Joint Base Lewis-McChord (JBLM) Bluetooth Traveler Information and Integration

11th Annual Western States Rural Transportation Technology Implementers Forum
June 21 – 23, 2016

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WSDOT Olympic Region

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Web Application Developer
WSDOT HQ Office of Information Technology

Roger Millar, PE, AICP
Acting Secretary of Transportation
Presentation Overview:

• Project History/Goals
• Project Planning/Technology Selection
• Project Coordination/Installation
• How it Works
• Demonstration
• Project Implementation
• Project Issues / Challenges
• Public Outreach/Measuring Success
• Summary, Lessons Learned, Overall Experience
• Questions
Project History/Goals

TIGER III Grant – I-5 ITS Congestion Relief Project

- $15M Congestion Relief project through the I-5/JBLM corridor
- Rural environment transitions to urban along I-5 near Puget Sound
- Grant element required using a portion of funds to address the installation and more rural roadways around the corridor
Attempted efforts to satisfy local community support requirement:
  • 100 yds to JBLM EOC with fiber from WSDOT
  • Provide devices on the installation for gate wait times
  • Unsuccessful in eliminating Red Tape with DOD IT/Security and Purchasing
  • Preliminary efforts with INRIX

Two Primary Goals:
✓ Provide Traveler Information to benefit local community
✓ Give travelers awareness of options that will encourage spreading traffic out, reducing short and/or unnecessary trips, and relieving congestion
Project Planning/Technology Selection

Previous study/Proven Technologies Assessed
(2013 Presented at the WTI TTI Forum)

Error Assessment for Emerging Traffic Data Collection Devices

Ted Bailey, WSDOT
Ron Vessey, WSDOT
Bahar Namaki, Aalborg Univ.
Yegor Malinovskiy, UW
Yinhai Wang, UW
Existing state contracts available

- TrafficCast and Blip Systems

- Still solicited five bids

- Blip was less expensive but hadn’t successfully proven their solar solution (as TrafficCast had)
Project Planning/Technology Selection

Cost Considerations

Included:
- Equipment purchase

Not included:
- Ongoing operations costs (past 1\textsuperscript{st} six months)
- WSDOT staff installation costs
- WSDOT staff maintenance costs/impacts
- IT development and maintenance costs

Gain acceptance with stakeholders (WSDOT Management, JBLM, Pierce County, local agencies, etc.) on project approach, important routes, pilot project status
Project Coordination / Installation

- Assembling the WSDOT team (Region Traffic Operations/ITS & Signals/HQ IT Traffic Operations/Communications)
- Partnership w/JBLM to identify key routes for equipment location (prescribed by them)
- Regular meetings/timelines for WSDOT Field crews/JBLM Access
- “Temporary”/Pilot project - one year limitation (planning to ignore)
- Impacts of Leadership changes at JBLM
How It Works

Simple Installation:

- Band mount box and solar panel
- Attach Ethernet cable, Bluetooth antenna, and solar panel cable
- Install and connect battery
- Turn it on (auto discovery)
How It Works

Video of TrafficCast BlueTOAD Process

![Diagram of TrafficCast BlueTOAD Process]
How It Works

Registers vehicle passing within 200 feet of detectors.
How It Works

Determines travel time and speed after passing second device
How It Works

- Correlates whichever pair of devices a vehicle triggers
- Calculates travel times based on speed and distance
How It Works

- Flow chart provided by TrafficCast
- According to TrafficCast, time from device to XML averages 3 minutes, an acceptable latency for flow map production
How It Works

Data transfer flow from TrafficCast to WSDOT
Demonstration

- TrafficCast BlueToad Website
- WSDOT Website
- WSDOT Smartphone App
BlueTOAD Site: Devices
Device ID is provided by BlueTOAD, pre-assigned to device
## BlueTOAD Site: Pairs

<table>
<thead>
<tr>
<th>ID</th>
<th>Act</th>
<th>OD</th>
<th>Dist</th>
<th>Dir</th>
<th>From</th>
<th>To</th>
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<td>N</td>
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<td>5037</td>
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<td>S</td>
<td>5024</td>
<td>5028</td>
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<td>Main Gate</td>
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<tr>
<td>21038</td>
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<td>0.3</td>
<td>N</td>
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<td>5026</td>
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<tr>
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<td>N</td>
<td>1</td>
<td>NE</td>
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<td>5039</td>
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<td>S</td>
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<td>5015</td>
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<td>E</td>
<td>5037</td>
<td>5010</td>
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<td>Integrity Gate</td>
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</table>
BlueTOAD Site: Routes

Routes - WSDOT-Or-JBLM

- Show Active Routes
- Show Inactive Routes
- Show Active Devices
- Show Inactive Devices

Map

Table:

<table>
<thead>
<tr>
<th>ID</th>
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</table>

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### BlueTOAD Site: Dashboard

#### Dashboard - WSDOT-Or-JBLM

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<tr>
<th>Type</th>
<th>ID</th>
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<th>To</th>
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<td></td>
<td>Ave I/S</td>
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</tbody>
</table>
BlueTOAD Site: Historical Report Setup

Reports


Generate Report

BlueTOAD Pair / Route

- Pair 20996: (Pendleton Ave / Main St. Gate to I-5 SB Ramp @DuPont JC)
- Show inactive pairs/routes
- Show speed limit

Comparison Index #1

- Default Historical Average (12 Weeks)
- Custom Historical Average

Days of the Week

- All
- Sun
- Mon
- Tue
- Wed
- Thu
- Fri
- Sat

Add Comparison Index

Output Type

- HTML

Generate

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BlueTOAD Site: Report – Pair/Route

Report Parameters

Pair / Route
Route 22883: (41st Division Dr/Pendleton Ave I/S to I-5 NB Ramp @ Berkely I/C)

Start Date
2016-04-26

End Date
2016-04-26

Period
0:00 to 23:55

Type
Smoothed Speed (5-min)

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<tr>
<th>Day of week</th>
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<th>Time</th>
<th>Last match time</th>
<th>Travel time (s)</th>
<th>Speed (mph)</th>
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<td>00:00</td>
<td>2016-04-25 23:54:28</td>
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<td>2016-04-26 00:11:58</td>
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<tr>
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<tr>
<td>Tuesday</td>
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<td>00:25</td>
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<td>2016-04-26 00:49:38</td>
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</tbody>
</table>
BlueTOAD Site: Pair Historic Data - Speed

Smoothed (15 min) for Pair 21458: 41st Division Dr/ A St I/S to I St Gate® DuPont Steilacoom Rd I/S
from 2016-04-24 19:27 to 2016-04-26 19:27

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BlueTOAD Site: Pair Historic Data – Travel Time

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BlueTOAD Site: O/D Studies

Start Date
2016-03-01 00:00:00

End Date
2016-04-25 23:55:00

<table>
<thead>
<tr>
<th>Origin</th>
<th>Destination</th>
<th>Waypoint</th>
<th>Map/Graph Color</th>
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<tr>
<td>DuPont Steilacoom Rd/East Dr I/S</td>
<td>I-5 SB Ramp @ 41st Division Dr (North Gate)</td>
<td></td>
<td>Green</td>
</tr>
<tr>
<td>DuPont Steilacoom Rd/East Dr I/S</td>
<td>I-5 SB Ramp @DuPont I/C</td>
<td></td>
<td>Pink</td>
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<tr>
<td>DuPont Steilacoom Rd/East Dr I/S</td>
<td>I-5 SB Ramp @Center Drive</td>
<td></td>
<td>Blue</td>
</tr>
</tbody>
</table>
BlueTOAD Site: O/D Study Results

Match count bar chart

Ken's Pet Project - Spring 2016

To zoom in, drag the mouse over the area to magnify. To hide/show a data series, click the name of the series in the legend bar.

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Project Implementation

WSDOT Database Structure
Project Implementation

BlueTOAD Data Retrieval

• Each data file requires a secure connection to BlueToad server
• Download devices XML data, save to list
• Add new devices
• Record last detection and voltage
• Download Pairs XML data
• Insert new pairs and update existing ones
• Save the current values to database
• Save history every 10 minutes
• Routes are ignored
Project Implementation

Map presentation work

- Graphic artist created new map in Photoshop
- Road segments which correspond with pairs are given unique colors
Project Implementation

Map coloring program

- Speeds are associated to colors
  - Black – 10% and below of posted speed limit
  - Red – 11 to 35%
  - Yellow – 36 to 76%
  - Green – 77% and above
- Retrieve flow data and device locations from database
- Find the box which has both devices in a pair on opposite edges
- Within box change segment color to appropriate speed color
- Add date and time to image
- Publish to web and mobile app
Project Implementation

Showing approximate device locations

Final published map
Project Issues / Challenges

• Permitting
  • JBLM – one week
  • Pierce County – one year
  • Thurston County – “Sure, no problem”

• TrafficCast Server down
  • Maintenance performed by vendor affected production feed
  • Called support line
  • Quick response from vendor directed to use a backup system
  • Have to remember to change back

• Responsive service from vendor? Helpful?
  • Initial ordering issues due to Tesla buying up inventory of items that make up BlueTOAD devices
  • When issues came up, vendor was genuinely concerned and helpful

• Ongoing funding/operations costs
  • 30 units @ $35K/yr for cellular connectivity and data processing fees can add up
Project Issues / Challenges

Rural Geography:
Hills, trees, difficult southern exposure to sunlight
Utility power generally unavailable (solar, battery backed)
Communications – cell signal/strength, radio if used
Project Issues / Challenges
Solar Power, device locations

Panel Too Flat and Shaded

Better Location Across Intersection
Project Issues / Challenges

Solar Power, device locations

Panel Too Steep

Poor Location, Shaded in Trees

• Unable to get permission to install along main road due to permitting requirements from county.
• This installation requires routine monitoring and extra battery replacement
Public Outreach / Measuring Success

- Attempts to post website/information inside common areas (PX, etc.)
- Multiple local newspaper/online blog interviews and articles
- At local agency open houses
- Through WSDOT Communications
- System Reports – Coming Soon
- Web page hits - steady trend (source: Google Analytics)
- Plan to make available for programmatic API access
Summary, Lessons Learned, Overall Experience

- Installation details (example: WSDOT installation - $2K to reposition equipment)
- Use of this technology is being considered as possible model for other area efforts (Port Alliance – Seattle/Tacoma)
- Great team effort amongst stakeholders required for success
- Experience to date: Recommend this vendor and product for consideration
- Coming soon: Pre-planned detours using installation roads
- Next Steps: Project Phase 2 - Exploring other ways to achieve same results - different technology/different funding configuration
Questions?

KNOW BEFORE YOU GO
NEW JBLM TRAFFIC FLOW MAP NOW AVAILABLE

- Backups at your gate? Check the WSDOT Flow Maps and Mobile App for the quickest route to take!
- Automated system available at your convenience!

Through a partnership with WSDOT & JBLM, 30 Bluetooth readers were installed at key installation intersections. The information is linked with WSDOT traffic flow maps, available to the public.

Joint Base Lewis-McChord Traffic and Cameras

- Traffic Conditions as of: Feb 24, 2016 1:39 PM
- View of the JBLM Corridor on the WSDOT mobile app.
- You can access the JBLM Traffic Flow Map from the Tacoma Flow Map webpage!

Contacts:
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Tom Stidham - StidhaT@wsdot.wa.gov / 360-705-7729