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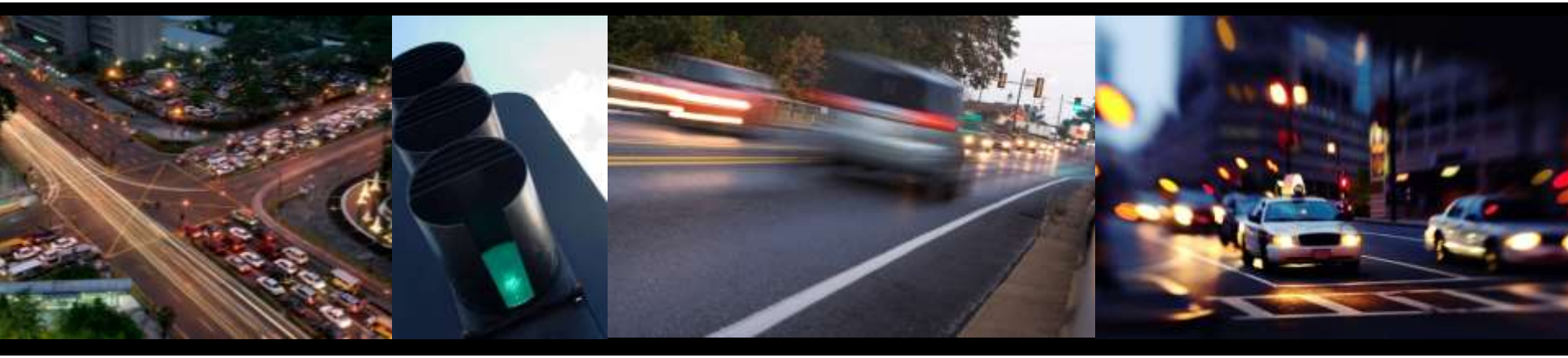



# Vantage® Velocity

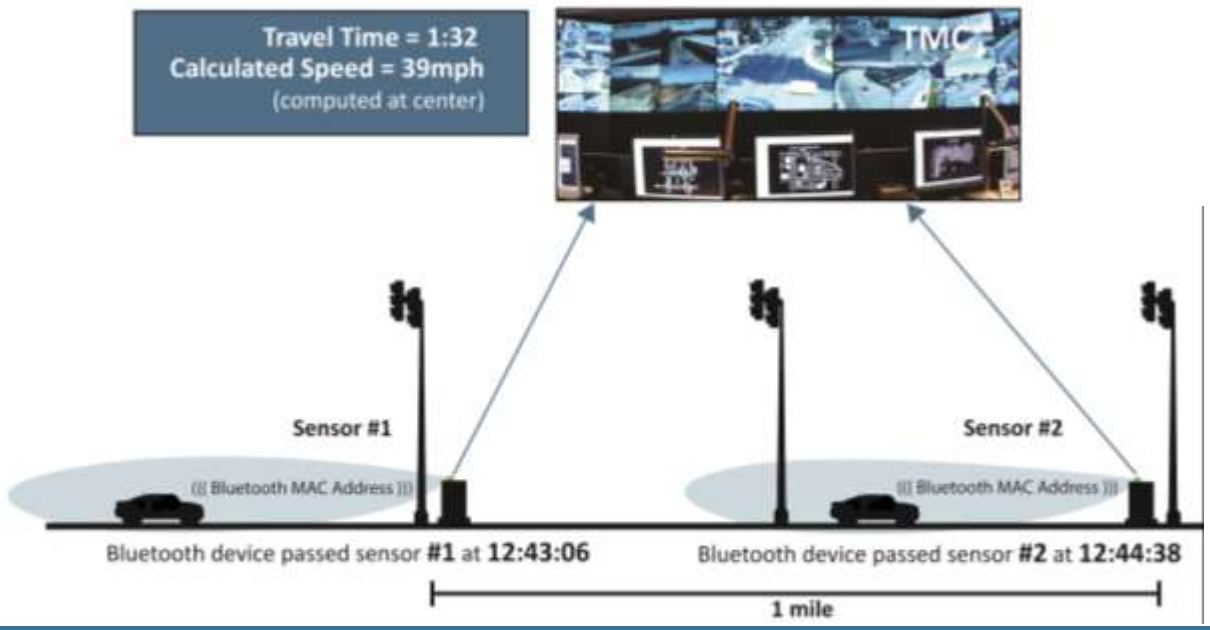
## Calculating Accurate Travel Time Cost Effectively

# MAC Address Matching Technology

- ***Agencies want a cost-effective travel time system that delivers accurate real-time data***
- Bluetooth or Wi-Fi MAC Address matching travel time systems can provide that by being:
  - Low cost
  - Reliable
  - Accurate
  - Low maintenance
  - Low risk
  - Proven - ***<u>Many</u> studies around the world verify data sets, accuracy, and value***

# Vantage Velocity

- Vantage Velocity anonymously reads the MAC ID of passing devices (vehicles, phones, tablets, etc.) and compares the time of these ID's from one known location to another



# Vantage Velocity Applications

1. Congestion mapping
2. Providing travel times and speeds for real-time traffic information
3. Populating Dynamic Message Signs (DMS)
4. Origin-destination information
5. Measuring the impact of construction projects
6. Triggering or prioritizing re-timing of traffic signals

# Bluetooth Technology Development

- Traditional MAC address readers were cost effective and provided adequate data sets, but there were issues…
- Synchronous I/O
  - Limited number of reads (up to 8 in 10 sec. scan)
  - Batch scanning and batch processing – grouping reads with the same timestamp
- **<u>Asynchronous I/O</u> – *Advanced Methodology***
  - Real-time read of a MAC Address that is immediately time stamped and sent for processing
  - <u>Enables more MAC Address reads</u>
  - <u>Enables for more MAC Address matches</u>

# Vantage Velocity Installation

- Traffic cabinet installation
  - Rack or Shelf-Mount

- Integrated into existing cabinets
  - Omni-Directional
  - 300 foot radius
  - Same antenna for BT or

# Alternative Installations

AC Standalone

Solar Powered

# Bluetooth or Wi-Fi

- Velocity is a modular system, and has the ability to collect Bluetooth or Wi-Fi MAC addresses
  - Simply change out the USB Adapter, configure the field units
- Bluetooth – continually *scans* for devices in proximity
  - Fast "grab" of MAC address, useful at all speeds
  - Very high re-identification rate – 90% and up
  - Asynchronous process
- Wi-Fi – continually *listens* for devices in proximity
  - Field units act as a hotspot
  - Slower "grab" of MAC address
  - Results have shown that the re-identification rate of Wi-Fi devices is much lower than BT (~1/10$^{TH}$)

# Bluetooth or Wi-Fi – Velocity Advantage

## Bluetooth

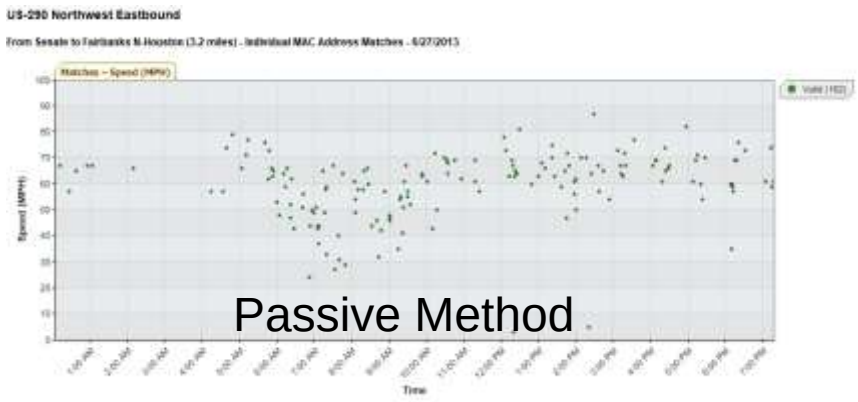
- 3-20% of volume includes Bluetooth-enabled devices
- The Velocity asynchronous process improves quantity of reads/matches
- Bluetooth is a proven data set
- Bluetooth is superior to Wi-Fi in free flow conditions

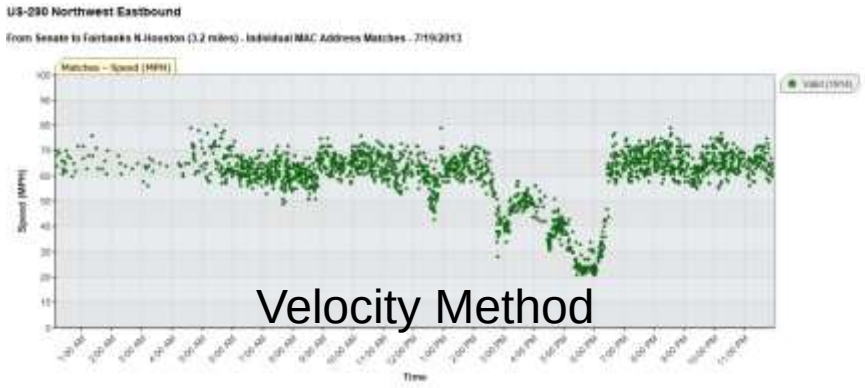
## Wi-Fi

- Collects Wi-Fi MACs from ALL devices
- More reads can provide more robust O/D data
- Only useful when the traffic has the opportunity to slow or stop

# Velocity Wi-Fi Advantage

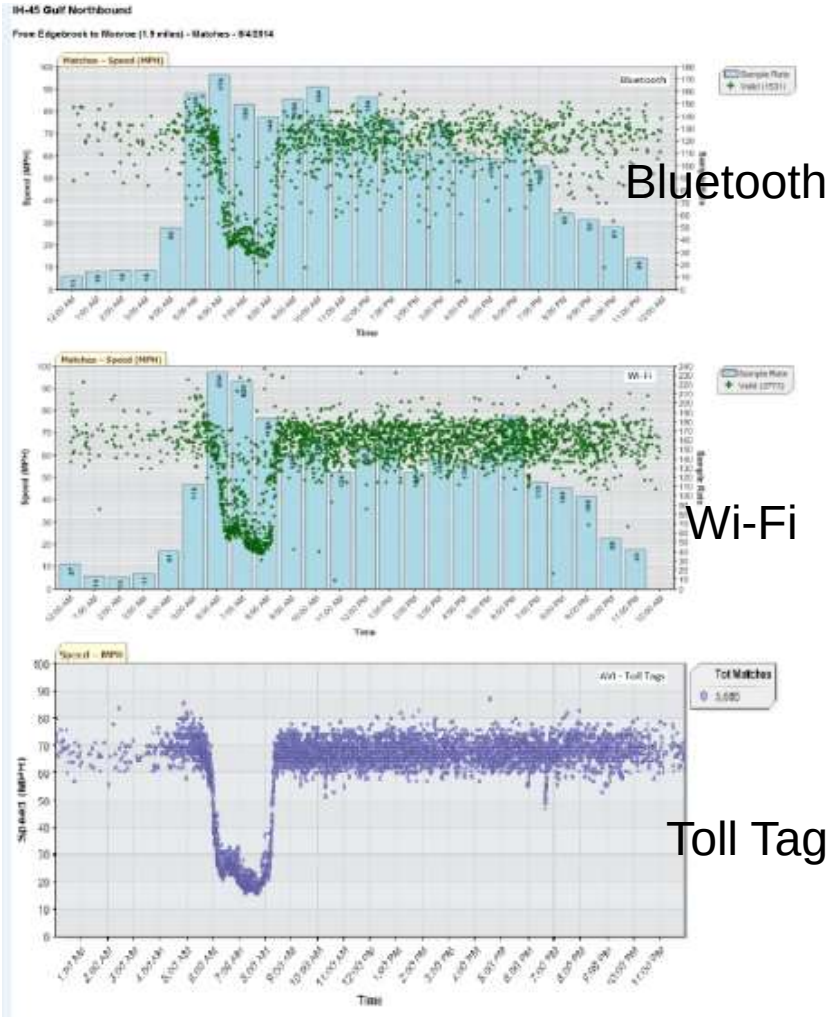
- Multiple methods for scanning for Wi-Fi MACs
  - Passive method only yields 10% of the matches that Bluetooth does, even though there are more reads
    - attwifi, hiltonhhonors, etc.
  - Velocity method listens for **ALL** Wi-Fi devices and typically generate 50+ % more matches than Bluetooth **when vehicles are slow are stopped.**



# Wi-Fi Comparison

- Side-by side comparison on I-45 at same locations
- Typical mid-week day
- **Travel time patterns are virtually identical**

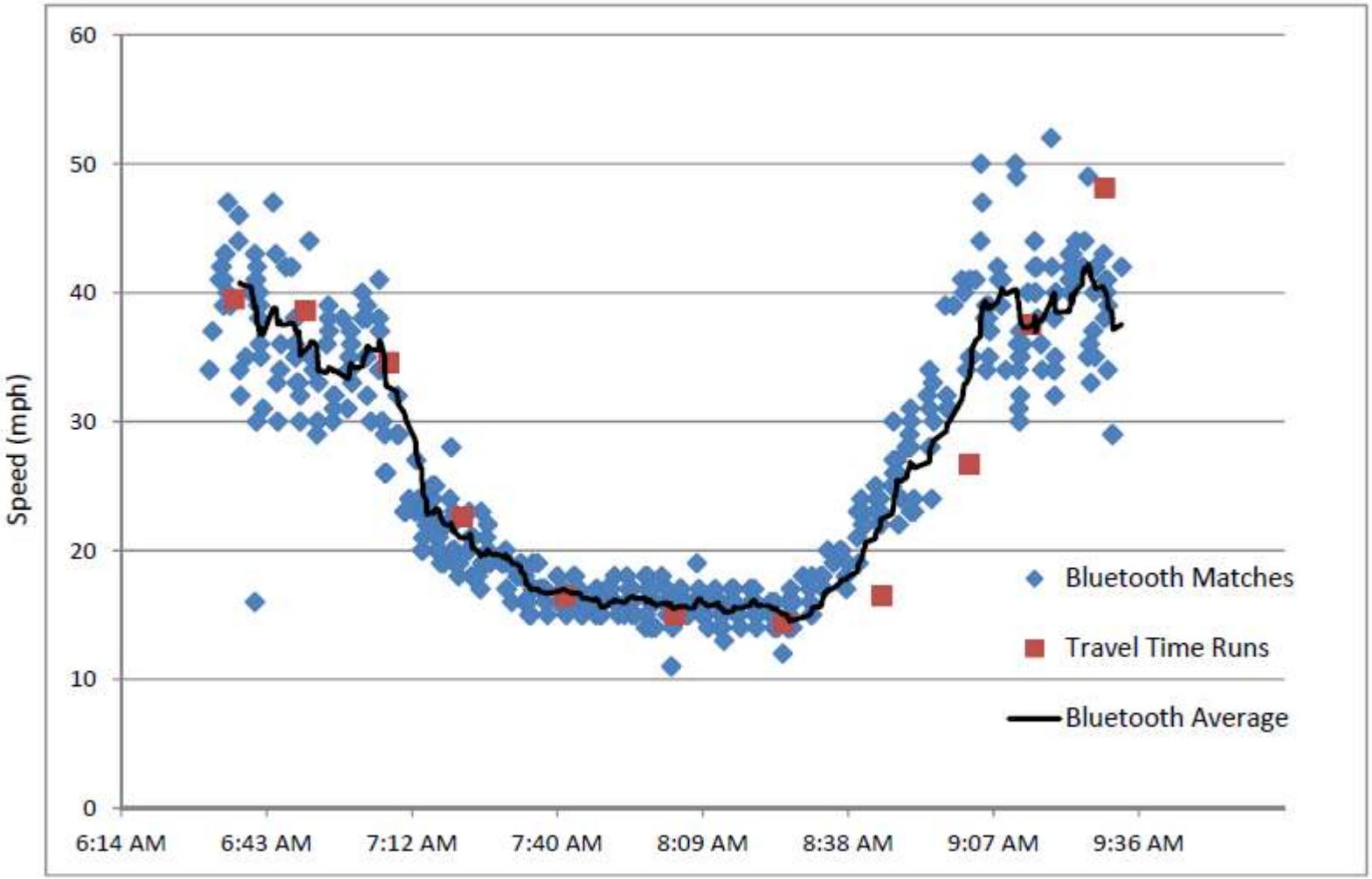


# Travel Time Algorithm Development

- Developed algorithms over a 20+ year period from toll tag travel time analysis
- 3 main algorithms, could customize for new applications

| Algorithm | Description | Suggested Applications |
|---|---|---|

# Comparison of Data to Floating Cars

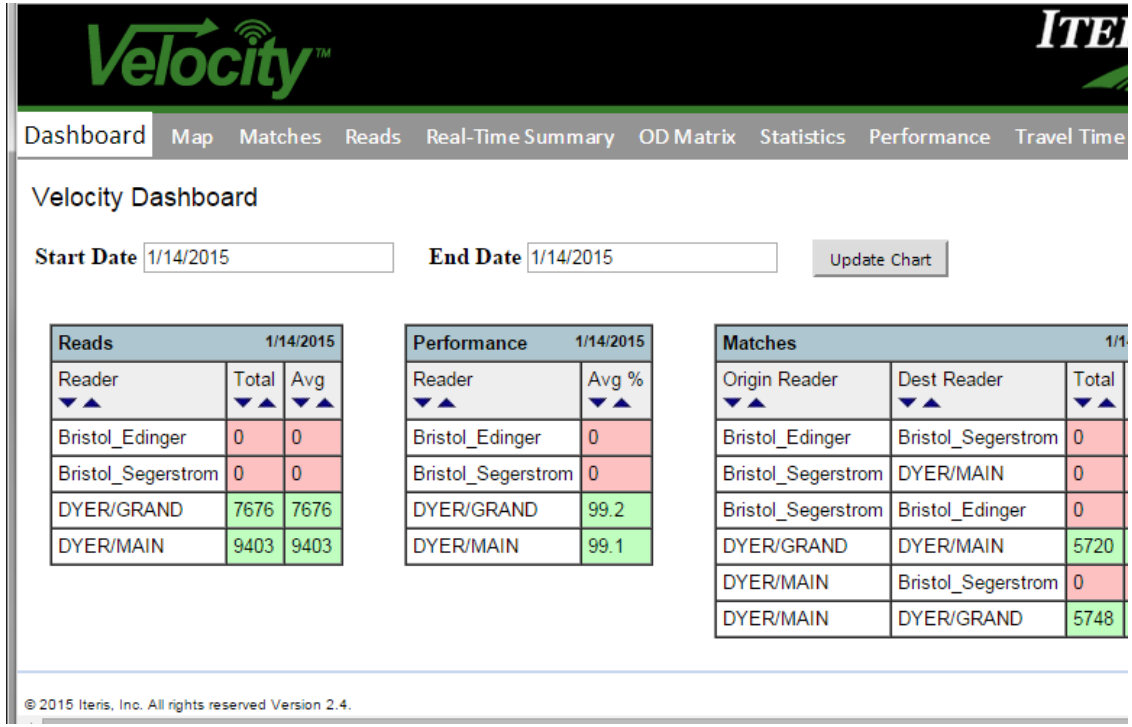


# Vantage Velocity Host Software

- Complete ownership of ***Data*** by operating agency
- Complete ownership of ***Equipment*** by operating agency
- No recurring fees
- Web-based GUI that provides output and graphics for:
  - System and Segment Statistics
  - Congestion Map
  - Reads & Matches
  - Historical Data Comparison
  - Travel Time Reports
  - Origin-Destination Matrix
  - Intersection Passage Time (Delay)
  - Data export to CSV and XML

# Statistics

- System Statistics Page



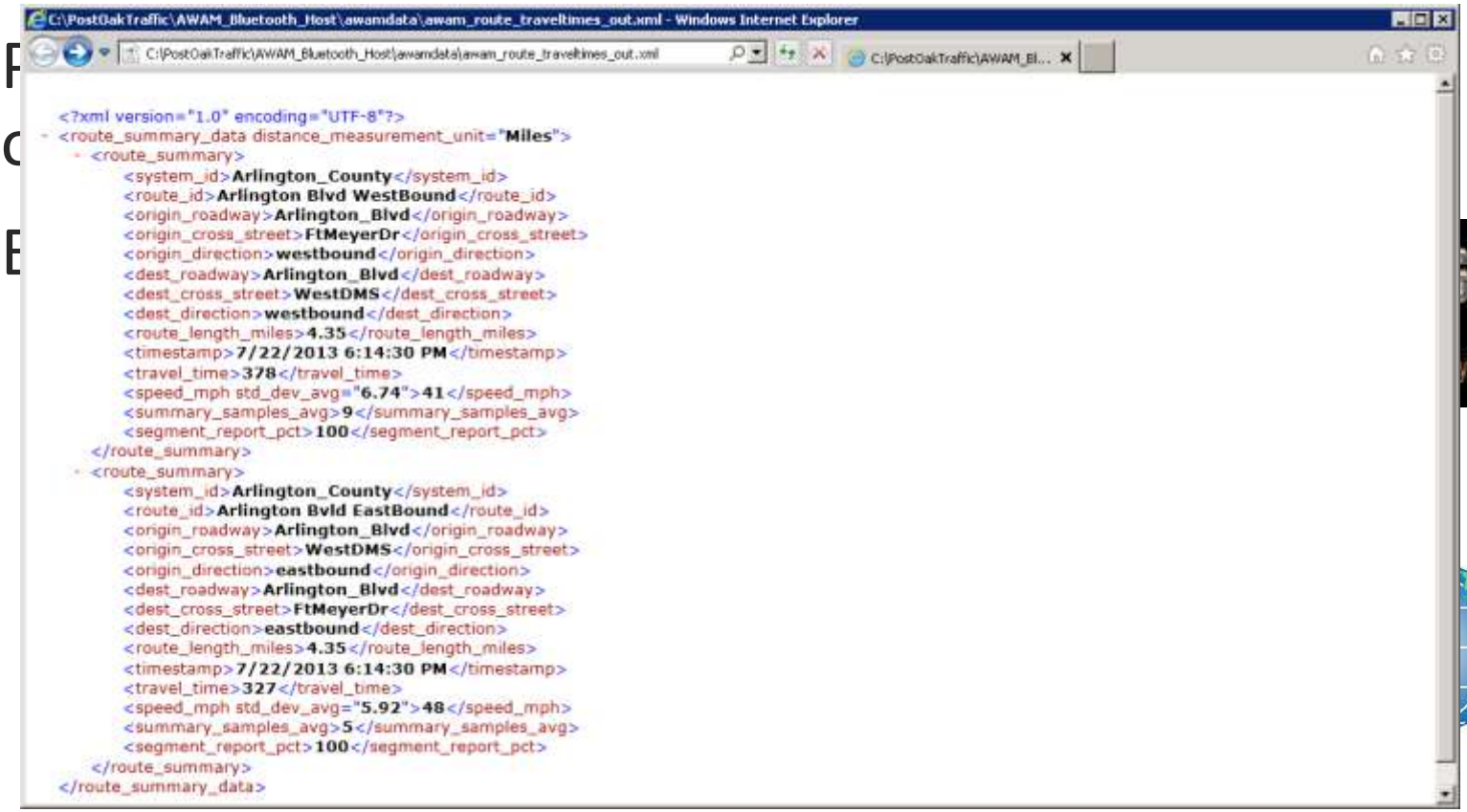

| Statistics | |
|---|---|
| Mean Travel Time | 0:35 |
| Mean Speed | 26.9 |
| Median Travel Time | 0:36 |
| Median Speed | 20 |
| 85th Percentile Travel Time | 0:54 |
| 85th Percentile Speed | 45 |
| 95th Percentile Travel Time | 1:00 |
| 95th Percentile Speed | 65 |

**Travel Time Frequency Distribution**

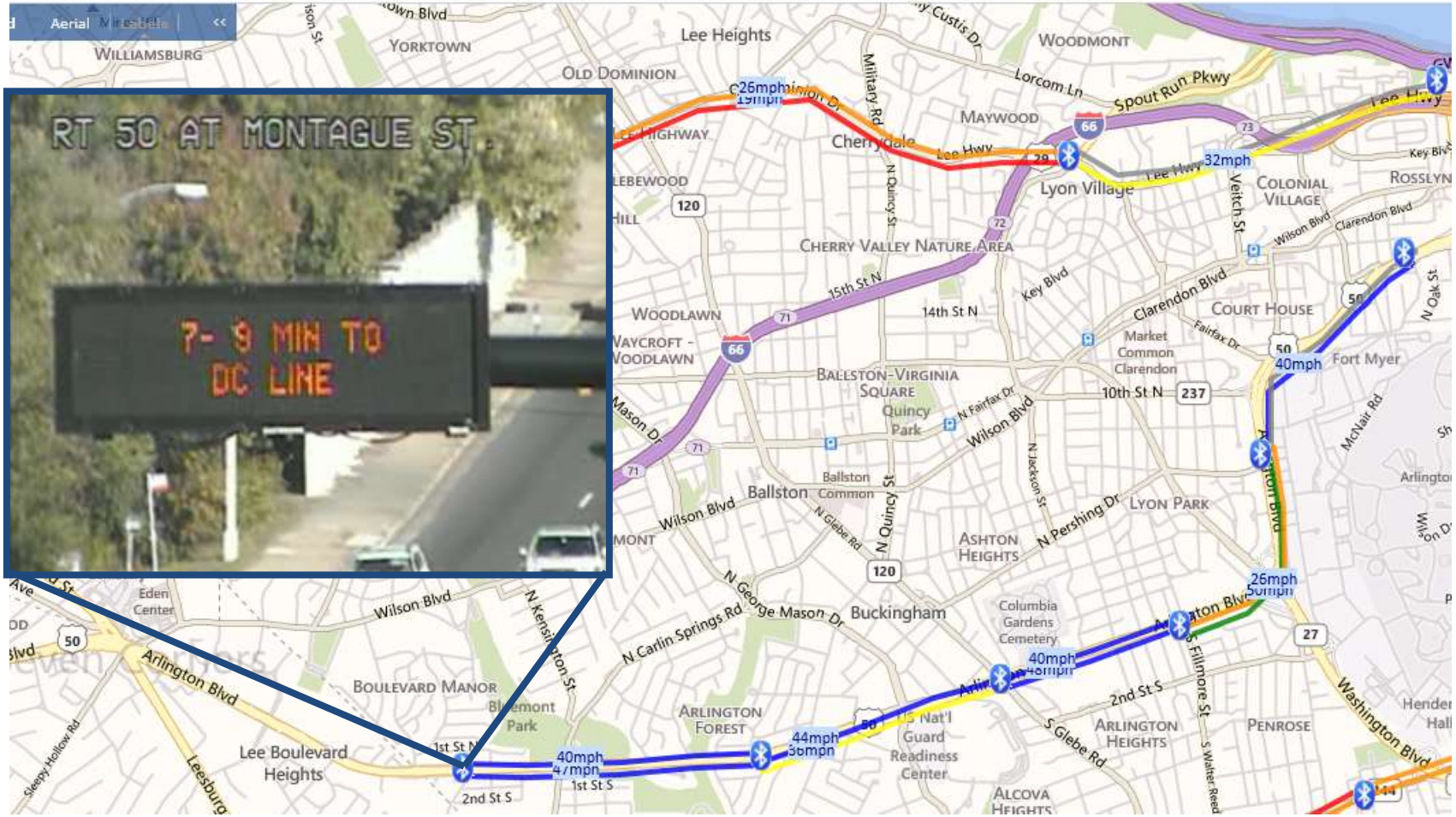
| Travel Time Minutes | Count | Percentage |
|---|---|---|
| 0-1 | 2024 | 94.4% |
| 1-2 | 121 | 5.6% |

# Third Party Systems Integration

- Utilize an XML output that external programs can extract data sets from



# DMS Integration Example



# Congestion Mapping

# Privacy – MAC Addresses

- Not directly associated with a specific user
- Can not be used to identify or “track” an individual’s whereabouts
- No personal data
- Can be anonymous
- Can be **encrypted**

# Vantage Velocity Differentiators

- Any form factor available
  - Rack-mount, shelf-mount, standalone
- Bluetooth or Wi-Fi capable
- Asynchronous I/O
- Easy-to-use GUI
- Powerful and robust host software
- E-mail notifications
- Complete ownership of data by operating agency

# Questions and Comments


www.iteris.com