



ADVANCED TOLL MODELING



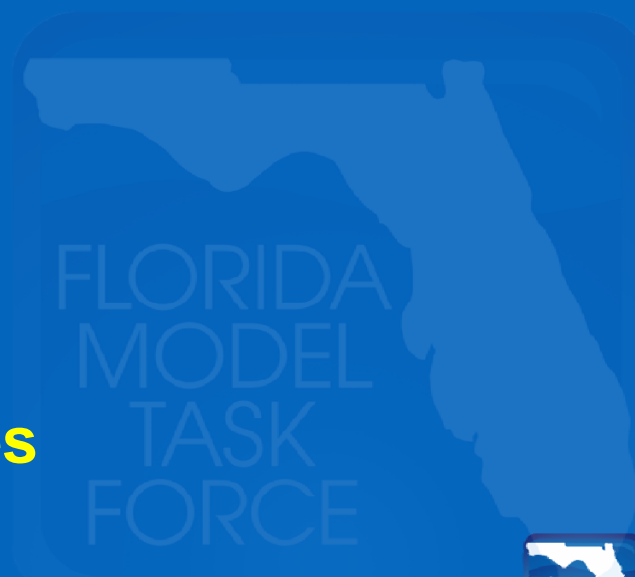
Presented To:

**Model Task Force Meeting
Orlando, Florida**

Presented By:

**Jim Fennessy
Fennessy Associates**

May 25, 2010





Advanced Toll Modeling

- **MTF Priorities Survey**

- 1. Time-of-Day Modeling**

- 2. Land Use Interfaces**

- 3. Advanced Toll Modeling**


- **Florida Turnpike Features since the Toll Facilities Model (since 1998)**



Advanced Toll Modeling



- **History and Development**
- **Application at Florida's Turnpike**
 - **Technology Advances**
 - **Alternate Tolling Strategies**
- **Cube-FSUTMS Application**



Development History of Toll Modeling

- CTOLL
- UTPS -- UROAD
- Toll Facilities Model
- Other Miscellaneous Toll Modeling Developments
- Ramp-to-Ramp Toll Modeling



CTOLL

- Conversion of cost to time based upon average income in study area
- Equilibrium highway load parameter: ranges from 0.02 (income = \$100k) to 0.10 (income = \$20k)
- $CTOLL = 1.0 / (Rate * A)$

Where:

Rate = Average Wage Rate for Study Area

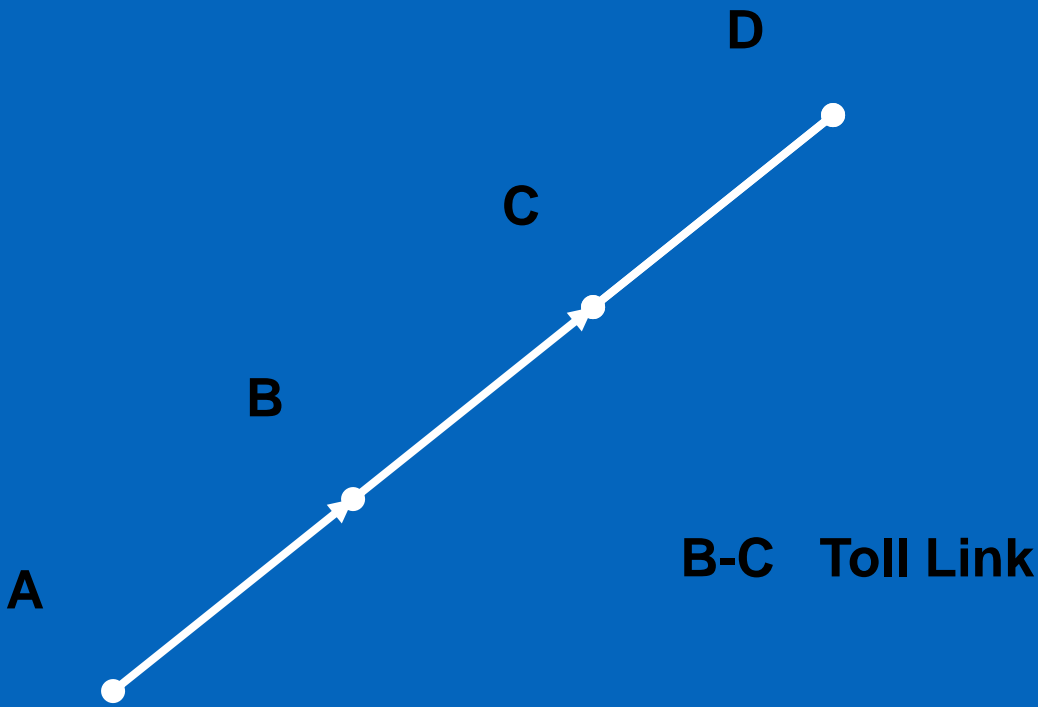


UTPS – UROAD Toll Representation

- Up to 20 toll categories
- Coded in the TRANPLAN cost field
- TOLLS – toll in dollars for each category (converted to time via CTOLL)
- SERVTIME – service time in minutes
- Toll links should be coded with zero distance on links to turn off capacity restraint calculation



UTPS – UROAD Link Representation



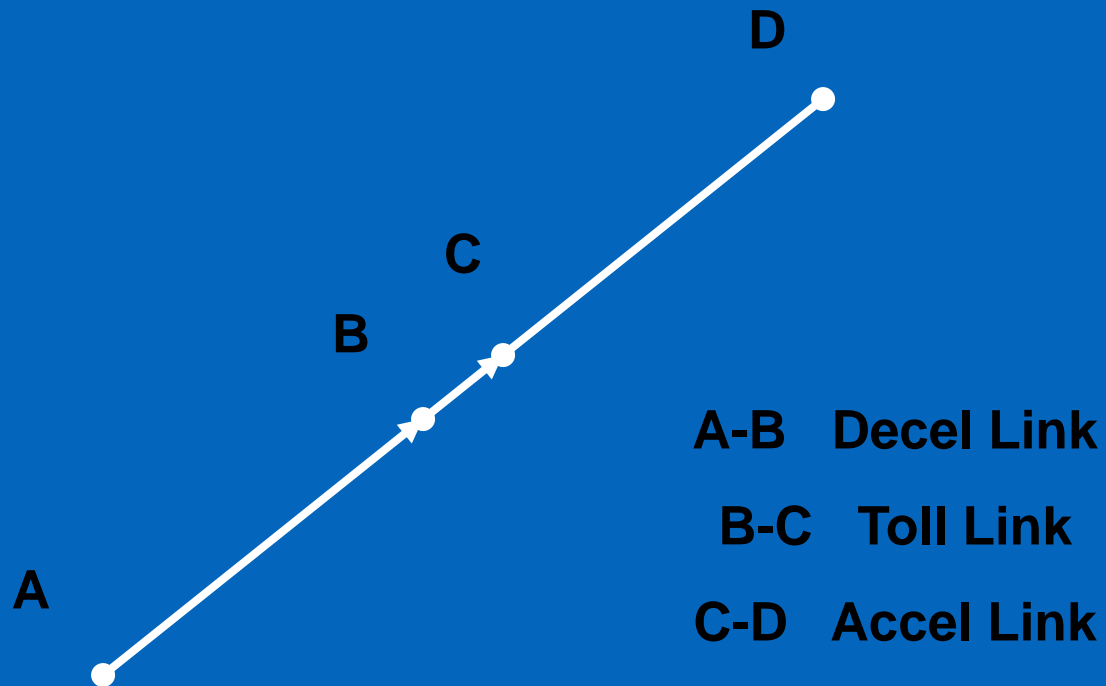


Toll Facilities Model

- **Current FSUTMS Toll Model**
- **TOLL DATA file**
 - **CTOLL (overrides any parameter)**
 - **A-NODE and B-NODE**
 - **Toll in dollars**
 - **Service time in minutes : seconds**
 - **Toll facility identification**
 - **Number of lanes**
 - **Toll type ramp (no accel/decel) or barrier**

TOLL FACILITIES MODEL

Link Representation





Advanced Toll Modeling Developments

- Open Road Tolling (TOLDATA file additional fields)
- Hot-Lane (Value Pricing) Tolls
- Distance-Based Tolls
- **Discrete Tolls – Toll based upon the number of toll facilities crossed**
- **Congestion-Pricing Tolls**
- **Ramp-to-Ramp**



Project Team



- **Jim Fennessy, Fennessy Associates**
- **Wilbur Smith Associates**
- **Central Office Staff**



CUBE Application



- Identification of Pertinent Advanced Features
- Features Currently in CUBE
- Verification of CUBE and TRANPLAN Features



CUBE Application Features Currently in CUBE

- Review Current CUBE Documentation
- Undocumented Features About to be Released
- Discussions with Citilabs



CUBE Application CUBE and TRANPLAN Verification

- Recognize the Inherent Differences in the Equilibrium Assignments
- Rigorous Testing of the Selected Toll Features utilizing TRANPLAN as a Benchmark
- Ensure Adequate Reporting Capabilities

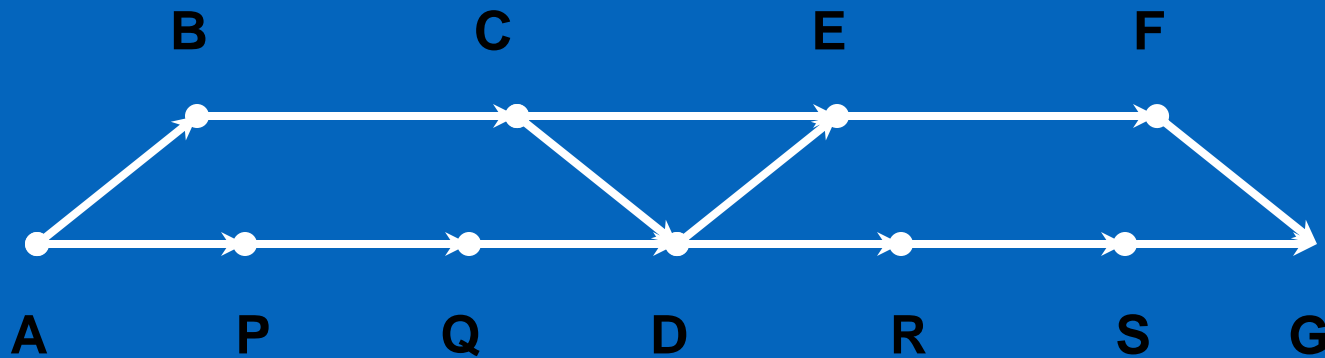


Ramp-to-Ramp Toll Modeling

- Latest Toll Collection Methods
 - Ramp-to-Ramp (Card System)
 - Barrier
 - Electronic Tolling (SunPass)
 - Discount Pricing (Discrete Tolling)
 - Open Road Tolling
 - Variable Pricing (HOT-Lanes)
- Flexible for all cases
- Software Modifications

Ramp-to-Ramp Toll Modeling

Software Problem:



Toll Pathing :

A B C D + 50
D E F G + 75
A B C E F G + 125



Ramp-to-Ramp Toll Modeling

Software Solutions:

- Network Restructure
- Pseudo Links
 - Turn Prohibitors / Penalties
 - Selected Links
- Pseudo to Real Links
- Assignment by Iteration
- Output File – Real Links



Ramp-to-Ramp Toll Modeling

Software Output :

- Ramp-to-Ramp Detail Report
 - Volumes
 - Estimated Revenue
 - Ramp ID's
- Company Summary
- DBF Output for Other Software Interfaces



Ramp-to-Ramp Toll Modeling



SUB-TASKS:

- Software developed to convert TRANPLAN ramp-to-ramp inputs to DBF files for CUBE Voyager processing
- DBF files input to CUBE Voyager for ramp-to-ramp processing
- Several model runs with selected toll facilities



Ramp-to-Ramp Toll Modeling

CUBE Voyager Tests:

- Basic tests virtually replicate TRANPLAN
- Turn prohibitors OK
- Selected links OK

Problems

- Certain ramp-to-ramp configurations not handled
- Detailed and Summary reports not available

Ramp-to-Ramp Toll Modeling

Ramp-to-Ramp Detail Report

RAMP-RAMP TOLL DETAIL REPORT -- Mode = 1 -- Company Number: 11 -- Company Name: Veterans Exwy

----- Ramp-to-Ramp Identification -----		Toll (\$)	Dist. (Miles)	Volume	Rev. (\$)	From Ramp	To Ramp
Veterans Exwy SB On at Suncoast	-to- Veterans Exwy SB Off at SR 60	1.75	11.5	11353	19868	15567-15557	15468-15425
	-to- Veterans Exwy SB Off at Memorial	1.75	11.1	95	166		15468-15436
	-to- Veterans Exwy SB Off at Hillsboroug	1.75	10.2	3762	6584		15521-15469
	-to- Veterans Exwy SB Off at Waters	1.75	8.2	7827	13697		15576-15569
	-to- Veterans Exwy SB Off at Wilsky	1.25	6.3	441	551		15093-15065
	-to- Veterans Exwy SB Off at Gunn	1.00	4.5	997	997		15081-15050
	-to- Veterans Exwy SB Off at Ehrlich	0.75	3.6	2374	1781		15193-15162
-to- Veterans Exwy SB Off at Hutchison	0.50	1.6	3777	1889		15700-15653	
Veterans Exwy SB On at Dale Mabry	-to- Veterans Exwy SB Off at SR 60	1.75	14.4	745	1304	16755-16563	15468-15425
	-to- Veterans Exwy SB Off at Memorial	1.75	13.9	20	35		15468-15436
	-to- Veterans Exwy SB Off at Hillsboroug	1.75	13.0	400	700		15521-15469
	-to- Veterans Exwy SB Off at Waters	1.75	11.0	1601	2802		15576-15569
	-to- Veterans Exwy SB Off at Wilsky	1.25	9.2	112	140		15093-15065
	-to- Veterans Exwy SB Off at Gunn	1.00	7.4	634	634		15081-15050
	-to- Veterans Exwy SB Off at Ehrlich	0.75	6.5	2419	1814		15193-15162
-to- Veterans Exwy SB Off at Hutchison	0.50	4.5	1243	622		15700-15653	
Company Totals				169618*****			

Ramp-to-Ramp Toll Modeling

Company Summary Report

RAMP-RAMP TOLL SUMMARY REPORT:

Company Number	Company Name	Volume	Revenue (\$)
7	Sunshine Skwy BR	73997	73997.
17	St. Johns Ferry	22963	74630.
12	Suncoast Pky	119374	97214.
42	Suncoast Pky 2	46591	43054.
29	Tpk NorthCoin Sys	318830	409126.
31	Tpk SouthCoin Sys	471758	561620.
28	Tpk SouthConn Ext	50633	28874.
30	Tpk Ticket Sys	214306	699633.
8	Treasure Is BR	8964	4482.
35	Venetian Causeway BR	13442	10082.
11	Veterans Exwy	168637	178632.
Total -- All Companies		6148844	5472082.



OTHER PROJECT TOLLING

- **OPEN ROAD TOLLING**
- **HOT LANE (VALUE PRICING)**
- **DISTANCED-BASED TOLLS**



OPEN ROAD TOLLING

CUBE Voyager Tests:

- **Voyager scripts developed with Toll Facilities Model with the only impedance on the toll facilities being a function of the toll and not related to delays**

Problems

- **Non identified – testing still underway**



HOT LANE (VALUE PRICING) TOLLS

CUBE Voyager Tests:

- **Voyager scripts developed with Toll Facilities Model with the impedances being a function of the toll, service time, queuing and accel/decel delays by trip mode**

Problems

- **Non identified – testing still underway**



DISTANCE-BASED TOLLS

CUBE Voyager Tests:

- **Voyager scripts developed with Toll Facilities Model with the impedances being a function of the toll (based upon the distance travelled on the toll facility), service time, queuing and accel/decel delays by trip mode**

Problems

- **Non identified – testing still underway**



Tasks to Complete

RAMP-TO-RAMP

- **Certain ramp-to-ramp configurations not handled**
- **Detailed and Summary reports needed**
- **Improved Voyager documentation**

Task Assignments

- **Fennessy Associates**
- **Citilabs**



Tasks to Complete

OPEN ROAD TOLLING

- Verify network inputs to the path builders and assignment algorithms
- Compare assignment outputs for “reasonableness”

Task Assignments

- Fennessy Associates
- Wilbur Smith Associates
- Central Office Staff



Tasks to Complete

HOT LANE (VALUE PRICING)

- Verify network inputs to the path builders and assignment algorithms
- Compare assignment outputs for “reasonableness”

Task Assignments

- Fennessy Associates
- Wilbur Smith Associates
- Central Office Staff



Tasks to Complete

DISTANCE-BASED TOLLS

- Create Voyager script with Toll Facilities Model for distance based tolls
- Verify network inputs to the path builders and assignment algorithms
- Compare assignment outputs for “reasonableness”

Task Assignments

- Fennessy Associates
- Wilbur Smith Associates
- Central Office Staff



Tasks to Complete

FINAL REPORT

- Detailed and summary analyses of the testing between the two software packages
- Determination of needs to be referred to Citilabs – software modifications and documentation
- Listings of TRANPLAN and CUBE Voyager scripts

Task Assignments

- Fennessy Associates
- Wilbur Smith Associates
- Central Office Staff



ADVANCED TOLL MODELLING



- Questions / Comments?



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