Future of Smart Mobility: Emerging Technology

TxDOT Austin District

Miguel "Mike" Arellano - Deputy District Engineer

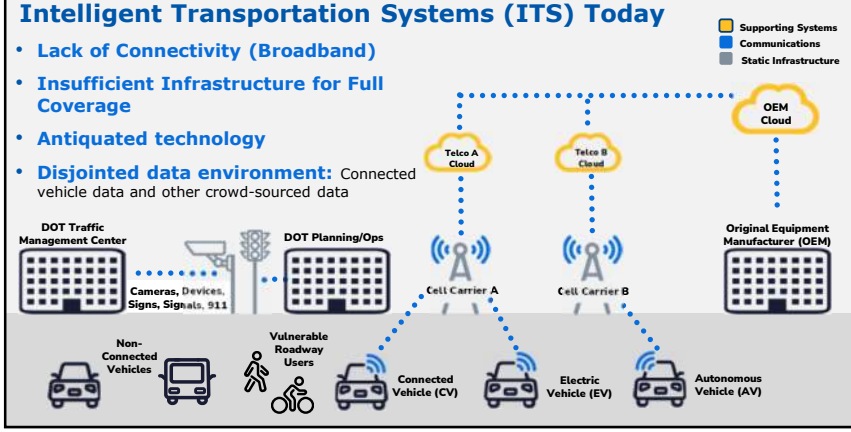
April 24, 2026

1

Texas Department of Transportation — Connecting you with Texas.

Intelligent Transportation Systems (ITS) Today

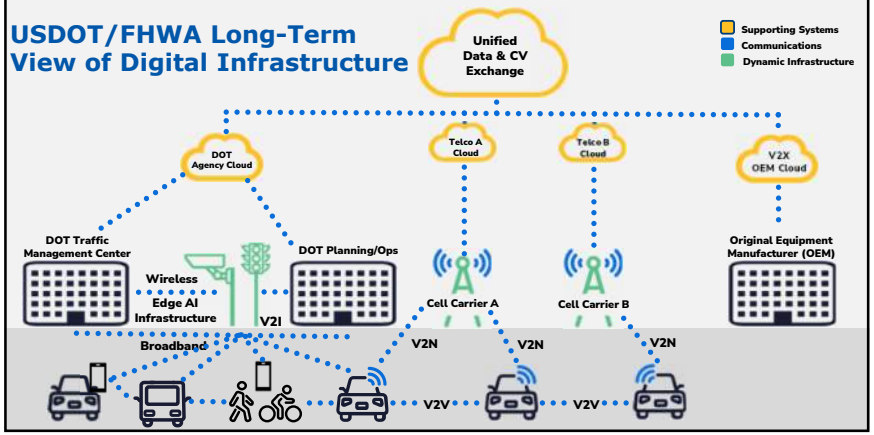
- **Lack of Connectivity (Broadband)**
- **Insufficient Infrastructure for Full Coverage**
- **Antiquated technology**
- **Disjointed data environment:** Connected vehicle data and other crowd-sourced data



2

Texas Department of Transportation — Connecting you with Texas.

USDOT/FHWA Long-Term View of Digital Infrastructure



3

Texas Department of Transportation — Connecting you with Texas.

Emerging Transportation Technology

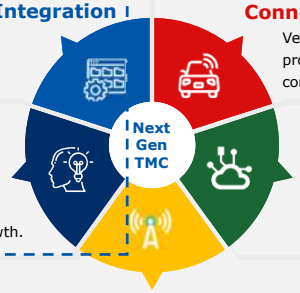
Key technological advancements are driving the emergence of next-generation traffic management centers.

Data Management & Integration

Supports the growth of data volume and variety without sacrificing performance.

AI & ML

Transform data into actional insights, increasing scope, improving efficiency and supporting step function growth.



Connected Vehicle Technology

Vehicles act as moving sensors, providing direct data feeds about road conditions, traffic density, and incidents.

Edge Computing

Distributed processing workloads, improving accuracy and efficiency, conserving bandwidth and cost.

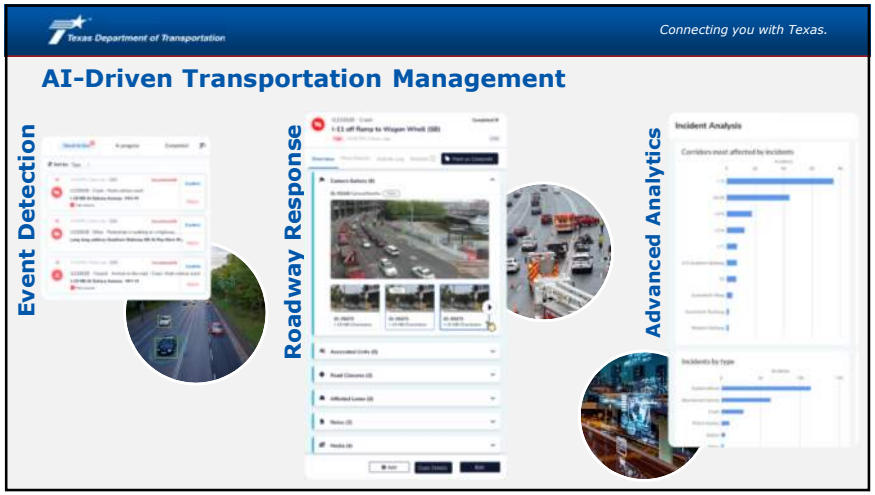
Advanced Communication Networks

Essential for scaling deployments, it ensures reliable and consistent communication with low latency and high granularity

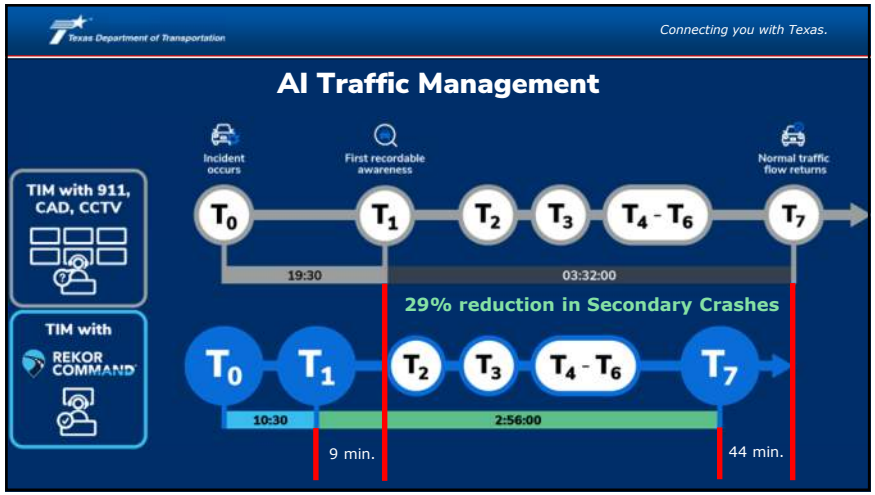
4


Texas Department of Transportation
Connecting you with Texas.
Local Assets
TIMS
HERO
TxDOT Assets
TMC
3rd Party Data
Public Users
waze

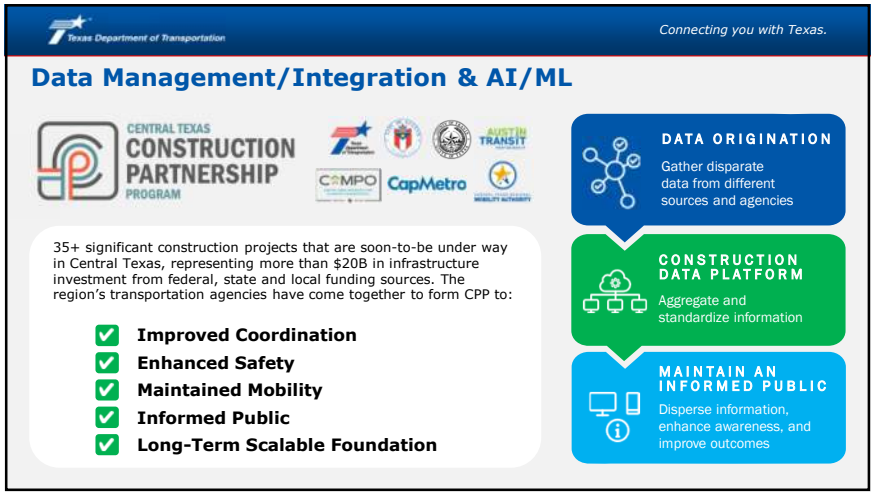
5


Texas Department of Transportation
Connecting you with Texas.
AI-Driven Transportation Management
Event Detection
Roadway Response
Advanced Analytics

6


Texas Department of Transportation
Connecting you with Texas.
AI Traffic Management
Incident occurs
First recordable awareness
Normal traffic flow returns
TIM with 911, CAD, CCTV
TIM with REKOR COMMAND
T0
T1
T2
T3
T4 - T6
T7
19:30
03:32:00
29% reduction in Secondary Crashes
10:30
2:56:00
9 min.
44 min.

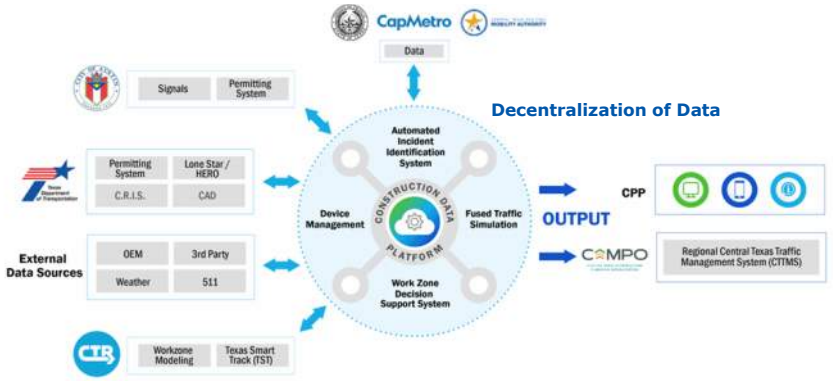
7


Texas Department of Transportation
Connecting you with Texas.
Data Management/Integration & AI/ML
CENTRAL TEXAS CONSTRUCTION PARTNERSHIP PROGRAM
CAMPO
CapMetro
AUSTIN TRANSIT
35+ significant construction projects that are soon-to-be under way in Central Texas, representing more than $20B in infrastructure investment from federal, state and local funding sources. The region's transportation agencies have come together to form CPP to:
Improved Coordination
Enhanced Safety
Maintained Mobility
Informed Public
Long-Term Scalable Foundation
DATA ORIGINATION
Gather disparate data from different sources and agencies
CONSTRUCTION DATA PLATFORM
Aggregate and standardize information
MAINTAIN AN INFORMED PUBLIC
Disperse information, enhance awareness, and improve outcomes

8

Texas Department of Transportation — Connecting you with Texas.

Regional Traffic Management Powered by AI and ML



9

Texas Department of Transportation — Connecting you with Texas.

Data Management/Integration & AI/ML

Designed to provide scheduled and real-time information to best serve the traveling public, elected officials, and construction workers.

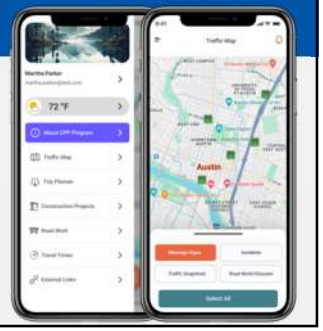
REAL-TIME INFO
- Traffic Map
- Trip Planner
- Road Work
- Incidents
- Travel Times

USER EXPERIENCE
- Personalization of Construction Alerts
- Data integrations with agency systems (i.e. Report an Issue)

PRIVACY & SECURITY
- Security by Design
- Data Protection

ACCESSIBILITY
- Customizable Settings
- English/Spanish Language
- ADA Compliant

A COMPANION APP TO TRADITIONAL JOURNEY PLANNING TOOLS



10

Texas Department of Transportation — Connecting you with Texas.

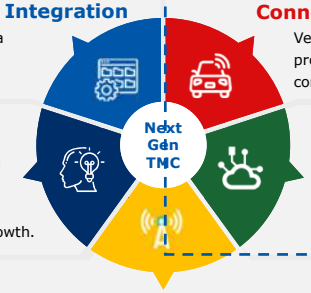
Emerging Technology

Key technological advancements are driving the emergence of next-generation traffic management centers.

Data Management & Integration
Supports the growth of data volume and variety without sacrificing performance.

Connected Vehicle Technology
Vehicles act as moving sensors, providing direct data feeds about road conditions, traffic density, and incidents.

AI & ML
Transform data into actional insights, increasing scope, improving efficiency and supporting step function growth.



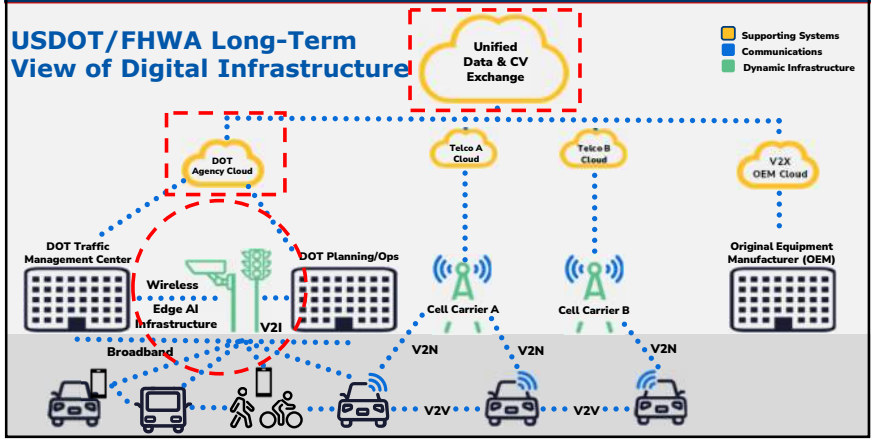
Edge Computing
Collects and analyzing roadside conditions to provide road users and operators real-time information and suggested action.

Advanced Communication Networks
Essential for scaling deployments, it ensures reliable and consistent communication with low latency and high granularity

11

Texas Department of Transportation — Connecting you with Texas.

USDOT/FHWA Long-Term View of Digital Infrastructure

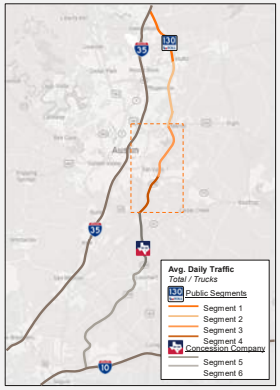


12

Texas Department of Transportation — Connecting you with Texas.

SH 130 Smart Corridor Project

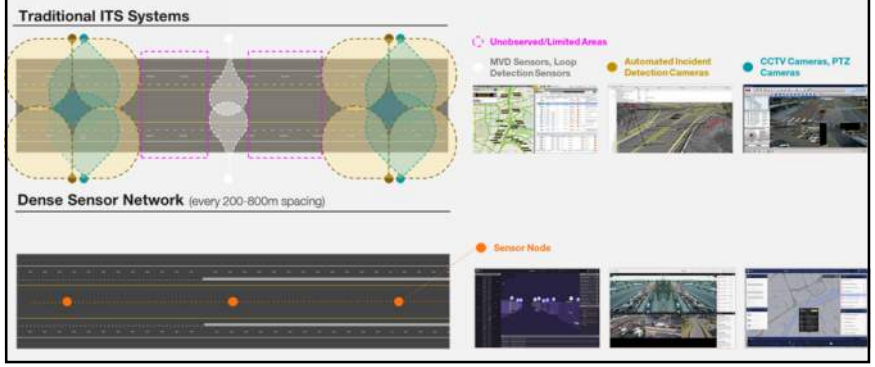
- Project Description: First, turnkey Smart Corridor Project
- Alternative Delivery: Design-Build with Performance-Based O&M
  - Technology as a Service
  - Commercial Monetization Opportunities
- Initial Deployment:
  - 4-mile segment
  - Construction – November 2025
  - Operational – February 2026



13

Texas Department of Transportation — Connecting you with Texas.

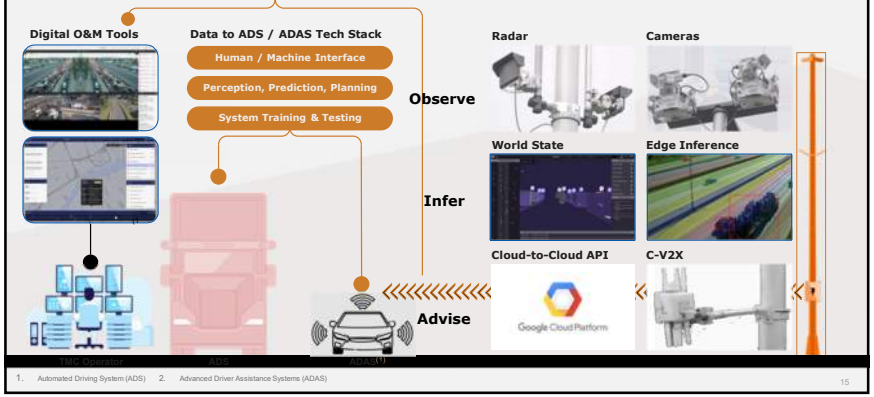
ITS Digital Infrastructure Today vs Future



14

Texas Department of Transportation — Connecting you with Texas.

CAV & Edge Computing Technology – SH 130 Smart Corridor



15

Texas Department of Transportation — Connecting you with Texas.

Emerging Technology

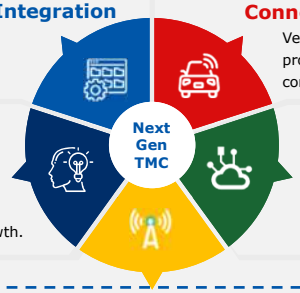
Key technological advancements are driving the emergence of next-generation traffic management centers.

Data Management & Integration

Supports the growth of data volume and variety without sacrificing performance.

Connected Vehicle Technology

Vehicles act as moving sensors, providing direct data feeds about road conditions, traffic density, and incidents.



AI & ML

Transform data into actional insights, increasing scope, improving efficiency and supporting step function growth.

Edge Computing

Collects and analyzing roadside conditions to provide road users and operators real-time information and suggested action.

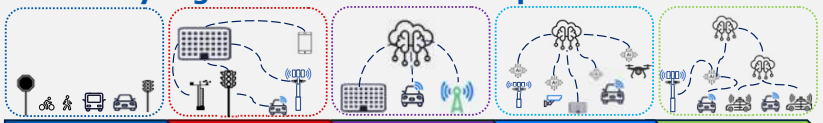
Advanced Communication Networks

Essential for scaling deployments, it ensures reliable and consistent communication with low latency and high granularity

16

Texas Department of Transportation — Connecting you with Texas.

Roadway Digital Infrastructure Implementation Levels



Gen 1	Gen 2	Gen 3	Gen 4	Gen 5
• **Characteristics**: Roads **with no intelligent** infrastructure. • **Infrastructure**: May include traditional traffic operation components such as traffic signals and detectors. •**Capabilities**: Basic feedback loops at the roadway level, utilizing detectors and responses from a traffic operations perspective. • **Data**: **No real-time data being collected or used.**	• **Characteristics**: **Roads with some ITS generating data** being utilized for various applications with significant latency. • **Infrastructure**: **ITS infrastructure**, including dynamic messaging signs, CCTV and speed detection. •**Capabilities**: **Data latency of 10 to 30 minutes.** •**Data**: Utilizes 3rd party data for origin-destination information and traffic management updates. Agencies can update ITS infrastructure and manage traffic systems accordingly, but the **data is slow and unsuitable for real-time responses.**	• **Characteristics**: **Roads integrating real-time data** from vehicles, 3rd party data and ITS. • **Infrastructure**: **Roadside equipped to act as virtual sensors**, enabling connectivity that supports early-stage autonomous functions. • **Capabilities**: **30 second latency data for real-time awareness of incidents, work zones, and disruptions, crossing jurisdictional boundaries.** • **Data**: **Vehicles generated data** contributes as virtual sensors, providing timely and relevant information.	• **Characteristics**: Roads with very low latency, supporting high levels of connectivity **fusion of edge AI and cloud AI.** • **Infrastructure**: **Incorporates equipment such as V2X, ITS with compute ability** and other connected vehicle technologies. • **Capabilities**: **Latency low enough to send alerts for human reaction, though not fully autonomous.** • **Data**: **Low latency data environment from AI/ML** to support more immediate responses and higher-equipped vehicles, enhancing safety and efficiency.	• **Characteristics**: Roads with the **highest level of digital infrastructure, supporting full autonomy using AI/ML.** • **Infrastructure**: **Fully integrated systems similar to Operational Design Domain** • **Capabilities**: **Real-time, seamless connectivity and advanced data analytics.** Supports autonomous vehicles and fully integrated transportation systems. • **Data**: **Provides the lowest latency and most comprehensive data integration,** setting the stage for the future of roadway infrastructure.

17

Texas Department of Transportation — Connecting you with Texas.

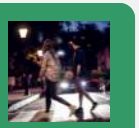
Transportation Technology - Potential Societal Benefits

Improved Safety:
AI –Driven Systems and Smart Roadways

Reduced Congestion:
Optimized Traffic and Vehicle Operations

Economic Efficiency:
Reduced User Costs & Logistics Efficiency

Enhanced Accessibility:
Integrated Mobility and Autonomous On-demand Transport



Ecological Sustainability:
Eco-Driving and Facilitating EV Deployment

18

Texas Department of Transportation — Connecting you with Texas.

Fatal Crashes and Causation

4,134
2024 Texas Fatalities

316
2024 Central Texas Fatalities

94%*
of all motor-vehicle crashes are attributed to **driver error**

*According to the National Highway Traffic Safety Administration's (NHTSA) National Motor Vehicle Crash Causation Survey (NMVCCS)

19

Texas Department of Transportation — Connecting you with Texas.

Cost of Fatal Crashes

$340B **National Cost of Car Crashes**

$1.37T **Additional total crash cost in the US** when crashes result in fatalities or severe injuries

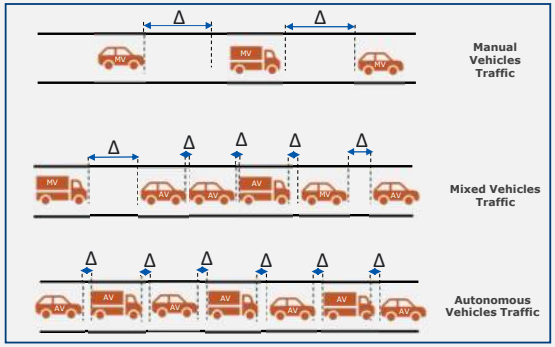
Congestion Costs

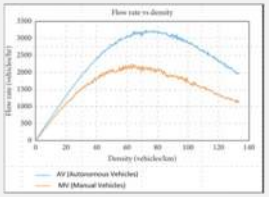
$13.3B **2020 State of Texas** Delay and Wasted Fuel Cost

20

Texas Department of Transportation — Connecting you with Texas.

Autonomy Benefits for Mobility and Economic Growth





- **Safety – Coordinated Driving**
- **Optimized Capacity**
- **Reduce Congestion**
- **Reduce Travel Time**
- **Promote Economic growth**
- **Reduce Emissions**

21

Texas Department of Transportation — Connecting you with Texas.

Transportation Technology - Potential Impacts & Challenges

Privacy & Data Security:

Data-Rich Environment and Cyber Threats

System Reliability & Safety Risk:

Mixed Traffic Use and Overreliance on Technology

Adoption Gap & Future Proofing:

Increased Capital Costs, Disparate Technology Adoption & Rapid Evolution

Ethical & Legal Challenges:

Decision Making, Governance, Standards

Job Displacement:

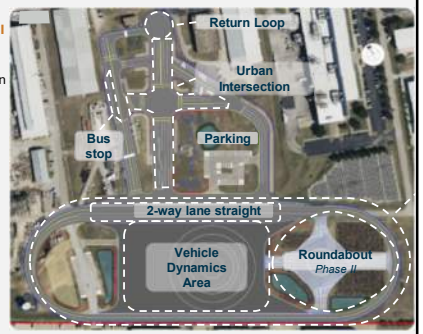
Changes in the Labor Market, Automation & New Logistics/ Skil

22

Texas Department of Transportation — Connecting you with Texas.

Texas SMARTTrack
Safety Mobility Autonomy Research and Testing Track

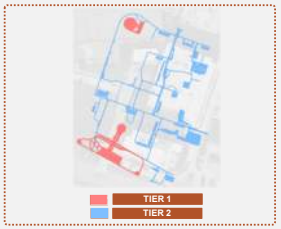
- **Testing and Certification of Smart Mobility Technology**
  - Create and approve **safe, cybersecurity-focused operational standards** for next-generation data or roadside technologies.
  - **Assess the effects of technology interruptions** (CAV, EV) on infrastructure and traffic operation
  - **Future Proofing:** Track technological advancements and their effects on systems.
  - Inform new **legislation** related to future advanced operations
- **Alternative Delivery of Technology**
  - **Technology as Service:** Design Build/Performance-Based Services
  - Cost recovery ~ **Monetization/Cost Sharing Models**
- **Workforce Development: Train new labor force** to address advanced transportation systems



23

Texas Department of Transportation — Connecting you with Texas.

TEXAS SMARTTrack consists of 3 tiers, featuring closed & open testbeds designed for executing testing scenarios & collecting data to substantiate future mobility topics



TIER 1	TIER 2	TIER 1 + TIER 2 inside Pickle Research Campus	TIER 3 - Public test network along city of Austin
Closed Testbed	Open test network under special control / beta-testing	The Pickle Research Campus will be transformed into a complex testbed with open and closed test section for improving and validate future mobility topics	Public Road test network along several existing highway roads in the region of north Austin. These roads will be the primarily data source to gain real world traffic data which will be the basis for implementing relevant testing data into the SmartTrack testing facility

Main Focus Areas:

- **Operating standards / strategies**: connect producers and consumers of information
- **Testing standards**: evaluate efficacy of technologies
- **Pilot deployment**: demonstrate scalability and value

24

Keys to Future Smart Mobility

- **Connectivity**
  - Infrastructure investment in advance network communications (fiber, 5G)
- **Regional Collaboration**
  - Data Governance – decentralized data
  - Standards for efficient data sharing, integration, adoption and management
- **Strategic Partnerships**
  - Everyone should do what they do well and strategically partner with others

25

April 24, 2026

Q&A Discussion

Miguel "Mike" Arellano
Deputy District Engineer
TxDOT-AUS
(512) 832-7040
Miguel.Arellano@txdot.gov

TxDOT Austin District Headquarters | 7901 N. IH35, Austin, TX 78753

26

Data Management/Integration & AI/ML

- Due to limited coverage of conventional ITS and dependence on computer-aided dispatch (CAD), current detection capabilities may be unreliable or inefficient.
- Efficient collaboration saves time, money, and resources and results in more transparency, safer roads, reduced congestion, and more reliable travel times
- Improved detection of AI/ML versus conventional CAD systems

Impact Metrics	• Added incidents percentage by Rekor over CAD – **159%** • Added crashes percentage by Rekor over CAD – **33%** • **44 minutes** (avg) faster return to normal traffic operations • **29% reduction** in a secondary crash
Verified Incident Detection	• All Incidents Detected: **5124** • Total Crash-Only Detected: **2063** • All Verified **Unique** Incidents (over CAD): **2558** • Total Verified **Unique** Crash-Only (over CAD) Detected: **409**
Incident Precision	• % Total (Crash & Non-Crash Matches) with CAD: **83%** • % Crash-Only Matches with CAD: **94%**
Speed of Detection (Rekor vs. CAD)	• Total Matches with CAD: **2001** • Percentage Faster than CAD: **34%** • Rekor Outperforms CAD by a Median Time: **8.4 minutes**

27

Mission, Vision, Values & Priorities of TxDOT

- **Vision:** A **forward-thinking** leader delivering mobility, enabling economic opportunity, and enhancing quality of life for all Texans.
- **Values:** **People,** Accountability, Trust, and Honesty
- **Priorities**
  - **Safety:** Design, build, operate, and maintain our transportation system with **safety as our #1 priority**
  - **Delivery:** Responsible program execution throughout the transportation life cycle (planning, design, construction, maintenance, and operations)
  - **Innovation:** ***Forward-thinking, technology-focused, fostering a culture of continuous improvement***
  - **Stewardship:** Professional, responsible stewards of resources

28