State of Texas
Regional ITS Architectures and Deployment Plans

West Central Texas Region

Regional ITS Architecture Report

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LIST OF ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
ASTM	American Society for Testing and Materials
ATIS	Advanced Travel Information System
ATMS	Advanced Traffic Management System
AVL	Automated Vehicle Location
BRINSAP	Bridge Inventory Inspection System
CAD	Computer-Aided Dispatch
CARR	City and Rural Rides
CC	Control Center
CCTV	Closed-Circuit Television
CEA	Consumer Electronics Association
CPT	Common Public Transportation
CV	Commercial Vehicle
DARC	Data Radio Channel
DMS	Dynamic Message Sign
DPS	Department of Public Safety
DSRC	Dedicated Short Range Communications
EIA	Electronic Industries Association
EOC	Emergency Operations Center
ETMCC	External TMC Communication
EV	Emergency Vehicle
FC	Fare Collection
FHWA	Federal Highway Administration
HAR	Highway Advisory Radio
HAZMAT	Hazardous Materials
HCRS	Highway Condition Reporting System
HRI	Highway-Rail Intersections
I/F	Interface

LIST OF ACRONYMS

IEEE	Institute of Electrical and Electronics Engineers
IM	Incident Management
IMMS	Incident Management Message Sets
ISP	Information Service Provider
ITE	Institute of Transportation Engineers
ITS	Intelligent Transportation System
K-TUTS	Killeen-Temple Transportation Study
MCM	Maintenance and Construction Management
MCV	Maintenance and Construction Vehicle
MOU	Memorandum of Understanding
MPO	Metropolitan Planning Organization
MS	Message Sets
NEMA	National Electrical Manufacturers Association
NOAA	National Oceanic and Atmospheric Administration
NTCIP	National Transportation Communications for ITS Protocol
OB	Onboard
PI	Passenger Information
RWIS	Road Weather Information System
SAE	Society of Automotive Engineers
SDO	Standards Development Organization
SP	Spatial Representation
STIC	Subcarrier Traffic Information Channel
TCEQ	Texas Commission on Environmental Quality
TCIP	Transit Communication Interface Protocol
TEA-21	Transportation Equity Act for the 21st Century
TM	Traffic Management
TMC	Traffic Management Center
TMDD	Traffic Management Data Directory
TOC	Traffic Operations Center

LIST OF ACRONYMS

TxDOT	Texas Department of Transportation
USDOT	United States Department of Transportation
USGS	United States Geological Survey
VIVDS	Video Image Vehicle Detection Systems

SUMMARY

In January 2001, the Federal Highway Administration (FHWA) issued a final rule to implement Section 5206(e) of the Transportation Equity Act for the 21st Century (TEA-21) requiring that Intelligent Transportation System (ITS) projects funded through the Highway Trust Fund conform to the National ITS Architecture and applicable standards.

To meet these requirements, in 2001 the Texas Department of Transportation (TxDOT) initiated the development of Regional ITS Architectures and Deployment Plans throughout the State of Texas. The West Central Texas Region was the fourteenth in the series of Regional ITS Architectures to be prepared as part of this initiative.

The West Central Texas Region is made up of the TxDOT Abilene and Brownwood Districts. The West Central Texas Region is bordered by the TxDOT Childress, Wichita Falls and Fort Worth Districts to the north, the TxDOT San Angelo and Austin Districts to the south, the TxDOT Waco District to the east, and the TxDOT Odessa and Lubbock Districts to the west.

The Architecture for the West Central Texas Region followed a comprehensive process focused on stakeholder outreach and education, identifying market packages and interfaces tailored to the needs of the West Central Texas Region, and developing a consensus-based architecture for the Region. This architecture provides a framework for ITS infrastructure to be deployed and integrated in the West Central Texas Region over the next 20 years.

Stakeholders from throughout the Region participated in the development of the Regional ITS Architecture, including representatives from TxDOT, City of Abilene, City of Brownwood, other area cities, Department of Public Safety (DPS), and area transit agencies. These stakeholders provided input and review at key steps in the architecture development process, including a project kick-off meeting, architecture development and review workshops, and final review of the architecture documentation.

An inventory of existing and planned ITS infrastructure in the Region provided the basis for the architecture development. Stakeholder needs that could be addressed by ITS technologies guided the selection of market packages, data flows, and integration requirements. A diverse range of needs were identified by stakeholders in the Region. High priority needs focused on traffic management, traffic information dissemination, and incident management.

Market packages were selected that corresponded to the desired services and functions identified for the Region, and were customized for West Central Texas Region agencies and equipment. These market packages included high priority 'foundation' services and functions, such as network surveillance and traveler information, as well as market packages to address coordination needs, including incident management and regional emergency response. Stakeholders then prioritized these market packages as high, medium, and low. These priorities were used in the second phase of the project to develop the ITS Deployment Plan for the West Central Texas Region.

An interconnect, or "Sausage Diagram" was developed for the West Central Texas Region which provided a top-level overview of system functions and primary interconnects. More detailed interfaces were then developed which identified the connectivity between the systems and elements. Each element identified in the ITS architecture for the West Central Texas Region was mapped to the other elements that it must interface with. These interfaces were further defined by architecture data flows between individual elements that specify the information to be exchanged. These data flows could include requests for information, alerts and messages, status requests, confirmations, and other information requirements.

Functional requirements for the West Central Texas Region were identified through customized market packages and data flows, as well as through equipment packages that deliver specific capabilities. The equipment packages that were identified provide more detailed descriptions of functionality and can be deployed incrementally. Standards that could apply to the West Central Texas Region also were identified as part of the architecture development process.

An Operational Concept for the West Central Texas Region was developed to illustrate how systems, components, and agencies will be integrated and function as a result of the framework provided by the Regional ITS Architecture. The purpose of the Operational Concept is to demonstrate the roles and responsibilities of the various stakeholders in the West Central Texas Region. Potential agreements that could be required for maintenance and operations, data sharing (among agencies and with the private sector), or joint operations are listed.

The Regional ITS Architecture for the West Central Texas Region is documented in the final report. In addition, a companion web site was developed that contains all of the architecture information, stakeholders, regional inventory, customized market packages, interfaces, and standards.

1. INTRODUCTION

1.1 Project Overview

In January 2001, FHWA issued a final rule to implement Section 5206(e) of the TEA-21. This rule required that ITS projects funded through the Highway Trust Fund conform to the National ITS Architecture and applicable standards. The rule requests that the National ITS Architecture be used to develop a local implementation of the National ITS Architecture, which is referred to as a "Regional ITS Architecture."

In order to meet these requirements, TxDOT initiated the development of Regional ITS Architectures and Deployment Plans throughout the State of Texas. In addition to meeting the federal requirements for funding, the development of regional ITS architectures provides a framework for implementing ITS on a regional level, encourages interoperability and resource sharing, identifies applicable standards, and allows for cohesive long range planning among stakeholders in the Region. Although not required by the FHWA final rule, TxDOT also sought to have an ITS deployment plan developed for each Region. An ITS deployment plan identifies and prioritizes projects that are needed to implement the ITS architecture on a short-, medium-, and long-term basis.

A key goal in the development of the regional ITS architectures was to develop a consensus-based architecture with as many stakeholders as possible involved. Each stakeholder had an equal voice in determining the direction of the architecture for the Region. Stakeholders included representatives from TxDOT, Dyess Air Force Base, cities, and transit agencies. A series of five meetings were held with the ITS stakeholders to discuss the development and gather input into the West Central Texas Regional ITS Architecture and Deployment Plan. In addition, a project web site was developed which contains all of the information on the West Central Texas Regional ITS Architecture and provides stakeholders with an opportunity to review and comment on the architecture directly from the web.

The result is an ITS architecture that establishes a vision and direction for the Region. ITS needs of the West Central Texas Region were established early in the project. Existing and planned elements of the architecture have been identified and the key agencies required to develop the ITS services, or market packages as they are referred to in the National ITS Architecture, for the West Central Texas Region have been identified. An operational concept has been developed that focuses on the roles and responsibilities of the various agencies involved in the West Central Texas Region. A separate ITS Deployment Plan was developed that identifies projects in the West Central Texas Region that are required to implement the architecture.

1.2 Document Overview

The West Central Texas Regional ITS Architecture report is organized into five key sections:

Section 1 – Introduction

This section provides an overview of the State of Texas ITS Architectures and Deployment Plan Program, the ITS Architecture for the West Central Texas Region, as well as an overview of some of the key features and stakeholders in the West Central Texas Region.

Section 2 – Integration Strategy

This section discusses West Central Texas Region stakeholder needs and issues, regional ITS initiatives and potential regional ITS programs, and opportunities for integration to achieve regional goals and contribute to regional and national ITS interoperability. Stakeholders and their contact information are also included.

Section 3 – Regional ITS Architecture Development Process

An overview of the key steps involved in developing the ITS architecture for the West Central Texas Region is provided in this section. It includes a discussion of the methodology, stakeholder involvement, architecture workshops, and architecture development process.

Section 4 – Conceptual Design

The conceptual design contains the key sections of the West Central Texas Regional ITS Architecture. The inventory of existing and planned systems is presented in Section 4, and is sorted by stakeholder as well as by entity for easy reference. The market packages that were selected for the West Central Texas Region are also included in this section, as are the system functional requirements. The West Central Texas Region interconnects are presented, including the "Sausage Diagram" showing the relationships of the key subsystems and elements in the Region, system interfaces, and the physical subsystem architecture flows. Standards that apply to the West Central Texas Regional ITS Architecture also are listed.

Section 5 – Operational Concept

An Operational Concept has been prepared that discusses the key functions and services of the envisioned ITS for the West Central Texas Region. As part of this concept, operational scenarios are described and roles and responsibilities of stakeholders are discussed. Potential public-public and public-private agreements also have been identified.

The West Central Texas Regional ITS Architecture also contains two appendices:

- Appendix A – Customized Market Packages; and
- Appendix B – Interface Diagrams.

A web site has been established that contains the architecture documentation, inventories, interconnects, market packages, interfaces, and functional requirements. This web site can be accessed from www.consystec.com, and by selecting the link to the Texas Regional ITS Architecture Home Page, and then West Central Texas Region. The web site provides hyperlinks to more detailed information about the West Central Texas Regional ITS Architecture than what could feasibly be included in the printed document. In certain sections of the document, readers are referred to the web site for additional information and details. At the time this report was published, the West Central Texas Regional ITS Architecture web site was being hosted at www.consystec.com. TxDOT plans to permanently host the site in the future at www.dot.state.tx.us/trf/its.

1.3 The West Central Texas Region

1.3.1 Geographic Overview

The West Central Texas Region is bordered by the TxDOT Childress, Wichita Falls and Fort Worth Districts to the north, the TxDOT San Angelo and Austin Districts to the south, the TxDOT Waco District to the east, and the TxDOT Odessa and Lubbock Districts to the west. For the West Central Texas Regional ITS Architecture and Deployment Plan, the study area included all 13 counties that comprise the TxDOT Abilene District and the 9 counties that comprise the TxDOT Brownwood District. The geographic boundaries of the West Central Texas Region are highlighted in **Figure 1**.

The counties included in the West Central Texas Region area are:

- Borden;
- Brown;
- Callahan;
- Coleman;
- Comanche;
- Eastland;
- Fisher;
- Haskell;
- Howard;
- Jones;
- Kent;
- Lampasas;
- McCulloch;
- Mills;
- Mitchell;
- Nolan;
- San Saba;
- Scurry;
- Shackelford;
- Stephens;
- Stonewall; and
- Taylor.

TxDOT partners with local governments for roadway construction, maintenance, and traffic operations support, and serves as the responsible agency for on-system roadways in cities with populations less than 50,000. The City of Abilene is the only city in the project Region with a population that exceeds the 50,000 threshold.

1.3.2 Transportation Infrastructure

As illustrated in **Figure 1**, the West Central Texas Region has an extensive transportation infrastructure. The primary roadway facilities include I-20, US-67, US-83, US-84, US-87, US-180, US-183, US-277, US-283, and US-377.

I-20 is as east-west, divided interstate highway. The effective operation of this highway is critical to the movement of goods and people through the State of Texas and the United States. I-20 starts in South Carolina and ends at I-10 in west Texas. Blockages along I-20 can have serious implications for drive-time for commercial vehicles and motorists alike due to the lack of obvious alternate routes. Knowing the road and travel conditions within this transportation corridor and having the ability to disseminate this information to motorists are important elements for this project. For example, if I-20 has been closed due to a major incident or weather, and motorists are informed of the closure in advance, they can alter their travel plans with an alternate route or wait to begin their travels.

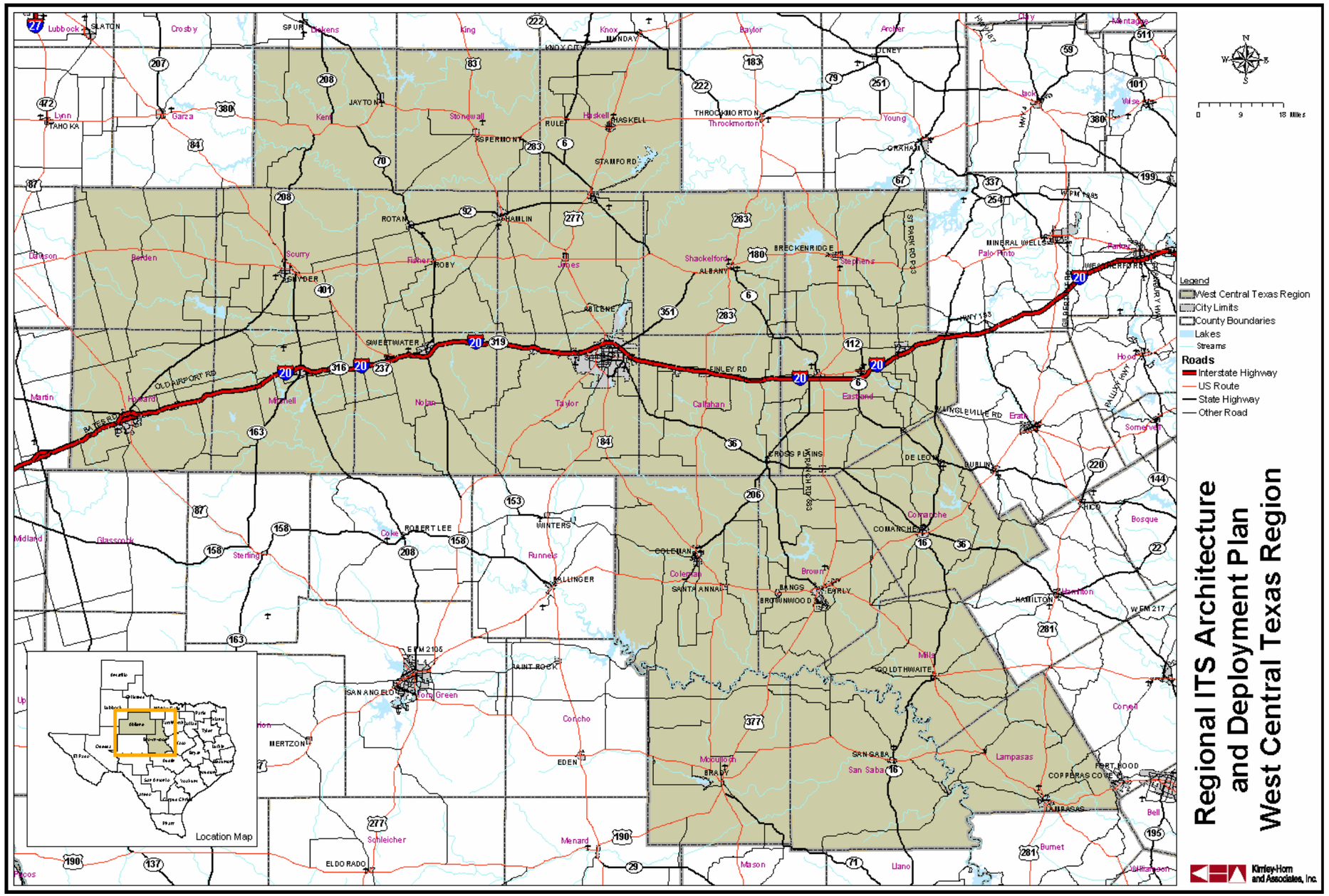


Figure 1 – West Central Texas Region Map

1.3.3 West Central Texas Region ITS Plans

There are several agencies in the West Central Texas Region that have already deployed ITS components. It is important to recognize the initial deployment of ITS infrastructure in a Region because in order for that Region to receive federal funding for ITS projects, the United States Department of Transportation (USDOT) requires that the Region have an ITS architecture by April 2005. This requirement is only for Regions with existing ITS infrastructure deployed. For Regions that do not have any ITS infrastructure deployed, the USDOT requires that they have an ITS architecture within four years of their first ITS project entering final design. As the West Central Texas Region pursues funding opportunities for proposed projects, it will be necessary to show that the proposed project fits within the architecture developed for the Region as part of this project.

Currently, the West Central Texas Region has several ITS components deployed in the field including closed loop signal systems with video image vehicle detection systems (VIVDS), signal preemption for emergency vehicles, computer aided dispatch (CAD), and portable dynamic message signs (DMS). The following sections discuss these deployments.

Video Detection

TxDOT is using VIVDS at several intersections within the Region. Unlike loop detection, VIVDS will not be affected by paving operations, and the detection zone of a VIVDS can be quickly changed to accommodate lane shifts during construction. VIVDS can detect vehicles approaching or stopping at a signalized intersection, and under actuated conditions can place a call for the service of the appropriate phase for that vehicle.

Signal Preemption for Emergency Vehicles

Currently, the City of Abilene has signal preemption installed at intersections within the city limits for fire vehicles. Emergency vehicle preemption works when a vehicle equipped with a preemption emitter approaches an intersection and the detector activates a change in signal timing to allow fast and safe passage.

Computer Aided Dispatch

Several emergency management and transit agencies in the Region have implemented CAD systems. CAD systems enhance dispatch capabilities and allow dispatch records and any incident information entered by the dispatcher to be saved for future reference in a dispatch log.

Portable Dynamic Message Signs

TxDOT currently has several portable DMS in the West Central Texas Region. These are controlled by the TxDOT Abilene and Brownwood District Offices and are used to display incident and construction related messages.

1.3.4 Stakeholders

Stakeholder coordination and involvement is one of the key elements in the development of a Regional ITS Architecture and Deployment Plan. Because ITS often transcends traditional transportation infrastructure, it is important to involve non-traditional stakeholders in the architecture development and visioning process. Input from these stakeholders, both public

and private, is a critical part of defining the interfaces, integration needs, and overall vision for ITS in the West Central Texas Region.

The following is a list of stakeholders in the West Central Texas Region who have participated in the project workshops or provided input to the study team as to the needs and issues that should be considered as part of the West Central Texas Regional ITS Architecture.

- Abilene Regional Airport;
- Aspermont Small Business Development Center;
- Central Texas Rural Transit District;
- City of Abilene;
- City of Breckenridge;
- City of Brownwood;
- City of Coleman;
- City of Comanche;
- City of Eastland;
- City of Roscoe;
- City of San Saba;
- Department of Public Safety;
- Dyess Air Force Base;
- Hill Country Transit;
- Jones County;
- McCulloch County;
- Nolan County;
- Taylor County;
- TxDOT Abilene District;
- TxDOT Austin Traffic Operations Division;
- TxDOT Brownwood District; and
- US Geological Survey.

2. INTEGRATION STRATEGY

2.1 Integration Purpose

The purpose of the integration strategy is to identify the needs, stakeholders, and strategy for regional integration in the West Central Texas Region.

For each operating agency or stakeholder entity identified through the development of the Regional ITS Architecture, there are operations that currently exist as a normal practice in order to accomplish the primary business goals and objectives for each stakeholder. As an example, a primary operation of the City of Abilene Police Dispatch is to dispatch emergency personnel to the appropriate locations when a call for help is placed within the city. The integration of the dispatch with any of the other stakeholders will not change this primary function of the dispatch or disrupt typical business practices. The integration of the City of Abilene Police Dispatch with another agency, such as the TxDOT Abilene District, will require that the data to be exchanged between the two entities (such as the blockage of a lane of traffic due to a crash) meet certain requirements for that particular data type. Identifying the need for this connection between agencies and the opportunities for integration and interoperability in the Region are key purposes of this section.

This section will provide an overview of the major issues and stakeholders' needs within the West Central Texas Region and the primary areas of concern that were uncovered in the preparation of the West Central Texas Regional ITS Architecture. This section will also discuss the need for interregional integration with agencies external to the West Central Texas Region, such as the need for integration with other TxDOT Districts.

A key step in developing any regional ITS architecture is the identification of major stakeholders in the Region. Key stakeholder agencies that participated in the development of the West Central Texas Regional ITS Architecture are listed in **Table 1**. A number of other stakeholders were identified and invited to participate. In many cases, these stakeholders were not able to attend due to time constraints. Minutes of meetings, copies of reports, and access to the project web site was provided to these stakeholders to encourage their participation as much as possible.

Table 1 – West Central Texas Stakeholder Agencies and Contacts

Stakeholder Agency	Contact	Address	Phone Number	E-Mail
Abilene Regional Airport	Paula Edwards	2933 Airport Blvd Abilene, Texas 79604	325-676-6225	N/A
Aspermont Small Business Development Center, Inc	Mylissa Gholson	620 Washington St. Aspermont, Texas 79601	940-989-3538	N/A
Aspermont Small Business Development Center, Inc.	Dana Myers	620 Washington St. Aspermont, Texas 79601	940-989-3538	asbdc@westex.net
Central Texas Rural Transit District	J.R. Salazar	2310 South Concho Street Coleman, Texas 76834	325-625-4491	carr@web-access.net
City of Abilene	James Condry	555 Walnut St. Abilene, Texas 79604	325-676-6489	james.condry@abilenetx.com

Table 1 – West Central Texas Stakeholder Agencies and Contacts (continued)

Stakeholder Agency	Contact	Address	Phone Number	E-Mail
City of Abilene	Amy Foerster	1189 South Second Street Abilene, Texas 79602-1411	325-676-6403	amy.foerster@abilenetx.com
City of Breckenridge	Virgil Moore, Jr.	126 E. Walter Breckenridge, Texas 76424	254-559-8287	vefm@wtconnect.com
City of Brownwood	Gary Butts	501 Center Ave Brownwood, Texas 76801	325-643-3631	N/A
City of Brownwood	Don Hatcher	501 Center Ave Brownwood, Texas 76801	325-643-6626	dhatcher@ci.brownwood.tx.us
City of Coleman	Nick Poldrack	PO Box 592 Coleman, Texas 76834	325-625-1402	N/A
City of Comanche	Darwin Dickerson	114 W Central Comanche, Texas 76442	325-356-2616	N/A
City of Eastland	Cecil Funderburgh	416 S. Seaman St. Eastland, Texas 76448	254-629-1700	epdchief@bryrus.net
City of Eastland	Larry Smith	416 S. Seaman St. Eastland, Texas 76448	254-629-3845	N/A
City of Roscoe	Frank Porter	PO Box 340 Roscoe, Texas 79545	325-766-3871	N/A
City of San Saba	David Parker	PO Box 788 San Saba, Texas 76877	325-372-5144	N/A
Department of Public Safety – Lampasas	Stephen Bynum	1690 N. U.S. 281 Lampasas, Texas 76550	512-556-6871	N/A
Department of Public Safety – Eastland	Tim Pitts	1002 Laga Vista Eastland, Texas 76448	254-629-2849	N/A
Dyess AFB	Donald Emerson	626 Alert Ave Abilene, Texas 79607	325-696-5222	illia.emerson@dyess.af.mil
Dyess AFB	Robert Simpson	626 Alert Drive Abilene, Texas 79607	325-696-5227	N/A
Dyess AFB	William Warren	466 5th Street Abilene, Texas 79607	325-696-1435	william.warren@dyess.af.mil
Hill Country Transit	Carole Warlick	2905 W. Wallace San Saba, Texas 76877	325-372-4677	hctd@hccaa.com
Jones County	Dale Spurgin	1100 12th Street Anson, Texas 79501	325-823-3741	jonescty@nts-online.net
McCulloch County	Randy Young	199 County Courthouse, Room 202 Brady, Texas 76825	325-597-0733	judgeyoung@hotmail.com
Nolan County	Tim Fambrough	100 East 3rd Street, Suite 105 Sweetwater, Texas 79556	325-235-2263	N/A
Taylor County	George Newman	300 Oak Street Abilene, Texas 79602	325-674-1235	newmang@taylorcountytexas.org

Table 1 – West Central Texas Stakeholder Agencies and Contacts (continued)

Stakeholder Agency	Contact	Address	Phone Number	E-Mail
TxDOT Abilene District	Paul Hoelscher	4250 North Clack Abilene, Texas 79601	325-676-6801	N/A
TxDOT Abilene District	Debra Rector	102 E. College Dr Abilene, Texas 79604	325-676-6811	drecto1@dot.state.tx.us
TxDOT Abilene District	David Seago	102 E College Drive Abilene, Texas 79604	325-676-6930	dseago@dot.state.tx.us
TxDOT Abilene District	Roy Wright	4250 North Clack Abilene, Texas 79601	325-676-6805	rwright@dot.state.tx.us
TxDOT Austin Traffic Operations	Fabian Kalapach	Attn: TRF-Cedar Park #51 125 East 11th Street Austin, Texas 78701-2483	512-506-5112	fkalapa@dot.state.tx.us
TxDOT Austin Traffic Operations	Alex Power	Attn: TRF-TM 125 East 11th Street Austin, Texas 78701-2483	512-416-3444	apower@dot.state.tx.us
TxDOT Brownwood District	Tom Dahl	1133 North Hwy 281 Lampasas, Texas 76550	512-556-5435	N/A
TxDOT Brownwood District	Howard Holland	2495 Hwy 183 N Brownwood, Texas 76802	325-643-0417	N/A
TxDOT Brownwood District	Bryan Raschke	2150 CR 381 Brownwood, Texas 76801	325-643-0320	N/A
TxDOT Brownwood District	Elias Rmeili	2495 US 183 N Brownwood, Texas 76801	325-643-0441	ermeili@dot.state.tx.us
TxDOT Brownwood District	Larry Smith	906 E. Main Eastland, Texas 76448	254-629-3845	N/A
US Geological Survey	Dave Holmes	3010 Buchanan Wichita Falls, Texas 76308	940-692-4283	dholmes@usgs.gov
US Geological Survey	Jimmy Pond	944 Ahoyo Drive San Angelo, Texas 76903	325-944-4600	jgpond@usgs.gov

2.2 Regional Needs

Needs from the Region were identified in the project kick-off meeting held on September 25, 2003. Stakeholders participating in that meeting identified the needs in the Region according to the eight user service areas defined in the National ITS Architecture. The needs identified in the project kick-off meeting are documented in **Table 2**.

Table 2 – West Central Texas Region: Summary of ITS Needs

West Central Texas Region

Summary of ITS Needs
West Central Texas Regional ITS Architecture and Deployment Plan Kick-Off Meeting
September 25, 2003

Travel and Traffic Management Needs
- Need DMS on I-20 (at Ranger Hill) and US 84, 87 and 180 (alternate routes for I-20)
- Need communications improvements
- Need ice detection
- Need water level sensors and precipitation monitors
- Need real time weather information along I-20
- Need CCTV
- Need center to center communications
- Need traffic responsive signal control in Brownwood District
- Need flood detection in City of Brownwood
- Need additional closed loop signal systems in City of Abilene (2 are already funded)
- Need City of Abilene Traffic Operations Center
- Need VIVDS in City of Abilene
- Need CCTV in the City of Abilene along the rail line and at key interchanges
- Need incident management strategies
- Need highway advisory radio on US 180
- Need school zone flasher pagers

Public Transportation Management Needs
- Need center to vehicle communication for Aspermont Small Business
- Need AVL for Aspermont Small Business and Hill Country Transit
- Need mayday on Aspermont Small Business and City Link Transit Vehicles
- Need CAD for Hill Country Transit
- Need MDTs for Hill Country Transit
- Need on-board video surveillance for Hill Country Transit and City Link
- Need electronic fare collection for Hill Country Transit and City Link
- Need AVL and MDTs for City Link
- Need transit transfer station

Commercial Vehicle Operations Needs
- Need weigh-in-motion

Emergency Management Needs
None Identified

Archived Data Management Needs
- Need improved/automated data collection for Aspermont Small Business transit agency and Hill Country Transit

Maintenance and Construction Management Needs
None Identified

2.3 Regional Integration and Interoperability

A vision for the West Central Texas Region is to integrate systems both on an intra-regional and an inter-regional basis. Within the West Central Texas Region, nearly every stakeholder identified is involved in emergency management. Incidents that occur on major roadways either in the West Central Texas Region or on roadways that could impact the movement of people and goods in the West Central Texas Region should be shared. The integration of the State Emergency Operations Center (EOC) and the local EOCs can facilitate the clearing of such an incident more efficiently. As an example, a chemical spill along I-20 between Fort Worth and Abilene would require a major clean-up in addition to other emergency personnel on site. Coordination between the two EOCs could identify the closest clean-up crew that could respond to the spill and dispatch them to the scene. Similarly, once on scene, the response team could provide the State EOC and the local EOCs status reports on the clean-up and potential timing for return to normal operations.

The West Central Texas Region is bordered by eight other TxDOT Districts. Improved coordination with these surrounding Districts for incident management and roadway closures is a very important need in West Central Texas.

Road closures due to maintenance or incidents also lead to a number of opportunities for improved operations through integration. TxDOT and other transportation agencies would like to be able to share this information throughout the Region so that as soon as one agency is aware of a closure, whether planned or unplanned, other agencies can also be made aware of the closure and make appropriate plans.

Operators of the transportation system have many opportunities to improve performance through integration. CityLink Transit and Hill Country Transit can improve performance and schedule adherence by integrating closure information from operators of the transportation network.

Systems such as TxDOT's Highway Condition Reporting System (HCRS) provide an integrated method to gather consistent traveler information on a statewide basis. This type of system could eventually feed into a 511 traveler information number that would provide consistent traveler information throughout the state.

The headquarters of TxDOT maintains a database of traffic counts and accident records for roadways throughout the State of Texas. On occasion, agencies within the West Central Texas Region will need access to these databases either to retrieve data or supply data to the database. These data exchanges also will require integrating the agencies' data flows such that neither of the agencies' normal business operations is disturbed to share these data.

One of the primary purposes of the development of an ITS architecture is to ensure that while various agencies are deploying ITS components, there are some commonalities between them that will allow and facilitate the exchange of data fairly seamlessly and automatically. This is not to say that all technologies or media that are used by the various agencies will be the same, but that there is an acknowledgement that the data that is being collected and disseminated is valuable to many different agencies; therefore, the integration strategy has to be implemented to ensure the data exchange is possible.

3. REGIONAL ITS ARCHITECTURE DEVELOPMENT PROCESS

Development of the Regional ITS Architecture and Deployment Plan for the West Central Texas Region relied heavily on stakeholder input to ensure that the architecture reflected local needs. A series of five meetings was held with stakeholders to gather input, and a web site with the components of the regional architecture as well as hard copies of documents were made available to stakeholders for review and comment.

3.1 West Central Texas Process

The process followed for the West Central Texas Region was designed to ensure that stakeholders could provide input and review to the development of the Region's ITS Architecture.

Prior to the project kick-off meeting with the contractor and stakeholders, TxDOT identified relevant stakeholders in the Region to begin discussions on the development of a Regional ITS Architecture and Deployment Plan. Stakeholders signed a memorandum of understanding (MOU) stating that they would work together in the Region to develop the ITS architecture.

After selecting a contractor, the process shown in **Figure 2** was used to develop the Region's ITS Architecture. In addition to the architecture, an ITS Deployment Plan for the Region also was developed to identify projects needed to implement the architecture.

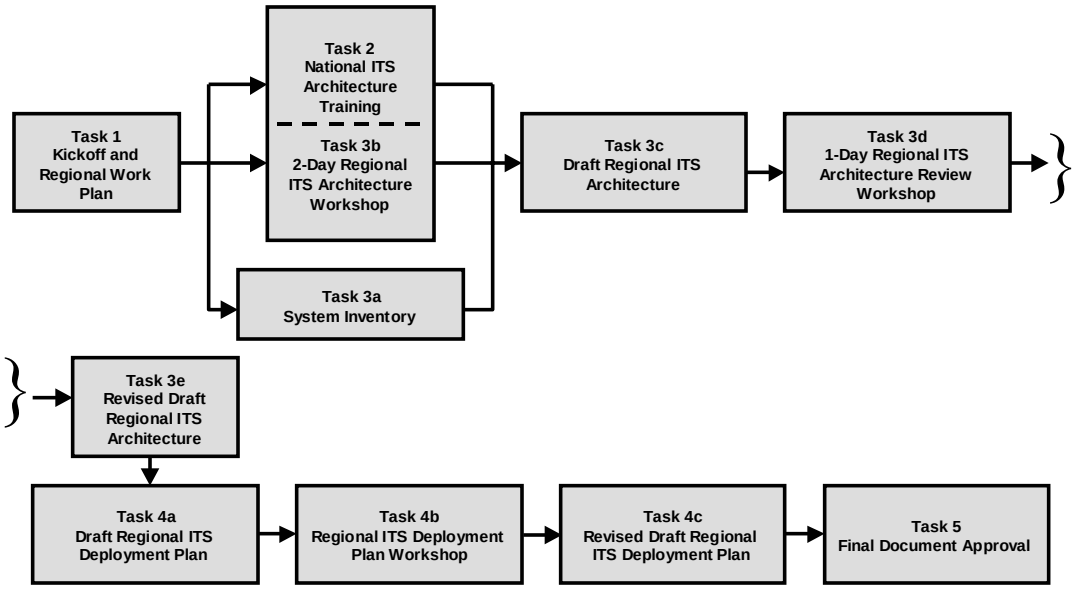


Figure 2 – West Central Texas Regional ITS Architecture and Deployment Plan Development Process

A total of five meetings and workshops with stakeholders over a period of eleven months were used to develop the West Central Texas Regional ITS Architecture and Deployment Plan. These meetings and workshops included:

- Kick-off and Regional Work Plan Meeting;
- 2-Day Regional ITS Architecture Workshop;

- 1-Day Regional ITS Architecture Review Workshop;
- ITS Deployment Plan Workshop; and
- Final Comment Resolution Meeting.

Key components of the process are described below:

Task 1 – Kick-Off and Regional Work Plan: Based on the initial stakeholder meeting and MOU that was signed, a number of key stakeholders were identified. Additional stakeholders that did not sign the initial MOU also were identified and invited to the project kick-off meeting. At this meeting, the regional work plan was presented to stakeholders for review and comment. Subsequent meeting dates were identified and agreed upon by the stakeholders.

As part of this meeting, a workshop was held with the stakeholders to identify three additional areas of information:

- Additional stakeholders to invite to participate in the process;
- Needs of the stakeholders in the Region; and
- Existing and planned ITS elements in the Region.

Task 2 – National ITS Architecture Training: Task 2 was the development and presentation of training on the National ITS Architecture. The purpose of the training was to familiarize stakeholders with the architecture terminology to the extent needed to allow them to provide input and review on the West Central Texas Region's ITS Architecture. The National ITS Architecture training was presented in conjunction with the 2-Day Regional ITS Architecture Workshop described in Task 3B.

Task 3A – System Inventory: Collecting information for the system inventory began at the kick-off meeting through the workshop with the stakeholders to determine existing and planned ITS elements in the Region. After the kick-off meeting, follow-up calls were conducted with a number of local stakeholders to gather additional input for the architecture. To complete the inventory, stakeholders were presented with the results of the inventory in the 2-Day Regional ITS Architecture Workshop described in Task 3B.

Task 3B – 2-Day Regional ITS Architecture Workshop: The purpose of the 2-Day Regional ITS Architecture Workshop was to review the inventory with stakeholders and begin the development of the West Central Texas Regional ITS Architecture. Training on the National ITS Architecture also was integrated into the workshop so that key elements of the architecture, such as market packages, could be explained prior to the selection and editing of these elements. The result of the 2-Day Regional ITS Architecture Workshop was a Regional ITS Architecture for West Central Texas, which included a system inventory, interconnect diagram, customized market packages, identification of functional requirements through process specifications, system interfaces, and relevant ITS standards.

Task 3C – Draft Regional ITS Architecture: After the 2-Day Regional ITS Architecture Workshop was completed, a web site was developed with a dedicated link to the West Central Texas Regional ITS Architecture program. Stakeholders were asked to review the web site and provide comments through an email link set up on the site. A hard copy of the Draft Regional ITS Architecture for the West Central Texas Region was sent to stakeholders prior to the 1-Day Regional ITS Architecture Review Workshop.

Task 3D – 1-Day Regional ITS Architecture Review Workshop: The 1-Day Regional ITS Architecture Review workshop was designed to allow stakeholders to review the draft architecture and provide comments. The primary focus of the workshop was to review the architecture flows between elements in the market packages. Training on architecture flows as well as ITS standards also was completed.

Task 3E – Revised Draft Regional ITS Architecture: Input from stakeholders in the 1-Day Regional ITS Architecture Review Workshop, as well as comments from stakeholders reviewing the web site and hard copy document, were used to revise the Draft Regional ITS Architecture. The revisions were incorporated into the web site as well as into the hard copy document. The Revised Draft Regional ITS Architecture was mailed to stakeholders for additional review.

Task 4A – Draft Regional ITS Deployment Plan: A Draft Regional ITS Deployment Plan was developed based on the prioritization of market packages and needs expressed by the stakeholders in the Region. The Draft Regional ITS Deployment Plan included a list of recommended projects in a 5-year, 10-year, and 20-year timeframe. Each project was linked to at least one or more market packages from the West Central Texas Regional ITS Architecture.

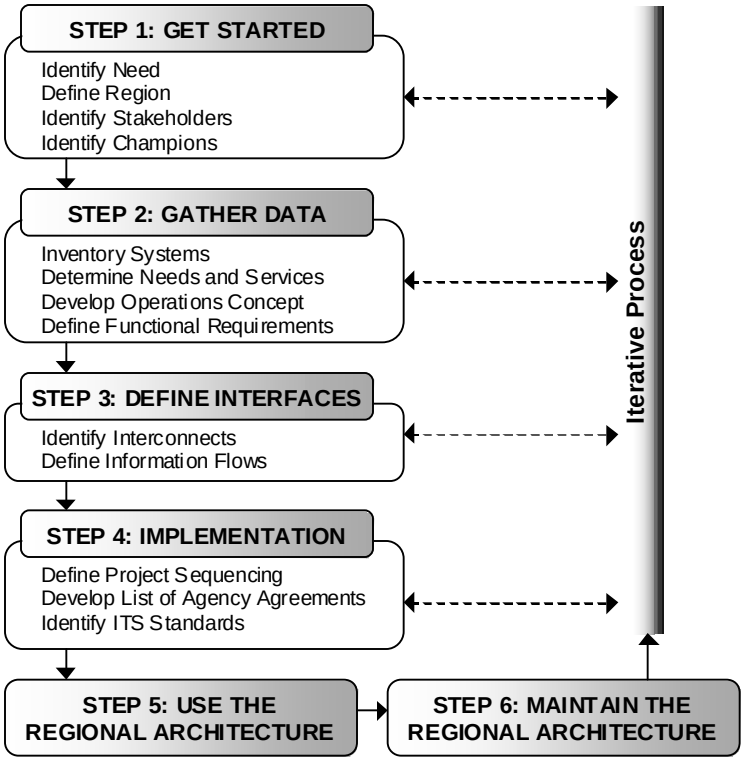
Task 4B – Regional ITS Deployment Plan Workshop: The Draft Regional ITS Deployment Plan was presented to stakeholders at the Regional ITS Deployment Plan Workshop. Stakeholders were asked to provide input on the recommended projects, priority, and deployment timeframe.

Task 4C – Revised Draft Regional ITS Deployment Plan: Based on the review and input from stakeholders at the Regional ITS Deployment Plan Workshop, as well as review comments received from stakeholders outside of the workshop, a Revised Draft Regional ITS Deployment Plan was developed and sent to stakeholders.

Task 5 – Final Document Approval: A final comment resolution meeting was held with stakeholders to review the Revised Draft Regional ITS Architecture and the Revised Draft Regional ITS Deployment Plan. Next steps for the Region were also discussed. Comments were incorporated and a final Regional ITS Architecture and Regional ITS Deployment Plan were developed.

3.2 USDOT Regional ITS Architecture Guidance

On October 12, 2001, the USDOT issued guidance on development of a regional ITS architecture through the document "Regional ITS Architecture Guidance: Developing, Using, and Maintaining an ITS Architecture for Your Region." **Figure 3** summarizes the guidance provided by the USDOT.



(Source: Regional ITS Architecture Guidance: Developing, Using, and Maintaining an ITS Architecture for Your Region, USDOT)

Figure 3 – USDOT Guidance on Regional ITS Architecture Development

The process used to develop the West Central Texas Regional ITS Architecture and Deployment Plan follows Steps 1 through 4 of the guidance. Steps 5 and 6 are designed to provide guidance upon the completion of the development of the Regional ITS Architecture.

Step 1, Get Started, of the guidance was completed in Task 1 – Kick-off and Regional Work Plan, as well as preliminary work completed by TxDOT to identify initial stakeholders and the need to complete the architecture for the West Central Texas Region. Through these efforts, the need for an architecture, appropriate stakeholders, and the Region was defined.

Step 2, Gather Data, was completed through Task 1 – Kick-off and Regional Work Plan, Task 3A – System Inventory, and Task 3B – 2-Day Regional ITS Architecture Workshop. These efforts allowed the inventory for the West Central Texas Region to be completed, identified ITS needs in the Region, and led to the development of an operational concept and definition of functional requirements.

Step 3, Define Interfaces, was completed in Task 3B – 2-Day Regional ITS Architecture Workshop and Task 3D – 1-Day Regional ITS Architecture Review Workshop. These workshops engaged stakeholders in customizing Market Packages for the Region, which included identifying interconnects among elements in the architecture and reviewing and selecting data flows between elements.

Step 4, Implementation, was completed in Task 3D – 1-Day Regional ITS Architecture Review Workshop through the prioritization of market packages. Sequencing of projects began in this process and was completed in the ITS Deployment Plan. Applicable ITS standards to match the identified data flows also were identified through the 1-Day ITS Architecture Review Workshop. Based on the envisioned information exchanges and integration outlined in the Regional ITS Architecture, potential agreements were identified.

4. CONCEPTUAL DESIGN

4.1 Systems Inventory

An important initial step in the architecture development process is to establish an inventory of existing ITS elements. At the project kick-off meeting and through subsequent discussions with agency representatives throughout the Region, West Central Texas stakeholders provided the team with a list of existing, planned, and future systems that would play a role in the Region's ITS architecture. "Planned" is defined as a system with funding identified while "future" is defined as a system that does not yet have funding identified.

Existing, planned, and future systems in the West Central Texas Region were identified in the following categories:

- ***Travel and Traffic Management*** – includes the TxDOT Abilene and Brownwood Traffic Management Centers (TMCs), center-to-center links, detection systems, closed-circuit television (CCTV), fixed and portable dynamic message signs, broadcast traveler information, and other related technologies.
- ***Public Transportation Management*** – includes transit and paratransit automated vehicle location, and transit travel information systems.
- ***Commercial Vehicle Operations*** – includes Hazardous Materials (HAZMAT) permitting and weigh-in-motion.
- ***Emergency Management*** – includes emergency operations/management centers and improved information sharing among traffic and emergency services.
- ***Information Management*** – includes electronic data management and archiving systems.
- ***Maintenance and Construction Management*** – includes roadway maintenance and construction information, and work zone management.

The System Inventory is a valuable task for several reasons. First, it provides a baseline of existing and planned ITS projects and systems in the Region. Second, it outlines which agencies are currently deploying and operating ITS, as well as those that are planning to implement ITS programs. Third, it provides a foundation for identifying needed elements or agency participation for the regional ITS, which will be important for subsequent tasks including the market package identification and prioritization, system interface and integration requirements in the Region, and ultimately the ITS Deployment Plan.

4.1.1 Subsystems and Terminators

Each identified system or component in the West Central Texas Regional ITS inventory was mapped to a subsystem or terminator in the National ITS Architecture. Subsystems and terminators are the 'entities' that represent systems in ITS. Subsystems are the highest level building blocks of the physical architecture, and the National ITS Architecture groups them into four major classes: Centers, Roadside, Vehicles, and Travelers. Each of these major classes includes various subsystems that represent a set of transportation functions (or processes) that are likely to be collected together under one agency, jurisdiction, or location, and correspond to physical elements, such as traffic operations centers, traffic signals, vehicles, and so on. **Figure 4** shows the National ITS Architecture subsystems. This figure, also known as the "sausage diagram" is a standard interconnect diagram, showing the

relationships of the various subsystems within the architecture; a customized interconnect diagram for the West Central Texas Region is included in Section 4.3.1 of this report. Communication functions between the subsystems are represented in the ovals. It should be noted that "wireline" communication refers to fixed-point to fixed-point communications, which include not only twisted pair and fiber optic technologies, but also such wireless technologies as microwave and spread spectrum.

Terminators are the people, systems, other facilities, and environmental conditions outside of ITS that need to communicate or interface with ITS subsystems. They help to define the boundaries of the National ITS Architecture as well as a regional system. Examples of terminators include drivers, traffic operations personnel, information service providers, weather effects (snow, rain, ice), telecommunications systems, and government reporting systems, among others.

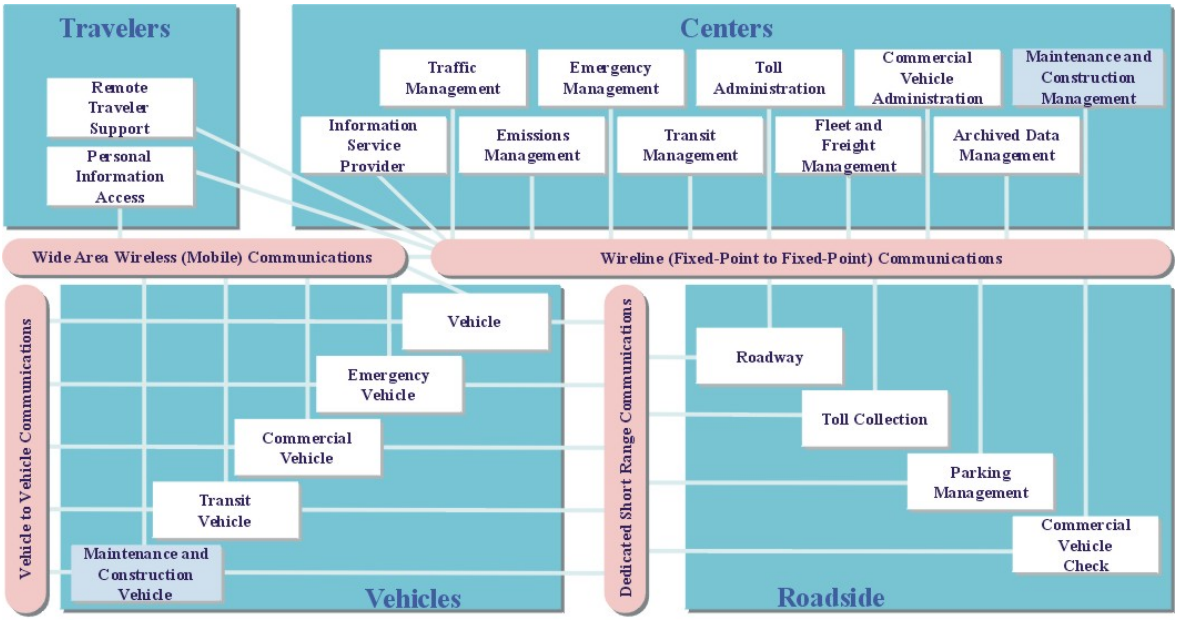


Figure 4 – Physical Subsystem Interconnect Diagram

4.1.2 West Central Texas ITS Inventory by Stakeholder

Each stakeholder is associated with one or more systems or elements (subsystems and terminators) that make up the transportation system in the West Central Texas Region. **Table 3** sorts the inventory by stakeholder, so each stakeholder can easily identify and review all their relevant assets that are identified in the West Central Texas Regional ITS Architecture.

The information in **Table 3** also is included on the West Central Texas ITS Architecture web site, which is accessible by selecting the link to the Texas Regional ITS Architecture, the West Central Texas Region, and then selecting the "Inventory by Stakeholder" button which will open the stakeholder list. Each element in the list contains a hyperlink to more detailed information, including status, description, stakeholder, and other elements within the inventory with which it interfaces. At the time this report was published, the West

Central Texas Regional ITS Architecture web site was being hosted at www.consystec.com. TxDOT plans to permanently host the site in the future at www.dot.state.tx.us/trf/its.

4.1.3 West Central Texas ITS Inventory by Entity

The West Central Texas Regional ITS Architecture inventory is made up of the transportation and communications centers, the field equipment, the vehicles, and other systems in the regional transportation system. These components have been assigned to an entity (subsystem or terminator) as defined by the National ITS Architecture. **Table 4** presents the West Central Texas Region inventory using the associated National ITS Architecture subsystem or terminator. This sorts elements that perform similar functions together, so elements of a particular type can be easily identified. This inventory also can be accessed from the West Central Texas Regional ITS Architecture web site by selecting the "Inventory by Entity" button.

Table 3 – West Central Texas Inventory of Regional Subsystems/Terminators (sorted by Stakeholder)

Stakeholder	Element	Entity	Status
Abilene Fire Department	City of Abilene Fire Dispatch	Emergency Management Subsystem	Existing
	City of Abilene Fire Vehicles	Emergency Vehicle Subsystem	Existing
Abilene MPO	Abilene MPO Archived Data Users	Archived Data User Systems	Existing
	Abilene MPO Regional Traffic Count Database	Archived Data Management Subsystem	Existing
	Abilene MPO Website	Information Service Provider Subsystem	Future
Abilene Police Department	City of Abilene Crash Database (PD)	Archived Data Management Subsystem	Existing
	City of Abilene Police Dispatch	Emergency Management Subsystem	Existing
	City of Abilene Police Dispatch	Event Promoters	Existing
	City of Abilene Police Vehicles	Emergency Vehicle Subsystem	Existing
Abilene Traffic Engineering Division	City of Abilene CCTV	Roadway Subsystem	Future
	City of Abilene Crash Database (TE)	Archived Data Management Subsystem	Existing
	City of Abilene DMS	Roadway Subsystem	Future
	City of Abilene Environmental Sensors	Roadway Subsystem	Existing
	City of Abilene Flood Detection System	Roadway Subsystem	Future
	City of Abilene School Pager System	Roadway Subsystem	Future
	City of Abilene Traffic Operations Center	Traffic Management Subsystem	Future
	City of Abilene Traffic Signals	Roadway Subsystem	Existing
	City of Abilene Vehicle Detectors	Roadway Subsystem	Existing
	City of Abilene Work Zone Equipment	Roadway Subsystem	Existing
Amtrak	Amtrak	Multimodal Transportation Service Provider	Existing
Aspermont Small Business Development Center	Double Mountain Coach Dispatch	Transit Management Subsystem	Existing
	Double Mountain Coach Ridership Database	Archived Data Management Subsystem	Existing
	Double Mountain Coach Transit Vehicles	Transit Vehicle Subsystem	Existing
	Double Mountain Coach Website	Information Service Provider Subsystem	Future
Brownwood Fire Department	City of Brownwood Fire Vehicles	Emergency Vehicle Subsystem	Existing

Table 3 – West Central Texas Inventory of Regional Subsystems/Terminators (sorted by Stakeholder) (continued)

Stakeholder	Element	Entity	Status
Brownwood Police Department	City of Brownwood Police Vehicles	Emergency Vehicle Subsystem	Existing
	City of Brownwood Public Safety Dispatch	Emergency Management Subsystem	Existing
Brownwood Street Department	City of Brownwood CCTV	Roadway Subsystem	Future
	City of Brownwood DMS	Roadway Subsystem	Future
	City of Brownwood School Pager System	Roadway Subsystem	Future
	City of Brownwood Traffic Operations Center	Traffic Management Subsystem	Future
	City of Brownwood Traffic Signals	Roadway Subsystem	Planned
	City of Brownwood Vehicle Detectors	Roadway Subsystem	Existing
	City of Brownwood Work Zone Equipment	Roadway Subsystem	Existing
Central Texas Rural Transit District	CARR – City and Rural Rides Dispatch	Transit Management Subsystem	Existing
	CARR – City and Rural Rides Ridership Archive	Archived Data Management Subsystem	Existing
	CARR – City and Rural Rides Vehicles	Transit Vehicle Subsystem	Existing
	CARR – City and Rural Rides Web Site	Information Service Provider Subsystem	Future
City of Abilene	City of Abilene Equipment Management	Maintenance and Construction Management Subsystem	Existing
	City of Abilene Equipment Repair	Equipment Repair Facility	Existing
	City of Abilene Public Works Vehicles	Maintenance and Construction Vehicle Subsystem	Existing
	City of Abilene Street Services	Maintenance and Construction Management Subsystem	Existing
	City of Abilene Traffic Engineering	Event Promoters	Existing
	City of Abilene Traffic Engineering	Maintenance and Construction Management Subsystem	Existing
	City of Abilene Website	Information Service Provider Subsystem	Existing
City of Brownwood	City of Brownwood City Council	Event Promoters	Existing
	City of Brownwood Flood Detection System	Roadway Subsystem	Future

Table 3 – West Central Texas Inventory of Regional Subsystems/Terminators (sorted by Stakeholder) (continued)

Stakeholder	Element	Entity	Status
City of Brownwood (continued)	City of Brownwood PWD	Maintenance and Construction Management Subsystem	Existing
	City of Brownwood PWD Vehicles	Maintenance and Construction Vehicle Subsystem	Existing
	City of Brownwood Website	Information Service Provider Subsystem	Existing
CityLink Transit	CityLink Transit Kiosks	Remote Traveler Support Subsystem	Future
	CityLink Transit Operations Center	Transit Management Subsystem	Existing
	CityLink Transit Ridership and Maintenance Database	Archived Data Management Subsystem	Existing
	CityLink Transit Stations	Remote Traveler Support Subsystem	Future
	CityLink Transit Vehicles	Transit Vehicle Subsystem	Existing
	Regional Transit Card	Traveler Card	Future
	Transit Database Users	Archived Data User Systems	Existing
Commercial Vehicle Operators	Commercial Vehicles	Commercial Vehicle Subsystem	Existing
	Commercial Vehicles	Vehicle Subsystem	Existing
	Private Fleet Management Systems	Fleet and Freight Management Subsystem	Future
Correctional Facilities	Correctional Facilities Transportation Operations	Transit Management Subsystem	Existing
County and Municipal Emergency Management Agencies	City of Abilene EOC	Emergency Management Subsystem	Existing
	City of Brownwood EOC	Emergency Management Subsystem	Existing
	County and Municipal EOCs	Emergency Management Subsystem	Existing
County Road and Bridge	County Road and Bridge	Maintenance and Construction Management Subsystem	Existing
	County Road and Bridge Equipment Repair	Equipment Repair Facility	Existing
	County Road and Bridge Field Equipment	Roadway Subsystem	Existing
	County Road and Bridge Vehicles	Maintenance and Construction Vehicle Subsystem	Existing
County Sheriff	County Public Safety Dispatch	Emergency Management Subsystem	Existing

Table 3 – West Central Texas Inventory of Regional Subsystems/Terminators (sorted by Stakeholder) (continued)

Stakeholder	Element	Entity	Status
DPS	DPS Administration	Emergency Management Subsystem	Existing
	DPS Communications Service	Emergency Management Subsystem	Existing
	DPS Emergency Vehicles	Emergency Vehicle Subsystem	Existing
	DPS Inspection Stations	Commercial Vehicle Check Subsystem	Planned
	Statewide Crash Records Information System	Archived Data Management Subsystem	Existing
	Statewide Crash Records Information System Users	Archived Data User Systems	Existing
DPS Division of Emergency Management	State EOC	Emergency Management Subsystem	Existing
Financial Institution	Financial Institution	Financial Institution	Future
Hill Country Transit District	Hill Country Rural Transit Vehicles	Transit Vehicle Subsystem	Existing
	Hill Country Transit District Ridership Database	Archived Data Management Subsystem	Existing
	Hill Country Transit Maintenance Database	Archived Data Management Subsystem	Existing
	Hill Country Transit Rural Dispatch	Transit Management Subsystem	Existing
	Hill Country Transit Website	Information Service Provider Subsystem	Existing
Independent School Districts	Independent School District Buses	Transit Vehicle Subsystem	Existing
	Independent School District Dispatch	Transit Management Subsystem	Existing
K-TUTS MPO	K-TUTS MPO Archived Database Users	Archived Data User Systems	Existing
	K-TUTS MPO Website	Information Service Provider Subsystem	Existing
	K-TUTS Traffic Counts Database	Archived Data Management Subsystem	Existing
Local Media	Local Print and Broadcast Media	Media	Existing
Municipal or County Government	Municipal ITS Field Equipment	Roadway Subsystem	Future
	Municipal Traffic Operations Center	Traffic Management Subsystem	Future
Municipal or County Public Safety	County Emergency Vehicles	Emergency Vehicle Subsystem	Existing
	Municipal Emergency Vehicles	Emergency Vehicle Subsystem	Existing
	Municipal Public Safety Dispatch	Emergency Management Subsystem	Existing

Table 3 – West Central Texas Inventory of Regional Subsystems/Terminators (sorted by Stakeholder) (continued)

Stakeholder	Element	Entity	Status
Municipal Public Works Department	Municipal Pavement Management System	Asset Management	Existing
	Municipal PWD	Maintenance and Construction Management Subsystem	Existing
	Municipal PWD Vehicles	Maintenance and Construction Vehicle Subsystem	Existing
NOAA	National Weather Service	Weather Service	Existing
One Call System	One Call System	Maintenance and Construction Management Subsystem	Existing
Pipeline Group	Pipeline Group	Emergency Management Subsystem	Existing
Private Information Service Providers	Private Sector Traveler Information Services	Information Service Provider Subsystem	Future
Private Maintenance Contractor	Private Maintenance Contractor	Maintenance and Construction Management Subsystem	Existing
Private Tow/Wrecker Providers	Private Tow/Wrecker Dispatch	Emergency Management Subsystem	Existing
	Private Tow/Wrecker Vehicles	Emergency Vehicle Subsystem	Existing
Private Transit Providers	Private Transit Systems	Transit Management Subsystem	Existing
Private Travelers	Driver	Driver	Existing
	Private Travelers Personal Computing Devices	Personal Information Access Subsystem	Future
Rail Operators	Rail Operations Centers	Archived Data User Systems	Existing
	Rail Operations Centers	Fleet and Freight Management Subsystem	Existing
	Rail Operations Centers	Rail Operations	Existing
	Rail Operators Wayside Equipment	Wayside Equipment	Existing
Regional Airport Operators	Regional Airports	Information Service Provider Subsystem	Existing
	Regional Airports	Multimodal Transportation Service Provider	Existing
Regional Emergency and Public Safety Agencies	West Central Texas Incident and Mutual Aid Network	Other Emergency Management	Future

Table 3 – West Central Texas Inventory of Regional Subsystems/Terminators (sorted by Stakeholder) (continued)

Stakeholder	Element	Entity	Status
Regional Medical Center	Private and County Hospital Ambulance Dispatch	Emergency Management Subsystem	Existing
	Private and County Hospital Ambulance Vehicle	Emergency Vehicle Subsystem	Existing
	Regional Medical Center	Care Facility	Existing
State of Texas	Service Agencies	Information Service Provider Subsystem	Existing
Texas Commission on Environmental Quality (TCEQ)	TCEQ Monitor Operations Sections	Emergency Management Subsystem	Existing
Texas Forest Service	Texas Forest Service Dispatch	Emergency Management Subsystem	Existing
	Texas Forest Service Vehicles	Emergency Vehicle Subsystem	Existing
TxDOT	Other TxDOT District Maintenance Sections	Maintenance and Construction Management Subsystem	Existing
	Other TxDOT District TMCs	Traffic Management Subsystem	Existing
	TxDOT 511 System	Information Service Provider Subsystem	Planned
	TxDOT Abilene District CCTV	Roadway Subsystem	Future
	TxDOT Abilene District DMS	Roadway Subsystem	Existing
	TxDOT Abilene District Field Sensors	Roadway Subsystem	Existing
	TxDOT Abilene District HAR	Roadway Subsystem	Future
	TxDOT Abilene District Lane Control Signals	Roadway Subsystem	Future
	TxDOT Abilene District Office	Event Promoters	Existing
	TxDOT Abilene District Office	Traffic Management Subsystem	Existing
	TxDOT Abilene District Pavement Management System	Asset Management	Existing
	TxDOT Abilene District Pavement Management System Users	Archived Data User Systems	Existing
	TxDOT Abilene District Public Information Office	Information Service Provider Subsystem	Existing
	TxDOT Abilene District School Pager System	Roadway Subsystem	Existing
	TxDOT Abilene District Traffic Management Center	Archived Data User Systems	Future
	TxDOT Abilene District Traffic Management Center	Traffic Management Subsystem	Future

Table 3 – West Central Texas Inventory of Regional Subsystems/Terminators (sorted by Stakeholder) (continued)

Stakeholder	Element	Entity	Status
TxDOT (continued)	TxDOT Abilene District Traffic Signals	Roadway Subsystem	Existing
	TxDOT Abilene District Web Page	Information Service Provider Subsystem	Existing
	TxDOT Abilene District Weigh-In-Motion Station	Roadway Subsystem	Future
	TxDOT Abilene District Work Zone Equipment	Roadway Subsystem	Existing
	TxDOT BRINSAP	Asset Management	Existing
	TxDOT Brownwood District CCTV	Roadway Subsystem	Future
	TxDOT Brownwood District DMS	Roadway Subsystem	Existing
	TxDOT Brownwood District Field Sensors	Roadway Subsystem	Existing
	TxDOT Brownwood District Office	Event Promoters	Existing
	TxDOT Brownwood District Office	Traffic Management Subsystem	Existing
	TxDOT Brownwood District Pavement Management System	Asset Management	Existing
	TxDOT Brownwood District Pavement Management System Users	Archived Data User Systems	Existing
	TxDOT Brownwood District Public Information Office	Information Service Provider Subsystem	Existing
	TxDOT Brownwood District School Pager System	Roadway Subsystem	Existing
	TxDOT Brownwood District Traffic Management Center	Traffic Management Subsystem	Future
	TxDOT Brownwood District Traffic Signals	Roadway Subsystem	Existing
	TxDOT Brownwood District Web Page	Information Service Provider Subsystem	Existing
	TxDOT Brownwood District Weigh-In-Motion Stations	Roadway Subsystem	Future
	TxDOT Brownwood District Work Zone Equipment	Roadway Subsystem	Existing
	TxDOT Fort Worth TMC (TransVision)	Traffic Management Subsystem	Existing
	TxDOT Highway Conditions Reporting System	Maintenance and Construction Management Subsystem	Existing
	TxDOT Maintenance and Management Information System	Asset Management	Existing
	TxDOT Motor Carrier Routing Information	Information Service Provider Subsystem	Existing

Table 3 – West Central Texas Inventory of Regional Subsystems/Terminators (sorted by Stakeholder) (continued)

Stakeholder	Element	Entity	Status
TxDOT (continued)	TxDOT Public Transportation Division	Archived Data Management Subsystem	Existing
	TxDOT Rest Areas/Visitor Centers/Truck Stops/Service Plaza Kiosks	Remote Traveler Support Subsystem	Planned
	TxDOT Statewide Pavement Management System	Archived Data Management Subsystem	Existing
	TxDOT Transportation Planning and Programming Division	Traffic Management Subsystem	Existing
	TxDOT West Central District Shop	Equipment Repair Facility	Existing
	TxDOT West Central Environmental Sensors	Roadway Subsystem	Future
	TxDOT West Central Texas Area Engineers Offices	Event Promoters	Existing
	TxDOT West Central Texas Area Engineers Offices	Maintenance and Construction Administrative Systems	Existing
	TxDOT West Central Texas Area Engineers Offices	Maintenance and Construction Management Subsystem	Existing
	TxDOT West Central Texas Maintenance Sections	Maintenance and Construction Management Subsystem	Existing
	TxDOT West Central Texas Maintenance Vehicles	Maintenance and Construction Vehicle Subsystem	Existing
US Air Force	Dyess AFB FD Dispatch	Emergency Management Subsystem	Existing
	Dyess AFB Fire Vehicles	Emergency Vehicle Subsystem	Existing
US Geological Survey	USGS Water Level Sensors	Roadway Subsystem	Existing
Water Districts and River Authorities	Water District/River Authorities Monitoring Sensors	Roadway Subsystem	Existing
	Water District/River Authorities Public Safety Dispatch	Emergency Management Subsystem	Existing
	Water District/River Authorities Public Safety Vehicles	Emergency Vehicle Subsystem	Future

Table 4 – West Central Texas Inventory of Regional Subsystems/Terminators (sorted by Entity)

Entity	Element	Stakeholder	Status
Archived Data Management Subsystem	Abilene MPO Regional Traffic Count Database	Abilene MPO	Existing
	CARR – City and Rural Rides Ridership Archive	Central Texas Rural Transit District	Existing
	City of Abilene Crash Database (PD)	Abilene Police Department	Existing
	City of Abilene Crash Database (TE)	Abilene Traffic Engineering Division	Existing
	CityLink Transit Ridership and Maintenance Database	CityLink Transit	Existing
	Double Mountain Coach Ridership Database	Aspermont Small Business Development Center	Existing
	Hill Country Transit District Ridership Database	Hill Country Transit District	Existing
	Hill Country Transit Maintenance Database	Hill Country Transit District	Existing
	K-TUTS Traffic Counts Database	K-TUTS MPO	Existing
	Statewide Crash Records Information System	DPS	Existing
	TxDOT Public Transportation Division	TxDOT	Existing
	TxDOT Statewide Pavement Management System	TxDOT	Existing
Archived Data User Systems	Abilene MPO Archived Data Users	Abilene MPO	Existing
	K-TUTS MPO Archived Database Users	K-TUTS MPO	Existing
	Rail Operations Centers	Rail Operators	Existing
	Statewide Crash Records Information System Users	DPS	Existing
	Transit Database Users	CityLink Transit	Existing
	TxDOT Abilene District Pavement Management System Users	TxDOT	Existing
	TxDOT Abilene District Traffic Management Center	TxDOT	Future
	TxDOT Brownwood District Pavement Management System Users	TxDOT	Existing
Asset Management	Municipal Pavement Management System	Municipal Public Works Department	Existing
	TxDOT Abilene District Pavement Management System	TxDOT	Existing
	TxDOT BRINSAP	TxDOT	Existing

Table 4 – West Central Texas Inventory of Regional Subsystems/Terminators (sorted by Entity) (continued)

Entity	Element	Stakeholder	Status
Asset Management (continued)	TxDOT Brownwood District Pavement Management System	TxDOT	Existing
	TxDOT Maintenance and Management Information System	TxDOT	Existing
Care Facility	Regional Medical Center	Regional Medical Center	Existing
Commercial Vehicle Check Subsystem	DPS Inspection Stations	DPS	Planned
Commercial Vehicle Subsystem	Commercial Vehicles	Commercial Vehicle Operators	Existing
Driver	Driver	Private Travelers	Existing
Emergency Management Subsystem	City of Abilene EOC	County and Municipal Emergency Management Agencies	Existing
	City of Abilene Fire Dispatch	Abilene Fire Department	Existing
	City of Abilene Police Dispatch	Abilene Police Department	Existing
	City of Brownwood EOC	County and Municipal Emergency Management Agencies	Existing
	City of Brownwood Public Safety Dispatch	Brownwood Police Department	Existing
	County and Municipal EOCs	County and Municipal Emergency Management Agencies	Existing
	County Public Safety Dispatch	County Sheriff	Existing
	DPS Administration	DPS	Existing
	DPS Communications Service	DPS	Existing
	Dyess AFB FD Dispatch	US Air Force	Existing
	Municipal Public Safety Dispatch	Municipal or County Public Safety	Existing
	Pipeline Group	Pipeline Group	Existing
	Private and County Hospital Ambulance Dispatch	Regional Medical Center	Existing
	Private Tow/Wrecker Dispatch	Private Tow/Wrecker Providers	Existing
	State EOC	DPS Division of Emergency Management	Existing

Table 4 – West Central Texas Inventory of Regional Subsystems/Terminators (sorted by Entity) (continued)

Entity	Element	Stakeholder	Status
Emergency Management Subsystem (continued)	TCEQ Monitor Operations Sections	Texas Commission on Environmental Quality (TCEQ)	Existing
	Texas Forest Service Dispatch	Texas Forest Service	Existing
	Water District/River Authorities Public Safety Dispatch	Water Districts and River Authorities	Existing
Emergency Vehicle Subsystem	City of Abilene Fire Vehicles	Abilene Fire Department	Existing
	City of Abilene Police Vehicles	Abilene Police Department	Existing
	City of Brownwood Fire Vehicles	Brownwood Fire Department	Existing
	City of Brownwood Police Vehicles	Brownwood Police Department	Existing
	County Emergency Vehicles	Municipal or County Public Safety	Existing
	DPS Emergency Vehicles	DPS	Existing
	Dyess AFB Fire Vehicles	US Air Force	Existing
	Municipal Emergency Vehicles	Municipal or County Public Safety	Existing
	Private and County Hospital Ambulance Vehicle	Regional Medical Center	Existing
	Private Tow/Wrecker Vehicles	Private Tow/Wrecker Providers	Existing
	Texas Forest Service Vehicles	Texas Forest Service	Existing
	Water District/River Authorities Public Safety Vehicles	Water Districts and River Authorities	Future
Equipment Repair Facility	City of Abilene Equipment Repair	City of Abilene	Existing
	County Road and Bridge Equipment Repair	County Road and Bridge	Existing
	TxDOT West Central District Shop	TxDOT	Existing
Event Promoters	City of Abilene Police Dispatch	Abilene Police Department	Existing
	City of Abilene Traffic Engineering	City of Abilene	Existing
	City of Brownwood City Council	City of Brownwood	Existing
	TxDOT Abilene District Office	TxDOT	Existing
	TxDOT Brownwood District Office	TxDOT	Existing
	TxDOT West Central Texas Area Engineers Offices	TxDOT	Existing

Table 4 – West Central Texas Inventory of Regional Subsystems/Terminators (sorted by Entity) (continued)

Entity	Element	Stakeholder	Status
Financial Institution	Financial Institution	Financial Institution	Future
Fleet and Freight Management Subsystem	Private Fleet Management Systems	Commercial Vehicle Operators	Future
	Rail Operations Centers	Rail Operators	Existing
Information Service Provider Subsystem	Abilene MPO Website	Abilene MPO	Future
	CARR – City and Rural Rides Web Site	Central Texas Rural Transit District	Future
	City of Abilene Website	City of Abilene	Existing
	City of Brownwood Website	City of Brownwood	Existing
	Double Mountain Coach Website	Aspermont Small Business Development Center	Future
	Hill Country Transit Website	Hill Country Transit District	Existing
	K-TUTS MPO Website	K-TUTS MPO	Existing
	Private Sector Traveler Information Services	Private Information Service Providers	Future
	Regional Airports	Regional Airport Operators	Existing
	Service Agencies	State of Texas	Existing
	TxDOT 511 System	TxDOT	Planned
	TxDOT Abilene District Public Information Office	TxDOT	Existing
	TxDOT Abilene District Web Page	TxDOT	Existing
	TxDOT Brownwood District Public Information Office	TxDOT	Existing
	TxDOT Brownwood District Web Page	TxDOT	Existing
	TxDOT Motor Carrier Routing Information	TxDOT	Existing
Maintenance and Construction Administrative Systems	TxDOT West Central Texas Area Engineers Offices	TxDOT	Existing
Maintenance and Construction Management Subsystem	City of Abilene Equipment Management	City of Abilene	Existing
	City of Abilene Street Services	City of Abilene	Existing
	City of Abilene Traffic Engineering	City of Abilene	Existing
	City of Brownwood PWD	City of Brownwood	Existing

Table 4 – West Central Texas Inventory of Regional Subsystems/Terminators (sorted by Entity) (continued)

Entity	Element	Stakeholder	Status
Maintenance and Construction Management Subsystem (continued)	County Road and Bridge	County Road and Bridge	Existing
	Municipal PWD	Municipal Public Works Department	Existing
	One Call System	One Call System	Existing
	Other TxDOT District Maintenance Sections	TxDOT	Existing
	Private Maintenance Contractor	Private Maintenance Contractor	Existing
	TxDOT Highway Conditions Reporting System	TxDOT	Existing
	TxDOT West Central Texas Area Engineers Offices	TxDOT	Existing
	TxDOT West Central Texas Maintenance Sections	TxDOT	Existing
Maintenance and Construction Vehicle Subsystem	City of Abilene Public Works Vehicles	City of Abilene	Existing
	City of Brownwood PWD Vehicles	City of Brownwood	Existing
	County Road and Bridge Vehicles	County Road and Bridge	Existing
	Municipal PWD Vehicles	Municipal Public Works Department	Existing
	TxDOT West Central Texas Maintenance Vehicles	TxDOT	Existing
Media	Local Print and Broadcast Media	Local Media	Existing
Multimodal Transportation Service Provider	Amtrak	Amtrak	Existing
	Regional Airports	Regional Airport Operators	Existing
Other Emergency Management	West Central Texas Incident and Mutual Aid Network	Regional Emergency and Public Safety Agencies	Future
Personal Information Access Subsystem	Private Travelers Personal Computing Devices	Private Travelers	Future
Rail Operations	Rail Operations Centers	Rail Operators	Existing
Remote Traveler Support Subsystem	CityLink Transit Kiosks	CityLink Transit	Future
	CityLink Transit Stations	CityLink Transit	Future
	TxDOT Rest Areas/Visitor Centers/Truck Stops/Service Plaza Kiosks	TxDOT	Planned
Roadway Subsystem	City of Abilene CCTV	Abilene Traffic Engineering Division	Future
	City of Abilene DMS	Abilene Traffic Engineering Division	Future

Table 4 – West Central Texas Inventory of Regional Subsystems/Terminators (sorted by Entity) (continued)

Entity	Element	Stakeholder	Status
Roadway Subsystem (continued)	City of Abilene Environmental Sensors	Abilene Traffic Engineering Division	Existing
	City of Abilene Flood Detection System	Abilene Traffic Engineering Division	Future
	City of Abilene School Pager System	Abilene Traffic Engineering Division	Future
	City of Abilene Traffic Signals	Abilene Traffic Engineering Division	Existing
	City of Abilene Vehicle Detectors	Abilene Traffic Engineering Division	Existing
	City of Abilene Work Zone Equipment	Abilene Traffic Engineering Division	Existing
	City of Brownwood CCTV	Brownwood Street Department	Future
	City of Brownwood DMS	Brownwood Street Department	Future
	City of Brownwood Flood Detection System	City of Brownwood	Future
	City of Brownwood School Pager System	Brownwood Street Department	Future
	City of Brownwood Traffic Signals	Brownwood Street Department	Planned
	City of Brownwood Vehicle Detectors	Brownwood Street Department	Existing
	City of Brownwood Work Zone Equipment	Brownwood Street Department	Existing
	County Road and Bridge Field Equipment	County Road and Bridge	Existing
	Municipal ITS Field Equipment	Municipal or County Government	Future
	TxDOT Abilene District CCTV	TxDOT	Future
	TxDOT Abilene District DMS	TxDOT	Existing
	TxDOT Abilene District Field Sensors	TxDOT	Existing
	TxDOT Abilene District HAR	TxDOT	Future
	TxDOT Abilene District Lane Control Signals	TxDOT	Future
	TxDOT Abilene District School Pager System	TxDOT	Existing
	TxDOT Abilene District Traffic Signals	TxDOT	Existing
	TxDOT Abilene District Weigh-In-Motion Station	TxDOT	Future
	TxDOT Abilene District Work Zone Equipment	TxDOT	Existing
	TxDOT Brownwood District CCTV	TxDOT	Future

Table 4 – West Central Texas Inventory of Regional Subsystems/Terminators (sorted by Entity) (continued)

Entity	Element	Stakeholder	Status
Roadway Subsystem (continued)	TxDOT Brownwood District DMS	TxDOT	Existing
	TxDOT Brownwood District Field Sensors	TxDOT	Existing
	TxDOT Brownwood District School Pager System	TxDOT	Existing
	TxDOT Brownwood District Traffic Signals	TxDOT	Existing
	TxDOT Brownwood District Weigh-In-Motion Stations	TxDOT	Future
	TxDOT Brownwood District Work Zone Equipment	TxDOT	Existing
	TxDOT West Central Environmental Sensors	TxDOT	Future
	USGS Water Level Sensors	US Geological Survey	Existing
	Water District/River Authorities Monitoring Sensors	Water Districts and River Authorities	Existing
Traffic Management Subsystem	City of Abilene Traffic Operations Center	Abilene Traffic Engineering Division	Future
	City of Brownwood Traffic Operations Center	Brownwood Street Department	Future
	Municipal Traffic Operations Center	Municipal or County Government	Future
	Other TxDOT District TMCs	TxDOT	Existing
	TxDOT Abilene District Office	TxDOT	Existing
	TxDOT Abilene District Traffic Management Center	TxDOT	Future
	TxDOT Brownwood District Office	TxDOT	Existing
	TxDOT Brownwood District Traffic Management Center	TxDOT	Future
	TxDOT Fort Worth TMC (TransVision)	TxDOT	Existing
	TxDOT Transportation Planning and Programming Division	TxDOT	Existing
	CARR – City and Rural Rides Dispatch	Central Texas Rural Transit District	Existing
	CityLink Transit Operations Center	CityLink Transit	Existing
	Correctional Facilities Transportation Operations	Correctional Facilities	Existing
	Double Mountain Coach Dispatch	Aspermont Small Business Development Center	Existing
	Hill Country Transit Rural Dispatch	Hill Country Transit District	Existing

Table 4 – West Central Texas Inventory of Regional Subsystems/Terminators (sorted by Entity) (continued)

Entity	Element	Stakeholder	Status
Traffic Management Subsystem (continued)	Independent School District Dispatch	Independent School Districts	Existing
	Private Transit Systems	Private Transit Providers	Existing
Transit Vehicle Subsystem	CARR – City and Rural Rides Vehicles	Central Texas Rural Transit District	Existing
	CityLink Transit Vehicles	CityLink Transit	Existing
	Double Mountain Coach Transit Vehicles	Aspermont Small Business Development Center	Existing
	Hill Country Rural Transit Vehicles	Hill Country Transit District	Existing
	Independent School District Buses	Independent School Districts	Existing
Traveler Card	Regional Transit Card	CityLink Transit	Future
Vehicle Subsystem	Commercial Vehicles	Commercial Vehicle Operators	Existing
Wayside Equipment	Rail Operators Wayside Equipment	Rail Operators	Existing
Weather Service	National Weather Service	NOAA	Existing

4.2 Regional Market Packages

Upon completion of the system inventory, the next step in the development of the architecture was to identify the transportation services that are important to the West Central Texas Region. In the National ITS Architecture, services are referred to as market packages. Market packages could include several stakeholders and elements that work together to provide a service in the Region. Examples of market packages from the National ITS Architecture include Network Surveillance, Traffic Information Dissemination, and Transit Vehicle Tracking. There are currently a total of 75 market packages identified in the National ITS Architecture Version 4.0.

In the West Central Texas Region, the National ITS Architecture market packages were reviewed by the stakeholders and selected based on the relevance of the service that the market package could provide to the Region. All of the market packages that stakeholders in the West Central Texas Region selected for implementation in the Region are identified in **Table 5**, as well as the elements in the Region that serve a role in providing the market package service and the primary stakeholders responsible for implementing the market packages.

In several cases, there are multiple stakeholders in the Region that provide the same service at different levels. For example, Surface Street Control (ATMS03) could be provided on arterials by the City of Abilene and by TxDOT on highways throughout the Abilene District. The market packages status is identified as existing, planned, or future for each of the primary stakeholders in the Region. In many cases market packages classified as existing might still need to be enhanced to increase the service that the market package provides and establish all of the elements associated with it.

Upon selecting the market packages that were applicable for the Region, stakeholders then reviewed each market package and the elements that could be included to customize it for the Region. This customization is discussed further in the following section.

Table 5 – West Central Texas Region Selected Market Packages

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
ATMS01	Network Surveillance	City of Abilene CCTV	City of Abilene	Existing
		City of Abilene Traffic Operations Center	City of Brownwood	Existing
		City of Abilene Vehicle Detectors	TxDOT Abilene District	Existing
		City of Abilene Website	TxDOT Brownwood District	Existing
		City of Brownwood CCTV	Other Municipalities	Future
		City of Brownwood Traffic Operations Center		
		City of Brownwood Vehicle Detectors		
		City of Brownwood Website		
		Municipal ITS Field Equipment		
		Municipal Traffic Operations Center		
		Private Sector Traveler Information Services		
		TxDOT Abilene District CCTV		
		TxDOT Abilene District Field Sensors		
		TxDOT Abilene District Traffic Management Center		

Table 5 – West Central Texas Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
ATMS01 (continued)	Network Surveillance (continued)	TxDOT Abilene District Web Page TxDOT Brownwood District CCTV TxDOT Brownwood District Field Sensors TxDOT Brownwood District Traffic Management Center TxDOT Brownwood District Web Page		
ATMS02	Probe Surveillance	Commercial Vehicles TxDOT Abilene District Field Sensors TxDOT Abilene District Traffic Management Center TxDOT Brownwood District Field Sensors TxDOT Brownwood District Traffic Management Center	TxDOT Abilene District TxDOT Brownwood District	Future Future
ATMS03	Surface Street Control	City of Abilene CCTV City of Abilene Traffic Operations Center City of Abilene Traffic Signals City of Brownwood CCTV City of Brownwood Traffic Operations Center City of Brownwood Traffic Signals Municipal ITS Field Equipment Municipal Traffic Operations Center TxDOT Abilene District CCTV TxDOT Abilene District Field Sensors TxDOT Abilene District Traffic Management Center TxDOT Abilene District Traffic Signals TxDOT Brownwood District CCTV TxDOT Brownwood District Field Sensors TxDOT Brownwood District Traffic Management Center TxDOT Brownwood District Traffic Signals	City of Abilene City of Brownwood TxDOT Abilene District TxDOT Brownwood District Other Municipalities	Existing Existing Existing Existing Future
ATMS04	Freeway Control	TxDOT Abilene District CCTV TxDOT Abilene District Field Sensors TxDOT Abilene District Lane Control Signals TxDOT Abilene District Traffic Management Center TxDOT Brownwood District CCTV TxDOT Brownwood District Field Sensors TxDOT Brownwood District Traffic Management Center	TxDOT Abilene District TxDOT Brownwood District	Future Future

Table 5 – West Central Texas Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
ATMS06 (continued)	Traffic Information Dissemination	CARR – City and Rural Rides Dispatch	City of Abilene	Future
		City of Abilene DMS	City of Brownwood	Future
		City of Abilene Fire Dispatch	Other Municipalities	Future
		City of Abilene Police Dispatch	TxDOT Abilene District	Future
		City of Abilene Street Services	TxDOT Brownwood District	Future
		City of Abilene Traffic Engineering		
		City of Abilene Traffic Operations Center		
		City of Abilene Website		
		City of Brownwood DMS		
		City of Brownwood Public Safety Dispatch		
		City of Brownwood PWD		
		City of Brownwood Traffic Operations Center		
		City of Brownwood Website		
		CityLink Transit Operations Center		
		County Public Safety Dispatch		
		County Road and Bridge		
		Double Mountain Coach Dispatch		
		DPS Communications Service		
		Hill Country Transit Rural Dispatch		
		Independent School District Dispatch		
		Local Print and Broadcast Media		
		Municipal ITS Field Equipment		
		Municipal Public Safety Dispatch		
		Municipal PWD		
		Municipal Traffic Operations Center		
		Private and County Hospital Ambulance Dispatch		
		Private Sector Traveler Information Services		
		Private Transit Systems		
		TCEQ Monitor Operations Sections		
		TxDOT 511 System		
		TxDOT Abilene District DMS		
		TxDOT Abilene District HAR		
		TxDOT Abilene District Public Information Office		
		TxDOT Abilene District Traffic Management Center		
		TxDOT Abilene District Web Page		

Table 5 – West Central Texas Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
ATMS06 (continued)	Traffic Information Dissemination (continued)	TxDOT Brownwood District DMS TxDOT Brownwood District Public Information Office TxDOT Brownwood District Traffic Management Center TxDOT Brownwood District Web Page TxDOT West Central Texas Area Engineers Offices TxDOT West Central Texas Maintenance Sections		
ATMS07	Regional Traffic Control	City of Abilene Traffic Operations Center City of Brownwood Traffic Operations Center Municipal Traffic Operations Center Other TxDOT District TMCs TxDOT Abilene District Traffic Management Center TxDOT Brownwood District Traffic Management Center TxDOT Fort Worth TMC (TransVision)	TxDOT Abilene District TxDOT Brownwood District	Future Future
ATMS08	Incident Management System	CARR – City and Rural Rides Dispatch City of Abilene Environmental Sensors City of Abilene EOC City of Abilene Fire Dispatch City of Abilene Fire Vehicles City of Abilene Police Dispatch City of Abilene Police Vehicles City of Abilene Street Services City of Abilene Traffic Engineering City of Abilene Traffic Operations Center City of Brownwood City Council City of Brownwood EOC City of Brownwood Fire Vehicles City of Brownwood Flood Detection System City of Brownwood Public Safety Dispatch City of Brownwood Police Vehicles City of Brownwood PWD City of Brownwood Traffic Operations Center CityLink Transit Operations Center	Transportation and Emergency Management Agencies	Future

Table 5 – West Central Texas Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
ATMS08 (continued)	Incident Management System (continued)	County and Municipal EOCs County Emergency Vehicles County Public Safety Dispatch County Road and Bridge Double Mountain Coach Dispatch DPS Communications Service DPS Emergency Vehicles Dyess AFB FD Dispatch Dyess AFB Fire Vehicles Hill Country Transit Rural Dispatch Independent School District Dispatch Municipal Emergency Vehicles Municipal Public Safety Dispatch Municipal PWD Municipal Traffic Operations Center Other TxDOT District Maintenance Sections Private and County Hospital Ambulance Dispatch Private and County Hospital Ambulance Vehicle Private Maintenance Contractor Private Tow/Wrecker Dispatch Private Tow/Wrecker Vehicles Private Transit Systems Rail Operations Centers State EOC TCEQ Monitor Operations Sections Texas Forest Service Dispatch Texas Forest Service Vehicles TxDOT Abilene District Office TxDOT Abilene District Traffic Management Center TxDOT Brownwood District Office TxDOT Brownwood District Traffic Management Center TxDOT West Central Texas Area Engineers Offices TxDOT West Central Texas Maintenance Sections USGS Water Level Sensors		

Table 5 – West Central Texas Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
ATMS08 (continued)	Incident Management System (continued)	Water District/River Authorities Monitoring Sensors Water District/River Authorities Public Safety Dispatch Water District/River Authorities Public Safety Vehicles		
ATMS13	Standard Railroad Grade Crossing	City of Abilene Traffic Operations Center City of Abilene Traffic Signals City of Brownwood Traffic Operations Center City of Brownwood Traffic Signals Rail Operations Centers Rail Operators Wayside Equipment TxDOT Abilene District Traffic Management Center TxDOT Abilene District Traffic Signals TxDOT Brownwood District Traffic Management Center TxDOT Brownwood District Traffic Signals	City of Abilene City of Brownwood TxDOT Abilene District TxDOT Brownwood District	Existing Future Future Future
ATMS15	Railroad Operations Coordination	Rail Operations Centers TxDOT Abilene District Traffic Management Center TxDOT Brownwood District Traffic Management Center	TxDOT Abilene District TxDOT Brownwood District	Future Future
ATMS19	Speed Monitoring	City of Abilene School Pager System City of Abilene Traffic Operations Center City of Brownwood School Pager System City of Brownwood Traffic Operations Center Driver Municipal ITS Field Equipment Municipal Traffic Operations Center TxDOT Abilene District School Pager System TxDOT Abilene District Traffic Management Center TxDOT Brownwood District School Pager System TxDOT Brownwood District Traffic Management Center	City of Abilene City of Brownwood Other Municipalities TxDOT Abilene District TxDOT Brownwood District	Future Future Future Existing Existing

Table 5 – West Central Texas Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
EM01	Emergency Response	City of Abilene EOC City of Abilene Fire Dispatch City of Abilene Police Dispatch City of Brownwood EOC City of Brownwood Public Safety Dispatch County and Municipal EOCs County Public Safety Dispatch DPS Communications Service Dyess AFB FD Dispatch Municipal Public Safety Dispatch Pipeline Group Private and County Hospital Ambulance Dispatch Private Tow/Wrecker Dispatch State EOC TCEQ Monitor Operations Sections Texas Forest Service Dispatch Water District/River Authorities Public Safety Dispatch West Central Texas Incident and Mutual Aid Network	Emergency Management Agencies	Future
EM02	Emergency Routing	City of Abilene Fire Dispatch City of Abilene Fire Vehicles City of Abilene Traffic Operations Center City of Abilene Traffic Signals City of Brownwood Fire Vehicles City of Brownwood Public Safety Dispatch Private and County Hospital Ambulance Dispatch Private and County Hospital Ambulance Vehicle Regional Medical Center TxDOT Abilene District Traffic Management Center TxDOT Abilene District Traffic Signals TxDOT Brownwood District Traffic Management Center TxDOT Brownwood District Traffic Signals	City of Abilene TxDOT Abilene District TxDOT Brownwood District	Future Future Future

Table 5 – West Central Texas Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
EMEX1	Emergency Evacuation by Transit	CARR – City and Rural Rides Dispatch CityLink Transit Operations Center City of Abilene EOC City of Brownwood EOC Correctional Facilities Transportation Operations County and Municipal EOCs Double Mountain Coach Dispatch DPS Communications Service Hill Country Transit Rural Dispatch Independent School District Dispatch State EOC	Emergency Management Agencies	Future
			Transit Management Agencies	Future
MC01	Maintenance and Construction Vehicle Tracking	City of Abilene Public Works Vehicles City of Abilene Street Services City of Abilene Traffic Engineering City of Brownwood PWD City of Brownwood PWD Vehicles County Road and Bridge County Road and Bridge Vehicles Municipal PWD Municipal PWD Vehicles TxDOT West Central Texas Maintenance Sections TxDOT West Central Texas Maintenance Vehicles	City of Abilene	Future
			City of Brownwood	Future
			Other Municipalities	Future
			TxDOT Abilene District	Future
			TxDOT Brownwood District	Future
			County Road and Bridge	Future
MC02	Maintenance and Construction Vehicle Maintenance	City of Abilene Equipment Management City of Abilene Equipment Repair City of Abilene Public Works Vehicles City of Brownwood PWD City of Brownwood PWD Vehicles County Road and Bridge County Road and Bridge Equipment Repair County Road and Bridge Vehicles Municipal PWD Municipal PWD Vehicles TxDOT West Central District Shop TxDOT West Central Texas Maintenance Sections TxDOT West Central Texas Maintenance Vehicles	TxDOT Abilene District	Future
			TxDOT Brownwood District	Future
			City of Abilene	Future
			City of Brownwood	Future
			Other Municipalities	Future
			County Road and Bridge	Future

Table 5 – West Central Texas Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
MC03	Road Weather Data Collection	City of Abilene Flood Detection System City of Abilene Street Services City of Brownwood Flood Detection System City of Brownwood PWD County Road and Bridge National Weather Service TxDOT West Central Environmental Sensors TxDOT West Central Texas Maintenance Sections USGS Water Level Sensors Water District/River Authorities Monitoring Sensors	City of Abilene City of Brownwood TxDOT Abilene District TxDOT Brownwood District	Future Future Future Future
MC04	Weather Information Processing and Distribution	CARR – City and Rural Rides Dispatch City of Abilene EOC City of Abilene Fire Dispatch City of Abilene Police Dispatch City of Abilene Street Services City of Abilene Traffic Operations Center City of Brownwood EOC City of Brownwood Public Safety Dispatch City of Brownwood PWD City of Brownwood Traffic Operations Center CityLink Transit Operations Center County and Municipal EOCs County Public Safety Dispatch County Road and Bridge Double Mountain Coach Dispatch DPS Communications Service Hill Country Transit Rural Dispatch Independent School District Dispatch Municipal Public Safety Dispatch Municipal PWD Municipal Traffic Operations Center National Weather Service Other TxDOT District Maintenance Sections Other TxDOT District TMCs	City of Abilene City of Brownwood Other Municipalities County Road and Bridge TxDOT Abilene District TxDOT Brownwood District	Future Future Future Future Future Future

Table 5 – West Central Texas Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
MC04 (continued)	Weather Information Processing and Distribution (continued)	TxDOT Abilene District Traffic Management Center TxDOT Brownwood District Traffic Management Center TxDOT Fort Worth TMC (TransVision) TxDOT West Central Texas Maintenance Sections		
MC07	Roadway Maintenance and Construction	City of Abilene Public Works Vehicles City of Abilene Street Services City of Abilene Traffic Engineering City of Abilene Traffic Operations Center City of Brownwood PWD City of Brownwood PWD Vehicles City of Brownwood Traffic Operations Center County Road and Bridge County Road and Bridge Field Equipment County Road and Bridge Vehicles Municipal Pavement Management System Municipal PWD Municipal PWD Vehicles TxDOT Abilene District Pavement Management System TxDOT BRINSAP TxDOT Brownwood District Pavement Management System TxDOT Maintenance and Management Information System TxDOT West Central Texas Area Engineers Offices TxDOT West Central Texas Maintenance Sections TxDOT West Central Texas Maintenance Vehicles	TxDOT Abilene District TxDOT Brownwood District County Road and Bridge City of Abilene City of Brownwood Other Municipalities	Future Future Future Future Future Future
MC08	Work Zone Management	CARR – City and Rural Rides Dispatch City of Abilene Fire Dispatch City of Abilene Police Dispatch City of Abilene Public Works Vehicles City of Abilene Street Services City of Abilene Traffic Engineering	TxDOT Abilene District TxDOT Brownwood District County Road and Bridge City of Abilene City of Brownwood Other Municipalities	Future Future Future Future Future Future

Table 5 – West Central Texas Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
MC08 (continued)	Work Zone Management (continued)	City of Abilene Traffic Operations Center City of Abilene Work Zone Equipment City of Brownwood PWD City of Brownwood PWD Vehicles City of Brownwood Traffic Operations Center City of Brownwood Work Zone Equipment CityLink Transit Operations Center County and Municipal EOCs County Public Safety Dispatch County Road and Bridge County Road and Bridge Field Equipment County Road and Bridge Vehicles Double Mountain Coach Dispatch DPS Communications Service Hill Country Transit Rural Dispatch Independent School District Dispatch Municipal ITS Field Equipment Municipal Public Safety Dispatch Municipal PWD Municipal PWD Vehicles Other TxDOT District Maintenance Sections Private and County Hospital Ambulance Dispatch Private Maintenance Contractor Private Tow/Wrecker Dispatch State EOC TxDOT Abilene District Traffic Management Center TxDOT Abilene District Web Page TxDOT Abilene District Work Zone Equipment TxDOT Brownwood District Traffic Management Center TxDOT Brownwood District Web Page TxDOT Brownwood District Work Zone Equipment TxDOT Highway Conditions Reporting System TxDOT West Central Texas Area Engineers Offices		

Table 5 – West Central Texas Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
MC08 (continued)	Work Zone Management (continued)	TxDOT West Central Texas Maintenance Sections TxDOT West Central Texas Maintenance Vehicles		
MC09	Work Zone Safety Monitoring	City of Abilene Public Works Vehicles City of Abilene Street Services City of Abilene Traffic Engineering City of Abilene Work Zone Equipment City of Brownwood PWD City of Brownwood PWD Vehicles City of Brownwood Work Zone Equipment County Road and Bridge County Road and Bridge Field Equipment County Road and Bridge Vehicles Municipal ITS Field Equipment Municipal PWD Municipal PWD Vehicles TxDOT Abilene District Work Zone Equipment TxDOT Brownwood District Work Zone Equipment TxDOT West Central Texas Maintenance Sections TxDOT West Central Texas Maintenance Vehicles	City of Abilene City of Brownwood Other Municipalities TxDOT Abilene District TxDOT Brownwood District County Road and Bridge	Future Future Future Future Future Future
MC10	Maintenance and Construction Activity Coordination	Abilene MPO Website CARR – City and Rural Rides Dispatch City of Abilene Fire Dispatch City of Abilene Police Dispatch City of Abilene Street Services City of Abilene Traffic Engineering City of Abilene Traffic Operations Center City of Abilene Website City of Brownwood Public Safety Dispatch City of Brownwood PWD City of Brownwood Traffic Operations Center City of Brownwood Website CityLink Transit Operations Center County Public Safety Dispatch	TxDOT Abilene District TxDOT Brownwood District County Road and Bridge City of Abilene City of Brownwood Other Municipalities	Future Future Future Future Future Future

Table 5 – West Central Texas Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
MC10 (continued)	Maintenance and Construction Activity Coordination (continued)	County Road and Bridge Double Mountain Coach Dispatch DPS Communications Service Dyess AFB FD Dispatch Hill Country Transit Rural Dispatch Independent School District Dispatch K-TUTS MPO Website Local Print and Broadcast Media Municipal Public Safety Dispatch Municipal PWD Municipal Traffic Operations Center One Call System Other TxDOT District Maintenance Sections Private Maintenance Contractor Private Sector Traveler Information Services Private Tow/Wrecker Dispatch TxDOT 511 System TxDOT Abilene District Public Information Office TxDOT Abilene District Traffic Management Center TxDOT Abilene District Web Page TxDOT Brownwood District Public Information Office TxDOT Brownwood District Traffic Management Center TxDOT Brownwood District Web Page TxDOT Highway Conditions Reporting System TxDOT West Central Texas Area Engineers Offices TxDOT West Central Texas Maintenance Sections		
APTS1	Transit Vehicle Tracking	CARR – City and Rural Rides Dispatch	CARR	Future
		CARR – City and Rural Rides Vehicles	CityLink Transit	Future
		CityLink Transit Operations Center	Double Mountain Coach	Future
		CityLink Transit Vehicles	Hill Country Transit	Future
		Double Mountain Coach Dispatch	Independent School Districts	Future
		Double Mountain Coach Transit Vehicles		
		Hill Country Rural Transit Vehicles		

Table 5 – West Central Texas Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
APTS1 (continued)	Transit Vehicle Tracking (continued)	Hill Country Transit Rural Dispatch Independent School District Buses Independent School District Dispatch		
APTS2	Transit Fixed-Route Operations	City of Abilene Street Services City of Abilene Traffic Engineering City of Abilene Traffic Operations Center City of Abilene Website City of Brownwood PWD City of Brownwood Traffic Operations Center CityLink Transit Operations Center CityLink Transit Vehicles County Road and Bridge Independent School District Buses Independent School District Dispatch Municipal PWD Municipal Traffic Operations Center Private Sector Traveler Information Services TxDOT 511 System TxDOT Abilene District Traffic Management Center TxDOT Brownwood District Traffic Management Center TxDOT West Central Texas Maintenance Sections	CityLink Transit Independent School Districts	Future Future
APTS3	Demand Response Transit Operations	CARR – City and Rural Rides Dispatch CARR – City and Rural Rides Vehicles CARR – City and Rural Rides Web Site City of Abilene Street Services City of Abilene Traffic Operations Center City of Abilene Website City of Brownwood PWD City of Brownwood Traffic Operations Center CityLink Transit Operations Center CityLink Transit Vehicles County Road and Bridge Double Mountain Coach Dispatch Double Mountain Coach Transit Vehicles Double Mountain Coach Website	CARR Double Mountain Coach Hill Country Transit CityLink Transit	Future Future Future Future

Table 5 – West Central Texas Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
APTS3 (continued)	Demand Response Transit Operations (continued)	Hill Country Rural Transit Vehicles Hill Country Transit Rural Dispatch Hill Country Transit Website Municipal PWD Municipal Traffic Operations Center Private Sector Traveler Information Services Service Agencies TxDOT 511 System TxDOT Abilene District Traffic Management Center TxDOT Abilene District Web Page TxDOT Brownwood District Traffic Management Center TxDOT Brownwood District Web Page TxDOT West Central Texas Maintenance Sections		
APTS4	Transit Passenger and Fare Management	CARR – City and Rural Rides Dispatch CARR – City and Rural Rides Vehicles CityLink Transit Kiosks CityLink Transit Operations Center CityLink Transit Vehicles Double Mountain Coach Dispatch Double Mountain Coach Transit Vehicles Financial Institution Hill Country Rural Transit Vehicles Hill Country Transit Rural Dispatch Regional Transit Card Service Agencies	CityLink Transit Hill Country Transit Double Mountain Coach CARR	Future Future Future Future
APTS5	Transit Security	CARR – City and Rural Rides Dispatch CARR – City and Rural Rides Vehicles City of Abilene Police Dispatch City of Brownwood Public Safety Dispatch CityLink Transit Kiosks CityLink Transit Operations Center CityLink Transit Stations CityLink Transit Vehicles County Public Safety Dispatch Double Mountain Coach Dispatch Double Mountain Coach Transit Vehicles	Hill Country Transit CityLink Transit Double Mountain Coach CARR	Future Future Future Future

Table 5 – West Central Texas Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
APTS5 (continued)	Transit Security (continued)	DPS Communications Service Hill Country Rural Transit Vehicles Hill Country Transit Rural Dispatch Municipal Public Safety Dispatch		
APTS6	Transit Maintenance	CARR – City and Rural Rides Dispatch CARR – City and Rural Rides Vehicles CityLink Transit Operations Center CityLink Transit Vehicles Double Mountain Coach Dispatch Double Mountain Coach Transit Vehicles Hill Country Rural Transit Vehicles Hill Country Transit Rural Dispatch	CityLink Transit Double Mountain Coach CARR Hill Country Transit	Future Future Future Future
APTS7	Multi-modal Coordination	Amtrak CARR – City and Rural Rides Dispatch CityLink Transit Operations Center Double Mountain Coach Dispatch Hill Country Transit Rural Dispatch Private Transit Systems Regional Airports	CityLink Transit Hill Country Transit Double Mountain Coach CARR	Future Future Future Future
APTS8	Transit Traveler Information	CARR – City and Rural Rides Dispatch CARR – City and Rural Rides Web Site City of Abilene Website CityLink Transit Kiosks CityLink Transit Operations Center Double Mountain Coach Dispatch Double Mountain Coach Website Hill Country Transit Rural Dispatch Hill Country Transit Website Private Travelers Personal Computing Devices TxDOT 511 System TxDOT Rest Areas/Visitor Centers/Service/Truck Stops/ Plaza Kiosks	Hill Country Transit CityLink Transit Double Mountain Coach CARR	Future Future Future Future

Table 5 – West Central Texas Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
CVO06	Weigh-in-Motion	TxDOT Abilene District Traffic Management Center TxDOT Abilene District Weigh-in-Motion Station DPS Inspection Stations TxDOT Brownwood District Traffic Management Center TxDOT Brownwood District Weigh-in-Motion Stations	TxDOT Abilene District	Future
			TxDOT Brownwood District	Future
CVO10	HAZMAT Management	City of Abilene Fire Dispatch City of Abilene Police Dispatch City of Brownwood Public Safety Dispatch Commercial Vehicles County Public Safety Dispatch DPS Communications Service Dyess AFB FD Dispatch Municipal Public Safety Dispatch Private Fleet Management Systems TCEQ Monitor Operations Sections	Emergency Management Agencies	Future
ATIS1	Broadcast Traveler Information	City of Abilene Street Services City of Abilene Traffic Engineering City of Abilene Traffic Operations Center City of Abilene Website City of Brownwood Public Safety Dispatch City of Brownwood PWD City of Brownwood Traffic Operations Center City of Brownwood Website CityLink Transit Operations Center County Road and Bridge Local Print and Broadcast Media Municipal PWD Private Travelers Personal Computing Devices TxDOT 511 System TxDOT Abilene District Public Information Office TxDOT Abilene District Traffic Management Center TxDOT Abilene District Web Page	TxDOT Abilene District	Future
			TxDOT Brownwood District	Future
			City of Brownwood	Future
			City of Abilene	Future

Table 5 – West Central Texas Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
ATIS1 (continued)	Broadcast Traveler Information (continued)	TxDOT Brownwood District Public Information Office TxDOT Brownwood District Traffic Management Center TxDOT Brownwood District Web Page TxDOT Rest Areas/Visitor Centers/Service/Truck Stops/ Plaza Kiosks TxDOT West Central Texas Area Engineers Offices TxDOT West Central Texas Maintenance Sections		
ATIS5	ISP Based Route Guidance	City of Abilene Traffic Operations Center City of Brownwood Traffic Operations Center Municipal Traffic Operations Center Other TxDOT District TMCs Private Fleet Management Systems TxDOT Abilene District Traffic Management Center TxDOT Brownwood District Traffic Management Center TxDOT Motor Carrier Routing Information TxDOT Rest Areas/Visitor Centers/Service/Truck Stops/ Plaza Kiosks TxDOT West Central Texas Maintenance Sections	TxDOT Motor Carrier	Future
AD1	ITS Data Mart	Abilene MPO Archived Data Users Abilene MPO Regional Traffic Count Database CARR – City and Rural Rides Dispatch CARR – City and Rural Rides Ridership Archive City of Abilene Crash Database (PD) City of Abilene Crash Database (TE) City of Abilene Police Dispatch City of Abilene Traffic Operations Center City of Brownwood Public Safety Dispatch CityLink Transit Operations Center CityLink Transit Ridership and Maintenance Database County Public Safety Dispatch Double Mountain Coach Dispatch	TxDOT Public Transportation Division	Future
			TxDOT Abilene District	Existing
			TxDOT Brownwood District	Existing
			Department of Public Safety	Existing
			City of Abilene	Future
			Abilene MPO	Future
			K-TUTS	Future
			CityLink Transit	Future
			Hill Country Transit	Future
			CARR	Future
			Double Mountain Coach	Future

Table 5 – West Central Texas Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
AD1 (continued)	ITS Data Mart (continued)	Double Mountain Coach Ridership Database DPS Administration Hill Country Transit District Ridership Database Hill Country Transit Maintenance Database Hill Country Transit Rural Dispatch K-TUTS MPO Archived Database Users K-TUTS Traffic Counts Database Municipal Public Safety Dispatch Statewide Crash Records Information System Statewide Crash Records Information System Users Transit Database Users TxDOT Abilene District Pavement Management System TxDOT Abilene District Pavement Management System Users TxDOT Abilene District Traffic Management Center TxDOT Brownwood District Pavement Management System TxDOT Brownwood District Pavement Management System Users TxDOT Brownwood District Traffic Management Center TxDOT Public Transportation Division TxDOT Statewide Pavement Management System TxDOT Transportation Planning and Programming Division TxDOT West Central Texas Area Engineers Offices TxDOT West Central Texas Maintenance Sections		

4.3 Interconnections

4.3.1 Top Level Regional System Interconnect Diagram

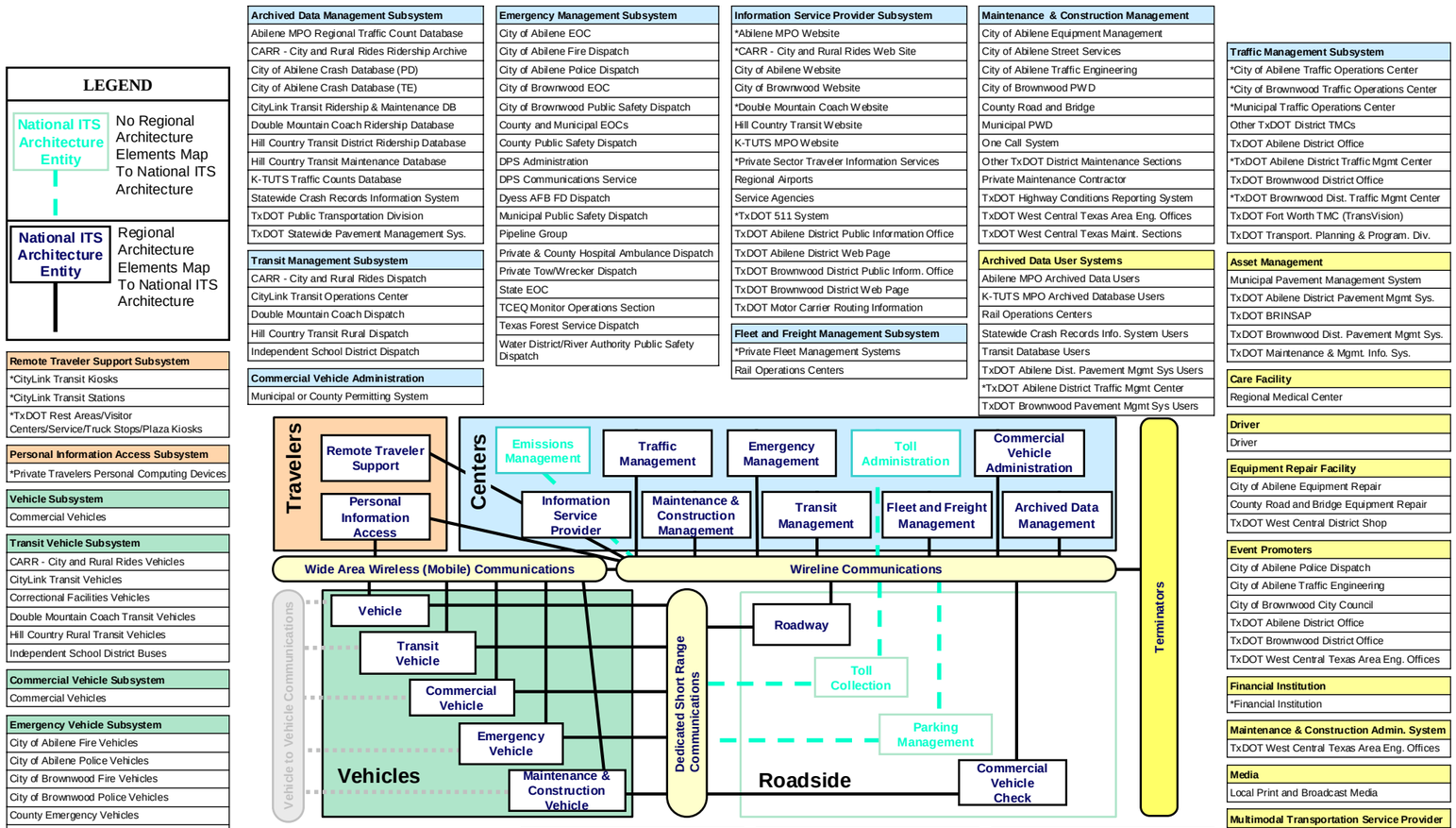
A system interconnect diagram, or sausage diagram (shown previously in **Figure 4**), shows the systems and primary interconnects in the Region. The National ITS Architecture interconnect diagram has been customized for the West Central Texas Region based on the information gathered from the stakeholders and system inventory. **Figure 5** summarizes the existing, planned, and future ITS elements for the West Central Texas Region in the context of a physical interconnect. Subsystems and elements specific to West Central Texas are called out in the boxes surrounding the main interconnect diagram, and these are color-coded to the subsystem to which they are associated.

4.3.2 Customized Market Packages

The market packages in the National ITS Architecture were customized to reflect the unique systems, subsystems, and terminators in the West Central Texas Region. Each market package is shown graphically, with the market package name, West Central Texas-specific element, and with the unique agency and system identifiers within the subsystems and terminators. Market packages represent a service that will be deployed as an integrated capability. Market packages are often comprised of one or more equipment packages, which are functional capabilities that could be deployed at a specific time. Equipment packages are the most basic functions that will be developed or bought by implementers.

Figure 6 is an example of an ATMS market package for Surface Street Control that has been customized for the TxDOT Abilene District. This market package shows the two subsystems, Traffic Management and Roadway, and the associated entities (TxDOT Abilene District Traffic Signals, TxDOT Abilene District Field Sensors, etc.) for the TxDOT Abilene District signal system. Data flows between the subsystems indicate what information is being shared.

Market packages that were customized for the West Central Texas Region are shown in **Appendix A**. These market packages also are included on the West Central Texas Regional ITS Architecture web site by selecting the "Market Package" button. Market packages are grouped by functional area (Traffic Management, Maintenance and Construction, Public Transportation, etc.), and each of the customized market packages can be viewed by clicking on the Market Package Diagram icon under each area heading. It is important to note that while the market package table on the web site shows all of the available market packages from the National ITS Architecture, only those selected for the West Central Texas Region are included in the diagrams. The selected market packages on the web site also are highlighted in the table with bold print, and are indicated as existing or planned.



LEGEND

National ITS Architecture Entity — No Regional Architecture Elements Map To National ITS Architecture

National ITS Architecture Entity — Regional Architecture Elements Map To National ITS Architecture

Remote Traveler Support Subsystem
*CityLink Transit Kiosks
*CityLink Transit Stations
*TxDOT Rest Areas/Visitor Centers/Service/Truck Stops/Plaza Kiosks

Personal Information Access Subsystem
*Private Travelers Personal Computing Devices

Vehicle Subsystem
Commercial Vehicles

Transit Vehicle Subsystem
CARR - City and Rural Rides Vehicles
CityLink Transit Vehicles
Correctional Facilities Vehicles
Double Mountain Coach Transit Vehicles
Hill Country Rural Transit Vehicles
Independent School District Buses

Commercial Vehicle Subsystem
Commercial Vehicles

Emergency Vehicle Subsystem
City of Abilene Fire Vehicles
City of Abilene Police Vehicles
City of Brownwood Fire Vehicles
City of Brownwood Police Vehicles
County Emergency Vehicles
DPS Emergency Vehicles
Dyess AFB Fire Vehicles
Municipal Emergency Vehicles
Private & County Hospital Ambulance Vehicle
Private Tow/Wrecker Vehicles
Texas Forest Service Vehicles
*Water Dist./River Author. Pub. Safety Vehicles

Maintenance and Const Vehicle Subsystem
City of Abilene Public Works Vehicles
City of Brownwood PWD Vehicles
County Road and Bridge Vehicles
Municipal PWD Vehicles
TxDOT West Central Texas Maint. Vehicles

Archived Data Management Subsystem
Abilene MPO Regional Traffic Count Database
CARR - City and Rural Rides Ridership Archive
City of Abilene Crash Database (PD)
City of Abilene Crash Database (TE)
CityLink Transit Ridership & Maintenance DB
Double Mountain Coach Ridership Database
Hill Country Transit District Ridership Database
Hill Country Transit Maintenance Database
K-TUTS Traffic Counts Database
Statewide Crash Records Information System
TxDOT Public Transportation Division
TxDOT Statewide Pavement Management Sys.

Transit Management Subsystem
CARR - City and Rural Rides Dispatch
CityLink Transit Operations Center
Double Mountain Coach Dispatch
Hill Country Transit Rural Dispatch
Independent School District Dispatch

Commercial Vehicle Administration
Municipal or County Permitting System

Emergency Management Subsystem
City of Abilene EOC
City of Abilene Fire Dispatch
City of Abilene Police Dispatch
City of Brownwood EOC
City of Brownwood Public Safety Dispatch
County and Municipal EOCs
County Public Safety Dispatch
DPS Administration
DPS Communications Service
Dyess AFB FD Dispatch
Municipal Public Safety Dispatch
Pipeline Group
Private & County Hospital Ambulance Dispatch
Private Tow/Wrecker Dispatch
State EOC
TCEQ Monitor Operations Section
Texas Forest Service Dispatch
Water District/River Authority Public Safety Dispatch

Information Service Provider Subsystem
*Abilene MPO Website
*CARR - City and Rural Rides Web Site
City of Abilene Website
City of Brownwood Website
*Double Mountain Coach Website
Hill Country Transit Website
K-TUTS MPO Website
*Private Sector Traveler Information Services
Regional Airports
Service Agencies
*TxDOT 511 System
TxDOT Abilene District Public Information Office
TxDOT Abilene District Web Page
TxDOT Brownwood District Public Inform. Office
TxDOT Brownwood District Web Page
TxDOT Motor Carrier Routing Information

Fleet and Freight Management Subsystem
*Private Fleet Management Systems
Rail Operations Centers

Maintenance & Construction Management
City of Abilene Equipment Management
City of Abilene Street Services
City of Abilene Traffic Engineering
City of Brownwood PWD
County Road and Bridge
Municipal PWD
One Call System
Other TxDOT District Maintenance Sections
Private Maintenance Contractor
TxDOT Highway Conditions Reporting System
TxDOT West Central Texas Area Eng. Offices
TxDOT West Central Texas Maint. Sections

Archived Data User Systems
Abilene MPO Archived Data Users
K-TUTS MPO Archived Database Users
Rail Operations Centers
Statewide Crash Records Info. System Users
Transit Database Users
TxDOT Abilene Dist. Pavement Mgmt Sys Users
*TxDOT Abilene District Traffic Mgmt Center
TxDOT Brownwood Pavement Mgmt Sys Users

Traffic Management Subsystem
*City of Abilene Traffic Operations Center
*City of Brownwood Traffic Operations Center
*Municipal Traffic Operations Center
Other TxDOT District TMCs
TxDOT Abilene District Office
*TxDOT Abilene District Traffic Mgmt Center
TxDOT Brownwood District Office
*TxDOT Brownwood Dist. Traffic Mgmt Center
TxDOT Fort Worth TMC (TransVision)
TxDOT Transport. Planning & Program. Div.

Asset Management
Municipal Pavement Management System
TxDOT Abilene District Pavement Mgmt Sys.
TxDOT BRINSAP
TxDOT Brownwood Dist. Pavement Mgmt Sys.
TxDOT Maintenance & Mgmt. Info. Sys.

Care Facility
Regional Medical Center

Driver
Driver

Equipment Repair Facility
City of Abilene Equipment Repair
County Road and Bridge Equipment Repair
TxDOT West Central District Shop

Event Promoters
City of Abilene Police Dispatch
City of Abilene Traffic Engineering
City of Brownwood City Council
TxDOT Abilene District Office
TxDOT Brownwood District Office
TxDOT West Central Texas Area Eng. Offices

Financial Institution
*Financial Institution

Maintenance & Construction Admin. System
TxDOT West Central Texas Area Eng. Offices

Media
Local Print and Broadcast Media

Multimodal Transportation Service Provider
Amtrak
Regional Airports

Other EM
West Cent. Tx. Incident & Mutual Aid Network

Rail Operations
Rail Operations Centers

Traveler Card
*Regional Transit Card

Wayside Equipment
Rail Operators Wayside Equipment

Weather Service
National Weather Service

Roadway Subsystem
*City of Abilene CCTV
*City of Abilene DMS
City of Abilene Environmental Sensors
*City of Abilene Flood Detection System
*City of Abilene School Pager System
City of Abilene Traffic Signals
City of Abilene Vehicle Detectors
City of Abilene Work Zone Equipment
*City of Brownwood CCTV
*City of Brownwood DMS
*City of Brownwood Flood Detection System
*City of Brownwood School Pager System
*City of Brownwood Traffic Signals

Roadway Subsystem
City of Brownwood Vehicle Detectors
City of Brownwood Work Zone Equipment
County Road and Bridge Field Equipment
*Municipal ITS Field Equipment
TxDOT Abilene District CCTV
TxDOT Abilene District DMS
TxDOT Abilene District Field Sensors
*TxDOT Abilene District HAR
*TxDOT Abilene District Lane Control Signals
TxDOT Abilene District School Pager System
TxDOT Abilene District Traffic Signals
*TxDOT Abilene District Weigh-In-Motion Sta.
TxDOT Abilene District Work Zone Equipment

Roadway Subsystem
*TxDOT Brownwood District CCTV
TxDOT Brownwood District DMS
TxDOT Brownwood District Field Sensors
TxDOT Brownwood District School Pager Sys.
TxDOT Brownwood District Traffic Signals
*TxDOT Brownwood District WIM Stations
TxDOT Brownwood District Work Zone Equip.
*TxDOT West Central Environmental Sensors
USGS Water Level Sensors
Water Dist./River Authori. Monitoring Sensors

Commercial Vehicle Check
*DPS Inspection Stations

* Elements are *planned or future*, not *existing*.
Last update: August 20, 2004

Figure 5 – West Central Texas Regional System Interconnect Diagram

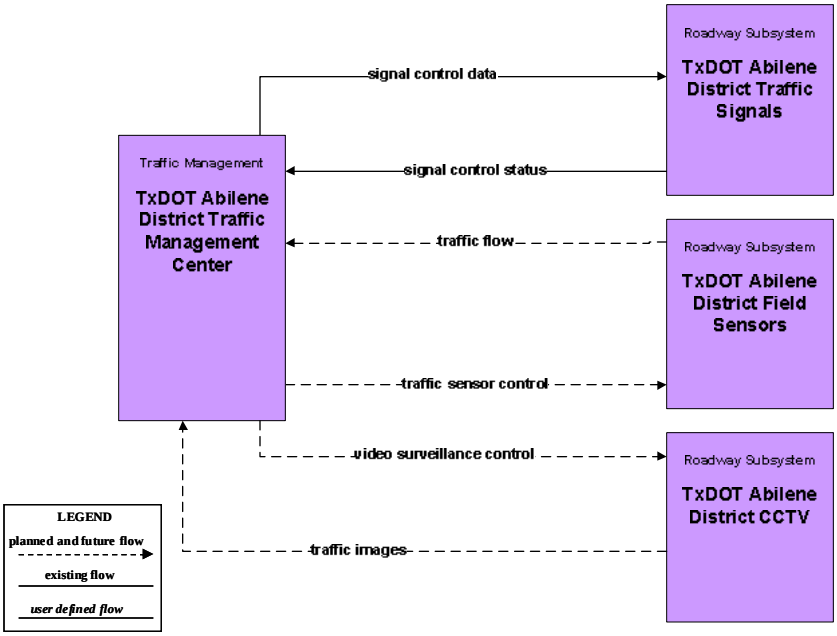


Figure 6 – Custom Market Package for Surface Street Control

4.3.3 West Central Texas Architecture Interfaces

While it is important to identify the various systems and stakeholders as part of a regional ITS, a primary purpose of the architecture is to identify the *connectivity* between transportation systems in the West Central Texas Region. The interconnect diagram shown previously in **Figure 5** showed the high-level relationships of the subsystems and terminators in the West Central Texas Region and the associated local projects and systems. The customized market packages represent services that can be deployed as an integrated capability, and the market package diagrams show the information flows between the subsystems and terminators that are most important to the operation of the market packages. How these systems interface with each other is an integral part of the overall ITS architecture.

There are 165 different elements identified as part of the West Central Texas Regional ITS Architecture. These elements include traffic management centers, transit vehicles, dispatch systems, emergency management agencies, media outlets, and others – essentially, all of the existing and planned physical components that contribute to the regional intelligent transportation system. Interfaces have been identified for each element in the West Central Texas Regional ITS Architecture, and each element has been mapped to those other elements with which it must interface. For example, the TxDOT Brownwood District TMC has existing or planned interfaces with 39 other elements in the TxDOT Brownwood District, ranging from field equipment and dispatch centers, to other TxDOT District TMCs. Other interfaces are far less complex, such as the interface between the DPS vehicles and the DPS Communications Dispatch.

An example of one of the system interfaces is shown in **Figure 7**. This graphic shows the City of Abilene Traffic Signals and the existing and planned interfaces with other elements throughout the Region. These interfaces are shown as existing, planned, or future. Interfaces defined as planned have funding identified, while future interfaces are desired by stakeholders but funding has not yet been identified.

Each element and its defined interfaces are listed in **Appendix B**. Elements and their interfaces also are accessible via the West Central Texas Regional ITS Architecture web site by clicking on the "Interfaces" button. Elements are listed alphabetically in the column on the left, and each entry in the Interfacing Element column on the right is a link to more detailed information about the particular interface. The architecture flows between the individual element interfaces are described in more detail in the following section.

4.3.4 Physical Subsystem Architecture Flows

Architecture flows between the subsystems and terminators define the specific information (data) that is exchanged between subsystems and terminators. Each architecture flow has one or more data flows that specify what information is exchanged and the direction of the exchange. These data flows could be requests for information, alerts and messages, status requests, broadcast advisories, event messages, confirmations, electronic credentials, and other key information requirements. These architecture flows define the interface requirements between the various elements in the West Central Texas Regional ITS Architecture.

An example of the architecture flows between two elements is shown in **Figure 8**. In this interface, the flows between the TxDOT Brownwood District TMC and Other TxDOT District TMCs show information that must go from the Brownwood District TMC to other Texas TMCs, as well as information that the District TMC needs from devices. Similar to the interfaces, architecture flows also are defined as existing, planned, or future.

Each of the individual element interfaces can be accessed on the West Central Texas Regional ITS Architecture web site by clicking on the "Interfaces" button. Selecting any of the interfacing elements from the column on the right will display an interface diagram and architecture flows between two specific elements, similar to the diagram shown in **Figure 8**. Each data flow is defined, and any standards associated with that data flow are noted. Standards as they apply to the West Central Texas Region are discussed in more detail in Section 4.5.

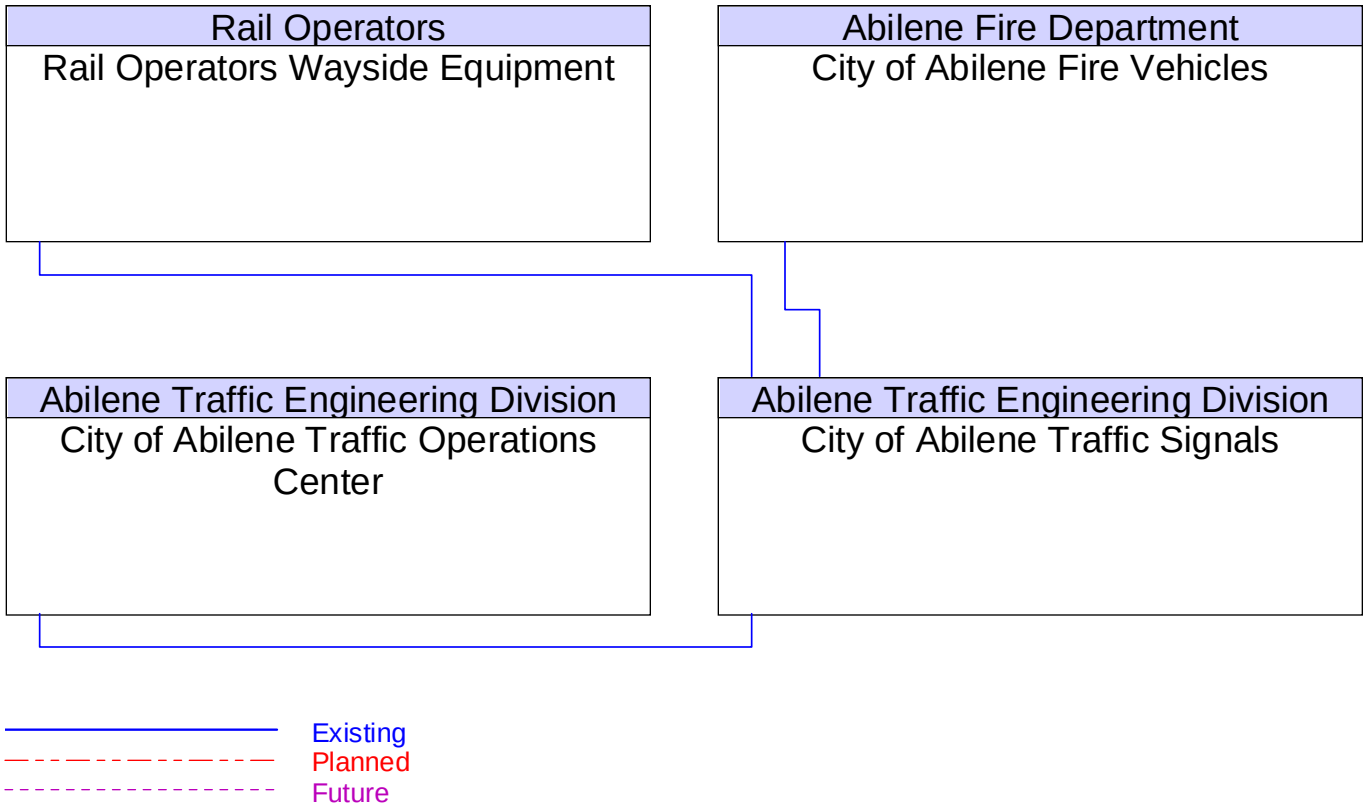


Figure 7 – City of Abilene Traffic Signals Interfaces

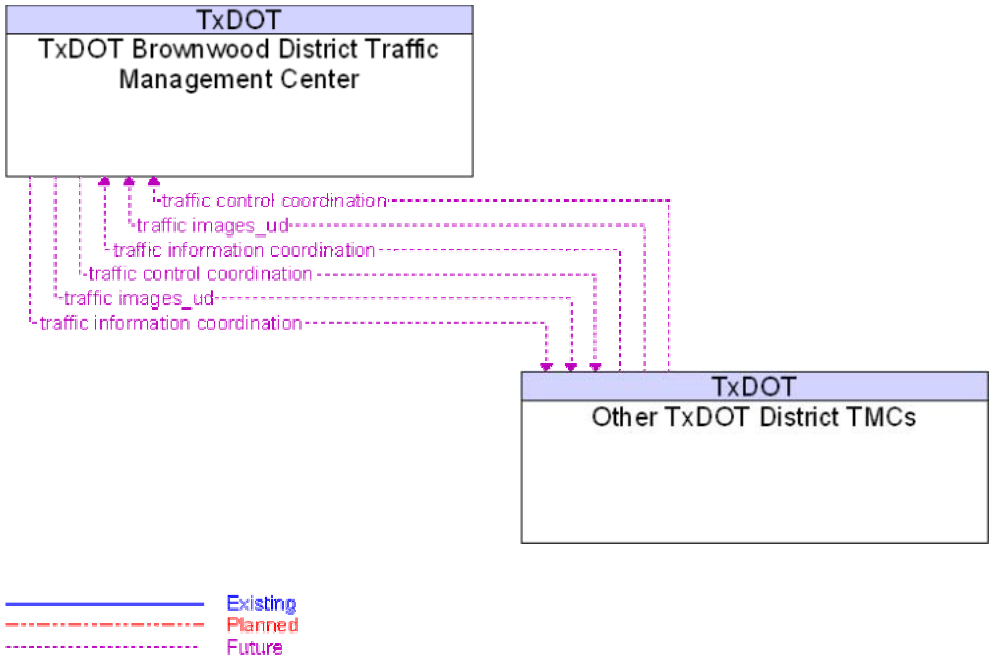


Figure 8 – TxDOT Brownwood District TMC to Other TxDOT District TMCs Architecture Flows

4.4 Functional Requirements

Functions are a description of what the system has to do. In the National ITS Architecture, functions are defined at several different levels, ranging from general subsystem descriptions through somewhat more specific equipment package descriptions to Process Specifications that include substantial detail. Guidance from the USDOT on developing a Regional ITS Architecture recommends that each Region determine the level of detail of the functional requirements for their Region. In the West Central Texas Region, it is recommended that the development of detailed functional requirements such as the "shall" statements included in Process Specifications for a system be developed at the project level. These detailed "shall" statements identify all functions that a project or system needs to perform.

For the West Central Texas Regional ITS Architecture, functional requirements have been identified at two levels. The customized market packages, discussed previously in Section 4.3.2, describe the services that ITS needs to provide in the Region and the architecture flows between the elements. These market packages and data flows describe what the ITS system in West Central Texas has to do and the data that needs to be shared among elements.

At a more detailed level, functional requirements for the West Central Texas Region also are described in terms of equipment packages that are associated with one or more subsystems in the West Central Texas Regional ITS Architecture as shown in **Table 6**. An equipment package is a functional capability that could be deployed at a specific time. Each equipment package can be linked in the National ITS Architecture to the Process Specifications that might be applicable. It is recommended that during the design concept stage of a project, the applicable equipment package and associated Process Specifications from the National ITS Architecture be reviewed by

the implementer to determine the appropriate functional requirements for the project. A link for each equipment package is available on the West Central Texas Regional ITS Architecture web site by clicking on the "Functions" button.

Table 6 – West Central Texas Region Equipment Packages

Subsystem	Equipment Package
Archived Data Management Subsystem	Government Reporting Systems Support
	ITS Data Repository
	Traffic and Roadside Data Archival
Commercial Vehicle Administration Subsystem	CV Data Collection
Commercial Vehicle Check Subsystem	Roadside WIM
Commercial Vehicle Subsystem	On-Board Cargo Monitoring
	On-board CV Electronic Data
Emergency Management Subsystem	Emergency Call-Taking
	Emergency Data Collection
	Emergency Dispatch
	Emergency Environmental Monitoring
	Emergency Response Management
	Mayday Support
Emergency Vehicle Subsystem	On-board EV En Route Support
	On-Board EV Environmental Monitoring
	On-board EV Incident Management Communication
Emissions Management Subsystem	Emissions Data Collection
Fleet and Freight Management Subsystem	Fleet HAZMAT Management
Information Service Provider Subsystem	Basic Information Broadcast
	Infrastructure Provided Route Selection
	Interactive Infrastructure Information
	ISP Data Collection
	ISP Probe Information Collection
Maintenance and Construction Management Subsystem	MCM Data Collection
	MCM Environmental Information Collection
	MCM Environmental Information Processing
	MCM Incident Management
	MCM Maintenance Decision Support
	MCM Roadway Maintenance and Construction
	MCM Speed Monitoring
	MCM Vehicle and Equipment Maintenance Management
	MCM Vehicle Tracking
	MCM Work Activity Coordination
	MCM Work Zone Management
	MCM Work Zone Safety Management

Table 6 – West Central Texas Region Equipment Packages (continued)

Subsystem	Equipment Package
Maintenance and Construction Vehicle Subsystem	MCV Environmental Monitoring
	MCV Infrastructure Monitoring
	MCV Roadway Maintenance and Construction
	MCV Vehicle Location Tracking
	MCV Vehicle Safety Monitoring
	MCV Vehicle System Monitoring and Diagnostics
	MCV Work Zone Support
Parking Management Subsystem	Parking Data Collection
Personal Information Access Subsystem	Personal Basic Information Reception
	Personal Interactive Information Reception
	Personal Location Determination
	Personal Provider-Based Route Guidance
Remote Traveler Support Subsystem	Remote Basic Information Reception
	Remote Interactive Information Reception
	Remote Mayday I/F
	Remote Transit Fare Management
	Remote Transit Information Services
	Secure Area Monitoring
Roadway Subsystem	Roadside Data Collection
	Roadside Signal Priority
	Roadway Basic Surveillance
	Roadway Environmental Monitoring
	Roadway Equipment Coordination
	Roadway Freeway Control
	Roadway Incident Detection
	Roadway Infrastructure Monitoring
	Roadway Probe Beacons
	Roadway Signal Controls
	Roadway Speed Monitoring
	Roadway Traffic Information Dissemination
	Roadway Work Zone Safety
	Roadway Work Zone Traffic Control
	Standard Rail Crossing
Toll Administration Subsystem	Toll Data Collection
Traffic Management Subsystem	Collect Traffic Surveillance
	HRI Traffic Management
	Rail Operations Coordination
	TMC Environmental Monitoring
	TMC Freeway Management

Table 6 – West Central Texas Region Equipment Packages (continued)

Subsystem	Equipment Package
Traffic Management Subsystem (continued)	TMC Incident Detection
	TMC Incident Dispatch Coordination/Communication
	TMC Multimodal Coordination
	TMC Probe Information Collection
	TMC Regional Traffic Control
	TMC Signal Control
	TMC Speed Monitoring
	TMC Traffic Information Dissemination
	TMC Work Zone Traffic Management
	Traffic Data Collection
	Traffic Maintenance
Transit Management Subsystem	Transit Center Fare and Load Management
	Transit Center Fixed-Route Operations
	Transit Center Information Services
	Transit Center Multi-Modal Coordination
	Transit Center Paratransit Operations
	Transit Center Security
	Transit Center Tracking and Dispatch
	Transit Data Collection
	Transit Environmental Monitoring
	Transit Garage Maintenance
	Transit Garage Operations
Transit Vehicle Subsystem	On-Board Environmental Monitoring
	On-board Fixed Route Schedule Management
	On-board Maintenance
	On-board Paratransit Operations
	On-board Transit Fare and Load Management
	On-board Transit Information Services
	On-board Transit Security
	On-board Transit Signal Priority
	On-board Transit Trip Monitoring
Vehicle Subsystem	Basic Vehicle Reception
	Smart Probe
	Vehicle Location Determination
	Vehicle Mayday I/F
	Vehicle Probe Support
	Vehicle Provider-Based Route Guidance
	Vehicle Safety Monitoring System

4.5 Standards

Standards are an important tool that will allow efficient implementation of the elements in the West 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. **Table 7** identifies each of the ITS standards that could apply to the West Central Texas Regional ITS Architecture. These standards are based on the physical subsystem architecture flows previously identified in Section 4.3.4. The connection of each standard to the applicable architecture flows between elements can be viewed on the West Central Texas Regional ITS Architecture web site by clicking on the "Interfaces" or "Standards" buttons.

Table 7 – Applicable ITS Standards for the West Central Texas Region

SDO	Document ID	Title	Type
AASHTO/ITE/NEMA	NTCIP 1201	Global Object Definitions	Message
	NTCIP 1202	Object Definitions for Actuated Traffic Signal Controller Units	Message
	NTCIP 1203	Object Definitions for Dynamic Message Signs	Message
	NTCIP 1204	Object Definitions for Environmental Sensor Stations and Roadside Weather Information System	Message
	NTCIP 1205	Data Dictionary for Closed Circuit Television (CCTV)	Message
	NTCIP 1206	Data Collection and Monitoring Devices	Message
	NTCIP 1207	Ramp Meter Controller Objects	Message
	NTCIP 1208	Object Definitions for Video Switches	Message
	NTCIP 1209	Transportation System Sensor Objects	Message
	NTCIP 1210	Objects for Signal Systems Master	Message
	NTCIP 1211	Objects for Signal Control Priority	Message
	NTCIP 1301	Message Set for Weather Reports	Message
	NTCIP 1401	TCIP – Common Public Transportation (CPT) Business Area Standard	Message
	NTCIP 1402	TCIP – Incident Management (IM) Business Area Standard	Message
	NTCIP 1403	TCIP – Passenger Information (PI) Business Area Standard	Message
	NTCIP 1404	TCIP – Scheduling/Runcutting (SCH) Business Area Standard	Message
	NTCIP 1405	TCIP – Spatial Representation (SP) Business Area Standard	Message
	NTCIP 1406	TCIP – Onboard (OB) Business Area Standard	Message
	NTCIP 1407	TCIP – Control Center (CC) Business Area Standard	Message
	NTCIP 1408	TCIP – Fare Collection (FC) Business Area Standard	Message
	Various	NTCIP Center-to-Center Standards Group	Communication
	Various	NTCIP Center-to-Field Standards Group	Communication

Table 7 – Applicable ITS Standards for the West Central Texas Region (continued)

SDO	Document ID	Title	Type
ASTM	ASTM 5 GHz Data Link	Standard Specification for 5.9 GHz Data Link Layer	Communication
	ASTM 5 GHz Phys	Standard Specification for 5.9 GHz Physical Layer	Communication
	ASTM DD 17.54.00.2	ADMS Data Dictionary Specifications	Data
	ASTM PS 105-99	Specification for Dedicated Short Range Communication (DSRC) Data Link Layer: Medium Access and Logical Link Control	Communication
	ASTM PS 111-98	Specification for Dedicated Short Range Communication (DSRC) Physical Layer using Microwave in the 902-928 MHz	Communication
EIA/CEA	CEA/EIA-794	Data Radio Channel (DARC) System	Communication
	CEA/EIA-795	Subcarrier Traffic Information Channel (STIC) System	Communication
IEEE	IEEE P1512.1	Standard for Traffic Incident Management Message Sets for Use by EMCs	Message
	IEEE P1512.2	Standard for Public Safety IMMS for use by EMCs	Message
	IEEE P1512.3	Standard for Hazardous Material IMMS for use by EMCs	Message
	IEEE P1512.a	Standard for Emergency Management Data Dictionary	Data
	IEEE P1512-2000	Standard for Common Incident Management Message Sets (IMMS) for use by EMCs	Message
	IEEE P1556	Security/Privacy of Vehicle/RS Communications including Smart Card Communications	Communication
	IEEE P1570	Standard for Interface Between the Rail Subsystem and the Highway Subsystem at a Highway Rail Intersection	Message
	IEEE Std 1455-1999	Standard for Message Sets for Vehicle/Roadside Communications	Message
ITE	ITE TM 1.03	Standard for Functional Level Traffic Management Data Dictionary (TMDD)	Data
	ITE TM 2.01	Message Sets for External TMC Communication (MS/ETMCC)	Message
SAE	SAE J1746	ISP-Vehicle Location Referencing Standard	Data
	SAE J2313	On-Board Land Vehicle Mayday Reporting Interface	Message
	SAE J2353	Data Dictionary for Advanced Traveler Information System (ATIS)	Data
	SAE J2354	Message Set for Advanced Traveler Information System (ATIS)	Message
	SAE J2369	Standard for ATIS Message Sets Delivered Over Bandwidth Restricted Media	Message
	SAE J2529	Rules for Standardizing Street Names and Route IDs	Message
	SAE J2540	Messages for Handling Strings and Look-Up Tables in ATIS Standards	Message

4.6 Phases of Implementation

The Regional ITS Architecture will be implemented through a series of projects led by both public sector and private sector agencies. Key foundation systems will need to be implemented in order to support other systems that have been identified in the Regional ITS Architecture. The deployment of all of the systems required to achieve the final Regional ITS Architecture build out will occur over many years.

A sequence of projects and their respective time frames have been identified in the West Central Texas Regional ITS Deployment Plan. These projects have been sequenced over a 20-year period, with projects identified for deployment in 5-, 10- and 20-year timeframes.

Some of the key market packages that will provide the functions for the key foundation systems in the West Central Texas Region are listed below. Projects associated with these and other market packages identified for the Region have been included in the West Central Texas Regional ITS Deployment Plan.

- Network Surveillance;
- Surface Street Control;
- Road Weather Data Collection;
- Weather Information Processing and Distribution;
- Transit Vehicle Tracking; and
- Broadcast Traveler Information.

In addition to the above market packages, the implementation of an appropriate communications system in the Region to support ITS is critical for continued deployment of projects.

5. OPERATIONAL CONCEPT

The operational concept for the West Central Texas Region provides a description of the stakeholders' roles and responsibilities in the operation of the systems that exist or that are being proposed. This operational concept provides an "executive summary" view of the way the West Central Texas Region's systems will work together, and it documents the roles and responsibilities for each of the services that the intelligent transportation system will provide. The approach to describing the operational concept is to present specific operational scenarios that describe and define the stakeholders' general roles in providing the services.

In addition to the operational scenarios that illustrate the roles and responsibilities of each agency, a list of the key agencies that are responsible for operations in the eight ITS areas is presented. This list will serve as a high level overview of the different roles and responsibilities in this operational concept. In addition, specific roles and coordination requirements for operations are illustrated through the customized market package diagrams presented in **Appendix A**.

5.1 Operational Scenarios

Scenario 1

The first operational scenario describes how ITS technologies may be used during a major ice storm along IH-20. In this operational scenario, I-20 along Ranger Hill has been instrumented with CCTV cameras, ice detectors, and DMS. Additionally, portions of IH-20 in the Abilene District and Brownwood District have DMS. Connections between the TxDOT Brownwood TMC, TxDOT Abilene TMC, TransVision in Fort Worth and other key agencies have been established. Road weather information system (RWIS) stations have been installed in areas that are prone to icing. All the systems are continuously monitored using an integrated network of detection and monitoring systems providing real-time information to the TxDOT Brownwood TMC. At the TxDOT TMC the surveillance information is assimilated and "packaged" so it can be effectively disseminated to the public through the West Central Texas Region's traveler information system.

A winter storm is approaching the West Central Texas Region and an alert is put out to citizens to monitor the situation. TxDOT monitors the freeway conditions through CCTV cameras ice detection systems along IH-20. DMS provide up to date information to motorists as they travel along I-20, and highway advisory radio (HAR) provides longer more detailed messages. The alternate routes to I-20 are also closely monitored by the City of Abilene and the City of Brownwood. The two TxDOT Districts also monitor the routes through VIVDS at the intersections and CCTV cameras on arterial streets and state roads. The data and camera feeds that TxDOT and the Cities of Abilene and Brownwood have access to are shared with other key agencies, such as DPS, City Police and Fire, and the EOCs. The EOC alerts the public transportation providers of the approaching dangers. Through automated vehicle location (AVL) on the buses, all vehicles can be tracked and their location verified.

As the winter storm grows nearer and the ice detection stations begin to report that the roadway temperatures are at or below freezing with precipitation in the air. The automated treatment is sprayed onto the surface of the roadway along Ranger Hill and sand trucks are dispatched throughout the West Central Texas Region. Through a common radio frequency, all agencies are in communication to coordinate this effort. TxDOT uses DMS to warn vehicles that ice may be forming on the roads. As the frozen precipitation begins falling, TxDOT Brownwood notifies

TxDOT Abilene and Fort Worth that the roadway conditions are worsening and alternate routes to Ranger Hill should be sought. The cities and the TxDOT districts monitor their RWIS stations for more roadway conditions information. Due to safety concerns, TxDOT decides to close a portion of IH-20 along Ranger Hill and due to the worsening conditions, sends personnel from the TxDOT TMC to safety. Monitoring and control of the TxDOT ITS infrastructure is switched to the TxDOT Fort Worth District. An automatic notice is sent to the Abilene and Brownwood TOC, the local EOC, and the DPS to let them know the status of the TxDOT TMC.

Throughout the winter storm, data and camera feeds have been continuously sent to the media for broadcast alerts on traffic conditions. The improved accuracy of traveler information and the ability to monitor and control the freeway and arterial systems have contributed to the successful management of traffic during the winter storm.

Scenario 2

In the second scenario, a multi-vehicle crash has occurred on US 83 just as the afternoon rush hour is about to begin. Motorists call 911 from cell phones and City of Abilene Police is quickly informed of the crash. An alert is automatically sent from the police dispatch to the City of Abilene TMC and the TxDOT Abilene TOC. TxDOT activates DMS and monitors the situation with a CCTV camera that is near the accident. The City of Abilene Fire Department uses the video feed from TxDOT to determine the severity of the accident and the number and type of fire and rescue vehicles to dispatch. Using AVL on the fire vehicles, those vehicles that are closest to the scene with the appropriate equipment are dispatched.

Southbound US 83 is completely closed and the City of Abilene police begin setting up a closure and detour. The City of Abilene uses their closed loop signal system to implement a timing plan from the Abilene TOC on alternate routes along the arterials to accommodate the large increases in traffic volume.

TxDOT enters the closure on the Highway Condition Reporting System, which also feeds the statewide 511 traveler information number. DMS and HAR continue to warn motorist that southbound US 83 is closed. The CCTV camera feed, which has been turned away from the crash to focus on the traffic condition on the freeway, is shared with the media which broadcasts the live shots of US 83 on the evening news to warn motorist that southbound US 83 is still closed.

5.2 Roles and Responsibilities

The operational scenarios described in the previous section illustrate the interagency cooperation and coordination that is required in two situations that might occur in the West Central Texas Region. During any incident, a number of agencies will be required to coordinate closely to perform their operational responsibilities. The key agencies that have a lead role or responsibility during operations are listed below for each ITS area. It is recognized that a number of other agencies will also need to be involved during an incident in addition to the ones listed below, although it is not expected that these agencies will play as critical a role in operations.

Travel and Traffic Management

- City of Abilene
- City of Brownwood
- Texas Department of Transportation Abilene District
- Texas Department of Transportation Brownwood District
- Other Texas Department of Transportation Districts
- Texas Department of Public Safety

Public Transportation Management

- CARR
- CityLink
- Hill Country Transit
- Independent School Districts

Electronic Payment

- City of Abilene
- Hill Country Transit

Commercial Vehicle Operations

- Texas Department of Public Safety
- Texas Department of Transportation

Emergency Management

- City of Abilene (Police, Fire, Emergency Operations Center, Traffic)
- Regional Hospitals
- Texas Department of Public Safety
- Texas Department of Transportation

Advanced Vehicle Safety System Needs

- Not Applicable

Information Management

- Texas Department of Transportation
- City of Abilene
- City of Brownwood
- Abilene MPO

Maintenance and Construction Management

- City of Abilene
- City of Brownwood
- Texas Department of Transportation Abilene District
- Texas Department of Transportation Brownwood District

5.3 West Central Texas Agreements

The Regional ITS Architecture for the West Central Texas Region has identified several agency interfaces, information exchanges, and integration strategies that would be needed to provide the ITS services and systems identified by the stakeholders in the Region. Interfaces and data flows among public and private entities in the West Central Texas Region will require agreements among agencies that establish parameters for sharing agency information to support traffic management, incident management, provide traveler information, and other functions identified in the Regional ITS Architecture.

Currently, there are no formal agreements in place in the West Central Texas Region with regards to ITS. Stakeholders indicated that while there is a high degree of cooperation among agencies, there hasn't been a need for formal agreements to facilitate multi-jurisdictional resource sharing and cooperation. With the implementation of ITS technologies, integrating systems from one or more agencies, the anticipated level of information exchange identified in the architecture, it is likely that more formal agreements will be needed. These agreements, while perhaps not requiring a financial commitment from agencies in the Region, should outline specific roles, responsibilities, data exchanges, levels of authority, and other facets of regional operations. Some agreements also will outline specific funding responsibilities, where appropriate and applicable.

Table 8 provides a list of potential agreements for the West Central Texas Region based on the interfaces identified in the Regional Architecture. It is important to note that as ITS services and systems are implemented in the Region, part of the planning and review process for those projects should include a review of potential agreements that would be needed for implementation or operations.

Table 8 – Potential Agreements for the West Central Texas Region

Agreement and Agencies	Status	Agreement Description	Considerations
Data Sharing and Usage (Public) TxDOT Abilene District, TxDOT Brownwood District and Public Agencies within the Region	Future	This agreement would define the parameters, guidelines, and policies for inter- and intra-agency ITS data sharing. This data sharing would support regional activities related to traffic management, incident management, and traveler information, and other functions. The terms of this agreement should generally address such items as: ▪ Types of data and information to be shared ▪ Repository for information (i.e., TxDOT Abilene or Brownwood TMC) ▪ How the information will be used (traffic incident management, displayed on web site for travel information, distributed to private media, etc.) ▪ Parameters for data format, quality, security	These agreements are typically zero-dollar agreements, in that there is no charge among agencies for the actual data, although there might be some cost incurred for infrastructure, systems or fiber to enable communications between agencies.
Data Sharing and Usage (Public-Private) TxDOT Abilene District, TxDOT Brownwood District and Private Media/Information Service Providers	Future	This agreement would define the parameters, guidelines, and policies for private media use of regional ITS-related information from TxDOT Abilene or Brownwood. This type of agreement is recommended between TxDOT (data provider) and the media (data user) to define terms of use for broadcasting public-agency information regarding traffic conditions, closures, restrictions, as well as video images. Agreements can also include requirements for the media to 'source' the information (i.e., using the TxDOT logo on all video images broadcast).	These agreements can be zero-dollar agreements, although some agencies have stipulated identifying the information, public service announcements by the media, or other requirements as a term of use. The private media entity is typically responsible for paying any necessary costs for access (i.e., communications infrastructure to link to the TxDOT database or video switch). These agreements also typically include a sunset clause to allow the agency to periodically review the agreement and make any modifications prior to renewal.

Table 8 – Potential Agreements for the West Central Texas Region (continued)

Agreement and Agencies	Status	Agreement Description	Considerations
Shared Video Monitoring (Public) TxDOT Abilene District, TxDOT Brownwood District, City of Abilene, TxDOT Brownwood District, State EOC, DPS	Future	This agreement would enable shared video monitoring of TxDOT CCTV cameras by public safety and emergency services agencies in the West Central Texas Region for incident management purposes. This agreement would define the parameters and policies for public safety agencies to access video images via the TxDOT video switch. It is recommended that the agreement include any TxDOT policies relating to video images (including archiving, privacy, disclaimers, use of video and redistribution) as well as processes for agency requests for specific views. Shared video monitoring does not address shared use or shared control of video equipment functions.	These agreements are typically zero-dollar agreements, in that there is no charge among agencies for the actual data, although there might be some cost incurred for infrastructure, systems or fiber to enable communications between agencies, particularly with the high bandwidth required for transmitting live video images.
Mutual Aid Agreements (Public) DPS, TxDOT Abilene District, TxDOT Brownwood District, Abilene Police, Abilene Fire, Rural Volunteer Fire	Existing (Informal)	Mutual aid agreements currently exist as informal arrangements in the West Central Region, although they are a routine practice among public safety and emergency services agencies. Formal mutual aid agreements will become more important as agencies integrate systems and capabilities, particularly automated dispatch and notification.	These agreements are typically zero-dollar agreements, although there might be some funding required to support regional incident management activities. The agreement also would outline resource commitments that would be part of any mutual aid arrangement (personnel, equipment, facilities, etc.).
Joint Operations/Shared Control Agreements (Public) TxDOT Abilene District, TxDOT Brownwood District, City of Abilene, DPS (potential)	Future	These agreements are formal arrangements to allow joint operations or control of certain systems and equipment. The agreement would need to define the terms of this arrangement, such as hours of operation and time of day/time of week where shared control would take effect, circumstances or incidents where shared control would take effect, notification procedures between the agencies agreeing to shared control arrangements, etc. Additional agencies (such as DPS) could be part of a joint operations/shared control agreement for certain types of devices.	Joint operations/shared control agreements could consider some form of mutual funding for certain system elements, primarily communication links.