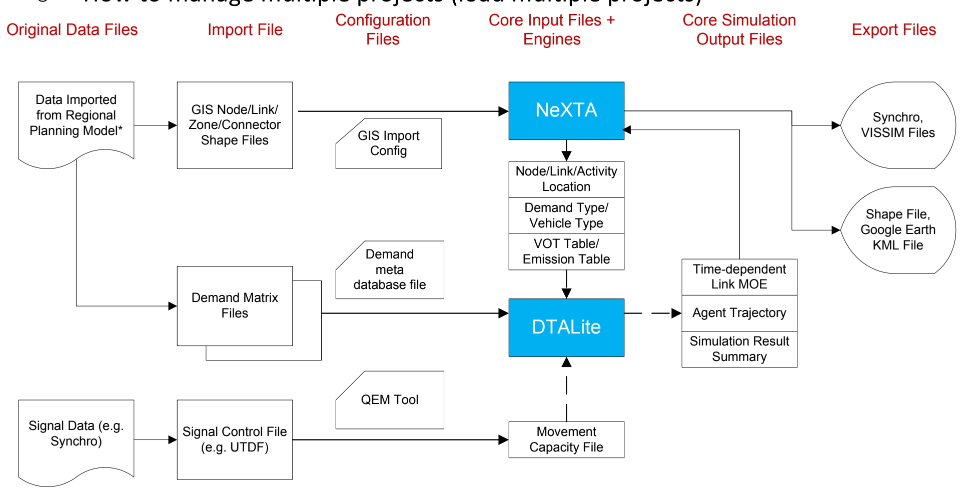
If you encounter a message showing "mfc120.dll is missing from computer:, please download Visual C++ redistribution package for 2013http://www.microsoft.com/en-us/download/details.aspx?id=40784 as this package is required for our OpenMP-based parallel computing.

Module 1: Introduction to NEXTA/DTALite: (10AM-10:30 AM)

- Two software applications: NEXTA as GUI and data hub; DTALite as DTA simulation engine
- 32_bit vs. 64_bit: 32_bit for GIS shape file importing and legacy support; 64_bit for large network: (e.g. NCSU network, 1M vehicles, 5-10 AM, 4 CPU cores, 9GB RAM, 1 hour CPU time for 20 iterations)
- Data files are in CSV format: with geometric fields (for importing from and exporting to GIS, Google Fusion Tables)
- Project folder: *.tnp file as a reference for other data files:
    - One network per project folder
    - Prefix of input, output files
    - How to manage multiple projects (load multiple projects)



File structure:

- Different layers: different files: node, link, zone, activity locations
- Many model attribute files: node control type, link type, demand type and vehicle type
- Time representation: 24 hour (for demand and sensor data), day number= iteration number, work zone has day attributes (for modelling day-to-day learning)
- Demand meta database file: “Dynamic demand data manager”, read multiple demand files, in different format: column, matrix, agent file, DYNASMART file,   different demand loading periods, additional departure time profile
- Scenario setting file: traffic flow model, traffic assignment model, scenario number for multiple scenario runs
- Scenario files for advanced modelling features: work zone, incident, tolling, VMS files
- Sensor data file: for model validation and calibration, different time period
- Output files: simulation summary, network MOE, link MOE, trajectory file

Subfolders under internal release folder

- Documentation (for data structure, users guide, QEM tool)
- Default data folder (default data attribute files)
- Sample data sets (real-world test networks)
- Importing sample data sets (GIS files, Excel, Synchro)
- Test data sets (simple networks for testing traffic flow models and other key modelling features)

Internet Resources:

   a. Google Code (for hosting source code, latest release, bug reporting) : https://code.google.com/p/nexta/
- Training website (for learning material and user forum)
   a. https://sites.google.com/site/nextadtalitetraining/
- www.learning-transportation.org (for hosting general learning material about network modelling)

Module 2: Working through visualization features in NEXTA (West Jordan Network) (10:30AM-11AM)

1. Basic GUI features
   a. Turn on and off GIS layers; Move around, select node and links; Toolbars for editing networks
   b. Open project folder (CSV file format)
2. View/Edit data files in NEXTA's "project" menu
   a. Node/link/zone/activity location
   b. Demand meta database
   c. Scenario files
3. Integration with assignment model
   a. Traffic flow model; Assignment method
4. Advanced visualization functions of NEXTA
   a. 24-hour Time control/Clock bar
   b. Volume (bandwidth), density, speed
   c. Animation and queue: (turn off node layer and bandwidth)
5. Sensor-related display
   a. Turn on sensor layer to see sensor data/locations
   b. Activate sensor data table through right click
   c. Validation Plot; and zoom to the link
6. Path-related display
   a. Manually select a path: travel time over the time
   b. Import path file
      i. Simulated vs. observed travel time series
      ii. Contours of density, speed and V/C
   c. Export path summary file to Excel file to do a column chart
7. Vehicle and Summary Charts
   a. Examining route choice decisions
   b. X axis and Y axis: 1 hour and average travel time
   c. Export all summary statistics to Excel
8. Data exporting to Google Earth /GIS package
   a. 2D KML, 3D KML, GIS shape files
   b. Google Earth visualization
   c. Zone level display*: adjust height/color*

Module 2.2: Importing network and demand data from a regional planning model (11:30AM-12:00PM)

Learning Goals:

1. *Understand how to export GIS shapefiles from CUBE*
2. *Understand how to prepare importing configuration*

Step 1: Open and prepare VISUM network, export GIS shape files

- Open the provided Maryland Statewide model network files in Cube
- Change network to WGS 84 coordinate system (Menu > Network > Network parameters, under Spatial reference system)
- Check the available data: link types, links, nodes, zones, matrices...
- Export GIS shape files through Menu > File > Export > Shapefile
  - Give the base file name (i.e. 35S_shapefile) and export nodes, links, zones, zone centroids and connectors
  - The corresponding files will be written to the destination folder
- Export demand matrix through ______

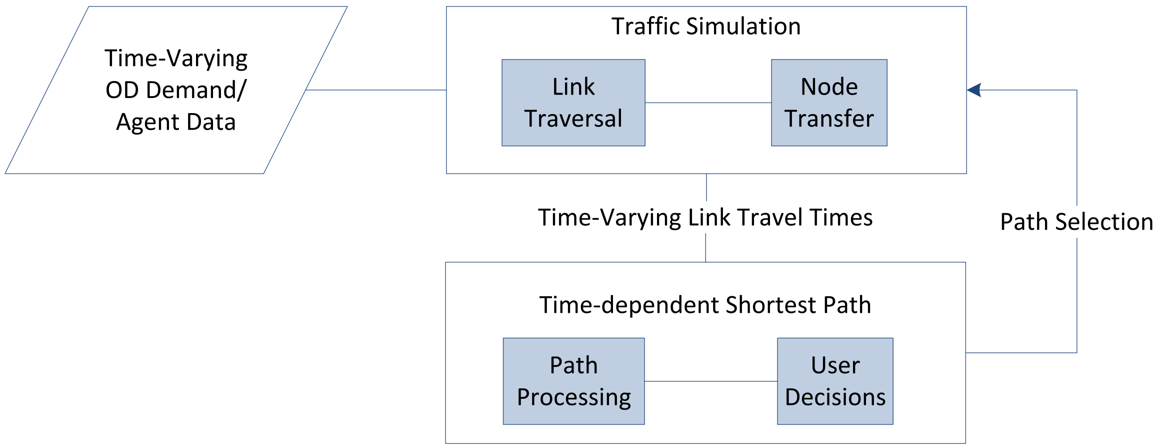
Step 2: Prepare the necessary CSV files

- Copy import_GIS_settings, input_demand, input_demand_meta_data, input_link_type and input_node_control_type CSV files from any sample data set to the destination folder
- Prepare the import_GIS_settings file for the exported network for node, link, zone, centroid and connector shapefiles, as well as default settings
  - Hint: use any GIS software (such as Q GIS) to read the key values for each layer
- Prepare input_link_type and input_node_control_type files
  - Hint: use List link types and List nodes in VISUM to read corresponding values
- Set input_demand_meta_data to read the corresponding demand matrix, or copy the demand matrix into the input_demand CSV file

Step 3: Import the network into NeXTA

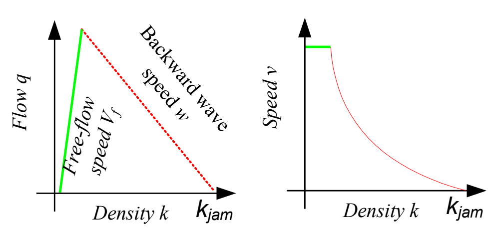
- Menu > File > Import > GIS Planning Data Set
- Save the network as a *.tnp file
- Check imported network (coordinate system, link, node, demand...)
- Run simulation and perform analysis

Module 3: Introduction to DTA modelling principles (20 min)

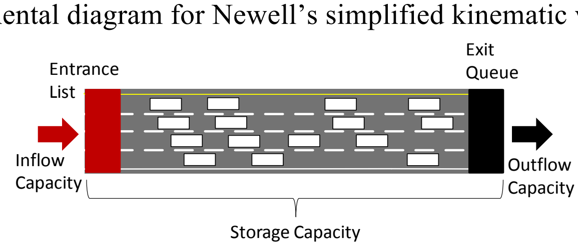


Typical Simulation-based Dynamic Traffic Assignment Modelling Framework

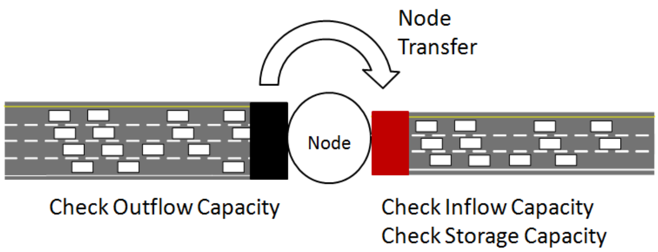
	Key modelling component	Notes
D	Dynamic demand, dynamic capacity	
T	Traffic flow models, link model, node model, bottlenecks (lane drop, merge and diverge, signalized intersections)	
A	Equilibrium assignment and gap functions, Day-to-day learning; agent-based routing	
Lite	Light-weight modelling features: 1. Computational efficiency (parallel computing for both traffic flow model and agent-based routing) 2. Signal representation (link-based, and movement-based effective green time) 3. Traffic flow model on freeway	



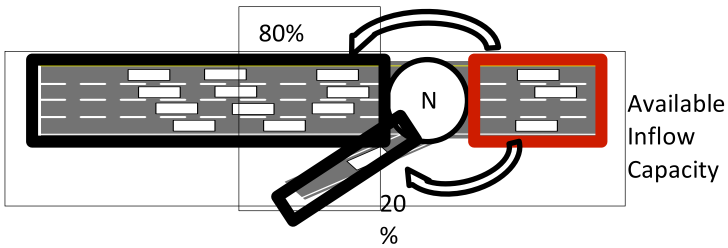
Fundamental diagram for Newell's simplified kinematic wave model



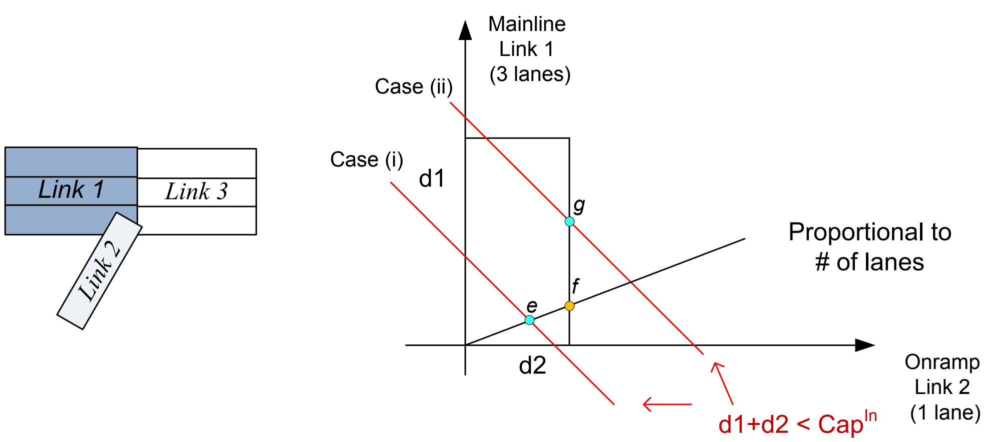
Link traversal step: outflow, inflow, and storage capacity constraints



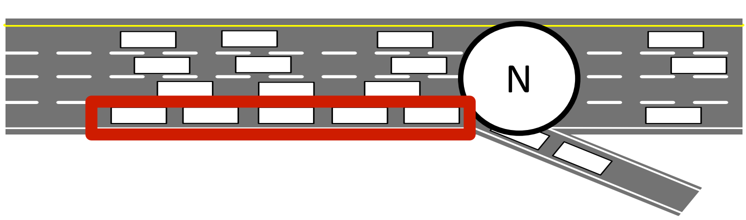
Node transfer: Move vehicles between links, subject to capacity constraints



Inflow capacity allocation in DTALite using lane-based proportional model



Detailed capacity allocation at merge nodes

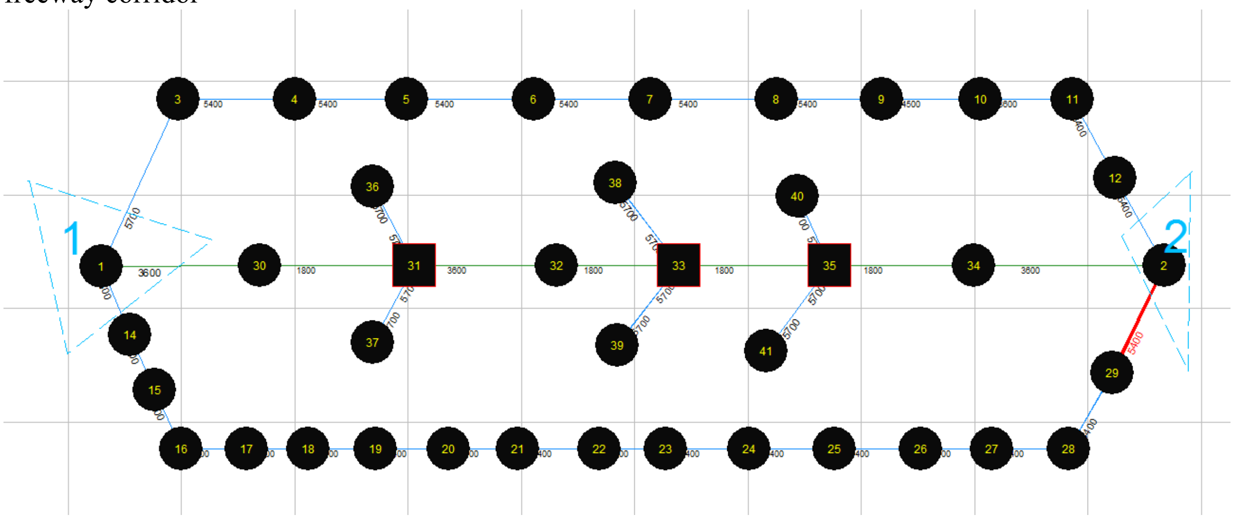


Diverge nodes: Inflow constraint relaxation to handle first-in-first-out (FIFO) at off-ramp bottlenecks

Module 4: Hands-on with 3-Corridor Network:

Learning objectives:
I: how to identify bottlenecks and model congestion propagation?
II: how to quantify dynamic traffic equilibrium? Gap functions, and how many iterations to achieve traffic equilibrium; different route choice behaviour at different travel times
III: how to evaluate road tolling scenarios?

1. Introduction: 2 hours of demand, bottlenecks with capacity of 3600 vehicles per link per hour on first freeway corridor

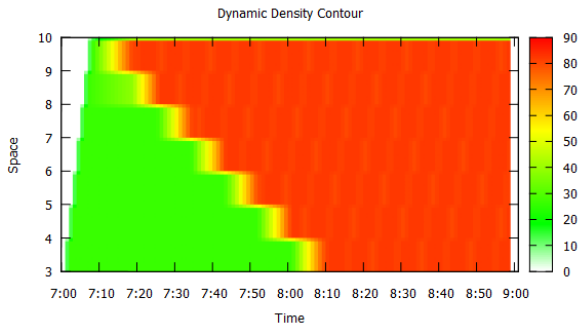


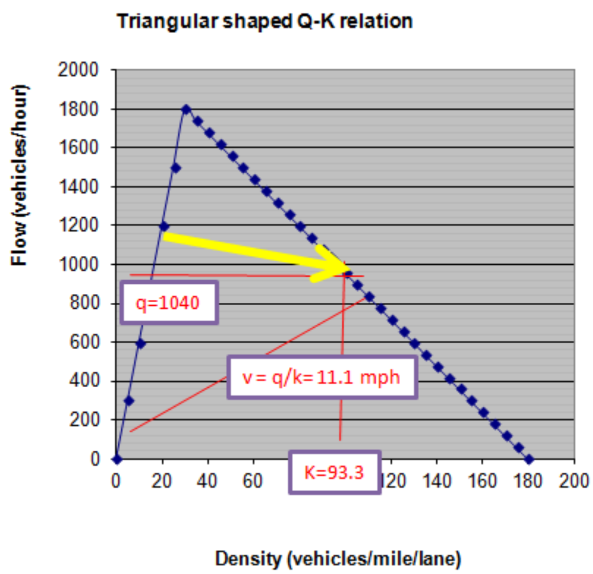
2. Demand = bottleneck capacity: demand multiplier = 1, 1 iteration
Density increase on bottleneck; Speed = free flow speed; V/C =1 on bottleneck

3. Demand multiplier = 1.2: hourly demand = 3600*1.2 = 4320
   a. slightly higher than capacity of 3600 (on downstream bottleneck)
   b. slightly lower than capacity of 4500 (on upstream bottleneck)
   c. bottleneck on upstream bottleneck; speed = free-flow speed on downstream bottleneck; V/C = 1 on downstream bottleneck

4. Demand multiplier = 1.3: hourly demand = 3600*1.3 = 4680
   a. 4680 > 4500 > 3600 (on two bottlenecks)
   b. Severe queue spillback on the loading link
   c. Queue spillback speed

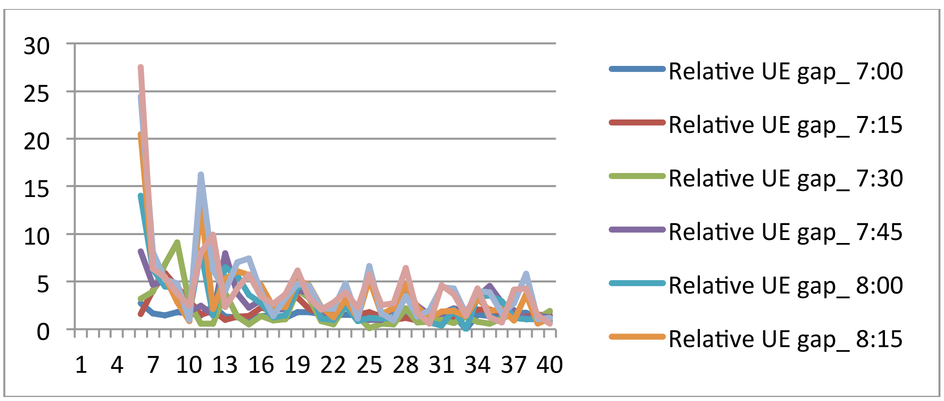
Link speed = 11.4, link density = 93.3
Shockwave speed = 6.73 mph,
Propagation time per mile = 8.9 min;
Propagation time for 6 miles (from node 3 to node 9) = 8.9*6= 53.4 min
Observation: 8:05 AM – 7:15 AM = 50 min;
Link speed = 13 mph: density close to 90 vehicles per mile per lane





5. 20 iterations; demand level = 1.3
User equilibrium; Relative gap function; After 5 iterations

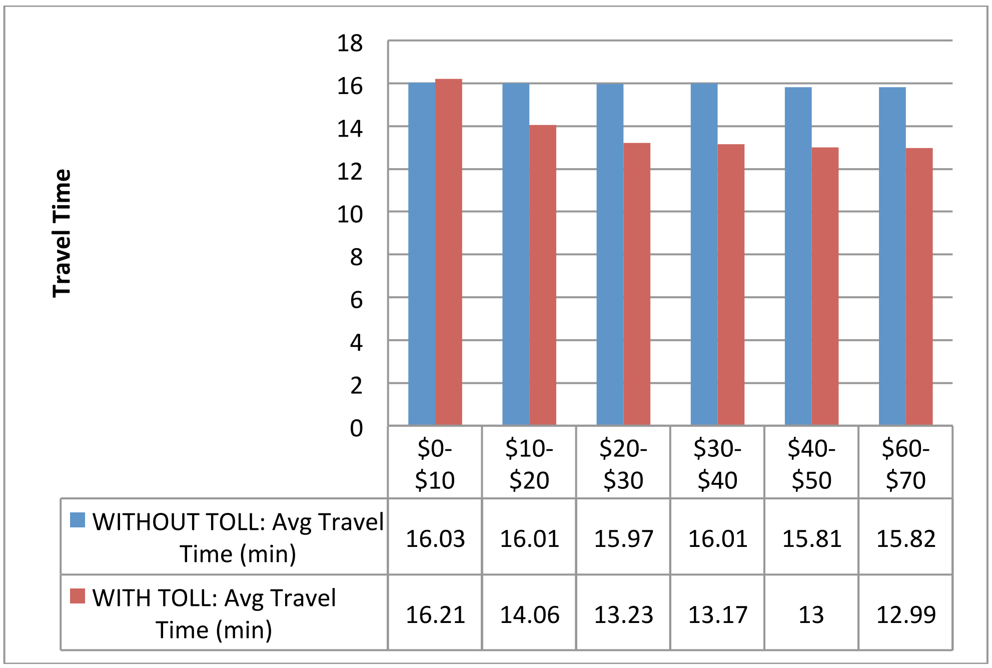
6. 40 iterations; demand level = 1.3
Check 15-min gap function



7. 40 iterations: demand level = 1.5
   Three paths are used; including the third path with FFTT = 17 min
   After 8AM, third path is used.
   Average travel time on three paths through vehicle path analysis
8. Add $0.50 toll on link 3->4
   VOT = $10 per hour, additional equivalent travel time = $0.5/$10* 60 min /hour= 3 min
   VOT = $20 per hour, additional equivalent travel time = $0.5/$20* 60 min /hour= 1.5 min
   VOT = $30 per hour, additional equivalent travel time = $0.5/$30* 60 min /hour= 1 min

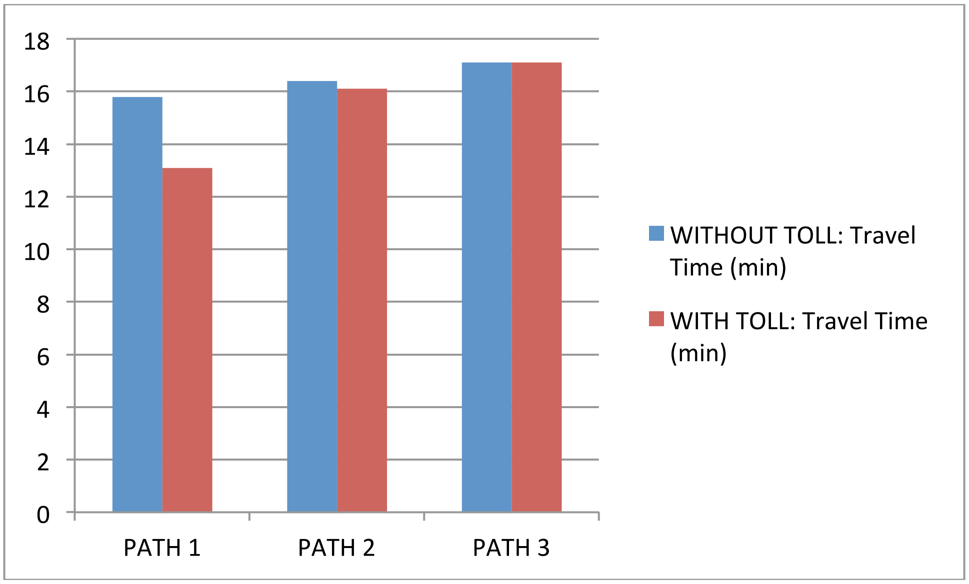
Check VOT distribution and travel time through Summary Chart

Category	WITHOUT TOLL: Avg Travel Time (min)	WITH TOLL: Avg Travel Time (min)	Avg Toll Cost ($)
$0-$10	16.03	16.21	0
$10-$20	16.01	14.06	0.34
$20-$30	15.97	13.23	0.48
$30-$40	16.01	13.17	0.48
$40-$50	15.81	13	0.5
$60-$70	15.82	12.99	0.5



Check where the low-income travelers are diverted to, through vehicle path dialog

Path No	Count	Percentage	Travel Time (min)	Distance (mile)	Speed (mph)	Toll Cost($)
1	7294	67.5	15.8	11	41.8	0
2	3211	29.7	16.4	8	29.3	0
3	295	2.7	17.1	17	59.8	0
Path No	Count	Percentage	Travel Time (min)	Distance (mile)	Speed (mph)	Toll Cost($)
1	7203	66.7	13.1	11	50.5	0.5
2	3297	30.5	16.1	8	29.8	0
3	300	2.8	17.1	17	59.8	0



9. Add HOV toll by modifying input_demand_meta_data.csv

Total toll revenue: 3601 (regular toll) vs. 3327 (HOV toll)