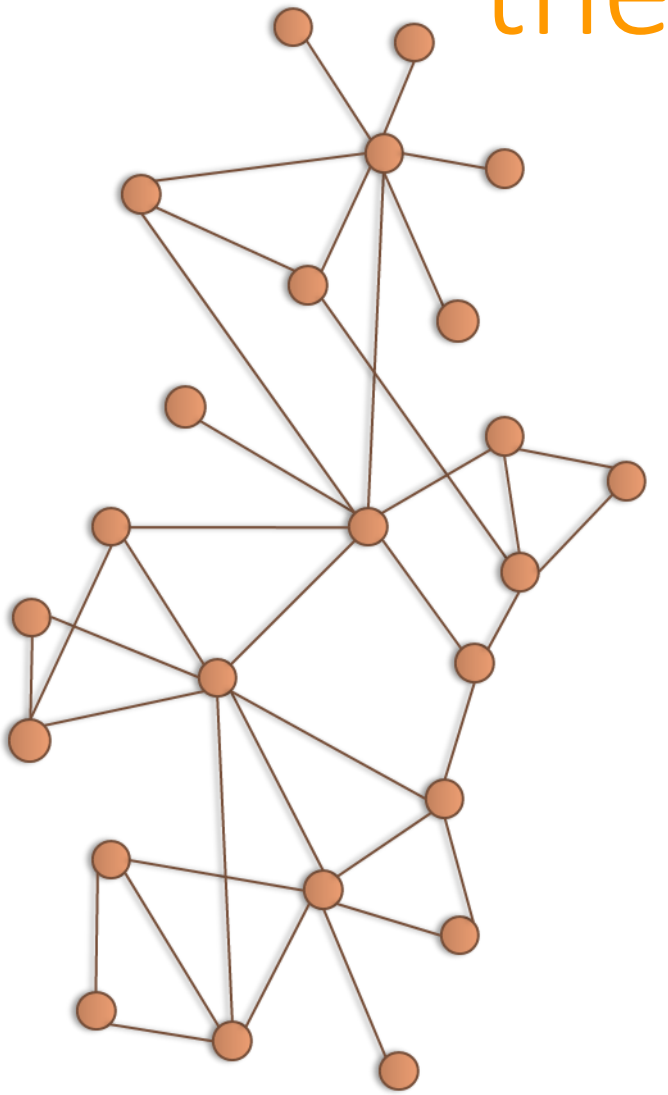
# Modeling Urban Traffic using the Neo4j Graph Database



GGE 4700

Technical Report

Presented by Jacob Wood

*Supervisor*

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THE UNIVERSITY OF NEW BRUNSWICK

2015

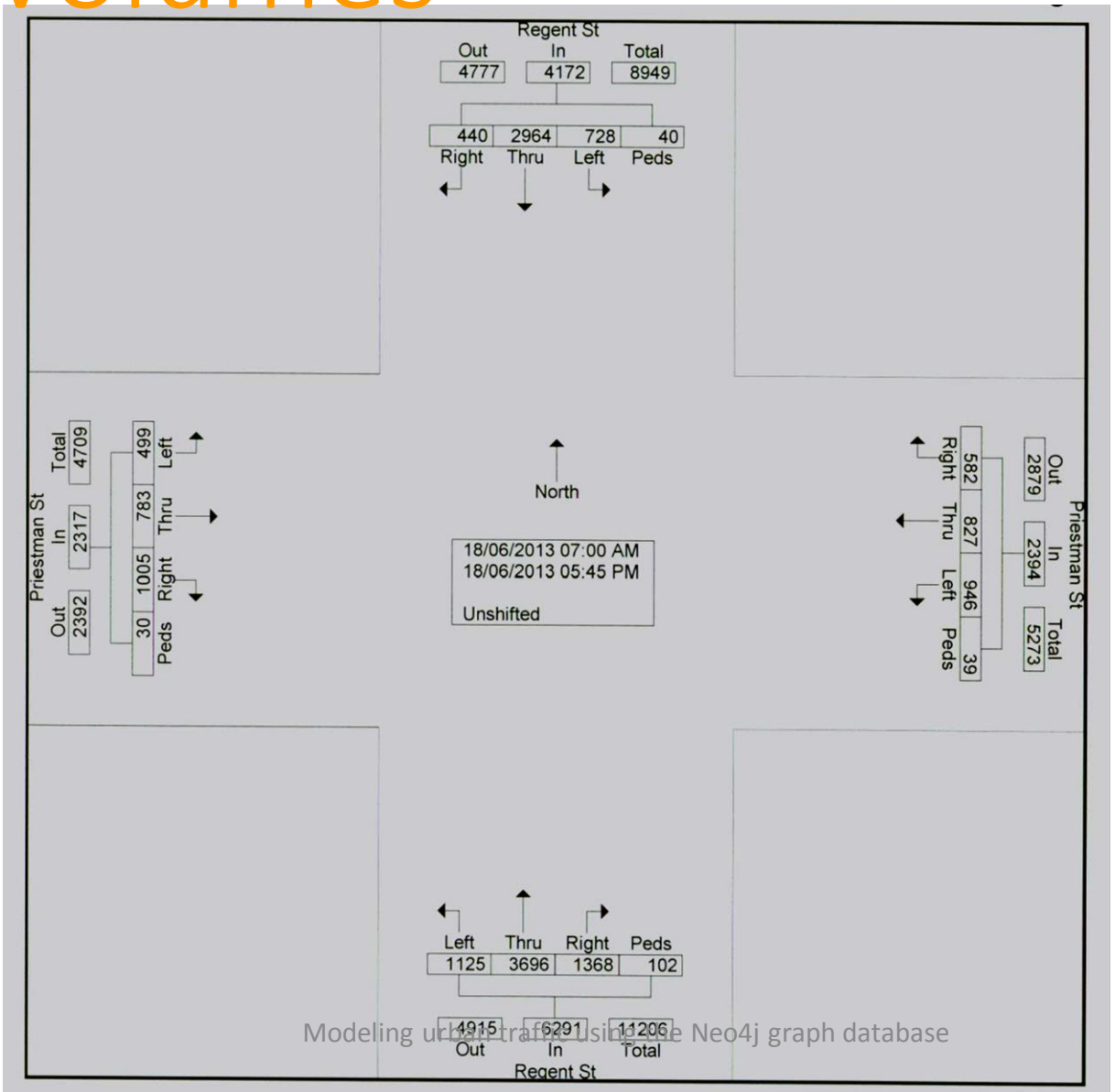
# Motivation

- Volume of traffic: simulation, small samples for collection
- Best way to store and manage the future data
- Most appropriate representation for a specific use

# Research Objectives

- Creating a Network Representation of a section of the road network
- Collect traffic Volumes from various sources at multiple scales
- Determine best graph representation traffic network
- Learning how to store and query traffic data using a new Software (Neo4j database)

# Traffic Volumes Regent St. & Priestman St. Intersection



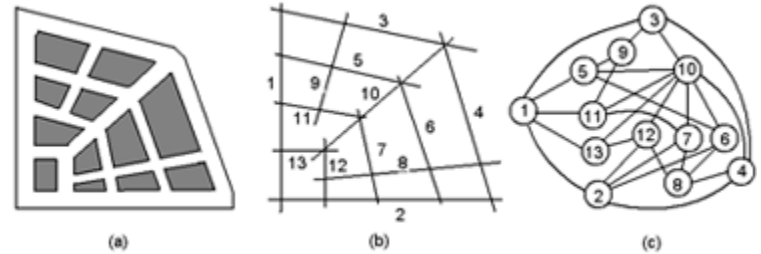
# Dual vs. Primal

Dual:

- Focus on the flow of traffic
- Mathematically driven
- Streets as nodes
- Intersections as the relationship

Primal:

- Resembles a map
- Intersections as nodes
- Streets as the relationship




Porta(2015)

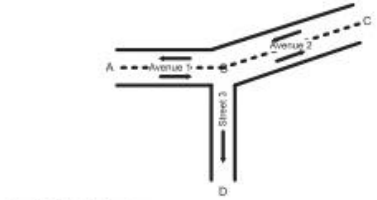



Fig. 2. Road network.

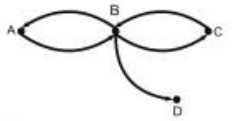



Fig. 3. Primal graph.

Wingz Technologies (2015)

# Methodology
# Neo4j

- Importing data
- Creating nodes and links
- Adding attributes
- Querying the data
- Comparing scale

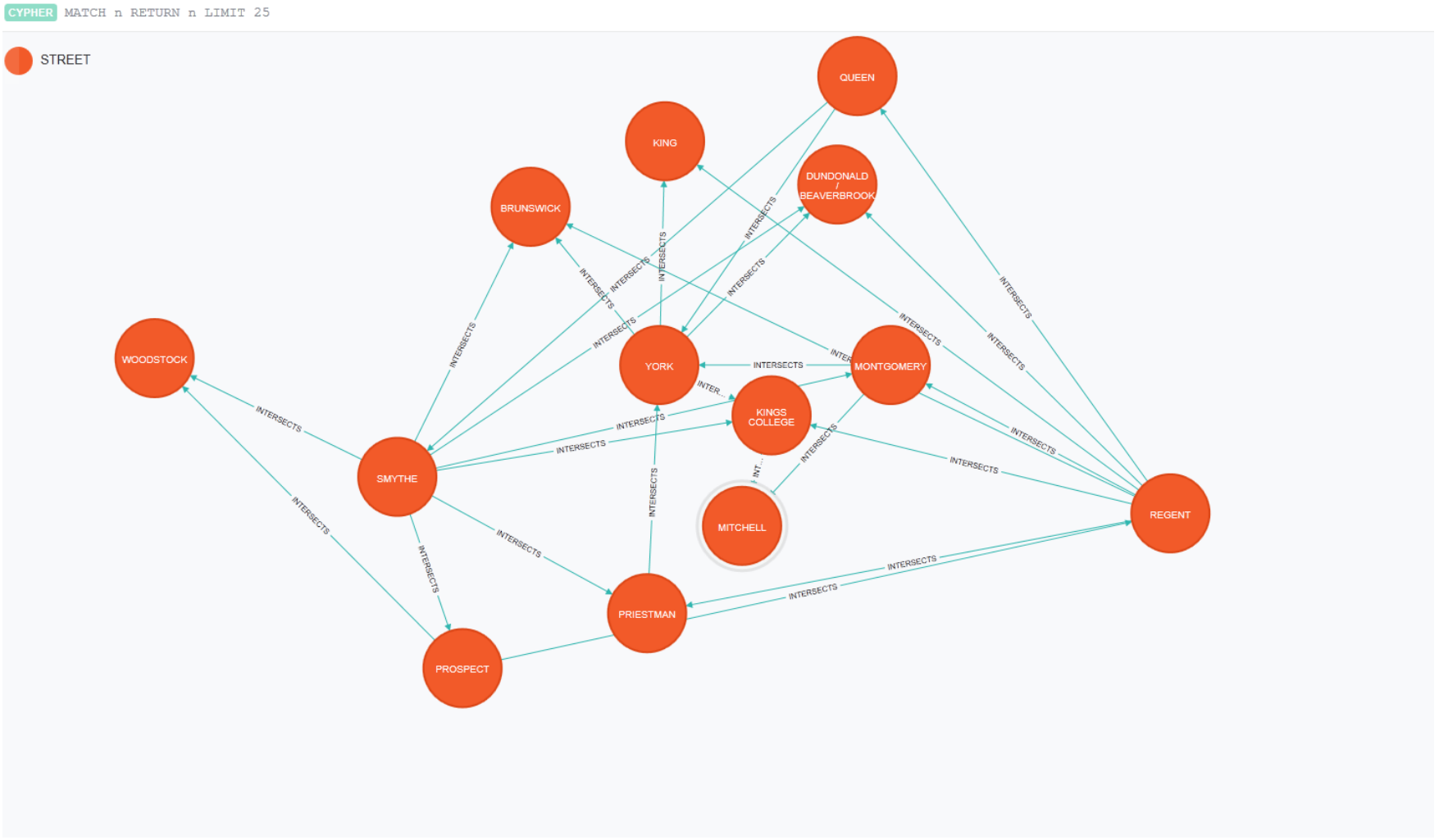
# Network Representation

Streets:

- SMYTHE
- REGENT
- PROSEPECT
- PRIESTMAN
- MONTGOMERY
- YORK
- KINGS COLLEGE
- MITCHELL
- DUNDONALD / BEAVERBROOK
- HANWELL
- BRUNSWICK
- WOODSTOCK
- KING
- QUEEN

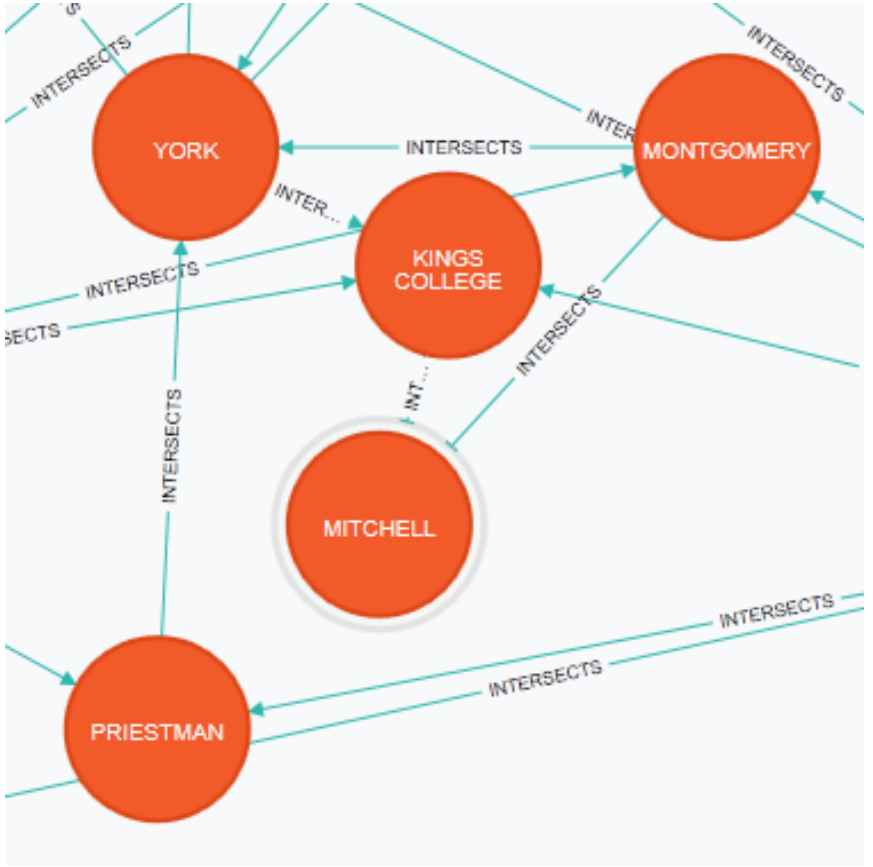
# Dual Representation

(1/4)



# Dual Representation

(2/4)



# Relationship

(3/4)

| | a | b |
|---|---|---|
| Name | Smythe | Priestman |
| Type | Local | Local |
| Length | 3.15 km | 1.64 km |
| AADT | 16400 | 11400 |

# Relationship (4/4)

| Relationship (Intersects) | |
|---|---|
| a | b |
| {"name":"SMYTHE","TYPE":"LOCAL","LENGTH":"3.15 KM","AADT":"16400"} | {"name":"WOODSTOCK","TYPE":"COLLECTOR","LENGTH":"4.94 KM","AADT":"12200"} |
| {"name":"SMYTHE","TYPE":"LOCAL","LENGTH":"3.15 KM","AADT":"16400"} | {"name":"PRIESTMAN","TYPE":"LOCAL","LENGTH":"1.64 KM","AADT":"11400"} |
| {"name":"SMYTHE","TYPE":"LOCAL","LENGTH":"3.15 KM","AADT":"16400"} | {"name":"MONTGOMERY","TYPE":"LOCAL","LENGTH":"1.65 KM","AADT":"5000"} |

## Relationship type

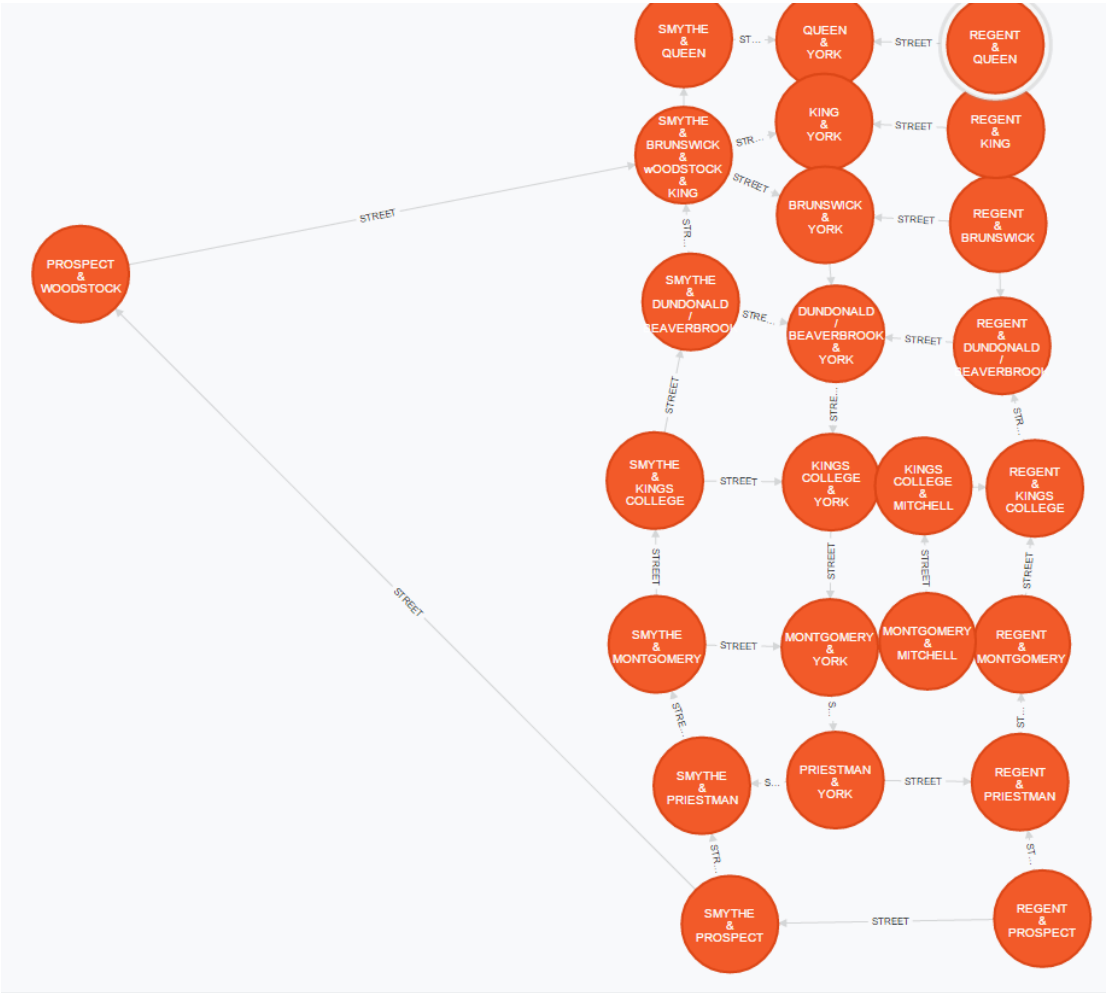
- Intersects

## Properties

- Street type
- Street length
- Average Annual Daily Traffic (AADT)

# Primal Representation

(1/2)



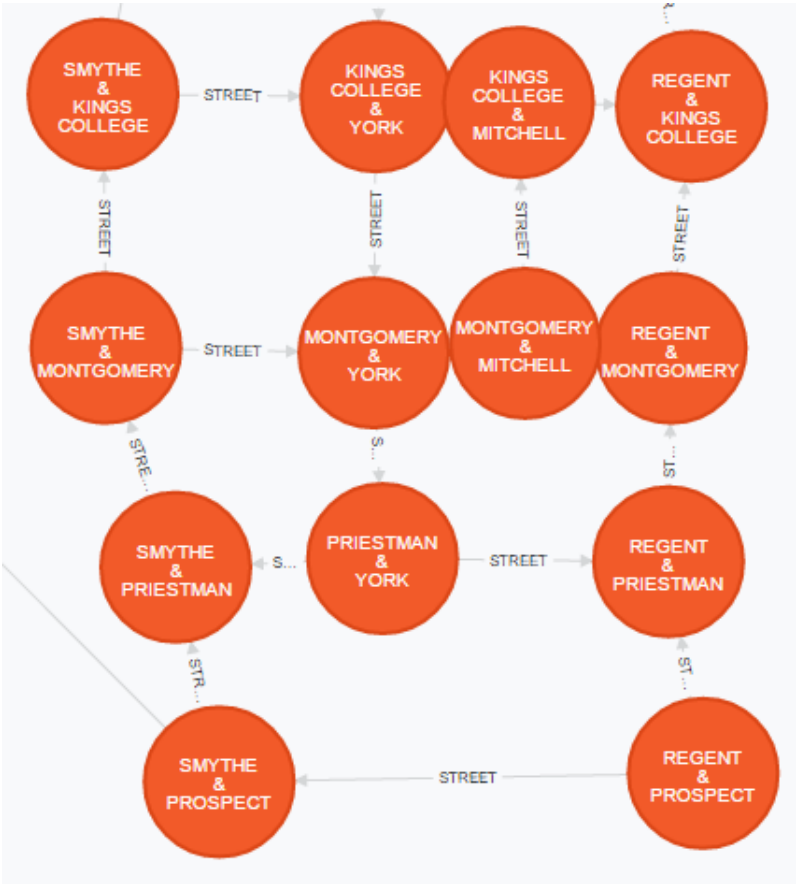

hips

# Primal

(2/2)

Properties

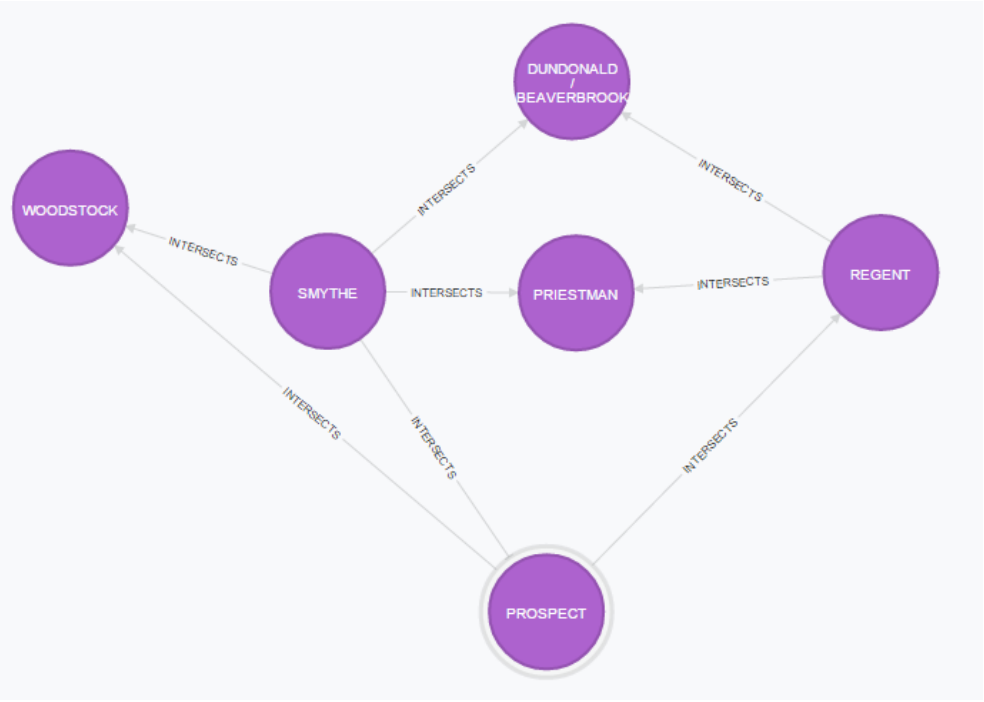
- Name
- Northing & Easting
- AADT Northbound
- AADT Eastbound
- AADT Southbound
- AADT Westbound



# Query 1
## AADT Information

**Dual**

- AADT Volumes > 10000




**Primal**

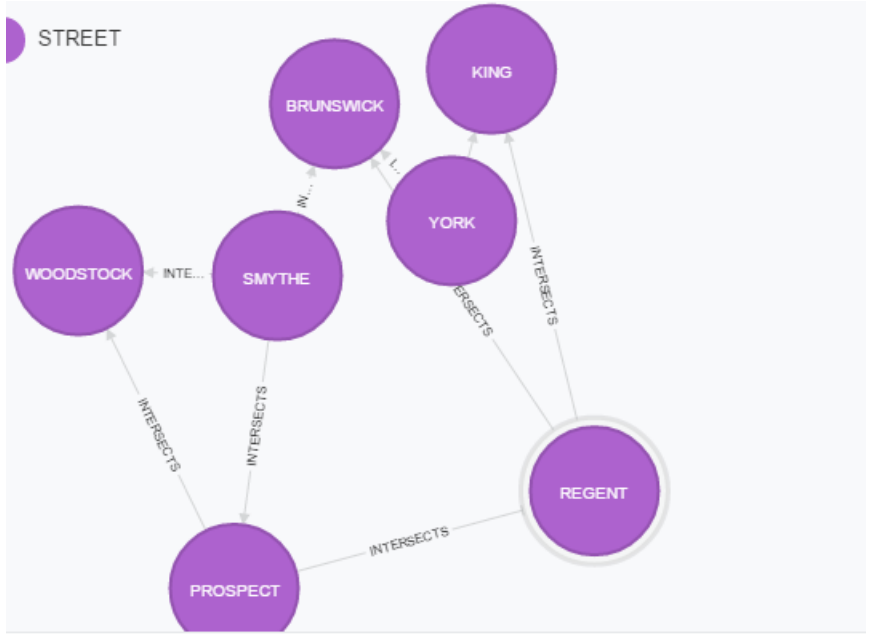
- AADT Northbound > 5000



# Query 2
## Miscellaneous

**Dual**

Street Length > 2500 m




Displaying 7 nodes, 9 relationships

**Primal**

Sum of AADT Southbound per Day

Result:

90398 (Vehicles Southbound Each day)

# Conclusions

- Promising application of graph databases for traffic data integration
- Importance
- Complexity
- Dual vs. Primal

# Future Work

- More dense network
- Import real-time data for observation
- Provide service to City Centers

# Acknowledgements

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Fredericton