State of Texas
Regional ITS Architectures

El Paso Region

Regional ITS Architecture Report

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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
BCAP	Bureau of Customs and Border Protection
BRINSAP	Bridge Inventory Inspection System
CC	Control Center
CCTV	Closed-Circuit Television
CPT	Common Public Transportation
CVO	Commercial Vehicle Operations
DMS	Dynamic Message Sign
DOT	Department of Transportation
DPS	Department of Public Safety
DSRC	Dedicated Short Range Communications
EIA	Electronic Industries Association
EMS	Emergency Medical Services
EOC	Emergency Operations Center
ETMCC	External TMC Communication
EV	Emergency Vehicle
FC	Fare Collection
FMS	Fire Medical Services
FHWA	Federal Highway Administration
HAR	Highway Advisory Radio
HAZMAT	Hazardous Materials
HRI	Highway-Rail Intersections
I/F	Interface
IM	Incident Management
IMMS	Incident Management Message Sets

LIST OF ACRONYMS

ISP	Information Service Provider
ITE	Institute of Transportation Engineers
ITS	Intelligent Transportation System
MCM	Maintenance and Construction Management
MCV	Maintenance and Construction Vehicle
MOU	Memorandum of Understanding
MPO	Metropolitan Planning Organization
MS	Message Sets
NAFTA	North America Free Trade Agreement
NEMA	National Electrical Manufacturers Association
NOAA	National Oceanic and Atmospheric Administration
NTCIP	National Transportation Communications for ITS Protocol
OB	Onboard
PI	Passenger Information
PSAP	Public Safety Answering Point
PTMS	Public Transportation Management System
SAE	Society of Automotive Engineers
SDO	Standards Development Organization
SP	Spatial Representation
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
TxDOT	Texas Department of Transportation
USDOT	United States Department of Transportation
UTEP	University of Texas at El Paso

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 El Paso Region was the ninth in the series of regional ITS architectures to be prepared as part of this initiative. Because an ITS deployment plan already existed for El Paso, only an ITS architecture was developed for the El Paso Region.

The El Paso Region is located at the westernmost tip of Texas and is bordered by Mexico, New Mexico, and the TxDOT Midland-Odessa District. The ITS stakeholders defined the regional boundaries to correspond with the boundaries of the TxDOT El Paso District and also to include southern New Mexico near the Texas Border and Ciudad Juarez, Mexico where connections are required.

The primary city in the Region is El Paso, Texas. There are several major cities within or immediately adjacent to the Region, including Sunland Park in Texas, Las Cruces, University Park, and Anthony in New Mexico, and Ciudad Juarez in Mexico. The primary routes in the Region include I-10, US 54, US 62, US 85, SR 20, SR 375, and SR 487. Although I-25 does not continue into Texas, it terminates at I-10 just outside of the Region in Las Cruces, and Mexico's federal route 45 terminates in Juarez at the United States border, these routes have an influence on traffic in the Region.

The architecture for the El Paso Region followed a comprehensive process focused on stakeholder outreach and education, identifying market packages and interfaces tailored to the needs of the El Paso 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 El Paso Region over the next 20 years.

Stakeholders from throughout the Region participated in the development of the Regional ITS Architecture, including representatives from TxDOT, cities, counties, municipal planning organizations (MPOs), transit agencies, police and fire, U.S. Customs, and the U.S. Border Patrol. Representatives from the New Mexico DOT and State Police have also participated. These stakeholders provided input and review at key steps in the architecture development process, including a project kick-off meeting, architecture development workshop and an architecture review workshop.

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. The highest priority needs focused on improving freeway and arterial control, transit operations, border crossings, emergency coordination and response, flash flood warnings, and commercial vehicle operations. Coordination of traffic at the multiple international border crossings is a special priority for stakeholders.

Market packages were selected that corresponded to the desired services and functions identified for the Region, and were customized for El Paso Region agencies and equipment. These market packages included high priority 'foundation' services and functions, such as network surveillance, surface street control, and transit vehicle tracking, as well as market packages to address coordination needs, including incident management system and regional traffic control and coordination. A Deployment

Plan had been prepared as a previous project in 1998 for the City of El Paso by Kimley-Horn and Associates, Inc. This document was used to gain understanding of stakeholder desires when selecting market packages for the Regional Architecture. In 2003, the stakeholders prioritized the market packages selected as high, medium, and low.

An interconnect, or "Sausage Diagram" was developed for the El Paso 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 El Paso 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 El Paso Region were identified through customized market packages and data flows, and the 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 El Paso Region also were identified as part of the architecture development process.

An Operational Concept for the El Paso 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 El Paso Region.

The Regional ITS Architecture for the El Paso 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. An ITS deployment plan will not be prepared for the El Paso Region at this time because an ITS deployment plan was prepared for the City of El Paso in 1998. At some point in the future the City of El Paso Deployment Plan Project will need to be updated to reflect projects that have been deployed since 1998 as well as changes in needs and priorities.

A key goal in the development of the regional ITS architectures was to develop a consensus-based architecture involving as many stakeholders as possible. Each stakeholder had an equal voice in determining the direction of the architecture for the Region. Stakeholders included representatives from TxDOT, cities, counties, MPOs, transit agencies, police and fire, U.S. Customs, and the U.S. Border Patrol. Additional stakeholders from New Mexico were also involved. A series of three meetings was held with the ITS stakeholders to discuss the development and gather input into the El Paso Regional ITS Architecture. In addition, a project web site was developed which contains all of the information on the El Paso 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 for the El Paso Region were previously established in the 1998 City of El Paso ITS Deployment Plan Project, but were revisited during the kickoff meeting to make sure that desires and goals continued to be relevant. As would be expected, several had changed. 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 El Paso Region have been identified. An operational concept has been developed that focuses on the roles and responsibilities of the various agencies involved in the El Paso Region.

1.2 Document Overview

The El Paso Regional ITS Architecture report is organized into six 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 El Paso Region, as well as an overview of some of the key features and stakeholders in the El Paso Region.

Section 2 – Integration Strategy

This section discusses the El Paso 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.

Section 3 – Regional ITS Architecture Development Process

An overview of the key steps involved in developing the ITS architecture for the El Paso 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 El Paso Regional ITS Architecture. The inventory of existing and planned systems is presented in Section 4, and is sorted by both stakeholders as well as by entity for easy reference. The market packages that were selected for the El Paso Region also are included in this section, as are the system functional requirements. The El Paso 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 El Paso 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 El Paso Region. As part of this concept, several operational scenarios are described and roles and responsibilities of stakeholders are discussed. Potential agreements that could be required to support integration and information sharing are described.

The El Paso Regional ITS Architecture also contains two appendices:

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

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

Section 6 – Maintaining the Regional ITS Architecture

A procedure for maintaining the Regional ITS Architecture is recommended in this section.

1.3 The El Paso Region

1.3.1 Geographic Overview

The El Paso Region is located in the westernmost tip of Texas. Unlike the rest of Texas, the El Paso Region is in the Mountain Time Zone. The ITS stakeholders defined the regional boundaries to correspond with the TxDOT El Paso District Boundaries and also to include southern New Mexico near the Texas border and Ciudad Juarez, Mexico where connections are required. **Figure 1** presents a geographical overview of the El Paso Region.

The El Paso Region encompasses 11 counties; Brewster, Culberson, El Paso, Hudspeth, Jeff Davis, and Presidio. The southern portion of Doña Ana and Otero counties in New Mexico are also included in the Region.

The major cities within and immediately adjacent to the Region include the City of El Paso, the City of Las Cruces in New Mexico, and Ciudad Juarez (located in the Mexican state of Chihuahua). TxDOT partners with local governments for roadway construction, maintenance, and traffic operations support. TxDOT also serves as the responsible agency for on-system roadways throughout the Region in cities with populations of less than 50,000. The City of El Paso, with a population of approximately 570,000 is currently the only city in the El Paso Region with a population that exceeds TxDOT's threshold.

El Paso is the fifth largest city in Texas and the seventeenth largest city in the United States. Across the Texas-Mexico border from El Paso is Ciudad Juarez, with a population of 1.3 million. The El Paso-Juarez community comprises the largest metropolitan area on the United States/Mexico border. It is important to note that many of the people that live in Juarez come to El Paso daily to work. Significant population and employment also depends on the military presence at Fort Bliss and the educational facilities of the University of Texas at El Paso (UTEP).

El Paso's proximity to Mexico furnishes an opportunity for business to capitalize on the North American Free Trade Agreement (NAFTA), the maquiladora industry, and other prospects in Central and South America. El Paso is served by four international border crossings. New Mexico also has a border crossing at Santa Teresa, 11 miles west of El Paso. Commercial vehicle operations, tourism, and international trade are significant economic factors in the Region.

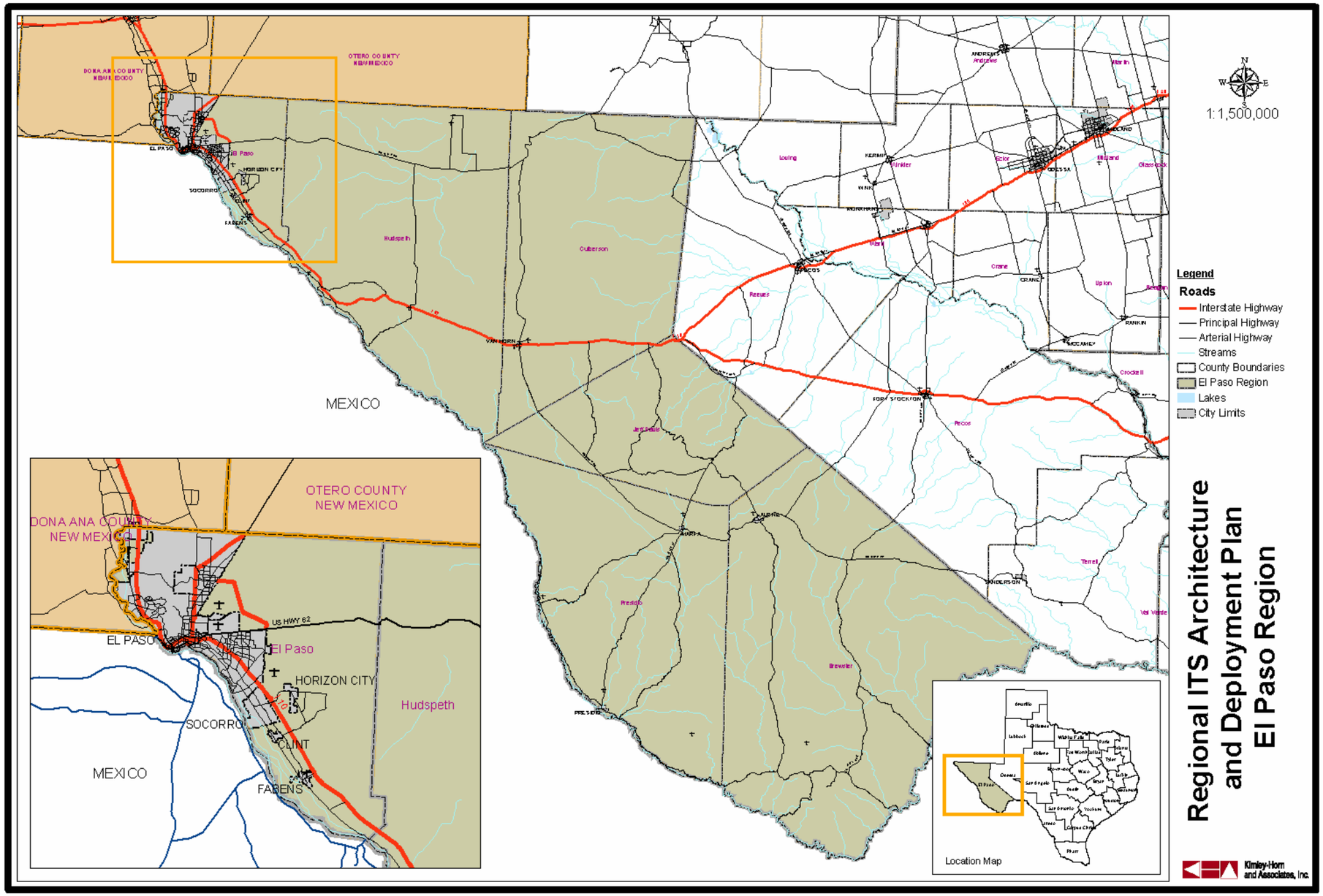


Figure 1 – El Paso Region Map

1.3.2 Roadway Infrastructure

As illustrated in **Figure 1**, the El Paso Region connects major cities of the United States to Mexico through El Paso and Ciudad Juarez. The roadway network is well developed. The primary facilities include Interstate 10, US 54, US 62/180, US 85, Loop 375, War Highway, and Mexico's State Route 2.

I-10 crosses the United States from west to east beginning at the Pacific Ocean in Santa Monica, California and terminating at I-95 in Jacksonville, Florida. Within the state of Texas I-10 serves cities such as El Paso, San Antonio, and Houston. It also provides a direct connection with the City of Las Cruces in New Mexico.

1.3.3 El Paso Region ITS Plans

TxDOT and the local agencies are in the process of implementing ITS throughout the Region. Fiber optic connectivity is being stage-constructed in several projects and will form the nucleus for the communication infrastructure within the Region. TxDOT has already proposed to expand the fiber backbone in the Region and to provide fiber connections to more rural areas.

Freeway operations such as dynamic message signs, closed-circuit television (CCTV) cameras, and other services are being planned and small-scale projects are being developed.

TxDOT is also deploying Commercial Vehicle Information Systems and Network—truck monitoring, weigh-in-motion, automatic vehicle identification, and intelligent permitting systems—on the major international crossings. A traveler information system to route commercial and general traffic to appropriate lanes and appropriate bridges is needed. Probe surveillance using commercial vehicle tags is possible for the future but no plans for their implementation exist at the present time.

In relation to public transportation management, there are not immediate plans to implement ITS related services in the Region. However, Sun Metro and El Paso County Rural Transit have identified several needs for future implementation including electronic fare collection, transit traveler information systems, smart cards containing traveler identification documentation for travel on international buses and signal priority.

There is a need in the Region for an Emergency Management Network to integrate the activities of agencies such as the City of El Paso, TxDOT, 911, DPS, and the New Mexico State Police. A common radio frequency for these emergency management agencies would aid in this coordination and integration.

Flood detection systems need to be deployed at several low water crossings in the Region that flood during flash flood conditions.

1.3.4 Stakeholders

Stakeholder coordination and involvement is one of the key elements to the development of a regional ITS architecture. Because ITS often transcends traditional transportation infrastructure, it is important to involve several 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 El Paso Region.

The following is a list of stakeholders in the El Paso 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 El Paso Regional ITS Architecture:

- City of El Paso;
- County of El Paso;
- Doña Ana County, New Mexico;
- El Paso 911 Communications;
- El Paso Fire Department;
- El Paso MPO;
- El Paso Police;
- El Paso Sheriff's Office;
- International Boundary and Water Commission;
- Las Cruces MPO;
- New Mexico DOT;
- New Mexico State Police;
- Sun Metro;
- TxDOT El Paso District;
- TxDOT Traffic Operations Division (Austin);
- U.S. Border Patrol; and
- U.S. Customs.

1.3.5 Major Industries and Employers

Manufacturing, agriculture, and tourism are among the major economic forces in the Region. The economy in this area of the country has been influenced by many factors, but perhaps the largest factor was an increase in manufacturing resulting from NAFTA. Military presence at Fort Bliss also plays a large role in the El Paso Region economy.

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 El Paso Region.

For each operating agency or stakeholder entity identified through the development of the Regional ITS Architecture, there are operations that currently exist as normal practice in order to accomplish the primary business goals and objectives for each stakeholder. The integration of each agency with any of the other stakeholders will not change the agency's primary function or disrupt its typical business practices. The integration process will require that the data that is exchanged between the two entities 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 El Paso Region and the primary areas of concern that were uncovered in the preparation of the El Paso Regional ITS Architecture. Additionally, this section will discuss the need for interregional communications with agencies external to the El Paso Region.

A key step in developing any regional ITS architecture is identifying major stakeholders in the Region. Key stakeholders that participated in the development of the El Paso 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 were provided to these stakeholders to encourage their participation as much as possible.

2.2 Regional Needs

Needs from the Region were identified in the project kick-off meeting held on December 18, 2002. Stakeholders participating in that meeting identified the needs in the Region according to the eight user service areas defined in the National ITS Architecture, as well as institutional issues and needs. The needs identified in the project kick-off meeting are documented in **Table 2**. Also included in this table are needs identified as part of the 1998 City of El Paso ITS Deployment Plan Project development process.

Table 1 – El Paso Stakeholder Agencies and Contacts

Stakeholder Agency	Contact	Address	Phone Number	E-Mail
City of El Paso	Lourdes Cardenas	2 Civic Center Plaza El Paso, Texas 79901-1196	(915) 541-4048	cardenaslx@ci.el-paso.tx.us
City of El Paso	Filiberto Castorena	2 Civic Center Plaza El Paso, Texas 79901-1196	(915) 541-4037	gonzalezax@ci.el-paso.tx.us
City of El Paso	Albert Gonzalez	2 Civic Center Plaza El Paso, Texas 79901-1196	(915) 541-4037	gonzalezax@ci.el-paso.tx.us
City of El Paso	Ted Marquez	Engineering Department Traffic Division 2 Civic Center Plaza El Paso, Texas 79901-1196	(915) 541-4050	marqueztx@ci.el-paso.tx.us
City of El Paso Street Department	Gerald Pucel	7969 San Paulo El Paso, Texas 79907	(915) 621-6750	pucelge@ci.el-paso.tx.us
City of El Paso Street Department	Israel Toro	7969 San Paulo El Paso, Texas 79907	(915) 621-6872	toroix@ci.el-paso.tx.us
Doña Ana County	Steve Meadows	430 S Main Las Cruces, NM 88001	(505) 647-7242	stevenm@co.dona-ana.nm.us
El Paso 911 Communications	Mary Kozak	911 N Raynor El Paso, Texas 79903	(915) 564-6945	maryk@ci.el-paso.tx.us
El Paso County	Bob Geyer	500 E. San Antonio Ave El Paso, Texas 79901-2419	(915) 834-8242 (ext 4071)	bgeyer@co.el-paso.tx.us
El Paso County	Rick Sowell	501 E. San Antonio Room 404 El Paso, Texas 79901	(915) 543-3848	rsowell@co.el-paso.tx.us
El Paso County Sheriff Dept	Art Martinez	800 E. Overland El Paso, Texas 79901	(915) 546-2210	martineza@co.el-paso.tx.us
El Paso County Sheriff Dept	Christopher Paz	800 E. Overland El Paso, Texas 79901	(915) 546-2210	N/A
El Paso Fire Department	Larry Rascon	8600 Montana El Paso, Texas 79925	(915) 771-1000	rasconlx@ci.el-paso.tx.us
El Paso MPO	Ricardo Dominguez	10767 Gateway Blvd. West Suite 605 El Paso, Texas 79935	(915) 591-9735 (ext 19)	rdominguez@elpasompo.org
El Paso MPO	Sonia Perez	10767 Gateway Blvd. West Suite 605 El Paso, Texas 79935	(915) 591-9735	sperez@elpasompo.org
El Paso Fire Department	Chris Johnson	911 North Raynor El Paso, TX 79903	(915) 832-4432	johnsonca@ci.el-paso.tx.us
El Paso Police Department	Rosario Galceran	911 N Raynor El Paso, Texas 79903	(915) 832-4445	galceranr@ci.el-paso.tx.us
El Paso Police Department	Eddie Smith	911 N Raynor El Paso, Texas 79903	(915) 564-7044	edsmith04@yahoo.com

Table 1 – El Paso Stakeholder Agencies and Contacts (continued)

Stakeholder Agency	Contact	Address	Phone Number	E-Mail
International Boundary and Water Commission	Billy Finn	Engineering Services Div. The Commons Bldg C Suite 100 4171 N. Mesa St. El Paso, Texas 79902-1441	(915) 832-4789	williamfinn@ibwc.state.gov
International Boundary and Water Commission	Manuel Rubio, Jr.	4171 N Mesa El Paso, TX 79902	(915) 832-4137	mannyrubio@ibwc.state.gov
Las Cruces MPO	Lisa Fuselier	575 S Alameda Las Cruces, NM 88005	(505) 529-3069	lfuselier@las-cruces.org
New Mexico State Highway and Transportation Dept.	Frank Guzman	2912 Pine Street Deming, NM 88031	(505) 544-6590	frank.guzman@nmshtd.state.nm.us
New Mexico State Police	Richard Williams	3000 E. University Ave Las Cruces, NM 88005	(505) 524-6111	rwilliams@dps.state.nm.us
Sun Metro	Tom Cardona	700-A San Francisco El Paso, Texas 79901	(915) 534-5890	cardonatn@ci.el-paso.tx.us
Sun Metro	Stewart Ed	700-A San Francisco El Paso, Texas 79901	(915) 534-5823	edsc@ci.el-paso.tx.us
TxDOT El Paso District	Manuel Aguilera	13301 Gateway West El Paso, Texas 79928	(915) 790-4205	maguile@dot.state.tx.us
TxDOT El Paso District	Charles Berry, Jr.	13301 Gateway West El Paso, Texas 79928	(915) 790-4200	cberry@dot.state.tx.us
TxDOT El Paso District	Robert Cardoza	1430 Joe Battle Blvd El Paso, Texas 79936	(915) 849-5554	rcardoz@dot.state.tx.us
TxDOT El Paso District	Carlos Chavez	13301 Gateway West El Paso, Texas 79928	(915) 790-4307	cchavez@dot.state.tx.us
TxDOT El Paso District	Richard Cortez	13301 Gateway West El Paso, Texas 79928	(915) 790-4335	rcorte2@dot.state.tx.us
TxDOT El Paso District	Victor De la Garza	13301 Gateway West El Paso, Texas 79928	(915) 790-4346	vdelag@dot.state.tx.us
TxDOT El Paso District	Edgar Fino	13301 Gateway West El Paso, Texas 79928	(915) 790-4306	efino@dot.state.tx.us
TxDOT El Paso District	Jack Lord	13301 Gateway West El Paso, Texas 79928	(915) 790-4329	N/A
TxDOT El Paso District	Antonio Loya	1430 Joe Battle Blvd El Paso, Texas 79936	(915) 849-5555	N/A
TxDOT El Paso District	Thelma Ramirez	13301 Gateway West El Paso, Texas 79928	(915) 790-4392	tramir2@dot.state.tx.us
TxDOT El Paso District	Judy Ramsey	13301 Gateway El Paso, Texas 79928	(915) 790-4322	jramsey@dot.state.tx.us

Table 1 – El Paso Stakeholder Agencies and Contacts (continued)

Stakeholder Agency	Contact	Address	Phone Number	E-Mail
TxDOT El Paso District	Mary Telles-Goins	13301 Gateway West El Paso, Texas 79928	(915) 790-4324	mtelles@dot.state.tx.us
TxDOT Traffic Operations Division (Austin)	Charles Brindell	ATTN: TRF-TM 125 East 11th Street Austin, Texas 78701-2483	(512) 416-3268	cbrinde@dot.state.tx.us
TxDOT Traffic Operations Division (Austin)	Alesia Gamboa	ATTN: TRF-TM 125 East 11th Street Austin, Texas 78701-2483	(512) 416-2780	agamboa@dot.state.tx.us
TxDOT Traffic Operations Division (Austin)	Janie Light	Attn: TRF-TM 125 East 11th Street Austin, Texas 78701-2483	(512) 416-3258	jlight@dot.state.tx.us
US Border Patrol	Rodolfo Green	8935 Montana El Paso, Texas 79925	(915) 834-8717	N/A
US Customs	Bill Nowak	9400 Viscount El Paso, Texas 79925	(915) 633-7300, ext. 157	william.r.nowak@customs.treas.gov

Table 2 – El Paso Region: Summary of ITS Needs

El Paso Region

Summary of ITS Needs
El Paso Regional ITS Architecture Kick-Off Meeting
December 18, 2002

Institutional Issues/Needs

- Need to restart Traffic Management Team
- Need to develop incident management agreements
- Need to develop incident response/diversion plans
- Need to develop telecommunications map for multi-agency use
- Need to coordinate with 3C (continuous, comprehensive, and cooperative) planning process and security planning
- Need to develop policy and an implementation plan for 511 system
- Need a policy for staffing TMC at TxDOT

Travel and Traffic Management Needs

- Need to identify alternate routes for International bridge crossings
- Need bridge management system
- Need to develop diversion routing
- Need to develop plans for multiple road closure/detour plans
- Need communications access from the City of El Paso communication to signal controllers and video surveillance
- Need improved highway rail crossings
- Need to make traffic video feeds available at truck stops and on private access network
- Need to involve radio stations with traffic information dissemination
- Need kiosks with possible locations at:
  - Tourist Bureau
  - Truck stops
  - Airport
  - Large employment centers
  - Malls
- Need trailblazer signs
- Need cellular on wheels
- Need to coordinate information on international bridges along the border (fiber)
- Need English and International symbols on DMS
- Need coordination with Mexico for major events
- Need to develop interagency communications network, including inventory of assets
- Need policies and infrastructure to allow video sharing, including the following agencies:
  - Fort Bliss
  - Ports of Entry
  - US Border Patrol
  - US Customs
  - Sun Metro
  - FBI
  - Towing contractors
- Need traffic counts and classification data
- Need bridge management system information
- Need to use ISD vehicles as probes (AVL)
- Need National Weather Service information
- Need to develop air quality monitoring system (Fort Bliss and the University of Texas at El Paso)

Table 2 – El Paso Region: Summary of ITS Needs (continued)

Public Transportation Management Needs
- Need bus signal priority system
- Need Sun Metro connections for traffic information
- Need AVL for Sun Metro buses
- Need AVL for rural transit
- Need provisions for ITS in light rail transit
- Need staged deployment of Smart cards for fare collection

Electronic Payment Needs
- Need Sun Metro electronic payment
- Need International bridge electronic payment

Commercial Vehicle Operations Needs
- Need special response strategy for truck traffic, including:
  - Special lanes
  - Weigh-in-motion
  - Permitting
- Need truck information

Emergency Management Needs
- Need preemption for fire and emergency vehicles
- Need to integrate emergency management network for:
  - City of El Paso
  - TxDOT
  - 911
  - DPS
  - New Mexico State Police
- Need to coordinate incident management
- Need railroad incident management coordination
- Need AVL for TxDOT courtesy patrol
- Need common radio frequency for all agencies
- Need rural security information

Advanced Vehicle Safety System Needs
None Identified

Information Management Needs (Data Archiving)
- Need data for web pages

Maintenance and Construction Management Needs
- Need AVL for TxDOT maintenance vehicles
- Need portable electronic messaging
- Need to identify locations and deploy flood detection systems at low water crossings
- Need to initiate pump monitoring system
- Need to develop ice warning system

1998 City of El Paso ITS Deployment Plan Needs
- Need to improve information for bus driver dispatch
- Need emergency vehicle preemption
- Need to clear incidents on freeways faster
- Need to improve ability to manage arterial traffic on corridors during incidents
- Need to reduce traffic congestion on I-10
- Need to improve traffic management for special events
- Need to improve use of DMS
- Need to improve use of standards and interoperability between PSAPs and traffic operations for incidents
- Need to reduce congestion and time to cross international borders
- Need information on roadway conditions
- Need to use websites more effectively

2.3 Regional Integration and Interoperability

The El Paso Region is bordered by New Mexico to the north and west, Mexico to the south, and the TxDOT Odessa District to the east. Improvements in coordination and integration among agencies in the El Paso Region with each other as well as with areas surrounding the Region can provide numerous benefits for the transportation system. A vision for the El Paso Region is to increase the area over which control and data are available and to increase the number of agencies with access to system capabilities. This vision integrates systems both on an intra-regional and an inter-regional basis.

Road closures due to maintenance or incidents can lead to a number of opportunities for improved operations through integration. The TxDOT El Paso District and the City of El Paso have been sharing data and control information for many years. The implementation of the TxDOT TransVista Traffic Management Center (TMC) and the City of El Paso TMC has greatly enhanced the ability of TxDOT and the City to share information. 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 not, other agencies can also be made aware of the closure and make appropriate plans. The reinstitution of the Transportation Management Committee is the first institutional step towards achieving this coordination. The ITS architecture also identifies the numerous connections that are desired by various agencies with the TransVista TMC and the City of El Paso TMC that will add to this coordination. A regional Smart card for transit and parking is another example of an integration opportunity that will provide benefits to travelers, particularly those using several modes of transportation.

In addition to the integration opportunities within the El Paso Region, integrating the El Paso Region with the adjacent TxDOT Odessa District, as well as with the other TxDOT Districts that border Mexico, offer a forum for software development that can be shared. As one TxDOT District develops an appropriate border crossing solution, or a low water crossing response for flash floods, the others can adapt these solutions at relatively small costs as shared solutions. The TxDOT El Paso District already uses the TxDOT Advanced Transportation Management System (ATMS) software program for some of its ITS functions; however, some of the legacy hardware needs to be either replaced or more solidly integrated to make those functions executable from the integrated workstation. As this integration is achieved, it will allow better statewide center-to-center communications among the TxDOT District TMCs.

Systems such as TxDOT's Highway Condition Reporting System 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 service which would provide consistent traveler information throughout the state.

The El Paso Region also has a need to gather information and coordinate with New Mexico and Mexico on closures of major routes in and out of the state of Texas. Closures of the U.S./Mexico border also need to be coordinated with U.S. Border Patrol, U.S. Customs, as well as with transportation agencies. For example, if Mexico has closed its borders, it is crucial that the TxDOT El Paso District have this information in order to update motorists and commercial vehicles as soon as possible before they approach the border crossing. The stakeholders at the Regional ITS architecture workshops demonstrated a willingness for this inter-state and international operational coordination and response to become a reality.

One of the primary purposes in developing an El Paso Regional ITS Architecture is to ensure that while various agencies are deploying ITS components, there are some commonalties 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 for the El Paso Region relied heavily on stakeholder input to ensure that the architecture reflected local needs. A series of three 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 El Paso Process

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

Prior to the first 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. 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.

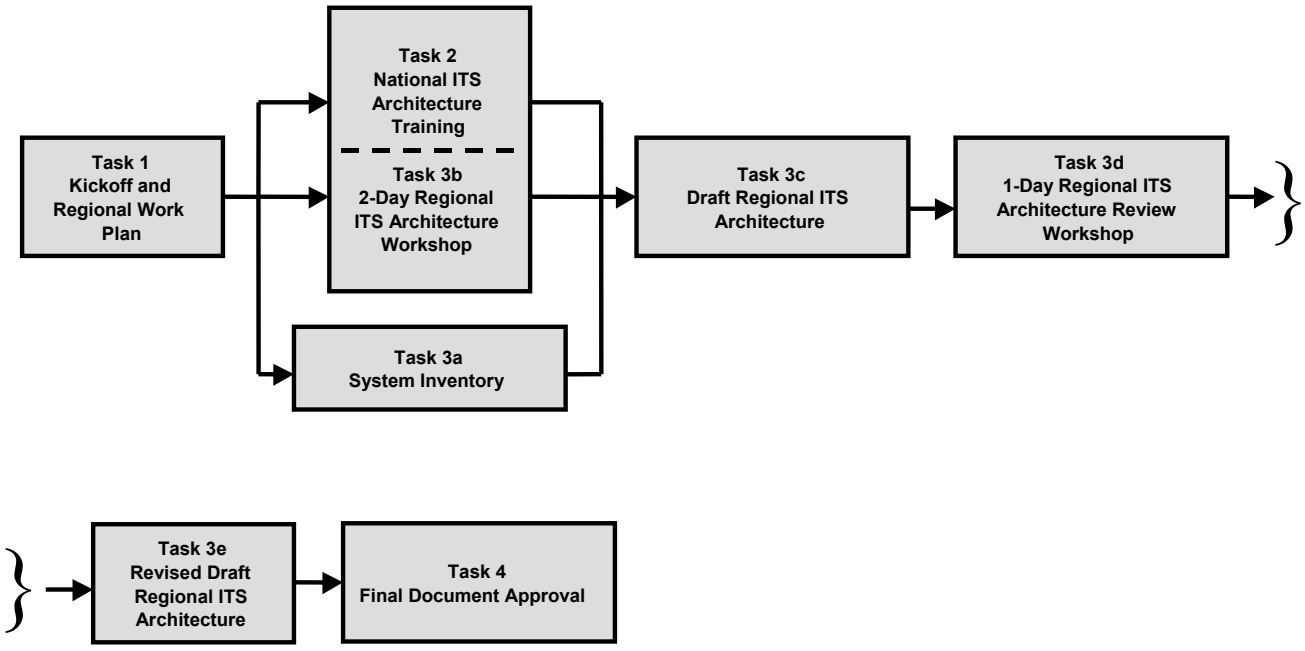


Figure 2 – El Paso Regional ITS Architecture Development Process

A total of three meetings and workshops with stakeholders over a period of five months were used to develop the El Paso Regional ITS Architecture. These meetings and workshops included:

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

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 El Paso Region 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 El Paso 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 El Paso, 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 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 El Paso Region was sent to stakeholders prior to the 1-Day Regional ITS Architecture Review Workshop.

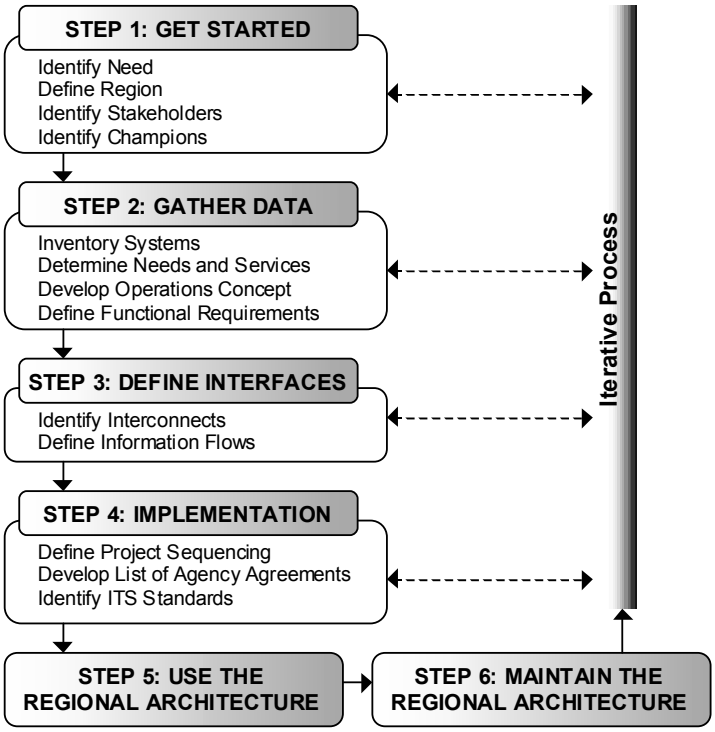
Task 3D – 1-Day Regional ITS Architecture Review Workshop: The 1-Day Regional ITS Architecture Review workshop was designed to allow stakeholders to review the draft architecture and provide comments. The primary focus of the workshop was to review the architecture flows between elements in the market 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 4 – Final Document Approval: Stakeholders were given an opportunity to review the Revised Draft Regional ITS Architecture and make comments. Comments were incorporated and a final Regional ITS Architecture was developed.

3.2 USDOT Regional ITS Architecture Guidance

On October 12, 2001, the U.S. Department of Transportation (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 El Paso Regional ITS Architecture 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 El Paso 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 El Paso 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. 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. Project sequencing was not completed as part of the effort. Projects initially developed as part of the 1998 City of El Paso ITS Deployment Plan Project were not addressed under the scope of this project; however, the market package prioritization completed in Step 4 should serve as a useful tool for prioritizing projects identified in the 1998 City of El Paso ITS Deployment Plan Project.

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, El Paso 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 El Paso Region were identified in the following categories:

- ***Travel and Traffic Management*** – includes state traffic management center, center-to-center links, detection systems, CCTV, fixed and portable dynamic message signs, broadcast traveler information, and other related technologies.
- ***Public Transportation Management*** – includes transit and paratransit automated vehicle location, transit security, and transit travel information systems.
- ***Commercial Vehicle Operations*** – includes weigh-in-motion and hazardous materials management.
- ***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 road weather information systems and workzone 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.

4.1.1 Subsystems and Terminators

Each identified system or component in the El Paso 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 El Paso 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.

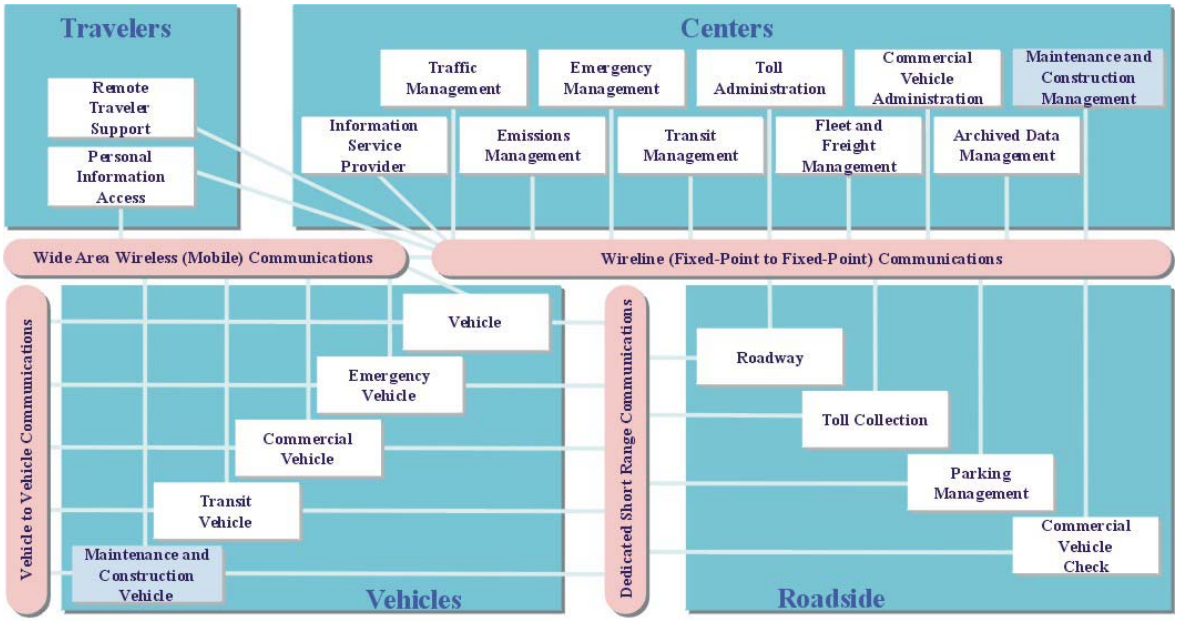


Figure 4 – Physical Subsystem Interconnect Diagram

4.1.2 El Paso 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 El Paso 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 El Paso Regional ITS Architecture.

The information in **Table 3** also is included on the El Paso ITS Architecture web site, which is accessible by 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 El Paso 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 El Paso ITS Inventory by Entity

The El Paso 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 El Paso 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 El Paso Regional ITS Architecture web site by selecting the "Inventory by Entity" button.

Table 3 – El Paso ITS Inventory (sorted by Stakeholder)

Stakeholder	Element	Entity	Status
AMTRAK	AMTRAK Passenger Terminal	Multimodal Transportation Service Provider	Existing
Archive Data Users	Crash Data Users	Archived Data User Systems	Future
	El Paso MPO Data System Users	Archived Data User Systems	Future
	Pavement Management Data Users	Archived Data User Systems	Existing
	Public Transportation Archive Data Users	Archived Data User Systems	Existing
City of El Paso	City of El Paso Comptroller	Financial Institution	Future
	City of El Paso Parking Meter Reader System	Parking Management Subsystem	Future
	City of El Paso Web Site	Information Service Provider Subsystem	Existing
	El Paso International Airport	Multimodal Transportation Service Provider	Existing
	El Paso Transportation Hub	Intermodal Freight Depot	Future
	El Paso Transportation Hub	Remote Traveler Support Subsystem	Future
City of El Paso Engineering Department	City of El Paso Crash Records Database	Archived Data Management Subsystem	Existing
	City of El Paso Field Equipment	Roadway Subsystem	Existing
	City of El Paso International Bridge Field Equipment	Roadway Subsystem	Future
	City of El Paso Traffic Engineering	Maintenance and Construction Management Subsystem	Existing
	City of El Paso Traffic Engineering	Traffic Management Subsystem	Existing
	City of El Paso Traffic Management Center	Emergency Management Subsystem	Existing
	City of El Paso Traffic Management Center	Traffic Management Subsystem	Existing
City of El Paso Fire Department	City of El Paso EOC	Emergency Management Subsystem	Existing
	City of El Paso Fire and FMS Dispatch	Emergency Management Subsystem	Existing
	City of El Paso Fire and FMS Vehicles	Emergency Vehicle Subsystem	Existing
City of El Paso Fleet Services	City of El Paso Vehicle Repairs	Equipment Repair Facility	Existing

Table 3 – El Paso ITS Inventory (sorted by Stakeholder) (continued)

Stakeholder	Element	Entity	Status
City of El Paso Police Department	City of El Paso 911 Communications Center	Emergency Management Subsystem	Existing
	City of El Paso 911 Communications Center	Traffic Management Subsystem	Existing
	City of El Paso Police Vehicles	Emergency Vehicle Subsystem	Existing
City of El Paso Street Department	City of El Paso Electronic Parking Meter Systems	Traveler Card Reader System	Future
	City of El Paso Maintenance Dispatch	Maintenance and Construction Management Subsystem	Existing
	City of El Paso Pavement Management System	Archived Data Management Subsystem	Existing
	City of El Paso Street Department Vehicles	Maintenance and Construction Vehicle Subsystem	Existing
	City of El Paso Traffic Signal Maintenance Dispatch	Maintenance and Construction Management Subsystem	Existing
	City of El Paso Traffic Signal Maintenance Dispatch	Traffic Management Subsystem	Existing
	City of El Paso Water Level Sensors	Roadway Subsystem	Existing
	International Bridge Audit System	Toll Administration Subsystem	Existing
	International Bridge Toll Plazas	Toll Collection Subsystem	Existing
City of El Paso Street Dept. and Sun Metro	El Paso Regional Smart Card	Traveler Card	Future
City of Las Cruces	Sunland Park Municipal Traffic Signal System	Other TM	Existing
Commercial Vehicle Operators	Commercial Vehicle Operator Systems	Fleet and Freight Management Subsystem	Existing
	Commercial Vehicles	Commercial Vehicle Subsystem	Existing
	Commercial Vehicles	Vehicle Subsystem	Existing
Correctional Facilities	Correctional Facilities Operations	Emergency Management Subsystem	Existing
County Emergency Management Agencies	Rural County EOCs	Emergency Management Subsystem	Existing

Table 3 – El Paso ITS Inventory (sorted by Stakeholder) (continued)

Stakeholder	Element	Entity	Status
County Road and Bridge	County Road and Bridge	Maintenance and Construction Management Subsystem	Existing
	County Road and Bridge Field Equipment	Roadway Subsystem	Future
	County Road and Bridge Vehicles	Maintenance and Construction Vehicle Subsystem	Existing
County Sheriff	County Public Safety Dispatch and PSAP	Emergency Management Subsystem	Existing
DPS	DPS Vehicles	Emergency Vehicle Subsystem	Existing
	DPS Administration	Emergency Management Subsystem	Existing
	DPS Communications Service	Emergency Management Subsystem	Existing
	DPS Electronic Screening Stations	Commercial Vehicle Check Subsystem	Existing
	DPS License and Weights Division	Enforcement Agency	Existing
	Statewide Crash Records Information System	Archived Data Management Subsystem	Existing
	Statewide Crash Records Information System	Information Service Provider Subsystem	Existing
DPS Division of Emergency Management	State EOC	Emergency Management Subsystem	Existing
El Paso Convention and Visitors Bureau	El Paso Convention and Visitors Bureau	Event Promoters	Existing
El Paso County Rural Transit	El Paso County Rural Transit System Dispatch	Transit Management Subsystem	Existing
	El Paso County Rural Transit Vehicles	Transit Vehicle Subsystem	Existing
El Paso MPO	El Paso MPO Website	Information Service Provider Subsystem	Existing
	El Paso MPO Data System	Archived Data Management Subsystem	Future
Federal Bureau of Investigation	FBI El Paso Dispatch	Emergency Management Subsystem	Future
Financial Institution	Financial Institution	Financial Institution	Future
IBWC	IBWC BOTA Field Equipment	Roadway Subsystem	Future
	IBWC Operations Center	Traffic Management Subsystem	Future

Table 3 – El Paso ITS Inventory (sorted by Stakeholder) (continued)

Stakeholder	Element	Entity	Status
Independent School Districts	Independent School District Buses	Transit Vehicle Subsystem	Existing
	Independent School District Dispatch	Transit Management Subsystem	Existing
	Independent School District Police Dispatch	Emergency Management Subsystem	Existing
	Independent School District Police Vehicles	Emergency Vehicle Subsystem	Existing
Juarez IMIP	Juarez IMIP	Archived Data Management Subsystem	Future
Las Cruces MPO	Las Cruces MPO	Archived Data Management Subsystem	Future
Local Media	Local Print and Broadcast Media	Media	Existing
Municipal or County Public Safety	Municipal or County Emergency Vehicles	Emergency Vehicle Subsystem	Existing
	Municipal Public Safety Dispatch	Emergency Management Subsystem	Existing
Municipal Public Works Department	Municipal PWD	Maintenance and Construction Management Subsystem	Existing
New Mexico DOT	New Mexico DOT Maintenance Dispatch	Maintenance and Construction Management Subsystem	Existing
	New Mexico DOT TMC	Traffic Management Subsystem	Existing
	New Mexico DOT Website	Information Service Provider Subsystem	Existing
New Mexico DPS	NM State Police Dispatch	Emergency Management Subsystem	Existing
New Mexico Emergency Agencies	New Mexico County EOCs	Emergency Management Subsystem	Existing
NOAA	National Weather Service	Weather Service	Existing
Other States	Other States Credentials Administration and Safety Systems	Other CVAS	Future
Private Ambulance	Private Ambulance Dispatch	Emergency Management Subsystem	Existing
	Private Ambulance Vehicle	Emergency Vehicle Subsystem	Existing
Private Information Service Providers	Private Sector Traveler Information Services	Information Service Provider Subsystem	Future
Private Rural Transit Systems	Private Sector Transit System Dispatch	Transit Management Subsystem	Existing
Private Taxi Providers	Private Taxi Provider Dispatch	Transit Management Subsystem	Existing

Table 3 – El Paso ITS Inventory (sorted by Stakeholder) (continued)

Stakeholder	Element	Entity	Status
Private Tow/Wrecker Providers	Private Tow/Wrecker Dispatch	Emergency Management Subsystem	Existing
	Private Tow/Wrecker Vehicles	Emergency Vehicle Subsystem	Existing
Private Travelers	Private Travelers Personal Computing Devices	Personal Information Access Subsystem	Future
	Private Vehicles	Vehicle Subsystem	Existing
Rail Operators	Rail Operations Centers	Rail Operations	Existing
	Rail Operators Wayside Equipment	Wayside Equipment	Existing
Regional Emergency and Public Safety Agencies	El Paso Regional Incident and Mutual Aid Network	Other EM	Future
Regional Event Facilities	Regional Event Facilities	Event Promoters	Existing
Regional Medical Center	Regional Medical Center	Care Facility	Existing
Regional University/Colleges	Regional University/College Police	Emergency Management Subsystem	Existing
	Regional University/College Police Vehicles	Emergency Vehicle Subsystem	Existing
Regional Utility Companies	Utility Company Dispatch	Maintenance and Construction Management Subsystem	Existing
Sun Metro Transit	Sun Metro Fixed Route Transit Vehicle Maintenance Facility	Transit Management Subsystem	Existing
	Sun Metro Fixed Route Transit Vehicles	Transit Vehicle Subsystem	Existing
	Sun Metro International Transit Terminal	Remote Traveler Support Subsystem	Future
	Sun Metro IVR System	Information Service Provider Subsystem	Future
	Sun Metro LIFT Maintenance Facility	Transit Management Subsystem	Existing
	Sun Metro LIFT Vehicles	Transit Vehicle Subsystem	Existing
	Sun Metro Maintenance Vehicles	Transit Vehicle Subsystem	Existing
	Sun Metro Paratransit Dispatch	Transit Management Subsystem	Existing
	Sun Metro Public Transportation Archive	Archived Data Management Subsystem	Existing
	Sun Metro Support Vehicles	Transit Vehicle Subsystem	Existing

Table 3 – El Paso ITS Inventory (sorted by Stakeholder) (continued)

Stakeholder	Element	Entity	Status
Sun Metro Transit (continued)	Sun Metro Transit Fixed Route Dispatch	Information Service Provider Subsystem	Existing
	Sun Metro Transit Fixed Route Dispatch	Transit Management Subsystem	Existing
	Sun Metro Transit Information Display	Remote Traveler Support Subsystem	Future
	Sun Metro Transit Kiosks	Remote Traveler Support Subsystem	Future
	Sun Metro Transit Web Site	Information Service Provider Subsystem	Existing
Texas Commission on Environmental Quality (TCEQ)	TCEQ Field Emissions Monitors	Roadway Subsystem	Existing
	TCEQ Monitor Operations Section	Emissions Management Subsystem	Existing
Travel Service Providers	Travel Service Providers	Yellow Pages Service Providers	Future
TxDOT	Other Texas District TMCs	Traffic Management Subsystem	Existing
	Other TxDOT District Maintenance Sections	Maintenance and Construction Management Subsystem	Existing
	TransVista	Emergency Management Subsystem	Existing
	TransVista	Traffic Management Subsystem	Existing
	TransVista Web Site	Information Service Provider Subsystem	Existing
	TxDOT 511 System	Information Service Provider Subsystem	Future
	TxDOT BRINSAP	Asset Management	Existing
	TxDOT Courtesy Patrol Vehicles	Emergency Vehicle Subsystem	Existing
	TxDOT Credentials Administration and Safety Information Exchange	Commercial Vehicle Administration Subsystem	Future
	TxDOT El Paso District Area Engineers Office	Maintenance and Construction Administrative Systems	Existing
	TxDOT El Paso District Area Engineers Office	Maintenance and Construction Management Subsystem	Existing
	TxDOT El Paso District CCTV	Roadway Subsystem	Existing
	TxDOT El Paso District DMS	Roadway Subsystem	Existing

Table 3 – El Paso ITS Inventory (sorted by Stakeholder) (continued)

Stakeholder	Element	Entity	Status
TxDOT (continued)	TxDOT El Paso District Field Sensors	Roadway Subsystem	Existing
	TxDOT El Paso District HAR	Roadway Subsystem	Future
	TxDOT El Paso District Lane Control Signals	Roadway Subsystem	Existing
	TxDOT El Paso District Maintenance Sections	Maintenance and Construction Management Subsystem	Existing
	TxDOT El Paso District Maintenance Vehicles	Maintenance and Construction Vehicle Subsystem	Existing
	TxDOT El Paso District Office	Maintenance and Construction Management Subsystem	Existing
	TxDOT El Paso District Pavement Management System	Archived Data Management Subsystem	Existing
	TxDOT El Paso District Pavement Management System	Archived Data User Systems	Existing
	TxDOT El Paso District Pavement Management System	Asset Management	Existing
	TxDOT El Paso District Public Information Office	Information Service Provider Subsystem	Future
	TxDOT El Paso District Public Transportation Management System (PTMS)	Archived Data Management Subsystem	Existing
	TxDOT El Paso District Ramp Meters and Ramp Gates	Roadway Subsystem	Future
	TxDOT El Paso District Shop	Equipment Repair Facility	Existing
	TxDOT El Paso District Traffic Signals	Roadway Subsystem	Existing
	TxDOT El Paso District Web Page	Information Service Provider Subsystem	Existing
	TxDOT El Paso District Work Zone Equipment	Roadway Subsystem	Future
	TxDOT Fort Worth TMC (TransVision)	Traffic Management Subsystem	Existing
	TxDOT Highway Conditions Reporting System	Information Service Provider Subsystem	Existing
	TxDOT Highway Conditions Reporting System	Maintenance and Construction Management Subsystem	Existing
	TxDOT Motor Carrier Routing Information	Information Service Provider Subsystem	Existing
	TxDOT Rest Areas/Visitor Center Kiosks	Remote Traveler Support Subsystem	Future

Table 3 – El Paso ITS Inventory (sorted by Stakeholder) (continued)

Stakeholder	Element	Entity	Status
TxDOT (continued)	TxDOT Statewide Pavement Management System	Archived Data Management Subsystem	Existing
	TxDOT Water Level Sensors	Roadway Subsystem	Future
US Army	Fort Bliss Operations Center	Emergency Management Subsystem	Existing
	William Beaumont Army Medical Center	Care Facility	Existing
	William Beaumont Army Medical Center	Emergency Management Subsystem	Existing
US Bureau of Customs and Border Protection	Smart Card Reader	Traveler Card Reader System	Future
	US BCBP Border Patrol Communications Center	Emergency Management Subsystem	Existing
	US BCBP Border Patrol Stations	Emergency Management Subsystem	Existing
	US BCBP Border Patrol Stations	Roadway Subsystem	Existing
	US BCBP Border Patrol Vehicles	Emergency Vehicle Subsystem	Existing
	US BCBP Bridge Operations Office	Emergency Management Subsystem	Existing
	US BCBP CASC	Emergency Management Subsystem	Existing
US Bureau of Customs and Border Protection (continued)	US BCBP Customs Field Equipment	Roadway Subsystem	Existing
	US BCBP Customs Product Manifest System	Commercial Vehicle Administration Subsystem	Future
	US BCBP Customs Sector Communications	Emergency Management Subsystem	Existing
	US BCBP Customs Web Site	Information Service Provider Subsystem	Existing
	US BCBP Electronic Clearance System	Commercial Vehicle Check Subsystem	Future
	US Border Patrol Checkpoints	Roadway Subsystem	Existing
UTEP	UTEP Weather Systems	Weather Service	Future

Table 4 – El Paso ITS Inventory (sorted by Entity)

Entity	Element	Stakeholder	Status
Archived Data Management Subsystem	City of El Paso Crash Records Database	City of El Paso Engineering Department	Existing
	City of El Paso Pavement Management System	City of El Paso Street Department	Existing
	El Paso MPO Data System	El Paso MPO	Future
	Juarez IMIP	Juarez IMIP	Future
	Las Cruces MPO	Las Cruces MPO	Future
	Statewide Crash Records Information System	DPS	Existing
	Sun Metro Public Transportation Archive	Sun Metro Transit	Existing
	TxDOT El Paso District Pavement Management System	TxDOT	Existing
	TxDOT El Paso District Public Transportation Management System (PTMS)	TxDOT	Existing
	TxDOT Statewide Pavement Management System	TxDOT	Existing
Archived Data User Systems	Crash Data Users	Archive Data Users	Future
	El Paso MPO Data System Users	Archive Data Users	Future
	Pavement Management Data Users	Archive Data Users	Existing
	Public Transportation Archive Data Users	Archive Data Users	Existing
	TxDOT El Paso District Pavement Management System	TxDOT	Existing
Asset Management	TxDOT BRINSAP	TxDOT	Existing
	TxDOT El Paso District Pavement Management System	TxDOT	Existing
Care Facility	Regional Medical Center	Regional Medical Center	Existing
	William Beaumont Army Medical Center	US Army	Existing
Commercial Vehicle Administration Subsystem	TxDOT Credentials Administration and Safety Information Exchange	TxDOT	Future
	US BCBP Customs Product Manifest System	US Bureau of Customs and Border Protection	Future

Table 4 – El Paso ITS Inventory (sorted by Entity) (continued)

Entity	Element	Stakeholder	Status
Commercial Vehicle Check Subsystem	DPS Electronic Screening Stations	DPS	Existing
	US BCBP Electronic Clearance System	US Bureau of Customs and Border Protection	Future
Commercial Vehicle Subsystem	Commercial Vehicles	Commercial Vehicle Operators	Existing
Emergency Management Subsystem	City of El Paso 911 Communications Center	City of El Paso Police Department	Existing
	City of El Paso EOC	City of El Paso Fire Department	Existing
	City of El Paso Fire and FMS Dispatch	City of El Paso Fire Department	Existing
	City of El Paso Traffic Management Center	City of El Paso Engineering Department	Existing
	Correctional Facilities Operations	Correctional Facilities	Existing
	County Public Safety Dispatch and PSAP	County Sheriff	Existing
	DPS Administration	DPS	Existing
	DPS Communications Service	DPS	Existing
	FBI El Paso Dispatch	Federal Bureau of Investigation	Future
	Fort Bliss Operations Center	US Army	Existing
	Independent School District Police Dispatch	Independent School Districts	Existing
	Municipal Public Safety Dispatch	Municipal or County Public Safety	Existing
	New Mexico County EOCs	New Mexico Emergency Agencies	Existing
	NM State Police Dispatch	New Mexico DPS	Existing
	Private Ambulance Dispatch	Private Ambulance	Existing
	Private Tow/Wrecker Dispatch	Private Tow/Wrecker Providers	Existing
	Regional University/College Police	Regional University/Colleges	Existing
	Rural County EOCs	County Emergency Management Agencies	Existing
	State EOC	DPS Division of Emergency Management	Existing
	TransVista	TxDOT	Existing

Table 4 – El Paso ITS Inventory (sorted by Entity) (continued)

Entity	Element	Stakeholder	Status
Emergency Management Subsystem (continued)	US BCBP Border Patrol Communications Center	US Bureau of Customs and Border Protection	Existing
	US BCBP Border Patrol Stations	US Bureau of Customs and Border Protection	Existing
	US BCBP Bridge Operations Office	US Bureau of Customs and Border Protection	Existing
	US BCBP CASC	US Bureau of Customs and Border Protection	Existing
	US BCBP Customs Sector Communications	US Bureau of Customs and Border Protection	Existing
	William Beaumont Army Medical Center	US Army	Existing
Emergency Vehicle Subsystem	City of El Paso Fire and FMS Vehicles	City of El Paso Fire Department	Existing
	City of El Paso Police Vehicles	City of El Paso Police Department	Existing
	DPS Vehicles	DPS	Existing
	Independent School District Police Vehicles	Independent School Districts	Existing
	Municipal or County Emergency Vehicles	Municipal or County Public Safety	Existing
	Private Ambulance Vehicle	Private Ambulance	Existing
	Private Tow/Wrecker Vehicles	Private Tow/Wrecker Providers	Existing
	Regional University/College Police Vehicles	Regional University/Colleges	Existing
	TxDOT Courtesy Patrol Vehicles	TxDOT	Existing
	US BCBP Border Patrol Vehicles	US Bureau of Customs and Border Protection	Existing
Emissions Management Subsystem	TCEQ Monitor Operations Section	Texas Commission on Environmental Quality (TCEQ)	Existing
Enforcement Agency	DPS License and Weights Division	DPS	Existing
Equipment Repair Facility	City of El Paso Vehicle Repairs	City of El Paso Fleet Services	Existing
	TxDOT El Paso District Shop	TxDOT	Existing

Table 4 – El Paso ITS Inventory (sorted by Entity) (continued)

Entity	Element	Stakeholder	Status
Event Promoters	El Paso Convention and Visitors Bureau	El Paso Convention and Visitors Bureau	Existing
	Regional Event Facilities	Regional Event Facilities	Existing
Financial Institution	City of El Paso Comptroller	City of El Paso	Future
	Financial Institution	Financial Institution	Future
Fleet and Freight Management Subsystem	Commercial Vehicle Operator Systems	Commercial Vehicle Operators	Existing
Information Service Provider Subsystem	City of El Paso Web Site	City of El Paso	Existing
	El Paso MPO Website	El Paso MPO	Existing
	New Mexico DOT Website	New Mexico DOT	Existing
	Private Sector Traveler Information Services	Private Information Service Providers	Future
	Statewide Crash Records Information System	DPS	Existing
	Sun Metro IVR System	Sun Metro Transit	Future
	Sun Metro Transit Fixed Route Dispatch	Sun Metro Transit	Existing
	Sun Metro Transit Web Site	Sun Metro Transit	Existing
	TransVista Web Site	TxDOT	Existing
	TxDOT 511 System	TxDOT	Future
	TxDOT El Paso District Public Information Office	TxDOT	Future
	TxDOT El Paso District Web Page	TxDOT	Existing
	TxDOT Highway Conditions Reporting System	TxDOT	Existing
	TxDOT Motor Carrier Routing Information	TxDOT	Existing
	US BCBP Customs Web Site	US Bureau of Customs and Border Protection	Existing
Intermodal Freight Depot	El Paso Transportation Hub	City of El Paso	Future
Maintenance and Construction Administrative Systems	TxDOT El Paso District Area Engineers Office	TxDOT	Existing

Table 4 – El Paso ITS Inventory (sorted by Entity) (continued)

Entity	Element	Stakeholder	Status
Maintenance and Construction Management Subsystem	City of El Paso Maintenance Dispatch	City of El Paso Street Department	Existing
	City of El Paso Traffic Engineering	City of El Paso Engineering Department	Existing
	City of El Paso Traffic Signal Maintenance Dispatch	City of El Paso Street Department	Existing
	County Road and Bridge	County Road and Bridge	Existing
	Municipal PWD	Municipal Public Works Department	Existing
	New Mexico DOT Maintenance Dispatch	New Mexico DOT	Existing
	Other TxDOT District Maintenance Sections	TxDOT	Existing
	TxDOT El Paso District Area Engineers Office	TxDOT	Existing
	TxDOT El Paso District Maintenance Sections	TxDOT	Existing
	TxDOT El Paso District Office	TxDOT	Existing
	TxDOT Highway Conditions Reporting System	TxDOT	Existing
	Utility Company Dispatch	Regional Utility Companies	Existing
Maintenance and Construction Vehicle Subsystem	City of El Paso Street Department Vehicles	City of El Paso Street Department	Existing
	County Road and Bridge Vehicles	County Road and Bridge	Existing
	TxDOT El Paso District Maintenance Vehicles	TxDOT	Existing
Media	Local Print and Broadcast Media	Local Media	Existing
Multimodal Transportation Service Provider	AMTRAK Passenger Terminal	AMTRAK	Existing
	El Paso International Airport	City of El Paso	Existing
Other CVAS	Other States Credentials Administration and Safety Systems	Other States	Future
Other EM	El Paso Regional Incident and Mutual Aid Network	Regional Emergency and Public Safety Agencies	Future
Other TM	Sunland Park Municipal Traffic Signal System	City of Las Cruces	Existing
Parking Management Subsystem	City of El Paso Parking Meter Reader System	City of El Paso	Future
Personal Information Access Subsystem	Private Travelers Personal Computing Devices	Private Travelers	Future

Table 4 – El Paso ITS Inventory (sorted by Entity) (continued)

Entity	Element	Stakeholder	Status
Rail Operations	Rail Operations Centers	Rail Operators	Existing
Remote Traveler Support Subsystem	El Paso Transportation Hub	City of El Paso	Future
	Sun Metro International Transit Terminal	Sun Metro Transit	Future
	Sun Metro Transit Information Display	Sun Metro Transit	Future
	Sun Metro Transit Kiosks	Sun Metro Transit	Future
	TxDOT Rest Areas/Visitor Center Kiosks	TxDOT	Future
Roadway Subsystem	City of El Paso Field Equipment	City of El Paso Engineering Department	Existing
	City of El Paso International Bridge Field Equipment	City of El Paso Engineering Department	Future
	City of El Paso Water Level Sensors	City of El Paso Street Department	Existing
	County Road and Bridge Field Equipment	County Road and Bridge	Future
	IBWC BOTA Field Equipment	IBWC	Future
	TCEQ Field Emissions Monitors	Texas Commission on Environmental Quality (TCEQ)	Existing
	TxDOT El Paso District CCTV	TxDOT	Existing
	TxDOT El Paso District DMS	TxDOT	Existing
	TxDOT El Paso District Field Sensors	TxDOT	Existing
	TxDOT El Paso District HAR	TxDOT	Future
	TxDOT El Paso District Lane Control Signals	TxDOT	Existing
	TxDOT El Paso District Ramp Meters and Ramp Gates	TxDOT	Future
	TxDOT El Paso District Traffic Signals	TxDOT	Existing
	TxDOT El Paso District Work Zone Equipment	TxDOT	Future
	TxDOT Water Level Sensors	TxDOT	Future
	US BCBP Border Patrol Stations	US Bureau of Customs and Border Protection	Existing

Table 4 – El Paso ITS Inventory (sorted by Entity) (continued)

Entity	Element	Stakeholder	Status
Roadway Subsystem (continued)	US BCBP Customs Field Equipment	US Bureau of Customs and Border Protection	Existing
	US Border Patrol Checkpoints	US Bureau of Customs and Border Protection	Existing
Toll Administration Subsystem	International Bridge Audit System	City of El Paso Street Department	Existing
Toll Collection Subsystem	International Bridge Toll Plazas	City of El Paso Street Department	Existing
Traffic Management Subsystem	City of El Paso 911 Communications Center	City of El Paso Police Department	Existing
	City of El Paso Traffic Engineering	City of El Paso Engineering Department	Existing
	City of El Paso Traffic Management Center	City of El Paso Engineering Department	Existing
	City of El Paso Traffic Signal Maintenance Dispatch	City of El Paso Street Department	Existing
	IBWC Operations Center	IBWC	Future
	New Mexico DOT TMC	New Mexico DOT	Existing
	Other Texas District TMCs	TxDOT	Existing
	TransVista	TxDOT	Existing
	TxDOT Fort Worth TMC (TransVision)	TxDOT	Existing
Transit Management Subsystem	El Paso County Rural Transit System Dispatch	El Paso County Rural Transit	Existing
	Independent School District Dispatch	Independent School Districts	Existing
	Private Sector Transit System Dispatch	Private Rural Transit Systems	Existing
	Private Taxi Provider Dispatch	Private Taxi Providers	Existing
	Sun Metro Fixed Route Transit Vehicle Maintenance Facility	Sun Metro Transit	Existing
	Sun Metro LIFT Maintenance Facility	Sun Metro Transit	Existing
	Sun Metro Paratransit Dispatch	Sun Metro Transit	Existing
	Sun Metro Transit Fixed Route Dispatch	Sun Metro Transit	Existing

Table 4 – El Paso ITS Inventory (sorted by Entity) (continued)

Entity	Element	Stakeholder	Status
Transit Vehicle Subsystem	El Paso County Rural Transit Vehicles	El Paso County Rural Transit	Existing
	Independent School District Buses	Independent School Districts	Existing
	Sun Metro Fixed Route Transit Vehicles	Sun Metro Transit	Existing
	Sun Metro LIFT Vehicles	Sun Metro Transit	Existing
	Sun Metro Maintenance Vehicles	Sun Metro Transit	Existing
	Sun Metro Support Vehicles	Sun Metro Transit	Existing
Traveler Card	El Paso Regional Smart Card	City of El Paso Street Dept. and Sun Metro	Future
Traveler Card Reader System	City of El Paso Electronic Parking Meter Systems	City of El Paso Street Department	Future
	Smart Card Reader	US Bureau of Customs and Border Protection	Future
Vehicle	Commercial Vehicles	Commercial Vehicle Operators	Existing
	Private Vehicles	Private Travelers	Existing
Wayside Equipment	Rail Operators Wayside Equipment	Rail Operators	Existing
Weather Service	National Weather Service	NOAA	Existing
	UTEP Weather Systems	UTEP	Future
Yellow Pages Service Providers	Travel Service Providers	Travel Service Providers	Future

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 El Paso 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.

In the El Paso 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 El Paso Region selected for implementation in the Region are identified in **Table 5**, as well as 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 El Paso and on highways throughout the TxDOT El Paso Region. The market package 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 – El Paso 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 El Paso Web Site	City of El Paso	Existing
		City of El Paso Field Equipment	TxDOT El Paso District	Existing
		City of El Paso International Bridge Field Equipment	IBWC	Future
		City of El Paso Traffic Management Center		
		El Paso MPO Website		
		IBWC BOTA Field Equipment		
		IBWC Operations Center		
		New Mexico DOT Website		
		Private Sector Traveler Information Services		
		TransVista		
		TransVista Web Site		
		TxDOT 511 System		
		TxDOT El Paso District CCTV		

Table 5 – El Paso 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 El Paso District Field Sensors TxDOT El Paso District Web Page		
ATMS02	Probe Surveillance	Commercial Vehicles Private Vehicles TransVista TxDOT El Paso District Field Sensors	TxDOT El Paso District	Future
ATMS03	Surface Street Control	City of El Paso Field Equipment City of El Paso Traffic Management Center City of El Paso Traffic Signal Maintenance Dispatch TransVista TxDOT El Paso District Field Sensors TxDOT El Paso District Traffic Signals	City of El Paso TxDOT El Paso District	Existing Future
ATMS04	Freeway Control	TransVista TxDOT El Paso District CCTV TxDOT El Paso District Field Sensors TxDOT El Paso District Lane Control Signals TxDOT El Paso District Ramp Meters and Ramp Gates	TxDOT El Paso District	Existing
ATMS06	Traffic Information Dissemination	City of El Paso Web Site City of El Paso Field Equipment City of El Paso Traffic Management Center City of El Paso EOC City of El Paso Fire and FMS Dispatch City of El Paso 911 Communications Center County Road and Bridge DPS Communications Service El Paso County Rural Transit System Dispatch El Paso MPO Website FBI El Paso Dispatch	TxDOT El Paso District City of El Paso	Existing Future

Table 5 – El Paso 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)	Fort Bliss Operations Center Independent School District Dispatch Local Print and Broadcast Media NM State Police Dispatch Private Sector Traveler Information Services Private Sector Transit System Dispatch Private Tow/Wrecker Dispatch Sun Metro Paratransit Dispatch Sun Metro Transit Fixed Route Dispatch Sun Metro Transit Kiosks TransVista TransVista Web Site TxDOT 511 System TxDOT El Paso District DMS TxDOT El Paso District HAR TxDOT El Paso District Maintenance Sections TxDOT El Paso District Public Information Office TxDOT El Paso District Web Page		
ATMS07	Regional Traffic Information	City of El Paso Traffic Management Center City of El Paso 911 Communications Center Sunland Park Municipal Traffic Signal System IBWC Operations Center New Mexico DOT TMC Other Texas District TMCs TransVista TxDOT Fort Worth TMC (TransVision)	TxDOT El Paso District City of El Paso	Existing Existing
ATMS08	Incident Management System	City of El Paso Traffic Management Center City of El Paso EOC City of El Paso Fire and FMS Vehicles	Emergency and Transportation Management Agencies	Future

Table 5 – El Paso 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)	City of El Paso Fire and FMS Dispatch City of El Paso 911 Communications Center City of El Paso Police Vehicles City of El Paso Maintenance Dispatch City of El Paso Traffic Signal Maintenance Dispatch City of El Paso Water Level Sensors County Road and Bridge County Public Safety Dispatch and PSAP DPS Electronic Screening Stations DPS Vehicles DPS Communications Service State EOC El Paso Convention and Visitors Bureau Fort Bliss Operations Center Independent School District Police Dispatch Independent School District Police Vehicles Municipal or County Emergency Vehicles Municipal Public Safety Dispatch Municipal PWD NM State Police Dispatch New Mexico DOT Maintenance Requests Other TxDOT District Maintenance Sections Private Ambulance Dispatch Private Ambulance Vehicle Private Tow/Wrecker Dispatch Private Tow/Wrecker Vehicles Regional Event Facilities Regional University/College Police		

Table 5 – El Paso 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)	Regional University/College Police Vehicles Rural County EOCs State EOC TransVista TxDOT El Paso District Maintenance Sections TxDOT El Paso District Office TxDOT Water Level Sensors US BCBP Border Patrol Communications Center US BCBP Border Patrol Stations US BCBP Border Patrol Vehicles US BCBP Bridge Operations Office US BCBP CASC US BCBP Customs Field Equipment US Border Patrol Checkpoints Utility Company Dispatch		
ATMS10	Electronic Toll Collection	International Bridge Audit System International Bridge Toll Plazas El Paso Regional Smart Card Commercial Vehicles Financial Institution Private Vehicles	International Bridge Operators	Future
ATMS11	Emissions Monitoring and Management	Local Print and Broadcast Media Sun Metro Transit Fixed Route Dispatch Sun Metro Transit Kiosks TCEQ Field Emissions Monitors TCEQ Monitor Operations Section TransVista	TCEQ	Future
ATMS13	Standard Railroad Grade Crossing	City of El Paso Field Equipment City of El Paso Traffic Management Center Rail Operations Centers Rail Operators Wayside Equipment	City of El Paso TxDOT El Paso District	Existing Existing

Table 5 – El Paso Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
ATMS13 (continued)	Standard Railroad Grade Crossing (continued)	TransVista TxDOT El Paso District Traffic Signals		
ATMS15	Railroad Operations Coordination	City of El Paso Traffic Management Center Rail Operations Centers TransVista	City of El Paso TxDOT El Paso District	Future Future
ATMS16	Parking Facility Management	City of El Paso Comptroller City of El Paso Electronic Parking Meter Systems City of El Paso Parking Meter Reader System El Paso Regional Smart Card	City of El Paso	Future
EM1	Emergency Response	City of El Paso 911 Communications Center City of El Paso EOC City of El Paso Fire and FMS Dispatch City of El Paso Traffic Management Center Correctional Facilities Operations County Public Safety Dispatch and PSAP DPS Electronic Screening Stations DPS Communications Service El Paso County Rural Transit System Dispatch El Paso Regional Incident and Mutual Aid Network Fort Bliss Operations Center Independent School District Dispatch Independent School District Police Dispatch Municipal Public Safety Dispatch New Mexico County EOCs New Mexico DOT TMC NM State Police Dispatch Other Texas District TMCs Private Ambulance Dispatch Private Ambulance Vehicle	Emergency and Transportation Management Agencies	Future

Table 5 – El Paso Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
EM1 (continued)	Emergency Response (continued)	Private Sector Transit System Dispatch Private Tow/Wrecker Dispatch Regional University/College Police Rural County EOCs State EOC Sun Metro Paratransit Dispatch Sun Metro Transit Fixed Route Dispatch TransVista US BCBP Border Patrol Communications Center US BCBP Border Patrol Stations US BCBP Bridge Operations Office US BCBP CASC US BCBP Customs Sector Communications William Beaumont Army Medical Center		
EM2	Emergency Routing	City of El Paso Field Equipment City of El Paso Traffic Management Center City of El Paso Fire and FMS Vehicles City of El Paso Fire and FMS Dispatch City of El Paso 911 Communications Center City of El Paso Police Vehicles County Public Safety Dispatch and PSAP Municipal or County Emergency Vehicles Private Ambulance Dispatch Private Ambulance Vehicle Regional Medical Center TransVista TxDOT El Paso District Traffic Signals William Beaumont Army Medical Center	City of El Paso TxDOT El Paso District Municipalities and Counties	Future Future Future

Table 5 – El Paso Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
EM4	Roadway Service Patrols	TransVista	TxDOT El Paso District	Future
		TxDOT Courtesy Patrol Vehicles		
MC01	Maintenance and Construction Vehicle Tracking	City of El Paso Maintenance Dispatch	City of El Paso	Future
		City of El Paso Street Department Vehicles	TxDOT El Paso District	Future
		County Road and Bridge	County Road and Bridge	Future
		County Road and Bridge Vehicles		
		TxDOT El Paso District Maintenance Sections		
		TxDOT El Paso District Maintenance Vehicles		
MC02	Maintenance and Construction Vehicle Maintenance	City of El Paso Vehicle Repairs	TxDOT El Paso District	Future
		City of El Paso Maintenance Dispatch	City of El Paso	Future
		City of El Paso Street Department Vehicles	County Road and Bridge	Future
		County Road and Bridge		
		County Road and Bridge Vehicles		
		TxDOT El Paso District Maintenance Sections		
		TxDOT El Paso District Maintenance Vehicles		
		TxDOT El Paso District Shop		
MC04	Weather Information Processing and Distribution	City of El Paso Traffic Management Center	University of Texas El Paso	Future
		City of El Paso EOC		
		City of El Paso Fire and FMS Dispatch		
		City of El Paso 911 Communications Center		
		City of El Paso Maintenance Dispatch		
		DPS Communications Service		
		El Paso County Rural Transit System Dispatch		
		Fort Bliss Operations Center		
		National Weather Service		
		Sun Metro Paratransit Dispatch		
		Sun Metro Transit Fixed Route Dispatch		

Table 5 – El Paso 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)	TransVista TxDOT El Paso District Maintenance Sections UTEP Weather Systems		
MC07	Roadway Maintenance and Construction	City of El Paso Traffic Management Center City of El Paso Maintenance Dispatch City of El Paso Street Department Vehicles City of El Paso Traffic Signal Maintenance Dispatch County Road and Bridge County Road and Bridge Vehicles National Weather Service TransVista TxDOT BRINSAP TxDOT El Paso District Area Engineers Office TxDOT El Paso District Maintenance Sections TxDOT El Paso District Maintenance Vehicles TxDOT El Paso District Pavement Management System	TxDOT El Paso District County Road and Bridge City of El Paso	Future Future Future
MC08	Work Zone Management	City of El Paso Web Site City of El Paso Field Equipment City of El Paso Traffic Management Center City of El Paso Fire and FMS Dispatch City of El Paso 911 Communications Center City of El Paso Maintenance Dispatch City of El Paso Street Department Vehicles County Road and Bridge County Road and Bridge Field Equipment County Road and Bridge Vehicles	TxDOT El Paso District County Road and Bridge City of El Paso	Future Future Future

Table 5 – El Paso 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)	County Public Safety Dispatch and PSAP DPS Communications Service El Paso County Rural Transit System Dispatch Independent School District Dispatch Municipal Public Safety Dispatch Municipal PWD Other TxDOT District Maintenance Sections Private Sector Transit System Dispatch Rural Transit System Dispatch Sun Metro Paratransit Dispatch Sun Metro Transit Fixed Route Dispatch TransVista TransVista Web Site TxDOT 511 System TxDOT El Paso District Area Engineers Office TxDOT El Paso District Maintenance Sections TxDOT El Paso District Maintenance Vehicles TxDOT El Paso District Public Information Office TxDOT El Paso District Web Page TxDOT El Paso District Work Zone Equipment TxDOT Highway Conditions Reporting System		

Table 5 – El Paso Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
MC09	Work Zone Safety Monitoring	City of El Paso Field Equipment City of El Paso Maintenance Dispatch City of El Paso Street Department Vehicles TxDOT El Paso District Maintenance Sections TxDOT El Paso District Maintenance Vehicles TxDOT El Paso District Work Zone Equipment	TxDOT El Paso District City of El Paso	Future Future
MC10	Maintenance and Construction Activity Coordination	City of El Paso Traffic Engineering City of El Paso Traffic Management Center City of El Paso 911 Communications Center City of El Paso Maintenance Dispatch County Road and Bridge County Public Safety Dispatch and PSAP DPS Communications Service El Paso County Rural Transit System Dispatch Independent School District Dispatch Municipal PWD New Mexico DOT TMC Other TxDOT District Maintenance Sections Private Sector Transit System Dispatch Rail Operations Centers Rural Transit System Dispatch Sun Metro Paratransit Dispatch Sun Metro Transit Fixed Route Dispatch TransVista TxDOT El Paso District Area Engineer's Office TxDOT El Paso District Maintenance Sections	TxDOT El Paso District County Road and Bridge City of El Paso	Future Future Future

Table 5 – El Paso 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)	TxDOT El Paso District Office TxDOT El Paso District Public Information Office TxDOT El Paso District Web Page TxDOT Highway Conditions Reporting System Utility Company Dispatch		
APTS1	Transit Vehicle Tracking	El Paso County Rural Transit System Dispatch El Paso County Rural Transit Vehicles Independent School District Buses Independent School District Dispatch Sun Metro Fixed Route Transit Vehicles Sun Metro Paratransit Dispatch Sun Metro LIFT Vehicles Sun Metro Support Vehicles Sun Metro Transit Fixed Route Dispatch	Sun Metro	Existing
			El Paso County Rural Transit	Future
			Independent School Districts	Future
APTS2	Transit Fixed-Route Operations	City of El Paso Traffic Management Center City of El Paso Maintenance Dispatch County Road and Bridge El Paso County Rural Transit System Dispatch El Paso County Rural Transit Vehicles El Paso MPO Website Independent School District Buses Independent School District Dispatch Private Sector Traveler Information Services Private Sector Transit Dispatch System Sun Metro Fixed Route Transit Vehicles	Sun Metro	Existing
			El Paso County Rural Transit	Future
			Independent School Districts	Future

Table 5 – El Paso Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
APTS2 (continued)	Transit Fixed-Route Operations (continued)	Sun Metro Transit Fixed Route Dispatch Sun Metro Transit Web Site TransVista TxDOT 511 System TxDOT El Paso District Maintenance Sections		
APTS3	Demand Response Transit Operations	City of El Paso Traffic Management Center Private Sector Traveler Information Services Sun Metro Paratransit Dispatch Sun Metro LIFT Vehicles Sun Metro Transit Web Site TxDOT 511 System	Sun Metro	Existing
APTS4	Transit Passenger and Fare Management	City of El Paso Comptroller El Paso Regional Smart Card Financial Institution Sun Metro Fixed Route Transit Vehicles Sun Metro Transit Fixed Route Dispatch Sun Metro Transit Kiosks	Sun Metro	Future
APTS5	Transit Security	City of El Paso 911 Communications Center El Paso County Rural Transit System Dispatch El Paso County Rural Transit Vehicles El Paso Regional Smart Card Smart Card Reader Sun Metro Transit Fixed Route Dispatch Sun Metro Fixed Route Transit Vehicles Sun Metro Paratransit Dispatch Sun Metro LIFT Vehicles US BCBP Bridge Operations Office	Sun Metro El Paso County Rural Transit	Future Future

Table 5 – El Paso Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
APTS6	Transit Maintenance	Sun Metro Fixed Route Transit Vehicle Maintenance Facility Sun Metro Fixed Route Transit Vehicles Sun Metro LIFT Vehicles Sun Metro LIFT Vehicle Maintenance Facility Sun Metro Maintenance Vehicles Sun Metro Paratransit Dispatch Sun Metro Support Vehicles Sun Metro Transit Fixed Route Dispatch	Sun Metro	Future
APTS7	Multi-modal Coordination	AMTRAK Passenger Terminal City of El Paso Field Equipment City of El Paso Traffic Management Center El Paso County Rural Transit System Dispatch El Paso County Rural Transit Vehicles El Paso International Airport Private Taxi Provider Dispatch Sun Metro Fixed Route Transit Vehicles Sun Metro Paratransit Dispatch Sun Metro LIFT Vehicles Sun Metro Transit Fixed Route Dispatch	Sun Metro El Paso County	Future Future
APTS8	Transit Traveler Information	El Paso Convention and Visitors Bureau El Paso County Rural Transit System Dispatch Private Sector Transit System Dispatch Private Travelers Personal Computing Devices Regional Event Facilities Sun Metro International Transit Terminal Sun Metro IVR System Sun Metro Paratransit Dispatch Sun Metro Transit Fixed Route Dispatch	Sun Metro	Future

Table 5 – El Paso Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
APTS8 (continued)	Transit Traveler Information (continued)	Sun Metro Transit Information Display Sun Metro Transit Kiosks Sun Metro Transit Web Site Travel Service Providers		
CVO02	Freight Administration	City of El Paso Traffic Management Center City of El Paso Transportation Hub City of El Paso Web Site El Paso Transportation Hub Rail Operations Centers TransVista TransVista Web Site TxDOT El Paso District Work Zone Equipment US BCBP CASC	Commercial Vehicle and Rail Operators	Future
CVO03	Electronic Clearance	Commercial Vehicle Operator Systems Commercial Vehicles DPS Electronic Screening Stations DPS License and Weights Division Other States Credentials Administration and Safety Systems Rural County EOCs TxDOT El Paso District Work Zone Equipment TxDOT Credentials Administration and Safety Information Exchange US BCBP Customs Product Manifest System	Department of Public Safety BCBP	Future Future

Table 5 – El Paso Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
CVO10	HAZMAT Management	City of El Paso 911 Communications Center Commercial Vehicle Operator Systems Commercial Vehicles County Public Safety Dispatch and PSAP DPS Communications Service	Emergency Management Agencies	Future
ATIS1	Broadcast Traveler Information	AMTRAK Passenger Terminal City of El Paso Web Site City of El Paso Traffic Management Center City of El Paso Maintenance Dispatch El Paso International Airport El Paso MPO Website Local Print and Broadcast Media Private Travelers Personal Computing Devices Sun Metro Transit Kiosks TransVista Web Site TxDOT 511 System TxDOT El Paso District Maintenance Sections TxDOT El Paso District Public Information Office TxDOT El Paso District Web Page TxDOT Highway Conditions Reporting System TxDOT Rest Areas/Visitor Center Kiosks US BCBP Customs Web Site	TxDOT El Paso District	Future
			City of El Paso	Future
			US Customs	Future
ATIS5	ISP Based Route Guidance	City of El Paso Traffic Management Center TransVista TxDOT El Paso District Maintenance Sections TxDOT Motor Carrier Routing Information TxDOT Rest Areas/Visitor Center Kiosks	TxDOT El Paso District	Future

Table 5 – El Paso Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
AD1	ITS Data Mart	City of El Paso 911 Communications Center	TxDOT Public Transportation Archives	Future
		City of El Paso Crash Records Database	TxDOT Pavement Management System	Future
		City of El Paso Maintenance Dispatch	TxDOT/DPS Crash Records Information System	Future
		City of El Paso Pavement Management System	El Paso MPO	Future
		Crash Data Users	City of El Paso	Future
		DPS Administration		
		El Paso County Rural Transit System Dispatch		
		El Paso MPO Data System		
		Pavement Management Data Users		
		Public Transportation Archive Data Users		
		Statewide Crash Records Information System		
		Sun Metro Paratransit Dispatch		
		Sun Metro Public Transportation Archive		
		Sun Metro Transit Fixed Route Dispatch		
		TxDOT El Paso District Maintenance Sections		
		TxDOT El Paso District Pavement Management System		
		TxDOT El Paso District Public Transportation Management System (PTMS)		
		TxDOT Statewide Pavement Management System		
AD2	ITS Data Warehouse	City of El Paso Traffic Management Center	El Paso MPO	Future
		El Paso County Rural Transit System Dispatch		
		El Paso International Airport		
		El Paso MPO Data System		
		El Paso MPO Data System Users		
		Juarez IMIP (like an MPO)		
		Las Cruces MPO		
		Rail Operations Centers		

Table 5 – El Paso Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
AD2 (continued)	ITS Data Warehouse (continued)	Sun Metro Paratransit Dispatch Sun Metro Transit Fixed Route Dispatch US BCBP CASC		

4.3 Market Package Prioritization

Of the 75 available market packages in the National ITS Architecture, 37 were selected and customized for deployment in the El Paso Region. Stakeholders were asked to prioritize the market packages into high, medium, and low priorities, based on regional needs, feasibility and likelihood of deployment, and overall contribution of the market package to the goals and vision for ITS functionality in the Region. A summary of these prioritized market packages is shown in **Table 6**.

These priorities identified the key needs and services that are desired in the El Paso Region, as well as the interfaces that need to be established to provide integrated functionality and establish communication between elements.

Table 6 – Summary of Prioritized Market Packages for the El Paso Region

High Priority	Medium Priority	Low Priority
▪ Network Surveillance ▪ Surface Street Control ▪ Freeway Control ▪ Traffic Information Dissemination ▪ Regional Traffic Information ▪ Incident Management System ▪ Emissions Monitoring and Management ▪ Standard Railroad Grade Crossing ▪ Railroad Operations Coordination ▪ Parking Facility Management ▪ Maintenance and Construction Activity Coordination ▪ Transit Vehicle Tracking ▪ Transit Fixed-Route Operations ▪ Transit Passenger and Fare Management ▪ Transit Security ▪ Transit Traveler Information ▪ Broadcast Traveler Information ▪ Electronic Clearance ▪ Emergency Response ▪ Emergency Routing ▪ Roadway Service Patrol ▪ ITS Data Mart ▪ ITS Virtual Data Warehouse	▪ Electronic Toll Collection ▪ Maintenance and Construction Vehicle Tracking ▪ Weather Information Processing and Distribution ▪ Roadway Maintenance and Construction ▪ Work Zone Management ▪ Work Zone Safety Monitoring ▪ Demand Response Transit Operations ▪ Multimodal Coordination ▪ Freight Administration ▪ HAZMAT Management	▪ Probe Surveillance ▪ Maintenance and Construction Vehicle Maintenance ▪ Transit Maintenance ▪ ISP Based Route Guidance

4.4 Interconnections

4.4.1 Top Level Regional System Interconnect Diagram

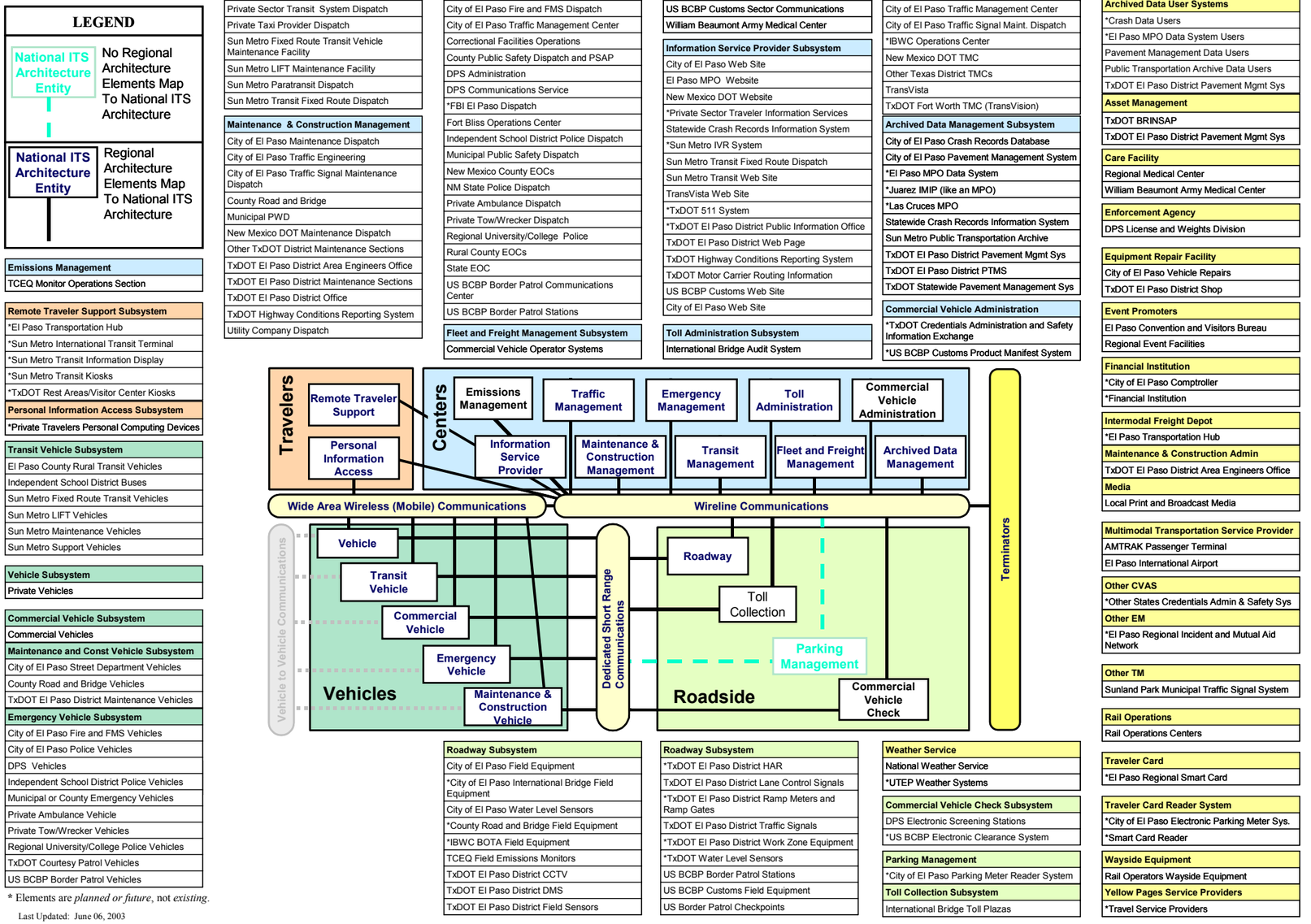
A system interconnect diagram, or sausage diagram (shown previously in **Figure 4**), shows the systems and primary interconnects in the Region. The National ITS Architecture interconnect diagram has been customized for the El Paso Region based on the information gathered from the stakeholders and system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

4.4.2 Customized Market Packages

The market packages in the National ITS Architecture were customized to reflect the unique systems, subsystems, and terminators in the El Paso Region. Each market package is shown graphically, with the market package name, El Paso-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.

Figure 6 is an example of an Advanced Traffic Management System (ATMS) market package for Traffic Information Dissemination that has been customized for the El Paso Region. This market package shows the three subsystems, Transit Management, Traffic Management, and Roadway, and the associated entities (El Paso County Rural Transit System Dispatch, Independent School District Dispatch, Sun Metro Paratransit Dispatch, Sun Metro Transit Fixed Route Dispatch, City of El Paso Traffic Management Center, and City of El Paso Field Equipment). Data flows between the subsystems and the terminators (Media) indicate what information is being shared. The solid data flow lines in this market package indicate existing information flows and the dashed lines indicate planned or future flows.

Market packages that were customized for the El Paso Region are shown in **Appendix A**. These market packages also are included on the El Paso 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 El Paso 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.



Emissions Management
- TCEQ Monitor Operations Section

Remote Traveler Support Subsystem
- *El Paso Transportation Hub
- *Sun Metro International Transit Terminal
- *Sun Metro Transit Information Display
- *Sun Metro Transit Kiosks
- *TxDOT Rest Areas/Visitor Center Kiosks

Personal Information Access Subsystem
- *Private Travelers Personal Computing Devices

Transit Vehicle Subsystem
- El Paso County Rural Transit Vehicles
- Independent School District Buses
- Sun Metro Fixed Route Transit Vehicles
- Sun Metro LIFT Vehicles
- Sun Metro Maintenance Vehicles
- Sun Metro Support Vehicles

Vehicle Subsystem
- Private Vehicles

Commercial Vehicle Subsystem
- Commercial Vehicles

Maintenance and Const Vehicle Subsystem
- City of El Paso Street Department Vehicles
- County Road and Bridge Vehicles
- TxDOT El Paso District Maintenance Vehicles

Emergency Vehicle Subsystem
- City of El Paso Fire and FMS Vehicles
- City of El Paso Police Vehicles
- DPS Vehicles
- Independent School District Police Vehicles
- Municipal or County Emergency Vehicles
- Private Ambulance Vehicle
- Private Tow/Wrecker Vehicles
- Regional University/College Police Vehicles
- TxDOT Courtesy Patrol Vehicles
- US BCBP Border Patrol Vehicles

* Elements are *planned or future*, not *existing*.

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Transit Management Subsystem
- El Paso County Rural Transit System Dispatch
- Independent School District Dispatch
- Private Sector Transit System Dispatch
- Private Taxi Provider Dispatch
- Sun Metro Fixed Route Transit Vehicle Maintenance Facility
- Sun Metro LIFT Maintenance Facility
- Sun Metro Paratransit Dispatch
- Sun Metro Transit Fixed Route Dispatch

Maintenance & Construction Management
- City of El Paso Maintenance Dispatch
- City of El Paso Traffic Engineering
- City of El Paso Traffic Signal Maintenance Dispatch
- County Road and Bridge
- Municipal PWD
- New Mexico DOT Maintenance Dispatch
- Other TxDOT District Maintenance Sections
- TxDOT El Paso District Area Engineers Office
- TxDOT El Paso District Maintenance Sections
- TxDOT El Paso District Office
- TxDOT Highway Conditions Reporting System
- Utility Company Dispatch

Emergency Management Subsystem
- City of El Paso 911 Communications Center
- City of El Paso EOC
- City of El Paso Fire and FMS Dispatch
- City of El Paso Traffic Management Center
- Correctional Facilities Operations
- County Public Safety Dispatch and PSAP
- DPS Administration
- DPS Communications Service
- *FBI El Paso Dispatch
- Fort Bliss Operations Center
- Independent School District Police Dispatch
- Municipal Public Safety Dispatch
- New Mexico County EOCs
- NM State Police Dispatch
- Private Ambulance Dispatch
- Private Tow/Wrecker Dispatch
- Regional University/College Police
- Rural County EOCs
- State EOC
- US BCBP Border Patrol Communications Center
- US BCBP Border Patrol Stations

Fleet and Freight Management Subsystem
- Commercial Vehicle Operator Systems

Emergency Vehicle Administration
- US BCBP Bridge Operations Office
- US BCBP CASC
- US BCBP Customs Sector Communications
- William Beaumont Army Medical Center

Information Service Provider Subsystem
- City of El Paso Web Site
- El Paso MPO Website
- New Mexico DOT Website
- *Private Sector Traveler Information Services
- Statewide Crash Records Information System
- *Sun Metro IVR System
- Sun Metro Transit Fixed Route Dispatch
- Sun Metro Transit Web Site
- TransVista Web Site
- *TxDOT 511 System
- *TxDOT El Paso District Public Information Office
- TxDOT El Paso District Web Page
- TxDOT Highway Conditions Reporting System
- TxDOT Motor Carrier Routing Information
- US BCBP Customs Web Site
- City of El Paso Web Site

Toll Administration Subsystem
- International Bridge Audit System

Traffic Management Subsystem
- City of El Paso 911 Communications Center
- City of El Paso Traffic Engineering
- City of El Paso Traffic Management Center
- City of El Paso Traffic Signal Maint. Dispatch
- *IBWC Operations Center
- New Mexico DOT TMC
- Other Texas District TMCs
- TransVista
- TxDOT Fort Worth TMC (TransVision)

Archived Data Management Subsystem
- City of El Paso Crash Records Database
- City of El Paso Pavement Management System
- *El Paso MPO Data System
- *Juarez IMIP (like an MPO)
- *Las Cruces MPO
- Statewide Crash Records Information System
- Sun Metro Public Transportation Archive
- TxDOT El Paso District Pavement Mgmt Sys
- TxDOT El Paso District PTMS
- TxDOT Statewide Pavement Management Sys

Commercial Vehicle Administration
- *TxDOT Credentials Administration and Safety Information Exchange
- *US BCBP Customs Product Manifest System

Archived Data User Systems
- *Crash Data Users
- *El Paso MPO Data System Users
- Pavement Management Data Users
- Public Transportation Archive Data Users
- TxDOT El Paso District Pavement Mgmt Sys

Asset Management
- TxDOT BRINSAP
- TxDOT El Paso District Pavement Mgmt Sys

Care Facility
- Regional Medical Center
- William Beaumont Army Medical Center

Enforcement Agency
- DPS License and Weights Division

Equipment Repair Facility
- City of El Paso Vehicle Repairs
- TxDOT El Paso District Shop

Event Promoters
- El Paso Convention and Visitors Bureau
- Regional Event Facilities

Financial Institution
- *City of El Paso Comptroller
- *Financial Institution

Intermodal Freight Depot
- *El Paso Transportation Hub

Maintenance & Construction Admin
- TxDOT El Paso District Area Engineers Office

Media
- Local Print and Broadcast Media

Multimodal Transportation Service Provider
- AMTRAK Passenger Terminal
- El Paso International Airport

Other CVAS
- *Other States Credentials Admin & Safety Sys

Other EM
- *El Paso Regional Incident and Mutual Aid Network

Other TM
- Sunland Park Municipal Traffic Signal System

Rail Operations
- Rail Operations Centers

Traveler Card
- *El Paso Regional Smart Card

Traveler Card Reader System
- *City of El Paso Electronic Parking Meter Sys.
- *Smart Card Reader

Wayside Equipment
- Rail Operators Wayside Equipment

Yellow Pages Service Providers
- *Travel Service Providers

Roadway Subsystem
- City of El Paso Field Equipment
- *City of El Paso International Bridge Field Equipment
- City of El Paso Water Level Sensors
- *County Road and Bridge Field Equipment
- *IBWC BOTA Field Equipment
- TCEQ Field Emissions Monitors
- TxDOT El Paso District CCTV
- TxDOT El Paso District DMS
- TxDOT El Paso District Field Sensors

Roadway Subsystem
- *TxDOT El Paso District HAR
- TxDOT El Paso District Lane Control Signals
- *TxDOT El Paso District Ramp Meters and Ramp Gates
- TxDOT El Paso District Traffic Signals
- *TxDOT El Paso District Work Zone Equipment
- *TxDOT Water Level Sensors
- US BCBP Border Patrol Stations
- US BCBP Customs Field Equipment
- US Border Patrol Checkpoints

Weather Service
- National Weather Service
- *UTEP Weather Systems

Commercial Vehicle Check Subsystem
- DPS Electronic Screening Stations
- *US BCBP Electronic Clearance System

Parking Management
- *City of El Paso Parking Meter Reader System

Toll Collection Subsystem
- International Bridge Toll Plazas

Figure 5 – El Paso Regional System Interconnect Diagram

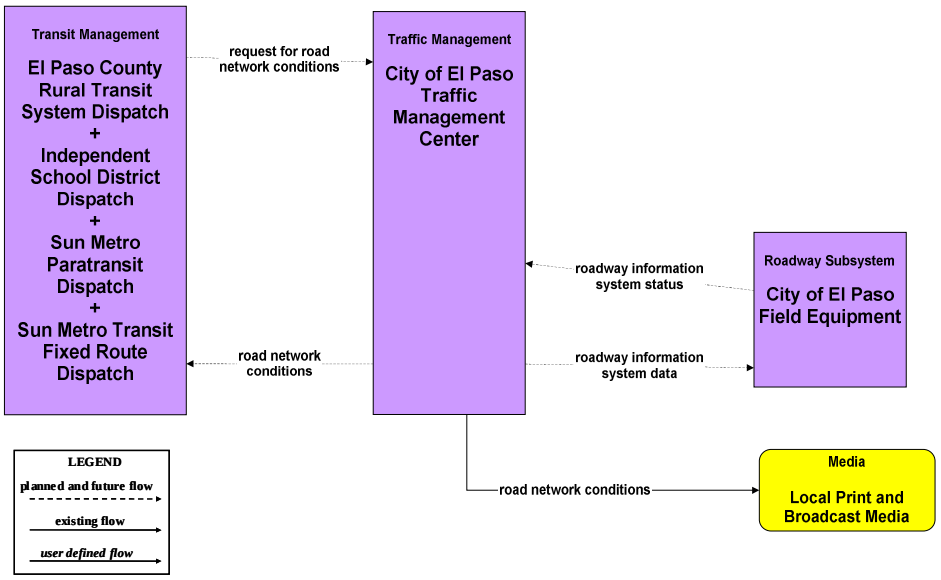

Figure 6 – Custom Market Package for City of El Paso Traffic Management Center

4.4.3 El Paso Architecture Interfaces

While it is important to identify the various systems and stakeholders as part of a regional ITS Architecture, a primary purpose of the architecture is to identify the *connectivity* between transportation systems in the El Paso Region. The interconnect diagram shown previously in **Figure 5** showed the high-level relationships of the subsystems and terminators in the El Paso 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 152 different elements identified as part of the El Paso 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 El Paso Regional ITS Architecture, and each element has been mapped to those other elements with which it must interface. For example, the City of El Paso TMC has existing or planned interfaces with 35 other elements in the El Paso Region, ranging from field equipment and dispatch centers, to TransVista, the TxDOT District TMC. 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 TxDOT El Paso District 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.

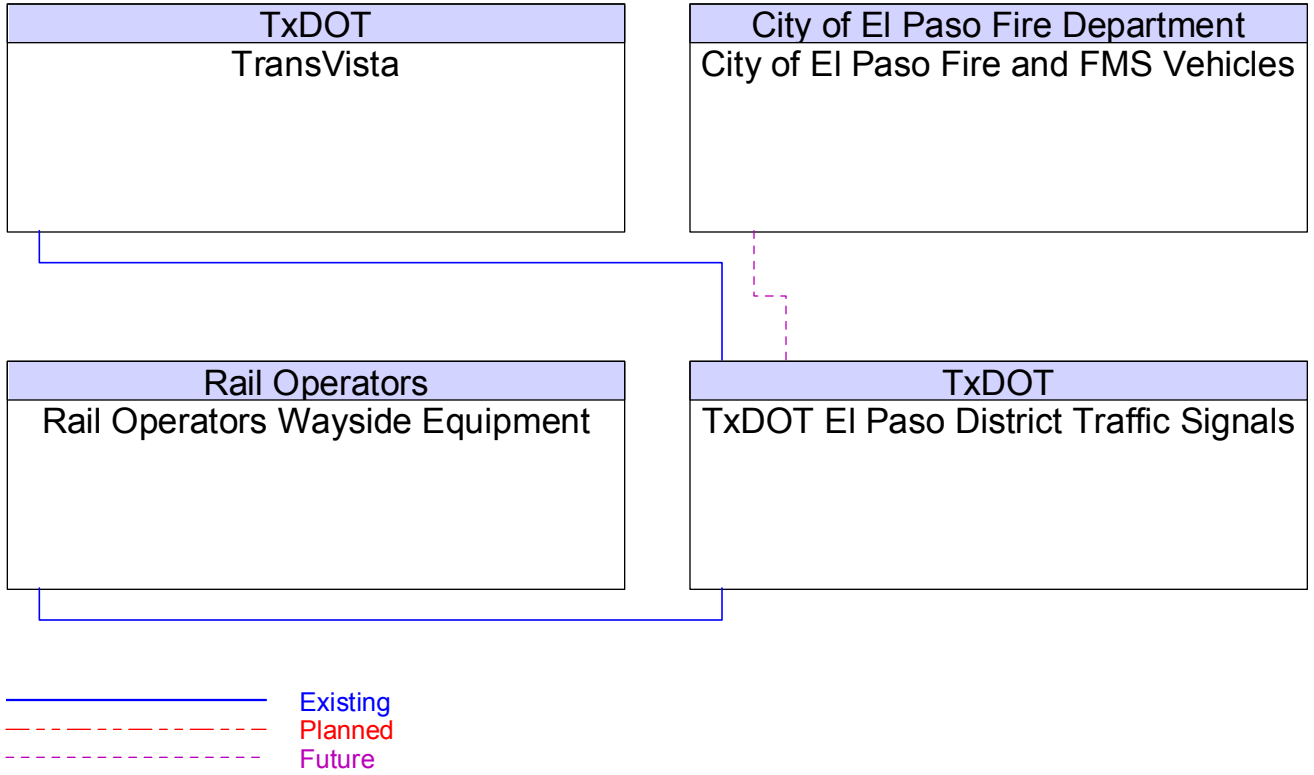

Figure 7 – TxDOT El Paso District Traffic Signals Interfaces

Each element and its defined interfaces are listed in **Appendix B**. Elements and their interfaces also are accessible via the El Paso 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.

4.4.4 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 El Paso Regional ITS Architecture.

An example of the architecture flows between two elements is shown in **Figure 8**. In this interface, the flows between the City of El Paso TMC and 911 Communications Center show information that is recommended to go from the City of El Paso TMC to the City of El Paso 911 Communications Center, as well as information that the TMC needs from the 911 Center. 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 El Paso 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 El Paso Region are discussed in more detail in Section 4.6.

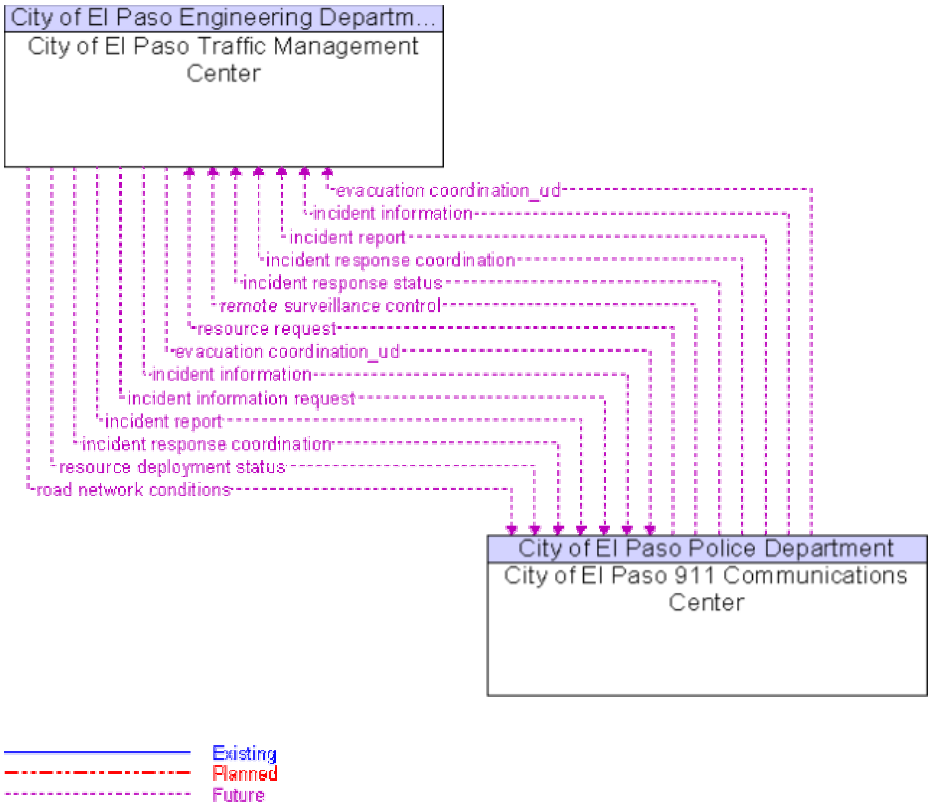

Figure 8 – City of El Paso TMC to City of El Paso 911 Communications Center Architecture Flows

4.5 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 El Paso 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 El Paso Regional ITS Architecture, functional requirements have been identified at two levels. The customized market packages, discussed previously in Section 4.4.2, 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 El Paso has to do and the data that needs to be shared among elements.

At a more detailed level, functional requirements for the El Paso Region also are described in terms of equipment packages that are associated with one or more subsystems in the El Paso Regional ITS Architecture as shown in **Table 7**. 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 El Paso Regional ITS Architecture web site by clicking on the "Functions" button.

Table 7 – El Paso Region Equipment Packages

Subsystem	Equipment Package
Archived Data Management Subsystem	Government Reporting Systems Support
	ITS Data Repository
	On-Line Analysis and Mining
	Traffic and Roadside Data Archival
Commercial Vehicle Administration Subsystem	CV Data Collection
	CV Information Exchange
	CV Safety Administration
Commercial Vehicle Check Subsystem	Citation and Accident Electronic Recording
	Roadside Electronic Screening
Commercial Vehicle Subsystem	On-board Cargo Monitoring
	On-board CV Electronic Data
	On-board Trip Monitoring
Emergency Management Subsystem	Emergency Call-Taking
	Emergency Data Collection
	Emergency Dispatch
	Emergency Environmental Monitoring
	Emergency Response Management
	Mayday Support
	Service Patrol Management
Emergency Vehicle Subsystem	On-board EV En Route Support
	On-board EV Incident Management Communication
Emissions Management Subsystem	Emissions Data Collection
	Emissions Data Management
Fleet and Freight Management Subsystem	Fleet Administration
	Fleet HAZMAT Management
	Freight Administration and Management
Information Service Provider Subsystem	Basic Information Broadcast
	Infrastructure Provided Route Selection
	Interactive Infrastructure Information
	ISP Data Collection
	ISP Probe Information Collection

Table 7 – El Paso Region Equipment Packages (continued)

Subsystem	Equipment Package
Maintenance and Construction Management Subsystem	MCM Data Collection
	MCM Environmental Information Processing
	MCM Incident Management
	MCM Maintenance Decision Support
	MCM Roadway Maintenance and Construction
	MCM Vehicle and Equipment Maintenance Management
	MCM Vehicle Tracking
	MCM Work Activity Coordination
	MCM Work Zone Management
	MCM Work Zone Safety Management
Maintenance and Construction Vehicle Subsystem	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
	Parking Electronic Payment
	Parking Management
	Parking Surveillance
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 Emissions Monitoring
	Roadway Equipment Coordination
	Roadway Freeway Control
	Roadway Incident Detection
	Roadway Infrastructure Monitoring
	Roadway Probe Beacons

Table 7 – El Paso Region Equipment Packages (continued)

Subsystem	Equipment Package
Roadway Subsystem (continued)	Roadway Signal Controls
	Roadway Traffic Information Dissemination
	Roadway Work Zone Safety
	Roadway Work Zone Traffic Control
	Standard Rail Crossing
Toll Administration Subsystem	Toll Administration
	Toll Data Collection
Toll Collection Subsystem	Toll Plaza Toll Collection
Traffic Management Subsystem	Collect Traffic Surveillance
	HRI Traffic Management
	Rail Operations Coordination
	TMC Environmental Monitoring
	TMC Freeway Management
	TMC Incident Detection
	TMC Incident Dispatch Coordination/Communication
	TMC Multimodal Coordination
	TMC Probe Information Collection
	TMC Regional Traffic Control
	TMC Signal Control
	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

Table 7 – El Paso Region Equipment Packages (continued)

Subsystem	Equipment Package
Transit Vehicle Subsystem	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
	Vehicle Location Determination
	Vehicle Mayday I/F
	Vehicle Probe Support
	Vehicle Provider-Based Route Guidance
	Vehicle Safety Monitoring System
	Vehicle Toll/Parking Interface

4.6 Standards

Standards are an important tool that will allow efficient implementation of the elements in the El Paso 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 8** identifies each of the ITS standards that could apply to the El Paso Regional ITS Architecture. These standards are based on the physical subsystem architecture flows previously identified in Section 4.4.4. The connection of each standard to the applicable architecture flows between elements can be viewed on the El Paso Regional ITS Architecture web site by clicking on the "Interfaces" or "Standards" buttons.

Table 8 – Applicable ITS Standards for the El Paso 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
ANSI	ANSI TS285	Commercial Vehicle Safety and Credentials Information Exchange	Message
	ANSI TS286	Commercial Vehicle Credentials	Message
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

Table 8 – Applicable ITS Standards for the El Paso Region (continued)

SDO	Document ID	Title	Type
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
	ITE TS 3.TM	TCIP – Traffic Management (TM) Business Area Standard	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

4.7 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 El Paso Regional ITS Architecture. The deployment of all of the systems required to archive the final Regional ITS Architecture build out will occur over many years.

Some of the key market packages that will provide the functions for the key foundation systems in the El Paso Region are listed below.

- Network Surveillance;
- Surface Street Control;
- Freeway Control;
- Traffic Information Dissemination;
- Work Zone Management;
- Maintenance and Construction Activity Coordination; and
- Railroad Grade Crossings and Operations Coordination.

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 El Paso 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 El Paso 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**.

With the integration, information sharing, and in some cases joint operations of systems, there will likely be a requirement for agency agreements. Descriptions of potential agreements that may be needed in the El Paso Region are included in Section 5.3.

5.1 Operational Scenarios

Scenario 1

The first operational scenario describes how ITS technologies may be used during a major freeway incident in the El Paso Region. In this operational scenario, freeways in the urban area of El Paso have been instrumented with CCTV cameras, detectors, and DMS. Connections between the City of El Paso, TransVista, DPS, counties, nearby TxDOT Districts, and other key agencies have been established. All of the field components are continuously monitored using an integrated network of detection and monitoring systems. This provides real-time information to the City of El Paso TMC and TransVista where the surveillance information is assimilated and "packaged" so it can be effectively used for operations applications and be disseminated to the public through the El Paso Region's traveler information system.

TransVista operators receive the alarm condition at a detection station and the CCTV automatically converges on the location to allow the operator to accept or reject the condition as an incident. Operators confirm a major crash on the freeway during rush hour. The TransVista staff initiates a pre-determined response. TransVista software automatically notifies DPS and the City of El Paso police and allows the City of El Paso fire department to view images from the CCTV cameras near the incident. Using the images, the fire department can determine the most appropriate equipment to dispatch and have an early indication of what they will encounter upon reaching the scene. This response also places messages about the incident on the DMS in the area and uses lane control signals to indicate which lanes are affected by the incident so drivers can react accordingly.

As the incident progresses, it becomes apparent that it will be several hours before the roadway is clear and all lanes are open to traffic. Congestion on roadways along the freeway has become an issue and the City of El Paso TMC implements alternate signal timing plans to alleviate some of this delay and keep rush hour traffic moving. In determining which alternate timing plans to implement, the City of El Paso uses TxDOT CCTV cameras as well as their own to observe the

altered traffic patterns in the area and uses detector information to estimate the demand volume that needs to be accommodated.

When rush hour is over, the incident still has one lane closed, but the traffic impact has lessened. TransVista, having access to the City of El Paso signal system controls after their normal operating hours, returns the signals to normal operation and updates the DMS and lane control signals. A TransVista operator remains at the center until the incident is clear and then removes the DMS messages and lane control closures.

Scenario 2

The second operational scenario describes how the integrated elements of the El Paso Region's ITS program will function together in the event of a localized evacuation due to a HAZMAT spill. In this operational scenario, some local arterials are instrumented with permanent DMS and major intersections in the City of El Paso have CCTV cameras for monitoring. These systems are controlled from the El Paso TMC, and TransVista also facilitates information sharing with motorists on the local freeways and has operational control of the City of El Paso systems when their TMC in not operational.

A motorist's cellular phone 911 call is received and the City of El Paso police dispatch is notified of a crash at a busy intersection by a motorist calling from a mobile phone. The dispatcher logs the incident details and dispatches an officer as well as notifies the City of El Paso TMC to find out if video coverage exists at that intersection. The City of El Paso TMC locates the incident on a camera and sharing the image with the police dispatcher they see that a HAZMAT vehicle is involved and that there is a potential spill. The officer is notified to proceed with caution while TMC operators read the license plate from the truck and determine the contents. A message is automatically routed to the City of El Paso Streets Department, TxDOT El Paso District Office, and the County EOC requesting HAZMAT crews to assist with incident clearance. The truck is carrying an extremely dangerous substance and since the extent of damage to the vehicle indicates that a leak is likely, emergency officials decide to evacuate the immediate area to limit exposure during the clean up process. Although the incident is not on the freeway, the TxDOT El Paso District Office makes a decision to close off-ramps within the portion of freeway in the vicinity of the HAZMAT spill as an added precaution.

Messages are immediately placed on DMS along the freeway to notify motorists of the closure. The City of El Paso crews close down streets in a one mile radius of the incident, and place portable DMS on approaches to divert motorists. Evacuation is encouraged while ingress is restricted. Local media are informed of the incident and closure, and they broadcast via radio and TV reports that several streets and a portion of I-10 will be closed for several hours. Residents in the area are advised to evacuate until further notice and extra transit buses are dispatched to the area to shuttle residents outside the contaminated area. TxDOT updates the El Paso Region web page, HAR and 511 traveler information phone number with the information. The center-to-center communications links allow for instantaneous dissemination of the same message to multiple agencies. With the regional integration and notification systems, the DPS alert also is sent to local emergency response and public safety, including the County EOC, local police, and area hospitals to alert them of the incident.

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 El Paso Region. During any operational scenario, 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 a scenario 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 El Paso Traffic Management Center
- City of El Paso Maintenance
- City Police
- County Road and Bridge
- Other Texas Department of Transportation Districts
- Texas Department of Public Safety
- TxDOT El Paso District Office (TransVista)

Public Transportation Management

- El Paso County Rural Transit
- Independent School Districts
- Sun Metro

Electronic Payment

- City of El Paso

Commercial Vehicle Operations

- Texas Department of Public Safety
- Texas Department of Transportation

Emergency Management

- City of El Paso (Police, Fire, Emergency Operations Center, Public Works)
- City/County Public Safety Agencies (Emergency Operations Center, Public Safety Dispatch)
- Regional Hospitals
- Texas Department of Public Safety
- Texas Department of Transportation (TransVista)

Advanced Vehicle Safety System

- Not Applicable

Information Management

- El Paso MPO
- City of El Paso
- Texas Department of Transportation

Maintenance and Construction Management

- City of El Paso Maintenance Department
- County Road and Bridge
- Texas Department of Transportation

5.3 El Paso Region Agreements

The Regional ITS Architecture for the El Paso 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 El Paso 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 a few formal agreements in place in the El Paso Region with regards to ITS. With the continued 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 additional 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 9 provides a list of potential agreements for the El Paso 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 9 – Potential Agreements for the El Paso Region

Agreement and Agencies	Status	Agreement Description	Considerations
Signal Agreements TxDOT and City of El Paso	Existing	TxDOT and the City of El Paso have an existing agreement whereby TxDOT reimburses the City for maintaining the traffic signals on state routes.	This agreement covers interchange signals only, and is only with the City of El Paso.
Data Sharing and Usage (Public) TxDOT El Paso 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. 'Data' also would include video images from CCTV cameras. 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 or City of El Paso TMC as central hub) ▪ 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 El Paso District/City of El Paso and Private Media/Information Service Providers	Existing	This agreement would define the parameters, guidelines and policies for private media use of regional ITS-related information from TxDOT El Paso and the City of El Paso. This type of agreement is recommended between TxDOT and/or City of El Paso (data providers) 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 9 – Potential Agreements for the El Paso Region (continued)

Agreement and Agencies	Status	Agreement Description	Considerations
Mutual Aid Agreements (Public) DPS, City of El Paso Police, City of El Paso Fire, EOCs, TxDOT	Existing	Mutual aid agreements currently exist as informal arrangements in the El Paso, 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, City of El Paso TMC, City of El Paso Police, City of El Paso Fire, DPS	Existing (TxDOT El Paso and City of El Paso for fiber sharing)	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.

6. MAINTAINING THE REGIONAL ITS ARCHITECTURE

With the substantial amount of effort invested by stakeholders in the El Paso Region to develop the Regional ITS Architecture, developing a plan for maintaining this important tool was a key component of the process.

New market packages are added to the National ITS Architecture every few years, and with the increasing emphasis on homeland security issues, it is envisioned that there will be additional market packages focused on addressing homeland security and emergency management. New federal initiatives, such as Amber Alert and 511, could also generate a new or updated category of market packages within the National ITS Architecture. El Paso stakeholders agreed that it would be beneficial to review any modifications to the National ITS Architecture as well as any USDOT/FHWA guidance on an as-needed basis, and identify any additions or modifications that should be considered for the El Paso Regional ITS Architecture.

At the final project meeting held in El Paso in April 2003, stakeholders agreed that the Regional ITS Architecture would need to be periodically reviewed and potentially updated in order to reflect current deployment status as well as re-evaluate priorities. A two-year timeframe was selected by the stakeholders for this update to correspond with the El Paso MPO's Transportation Improvement Plan update. The El Paso MPO was identified as the agency that should take the lead in maintaining and updating the Region's ITS Architecture, with support from a multijurisidictional committee in the Region.

The El Paso Regional ITS Architecture was developed with a consensus approach from the stakeholders. In order for this document to continue to reflect the needs of the Region, changes will need to be driven by consensus of all of the stakeholders.