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VISSIM Example – Special Use/Managed Lanes



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PTV Vision: Multi-Resolution Modeling







Special Use/Managed Lane Modeling **Understanding Demand Impacts** > Will improved travel times result in new traffic patterns? > Trip temporal distribution > Best Tool: Macroscopic 7 **Understanding Supply Impacts** > Will modified capacity result in additional trips? > Trip spatial distribution > Best Tool: Macroscopic/Mesoscopic/Microscopic **Understanding Operations** > How will the facility respond to short-term demand? How will the user respond to dynamic pricing? > > Trip spatial decisions ∦≮ > Best Tool: Microscopic PTV America, Inc. © PTV AG 2011



Special Use/Managed Lane – Demand Impacts

- > Trip start times are modified
- > Driver begins trip earlier / later because of travel time changes
- Application: >
 - > VISUM Dynamic User Equilibrium





Special Use/Managed Lane – Supply Impacts

- > Trip / path changes for O-D
- Driver takes a new path because of travel time changes
- > Applications:
 - > VISUM
 - > DynusT
 - > VISSIM Dynamic Traffic Assignment





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Special Use/Managed Lane - Operations

- > Smaller temporal and spatial decisions to use a managed lane facility
- Driver does not make decision to take unique trip based on immediate condition (toll)
- > Applications:
 - > VISSIM Managed Lanes Module
 - > VISSIM COM
 - > VISSIM VAP



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managed lane

main lanes

Special Use/Managed Lanes Module Components

Managed Lane Facility

- Main lanes: no toll, no restrictions
- > Managed lane: toll and/or occupancy restrictions

Pricing Model

- > In reality, different pricing models exist
- > Tolls typically depend dynamic traffic conditions
- > Different pricing for different vehicle classes

Decision Model

- > Which drivers use the managed lane?
- > Discrete choice model

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- utility of toll computed from travel time savings and current toll price
- logit decision function: 50% on toll lane if utility = 0
- > unique user classes react differently to same toll

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traffic mobility logist

VISSIM Special Use/Managed Lanes Workflow





Managed Lanes Facilities





Routing Decisions

> Defines the start and end point of a toll decision





Toll Pricing Model

- > Defines simple logic matrix of Travel Time Savings AND/OR Average Speed = Toll
- Defines nested COM script for all other advanced applications >
- Technologies used in the field can be replicated as closely as possible >

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▶ 1		Traffic Responsiv		No												
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			۲	Traffic Responsive												
					Travel Time Savings From [minutes]	Travel Time Savings To [minutes]	AND OR	Average Speed From [mph]	Average Speed To [mph]	Tol						
			1	ø	0	1	AND	50	125	0.5						
			2	\$	1	2	AND	50	125	1						
			3	0	2	4	AND	50	125	2.5						
			4	\$	4	99999	AND	50	125	5						
			5	2	0	99999	AND	0	50	99						

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Example Nested COM Script





Decision Model

- > Probability of vehicle class using the managed lanes facility based on a Logit model $P_{(Munaged)} = 1 \frac{e^{\alpha^+ U_{Managed}}}{e^{\alpha^+ U_{Managed}} + e^{\alpha^+ U_{Managed}}} = 1 \frac{1}{1 + e^{\alpha^+ \Delta U^-}}$
- > Cost coefficients define a general utility function

No Name	Details		
▶ 1 Northbound	No.: 1	Name: Northbound	
	Pricing Model Decision N	lodel	
	Logit alpha value	0.05000	
	Vehicle Class	Cost Utility Coefficient	Time [min.] Utility Coefficient
	▶ default	-1	0.4





Evaluation

> User-defined evaluation Managed Lanes Evaluatio - Confi Per vehicle class > Per pricing update interval > General Vehicle Cla 50 60 19.5 6 0 13.5 20 25.5 28.5 28.5 15 0 18.5 10 0.5 0.5 0.5 0.5 9999 10 10 0.5 0.5 0.5 0.5 0.5 Down ite [mph] HOT Lane Demo.mlo ... OK Cancel 197 221 480.5 366 119 51.1 48.11 48.22 48.47 49.95 32.58 3.88 1.29 0.5 0.5 287 146 556 46 33 0 0 39.28 0 49.67 50.48 44.34 © PTV AG 2011 PT/



Special Use/Managed Lanes Module Key Points

- > All vehicles are assigned to general purpose lanes by static routing
- > Origin-destination or decision area based
- > Vehicle classes are assigned to the facility "dynamically"
- > Pricing model built-in or user-defined
- Dynamic traffic assignment can be used in addition to the traffic assigned by the managed lanes module, but these vehicles will not respond to local dynamic routing
- > Feedback to planning process is possible
- In theory, dynamic traffic assignment could be based on dynamic cost feedback and COM applications



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Special Use/Managed Lanes Module Considerations

- > Application must have limited ingress/egress points for total trip
- The current problem: >
 - > Facility has multiple pricing zones
 - > User can enter/exit session
 - > Total trip has multiple possible uses



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VISSIM COM

Scripting/programming via VB, VBA, JavaScript, Python VISSIM object model externally accessible





VISSIM COM

Object attributes are modified during simulation

Example VBA script:



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VISSIM COM - VBA



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VISSIM COM - VBA

Feedback results to Excel

		Record	Macro	iout ro		Properties		Map Pro	eloper 📄	Import												
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3	180		0.2	0.2	0.15	0.2	0.15	0.15	0.15		61	32	(39	3	15	0					
4	360		0.5	0.25	0.15	0.25	0.2	0.2	0.15		147	73	9	128	64	43	8		\$29.40	\$14.60	\$1.35	\$25.
5	540		2.1	0.25	0.2	1000	0.2	0.3	0.2		212	110	30	204	118	117	37		\$106.00	\$27.50	\$4.50	\$51.
0	720		0.35	1.8	0.25	0.35	5.05	0.4	0.25		233	248	105	183	266	185	121		\$403.30	302.00	a21.00	50.
8	1080		0.35	5.05	0.2	0.35	0.35	0.75	1000		232	234	10/	198	180	268	110		\$63.70	\$1 217 06	\$36.20	\$63
9	1260		0.35	0.95	0.35	0.35	0.35	1000	1000		195	201	185	173	214	281	40		\$68.25	\$243.10	\$64.75	\$60
10	1440		0.35	0.85	0.9	0.35	0.35	1000	0.2		182	254	196	193	200	176	9		\$63.70	\$241.30	\$29.40	\$67
11	1620		0.35	0.35	0.6	0.35	7	1000	0.2		193	251	176	170	285	83	12		\$67.55	\$200.80	\$158.40	\$59
12	1800		0.35	5.05	0.15	0.35	0.35	0.3	0.2		213	257	181	182	161	23	77		\$74.55	\$89.95	\$108.60	\$63
13	1980		0.35	2.3	0.7	0.35	7	0.45	0.35		194	221	192	204	240	95	92		\$67.90	\$1,116.05	\$28.80	\$71.
14	2160		0.35	1.6	2.3	0.35	5.05	0.5	0.45		210	216	191	186	221	160	111		\$73.50	\$496.80	\$133.70	\$65.
15	2340		0.35	2.55	0.15	0.35	0.35	1000	1000		193	213	172	192	171	193	140		\$67.55	\$319.50	\$395.60	\$67.3
16	2520		0.35	1.05	0.55	1000	1000	1.35	1000		179	240	158	191	236	194	148		\$62.65	\$612.00	\$23.70	\$66.
17	2700		0.35	1.35	0.6	1000	0.95	0.3	1000		192	231	146	125	110	178	22		\$67.20	\$242.55	\$80.30	\$0.
18	2880		4.2	1.15	0.75	0.4	1000	0.85	0.2		190	226	139	38	79	231	66		\$66.50	\$305.10	\$83.40	\$0.
19	3060		0.35	0.4	0.2	0.25	1000	1000	0.2		176	214	138	118	124	210	120		\$739.20 \$49.66	\$246.10	\$103.60	\$47.3
24	2420		0.66	0.25	0.35	1000	0.2	0.2	1000		139	117	102	1/19	0	130	130		00.00m	409.20	\$21.40	344.
22	2600		0.00	0.35	1000	0.25	0.10	0.3	0.2		150	121	173	34	76	30	30		\$92.60	50.00	401.50 561.00	50
23	3780		1	0.35	1000	0.33	0.13	0.95	0.3		153	222	143	144	187	199	74		\$963.90	\$355.20	\$0.00	\$50
24	3960		0.45	0.55	0.15	16	0.45	1000	0.45		151	161	87	210	204	236	156		\$151.00	\$56.35	\$0.00	\$63
25	4140		1.95	0.6	1000	0.35	7	0.45	1000		182	197	26	158	276	180	135		\$81.90	\$108.35	\$3.90	\$252
26	4320		7	0.55	1000	0.35	1.2	0.35	0.45		129	219	105	163	224	143	62		\$251.55	\$131.40	\$0.00	\$57.
27	4500		0.65	0.45	0.2	0.35	0.35	1.3	0.25		158	178	80	198	238	168	66	\$	1,106.00	\$97.90	\$0.00	\$69
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VISSIM COM Example – Managed Lanes

Shoulder use based on density:







traffic mobility logistic

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VISSIM COM Example – Ramp Metering



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Thank you!

