



From Asphalt to Algorithms Bridging Physical and Digital Infrastructure for Tomorrow's Transportation

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Messaging – The Early Era (1970-1990)

- Newspapers
- Highway Advisory Radio (HAR)
- Static signs
- Portable Changeable Message Signs (PCMS)



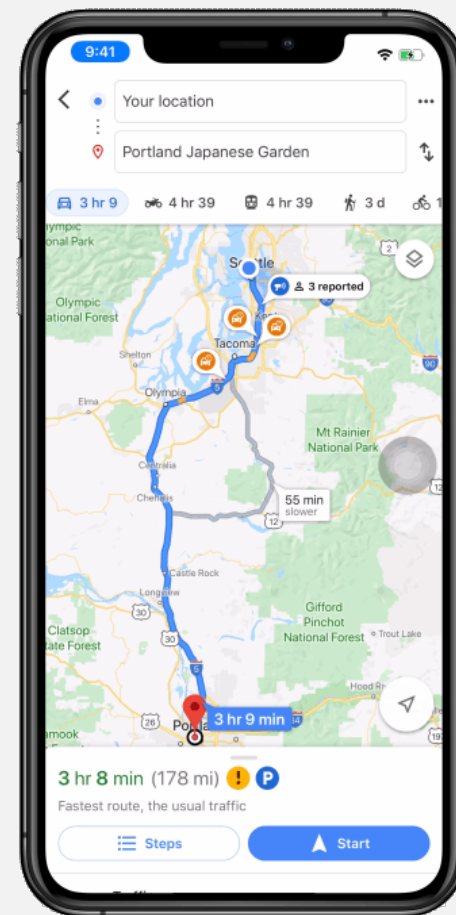
The ITS Era (1990's – 2000's)

- Dynamic Message Signs (DMS)
- Manual on Uniform Traffic Control Devices (MUTCD)
- Traveler Information 511
- Growing list of Safety Messages beside congestion



The Digital Integration Era (2010's)

- Apps, websites, and social media
- Automated Messaging
- Human factors research
- Message prioritization policies

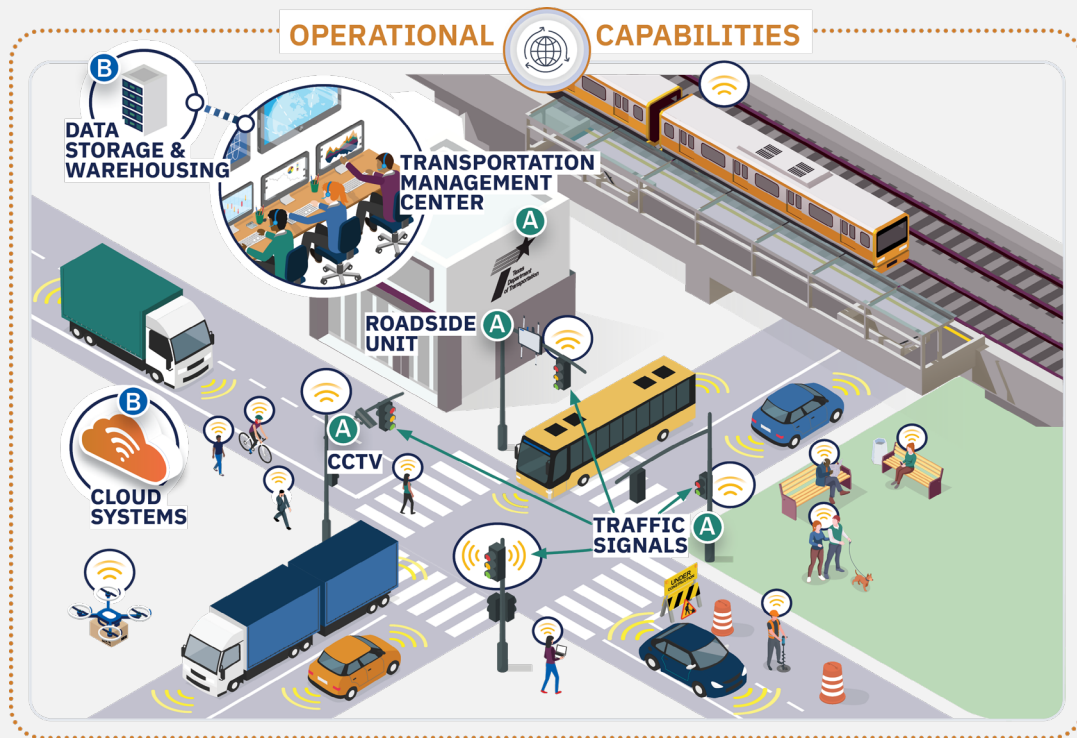


The Era of Connected & Coordinated Messaging (2020's)

- Advanced Traffic Management Systems (ATMS)
- Performance management
- V2X (Vehicle to Everything)
- Personalized or context-aware messages for connected vehicles.



What is Cooperative and Automated Transportation (CAT) Infrastructure?



CAT INFRASTRUCTURE EXAMPLES

Physical Infrastructure

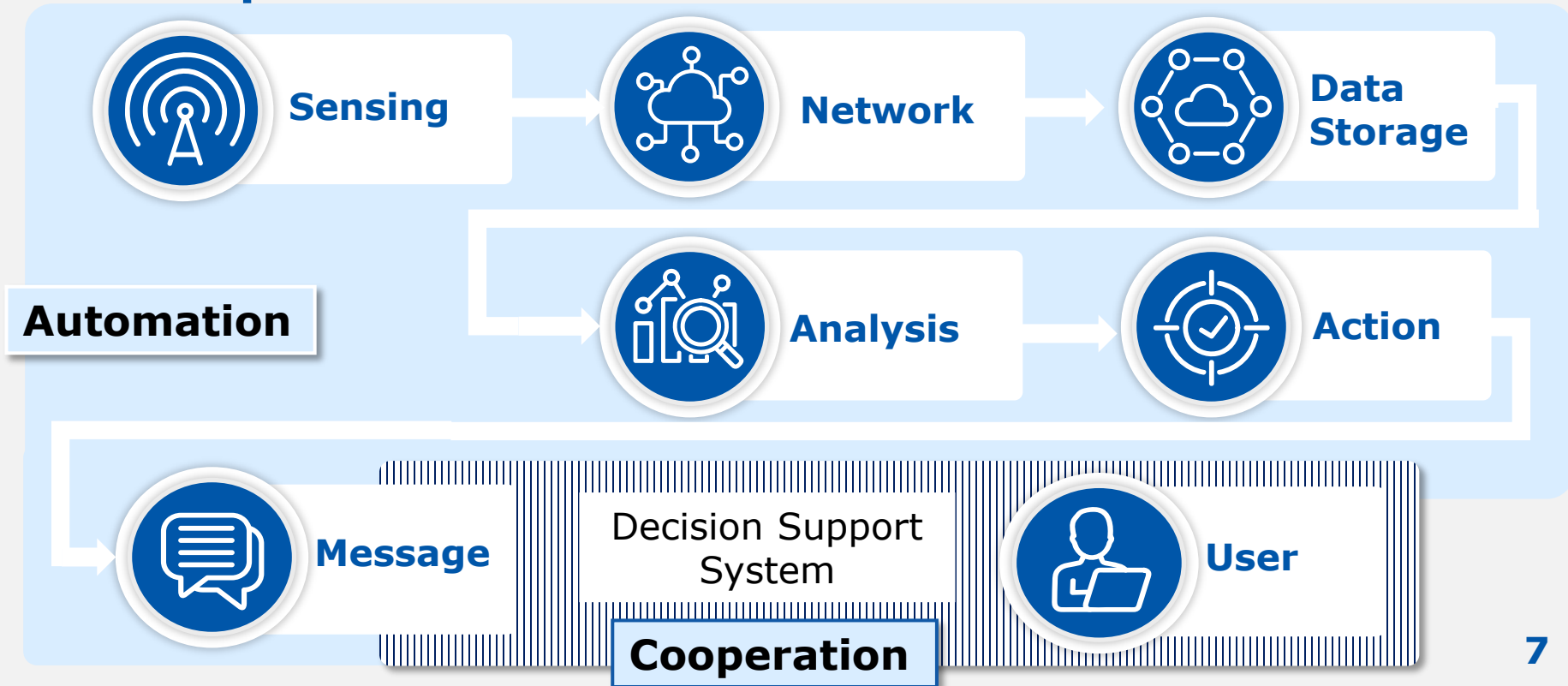
- Multimodal infrastructure
- Traffic control devices
- Intelligent Transportation System (ITS) devices
- Traffic management centers
- Connectivity infrastructure

Digital Infrastructure

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

LEGEND:  Physical Infrastructure  Digital Infrastructure

CAT Implementation Workflow



Statewide Priorities

- Safety
- Delivery
- Innovation
- Stewardship

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

Physical Assets

Digital Assets

Signal Timing Optimization

Connected Emergency Vehicle Preemption

Intelligent Traffic Management

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CAT Strategies



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Intelligent Traffic Management

Texas Strategic Highway Safety Plan



**Distracted
Driving**



**Impaired
Driving**



**Intersection
Safety**



**Occupant
Protection**



Post Crash Care



**Roadway and
Lane
Departures**

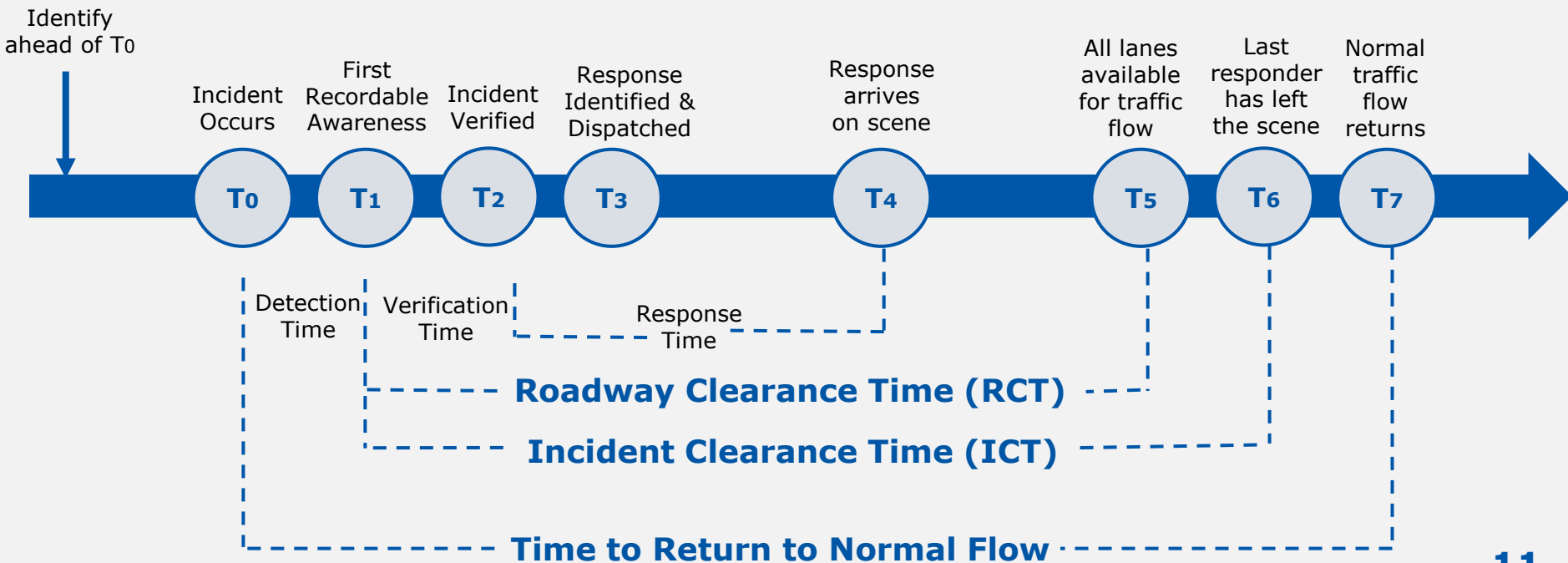


Speed Related

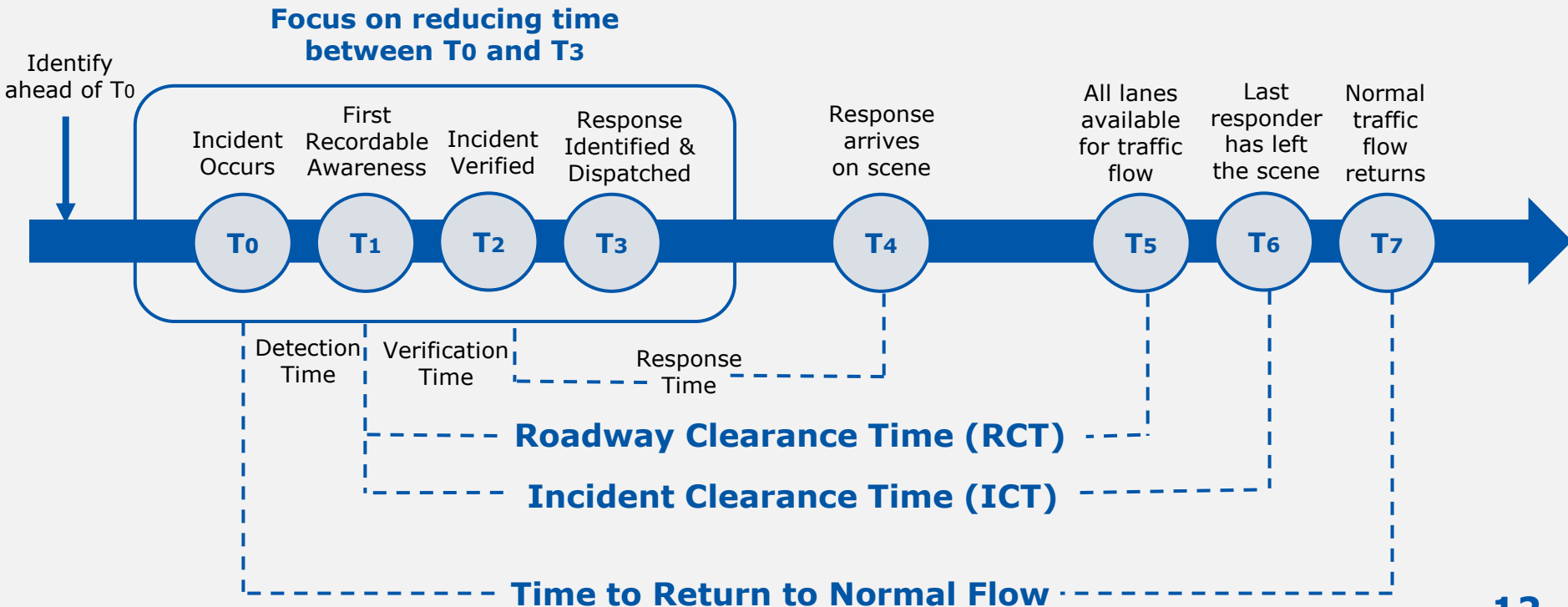


**Vulnerable
Road Users**

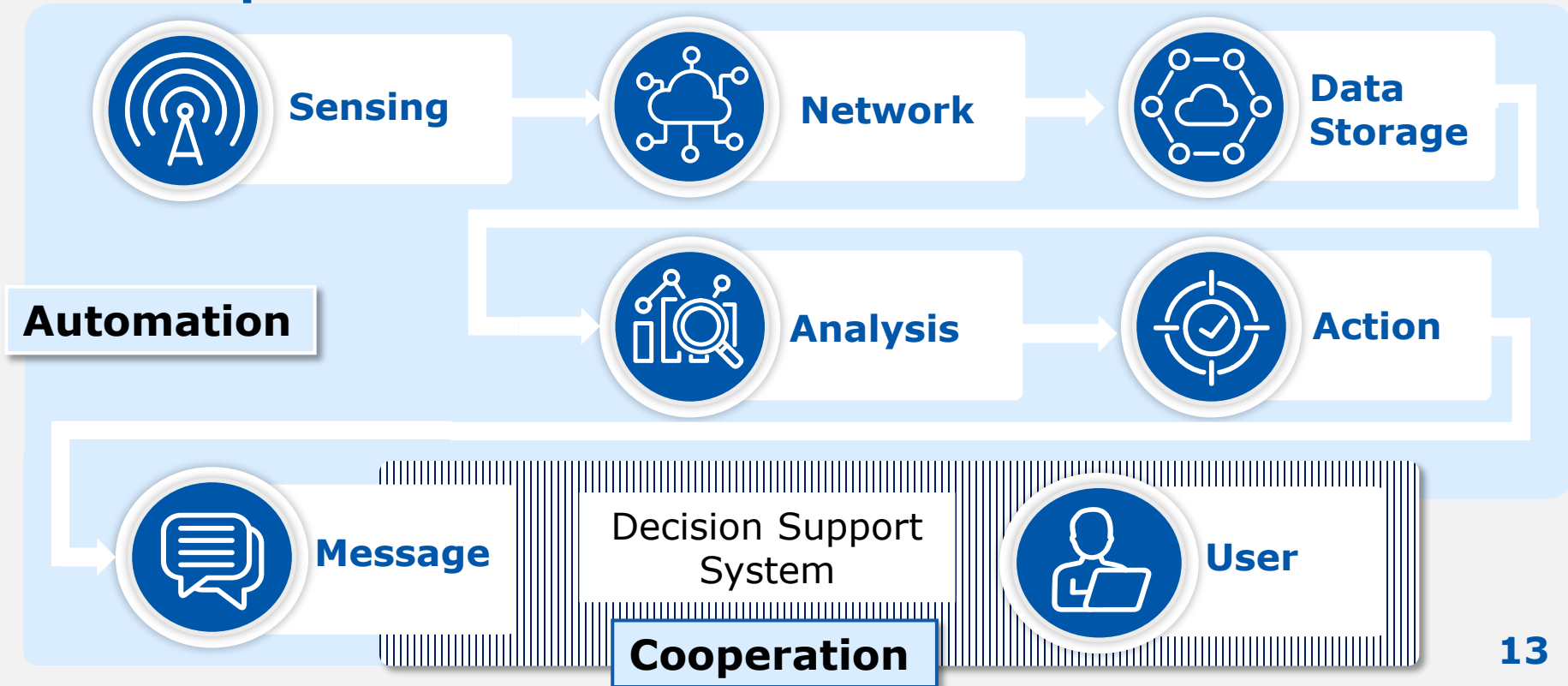
Traffic Incident Management Timeline



Future Traffic Incident Management Timeline



CAT Implementation Workflow



Automated Incident Detection and Response System



Sensing

- Collect real-time data using various sensing technologies and sources.
- **ITS Roadway Sensors**



Camera

Automated Incident Detection and Response System

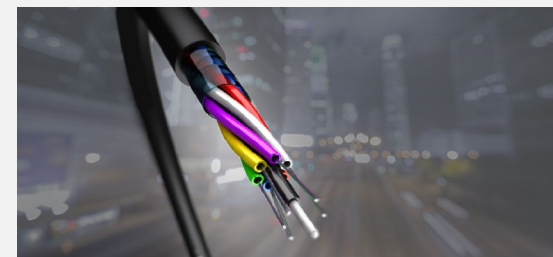


Network

- Communication infrastructure used to transmit Data
- **Cellular and Fiber**



Cellular Tower



Fiber

Automated Incident Detection and Response System



Data Storage

- Where will Data be stored?
- **Edge and Cloud**



Edge Processing Camera



Cloud

Automated Incident Detection and Response System



Analysis

- Processing of collected data to derive insights and make decisions
 - What and Where
- **Classification and Severity Analysis of Incident**
- **Mobilization of Resource**



Unmanned Aerial Systems (UAS) for Traffic Incident Management

Automated Incident Detection and Response System



Action

- Implementation of responses based on the analyzed data.
- **ITS Control Devices and Notification**



TxDOT Highway Emergency Response Operator (HERO) Truck

Automated Incident Detection and Response System



Message

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

**RIGHT LNS CLSD
AT SH 288
STALLED TRUCK**

DMS Message from TxDOT

Automated Incident Detection and Response 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).

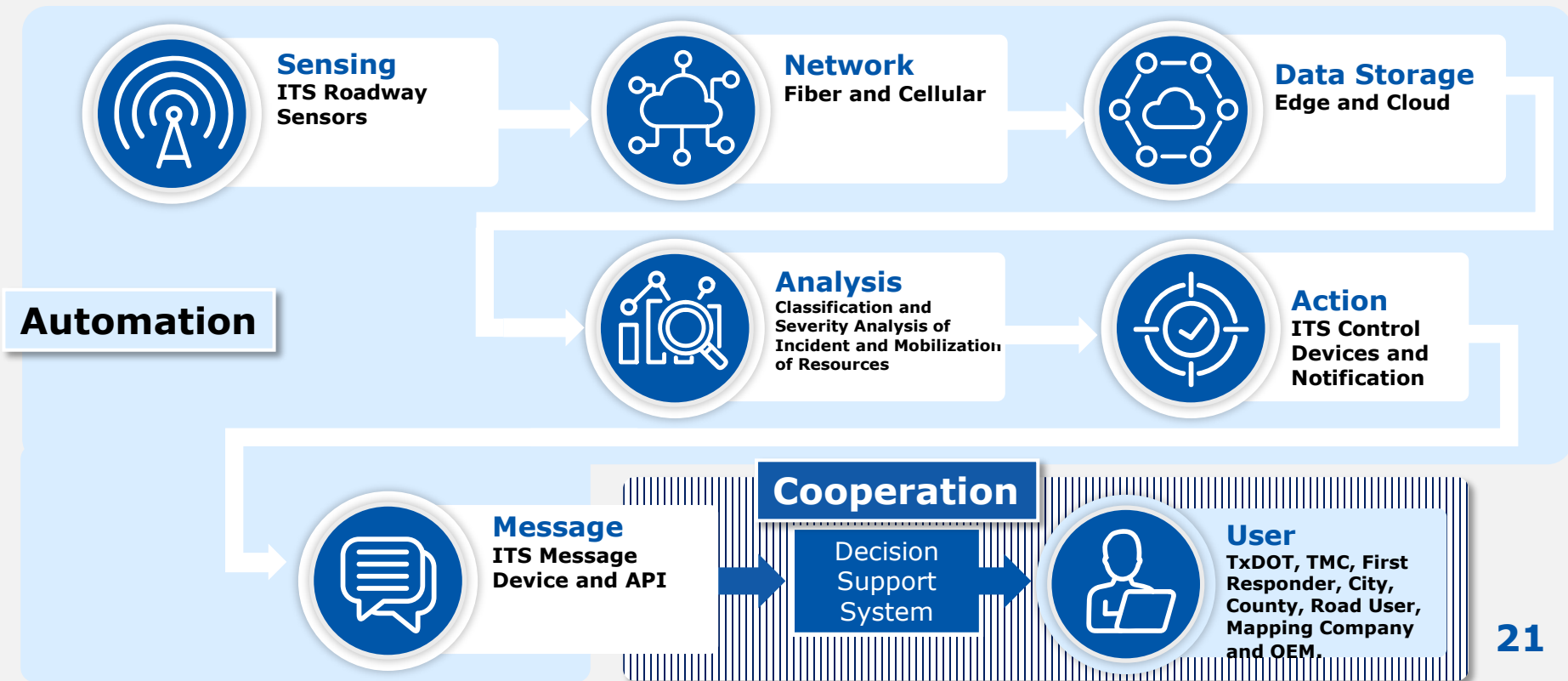


Houston Transtar Logo



Connected Vehicle

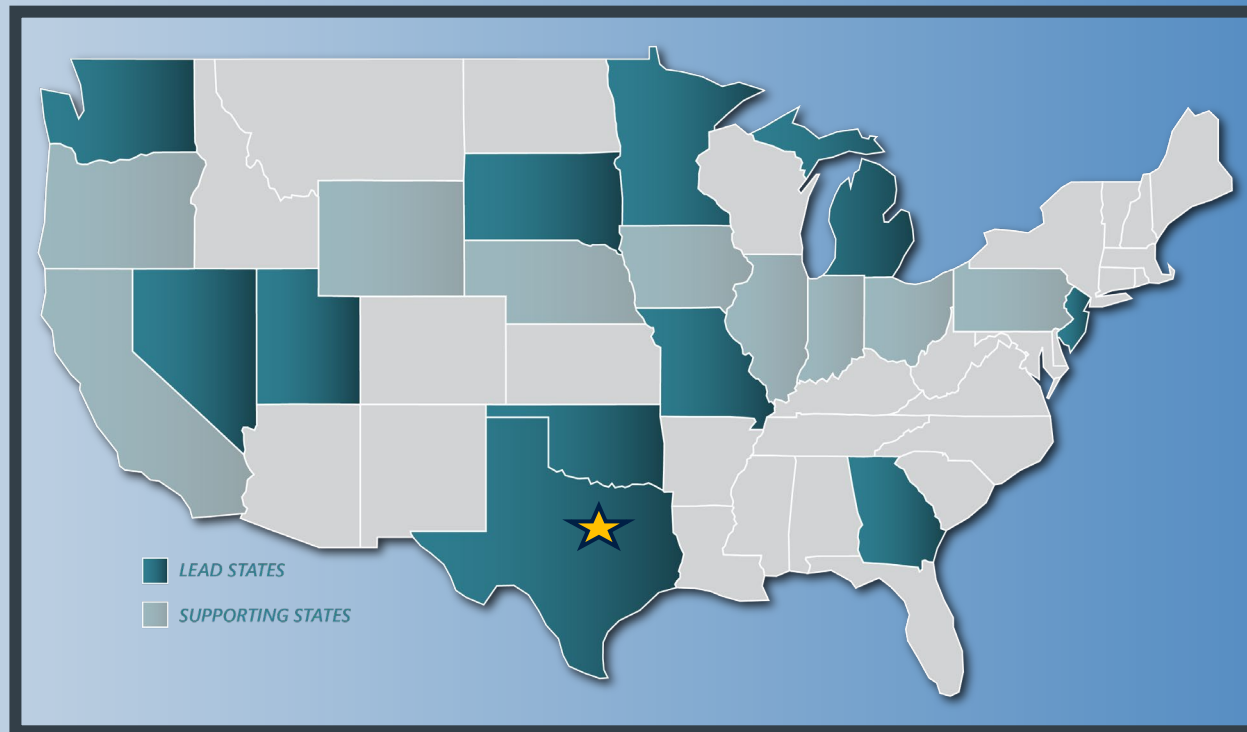
Automated Incident Detection and Response System



AASHTO Moonshot Project

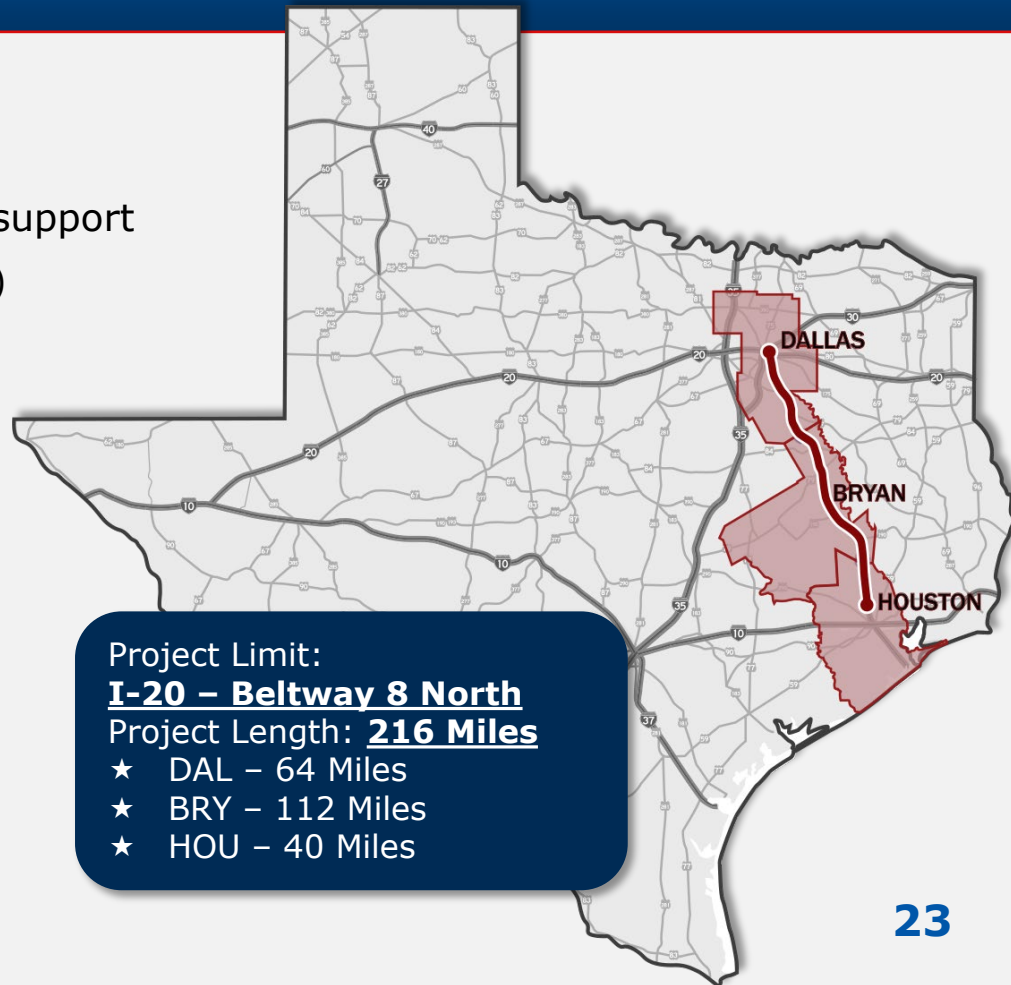
National: An effort to draft a cohesive national transportation vision.

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



Project Overview

- Enhancement of Physical ITS Assets to support Emerging Tech (Fiber, AI-Cameras, etc.)
 - Wrong-Way Driver Detection System
 - Incident Detection and Response
 - Flooding Detection and Response
 - Asset monitoring and management
- Predictive Analytics for Traffic Incident Management (Pilot)
- Digital Message Delivery (Pilot)



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