EVALUATING TRANSIT ROUTE CHOICE IN THE TWIN CITIES

Transit riders and the subjectively shortest path: A look into transit system resilience and user choice preferences.

MOTIVATION

Preliminary step in creating a transit route choice model for the Twin Cities Metro Area

- Choice Set Estimation
- Model Estimation
- Testing
- Application

OUTLINE

- Problem statement
- Background
- Methodology
- Results
- Conclusions

PROBLEM STATEMENT

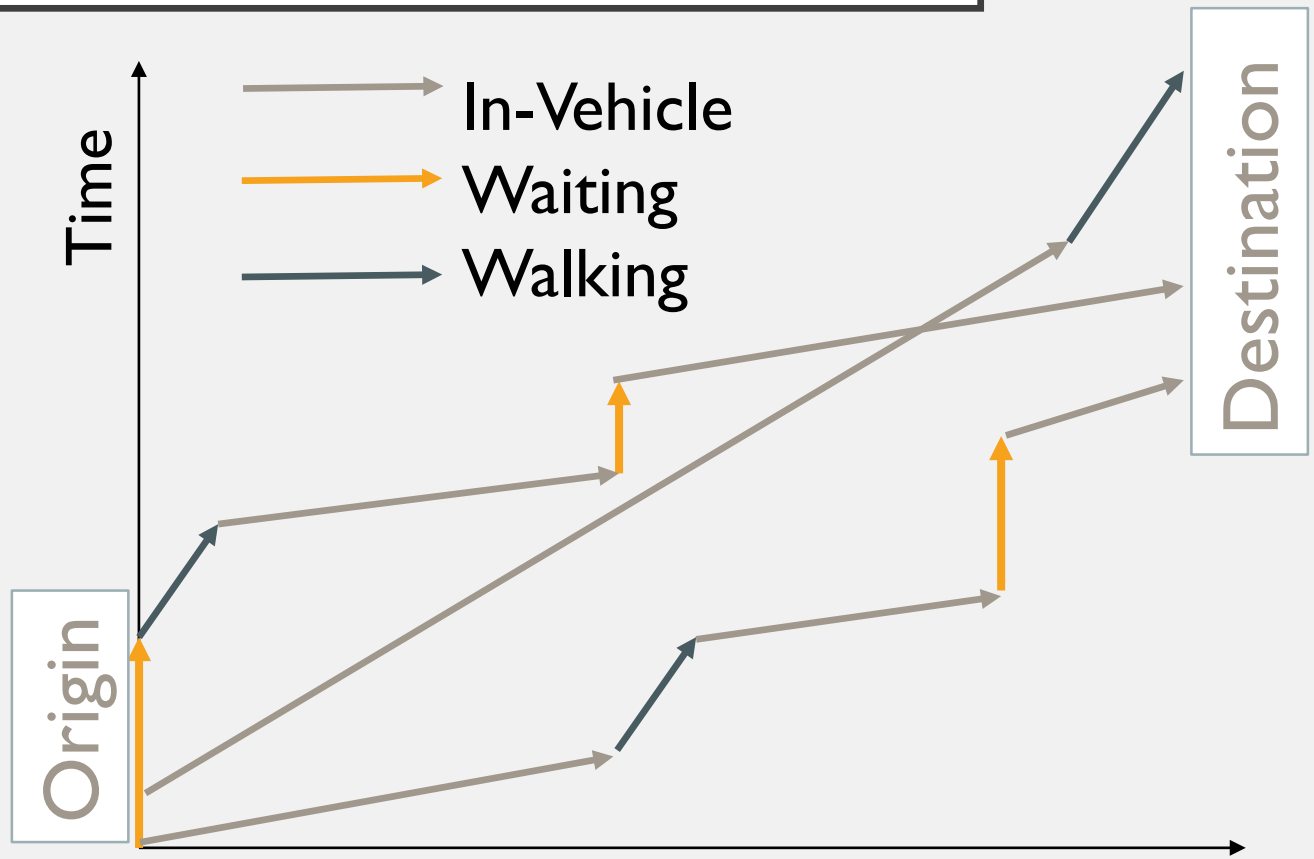
Determine whether Twin Cities transit riders take the shortest travel time path or a path from a set of extreme preferences.

BACKGROUND

1. What makes up a transit path?
2. What is a subjectively shortest path?

WHAT MAKES UP A TRANSIT PATH?

- Transit users must:
  - Access
  - Wait
  - Ride in a vehicle
  - Transfer
  - Egress



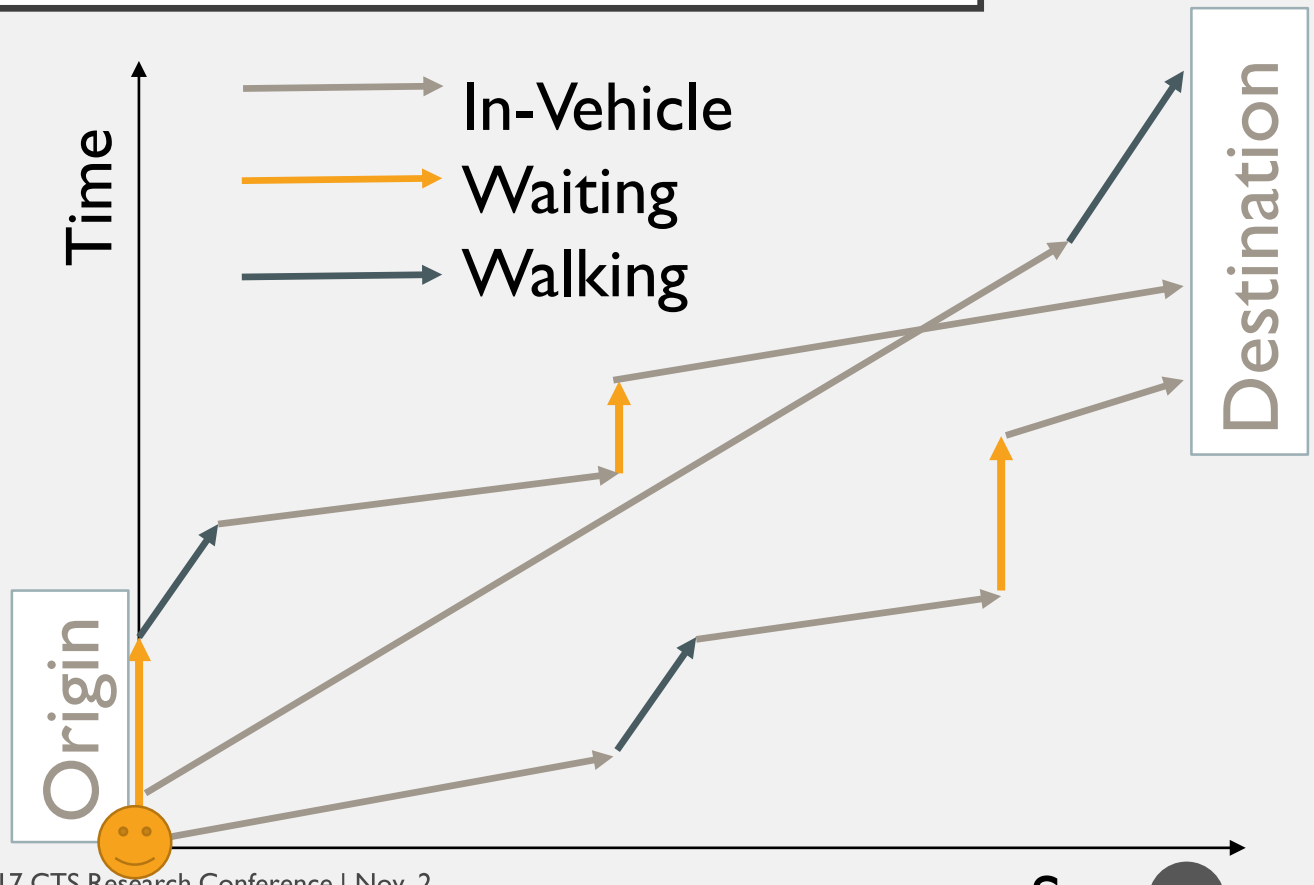
WHAT IS A SUBJECTIVELY SHORTEST PATH?

Trip Aspect	Weight
Walking	1
Waiting	1
In-Vehicle	1

- Path that acknowledges different user preferences
- Trip aspects are weighted differently relative to one another

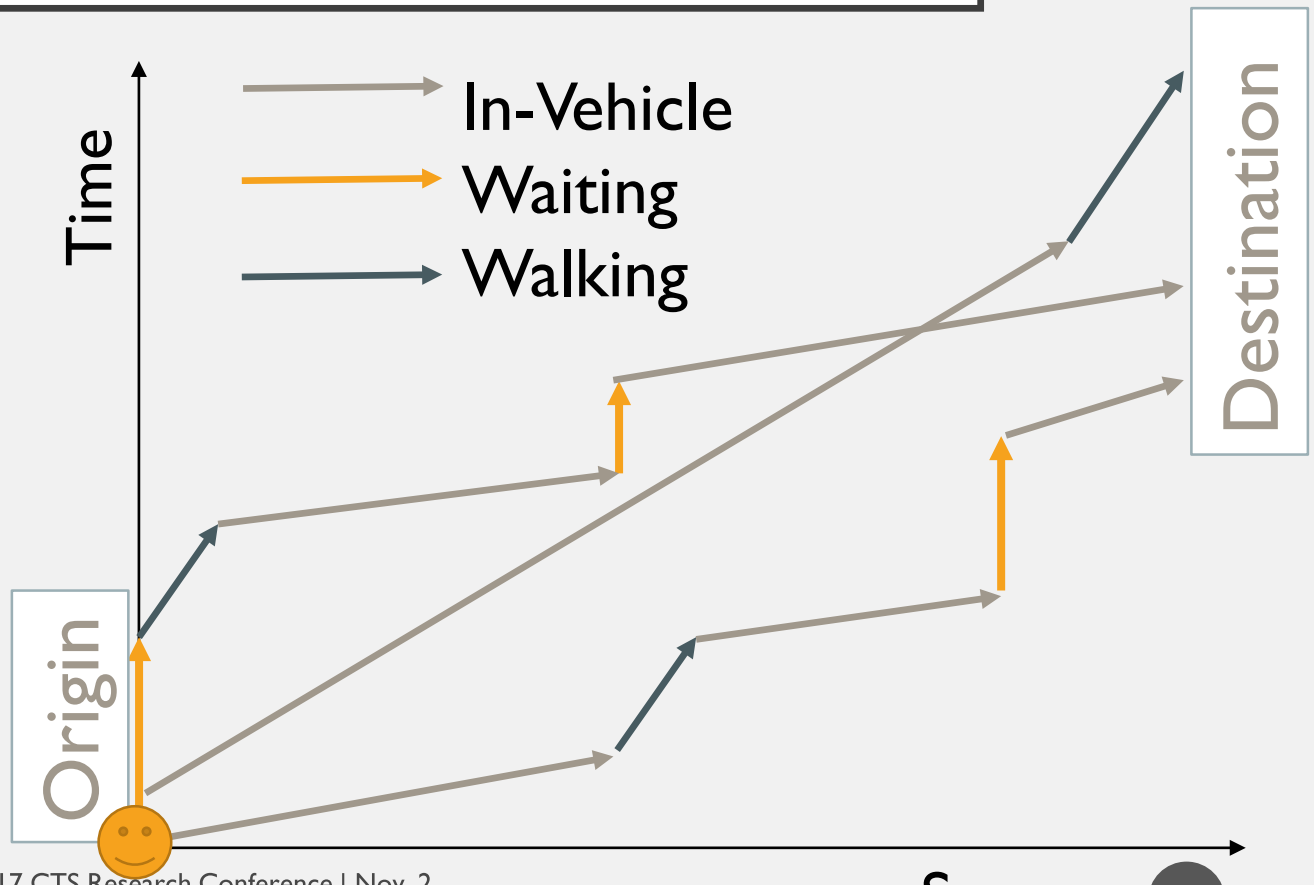
WHAT IS A SUBJECTIVELY SHORTEST PATH?

Trip Aspect	Weight
Walking	1
Waiting	1
In-Vehicle	1



WHAT IS A SUBJECTIVELY SHORTEST PATH?

Trip Aspect	Weight
Walking	1
Waiting	300
In-Vehicle	1



METHODOLOGY

1. Weighting schemes
2. Finding a schedule-based shortest path

WEIGHTING SCHEME

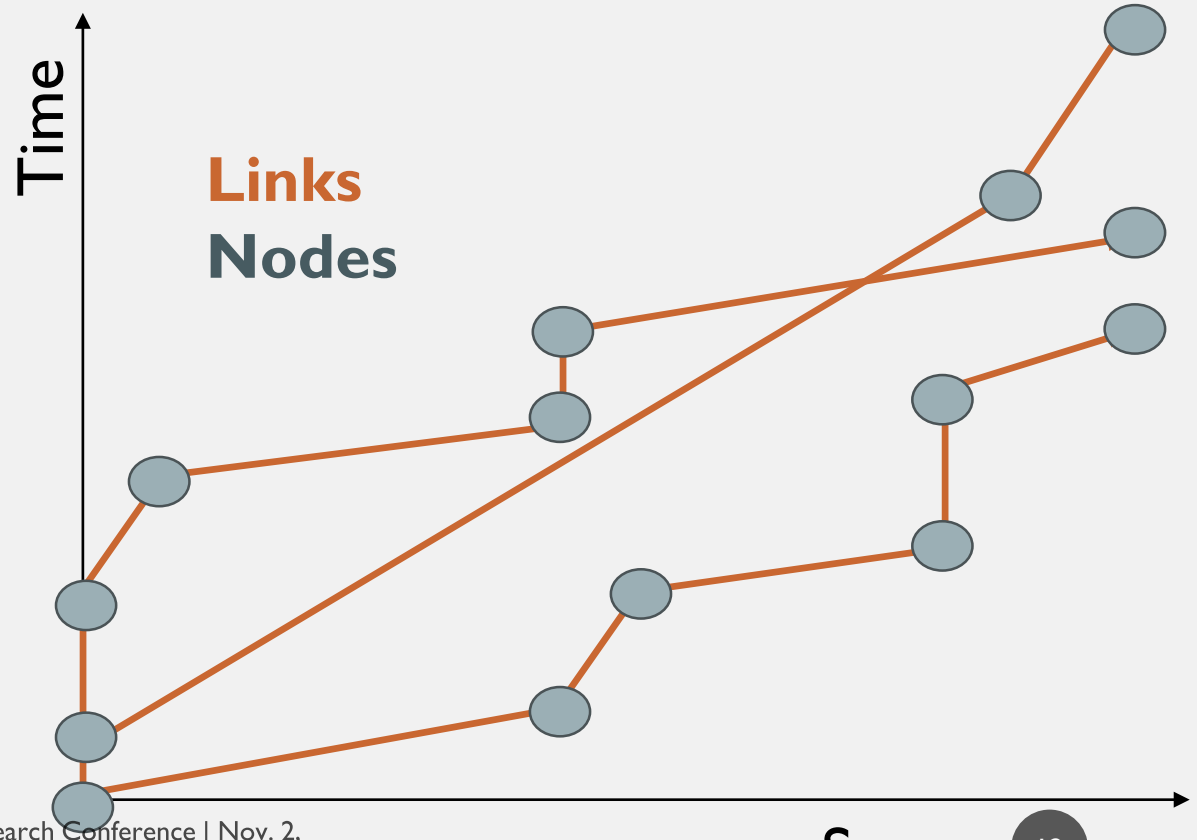
5 scenarios representing extreme user preferences.

Perceived Travel Time =
In-Vehicle Weight(In-Vehicle Time) +
Walk Weight(Walk Time) +
Wait Weight(Wait Time) +
Transfer Penalty(Number of Transfers)

Weights	Base Scenario	High In-Vehicle	High Walking	High Waiting	High Transfer
In-Vehicle	1.0	**50.0**	1.0	1.0	1.0
Walk	1.0	1.0	**50.0**	1.0	1.0
Wait	1.0	1.0	1.0	**50.0**	1.0
Transfer	0.0	0.0	0.0	0.0	**300.0**

FINDING A SCHEDULE BASED SHORTEST PATH

- Network constructed from general transit feed specification (GTFS) data
- Network links can be walking, waiting, or in-vehicle
- Network nodes are distributed in space and time
- Label setting algorithm applied (Khani 2017)

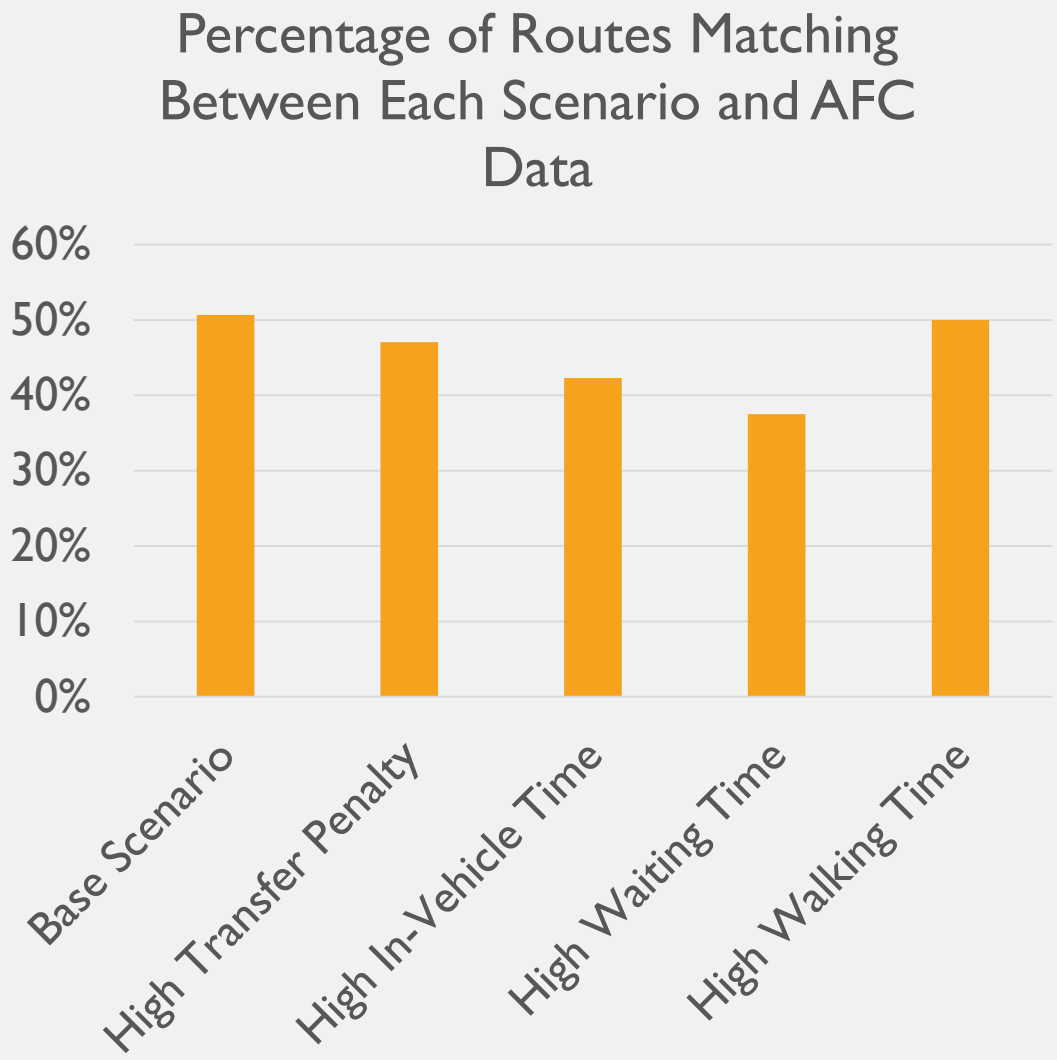


RESULTS

1. Which scenario most closely matches data?
2. How unique are paths in different scenarios?

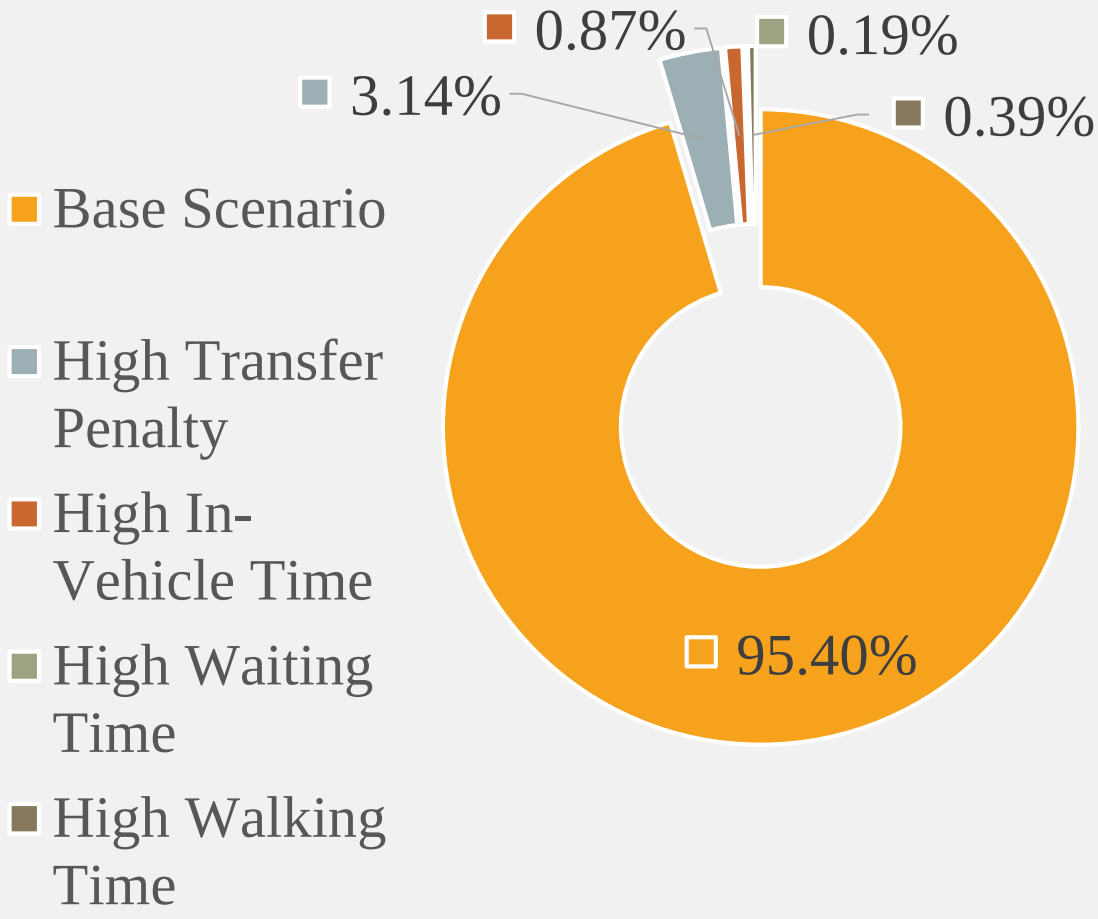
WHICH SCENARIO MOST CLOSELY MATCHES DATA?

Data Source: Automated Fare Card UPass Data



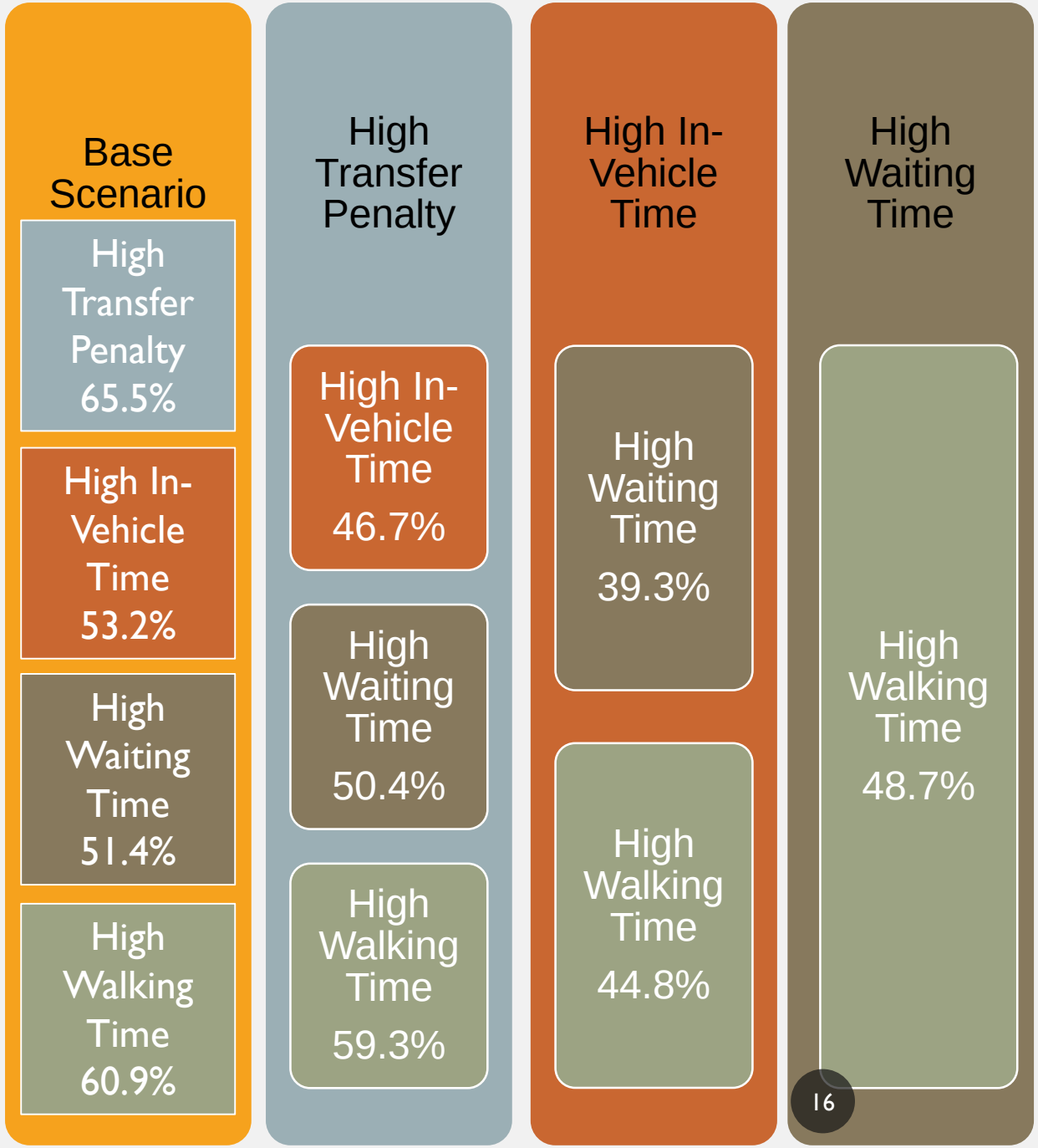
WHICH SCENARIO MOST CLOSELY MATCHES DATA?

For each passenger, which scenario had the greatest route overlap?



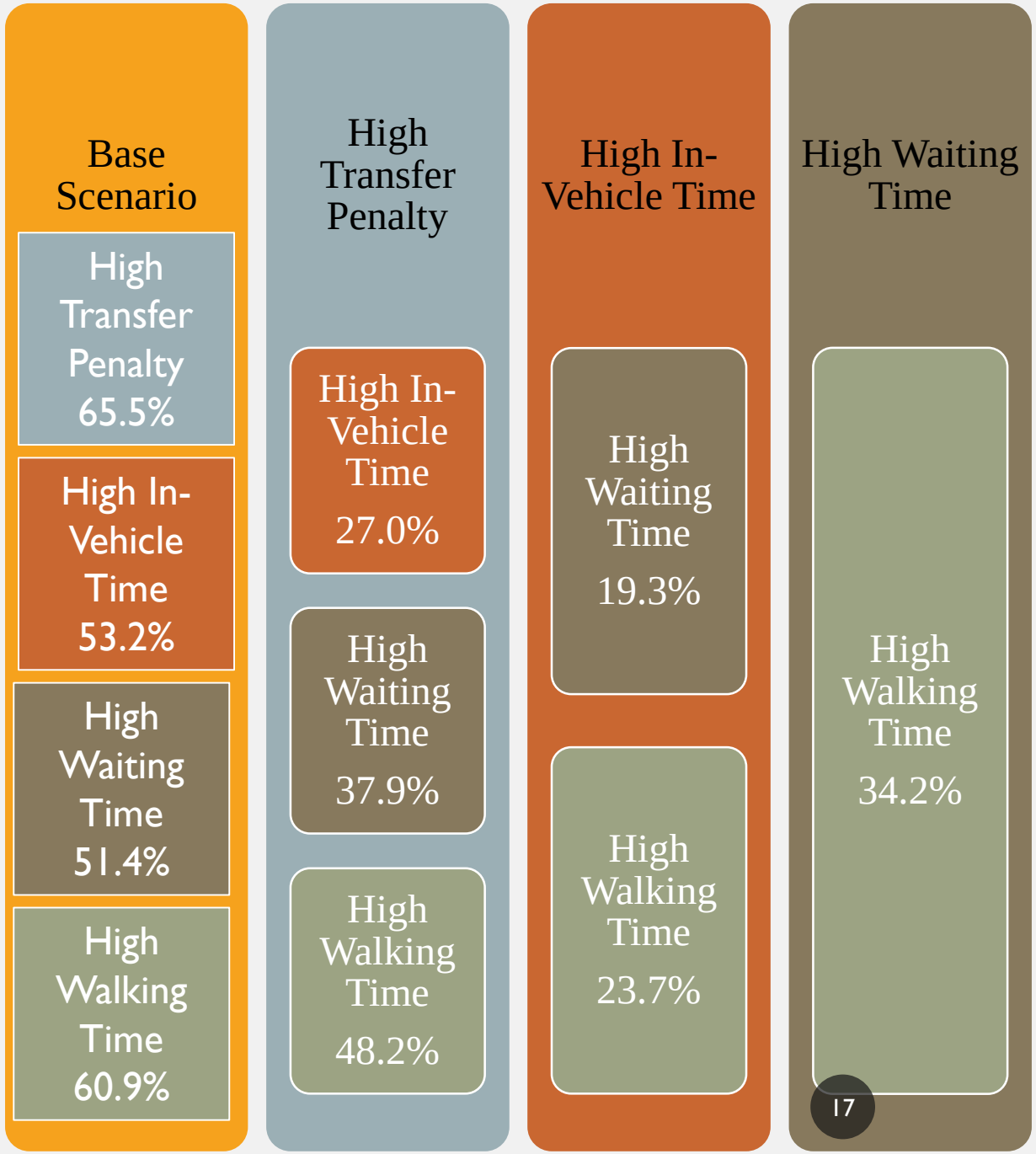
HOW UNIQUE ARE PATHS IN DIFFERENT SCENARIOS?

Route overlap between scenarios



HOW UNIQUE ARE PATHS IN DIFFERENT SCENARIOS?

Link overlap between scenarios (excluding access and egress links)



CONCLUSIONS

1. What did we learn?
2. Where do we go from here?

WHAT DID WE LEARN?

- Twin Cities transit riders follow the shortest travel time path more closely than other scenarios considered
- Lack of redundancy in Twin Cities transit network
- Transit riders have limited choices to accommodate their personal preferences

WHERE DO WE GO FROM HERE?

- Develop a choice set estimation procedure
- Estimate a route choice model for the Twin Cities

Questions?

Thank you!