Connected Vehicles & Ridesource Trips in the D1RPM

presented by
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12/6/2016
CV in the D1RPM

- An Update to the D1 Model

A model process to:

- Identify CV trips
- Estimate CV effects on capacity
CV in the D1RPM

Network

- Capacity changes based on user selected Saturation Rate
- Increased Capacity up to 2x
- Optional CV only lanes on interstate

Trip Generation

- Number of CV trips, from each by TAZ, weighted by Household Income, Autos, Saturation Rate
- All trips will be split into an CV and non-CV, separate implementation for trucks
## CV SATURATION rate Lookup Table

<table>
<thead>
<tr>
<th>SAT</th>
<th>FT10</th>
<th>FT20</th>
<th>FT30</th>
<th>FT40</th>
<th>FT50</th>
<th>FT60</th>
<th>FT70</th>
<th>FT80</th>
<th>FT90</th>
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<td>1</td>
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</tr>
<tr>
<td>10</td>
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<td>1</td>
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<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>20</td>
<td>1.03</td>
<td>1.01</td>
<td>1</td>
<td>1</td>
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<td>1</td>
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<td>1</td>
<td>1.03</td>
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<tr>
<td>30</td>
<td>1.1</td>
<td>1.02</td>
<td>1.01</td>
<td>1</td>
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<td>1.02</td>
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<td>1.1</td>
</tr>
<tr>
<td>40</td>
<td>1.2</td>
<td>1.05</td>
<td>1.02</td>
<td>1.01</td>
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<td>1.05</td>
<td>1</td>
<td>1</td>
<td>1.2</td>
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<tr>
<td>50</td>
<td>1.25</td>
<td>1.09</td>
<td>1.03</td>
<td>1.02</td>
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<td>1.09</td>
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<td>1</td>
<td>1.25</td>
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<tr>
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<td>1.33</td>
<td>1.15</td>
<td>1.04</td>
<td>1.03</td>
<td>1</td>
<td>1.15</td>
<td>1</td>
<td>1</td>
<td>1.33</td>
</tr>
<tr>
<td>70</td>
<td>1.6</td>
<td>1.23</td>
<td>1.07</td>
<td>1.04</td>
<td>1</td>
<td>1.23</td>
<td>1</td>
<td>1</td>
<td>1.6</td>
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<tr>
<td>80</td>
<td>1.75</td>
<td>1.3</td>
<td>1.15</td>
<td>1.09</td>
<td>1</td>
<td>1.3</td>
<td>1</td>
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<td>1.5</td>
<td>1.3</td>
<td>1.15</td>
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<td>1</td>
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<td>2</td>
<td>1.5</td>
<td>1.3</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
RS in the D1RPM

A model process to:

- Identify RS trips
- Determine RS effects
RS in the D1RPM

- Include
  - vehicle trips (RS and Non-RS)
  - transit trips (access & egress)
  - as a trip purpose (assignment)

- Design for “what if…”
  - Zero means Zero (0 = adopted model)
  - 100% user choice
RS in the D1RPM

Hot Spots (according to UBER -- am peak)

* other data… airports, ridesource trip lengths
Trip Generation

- Additional SE data allows model to pick RS areas for consideration
- User designated Service Areas
- Based on Population-Employment Density and Saturation Rate
**Journey to Work**

<table>
<thead>
<tr>
<th>Florida</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Car, truck, or van - drove alone:</td>
<td>7,075,864</td>
<td>79.7%</td>
</tr>
<tr>
<td>Car, truck, or van - carpooled:</td>
<td>794,711</td>
<td>8.9%</td>
</tr>
<tr>
<td>Public transportation (excluding taxicab):</td>
<td>195,638</td>
<td>2.2%</td>
</tr>
<tr>
<td>Walk</td>
<td>126,149</td>
<td>1.4%</td>
</tr>
<tr>
<td>Bike</td>
<td>97,681</td>
<td>1.1%</td>
</tr>
<tr>
<td>Taxicab, motorcycle, or other means:</td>
<td>96,752</td>
<td>1.1%</td>
</tr>
<tr>
<td>Worked at home</td>
<td>493,307</td>
<td>5.6%</td>
</tr>
<tr>
<td>Total</td>
<td>8,880,102</td>
<td></td>
</tr>
</tbody>
</table>

Source: U.S. Census Bureau, 2015 American Community Survey 1-Year Estimates
Mode

- Modes: User selectable percentages
- Transit Access: PNR, KNR, RS
- Transit Egress: (later)
RS in the D1RPM

Hot Spots (D1RPM model -- am peak)
Seven RS Areas were Pre-selected at “qualified” in the Model
RS in the D1RPM

Hot Spots (model and uber -- am peak)
RS in the D1RPM

The Model:

SPECIAL USE LANES
- Managed Lanes on I-4
- Managed Lanes on I-75 (Manatee-Sarasota)
- Managed Lanes on I-75 south (Lee-Collier)
- Managed Lanes CV Only

RS CV AV Options
- CV saturation rate AUTOS (%): 0.4
- CV saturation rate TRUCKS (%): 0
- Percent of trips to add for driverless AV ‘roaming’ to next trip: 0
- RS saturation rate AUTOS (%): 0.15
- RS saturation rate TRANSIT access (%): 0.05
- Percent of trips to add for vehicles ‘roaming’ to next lane, or returning to the airport: 0.5

Min Density for Ridesourced Trips: 4500

MODEL OPTIONS
- Florida’s normal unemployment rate (base year): 0.0418
- Alternative year unemployment rate: 0.05
- Alternative Letter: A
- Model Type: 40
- Description: 2040 LRTP CF – with Ridesourced trips and ML (es toll lanes) on I-4

Total number of internal zones:
- Total number of all zones (including externals):
- Minimum Network non-Zone Node Number:
- Which penalty set do you wish to use with this scenario?

SELECT LINK or NODE
- Check box for selectLink or selectNode analysis

Select1
- Select2
- Select3

CORRIDOR REPORTING
- Name of 1st Corridor/Roadway: CR 865

Special Use Lanes
RS in the D1RPM

Adds complexity

(revised)
RS in the D1RPM

• Existing Reporting

<table>
<thead>
<tr>
<th>D1RPM MODEL AREA</th>
<th>D1RPM MODEL AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>CF_40A</td>
<td>ML_40A</td>
</tr>
<tr>
<td>Note: 2040 LRTP CF ALT8</td>
<td>Note: ML on I-4 and I-75 RS &amp; AV Saturation Rate 40%</td>
</tr>
<tr>
<td>Total Number of Links: 46,483</td>
<td>Total Number of Links: 46,798</td>
</tr>
<tr>
<td>Total Centerline Miles: 11,471</td>
<td>Total Centerline Miles: 11,546</td>
</tr>
<tr>
<td>Total Lane Miles: 19,005</td>
<td>Total Lane Miles: 19,302</td>
</tr>
<tr>
<td>Total Directional Miles: 13,657</td>
<td>Total Directional Miles: 13,806</td>
</tr>
<tr>
<td>Total Volumes All Links: 401,870,968</td>
<td>Total Volumes All Links: 579,274,687</td>
</tr>
<tr>
<td>Total VMT All Links: 107,399,729</td>
<td>Total VMT All Links: 181,327,500</td>
</tr>
<tr>
<td>Total VHT All Links: 3,090,850</td>
<td>Total VHT All Links: 6,456,599</td>
</tr>
<tr>
<td>Original Speed (MPH): 36.79</td>
<td>Original Speed (MPH): 37.06</td>
</tr>
<tr>
<td>Congested Speed (MPH): 35.38</td>
<td>Congested Speed (MPH): 40.55</td>
</tr>
</tbody>
</table>

• Need New Reports

FSUMTS Model Run - YR2010.YR2040.YR2040_40pcnt
Input Directory ...\D1RPM-cvrsX\YR2010\YR2040\YR2040_40pcnt\input
Begin Run, 2016-11-18 03:11:53.54

CV_SATURATION AUTO #0.4
CV_SATURATION TRANSIT 0
RS_SATURATION AUTO #0.15
RS_TRANSIT TRANSIT #0.05

1 Ft. Myers = 11,953
2 Naples = 12,133
3 Sarasota/Bradenton = 5,256
4 Lakeland = 28,962
5 Winter Haven = 5,004
6 Venice = 6,459
7 Punta Gorda = 4,257
8 All Areas = 74,084

FSUMTS Model Run - YR2010.YR2040.YR2040_40pcnt
Input Directory ...\D1RPM-cvrsX\YR2010\YR2040\YR2040_40pcnt\input
Begin Run, 2016-11-18 13:11:54.55

CV_SATURATION AUTO #0.4
CV_SATURATION TRANSIT 0
RS_SATURATION AUTO #0.15
RS_TRANSIT TRANSIT #0.05

DA = 256,534,528 0.420
DAV = 219,347,887 0.389
SR = 50,808,613 0.084
SRAV = 43,956,730 0.072
subtotal = 370,687,758 0.984

TRK = 40,221,040 0.066
HT = 6,975,855 0.011
subtotal = 47,196,898 0.077

ATR = 2,279,444 0.004
RS = 1,904,351 0.003
• “What if” models need **built-in** comparisons
  – Something more than COMPNET
  – Perhaps some FITSEVAL style evaluations
The same process could be used for other ‘modes’

Bicycle / Walk Friendly Communities

Areas favorable to bike/ped
Benefits

• Based on Adopted Model, (about the same run time)

• Easy selection of future year options (special use lanes, vars)

• We can say: ‘our model can address that…’

• Users can “twist the knobs” for what-if analysis

• Includes Autos, Trucks, Taxi, Line-haul Bus

• Easy to incorporate other variables
  – SE data
  – Lookup Tables
Discussion...

- Lack of ‘real world’ data
  - Common for ‘future year’ models
  - Borrow parameters from elsewhere
  - New data becoming available
    - market penetration adoption rates
    - effects of CV on capacity

- Some parameters may require mode recalibration
  - included, but adds significant run-time.

- Should we even allow users to “twist the knobs”
  - Nonsense results
  - Guidance required

- How to Resolve Multiple Model Results?
  - Poor History for multiple land use scenario’s
  - Policy changes – Technological changes may invalidate assumptions.
Questions…
What are we talking about?

Saving Lives

Quality of Life
What are we talking about?

Cars of the Future are loaded with features
Network

- Capacity changes based on user selected *Saturation Rate*
- Increased Capacity up to 2x for Designated Lanes

V2V – vehicle to vehicle

V2I – vehicle to infrastructure
Trips

- Number of CV trips, from each by TAZ, weighted by Household Income, Autos, *Saturation Rate*
- All vehicle trips are split into an CV and non-CV

Lookup Tables: