

Transit Modeling Update District One Implementation & Status Report

presented to
MTF Transit & Rail Committee

presented by
Dan Macmurphy, Traf-O-Data Corp.

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Transit Modeling Update (TMU)




Purpose and Need

- Developed by FDOT Systems Planning, in conjunction with FTA, to provide transit travel demand forecasts consistent with federal expectations.
- Incorporates state of the practice techniques


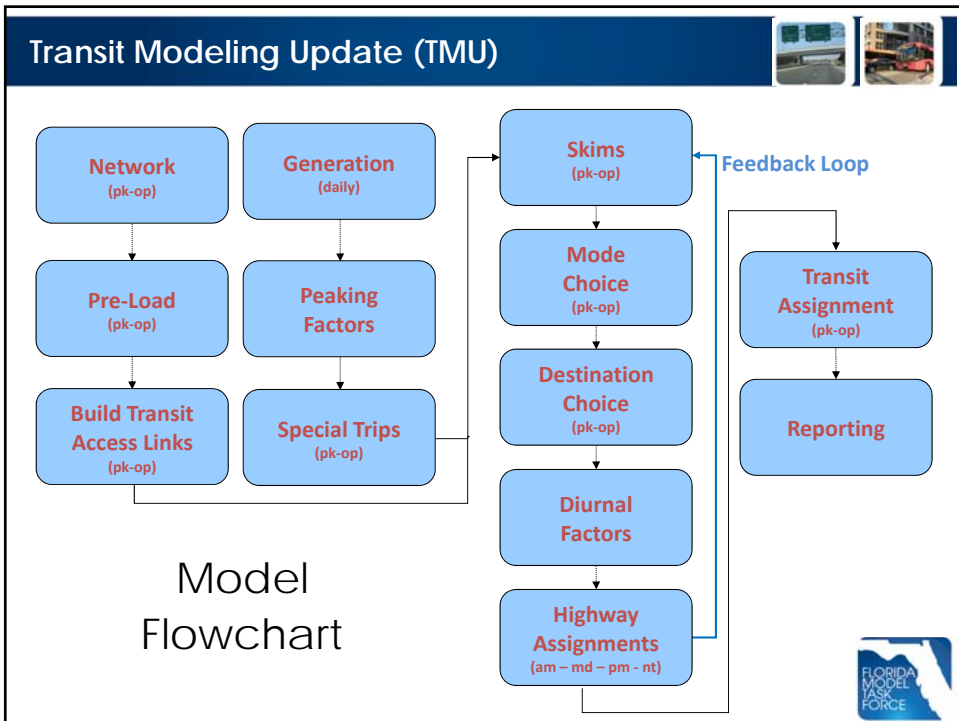


Transit Modeling Update (TMU)



Key Features

- New Trip Generation Rates and Purposes
- Peaking Factors split into peak and off-peak periods
- Mode Choice and Destination Choice (45 markets)
- Diurnal Factors split Highway Assignment into 4 periods
- A travel time Feedback Loop is included to account for the effects of congestion on Distribution and Mode Choice

Transit Modeling Update (TMU)

Trip Generation


New process, 2010 Census and 5-year ACS data

Table HBW Trip Production Rates

Household Income	Household Autos	Number of Workers in Household									
		Wrks0	Wrks1	Wrks2	Wrks3+						
\$0-\$24999		0.000	1.000	1.783	3.500						
\$25000-\$49999	Veh0	Table 1 Trip Attraction Rates									
\$50000-\$74999											
\$75000+											
\$0-\$24999											
\$25000-\$49999	Veh1	Trip Purpose	Industrial Employment		Service Employment		Commercial Employment		Households	School Enroll.	R ²
\$50000-\$74999		Coeff.	t-Stat	Coeff.	t-Stat	Coeff.	t-Stat	Coeff.	t-Stat		
\$75000+		HBW Inc1	0.0663	1.3	0.0910	7.4	0.2218	7.1			0.07
\$0-\$24999		HBW Inc2	0.4764	6.9	0.1943	11.5	0.3642	8.5			0.17
\$25000-\$49999	Veh2	HBW Inc3	0.1457	2.6	0.1932	14.3	0.2560	7.4			0.15
\$50000-\$74999		HBW Inc4	0.5202	7.9	0.4225	26.5	0.3132	7.7			0.35
\$75000+		HBSH					3.2805	56.0			0.37
\$0-\$24999		HBSR	0.1199	1.0	0.2359	8.0	0.6814	8.6	0.7368	35.5	0.42
\$25000-\$49999	Veh3+	HBO			0.4910	12.1	1.3213	12.9	1.1578	39.8	0.51
\$50000-\$74999		HBO								1.326	
\$75000+		HBSU								0.549	
\$0-\$24999		NHBW									0.45
\$25000-\$49999	NHBO									0.51	

Table HB College/University and HB School Trip Production Rates

Trip Purpose	Household Autos /Income	Household Size			
		Size1	Size2	Size3	Size4+
HB College/University	All	0.016	0.036	0.266	0.363
HB School	All	0.000	0.042	0.491	1.623



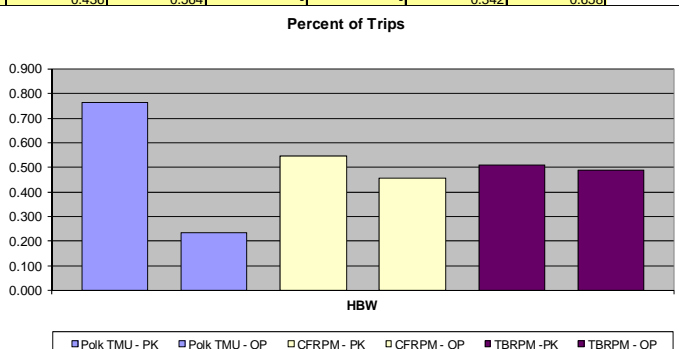

Transit Modeling Update (TMU)

Peak Factors


Use Peak / Off-Peak processes throughout the Model

	Polk TMU - PK	Polk TMU - OP	CFRPM - PK	CFRPM - OP	TBRPM - PK	TBRPM - OP
Time Period (AM, MD)	6:00 AM-9:00 AM	9:00 AM-3:00 PM	6:30 AM-9:00 AM	9:00 AM-3:30 PM	6:30 AM-9:00 AM	9:00 AM-3:30 PM
Time Period (PM, NT)	3:00 PM-7:00 PM	7:00 PM-6:00 AM	3:30 PM-6:30 PM	6:30 PM-6:30 AM	3:30 PM-6:30 PM	6:30 PM-6:30 AM
HBW	0.764	0.236	0.546	0.455	0.510	0.490
HBSH	0.409	0.591	0.282	0.718	0.263	0.737
HBSR	0.401	0.599	0.277	0.724	0.279	0.721
HBSU	0.816	0.184	-	-	0.582	0.418
HBO	0.565	0.435	0.452	0.548	0.408	0.592
NHBW	0.436	0.564	-	-	0.342	0.658
NHBO						
HBCU						

Percent of Trips

Transit Modeling Update (TMU)



Transit

Very similar to the "Tier A/B/C" methodology currently in use, but includes additional features:

- Use of REWALK for access-links
- Transit speeds are controlled by dwell at stops
- Change wait-time from 1/2 headway
- Use (new) recommended mode coefficients

- Mode Choice and Distribution (destination choice) have been revised to reflect detailed market segmentation

Calculate probabilities for:

HBW -- 7 markets

HBNW -- all trips

HBSH -- 7 markets

HBSR -- 7 markets


HBO -- 7 markets

NHBO -- all trips


HBW -- 7 markets

HBSC -- 4 markets

HBCU -- 4 markets




Transit Modeling Update (TMU)





Time-Of-Day Assignment

Diurnal Factors assign trips to time period "buckets"

TMU MODEL						
HBW_PA	HBW_AP	NHBW_PA	NHBW_AP	NHBO_PA	NHBO_AP	TIME
0.524	0.005	0.015	0.258	0.119	0.119	6:00AM-8:59AM
0.474	0.169	0.472	0.466	0.451	0.451	9:00AM-2:59PM
0.039	0.432	0.678	0.049	0.381	0.381	3:00PM-6:59PM
0.221	0.136	0.062	0.000	0.049	0.049	7:00PM-5:59AM
TBRTM						
HBW_PA	HBW_AP	NHBW_PA	NHBW_AP	NHBO_PA	NHBO_AP	TIME
0.491	0.028	0.336	0.048	0.177	0.177	6:00AM-8:59AM
0.261	0.327	0.297	0.328	0.421	0.421	9:00AM-2:59PM
0.030	0.451	0.262	0.354	0.323	0.323	3:00PM-6:59PM
0.184	0.228	0.096	0.279	0.080	0.080	7:00PM-5:59AM



Transit Modeling Update (TMU)

Feedback Loop

- **Feedback Loop Number = 1**
- START TRANSITMODEL Thu 05/02/2013 17:06:20.97
- START MODE CHOICE Thu 05/02/2013 17:07:15.45
- START DISTRIBUTION Thu 05/02/2013 17:19:44.19
- START HASSIGN Thu 05/02/2013 17:49:34.07
- AM percent time change 0.69542
- AM percent volume change 0.5959
- MD percent time change 0.3764
- MD percent volume change 0.28835
- **Feedback Loop Number = 2**
- START TRANSITMODEL Thu 05/02/2013 17:53:40.97
- START MODE CHOICE Thu 05/02/2013 17:54:34.31
- START DISTRIBUTION Thu 05/02/2013 18:07:39.58
- START HASSIGN Thu 05/02/2013 18:37:18.43
- AM percent time change 0.05759
- AM percent volume change 0.12637
- MD percent time change 0.03108
- MD percent volume change 0.07725
- **Feedback Loop Number = 3**
- START TRANSITMODEL Thu 05/02/2013 18:41:03.19
- START MODE CHOICE Thu 05/02/2013 18:41:57.27
- START DISTRIBUTION Thu 05/02/2013 18:54:53.13
- START HASSIGN Thu 05/02/2013 19:24:38.26
- ...
- CONVERGED Thu 05/02/2013 21:52:12.48
- START TASSIGN Thu 05/02/2013 21:52:20.85
- START REPORTS Thu 05/02/2013 21:52:35.42
- End Run Thu 05/02/2013 21:52:51.83
- The model ran for a total of: 290 Minutes (4 Hr 50 Min)

Skims
(pk-op)

↓

Mode
Choice
(pk-op)

↓


Destination
Choice
(pk-op)

↓



Diurnal
Factors

↓

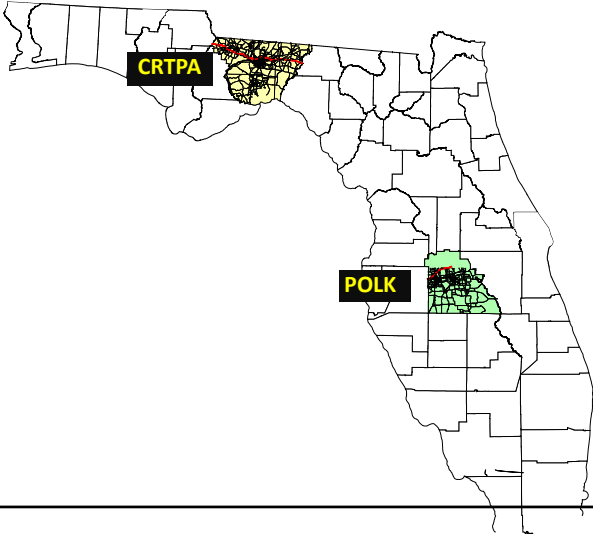
Highway
Assignments
(am - md - pm - nt)





Transit Modeling Update (TMU)

Polk Implementation









Transit Modeling Update (TMU) 

New Data Requirements

- Household Income
- Household Size
- Household Workers
- Auto Ownership
- University / College Students
- Peak Hour Traffic Counts
- Diurnal Factors
- Peak Hour Factors




Transit Modeling Update (TMU) 


Our Experience

- Added more error checking (out of range)
- Replaced hard-coded parameters with {keys}
- Revised some matrix calculations (autos > persons)
- Improved CLUSTER functionality
- Adjusted script to prevent "out of memory" errors
- Added reporting

- Timeframe for first run: 8 weeks



Transit Modeling Update (TMU)



"Out-of-the-Box" Summary


Reasonable Results and Run Times

C:\FSUTMS\Polk\R3\Base
 VOLUME AND COUNT SUMMARY BY SCREENLINE
 Total VOL= 9,552,803 CNT= 9,719,061 VOL/CNT= 0.98 N=1,083


Overall Summary

Total Number of Links:	8,132	
Total Centerline Miles:	2,611.75	
Total Lane Miles:	3,426.56	
Total Directional Miles:	2,654.00	
Total VMT using Volumes:	4,765,186	(Links With Counts)
Total VMT using Counts:	4,576,271	(Links With Counts)
Total VMT Volume over Counts:	1.04	(Links With Counts)
Total VHT using Volumes:	131,757	(Links With Counts)
Total VHT using Counts:	126,656	(Links With Counts)
Total VHT Volume over Counts:	1.04	(Links With Counts)
Total Volumes All Links:	53,000,190	
Total VMT All Links:	17,818,308	
Total VHT All Links:	517,371	
Original Speed (MPH):	35.49	
Congested Speed (MPH):	33.85	

=====
 End Run Tue 04/30/2013 17:02:51.03
 The model ran for a total of: 354 Minutes (5 Hr 54 Min)




Transit Modeling Update (TMU)




Potential Model Enhancements

- External Trips
 - Identify by trip type and occupancy
 - Split by trip purpose and trip length
- Special Trips
 - Airports
 - Theme Parks
 - Trucks
- Calibration Procedures
 - Mode Choice
 - Destination Choice



Transit Modeling Update (TMU)



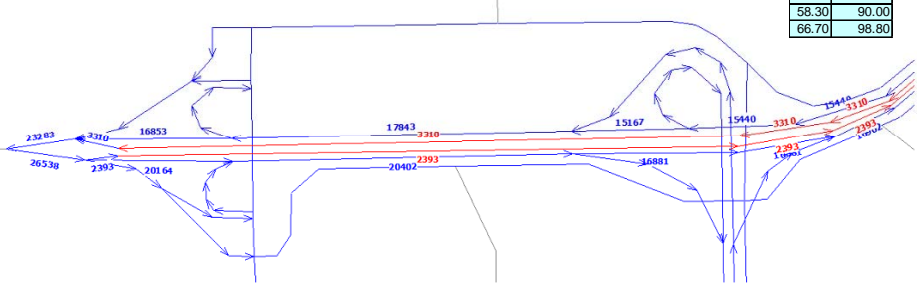

Managed Lanes Implementation

Incorporating the Phase 1 congestion pricing toll procedure in the Polk TMU


Preliminary results are encouraging

VC	TOLL	TOLL2
0.24	25	25
0.39	150	100
0.57	300	200
0.76	500	350
0.98	600	500
1.00	700	700

Willingness to Pay Curve	
COST	PCTWTP
0.00	5.00
8.00	20.00
10.00	25.00
16.30	40.00
20.00	48.00
23.70	55.00
31.40	65.00
41.70	75.00
51.80	85.00
58.30	90.00
66.70	98.80

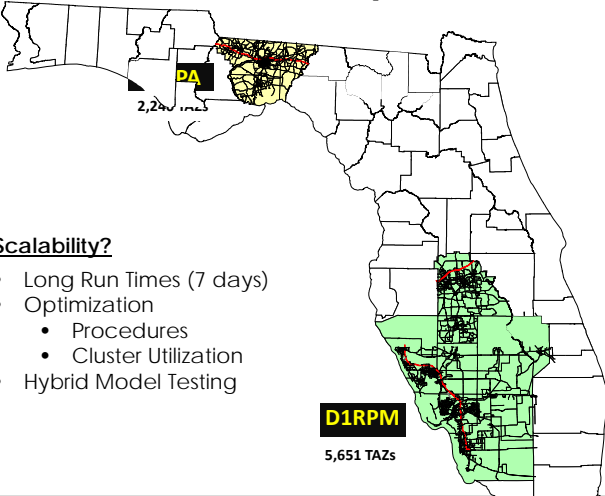
Transit Modeling Update (TMU)



D1RPM Implementation


Scalability?

- Long Run Times (7 days)
- Optimization
 - Procedures
 - Cluster Utilization
- Hybrid Model Testing



D1RPM

5,651 TAZs



Transit Modeling Update (TMU)



TMU Project Documents

- Trip Distribution Review and Recommended Improvements
- Trip Generation Review and Recommended Improvements
- Time of Day Stratification Review
- Mode Choice Review and Recommended Improvements
- Travel Time Feedback Review
- Reporting Functionality Recommendations
- Principles of Model Calibration & Validation
- User Benefit Guidelines and Procedures
- Quality Control Guidelines

Available for Download at FSUTMSONLINE.NET



Transit Modeling Update (TMU)



Q & A



Transit Ridership



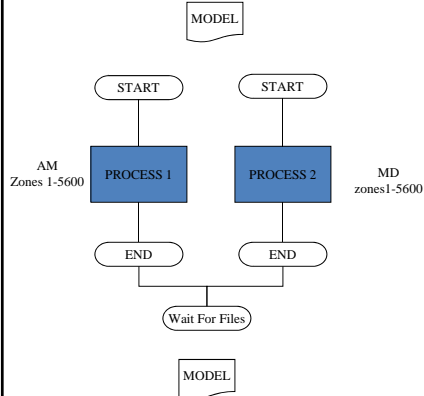
ESTIMATE OF AVERAGE WEEKDAY RIDERSHIP for 2007 BY ROUTE						
#	Route	Route Name	Ridership		TMU	
LAMTD	1	10	Shuttle	117	LAMTD 10	431.7
	2	11	E. Main/Corbee	256	LAMTD 11	462.9
	3	12	Lakeland/WinterHaven	247	LAMTD 12	355.6
	4	20	Grove Park/Crystal Lake	296	LAMTD 20	436
	5	21	Edgewood	106	LAMTD 21	742.7
	6	22X	Bartow Express to Lakeland	285	COUNTY 22XL	424.6
	7	30	Cleveland Heights	81	LAMTD 30	635.1
	8	31	S Florida Ave	545	LAMTD 31	2205.7
	9	32	Medulla Loop	16	LAMTD 32	155
	10	37	South	27	LAMTD 37	60.1
	11	40	Ariana/Beacon	68	LAMTD 40	581.8
	12	41	Central Ave	220	LAMTD 41	352.7
	13	42	W Memorial	414	LAMTD 42	1638.4
	14	50	Kathleen/Providence	190	LAMTD 50	1160.4
	15	51	N US98/Duff Rd	599	LAMTD 51	1930.9
	16	52	N Florida Ave	513	LAMTD 52	771.8
	17	53	Lakeside Village	32	LAMTD 53	475.3
	18	56	Kathleen/Mail Hill Rd	170	LAMTD 56	334
	19	57	Kidron/Fightline	88	LAMTD 57	223.1
			Subtotal	4,270	Subtotal	13,378
WHAT	1	10	Northside	232	WHAT 10	88.6
	2	12	Lakeland/WinterHaven	269	WHAT 12	355.6
	3	15	Haines City	101	WHAT 15	59.3
	4	20	PCC/Hospital	57	WHAT 20	233.2
	5	22x	Bartow Express to Winter Haven	170	COUNTY 22XWH	97.7
	6	30	Eagle Ridge/Winter Haven	305	WHAT 30	895.8
	7	40	Southside	179	WHAT 40	738.7
	8	44	Southwest	167	WHAT 44	161.3
	9	50	Westside	119	WHAT 50	286.8
			Subtotal	1,599	Subtotal	2,917
Polk County	1	25	Bartow/Fort Meade	81	COUNTY 25a	33.5
	2	35	Frostproof to Eagle Ridge Mall	111	COUNTY 25b	6.8
					COUNTY 35	19.5
			Subtotal	192	Subtotal	60
			Total	6,061	Total	16,355



Run Optimization

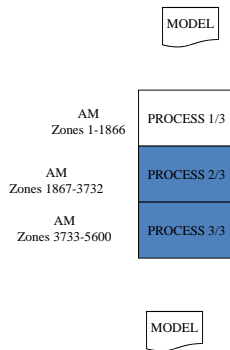


Distribute **MULTI** step
HASSIGN example



- Parallel Processing
- Manually Set-up for # of Cores
- Must use when summary stats needed
- Disadvantage if one process is longer than the other

Distribute **INTRA** step
HASSIGN example



- Parallel Processing
- Automatically Scales for # of Cores
- 10% time savings
- Cannot be used for summary stats



