BTI Institute Borders • Trade • Immigration

A Department of Homeland Security Center of Excellence

UNIVERSITY of **HOUSTON**

Kickoff: August 2nd, 2019

Measuring Border Wait Time at Land Ports of Entry: Technology Assessment and Data Dissemination PI: Juan Carlos Villa

Other personnel: Leonard Ruback, Senior Research Scientist Swapnil Samant, Software Applications Developer Carlos Silva, Research Specialist Lorenzo Cornejo, Assistant Transportation Researcher Jose Rivera, Assistant Transportation Researcher

Project Overview

Goals: Improve the border crossing wait time measuring system, and analyze emerging technologies to strengthen the system capabilities to provide accurate border crossing times for Commercial Vehicles (CVs) and Privately Owned Vehicles (POVs).

Objectives:

- 1. Analyze current system operation and maintenance practices to identify improvements in system operation and information dissemination
- 2. Finalize Installation of RFID Equipment at Otay Mesa border crossings
- 3. Identify improvements to POV border wait time measurement
- 4. Research emerging technologies for dynamic vehicle wait time reporting
- 5. Overhaul the current border wait time measurement system software



How RFID Based Wait and Crossing Time System Works?



- The RFID sensors read tags/transponders from truck-trailers. Some examples include: FAST, MX/US, IAVE card, toll tags from CBP, etc.
- The system only captures the ID of the tag, does not include information about the vehicle.



How the POVs System Works?





Archived Data – Hourly Average Wait Time



World Trade Bridge, Laredo, TX: Hourly Average Travel Time

Time of the Day



BCIS - Real Time Data

EXPE	CTED TIME	EXPE	CTED NG TIME	UPDATED AT	+ Map Satellite
FAST	Non FAST	FAST	Non FAST		ounted Sta
Veteran's I	Memorial Brid	ge, Brownsvi	lle, TX		- H COLORADO
No Delay	No Delay	13 Minute(s)	13 Minute(s)	Jul 29 2019 10:40AM CDT	ATT I ATTACK
Pharr-Rey	nosa Internati	onal Bridge, I	Pharr, TX		
18 Minute(s)	18 Minute(s)	46 Minute(s)	29 Minute(s)	Jul 29 2019 10:40AM CDT	
World Trac	le Bridge, Lar	edo, TX			
No Delay	No Delay	20 Minute(s)	17 Minute(s)	Jul 29 2019 10:40AM CDT	Dhamin
Colombia	Bridge, Lared	o, TX			Phoenix Paso
No Delay	No Delay	12 Minute(s)	15 Minute(s)	Jul 29 2019 10:40AM CDT	T
Camino Re	eal Internation	nal Bridge, Ea	gle Pass, TX		SONORA
N/A ¹	No Delay	N/A ¹	No Delay	Jul 29 2019 10:40AM CDT	CHIHUAHUA
Ysleta Brid	ige, El Paso,	тх			СОАНИЦА
44 Minute(s)	25 Minute(s)	71 Minute(s)	48 Minute(s)	Jul 29 2019 9:40AM MDT	NIEVO
Bridge of t	he Americas,	El Paso, TX			Motor
32 Minute(s)	33 Minute(s)	53 Minute(s)	66 Minute(s)	Jul 29 2019 9:40AM MDT	ALIFORNIA SUR
Santa Tere	sa Port of En	try, Santa Ter	esa, NM		Google
No Delav	No Delay	14 Minute(s)	14 Minute(s)	Jul 29 2019 9:40AM MDT	Map data ©2019 Google, INEGI 200 km L

Nogales-Mariposa Port of Entry, Nogales, AZ

N	o Delay	No Delay	18 Minute(s)	15 Minute(s)	Jul 29 2019 8:40AM MST			

N / A¹ = Not available as there are no FAST lanes at this crossing





Data

Objective 1: Analyze current system operation and maintenance practices

- Monitor the sample size for each segment at the border crossings equipped with the Border Crossing Information System (BCIS).
- Monitor the number of RFID tags read by each RFID reader.
- Researchers will create monitoring metrics which would trigger automated notifications for maintenance.
- Data collected from RFID readers would be processed in real-time, at a centralized server, to compute wait times and crossing times.
- The computed wait times will be made available to CBP through an automated interface in real-time and also on the BCIS web portal for general public.

Objective 2: Finalize Installation of RFID Equipment at Otay Mesa border crossings

• Perform a penetration rate analysis for the Wait Time segment of the border crossing process



Student Involvement

Master's degree student will participate in:

- Assisting during the analysis of Bluetooth equipment (Task 4) as well as the Blockchain, GPS and emerging technologies (Task 5).
- Assisting on the project and could participate in preparing a submission for publication based on the work performed during the course of this project.

Undergraduate students will participate in:

- Assisting in data collection, technology analysis
- Assisting in programming and supporting the website status check.



ID	Task	Start	End		
	Project Management	Start	Ena		
	Task description: Kickoff Meeting and recurring	08/19	12/20		
т 1	meetings with stakeholders	Deliverat	oles		
1.1		Meeting minute	es,		
		agreements, status			
		meetings			
	Analyze current system operation and maintenance	Start	End		
	practices	Start	LIIG		
	Task description: Analyze current practices to identify	08/19	12/20		
T.2	improvements in the way BCIS is operating. Operate	Deliverables			
	and maintain the system, disseminate information to	Inception report and			
	CBP and other stakeholders	monthly operat	ions		
		report			



ID	Task				
	Finalize Installation of RFID Equipment at Otay Mesa	Start	End		
	border crossing				
тр	Task description: Install and test RFID equipment at	08/19	12/20		
1.5	the California Otay Mesa Border crossing	Deliverables			
		Penetration test	report		
		and Installation	report		
	Research Blockchain and GPS technologies for	Start	End		
	dynamic vehicle wait time	Start	LIIG		
т.4	Task description: Study the viability of integrating	02/20	09/20		
	vehicle GPS tracking and Blockchain technologies to	Deliverables			
	report commercial vehicle wait times from Mexico	Emerging technologies			
	into the U.S. dynamically.	White paper			



ID	Task			
	Research Blockchain and GPS technologies for	Start	End	
	dynamic vehicle wait time			
тс	Task description: Study the viability of integrating	02/20	09/20	
1.5	vehicle GPS tracking and Blockchain technologies to	Deliverab	oles	
	report commercial vehicle wait times from Mexico	Emerging techn	ologies	
	into the U.S. dynamically.	White paper		
	Develop a more efficient border wait time	Start	End	
	measurement system	Start	LIIU	
	Task description: Overhaul the current border wait	10/19	09/20	
т.6	time measurement system software.	Deliverables		
		Website and Database		
		report, and algorithm for		
		server side softw	ware	
		report.		

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Texas A&M Transportation Institute		Dunation	Calendar Year 1 (2019)				Calendar Year 2 (2020)											
ID	Tasks	Duration	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
T.1	Project Management	16 months																
Т.2	Analyze current system operation and maintenance practices	16 months																
Т.З	Finalize Installation of RFID Equipment at Otay Mesa border crossings	6 Months																
Т.4	Identify improvements to POV border wait time measurement	6 months																
T.5	Research Blockchain and GPS technologies for dynamic vehicle wait time	8 months																
Т.6	Develop a more efficient border wait time measurement system	12 months																



Deliverables

ID	Description	Туре	Date				
	Task 1						
D.1	Monthly system operation report	Report	Recurring				
	Task 3						
D.2	Penetration test report	Report	01/2020				
D.3	Final installation report	Report	01/2020				
	Task 4						
D.4	Bluetooth analysis report	Report	06/2020				
	Task 5						
D.5	Innovative technologies white paper	Report	09/2020				
		/Paper					
Task 6							
D.6	New border wait time measurement	Report	09/2020				
	system software						
Seci	ire Facilitate Ensure		BTI Institute				

Milestones

ID	Description	Means of verification							
Task 2									
M.1	System Operation (continuous)	10 th day of the month	Reliability of the system measured in hours of system downtime						
		Task 3							
M.2	Otay-Mesa System reporting Wait Time	October 2019	System transmitting information to CBP on a regular basis						
M.3	Otay-Mesa System reporting Crossing Time	January 2020	System transmitting information to CBP on a regular basis						
		Task 4							
M.4	POV research prototype	March 2020	POV lane detection prototype						
M.5	POV research test	May 2020	Prototype test at the RELLIS campus						
M.6	Bluetooth analysis report	June 2020	Bluetooth analysis report						



Milestones

ID	Description	Date	Means of verification				
Task 5							
M.7	Emerging technologies white paper	September 2020	Paper submitted for publication				
		Task 6					
M.8	Border wait time measuring system	September 2020	System is estimating border wait times accurately and responds to queries efficiently				



Performance Metrics

Research	and Innovation KPIs	Date	Means of
			verification
KPI-RI-1	Bluetooth system functionality to measure border wait time by lane	May 2020	Successful test at RELLIS
KPI-RI-2	Improved software to measure and report border wait times	September 2020	System operates efficiently and provides information to CBP
Dissemin	ation KPIs (HSE, scientific community, public)	Date	Means of verification
KPI-D-1	Innovative Technologies Paper	September 2020	Paper submitted for publication
KPI-D-2	Data delivered in a timely manner	Throughout the project in a regular basis	CBP receives data



Transition Plan

- Stakeholder Engagement
 - The Research Team will work closely with CBP's field offices to ensure that the estimated border wait time information is disseminated efficiently and will respond to any request to prepare special reports.
 - The Research Team will consult with CBP field office representatives in Washington to identify any new technological developments at the U.S./Canada border that could be used to improve the system.
- Notional Transition Plan
 - The Research Team will work with the Project Champion to assure the border wait time information is reliable.
 - The results of the new technology analysis will include recommendations for implementation that will be presented to CBP for further analysis and potential transition to pilots.



Programmatic Risks and Mitigation Plans

R.1 Uncooperative Mexican Customs – Medium Risk (task 3)

- Present objectives and benefits to Mexican Customs Director and obtain approval from Headquarters
- Obtain support from Mexican DOT
- Inform CBP and request support as needed

R.2 Delays in obtaining permits from California authorities – Low (task 3)

- Present project objectives to local authorities
- Secure local authorized contractor with experience working at the CHP site

R.3 Major natural disaster – High (task 2 and 3)

• Have a reserve budget for parts and other elements that would need to be replaced in case of a major disaster damaging the field equipment



Next Steps

- Define start date
- Define monthly conference call schedule

