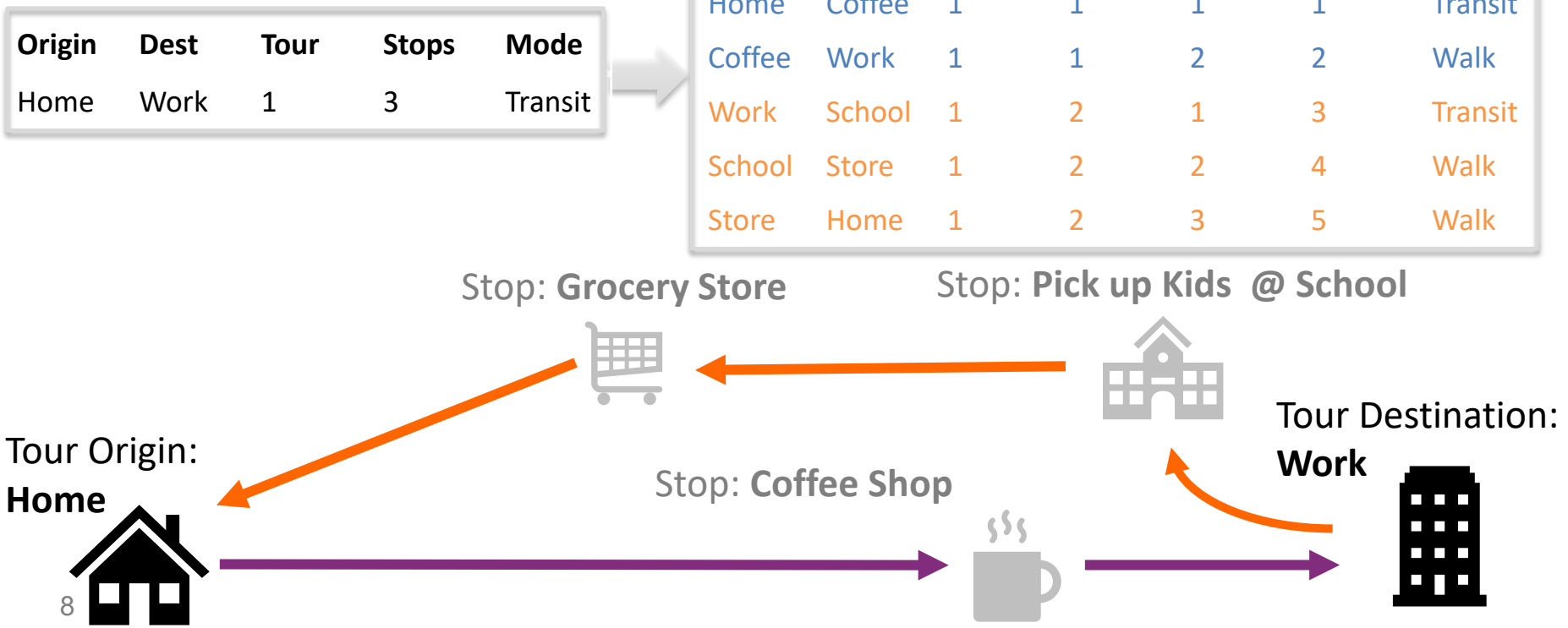
Anatomy of a Tour

Tour

Origin	Dest	Tour	Stops	Mode
Home	Work	1	3	Transit

Trip

Origin	Dest	Tour	Half	Seg	Trip	Mode
Home	Coffee	1	1	1	1	Transit
Coffee	Work	1	1	2	2	Walk
Work	School	1	2	1	3	Transit
School	Store	1	2	2	4	Walk
Store	Home	1	2	3	5	Walk



Model Steps

Households/Persons
Who is traveling?

Day Pattern
How much do people travel?

Destination Choice
Where do people go?

Mode Choice
What mode do people use?

Time Choice
What time do people travel at?

Route Assignment
What paths do trips use?

Choice Models

Route Assignment: What does it do?

Steps so far result in a detailed trip table

deptm	arrtm	opcl	dpcl	otaz	dtaz	opurp	dpurp	mode	hhno	pno
501	511	1144246	1006532	20	1859	none/home	pers.bus	other	23	1
530	541	1006532	1144246	1859	20	pers.bus	none/home	other	23	1
740	762	1251568	828924	19	501	none/home	pers.bus	sov	7	1
842	864	828924	1251568	501	19	pers.bus	none/home	sov	7	1
846	883	1251644	852051	19	1872	none/home	social	walk	15	1
898	935	852051	1251644	1872	19	social	none/home	walk	15	1
1163	1179	782926	1015112	20	54	none/home	social	walk	3	1
1373	1389	1015112	782926	54	20	social	none/home	walk	3	1
787	810	1251648	683047	19	1791	none/home	escort	sov	1	1
811	835	683047	1251648	1791	19	escort	none/home	hov3	1	1
757	766	1251609	1089432	19	1855	none/home	shop	sov	32	2
799	808	1089432	1251609	1855	19	shop	none/home	sov	32	2
789	820	783043	1106508	20	71	none/home	pers.bus	w_transit	21	1
1059	1113	1106508	783043	71	20	pers.bus	none/home	walk	21	1

Route Assignment: What does it do?

From steps so far, we can say a lot:

- Distributions of mode choice, trip purpose, destination choice, trip distance, trip time etc.

But we cannot say:

- Volume on I-5 between 7 and 8
- Daily light rail boardings

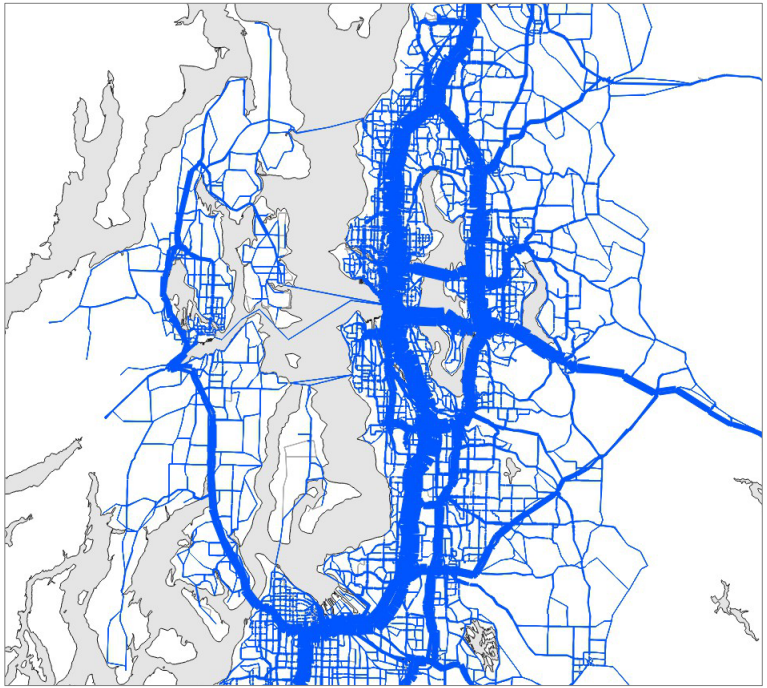
Assignment also allows for updated travel time and distances to be fed back to demand steps

Route Assignment: What does it do?

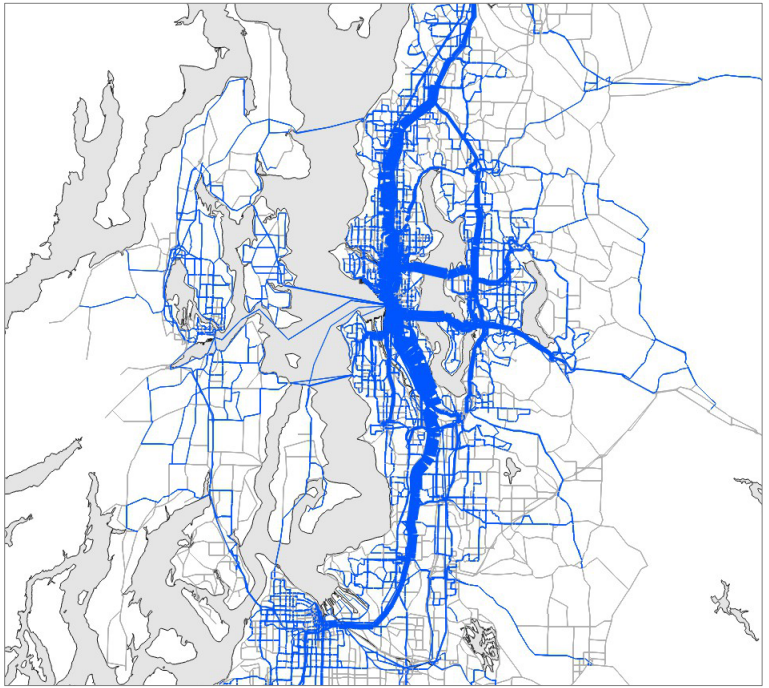
Trips are aggregated from Parcels to TAZs

Route Assignment: What does it do?

Places cars, trucks and buses on the network



AM Peak Period Auto Volumes



AM Peak Period Transit Volumes

Model Development: ActivitySim Implementation

ActivitySim Mission & Overview

- Create and maintain advanced, open-source, activity-based travel modeling software based on best software development practices for distribution at no charge to the public

- For PSRC, ActivitySim will eventually replace Daysim, which is the ABM in Soundcast

ActivitySim Agency Partnership

- Agencies contribute annually to pooled fund
- AMPO facilitates coordination and provides administrative support
- All funding agency partners participate in decision-making
- New agencies are welcome
- 9 years of successful collaboration

Metropolitan Washington Council of Governments

odot transportation.ohio.gov

AMPO Association of Metropolitan Planning Organizations

ActivitySim Principals

Collaborative	One open common platform / code base that is shared by all users
Cost effective	Reduced development and maintenance costs and economies of scale through pooled funding
Practical	Easy for agencies and modelers of different skill levels to use to produce reasonable and reliable estimates and forecasts
Extensible	Can be customized and extended for new features and region specific needs
Performant	Makes efficient use of computing resources, including memory, storage, and processors

ActivitySim Project Management

- Let by Project Management Committee (PMC)
- PMC Comprised of agency staff
- PMC sets development priorities and provides technical direction and oversight
- Implementing advanced state-of-the-practice features
- Identifying and developing capabilities to respond to new policy and investment analysis needs
- Annual scoping and budgeting

ActivitySim Approach

- Design based on an existing best practice model (MTC's CT-RAMP)
- Implement in Python using best software development practices and popular data science libraries
- Facilitate extensibility through modular design
- Continuously integrate and test
- Document comprehensively

ActivitySim Features

- **Utilities/Variables:**
  - Expressed as user configurable expressions
- **Mulitprocessing**
  - Python is single threaded but supports parallel operations
- **Pipelining**
  - Model can be started/stopped at any point
- **Tracing and logging**
  - All calculations traced to CSVs for tagged households and ODs

ActivitySim — Status

Pre 2018- Software development work to replicate MTC's Travel Model 1

- Each model component implemented in ActivitySim framework
- Extensive verification for each sub-model

ActivitySim — Status

Post 2018- Software development work to improve performance and implement new features, including:

- Multiprocessing
- Model estimation mode
- Support for modeling TNCs and for-hire vehicles
- Telecommute Model
- Vehicle Type Model
- Explicit School pick up and drop off
- Better Accessibility Measures

ActivitySim — PSRC Implementation

Phase 1 (completed):

- Translate Soundcast data to be usable by ActivitySim
- Get familiar with code base and running model
- Help Consortium test performance, new features
- Test estimation mode

ActivitySim — PSRC Implementation

Current Work:

- Customize model specifications to PSRC region
- Implement new ActivitySim features/models
- Estimate each sub-model with PSRC's Household Travel Survey
- Integrate ActivitySim into Soundcast

ActivitySim — PSRC Development Goals

Current Work:

- Move Soundcast to 2023 Base Year
- Estimate ActivitySim using 2023 HTS. Optimistic that this will represent ‘new normal’ conditions
- Use Soundcast with ActivitySim for the next RTP
- Will have a support contract to help

Questions