A Peer-to-Peer Matching System for Grocery Home Delivery

Freight Day IV Symposium
February 10, 2015

UNIVERSITY OF TORONTO
FACULTY OF APPLIED SCIENCE & ENGINEERING
Transportation Research Institute

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Agenda

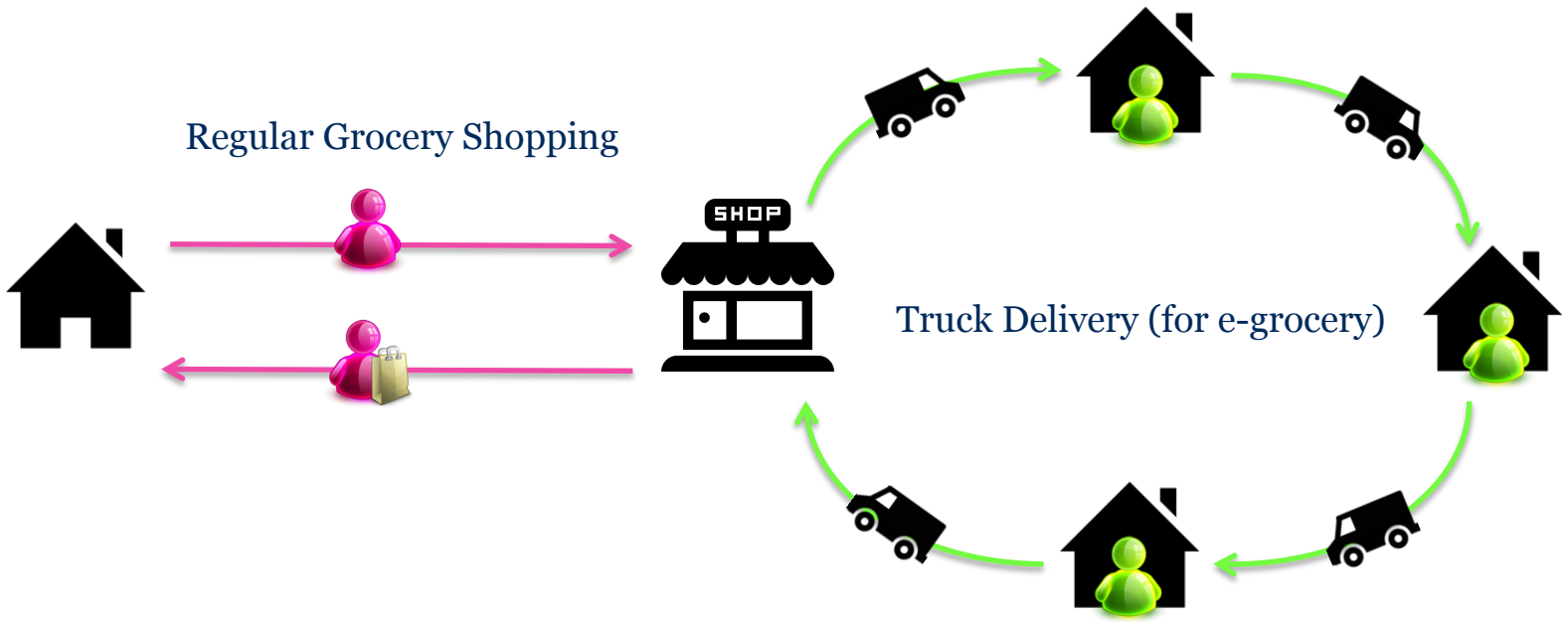
- Introduction
- Methodology
- Analysis
- Results
- Discussion and Conclusion

Introduction

Collaborative Consumption

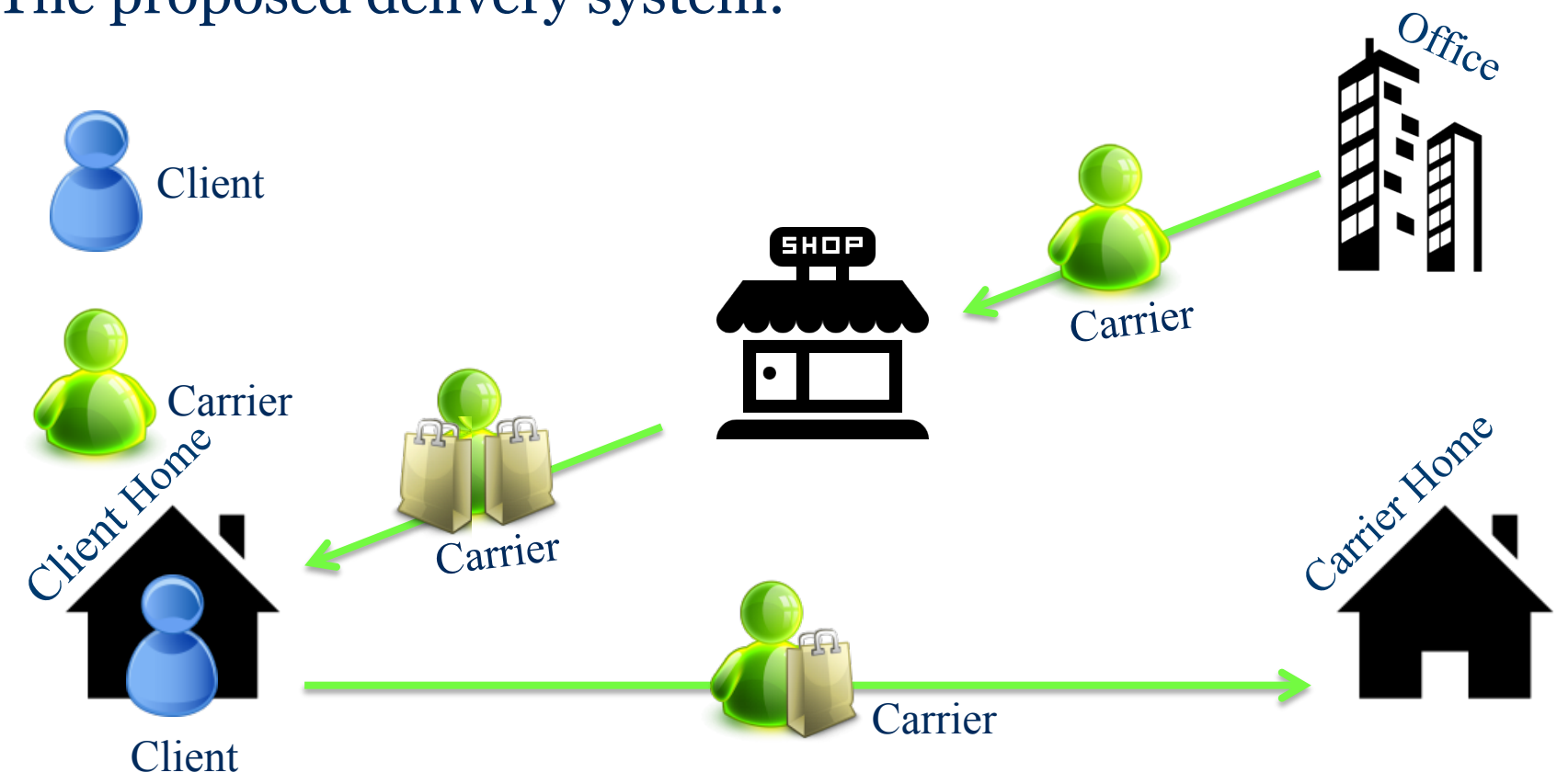
Introduction

- Current grocery shopping methods:



Methodology

The proposed delivery system:



Methodology

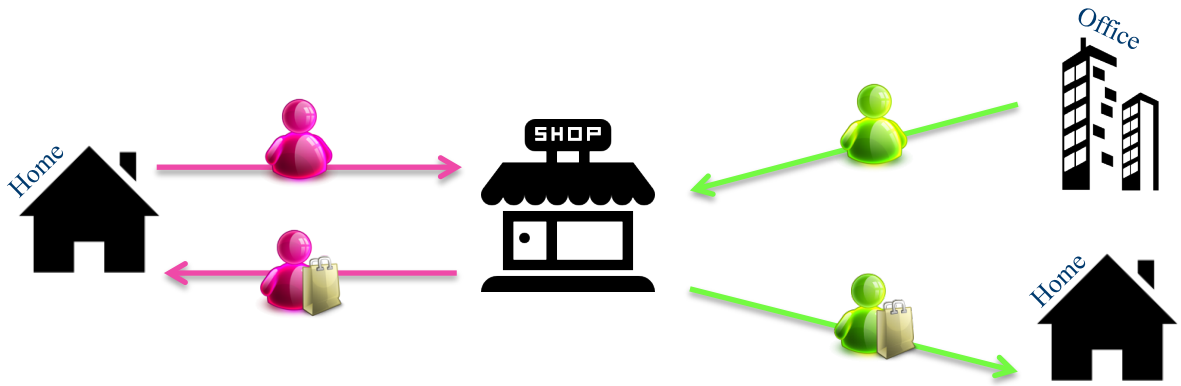
3 Methods of grocery delivery:

- ✓ The regular grocery shopping method
- ✓ The truck delivery service
- ✓ The matching system

Methodology

- Delivery scenarios:

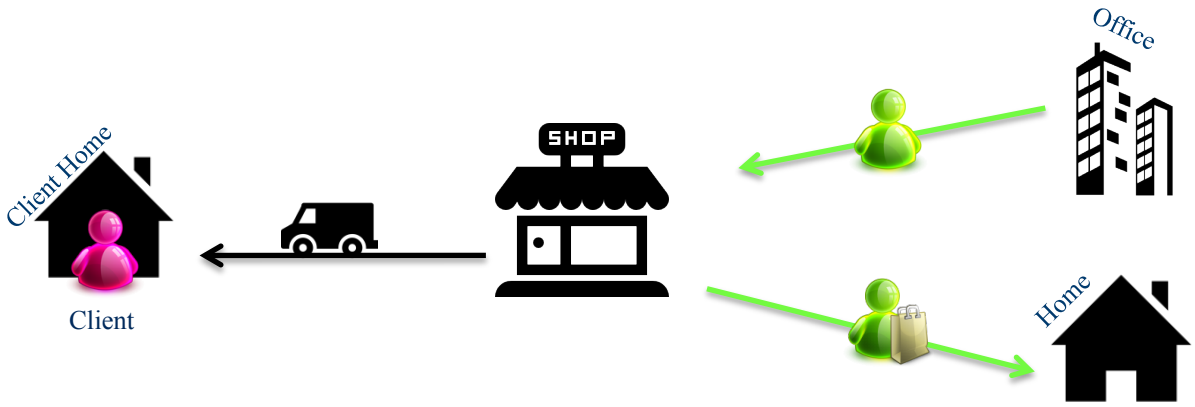
  Scenario 1



Methodology

- Delivery scenarios:

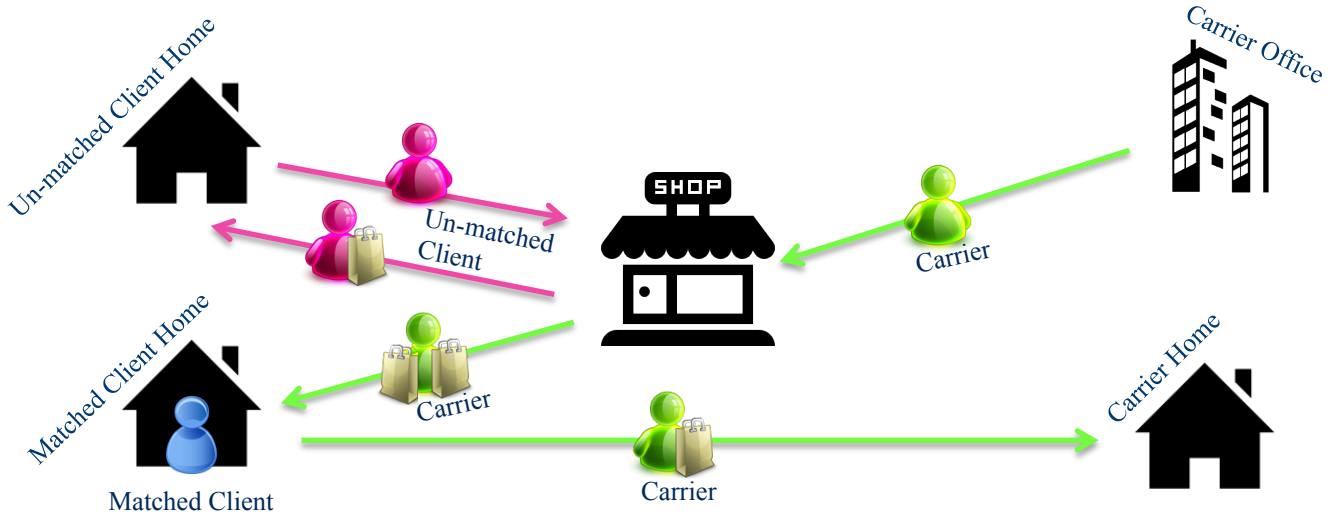
Scenario 2



Methodology

- Delivery scenarios:

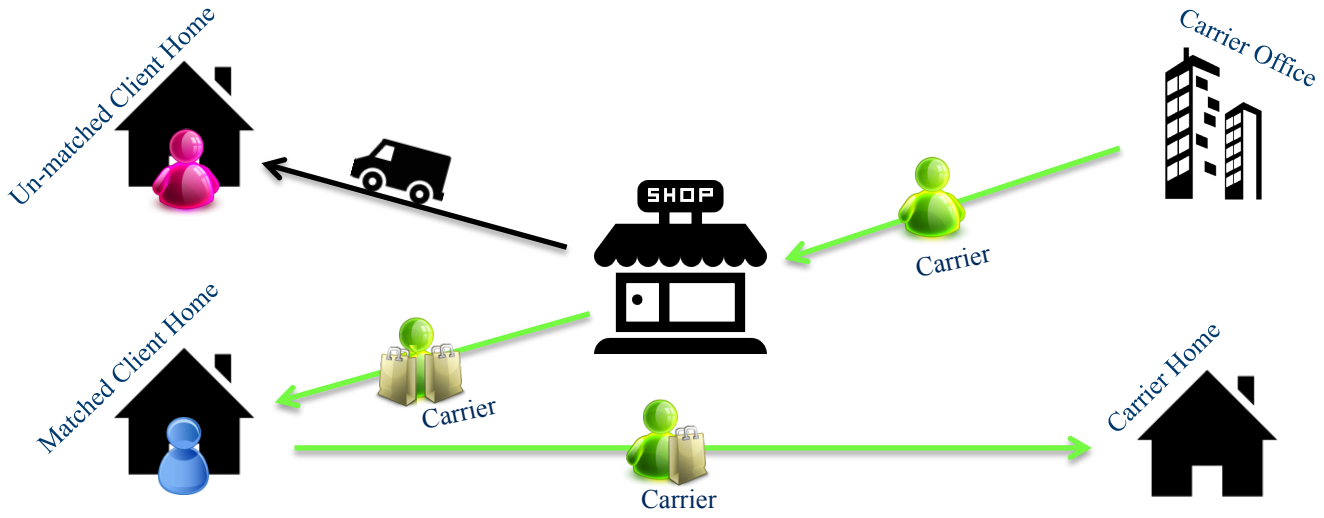
Scenario 3



Methodology

- Delivery scenarios:

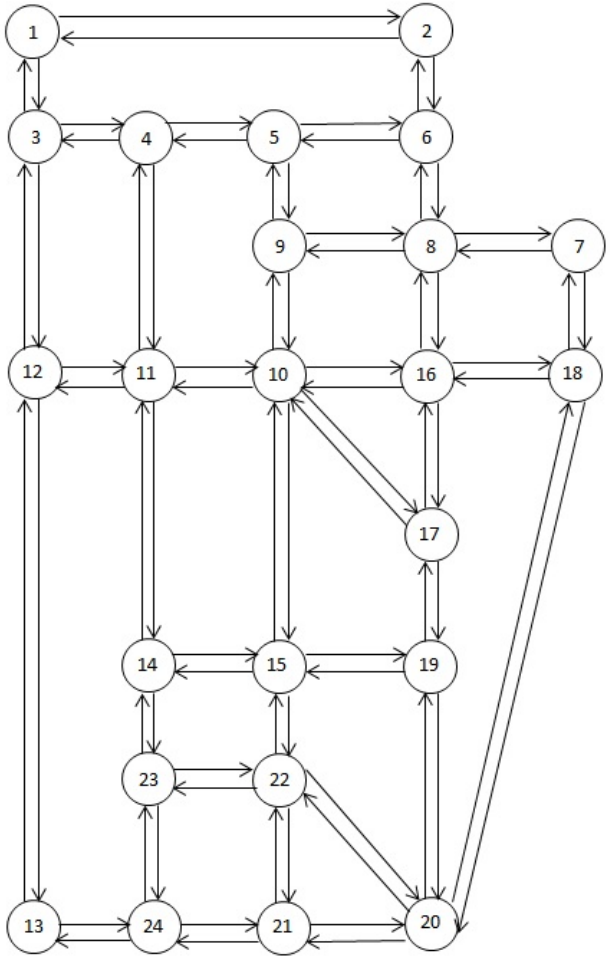
Scenario 4



Analysis

Study Network

- Sioux Falls network
  - ✓ 24 zones
  - ✓ 76 links
  - ✓ Origin Destination Matrix
  - ✓ Travel-time Matrix



Analysis

Customers and Stores Specifications

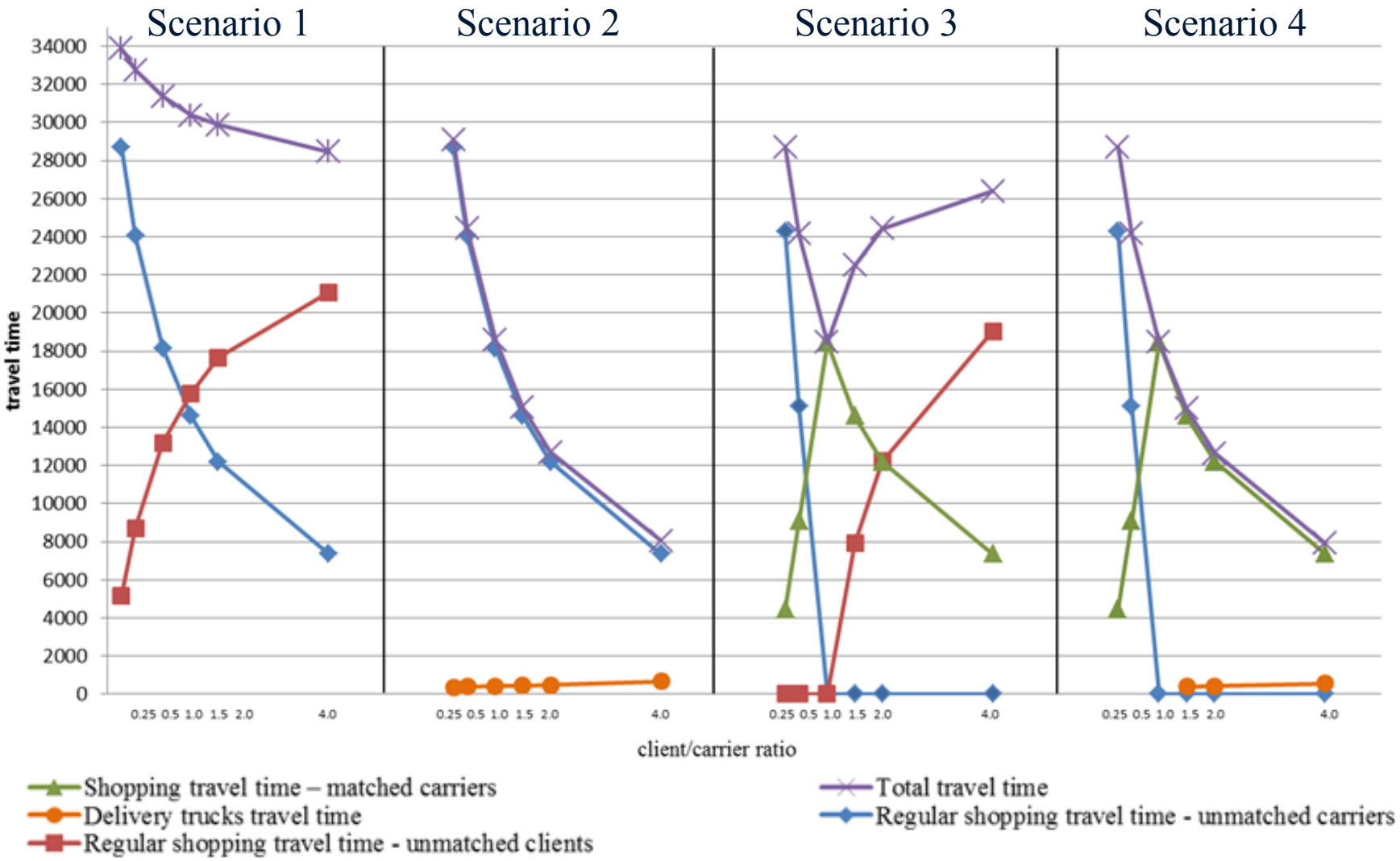
- Customers and stores are scattered randomly in the network zones.

- Scenarios are simulated under six different client/carrier ratios as follows:

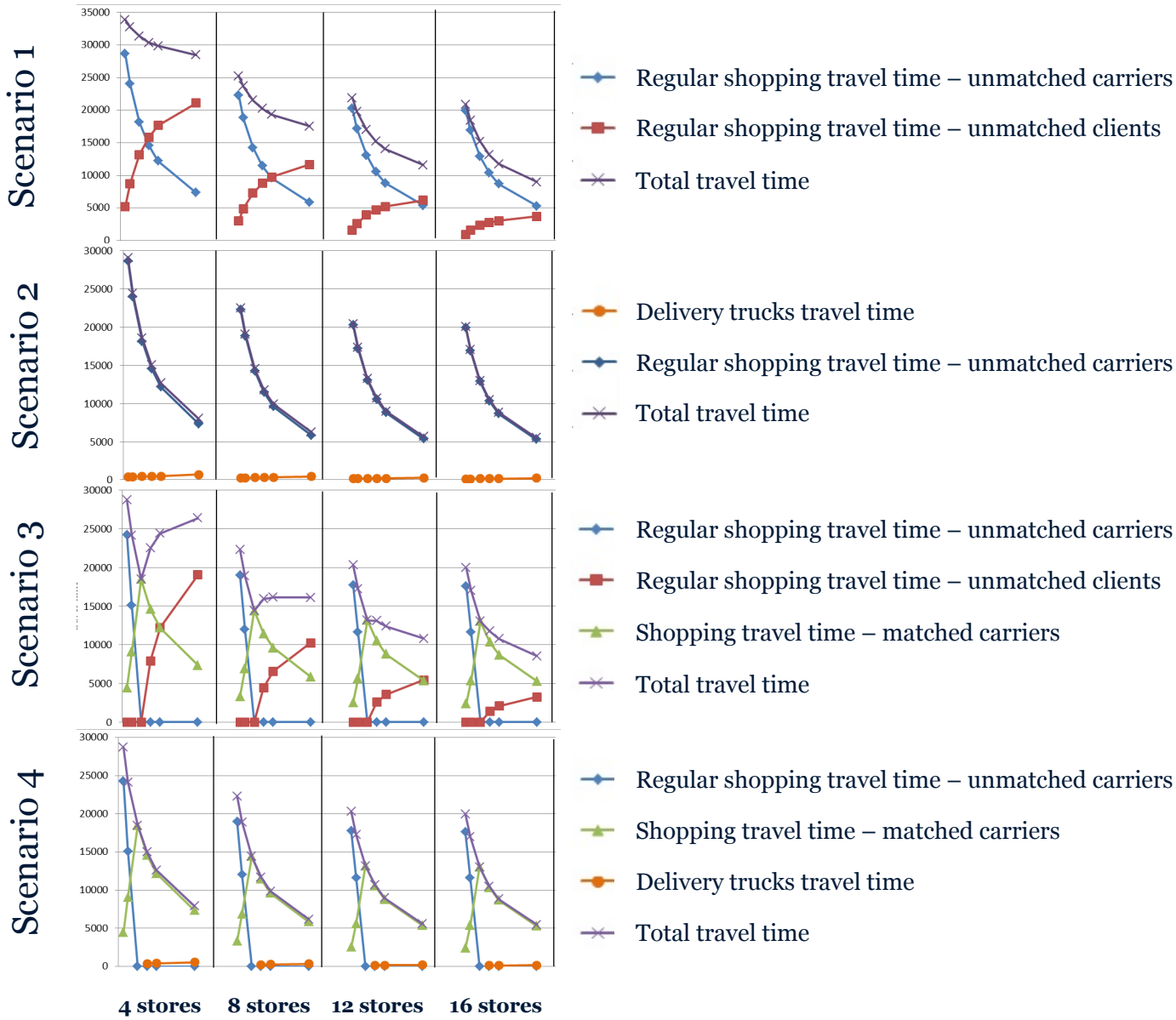
Client/Carrier Ratio	0.25	0.5	1	1.5	2	4

- Scenarios are simulated in network with 4 different total number of stores: 4,8,12 and 16.

Results


Scenario 1
Scenario 2
Scenario 3
Scenario 4
travel time
34000
32000
30000
28000
26000
24000
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
0.25 0.5 1.0 1.5 2.0 4.0
client/carrier ratio
Shopping travel time – matched carriers
Delivery trucks travel time
Regular shopping travel time - unmatched clients
Total travel time
Regular shopping travel time - unmatched carriers

Results


Scenario 1
Scenario 2
Scenario 3
Scenario 4
4 stores
8 stores
12 stores
16 stores
Regular shopping travel time – unmatched carriers
Regular shopping travel time – unmatched clients
Total travel time
Delivery trucks travel time
Shopping travel time – matched carriers

Discussion and Conclusion

- Future research should focus on testing the system with a real network.
- A more detailed cost matrix is recommended for future research.
- Delivery time windows are a logical add-on.
- On the basis of travel time, the matching system seems to be a promising method of grocery delivery.

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