State of Texas
ITS Architectures and Deployment Plans

Lufkin Region

Executive Summary

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PROJECT APPROACH

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) in January of 2001. This final rule requires that Intelligent Transportation System (ITS) projects funded through the Highway Trust Fund conform to the National ITS Architecture and applicable standards. The rule went in to effect on April 8, 2005. After that date, any region with existing ITS deployments must have an ITS architecture in order to receive federal funding for ITS projects.

To meet these requirements and ensure future federal funding eligibility for ITS, the Texas Department of Transportation (TxDOT) initiated the development of regional ITS architectures throughout the State of Texas. There are several metropolitan areas in the state that already have ITS architectures in place or under development. The focus of the State of Texas Regional ITS Architectures and Deployment Plans program is to develop architectures in those areas outside of the Austin, Houston, Dallas, Fort Worth, and San Antonio Regions. TxDOT expanded upon the ITS architecture requirements outlined in the FHWA Final Rule, and included an ITS deployment plan as part of the regional efforts. The regional ITS architecture provides a framework for ITS systems, services, integration, and interoperability, and the regional ITS deployment plan identifies specific projects and timeframes for ITS implementation to support the vision developed by stakeholders in the architecture.

TxDOT's process for developing the regional ITS architectures and deployment plans followed a consensus-based approach to meeting the requirements in the FHWA Final Rule and supporting guidelines. This process was further tailored to meet the specific multi-agency needs of these regional plans, and was structured around stakeholder input and involvement. The addition of an ITS deployment plan provides a tangible road map for regional ITS deployment and integration. **Figure 1** shows the development process for each of the State of Texas Regional ITS Architectures and Deployment Plans.
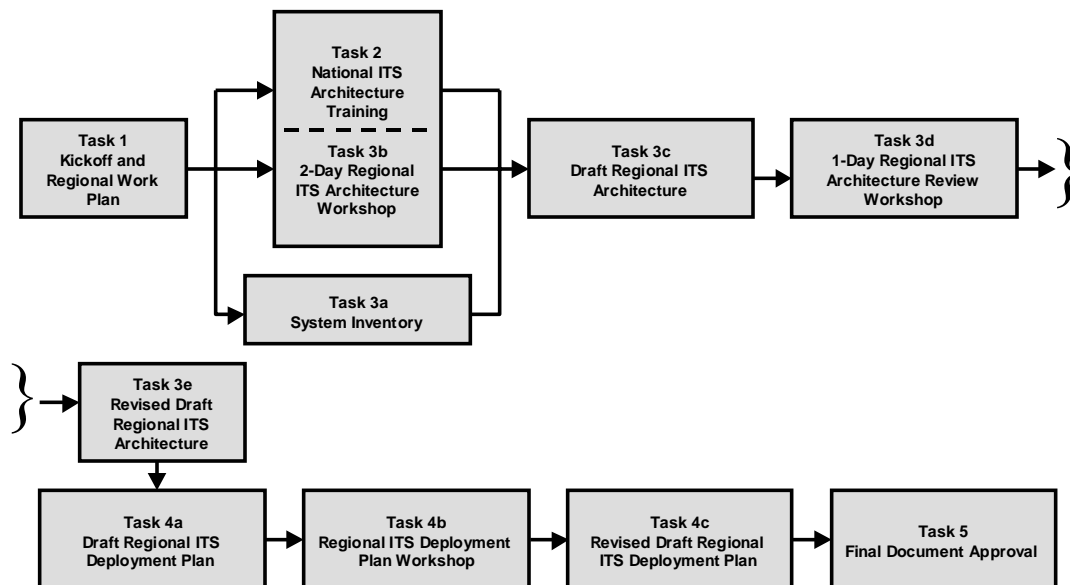
Figure 1 – Lufkin Regional ITS Architecture and Deployment Plan Development Process

OVERVIEW OF THE LUFKIN REGION

The Lufkin Region is bordered by the TxDOT Tyler and Atlanta Districts to the north, the State of Louisiana to the east, the TxDOT Beaumont and Houston Districts to the south, and the TxDOT Bryan District to the west. For the Lufkin Regional ITS Architecture and Deployment Plan, the study area included all nine counties that comprise the TxDOT Lufkin District. **Figure 2** illustrates the Regional boundaries.

The Lufkin Region's transportation infrastructure is primarily US and State Highway Routes. The primary roadway facilities include US 59, US 69, US 96, US 259, and State Highways 7, 21, and 103.

US 59 is the most heavily traveled corridor in the Region, and provides a vital link between Houston and Lufkin, as well as Lufkin and Nacogdoches. North of Nacogdoches, this highway ultimately connects with I-20. Its effective operation is critical to the movement of people and good throughout the Region. Blockages along US 59 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 US 59 has been closed due to a major incident or weather (such as the hazardous material (HAZMAT) truck incident in June 2004 that shut down a substantial portion of US 59 between Lufkin and Nacogdoches) 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.

Public transportation in the Lufkin Region is provided primarily by the Brazos Transit District, which operates both fixed-route and demand-response services. Fixed-route services are available in the Cities of Lufkin and Nacogdoches, as well as an express service between those two cities. There are also smaller transit operators that provide non-emergency medical and social services transportation. An intermodal terminal is planned for the City of Lufkin that will serve as an access point for local transit services, Greyhound, and other intercity coaches as well as include a parking facility.
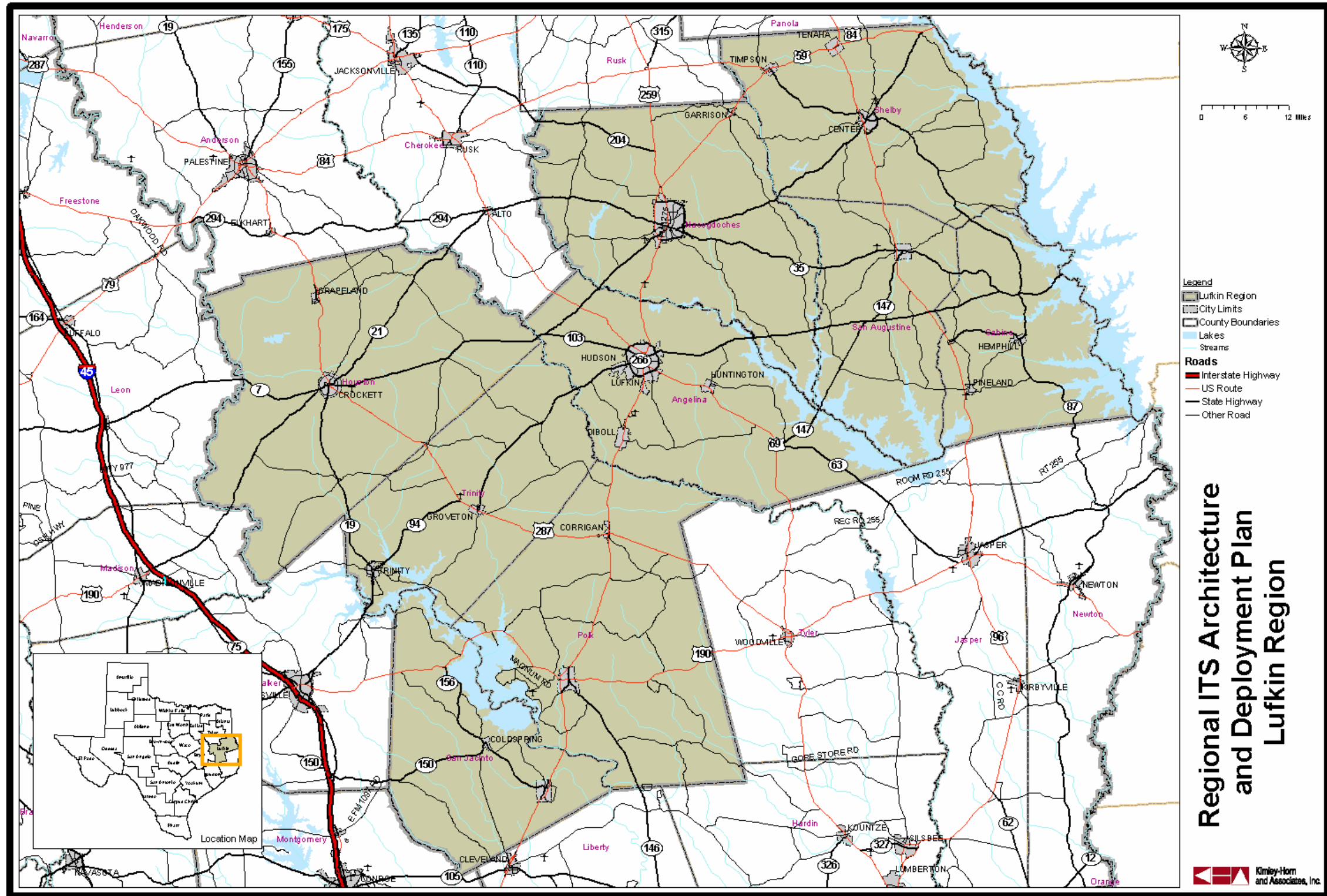
Figure 2 – Lufkin Region Map

LUFKIN REGION STAKEHOLDERS

Involving a range of perspectives in the development of a regional ITS architecture and deployment plan, and obtaining consensus on the vision and recommendations are key components to the process. Stakeholders from throughout the Lufkin Region participated in the development of the Lufkin Regional ITS Architecture and Deployment Plan. Key participants included representatives from TxDOT, cities, public safety, transit agencies, and planning organizations. These stakeholders provided input and review at key steps in the development process, including a project kick-off meeting, architecture development and review workshops, a deployment plan workshop, and review of the final project documentation.

The following is a list of stakeholders in the Lufkin 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 Lufkin Regional ITS Architecture and Deployment Plan:

- Angelina and Neches River Authority;
- Brazos Transit District;
- City of Crockett;
- City of Livingston;
- City of Lufkin;
- City of Nacogdoches;
- City of San Augustine;
- Crockett Economic Development Corporation;
- Deep East Texas Council of Governments;
- Polk County;
- San Augustine County;
- Trinity County;
- Texas Department of Public Safety;
- TxDOT Lufkin District; and
- TxDOT Traffic Operations Division (Austin).

LUFKIN REGIONAL ITS ARCHITECTURE

The process for developing the Regional ITS Architecture for the Lufkin Region included several key steps:

- Preparing an inventory of planned and existing systems in the Region;
- Identifying needs in the Region that could be addressed by ITS deployment or integration;
- Customizing and prioritizing market packages to address the specific needs and services identified by stakeholders;
- Developing interconnects and interfaces for system elements to map out data flows and agency links;
- Preparing an operational concept to illustrate how the systems, components, and agencies will be integrated and function as a result of the architecture framework;
- Identifying high-level functional requirements;
- Identifying standards that could be applicable to the Lufkin Region; and
- Outlining potential agreements that would be needed to facilitate information or resource sharing as a result of ITS implementation.

Inventory and Needs in the Region

The Lufkin Regional ITS Architecture began with a project kick-off meeting in June 2004. At that meeting, stakeholders provided information about existing and planned ITS elements in the Region. A diverse range of needs were identified by stakeholders who attended. The inventory of planned and existing ITS infrastructure provided the basis for the architecture development. Needs that could be addressed by ITS technologies guided the selection of market packages, data flows, and integration requirements.

The needs identified by the Lufkin Region stakeholders were categorized into functional areas and are shown in **Table 1**.

Table 1 – Lufkin Region: Summary of ITS Needs

Lufkin Region

Summary of ITS Needs
Lufkin Regional ITS Architecture and Deployment Plan Kick-Off Meeting
June 3, 2004

Travel and Traffic Management Needs

- Need hurricane evacuation/detour routes
- Need improved hurricane evacuation coordination between Beaumont, Houston, and Louisiana
- Need alternate route planning/driver notification
- Need flood detection
- Need closed circuit television (CCTV) cameras
- Need portable CCTV cameras
- Need highway advisory radio (HAR)
- Need TxDOT traffic management center

Public Transportation Management Needs

- Need improved incident, detour, and construction notification for transit
- Need mobile data terminals for demand response transit vehicles
- Need automated vehicle location (AVL) and mobile data terminals (MDTs) for fixed route transit vehicles
- Need connections to emergency management responders for improved coordination (especially during evacuations)

Electronic Payment Needs

None Identified

Commercial Vehicle Operations Needs

None Identified

Emergency Management Needs

- Need HAZMAT incident notification
- Need AVL, MDTs, and emergency vehicle preemption traffic signal for Nacogdoches Fire Department
- Need AVL, MDTs, and emergency vehicle preemption traffic signal for Lufkin Fire Department
- Need radio interoperability

Advanced Vehicle Safety Systems Needs

None Identified

Information Management Needs (Data Archiving)

- Need resource sharing database
- Need communications infrastructure to support data exchange

Maintenance and Construction Management Needs

- Need portable DMS for the City of Nacogdoches
- Need additional portable DMS for TxDOT
- Need flood detection/stream level monitoring in Nacogdoches
- Need work zone safety monitoring
- Need additional speed trailers

Market Packages

A 2-Day ITS Architecture Workshop was held in Lufkin in July 2004. At this workshop, stakeholders were provided with architecture training that included background information about the National ITS Architecture and the process that would be used to develop the Lufkin Regional ITS Architecture.

The next step in developing the Lufkin Regional ITS Architecture was to identify the services that would be needed to address the stakeholder needs. In the National ITS Architecture, services are referred to as market packages. Market packages can 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 a total of 85 market packages identified in Version 5.0 of the National ITS Architecture.

At the 2-Day ITS Architecture Workshop, stakeholders selected the market packages that corresponded to the desired services and functions identified for the Region, and then customized these market packages. They included services and functions such as Network Surveillance, Traffic Information Dissemination, and Emergency Response as well as market packages to address coordination needs, including an Incident Management System and Regional Traffic Control and Coordination. Because market packages are groups of services and functions, they can be deployed incrementally and over time. Of the 85 market packages in the National ITS Architecture Version 5.0, stakeholders identified 37 as being applicable to the Lufkin Region.

Interconnects, Interfaces, and Standards

Stakeholders also began the process of mapping existing and planned ITS elements in the Lufkin Region to the subsystems in the National ITS Architecture. These elements included agencies, systems, and essentially all of the ITS components in the Region. 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. This mapping resulted in an interconnect diagram for the Lufkin Region that is shown in **Figure 3**. This architecture diagram, also referred to as the "sausage diagram" shows the relationship of existing, planned, and future systems in the Lufkin Region.

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
- BTD Information Display / Point of Sale*
- BTD Transit Kiosks*
- TxDOT Rest Area/Visitor Center/Service Plaza/Truck Stop Kiosks*

Personal Information Access Subsystem
- Private Travelers Personal Computing Devices

Transit Vehicle Subsystem
- BTD Fixed Route Transit Vehicles
- BTD Demand Response Transit Vehicles
- Independent School District Buses
- SFA Shuttle Buses

Vehicle Subsystem
- BTD Fixed Route Transit Vehicles
- Commercial Vehicles
- Private Vehicles
- Rail Operations Rail Cars

Commercial Vehicle Subsystem
- Commercial Vehicles
- Rail Operators Rail Cars

Maintenance and Const Vehicle Subsystem
- County Road and Bridge Vehicles
- Municipal PWD Vehicles
- TxDOT Lubbock District Maintenance Vehicles

Emergency Vehicle Subsystem
- City of Livingston Fire/EMS Vehicles
- City of Livingston Police Vehicles
- City of Lufkin Fire/EMS Vehicles
- City of Lufkin Police Vehicles
- City of Nacogdoches EMS Vehicles
- City of Nacogdoches Fire Vehicles
- City of Nacogdoches Police Vehicles
- DPS Emergency Vehicles
- Municipal or County Public Safety Vehicles
- Private Ambulance Vehicle
- Private Tow/Wrecker Vehicles

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

Last Updated: May 23, 2005

Maintenance & Construction Management
- City of Livingston Public Works
- City of Lufkin Maintenance
- City of Nacogdoches Public Works
- County Road and Bridge
- Municipal PWD
- Other TxDOT District Maintenance Sections
- TxDOT Highway Conditions Reporting System
- TxDOT Lufkin District Area Engineers Office
- TxDOT Lufkin District Maintenance Sections

Emergency Management Subsystem
- Angelina Neches River Authority Dispatch
- City of Livingston Fire/Police/EMS Dispatch and PSAP
- City of Livingston Traffic Operations Center*
- City of Lufkin Fire/Police/EMS Dispatch and PSAP
- City of Lufkin Traffic Operations Center*
- City of Nacogdoches EMS Dispatch
- City of Nacogdoches EOC
- City of Nacogdoches Police/Fire Dispatch
- City of Nacogdoches Traffic Operations Center*
- Concierge Service Provider*

Emergency Management Subsystem (Cont.)
- County EOC
- County Public Safety Dispatch and PSAP
- DPS Administration
- DPS Communications Service
- Forest Service Dispatch*
- LA DPS Dispatch
- Lower Neches Valley Dispatch
- Municipal Public Safety Dispatch
- Private Ambulance Dispatch
- Private Hazmat Dispatch
- Private Tow/Wrecker Dispatch
- Regulatory Agencies
- Sabine River Authority Gulf Coast Division
- State EOC
- TranStar and Other Texas Region TMCs
- Trinity River Authority Control Center
- TxDOT Fort Worth TMC (TransVision)
- TxDOT Lufkin District TMC*
- Volunteer Fire Departments

Information Service Provider Subsystem
- BTD Transit Kiosks*
- BTD Transit Website
- City of Livingston Web Page
- City of Lufkin Web Page
- City of Nacogdoches Web Page
- County EOC Public Information Office
- DETCOG Website
- DPS Public Information Office
- Municipal EOC Public Information Office
- Municipal Web Page*
- Private Sector Traveler Information Services*
- Statewide Crash Records Information System
- TxDOT 511 System*
- TxDOT Highway Conditions Reporting System
- TxDOT Lufkin District Public Information Office
- TxDOT Lufkin District Web Page
- TxDOT Motor Carrier Routing Information

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

Transit Management Subsystem
- BTD Transit Dispatch
- Independent School District Dispatch
- Local Transit Operations
- Private Long Distance Bus Company Dispatch
- Private Shuttle Operations
- Private Taxi Provider Dispatch
- SFA Shuttle Dispatch

Traffic Management Subsystem
- City of Livingston Traffic Operations Center*
- City of Lufkin Traffic Operations Center*
- City of Nacogdoches Traffic Operations Center*
- LADOTD
- Municipal or County Traffic Operations Center*
- TranStar and Other TxDOT Region TMCs
- TxDOT Fort Worth TMC (TransVision)
- TxDOT Lufkin District Office
- TxDOT Lufkin District TMC*
- TxDOT Statewide Highway Conditions Reporting System

Commercial Vehicle Admin Subsystem
- Municipal or County Permitting System

Archived Data Management Subsystem
- BTD Transit Database
- City of Livingston Crash Records Database
- City of Lufkin Crash Records Database
- City of Lufkin Law Enforcement Citation Database
- City of Nacogdoches Crash Records Database
- DETCOG Accident Database
- DETCOG Regional ITS Database*
- Municipal/County Crash Records Database
- Statewide Crash Records Information System
- TxDOT Lufkin District Pavement Management System
- TxDOT Statewide Pavement Management System

Archived Data User Systems
- BTD Transit Database Users
- City of Lufkin Law Enforcement Citation Database Users
- DETCOG Accident Database User Systems
- DETCOG Data System Users*
- Rail Operations Centers
- Statewide Crash Records Information System Users
- TxDOT Lufkin District Pavement Management System Users*

Asset Management
- TxDOT BRINSAP
- TxDOT Lufkin District Pavement Management System

Care Facility
- Regional Medical Center

Driver
- Driver

Equipment Repair Facility
- County Road and Bridge Equipment Repair
- TxDOT Lufkin District Shop

Event Promoters
- Municipal Convention and Visitors Bureau

Financial Institution
- Financial Institution

Maintenance and Const Admin Systems
- TxDOT Lufkin District Area Engineers Office

Media
- Local Print and Broadcast Media

Multimodal Transportation Service Provider
- Lufkin Intermodal Terminal*
- Regional Airports

Other EM
- Army Corps of Engineers Flood Monitoring System
- DPS Headquarters (Austin)
- Texas DEM Disaster District Information System
- USGS Flood Monitoring System

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

Roadway Subsystem
- Angelina Neches River Authority Flood Detectors
- City of Livingston ITS Field Equipment*
- City of Lufkin ITS Field Equipment*
- City of Nacogdoches ITS Field Equipment*
- County Road and Bridge Field Equipment*
- Lower Neches Valley Flood Detectors
- Municipal ITS Field Equipment*
- Sabine River Authority Flood Warning Devices
- Trinity River Authority Flood Detectors

Roadway Subsystem
- TxDOT Lufkin District CCTV*
- TxDOT Lufkin District DMS
- TxDOT Lufkin District Field Sensors*
- TxDOT Lufkin District Flood Sensors*
- TxDOT Lufkin District HAR*
- TxDOT Lufkin District School Pager System*
- TxDOT Lufkin District Traffic Signals
- TxDOT Lufkin District Work Zone Equipment*

Parking Management
- Lufkin Intermodal Terminal*

Rail Operations
- Rail Operations Centers

Transit Vehicle Operator
- BTD Transit Vehicle Operator
- Independent School Bus Operator

Traveler Card
- Lufkin Regional Smart Card*

Wayside Equipment
- Rail Operators Wayside Equipment

Weather Service
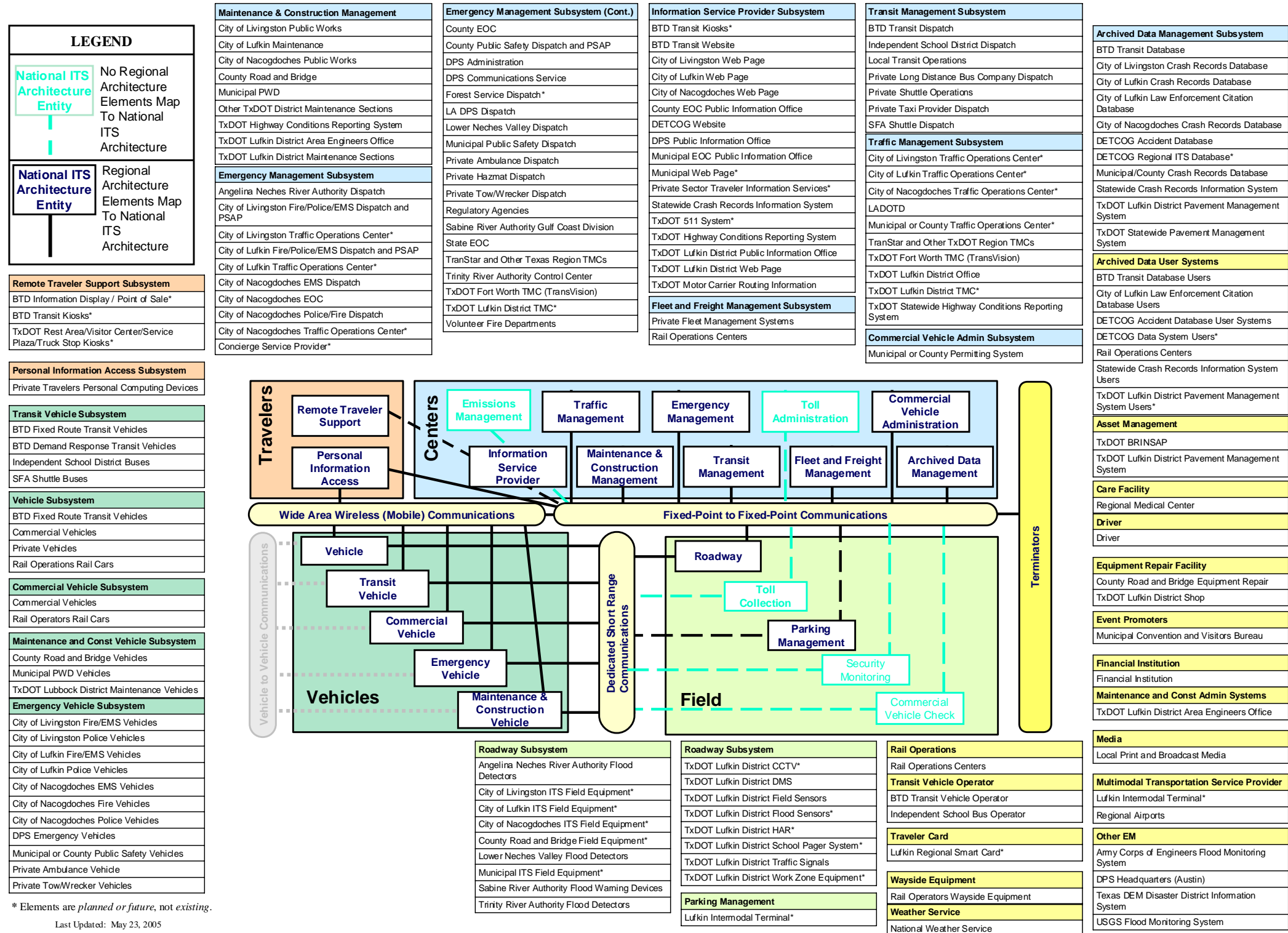- National Weather Service

Figure 3 – Lufkin Regional System Interconnect Diagram

The market packages in the National ITS Architecture were customized to reflect the unique systems, subsystems, and terminators in the Lufkin Region. Each market package was shown graphically, with the market package name, Lufkin Region specific element, and the unique agency and system identifiers within the subsystems and terminators.

Figure 4 is an example of an advanced traffic management system (ATMS) market package for Surface Street Control that has been customized for the Lufkin Region. This market package shows the two subsystems, Traffic Management and Roadway, and the associated entities (TxDOT Lufkin District Traffic Signals, TxDOT Lufkin District Field Sensors, etc.) for the TxDOT Lufkin District signal system. Data flows between the subsystems indicate what information is being shared. All of the Lufkin Region market package diagrams are included in the Regional ITS Architecture report.
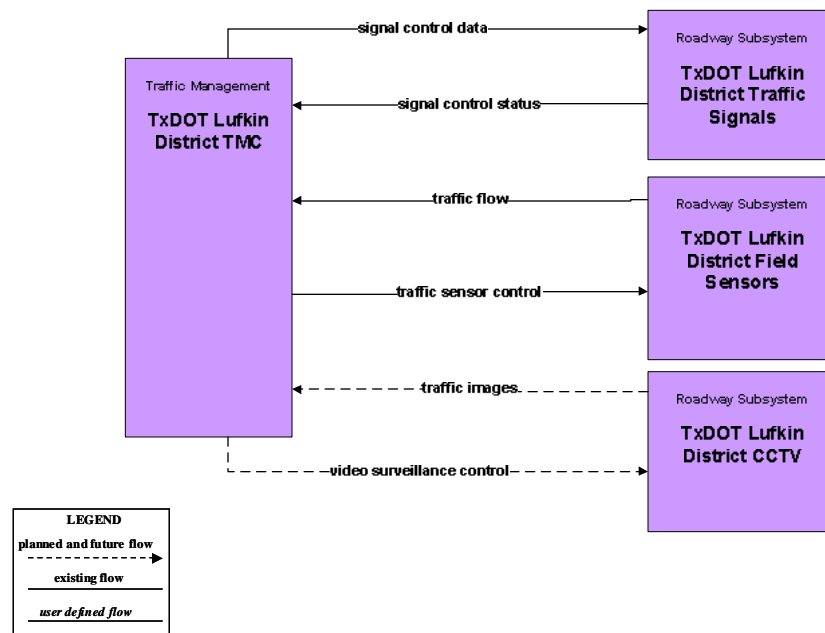
Figure 4 – TxDOT Lufkin District Surface Street Control Customized Market Package

More detailed interfaces were developed which identified the connectivity between the systems and elements. Each element identified in the ITS architecture for the Lufkin 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. The data flows include requests for information, alerts and messages, status requests, confirmations, and other information requirements.

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 Lufkin Region. There are 144 different elements identified as part of the Lufkin Regional ITS Architecture. These elements include local and state traffic management/operations centers, transit vehicles, dispatch systems, emergency management agencies, and others – essentially all of the existing and planned physical components that contribute to a Regional ITS. Interfaces

have been identified for each element in the Lufkin Regional ITS Architecture, and each element has been mapped to those other elements with which it must interface.

An example of one of the system interfaces is included as **Figure 5**. This graphic shows the TxDOT Lufkin 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.

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.

An example of the architecture flows between two elements is shown in **Figure 6**. In this interface, the flows between the TxDOT Lufkin District TMC and the City of Nacogdoches Public Works Department show information that must go from the Lufkin District TMC to the City of Nacogdoches Public Works Department, as well as information that the TMC needs from devices. Similar to the interfaces, architecture flows also are defined as existing, planned, or future. Diagrams of all of the architecture flows between elements have been included on the project website.

With the required interfaces and interconnections identified, standards that could potentially be applied to the Lufkin Region were identified. Standards are an important tool that will allow efficient implementation of the elements in the Lufkin Regional ITS Architecture over time. They facilitate deployment of interoperable systems at local, regional, and national levels without impeding innovation as technology advances, vendors change, and as new approaches evolve.
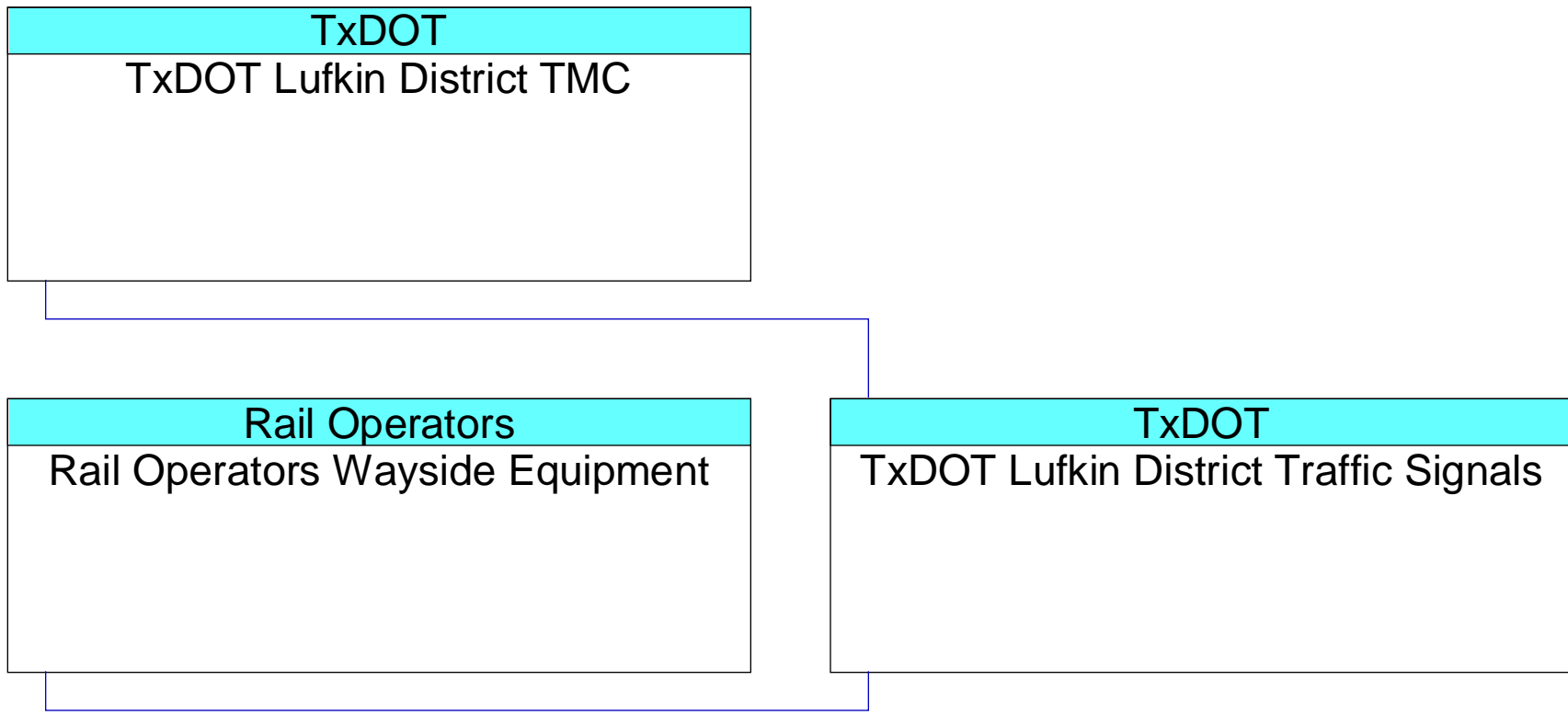
Figure 5 – TxDOT Lufkin District Traffic Signals Interfaces
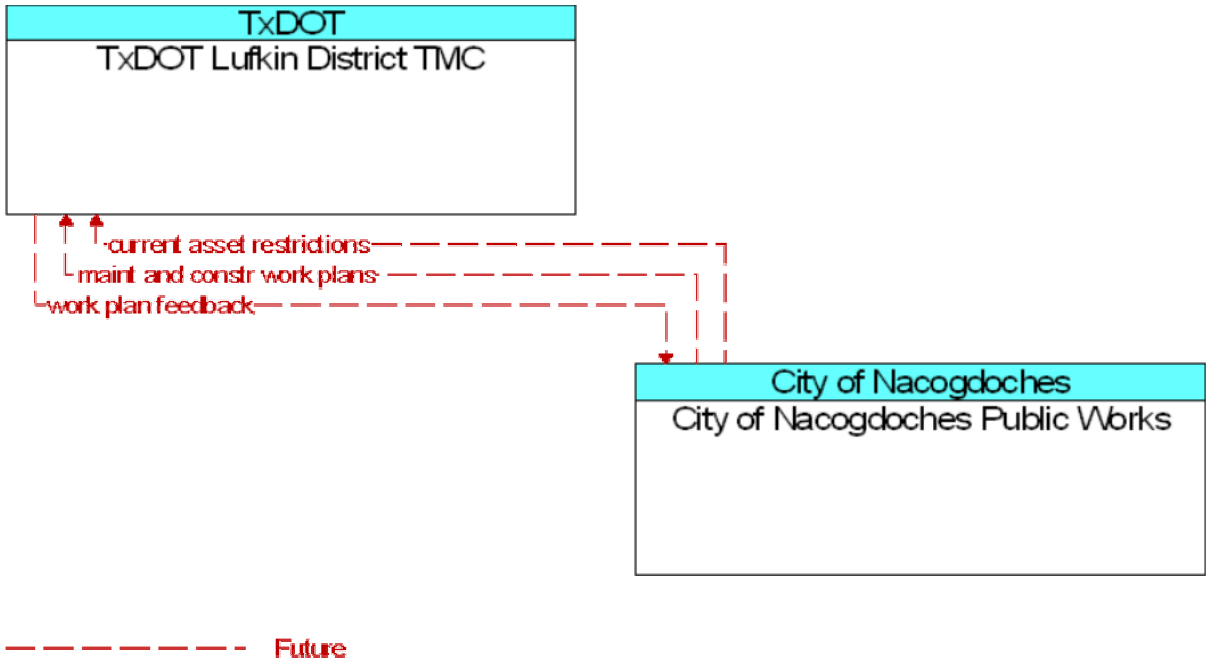
Figure 6 – TxDOT TxDOT Lufkin District TMC to City of Nacogdoches Public Works Architecture Flows

Operational Concept and Scenarios

An operational concept for the Lufkin Region was developed as part of the architecture process to illustrate how systems, components, and agencies will be integrated and function as a result of the framework provided by the Regional ITS Architecture. For the Lufkin Region, two concepts were illustrated. The first describes how ITS technologies could be used to manage a hurricane evacuation from the Texas Gulf Coast. As evacuees travel through the Lufkin region, the operational concept shows how ITS technologies are used to detect flooding on area roadways and assist in implementing strategies to manage traffic, inform motorists, and facilitate the dispatch of emergency vehicles. The second scenario describes how ITS supports the management of a HAZMAT incident on US 59 between Lufkin and Nacogdoches. The same systems also assist in the coordination of emergency management personnel.

Agreements

Interfaces and data flows among public and private entities in the Lufkin Region will require agreements among agencies that establish parameters for sharing agency information to support traffic and incident management, provide traveler information, and perform other functions identified in the Regional ITS Architecture. Recommended projects will result in systems and interfaces that will require inter-agency agreements, both public and private, to facilitate the exchange of information.

Currently, there are no formal agreements in place in the Region. With the implementation of ITS technologies, integration of systems from one or more agencies, and the anticipated level of

information exchange identified in the architecture, it is likely that formal agreements will be needed in the future.

The following is a list of potential agreements for the Lufkin Region based on the interfaces identified in the Regional ITS Architecture and recommended ITS projects in the Deployment Plan:

- Data sharing and usage agreements among public agencies;
- Data sharing and usage agreements among public agencies and private media and information service providers;
- Shared video monitoring agreements between TxDOT, public sector agencies, and public safety agencies;
- Mutual aid agreements among primarily fire, police, emergency services, DPS, and TxDOT; and
- Joint operations/shared control agreements between TxDOT, the Cities of Lufkin, Nacogdoches, Livingston, and Crockett, and DPS.

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.

ITS Architecture Documentation

The Regional ITS Architecture for the Lufkin Region is documented in a final report. Stakeholders were brought together to review the Regional ITS Architecture and provide feedback. The final architecture report was not prepared until after completion of the Lufkin Regional ITS Deployment Plan to allow for modifications based on information and input received for the ITS Deployment Plan recommendations.

A website with all of the Regional ITS Architectures also was maintained. The website allowed stakeholders to review the architecture and provide comments directly to the project team through the website. At the time this report was published, the Lufkin Regional ITS Architecture website was being hosted at www.consystec.com. The site can be accessed by selecting the link to Texas Regional, and then the link to Lufkin. TxDOT plans to permanently host the site in the future at www.dot.state.tx.us/trf/its.

LUFKIN REGIONAL ITS DEPLOYMENT PLAN

Although development of an ITS deployment plan was not required by the FHWA Final Rule for the architecture, the Final Rule does request a sequence of projects required for implementation. Capitalizing on the momentum and interagency dialogue established during the development of the Lufkin Regional ITS Architecture, TxDOT chose to expand on the project sequence requirement to develop a formal ITS deployment plan for the Region.

The Lufkin Regional ITS Architecture provided the framework and prioritized the key functions and services desired by stakeholders in the Region. The Lufkin Regional ITS Deployment Plan builds on the architecture by prioritizing market packages, outlining specific ITS project recommendations and strategies for the Region, and identifying deployment timeframes so that the recommended projects and strategies can be implemented over time. Agency responsibilities for implementing and operating the systems also are a key component of the Regional ITS Deployment Plan.

Prioritized Market Packages

Market packages for the Lufkin Region previously identified as part of the architecture were categorized into high, medium, and low priorities by stakeholders. The market package prioritization was a key factor in developing recommendations for ITS deployment and integration in the Lufkin Region. These priorities identified the key needs and services that are desired in the Region, as well as the interfaces that need to be established to provide integrated functionality and establish communication between elements.

It is important to note that the high, medium, and low priorities were not directly related to anticipated deployment timeframes (such as 5, 10, or 20 year deployment horizon). For example, a market package can be a high priority, but because of funding or prerequisite project requirements, it might not be feasible for deployment for several years. Maturity and availability of technology was another factor for prioritizing the market packages. Because market packages often represent groups of technologies or services to deliver a particular functionality, certain components of the market package could be identified as a high priority or existing capability, while other components would have a lower priority. Other considerations included whether or not the market package was better suited for deployment and operations by the private sector rather than public agencies in the Region.

Table 2 shows the prioritization of the selected market packages for the Lufkin Region. The majority of these market packages fall into the high priority category. This category also includes market packages (or portions of market packages) that are already deployed in the Lufkin Region, such as surface street control and traffic information dissemination.

Table 2 – Summary of Prioritized Market Packages for the Lufkin Region

High Priority	Medium Priority	Low Priority
▪ Network Surveillance	▪ Regional Traffic Control	▪ Probe Surveillance
▪ Surface Street Control	▪ Maintenance and Construction Vehicle and Equipment Tracking	▪ Emissions Monitoring and Management
▪ Traffic Information Dissemination	▪ Roadway Maintenance and Construction	▪ Standard Railroad Grade Crossing
▪ Traffic Incident Management System	▪ Maintenance and Construction Activity Coordination	▪ Railroad Operations Coordination
▪ Speed Monitoring	▪ Transit Fixed-Route Operations	▪ Parking Facility Management
▪ Emergency Call-Taking and Dispatch	▪ Interactive Traveler Information	▪ Maintenance and Construction Vehicle Maintenance
▪ Emergency Vehicle Routing		▪ Transit Passenger and Fare Management
▪ Wide-Area Alert		▪ Transit Security
▪ Evacuation and Reentry Management		▪ ISP Based Route Guidance
▪ Disaster Traveler Information		▪ ITS Data Mart
▪ Road Weather Data Collection		
▪ Weather Information Processing and Distribution		
▪ Work Zone Management		
▪ Work Zone Safety Monitoring		
▪ Transit Vehicle Tracking		
▪ Demand Response Transit Operations		
▪ Multi-modal Coordination		
▪ Transit Traveler Information		
▪ CV Administrative Processes		
▪ HAZMAT Management		
▪ Broadcast Traveler Information		

Each of the prioritized market packages was assessed from the perspective of deployment status (which components, if any, were already existing in the Region), as well as any planned projects or additional new projects needed to fully implement the market package in the Lufkin Region. Each market package analysis included:

- A brief definition of the market package (modified from the National ITS Architecture definitions);
- Any infrastructure or components from that market package that is already existing in the Lufkin Region;
- Agencies currently operating or maintaining systems that apply to that market package;
- Planned projects that will address some or all of the services that are contained in the market package; and
- Any additional needs to bring the market package to the desired level of deployment or functionality.

ITS Project Recommendations for the Lufkin Region

Using the needs, market package priorities, and any planned projects identified by the stakeholders during the architecture process, a list of recommended ITS projects for the Lufkin Region was developed. These projects were refined and additions and deletions were made by the Regional stakeholders at the ITS Deployment Plan Workshop in December 2004.

Recommended ITS projects for the Lufkin Region were categorized into short-, medium-, and long-term timeframes for programming in the 5, 10, and 20 year horizons. This was done based on current status if the project had previously been identified and planned by the Region, market package priority, and dependency on other project completions. The majority of the short-term or 5-year recommendations serve as "foundation" projects to implement basic functionality, infrastructure, and interfaces, with the intent of continuing to build out those foundation projects over the 10 and 20 year timeframes. Most projects for the Lufkin Region are infrastructure based; however, there are some recommendations that focus more on institutional practices and interconnectivity to enhance coordination and communications.

Each recommended project for the Lufkin Region was included in a short-, medium-, or long-term table. These tables provided the name of the project, primary operating/implementing agency, a planning level estimate of probable cost, an indication of whether or not funding had been identified for that specific project, and an estimated project duration. Following each table, detailed descriptions of each project were developed, which also included associated market packages and any pre-requisite project requirements.

Table 3 summarizes the ITS projects recommended for the Lufkin Region. This summary is divided into the major program areas and subdivided by timeframe. As can be seen from this summary, the majority of the project recommendations focus on the Travel and Traffic Management category which would implement surface street traffic management, traveler information, and inter-agency coordination elements.

Table 3 – Recommended ITS Projects for the Lufkin Region

Project Time Frame	Project Name	Funding Identified (Funding Agency if Applicable)
Travel and Traffic Management		
Short Term Projects 5-year Horizon	TxDOT Lufkin TMC	No
	TxDOT Lufkin ATMS Implementation	N/A
	TxDOT CCTV Phase 1	No
	TxDOT School Zone Pager System	No
	TxDOT DMS Phase 1	No
	TxDOT Center-to-Center Communications	N/A
	Communications Master Plan	No
	TxDOT Highway Advisory Radio	No
	TxDOT Traffic Signal System Expansion Phase 1	No
	TxDOT Portable Speed Monitoring	No
	TxDOT Lufkin Web Page	No
Mid Term Projects 10-year Horizon	TxDOT CCTV Phase 2	No
	TxDOT DMS Phase 2	No
	TxDOT Media Liaison and Coordination	No
	TxDOT 511 Advanced Traveler Information System Server	No
	Interstate Coordination	No
	TxDOT Traffic Signal System Expansion Phase 2	No
Long Term Projects 20-year Horizon	City of Lufkin TOC	No
	City of Lufkin Traffic Signal System	No
	City of Nacogdoches TOC	No
	City of Nacogdoches Traffic Signal System	No
	TxDOT/City of Lufkin Communications Connection	No
	TxDOT/City of Nacogdoches Communications Connection	No
Emergency Management		
Short Term Projects 5-year Horizon	TxDOT Evacuation Route Implementation	No
	TxDOT Lufkin TMC/DPS Communications Connection	No
	City of Lufkin Fire Vehicle AVL/MDT	No
	City of Nacogdoches Fire Vehicle AVL	No

Table 3 – Recommended ITS Projects for the Lufkin Region (continued)

Project Time Frame	Project Name	Funding Identified (Funding Agency if Applicable)
Emergency Management (continued)		
Mid Term Projects 10-year Horizon	TxDOT Lufkin TMC/City of Livingston Fire/Police/EMS Dispatch Communications Connection	No
	TxDOT Lufkin TMC/City of Lufkin EMS Dispatch Communications Connection	No
	TxDOT Lufkin TMC/City of Nacogdoches Police/Fire Dispatch Communications Connection	No
	TxDOT Lufkin TMC/County Public Safety Dispatch Communications Connection	No
	TxDOT Lufkin TMC/Angelina and Neches River Authority Dispatch Communications Connection	No
	TxDOT Emergency Vehicle Traffic Signal Preemption	No
Long Term Projects 20-year Horizon	TxDOT Lufkin TMC/Trinity River Authority Control Center Communications Connection	No
	TxDOT Lufkin TMC/Sabine River Authority Gulf Coast Division Communications Connection	No
	TxDOT Lufkin TMC/Lower Neches Valley Dispatch Communications Connection	No
Maintenance and Construction Management		
Short Term Projects 5-year Horizon	TxDOT HCRS Enhancements	Yes (TxDOT Statewide)
	TxDOT Portable DMS Phase 1	No
	TxDOT Flood Detection Phase 1	No
	City of Lufkin Flood Detection	No
	City of Lufkin Portable DMS	No
	City of Nacogdoches Flood Detection	No
	City of Nacogdoches Portable DMS	No
Mid Term Projects 10-year Horizon	TxDOT Portable DMS Phase 2	No
	TxDOT Advanced Work Zone Equipment	No
	TxDOT Flood Detection Phase 2	No
	TxDOT Work Zone Safety Monitoring Equipment	No
	TxDOT Maintenance Vehicle AVL	No
	Regional Roadway Maintenance/Work Zone Activity Clearinghouse	No

Table 3 – Recommended ITS Projects for the Lufkin Region (continued)

Project Time Frame	Project Name	Funding Identified (Funding Agency if Applicable)
Maintenance and Construction Management (continued)		
Long Term Projects 20-year Horizon	County Maintenance Vehicle AVL	No
	County Maintenance Vehicle Management System	No
	TxDOT Lufkin Maintenance Vehicle Management System	No
	City of Nacogdoches Work Zone Safety Monitoring Equipment	No
	City of Lufkin Work Zone Safety Monitoring Equipment	No
Public Transportation Management		
Short Term Projects 5-year Horizon	Lufkin Intermodal Terminal Transit Travel Information System	No
	BTD Demand Response MDTs	Yes (Brazos Transit District)
	BTD Fixed Route AVL/MDT	No
	BTD Transit Dispatch Center Enhancements	No
Mid Term Projects 10-year Horizon	Regional Paratransit Coordination System	No
	BTD Web Site Enhancements	No
Long Term Projects 20-year Horizon	Regional Transit Smart Card	No
	Lufkin Intermodal Terminal Parking Management System	No
Commercial Vehicle Operations		
Short Term Projects 5-year Horizon	CVO/HAZMAT Permit Coordination and Notification System	No
	CVO Emergency Information Clearinghouse	N/A
Mid Term Projects 10-year Horizon	None identified at this time	N/A
Long Term Projects 20-year Horizon	None identified at this time	N/A
Archived Data		
Short Term Projects 5-year Horizon	None identified at this time	N/A
Mid Term Projects 10-year Horizon	None identified at this time	N/A
Long Term Projects 20-year Horizon	DETCOG Regional ITS Database	No

MAINTAINING THE REGIONAL ITS ARCHITECTURE AND DEPLOYMENT PLAN

The Lufkin Regional ITS Deployment Plan is a living document. The recommended projects and their timeframes for implementation reflect the needs of the Region at the time the plan was developed. It is expected that the needs of the Region will change as ITS deployments are put into place, population and travel patterns change, and as new technology is developed. In order for the ITS Deployment Plan to remain a useful document for Regional stakeholders, the plan must be updated over time.

TxDOT will serve as the lead agency for maintaining both the Lufkin Regional ITS Architecture and the ITS Deployment Plan, however, these plans will continue to be driven by stakeholder consensus rather than a single stakeholder.

At the ITS Deployment Plan Meeting in December 2004, stakeholders recommended that the group meet every two years to correspond with the Transportation Improvement Plan update process to review the Regional ITS Architecture and Deployment Plan and formally update both documents. The Regional ITS Architecture Update will include a review of any new market packages that have been added to the National Architecture to see if they are applicable to the Lufkin Region. Data flows in existing market packages will also be reviewed to determine if any planned/future flows have been implemented. The Deployment Plan will be updated at that time to reflect projects that have been deployed, new projects that are necessary, and to reprioritize projects currently shown in the plan. Projects that are added to the ITS Deployment Plan should also be reviewed closely to determine if they fit into the ITS Architecture for the Lufkin Region. If a new project does not fit into the ITS Architecture, then the ITS Architecture will need to be revised to include the necessary links and data flows for the project. Any changes to the geographic scope of the Region should be agreed upon by the stakeholders.

Both the Lufkin Regional ITS Architecture and the ITS Deployment Plan were developed with a consensus approach from the stakeholders. In order for these documents to continue to reflect the needs of the Region, changes in the documents will need to be driven by consensus of all of the stakeholders.

MEMORANDUM OF UNDERSTANDING

As a final step in the development of the Lufkin Regional ITS Architecture and Deployment Plan, a Memorandum of Understanding (MOU) was prepared for the participating stakeholder agencies. The MOU was developed for stakeholders to acknowledge their participation and approval of the plan, and pledge their support in the implementation and operation of ITS in the Lufkin Region. Also included in the MOU was a pledge to provide TxDOT with the information necessary to maintain the Regional ITS Architecture and ITS Deployment Plan.

Those stakeholders that were asked to sign the MOU represented agencies that participated in the planning process. In most cases these agencies will have the greatest impact in the Region in terms of ITS deployments and system operations. Stakeholder agencies that were asked to sign the MOU for the Lufkin Regional ITS Architecture and Deployment Plan included the following:

- Angelina and Neches River Authority;
- Brazos Transit District;
- City of Crockett;
- City of Groveton;
- City of Livingston;
- City of Lufkin;
- City of Nacogdoches;
- City of San Augustine;
- Deep East Texas Council of Governments;
- Polk County;
- San Augustine County;
- Texas Department of Public Safety;
- Texas Department of Transportation; and
- Trinity County.