State of Texas
Regional ITS Architectures and Deployment Plans

Paris Region

Regional ITS Architecture Report

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LIST OF ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
ASTM	American Society for Testing and Materials
ATCOG	Ark-Tex Council of Governments
ATIS	Advanced Travel Information System
ATMS	Advanced Traffic Management System
BRINSAP	Bridge Inventory Inspection System
CAD	Computer Aided Dispatch
CC	Control Center
CCTV	Closed-Circuit Television
CPT	Common Public Transportation
CV	Commercial Vehicle
DART	Dallas Area Rapid Transit
DMS	Dynamic Message Sign
DPS	Department of Public Safety
EMS	Emergency Medical Services
EOC	Emergency Operations Center
ETMCC	External TMC Communication
EV	Emergency Vehicle
FC	Fare Collection
FHWA	Federal Highway Administration
HAR	Highway Advisory Radio
HAZMAT	Hazardous Materials
HCRS	Highway Condition Reporting System
HRI	Highway-Rail Intersections
I/F	Interface
IEEE	Institute of Electrical and Electronics Engineers
IM	Incident Management
ISP	Information Service Provider
ITE	Institute of Transportation Engineers

LIST OF ACRONYMS

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
NEMA	National Electrical Manufacturers Association
NOAA	National Oceanic and Atmospheric Administration
NTCIP	National Transportation Communications for ITS Protocol
OB	On-board
ODOT	Oklahoma Department of Transportation
PI	Passenger Information
PSAP	Public Safety Answering Point
PTMS	Public Transportation Management System
PWD	Public Works Department
RTD	Rural Transit District
RWIS	Road Weather Information System
SAE	Society of Automotive Engineers
SDO	Standards Development Organization
SP	Spatial Representation
TAPS	Texoma Area Paratransit System
TCEQ	Texas Commission on Environmental Quality
TCIP	Transit Communication Interface Protocol
TDCJ-ID	Texas Department of Criminal Justice – Institutional Division
TEA-21	Transportation Equity Act for the 21st Century
TM	Traffic Management
TMC	Traffic Management Center
TMDD	Traffic Management Data Directory
TOC	Traffic Operations Center

LIST OF ACRONYMS

TxDOT	Texas Department of Transportation
USDOT	United States Department of Transportation
USGS	United States Geological Survey
VIVDS	Video Image Vehicle Detection Systems
WIM	Weigh-in-Motion

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 Paris Region was the eighteenth in the series of Regional ITS Architectures to be prepared as part of this initiative.

The Paris Region is located in northeast Texas. The Region is bordered by Oklahoma to the north, the TxDOT Atlanta District to the east, the TxDOT Tyler District to the south, the TxDOT Dallas District to the southwest, and the TxDOT Wichita Falls District to the west.

The Architecture for the Paris Region followed a comprehensive process focused on stakeholder outreach and education, identifying market packages and interfaces tailored to the needs of the Paris 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 Paris 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, emergency management, and area transit agencies. These stakeholders provided input and review at key steps in the architecture development process, including a project kick-off meeting, architecture development and review workshops, and final review of the architecture documentation.

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

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

An interconnect, or "Sausage Diagram" was developed for the Paris 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 Paris 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 Paris 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 Paris Region also were identified as part of the architecture development process.

An Operational Concept for the Paris 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 Paris Region. Potential agreements that could be required for maintenance and operations, data sharing (among agencies and with the private sector), or joint operations are listed.

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

1. INTRODUCTION

1.1 Project Overview

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

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

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

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

1.2 Document Overview

The Paris Regional ITS Architecture report is organized into five key sections:

Section 1 – Introduction

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

Section 2 – Integration Strategy

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

Section 3 – Regional ITS Architecture Development Process

An overview of the key steps involved in developing the ITS architecture for the Paris 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 Paris Regional ITS Architecture. The inventory of existing and planned systems is presented in Section 4, and is sorted by stakeholder as well as by entity for easy reference. The market packages that were selected for the Paris Region are also included in this section, as are the system functional requirements. The Paris 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 Paris 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 Paris Region. As part of this concept, operational scenarios are described and roles and responsibilities of stakeholders are discussed. Potential public-public and public-private agreements also have been identified.

The Paris Regional ITS Architecture also contains two appendices:

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

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

1.3 The Paris Region

1.3.1 Geographic Overview

The Paris Region is bordered by Oklahoma to the north, the TxDOT Atlanta District to the east, the TxDOT Tyler District to the south, the TxDOT Dallas District to the southwest, and the TxDOT Wichita Falls District to the west. For the Paris Regional ITS Architecture and Deployment Plan, the study area included all nine counties that comprise the TxDOT Paris District. The geographic boundaries of the Paris Region are highlighted in **Figure 1**.

The counties included in the Paris Region area are:

- Delta;
- Fannin;
- Franklin;
- Grayson;
- Hopkins;
- Hunt;
- Lamar;
- Rains; and
- Red River.

TxDOT partners with local governments for roadway construction, maintenance, and traffic operations support, and serves as the responsible agency for on-system roadways in cities with populations less than 50,000. All of the cities in the Paris Region have a population less than 50,000; however, the Sherman urban area has a population of approximately 56,000 and therefore the Sherman-Denison Metropolitan Planning Organization (MPO) is responsible for transportation planning within the urban area.

1.3.2 Transportation Infrastructure

As illustrated in **Figure 1**, the Paris Region has an extensive transportation infrastructure. The primary roadway facilities include I-30, US-69, US-75, US-82, and US-271.

I-30 is an east-west divided interstate highways. Its' effective operation is critical to the movement of goods and people through the State of Texas and the United States. Blockages along I-30 can have serious implications on drive-time for commercial vehicles and motorists alike due to the lack of obvious alternate routes. Knowing the road and travel conditions within this transportation corridor and having the ability to disseminate this information to motorists are important elements for this project. For example, if I-30 has been closed due to a major incident or weather, and motorists are informed of the closure in advance, they can alter their travel plans with an alternate route or wait to begin their travels.
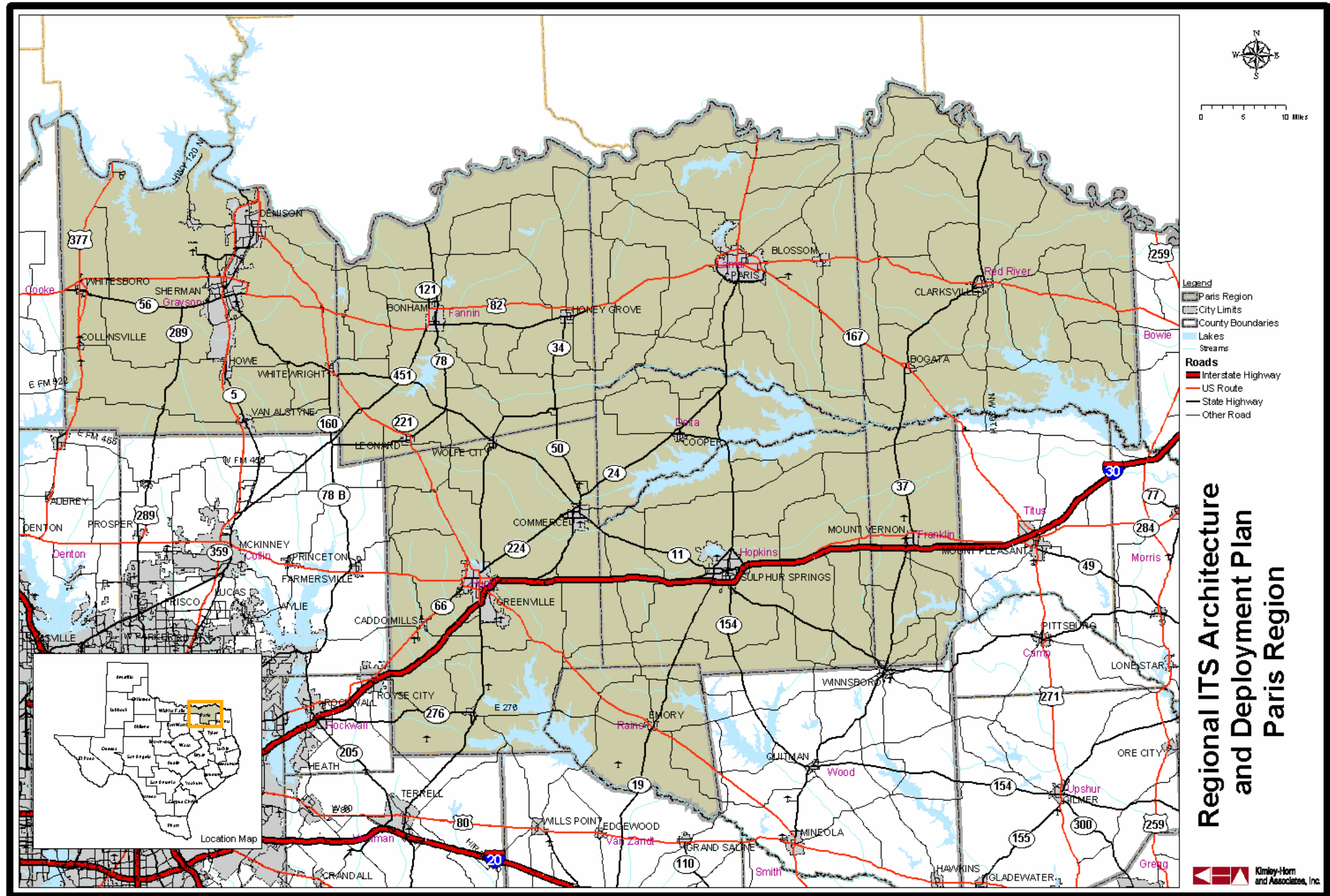
Figure 1 – Paris Region Map

1.3.3 Paris Region ITS Plans

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

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

Video Detection

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

Computer Aided Dispatch

Several municipalities and counties including the City of Paris Police Department, City of Sherman Police Department, and Grayson County Sheriff have CAD systems to enhance dispatch capabilities and allow dispatch records and any incident information entered by the dispatcher to be saved for future reference in a dispatch log.

1.3.4 Stakeholders

Stakeholder coordination and involvement is one of the key elements to the development of a Regional ITS Architecture and Deployment Plan. Because ITS often transcends traditional transportation infrastructure, it is important to involve non-traditional stakeholders in the architecture development and visioning process. Input from these stakeholders, both public and private, is a critical part of defining the interfaces, integration needs, and overall vision for ITS in the Paris Region.

The following is a list of stakeholders in the Paris 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 Paris Regional ITS Architecture.

- Ark-Tex Council of Governments (ATCOG);
- City of Bonham;
- City of Greenville;
- City of Paris;
- City of Sherman;

- Grayson County;
- Hopkins County;
- Hunt County Committee on Aging, Inc.;
- Rains County;
- Sherman-Denison MPO;
- Texoma Area Paratransit System, Inc.;
- Texoma Council of Governments;
- TxDOT Paris District; and
- TxDOT Traffic Operations Division (Austin).

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 Paris Region.

For each operating agency or stakeholder entity identified through the development of the Regional ITS Architecture, there are operations that currently exist as a normal practice in order to accomplish the primary business goals and objectives for each stakeholder. As an example, a primary operation of the City of Sherman Police Department dispatch is to dispatch emergency personnel to the appropriate locations when a call for help is placed within the city. The integration of the dispatch with any of the other stakeholders will not change this primary function of the dispatch or disrupt typical business practices. The integration of the Sherman 911 Public Safety Answering Point (PSAP) with another agency, such as the TxDOT Paris District or City of Sherman Traffic Operations Center (TOC), will require that the data that will be exchanged between the two entities (such as the blockage of a lane of traffic due to a crash) meet certain requirements for that particular data type. Identifying the need for this connection between agencies and the opportunities for integration and interoperability in the Region are key purposes of this section.

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

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

Table 1 – Paris Stakeholder Agencies and Contacts

Stakeholder Agency	Contact	Address	Phone Number	E-Mail
Ark-Tex Council of Governments	Lynda Pugh	122 Plaza West Texarkana, Texas 75501	(903) 832-8636	lwoods@atcog.org
City of Bonham	Blaine Hinds	301 E. 5th Street Bonham, Texas 75418	(903) 583-7555	city-manager@cobon.net
City of Greenville	Keith Hawkins	P.O. Box 1049 Greenville, Texas 75403	(903) 457-3116	N/A
City of Paris	Shawn Napier	150 SE 1st Paris, Texas 75460	(903) 784-9234	s_napier@ci.paris.tx.us
City of Paris 911 Communications	Bob Hundley	811 Bonham Street Paris, Texas 75460	(903) 784-6688	N/A

Table 1 – Paris Stakeholder Agencies and Contacts (continued)

Stakeholder Agency	Contact	Address	Phone Number	E-Mail
City of Paris EMS	Kent Klinkerman	150 SE 1st Paris, Texas 75460	(903) 784-9228	k_klinkerman@ci.paris.tx.us
City of Paris Police Department	William Hodge	811 Bonham Street Paris, Texas 75460	(903) 784-6688	w_hodge@ci.paris.tx.us
City of Paris Police Department	Karl Louis	811 Bonham Street Paris, Texas 75460	(903) 737-4100	k_louis@ci.paris.tx.us
City of Sherman	Jeff Miller	405 N Rusk Street Sherman, Texas 75090	(903) 892-7035	jeffm@ci.sherman.tx.us
City of Sherman	Bruce Simpson	800 S East Street Sherman, Texas	(903) 892-7254	N/A
Grayson County	Gene Short	100 W Houston Sherman, Texas 75090	(903) 813-4318	shortg@co.grayson.tx.us
Grayson County	Jerry White	100 W. Houston Sherman, Texas 75090	(903) 813-4247	jdwhite@co.grayson.tx.us
Grayson County Sheriff	Mark Hudson	200 S Crockett Sherman, Texas 75090	(903) 813-4010	hudsonm@co.grayson.tx.us
Hopkins County	Cletis Milsap	P.O. Box 288 Sulphur Springs, Texas 75483	(903) 438-4006	N/A
Hunt County Committee on Aging, Inc.	David Caldwell	3720 O'Neal Street Greenville, Texas 75401	(903) 454-1444	dcaldwell@huntrockwallseniorservices.org
Rains County	Gary Bishop	P.O. Box 158 Emory, Texas 75440	(903) 473-2565	N/A
Rains County	Joe Ray Doughtery	P.O. Box 158 Emory, Texas 75440	(903) 473-2565	N/A
Sherman-Denison MPO	Wally Johnson	1117 Gallagher, Suite 300 Sherman, Texas 75090	(903) 813-3531	wjohnson@sdmpo.org
Sherman-Denison MPO/ Texoma COG	Bob Wood	1117 Gallagher, Suite 300 Sherman, Texas 75090	(903) 813-3534	rwood@texoma.cog.tx.us rwood@sdmpo.org
Texoma Area Paratransit System, Inc.	Ven Hammonds	6104 Texoma Parkway Sherman, Texas 75090-2128	(903) 893-4601	tapsinc1@airmail.net
TxDOT Paris District	Tommie Cox	1365 N Main Street Paris, Texas 75460	(903) 737-9358	tcox@dot.state.tx.us
TxDOT Paris District	Richard Harper	3600 S.W. Loop 286 Paris, Texas 75460	(903) 784-1357	rharper@dot.state.tx.us
TxDOT Paris District	Steve Hodges	3600 S.W. Loop 286 Paris, Texas 75460	(903) 784-1357	shodges@dot.state.tx.us
TxDOT Paris District	Jerry Keisler	1365 N Main Street Paris, Texas 75460	(903) 737-9251	jkeisle@dot.state.tx.us
TxDOT Paris District	Bobby Littlefield	1365 Main Street Paris, Texas 75460	(903) 737-9206	blittle@dot.state.tx.us

Table 1 – Paris Stakeholder Agencies and Contacts (continued)

Stakeholder Agency	Contact	Address	Phone Number	E-Mail
TxDOT Paris District	Darius Samuels	1365 N Main Street Paris, Texas 75460	(903) 737-9498	dsamuel@dot.state.tx.us
TxDOT Paris District	Penny Sansom	1365 N Main Street Paris, Texas 75460	(903) 737-9373	psansom@dot.state.tx.us
TxDOT Paris District Greenville Area Office	R. Craig Miser	5900 Joe Ramsey Greenville, Texas 75402	(903) 455-2363	cmiser@dot.state.tx.us
TxDOT Paris District Sherman Area Office	Kevin Harris	3711 US 75 South Sherman, Texas 75091	(903) 892-6529	kharris@dot.state.tx.us
TxDOT Paris District Sherman Area Office	Noel Paramanant-ham	3711 US 75 South Sherman, Texas 75091	(903) 892-6529	nparama@dot.state.tx.us
TxDOT Traffic Operations Division	Alesia Gamboa	Attn: TRF-Cedar Park #51 125 East 11th Street Austin, Texas 78701-2483	(512) 506-5154	agamboa@dot.state.tx.us
TxDOT Traffic Operations Division	Fabian Kalapach	Attn: TRF-Cedar Park #51 125 East 11th Street Austin, Texas 78701-2483	(512) 506-5134	fkalapa@dot.state.tx.us

2.2 Regional Needs

Needs from the Region were identified in the project kick-off meeting held on May 18, 2004. Stakeholders participating in that meeting identified the needs in the Region according to the eight user service areas defined in the National ITS Architecture. The needs identified in the project kick-off meeting are documented in **Table 2**.

Table 2 – Paris Region: Summary of ITS Needs

Paris Region

Summary of ITS Needs
Paris Regional ITS Architecture and Deployment Plan Kick-Off Meeting
May 18, 2004

Travel and Traffic Management Needs

- Need dynamic message signs on I-30, US 75, US 82, US 271 and BUS 271
- Need additional closed loop signal systems
- Need improved communications for getting signal data back to the TxDOT Paris District signal shop
- Need CCTV in Sherman area (along US 75 and US 82)
- Need signal system coordination in the City of Sherman (Loy Lake is a priority corridor)

Electronic Payment Needs

None Identified

Commercial Vehicle Operations Needs

None Identified

Public Transportation Management Needs

- Need automated vehicle location
- Need mobile data terminals
- Need CAD upgrades

Emergency Management Needs

- Need automated vehicle location and mobile data terminals for City of Paris Police Department
- Need emergency vehicle signal preemption in the City of Paris
- Need connections from emergency management to TxDOT for data sharing
- Need weather information
- Need CCTV video image access

Advanced Vehicle Safety Systems Needs

None Identified

Information Management Needs (Data Archiving)

- Need electronic traffic data collection
- Need traffic count stations in the Sherman area

Maintenance and Construction Management Needs

- Need flood monitoring
- Need flood condition notification for drivers (i.e. flashers)
- Need portable DMS in the Sherman area
- Need pavement sensors in the Sherman area for monitoring roadway conditions
- Need weather stations
- Need ice detection on overpasses

2.3 Regional Integration and Interoperability

A vision for the Paris Region is to integrate systems both on an intra-regional and an inter-regional basis. Within the Paris Region, nearly every stakeholder identified is involved in emergency management. Incidents that occur on major roadways either in the Paris Region or on roadways that could impact the movement of people and goods in the Paris Region should be shared. The integration of the State Emergency Operations Center (EOC) and the local EOCs can facilitate the clearing of such an incident more efficiently. As an example, a chemical spill along US-75 between Sherman and Denison would require a major clean-up in addition to other emergency personnel on site. Coordination between the EOCs could identify the closest clean-up crew that could respond to the spill and dispatch them to the scene. Similarly, once on scene, the response team could provide the State EOC and the local EOCs with status reports on the clean-up and time estimates for a return to normal operations.

The Paris Region is bordered by four other TxDOT Districts. Improved coordination with these surrounding Districts for incident management and roadway closures is a very important need in the Paris Region.

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

Operators of the transportation system have many opportunities to improve performance through integration. TAPS and The Connection can improve performance and schedule adherence of their transit agencies by integrating closure information from operators of the transportation network.

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

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

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

3. REGIONAL ITS ARCHITECTURE DEVELOPMENT PROCESS

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

3.1 Paris Process

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

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

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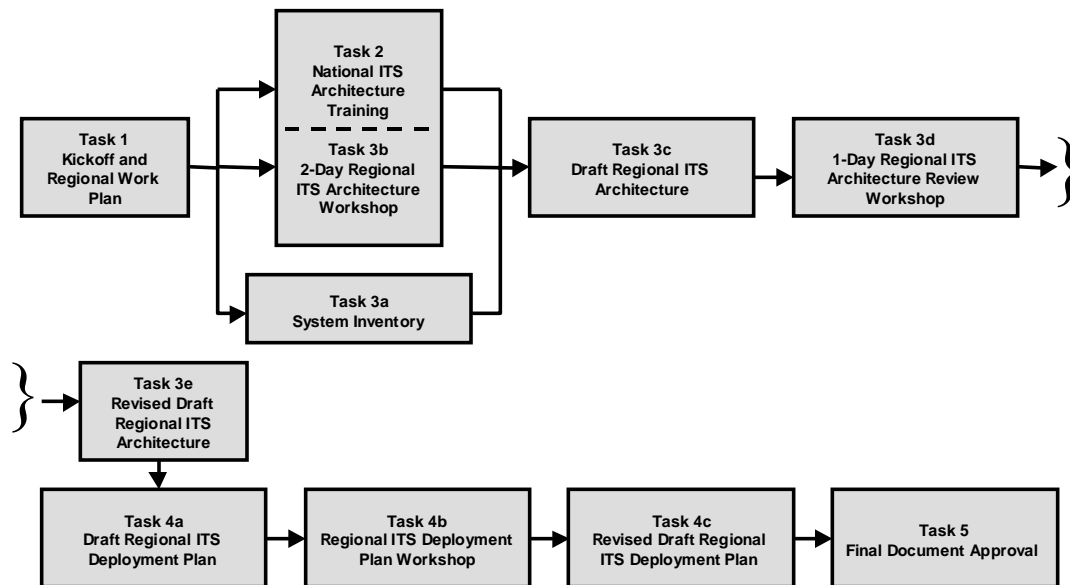
Figure 2 – Paris Regional ITS Architecture and Deployment Plan Development Process

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

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

Key components of the process are described below:

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

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

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

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

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

Task 3B – 2-Day Regional ITS Architecture Workshop: The purpose of the 2-Day Regional ITS Architecture Workshop was to review the inventory with stakeholders and begin the development of the Paris 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 Paris, 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 Paris Region was sent to stakeholders prior to the 1-Day Regional ITS Architecture Review Workshop.

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

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

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

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

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

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

3.2 USDOT Regional ITS Architecture Guidance

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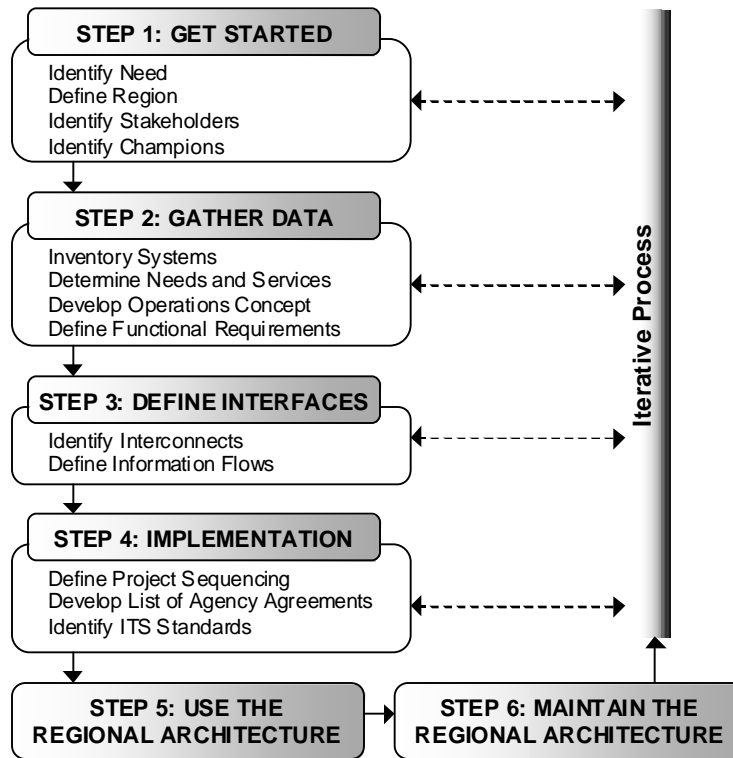
(Source: Regional ITS Architecture Guidance: Developing, Using, and Maintaining an ITS Architecture for Your Region, USDOT)

Figure 3 – USDOT Guidance on Regional ITS Architecture Development

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

Step 1, Get Started, of the guidance was completed in Task 1 – Kick-off and Regional Work Plan, as well as preliminary work completed by TxDOT to identify initial stakeholders and the need to complete the architecture for the Paris 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 Paris Region to be completed, identified ITS needs in the Region, and led to the development of an operational concept and definition of functional requirements.

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

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

4. CONCEPTUAL DESIGN

4.1 Systems Inventory

An important initial step in the architecture development process is to establish an inventory of existing ITS elements. At the project kick-off meeting and through subsequent discussions with agency representatives throughout the Region, Paris 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 Paris Region were identified in the following categories:

- *Travel and Traffic Management* – includes the TxDOT Paris Traffic Management Center (TMC), center-to-center links, detection systems, closed-circuit television (CCTV), fixed and portable dynamic message signs, broadcast traveler information, and other related technologies.
- *Public Transportation Management* – includes transit and paratransit automated vehicle location, and transit travel information systems.
- *Commercial Vehicle Operations* – includes coordination with TexView (CVISN) efforts.
- *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 maintenance and construction vehicle tracking, roadway maintenance and construction information, and work zone management.

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

4.1.1 Subsystems and Terminators

Each identified system or component in the Paris 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 Paris 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.
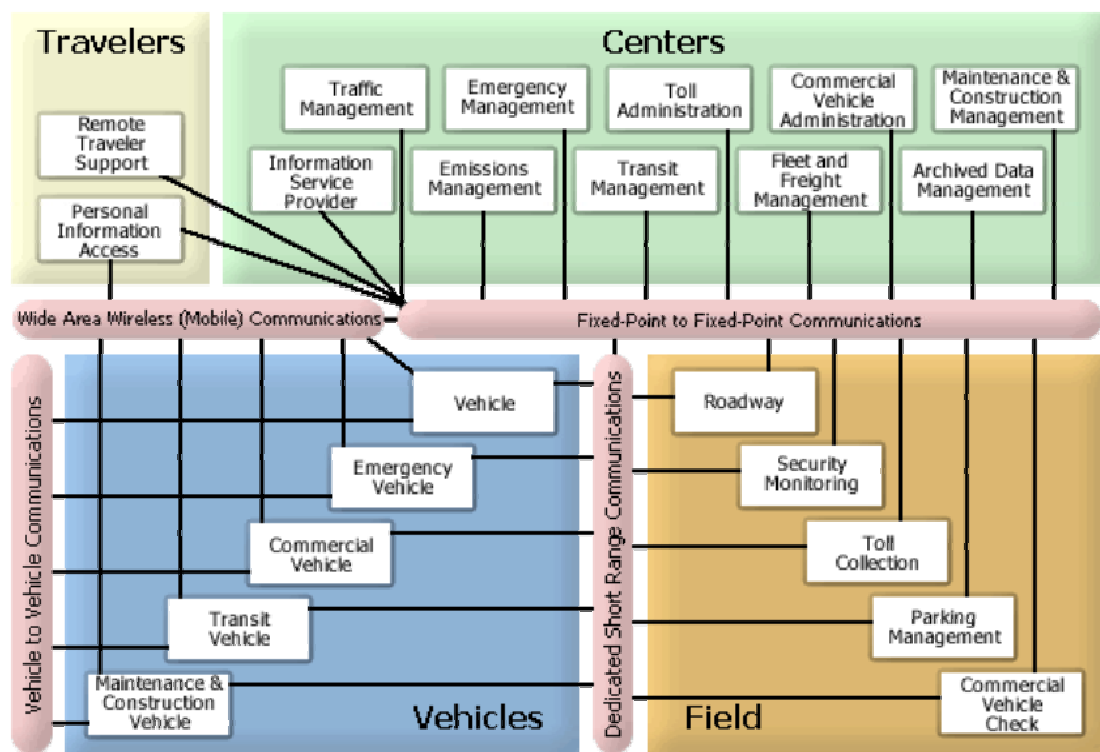
Figure 4 – Physical Subsystem Interconnect Diagram

4.1.2   Paris 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 Paris 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 Paris Regional ITS Architecture.

The information in **Table 3** also is included on the Paris ITS Architecture web site, which is accessible by selecting the link to the Texas Regional ITS Architecture, the Paris Region, and then selecting the "Inventory by Stakeholder" button which will open the stakeholder list. Each element in the list contains a hyperlink to more detailed information, including

status, description, stakeholder, and other elements within the inventory with which it interfaces. (At the time this report was published, the Paris 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   Paris ITS Inventory by Entity

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

Stakeholder	Element	Entity	Status
ATCOG	ATCOG-RTD Transit Dispatch	Transit Management Subsystem	Existing
	ATCOG-RTD Transit Vehicles	Transit Vehicle Subsystem	Existing
	ATCOG-RTD Website	Information Service Provider Subsystem	Future
Choctaw Watershed District	Choctaw Watershed District Water Level Sensors	Roadway Subsystem	Future
City of Sherman	City of Sherman Central Services Garage	Equipment Repair Facility	Existing
	City of Sherman EOC	Emergency Management Subsystem	Existing
	City of Sherman ITS Field Equipment	Roadway Subsystem	Existing
	City of Sherman Maintenance Vehicles	Maintenance and Construction Vehicle Subsystem	Existing
	City of Sherman Pavement Management System	Asset Management	Existing
	City of Sherman Website	Information Service Provider Subsystem	Existing
City of Sherman Public Safety Departments	City of Sherman Emergency Vehicles	Emergency Vehicle Subsystem	Existing
	City of Sherman Public Safety Dispatch	Emergency Management Subsystem	Existing
City of Sherman Street Department	City of Sherman Maintenance Division	Maintenance and Construction Management Subsystem	Existing
	City of Sherman Traffic Operations Center	Maintenance and Construction Management Subsystem	Existing
	City of Sherman Traffic Operations Center	Traffic Management Subsystem	Existing
Commercial Vehicle Operators	Commercial Vehicles	Commercial Vehicle Subsystem	Existing
	Commercial Vehicles	Vehicle Subsystem	Existing
	Private Fleet Management Systems	Fleet and Freight Management Subsystem	Future
County Emergency and Public Safety Agencies	County Emergency Vehicles	Emergency Vehicle Subsystem	Existing
	County EOC	Emergency Management Subsystem	Existing
	County Public Safety Dispatch	Emergency Management Subsystem	Existing
County Road and Bridge	County Road and Bridge	Maintenance and Construction Management Subsystem	Existing
	County Road and Bridge Equipment Repair	Equipment Repair Facility	Existing

Stakeholder	Element	Entity	Status
County Road and Bridge (continued)	County Road and Bridge Field Equipment	Roadway Subsystem	Future
	County Road and Bridge Vehicles	Maintenance and Construction Vehicle Subsystem	Existing
County Volunteer Fire Departments	County Volunteer Fire Departments Dispatch	Emergency Management Subsystem	Existing
Dallas Area Rapid Transit	DART Dispatch	Transit Management Subsystem	Existing
DPS	DPS Administration	Emergency Management Subsystem	Existing
	DPS Communications Service	Emergency Management Subsystem	Existing
	DPS Emergency Vehicles	Emergency Vehicle Subsystem	Existing
	DPS/District Disaster Committee EOC	Emergency Management Subsystem	Existing
	State EOC	Emergency Management Subsystem	Existing
	Statewide Crash Records Information System	Archived Data Management Subsystem	Existing
	Statewide Crash Records Information System Users	Archived Data User Systems	Existing
Financial Institution	Financial Institution	Financial Institution	Existing
Grayson County	Grayson County Sheriffs Office Communications	Emergency Management Subsystem	Existing
Hunt County Committee on Aging	The Connection Transit Dispatch	Transit Management Subsystem	Existing
	The Connection Vehicles	Transit Vehicle Subsystem	Existing
	The Connection Website	Information Service Provider Subsystem	Future
Independent School Districts	Independent School District Buses	Transit Vehicle Subsystem	Existing
	Independent School District Dispatch	Transit Management Subsystem	Existing
Local Media	Local Print and Broadcast Media	Media	Existing
Municipal Emergency and Public Safety Agencies	Municipal Emergency Vehicles	Emergency Vehicle Subsystem	Existing
	Municipal EOC	Emergency Management Subsystem	Existing
	Municipal Public Safety Dispatch	Emergency Management Subsystem	Existing
Municipal Government	Municipal TOCs	Traffic Management Subsystem	Future
	Municipal/County Websites	Information Service Provider Subsystem	Existing

Stakeholder	Element	Entity	Status
Municipal Public Works Department	Municipal ITS Field Equipment	Roadway Subsystem	Future
	Municipal PWD	Maintenance and Construction Management Subsystem	Existing
	Municipal PWD Garage	Equipment Repair Facility	Existing
	Municipal PWD Vehicles	Maintenance and Construction Vehicle Subsystem	Existing
NOAA	National Weather Service	Weather Service	Existing
Oklahoma Department of Public Safety	Oklahoma Highway Patrol Dispatch	Emergency Management Subsystem	Existing
Oklahoma DOT	ODOT TMC	Traffic Management Subsystem	Existing
	Oklahoma DOT Maintenance Sections	Maintenance and Construction Management Subsystem	Existing
Paris Region Reconciliation Network Owners	Paris Region Transit Reconciliation Network	Transit Management Subsystem	Future
Private Ambulance	Private Ambulance Dispatch	Emergency Management Subsystem	Existing
	Private Ambulance Vehicle	Emergency Vehicle Subsystem	Existing
Private HAZMAT Security Provider	Private HAZMAT Verifier	Emergency Management Subsystem	Future
Private Information Service Providers	Private Sector Traveler Information Services	Information Service Provider Subsystem	Future
Private Maintenance Contractors	Private Contractors Maintenance and Construction Vehicles	Maintenance and Construction Vehicle Subsystem	Existing
	Private Contractors Work Zone Equipment	Roadway Subsystem	Existing
	Private Contractors Work Zone TMC	Maintenance and Construction Management Subsystem	Existing
Private Taxi Providers	Private Taxi Provider Dispatch	Transit Management Subsystem	Existing
Private Tow/Wrecker Providers	Private Tow/Wrecker Dispatch	Emergency Management Subsystem	Existing
Private Travelers	Private Travelers Personal Computing Devices	Personal Information Access Subsystem	Future
	Vehicles	Vehicle Subsystem	Existing

Stakeholder	Element	Entity	Status
Rail Operators	Rail Operations Centers	Fleet and Freight Management Subsystem	Existing
	Rail Operations Centers	Rail Operations	Existing
	Rail Operators Rail Cars	Commercial Vehicle Subsystem	Existing
	Rail Operators Wayside Equipment	Wayside Equipment	Existing
Regional Emergency and Public Safety Agencies	Paris Region and Mutual Aid Network	Other EM	Future
Regional Medical Center	Regional Medical Centers	Care Facility	Existing
	Regional Medical Centers	Emergency Management Subsystem	Existing
Regional Mobility Authority	Regional Mobility Authority Reconciliation Network	Toll Collection Subsystem	Future
	Regional Mobility Authority Toll Plazas	Toll Collection Subsystem	Future
	Regional Mobility Authority Toll Road Customer Service Center	Toll Administration Subsystem	Future
	Toll Road Tag	Traveler Card	Future
Regions Chamber of Commerce	Municipal Chambers of Commerce	Event Promoters	Future
Sherman-Denison MPO	Sherman-Denison MPO Archive	Archived Data Management Subsystem	Planned
	Sherman-Denison MPO Archive Data User Systems	Archived Data User Systems	Future
State of Texas	Service Agencies	Information Service Provider Subsystem	Existing
Texarkana Urban Transit District	T Line Transit Dispatch	Transit Management Subsystem	Existing
Texas Commission on Environmental Quality	TCEQ Air Monitoring Devices	Roadway Subsystem	Existing
	TCEQ Monitoring Center	Emissions Management Subsystem	Existing
	TCEQ Website	Information Service Provider Subsystem	Existing
Texas Department of Criminal Justice Institutional Division	TDCJ-ID Regional Dispatch	Emergency Management Subsystem	Existing
Texoma Area Paratransit Systems	Paris Regional Smart Card	Traveler Card	Future
	TAPS Demand Response Vehicles	Transit Vehicle Subsystem	Existing
	TAPS Maintenance Facility Video Surveillance System	Security Monitoring Subsystem	Future

Stakeholder	Element	Entity	Status
Texoma Area Paratransit Systems (continued)	TAPS Transit Dispatch	Transit Management Subsystem	Existing
	TAPS Website	Information Service Provider Subsystem	Future
TxDOT	Other TxDOT District Area Engineers Office	Maintenance and Construction Management Subsystem	Existing
	Other TxDOT District Maintenance Sections	Maintenance and Construction Management Subsystem	Existing
	Other TxDOT District TMCs	Traffic Management Subsystem	Existing
	TxDOT 511 System	Information Service Provider Subsystem	Planned
	TxDOT BRINSAP	Asset Management	Existing
	TxDOT Dallas TMC (DalTrans)	Traffic Management Subsystem	Existing
	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 Paris District Anti-Icing Equipment	Roadway Subsystem	Future
	TxDOT Paris District Area Engineers Office	Maintenance and Construction Administrative Systems	Existing
	TxDOT Paris District Area Engineers Office	Maintenance and Construction Management Subsystem	Existing
	TxDOT Paris District CCTV	Roadway Subsystem	Future
	TxDOT Paris District DMS	Roadway Subsystem	Existing
	TxDOT Paris District Equipment Repair Garage	Equipment Repair Facility	Existing
	TxDOT Paris District Field Sensors	Roadway Subsystem	Existing
	TxDOT Paris District Flood Detection	Roadway Subsystem	Future
	TxDOT Paris District HAR	Roadway Subsystem	Future

Stakeholder	Element	Entity	Status
TxDOT (continued)	TxDOT Paris District Infrastructure Monitoring Equipment	Security Monitoring Subsystem	Future
	TxDOT Paris District Lane Use Control Signals	Roadway Subsystem	Future
	TxDOT Paris District Maintenance and Construction Vehicles	Maintenance and Construction Vehicle Subsystem	Existing
	TxDOT Paris District Maintenance Management Office	Maintenance and Construction Management Subsystem	Existing
	TxDOT Paris District Maintenance Sections	Maintenance and Construction Administrative Systems	Existing
	TxDOT Paris District Maintenance Sections	Maintenance and Construction Management Subsystem	Existing
	TxDOT Paris District Pavement Management System	Archived Data Management Subsystem	Existing
	TxDOT Paris District Pavement Management System	Asset Management	Existing
	TxDOT Paris District Pavement Management System Users	Archived Data User Systems	Existing
	TxDOT Paris District Public Information Office	Information Service Provider Subsystem	Existing
	TxDOT Paris District Public Transportation Management System (PTMS)	Archived Data Management Subsystem	Existing
	TxDOT Paris District Ramp Meters	Roadway Subsystem	Future
	TxDOT Paris District Roadway Asset Inventory	Asset Management	Future
	TxDOT Paris District RWIS Sensors	Roadway Subsystem	Future
	TxDOT Paris District TMC	Information Service Provider Subsystem	Existing
	TxDOT Paris District TMC	Traffic Management Subsystem	Existing
	TxDOT Paris District Traffic Signals	Roadway Subsystem	Existing
	TxDOT Paris District Transportation Planning and Development	Maintenance and Construction Management Subsystem	Existing
	TxDOT Paris District Website	Information Service Provider Subsystem	Existing
	TxDOT Paris District Weigh-In-Motion Station	Commercial Vehicle Check Subsystem	Future

Stakeholder	Element	Entity	Status
TxDOT (continued)	TxDOT Paris District Work Zone Equipment	Roadway Subsystem	Future
	TxDOT PTMS Archive Data Users Systems	Archived Data User Systems	Existing
	TxDOT Rest Areas/Visitor Centers/Service Plaza/Truck Stops Kiosks	Remote Traveler Support Subsystem	Future
	TxDOT Statewide Pavement Management System	Archived Data Management Subsystem	Existing
	TxDOT Transportation Planning and Programming Division	Traffic Management Subsystem	Existing
USGS	USGS Water Level Sensors	Roadway Subsystem	Future

Table 4 – Paris Inventory of Regional Subsystems/Terminators (sorted by Entity)

Entity	Element	Stakeholder	Status
Archived Data Management Subsystem	Sherman-Denison MPO Archive	Sherman-Denison MPO	Planned
	Statewide Crash Records Information System	DPS	Existing
	TxDOT Paris District Pavement Management System	TxDOT	Existing
	TxDOT Paris District Public Transportation Management System (PTMS)	TxDOT	Existing
	TxDOT Statewide Pavement Management System	TxDOT	Existing
Archived Data User Systems	Sherman-Denison MPO Archive Data User Systems	Sherman-Denison MPO	Future
	Statewide Crash Records Information System Users	DPS	Existing
	TxDOT Paris District Pavement Management System Users	TxDOT	Existing
	TxDOT PTMS Archive Data Users Systems	TxDOT	Existing
Asset Management	City of Sherman Pavement Management System	City of Sherman	Existing
	TxDOT BRINSAP	TxDOT	Existing
	TxDOT Paris District Pavement Management System	TxDOT	Existing
	TxDOT Paris District Roadway Asset Inventory	TxDOT	Future
Care Facility	Regional Medical Centers	Regional Medical Center	Existing
Commercial Vehicle Check Subsystem	TxDOT Paris District Weigh-In-Motion Station	TxDOT	Future
Commercial Vehicle Subsystem	Commercial Vehicles	Commercial Vehicle Operators	Existing
	Rail Operators Rail Cars	Rail Operators	Existing
Emergency Management Subsystem	City of Sherman EOC	City of Sherman	Existing
	City of Sherman Public Safety Dispatch	City of Sherman Public Safety Departments	Existing
	County EOC	County Emergency and Public Safety Agencies	Existing
	County Public Safety Dispatch	County Emergency and Public Safety Agencies	Existing
	County Volunteer Fire Departments Dispatch	County Volunteer Fire Departments	Existing

Entity	Element	Stakeholder	Status
Emergency Management Subsystem (continued)	DPS Administration	DPS	Existing
	DPS Communications Service	DPS	Existing
	DPS/District Disaster Committee EOC	DPS	Existing
	Grayson County Sheriffs Office Communications	Grayson County	Existing
	Municipal EOC	Municipal Emergency and Public Safety Agencies	Existing
	Municipal Public Safety Dispatch	Municipal Emergency and Public Safety Agencies	Existing
	Oklahoma Highway Patrol Dispatch	Oklahoma Department of Public Safety	Existing
	Private Ambulance Dispatch	Private Ambulance	Existing
	Private HAZMAT Verifier	Private HAZMAT Security Provider	Future
	Private Tow/Wrecker Dispatch	Private Tow/Wrecker Providers	Existing
	Regional Medical Centers	Regional Medical Center	Existing
	State EOC	DPS	Existing
	TDCJ-ID Regional Dispatch	Texas Department of Criminal Justice Institutional Division	Existing
Emergency Vehicle Subsystem	City of Sherman Emergency Vehicles	City of Sherman Public Safety Departments	Existing
	County Emergency Vehicles	County Emergency and Public Safety Agencies	Existing
	DPS Emergency Vehicles	DPS	Existing
	Municipal Emergency Vehicles	Municipal Emergency and Public Safety Agencies	Existing
	Private Ambulance Vehicle	Private Ambulance	Existing
Emissions Management Subsystem	TCEQ Monitoring Center	Texas Commission on Environmental Quality	Existing
Equipment Repair Facility	City of Sherman Central Services Garage	City of Sherman	Existing
	County Road and Bridge Equipment Repair	County Road and Bridge	Existing
	Municipal PWD Garage	Municipal Public Works Department	Existing

Entity	Element	Stakeholder	Status
Equipment Repair Facility (continued)	TxDOT Paris District Equipment Repair Garage	TxDOT	Existing
Event Promoters	Municipal Chambers of Commerce	Regions Chamber of Commerce	Future
Financial Institution	Financial Institution	Financial Institution	Existing
Fleet and Freight Management Subsystem	Private Fleet Management Systems	Commercial Vehicle Operators	Future
	Rail Operations Centers	Rail Operators	Existing
Information Service Provider Subsystem	ATCOG-RTD Website	ATCOG	Future
	City of Sherman Website	City of Sherman	Existing
	Municipal/County Websites	Municipal Government	Existing
	Private Sector Traveler Information Services	Private Information Service Providers	Future
	Service Agencies	State of Texas	Existing
	TAPS Website	Texoma Area Paratransit Systems	Future
	TCEQ Website	Texas Commission on Environmental Quality	Existing
	The Connection Website	Hunt County Committee on Aging	Future
	TxDOT 511 System	TxDOT	Planned
	TxDOT Highway Conditions Reporting System	TxDOT	Existing
	TxDOT Motor Carrier Routing Information	TxDOT	Existing
	TxDOT Paris District Public Information Office	TxDOT	Existing
	TxDOT Paris District TMC	TxDOT	Existing
	TxDOT Paris District Website	TxDOT	Existing
Maintenance and Construction Administrative Systems	TxDOT Paris District Area Engineers Office	TxDOT	Existing
	TxDOT Paris District Maintenance Sections	TxDOT	Existing
Maintenance and Construction Management Subsystem	City of Sherman Maintenance Division	City of Sherman Street Department	Existing
	City of Sherman Traffic Operations Center	City of Sherman Street Department	Existing
	County Road and Bridge	County Road and Bridge	Existing
	Municipal PWD	Municipal Public Works Department	Existing

Entity	Element	Stakeholder	Status
Maintenance and Construction Management Subsystem (continued)	Oklahoma DOT Maintenance Sections	Oklahoma DOT	Existing
	Other TxDOT District Area Engineers Office	TxDOT	Existing
	Other TxDOT District Maintenance Sections	TxDOT	Existing
	Private Contractors Work Zone TMC	Private Maintenance Contractors	Existing
	TxDOT Highway Conditions Reporting System	TxDOT	Existing
	TxDOT Paris District Area Engineers Office	TxDOT	Existing
	TxDOT Paris District Maintenance Management Office	TxDOT	Existing
	TxDOT Paris District Maintenance Sections	TxDOT	Existing
	TxDOT Paris District Transportation Planning and Development	TxDOT	Existing
Maintenance and Construction Vehicle Subsystem	City of Sherman Maintenance Vehicles	City of Sherman	Existing
	County Road and Bridge Vehicles	County Road and Bridge	Existing
	Municipal PWD Vehicles	Municipal Public Works Department	Existing
	Private Contractors Maintenance and Construction Vehicles	Private Maintenance Contractors	Existing
	TxDOT Paris District Maintenance and Construction Vehicles	TxDOT	Existing
Media	Local Print and Broadcast Media	Local Media	Existing
Other EM	Paris Region and Mutual Aid Network	Regional Emergency and Public Safety Agencies	Future
Personal Information Access Subsystem	Private Travelers Personal Computing Devices	Private Travelers	Future
Rail Operations	Rail Operations Centers	Rail Operators	Existing
Remote Traveler Support Subsystem	TxDOT Rest Areas/Visitor Centers/Service Plaza/Truck Stops Kiosks	TxDOT	Future
Roadway Subsystem	Choctaw Watershed District Water Level Sensors	Choctaw Watershed District	Future
	City of Sherman ITS Field Equipment	City of Sherman	Existing
	County Road and Bridge Field Equipment	County Road and Bridge	Future

Entity	Element	Stakeholder	Status
Roadway Subsystem (continued)	Municipal ITS Field Equipment	Municipal Public Works Department	Future
	Private Contractors Work Zone Equipment	Private Maintenance Contractors	Existing
	TCEQ Air Monitoring Devices	Texas Commission on Environmental Quality	Existing
	TxDOT Paris District Anti-Icing Equipment	TxDOT	Future
	TxDOT Paris District CCTV	TxDOT	Future
	TxDOT Paris District DMS	TxDOT	Existing
	TxDOT Paris District Field Sensors	TxDOT	Existing
	TxDOT Paris District Flood Detection	TxDOT	Future
	TxDOT Paris District HAR	TxDOT	Future
	TxDOT Paris District Lane Use Control Signals	TxDOT	Future
	TxDOT Paris District Ramp Meters	TxDOT	Future
	TxDOT Paris District RWIS Sensors	TxDOT	Future
	TxDOT Paris District Traffic Signals	TxDOT	Existing
	TxDOT Paris District Work Zone Equipment	TxDOT	Future
	USGS Water Level Sensors	USGS	Future
Security Monitoring Subsystem	TAPS Maintenance Facility Video Surveillance System	Texoma Area Paratransit Systems	Future
	TxDOT Paris District Infrastructure Monitoring Equipment	TxDOT	Future
Toll Administration Subsystem	Regional Mobility Authority Toll Road Customer Service Center	Regional Mobility Authority	Future
Toll Collection Subsystem	Regional Mobility Authority Reconciliation Network	Regional Mobility Authority	Future
	Regional Mobility Authority Toll Plazas	Regional Mobility Authority	Future
Traffic Management Subsystem	City of Sherman Traffic Operations Center	City of Sherman Street Department	Existing
	Municipal TOCs	Municipal Government	Future
	ODOT TMC	Oklahoma DOT	Existing
	Other TxDOT District TMCs	TxDOT	Existing

Entity	Element	Stakeholder	Status
Traffic Management Subsystem (continued)	TxDOT Dallas TMC (DalTrans)	TxDOT	Existing
	TxDOT Fort Worth TMC (TransVision)	TxDOT	Existing
	TxDOT Paris District TMC	TxDOT	Existing
	TxDOT Transportation Planning and Programming Division	TxDOT	Existing
Transit Management Subsystem	ATCOG-RTD Transit Dispatch	ATCOG	Existing
	DART Dispatch	Dallas Area Rapid Transit	Existing
	Independent School District Dispatch	Independent School Districts	Existing
	Paris Region Transit Reconciliation Network	Paris Region Reconciliation Network Owners	Future
	Private Taxi Provider Dispatch	Private Taxi Providers	Existing
	T Line Transit Dispatch	Texarkana Urban Transit District	Existing
	TAPS Transit Dispatch	Texoma Area Paratransit Systems	Existing
	The Connection Transit Dispatch	Hunt County Committee on Aging	Existing
Transit Vehicle Subsystem	ATCOG-RTD Transit Vehicles	ATCOG	Existing
	Independent School District Buses	Independent School Districts	Existing
	TAPS Demand Response Vehicles	Texoma Area Paratransit Systems	Existing
	The Connection Vehicles	Hunt County Committee on Aging	Existing
Traveler Card	Paris Regional Smart Card	Texoma Area Paratransit Systems	Future
	Toll Road Tag	Regional Mobility Authority	Future
Vehicle Subsystem	Commercial Vehicles	Commercial Vehicle Operators	Existing
	Vehicles	Private Travelers	Existing
Wayside Equipment	Rail Operators Wayside Equipment	Rail Operators	Existing
Weather Service	National Weather Service	NOAA	Existing

4.2 Regional Market Packages

Upon completion of the system inventory, the next step in the development of the architecture was to identify the transportation services that are important to the Paris 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 85 market packages identified in the National ITS Architecture Version 5.0.

In the Paris 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 Paris Region selected for implementation in the Region are identified in **Table 5**, as well as the elements in the Region that serve a role in providing the market package service and the primary stakeholders responsible for implementing the market packages.

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

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

Table 5 – Paris 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 Sherman ITS Field Equipment	City of Sherman	Future
		City of Sherman Traffic Operations Center	Municipalities	Future
		City of Sherman Website	TxDOT Paris District	Existing
		Municipal ITS Field Equipment		
		Municipal TOCs		
		Municipal/County Websites		
		Private Sector Traveler Information Services		
		TxDOT 511 System		
		TxDOT Paris District CCTV		
		TxDOT Paris District Field Sensors		
		TxDOT Paris District TMC		
		TxDOT Paris District Website		

Table 5 – Paris Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
ATMS03	Surface Street Control	City of Sherman ITS Field Equipment	City of Sherman	Existing
		City of Sherman Traffic Operations Center	Municipalities	Future
		Municipal ITS Field Equipment	TxDOT Paris District	Existing
		Municipal TOCs		
		TxDOT Paris District Field Sensors		
		TxDOT Paris District TMC		
		TxDOT Paris District Traffic Signals		
ATMS04	Freeway Control	TxDOT Paris District CCTV	TxDOT Paris District	Future
		TxDOT Paris District Field Sensors		
		TxDOT Paris District Lane Use Control Signals		
		TxDOT Paris District Ramp Meters		
		TxDOT Paris District TMC		
ATMS06	Traffic Information Dissemination	ATCOG-RTD Transit Dispatch	City of Sherman	Future
		City of Sherman ITS Field Equipment	Municipalities	Future
		City of Sherman Maintenance Division	TxDOT Paris District	Future
		City of Sherman Public Safety Dispatch		
		City of Sherman Traffic Operations Center		
		City of Sherman Website		
		County Public Safety Dispatch		
		County Road and Bridge		
		DPS Communications Service		
		Grayson County Sheriffs Office Communications		
		Independent School District Dispatch		
		Local Print and Broadcast Media		
		Municipal ITS Field Equipment		
		Municipal PWD		
		Municipal Public Safety Dispatch		
		Municipal TOCs		
		Municipal/County Websites		
		Private Sector Traveler Information Services		
		TAPS Transit Dispatch		
		The Connection Transit Dispatch		
		TxDOT 511 System		
		TxDOT Paris District DMS		
		TxDOT Paris District HAR		
		TxDOT Paris District Maintenance Sections		
		TxDOT Paris District TMC		
		TxDOT Paris District Website		

Table 5 – Paris Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
ATMS07	Regional Traffic Control	City of Sherman Traffic Operations Center Municipal TOCs ODOT TMC Other TxDOT District TMCs TxDOT Dallas TMC (DalTrans) TxDOT Paris District TMC	TxDOT Paris District	Future
ATMS08	Traffic Incident Management System	Choctaw Watershed District Water Level Sensors City of Sherman Emergency Vehicles City of Sherman EOC City of Sherman ITS Field Equipment City of Sherman Maintenance Division City of Sherman Public Safety Dispatch City of Sherman Traffic Operations Center County Emergency Vehicles County EOC County Public Safety Dispatch County Road and Bridge County Volunteer Fire Departments Dispatch DPS Communications Service DPS Emergency Vehicles DPS/District Disaster Committee EOC Grayson County Sheriffs Office Communications Municipal Chambers of Commerce Municipal Emergency Vehicles Municipal ITS Field Equipment Municipal Public Safety Dispatch Municipal PWD Municipal TOCs ODOT TMC Oklahoma DOT Maintenance Sections Other TxDOT District Maintenance Sections Private Ambulance Dispatch Private Ambulance Vehicle Private Sector Traveler Information Services Rail Operations Centers TxDOT Highway Conditions Reporting System TxDOT Paris District Area Engineers Office	Transportation and Emergency Management Agencies	Future

Table 5 – Paris 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)	Traffic Incident Management System (continued)	TxDOT Paris District DMS TxDOT Paris District Flood Detection TxDOT Paris District HAR TxDOT Paris District Maintenance Sections TxDOT Paris District TMC TxDOT Paris District Website USGS Water Level Sensors		
ATMS10	Electronic Toll Collection	Commercial Vehicles Financial Institution Paris Regional Smart Card Private Fleet Management Systems Private Sector Traveler Information Services Regional Mobility Authority Reconciliation Network Regional Mobility Authority Toll Plazas Regional Mobility Authority Toll Road Customer Service Center Toll Road Tag Vehicles	Regional Mobility Authority	Future
ATMS11	Emissions Monitoring and Management	TCEQ Air Monitoring Devices TCEQ Monitoring Center TCEQ Website TxDOT Paris District TMC	TCEQ	Future
ATMS13	Standard Railroad Grade Crossing	City of Sherman ITS Field Equipment City of Sherman Traffic Operations Center Rail Operations Centers Rail Operators Wayside Equipment TxDOT Paris District TMC TxDOT Paris District Traffic Signals	City of Sherman TxDOT Paris District	Future Existing
ATMS15	Railroad Operations Coordination	City of Sherman Traffic Operations Center Rail Operations Centers TxDOT Paris District TMC	City of Sherman TxDOT Paris District	Future Future
EM01	Emergency Call-Taking and Dispatch	City of Sherman EOC City of Sherman Public Safety Dispatch County EOC County Public Safety Dispatch County Volunteer Fire Departments Dispatch DPS Communications Service	Emergency Management Agencies	Future

Table 5 – Paris Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
EM01 (continued)	Emergency Call-Taking and Dispatch (continued)	Grayson County Sheriffs Office Communications		
		Municipal Public Safety Dispatch		
		Oklahoma Highway Patrol Dispatch		
		Paris Region Incident and Mutual Aid Network		
		Private Ambulance Dispatch		
		Private Tow/Wrecker Dispatch		
		Regional Medical Centers		
		TDCJ-ID Regional Dispatch		
EM02	Emergency Routing	City of Sherman Emergency Vehicles	City of Sherman	Existing
		City of Sherman ITS Field Equipment	Counties	Existing
		City of Sherman Public Safety Dispatch	Municipalities	Existing
		City of Sherman Traffic Operations Center	Private Ambulance Provider	Future
		County Emergency Vehicles	TxDOT Paris District	Future
		County Public Safety Dispatch		
		Grayson County Sheriffs Office Communications		
		Municipal Emergency Vehicles		
		Municipal Public Safety Dispatch		
		Private Ambulance Dispatch		
		Private Ambulance Vehicle		
		Regional Medical Centers		
		TxDOT Paris District TMC		
		TxDOT Paris District Traffic Signals		
EM05	Transportation Infrastructure Protection	TxDOT Paris District Infrastructure Monitoring Equipment	TxDOT Paris District	Future
		TxDOT Paris District Maintenance Sections		
		TxDOT Paris District TMC		
EM06	Wide-Area Alert	ATCOG-RTD Transit Dispatch	Emergency Operations Centers	Future
		City of Sherman EOC		
		City of Sherman Maintenance Division		
		City of Sherman Public Safety Dispatch		
		City of Sherman Traffic Operations Center		
		City of Sherman Website		
		County EOC		
		County Public Safety Dispatch		
		County Road and Bridge		
		Grayson County Sheriffs Office Communications		
		DPS Communications Service		

Table 5 – Paris Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
EM06 (continued)	Wide-Area Alert (continued)	DPS/District Disaster Committee EOC Independent School District Dispatch Municipal/County Websites Municipal EOC Municipal Public Safety Dispatch Municipal PWD Municipal TOCs Private Sector Traveler Information Services State EOC TAPS Transit Dispatch The Connection Transit Dispatch TxDOT 511 System TxDOT Fort Worth TMC (TransVision) TxDOT Paris District Maintenance Sections TxDOT Paris District TMC TxDOT Paris District Website		
EM07	Early Warning System	ATCOG-RTD Transit Dispatch City of Sherman EOC City of Sherman Maintenance Division City of Sherman Public Safety Dispatch City of Sherman Traffic Operations Center County EOC County Public Safety Dispatch County Road and Bridge DPS Communications Service Grayson County Sheriffs Office Communications Independent School District Dispatch Municipal Public Safety Dispatch Municipal PWD Municipal TOCs TAPS Transit Dispatch The Connection Transit Dispatch TxDOT Paris District Maintenance Sections TxDOT Paris District TMC	Emergency Operations Centers	Future
EM08	Disaster Response and Recovery	ATCOG-RTD Transit Dispatch City of Sherman Maintenance Division City of Sherman Traffic Operations Center County EOC County Public Safety Dispatch	Emergency Operations Centers	Future

Table 5 – Paris Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
EM08 (continued)	Disaster Response and Recovery (continued)	County Road and Bridge DPS Communications Service DPS/District Disaster Committee EOC Grayson County Sheriffs Office Communications Independent School District Dispatch Municipal EOC Municipal Public Safety Dispatch Municipal PWD Municipal TOCs Private Taxi Provider Dispatch State EOC TAPS Transit Dispatch The Connection Transit Dispatch TxDOT Paris District Maintenance Sections TxDOT Paris District TMC		
EM09	Evacuation and Reentry Management	ATCOG-RTD Transit Dispatch City of Sherman EOC City of Sherman Maintenance Division City of Sherman Public Safety Dispatch City of Sherman Traffic Operations Center County EOC County Public Safety Dispatch County Road and Bridge DPS Communications Service Grayson County Sheriffs Office Communications Independent School District Dispatch Municipal Public Safety Dispatch Municipal PWD Municipal TOCs Private Taxi Provider Dispatch TAPS Transit Dispatch The Connection Transit Dispatch TxDOT Paris District Maintenance Sections TxDOT Paris District TMC	Emergency Operations Centers	Future
MC01	Maintenance and Construction Vehicle and Equipment Tracking	City of Sherman Maintenance Division City of Sherman Maintenance Vehicles County Road and Bridge County Road and Bridge Vehicles	City of Sherman	Future
			Counties	Future
			Municipalities	Future
			TxDOT Paris District	Future

Table 5 – Paris Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
MC01 (continued)	Maintenance and Construction Vehicle and Equipment Tracking (continued)	Municipal PWD Municipal PWD Vehicles TxDOT Paris District Maintenance and Construction Vehicles TxDOT Paris District Maintenance Sections		
MC02	Maintenance and Construction Vehicle Maintenance	City of Sherman Central Services Garage City of Sherman Maintenance Division City of Sherman Maintenance Vehicles County Road and Bridge County Road and Bridge Equipment Repair County Road and Bridge Vehicles Municipal PWD Municipal PWD Garage Municipal PWD Vehicles TxDOT Paris District Equipment Repair Garage TxDOT Paris District Maintenance and Construction Vehicles TxDOT Paris District Maintenance Sections	City of Sherman Counties Municipalities TxDOT Paris District	Future Future Future Future
MC03	Road Weather Data Collection	City of Sherman ITS Field Equipment City of Sherman Maintenance Division City of Sherman Traffic Operations Center TxDOT Paris District DMS TxDOT Paris District HAR TxDOT Paris District Maintenance Sections TxDOT Paris District RWIS Sensors TxDOT Paris District TMC	City of Sherman TxDOT Paris District	Future Future
MC04	Weather Information Processing and Distribution	ATCOG-RTD Transit Dispatch City of Sherman EOC City of Sherman Public Safety Dispatch City of Sherman Traffic Operations Center County EOC County Public Safety Dispatch County Volunteer Fire Departments Dispatch DPS Communications Service DPS/District Disaster Committee EOC Grayson County Sheriffs Office Communications Independent School District Dispatch Local Print and Broadcast Media	TxDOT Paris District National Weather Service	Future Future

Table 5 – Paris 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)	Municipal Public Safety Dispatch Municipal TOCs National Weather Service ODOT TMC Oklahoma Highway Patrol Dispatch Other TxDOT District TMCs Private Ambulance Dispatch Private Travelers Personal Computing Devices TAPS Transit Dispatch TDCJ-ID Regional Dispatch The Connection Transit Dispatch TxDOT Paris District Maintenance Sections TxDOT Paris District Public Information Office TxDOT Paris District TMC TxDOT Paris District Website		
MC05	Roadway Automated Treatment	TxDOT Paris District Anti-Icing Equipment	TxDOT Paris District	Future
		TxDOT Paris District Maintenance Sections		
MC06	Winter Maintenance	ATCOG-RTD Transit Dispatch	City of Sherman	Future
		City of Sherman Maintenance Division	Counties	Future
		City of Sherman Maintenance Vehicles	Municipalities	Future
		City of Sherman Public Safety Dispatch	TxDOT Paris District	Future
		City of Sherman Traffic Operations Center		
		City of Sherman Website		
		County EOC		
		County Public Safety Dispatch		
		County Road and Bridge		
		County Road and Bridge Vehicles		
		DPS Communications Service		
		Grayson County Sheriffs Office Communications		
		Independent School District Dispatch		
		Local Print and Broadcast Media		
		Municipal Public Safety Dispatch		
		Municipal PWD		
		Municipal PWD Vehicles		
		Municipal TOCs		
		National Weather Service		
		Other TxDOT District Maintenance Sections		

Table 5 – Paris Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
MC06 (continued)	Winter Maintenance (continued)	TAPS Transit Dispatch		
		The Connection Transit Dispatch		
		TxDOT Paris District Maintenance and Construction Vehicles		
		TxDOT Paris District Maintenance Sections		
		TxDOT Paris District TMC		
		TxDOT Paris District Website		
MC07	Roadway Maintenance and Construction	City of Sherman Maintenance Division	City of Sherman	Future
		City of Sherman Maintenance Vehicles	Counties	Future
		City of Sherman Pavement Management System	Municipalities	Future
		City of Sherman Traffic Operations Center	TxDOT Paris District	Future
		County Road and Bridge		
		County Road and Bridge Vehicles		
		Municipal PWD		
		Municipal PWD Vehicles		
		National Weather Service		
		TxDOT BRINSAP		
		TxDOT Paris District Area Engineers Office		
		TxDOT Paris District Maintenance and Construction Vehicles		
		TxDOT Paris District Maintenance Sections		
		TxDOT Paris District Pavement Management System		
		TxDOT Paris District Roadway Asset Inventory		
		TxDOT Paris District TMC		
MC08	Work Zone Management	ATCOG-RTD Transit Dispatch	City of Sherman	Future
		City of Sherman ITS Field Equipment	Municipalities	Future
		City of Sherman Maintenance Division	Private Contractors	Future
		City of Sherman Maintenance Vehicles	TxDOT Paris District	Future
		City of Sherman Public Safety Dispatch		
		City of Sherman Traffic Operations Center		
		County EOC		
		County Public Safety Dispatch		
		County Road and Bridge		
		DPS Communications Service		
		Grayson County Sheriffs Office Communications		
		Independent School District Dispatch		
		Municipal ITS Field Equipment		

Table 5 – Paris 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)	Municipal PWD Municipal PWD Vehicles Municipal TOCs Other TxDOT District Area Engineers Office Other TxDOT District Maintenance Sections Private Contractors Maintenance and Construction Vehicles Private Contractors Work Zone Equipment Private Contractors Work Zone TMC Private Tow/Wrecker Dispatch State EOC TAPS Transit Dispatch The Connection Transit Dispatch TxDOT Highway Conditions Reporting System TxDOT Paris District Area Engineers Office TxDOT Paris District Maintenance and Construction Vehicles TxDOT Paris District Maintenance Sections TxDOT Paris District Public Information Office TxDOT Paris District TMC TxDOT Paris District Website TxDOT Paris District Work Zone Equipment		
MC09	Work Zone Safety Monitoring	City of Sherman ITS Field Equipment City of Sherman Maintenance Division City of Sherman Maintenance Vehicles County Road and Bridge County Road and Bridge Field Equipment County Road and Bridge Vehicles Municipal ITS Field Equipment Municipal PWD Municipal PWD Vehicles Private Contractors Maintenance and Construction Vehicles Private Contractors Work Zone Equipment TxDOT Paris District Maintenance and Construction Vehicles TxDOT Paris District Maintenance Sections TxDOT Paris District Work Zone Equipment	City of Sherman Counties Municipalities TxDOT Paris District	Future Future Future Future

Table 5 – Paris Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
MC10	Maintenance and Construction Activity Coordination	ATCOG-RTD Transit Dispatch	City of Sherman	Future
		City of Sherman EOC	Counties	Future
		City of Sherman Maintenance Division	Municipalities	Future
		City of Sherman Public Safety Dispatch	TxDOT Paris District	Future
		City of Sherman Traffic Operations Center		
		County Public Safety Dispatch		
		County Road and Bridge		
		DPS Communications Service		
		Grayson County Sheriffs Office Communications		
		Independent School District Dispatch		
		Local Print and Broadcast Media		
		Municipal Public Safety Dispatch		
		Municipal PWD		
		Municipal TOCs		
		ODOT TMC		
		Oklahoma DOT Maintenance Sections		
		Other TxDOT District Area Engineers Office		
		Other TxDOT District Maintenance Sections		
		Other TxDOT District TMCs		
		Rail Operations Centers		
		TAPS Transit Dispatch		
		The Connection Transit Dispatch		
		TxDOT Highway Conditions Reporting System		
		TxDOT Paris District Area Engineers Office		
		TxDOT Paris District Maintenance Sections		
		TxDOT Paris District Public Information Office		
		TxDOT Paris District TMC		
		TxDOT Paris District Website		
APTS1	Transit Vehicle Tracking	ATCOG-RTD Transit Dispatch	ATCOG	Future
		ATCOG-RTD Transit Vehicles	Hunt County Committee on Aging	Future
		Independent School District Buses	Independent School Districts	Future
		Independent School District Dispatch	TAPS	Future
		TAPS Demand Response Vehicles		
		TAPS Transit Dispatch		
		The Connection Transit Dispatch		
		The Connection Vehicles		

Table 5 – Paris Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
APTS2	Transit Fixed-Route Operations	City of Sherman Traffic Operations Center County Road and Bridge Independent School District Buses Independent School District Dispatch Municipal PWD Municipal TOCs Private Sector Traveler Information Services The Connection Transit Dispatch The Connection Vehicles The Connection Website TxDOT Paris District Area Engineers Office TxDOT Paris District Maintenance Sections TxDOT Paris District TMC	Hunt County Committee on Aging	Future
			Independent School Districts	Future
APTS3	Demand Response Transit Operations	ATCOG-RTD Transit Dispatch ATCOG-RTD Transit Vehicles ATCOG-RTD Website City of Sherman Maintenance Division City of Sherman Traffic Operations Center County Road and Bridge Municipal PWD Municipal TOCs Private Sector Traveler Information Services TAPS Demand Response Vehicles TAPS Transit Dispatch TAPS Website The Connection Transit Dispatch The Connection Vehicles The Connection Website TxDOT 511 System TxDOT Paris District Area Engineers Office TxDOT Paris District Maintenance Management Office TxDOT Paris District TMC	ATCOG	Future
			Hunt County Committee on Aging	Future
			TAPS	Future
APTS4	Transit Passenger and Fare Management	ATCOG-RTD Transit Dispatch ATCOG-RTD Transit Vehicles Financial Institution Paris Region Transit Reconciliation Network Paris Regional Smart Card Service Agencies	ATCOG	Future
			Hunt County Committee on Aging	Future
			TAPS	Future

Table 5 – Paris Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
APTS4 (continued)	Transit Passenger and Fare Management (continued)	TAPS Demand Response Vehicles TAPS Transit Dispatch The Connection Transit Dispatch The Connection Vehicles		
APTS5	Transit Security	ATCOG-RTD Transit Dispatch ATCOG-RTD Transit Vehicles City of Sherman Public Safety Dispatch County Public Safety Dispatch DPS Communications Service Grayson County Sheriffs Office Communications Municipal Public Safety Dispatch TAPS Demand Response Vehicles TAPS Maintenance Facility Video Surveillance System TAPS Transit Dispatch The Connection Transit Dispatch The Connection Vehicles	ATCOG — Future Hunt County Committee on Aging — Future TAPS — Future	
APTS6	Transit Vehicle Maintenance	ATCOG-RTD Transit Dispatch ATCOG-RTD Transit Vehicles Independent School District Buses Independent School District Dispatch TAPS Demand Response Vehicles TAPS Transit Dispatch The Connection Transit Dispatch The Connection Vehicles	ATCOG — Future Independent School Districts — Future TAPS — Future The Connection — Future	
APTS7	Multi-modal Coordination	ATCOG-RTD Transit Dispatch DART Dispatch Private Taxi Provider Dispatch TAPS Transit Dispatch T Line Transit Dispatch The Connection Transit Dispatch	ATCOG — Future Hunt County Committee on Aging — Future TAPS — Future	
APTS8	Transit Traveler Information	ATCOG-RTD Transit Dispatch ATCOG-RTD Website Private Travelers Personal Computing Devices TAPS Transit Dispatch TAPS Website The Connection Transit Dispatch The Connection Website	ATCOG — Future Hunt County Committee on Aging — Future TAPS — Future	

Table 5 – Paris 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)	TxDOT Rest Areas/Visitor Centers/Service Plaza/Truck Stops Kiosks		
CVO06	Weigh-in-Motion	TxDOT Paris District Weigh-In-Motion Station	TxDOT Paris	Future
		Commercial Vehicles		
CVO10	HAZMAT Management	City of Sherman Public Safety Dispatch	Private Fleet Management	Future
		Commercial Vehicles	Rail Operations	Future
		County Public Safety Dispatch		
		DPS Communications Service		
		Grayson County Sheriffs Office Communications		
		Municipal Public Safety Dispatch		
		Private Fleet Management Systems		
		Private HAZMAT Verifier		
		Rail Operations Centers		
		Rail Operators Rail Cars		
ATIS1	Broadcast Traveler Information	City of Sherman Traffic Operations Center	TxDOT Paris District	Future
		Local Print and Broadcast Media		
		Municipal TOCs		
		Other TxDOT District Maintenance Sections		
		Private Travelers Personal Computing Devices		
		TxDOT 511 System		
		TxDOT Highway Conditions Reporting System		
		TxDOT Paris District Area Engineers Office		
		TxDOT Paris District Maintenance Sections		
		TxDOT Paris District Public Information Office		
		TxDOT Paris District TMC		
		TxDOT Paris District Website		
		TxDOT Rest Areas/Visitor Centers/Service Plaza/Truck Stops Kiosks		
ATIS2	Broadcast Traveler Information	Local Print and Broadcast Media	TxDOT	Future
		Private Travelers Personal Computing Devices		
		TxDOT 511 System		
		TxDOT Rest Areas/Visitor Centers/Service Plaza/Truck Stops Kiosks		
		Vehicles		

Table 5 – Paris Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
ATIS5	ISP Based Route Guidance	Private Fleet Management Systems	TxDOT Motor Carrier Division	Future
		TxDOT Motor Carrier Routing Information		
		TxDOT Paris District Maintenance Sections		
		TxDOT Paris District TMC		
		TxDOT Rest Areas/Visitor Centers/Service Plaza/Truck Stops Kiosks		
AD1	ITS Data Mart	ATCOG-RTD Transit Dispatch	DPS	Future
		City of Sherman Traffic Operations Center	Sherman-Denison MPO	Future
		DART Dispatch	TxDOT Paris District	Future
		DPS Administration		
		Municipal TOCs		
		Sherman-Denison MPO Archive Data User Systems		
		Sherman-Denison MPO Archive		
		Statewide Crash Records Information System		
		Statewide Crash Records Information System Users		
		TAPS Transit Dispatch		
		The Connection Transit Dispatch		
		TxDOT Paris District Pavement Management System Users		
		TxDOT Paris District Public Transportation Management System (PTMS)		
		TxDOT Paris District TMC		
		TxDOT Paris Transportation Planning and Development		
		TxDOT PTMS Archive Data Users Systems		
		TxDOT Statewide Pavement Management System		
		TxDOT Transportation Planning and Programming Division		
AD2	ITS Data Warehouse	Rail Operations Centers	Sherman-Denison MPO	Future
		Sherman-Denison MPO Archive Data User Systems		
		Sherman-Denison MPO Archive		

4.3 Interconnections

4.3.1 Top Level Regional System Interconnect Diagram

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

4.3.2 Customized Market Packages

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

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

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

Maintenance & Construction Management
- City of Sherman Maintenance Division
- City of Sherman Traffic Operations Center
- County Road and Bridge
- Municipal PWD
- Oklahoma DOT Maintenance Sections
- Other TxDOT District Area Engineers Office
- Other TxDOT District Maintenance Sections
- Private Contractors Work Zone TMC
- TxDOT Highway Conditions Reporting System
- TxDOT Paris District Area Engineers Office
- TxDOT Paris District Maintenance Management Office
- TxDOT Paris District Maintenance Sections
- TxDOT Paris District Transportation Planning and Development

Fleet and Freight Management Subsystem
- *Private Fleet Management Systems
- Rail Operations Center

Emissions Management Subsystem
- TCEQ Monitoring Center

Emergency Management Subsystem
- City of Sherman EOC
- City of Sherman Public Safety Dispatch
- County EOC
- County Public Safety Dispatch
- County Volunteer Fire Departments Dispatch
- DPS Administration
- DPS Communications Service
- DPS/District Disaster Committee EOC
- Grayson County Sheriffs Office Communications
- Municipal EOC
- Municipal Public Safety Dispatch
- Oklahoma Highway Patrol Dispatch
- Private Ambulance Dispatch
- *Private HAZMAT Verifier
- Private Tow/Wrecker Dispatch
- Regional Medical Centers
- State EOC
- TDCJ-ID Regional Dispatch

Information Service Provider Subsystem
- *ATCOG-TRAX Website
- City of Sherman Website
- Municipal/County Websites
- *Private Sector Traveler Information Services
- Service Agencies
- *TAPS Website
- TCEQ Website
- *The Connection Website
- *TxDOT 511 System
- TxDOT Highway Conditions Reporting System
- TxDOT Motor Carrier Routing Information
- TxDOT Paris District TMC
- TxDOT Paris District Website

Archived Data Management Subsystem
- *Sherman-Denison MPO Archive
- Statewide Crash Records Information System
- TxDOT Paris District Pavement Mgmt System
- TxDOT Paris District Public Transportation Management System (PTMS)
- TxDOT Statewide Pavement Mgmt System

Transit Management Subsystem
- ATCOG-RTD Transit Dispatch
- DART Dispatch
- Independent School District Dispatch
- *Paris Region Transit Reconciliation Network
- Private Taxi Provider Dispatch
- T Line Transit Dispatch
- TAPS Transit Dispatch
- The Connection Transit Dispatch

Traffic Management Subsystem
- City of Sherman Traffic Operations Center
- *Municipal TOCs
- ODOT TMC
- Other TxDOT District TMCs
- TxDOT Dallas TMC (DalTrans)
- TxDOT Fort Worth TMC (TransVision)
- TxDOT Paris District TMC
- TxDOT Transportation Planning and Programming Division

Toll Administration
- *Regional Mobility Authority Toll Road Customer Service Center

Archived Data User Systems
- *Sherman-Denison MPO Archive Data User Systems
- Statewide Crash Records Info. System Users
- TxDOT Paris Dist. Pavement Mgmt Sys. Users
- TxDOT PTMS Archive Data Users Systems

Asset Management
- City of Sherman Pavement Mgmt System
- TxDOT BRINSAP
- TxDOT Paris District Pavement Mgmt System
- *TxDOT Paris Dist. Roadway Asset Inventory

Care Facility
- Regional Medical Centers

Driver
- Driver

Equipment Repair Facility
- City of Sherman Central Services Garage
- County Road and Bridge Equipment Repair
- Municipal PWD Garage
- TxDOT Paris District Equipment Repair Garage

Event Promoters
- *Municipal Chambers of Commerce

Financial Institution
- Financial Institution

Maintenance & Construction Admin
- TxDOT Paris District Area Engineers Office
- TxDOT Paris District Maintenance Sections

Media
- Local Print and Broadcast Media

Other EM
- *Paris Region and Mutual Aid Network

Rail Operations
- Rail Operations Centers

Traveler Card
- *Paris Regional Smart Card
- *Toll Road Tag

Wayside Equipment
- Rail Operators Wayside Equipment

Weather Service
- National Weather Service

Commercial Vehicle Check
- *TxDOT Paris District Weigh-In-Motion Station

Security Monitoring
- *TAPS Maintenance Facility Video Surveillance System
- *TxDOT Paris District Infrastructure Monitoring Equipment

Toll Collection
- *Regional Mobility Authority Reconciliation Network
- *Regional Mobility Authority Toll Plazas

LEGEND

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

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

Personal Information Access Subsystem
- *Private Travelers Personal Computing Devices

Transit Vehicle Subsystem
- ATCOG-RTD Transit Vehicles
- Independent School District Buses
- TAPS Demand Response Vehicles
- The Connection Vehicles

Vehicle Subsystem
- Commercial Vehicles
- Vehicles

Commercial Vehicle Subsystem
- Rail Operators Rail Cars
- Commercial Vehicles

Maintenance and Const Vehicle Subsystem
- City of Sherman Maintenance Vehicles
- County Road and Bridge Vehicles
- Municipal PWD Vehicles
- Private Contractors Maintenance and Construction Vehicles
- TxDOT Paris District Maintenance and Construction Vehicles

Emergency Vehicle Subsystem
- City of Sherman Emergency Vehicles
- County Emergency Vehicles
- DPS Emergency Vehicles
- Municipal Emergency Vehicles
- Private Ambulance Vehicle

Roadway Subsystem
- *Choctaw Watershed Dist. Water Level Sensors
- City of Sherman ITS Field Equipment
- *County Road and Bridge Field Equipment
- *Municipal ITS Field Equipment
- Private Contractors Work Zone Equipment
- TCEQ Air Monitoring Devices
- *TxDOT Paris District Anti-Icing Equipment
- *TxDOT Paris District CCTV
- TxDOT Paris District DMS

Roadway Subsystem
- *TxDOT Paris District Field Sensors
- *TxDOT Paris District Flood Detection
- *TxDOT Paris District HAR
- *TxDOT Paris District Lane Use Control Signals
- *TxDOT Paris District Ramp Meters
- *TxDOT Paris District RWIS Sensors
- *TxDOT Paris District Traffic Signals
- *TxDOT Paris District Work Zone Equipment
- *USGS Water Level Sensors

Diagram elements:

Travelers: Remote Traveler Support, Personal Information Access

Centers: Emissions Management, Traffic Management, Emergency Management, Toll Administration, Commercial Vehicle Administration, Information Service Provider, Maintenance & Construction Management, Transit Management, Fleet and Freight Management, Archived Data Management

Wide Area Wireless (Mobile) Communications — Fixed-Point to Fixed-Point Communications

Vehicle to Vehicle Communications

Vehicles: Vehicle, Transit Vehicle, Commercial Vehicle, Emergency Vehicle, Maintenance & Construction Vehicle

Dedicated Short Range Communications

Field: Roadway, Toll Collection, Parking Management, Security Monitoring, Commercial Vehicle Check

Terminators

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

Last Updated: May 23, 2005

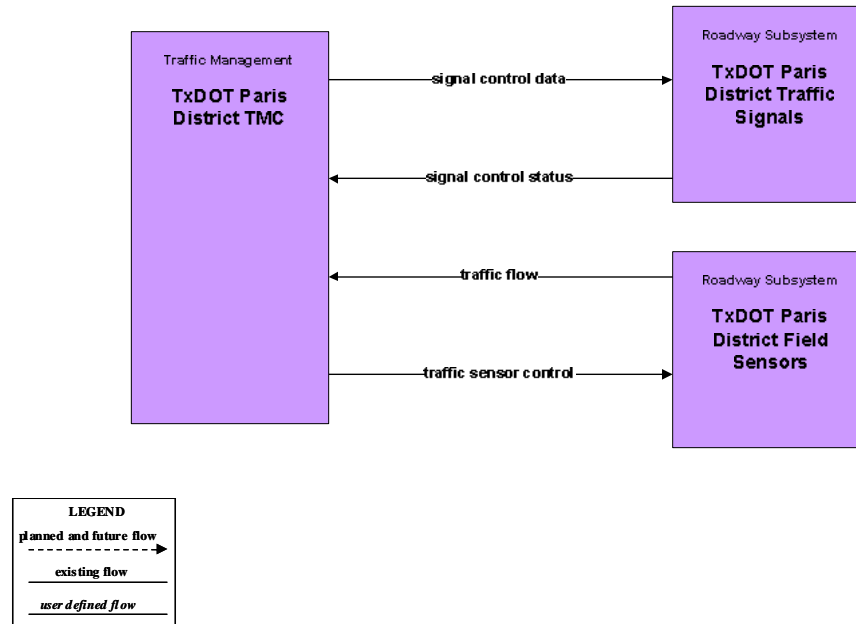**Figure 5 – Paris Regional System Interconnect Diagram**

Figure 6 – Custom Market Package for Surface Street Control

4.3.3 Paris Architecture Interfaces

While it is important to identify the various systems and stakeholders as part of a regional ITS, a primary purpose of the architecture is to identify the connectivity between transportation systems in the Paris Region. The interconnect diagram shown previously in **Figure 5** showed the high-level relationships of the subsystems and terminators in the Paris 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 128 different elements identified as part of the Paris 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 Paris Regional ITS Architecture, and each element has been mapped to those other elements with which it must interface. For example, the TxDOT Paris District TMC has existing or planned interfaces with 48 other elements in the Paris Region, ranging from field equipment and dispatch centers, to other TxDOT District TMCs. Other interfaces are far less complex, such as the interface between the DPS vehicles and the DPS Communications Dispatch.

An example of one of the system interfaces is shown in **Figure 7**. This graphic shows the TxDOT Paris 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.

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

4.3.4   Physical Subsystem Architecture Flows

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

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

Each of the individual element interfaces can be accessed on the Paris 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 Paris Region are discussed in more detail in Section 4.5.
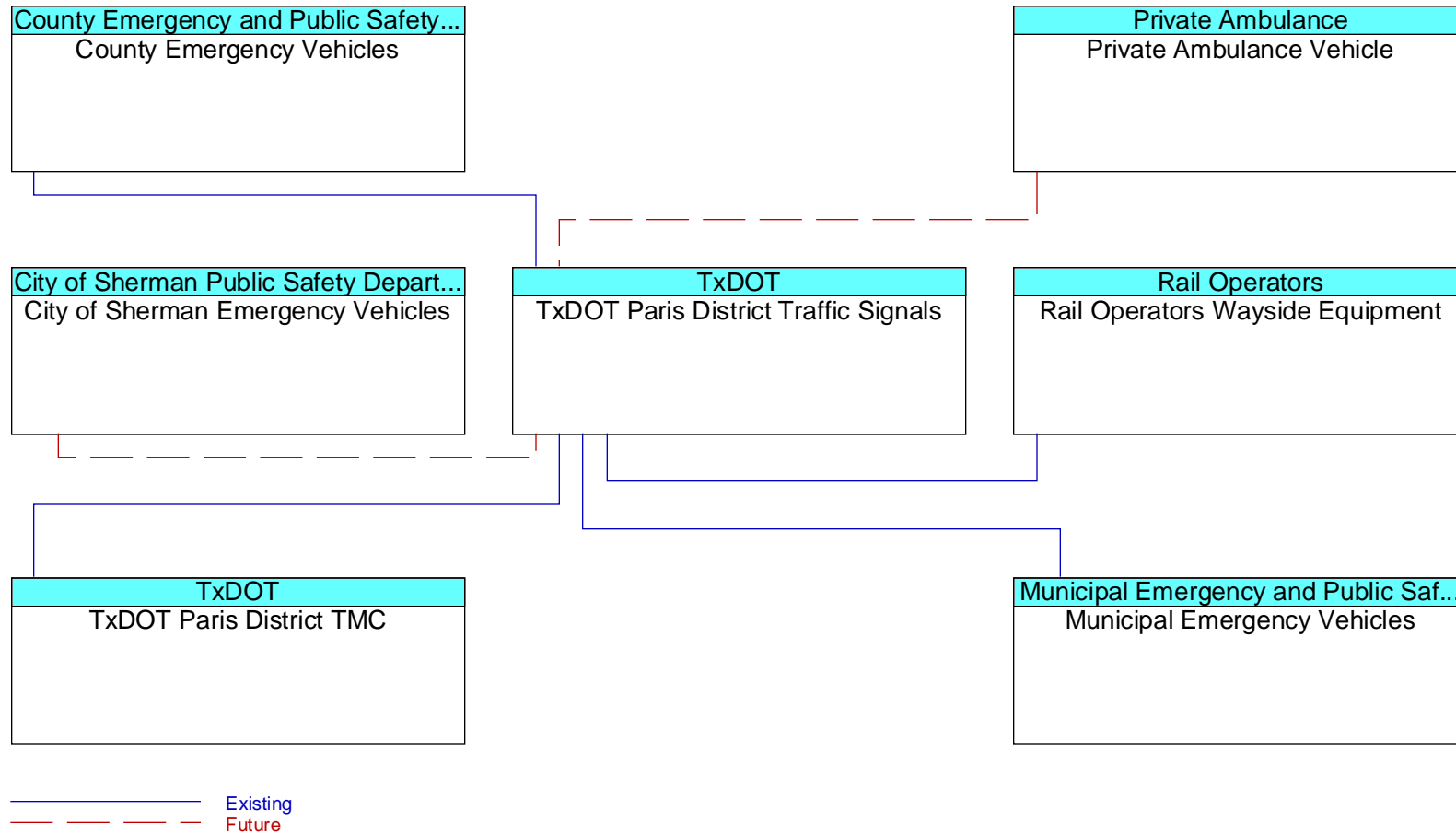
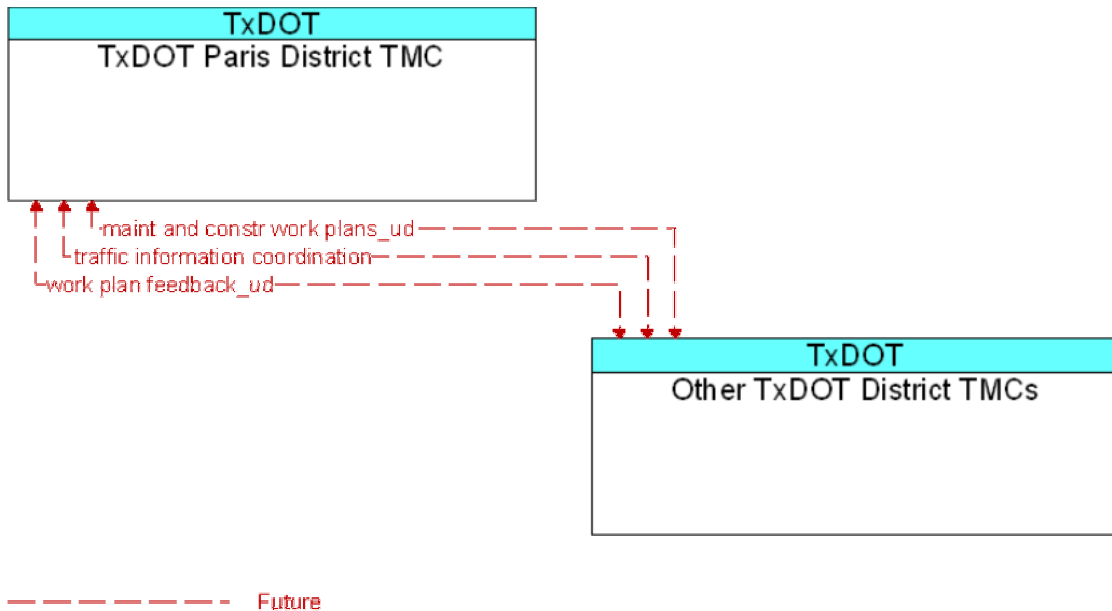**Figure 7 – TxDOT Paris District Traffic Signals Interfaces**

**Figure 8 – TxDOT Paris District TMC to Other TxDOT District TMCs
Architecture Flows**

4.4   Functional Requirements

Functions are a description of what the system has to do. In the National ITS Architecture, functions are defined at several different levels, ranging from general subsystem descriptions through somewhat more specific equipment package descriptions to Process Specifications that include substantial detail. Guidance from the USDOT on developing a Regional ITS Architecture recommends that each Region determine the level of detail of the functional requirements for their Region. In the Paris 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 Paris Regional ITS Architecture, functional requirements have been identified at two levels.   The customized market packages, discussed previously in Section 4.3.2, describe the services that ITS needs to provide in the Region and the architecture flows between the elements. These market packages and data flows describe what the ITS system in Paris has to do and the data that needs to be shared among elements.

At a more detailed level, functional requirements for the Paris Region also are described in terms of equipment packages that are associated with one or more subsystems in the Paris Regional ITS Architecture as shown in **Table 6**. An equipment package is a functional capability that could be deployed at a specific time. Each equipment package can be linked in the National ITS Architecture to the Process Specifications that might be applicable. It is recommended that during the design concept stage of a project, the applicable equipment package, and associated Process Specifications from the National ITS Architecture be reviewed by the implementer to determine the appropriate functional requirements for the project. A link for each equipment package is available on the Paris Regional ITS Architecture web site by clicking on the "Functions" button.

Table 6 – Paris 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
Commercial Vehicle Check Subsystem	Roadside WIM
Commercial Vehicle Subsystem	On-board Cargo Monitoring
	On-board CV Electronic Data
Emergency Management Subsystem	Emergency Call-Taking
	Emergency Data Collection
	Emergency Dispatch
	Emergency Environmental Monitoring
	Emergency Response Management
	Emergency Secure Area Surveillance
	Mayday Support
Emergency Vehicle Subsystem	On-board EV En Route Support
	On-board EV Environmental Monitoring
	On-board EV Incident Management Communication
Emissions Management Subsystem	Emissions Data Collection
	Emissions Data Management
Fleet and Freight Management Subsystem	Fleet Administration
	Fleet HAZMAT Management
Information Service Provider Subsystem	Basic Information Broadcast
	Infrastructure Provided Route Selection
	Interactive Infrastructure Information
	ISP Data Collection
	ISP Probe Information Collection
Maintenance and Construction Management Subsystem	MCM Automated Treatment System Control
	MCM Data Collection
	MCM Environmental Information 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 Winter Maintenance Management
	MCM Work Activity Coordination

Table 6 – Paris Region Equipment Packages (continued)

Subsystem	Equipment Package
Maintenance and Construction Management Subsystem (continued)	MCM Work Zone Management
	MCM Work Zone Safety Management
Maintenance and Construction Vehicle Subsystem	MCV Environmental Monitoring
	MCV Infrastructure Monitoring
	MCV Roadway Maintenance and Construction
	MCV Vehicle Location Tracking
	MCV Vehicle Safety Monitoring
	MCV Vehicle System Monitoring and Diagnostics
	MCV Winter Maintenance
	MCV Work Zone Support
Parking Management Subsystem	Parking Data Collection
Personal Information Access Subsystem	Personal Basic Information Reception
	Personal Interactive Information Reception
	Personal Location Determination
	Personal Provider-Based Route Guidance
Remote Traveler Support Subsystem	Remote Basic Information Reception
	Remote Interactive Information Reception
	Remote Mayday I/F
	Remote Transit Fare Management
	Remote Transit Information Services
	Secure Area Monitoring
Roadway Subsystem	Roadside Data Collection
	Roadside Signal Priority
	Roadway Automated Treatment
	Roadway Basic Surveillance
	Roadway Emissions Monitoring
	Roadway Environmental Monitoring
	Roadway Equipment Coordination
	Roadway Freeway Control
	Roadway Incident Detection
	Roadway Infrastructure Monitoring
	Roadway Probe Beacons
	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

Table 6 – Paris Region Equipment Packages (continued)

Subsystem	Equipment Package
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
Transit Vehicle Subsystem	On-board Environmental Monitoring
	On-board Fixed Route Schedule Management
	On-board Maintenance
	On-board Paratransit Operations
	On-board Transit Fare and Load Management
	On-board Transit Information Services
	On-board Transit Security
	On-board Transit Signal Priority
	On-board Transit Trip Monitoring

Table 6 – Paris Region Equipment Packages (continued)

Subsystem	Equipment Package
Vehicle Subsystem	Basic Vehicle Reception
	Interactive Vehicle Reception
	Smart Probe
	Vehicle Location Determination
	Vehicle Mayday I/F
	Vehicle Provider-Based Route Guidance
	Vehicle Safety Monitoring System
	Vehicle Toll/Parking Interface

4.5   Standards

Standards are an important tool that will allow efficient implementation of the elements in the Paris Regional ITS Architecture over time. Standards facilitate deployment of interoperable systems at local, regional, and national levels without impeding innovation as technology advances, vendors change, and as new approaches evolve. The USDOT's ITS Joint Program Office is supporting Standards Development Organizations (SDOs) with an extensive, multi-year program of accelerated, consensus-based standards development to facilitate successful ITS deployment in the United States. **Table 7** identifies each of the ITS standards that could apply to the Paris Regional ITS Architecture.   These standards are based on the physical subsystem architecture flows previously identified in Section 4.3.4.   The connection of each standard to the applicable architecture flows between elements can be viewed on the Paris Regional ITS Architecture web site by clicking on the "Interfaces" or "Standards" buttons.

Table 7 – Applicable ITS Standards for the Paris Region

SDO	Document ID	Title	Type
AASHTO/ITE/NEMA	NTCIP 1201	Global Object Definitions	Message/Data
	NTCIP 1202	Object Definitions for Actuated Traffic Signal Controller Units	Message/Data
	NTCIP 1203	Object Definitions for Dynamic Message Signs	Message/Data
	NTCIP 1204	Object Definitions for Environmental Sensor Stations and Roadside Weather Information System	Message/Data
	NTCIP 1205	Data Dictionary for Closed Circuit Television (CCTV)	Message/Data
	NTCIP 1207	Ramp Meter Controller Objects	Message/Data
	NTCIP 1208	Object Definitions for Video Switches	Message/Data
	NTCIP 1209	Transportation System Sensor Objects	Message/Data
	NTCIP 1210	Objects for Signal Systems Master	Message/Data
	NTCIP 1211	Objects for Signal Control Priority	Message/Data
	NTCIP 1401	TCIP – Common Public Transportation (CPT) Business Area Standard	Message/Data
	NTCIP 1402	TCIP – Incident Management (IM) Business Area Standard	Message/Data

Table 7 – Applicable ITS Standards for the Paris Region (continued)

SDO	Document ID	Title	Type
AASHTO/ITE/NEMA (continued)	NTCIP 1403	TCIP – Passenger Information (PI) Business Area Standard	Message/Data
	NTCIP 1404	TCIP – Scheduling/Runcutting (SCH) Business Area Standard	Message/Data
	NTCIP 1405	TCIP – Spatial Representation (SP) Business Area Standard	Message/Data
	NTCIP 1406	TCIP – Onboard (OB) Business Area Standard	Message/Data
	NTCIP 1407	TCIP – Control Center (CC) Business Area Standard	Message/Data
	NTCIP 1408	TCIP – Fare Collection (FC) Business Area Standard	Message/Data
	Various	NTCIP Center-to-Center Standards Group	Group
	Various	NTCIP Center-to-Field Standards Group	Group
ASTM	ASTM E2259-xx	Standard Specification for Archiving ITS Generated Traffic Monitoring Data	Message/Data
	Various	Dedicated Short Range Communication at 915 MHz Standards Group	Group
IEEE	IEEE 1570-2002	Standard for Interface Between the Rail Subsystem and the Highway Subsystem at a Highway Rail Intersection	Message/Data
	IEEE Std 1455-1999	Standard for Message Sets for Vehicle/Roadside Communications	Message/Data
	Various	Incident Management Standards Group	Group
ITE	ITE TM 1.03	Standard for Functional Level Traffic Management Data Dictionary (TMDD)	Message/Data
	ITE TM 2.01	Message Sets for External TMC Communication (MS/ETMCC)	Message/Data
SAE	Various	Advanced Traveler Information Systems (ATIS) General Use Standards Group	Group
	Various	Advanced Traveler Information Systems (ATIS) Bandwidth Limited Standards Group	Group
	Various	On-board Vehicle Mayday Standards Group	Group
SAE/IEEE	Various	Dedicated Short Range Communication at 5.9 GHz Standards Group	Group

4.6 Phases of Implementation

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

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

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

- Network Surveillance;
- Surface Street Control;
- Traffic Information Dissemination; and
- Transit Vehicle Tracking.

5. OPERATIONAL CONCEPT

The operational concept for the Paris Region provides a description of the stakeholders' roles and responsibilities in the operation of the systems that currently exist or that are being proposed. This operational concept provides an "executive summary" view of the way the Paris Region's systems will work together, and it documents the roles and responsibilities for each of the services that ITS 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 Paris 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 multi-vehicle crash on US 75 within the Sherman city limits. Motorists call 911 from cellular telephones and the City of Sherman Public Safety Dispatch is quickly informed of the crash. An alert is automatically sent from the City of Sherman Public Safety Dispatch to the TxDOT Paris District TMC. TxDOT activates dynamic message signs on US 75 and I-30 and monitors the situation with a CCTV camera that is near the crash. The City of Sherman Fire Department uses the video feed from TxDOT to determine the severity of the accident and the number and type of fire and rescue vehicles to dispatch.

Northbound US 75 is completely closed and the City of Sherman Police and Grayson County Sheriff's Department, in coordination with the TxDOT Paris District, begin setting up a closure and detour. The City of Sherman uses their closed-loop signal system to implement a modified timing plan from their TMC on alternate routes along the arterials to accommodate the large increases in traffic volume. The TxDOT Paris District does the same for their signals. The TxDOT Paris District TMC also contacts the TxDOT Dallas District TMC, so that motorists on US 75 approaching the area can be forewarned of the impending delay along northbound US 75 as a result of the accident.

TxDOT enters the closure on the Highway Condition Reporting System, which also feeds the statewide 511 traveler information number. Dynamic message signs continue to warn motorists that northbound US 75 is closed. The CCTV camera feed, which has been turned away from the crash to focus on the traffic condition on the freeway, is shared with the media which broadcasts the live shots of US 75 on the evening news to warn motorists that US 75 remains closed.

The Texoma Area Public Transit is sent a request for a transit vehicle to assist in transporting non-injured motorists. The automated vehicle locating system on the transit vehicles allows the dispatcher to identify the transit vehicles that are closest to the scene. The mobile data terminals

in the transit vehicles allow the dispatcher to quickly dispatch the appropriate transit vehicle to the scene.

Scenario 2

Road construction along US 271 just north of the City of Paris is expected to result in the long-term closure of one lane of traffic as well as the shoulders. The TxDOT Paris District TMC reports the closure to the City of Paris and local media. The TxDOT Paris District TMC implements detour timing plans on its closed-loop signal system and resets vehicle detectors using their video image vehicle detection system to account for changes in approaches to the signalized intersections. The TxDOT Paris District TMC posts messages on permanent and portable dynamic message signs along US 271 and SR 286 alerting motorists of the construction and potential detour routes.

The TxDOT Paris District TMC also sends a message to the Texas Department of Public Safety and the Lamar County Dispatch so that when emergency vehicles are dispatched the drivers are cognizant of the closures and can take the appropriate detours.

Once the construction is complete, the TxDOT Paris District TMC sends out a message to all affected agencies that all lanes are once again open. .

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 Paris 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 Sherman
- County Road and Bridge
- Grayson County Sheriff
- Texas Department of Transportation Paris District
- Other Texas Department of Transportation Districts
- Texas Department of Public Safety

Public Transportation Management

- ATCOG Rural Transit
- Independent School Districts
- TAPS
- The Connection

Electronic Payment

- ATCOG Rural Transit
- Service Providers
- TAPS
- The Connection

Commercial Vehicle Operations

- Texas Department of Public Safety
- Texas Department of Transportation

Emergency Management

- City of Sherman (Police, Fire, Traffic)
- County Public Safety (Sheriff's Office, Emergency Operations Center)
- Grayson County Sheriff
- Regional Hospitals
- Texas Department of Public Safety
- Texas Department of Transportation

Advanced Vehicle Safety System Needs

- Not Applicable

Information Management

- City of Sherman
- Department of Public Safety
- Sherman-Denison MPO
- Texas Department of Transportation

Maintenance and Construction Management

- City of Sherman
- County Road and Bridge
- Texas Department of Transportation

5.3 Paris Agreements

The Regional ITS Architecture for the Paris 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 Paris Region will require agreements among agencies that establish parameters for sharing agency information to support traffic management, incident management, provide traveler information, and other functions identified in the Regional ITS Architecture.

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

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

Table 8 – Potential Agreements for the Paris Region

Agreement and Agencies	Status	Agreement Description	Considerations
Data Sharing and Usage (Public) TxDOT Paris District and Public Agencies within the Region	Future	This agreement would define the parameters, guidelines, and policies for inter- and intra-agency ITS data sharing. This data sharing would support regional activities related to traffic management, incident management, and traveler information, and other functions. The terms of this agreement should generally address such items as: ▪ Types of data and information to be shared ▪ Repository for information (i.e., TxDOT Paris District 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.

Table 8 – Potential Agreements for the Paris Region (continued)

Agreement and Agencies	Status	Agreement Description	Considerations
Data Sharing and Usage (Public-Private) TxDOT Paris District and Private Media/Information Service Providers	Future	This agreement would define the parameters, guidelines, and policies for private media use of regional ITS-related information from TxDOT Paris. This type of agreement is recommended between TxDOT (data provider) and the media (data user) to define terms of use for broadcasting public-agency information regarding traffic conditions, closures, restrictions, as well as video images. Agreements can also include requirements for the media to 'source' the information (i.e., using the TxDOT logo on all video images broadcast).	These agreements can be zero-dollar agreements, although some agencies have stipulated identifying the information, public service announcements by the media, or other requirements as a term of use. The private media entity is typically responsible for paying any necessary costs for access (i.e., communications infrastructure to link to the TxDOT database or video switch). These agreements also typically include a sunset clause to allow the agency to periodically review the agreement and make any modifications prior to renewal.
Shared Video Monitoring (Public) TxDOT Paris District, City of Sherman, Counties, State EOC, DPS	Future	This agreement would enable shared video monitoring of TxDOT CCTV cameras by public safety and emergency services agencies in the Paris Region for incident management purposes. This agreement would define the parameters and policies for public safety agencies to access video images via the TxDOT video switch. It is recommended that the agreement include any TxDOT policies relating to video images (including archiving, privacy, disclaimers, use of video and redistribution) as well as processes for agency requests for specific views. Shared video monitoring does not address shared use or shared control of video equipment functions.	These agreements are typically zero-dollar agreements, in that there is no charge among agencies for the actual data, although there might be some cost incurred for infrastructure, systems or fiber to enable communications between agencies, particularly with the high bandwidth required for transmitting live video images.
Mutual Aid Agreements (Public) DPS, TxDOT Paris District, Sherman Police, Sherman Fire/EMS, Grayson County Sheriff, County Sheriffs, Rural Volunteer Fire	Existing	Mutual aid agreements currently exist as informal arrangements in many Regions around the state, 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.).

Table 8 – Potential Agreements for the Paris Region (continued)

Agreement and Agencies	Status	Agreement Description	Considerations
Joint Operations/Shared Control Agreements (Public) TxDOT Paris District, City of Sherman, DPS (potential)	Future	These agreements are formal arrangements to allow joint operations or control of certain systems and equipment. The agreement would need to define the terms of this arrangement, such as hours of operation and time of day/day 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.