

# 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.



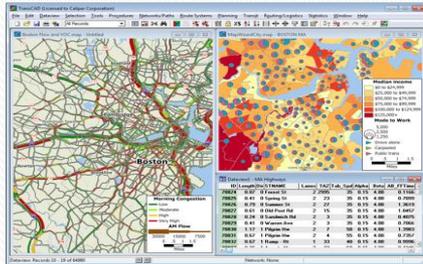
### Planning & Demand Forecasting:

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.

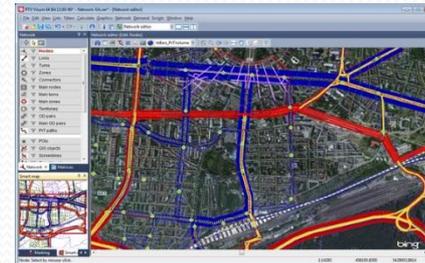


# Major Planning Software

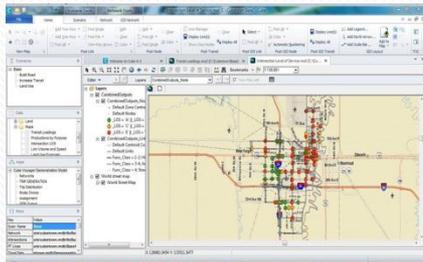
TransCAD



Visum

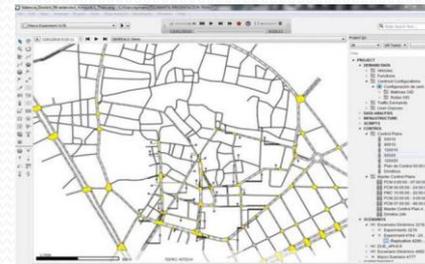


CUBE



Planning-  
Demand  
Modeling

Aimsun



# Major Simulation Software

Vissim



Paramics



SimTraffic



Micro-  
simulation

Aimsun



# Paramics

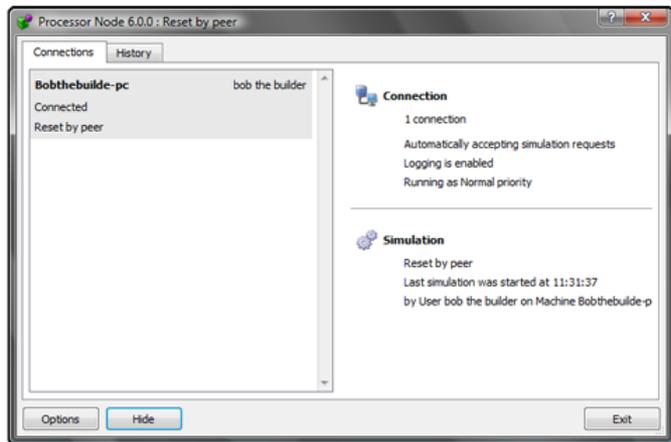
- Developed by Quadstone Paramics
- Introduced in 1990s by the UK Department for Transport
- Simulate individual vehicle at the **micro level**
- Simulate the impact of **future travel pattern**

# 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

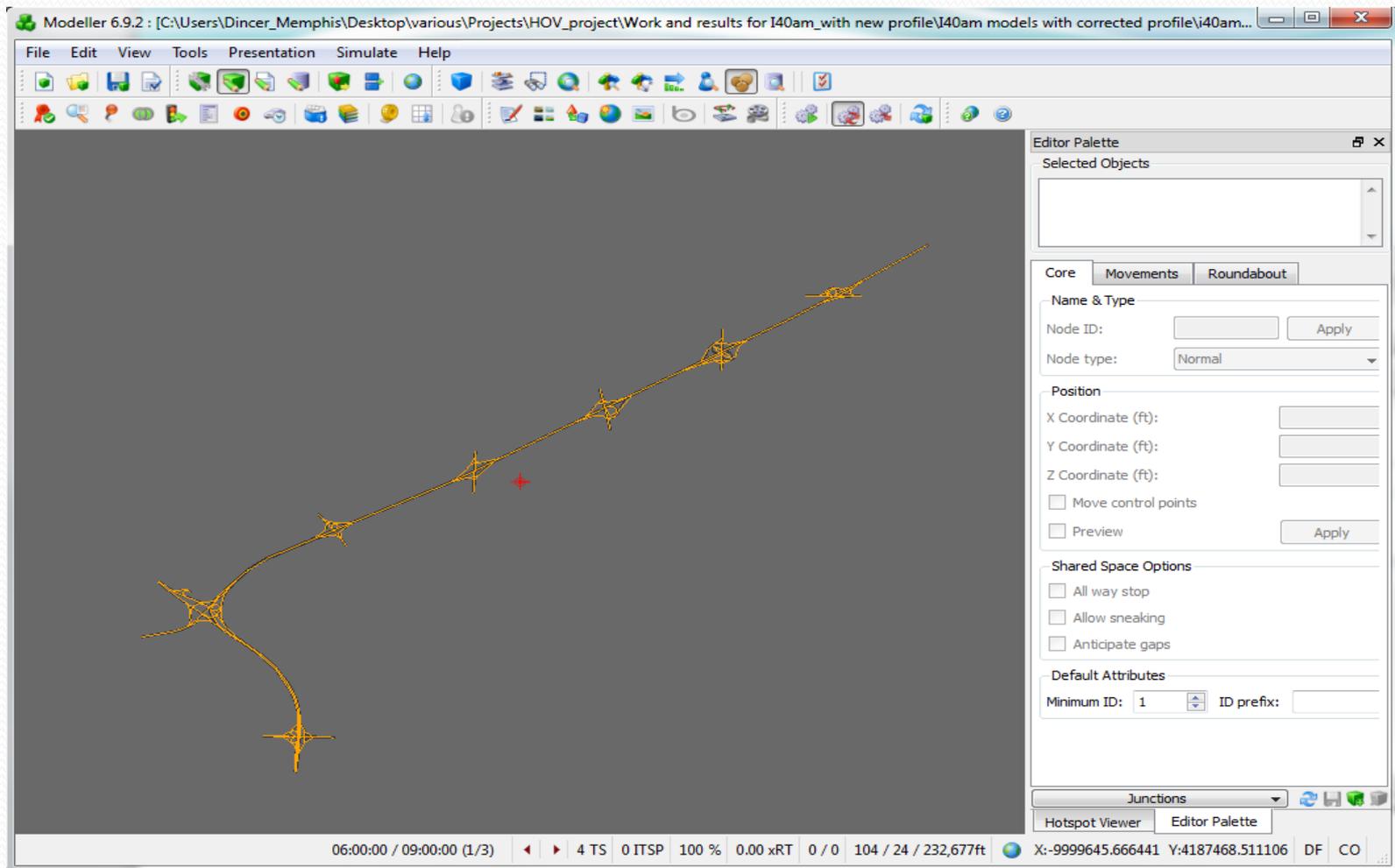
# Estimator

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

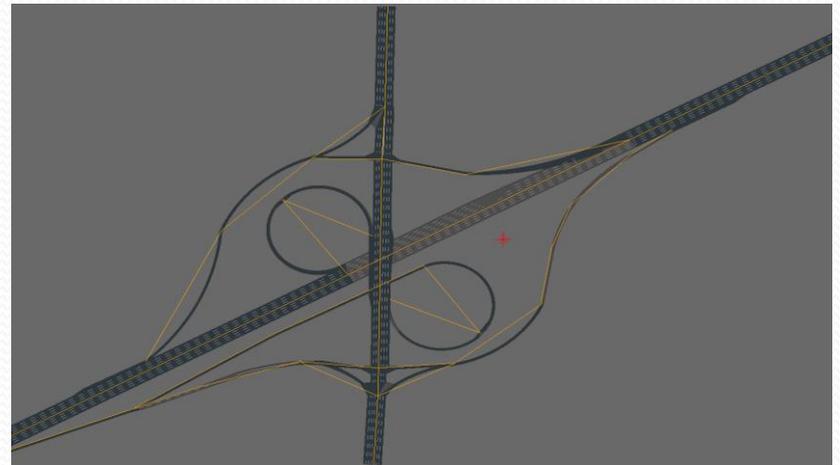
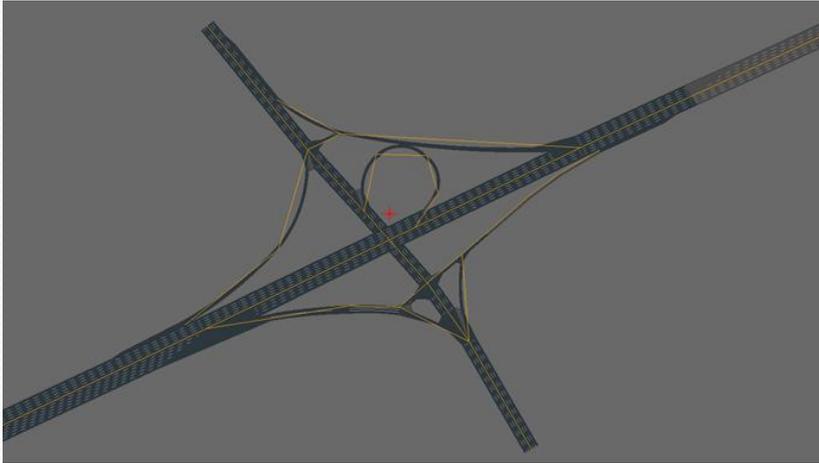
# Modeler

- 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

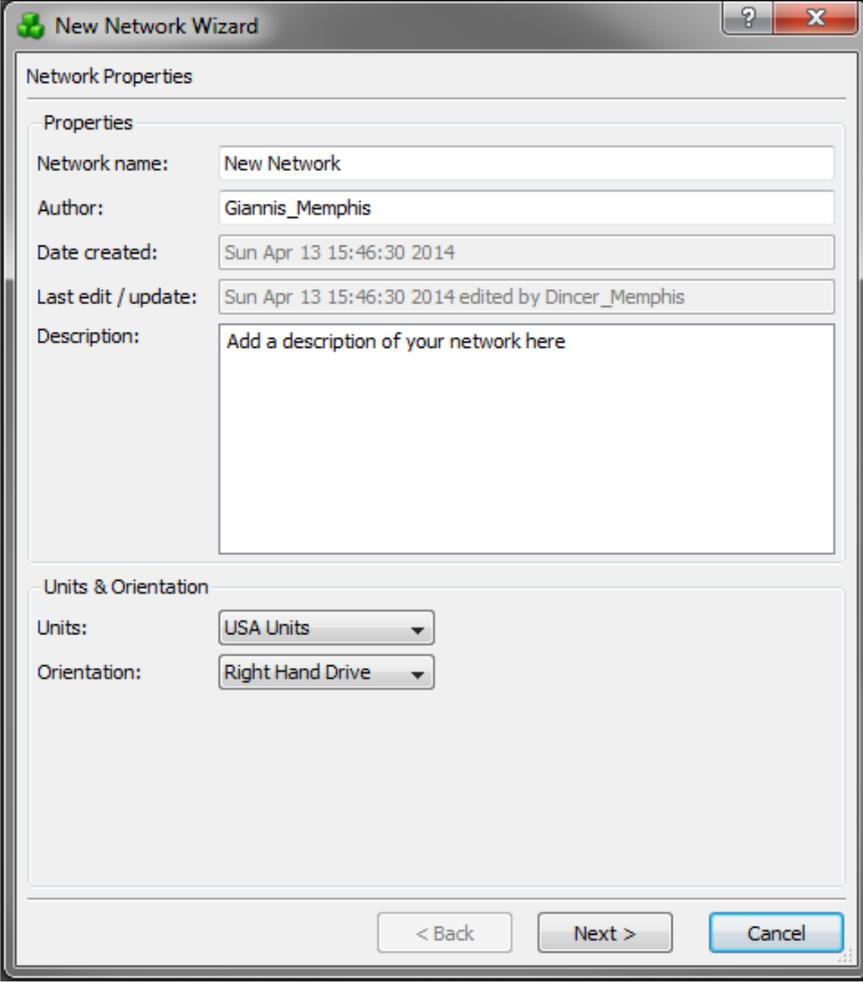
# Analyser

- 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 screenshot shows a dialog box titled "New Network Wizard" with a standard Windows-style title bar (minimize, maximize, close buttons). The dialog is divided into two main sections: "Network Properties" and "Units & Orientation".

**Network Properties**

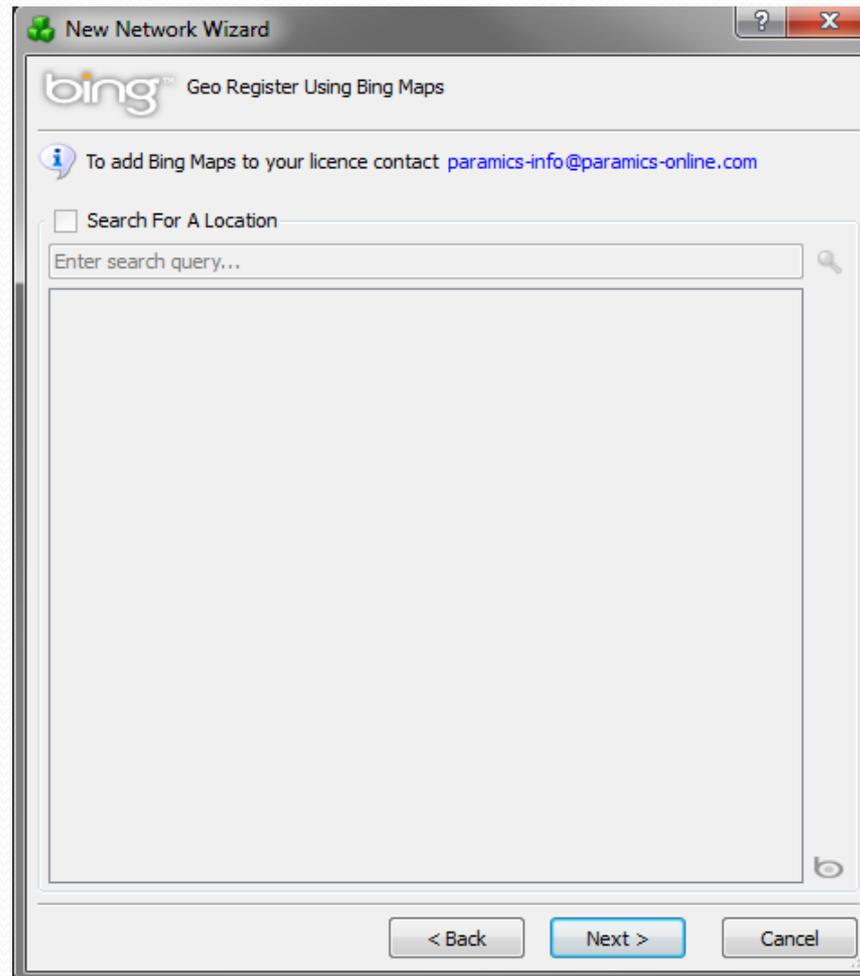
- Properties**
  - Network name:
  - Author:
  - Date created:
  - Last edit / update:
  - Description:

**Units & Orientation**

- Units:
- Orientation:

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

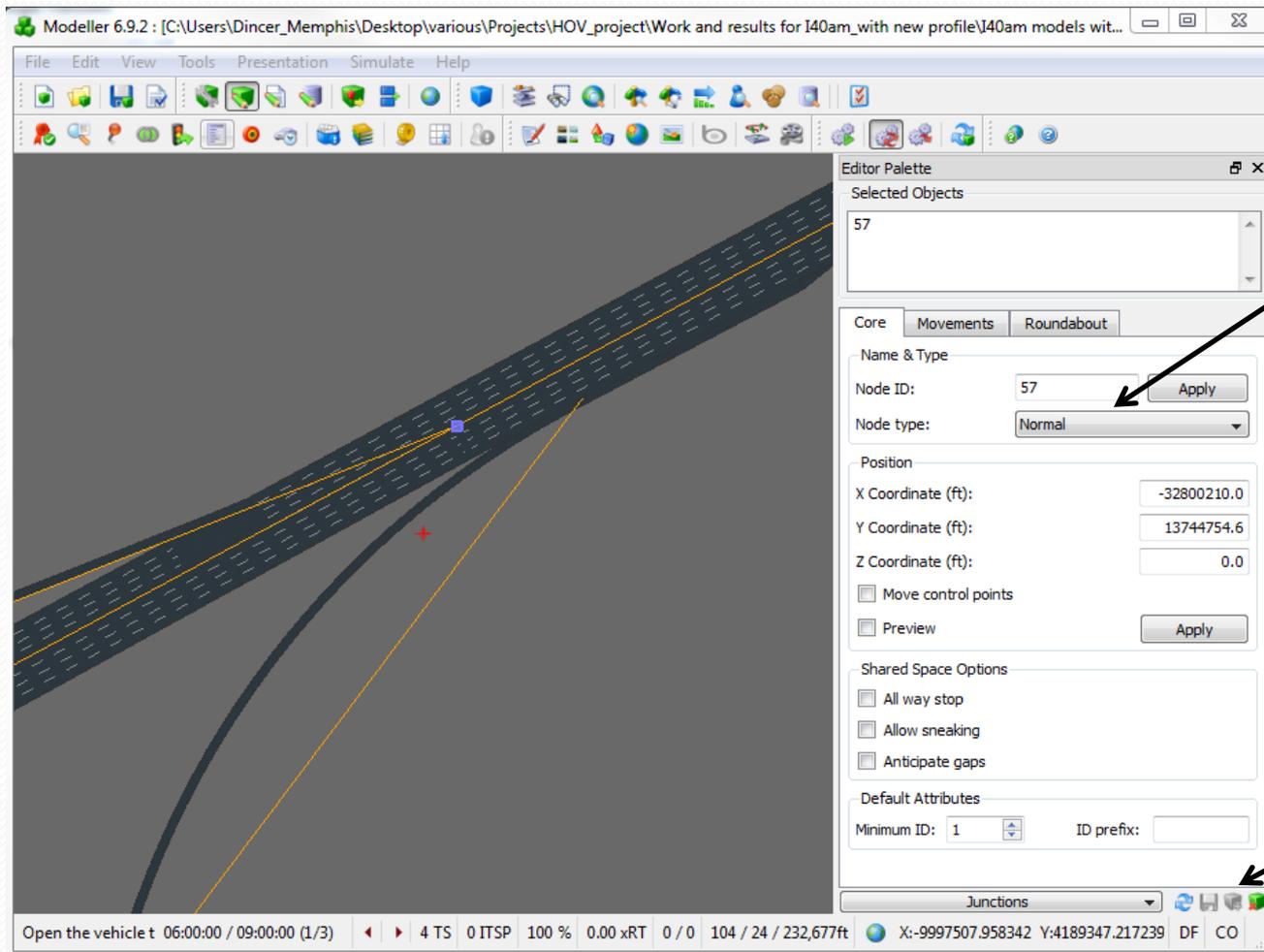
# New Network Wizard (Cont.)



# 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

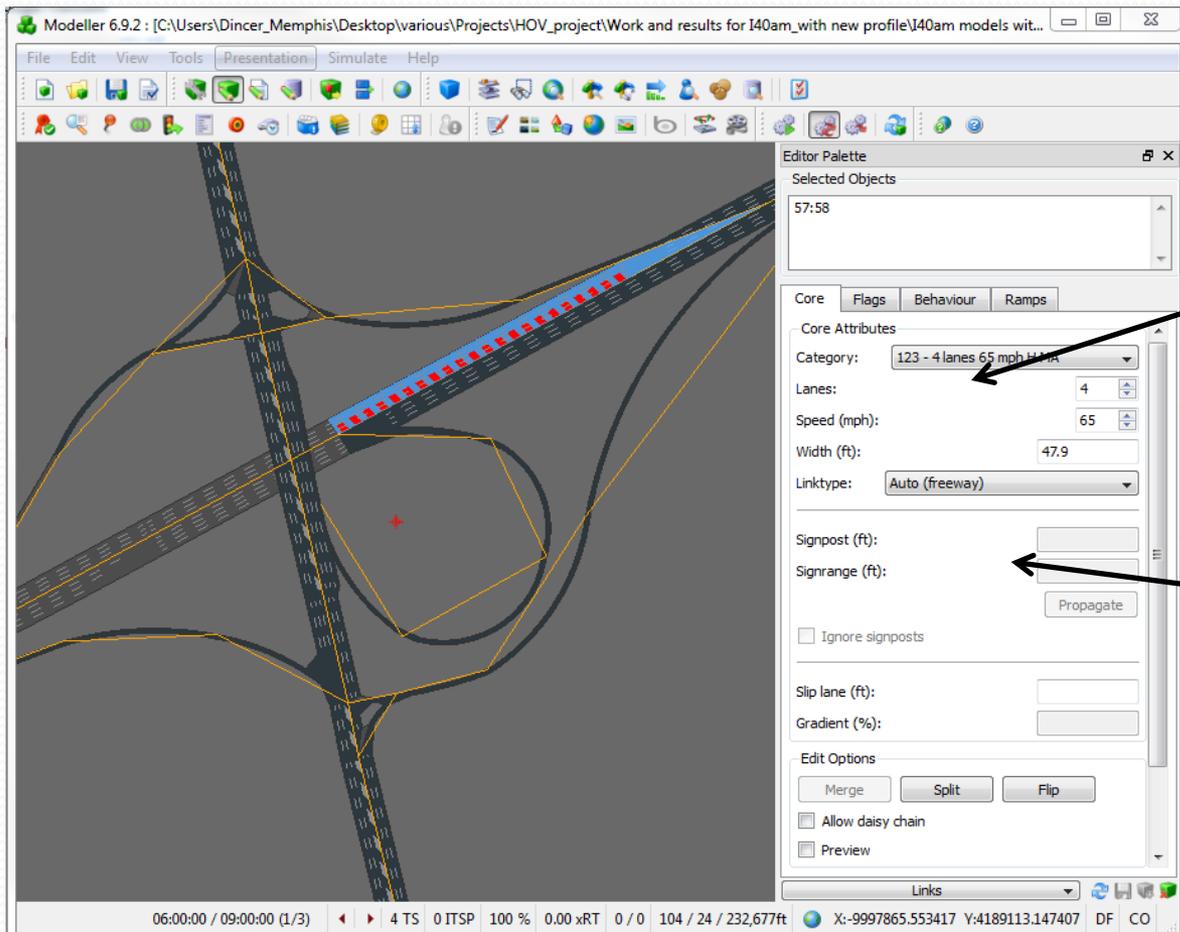


Node Type:

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

Create/delete junctions

# Link Editing



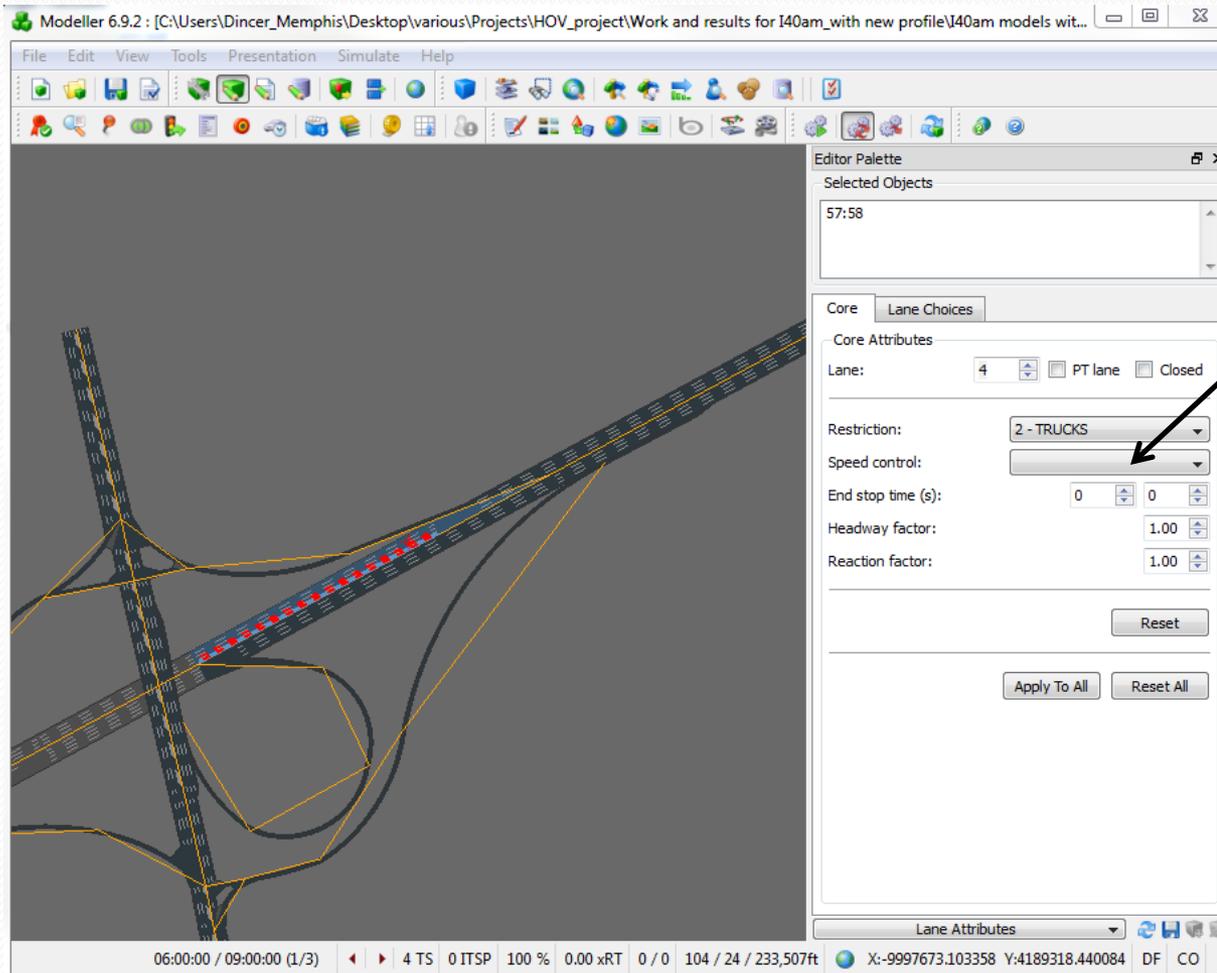
Link characteristics:

- 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

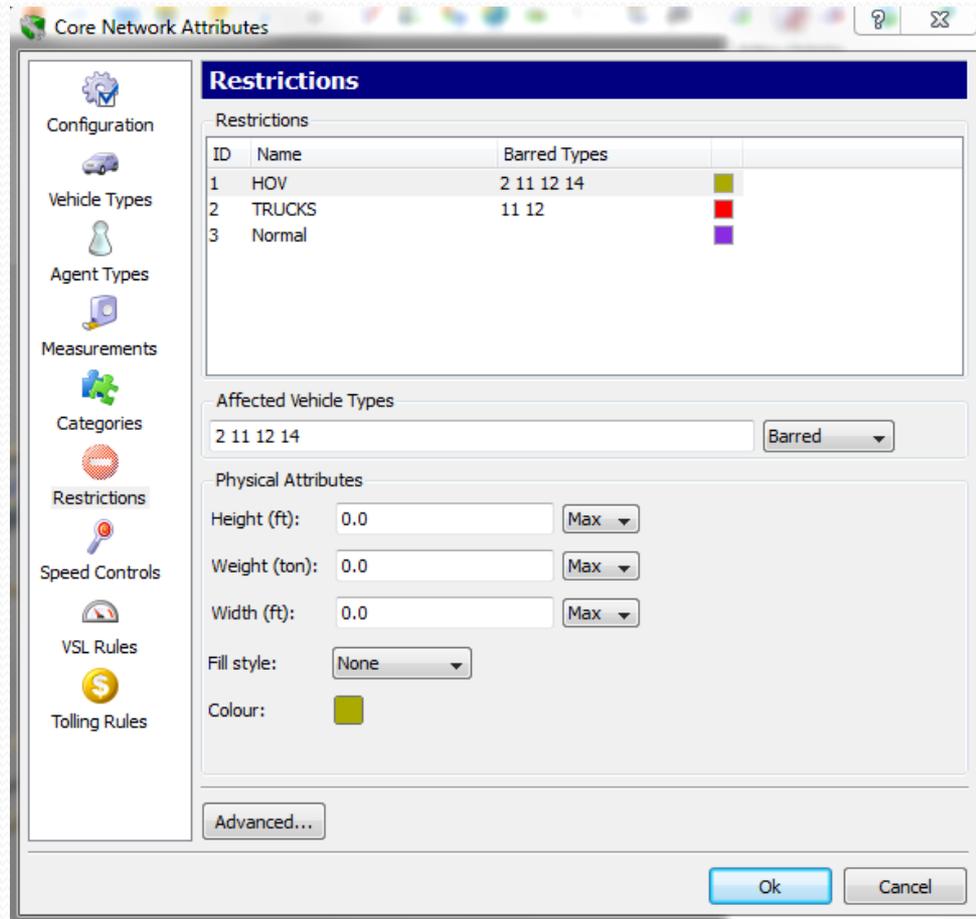
Having identified the junctions of the network, you can create links to connect them

# Editing Lane Attributes

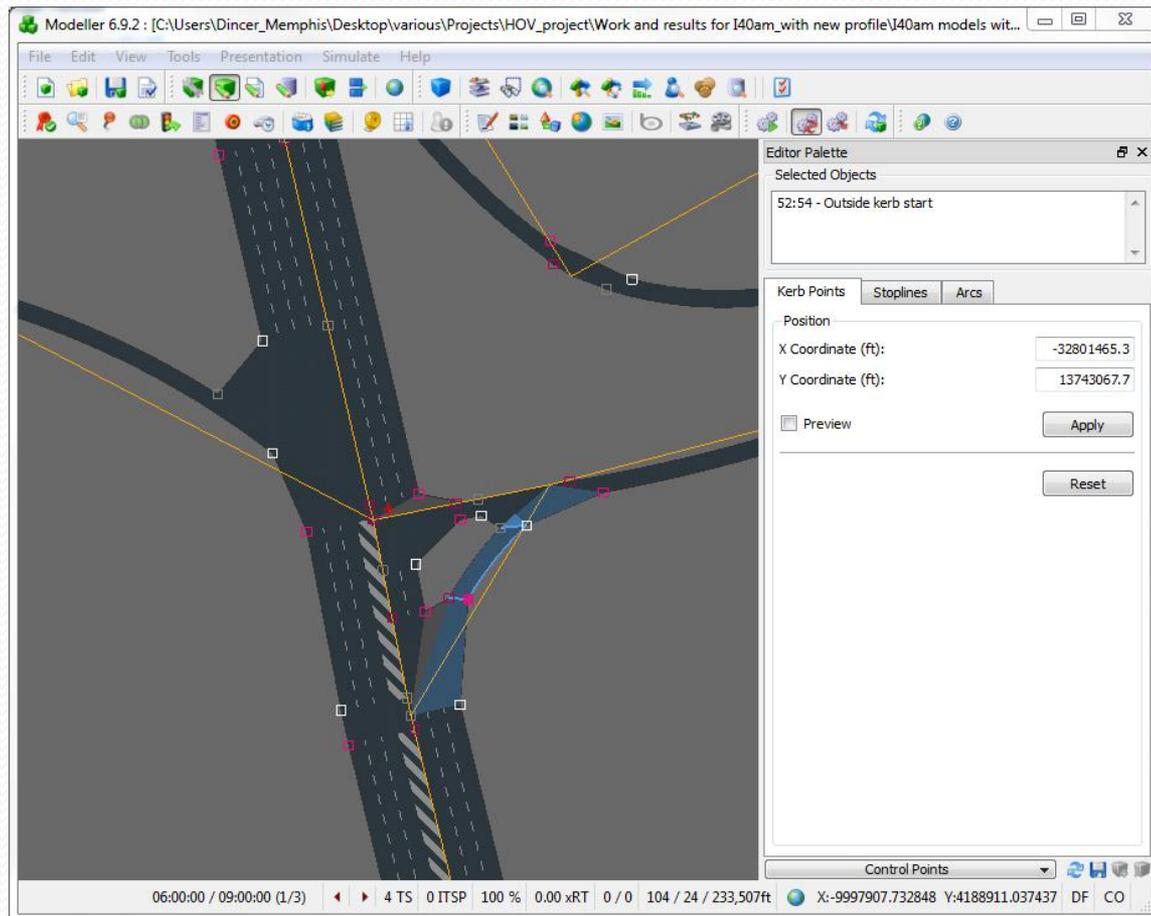


- Determine for each lane:
  - Any restrictions
  - Any speed control
  - Stop time at link end (simulate tolls)
  - Headway/reaction factor for adjusting vehicles behavior)

# Modelling Restrictions



# Control Points!!!



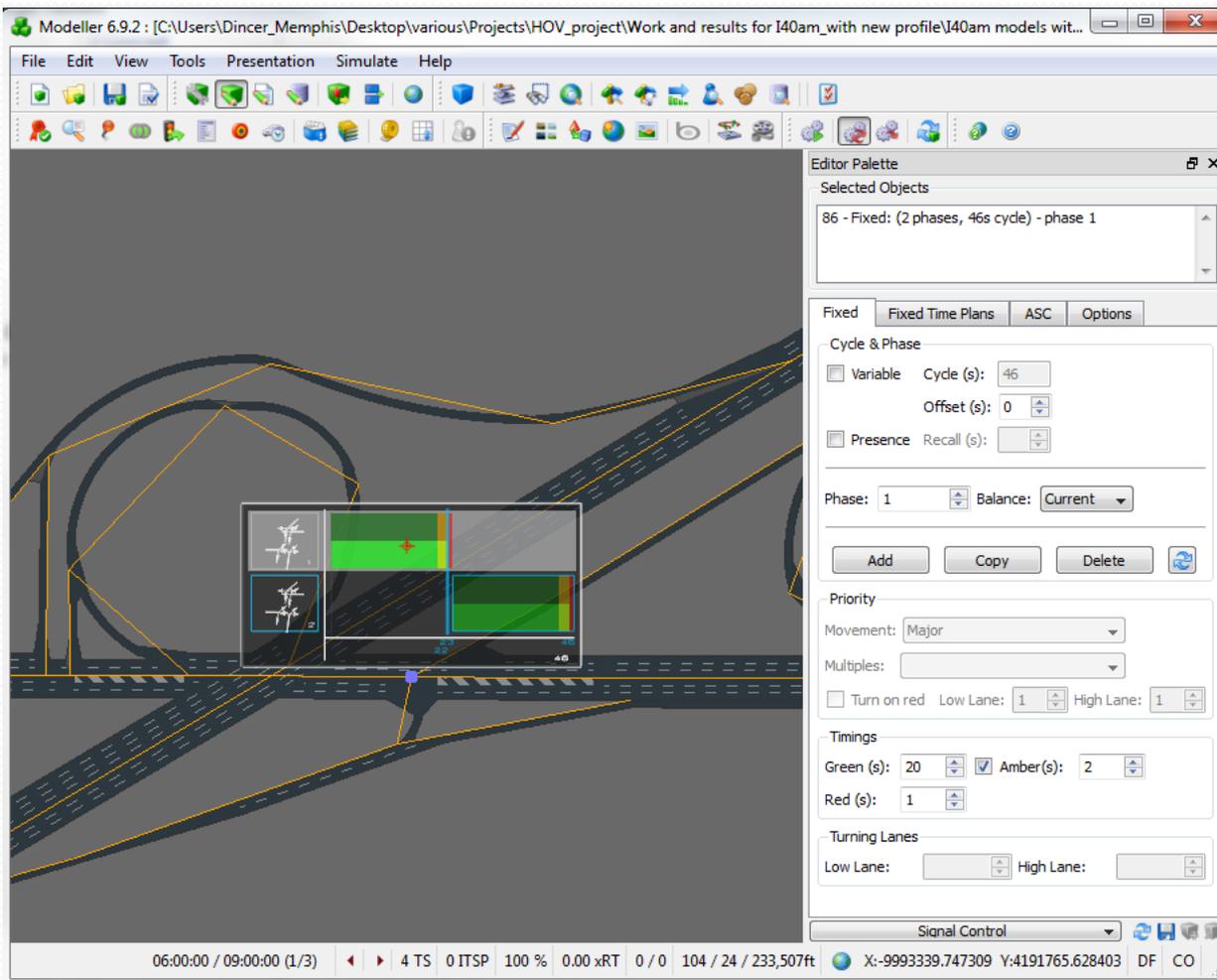
# Editing Movements!!!

The screenshot displays the Modeller 6.9.2 software interface. The main window shows a 3D perspective view of a road layout with several lanes. The Editor Palette is open on the right side, showing the 'Movements' tab. The 'Selected Objects' list contains '184:124 -> 124:24'. The 'Priority & Restrictions' section has 'Movement' set to 'Major', 'Multiples' set to '1', and 'Restriction' set to 'None'. The 'Turning Lanes' section has 'Low Lane' set to '1' and 'High Lane' set to '4'. The 'Nextlanes' table is shown below:

Lane	Low Index	High Index	% (1)	% (2)
Lane 1	1	2	50	50
Lane 2	3	3	100	

The status bar at the bottom shows '06:00:00 / 09:00:00 (1/3)', '4 TS', '0 ITSP', '100 %', '0.00 xRT', '0 / 0', '104 / 24 / 233,507ft', and coordinates 'X:-10002803.083559 Y:4186614.410539'. The 'Junctions' dropdown is also visible.

# 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

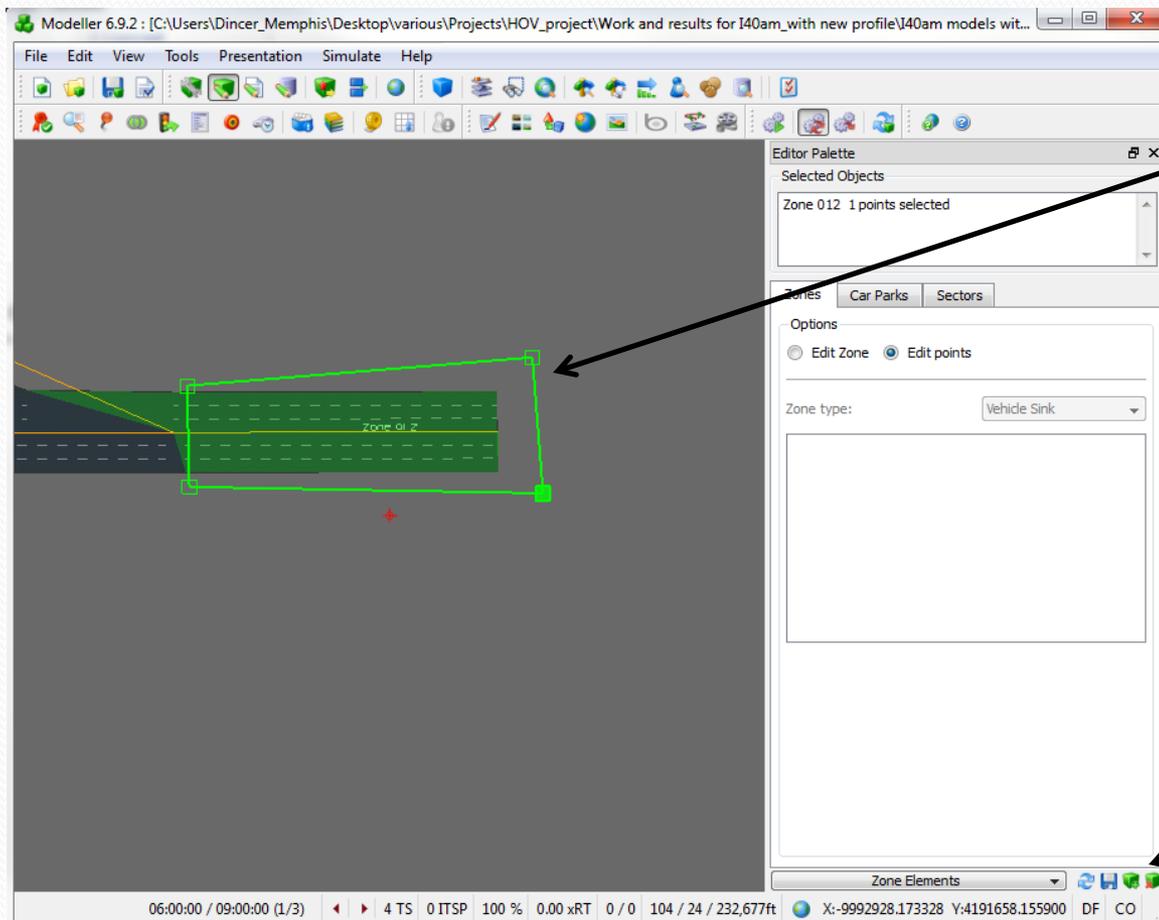
Turning Lanes

Low Lane: 3 High Lane: 3

Signal Control

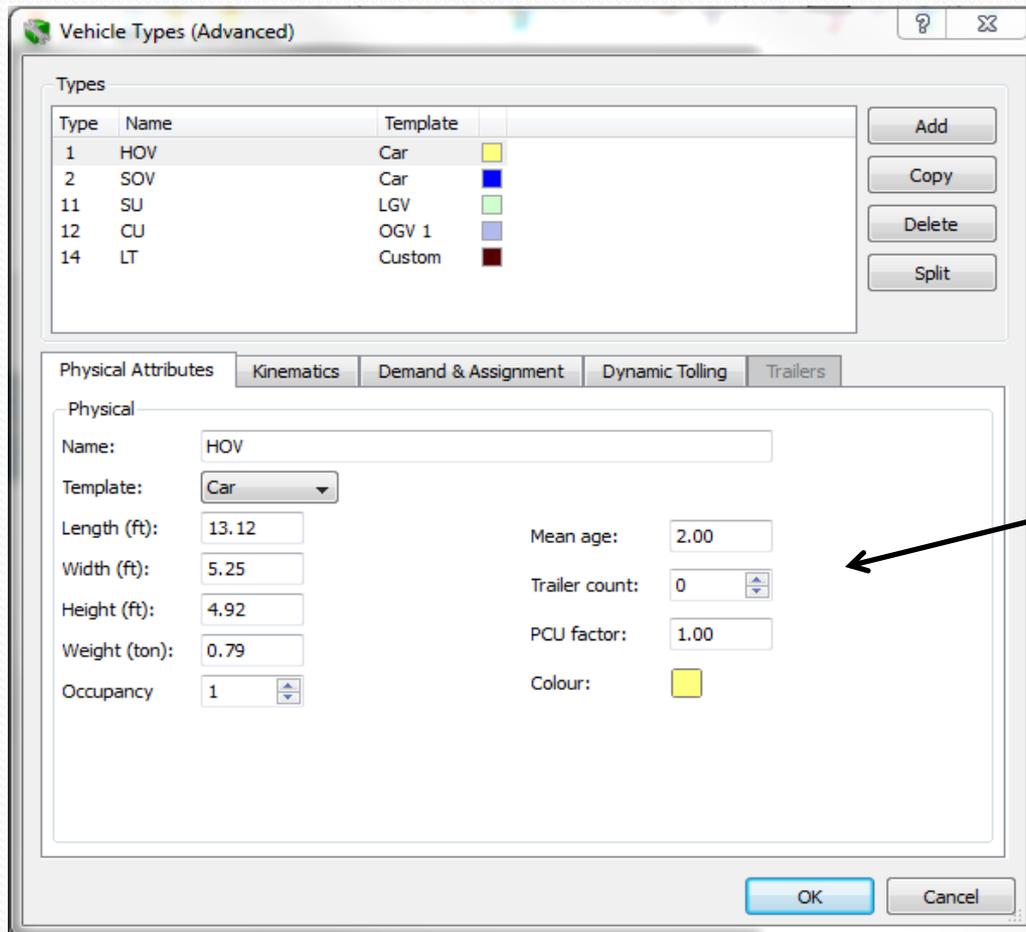
06:00:00 / 09:00:00 (1/3) 4 TS 0 ITSP 100 % 0.00 xRT 0 / 0 104 / 24 / 232,677ft X:-9993341.871881 Y:4191733.935900 DF CO

# 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



- 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
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

Demand & Assignment

OD Routing

Proportion (%): 7.80

Perturbation: 0.00

Familiarity (%): 85.00

Matrix: 1

Fixed Routing

Capacity:

Exit doors:

Entry doors:

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

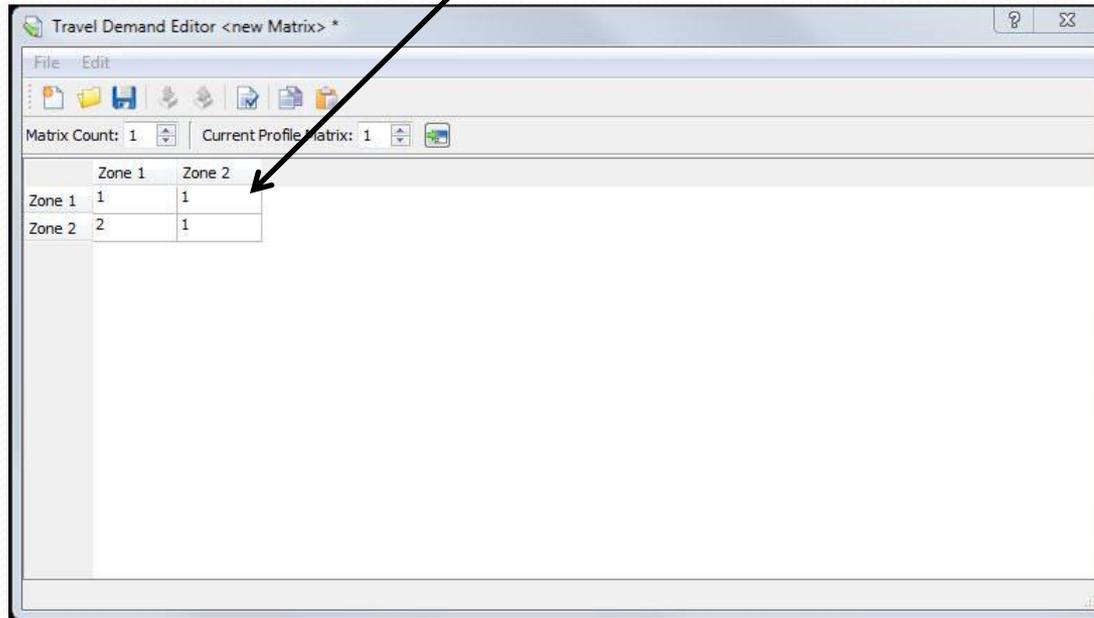
- This is the second profile

	Start Time			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 with '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

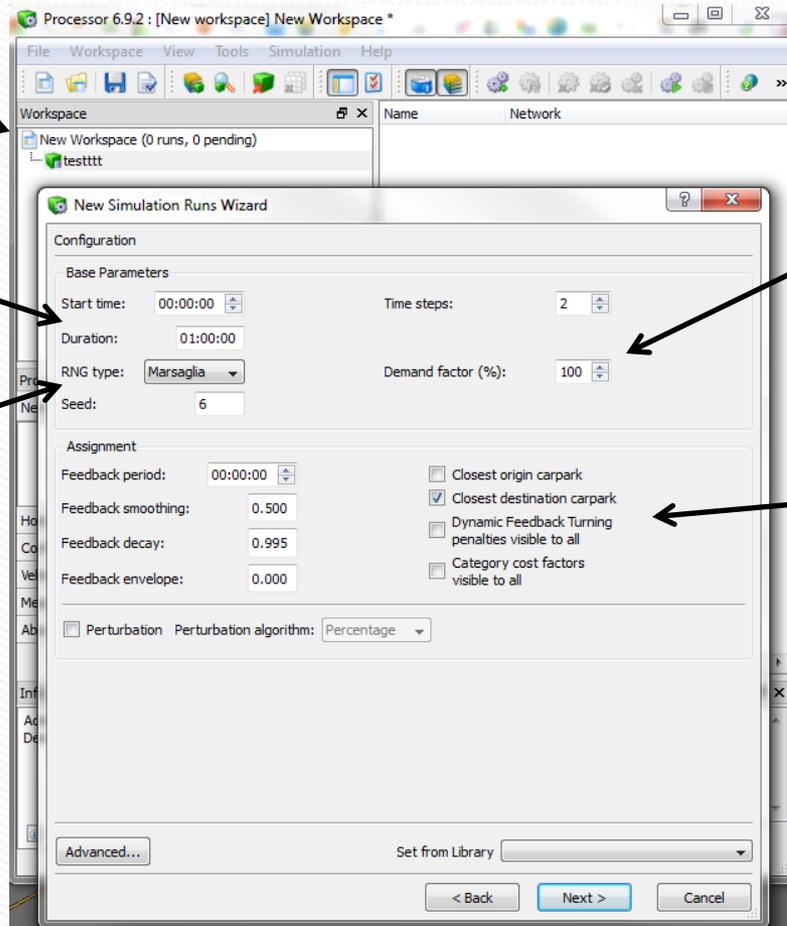
- Upload network



- Start time and duration of simulation



- Random number Generator for seeds (determined later)



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

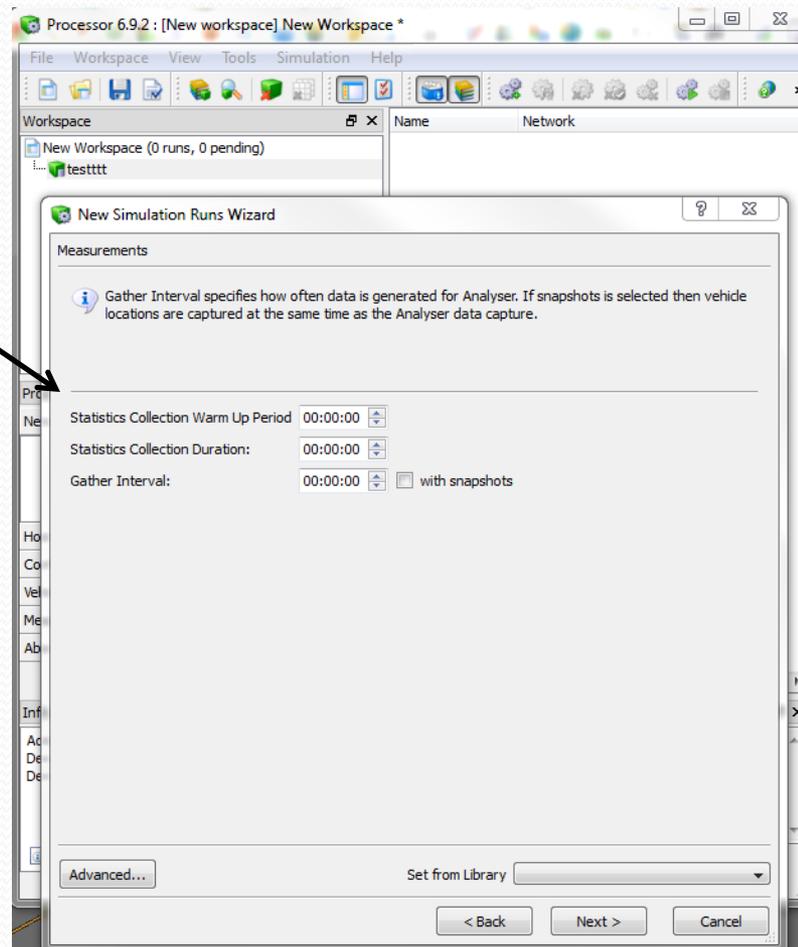


- Manages costs related to vehicles routes and vehicle travel behavior (use default values)



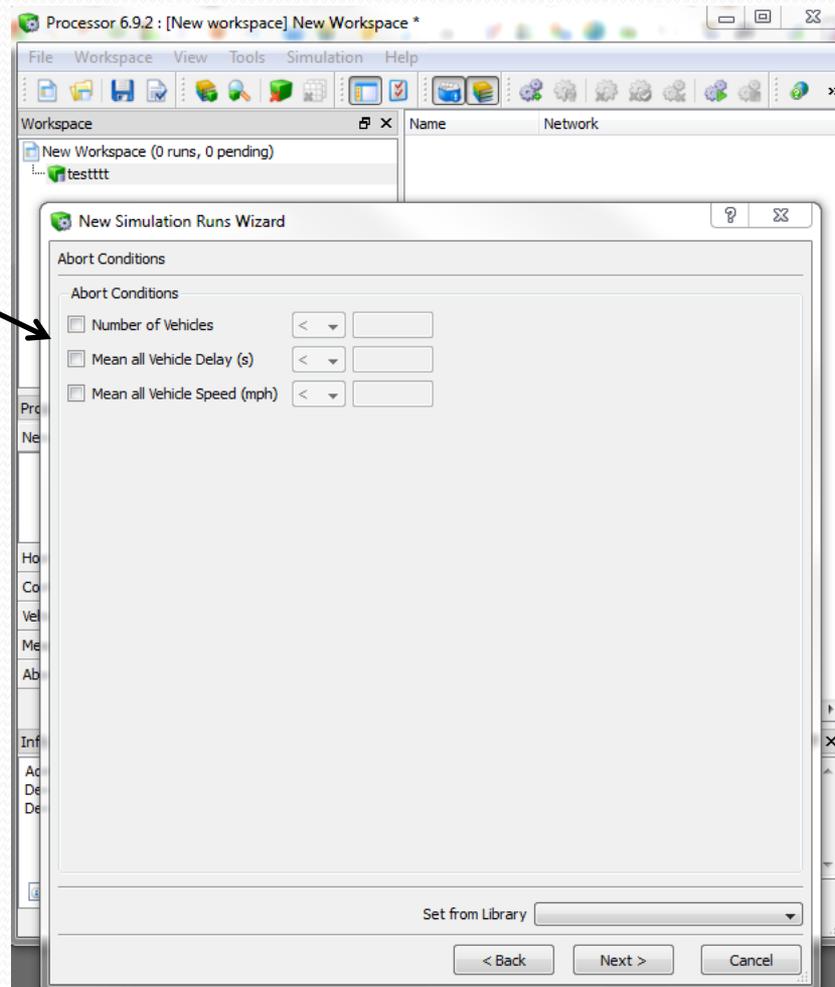
# Simulation with Processor-2

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



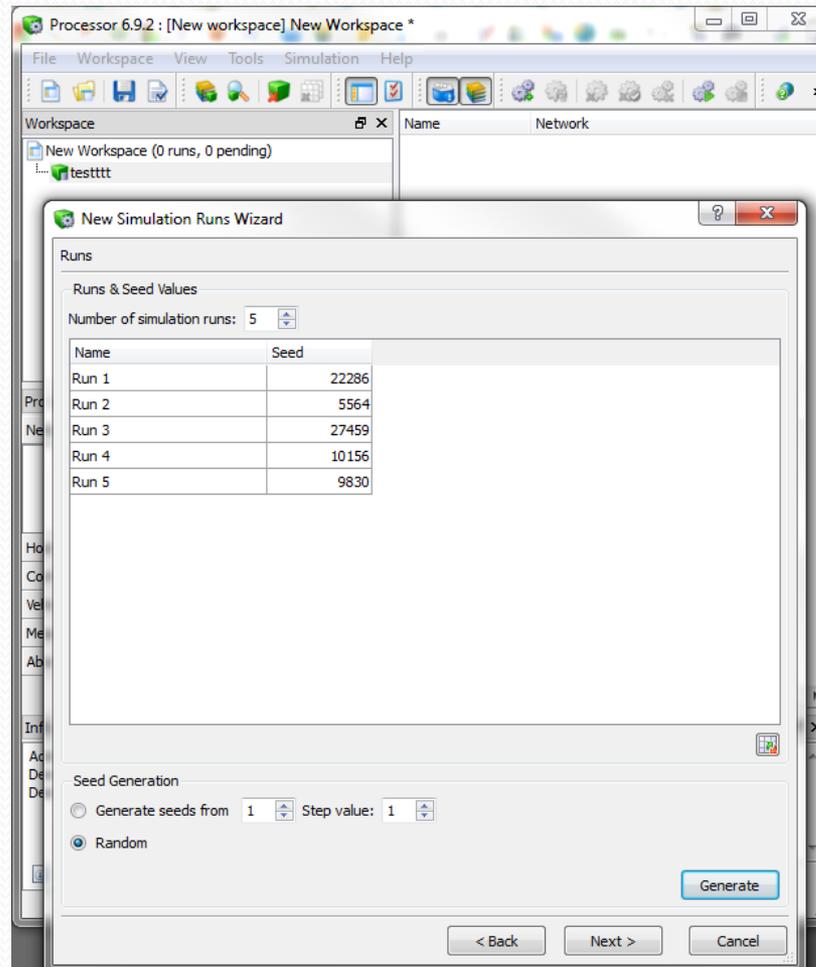
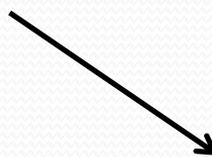
# Simulation with Processor-3

- If conditions are satisfied, simulation is aborted

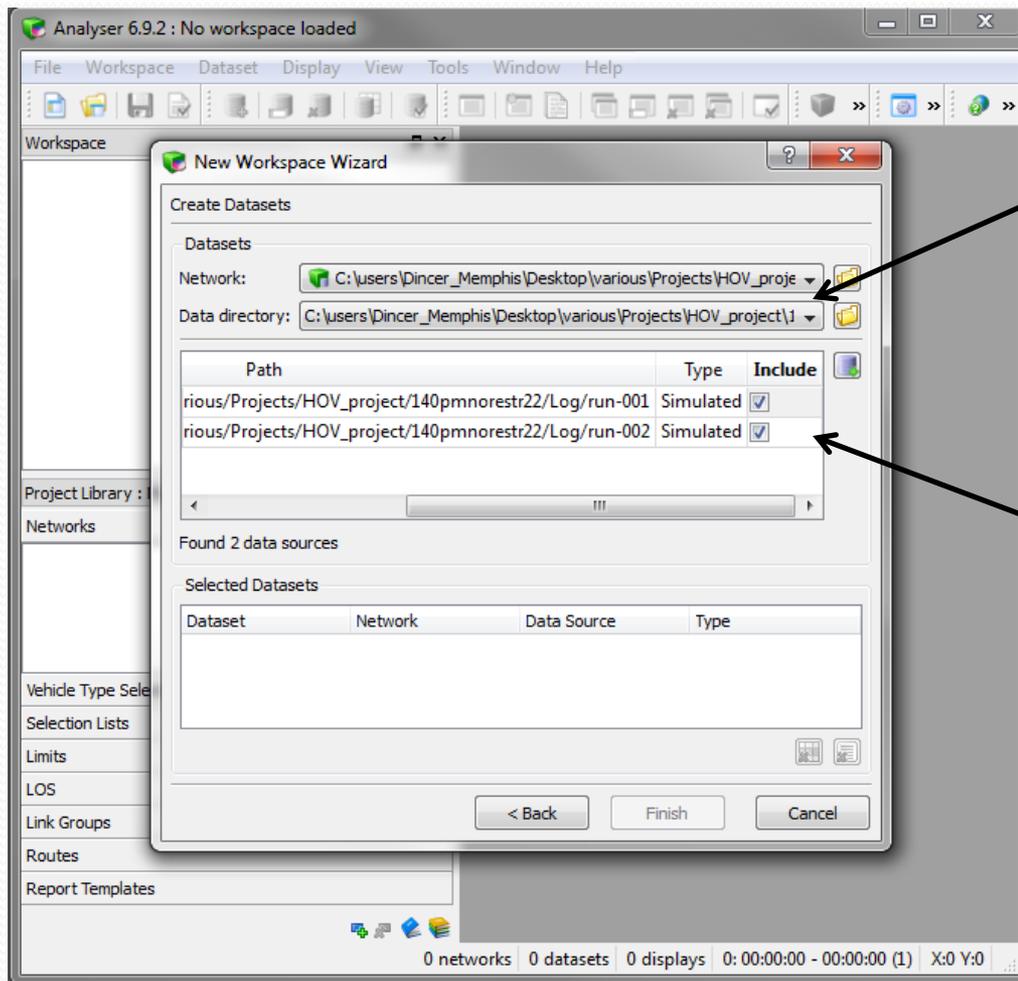


# Simulation with Processor-4

- Number of simulations



# Analyser for Outputs-1

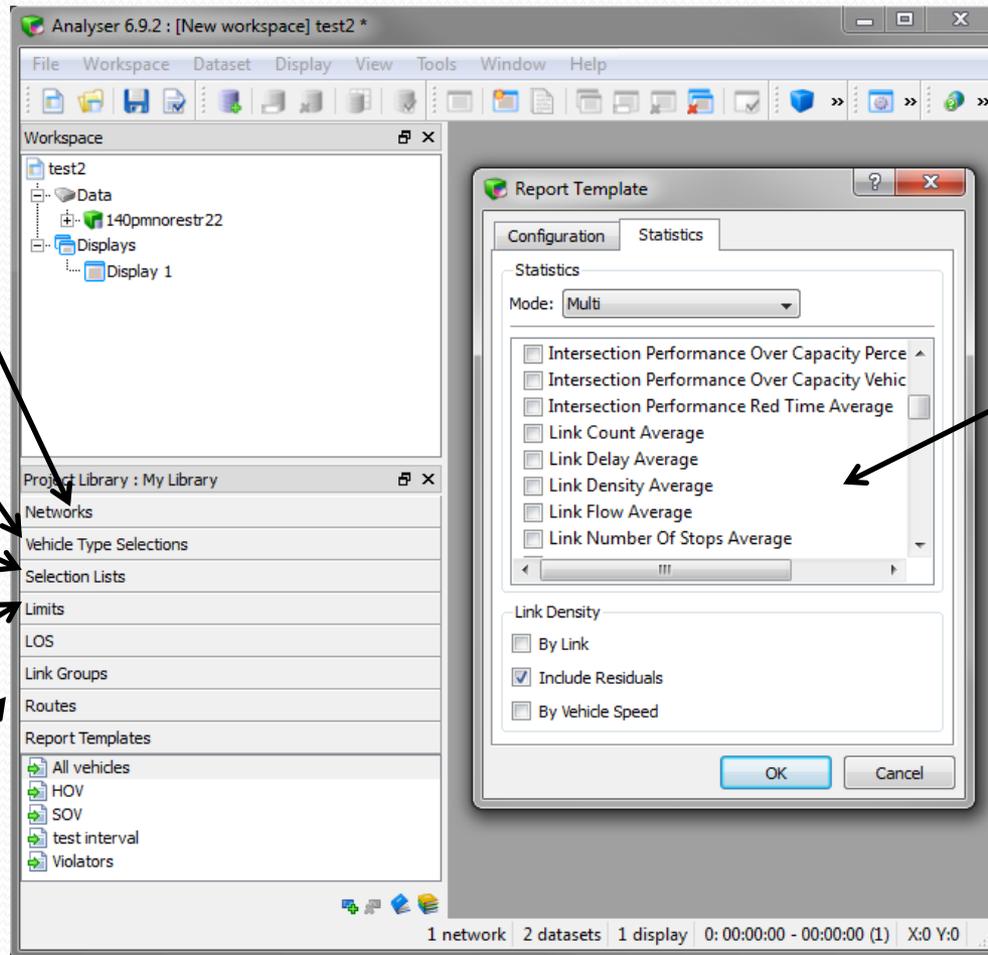


- Upload the network

- 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**