

# Paramics Software Presentation

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# Transportation Research

- **Increased demand** has created major **problems** (e.g. congestion, delays, etc.) in traffic operations
- To **mitigate** these **problems** further research in the transportation area is needed
- **Various software platforms** can be used as significant tools in carrying out this research

# Analysis Level

## Major Categories

### Traffic Simulation:

Modeling of individual vehicles movements in a micro level to assess the traffic performance of highway and street systems, transit and pedestrians.



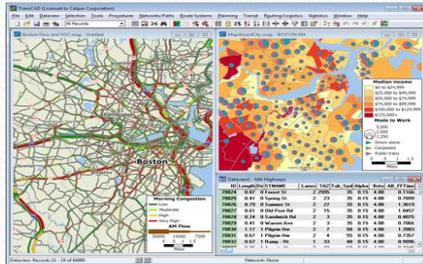
### Planning & Demand Forecasting:

Application of forecasting models to develop a long range transportation plan. These models calculate the number of trips, connect origins with destinations, predict the travel mode and identify the routes to complete the trips.

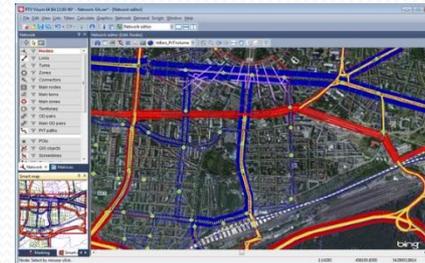


# Major Planning Software

TransCAD

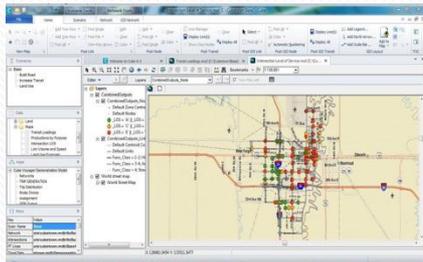


Visum

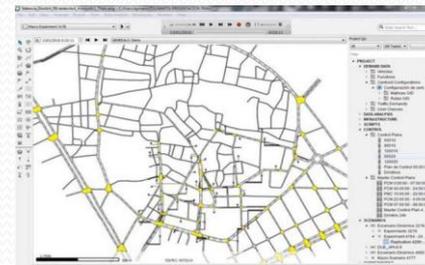


Planning-  
Demand  
Modeling

CUBE



Aimsun



# Major Simulation Software

Vissim



Paramics



Micro-  
simulation

SimTraffic



Aimsun



# Paramics

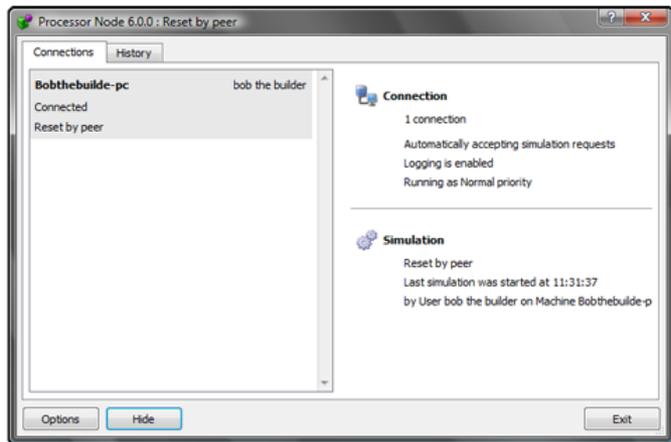
- Developed by Quadstone Paramics
- Introduced in 1990s by the UK Department for Transport
- Simulate individual vehicle at the **micro level**
- Simulate the impact of **future travel pattern**

# Paramics Suite

- **Modeler**
  - **Processor**
  - **Analyser**
  - Processor Node
  - Converter
  - Designer
  - Estimator
- *Most widely used tools*

# Processor Node

- Paramics provides a **network tool** for running simulations without any graphical interface



- Processor Node:
  - manages the connection to the network
  - checks for connection availability
  - executes the network simulation

# Converter

- “**Convert**” networks from other sources
- Input file data can include:
  - GIS shapefiles
  - SYNCHRO networks
  - CSV files
  - CORSIM Networks
  - EMME/2 Networks
  - Cube Networks

# Designer

- Model conversion and editing tool (3D management)
- It allows user to:
  - Convert different 3D model files to PMX files (PMX. is the major 3D model file format used by Paramics)
  - Import existing 3D models
  - Easily edit 3D models



Source: google.com

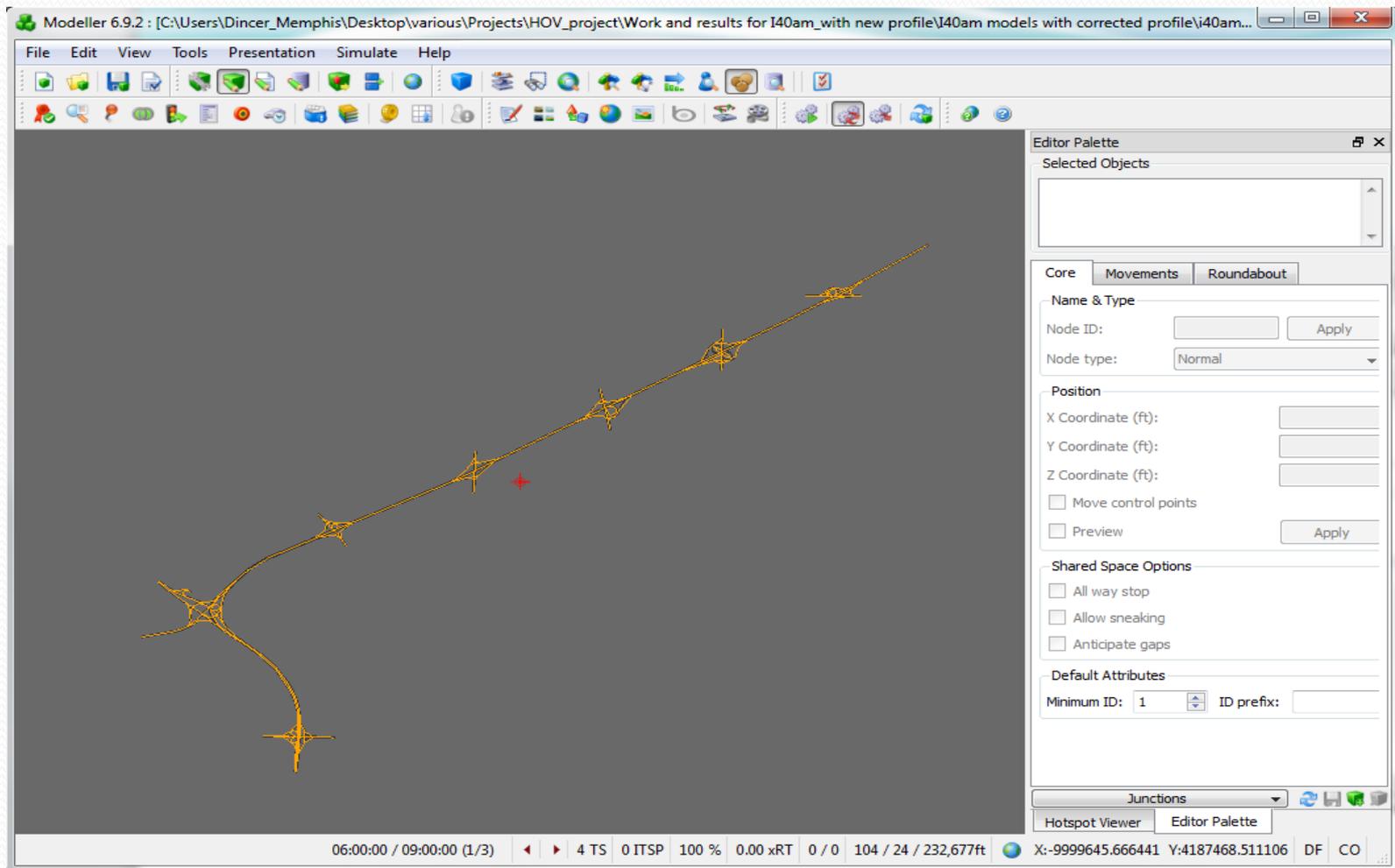
# Estimator

- Additional tool for **OD matrix estimation**
- “Reverse” OD matrix estimation
- OD matrices estimation from count data (link, intersections)

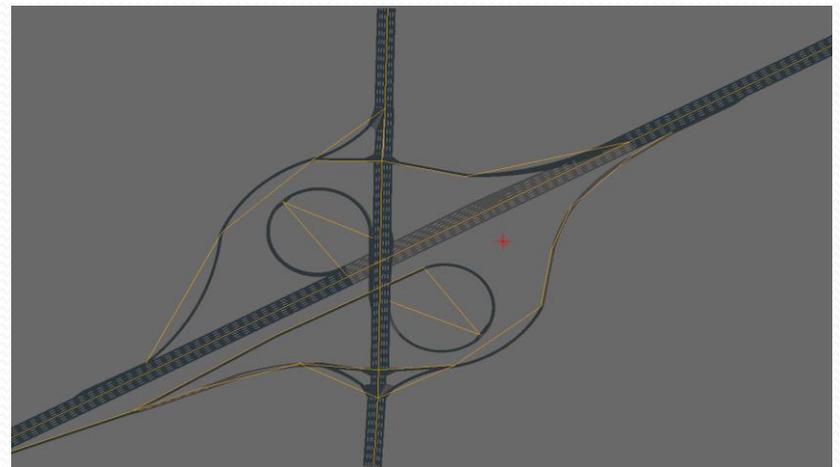
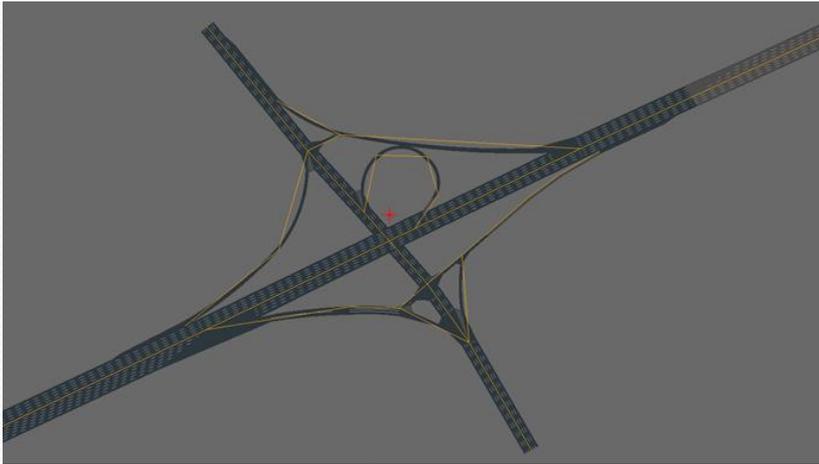
# Modeler

- Main tool
- It provides 4 fundamental operations:
  - **Building the network** (geometry, link speeds, junctions rules and priorities, traffic signals)
  - **Editing demand** (zones, OD matrix, demand profile)
  - **Simulating traffic** (with 3D visualization)
  - **Estimating MOEs** using detectors

# I-40 in Paramics Modeler



# I-40 Closer View



# Processor

- Tool for **running simulations** without any graphical interface (see Processor Node)
- Processor allows user to:
  - Specify parameters of the simulation runs (start time, duration, vehicle types considered, statistics collection duration)
  - Determine number of simulations
  - Determine seed generation

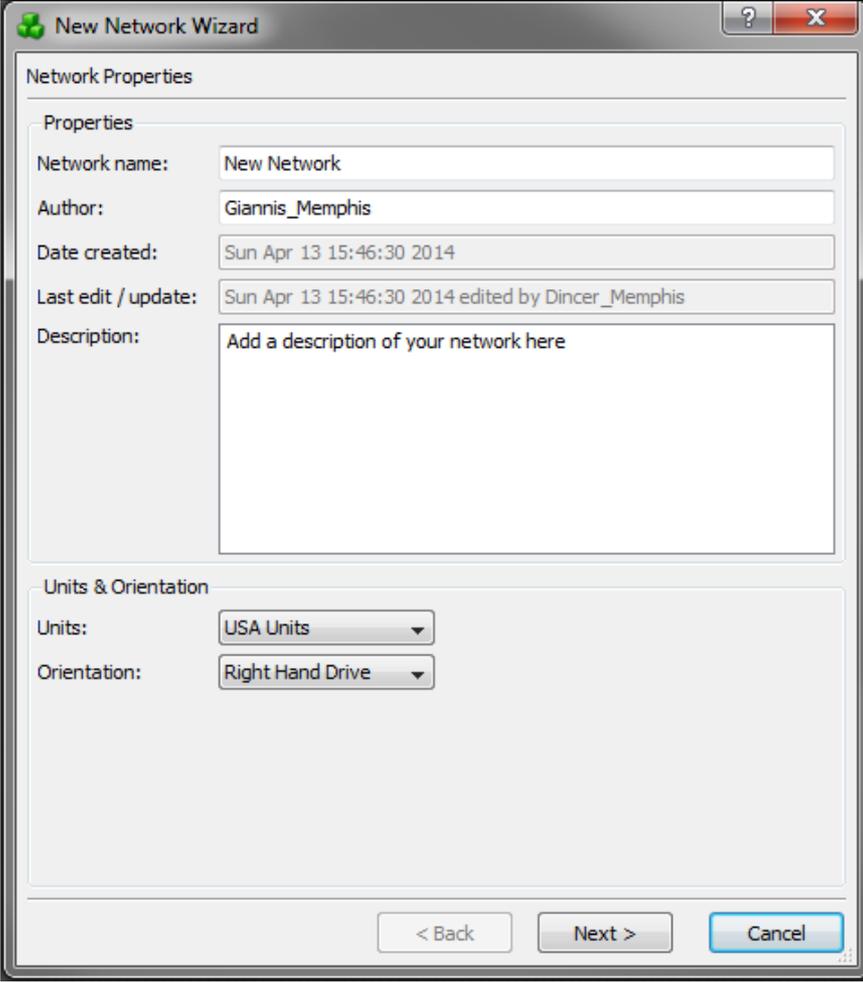
# Analyser

- Determines **statistics** to be gathered during simulation
- You can have:
  - Outcomes per vehicle type
  - Results for specific road segments (use detectors)
  - Results for specific routes
  - Outputs include:
    - Speed, flow, volume, delay, LOS, queue length, trip time, etc.

# Developing a Model in Modeller

- Step 1: New network wizard..
- Step 2: Create the network geometry
- Step 3: Fix traffic signals if needed
- Step 4: Identify the zones of the case study area
- Step 5: Develop vehicle templates and load OD matrix with travel demand
- Step 6: Run the simulation..

# New Network Wizard



The image shows a screenshot of a software dialog box titled "New Network Wizard". The dialog is divided into two main sections: "Network Properties" and "Units & Orientation".

**Network Properties**

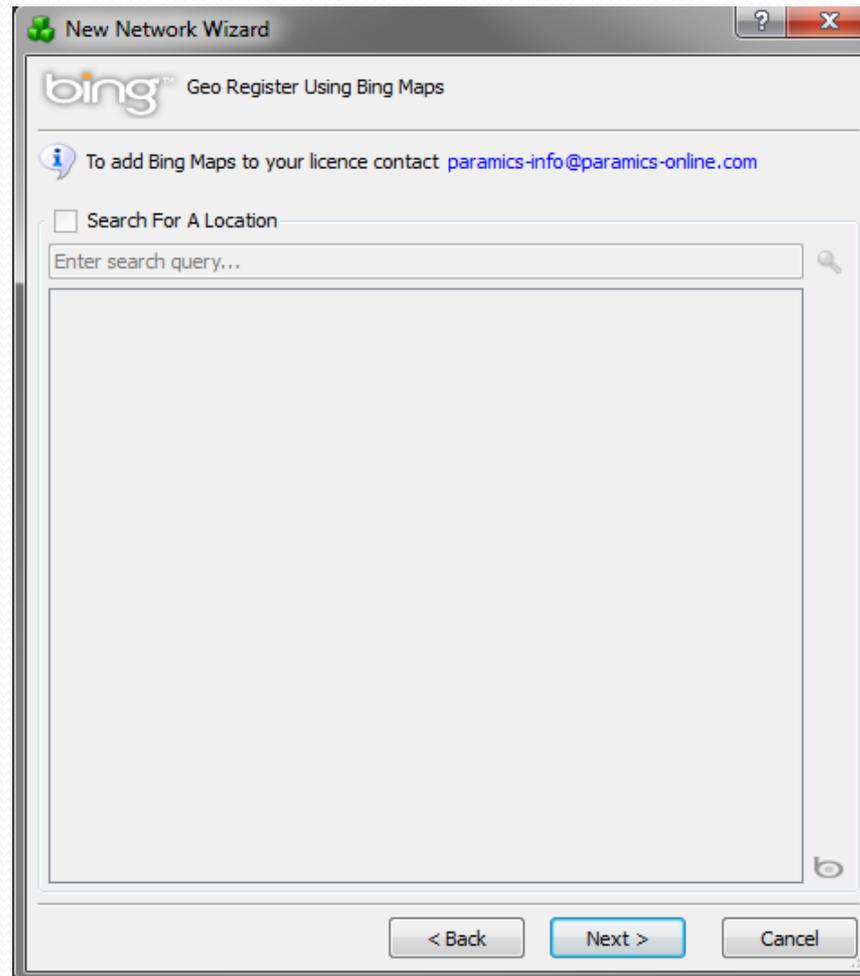
- Network name:** New Network
- Author:** Giannis\_Memphis
- Date created:** Sun Apr 13 15:46:30 2014
- Last edit / update:** Sun Apr 13 15:46:30 2014 edited by Dincer\_Memphis
- Description:** Add a description of your network here

**Units & Orientation**

- Units:** USA Units
- Orientation:** Right Hand Drive

At the bottom of the dialog, there are three buttons: "< Back", "Next >", and "Cancel".

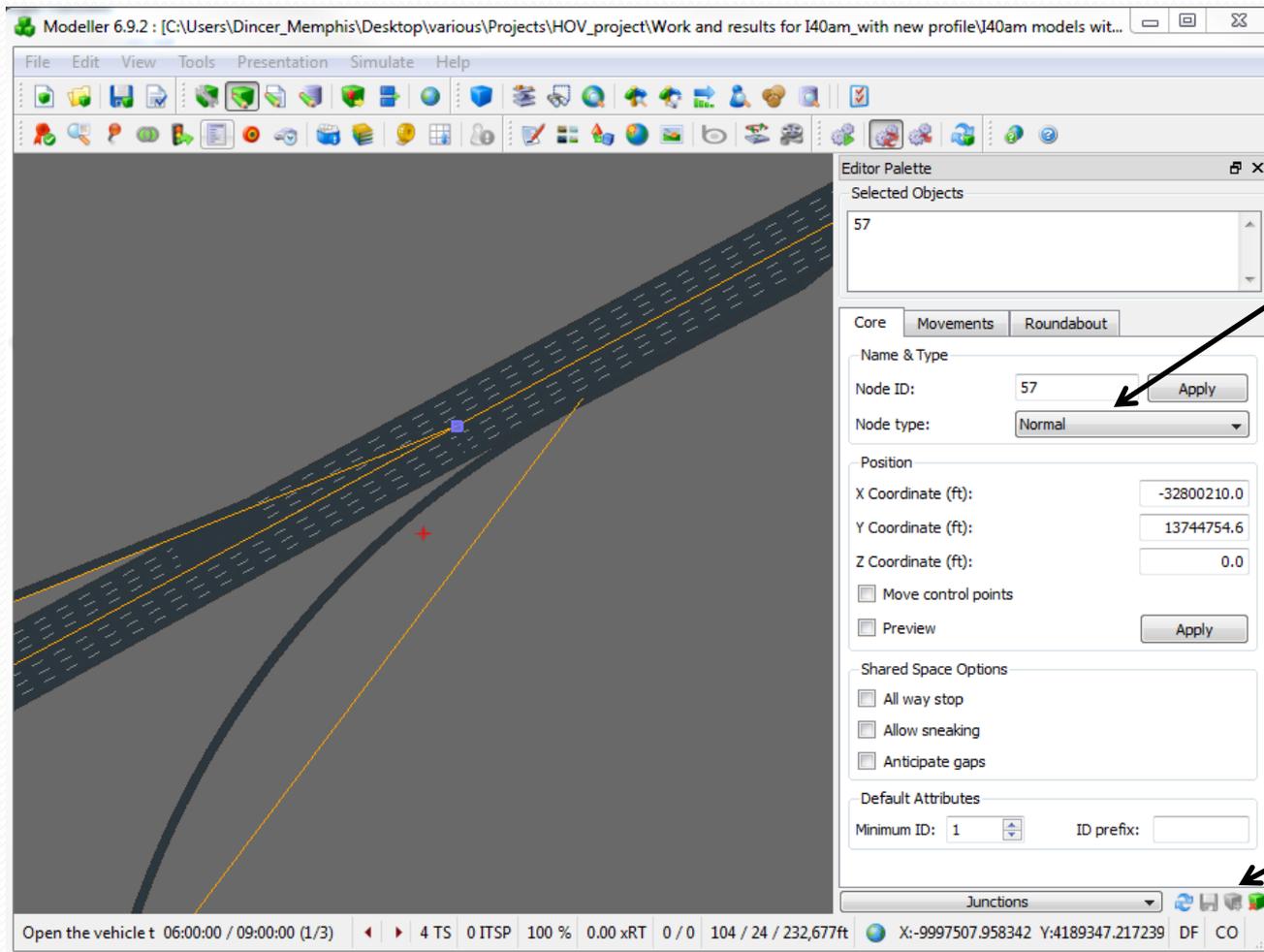
# New Network Wizard (Cont.)



# Creating Network Geometry

- Place the junction (**intersections**) of the network
- **Create the links** and edit their **characteristics** (link type and number of lanes, speed limit, signpost, etc.)
- Edit lane **attributes** (specify lane closures, restrictions, speed controls, etc.)
- **Fix the geometry** of the network links using **control points**
- Fix **movements** at junctions (congestion due to unnecessary lane changing)

# Junction Editing

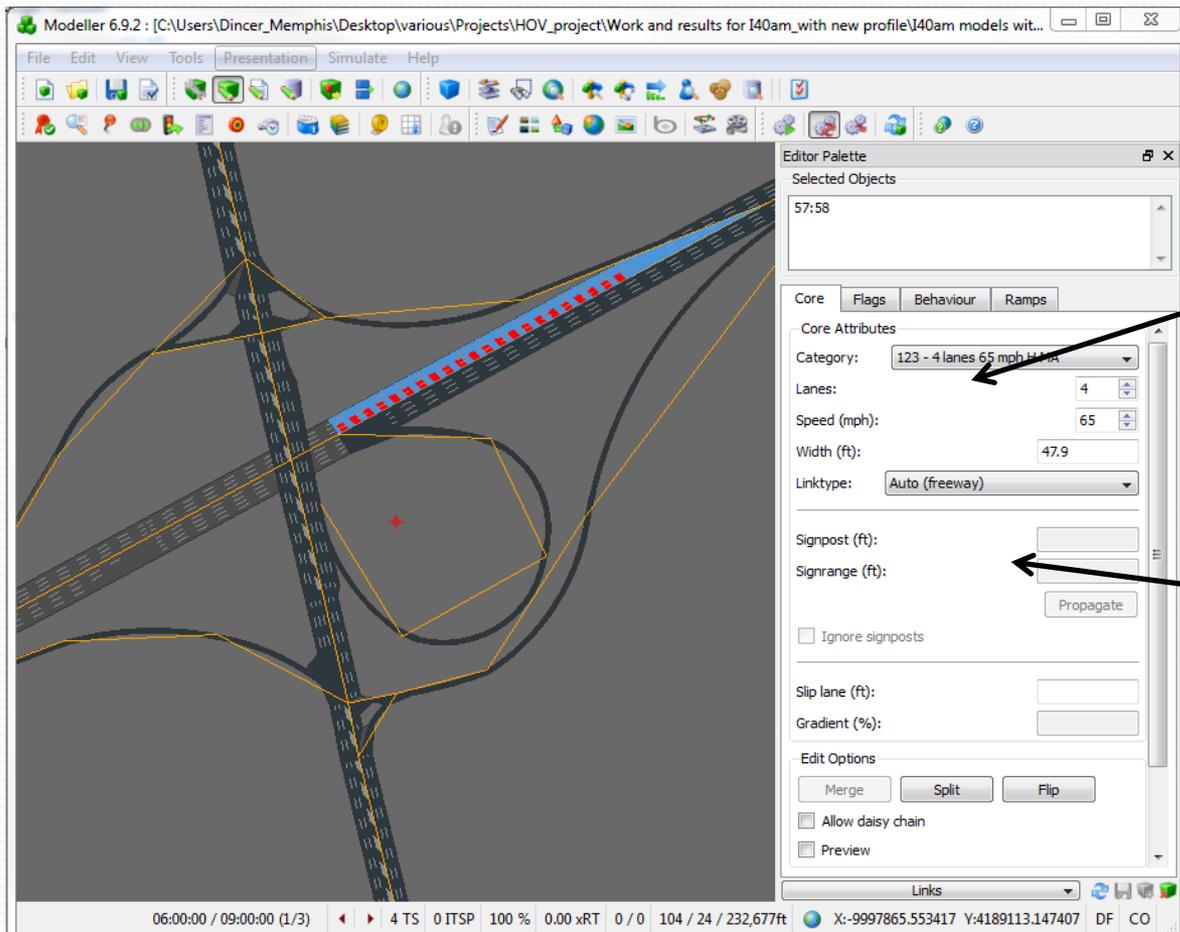


Node Type:

- Normal
- Roundabout
- Ghost island (split of a 2 lane segment to 2 separate single lane roadways)
- Zone connector

Create/delete junctions

# Link Editing



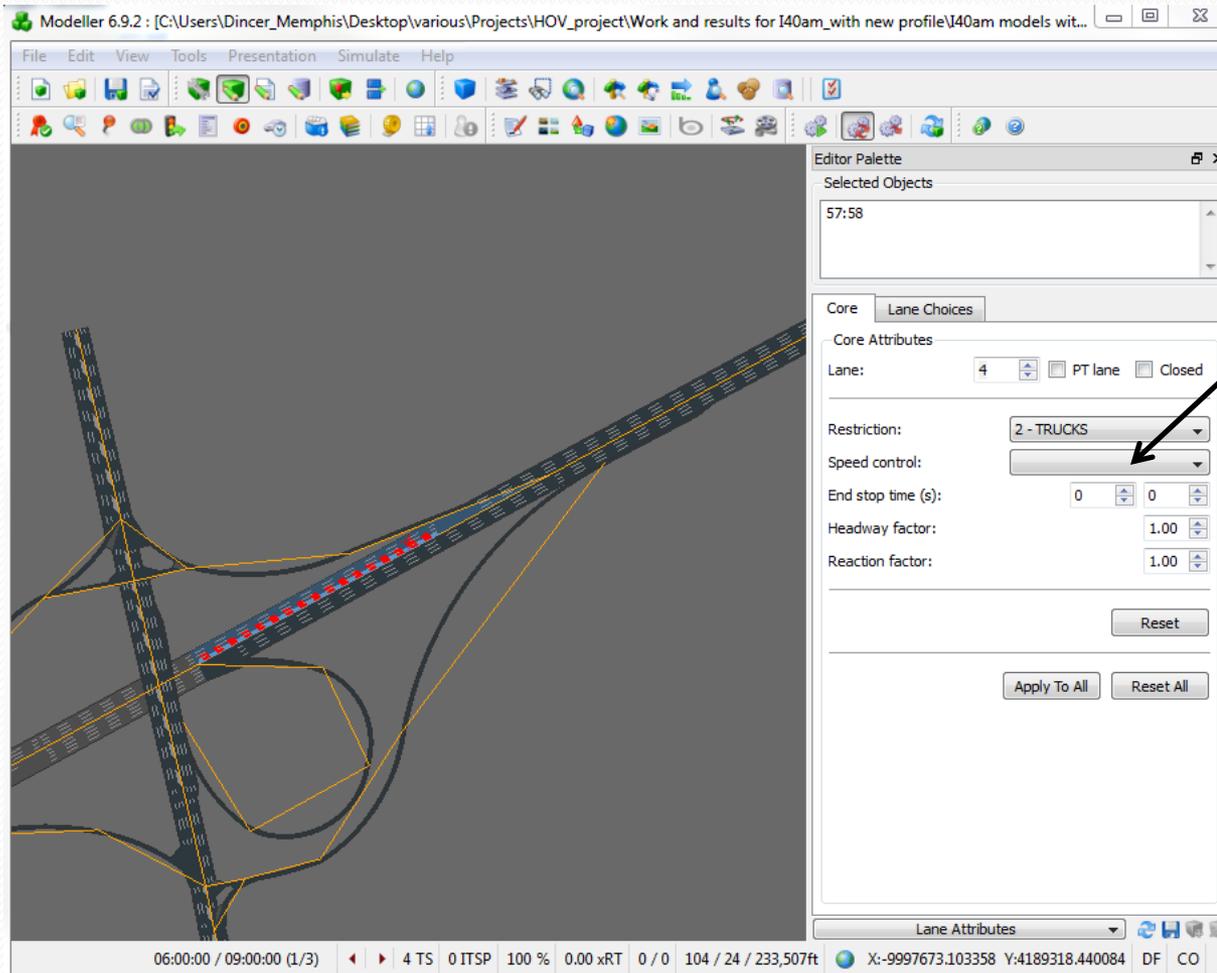
Link characteristics:

- Number of lanes
- Speed limit
- Link type:
  - Highway
  - Signalised
  - Weaving area
  - Ramp

Existence of hazard (turn, narrowing, etc.) and when the driver becomes aware of it

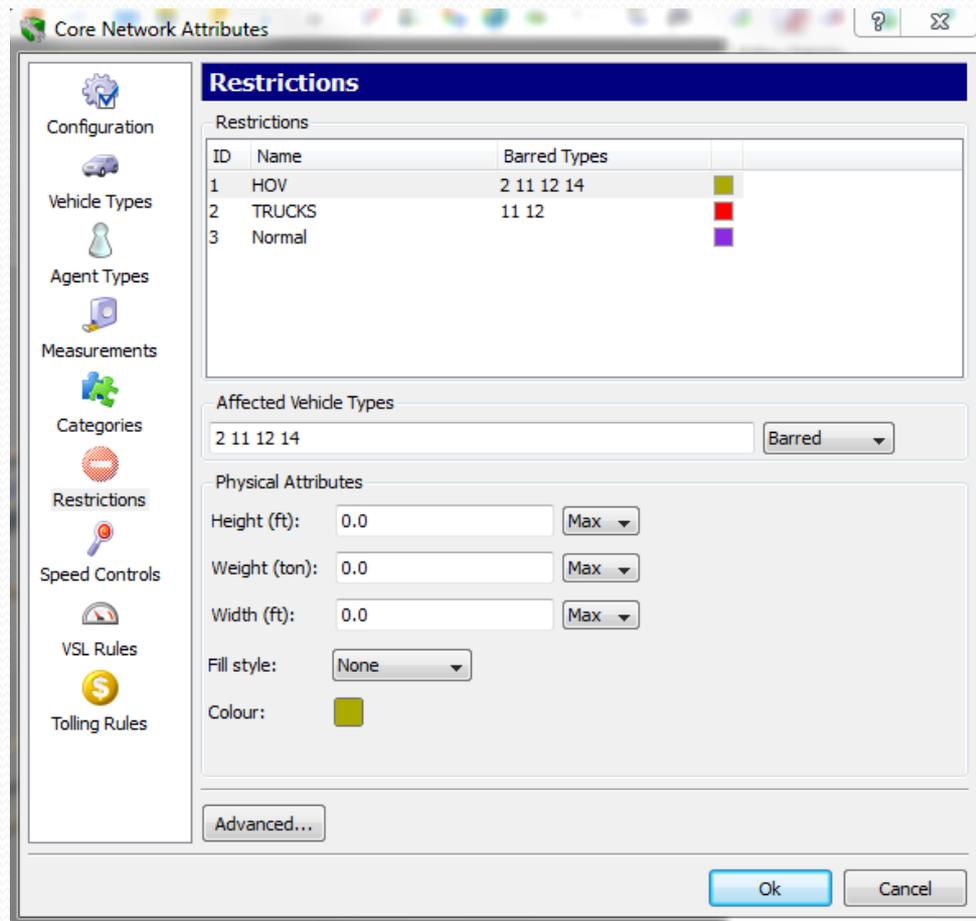
Having identified the junctions of the network, you can create links to connect them

# Editing Lane Attributes

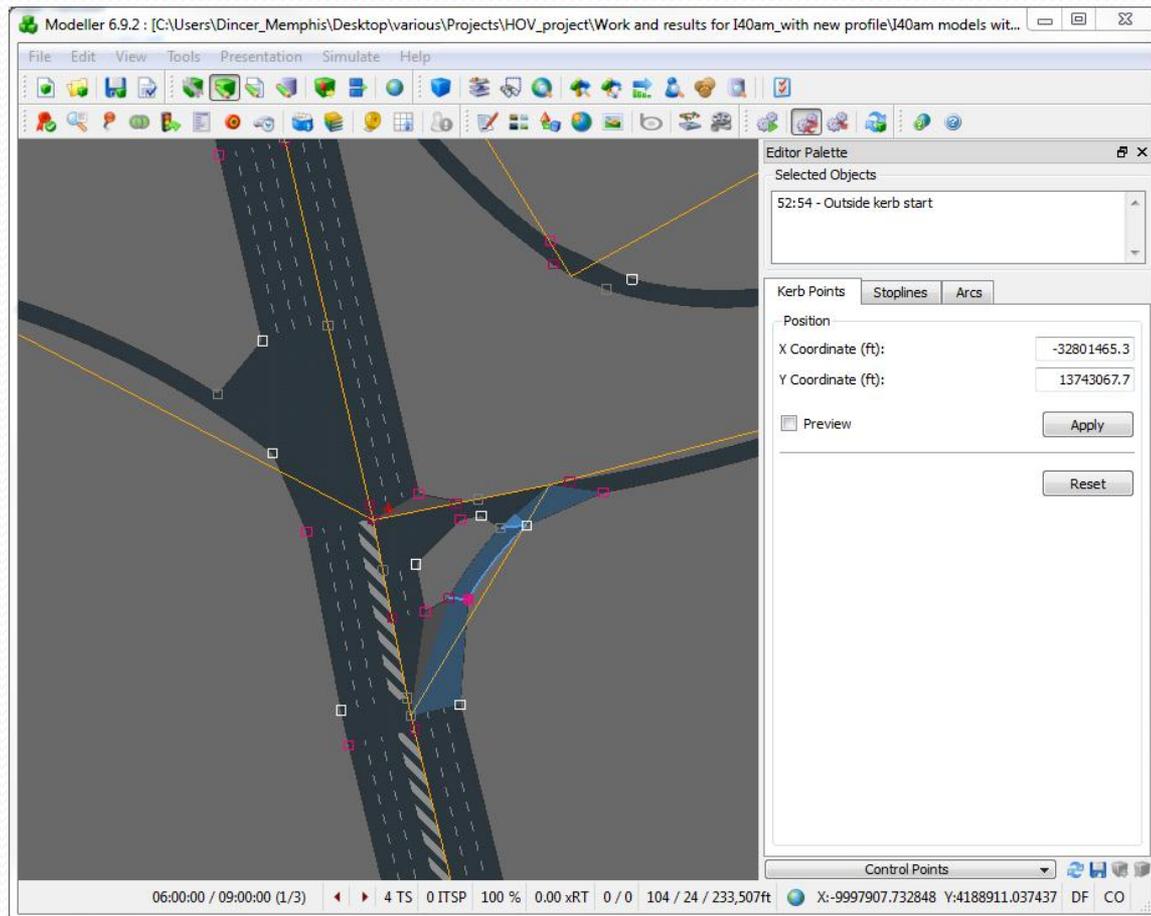


- Determine for each lane:
  - Any restrictions
  - Any speed control
  - Stop time at link end (simulate tolls)
  - Headway/reaction factor for adjusting vehicles behavior)

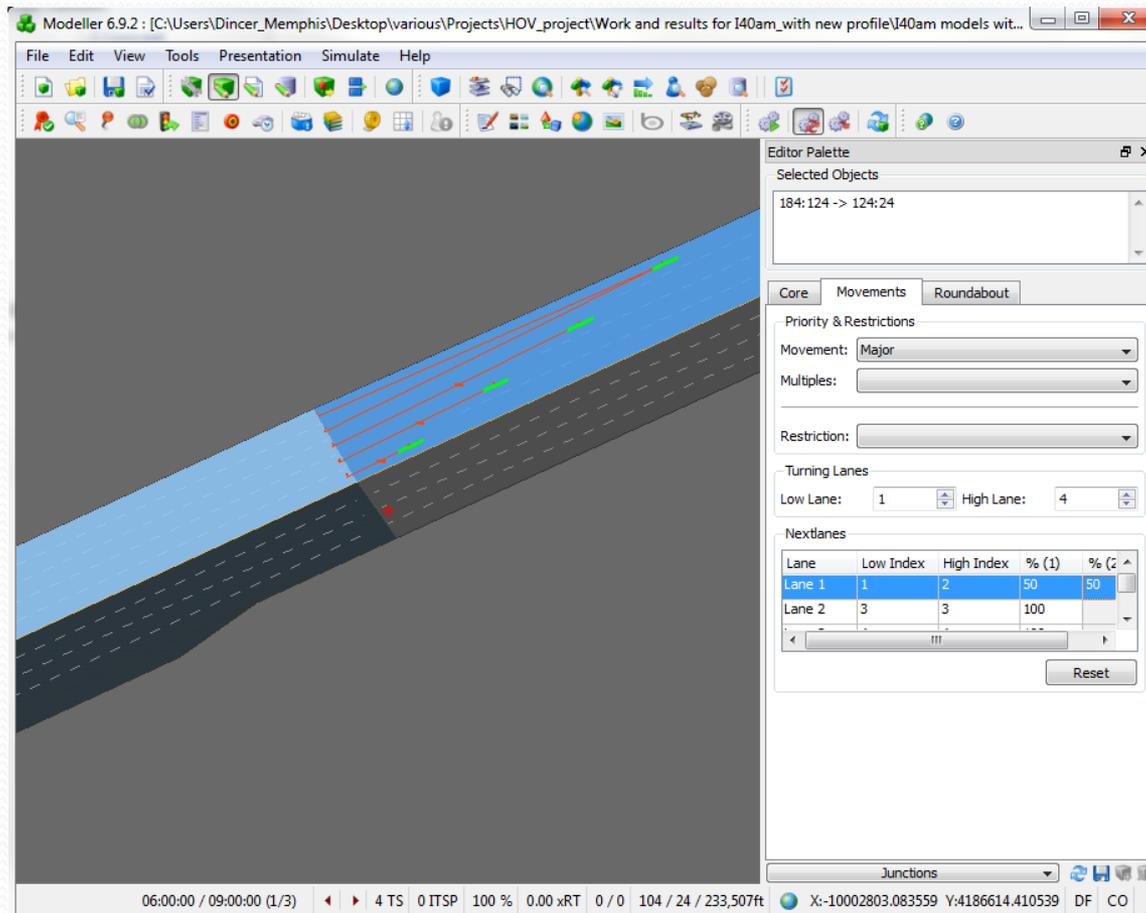
# Modelling Restrictions



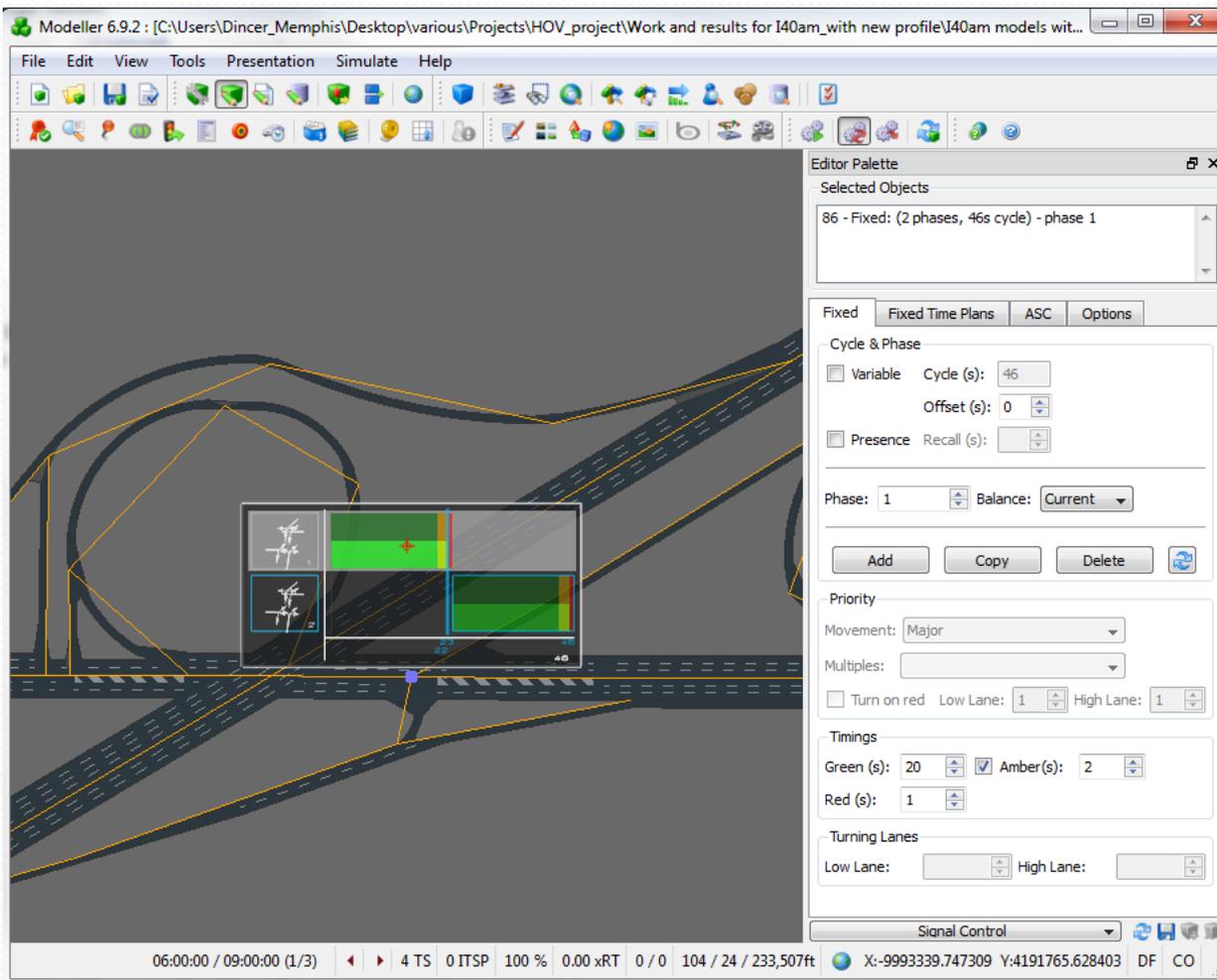
# Control Points!!!



# Editing Movements!!!



# Fixing Traffic Signals



- After pressing Signalize button a template is developed
- This template is wrong!
- You have to adjust:
  - Number of Phases
  - Movements allowed or barred in each phase
  - Signal timings per phase
- **You can also model Actuated Signal Control**

# Fixed Traffic Signal

Modeller 6.9.2: [C:\Users\Dincer\_Memphis\Desktop\various\Projects\HOV\_project\Work and results for I40am\_with new profile\I40am models wit...

File Edit View Tools Presentation Simulate Help

Editor Palette

Selected Objects

86 - Fixed: (3 phases, 116s cycle) - phase 1  
92:86 -> 86:87

Fixed Fixed Time Plans ASC Options

Cycle & Phase

Variable Cycle (s): 116  
Offset (s): 0  
 Presence Recall (s):

Phase: 1 Balance: Current

Add Copy Delete

Priority

Movement: Barred  
Multiples:  
 Turn on red Low Lane: 1 High Lane: 3

Timings

Green (s): 57  Amber(s): 4  
Red (s): 2

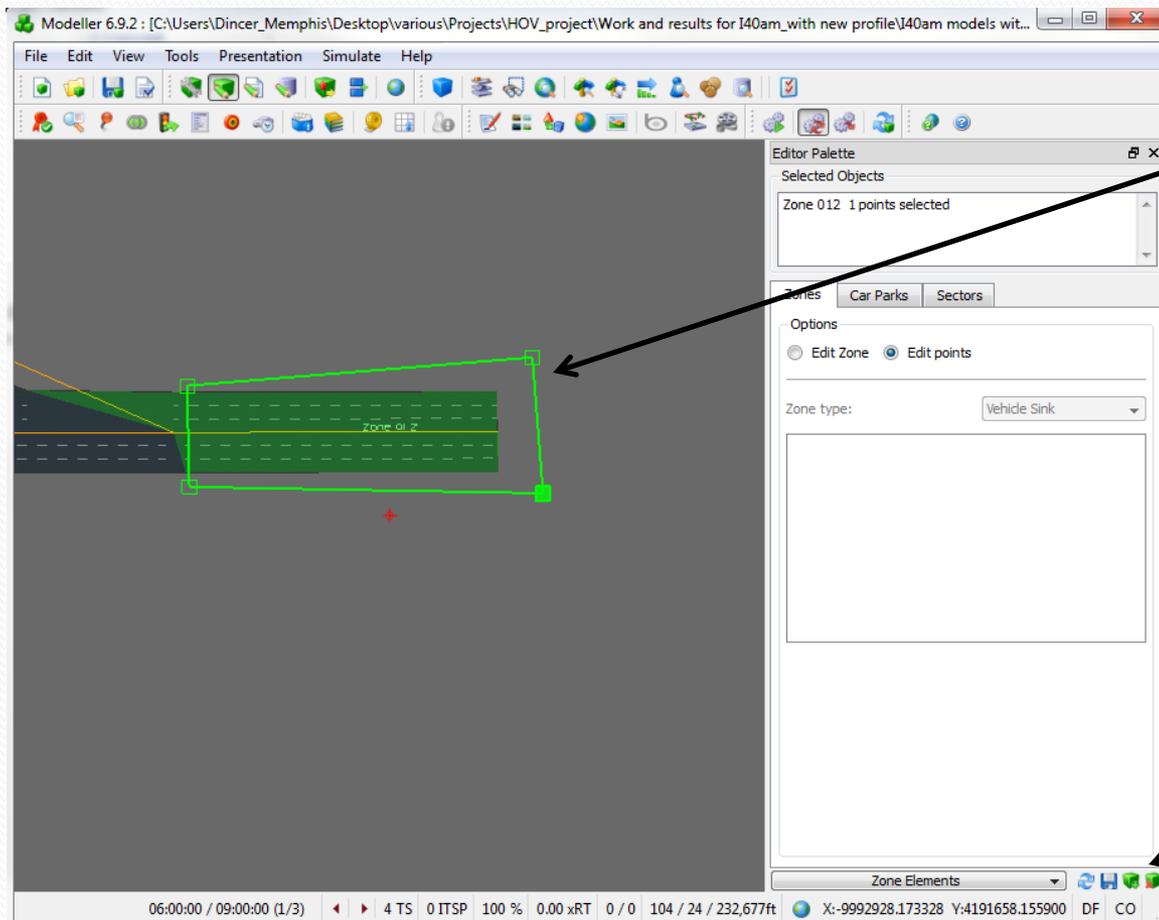
Turning Lanes

Low Lane: 3 High Lane: 3

Signal Control

06:00:00 / 09:00:00 (1/3) 4 TS 0 ITSP 100 % 0.00 xRT 0 / 0 104 / 24 / 232,677ft X:-9993341.871881 Y:4191733.935900 DF CO

# Zones of the Study Area



- Zones can produce /attract (or both) trips, depending on the borders of the zone
- Zone types:
  - Vehicle sink
  - Car parking
  - Waypoints
- Zone borders in red, zone doesn't work properly
- Tools for creating /deleting zones

# Vehicle Templates

Vehicle Types (Advanced)

Type	Name	Template	
1	HOV	Car	Yellow
2	SOV	Car	Blue
11	SU	LGV	Green
12	CU	OGV 1	Purple
14	LT	Custom	Brown

Physical Attributes | Kinematics | Demand & Assignment | Dynamic Tolling | Trailers

Physical

Name: HOV

Template: Car

Length (ft): 13.12

Width (ft): 5.25

Height (ft): 4.92

Weight (ton): 0.79

Occupancy: 1

Mean age: 2.00

Trailer count: 0

PCU factor: 1.00

Colour: Yellow

OK Cancel

- Vehicles can be edited using:
  - New network wizard (at the beginning)
  - Core network attributes
- Vehicle characteristics can be edited
- UK vehicle templates provided:
  - Car
  - LGV
  - OGV1 and 2
  - Bus/Minibus
  - Coach
  - User specified

# Vehicle templates

Vehicle Types (Advanced)

Types

Type	Name	Template	
1	HOV	Car	Yellow
2	SOV	Car	Blue
11	SU	LGV	Light Green
12	CU	OGV 1	Purple
14	LGV	LGV	Green

Add  
Copy  
Delete  
Split

Physical Attributes Kinematics Demand & Assignment Dynamic Tolling Trailers

Acceleration

Profile: Car Acceleration

Max. (fpss): 5.91

Deceleration

Profile: Car Deceleration

Max. (fpss): 12.80

Speed

Top speed (mph): 80

Crawl speed (mph): 40.0

Net horse power: 80.0

Behavioural Factors

HGV following factor: 1.00

Mean driver reaction factor: 1.00

Mean target headway factor: 1.00

Driver Perception Reaction Time: 1.50

OK Cancel

Vehicle Types (Advanced)

Types

Type	Name	Template	
1	HOV	Car	Yellow
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11	SU	LGV	Light Green
12	CU	OGV 1	Purple
14	LGV	LGV	Green

Add  
Copy  
Delete  
Split

Physical Attributes Kinematics Demand & Assignment Dynamic Tolling Trailers

Demand & Assignment

OD Routing  Fixed Routing

Proportion (%): 7.80 Capacity:

Perturbation: 0.00 Exit doors:

Familiarity (%): 85.00 Entry doors:

Matrix: 1

OK Cancel

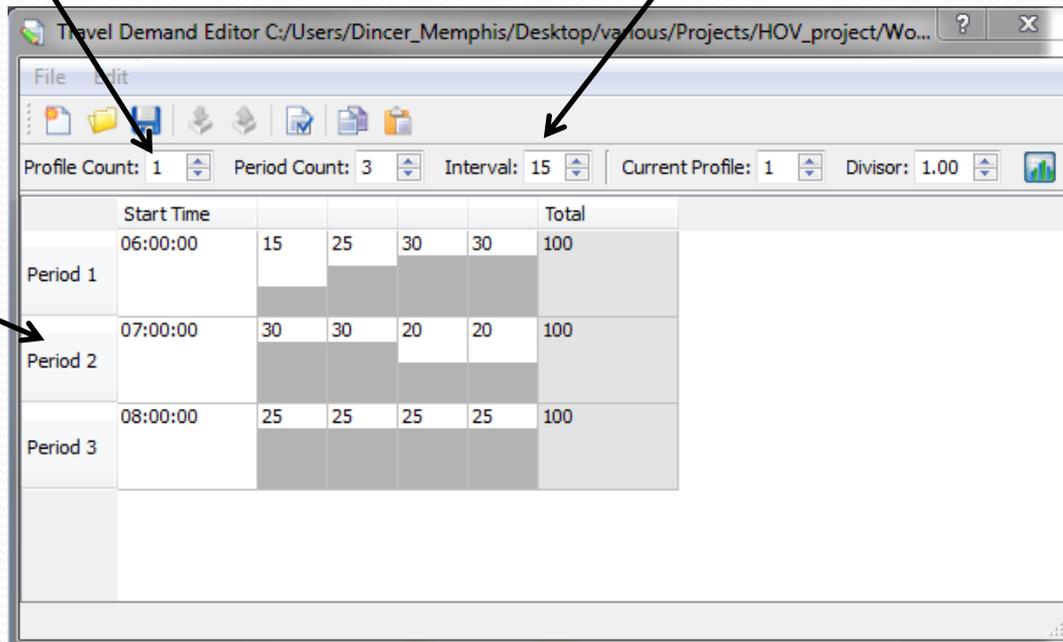
# Demand Editor

- Demand editing: the significant part of developing an accurate simulation model
  - Remember Static VS Dynamic traffic assignment!!!!!!
- It allows user to:
  - Import/export OD matrices with traffic demand per vehicle type
  - Edit the demand profile (distribution of volume per time interval)

# Editing Demand Profile

- 1 profile for the whole simulation period. You can have different profiles for each trip
- Demand distribution for each demand period is provided for 15 min time intervals

• Simulation period of 3 hours, demand is identified for 3 separate demand periods (per hour)



The screenshot shows the 'Travel Demand Editor' window. The interface includes a menu bar (File, Edit), a toolbar with various icons, and a control panel with the following settings: Profile Count: 1, Period Count: 3, Interval: 15, Current Profile: 1, and Divisor: 1.00. Below the control panel is a table with the following data:

	Start Time				Total	
Period 1	06:00:00	15	25	30	30	100
Period 2	07:00:00	30	30	20	20	100
Period 3	08:00:00	25	25	25	25	100

# Editing Demands

- You can have 1 demand period for the whole simulation period or split it (e.g. demand/hour)
- For high volumes you can divide the volume numbers
- Specify one matrix per vehicle type for each demand period

Travel Demand Editor C:/Users/Dincer\_Memphis/Desktop/various/Projects/HOV\_project/Work and results for 140am\_with ne...

File Edit

Matrix Count: 5 Demand Period: 1 Divisor: 1.00 Current Matrix: 2 Vehicle Type: Type 2 - SOV (100%)

	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Zone 9	Zone 10	Zone 11	Zone 1
Zone 1	0	0	5	668	8	0	1	70	340	0	8	9
Zone 2	0	0	0	5	2	9	0	4	2	0	30	0
Zone 3	0	0	0	14	2	264	0	9	2	0	49	2
Zone 4	618	0	2	0	1	0	1	0	3	0	5	3
Zone 5	0	0	0	16	0	1	0	4	3	0	3	7
Zone 6	0	0	0	0	0	0	0	0	0	0	0	0
Zone 7	0	0	0	0	0	0	0	0	0	0	0	257
Zone 8	0	0	0	0	0	0	0	0	82	0	0	0
Zone 9	0	0	0	0	0	0	0	0	0	0	0	0
Zone 10	0	0	11	329	3	20	8	0	0	0	74	55
Zone 11	0	0	4	5	2	1	1	0	3	0	0	8
Zone 12	0	0	0	20	31	24	638	17	50	0	76	0
Zone 13	0	0	0	5	20	0	0	15	15	0	35	62
Zone 14	0	0	25	2	369	2	8	2	6	0	0	17
Zone 15	0	0	248	2	4	0	3	3	7	0	1	9
Zone 16	0	0	0	0	0	0	0	0	0	0	0	0
Zone 17	0	0	0	0	0	0	0	0	0	0	0	0
Zone 18	0	0	80	15	55	67	31	0	1	0	189	78
Zone 19	140	0	41	2	52	2	12	86	457	0	82	32
Zone 20	0	0	0	0	0	0	0	0	0	0	0	0
Zone 21	0	0	0	45	0	2	1	2	1	0	667	16

- Total matrix number for each demand period

- Traffic demand is usually provided by TransCAD software

# Different Profiles for each Trip

- 2 separate profiles for 1 period

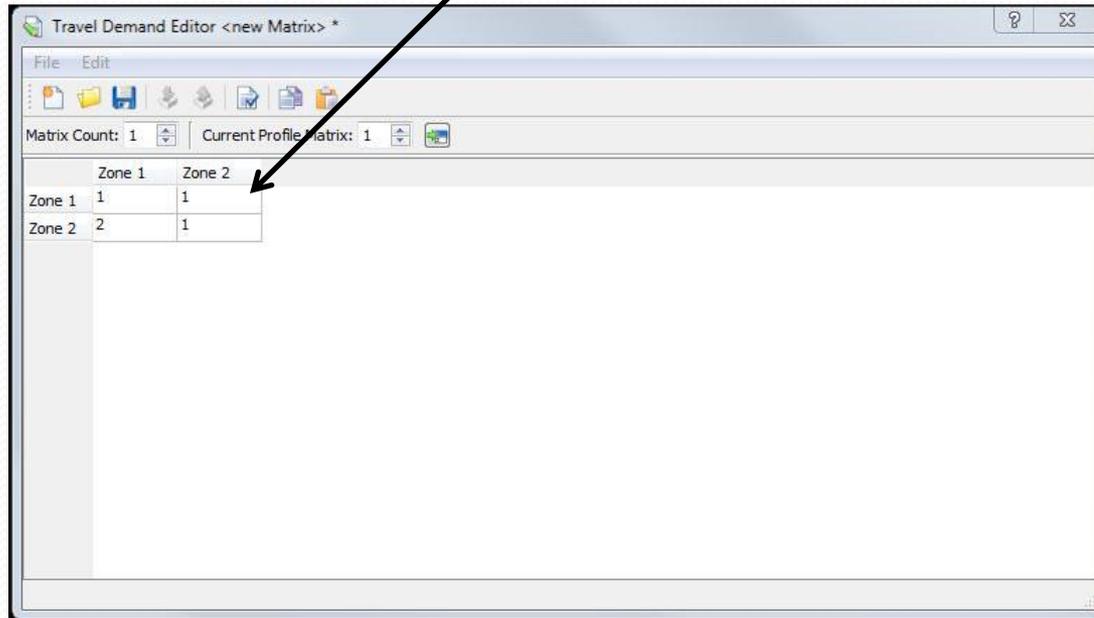
- This is the second profile

	Start Time	10	5	85	Total
Period 1	00:00:00	10	5	85	10

- Need to assign a profile for each trip?

# Profile Assignment Matrix

- Assigning profiles to trips



The screenshot shows the 'Travel Demand Editor <new Matrix>' window. It features a menu bar with 'File' and 'Edit', a toolbar with various icons, and a status bar showing 'Matrix Count: 1' and 'Current Profile Matrix: 1'. The main area contains a table with the following data:

	Zone 1	Zone 2
Zone 1	1	1
Zone 2	2	1

# Simulation in Paramics-1

- Visual simulation using Modeller
  - Visual representation of vehicles movements
  - Easy way to identify potential errors (e.g. hotspot viewer)
  - Difficulties in producing simulation outputs
  - Time consuming

# Simulation in Paramics-2

- Simulation using Processor
  - No visual representation
  - Faster way to accomplish a large number of simulations for the same network
  - Compatibility with Analyser tool for faster production of simulation outputs

# Simulation with Processor-1

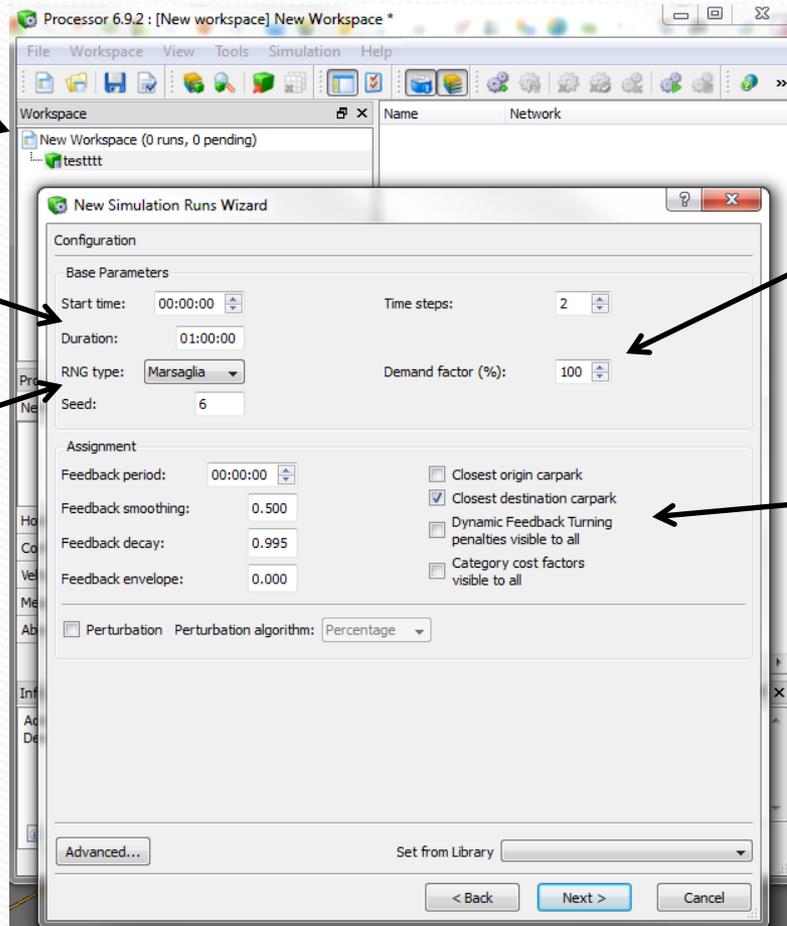
- Upload network



- Start time and duration of simulation



- Random number Generator for seeds (determined later)



- Demand factor allows the adjustment of demand to capture future conditions

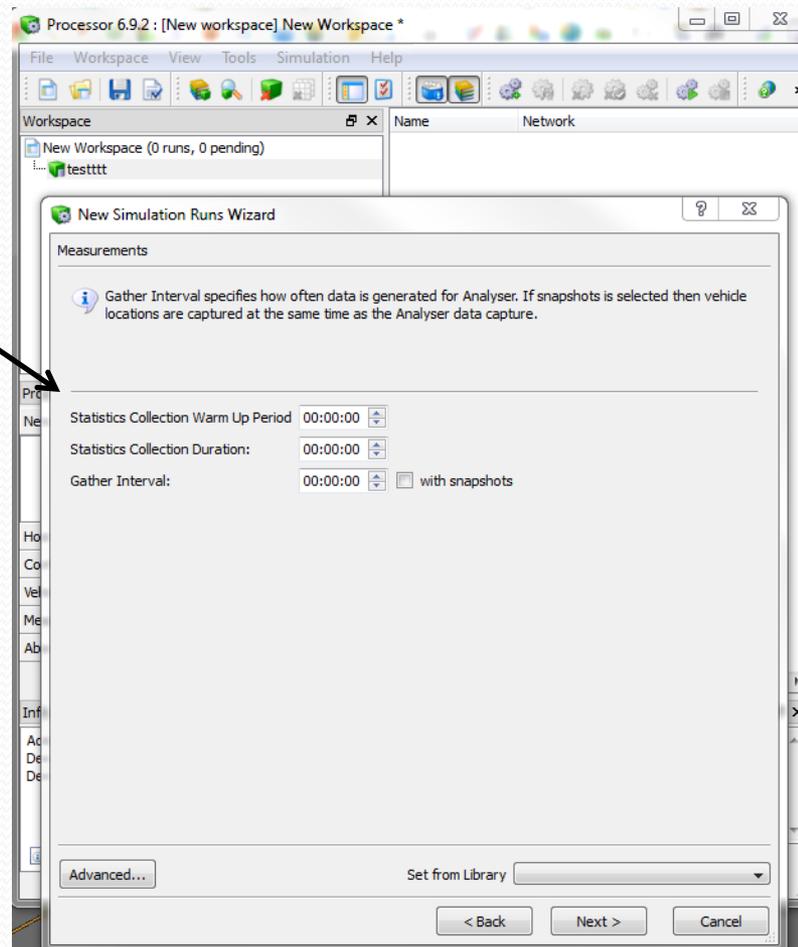


- Manages costs related to vehicles routes and vehicle travel behavior (use default values)



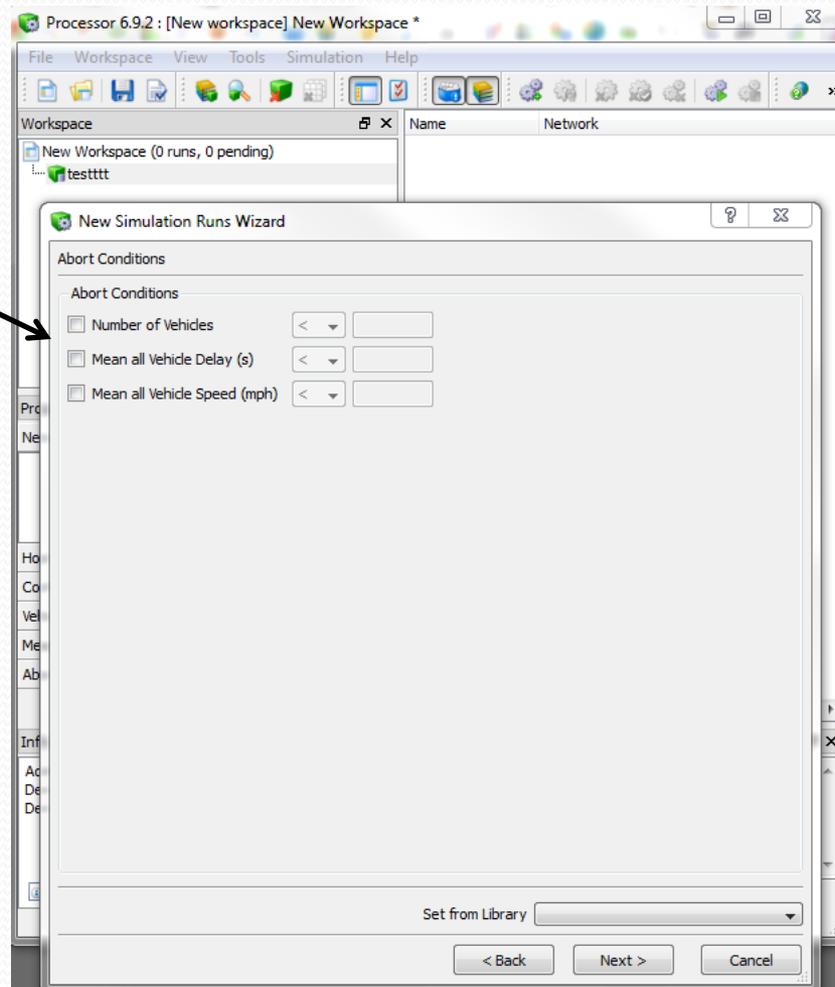
# Simulation with Processor-2

- Determine for Statistics:
  - Collection warm up time
  - Collection duration
  - Gather interval



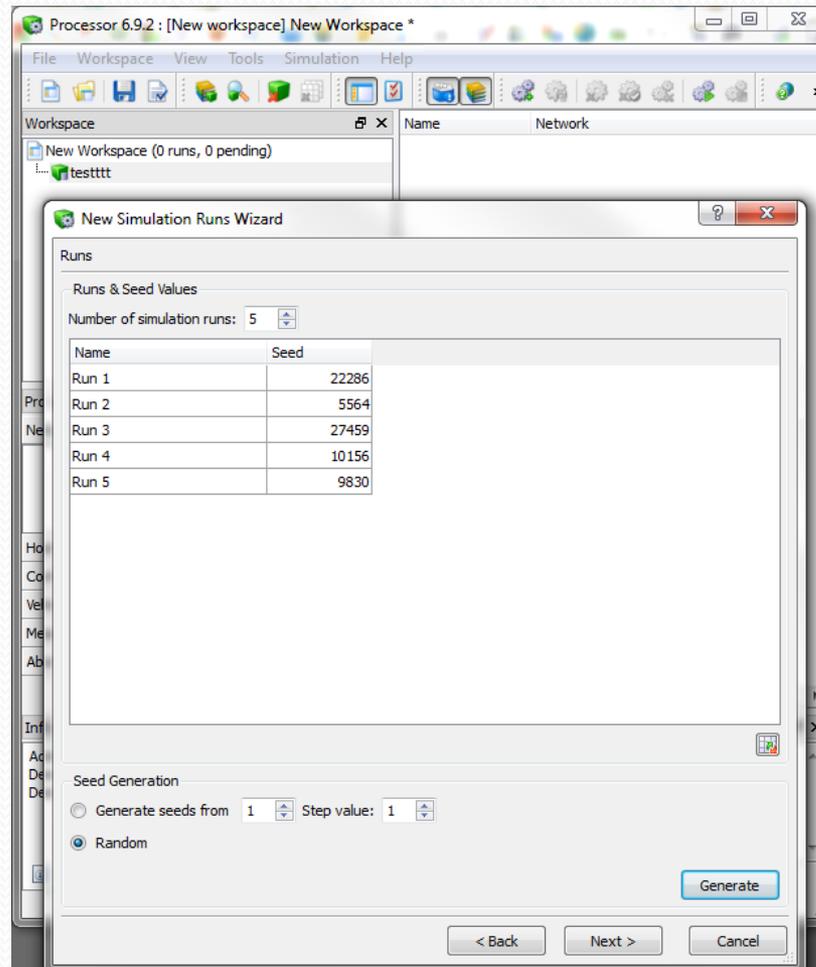
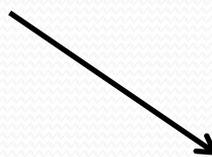
# Simulation with Processor-3

- If conditions are satisfied, simulation is aborted

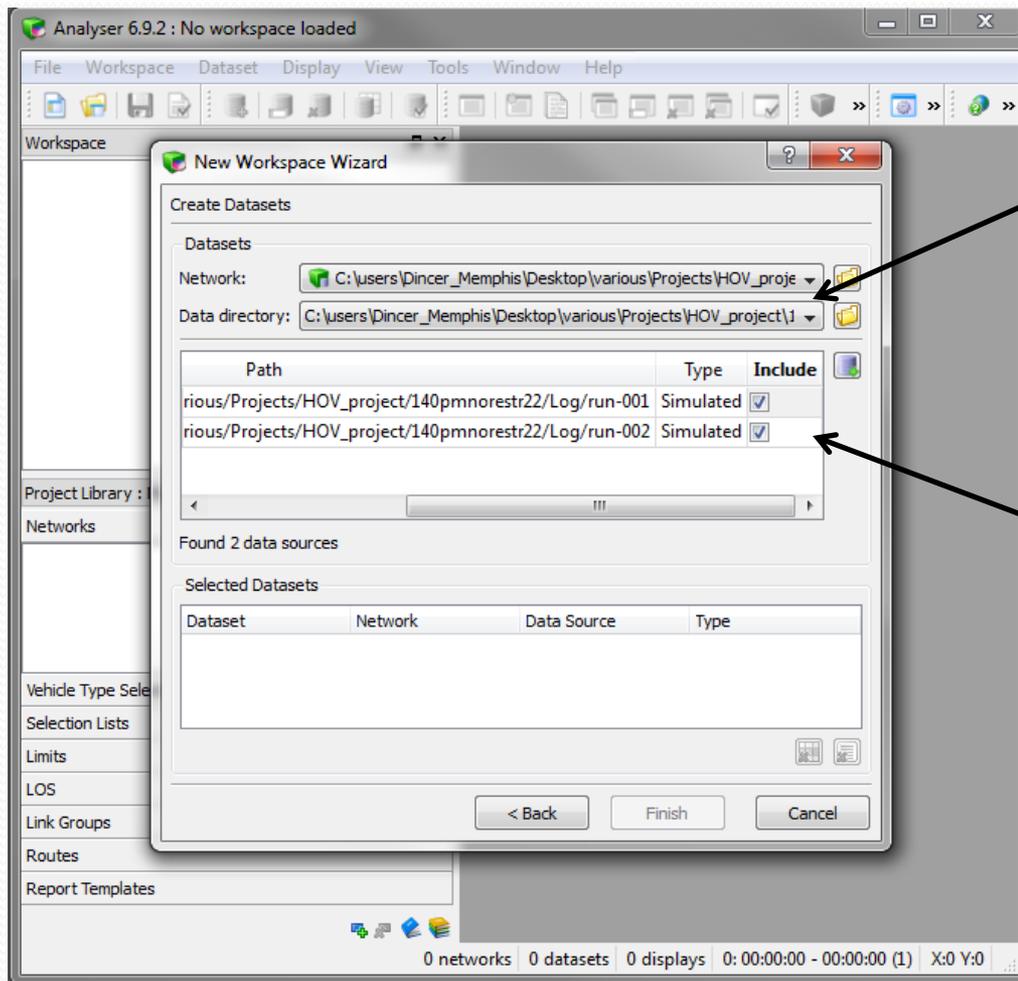


# Simulation with Processor-4

- Number of simulations



# Analyser for Outputs-1

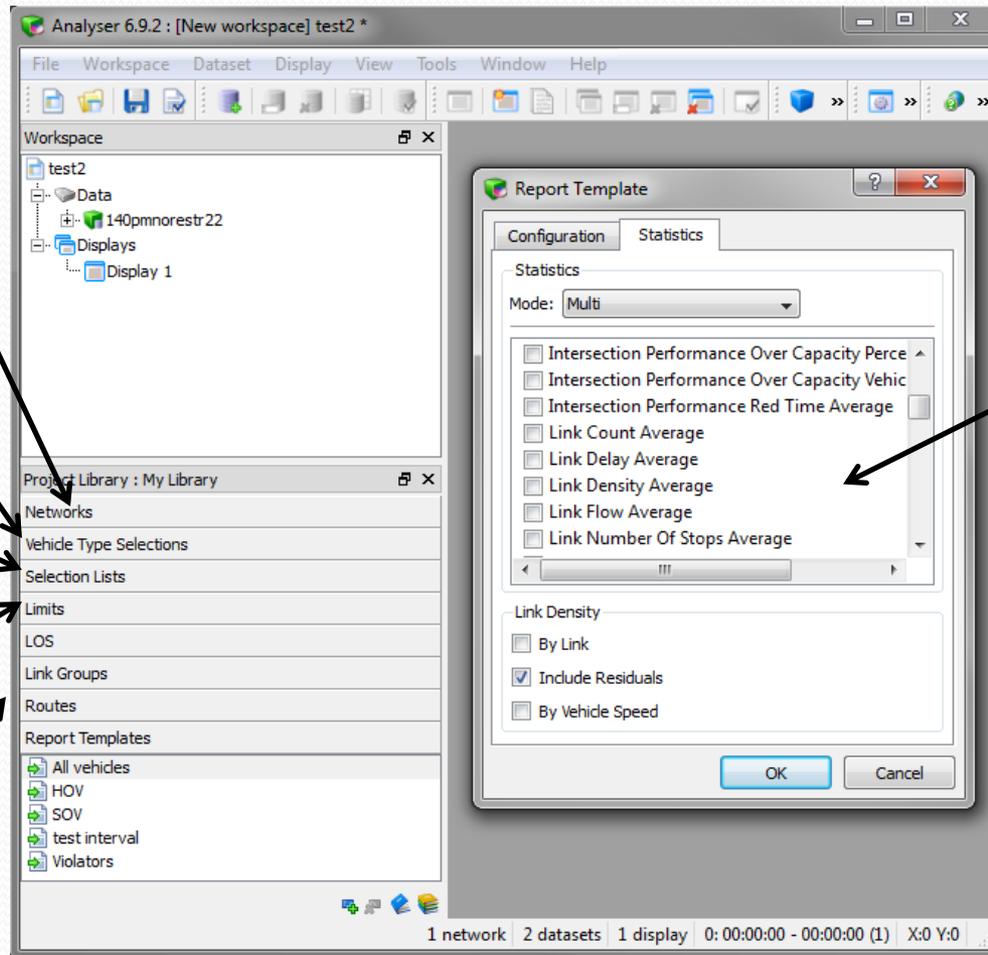


- Upload the network

- Include all the related simulations

# Analyser for Outputs-2

- Network visualization
- Create outputs per vehicle type
- Create outputs for specific nodes, links, detectors..
- Place limits on the values of outputs to be displayed
- Outputs for specific groups of links or routes



- Choose the MOEs to be estimated



**Thank you for your attention**

**Q/A**