

Texas TRUST: Transforming Roads Unleashing Smart Technologies

Progress, Insights, and Lessons Learned

August 19th, 2026



TRUST Leads



Robert Brydia
Principal
Investigator



Walt Magnussen
Co-PI



Chiara Dobrovolny
Project Management
Lead



Srinivasa Sunkari
Deployment and
Installation Lead



Reza Langari
Systems
Engineering Lead



James Hubbard
Data Lead



Nick Wood
PM Co-Lead



Margaret Fowler
Outreach Lead



Peter Rafferty
Performance Lead



Snehasis Chakraborty
Data Governance Lead

Agenda



- Project Overview
- Use Case Overview
- System Requirements
- Performance Evaluation
- Testing
- Lessons Learned and Next Steps





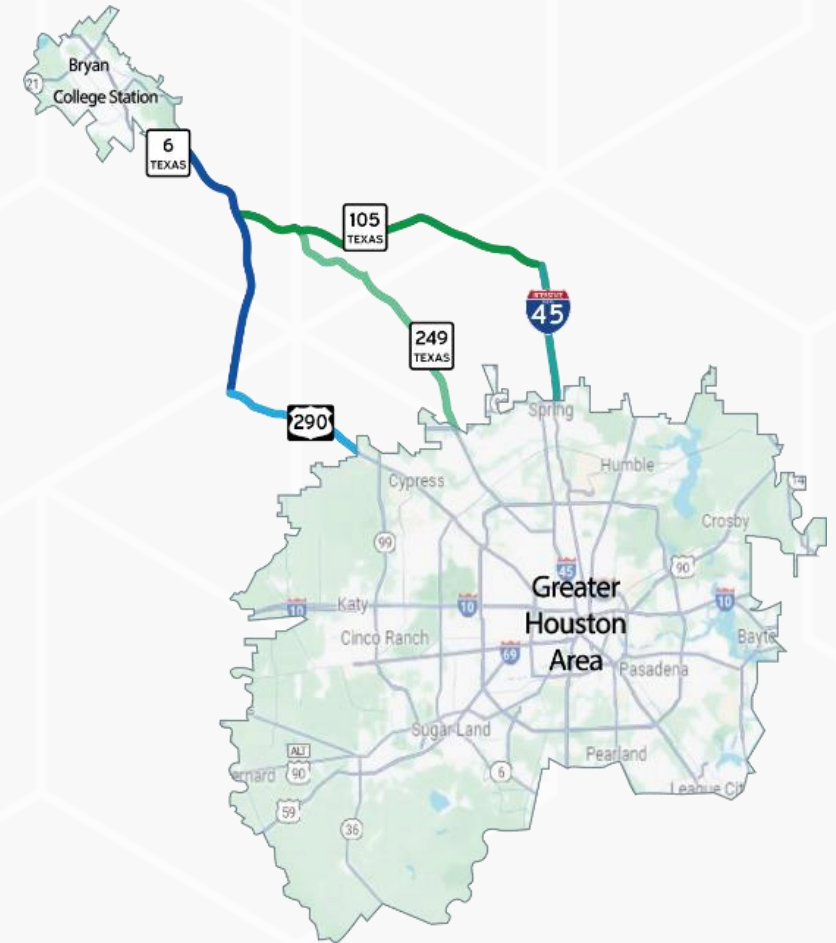
Project Overview

ROBERT BRYDIA

Deployment Region



- The Texas TRUST deployment region serves as an ideal testbed, spanning varied roadway types, user groups, and operational environments.
 - Extends from **Bryan-College Station to Houston**, covering urban, suburban, and rural corridors.
 - Encompasses **over 5 million residents** across the region.
 - Supports **hundreds of thousands of daily trips** along **300 miles of National Highway System (NHS)**.
 - Anchored by **Texas A&M University (TAMU)**, one of the nation's largest campuses, with **80,000 students** and **12,000 faculty and staff**.



Our IOO Partner: TxDOT



- Largest state highway system in the nation more than 80,000 miles.
- Largest highway network in the U.S. with 314,000 miles of public road.
- Nearly 25 years since no daily fatalities (November 7, 2000).
- Challenges include congestion, adverse weather, safety, and substantial construction.
- Implements technologies such as ITS, AI, V2X and more.
- Home to numerous autonomous vehicle firms seeking to prove and scale their technologies on Texas roadways.



Our 100 Partner: City of Houston



- 4th largest city in the United States.
- Largest city in Texas.
- Larger metropolitan area nears 7 million residents.
- 3,500 centerline miles of roadway with daily vehicle miles travelled exceeding 100 million.
- Nearly 80,000 intersections including more than 2,000 of which are signal controlled across multiple entities.
- In 2024, fatalities in Houston increased 15 percent, to 345.



Our IOO Partner: City of College Station



- Growth is approximately 1.2 percent per year.
- 75 percent population increase over the next 25 years.
- Spans approximately 50 square miles.
- More than 200 miles of streets, 102 signalized intersections.
- Congestion has been increasing by more than 2% per year.
- Congestion on SH6 is rapidly increasing with several hours per day now being in a congestion condition.
- SH 6 is undergoing a \$671 million expansion to widen it from four to six lanes as well as changing access paths and providing shared use pedestrian and bicycle paths.

Our IOO Partner: Missouri City



- Home to approximately 80,000 people.
- Faces typical Houston area traffic volume and congestion challenges, particularly during peak hours.
- The city's location near major employment centers Houston contributes to congestion on connecting roadways.
- ITS technologies have been employed to help monitor and manage traffic, reduce congestion, and enhance safety.
- V2X technologies have been installed at some locations with the information being broadcast via a network approach.



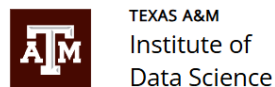
Our IOO Partner: Fort Bend County



- Home to nearly a million people.
- Encompasses nearly 900 square miles
- Has several recent roadway and tollway expansion efforts.
- Significant increases in traffic crashes and fatalities.
- Utilizes ITS technologies for traffic monitoring, signal operation, and emergency operations.
- Implementing advanced technologies such as V2X and Artificial Intelligence (AI) to monitor traffic flow, detect pedestrians and bicycles, measure delays, and identify incidents like stalled vehicles and red-light runners.



Our Partners



TRUST Vision and Mission



Vision: To create the nation's most advanced, connected, *and resilient transportation system—where every trip is safer, smarter, and more efficient.*

Mission: Through large-scale, real-world V2X deployments, *we will integrate cutting-edge technologies across diverse environments, deliver measurable safety and mobility benefits, and set the standard for how connected systems transform transportation.*

Our Approach



- Deploy V2X technology on and within:
 - TxDOT Roadways,
 - City of Houston,
 - Missouri City,
 - Fort Bend County,
 - College Station,
 - Transit Fleets, and,
 - Emergency Vehicles.
- Enhance existing infrastructure.
- Install new roadside equipment as warranted.
- Enable the delivery of safety messages and V2X communications.



Use Case Overview

ROBERT BRYDIA

Use Case Overview



The Texas TRUST project includes 15 Use Cases:

City of College Station

1. SPaT-Enabled Intersections for VRU Identification & Protection
2. Traffic Signal Preemption and Priority
3. Transit Fleet Integration
4. Every Day a Gameday
5. Enhanced Highway Construction Worker Safety

US 290 / SH 6 / SH 249 / I-45 NHS Corridors

6. Incident Management
7. Adverse Weather Events / Flooding
8. Planned Construction and Special Events
9. Curve Speed Warning

Greater Houston Metropolitan Area

10. Roadway Flood Warning
11. Houston SPaT-Enabled Intersections
12. Right Turn on Red Warning
13. Red Light Violation Warning
14. Wrong-Way Driver (WWD) Detection
15. Emergency Vehicle Response Time and Safety

Network vs. Direct V2X



- 15 Total Use Cases
 - 5 in College Station/Bryan
 - 4 along the National Highway System (NHS)
 - 6 in Houston
- 9 Direct V2X Applications
- 6 Network V2X Applications

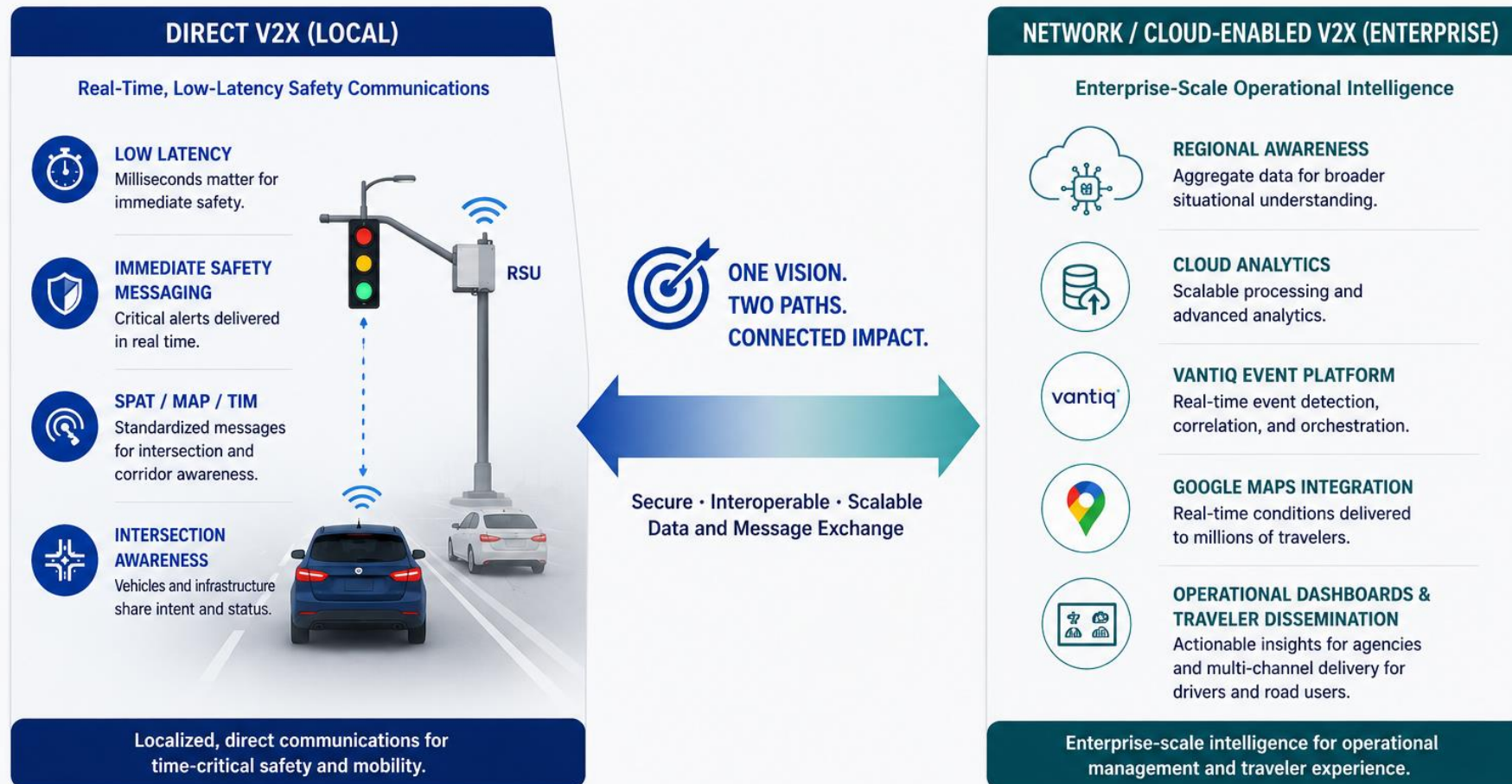
No.	Loc.	Use Case	Mode
UC01	CS	SPaT-Enabled Intersections for VRU Identification/Protection	Direct
UC02	CS	Traffic Signal Preemption and Priority	Direct
UC03	CS	Transit Fleet Integration	Direct
UC04	CS	Every Day a Gameday	Network
UC05	CS	Enhanced Highway Construction Worker Safety	Direct
UC06	NHS	Incident Management	Network
UC07	NHS	Adverse Weather Events / Flooding	Network
UC08	NHS	Planned Construction and Special Events	Network
UC09	NHS	Curve Speed Warning	Direct
UC10	HOU	Roadway Flood Warning	Network
UC11	HOU	Houston SPaT-Enabled Intersections	Direct
UC12	HOU	Right Turn on Red Warning	Direct
UC13	HOU	Red Light Violation Warning	Direct
UC14	HOU	WWD Detection	Network
UC15	HOU	Emergency Vehicle Response Time and Safety	Direct

Direct vs. Network V2X



Direct + Network V2X Ecosystem

Evaluating localized safety communications alongside enterprise-scale operational intelligence



Deployment Goals



Goal 1: Deliver Measurable Safety, Mobility, & Efficiency Gains

Goal 2: Deploy Reliable, Secure, & Standards-Based Systems

Goal 3: Support Innovation, Workforce, & Access

Goal 4: Showcase Regional Impacts & Stakeholder Engagement

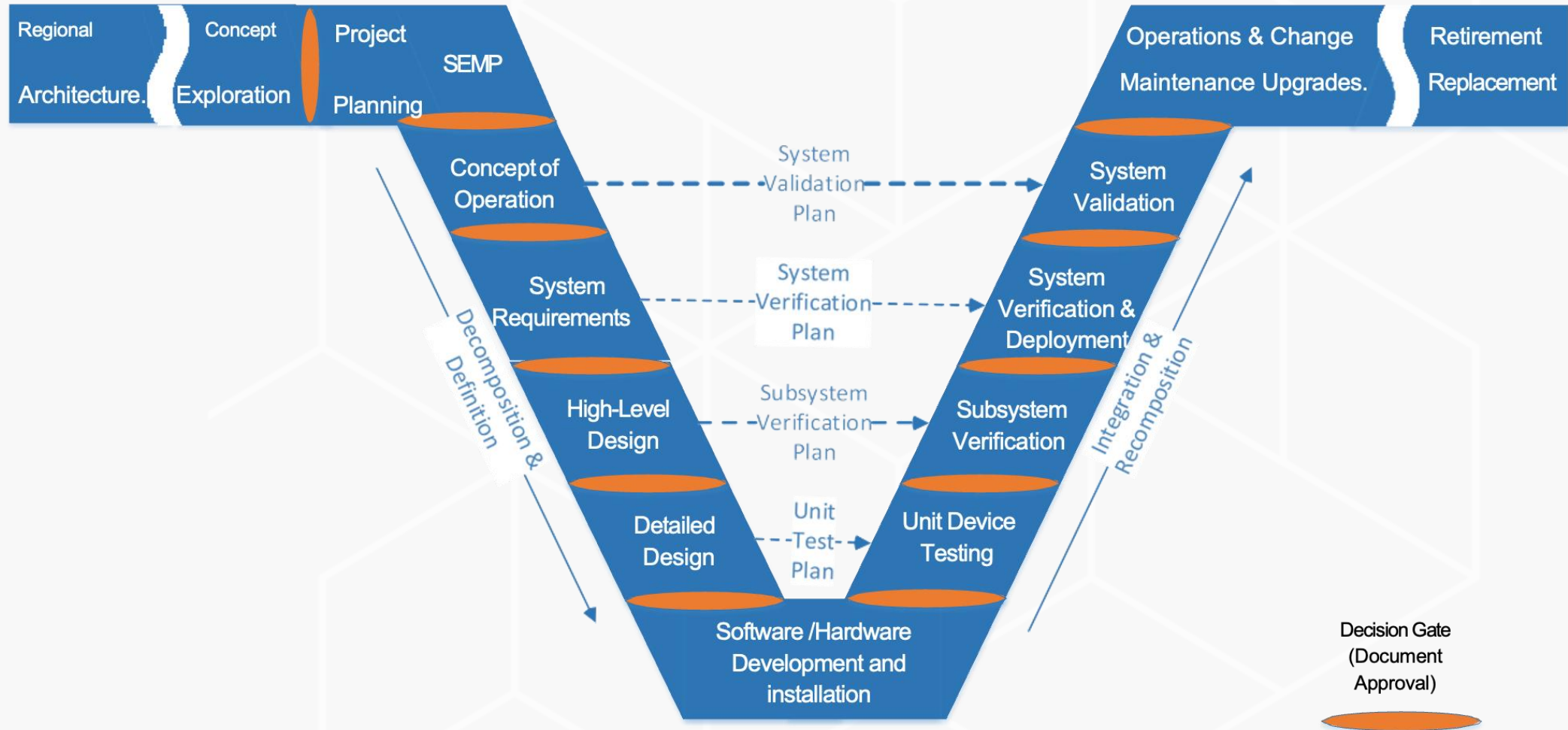
Goal 5: Enable, Scalable, Transferable, & Interoperable Solutions



System Requirements

REZA LANGARI

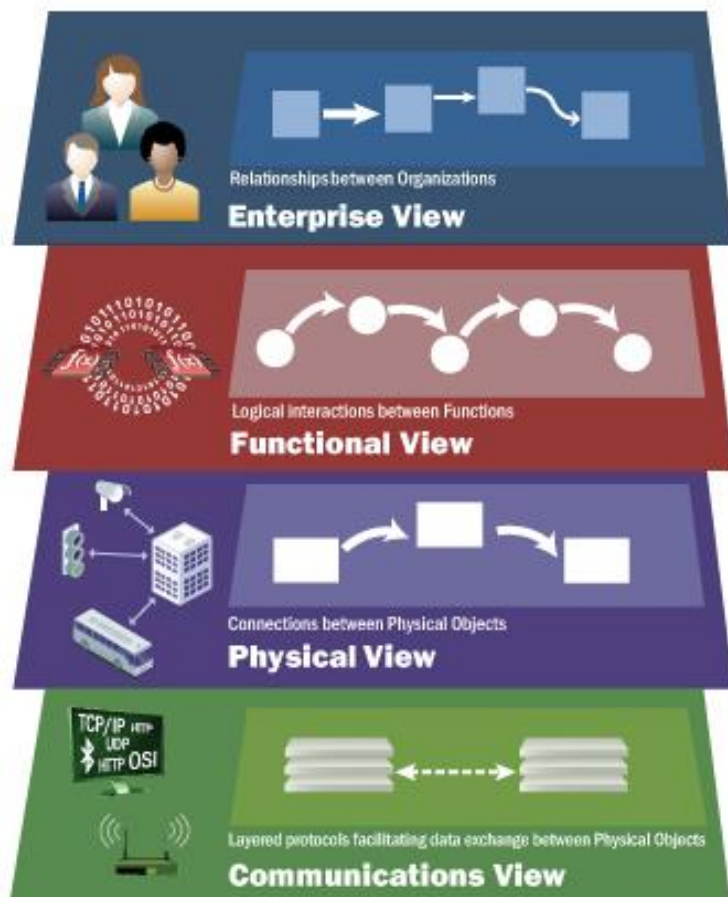
Systems Engineering Process



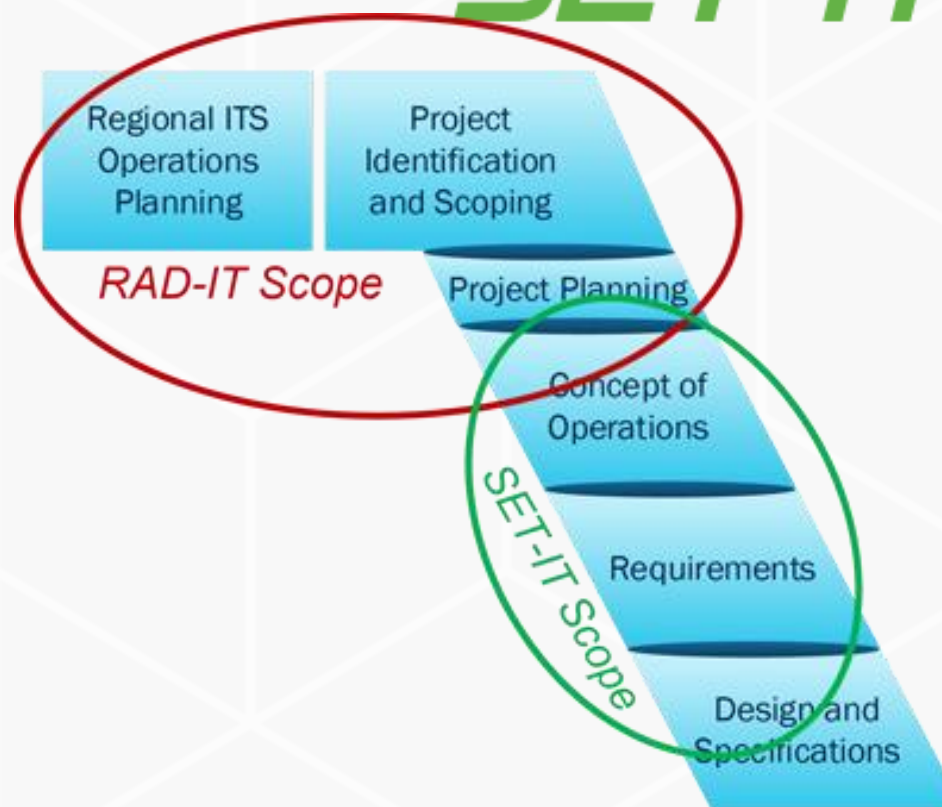
ARC-IT Tool Use



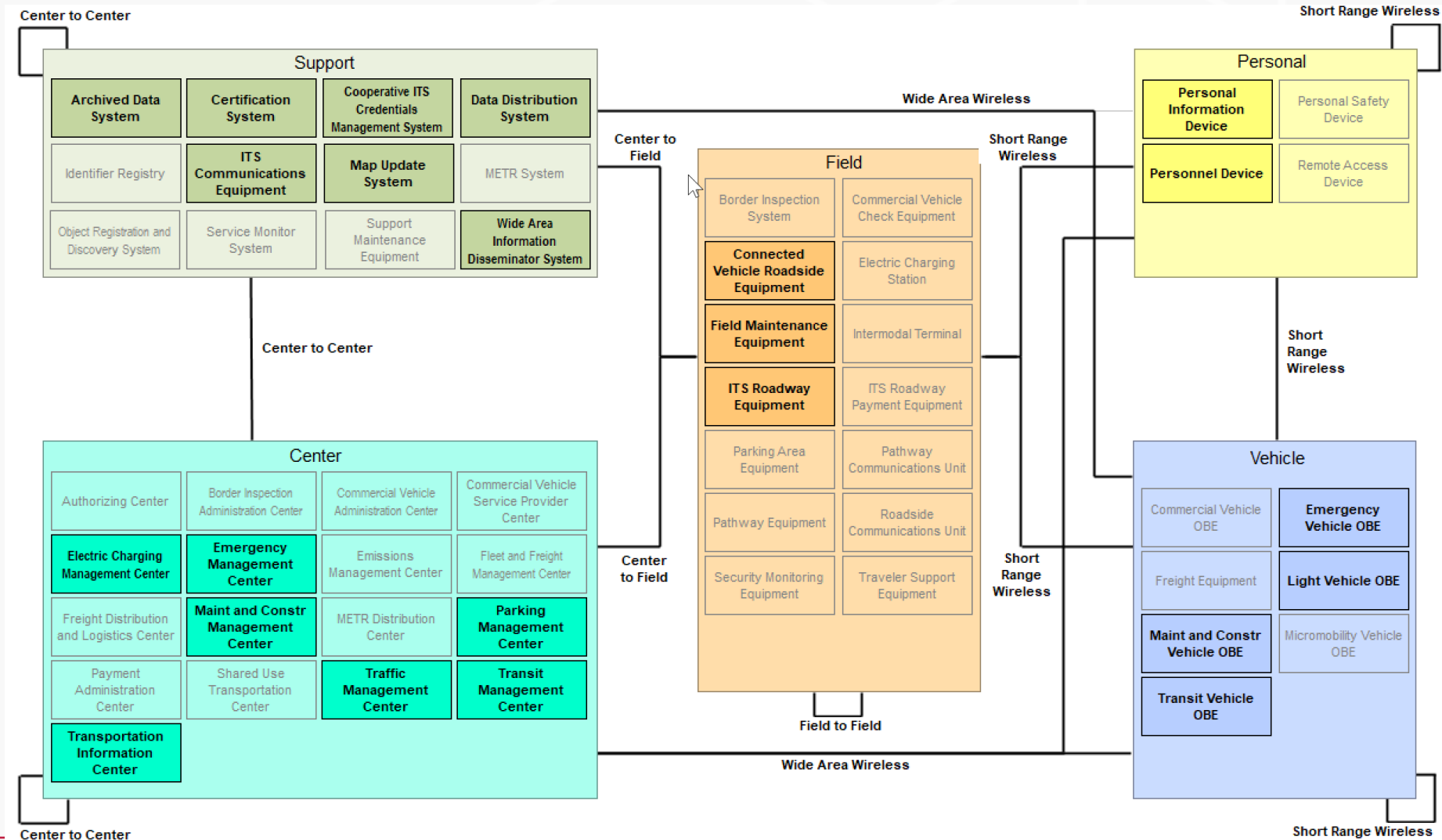
Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT)



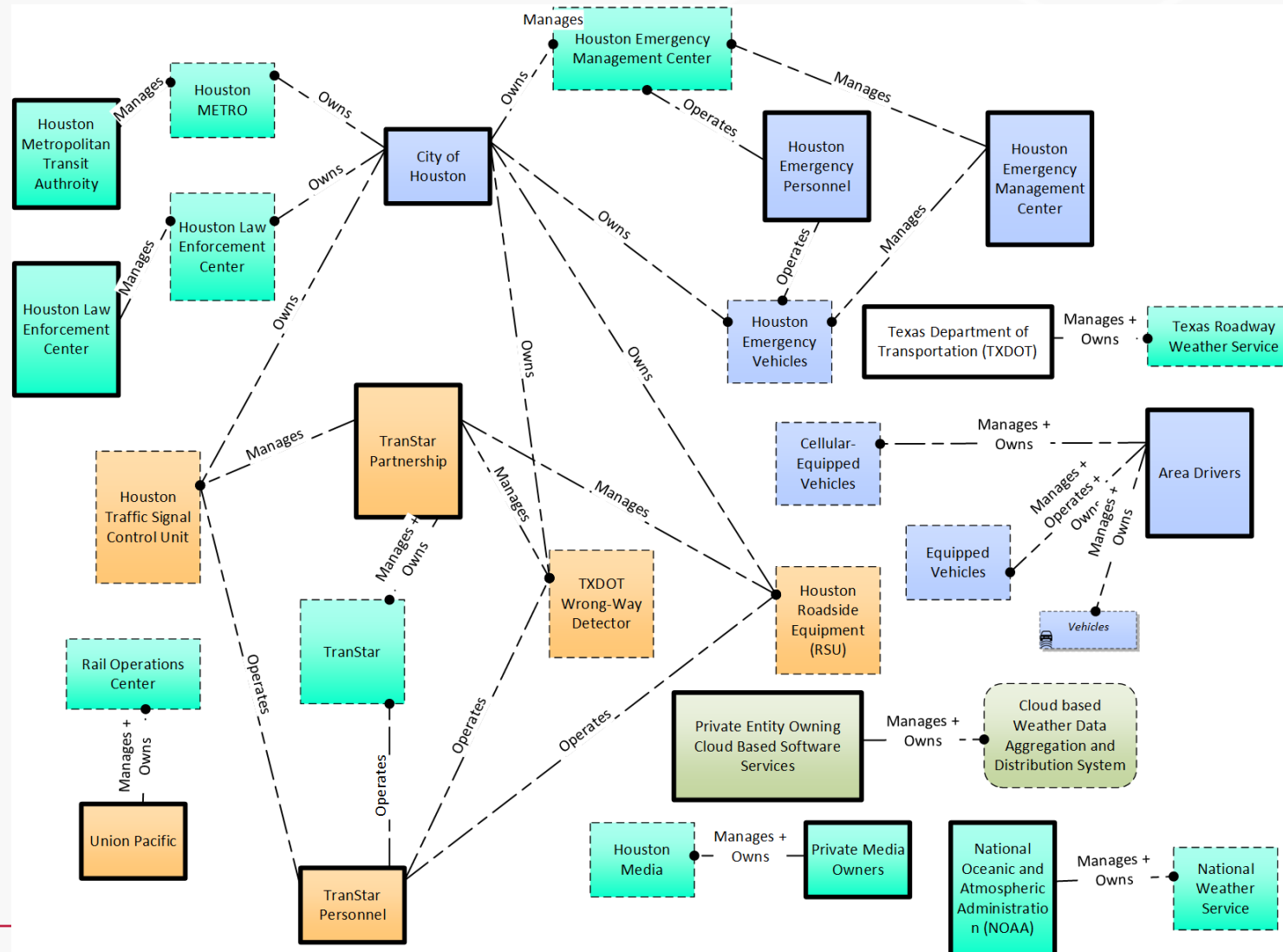
RAD-IT ✓
SET-IT 🚦



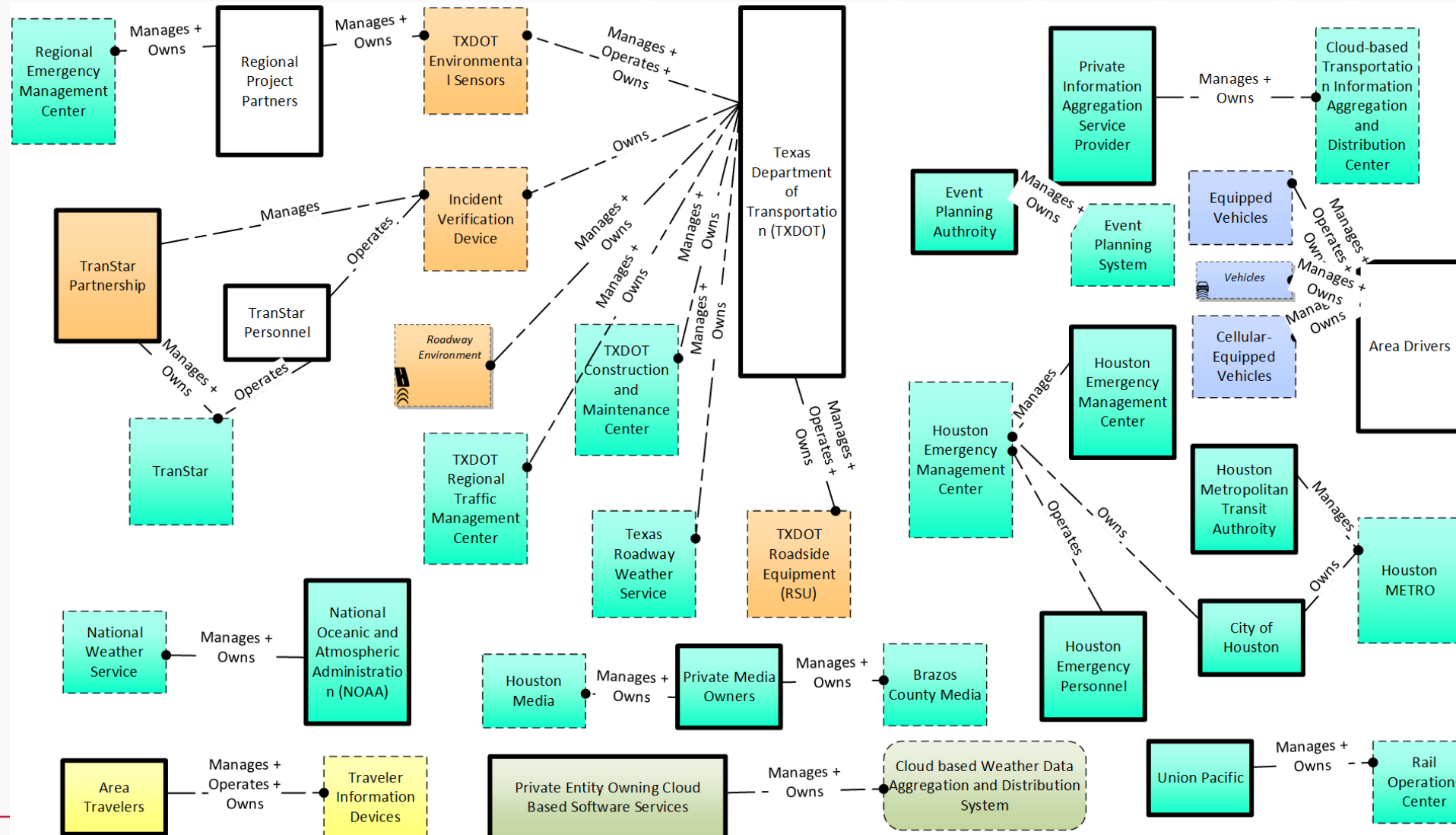
Systems and Subsystems



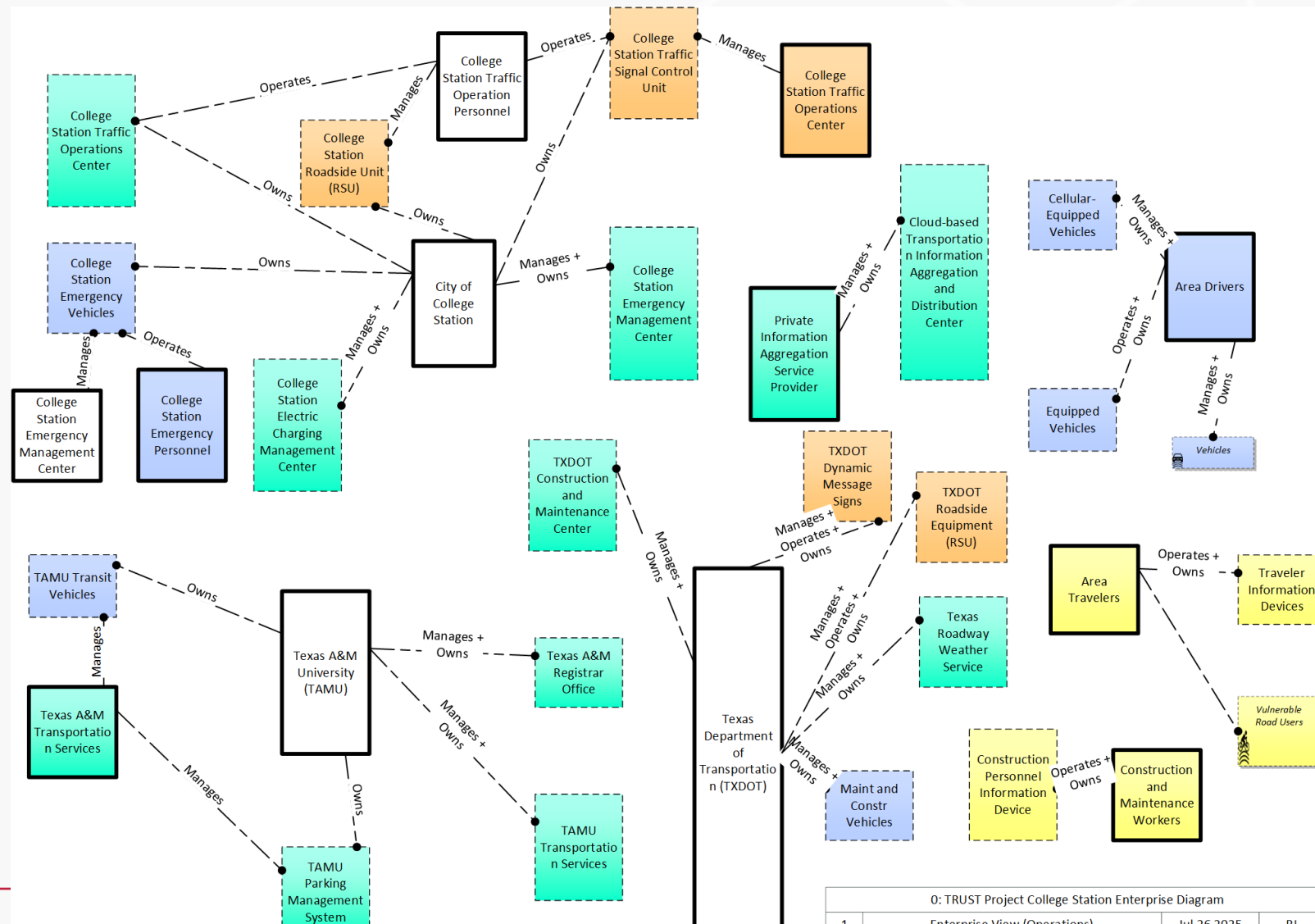
Subsystems (Houston Metro Area)



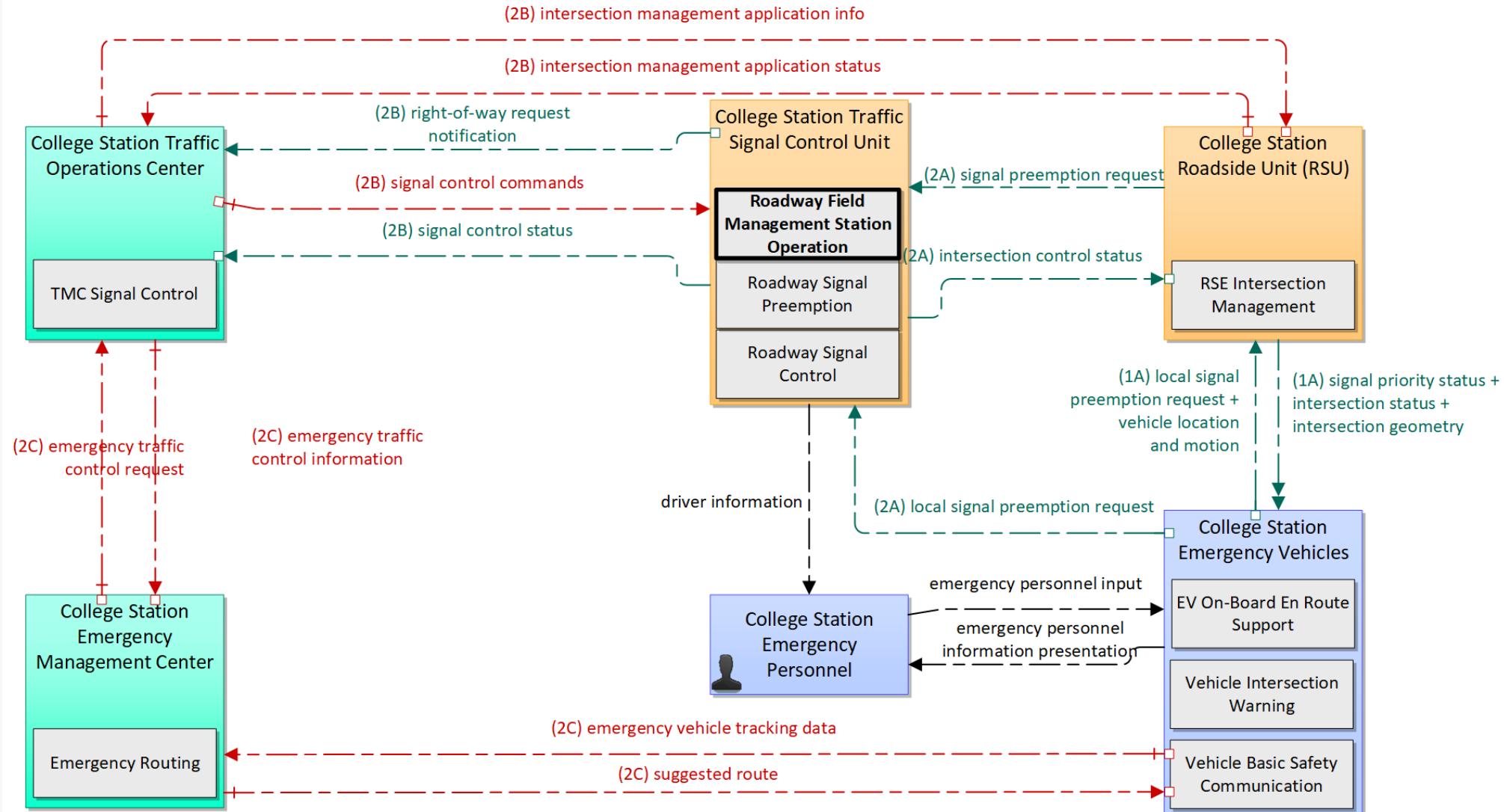
Subsystems (US 290 Corridor)



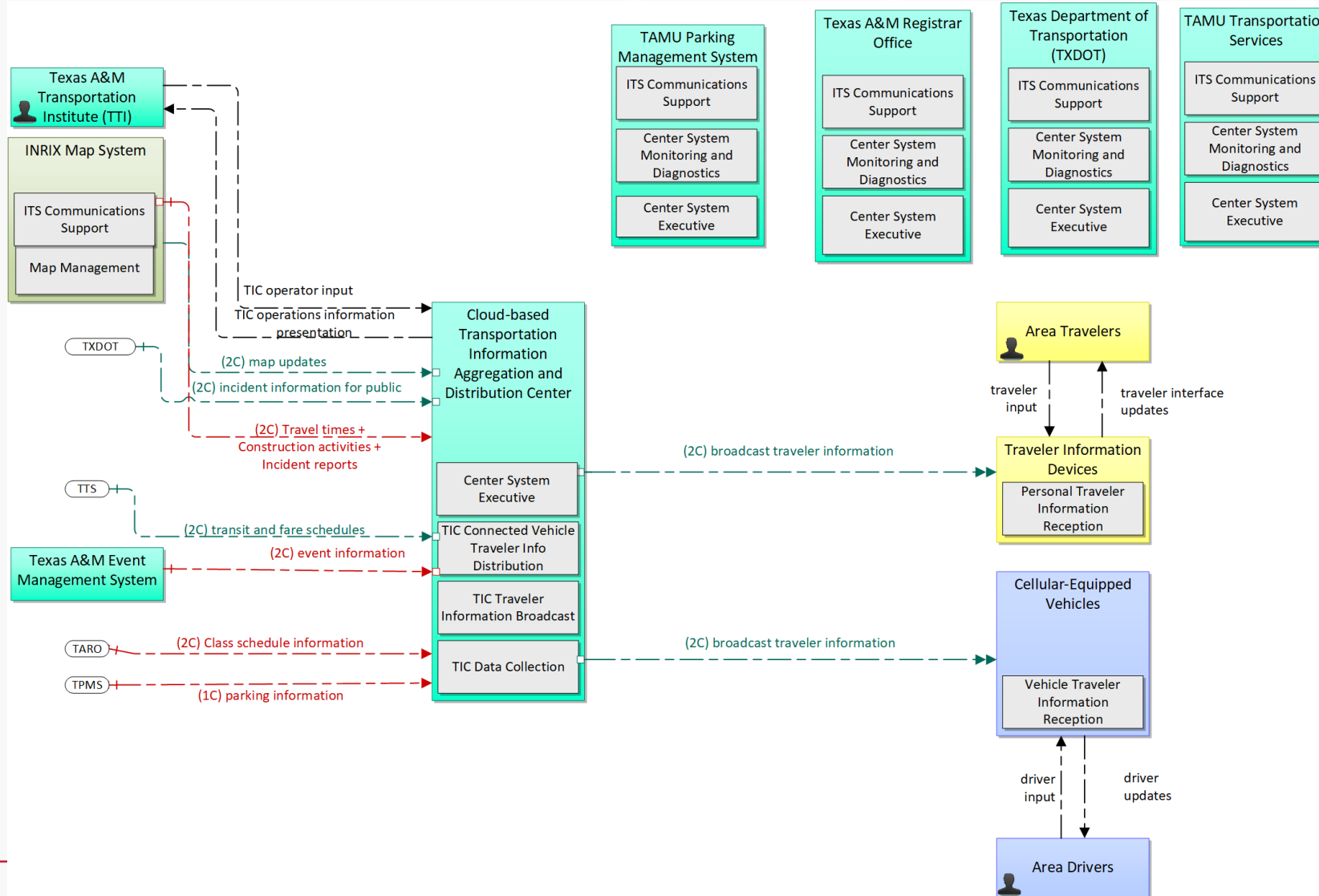
Subsystems (College Station Metro Area)



Direct V2X Service Package Example: Traffic Signal Preemption and Priority



Network V2X Service Package Example: *Every Day a Game Day*



User Needs



Label	Name
NSPAT	User Need for SPaT-Enabled Intersections
NTSPP	User Need for Emergency Vehicle Preemption and Priority
NTBI	User Need for Traveler Information Broadcast
NCWS	User Need for Construction Worker Safety
NIM	User Need for Incident Management
NAWF	User Need for Adverse Weather and Flooding
NPCSE	User Need for Planned Construction, Special Events
NCSW	User Need for Curve Speed Warning
NRTR	User Need for Right Turn on Red
NRLVW	User Need for Red Light Violation Warning
NWWD	User Need for Wrong Way Driving Detection
NCSM	User Need for Connected Systems Monitoring
NPMM	User Need for Project Map Management
NLTS	User Need for Location and Time
NSCMS	User Need for Credentials Management Systems
NDMA	User Need for Project Data Archive

Sample User Needs



Need Tag	User Need	Use Case
NSPAT-1	Traffic Operations need to be able to generate intersection maps for transmission to connected vehicles in order to prevent crashes and provide beyond Line of Sight (LOS) visibility to crossing vehicles.	UC01, UC02, UC03, UC11, UC12, UC13, UC15
NSPAT-2	Traffic Operations need to be able to disseminate SPaT data to connected vehicles to facilitate improved movement through intersections.	UC01, UC02, UC03, UC11, UC12, UC13, UC15
NSPAT-3	Area Drivers (vehicle operators) need to be aware of available movements in each lane and the status of the traffic lights controlling the movements through the intersection.	UC01, UC02, UC03, UC11, UC12, UC13, UC15
NSPAT-4	Traffic Operations needs to be able to reliably detect and identify VRUs in order to verify their presence within the operational setting and inform Equipped Vehicles of their locations.	UC01, UC02, UC03, UC11, UC12, UC13, UC15
NSPAT-5	Area Drivers (vehicle operators) need to be aware of the presence of, and prevent crashes with, VRUs at intersections.	UC01, UC03, UC11, UC12

Functional Requirements



Label	Name
FRSPAT	Functional Requirement for SPaT-Enabled Intersections
FRTSPP	Functional Requirement for Emergency Vehicle Preemption and Priority
FRTBI	Functional Requirement for Traveler Information Broadcast
FRCWS	Functional Requirement for Construction Worker Safety
FRIM	Functional Requirement for Incident Management
FRAWF	Functional Requirement for Adverse Weather and Flooding
FRPCSE	Functional Requirement for Planned Construction, Special Events
FRCSW	Functional Requirement for Curve Speed Warning
FRRTR	Functional Requirement for Right Turn on Red
FRRLVW	Functional Requirement for Red Light Violation Warning
FRWWD	Functional Requirement for Wrong Way Driving Detection
FRCSM	Functional Requirement for Connected Systems Monitoring
FRPMM	Functional Requirement for Project Map Management
FRLTS	Functional Requirement for Location and Time
FRSCMS	Functional Requirement for Credentials Management Systems
FRDMA	Functional Requirement for Project Data Archive

Sample Functional Requirements



FRSPAT-1: A CI (Connected Intersection) shall be equipped with an NTCIP compatible Traffic Signal Controller (TSC).

FRSPAT-2: A CI shall be equipped with a SPaT-enabled TSC.

FRSPAT-3: A CI shall be equipped with an infrastructure processing unit called Field Monitoring Unit (FMU).

FRSPAT-4: A CI shall be equipped with a V2X Roadside Unit (RSU).

FRSPAT-5: Traffic Operations shall generate an SAE J2735 MAP message for the intersection using the USDOT MAP tool.

FRSPAT-6: Traffic Operations shall upload the generated SAE J2735 MAP message and store it on the RSU.

FRSPAT-7: The RSU shall broadcast the stored SAE J2735 MAP message to passing connected vehicles (CVs) at a CI in the Store-and-Repeat mode.

FRSPAT-8: The FMU (Field Monitoring Unit) shall collect the current SPaT data from the Traffic Signal Controller (TSC) at a CI.

FRSPAT-9: The FMU shall forward the SPaT data received from the TSC to the RSU

Sample Traceability Matrix



Need Tag	User Need	Req#	Requirement	Use Case	Verification Method
NSPAT-1	Traffic Operations need to be able to generate intersection maps for transmission to connected vehicles in order to prevent crashes and provide beyond Line of Sight (LOS) visibility to crossing vehicles.	FRSPAT-1	A CI (Connected Intersection) shall be equipped with an NTCIP compatible Traffic Signal Controller (TSC).	UC01, UC02, UC03, UC11, UC12, UC13, UC15	Test and Demonstration
NSPAT-1	Traffic Operations need to be able to generate intersection maps for transmission to connected vehicles in order to prevent crashes and provide beyond Line of Sight (LOS) visibility to crossing vehicles.	FRSPAT-2	A CI shall be equipped with SPaT-enabled TSC.	UC01, UC02, UC03, UC11, UC12, UC13, UC15	Test and Demonstration
NSPAT-1	Traffic Operations need to be able to generate intersection maps for transmission to connected vehicles in order to prevent crashes and provide beyond Line of Sight (LOS) visibility to crossing vehicles.	FRSPAT-3	A CI shall be equipped with an infrastructure processing unit called Field Monitoring Unit (FMU).	UC01, UC02, UC03, UC11, UC12, UC13, UC15	Test and Demonstration
NSPAT-1	Traffic Operations need to be able to generate intersection maps for transmission to connected vehicles in order to prevent crashes and provide beyond Line of Sight (LOS) visibility to crossing vehicles.	FRSPAT-4	A CI shall be equipped with a V2X Road Side Unit (RSU).	UC01, UC02, UC03, UC11, UC12, UC13, UC15	Test and Demonstration



Performance Evaluation

PETER RAFFERTY

Phase 1 Evaluation



15 Use Cases & 3 Deployment Regions

5 Goals

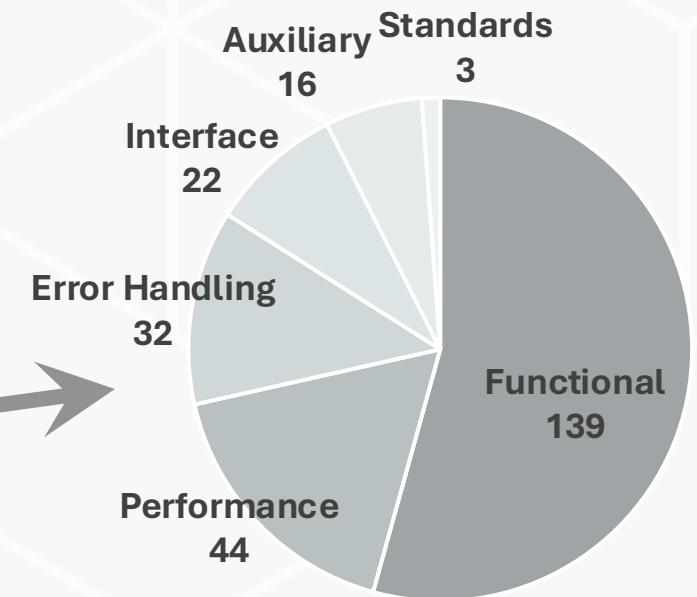
18 Objectives

53 User Needs

256 Requirements

23 Verification Cases

Decomposition →



Measuring Success



29 TRUST Performance Measures

Safety

Crashes and incidents

Mobility

Travel time and delay

Accuracy

VRU detection

Data Integrity

Message transmission

User Trust

Driver responses

Sentiment

Stakeholder feedback

Outreach

Web and event engagement

Economic

Return on investment

Traces to 18 Objectives across 15 Use Cases



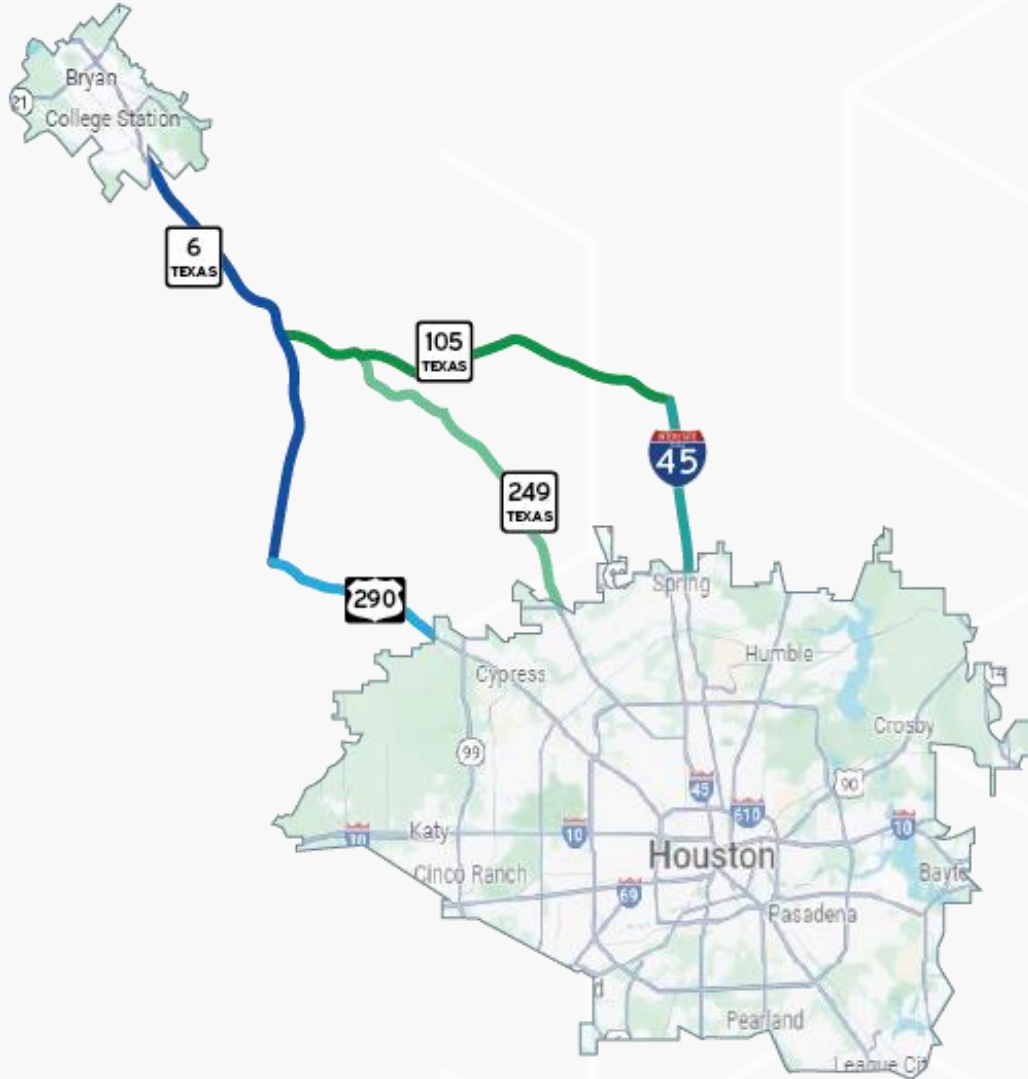
Use Case Demonstrations

Preparedness Check – May 2026

Operational Readiness Demonstration – July 2026

SRINIVASA SUNKARI

Testing and Demonstration Venue



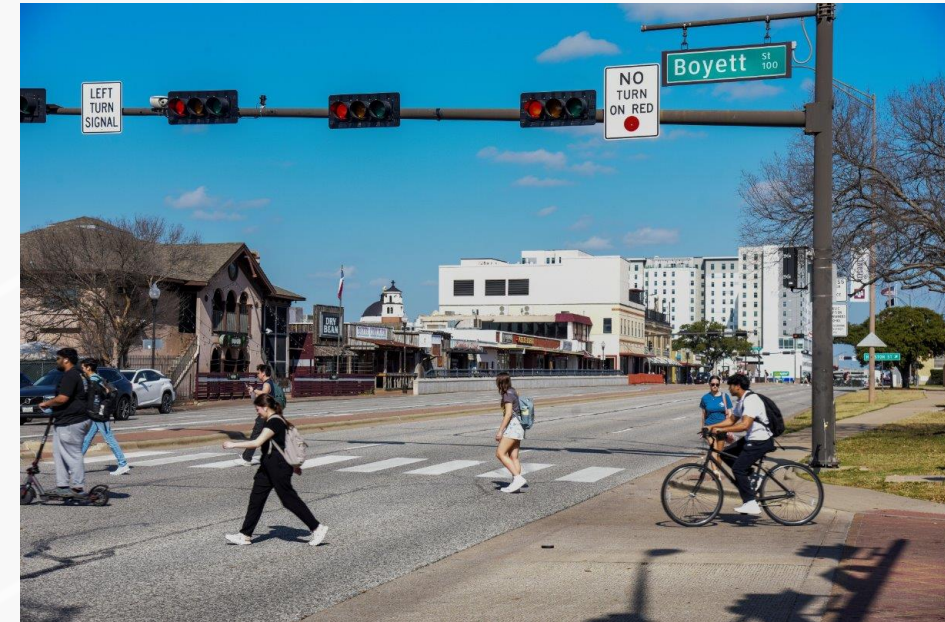
UC 1: SPaT-Enabled Intersections for VRU Protection & Identification



College Station

DIRECT

- **Goal:** Identify and Protect VRUs at SPaT Enabled Intersections in College Station (CS)
- **Information Exchange & Delivery:**
 - Deployed in 35 intersections
 - Use *SPaT*, *MAP*, *PSM*, and *BSM* messaging
 - Alert equipped vehicles and drivers
 - Provide drivers with:
 - MAP and SPaT
 - VRU alerts at the connected intersection

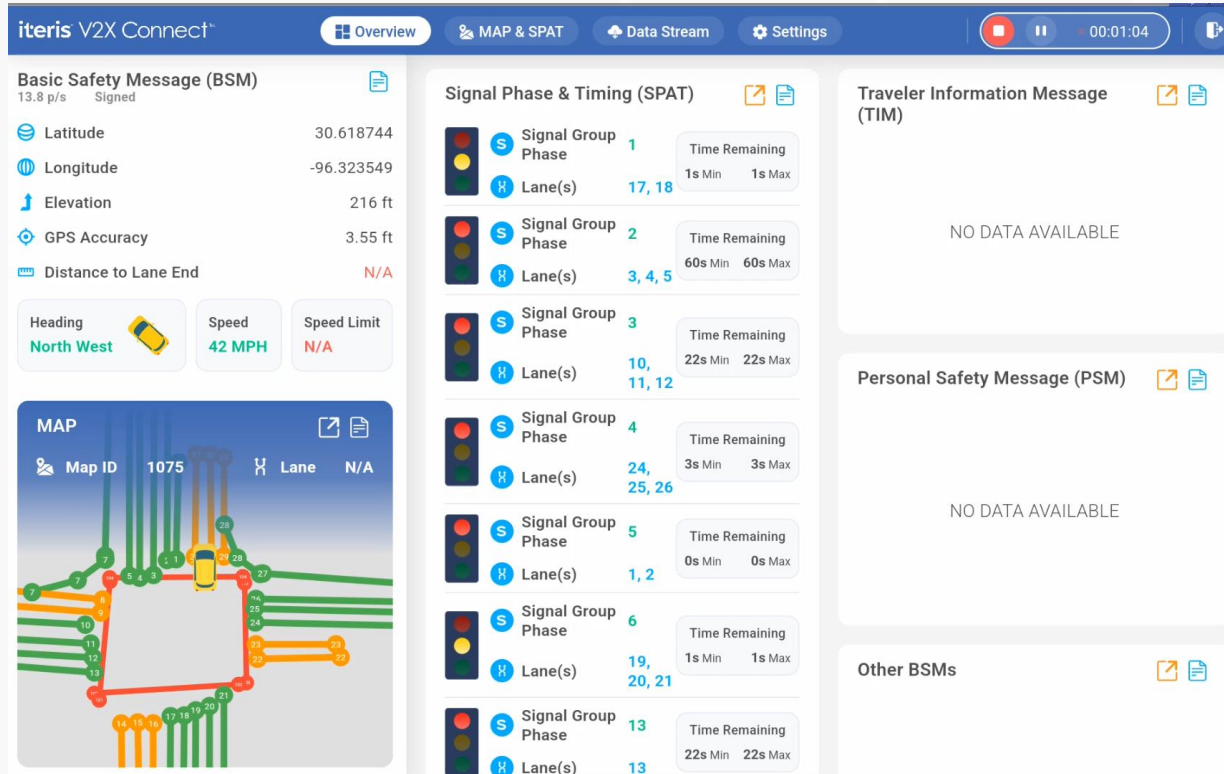


UC 1: SPaT-Enabled Intersections for VRU Protection & Identification



College Station

DIRECT



UC 2: Traffic Signal Preemption and Priority



College Station

DIRECT

- **Goal:** Improve Emergency Response and Safety in College Station
- **Information Exchange & Delivery:**
 - Deployed in four TAMU EMS vehicles
 - Use *SPaT*, *MAP*, and SRM
 - Provide emergency vehicle with Emergency Preemption
- **Evaluated the deployment for numerous scenarios**
 - Single vs multiple emergency vehicles
 - Arrival on the same approach vs conflicting approach



UC 3: Transit Fleet Integration



College Station

DIRECT

- **Goal:** Improve Transit Bus Mobility in College Station
- **Information Exchange & Delivery:**
 - Deployed in 40 TAMU Buses
 - Use *SPaT*, *MAP*, *SRM* messages
 - Provide Transit Bus with priority if conditions permit



UC 4: Everyday A Gameday



College Station

NETWORK

- **Goal:** Develop a centralized repository for available information in a format that can be shared to mapping companies and virtual RSUs.
- **Information Exchange & Delivery:**
 - Use *MAP, TIM, and V2X-enabled device*
 - Alert equipped vehicles and drivers
 - Provide drivers with:
 - Real-time parking garage information
 - Real-time road-closure locations
 - Real-time Texas A&M bus capacity and locations
 - Travel Time Information
 - Real-time dynamic message sign messages
 - Real-time construction information
- **Beta version of Google Maps as the end point**

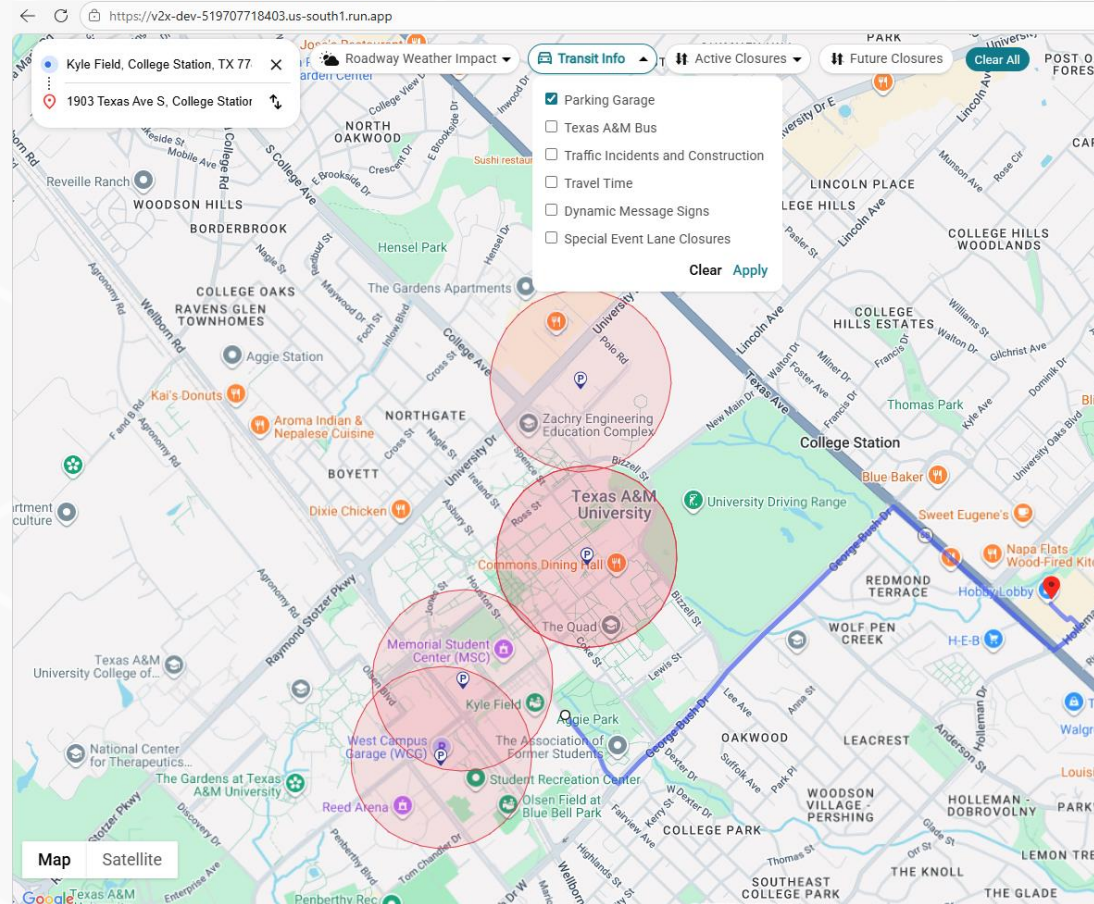
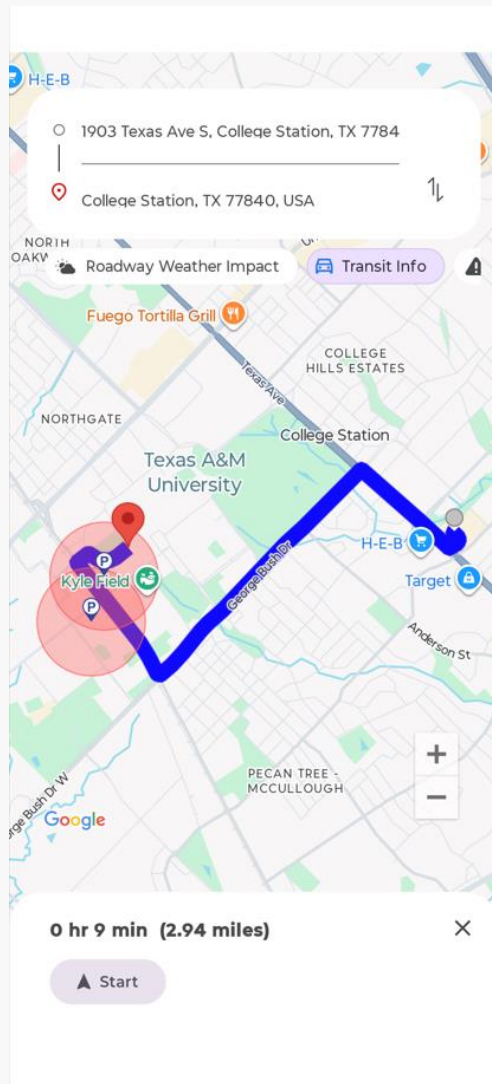


UC 4: Everyday A Gameday (Travel Time, Parking Garage, and other info)



College Station

NETWORK



UC 5: Enhanced Highway Construction Worker Safety



College Station

DIRECT

- **Goal:** Enhance Highway Construction Worker Safety in College Station
- **Information Exchange & Delivery:**
 - Use *BSM*, *TIM* messaging
 - Alert equipped vehicles and drivers
 - Stationary and mobile work zones
 - Provide vehicles and drivers with:
 - Work zone Alerting
 - Workers (VRU) present in the work zone
- **Hybrid OBU**
 - Use an OBU to broadcast a TIM message



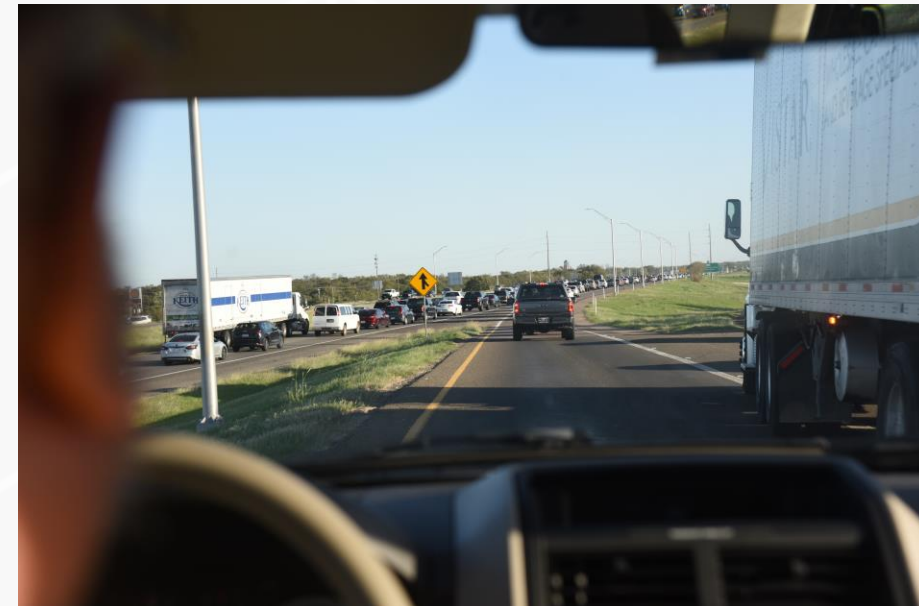
UC 6: Incident Management



NHS

NETWORK

- **Goal:** Improve incident management at identified locations on the National Highway System
- **Information Exchange & Delivery:**
 - Use J2735 TIM messages
 - Use Google Maps V2X Dev App to alert drivers
 - Provide in-vehicle systems and their drivers with information about incidents within five miles upstream including:
 - Incident location
 - Number and position of lanes blocked
 - Incident updates, including timestamps

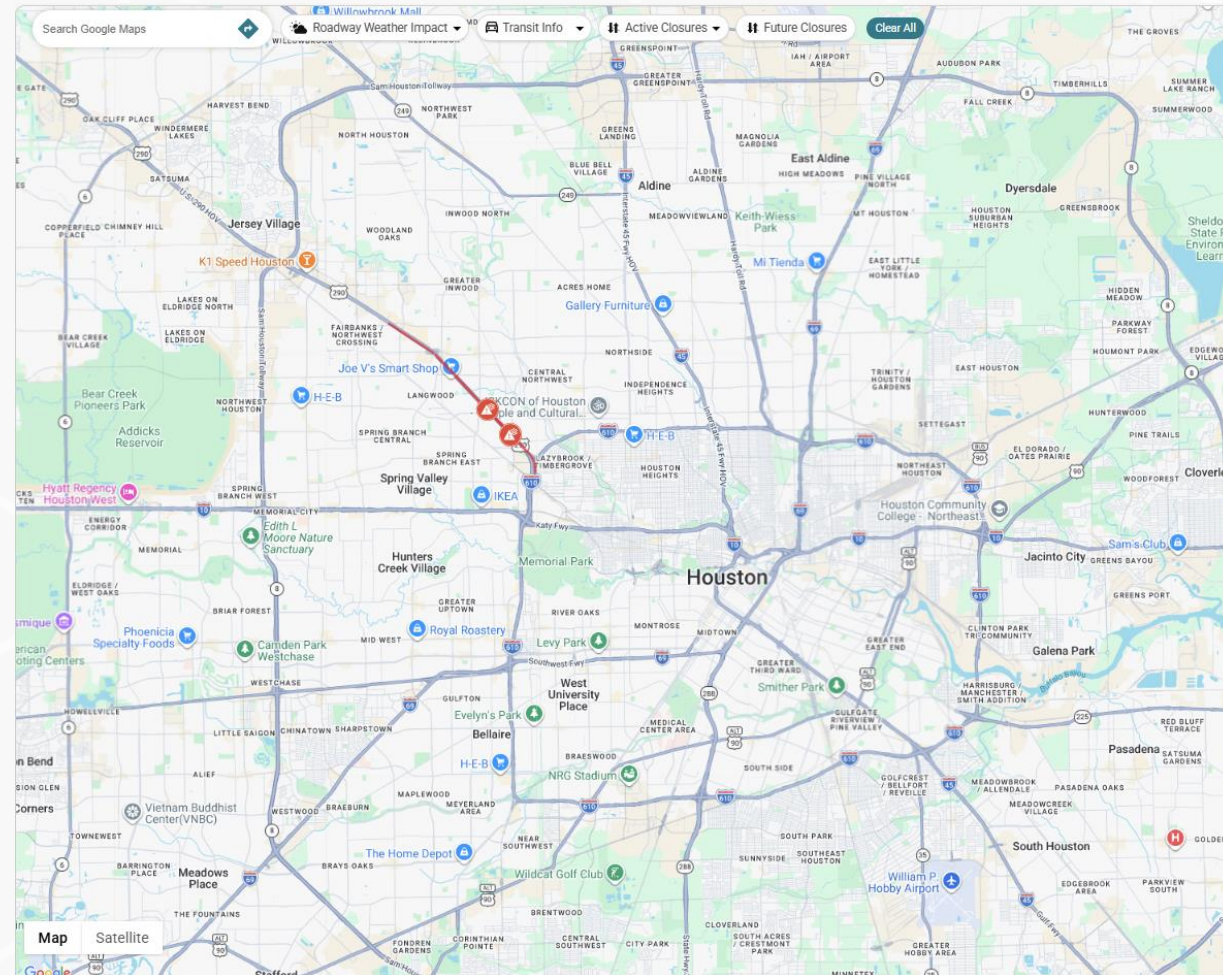
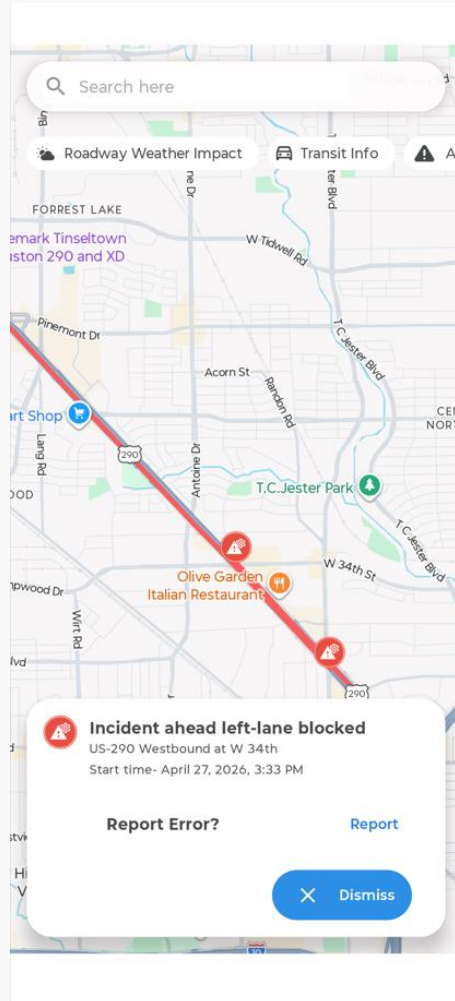


UC 6: Incident Management



NHS

NETWORK



UC 7: Adverse Weather Events



NHS

NETWORK

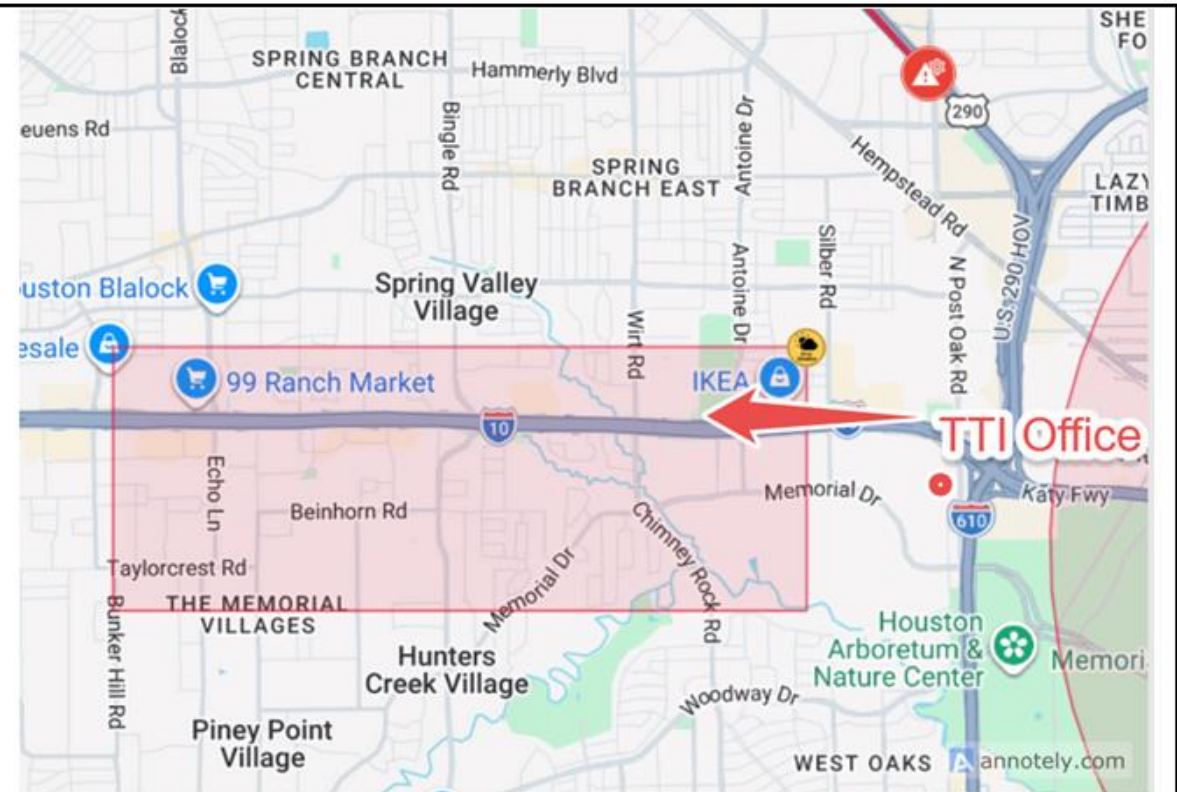
- **Goal:** Improve mobility and safety on the National Highway System during adverse weather conditions using local and national weather data sources.
- **Information Exchange & Delivery:**
 - Use SAEJ2735 TIM messaging
 - Use Google Maps V2X Dev App, to alert drivers
 - Provide drivers with visual and auditory alerts of adverse weather conditions impacting travel.



UC 7: Adverse Weather Events

National Weather Service Demo Route

From TTI Office, drive west down I-10 Katy into National Weather Service Warning geofence to demonstrate alert notification.



UC 8: Planned Construction and Special Events



NHS

NETWORK

- **Goal:** Improve Mobility During Planned Construction and Planned Special Events (PSEs) on identified locations on the National Highway System
- **Information Exchange & Delivery:**
 - Use SAEJ2735 TIM messages:
 - Use Google Maps V2X Dev App alert drivers about:
 - Upcoming lane closures
 - Active lane closures
 - Real-time Congestion and Queue Warning

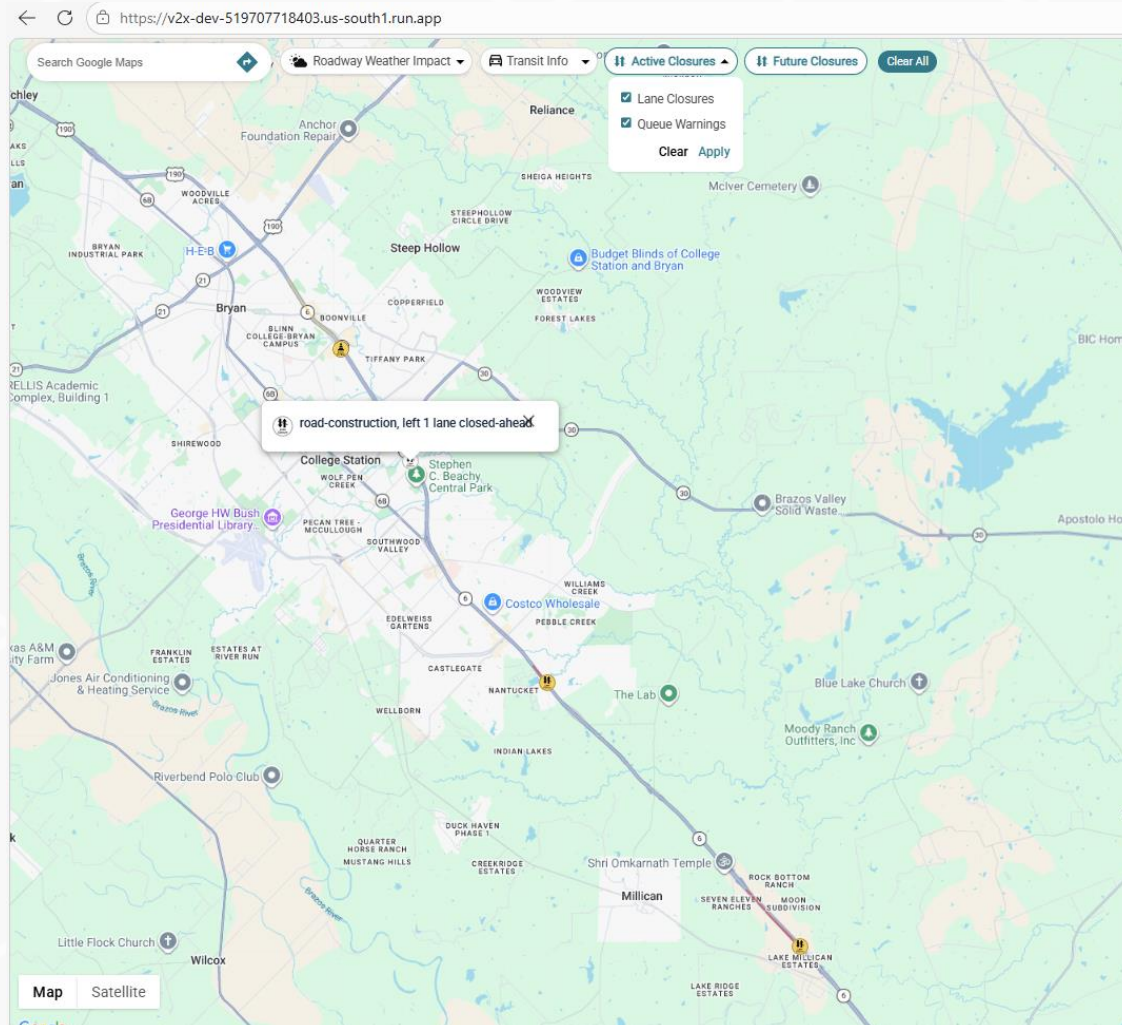
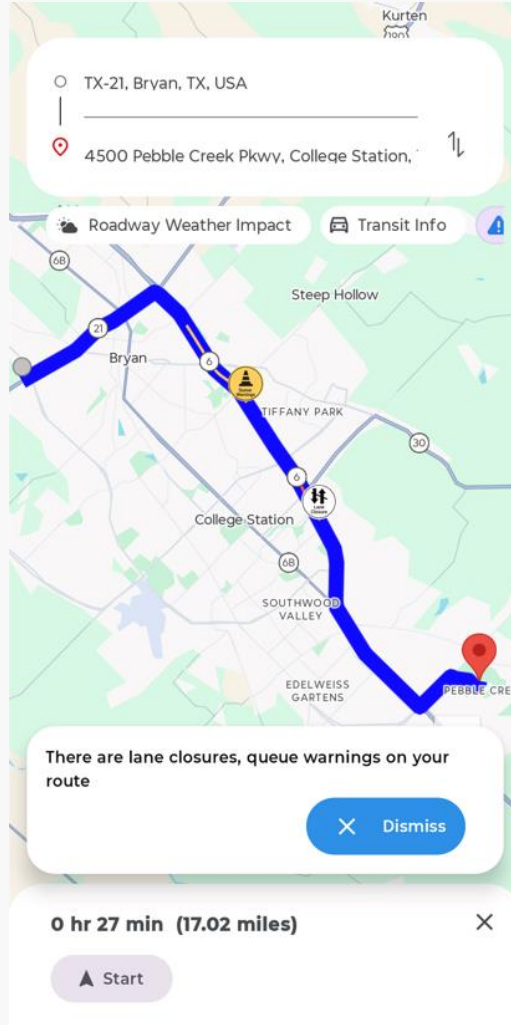


UC 8: Planned Construction and Special Events



NHS

NETWORK



UC 9: Curve Speed Warning



NHS

DIRECT

- **Goal:** Improve Safety at Sharp Curves on identified locations on the National Highway System
- **Information Exchange & Delivery:**
 - Use SAEJ2735 TIM messages:
 - Alert drivers via equipped vehicle display
 - Provide drivers with:
 - Speed advisory information
- **Installation at US290 and SH6 Ramp**
 - TxDOT weather station on the ramp
 - Advisory speeds based on pavement conditions



UC 9: Curve Speed Warning

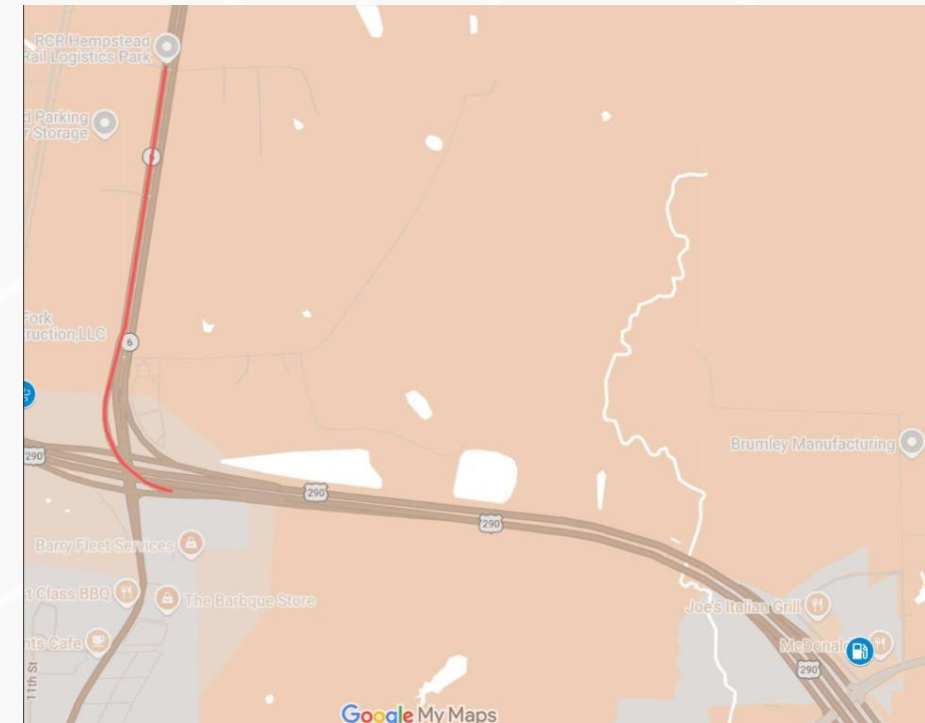
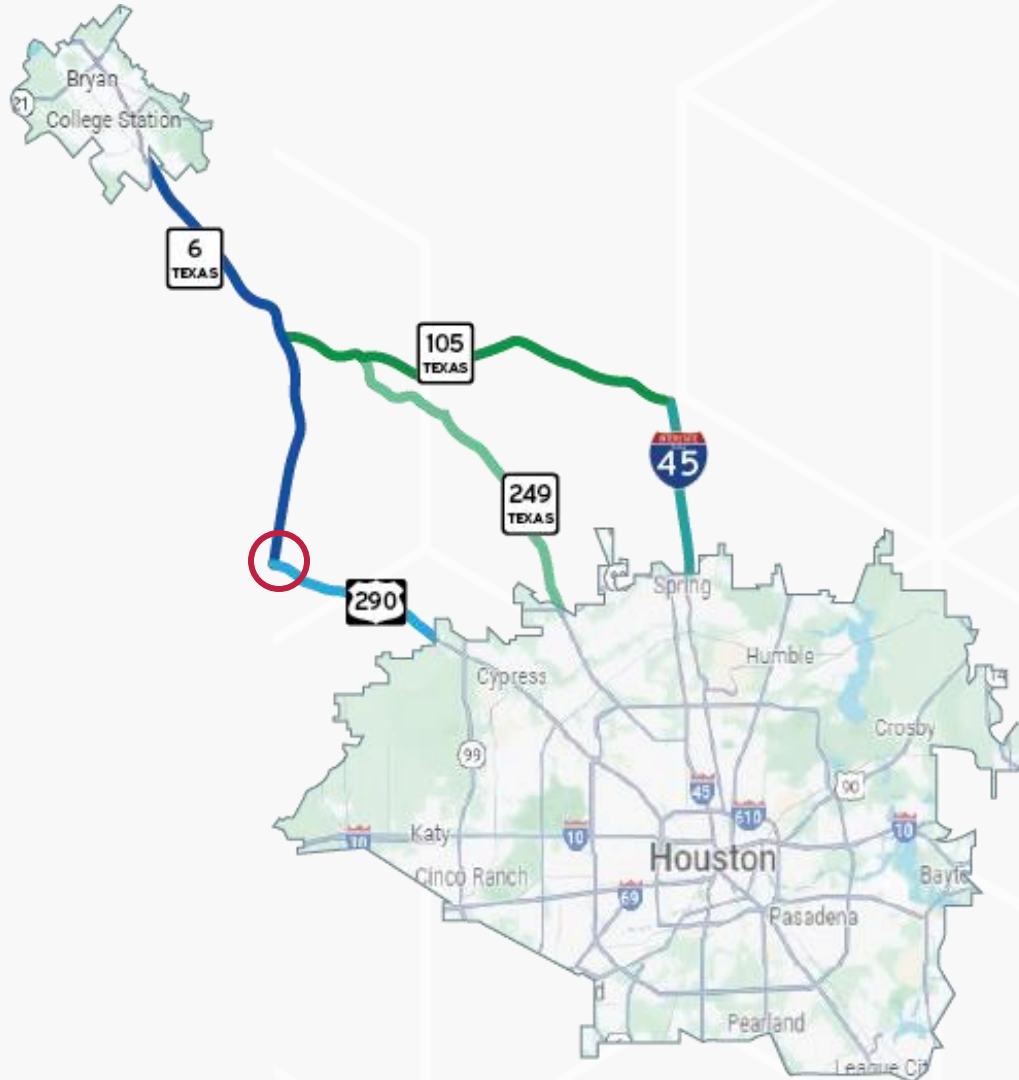


NHS

DIRECT

Start: College Station, Texas

Destination: Houston, Texas



UC 10: Roadway Flood Warning



Houston

NETWORK

- **Goal:** Improve mobility and road safety in Houston during Roadway Flooding events using local and national weather data sources.
- **Information Exchange & Delivery:**
 - Use SAEJ2735 TIM messaging
 - Use Google Maps V2X Dev App alert drivers
 - Provide drivers with:
 - Visual and auditory alerts of high flood risk roadways during events based on weather sensor data.

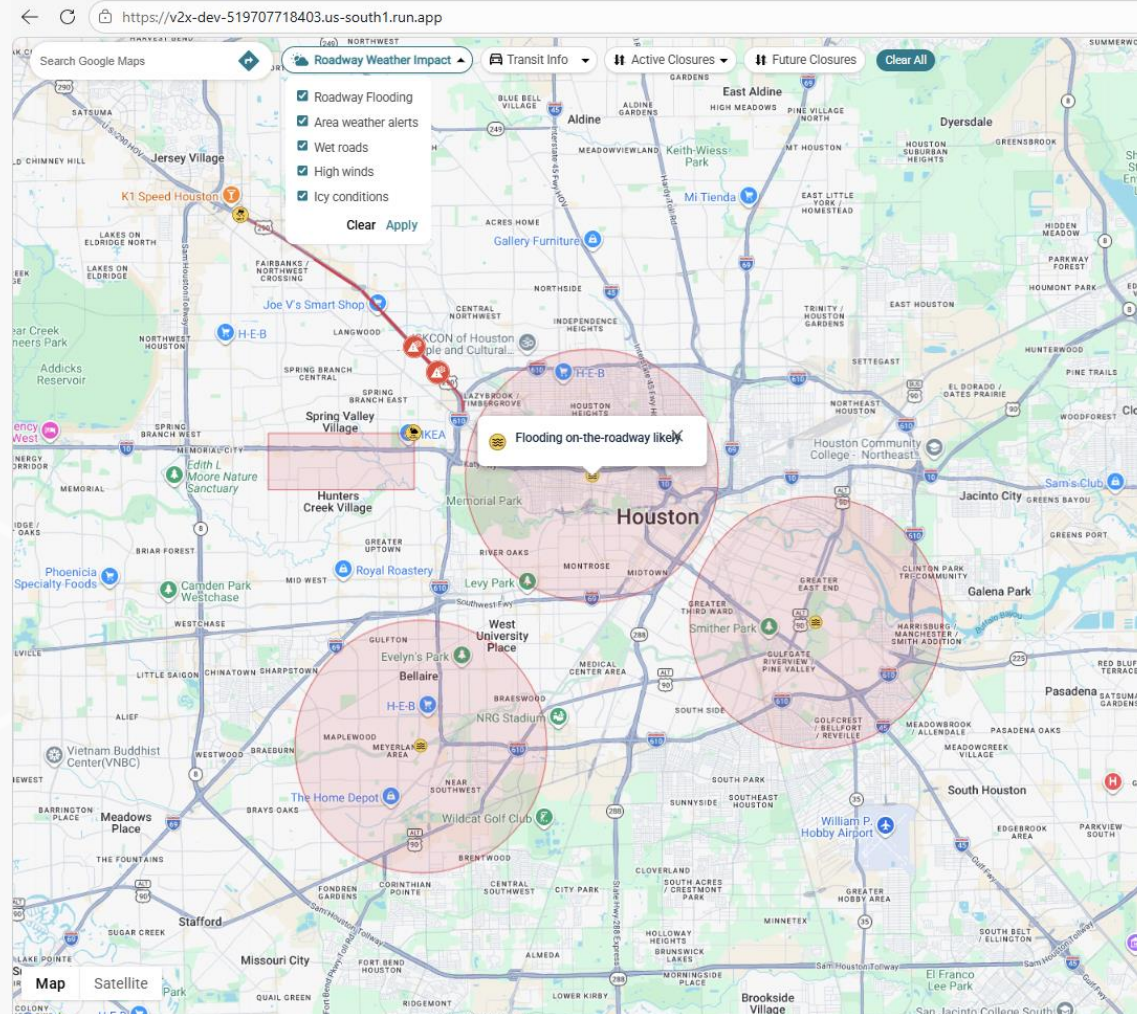
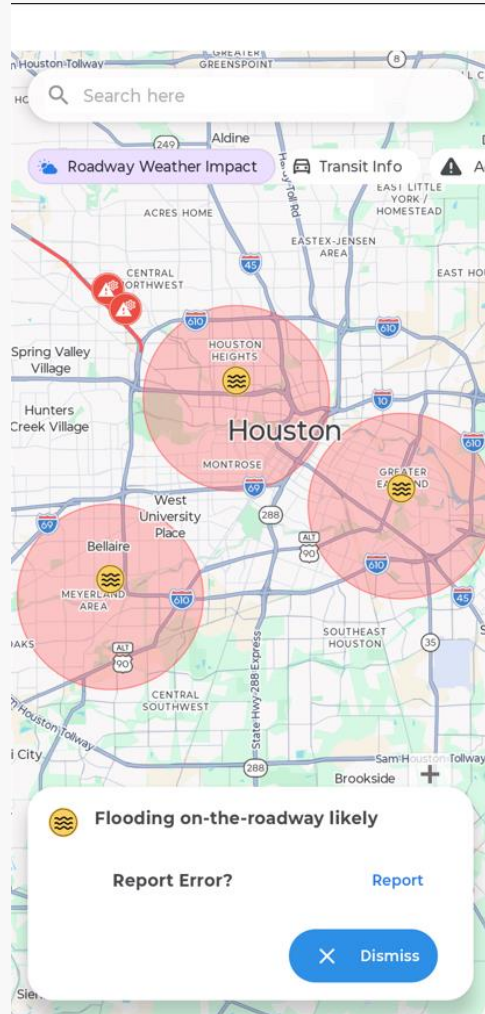


UC 10: Roadway Flood Warning



Houston

NETWORK



UC 11: Houston SPaT-Enabled Intersections



Houston

DIRECT

- **Goal:** Improve Safety and Mobility in Houston via SPaT Enabled Intersections
- **Information Exchange & Delivery:**
 - Deployed in 50 intersections in the Houston area
 - Use *SPaT*, *MAP*, *PSM*, and *BSM* messaging
 - Alert equipped vehicles and drivers
 - Provide drivers with:
 - MAP and SPaT
 - VRU alerts at the connected intersection

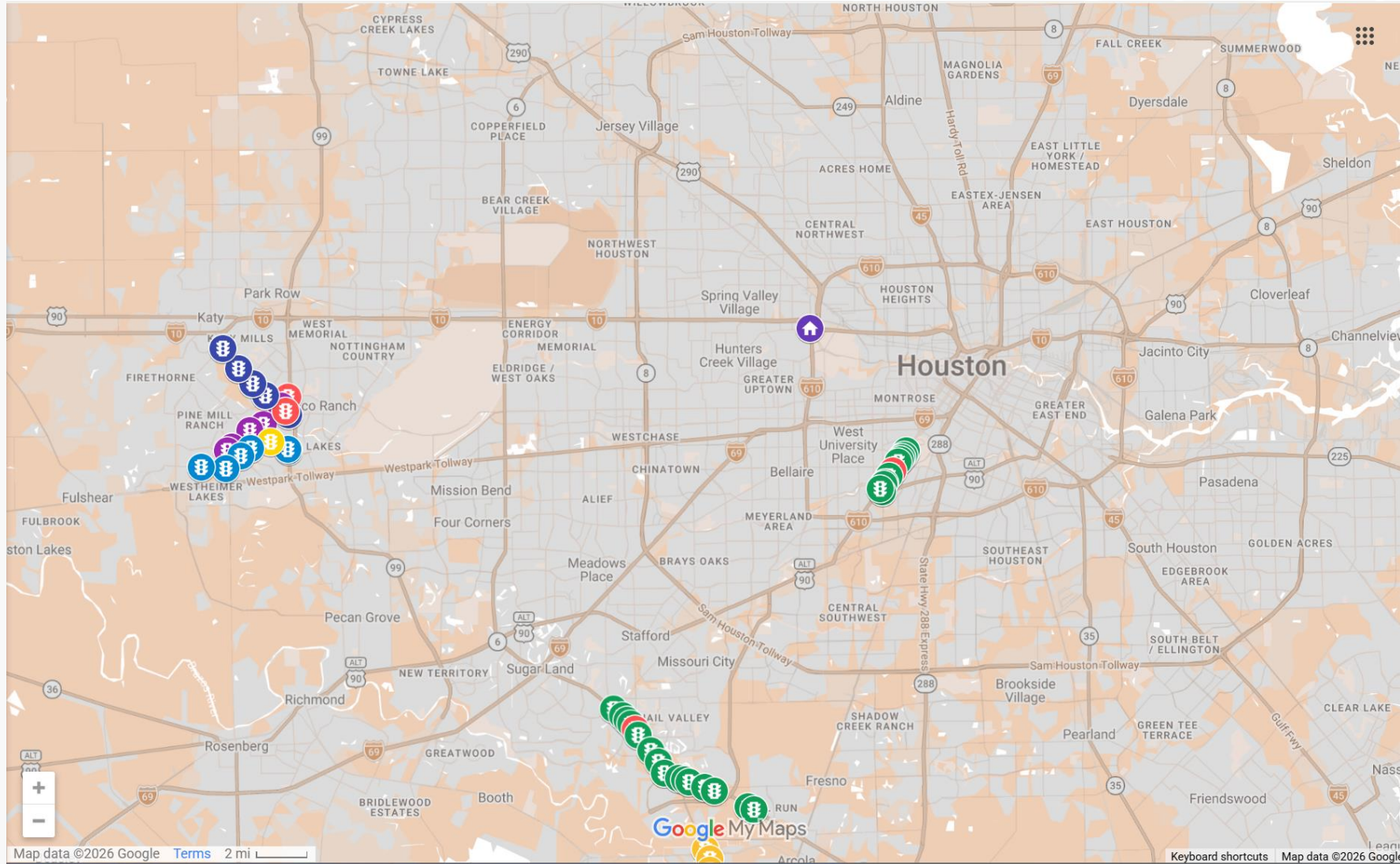


UC 11: Houston SPaT-Enabled Intersections



Houston

DIRECT



UC 12: Right Turn on Red



Houston

DIRECT

- **Goal:** Enhance VRU Safety through Right-Turn-on-Red Warning at Intersections
- **Information Exchange & Delivery:**
 - Use *SPaT*, *MAP*, *PSM*, and *BSM* messaging
 - Alert equipped vehicles and drivers
 - Provide drivers with:
 - MAP and SPaT
 - VRU alerts at the connected intersection



UC 13: Red Light Violation Warning



Houston

DIRECT

- **Goal:** Improve Safety through red-light violation warnings at Intersections.
- **Information Exchange & Delivery:**
 - Use SPaT & MAP
 - Alert equipped vehicles
 - Provide drivers with:
 - Audible and visual alert if the vehicle is about to cross the stop bar on a red indication.

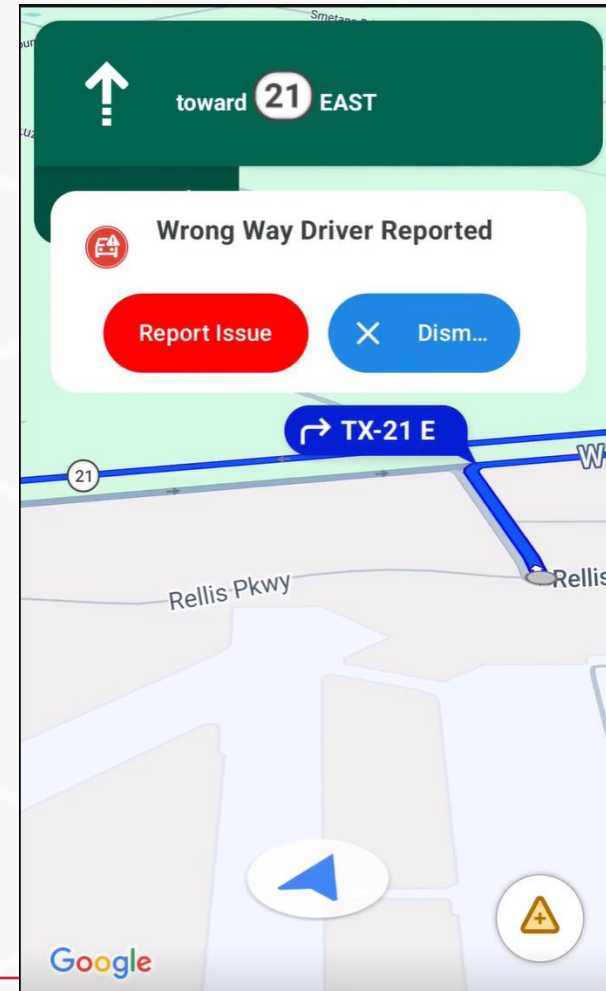


UC 14: Wrong Way Driving



Houston

- **Goal:** Improve Safety at Offramps in Houston through Wrong-Way Driving Detection
- **Information Exchange & Delivery:**
 - Use TIM
 - Alert area drivers
 - Provide drivers with:
 - Alert about a reported wrong-way driver on the facility
- **Demonstrated end-to-end functionality at RELLIS**
 - Used a TAPCO trailer
 - Detected a wrong-way driver
 - Confirmed at the TMC
 - Right-way driver alerted within the geofence



UC 15: Emergency Vehicle Response Time and Safety



Houston

DIRECT

- **Goal:** Improve Emergency Response and Safety in the Houston area
- **Information Exchange & Delivery:**
 - Deployed in four Missouri City FD Vehicles
 - Use *SPaT*, *MAP*, and SRM
 - Provide Emergency Vehicle Preemption



Operational Readiness Demonstration – July 2026 – Five Use Cases



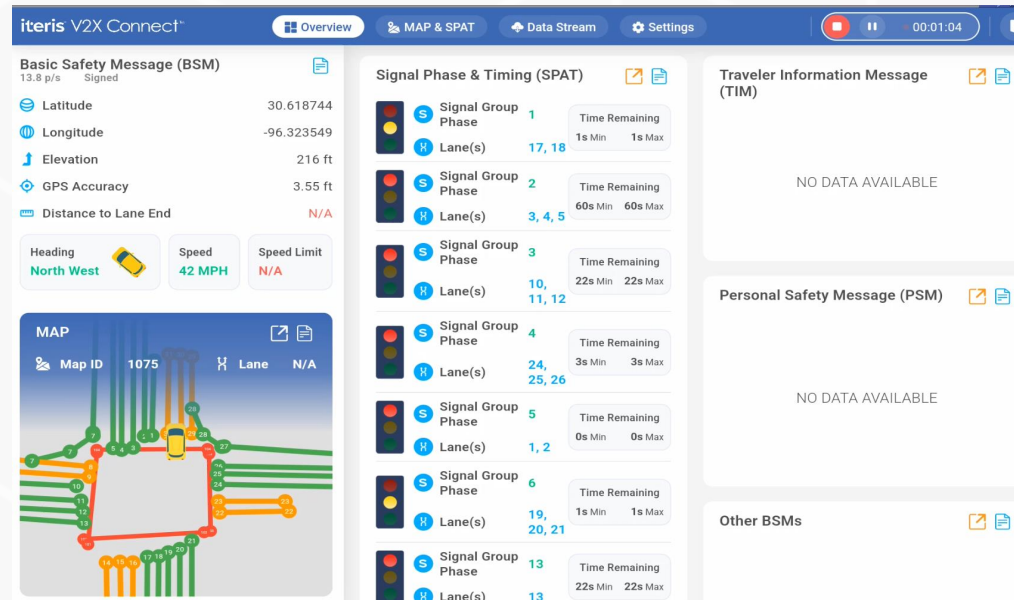
UC 1: SPaT-Enabled Intersections for VRU Protection & Identification



College Station

DIRECT

- Illustrated the messages
 - Iteris tablet with a Denso OBU in the TTI vehicles
 - Keysight Sniffer
 - In the GM vehicle's HMI



UC 2: Traffic Signal Preemption and Priority



College Station

DIRECT

- **Equipment Used**
 - TAMU EMS Unit
 - TTI-equipped vehicle functioning as an EV
- **Multiple Scenarios**
 - Single EV driving through the intersection
 - Multiple vehicles driving through the intersection



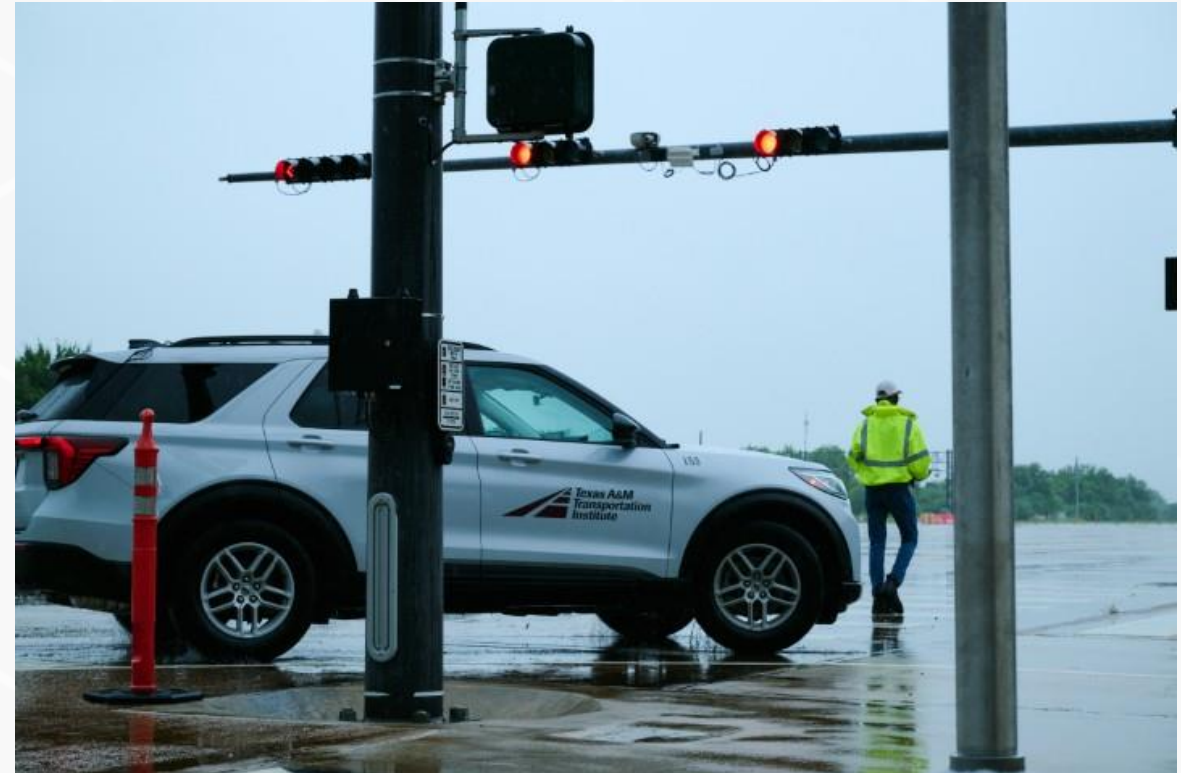
UC 12: Right Turn on Red



Houston

DIRECT

- **Equipment Used**
 - TTI Vehicle with AI OBU and HMI
 - GM Vehicle
- **Two Scenarios**
 - Vehicle drives through the intersection in the right lane with a pedestrian at the corner
 - Vehicle turns right at the intersection with a pedestrian in the crosswalk



UC 12: Right Turn on Red



UC 13: Red Light Violation Warning



Houston

DIRECT

- **Equipment Used**
 - TTI Vehicle with AI OBU and HMI
 - GM Vehicle
- **Vehicles approach the intersection at 40-50 mph**



UC 13: Red Light Violation Warning



UC 9: Curve Speed Warning



NHS

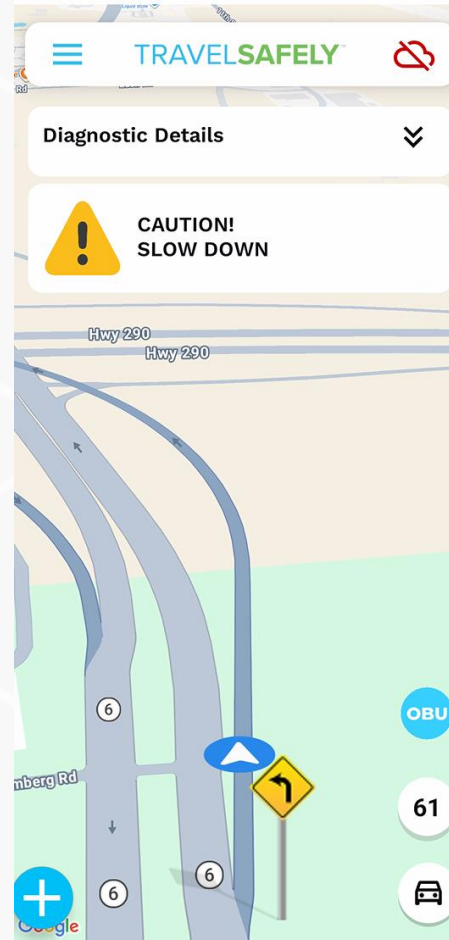
DIRECT

- **Equipment Used**

- TTI Vehicle with AI OBU and HMI
- GM Vehicle

- **Two Scenarios**

- Vehicles go through the curve at speeds > 45 mph (threshold for wet conditions)
- Vehicles go through the curve at speeds < 45 mph





Lessons Learned and Next Steps

ROBERT BRYDIA

Lessons Learned



Systems Engineering

Establish requirements early and use them as the authoritative baseline. A disciplined ConOps → requirements → design → test process keeps a complex deployment aligned, controls scope, and provides an objective basis for determining readiness.

Interoperability & Standards

Standards compliance does not automatically produce interoperability. Vendors can implement the same standards differently; interoperability must be explicitly defined, tested early, and validated across vendors, devices, vehicles, infrastructure, and back-office systems.

Procurement & Scheduling

Start procurement earlier than you think necessary—and build contingency into the schedule. Contracting, purchasing, licensing, legal reviews, OEM timelines, and vendor dependencies can take longer than the actual technical development and become the project's critical path.

Lessons Learned (Cont.)



Integration & Dependencies

Treat V2X as a system of systems, not a collection of independent use cases. Foundational capabilities, shared interfaces, data sources, vendors, and infrastructure create dependencies across use cases; identify those dependencies early and sequence development accordingly.

Testing & Readiness

Test the integrated operational system before the formal demonstration—not just the individual components. Site and subsystem testing can miss issues that emerge only when vehicles, infrastructure, communications, software, people, and operational scenarios come together. Rehearsals and pre-readiness reviews are invaluable.

Data & Network V2X

Network V2X introduces different dependencies and uncertainties than direct V2X. External data quality, latency, availability, ownership, cellular/cloud pathways, and third-party systems require stronger data governance—and success metrics appropriate to probabilistic rather than deterministic delivery.

Lessons Learned (Cont.)



Partnerships & Governance

Technical integration is only half the challenge; institutional integration matters just as much. Multi-agency deployments need clear commitments, data-access expectations, roles, decision authority, escalation paths, and sustained stakeholder engagement from the beginning.

Operations & Scale

Design for sustained operations and scale, not simply a successful demonstration. Processes that work at one intersection or during a controlled demonstration may not work across a region. Credential management, FCC licensing, cybersecurity, maintenance, monitoring, data management, and support all become continuing operational responsibilities.

Next Steps



- **Finish Phase 1 Documentation**
 - Update to 'as built' status
- **Interoperability Demonstrations**
 - What works in Texas must work elsewhere (and vice versa)
- **Develop Operating Agreements with IOO's**
 - Emphasis of Phase 2 is Operations and Performance Measurement
- **Targeted Explorations**
 - Virtual RSU's
 - Bicycles
 - Expand vehicle fleet (Class 8 demonstrations)
- **Outreach, Outreach, Outreach**
 - The challenge is not the technology. Its the knowledge and scaling beyond pilots.

Questions?

