

Dynamic Traffic Assignment

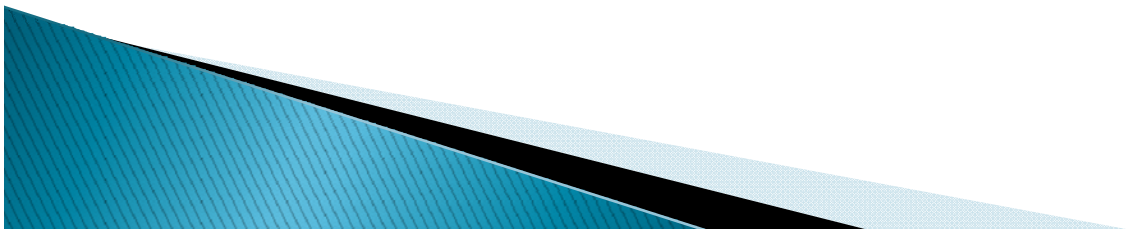
Emerging Tool to Meet Emerging Policy Needs

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In an Hour.....

- ▶ What is Dynamic Traffic Assignment (DTA)?
- ▶ How it is Different than Static Traffic Assignment?
- ▶ What is it Good For (Applications)?
- ▶ Why Isn't Everybody Using it Now?
- ▶ What Does it Look Like?
- ▶ Where Can I Get DTA Software?



A Primer for Dynamic Traffic Assignment

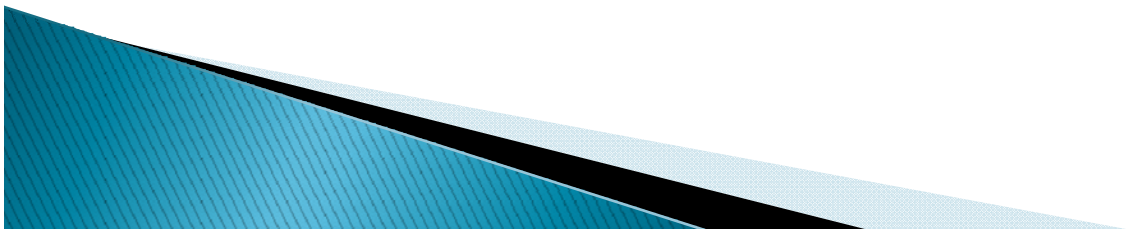
ADB30 Transportation Network Modeling Committee
Transportation Research Board

2010



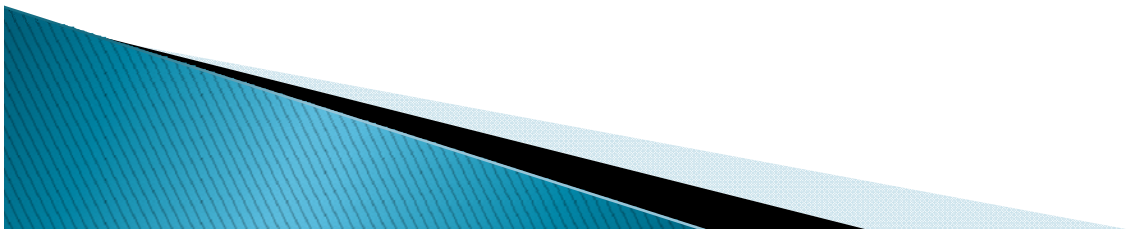
What is Dynamic Traffic Assignment (DTA)?

- ▶ Mesososcopic Traffic Assignment
- ▶ Not Macroscopic (planning)
- ▶ Not Microscopic (operations)



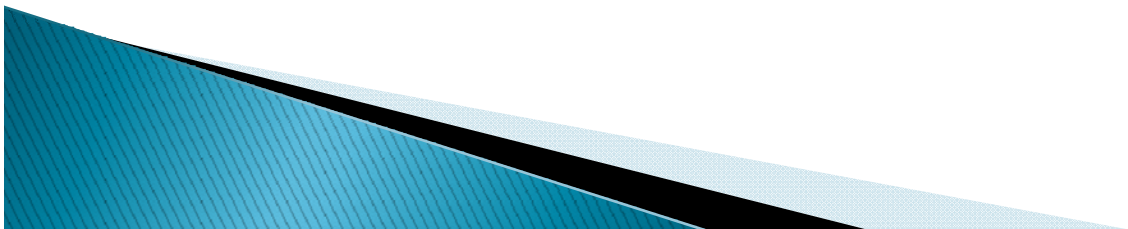
How is it Different from Static Traffic Assignment?

- ▶ Simultaneously assign all trips along entire route from origin to destination along minimum time path
- ▶ Adjust travel time on link based on V/C function
- ▶ Reassign all trips along entire route from origin to destination along minimum revised time path
- ▶ When answer doesn't change very much, stop

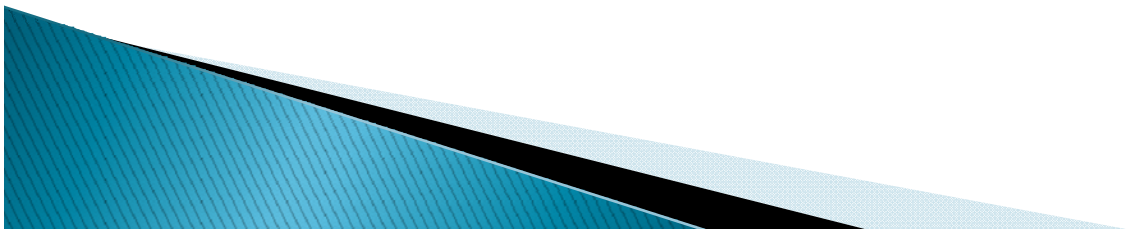
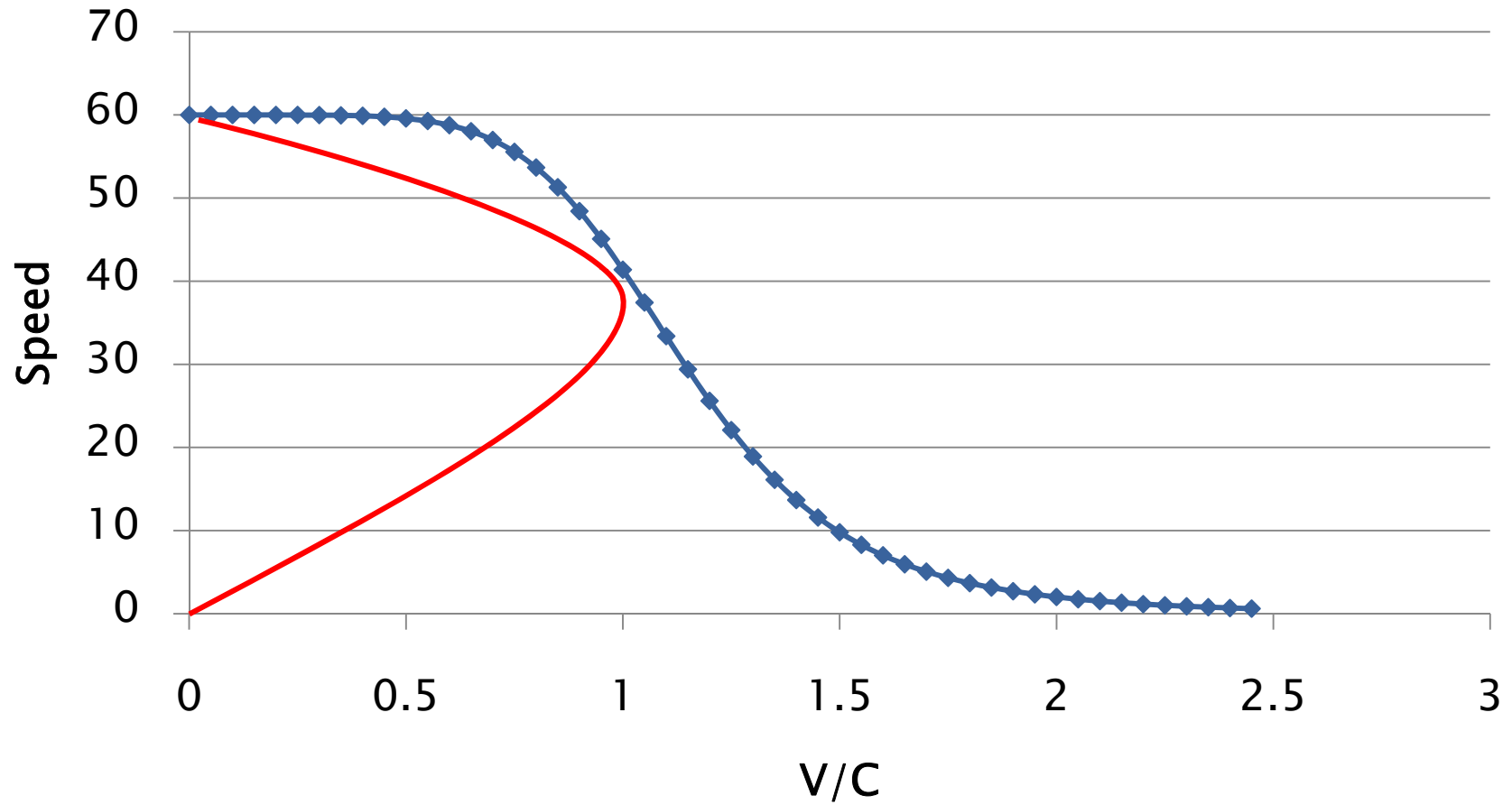


How is it Different from Static Traffic Assignment?

- ▶ Trips may be assigned by 'time slice':
 - ▶ Daily
 - ▶ Period (a.m. peak, offpeak, p.m. peak, etc.)
 - ▶ Hourly
 - ▶ Portion of Hour (15-minute increments, etc.)
- ▶ Simultaneously assign all trips along entire route from origin to destination
- ▶ Information NOT RETAINED between slices
- ▶ Volume-dependent relationship

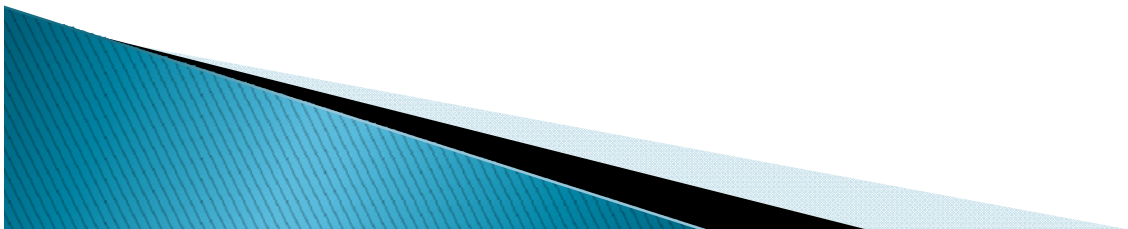


Traffic Flow Realism

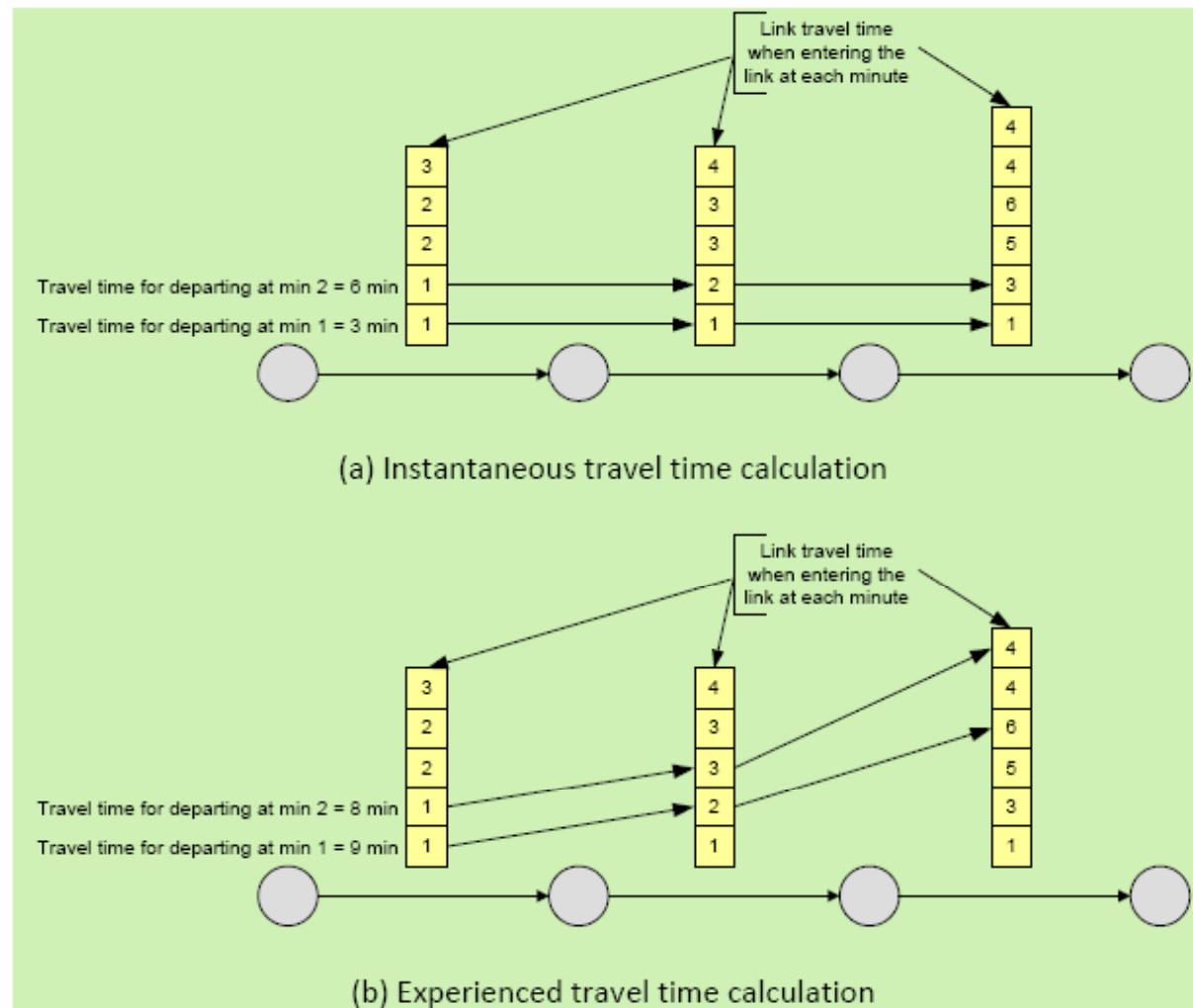


What is Dynamic Traffic Assignment (DTA)?

- ▶ “Experienced” travel time
- ▶ Time-dependent
- ▶ Queuing
- ▶ “Spillback”/Blockages
- ▶ Speed/flow relationship



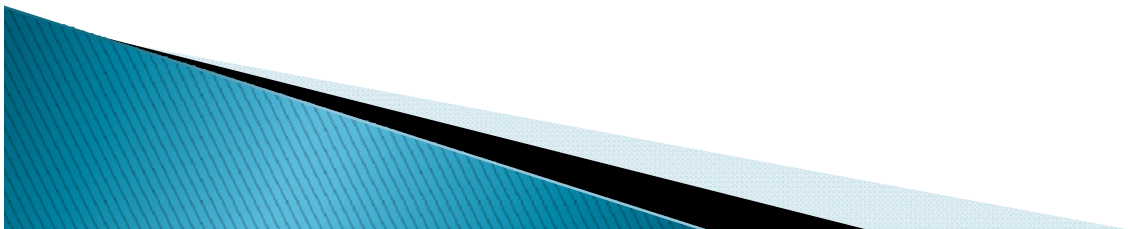
Experienced/Time Dependent Paths



Source: A Primer for Dynamic Traffic Assignment , ADB30 Transportation Network Modeling Committee Transportation Research Board (2010)

What is it Good For (Applications)?

- ▶ Advanced practice travel demand models
- ▶ “High level” operations analysis
- ▶ Parallel/multiple corridor conditions
- ▶ Pricing/HOT/toll lanes
- ▶ System management alternatives
- ▶ Work zone planning



What is it Good For (Applications)?

1	2	3	4	5	6	7
Geographic Scope	Facility Type	Travel Mode	Management Strategy	Traveler Response	Performance Measures	Tool/Cost-Effectiveness
What is your study area?	Which facility types do you want to include?	Which travel modes do you want to include?	Which management strategies should be analyzed?	Which traveler responses should be analyzed?	What performance measures are needed?	What operational characteristics are necessary?
- Isolated Location - Segment - Corridor/Small Network - Region	- Isolated Intersection - Roundabout - Arterial - Highway - Freeway - HOV Lane - HOV Bypass Lane - Ramp - Auxiliary Lane - Reversible Lane - Truck Lane - Bus Lane - Toll Plaza - Light Rail Line	- SOV - HOV (2, 3, 3+) - Bus - Rail - Truck - Motorcycle - Bicycle - Pedestrian	- Freeway Mgmt - Arterial Intersections - Arterial Mgmt - Incident Mgmt - Emergency Mgmt - Work Zone - Spec Event - APTS - ATIS - Electronic Payment - RRX - CVO - AVCSS - Weather Mgmt - TDM	- Route Diversion - Pre-Trip - En-Route - Mode Shift - Departure Time Choice - Destination Change - Induced/Foregone Demand	- LOS - Speed - Travel Time - Volume - Travel Distance - Ridership - AVO - v/c Ratio - Density - VMT/PMT - VHT/PHT - Delay - Queue Length # Stops - Crashes/Duration - TT Reliability - Emissions/Fuel Consump - Noise - Mode Split - Benefit/Cost	- Tool Capital Cost - Effort (Cost/Training) - Ease of Use - Popular/Well-Trusted - Hardware Requirements - Data Requirements - Computer Run Time - Post-Processing - Documentation - User Support - Key Parameters User Definable - Default Values - Integration - Animation/Presentation

Figure 3.1: General decision making process for selecting traffic analysis tools [66]

Source: FHWA, *Traffic Analysis Toolbox Volume II: Decision Support methodology for Selecting Traffic Analysis Tools*. 2004

DTA in TRANSCAD

The screenshot displays the TransCAD 5.0 software interface. The title bar at the top reads 'TransCAD 5.0'. Below it is a menu bar with 'Hide', 'Back', 'Print', and 'Options'. A toolbar contains icons for 'Previous' and 'Next'. The main window is divided into three panes. The left pane shows a 'Contents' tree with the following structure:

- Welcome to TransCAD Help
- Help for TransCAD
- Help for Planning
 - Welcome to Planning Help
 - Trip Generation - Production
 - Trip Generation - Attraction
 - Trip Balancing
 - Quick Response Method for Trip G
 - Trip Distribution
 - Logit Mode Choice Analysis
 - P-A to O-D and Time of Day Trans
 - Traffic Assignment
 - Traffic Assignment with Volume-De
 - Dynamic Traffic Assignment
 - Dynamic Traffic Assignment (D
 - Dynamic Traffic Assignmer
 - Preparing Data for Dynamic
 - Options for Dynamic Traffic
 - Standard Results of Dynam
 - Optional Results of Dynam
 - Performing Dynamic Traffic
 - Displaying Results from Dyt
- Transit Networks, Best Transit Pat
- Transit Assignment
- O-D Matrix Estimation
- Transit O-D Matrix Estimation
- Data Preparation and Planning Utili
- Batch Mode
- Model Manager
- Distributed Computing
- Help for Routing and Logistics
- Help for GISDK

The middle pane shows the 'Standard Results of Dynamic Traffic Assignment' page. It contains the following text:

Standard Results of Dynamic Traffic Assignment

Upon successful completion, the dynamic traffic assignment procedure produces the following output files:

- A table file containing the estimated link volumes and link costs by time period
- A text file containing a summary of user inputs and model outputs
- A text file containing warning messages (if any)

The purpose of dynamic traffic assignment is to forecast the dynamic traffic conditions for the given network and dynamic demand volumes. The assigned dynamic link volumes are the primary output of the measures in the form of a solution file, which is a fixed format binary file that is automatically joined to the line layer on which the network is based. The solution file also includes dynamic loaded travel times reflect the degree of congestion on each link for each time period. The link outputs included in the output table file are as follows:

Link Output Fields	Contents
AB_Flow _i , BA_Flow _i	Volume on link from A to B and from B to A (A and B are end nodes of a link) at time i
TOT_AB_Flow, TOT_BA_Flow	Total volume on links from A to B and from B to A over all time periods
AB_Time _i , BA_Time _i	Travel time (or cost) for link from A to B and from B to A at time i
AVG_AB_Time, AVG_BA_Time	Average time (or cost) for links from A to B and from B to A over all time periods
AB_voc _i , BA_voc _i	Volume to capacity (V/C) ratio for link from A to B and from B to A at time i
AB_Speed _i , BA_Speed _i	Speed on link from A to B and from B to A at time i
AVG_AB_Speed _i , AVG_BA_Speed _i	Average speed on link from A to B and from B to A over all time periods at time i

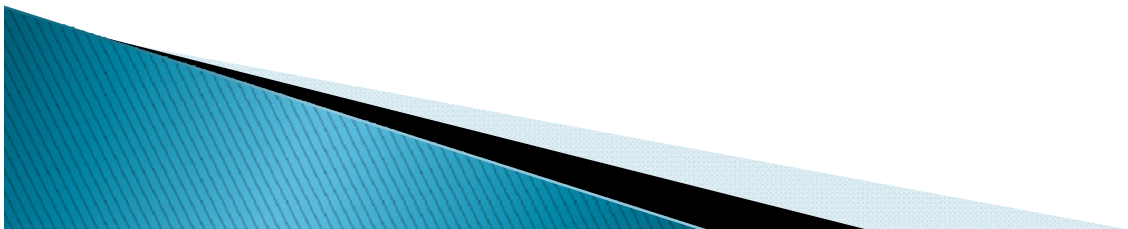
TransCAD also produces a report that is appended to the master report file. This report includes general information about the assignment, such as date, time, options, input files, and output files. In addition wide summary variables:

System-wide Outputs	Contents
Total VHT	Total vehicle hours of traffic from the dynamic assignment
Total VMT	Total vehicle miles of travel from the dynamic assignment

If there are any discrepancies in the data, a log report will be generated and appended to the master log file listing the problematic data.

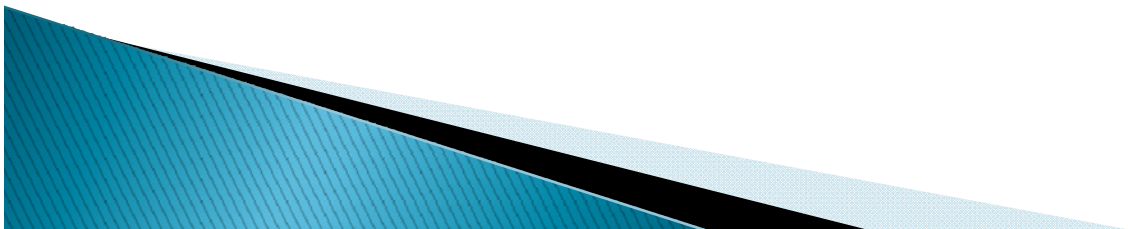
Why Isn't Everybody Using it Now?

- ▶ Lack of Awareness
- ▶ Diverging Opinions
- ▶ Computer Processing
- ▶ Need
- ▶ Data Requirements for Validation

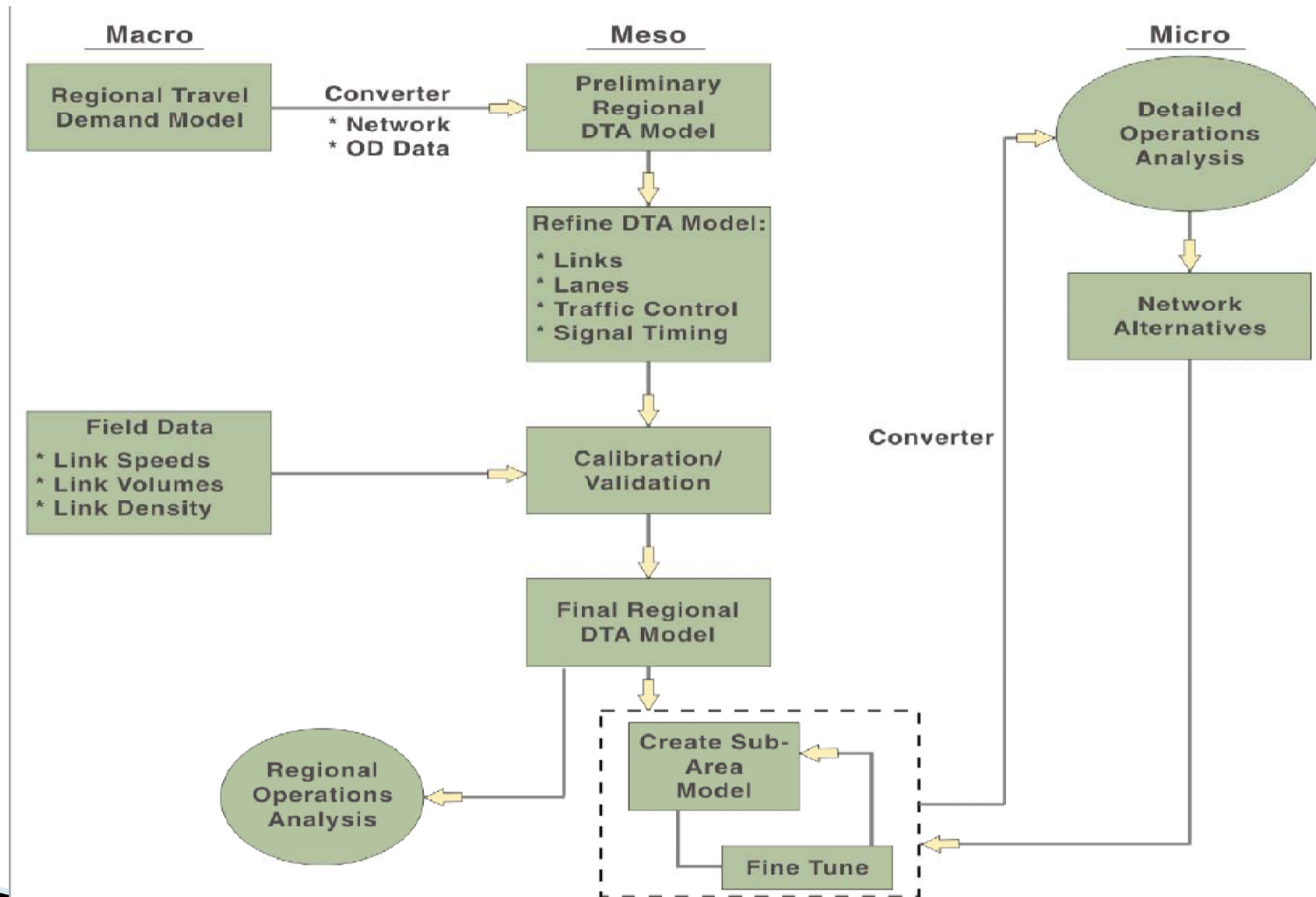


Implementation

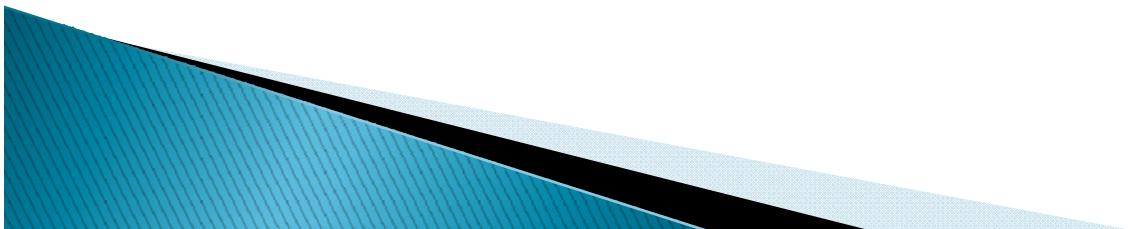
- ▶ Conversion of Regional Model
 - Network Detail
 - Traffic Signals/junctions
- ▶ Conversion of OD Matrix
 - Typically Subarea
 - Extract from Regional Model
 - Time slices (estimated)
- ▶ Calibration
 - Volumes
 - Speeds
 - densities



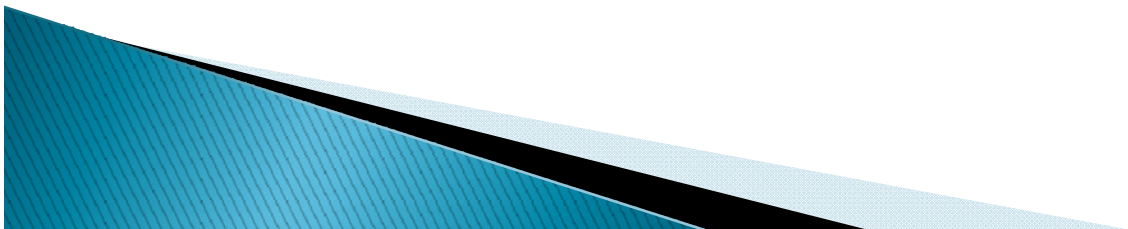
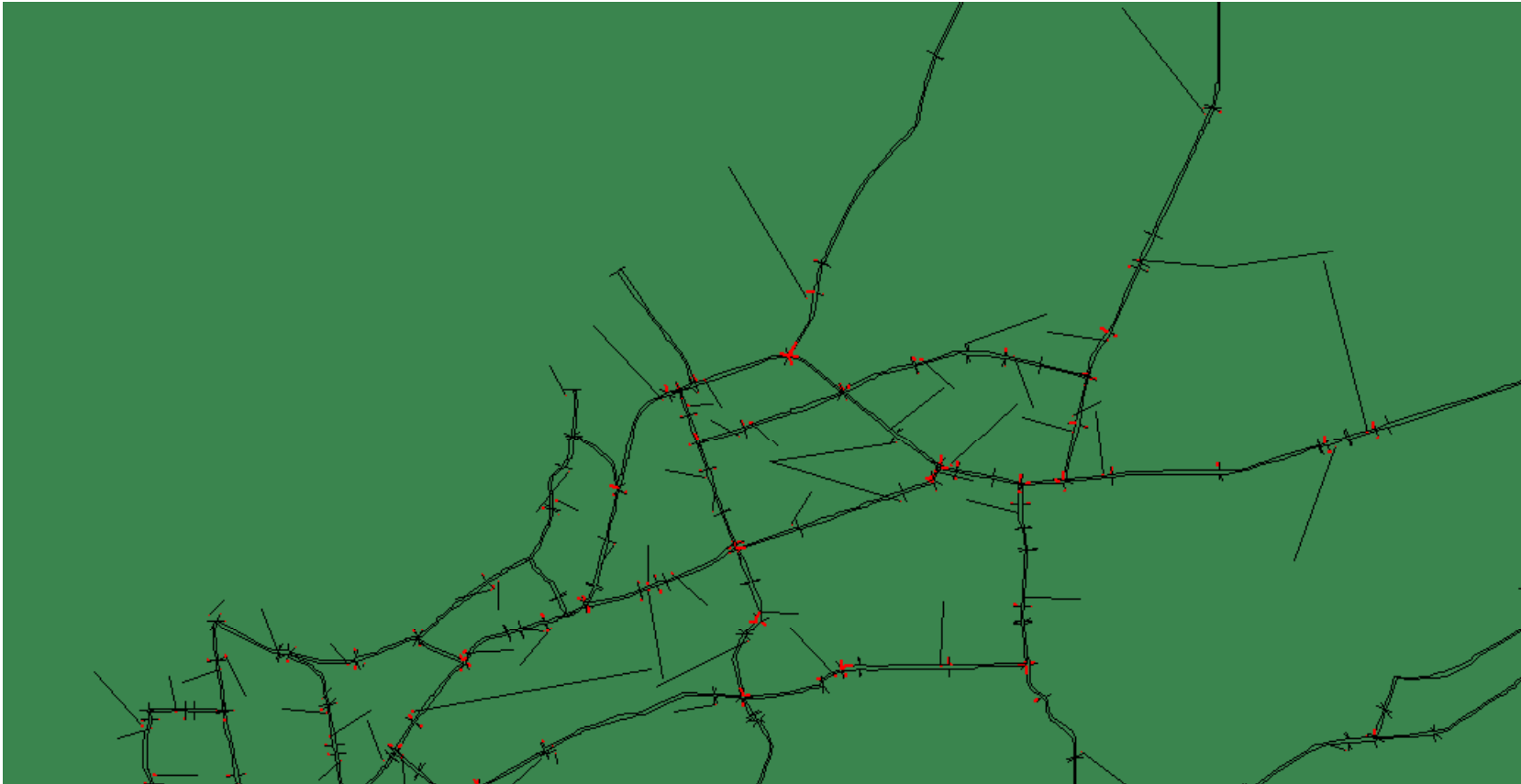
Multi Resolution Modeling



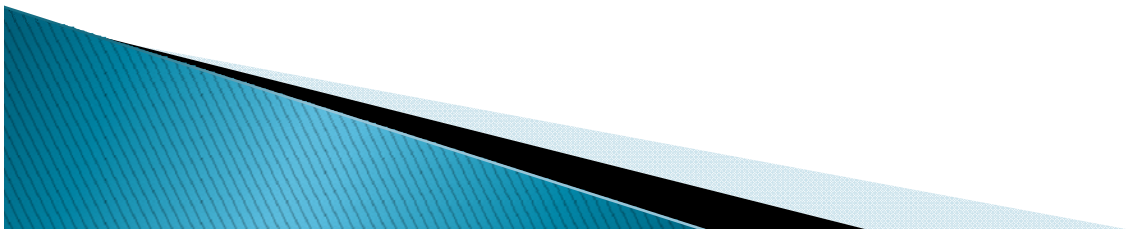
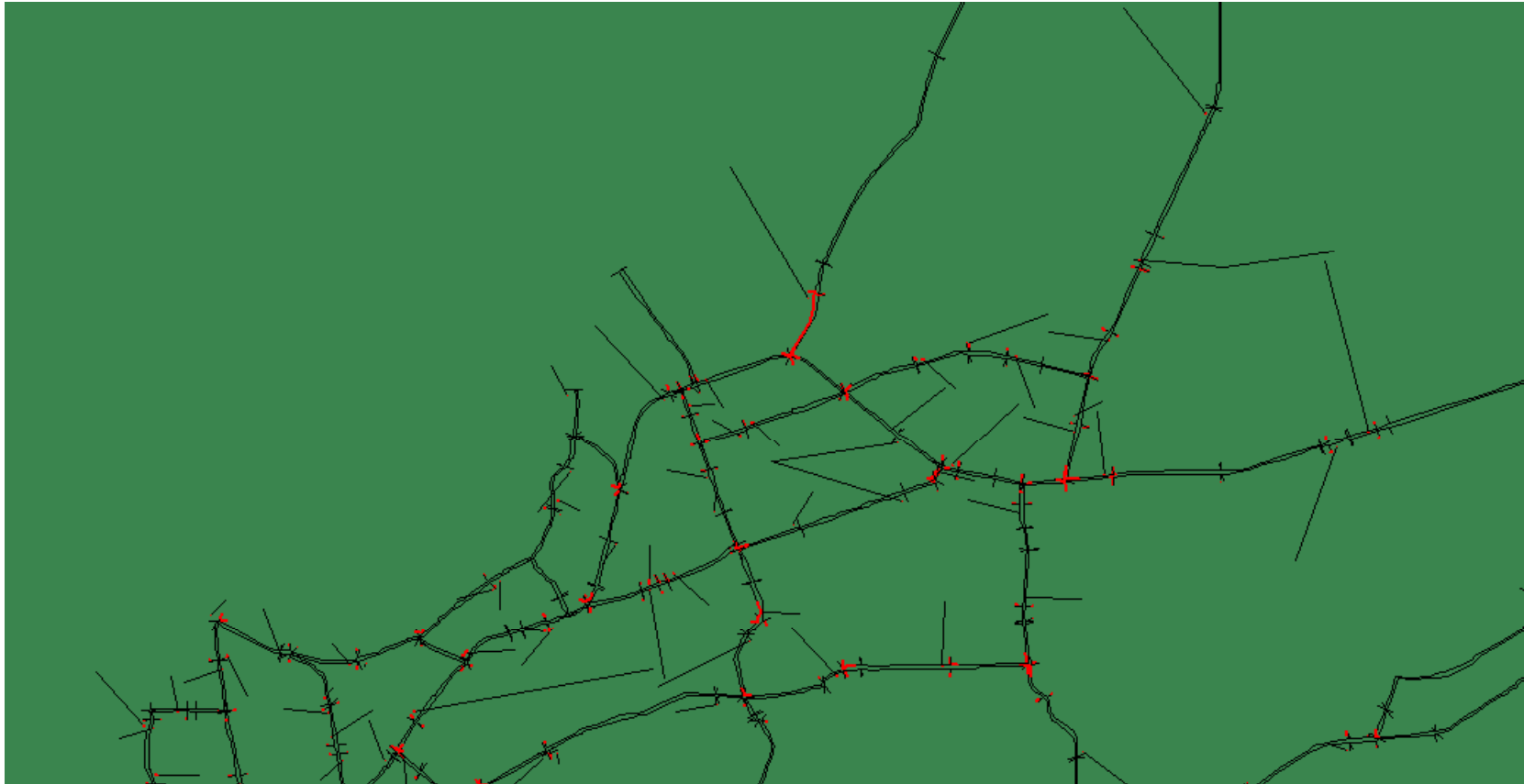
What Does it Look Like?



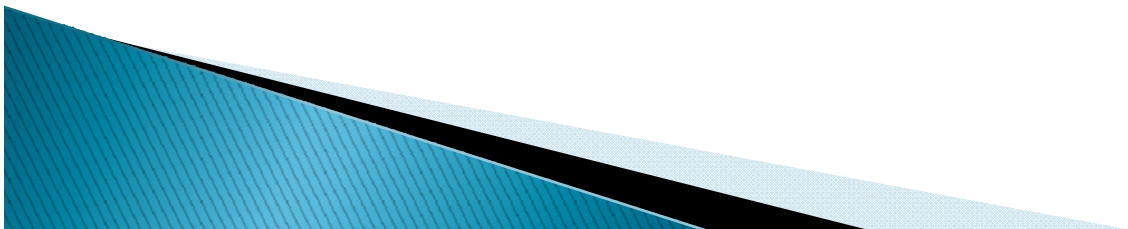
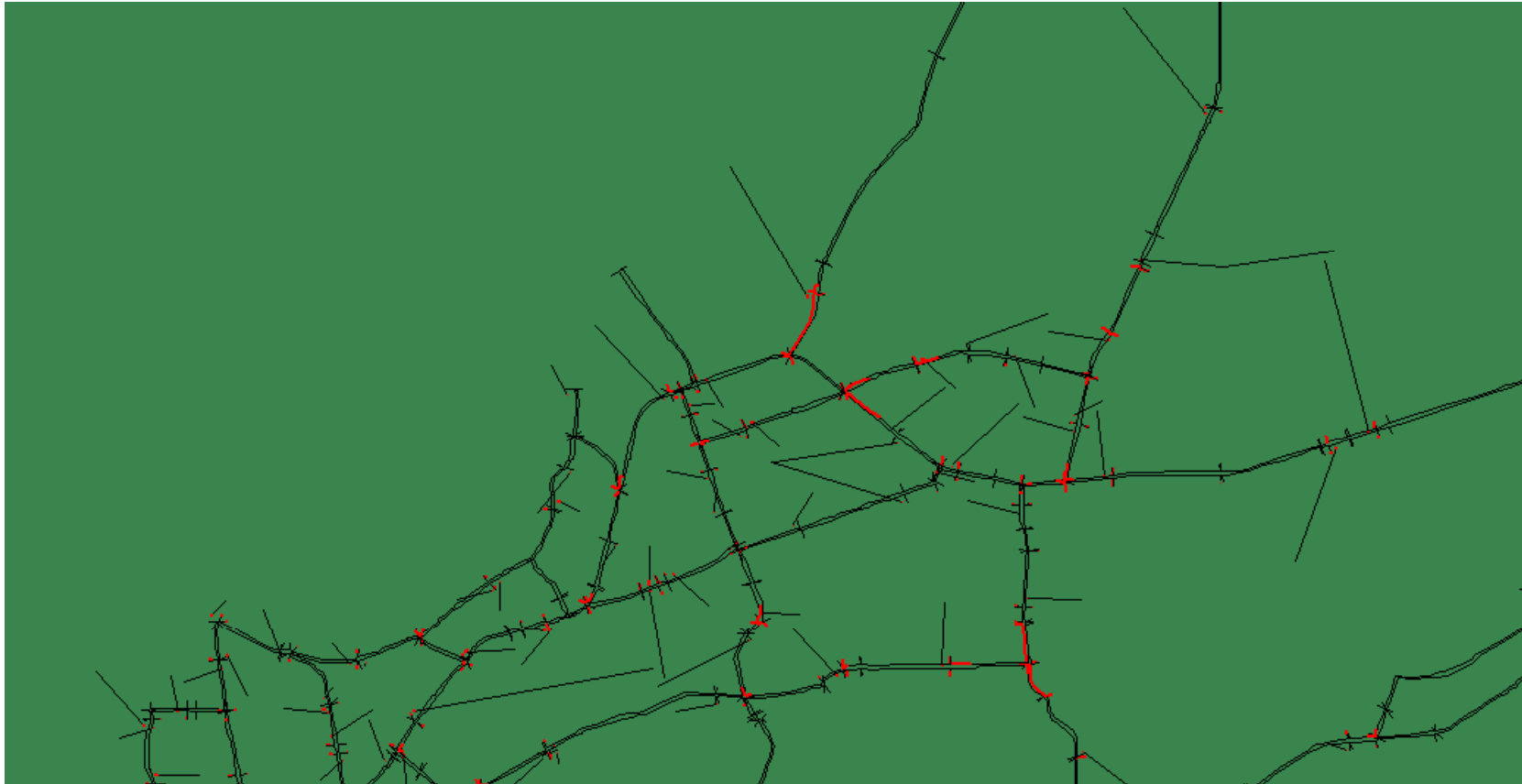
Start +5 Minutes



Start +45 Minutes

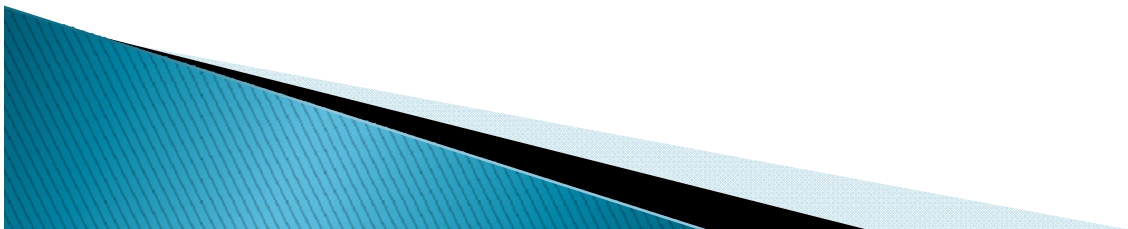


Start +1 Hour



Where Can I Get DTA Software?

- ▶ CALIPER (TransCAD, TransModeler)
- ▶ CITILABS (Avenue)
- ▶ INRO (DYNAMEQ)
- ▶ PTV (VISSIM)
- ▶ McTRANS (DYNASMART/DYNUS-T)
- ▶ VISTA
- ▶ Others



Questions?

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- ▶ 763.249.6760

