TXDOT HOUSTON DISTRICT CONNECTED VEHICLE (CV) SYSTEMS ENGINEERING

ADVANCING CV DEPLOYMENT THROUGH SYSTEMS ENGINEERING

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AGENDA

- **1 / PROJECT BACKGROUND**
- **2 / SYSTEMS ENGINEERING OVERVIEW**
- **3 / THE CV APPLICATIONS**



PROJECT BACKGROUND

TXDOT HAS BEEN ACTIVELY ADVANCING CV TECHNOLOGIES

Various pilot projects and initial implementations for:

- Signalized Corridors
 - Traffic Optimization for Signalized Corridors (TOSCo) (FHWA-JPO-22-958)
- Arterial Applications
- Freeway Applications



HTTPS://WWW.TXDOT.GOV/ABOUT/DISTRICTS/HOUSTON-DISTRICT.HTML



C-V2X SHOWCASE (FEBRUARY 2024)

Hosted by:

- TxDOT Houston District
- Applied Information
- Paradigm Traffic Systems

Supported by:

- Audi
- HAAS Alert
- 5GAA
- ITS America



EXAMPLE SCHOOL ZONE ALERTS FROM THE SHOWCASE DEMONSTRATIONS



NEAR-TERM DEPLOYMENTS

- Connected Traffic Signals:
 - > CV roadside units at all 1,000+ district signals by end of 2025
 - > 10-year contract with Paradigm Traffic Systems and Applied Information
- TTI's Transforming Roads, Unleashing Smart Technologies (TRUST) Project
 - > Includes greater Houston area and College Station



TXDOT HOUSTON DISTRICT TRAFFIC SIGNALS



CURRENT CV CHALLENGES

- Complexity Management
- Stakeholder Coordination
- Requirements Definition
- Risk Mitigation
- Scalability and Interoperability
- Performance Evaluation







SYSTEMS ENGINEERING OVERVIEW

VEE DIAGRAM



SOURCE: HTTPS://OPS.FHWA.DOT.GOV/SEITS/PROCESS.HTML



CURRENT EFFORTS

- Completed:
 - > Baseline inventory
 - > Best practices review
- Underway:
 - > Implementation framework
 - > Corridor profiles
 - Mapping where to implement CV applications

- Vision & Goals
- Technical Framework
- CV Applications
- Deployment & Operations
- Stakeholder Cooperation & Interoperability
- Institutional Sustainability & Scalability
- Data, Security, & Privacy



BASELINE SYSTEM





PROPOSED TECHNICAL FRAMEWORK







THE CV APPLICATIONS

THE CV APPLICATIONS

NO	APPLICATIONS	A Safety	→ Mobility	Environmental Impacts
1	GPS-based Traffic Detection	\checkmark	\checkmark	\checkmark
2	Autonomous Vehicles (AV) SPaT Application	\checkmark	\checkmark	\checkmark
3	Emergency Vehicle Preemption (EVP)	\checkmark	\checkmark	
4	Transit Signal Priority (TSP)	\checkmark	\checkmark	\checkmark
5	Traffic Signal Phase Countdown	\checkmark	\checkmark	\checkmark
6	Virtual Dynamic Message Signs (DMSs)	\checkmark	\checkmark	\checkmark
7	Work Zone Alerts	\checkmark	\checkmark	
8	Pedestrian Warnings	\checkmark	\checkmark	
9	School Warnings	\checkmark	\checkmark	
10	Road Surface Condition Alerts	\checkmark	\checkmark	
11	Evacuation and Re-entry Management	\checkmark	\checkmark	
12	Wrong-Way Driving Alerts	\checkmark	\checkmark	
13	Region-Wide Warnings	\checkmark	\checkmark	\checkmark



1: GPS-BASED TRAFFIC DETECTION





2: AUTONOMOUS VEHICLES (AV) SPaT APPLICATION





3: EMERGENCY VEHICLE PREEMPTION (EVP)





4: TRANSIT SIGNAL PRIORITY (TSP)





5: TRAFFIC SIGNAL PHASE COUNTDOWN





6: VIRTUAL DYNAMIC MESSAGE SIGNS (DMSs)





7: WORK ZONE ALERTS





8: PEDESTRIAN WARNINGS





9: SCHOOL WARNINGS





10: ROAD SURFACE CONDITION ALERTS





11: EVACUATION & RE-ENTRY MANAGEMENT





12: WRONG-WAY DRIVING ALERTS





13: REGION-WIDE WARNINGS





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DKS CORE VALUES THANK YOU

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