INRIX Data - Uses for Transportation Planning

Tennessee Model User's Group Meeting
Mt. Juliet, TN
May 8, 2014
THE FUTURE OF MOBILITY IS ABOUT MAKING SMARTER AND BETTER DECISIONS
More Than Buzzwords

• Big Data
• Analytics / Performance Measures
• The Cloud
• Crowdsourcing
Crowd: Data Collection Infrastructure?

June 29, 2007: iPhone, You Phone, We All Wanna iPhone

June 29, 2007
Crowd: Data Collection Infrastructure?

Tokyo – September 21, 2012
INRIX Traffic Intelligence Network Free Apps

www.inrixtraffic.com
Crowdsourse with Fleets

Long Haul Trucks

Local Sales, Service & Delivery

Taxis

Airport Shuttles
Crowdsource with Connected Vehicles

Traffic Daily Nav Search Weather
Traffic Cams Fuel Parking
Many service providers are struggling to deliver, but INRIX is on its second generation of automotive grade connected services.
GPS Probe Points – June 2013
GPS Probe Points – August 2008
INRIX’s “Big Data” Technology-driven Platform

Above All, INRIX is a High Quality Big Data Aggregator

INRIX technology platform
• Leverages big data for real-time fusion and predictive analytics
• Advanced crowdsourcing technology
• Cloud-based service delivery for robust customer applications

Real Time Data
Historical Data
Predictive Data
INRIX Coverage – Tennessee

- 11,542 Centerline Miles
- 1.4 million+ miles in the U.S.A. and Canada
Real-Time & Predictive Traffic Flow

• Road segment by road segment, INRIX provides:
  • Segment information (code, road name, cross streets, direction, length)
  • Speed information (current speed, typical speed, free flow speed)
  • Travel time (in minutes through segment)
  • Congestion level (percentage of free flow)
  • Predictive traffic (speed and congestion forecast in 15 minute increments)
Analytics & Performance Measures

- Programmable queries to create data sets for performance measurement analytics
- Key “out of the box” analytical measures include:
  - Peak hour congestion: assessing and comparing congestion levels from year to year
  - Travel Time Tax: ratio of peak period travel time to free flow travel time
  - Key Bottlenecks: Congested locations with each hour of week that the average speed is less than 50% of free flow
- Plug data into existing analytical engines for further inquiry
Analytics: INRIX Traffic Scorecard

scorecard.inrix.com
INRIX™ Analytics

INRIX Analytics provides an easy-to-use web portal that enables transportation agencies to leverage our extensive real-time and historical traffic information.

INRIX Analytics enables agencies to view system performance in real time and easily generate system-wide performance measures or drill down on specific corridors and bottlenecks with a few clicks of a mouse. All you need is a web browser to access rich traffic data at your fingertips.

INRIX offers a cloud-based software-as-a-service that includes calibration data, processed information, and analytical insight in formats tailored to individual or cross-agency needs in sub-1 minute real-time, archive, or historical datasets.

Click below to contact INRIX.

Find Out More

Benefits of INRIX Analytics
- One-stop shop for traffic analysis - data and tools
- No agency systems integration required providing true ‘Dashboard-in-a-box’ graphics
- Available to any or all agency and extended staff
- Flexible use options to match need and budget
- New features upgraded seamlessly
Dashboard

INRIX System Monitoring Dashboard

INRIX Traffic - US

INRIX Analytic Tools

INRIX System Monitoring Dashboard

- Road: I-40 Eastbound
- Starting point: TN-840/EXIT 233
- Began: May 07, 2014 9:21 PM
- Duration: 35 min
- Queue length: 8.16 miles
- Average queue length: 7.08 miles

Travel time index / queue length over time

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Duration</th>
<th>Length (miles)</th>
<th>State</th>
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<tr>
<td>Bottleneck</td>
<td>I-40 E @ TN-840/EXIT 233</td>
<td>35 min</td>
<td>8.16</td>
<td>TN</td>
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Bottleneck Definition

A bottleneck represents a single TMC segment or group of adjacent segments in which the actual travel speed drops below 60% of the reference speed for a period longer than 5 minutes. The bottleneck is considered closed once the travel speed returns to a value greater than 60% of the reference speed and remains there for 10 minutes.

The chart below shows a basic example of the speed over time plot for a bottleneck, and indicates where the bottleneck’s status would be updated.
### Tennessee Bottlenecks May 1 – 6

#### TN-397N @ US-31/TN-6/FRANKLIN RD (14,093)

**INRIX Traffic - US**

Bottleneck Ranking

<table>
<thead>
<tr>
<th>Rank</th>
<th>Map</th>
<th>Location</th>
<th>Average duration</th>
<th>Average max length (miles)</th>
<th>Occurrences</th>
<th>Impact factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>TN-397 N @ US-31/TN-6/FRANKLIN RD</td>
<td>2 h 12 m</td>
<td>3.05</td>
<td>36</td>
<td>14,093</td>
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<td>2</td>
<td></td>
<td>I-75 N @ US-25W/TN-63/EXIT 134</td>
<td>3 h 57 m</td>
<td>4.40</td>
<td>10</td>
<td>10,424</td>
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<tr>
<td>3</td>
<td></td>
<td>US-25W N @ 1-75</td>
<td>3 h 43 m</td>
<td>2.06</td>
<td>22</td>
<td>10,118</td>
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<tr>
<td>4</td>
<td></td>
<td>I-24 W @ I-40/EXIT 52</td>
<td>1 h 56 m</td>
<td>7.82</td>
<td>11</td>
<td>9,972</td>
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<tr>
<td>5</td>
<td></td>
<td>US-31 S @ TN-397/MACK HATCHER BLVD (FRANKLIN) (SOUTH)</td>
<td>2 h 6 m</td>
<td>2.62</td>
<td>29</td>
<td>9,576</td>
</tr>
</tbody>
</table>

**Bottleneck locations from TN (11358 tmc's) between May 1, 2014 and May 6, 2014 (2800 total)**

**INRIX Analytic Tools**

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Tennessee Bottlenecks May 1 – 6

I-75N @ US-25W/TN-63/EXIT 134 (10,424)
Tennessee Bottlenecks May 1 – 6

US-25W N @ I-75 (10,118)
Tennessee Bottlenecks May 1 – 6

I-24W @ I-40/EXIT 52 (9,972)
Tennessee Bottlenecks May 1 – 6

US-31S @ TN-397/MACK HATCHER BLVD (9,576)
Congestion Scans
Performance Summaries

Before, During and After Studies
1 Minute Archive Back to January 1, 2011
Performance Summaries

Before, During and After Studies
1 Minute Archive Back to January 1, 2011
Performance Summaries

Buffer, Planning and Travel Time and Their Associated Indices
INRIX Analytics User Delay Examples

What should I be concerned about with the User Delay Analysis reports?

The volume data used to generate these reports has been extracted from a national dataset for average annual daily traffic (AADT) counts at a segment level. These annual traffic volumes were converted into 15-minute volumes for each day of the average week. This method produced 15-minute volumes that could be higher or lower than actually experienced on any segment; however, as larger geographies are analyzed (corridors, subareas, etc) the results will prove reasonably correct. This national dataset was meant for planning purposes; any analysis that focuses on finite times/dates or on analyses of very short road sections should be approached with caution.

If your agency wishes to help improve the accuracy of this volume dataset, instructions on how to provide better volume data to the University of Maryland can be found [here](#).
INRIX Analytics User Delay Examples

Delay Analysis Calculations

This document explains the procedures to calculate hourly delay and user delay cost for a segment of road. All calculations that are performed are provided with an example.

Adjustment Factors
When calculating Average Daily Traffic counts (ADT) from Annual Average Daily Traffic (AADT) counts, daily factors must be applied.

Day of Week  Adjustment Factor
Monday to Thursday  +5%
Friday  +10%
Saturday  -10%
Sunday  -20%

AADT for 2011 = 45250
ADT for Tuesday = 45250 + (45250 * 0.05) = 47512
ADT for Sunday = 45250 - (45250 * 0.20) = 36200

With these daily factors calculated, the percentage of passenger and commercial vehicles must be applied to the ADT value. If no percentages are found for a TMC segment, use 75% passenger, 25% commercial.

Some TMC segments may span across two or more defined volume link locations, and vice versa (as shown in Figure 1). In order to obtain a single AADT measurement for TMCs that fall under this case, the AADT of the overlapped detector locations must be weighted by the distance of the portion of the TMC that falls into the range of each link location.

Figure 1: Example of a TMC and overlapping detector locations.
INRIX Analytics User Delay Examples

Report parameters:
- Vehicle costs:
  - 2014 - Passenger: $16.79 Commercial: $86.81
- Percentage of vehicles (weighted on segment length):
  - 2014 - Passenger: 75% Commercial: 25%
- Delay is calculated against the freeflow speed for segments whose speeds fall 20 mph or more below freeflow.

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<th>Vehicle Type</th>
<th>Display</th>
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<tr>
<td>All</td>
<td>Total cost</td>
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<table>
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<th>Hourly Totals</th>
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<td>1 AM</td>
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<td>5/06/14</td>
<td>$0.1K</td>
<td>$0K</td>
</tr>
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</table>

Sat May 03 2014 12:00:00

Delay cost:
- Total: $293,972.46
- Per vehicle: $118.68
- Per person: $99.94

Hours of delay:
- Person-hours: 9,323.27 hours
- Vehicle-hours: 7,851.17 hours
- Per vehicle: 3.17 hours

Volume:
- Passenger: 1077 vph
- Commercial: 359 vph

Data validity: 100.00%

Click the table cell to see links to congestion scans

Grand total

Delay cost:
- Total: $2,512,726.46
- Per vehicle: $1,102.73
- Per person: $928.61

Hours of delay:
- Person-hours: 79,690.54 hours
- Vehicle-hours: 67,107.82 hours
- Per vehicle: 29.45 hours
Congestion Scans

May 03, 2014
Time: 12:44 PM
Speed: 13.87 mph
Massive Raw Data Downloader
File posted to FTP site in .csv format

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</tbody>
</table>
NCDOT - Before/After Adding 3rd Lane

Before (June 2009)  After (June 2011)
Analytics: Ohio DOT

- Assessing Performance of Winter Operations
  - Time to return to normal travel after major winter storms
  - Reported as “Critical Success Factor” under Operations
- Assessing Urban Area Travel Time Reliability INDEX
  - Number of hours below posted speed between 5 AM and 9 PM
Ohio DOT Winter Return To Normal

Snow & Ice Recovery Dec 2013

Number of Routes that did not recover within 2 hrs (goal 0)

19

Number of Routes with speed drops

655
Ohio DOT Winter Return To Normal
ODOT District 7 Winter Return To Normal

71 Speed Drops

6 Routes Did Not Recover

December 23rd: AUG I-75
December 31st: SHE I-75
Ohio DOT Winter Return To Normal

• ODOT has patent pending on methodology
• Contacts
  • Mr. John MacAdam, John.MacAdam@dot.state.oh.us, (614) 752-9695
  • Mr. Merih Ocbazghi, merih.ocbazghi@dot.state.oh.us, (614) 466-1290
2011 Indiana Interstate Mobility Report
Summary Version

Stephen Remias, Thomas Brennan, Gannon Grimmer, Edward Cox, Deborah Horton, Darcy Bullock

http://docs.lib.purdue.edu/imr/
Arterial Retiming Cost
Benefit Analysis using Crowd Sourced Data

**MARCH 2012**

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<thead>
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**Week 13 (Before)**

**Week 16 (After)**

**APRIL 2012**

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<td>27</td>
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</tr>
</tbody>
</table>

**Plan 1 (0500-0900), NB Travel Time**

Week 13 (Before) - 1.22 min.
Week 16 (After) - 0.75 min.

**Plan 2 (0900-1100), NB Travel Time**

Week 13 (Before) - 1.83 min.
Week 16 (After) - 1.02 min.

**Plan 3 (1100-1300), NB Travel Time**

Week 13 (Before) - 1.10 min.
Week 16 (After) - 1.10 min.

**Plan 4 (1300-1500), NB Travel Time**

Week 13 (Before) - 1.53 min.
Week 16 (After) - 1.26 min.

**Plan 5 (1500-1900), NB Travel Time**

Week 13 (Before) - 0.93 min.
Week 16 (After) - 0.69 min.

**Legend**

9 Mile Segment

**INRIX**
### Arterial Retiming Cost Benefit Analysis using Crowd Sourced Data

#### Using TTI Travel Time Savings Calculations: Expected Yearly Savings are $2.7 Million

<table>
<thead>
<tr>
<th>Plan</th>
<th>Median TT Savings (min)</th>
<th>% of Daily Traffic</th>
<th>TT Savings (h)</th>
<th>TTI Travel Time Savings ($)</th>
<th>CO2 Reduction (tons)</th>
<th>CO2 Emission Savings ($)</th>
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<tr>
<td>Plan 0 (0000 – 0500)</td>
<td>0.79</td>
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<td>1987.34</td>
<td>$46,941.69</td>
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<td>$368.96</td>
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<tr>
<td>Plan 1 (0500 – 0900)</td>
<td>1.22</td>
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<td>9925.88</td>
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<td>5.3%</td>
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<td>$256,941.12</td>
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<td>Plan 3 (1100 – 1300)</td>
<td>1.1</td>
<td>6.7%</td>
<td>8246.25</td>
<td>$194,779.77</td>
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<tr>
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<td>5.5%</td>
<td>6316.57</td>
<td>$149,199.92</td>
<td>53.31</td>
<td>$1,172.69</td>
</tr>
<tr>
<td>Plan 8 (0000 – 0500)</td>
<td>1.53</td>
<td>13.5%</td>
<td>23311.22</td>
<td>$550,620.34</td>
<td>196.72</td>
<td>$4,327.91</td>
</tr>
<tr>
<td>Plan 9 (0500 – 0900)</td>
<td>0.91</td>
<td>7.1%</td>
<td>7319.89</td>
<td>$172,898.62</td>
<td>61.77</td>
<td>$1,359.00</td>
</tr>
<tr>
<td>Plan 10 (0900 – 1300)</td>
<td>0.58</td>
<td>2.2%</td>
<td>1462.30</td>
<td>$34,540.02</td>
<td>12.34</td>
<td>$271.49</td>
</tr>
<tr>
<td>Plan 11 (1300 – 1500)</td>
<td>0.75</td>
<td>7.6%</td>
<td>6420.27</td>
<td>$151,649.25</td>
<td>54.18</td>
<td>$1,191.97</td>
</tr>
<tr>
<td>Plan 12 (1500 – 1900)</td>
<td>1.02</td>
<td>5.5%</td>
<td>6316.57</td>
<td>$149,199.92</td>
<td>53.31</td>
<td>$1,172.69</td>
</tr>
<tr>
<td>Plan 13 (1900 – 2400)</td>
<td>1.53</td>
<td>13.5%</td>
<td>23311.22</td>
<td>$550,620.34</td>
<td>196.72</td>
<td>$4,327.91</td>
</tr>
</tbody>
</table>

**Total**

| 100.0% | 116321.6 | $2,747,562 | 981.64 | $21,596.03 |
Interstate Closure Impact Analysis

- I-20 EB Closure began April 9, 2013
- Recommended Detour I-59 / I-459
Friday’s Before (I-59)

Friday’s After (I-59)
Traffic Data Segmentation

- **Actual Speed Data**
  Speeds at 1/16 of the length (reference speed=60)

<table>
<thead>
<tr>
<th>Segment ID: 135012</th>
<th>Segment ID: 135013</th>
</tr>
</thead>
<tbody>
<tr>
<td>66 65 64 64 62 60 60 62 61 58 50 42 38 33 30 25</td>
<td>21 18 14 10 16 18 20 25 29 30 31 36 40 42 43 44</td>
</tr>
</tbody>
</table>

- **TMC Level granularity**
  Average detailed speeds, one report per segment

- **Sub-Segment (1/16th Segment) Level granularity**
  Congestion levels smartly grouped to avoid striping
INRIX XD Segment Fundamentals

1.5 Mile Segment Length

Most Segments less than 1 Mile

No Overlaps or Gaps
INRIX XD Sub-Segment Fundamentals

250 Meter Granularity

Sub Segment Traffic Tiles
Coverage – TMC Segments
Coverage – XD Segments

Roadway “adder” available
Coverage – XD Subsegments

Roadway “adder” available
Origin-Destination Studies

- Origin Destination data, monitoring daily probe movement.
- **Built for both Cellular AND GPS data sources.**
- Illustrating for a region where its visitors originated, and when that region was in demand.
Origin-Destination Studies

- Study Area: Greater Chicagoland Area (154 zones)
- Study Period: July – September 2013 (3 months)
- Total Data Points Analyzed: ~1.5 billion
- Freights Trips Determined/Used: 4.8 million
Our Connected Vehicle Vision

1. Smartphone integration
2. Daily navigation
3. Multimodal routing
4. Road weather
5. EV range finder
6. Safety cameras
7. Fuel prices
8. Parking availability

- Will icy roads impact my route?
- Is there traffic ahead of me?
- Where is the cheapest fuel?
- Will it be faster to drive to the train?
- Is parking available close to my destination?
Vision Zero / Toward Zero Deaths

LinkedIn Group: Vision Zero for Transportation
Thank You!

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