CAMPO
CAPITAL AREA METROPOLITAN PLANNING ORGANIZATION
CENTRAL TEXAS

Central Texas Regional ITS Architecture and Deployment Plan

2025 Update

Prepared by the Capital Area Metropolitan Planning Organization in coordination with stakeholder agencies throughout Central Texas.

April 2025

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS

ATMS	Advanced Traffic Management System
ATSPM	Automated Traffic Signal Performance Measures
AVL	Automated Vehicle Location
CAMPO	Capital Area Metropolitan Planning Organization
CAPCOG	Capital Area Council of Governments
CARTPO	Capital Area Regional Transportation Planning Organization
CARTS	Capital Area Rural Transportation System
CAV	Connected and Automated Vehicles
CCTV	Closed-Circuit Television
CTR	Center for Transportation Research (University of Texas)
CPP	Construction Partnership Program
CTECC	Combined Transportation, Emergency and Communications Center
CTTMS	Central Texas Traffic Management System
DM	Data Management
DMS	Dynamic Message Sign
EMS	Emergency Medical Services
EVP	Emergency Vehicle Preemption
FHWA	Federal Highway Administration
FSSP	Freeway Safety Service Patrol
FTA	Federal Transit Administration
GPS	Global Positioning Satellites
ITS	Intelligent Transportation System
MMC	Mobility Management Center
MPO	Metropolitan Planning Organization
PS	Public Safety
RAD-IT	Regional Architecture Development for Intelligent Transportation
RIDI	Regional ITS Data Infrastructure
RWIS	Road Weather Information System
SDO	Standards Development Organization
ST	Sustainable Travel
SU	Support
TI	Traveler Information
TM	Traffic Management
TMC	Traffic Management Center
TPAS	Truck Parking Availability Systems
TxDOT	Texas Department of Transportation
USDOT	United States Department of Transportation
VS	Vehicle Safety
WX	Weather

Executive Summary

EXECUTIVE SUMMARY

The **Central Texas Regional Intelligent Transportation System (ITS) Architecture and Deployment Plan** provides a long-range plan for the deployment, integration, and operation of ITS in Central Texas. The Regional ITS Architecture and Deployment Plan allows stakeholders to plan for what they want their system to look like in the long term, then organizes the system into smaller pieces that can be implemented over time as funding permits. Development of a regional ITS architecture encourages interoperability and resource sharing among agencies and allows for cohesive long-range planning among regional stakeholders. Completing and regularly updating the plan is also required by the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) to use federal transportation funds for ITS projects in the region.

The 2025 Central Texas Regional ITS Architecture and Deployment Plan was developed by the **Capital Area Metropolitan Planning Organization (CAMPO)** in close coordination with stakeholders representing local, regional, and state agencies that operate ITS in Central Texas. The geographic boundaries of the Regional ITS Architecture and Deployment Plan includes the same counties and CAMPO's service area and includes **Bastrop, Burnet, Caldwell, Hays, Travis, and Williamson Counties**.

Central Texas Regional ITS Architecture

The Regional Architecture Development for Intelligent Transportation (RAD-IT) Version 9.3 was used to develop the Central Texas Regional ITS Architecture. Formerly referred to as Turbo Architecture, RAD-IT is a software application that was developed by the United States Department of Transportation (USDOT) to be used as a tool for documenting and maintaining ITS architectures. An interactive version of the Central Texas Regional ITS Architecture was built using RAD-IT and allows users to access the Regional ITS Architecture online and focus specifically on sections that apply to their agency. The **Interactive ITS Architecture** is available at CAMPO's website. Training on how to show conformity of an ITS project to the Regional ITS Architecture is also available on CAMPO's website.

INTERACTIVE ITS ARCHITECTURE

The **Interactive ITS Architecture** can be accessed on the CAMPO website under the **Plans & Studies** tab, or through the link provided below. Throughout this report, look for blue call out boxes that will note key parts of the Regional ITS Architecture that can be accessed on-line via the **Interactive ITS Architecture**.

www.CAMPOTexas.org

The 2025 update to the Central Texas Regional ITS Architecture focuses primarily on **building a connected region**. Many of the stakeholders in Central Texas have made significant investments in ITS and operations within their jurisdictions. The deployments, as well as significant regional ITS project and programs, are included in the graphic on the next page. However, most stakeholders noted that to fully optimize operations there is additional connectivity needed between agencies to operate the regional

CENTRAL TEXAS

KEY ITS INFRASTRUCTURE AND PROGRAMS

TRAFFIC ITS INFRASTRUCTURE

- Traffic Management Center (TMC)
- Closed Circuit Television (CCTV) Cameras
- Centralized Traffic Signal System
- Comparative Travel Time Signs (CTTS)
- Dynamic Message Signs (DMS)
- Electronic Toll Collection
- Emergency Vehicle Signal Preemption
- Flood Monitoring
- Freeway Safety Service Patrol
- Railroad Detection and Notification
- Transit Signal Priority

TRANSIT ITS INFRASTRUCTURE

- Transit Operations Center (TOC)
- Automated Fare Payment
- Automated Passenger Counters
- Bus Rapid Transit
- Real-Time Traveler Information
- Transit Signal Priority
- Transit Vehicle Tracking

PLANNED SYSTEM

CITY OF CEDAR PARK

- TMC (Mobility Management Center)
- CCTV Cameras
- Centralized Traffic Signal Control System
- Emergency Vehicle Signal Preemption
- Railroad Detection and Notification

CITY OF AUSTIN

- TMC
- CCTV Cameras
- Centralized Traffic Signal Control System
- DMS
- Emergency Vehicle Signal Preemption
- Flood Monitoring
- Transit Signal Priority

CITY OF SAN MARCOS

- TMC
- CCTV Cameras
- Centralized Traffic Signal Control System
- Emergency Vehicle Signal Preemption
- Flood Monitoring
- Railroad Detection and Notification

CITY OF LEANDER

- Centralized Traffic Signal Control System
- Emergency Vehicle Signal Preemption

CITY OF GEORGETOWN

- CCTV Cameras
- Centralized Traffic Signal Control System
- Emergency Vehicle Signal Preemption
- Flood Monitoring

CITY OF ROUND ROCK

- TMC
- CCTV Cameras
- Centralized Traffic Signal Control System
- Emergency Vehicle Signal Preemption
- Flood Monitoring

CITY OF PFLUGERVILLE

- Centralized Traffic Signal Control System
- Emergency Vehicle Signal Preemption

REGIONAL INITIATIVES

- Central Texas Traffic Management System (CAMPO)
- Construction Partnership Program (TxDOT Austin District)
- Regional Traffic Management Center (TxDOT Austin District)
- SMARTTrack (University of Texas)

TxDOT AUSTIN DISTRICT

TMC
CCTV Cameras
Centralized Traffic Signal System
CTTS
DMS
Flood Monitoring
Freeway Safety Service Patrol

CTRMA

TMC
CCTV Cameras
DMS
Electronic Toll Collection
Flood Monitoring
Freeway Safety Service Patrol

SH 130 CONCESSIONAIRE

TMC
CCTV Cameras
CTTS
DMS
Electronic Toll Collection

CAPITAL METRO

TOC
Automated Fare Payment
Automated Passenger Counters
Bus Rapid Transit
On-Board CCTV Cameras
Real-Time Traveler Information
Transit Signal Priority
Transit Vehicle Tracking

CARTS

TOC
Automated Fare Payment
Automated Passenger Counters
Real-Time Traveler Information
Transit Vehicle Tracking

transportation network as one integrated system. The National ITS Architecture service packages were reviewed by the stakeholders and selected based on the relevance of the functionality that the ITS service package could provide to the region. Stakeholders selected 57 separate ITS service packages for implementation in the region. Stakeholders also noted the need for a more **robust communications system** that utilized fiber optics for high bandwidth reliable communications.

Regional ITS Deployment Plan

The ITS Deployment Plan section of the Central Texas Regional ITS Architecture and Deployment Plan serves as a tool to identify projects that should be deployed to achieve the desired functionality identified in the Regional ITS Architecture. The ITS Deployment Plan builds on the ITS Architecture by outlining project and program recommendations for the region, potential stakeholders, and deployment timeframes. The **focus is on larger multi-agency projects and programs that could significantly benefit travelers** throughout Central Texas.

Central Texas stakeholders noted a strong need for the implementation of systems and programs to meet regional needs. Regional needs generally focused on data integration, public transportation, traffic management, and improved communication systems.

Stakeholders identified **nine regional deployment projects and programs** for ITS in Central Texas. These projects and programs do not encompass all the regional ITS needs within the Central Texas, but stakeholders recommended that emphasis be placed on implementation related to these projects and programs to provide the greatest benefit to travelers.

Regional ITS Deployment Plan Projects and Programs

- Regional Traffic Management Center
- Real-Time Data Sharing
- Regional Live Video Sharing Platform
- Railroad Crossing Detection and Notification Systems
- Regional Fiber Network Plan
- Highway Emergency Response Operator (HERO) Roadside Assistance Expansion
- Regional Transit Fare Payment Platform
- Automation of Operational Capabilities
- Increased Staffing for ITS Operations and Maintenance

Document Maintenance and Architecture Update Process

The Central Texas Regional ITS Architecture and Deployment Plan is considered a **living document**. Shifts in regional needs and focus, advances in technology, and changes in the National ITS Architecture, will necessitate that the Central Texas ITS Architecture and Deployment Plan be updated periodically to remain a useful resource for the region. CAMPO will review the Plan after major ITS deployments in the region and evaluate if an update is needed. CAMPO will also lead the effort to maintain the Regional ITS Architecture and Deployment Plan for Central Texas.

Introduction

INTRODUCTION

Overview

The Central Texas Regional Intelligent Transportation System (ITS) Architecture and Deployment Plan provides a long-range plan for the deployment, integration, and operation of ITS in Central Texas. The Regional ITS Architecture and Deployment Plan allows stakeholders to plan for what they want their system to look like in the long term, then organizes the system into smaller pieces that can be implemented over time as funding permits. Development of a regional ITS architecture encourages interoperability and resource sharing among agencies and allows for cohesive long-range planning among regional stakeholders. Completing and regularly updating the plan is also required by the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) to use federal transportation funds for ITS projects in the region.

The 2025 update to the Central Texas Regional ITS Architecture and Deployment Plan focuses primarily on establishing a connected region. Many of the stakeholders in the region have made significant investments in ITS and operations within their jurisdictions. However, most noted that to fully optimize operations there is additional connectivity needed between agencies to operate the transportation system as a single, seamless, integrated system. Emphasis in Central Texas includes improved sharing of real time data and live video, construction closure information, relevant incident notifications, performance metrics and archived data, and planning for connected and autonomous vehicle (CAV) deployment. The need for a robust fiber communications system to support ITS deployments was also a key emphasis area.

The Central Texas Regional ITS Architecture and Deployment Plan was developed with significant input from local, regional, and state officials. Individual interviews were conducted with stakeholders and a workshop was conducted for all stakeholder agencies in the region. Input was requested to ensure that the Plan reflects the unique needs of the region. The Plan was developed based on how the stakeholders envision the implementation and operation of ITS over the next ten years. The Plan identifies projects that may address the gaps in ITS and needs identified by the stakeholders as priorities for their agency and will help the region progress towards its vision for ITS. Additionally, a website was developed that includes documentation related to the 2025 update of the Plan and an interactive version of the Regional ITS Architecture. The website, including the Interactive ITS Architecture, is located on the Capital Area Metropolitan Planning Organization's (CAMPO) website at www.CAMPOTexas.org under the **Plans & Studies** tab.

The Central Texas Regional ITS Architecture and Deployment Plan strives to present an accurate snapshot of existing ITS deployment and future ITS plans in the region. However, needs and priorities of the region will change over time, and to remain

INTERACTIVE ITS ARCHITECTURE

The **Interactive ITS Architecture** can be accessed on the CAMPO website under the **Plans & Studies** tab, or through the link provided below. Throughout this report, look for blue call out boxes that will note key parts of the Regional ITS Architecture that can be accessed on-line via the **Interactive ITS Architecture**.

effective, this Plan will be periodically reviewed and updated.

Background

In Central Texas, the first regional plan for ITS was the Austin Area-Wide Intelligent Vehicle Highway System (IVHS) Plan and IH 35 Corridor Deployment Plan, which was developed in 1996. This plan served as the predecessor to the first Regional ITS Architecture and Deployment Plan which was developed in 2002. Since then, many new ITS projects have been implemented and the National ITS Architecture, which served as the basis for the Central Texas Regional ITS Architecture, has been updated several times. In order to reflect these changes, the Texas Department of Transportation (TxDOT) Austin District, working closely with stakeholders throughout the region, completed updates to the Regional ITS Architecture and Deployment Plan in 2007, 2015, and most recently in 2019. In the past, the Plan was maintained by the TxDOT Austin District and geographic coverage of the Plan consisted of the 11 counties that make up the TxDOT Austin District. In 2024, CAMPO and the TxDOT Austin District agreed that CAMPO would take over maintenance of the Plan. Future updates of the Plan, including this 2025 update, will only focus on the six counties that are included within the CAMPO boundaries.

Regional ITS architectures are necessary to satisfy the ITS conformity requirements first established in the Transportation Equity Act for the 21st Century (TEA-21) highway bill passed in 1998 and continued in subsequent federal transportation funding bills. In response to Subsection 5206(e) of TEA-21, the FHWA issued a final rule and the FTA issued a final policy that required regions implementing any ITS project to have an ITS architecture in place by April 2005. After this date, any ITS projects must show conformance with their regional ITS architecture to be eligible for funding from FHWA or FTA. To adequately demonstrate this conformance, it is important that regions deploying ITS have an updated regional ITS architecture in place.

Central Texas Region

Geographic Boundaries

This plan defines Central Texas as the CAMPO service area encompassing six Texas counties: Bastrop, Burnet, Caldwell, Hays, Travis, and Williamson. **Figure 1** shows the Central Texas boundary and its included counties. Central Texas encompasses approximately 5,300 square miles and has a population of approximately 2.33 million according to the US Census Bureau's 2020 census. By January 2024, the population of Central Texas had grown to 2.59 million according to the Texas Demographic Center.

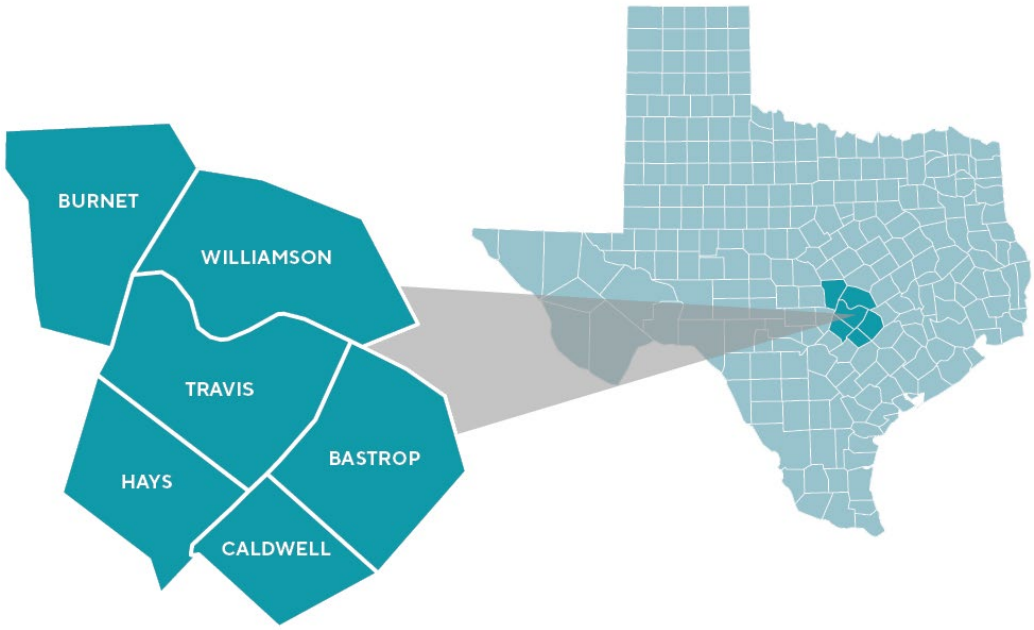


Figure 1: Central Texas Regional ITS Architecture Boundary

Transportation Infrastructure

Central Texas utilizes the Federal Highway Administration's (FHWA) functional classifications to characterize the level of mobility and degree of access a roadway provides. **Figure 2** displays the functional classification of the existing roadway facilities, eligible to receive federal funding, within Central Texas.

The region is served by a significant number of federal and state highways. The primary access-controlled facilities include IH 35, US 183, US 290, SH 45, SH 71, SH 130, Loop 1 (MoPac), 183A Toll, 183 South Toll, and 290 Toll (Manor Expressway). Several of those facilities are either tolled for their entire length (183A Toll, 183 South Toll, SH 45, SH 130) or have sections or lanes that are tolled (US 290, SH 71, and Loop 1 (MoPac)). Toll roads in the region are either managed by TxDOT, the Central Texas Regional Mobility Authority (CTRMA), or the SH 130 Concession Company.

IH 35 is the primary Interstate highway in the region, extending from Laredo, Texas at the US-Mexico border to Duluth, Minnesota. The effective operation of IH 35 is critical to the movement of goods and people through the State of Texas as well as the United States. Construction and incidents along IH 35 can have a severe impact on commercial vehicle traffic and motorists traveling through the region on this significant cross-country thoroughfare. The on-going IH 35 Capital Express Project will reconstruct IH 35 through Travis County. It is anticipated that the construction will cause significant impacts and delays over the next several years.

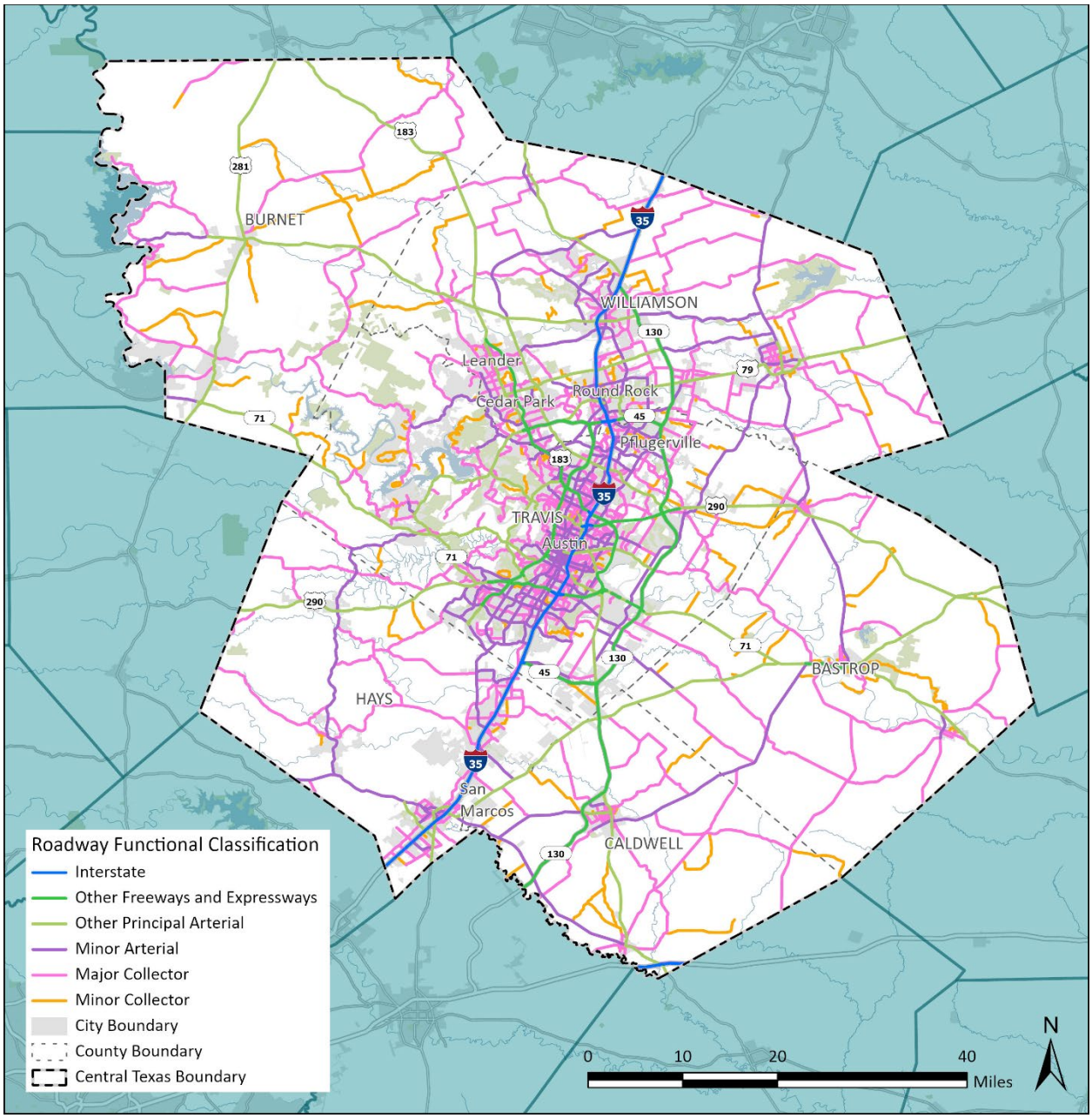


Figure 2: Central Texas Roadway Functional Classification

Fixed-route and paratransit services are provided in Travis County and portions of Hays and Williamson Counties by the Capital Metropolitan Transportation Authority (CapMetro). CapMetro operates the University of Texas Shuttle in the City of Austin near the University of Texas campus. Commuter rail is provided by CapMetro and serves the City of Austin and the City of Leander. The Capital Area Rural Transportation System (CARTS) provides fixed-route and paratransit services in the six counties included in the Central Texas Regional ITS Architecture and Deployment Plan. CARTS operates the Texas State University Bobcat Shuttle, a fixed-route bus service for students in the City of San Marcos. CARTS also provides a fixed-route bus service for commuters between the City of Austin and City of San Marcos. Demand response service in Central Texas is provided primarily by CapMetro and CARTS in the same areas in which they provide fixed-route service.

Key Components of the Plan

The Central Texas Regional ITS Architecture and Deployment Plan consists of several key components:

Regional ITS Inventory – The inventory describes each stakeholder's ITS deployments and programs that either are existing, in progress of being implemented, or planned for the region.

Regional ITS Needs – The needs describe the transportation related needs in the region that could possibly be addressed by ITS.

Regional ITS Architecture – This section includes the regional ITS service packages, which describe the services that stakeholders in the region want ITS to provide. ITS service package diagrams have been developed to illustrate how each service will be deployed and operated by each agency in the region that expressed interest in a particular service. ITS service package diagrams are available on the Interactive ITS Architecture.

Regional ITS Deployment Plan – The Regional Deployment Plan documents potential ITS projects that could be implemented to provide the ITS services that stakeholders identified as important to the region.

Use and Maintenance – The use and maintenance section of the report describes how to use the Regional ITS Architecture and Deployment Plan for ITS planning and design efforts, such as the development of a systems engineering analysis. It also describes how the Regional ITS Architecture should be maintained in the future.

Interactive ITS Architecture – Available at the CAMPO website, the Interactive ITS Architecture includes the full inventory of existing, planned, and future systems, ITS service packages, roles and responsibilities for stakeholders, and associated national standards.

RAD-IT Database – The Regional Architecture Development for Intelligent Transportation (RAD-IT) is a software application developed by the United States Department of Transportation (USDOT) that's used as a tool for documenting and maintaining ITS architectures. The RAD-IT database for Central Texas is available for download at the CAMPO website.

Regional ITS Architecture and Deployment Plan Development Process

REGIONAL ITS ARCHITECTURE AND DEPLOYMENT PLAN DEVELOPMENT PROCESS

The 2025 update of the Central Texas Regional ITS Architecture and Deployment Plan relied heavily on stakeholder input to ensure that the ITS architecture reflected regional needs. Interviews were conducted with individual representatives from many of the regional stakeholder agencies to gather input, a workshop was held with stakeholders to discuss initial findings and recommendations, and a website was developed with the draft and final Regional ITS Architecture and Deployment Plan documents. The website includes an interactive version of the Regional ITS Architecture generated from the RAD-IT database. Additional guidance on the use and maintenance of the Regional ITS Architecture is also included on the website.

Stakeholder Involvement

The process followed for the region was designed to ensure that stakeholders could provide input and review for the development of the Region's ITS Architecture and Deployment Plan. **Figure 3** illustrates the process that was followed.

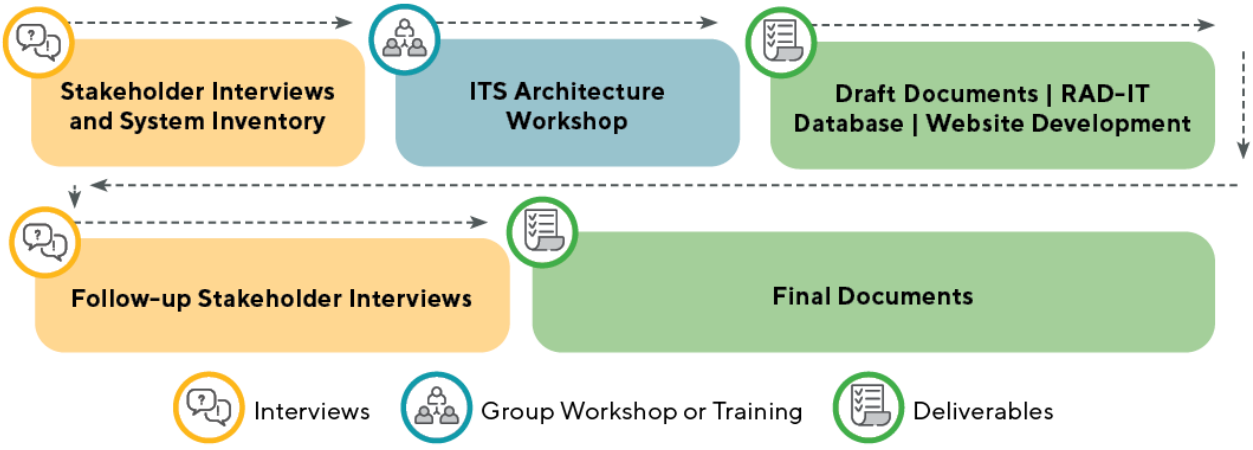


Figure 3: Central Texas Regional ITS Architecture and Deployment Plan Development Process

The key components of the stakeholder involvement process are described below.

Stakeholder Interviews (June – August 2024)
Stakeholder input was first gathered through a series of interviews that were conducted with individual stakeholder agencies. The interviews were used to develop the system inventory for Central Texas, define how ITS services are currently being operated, define how ITS services could be operated in the future, and identify potential regional ITS projects for Central Texas. Stakeholders were given the choice of conducting the interviews in-person at their offices or remotely with the project team.

ITS Architecture Workshop (October 2024)
Stakeholders were invited to the Stakeholder Review Workshop, an in-person workshop where an overview of the Regional ITS Architecture and Deployment Plan was provided, regional boundaries were defined, existing and planned ITS deployments in the region were reviewed, ITS needs for the region were identified, and regional ITS projects and programs recommended by stakeholders in interviews were discussed.

Draft Documents (December 2024)
Following the stakeholder input through interviews and the workshop, a draft report was developed which identified the roles and responsibilities of stakeholders in the operation and implementation of the ITS system, identified initial recommended projects and programs for deployment, and established a maintenance plan. Additionally, the Regional ITS Architecture and Deployment Plan website was updated to allow stakeholders access to an interactive version of the Central Texas RAD-IT architecture database and the Regional ITS Architecture and Deployment Plan report. Once completed, the draft report was shared with the Central Texas stakeholders for their review and comments.

Follow-Up Stakeholder Discussions (January 2025)
Follow-up discussions were conducted with stakeholders as needed to resolve outstanding questions about ITS services and project deployments prior to finalizing the Central Texas Regional ITS Architecture and Deployment Plan.

Final Documents (April 2025)
The final 2025 update of the Central Texas Regional ITS Architecture and Deployment Plan was developed, which included an executive summary, written report, RAD-IT architecture database, and Regional ITS Architecture and Deployment Plan website with an interactive version of the Regional ITS Architecture.

Since ITS often transcends traditional transportation infrastructure, it is important to involve a wide range of local, regional, and state stakeholders in the ITS architecture development process. Input from these stakeholders is a critical part of defining the interfaces, integration needs, and overall vision for ITS in a region. When developing the stakeholder group, CAMPO identified the appropriate local, regional, and state agencies. Stakeholders included representatives from traffic, transit, public safety, emergency management, and toll agencies within Central Texas.

Table 1 contains a listing of Central Texas stakeholders who participated in stakeholder interviews and workshop to provide input. Other stakeholders that were invited to participate but were not able to attend were provided PDFs of the presentations and were notified when copies of reports were available for review on the Regional ITS Architecture and Deployment Plan website to encourage their participation. A complete listing of all stakeholders that participated in the interviews and workshops is including in the stakeholder database in **Appendix** A**.**

Table 1: Participating Central Texas Stakeholder Agencies

Local Agencies	Regional Agencies	State Agencies
City of Austin	Capital Area Council of Governments	Texas Department of Public Safety
City of Cedar Park	Capital Metropolitan Transportation Authority	TxDOT Austin District
City of Georgetown	Capital Area Regional Transportation Planning Organization	University of Texas Center for Transportation Research
City of Leander	Capital Area Rural Transportation System	
City of Pflugerville	Combined Transportation, Emergency and Communications Center	
City of Round Rock	Central Texas Regional Mobility Authority	
City of San Marcos	SH 130 Concession Company	
Hays County		
Travis County Office of Emergency Management		

ITS Architecture Components

A regional ITS architecture consists of the following components.

Stakeholders

A regional ITS architecture results from the consensus input of a diverse set of stakeholders, encompassing traffic, transit, public safety, and many other operating agencies at local, state, and national levels. It includes both public and private sectors and spans the organizations that manage, support, or are impacted by the surface transportation system, with particular focus on agencies that operate transportation systems in a region.

Inventory

Each stakeholder agency, company, or group owns, operates, maintains, or plans ITS systems in the region. A regional ITS architecture inventory is a list of elements that represent all existing, planned, and future ITS systems in a region as well as non-ITS systems that provide information to or get information from the ITS systems. The inventory can be sorted by physical object or by stakeholder.

Needs

The stakeholder needs identified in a regional ITS architecture determine what the system needs to do and what users need from the system. They are written from the perspective of a system user or stakeholder in that system and are categorized by the ITS service packages that comprise the regional ITS architecture. Service packages provide an accessible, service-oriented perspective to the overall system architecture used to describe a region or project. They identify the pieces of the physical view that are required to implement a particular ITS service. Each of these service packages has a set of needs associated with it that can be used as the basis for stakeholder validation, setting proper expectations, and eliciting requirements for the systems and devices to be implemented.

ITS Service Packages

In the National ITS Architecture, services that are provided by ITS are referred to as ITS service packages. ITS service packages provide a visual representation of how ITS services are deployed and how information is shared. ITS service packages can include several stakeholders and elements that work together to provide a service in a region. Examples of service packages from the National ITS Architecture include Infrastructure-Based Traffic Surveillance, Traffic Information Dissemination, and Transit Vehicle Tracking.

There are currently 157 ITS service packages identified in the National ITS Architecture Version 9.3, which was the most recent version available of the National ITS Architecture at the time of the 2025 Central Texas Regional ITS Architecture update. The National ITS Architecture groups these service packages into 12 ITS architecture service areas, described in **Table 2**.

Table 2: ITS Architecture Service Areas

Service Area	Description
Commercial Vehicle Operations (CVO)	CVO addresses the management of commercial vehicle fleets and the movement of freight. *Example Service Packages: Roadside CVO Safety, Smart Roadside and Virtual Weigh-in-Motion, HAZMAT Management*
Data Management (DM)	DM addresses the management of data that can be used by transportation agencies to support transportation planning, performance monitoring, safety analysis, and research. *Example Service Packages: ITS Data Warehouse, Performance Monitoring*
Maintenance and Construction (MC)	MC addresses the monitoring, maintaining, improving, and managing of the roadway physical condition and its associated infrastructure equipment. *Example Service Packages: Maintenance and Construction Vehicle and Equipment Tracking, Work Zone Management, Infrastructure Monitoring*
Parking Management (PM)	PM addresses the management of parking operations including both space management and electronic payment for parking. *Example Service Packages: Parking Space Management, Smart Park and Ride System, Parking Electronic Payment*
Public Safety (PS)	PS addresses the management by public safety agencies of emergencies or incidents in the transportation. It also addresses how emergency operations centers interact with transportation and public safety agencies to support response to disasters and for evacuations impacting the transportation network. *Example Service Packages: Emergency Vehicle Preemption, Roadway Service Patrols, Disaster Response and Recovery*

Service Area	Description
Public Transportation (PT)	PT addresses the management, operations, maintenance, and security of public transportation. This area covers both fixed-route and on-demand systems, as well as those passenger rail systems operated by transit agencies. *Example Service Packages: Transit Vehicle Tracking, Transit Traveler Information, Transit Signal Priority*
Support (SU)	SU addresses monitoring, maintaining, and managing of the connected vehicle system. Service packages in this service area are generally applied most directly to private-sector services, many of which are operating their services throughout the U.S. As a result, these service packages are not always included in regional ITS architectures and are instead described at the project architecture level if needed. *Example Service Packages: Map Management, Location and Time, Object Registration and Discovery*
Sustainable Travel (ST)	ST addresses the operation of the transportation system to minimize the environmental impact. It promotes a balance of accessibility, mobility, protection of human safety and environment. *Example Service Packages: Emissions Monitoring, Electric Charging Stations Management, HOV/HOT Lane Management*
Traveler Information and Personal Mobility (TI)	TI addresses the provision of both static and dynamic information about the transportation network to users both prior to and during their trips. *Example Service Packages: Broadcast Traveler Information, Personalized Traveler Information, In-Vehicle Signage*
Traffic Management (TM)	TM addresses the management of the movement of all types of vehicles and travelers throughout the transportation network. It deals with information collection, dissemination, and processing for the surface transportation system. *Example Service Packages: Traffic Signal Control, Traffic Incident Management System, Variable Speed Limits*
Vehicle Safety (VS)	VS addresses the vehicle's safety for automated, connected, and non-equipped vehicles. *Example Service Packages: Curve Warning, Queue Warning, Automated Vehicle Operations*
Weather (WX)	WX addresses activities that monitor and notify users and transportation network managers of weather and environmental conditions that have an impact on the road transportation network. *Example Service Packages: Weather Data Collection, Weather Information Processing and Distribution, Spot Weather Impact Warning*

The service packages in the National ITS Architecture are meant to be customized to reflect the unique systems, subsystems, and terminators in a region. ITS service packages represent a service that will be deployed as an integrated capability by a particular stakeholder. Each service package is shown graphically with the service package name, agencies involved, and desired data flows. ITS service packages consist of the two primary pieces:

Elements – Elements represent ITS inventory assets deployed by all stakeholders in a region. Elements are classified as existing, planned, or future. An element classified as existing means at least one or more of the element is deployed, however addition elements may be needed. For example, a city may have deployed a small number of CCTV cameras which are classified as existing but may have a need to deploy many more of this element. Planned elements indicate that the element is in the process of being deployed or has been funded, while future elements indicate the stakeholder(s) has expressed interest in deploying the element at some point in the future but no plans are in place for deployment.

Architecture Flows – Architecture flows provide a standardized method for documenting the types of information that flow between elements. Similar to elements, flows are also classified as existing, planned, or future.

Figure 4 is an example of a template ITS service package diagram from the National ITS Architecture for a Traffic Signal Control. This ITS service package describes the information flows between a Traffic Management Center and ITS Roadway Equipment (Traffic Signal and Controller), as well as interactions of the ITS Roadway Equipment with travelers and pedestrian and the Traffic Management Center with Traffic Operations Personnel. The rectangles represent the elements involved in the ITS service package, color coded based on the subsystem each element is classified as. The lines with arrows connecting elements to each other represent information flows. The color and style of the information flow indicate the level of security surrounding the information, and whether an information flow is acknowledged, whether a flow is unicast, multicast, or broadcast. Each flow has a name or label identifying the type of information that is flowing between the elements, some of which are preceded by a number to indicate the time sensitivity of the data within the flow and a letter to indicate the geospatial relevance of the data.

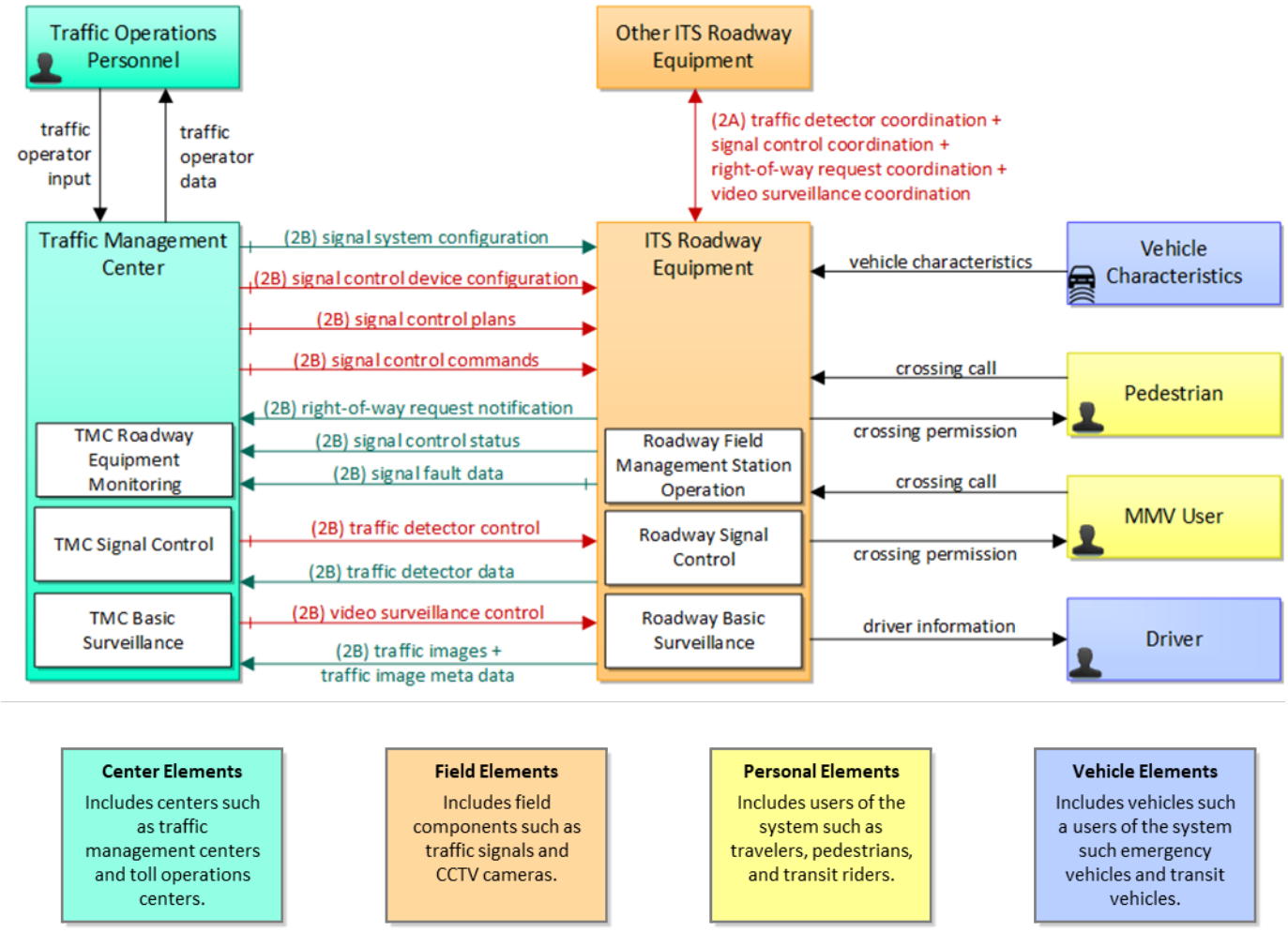


Figure 4: Example ITS Service Package Diagram (TM03 – Traffic Signal Control)

Roles and Responsibilities

A regional ITS architecture documents the current and future roles and responsibilities of each stakeholder in the operation of the regional transportation system across a range of transportation services and related support services.

Standards

Standards are an important tool that allow efficient implementation of the elements in a regional ITS architecture over time. Standards facilitate deployment of interoperable systems at local, regional, and national levels without impeding innovation as technology advances, vendors change, and as new approaches evolve. The USDOT's ITS Joint Program Office is supporting Standards Development Organizations (SDOs) with an extensive, multi-year program of accelerated, consensus-based standards developed to facilitate successful ITS deployment in the United States.

Projects and Programs

To address the ITS needs identified in the Regional ITS Architecture and provide the desired functionality of ITS, a Regional ITS Architecture should identify a series of projects and programs that will allow stakeholders to meet that functionality. These projects and programs make up the Regional ITS Deployment Plan. They focus on larger multi-agency type projects that will impact at least two or more stakeholders. Projects in the ITS Deployment Plan often require a high level of planning and interagency coordination in order to be successfully deployed and operated.

Agreements

Agreements provide the institutional underpinnings for the technical integration identified in a regional ITS architecture. A regional ITS architecture can be a tool to compile ITS related agreements between stakeholder agencies within a region.

RAD-IT Database

RAD-IT is a software application that was developed by the USDOT to be used as a tool for documenting and maintaining ITS architectures. Version 9.3 of RAD-IT was released in December 2024 and was developed to support Version 9.3 of the Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT), the National ITS Architecture framework. The Systems Engineering Tool for Intelligent Transportation (SET-IT) Version 9.3 can be used to generate ITS service package diagrams for a regional ITS architecture and could be used in greater detail by agencies to develop project architectures for ITS deployments, pilots, and test beds. Both FHWA and FTA recommend using RAD-IT and SET-IT software in development of regional ITS architectures. Therefore, Version 9.3 of RAD-IT and SET-IT were utilized for the 2025 update of the Central Texas Regional ITS Architecture.

RAD-IT saves data in Microsoft Access compatible data files and therefore RAD-IT files can be accessed using Microsoft Access. However, use of Microsoft Access will not provide the same amount of capabilities as accessing the files using the RAD-IT software. The USDOT offers RAD-IT and SET-IT available for download free of charge from the ARC-IT website. At the time this report was written, that site was located at www.arc-it.net and Version 9.3 was the most recent version available.

Online Interactive ITS Architecture

RAD-IT generates an online interactive ITS architecture database with all components of the ITS architecture, described previously. SET-IT allows the user to quickly access any standards that are associated with the data flows and to generate reports and diagrams that assist in reviewing the data.

RAD-IT Reports

Some examples of the useful reports and diagrams that may be generated using RAD-IT, several of which make up the components of the online Interactive ITS Architecture, are included in **Table 3**.

Table 3: RAD-IT Reports and Diagrams

Report or Diagram Name	Functions
Stakeholder Summary	Provides a description of the stakeholder and the associated elements for each stakeholder in an ITS architecture.
Inventory Summary	Provides a description and status for each element in an ITS architecture.
Service Packages Summary	Identifies each of the ITS service packages selected for a region and the elements associated with each ITS service package.
Interconnect Report	Identifies for each element all the other elements that are connected and the status of each connection.
Standards Activities Report	Identifies relevant standards associated with each of the data flows used in an ITS architecture.
Subsystem Diagram	Identifies the subsystems from the National ITS Architecture that are included in an ITS architecture.
Interconnect Diagrams	Identifies for each element all the other elements that are connected and the status of each connection. The Interconnect Diagrams can be customized to show all elements in an ITS architecture or a single element can be selected so that only the connections it has with other elements are shown. Interconnect Diagrams can also be viewed by individual ITS service packages to view all the elements and connections in each ITS service package.
Context Diagrams	Context Diagrams show all the data flows coming to and from a center (such as a Traffic Management Center), physical object, functional object, or a terminator (such as a vehicle). (Context diagrams can also be exported from SET-IT.)
Flow Diagrams	Flow Diagrams are similar to Interconnect Diagrams; however, the actual data flows that are part of each connection between elements are also shown.
Website	RAD-IT generates a customized interactive regional ITS architecture website with a hyperlinked database of stakeholders, ITS elements, data standards, and other elements of the architecture for reference.

Regional ITS Inventory

REGIONAL ITS INVENTORY

Central Texas has already deployed many ITS projects, programs, and initiatives that have come from multiple agencies and cover a range of transportation modes. During the stakeholder interviews and the stakeholder workshop, each stakeholder identified key existing and planned ITS deployments, as well as larger long-term ITS efforts that were underway.

Existing and Planned ITS Deployments

Table 4 shows the Regional ITS Deployment Inventory consisting of key ITS deployments for each stakeholder agency. In many cases, a deployment classified as existing might still need to be enhanced to attain the service level desired by the stakeholder. The deployments documented in this regional ITS inventory make up the majority of the elements included in the Regional ITS Architecture.

Following **Table 4**, a summary of each agency in the table is provided, including a discussion of the larger ITS efforts that each has underway as of 2024. Some of the larger multi-agency regional ITS efforts underway that are discussed in the summary, but are not shown in **Table 4**, include the following initiatives.

ITS INVENTORY IN THE INTERACTIVE ITS ARCHITECTURE

All ITS elements in the Central Texas Regional ITS Architecture can be found in the online **Interactive ITS Architecture**. To access the ITS elements, select the **Inventory** link on the left side bar of the **Interactive ITS Architecture**. To search by stakeholder, select **By Stakeholder**.

CAMPO Central Texas Transportation Management System (CTTMS) – CAMPO led effort to establish a platform for sharing transportation network data in real time. The initial focus of CTTMS is on sharing traffic signal timing data among partner agencies to streamline data sharing processes and improve traffic signal coordination across jurisdictional boundaries

TxDOT Regional Traffic Management Center (TMC) – TxDOT Austin District led effort to create a concept for a regional TMC. The effort is in the early planning phase, with key decisions on which agencies will be involved and the level of physical versus virtual infrastructure yet to be determined.

TxDOT Construction Partnership Program (CPP) –TxDOT Austin District led effort to develop an agency coordination and traveler information application to support major roadway construction projects and help the traveling public make informed route selection decisions. The initial focus of the CPP is the reconstruction of IH 35 through Central Texas, but the partnership could support all future regional construction projects.

University of Texas Safety, Mobility, Autonomy Research and Testing Track (SMARTTrack) – University of Texas Center for Transportation Research led effort to design and construct a three-tier test track for emerging ITS and CAV technologies and strategies. The effort also aims to compile a database for the capabilities and limitations of all tested technologies.

Table 4: Central Texas ITS Deployment Inventory

Agency	Freeway and Arterial Applications																						Transit Applications										
	Archived ITS Data	Blank Out Message Signs	Bluetooth Detection	CCTV Cameras	Centralized Traffic Signal Control Systems	Comparative Travel Time (CTT) Signs	Dynamic Message Signs (DMS)	Electronic Toll Collection	Emergency Vehicle Signal Preemption	Flood Monitoring Drones	Flood Monitoring Roadside Equipment	Freeway Safety Service Patrol	Lane Control DMS	Parking Management Systems	Pedestrian Hybrid Beacons	Portable Changeable Message Signs (PCMS)	Railroad Detection and Notification System	Real-Time Traveler Info. Website/Mobile Data	Road Weather Information Systems (RWIS)	Smart Work Zones	Traffic Management/Operations Center	Vehicle Detection - Arterial Intersections	Vehicle Detection - Freeways	Archived Transit Data	Automated Fare Payment	Automated Passenger Counters	Bus Rapid Transit	On-Board CCTV Cameras	Real-Time Traveler Info. at Transit Centers/Stops	Real-Time Traveler Info. Website/Mobile Data	Transit Operations Center	Transit Security Systems	Transit Signal Priority	Transit Vehicle Tracking
Regional																																	
TxDOT Austin District	●		●	●	●	●	●				●	●	●			●		●	●	●	●	●	●										
TxDOT Tolling				●				●				●									●												
CAMPO	○																																
CTRMA	●		●	●			●	●			●	●							●		●		●										
SH 130 Concessionaire				●		●	●	●													●		●										
Travis County OEM				○						○																							
Municipal																																	
City of Austin	●	●		●	●		●		●		●		●	●	●	●		●	●		●	●										●	
City of Cedar Park		●	●	●	●				○						●		●				●	●											
City of Georgetown				●	●				○		●			○								●											
City of Leander					●				●													●											
City of Pflugerville					●				○													●											
City of Round Rock				●	●				●		●			●		●					●	●											
City of San Marcos	●			●	●				●		●			○	●		●	●	○		●	●											
Transit																																	
CapMetro																								●	●	●	●	●	●	●	●	●	●	●
CARTS																								●	●	●			●	●	●	●		●

● Existing System ○ Planned System

LOCAL AGENCIES

City of Austin

The City of Austin Mobility Management Center (MMC) utilizes advanced traffic management system software that is used to actively monitor and operate traffic signals, dynamic message signs (DMS), field sensors, and closed-circuit television (CCTV) cameras. The City of Austin is continuing to explore pilot projects to test connected and autonomous vehicles in the City.

Advanced Traffic Signal Systems – The City of Austin operates almost 1,200 traffic signals. About 75 percent of its traffic signals and ITS devices are connected via the City's fiber network. The City of Austin is planning to have battery backup units deployed at all its traffic signals within the next five years as part of an effort to be more resilient during inclement weather events. In coordination with CapMetro, the City of Austin has transit signal priority implemented at about 150 traffic signals. About 200 of the City of Austin traffic signals have optical emergency vehicle preemption (EVP). However, the City is moving away from the optical EVP system and is piloting GPS-based EVP for its fire department and EMS vehicles. The City of Austin also has railroad preemption implemented at many signalized intersections with railroad crossings.

Combined Transportation, Emergency and Communications Center (CTECC) – CTECC is a partnership between the City of Austin, Travis County, TxDOT, and CapMetro. The building includes the TxDOT Austin District Traffic Management Center (TMC), City of Austin 911 and 311 answering and dispatch, CapMetro dispatch, and the Region's Emergency Operations Center (EOC).

Agencies currently located in CTECC include the following:

- City of Austin – Austin-Travis County Emergency Medical Services, Austin Fire Department, Austin Police Department, Office of Homeland Security and Emergency Management
- Travis County – Travis County Sheriff's Office, Travis County Constable, Office of Emergency Management
- TxDOT Austin District – TMC and HERO dispatch
- CapMetro – Transit Dispatch (on an ad hoc basis) and CapMetro Police Department

In Spring 2024, the City of Austin purchased an office complex in South Austin with significantly more space that is available at CTECC. The complex is anticipated to house CTECC 2.0. The preliminary plans for CTECC 2.0 include a larger operations floor with state-of-the-art technology, increased resiliency, and space for new agencies to locate some operations to CTECC including the University of Texas and Austin Independent School District.

City of Cedar Park

The City of Cedar Park has been increasing its surveillance coverage of its transportation network by installing CCTV cameras at all new traffic signals and deploying cameras at existing traffic signals. The City of Cedar Park has also increased ITS deployments by installing blank out signs for no right turns for vehicles at railroad crossings and major crosswalks. These signs are activated when a train or pedestrian is blocking the road for a vehicle turning right, where a vehicle would normally be able to turn right, particularly turning right on red.

School Zone Warning – The City of Cedar Park recently updated all of its school zone flashing beacons to have cellular modems. The City partnered with Glance to utilize an app that

notifies drivers when they enter a school zone. However, this app's notifications are limited to just drivers that open the app before their trip and leave the app running on their mobile device while they drive.

Traffic Signal Detection Systems – The City of Cedar Park plans to replace its existing traffic signal detection systems with a more integrated system. This would enable CAV capabilities, EVP, and ATSPM performance measures. The City of Cedar Park does not currently have EVP but plans to implement a partially GPS-based system that supplements GPS data from onboard units in emergency vehicles with advanced detection cameras.

City of Georgetown

Since the 2019 update of the Regional ITS Architecture, the City of Georgetown took over the operation and maintenance of TxDOT traffic signals within the City's boundaries, as well as blank out signage to warn drivers of trains blocking a railroad crossing and wrong-way driving detectors.

Parking Availability System – The City of Georgetown recently began construction of a large downtown parking garage with parking space availability technology. The parking garage will initially show parking space availability status using red and green lights above each space. In the mid-term future, the City hopes to be able to share parking space availability information online in real-time. In the long-term future, the City would like to deploy parking space availability systems in all its flat parking lots and street parking areas.

City of Leander

Since the 2019 update of the Regional ITS Architecture, the City of Leander took over the operation and maintenance of TxDOT traffic signals within the City's boundaries, which all have detection cameras that allow the City staff to see the traffic signal, detection status, and timing in real time. Several of the City of Leander's traffic signals have EVP implemented.

School Zone Systems – The City of Leander recently upgraded its school zone flashing beacon system to enable remote programming capabilities. The City of Leander has several speed feedback systems deployed in school zones and has the desire to deploy more.

City of Pflugerville

The City of Pflugerville recently took over the operation and maintenance of the TxDOT traffic signals within the City's boundaries, which currently utilize a mix of detection types including video, radar, and loop detection. The City of Pflugerville is exploring ways to shift from relying on contractors for traffic signal operations, maintenance, and ITS related activities and bring those in-house.

Adaptive Traffic Signal Timing – The City of Pflugerville recently signed a 10-year agreement with Applied Information to utilize Glance, a software platform for asset management and operations. The City plans to upgrade the City's traffic signal controllers to be on the same platform and establish a communication connection via cell modems in order to implement Glance. The City plans to pilot Glance to establish adaptive traffic signal timing at ten pilot intersections along FM 685, near SH 130. Glance supports the traffic signal cabinet aspects of EVP and the City recently purchased the compatible in-vehicle EVP system for its police department vehicles.

City of Round Rock

The City of Round Rock has implemented several new ITS systems since the 2019 update of the Regional ITS Architecture, such as piloting new detection systems that utilize radar and video, radar speed

feedback signs for school zones, and parking space availability systems in parking garages. The City of Round Rock has also made improvements to its traffic signal network by deploying battery backup units at every signal which trigger automated notifications when a signal's status switches to rely on the battery backup unit.

Dedicated TMC – The City of Round Rock now has a dedicated space in the Public Works building for a TMC with a video wall for monitoring the City's traffic signals. The new TMC has improved capabilities to remotely monitor and implement traffic signal timing changes as well as monitor and control CCTV cameras at various locations throughout the City for traffic surveillance. The TMC has one dedicated full-time staff member during standard business hours and is staffed outside of standard business hours as needed, such as for major special events.

City of San Marcos

The City of San Marcos has continued to expand its use of ITS and has implemented a traffic signal system that includes signal monitoring and control capabilities as well as pan-tilt-zoom CCTV cameras and GPS-based emergency vehicle preemption.

Virtual TMC Interactive Map – The City of San Marcos has developed an interactive map to compile and track the City's transportation asset data and make it accessible to the public. A key purpose of the map is to support virtual TMC operations because the City of San Marcos does not have the funds, staff, or space for a physical full-time TMC. The map allows City staff to set up automatic alerts triggered by various events such as asset status changes. This eliminates the need for City staff positions dedicated to monitoring traffic and the City's assets. The map identifies where the City has CCTV cameras and provides a link to a live stream site on YouTube. Another purpose of the map is to encourage residents and students to utilize alternate modes of transportation by showing bus routes, bus stops, and bus locations in real time, SPIN scooter locations and remaining charge range, sidewalk, bike lanes, etc. The map also shows the status of railroad crossings so travelers and emergency responders can see if a train is blocking their route in real-time and the duration the crossing has been blocked.

Travis County Office of Emergency Management (OEM)

Transportation Network Surveillance – Travis County OEM does not currently own, operate or monitor its own CCTV cameras, but is considering deploying CCTV cameras on Travis County facilities. Travis County OEM currently has access to the City of Austin CCTV camera feeds and more of the TxDOT camera feeds while in the Travis County EOC at CTECC. Travis County OEM also has access to remote cameras on helicopters and feeds from police. Travis County OEM is working on developing unmanned aerial vehicles (UAVs) for real-time video surveillance. These drones could allow Travis County OEM monitor crowd activity during special events such as the April 8, 2024 solar eclipse. The drones could also help monitor floods and assess damages after major weather events, tasks that are often difficult or unsafe to do when cameras and roads are damaged.

Public Alert System – Travis County OEM utilizes Warn Central Texas, a service provided to the Capital Area Council of Governments (CAPCOG) region. This service enables emergency centers and public safety answering points (PSAPs) to send messages to subscribers' phones. Travis County OEM also utilizes Integrated Public Alert System (IPAS), a system that allows emergency centers and weather centers to send a message, such as AMBER alerts and weather alerts, to all

mobile devices within a geofenced area. The message can be set for a duration so if anyone enters the geofenced area after the message is programmed, they will receive the message. Unlike Warn Central Texas, IPAS does not require a subscription. Not all counties in Central Texas can send messages because they have not gone through the process to apply to get access to IPAS.

REGIONAL AGENCIES

Capital Area Metropolitan Planning Organization (CAMPO)

While CAMPO does not deploy, manage, maintain, or operate ITS devices themselves, the agency leads the facilitation of ITS related discussions to identify and address challenges the transportation network faces at a regional level.

Central Texas Transportation Management System (CTTMS) – CAMPO is leading an effort to establish a platform for sharing transportation network data in real time. The initial focus of CTTMS is on sharing traffic signal timing data among partner agencies to streamline data sharing processes and improve traffic signal coordination across jurisdictional boundaries.

Capital Metropolitan Transportation Authority (CapMetro)

CapMetro has developed an extensive ITS program that includes automated vehicle location (AVL), automated passenger counters, security cameras both on buses and at multimodal stations, transit signal priority at City of Austin traffic signals for the entire CapMetro fleet, and automated transit fleet monitoring for fixed-route and paratransit vehicles.

Mobile Device Applications – Additionally, CapMetro has developed a separate mobile device application for each of its transit services that allow riders to view routes and schedules, purchase tickets, track CapMetro vehicles in real time, and request rides, varying depending on the service the application is for. CapMetro also shares real-time bus occupancy data in its applications including availability thresholds set to 'many seats', 'few seats', and 'full'.

Assisted and Autonomous Buses – CapMetro is exploring assisted buses, which means that the buses are not completely autonomous but would incorporate safety and operation features common in passenger cars such as back up cameras, blind spot monitoring, and lane assist. CapMetro is also working with the Federal Transit Administration (FTA) to develop an automated bus yard, in which busses would be able to pull out of their parking spot when they are done for the day and drive themselves through the wash, refuel themselves, and return to their parking spot.

Capital Area Rural Transit (CARTS)

CARTS buses include AVL, automated passenger counters, security systems, and automated maintenance tracking and alert systems.

Trip Planning Software – CARTS is developing a trip planner software with the goal to incorporate all CARTS services on one platform, as well as CapMetro information. CARTS

currently utilizes a different software for each of its transit services, which allow riders to purchase tickets, track CARTS vehicles in real time, and request rides, varying depending on the service the application is for.

Central Texas Regional Mobility Authority (CTRMA)

CTRMA has implemented several emerging ITS technologies and strategies along its toll facilities to actively monitor general traffic operations, detect and monitor traffic incidents, and manage the pricing of its toll lanes. CTRMA has also deployed wrong-way driving detection and warning systems that warns the wrong-way driver and automatically alerts CTRMA operators, TxDOT, and law enforcement. CTRMA is currently evaluating its existing shared-use paths to identify other potential technologies that could be beneficial, such as smart lighting at crossings, additional CCTV cameras, and classification kiosks that provide information regarding how many shared-use path users are walking and biking

Automated Transportation Management – CTRMA also utilizes Rekor for managing, monitoring, and analyzing most of its ITS deployments and collected data. CTRMA, as well as the TxDOT Austin District, utilizes Rekor's decision support system for incident detection and management. Rekor enables CTRMA's fixed CCTV camera arrays to detect traffic incidents and unexpected queueing and can then send automated notifications to alert CTRMA operators and other staff. Rekor uses microwave sensors to detect unexpected queueing and trigger queue notifications. Rekor enables CTRMA to have two-way communication with WAZE regarding traffic incidents, maintenance activities, planned construction, congestion, and other closures. Data linked to Rekor allows CTRMA staff to see where TxDOT HERO vehicles are in real-time using AVL data. CTRMA also uses Rekor to create crash risk heat maps for tracking metrics and planning purposes.

SH 130 Concession Company

Electronic Toll Payment – Within Central Texas, the SH 130 Concession Company operates Segments 5 and 6 of SH 130 in Caldwell and Travis Counties. This portion of SH 130 also operates using open road tolling, which accepts electronic tags including TxDOT's TxTAG, NTTA's TollTag, HCTRA's EZ TAG, Kansas Turnpike Authority's K-Tag, and Oklahoma Turnpike Authority's Pikepass.

Advanced Traffic Management System (ATMS) Software – The SH 130 Concession Company is nearing the completion of an upgrade to its ATMS software which would allow staff to control CCTV cameras and stream camera feeds on mobile devices.

Smart Truck Parking Facility RAISE Grant – To support Caldwell County with a recent RAISE Grant award, the SH 130 Concession Company is also getting involved with the initial planning stage of constructing a technologically advanced truck parking facility near the SH 130 and SH 80 interchange. This parking facility is anticipated to have over 100 long-term parking sites, amenities, electric vehicle (EV) charging stations, and an online platform with real-time parking space availability and reservation capabilities.

STATE AGENCIES

TxDOT Austin District

Highway Emergency Response Operator (HERO) Program – TxDOT operates the HERO Program, which is a safety service patrol program that provides roadside assistance and incident management services along 138 miles of IH 35, US 183, US 290, SH 71, and Loop 1 (Mopac). All HERO vehicles are equipped with traffic and lane control devices to assist at crash scenes, pressurized air to fill low tires, gasoline, battery jump-start cables, and more to support relocating disabled vehicles to safety and removing obstacles from the roadway. Several HERO trucks are also equipped with lane blades or push bumpers to remove debris or disabled vehicles from travel lanes, respectively. TxDOT recently expanded its fleet to have six vehicles with tow capabilities to remove vehicles from the roadway faster.

Regional Traffic Management Center (TMC) – The TxDOT Austin District is creating a concept for a regional TMC. The effort is in the early planning phase, beginning with identifying what ITS deployments partner transportation agencies have and could potentially supply information to a regional TMC. The TxDOT Austin District met with its partner transportation agencies to determine that a hybrid of in-person and virtual operations would be the most feasible and beneficial type of TMC for the region.

Construction Partnership Program (CPP) – The TxDOT Austin District established a working group, CPP, that is developing an agency coordination and traveler information application to support major roadway construction projects and help the traveling public make informed route selection decisions. The idea of the working group was initially sparked by the need to coordinate construction during the upcoming major reconstruction of IH 35, along intersecting routes and key alternate routes. The impact of work zones and need for coordination of closures do not end at IH 35, therefore the app will compile all planned construction projects from all participating agencies in the region. The effort will provide public notifications and access to construction information via 511 and the app.

Automated Freight Corridor - The TxDOT Austin District is working with Cavnue to pilot ITS deployments for an automated trucking corridor. This SH 130 Smart Freight Corridor project focuses on a 21-mile segment of SH 130 through the greater Austin area. The effort includes the deployment of cameras with artificial intelligence computation power to communicate with connected and automated commercial vehicles, which could also be used to support WWD detection and warning.

University of Texas Center for Transportation Research (UT CTR)

Safety, Mobility, Autonomy Research and Testing Track (SMARTTrack) – UT CTR, in coordination with transportation partners throughout the region, are designing and constructing a three-tier test track for putting emerging technologies and strategies through a thorough verification process. A key goal of SMARTTrack is to standardize the vetting process for all vendors and serve as a technology certification testbed. SMARTTrack also aims to compile a database for the capabilities and limitations of all tested technologies for transportation agencies throughout the region to reference when considering emerging technologies and strategies.

Regional ITS Data Infrastructure (RIDI) – With funding from the TxDOT Austin District, UT CTR is working on an effort referred to as RIDI. The goal is to compile transportation data from various data sources throughout the region, analyze that data, and disseminate inferences based on the analysis results and metrics. A key focus of this data processing project will be to establish methods and standards for communication flows and protocol among partner agencies, as well as how to react to the analysis results. This effort supports SMARTTrack's long-term goal for establishing an instantaneous data feedback loop involving connected and autonomous vehicles (CAVs).

Upon completion of the regional ITS deployment inventory, the next step in the development of the Regional ITS Architecture was to identify the level of deployment of ITS services that are important to Central Texas. The twelve groups of ITS service areas from the National ITS Architecture are shown in **Table 5**. Each service area is shown in the table with the current level of deployment in the region based on stakeholder feedback aggregated from the interviews and the stakeholder workshop. Limited, partial, and substantial levels of deployment in the region were considered for each of the service areas.

ITS services related to Public Transportation and Traffic Management were considered to have substantial deployment. These were areas where stakeholders had made significant investments in deploying an ITS service and generally described the functionality of the systems as meeting their needs. However, some additional deployments were still needed before a stakeholder could consider the ITS deployment completed. For example, with centralized traffic signal control most cities had some level of connectivity where they could remotely monitor and control some traffic signals. But several of them noted they had ongoing projects to connect more signals and upgrade controllers to enhance their ability to monitor signal status and implement real-time signal control changes.

ITS services related to Sustainable Travel and Vehicle Safety were the most limited. Sustainable travel, which includes infrastructure like HOV lanes and electric vehicle charging stations, is still very limited within Central Texas but offers many opportunities for additional deployment. Vehicle Safety services, which primarily include on-board vehicle safety features, is generally not something driven by public sector stakeholders so there was only limited deployment. Stakeholders did recognize there were opportunities to integrate more with CAV and will continue to look at opportunities to do so.

The Support service area ITS service packages tends to focus on support of ITS, such as mapping software or communications protocols, and there were not specific services identified that are deployed by stakeholders in Central Texas. The Support service area will be primarily addressed at the national level and ITS service packages for Central Texas will not be recommended.

Table 5: Central Texas ITS Architecture Service Areas

Service Area	Level of Deployment
Commercial Vehicle Operations	Partial Deployment
Data Management	Partial Deployment
Maintenance and Construction	Partial Deployment
Parking Management	Partial Deployment
Public Safety	Partial Deployment
Public Transportation	Substantial Deployment
Support	Not Applicable
Sustainable Travel	Limited Deployment
Traveler Information and Personal Mobility	Partial Deployment
Traffic Management	Substantial Deployment
Vehicle Safety	Limited Deployment
Weather	Limited Deployment

Existing Stakeholder Agency Agreements

The Central Texas ITS Architecture has identified numerous agency interfaces, information exchanges, and integration strategies necessary to deliver the ITS services and systems desired by stakeholders in Central Texas. Establishing these interfaces and information flows among public and private entities in the region will necessitate agreements among agencies to define parameters for sharing information. This is essential for supporting traffic management and incident management, providing traveler information, and performing other functions identified in the Regional ITS Architecture.

With the implementation of ITS technologies and the anticipated volume of information exchange outlined in the Central Texas ITS Architecture, it is likely that formal agreements between agencies will become necessary in the future. These agreements, while possibly not requiring financial commitments from agencies in Central Texas, should clearly outline specific roles, responsibilities, data exchanges, levels of authority, and other aspects of regional operations. Additionally, some agreements may outline specific funding responsibilities where appropriate and applicable.

Agreements should avoid being overly specific regarding technology whenever possible. As technology is likely to evolve, agreements that are not technology-neutral could necessitate updates with every technological advancement. Therefore, the primary focus of the agreements should be on the responsibilities of the agencies and the types of information that need to be exchanged.

Table 6 provides a list of existing agreements for Central Texas ITS operations. It is important to note that as ITS services and systems are implemented in the region, the planning and review process for those projects should include a thorough evaluation of potential agreements necessary for implementation or ongoing operations.

In **Appendix B**, templates have been provided for agreements that may be needed for two of the projects introduced in the Regional ITS Deployment Plan section. These templates cover agreements that may need to be established between agencies for the Regional TMC recommendation and the Real-Time Data Sharing recommendation. Several other recommended projects and programs in the Regional ITS Deployment Plan section either already have agreements in place, such as those TxDOT has developed for HERO services, or may not require agreements, such as Railroad Crossing Detection and Notification System which may be implemented independently by each municipality. The templates provided in **Appendix B** serve as a starting point and could be modified for use for a variety of future ITS projects and programs that may be implemented in Central Texas.

Table 6: Central Texas ITS Operational Agreements

Agreement	Description
Austin-Area Incident Management for Highways (AIMHigh) Memorandum of Regional Cooperation	Memorandum that outlines regional coordination among the State, local agencies, and private entities within the Austin region regarding traffic incident management.
CAMPO Open Roads Policy	Policy adopted by the CAMPO board that prioritizes safe and quick clearance of traffic incidents on major roads in Central Texas.
CapMetro/CARTS Real Time Bus Arrival Agreement	Agreement between CapMetro and CARTS to share real-time bus arrival information.
CapMetro/City of Austin Transit Signal Priority Agreement	Agreement between the City of Austin and CapMetro regarding transit signal priority at specific signals that are along CapMetro MetroRapid BRT routes.
City of Georgetown/TxDOT Wrong Way Driving Equipment Agreement	Agreement between the City of Georgetown and the TxDOT Austin District for Georgetown to maintain wrong-way driving equipment deployed on state routes in Georgetown.
City of Round Rock/CapMetro Fixed-Route Transit System Operation	Agreement between the City of Round Rock and CapMetro for fixed-route transit service in Round Rock.
CTECC Joint Operations Agreement	Agreement among all agencies located at CTECC for the operations and maintenance of CTECC facilities.
SMARTTrack Regional Partner Memorandum of Understanding	Agreement between the University of Texas and the TxDOT Austin District, CAMPO, City of Austin, and CTRMA to work together for the implementation and operation of Texas SMARTTrack.
TxDOT Agreement for Sharing ITS Data with the Media	Agreement between the TxDOT Austin District and various media outlets for the sharing of TxDOT CCTV camera feeds.
TxDOT Agreement for Fiber Sharing with Local Governments	Agreement between the TxDOT Austin District and local governments for the connection and sharing of fiber optic cable or related infrastructure owned by either TxDOT or a local government.

Regional Transportation Goals and ITS Needs

REGIONAL TRANSPORTATION GOALS AND ITS NEEDS

Regional needs that could be addressed by ITS were identified by stakeholders during the individual stakeholder interviews in June and July 2024 and the Stakeholder Review Workshop held in October 2024. The Capital Area Metropolitan Planning Organization's (CAMPO) 2050 Regional Transportation Plan (RTP) and the TxDOT Austin District's Transportation Systems Management and Operations (TSMO) Program Plan were also reviewed to determine other regional needs that could possibly be addressed through ITS. The needs identified through the regional ITS architecture and deployment plan development process as well as the CAMPO 2050 RTP and TxDOT Austin District TSMO Program Plan help determine which ITS service packages should be included in the Central Texas Regional ITS Architecture.

Regional Transportation Goals

CAMPO 2050 Regional Transportation Plan (RTP)

CAMPO is currently updating their RTP, which will be referred to as the 2050 Regional Transportation Plan. The draft CAMPO 2050 RTP outlines six goals related to Safety, Mobility, Stewardship, Economy, Equity, and Innovation. The deployment, integration, and operation of ITS can support all of these goals, with ITS strategies especially able to support goals related to safety and mobility.

Safety – Objectives include crash reduction and achieving vision zero metrics. Road service patrols such as the TxDOT Highway Emergency Response Operator (HERO) Program aid in making highways safer by assisting emergency responders, removing disabled vehicles from the roadway and shoulder, clearing debris from the roadway, and aiding stranded motorists. Network surveillance utilizing CCTV cameras and vehicle field sensors can provide a real-time view of conditions to improve incident detection times. Once detected, agencies can provide advanced warning of incidents or other potential safety issues that might impact travelers to reduce secondary crashes. ITS can also be used to disseminate traveler information, as well as emergency alerts including missing children, missing elderly, or suspected criminals can be broadcast to the public.

Mobility – Objectives include improving connectivity and reliability, proving more travel choices, and more regional coordination. ITS can provide traveler information for upcoming work zone delays or travel time comparisons which can be disseminated via different sources such as using roadside field equipment like DMS, through in-vehicle messaging, and directly to driver's personal device. Sensors, detectors, and cameras can enable real-time data collection which can support sharing existing transportation network condition information among partner transportation agencies so each can make informed decisions for how to proactively or reactively adjust the assets within their jurisdiction for a seamless and cohesive driver experience.

Stewardship – Objectives including system preservation though optimization and improving public health though air quality protection. ITS provides freeways, arterials, and transit systems with the tools to better operate and maximize the capacity of the system. ITS allows transportation system managers to coordinate with one another and with other agencies, such as public safety, that play a critical role in operations. ITS can be used to reduce the idle time of vehicles through coordinated signals and

adaptive signal timing. As a result, these technologies help reduce energy consumption and air pollution.

Economy – Objectives include economic development and keeping people and goods moving to reduce lost hours of productivity. ITS can support the movement and the regulation of commercial vehicles that carry essential goods to consumers in addition to hazardous materials. By reducing the impacts of traffic incidents, work zones, and weather events, ITS can reduce delays to goods and lost hours of productivity to limit negative impacts to the economy. ITS can also support the operation of the transportation network during special events to assist with managing visitor traffic and atypical traffic patterns.

Equity – Objectives include providing access to opportunity and minimizing impact on human environment. ITS can improve transit operations, safety, and user experience by providing signal priority to transit vehicles, alerting transit vehicles of nearby pedestrians, and streamlining the process of trip planning and purchasing fares. ITS can benefit vulnerable road users such as pedestrians and bicyclists by alerting motor vehicles of their presence. ITS can also automate tasks and processes that historically require dedicated staff, therefore bringing new transportation network management capabilities to jurisdictions with fewer resources.

Innovation – Objectives including leveraging technology to increase efficiency of travel and improving the flexibility of the system to meet changing needs, conditions, and emergency technologies. ITS can establish communication and remote control capabilities infrastructure to allow signal technicians to remotely troubleshoot traffic signal issues, to allow adjustments traffic signal timings when volumes are diverted due to unexpected closures or congestion, and to make the system compatible with CAVs. Adaptive signal timing systems allow the transportation network to accommodate fluctuating traffic patterns in real time.

TxDOT Austin District Transportation Systems Management and Operations (TSMO) Program Plan

TSMO is an approach that aims to improve mobility, safety, and reliability for all modes of transportation. The approach makes use of mobility solutions and ITS that can be implemented faster and at a lower cost than other projects seeking to add roadway capacity. Recognizing the need to operate the system in an integrated and coordinated fashion, the TxDOT Austin District completed its TSMO Program Plan in June 2018. This TSMO Program Plan identifies the strengths and needs related to transportation operations within the District, which lead the District to develop seven goals to strive for over the next five years to improve operations of the existing transportation network. Of these seven goals, the following five can be addressed by ITS as described:

Reliability – ITS can enable real-time data collection and automate data analysis to support decision-making processes. This can include sensors collecting data to provide real-time travel time comparison information to drivers via DMS or map applications on their mobile devices to assist them in making informed routing decisions.

Efficiency – ITS can establish communication and remote control capabilities infrastructure to allow signal technicians to remotely troubleshoot traffic signal issues, to enable adjustments traffic signal timings when volumes are diverted due to unexpected closures or congestion, and to make the system

compatible with CAVs. ITS can also include adaptive signal timings to accommodate fluctuating traffic patterns in real time.

Customer Service – ITS can provide real-time traveler information such as upcoming work zone delays, travel time comparisons, and transit vehicle locations by utilizing sensors, Bluetooth data, or AVL. This information can be disseminated via various sources such as posting on roadside field equipment like DMS, through in-vehicle messaging, sent directly to driver's personal device, or updating information on a mobile device application. ITS can improve transit operations and user experience by providing signal priority to transit vehicles and streamlining the process of trip planning and purchasing fares.

Collaboration – ITS can enable transportation agencies to collect and share transportation network data in real time. This allows agencies to optimize their transportation network assets based on the surrounding traffic conditions and creates a seamless traveler experience across jurisdictional boundaries.

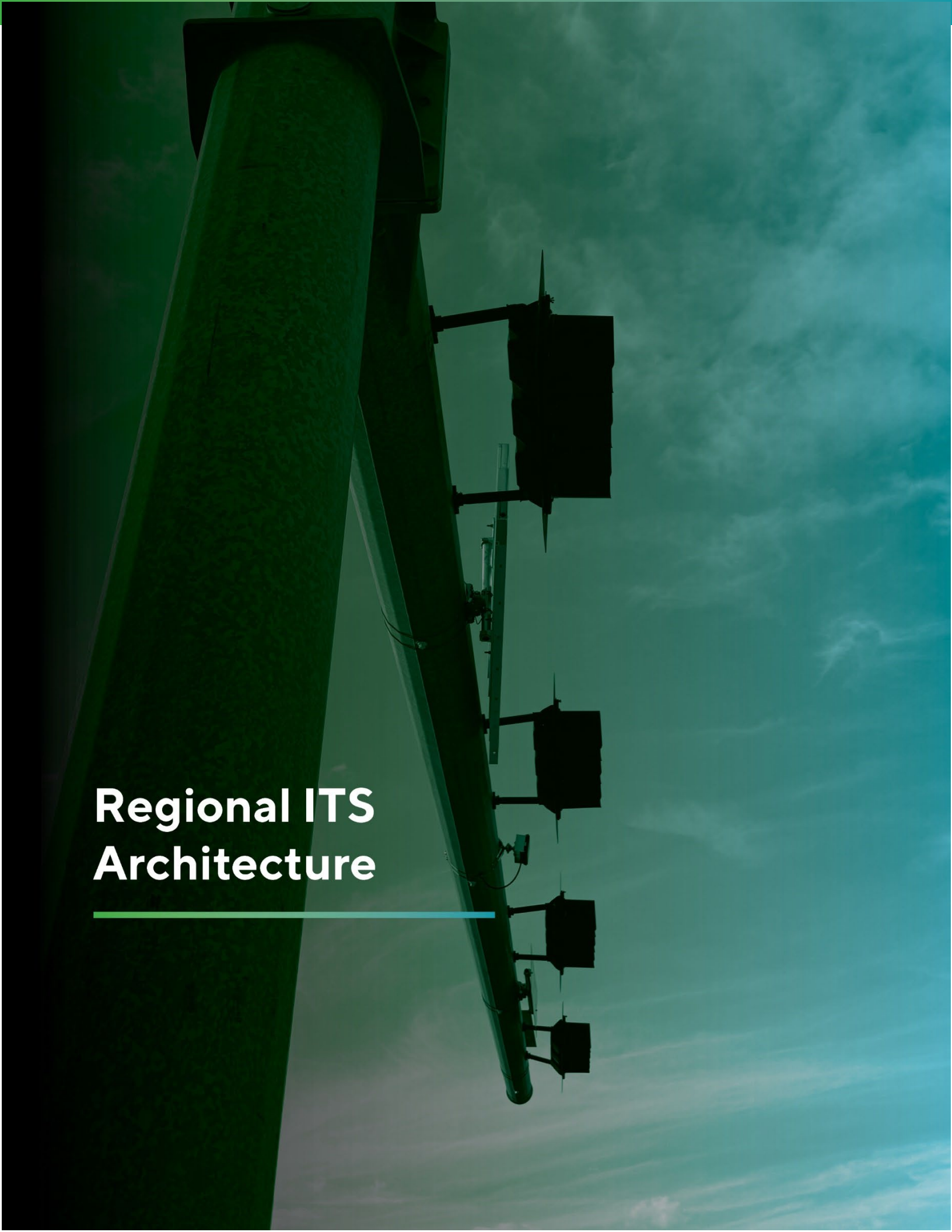
Technology – The deployment and implementation of ITS enables real-time data collection, data processing, and ultimately decision making for not only transportation agency operations staff, but for the driving public and CAVs. Additional data provide a more accurate picture of the existing traffic conditions and allows operations staff to better understand what impacts changes to the transportation network may have.

Regional ITS Needs

Regional ITS needs were defined based on stakeholder input gathered through the individual stakeholder interviews and the Stakeholder Review Workshop, as well as review of existing studies and reports in the region such as the draft CAMPO 2050 RTP and the TxDOT Austin District TSMO Program Plan discussed previously. The primary ITS regional needs identify most often by Central Texas stakeholders are presented in **Table 7**, organized by ITS service area. The goals most often expressed by stakeholders were related to the ITS service areas of: Data Management, Maintenance and Construction, Public Safety, Public Transportation, and Traffic Management.

Table 7: Central Texas Regional ITS Needs

ITS Need	
 ***Data Management***	Share traffic signal timing, closure, and relevant incident data among agencies in real time for both operational and planning initiatives.
	Share live CCTV camera feeds among all agencies for improved active traffic monitoring and incident detection.
	Develop a local or regional fiber plan to inventory existing fiber optic cable deployments and to support future ITS bandwidth.
 ***Maintenance and Construction***	Improve coordination of maintenance and construction activities between agencies for traffic operations.
 ***Public Safety***	Expand freeway safety service patrol coverage to help maintain traffic operations on principal arterials.
	Improve coordination between agencies during large-scale incidents and other events.
 ***Public Transportation***	Develop a regional transit fare payment system that could accommodate the transfer of passengers between modes and agencies.
 ***Traffic Management***	Improve coordination of traffic signal system timing between agencies.
	Improve coordination between all agencies for traffic and transit operations.
	Establish railroad crossing monitoring capabilities and communicate blockages to drivers, transit, and emergency personnel.
	Increase staffing and additional training to operators and signal technicians to ensure that deployments of ITS are fully utilized and issues are resolved efficiently.



Regional ITS Architecture

REGIONAL ITS ARCHITECTURE

Upon completion of the Central Texas ITS inventory and identification of ITS related regional needs, the next step in the development of the Regional ITS Architecture was to identify the ITS services that are important to the region.

ITS Service Packages

The Central Texas stakeholders reviewed the National ITS Architecture service packages and selected based on the relevance of the functionality that each ITS service package could provide to the region, as well as to each individual agency.

Selection and Prioritization of Service Packages

Stakeholders selected 76 ITS service packages for implementation in Central Texas. The selected ITS service packages are identified in **Table 8**, organized by the applicable ITS service area from the National ITS Architecture and implementation priority. Detailed descriptions of each ITS service package in the National ITS Architecture are located in the online Interactive ITS Architecture at CAMPO's website.

The Interactive ITS Architecture ITS Service Package section provides customized version of the ITS service packages for stakeholders that currently, or plan to operate, specific services. Most ITS services have been customized for agencies, however in some cases ITS service packages were developed for a general Municipality/County stakeholder rather than specifically for each city or county separately. Regional and state agencies, such as TxDOT, CTRMA, and Capital Metro do have all their ITS service packages customized.

SERVICE PACKAGES IN THE INTERACTIVE ITS ARCHITECTURE

All ITS service packages that were customized for the Central Texas Regional ITS Architecture can be found in the online **Interactive ITS Architecture**. To access the ITS service packages, select the **Services** link on the left side bar of the **Interactive ITS Architecture**, then click on the desired ITS service package. To see the ITS service package diagram, select the link below **Diagram**.

While the Support ITS service area did draw some interest from Regional stakeholders, the ITS service packages within the Support service area generally applied most directly to existing private-sector services, many of which are operating their services in regions throughout the United States. Examples including mapping services and communication protocols. As a result, the Support ITS service area service packages are not included in the Central Texas Regional ITS Architecture and will instead be described at the project architecture level if needed for future projects that may use these services.

Table 8: Central Texas ITS Service Package Prioritization by Service Area

Legend

High Priority Service Packages

Medium Priority Service Packages

Low Priority Service Packages

COMMERCIAL VEHICLE OPERATIONS

CVO12 HAZMAT Management

CVO07 Roadside CVO Safety

CVO08 Smart Roadside and Virtual WIM

DATA MANAGEMENT

DM01 ITS Data Warehouse

DM02 Performance Monitoring

MAINTENANCE AND CONSTRUCTION

MC05 Roadway Maintenance and Construction

MC06 Work Zone Management

MC08 Maintenance and Construction Activity Coordination

MC01 Maintenance and Construction Vehicle and Equipment Tracking

MC07 Work Zone Safety Monitoring

MC02 Maintenance and Construction Vehicle Maintenance

MC09 Infrastructure Monitoring

PARKING MANAGEMENT

PM01 Parking Space Management

PM03 Parking Electronic Payment

PM02 Smart Park and Ride System

PM04 Regional Parking Management

PUBLIC SAFETY

PS01 Emergency Call-Taking and Dispatch

PS02 Emergency Response

PS03 Emergency Vehicle Preemption

PS08 Roadway Service Patrols

PS10 Wide-Area Alert

PS12 Disaster Response and Recovery

PS13 Evacuation and Reentry Management

PS14 Disaster Traveler Information

PUBLIC TRANSPORTATION

PT01 Transit Vehicle Tracking

PT02 Transit Fixed-Route Operations

PT03 Dynamic Transit Operations

PT04 Transit Fare Collection Management

PT05 Transit Security

PT06 Transit Fleet Management

PT08 Transit Traveler Information

PT09 Transit Signal Priority

PT07 Transit Passenger Counting

PT11 Transit Pedestrian Indication

PT12 Transit Vehicle at Station/ Stop Warnings

PT14 Multi-modal Coordination

SUSTAINABLE TRAVEL

ST06 HOV/HOT Lane Management

ST02 Eco-Traffic Signal Timing

ST05 Electric Charging Stations Management

ST01 Emissions Monitoring

Legend

High Priority Service Packages

Medium Priority Service Packages

Low Priority Service Packages

TRAVELER INFORMATION AND PERSONAL MOBILITY

TI01 Broadcast Traveler Information

TI02 Personalized Traveler Information

TI07 In-Vehicle Signage

TRAFFIC MANAGEMENT

TM01 Infrastructure-Based Traffic Surveillance

TM03 Traffic Signal Control

TM06 Traffic Information Dissemination

TM07 Regional Traffic Management

TM08 Traffic Incident Management System

TM10 Electronic Toll Collection

TM12 Dynamic Roadway Warning

TM13 Standard Railroad Grade Crossing

TM15 Railroad Operations Coordination

TM19 Roadway Closure Management

TM25 Wrong-Way Vehicle Detection and Warning

TM02 Vehicle-Based Traffic Surveillance

TM04 Connected Vehicle Traffic Signal System

TM17 Speed Warning and Enforcement

TM16 Reversible Lane Management

VEHICLE SAFETY

VS05 Curve Speed Warning

VS07 Road Weather Motorist Alert and Warning

VS08 Queue Warning

VS12 Vulnerable Road User Safety

VS13 Intersection Safety Warning and Collision Avoidance

VS09 Reduced Speed Zone Warning/Lane Closure

VS11 Oversize Vehicle Warning

VS16 Automated Vehicle Operations

VS10 Restricted Lane Warnings

VS15 Infrastructure Enhanced Cooperative Adaptive Cruise Control

WEATHER

WX01 Weather Data Collection

WX02 Weather Information Processing and Distribution

WX03 Spot Weather Impact Warning

The needs identified in the stakeholder engagement efforts, as well as needs from the CAMPO 2050 RTP and TxDOT Austin District TSMO Program Plan are listed in **Table 9**. The table also identifies which ITS service packages address each ITS need.

Customization of ITS Service Packages

After selecting the ITS service packages in the National ITS Architecture that were applicable for Central Texas, each ITS service package and the elements that could be included to customize it for the region were reviewed for each specific stakeholder. The selected ITS service packages were customized to reflect the unique systems, subsystems, and data flows in Central Texas.

ITS service packages represent a service that will be deployed as an integrated capability. Each ITS service package is shown graphically with the ITS service package name, agencies involved, and desired data flows. The data flows are shown as either existing, planned, or future. Data flows shown as existing indicate that the connection exists in at least one location within the jurisdiction. Data flows shown as existing should not be interpreted to mean that deployment of that service is complete as there are many cases where a data flow exists in an ITS service package but a need has been identified to expand the service to additional locations. Planned flows indicate a connection that is in the process of being established or has funding procured. Future flows indicate that the stakeholder(s) has expressed interest in creating the connection but does not have concrete plans developed or dedicated funding to do so.

Customized ITS service packages were created for the Central Texas Regional ITS Architecture based on stakeholder input during the stakeholder interviews and stakeholder workshop. If a stakeholder specified a system has been deployed, there are plans for deploying a new system that has dedicated funding, or the stakeholder has interest in the system in the future, a customized ITS service package for that system was developed for that stakeholder. If a stakeholder did not identify existing deployments or the potential for future deployments of a particular system, a custom ITS service package for that system was not developed for the stakeholder.

As noted earlier in this section, most ITS services have been customized for agencies, however in the case of cities, ITS service packages were developed for a general Municipality/County stakeholder rather than specifically for each city or county separately. The primary reason for this was due to limitations of RAD-IT and the number of ITS service packages and elements that it can included. For these cities, customized ITS service packages that are specific to individual cities or counties can be developed at the project level. The Municipal/County ITS service packages should provide a good starting point and generally match what most cities have, or have planned, for deployment. The one exception is the City of Austin. Because the City of Austin had the greatest number of unique deployments and is the largest city by population in Central Texas, the City of Austin ITS service packages are customized.

Regional and state agencies, such as TxDOT, CTRMA, and Capital Metro do have all their ITS service packages customized. The ITS service package diagrams for all service packages identified for Central Texas are included on the CAMPO website on the Interactive ITS Architecture section of the Regional ITS Architecture page. The status of all ITS service packages for all stakeholders, provided as existing, planned, or future, can be found in **Appendix C**.

Regional ITS Needs and Corresponding ITS Service Packages

Input received from stakeholders during the stakeholder interview and stakeholder workshop provided valuable information for the ITS service package customization process. The needs that were identified by stakeholders and presented in Regional Transportation Goals and ITS Needs section of this report are included in **Table 9**. **Table 9** also identifies how each need was addressed and includes all the ITS service packages that were identified and customized to address the ITS need.

Architecture Interfaces

The Central Texas Regional ITS Architecture not only identifies the various systems and stakeholders involved, but it also emphasizes the importance of connectivity between transportation systems. The system interconnect diagram provides a high-level overview of the relationships between subsystems in the architecture, such as the relationship between various types of centers, field devices, and vehicles. The system interconnect diagram helps explain the high-level interfaces between all subsystems.

The National ITS Architecture system interconnect diagram has been customized for the Central Texas Regional ITS Architecture and is shown in **Figure 5**. The customized system interconnect diagram is based on the system inventory and information gathered from the stakeholders. Each of the sub-systems that are included in the Central Texas Regional ITS Architecture have been shown in black text. Subsystems that are not included in the Central Texas Regional ITS Architecture are shown in gray text.

Element interconnect diagrams have also been developed, which show each element from the Central Texas ITS Architecture and all of the other elements it interfaces with in the architecture. These diagrams are available through the Interactive website on CAMPO's website and include all elements and data flows between them.

INTERFACES IN THE INTERACTIVE ITS ARCHITECTURE

Interfaces between elements in the Central Texas Regional ITS Architecture can be found in the online **Interactive ITS Architecture**. To access the interfaces, select the **Interfaces** link on the left side bar of the **Interactive ITS Architecture**, then click on the element you are interested in to see the data flows between the element and all other elements with which it interfaces.

Table 9: Central Texas Regional ITS Needs and Corresponding ITS Service Packages

ITS Need	Corresponding ITS Service Packages
Data Management Realated Needs	
Share traffic signal timing, closure, and relevant incident data among agencies in real time for both operational and planning initiatives.	DM01 – ITS Data Warehouse TM03 – Traffic Signal Control TM08 – Traffic Incident Management System MC05 – Roadway Maintenance and Construction MC06 – Work Zone Management
Share live CCTV camera feeds among all agencies for improved active traffic monitoring and incident detection.	DM01 – ITS Data Warehouse TM01 – Infrastructure-Based Traffic Surveillance TM06 – Traffic Information Dissemination TM08 – Traffic Incident Management System
Develop a local or regional fiber plan to inventory existing fiber optic cable deployments and to support future ITS bandwidth.	DM01 – ITS Data Warehouse M01 – Infrastructure-Based Traffic Surveillance TM03 – Traffic Signal Control TM06 – Traffic Information Dissemination TM07 – Regional Traffic Management
Maintenance and Construction Related Needs	
Improve coordination of maintenance and construction activities between agencies for traffic operations.	MC05 – Roadway Maintenance and Construction MC06 – Work Zone Management MC08 – Maintenance and Construction Activity Coordination
Public Safety Related Needs	
Expand freeway safety service patrol coverage to help maintain traffic operations on principal arterials.	PS02 – Emergency Response PS08 – Roadway Service Patrols
Improve coordination between agencies during large-scale incidents and other events.	PS02 – Emergency Response PS12 – Disaster Response and Recovery TM06 – Traffic Information Dissemination TM07 – Regional Traffic Management TM08 – Traffic Incident Management System TM19 – Roadway Closure Management WX02 – Weather Info Processing and Dissemination
Public Transportation Related Needs	
Develop a regional transit fare payment system that could accommodate the transfer of passengers between modes and agencies.	PT04 – Transit Fare Collection Management PT14 – Multi-modal Coordination

ITS Need	Corresponding ITS Service Packages
Traffic Management Related Needs	
Improve coordination of traffic signal system timing between agencies.	ST02 – Eco-Traffic Signal Timing TM03 – Traffic Signal Control TM07 – Regional Traffic Management
Improve coordination between all agencies for traffic and transit operations.	TM07 – Regional Traffic Management
Establish railroad crossing monitoring capabilities and communicate blockages to drivers, transit, and emergency personnel.	TM13 – Standard Railroad Grade Crossing TM15 – Railroad Operations Coordination
Increase staffing and additional training to operators and signal technicians to ensure that deployments of ITS are fully utilized and issues are resolved efficiently.	TM03 – Traffic Signal Control TM07 – Regional Traffic Management

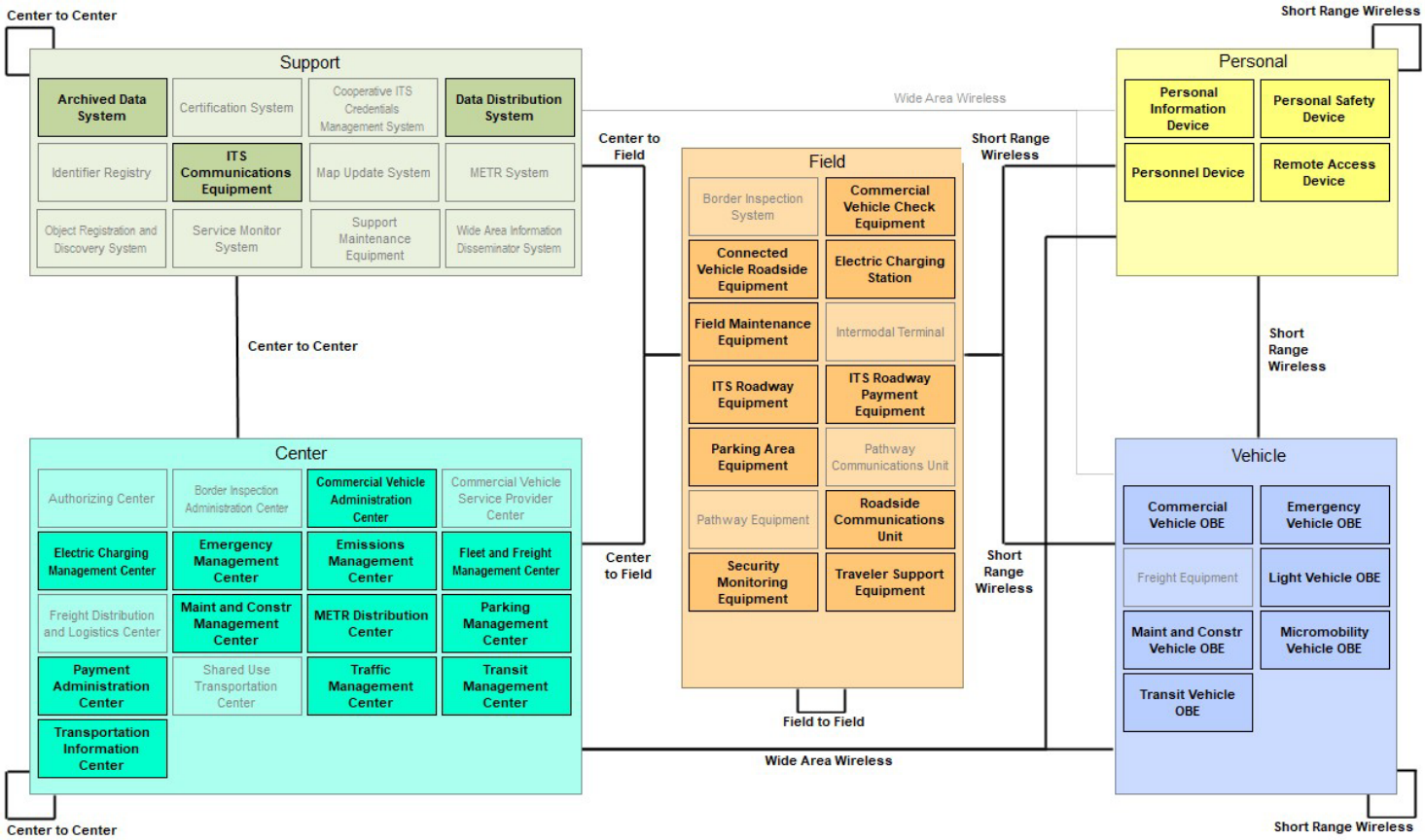


Figure 5: Central Texas System Interconnect Diagram

Roles and Responsibilities

Roles and responsibilities related to the operations of the ITS in Central Texas are included in the Interactive ITS Architecture. In the Central Texas Regional ITS Architecture, these roles and responsibilities are documented for eight separate service area, with each area describing an aspect of the operation of an interconnected, regional ITS network. The service areas covered are described briefly below:

Archived Data System – Operation of systems to collect and maintain archived data.

Emergency Management – Operation of systems to provide emergency call taking, public safety dispatch, and emergency operations center operations.

Freeway Management – Operation of systems to provide wrong-way driving warning, variable speed limits, service patrols, and roadside traveler information.

Incident Management – Operation of systems to provide rapid and effective response to traffic incidents. This service area includes systems to detect and verify incidents as well as coordinated agency response to the incidents.

Parking Management – Operations of systems for regional and local parking information dissemination.

Maintenance and Construction Management – Operation of systems to monitor and manage roadside maintenance and construction work zone activities.

Traffic Signal Management – Operation of traffic signal systems that react to changing traffic conditions and provide coordinated intersection timing over a corridor or an area.

Transit Services – Operation of systems to manage fleets of transit vehicles and overall transit systems more efficiently.

Traveler Information Dissemination – Operation of systems to provide static and real-time transportation information to travelers.

ROLES AND RESPONSIBILITIES IN THE INTERACTIVE ITS ARCHITECTURE

Roles and responsibilities in the Central Texas Regional ITS Architecture can be found in the online **Interactive ITS Architecture**. To access the roles and responsibilities, select the **Roles and Responsibilities** link on the left side bar of the **Interactive ITS Architecture**, then click on the desired area

Standards

Standards are an important tool that will allow efficient implementation of the elements in the Central Texas Regional ITS Architecture over time. Standards facilitate deployment of interoperable systems at local, regional, and national levels without impeding innovation as technology advances, vendors change, and as new approaches evolve. The USDOT's ITS Joint Program Office is supporting Standards Development Organizations (SDOs) with an extensive, multi-year program of accelerated, consensus-based standards development to facilitate successful ITS deployment in the United States.

Standards are based on the physical subsystem architecture flows identified in the customized ITS service packages for the Central Texas region. Standards for specific ITS architecture flows in the Central Texas Regional ITS Architecture are available through the National ITS Architecture website. Since the website is updated more frequently than the RAD-IT software and links directly to additional information about the applicable standard, the website is the preferred method for determining which standards apply to a particular architecture flow. To locate this information, do the following:

Go to the main page of the National Architecture website at http://www.arc-it.net/

↓

Select the link for **Information Flow** embedded in the sub-bullet titled **Views.**

↓

Select the desired information flow from the alphabetical list of information flows.

↓

Scroll to find the appropriate application of the information flow you are researching.

↓

Select the information flow name again to find additional detail about the information flow, including applicable standards found in the **Communication Solutions** tab

RAD-IT Database

The USDOT RAD-IT Version 9.3 was used generate document the Central Texas Regional ITS Architecture and generate the ITS service package diagrams and other pieces of the Regional ITS Architecture discussed in this section. The RAD-IT database can be downloaded directly from CAMPO's website. To access the file, it is recommended that the user download the free RAD-IT software directly from the USDOT National ITS Architecture website. Version 9.3 or newer will be required to view the CAMPO Regional ITS Architecture RAD-IT database.

RAD-IT DATABASE

The **RAD-IT** database can be downloaded directly from the CAMPO website under the Regional ITS Architecture and Deployment Plan section.

www.CAMPOTexas.org

Regional ITS Deployment Plan

REGIONAL ITS DEPLOYMENT PLAN

The ITS Deployment Plan Section identifies regionally significant ITS projects and programs in Central Texas that should be implemented to achieve the desired functionality outlined in Regional ITS Architecture. The ITS Deployment Plan Section expands upon the ITS Architecture by providing recommendations and strategies for projects and programs in Central Texas, potential stakeholders involved, and proposed timelines for implementation. The ITS Deployment Plan Section also connects each regional project and program to the ITS Architecture by identifying ITS service packages that correspond to respective projects and programs.

Project and Program Development

Stakeholder input was gathered through a review of existing ITS inventory and deployments, stakeholder interviews, and a stakeholder workshop. The regional needs identified in the Regional ITS Architecture, as well as the prioritized list of ITS service packages, also contributed to projects and programs that have been identified in this section.

The ITS Deployment Plan Section provides stakeholders with a comprehensive list of regionally significant ITS projects and programs that align with the Regional ITS Architecture and aim to address transportation needs in Central Texas. It is important to note that the Plan is not limited by financial constraints. The included projects represent the desired implementations of stakeholders, although funding will still be required to bring these projects to fruition. It should also be noted that this plan focuses primarily on larger, multi-agency, regional projects. Many of the stakeholders in Central Texas have plans to expand existing system or add new systems within their agencies. These existing and planned systems are presented in the Regional ITS Inventory section of this report.

Each of the projects and program recommended in the Regional ITS Deployment Plan has been checked against the Regional ITS Architecture to ensure they are in conformance. This should assist agencies deploying these projects in the future with meeting FHWA and FTA requirements for ITS architecture conformity. The projects in the Plan could also feed into the long-range planning process and provide CAMPO with a list of priority ITS projects for consideration during future calls for projects.

Recommended Regional Projects and Programs

Stakeholders identified nine regionally significant ITS deployment projects and programs for ITS in Central Texas. These projects do not encompass all the regional ITS needs within the Central Texas; however, stakeholders recommended that emphasis be placed on implementation related to these nine in order to provide the greatest benefit to travelers. The nine projects and programs included are:

- Regional Traffic Management Center
- Real-Time Data Sharing
- Regional Live Video Sharing Platform – Regional Traffic Information Dissemination
- Railroad Crossing Detection and Notification System
- Regional Fiber Network Plan
- HERO Expansion

- Regional Transit Fare Payment Platform
- Automation of Operational Capabilities
- Increased Staffing for Operations and Maintenance

A summary of each of the nine regional projects and programs is provided in this section. For each in addition to a description of the project or program, the following information is provided:

Basis of Need – Describes how the regional deployment project or program meets one of more of the regional ITS needs that were identified in the Regional ITS Architecture.

Benefits – Potential benefits that might be realized with implementation of the project or program.

Timeframe – Describes the approximate timeframe it may take to develop and implement each project.

- Short-Term: Within the next five years
- Medium-Term: Within the next six to ten years
- Long-Term: Anything over ten years

Lead and Supporting Agencies – The agencies identified as most likely to lead and support the implementation of the project or program.

Relevant ITS Service Packages – The ITS service packages identified in the Regional ITS Architecture that support this implementation and should be used to show ITS architecture conformity if federal funding is being used. These ITS service packages can also be used to support the development of a systems engineering analysis.

REGIONAL TRAFFIC MANAGEMENT CENTER

The establishment of a Regional Traffic Management Center (TMC) in Central Texas has been prioritized by several stakeholders, including TxDOT, CAMPO, and various municipal agencies. A Regional TMC would enhance traffic operations in the Central Texas Region by increasing opportunities to share real-time information, facilitate inter-agency communication, and enable collaborative operational decisions that impact multiple agencies. The Regional TMC will likely be a virtual or hybrid model (a physical building with many partners participating virtually) since many municipalities noted interest in participating but face challenges in sending staff to a physical location outside their own municipality. TxDOT is currently leading an effort to study the feasibility of a Regional TMC.

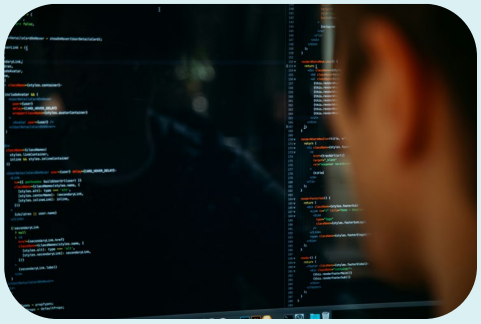
Basis of Need

Several Central Texas stakeholders have emphasized the need to connect the region's transportation agencies via a Regional TMC to improve traffic signal coordination across jurisdictional boundaries. These stakeholders also noted the necessity of real-time traffic monitoring and management, particularly along the regional surface street network during major freeway construction planned for the region. Stakeholders highlighted the need for better incident management, coordination of work zones, and preparation for inclement weather and planned special events. CAPCOG's Homeland Security Task Force ITS Sub-Committee identified the need for a regional transportation resource list to facilitate multi-agency coordination, resource sharing, and swift emergency responses. A Regional TMC could provide the type of multi-agency coordination recommended by CAPCOG.

Benefits

A Regional TMC would support improved coordination among agencies for improved signal timing and better management of incidents, construction, inclement weather, and planned special events. Beyond coordination between traffic agencies, a Regional TMC could also enable better coordination with transit, public safety, and location emergency management agencies. Additionally, the Regional TMC could provide access to resources and information for smaller municipalities that do not have the means to establish their own TMC.

Houston TranStar, the joint operations center in Houston, estimated a **benefit-cost ratio of 21.5** for 2023.



Relevant ITS Service Packages

- **TM03** Traffic Signal Control
- **TM06** Traffic Information Dissemination
- **TM07** Regional Traffic Management
- **TM08** Traffic Incident Management System

Timeframe

Short to Mid-Term

Lead Agency

TxDOT Austin District

Supporting Agencies

All Central Texas Stakeholders

Related Efforts

The TxDOT Austin District is studying the establishment of a Regional TMC like the one described here, which includes participation from TxDOT, local municipalities, and CTRMA. TxDOT is considering a hybrid TMC format that would offer a physical space for staff from regional agencies who wish to collocate, as well as a virtual connection option for agencies that prefer not to send staff to a physical TMC. Additionally, the City of Austin is expanding CTECC with CTECC 2.0, which could serve as the location for the Regional TMC. CTECC 2.0 provides more floor space than the original CTECC and could likely accommodate additional traffic agencies on the operations floor.

REAL-TIME DATA SHARING

The ability to share real-time traffic operations data has been identified as a key need in Central Texas. Real-time data needs include traffic signal timing, incidents, construction closures, rail crossing blockages, and weather. Guidance from the USDOT has also emphasized making real-time transportation data available so agencies can more reliably track the performance of a transportation network. Many stakeholders have access to real-time data for their own agency but have limited or no access to real-time data from other stakeholders in the region. The CAMPO CTTMS is piloting a deployment of a real-time data sharing system for traffic signal timing, which could eventually be expanded to provide much of the needed real-time regional data. The TxDOT CPP will provide additional real-time data for construction closures. The CPP is initially focused on closures related to construction on IH 35 but could be expanded to provide closure information regionwide.

Basis of Need

Almost all stakeholders identified the need to improve access to real-time data including traffic signal coordination, incident management, maintenance activities, and construction among agencies in Central Texas. Information from a real-time data sharing system will help agencies make operational decisions that consider the conditions beyond their own jurisdiction and impacts to the entire transportation system.

Benefits

Improving operations begins with a complete understanding and situational awareness of the full transportation system. Sharing real-time information related to traffic signal timing, incidents, construction closures, and other conditions will allow transportation operators to make informed decisions and quickly understand the impact of changes to the system. Shared information will also enable public and private sector agencies to provide more complete traveler information to the public. Information can be shared with public safety and emergency operations agencies to provide advance situational awareness throughout the region during emergencies. Additionally, real-time data sharing systems can provide real-time information to CAVs, improving their performance and safety.

Relevant ITS Service Packages

- **DM01** ITS Data Warehouse
- **MC05** Roadway Maintenance and Construction
- **MC06** Work Zone Management
- **TM03** Traffic Signal Control
- **TM08** Traffic Incident Management System

Timeframe

Short to Mid-Term

Lead Agencies

CAMPO ● TxDOT Ausitn District

Supporting Agencies

All Central Texas Stakeholders

Related Efforts

Central Texas systems with real-time data sharing capabilities include the CAMPO CTTMS and the TxDOT CPP. The CTTMS is focused on providing real-time traffic signal timing information on corridors that cross jurisdictional boundaries but could be expanded to include many other types of data in the future. The CPP is focused on construction closure information on IH 35 but could expand to include other routes and additional types of data. The Regional TMC effort led by TxDOT would also provide agencies the ability to share real-time information if multiple agencies work through a single hybrid or virtual TMC.

REGIONAL LIVE VIDEO SHARING PLATFORM

A regional platform for sharing live video from CCTV cameras would enable agencies to share video from TxDOT, CTRMA, municipalities, and other traffic operations agencies with public sector transportation, public safety, and emergency management agencies. This sharing platform could be designed to allow the owning agency the ability to quickly terminate any video feeds if needed. Only the owning agency of a CCTV camera would have the ability to pan, tilt, and zoom the camera unless a joint operations agreement is signed between two or more agencies to share control of the CCTV cameras.

Basis of Need

Stakeholders expressed concerns that the lack of live video sharing between agencies in the region could lead to less organized responses to major events impacting traffic along the Central Texas region's most heavily traveled corridors, such as IH 35 and Loop 1 (MoPac). This regional project deployment would provide agencies with on-demand access to traffic conditions at various points throughout the region. Stakeholders identified several needs that could be addressed through the development of a regional platform for live video sharing, including improved communication and coordination between agencies for traffic operations, transit operations, incident management, and enhanced accuracy, timeliness, and availability of regional travel information. In addition to stakeholder discussions, this regional project was also identified as a need in the CAMPO Regional Incident Management Strategic Plan and Performance Assessment completed in 2018.

Benefits

The regional live video sharing platform would allow operations staff to better assess real-time road surface conditions, traffic levels, and driving conditions. For example, with video sharing, all participating stakeholders would be able to observe how road and traffic conditions change when a winter storm arrives and impacts the first jurisdiction. Additionally, such a platform would help neighboring jurisdictions monitor queues and congestion levels related to nearby incidents or construction that may soon affect other areas. Stakeholders from across Central Texas can use this information from the live video sharing platform to update signal timings and Dynamic Message Sign (DMS) content in anticipation of impacts from conditions originating in other jurisdictions.

Relevant ITS Service Packages

- **TM01** Infrastructure-Based Traffic Surveillance
- **TM06** Traffic Information Dissemination
- **TM07** Regional Traffic Management
- **TM08** Traffic Incident Management System

Timeframe

Short-Term

Lead Agencies

CAMPO ● TxDOT Austin District

Supporting Agencies

All Central Texas Stakeholders

Related Efforts

None

RAILROAD CROSSING DETECTION AND NOTIFICATION SYSTEM

Railroad crossing detection and notification systems are designed to detect when a train is at a railroad crossing and inform motorists of the blockage. Traditionally, these systems use sensors and gates with flashing beacons to automatically close the road when a train is approaching the crossing. Modern systems often still utilize sensors and gates but also incorporate cameras paired with AI to improve detection and communication links, enabling automated notifications to operations staff, transit operators, and emergency personnel. These systems can provide information to drivers by engaging blank-out signs to prohibit certain turning movements when a train is present at the crossing, as well as updating railroad crossing information online, and ultimately may support CAV applications to facilitate alternate routing during extended blockages.

Basis of Need

Many Central Texas stakeholders identified the need for improved real-time information regarding railroad crossing blockages and automated notifications, as rail lines run through almost every large city in Central Texas. Cities with existing railroad crossing detection systems noted challenges with high frequencies of false triggers.

The City of San Marcos is a good example of the need for improved rail crossing and detection systems. The City noted several crossings where trains often stop for 30 minutes to an hour, cutting off one side of the City from the other. As the frequency of stopped trains has been increasing, this has become a growing concern for emergency responders who are unable to quickly travel throughout the city. The main CARTS station in San Marcos is located between two railroads, resulting in transit delays when trains block crossings. Other cities noted similar challenges when discussing the need for railroad crossing detection and notification systems.

Benefits

Automatic notifications triggered when a train is approaching a railroad crossing could allow transit operators and emergency responders to select alternate routes in advance of route decision points, reducing delays. Publicly available real-time traveler information related to railroad crossing blockages could also reduce driver frustration, as drivers are informed as to why they are stopped, how long they have been stopped, and if they should reroute. Notifications triggered when a crossing's gates have been down for an extended period would allow operations staff to quickly detect and address issues with the crossing.

Relevant ITS Service Packages

- **TM01** Infrastructure-Based Traffic Surveillance
- **TM06** Traffic Information Dissemination
- **TM13** Standard Railroad Grade Crossing
- **TM15** Railroad Operations Coordination

Timeframe

Short to Mid-Term

Lead Agencies

Austin ● CAMPO ● Cedar Park ● Georgetown ● Leander ● Round Rock ● San Marcos

Supporting Agencies

CAPCOG ● TxDOT Austin District

Related Efforts

San Marcos has developed an Interactive Transportation Map that includes real-time rail crossing blockages, however they have noted additional crossing locations need to be added to their system. Austin, Cedar Park, and Georgetown have blank out signs deployed prohibiting turns onto roads with rail crossing blockages.

REGIONAL FIBER NETWORK PLAN

Nearly every stakeholder interviewed emphasized the need for a robust, reliable, high-bandwidth communication system to support their existing and future ITS deployments. A fiber-optic network was identified as the best solution to support local and regional ITS deployments. A transportation-focused regional fiber network plan typically involves an inventory of existing fiber-optic cable deployments, identification of gaps in the communications network, and strategic design and implementation of fiber-optic infrastructure across the region. Developing such a plan can standardize fiber installation and establish a robust fiber network to support the bandwidth needed for future ITS deployments throughout Central Texas.

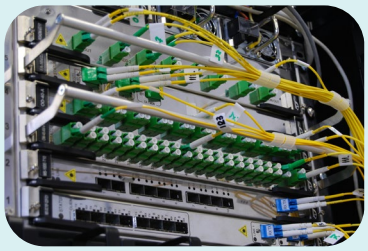
Basis of Need

Central Texas stakeholders identified the need for a transportation-focused regional fiber network plan because they either do not have an existing fiber plan or their existing fiber plan was not focused on transportation or the bandwidth required for ITS. Several stakeholders also noted that they lack a current map or database detailing the locations of the existing fiber network within their jurisdiction, making it difficult to determine where all their fiber assets are. Fiber optic deployment is typically incorporated into major roadway construction projects as funding permits, resulting in sections of fiber being scattered throughout the region, often with no consistent design or overall connectivity plan.

Benefits

Fiber-optic communications can transmit large amounts of data at extremely high speeds with very low latency, allowing for real-time monitoring and management of traffic conditions. Fiber-optic technology also facilitates the integration of data from various sources, such as traffic cameras, sensors, and public transit systems, helping traffic managers make informed decisions to optimize traffic flow and enhance safety. Fiber networks offer robust and consistent connectivity, reducing the chances of communication disruptions that can affect traffic management systems and ITS deployments.

Developing a regional fiber network plan with standardized fiber design and installation procedures can improve the efficiency of prioritizing and constructing new fiber connections. Established standards can also reduce the need to reconstruct existing fiber lines for tie-ins with new fiber, minimizing the additional materials, labor, and time required for connecting existing lines located on opposite sides of a road.



Relevant ITS Service Packages

- **DM01** ITS Data Warehouse
- **TM01** Infrastructure-Based Traffic Surveillance
- **TM03** Traffic Signal Control
- **TM06** Traffic Information Dissemination
- **TM07** Regional Traffic Management

Timeframe

Short-Term

Lead Agency

CAMPO

Supporting Agencies

TxDOT Austin District ● Austin ● Cedar Park ● Georgetown ● Round Rock ● San Marcos

Related Efforts

The TxDOT Austin District has been inventorying existing fiber. No other current planning efforts were identified for Central Texas.

HERO EXPANSION

The existing HERO Roadside Assistance Program offers free services such as changing flat tires, providing fuel, or moving disabled vehicles off the road, enhancing motorists' safety along IH 35, US 183, US 290, SH 71, and Loop 1 (MoPac). There is a need to expand the existing weekday HERO Program coverage to principal arterials such as Loop 360, RM 620, and RM 2222 to help these regionally significant corridors perform better and reduce the impact of incidents. Stakeholders also noted the need to expand HERO coverage during major construction to all impacted freeways and principal arterials during closures.

Basis of Need

Central Texas stakeholders emphasized the region's rapid growth in population and tourism, resulting in rapidly increasing traffic volumes on all roads. Higher volumes lead to more incidents and greater delays, particularly along principal arterials that were not designed to handle the demanded capacity. The next phase of the IH 35 Capital Express Central project, which involves the reconstruction of the Lady Bird Lake segment, is expected to begin in early 2025. This will result in large volumes of traffic being diverted onto alternate routes, primarily principal arterials, meaning more travelers would be impacted by incidents or debris along these alternate routes.

Benefits

HERO provides a quick response to crashes and other road incidents, reducing the duration of these events and their impact on traffic. By clearing incidents quickly, HERO patrols help maintain smoother traffic flow, minimizing congestion and reducing secondary crashes. HERO reduces the economic and environmental impact of incidents and congestion by quickly clearing incidents, which can save fuel costs and reduce emissions released during idling. HERO responders managing vehicle assistance and minor incidents also free up law enforcement officers to focus on more critical tasks.

Expanding HERO coverage to principal arterials could improve operations and safety on these routes and subsequently on freeways, as more drivers may utilize these arterials, especially during major construction in the region. HERO coverage in major construction work zones could enhance safety for both construction workers and motorists by assisting disabled vehicles or responding to minor incidents within the work zone, quickly clearing hazards where the roadway may already be constricted.

In 2018, the TxDOT HERO Program **benefit-cost ratio** was estimated at **34:1** in the CAMPO Regional Incident Management Strategic Plan.

Relevant ITS Service Packages

PS08 Roadway Service Patrol

TM08 Traffic Incident Management System

Timeframe

Short to Mid-Term

Lead Agency

TxDOT Austin District

Supporting Agencies

CTRMA ● Austin ● Cedar Park ● Round Rock ● San Marcos

Related Efforts

TxDOT had been expanding HERO services with funding through CAMPO for more than a decade. This program has provided a high return on investment for the region and should continue expansion.

REGIONAL TRANSIT FARE PAYMENT PLATFORM

CapMetro and CARTS currently have separate payment systems that are not compatible with each other. The CapMetro payment systems include transit passes that can be purchased for a set number of days or a stored value card funded at a user-determined prepaid amount. Until 2025, CapMetro also had its own mobile ticketing application that allowed users to purchase tickets from their smartphones. CapMetro recently transitioned to a widely used payment application that allows riders to purchase fares for multiple transit agencies that have implemented this platform in a single application. CARTS allows users to purchase fare cards through their website with a stored value. These fare cards can be used for Curb-to-Curb service (also known as Country Bus), but eventually CARTS aims to implement fare cards for all services.

There are existing routes that combine both CapMetro and CARTS services on a single bus, but riders must pay twice using separate fare boxes. CARTS has identified the need for a shared payment system on these routes, allowing riders to pay with either a CapMetro or CARTS card, with a reconciliation process between the two agencies. The system architecture of the combined payment system has not been determined yet, but CapMetro and CARTS should collaborate to develop such a solution.

Basis of Need

Transit users who need to access routes combining CapMetro and CARTS services must purchase two fares. Both CARTS and CapMetro staff have identified the need to consolidate to a single regional transit fare payment platform. Staff from both agencies also noted that each has a different mobile application for their unique services and highlighted the need to consolidate to either a single application for each transit agency or a unified application for all transit agencies in the Region.

Benefits

A single payment system would simplify the process for riders using services from multiple transit agencies or riding a single fixed-route service operated by both CapMetro and CARTS, such as Route 990. Instead of needing separate tickets or passes for different systems, riders could use one fare card or app across all agencies, making their travel experience smoother and more convenient. The ease of use provided by a unified payment system could encourage more people to use public transportation, potentially increasing ridership and reducing traffic congestion and pollution. A single payment platform would also enable better data collection and analysis across different transit systems, helping agencies understand ridership patterns, optimize routes, and improve overall service planning and coordination.

Relevant ITS Service Packages

PT04 Transit Fare Collection Management

PT14 Multi-modal Coordination

Timeframe

Mid-Term

Lead Agencies

CapMetro ● CARTS

Supporting Agencies

CAMPO

Related Efforts

None

AUTOMATION OF OPERATIONAL CAPABILITIES

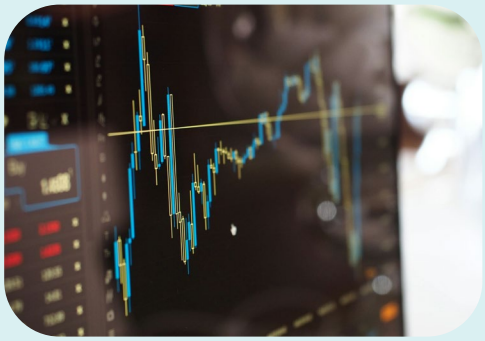
Automation of operational capabilities refers to the development of tools for Central Texas stakeholders that utilize available transportation data without requiring dedicated staff time. Ideally, these tools can provide easily digestible summaries of key transportation network conditions, enabling agency staff to make informed decisions about managing their transportation network. In some cases, the system may implement an action automatically based on the analysis. Examples of these tools include data dashboards that process incoming information and display key performance indicators, such as travel delays or road surface conditions, in real-time, as well as data processing tools that analyze multiple data sources and suggest actions operators can take, such as updating DMS or adjusting traffic signal timing plans.

Basis of Need

Almost all stakeholders identified the need for real-time data sharing, but many noted that simply receiving access to transportation data would not be useful without tools to help analyze and utilize the data to support decision-making. Several stakeholders noted challenges with limited staffing levels and available resources to review transportation data. Stakeholders highlighted difficulties in filtering through traffic incident updates to determine what information is relevant to their agency. CAPCOG's Homeland Security Task Force ITS Sub-committee identified the need for more efficient dissemination of traffic incident information and traffic management around incidents. The Sub-committee suggested using dispatched public safety vehicle locations to automatically geo-fence the area impacted by an incident and send traveler information to the public while adjusting traffic signal timings in real-time to redirect traffic away from the incident.

Benefits

Tools that automate operational capabilities for transportation management staff reduce the time and effort required by staff to process data. For agencies with limited staffing and small operations budgets, these tools can significantly expand the range of traffic management activities. Regardless of staffing levels, these tools can also support, suggest, or even implement traffic management actions by drawing from a larger breadth of data than a human operator could process quickly.



Relevant ITS Service Packages

- **TM03** Traffic Signal Control
- **TM06** Traffic Information Dissemination
- **TM07** Regional Traffic Management

Timeframe

Short to Mid-Term

Lead Agencies

All Central Texas Stakeholders

Supporting Agency

CAMPO

Related Efforts

The CAMPO CTTMS pilot includes tools that automate the processing of transportation data. The University of Texas at Austin's SMARTTrack initiative may also provide opportunities to test the automation of operational capabilities related to the processing of connected and autonomous vehicle data. Additionally, the University of Texas is leading the RIDI initiative, which serves as a technology and ITS device library for testing and evaluating systems, compiling use cases, and establishing best practices for transportation agencies throughout the region to reference. Another goal of RIDI is to establish a method for collecting, processing, and analyzing data to enhance traffic management.

INCREASED STAFFING FOR OPERATIONS AND MAINTENANCE

Many agencies noted that without increased staffing and investments in training, local and regional investments in traffic management and ITS technology will likely remain underutilized. Agencies need to increase funding to support additional staff for the operations and maintenance of ITS and traffic management systems. This requires support from decision-makers and intentional budgeting efforts. Additionally, investing in formal training is crucial to streamline onboarding and support the development and retention of staff, thereby preserving institutional knowledge typically acquired through on-the-job experience.

Basis of Need

Stakeholders highlighted challenges due to limited staff and resources, particularly in reviewing received information and filtering relevant traffic incident updates. High turnover and lack of training further reduce the capacity to address traffic management needs. For instance, new signal technicians often lack knowledge of past signal issues, leading to unnecessary equipment replacement, which results in road closures, higher costs, and wasted time and resources.

Benefits

Increased staffing and training for ITS and traffic management roles will enhance the ability of agency to actively manage its system, improve troubleshooting efficiency, reduce equipment downtime, save agency time and resources, and minimize impacts on the traveling public. Investing in training leads to more capable staff, higher job satisfaction, and improved retention. These benefits collectively help retain an agency's institutional knowledge regarding its deployed ITS and traffic management technology.

Relevant ITS Service Packages

- **DM02** Performance Monitoring
- **PT02** Transit Fixed-Route Operations
- **TM03** Traffic Signal Control
- **TM06** Traffic Information Dissemination
- **TM08** Traffic Incident Management System

Timeframe

Short to Long-Term

Lead Agencies

All Central Texas Stakeholders

Supporting Agencies

CAMPO

Related Efforts

None

Use and Maintenance

USE AND MAINTENANCE

The Central Texas Regional ITS Architecture and Deployment Plan addresses the region's vision for ITS implementation at the time the Plan was developed. With the growth of the region, needs will change and as technology progresses, new ITS opportunities will arise. Shifts in regional needs and focus as well as changes in the National ITS Architecture will necessitate that the Regional ITS Architecture and Deployment Plan be updated periodically to remain a useful resource for the region. As projects are developed and deployed, it will be important that those projects conform to the Regional ITS Architecture so that they are consistent with both the region's vision for ITS as well as the national standards. In some cases, if projects do not conform, it may be necessary to modify the Regional ITS Architecture to reflect changes in the region's vision for ITS rather than modify the project. In this section, a process for determining ITS architecture conformity of projects is presented and a plan for how to maintain and update the Central Texas Regional ITS Architecture and Deployment Plan is described.

Incorporation into the Regional Planning Process

Stakeholders invested considerable effort in the development of the Regional ITS Architecture and Deployment Plan. This plan should be incorporated into the regional planning process to ensure that the ITS needs for the Central Texas are considered during the implementation of ITS projects. By incorporating recommendations from the Regional ITS Architecture and Deployment into the regional planning process, the region can maintain eligibility for federal funding for ITS projects, as the FHWA and FTA require any project funded with federal money to conform to the Regional ITS Architecture.

The Regional ITS Architecture can serve as a valuable resource in developing the RTP. **Figure 6** illustrates the CAMPO planning process and the involvement of the Regional ITS Architecture. The ITS needs identified in the Regional ITS Architecture should be considered by CAMPO when identifying regional transportation needs. During the project selection process, the ITS service packages and project prioritization set by the Regional ITS Architecture stakeholders (and presented in this report) should be utilized to select projects for inclusion in the RTP.

As projects transition from the RTP to the Transportation Improvement Program (TIP), each project should be evaluated to determine if it includes any ITS elements. If a project contains an ITS

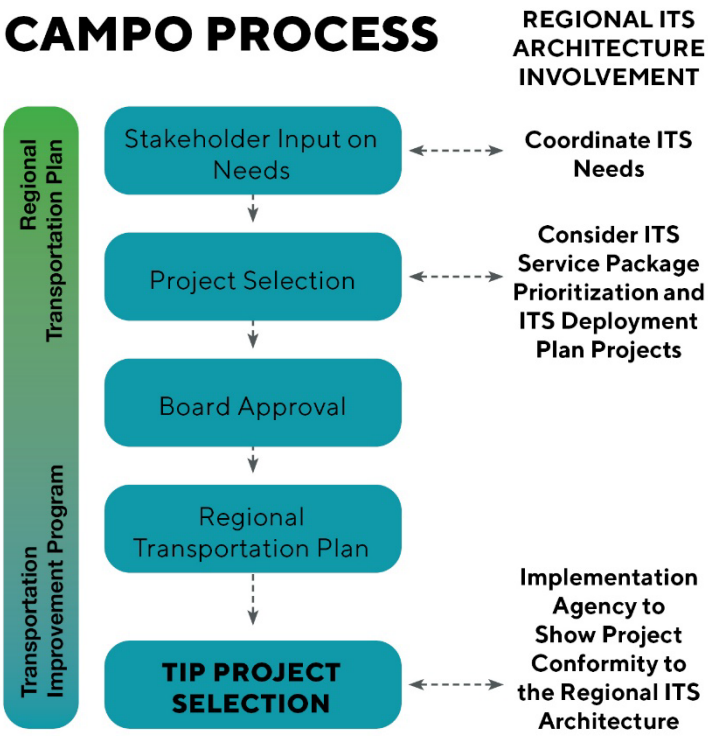


Figure 6: CAMPO ITS Project Selection Process

element, the Regional ITS Architecture must be reviewed to ensure conformance. CAMPO will assist agencies in this examination as part of the project application process, using the procedure outlined in the next section.

Process for Determining ITS Architecture Conformity

The Central Texas Regional ITS Architecture documents the customized ITS service packages that were developed as part of the ITS architecture process. To satisfy FHWA and FTA requirements and remain eligible to use federal funds, a project must be accurately documented. The steps of the process are as follows:

1. Identify the ITS components in the project.
2. Identify the corresponding ITS service packages from the Regional ITS Architecture.
3. Locate the ITS components within the ITS service packages.
4. Compare the connections to other agencies or elements documented in the Regional ITS Architecture as well as the information flows between them to the connections that will be part of the project.
5. Document any changes necessary to the Regional ITS Architecture or the project to ensure there is conformance.

ITS ARCHITECTURE USE TRAINING

Training on the how to modify the Regional ITS Architecture to establish project conformity is available on CAMPO's website at the link below. Select the tab for **Training** to access videos and a guide.

www.CAMPOTexas.org

The steps for determining ITS architecture conformity of a project are described in more detail below. Additional resources are included on the Regional ITS Architecture and Deployment Plan section of CAMPO's website.

Step 1 – Identify the ITS Components

ITS components can be fairly apparent in an ITS focused project such as CCTV or DMS deployments but could also be included in other types of projects where they are not as apparent. For example, an arterial widening project could include the installation of signal system interconnect, signal upgrades, and the incorporation of the signals in the project limits into a city's closed loop signal system. These are all ITS functions and should be included in the Regional ITS Architecture.

Step 2 – Identify the Corresponding ITS Service Packages

If a project was included in the ITS Deployment Plan section's list of projects, then the applicable ITS service package(s) for that project were also identified. However, it is not a requirement that the ITS project be identified in the ITS Deployment Plan to be eligible for federal funding, but it must conform to the ITS Architecture; therefore, ITS service packages might need to be identified for a project. In that case, the ITS service packages selected and customized for the Central Texas Regional ITS Architecture should be reviewed to determine if they adequately cover the project.

Step 3 - Identify the Component within the ITS Service Package

Once the element is located within the appropriate ITS service package, the evaluator should determine if the element name used in the ITS service package is accurate or if a change to the name is needed. If a general ITS service package that was developed for Municipal/County is being used, the elements in that ITS service package should be renamed to match the agency that is implementing the ITS service.

Step 4 – Evaluate the Connections and Flows

The connections and architecture flows documented in the ITS service package diagrams were selected based on the information available at the time the Regional ITS Architecture was developed. As the projects are designed, decisions will be made on the system layout that might differ from what is shown in the ITS service package. These changes in the project should be documented in the ITS service packages.

Step 5 – Document Required Changes

If any changes are needed to accommodate a project under review they should be documented per this section and through the use of the form on CAMPO's website. Any changes will be incorporated during the next Regional ITS Architecture update. Conformance will be accomplished by documenting how the ITS service packages should be modified so that the connections and data flows are consistent with the project.

ITS Architecture Maintenance Process

CAMPO will be responsible for leading the process to update the Central Texas Regional ITS Architecture and Deployment Plan. **Table 10** summarizes the maintenance process agreed upon by stakeholders in the region.

Table 10: Central Texas Regional ITS Architecture Maintenance Plan

Maintenance Details	Full Plan Update Guidance
Timeframe for Updates	Updates will occur on an as needed basis as determined by CAMPO and FHWA. CAMPO will review the Regional ITS Architecture after major ITS deployments in the region and evaluate if an update is needed.
Scope of Update	Entire Regional ITS Architecture
Lead Agency	CAMPO
Participants	Entire Stakeholder Group
Results	Updated Regional ITS Architecture and Deployment Plan, RAD-IT Architecture Database, and Interactive ITS Architecture on CAMPO's website

Stakeholders agreed that a full update of the Central Texas Regional ITS Architecture and Deployment Plan should occur on an as needed basis. CAMPO will work with the FHWA Texas Division to determine if

there have been enough changes to warrant a full update. Changes that will be considered when evaluating the need to update the Plan include:

- Major ITS deployments in the region that add new functionality not currently covered in the Central Texas Regional ITS Architecture and Deployment Plan
- Major updates to the National ITS Architecture that add new ITS service packages, or substantially change existing ITS service packages, to the extent that the Central Texas Regional ITS Architecture and Deployment Plan is no longer consistent with the National ITS Architecture.

As with all projects in the RTP, ITS projects are reviewed for compliance with all federal rules and regulations, just as non-ITS projects. If new proposed projects are found to be non-compliant corrective action will be taken or not included for federal funding.

CAMPO, in coordination with the FHWA Texas Division, will be responsible for completing updates of the ITS Deployment Plan when needed. During the update process, all stakeholder agencies that participated in the original development of the Central Texas Regional ITS Architecture and Deployment Plan should be included in addition to any other agencies in the region that are deploying or may be impacted by ITS projects.

Procedure for Submitting ITS Architecture Changes Between Updates

Updates to the Central Texas Regional ITS Architecture and Deployment Plan will occur as described earlier to maintain the architecture as a useful planning tool. In between updates, ITS project owners will need to submit documentation of any requested change to the Plan to CAMPO, the agency designated as the Regional ITS Architecture maintainer.

For situations where a change is required, an ITS Architecture Maintenance Documentation Form was developed and is in **Appendix D**. This form should be completed and submitted to CAMPO whenever a change to the Regional ITS Architecture is proposed.

Change Information – The type of change that is being requested can include an Administrative Change, Functional Change (Single Agency or Multiple Agency), or a Project Change. A description of each type of change is as follows:

- Administrative Change – Basic changes that do not affect the structure of the ITS service packages in the Regional ITS Architecture. Examples include changes to stakeholder or element names, element status, or information flow status.
- Functional Change (Single Agency) – Structural changes to the ITS service packages that impact only one agency in the Regional ITS Architecture. Examples include the addition of a new ITS service package or changes to information flow connections of an existing ITS service package. The addition or change would only impact a single agency.
- Functional Change (Multiple Agencies) – Structural changes to the ITS service packages that have the potential to impact multiple agencies in the Regional ITS Architecture. Examples include the addition of a new ITS service package or changes to information flow connections of an existing ITS service package. The addition or changes would impact multiple agencies and require coordination between the agencies.

- Project Change – Addition, modification, or removal of a project in the ITS Deployment Plan section of the Central Texas Regional ITS Architecture and Deployment Plan.

Description of the Requested Change – A brief description of the type of change being requested should be included.

ITS Service Packages being Impacted by the Change – Each of the ITS service packages that are impacted by the proposed change should be listed on the ITS Architecture Maintenance Documentation Form. If the proposed change involves creating or modifying an ITS service package, then the agency completing the ITS Architecture Maintenance Documentation Form is asked to include a sketch of the new or modified ITS service package.

ITS ARCHITECTURE CHANGES

To formally document and submit changes to CAMPO, forms and additional information can be found at the **Use and Maintenance** section of CAMPO's website at the link below. Select the tab for **Use and Maintenance** once on the site.

Impact of Proposed Change on Other Stakeholders – If the proposed change is expected to have any impact on other stakeholders in the region, then those stakeholders should be listed on the ITS Architecture Maintenance Documentation Form. A description of any coordination that has occurred with other stakeholders that may be impacted by the change should be also included. Ideally all stakeholders that may be impacted by the change should be contacted and consensus should be reached on any new or modified ITS service packages that will be included as part of the Central Texas Regional ITS Architecture and Deployment Plan.

Moving Forward

The Central Texas Regional ITS Architecture and Deployment Plan was developed to provide Central Texas with a long-range plan for the deployment, integration, and operation of ITS. The Plan encourages interoperability and resource sharing among agencies and supports the building of a more connected region. The Plan also meets the FHWA and FTA requirements that state a region needs to have an updated regional ITS architecture and projects must conform to that ITS architecture to use federal transportation funds for ITS projects.

As with any plan, real success comes from implementation. The Central Texas Regional ITS Architecture and Deployment Plan identifies nine regional projects and programs that should be implemented to significantly address stakeholder needs. These projects and programs support not only stakeholder needs identified in this plan, but also key needs from the CAMPO 2050 RTP. In addition to the nine regional projects and programs, many of the stakeholders in Central Texas have identified projects that are specific to their agency and are also important to meeting identified needs. Continued focus on implementing all the regional and local projects, as well as providing the staffing and maintenance to be sure systems are fully operational, is vitally important for Central Texas to operate a safe, efficient, and reliable transportation system.

Appendix

Appendix A: Stakeholder Database

	Agency	First Name	Last Name	Email Address	Attended Stakeholder Interview	Attended Stakeholder Workshop
Local Agencies	City of Austin	Joshil	Bhatpuria	joshil.bhatpuria@austintexas.gov		✓
		Brian	Craig	brian.craig@austintexas.gov	✓	✓
		Matt	Holmes	matt.holmes@austintexas.gov		✓
		Lewis	Leff	lewis.leff@austintexas.gov		✓
		Matt	McElearney	matthew.mcelearney@austintexas.gov		✓
		Boniface	Njoroge	boniface.njoroge@austintexas.gov		✓
		Kirk	Scanlon	kirk.scanlon@austintexas.gov		✓
	City of Cedar Park	Stephen	Hanuscin	stephen.hanuscin@cedarparktexas.gov	✓	
		Logan	Williams	logan.williams@cedarparktexas.gov	✓	
	City of Georgetown	Eric	Johnson	eric.johnson@georgetowntexas.gov	✓	
		Danny	Thiele	danny.thiele@georgetowntexas.gov	✓	
		Randell	Young	randell.young@georgetowntexas.gov	✓	
	City of Leander	Roman	Poudyal	rpoudyal@leandertx.gov	✓	✓
		Michael	Riley	mriley@leandertx.gov		✓
	City of Round Rock	Matthew	Bushak	mbushak@roundrocktexas.gov		✓
		Brian	Kuhn	bkuhn@roundrocktexas.gov	✓	
	City of San Marcos	Sabas	Avila	savila@sanmarcostx.gov	✓	✓
		Ning	Zou	nzou@sanmarcostx.gov		✓
	Hays County Office of Emergency Services	Mike	Jones	mike.jones@hayscountytx.gov		✓
	Travis County Office of Emergency Management	Courtland	Ballou	courtland.ballou@traviscountytx.gov	✓	
		Blake	Clampffer	blake.clampffer@traviscountytx.gov	✓	
		Fabio	Santos	fabio.santos@traviscountytx.gov	✓	
Regional Agencies	Capital Area Council of Governments (CAPCOG)	Gabriel	Bailey	gbailey@capcog.org		✓
		Douglas	Havron	dhavron@catrac.org		✓
		Martin	Ritchey	mritchey@capcog.org	✓	
		Charles	Simon	csimon@capcog.org	✓	✓

	Agency	First Name	Last Name	Email Address	Attended Stakeholder Interview	Attended Stakeholder Workshop
	Capital Metro (CapMetro)	Daryl	Weinberg	daryl.weinberg@capmetro.org	✓	
Regional Agencies (continued)	Capital Area Rural Transportation System (CARTS)	Adrian	Elliott	adrian@ridecarts.com	✓	✓
		Dave	Marsh	dave@ridecarts.com	✓	
	Combined Transportation, Emergency and Communications Center (CTECC)	Robert	Turner	robert.turner@austintexas.gov	✓	
	Central Texas Regional Mobility Authority (CTRMA)	Craig	Bluhm	cbluhm@ctrma.org	✓	
		Greg	Mack	gmack@ctrma.org	✓	
		Fabiola	Newman	fnewman@ctrma.org	✓	
	SH 130 Concession Company	Manish	Jain	mjain@sh130cc.com	✓	
		Jason	Kerby	jkerby@sh130cc.com	✓	
		James	Lovett	jlovett@sh130cc.com	✓	✓
		Binny	Paul	bpaul@sh130cc.com		✓
	Texas Department of Public Safety (DPS)	Nick	LaRocque	nick.larocque@dps.texas.gov		✓
State Agencies	TxDOT Austin District	Mike	Arellano	miguel.arellano@txdot.gov	✓	
		Carolina	Baumanis	carolina.baumanis@txdot.gov		✓
		John	Gold	john.gold@txdot.gov		✓
		Brenda	Guerra	brenda.guerra@txdot.gov	✓	
		Kevin	Plumlee	kevin.plumlee@txdot.gov	✓	✓
		Douglas	Turner	douglas.l.turner@txdot.gov	✓	
	University of Texas Center for Transportation Research	Heidi	Ross	heidiwross@austin.utexas.edu	✓	✓
Other	Tetra Tech (Consultant for CTTMS)	Brent	Christian	brent.christian@tetratech.com		✓
	Atkins Realis (Consultant for CPP)	David	McDonald	david.mcdonald@atkinsrealis.com		✓
		Neil	Mehta	neil.mehta@atkinsrealis.com		✓
		George	Villarreal	george.villarreal@atkinsrealis.com		✓

Appendix B: Regional Agreement Templates

Regional Traffic Management Center Agreement Template

Live Video Sharing Agreement Template

Regional Traffic Management Center Agreement Template

THIS AGREEMENT is made and entered into as of [Effective Date] by and between [Agency Name 1], located at [Address of Agency 1], and [Agency Name 2], located at [Address of Agency 2] (hereinafter collectively referred to as the "Parties").

RECITALS

WHEREAS, the Parties recognize the mutual benefits and efficiencies obtained by the regional operation of a Regional Traffic Management Center;

WHEREAS, the Parties desire to share resources, data, and responsibilities to enhance traffic management and operations across their respective jurisdictions;

NOW, THEREFORE, in consideration of the mutual promises and benefits described herein, the Parties agree as follows:

1. PURPOSE

The purpose of this Agreement is to establish the terms and conditions under which the Parties will jointly operate the Regional Traffic Management Center.

2. SCOPE OF THE REGIONAL TRAFFIC MANAGEMENT CENTER

2.1 The Regional Traffic Management Center will provide real-time traffic monitoring, incident management, and coordination of traffic control devices within the jurisdictions of the Parties.

2.2 The Regional Traffic Management Center will house and utilize advanced traffic management technologies to facilitate data sharing and collaborative traffic management strategies.

3. FORMATION OF REGIONAL TRAFFIC MANAGEMENT CENTER COMMITTEE

3.1 A Regional Traffic Management Center Committee (hereinafter referred to as the "Committee") will be formed, comprising representatives from each Party.

3.2 The Committee will oversee the operation, maintenance, and policy formation for the Regional Traffic Management Center.

4. DUTIES AND RESPONSIBILITIES

4.1 The Parties agree to share data, resources, and personnel as necessary for the efficient operation of the Regional Traffic Management Center.

4.2 Each Party shall appoint and maintain at least one representative to the Committee.

4.3 The Parties agree to contribute to the financial, operational, and maintenance costs of the Regional Traffic Management Center, as outlined in the cost-sharing schedule attached as Exhibit A.

5. FUNDING AND COST SHARING

5.1 The costs associated with the Regional Traffic Management Center, including initial setup, ongoing operations, and maintenance, shall be shared by the Parties according to the cost-sharing schedule outlined in Exhibit A.

5.2 Each Party shall be responsible for securing its share of the funding for the Regional Traffic Management Center.

6. COMPLIANCE WITH LAWS

Both agencies agree to comply with all applicable federal, state, and local laws and regulations relating to data sharing, privacy, and security.

7. TERM AND TERMINATION

7.1 This Agreement shall commence on the effective date and continue for a period of [Number] years, unless terminated earlier as provided herein.

7.2 Either Party may terminate this Agreement upon [Number] days' written notice to the other Party in the event of a material breach, insolvency, or as otherwise required by law.

8. DISPUTE RESOLUTION

In the event of a dispute arising out of or relating to this Agreement, the Parties agree to first attempt to resolve the dispute through good faith negotiations. If unresolved, the Parties may pursue mediation or arbitration as mutually agreed upon.

9. AMENDMENT

This Agreement may be amended only by the written agreement of the Parties.

10. MISCELLANEOUS

10.1 This Agreement shall be governed by and construed in accordance with the laws of the State of Texas.

10.2 This Agreement constitutes the entire agreement between the Parties with respect to the subject matter hereof and supersedes all prior agreements and understandings.

IN WITNESS WHEREOF, the Parties have executed this Agreement as of the Effective Date.

Agency Name 1
By: _____
Name: [Name of Agency 1's Authorized Representative]
Title: [Title of Agency 1's Authorized Representative]
Date: _____

Agency Name 2
By: _____
Name: [Name of Agency 2's Authorized Representative]
Title: [Title of Agency 2's Authorized Representative]
Date: _____

Real-Time Data Sharing Agreement Template

THIS AGREEMENT is made and entered into as of [Effective Date] by and between [Agency Name 1], located at [Address of Agency 1], and [Agency Name 2], located at [Address of Agency 2] (hereinafter collectively referred to as the "Parties").

RECITALS

WHEREAS, the Parties realize the mutual benefits of sharing real-time data to improve traffic management, public safety, transportation planning, and research initiatives; and

WHEREAS, the Parties desire to enter into this Agreement to define their rights and responsibilities regarding the sharing real-time data;

NOW, THEREFORE, in consideration of the mutual covenants and promises herein contained, the Parties agree as follows:

1. PURPOSE

The purpose of this Agreement is to establish the terms under which the Parties will share real-time data to enhance traffic management, improve public safety, support transportation planning, and facilitate research initiatives.

2. RESPONSIBILITIES OF THE PARTIES

2.1 [Agency 1] shall: a. Collect and provide accurate and timely traffic data as agreed upon in this Agreement. b. Ensure the data shared is free from errors and anomalies to the best of their ability. c. Implement and maintain data security measures to protect he data during transmission.

2.2 [Agency 2] shall: a. Utilize the traffic data solely for the permitted purposes outlined in this Agreement. b. Maintain the confidentiality and security of any received data. c. Share feedback or insights derived from the traffic data with [Agency 1].

3. DATA SHARING PROTOCOLS

3.1 Data Specifications

3.1.1 Types of Data: *Specify traffic counts, speeds, incidents, travel times, road conditions, etc.*
3.1.2 Data Collection Frequency: *Specify frequency, e.g., real-time, daily, weekly, etc.*
3.1.3 Data Format: *Specify formats, e.g. CSV, JSON, TXT, etc.*

3.2 Method of Data Sharing

3.2.1 Data Transfer Method: Specify *file transfer protocols.*
3.2.2 Security Measures: *Specify encryption during transit and storage, access controls, and other security.*

4. CONFIDENTIALITY AND DATA PROTECTION

Both parties agree to maintain the confidentiality of the traffic data and ensure it is not disclosed to unauthorized entities. Both agencies commit to implementing robust security measures to protect the data against unauthorized access, handling, or breaches.

5. DATA USAGE

The traffic data shared under this agreement may be used for: Traffic management and control; transportation planning and policy-making; public safety and emergency response; research and analysis for enhancing traffic operations.

6. FINANCIAL RESPONSIBILITIES

The Parties agree to share costs related to the deployment of infrastructure and maintenance of systems needed to share traffic data.

7. COMPLIANCE WITH LAWS

Both agencies agree to comply with all applicable federal, state, and local laws and regulations relating to data sharing, privacy, and security.

8. TERM AND TERMINATION

8.1 This Agreement shall commence on the effective date and continue for a period of [Number] years, unless terminated earlier as provided herein.

8.2 Either Party may terminate this Agreement upon [Number] days' written notice to the other Party in the event of a material breach, insolvency, or as otherwise required by law.

9. INDEMNIFICATION

Each Party agrees to indemnify, defend, and hold harmless the other Party from any claims, damages, or liabilities arising out of or related to their own use or maintenance of the Real-Time Data Sharing system.

10. CONFIDENTIALITY

The Parties agree to maintain the confidentiality of all sensitive information disclosed under this Agreement, except as required by applicable law or regulation.

11. DISPUTE RESOLUTION

In the event of a dispute arising out of or relating to this Agreement, the Parties agree to first attempt to resolve the dispute through good faith negotiations. If unresolved, the Parties may pursue mediation or arbitration as mutually agreed upon.

12. MISCELLANEOUS

12.1 This Agreement constitutes the entire agreement between the Parties and supersedes all prior negotiations, representations, and agreements.

12.2 Any amendments to this Agreement must be in writing and signed by authorized representatives of both Parties.

12.3 This Agreement shall be governed by, and construed in accordance with, the laws of the State of Texas.

IN WITNESS WHEREOF, the Parties have executed this Agreement as of the Effective Date.

Agency Name 1
By: _____
Name: [Name of Agency 1's Authorized Representative]
Title: [Title of Agency 1's Authorized Representative]
Date: _____

Agency Name 2
By: _____
Name: [Name of Agency 2's Authorized Representative]
Title: [Title of Agency 2's Authorized Representative]
Date: _____

Appendix C: ITS Service Package Status by Agency

	Commercial Vehicle Operations (CVO)			Data Management (DM)		Maintenance and Construction (MC)						
Stakeholder	CVO07: Roadside CVO Safety	CVO08: Smart Roadside and Virtual WIM	CVO12: HAZMAT Management	DM01: ITS Data Warehouse	DM02: Performance Monitoring	MC01: Maintenance and Construction Vehicle and Equipment Tracking	MC02: Maintenance and Construction Vehicle Maintenance	MC05: Roadway Maintenance and Construction	MC06: Work Zone Management	MC07: Work Zone Safety Monitoring	MC08: Maintenance and Construction Activity Coordination	MC09: Infrastructure Monitoring
State Agencies												
Texas DPS												
TxDOT Austin District	✳	✳		O	O	O	✳	✳	O	✳	O	✳
Regional Agencies												
CAMPO				O								
CapMetro				●								
CARTS				●								
City of Austin and Travis County (CTECC)												
CTRMA				●				✳			O	
Independent School District												
Regional TMC												
SH 130 Concessionaire												
University of Texas at Austin				O								
Local Agencies												
City of Austin				●	●	O	✳	✳	✳	✳	O	
Municipal/County*				✳	✳	✳	✳	✳	✳	✳	O	
City of Round Rock				✳	✳	O	✳		✳		O	
City of Georgetown				✳	✳						O	
City of Cedar Park				O	✳						O	
City of Leander				✳	✳						✳	
City of San Marcos				●	●	✳	✳				✳	
City of Pflugerville				✳	✳						O	
Other												
Commercial Vehicles			O									

*The Central Texas Regional ITS Architecture only has specific local agency level service package instances for the City of Austin due to the City's advanced capabilities and plans for deploying emerging technologies. Due to the limitations of the RAD-IT software, all other municipalities and counties within the region are gouped into a general Municipal/County service package instance when applicable, with the exception of TM25 for the City of Georgetown due to the City's takeover of TxDOT's wrong-way vehicle detection and warning system. The general Municipal/County service package instance can be used as a template by other municipalities and counties to create their unique service package instances when there is a need to show project conformity with the Regional ITS Architecture. To aid this future effort, the other municipalities within Central Texas with a population over 50,000 have been listed in this table and their relevant service packages and status are indicated by the brown symbols.

● Existing System

O Planned System

✳ Future System

Stakeholder	Parking Management (PM)				Public Safety (PS)							
	PM01: Parking Space Management	PM02: Smart Park and Ride System	PM03: Parking Electronic Payment	PM04: Regional Parking Management	PS01: Emergency Call-Taking and Dispatch	PS02: Emergency Response	PS03: Emergency Vehicle Preemption	PS08: Roadway Service Patrols	PS10: Wide-Area Alert	PS12: Disaster Response and Recovery	PS13: Evacuation and Reentry Management	PS14: Disaster Traveler Information
State Agencies												
Texas DPS					O	O						
TxDOT Austin District								●	●			O
Regional Agencies												
CAMPO												
CapMetro	✳	✳		✳								
CARTS		✳										
City of Austin and Travis County (CTECC)					●	✳				O	O	
CTRMA									●			
Independent School District												
Regional TMC												
SH 130 Concessionaire								●	●			
University of Texas at Austin												
Local Agencies												
City of Austin	●		●	●			●		●			●
Municipal/County*	O		●		●	✳	O		✳	✳	✳	✳
City of Round Rock	●		●		●	✳	●					✳
City of Georgetown	O		●		●	✳	O					✳
City of Cedar Park	✳		●		●	✳	O					✳
City of Leander			●				●					✳
City of San Marcos	O		●		●	✳	●					✳
City of Pflugerville			●		✳	✳	O					✳
Other												
Commercial Vehicles												

*The Central Texas Regional ITS Architecture only has specific local agency level service package instances for the City of Austin due to the City's advanced capabilities and plans for deploying emerging technologies. Due to the limitations of the RAD-IT software, all other municipalities and counties within the region are gouped into a general Municipal/County service package instance when applicable, with the exception of TM25 for the City of Georgetown due to the City's takeover of TxDOT's wrong-way vehicle detection and warning system. The general Municipal/County service package instance can be used as a template by other municipalities and counties to create their unique service package instances when there is a need to show project conformity with the Regional ITS Architecture. To aid this future effort, the other municipalities within Central Texas with a population over 50,000 have been listed in this table and their relevant service packages and status are indicated by the brown symbols.

● Existing System

O Planned System

✳ Future System

	Public Transportation (PT)												
Stakeholder	PT01: Transit Vehicle Tracking	PT02: Transit Fixed-Route Operations	PT03: Dynamic Transit Operations	PT04: Transit Fare Collection Management	PT05: Transit Security	PT06: Transit Fleet Management	PT07: Transit Passenger Counting	PT08: Transit Traveler Information	PT09: Transit Signal Priority	PT11: Transit Pedestrian Indication	PT12: Transit Vehicle at Station/Stop Warnings	PT14: Multi-modal Coordination	PT15: Transit Stop Request
State Agencies													
Texas DPS													
TxDOT Austin District													
Regional Agencies													
CAMPO													
CapMetro	●	●	●	●	●	●	●	●	●	O	O	O	O
CARTS	●	●	●	●	●	●	●	●	✳	O	✳	O	O
City of Austin and Travis County (CTECC)													
CTRMA													
Independent School District	O	O											
Regional TMC													
SH 130 Concessionaire													
University of Texas at Austin													
Local Agencies													
City of Austin													
Municipal/County*													
City of Round Rock													
City of Georgetown													
City of Cedar Park													
City of Leander													
City of San Marcos													
City of Pflugerville													
Other													
Commercial Vehicles													

*The Central Texas Regional ITS Architecture only has specific local agency level service package instances for the City of Austin due to the City's advanced capabilities and plans for deploying emerging technologies. Due to the limitations of the RAD-IT software, all other municipalities and counties within the region are gouped into a general Municipal/County service package instance when applicable, with the exception of TM25 for the City of Georgetown due to the City's takeover of TxDOT's wrong-way vehicle detection and warning system. The general Municipal/County service package instance can be used as a template by other municipalities and counties to create their unique service package instances when there is a need to show project conformity with the Regional ITS Architecture. To aid this future effort, the other municipalities within Central Texas with a population over 50,000 have been listed in this table and their relevant service packages and status are indicated by the brown symbols.

● Existing System

O Planned System

✳ Future System

Stakeholder	Sustainable Travel (ST)				Traveler Information and Personal Mobility (TI)		
	ST01: Emissions Monitoring	ST02: Eco-Traffic Signal Timing	ST05: Electric Charging Stations Management	ST06: HOV/HOT Lane Management	TI01: Broadcast Traveler Information	TI02: Personalized Traveler Information	TI07: In-Vehicle Signage
State Agencies							
Texas DPS							
TxDOT Austin District			✳	✳	●	O	✳
Regional Agencies							
CAMPO							
CapMetro							
CARTS			✳				
City of Austin and Travis County (CTECC)							
CTRMA				●			
Independent School District							
Regional TMC							
SH 130 Concessionaire							
University of Texas at Austin							
Local Agencies							
City of Austin	✳	✳	✳		✳		✳
Municipal/County*		✳	✳		✳	✳	✳
City of Round Rock			✳		✳		✳
City of Georgetown					✳		✳
City of Cedar Park			✳		✳		✳
City of Leander					✳		✳
City of San Marcos			✳		✳		✳
City of Pflugerville					✳		✳
Other							
Commercial Vehicles							

*The Central Texas Regional ITS Architecture only has specific local agency level service package instances for the City of Austin due to the City's advanced capabilities and plans for deploying emerging technologies. Due to the limitations of the RAD-IT software, all other municipalities and counties within the region are gouped into a general Municipal/County service package instance when applicable, with the exception of TM25 for the City of Georgetown due to the City's takeover of TxDOT's wrong-way vehicle detection and warning system. The general Municipal/County service package instance can be used as a template by other municipalities and counties to create their unique service package instances when there is a need to show project conformity with the Regional ITS Architecture. To aid this future effort, the other municipalities within Central Texas with a population over 50,000 have been listed in this table and their relevant service packages and status are indicated by the brown symbols.

● Existing System

O Planned System

✳ Future System

	Traffic Management (TM)									
Stakeholder	TM01: Infrastructure-Based Traffic Surveillance	TM02: Vehicle-Based Traffic Surveillance	TM03: Traffic Signal Control	TM04: Connected Vehicle Traffic Signal System	TM06: Traffic Information Dissemination	TM07: Regional Traffic Management	TM08: Traffic Incident Management System	TM 10: Electronic Toll Collection	TM 12: Dynamic Roadway Warning	TM 13: Standard Railroad Grade Crossing
State Agencies										
Texas DPS										
TxDOT Austin District	●	●	●		●	●	●		✳	●
Regional Agencies										
CAMPO										
CapMetro										
CARTS										
City of Austin and Travis County (CTECC)										
CTRMA	●	●			●	●	●	●	✳	
Independent School District										
Regional TMC						○				
SH 130 Concessionaire	●				●		●	●		
University of Texas at Austin										
Local Agencies										
City of Austin	●	●	●	✳	●	●	●			●
Municipal/County*	○	✳	○	✳	✳	✳	✳		✳	●
City of Round Rock	●		●			✳	✳			●
City of Georgetown	○		○	✳		✳	✳			●
City of Cedar Park	●		●	✳	✳	✳	✳			●
City of Leander	✳		○			✳	✳			●
City of San Marcos	●		●	✳	✳	✳	✳			●
City of Pflugerville	✳		○			✳				
Other										
Commercial Vehicles										

*The Central Texas Regional ITS Architecture only has specific local agency level service package instances for the City of Austin due to the City's advanced capabilities and plans for deploying emerging technologies. Due to the limitations of the RAD-IT software, all other municipalities and counties within the region are gouped into a general Municipal/County service package instance when applicable, with the exception of TM25 for the City of Georgetown due to the City's takeover of TxDOT's wrong-way vehicle detection and warning system. The general Municipal/County service package instance can be used as a template by other municipalities and counties to create their unique service package instances when there is a need to show project conformity with the Regional ITS Architecture. To aid this future effort, the other municipalities within Central Texas with a population over 50,000 have been listed in this table and their relevant service packages and status are indicated by the brown symbols.

● Existing System

○ Planned System

✳ Future System

Stakeholder	Traffic Management (TM) *(Continued)*								
	TM15: Railroad Operations Coordination	TM16: Reversible Lane Management	TM17: Speed Warning and Enforcement	TM19: Roadway Closure Management	TM20: Variable Speed Limits	TM21: Speed Harmonization	TM22: Dynamic Lane Management and Shoulder Use	TM24: Tunnel Management	TM25: Wrong-Way Vehicle Detection and Warning
State Agencies									
Texas DPS									
TxDOT Austin District	✳		✳	✳	✳	✳	●	✳	●
Regional Agencies									
CAMPO									
CapMetro									
CARTS									
City of Austin and Travis County (CTECC)									
CTRMA			✳						●
Independent School District									
Regional TMC									
SH 130 Concessionaire									✳
University of Texas at Austin									
Local Agencies									
City of Austin		✳			✳		●		
Municipal/County*	✳		✳	✳					
City of Round Rock									
City of Georgetown									●
City of Cedar Park									
City of Leander									
City of San Marcos									
City of Pflugerville									
Other									
Commercial Vehicles									

*The Central Texas Regional ITS Architecture only has specific local agency level service package instances for the City of Austin due to the City's advanced capabilities and plans for deploying emerging technologies. Due to the limitations of the RAD-IT software, all other municipalities and counties within the region are gouped into a general Municipal/County service package instance when applicable, with the exception of TM25 for the City of Georgetown due to the City's takeover of TxDOT's wrong-way vehicle detection and warning system. The general Municipal/County service package instance can be used as a template by other municipalities and counties to create their unique service package instances when there is a need to show project conformity with the Regional ITS Architecture. To aid this future effort, the other municipalities within Central Texas with a population over 50,000 have been listed in this table and their relevant service packages and status are indicated by the brown symbols.

● Existing System

○ Planned System

✳ Future System

Stakeholder	Vehicle Safety (VS)										Weather (WX)		
	VS05: Curve Speed Warning	VS07: Road Weather Motorist Alert and Warning	VS08: Queue Warning	VS09: Reduced Speed Zone Warning / Lane Closure	VS10: Restricted Lane Warnings	VS11: Oversize Vehicle Warning	VS12: Vulnerable Road User Safety	VS13: Intersection Safety Warning and Collision Avoidance	VS15: Infrastructure Enhanced Cooperative Adaptive Cruise Control	VS17: Automated Vehicle Operations	WX01: Weather Data Collection	WX02: Weather Information Processing and Distribution	WX03: Spot Weather Impact Warning
State Agencies													
Texas DPS													
TxDOT Austin District	✳	✳	✳	✳		✳	✳	✳	✳	✳	●	○	
Regional Agencies													
CAMPO													
CapMetro													
CARTS													
City of Austin and Travis County (CTECC)													
CTRMA			✳	✳							●		
Independent School District													
Regional TMC													
SH 130 Concessionaire											✳		
University of Texas at Austin													
Local Agencies													
City of Austin			✳		✳		●				●	○	
Municipal/County*	✳	✳	✳	✳		✳	✳	✳		✳	✳	✳	✳
City of Round Rock											✳		
City of Georgetown											✳		
City of Cedar Park											✳		
City of Leander											✳		
City of San Marcos											●	●	
City of Pflugerville											✳		
Other													
Commercial Vehicles													

*The Central Texas Regional ITS Architecture only has specific local agency level service package instances for the City of Austin due to the City's advanced capabilities and plans for deploying emerging technologies. Due to the limitations of the RAD-IT software, all other municipalities and counties within the region are gouped into a general Municipal/County service package instance when applicable, with the exception of TM25 for the City of Georgetown due to the City's takeover of TxDOT's wrong-way vehicle detection and warning system. The general Municipal/County service package instance can be used as a template by other municipalities and counties to create their unique service package instances when there is a need to show project conformity with the Regional ITS Architecture. To aid this future effort, the other municipalities within Central Texas with a population over 50,000 have been listed in this table and their relevant service packages and status are indicated by the brown symbols.

● Existing System

○ Planned System

✳ Future System

Appendix D: Regional ITS Architecture Maintenance Documentation Form

Central Texas Regional ITS Architecture

ITS Architecture Maintenance Form

Please complete the following form to document changes to the 2025 Central Texas Regional Intelligent Transportation System (ITS) Architecture. Forms should be submitted to CAMPO for review and acceptance. All accepted changes will be kept on file by CAMPO. Changes will be incorporated into the Central Texas Regional ITS Architecture during the next scheduled update.

Contact Information

Agency	
Agency Contact Person	
Street Address	
City	
State, Zip Code	
Telephone	
E-Mail	

Change Information

Please indicate the type of change to the Regional ITS Architecture:

- ☐ Administrative Change – Basic changes that do not affect the structure of the ITS service packages in the Regional ITS Architecture.
  Examples Include: Changes to stakeholder or element name, element status, or data flow status.
- ☐ Functional Change – Single Agency: Structural changes to the ITS service packages that impact only one agency in the Regional ITS Architecture.
  Examples Include: Addition of a new ITS service package or changes to data flow connections of an existing ITS service package. The addition or changes would only impact a single agency.
- ☐ Functional Change – Multiple Agencies: Structural changes to the ITS service packages that have the potential to impact multiple agencies in the Regional ITS Architecture.
  Examples Include: Addition of a new ITS service package or changes to data flow connections of an existing ITS service package. The addition or changes would impact multiple agencies and require coordination between the agencies.
- ☐ Project Change – Addition, modification, or removal of a project in the Regional ITS Architecture.
- ☐ Other: _____

Submittal

Please submit Regional ITS Architecture Maintenance Documentation form to:

CAMPO
8303 N. Mopac Expressway, Suite A210
Austin, Texas 78759
E-mail: campo1@campotexas.org

Form Submittal Date: _____

Central Texas Regional ITS Architecture and Deployment Plan Version 2025-1

Central Texas Regional ITS Architecture

ITS Architecture Maintenance Form

Question 1 Describe the requested change to the Central Texas Regional ITS Architecture.	
Question 2 Are any of the Regional ITS Architecture service packages impacted by the proposed change?	☐ Yes: Please complete Questions 2A and 2B ☐ No: Please proceed to Question 3 ☐ Unknown: Please coordinate with CAMPO to determine impacts of the change to the Central Texas Regional ITS Architecture
Question 2A List all ITS service packages impacted by the proposed change.	
Question 2B Include a copy of the ITS service packages diagrams for all ITS service packages impacted by the proposed change. Mark any proposed modifications to the ITS service packages requested. Add any additional notes on proposed changes in this section.	
Question 3 Does the proposed change impact any stakeholder agencies other than the agency completing this form?	☐ Yes: Please complete Questions 3A and 3B ☐ No: Form is complete ☐ Unknown: Please coordinate with CAMPO to determine impacts of change to other agencies in the Central Texas Regional ITS Architecture
Question 3A Identify the stakeholder agencies impacted by the change and a contact person for each agency.	
Question 3B Describe the coordination that has occurred with the stakeholder agencies and the results of the coordination?	