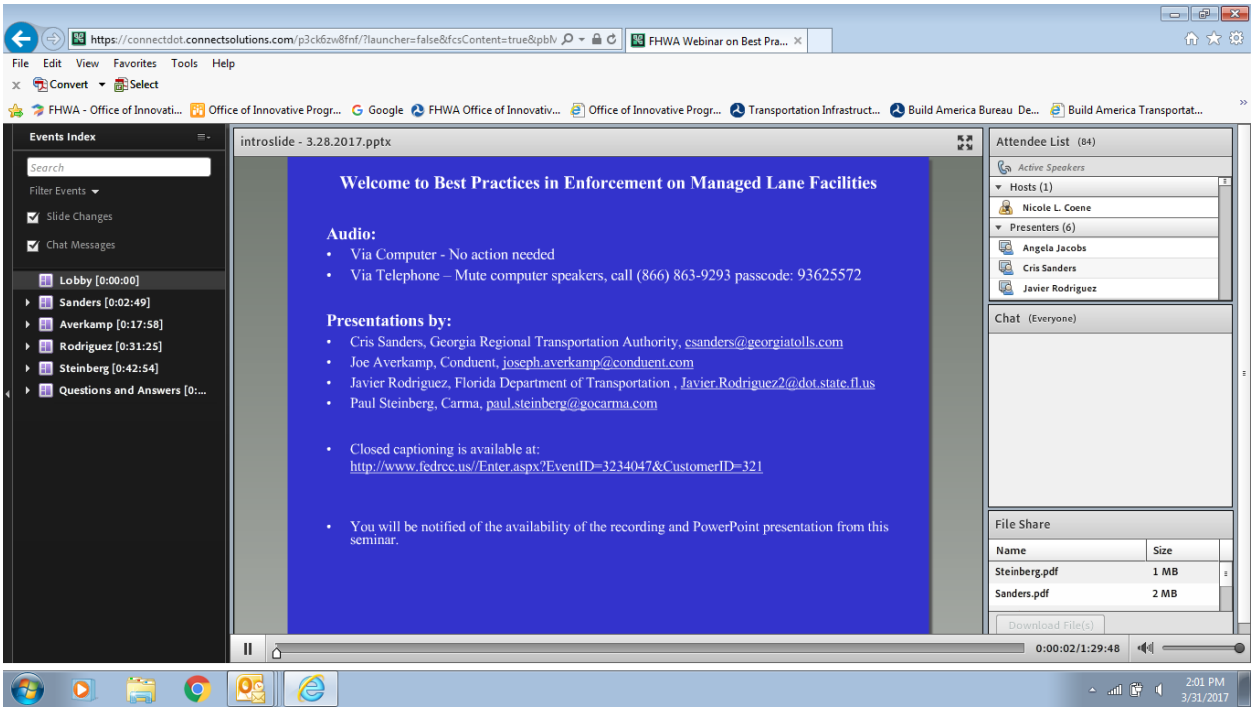
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Welcome to Best Practices in Enforcement on Managed Lane Facilities
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Managing Enforcement

and

The Customer Experience

Presented by Cris Sanders
Director of Tolling Operations

STATE ROAD & TOLLWAY AUTHORITY
SRTA

- State Road and Tollway Authority (SRTA) Overview
- Tolling Operations
- I-75 South Metro Express Lanes
- I-85 Express Lanes
- Enforcement
- Customer Experience

SRTA

SRTA is a state-level independent authority created by the Georgia General Assembly to:

- Operate Georgia toll facilities
- Serve as a State transportation financing arm
  - Manage ~ $1.3B in transportation bonds
  - Issue & service toll revenue financed debt
  - Administer GTIB (Georgia Transportation Infrastructure Bank)Program

SRTA is governed by a five-member Board

SRTA Tolling Operations

Customer Service

Quality Assurance & TRAINING

Operations

Toll Operations Command Center

Registered Lane

I-75 South Metro Express Lanes

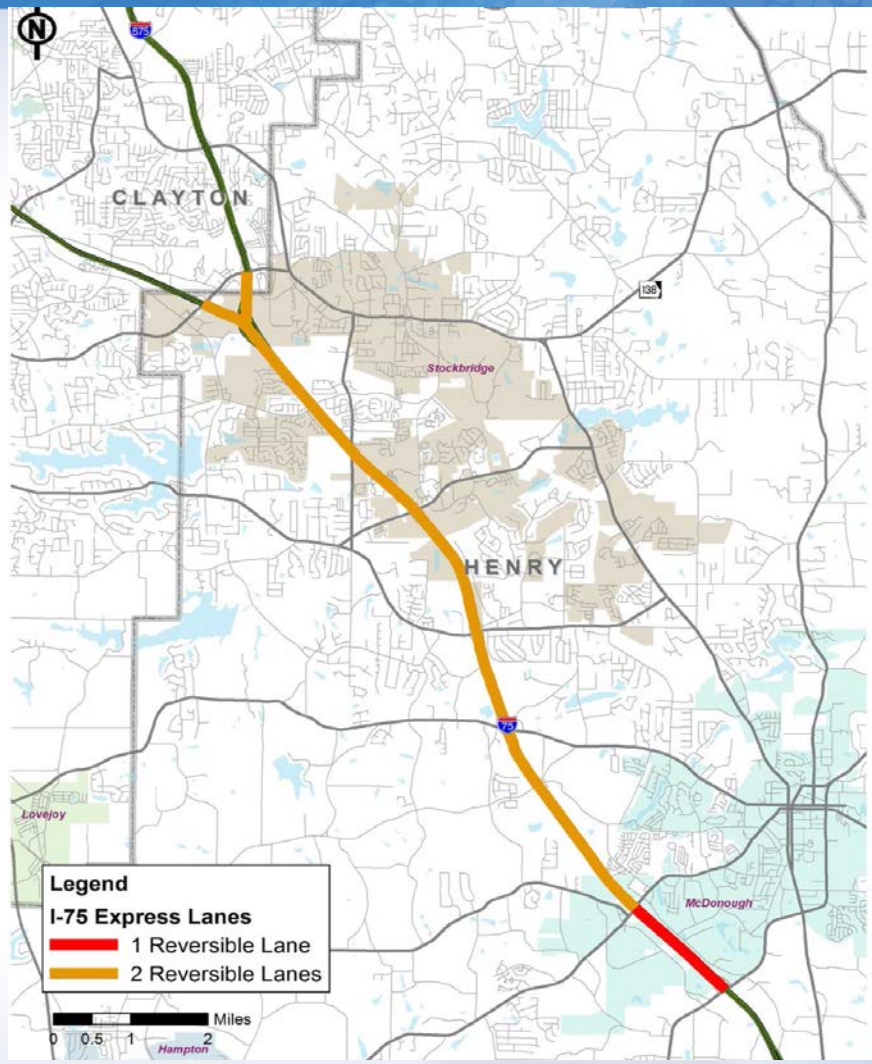
Toll Exempt	Tolled	Prohibited
•Over-the-road buses •Emergency vehicles	• Single driver • Carpools • Motorcycles • Alternative Fuel Vehicles	• Vehicles with more than 6 wheels

I-85 Express Lanes

Toll Exempt	Tolled	Prohibited
• Motorcycles • Alternative Fuel Vehicles • Over-the-road buses 3 or more person carpools • Emergency vehicles	• Single driver • 2 Person carpools	• Vehicles with more than 6 wheels

I-75 South Metro Express Lanes

- 12 miles of newly constructed roadway
- Lanes extends between SR 155/ McDonough Road and SR 138/ Stockbridge Highway
- Express Lanes were constructed within the median of the existing roadways
- Lanes are reversible, allowing traffic to travel northbound in the morning and southbound in the evening
- Traffic flow will be adjusted to support special events such as NASCAR races and spring break travel



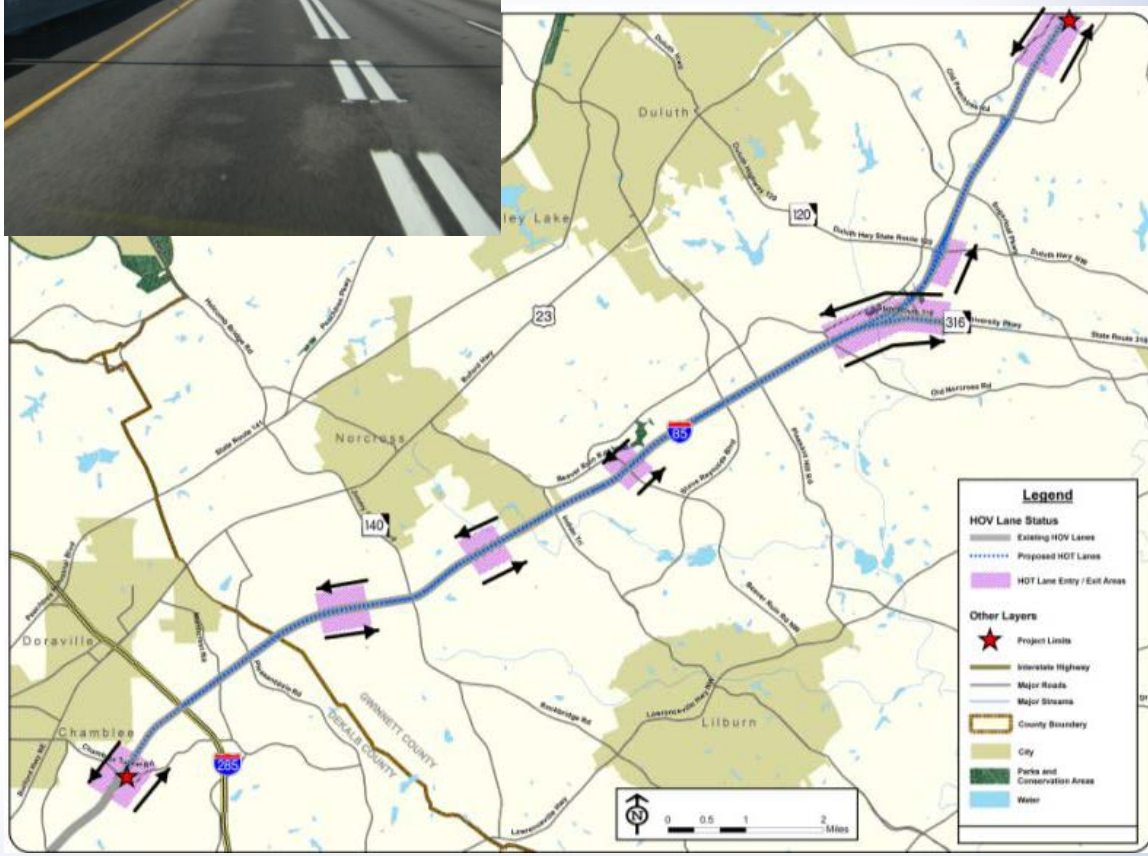
I-75 South Metro Express Lanes

- Groundbreaking October 6, 2014
- Construction took approximately two years
- Lanes were opened to traffic January 2017
- Georgia Department of Transportation (GDOT) is responsible for reversing lanes
- SRTA is responsible for setting tolls

I-85 Express Lanes Overview

- 15.5 miles
- 1 lane in each direction
- Painted, rumble-striped buffer; no physical barriers
- 66 active toll points, ***½ mile apart***
- Dynamically priced
- Lanes operate 24/7
- Registered lane, even for toll-exempt vehicles
- 2 axles; no more than 6 wheels
- 6C transponder technology

6C tag



I-85 Express Lanes

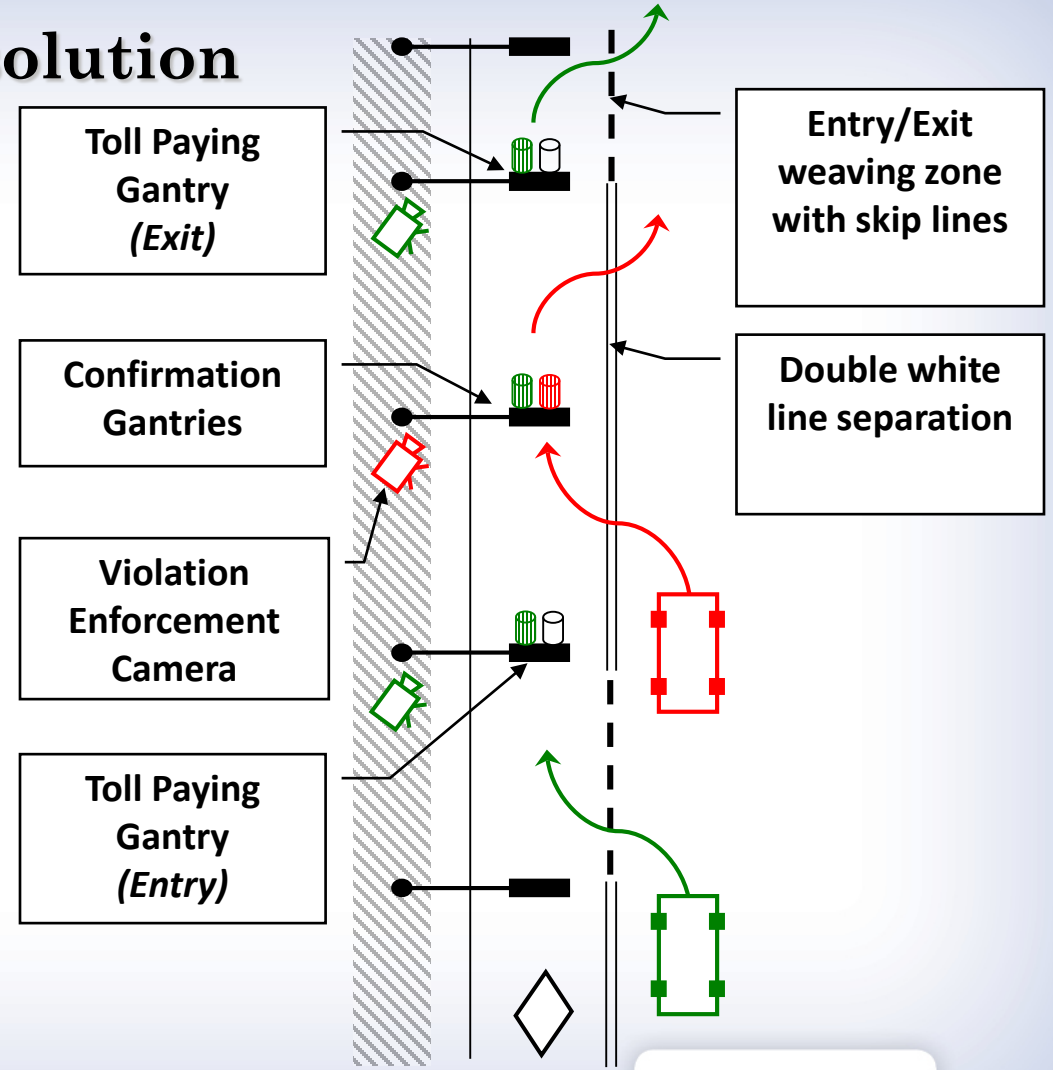
- $182M original project budget
- Won federal grant -$110M
- Express Lanes $60M
- Opened October 1, 2011
- 1st Pricing Demand Management Strategy Project in GA
- HOV2+-HOT3+ Conversion

High Occupancy Vehicle (HOV)
High Occupancy Toll (HOT)

I-85 Express Lanes

"Invisible Barrier" solution

- Overhead tolling system detects vehicle entry/exit
- Gantry spacing deters dodging into the Express Lanes
- Gantry to gantry monitoring detects entry/exit violations
- Automatic toll violation notices
- Indirectly enforces double white line weaving



Enforcement

Violations:

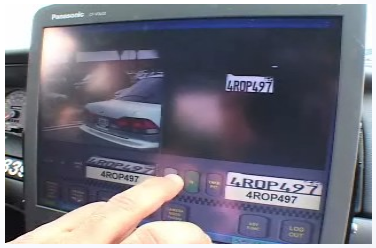
- Using the Express Lanes without a Peach Pass transponder
- Occupancy (vehicle does not meet 3+ requirement to ride free) – Automatic License Plate Recognition (ALPR)
- Addressing crossing the solid, double white line – Gantry Controlled Access

Penalties:

- SRTA toll violation = $25 + toll amount
- May also be issued citation by law enforcement

Vehicle Occupancy Enforcement

- Qualifying carpoolers self-declare HOV status by telephone, smart phones, or online account.
- Tolling Back Office transmits list of "Toll-Exempt" vehicles to a mobile Automatic License Plate Recognition (ALPR) system onboard police cars
- ALPR scans license plate and notifies officer to check occupancy for vehicles registered with SRTA in the 3+ non-toll mode
- The ALPR reads license plate of passing vehicles and notify officers to check occupancy of only "Toll Exempt" vehicles
  - Full list updated daily
  - Incremental updates every 5-10 minutes throughout the day
- Officer's on board computer system sends "stop/citation" information back to SRTA



Customer Experience

Toll Mode Options

- There are 2 Modes of a Peach Pass
  - Toll: when there are <3 occupants in a vehicle
  - Non-toll: when there are 3+ occupants
- Toll Mode Duration Options
  - 4 hours
  - 1 day
  - Weekdays
  - Indefinite
- Change between Modes
  - 15 minutes before using Express Lanes
  - Call, online, in person, Mobile App.
  - Automated confirmation

**Toll Mode Change Options apply only for the I-85 Express Lanes*

Customer Experience

Violation Processing

- **DWL Violations:** Entering or exiting Express Lane by crossing the solid, double white line
  - No Double penalties
  - Fine and Fee reductions
- **Unregistered Use:** Using the Express Lanes without a Peach Pass
  - Violator to Customer
  - Fine and Fee reductions
- **Occupancy:** Occupancy (vehicle does not meet the appropriate number of occupants for toll-free access)
  - Declaration status validation

Customer Experience

Payment Options

- Pay N Go
  - Payment card purchased at one of our retail partners location to pay violations
- Online
  - Notification provided when customers access their accounts online
- Interactive Voice Response (IVR system)
- Payment Plans
  - Violations with 10 or more transactions

Thank You!

March 28, 2017

Joseph Averkamp

FHWA Webinar

Best Practices in Enforcement on Managed Lanes Facilities

Option 2

Overview

- High Occupancy Vehicle and High Occupancy Toll Lanes are a key tool used in Managed Lane Systems
- Most systems rely on people honestly declaring if they are qualified to be in the lane
  - Switchable Tag for HOT
  - Entering Lane for HOV
- Enforcement by Human Roadside Observers is challenging

Conduent Vehicle Passenger Detection System™.....So Far

- Conduent has developed and tested an Automated Vehicle Occupancy Detection System
  - Conduent Vehicle Passenger Detection System™

- Conduent has conducted a series of pilots to assess the system
  - Halifax Harbour Bridges
  - 495 Express Lanes Northern Virginia
  - Colorado DOT I25
  - CalTrans I5 in Orange County
  - SANDAG I15
  - Jougne, France
  - LA Metro I110

Primary Focus Of Pilots

- What level of automated accuracy can be achieved?
- What is the Violation Rate on the roadway being evaluated?
- How well can human enforcement perform?

Primary Focus Of Pilots

- ❑ What level of automated accuracy can be achieved? ~95%
- ❑ What is the Violation Rate on the roadway being evaluated? Varies from 11% to 28% depending on the roadway
- ❑ How well can human enforcement perform? High volume roadways are challenging and pulling vehicles over can create a Safety and Congestion issue

Focused Discussion:
Caltrans Trial : I-5 in Irvine, CA Testing
HOV2 Lane, Three Month Trial

Front Seat Image Capture Equipment

Rear Seat Image Capture Equipment

Conduent VPDS Produces High Quality Images For Manual Image Review

Note: Images Redacted for Privacy

Single Occupant Vehicle Rate Accuracy: Human versus Machine

Conduent VPDS accuracy as compared to Human Roadside Observers

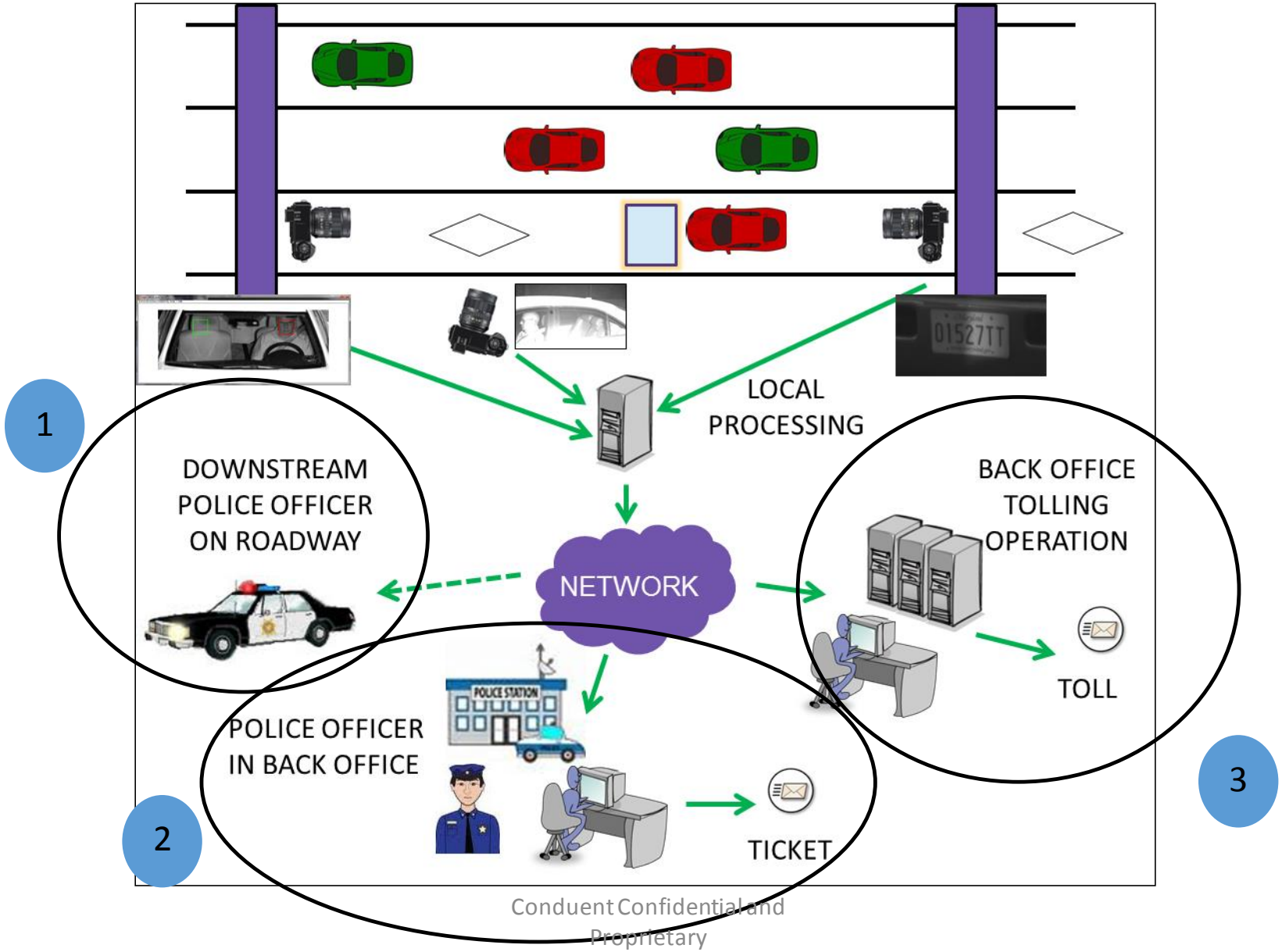
	Average Vehicle Count For A Three Hour Period	XVPDS SOV Rate Accuracy	Roadside Observer SOV Rate Accuracy
Mornings 6am-9am Jan 27, 28, 29 Tues, Wed, Thurs	1774	95.0%	35.7%
Evenings 3pm-6pm Jan 27, 28, 29 Tues, Wed, Thurs	2250	95.3%	35.6%

Statistics From the CalTrans Trial

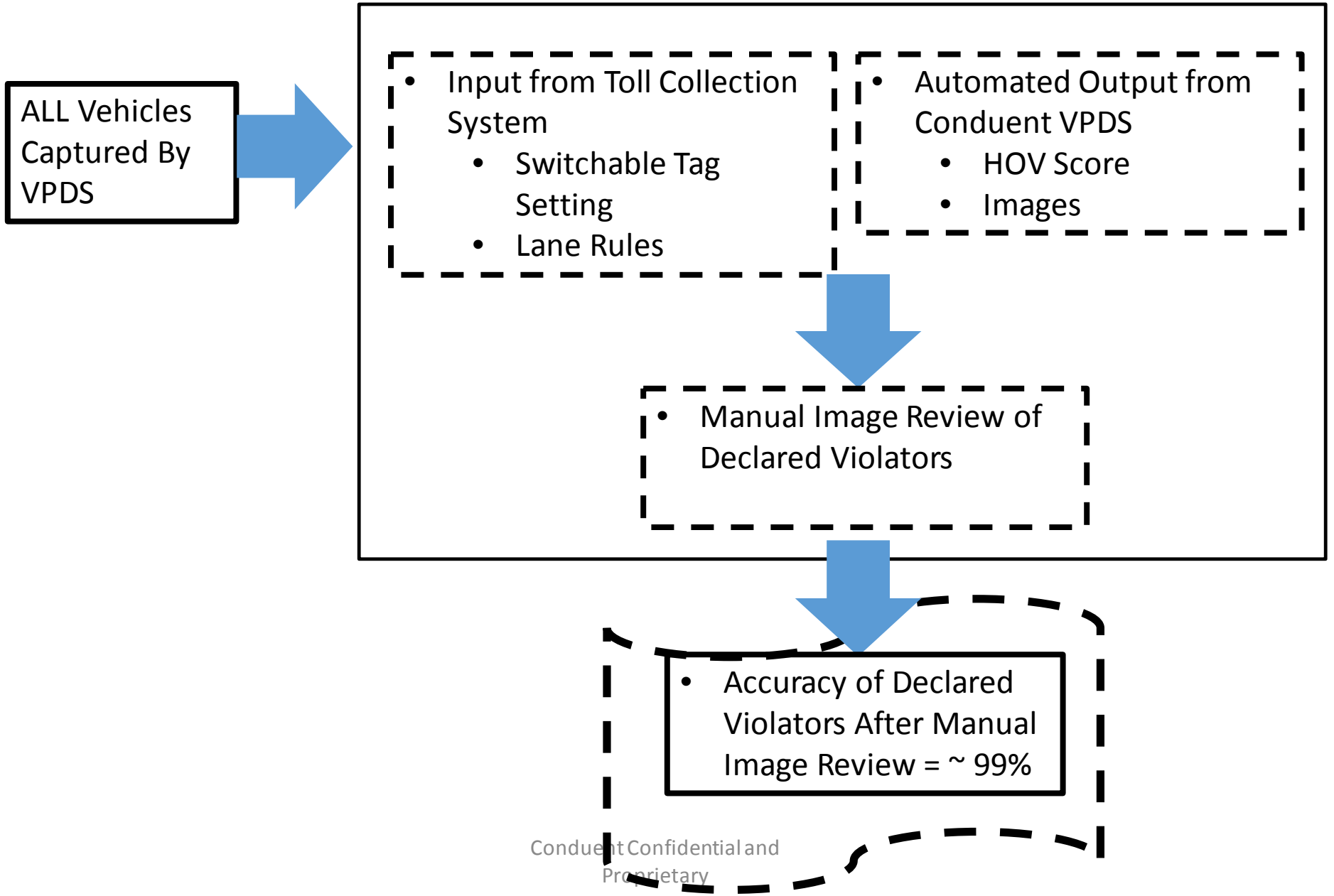
Statistic	Measure	Comments
Period of Analysis	January 27,28,29: 6 am-9 am, 3 pm – 6 pm	
Total Vehicles Reviewed	12,073	
Violation Rate	11.65%	17.4% adjusted down for LEVs
Total Violations	**1,406**	11.65% out of 12,073
Number of Hours During Analysis Period	18	3 days for 6 hours each day
Number of Vehicles Seen Per Hour	**671**	This represents 11 vehicles per minute or one vehicle every **5.4** seconds
Violators Per Hour	**78**	This is the average number of Violators passing this location each hour.

The Roadside Observers see a Vehicle every 5.4 seconds---Don't Look Away!

Vehicle Occupancy Detection Concept of Operations



Concept of Operations For High Occupancy Toll Lanes



Economics: The Technology May Work But What About the Business Case?

- Consider a "typical" Toll Lane
  - 10,000 vehicles per day
  - Violation Rate of 10%-- in studies, Violation Rate was 11% -28%
  - Yields 1,000 violations per day
  - 250 Commuting Days a year—5 days X 50 weeks
  - This yields 250,000 Violations or Toll Adjustments Per Year
- Finances
  - $10 Toll Charge X 250,000 Toll Adjustments = $2.5 million per year in "found" revenue on one lane
    - Supported with Manual Review and Correspondence Management

Lessons Learned

- Good news! Most people in the HOV/HOT lanes are qualified to be there: 72%-89%
  - Conversely, 11%-28% of the vehicles are not qualified
- Revenue may be important but….
  - Safety and Congestion: Stops by enforcement officers lead to Congestion and Safety concerns
  - Equity: Equity on the road is important-----if a select percentage don't adhere to the rules, others may follow if there is no visible means of enforcement
  - Improving Flow: Reducing non-qualified vehicles may help restore free flow: an 11% to 28% violation rate is the difference between Service Level E or F and Service Level A or B
- Perfection cannot be the enemy of the good
  - 95% accuracy is not good enough for completely automated enforcement, but it is a good start. When augmented by manual review, the number of mis-categorized vehicles can be reduced to ~1%
- For the naked human eye, identifying HOV/HOT violators at highway speeds is very challenging.

SUNGUIDE TRANSPORTATION MANAGEMENT CENTER
FLORIDA DEPARTMENT OF TRANSPORTATION - DISTRICT 6

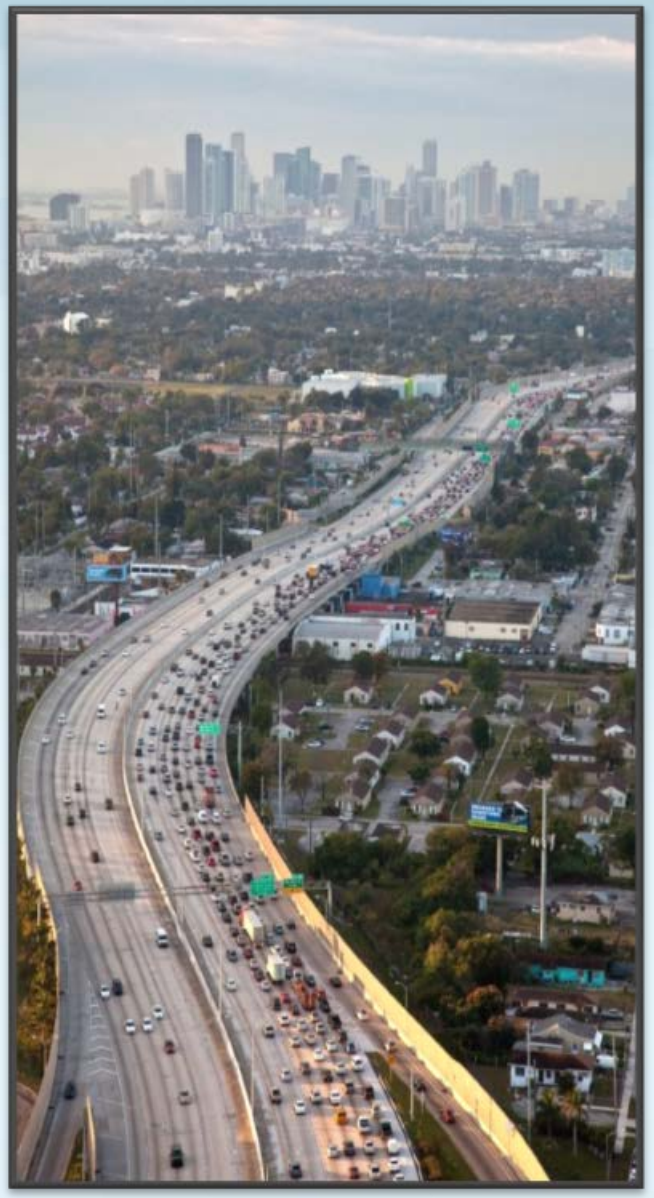
95 Express Incident Management & Enforcement Lessons Learned

March 28, 2017

Javier Rodriguez, P.E., FDOT District Six, TSM&O Program Engineer

Agenda

- Project Overview
- Incident Management Resources
- Enforcement
- Lessons Learned



Project Overview

- **Phase 1 Completion**
  - Northbound – Dec 2008
  - Southbound – Jan 2010
- **Phase 2 Completion**
  - Oct 2016
- **HOV to HOT Conversion**
  - 1 HOV Lane to 2 Express Lanes
- **Congestion-Priced Tolling**
- **Bus Rapid Transit (BRT)**
- **Ramp Signaling**

Incident Management Resources

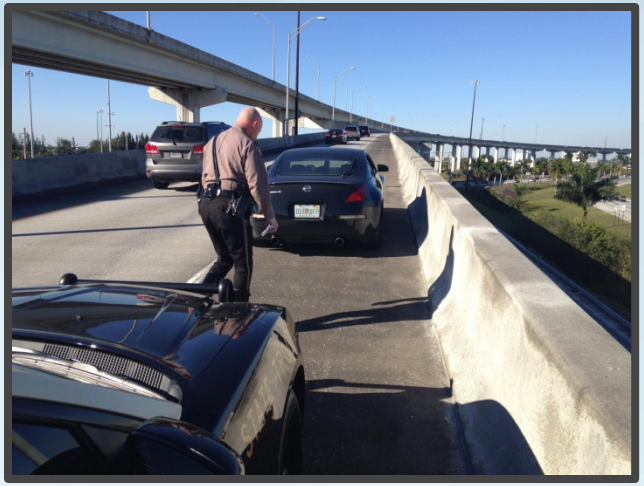
➢ Major Elements

- Dedicated TMC Express Lane Operators
- Road Ranger Service Patrol
  - ✓ Added flatbed wrecker
  - ✓ Added heavy duty wrecker
- Incident Response Vehicle & Operators
- Law Enforcement

➢ Quick Clearance Procedures

Enforcement

- **Electronic Toll Enforcement**
- **Florida Highway Patrol Support**
  - Enforcement
    - ✓ Toll Violation
    - ✓ Speeding
    - ✓ HOV
    - ✓ Improper Lane Change (Lane Diving)
    - ✓ Hard Closures
  - Incident Management
    - ✓ Relocation of Incidents
    - ✓ Crash Investigation
    - ✓ Express Lanes (EL) & Local Lanes (LL)



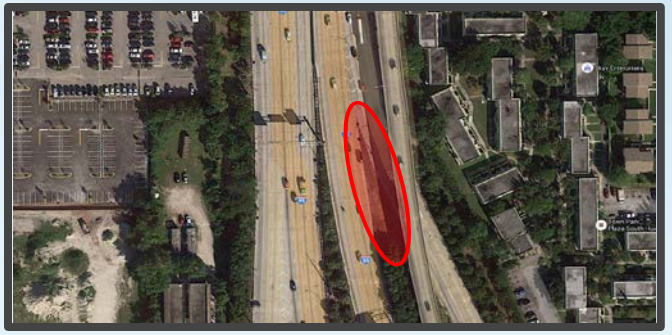
Lessons Learned

➢ Operations

- Provide Full Width Shoulders
- Separate EL from LL
- Provide Means of Physically Closing Facility
- Operational Changes should be made ‘Quickly’
  - ✓ Adequate Supporting Staff & Resources
  - ✓ Evaluate & Adjust as Necessary
  - ✓ Mitigate Bad Driver Behavior

Lessons Learned

- **Incident Management**
  - Dedicated Resources
    - ✓ Specially Trained & Equipped
  - Multi-Agency Partnerships
    - ✓ FHP Hireback Program
    - ✓ Traffic Incident Management (TIM) Team
    - ✓ Table Top Exercises
    - ✓ Coordination Meetings
  - Quick Clearance Procedures
    - ✓ Dedicated Strategic Staging Areas



Lessons Learned

➢ Closing Facility

- Posting "CLOSED" – 87% Violations
- Hard Closures
- Post-Incident Pricing
- Regulatory Lane Status Signs
  - ✓ Color DMS
  - ✓ Allows for white text on black background
  - ✓ Enforceable per MUTCD
- Automated Gate System

Lessons Learned

- **Driver Awareness**
  - Lane Diving (Moving Violation)
  - Toll Violation

BEFORE

AFTER

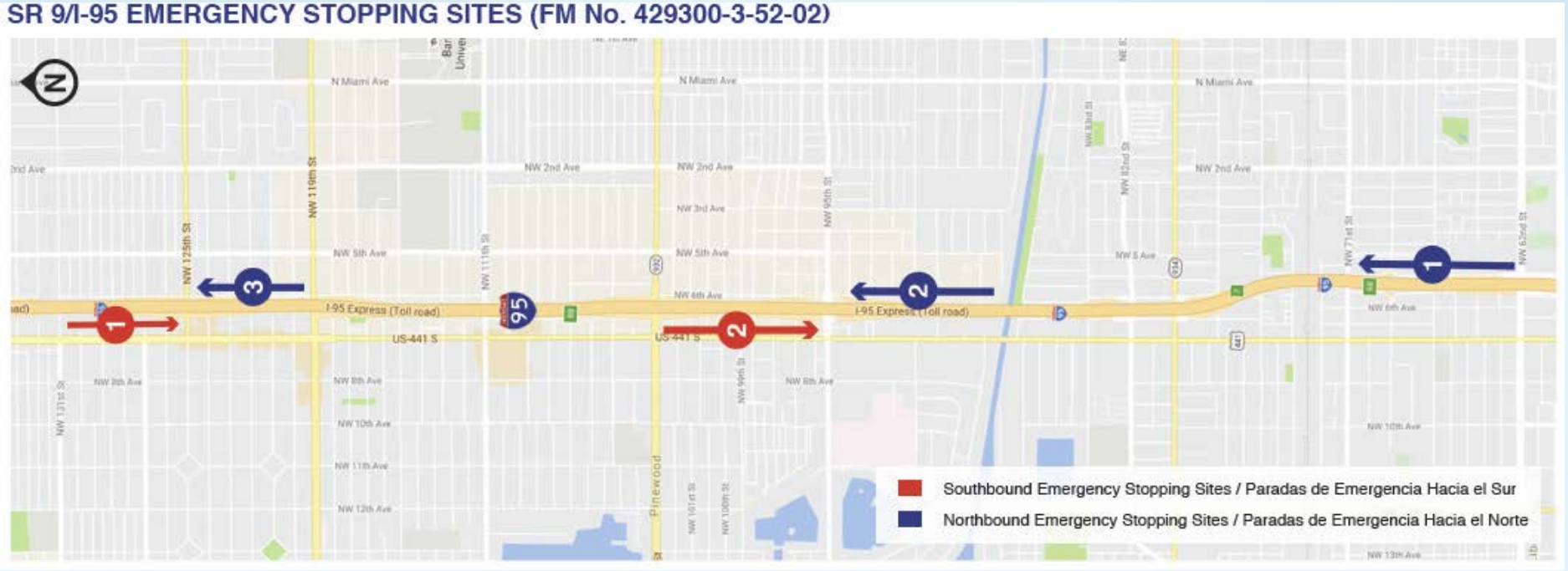
Lessons Learned

- **Express Lane Markers**
  - Lane Diving
  - Type and Installation
  - Spacing
  - Maintenance

Lessons Learned

➢ Roadway Design

- Reduced Shoulder Width
- Median Emergency Stopping Sites
  - ✓ February 2017 – February 2018



"Buzzed Driving is Drunk Driving"

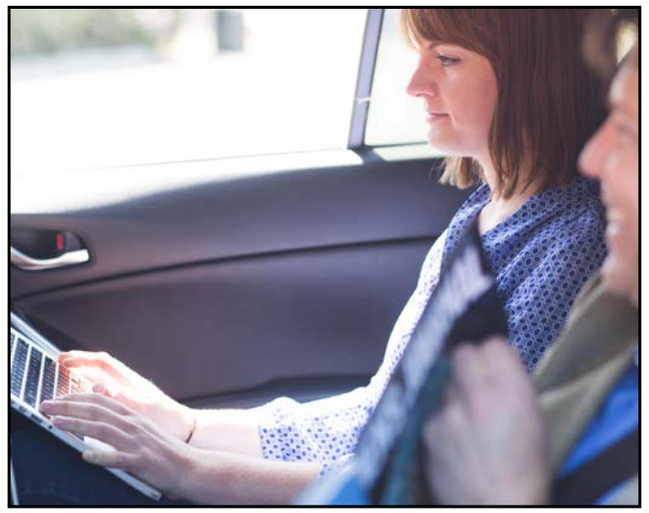
Thank you,

Javier Rodriguez, P.E., FDOT District Six, TSM&O Program Engineer
javier.rodriguez2@dot.state.fl.us

carma

Carma Mobility Solutions

Extending mobility freedom to everyone

	CarmaCar Carshare where people really live and work	CarmaZoom High-occupancy commute carshare	CarmaCarpool Peer-to-peer commute carpool
			
USP:	San Francisco's orginal carshare service (2002); non-profit; 400 cars.	World first high-occupancy carshare service introduced 2015	World's leading commute carpool solution since 2007.
Competition:	+ + = 95% US Market Share	First-to-market. Closest business is Bridj.	ride (Only new entrants focus on the commute; Waze in Israel)
Momentum:	• Agressive pod expansion • Introduction of corporate carshare • Close government partnerships • Data-driven momentum • Roll-out of new app, hardware • 3-minute sign-up and approval	• Extends utilization to off-peak hours • Extends utilization to new areas • Ideal employment campus solution • Far less costly than a new shuttle • Valet service, simple reservations • 3-minute sign-up and approval	• Market leader • 250+ APIs, being used globally • Government partnerships • Toll rebates for verified carpools • Community management expertise • Employer partnerships
Vision:	**High-occupancy in our fleet of cars; then high-occupancy in every car.**		

PPP Partnerships

In partnership with local governments and transportation agencies

Tolling

- Texas Department of Transportation, Central Texas Regional Mobility Authority; Bay Area Toll Authority; Contra Costa Transportation Authority, Caltrans

Carpooling

- Washington State DOT; Northern Virginia Regional Council; US Dept of Defense; Metropolitan Transportation Commission; and Federal Highway Administration

Carsharing

- *City and County of San Francisco; City of Berkeley; and University of California and Metropolitan Transportation Commission*

Parking

- San Francisco Metropolitan Transportation Authority

Carpool Incentives

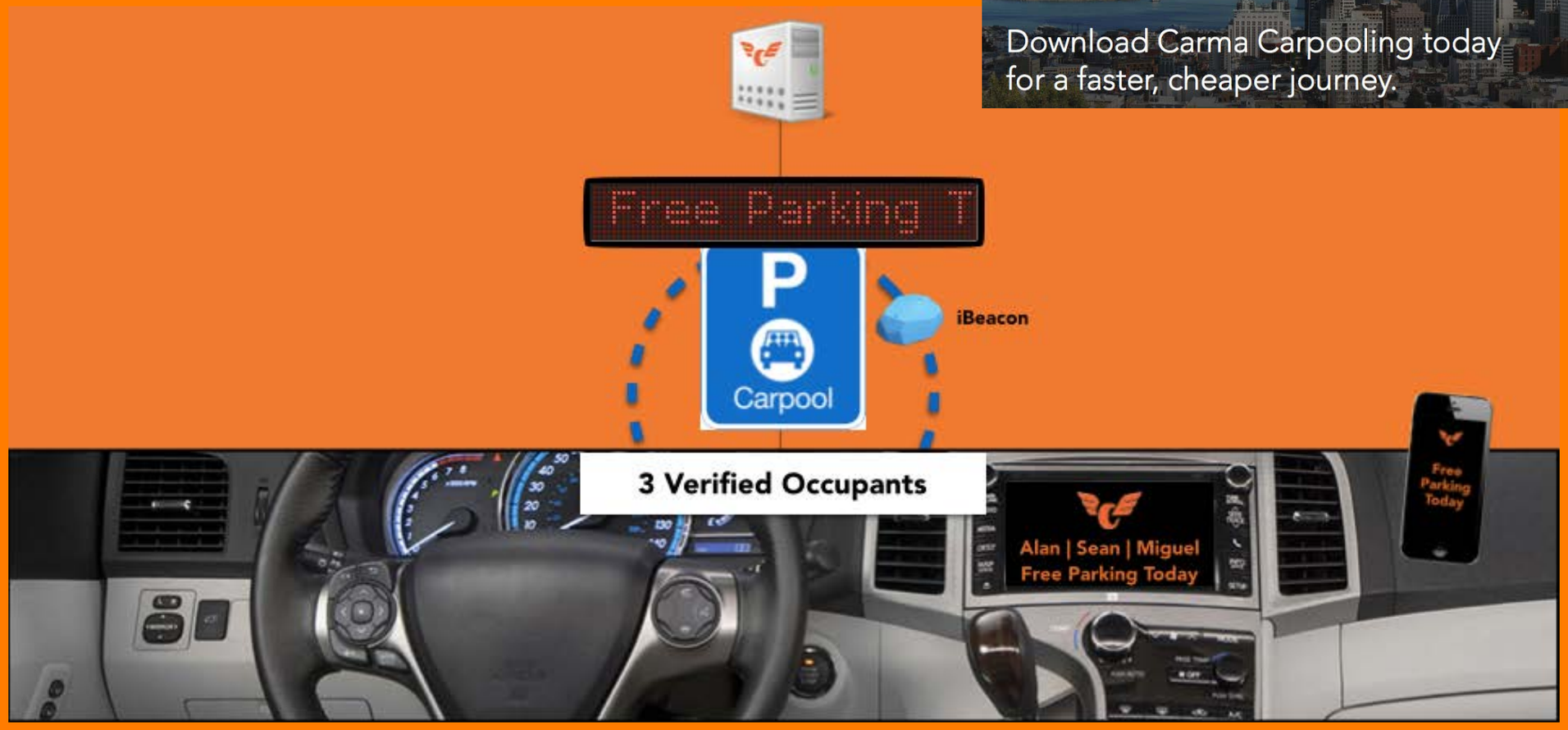
Real-time SOV / HOV travel alerts

Real-time availability at parking lots

Real-time alerts on rider / driver availability at roadside pick-up zones

Real-time incentive confirmations

Parking Discounts

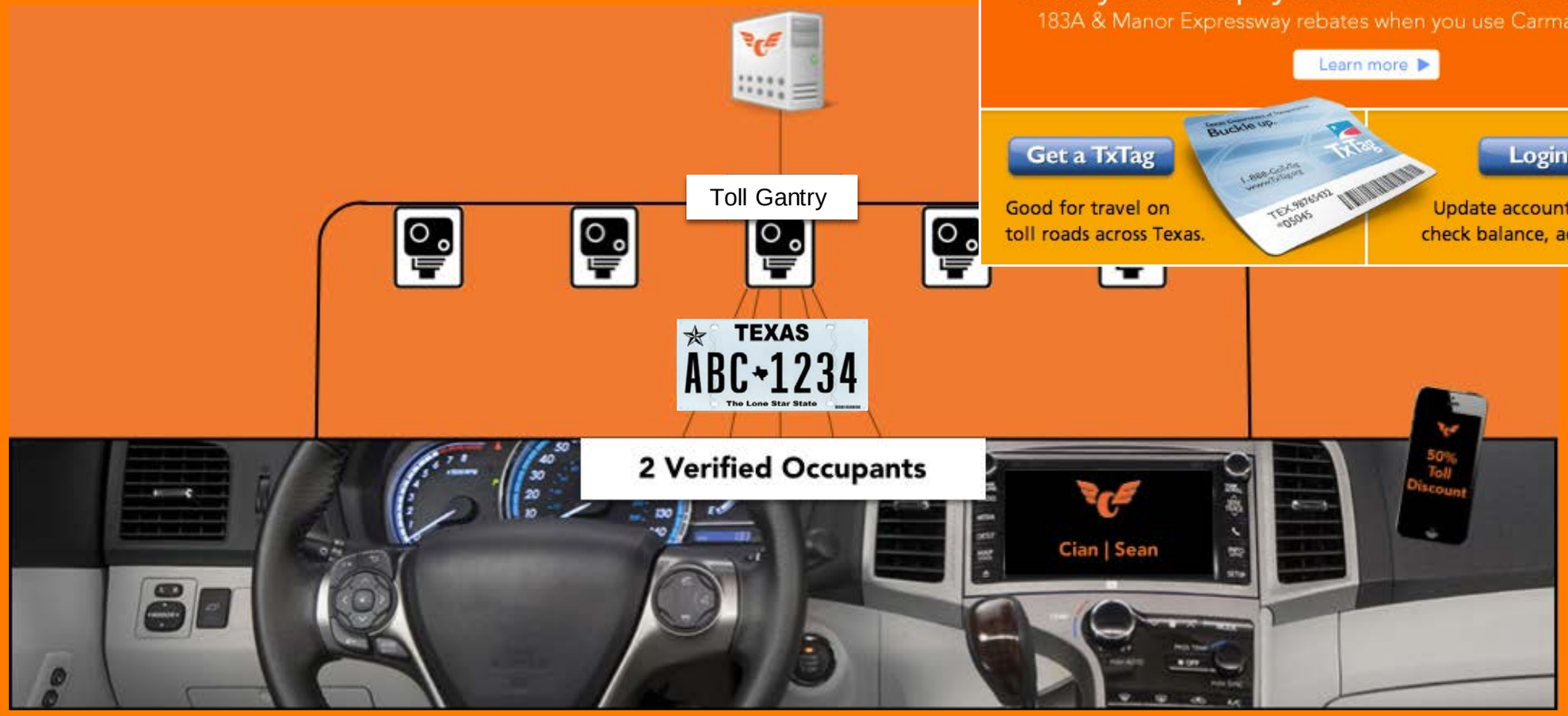


Shift from cars-per-lot to people-per-lot

Near-field occupancy detection at fixed locations

World’s first iBeacon implementation for transportation

Managed Lane Discounts



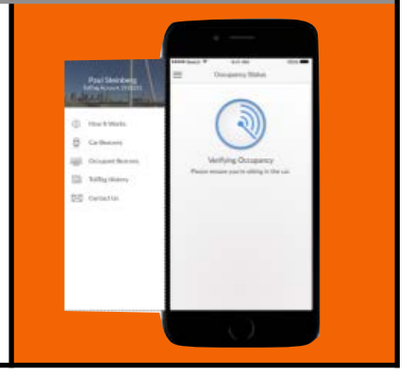
Interoperable with any tolling network via back-end reconciliation

Real-time toll discounts with optional in-car alerts for *verified carpools*

Toll sharing amongst vehicle occupants

Tolling Enforcement vs Verification

Dominated by legacy roadside systems provided by giant vendors

Highway Patrol Support Systems	*Switchable Transponders*	*Video Analytics (Geometric)*	*Infrared*	*In Car Sensors*	*Mobile Verification*
3M, Kapsch Trafficcom, Transcore, Siemens, IBM, Schneider Electric	*Sirit, Transcore, Kapsch TrafficCom, Telematic Wireless*	*Xerox (VPDS), Cubic (NextCity)*	*Siemens, Vehicle Occupancy Detection Corporation (Dtect)*	*Delphi, Siemens*	*Carma*
					

“The Wildcard is Smartphone Tolling”

- Mark Cantelli, Xerox, VP, State Government Transportation

- Invulnerable to weather conditions, sun reflections, vehicle geometry, window tint, posture, skin color, travel speed
- No roadside infrastructural investment required
- High reliability, accessibliity and scalability

Carma Occupancy

Automated Occupancy Verification Using Mobile Technology

Ambient Occupancy Detection

- Beacon technology or embedded in Toll Tag
- Near Field Communications for detection upon vehicle entry / exit

Occupant Devices

- Smartphone, with Carma app installed
- Optional Beacon for occupants without a smartphone

Continuous Monitoring of Coordinated Proximity

- Occupancy verified throughout a trip
- Patent-pending (US US 20110059693)
- Enabling non-PII travel pattern analysis

Occupancy API

- Toll Authority queries web-API for verified occupancy at any time and location in network.

In-App Occupancy Display

- Verified occupancy status can be inspected in the app, but no user interaction required at any time.

Offline Reconciliation

- Smartphones without data connection report occupancy once reconnected to data.