

Texas ITS Annual Conference – Session 6B:  
Technology & Safety



# Enhancing Road Weather Safety in San Antonio through Regional ITS Architecture

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# Agenda

## 1 **San Antonio Regional ITS Architecture**

2024 Update

## 2 **Stakeholder Workshop**

Survey, Service Packages Review

## 3 **Spot Weather Impact Warning**

Stakeholders, Information Flow

## 4 **Emerging Technologies**

Sensor Network, Data and Software,  
Maintenance, and Emergency Response

# San Antonio Regional ITS Architecture

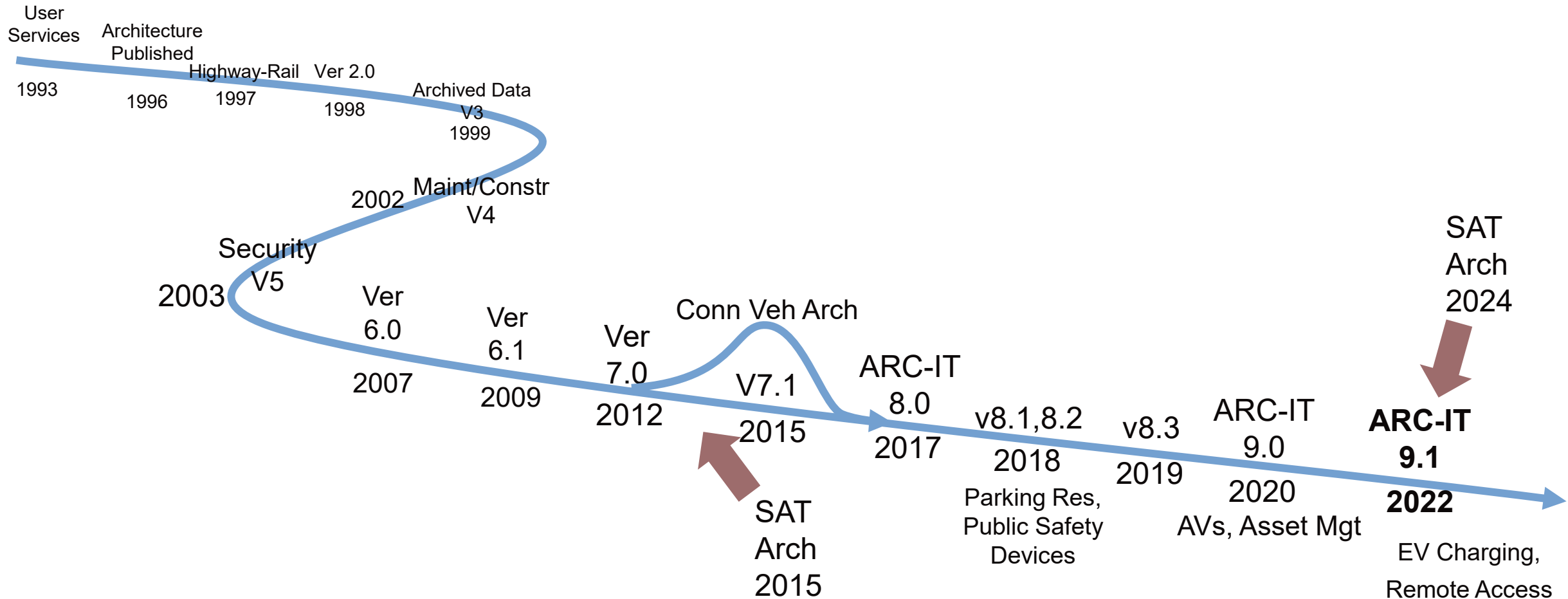
- Existing Regional ITS Architecture is outdated (last update in 2015)
- ITS Architecture provides funding opportunities through FHWA
- Focused on identifying coordination opportunities relating to ITS deployments between the regional stakeholders



# San Antonio Regional ITS Architecture

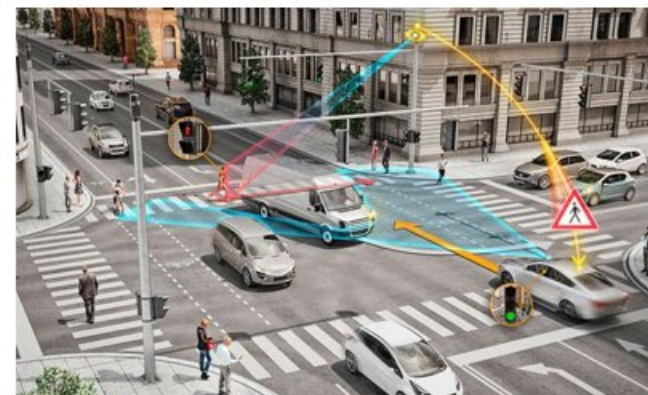
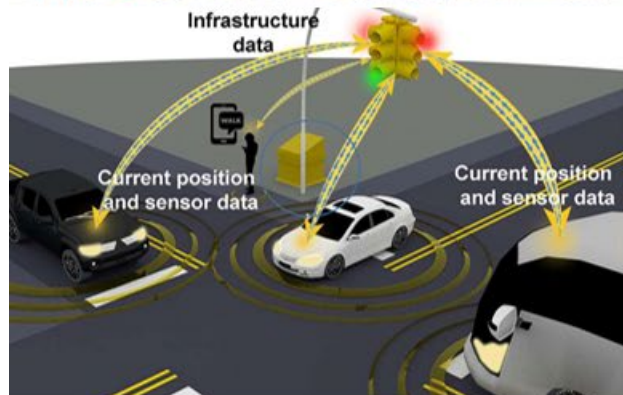


- 2015 update: 97 ITS service packages in Version 7.0 of RAD-IT
- 2024 update: 152 ITS service packages in Version 9.1 of RAD-IT



# Stakeholder Workshop

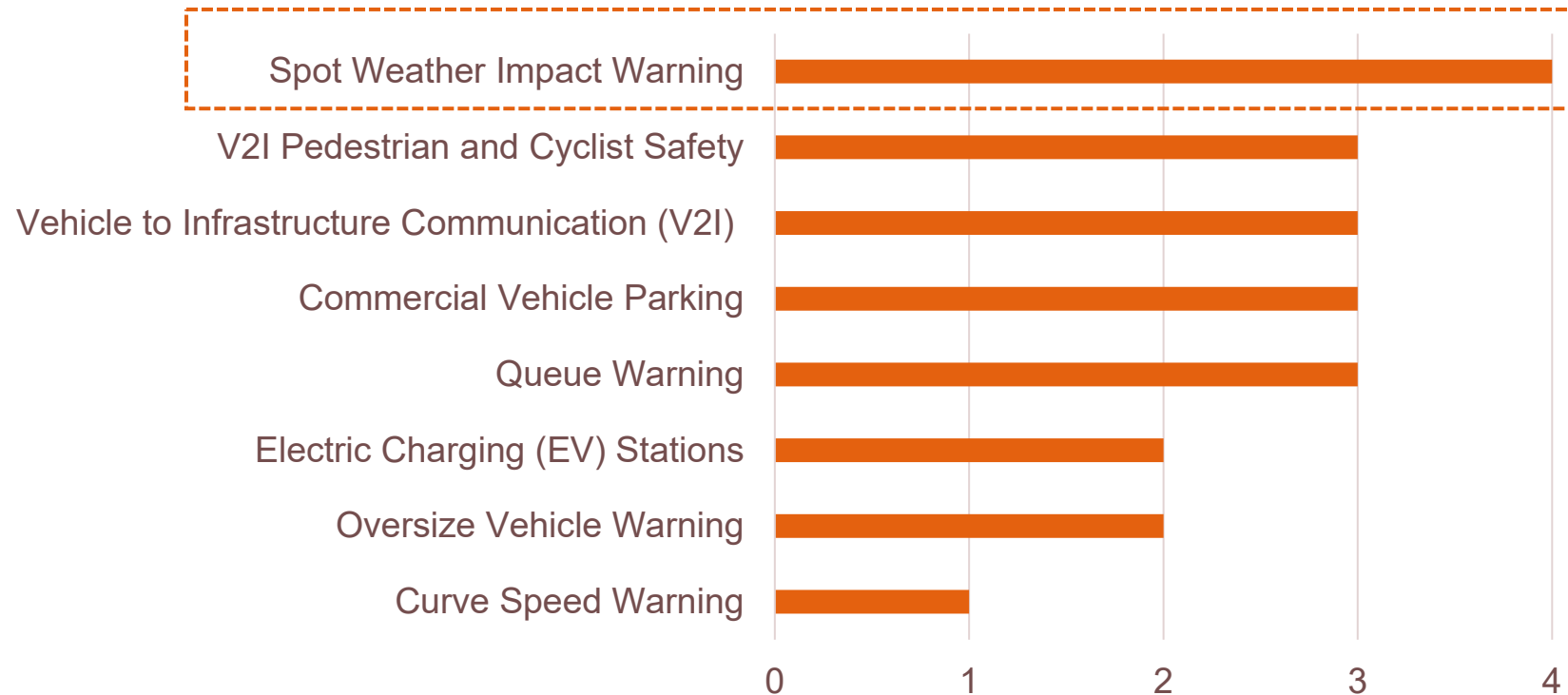
- Spot Weather Impact Warning
- Electric Charging (EV) Stations
- Commercial Vehicle Parking
- Oversize Vehicle Warning
- Curve Speed Warning
- Vehicle to Infrastructure Communication (V2I)
- V2I Pedestrian and Cyclist Safety
- Queue Warning



# Survey: Emerging ITS Applications

Stakeholders: TxDOT, City of San Antonio, VIA Metropolitan Transit, Bexar County, Guadalupe County, Comal County

## Emerging ITS applications that are applicable in your area



# San Antonio Flooding

- Long history of flooding
- Among the top U.S. metro areas for flood risk.
- A single flash flood can close dozens of roads in minutes
- 2016 Environmental Protection Agency (EPA) predicts that there will be an increase in heavy storms, hurricane intensity, and inland flooding in Texas.



Flood waters at 281 and Jones Maltsberger Rd. 2024

# New ITS Service Package Review and Prioritization

## High Priority Service Packages

## Medium Priority Service Packages

## Low Priority Service Packages

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**Commercial Vehicle Operations**  
CVO05: Commercial Vehicle Parking

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**Data Management**  
DM02: Performance Monitoring

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**Maintenance and Construction**  
MC10: Asset Tracking

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**Sustainable Travel**  
ST05: Electric Charging Stations Management

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**Support**  
SU10: Center Maintenance

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**Support**  
SU11: Field Equipment Maintenance

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**Traffic Management**  
TM25: Wrong Way Vehicle Detection and Warning

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**Vehicle Safety**  
VS07: Road Weather Motorist Alert and Warning

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**Vehicle Safety**  
VS08: Queue Warning

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**Vehicle Safety**  
VS09: Reduced Speed Zone Warning / Lane Closure

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**Vehicle Safety**  
VS11: Oversize Vehicle Warning

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**Weather**  
WX03: Spot Weather Impact Warning

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**Commercial Vehicle Operations**  
CVO08: Smart Roadside and Virtual WIM

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**Commercial Vehicle Operations**  
CVO06: Freight Signal Priority

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**Parking Management**  
PM02: Smart Park and Ride System

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**Support**  
SU08: Security and Credentials Management

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**Support**  
SU14: Remote Access

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**Sustainable Travel**  
ST08: Eco-Approach and Departure at Signalized Intersections

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**Traffic Management**  
TM04: Connected Vehicle Traffic Signal

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**Traffic Management**  
TM21: Speed Harmonization

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**Vehicle Safety**  
VS05: Curve Speed Warning

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**Vehicle Safety**  
VS12: Pedestrian and Cyclist Safety

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**Commercial Vehicle Operations**  
CVO03: Electronic Clearance

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**Parking Management**  
PM05: Parking Reservations

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**Public Safety**  
PS07: Incident Scene Safety Monitoring

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**Public Safety**  
PS05: Vehicle Emergency Response

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**Support**  
SU04: Map Management

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**Support**  
SU01: Connected Vehicle System Monitoring and Management

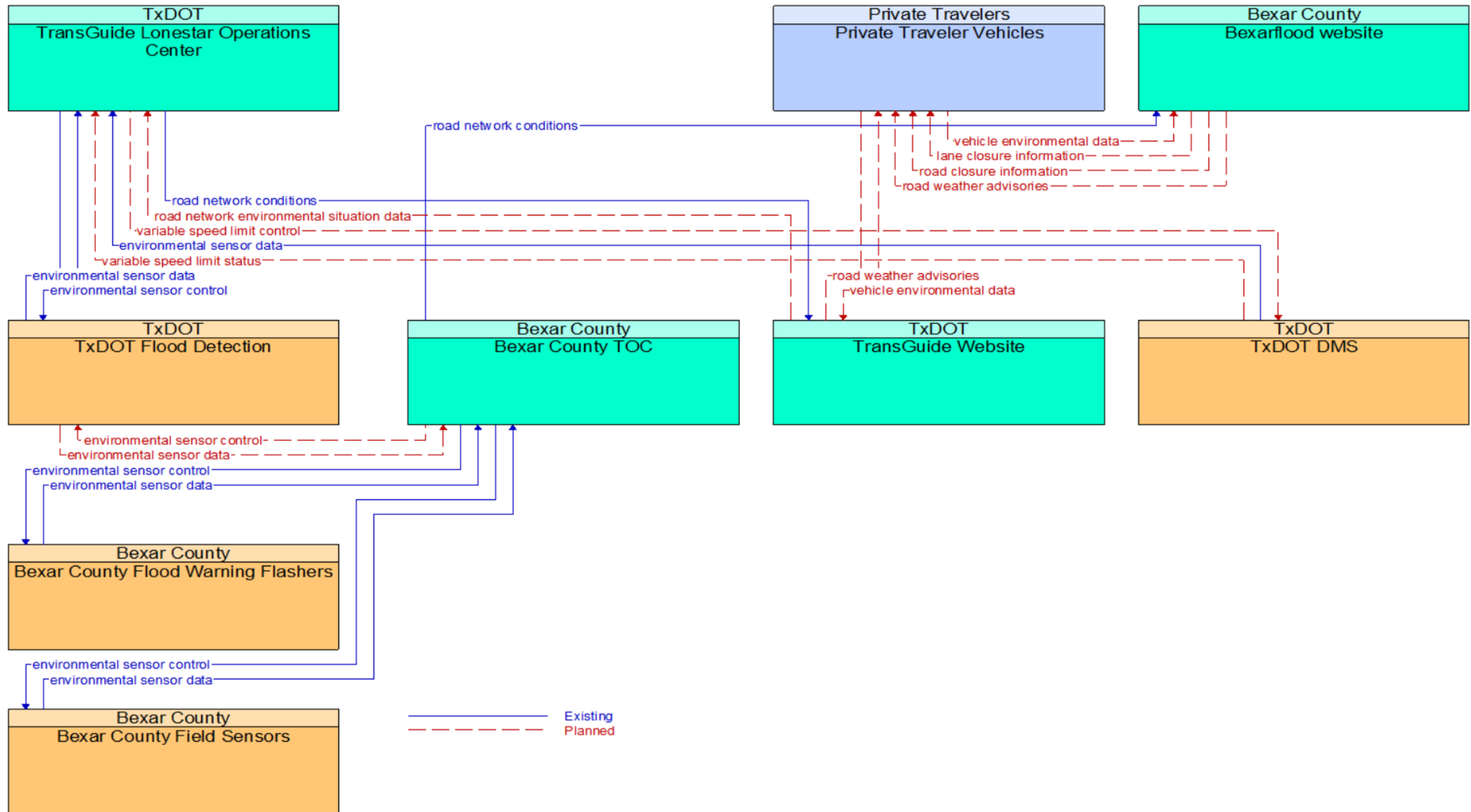
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**Vehicle Safety**  
VS10: Restricted Lane Warnings

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**Public Transportation**  
PT18: Integrated Multi-Modal Electronic Payment

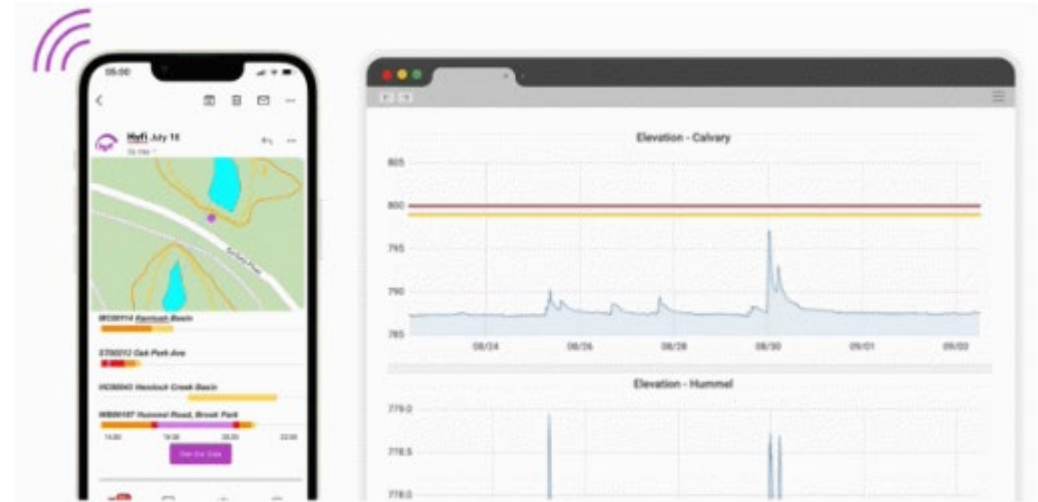
# Spot Weather Impact Warning



# How to Leverage Emerging Technologies?

## Infrastructure Deployment Strategies

- 1) Implement/Expand Sensor Networks
- 2) Software and Data Management
- 3) Maintenance
- 4) Emergency Response – Upgrade applicable existing Infrastructure to allow Internet connection such as valves, pumps, and gates for flood water control and management



# Real-Time Flood Monitoring – Sensor Network

## Flood Detection Using CCTV Video

- Uses Smart Cameras and computer vision (AI-enabled video analytics) to monitor water levels in real time and provide early warnings for flooding events.
- Monitor water ways, bridges, roads, urban flood zones, parking garages, etc.
- Typically works with 4G/5G or satellite connectivity
- Sends alerts via SMS, email, or integration with emergency response platforms.



# Real-Time Flood Monitoring – Sensor Network

## Flood Detection Using Pressure Transducers

- Uses pressure transducers to detect rising water. When water reaches pre-determined levels, the system triggers local and remote warnings.
- Monitors low-water crossings
- Sensors can be installed with flashing beacons or lights.
- Typically works with 4G/5G or satellite connectivity
- Alert is transmitted to a central data base station.



# Real-Time Flood Monitoring – Sensor Network

## Flood Detection Technology Using Sonar

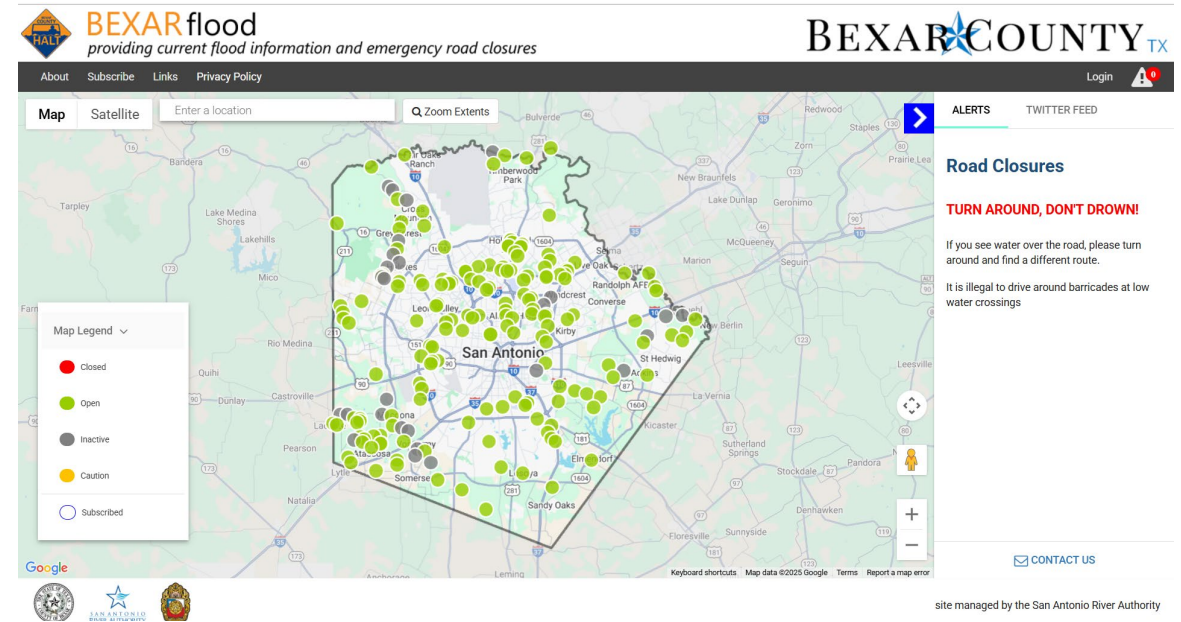
- Uses sonar sensors to detect rising water. With the sonar pointing downward, it bounces that sonar off of the surface of the water to detect the water level.
- Monitors low-water crossings
- Solar powered
- Alert is transmitted to a central data base station through cellular connection.
- Relatively low cost



# Real-Time Flood Monitoring – Software & Data

## Back-end System & Data Management

- Use data to create flood maps and raise public awareness (alerts, traveler information, evacuations, etc.)
- Emergency response (roadway closures, etc.)
- Planning and future flood mitigation



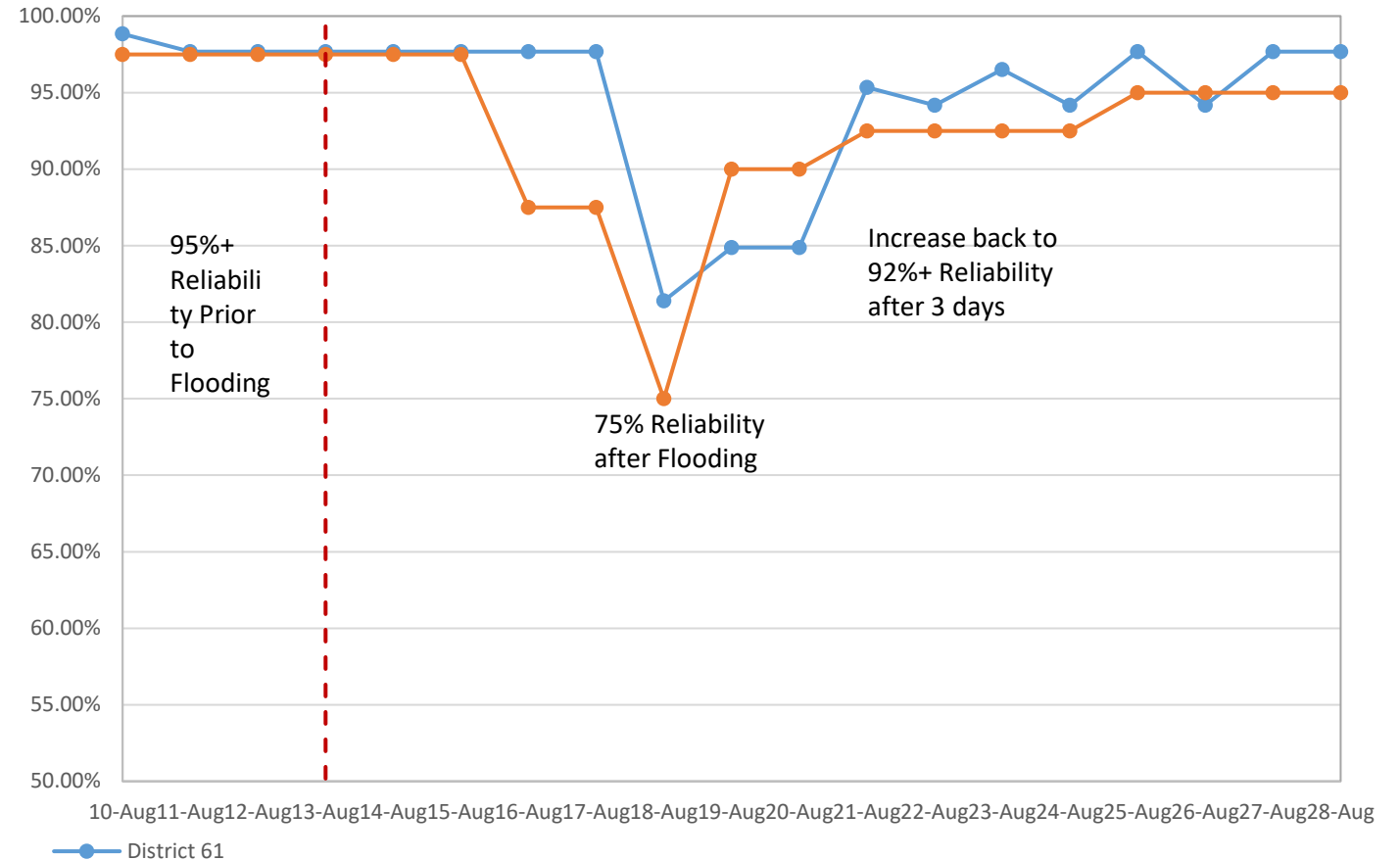
# Real-Time Flood Monitoring – Maintenance

## Routine and Responsive Maintenance

- Calibration checks
- Power (battery, solar panel, etc.)
- Communication
- Device failure replacements
- Spare equipment



ITS Maintenance Contract - CCTV Reliability



Baton Rouge Flood August 2016

# Real-Time Flood Monitoring – Emergency Response

## Example

- Use smart technologies to close roads
- Provide real time roadway closure information on DMS, website, and mobile app
- Modifying traffic signal timing based on pavement conditions



# Challenges & Successes

## Challenges

- Difficult to get people excited about developing architecture
- Developing consensus

## Successes

- Established agreements with partner agencies
- Raised awareness of projects planned by other stakeholders in the region

## Contact us



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