Using Innovative Data in Transportation Planning and Modeling

presented at

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presented by

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Outline

- Context – need for good data
- Applications in transportation planning and modeling
- Benefits and limitations of using (big) data
- Potential applications

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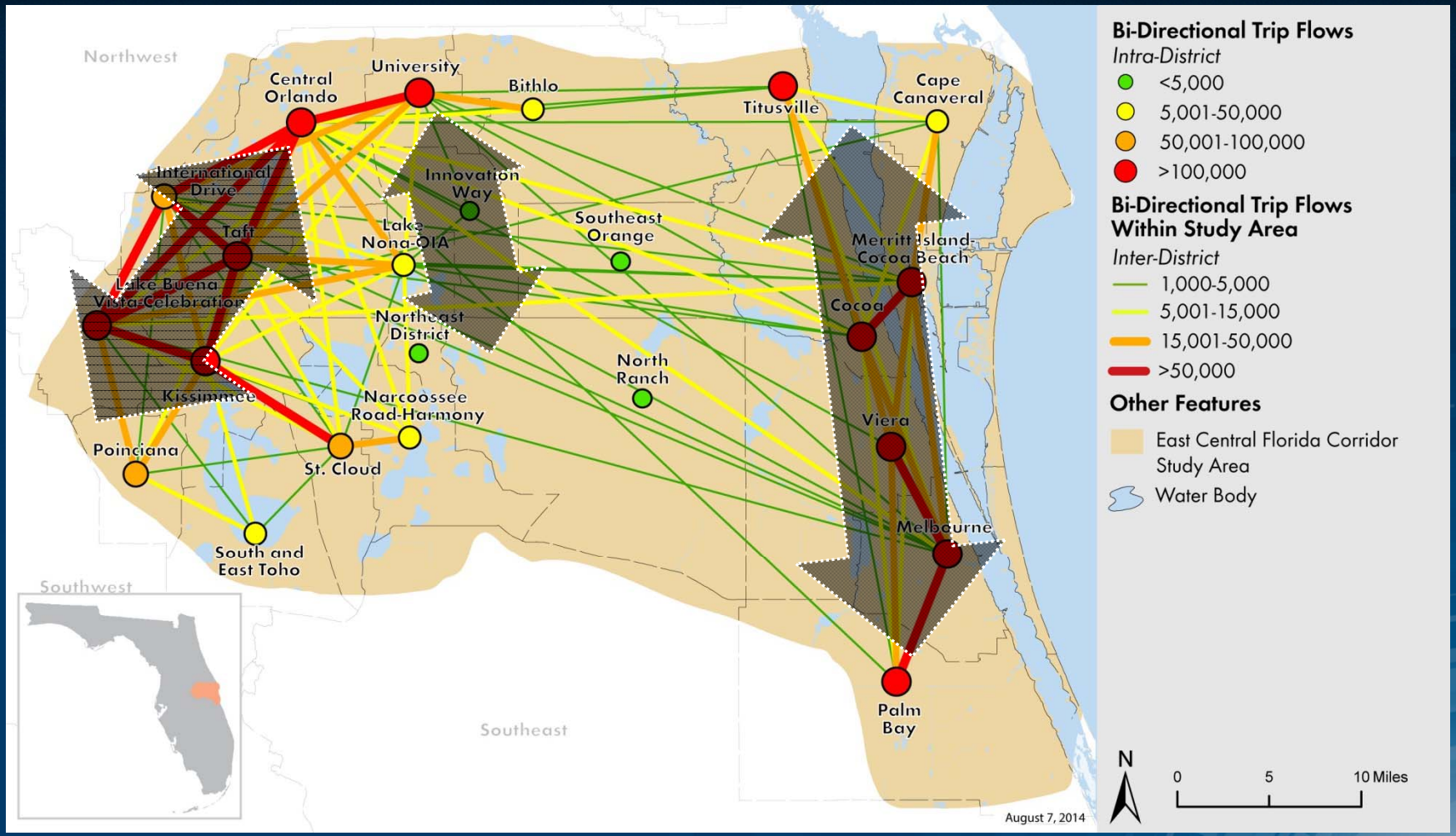
Context
Need for Good Data

- Transportation sector accounts for 25% of total commercial energy worldwide *(2001 United Nations report)*
- Annual cost of traffic congestion in the U.S. – 100s of billions *($124 billion recent study by INRIX and the Centre for Economics and Business Research)*
- Key infrastructure decisions based on travel demand models
  - » Rely on (good) data
- Traditional data collection – intercept origin-destination, tube counters, household travel surveys
  - » Still needed
- Innovative data collection sources – anonymized cell phones, GPS probes, aircraft, Bluetooth devices and toll plaza, General Transit Feed Specification (GTFS)
  - » Becoming more common
  - » Not without limitations

Applications in Transportation Planning and Modeling

- Planning
  - » Understanding O-D patterns, trip lengths, imputed trip purposes, external trip patterns
  - » Performance measurement – speeds
  - » Travel behavior (infancy)
- Model Applications
  - » Macroscopic and microscopic models
  - » Calibration/validation of models – trip lengths, trip distribution patterns, trip purposes, speeds, counts

Central Florida Person Trips: 2014



Note: Derived from AirSage Data

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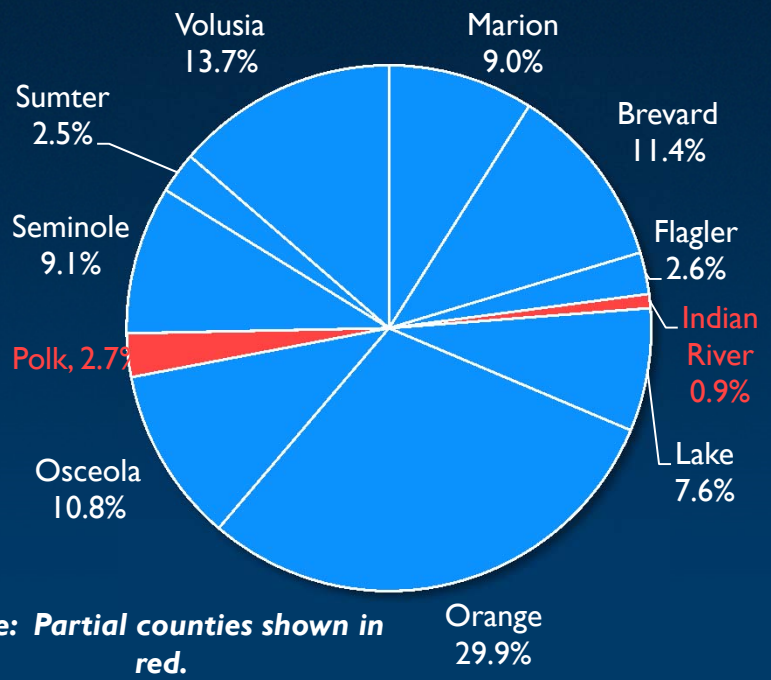
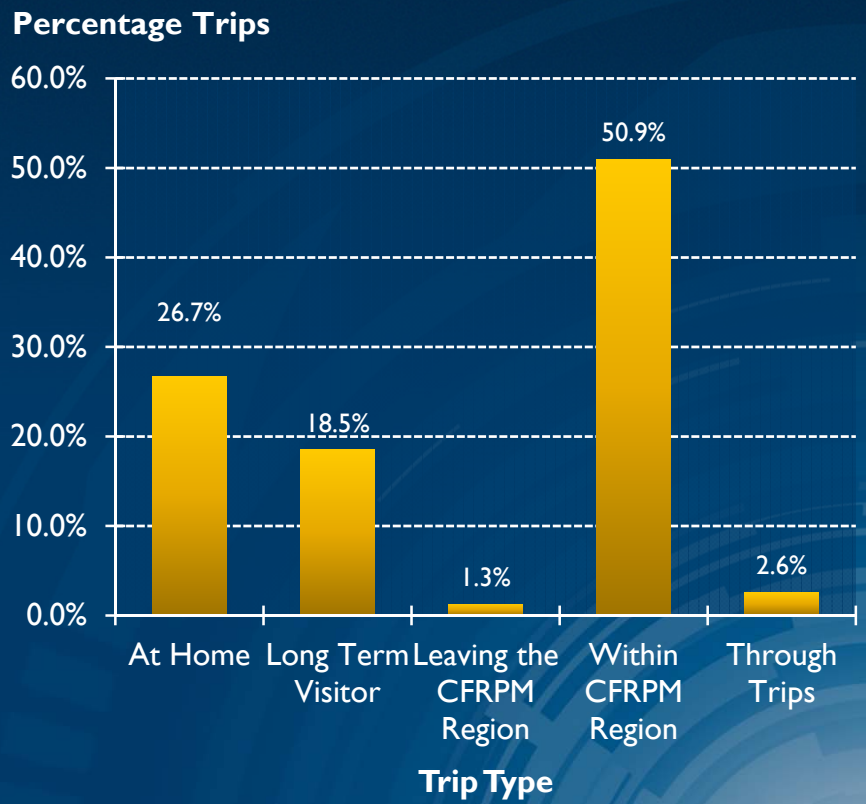
Central Florida Region – Spatial Distribution of Daily Trips



Note: Partial counties shown in red.

Central Florida Region Spatial Distribution (Destination)



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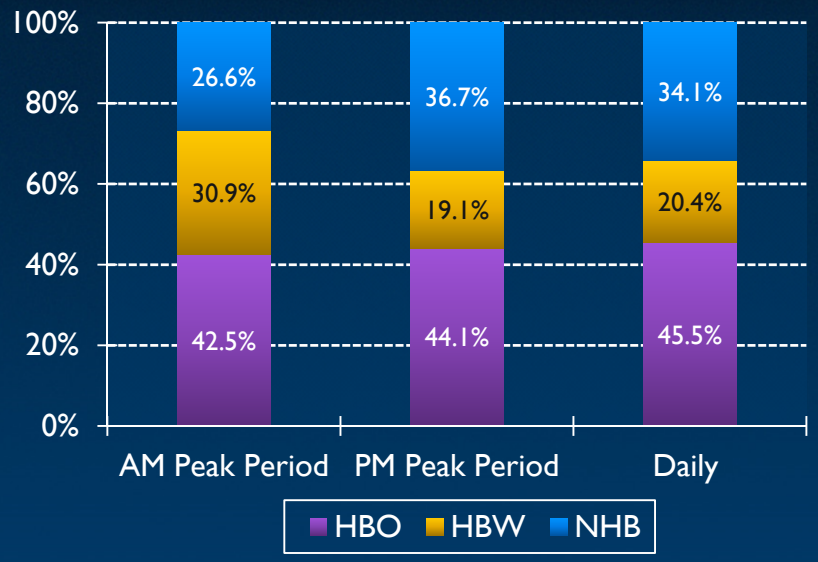
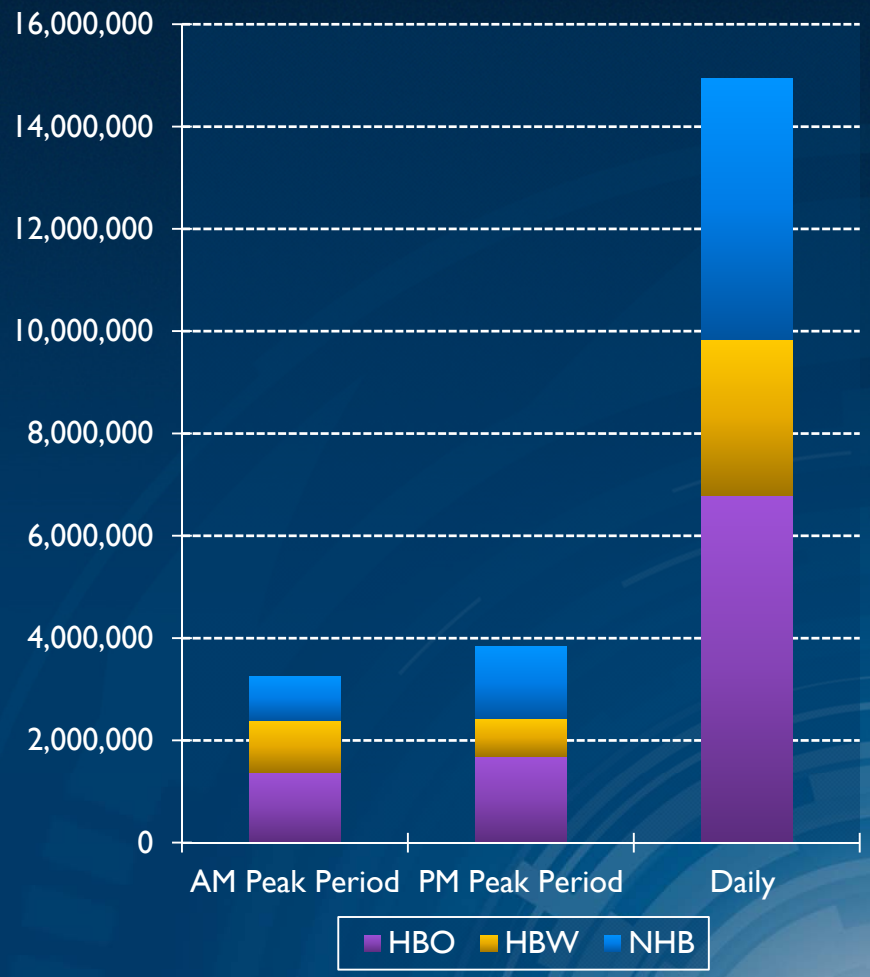
Temporal Distribution by Trip Purpose (Percentage & Absolute)





- *Over 40 percent of trips are Home Based Other Trips*
- *There is a large variation in Home Based Work trips between AM and PM periods*
- *Approximately 22 percent of trips occur during the AM peak, whereas 26 percent occur during the PM peak*

Note: Derived from AirSage Data

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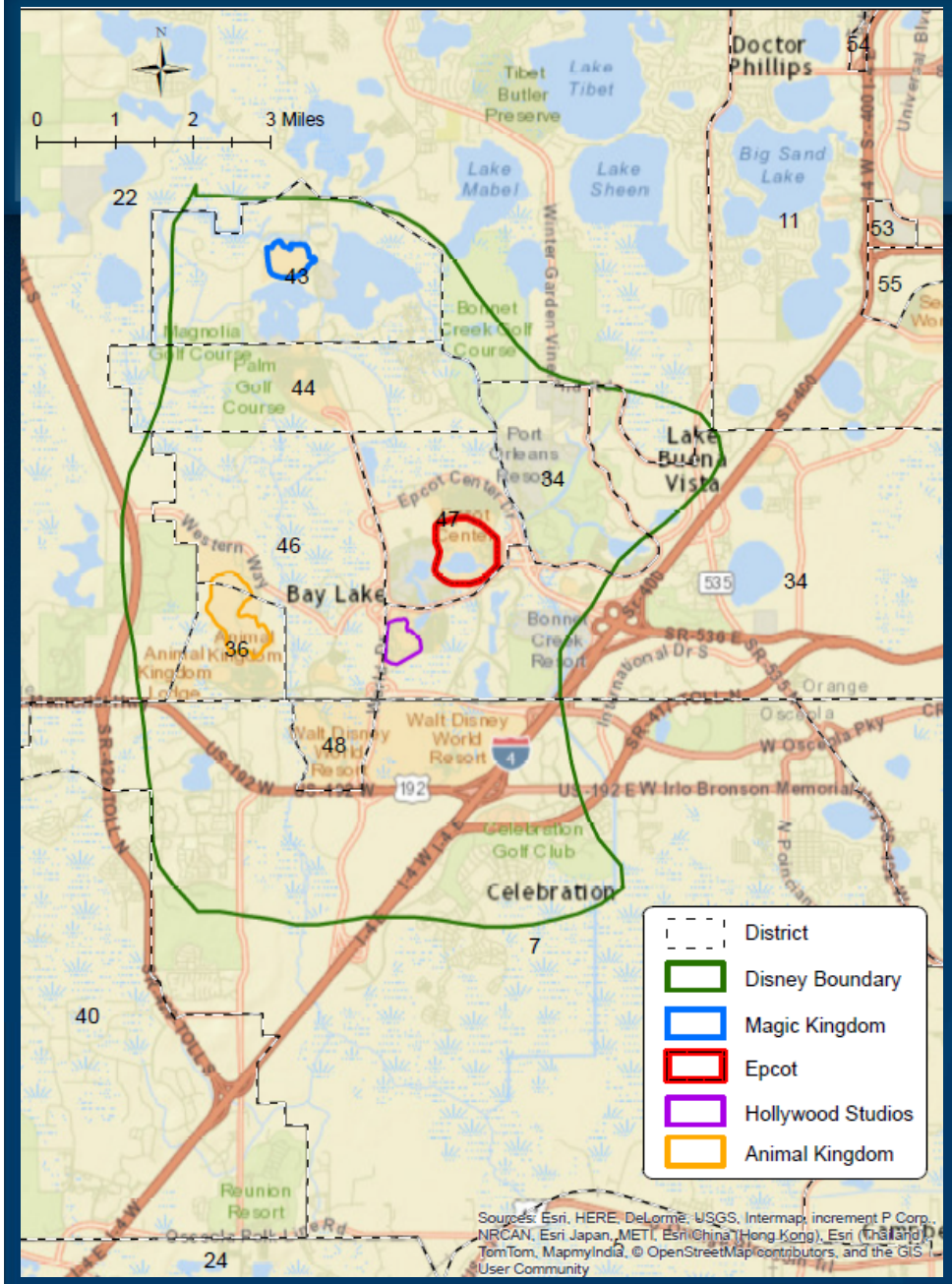
Disney World Patronage



Interesting findings…

- Green boundary represents Disney World area
- Summation of daily non-home-based work trips 189K trips. In comparison, observed 2013 counts was in the order of 207K annual visitors

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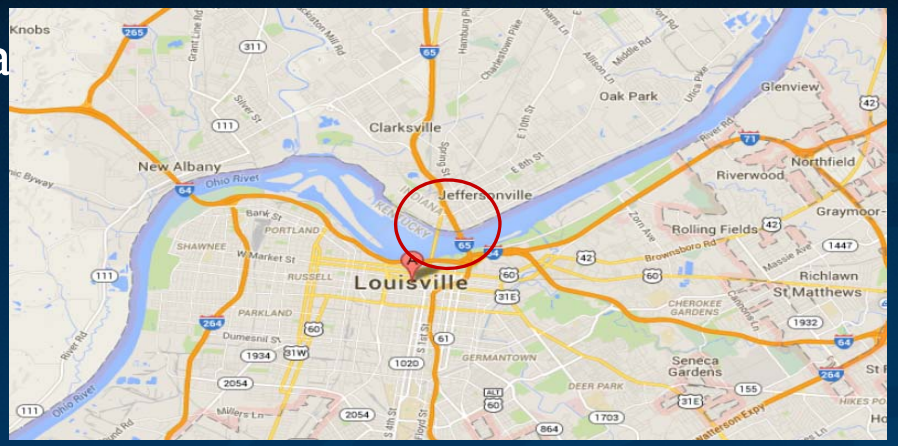
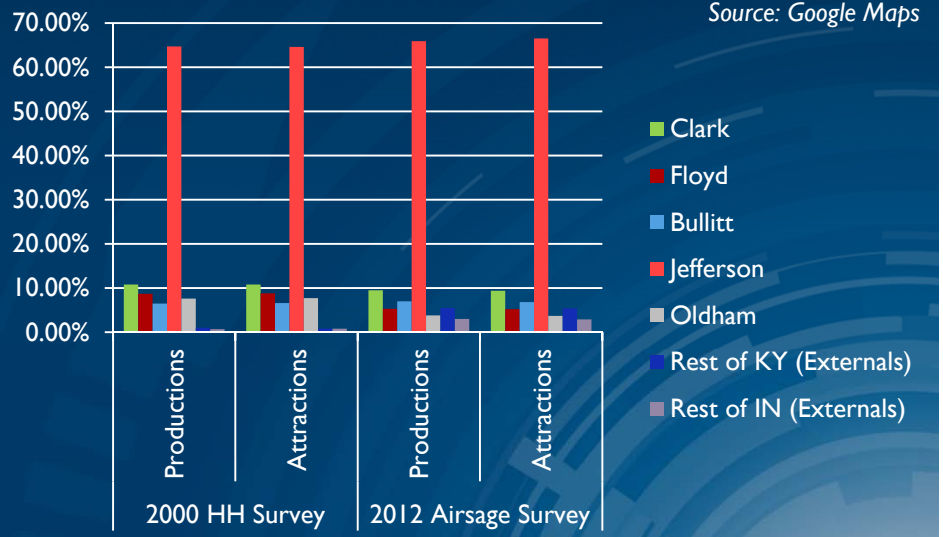
Select Link Analysis Using Cell Phone Data

- Used anonymized cell phone data (2012)
- Select link analysis on bridges (O-Ds on bridges)
- Findings
  - » Due to proximity of bridges, hard to distinguish which bridge traffic was on
  - » O-D patterns compared reasonably well at county level



Source: Google Maps



Comparison of County Level Distribution Patterns - Household Travel Survey vs Cell Phone Data

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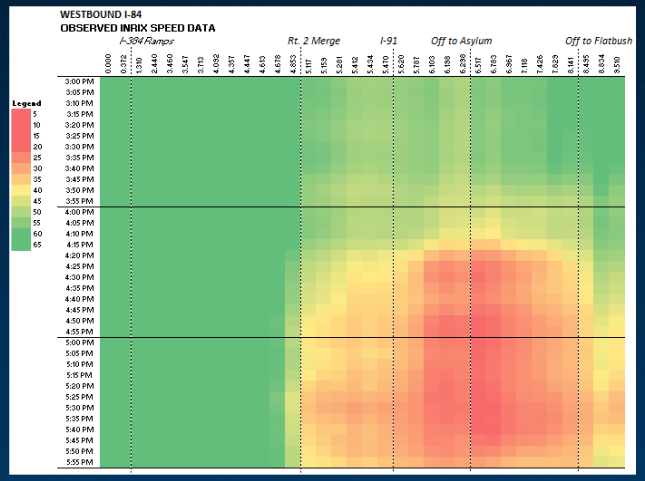
Probe Speed Data



Heat map indicating congestion locations and time

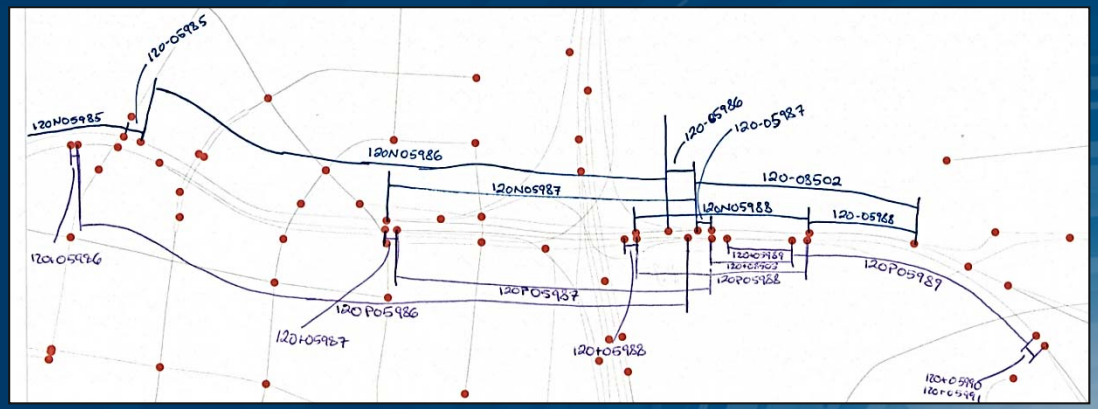
Data tells us…

- Bottleneck location and severity
- Duration of congestion
- Extents of queues
- Free-flow conditions
- Issues: Overlapping TMC links

Some Applications:

- Performance Measures
- Macro and micro transportation model validation
- Toll diversion modeling

Example of overlapping TMC links



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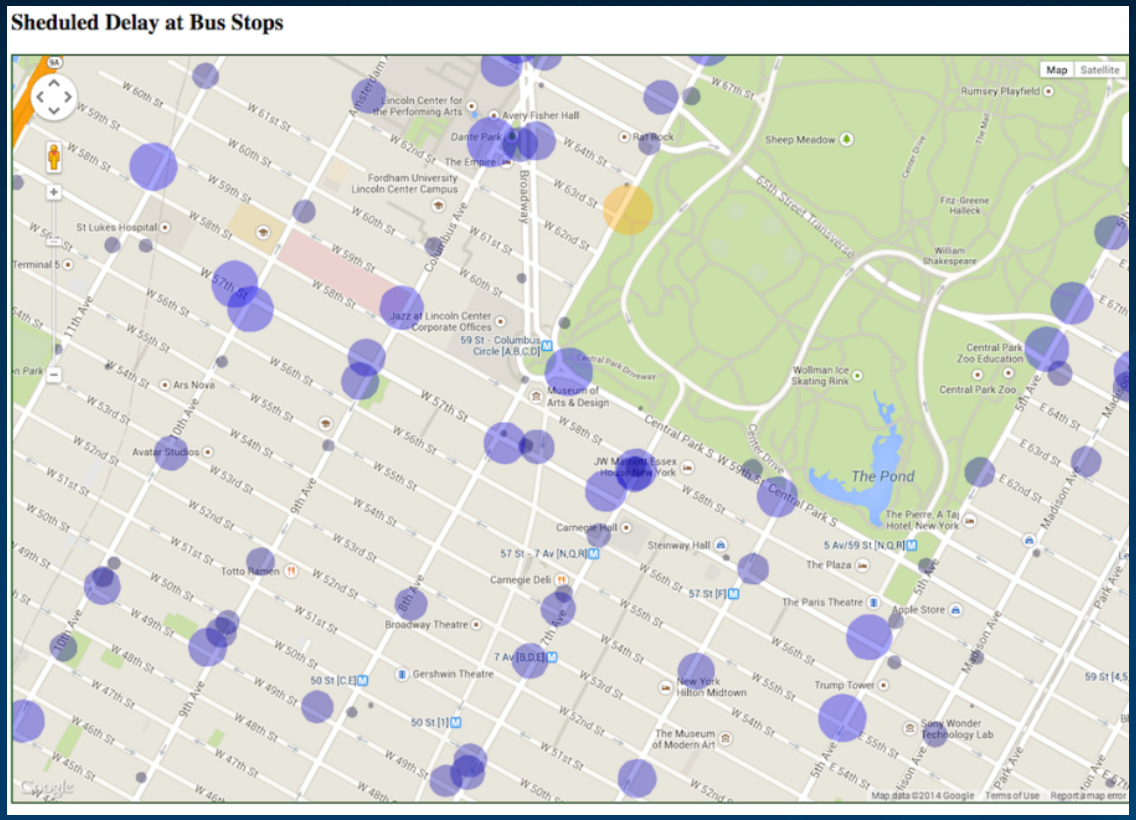
MTA (New York) BusTime® Data



Note: Not based on real data

- Approximately 6,000 buses throughout NYC
- 8 Million daily data points
- GPS bus data every 30 seconds
- Currently comparing data against GTFS for reliability statistics

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Benefits and Limitations of Using (Big) Data

- Benefits
  - » Often larger sample sizes
  - » Easily collected; archived data available
  - » Often cheaper with wider coverage
- Limitations
  - » Spatial accuracy (cell phone data)
  - » Currently unable to gain additional insights on trip behavior characteristics such as mode
  - » Accuracy may be susceptible to weather
  - » Privacy concerns

Potential Applications

- Using trajectory data – route choice behavior
- Transit ridership
- Performance measurement for transit operations
- Travel behavior during events
- Emergency response
- Airport usage
- Tourism

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