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

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

Tony Leingang

Freeway Operations Engineer JBLM Bluetooth Project Manager WSDOT Olympic Region

Tom Stidham

Information Technology Specialist 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



Project History/Goals

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)





Project Planning/Technology Selection

All Pricing based on the purchase (NOT Lease) of 30 units and 2 yrs Pricing does NOT included installation.	Recommended Option				
Line Item	*** TrafficCast *Blip Systems - BlueTOAD BlipTrak (Coral (Advanced Sales Quote)		Acyclica - (Western Systems Quote)	**Acyclica - (INRIX Quote)	lteris - Velocity (Western Systems Quote)
Equipment (w/solar power and cellular communication) - 30 units	\$126,000	\$117,090	\$187,555	\$136,800	\$210,000
			(Pricing was		
			included in the		
2 yr - SUPPORT (Data Service, Web Service, Data Analytics, API, XML			Equipment Line		
for WSDOT Flow Map)	\$39,600	\$17,760	Item)	\$15,000	\$25,409
2yr - celluar communicaiton	\$21,600	\$28,260	\$22,500	\$21,600	\$36,000
2 yr - INRIX Fixed Route Travel Times	\$0	\$0	\$0	\$24,000	\$0
SubTotal	\$187,200	\$163,110	\$210,055	\$197,400	\$271,409
Sales Tax (8.8%)	\$16,474	\$14,354	\$18,485	\$17,371	\$23,884
Grand Total	\$203,674	\$177,464	\$228,540	\$214,771	\$295,293
Variance from BlueTOAD	\$0	(\$26,210)	\$24,866	\$11,098	\$91,619

I-5 JBLM Traveler Information Options

* Solar Power Solution would be custom for this installation (not tested)

** INRIX Equipment bid is unclear if solar power is included. INRIX bid also includes INRIX Fixed Route Travel Times

*** Cellular communication billing is covered directly by TrafficCast as part of their turn key solution

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 1st 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



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)





Video of TrafficCast BlueTOAD Process







Registers vehicle passing within 200 feet of detectors.





Determines travel time and speed after passing second device



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









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



Data transfer flow from TrafficCast to WSDOT





Demonstration

- TrafficCast BlueToad Website
- WSDOT Website
- WSDOT Smartphone App









BlueTOAD Site: Devices

Devices - WSDOT-Or-JBLM 1

Show Active Devices

Show Inactive Devices





BlueTOAD Site: New Device Setup

Device ID * Device Name *		
		Now
Location	└ Settings	
Latitude * N/S Longitude * E/W N W City State/Prov/Country	Effective Date * Valid Until * 2016-04-26 2020-04-26 Format: 2016-04-26 Format: 2016-04-26 Time Zone * Device Model *	Save Device
Mile Marker Section Marker	T	Cancel
	XF1 (user-defined)	
 Active Inactive 		
Preset Alarms		
Use the Alarms menu to create new alarms		
Low Voltage From 00:00 to 23:59 (UMTWRFS)		

Device ID is provided by BlueTOAD, pre-assigned to device



BlueTOAD Site: Pair Creation

Pair ID TBD	Pair Name *				
From Device *	From Device Name To Device Name Direction * m Timed)	Speed Limit *	Road Class None XF2 (user-define	Smoothing Method *	Save Pair Add Reverse
Settings Match-Spee Min Speed *	ed Limits Max Speed * ph 30mp	Stale Tin	Make Like Default ▼ me * 30min	Alarms Preset Alarms No preset alarms have been created. Use the Alarms menu to create new alarms	Cancel
Speed Map Orange * 50	Color Thresholds	S (% of speed li Green * 75 %	imit) Blue * 115 %		



BlueTOAD Site: Pairs



ID	Act	OD	Dist	Dir	From	То	Pair Name 🕶	XF1
20984	Y	N	1	SW	5039	5037	32nd Div St/N Gate (East Dr) to 41st Division Dr/ A St I/S	East Gate
20983	Y	N	0.6	NW	5039	5008	32nd Div St/N Gate (East Dr) to DuPont Steilacoom Rd/East Dr I/S	East Gate
21011	Y	N	0.3	S	5024	5028	41st Division Dr @ Main Gate Visitor Center I5 NB Ramp to 41st Division Dr/Colorado Ave I/S	
21038	Y	N	0.3	N	502 <mark>4</mark>	<mark>5026</mark>	41st Division Dr @ Main Gate Visitor Center I5 NB Ramp to I-5 SB Ramp @ 41st Division Dr (North Gate)	
20985	Y	N	1	NE	5037	5039	41st Division Dr/ A St I/S to 32nd Div St/N Gate (East Dr)	
20986	Y	N	1	S	5037	5015	41st Division Dr/ A St I/S to 41st Division Dr/San Francisco Ave I/S	
21458	Y	N	1.54	E	5037	5010	41st Division Dr/ A St I/S to I St Gate@ DuPont Steilacoom Rd I/S	Integrity Gate



BlueTOAD Site: Routes

Routes - WSDOT-Or-JBLM 1

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



22883	Y	3.60	4	5029	5038	41st Division Dr/Pendleton Ave I/S to I-5 NB Ramp @ Berkely I/C	
23881	Y	3.00	4	5008	5026	DuPont Steilacoom Rd/East Dr I/S to I-5 SB Ramp @ 41st Division Dr (North Gate)	
23885	Y	5.06	2	5008	5009	DuPont Steilacoom Rd/East Dr I/S to I-5 SB Ramp @Center Drive	
23883	Y	3.70	2	5008	5047	DuPont Steilacoom Rd/East Dr I/S to I-5 SB Ramp @DuPont I/C	
22884	Y	3.60	4	5038	5029	I-5 NB Ramp @ Berkely I/C to 41st Division Dr/Pendleton Ave I/S	
23882	Y	3.00	4	5026	5008	I-5 SB Ramp @ 41st Division Dr (North Gate) to DuPont Steilacoom Rd/East Dr I/S	
23886	Y	5.06	2	5009	5008	I-5 SB Ramp @Center Drive to DuPont Steilacoom Rd/East Dr I/S	
23884	Y	3.70	2	5047	5008	I-5 SB Ramp @DuPont I/C to DuPont Steilacoom Rd/East Dr I/S	

For support, please send email to: bluetoad-help@trafficcast.com

© 2013-2016 TrafficCast International, Inc - All Rights Reserved



21

BlueTOAD Site: Dashboard



Dashboard - WSDOT-Or-JBLM 1

Show Pairs Show Routes

Туре	ID	From	То	*	Name 🕶	Speed	Time	Last Match
Pair	20984	5039	5037		32nd Div St/N Gate (East Dr) to 41st Division Dr/ A St I/S	18 mph	3:15	04-26 17:57
Pair	20983	5039	5008	•	32nd Div St/N Gate (East Dr) to DuPont Steilacoom Rd/East Dr I/S	39 mph	0:56	04-26 19:24
Pair	<mark>21011</mark>	5024	5028	•	41st Division Dr @ Main Gate Visitor Center I5 NB Ramp to 41st Division Dr/Colorado Ave I/S	11 mph	1:42	04-26 19:29
Pair	21038	5024	5026	•	41st Division Dr @ Main Gate Visitor Center I5 NB Ramp to I-5 SB Ramp @ 41st Division Dr (North Gate)	36 mph	0:30	04-26 19:29
Pair	20985	5037	5039		41st Division Dr/ A St I/S to 32nd Div St/N Gate (East Dr)	24 mph	2:31	04-26 19:26
Pair	20986	5037	5015		41st Division Dr/ A St I/S to 41st Division Dr/San Francisco Ave I/S	34 mph	1:47	04-26 19:29
Pair	21458	5037	5010	•	41st Division Dr/ A St I/S to I St Gate@ DuPont Steilacoom Rd I/S	8 mph	11:52	04-26 18:42
Pair	21010	5028	5024	•	41st Division Dr/Colorado Ave I/S to 41st Division Dr @ Main Gate Visitor Center I5 NB Ramp	33 mph	0:32	04-26 19:31
Pair	21009	5028	5029		41st Division Dr/Colorado Ave I/S to 41st Division Dr/Pendleton Ave I/S	19 mph	1:56	04-26 19:29



BlueTOAD Site: Historical Report Setup

Reports										
Pair/Route Report Comparison R	eport Historical Report	Device Report	Alarm Report							
← Generate Report			· ·							
BlueTOAD Pair / Route										
Pair 20996: (Pendleton Ave / Main St. Gate	to I-5 SB Ramp @DuPont I/C)		•							
Show inactive pairs/routes										
Show speed limit										
Comparison Index #1	0									
Default Historical Average (12 W	eeks) Custom Historica	al Average			Remove Comparison					
Days of the Week					Save these settings					
All Sun 🗹 Mon 🗹	Tue 🗹 Wed 🗹 Thu	🗹 Fri 🔲 S	Sat							
Add Comparison Index										
Output Type										
Generate										

For support, please send email to: bluetoad-help@trafficcast.com

© 2013-2016 TrafficCast International, Inc - All Rights Reserved



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)

Day of week	Date	Time	Last match time	Travel time (s)	Speed (mph)
Tuesday	04/26/2016	00:00	2016-04-25 23:54:28	393.9	32.9
Tuesday	04/26/2016	00:05	2016-04-25 23:54:28	393.9	32.9
Tuesday	04/26/2016	00:10	2016-04-25 23:54:28	393.9	32.9
Tuesday	04/26/2016	00:15	2016-04-26 00:11:58	393.9	32.9
Tuesday	04/26/2016	00:20	2016-04-26 00:16:48	Not enough matches	
Tuesday	04/26/2016	00:25	2016-04-26 00:22:00	Not enough matches	
Tuesday	04/26/2016	00:30	2016-04-26 00:25:22	Not enough matches	
Tuesday	04/26/2016	00:35	2016-04-26 00:32:00	Not enough matches	
Tuesday	04/26/2016	00:40	2016-04-26 00:37:11	388.7	33.3
Tuesday	04/26/2016	00:45	2016-04-26 00:39:48	388.0	33.4
Tuesday	04/26/2016	00:50	2016-04-26 00:47:03	388.0	33.4
Tuesday	04/26/2016	00:55	2016-04-26 00:49:38	387.7	33.4



BlueTOAD Site: Pair Historic Data -Speed



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.

For support, please send email to: bluetoad-help@trafficcast.com



BlueTOAD Site: Pair Historic Data – Travel Time



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.

8

ćΰ

04/26

8

99

Match counts

8

Ň

For support, please send email to: bluetoad-help@trafficcast.com

8

i 90 2:00

Raw Times

Washin Depart

0:00

04/25

Speed Limit Travel Time for Pair 21458

- Smoothed travel times

© 2013-2016 TrafficCast International, Inc - All Rights Reserved

0

8

óó

BlueTOAD Site: O/D Studies

Start Date

2016-03-01 00:00:00

End Date

2016-04-25 23:55:00

Origin	Destination	Waypoint	Map/Graph Color
DuPont Steilacoom Rd/East Dr I/S	I-5 SB Ramp @ 41st Division Dr (North Gate)		
DuPont Steilacoom Rd/East Dr I/S	I-5 SB Ramp @DuPont I/C		
DuPont Steilacoom Rd/East Dr I/S	I-5 SB Ramp @Center Drive		





BlueTOAD Site: O/D Study Results

Match count bar chart



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.

For support, please send email to: bluetoad-help@trafficcast.com

© 2013-2016 TrafficCast International, Inc - All Rights Reserved





Washington State Department of Transportation

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





Map presentation work

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





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





Showing approximate device locations



Final published map





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







Google maps

Rural Geography:

Hills, trees, difficult southern exposure to sunlight Utility power generally unavailable (solar, battery backed) Communications – cell signal/strength, radio if used



Solar Power, device locations



Panel Too Flat and Shaded



Better Location Across Intersection



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



Primary Dimension: Page path level 3 Page Other -

Secondary dimension 💌 Sort Type: Defau	lt 🔻	Advance	ed Filter ON	× edit 🏢	Ⅲ ● Ξ ૠ IIII	
Page path level 3 🕐	Pageviews ?	Unique Pageviews	Avg. Time on Page	Bounce Rate 🥐 🤟	% Exit ?	
	95,772 % of Total: 0.05% (182,238,922)	77,495 % of Total: 0.06% (132,174,378)	00:00:47 Avg for View: 00:01:34 (-49.99%)	53.34% Avg for View: 52.20% (2.18%)	17.41% Avg for View: 32.11% (-45.78%)	



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!
- http://www.wsdot.com/traffic/dupont/jblm.aspx



Joint Base Lewis-McChord Traffic and Cameras

NOTICE: ROADS IN DARK GREY AREAS ARE FOR MILITARY ACCESS ONLY

New JBLM Traffic Flow Map available on the Mobile App and on your desktop. 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.



View of the JBLM Corridor on the WSDOT mobile app.



Tacoma Washington Traffic and Cameras

Zoon Shut Lileal a Zoom In

You can access the JBLM Traffic Flow Map from the Tacoma Flow Map webpage!



Contacts:

Tony Leingang - <u>LeingaA@wsdot.wa.gov</u> / 253-548-2430 Tom Stidham - <u>StidhaT@wsdot.wa.gov</u> / 360-705-7729



shington State partment of Transportation