Analytical Efficiencies Through the Integration of Modeling and Simulation Tools

Steve Perone
PTV Group
ANALYTICAL EFFICIENCIES THROUGH THE INTEGRATION OF MODELING AND SIMULATION TOOLS

PTV Vision Traffic Suite Software

Portland State University
Spring Transportation Seminar
May 9, 2014

Steve Perone, President
Who is PTV Group?

Modeling Resolutions

Tools & Methods to Support Integrated Modeling

The Next Frontier – Real Time Prediction
Who is PTV Group?

Multi-Resolution Modeling – The PTV Way

Methodologies and Tools for Multi-Resolution Modeling

The Next Frontier – Real Time Technology
PTV GROUP’S INTERNATIONAL FOOTPRINT:

- **600** employees across the world
- **12** subsidiaries
- **70 million euros turnover**

On 5 continents:

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<tbody>
<tr>
<td>Europe</td>
<td>Asia</td>
<td>Australia</td>
<td>North/Latin America</td>
</tr>
</tbody>
</table>
TRAFFIC SOFTWARE PRODUCTS

PTV VISSIM
PTV VISUM
PTV OPTIMA

PTV VISWALK
PTV VISTRO
PTV BALANCE
PTV VISION – BEGIN WITH THE END IN MIND
Who is PTV Group?

Modeling Resolutions

Tools & Methods to Support Integrated Modeling

The Next Frontier – Real Time Technology
MULTI-RESOLUTION MODELING COMPONENTS

- Macroscopic Modeling
- Regional Focus
- Mesoscopic Modeling
- Corridor Focus
- Microscopic Modeling
- Facility Focus
WHAT IS MULTI-RESOLUTION MODELING?

Regional

Corridor

Facility

Hour

Minutes

Seconds
WHAT IS MULTI-RESOLUTION MODELING?

- Regional
- Corridor
- Facility

- Design
- Modes
- Alternatives
WHAT ARE THE BENEFITS?

1. Data Access
   - Networks, Performance Indicators

2. Consistency
   - Adopted Lane-Use & Growth Patterns

3. Level of Details
   - Mode, Route, Lane Choice(s)

4. Resources (Data, Model, Staff)
   - Life-Cycle Analysis Framework / Tools
WHAT ARE THE KEYS TO SUCCESS?

1. Robust & Well-defined Data Model
2. Support Correct Level of Detail
3. Vertical Consistency of Outputs
4. Ability of Cross-Validity
AGENDA

- Who is PTV Group?
- Multi-Resolution Modeling – The PTV Way
- Methodologies and Tools for Multi-Resolution Modeling
- The Next Frontier – Real Time Technology
MULTI-RESOLUTION MODELING COMPONENTS – PTV
1. Work with Travel Demand Model Data?

2. Work with Big Data?

3. Work with Detailed Network Geometry & Control Data?

4. Model Time Dynamics?

5. Fuse Data Sources?

6. Can this help a Traffic Management Center?
Can I Work with Travel Demand Model Data?
PTV VISUM – NATIVE & SECONDARY SUPPORT

Nodes / Zones

Links / Connectors

Turns

Transit
INTEGRATE WITH OPEN STREET MAP (OSM)
WORK DIRECTLY WITH BING AERIAL MAPS
Can I Work with 'Big Data'?
NAVIGATION NETWORKS WITH TMC CODES
NAVIGATION NETWORKS WITH TMC CODES
ACCESS COUNT & SPEED DATA WITH LINK COLUMN CHART

The image shows a software interface for analyzing traffic data. The upper graph is a column chart for links, with a speed profile showing the distribution of speeds throughout the day. The lower graph is a bar chart displaying the count (AADT) for different years (2005 to 2010). The bars are color-coded to represent each year.
Can I Add Detailed Network Geometry / Control Data?
GEOMETRY DATA
SIGNAL TIMING DATA
Can I Model Time Dynamics?
DYNAMIC USER EQUILIBRIUM (DUE) ASSIGNMENT
How Do I Fuse Data?
A SINGLE INTEGRATED MULTI-MODAL NETWORK
ORIGIN-DESTINATION MATRIX ESTIMATION (ODME)

```
<table>
<thead>
<tr>
<th>Input</th>
<th>Count data PrT</th>
<th>Distribution CX</th>
<th>Parameters</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use only network objects with volume &gt; 0 and counted value &gt; 0</td>
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<td></td>
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### Zones
- Take the totals of matrix rows and columns as basis
- Only active zones
  - Row total: AddValue 1, +/- AddValue 3
  - Column total: AddValue 2, +/- AddValue 3

### Links
- Based on counted link volumes
- Only active links
  - Volumes: AddValue 1, +/- AddValue 2

### Turns and main turns
- Based on counted turn and main turn volumes
- Only active turns and main turns
  - Volumes: AddValue 1, +/- AddValue 2

### Screenlines
- Based on volumes counted in the direction of the screenline
- Only active screenlines
  - Volumes: ...

### Total traffic
- Based on counted total traffic (all demand segments)
  - Total traffic: 1, +/- 1
```

Open old settings
OK
Cancel
ORIGIN-DESTINATION MATRIX ESTIMATION (ODME)
9. Can this help a Traffic Management Center?
PTV VISION – DYNAMIC TRAFFIC MANAGEMENT ELEMENTS

Smart Dynamic Traffic Management System

- Situation Awareness
- Forecast
- Incident Detection
- Recommendation & Execution
- Evaluation & Reporting
- Data Transfer Platform

sense, measure, collect, check, inform, control, plan, act
PTV OPTIMA – HOW DOES IT WORK

**OFF LINE | ON LINE**

- **PTV VISUM**
  - CENSUS DATA (inhabitants, workers)
  - NETWORK DATA (street map)
  - TRANSPORT MODEL (graph, OD matrices)
  - BASE PATH CHOICES (turn splitting rates)
  - BASE TRAFFIC ESTIMATION
  - TMB TRANSPORTATION MODEL BUILDER

- **PTV OPTIMA**
  - PROBE TRAJECTORIES (cars, taxi, trucks…)
  - AVL/AVM DATA (busses & TPL vehicles)
  - TRAVEL TIME MEASURES (ANPR, Bluetooth…)
  - DETECTOR DATA (loops, cameras, …)
  - EVENTS (incidents, roadworks, …)
  - EVENT EFFECTS (max speeds, capacities)

**DUE DYNAMIC USER EQUILIBRIUM**
- STRATEGIES (signal plans…)
- STRATEGY EFFECTS (max speeds, capacities)

**TRE TRAFFIC REAL-TIME EQUILIBRIUM**
- REAL-TIME KPI
- REAL-TIME TRAFFIC FORECAST (speeds, flows, queues, …)
- DETECTION AND CONTROL
  - DETECTION (incident detection, alerts)
  - CONTROL (signal plans, messages, …)

**VEHICLE TRACKER**
- LINK SPEEDS
- TRAFFIC MEASURES (speeds, flows)

**VEHICLE TRACKER**
- TRAFFIC STATE HARMONIZER
- TRAFFIC MEASURES

**SMART DISPLAY**
- DETECTOR DATA
- EVENTS
- CONTROL STATUS
- RECOMMENDATIONS (VMS messages)

**TRAFFIC CONTROL & INFORMATION SYSTEMS**
- VEHICLE TRACKER
- TRAFFIC STATE HARMONIZER
- TRAFFIC CONTROL & INFORMATION SYSTEMS

**DETECTION AND CONTROL**
- REAL-TIME KPI
- REAL-TIME TRAFFIC FORECAST

**DETECTOR DATA**
- LOOPS, CAMERAS, …

**PTV GROUP**
www.ptvgroup.com

I Slide 42
PTV OPTIMA – YOUR TRAFFIC DATA AMPLIFIER!

A traffic data AMPLIFIER

A traffic data HUB
PUTTING IT ALL TOGETHER
REALIZE THE BENEFITS
Decision Support at Each Level

Decision Support Across Levels
ANALYTICAL EFFICIENCIES THROUGH THE INTEGRATION OF MODELING AND SIMULATION TOOLS

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