

Multilane Roundabouts

Supplement to Synchro 7 Studio Users Guide

Discussion

SimTraffic 7 has been updated to better model multilane roundabouts. With the new logic it is possible to model a two-lane arterial crossing another two-lane arterial (2x2), also a (3x2) or (3x3) roundabout.

Synchro 7 and the Australian Design

Figure 1 shows the Australian roundabout design.

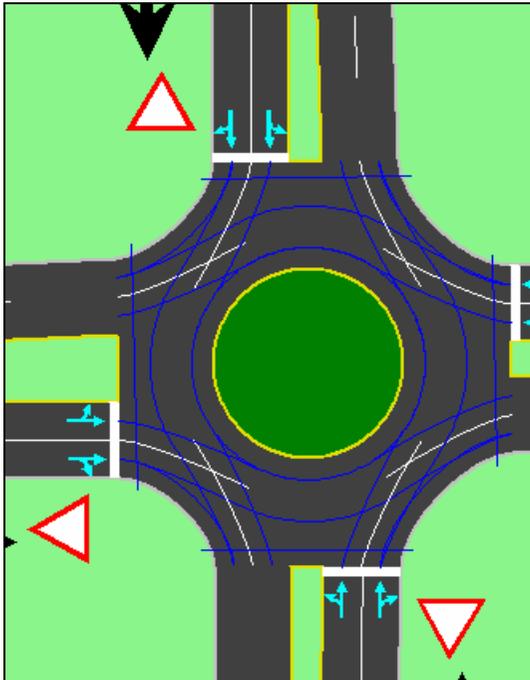


Figure 1 Australian Method of Roundabout Design

In the Australian roundabout design, all traffic must exit at a two lane exit, **EXCEPT** traffic entering on a crossing path. With the Australian design there are no lane changes in the circle. But it is possible to have crossing two lane arterials and even three lane arterials.

The Synchro 7 design will only allow lane changes in one case, to reach a single lane exit after a two lane exit. Refer to **Figure 2** for an illustration.

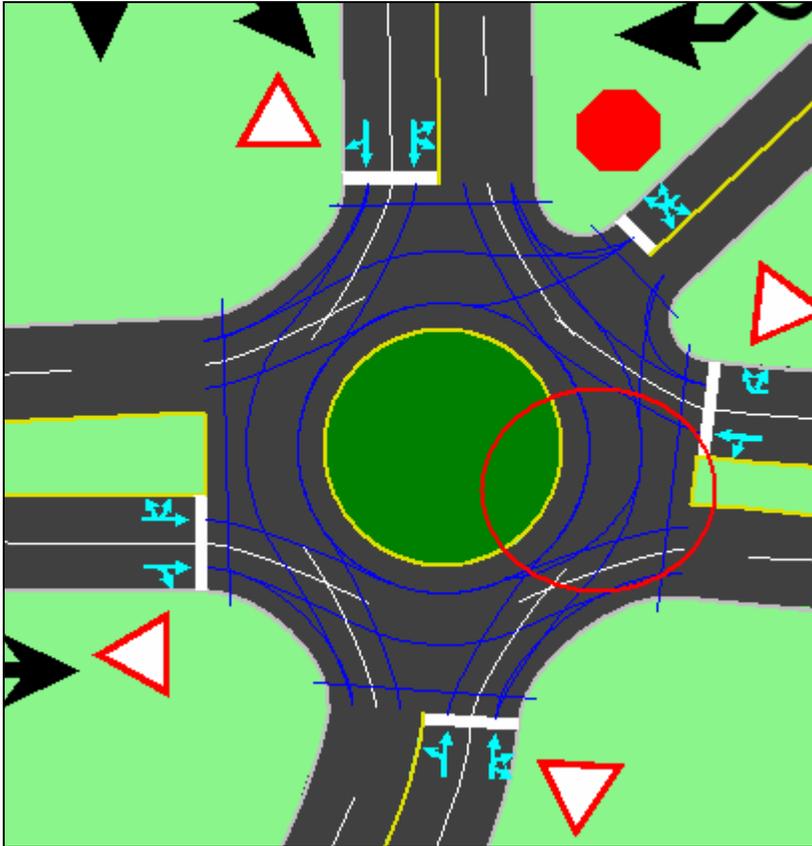


Figure 2 Lane Change Exception

Roundabouts in Version 6

SimTraffic 6 and earlier versions of SimTraffic 7 (build 746 and earlier) had some limitations on roundabouts that prevented modeling these types of junctions. Refer to **Figure 3** for an image of the roundabout paths for past versions of SimTraffic.

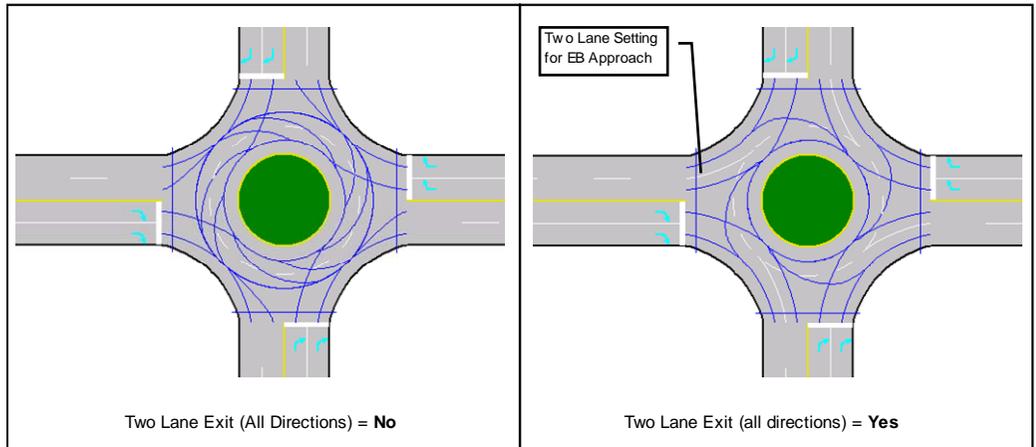


Figure 3 Roundabout Paths in Past Versions of SimTraffic

Figure 3 illustrates the **Two Lane Exit** option. The left side of the figure shows the Two Lane Exit set to “No”. In this case, vehicles in the inside lane must change to the outside lane before exiting.

The right side of the figure shows the Two Lane Exit set to “Yes” for all directions. In this model all traffic must exit the right lane at a two lane exit. Through and left turning traffic enters the inside lanes of the roundabout and merges right as it reaches the exit. It was not possible to model two crossing arterials with two lanes each. The lane changes were also problematic.

The Synchro 6 multilane roundabout design was designed for large roundabout with inside radius of 150 feet or more. For these roundabouts there is enough distance to make lane changes inside the circle, and there can be 5 legs or more. Roundabouts in the US are still somewhat experimental. Some of the older multilane roundabouts found in the northeast are the large radius types with 5 or more legs; whereas most new roundabouts are more modest in size and follow the Australian model.

Multilane Roundabout Safety

As in any traffic facility safety is the number one concern of engineers that multilane roundabouts have several features that make can be safety hazards.

Three possible conflicts in a multilane roundabout are discussed below.

Conflicts on Entry

Vehicles entering could conflict with traffic in the circle, including crossing outside lane traffic to get to an inside lane. Entry conflicts are eliminated in all designs by having traffic yield on entry.

Conflicts on Exit

Conflicts on exit are possible if a vehicle is exiting the inside lane while a continuing vehicle is in the outside lane.

The Synchro 6 design requires all vehicles to exit the outside lane at a 2 lane exit, thus eliminating this conflict (see **Figure 3**).

The Synchro 7 and Australian design also requires all vehicles to exit the outside lane at a 2 lane exit, except those vehicles in the process of entering. There will not be a conflict with the entering vehicles because they are required to yield to any crossing traffic before entering.

Some designs could have conflicts on exit if both roundabout lanes are allowed to exit. Although in practice the continuing vehicles in the outside lane will have just entered so in theory they will yield to the exiting traffic.

Lane Changes

Lane changes in roundabouts are troublesome because it is difficult to change lanes while in a curve. Also the entering and exiting traffic along with short distances can make lane changes difficult.

The Synchro 6 roundabout model had vehicles merging right as they approach their exit link. The Synchro 7 and Australian models have no lane changes. This eliminates one potential safety hazard.

Synchro 7 roundabouts will allow a lane change to reach a single lane exit after a two lane exit (or two lane exit after a three lane exit). This lane change is less risky because all traffic will have exited the outside lane at the two lane exit.

Inputs in Synchro

In the **SIGNING** settings, **Exit Lanes** field, you can now have 1, 2, or 3 lane exits. Select the desired link in the **SIGNING** settings. All traffic must exit the right lane at a two lane exit (Exit Lanes = 2), and the right two lanes at a three lane exit (Exit Lanes = 3), EXCEPT vehicles entering on a crossing entry from the previous entry link.

To model a 2x2 roundabout

Refer to **Figure 4** for an example of a 2x2 roundabout.

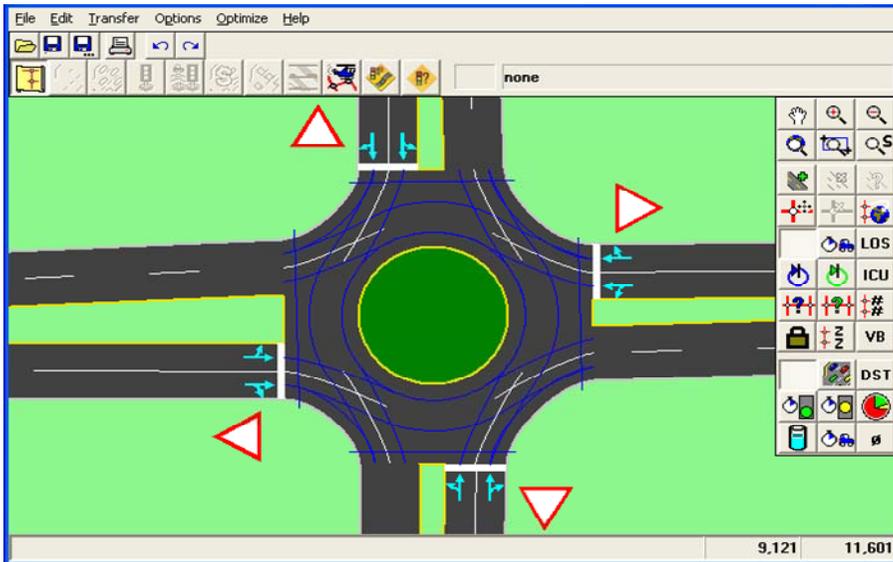


Figure 4 2x2 Roundabout

Steps to modeling a 2x2 roundabout:

1. Set the **Roundabout Lanes** to 2 (**NODE** settings).

NODE SETTINGS	
Node #	3
Zone:	
X East (ft):	9052
Y North (ft):	11513
Z Elevation (ft):	0
Description	
Control Type	Roundabout
Max v/c Ratio:	0.31
Intersection Delay (s):	—
Intersection LOS:	—
ICU:	0.25
ICU LOS:	A
Inside Radius (ft):	30
Outside Radius (ft):	56
Roundabout Lanes (#):	2
Circle Speed (mph):	18
Inside Color:	
Transparent Circle:	<input type="checkbox"/>

2. Select 2 through lanes for all input links (**SIGNING** settings, for each link).
3. Select 2 lane exits for all links (**SIGNING** settings, for each link).

SIGNING SETTINGS												
Lanes and Sharing (#RL)	↑↑			↑↑			↑↑			↑↑		
Traffic Volume (vph)	50	300	50	0	2	0	0	2	0	0	2	0
Sign Control	Yield			Yield			Yield			Yield		
Exit Lanes	2			2			2			2		
Right Turn Channelized	None			None			None			None		
Volume to Capacity Ratio	0.31			0.00			0.00			0.00		

4. Make sure the input paths cross the exit paths for the next link. If necessary, increase the **Median Width** of the entry links (**SIMULATION** settings). Try using a Median Width of **Inside Radius** minus 10 ft.



It is important to adjust the **Median Width** for crossing entry and exit paths. Adjusting the Median Width will impact the roundabout paths. To see this when coding, use the command Options→Map-Settings, turn on intersection paths.

To model a 3x3 roundabout

Refer to **Figure 5** for an example of a 3x3 roundabout.

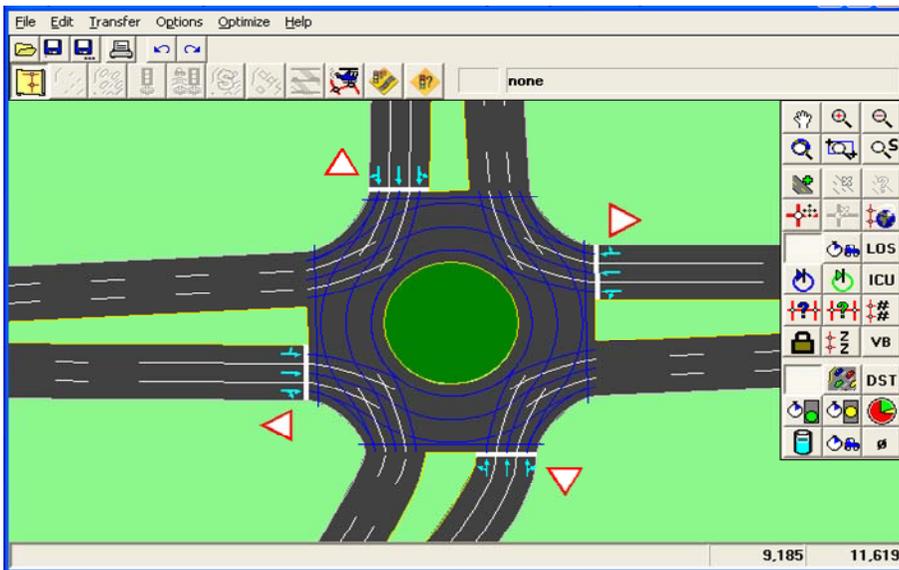


Figure 5 3x3 Roundabout

Steps to modeling a 3x3 roundabout:

1. Set the **Roundabout Lanes** to 3 (**NODE** settings).

NODE SETTINGS	
Node #	B
Zone:	
X East (ft):	9052
Y North (ft):	11513
Z Elevation (ft):	0
Description	
Control Type	Roundabout
Max v/c Ratio:	1.88
Intersection Delay (s):	—
Intersection LOS:	—
ICU:	0.94
ICU LOS:	F
Inside Radius (ft):	40
Outside Radius (ft):	85
Roundabout Lanes (#):	3
Circle Speed (mph):	18
Inside Color:	
Transparent Circle:	<input type="checkbox"/>

2. Select 3 through lanes for all input links (**SIGNING** settings, for each link).
3. Select 3 lane exits for all links (**SIGNING** settings, for each link).

SIGNING SETTINGS												
Lanes and Sharing (#RL)		↑↑↑			↑↑↑			↑↑↑			↑↑↑	
Traffic Volume (vph)	200	800	200	200	800	200	200	400	200	200	400	200
Sign Control	—	Yield	—									
Exit Lanes	—	3	—	—	3	—	—	3	—	—	3	—
Right Turn Channelized	—	—	None									
Volume to Capacity Ratio		1.88	—	—	1.88	—	—	1.80	—	—	1.80	—

4. Make sure the input paths cross the exit paths for the next link. If necessary, increase the **Median Width** of the entry links (**SIMULATION** settings). Try using a Median Width of **Inside Radius** minus 10 ft.

To model right turn only lanes

Refer to **Figure 6** for an example of a 2x2 roundabout with a NB and WB right turn slip lanes.

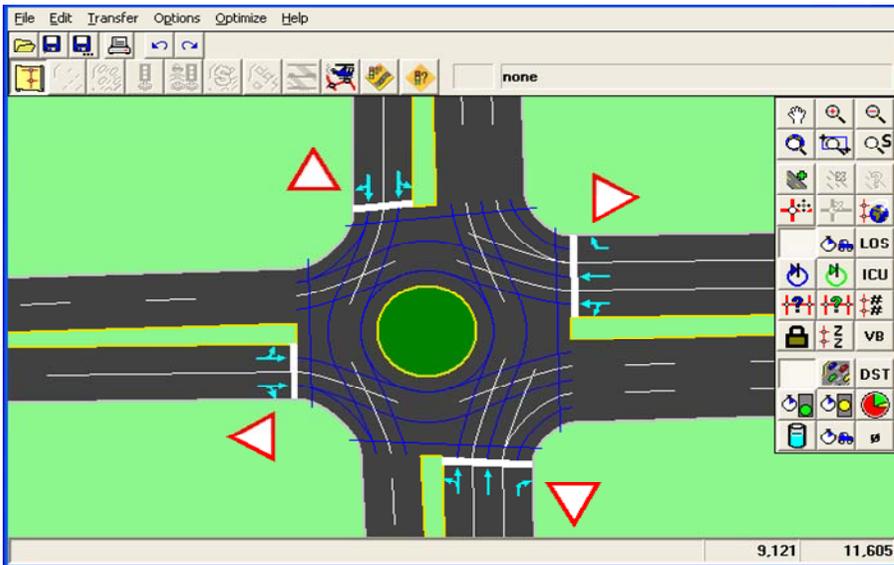


Figure 6 2x2 Roundabout with Slip Lanes

Steps to create a 2x2 roundabout with slip lanes:

1. Set **Right Turn Channelized** to Yield or Free from none (**LANE** settings).
2. Add a right turn lane if desired (**SIGNING** settings).
3. To have an added lane downstream set **Add Lanes** to 1, (**LANE** settings)

Offset Entry

One final note about the Australian roundabouts; in some cases the entry links are closer to the center than the exit links. This forces drivers to slow at entry and also enter at more of an angle to better view the crossing traffic.

Refer to **Figure 7**.

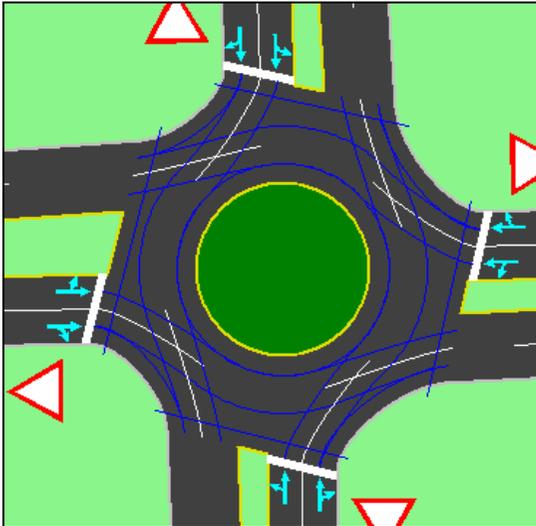


Figure 7 **Offset Entry in Roundabout**

The field design may not allow for this alignment, but to code an offset in Synchro, use a negative **Link Offset**, in the **SIMULATION** settings.