Advances in Bluetooth Technologies For Travel-Times

Presented By:
Paul Misticawi
VP of Sales, TrafficCast
Bluetooth Technologies for Travel-Times

- What is Bluetooth
- How are travel-times derived from Bluetooth devices
  - Turning Raw Data into Information
- Applications Using Bluetooth Travel-Times
- Using neighboring agencies Bluetooth devices
- Advancements in Hardware and Why
- How do you view and use the information
  - Sevierville, TN – Live Demonstration
Bluetooth and MAC Address

- **Bluetooth** is an open wireless technology standard for exchanging data over short distances from fixed and mobile devices, creating personal area networks (PANs) with high levels of security.

- **Bluetooth** uses a radio technology called frequency-hopping spread spectrum and is in the 2.4 GHz short-range radio frequency band.

- A Media Access Control address (MAC address) is a unique identifier assigned to network interfaces for communications on the physical network segment.
How Does Bluetooth Work w/ Bluetooth
Data into Information

**Hardware**
- AC or DC Power
- Ethernet and/or Cellular
- Stand alone or existing cabinet

**Filters/Algorithms**
- Proprietary algorithms that smooth the data based upon road classes (i.e. arterial, expressways, etc.)
- Traffic engineering and data analysis that check to see if the data is accurate

**Web Based Backend**
- Real time speed and travel time information displayed on website hosted by TrafficCast
- Statistical data reports covering speed, travel time, origin/destination
Filters Out Data Outliers in Real Time

Smoothed (15 min) for Pair 16536: Zoo: I-894 NB N of Cold Spring to Cleveland

from 2014-10-12 17:22 to 2014-10-14 17:22
Bluetooth Applications

• Arterial Travel-Times (operations, OD, message boards, before/after studies, adaptive analysis)
• Freeway Travel-Times (operations, OD, message boards)
• Performance Measures
• Work Zone Applications
• 511/Traveler Information Systems
• Planning/Modeling (OD)
• Incident Management
Device Replication...Multi-Jurisdictional Sharing & Pairing

Device Replication Feature:
- Multi-jurisdictional sharing of information made simple
- Server to server data exchange
- Copy and pair any Bluetooth device in real-time
- Allows users to expand their travel-time system at no cost
Hardware Enhancements

2010
Stand Alone Processor

2012
Integrated Processor/Ant

2016
Dual Radio System
TrafficCast set forth to engineer a system that would detect the most samples per unit and most matches between units in the industry; far more than any Bluetooth and/or Wi-Fi system.

This would provide our partners accurate and reliable travel-times on lower volume roads and on non peak-hours, while also providing greater OD accuracy.
BlueTOAD Spectra Technology

- New Dual Radio System
- Detection of Discoverable AND “Non-Discoverable” segments of Bluetooth signal.
- Ensures privacy as it only detects 6 characters of MAC address.
- Compatible to all existing BlueTOAD systems.
- Great for “hands-free” states.
- More accurate travel-times on lower volume roads.
- Origin/Destination Metrics more advanced now.
- Plug-and-Play in to existing BlueARGUS software suite.
BlueTOAD Spectra Sample Rate

- Sample rate is the % of unique detects compared to overall volume for a given time or what % of vehicles are being detected
- ~40% or higher sample rate (far greater than Wi-Fi)

![Sample Rate - AM & PM (Spectra vs WiFi)](chart.png)

<table>
<thead>
<tr>
<th></th>
<th>AM</th>
<th>PM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wifi</td>
<td>24%</td>
<td>27%</td>
</tr>
<tr>
<td>Spectra</td>
<td>40%</td>
<td>39%</td>
</tr>
<tr>
<td>Difference</td>
<td>16%</td>
<td>12%</td>
</tr>
</tbody>
</table>
BlueTOAD Spectra Match Rate

- 14-20% or higher match rate.
- +300% (3X) more matches than Wi-Fi matches.
- Match rate is what really matters.

<table>
<thead>
<tr>
<th>Technology</th>
<th>AM Match Rate</th>
<th>PM Match Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wi-Fi</td>
<td>5.06%</td>
<td>4.58%</td>
</tr>
<tr>
<td>Spectra</td>
<td>16.82%</td>
<td>14.28%</td>
</tr>
</tbody>
</table>

AM = 3.3X Increase

PM = 3.1X Increase
From Device to Information

BlueTOAD Devices
Ethernet or Cellular Comm.
to BlueARGUS Server

BlueARGUS Server
TrafficCast OR customer hosted

BlueARGUS Applications
Web Based Software Suite and
XML for 3rd Party Systems
BlueARGUS 2.0 Software Suite

- TrafficCast hosted or customer hosted solution
- Web-based GUI with unlimited users
- 3 main components:
  - Simple setup of pairings and routes
  - Real-time information and alarms
  - Historical Reports and Analysis
- Over 2,000 BlueARGUS customers
For more information:

Paul Misticawi  
pmisticawi@trafficcast.com  
678-575-0958  
trafficcast.com/Spectra