Transportation Modeling Forum

June 10, 2015
Forum Agenda

- Network Maintenance
- Dynamic Traffic Assignment
- ABM / Active Transportation Model Update
Network Maintenance

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Network Maintenance

- **TCOV:** The master GIS network layer
  - Current and future technology
  - Related geographies

- **Network editing**
  - Geometrics
  - Attributes
  - Transit

- **Project control:** Extract, Transfer and Load

- **Network review**
Network Maintenance

- **GIS technology**
  - Existing system uses ArcINFO
  - Upgrade to ArcGIS on-hold

- **Related geographies**
  - Parcels
  - Master Geographic Reference Areas (MGRA)
  - Traffic Analysis Zones (TAZ)
  - Jurisdictions and Districts
  - Census Blocks and Tracts
Network Maintenance

- **Geographic dimensions**
  - 45,000+ links
  - 23,002 MGRAs
  - 4,996 TAZs
  - 12 External cordon zones
  - 10 Network facility types
  - 2,500 Transit Access Points (TAPs)
  - 7 Transit modes
  - 3 Transit access modes
  - 3 Truck classes
Network Maintenance

- **Network features**
  - Original source: SanGIS *roadg* layer
    - Grade separated facilities had to be ‘unsplit’
    - Aerial imagery used for alignments and newly constructed roadways
    - Future planned roads added via General Plans
  - TCOV attributes
    - Bi-directional link attributes
    - Node attributes
    - Linear referencing
    - Link costs
    - Project phasing and control
    - Turn prohibitions
Network Maintenance

**Link attributes**
- Functional classification
- Posted speed limit
- Mid-block lanes
- Intersection approach lanes
- Intersection control type
- Median type
- Link operation type
- Tolls
- 1-way vs 2-way

**Node attributes**
- Intersection control type
- Z-Coordinates
Network Maintenance

- Custom network editing menu system
Network Maintenance

- Intersection approaches
Network Maintenance

- Intersection controls

- Ramp Meter
- Traffic Signal
- Rail Crossing
- All-way Stop
- Two-way Stop
Network Maintenance

- **Turn prohibitors**
  - Adheres to signage
  - Prevents unrealistic movements around the network
Network Maintenance

- **Transit network**
  - Linear Referencing System (Dynamic Segmentation) used to code routes on top of highway network links

- **Transit modes**

- **Transit network editing**

- **Transit routes, schedules and stations**
Transit Ride Modes

- Commuter / High Speed Rail
- Light Rail / Streetcar
- Freeway Rapid
- Arterial Rapid
- Premium Express
- Express
- Local
Route 929 – 2010 Configuration
Stop Coding
Other Network Edits

- Park and Ride Lots
- Station Elevation
- Walk Barriers/Walkable Areas (4 Step)
- Walk Network (ABM)
- Fares/COASTER Fare Zones
Transit Network Build

- Transit network control by “Headways” file
  - Grouping routes into a common year/scenario
  - Headways file tells the transit network build program which routes, configurations, and frequencies to use
Highway Network Maintenance

- **Project control**
  - Grouping links in a common project
  - External project list treats each project like a light switch

- **Row** = Project
- **Column** = Network Scenario

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<td>I5/I8 IC, Rosecrans St off ramp</td>
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Network Maintenance

- Project control
  - Used for nodes and links
  - Used to add, delete, or upgrade projects
Network Maintenance

- Project control
  - Link and node project phasing
Network Maintenance

- **Project control: Extract, Transfer and Load**
  - TCOV includes 20+ years of actual and machinated link-level projects
  - Post-editing scripts
    - *Postarc* processed edits made in TCOV
    - *Tchc* extracts links defined by the project list into a HWYCOV2
    - *Tctr* extracts transit routes defined by headways into a TRCOV

Work performed in a ‘covs’ folder with all GIS layers  Work performed in a specific model scenario folder
Network Maintenance

- Local jurisdiction network review
  - Current and future-year networks are reviewed to ensure consistency with Circulation Elements
Network Maintenance

- Network Segway

Regional MACRO Network → Regional DTA Network

Link/Node-Based Network → Lane/Trajectory-Based Network
DYNAMIC TRAFFIC ASSIGNMENT

RICK CURRY

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Project Introduction

• Develop Region-Wide DTA Model for San Diego
• Integrate DTA Model with the SANDAG ABM
• Desired Outcome:
  – Analysis of projects that improve system efficiency
Why DTA-ABM Integration

- Congestion Duration
- Dynamic Tolling
- Travel Time Reliability
- Refined Speeds for Air Quality
- Finer Time Period Resolution for the ABM Choice models
- Launching Point for New ICM Corridors
DTA-ABM Interface

• General Framework

- SANDAG GIS DATABASE (TCOV)
  - Activity Based Model (CT-RAMP)
  - Dynamic Traffic Assignment (Aimsun)
GIS Network Database

• TCOV Master Network Framework
  – Road & transit network data
  – Contains all future project phasing
• Goal: Support Meso and Macro Networks in 1 GIS Database
Challenges with Existing Structure

• Network Attributes Configured for Macroscopic Assignment
  – Missing minor intersection approaches
  – Missing intersection details:
    • U-turns
    • Turn bay lengths
    • Number of turn bays
    • No turn on red signage
  – Controller IDs and signal timing details
  – 3,600+ signalized intersections
Existing Network Structure

Current GIS Network

Actual Geometry
Updated Network Structure

Updated Network

Actual Geometry
Network Database

- DTA Network Generation Framework

- GIS Network (TCOV)
  - Shape File
  - Aimsun Network Import
  - Updated GIS attributes
  - Aimsun Network Calibration
Data Interfaces

Integrated Corridor Management System
- RAMS
- RMIS
- CPS
  - Manual Signal Parameters

SANDAG GIS (TCOV)
- Node and Links
- Transit Routes
- Traffic Counts
- Historical Travel Times

Aimsun Network
## Network Update Fields

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<thead>
<tr>
<th>Item</th>
<th>Task</th>
<th>Data Entry</th>
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<tbody>
<tr>
<td>Mid-block lanes</td>
<td>Review</td>
<td>Aimsun (if fix is needed)</td>
</tr>
<tr>
<td>Thru, left, right bays</td>
<td>Review</td>
<td>Aimsun (if fix is needed)</td>
</tr>
<tr>
<td>Shared TLR, TL, TR, LR</td>
<td>Review / Collect</td>
<td>Aimsun (if fix is needed)</td>
</tr>
<tr>
<td>Right and left bay lengths</td>
<td>Collect</td>
<td>Aimsun</td>
</tr>
<tr>
<td>U-turns</td>
<td>Collect</td>
<td>Aimsun</td>
</tr>
<tr>
<td>No turn on red</td>
<td>Collect</td>
<td>Aimsun</td>
</tr>
<tr>
<td>Transit queue jumps</td>
<td>Collect</td>
<td>Excel</td>
</tr>
<tr>
<td>Lane usage restrictions (time)</td>
<td>Collect</td>
<td>Excel</td>
</tr>
</tbody>
</table>
Importation Process

• Exportation from ArcINFO Coverage to Shapefile
  - Adds QuicNet signal controller IDs
  - Creates MGRA (MAZ) to network nodes correspondence

TAZ (4,996 Centroids)  MGRA (23,002 Centroids)
Importation Process

• Importation to Aimsun Using Python Scripts
  − Node names
  − Time of day (TOD) lane closures and configurations
  − HOV/Truck/Transit links and prohibitions
  − Auxiliary lanes
Importation Process

• Importation to Aimsun Using Python Scripts
  – Transit details
  – TOD tolling details
  – Turn bays and ramps
Importation Process

• Importation to Aimsun Using Python Scripts
  – Intersection controls
    • Signal timing/phases
  – ABM demand data
Calibration Parameters

- Parameters Stored Such As
  - Look-ahead distance
  - Give way time factor
  - Visibility distance

Sample Aimsun Parameters
Next Steps/Challenges

• Existing Signal timing data
  – Only 70% of data in standardized format
  – Large amount of data in pdf or doc format needs conversion to standardized database
  – NEMA approach phasing import data needed
What do we want to test??

- Future Projects
  - ITS/System management applications
  - Signal timing
  - Transit improvements/projects
Project Team

• DTA Project Team
  – Rick Curry, SANDAG rick.curry@sandag.org
  – Mike Calandra, SANDAG mca@sandag.org
  – Pascal Volet, Parsons Brinckerhoff volet@pbworld.com
  – Matthew Juckes, TSS-Transport Simulation Systems, Inc. matthew.juckes@aimsun.com
ABM / Active Transportation Model Update

Wu Sun

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**Status & Timeline**

### Development
- ABM Development
  - 01/2009 - 01/2013

### Transition
- FY13-14
  - 06/2014
- AT Phase 1
  - DB & Reporting
  - RTP applications

### Application
- FY15
  - 06/2015
- SHRP2-Toll/MLs
- AT Phase 2
- Military Bases
- Demand Side Improvement
- Workflow improvement

### PopSyn III
- Documentation
Military Trip Modeling Improvement

- Military base traffic counts:
  - Locations
  - 10 military bases
  - 48 gates
  - Radar and manual counts

- Model improvements

- Calibrations and validations
Population Synthesizer III

- **Features:**
  - Improved algorithm with relaxed target balancing.
  - Allows multiple level of geography
  - Customized to fit SANDAG ABM database

- **Results:**
  - Hits population and household targets better than PopSyn II
Documentation Update

- **Goals:**
  - Update changes/improvements made to ABM/AT models

- **Updated documentations:**
  - User guide
  - Estimation report
SHRP2 Grant

- **SHRP2 Grant:**
  - The 2nd Strategic Highway Research Program (SHRP2)
  - Advanced Travel Analysis Bundle: promote advanced travel modeling methodologies
  - SANDAG selected as lead adopter for C04

- **Goals:**
  - Integrate C04 in SANDAG ABM
  - Introduce travel time reliability & traveler response to congestion and pricing in ABM.
  - Improve toll & managed lanes modeling
ABM Supply Side Improvement

- **Traffic assignments:**
  - Convergence criteria
  - Feedback loop
  - Model run time impact

- **Streamline GISDK scripts:**
  - Assignment
  - Skimming
  - Network building scripts
Workflow Improvement

- Inputs consistency screening
- Logging and error handling
- Configuration optimization
- Parallel traffic assignments
Open Discussion
Forum Agenda Recap

- Network Maintenance
- Dynamic Traffic Assignment
- ABM / Active Transportation Model Update

Next Transportation Modeling Forum: December 9, 2015
Transportation Modeling Forum

June 10, 2015