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:

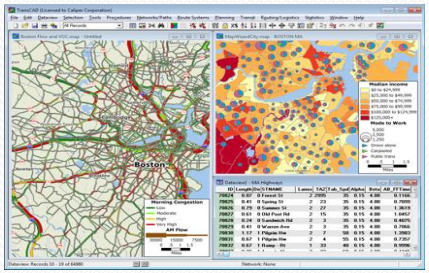
Modeling of individual vehicles movements in a micro level to assess the traffic performance of highway and street systems, transit and pedestrians.

Planning & Demand Forecasting:

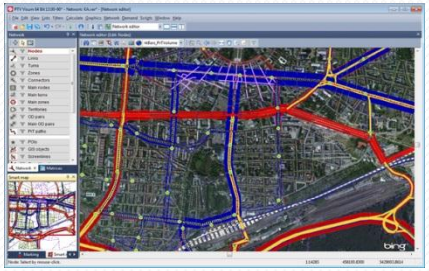
Application of forecasting models to develop a long range transportation plan. These models calculate the number of trips, connect origins with destinations, predict the travel mode and identify the routes to complete the trips.

Major Planning Software

TransCAD

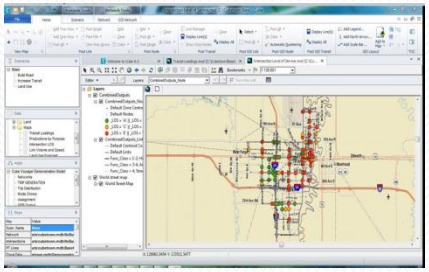


Visum



Planning-Demand Modeling

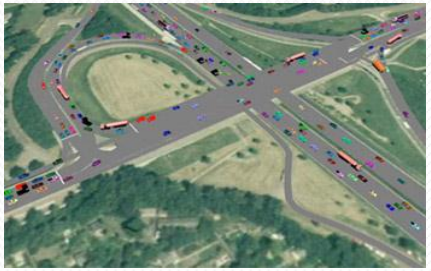
CUBE



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

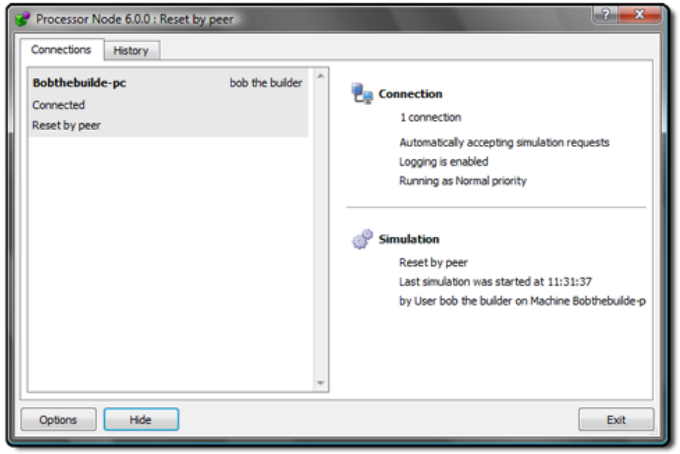
- **Modeler**
- **Processor**
- **Analyser**

→ ***Most widely used tools***

- Processor Node
- Converter
- Designer
- Estimator

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

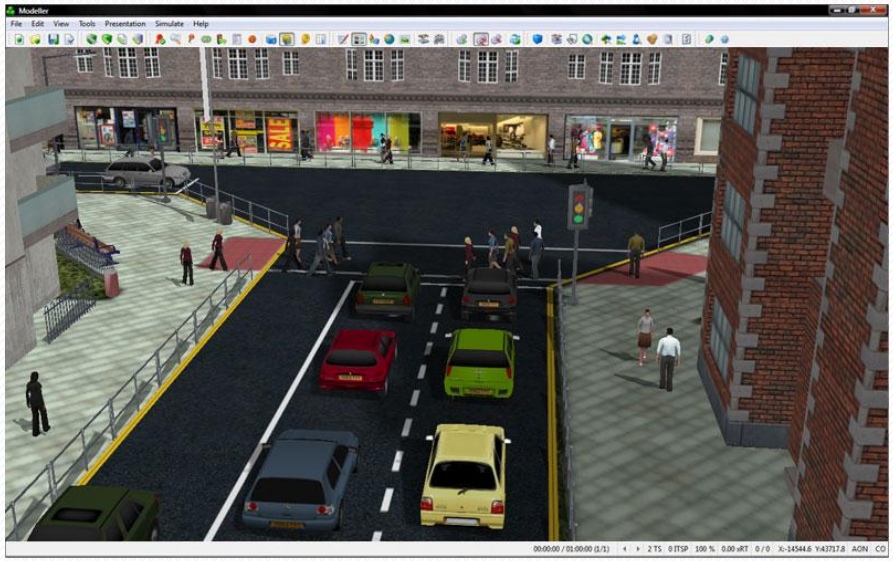
- "**Convert**" networks from other sources

- 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

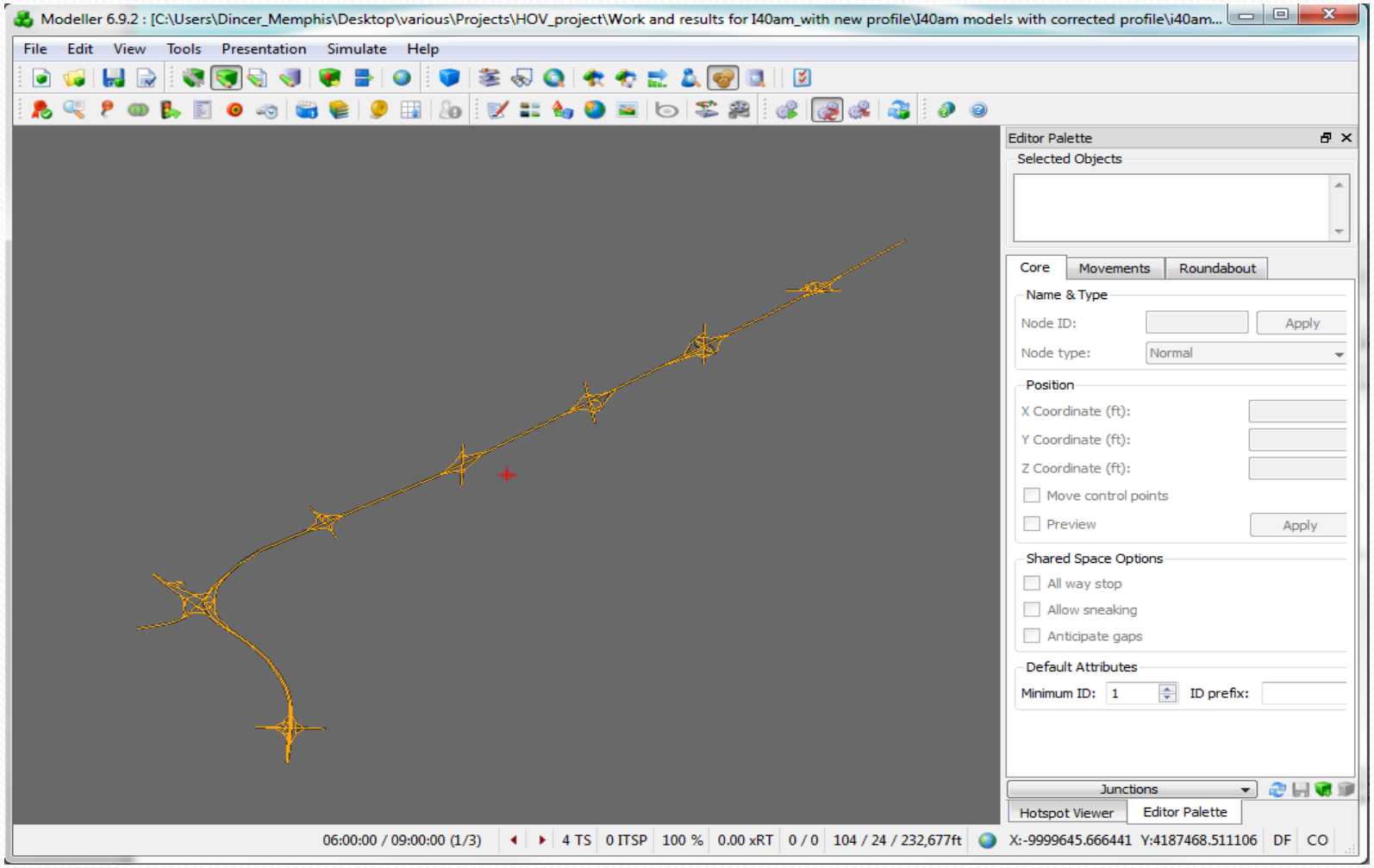
Estimator

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

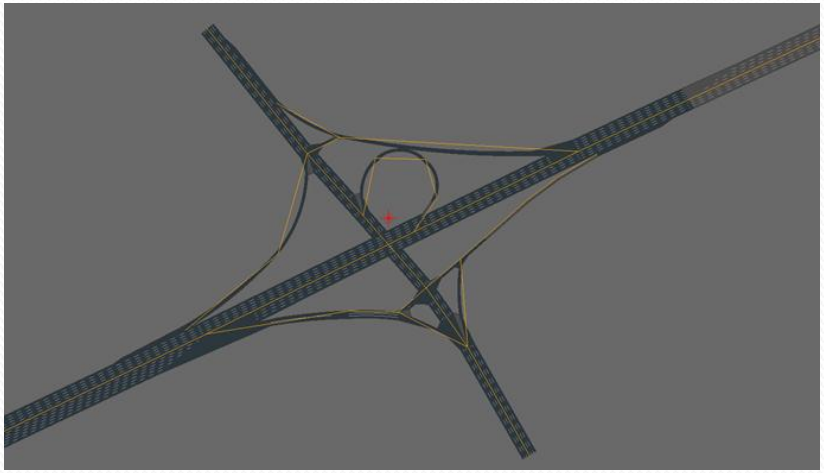
Modeler

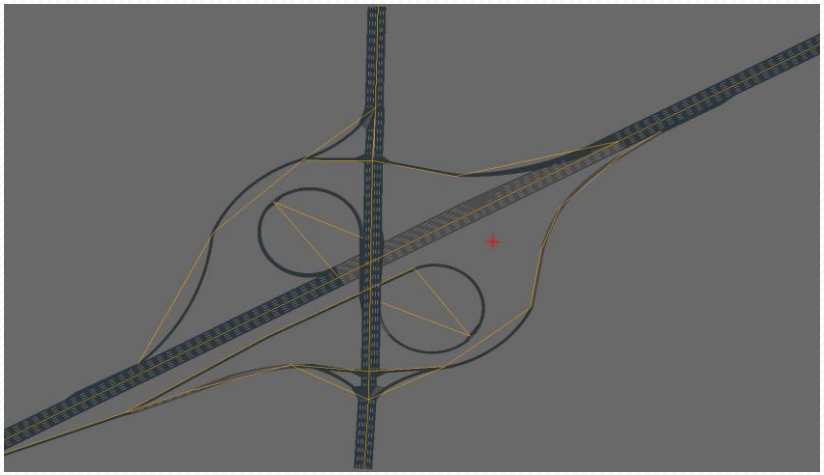
- Main tool
- It provides 4 fundamental operations:
  - **Building the network** (geometry, link speeds, junctions rules and priorities, traffic signals)
  - **Editing demand** (zones, OD matrix, demand profile)
  - **Simulating traffic** (with 3D visualization)
  - **Estimating MOEs** using detectors

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

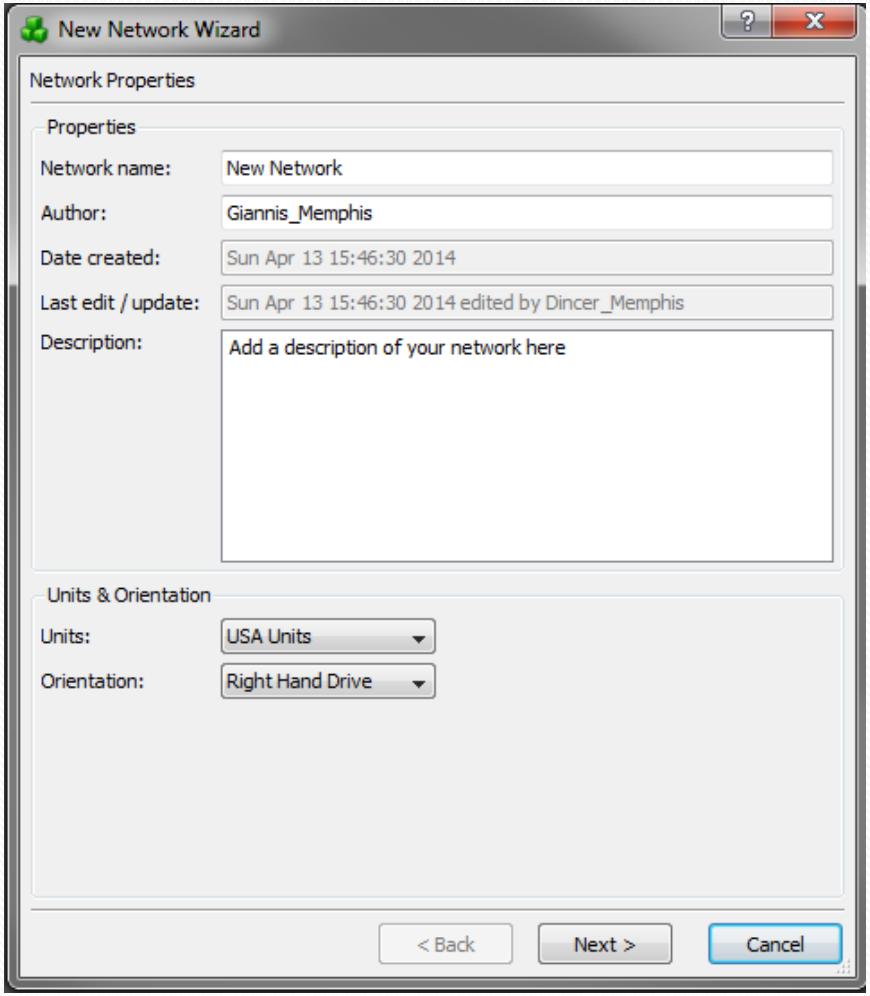
Analyser

- 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.

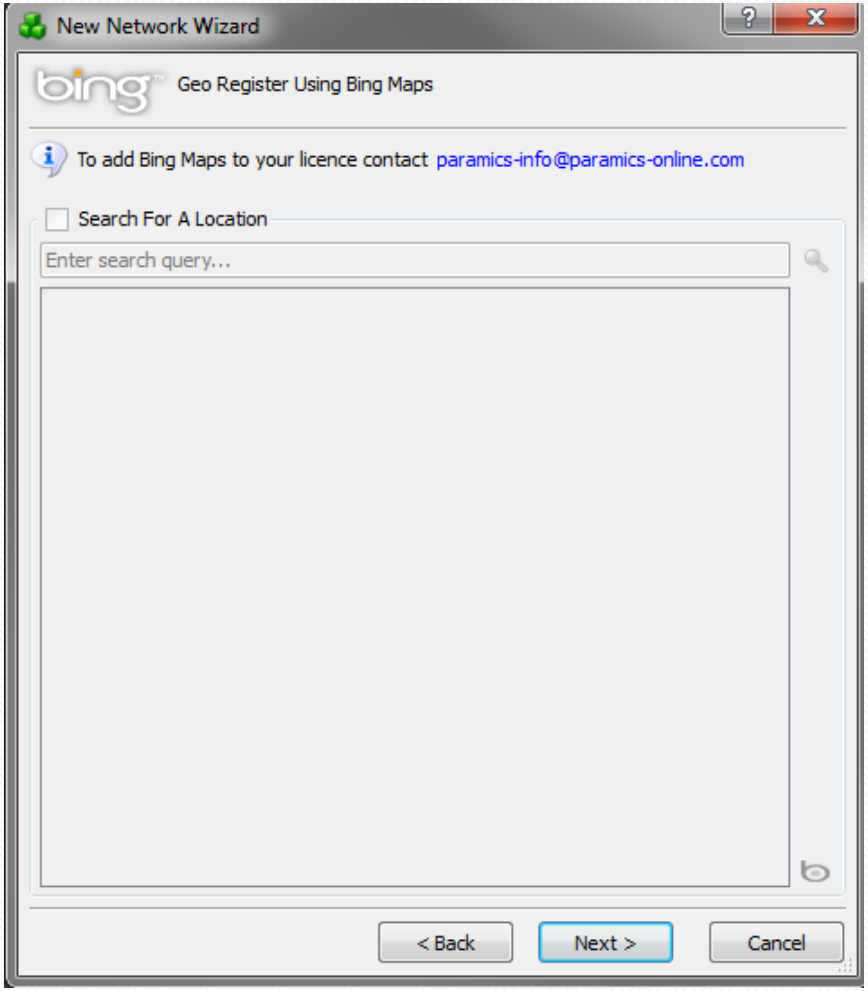
Developing a Model in Modeller

- 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



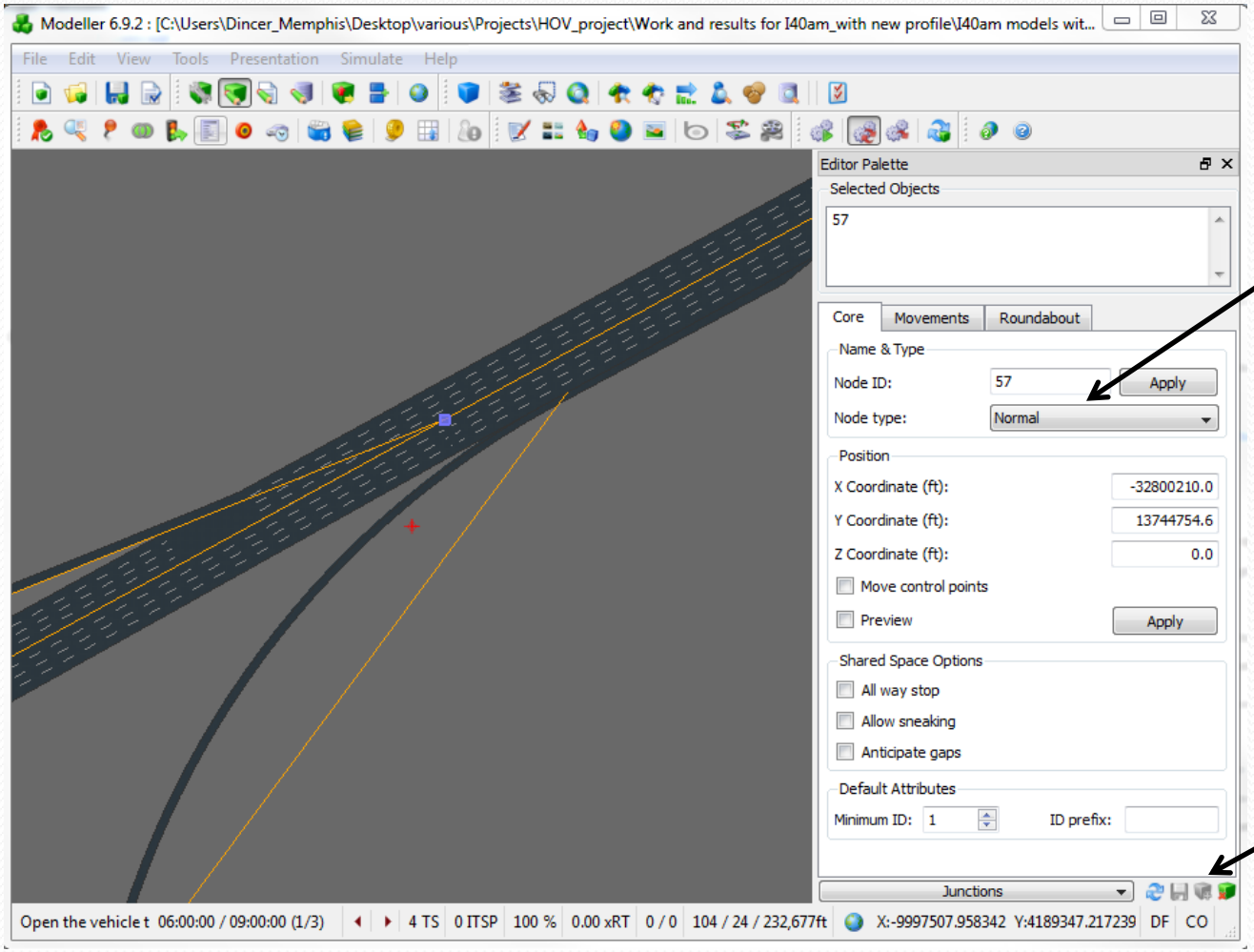
New Network Wizard (Cont.)



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

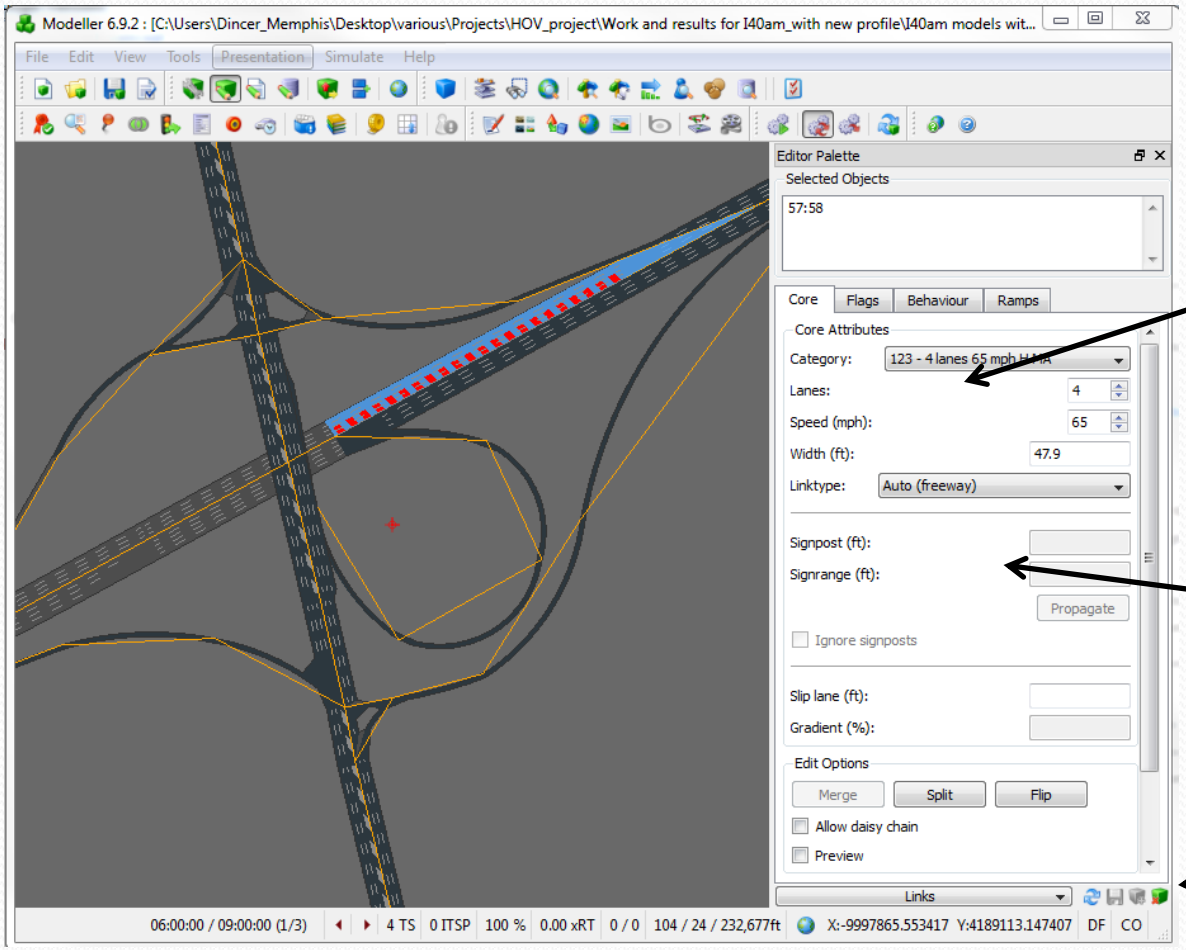


Node Type:

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

Create/delete junctions

Link Editing



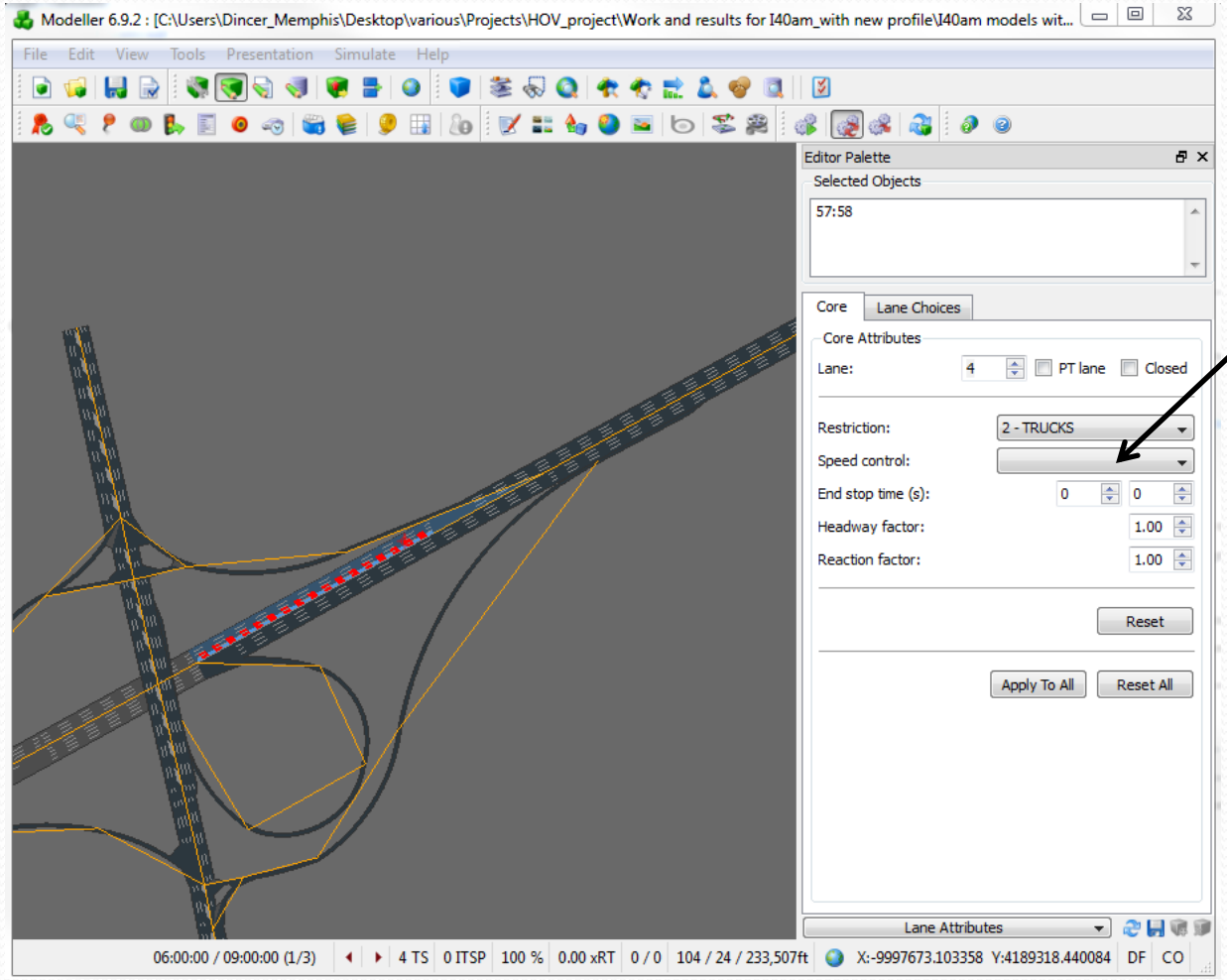
Link characteristics:

- 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

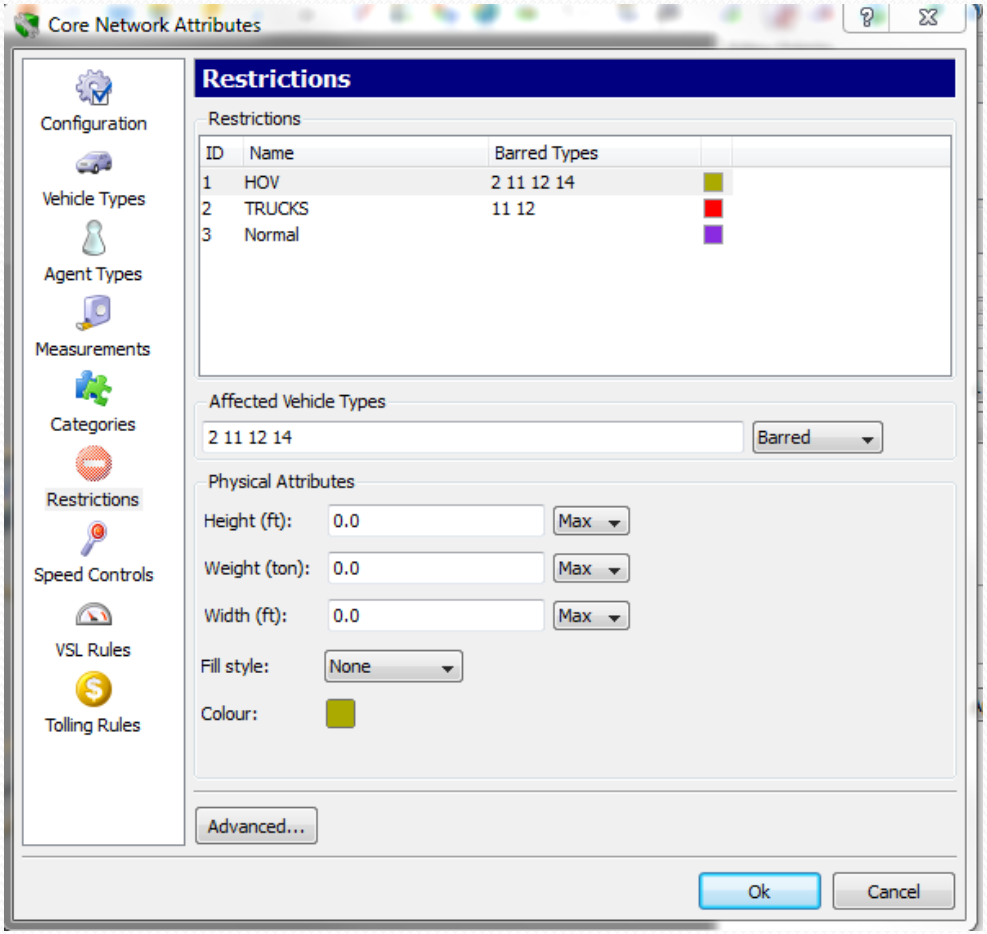
Having identified the junctions of the network, you can create links to connect them

Editing Lane Attributes

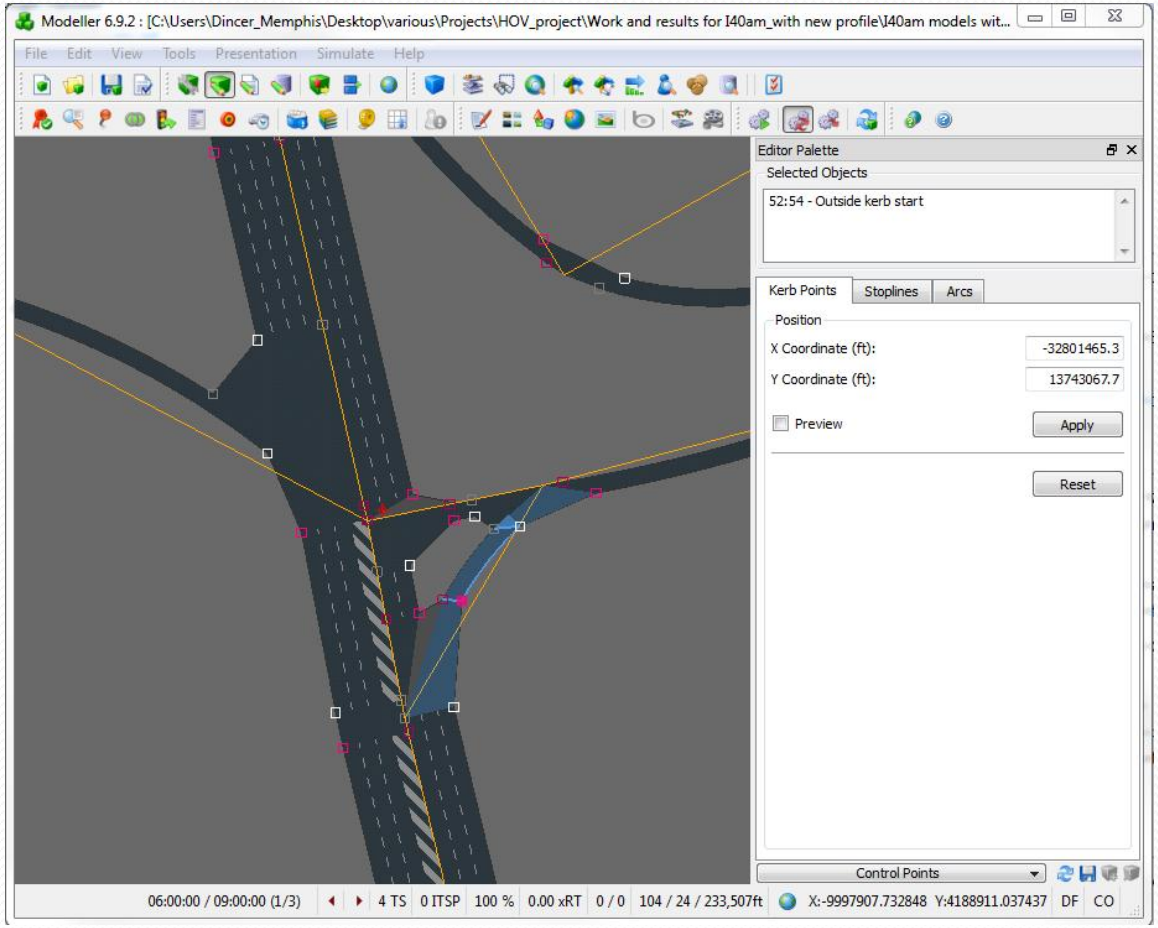


- Determine for each lane:
  - Any restrictions
  - Any speed control
  - Stop time at link end (simulate tolls)
  - Headway/reaction factor for adjusting vehicles behavior)

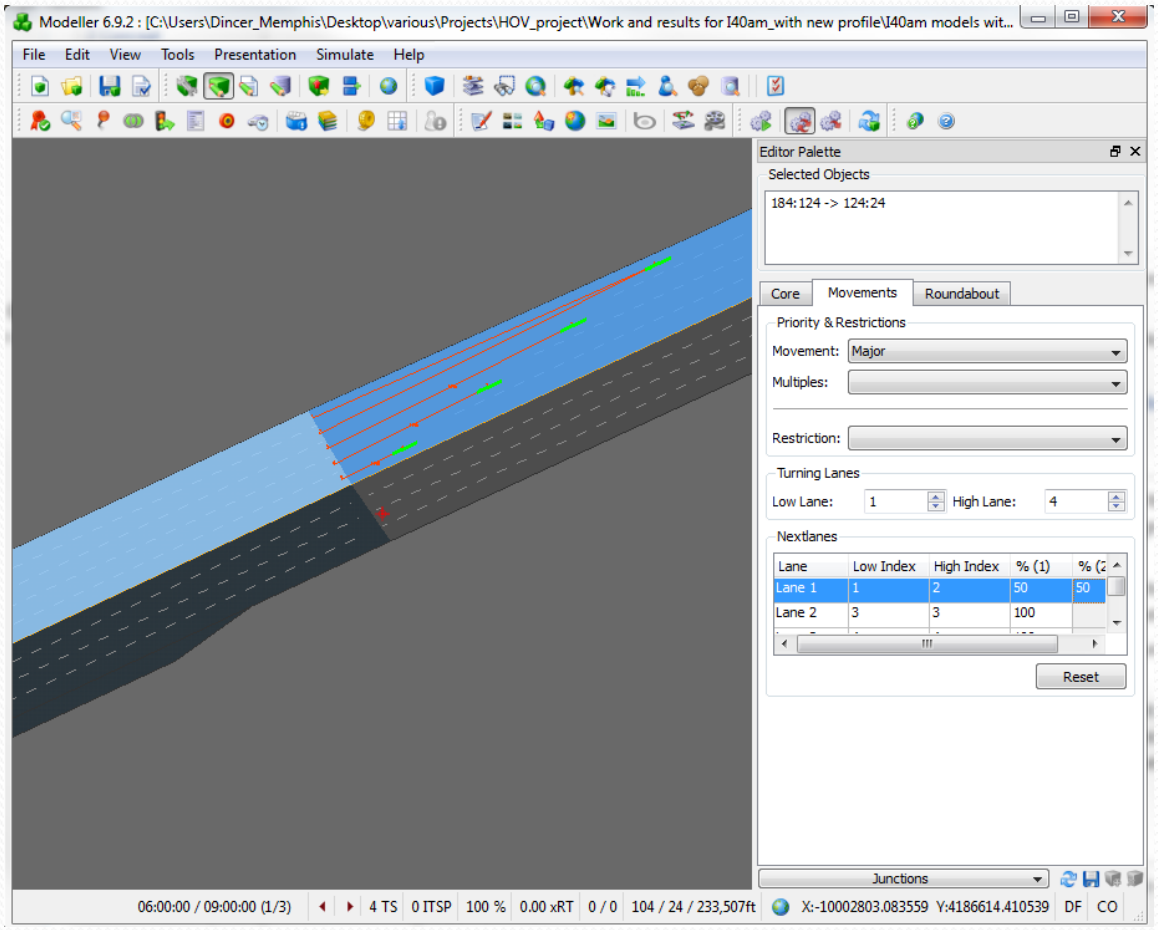
Modelling Restrictions



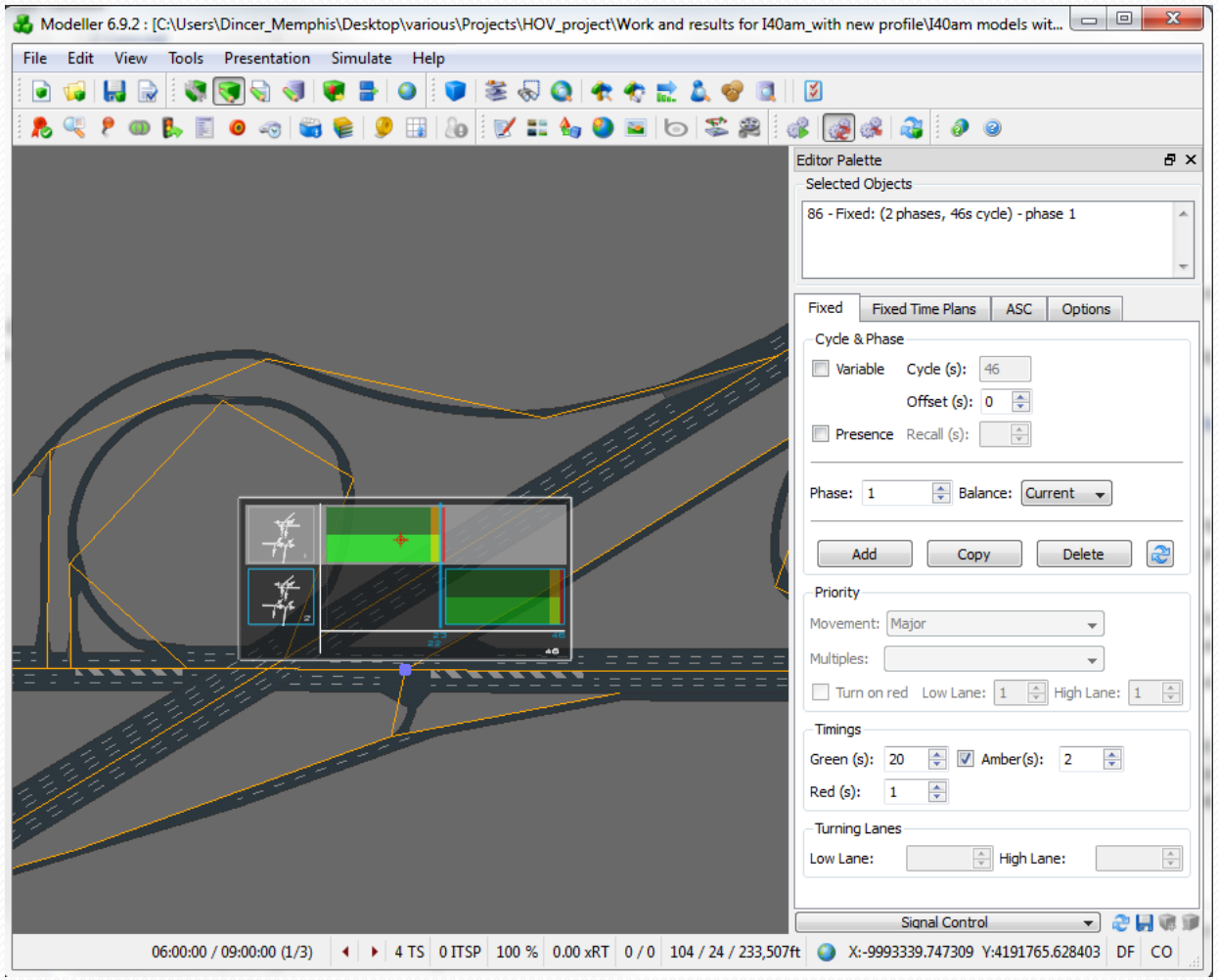
Control Points!!!



Editing Movements!!!

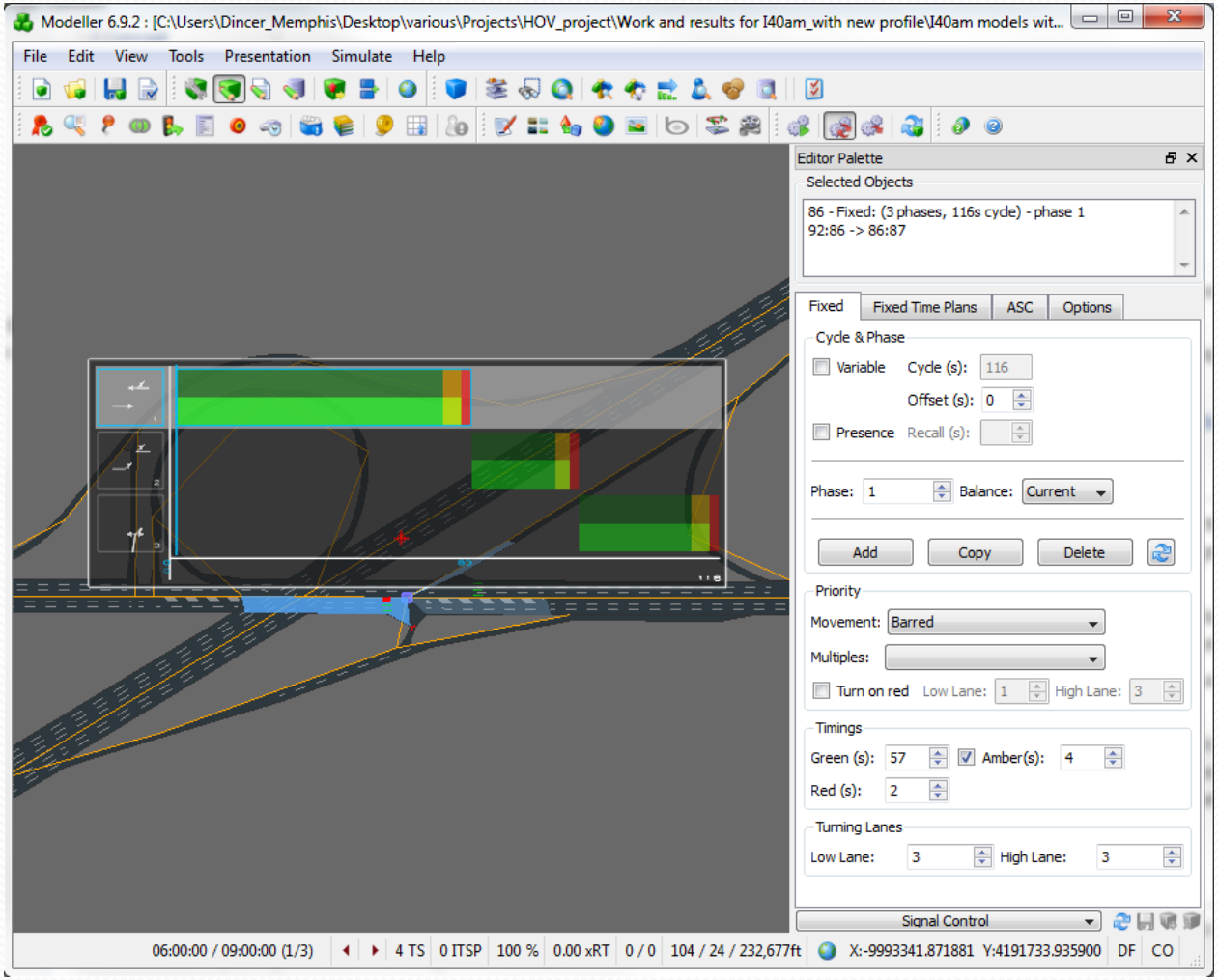


Fixing Traffic Signals

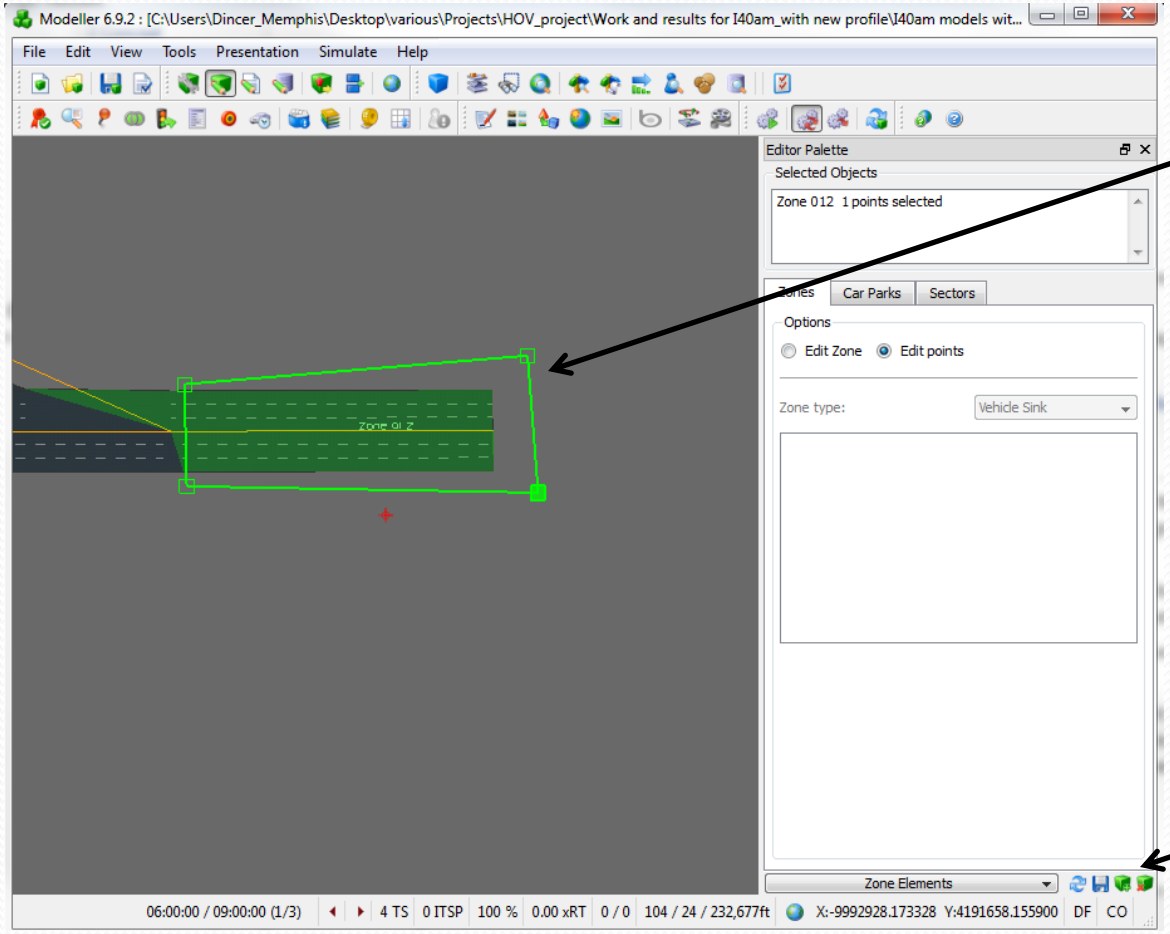


- After pressing Signalize button a template is developed
- This template is wrong!
- You have to adjust:
  - Number of Phases
  - Movements allowed or barred in each phase
  - Signal timings per phase
- **You can also model Actuated Signal Control**

Fixed Traffic Signal

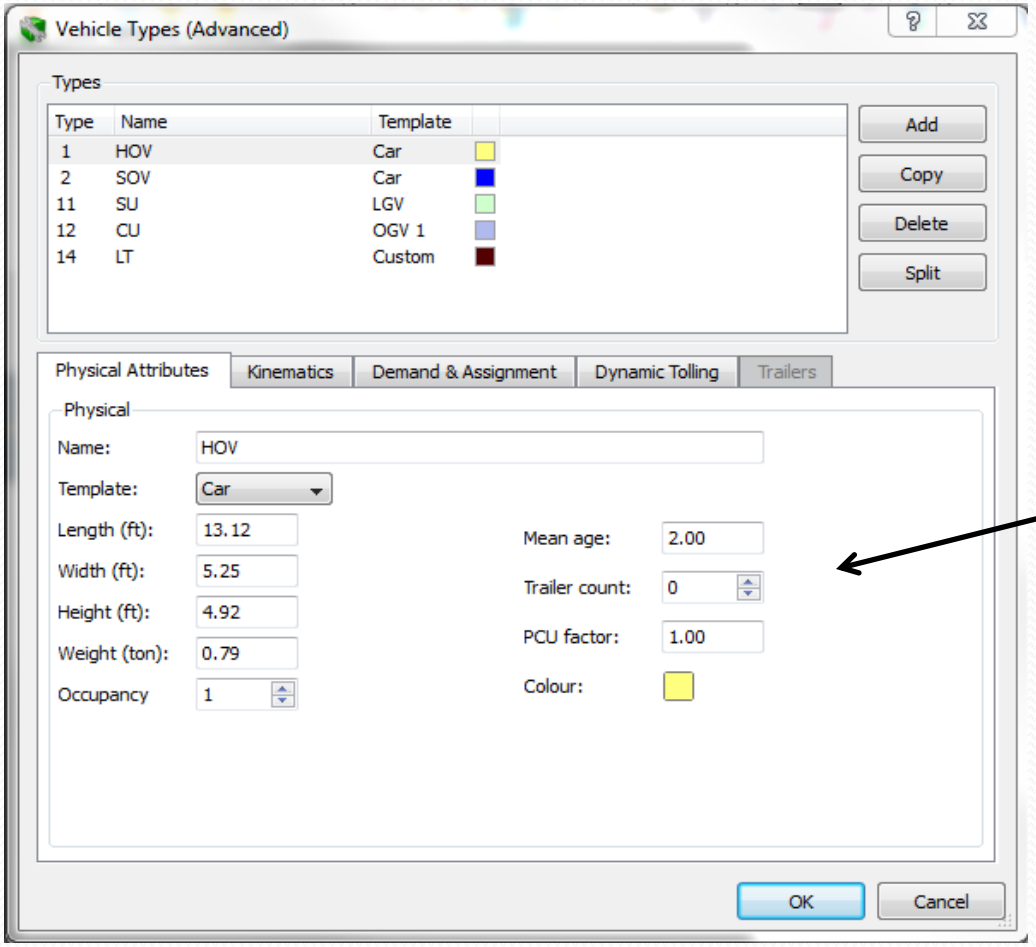


Zones of the Study Area



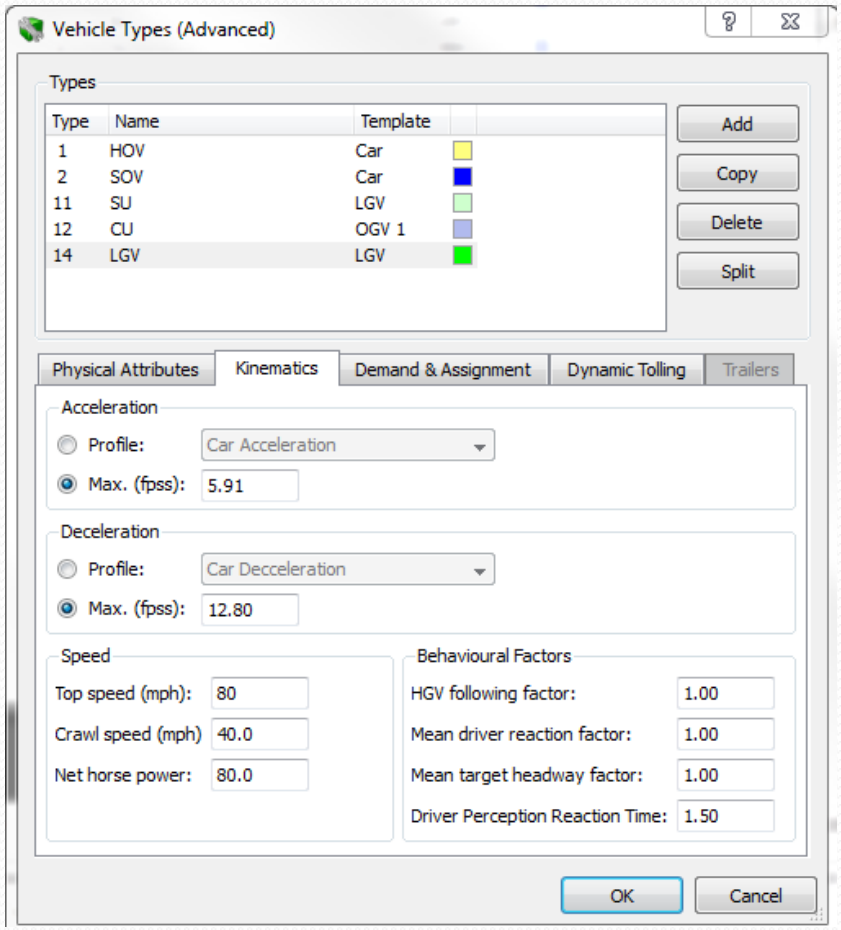
- Zones can produce /attract (or both) trips, depending on the borders of the zone
- Zone types:
  - Vehicle sink
  - Car parking
  - Waypoints
- Zone borders in red, zone doesn't work properly
- Tools for creating /deleting zones

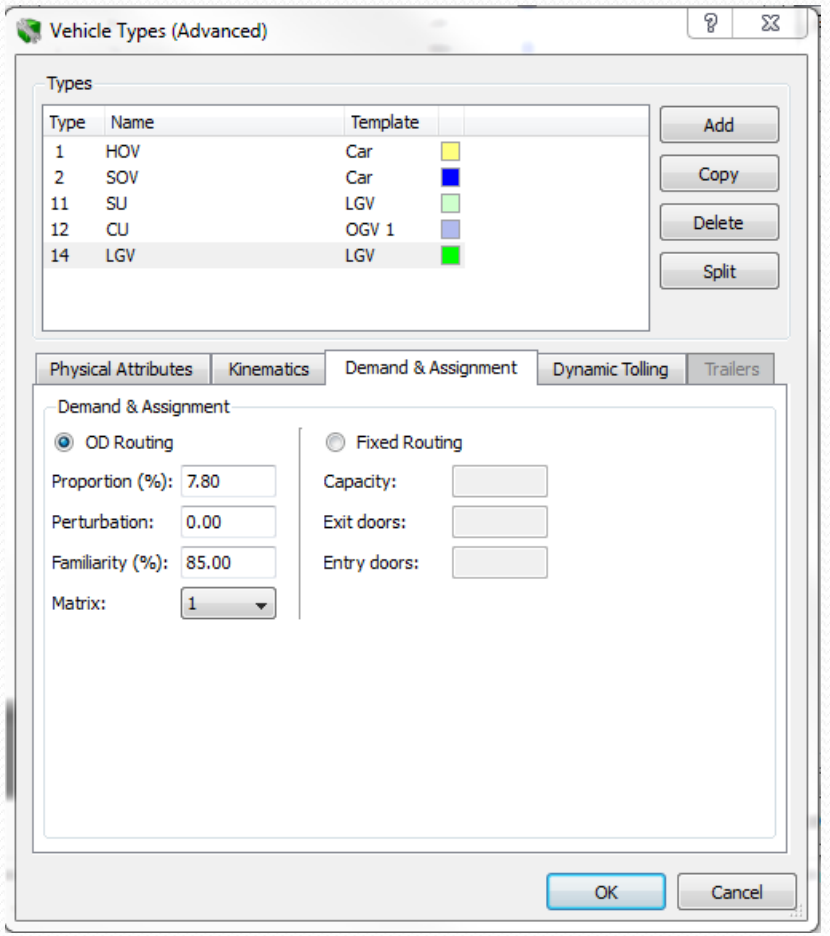
Vehicle Templates



- 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



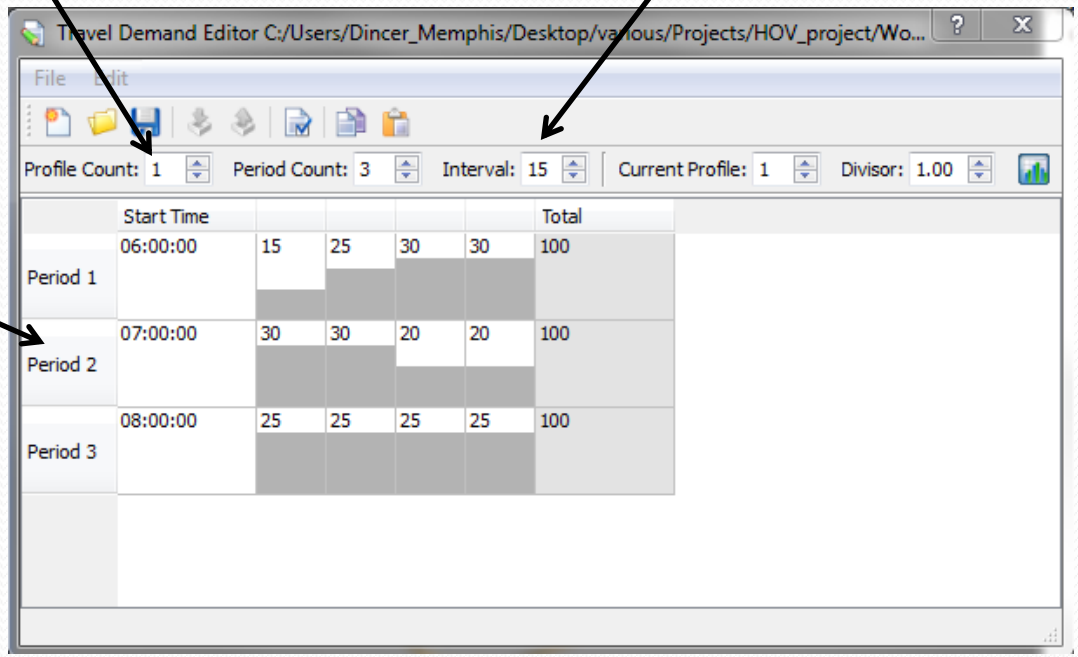


Demand Editor

- 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)

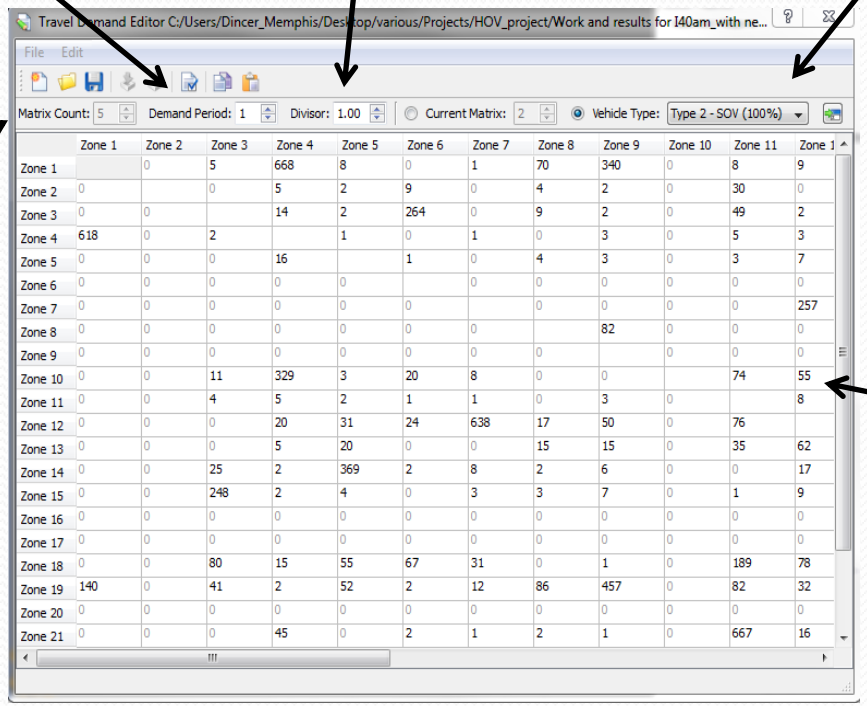
Editing Demand Profile

- 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)



Editing Demands

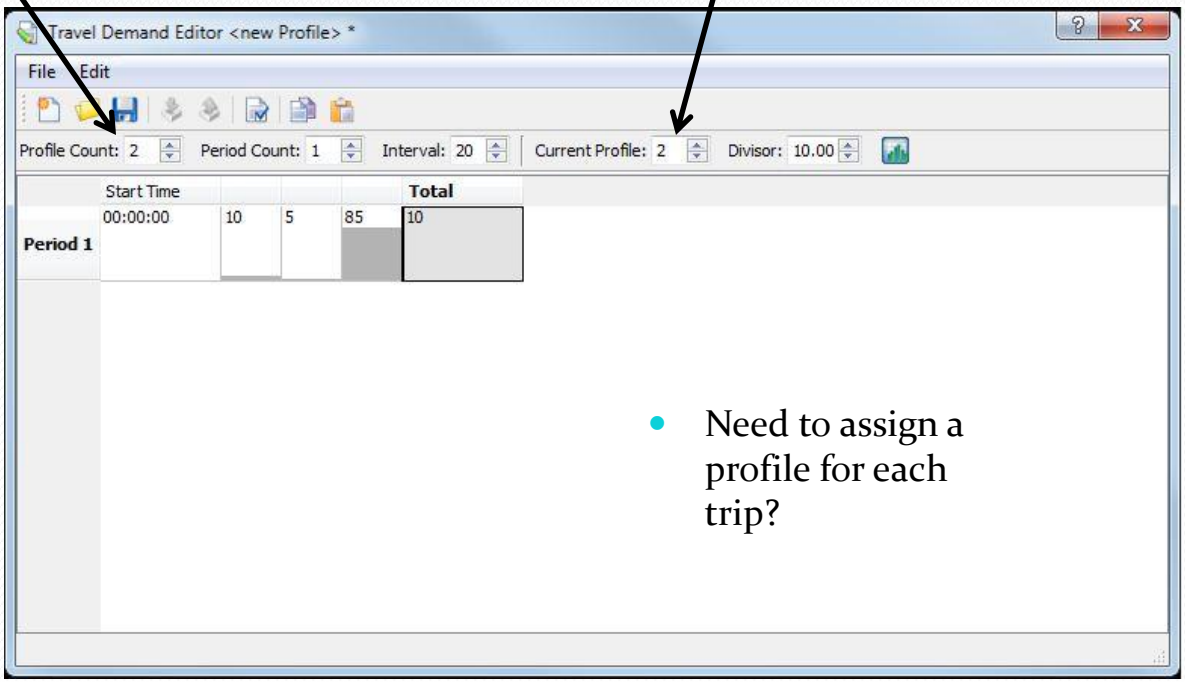
- You can have 1 demand period for the whole simulation period or split it (e.g. demand/hour)
- For high volumes you can divide the volume numbers
- Specify one matrix per vehicle type for each demand period
- Total matrix number for each demand period
- Traffic demand is usually provided by TransCAD software



	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	5	668	8	0	1	70	340	0	8	9
Zone 2	0		0	5	2	9	0	4	2	0	30	0
Zone 3	0	0		14	2	264	0	9	2	0	49	2
Zone 4	618	0	2		1	0	1	0	3	0	5	3
Zone 5	0	0	0	16		1	0	4	3	0	3	7
Zone 6	0	0	0	0	0		0	0	0	0	0	0
Zone 7	0	0	0	0	0	0		0	0	0	0	257
Zone 8	0	0	0	0	0	0	0		82	0	0	0
Zone 9	0	0	0	0	0	0	0	0		0	0	0
Zone 10	0	0	11	329	3	20	8	0	0		74	55
Zone 11	0	0	4	5	2	1	1	0	3	0		8
Zone 12	0	0	0	20	31	24	638	17	50	0	76	
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

Different Profiles for each Trip

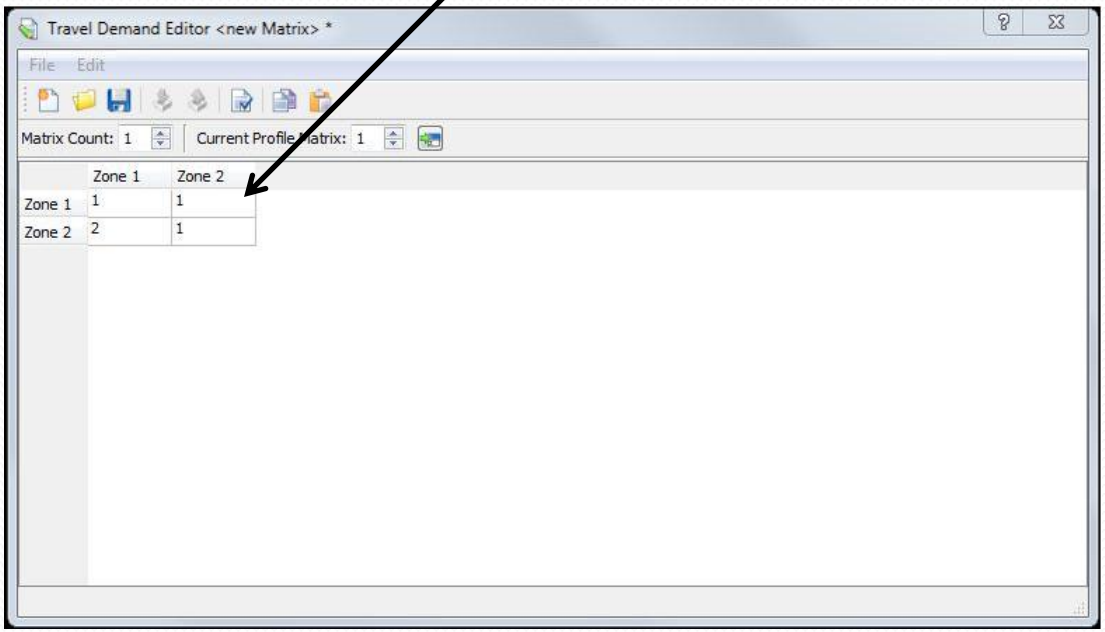
- 2 separate profiles for 1 period
- This is the second profile



- Need to assign a profile for each trip?

Profile Assignment Matrix

- Assigning profiles to trips



Simulation in Paramics-1

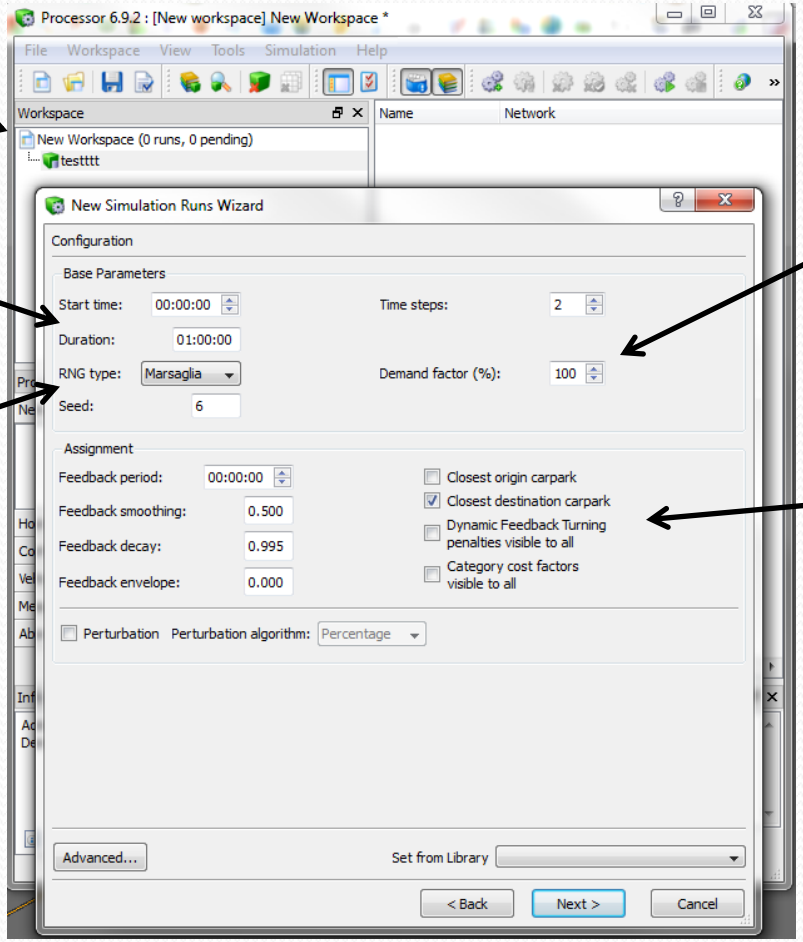
- Visual simulation using Modeller
  - Visual representation of vehicles movements
  - Easy way to identify potential errors (e.g. hotspot viewer)
  - Difficulties in producing simulation outputs
  - Time consuming

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

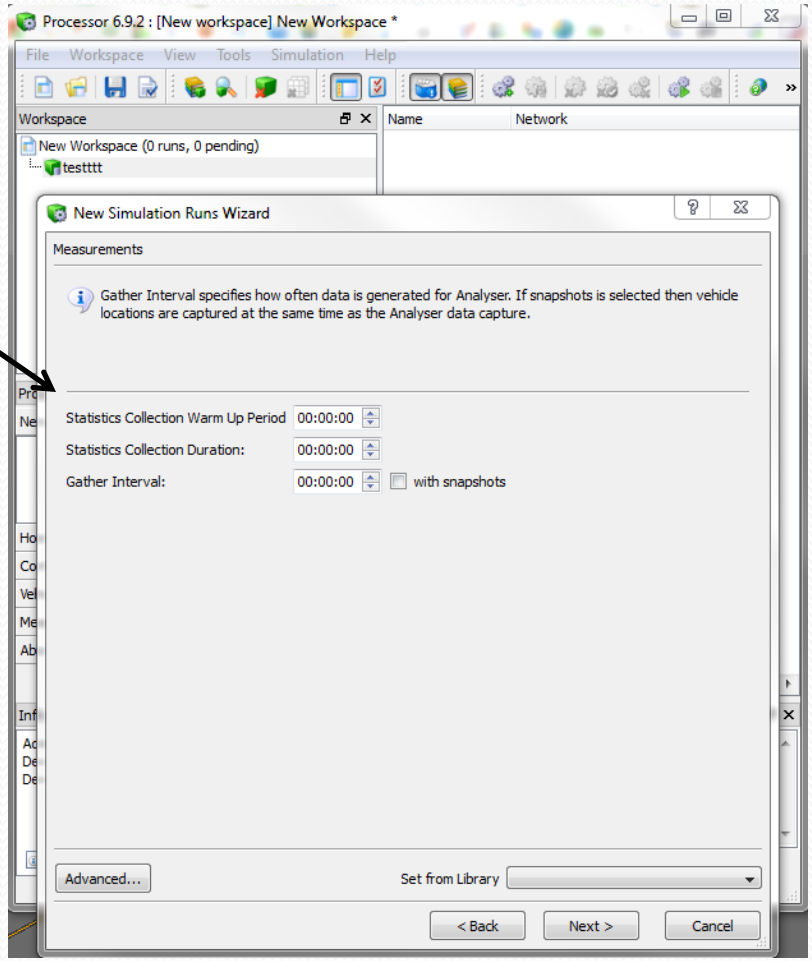
- Upload network
- Start time and duration of simulation
- Random number Generator for seeds (determined later)



- Demand factor allows the adjustment of demand to capture future conditions
- Manages costs related to vehicles routes and vehicle travel behavior (use default values)

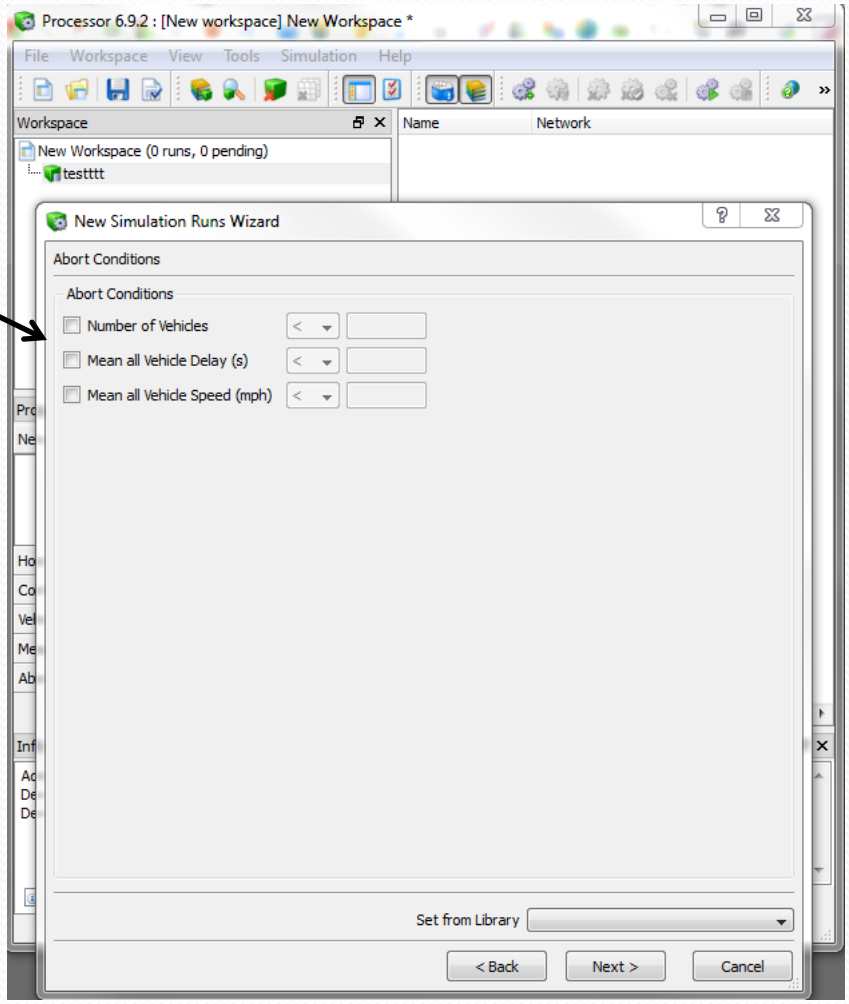
Simulation with Processor-2

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



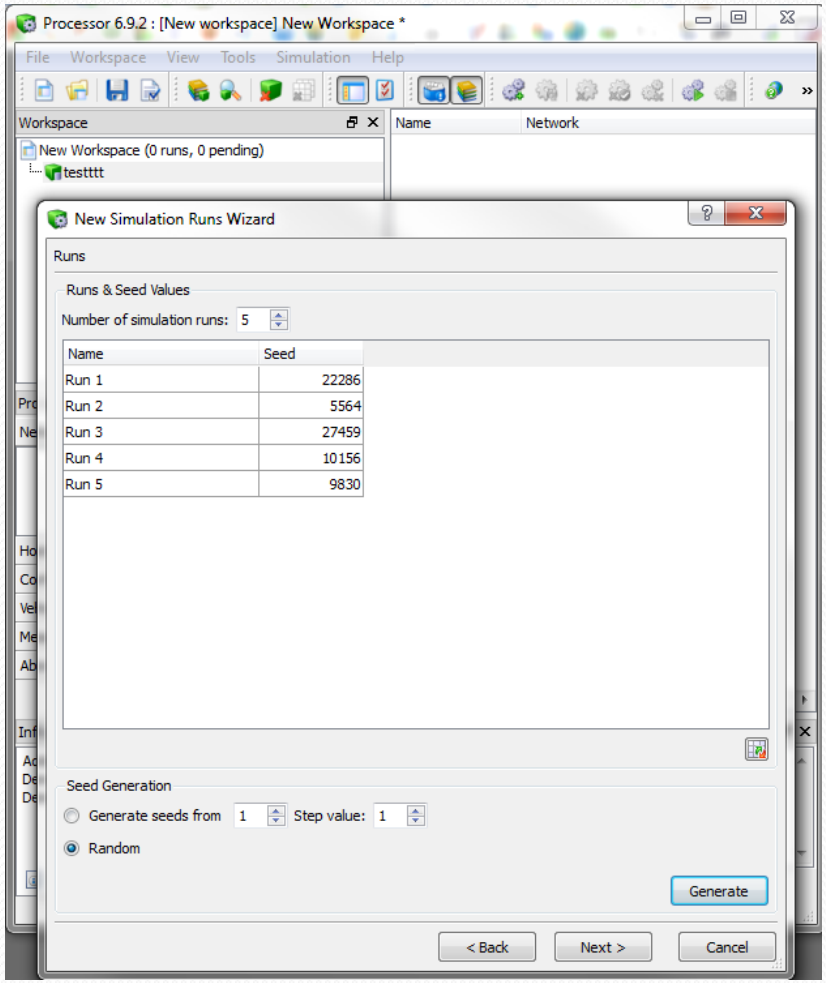
Simulation with Processor-3

- If conditions are satisfied, simulation is aborted

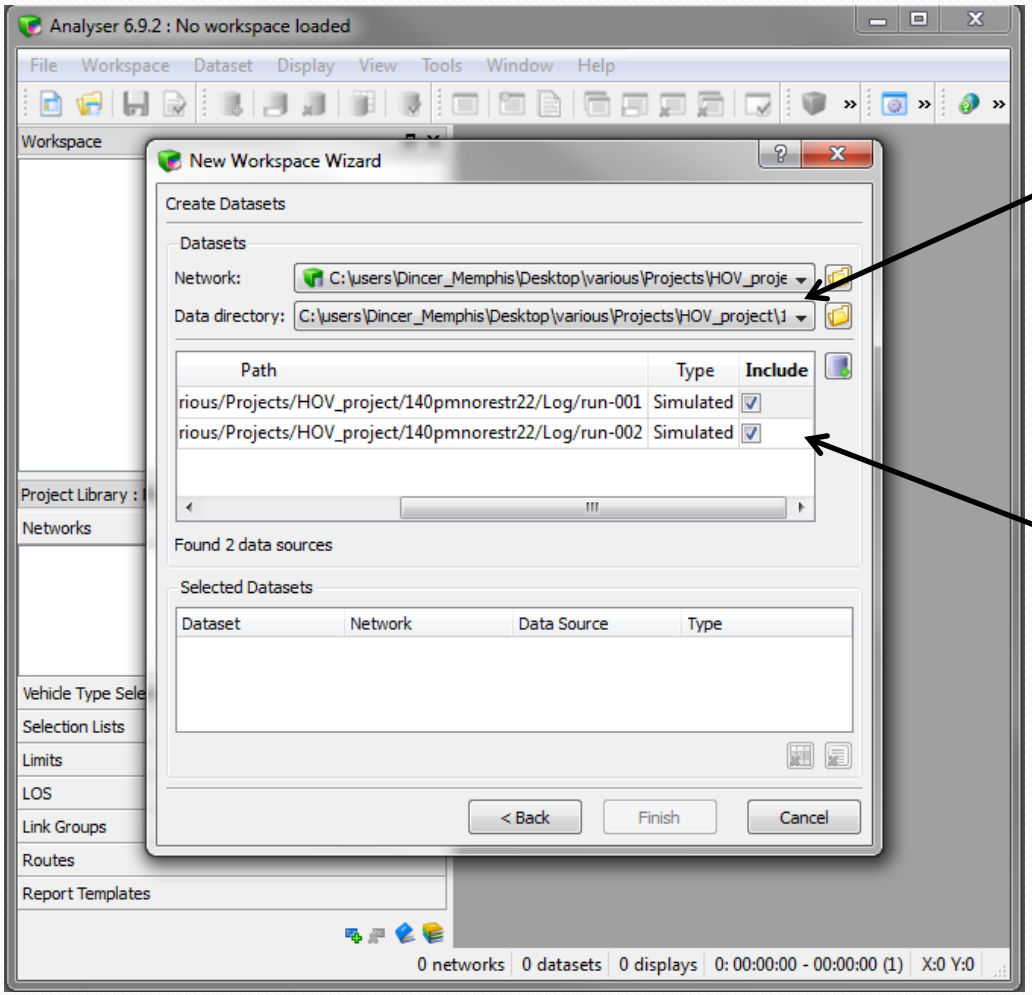


Simulation with Processor-4

- Number of simulations



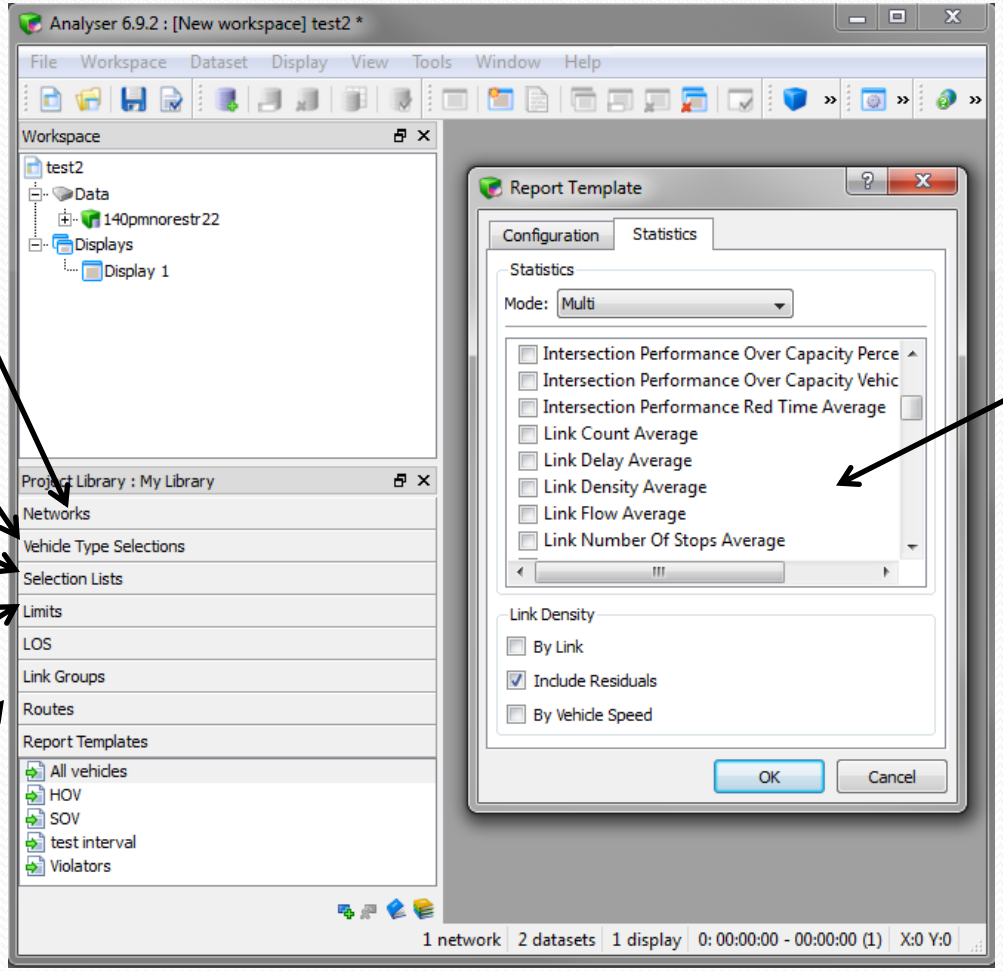
Analyser for Outputs-1



- Upload the network
- Include all the related simulations

Analyser for Outputs-2

- Network visualization
- Crate 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