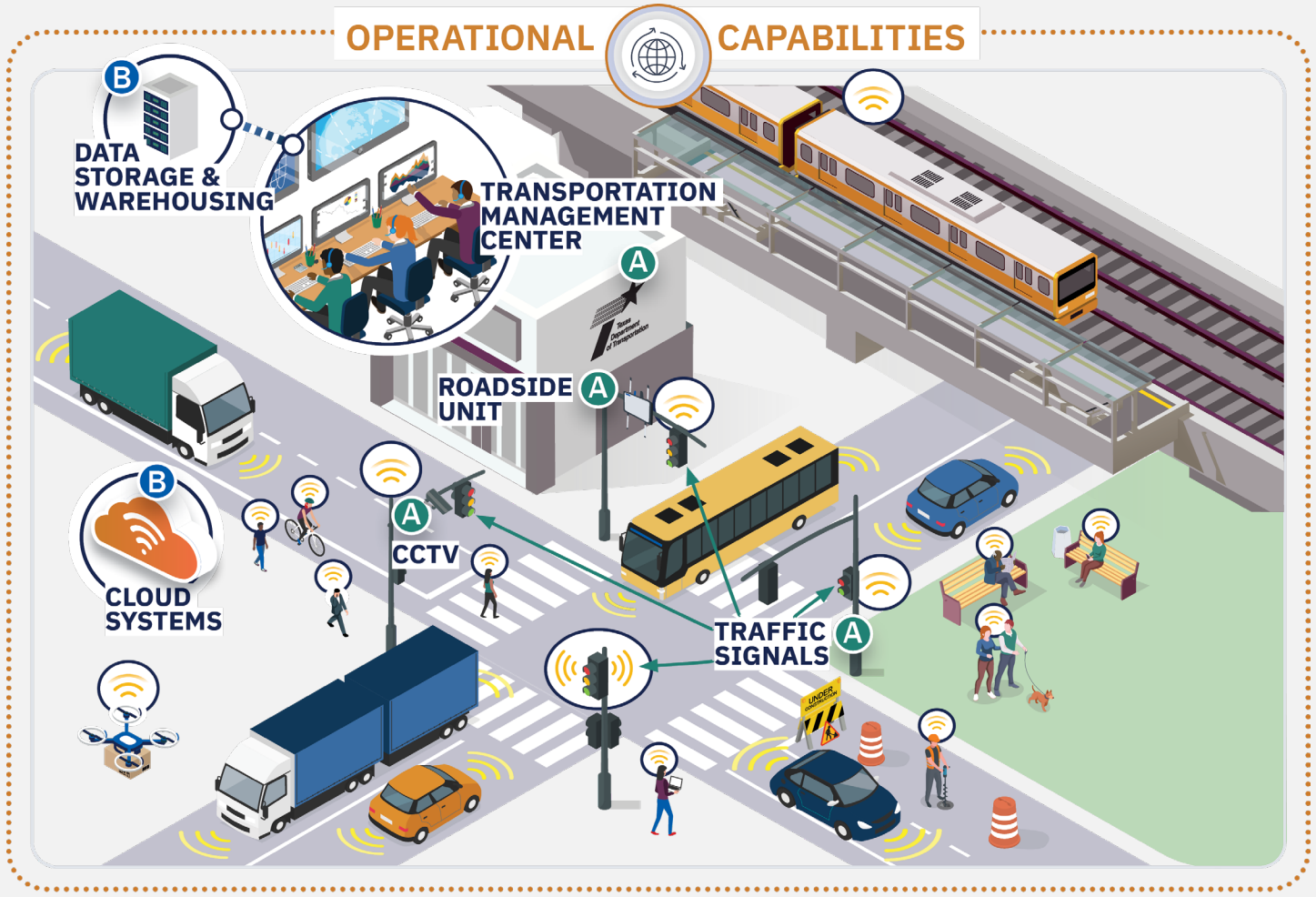
CAT Program and I-45 Innovation Corridor: A Journey of Safety and Innovation

Petikorn Vichitbandha, P.E., RSP1 and Nicole Coronado, P.E.

Texas Department of Transportation

November 25, 2025

What is Cooperative and Automated Transportation (CAT)?



CAT INFRASTRUCTURE EXAMPLES

Physical Infrastructure

- Multimodal infrastructure
- Traffic control devices
- Intelligent Transportation System (ITS) devices
- Traffic management centers
- Connectivity infrastructure

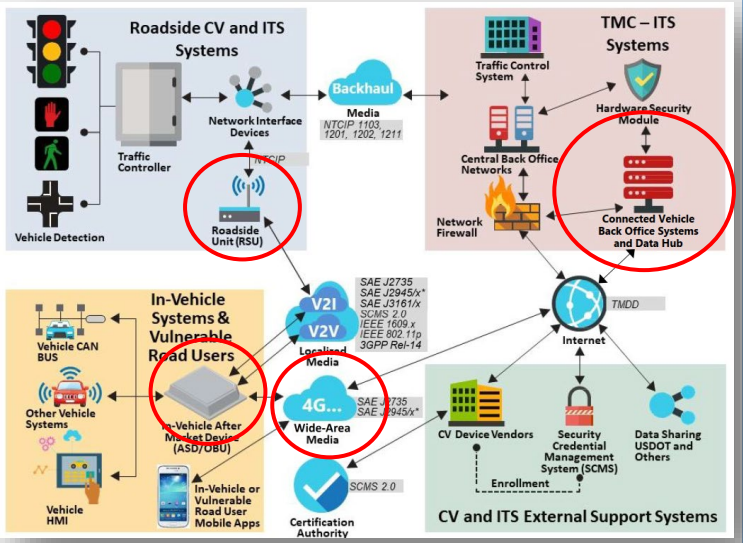
Digital Infrastructure

- Cybersecurity and data privacy
- Digital communication network
- Advanced sensing technologies
- Data management platform
- Edge computing infrastructure
- High accuracy geographic information systems (GIS)

CAT Capability Maturity Model (CMM)

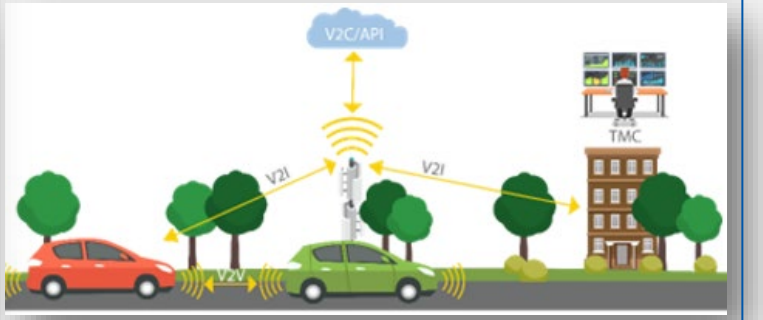
Existing Phase

- Majority of mobility users are not CAT compatible.
- Lack of Direct C-V2X coverage.
- Lack of integration and digitalization.
- Requires human decisions and actions



Growth Phase

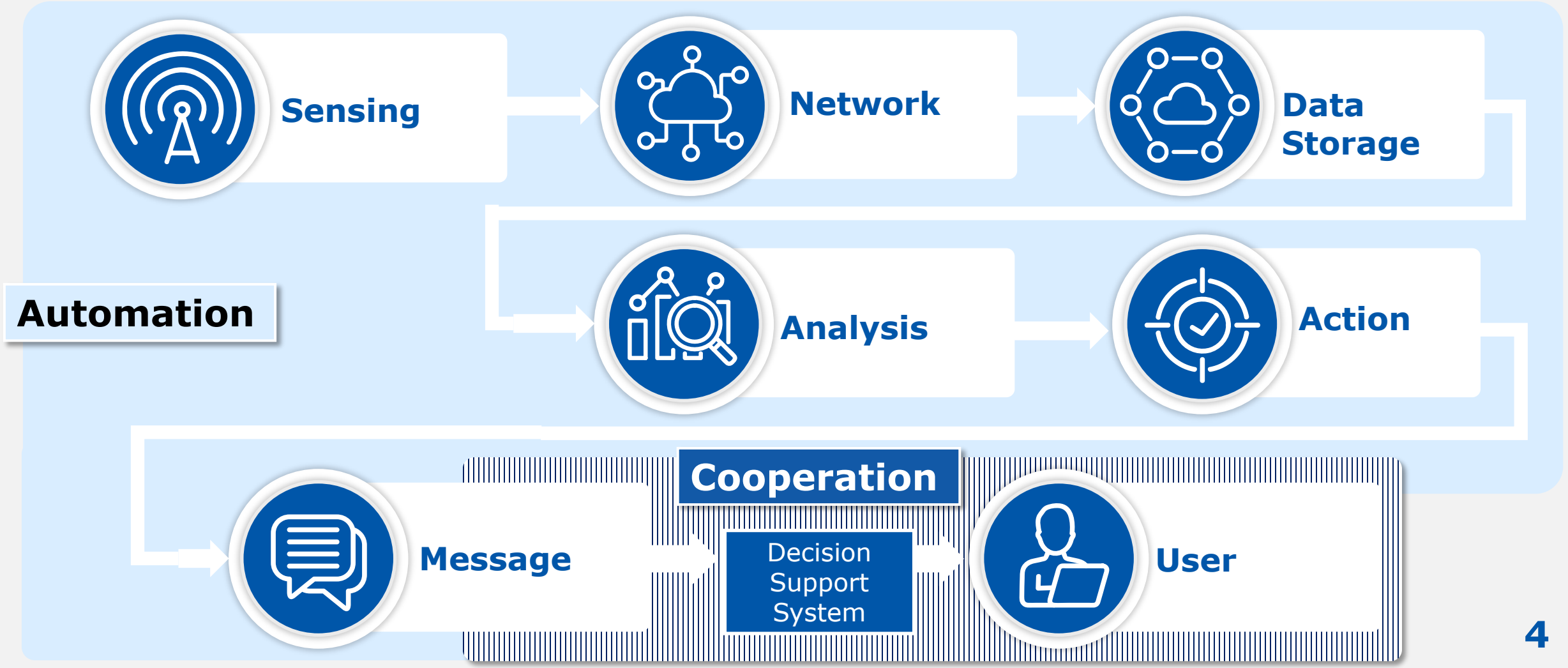
- The road traffic will comprise both CAT technology adopters and traditional mobility users.
- Traditional roadside ITS devices and traffic control devices remain crucial.
- Digital infrastructure will be deployed to enhance operational capabilities.
- Physical infrastructure will expand as new technologies emerge.



Mature Phase

- **Safer**: Eliminate fatalities, serious injuries, and near misses on Texas roadways for all road users.
- **Greener**: Reduce carbon emissions from transportation sources.
- **Accessible**: Provide equal, affordable, convenient access for all travelers to promote economic opportunity.
- **Reliability**: Build a reliable communications system to support CAT operations.
- **Data**: Implement a digital ecosphere to provide the right information, to the right people, at the right time, with the right policies to make the right actionable decisions.

CAT Implementation Workflow

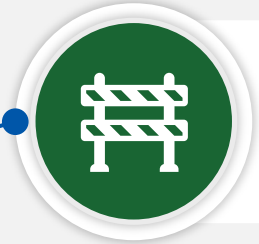


Statewide TSMO Goals

- Safety
- Reliability
- Efficiency
- Customer Service
- Collaboration
- Integration

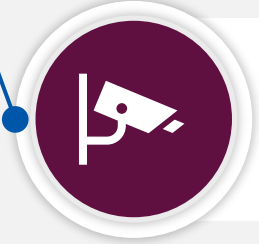
CAT Strategies

Incident Prediction and Management



Work Zone Management

Asset Monitoring and Management



Traffic Management

CAT Applications

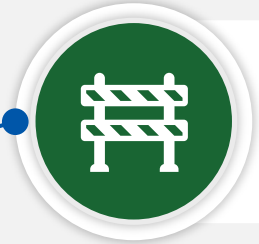
- Wrong-Way Driver Detection System
- Incident Detection and Response
- Flooding Detection and Response
- Connected Work Zone System
- Work Zone Intrusion and Monitoring
- Asset Monitoring and Maintenance
- ITS and Illumination Asset
- Signal Timing Optimization
- Connected Emergency Vehicle Preemption
- Intelligent Traffic Management

Statewide TSMO Goals

- Safety
- Reliability
- Efficiency
- Customer Service
- Collaboration
- Integration

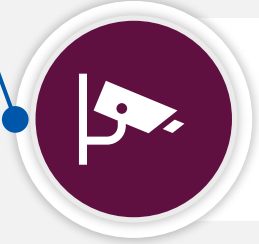
CAT Strategies

Incident Prediction and Management



Work Zone Management

Asset Monitoring and Management



Traffic Management

CAT Applications

- Wrong-Way Driver Detection System
- Incident Detection and Response
- Flooding Detection and Response
- Connected Work Zone System
- Work Zone Intrusion and Monitoring
- Asset Monitoring and Maintenance
- ITS and Illumination Asset
- **Signal Timing Optimization**
- Connected Emergency Vehicle Preemption
- Intelligent Traffic Management

Real-Time and Automated Signal Timing Adjustment System

Sensing

- Collect real-time data using various sensing technologies and sources.
- **Signal Timing Optimization – ITS Signal Detection**

Loop Detector

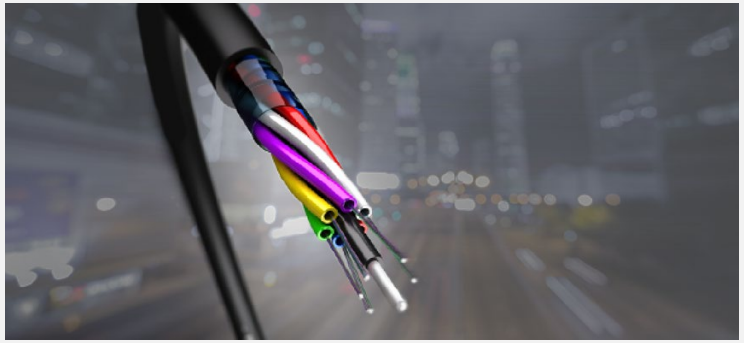
Camera

Real-Time and Automated Signal Timing Adjustment System

Network

- Communication infrastructure used to transmit Data
- **Signal Timing Optimization– Cellular and Fiber**

Cellular Tower



Fiber

Real-Time and Automated Signal Timing Adjustment System

Data Storage

- Where will Data be stored?
- **Signal Timing Optimization– Edge and Cloud**

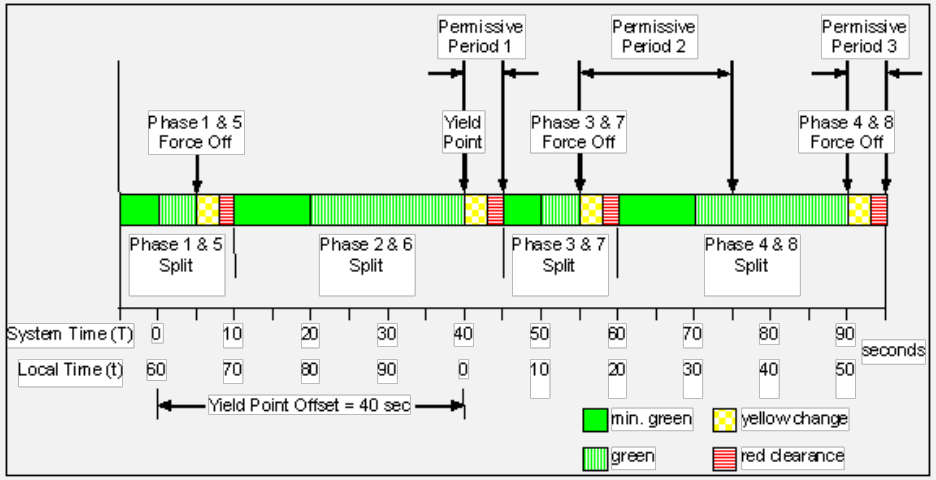
Edge Processing Camera

Cloud

Real-Time and Automated Signal Timing Adjustment System

Analysis

- Processing of collected data to derive insights and make decisions
  - What and Where
- **Signal Timing Optimization – Real Time and Predictive Volume**



Phase Split Diagram

Real-Time and Automated Signal Timing Adjustment System

Action

- Implementation of responses based on the analyzed data.
- **Signal Timing Optimization – Signal Phase and Timing**

Traffic Light

Real-Time and Automated Signal Timing Adjustment System

Message

- Communication of information to stakeholders through various channels.
- **Signal Timing Optimization– ITS Message Device and API**

SPAT on mobile app

Real-Time and Automated Signal Timing Adjustment System

Users

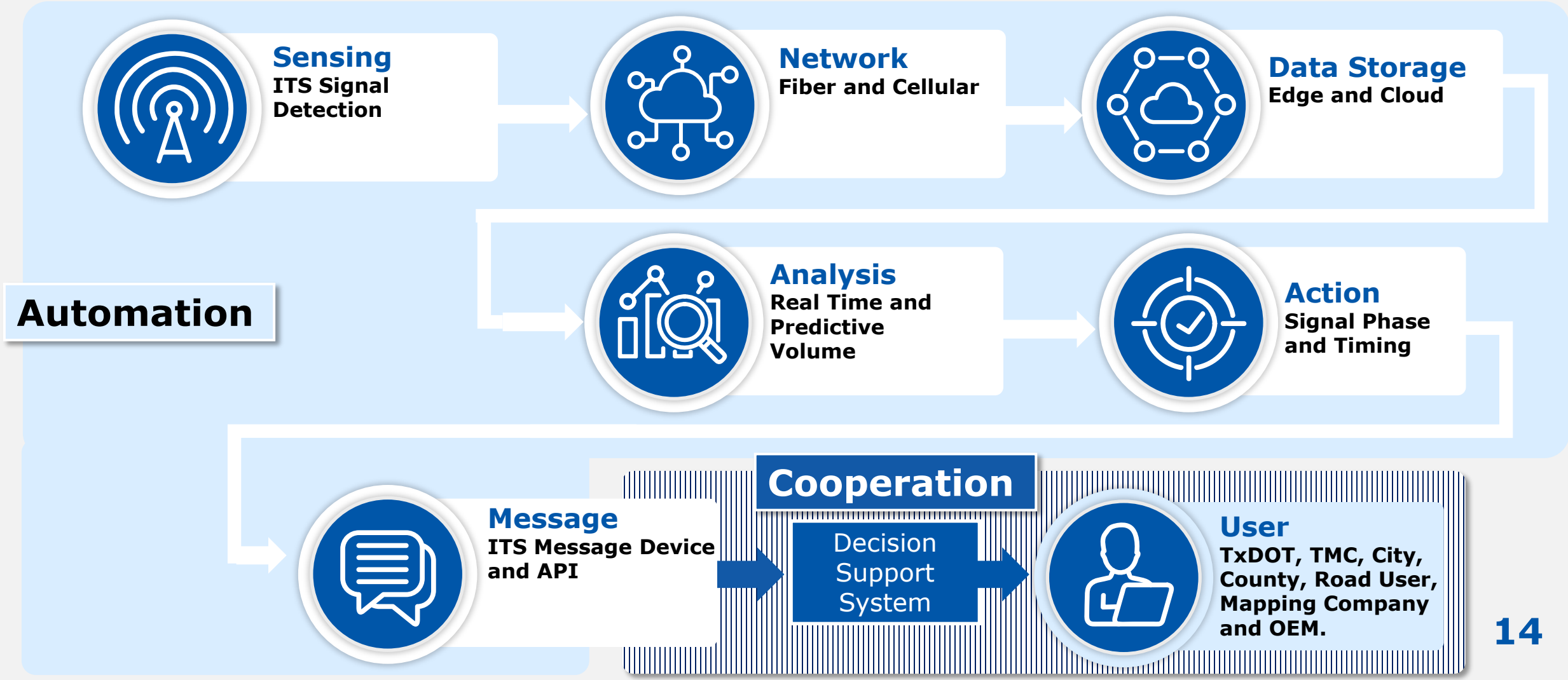
- **TxDOT and Government Partners**: TxDOT offices, local municipalities, MPO, TMC.
- **External User(s):** Road users, third-party mapping companies, and Original Equipment Manufacturers (OEMs).

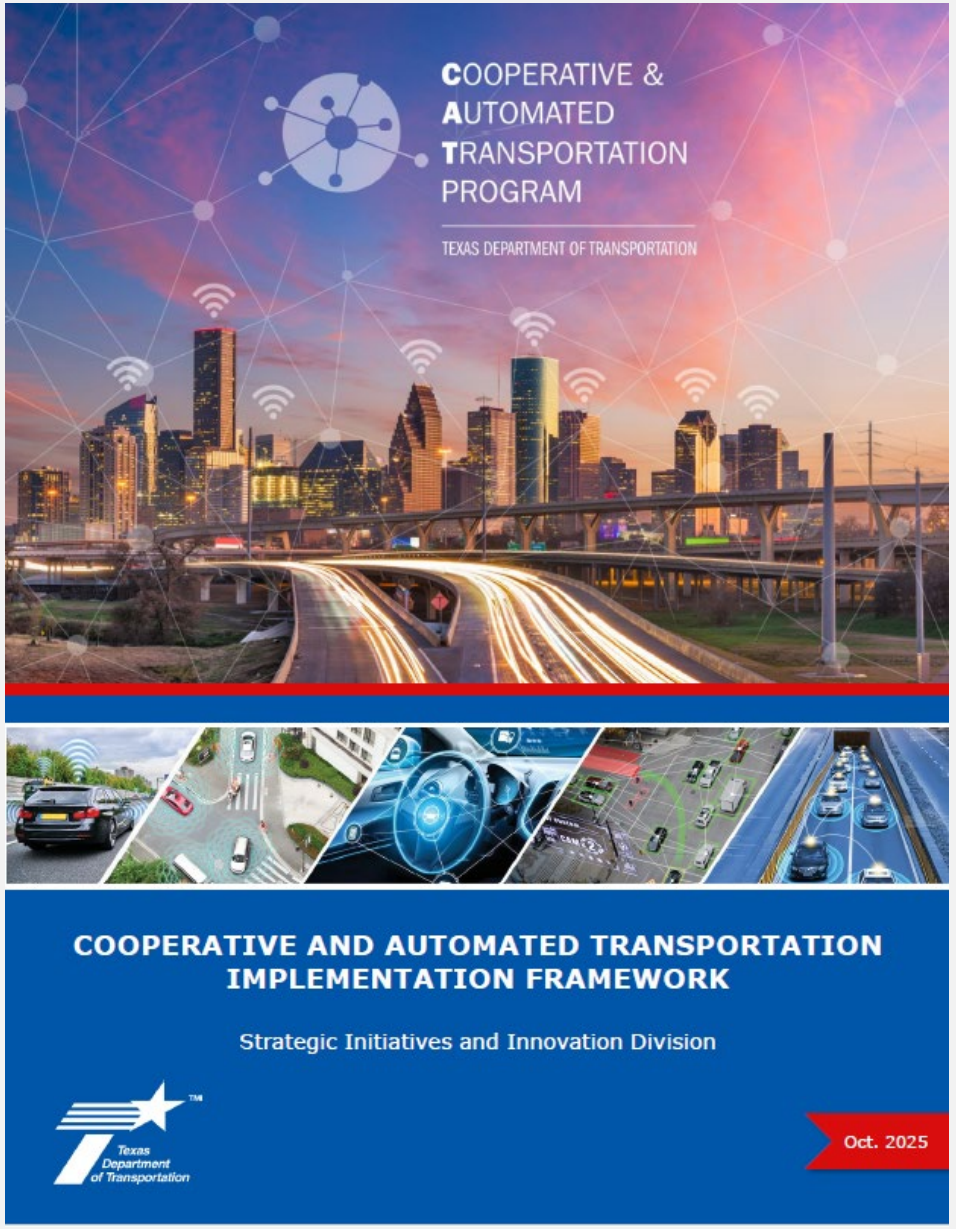
North Central Texas Council of Governments

NCTCOG Logo

Connected Vehicle

Real-Time and Automated Signal Timing Adjustment System

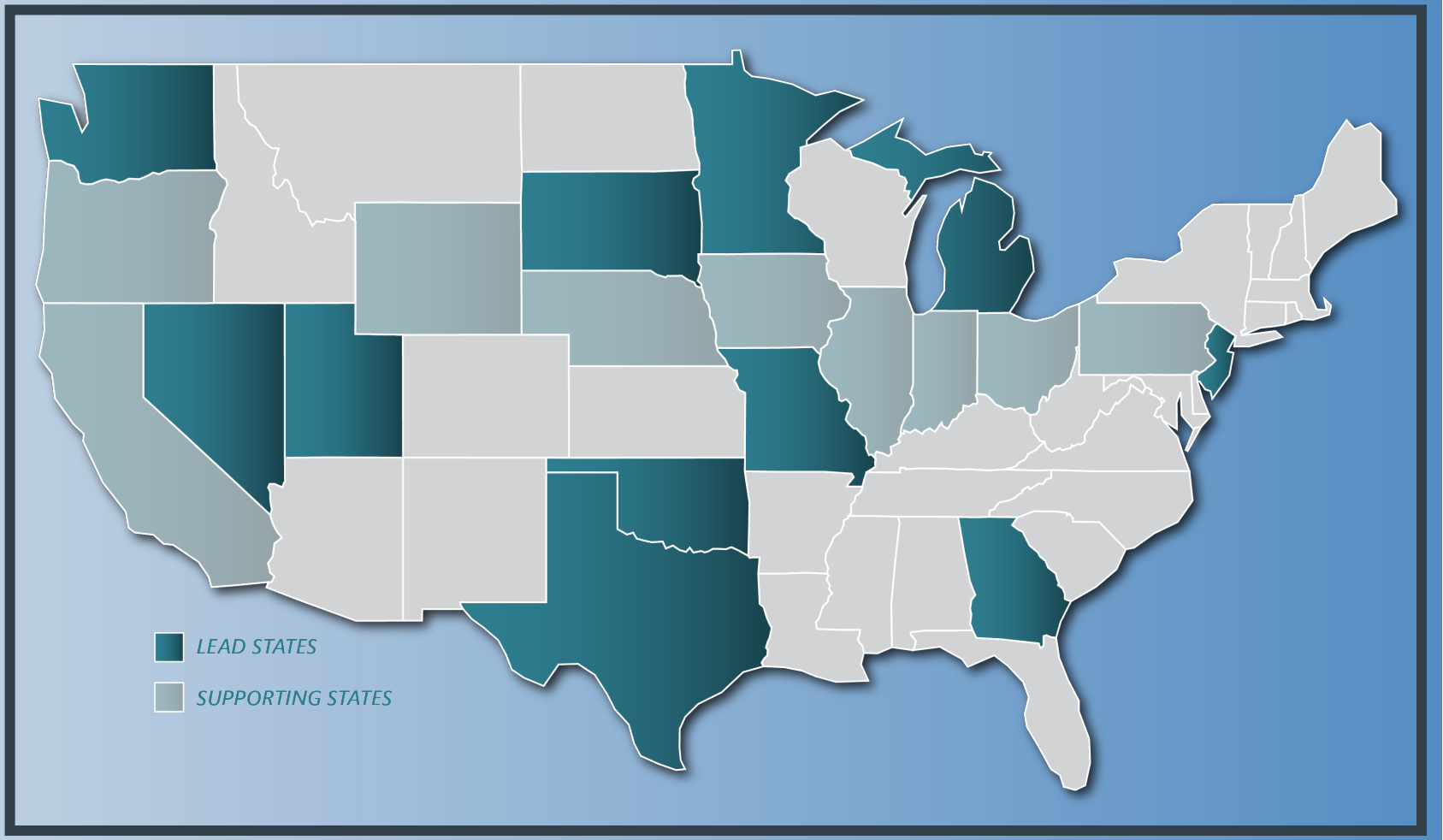



COOPERATIVE &
AUTOMATED
TRANSPORTATION
PROGRAM
TEXAS DEPARTMENT OF TRANSPORTATION
COOPERATIVE AND AUTOMATED TRANSPORTATION
IMPLEMENTATION FRAMEWORK
Strategic Initiatives and Innovation Division
Texas
Department
of Transportation
Oct. 2025

AASHTO Moonshot Project

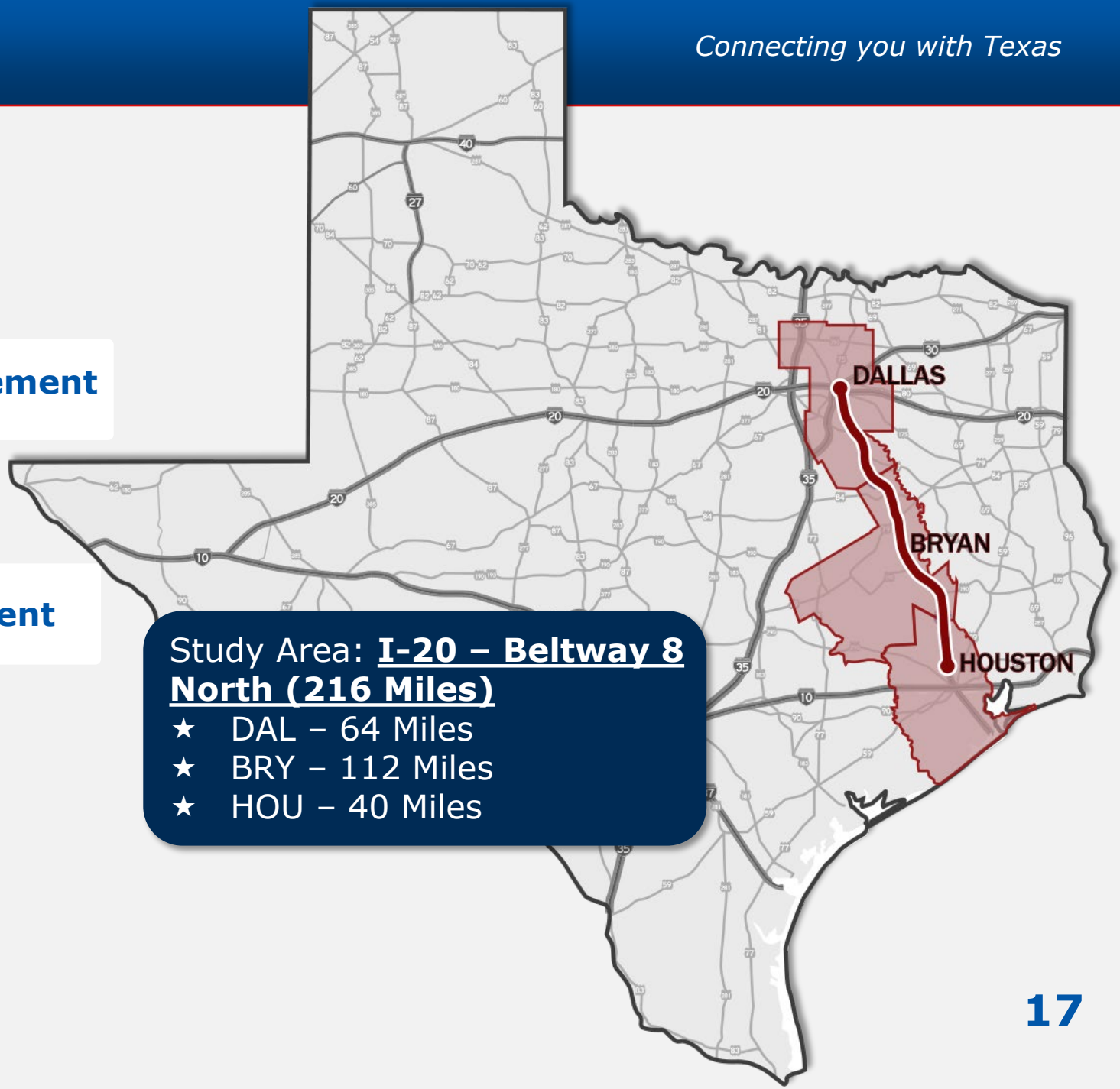
National: An effort to draft a cohesive national transportation vision.

TxDOT: Developing digital infrastructure along I-45 Innovative Corridor.



Project Overview

- **Incident Prediction and Management**
- **Work Zone Management**
- **Asset Monitoring and Management**
- **Traffic Management**



Study Area: **I-20 – Beltway 8 North (216 Miles)**

- ★ DAL – 64 Miles
- ★ BRY – 112 Miles
- ★ HOU – 40 Miles

I 45 ITS Innovative Corridor PS&E

Physical Infrastructure

↓

Analysis Enhancements

↓

Traffic Monitoring Enhancements

Automated Incident Detection CCTV AI Edge Analytic Cameras CAT – Capability Maturity Model

Existing Phase

- Provides video without detection
- Dependent on human detection and actions

Growth Phase

- Human and AI Identification and detection
- Automated processing at the location reducing decision latency
- Human and AI decision making and action

Mature Phase

- Enhancement of :
  - Sensing/ Detection
  - Network
  - Data Storage
  - Analysis
  - Action
- Messaging capabilities to TxDOT and Road Users

Cooperation

Flood Warning System/ High Water Detection
CAT – Capability Maturity Model

Existing Phase

- Unable to integrate and digitalization.
- Physical features
- Completely dependent on human decision and actions

Growth Phase

- Virtual sensors
- Automated actions
  - Flashing Beacons
  - Automated gates
- Automated Messaging

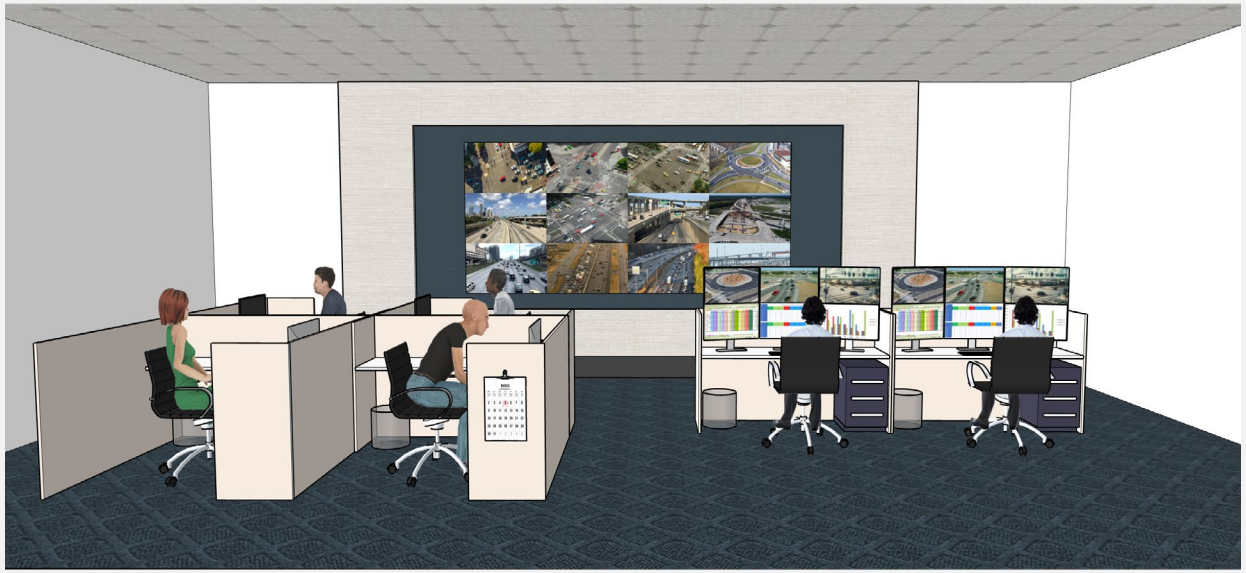
Mature Phase

- Enhancement of :
  - Sensing/ Detection
  - Network
  - Data Storage
  - Analysis
  - Action
- Messaging capabilities to TxDOT and Road Users

Cooperation

Traffic Monitoring Center

- Centralized location for traffic monitoring
- Video Enhancement Functionality:
  - Video sharing
  - Traffic Vision incident detection
- Supports ITS across the district
- Video wall will accommodate TSMO functions



Emerging Technology Assessment Program (ETAP)

TxDOT actively seeks new technologies to advance the state's transportation system and partners with technology-based vendors via ETAP. If your company offers an emerging technology product that meets program requirements, complete the ETAP form:

ETAP Requirements

Is at least a LEVEL SIX on Technology Readiness Level (TRL)

Established at least two years at the time of pilot program start.

Meets TxDOT's Cybersecurity requirement.

FedRAMP or TxRAMP Certified (required for Cloud services).

TxDOT statewide data contract

Unlock digital roadway insights with TxDOT's statewide connected vehicle data contracts.

Services

- Real-time and historic traffic and trip data
- Granular connected vehicle data

Who can access data and data services?

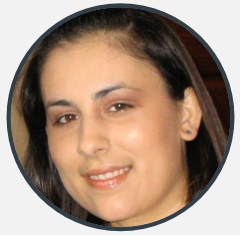
- TxDOT employees
- TxDOT contractors and consultants
- Texas research partners
- Texas public transportation partners (cities, counties, metropolitan planning organizations, and other Texas state agencies and their consultants)

TxDOT statewide data contract

SAFETY FIRST

INNOVATION ALWAYS

Thank you!



Nicole Coronado, P.E.
Transportation Engineer
Nicole.Coronado@txdot.gov

Peter Vichitbandha, P.E., RSP1
Strategic Management Analyst
Petikorn.Vichitbandha@txdot.gov

Brandi Bush, P.E.
Strategic Initiatives Section Director
Brandi.Bush@txdot.gov

Charles Tapp, P.E.
Strategic Management Analyst
Charles.Tapp@txdot.gov