Using Trip Chain Simulation to Understand Transit Travel Behavior

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What Is Trip Chain Simulation?

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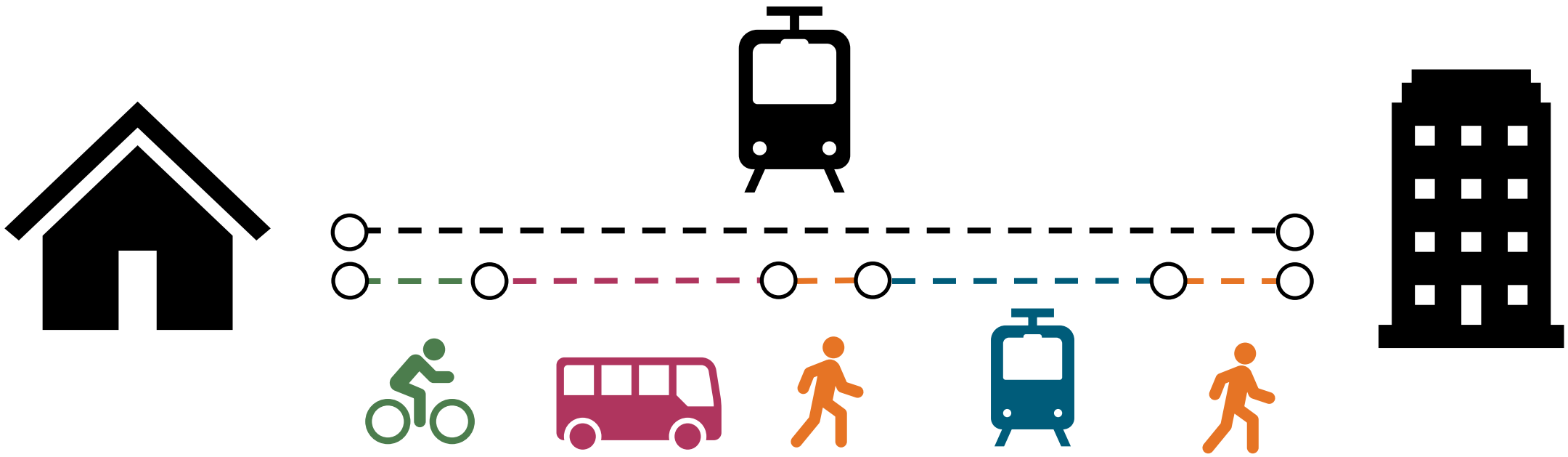
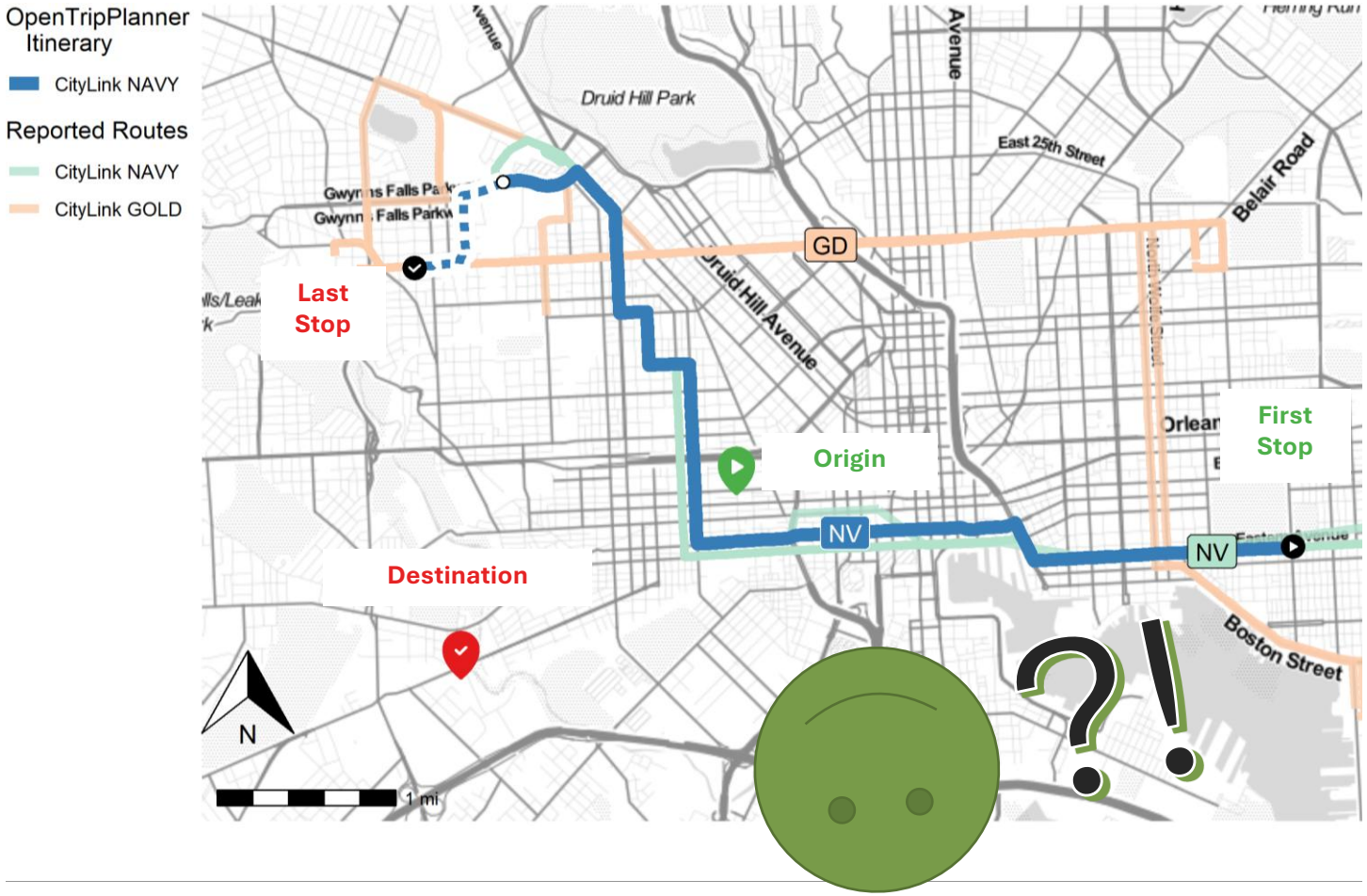
Modeling the full sequence of movements that make up a trip from origin to destination.



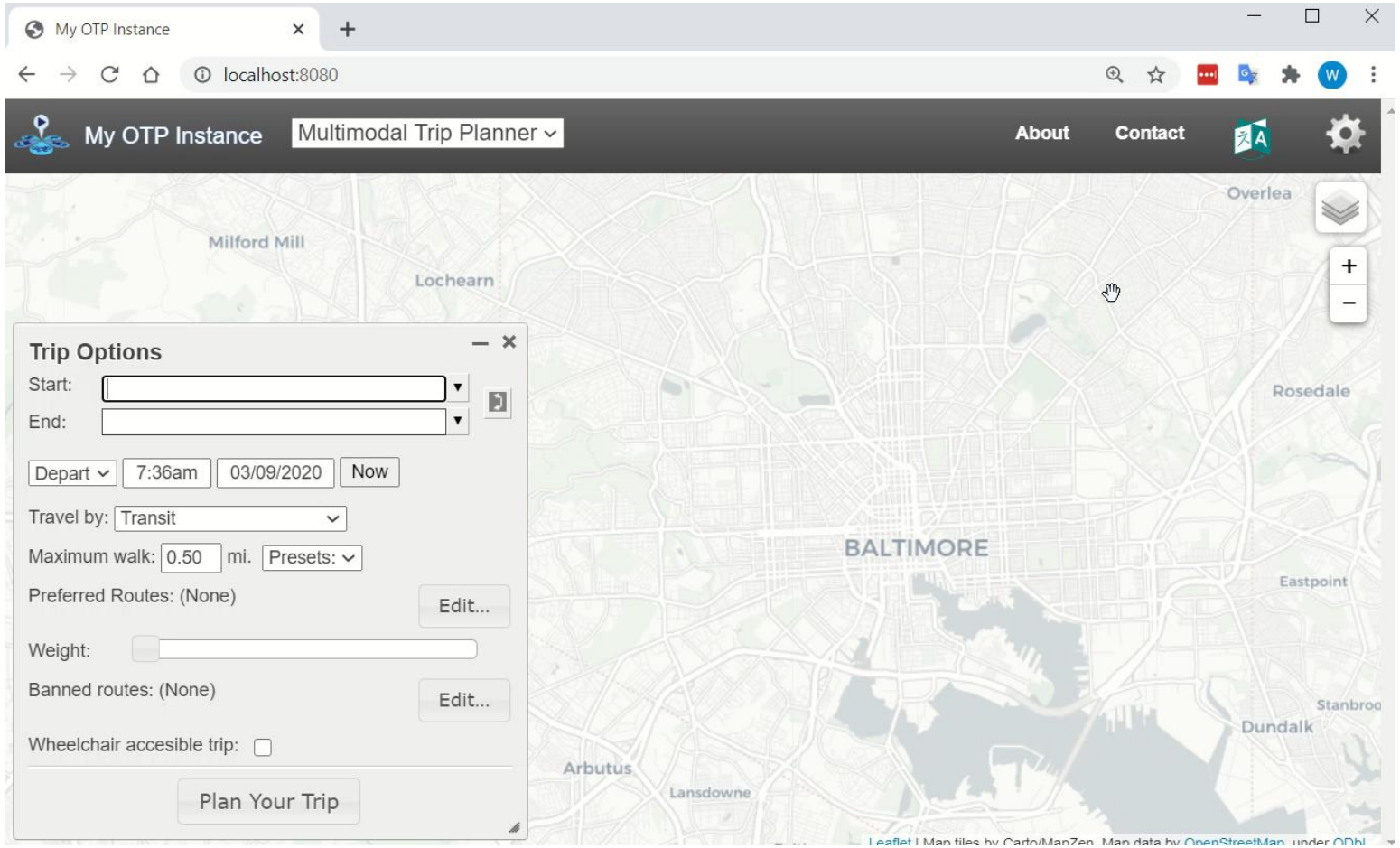
Why Do Trip Chain Simulation?

- Improve survey data quality
- Infer additional details about a trip
- Provide sketch-level assessments of proposed changes



How We Do Trip Chain Simulation

- Open Trip Planner + R / SQL
- Trip data inputs can vary:
  - Origin-destination survey data
  - Travel model outputs
  - Any point-to-point O/D data!



Trip Chain Simulation in Action

Transit Planning Case Studies

Trip Chain Validator

Answers the question: Is this survey trip possible?

Validates whether a person can in fact go from Point A to Point B using routes they reported in an origin-destination survey.

Person 1

Reported in Survey:	-	Route 1
Suggested Itinerary:	-	Route 1

Trip Chain Validated

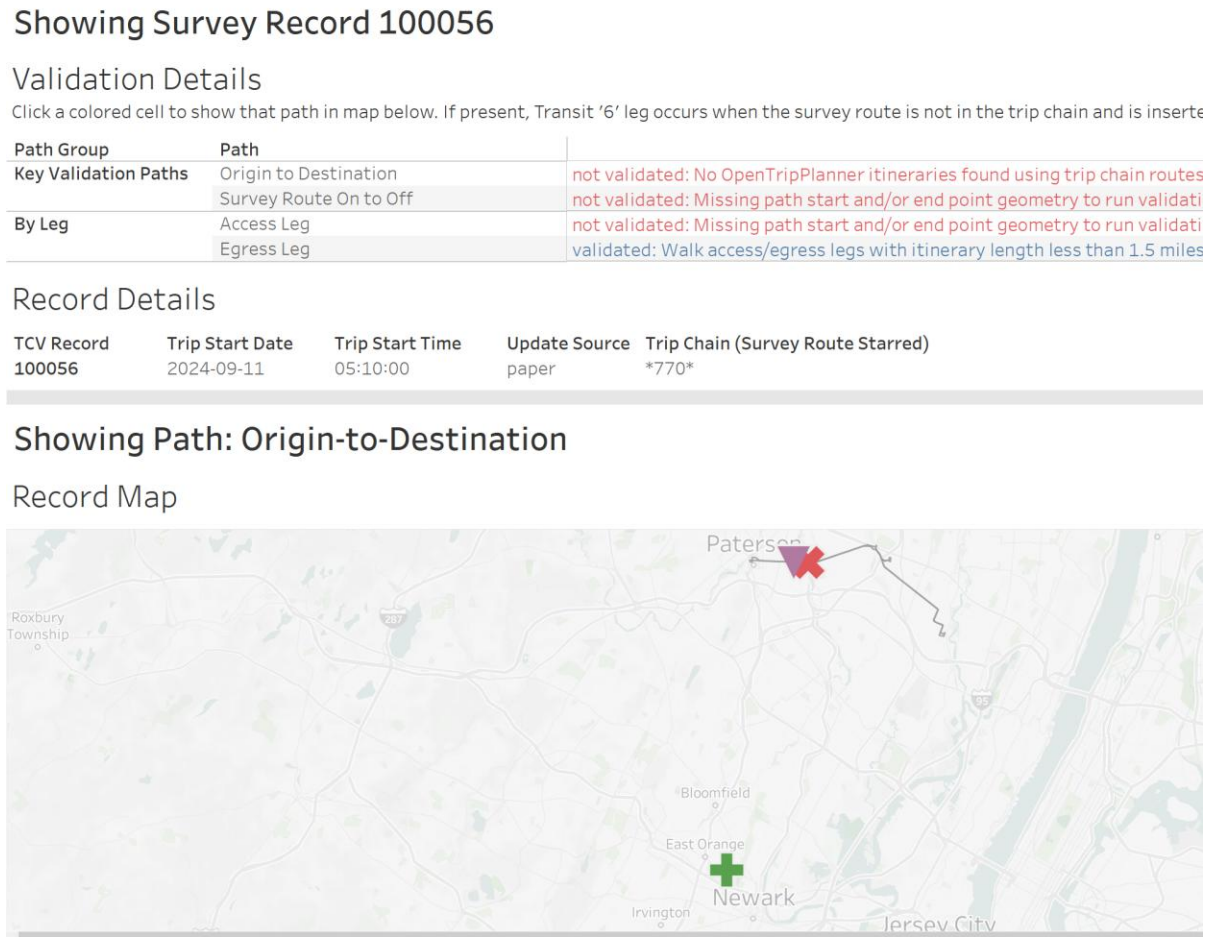
Person 2

Reported in Survey:	-	Route 1
Suggested Itineraries:	-	Route 10 - Route 15

Trip Chain Not Validated

What it Produces

- Spreadsheet exports with results
- Dashboard & report with step-by-step itinerary for validated responses
- Automatically generated report with diagnostic maps and details
- Other benefits:
  - Total travel time
  - Access/egress trip time/distance/path
  - Transfer locations



More Trustworthy Data!

- Verify quality of survey data to improve analysis accuracy
- Improve data by identifying records to review/correct

Tablet Survey	
Number of Records Analyzed	1,266
Percent Validated by Any Means	**97%**
Number of Records to Review	93

Paper Survey	
Number of Records Analyzed	2,562
Percent Validated by Any Means	**59%**
Number of Records to Review	1,191

Service Change Impacts Analysis

- Analyze service scenarios by comparing travel times between baseline and proposed systems

FISCAL CLIFF SCENARIO IMPACT	VALUE
Average Change in Travel Time (%)	5.7%
Average Change in Travel Time (minutes)	2.76 minutes (02:46)
Median Change in Travel Time (%)	3.1%
Median Change in Travel Time (minutes)	1.3 minutes (01:18)

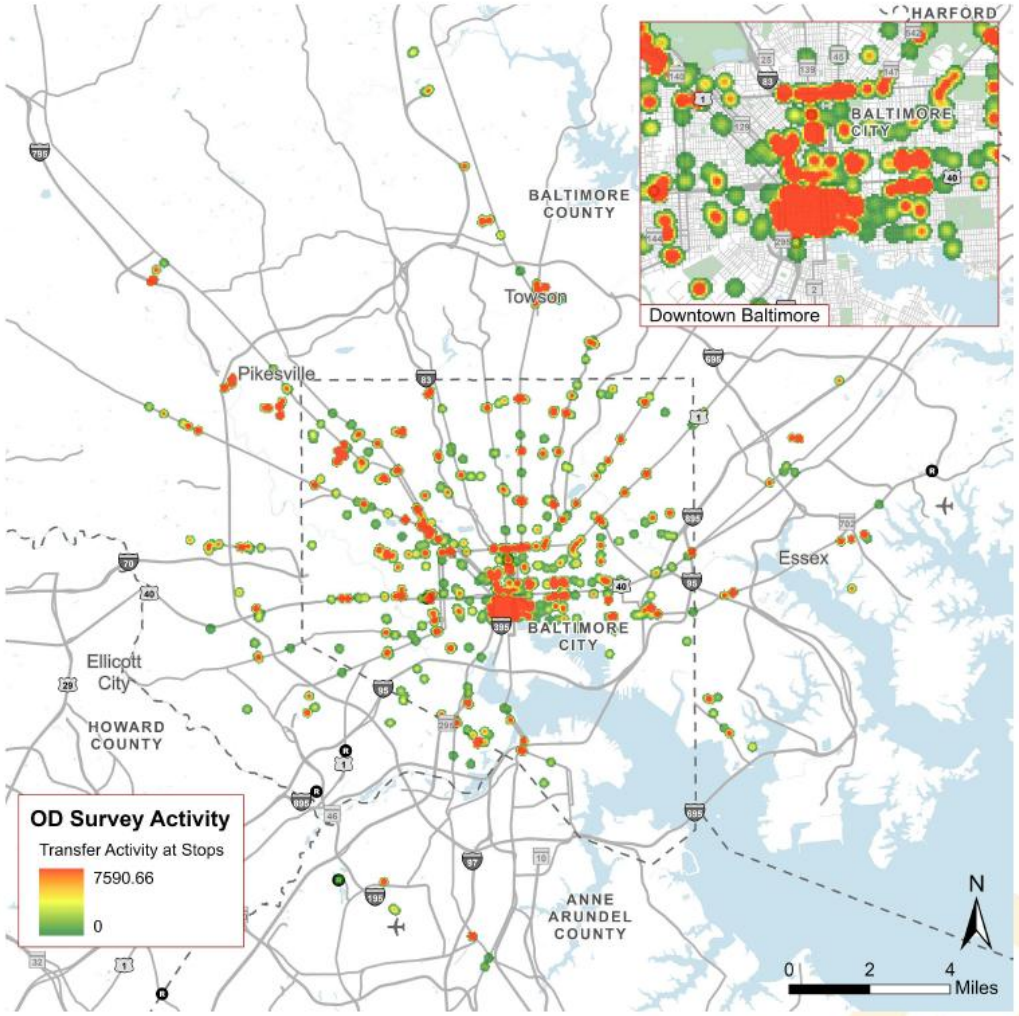
Transfer Hotspot Analysis

- Use O-D survey data to model transit trips and find transfer locations
- Identify key transfer locations throughout the service area

Table 1. Top 20 Transfer Locations Ranked by Weekday Interpolated OD Survey Transfer Activity

Rank	Transfer Location Name	Routes with Activity at Location	Boarding & Alighting Transfer Activity[1]	Percent of Activity that is Transfer Related
1	Mondawmin	22, 26, 29, 79, 82, 83, 85, 91, LM, MS, NV, YW	11,157	52%
2	Lexington Market	105, 115, 150, 54, 71, 73, 78, 80, 94, BL, LR, MS, OR, PR, RD	9,644	57%
3	Charles Center	103, 105, 120, 150, 51, 56, 65, 67, 71, 76, 78, 95, GR, MS, OR, PR, RD, SV	7,236	61%
4	Rogers Avenue	28, 30, 31, 34, 80, 82, 89, 94, MS	6,813	60%
5	Baltimore Arena (University Center)	105, 120, 150, 160, 320, 51, 54, 56, 65, 71, 78, 94, LR, NV, OR, PR, RD	5,044	54%
6	Owings Mills	87, 89, MS	4,846	66%
7	Penn-North	22, 85, GD, LM, MS	4,227	48%
8	Patapsco	29, 69, 70, 71, 73, 75, LR, YW	3,981	72%
9	Courthouse	103, 105, 115, 120, 160, 56, 67,	3,757	54%

Figure 1. Transfer Activity Heatmap



Assess First/Last Mile Connections

- Analyze average walk/bike distance during reported access/egress/transfer trips
- Identify key infrastructure gaps in bike/ped networks around stops

Mode	Service Area Definition
Core Bus	All Census Block Groups within 0.5 miles of Core Bus stops.
Commuter Bus	All Census Block Groups within three miles of Commuter Bus stops, excluding stops where morning boarding is not possible.
MARC Commuter Rail	All Census Block Groups within three miles of MARC stations.
Light Rail	All Census Block Groups within 0.75 miles of Light Rail stations.
Metro Subway	All Census Block Groups within 0.75 miles of Metro Subway stations.

Thank you!

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