Dynamic Traffic Assignment (DTA)

“DTA is now well heard, but still not well understood”

Amanda M. Johnson, PE
Trip Assignment and Distribution

• What is a “trip”?  
  – Used in traffic studies  
  – Vehicle route  
  – Origin to Destination  
  – Does not include “return trip”

• Goal is to add trips to the roadway network  
  – Proposed trips due to new development  
  – Redistributed existing trips due to network change  
  – Combination of both
Trip Assignment and Distribution

- Gates and Zones
- Trip Matrices
- Conventional Method
  - By Hand/Excel
  - TRAFFIX/ other software
Need for Dynamic

- Traffic networks are not static
- Driver routes may vary throughout the hour: behavior & congestion
- Often are distributing before knowing capacity constraints
- Large networks
Driver Behavior and Congestion
Dynamic Traffic Assignment (DTA)

- Must validate/calibrate the model to existing data
- Uses impedance to determine desirable routes
- Many dynamic models
- Equilibrium model

*O = Origin
D = Destination
Equilibrium Model
Static vs. Dynamic

Static Assignment
- Pre-defined shortest path
- To newly generated vehicles

Dynamic Assignment
- Updated traffic condition
- Updated shortest path
- To newly generated or enroute vehicles
- Instantaneous shortest path

Static vs. Dynamic

**Static Assignment**
- Speed, density, and queues are not directly considered
- One solution
- Based on FIFO
- No representation of individual lanes
- All travelers for same O-D pair experience same travel time

**Dynamic Assignment**
- If link outflow < link inflow, travel time increases due to queues and density
- Iterative process to determine solution
- Not all based on FIFO
- Individual lanes are considered
- All travelers for same O-D pair for **same departure time** experience same travel time
Software

- Paramics
- Visum
- TransCAD
- Cube
Dynamic Traffic Assignment

- **Advantages**
  - More realistic traffic assignments
  - Automatic assignments save time from manually assigning
  - Evaluate different roadway situations
    - Lane closures
    - Tolls
    - New roadways
    - New developments

- **Disadvantages**
  - Iterative process
  - Takes time to set up and check the network
  - Network must be accurate to achieve best assignment
Dynamic Traffic Assignment

• Best to use on large, complex networks
  – City-wide modeling and planning
  – Traffic management for short- or long-term disruptions
  – Downtown traffic management and street configurations
  – Managed lanes
  – HOV or HOT lanes
  – New interchange
  – Tolling facilities

• Not good for simple TIA’s
Project Experience

Fishers, Indiana

Westfield, Indiana
I-69 in Fishers, Indiana

VISUM with Interchange

VISUM without Interchange
References

• Transportation Research Circular, Number E-C153: Dynamic Traffic Assignment, June 2011. Transportation Research Board.
Questions?

- Amanda Johnson, PE
  American Structurepoint Inc.
  ajohnson@structurepoint.com