PTV VISSIM 2025

Step-by-Step Tutorial for Simulating Signalized Urban Intersection (Left-hand Traffic)

PTV GROUP
part of Umovity

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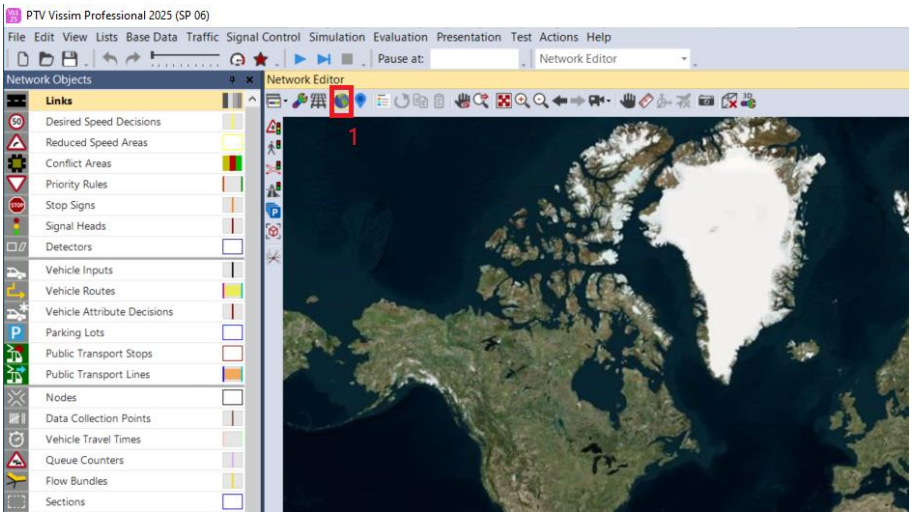
1. Vissim Network & Demand Modelling

1.1. Supply Modelling

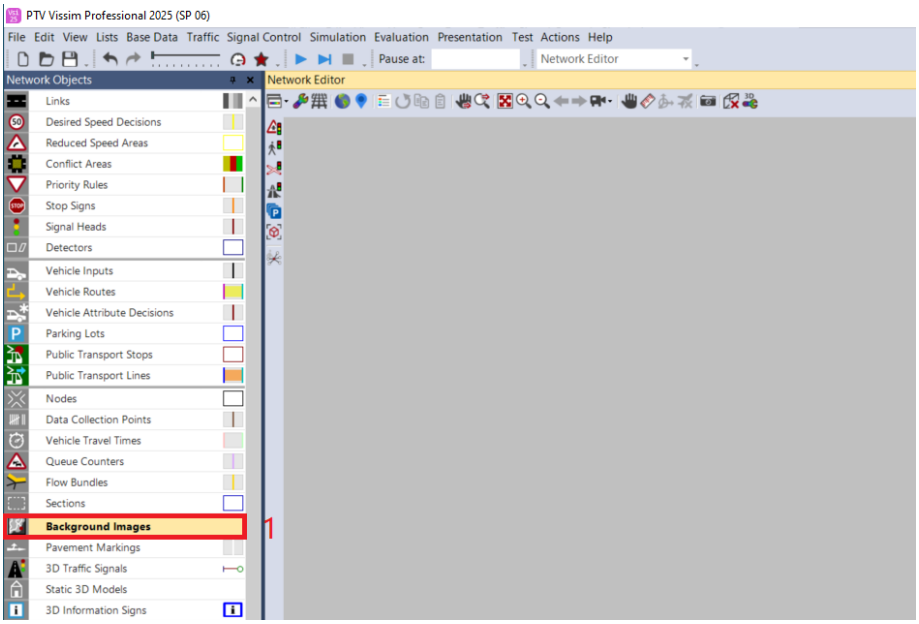
(1) Open PTV Vissim

(2) Left click Network Editor at the tab

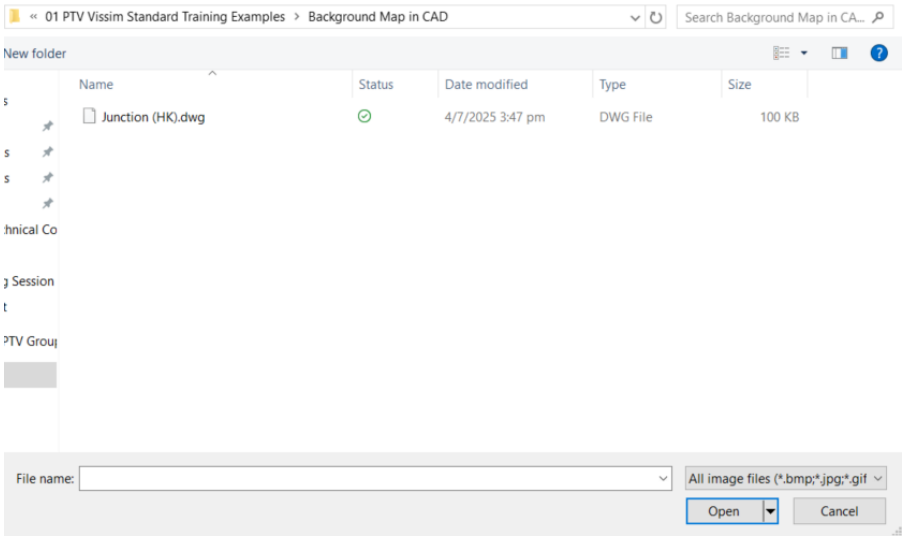
(3) Left click the earth icon, and close the background world map



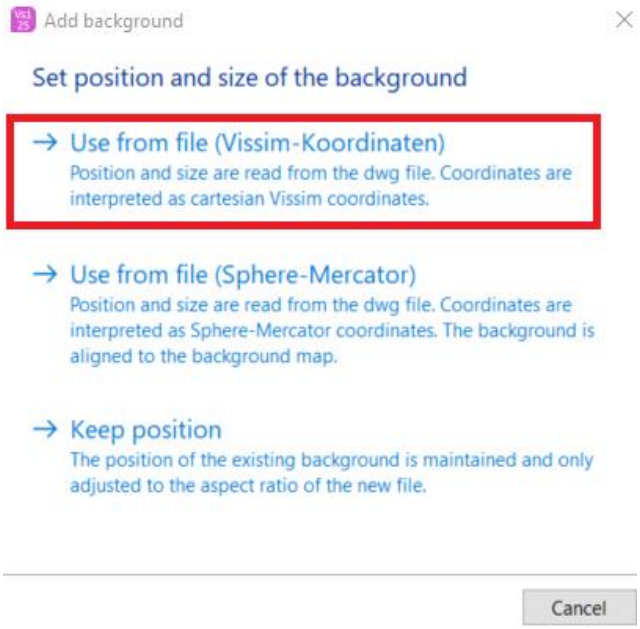
(4) Left click Background Images, and in the Network Editor, right click and add background image



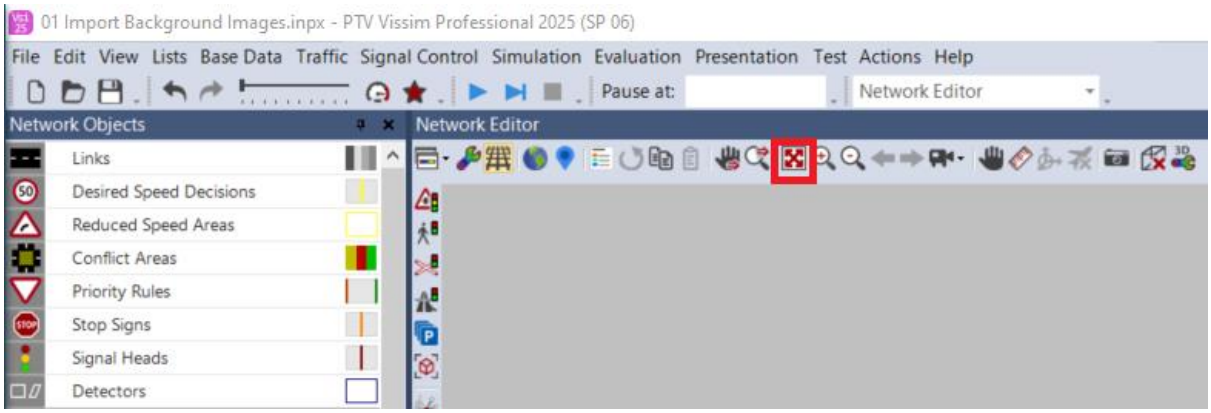
(5) Find the CAD background map, and left click to open it



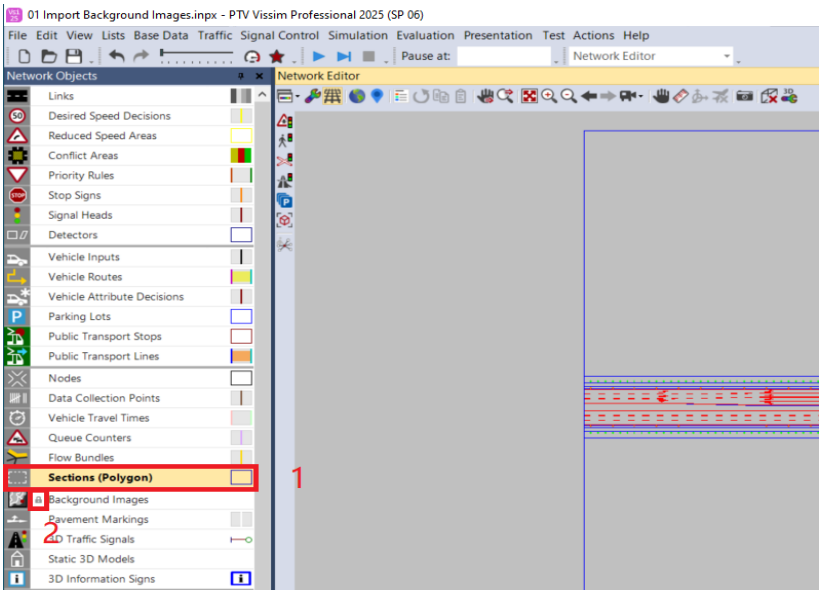
(6) Left click Use from file (Vissim-Koordinaten)



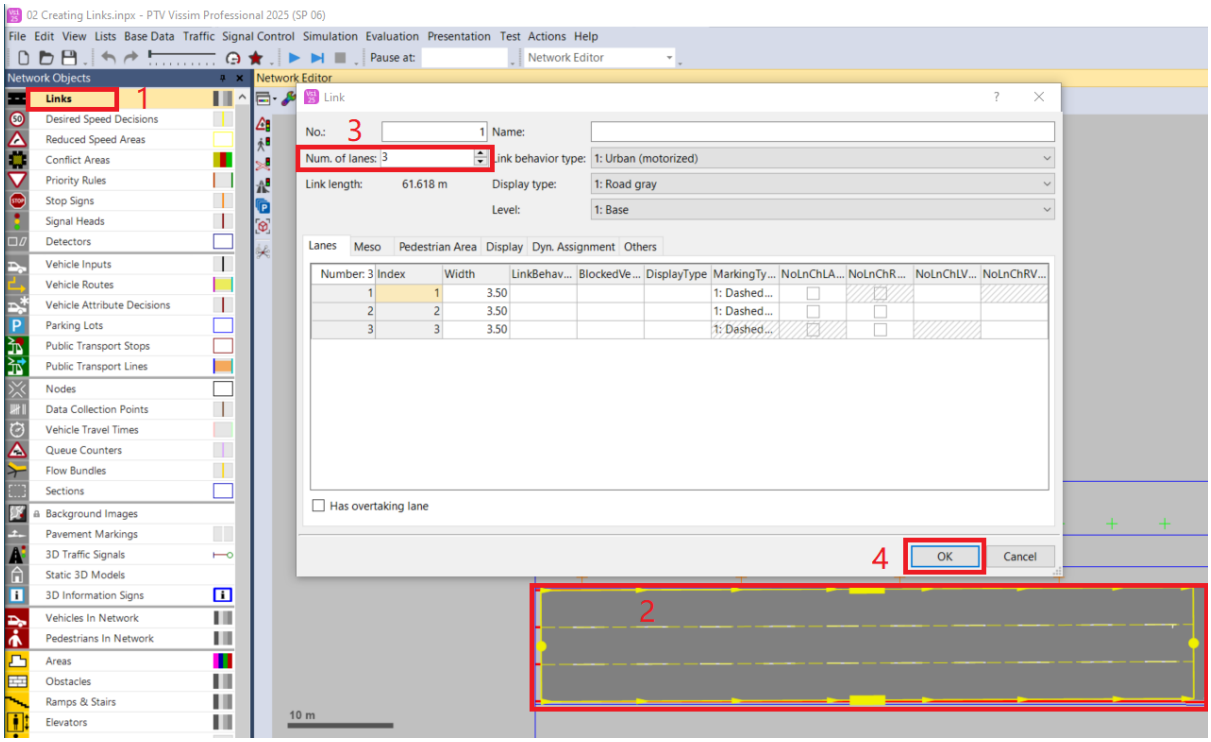
(7) Left click , to show the entire road network



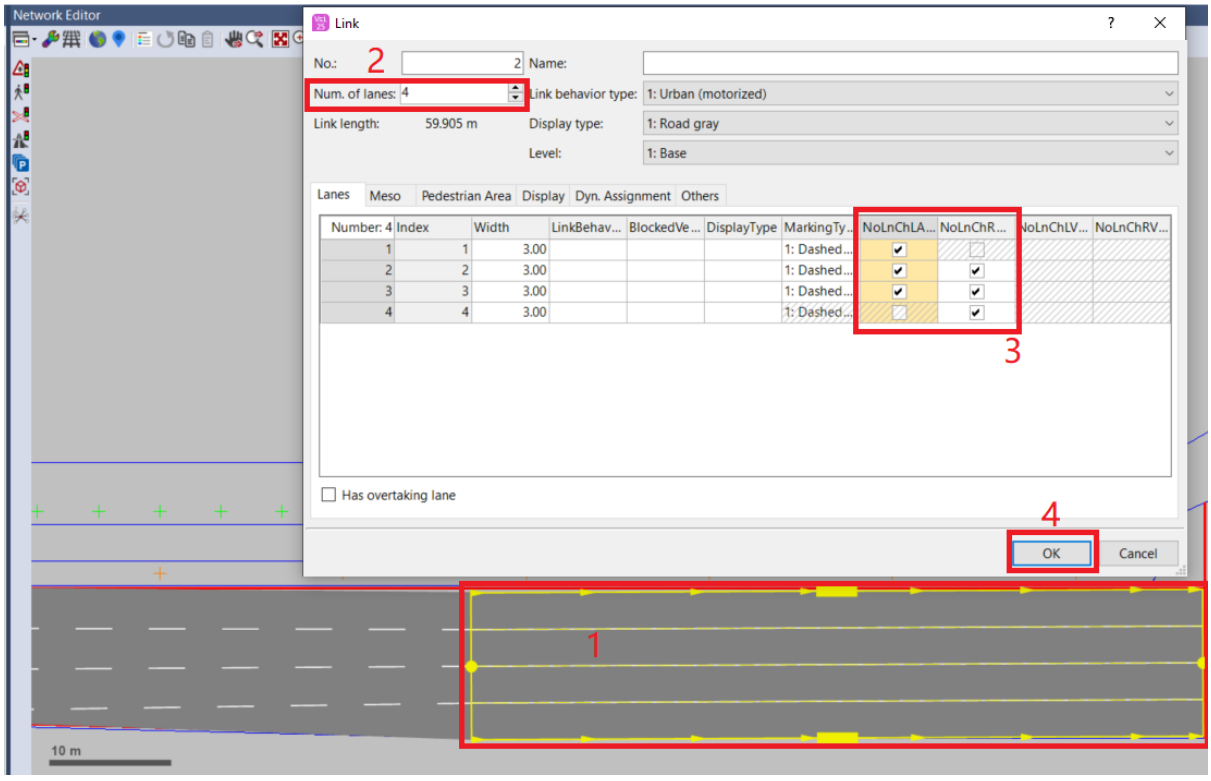
(8) First left click Section (Polygon), and then left click to lock the background image, to prevent the moving of background image by accident.



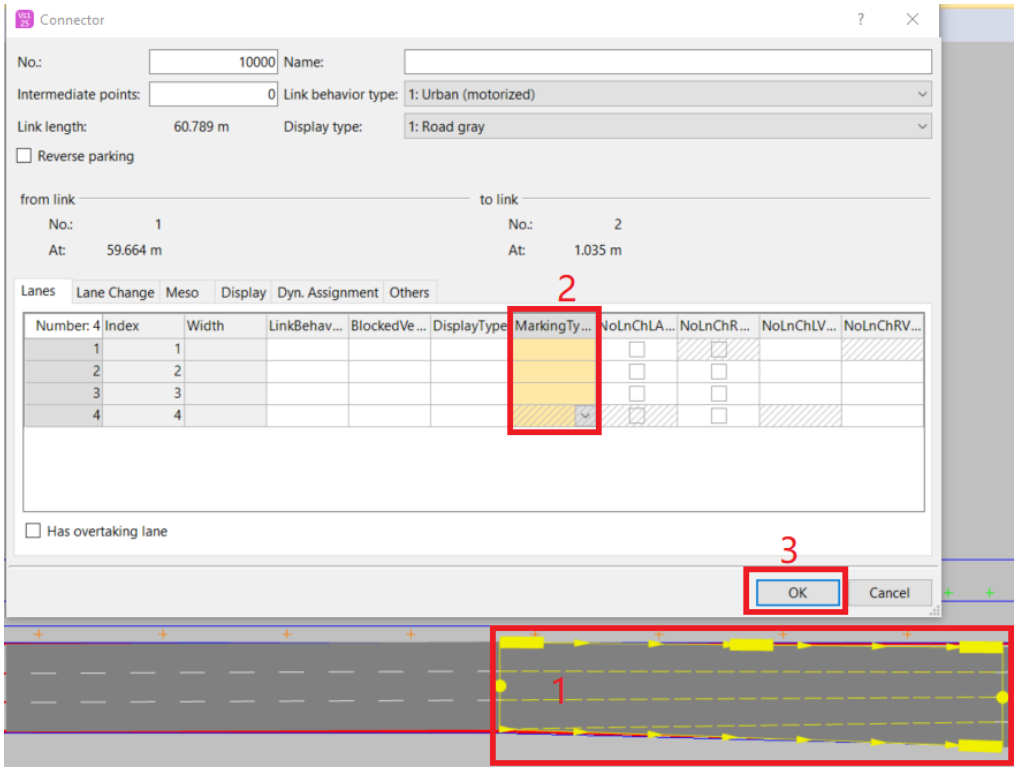
(9) Left click Links, and in the Network Editor, press and hold Ctrl and the right button to draw the link. Release the buttons at the end of the link. Change the number of lanes to 3 in the dialogue box and click OK.



(10) Similarly, press and hold Ctrl and right button to draw the solid line section. Change the number of lanes to 4, and choose No Lane Change and click OK.

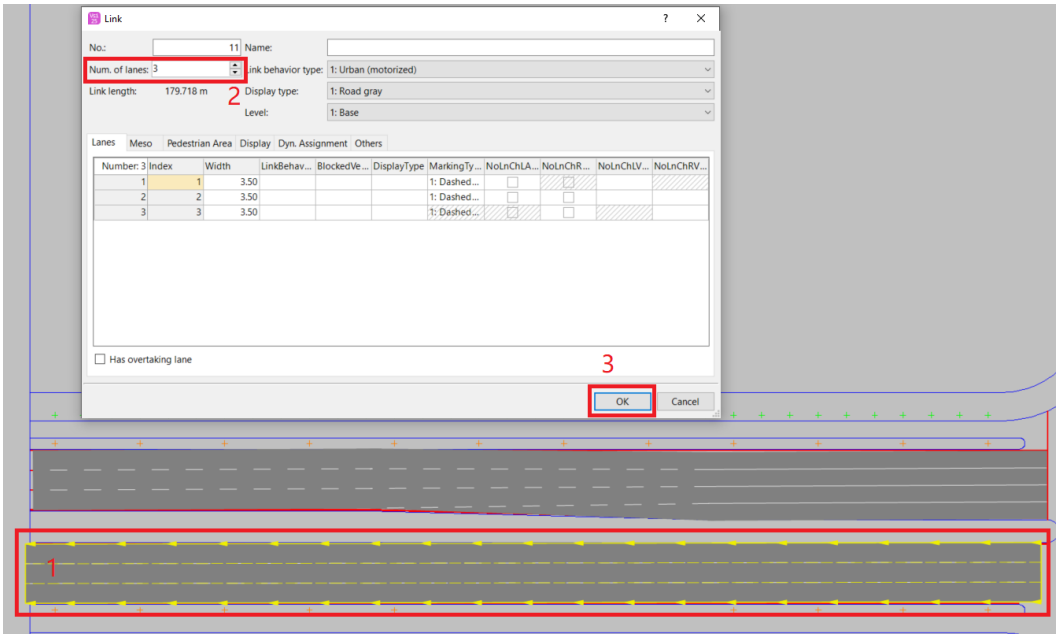


(11) Add connector between the links. At the end of upper section (beginning of the connector), press and hold Ctrl and right button to the beginning of the lower section (end of the connector), then release the button. Delete the Marking Type in the dialogue box and click OK.

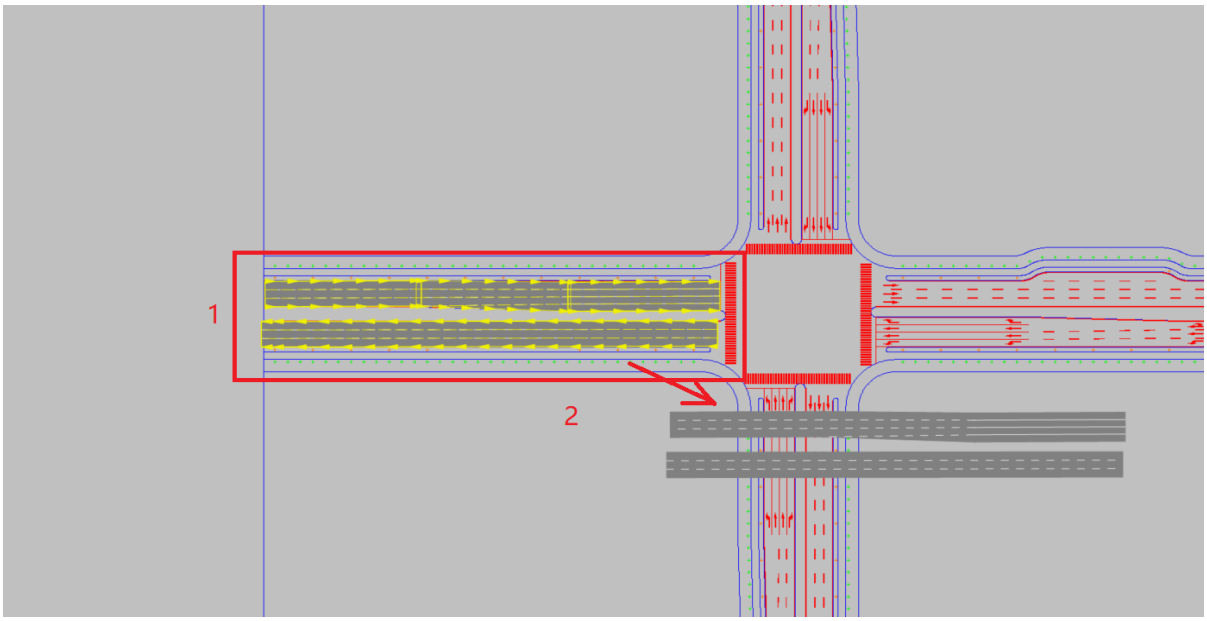


* Need to minimize the overlap between links and connectors, to eliminate modelling error.

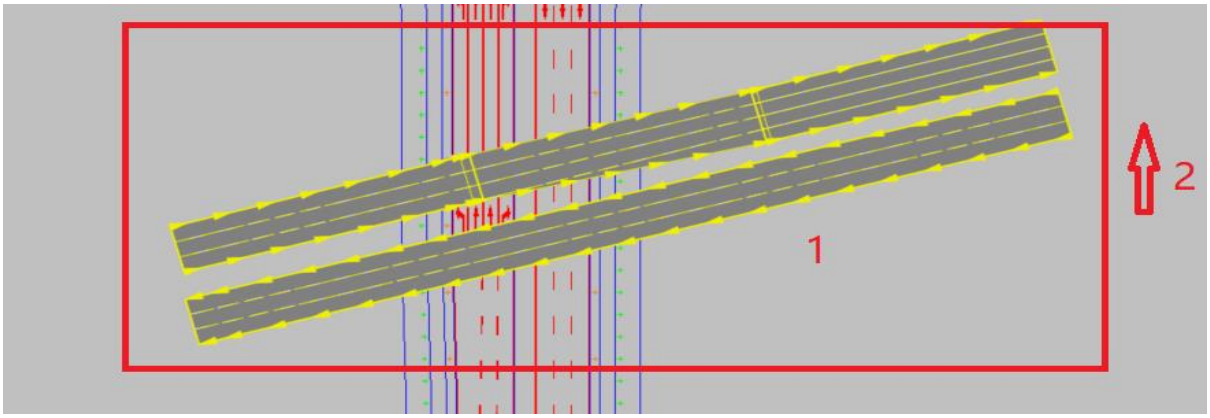
(12) Press and hold Ctrl and right button to draw the exit links, and release the buttons at the end. Change the number of lanes to 3 in the dialogue box and click OK.



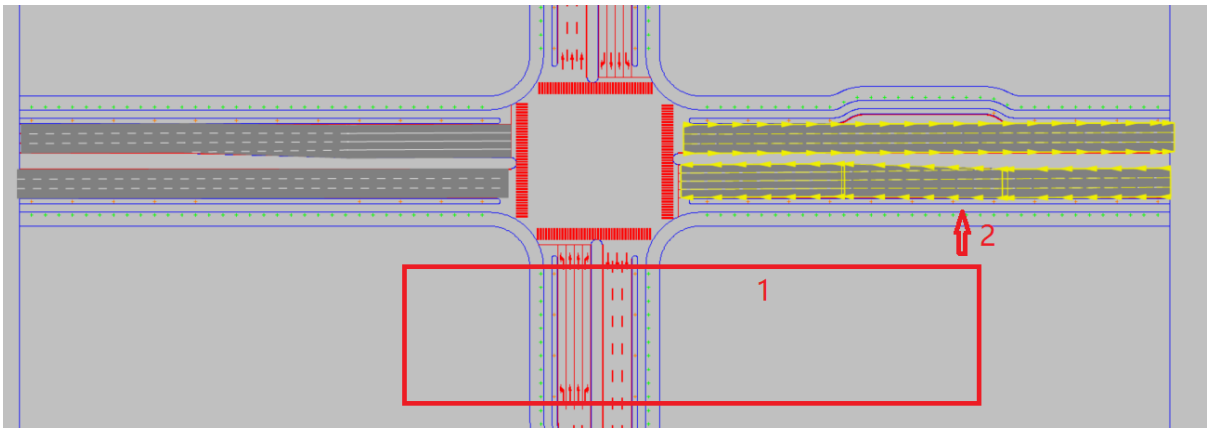
(13) Select the links and connector shown in the red box below, then press and hold Ctrl and left button and drag to duplicate.



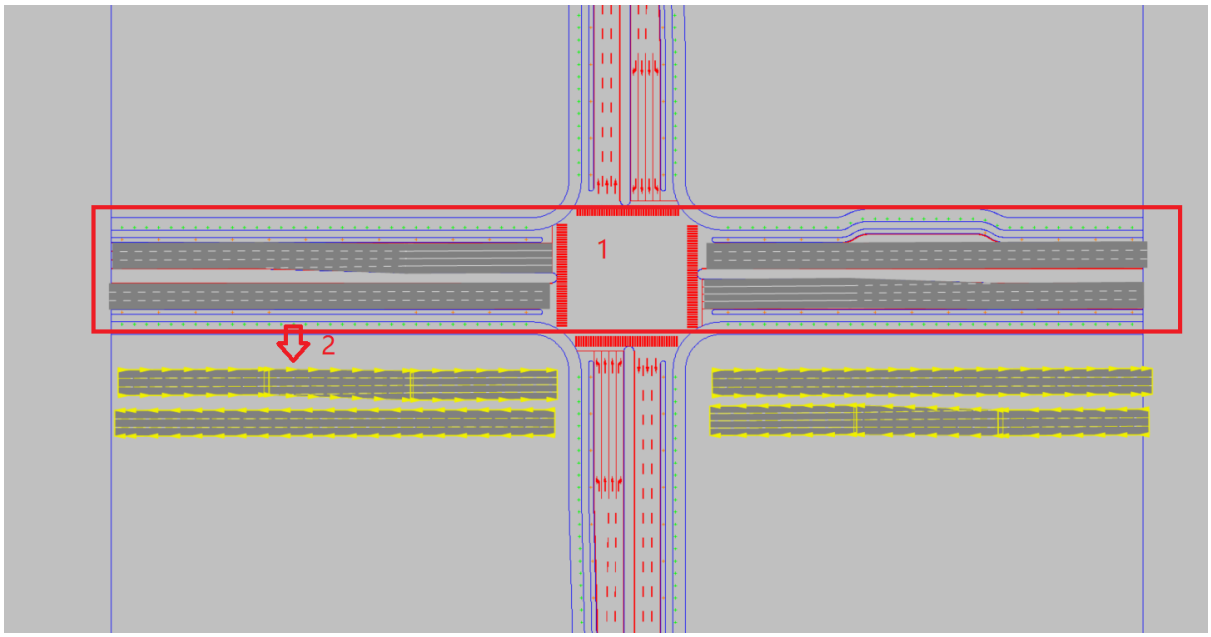
(14) Select the duplicated links and connector, then press and hold Alt and left button and drag to rotate.



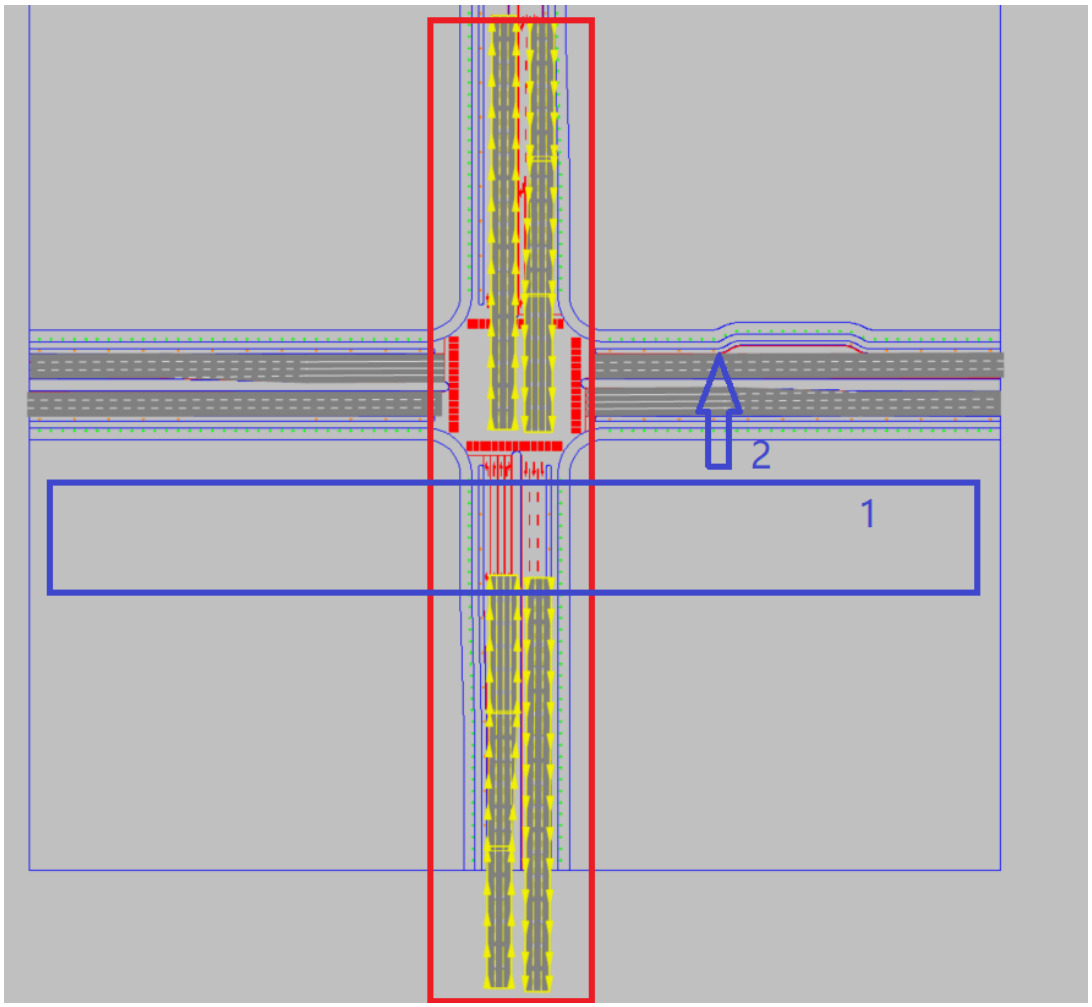
(15) Rotate 180° of the links and connector, then press and hold left button to put them on the opposite side.



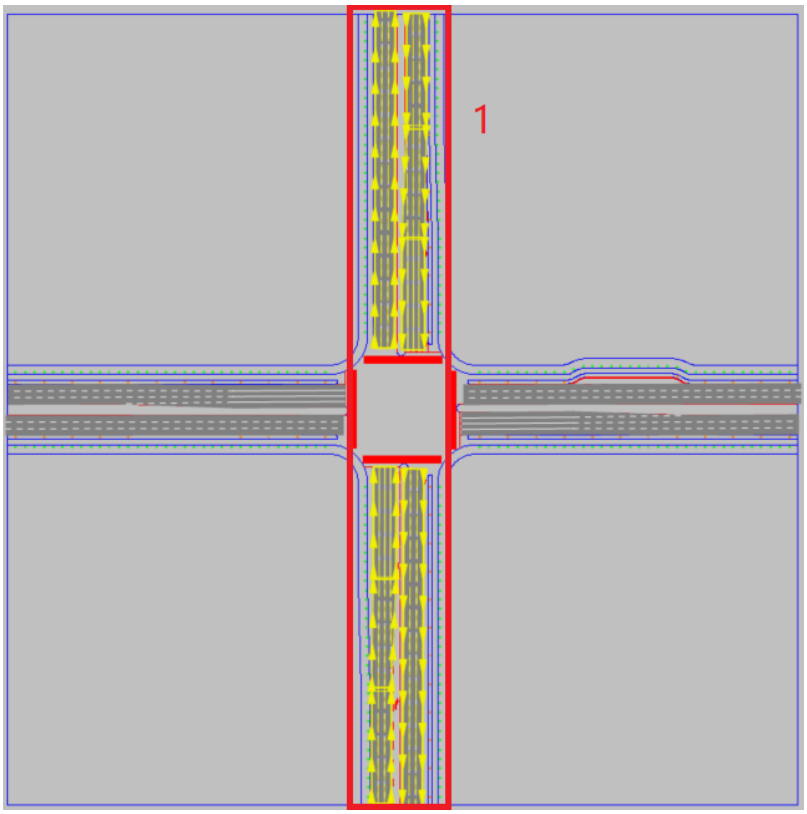
(16) Similarly, select all the links and connectors within the box, then press and hold Ctrl and left button to drag them and duplicate.



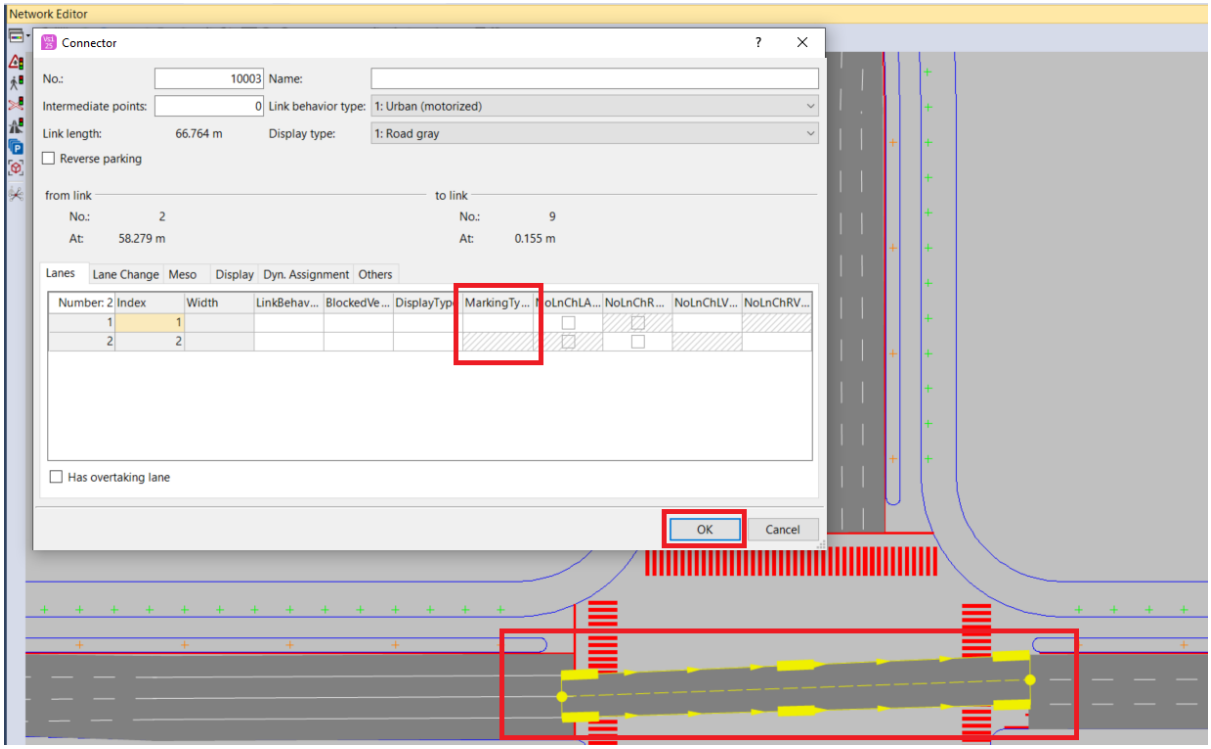
(17) Press and hold Alt and left button to rotate 90° of these links and connectors.



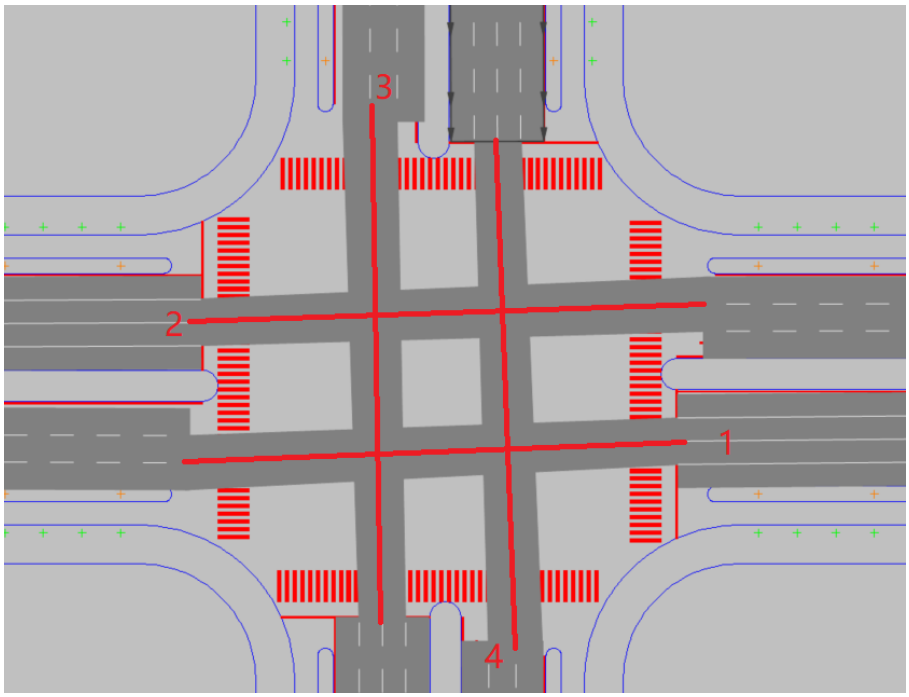
(18) Press and hold the left button to drag them to the corresponding position.



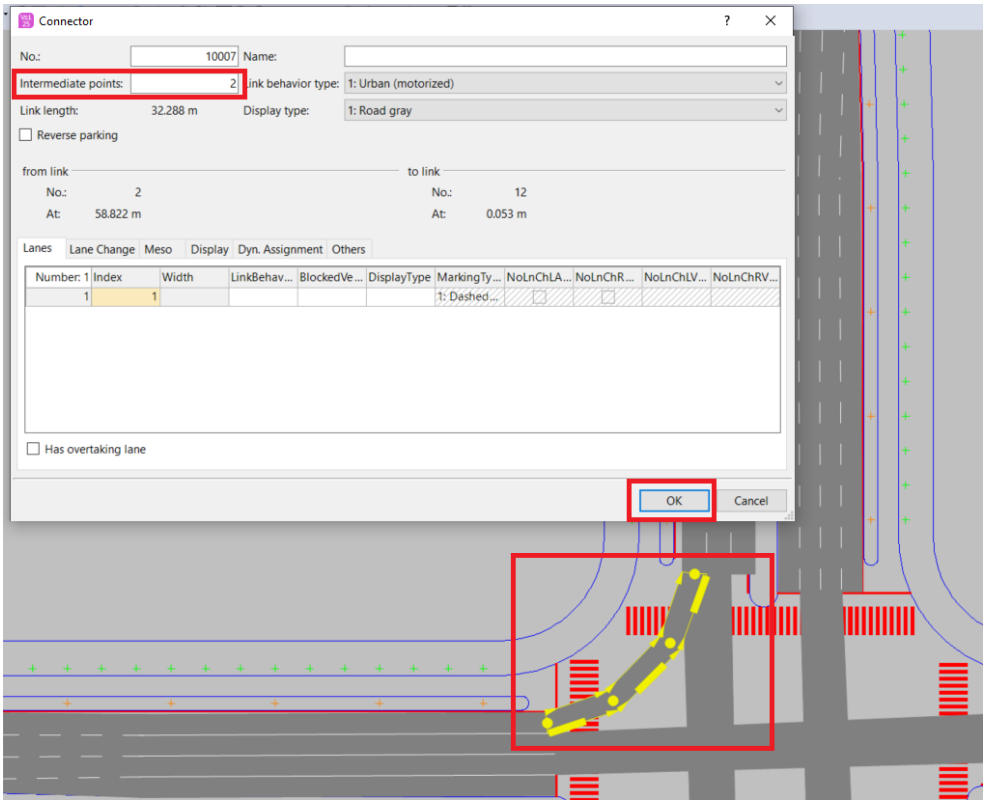
(19) Add connectors in the middle of the intersection. From the end of the west exit (beginning of the connector) to the beginning of the east entrance (end of the connector), press Ctrl and right button to create connector. Adjust the connector in the Network Editor and delete the Marking Type in the dialogue box and click OK.



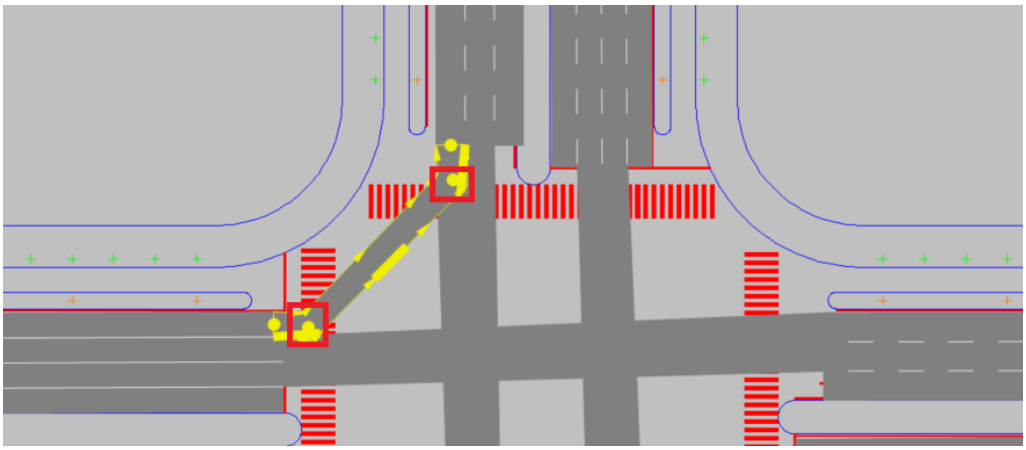
(20) Repeat step 19 and create another 3 connectors.



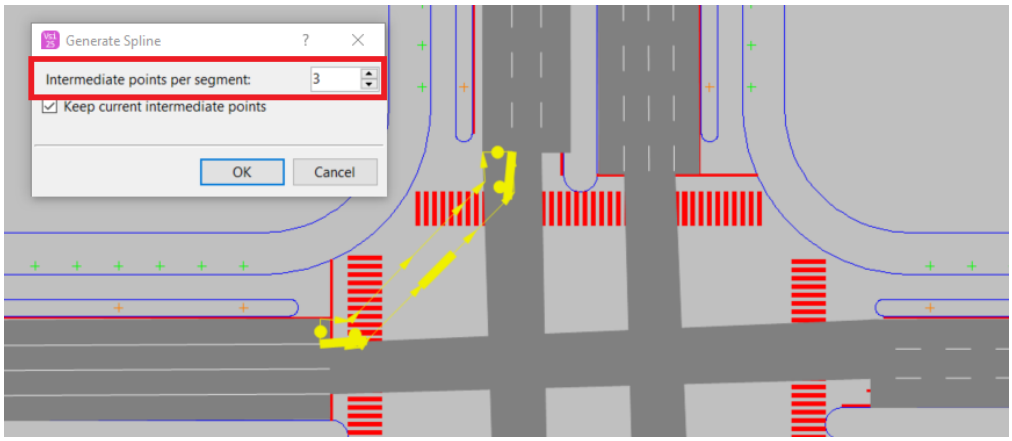
(21) Add left-turn connector in the middle of the intersection. From the end of the west exit (beginning of the connector) to the beginning of the north entrance (end of the connector), press Ctrl and right button to create connector. Define 2 intermediate points, adjust the connector in Network Editor, delete the Marking Type in the dialogue box and click OK.



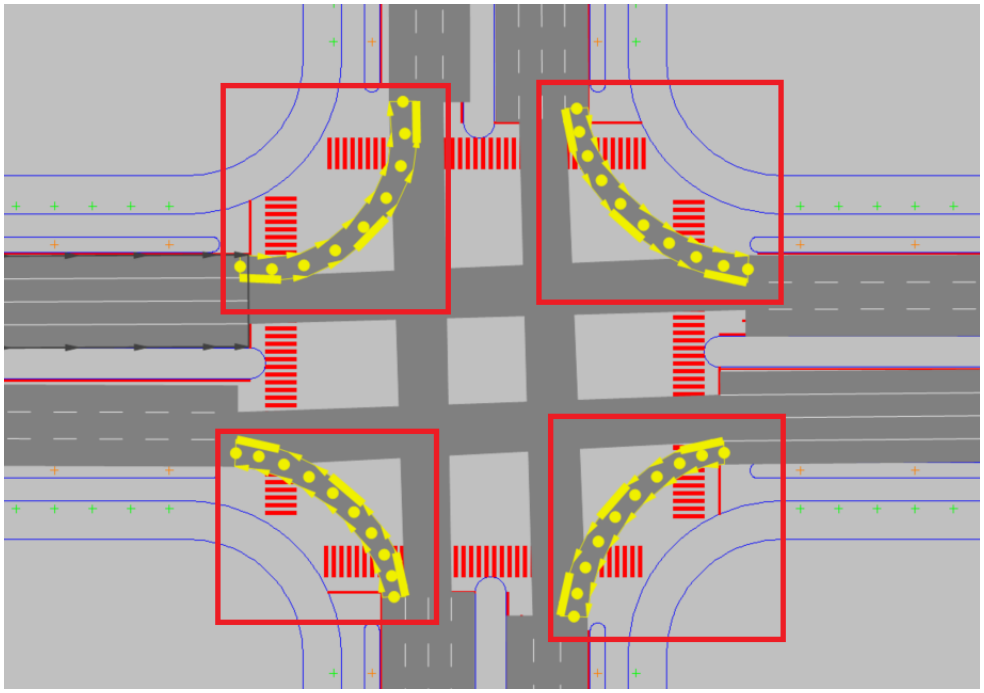
(22) Left click to move the intermediate points to suitable positions.



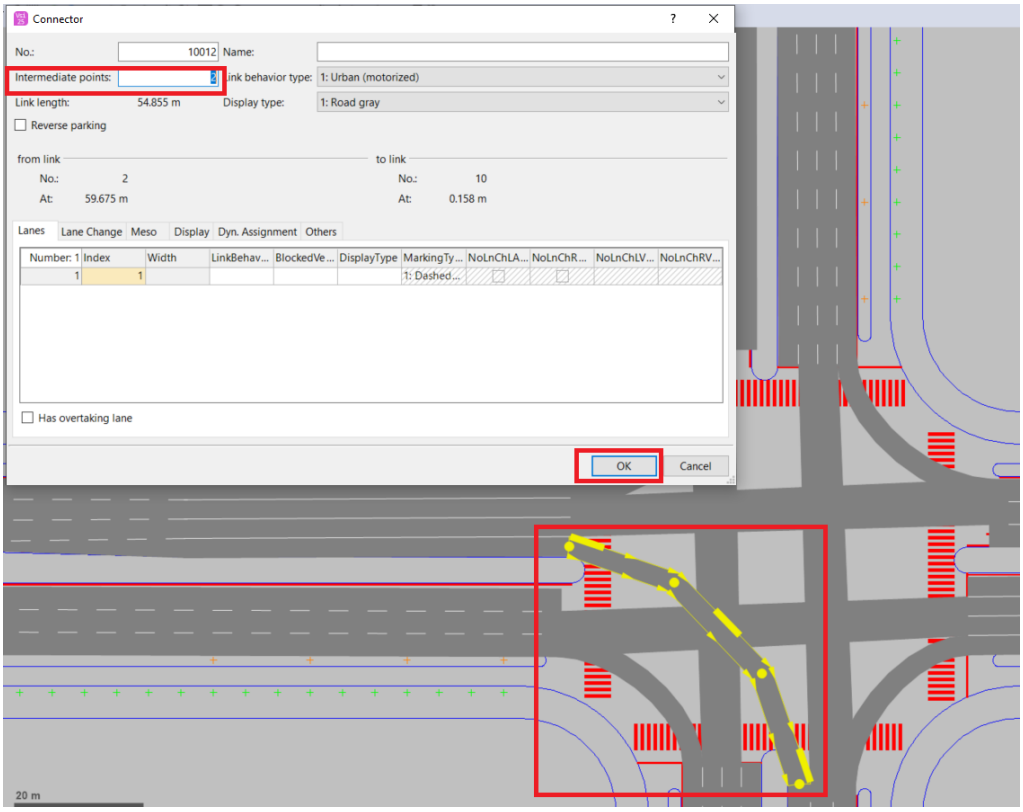
(23) Select this left-turn connector. Hold Alt and press right button in the middle of the connector and set the number of intermediate points.



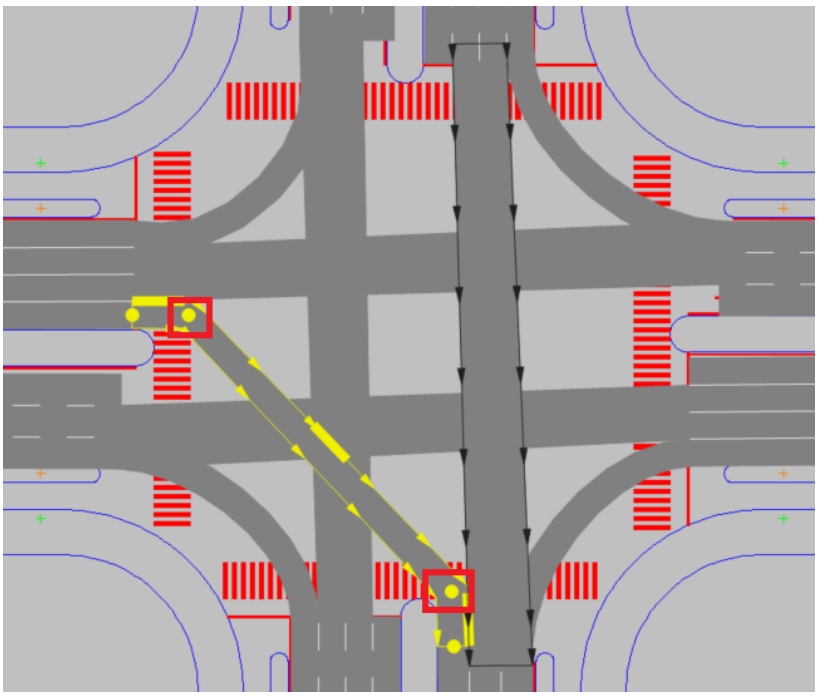
(24) Repeat step 21 to 23 and create other 3 left-turn connectors.



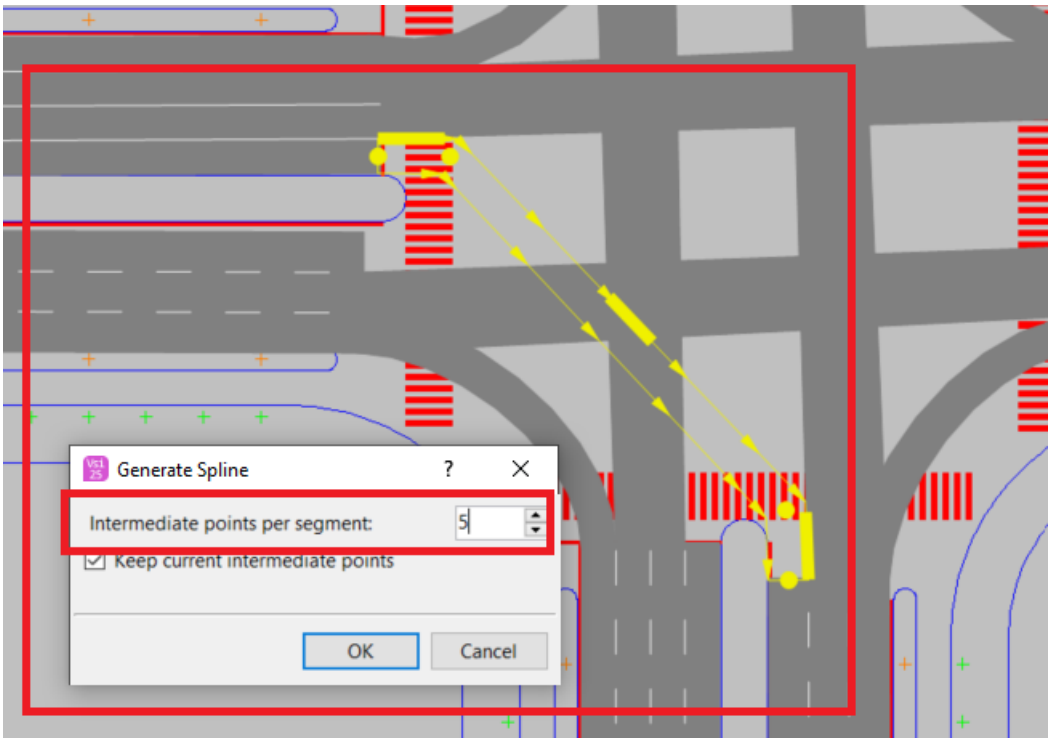
(25) Add right-turn connector in the middle of the intersection. From the end of the west exit (beginning of the connector) to the beginning of the south entrance (end of the connector), press Ctrl and right button to create connector. Define 2 intermediate points, adjust the connector in Network Editor, delete the Marking Type in the dialogue box and click OK.



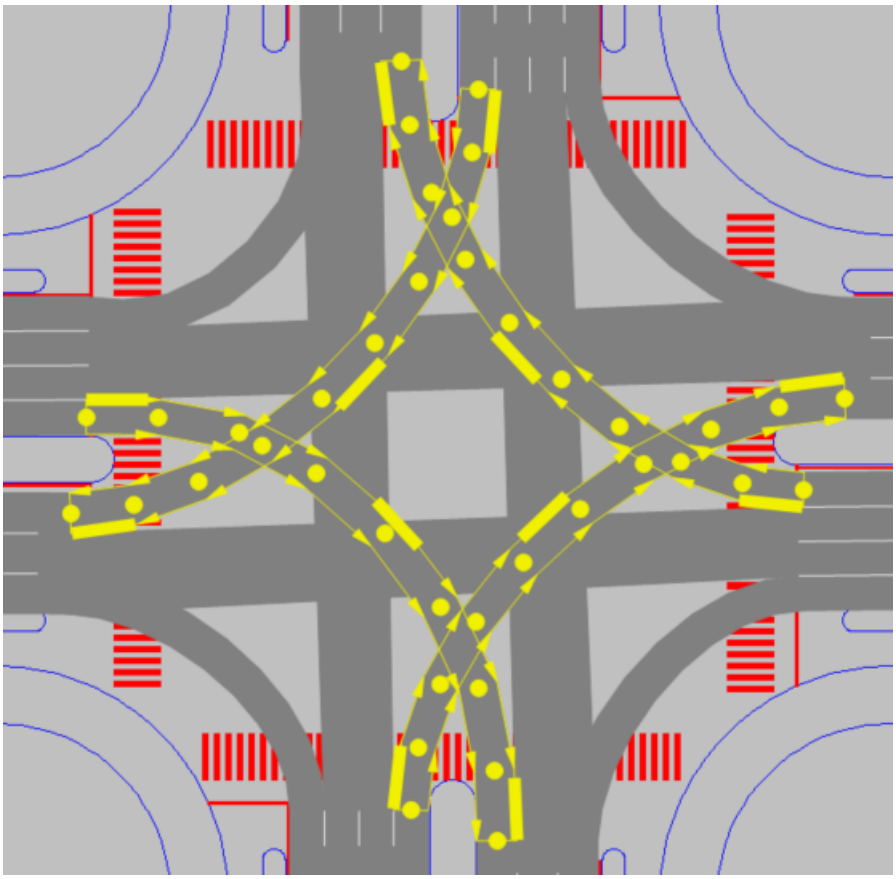
(26) Left click to move the intermediate points to suitable positions.



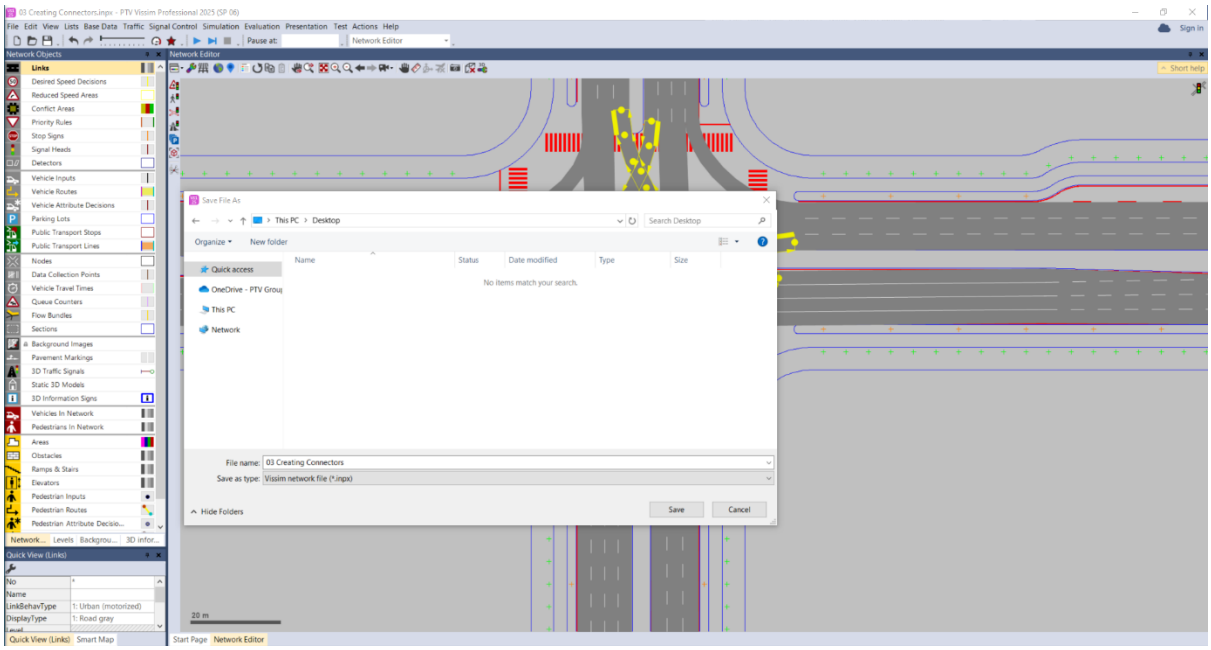
(27) Select this right-turn connector. Hold Alt and press right button in the middle of the connector, and set the number of intermediate points.



(28) Repeat step 25 to 27, and create other 3 right-turn connectors.

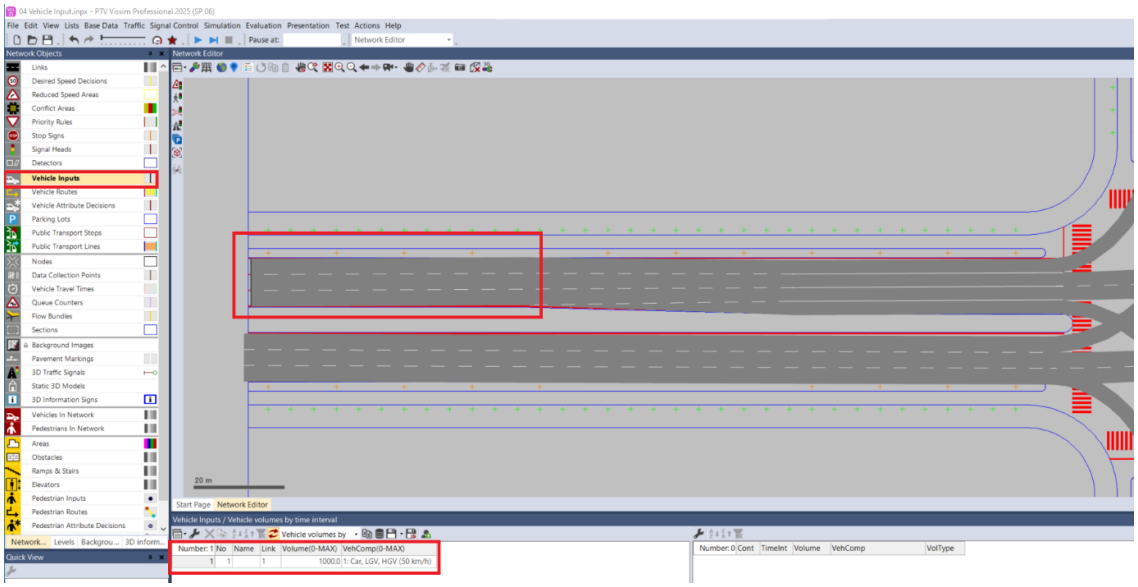


(29) Left click to save the file. Name the file and click Save.



1.2. Demand Modelling

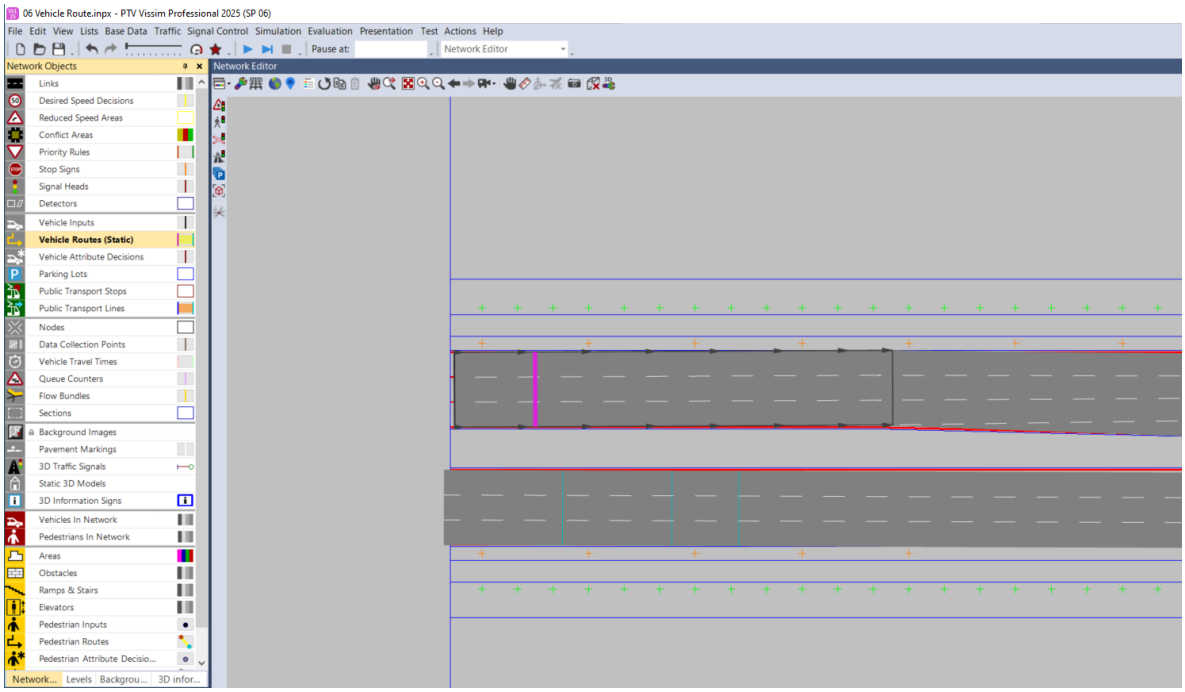
(1) Left click on the Vehicle Inputs. Hold Ctrl and right click on the first link of the west entrance. Change the Volume to 1000.



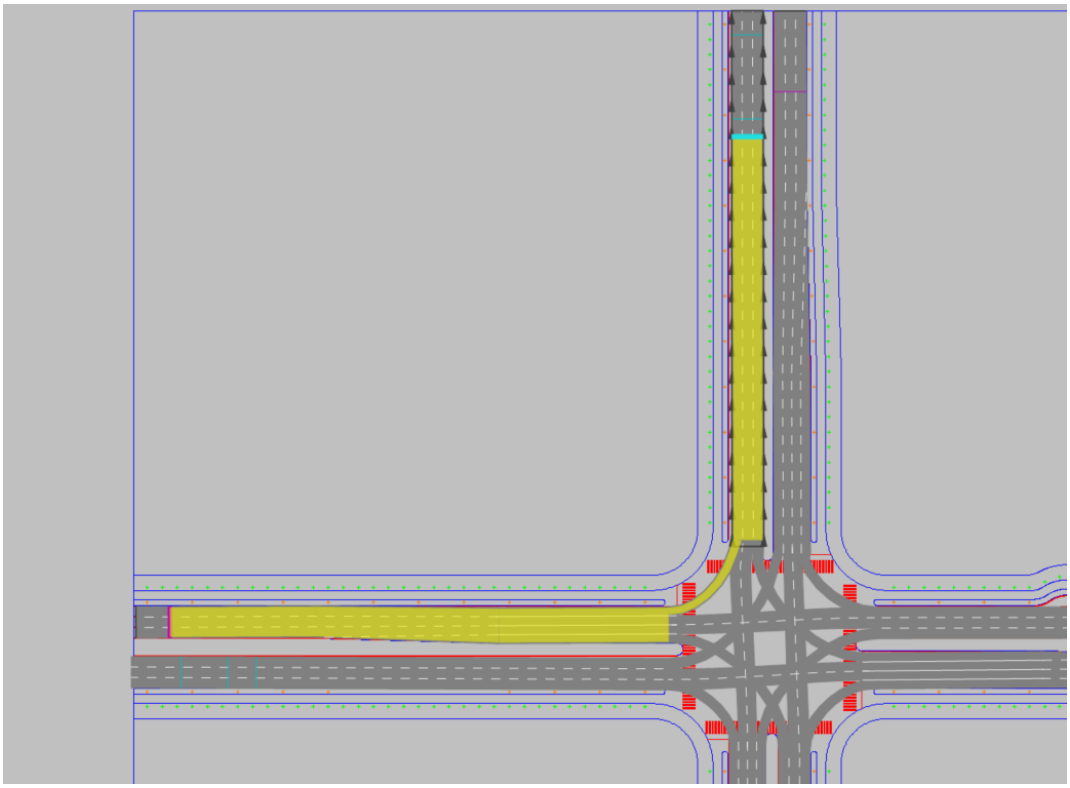
* The unit of vehicle input is veh/hr. Even if the time interval is not exactly 1 hour. The vehicle input follows Poisson distribution.

* If the defined traffic volume exceeds the capacity of the link, the vehicles will “pile up” outside the network, until there is a spare space to access in the network. The maximum volume depends on operating speed and driving behavior.

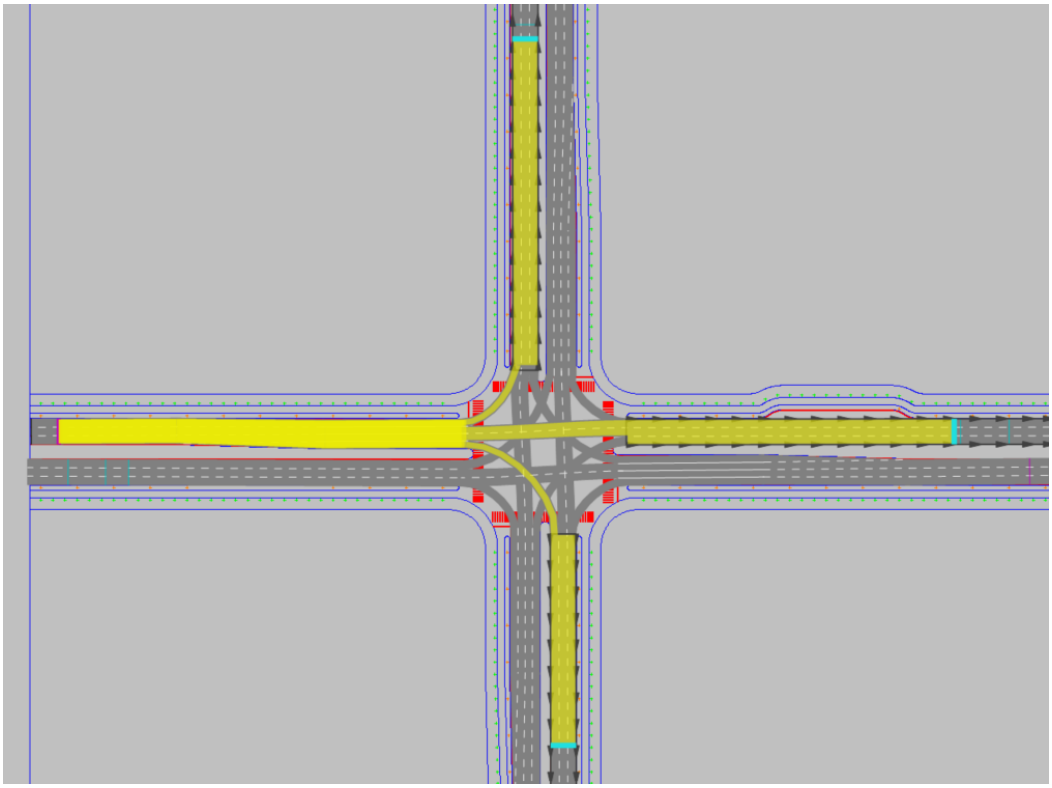
(2) Left click on the Vehicle Routes. Hold Ctrl and right click after the vehicle input (black line) and create a vehicle routing decision point.



(3) Move the mouse to the north entrance, and left click to define the end of the route. So, the left turning for west exit is completed.

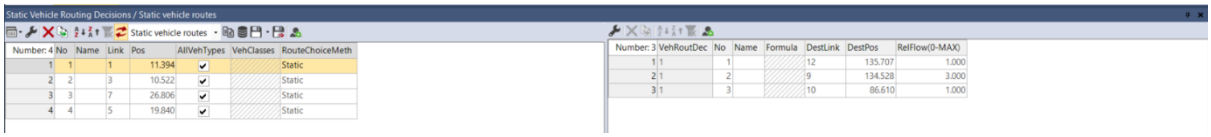


(4) Similarly, continue to move and left click the mouse to complete other directions.



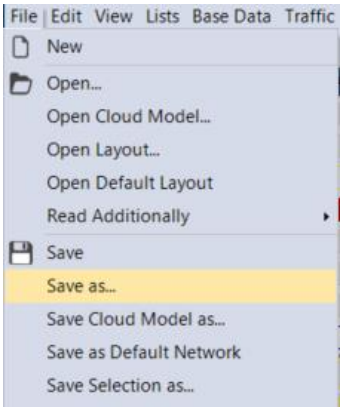
(5) Outside the road network, when the mouse shows X, the routing decision can be ended by left click.

(6) In the list of Static Vehicle Routing Decisions, select the first row. In the list on the right, change the relative flow to 1:3:1 (Left: Through: Right).

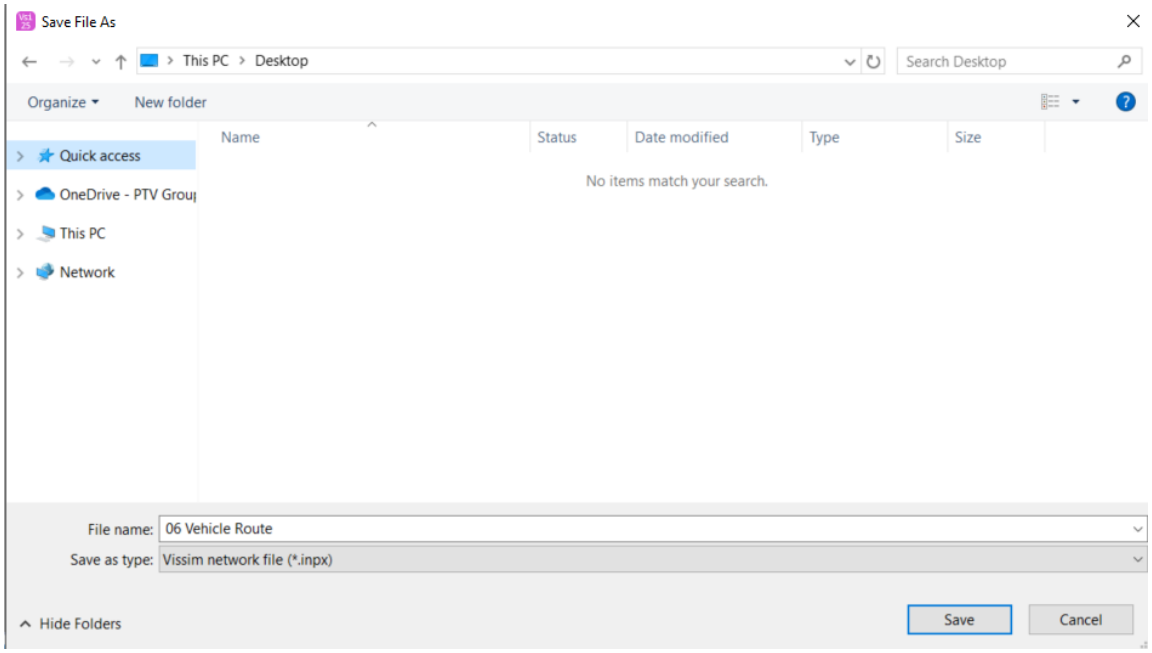


* Vissim uses relative flow instead of absolute flow to determine the ratio of all destinations in one routing decisions. Therefore, either the actual volume or volume ratio can be input. In Vissim program, the relative flow is accumulated and then the absolute ratios of the flow are automatically calculated.

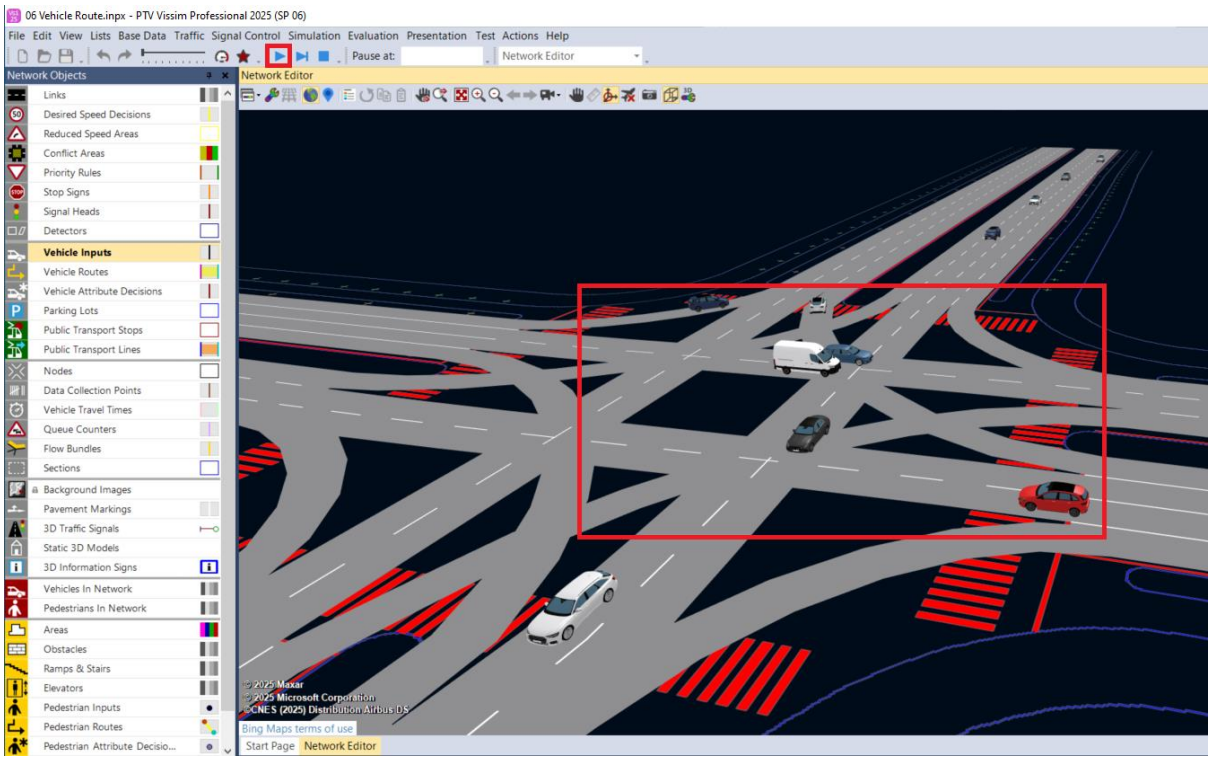
(7) Click File and Save as.



(8) Find the place to save and click save.



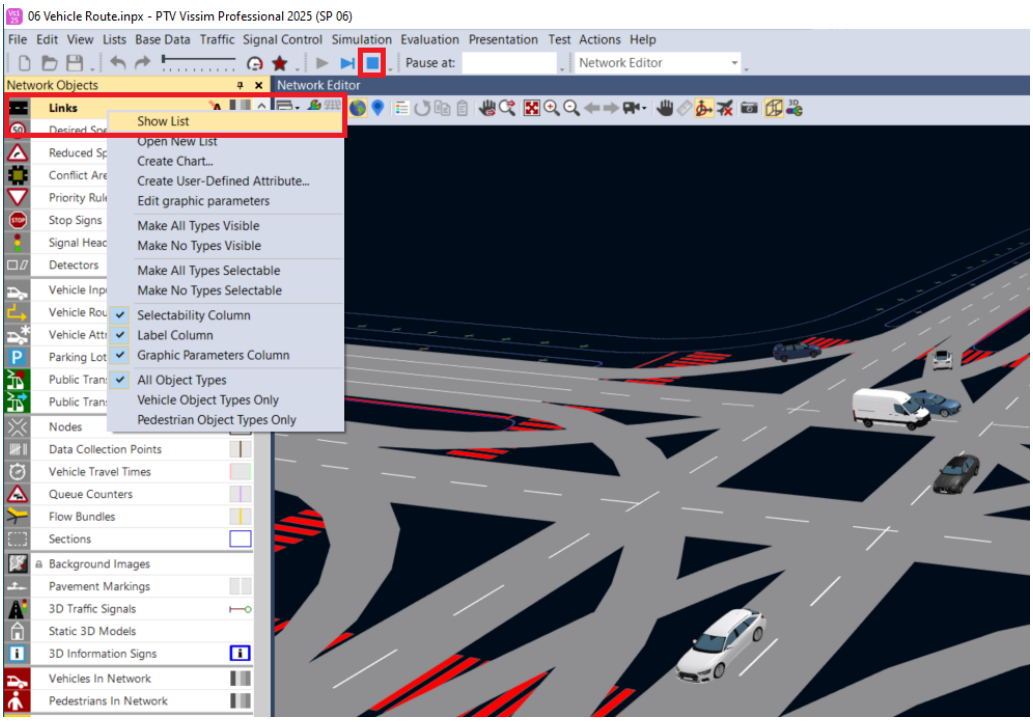
(9) Run the simulation and press Ctrl + D to change to the 3D modes. See if the model is running correctly.



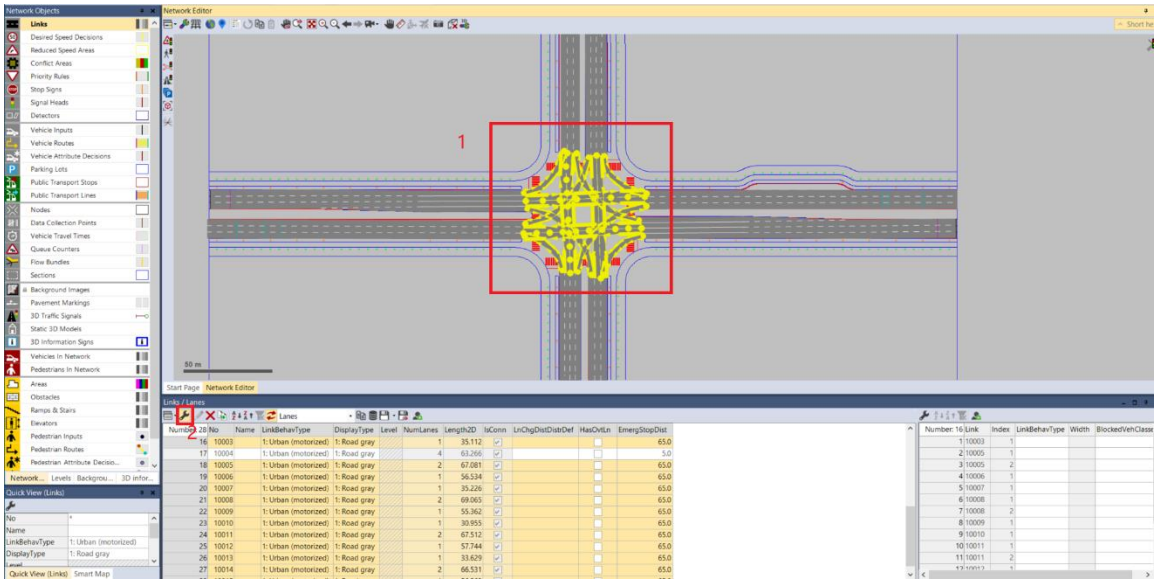
* After running simulation for a certain time, it can be found that some vehicles will stop at the intersection for a while and then disappear. The main reason of this is because the vehicles which wants to change their lanes are disrupted by other vehicles, they cannot change their lanes and can only go straight. When they arrive at the emergency stopping position at the connectors, they will stop to wait. But this area belongs to the solid line area and does not allow vehicles to change lane, so if the waiting time is bigger than 60 seconds, the vehicles will disappear from the network (which can be considered that these vehicles are forced to join the traffic flow). If they do not disappear, unreasonable congestion will be produced. The default 60 seconds can be changed in the driving behavior factor settings.

* To eliminate this, the easiest way is to move the emergency stopping position to the dash line area, so that the vehicles are not restricted to lane changing.

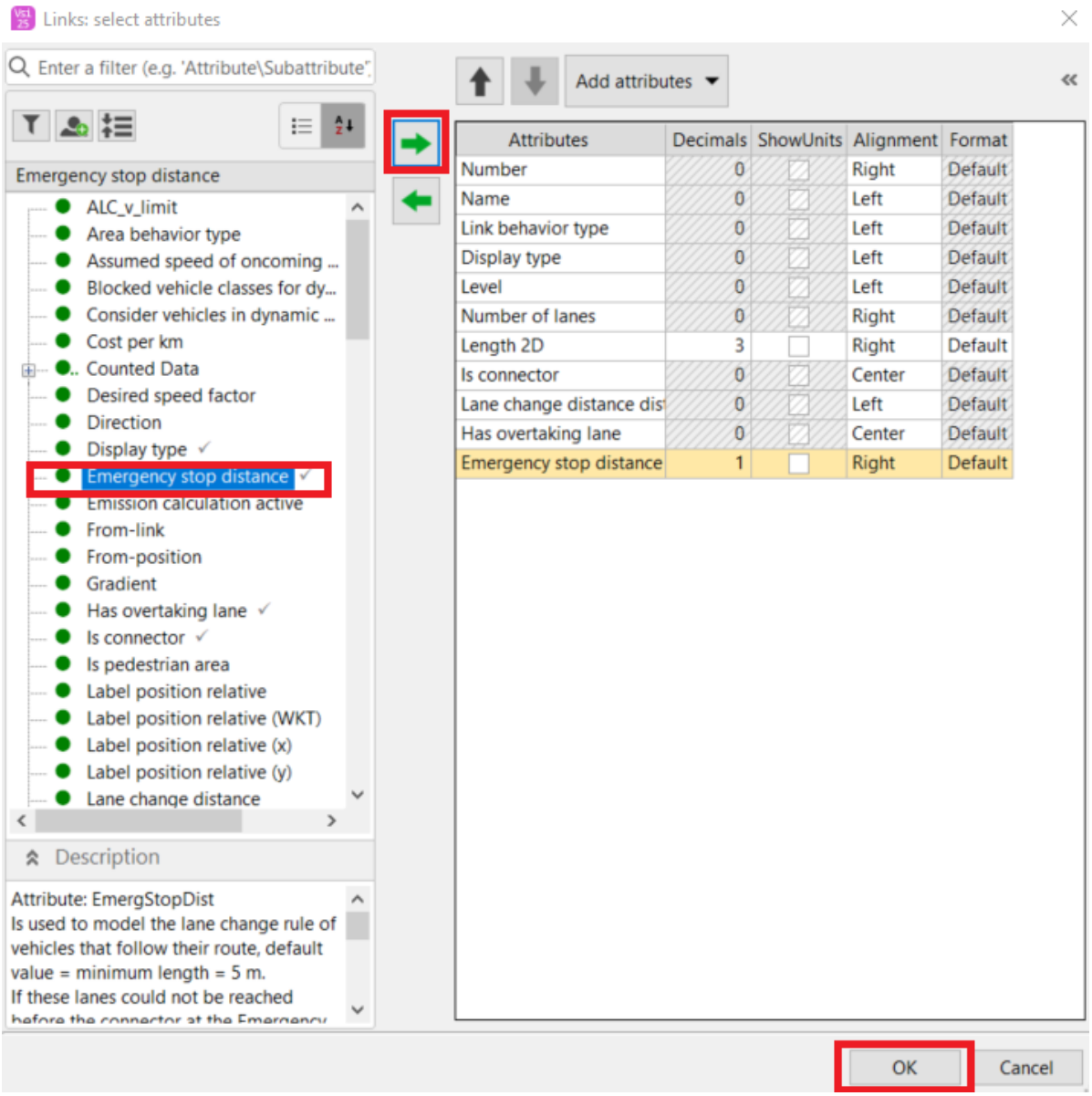
(10) After stopping the simulation, right click on Links, and select Show Lists.



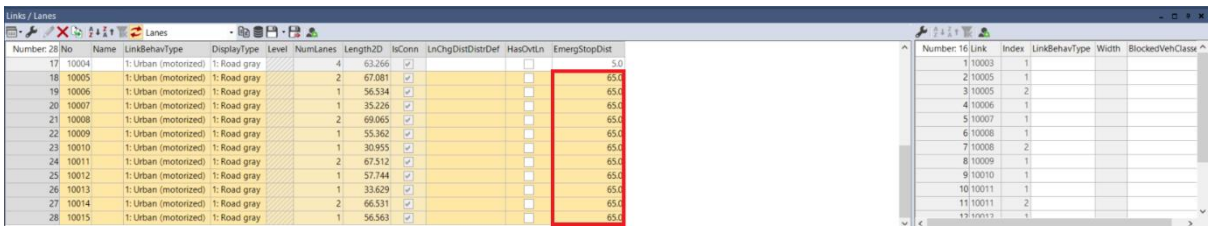
(11) Press Ctrl + D to switch back to 2D view. Select all the connectors, and left click on attribute selection.



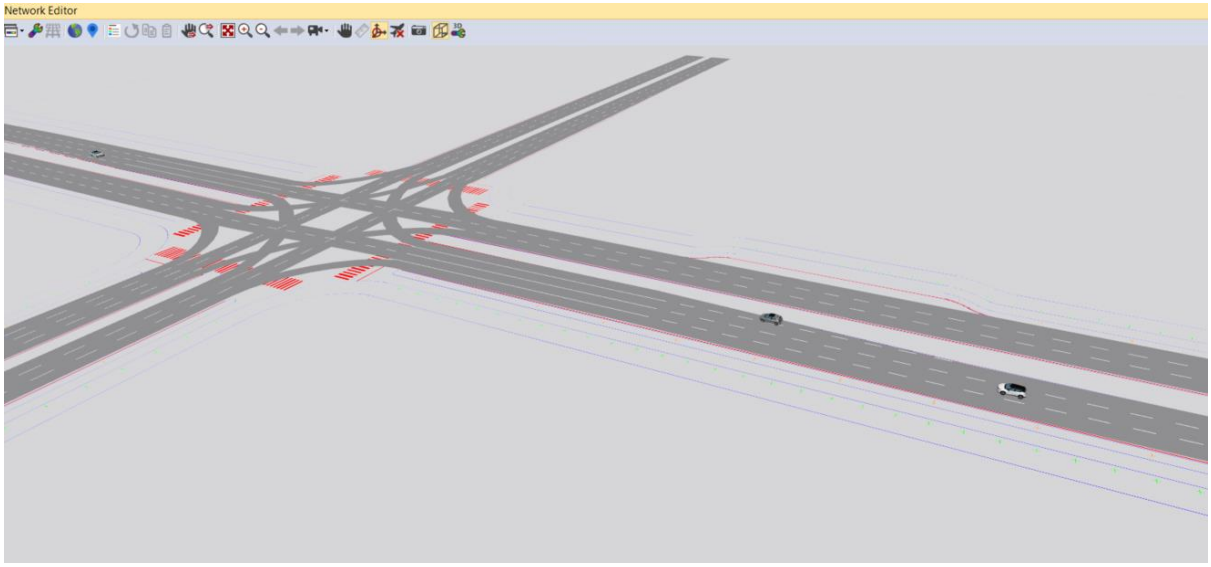
(12) Left click on emergency stop distance and add it to the list. Then click OK.



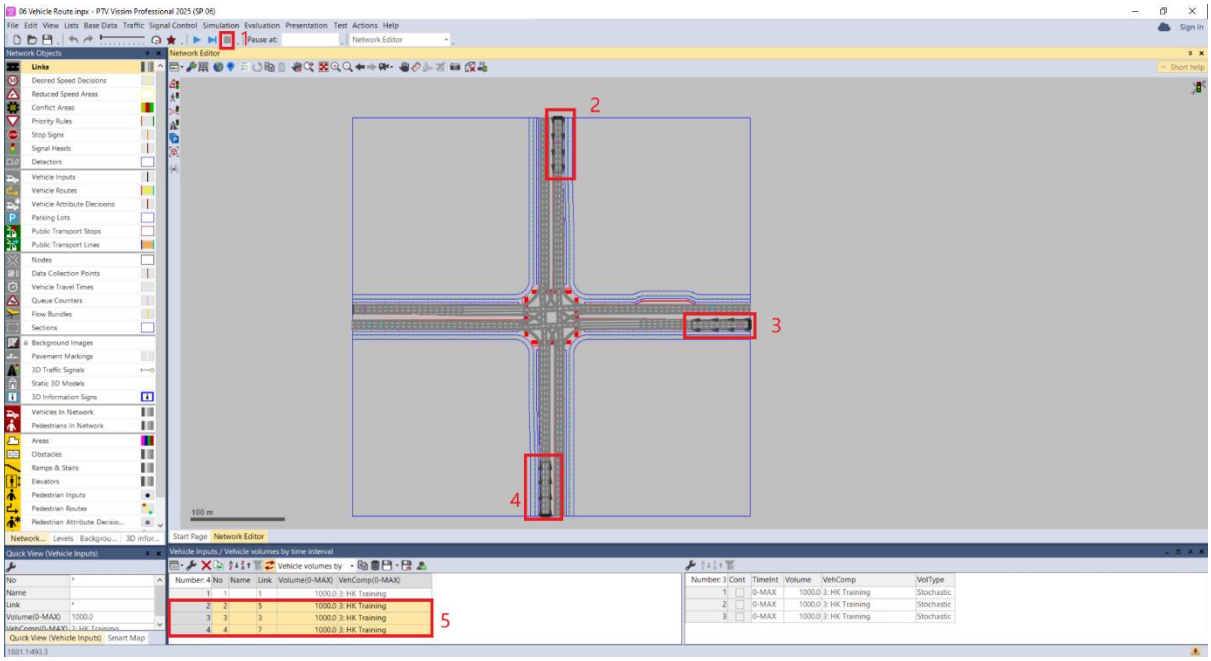
(13) Change the emergency stop distance of corresponding connectors, and ensure that the value is bigger than the solid line length.



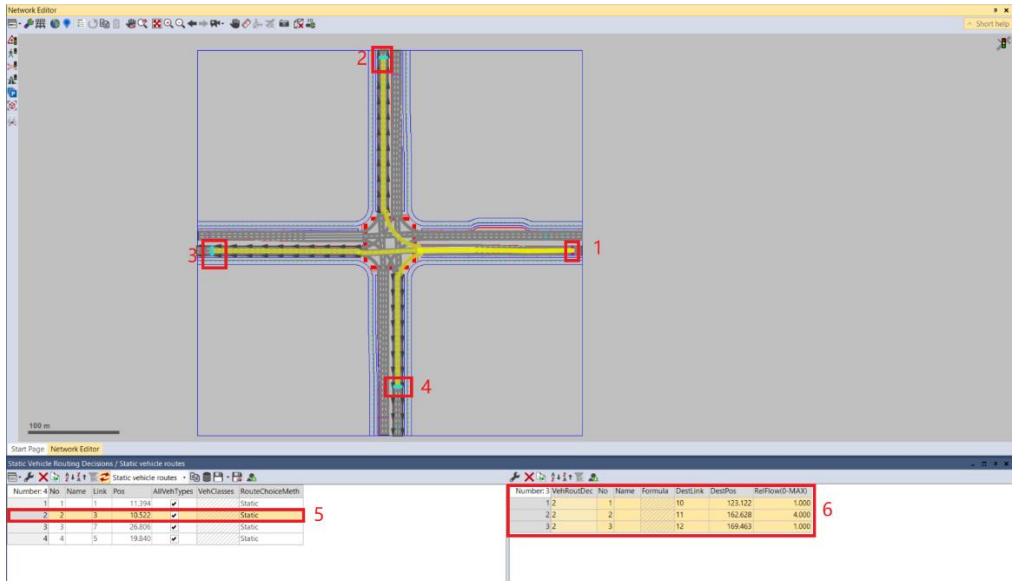
(14) Run the simulation and press Ctrl + D to switch to 3D view. Check if the model is running correctly.

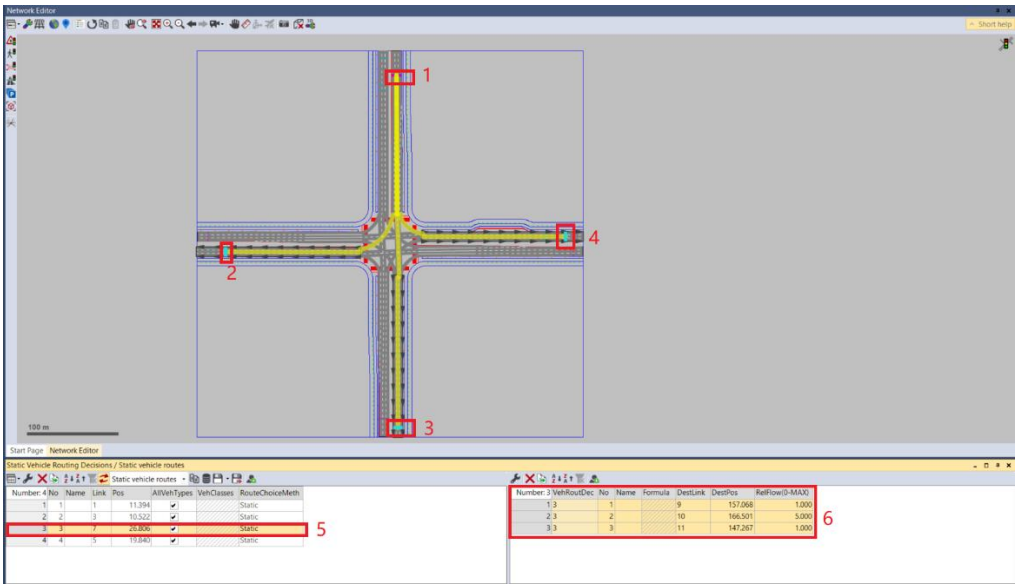


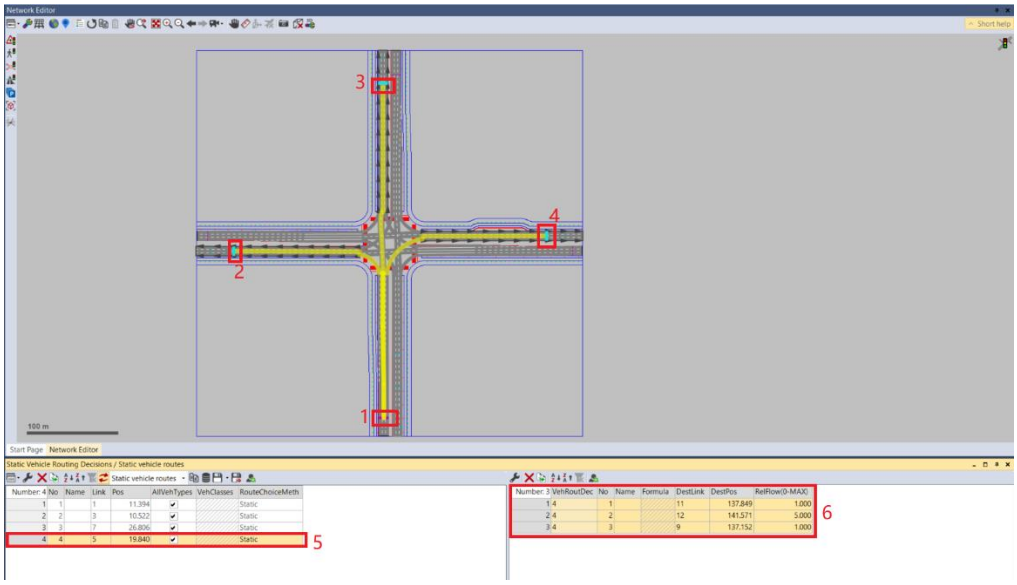
(15) Stop the simulation. Press Ctrl + D to switch back to 2D view. Repeat step 1 to add the vehicle input of other three directions.



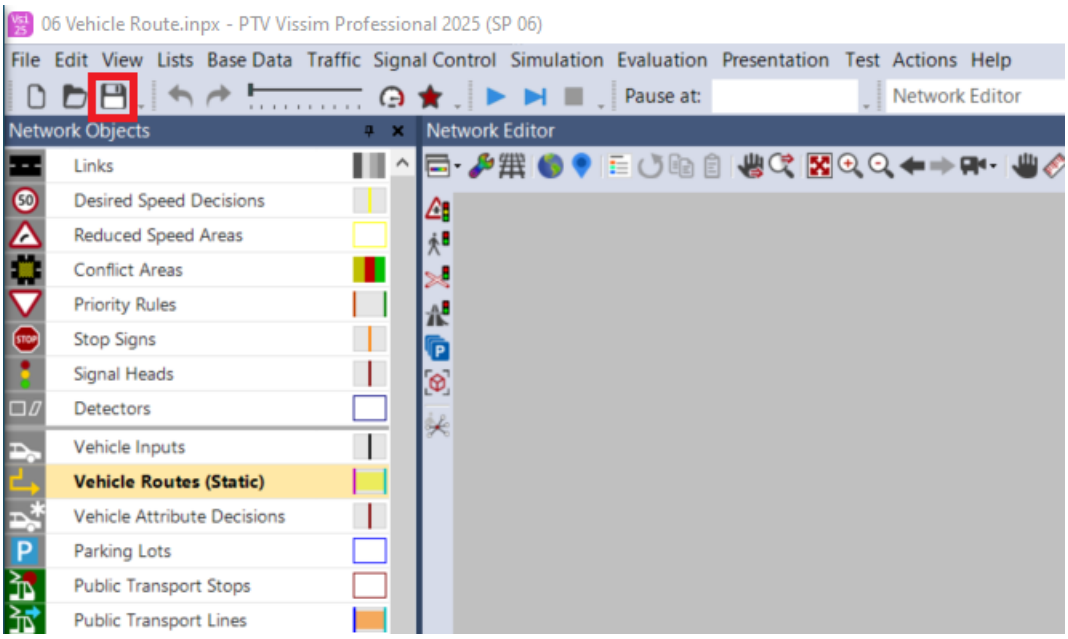
(16) Repeat step 2 to 6 to add the vehicle route of other three directions.







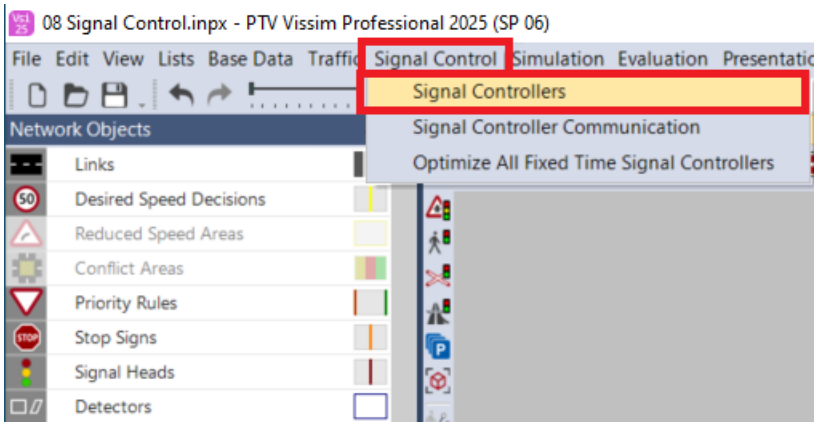
(17) Left click to save the file.



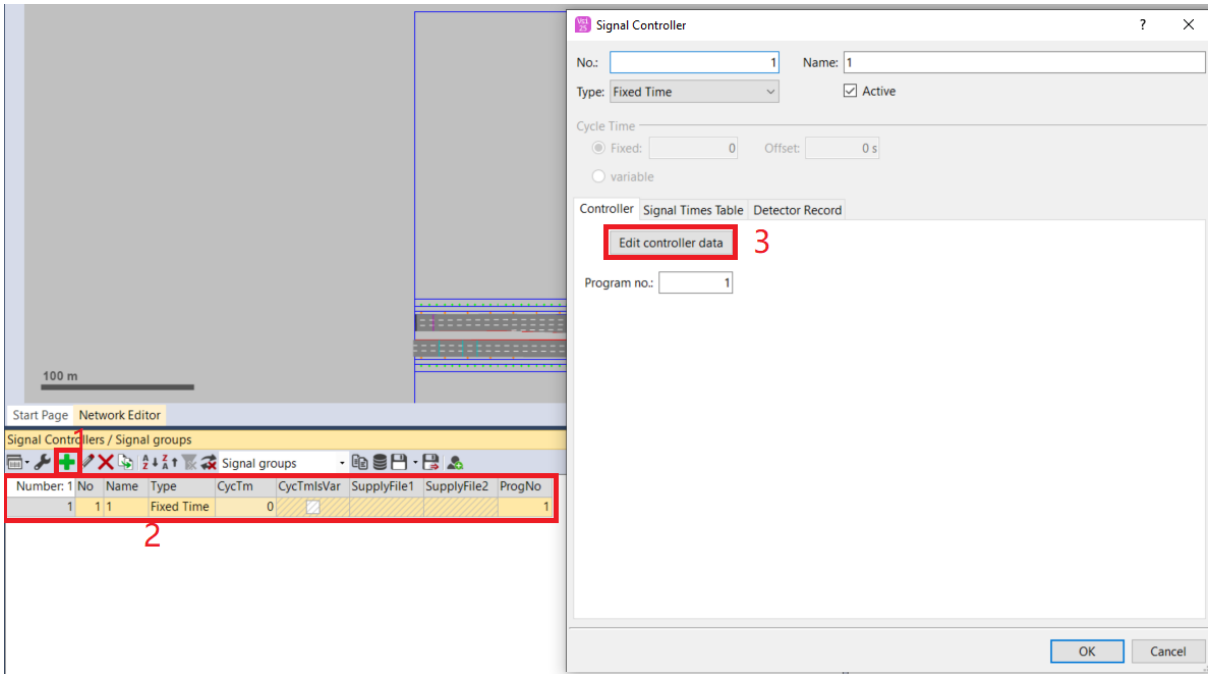
2. Traffic Control

2.1. Signal Control

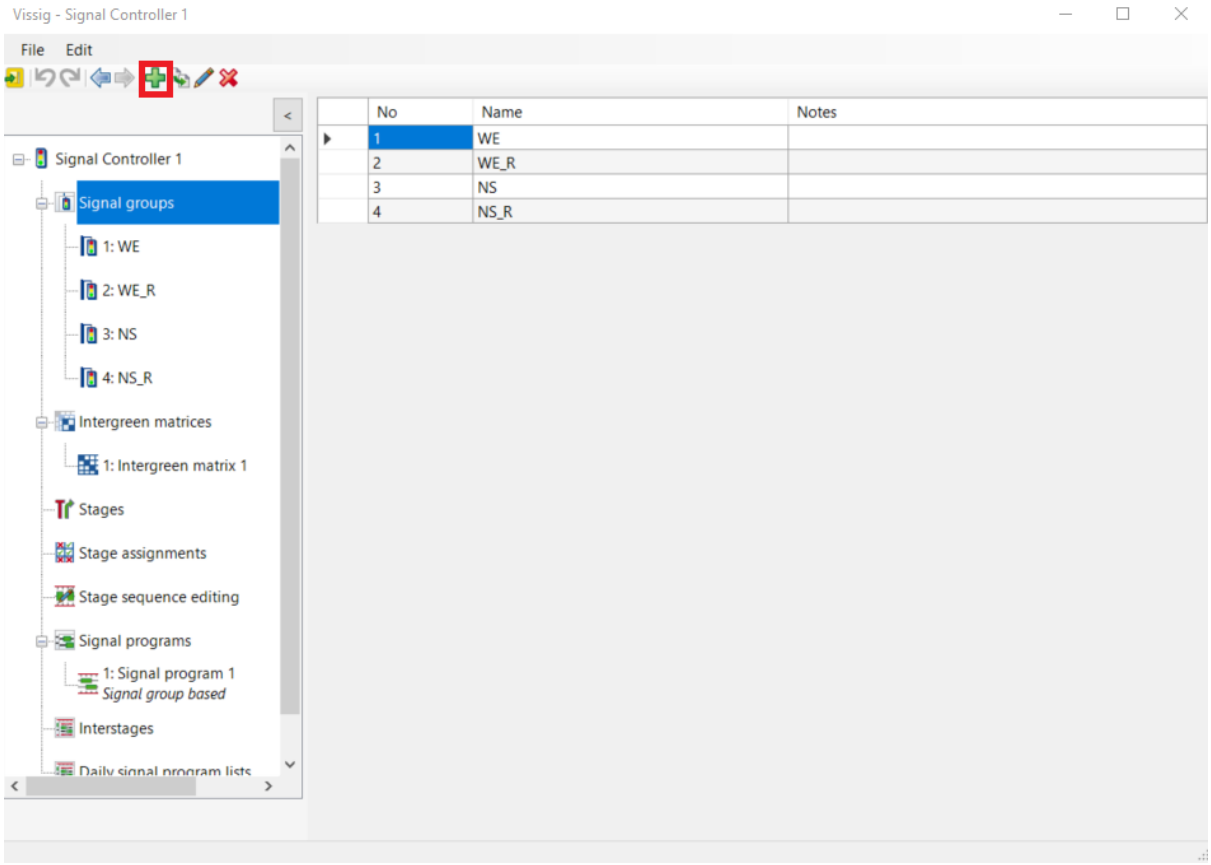
(1) In the menu bar, under Signal Control, click Signal Controllers.

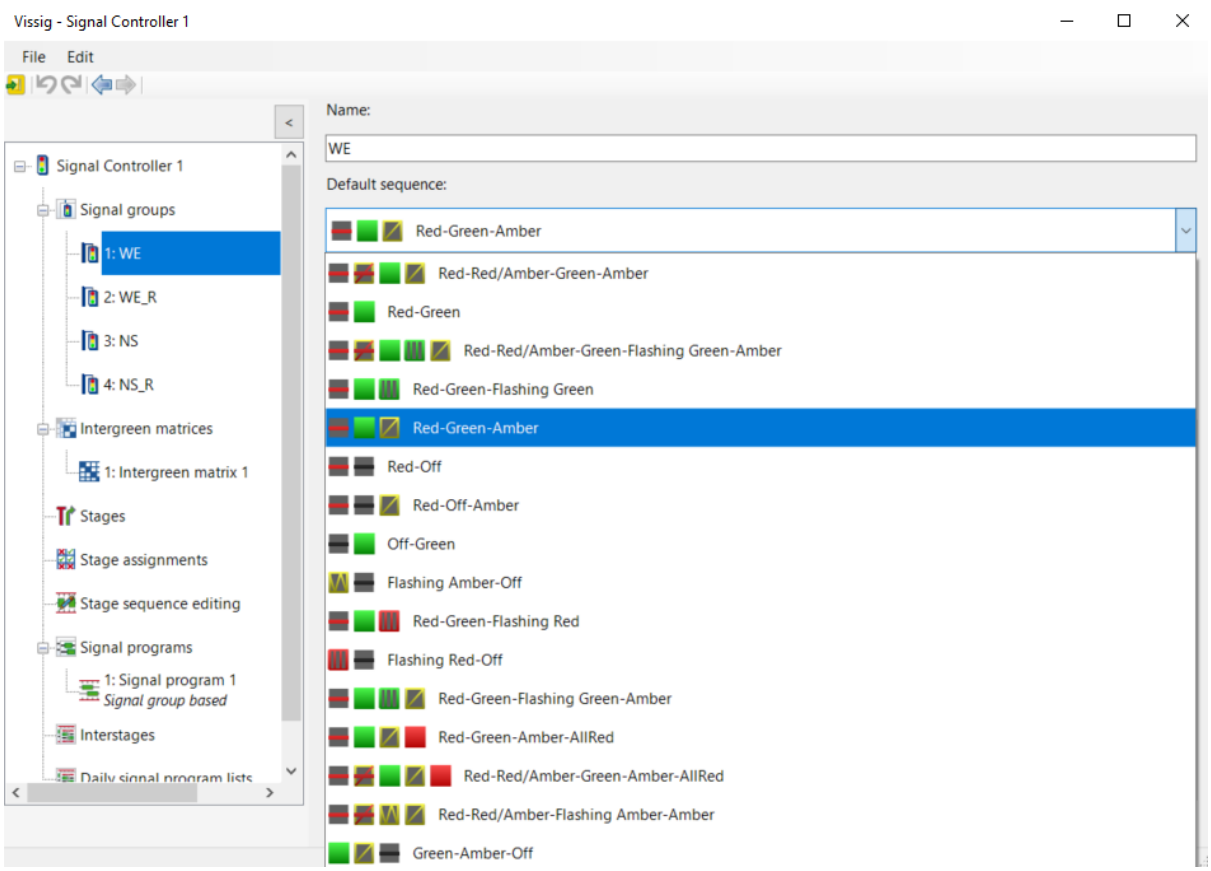


(2) Click + to add a new signal controller. Double-left click to open the dialogue box. Click edit controller data.

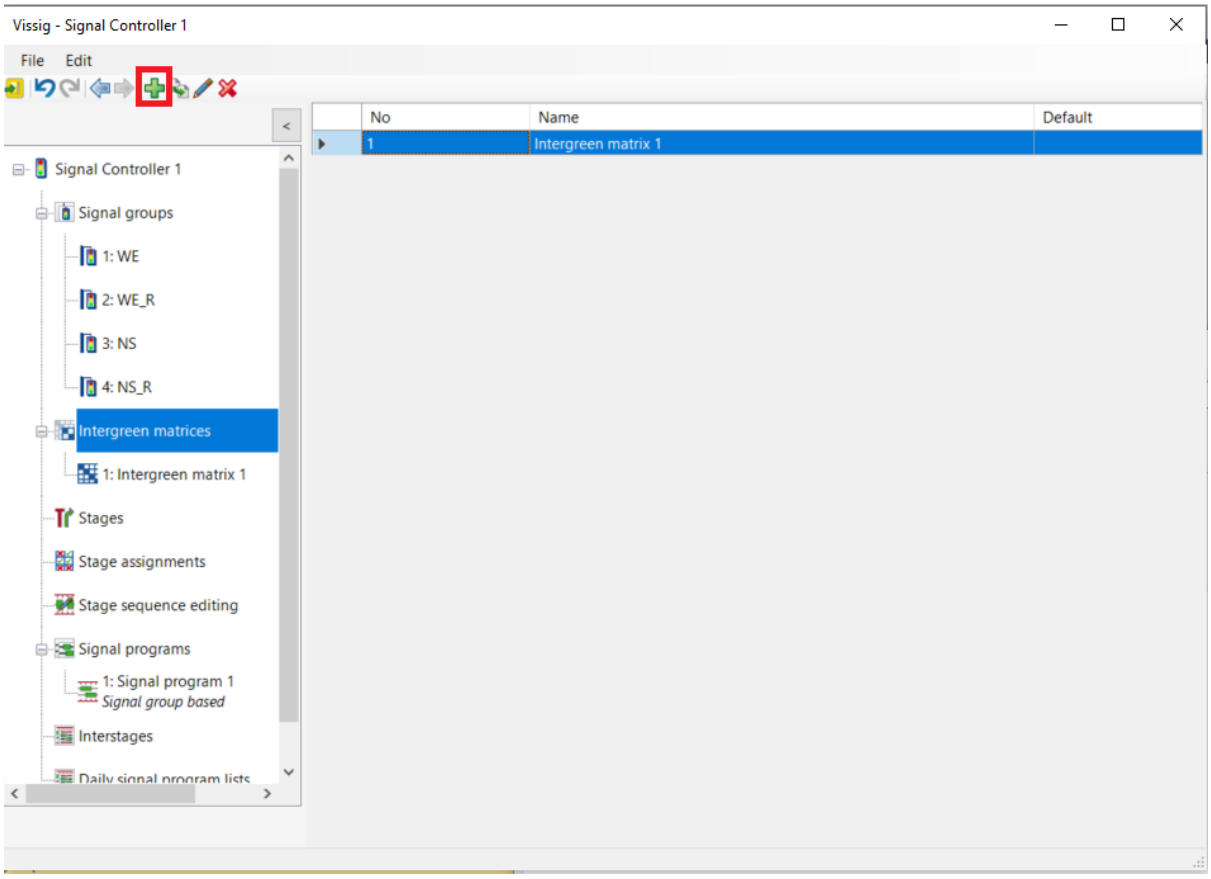


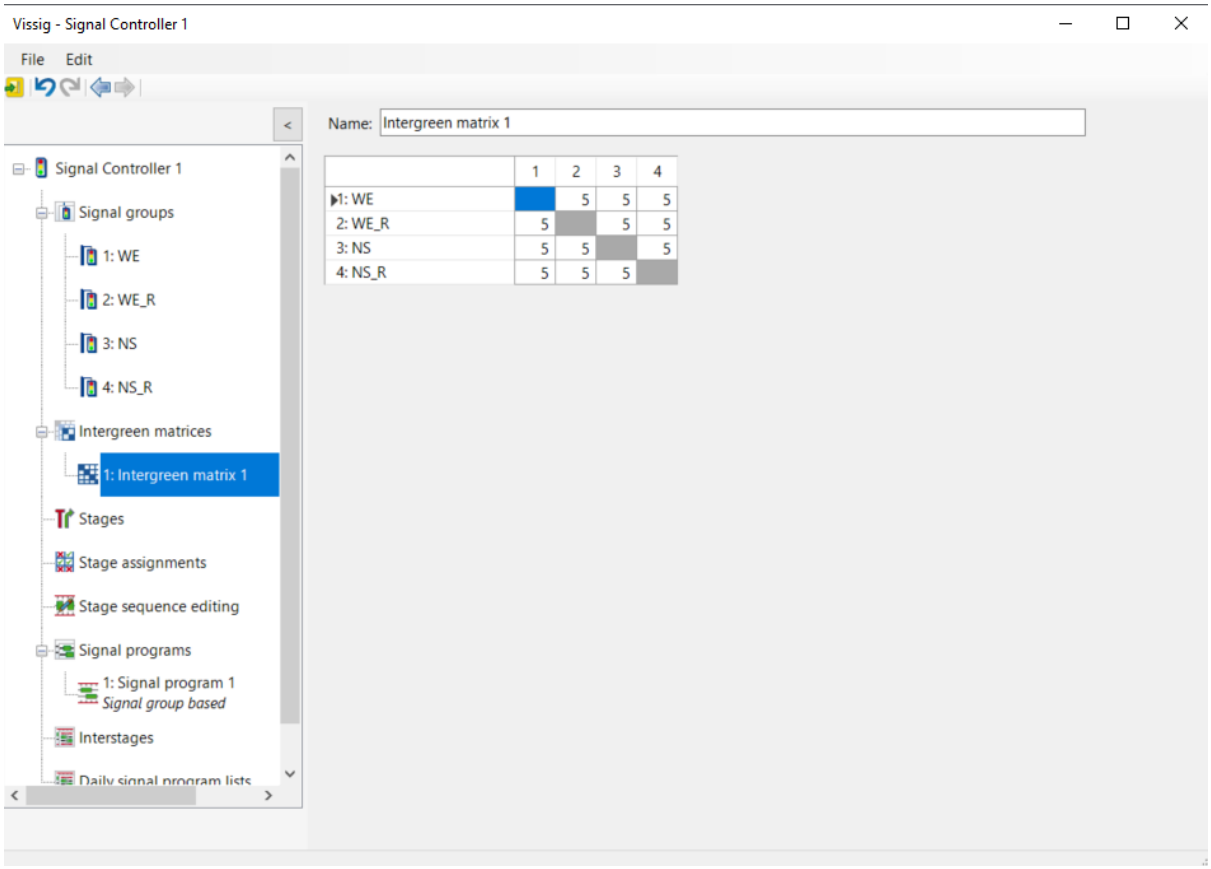
(3) Select signal groups. Click + to add new signal group. Under different signal groups, default sequence can be defined.



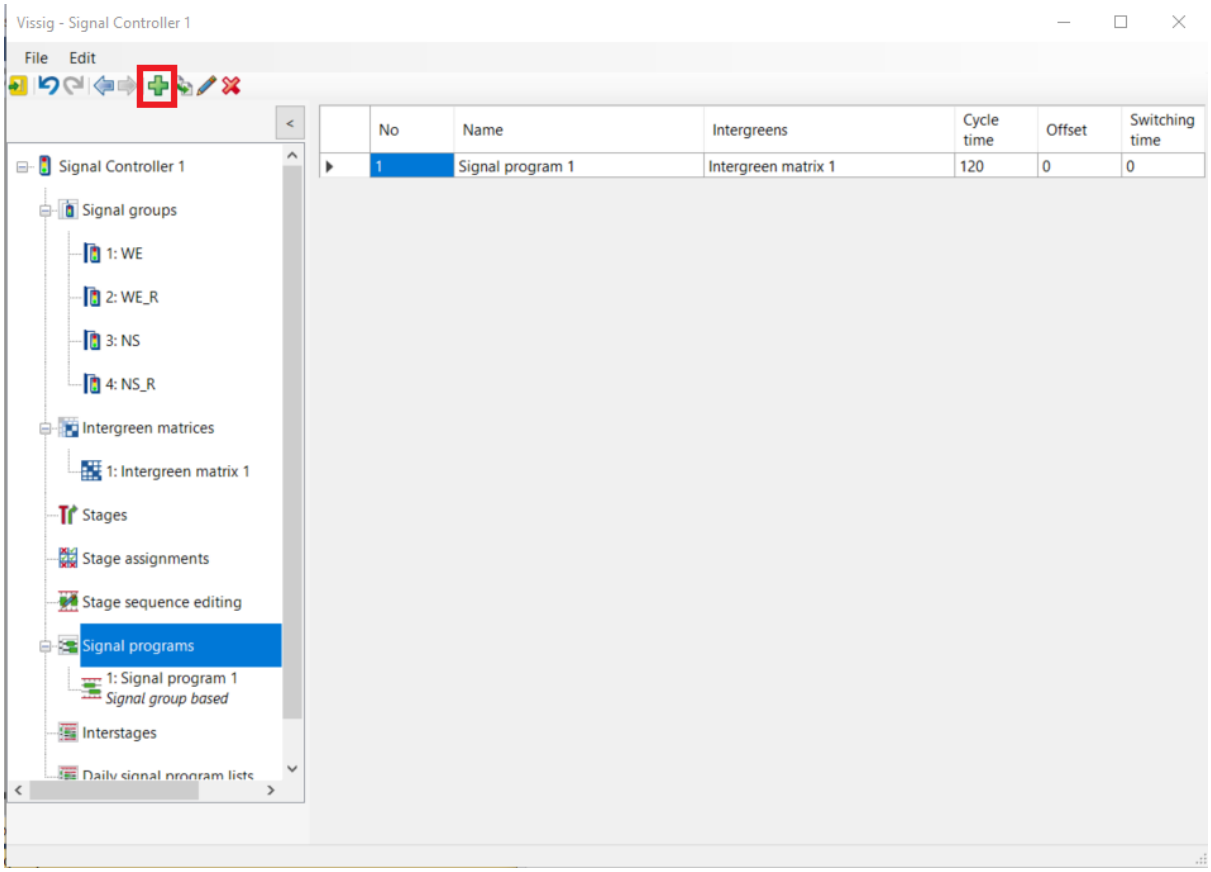


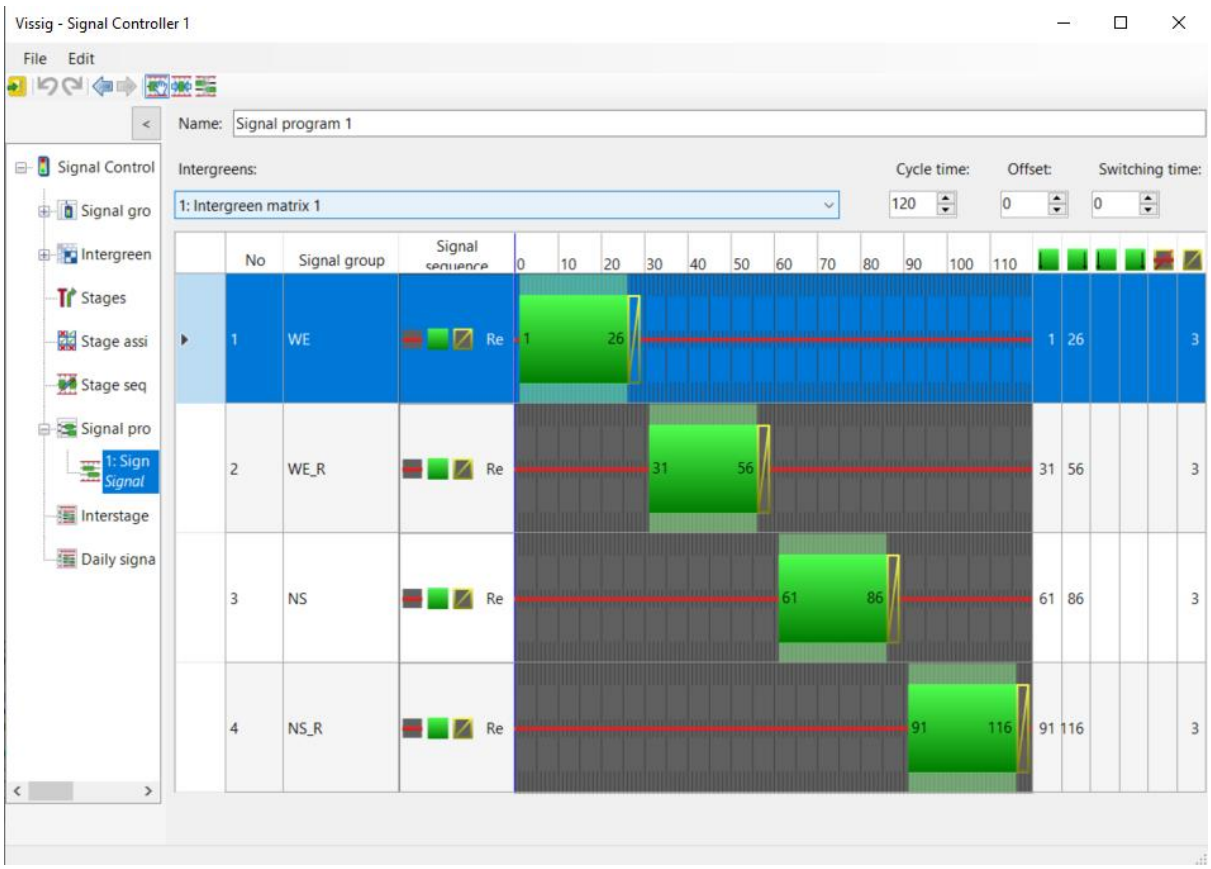
(4) Select intergreen matrices. Click + to add a new intergreen matrix. Edit the intergreen times between each signal group.



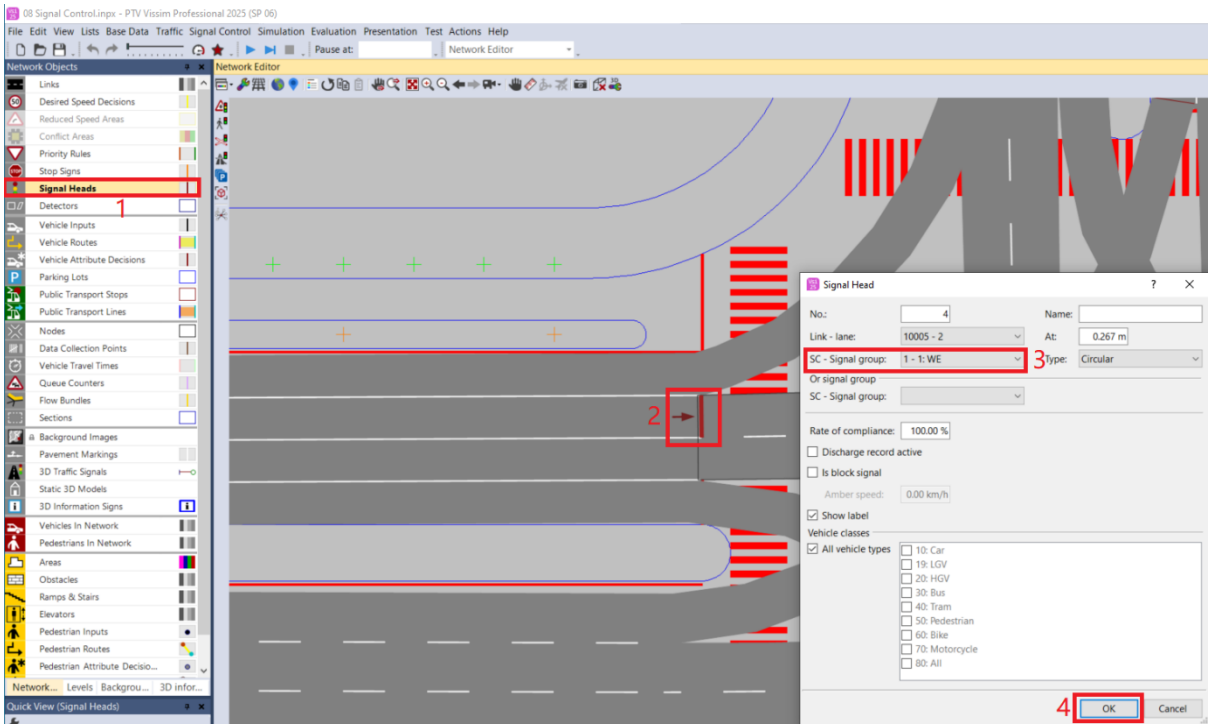


(5) Select signal programs. Click + to create a new signal program. Edit the signal program in the interface.



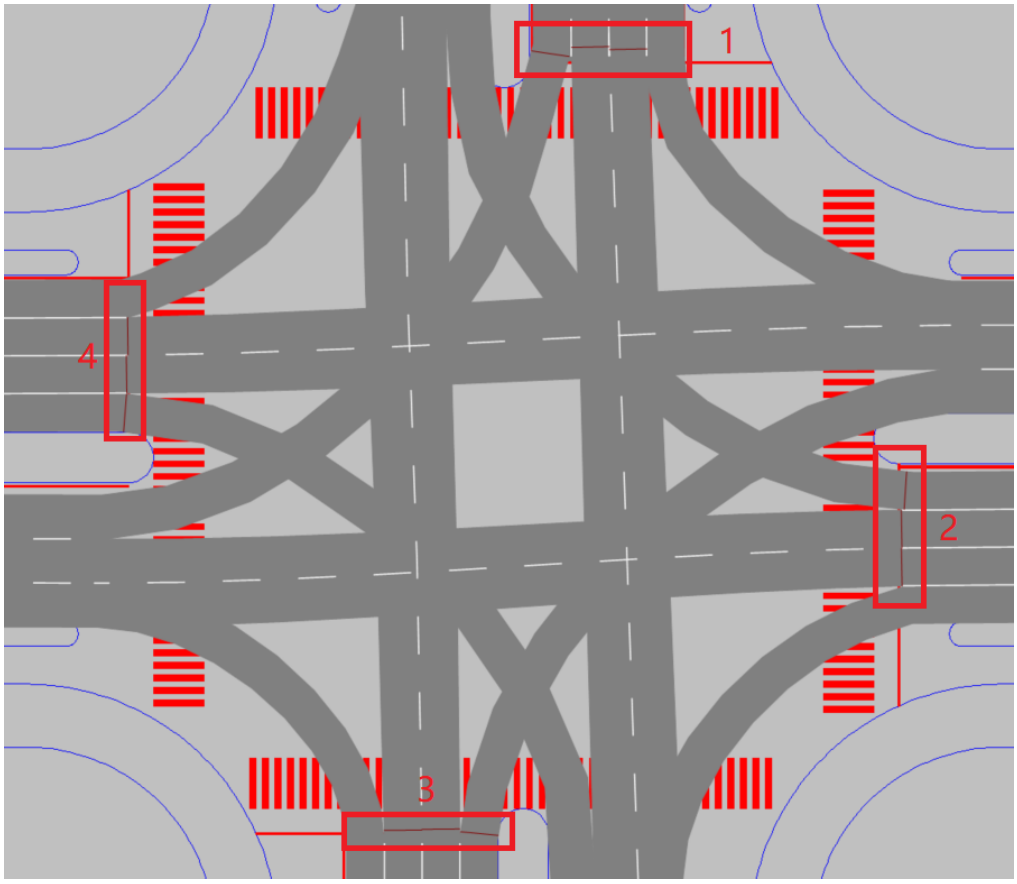


(6) Select Signal Heads. Hold Ctrl and right click on the position of the stopping line. Choose the corresponding signal group in the dialogue box and click OK.

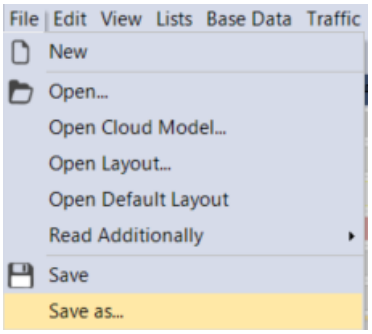


* If there are both links and connectors near the stopping line, please put the signal heads on the connectors.

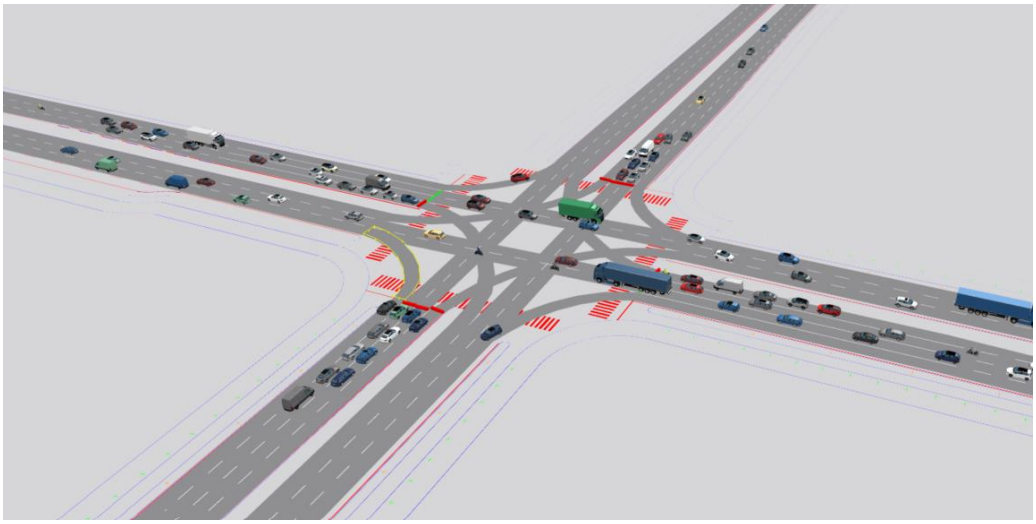
(7) Similarly, repeat step 5, and set every signal head.



(8) Save the file.



(9) Run the simulation. Press Ctrl + D to change to 3D view. Check if the model is running correctly.

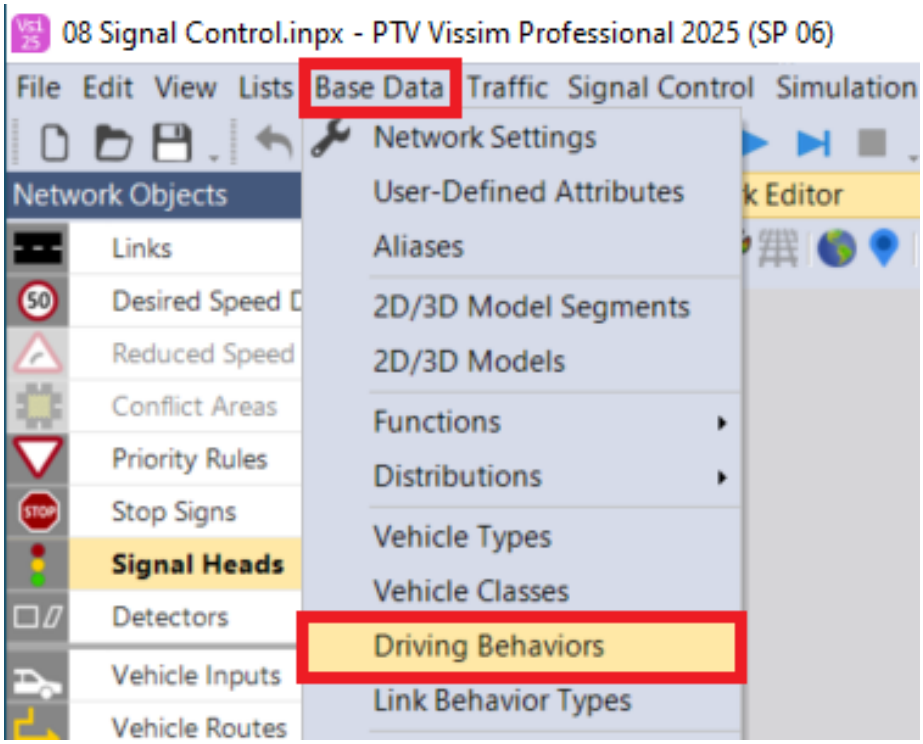


* Sometimes after a certain time of the simulation, some problems can be found. The first problem Is that the vehicles are overlapping with each other. Another problem is that the lane changing behaviors of vehicles at dash lines become very extreme. For example, assume that there is a car that appears at the leftmost lane, but then it is allocated by the vehicle routing decision to turn right. The car then has to travel across multiple lanes, and when there are other vehicles, it must stop to wait for them until it is able to go.

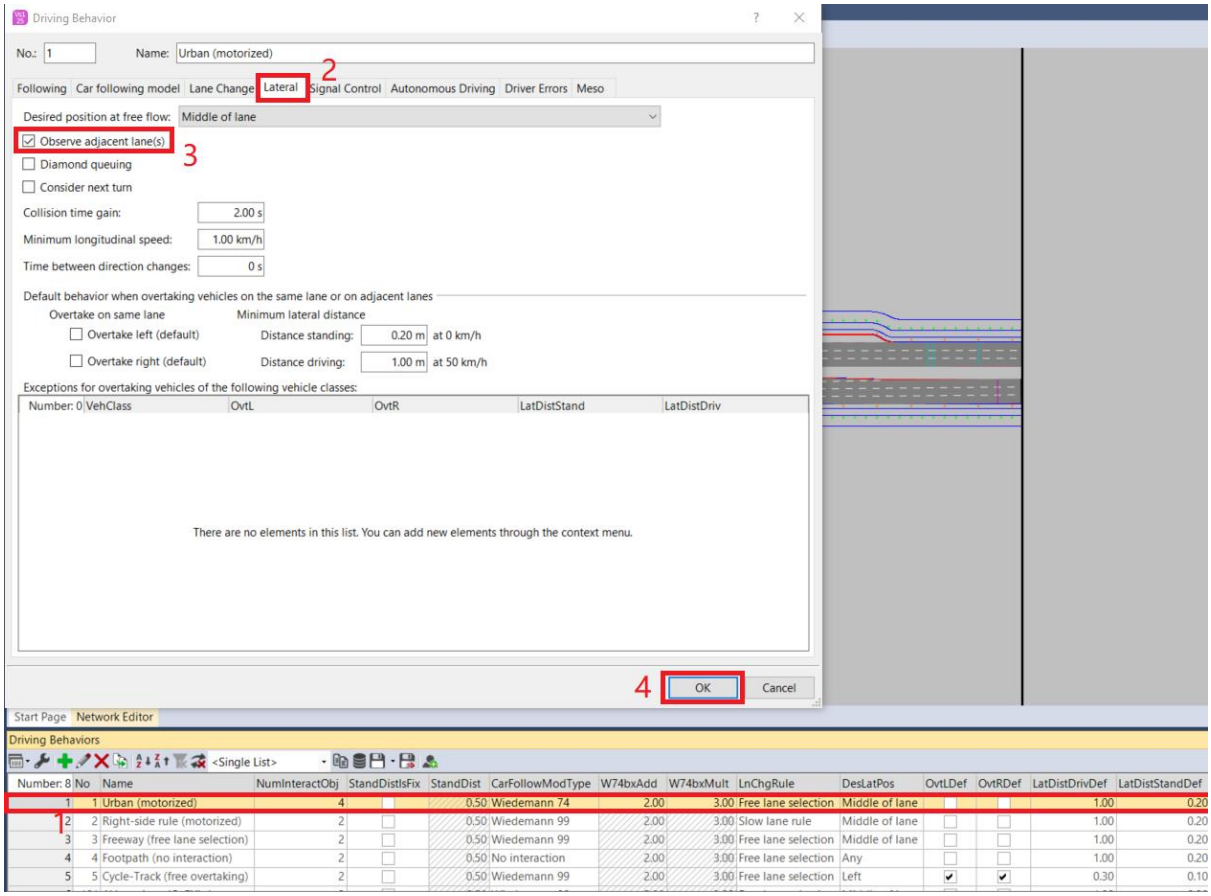
* It is possible to solve the first problem by adjusting the driving behavior. Although it cannot avoid the problem by 100%, it can mitigate the problem to some extent.

* It is possible to solve the second problem by adding links and connectors to assist vehicles to change their lanes earlier. Although this method has more steps, it has the best performance. However, it is only suitable for the links that have an end.

(10) After stopping the simulation, select Base Data and go to Driving Behaviors.

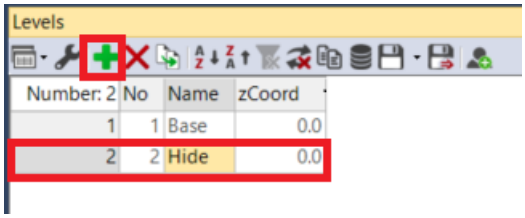


(11) Double-left click Urban (motorized) to open the dialogue. Select Lateral and choose Observe adjacent lane(s), then click OK.

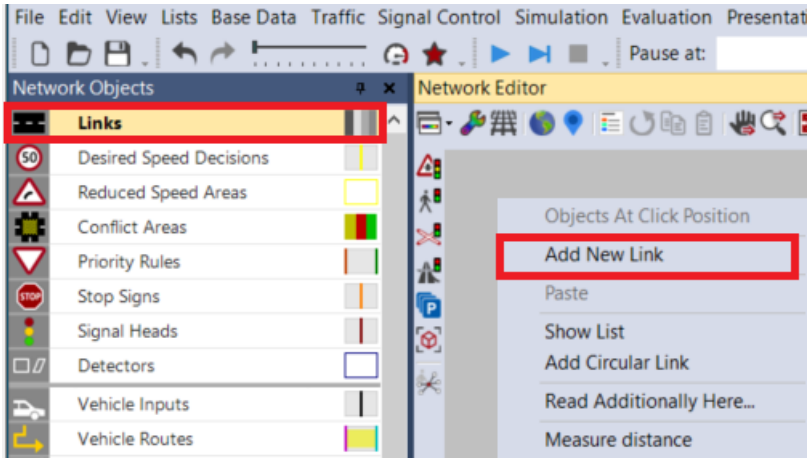


(12) Go to Base Data and select Levels.

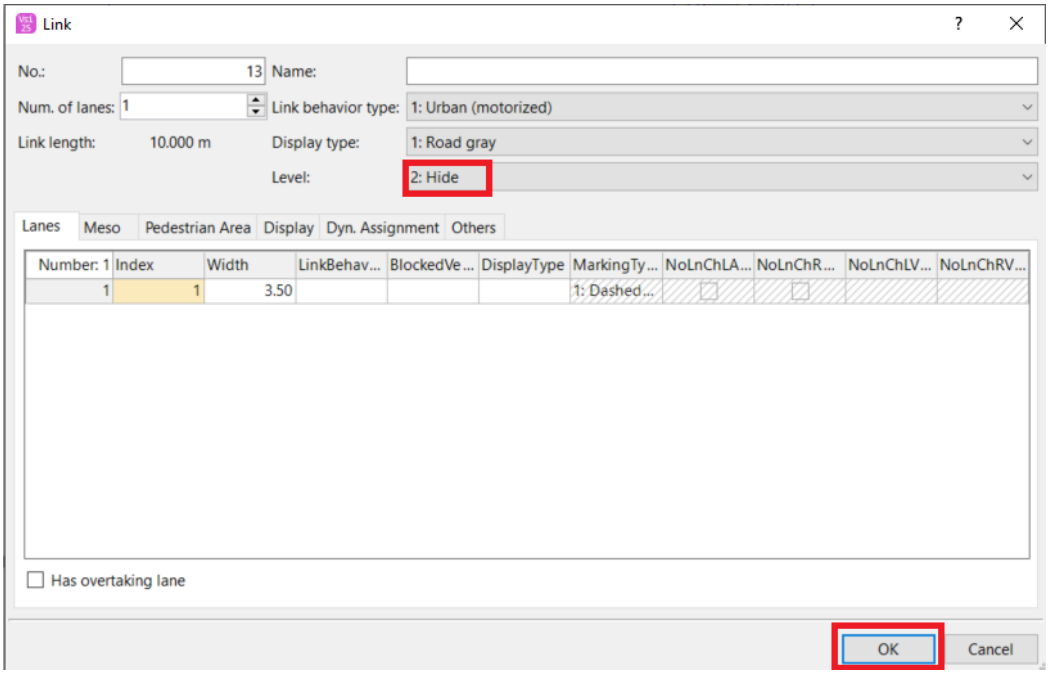
(13) Left click + in the list and change its name to Hide.



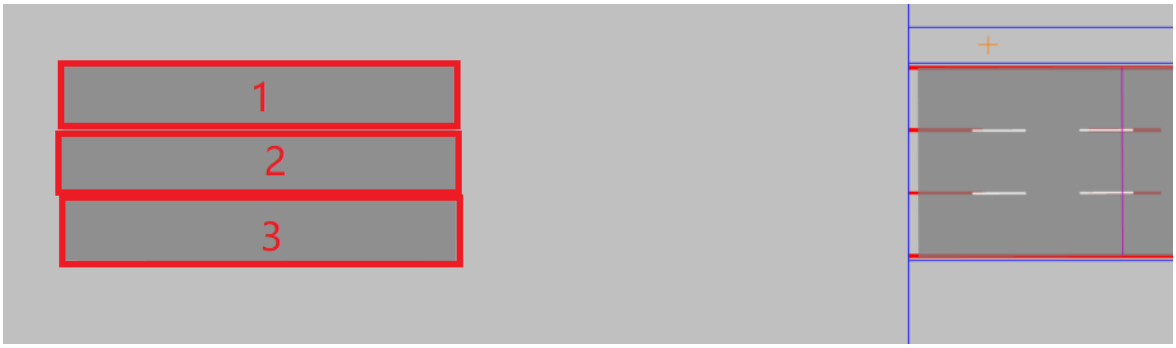
(14) Select Links, and in Network Editor, right click and choose Add New Link.



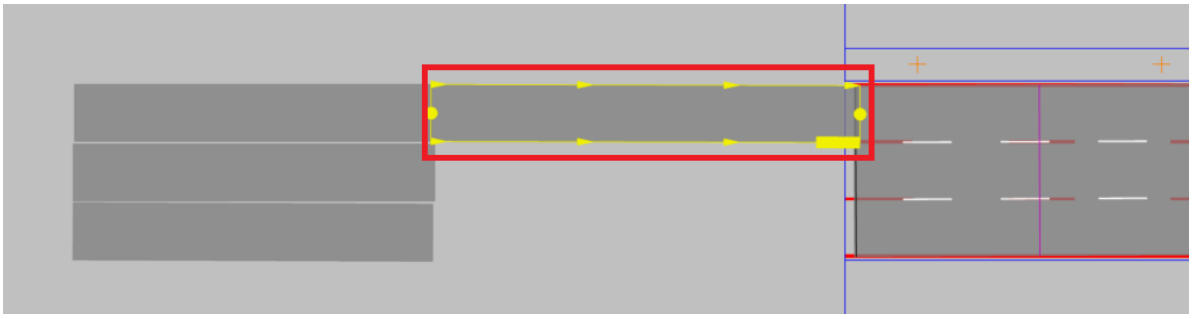
(15) In the dialogue box, change the Level to Hide, and then left click OK.



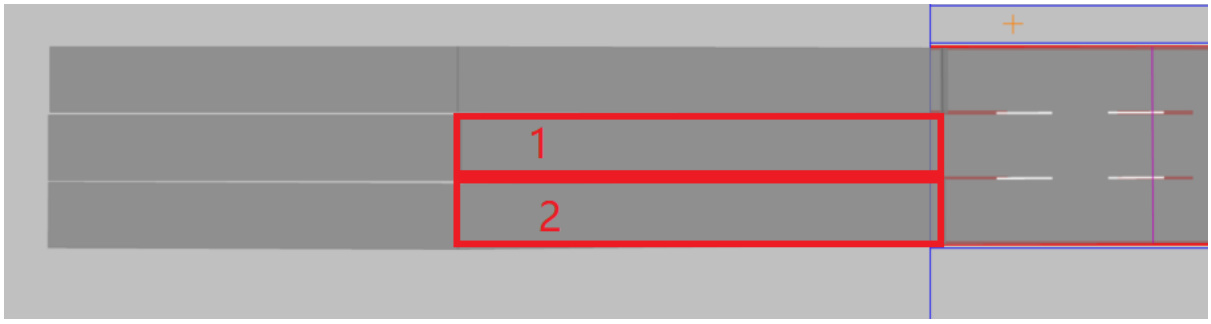
(16) Repeat step 14 to 15 to create more assistance links.



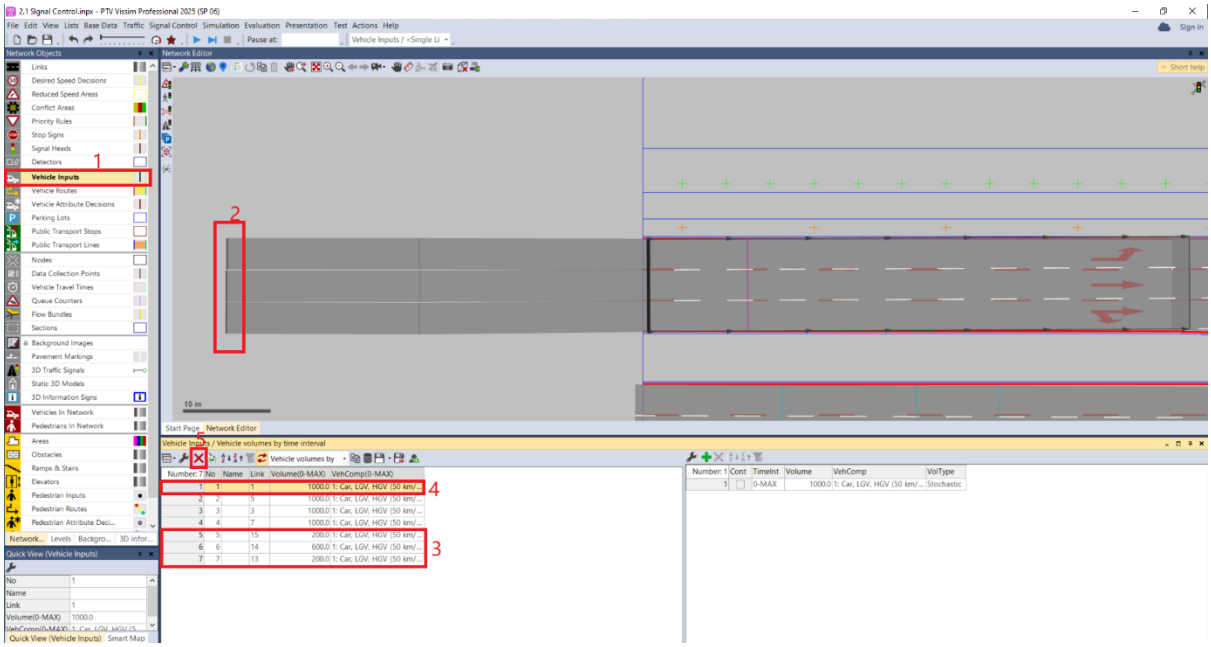
(17) Add connectors between the links. Directly click OK in the dialogue box.



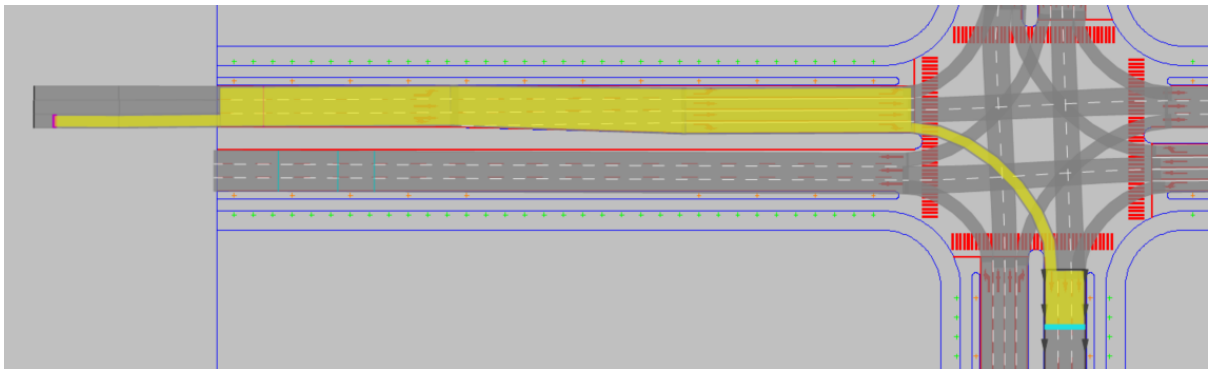
(18) Repeat step 18 to create more connectors.



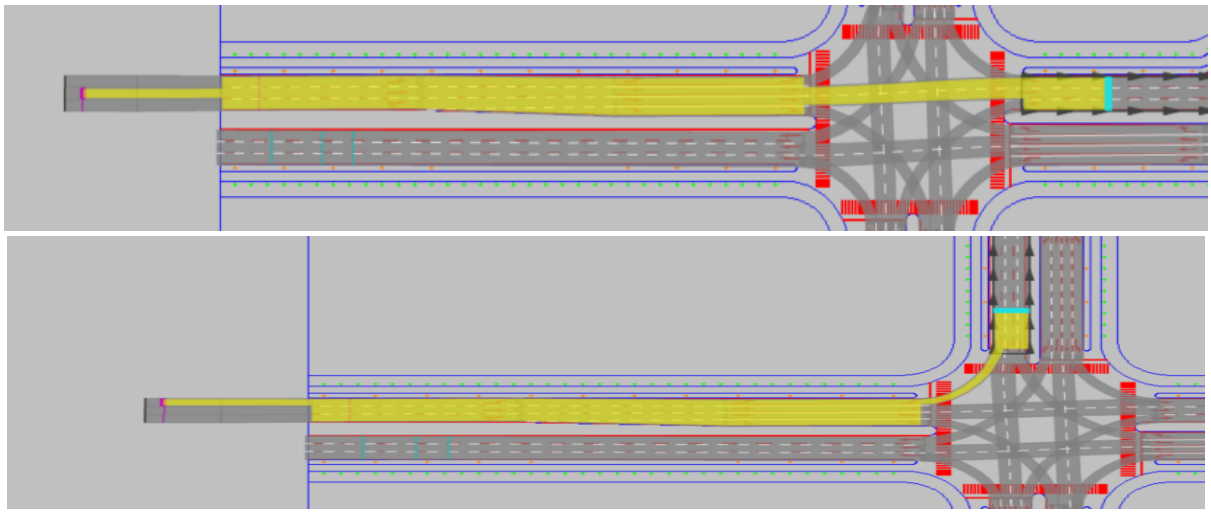
(19) Select Vehicle Inputs. Hold Ctrl and right click the links by order to create vehicle input. According to assumed relative flow ratio, put the traffic volume in each direction. Then delete the original vehicle input.



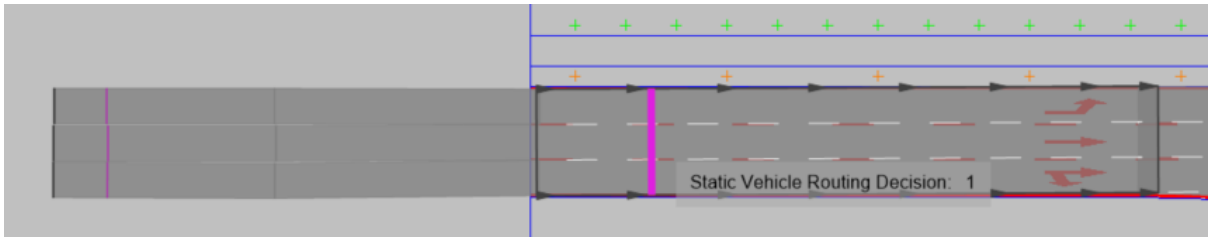
(20) Select Vehicle Routes. After the vehicle input, press Ctrl and right button to create a routing decision point. Move the mouse to the south entrance and create a right turn route for the vehicles.



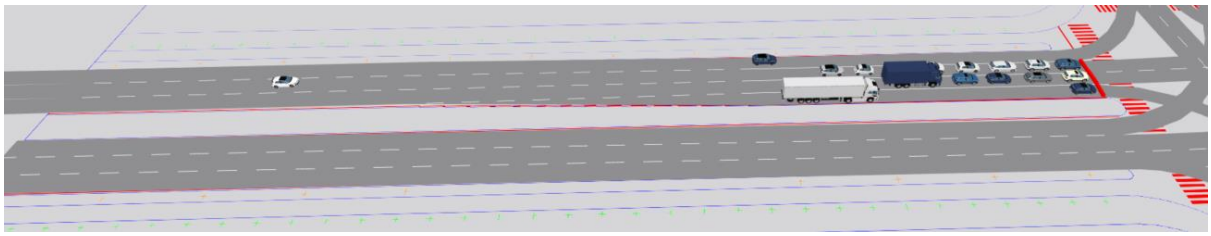
(21) Similarly, create more vehicle routes on other routes.



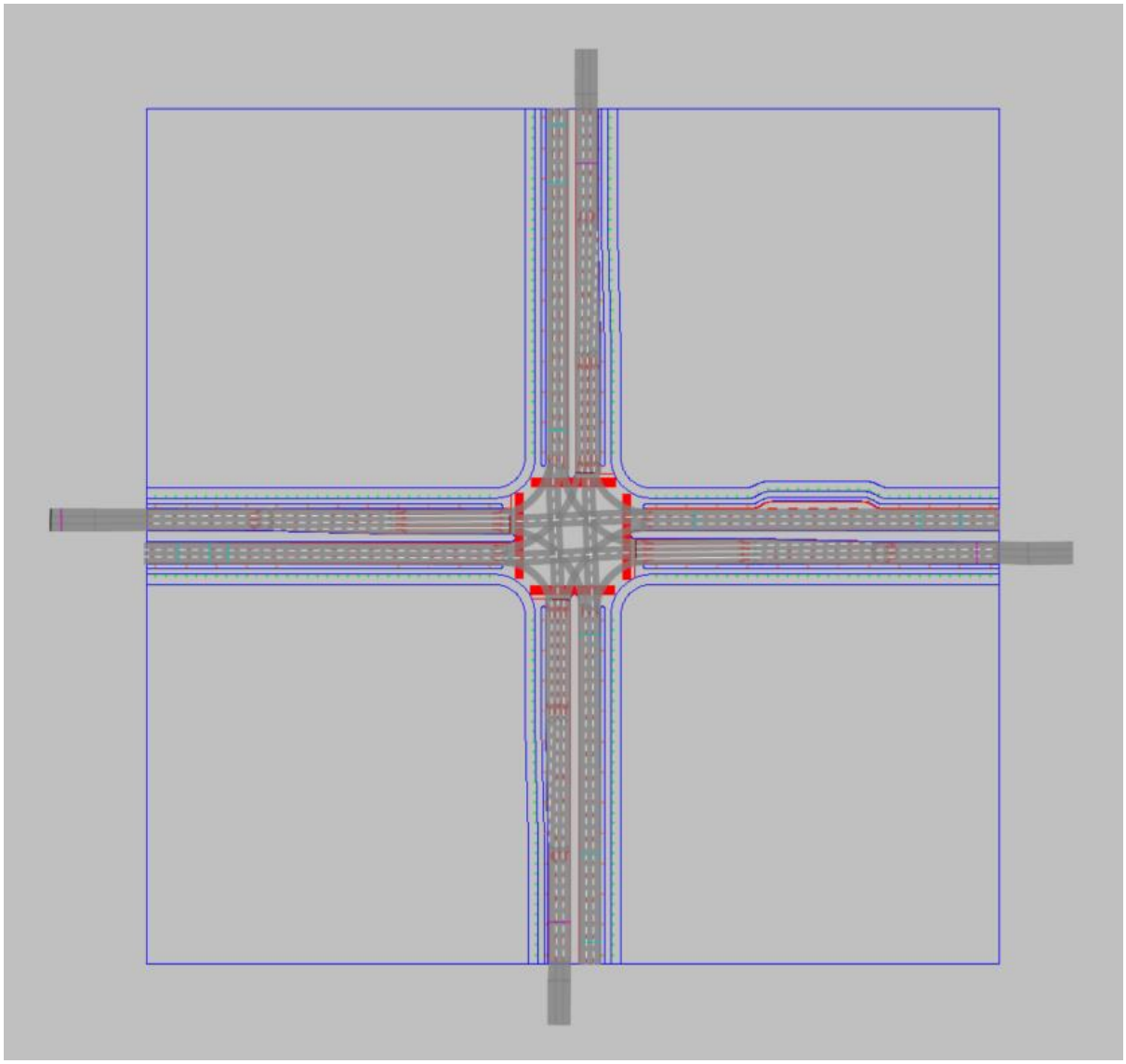
(22) Lastly, left click the original vehicle routing decisions, and press Delete to delete it.



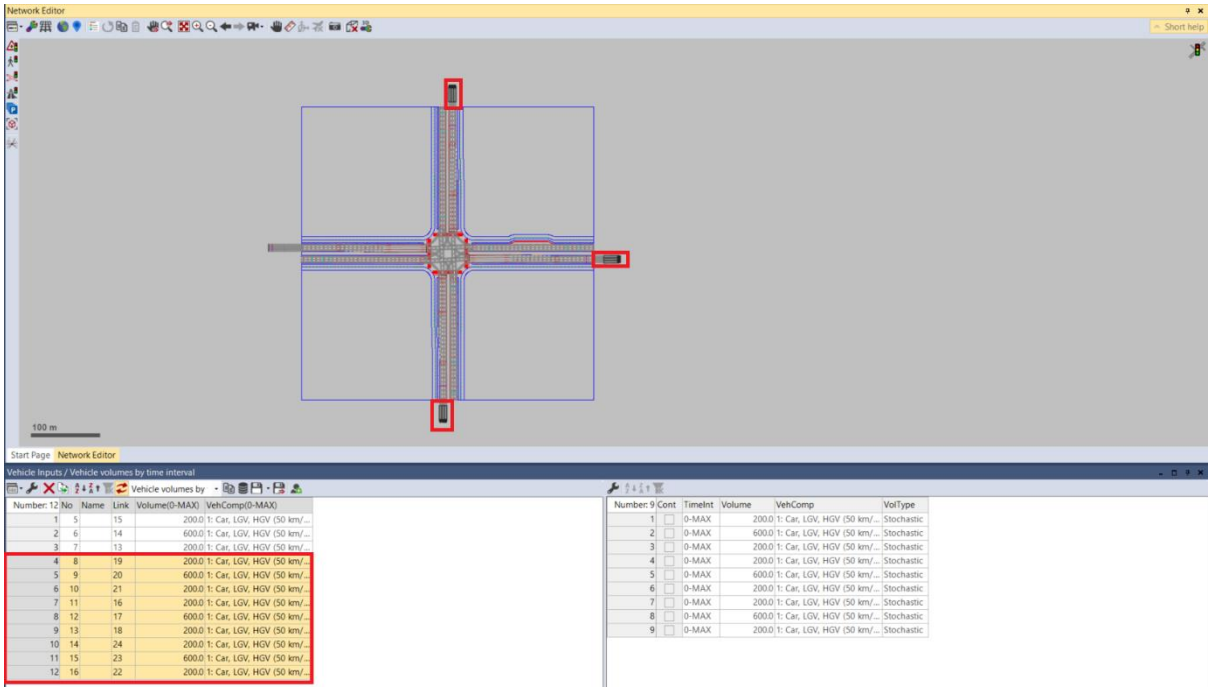
(23) Run the simulation, and check if the problem still exists.



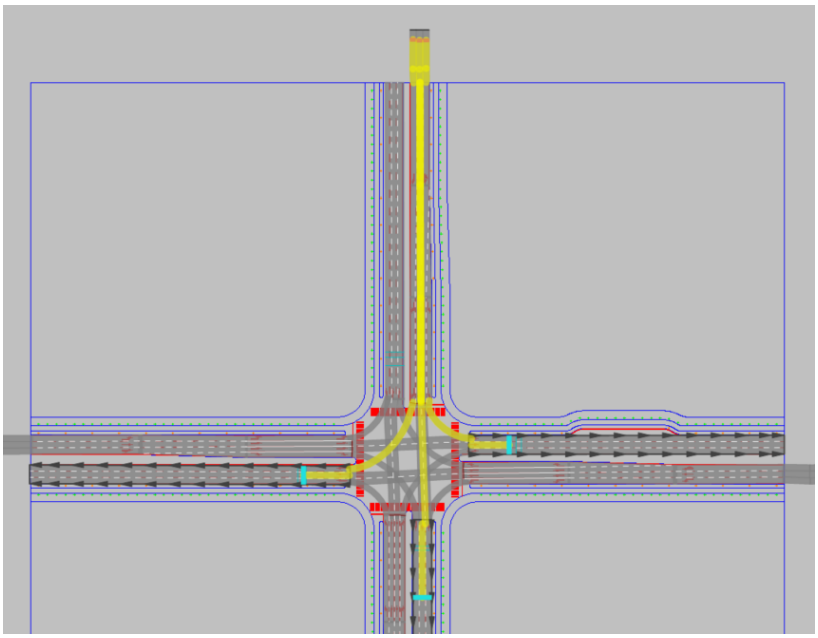
(24) If the problem does not exist anymore, stop the simulation. Repeat step 14 to 18 to create the links and connectors for the other three directions.

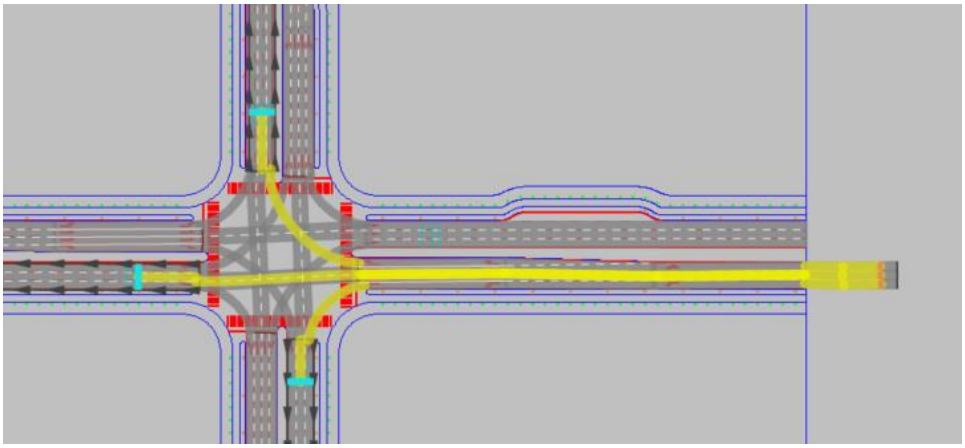


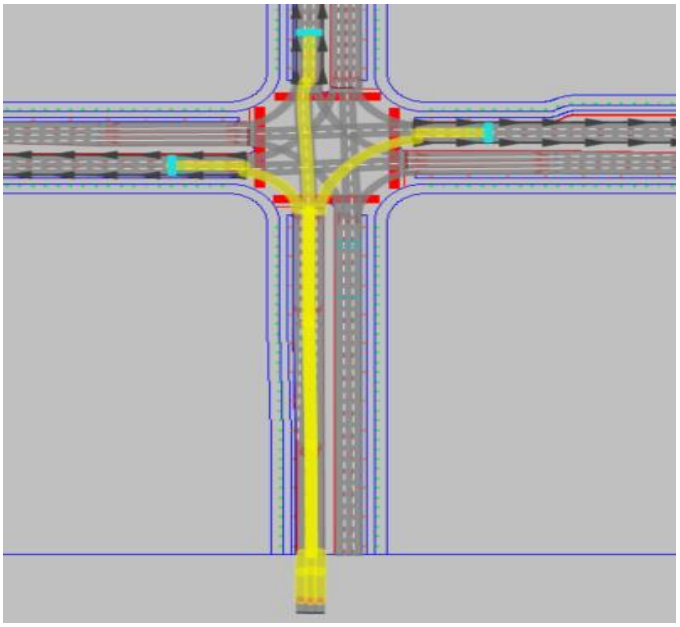
(25) Repeat step 19, and define the vehicle input again for the other three directions.



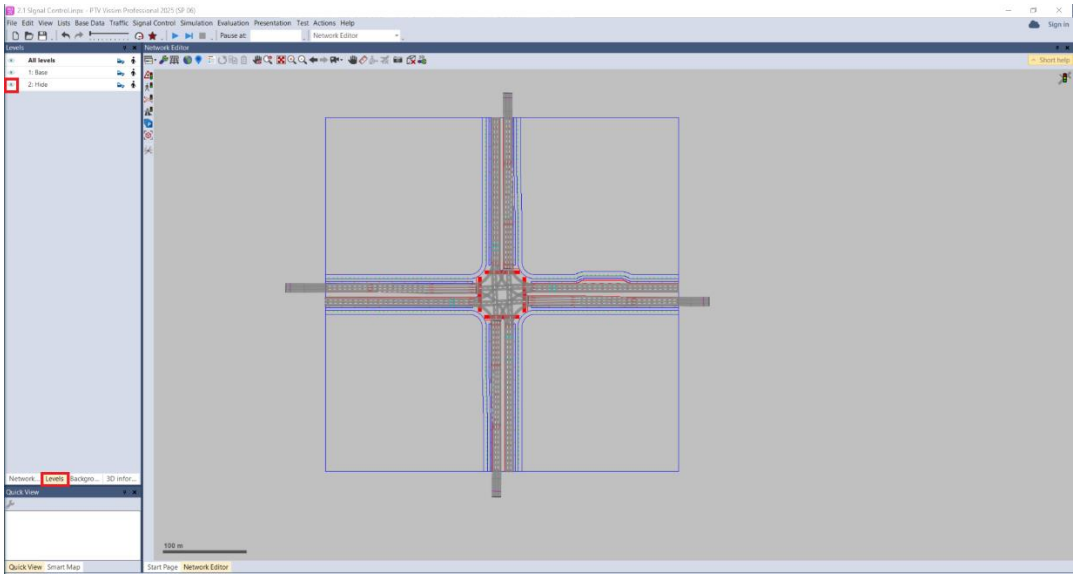
(26) Repeat step 20 to 22, and define the vehicle routing decisions.



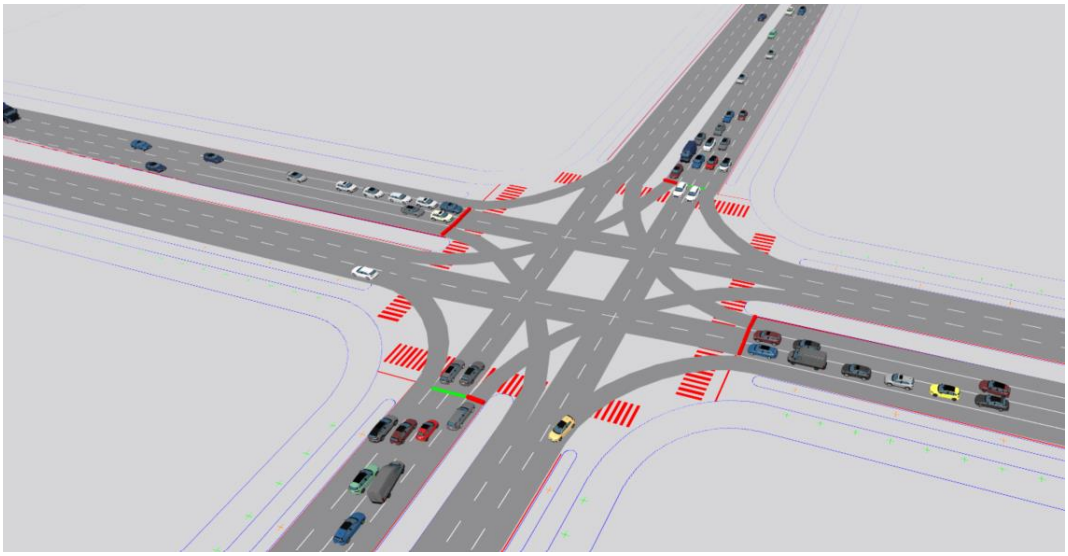




(27) Select Levels tab and left click near the Hide Level.



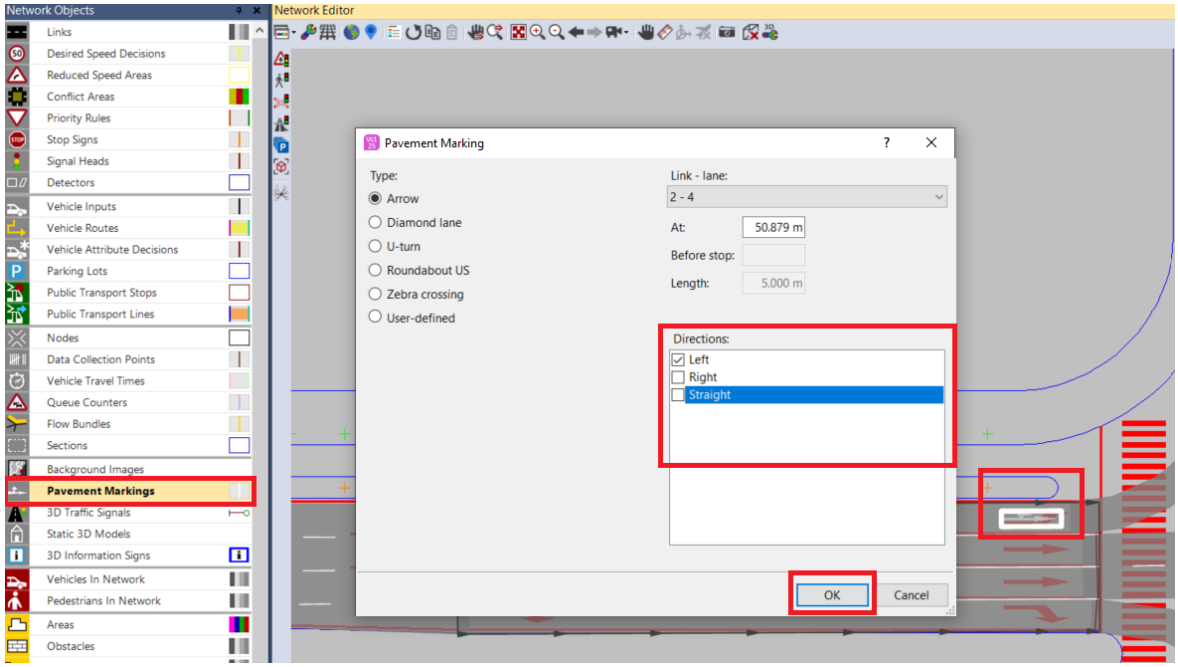
(28) Run the simulation and check if the problem still exists for the other directions.



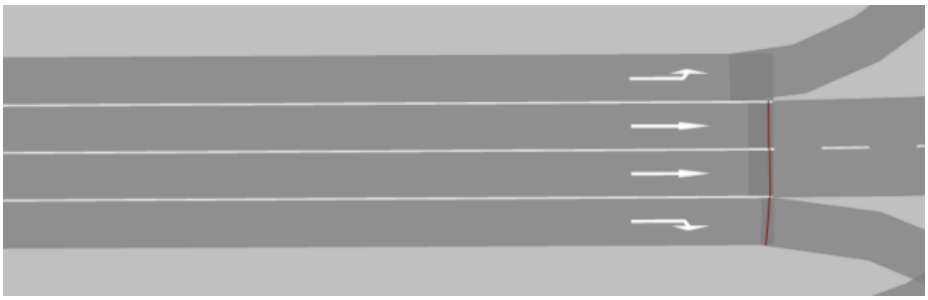
2.2. Beautification

* Please note that this part is only for beautification and will not affect the results of the simulation.

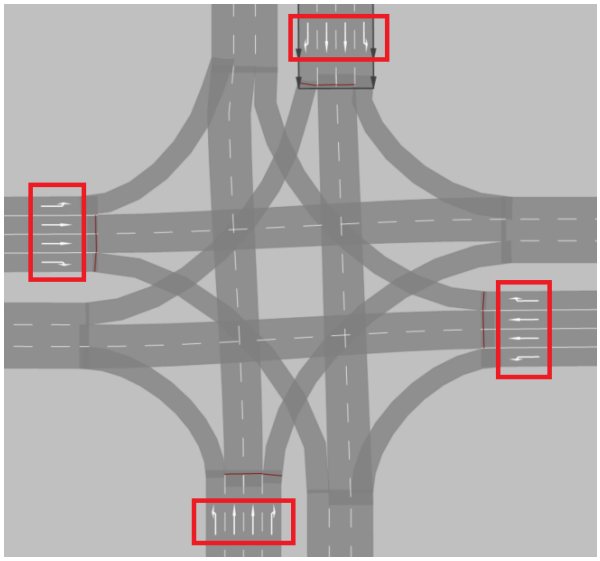
(1) Select Pavement Markings. Hold Ctrl and right click on the link. Choose the directions of the arrow, and then click OK.



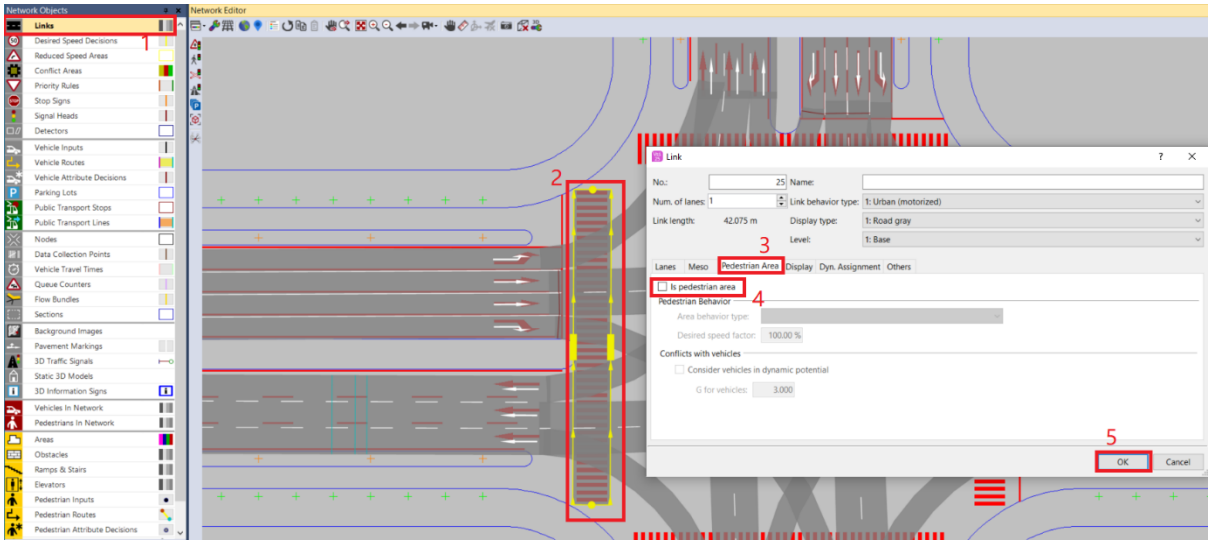
(2) Similarly, define the arrow marking for other lanes.



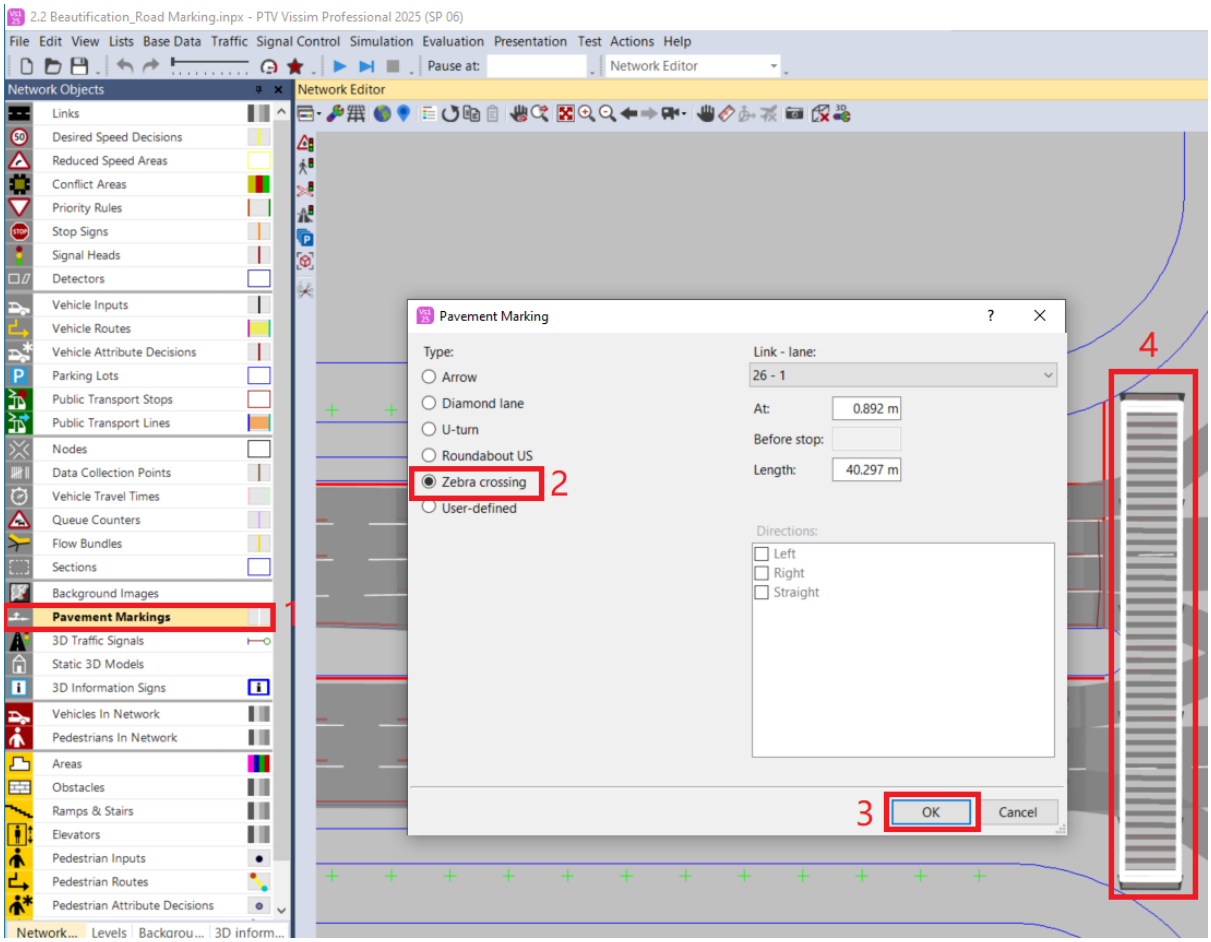
(3) Repeat step 1 and 2 to create road marking for the other three directions.



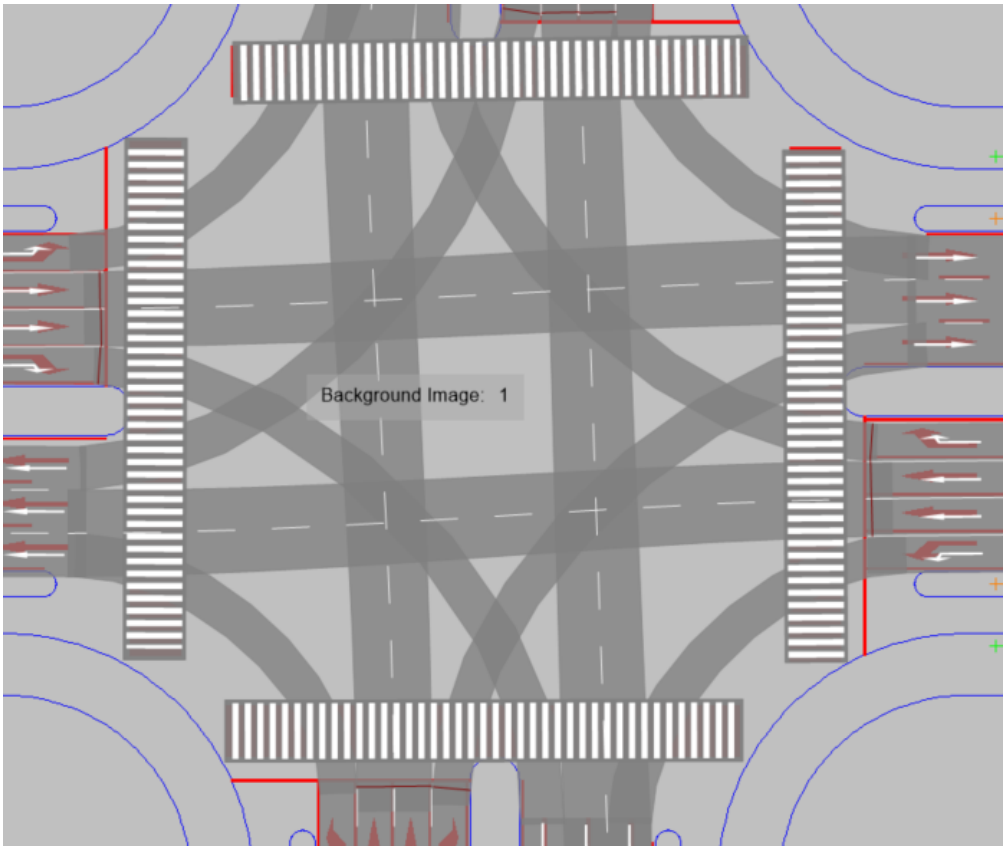
(4) Select Links. Press and hold Ctrl and right button to draw a link based on the pedestrian crossing of the background image. In the dialogue box, choose Pedestrian Area, click on “Is pedestrian Area”, and click OK.



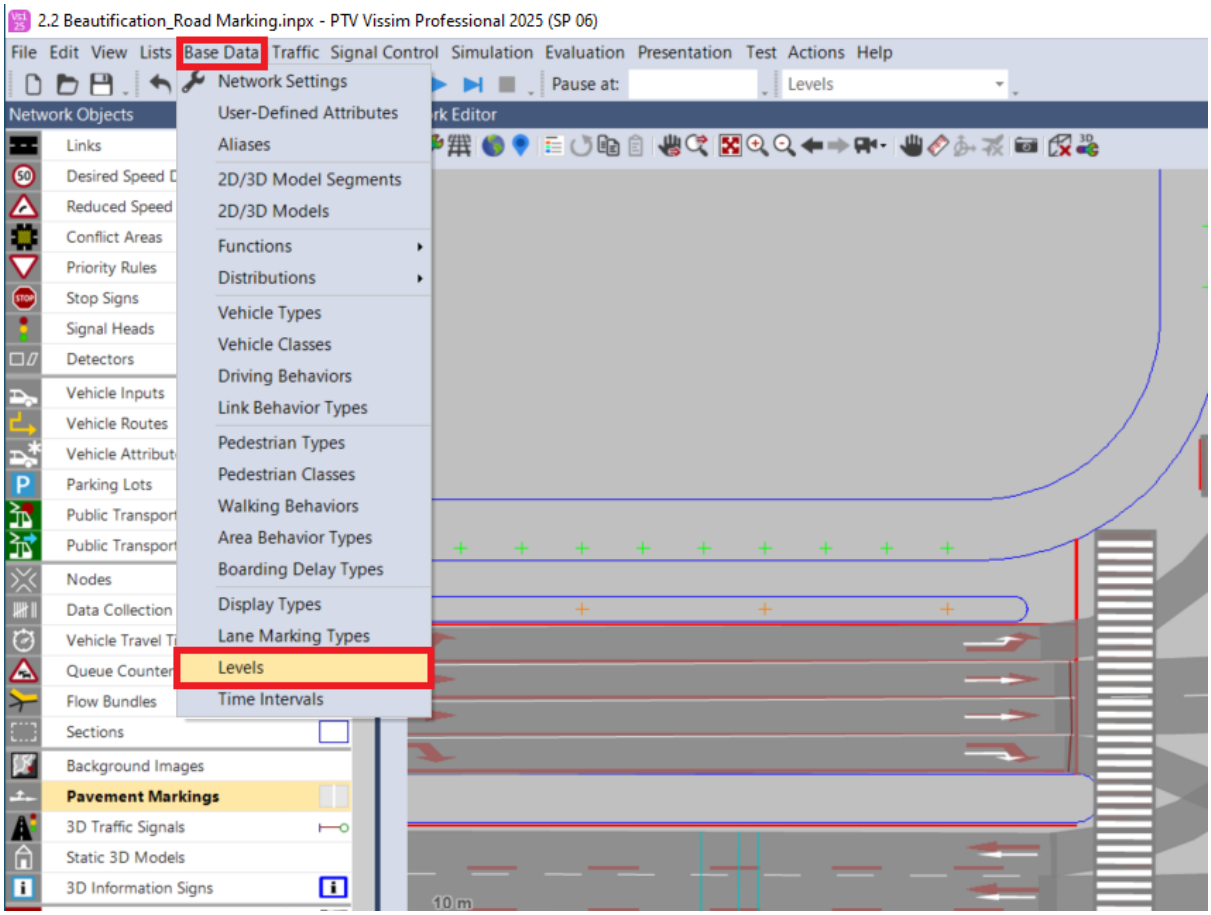
(5) Select Pavement Markings. Press Ctrl and right click the pedestrian link. Choose zebra crossings in the dialogue box and click OK. Adjust the length of zebra crossings.



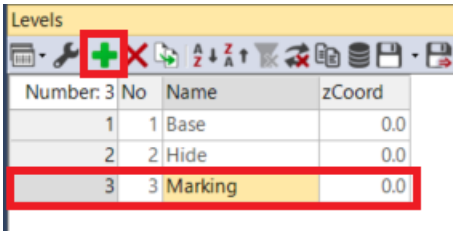
(6) Repeat step 4 and 5. Define more zebra crossings.



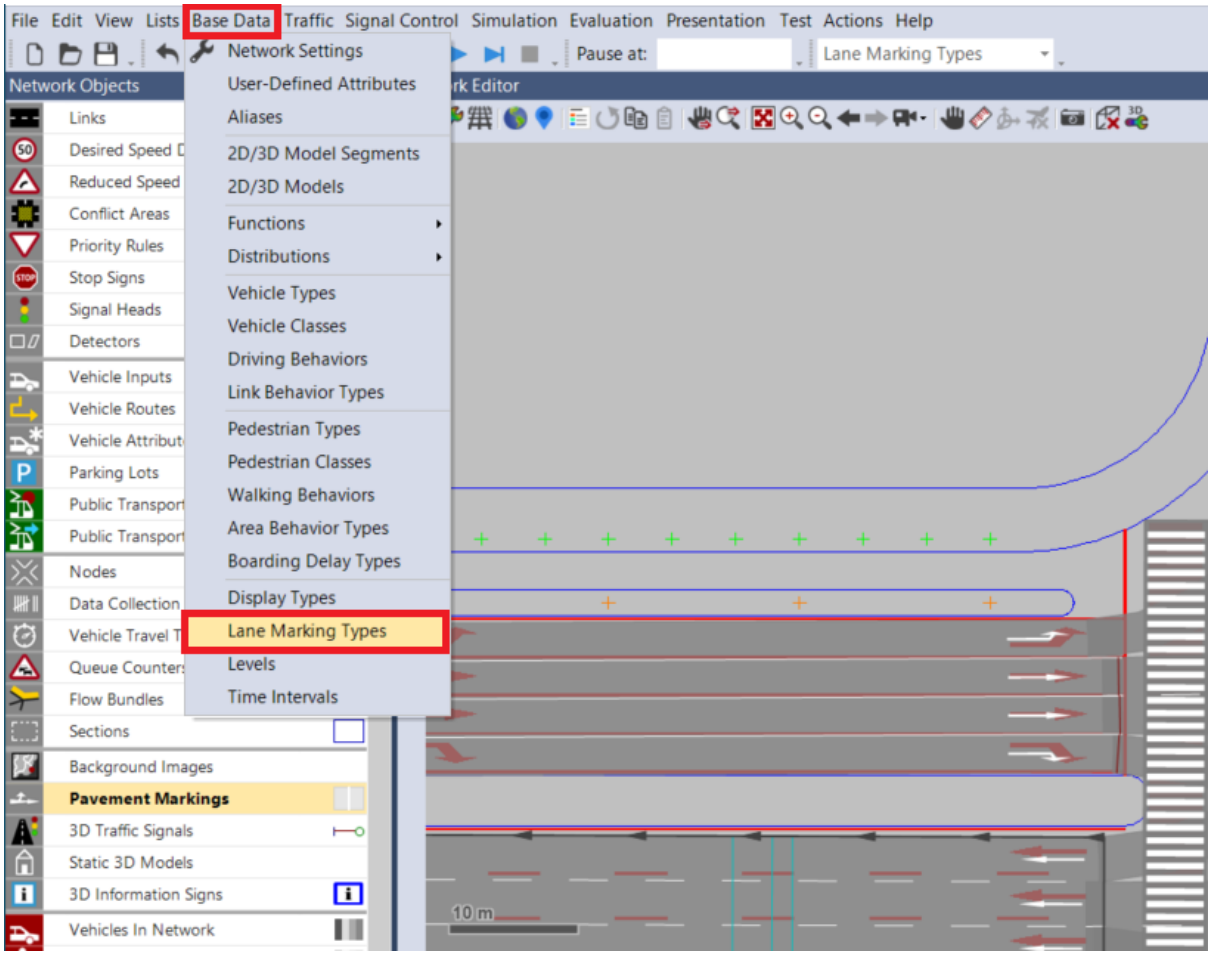
(7) Select Base Data and Levels.



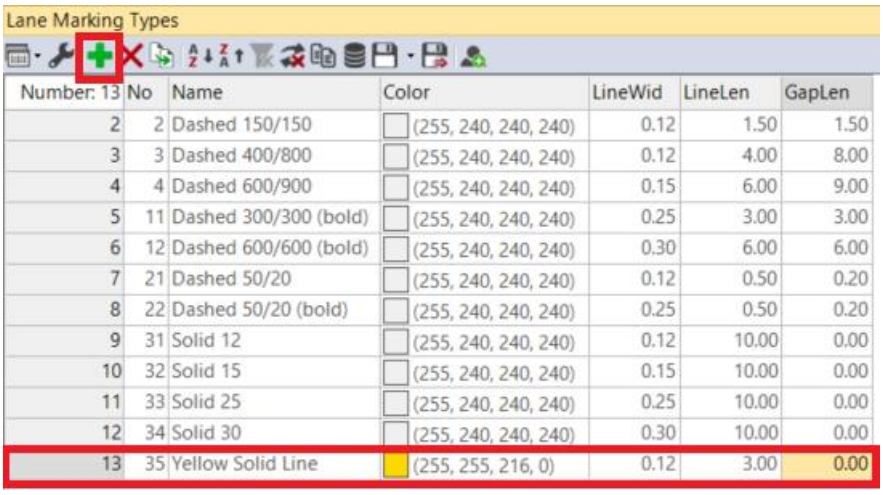
(8) In Levels list, click + to add a new layer, and change the name to Markings.



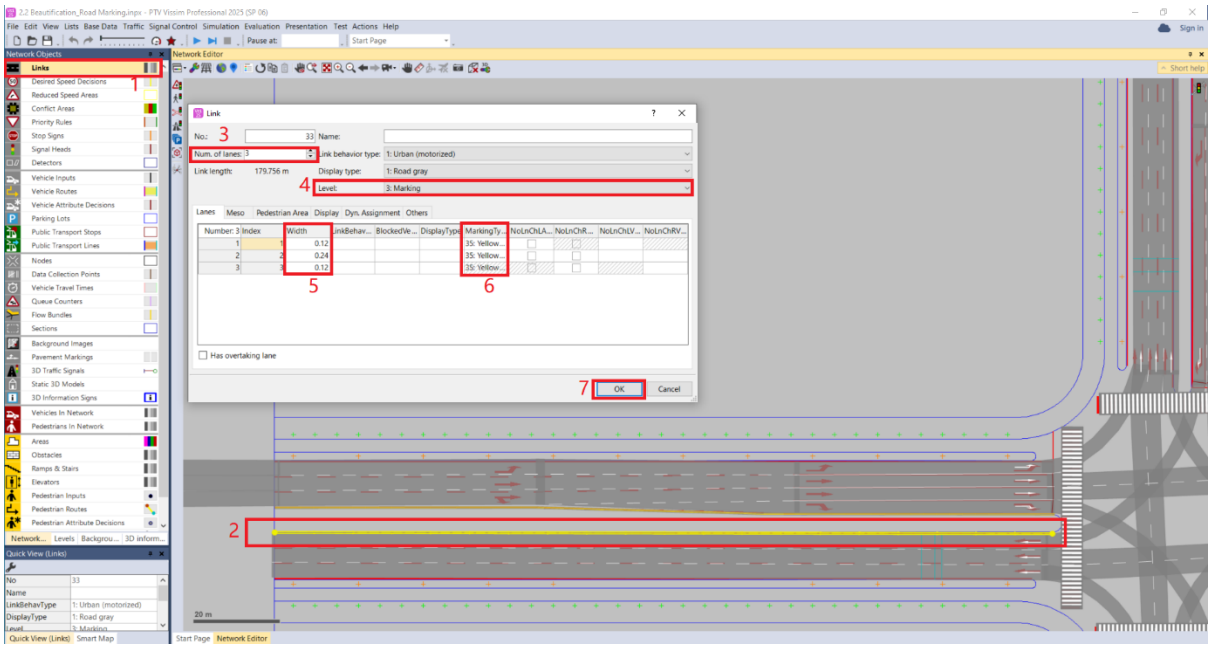
(9) Select Base Data and Lane Marking Types.



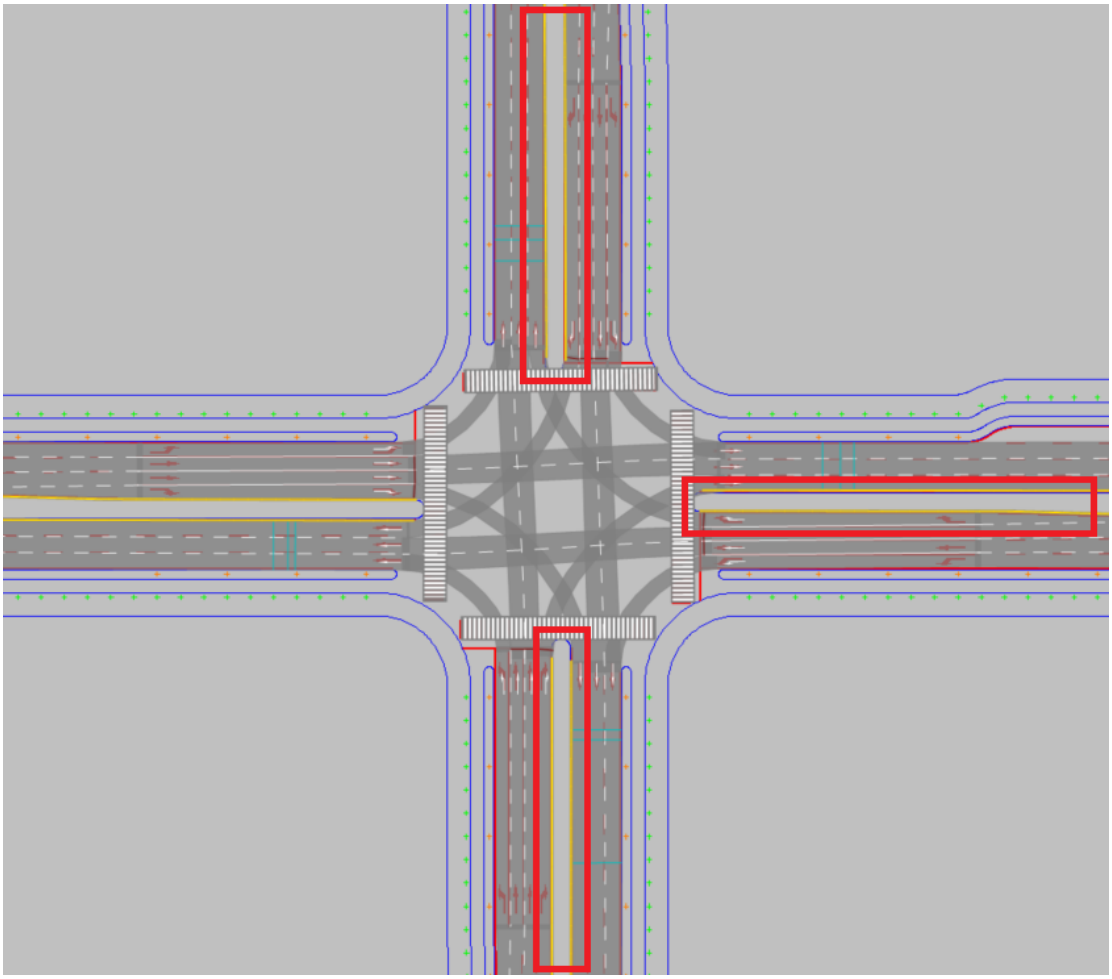
(10) In the list, left click + to add new Lane Marking Types and change the name to Yellow Solid Line. Set the color yellow and the Gap Length to 0.



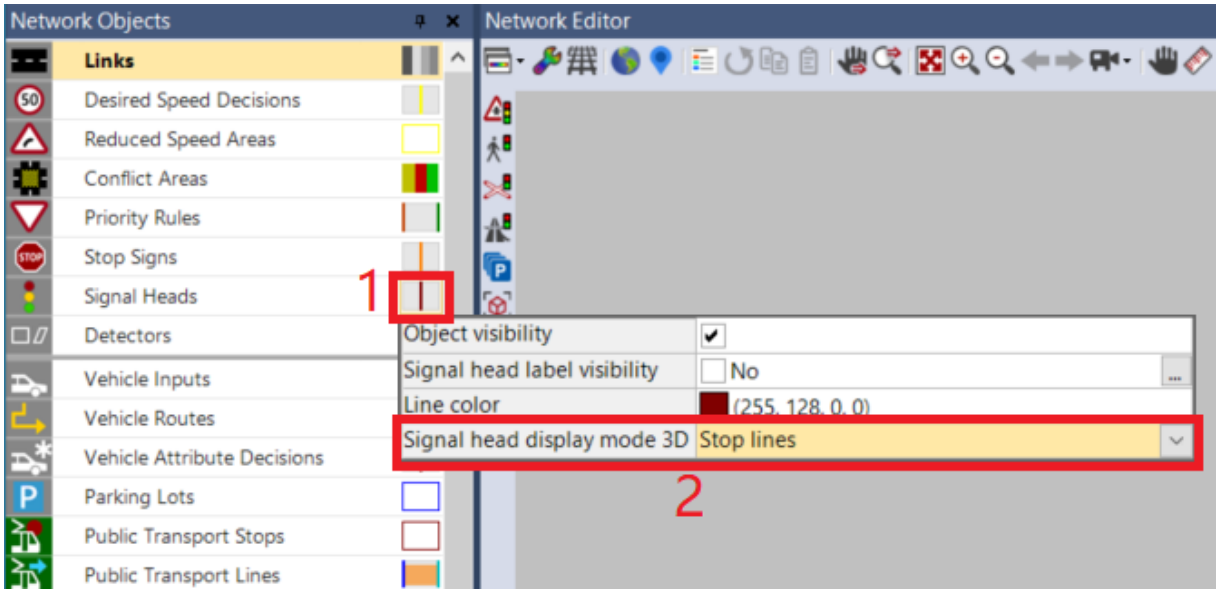
(11) Select links. In the middle of the road, hold and press Ctrl and right click to draw the link, and release the button at the end. In the dialogue box, change the number of lanes to 3 and the levels to Marking. Change the width to 0.12, 0.24 and 0.12 separately, and the Marking Type to Yellow Solid Line. Then click OK.



(12) Similarly, repeat step 11 to create yellow solid line for the other three directions.

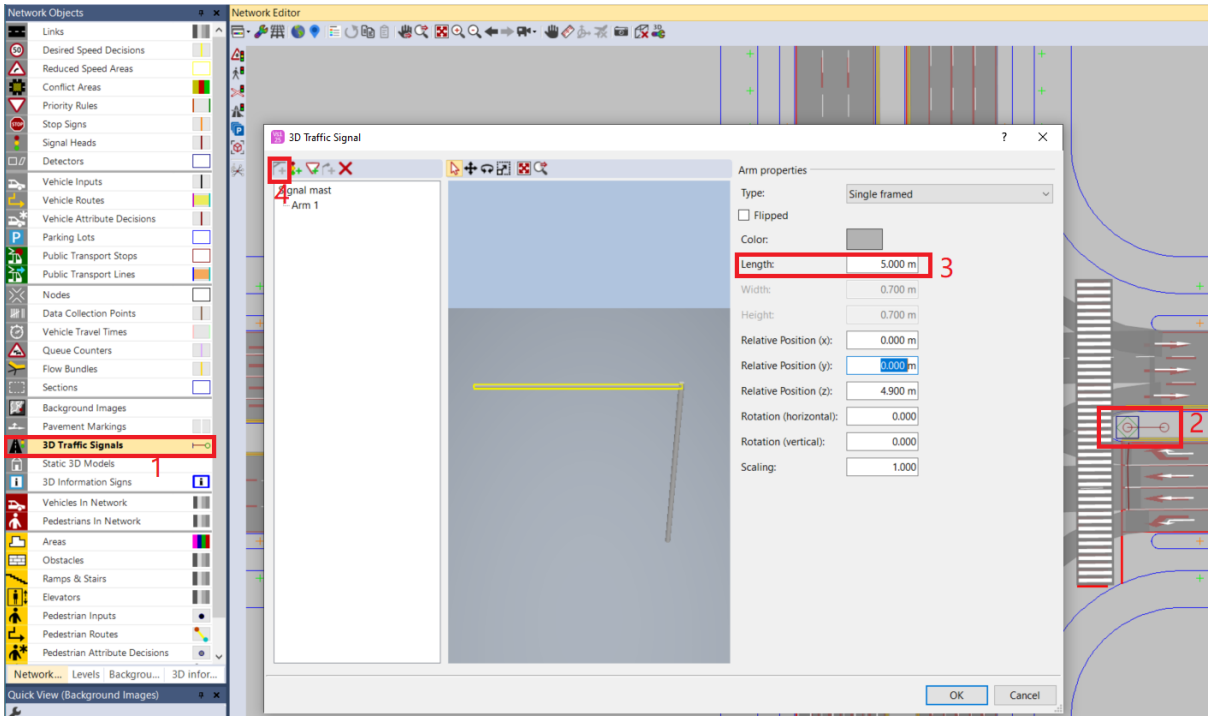


(13) Choose Signal Heads and change the signal head display mode 3D to stop lines.

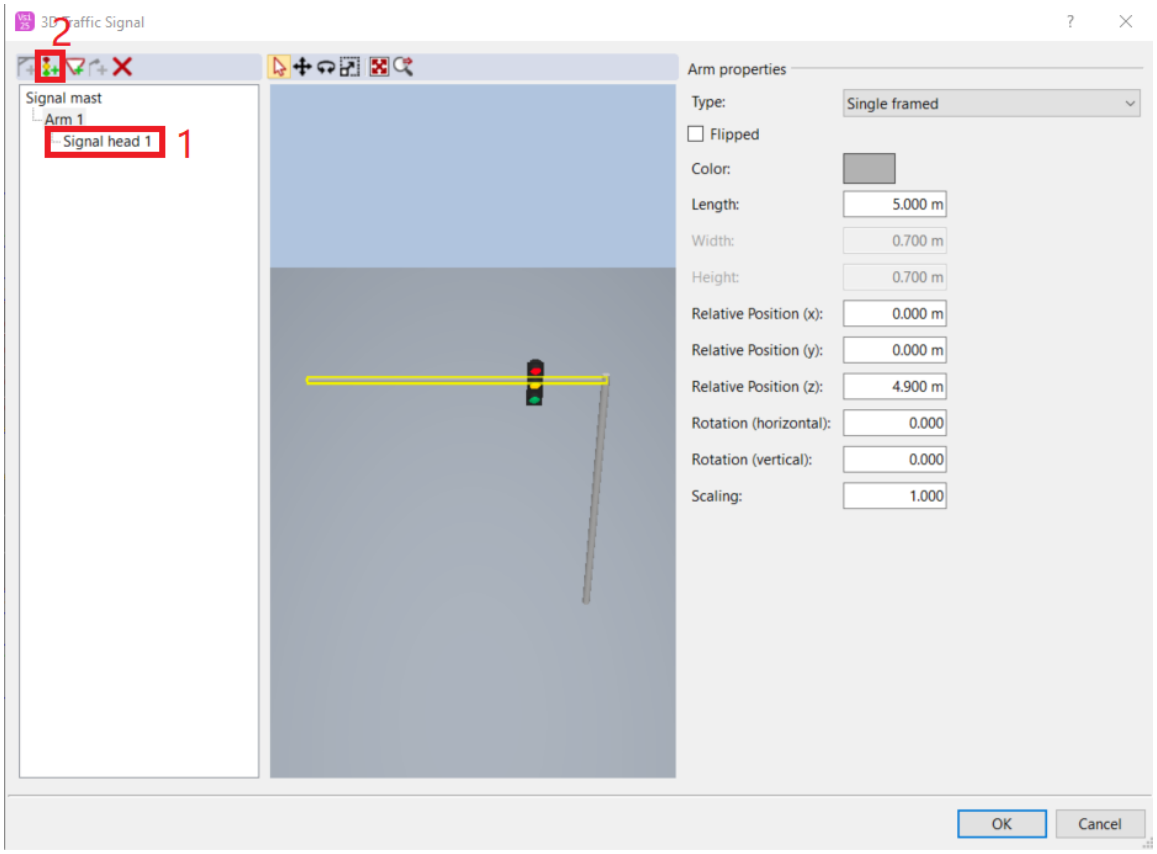


* When running the simulation, the signal color block will become stopping lines. However, the left-turn directions are not assigned with traffic signals. If stopping lines are needed, additional signal heads can be put on the left-turn connectors. Alternatively, additional stopping lines can be drawn based on the method to draw yellow solid lines in this chapter.

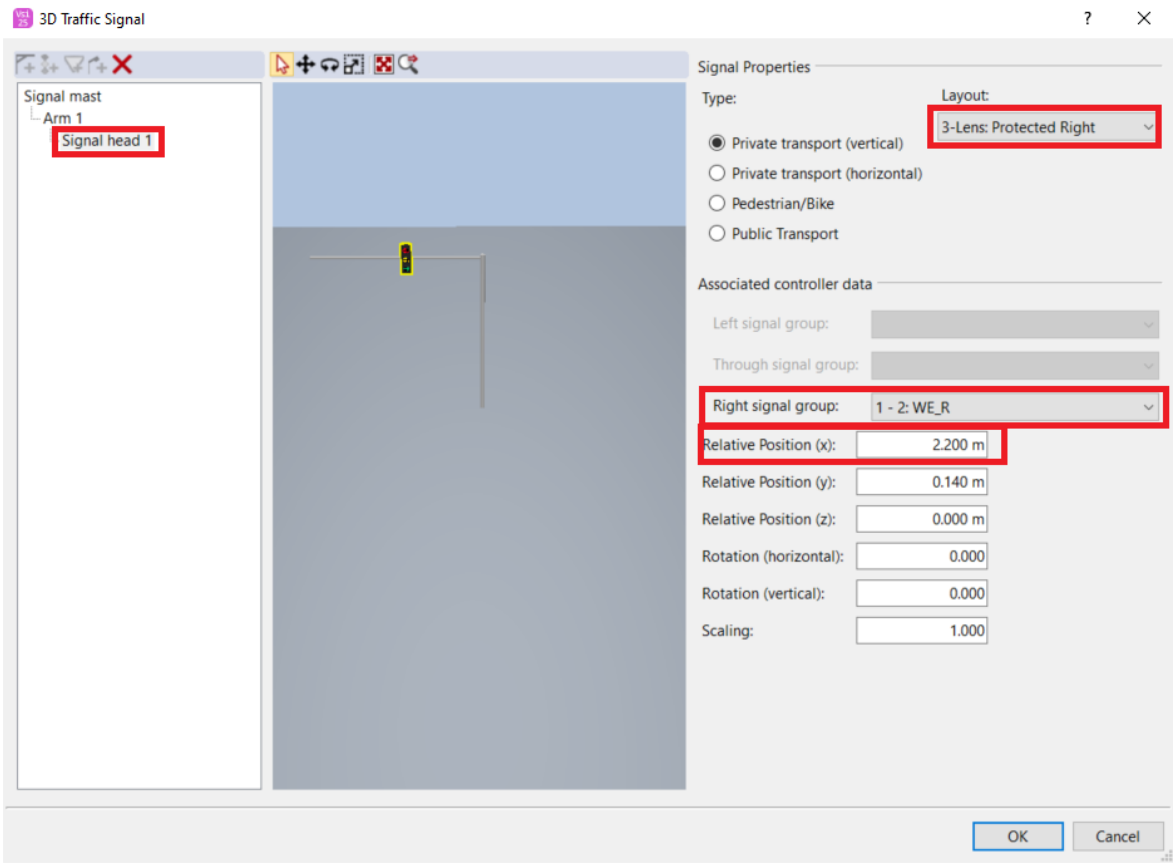
(14) Choose the 3D Traffic Signals. In the Network Editor, hold Ctrl and right click. In the dialog box, change the height of signal mast to 5m and left click to add arm.



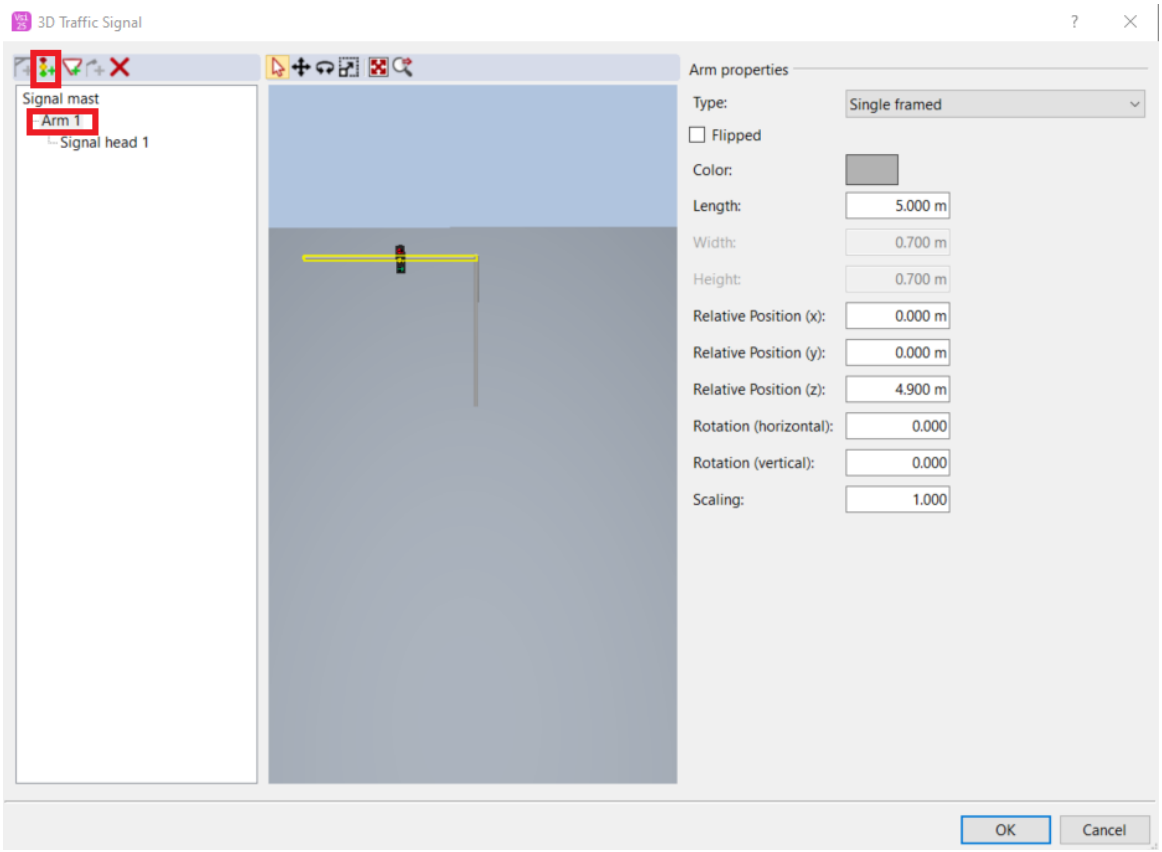
(15) Left click Arm 1 and left click to add signal heads.



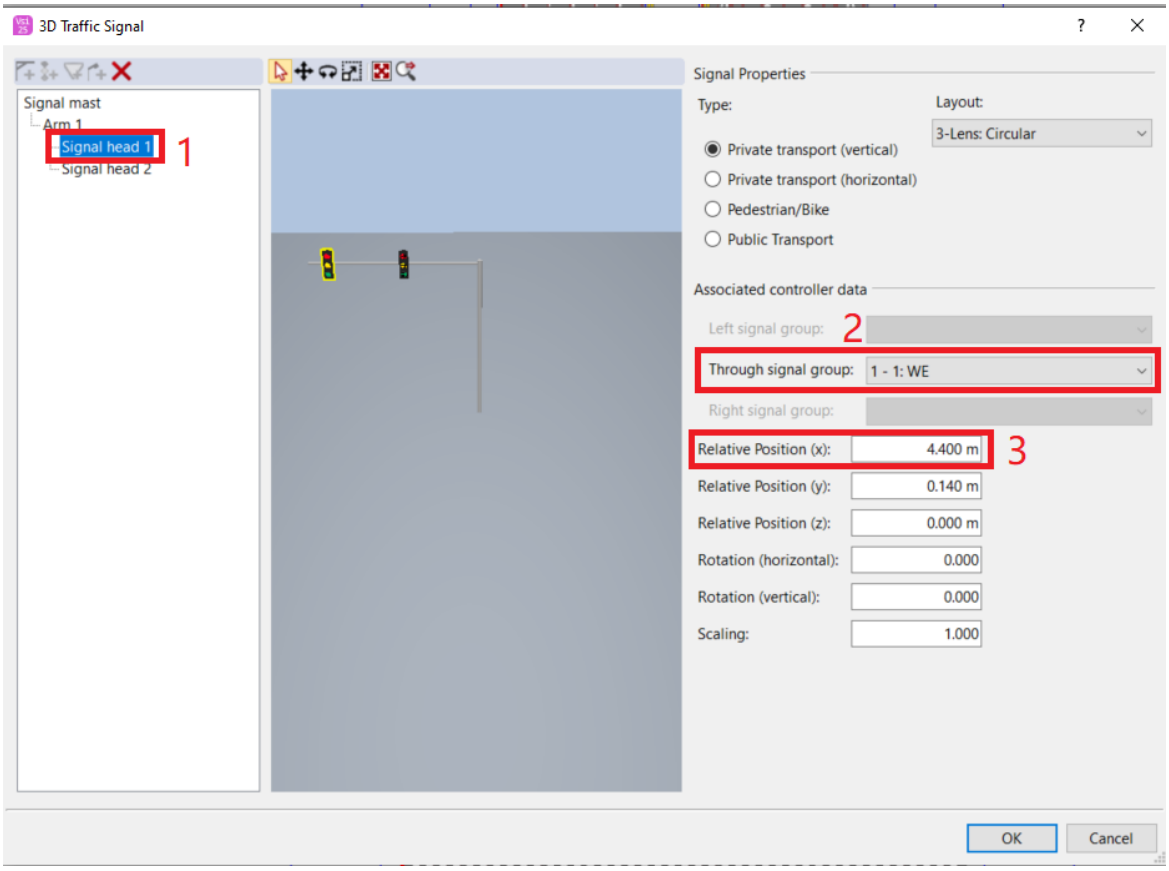
(16) Left click signal head 1. Change the layout to 3-Lens: Protected Right and choose the corresponding right signal group. Adjust the Relative Position (x) to 2.2m.



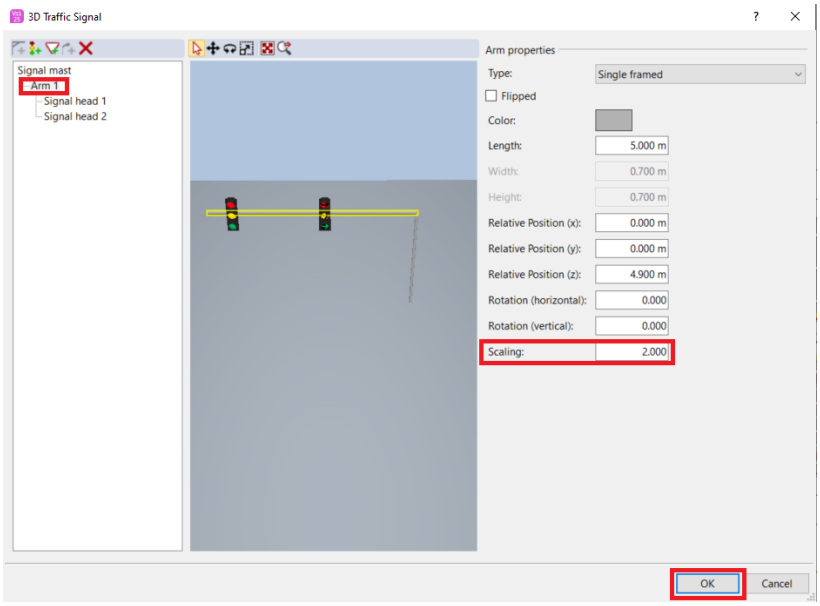
(17) Left click Arm 1 and add new signal heads.



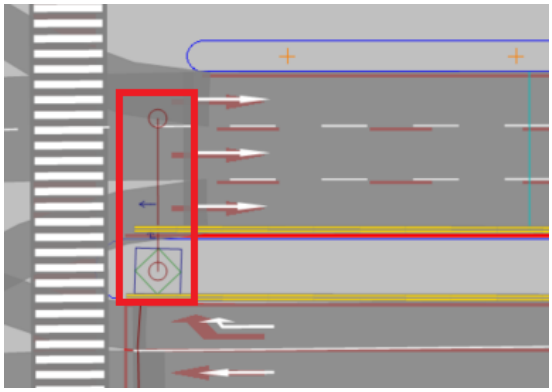
(18) Left click signal head 1. Choose the corresponding through signal group and adjust Relative Position (x) to 4.4m.



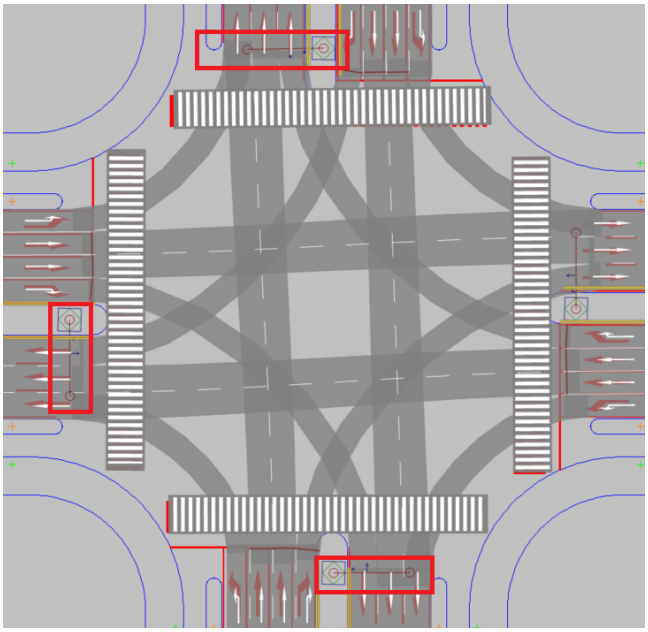
(19) Left click Arm 1. To look more clearly, change the scaling to 2 and then click OK.



(20) Left click the signal. Press and hold the left button to drag it. Press and hold Alt to rotate the signal direction.



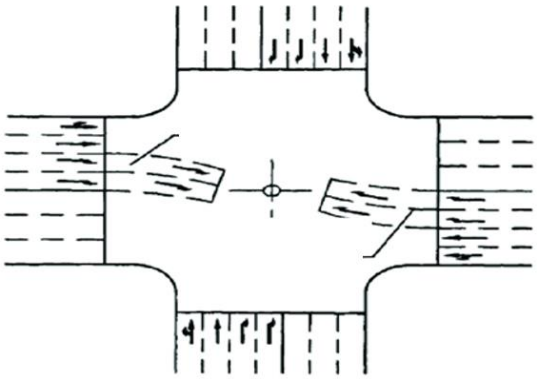
(21) Similarly, repeat step 14 to 20 to create 3D signals for the other three directions.



(22) Save the file.

3. Waiting zone

The right-turn waiting zone means when the signal for through traffic at the same direction turns green, the right-turning vehicles can enter the waiting zone to wait for signal change. An additional length of dash lines is connected to the center of the intersection, which is the waiting zone. The goal is to increase the vehicle storage capacity and reduce the waiting time of the right-turning vehicles. In a same time interval, more right-turning vehicles can pass through the intersection, so the intersection capacity can be increased.



Through Traffic waiting zone means to divide a dedicated section for the through traffic after the stopping line. When the right-turning light turns green for the intersecting direction, the through traffic also enters the waiting zone at the same time or after certain time. When the traffic light turns green, the vehicles can cross the intersection.

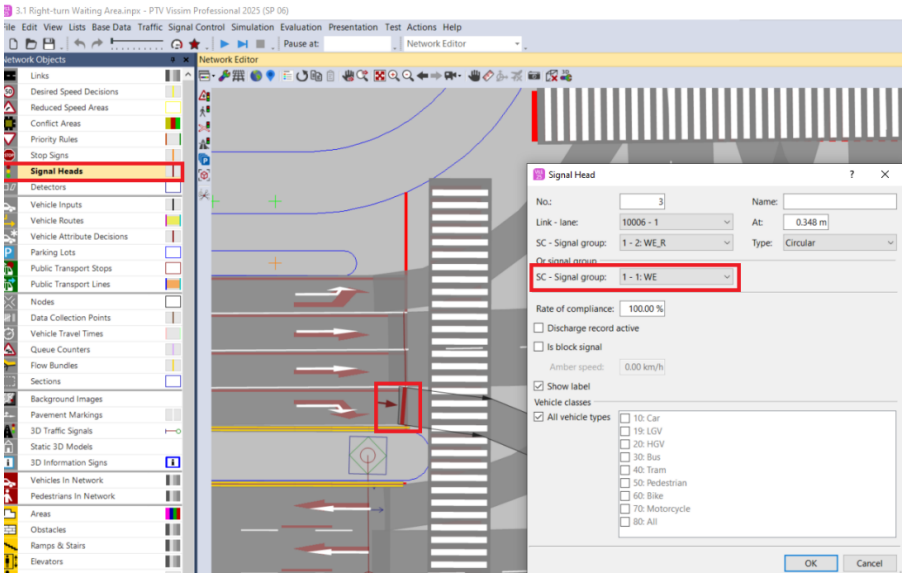
3.1. Right-turning Waiting zone

(1) Open file “2.2 Beautification_Road Marking”.

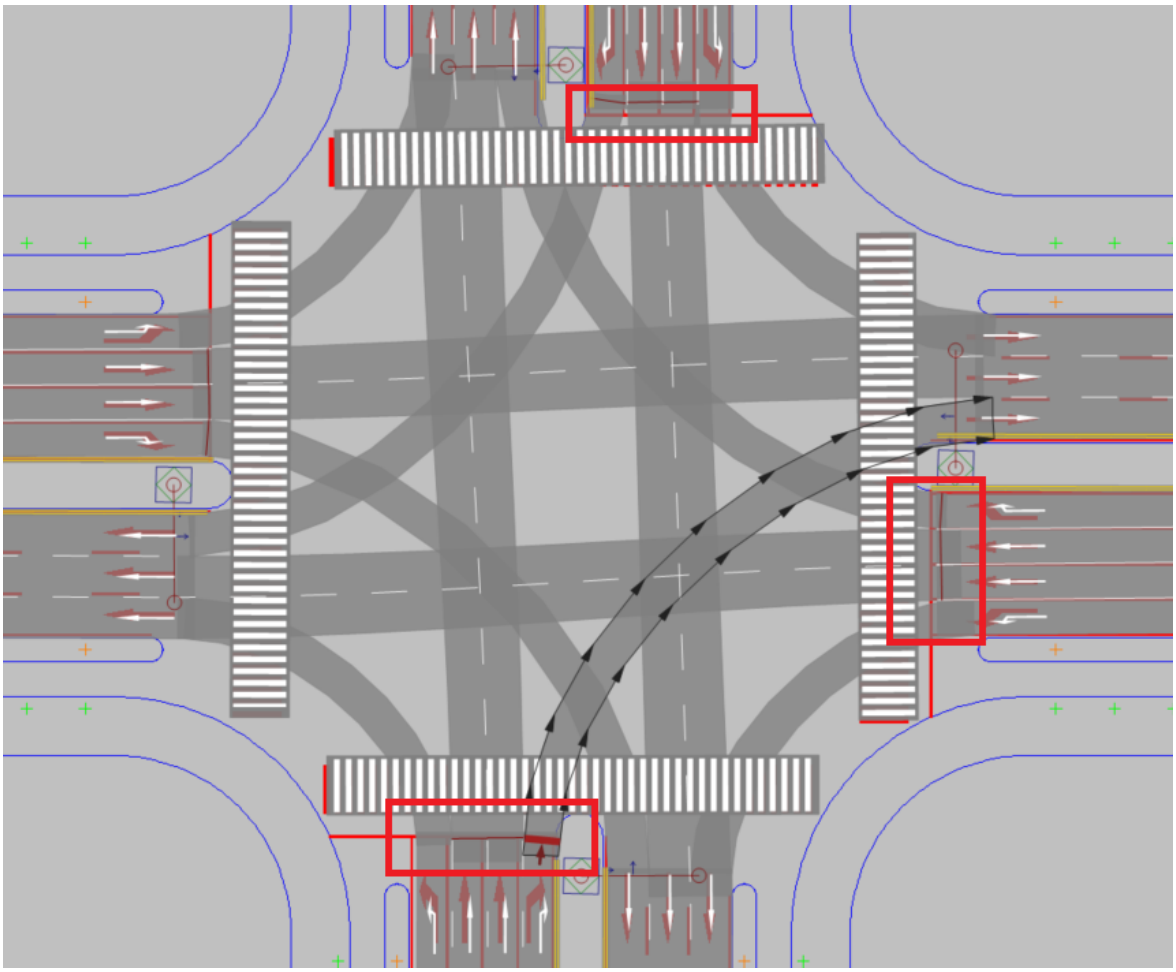
(2) To avoid overriding the basic road network, click Save as.

(3) Define the name of the file and click save.

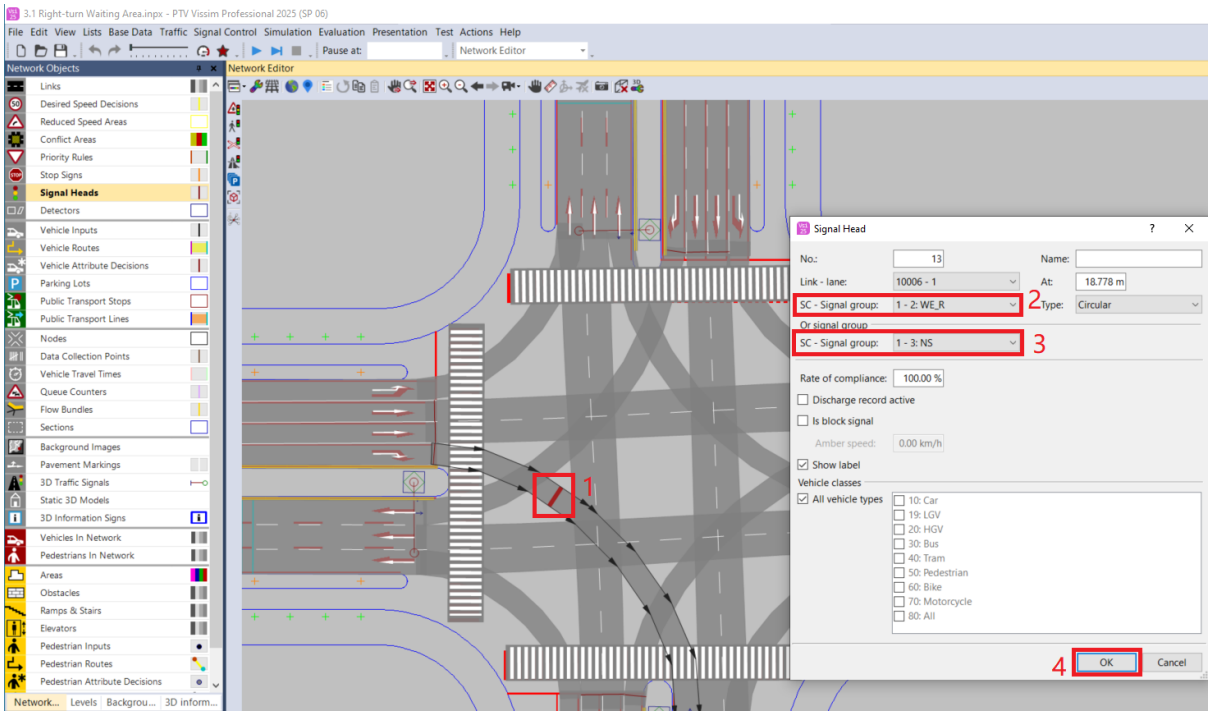
(4) Choose Signal Heads and then double-click the signal heads for right-turning direction. Add the signal group of the phase before the right-turning phase so the vehicles can enter the waiting zone in advance. Click OK.



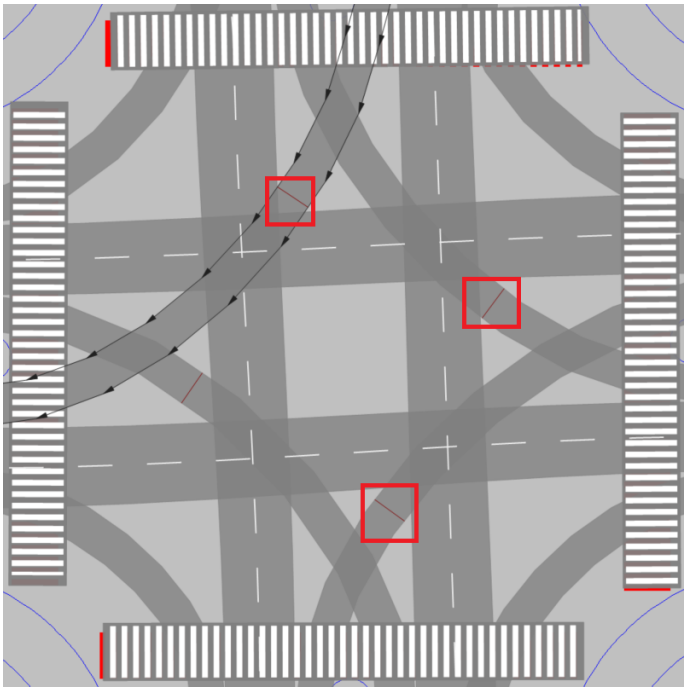
(5) Similarly, repeat step 4. Change the signal group for the other three directions.



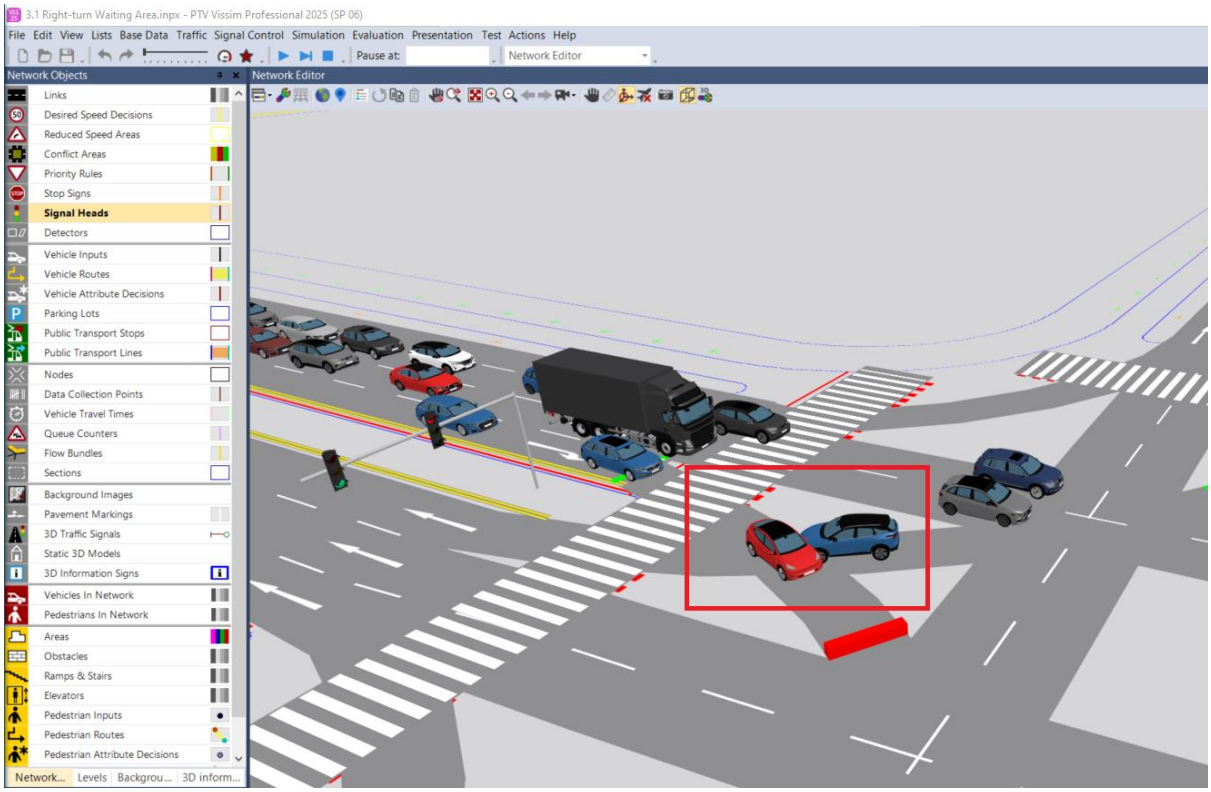
(6) Hold Ctrl and right click the connector to create a new signal head. In the dialog box, choose the corresponding signal group, or the signal group of the next phase, to avoid the stuck of vehicle in the waiting zone. Then click OK.



(7) Similarly, repeat step 6. Create new signal heads for the other three directions.

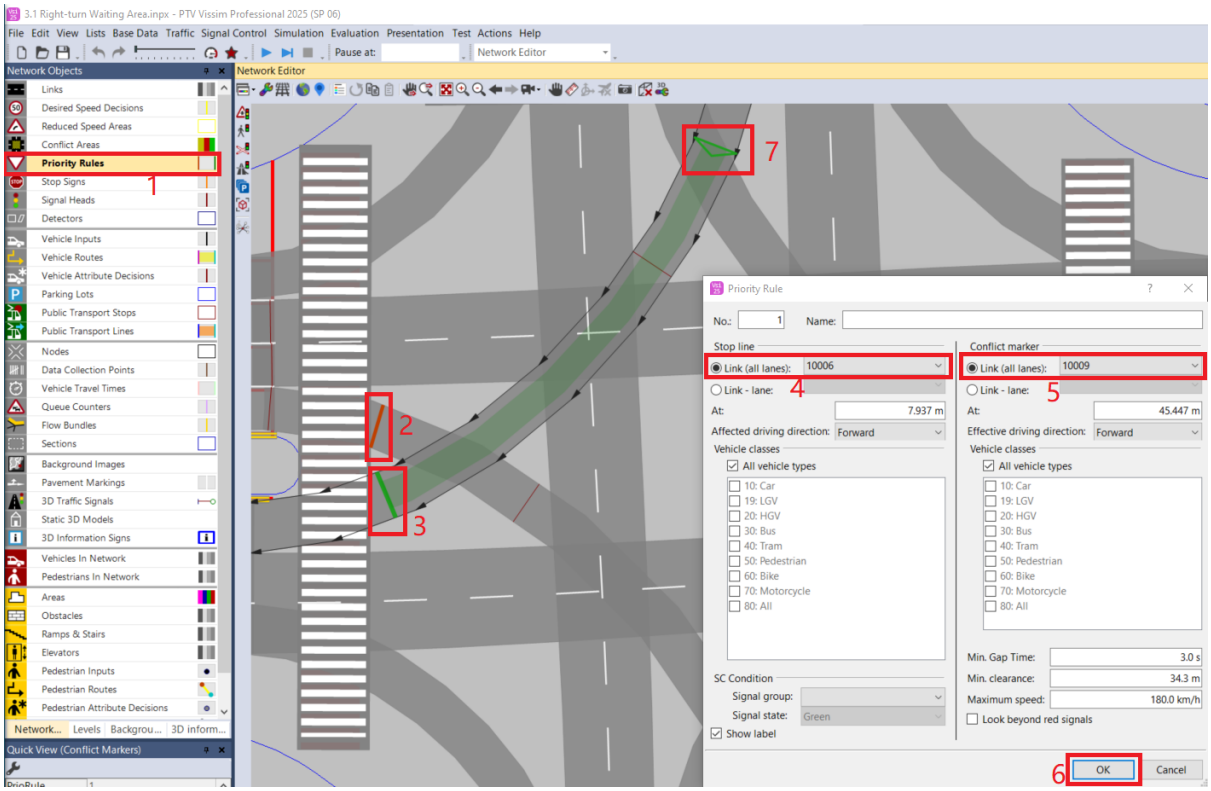


(8) Run the simulation, and check if the traffic lights are working correctly.

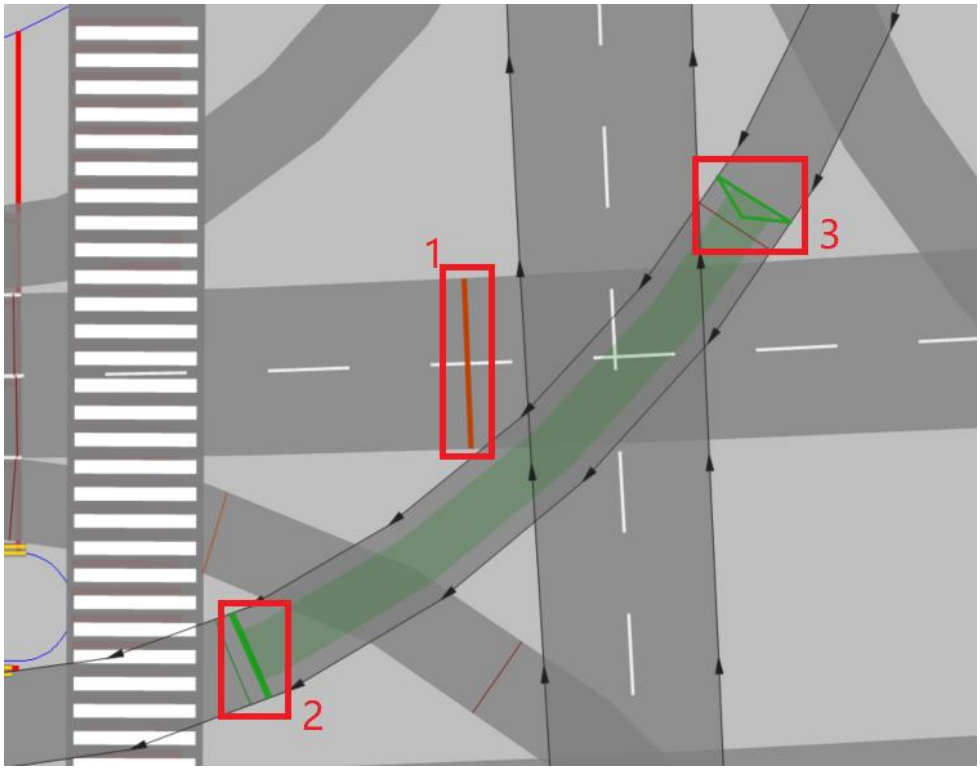


* Sometimes it could be found that the amber time and all-red time between phase change are also included, which can cause the vehicle to decelerate, stop and accelerate again. This can disturb the vehicles in the next phases. To avoid the overlap of vehicles in simulation (accidents), additional priority rules are needed. Therefore, in over-saturated intersections and in the intersections that have all-red time, please think carefully if this method should be used or not.

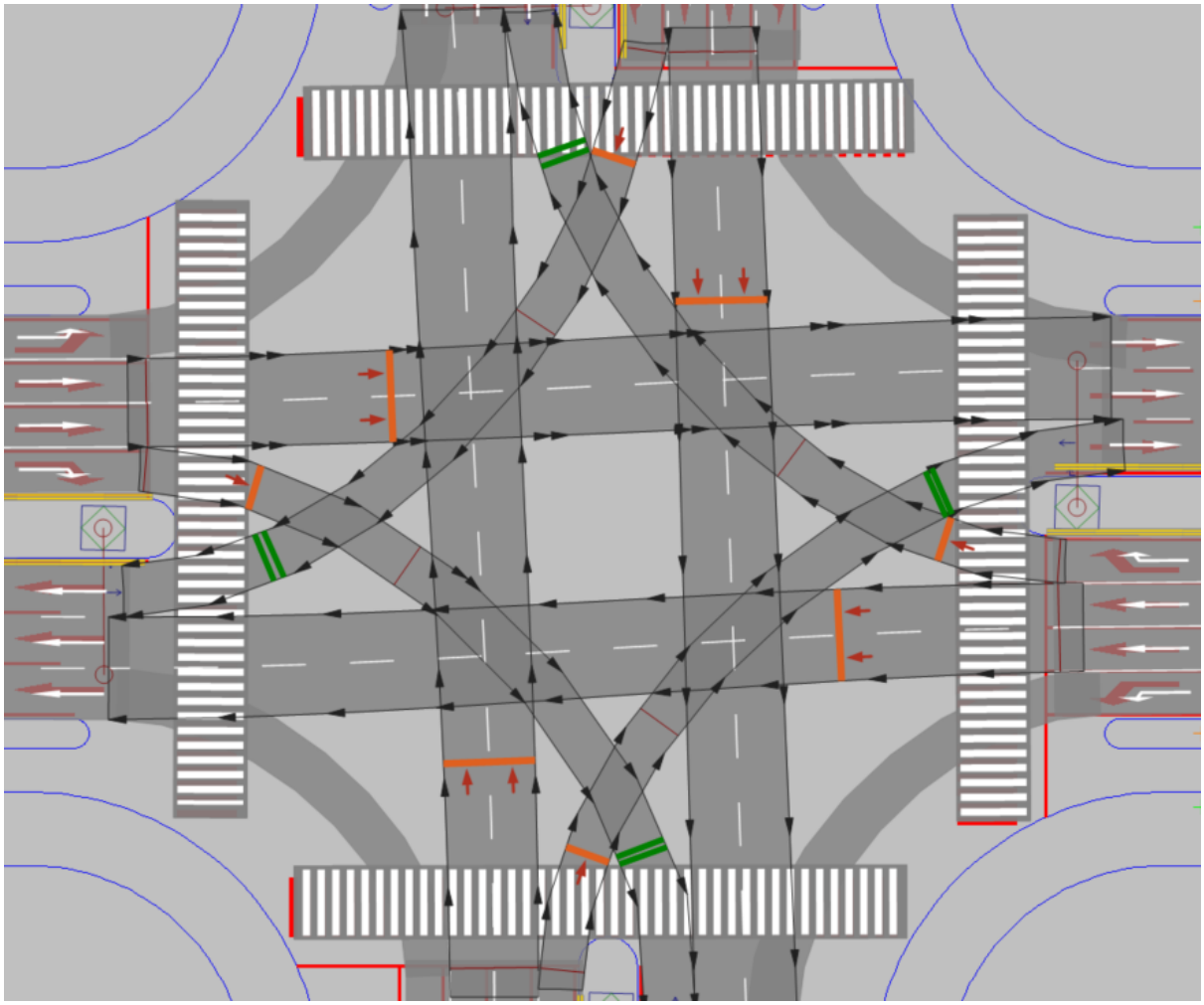
(9) Choose Priority Rules. Right click to create the stopping line in the right-turn connector (red line). Then right click conflict sign in the conflicting right-turn connector (green line). In the dialog box, change Link – lane to Link (all lanes) and click OK. Left click in the blank area in Network Editor to end the insertion. Then left click to drag the green triangle sign before the traffic signal.



(10) Similarly, repeat step 9 to complete the priority rule on the through movement connector.



(11) Repeat step 9 and 10 to create the priority rules for the other three directions.

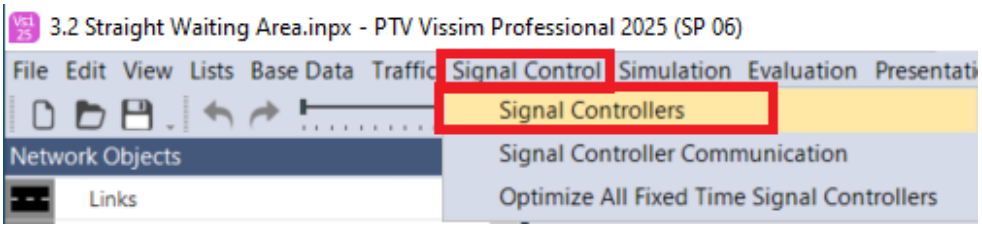


3.2. Through Traffic Waiting zone

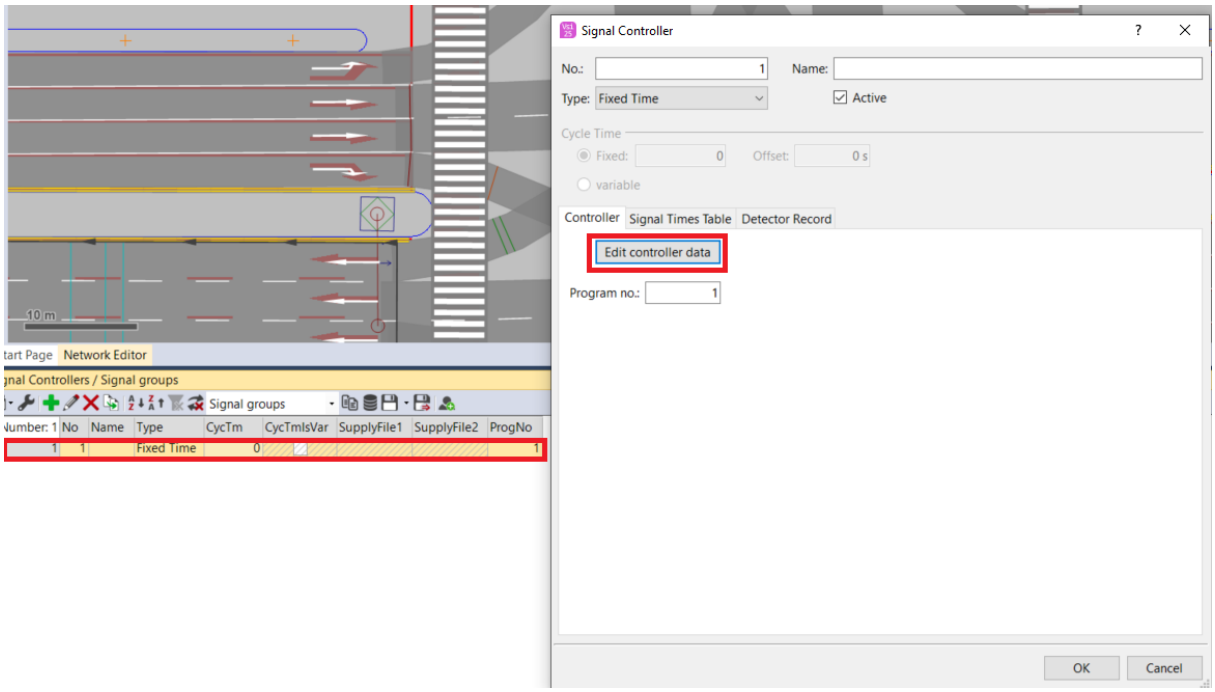
(1) Save a separated file by clicking Save as.

(2) Define the file name and click Save.

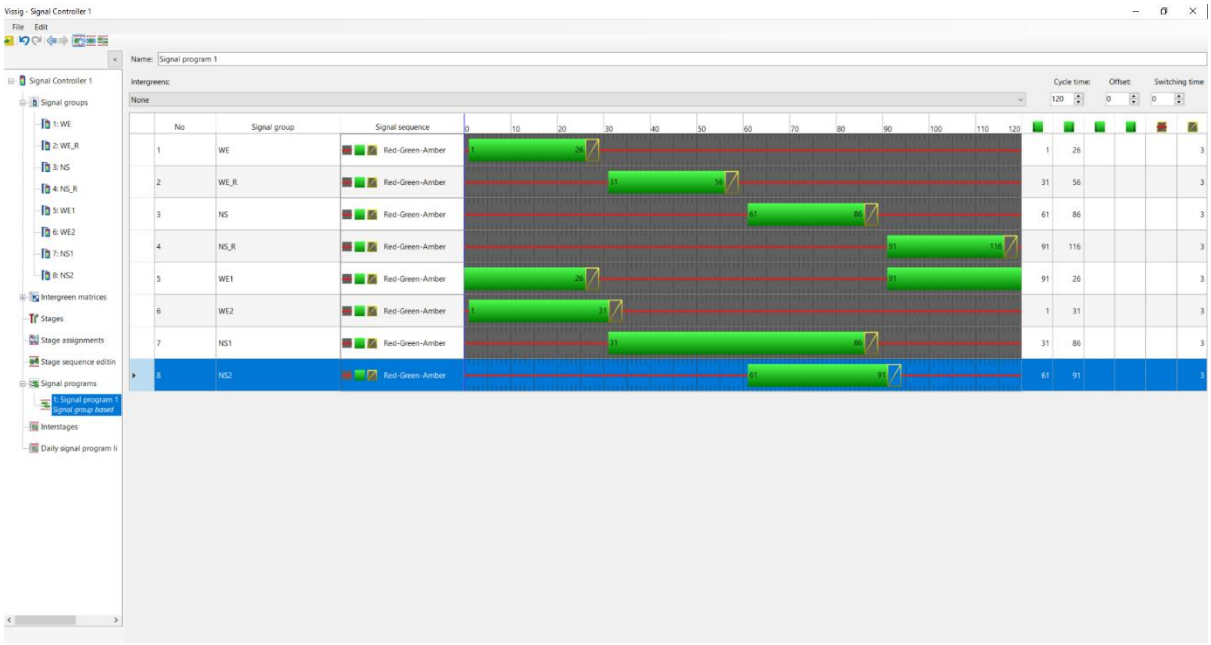
(3) Choose Signal Control and Signal Controllers.



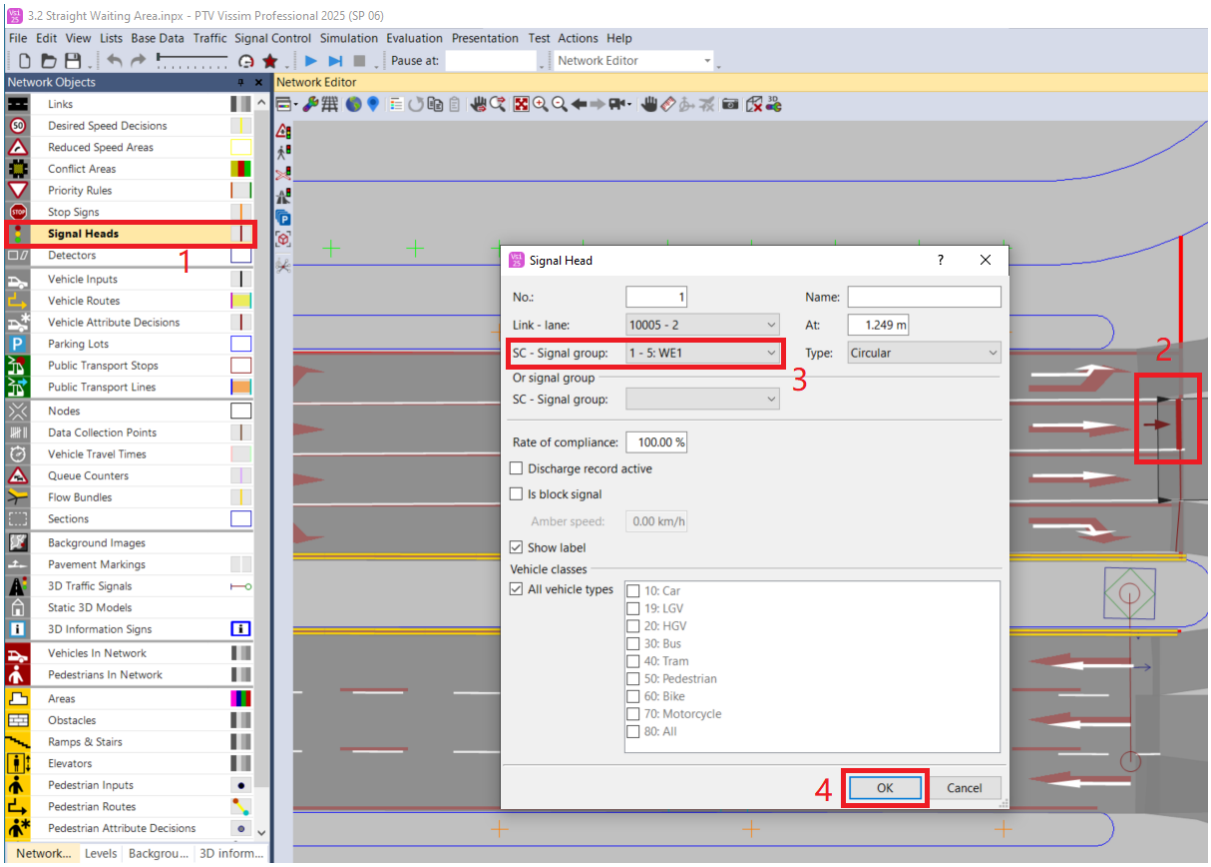
(4) Double left click Signal Controllers and in the dialog box select edit controller data.



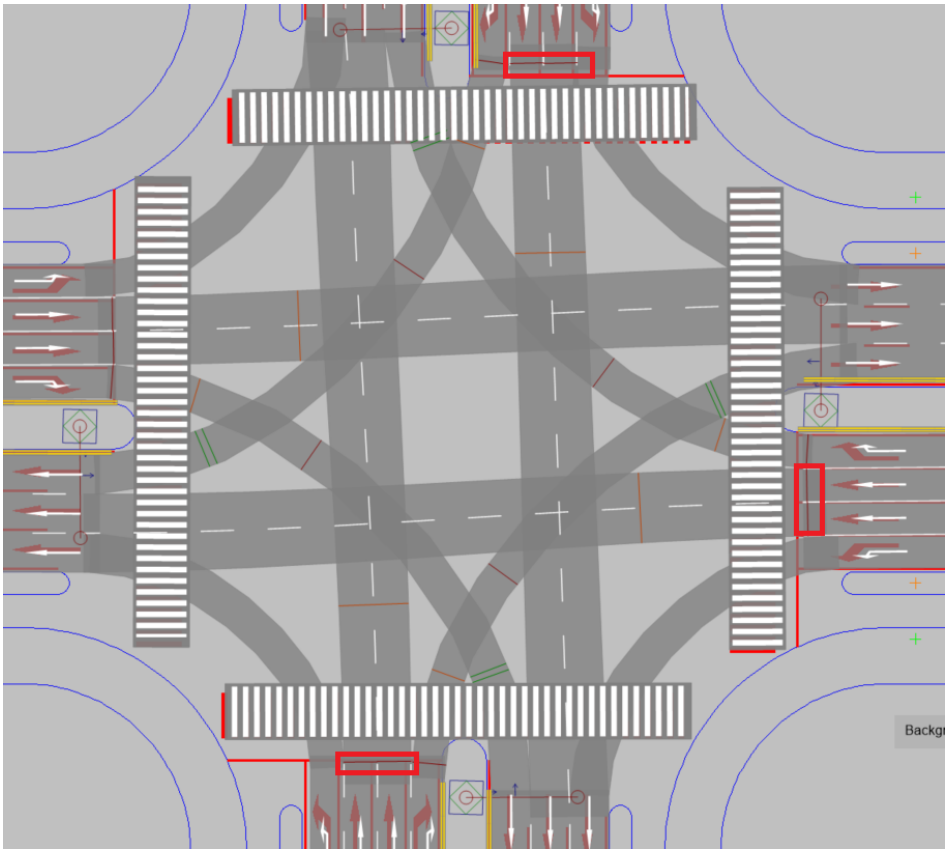
(5) Add and adjust the signal plan.



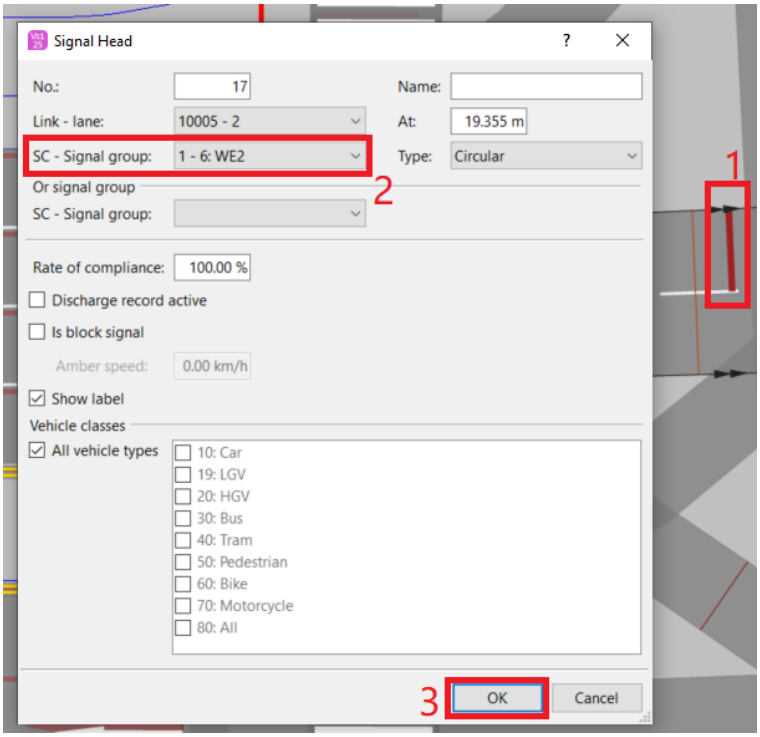
(6) Choose Signal Heads. Double left click the signal heads for through traffic. In the dialog box, choose the corresponding signal group and click OK.



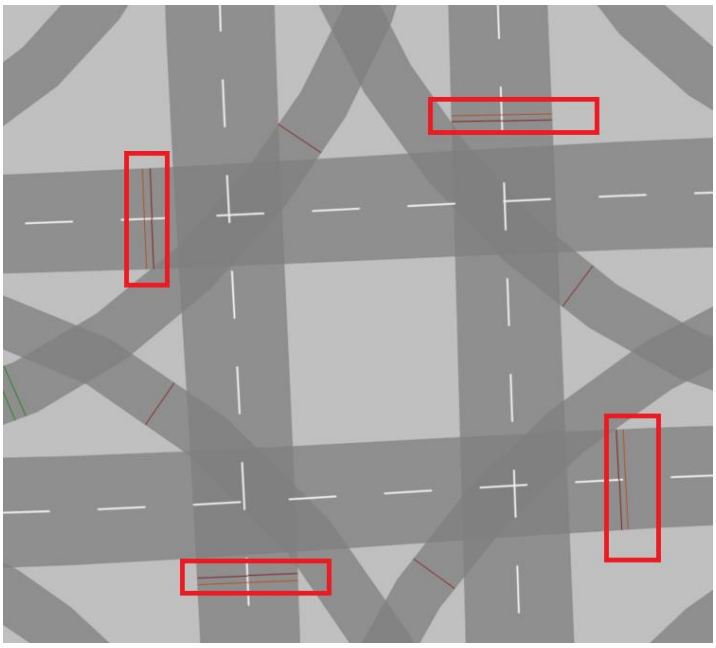
(7) Similarly, change the signal heads for the other three directions.



(8) Hold Ctrl and right click to create signal head in the through traffic waiting zone. In the dialog box, choose the corresponding signal group and click OK.



(9) Similarly, repeat step 8 and complete all the waiting zones in the entry.



(10) Run the simulation and check if the traffic lights are working correctly.

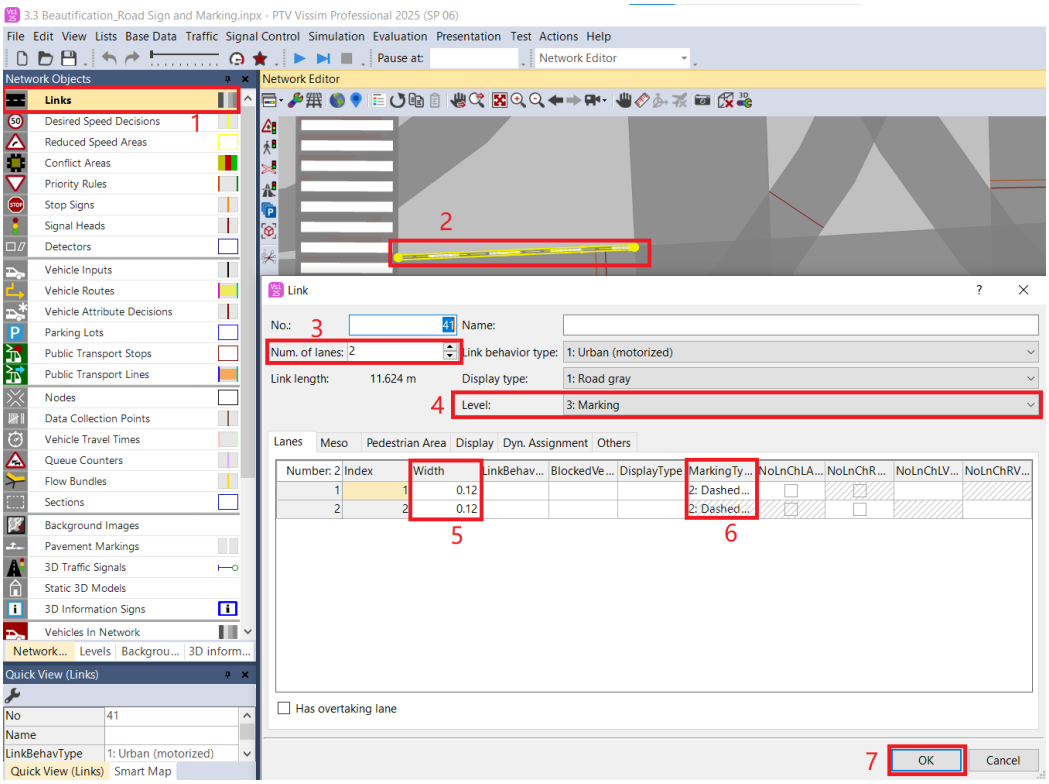
3.3. Beautification

* Please note that this part is only for beautification and will not affect the results of the simulation.

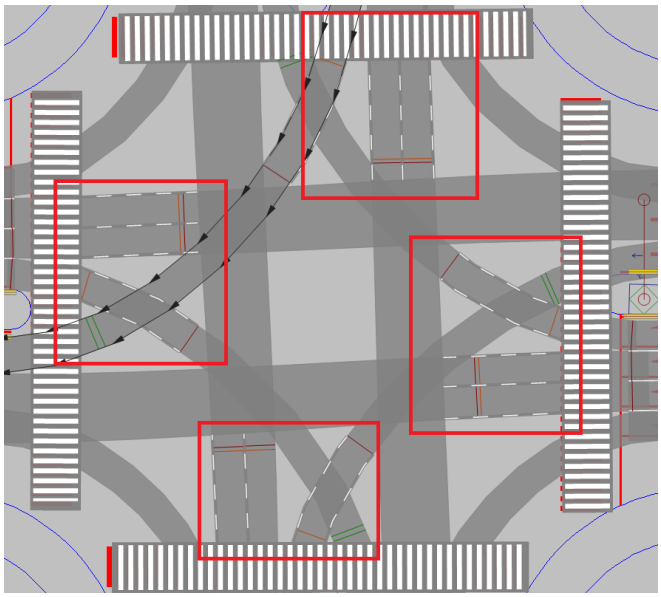
(1) Save a separated file by clicking Save as.

(2) Define the file name and click Save.

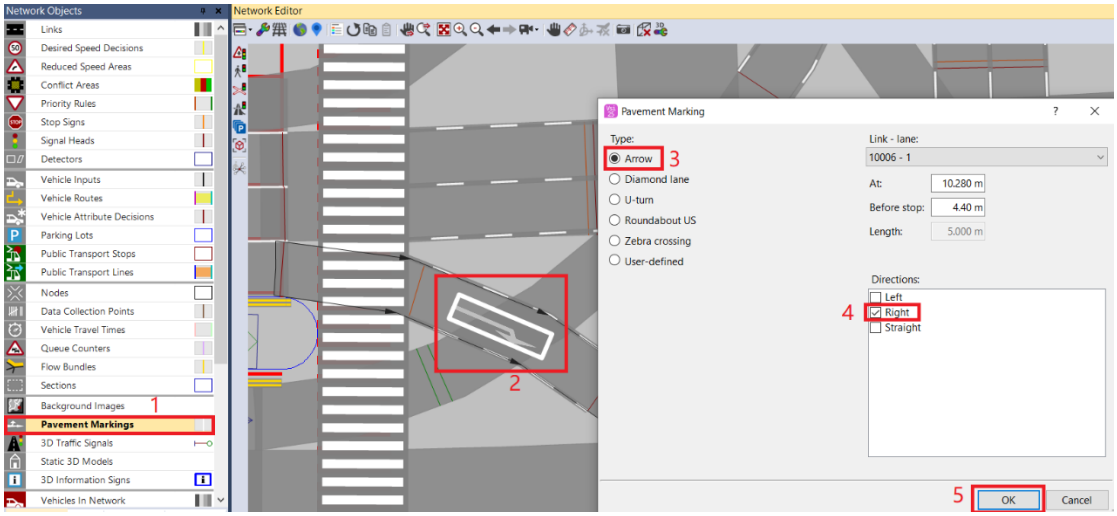
(3) Choose Links. In Network Editor, press and hold Ctrl to draw a link. In the dialog box, change the number of lanes to 2. Set the level as Marking, width as 0.12, and Marking Type as 2: Dashed 150/150. Then click OK.



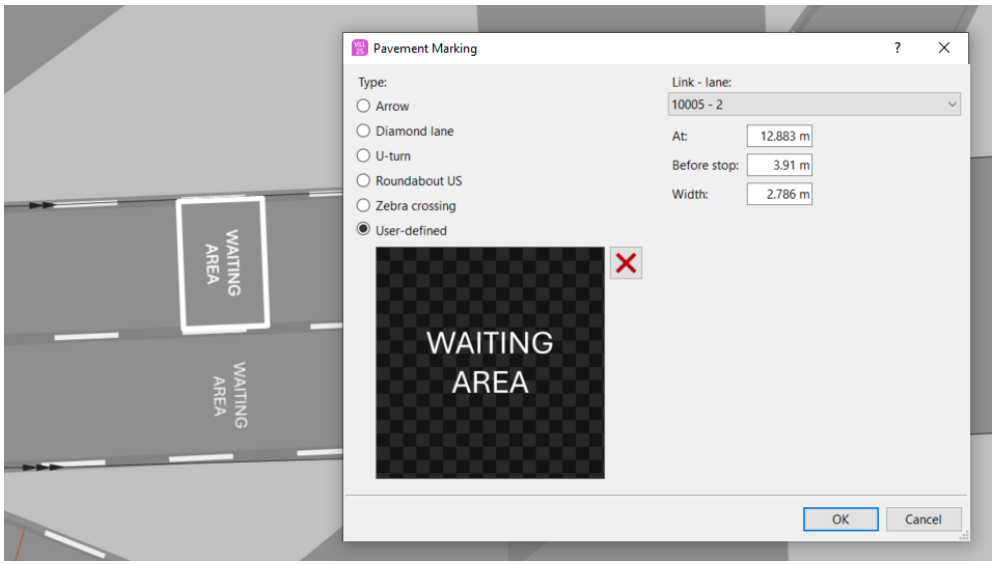
(4) Similarly, repeat step 3 to create road markings for the other three directions.



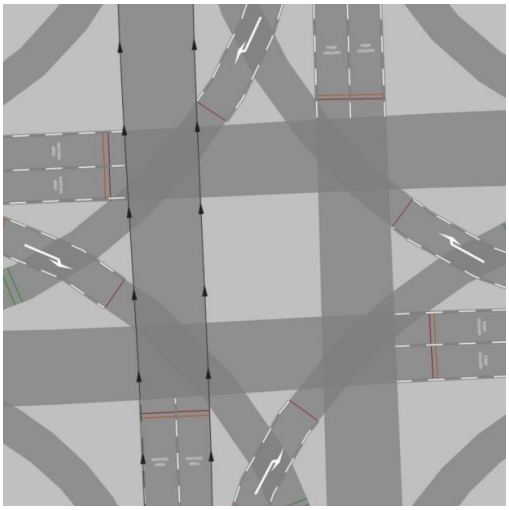
(5) Choose Pavement Markings. Press Ctrl and right click on the waiting zone. Choose Right and click OK.



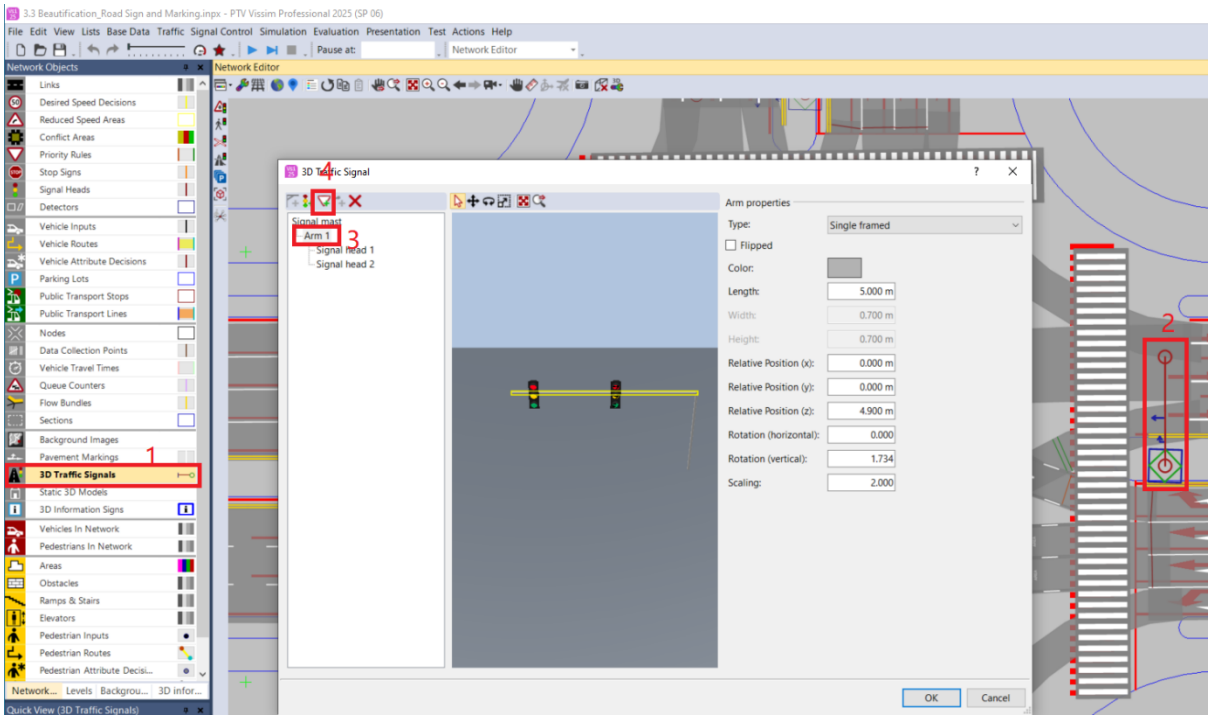
(6) Hold Ctrl and click on the through traffic waiting zone. Choose user-defined and select the picture of the waiting zone. Then click OK.



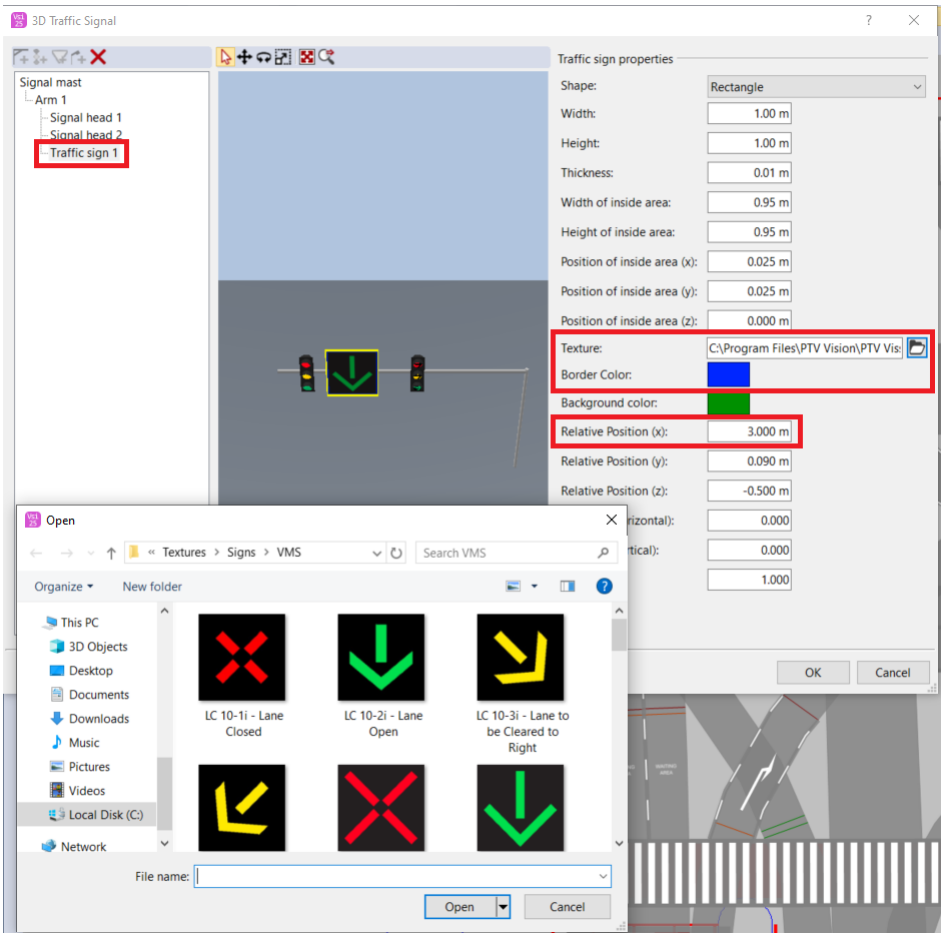
(7) Similarly, repeat step 5 and 6 and complete all the road marking for the other three directions.



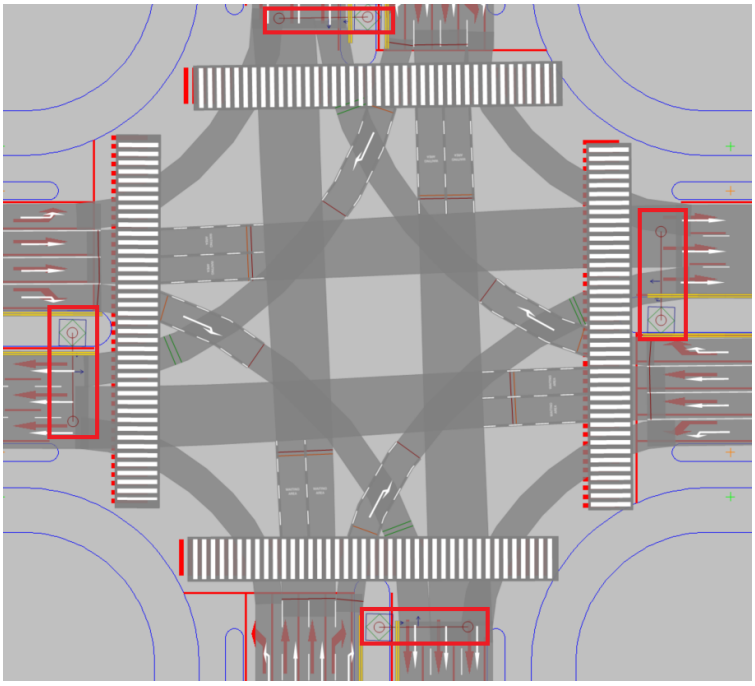
(8) Select 3D Traffic Signals. Double left click the 3D traffic signal sign. In the dialog box, left click Arm 1, and add sign.



(9) Left click traffic sign 1. Select corresponding picture and change the border color and relative position (x).

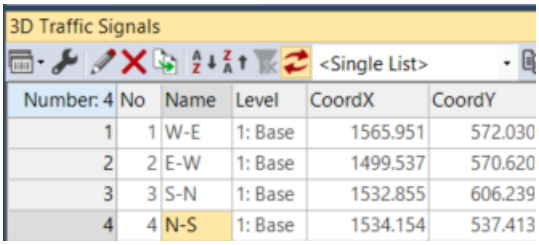


(10) Similarly, repeat step 8 and 9 to complete the traffic sign for the other three directions.



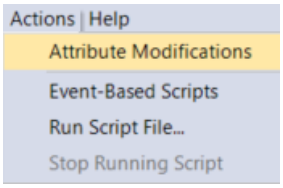
(11) Select Lists – Intersection Control – 3D Traffic Signals.

(12) Change the name of the traffic signal based on the real direction.

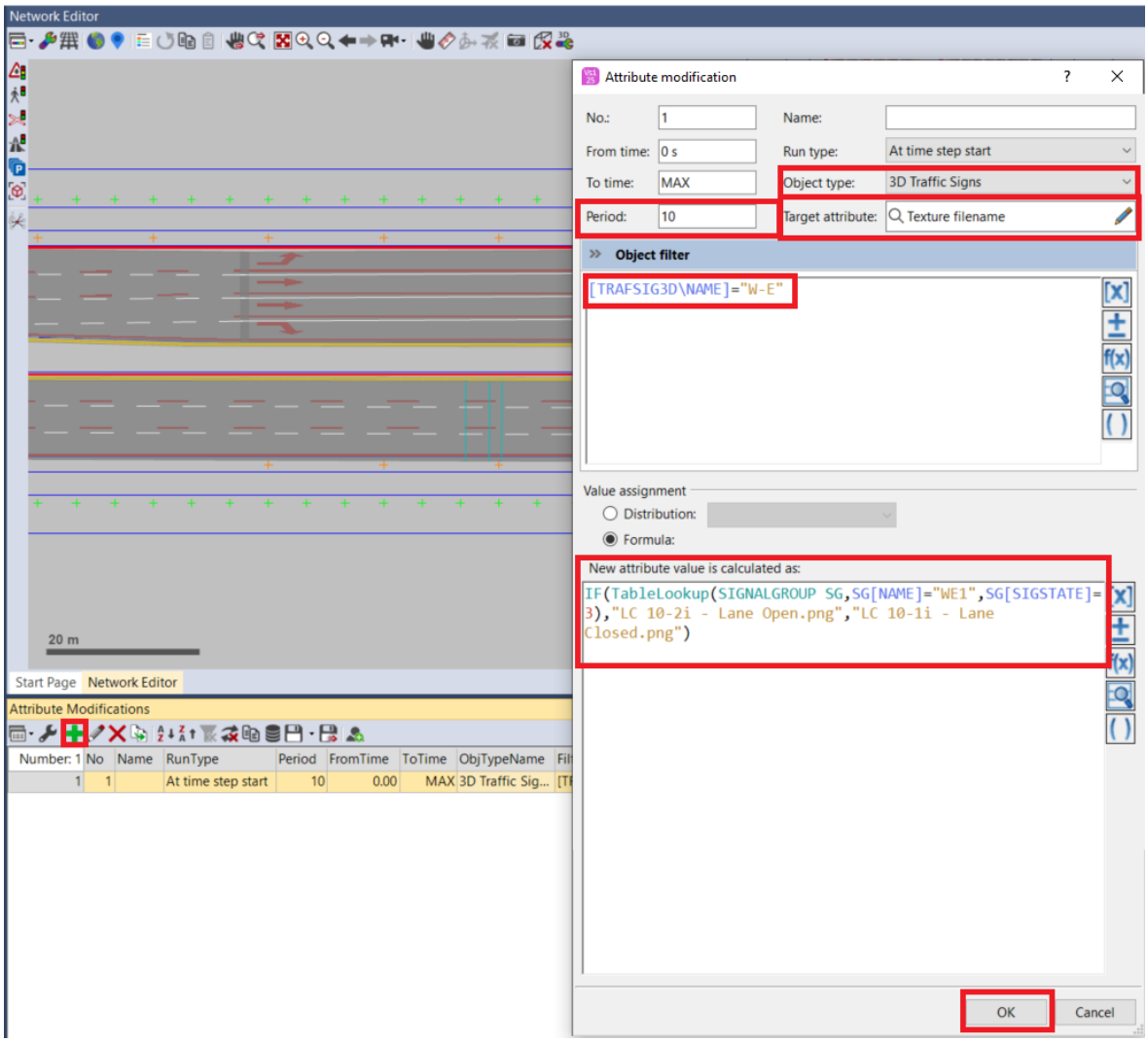


Number: 4	No	Name	Level	CoordX	CoordY
1	1	W-E	1: Base	1565.951	572.030
2	2	E-W	1: Base	1499.537	570.620
3	3	S-N	1: Base	1532.855	606.239
4	4	N-S	1: Base	1534.154	537.413

(13) Select Actions – Attribute Modification.



(14) In attribute modification, click + to add new attributes. Change the target attribute to texture filename and the period to 10. Adjust object filter and calculate new attribute value, and then click OK.



(15) Similarly, duplicate the attribute modification and change the index to North – South direction.

(16) Run the simulation and check if there is any problem.

4. Reversable Lane

The working principle of reversable lane is based on the traffic volume in different time periods to adjust the direction of the vehicle lane and to improve efficiency of the intersection. For instance, in peak hours, if the right turning volume is big and there is only one lane, there would be huge congestion and delay for the vehicles. At the same time, the traffic volumes on the other lanes may be small, and this can cause the imbalance of the lanes. Therefore, the reversable lane can control the direction of the vehicle flow, thus improving the efficiency of the intersection.

Above the reversable lane, there is usually an electronic sign which will show the direction of the lane, and it can change based on different time. The drivers need to choose the correct lane before entering the intersection.

* Assumptions:

(1) Before the simulation time 1200s, more vehicles are going straight from the north entrance.

(2) After the simulation time 1200s, more vehicles are turning right from the north entrance.

(3) There should be a clearance indication 30 seconds advance before the electronic sign changes.

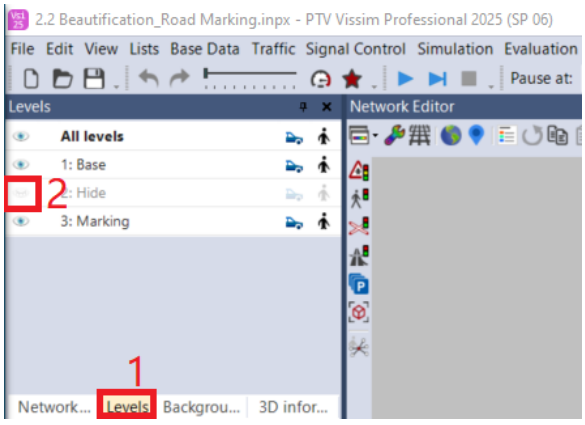
4.1. Traffic Volume Modification

(1) Open file 2.2 Beautification_Road Marking.

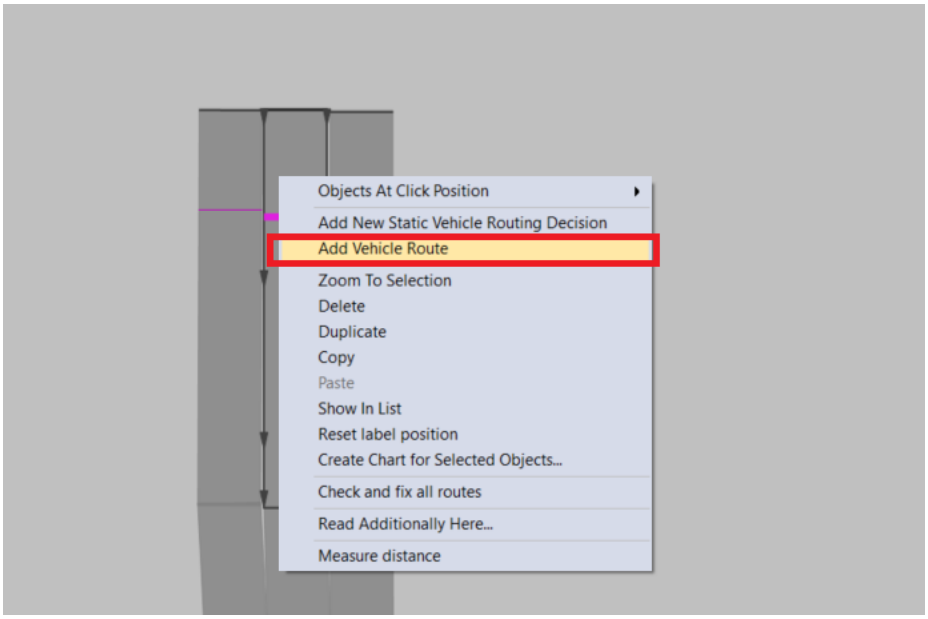
(2) To avoid overriding the original file, save a separate file.

(3) Define the file name and click save.

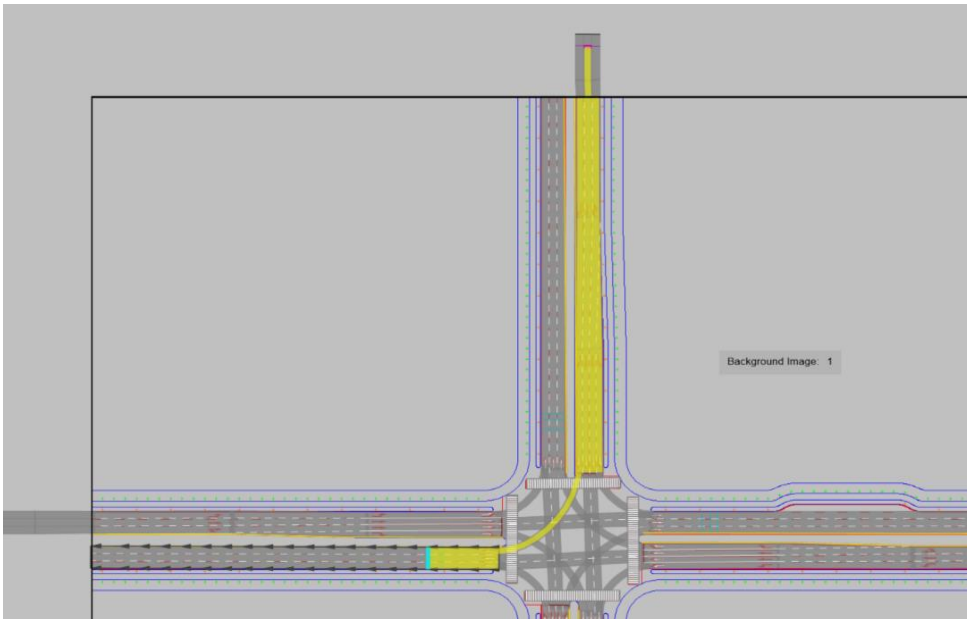
(4) Select Levels and click to make the Hide Level visible.



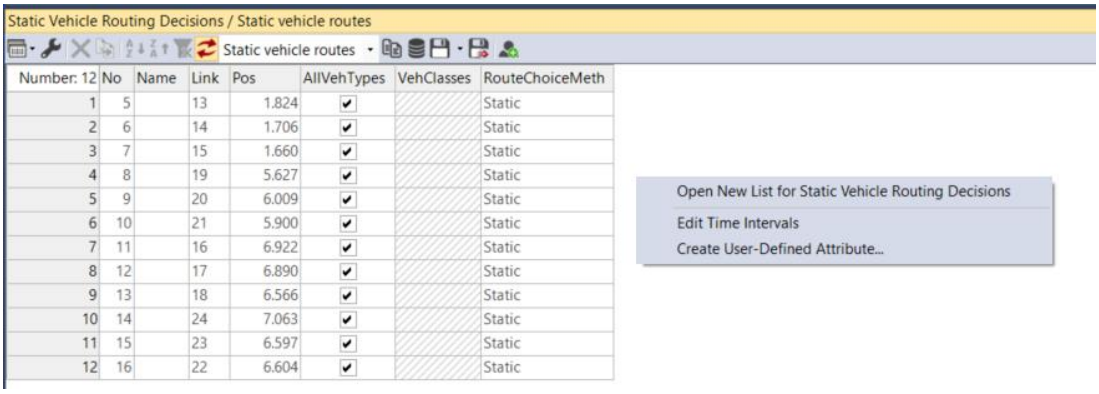
(5) Select Vehicle Routes. Right click the vehicle decision route and choose Add Vehicle Route.



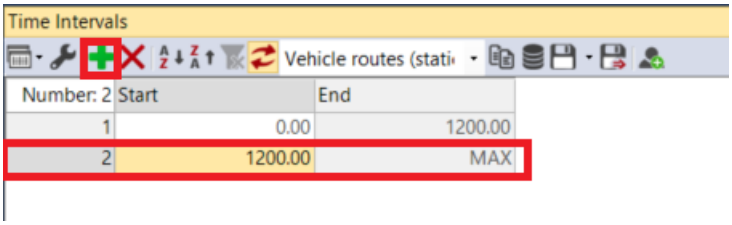
(6) Create a right turning route from the north to the west.



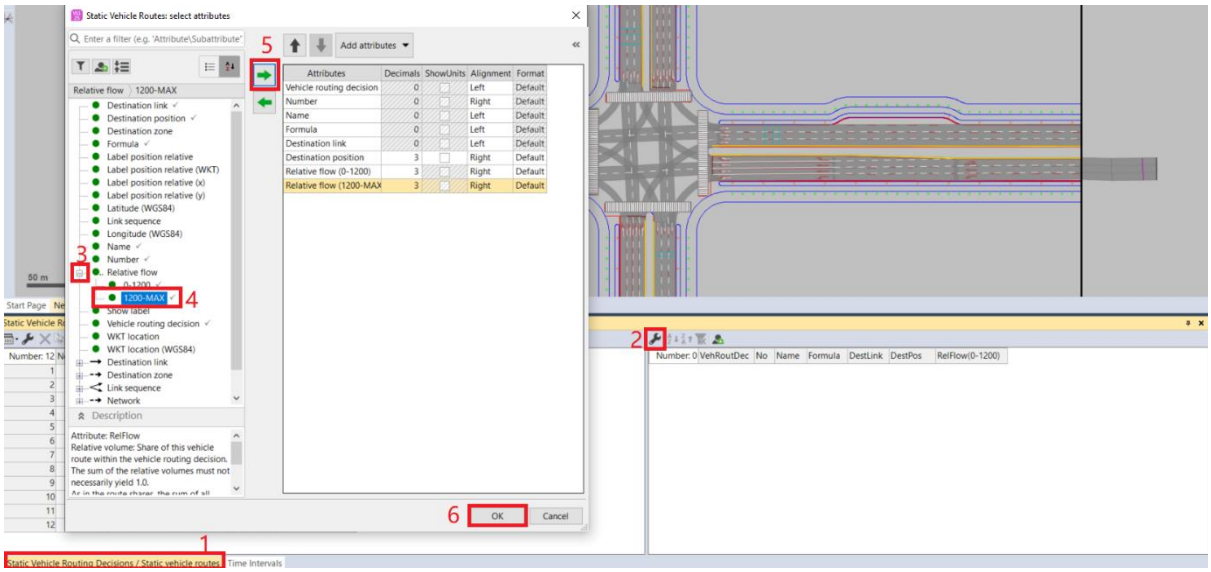
(7) In the blank area of Static Vehicle Routing Decisions, right click and click Edit Time Intervals.



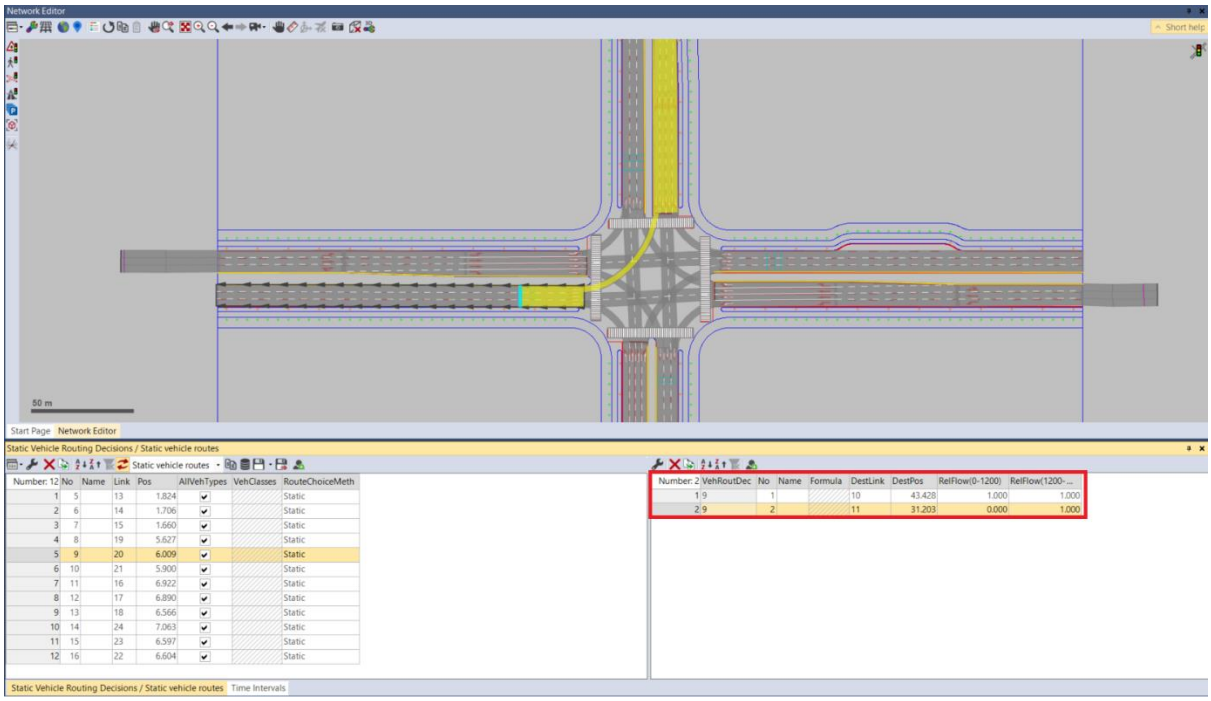
(8) Left click to add new time interval and change start time to 1200.



(9) Switch back to Static Vehicle Routing Decisions. Left click to select attributes. Click + next to relative flow and choose 1200-MAX. Add this attribute and click OK.



(10) Choose the corresponding route. In Static Vehicle Routing Decisions / Static vehicle routes, change the relative flow based on different time intervals.



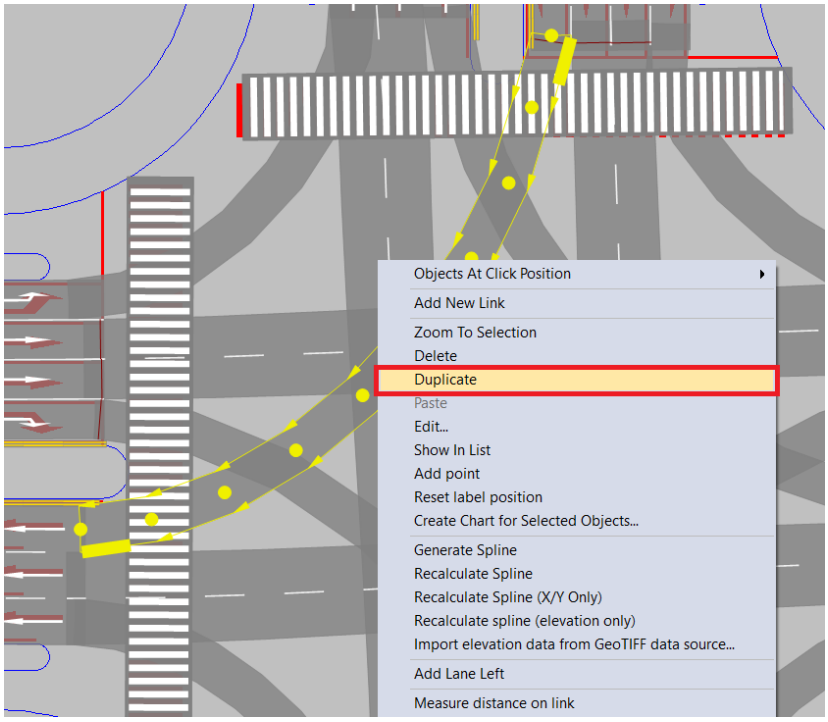
(11) Run the simulation and check if the simulation is running correctly.

4.2. Reversable Lane

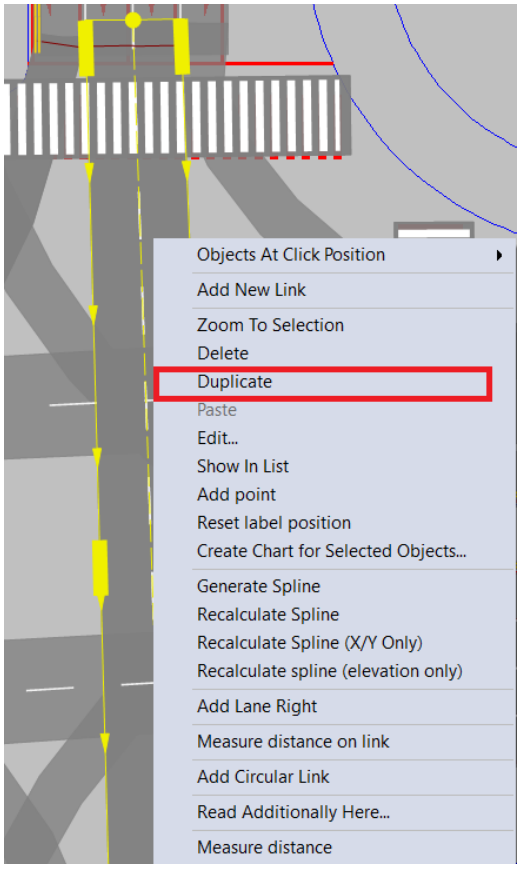
(1) Select File and Save as.

(2) Define the file name and click save.

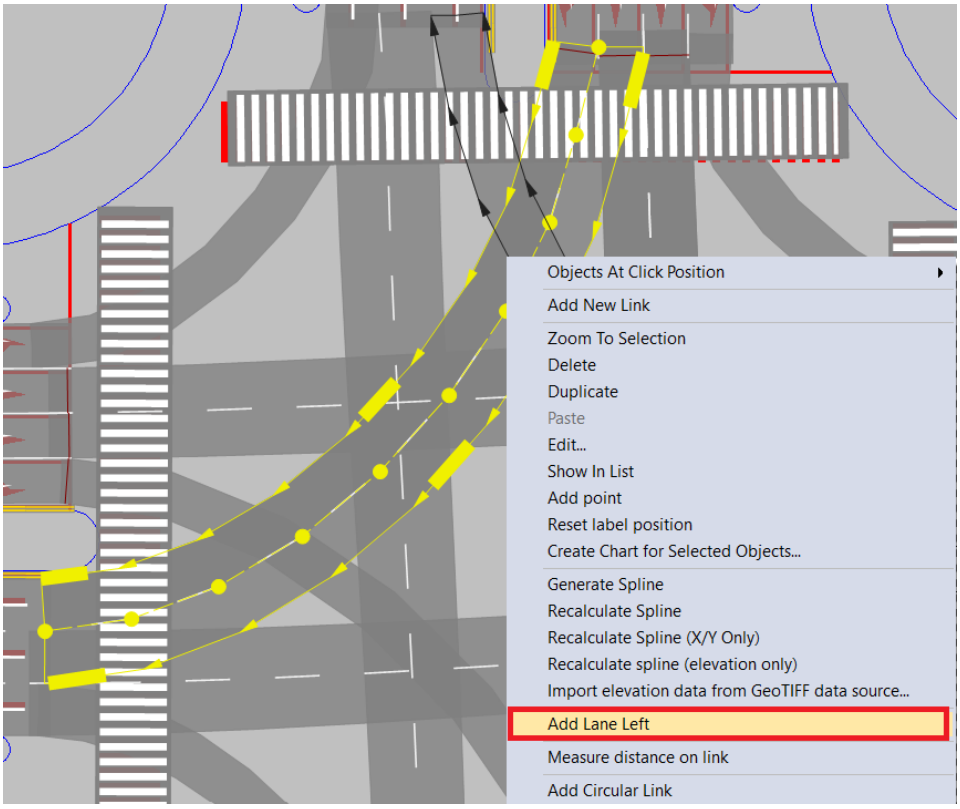
(3) Right click the right turning connector and click duplicate.



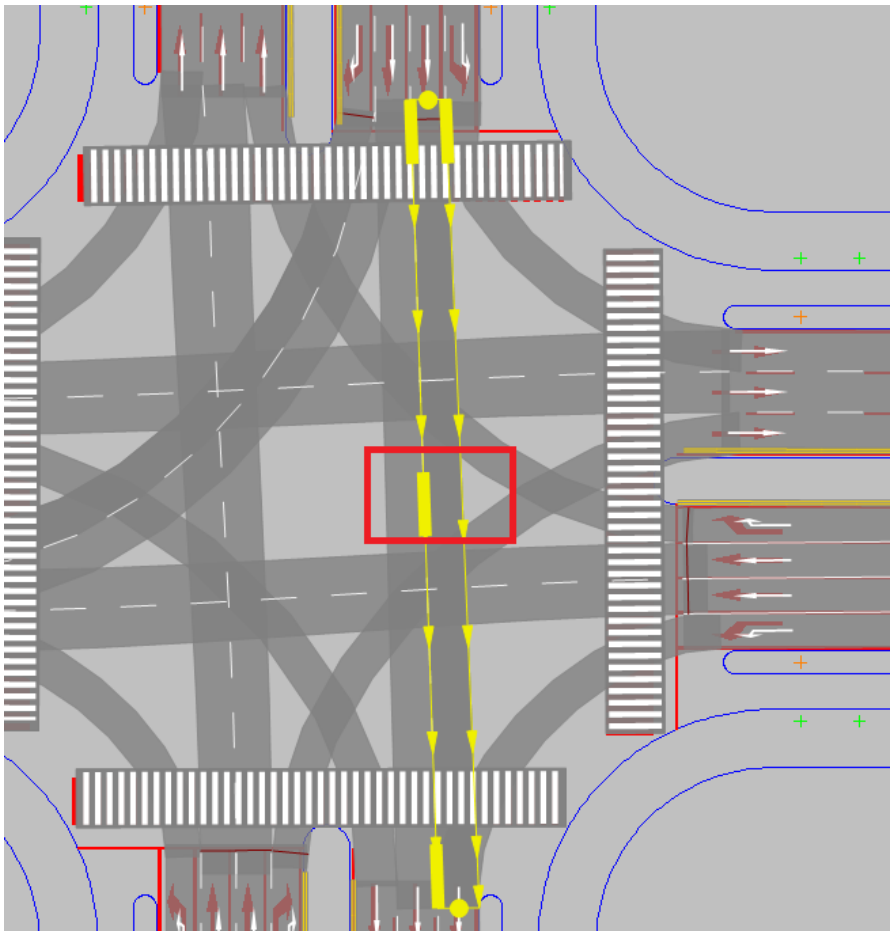
(4) Similarly, right click the straight movement connector and duplicate.



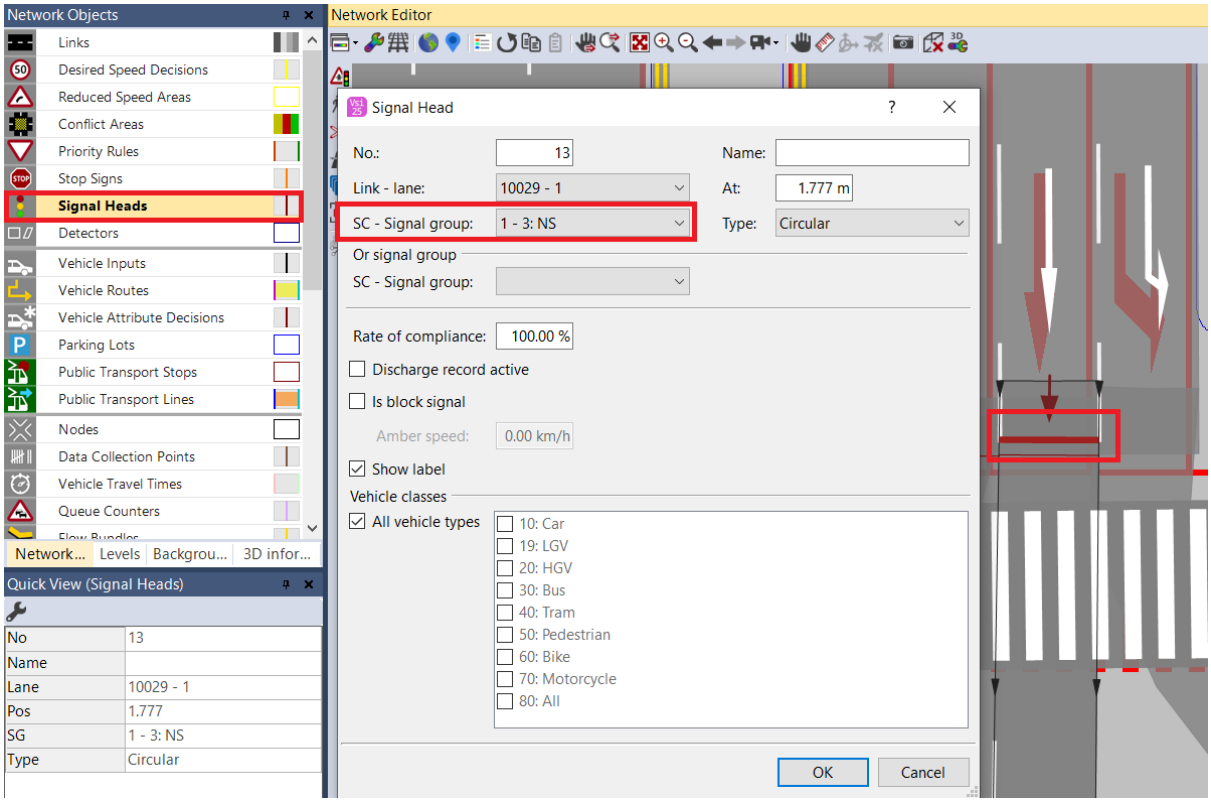
(5) Right click the duplicated right turning connector, and select Add Lane Left.



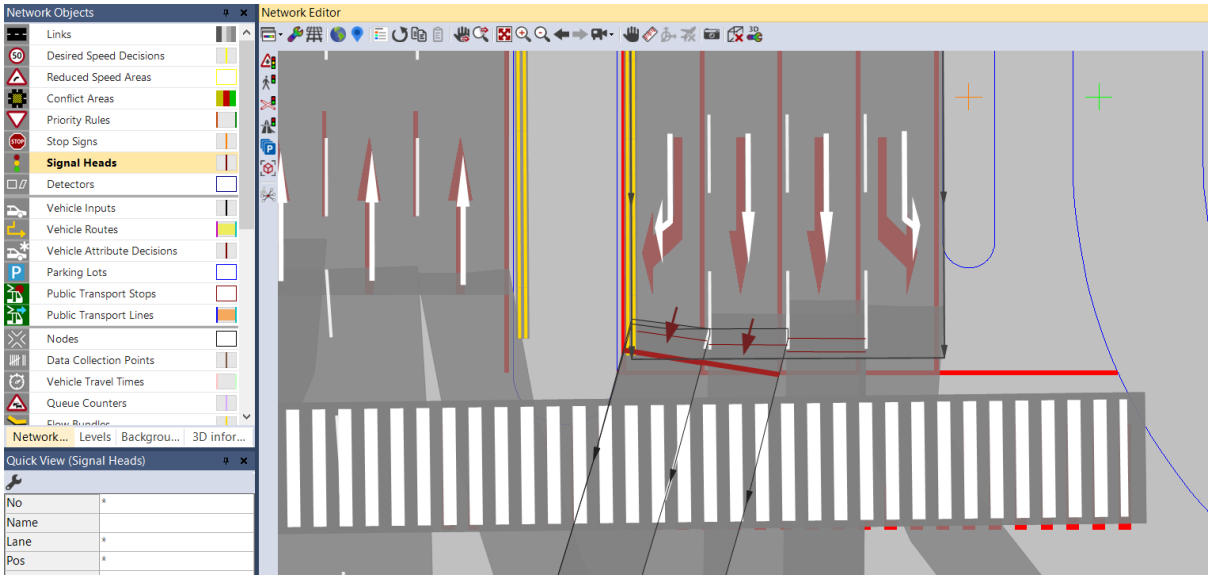
(6) Adjust the duplicated straight movement connector to one lane.



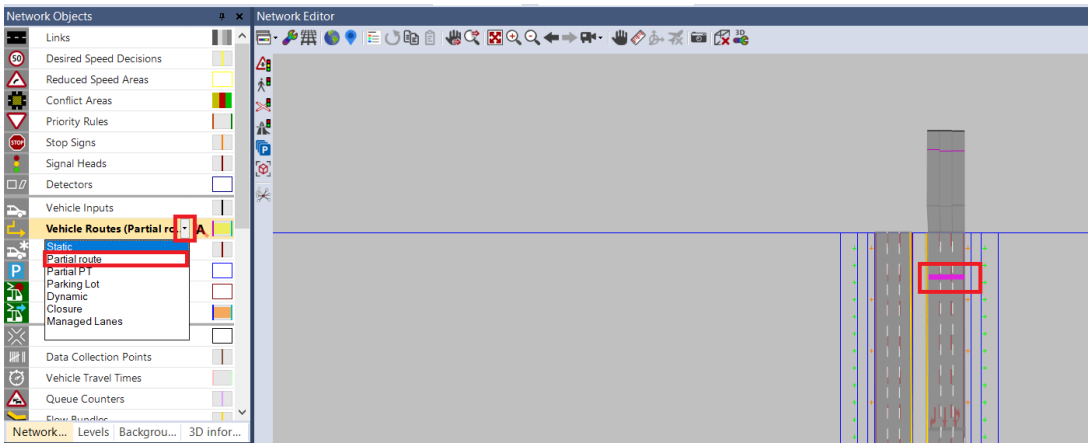
(7) Select Signal Heads. Press Ctrl and add new signal heads to the new straight movement connector. Select the corresponding signal group and click OK.



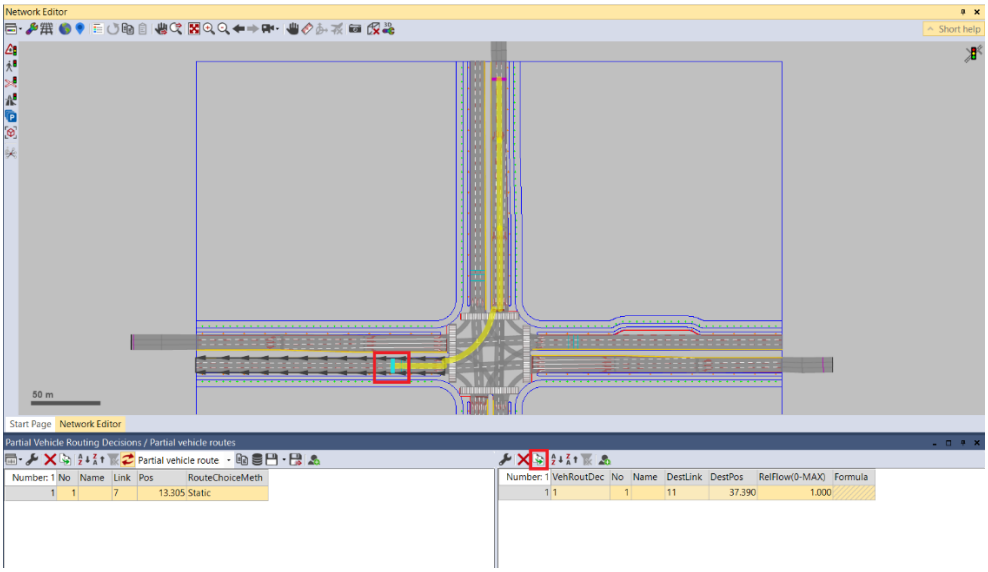
(8) Similarly, repeat step 7 to add new signal heads on the new right turning connector.



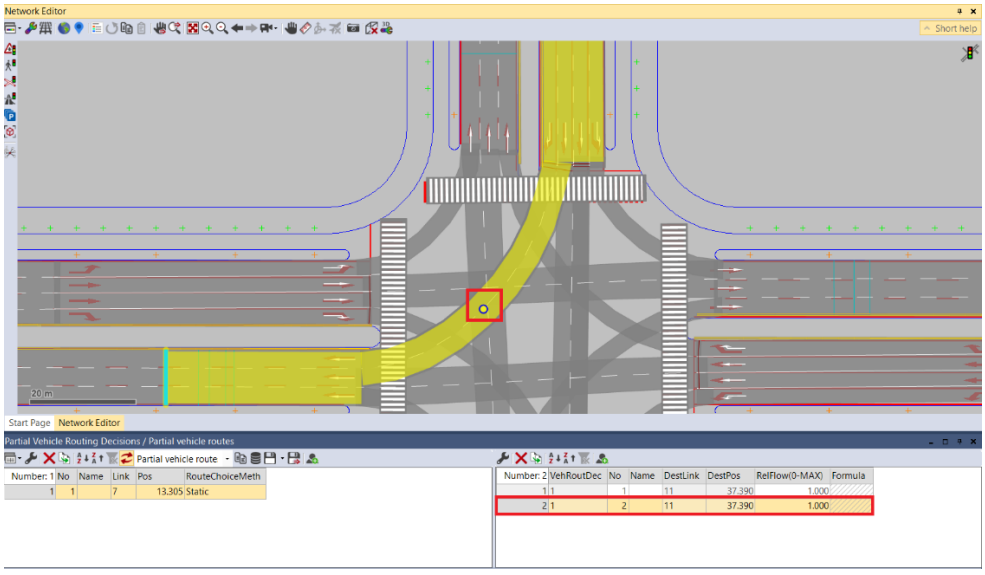
(9) Select Vehicle Routes and choose Partial Route. Then create a new vehicle route.



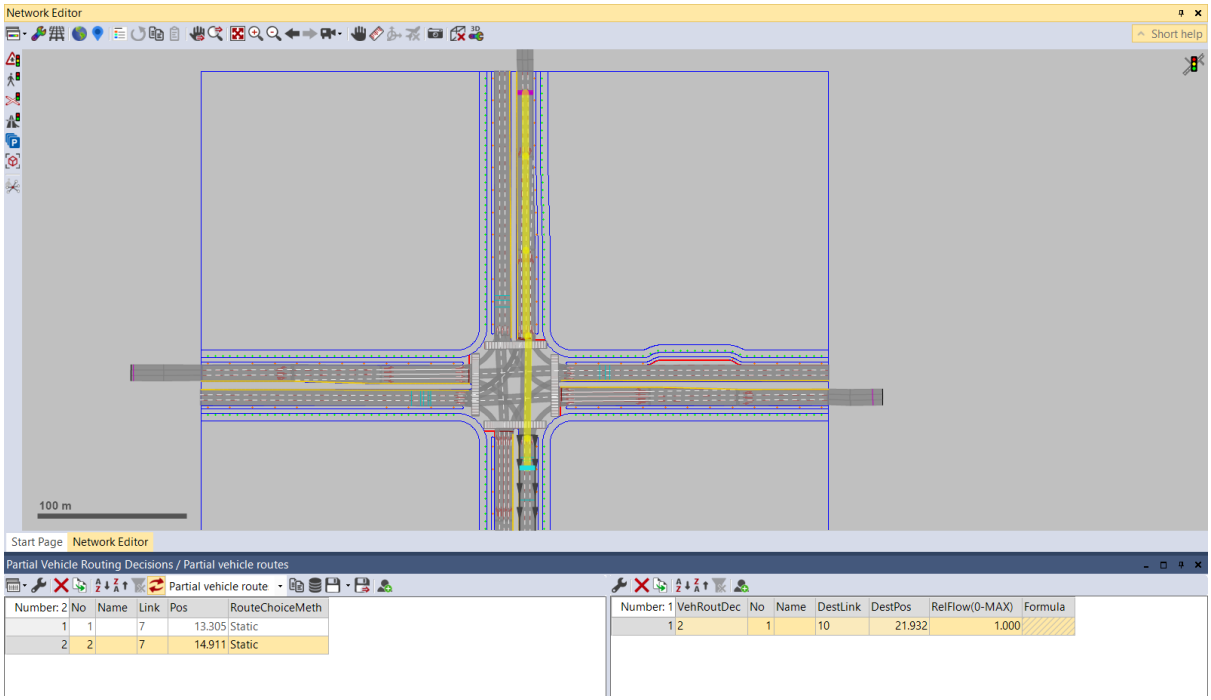
(10) Create the partial vehicle route. In the Partial Vehicle Routing Decisions / Partial vehicle routes, click duplicate.



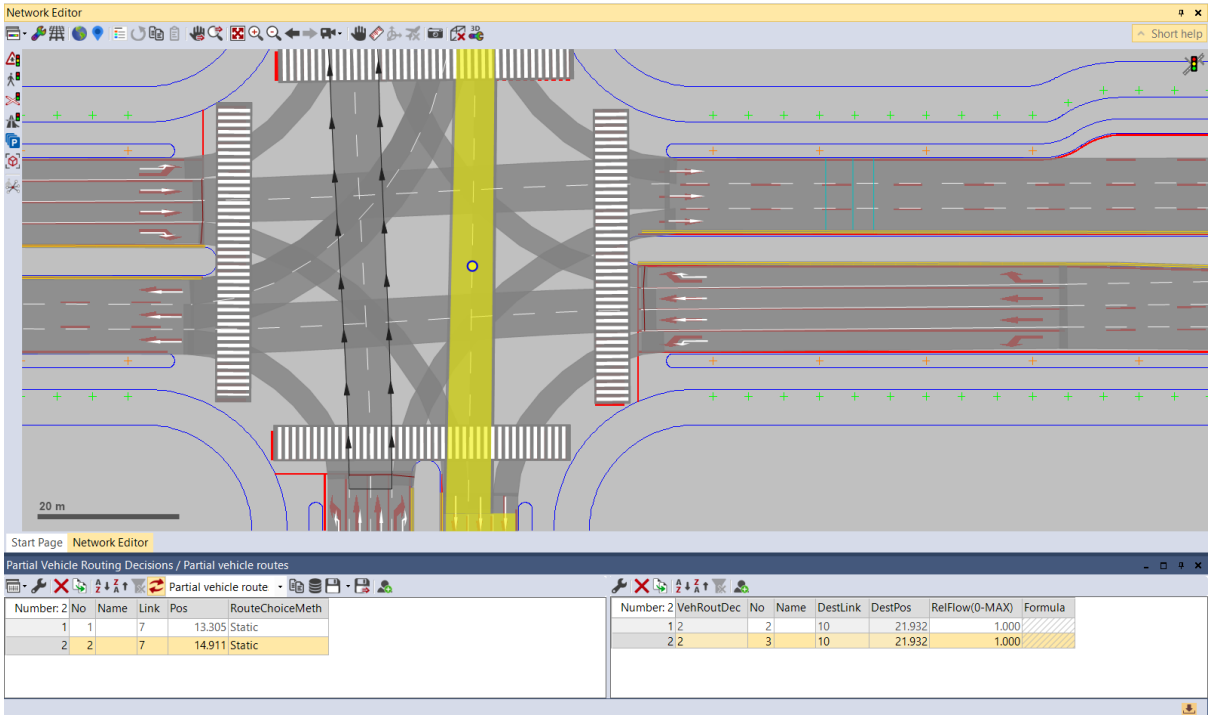
(11) Left click to select the second partial route. Press Ctrl and right button to create an intermediate point in the middle of the route. Drag the point to another right turning connector.



(12) Press Ctrl and right click to create another partial route decision for through traffic. In the Partial Vehicle Routing Decisions / Partial vehicle routes, click duplicate.

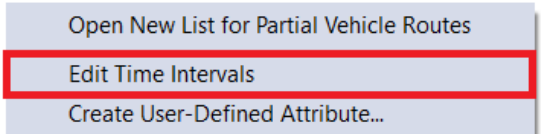


(13) Left click to select the second partial route. Press Ctrl and right button to create an intermediate point in the middle of the route. Drag the point to another straight movement connector.

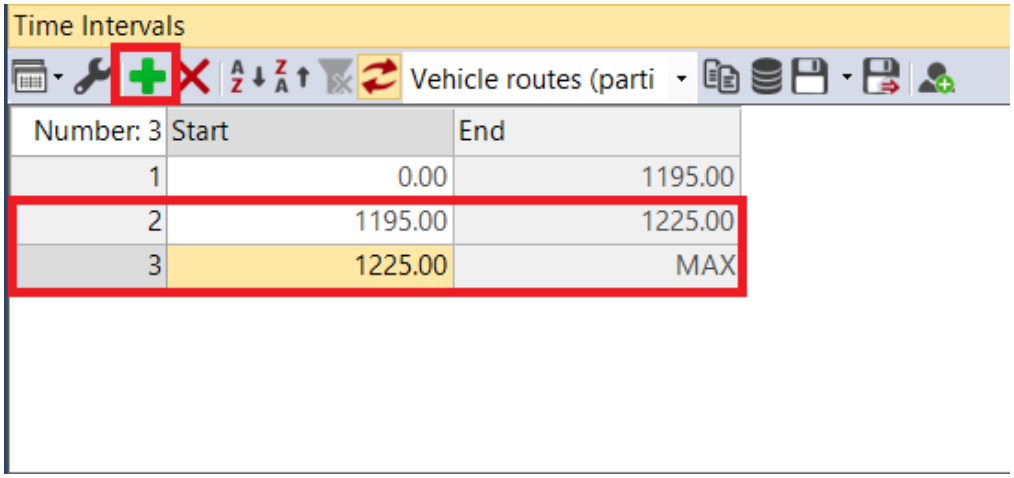


(14) In the Partial Vehicle Routing Decisions / Partial vehicle routes, right click to select Edit Time Intervals.

Number: 2	VehRoutDec	No	Name	DestLink	DestPos	RelFlow(0-MAX)	Formula
1	2	2		10	21.932	1.000	
2	2	3		10	21.932	1.000	



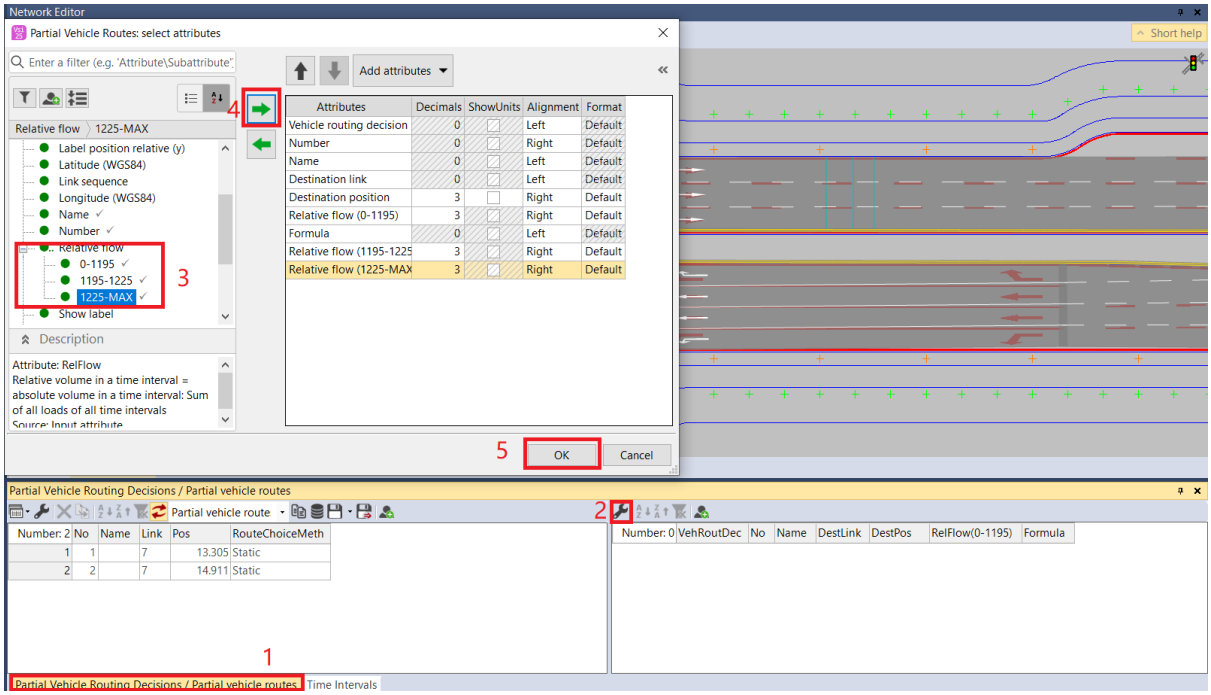
(15) Left click + to add two intervals. Change the start time to 1195 and 1225.



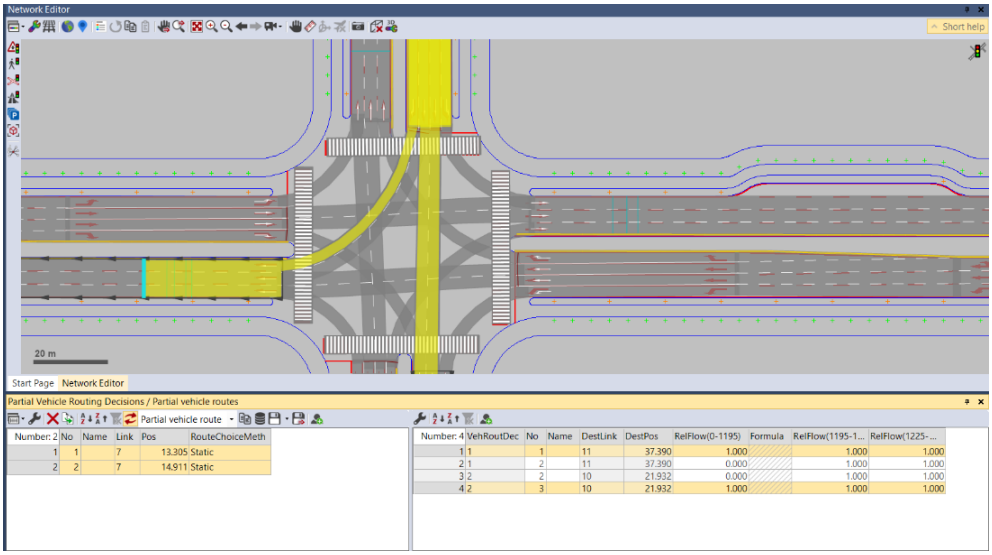
Number: 3	Start	End
1	0.00	1195.00
2	1195.00	1225.00
3	1225.00	MAX

* 0-1995s: one right turning lane & two through traffic lanes
1195s-1225s: one right turning lane & one clearance lane & one through traffic lane
1225s-MAX: two right turning lanes & one through traffic lane

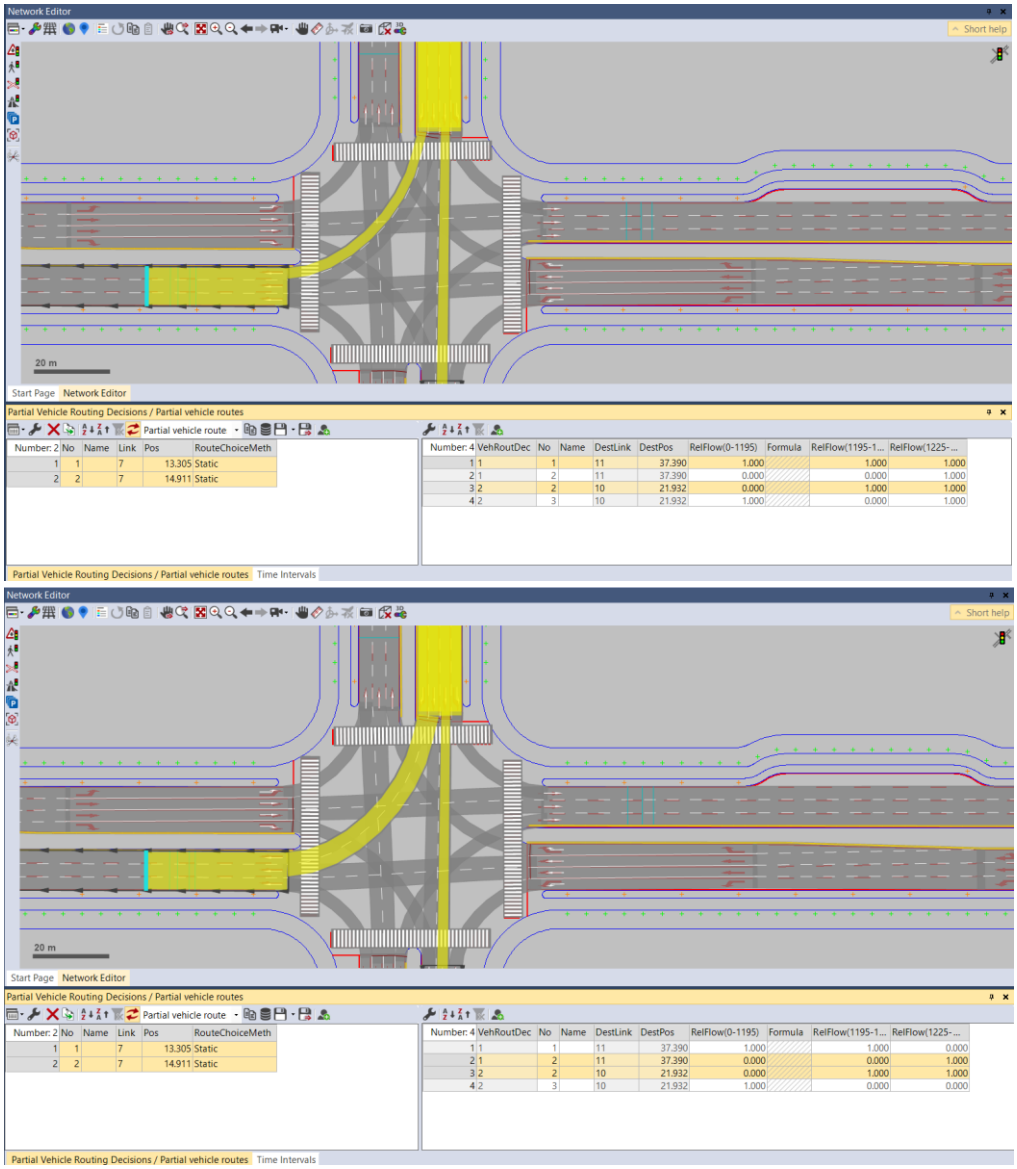
(16) Switch back to Partial Vehicle Routing Decisions / Partial vehicle routes. Click to select attributes and choose relative flow. Add the attributes and click OK.



(17) Select all the partial route decisions. Adjust the relative flow (0-1195s).



(18) Similarly, adjust the relative flow (1195s-1225s) and relative flow (1225s-MAX).



(19) Run the simulation and check if the simulation is running correctly.

5. Simulation Result Evaluation

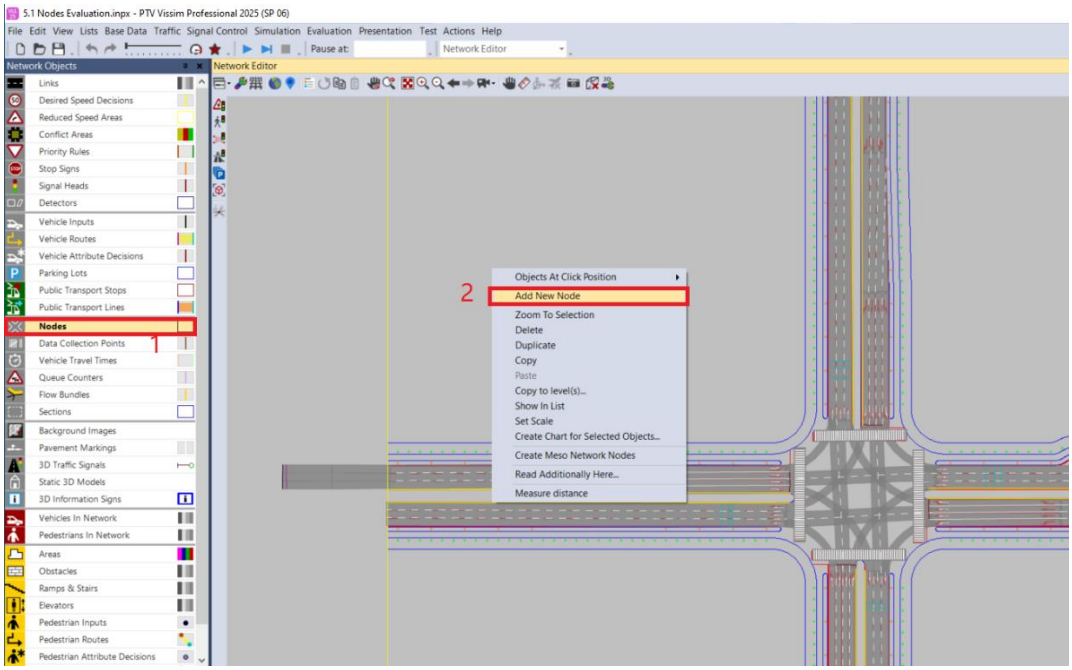
5.1. Nodes Evaluation

(1) Open file 2.2 Beautification_Road Marking.

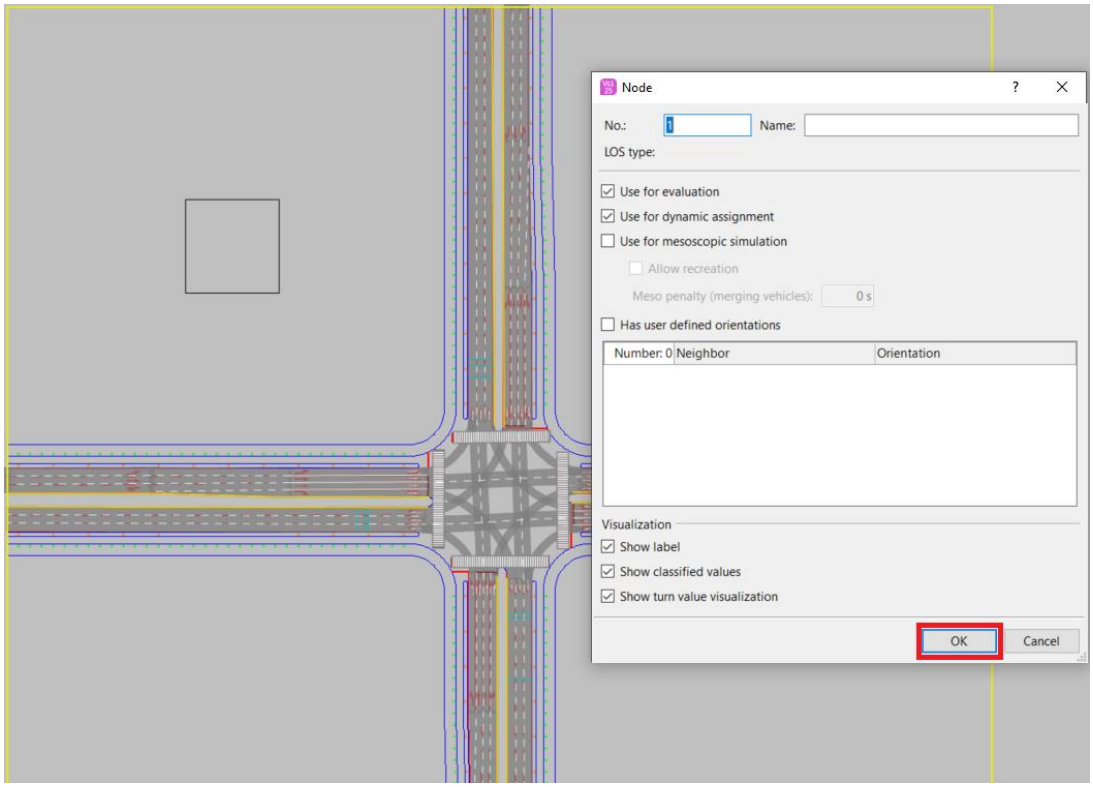
(2) To avoid overriding the original file, save a separate file.

(3) Define the file name and click save.

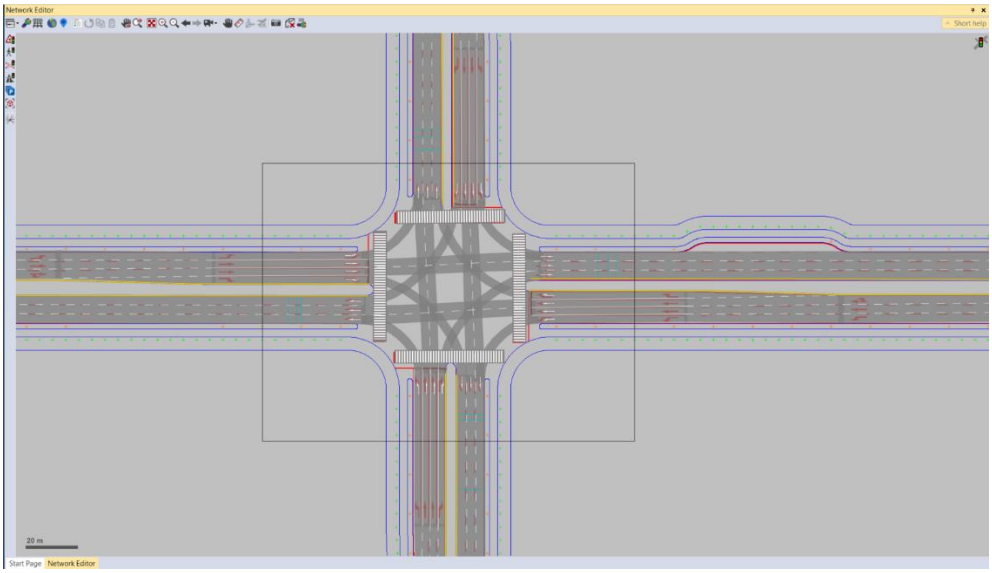
(4) Select Nodes. In the blank area in Network Editor, right click and choose Add New Nodes.



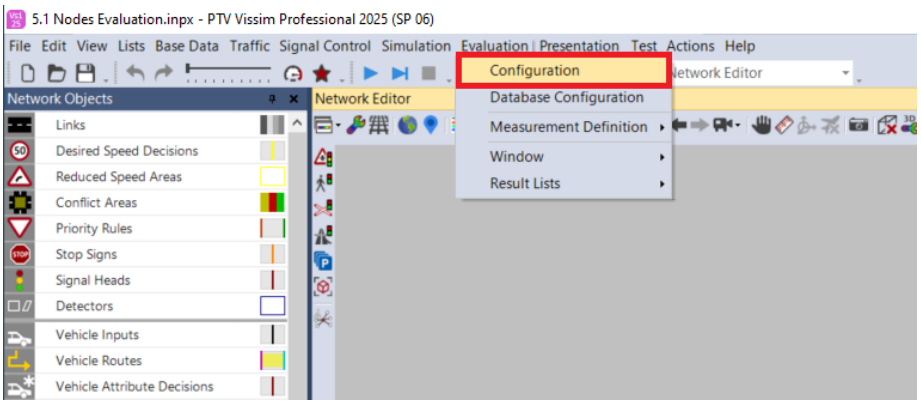
(5) Directly click OK in the dialog box.



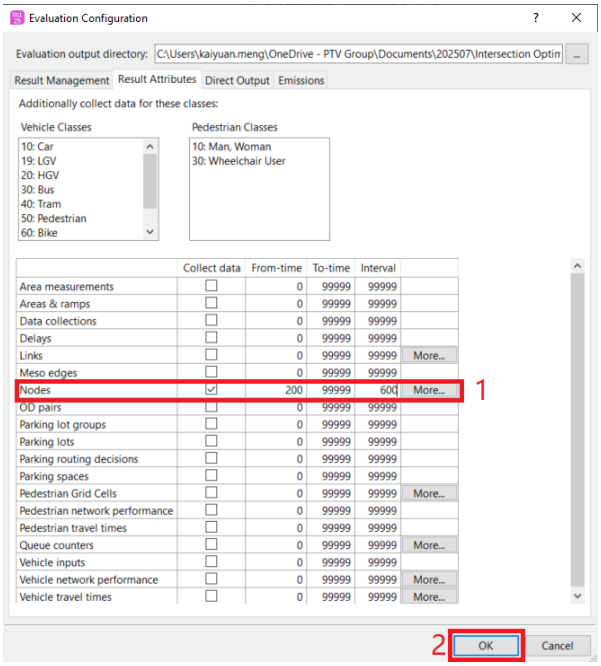
(6) Left click the yellow nodes and drag it to the proper position to contain the whole intersection. Ensure that the edges of the node only intersect with the solid line section.



(7) Select Evaluation -> Configuration.

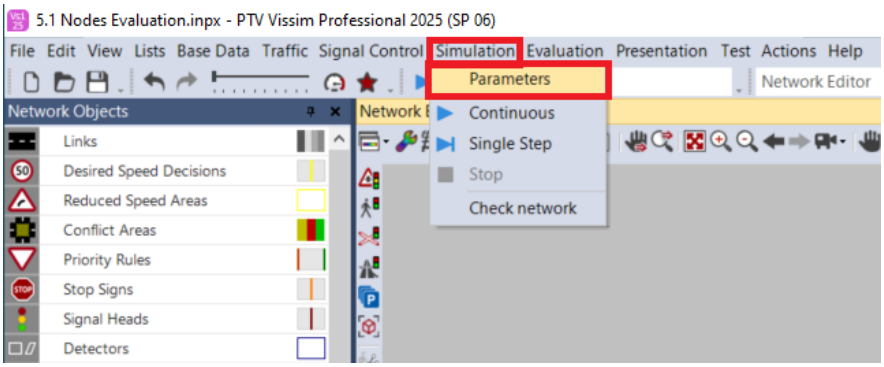


(8) In the Evaluation Configuration dialog box, click Nodes and change the From-time to 200 and Interval to 600. Then click OK.

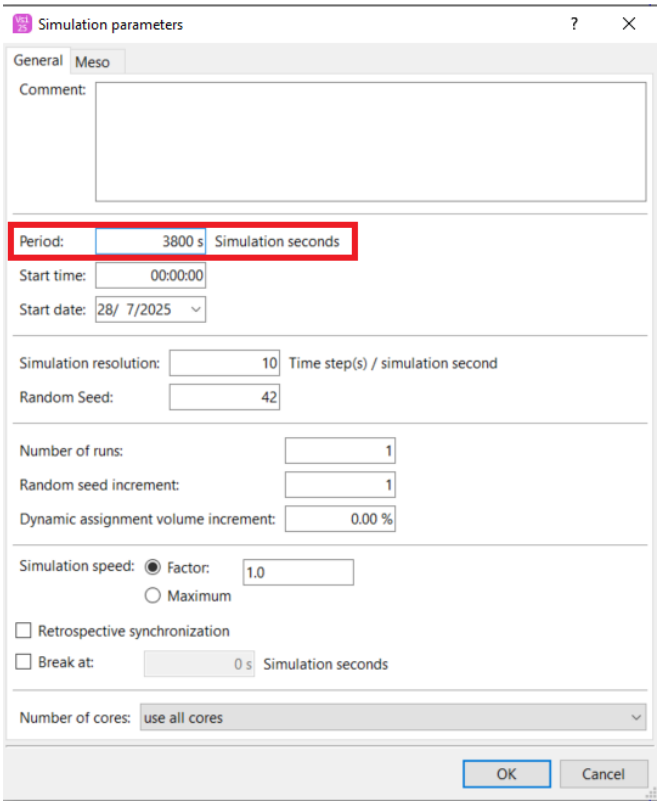


* For the simulation time, warming-up time needs to be considered (in this case is 200 seconds).

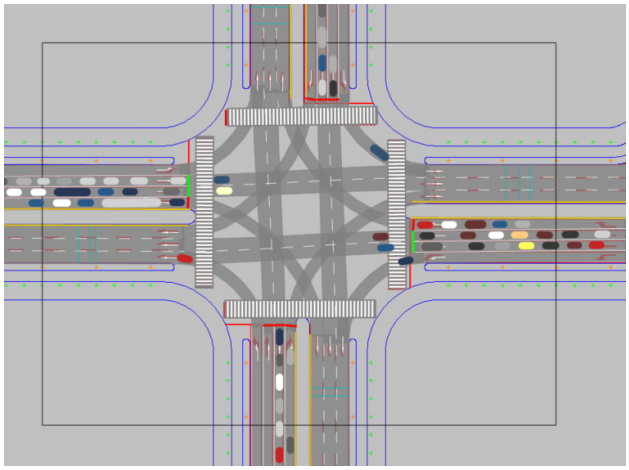
(9) Select Simulation -> Parameters.



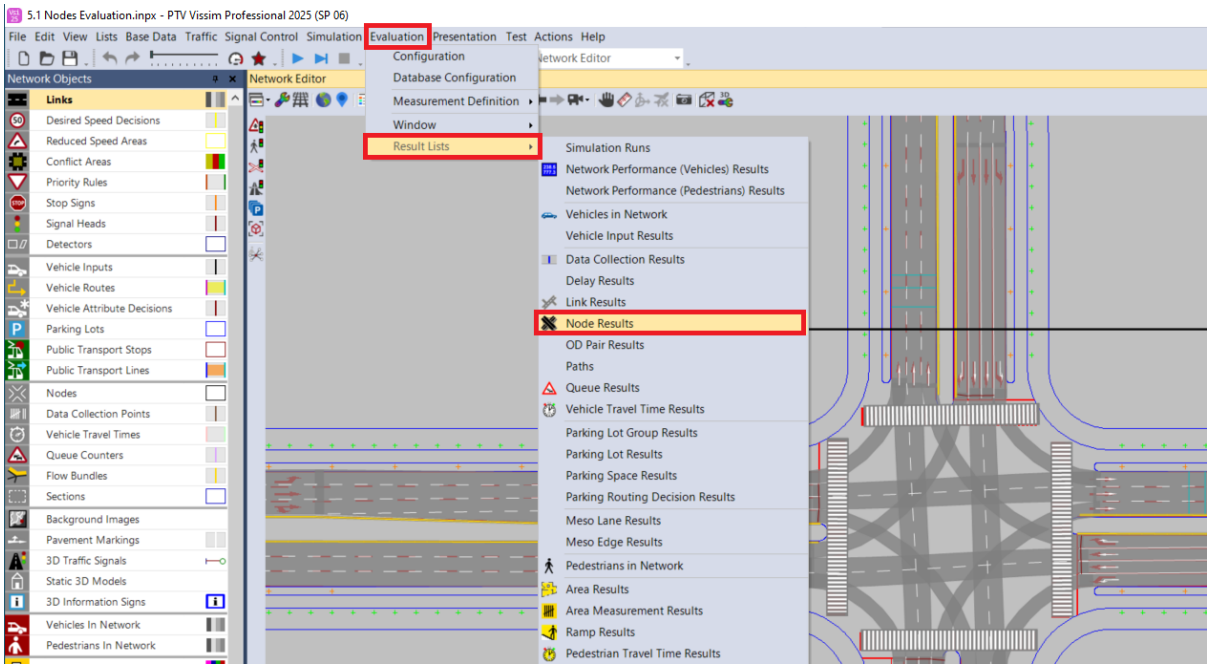
(10) In the Simulation Parameters, change the simulation time to 3800 seconds.



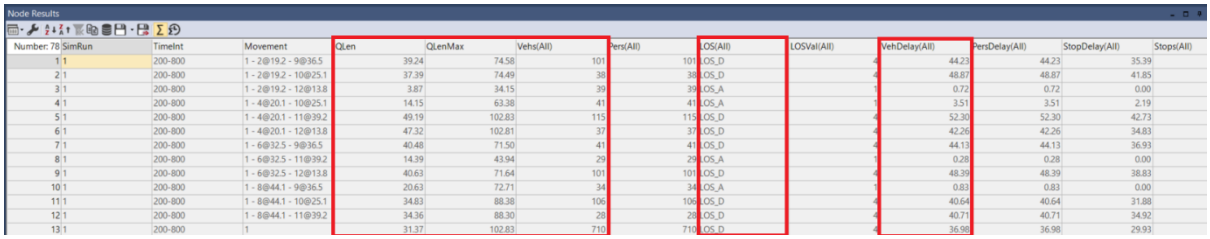
(11) Run the simulation.



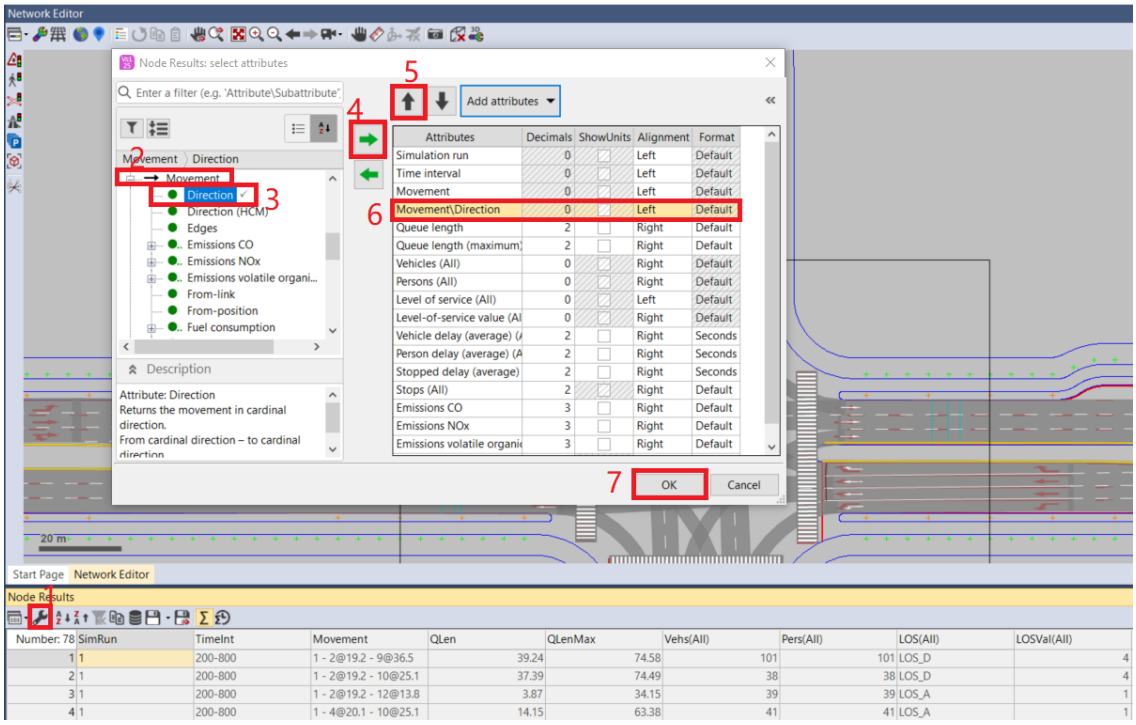
(12) Select Evaluation -> Result Lists -> Node Results.



(13) In the Node Results Lists, check the results.



(14) If the Movement in the result list is not understandable, left click the attribute selection. Click + next to Movement and add Direction to the list. Adjust the order of the attributes and click OK.

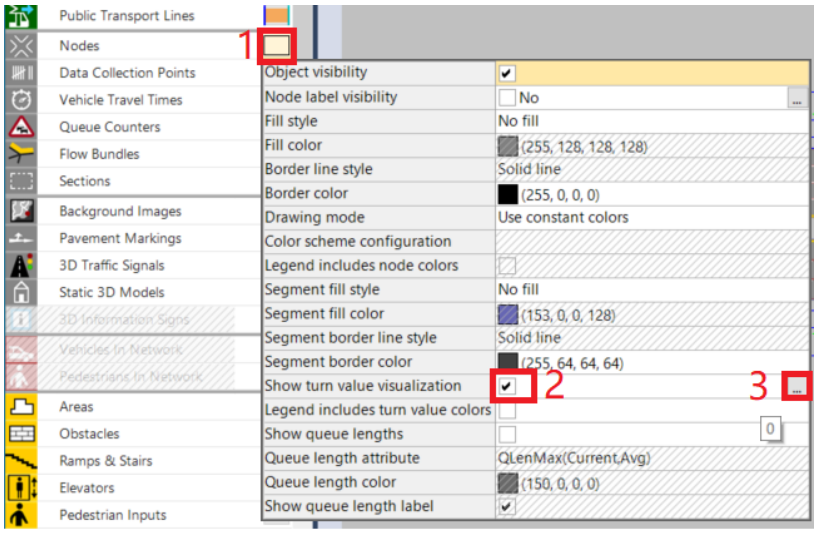


(15) Run the simulation again and wait for it to finish. Then check the results.

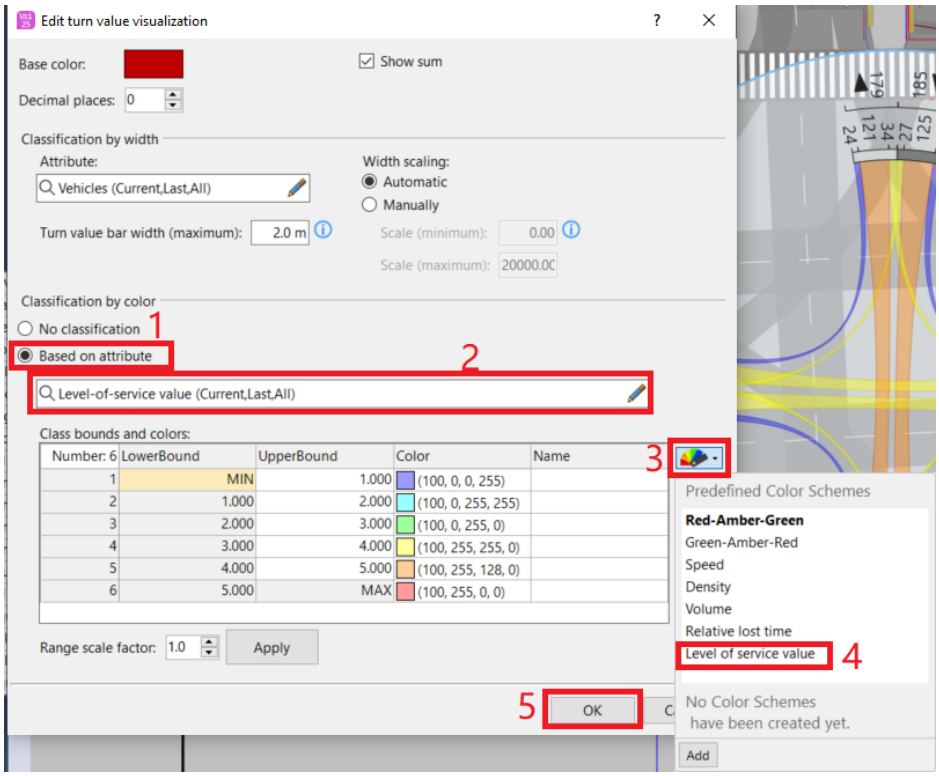
Node Results

Number: 546	SimRun	TimeInt	Movement	Movement\Dire...	QLen	QLenMax	Vehs(All)	Pers(All)	LOS(All)
157	3	200-800	1 - 2@19.2 - 9@36.5	W-E	39.24	74.58	101	101	LOS_D
158	3	200-800	1 - 2@19.2 - 10@25.1	W-S	37.39	74.49	38	38	LOS_D
159	3	200-800	1 - 2@19.2 - 12@13.8	W-N	3.87	34.15	39	39	LOS_A
160	3	200-800	1 - 4@20.1 - 10@25.1	E-S	14.15	63.38	41	41	LOS_A
161	3	200-800	1 - 4@20.1 - 11@39.2	E-W	49.19	102.83	115	115	LOS_D
162	3	200-800	1 - 4@20.1 - 12@13.8	E-N	47.32	102.81	37	37	LOS_D
163	3	200-800	1 - 6@32.5 - 9@36.5	S-E	40.48	71.50	41	41	LOS_D
164	3	200-800	1 - 6@32.5 - 11@39.2	S-W	14.39	43.94	29	29	LOS_A
165	3	200-800	1 - 6@32.5 - 12@13.8	S-N	40.63	71.64	101	101	LOS_D
166	3	200-800	1 - 8@44.1 - 9@36.5	N-E	20.63	72.71	34	34	LOS_A
167	3	200-800	1 - 8@44.1 - 10@25.1	N-S	34.83	88.38	106	106	LOS_D
168	3	200-800	1 - 8@44.1 - 11@39.2	N-W	34.36	88.30	28	28	LOS_D
169	3	200-800	1	Total	31.37	102.83	710	710	LOS_D

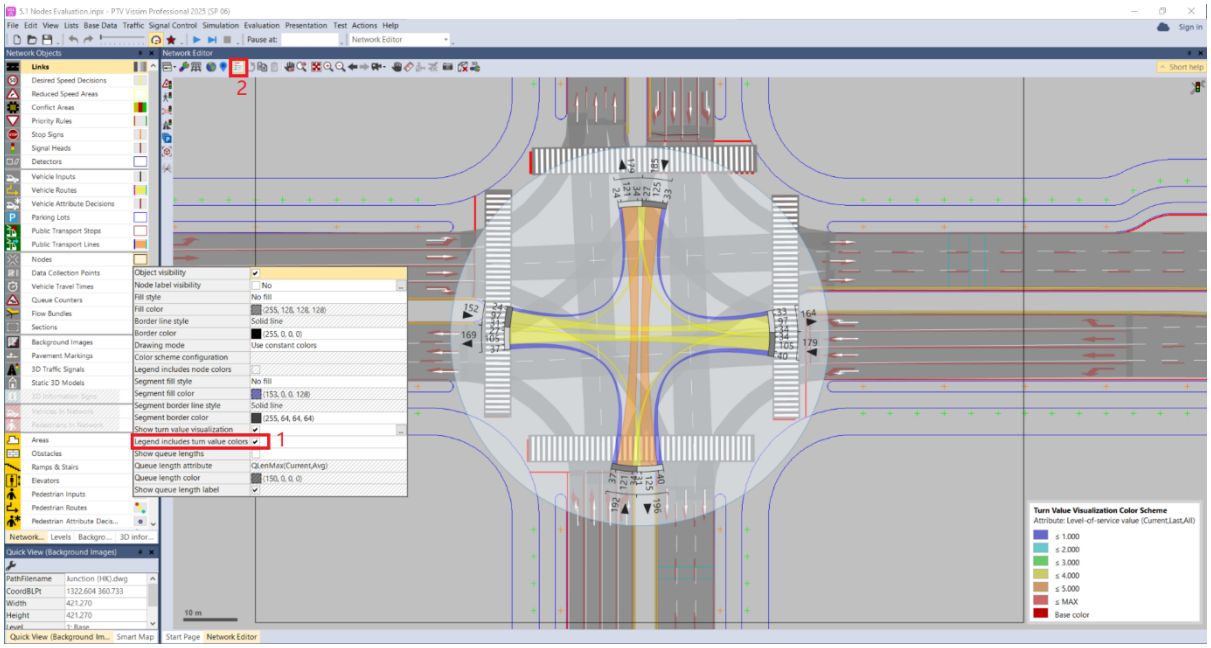
(16) Click the icon on the right side of the Nodes and click show turn value visualization. Then left click to edit.



(17) Select Based on attribute. Choose Level-of-service value (Current, Last, All). Left click the color scheme and select Level of Service value, then click OK.



(18) Click the icon on the right side of Nodes and click legend includes turn value colors. Left click to turn on/off the legend.

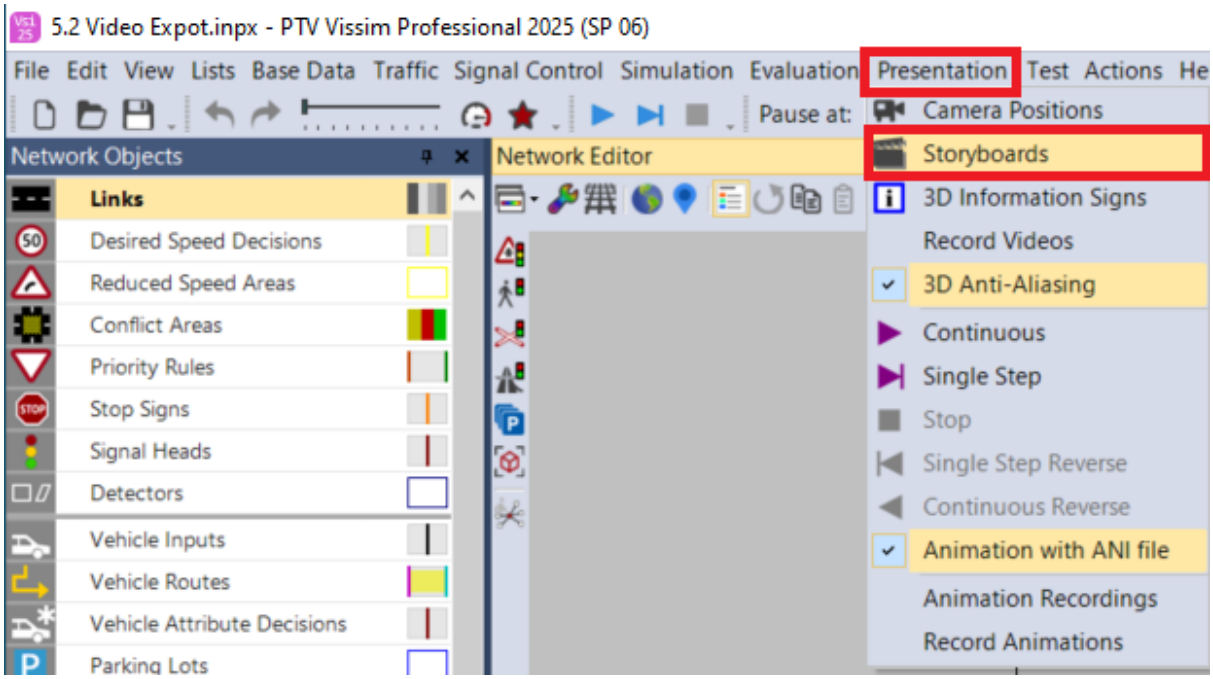


5.2. 3D Video Recording

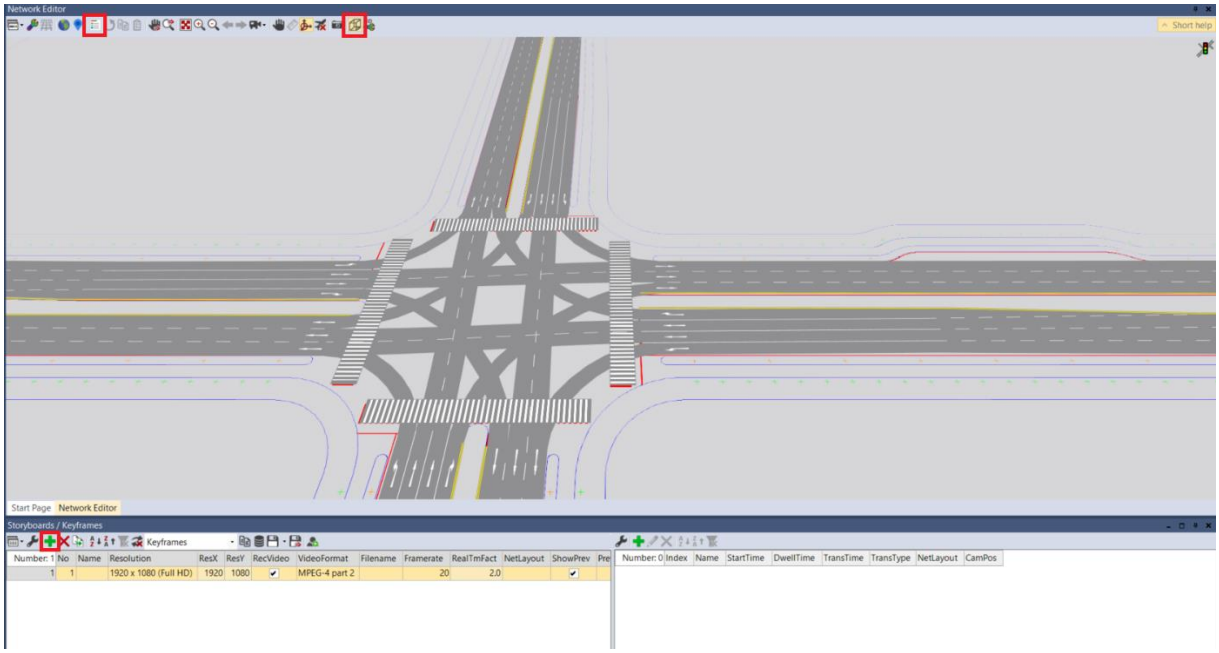
(1) To avoid overriding the original file, save a separate file.

(2) Define the file name and click save.

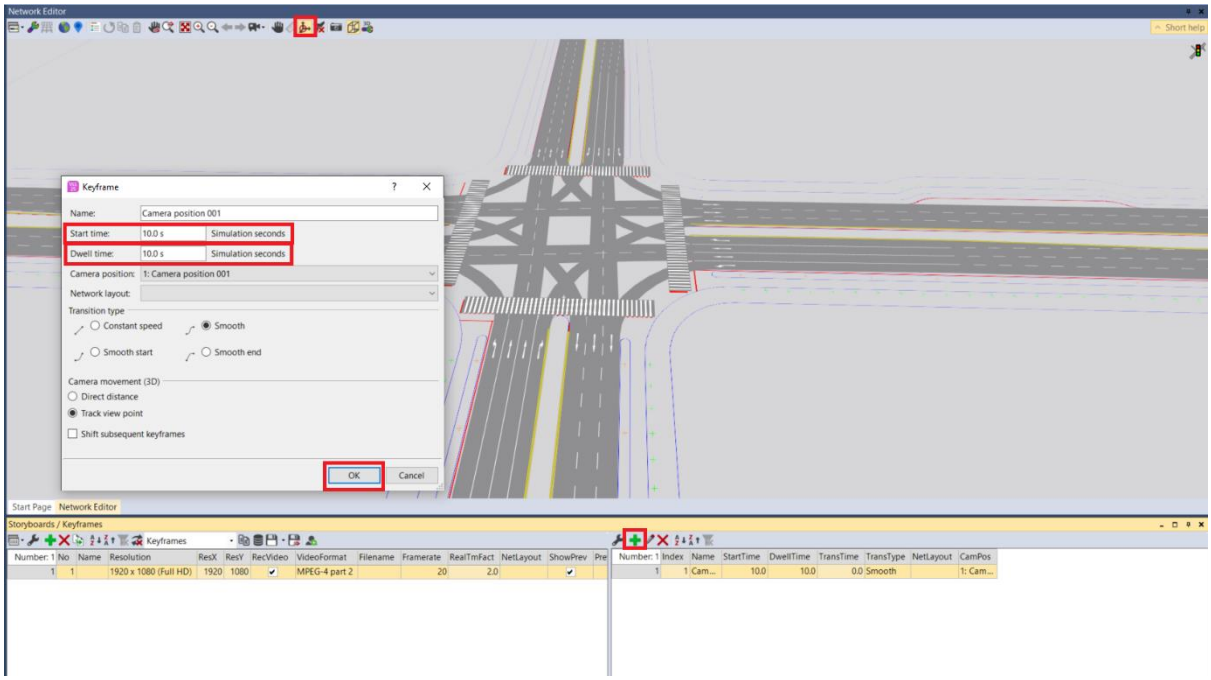
(3) Select Presentation -> Storyboard.



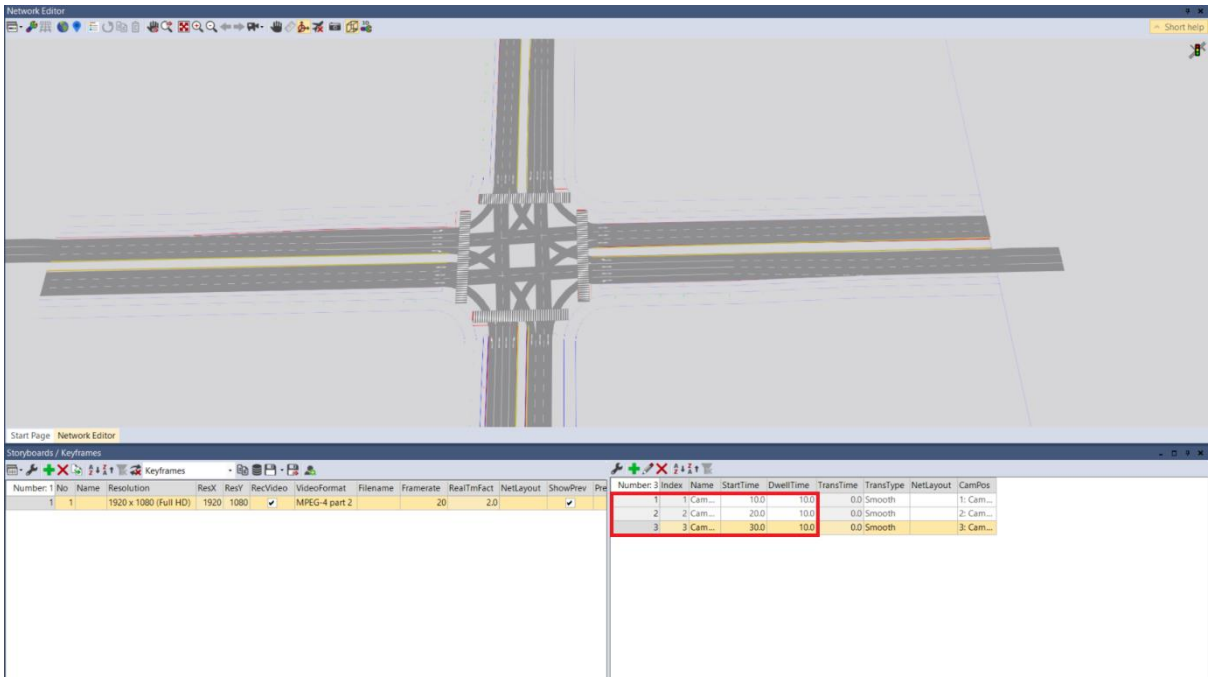
(4) Switch to 3D view and turn off the legend. Click + to add new storyboard.



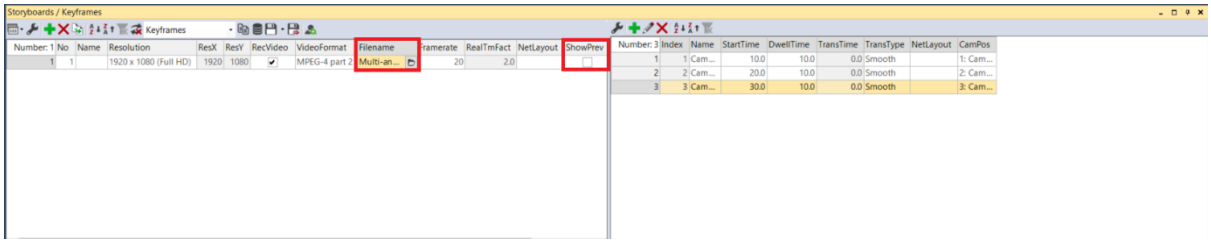
(5) Switch to rotation mode (3D). Drag left button to adjust the view and scroll to zoom in and out. In the Keyframes lists, click + to add new frame. Change the start time to 10 seconds and dwell time to 10 seconds and click OK.



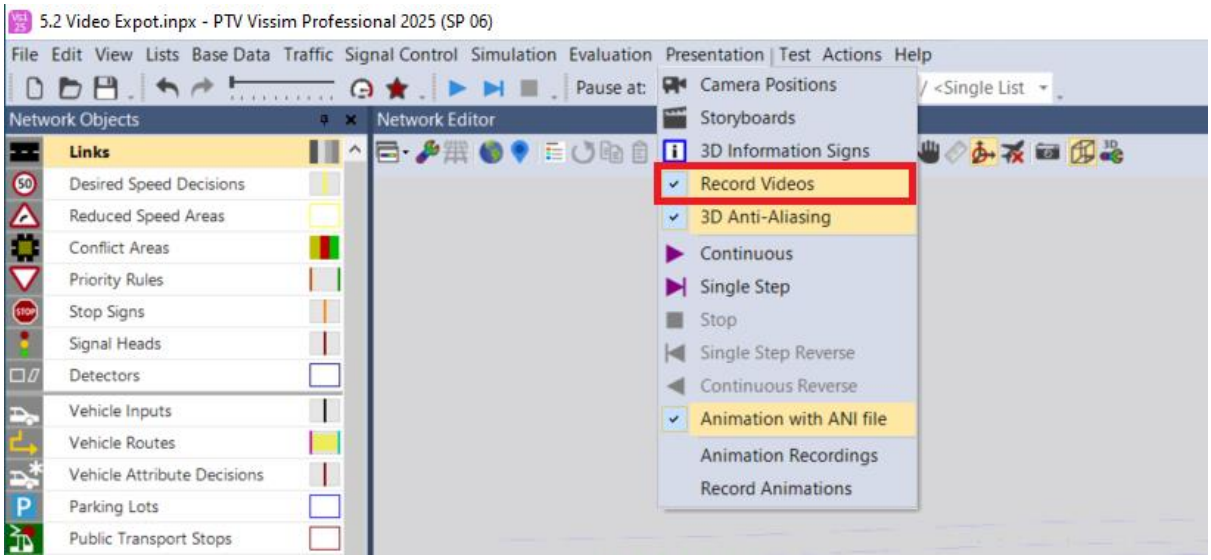
(6) Similarly, repeat step 5 to add more keyframes.

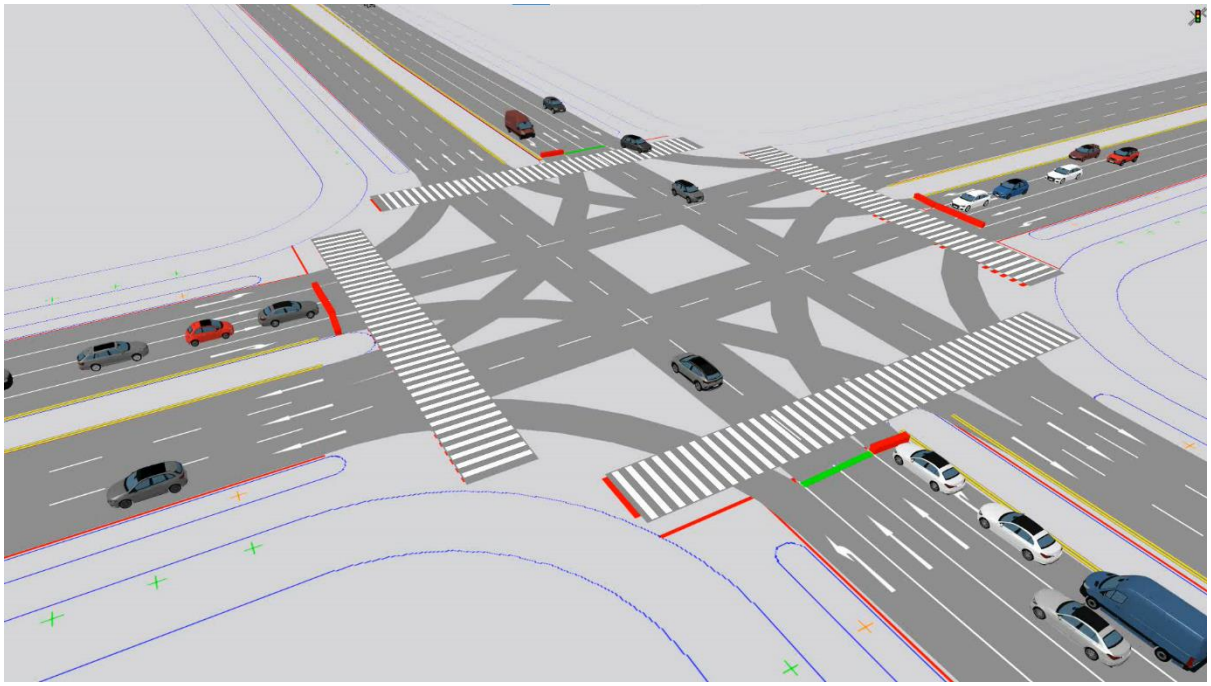


(7) In the list, change the file name to Multi-angle and disable Show Preview.



(8) Select Presentation -> Record Videos.



(9) Run the simulation and record the video.

(10) After recording, check the video.