

.....
AGENDA

Synchro

HCM 2010

SimTraffic

Tools for Analysis of Capacity and Efficient Flow for Roundabout Design: Part III, *Synchro & SimTraffic*

OUTLINE

AGENDA

Synchro

HCM 2010

SimTraffic

- Synchro
 - HCM 2010
 - Coding Requirements
 - Example
- Differences between Synchro & SimTraffic
- SimTraffic Calibration for Roundabouts

SYNCHRO 9 DEFINED

AGENDA

Synchro

HCM 2010

SimTraffic

- Software package for modeling and optimizing traffic signal timings.
 - Capacity Analysis
 - Coordination
 - Actuated Signals
 - Time-Space Diagram
 - Integration with SimTraffic
- Analysis of TWSC & AWSC Intersections
- One/Two-Lane Roundabouts

SYNCHRO'S METHODOLOGIES

AGENDA

Synchro

HCM 2010

SimTraffic

- Unsignalized Intersections
 - All-Way Stop Control (HCM 2000 & 2010)
 - Two-Way Stop Control (HCM 2000 & 2010)
 - Roundabouts (HCM 2010)
- Signalized Intersections
 - Percentile Delay
 - HCM 2000
 - HCM 2010

HCM 2010 ROUNDABOUTS (CHAPTERS 21 & 33)

AGENDA

Synchro

HCM 2010

SimTraffic

- Based on empirical data within US
- Lower capacities than other countries
- Analysis of two-lane roundabouts
 - Lane-by-lane analysis for multilane roundabouts
- Entry, exit and conflicting flow rates
- Capacity function of conflicting flow
 - Right & left computed separately
- Right-turn by-pass lanes considered
 - Either yielding exits or free flowing
- Encouraged to calibrate to local conditions
 - Critical and follow-up headways

HCM 2010 ROUNDABOUTS (CONT'D)

AGENDA

Synchro

▶ HCM 2010

SimTraffic

Step 1: Determine Circulating and Exiting Flow Rates



Step 2: Determine Capacity of Each Entry Lane and Bypass Lanes



Step 3: Compute V/C Ratio for Each Lane



Step 4: Compute Average Control Delay for Each Lane



Step 5: Determine LOS and 95% Queue

HCM 2010 ROUNDABOUTS EXAMPLE 21-2

AGENDA

Synchro

HCM 2010

SimTraffic

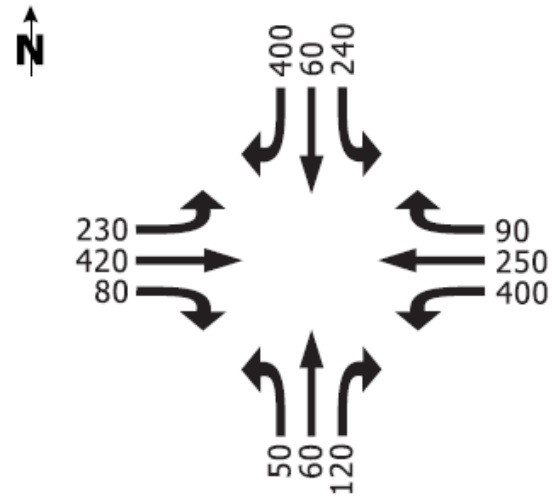
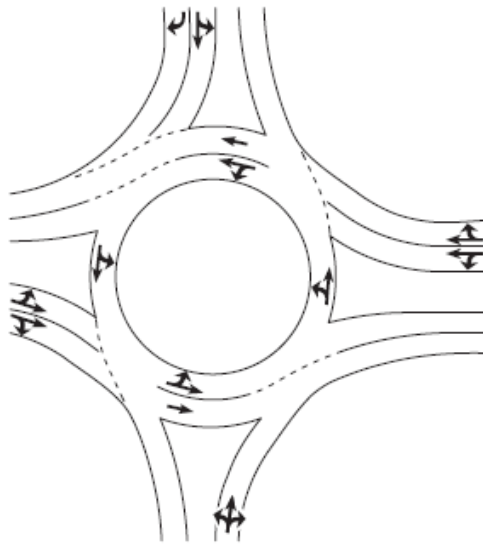


Exhibit 21-24
Demand Volumes and Lane
Configurations for Example
Problem 2

HCM 2010 ROUNDABOUTS EXAMPLE 21-2

AGENDA

Synchro

HCM 2010

SimTraffic

The screenshot displays the Synchro 9 software interface for a roundabout model. The window title is "Synchro 9 - C:\Users\TROhifs\Documents\Trafficware\Training\Intermediate\21-2 HCM2010_Roundabout.syn". The menu bar includes "File", "Edit", "Transfer", "Options", "Optimize", and "Help". The toolbar contains various icons for file operations, navigation, and simulation. A red circle highlights the "HCM 2010" icon in the toolbar. The main workspace shows a roundabout with a central island and four approaches. The approaches are labeled with HCM 2010 data values and arrows indicating flow directions:

- Top approach: 400 (left), 240 (right), 60 (right)
- Right approach: 90 (left), 250 (left), 400 (left)
- Bottom approach: 50 (left), 60 (right), 120 (right)
- Left approach: 230 (right), 420 (right), 80 (right)

The status bar at the bottom right shows "1,214" and "1,086".

HCM 2010 ROUNDABOUTS EXAMPLE 21-2

KEY INPUTS

AGENDA

Synchro

HCM 2010

SimTraffic

Synchro 9 - C:\Users\TRohlf\Documents\Trafficware\Training\Intermediate\21-2 HCM2010_Roundabout.syn

File Edit Transfer Options Optimize Help

LANE SETTINGS

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lanes and Sharing (#RL)		↕↕		↕↕			↕↕			↕↕		↕↕
Traffic Volume (vph)	230	420	80	400	250	90	50	60	120	240	60	400
Future Volume (vph)	230	420	80	400	250	90	50	60	120	240	60	400
Street Name												
Link Distance (ft)	—	1000	—	—	1000	—	—	1000	—	—	1000	—
Link Speed (mph)	—	30	—	—	30	—	—	30	—	—	30	—
Set Arterial Name and Speed	—	EB	—	—	WB	—	—	NB	—	—	SB	—
Travel Time (s)	—	22.7	—	—	22.7	—	—	22.7	—	—	22.7	—
Ideal Satd. Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)	—	0	—	—	0	—	—	0	—	—	0	—
Area Type CBD	—	<input type="checkbox"/>	—	—	<input type="checkbox"/>	—	—	<input type="checkbox"/>	—	—	<input type="checkbox"/>	—
Storage Length (ft)	0	—	0	0	—	0	0	—	0	0	—	0
Storage Lanes (#)	—	—	—	—	—	—	—	—	—	—	—	—
Right Turn Channelized	—	—	None	—	—	None	—	—	None	—	—	None
Curb Radius (ft)	—	—	—	—	—	—	—	—	—	—	—	—
Add Lanes (#)	—	—	—	—	—	—	—	—	—	—	—	—
Lane Utilization Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Right Turn Factor	—	0.984	—	—	0.982	—	—	0.930	—	—	1.000	0.850
Left Turn Factor (prot)	—	0.984	—	—	0.974	—	—	0.989	—	—	0.962	1.000
Saturated Flow Rate (prot)	—	3329	—	—	3288	—	—	1713	—	—	1792	1583
Left Turn Factor (perm)	—	0.984	—	—	0.974	—	—	0.989	—	—	0.962	1.000
Right Ped Bike Factor	—	1.000	—	—	1.000	—	—	1.000	—	—	1.000	1.000
Left Ped Factor	—	1.000	—	—	1.000	—	—	1.000	—	—	1.000	1.000
Saturated Flow Rate (perm)	—	3329	—	—	3288	—	—	1713	—	—	1792	1583
Right Turn on Red?	—	—	<input checked="" type="checkbox"/>	—	—	<input checked="" type="checkbox"/>	—	—	<input checked="" type="checkbox"/>	—	—	<input checked="" type="checkbox"/>
Saturated Flow Rate (RTOR)	—	0	—	—	0	—	—	0	—	—	0	—
Link Is Hidden	—	<input type="checkbox"/>	—	—	<input type="checkbox"/>	—	—	<input type="checkbox"/>	—	—	<input type="checkbox"/>	—
Hide Name in Node Title	—	<input type="checkbox"/>	—	—	<input type="checkbox"/>	—	—	<input type="checkbox"/>	—	—	<input type="checkbox"/>	—

HCM 2010 ROUNDABOUTS EXAMPLE 21-2

KEY INPUTS

AGENDA

Synchro

HCM 2010

SimTraffic

The screenshot shows the Synchro 9 software interface. The 'NODE SETTINGS' table on the left includes fields for Node #, Zone, East/Noth/Elevation (ft), Description, Control Type (set to Roundabout), Cycle Length (s), Lock Timings, Optimize Cycle Length, Optimize Splits, Actuated Cycle(s), Natural Cycle(s), Max v/c Ratio, Intersection Delay (s), Intersection LOS, ICU, ICU LOS, Offset (s), Referenced to, Reference Phase, Master Intersection, Yield Point, and Mandatory Stop On Yellow.

The 'TIMING SETTINGS' table on the right provides detailed data for various traffic phases and metrics. A red circle highlights the 'Control Type' dropdown menu in the Node Settings table, which is currently set to 'Roundabout'.

Node Settings	Value	Timing Settings	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	FED	HOLD	
Node #	3	Lanes and Sharing (#FL)	[Icons]														
Zone		Traffic Volume (vph)	230	420	80	400	250	90	50	60	120	240	60	400			
X East (ft)	1000	Future Volume (vph)	230	420	80	400	250	90	50	60	120	240	60	400			
Y North (ft)	1000	Turn Type	Perm			Perm			Perm			Perm			Perm		
Z Elevation (ft)	0	Protected Phases	4			8			2			6			6		
Description		Permitted Phases	4			8			2			6			6		
Control Type	Pretimed	Permitted Flashing Yellow	-														
Cycle Length (s)	Reserved	Detector Phases	4	4	-	8	8	-	2	2	-	6	6	6	-	-	
Lock Timings	Pretimed	Switch Phase	0	0	-	0	0	-	0	0	-	0	0	0	-	-	
Optimize Cycle Length	Semi Act-Uncred	Leading Detector (ft)	-	100	-	-	100	-	-	100	-	-	100	20	-	-	
Optimize Splits	Act-Coord	Trailing Detector (ft)	-	0	-	-	0	-	-	0	-	-	0	0	-	-	
Actuated Cycle(s)	Unsig	Minimum Initial (s)	4.0	4.0	-	4.0	4.0	-	4.0	4.0	-	4.0	4.0	4.0	-	-	
Natural Cycle(s)	Roundabout	Minimum Split (s)	20.0	20.0	-	20.0	20.0	-	20.0	20.0	-	20.0	20.0	20.0	-	-	
Max v/c Ratio	50.0	Total Split (s)	20.0	20.0	-	20.0	20.0	-	20.0	20.0	-	20.0	20.0	20.0	-	-	
Intersection Delay (s)	0.93	Yellow Time (s)	3.5	3.5	-	3.5	3.5	-	3.5	3.5	-	3.5	3.5	3.5	-	-	
Intersection LOS	22.9	All-Red Time (s)	0.5	0.5	-	0.5	0.5	-	0.5	0.5	-	0.5	0.5	0.5	-	-	
ICU	C	Lost Time Adjust (s)	-	0.0	-	-	0.0	-	-	0.0	-	-	0.0	0.0	-	-	
ICU LOS	0.86	Lagging Phase?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Offset (s)	E	Allow Lead/Lag Optimize?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Referenced to	0.0	Recall Mode	Max	Max	-	Max	Max	-	Max	Max	-	Max	Max	Max	-	-	
Reference Phase	Begin of Green	Speed limit (mph)	-	30	-	-	30	-	-	30	-	-	30	-	-	-	
Master Intersection	2+6 - NBTL SBTL	Actuated Effct. Green (s)	-	16.0	-	-	16.0	-	-	16.0	-	-	16.0	16.0	-	-	
Yield Point	Single	Actuated g/C Ratio	-	0.40	-	-	0.40	-	-	0.40	-	-	0.40	0.40	-	-	
Mandatory Stop On Yellow		Volume to Capacity Ratio	-	1.05dl	-	-	1.76dl	-	-	0.35	-	-	0.64	0.48	-	-	
		Control Delay (s)	-	34.1	-	-	29.8	-	-	6.1	-	-	17.9	3.3	-	-	
		Queue Delay (s)	-	0.0	-	-	0.0	-	-	0.0	-	-	0.0	0.0	-	-	
		Total Delay (s)	-	34.1	-	-	29.8	-	-	6.1	-	-	17.9	3.3	-	-	
		Level of Service	-	C	-	-	C	-	-	A	-	-	B	A	-	-	
		Approach Delay (s)	-	34.1	-	-	29.8	-	-	6.1	-	-	9.5	-	-	-	
		Approach LOS	-	C	-	-	C	-	-	A	-	-	A	-	-	-	
		Queue Length 50th (ft)	-	76	-	-	75	-	-	16	-	-	53	0	-	-	
		Queue Length 95th (ft)	-	#176	-	-	#174	-	-	49	-	-	#144	37	-	-	
		Stops (vph)	-	535	-	-	541	-	-	80	-	-	226	48	-	-	
		Fuel Used (g/hr)	-	14	-	-	13	-	-	3	-	-	5	4	-	-	

HCM 2010 ROUNDABOUTS EXAMPLE 21-2

KEY INPUTS

AGENDA

- Synchro
- HCM 2010
- SimTraffic

Synchro 9 - C:\Users\TRohlf\Documents\Trafficware\Training\Intermediate\21-2 HCM2010_Roundabout.syn

File Edit Transfer Options Optimize Help

Changed to Signing Settings

3

NODE SETTINGS		SIGNING SETTINGS																																																																																																
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR																																																																																					
Node #	3	<table border="1"> <tr> <td>Lanes and Sharing (#RL)</td> <td>4</td> <td>4</td> <td>4</td> <td>4</td> <td>4</td> <td>4</td> <td>4</td> <td>4</td> <td>4</td> <td>4</td> <td>4</td> <td>4</td> <td>4</td> </tr> <tr> <td>Traffic Volume (vph)</td> <td>230</td> <td>420</td> <td>80</td> <td>400</td> <td>250</td> <td>90</td> <td>50</td> <td>60</td> <td>120</td> <td>240</td> <td>60</td> <td>400</td> <td></td> </tr> <tr> <td>Future Volume (vph)</td> <td>230</td> <td>420</td> <td>80</td> <td>400</td> <td>250</td> <td>90</td> <td>50</td> <td>60</td> <td>120</td> <td>240</td> <td>60</td> <td>400</td> <td></td> </tr> <tr> <td>Sign Control</td> <td>—</td> <td>Yield</td> <td>—</td> <td>—</td> <td>Yield</td> <td>—</td> <td>—</td> <td>Yield</td> <td>—</td> <td>—</td> <td>Yield</td> <td>—</td> <td>—</td> </tr> <tr> <td>Max Exit Lanes</td> <td>—</td> <td>2</td> <td>—</td> <td>—</td> <td>2</td> <td>—</td> <td>—</td> <td>1</td> <td>—</td> <td>—</td> <td>1</td> <td>—</td> <td>—</td> </tr> <tr> <td>Right Turn Channelized</td> <td>—</td> <td>—</td> <td>None</td> <td>—</td> <td>—</td> <td>None</td> <td>—</td> <td>—</td> <td>None</td> <td>—</td> <td>—</td> <td>None</td> <td>—</td> </tr> </table>													Lanes and Sharing (#RL)	4	4	4	4	4	4	4	4	4	4	4	4	4	Traffic Volume (vph)	230	420	80	400	250	90	50	60	120	240	60	400		Future Volume (vph)	230	420	80	400	250	90	50	60	120	240	60	400		Sign Control	—	Yield	—	—	Yield	—	—	Yield	—	—	Yield	—	—	Max Exit Lanes	—	2	—	—	2	—	—	1	—	—	1	—	—	Right Turn Channelized	—	—	None	—	—	None	—	—	None	—	—	None	—
Lanes and Sharing (#RL)	4	4	4	4	4	4	4	4	4	4	4	4	4																																																																																					
Traffic Volume (vph)	230	420	80	400	250	90	50	60	120	240	60	400																																																																																						
Future Volume (vph)	230	420	80	400	250	90	50	60	120	240	60	400																																																																																						
Sign Control	—	Yield	—	—	Yield	—	—	Yield	—	—	Yield	—	—																																																																																					
Max Exit Lanes	—	2	—	—	2	—	—	1	—	—	1	—	—																																																																																					
Right Turn Channelized	—	—	None	—	—	None	—	—	None	—	—	None	—																																																																																					
Zone:																																																																																																		
X East (ft):	1000																																																																																																	
Y North (ft):	1000																																																																																																	
Z Elevation (ft):	0																																																																																																	
Description																																																																																																		
Control Type	Roundabout																																																																																																	
Max v/c Ratio:	1.00																																																																																																	
Intersection Delay (s):	—																																																																																																	
Intersection LOS:	—																																																																																																	
ICU:	0.86																																																																																																	
ICU LOS:	E																																																																																																	
Inside Radius (ft):	28																																																																																																	
Outside Radius (ft):	52																																																																																																	
Roundabout Lanes (#):	2																																																																																																	
Circle Speed (mph):	18																																																																																																	
Inside Color:																																																																																																		
Transparent Circle:	<input type="checkbox"/>																																																																																																	

HCM 2010 ROUNDABOUTS EXAMPLE 21-2

KEY INPUTS

AGENDA

Synchro

HCM 2010

SimTraffic

Synchro 9 - C:\Users\TRohlf\Documents\Trafficware\Training\Intermediate\21-2 HCM2010_Roundabout.syn

File Edit Transfer Options Optimize Help

HCM 2010 ROUNDABOUT		EB	WB	NB	SB
Node #	3				
Zone:					
X East (ft):	1000				
Y North (ft):	1000				
Z Elevation (ft):	0				
Description					
Max v/c Ratio:	0.81				
Intersection Delay (s):	19.7				
Intersection LOS:	C				
ICU:	0.86				
ICU LOS:	E				
Inside Radius (ft):	28				
Outside Radius (ft):	52				
Roundabout Lanes (#):	2				
Circle Speed (mph):	18				
Inside Color:					
Transparent Circle:	<input type="checkbox"/>				

HCM 2010 ROUNDABOUT	EB	WB	NB	SB
Entry Lanes	2	2	1	2
Conflicting Circle Lanes	1	1	2	2
Exit Lanes		2		1
Adjusted Approach Flow (vph)	768	779	242	737
Demand Flow Rate (pc/h)	806			
Vehicles Circulating (pc/h)	764			
Vehicles Exiting (pc/h)	759			
Follow-Up Headway (s)	3.186			
Ped Vol. Crossing Leg (#/hr)	0			
Ped Capacity Adjustment	1.000			
Approach Delay (sec/veh)	31.5			
Approach LOS	D			
Lane	Left Right			
Critical Headway (s)	5.193 5.193			
Designated Moves	LT TR			
Assumed Moves	LT TR			
Right Turn Channelized	-- --			
Lane Utilization	0.470 0.530			
Entry Flow Rate (pc/h)	379 427			
Capacity, Entry Lane (pc/h)	526 526			
Entry HV Adjustment Factor	0.952 0.953			
Flow Rate, Entry (vph)	361 407			
Capacity, Entry (vph)	501 502			
Volume to Capacity Ratio	0.720 0.811			
Control Delay (sec/veh)	27.1 35.3			
Level of Service	D E			
95th-Percentile Queue (veh)	6 8			

Maximum volume to capacity ratio

HCM 2010 ROUNDABOUTS EXAMPLE 21-2

RESULTS

AGENDA


Synchro

HCM 2010

SimTraffic

Synchro 9 - C:\Users\TRohlf\Documents\Trafficware\Training\Intermediate\21-2 HCM2010_Roundabout.syn

File Edit Transfer Options Optimize Help


 VIEW PORTS

HCM 2010 ROUNDABOUT		HCM 2010 ROUNDABOUT		EB		WB		NB		SB	
Node #	3	Entry Lanes		2		2		1		2	
Zone:		Conflicting Circle Lanes		1		1		2		2	
X East (ft):	1000	Exit Lanes		2		2		1		1	
Y North (ft):	1000	Adjusted Approach Flow (vph)		768		779		242		737	
Z Elevation (ft):	0	Demand Flow Rate (pc/h)		806		818		247		751	
Description		Vehicles Circulating (pc/h)		764		372		976		772	
Max v/c Ratio:	0.81	Vehicles Exiting (pc/h)		759		851		594		418	
Intersection Delay (s):	19.7	Follow-Up Headway (s)		3.186		3.186		3.186		3.186	
Intersection LOS:	C	Ped Vol. Crossing Leg (#/hr)		0		0		0		0	
ICU:	0.86	Ped Capacity Adjustment		1.000		1.000		1.000		1.000	
ICU LOS:	E	Approach Delay (sec/veh)		31.5		12.9		13.4		16.7	
Inside Radius (ft):	28	Approach LOS		D		B		B		C	
Outside Radius (ft):	52	Lane		Left	Right	Left	Right	Left	Right	Left	Right
Roundabout Lanes (#):	2	Critical Headway (s)		5.193	5.193	5.193	5.193	4.113	4.113	4.293	4.113
Circle Speed (mph):	18	Designated Moves		LT	TR	LT	TR	LTR	---	LT	R
Inside Color:		Assumed Moves		LT	TR	L	TR	LTR	---	LT	R
Transparent Circle:	<input type="checkbox"/>	Right Turn Channelized		---	---	---	---	---	---	---	---
		Lane Utilization		0.470	0.530	0.540	0.460	1.000	---	0.429	0.571
		Entry Flow Rate (pc/h)		379	427	442	376	247	---	322	429
		Capacity, Entry Lane (pc/h)		526	526	779	779	571	---	633	658
		Entry HV Adjustment Factor		0.952	0.953	0.952	0.952	0.979	---	0.981	0.981
		Flow Rate, Entry (vph)		361	407	421	358	242	---	316	421
		Capacity, Entry (vph)		501	502	742	741	558	---	621	646
		Volume to Capacity Ratio		0.720	0.811	0.567	0.483	0.433	---	0.508	0.652
		Control Delay (sec/veh)		27.1	35.3	13.9	11.7	13.4	---	14.2	18.6
		Level of Service		D	E	B	B	B	---	B	C
		95th-Percentile Queue (veh)		6	8	4	3	2	---	3	5

Maximum volume to capacity ratio

HCM 2010 ROUNDABOUTS RESULTS

AGENDA

Synchro

HCM 2010

SimTraffic

Control Delay (s/veh)	LOS	v/c > 1
0 – 10	A	F
10 – 15	B	F
15 – 25	C	F
25 – 35	D	F
35 – 50	E	F
> 50	F	F

- Delay Values mimic Unsignalized Thresholds
- Note LOS if $v/c > 1.0$

HCM 2010 ROUNDABOUTS OTHER CONSIDERATIONS

AGENDA

Synchro

HCM 2010

SimTraffic

Synchro 9 - Y:\HCM Files\Single Lane Roundabout.syn

File Edit Transfer Options Optimize Help

HCM 2010 ROUNDABOUT		HCM 2010 ROUNDABOUT	
Node #	3	Entry Lanes	
Zone:		Conflicting Circle Lanes	
X East (ft):	1000	Exit Lanes	
Y North (ft):	1000	Adjusted Approach Flow (vph)	
Z Elevation (ft):	0	Demand Flow Rate (pc/h)	
Description		Vehicles Circulating (pc/h)	
Max v/c Ratio:	0.97	Vehicles Exiting (pc/h)	
Intersection Delay (s):	34.8	Follow-Up Headway (s)	
Intersection LOS:	D	Ped Vol. Crossing Leg (#/hr)	
ICU:	1.50	Ped Capacity Adjustment	
ICU LOS:	H	Approach Delay (sec/veh)	
Inside Radius (ft):	28	Approach LOS	
Outside Radius (ft):	40	Lane	L
Roundabout Lanes (#):	1	Critical Headway (s)	5.193
Circle Speed (mph):	18	Designated Moves	LTR -- -- LT -- R
Inside Color:		Assumed Moves	LTR -- -- LT -- Yield
Transparent Circle:	<input type="checkbox"/>	Right Turn Channelized	-- -- -- -- Yield -- -- Free
		Lane Utilization	1.000 -- -- 1.000 -- -- 1.000 -- -- 1.000 -- --
		Entry Flow Rate (pc/h)	656 -- -- 568 -- 662 428 -- -- 314 -- 629
		Capacity, Entry Lane (pc/h)	694 -- -- 587 -- 718 510 -- -- 524 -- 1938
		Entry HV Adjustment Factor	0.980 -- -- 0.981 -- 0.980 0.981 -- -- 0.980 -- 0.980
		Flow Rate, Entry (vph)	643 -- -- 557 -- 649 420 -- -- 308 -- 617
		Capacity, Entry (vph)	681 -- -- 576 -- 704 497 -- -- 513 -- 1900
		Volume to Capacity Ratio	0.945 -- -- 0.968 -- 0.922 0.845 -- -- 0.600 -- 0.325
		Control Delay (sec/veh)	46.6 -- -- 56.5 -- 41.6 39.7 -- -- 20.0 -- 0.0
		Level of Service	E -- -- F -- E E -- -- C -- A
		95th-Percentile Queue (veh)	13 -- -- 13 -- 13 9 -- -- 4 -- 1

(1000 1000)

HCM 2010 ROUNDABOUTS

OTHER CONSIDERATIONS

AGENDA

Synchro

HCM 2010

SimTraffic

HCM 2010 ROUNDABOUT	EB			WB			NB			SB		
Entry Lanes	1			1			1			1		
Conflicting Circle Lanes	1			1			1			1		
Exit Lanes	1			1			1			1		
Adjusted Approach Flow (vph)	643			1207			420			925		
Demand Flow Rate (pc/h)	656			1230			428			943		
Vehicles Circulating (pc/h)	487			655			796			769		
Vehicles Exiting (pc/h)	596			569			347			454		
Follow-Up Headway (s)	2.500			2.500			2.500			2.500		
Ped Vol. Crossing Leg (#/hr)	0			0			50			0		
Ped Capacity Adjustment	1.000			1.000			0.993			1.000		
Approach Delay (sec/veh)	18.4			19.4			19.0			4.1		
Approach LOS	C			C			C			A		
Lane	Left	—	—	Left	—	Bypass	Left	—	—	Left	—	Bypass
Critical Headway (s)	4.800	—	—	4.800	—	—	4.800	—	—	4.800	—	—
Designated Moves	LTR	—	—	LT	—	R	LTR	—	—	LT	—	R
Assumed Moves	LTR	—	—	LT	—	—	LTR	—	—	LT	—	—
Right Turn Channelized	—	—	—	—	—	Yield	—	—	—	—	—	Free
Lane Utilization	1.000	—	—	1.000	—	—	1.000	—	—	1.000	—	—
Entry Flow Rate (pc/h)	656	—	—	568	—	662	428	—	—	314	—	629
Capacity, Entry Lane (pc/h)	891	—	—	755	—	915	657	—	—	675	—	1938
Entry HV Adjustment Factor	0.980	—	—	0.981	—	0.980	0.981	—	—	0.980	—	0.980
Flow Rate, Entry (vph)	643	—	—	557	—	649	420	—	—	308	—	617
Capacity, Entry (vph)	873	—	—	740	—	897	640	—	—	661	—	1900
Volume to Capacity Ratio	0.736	—	—	0.752	—	0.724	0.656	—	—	0.465	—	0.325
Control Delay (sec/veh)	18.4	—	—	21.8	—	17.4	19.0	—	—	12.4	—	0.0
Level of Service	C	—	—	C	—	C	C	—	—	B	—	A
95th-Percentile Queue (veh)	7	—	—	7	—	6	5	—	—	2	—	1

Calibrated

Non-Calibrated

Capacity, Entry (vph)	681	—	—	576	—	704	497	—	—	513	—	1900
Volume to Capacity Ratio	0.945	—	—	0.968	—	0.922	0.845	—	—	0.600	—	0.325
Control Delay (sec/veh)	46.6	—	—	56.5	—	41.6	39.7	—	—	20.0	—	0.0
Level of Service	E	—	—	F	—	E	E	—	—	C	—	A
95th-Percentile Queue (veh)	13	—	—	13	—	13	9	—	—	4	—	1

HCM 2010 LIMITATIONS

AGENDA

Synchro

HCM 2010

SimTraffic

- Upstream/downstream roundabouts or signalized intersections
- Extremely high entering traffic volumes
- High volumes of pedestrians
- More than two entry lanes
- Limited or short entry designs
- Pedestrian model not based on U.S. roundabouts
- Bicycle operations not available

SIMTRAFFIC 9 DEFINED

AGENDA

Synchro

HCM 2010

SimTraffic

- Microscopic Simulation Model
 - Simulate a wide variety of traffic control
 - Each vehicle individually tracked every 0.1 second
 - Vary driver behavior (aggressive to passive)
 - Measures queuing and blocking
 - Real-world type model
 - Account for affects of upstream signalized intersections or roundabouts

SIMTRAFFIC 9 DEFINED

AGENDA

Synchro

HCM 2010

SimTraffic

- Simulating roundabouts within SimTraffic allows more flexibility
- The number of circulating lanes within the roundabout can be user defined to mimic real world applications

SIMTRAFFIC CALIBRATION: VEHICLE PATHS

AGENDA

Synchro

HCM 2010

SimTraffic

Synchro 9 - C:\Users\...s.zip\Synchro Examples\Minneapolis AM.syn (read-only)

File Edit Transfer Options Optimize Help

Background [Travelled Way] Lane Dividers Curb Line Center Line Stop Bars Street Names Node Numbers Lane Markings **Intersection Paths** Detectors Right Trn Islands Signal Poles Signal Heads Arrow Diagrams Background Bitmap Bing(tm) Zoom Intersection Radius Unsignalized Intersection Radius

Visible	Screen	Printer	Size (ft)
<input checked="" type="checkbox"/>			
<input checked="" type="checkbox"/>			
<input checked="" type="checkbox"/>			
<input checked="" type="checkbox"/>			1.0
<input checked="" type="checkbox"/>			1.0
<input checked="" type="checkbox"/>			3.0
<input checked="" type="checkbox"/>			50.0
<input type="checkbox"/>			50.0
<input checked="" type="checkbox"/>			
<input checked="" type="checkbox"/>			
<input checked="" type="checkbox"/>			
<input checked="" type="checkbox"/>			
<input checked="" type="checkbox"/>			0.5
<input checked="" type="checkbox"/>			1.5
<input checked="" type="checkbox"/>			40.0
<input checked="" type="checkbox"/>	Bing(tm) Zoom		High
Intersection Radius			40
Unsignalized Intersection Radius			30

8.643 11.531

SIMTRAFFIC CALIBRATION: VEHICLE PATHS

AGENDA

Synchro

HCM 2010

SimTraffic

Simulation Settings Table 1 (Left):

SIMULATION SETTINGS	WBL2	WBL	WBT	WBR
Lanes and Sharing (#RL)		↩	↩	↩
Traffic Volume (vph)	0	337	81	0
Future Volume (vph)	0	337	81	0
Storage Length (ft)	—	0	—	0
Storage Lanes (#)	—	—	—	—
Taper Length (ft)	—	—	—	—
Lane Alignment	Left	Left	Left/Right	Right
Lane Width (ft)	12	12	12	12
Enter Blocked Intersection	No	No	No	No
Median Width (ft)	—	—	12	—
Link Offset (ft)	—	—	0	—
Crosswalk Width (ft)	—	—	16	—
TWLT Median	—	—	<input type="checkbox"/>	—
Headway Factor	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	15	—	9
Mandatory Distance (ft)	—	—	200	—
Positioning Distance (ft)	—	—	1320	—
Mandatory Distance 2 (ft)	—	—	880	—
Positioning Distance 2 (ft)	—	—	1760	—

Simulation Settings Table 2 (Right):

SIMULATION SETTINGS	WBL2	WBL	WBT	WBR
Lanes and Sharing (#RL)		↩	↩	↩
Traffic Volume (vph)	0	337	81	0
Future Volume (vph)	0	337	81	0
Storage Length (ft)	—	0	—	0
Storage Lanes (#)	—	—	—	—
Taper Length (ft)	—	—	—	—
Lane Alignment	Left	Left/Right	Right	Right
Lane Width (ft)	12	12	12	12
Enter Blocked Intersection	No	No	No	No
Median Width (ft)	—	—	12	—
Link Offset (ft)	—	—	0	—
Crosswalk Width (ft)	—	—	16	—
TWLT Median	—	—	<input type="checkbox"/>	—
Headway Factor	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	15	—	9
Mandatory Distance (ft)	—	—	200	—
Positioning Distance (ft)	—	—	1320	—
Mandatory Distance 2 (ft)	—	—	880	—
Positioning Distance 2 (ft)	—	—	1760	—

The background image shows a 3D simulation of a road intersection with various lane markings, traffic signs, and vehicle paths. A blue arrow labeled 'Lane Alignment' points to the 'Lane Alignment' row in the dialog box. The dialog box also features a 'Left/Right' radio button selection.

SIMTRAFFIC CALIBRATION: VEHICLE TYPES

AGENDA

Synchro

HCM 2010

SimTraffic

Heavy Vehicles

Vehicles Types	1	2	3	4	5	6	7	8	9	10
Vehicle Name	Car1	Car2	Truck SU	SemiTrk1	SemiTrk2	Truck DB	Bus	Carpool1	Carpool2	
Vehicle Occurrence (%)	0.64	0.16	0.60	0.10	0.05	0.05	0.20	0.16	0.04	0.00
Acceleration	File	File	File	File	File	File	File	File	File	File
Vehicle Length (ft)	16.0	14.0	35.0	53.0	53.0	64.0	40.0	16.0	14.0	16.0
Vehicle Width (ft)	6.0	6.0	8.0	8.0	8.0	8.0	8.0	6.0	6.0	6.0
Vehicle Fleet	Car	Car	Trk	Trk	Trk	Trk	Bus	Pool	Pool	Ca
Occupancy (# people)	1.3	1.3	1.2	1.2	1.2	1.2	20.0	2.8	2.8	1.3
Graphics Shape	Car	Car	Truck	SemiTrk	SemiTrk	DBTruck	Bus	Car	Car	Ca
Table Index (1 to 7)	1	2	3	4	5	6	7	1	2	

Vehicle and Driver Parameters

SIMTRAFFIC CALIBRATION: DRIVER TYPES

AGENDA

Synchro

HCM 2010

SimTraffic

SimTraffic Parameters

Vehicles Drivers Intervals Data Options

Driver Types	1	2	3	4	5	6	7	8	9	10
Yellow Decel (ft/s ²)	12.0	12.0	12.0	12.0	12.0	11.0	10.0	9.0	8.0	7.0
Speed Factor (%)	0.85	0.88	0.92	0.95	0.98	1.02	1.05	1.08	1.12	1.15
Courtesy Decel (ft/s ²)	10.0	9.0	8.0	7.0	6.0	5.0	4.0	4.0	3.0	3.0
Yellow React (s)	0.7	0.9	1.0	1.0	1.2	1.3	1.3	1.4	1.4	1.7
Green React (s)	0.8	0.7	0.6	0.6	0.5	0.5	0.5	0.4	0.3	0.2
Headway @ 0 mph (s)	0.65	0.63	0.60	0.58	0.55	0.45	0.42	0.40	0.37	0.35
Headway @ 20 mph (s)	1.80	1.70	1.60	1.50	1.40	1.20	1.10	1.00	0.90	0.80
Headway @ 50 mph (s)	2.20	2.00	1.90	1.80	1.70	1.50	1.40	1.30	1.20	1.00
Headway @ 80 mph (s)	2.20	2.00	1.90	1.80	1.70	1.50	1.40	1.30	1.20	1.00
Gap Acceptance Factor	1.15	1.12	1.10	1.05	1.00	1.00	0.95	0.90	0.88	0.85
Positioning Advantage (veh)	15.0	15.0	15.0	15.0	15.0	2.0	2.0	2.0	1.2	1.2
Optional Advantage (veh)	2.3	2.3	2.3	1.0	1.0	1.0	1.0	1.0	0.5	0.5
Mandatory Dist Adj (%)	200	170	150	135	110	90	80	70	60	50
Positioning Dist Adj (%)	150	140	130	120	110	95	90	80	70	60
Avg Lane Change Time (s)	55	50	45	40	35	30	25	20	15	10
Lane Change Variance +/- (%)	10	10	10	20	20	20	30	30	30	30

OK Cancel Default Vehicle and Driver Parameters

Maximum deceleration rate for yellow light (ft/s²).

- Calibrate Headway to local conditions
- Mandatory & Positioning Distance control lane change distances

SIMTRAFFIC CALIBRATION: DRIVER TYPES

AGENDA

Synchro

HCM 2010

SimTraffic

Synchro 9 - C:\Users\...s.zip\Synchro Examples\Minneapolis AM.syn (read-only)

File Edit Transfer Options Optimize Help

EBL EBT EBR EBR2 WBL2 WBL WBT WBR NWL2 NWL NWR NWR2 NEL NET NER NER2 SWL2 SWL SWT SWR

SIMULATION SETTINGS	EBL	EBT	EBR	EBR2	WBL2	WBL	WBT	WBR	NWL2	NWL	NWR	NWR2	NEL	NET	NER	NER2	SWL2	SWL	SWT	SWR
Lanes and Sharing (#RL)																				
Traffic Volume (vph)	3	17	43	68	0	337	81	0	211	413	25	0	155	181	209	24	5	13	118	3
Future Volume (vph)	3	17	43	68	0	337	81	0	211	413	25	0	155	181	209	24	5	13	118	3
Storage Length (ft)	0	—	0	—	—	0	—	0	—	0	0	—	0	—	0	—	—	0	—	0
Storage Lanes (#)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Taper Length (ft)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Lane Alignment	Left	Left	Right	Right	Left	Left	Right	Right	Left	Right	Right	Right	Left	Left	Right	Right	Left	Left	Left	Right
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Median Width (ft)	—	12	—	—	—	—	12	—	—	24	—	—	—	0	—	—	—	—	0	—
Link Offset (ft)	—	0	—	—	—	—	0	—	—	0	—	—	—	0	—	—	—	—	0	—
Crosswalk Width (ft)	—	16	—	—	—	—	16	—	—	16	—	—	—	16	—	—	—	—	16	—
TWLT Median	—	<input type="checkbox"/>	—	—	—	—	<input type="checkbox"/>	—	—	<input type="checkbox"/>	—	—	—	<input type="checkbox"/>	—	—	—	—	<input type="checkbox"/>	—
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	—	9	9	15	15	—	9	15	15	9	9	15	—	9	9	15	15	—	9
Mandatory Distance (ft)	—	200	—	—	—	—	200	—	—	200	—	—	—	200	—	—	—	—	200	—
Positioning Distance (ft)	—	1320	—	—	—	—	1320	—	—	1320	—	—	—	1320	—	—	—	—	1320	—
Mandatory Distance 2 (ft)	—	880	—	—	—	—	880	—	—	880	—	—	—	880	—	—	—	—	880	—
Positioning Distance 2 (ft)	—	1760	—	—	—	—	1760	—	—	1760	—	—	—	1760	—	—	—	—	1760	—

(8893 11392)

- Synchro's Simulation Settings are LOCAL
- SimTraffic's Driver Parameters are GLOBAL

SIMTRAFFIC CALIBRATION: MULTIPOINT ROUNDABOUTS

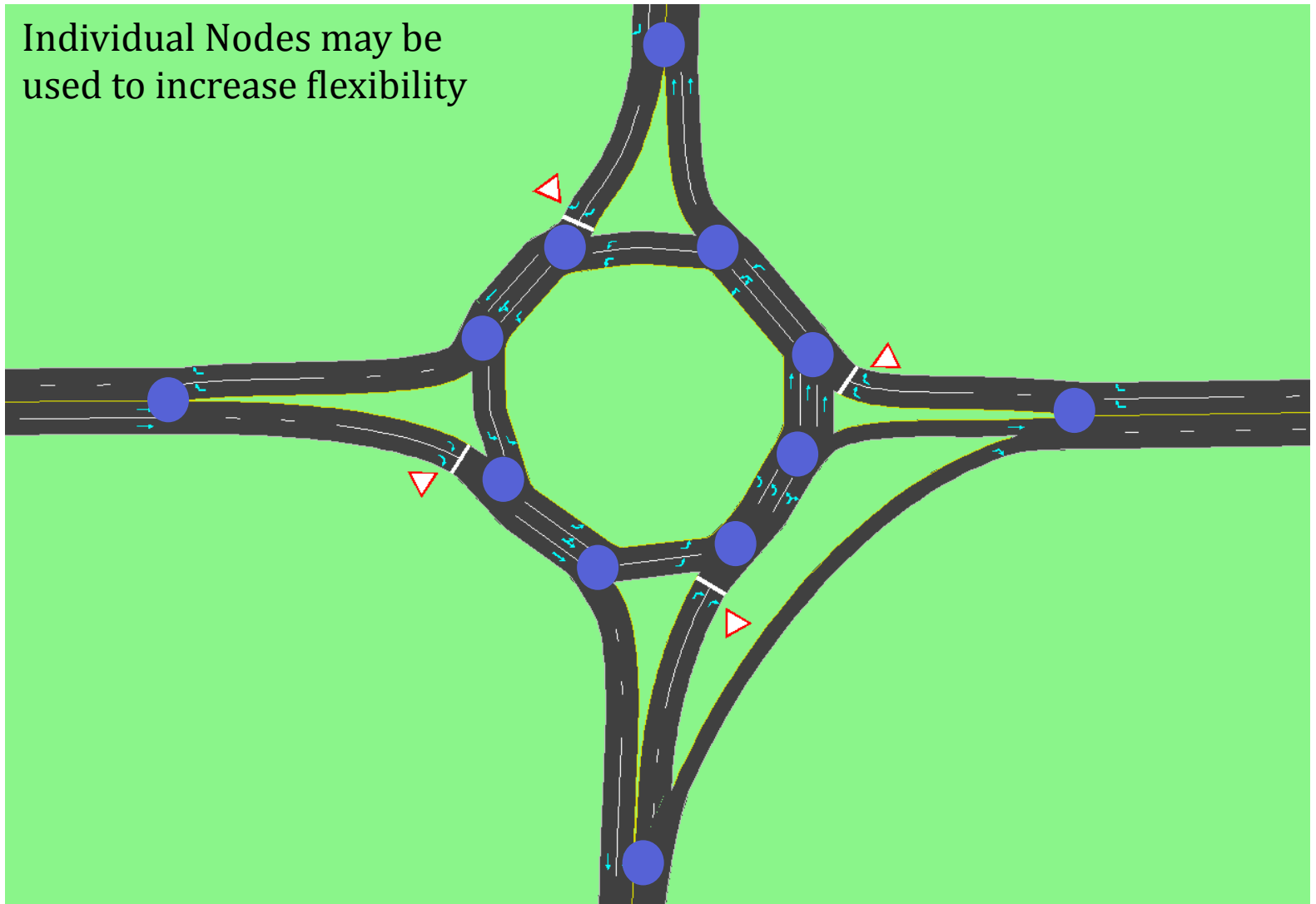
AGENDA

Synchro

HCM 2010

SimTraffic

Individual Nodes may be used to increase flexibility



SUMMARY

AGENDA

Synchro

HCM 2010

SimTraffic

- Synchro and HCM 2010 Inputs
- Synchro Simulation Inputs
- SimTraffic Parameters for Roundabouts
- Simulation Requires Additional Effort

REFERENCES

AGENDA

Synchro

HCM 2010

SimTraffic

- FHWA. 2004. Traffic Analysis Toolbox Volume III: Guidelines for Applying Traffic Microsimulation Modeling Software. FHWA, Turner-Fairbank Highway Research Center, FHWA-HRT-04-040, Springfield, VA.
- Trafficware. 2015. Synchro Studio 9 User's Manual, Sugar Land, TX.
- TRB. Highway Capacity Manual. Transportation Research Board, National Research Council, Washington DC, 2010. Highway Capacity Manual 2010. Copyright, National Academy of Sciences, Washington, D.C. Exhibit 21-8, p. 21-10; Exhibit 21-23, p. 21-28; and Exhibit 21-24, p. 21-33.
- Guan, F., Lu G. & Noyce D. 2010. A Simulation-Based Accessibility Study of Modern Urban Roundabouts Signalized with Common Pedestrian Signals. In Proceedings of the 2010 Mid-Continent Transportation Research Forum. University of Wisconsin – Madison, Traffic Operations & Safety (TOPS) Laboratory.

REFERENCES

AGENDA

Synchro

HCM 2010

SimTraffic

- Collins, R. 2008. Evaluation of a Roundabout at a Five-Way Intersection: An Alternatives Analysis Using Microsimulation. University of Minnesota.
- Wong, Eric. May 2011. Modern Roundabout in Connecticut: An Evaluation of Real World Operation Versus Common Macroscopic and Microscopic Models. New England Chronicle. ITE Northeastern District.
- Barry, C. 2012. Calibration of the HCM 2010 Roundabout Capacity Equations for Georgia Conditions. A Thesis Presented to The Academic Faculty of Georgia Institute of Technology.
- Wisconsin Traffic Operations and Safety (TOPS) Laboratory. 2011. Comprehensive Evaluation of Wisconsin Roundabouts Volume 1: Traffic Operations.



TOOLS FOR ANALYSIS OF CAPACITY AND EFFICIENT FLOW FOR ROUNABOUT DESIGN-PART III: **TRANSModeler**

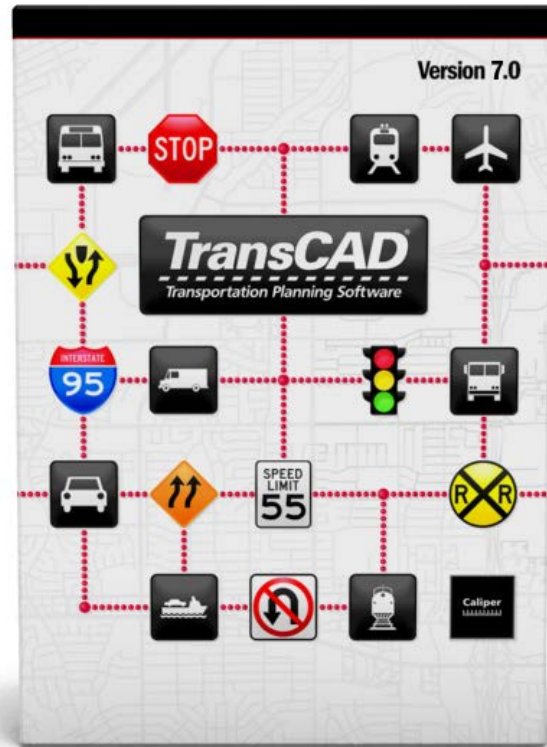
Daniel Morgan, Vice President &
Director of Traffic Simulation
CALIPER CORPORATION

Presentation Outline

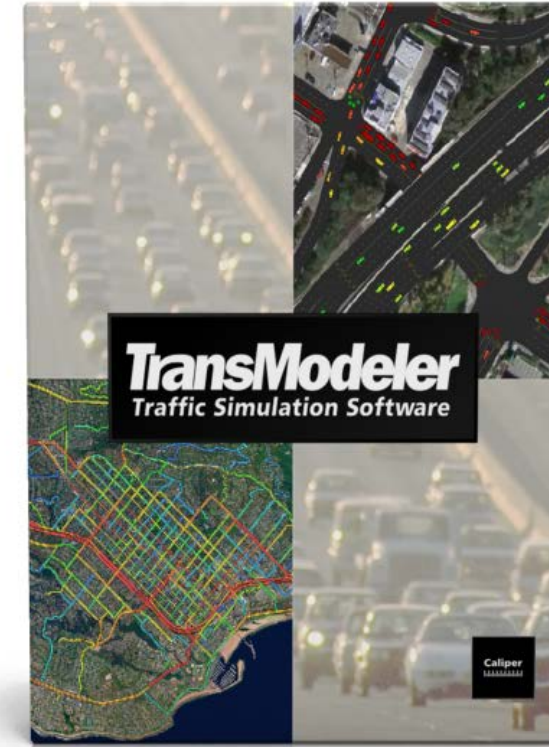
- Introduction to Caliper and TransModeler
- Model inputs and methods
 - Step by step data input
- Model output
 - Producing model outputs
- TransModeler strengths and advantages



Caliper Corporation: TransCAD & TransModeler



PLANNING: forecast travel demand



OPERATIONS: simulate project impacts

TransModeler SE

	TransModeler	TransModeler SE
Network Size Limits	Unlimited	20 Intersections/ 100 Links
SIMULATION	TransModeler	TransModeler SE
Microsimulation (freeways, urban streets, 2-lane highways, roundabouts)	●	●
Multi-modal simulation (auto, truck, bicycle)	●	●
Public transportation (bus & rail operations)	●	
DEMAND AND ASSIGNMENT	TransModeler	TransModeler SE
Turning movement-based demand	●	●
Origin-destination matrix-based demand	●	●
Simulation-based dynamic traffic assignment	●	
TRAFFIC SIGNALS	TransModeler	TransModeler SE
Traffic signal optimization	●	●
Simulation-based coordinated signal optimization	●	●
MUTCD signal warrant evaluation	●	●
Traffic signal priority and preemption	●	
TRAFFIC IMPACT ANALYSIS	TransModeler	TransModeler SE
Traffic Impact Analysis toolbox	●	●
ITE 9th Edition and custom trip generation rates	●	●
Simulation-based HCM 2010 LOS	●	●
VISUALIZATION	TransModeler	TransModeler SE
3-D visualization and animation	●	●
Built-in Google/USGS web map layer imagery	●	●



-
1. Bundles Microsimulation and HCM2010 Analysis
 2. Enables Ground Truth Geometry
 3. Scales for Broader Roundabout Impacts

TransModeler in 3 Key Points

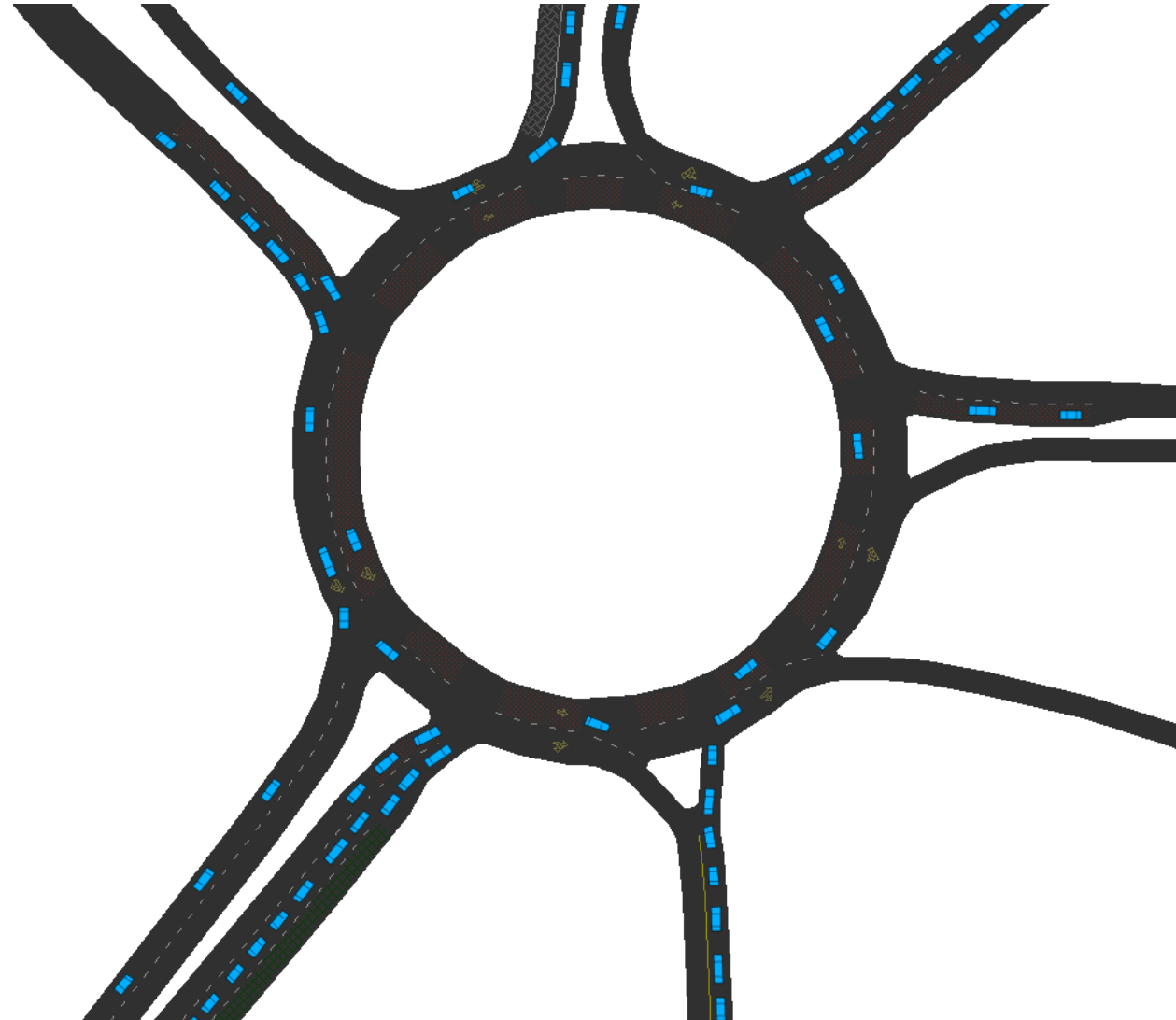
KEY POINT 1: Microsimulation + HCM2010

- **Integration of HCM with Microsimulation**
 - HCM2010 methods for intersections
 - Simulation-based LOS for all facility types
- **Driver behaviors**
 - Core algorithms: car following and lane changing
 - Enhanced, extended for congested merge & weave, oversaturated conditions
- **Route choice**
 - Fast computation for large networks
 - High-fidelity simulation-based DTA



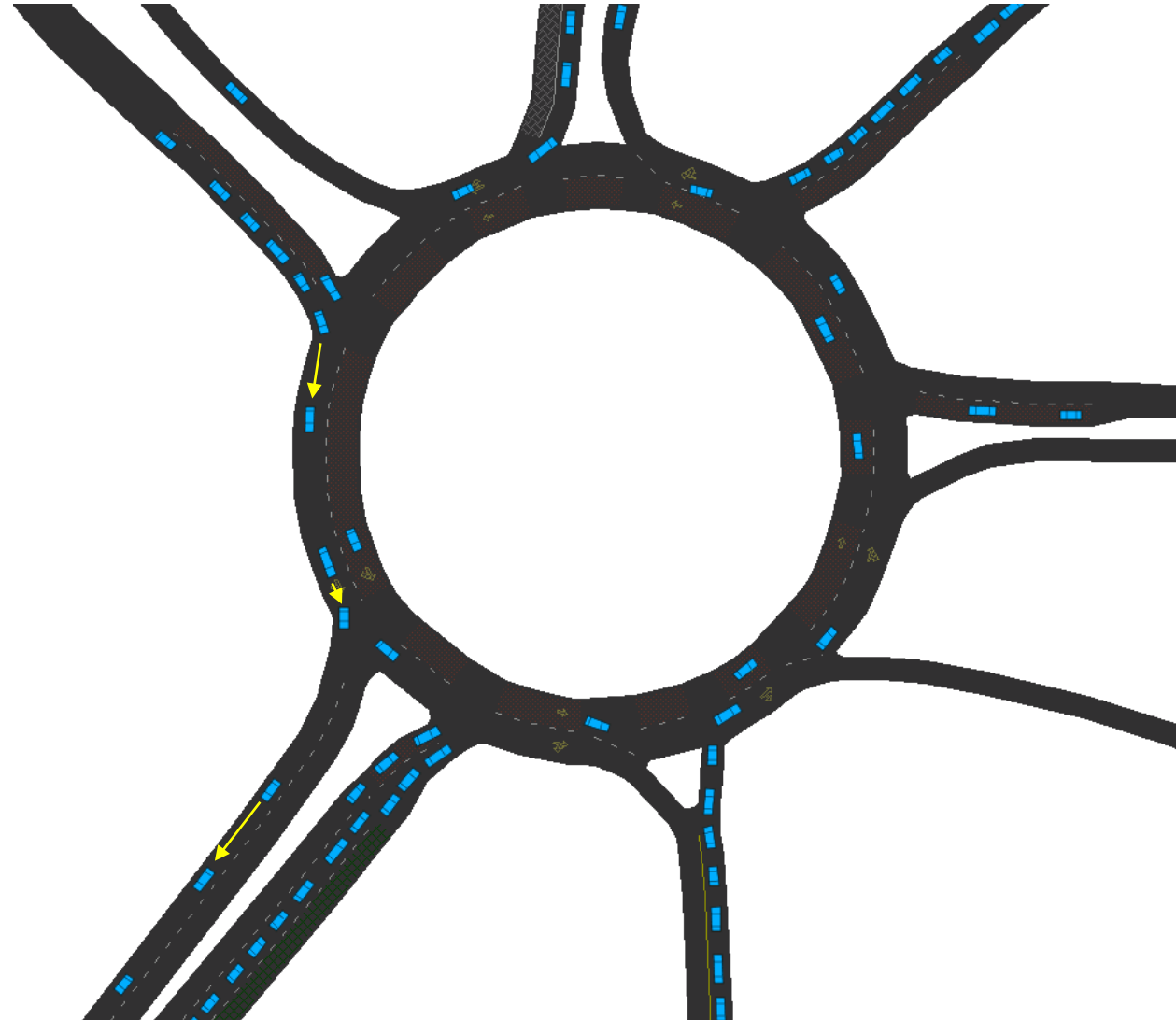
KEY POINT 1: Microsimulation Methods

- **Core Microsimulation Algorithms**
 - Car Following
 - Lane Changing
 - Gap Acceptance
 - Geometric, Striping Effects
- Roundabout-specific Driver Behaviors
 - (Intrabunch) Headway Gap Acceptance
 - Circulating Lane Preference



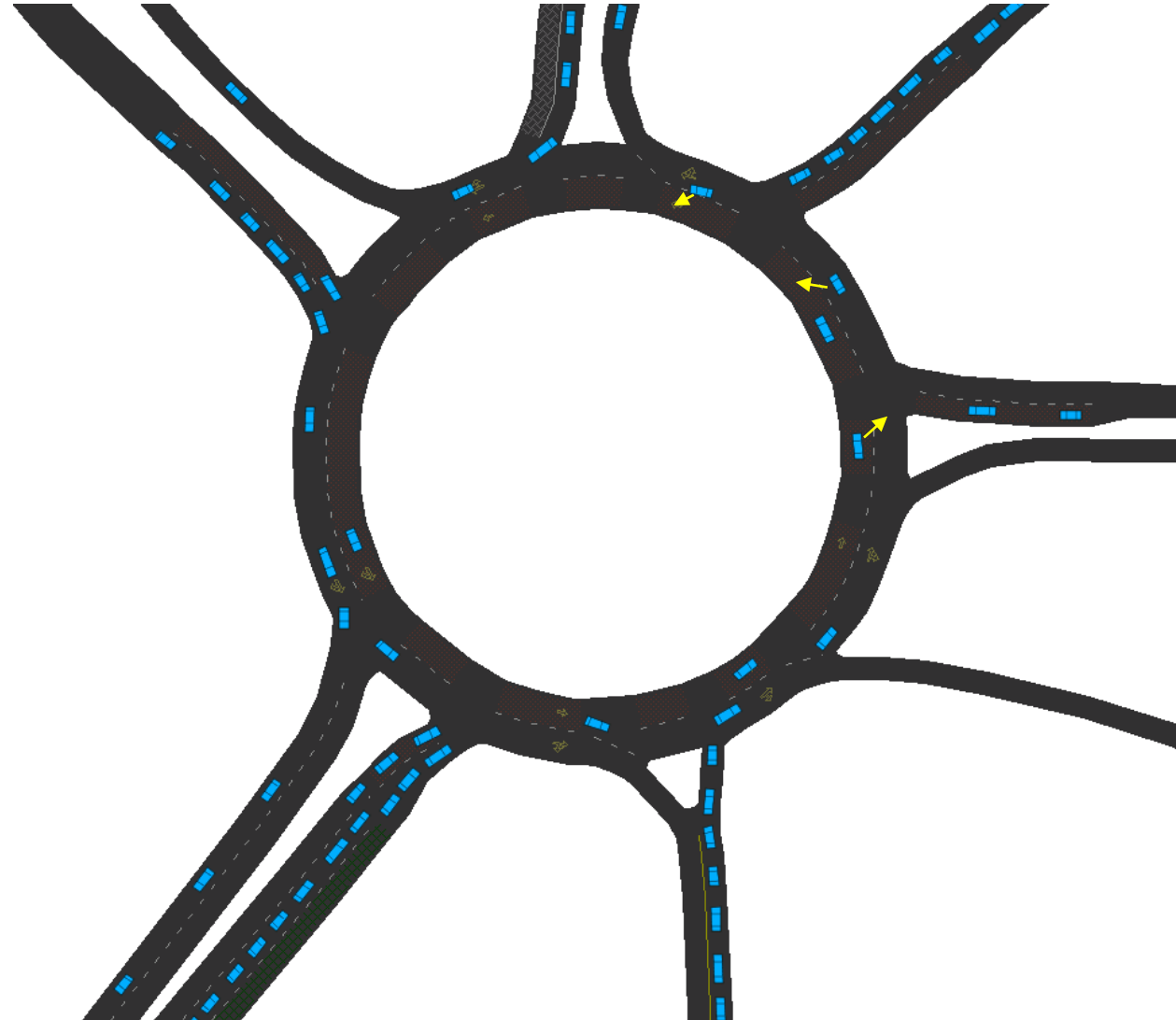
KEY POINT 1: Microsimulation Methods

- Core Microsimulation Algorithms
 - Car Following
 - Lane Changing
 - Gap Acceptance
 - Geometric, Striping Effects
- Roundabout-specific Driver Behaviors
 - (Intrabunch) Headway Gap Acceptance
 - Circulating Lane Preference



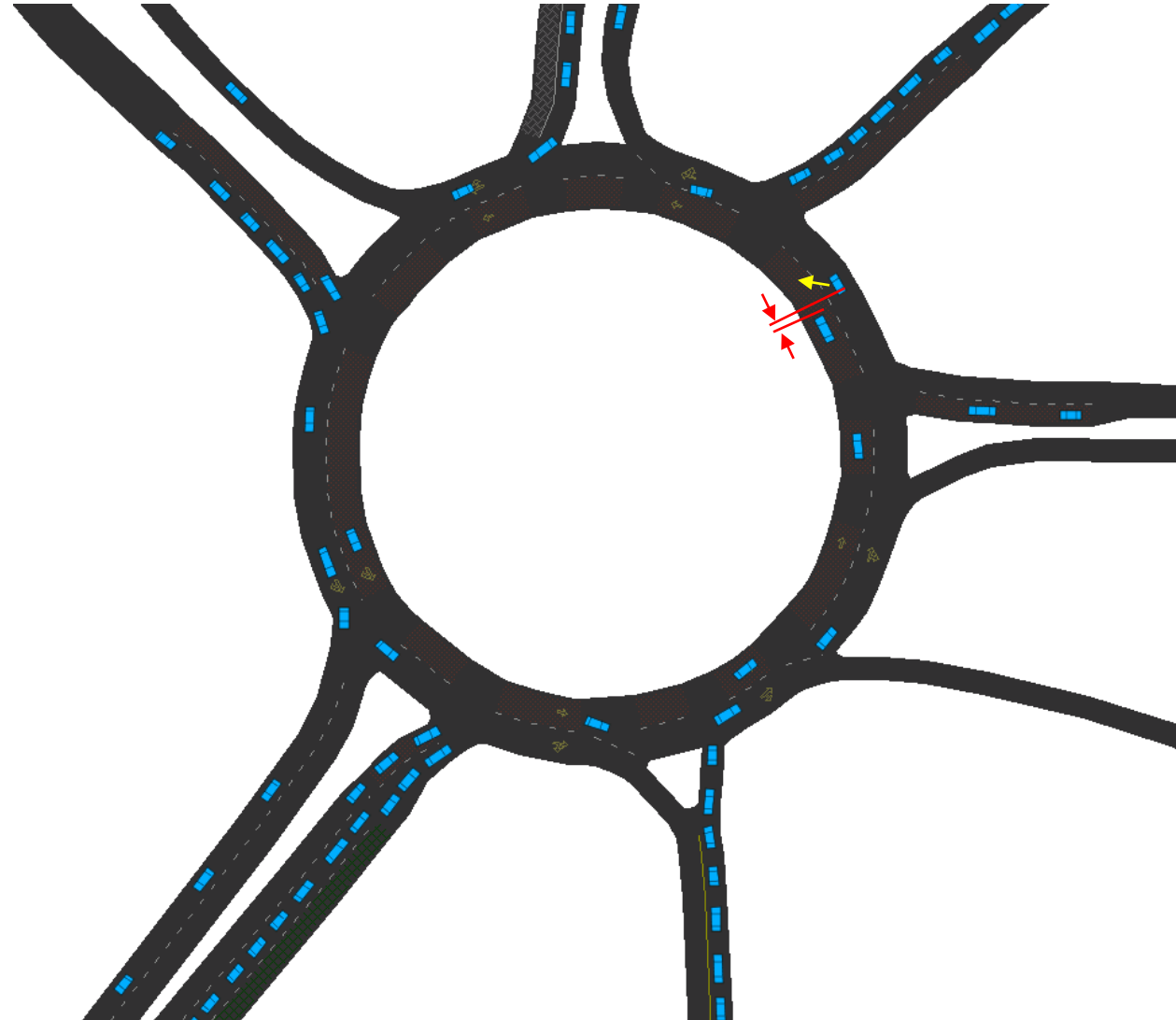
KEY POINT 1: Microsimulation Methods

- Core Microsimulation Algorithms
 - Car Following
 - Lane Changing
 - **Gap Acceptance**
 - Geometric, Striping Effects
- Roundabout-specific Driver Behaviors
 - (Intrabunch) Headway Gap Acceptance
 - Circulating Lane Preference



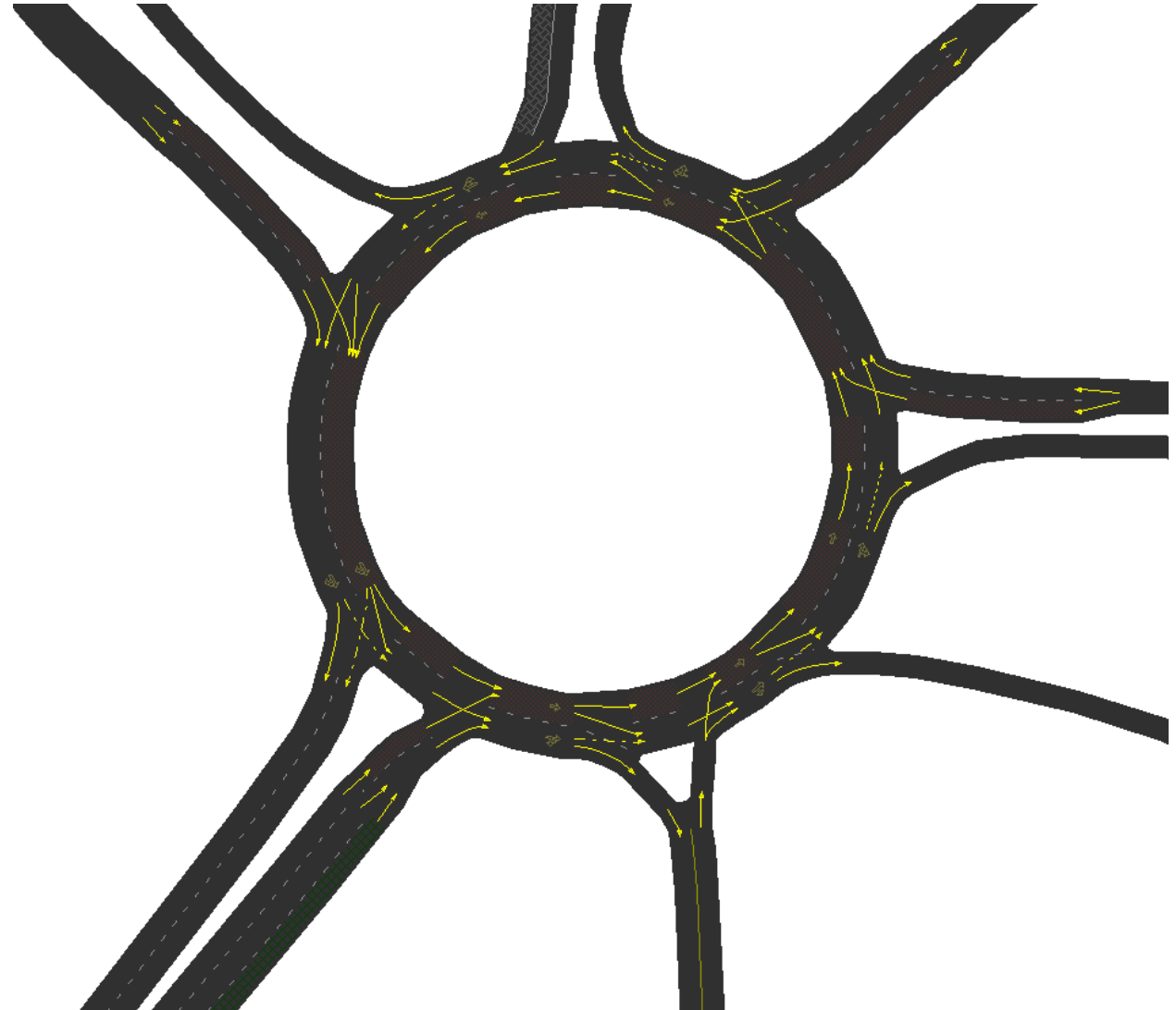
KEY POINT 1: Microsimulation Methods

- Core Microsimulation Algorithms
 - Car Following
 - **Lane Changing**
 - Gap Acceptance
 - Geometric, Striping Effects
- Roundabout-specific Driver Behaviors
 - (Intrabunch) Headway Gap Acceptance
 - Circulating Lane Preference



KEY POINT 1: Microsimulation Methods

- Core Microsimulation Algorithms
 - Car Following
 - Lane Changing
 - Gap Acceptance
 - **Geometric, Striping Effects**
- Roundabout-specific Driver Behaviors
 - (Intrabunch) Headway Gap Acceptance
 - Circulating Lane Preference



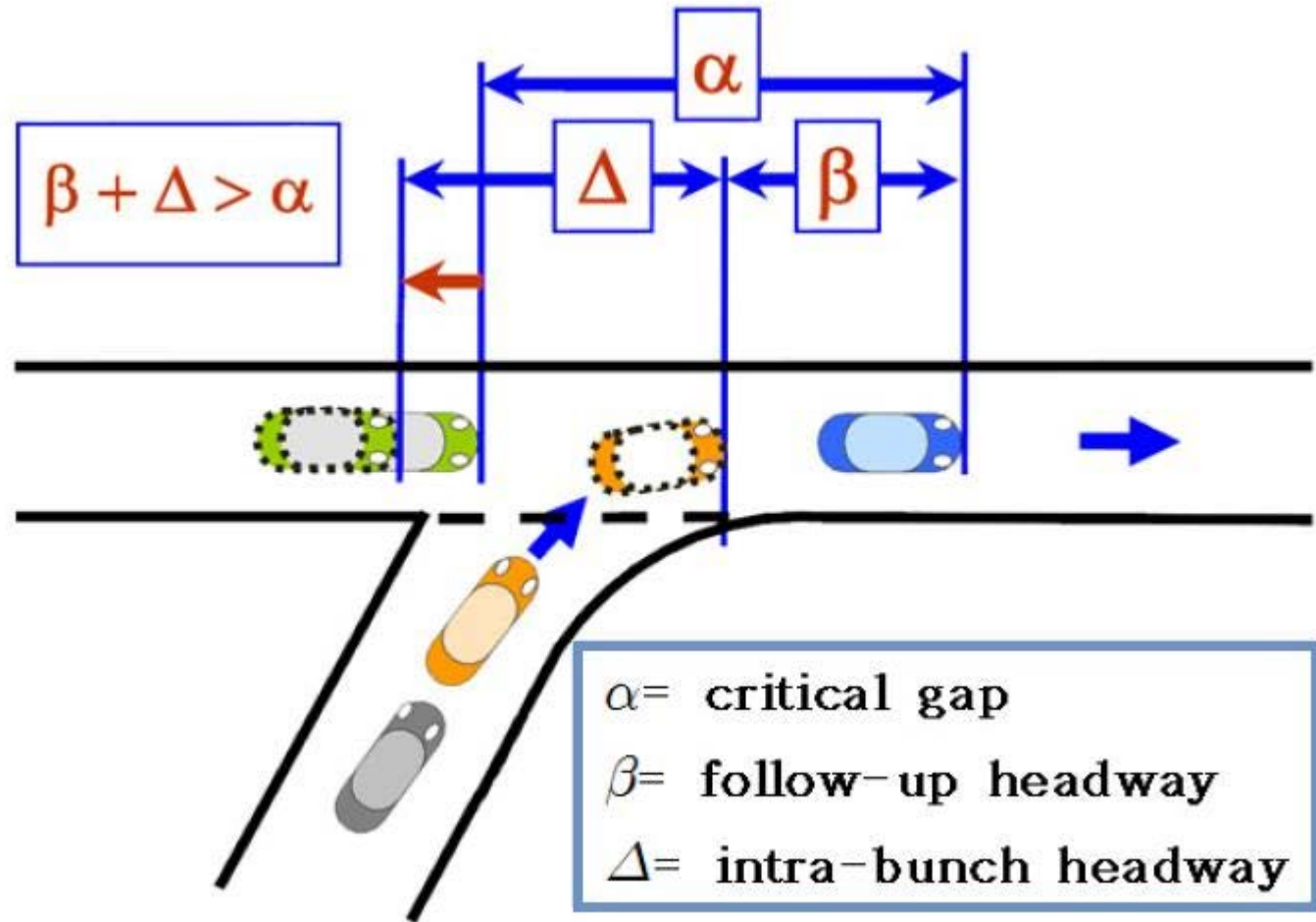
KEY POINT 1: Microsimulation Methods

Core Microsimulation Algorithms

- Car Following
- Lane Changing
- Gap Acceptance
- Geometric, Striping Effects

Roundabout-Specific Driver Behaviors

- (Intrabunch) Headway Gap Acceptance
- Circulating Lane Preference



Source: International Journal of Highway Engineering Vol.15 No.5 pp.217-226

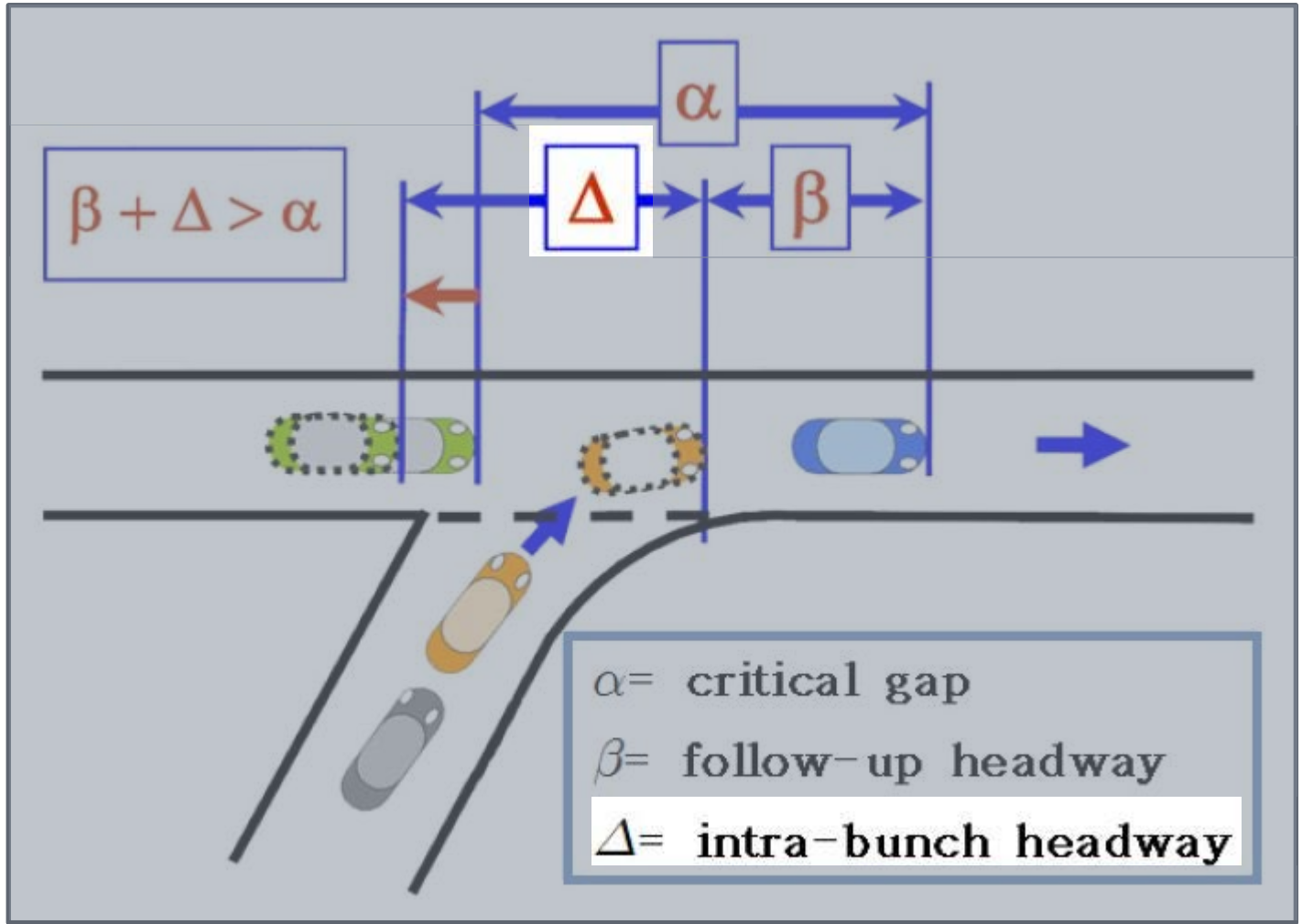
KEY POINT 1: Microsimulation Methods

- Core Microsimulation Algorithms

- Car Following
- Lane Changing
- Gap Acceptance
- Geometric, Striping Effects

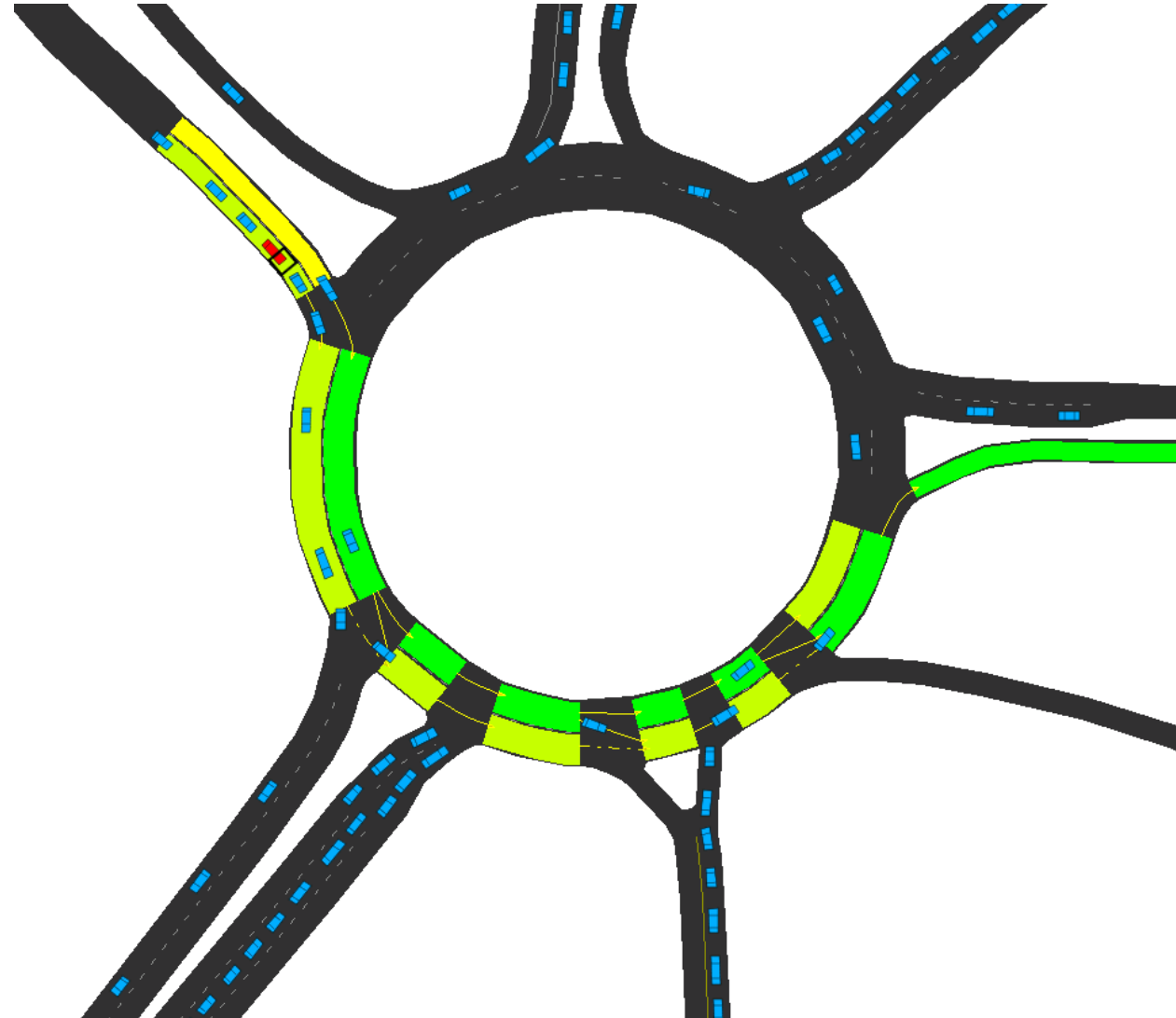
- Roundabout-Specific Driver Behaviors

- (Intrabunch) Headway Gap Acceptance
- Circulating Lane Preference



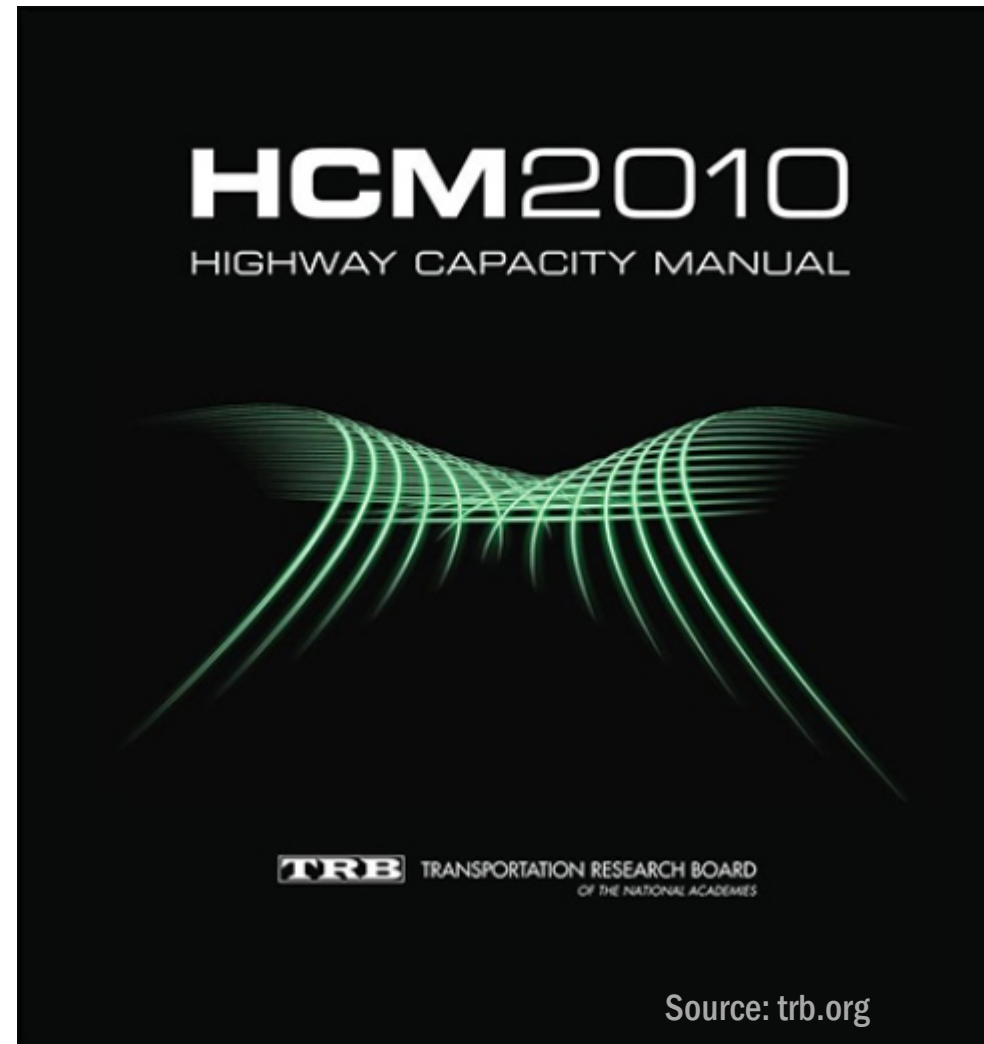
KEY POINT 1: Microsimulation Methods

- Core Microsimulation Algorithms
 - Car Following
 - Lane Changing
 - Gap Acceptance
 - Geometric, Striping Effects
- Roundabout-Specific Driver Behaviors
 - (Intrabunch) Headway Gap Acceptance
 - **Circulating Lane Preference**



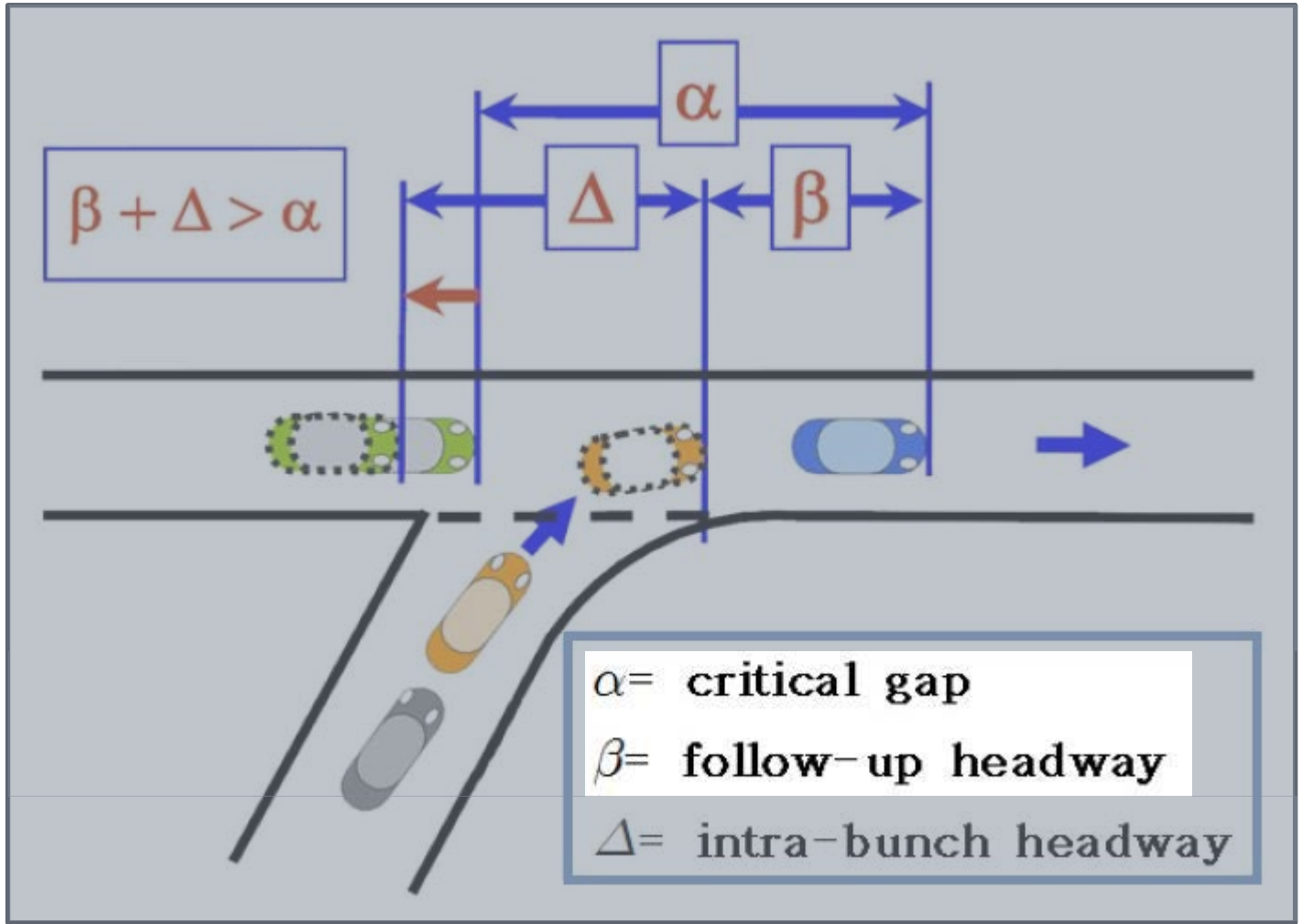
KEY POINT 1: HCM2010 Methods

- Chapter 21
- Calibrate to Critical Gap Headway, Follow-up Headway
- Derived from Empirical Data (NCHRP 3-92)



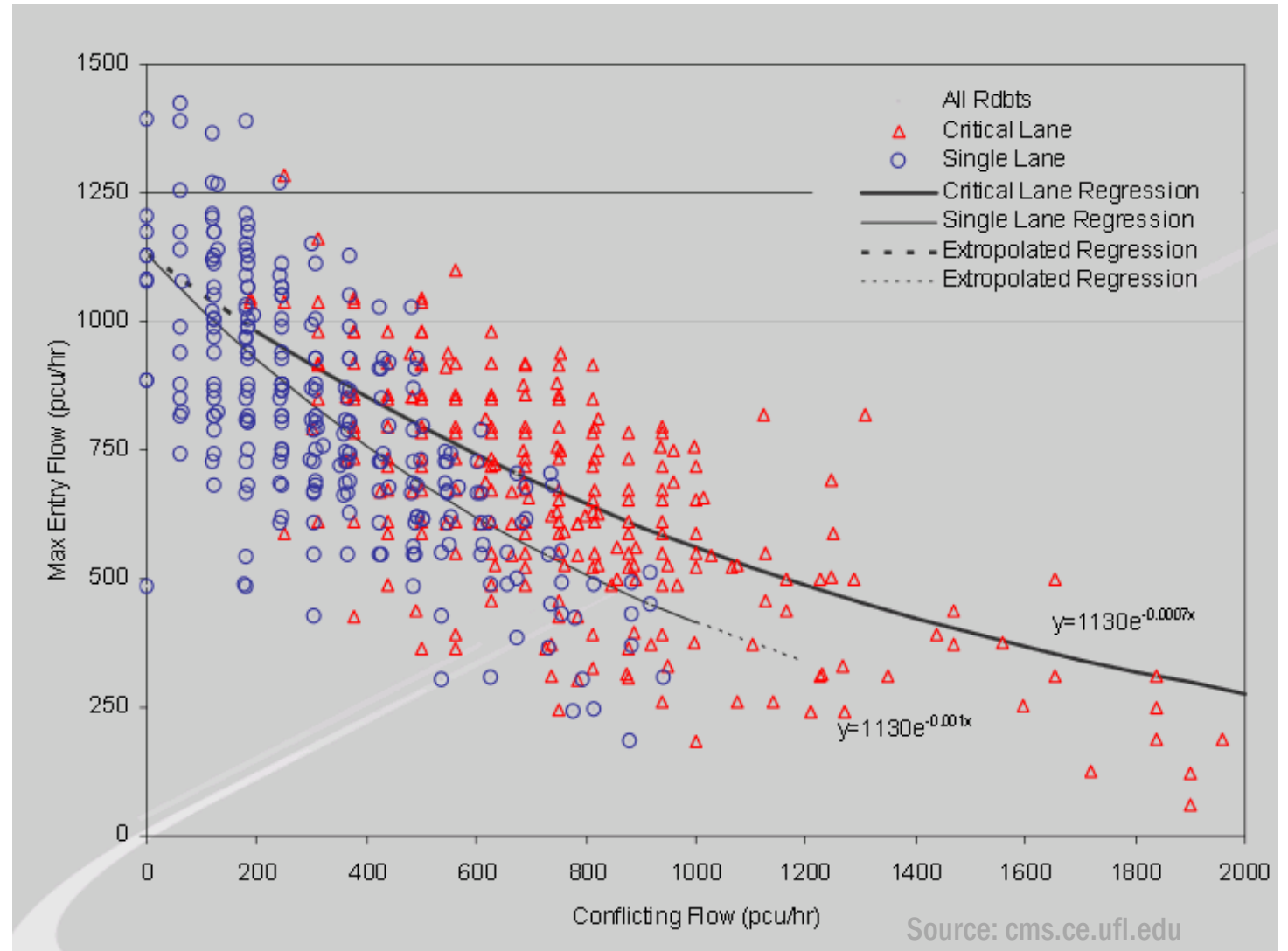
KEY POINT 1: HCM2010 Methods

- Chapter 21
- Calibrate to Critical Gap Headway, Follow-up Headway
- Derived from Empirical Data (NCHRP 3-92)



KEY POINT 1: HCM2010 Methods

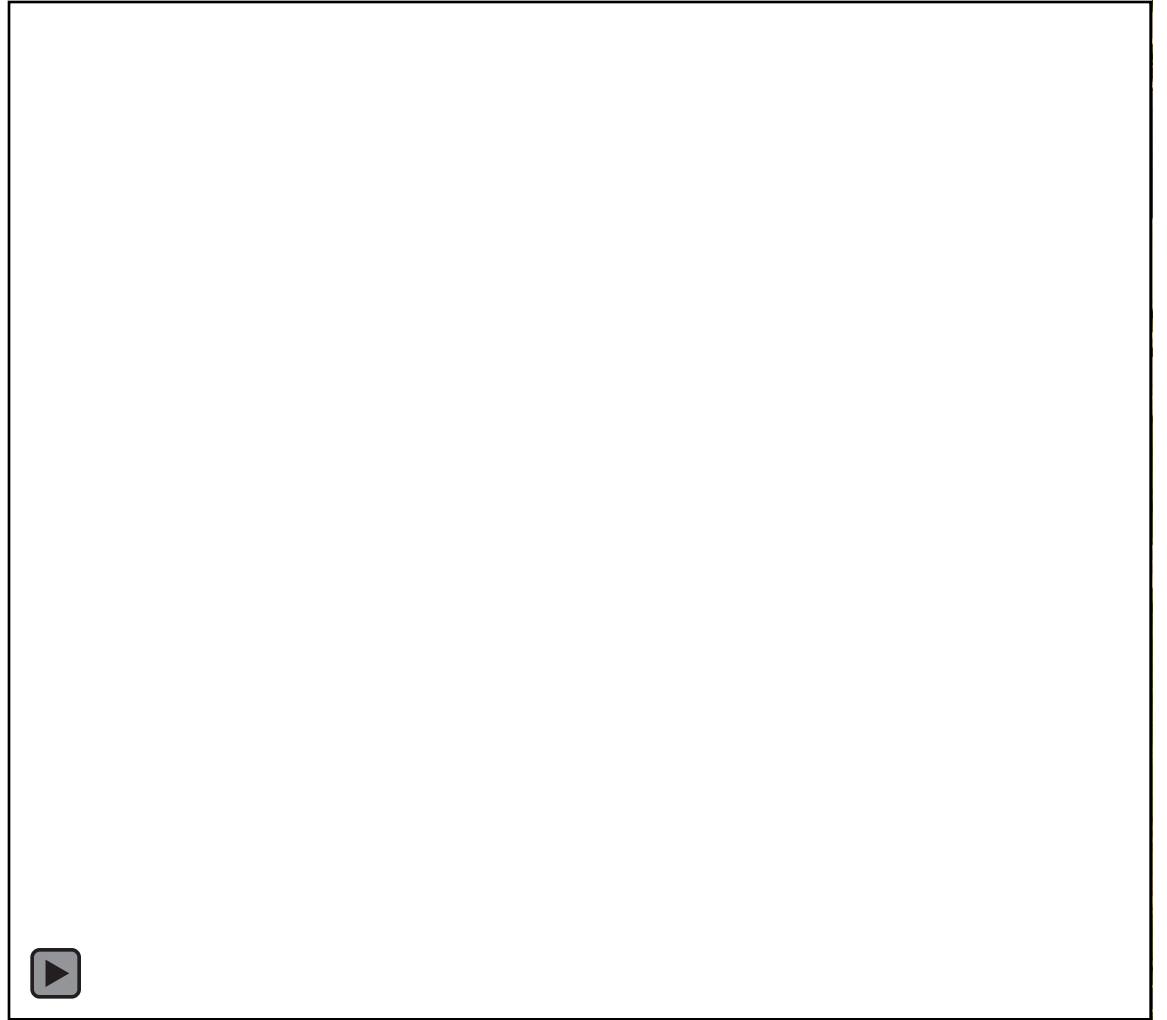
- Chapter 21
- Calibrate to Critical Gap Headway, Follow-up Headway
- Derived from Empirical Data (NCHRP 3-92)



KEY POINT 2: Ground Truth Geometry

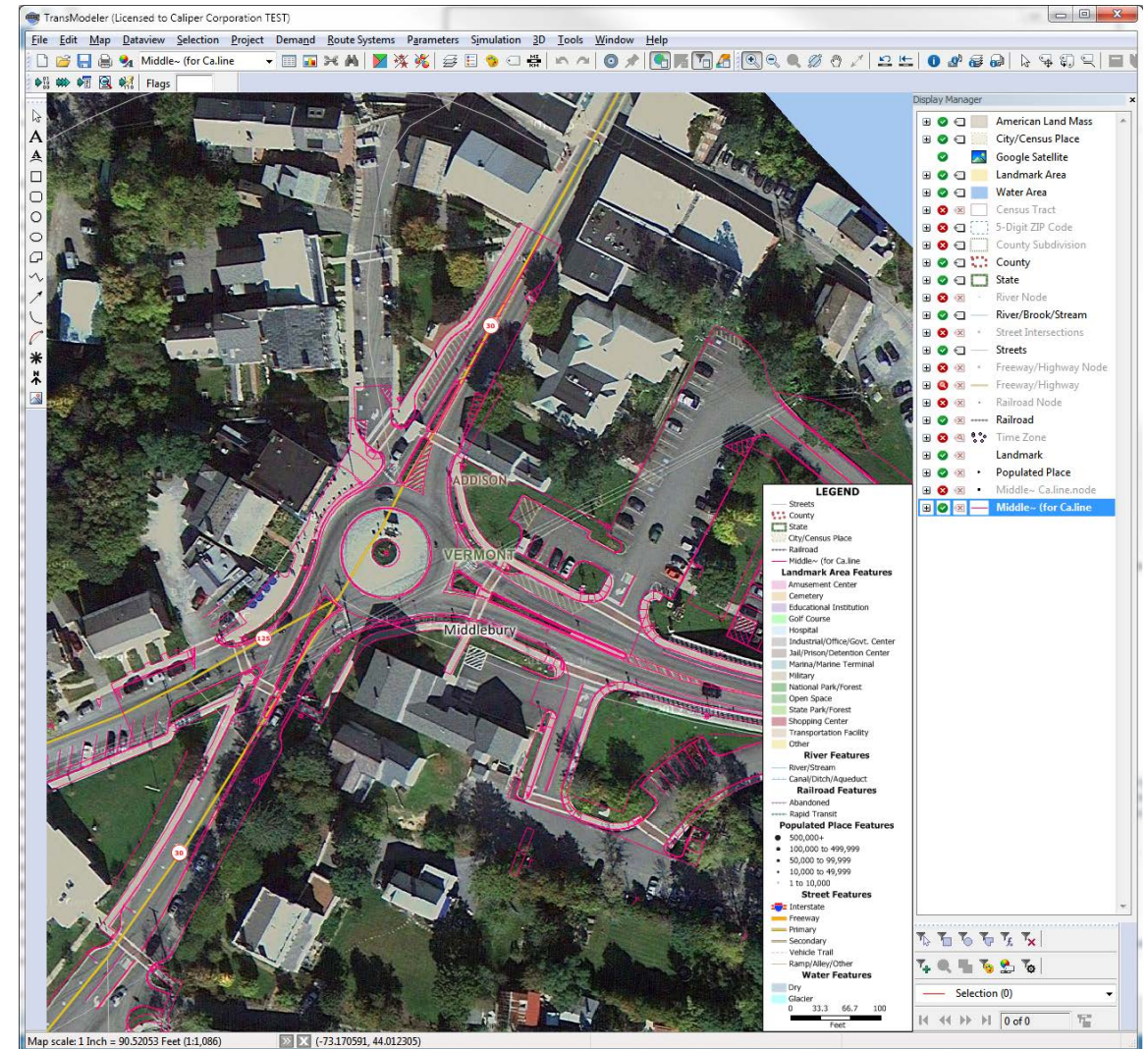
- **Road Network Development**

- Tools make common road editing tasks routine
- Automation of priority, ROW, gap determination
- Quickdraw roundabout creation
- Complete flexibility for modeling alternative and novel roundabout designs



KEY POINT 2: Ground Truth Geometry

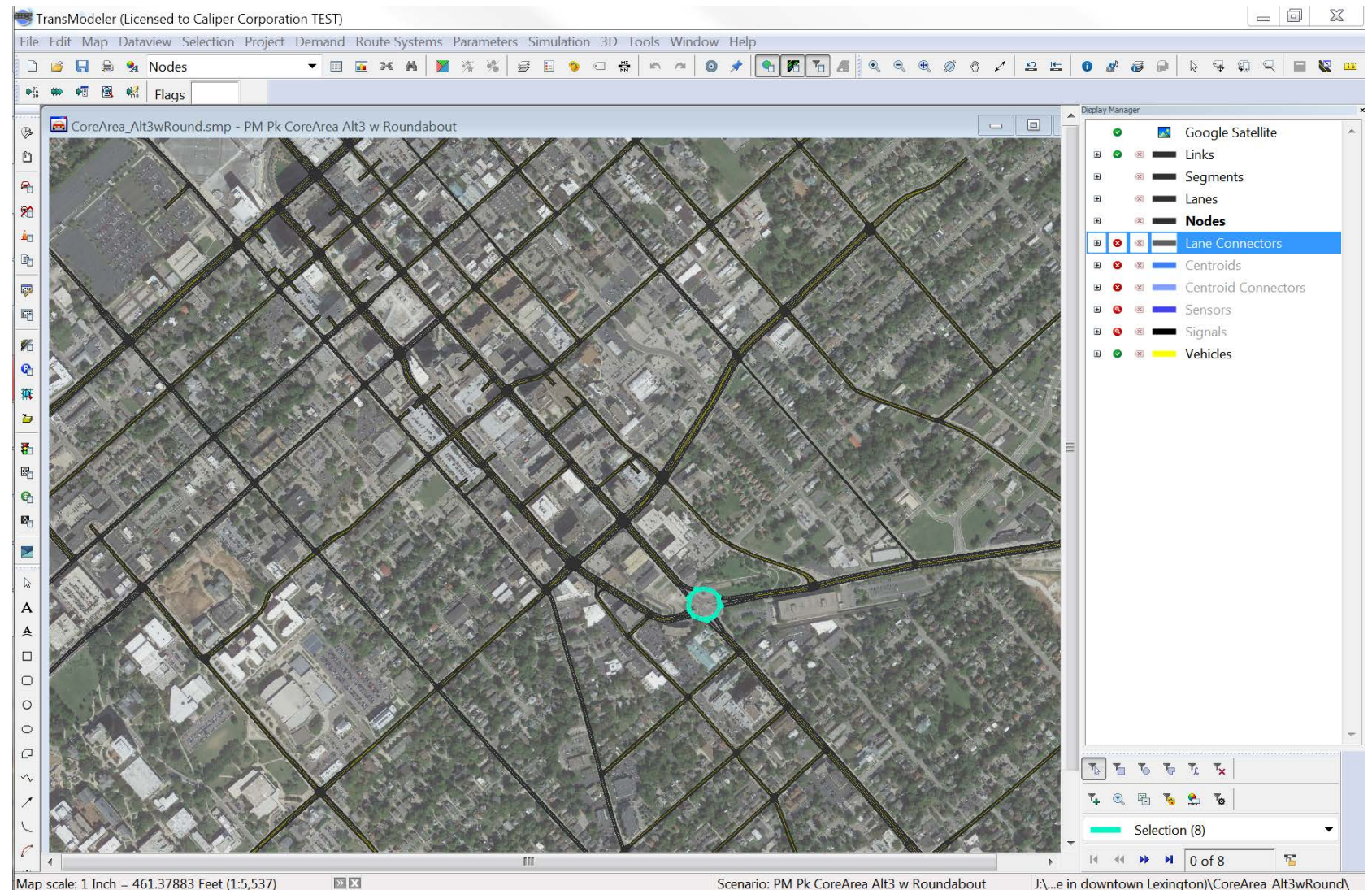
- **Easy access to and integration with GIS and CAD data**
 - Pre-installed with extensive map and census data (street line data, state/county/municipality boundaries, populated places, rail, water, etc.)
 - Built-in Google/USGS web map layers
 - The ability to import AutoCAD files



KEY POINT 3: Scales for Broader Roundabout Impacts

■ Broad Range of Applications

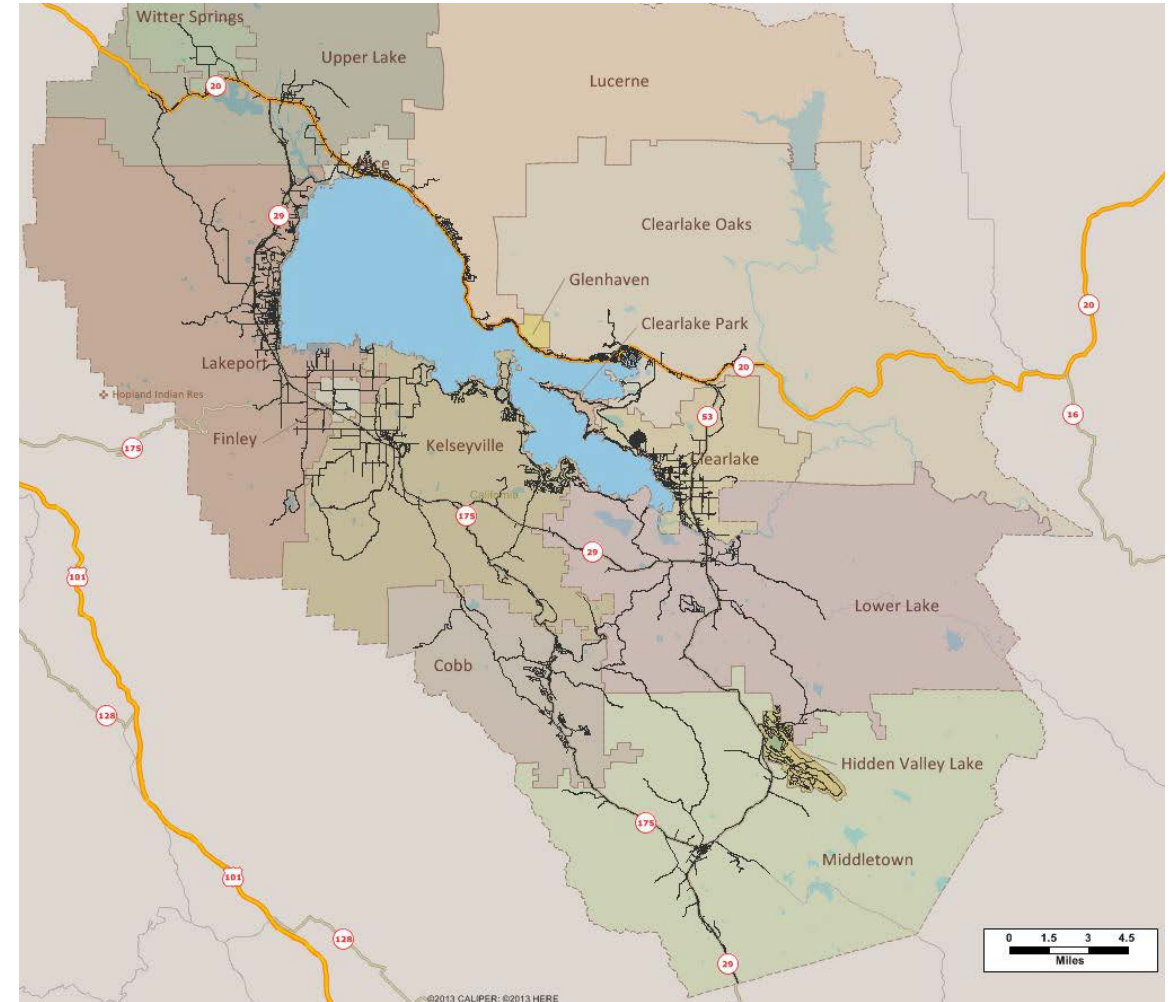
- Traditional traffic impact studies
- Geometric design
- Capacity analysis
- Alternatives analysis
- Signal timing, optimization
- ITS



KEY POINT 3: Scales for Broader Roundabout Impacts

- **Wide area simulation**

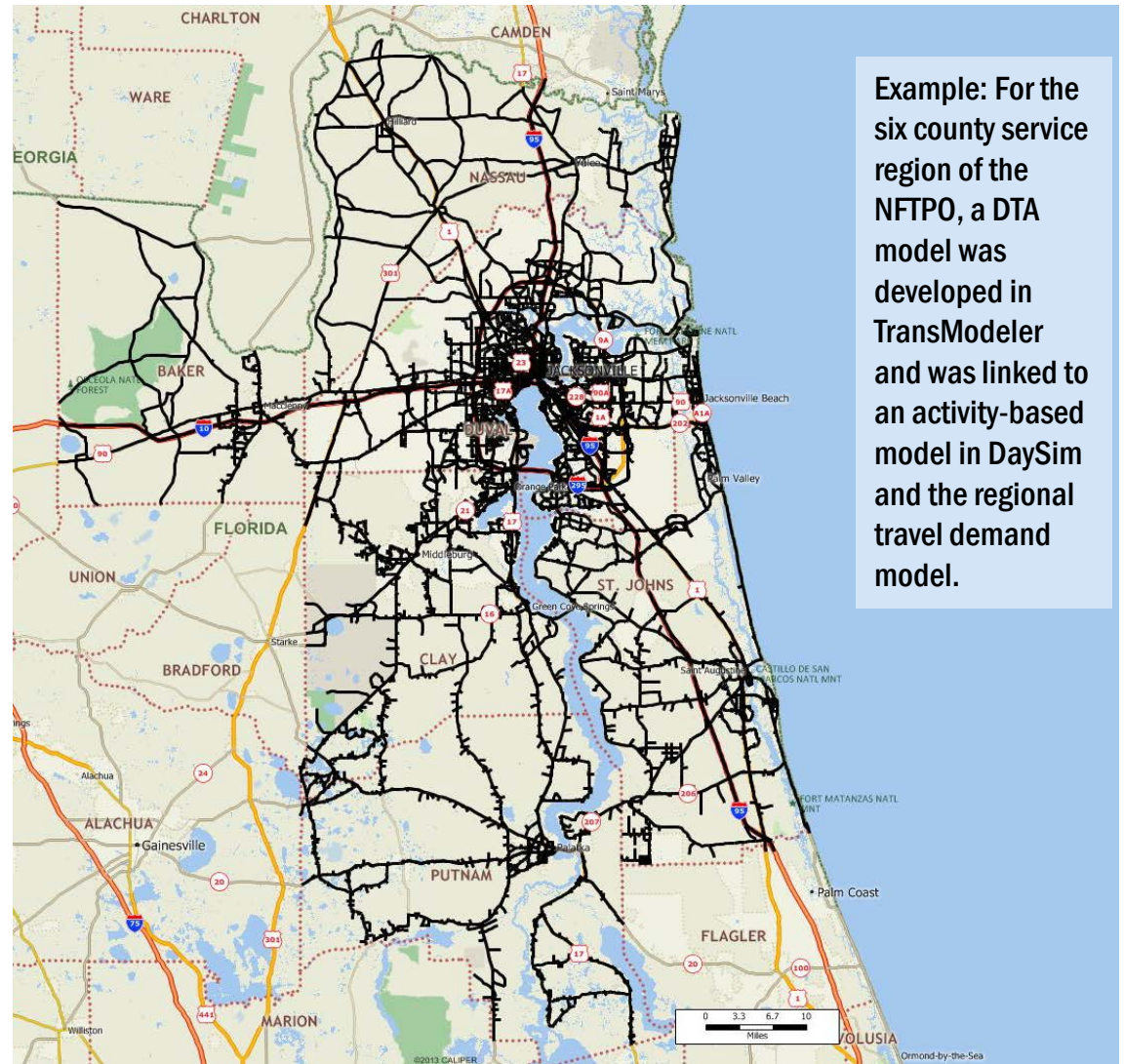
- GIS facilitates network, model data development
- Optimized for modern multi-core processors
- Hybrid simulation for tailoring to run-time needs



KEY POINT 3: Scales for Broader Roundabout Impacts

■ Travel Demand Model Integration

- Imports streets from planning networks
- Simulates matrices from subarea analyses
- Compatible with all styles of travel models and all travel demand model platforms
 - Links to traffic analysis zone (TAZ) centroids
 - Streamlines project impact analysis, prioritization



Step-by-Step Data Input

Roundabouts in TransModeler

Easy to Locate Existing Roundabouts

1. Draw geographically accurate road network using built-in tools
2. Add intersection controls (e.g., traffic signals), if applicable
3. Input traffic demand (e.g., TM counts, O-D matrices)
4. Adjust parameters
 - Headway Threshold (Intrabunch Headway)
 - Circulating Lane Preference: locally or globally



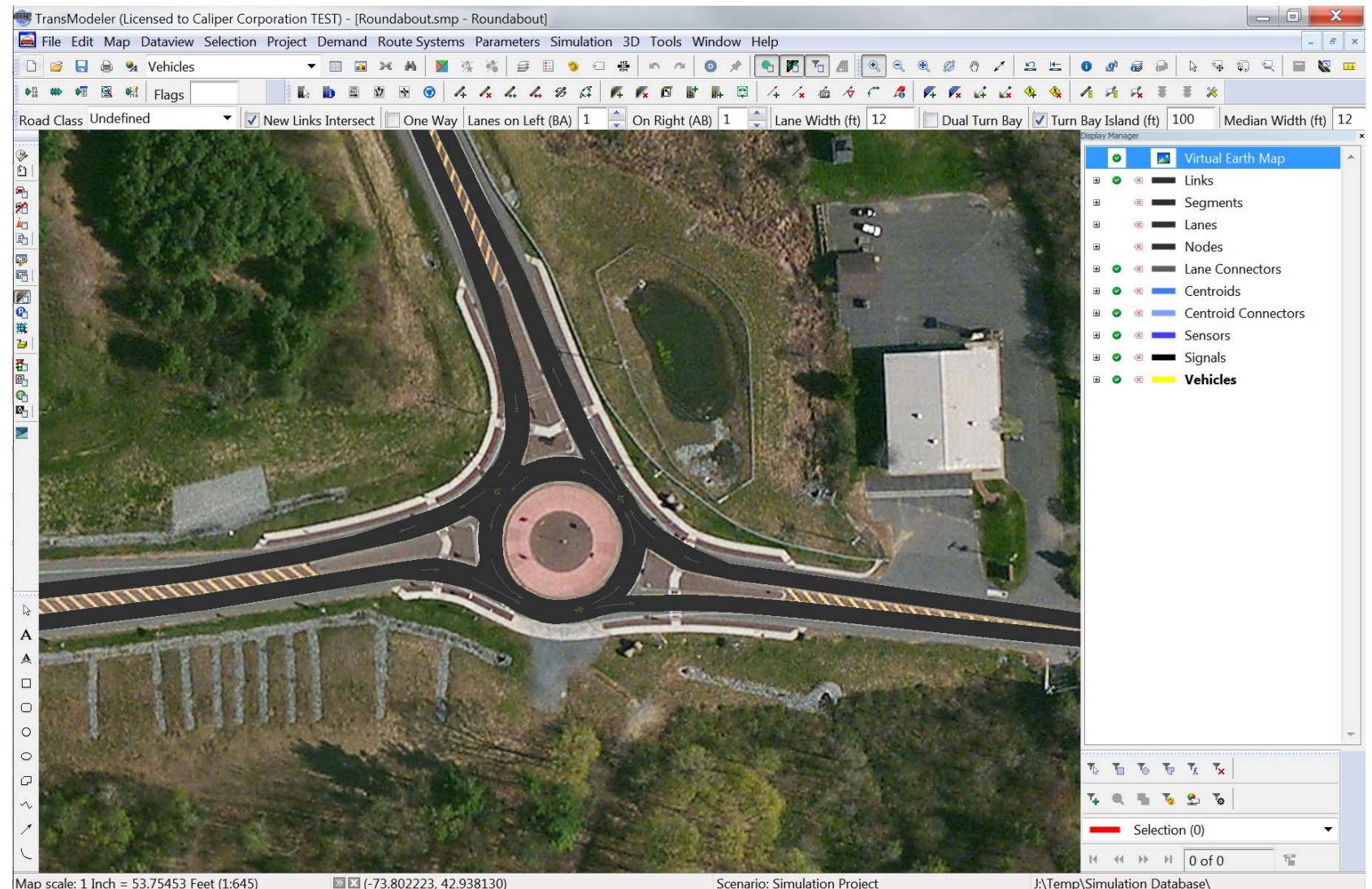
Roundabout Quickdraw

1. **Draw geographically accurate road network using built-in tools**
2. Add intersection controls (e.g., traffic signals), if applicable
3. Input traffic demand (e.g., TM counts, O-D matrices)
4. Adjust parameters
 - Headway Threshold (Intrabunch Headway)
 - Circulating Lane Preference: locally or globally



Detailed Roundabout Representations

1. Draw geographically accurate road network using built-in tools
2. Add intersection controls (e.g., traffic signals), if applicable
3. Input traffic demand (e.g., TM counts, O-D matrices)
4. Adjust parameters
 - Headway Threshold (Intrabunch Headway)
 - Circulating Lane Preference: locally or globally



Import from AutoCAD

1. **Draw geographically accurate road network using built-in tools**
2. Add intersection controls (e.g., traffic signals), if applicable
3. Input traffic demand (e.g., TM counts, O-D matrices)
4. Adjust parameters
 - Headway Threshold (Intrabunch Headway)
 - Circulating Lane Preference: locally or globally



Add Traffic Signals

1. Draw geographically accurate road network using built-in tools
2. **Add intersection controls (e.g., traffic signals), if applicable**
3. Input traffic demand (e.g., TM counts, O-D matrices)
4. Adjust parameters
 - Headway Threshold (Intrabunch Headway)
 - Circulating Lane Preference: locally or globally



Input Traffic Demand

1. Draw geographically accurate road network using built-in tools
2. Add intersection controls (e.g., traffic signals), if applicable
3. **Input traffic demand (e.g., TM counts, O-D matrices)**
4. Adjust parameters
 - Headway Threshold (Intrabunch Headway)
 - Circulating Lane Preference: locally or globally



Adjust Roundabout Parameters

1. Draw geographically accurate road network using built-in tools
2. Add intersection controls (e.g., traffic signals), if applicable
3. Input traffic demand (e.g., TM counts, O-D matrices)
4. Adjust parameters
 - Headway Threshold (Intrabunch Headway)
 - Circulating Lane Preference: locally or globally

The screenshot shows the 'Driver Behavior' software interface. On the left is a tree view of parameters, with 'Circulating Lane Preference' selected under the 'Roundabouts' category. On the right is a table titled 'Circulating Lane Preference' with the following data:

Exit from Roundabout	Inner lane(s)	Outer lane
1st	0.10	1.00
2nd	0.50	1.00
3rd	1.00	0.50
4th & greater	1.00	0.10

At the bottom of the window are buttons for 'Default', 'OK', 'Apply', 'Cancel', and 'Help'. A 'Filter' input field is also visible at the bottom left.

Output

Roundabouts in TransModeler

HCM 2014 Roundabout LOS

Whitley_Roundabout.smp - Simulation Project

Intersection Control Editor (Signals.tms)

Control: Roundabout Node: 8 (A)

General Turns LOS

MOEs

Flow Field: Vol Flow Interval (min.): 60 Base Saturation Flow Rate (pc/h/ln): 1900

Direction	↔	↔	↑	↑	↔	↔	↓	↓
Entry Approach	7 (E)	7 (E)	6 (NE)	6 (NE)	8 (NW)	8 (NW)	1 (SW)	1 (SW)
Lane	L	R	L	R	L	R	L	R
Circulating Flow, veh/h	520	<==	59	<==	375	<==	159	<==
PHF - Circulating Flow	0.92	<==	0.92	<==	0.92	<==	0.92	<==
Entry Lane Flow, veh/h	22	29	211	279	78	103	168	223
PHF - Entry Lane Flow	0.92	<==	0.92	<==	0.92	<==	0.92	<==
Adj. Circulating Flow, v...	565	565	64	64	408	408	173	173
Adj. Entry Lane Flow, v...	23	31	229	304	85	112	183	242
Entry Lane Capacity, ve...	761	740	1080	1077	849	832	1001	993
Volume-to-Capacity Ra...	0.031	0.042	0.212	0.282	0.100	0.135	0.183	0.244
Lane Control Delay, s/v...	5.036	5.290	5.286	6.059	5.204	5.671	5.309	6.014
95th Percentile Queues,...	0.095	0.131	0.801	1.164	0.331	0.465	0.666	0.959
Level Of Service	A	A	A	A	A	A	A	A

Update Lanes

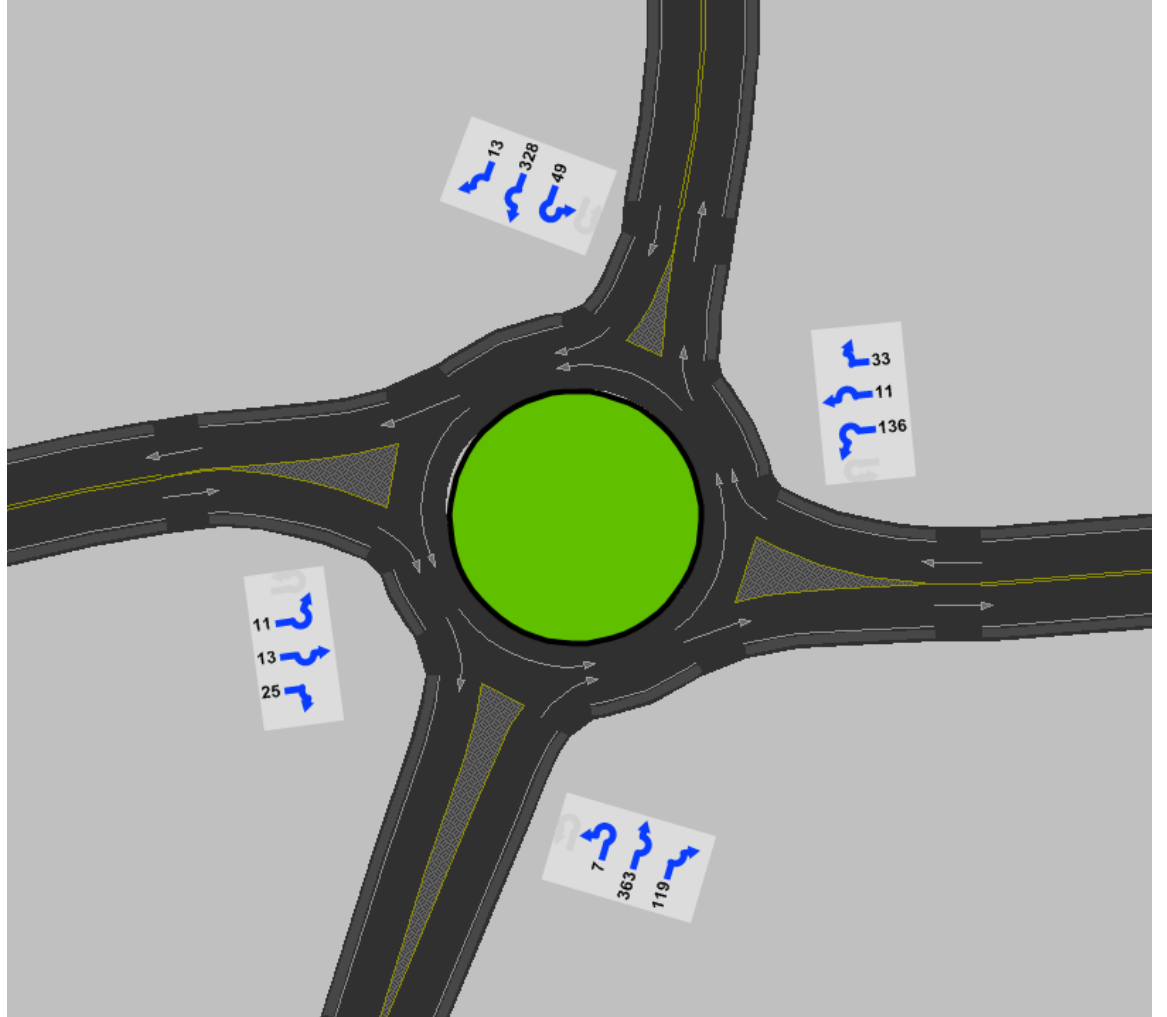
Roundabout Delay (s/veh) 5.7 Level of Service A

Save Summary Close

Feet

Generate Turning Movement Counts from Simulation

- Produce turning movement counts from simulations



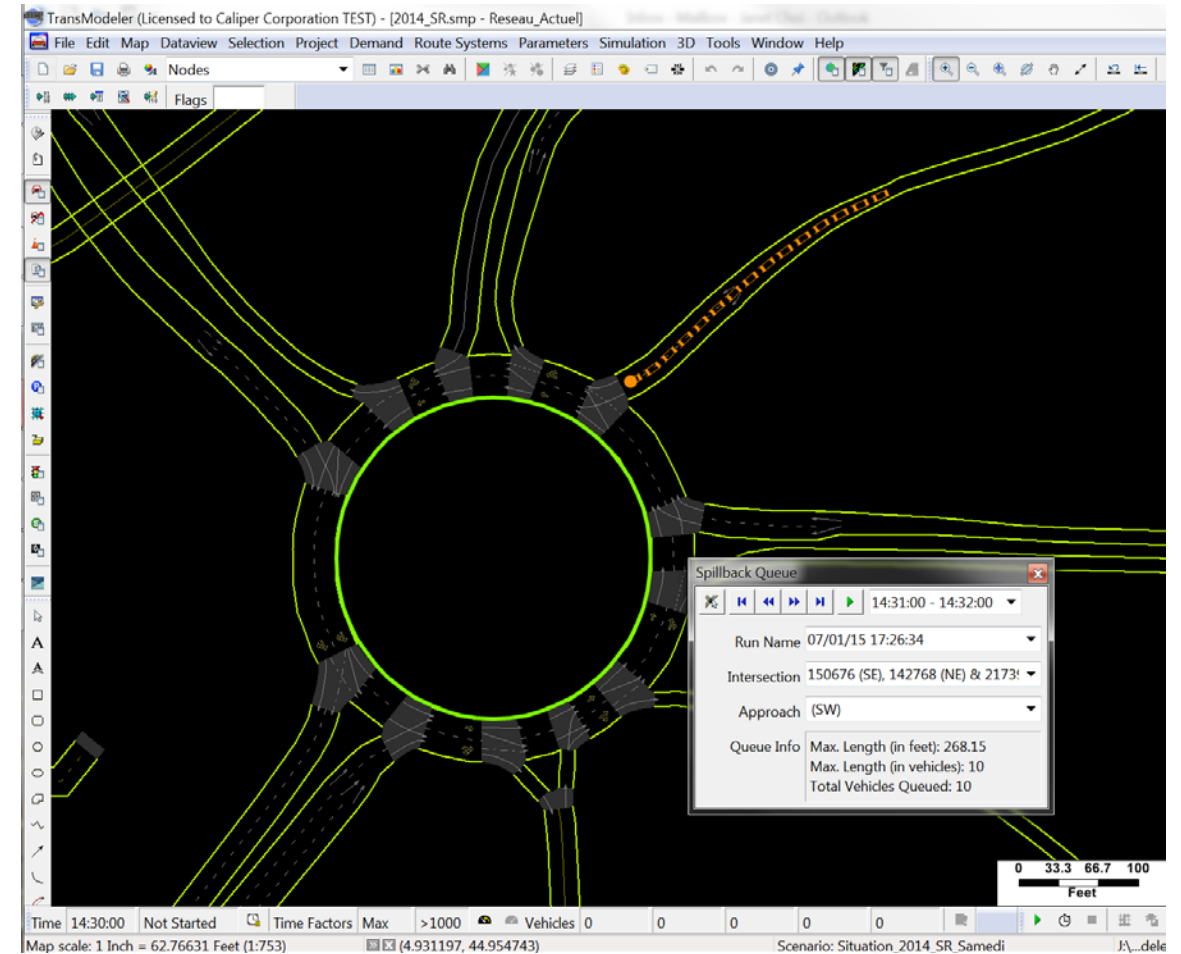
Simulation Output Reports

- Roundabout LOS
- Roundabout LOS by Lane



Other Simulation Outputs

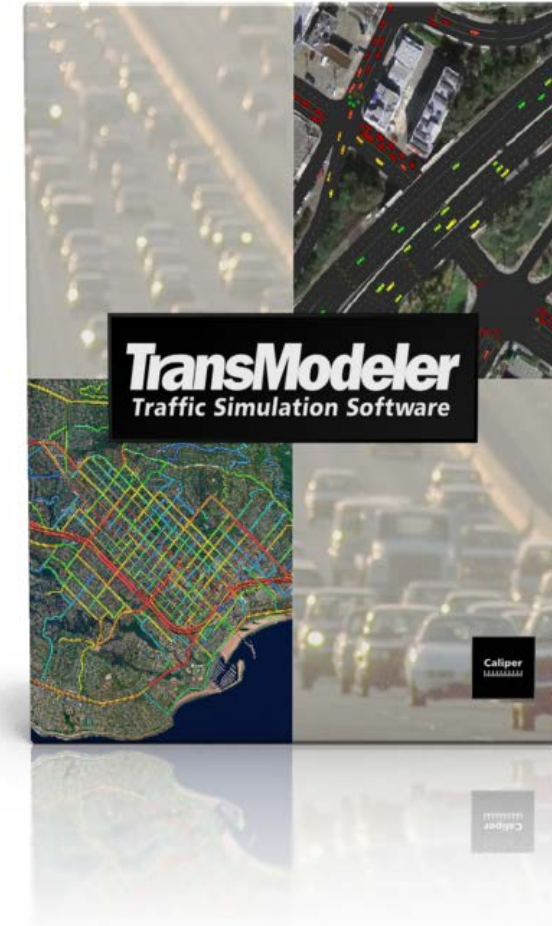
- Lane and spillback queues
- Travel times
- VHT, VMT, trip lengths, travel times

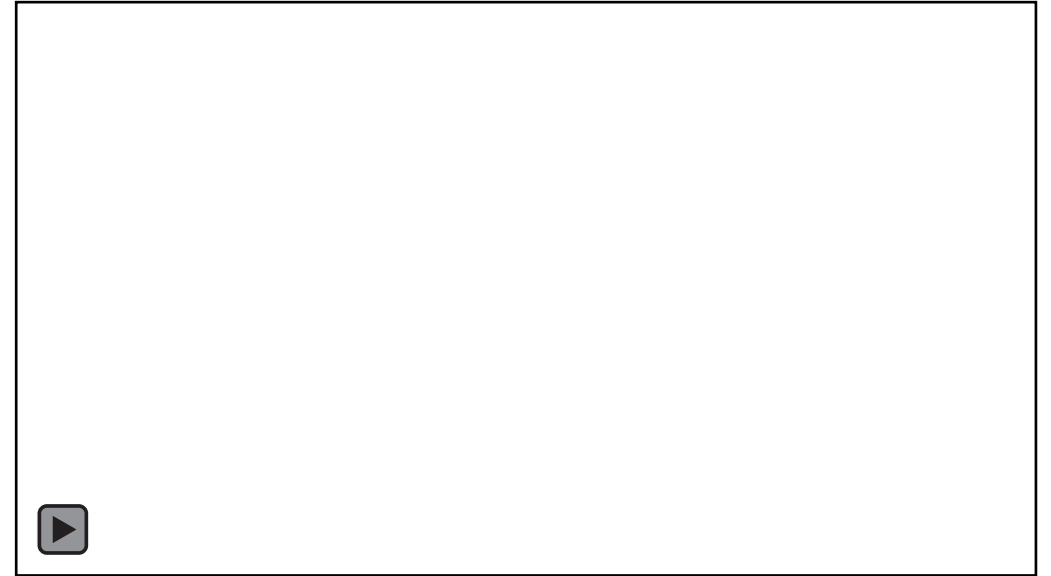
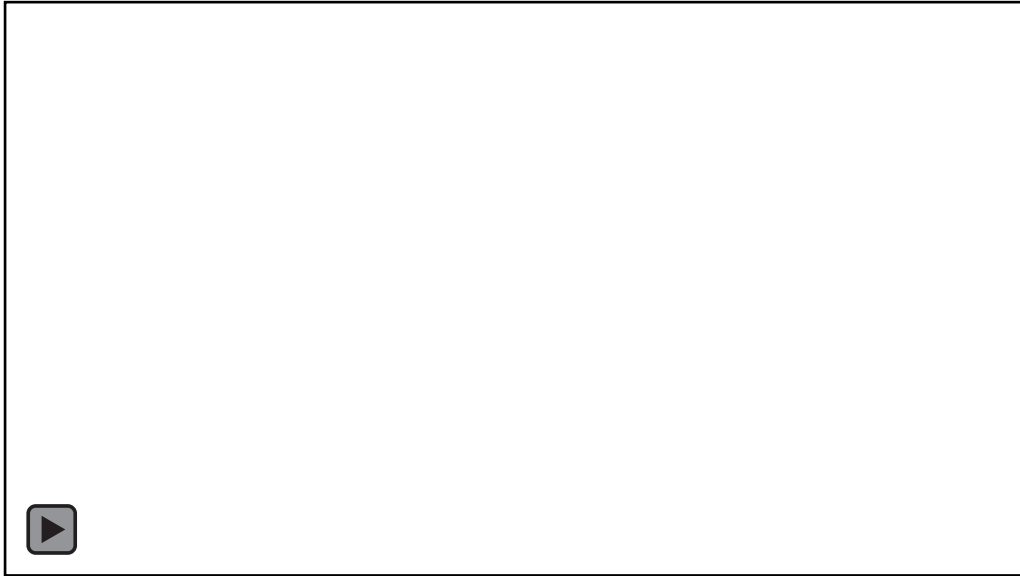


Summary of Key Strengths

Key Strengths of TransModeler

- High-fidelity microsimulation for the most robust operational analysis
- HCM2010 Level of Service analysis, deterministic *and simulation-based*
- Ground truth geometric accuracy, assisted by CAD and GIS
- Scalable for networks, wide geographic areas, and broader range of applications





Thank you!

Questions?

daniel@caliper.com