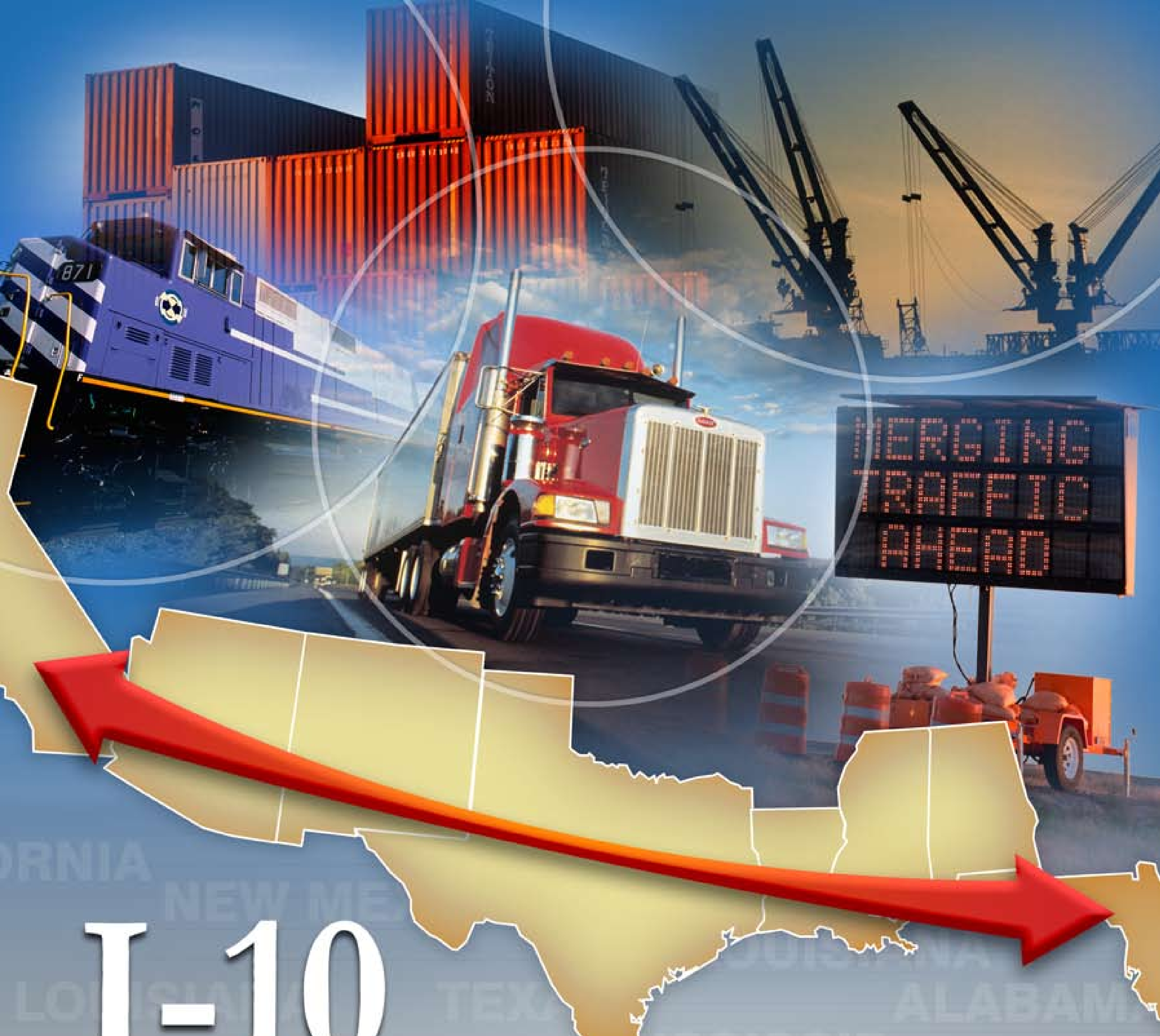


I-10
NATIONAL FREIGHT CORRIDOR STUDY

PHASE II REPORT/ CORRIDOR ITS ARCHITECTURE

INTERSTATE 10 NATIONAL FREIGHT CORRIDOR

Table of Contents

Executive Summary

Background

The Interstate 10 National Freight Corridor extends across the eight states that form the southern boundary of the contiguous 48 states. From west to east, the corridor crosses parts of California, Arizona, New Mexico, Texas, Louisiana, Mississippi, Alabama, and Florida. Four of the states form the entire land border between the United States and Mexico. The corridor passes through at least one metropolitan area in each of the eight states.

In 2005, the initial phase of the I-10 National Freight Corridor Study was completed under the joint auspices of eight state departments of transportation (DOTs). The objectives of the initial study included:

- assessing the economic importance of freight movement on Interstate 10
- identifying current and future problems in the areas of traffic operations and safety that could impede the movement of freight
- identifying and evaluating strategies to facilitate freight flow within the corridor

Phase II of the study was initiated to build on the previous effort, assisting the corridor states in their transition from a pooled fund status into a formal corridor coalition. To accomplish this goal, Phase II focuses on the development of an initial intelligent transportation systems (ITS) program and architecture. The primary intent was that by creating a corridorwide ITS architecture, the states would have 1) a process to bind them, 2) a means of seeking additional funding, and 3) the ability to implement improvements quickly. The study focus remains on goods movement and therefore addresses those ITS elements that are relevant to freight. This does include some more general congestion relief and incident management issues, which greatly affect freight.

Phase II Work Plan

Existing state and regional ITS architectures cover the entirety of the I-10 Corridor. The study built upon the existing architectures, avoiding replication of existing efforts while addressing gaps. The resulting corridor architecture is intended to provide a common set of goals for multistate initiatives and projects relevant to goods movement throughout the corridor.

As part of the development of the ITS architecture, the study team worked with the states to develop an initial ITS program for the corridor. The program includes projects that the corridor is likely to pursue in the next 10 years. Development of the program included a formal review of the estimated costs of the projects, along with an analysis of the strengths, weaknesses, opportunities, and threats (SWOT) that compared the projects according to how well each meets the stated needs of the corridor. The resulting 109 projects represent a consensus of efforts that will build toward improved freight movement along the entire I-10 Corridor.

User Needs

Identifying user needs is a critical part of the systems engineering and ITS architecture processes. These needs are used to develop the goals and objectives, which then determine how the corridorwide ITS architecture and program will meet these needs. The study team identified user needs through discussions with stakeholder representatives and review of documents provided by stakeholder groups. Additional user needs were identified from the various state and regional architectures, and from the state Commercial Vehicle Information Systems and Network (CVISN) plans. Table 1 illustrates the needs by functional area. They are also listed as formal goals and objectives within the Phase II report.

As a freight-focused study, the needs of the private shippers and carriers needed to be considered. Identification of the freight user needs began with a survey of previous research on commercial vehicle congestion and travel time information needs. Knowledge from previous research was used to develop a user survey of ITS needs for the trucking industry. More than 300 companies were contacted. The highlights of the survey results are as follows:

- Their most common delays are from congestion, accidents, and construction
- About 40 percent share real time information already
- About half are willing to pay for traffic information but are not willing to pay for anything else
- Information within the next four hours is most relevant to them
- Dynamic message signs (DMS) are the preferred way to get information, although Internet and cell phones were close

Table 1. Summary of Corridor ITS Needs

Institutional needs	• Identify keeper/manager of the corridor ITS architecture • Develop and use a process addressing/aligning ITS project requests with each project's relevance and compliance with the local/regional architecture • Coordinate regional/state agencies to resolve transportation issues • Develop memoranda of understanding to facilitate data sharing and agency roles • Develop common ITS planning objectives to better coordinate ITS efforts along the corridor • Improve coordination between traffic management agencies and emergency response agencies for evacuation, traffic data exchange, and traveler information purposes • Effective communication between all state and local agencies in the corridor
Travel and traffic management needs	• Expand deployment of centralized traffic management systems in parts of the corridor • Improve and expand data collection network for traveler information, planning, and operations • Develop a corridorwide clearinghouse for transportation data management • Improve traffic control in major cities and towns • Expanded CCTV video coverage of I-10 Corridor, primary roadways • Improved safety and homeland security efforts throughout the corridor • Improved traveler information on I-10, primary routes, and other strategic locations • Automated incident detection and management system for I-10 and primary routes • Improved incident response coordination • Improve interagency notification for traffic control and IM • Congestion management strategies
Commercial vehicle operations needs	• Overweight vehicle detection systems • Improved safety assurance at ports of entry • For real time, en-route weather information • For credentials administration and verification • For more effective size/weight enforcement
Emergency management needs	• Improved emergency response coordination • Emergency response data transfer • Interoperable communications between local police/fire/rescue • Coordination between regional emergency response agencies • Information management needs • Corridorwide clearinghouse for transportation data management • Maintenance and construction operations needs • Widely distribute road closure plans (e.g., media coverage) • Real time vehicle tracking and conditions reporting systems • Smart ITS work zones for long-term construction projects

ITS Program

As part of the development of an initial ITS architecture, a program of projects is necessary. The corridor's ITS program was developed and prioritized by the eight states, resulting in a list of more than 100 projects anticipated to have corridorwide benefits. Of these, 17 were identified by the Technical Advisory Committee (TAC) and consultants as being of particular importance to the development of ITS in the corridor, and thus appropriate for short-term implementation. Chapter 3 of this report includes brief descriptions of all the individual projects and how they fit into the corridor's ITS plan.

Table 2. Initial ITS Program Projects

Project code	Project
ADM.1.1.1	I-10 Project Management Contract
INF2.1.1	Create a web site with links to web sites for all states within the corridor
OPS1.3.4	THETA – Develop Stage 2 capabilities (evacuation across state lines, contra flow, evacuation shelters)
INF1.3.1	Fiber connections to provide state-to-state connectivity
INF2.1.2	Enhance the existing web site with an e-mail alert system
OPS2.2.5	Study in-state integration (FL, TX, CA, AZ) vs. statewide TMC (MS)
OPS6.1.1	Establish stakeholder group with port facilities and determine where improvements are possible
FI2.4.1	Upgrade of fog detection on Bayway Bridge
INF3.2.1	Localized and regional weather and traffic at parking facilities
OPS3.4.1	Coordination with federal agencies to ensure consistent operations of ports and border crossings
INF2.4.3	Create a "War Map," a single web site for all agencies that has all available information along I-10
OPS4.2.3	Integrate smart work zone into corridor web site
OPS1.4.1	TIMTOW – private sector certification for towers
FI1.2.2	Integrate key asset surveillance into existing TMC
INF2.4.5	Integrating the systems into regional information sharing
FI2.4.2	Additional dust warning system locations in Arizona
FI1.1.1	New TMC in Gulfport, MS

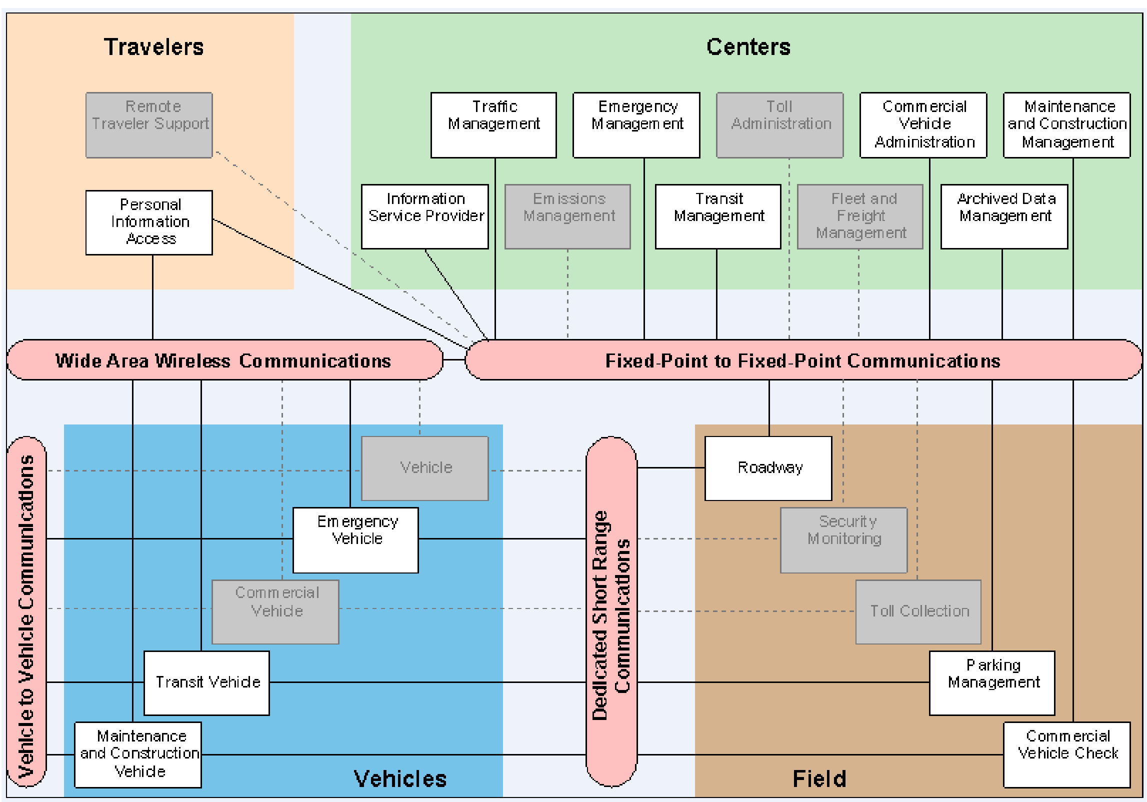
Communications

Each state and region uses long-distance communications to and from field devices and to and from other ITS centers. The Phase II report examined the existing long-distance communication systems in the corridor states and evaluated the potential for creating and expanding regional networks to cover longer portions of the corridor. The report also examined how the states and local jurisdictions currently share information on a regional and corridorwide level.

ITS Architecture

Working with the eight states, the study team developed a freight-centered ITS architecture that covers the entire corridor. The corridorwide ITS architecture addresses the gaps between the state and regional architectures. This corridorwide ITS architecture will make it possible for the corridor to pursue federal funds for ITS projects. The architecture complies with all 23 CFR 940 rules and is compatible with all state and regional ITS architectures along the I-10 Corridor.

Figure 1. I-10 Corridor ITS Architecture Framework



Note: Grayed out boxes do not apply

Corridors of the Future

During the course of Phase II, the Federal Highway Administration (FHWA) created the Corridors of the Future Program. This program sought multistate corridors that were ready to address congestion using a corridor approach. The eight corridor states submitted an initial application to FHWA in October 2006. The I-10 National Freight Corridor was selected as one of 16 finalists. Subsequently, a second application was submitted in May 2007. In September 2007, the I-10 National Freight Corridor was designated as one of six national Corridors of the Future. The initial award for corridor projects included $8 million for projects in Arizona and Louisiana.

The I-10 National Freight Corridor is now moving toward more formal interagency agreements and status. This includes developing a memorandum of understanding between the eight states and working with the FHWA to sign a long-term agreement. The focus of the agreements will be to define how the eight states will continue to cooperate and share ideas. All eight states recognize the federal desire to pursue alternative and private sector funding for the long term. Additionally, all eight states recognize the need to continue to address congestion beyond their own borders.

The I-10 National Freight Corridor states look forward to a new future in promoting the growth of freight along this critical national corridor.

Chapter 1

Data Sources

1.1 Introduction

The National Interstate 10 Freight Corridor passes through eight states and numerous metropolitan areas. Because of the corridor's extent and breadth, a number of intelligent transportation systems (ITS) architectures have been developed along the corridor. Six of the eight corridor states have developed statewide architectures that vary considerably in their scope and level of detail. In the two states without a statewide architecture, the I-10 Corridor passes through eight regional architectures; the corridor also passes through the coverage of regional architectures in most of the other states.

Many of the existing architectures in the corridor provided data that was used for development of a freight corridor architecture. Other data sources were also identified and used. This chapter describes the data collection process and discusses the information gained from each data source.

1.2 Summary of Data Sources

1.2.1 Existing ITS Architectures

Because of the number and extent of existing architectures in the corridor, the I-10 Corridor Steering Committee elected to use the existing ITS architectures as a foundation for the corridor architecture wherever possible. Using data from the existing architectures facilitates development of compatible corridor architecture without replicating the numerous stakeholder meetings that contributed to the development of the various regional and statewide ITS architectures. Working off of the existing architectures not only helps to ensure compatibility between the existing architectures and the corridor architecture, but also allows the corridor architecture to be developed in a much shorter time frame at significant cost savings. A detailed discussion of the existing ITS architecture data can be found in Section 1.3 of this chapter.

1.2.2 CVISN Programs and Plans

The existing Commercial Vehicle Information Systems and Networks (CVISN) program efforts in each state, where available, provided one readily available source of additional information regarding integration of freight related systems. The initial development stages of a CVISN plan are generally similar to those of an ITS architecture. Where available, CVISN plans were included to help develop the more freight-related user needs, goals, objectives, etc., as input to a corridorwide ITS architecture.

1.2.3 Stakeholder Outreach

Although it would not be time- or cost-effective to replicate the usual ITS architecture stakeholder development process, a considerable amount of information can be gathered through communications with selected shipping interests, such as national and large regional carriers, port authorities and operators, and trucking associations. To ensure that stakeholders are provided with an opportunity to contribute their input, each state has provided contact information for those interests they believe would have valuable input to this process. Web-based survey instruments have also been used to reach out to a wider audience of interested parties. In limited instances where their input is critical, interviews with selected large-scale users have also been incorporated.

1.2.4 Technical Review Committees

As part of the development of the I-10 Corridor Architecture, representatives from each state participated in technical review committees that contributed information and expertise in the process of developing the ITS architecture. The committees ensured that information flowed in two directions. The committee members provided input into the corridor architecture based on recent developments in their states, and were also able to take new information and ITS architecture elements from the corridor architecture for use in their own state and regional ITS architectures.

1.3 ITS Architecture Data

The I-10 Corridor crosses the geographic boundaries of numerous existing statewide and regional ITS architectures. This section describes the architectures and some of the information obtained from them.

In the initial stages of the architecture development process, one of the more critical steps is identifying the stakeholders and their needs. To help streamline the architecture development process, the various stakeholders will be consolidated and grouped as appropriate for the corridor architecture. For example, the corridor architecture may include all county departments of transportation (DOTs) as a single stakeholder group. By identifying the individual stakeholders listed in each stakeholder group, the needs of all stakeholders in the group are represented in the architecture, and the representation in the architecture of information flows to those stakeholders is greatly simplified. Stakeholders' needs will be also be examined and reviewed, and needs that are appropriate for the larger freight corridor will be incorporated into the corridor architecture. Specific elements contained in the architectures, such as market packages, will be discussed in later chapters.

The following sections discuss the statewide and regional ITS architectures identified and used in development of the corridor architecture.

1.3.1 Florida

The I-10 Corridor extends across the width of northern Florida, from Jacksonville on the Atlantic coast to the Alabama state line. Florida has completed development of a statewide ITS architecture, and the Turbo Architecture database used in its development has been made available to the study team, as have additional materials. Regional architectures were also identified for the Escambia County-Santa Rosa County, Fort Walton Beach, and Tallahassee/Leon County regions; however, these regional architectures have been incorporated into Florida's Statewide ITS Architecture. PDF copies of the architecture documents have been downloaded, as has a districtwide regional architecture for the Florida Department of Transportation District 3, which covers the northwest portion of the state and most of the I-10 Corridor; and District 2, which covers the northeast portion of the state including the I-10 Corridor in that area.

1.3.2 Alabama

The I-10 Corridor crosses the southern extremity of Alabama, extending just 70 miles across the state's two Gulf coastal counties. While Alabama has not developed a statewide ITS architecture, a regional architecture was developed for the Mobile area, which includes the two coastal counties traversed by I-10. Documents relating to the Mobile regional architecture include a final

report, an Access-format database, and a list of stakeholders.

1.3.3 Mississippi

The Mississippi section of I-10 stretches 70 miles from the Alabama state line to the Louisiana state line. Mississippi has completed a statewide ITS architecture, as well as an architecture for the Gulf Coast region through which I-10 crosses the state. Electronic copies of the statewide architecture report, in Word format, and the statewide architecture database, in Access format, are available.

1.3.4 Louisiana

I-10 crosses the widest section of Louisiana, from the Mississippi border to the Texas border. Louisiana has developed a statewide architecture and the WSA team has located a copy of the statewide implementation plan. Regional architectures have also been identified for the New Orleans, Lafayette, and Baton Rouge areas. Final reports have been located for the regional architectures, as have database files, including a Turbo-format file for Baton Rouge and an Access-format file for New Orleans.

1.3.5 Texas

The I-10 Corridor extends across the full width of Texas, coming particularly close to border crossings at the western end of the Texas portion of the corridor, near El Paso. Texas has not developed a statewide ITS architecture. The corridor extends through the limits of seven regional architectures. PDF documents have been identified and located for all of the regional architectures in the corridor, including the Beaumont, El Paso, Houston, Permian Basin (Odessa), San Angelo, San Antonio, and Yoakum regions. A Turbo-format database has been located for the Austin regional ITS architecture.

1.3.6 New Mexico

A portion of the I-10 Corridor extends across roughly half the width of the state, entering near El Paso and continuing on to the Las Cruces metropolitan area before turning west to Arizona. New Mexico is in the process of developing a statewide architecture, and draft documents for the architecture have been made available.

1.3.7 Arizona

In Arizona, the I-10 Corridor extends across the entire width of the southern part of the state, linking the state's two large metropolitan areas, Tucson and Phoenix. Arizona has developed a statewide architecture. The study team obtained the final report for the statewide architecture, along with final reports for the Tucson and Maricopa county (Phoenix area) regional architectures. All of the Arizona documents are in PDF.

1.3.8 California

The California portion of the I-10 Corridor crosses the southern portion of the state, linking several major cities in the Los Angeles metro area. The study team obtained both the final report and the Turbo database for the California statewide architecture. Final PDF reports were also obtained for both the Southern California regional ITS architecture and for the regional architecture for Los Angeles County, along with Turbo databases for the statewide and Southern California regional architectures.

1.4 Commercial Vehicle Information Systems and Networks Data

CVISN refers to "the collection of information systems and communications networks that support commercial vehicle operations (CVO)" (Richeson, 2000). These may include both publicly owned systems, as well as those owned and operated by motor carrier industry stakeholders. The CVISN program is intended to provide a framework of standards to promote information exchange and transmission using existing infrastructure.

For this project, the study team searched for all available CVISN documents and resources from the eight I-10 Corridor states. A summary of the CVISN documents located is found on the following pages. Detailed summaries of CVISN projects from the state plans can be found in Appendix A.

1.4.1 Florida

Florida completed development of a CVISN business plan in 2001. The study team obtained PDF versions of the business plan final report, along with copies of the program plan and the top-level design document. Florida's planned CVISN projects include 12 projects in four different program areas, including electronic credentials administration, safety information exchange, electronic screening systems, and programwide projects.

1.4.2 Alabama

Alabama completed a CVISN plan in 2004. The study team obtained the CVISN top-level design and program plan in PDF format. Alabama CVISN projects identified from the plans include a Commercial Vehicle Information Exchange Window (CVIEW) project to exchange CVO information with state and national systems, an electronic screening system to be developed in coordination with the CVIEW system, a roadside safety project intended to improve roadside screening and inspection data, and a credential/permit system.

1.4.3 Mississippi

Mississippi completed development of a CVISN plan in 2001. The study team obtained electronic versions of the program plan and top-level design documents. Projects referenced in the Mississippi CVISN plan include creation of a CVISN-compliant virtual "one-stop" shop, expansion of PrePass programs in coordination with Louisiana, deployment of laptop and cellular phone connectivity for enforcement systems, expansion of combined ports of entry operations with neighboring states, and deployment of ramp sorting capability using weigh-in-motion (WIM) systems.

1.4.4 Louisiana

Louisiana has completed development of a CVISN plan. WSA has obtained Word versions of the program plan and the top-level design documents, and the CVISN Operational and Architectural Compatibility Handbook (COACH). CVISN projects identified in Louisiana include 17 different projects in the general areas of automated safety assurance, credentials, and automated screening.

1.4.5 Texas

Texas completed development of a CVISN plan in 2003. WSA has obtained a PDF version of the Texas CVISN program plan. The plan references nine CVISN projects, including a tax project run by the state comptroller's office, four state DOT projects (registration, oversize/overweight, and registration and licensing projects), and four department of public safety projects.

1.4.6 New Mexico

New Mexico completed a CVISN plan in 2002. WSA has obtained copies of the plan and projects documents. Referenced projects include connectivity between ASPEN and Safety and Fitness Electronic Records (SAFER), expansion of ASPEN to all inspectors at all major inspection sites, and a CVIEW deployment.

1.4.7 Arizona

A CVISN plan has not yet been obtained from Arizona. However, a CVISN test plan document was found on the Arizona DOT web site, along with documentation of a CVISN safety information exchange project for the Nogales border crossing. Other referenced CVISN projects include two safety projects (ASPEN and CVIEW implementation), five credentials projects (including title/regulation projects, IFTA clearinghouse, and electronic credential projects), and a roadside screening project.

1.4.8 California

California's CVISN plans have not yet been identified. The project team will incorporate input from California's CVISN efforts when that information has been located.

1.5 Inventory of ITS Facilities and Stakeholders

This section provides a summary of existing and planned ITS facilities and stakeholders in the I-10 Corridor. Detailed tables of facilities by state are included in the appendices.

1.5.1 Method

Federal, state, and local governments and private sector entities have been planning and deploying ITS infrastructure along the I-10 Corridor for more than a decade. ITS architectures in the corridor were examined to evaluate the current status of ITS deployments in the corridor, and to develop data tables of ITS systems, stakeholders, and stakeholder groups to be used in development of the corridor ITS architecture.

To build these data tables, data representing ITS elements were extracted from architectures along the corridor. Data were obtained from architectures representing every state in the corridor, with the exception of Arizona. Table 1-1 provides a summary of the architectures referenced in the subsequent summary tables.

Not all architectures in the corridor were referenced for this step. In lieu of a statewide architecture, Texas developed a series of architectures for each DOT district. As the architectures are similar in format, it was decided to examine and extract data elements from three of the architectures that I-10 traverses, representing the larger cities and border regions of the corridor within Texas. Arizona's architecture documents containing summary-level data will be incorporated within the final ITS architecture. The Southern California Association of Governments (SCAG) architecture also contained summary-level data.

Table 1-1. ITS Architecture Data Sources

State	Architectures Referenced
California	California statewide architecture*
Arizona	None**
New Mexico	New Mexico statewide
Texas	San Antonio, El Paso, and Houston regional architectures***
Louisiana	New Orleans, Baton Rouge, and Acadiana (Lafayette area) regional architectures
Mississippi	Mississippi statewide architecture, Gulf Coast regional architecture
Alabama	Mobile regional architecture***
Florida	Florida statewide architecture Jacksonville and Pensacola/Tallahassee district architectures

* Detailed architecture provided inventory elements and stakeholders from throughout the state
** Maricopa and Pima architecture documents yielded only summary-level data
*** Alabama and Texas did not develop statewide architectures

1.5.2 Stakeholders and Stakeholder Groups

The architectures examined yielded more than 1,500 elements, representing approximately 360 unique stakeholders. To reduce this number to a usable level for purposes of developing the architecture database, some of the stakeholders were grouped into summary groups, resulting in just over 100 stakeholders and stakeholder groups.

Not all of the stakeholders were grouped. Federal agencies and other entities that serve in consistent roles along the extent of the corridor were left ungrouped. A summary of the stakeholder groupings is shown in Table 1-2.

Table 1-2. Preliminary Stakeholder Groupings

Ambulance Operators	Archive Data Users
Bureau of Indian Affairs	City and County Governments
Commercial Vehicle Operators	Convention Centers
Correctional Facilities	County DOTs
County Emergency Management Agencies	County Governments
County Police	County/Local Public Safety Agencies
County/Local Public Works	County/Local Tax and Revenue Agencies
County/Local Transportation Agencies	Customs Brokers
Drayage Companies	Event Facilities
Federal Bureau of Investigation	Financial Institutions
FMCSA	Hazmat Regulatory Agencies
IFTA	Industry Groups
Intermodal Facilities	International Boundary and Water Commission
IRP, Inc.	Local Broadcast Media
Local Emergency Management Agencies	Local Fire Departments
Local Media	Local Police Departments
Local Street Departments	Local Traffic Generators
Local Traffic Management Agencies	Medical Facilities
Metro Area TMCs	MetroScan
Mexican Governmental Agencies	Municipal Engineering Departments
Municipal Governments	Municipal Public Safety Agencies
Municipal Public Works Departments	Municipal Street Departments
National Guard	National Park Service/U.S. Forest Service
NOAA	Other Local Agencies
Other Local Stakeholders	Other State Agencies
Parish Levee Boards	Parking Operators
Port Operators	Private Carriers
Private Concierge Service Provider	Private HAZMAT Providers
Private Maintenance Contractors	Private Sector Traveler ISPs
Private Tow/Wrecker Providers	Private Weather Information Providers
Probe Information Providers	Public Lands Agencies
Radio ISPs	Rail Operators
Railroads	Refinery Operators
Regional MPO	State Agriculture Departments
State DOT Central Office	State DOT Districts
State DOT Maintenance	State DOT Traffic Engineering
State DOTs	State Emergency Management Agencies
State Environmental Agencies	State Governments
State Motor Vehicle Dept./Div.	State Natural Resources Departments
State Police and Highway Patrol	State Public Safety Depts.
State Regulatory Agencies	State Tourism Agencies
Telematics Service Providers	Toll Facility Operators
Travel Service Providers	Travelers
Tribal Governments	Truck Companies/Shippers
Universities and Colleges	U.S. Army
U.S. Army Corps of Engineers	U.S. Coast Guard
U.S. Customs and Border Protection	U.S. Dept. of Agriculture
U.S. Dept. of Defense	U.S. Dept. of Energy
U.S. Dept. of Interior	U.S. Immigration and Customs Enforcement
Utility Companies	VII Providers

1.5.3 Traffic Management Centers

Because many proposed ITS projects are likely to use some form of center-to-center communication, additional efforts were made to identify all traffic management centers in the corridor. Table 1-3 shows the centers that have been identified from the state and regional ITS architectures. Centers were identified in every state in the corridor, although not all planned centers are currently operational.

1.5.4 Other Corridor ITS Elements

The ITS elements from the inventoried corridor architectures were merged into a single data table. After filtering out elements not related to freight movement, approximately 1,500 elements remained. Table 1-4 provides a summary of the architecture elements and the states in which they were identified.

Table 1-3. Traffic Management Centers in the I-10 Corridor

State	Center Name	Status
California	Caltrans District 11 Intermodal TMC (San Diego and Imperial Counties)	Existing
	Caltrans District 8 Intermodal TMC (San Bernardino and Riverside Counties)	Existing
	Caltrans District 12 Intermodal TMC (Orange County)	Existing
	Caltrans District 7 Intermodal TMC (Los Angeles and Ventura Counties)	Existing
	California Regional TMCs in Districts 7, 11, 8, and 12	Existing
Arizona	Arizona DOT TOC	Existing
	Maricopa County DOT TMC	Existing
	Chandler TMC	Existing
	Gilbert TMC	Existing
	Glendale TMC	Existing
	Mesa TMC	Existing
	Paradise Valley TMC	Existing
	Peoria TMC	Existing
	Phoenix TMC	Existing
	Scottsdale TMC	Existing
	Tempe TMC	Existing
	Tucson Transportation Control Center (TTCC)	Existing
New Mexico	NMDOT Statewide TMC	Existing
	Las Cruces TMC	Planned
Texas	City of El Paso TMC	Existing
	TranStar	Existing
	City of San Antonio TMC	Existing
Louisiana	DOTD ATM/EOC Operations Center	Unknown
	DOTD Statewide Operations Center	Unknown
	Orleans Parish Traffic Control Center	Unknown
	Jefferson Parish Traffic Control Center	Unknown
	District 2 Traffic Operations Center	Unknown
	District 6 Traffic Management Center	Planned
Mississippi	Gulf Coast Region Traffic Management Center	Planned
Alabama	Alabama DOT Traffic Management Center	Planned
	COMTED Traffic Management Center	Planned
	MCTED Traffic Operations Center	Planned
Florida	Bay County Transportation Management Center	Planned
	City of Gulf Breeze Traffic Management Center	Planned
	City of Pensacola Traffic Operations Center	Existing
	City of Tallahassee Transportation Management Center	Existing
	Escambia County Traffic Management Center	Existing
	FDOT District 2 Jacksonville RTMC	Existing
	FDOT District 3 Escambia/Santa Rosa County RT	Planned
	FDOT District 3 Tallahassee RTMC	Planned
	City of Jacksonville Traffic Management Center	Planned

Table 1-4. ITS Elements in Source Architectures

Entity	AL	CA	FL	LA	MS	NM	TX
Alerting and Advisory Systems						x	
Archived Data Management	x	x	x	x	x	x	x
Archived Data User Systems		x	x	x		x	x
Asset Management		x	x			x	x
Border Inspection Administration						x	
Border Inspection Systems						x	
Care Facility			x	x		x	x
Commercial Vehicle		x	x	x		x	x
Commercial Vehicle Administration		x	x	x	x	x	x
Commercial Vehicle Check		x	x	x	x	x	x
Commercial Vehicle Driver			x				
Construction and Maintenance				x	x		
CVO Inspector			x				
Distribution/Logistics Management Provider						x	
DMV			x				
Emergency Management	x	x	x	x	x	x	x
Emergency System Operator				x			
Emergency Telecommunications System	x			x	x		
Emergency Vehicle	x	x	x	x		x	x
Emissions Management			x		x		x
Enforcement Agency		x	x			x	x
Equipment Repair Facility			x			x	x
Event Promoters			x	x	x	x	x
Financial Institution			x			x	x
Fleet and Freight Management		x	x	x	x	x	x
Freight Equipment		x				x	
Information Service Provider	x	x	x	x	x	x	x
Intermodal Freight Depot		x	x	x	x		x
Intermodal Freight Shipper					x	x	
Maintenance and Construction Administrative Systems		x	x				x
Maintenance and Construction Management		x	x	x		x	x
Maintenance and Construction Vehicle		x	x	x		x	x
Map Update Provider				x			
Media		x	x	x	x	x	x
Medical Facility					x		
Multimodal Crossings			x				
Multimodal Transportation Service Provider		x	x	x		x	x
Other Archives	x			x	x	x	
Other CVAS		x	x		x	x	x
Other Data Sources			x				
Other Emergency Management	x	x	x	x	x	x	x
Other ISP	x	x	x		x	x	

Table 1-4. ITS Elements in Source Architectures

Entity	AL	CA	FL	LA	MS	NM	TX
Other Maintenance and Construction Management		x	x	x		x	
Other MCV						x	
Other Parking						x	
Other Roadway		x				x	
Other Toll Administration		x	x				
Other Traffic Management		x	x	x	x	x	x
Other TRM					x		
Other Vehicle						x	
Parking Management			x	x	x	x	x
Personal Information Access		x	x	x		x	x
Rail Operations		x	x	x	x	x	
Remote Traveler Support		x	x	x		x	x
Roadway	x	x	x	x	x	x	x
Roadway (ITS Equipment)							x
Security Monitoring		x	x			x	
Shelter Provider				x			
Social Services Agencies			x				
Storage Facility						x	
Telecommunications System for Traveler Information			x				
Toll Administration		x	x	x			x
Toll Collection		x	x	x			x
Toll Systems							x
Traffic Management	x	x	x	x	x	x	x
Traveler Card		x	x			x	x
Travelers				x			x
Vehicle		x	x	x		x	x
Wayside Equipment			x			x	x
Weather Service		x	x	x	x	x	x
Yellow Pages Service Providers		x		x		x	x

1.6 User Needs Assessment Private Sector Input

As stated earlier, understanding the private sector's information needs is considered critical to the successful development and implementation of ITS projects for the National Freight Corridor. To understand what information commercial vehicle operators and other freight stakeholders using transportation services in the corridor currently find most useful, an extensive phone survey was undertaken. Specifically, the purpose of the telephone survey with truck companies and shippers along the I-10 Corridor was to:

- *define information and service needs for trucking companies operating along the I-10 Corridor*
- *identify opportunities for integration of public and private data and technology applications throughout the I-10 Corridor*
- *examine the possibilities for public/private sector involvement and financial commitment to ITS deployment in the corridor*

1.6.1 Telephone Survey Process

Before any calls were made, a draft interview/survey guide was developed and distributed to members of the Technical Advisory Committee (TAC) for their review and comment. One member of the TAC sought input from a colleague in the trucking industry. The reviewer had few specific comments on the survey questions, but provided the following general comments:

> "Surveys are generally the last thing I am going to have time for during my busy day, and I don't think I am alone. Generally, these folks out here are not going to take [surveys] unless they first are contacted personally by someone that they have a relationship with and that person can explain the value of this to them and request their time and opinion. After the personal request, you might even get some better responses by directing them to a web site to complete this set of questions, allow them to offer some comments such as this, and allow them to review the results of the survey at that web site and see what action is being taken as a result."

Following the review and revision of the survey instrument, TAC members were sent an e-mail message asking if they or anyone in their agency maintained a relationship with trucking companies or shippers through a committee or advisory group structure. None of the TAC members were aware of any existing truck- or freight-related committees in their agencies; however, several offered other agency personnel that might be able to assist in identifying carriers operating in the I-10 Corridor. One of these contacts proved to be extremely useful in providing the names of trucking companies using I-10.

The Mississippi DOT Law Enforcement Division was able to supply a list of motor carriers who had been stopped for safety and weight checks at one of two weight station facilities located on I-10 in the state of Mississippi. After checking the raw data file and removing duplicate and incomplete entries, a total of 422 complete entries remained, including phone contacts. The remaining full carrier records were distributed across the corridor states in the following manner:

Table 1-5. Survey Responses by State

State	Number of Carriers
Alabama	57
Florida	62
Louisiana	77
Mississippi	84
Texas	32

These carrier lists were used by several WSA regional offices to conduct phone interviews. Carriers in New Mexico, Arizona, and California were contacted using yellow pages listings.

As of April 13, 2007, approximately 300 carriers had been contacted, resulting in 27 completed surveys. A copy of the final survey/interview guide is included as Appendix B.

1.6.2 Web Survey Process

Due to the relatively low response rate using phone contacts, a somewhat shorter version of the phone survey was developed into a web-based survey using the “SurveyMonkey” web site. To communicate the need and purpose of the survey, an e-mail was sent to the state trucking association. The web survey form and e-mail appear as Appendix C.

Chapter 2

User Needs, Institutional Issues, and the Corridor Vision

2.1 Introduction

This chapter presents the transportation needs of the I-10 Corridor as identified by the corridor stakeholders. Identifying user needs is necessary to provide input to subsequent efforts in the development of a corridorwide intelligent transportation systems (ITS) architecture. User needs were identified through discussions with the stakeholder representatives and review of documents provided by stakeholder groups. The focus of the process is on those transportation needs that may be addressed by the application of ITS technologies.

For the I-10 Corridor ITS Architecture, user needs are defined as the reasons the stakeholders are participating in the ITS architecture process – or, more specifically, what stakeholders would most like to gain from this process. Identification of user needs began with a review of previous research. The review was intended to identify commercial vehicle congestion issues and travel time information needs on a corridorwide basis. Information gained from the review was then combined with information provided by I-10 stakeholders and information obtained from the various ITS architectures in the corridor. The result was a compilation of needs of I-10 freight corridor users.

The list of user needs was then used to develop the corridor ITS program and architecture. User needs that can be addressed by ITS technologies are mapped to elements of the National ITS Architecture such as User Services and Market Packages in this chapter. Institutional issues, including opportunities and barriers, are also identified, based on the identified user needs. Finally, this chapter defines the I-10 Corridor vision and supporting goals.

2.2 Urban Congestion and Impacts on Commercial Vehicles

Numerous studies have attempted to evaluate the impact of traffic congestion in the United States. A 1999 Federal Highway Administration (FHWA) study evaluated the costs of both scheduled (predictable) and nonscheduled (unpredictable) delay to motor carriers. The study concluded that while savings in transit time were valued at between $144 and $192 per hour, savings in unscheduled delay were even more valuable, as high as $371 per hour.[1] A later Texas Transportation Institute (TTI) study noted the possibility that the increasing duration of periods of congestion could ultimately have serious financial impacts on motor carriers.[2]

In the 2005 Urban Mobility Report, authors David Schrank and Tim Lomax estimated congestion costs in the United States at 3.7 billion hours of delay annually, wasting 2.3 billion gallons of fuel.[3] In the report, the authors ranked 85 urban areas in terms of their estimated annual delay per traveler (based on

[1] *Valuation of Travel-Time Savings and Predictability in Congested Conditions for Highway User-Cost Estimation*, NCHRP Report 431, National Academy Press, 1999.

[2] *Evaluation of U.S. Commercial Motor Carrier Industry Challenges and Opportunities, Final Report*. Federal Highway Administration, March 31, 2003. Available online at http://ops.fhwa.dot.gov/freight/publications/eval_mc_industry/index.htm.

[3] David Schrank and Tim Lomax, *2005 Annual Mobility Report.* Texas Transportation Institute. Available online at http://mobility.tamu.edu.

daily commute in peak periods) and a "travel time index" (the ratio of travel time in peak periods versus travel time in free-flow conditions). Table 2-1 presents information for 12 urban areas along the I-10 Corridor. Three of the top 10 congested areas in the United States lie on the I-10 Corridor, when measured by annual delay per traveler; Los Angeles (including Long Beach and Santa Ana), Houston, Riverside (including San Bernardino), and Phoenix rank in the top 20. While the TTI congestion analysis does not specifically address trucking operations on the I-10 Corridor, it does indicate that congestion is a serious issue in many parts of the corridor.

Table 2-1. Mobility Measures for I-10 Urban Areas

Urban Area Along I-10	Annual Delay per Traveler		Travel Time Index	
	2003 Hours	Rank	2003 Value	Rank
Los Angeles, CA	93	1	1.75	1
Houston, TX	63	5	1.42	6
Riverside, CA	55	9	1.37	14
Phoenix, AZ	49	18	1.35	20
Tucson, AZ	36	30	1.31	26
Jacksonville, FL	34	32	1.18	48
San Antonio, TX	33	33	1.22	35
New Orleans, LA	18	54	1.19	42
El Paso, TX-NM	18	54	1.17	52
Pensacola, FL-AL	18	54	1.12	59
Beaumont, TX	14	63	1.07	77

In business environments, timely delivery of goods is important and congestion is a costly impediment to trucking company operations. One way to mitigate unpredictable trip times that often result from traffic congestion is to provide better information about traffic conditions and alternate routes. A number of previous efforts have examined the feasibility and attractiveness of advanced traveler information services for commercial vehicle operations/advanced traveler information systems (CVO/ATIS) that provide congestion, routing, and other travel information aimed specifically at the trucking industry. In 2003, the Minnesota Department of Transportation (Mn/DOT) funded a study that examined the status of CVO/ATIS deployments across the United States and the familiarity of trucking industry personnel with ATIS technologies and available information. The review of existing CVO/ATIS deployments found that only a few 511 systems offered CVO-specific information, limited to vehicle load and speed restrictions. In addition, the researchers found that as of 2003 only three CVO/ATIS projects had been operationally tested, including:

- *FleetForward – An operational test conducted in the I-95 Corridor during 1999-2000*
- *FleetOnline – A web-based application for traffic and real time routing on the Gary-Milwaukee-Chicago Corridor*
- *Virginia DOT I-81 Truck Fleet Support Program – a pilot test operated during summer 2002 evaluated the usefulness of CVO-directed information during a major planned construction program*[4]

The Minnesota study also conducted in-depth interviews with six major trucking companies with operations in the state. Key findings from the interviews included the following:

1. ***Information that is easily accessible, reliable, and up-to-the-minute is the most important aspect of traveler information.***

[4] Additional information about these systems can be found: http://www.its.dot.gov.

2. ***Improved reliability of the roads, lower operating costs, and safer deliveries are the key benefits of providing traveler information.***

3. ***Truck size and weight restrictions, weather conditions, safety and security alerts, traffic conditions, and routing information based on driving conditions and restrictions are the most important types of traveler information needed from motor carrier companies interviewed.***

4. ***Location, direction, and estimated travel time to consignee; information from the state when route restrictions have changed; a way to receive more information on detours, construction, and weather conditions; and directions for locations where travelers could stop and receive information and pamphlets on tourist and traveler information are other useful types of information that private companies would like to have offered.***

5. ***Electronic roadside signs are the preferred method to receive traveler information by drivers. This method requires no effort from the driver to receive the information and it is directed at the drivers in the impacted region.***

6. ***Better marketing materials, such as booklets or pamphlets, will help drivers make better use of information. Drivers can take these materials with them and consult them to better understand what information is available and how to use it.***

7. ***DOTs or other agencies typically have a list of companies that operate commercial vehicles in certain areas. When the area is or will be affected by an event, a mass notice (e.g., e-mail) could be sent to the companies affected in that area prior to the event.***[5]

In 2001, University of California researchers conducted computer-aided phone interviews with more than 700 trucking companies operating in California to better understand the value and benefits of various types of traveler information to the trucking industry. The study focused on information delivery via Internet-enabled wireless devices. Thirty-six percent of the managers surveyed said that congestion was a serious or critically serious problem for their businesses. The authors concluded that the value of different ATIS information was largely dependent upon the type of trucking operation. “Locations of freeway incidents and lane closures,” “weather information,” and “travel times on alternative routes” were most frequently described as important information by the carriers.[6]

2.3 I-10 Motor Carrier Surveys

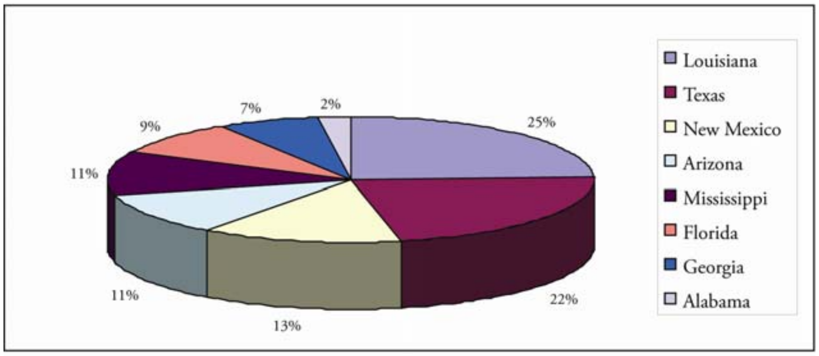
To gather specific information from freight transportation service providers using the I-10 Corridor, a phone and web-based survey of trucking companies located in states traversed by the I-10 Corridor was conducted. Figure 2-1 shows the distribution of survey respondents by state.

The responses highlighted in this section were recorded from telephone interviews conducted by the WSA team. The initial survey effort concentrated in March and April 2007 focused on Eastern and Gulf Coast areas of

[5] Commercial Vehicle Operations/Advanced Traveler Information Systems: A Summary of National Practice. Prepared for Mn/DOT by TranSmart Technologies, Inc., June 2003, pg. 39.

[6] Thomas Golob and Amelia Regan, *Trucking Industry Preferences for Driver Traveler Information Using Wireless Internet-enabled Devices. 2003 TRB Annual Meeting CD ROM, pg. 5.*

Figure 2-1. I-10 Trucking Company Respondents by State



the I-10 Corridor. The majority of the carriers contacted in the initial round of surveys were generated from a list of carriers passing through permanent weigh stations along I-10 in the state of Mississippi. Using the list provided by Mississippi Department of Transportation (MDOT), a total of 221 carriers were contacted by phone, resulting in 35 completed survey responses. A second round of surveys was conducted in April and May 2007, focusing on states along the western portion of the corridor. Most of the contacts made in western states were generated by "Yellow Pages" directories. In total, more than 300 carriers were contacted by phone, resulting in 45 complete survey responses. Completed responses were received from carriers based in all corridor states except California.[7]

The survey team also developed an Internet version of the survey instrument. Internet responses were processed using the "SurveyMonkey" web site. The web link and a cover letter to state trucking associations asking for their assistance were distributed to members of the I-10 Technical Advisory Committee (TAC) as another option for gaining additional input. The two survey instruments are found in appendices B and C.

2.3.1 Types of Carriers

To better understand how traveler information services might apply or be used by different sectors of the trucking industry, a brief description of several key industry segments are provided below.[8]

Truckload carriers do not base their business model on regular route services, but instead deliver shipments directly to a recipient and try to pick up another truckload shipment at or near the first delivery point for a "backhaul" load. Due to the direct delivery nature of the service, there is typically no need for terminals, distribution centers, or regularly scheduled routes for the carrier to remain competitive.

Less Than Truckload (LTL) and Small Package Carriers typically consolidate many smaller shipments from multiple shippers located in a common area or region, sort them at dock facilities according to common designation, and then line-haul trailers to a destination dock for delivery. LTL shipments are usually less than 10,000 pounds per load. LTL

[7] Follow-up efforts to potential California respondents did not result in additional surveys. The survey team's experience suggests that this may indicate other recent survey efforts.

[8] Much of the information provided in the truck segment descriptions was provided by the American Transportation Research Institute (ATRI), and was adapted from the American Trucking Trends 2004, from the American Trucking Association.

shipments require multiple terminal locations and are clustered according to a hub and spoke distribution network. Most LTL drivers are unionized, and generally paid by the hour.

Private Carriers are operated by businesses whose primary business is something other than transportation. Private carrier fleets may be operated by manufacturers, distributors, retailers, and other businesses operating trucks as an internal value-added function primarily to meet their own business shipping needs. While private truck fleets primarily serve a single company, private carriers are allowed sell unused backhaul capacity on a for-hire basis. Private fleets comprise the largest single segment of the trucking industry, representing nearly 76 percent of all trucks that are registered in the United States. Most private truck fleets are used in closed loop applications, allowing significant control of multistop scheduling. A private truck trip averages 71 miles, and most (75 percent) are less than 500 miles.

Bulk and Specialized Carriers transport specific types of goods including construction and military materials, oversize/overweight items, and hazardous materials. Many carriers have specialized commodities in addition to more traditional truckload goods. The specialized carrier market operates according to dedicated business segments and is often terminal-specific according to which materials are being transported (e.g., liquid and dry chemicals). The specialized carrier market is characterized by closed loop operation and trucks often operate with 50 percent empty miles. Tank trucks are often considered the most specialized type of carrier. They primarily haul bulk commodities such as petroleum products, chemicals, and intermediate products such as paint, solvents, and cement. More than 70 percent of tank trucks transport hazardous materials.[9]

Drayage carriers shuttle intermodal containers between ports, railroad terminals, local consolidation facilities, and shippers. Drayage carriers' business is focused on local transportation movements typically intracity or to regional intercity destinations. The demand for drayage carriers is derived from increased maritime and rail activity into/out of local ports. There is a high degree of variability in individual capabilities and specifications. Transportation efficiency is usually accounted for on a time-based rate structure and trailers are often owned by several different individuals.

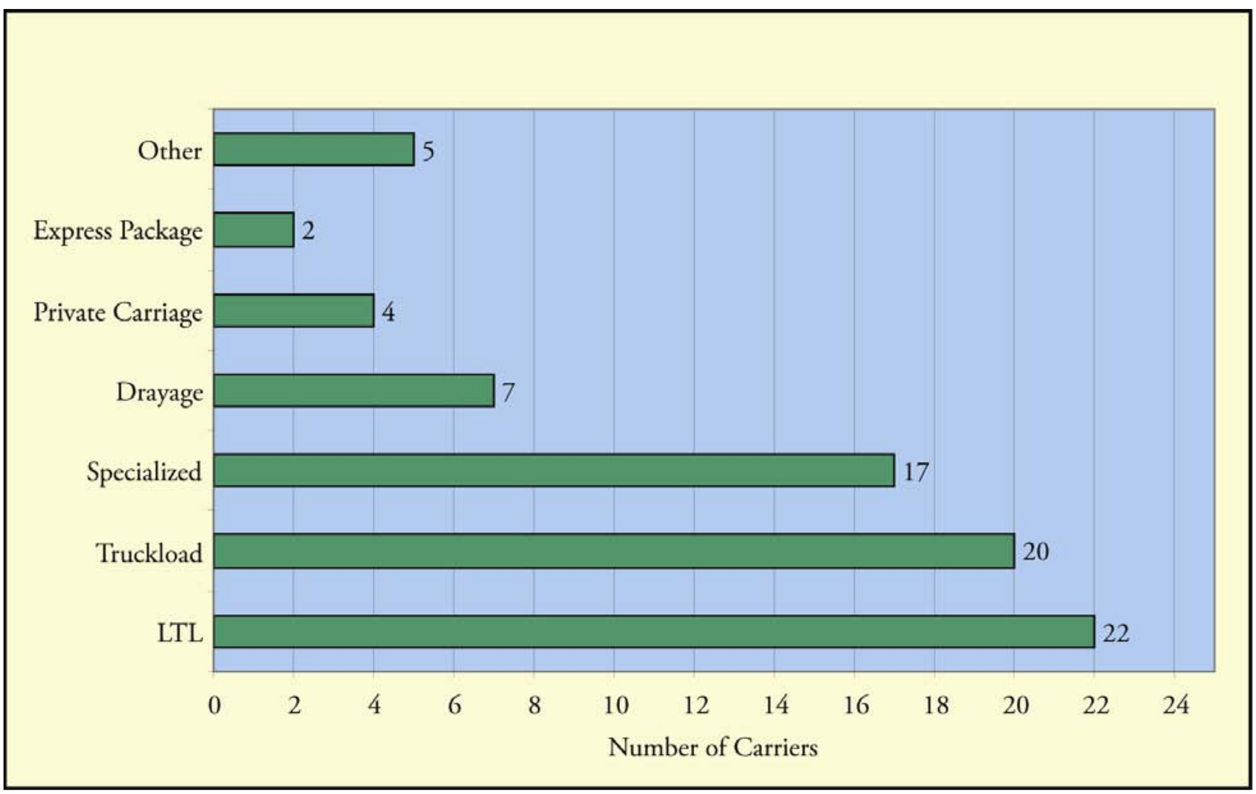
[9] National Tank Truck Carriers, About the Industry. Available online at http://www.tanktruck.net/links/index.html.

2.3.2 Truck Transport Services Offered by Respondents

Respondents were first asked to indicate the primary types of trucking services they provide. Figure 2-2 indicates a wide cross section of carriers that haul freight with different operating characteristics and highway infrastructure needs. Because many of the companies surveyed offer more than one type of service, the number of service type responses exceeded the number of carriers interviewed. "Truckload" (TL) services were the most common type of trucking service offered by carriers contacted, followed by "Less-than-Truckload" (LTL) and "Other."

Most of the survey respondents represented "for-hire" trucking firms that offer more than one type of service, primarily LTL or TL services. Specialty carriers (e.g., oil rigging, heavy equipment hauling, or hazmat transport) were the third most commonly referenced class of service. The "other" category included household goods movers, towing services, and several passenger transport service provides that completed the survey.

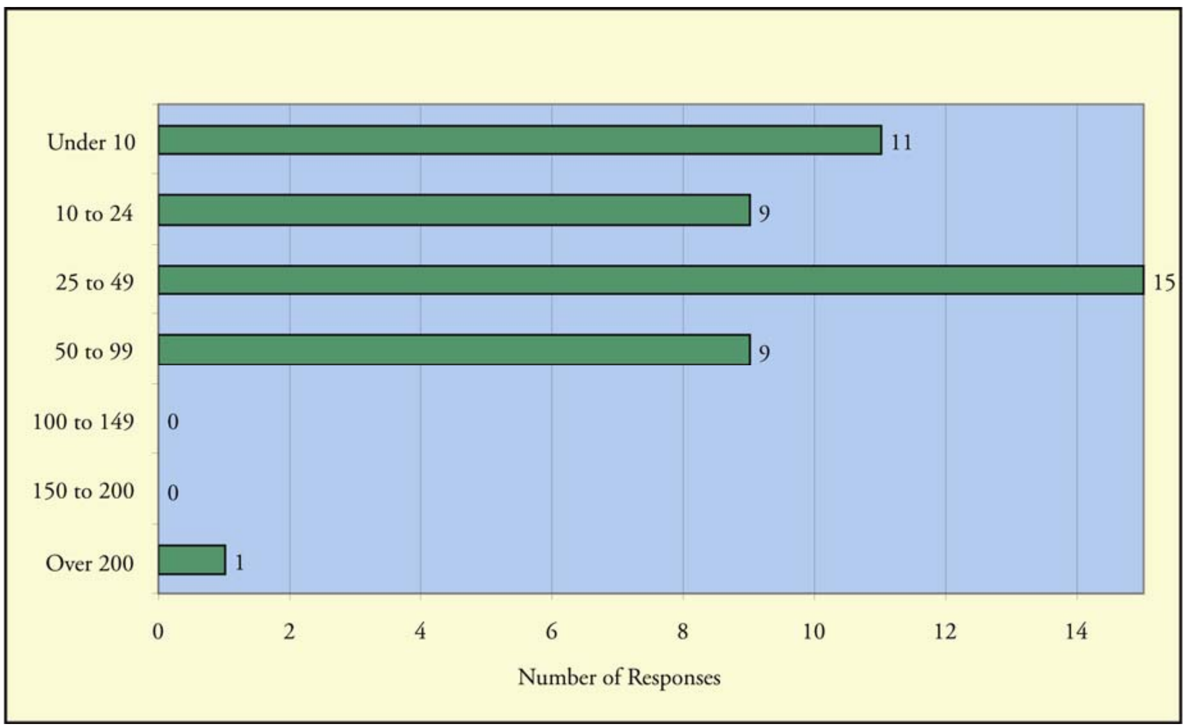
Figure 2-2. Trucking Services Offered by Responding Carrier



2.3.3 Number of Truck Assets by Respondent

The majority of the respondents that completed the survey were small- to medium-sized trucking companies. Overall, the size of the trucking firms responding to the survey operated on average 38 trucks. Forty-four percent of the respondents operated fewer than 25 trucks, and another 33 percent operated between 25 and 49 trucks. Only one respondent operated more than 200 trucks. Figure 2-3 shows the distribution of fleet sizes for responding carriers.

Figure 2-3. Number of Trucks per Company Surveyed



2.3.4 Current Technology

As shown in Figure 2-4, the majority of the respondents use two-way radio technologies as their primary means to communicate information to drivers en-route. Radio was chosen as the number one option by 37 respondents. Citizens' band (CB) radios where the most common type of radio reference, however "walkie-talkies" and "Nextel" were also referenced as a two-way radio technologies in current use. The next most common technology for communicating with drivers was by cell phone. Eight respondents stated that cell phones were their primary means for communicating with drivers, while only three respondents indicated using on-board computers to communicate with drivers.

Figure 2-4. Communication Technologies Used by Operators

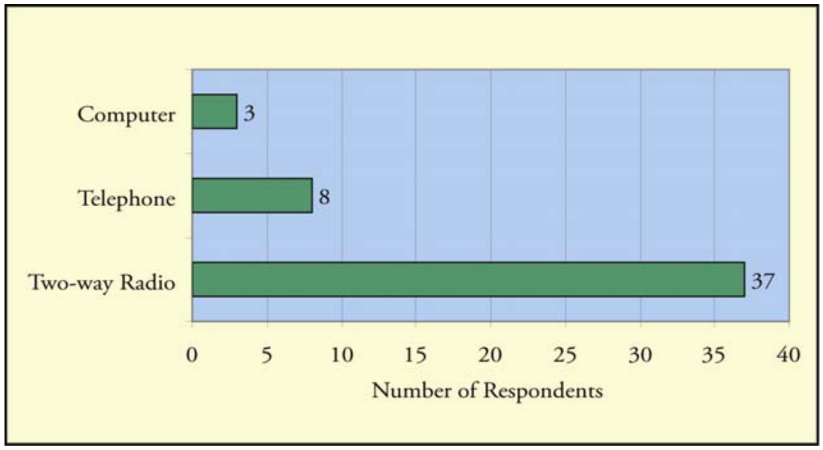
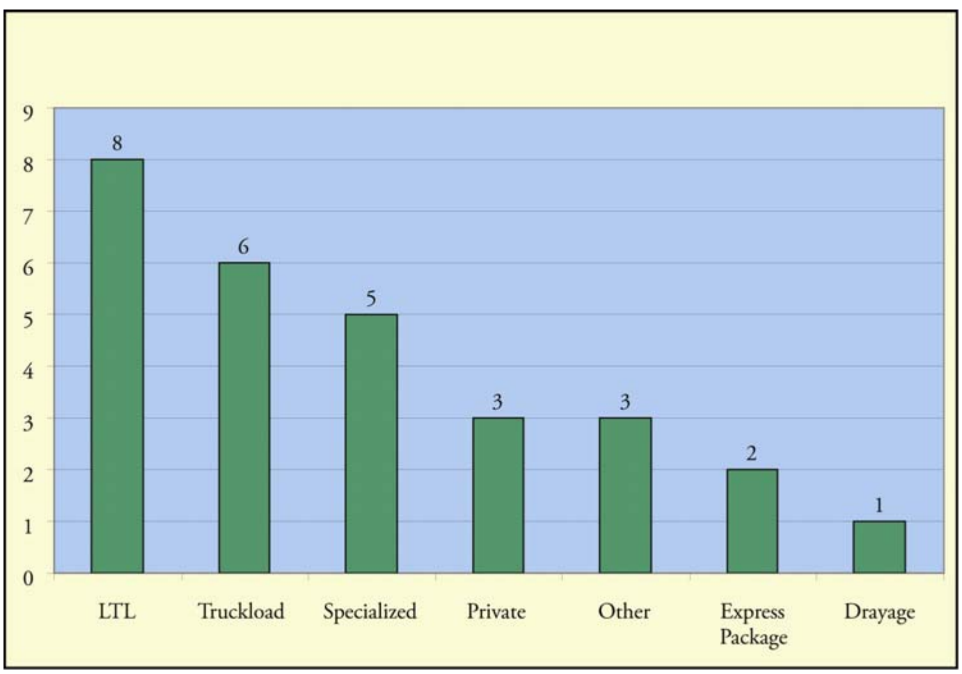


Figure 2-5. Carriers Providing Real Time Information by Carrier Type



2.3.5 Delays

The carrier survey asked respondents to name the most common reasons they experience delays when operating trucks on the I-10 Corridor. Not surprisingly, respondents reported that congestion caused by traffic volumes was the number one factor resulting in truck travel delays. The second most common response was delay due to traffic crashes or incidents, followed by construction delays. Figure 2-6 shows the counts of reasons for travel delays. Table 2-2 provides additional details regarding the responses that carrier representatives provided.

Figure 2-6. Common Reasons for Motor Carriers Delays

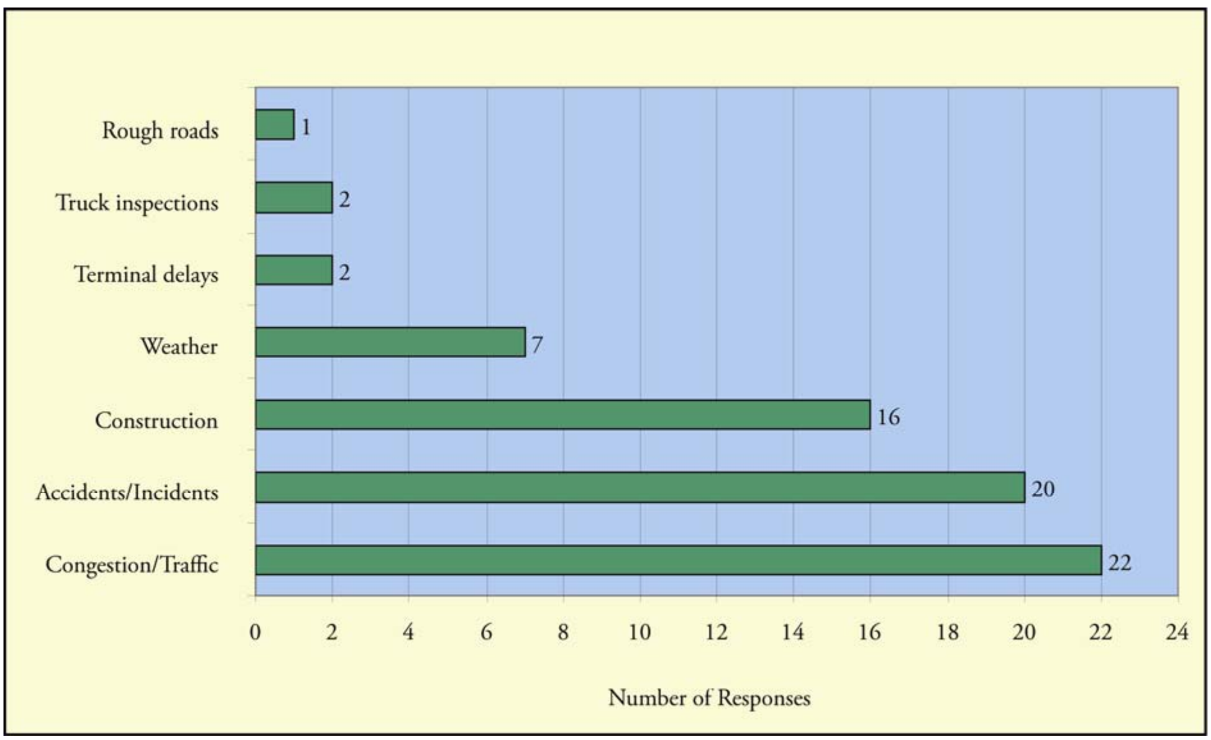


Table 2-2. Travel Delay Response Details from Carriers that Experienced Delays

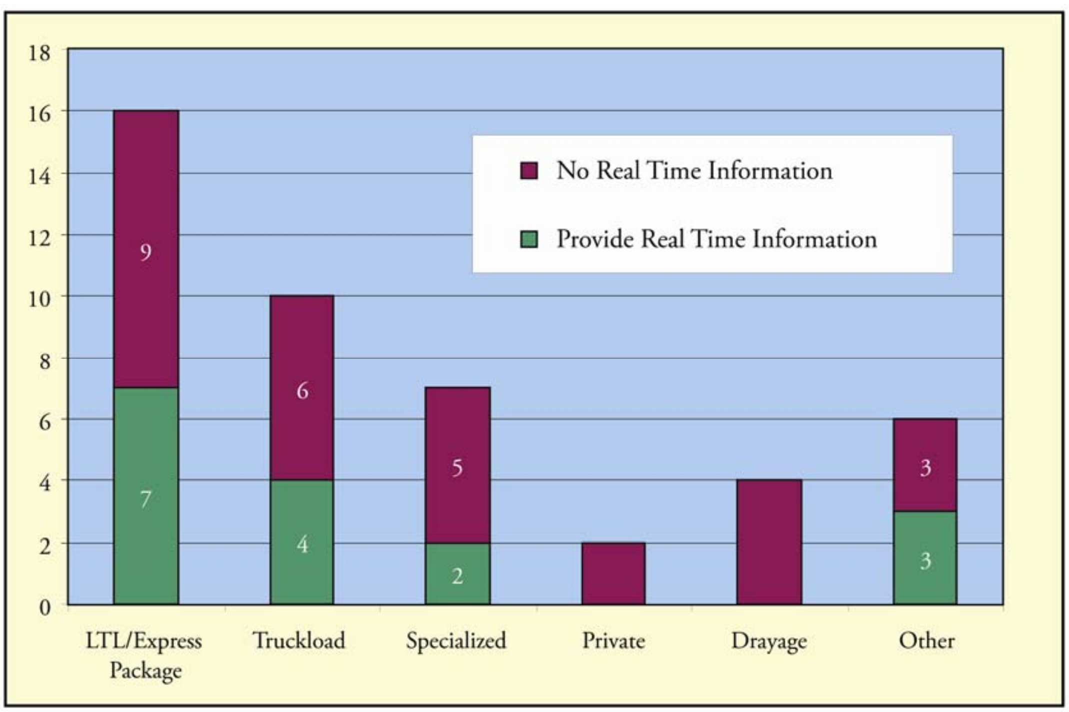
Area of Congestion	Specific Comments
BW8 E to BW8 W	Construction on the west side, congestion and accidents on the east side (I-45 the divider)
El Paso to Mississippi	Bottleneck at BW8 at Eldridge where freeways converge , accidents within I-610 Loop, construction near Baytown, winter ice storms
Houston to Lafayette	Construction, incidents
Anahuac to TX/LA line	Construction
CA to Split with I-20 near Kent/Balmorhea	Accidents, windstorms (Las Cruces, NM to Lordsburg, NM)
Odessa to Phoenix	Congestion
Houston to Louisiana	Construction, traffic
SE states	Terminal turnaround delays
Grand Bay to Pensacola	High traffic volumes AM and PM, not enough lanes Grand Bay to Mobile
Louisiana	accidents, inspections, weather, congestion
Jacksonville to California	Rough pavement
Florida to Rte. 75	Louisiana bridges
SE Mississippi and Louisiana	Construction, recurring delays in New Orleans and Baton Rouge
El Paso to Houston	Traffic, construction zones west of San Antonio
San Antonio to Houston/ Del Rio	Construction, traffic, trucks hitting deer and hogs at night (going west)
Texas	Local SA traffic, construction, and accidents
California and Texas	Weather, breakdowns
El Paso to Phoenix/CA	Traffic in Phoenix, dust storms in NM
Deming to Lordsburg, NM	Terminal turnaround delays
Las Cruces to AZ state line	Weather–wind and dust storms
Long Beach to Ocean Spring	Rush Hour Congestion – I.H. 10 at 49
San Antonio to Jacksonville	DOT inspections

2.3.6 Real Time Information

About one-third of the responding carriers (13 of 45) indicated that they provide real time information to their drivers. To better understand the carrier segments most likely to be interested in technology applications, each carrier was assigned to a primary service category based on their responses and on their advertised services as described in web pages or telephone directories.

Figure 2-7 shows the portion of carriers by type that provide real time traffic information to drivers. The responses suggest an opportunity for carriers to use technology to assist in relaying information to their driver base; however, many carriers operate on slim margins, and are reluctant to invest in technology such as on-board computers that enhance their ability to transmit information.

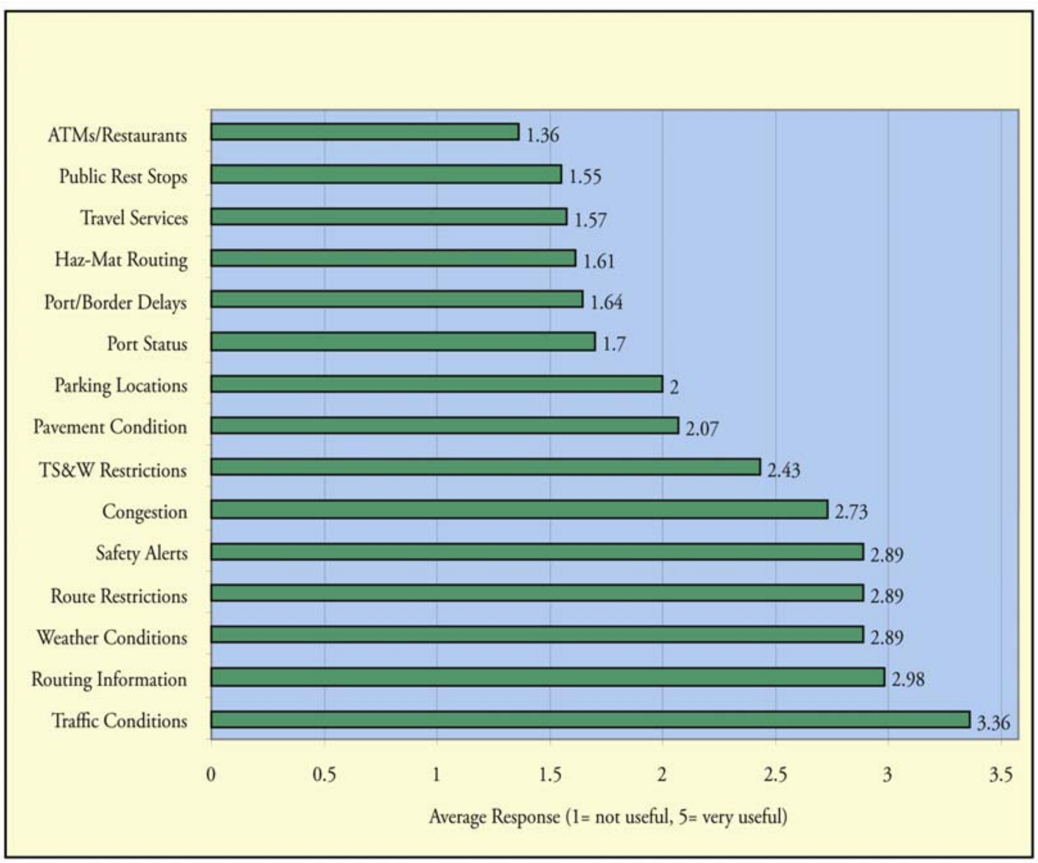
Figure 2-7. Respondents Providing Real Time Information to Drivers



2.3.7 Travel Information

To evaluate the importance of various types of traveler information, carriers were asked which types of information were most important. Figure 2-8 shows a summary of responses. The most important and useful element was updated traffic conditions, followed by routing information and weather conditions. Although knowledge of traffic conditions ranked highest, the average rating was just 3.36 on a 5-point scale, suggesting that the need is not particularly critical. Carriers were also asked about timeliness and willingness to pay for each of the types of information queried through the survey. Additional information on the most popular types of information is provided in the following series of figures.

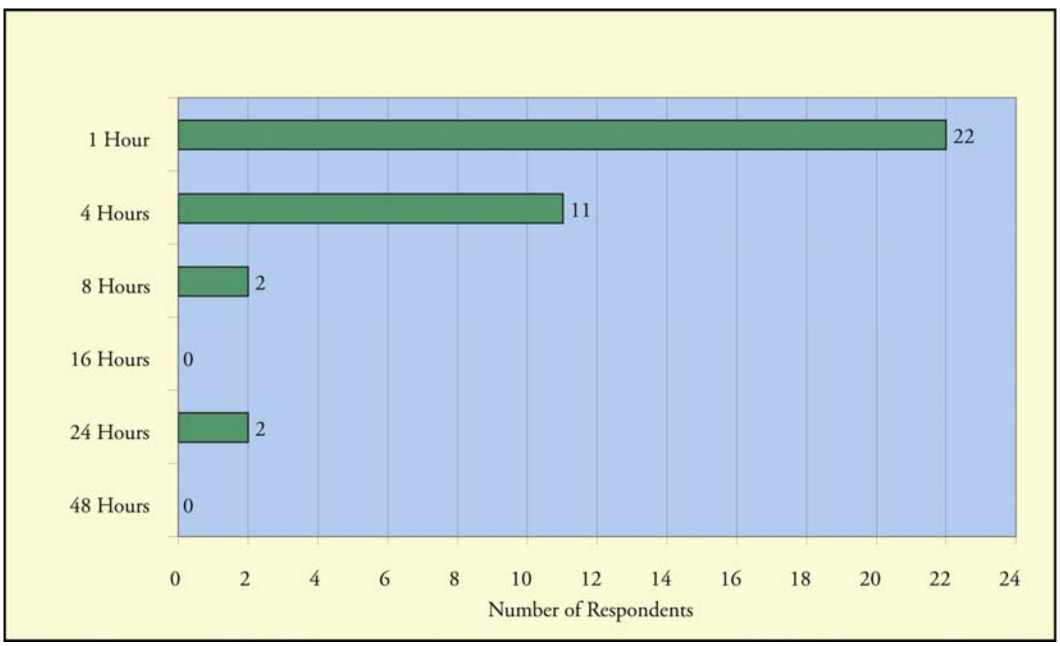
Figure 2-8. Important Traveler Information for Carriers Using I-10



2.3.8 Traffic Conditions

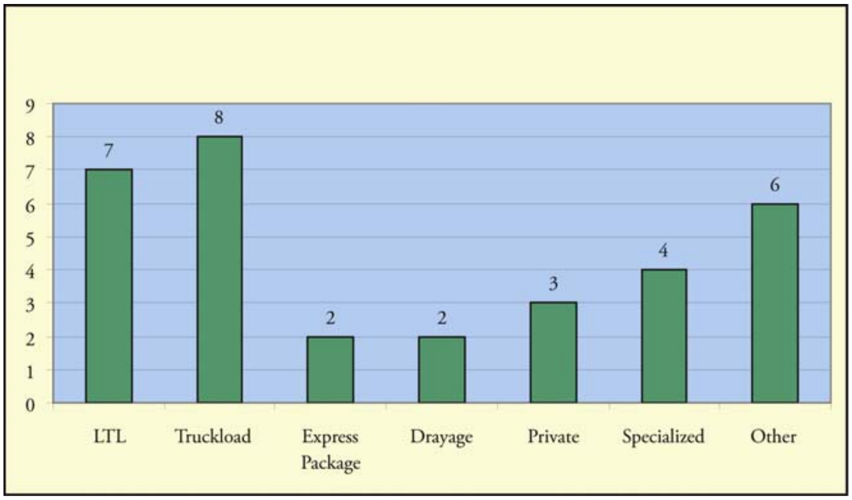
When carriers were probed about traffic condition information, most indicated that receiving traffic information from one to four hours in advance of the condition would provide the most usefulness. Figure 2-9 shows that 22 respondents stated that one hour is the necessary lead time to be aware of traffic conditions and 11 respondents indicated that four hours was the necessary advanced notice. Figure 2-10 shows that when asked about willingness to pay for real time traffic condition information, slightly less than one-half of the for-hire carrier segments of the trucking industry indicated they would be willing to pay for reliable, timely traffic information.[10]

Figure 2-9. Timeliness of Traffic Condition Information



[10] The number of responses to the question regarding willingness to pay for information services was lower than for other questions due to the position of the question at the end of the survey, and some respondents choosing not to complete the entire survey. Thirty-seven responses were received to the willingness to pay questions.

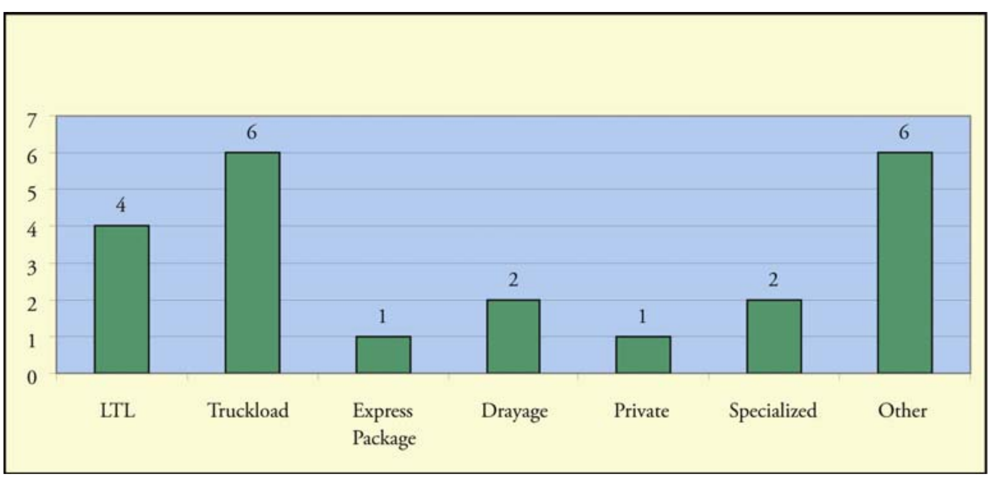
Figure 2-10. Willingness to Pay for Traffic Condition Information by Carrier Type



2.3.9 Routing Information

In addition to knowing where traffic congestion exists, carriers were also interested in knowing how to get around or avoid traffic congestion. Figure 2-11 shows that just over one-third of the responding carriers indicated a willingness to pay for routing information to avoid traffic congestion. Alternate routing information was most important to truckload carriers and to passenger services.

Figure 2-11. Carriers' Willingness to Pay for Routing Information by Carrier Type



2.3.10 Weather Information

During the development of the ITS Concept of Operations for the I-10 Corridor, weather events were highlighted as a major factor contributing to major delays along the corridor. Hurricanes and fog have been blamed for major devastation and multiple vehicle crashes on the eastern end of the corridor, while earthquakes, dust storms, and snow storms have created major havoc in the mid and western end of the corridor. Unsurprisingly, weather condition information ranked high among carriers surveyed as important information. Figure 2-12 and Figure 2-13 show carriers' responses to timeliness and willingness to pay for weather-related information. While many believed weather information to be important, relatively few were willing to pay for the information. One possible reason that carriers are unwilling to pay for weather information is that it has become more readily available through various media outlets.

Figure 2-12. Timeliness of Weather Information

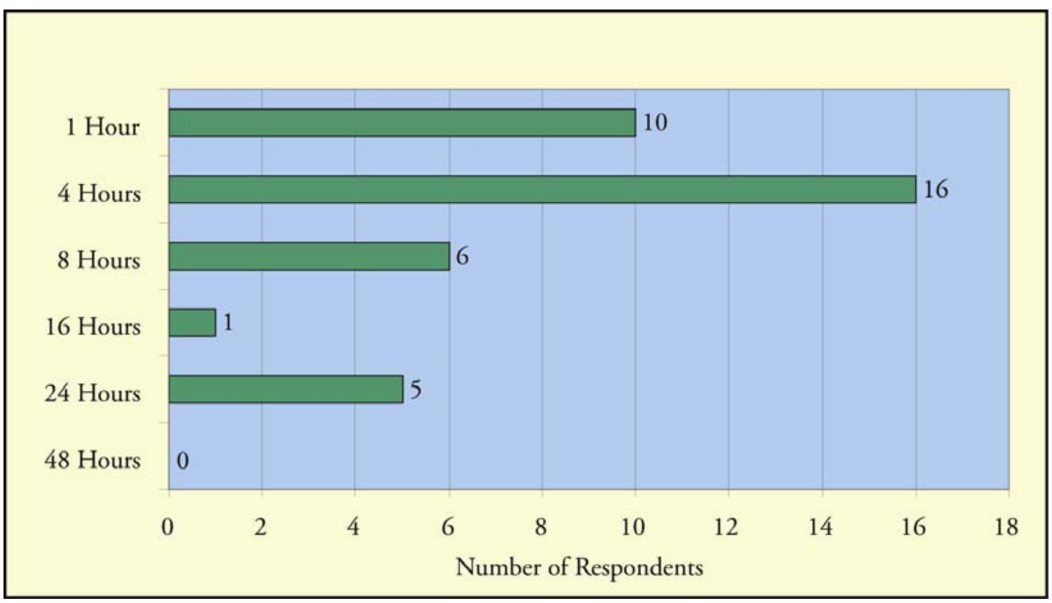
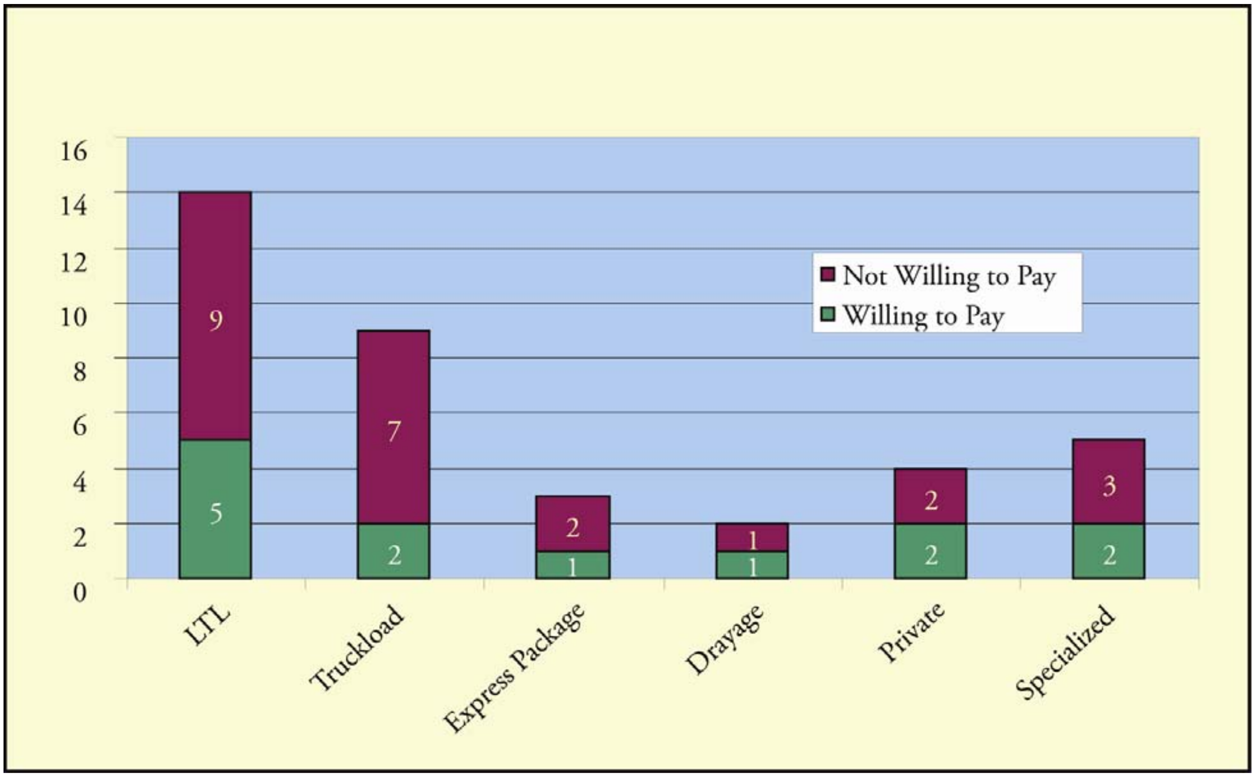


Figure 2-13. Willingness to Pay for Weather Condition Information by Carrier Type



2.3.11 Truck Size and Weight Information

Transmission of truck size and weight restrictions was not considered as critical as other types of time-sensitive data. Relatively few carriers were willing to pay for such information. This may suggest that information on size and weight restrictions is more appropriate for distribution via a web site. Figure 2-14 and Figure 2-15 summarize the timeliness and willingness to pay for size and weight restrictions.

Figure 2-14. Transmission of Truck Size and Weight Information

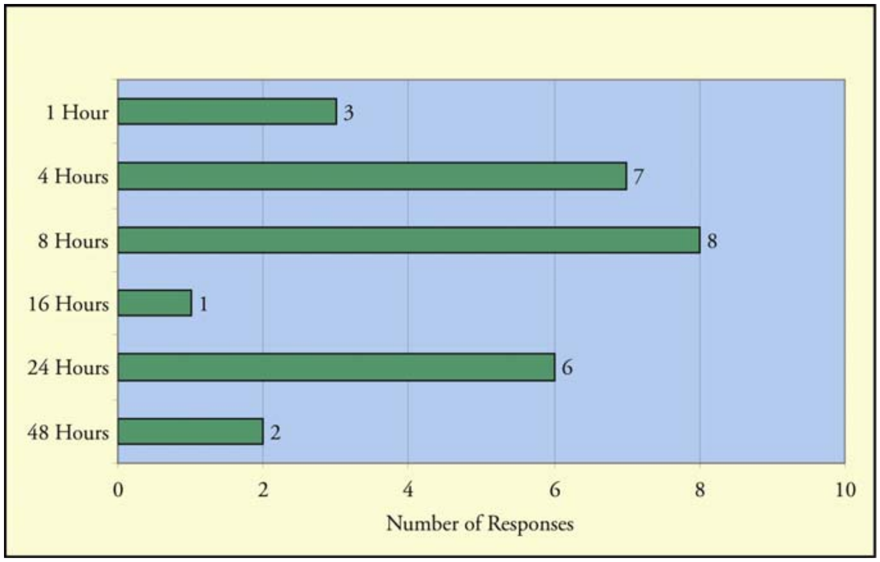
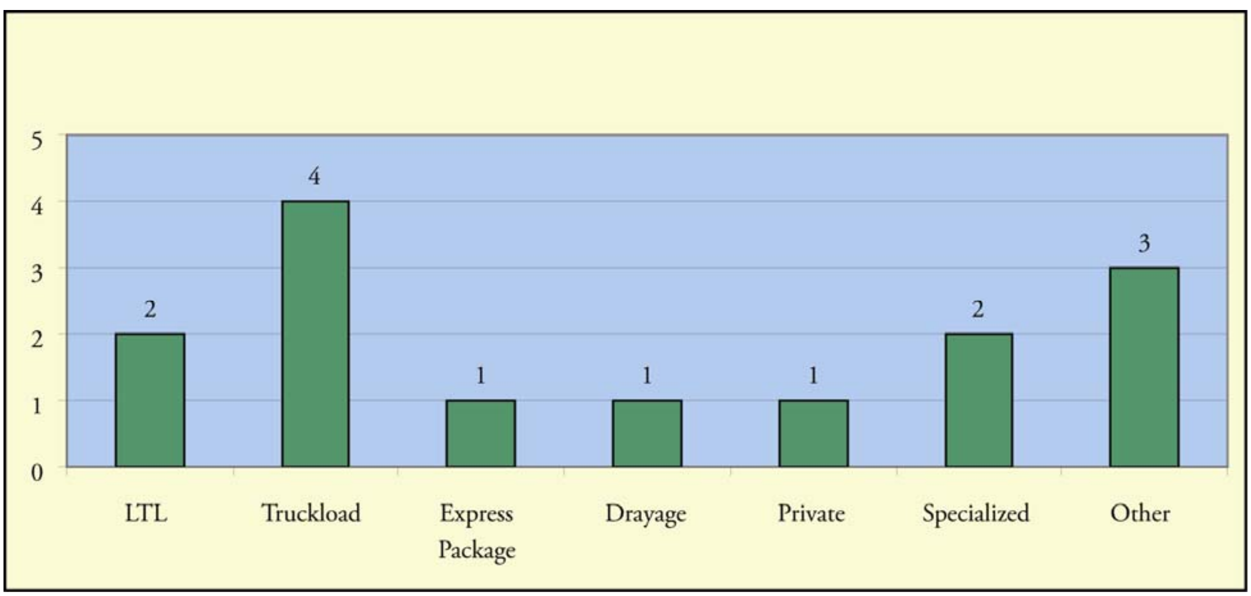


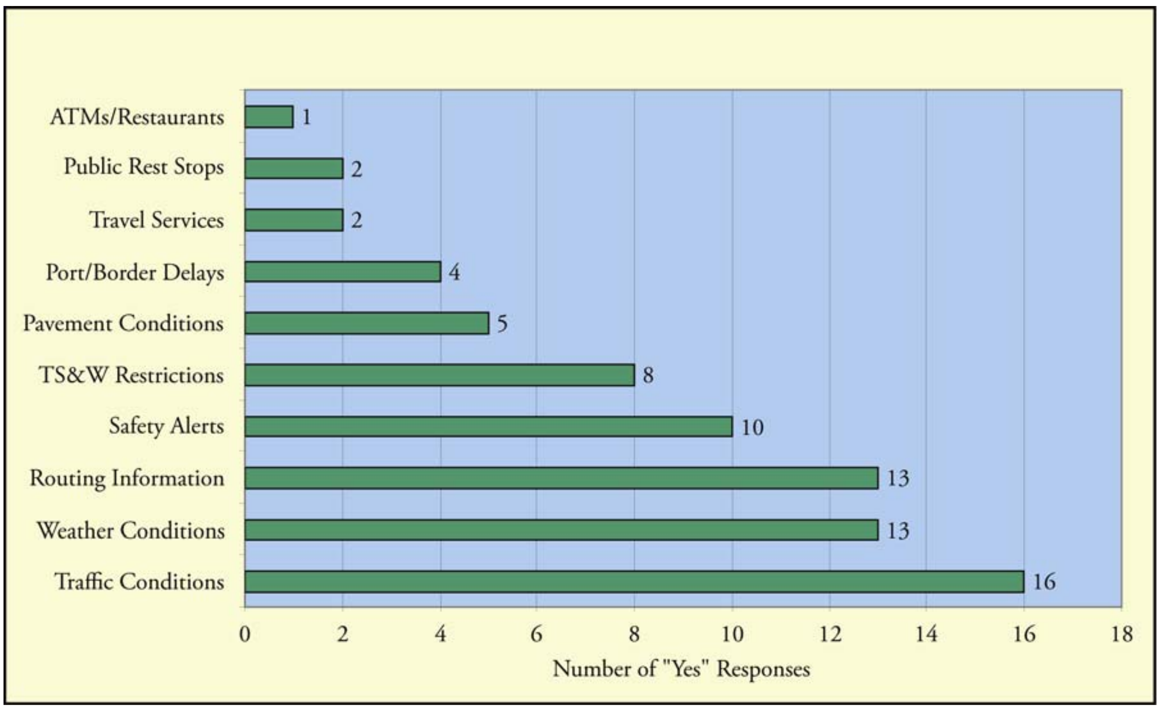
Figure 2-15. Willingness to Pay for Truck Size and Weight Restriction Information



2.3.12 User Fees for Travel Information

The responses from the carriers surveyed indicated a willingness to pay for information pertaining to traffic conditions, weather conditions, and routing information. Figure 2-16 shows that 16 respondents indicated that they are willing to pay for traffic conditions information and 13 respondents are willing to pay for weather conditions and routing information.

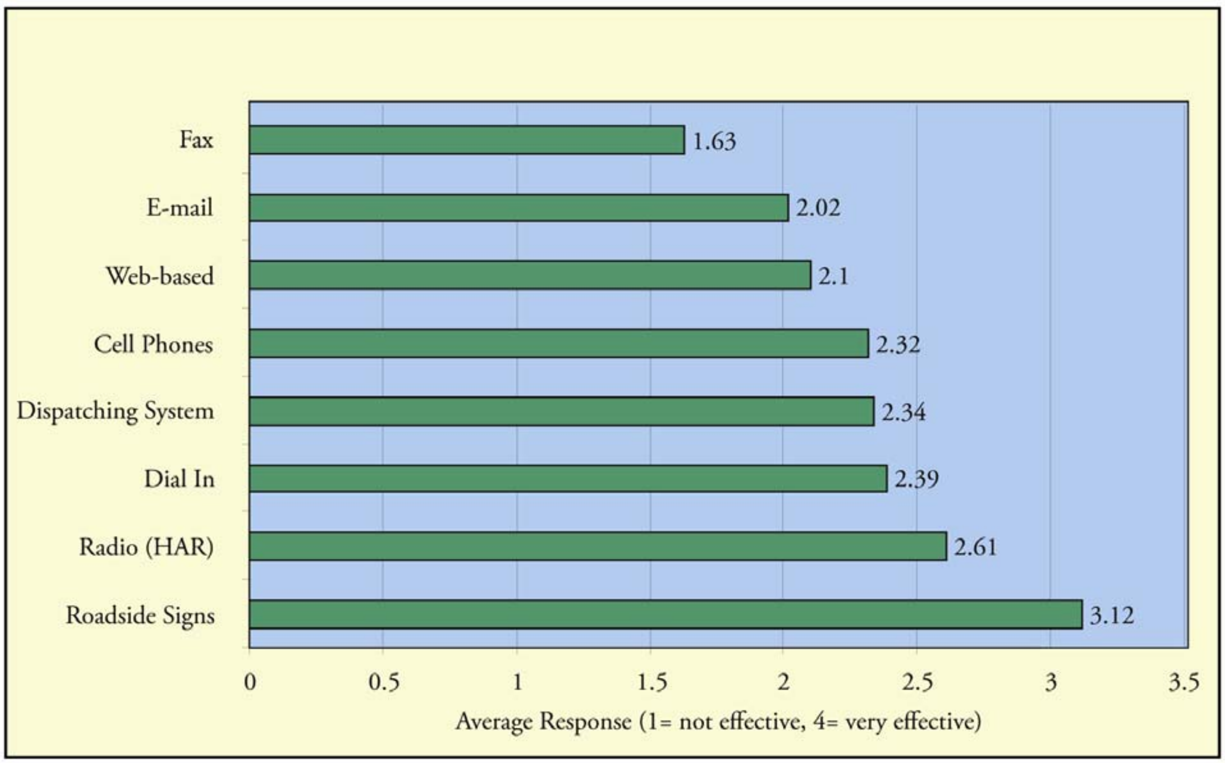
Figure 2-16. Overall Summary of Willingness to Pay



2.3.13 Technology Use

Respondents found road signs to be the most effective technology for conveying information to operators. Figure 2-17 shows the rank of the various technologies in the survey. Road signs scored an average of 3.12 on a 4-point scale of effectiveness. Highway advisory radio followed, averaging 2.61. Dial-in information systems for drivers averaged 2.39.

Figure 2-17. Most Effective Technology used by Carriers Surveyed



2.3.14 Key Survey Findings

The need for current traffic condition information stood out as one of the most important elements of travel information to the surveyed carriers. The needed traffic information includes both accident and incident information and traffic congestion information, and typically includes details of particular occurrences and potential delays along the corridor.

The ability for carriers to obtain this information is critical for carriers to satisfy customer delivery requirements. Carriers were generally willing to pay for services that can transfer this information effectively. However, many carriers currently do not have extensive access to newer technologies. Companies surveyed reported a high dependence on CB radio to convey information to operators. CB radio is often the quickest method for drivers to obtain travel information, due to equipment familiarity and ease of access.

Limited technologies can result in information gaps within a carrier. Information that is of immediate value to an operator can be even more valuable at the dispatch level. Getting this information sooner to multiple levels of the freight carrier has the potential to enable companies to take a proactive approach to rerouting freight. Dispatchers could then relay this information to the drivers using a variety of technologies, including on-board computers, radios, or other methods.

2.4 Existing User Needs from Other Architectures

The process of identifying user needs began with assembling the known user needs from the existing ITS architectures along the I-10 Corridor. Those needs were identified through stakeholder input in the development of the respective statewide and regional architectures, and have been reviewed to emphasize those relating to freight transportation. Needs that are not applicable to the I-10 Freight Corridor, such as most of the public transportation needs, were not included in the corridor architecture.

In addition to needs previously identified, additional needs were identified through the user input portions of the current study. Many of these reflect needs that evolved or were identified subsequent to the completion of the state ITS architectures. Additional sources of needs included those identified in the initial National I-10 Freight Corridor Study Final Report, (February 2002), CVISN documents from the coalition states, and state DOT participation in the study technical committees.

Table 2-3 summarizes the needs for the I-10 Freight Corridor that were identified from the existing ITS architectures and from stakeholder discussions, surveys, and interviews. The ITS needs in the I-10 Corridor are summarized and categorized into functional areas, and are reflected in the complete I-10 Corridor ITS Architecture document. Needs shown in Table 2-3 are not listed in order of priority or ranking.

Table 2-3. I-10 Freight Corridor ITS Needs

Institutional Needs (IN)	1. Identify keeper/manager of the corridor ITS architecture 2. Develop and use a process addressing/aligning ITS project requests with each project's relevance and compliance with the local/regional architecture 3. Coordinate regional/state agencies to resolve transportation issues 4. Develop memoranda of understanding to facilitate data sharing and agency roles 5. Develop common ITS planning objectives to better coordinate ITS efforts along the corridor 6. Improved coordination between traffic management agencies and emergency response agencies for evacuation, traffic data exchange, and traveler information purposes 7. Effective communications between all state and local agencies in the corridor
Travel and Traffic Management Needs (TTM)	1. Expand deployment of centralized traffic management systems in parts of the corridor 2. Improve and expand data collection network for traveler information, planning, and operations 3. Integrated transportation data management in the corridor (traffic data, CCTV, CMS, incident management, etc.) 4. Improve traffic control in major cities and towns 5. Real time condition information of corridor roadways for traffic managers 6. Improved safety and homeland security efforts throughout the corridor 7. Improved traveler information on I-10, primary routes, and other strategic locations 8. Automated incident detection and management system for I-10 and primary routes 9. Improved incident response coordination 10. Improve interagency notification for traffic control and IM ability to provide travel information through personal electronic devices 11. Coordination of congestion management strategies
Commercial Vehicle Operations Needs (CV)	1. Overweight vehicle detection systems 2. Improved safety assurance at ports of entry 3. Real time, en-route weather information 4. Credentials administration and verification 5. More effective size/weight enforcement
Emergency Management Needs (EM)	1. Improved emergency response coordination 2. Emergency response data transfer 3. Interoperable communications between local police/fire/rescue
Information Management Needs (IM)	1. Ability to share relevant information (e.g., traffic data, CCTV, CMS, incident management, etc.) across multiple jurisdictions (IM-1)
Maintenance and Construction Operations Needs (MCO)	1. Wide distribution of road closure plans (e.g., media coverage) (MC-1) 2. Better management of maintenance fleets and their operations in real time (MC-2) 3. Additional information and traffic management capabilities in work zones for long-term construction projects (MC-4)

2.5 User Services

The FHWA has defined eight user service bundles as part of the ITS architecture. User services are functional areas that a stakeholder can identify as services in which they are interested. The user service bundles make it relatively easy for a stakeholder to focus on areas that are most relevant to their business. Table 2-4 provides an overview of the user service bundles. As shown in the table, the applicability of each user services bundle to the I-10 Freight Corridor was determined in consultation with technical representatives from each of the eight corridor states.

The focus of these services is generally on the longer-distance and freight-oriented trips. As incident management, traveler information, and other areas benefit all travelers (including freight), they were ranked higher. While traffic signals and intersection control are not typical of interstate travel, the commercial vehicles will have to use these services to get in and out of ports and border crossings and will use them when making stops along the way. They are included here, but at a lower priority level.

2.6 Market Packages

Market packages provide an accessible, service-oriented perspective to the National ITS Architecture. Market packages collect one or more equipment packages that must work together to deliver a given transportation service and the architecture flows that connect them and other important external systems. They are tailored to fit, separately or in combination, real-world transportation problems and needs, identifying the pieces of the physical architecture that are required to implement a particular transportation service.

The National ITS Architecture provides a menu of 91 different market packages bundled into eight market package bundles. Based on the ITS needs and the existing/planned ITS systems, a set of market packages was selected for the I-10 Corridor ITS Architecture. The selected market packages are listed in Appendix D.[11]

[11] National ITS Architecture, Version 6.0

Table 2-4. I-10 User Services

User Service Bundle/User Services	Applicability to I-10
Travel and Traffic Management	
Pre-trip Travel Information	High
En-route Driver Information	High
Route Guidance	Medium
Ride Matching and Reservation	None
Traveler Services Information	Medium
Traffic Control	Medium
Incident Management	Medium
Travel Demand Management	High
Emissions Testing and Mitigation	Medium
Highway Rail Intersection	Medium
Public Transportation Management	
Public Transportation Management	None
En-route Transit Information	None
Personalized Public Transit	None
Public Travel Security	None
Electronic Payment	
Electronic Payment Services	High
Commercial Vehicle Operations	
Commercial Vehicle Electronic Clearance	High
Automated Roadside Safety Inspection	High
On-board Safety and Security Monitoring	High
Commercial Vehicle Administrative Processes	High
Hazardous Materials Security and Incident Response	High
Freight Mobility	High
Emergency Management	
Emergency Notification and Personal Security	High
Emergency Vehicle Management	Low
Disaster Response and Evacuation	Medium
Advanced Vehicle Safety Systems	
Longitudinal Collision Avoidance	Medium
Lateral Collision Avoidance	Medium
Intersection Collision Avoidance	Low
Vision Enhancement For Crash Avoidance	Medium
Safety Readiness	Medium
Pre-crash Restraint Deployment	Medium
Automated Vehicle Operation	Medium
Information Management	
Archived Data	High
Maintenance and Construction Management	
Maintenance and Construction Operations	High

2.7 Institutional Issues

With eight states and numerous metropolitan areas throughout the length of the corridor, any one region may have significant institutional issues relative to the deployment of ITS. This report is not intended to go into detail of any one area. The issues identified in this section are those relative to the corridor – either its entire length or critical sections. Some areas of the corridor may not experience select issues identified in this report. Others may experience additional issues that are not identified in this report. The issues are organized into opportunities and barriers. Opportunities represent potential future collaboration issues. Barriers represent obstacles that must be overcome to realize the opportunities.

2.7.1 Opportunities

Opportunities are defined as new areas of cooperation or development, such as the ability to integrate systems, share information, cooperate in seeking funding, etc. Opportunities may be potential projects or efforts that can benefit the corridor. Opportunities may not apply equally across the entire length of the corridor, though each is likely to have the potential for benefiting more than just spot locations. The initial opportunities identified include the following:

Agreements to share information: Both real time and archived information are important to a wide variety of stakeholders. Agreements to share that information can be either informal or formal. For example, a commitment by each agency to upload full road closures on I-10 to a web site can be done informally. The occurrences are sporadic and the cost to each agency is minimal. Alternatively, the commitment to provide real time traffic detector data to a central information source may require software programming and ongoing communication costs. In this case, a formal data sharing agreement is more appropriate

Creating a clearinghouse: Advanced warnings of major incidents and weather related roadway issues can be of great value to I-10 users. A central clearinghouse of data can help facilitate delivery of this information. Development of this clearinghouse can be accomplished in a variety of ways, with varying impacts and commitments from each agency, but the creation of this clearinghouse will be important for many additional future projects.

Creating a corridor coalition: The I-10 Corridor currently operates under a pooled-fund study status. Establishment of a formalized corridor coalition will allow the group of states more flexibility and opportunities to jointly pursue many new projects.

Seeking funding: Federal policy currently encourages states to approach problems on a corridorwide level. For ITS projects, federal agencies have made it clear that their intent is to promote interjurisdictional cooperation for projects where ITS has demonstrated clear benefits. As a corridor, the states will enjoy more numerous opportunities to pursue and receive funding for new projects with diverse beneficiaries.

2.7.2 Barriers

Barriers are defined as known or anticipated issues that must be overcome in order to achieve the opportunities. Barriers are not to be considered as fatal flaws. There are always ways to overcome barriers. Known barriers to achieve the aforementioned opportunities include the following:

Parochialism: Cohesion in any coalition results from the consensus that participation results in greater benefits than can be achieved by working independently. Participation is unlikely if there is little or no perceived benefit. Through the I-10 Steering Committee, all the coalition member states agreed to plan and implement projects that will have corridorwide benefits. Each state will also continue to pursue their own individual projects, as will the various stakeholders. The full impact of parochialism would be felt if a state were to determine that their interests are best served by not participating in the corridor effort. With some level of participation from all eight states, this barrier can be largely mitigated. It is expected that a healthy corridor will go through cycles, and that each region and stakeholder will go through varying levels of corridor activity, while continuing to work together toward the long-term vision.

Pooled-Fund Status: At the conclusion of this study in December 2007, the I-10 Freight Corridor is organized as a pooled-fund study. One of the opportunities listed above was the possibility of developing a more formalized corridor organization. The current status is both a barrier and an opportunity, as the pooled-fund study group is unlikely to continue indefinitely. Whether the end result is a fully organized corridor such as I-95, or a consortium such as CARS (Condition Acquisition and Reporting System), the current pooled-fund status is, by design, destined to result in either a transition into a different organization or to dissolve when its work is complete.

Lack of Funding: As noted in the Concept of Operations Report for the I-10 Freight Corridor, numerous ITS project needs were identified in the corridor. Addressing these needs would result in improved goods movement, but funding for these projects has not yet been identified. As the projects are multistate efforts, federal funds are especially critical to their implementation. Securing additional federal funding to aid in the deployment of projects should be a primary focus of the I-10 Freight Corridor's future efforts. The I-95 Coalition provides a useful initial template for corridor organization, and also illustrates many of the potential benefits.

Project Relevance: As the I-10 Freight Corridor extends across eight states, it is likely that few projects will be universally applicable across the entire corridor. Many will benefit large portions of the corridor, while others will have a more regional or local emphasis. Projects proposed and endorsed by the corridor group, however it is ultimately organized, should be relevant to multiple regions and jurisdictions. Even projects that are deployed in a small section for the first deployment should be planned to be relevant to greater portions the corridor, and should be deployed in a manner that promotes additional deployment and integration. Projects where the focus and benefits are highly localized should be pursued by the states and metropolitan planning organizations (MPOs) outside of the corridor framework.

2.8 Corridor Vision

The corridor vision is a brief statement of the organization's overall purpose, and the reason for the organization's existence. As of this writing, the corridor states have proposed a vision with the goal of improving freight movement along the entire I-10

Corridor, across all jurisdictions, using both operational and capital improvements.

2.9 Goals and Objectives

The goals and objectives result from the needs and issues outlined and identified above. Goals are aims that support fulfillment of the vision and mission, while objectives are the steps and actions that are necessary to accomplish a particular goal. In planning ITS systems, defining goals and objectives helps to ensure that development of the corridor ITS program stays focused on user needs.

Table 2-5 lists the corridor's goals for freight movement, summarized by functional area. A full list of the goals and objectives as identified based on the needs described above may be found in Appendix E, organized according to their function.

Table 2-5. ITS Program Goals

Area	Goals
Administration/ Planning/Policy	• Ensure the continued use and maintenance of the I-10 Corridor ITS Architecture • Improve coordination between regional and state agencies to resolve transportation issues • Create a corridor to unify the I-10 states and to allow the I-10 states more flexibility and opportunities to jointly pursue projects
Field Infrastructure	• Finalize deployment of centralized traffic management systems in selected areas of the corridor • Enhance/upgrade/expand coverage of sensors along select areas of the I-10 Corridor
Operations	• Improve communications and coordination between traffic management agencies and emergency response agencies for evacuation, traffic data exchange, emergency response coordination, and traveler information purposes • Improve communications and coordination between traffic management agencies, local government, and law enforcement • Enhance/streamline credentials administration and verification including at ports of entry • Enhance safety • Enhance security • Reduce congestion
Information	• Improved use and coordination of existing field infrastructure • Promote exchange of relevant information along the entire corridor • Provide services to aid commercial vehicle traffic throughout the corridor

Chapter 3

Short-Term Program Development

3.1 Introduction

An ITS architecture is intended to be used as a planning tool to facilitate the eventual deployment of intelligent transportation systems (ITS). Federal Highway Administration (FHWA) rules require that a regional ITS architecture be in place for projects that receive federal funds.[12]

Ideally, an ITS architecture directly supports a related program of ITS projects. A number of state and regional plans have already been developed in the I-10 National Freight Corridor, incorporating a variety of ITS projects. This chapter discusses the development of the I-10 National Freight Corridor's ITS program. The program focuses on improving freight movement in and through the corridor, and emphasizes multistate or regional efforts. To help the corridor move ahead quickly, there is a particularly strong emphasis on the short-term program.

3.2 Definition of Projects

An ITS architecture typically addresses needs and projects that extend out 10 to 20 years. The time frame of the I-10 Corridor Architecture is currently defined as 10 years. The projects developed for the program are also over a ten-year time frame. These projects are representative of a contemporary expectation of what will be built over this term. As the architecture is used, new systems will be developed and deployed. As this happens, the architecture and the ITS program should evolve as well, with the infrastructure reflecting changes both in the operational and planned systems.

A project is typically first defined as a functional concept. For example, a traffic management center (TMC) might be viewed as one project, although several distinct projects related to this TMC will likely be deployed over the span of the ITS architecture. Several generations of a system can be anticipated, along with several project expansions. The functions and connections identified in the ITS architecture are anticipated over the long term and may be realized through multiple phases and projects to achieve a full level of functionality.

This short-term ITS program was developed with the input of technical committees that included representatives from the corridor states' transportation departments. The initial corridor program is intended as a series of projects that may be separated by phases or deployments. The program includes a number of "early winner" projects that can be quickly implemented and quickly demonstrate results.

3.3 Definition of Program

The intent of this initial program is not to duplicate existing funding programs, such as transportation improvement programs (TIPs). Instead, the program includes various project concepts arranged into distinct, procurement-ready portions. The program is planned to be sufficiently flexible to allow various components to be procured and implemented as funding becomes available, while retaining the vision of how the various components will be tied together

[12] FHWA Rule 23 (CFR 940.9) specifies that "(a) A regional ITS architecture shall be developed to guide the development of ITS projects and programs and be consistent with ITS strategies and projects contained in applicable transportation plans."

into a system that provides greater utility than just the sum of the components.

In the program, the individual project concepts have been identified and defined in consultation with various corridor stakeholders. Project cost estimates provided represent planning level estimates that will need to be refined as the projects are included in state plans for implementation. An initial phasing plan is also identified in the initial program.

The projects identified in the program plan are categorized into the following phases:

- *Early Winners – projects that can be implemented almost immediately*
- *Short Term – projects that can be implemented within the first two years of the program*
- *Medium Term – projects that are in the three- to five-year horizon for implementation*
- *Long Term – projects that are at least five years away from being implemented*

It is anticipated that the projects will be implemented in this sequence/order over the term of the program.

3.4 Projects by Market Package

The projects described in this section are defined as part of a market package. Appendix F illustrates how the various goals and objectives of the corridor are met by these projects. Projects will be defined in greater detail through the systems engineering process and matched to other plans and architectures regardless of how they match up to these initial market packages.

For each market package area, only those market packages identified in Chapter 2 will be shown. There may not be a project to meet every individual market package, but the intent will be to meet the majority of the identified goals.

3.4.1 Archived Data Management

These projects relate specifically to the collection, maintenance, and usage of transportation data in an ITS environment. The intent is to create an initial high level archiving system that starts collecting data along the entire corridor. As the various systems evolve, so will the archiving efforts. An archive must be user friendly and support the various stakeholders throughout the corridor, both public and private.

These projects are identified to address most of the recurring congestion problems that the stakeholders identified. The vast majority of the program projects fall into this category. Many of these projects are intended to build upon existing or planned efforts – either building out the infrastructure, or completing connections. New and innovative uses of the traffic management tools are also included in this section.

Market Package	Project Code	Project Description
AD1 - ITS Data Mart	ADM2.5.1	Plan/design a corridorwide data archiving system
	ADM2.5.2	Build the initial corridor archiving system
AD2 - ITS Data Warehouse	ADM2.5.1	Plan/design a corridorwide data archiving system
	ADM2.5.2	Build the initial corridor archiving system
AD3 - ITS Virtual Data Warehouse	ADM2.5.3	Evolution 1 of archiving system

3.4.2 Traffic Management

Market Package	Project Code	Project Description
ATMS01 - Network Surveillance	INF1.1.1	Deploy test Wi-Fi for emergency response along selected sections of corridor
	INF1.1.2	Deploy TMC 2
	INF1.1.3	Deploy TMC 3
	INF2.1.1	Create a web site with links to web sites for all states within the corridor
	INF2.2.1	Integrate weather information into corridor web site
ATMS02 - Probe Surveillance	OPS4.5.1	Use cell phones for probes in rural New Mexico to generate travel times for use in incident information sharing
	OPS4.5.2	Use cell phones for probes in rural Texas to generate travel times for use in incident information sharing
	OPS4.5.3	Increased use of license plate readers in Florida
ATMS03 - Surface Street Control	OPS1.1.1	Pilot test integrated signals in State 1
	OPS2.2.8	Pilot test a rural alternate route plan for I-10
	OPS2.2.9	Pilot test an urban alternate route plan for I-10
ATMS04 - Freeway Control	INF1.1.1	New Gulfport TMC
	INF1.1.2	Deploy TMC 2
	INF1.1.3	Deploy TMC 3
ATMS06 - Traffic Information Dissemination	INF1.1.1	Deploy test Wi-Fi for emergency response along selected sections of corridor
	INF1.2.1	Deploy a project that provides ability to get 511 information across multiple states from one state
	INF1.2.2	Deploy 511 corridor information in all corridor states
	INF2.4.2	Create an instant messaging network
ATMS07 - Regional Traffic Control	ADM1.1.1	I-10 Project Management Contract
	INF1.3.1	Deploy fiber connections to provide state to state connectivity where appropriate
	INF2.1.1	Create a web site with links to web sites for all states within the corridor
	INF2.4.1	Establish a means of sharing information between TMCs along the corridor
	INF2.4.3	Create a "war map"
	OPS2.1.1	Add major special event information to the corridor web site
	OPS2.1.2	Develop a smart planned special event system for the corridor
	OPS2.1.3	Pilot test a smart planned special event system in State 1
	OPS2.1.4	Pilot test a smart planned special event system in State 2
ATMS07 - Regional Traffic Control	OPS2.2.1	Integrate REGIONAL TMC with two major regional agencies
	OPS2.2.2	Integrate REGIONAL TMC with two major regional agencies
	OPS2.2.3	Integrate REGIONAL TMC with minor local agencies
	OPS2.2.4	Integrate REGIONAL TMC with minor local agencies
	OPS2.2.5	Study in-state integration (FL, TX, CA, AZ) vs. statewide TMC (MS)
	OPS2.2.6	Biloxi/Mobile TMC integration
	OPS2.2.7	Mobile/Pensacola TMC integration
	OPS2.2.8	Pilot test a rural alternate route plan for I-10
	OPS2.2.9	Pilot test an urban alternate route plan for I-10
ATMS08 - Traffic Incident Management System	ADM2.1.1	Implement Quick Clearance policies (shoulder or in-lane?)
	ADM2.1.2	Enact legislation to limit liability for moving vehicles
	ADM2.1.3	Move-it laws
	ADM2.1.4	Move over laws for emergency responders
	ADM2.1.5	Create standard policies and procedures for planned special events
	OPS1.2.1	Pilot test automated incident detection in State 1
	OPS1.4.2	Create a Gulf region incident management system
	OPS6.2.1	Increase capability, range, and size of existing service patrols
ATMS10 - Electronic Toll Collection		

Market Package	Project Code	Project Description
ATMS11 - Emissions Monitoring and Management		
ATMS12 - Virtual TMC and Smart Probe Data	INF1.1.1	New Gulfport TMC
ATMS13 - Standard Railroad Grade Crossing	OPS6.1.2	Deploy project to reduce congestion in and around a port facility
ATMS14 - Advanced Railroad Grade Crossing	OPS6.1.1	Establish stakeholder group with port facilities and determine where improvements are possible
ATMS15 - Railroad Operations Coordination	OPS6.1.3	Deploy project to reduce congestion in and around a multimodal facility
ATMS18 - Reversible Lane Management	OPS1.3.4	THETA - Develop Stage 2 capabilities (evac. across state lines, contra flow, evac. shelters)
	OPS1.3.5	THETA - Implement Stage 2 with Alabama, Louisiana
	OPS1.3.6	THETA - Implement Stage 2 with Texas
ATMS19 - Speed Monitoring		
ATMS20 - Drawbridge Management	INF1.2.1	Identify key assets along corridor that are not covered as part of an urban TMC
ATMS21 - Roadway Closure Management	OPS1.3.2	THETA - Implement basic capabilities with state of Mississippi; implement 'almost real time' map updates with traffic and weather
	OPS1.3.3	THETA - Collaborate with all sponsoring states to achieve capabilities, economies of scale, and system architectures
	OPS1.3.4	THETA - Develop Stage 2 capabilities (evac. across state lines, contra flow, evac. shelters)
	OPS1.3.5	THETA - Implement Stage 2 with Alabama, Louisiana
	OPS1.3.6	THETA - Implement Stage 2 with Texas

These projects are identified to address most of the recurring congestion problems that the stakeholders identified. The vast majority of the program projects fall into this category. Many of these projects are intended to build upon existing or planned efforts - either building out the infrastructure, or completing connections. New and innovative uses of the traffic management tools are also included in this section.

3.4.3 Public Transportation

As noted in Chapter 2, it was determined that public transportation projects are not likely to play a significant role in the freight corridor architecture. Public transportation projects may be referenced in projects such as regional traveler information or emergency management, but the typical public transportation market packages are not considered to be applicable to the freight corridor program.

3.4.4 Traveler Information

Market Package	Project Code	Project Description
ATIS1 - Broadcast Traveler Information	INF1.2.1	Deploy a project that provides ability to get 511 information across multiple states from one state
	INF1.2.2	Deploy 511 corridor information in all corridor states
	INF2.2.1	Integrate weather information into corridor web site
	INF2.3.1	Deploy test Wi-Fi for emergency response along selected sections of corridor
	INF2.6.1	Enhance coordination with media through web site
	OPS4.2.3	Integrate smart work zone into corridor web site
	OPS4.2.4	Integrate smart work zone into TMC 1
ATIS2 - Interactive Traveler Information	INF2.1.2	Enhance the existing web site with an e-mail alert system
	INF2.1.3	Provide upgrades and enhancements to the corridor web site
	INF2.3.1	Deploy test Wi-Fi for emergency response along selected sections of corridor
	INF2.5.1	Deployment of 511 in states without 511
	INF2.5.2	Multistate coordination and seamless integration
ATIS3 - Autonomous Route Guidance		
ATIS4 - Dynamic Route Guidance		
ATIS5 - ISP-Based Route Guidance	INF3.2.1	Provide localized and regional weather and traffic at parking facilities
ATIS6 - Integrated Transportation Management/Route Guidance		
ATIS7 - Yellow Pages and Reservations	INF3.1.1	SmartPark demonstration in State 1
ATIS7 - Yellow Pages and Reservations	INF3.1.2	SmartPark demonstration in State 2
ATIS8 - Dynamic Ridesharing		
ATIS9 - In-Vehicle Signing		

These projects emphasize sharing of real time information. Some of the projects relate more to third party information providers, such as web providers and handheld and mobile content providers. Initial work on these projects typically emphasizes development of a corridorwide traveler information hub, as well as projects that can link to that hub and feed off of it. Also included are projects specifically aimed at commercial vehicle owners and operators, such as parking facility projects.

3.4.5 Vehicle Safety

The following vehicle safety market packages were initially identified:

- ***AVSS01: Vehicle Safety Monitoring***
- ***AVSS02: Driver Safety Monitoring***
- ***AVSS03: Longitudinal Safety Warning***
- ***AVSS04: Lateral Safety Warning***
- ***AVSS06: Pre-Crash Restraint Deployment***
- ***AVSS07: Driver Visibility Improvement***
- ***AVSS08: Advanced Vehicle Longitudinal Control***
- ***AVSS09: Advanced Vehicle Lateral Control***

All of these market packages are in-vehicle systems, and are typically procured by the private sector for use in vehicles. They should be considered part of the ITS architecture, although there are currently no specific public sector projects that match these market packages. The corridor will continue to monitor the deployment of these systems in private sector fleet vehicles and will modify the architecture and the program as necessary to accommodate these systems. These efforts may be integrated into other infrastructure, particularly with respect to the VII program.

3.4.6 Emergency Management

Emergency Management (EM) market packages in the architecture largely reflect efforts that are more related to on-road management and not back office or administrative work.

These projects focus on emergency management agencies and their relation to commercial vehicle operators. Along the Gulf Coast, the emphasis is on coordination with these entities during and after hurricane threats. In the southwest, military and border issues often lead to coordinated efforts between various government agencies and commercial vehicle owners, operators, and shippers.

Market Package	Project Code	Project Description
EM01 - Emergency Call-Taking and Dispatch		
EM02 - Emergency Routing		
EM03 - Mayday Support	OPS4.4.1	Pilot test automated crash reporting with a private service provider
	OPS4.4.2	Combine automated crash reporting with material load information
EM04 - Roadway Service Patrols	OPS1.4.1	TIMTOW- private sector certification for towers
	OPS6.2.1	Increase capability, range, and size of existing service patrols
	OPS6.2.2	Expand use of Rapid Incident Scene Clearance (RISC) in Florida
	OPS6.2.3	New service patrols in location A
	OPS6.2.4	Pilot test video from service patrol to TMC in State A
EM05 - Transportation Infrastructure Protection	INF1.2.1	Identify key assets along corridor that are not covered as part of an urban TMC
	INF1.2.2	Integrate key asset surveillance into existing TMC
	INF1.3.1	Deploy fiber connections to provide state to state connectivity where appropriate
EM06 - Wide-Area Alert	INF2.1.1	Create a web site with links to web sites for all states within the corridor
EM07 - Early Warning System		
EM08 - Disaster Response and Recovery	ADM2.4.1	Share response plans and determine areas for increased coordination
	OPS1.4.3	Share communications infrastructure with emergency providers
	OPS1.5.1	Provide EM training for DOT staff throughout the corridor
EM09 - Evacuation and Re-entry Management	ADM2.4.1	Share response plans and determine areas for increased coordination
EM10 - Disaster Traveler Information	OPS1.3.2	THETA - Implement basic capabilities with state of Mississippi, implement 'almost real time' map updates with traffic and weather
	OPS1.3.3	THETA - Collaborate with all sponsoring states to achieve capabilities, economies of scale, and system architectures

3.4.7 *Commercial Vehicle Operations*

These projects relate to commercial vehicle operations, with the focus remaining primarily on the public sector and how it interfaces with the private sector. As more and more port operations are privatized, the program anticipates ways to help improve both internal port operations and the administrative organizations that commercial vehicles deal with.

Market Package	Project Code	Project Description
CVO01 - Fleet Administration	OPS5.1.1	Set up committee to coordinate with businesses to look for joint opportunities
CVO02 - Freight Administration	ADM2.3.1	Multistate OW/OS vehicle permit (standard envelope)
	ADM2.3.2	Pilot test for one-stop credentialing along the Gulf Coast
	ADM2.3.3	Create a corridorwide credentialing center
	ADM2.3.4	Pilot test OS/OW automated permitting across multiple states
	ADM2.3.5	Add automated permitting to a corridorwide credentialing center
	OPS5.1.1	Set up committee to coordinate with businesses to look for joint opportunities
CVO03 - Electronic Clearance	OPS3.1.1	Horizon project with port of Jacksonville
CVO04 - CV Administrative Process	ADM2.3.1	Multistate OW/OS vehicle permit (standard envelope)
	ADM2.3.2	Pilot test for one-stop credentialing along the Gulf Coast
	ADM2.3.3	Create a corridorwide credentialing center
	ADM2.3.4	Pilot test OS/OW automated permitting across multiple states
	ADM2.3.5	Add automated permitting to a corridorwide credentialing center
	OPS5.1.2	Increase use of credentialing and checking around petroleum facilities along I-10
CVO05 - International Border Electronic Clearance	OPS3.4.1	Coordinate with federal agencies to ensure consistent operations of ports and crossings along border and through ports - admin contract
	OPS3.4.2	Deploy FAST at locations A, B, C, and D
	OPS3.4.3	Deploy other future project at locations A, B, C, and D
	OPS3.4.4	Expand combined points of entry program across all Gulf states
CVO06 - Weigh-In-Motion	INF2.5.1	Pilot Test WIM in Mississippi
	INF2.5.2	Additional WIM deployments in Florida
	INF2.5.3	Pilot Test WIM in State 2
	INF2.5.4	Integrate WIM with TMC 1
	INF2.5.5	Integrate WIM with TMC 2
	INF2.5.6	Integrate with PrePass
	INF2.6.1	Enhance coordination with media through web site
	OPS3.2.1	Deploy WIMs at all Florida Gulf Coast ports
CVO07 - Roadside CVO Safety	INF2.6.1	Enhance coordination with media through web site
	OPS4.1.1	Deployment of 511 in states without 511
CVO08 - On-board CVO and Freight Safety and Security	OPS3.3.1	Pilot test HAZMAT routing database across multiple states
	OPS4.4.1	Pilot test automated crash reporting with a private service provider
	OPS4.4.2	Combine automated crash reporting with material load information
CVO09 - CVO Fleet Maintenance		
CVO10 - HAZMAT Management	OPS3.3.2	Create initial corridor management center HAZMAT database
CVO11 - Roadside HAZMAT Security Detection and Mitigation	OPS3.3.2	Create initial corridor management center HAZMAT database
	OPS4.3.1	Increased training for emergency responders along I-10 (nuclear in the SW/petrochemicals in the Gulf Coast region)
CVO12 - CV Driver Security Authentication	OPS3.4.1	Coordinate with federal agencies to ensure consistent operations of ports and crossings along border and through ports - admin contract
	OPS3.4.2	Deploy FAST at locations A, B, C, and D
	OPS3.4.3	Deploy Other Future Project at locations A, B, C, and D
	OPS3.4.4	Expand combined points of entry program across all Gulf states
	OPS3.5.1	Work with federal agencies to create a secure commercial vehicle credentialing database
	OPS3.5.2	Pilot test of roadside safety inspection in State 1
	OPS3.5.3	Apply roadside safety application across multiple states
CVO13 - Freight Assignment Tracking	OPS3.3.1	Pilot test HAZMAT routing database across multiple states

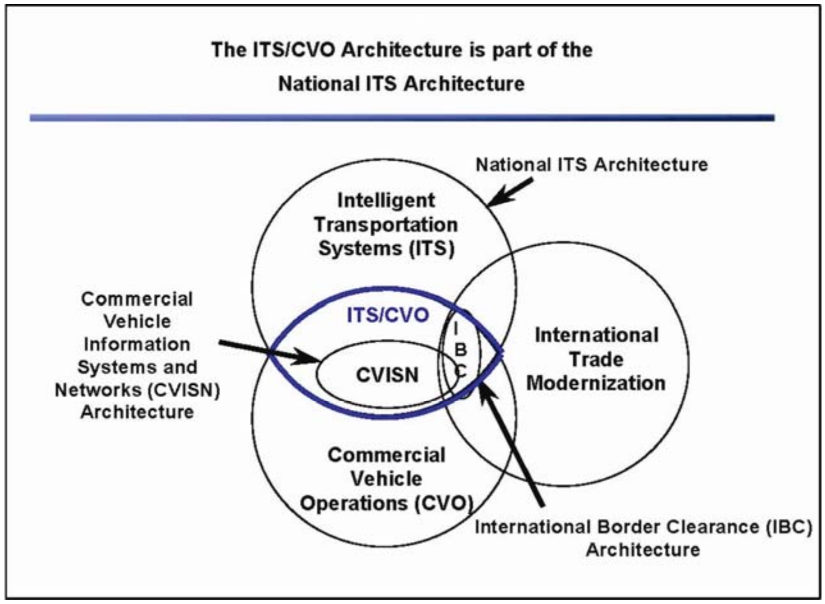
3.4.8 Maintenance and Construction Management

Information on maintenance and construction was highly desired by the commercial vehicle industry in the surveys conducted as part of Chapter 2. These projects focus on efforts to inform and improve operations throughout these work zones.

Market Package	Project Code	Project Description
MC03 - Road Weather Data Collection	INF2.4.1	Upgrading fog detection on Bayway Bridge
	INF2.4.2	Additional dust warning system locations in Arizona
	INF2.4.3	Initial deployment of dust warning system in New Mexico
	INF2.4.4	Initial deployment of dust warning system in Texas
	INF2.4.5	Integrating the systems into regional information sharing
MC04 - Weather Information Processing and Distribution	INF2.2.1	Integrate weather information into corridor web site
	INF2.4.1	Upgrading fog detection on Bayway Bridge
	INF2.4.2	Additional dust warning system locations in Arizona
	INF2.4.3	Initial deployment of dust warning system in New Mexico
	INF2.4.4	Initial deployment of dust warning system in Texas
	INF2.4.5	Integrating the systems into regional information sharing
MC05 - Roadway Automated Treatment		
MC07 - Roadway Maintenance and Construction	OPS4.2.5	Lane Rental Demonstration in State 1
	OPS4.2.6	Integrate lane rental into TMC 2
MC08 - Work Zone Management	OPS4.2.1	Pilot smart work zone in State 1
	OPS4.2.2	Pilot smart work zone in State 2
	OPS4.2.3	Integrate smart work zone into corridor web site
	OPS4.2.4	Integrate smart work zone into TMC 1
	OPS4.2.7	Full concept scope and design for uniform smart work zone
MC09 - Work Zone Safety Monitoring	OPS4.2.1	Pilot smart work zone in State 1
	OPS4.2.2	Pilot smart work zone in State 2
	OPS4.2.7	Full concept scope and design for uniform smart work zone
MC10 - Maintenance and Construction Activity Coordination	OPS4.2.8	Implementation of a standard smart work zone across the corridor

3.4.9 CVISN

Figure 3-1. CVISN and ITS Architecture



Intelligent Transportation Systems/ Commercial Vehicle Operations (ITS/CVO) was addressed earlier in this document. The Commercial Vehicle Information Systems and Network (CVISN) is a related effort that is part of several different initiatives. From the ITS community, it is considered a subset of ITS/CVO. CVISN was created in the 1990s as a framework for integrating freight information at the national level. While CVISN efforts have often paralleled freight-related ITS efforts, CVISN has accomplished a number of specific goals related to information sharing; in particular, the development of such systems as CVIEW, electronic credentialing, automated permitting, and other credential, financial, and safety systems. These achievements generally emphasize fleet vehicles and operations, and tend to result from regulation of the freight industry by federal and state governments. Because a number of forms, information systems, and institutional practices were already in place, the freight industry was able to move forward on specific initiatives that built upon those legacy efforts. The following figure from the Introductory Guide to CVISN (POR 99-7186) illustrates the current situation of CVISN and ITS architecture efforts.

All eight states have either completed or are in the process of completing the core deployment of CVISN. Additional CVISN projects that have yet to be deployed in the corridor are shown in Table 3-1.

Table 3-1. Undeployed CVISN Projects

State	Projects to be Deployed
California	No additional projects identified
Arizona	No additional projects identified
New Mexico	• ASPEN to SAFER connectivity • ASPEN to 100 percent of inspectors and at all major inspection sites • New Mexico CVIEW
Texas ("new systems")	• Texas CVIEW (TexVIEW) • Texas Roadside Systems (fixed electronic screening stations, mobile vehicles, and field offices all supported by DPS personnel) • Texas One-Stop Web Site and Credentialing Interface (CI)
Louisiana ("post Level 1")	• Automated Crash Reporting • Electronic credentialing for SSRS • Automated OS/OW permitting • Enhancements to the OS/OW permitting system (automation of size and weight citation issuance and citation/payment record tracking processes)
Mississippi	• Create a CVISN compliant virtual one-stop shop • Expand PrePass Program to joint port with Louisiana • Complete laptop and cellular phone connectivity to enforcement systems • Expand combined ports of entry operations with surrounding states • Ramp sorting capability using WIMs
Alabama	• AL-CVIEW • Roadside Safety – Improves screening and inspection data at the roadside • Credential and Permit System • Electronic Screening
Florida	• Electronic Credentialing/HelpDesk Feasibility Study • Automated Processing of International Fuel Tax Agreement (IFTA) • Automated Processing of International Registration Plan (IRP) • International Fuel Tax Agreement Clearinghouse • Automated Routing and Permitting Software Design/Development • Information Systems Inventory • Electronic Screening – Mainline Program 2 • Electronic Screening at Agricultural Stations • CVIEW3 • Electronic Payment Solution • Compliance HelpDesk/Service Representative

3.5 SWOT Analysis of Projects

Assessing and analyzing the various strengths, weaknesses, opportunities, and threats (SWOT) is a common practice in many industries to assist in the decision making process. SWOT analyses help ensure that all options are considered completely and fairly, and that decisions are made in the best interest of the organization.

For each of the projects identified in the initial program, a brief analysis is provided. Projects identified for inclusion in the SWOT analysis are either directly related to corridor operations or can provide a major benefit to the corridor. Typically, a SWOT analysis employs a 2-step process. In the first step, a number of initial screening criteria are applied to the projects to determine if they fit the goals of the program. Those projects that do not advance the goals are dropped from further consideration. In the second step, criteria are developed and applied that allow the stakeholders to rank the relative importance of each project relative to the entire program. A 1-step analysis is anticipated for this effort. The Technical Advisory Committee (TAC) and committees have already commented on projects in general, so it is expected that all will pass the initial screening.

3.5.1 Criteria

The first step is to determine the ranking criteria or needs for the projects. This is specific to the corridor application. Again, what may be a high priority for a local application does not necessarily make it a high priority for the corridor.

Funding was considered as a category, but removed by the committees. The committees generally agreed that funding trumps all other criteria. If federal dollars are specifically earmarked to implement a project, it is much more likely that the implementing agency – whether this project is a priority or not – will implement that project. It was assumed by the reviewing committees that these projects under consideration were not fiscally constrained over a 10-year program.

The state technical contacts agreed upon the following criteria:

Champion State or Agency: This criterion reflects the desires of a particular state or agency to implement a project. If an agency is willing to aggressively pursue and promote a project, its likelihood of success increases dramatically. Conversely, if it is a required effort that delays other projects, its likelihood of success diminishes. At this point in time, an individual entity does not have to be defined as a champion. Rather, the reviewers consider how likely it is that they or another agency would be interested in proposing this project.

Ease of Implementation: This criterion is generally related to complexity, although projects that cost an unusually high amount of money may be adversely affected with this criterion. Project cost is generally directly related to implementation difficulty: the more costly a project is, the more difficult it is to implement. Very complex projects also tend to be the ones in which more problems are anticipated. This is especially true of new technologies and new software. If the champion agency has extensive experience in deploying similar projects with different technologies, this will be less critical.

Operational Feasibility: This criterion is meant to reflect the current operations and structure of the public agencies throughout the corridor. There may be some projects which directly match the needs of the corridor, but there is no agency that currently has similar responsibilities. Therefore, to implement this technology, at least one agency will need to assume additional responsibilities and modify its current operations. While this is also reflected some in the previous criteria, this one addresses the ease or difficulty in operating and maintaining this technology. Additionally, many technology projects require an existing infrastructure. If infrastructure is already in place, or if previous projects created some limited deployment that could be expanded, a project would do well in this category.

Extent the Service/Technology Enables or Builds on Other Services: This criterion is an indication of how well the agencies have planned for the future. Some projects by themselves are not necessarily beneficial, but their completion is critical to the success of related projects. Establishing databases is one example. Creating a corridorwide database is neither particularly exciting nor visible, nor does it provide any direct impact on transportation operations. However, other related projects may require this service before they can be implemented. Additionally, some projects can only occur if related projects are already in place and operational. If an existing service is available, another agency may use information from that service to create new projects and services. An example is device sharing between agencies.

Multistate or Multiregional Applications or Benefits: The core purpose of the I-10 Corridor is to address those issues that are relative to the entire (or large portions of the) corridor. Even smaller regional projects should demonstrate consideration and integration with larger corridorwide efforts. Additionally, the corridor approach allows some projects with multiple champions to have a greater framework in which to demonstrate compliance and vision. This will aid in securing funding for projects which may not entirely benefit just an individual agency.

Each criterion will also have a weight associated with it. The weighting factor will be used to determine the relative importance to the corridor program. Each state provided their analysis of the criteria and recommendations for weights. The following table represents the average of the state weights:

Criterion	Weight
Champion state or agency	20.00 %
Ease of implementation	17.14 %
Operational feasibility	17.14 %
Extent to which the project enables, or builds upon, other projects	21.43 %
Multistate or multiregional application or benefits	24.29 %
Total	100.00%

3.5.2 Project Summaries

Appendix G provides a complete listing of the initial program projects. The table is organized by goals and objectives, to demonstrate compliance with the work completed at the end of Chapter 2. The projects have already been matched to ITS architecture market packages above.

Appendix H then addresses some detail of all of the projects. In particular, each project is briefly defined and an analysis of the SWOT is provided. By definition in SWOT, strengths and weaknesses are considered internal to the system, while opportunities and threats are external. For example, if a particular project directly and completely addresses the issues related to a particular need, it represents a strength. This would be reflected in higher scores for criteria such as "operational feasibility." On the other hand, if a technology or a service does not fit well with current operations and the implementing agency will have to modify its organization, then this is a weakness. This would be reflected in a lower score on the same criteria.

External factors could include issues such as an unproven technology. The issue is that there is no history or experience with this technology – something outside of the implementing agency's control. This would then represent a threat to the project and would be reflected in lower scores on "operational feasibility." On the other hand, if a project implements a tool that all agencies within the corridor can immediately use and benefit from, it represents an opportunity for enhanced integration. This applies when the work is to be completed outside of the agency's control, so the factor is external. This would be reflected in higher scores in criteria such as the "extent to which the service builds upon or enables other efforts."

3.5.3 Using the Criteria to Evaluate Projects

To assist the states in this effort, the consultant team provided initial analysis for all projects for each of the criteria. These initial rankings reflected the consultant's best estimate of the value the various agencies would place on each project, given the definition and the analysis in the SWOT process. When applied to the criteria, this provided an initial ranking of the projects.

The committees determined that reviewing all 108 projects was not cost effective for the states, and decided instead to use the initial ranking to classify the top 15 percent to 20 percent of the projects, which would then be ranked individually by the committee members. A natural breakpoint was chosen that isolated the top 17 projects. These projects were then distributed to the committees for review. Each committee member had the opportunity to add projects that they felt should have been included in this list from the full SWOT list. The result is an initial short-term program of 17 projects as illustrated in the following table:

Table 3-2. Short-Term Projects

Project Code	Project	Description
INF2.1.1	Create a web site with links to web sites for all states within the corridor	A simple corridor web site that just provides a single source to all available state and local traffic information sites
ADM1.1.1	I-10 Project Management Contract	This project will provide for consultant support for the overall I-10 Corridor management structure; this will include administration of committees and programs; support for task forces and management; and potentially some minor studies, designs, and implementations
INF1.3.1	Deploy fiber connections to provide state to state connectivity where appropriate	Where there are gaps in state-owned fiber or communications networks, close those gaps to allow agencies to share information directly
INF2.4.3	Create a "war map"	This will create a single web site for all agencies that has all available information along I-10
FI2.4.1	Upgrading fog detection on Bayway Bridge	This project will design and replace the existing fog detection system on the Bayway Bridge; it includes design and deployment
OPS1.3.4	THETA – Develop stage 2 capabilities (evacuation across state lines, contra flow, shelters)	This effort will build upon the initial deployment work to create additional features that are necessary for THETA to function as a regional resource for all
INF3.2.1	Provide localized and regional weather and traffic at parking facilities	Provide a local web site through Wi-Fi and kiosks that addresses regional weather and traffic information at rest stops
OPS4.2.3	Integrate smart work zone into corridor web site	A smart work zone is sometimes integrated into the local TMC, but only in terms of CCTV and possibly data; this project will take all of the outputs available from the smart work zone and make them available on the corridor web site
OPS1.4.1	TIMTOW - private sector certification for towers	Use existing proposed program to provide a means of certifying towers for work on critical links; towing companies must attend training and demonstrate they have the right equipment before getting the appropriate certification
OPS6.1.1	Establish stakeholder group with port facilities and determine where improvements are possible	Covered as part of the corridor administration contract
FI1.2.2	Integrate key asset surveillance into existing TMC	This project will deploy field equipment at the key assets, and provide integration into the nearest TMC
INF2.4.5	Integrating the systems into regional information sharing	This project will take the information available from the dust warning systems and integrate it into a regional information sharing system – either a regional TMC or an information exchange network
FI2.4.2	Additional dust warning system locations in Arizona	This will include the design and deployment of additional dust warning systems in designated locations in Arizona
FI1.1.1	New Gulfport TMC	A new TMC in the Gulfport region; includes all software, hardware, and field devices
INF2.1.2	Enhance the existing web site with an e-mail alert system	Provide e-mail alerts to motorists and carriers that sign up for it; they will receive an e-mail any time something unusual is happening on their chosen routes
OPS3.4.1	Coordinate with federal agencies to ensure consistent operations of ports and crossings along border and through ports – admin. contract	This project is to provide the necessary administration to coordinate with a wide variety of federal agencies concerning the operations of ports and border crossings
OPS2.2.5	Study in-state integration (FL, TX, CA, AZ) versus statewide TMC (MS)	This project is a study to examine the value of integrating TMCs within a state, versus having a single TMC to control all statewide traffic management functions

3.6 Schedule

As discussed earlier, many of the conceptual projects need to be broken into phases (e.g., demonstration, initial deployment, full deployment). For the schedule, each project was examined to determine if it needed to be divided into phases. A planning level cost is associated with each identified phase.

As mentioned previously, it is assumed at the creation of this program that there are no fiscal constraints, and that federal funding support will be available. Consequently, the program developed is very aggressive. It is safe to assume that there will be fiscal constraints on the program, and some projects will experience delays. It is expected that the corridor will review and update this program on a recurring basis to better reflect actual expectations.

The initial schedule and the relationship between projects are illustrated in Appendix I. Projects are related to their predecessors and are identified by phase. It was assumed that it would take from six to 12 months between phases to allow for typical procurement procedures.

3.6.1 Corridor Program

At a higher level, this demonstrates how the corridor will work toward interoperability. For the initial program, many of the projects will not achieve full deployment within the 10-year horizon. However, many of the projects will already be demonstrating the value of the program and improving operations early on in the program.

The projects are illustrated in Appendix F to illustrate how they relate together, and how they are working to meet the goals of the program. To help illustrate this, some visual license is used to illustrate different phases of implementation beyond the conceptual plan. For example, if a project is demonstrated in one state, deployments across the other states will be shown in the program, although they may not be defined to this level of detail in the description of projects.

The schedule reflects a first estimate of how the program could proceed. Much of the success of the program is dependent on future funding and the commitment of the states to pursue the projects listed in this program.

3.6.2 Program Costs

The detailed project phase costs are shown in Appendix J. Costs are summarized by anticipated implementation phase (pilot, initial deployment, full deployment). The assumptions used in calculating the costs are also illustrated.

For many projects, a pilot or demonstration phase is used when the technology or the application is not yet proven. Demonstrations take time, and following the systems engineering process will allow full development of the project vision. The actual demonstration can then be designed and implemented. After implementation, the project should be evaluated to determine if it meets the goals of the project. All through this process, the owning agency should be compiling a lessons learned document to share with the other states. The initial deployment should not occur until after the demonstration.

Initial deployments can happen first when a technology or application is already proven in another location within the corridor. In these cases, several initial (initial for the agency) deployments could occur simultaneously. Much of this will depend on the complexity of the project, how much it builds upon others, and the estimated costs.

Phased or complete deployments can occur when a technology or application is already in use across portions of the corridor. In this case, the phases can occur at any time.

The initial estimate for the 10-year program is approximately $69 million. Approximately $48 million of this is estimated equipment costs. Approximately $8 million of the total is allocated for pilot studies, with $54 million for initial deployments. The minimal amount remaining in full deployments is reflective of the relatively short time frame for this program – full deployments may take another decade.

Along with the projected consultant/contractor costs for each phase, an estimate was made of the public agency time that would be dedicated to this project. For consultant management, this was typically fairly minimal. However, some projects required additional staff for a state agency. In those instances, the public sector hours were substantial. The time estimates were for the first year or life of a project. Ongoing hours were not included because it is highly dependent on when within the program the project was implemented. The cost of these hours was not included in the total program cost, but should be used by the corridor agencies to better determine the timing of projects within the program.

3.7 Corridors of the Future

As of September 2007, the I-10 Freight Corridor has been selected as one of six national Corridors of the Future. It is the expectation of the corridor that this will result in some degree of annual funding for the corridor and its member organizations.

In the initial designation, only two projects were selected. Neither project was an ITS project, and only one was part of the Corridors of the Future Program application. As of October 2007 the corridor continues to work with FHWA to better understand the long-term implications of the corridor's designation and how an agreement will be structured between the corridor and the FHWA. The study team anticipates a long-term agreement with funding contingent on the corridor following through on its commitment to deploy the projects as planned.

Chapter 4

Standards

4.1 Introduction

In the systems engineering process, all requirements and designs derive from the identified user needs. Stakeholder involvement is emphasized in the initial steps of developing an ITS architecture. Once the stakeholders have been identified, their needs are defined. ITS standards are used to define an architecture of interrelated systems that will work together to deliver the transportation services necessary to meet the needs of the stakeholders.

Standards define how ITS systems exchange information and interact to deliver services within a transportation network using a common language and protocol. ITS standards are open-interface tools that establish communication rules for how ITS devices can perform, how they can connect, and how they can exchange data to interoperate. It is important to note that ITS standards do not specify specific products or designs to use. Instead, the standards provide users the confidence that components from different manufacturers will work together and are interchangeable to the maximum degree possible.

4.2 Definition of ITS Standards

As stated above, standards help to define an architecture of interrelated systems that work together to deliver transportation services. An ITS architecture, in turn, defines how systems functionally operate, how they interconnect, and how information is exchanged between the systems to deliver services to transportation users. An architecture is functionally oriented and not technology-specific, which allows the architecture to remain effective over time. It defines what must be done, but not how it will be done.

Critical ITS standards are ***voluntary, consensus-based,*** and ***open:***

- ***voluntary, meaning their use is not mandated by law***
- ***consensus-based, meaning that a published standard has attained general agreement through cooperation and compromise in a process that is inclusive of most, if not all, interested parties***
- ***open, meaning that they are not proprietary and are available for anyone to use***

Regarding the voluntary nature of standards, the Federal Highway Administration (FHWA) may at some point mandate specific standards. To date, FHWA has not done so and is not actively pursuing formal action. It is likely that the ITS environment will be more mature, and systems and standards will be well-tested before they are made mandatory.

ITS standards cover different communications layers in their description of how data is communicated between the relevant transportation systems. At their most basic, these layers start with the description of how bits and bytes of data are combined and transmitted. The layers then extend to the meaning of the entire message sent over the communications path. Standards specify consistency and compatibility in the interconnects and interfaces of both hardware and software in an advanced transportation system.

4.3 Purpose of Standards

The benefits of standards within the overall framework of the national and regional ITS architectures include the following:

Development costs are minimized for ITS deployments and preserve the agency investment. Standards can reduce investments in multiple incompatible approaches and technologies. This promotes a better-known technology path, which allows for incremental system upgrades and facilitates long-term system planning.

Interchangeability of equipment is promoted. This reduces capital costs by increasing competition between equipment providers. The availability of interchangeable equipment also increases the confidence of both providers and users of ITS products that equipment can be maintained, updated, or replaced as needed.

Interoperability of hardware and software is promoted between different and diverse systems. Interoperability allows local, regional, and state ITS networks to efficiently and easily communicate operational data.

More manufacturers and producers are attracted to the ITS industry. Manufacturers are more likely to enter a market if the market is larger. This increases competition, lowers product costs, and promotes the development of new technologies and innovations.

Maintenance costs are reduced by requiring smaller spare inventories and less expensive replacement parts.

System efficiency is increased while system implementation and maintenance costs are reduced, since standard parts are more readily available.

The Turbo Architecture software can be used to help develop an ITS architecture that is compatible with the National ITS Architecture, based on locally identified systems and subsystems in the regional ITS architecture. In Turbo Architecture, the output is better defined as a checklist: e.g., if component A has been identified, then standards X-Z should be used. Turbo Architecture output provides a good starting point for a region to consider; however, each agency will have to examine their particular system, its state of ITS development, and its individual needs to determine if the list is complete and accurate. Turbo Architecture has been used to develop the I-10 Freight Corridor Architecture, and will help support development of ITS standards for the I-10 Corridor.

4.4 Related Standards

Standards from other relevant industries such as information technology, telecommunications, and electronics are commonly used in ITS deployments. This allows ITS systems to benefit from the relevant experience of those industries. A list of available standards covering such areas as communication and information, computer engineering, instrumentation, measurement, and testing has been developed by the Institute of Electrical and Electronics Engineers, and can be found online at http://www.ieee.org/web/standards/home/index.html. A summary list of relevant ITS standards can be found in Appendix K.

4.5 Current National Standards

There are currently 105 approved and developing standards for ITS development and implementation. ITS standards are developed using an established industry-standard process.

4.5.1 Standard Development Organizations (SDOs)

The process of developing standards is led by Standard Development Organizations (SDOs), which are accredited by the American National Standards Institute (ANSI). The United States Department of Transportation (USDOT) ITS Standards Program supports eight SDOs in their various roles and responsibilities in the current and future development of ITS standards, including:

- *American Association of State Highway and Transportation Officials (AASHTO)*
- *American National Standards Institute (ANSI)*
- *American Public Transportation Association (APTA)*
- *American Society of Testing and Materials (ASTM)*
- *Institute of Electrical and Electronics Engineers (IEEE)*
- *Institute of Transportation Engineers (ITE)*
- *National Electrical Manufacture's Association (NEMA)*
- *Society of Automotive Engineers (SAE)*

Each of the SDOs has its own classifications of standards documents. Of the eight organizations, AASHTO, ITE, and NEMA are the primary developers of ITS standards applicable to this study.

4.5.2 NTCIP

The National Transportation Communications for ITS Protocol (NTCIP) is a family of standards for both the rules for communicating ("protocols") and the vocabulary ("objects") necessary to allow electronic traffic equipment from different manufacturers to operate with each other as a system. The NTCIP aims to provide a complete set of standards for the transportation industry to allow traffic systems to be built using a "mix and match" approach with equipment from different manufacturers. NTCIP standards are intended to reduce the need for reliance on specific equipment vendors and customized one-of-a-kind software. NTCIP is a joint product of AASHTO, ITE, and NEMA, and is part of a larger effort to develop a family of ITS standards that includes transit communications protocols.

To date, there are 51 NTCIP protocols that have either been jointly approved/recommended, or are in draft form. Appendix L provides summary descriptions of the NTCIP protocols. In addition, there are 12 information reports, the most basic of which is #9001, NTCIP Guide, which provides an overview of NTCIP and its overall content and processes. (Details on NTCIP can be found online at http://www.ntcip.org.)

4.5.3 CVISN

The Commercial Vehicle Information Systems and Networks (CVISN) program and associated architecture are of particular importance to the I-10 Corridor. As part of the CVISN program, the Federal Motor Carrier Safety Association has defined an initial set of core capabilities that could be deployed incrementally by a state and its motor carriers to promote ITS in truck freight operations. These core capabilities focus on electronically exchanging safety and credentialing information, electronically processing interstate registration and fuel tax credentials, and implementing roadside electronic screening at both fixed and mobile sites.

The CVISN architecture envisions several standards to enable the desired capabilities, about 15 of which are a part of the National ITS Architecture (see http://cvisn.fmcsa.dot.gov). Examples include credentials information, safety status information, and electronic screening request. Because of the direct relevance to the I-10 activities, developments in this area need to be closely tracked and integrated into the corridor efforts.

4.6 How Standards are Applied

The National ITS Architecture provides the appropriate framework for applying standards to the I-10 National Freight Corridor ITS Architecture. The National ITS Architecture data flows are linked to "interface classes," defined by the type of system at each end of the communications path: center, field, vehicle/traveler. The data flows are further divided into "application areas." For example, an application area within the center-to-field interface class would include bidirectional communication between a center system (e.g., traffic management center) communicating with a field system (e.g., roadside equipment).

Application areas are deployment-oriented categories that focus on commonly used ITS services or systems. Application areas can be used as the starting point for identifying the relevant ITS standard. To determine which standards may be applicable, one must first identify the application area, as identified in Table 4-1.

Not all possible application areas in the National ITS Architecture are included in the table (e.g., vehicle-to-vehicle). This is because application areas are only included if they are currently represented by an approved or published ITS standard. As additional ITS standards become available, more application areas will be added.

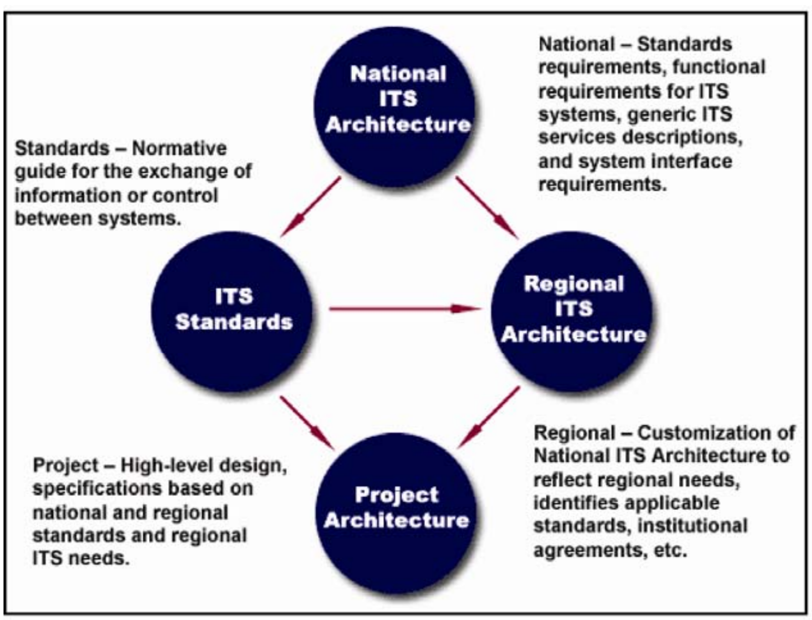
Table 4-1. Application Areas

Interface Class and Application Area	Standards Application Areas
Center-to-Center – Includes interfaces between transportation management centers.	• Traffic Management • Traveler Information • Incident Management • Transit Management • Rail Coordination • Data Archival
Center-to-Field – Includes interfaces between a management center and its field equipment (e.g., traffic monitoring, traffic control, environmental monitoring, driver information, security monitoring, and lighting control).	• Video Surveillance • Dynamic Message Signs • Traffic Signals • Data Collection and Monitoring • Vehicle Sensors • Ramp Metering • Environmental Monitoring • Lighting Management
Center-to-Vehicle/Traveler – Includes interfaces between a center and the devices used by drivers or travelers. Covers interfaces with motorists and travelers for exchange of traveler and emergency information as well as interfaces between management centers and fleet vehicles to support vehicle fleet management.	• Traveler Information • Mayday • Transit Vehicle Communication • Commercial Vehicle Safety and Credentials
Field-to-Field – Includes interfaces between field equipment, such as between wayside equipment and signal equipment at a highway rail intersection.	• Highway Rail Intersection
Field-to-Vehicle – Includes wireless communication interfaces between field equipment and vehicles on the road.	• Signal Priority • Toll/Fee Collection • Probe Surveillance

The application of specific standards for a project is predicated upon the regional or project ITS architecture, and the identification and selection of market packages and architectures flows/interface requirements. Once interfaces and information exchanges are determined for the region, ITS standards can be reviewed and mapped against requirements.

The I-10 Corridor spans over 2,400 miles across eight states, and passes through many geographic regions covered by a number of regional ITS architectures. Selection of standards for the corridor should be sensitive to different aspects of the various regional architectures, while also identifying common ground for eventual adoption. Figure 4-1 illustrates the relationship between architectures and standards.

Figure 4-1. ITS Architecture Relationships



Source: ITS Standards Program, U.S. Department of Transportation

Some states in the corridor have developed statewide ITS architectures. A state that has both statewide and regional architectures may identify the commercial vehicle operations (CVO) applications in the statewide ITS architecture, rather than in a regional ITS architecture, since CVO applications tend to be consistent throughout a given state.

It is not the intent of this effort to choose vendors or to enforce a particular standard along the entire corridor. Instead, by illustrating how standards are applied, the intent is to show the benefits of working toward a long-term uniform application of standards while allowing regional variations in the short to medium term.

4.7 Standards by State and Region

The various traffic management centers (TMCs) were contacted to determine various aspects of their existing communications systems, including standards that are currently in use or planned. The intent was not to fully inventory all of the standards and interface control specifications, but instead to lay the initial groundwork for a future more detailed study. A copy of the survey form can be found in Appendix M.

Areas of inquiry in the survey related to standards included the following:

1. *Are you currently sharing video/data/voice with another TMC?*
2. *Were C2C standards designed into the process or did they evolve?*

3. *Have you adopted any of the current NTCIP C2C standards?*
4. *How are you dealing with location referencing?*
5. *What type of information are you sharing?*

The survey response rate was about 25 percent and the results were fairly typical of TMCs elsewhere in the country. It should be noted that most of the TMCs were planned prior to the creation of many of the C2C standards, and most of the NTCIP standards have not yet been implemented in the current TMCs. There has also been very little integration of TMCs in the corridor to date. The few centers that did indicate links to other centers stated that such links typically covered voice, data, and video. These few centers said they used several location referencing systems, including latitude and longitude, state plane coordinate systems, centerline mileposts, and cross-street references. These and other centers did identify existing or planned use of XML and XML standards for center-to-center communications. This is consistent with trends at other TMCs across the nation to move away from DATEX or CORBA interfaces toward XML.

Overall, the survey indicates that as the I-10 Corridor evolves to more integrated operation, more detailed study of these issues will be needed. The adoption of corridor standards is expected to help facilitate the interconnection of centers.

4.8 Potential I-10 Standards

The companion I-10 ITS architecture identifies market packages that apply to the I-10 Corridor. The corridor architecture additionally lists the standards typically associated with the selected market packages, as presented in Table 4-2. Additional review of the various SDOs suggests a few more standards, presented in Table 4-3.

4.9 Barriers to Implementing Standards

Barriers are defined as known or anticipated issues that must be overcome to achieve and maximize opportunities. Barriers should not be considered as fatal flaws. Barriers are generally surmountable, although there may not always be immediate practical solutions due to time, costs, and resource availability. Barriers to consider when identifying standards are described below.

4.9.1 Limited Use and Lack of Maturity

While ITS systems have been deployed across the country, deployments have generally not been uniform in all regions. Because each area has different systems deployed, with different levels of integration, not all standards have been implemented everywhere. Lack of system and standard maturity is a particular issue in newer standards such as dedicated short-range communications (DSRC).

Achieving the full benefit of standards for multiregional application depends on consistent application of standards across those regions. Collaboration and coordination among the agencies responsible for ITS implementation in the design and implementation of ITS technologies and systems will be necessary in order to maximize the potential benefits of standards in those regions.

In some technical areas, standards may not yet exist, or may still be under development and subject to change. In these cases, it is important for the agency to carefully document the technical details of the implementation so that compliance with a future standard can be achieved at the appropriate time. In other technical areas, standards may exist but may not have been subjected to rigorous field testing. Again, full documentation of the agency's interim implementation will be needed to facilitate future compliance.

Table 4-2. Potential Standards from I-10 ITS Architecture

Name	**Identifier Code**
Global Objects Definitions	NTCIP 1201
Object Definitions for Actuated Traffic Signal Controller Units	NTCIP 1202
Object Definitions for Dynamic Message Signs	NTCIP 1203
Object Definitions for Environmental Sensor Stations and Roadside Weather Information System	NTCIP 1204
Data Dictionary for Closed Circuit Television (CCTV)	NTCIP 1205
Data Collection and Monitoring Devices	NTCIP 1206
Ramp Meter Controller Objects	NTCIP 1207
Object Definitions for Video Switches	NTCIP 1208
Transportation System Sensor Objects	NTCIP 1209
Objects for Signal Systems Master	NTCIP 1210
Objects for Signal Control Priority	NTCIP 1211
Commercial Vehicle Safety Reports	ANSI TS284
Commercial Vehicle Safety and Credentials Information Exchange	ANSI TS285
Commercial Vehicle Credentials	ANSI TS286
Electronic Filing of Tax Return Data	ANSI TS813
Standards Specification for Archiving ITS-Generated Traffic Monitoring Data	ASTM E2259-xx
Standard for Message Sets for Vehicle/Roadside Communications	IEEE 1455-1999
Standard for Functional Level Traffic Management Data Dictionary (TMDD)	ITE TM 1.03
Message Sets for External TMC Communications (MS/ETMCC)	ITE TM 2.01
Center-to-Center and Center-to-Field Standards Groups	
Simple Transportation Management Framework (STMF)	NTCIP 1101
Base Standard: Octet Encoding Rules (OER)	NTCIP 1102
Simple Transportation Management Protocol (STMP)	NTCIP 1103
CORBA Naming Convention	NTCIP 1104
CORBA Security Service	NTCIP 1105
CORBA Near-Real Time Data Service	NTCIP 1106
Point to Multipoint Protocol using RS-232 Subnetwork Profile	NTCIP 2101
Subnet Profile for PMPP over FSK Modems	NTCIP 2102
Subnet Profile for Point-to-Point Protocol using RS-232	NTCIP 2103
Subnet Profile for Ethernet	NTCIP 2104
Transportation Transport Profile	NTCIP 2201
Internet (TCP/IP and UDP/IP) Transport Profile	NTCIP 2202
Application Profile for Simple Transportation Management Framework (STMF)	NTCIP 2301
Application Profile for Trivial File Transfer Protocol	NTCIP 2302
Application Profile for File Transfer Protocol (FTP)	NTCIP 2303
Application Profile for Data Exchange ASN.1 (DATEX)	NTCIP 2304
Application Profile for Common Object Request Broker Architecture (CORBA)	NTCIP 2305
Information Profile for DATEX	NTCIP 2501
Information Profile for CORBA	NTCIP 2502
Dedicated Short-Range Communications at 5.9 GHz Standards Group	
Resource Manager for DSRC 5.9 GHz	IEEE 1609.1
Application Services (Layers 6,7) for DSRC 5.9 GHz	IEEE 1609.2
Communications Services (Layers 4,5) for DSRC 5.9 GHz (Future Standard)	IEEE 1609.3
Medium Access Control (MAC) Extension and the MAC Extension Management Entity for DSRC 5.9 GHz	IEEE 1609.4
Standard Specification for Telecommunications and Information Exchange Between Roadside and Vehicle Systems - 5 GHz Band Dedicated Short-Range Communications (DSRC), Medium Access Control (MAC), and Physical Layer (PHY) Specifications	IEEE 802.11
Logical Link (Layer 2) for DSRC 5.9 GHz	IEEE 802.2
Networking Services (Layer 3) for DSRC 5.9 GHz	ISO 21210
Dedicated Short-Range Communications at 915 MHz Standards Group	
Standard Specification for Dedicated Short-Range Communications (DSRC) Physical Layer using Microwave in the 902-928 MHz Band	ASTM E2158-01
Standard Provisional Specification for Dedicated Short-Range Communications (DSRC) Data Link Layer	ASTM PS 105-99
Incident Management Standards Group	
Standard for Traffic Incident Management Message Sets for use by EMCs	IEEE 1512.1-2003
Standard for Hazardous Material IMMS for use by EMCs	IEEE 1512.3-2006
Standard for Common Incident Management Message Sets (IMMS) for use by EMCs	IEEE 1512-2006
Standard for Public Safety IMMS for use by EMCs	IEEE P1512.2
Advanced Traveler Information Systems (ATIS) Bandwidth Limited, General Use and On-Board Vehicle Mayday Standards Groups	
Location Referencing Message Specification (LRMS)	SAE J2266
On-Board Land Vehicle Mayday Reporting Interface	SAE J2313
Message Sets for Advanced Traveler Information System (ATIS)	SAE J2354
Standard for ATIS Message Sets Delivered Over Bandwidth Restricted Media	SAE J2369
Rules for Standardizing Street Names and Route IDs	SAE J2529
Messages for Handling Strings and Look-Up Tables in ATIS Standards	SAE J2540
RDS (Radio Data System) Phrase List	SAE J2540-1
ITIS (International Traveler Information Systems) Phrase Lists	SAE J2540-2
National Names Phrase List	SAE J2540-3
Converting ATIS Message Standards from ASN.1 to XML	SAE J2630

Table 4-3. Other Potential Standards

Name	Identifier Code
Standard for Wireless Access in Vehicular Environments (WAVE) Resource Manager	IEEE 1909.1-2006
Standard for Common Traffic Incident Management Message Sets for use in Entities External to Centers	IEEE P1512.4
Traffic Management Data Dictionary and Message Sets for External TMC Communications	ITE TMDD 2.1
TCIP Incident Management (IM) Objects	NTCIP 1402
Class B Profile	NTCIP 2001
ISP - Vehicle Location Referencing Standard	SAE J1746
ITS Data Bus – IDB-C Physical Layer	SAE J2366/1
ITS In-Vehicle Message Priority	SAE J2395
Human Factors in Forward Collision Warning System: Operation Characteristics and User Interface Requirements	SAE J2400

4.9.2 Agency Unfamiliarity

Implementation of standards can be intimidating to agencies with limited in-staff resources and expertise. The challenge is to provide resources in the area of standards implementation to assist these agencies.

4.9.3 Legacy Systems

Local governments and transportation agencies often have legacy systems that may not have applied existing standards, or may not yet be fully compliant with those standards. The challenge will be to maximize their current ITS investment while at the same time upgrading the system using existing and emerging ITS standards.

4.9.4 Costs

When implementing standards, transportation agencies incur costs relating to purchase of equipment and software, in addition to the time required to educate and train staff. It may also be necessary for them to use outside expertise. In addition to direct labor costs, there are also costs to transportation users when implementation of ITS technologies is deferred while the necessary expertise in standards implementation is developed.

In some cases, a standards-based deployment may involve higher initial costs and levels of effort. However, using ITS standards should result in cost savings in the long run by providing managers with a wider range of options in service and product selections. This should translate into reduced cost and lower risk for transportation agencies when performing system maintenance, as well as when replacing, upgrading, or enhancing equipment. As standards become more widely deployed, integration with other systems in the future should be simplified.

4.9.5 TMC Integration

TMCs often serve as a focal point where multiple standards come together, resulting in fully functional, integrated operation. At TMCs, the use of standards should result in simplified operation and cost savings through connected, cooperative operation of ITS systems, subsystems, and devices. Standards deployment will help ensure efficient agency performance, maximize agency interoperability, and facilitate the flow of traveler information to I-10 users. Examples of specific applications for standards at TMCs include device management and additions, user interfaces, video displays, communications equipment, software, and media links.

Chapter 5

Communications

5.1 Introduction

Communications is the lifeblood of intelligent transportation systems (ITS). Reliable communications technology ensures that devices work together and helps agencies manage their systems to maximize benefits. Each of the I-10 Corridor states has deployed some communications infrastructure, whether as part of specific ITS deployments, or for other purposes.

Interagency communications is a critical goal for the corridor, but this does not necessarily imply a need for a dedicated coast-to-coast fiber optic link. Instead, the various needs should be examined so that the states can work to meet these needs by addressing the identified gaps, whether physical, institutional, or systemic. This chapter provides a review of the basics of ITS communications technologies, and discusses how these technologies apply to the I-10 Corridor as the states move to plan their next implementations.

5.2 Background

From a corridor perspective, it is assumed that the ideal alternative would be a single communications network spanning the corridor and shared by all of the states. Because of the high cost and the numerous agreements that would be needed, this is not anticipated to be a likely near-term alternative. However, some of the states and regions in the corridor have already established communications networks as part of their ITS deployments, and some states have worked to create statewide networks, typically to address issues other than transportation.

The intent of the corridor approach is to use existing resources and to enhance them by filling in any gaps, such as those between networks that do not extend to the state lines.

With eight states in the corridor and multiple agencies per state involved in communications technologies, it is not considered practical to invest in the design of a corridorwide communications architecture or design. However, even though the prospects of a single universal network may seem unlikely, the agencies will likely continue to work together toward the eventual implementation of this long-term goal. In the short term, some of the multistate regions will achieve communications interoperability, and certain types of information will be shared via other communications networks (e.g., the Internet, phone system, etc.).

The purpose of this chapter is to illuminate the various design and maintenance considerations associated with the development of ITS communications technologies as they pertain to the development and implementation of ITS networks in the I-10 Corridor. This information may be used by the different transportation agencies to enhance the communications component of their ITS facilities. The goal is to provide a useful resource for designing and implementing ITS communications infrastructure, with an emphasis on the physical components of the communications network. This will effectively promote coordination between the various transportation and emergency response agencies responsible for movement of interstate and intrastate freight.

The initial focus of this chapter is on the primary means of agency owned and operated landside communications: fiber optic, wire-line, or wireless. Other options, such as leasing services (either wire-line phone lines or cellular/radio) or using the Internet, are discussed at the end of the chapter.

5.3 Communications Design Essentials

The design of a communications link is comprised of three separate components: design load considerations and parameters, operation performance, and budgetary/cost performance analysis.

5.3.1 Design Load Considerations and Parameters

An implementing agency's initial step in communications link design is the determination of the data transmission system technology to be used. This is dependent upon the user's application, the transmission speed desired, and the load requirement of the overall system to be implemented. These three elements of design are documented and presented in the physical architecture component of the state and regional architecture plans developed by each I-10 Corridor state.

Transmission requirements for the communication system are the next critical consideration. Principal transmission requirements include data rates, bandwidth, and transmission distances. Data rates for ITS networks refers to the amount of information, usually expressed in bits per second, generated by the various system components for their operation and management. Bandwidth refers to the rate at which electronic impulses (symbols) may be transmitted. The term is also used to describe channel capacity, that is, how much electronic information can be transmitted through the system. Finally, the physical distance over which the data is transmitted must be considered. Optical signals transmitted over fiber optic links will fade and degrade as transmission distance increases. Longer distances will require regeneration or amplification of the optical signal. The same is true of wireless signals relating to fade and degradation over distances.

The anticipated future data transmission needs of the ITS network are another important design consideration. This will help determine the additional bandwidth to be included in the initial installation of the fiber optic link. Growth estimates should consider not just the needs of the implementing agency, but the needs of the corridor and other agencies. When establishing multiagency coordination, even one or two fibers can provide the majority of the bandwidth required for center-to-center communications. Although a minimum of two fibers should be included for interagency coordination, in practical terms, once the agencies' future needs are accommodated, it will be necessary to analyze the number of spares required versus the number included in a standard bundle (e.g., 24, 36, 72, etc.). When rounding up to the next size bundle, there will likely be more than two spare fibers that can be dedicated to this use.

The addition of spare fibers has only a minimal impact on the cost of a fiber optic cable installation. The incremental cost of installing a 72-count fiber cable is minimal relative to the cost of a 36-count fiber cable installation. Most of the cost of installation is labor, not in the cost of the fiber cable. For wireless networks, a similar analysis should be performed, although it is often easier to upgrade wireless equipment at a later date than it is to increase the number of fibers in the ground.

Selection of fiber optic operating wavelength for an initial ITS communications backbone is dictated by the applications that are to be used on the system. Typically for ITS systems, field device to center/hub distances are less than a mile, while backbone systems transmission distances are many miles in length. Networks that require high data rates over long distances typically use 850 nanometers (nm), 1310 nm, and 1550 nm wavelengths. For most current ITS fiber communication applications other than local distribution, single mode fiber is typically used. Fiber with low signal loss and high bandwidth will suffer less signal attenuation than higher signal loss and low bandwidth fibers. These factors will have an impact on the need for repeaters and amplifiers, as well as for transmitting and receiving equipment.

When selecting a transmission frequency for wireless communications, many factors must be considered. The desired bandwidth and transmission distance are the two most important factors in determining which frequencies can be used. For microwave, higher frequencies (such as 11 GHz, 13 GHz, and 18 GHz) are typically reserved for transmission distances of under 10 miles, as problems increase in the higher frequencies. Lower frequencies (such as 2.4 GHz, 5.8 GHz, and 6.0 GHz) are better choices for long distance transmission, although it should be noted that the 2.4 GHz and 5.8 GHz bands are unlicensed, and are therefore more vulnerable to signal interference.[13] When using the 6.0 GHz band, the Federal Communications Commission (FCC) requires a dish antenna with a minimum diameter of six feet to minimize co-channel and adjacent channel interference.[14]

The reliability of the fiber optic cable or wireless link is a direct function of system design. Variation in quality of the transmitting/receiving equipment, the physical attributes of the fiber or coaxial cable, the installation environment (shielding, conduit, or aerial), and the realities of construction (i.e., cable pulling, splicing, termination, etc.) can all affect the reliability of a cable or fiber optic system. Similar considerations affect wireless communications. Lower frequency wireless, such as those of 6 GHz or below, are typically less susceptible to rain and snow, and are somewhat more flexible in their ability to operate “line-of-sight.” The degree of competition for bandwidth is also a concern. A thorough review of wireless alternatives and the local communications environment must be conducted to complete a full trade-off analysis.

5.3.2 Determination of System Signal Loss for Fiber

A fiber optic backbone is critically dependent on its weakest link. The system can operate no better than its lowest performing link. This determines transmission capacity and impacts the maximum length of the system and the number of ITS devices the network can support. A system can only transmit effectively if enough power (i.e., light) remains in the transmitted signal to activate the receiver when the signal reaches the terminus of the cable.

[13] The Federal Communication Commission (FCC) regulates the use of the electromagnetic spectrum in the United States, including the use of radio and microwave frequencies.

[14] With all wireless designs, a Microwave Path and Profile analysis is recommended to ensure connectivity.

Estimating this capacity requires developing and calculating a signal link budget and bandwidth budget for the fiber optic cable system. Loss budgets are influenced by various factors including:

- ***number of splice points and termination points***
- ***number of field devices and equipment access points***
- ***usable bandwidth (wireless and fiber)***
- ***transmission distances***

The following sections describe procedures for developing loss budgets that must be considered when designing a fiber optic cable system.

5.3.2.1 Transmitter Power

To determine the output from an optic light source a small piece of fiber optic cable, typically two to three meters in length, is attached to a light source and its output is measured on the other end of the cable. This will identify any mismatches between fiber and the light source such as fiber core/light source size numerical aperture differences and other sources of power loss at the transmitter/fiber interface.

5.3.2.2 Minimum Transmit Power

Minimum transmit power that can be expected from the light source over its lifetime is typically quoted by the manufacturer. The output power of the transmitter is expressed in decibels referenced to 1.0 milliwatt (dBm) for either peak power or average power. It is important to remember to use the same power measurement (i.e., peak power or average power) in determining the loss budget or the calculation will be incorrect.

5.3.2.3 Receiver Sensitivity

When specifying a receiver, various manufacturers will quote the minimum level of signal power that is required at the receiving end of the fiber cable for the receiver to detect and decode the transmitted signal. This is known as receiver sensitivity. There are two important aspects regarding receiver sensitivity to be considered. First, as the data rates increase the receiver will require increased power to maintain the necessary bit error rate. Conversely, if the data rate remains the same while the transmitter input level drops only slightly, the bit error rate will increase significantly.

5.3.2.4 System Gain

Signal gain is a parameter that represents the increase of signal energy delivered by a particular device. System gain is the sum of the various signal gains within a system. Therefore, when working with a complete system the summation of all devices measured in dBm must be considered. Typically system gain is represented as the numerical difference between the transmitter output power and the receiver sensitivity.

5.3.2.5 System Losses

Optical signal loss (i.e., attenuation) over a fiber cable link is caused by a number of factors including splicing, coupler and connector losses, fiber attenuation, and dispersion losses due to aging and environmental conditions.

5.3.2.6 Power Margins

Because all conditions cannot be determined at the beginning of design, it is prudent for ITS communications designers to include a power margin in their link budget calculations to account for unpredictable circumstances. The power margin defines power beyond what is theoretically needed to account for uncertainty, such as the impact of future splices due to cable cuts, or the addition of ITS field equipment. Power margins also account for the natural and gradual loss of signal power over time.

Determination of an adequate margin depends on the size and complexity of the network; in general, the larger and more complex the network, the larger the desirable margin. In addition, manufacturers sometimes include a margin referred to as the receiver power penalty. The intent is to ensure that the component is used with a power margin that allows for some compensation for bandwidth limitations, clock recovery, and dispersion problems.

5.3.2.7 Dynamic Range

A receiver has a maximum limit to the signal power it can receive before it reaches saturation and experiences signal distortion. The difference between the maximum power that can be received and the sensitivity of the receiver is called the dynamic range. It is important in system design that the dynamic range of the receiver not be exceeded.

5.3.2.8 Transmitter to Fiber Coupling

Attaching light emitting diode (LED) transmitters to fiber cable results in a large power loss because the LED has a large surface area compared to the fiber cable core. The use of laser transmitters reduces the loss because the contact surface area is much smaller; however, there is a financial trade-off because LEDs are less costly than laser transmitters. As previously mentioned, equipment manufacturers will specify the output power of transmitters which is used in determining the power (i.e., signal) loss budgets for the system.

5.3.2.9 Fiber to Receiver Coupling

Receivers do not experience significant power loss when attached to the fiber cable core. This is due to the fact that receivers have large surface areas to receive the light signal for the smaller surface area of the fiber cable core. However, although this loss may be small, its cumulative effect must still be considered in the fiber communications design to ensure a properly operating system.

5.3.2.10 Link Loss Budget

When the safety margin designed into the system is subtracted from the system gain, the remaining value is the link loss budget. This value is the maximum amount of signal loss available during the design process for cable attenuation, splicing losses, and connector loss.

5.3.2.11 Fade Margin

Knowing the length of a fiber optic cable run, a total known power loss can be calculated (allowing for connectors, splices, and cable length). This value subtracted from the link loss budget should be a positive value. This is referred to as the fade margin and represents the amount of unused signal gain for this particular application.

5.3.3 Determination of System Signal Loss for Wireless

Critical to the design of the wireless communications backbone is determining whether each wireless hop (transceiver to transceiver) will operate at the performance level needed to support the overall length and number of external devices associated with the ITS network. The objective is to determine if enough power is left in the transmitted signal for the receiver to respond on the receiving end. This is done by developing and calculating a signal link budget and bandwidth budget for the wireless system. These loss budgets are influenced by various factors including:

- *number of wireless hops*
- *number of field devices and equipment access points*
- *usable bandwidth (wireless and fiber)*
- *transmission distances*

The following sections provide a brief description of the elements and procedures for developing loss budgets that should be considered when designing a point-to-point wireless system.

5.3.3.1 Transmitter Power

This parameter is usually specified by the manufacturer and taken into consideration at time of purchase.

5.3.3.3 Receiver Sensitivity

Along with the transmit power, the receive sensitivity metric is also given and is equally, as if not more, important than the transmitter power.

5.3.3.4 System Gain

Signal gain is a measure of the increase of signal energy delivered from a particular device. When working with a complete system the summation of all devices measured in dBm must be considered. Typically system gain is represented as the numerical difference between the transmitter output power and the receiver sensitivity. During wireless design, a theoretical model called a link budget is created. This process considers the various gains of the transmitter and receiver to determine if they are properly matched for the need.

5.3.3.5 System Losses

While signal loss (i.e., attenuation) within a wireless network can come from a variety of external sources, the physical components themselves should be designed to overcome these losses. The difference between the estimated and actual loss is directly dependant on the quality of construction and the integrity of coaxial cables, or waveguide, and their associated connectors. Immediately after construction, a benchmark measurement is usually taken as a method to compare against and measure degradation over time. Preventative maintenance measures must be put into place to combat failures due to aging and environmental conditions.

5.3.4 Determination of Design Bandwidth

Design of an ITS communications system must be such that it has sufficient bandwidth to support the data speed requirements of the system. The following information highlights different elements that should be considered when determining the bandwidth requirements for standard digital transmission.

5.3.4.1 Fiber Optics

The most useful evaluation method is to compare the time responses of the signal and the transmission. The light signal that emanates from the transmitter will be in the form of a square wave. In theory the link system (which includes the transmitter, receiver, and fiber optic cable) response time must be faster (shorter response period) than the signal response time (signal rise time) for the signal to pass through successfully. If the transmission link system time response is too slow, then the light pulses coming out of the receiving end of the link system will have their rise times slowed down by the system response time and will be overlapping each other. The limit of the time response must be defined for the system to operate properly. The rule of thumb for this is that the light pulse coming out of the receiver is equal to or greater than 90 percent of the input light pulse amplitude in 70 percent of the input light pulse duration. Thus the allowable rise time becomes the maximum allowable link system time response.

5.3.4.2 Wireless

Design of a point-to-point wireless data backhaul solution must have sufficient bandwidth to support the volume of data and speed requirements of the system. This requires that the summed data output rate for all devices expected to transmit needs to be taken into consideration. A rule of thumb for asynchronous transmission methods (e.g., ethernet) is that the summed data output rate should exceed no more than 30 percent of the rated bandwidth of any link. A similar rule for synchronous transmission methods is that no more than 50 percent of the rated bandwidth should be used.

5.4 Communications Systems Maintenance

Maintenance of the communications system is a critical component of ITS operations that sometimes does not receive adequate attention or resources. For a newly implemented system, maintenance is typically covered as a component of the construction contract or manufacturer warranties. However, as the system ages, maintenance issues become more of an issue and left unaddressed begin to affect the quality of operational services. The focus of this writing is to present and examine individual components that comprise a communications network maintenance program.

5.4.1 Technical Expertise and Training Requirements

For those transportation agencies that have in-house ITS maintenance operations (or that are considering it) it is essential to have personnel with suitable technical expertise. ITS maintenance personnel need to know not only the ITS field devices and their requirements, but also those of the communications networks. The ideal ITS maintenance personnel would include formal training and experience with fiber optic networks, wireless (RF) transmission, basic electrical systems, and electronics.

Industries that are good sources for this type of personnel include the cable television and telephone industry. The focus of these industries is that of providing high speed communications (voice, data, and video) anchored around providing consistent and reliable network service with the least amount of service failures. Technical personnel working in these two industries are exposed to the latest in communications technological innovation and continuous company-sponsored training. The armed forces operated extensive training programs in electronic and communications technologies, and are another source for experienced personnel.

Transportation agencies that outsource their maintenance activities to private companies also have a need for adequately trained in-house ITS technical staff. As the contracting agency, it is essential that agency personnel have the technical expertise to develop ITS maintenance requirements, evaluate maintenance proposal, and effectively oversee execution of the ITS maintenance contract.

5.4.2 Essential Testing Equipment

An essential component of maintaining a communications system is having and being able to use the necessary testing equipment. The following paragraphs identify and describe the major testing equipment that ITS maintenance personnel (in-house or contracted) will need to properly maintain fiber optic communications plant and wireless networks.

Optical Power Meter: This instrument measures the amount of optical power in a fiber. Most models handle several wavelengths and provide relative decibel (dB) as well as absolute (dB or watts) measurements. Different adapters will be required to connect with different types of optical connectors.

Optical Light Source: An optical light source injects a stable test light signal into a fiber. Models of this equipment offer both continuous wave (CW) mode and modulation mode. The typical test modulation frequencies are 270 Hz, 1 kHz, and 2 kHz.

Optical Loss Meter: This instrument combines an optical power meter and an optical light source into a single instrument. It may also be referred to as an optical loss test set (OLTS).

Fiber Identifier: This instrument traces the path of a given fiber. The fiber is identified by injecting a tracer signal into the fiber and using a tapping device on the fiber. The tapping device causes a small amount of light to be detected as it leaks from the fiber. The light emitted is captured and evaluated to determine if it matches the tracer signal.

Optical Time Domain Reflectometer (OTDR): This instrument is the most useful diagnostic tool for a fiber communications plant. It is used to evaluate anomalies in a length of fiber. The different aspects of fiber that can be analyzed using an OTDR include attenuation, optical loss, back reflection, and noise.

Optical Spectrum Analyzer: This instrument is used to determine the amplitude and wavelength of an optical signal. It is typically used to determine the emission spectrum of a given light source.

Fiber Optic Attenuator: This instrument is also referred to as an optical attenuator. It simulates the loss that would be caused by a long length of fiber. It is typically used to perform receiver testing. While the optical attenuator can simulate optical loss over the length of a fiber, the optical dispersion that is caused by a length of fiber is not accurately simulated.

Back Reflection Meter: This instrument quantifies the amount of light back reflection in the fiber path. Minimizing back reflection is critical because high bit rate digital fiber optic links and most laser-based analog links require very low back refection to properly operate.

Local Injector Detector: This instrument is used to measure and assist in the tuning of fiber splices. This is done by injection and light is detected through the sides of the fiber. For rotary splice tuning, the light is detected through the splice itself rather than the fiber.

RF Power Meter: This instrument measures the amount of power (in dB or watts) before it leaves the antenna. Different adapters can accommodate most connections.

Frequency Sweep Analyzer: This instrument is used to test the frequency response of the antenna at its tuned frequency. The end result is the check to see if the antenna is good or bad. It is also used to test the integrity of any coaxial cable or waveguide leading up to the antenna and is capable of accurately measuring the distance to any faults.

Spectrum Analyzer: This instrument gives a visual representation of a live signal and the adjacent frequency spectrum. From this representation, the user can tell the health of the signal in regard to signal strength and the RF noise floor, as well as see potential interfering frequencies.

RF Attenuator: This instrument is a tool that can be used when trouble shooting to "pad down" or attenuate the signal to avoid excessive power transmission when using with any particular measurement tool. Excessive power typically results in a higher than normal noise floor reading.

Tracking Generator: A tracking generator is used to visually see a band pass, or band notch filter, and its response. The tester can see exactly where the roll off of the filter is, and can also use this instrument to adjust or tune a filter if it is tunable.

5.4.3 Preventative Maintenance for ITS Communications

Proper ITS communications design enhances the transmission quality, capacity, and safety environment of the system. With preventative maintenance, optical fiber and wireless communication networks will function properly for years. Implementation of a preventative maintenance program is one of the most cost-effective actions that can be taken by the ITS operational agency. Factors that influence the scope and robustness of a preventative maintenance program include:

- ***environmental conditions***
- ***quality of initial installation***
- ***communications plant age***
- ***system expansion***
- ***construction accidents***
- ***budget constraints***

At minimum, nonintrusive tests such as an OTDR test for fiber optics and a frequency sweep analysis for wireless should be conducted annually. These tests will quickly detect any fiber micro-fractures, kinks in the coaxial cable, water migration, defective antennas, and other types of degradation in communications components. Test results should be documented so subsequent annual tests can be compared to one another and used to monitor the communications plant's functional integrity. These actions will result in the minimization of plant downtime for maintenance, increased operation effectiveness, and reduced repair costs.

5.4.4 Developing Maintenance Budgets

For operational and planning purposes each ITS operating agency along the I-10 Corridor should develop an annual maintenance budget for their ITS communications networks. The budgeting process should be predicated upon the life cycle and capital cost of components. Although the capital cost may vary in different regions it is generally accepted

Table 5-1. ITS Communications Component Costs

Items	Life Cycle (years)	Price per Unit	Units	Annual O&M	
				Low	High
Fiber Optic Backbone Cable 96 SMFO	10	$4.00	LF	$0.19	$0.47
Fiber Optic Backbone Cable 12 SMFO	10	$2.00	LF	$0.19	$0.47
Fiber Optic Drop Cable 6 SMFO	10	$2.00	LF	$0.19	$0.47
Fiber Splice Closure		$2,225.00	Ea	Included in O&M of fiber	
Wireless to Fiber Backbone Transition Switch	10	$10,000.00	Ea	$750.00	$1,500.00
Wireless Ethernet Bridge	10	$8,000.00	Ea	$2,000.00	$2,000.00
Terrestrial Microwave	10	$19,200.00	Ea	$500.00	$1000.00
900 MHz Spread Spec. Radio	10	$8,200.00	Ea	$100.00	$400.00

All data originated from the USDOT ITS Unit Cost Database as of September 30, 2006 (in 2005 dollars).

throughout the industry that the life cycle for fiber optic cable and wireless communication components is 10 years. The United States Department of Transportation (USDOT) has attempted to standardize the estimate of capital and maintenance cost for different ITS components throughout the country. Table 5-1 presents estimates for operation and maintenance (O&M) for communications components.

The costs identified here include only equipment costs. Often labor costs for installation and maintenance are more considerable. Whether this is contracted out, or handled by agency staff, a separate analysis must be made to determine the required number of staff and their costs.

5.4.5 Implications for the Corridor

Adequately maintaining a communications network has substantial implications for the I-10 Corridor ITS operations. Transportation agencies invest substantial amounts of money in the design, construction, and operation of their ITS facilities. Unlike traditional roadway construction and increased capacity projects, ITS networks are a complex integration of electronic technologies that constantly, and in real time, send and receive streams of electronic information. Electronic components typically either function or fail. If a key component (i.e., fiber cable) fails, then an entire network could be affected, temporarily causing Traffic Management Centers (TMCs) and their operations to be rendered ineffective.

To maximize return on investments in ITS equipment, the equipment must be kept operational. This is best achieved through an ongoing maintenance commitment on the part of the agencies that own and operate the equipment and systems. As seen by the O&M costs developed by USDOT for ITS components, financial resources dedicated to ITS communications maintenance are substantial. However, without the commitment to provide the resources (staff expertise, maintenance equipment, spare parts, etc.) to properly maintain ITS networks, the operational benefits of ITS technologies such as safety, increased freight movement efficiencies, and reduced congestion would be lost.

5.5 Existing Communications Resources

The management of existing and future ITS high-speed communications infrastructure by transportation agencies begins with the documentation of their existing communications resources. With the establishment of this baseline, it is possible to determine how well the communications infrastructure, primarily fiber optic cable, can support current ITS operations and future expansion. Additionally this information will show where there are gaps in the communications infrastructure along the I-10 Corridor that may inhibit the management of transportation operations for the corridor.

5.5.1 Communications Survey

WSA developed and distributed a written survey instrument to all the organizational members of the I-10 Freight Management committee. The survey was designed to solicit information from the seven state transportation agencies that operated a total of 38 ITS TMCs along the I-10 Corridor. The survey was comprised of seven primary questions and 13 subcategory questions.

The purpose of the survey was to obtain detailed information regarding the center-to-center communication interconnectivity between the various TMCs operating along the national I-10 Corridor. Additionally, information was solicited regarding types of information transmitted between TMCs, the communication technologies used to interconnect the TMCs, the communication technologies to connect to various ITS field equipment, and protocol standards being used.

Of the 38 TMCs surveyed, nine surveys have been returned to date.

5.5.2 Initial Survey Results

Results of the survey show that three of the nine TMCs have center-to-center agency-owned fiber optic communications which transmit data, voice, and video. Of the remaining six TMC responses, three indicated that they have plans for center-to-center communications, while the remaining three indicated they have no plans for center-to-center communications.

For communications between TMCs and field equipment, the survey showed the following:

- *Three TMCs communicate using fiber optic technology only*
- *Two TMCs communicate using fiber optic and wireless technologies*
- *One TMC communicates using fiber optic, cellular, and leased-line technologies*
- *One TMC communicates using fiber optic, wireless, cellular, and leased-line technologies*
- *One TMC communicates using fiber optic, wireless, and leased-line technologies*
- *One TMC communicates using fiber optic, wireless, and copper technologies*

5.5.3 Corridor Implications

The good news from the survey is that many agencies already recognize that different solutions may be appropriate at different times and with different systems. Depending on funding, agency skill sets, public policies, etc., various means of establishing communications may be best.

It is not necessary to dictate a single communications medium for the corridor. Instead, the corridor states should work to establish the end-to-end connectivity that will facilitate information exchange along the corridor. This will ensure that the corridor makes maximum use of whatever communication installations are currently available.

In some locations, the method of communicating may be predetermined. Possibly an agency has a long-term agreement with a carrier to supply all communications needs at a nominal price. While the marginal cost of installing fiber optic cable along a highway reconstruction may be minimal to ensure it is designed properly and installed safely and securely, that marginal cost may be more than the project can afford. With these types of issues affecting the decisions, new options are often limited.

In many cases, the private sector can supply a quality product and service for a reasonable price. This is especially true in locations where hiring the proper staff to maintain a system is problematic, or when the distance to be covered is very large making the infrastructure costs prohibitive.

Many of the newest devices are IP (Internet Protocol) addressable. This does not necessarily mean that they are all available on the Internet, only that they use the same protocols and could be accessed over the Internet. For the I-10 Corridor, there will likely be very little device sharing. However, the use of the Internet to exchange information is a viable alternative. This is especially useful for lower bandwidth and noncritical data. It should be noted that much of the initial center-to-center communications is via e-mail and by viewing web sites (either by a human or through web scraping), so the Internet is likely already in use. As the flow of information becomes more routine and the volume and bandwidth increase, a more dedicated solution is usually best. Public use of the Internet can result in congestion causing delays of potentially critical information, subsequently the transmission success rate is often not as good as a dedicated network. In essence, the agency must determine how critical the information is relative to the cost of the network and whether Internet communications will suffice.

5.6 Gap Analysis

State transportation agencies responsible for ITS network deployments along the I-10 Corridor would be well advised to conduct a gap analysis documenting the corridor's communication infrastructure. A gap analysis looks at where the transportation agencies are, as opposed to where they want to be, in terms of a communication network that can support the interconnectivity of the different TMCs throughout the corridor. The purpose of the gap analysis is to determine where there are deficiencies (i.e., gaps) in the ITS communications system. This information is vital to transportation agencies as they evaluate their existing and future needs for center-to-center communications throughout the corridor. A critical prerequisite for conducting a gap analysis is for agencies to determine the type (video, voice, databases, etc.) of data they want to share between TMCs (interstate and intrastate).

As the name implies, gap analysis focuses on identifying areas of the corridor where ITS communications infrastructure may be physically nonexistent or limited in its performance capacity. Conducting a gap analysis begins with a physical inventory of the corridor's existing ITS communications infrastructure. This effort, if undertaken, would be to document the technologies (fiber optic, copper wire, wireless radio, etc.) currently deployed throughout the I-10 Corridor. Ideally this inventory would include maps showing the location of communications backbone, equipment cabinets, transmitting equipment, and conduits.

The inventory should also document the bandwidth capacity of the system available for transmitting voice, video, data, and the future expansion needs for ITS hardware and services. Areas along the corridor that are devoid of any ITS communications infrastructure altogether, should be noted and an inventory of potential leased-line services should be developed. Where TMC interconnection is needed over particularly long distances, leasing communication services from private providers may be the most practical approach.

Conducting a gap analysis for the entire I-10 Corridor would not be an overwhelming effort. Most of the information needed should be currently documented in the regional ITS architectures, construction documents, and maintenance programs of the various transportation agencies responsible for freight movement and traffic operations throughout the corridor.

Appendix A

CVISN Projects Referenced in State CVISN Plans

Alabama

1. AL-CVIEW: Acquires the existing xCVIEW product and modifies it to exchange CVO information with state and national systems (Estimated cost: $125,000 to $200,000)
2. Roadside Safety: Improves screening and inspection data at the roadside ($100,000 to $200,000)
3. Credential and Permit System: Administers credentials and permits and allows carriers to electronically apply for, pay for, and receive credentials and permits ($400,000 to $700,000)
4. Electronic Screening: Enhances the electronic screening system to use information from AL-CVIEW ($50,000 to $100,000)

Florida

Electronic Credentials Administration

1. Electronic Credentialing/HelpDesk Feasibility Study (Estimated cost: $150,000)
2. Automated Processing of International Fuel Tax Agreement (IFTA) ($450,000)
3. 3.Automated Processing of International Registration Plan (IRP) ($450,000)
4. International Fuel Tax Agreement Clearinghouse ($100,000)
5. Automated Routing and Permitting Software Design and Development (OS/OW) ($750,000)

Safety Information Exchange

1. Information Systems Inventory (Estimated cost: $100,000)
2. ASPEN 2.0 - Complete

Electronic Screening Systems

1. Electronic Screening-Mainline Program 2 (Estimated cost: $6,200,000)
2. Electronic Screening at Agricultural Stations ($1,700,000)

Programwide

1. CVIEW3 (Estimated cost: $750,000)

2. Electronic Payment Solution ($50,000)

3. Compliance HelpDesk/Service Representative4 ($110,000)

Mississippi

1. Create a CVISN compliant virtual “one-stop” shop

2. Expand PrePass Program to joint port with LA

3. Complete laptop and cellular phone connectivity to enforcement systems

4. Expand combined ports of entry operations with surrounding states

5. Add ramp sorting capability using WIMs

Louisiana

Automated Safety Assurance Projects

1. ASPEN to 100% of TESS officers

2. ASPEN units deployed at all fixed weigh stations

3. Open Connection to SAFER via Cerulean Server

4. Louisiana Commercial Vehicle Information Exchange Window (LA CVIEW)

5. Automated Crash Reporting ("Post" Level 1 project)

Credentials Projects

1. Electronic credentialing for IRP and IFTA

2. Electronic quarterly filing for IFTA

3. IRP and IFTA Clearinghouse membership (IFTA clearinghouse functionality is already in place)

4. PRISM

5. Interfaces with Louisiana CVIEW

6. IRP and IFTA interfaces with SAFER

7. Electronic credentialing for SSRS ("Post" Level 1)

8. Automated OS/OW permitting ("Post" Level 1)

9. Enhancements to the OS/OW permitting system to include automation of size and weight citation issuance and citation/payment record tracking processes ("Post" Level 1)

Automated Screening Projects

1. PrePass/WIM/VMS installation at all interstate scales

2. Open connection from PERBA to CVIEW/scale house computer and communications upgrades

3. Expanded PrePass functionality

Texas

Existing Systems

1. TxCPA Tax Mainframe (IFTA/Interstate Registration)

2. TxDOT-MCD MCCS (MC Registration)

3. TxDOT-MCD CPS-III (OS/OW)

4. TxDOT-MCD SSRS

5. TxDOT Mainframe (IRP, Intrastate Registration, Titling)

6. DPS DL Mainframe (Driver's License)

7. DPS SAFETYNET 2000

8. DPS CAPRI

9. DPS SIDS (Inspection and Citation)

New Systems

1. Texas CVIEW (TexVIEW)

2. Texas Roadside Systems

3. Texas One-Stop Website and Credentialing Interface (CI)

New Mexico

1. ASPEN to SAFER connectivity
2. ASPEN to 100% of inspectors and at all major inspection sites
3. New Mexico Commercial Vehicle Information Exchange Window (NM CVIEW)

Arizona

An Arizona CVISN project plan document was not available at this stage of the project. The following projects were identified from the test plan and should be complete according to the timeline included.

Safety projects

1. ASPEN
2. CVIEW implementation

Credentials Projects

1. IPR (VISTA/RS TARGATS)
2. IFTA (TARGATS)
3. Title & Regulation (T&R)
4. Connect to IFTA clearinghouse
5. Electronic Credentials
6. Roadside Screening

California

California CVISN plans were not available at the close of the project.

Appendix B

User Needs Survey

NATIONAL I-10 FREIGHT CORRIDOR STUDY SURVEY

Interviewer: ______________________

Date: ______________________

Company Name: ____

Location/Address: ____

Contact: ______________________ Title: ______________________

Phone: ______________________ e-mail: ______________________

Purpose:

1) Define information and service needs for trucking companies operating along the I-10 Corridor

2) Identify opportunities for integration of public and private data and technology applications throughout the I-10 Corridor

3) Examine the possibilities for public/private sector involvement and financial commitment to ITS deployment in the corridor

NOTICE TO SURVEY RESPONDENTS

All information provided by this survey will remain strictly confidential. No statements or other information will be linked directly to individual respondents in any publication without the express permission of the respondent (i.e. the respondent would be contacted after the survey for permission to attribute any data or quotations). Demographic, organizational, and other individual information collected from survey respondents will be released only to members of the project team and staff acting on their behalf in the course of project-related activities only, including for record keeping and follow up purposes. Demographic, organizational, or data related to respondents will be reported only in aggregate formats with other survey responses.

1

CORRIDOR SURVEY/INTERVIEW GUIDE

Note: The first objective is to identify the correct person in the organization to interview regarding fleet management and communication matters.

Say: *Hello, this is _______from Wilbur Smith Associates, we are a transportation consulting firm. I am calling regarding a study we are conducting on Interstate-10. Can you tell me the name of the person responsible for dispatching and fleet management for your company at this location?*

Name:____

*Could you please connect me to this person's office, or provide me with a direct dial number for this person?*_________________________________

CONTINUE OR CALL BACK WHEN THAT PERSON IS AVAILABLE.

When person is on the line say: *I'm _______ from Wilbur Smith Associates, a transportation consulting firm conducting a study on the Interstate-10 Corridor. The reason I am calling is to learn about how fleets using I-10 communicate with their drivers and what road information is most valuable. We would like to find out how well the transportation system serves your needs and hear your opinions about what you believe could improve the region's transportation system. Are you the person responsible for managing transportation and logistics services at your facility?*

YES…………..Continue

NO…………....*Could you connect me with the person responsible for transportation?*
Contact:______________________

Say: *Would you be willing to take a brief five-minute phone survey regarding your communication and information needs that would help you manage your fleet?*

YES…………..Continue

NO…………....*Would there be a better time to call back and complete the survey?*

YES…………..*When?*______________________

NO……………Discontinue, and *"Thanks for your time"*

2

CORRIDOR SURVEY/INTERVIEW GUIDE

Say: *I'd like to start off by asking you a few background questions and then proceed to questions about your current fleet technologies and how you communicate with your drviers on the road.*

1. *What is your title?* ____

2. *What is the address of your terminal?*________________________________

3. *What are the primary services you provide at your location?* ______________

a. _____ LTL b. _____ Truckload c. _____ Express Package

d. _____ Drayage/cartage e. _____ Private Carriage f. _____ Specialized (Bulk, Hazmat) ________________

g. other ____

4. *How many trucks do you operate out of your facility?*_________

5. *What percentage of those trucks would you estimate travel on Interstate-10?* ____

6. *What is the most common segment of I-10 that your drivers use?* _____________ ____

7. *What are the most common types of delays or problems your drivers encounter while traveling I-10?* ____ ____

8. *Does your company provide real-time information regarding congestion, incidents, accidents, and other potential delays directly to your drivers?*_______

If so, how is this information obtained and delivered? ________________ ____

If not, why not? ____

3

9. *How do your drivers attain weather related road condition information?* ____

10. *How do your drivers attain information on the location and directions to trucking-related service facilities?* ________________________________

11. *How useful do you believe the following types of traveler information are, or would be, to your drivers/dispatchers:*

    1=not useful 4=very useful

    a) *Information on weather conditions 1.....2.....3.....4*
    b) *Information on traffic conditions 1.....2.....3.....4*
    c) *Information regarding CV parking locations 1.....2.....3.....4*
    d) *Work zone information/travel route restrictions 1.....2.....3.....4*
    e) *Current port of entry status 1.....2.....3.....4*
    f) *Localized travel pattern information (rush hour congestion) 1.....2.....3.....4*
    g) *Safety and security alerts 1.....2.....3.....4*
    h) *Routing information based on driving conditions/restrictions 1.....2.....3.....4*
    i) *Information about travel services at truck stops 1.....2.....3.....4*
    j) *Information about public rest stops 1.....2.....3.....4*
    k) *Information about ATMs, restaurants, and other services 1.....2.....3.....4*
    l) *Delays at port/border approaches 1.....2.....3.....4*
    m) *Information on pavement conditions 1.....2.....3.....4*
    n) *Information on truck size and weight restrictions 1.....2.....3.....4*
    o) *Information on hazardous materials routing 1.....2.....3.....4*

12. *Are there other types of traveler information that were not listed previously that you think would be useful to your drivers/dispatchers?* ___________________

    If yes, please describe them: ________________________________

____

____

4

13. How far in advance would each traveler information item need to be transmitted?

a) Information on weather conditions

1 Hour______ 4 Hours______ 8 Hours______ 16 Hours______

24 Hours______ 48 Hours______ More_____

b) Information on traffic conditions

1 Hour______ 4 Hours______ 8 Hours______ 16 Hours______

24 Hours______ 48 Hours______ More_____

c) Information on truck size and weight restrictions

1 Hour______ 4 Hours______ 8 Hours______ 16 Hours______

24 Hours______ 48 Hours______ More_____

14. How effective do you think the following methods are, or would be, for providing traveler information to your drivers/dispatchers:

1=not effective 4=very effective

- *a) Dial in phone service (511) 1.....2.....3.....4*
- *b) Web-based service 1.....2.....3.....4*
- *c) Email alerts 1.....2.....3.....4*
- *d) Information sent to cell phones and other wireless devices 1...2...3...4*
- *e) Directly integrated with routing/dispatching systems 1.....2.....3.....4*
- *f) Fax notices 1.....2.....3.....4*
- *g) Electronic roadside signs 1.....2.....3.....4*
- *h) HAR (Highway Advisory Radio) 1.....2.....3.....4*

15. How much would you estimate that delays due to congestion or incidents on I-10 cost your business per hour? Time___________ $_______________

16. How many hours of delay would you estimate your I-10 fleet experiences in an average month due to congestion or weather? _______________hours/vehicle

17. Does your fleet currently use GPS tracking systems to monitor trucks or shipments?____

18. Do you currently or would you be willing to pay a reasonable fee for receiving any of the following types of I-10 traveler information services?

a. Information on truck size and weight restrictions____

b. Information on weather conditions____

c. Information on traffic conditions____

d. Safety and security alerts____

e. Routing information based on driving conditions/restrictions____

f. Information about travel services at truck stops____

g. Information about public rest stops____

h. Information about ATMs, restaurants, and other services____

i. Delays at port/border approaches____

j. Information on pavement conditions____

"THANK YOU FOR YOUR COOPERATION"

Appendix C

Web Survey Questions

NATIONAL I-10 FREIGHT CORRIDOR STUDY SURVEY

Purpose:

1) Define information and service needs for trucking companies operating along the I-10 Corridor

2) Identify opportunities for integration of public and private data and technology applications throughout the I-10 Corridor

3) Examine the possibilities for public/private sector involvement and financial commitment to ITS deployment in the corridor

NOTICE TO SURVEY RESPONDENTS

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1

I-10 Motor Carrier Information Needs Survey

1. *Company Name:* ___________________________________
2. *What is your title?* ____
3. *What is the address of your terminal?*_________________________________
4. *What are the primary services you provide at your location?* ______________

a. _____ LTL b. _____ Truckload c. _____ Express Package

d. _____ Drayage/cartage e. _____ Private Carriage f. _____ Specialized (Bulk, Hazmat) _______________

g. other ____

5. *How many trucks operate out of your facility?* _____________________
6. *What percentage of those trucks would you estimate travel on Interstate-10 on a regular basis (once a week or more)?* ___________________
7. *What is the most common segment of I-10 that your drivers use?* ____________ ____

What are the most common types of delay or problems your drivers encounter while traveling I-10?

A.________ General Congestion B.________ Congestion due to incidents

C.________ Weather related events D.________ Other

8. *Does your fleet currently use GPS tracking systems to monitor trucks or shipments?*

______ *Yes* ______*No*

2

9. Does your company provide information regarding congestion, incidents, accidents, and other potential delays directly to your drivers?_______

If so, how is this information obtained and delivered? ________________
____

If not, why not? ____

10. How do your drivers attain weather-related road condition information?
____

11. How do your drivers attain information on the location and directions to trucking-related service facilities? ______________________________

12. How useful do you believe the following types of traveler information are, or would be, to your drivers/dispatchers:

1=not useful 4=very useful

a) Information on weather conditions 1.....2.....3.....4
b) Information on traffic conditions 1.....2.....3.....4
c) Information regarding CV parking locations 1.....2.....3.....4
d) Work zone information/travel route restrictions 1.....2.....3.....4
e) Current port of entry status 1.....2.....3.....4
f) Localized travel pattern information (rush hour congestion) 1.....2.....3.....4
g) Safety and security alerts 1.....2.....3.....4
h) Routing information based on driving conditions/restrictions 1.....2.....3.....4
i) Information about travel services at truck stops 1.....2.....3.....4
j) Information about public rest stops 1.....2.....3.....4
k) Information about ATMs, restaurants, and other services 1.....2.....3.....4
l) Delays at port/border approaches 1.....2.....3.....4
m) Information on pavement conditions 1.....2.....3.....4
n) Information on truck size and weight restrictions 1.....2.....3.....4
o) Information on hazardous materials routing 1.....2.....3.....4

13. Are there other types of traveler information that were not listed previously that you think would be useful to your drivers/dispatchers? ____________________

If yes, please describe them: _________________________________
____
____

14. How far in advance would each traveler information item need to be transmitted?

a) Information on weather conditions

1 Hour______ 4 Hours______ 8 Hours______ 16 Hours______

24 Hours______ 48 Hours______ More_____

b) Information on traffic conditions

1 Hour______ 4 Hours______ 8 Hours______ 16 Hours______

24 Hours______ 48 Hours______ More_____

c) Information on truck size and weight restrictions

1 Hour______ 4 Hours______ 8 Hours______ 16 Hours______

24 Hours______ 48 Hours______ More_____

15. How effective do you think the following methods are, or would be, for providing traveler information to your drivers/dispatchers:

1=not effective 4=very effective

- *a) Dial in phone service (511) 1.....2.....3.....4*
- *b) Web-based service 1.....2.....3.....4*
- *c) E-mail alerts 1.....2.....3.....4*
- *d) Information sent to cell phones and other wireless devices 1...2...3...4*
- *e) Directly integrated with routing/dispatching systems 1.....2.....3.....4*
- *f) Fax notices 1.....2.....3.....4*
- *g) Electronic roadside signs 1.....2.....3.....4*
- *h) HAR (Highway Advisory Radio) 1.....2.....3.....4*

16. *How much would you estimate that a truck stuck in traffic costs your business on an hourly basis?* $_______/hr.

17. *How many hours of delay would you estimate your I-10 fleet experiences in an average month due to congestion or weather?* _______________*hours*

"THANK YOU FOR YOUR COOPERATION"

Appendix D

Market Packages

MP ID	Market Package Name	Selected for I-10
	Archived Data Management	
AD1	ITS Data Mart	✓
AD2	ITS Data Warehouse	✓
AD3	ITS Virtual Data Warehouse	✓
	Traffic Management	
ATMS01	Network Surveillance	✓
ATMS02	Probe Surveillance	✓
ATMS03	Surface Street Control	✓
ATMS04	Freeway Control	✓
ATMS05	HOV Lane Management	
ATMS06	Traffic Information Dissemination	✓
ATMS07	Regional Traffic Control	✓
ATMS08	Traffic Incident Management System	✓
ATMS09	Traffic Forecast and Demand Management	
ATMS10	Electronic Toll Collection	✓
ATMS11	Emissions Monitoring and Management	✓
ATMS12	Virtual TMC and Smart Probe Data	✓
ATMS13	Standard Railroad Grade Crossing	✓
ATMS14	Advanced Railroad Grade Crossing	✓
ATMS15	Railroad Operations Coordination	✓
ATMS16	Parking Facility Management	
ATMS17	Regional Parking Management	
ATMS18	Reversible Lane Management	✓
ATMS19	Speed Monitoring	✓
ATMS20	Drawbridge Management	✓
ATMS21	Roadway Closure Management	✓
	Public Transportation	
APTS1	Transit Vehicle Tracking	
APTS2	Transit Fixed-Route Operations	
APTS3	Demand Response Transit Operations	
APTS4	Transit Passenger and Fare Management	
APTS5	Transit Security	
APTS6	Transit Maintenance	
APTS7	Multimodal Coordination	
APTS8	Transit Traveler Information	
	Traveler Information	
ATIS1	Broadcast Traveler Information	✓
ATIS2	Interactive Traveler Information	✓

MP ID	Market Package Name	Selected for I-10
ATIS3	Autonomous Route Guidance	✓
ATIS4	Dynamic Route Guidance	✓
ATIS5	ISP-Based Route Guidance	✓
ATIS6	Integrated Transportation Management/Route Guidance	✓
ATIS7	Yellow Pages and Reservation	✓
ATIS8	Dynamic Ridesharing	
ATIS9	In-Vehicle Signing	✓
	Vehicle Safety	
AVSS01	Vehicle Safety Monitoring	✓
AVSS02	Driver Safety Monitoring	✓
AVSS03	Longitudinal Safety Warning	✓
AVSS04	Lateral Safety Warning	✓
AVSS05	Intersection Safety Warning	
AVSS06	Pre-Crash Restraint Deployment	✓
AVSS07	Driver Visibility Improvement	✓
AVSS08	Advanced Vehicle Longitudinal Control	✓
AVSS09	Advanced Vehicle Lateral Control	✓
AVSS10	Intersection Collision Avoidance	
AVSS11	Automated Highway System	
	Emergency Management	
EM01	Emergency Call-Taking and Dispatch	✓
EM02	Emergency Routing	✓
EM03	Mayday Support	✓
EM04	Roadway Service Patrols	✓
EM05	Transportation Infrastructure Protection	✓
EM06	Wide-Area Alert	✓
EM07	Early Warning System	✓
EM08	Disaster Response and Recovery	✓
EM09	Evacuation and Reentry Management	✓
EM10	Disaster Traveler Information	✓
	Commercial Vehicle Operations	
CVO01	Fleet Administration	✓
CVO02	Freight Administration	✓
CVO03	Electronic Clearance	✓
CVO04	CV Administrative Processes	✓
CVO05	International Border Electronic Clearance	✓
CVO06	Weigh-In-Motion	✓
CVO07	Roadside CVO Safety	✓
CVO08	On-board CVO and Freight Safety & Security	✓
CVO09	CVO Fleet Maintenance	✓
CVO10	HAZMAT Management	✓
CVO11	Roadside HAZMAT Security Detection and Mitigation	✓
CVO12	CV Driver Security Authentication	✓
CVO13	Freight Assignment Tracking	✓

MP ID	Market Package Name	Selected for I-10
Maintenance and Construction Management		
MC01	Maintenance & Construction Vehicle/ Equipment Tracking	
MC02	Maintenance and Construction Vehicle Maintenance	
MC03	Road Weather Data Collection	✓
MC04	Weather Information Processing and Distribution	✓
MC05	Roadway Automated Treatment	✓
MC06	Winter Maintenance	
MC07	Roadway Maintenance and Construction	✓
MC08	Work Zone Management	✓
MC09	Work Zone Safety Monitoring	✓
MC10	Maintenance and Construction Activity Coordination	✓

Appendix E

Goals and Objectives

Administration/Planning/Policy

Goals	Objectives
Ensure the continued use and maintenance of the Corridor ITS Architecture	• Identify keeper/manager of the Corridor ITS Architecture • Develop checklist for ITS project requests by regional/state agencies that addresses each project's relevance and compliance with the architecture • Use checklist for ITS project requests by regional/state agencies
Improve coordination between regional and state agencies to resolve transportation issues	• Develop common or complimentary congestion management strategies • Develop memoranda of understanding for sharing data and agency roles • Develop standards to improve commercial vehicle efficiencies and operations • Provide hurricane coordination across state boundaries • Develop a corridorwide data archiving system
Create a corridor to unify the I-10 states and to allow the I-10 states more flexibility and opportunities to jointly pursue projects	• Develop common ITS planning objectives to better coordinate ITS efforts along the corridor • Apply for funding as a corridor/coalition to deploy additional projects

Field Infrastructure

Goals	Objectives
Finalize deployment of centralized traffic management systems in selected areas of the corridor	• Deploy TMCs in locations a-f • Deploy selected key asset TMCs • Develop rural travel time detection system
Enhance/upgrade/expand coverage of sensors along select areas of I-10 Corridor:	• Deploy CCTV video coverage of 50% of I-10, including all major structures and interchanges • Deploy traffic detector coverage of 50% of I-10, including all major structures and interchanges • Deploy DMS on 50% of I-10 • Deploy environmental sensors along selected portions of I-10 • Deploy WIM along 50% of I-10 • Develop/deploy overweight vehicle detection systems along selected portions of I-10

Operations

Goals	Objectives
Improve communication and coordination between traffic management agencies and emergency response agencies for evacuation, traffic data exchange, emergency response coordination, and traveler information purposes	• Interconnect and coordinate signal systems to improve traffic control between intermodal facilities and I-10 • Develop and deploy an automated incident detection and management system for I-10 and primary routes • Provide increased coordination during disasters • Develop new agreements and strategies for incident response coordination • Provide training and education to improve interagency coordination
Improve communication and coordination between traffic management agencies, local government, and law enforcement	• Provide ability to manage special events of a large size throughout the corridor • Create connectivity between traffic-related management centers throughout the entire corridor
Enhance/streamline credentials administration and verification, including at ports of entry	• Reduce cargo processing time at ports of entry • Develop and deploy electronic manifests • Develop and deploy real-time vehicle tracking and conditions reporting systems for specialty cargo • Complete deployment of FAST and other border programs
Enhance safety	• Improve CVO size/weight enforcement • Develop and deploy smart ITS work zones for long-term construction projects • Develop and deploy real time vehicle tracking and conditions reporting systems for specialty cargo • Develop and deploy projects to better respond to HAZMAT situations • Develop and deploy travel time systems for rural areas to improve incident information sharing
Enhance security	• Coordinate with regional and national businesses to improve security within the larger federal programs. • Coordinate with regional and national law enforcement to target areas of concern
Reduce congestion	• Implement projects to reduce congestion in and around ports and multimodal facilities • Expand the use and capabilities of service patrols

Appendix F

Projects Mapped to Goals

Administration/Planning/Policy

	Goals		Objectives		Project
ADM.G1	Ensure the continued use and maintenance of the Corridor ITS Architecture	ADM.G1.O1	Identify keeper/ manager of the Corridor ITS Architecture	ADM.1.1.1	I-10 Project Management Contract
		ADM.G1.O2	Develop a checklist for ITS project requests by regional/state agencies that addresses each project's relevance and compliance with the architecture		See ADM1.1.1
		ADM.G1.O3	Use checklist for ITS project requests by regional/state agencies		
ADM.G2	Improve coordination between regional and state agencies to resolve transportation issues	ADM.G2.O1	Develop common or complimentary congestion management strategies	ADM2.1.1	Implement Quick Clearance policies (shoulder or in-lane?)
				ADM2.1.2	Enact legislation to limit liability for moving vehicles
				ADM2.1.3	Move-it laws
				ADM2.1.4	Move over laws for emergency responders
				ADM2.1.5	Create standard polices and procedures for planned special events
		ADM.G2.02	Develop memoranda of understanding for sharing data and agency roles		Task under ADM1.1.1

	Goals		Objectives		Project
		ADM.G2.O3	Develop standards to improve commercial vehicle efficiencies and operations	ADM2.3.1	Multi-state OW/OS vehicle permit (standard envelop)
				ADM2.3.2	Pilot test for one-stop credentialing along the Gulf Coast
				ADM2.3.3	Create a corridor-wide credentialing center
				ADM2.3.4	Pilot test OS/OW automated permitting across multiple states
				ADM2.3.5	Add automated permitting to a corridor wide credentialing center
		ADM.G2.04	Provide hurricane coordination across state boundaries	ADM2.4.1	Share response plans and determine areas for increased coordination.
		ADM.G2.O5	Develop a corridor wide data archiving system	ADM2.5.1	Plan/design a corridor wide data archiving system
				ADM2.5.2	Build the initial corridor archiving system
				ADM2.5.3	Evolution 1 of archiving system
ADM.G3	Create a corridor to unify the I-10 states and to allow the I-10 states more flexibility and opportunities to jointly pursue projects	ADM.G3.O1	Develop common ITS planning objectives to better coordinate ITS efforts along the corridor		Task under ADM1.1.1
		ADM.G3.O2	Apply for funding as a corridor/coalition to deploy additional projects		Task under ADM1.1.1

Field Infrastructure

	Goals		Objectives		Project
FI.G1	Finalize deployment of centralized traffic management systems in selected areas of the corridor	FI.G1.O1	Deploy TMCs in all metropolitan areas greater than 75,000	FI1.1.1	New Gulfport TMC
				FI1.1.2	Deploy TMC 2
				FI1.1.3	Deploy TMC 3
		FI.G1.O2	Deploy selected key asset TMCs	FI1.2.1	Identify key assets along corridor that are not covered as part of an urban TMC
				FI1.2.2	Integrate key asset surveillance into existing TMC
		FI.G1.O3	Develop rural travel time detection system	0	See OPS.G4.O5
FI.G2	Enhance/upgrade/expand coverage of sensors along select areas of the I-10 Corridor	FI.G2.O1	Deploy CCTV video coverage of 50% of I-10 including all major structures and interchanges	FI2.1.1	
		FI.G2.O2	Deploy traffic detector coverage of 50% of I-10 including all major structures and interchanges	FI2.2.1	
		FI.G2.O3	Deploy DMS on 50% of I-10	FI2.3.1	
		FI.G2.O4	Deploy environmental sensors along selected portions of I-10	FI2.4.1	Upgrading fog detection on Bayway Bridge
				FI2.4.2	Additional dust warning system locations in Arizona

	Goals		Objectives		Project
				FI2.4.3	Initial deployment of dust warning system in New Mexico
				FI2.4.4	Initial deployment of dust warning system in Texas
				FI2.4.5	Integrating the systems into regional information sharing
		FI.G2.O5	Deploy WIM along 50% of I-10	FI2.5.1	Pilot test WIM in Mississippi
				FI2.5.2	Additional WIM deployments in Florida
				FI2.5.3	Pilot test WIM in state 2
				FI2.5.4	Integrate WIM with TMC1
				FI2.5.5	Integrate WIM with TMC2
				FI2.5.6	Integrate with PrePass
		FI.G2.O6	Develop/deploy oversize vehicle detection systems along selected portions of I-10	FI2.6.1	

Operations

	Goals		Objectives		Project
OPS.G1	Improve communications and coordination between traffic management agencies and emergency response agencies for evacuation, traffic data exchange, emergency response coordination, and traveler information purposes	OPS.G1.O1	Interconnected coordinated signal systems and inter-agency signal system for traffic control between intermodal facilities and I-10	OPS1.1.1	Pilot test integrated signals in state 1
		OPS.G1.O2	Develop and deploy an automated incident detection and management system for I-10 and primary routes	OPS1.2.1	Pilot test automated incident detection in state 1
		OPS.G1.03	Provide increased coordination during disasters	OPS1.3.1	THETA - Implement basic capabilities with state of Florida
				OPS1.3.2	THETA - Implement basic capabilities with state of Mississippi; implement “almost real time” map updates with traffic and weather
				OPS1.3.3	THETA - Collaborate with all sponsoring states to achieve capabilities, economies of scale, and system architectures

	Goals		Objectives		Project
				OPS1.3.4	THETA - Develop stage 2 capabilities (evacuation across state lines, contra flow, evacuation shelters)
				OPS1.3.5	THETA - Implement stage 2 with Alabama, Louisiana
				OPS1.3.6	THETA - Implement stage 2 with Texas
		OPS.G1.O4	Develop new agreements and strategies for incident response coordination	OPS1.4.1	TIMTOW - private sector certification for towers
				OPS1.4.2	Create a Gulf region incident management system
				OPS1.4.3	Share communications infrastructure with emergency providers
		OPS.G1.O5	Provide training and education to improve interagency coordination	OPS1.5.1	Provide EM training for DOT staff throughout the corridor
OPS.G2	Improve communications and coordination between traffic management agencies, local government, and/or law enforcement	OPS.G2.O1	Provide ability to manage special events of a large size throughout the corridor	OPS2.1.1	Add major special event information to the corridor web site
				OPS2.1.2	Develop a smart planned special event system for the corridor
				OPS2.1.3	Pilot test a smart planned special event system in state 1

	Goals		Objectives		Project
				OPS2.1.4	Pilot test a smart planned special event system in state 2
		OPS.G2.O2	Create connectivity between traffic related management centers throughout the entire corridor	OPS2.2.1	Integrate REGIONAL TMC with two major regional agencies
				OPS2.2.2	Integrate REGIONAL TMC with two major regional agencies
				OPS2.2.3	Integrate REGIONAL TMC with minor local agencies
				OPS2.2.4	Integrate REGIONAL TMC with minor local agencies
				OPS2.2.5	Examine the ways the states are currently deploying TMCs for suggested improvements
				OPS2.2.6	Biloxi/Mobile TMC integration
				OPS2.2.7	Mobile/Pensacola TMC integration
				OPS2.2.8	Pilot test a rural alternate route plan for I-10
				OPS2.2.9	Pilot test an urban alternate route plan for I-10
OPS.G3	Enhance/streamline credentials administration and verification including at ports of entry	OPS.G3.O1	Reduce the time cargo spends processing through ports of entry	OPS3.1.1	Horizon project with port of Jacksonville

	Goals		Objectives		Project
		OPS.G3.O2	Deploy WIMs at ports of entry to provide checks on loads before they leave the port	OPS3.2.1	Deploy WIMs at all Florida Gulf coast ports
		OPS.G3.O3	Develop/deploy real-time vehicle tracking and conditions reporting systems for specialty cargo	OPS3.3.1	Pilot test HAZMAT routing database across multiple states
				OPS3.3.2	Create initial corridor management center HAZMAT database
		OPS.G3.O4	Finish deploying FAST and other border programs along the entire corridor	OPS3.4.1	Coordinate with federal agencies to ensure consistent operations of ports and crossings along border and through ports – admin. contract
				OPS3.4.2	Deploy FAST at locations A, B, C, and D
				OPS3.4.3	Deploy next generation federal security project at locations A, B, C, and D
				OPS3.4.4	Expand combined points of entry program across all Gulf states
		OPS.G3.O5	Use credentialing information in multiple applications	OPS3.5.1	Work with federal agencies to create a secure commercial vehicle credentialing database

	Goals		Objectives		Project
				OPS3.5.2	Pilot test of roadside safety inspection in state 1
				OPS3.5.3	Apply roadside safety application across multiple states
OPS.G4	Enhance safety	OPS.G4.01	Enhance more effective CVO size/weight enforcement	OPS4.1.1	See INF.G2.O5
		OPS.G4.02	Develop/deploy smart ITS work zones for long-term construction projects	OPS4.2.1	Pilot smart work zone in state 1
				OPS4.2.2	Pilot smart work zone in state 2
				OPS4.2.3	Integrate smart work zone into corridor web site
				OPS4.2.4	Integrate smart work zone into TMC 1
				OPS4.2.5	Lane Rental Demonstration in state 1
				OPS4.2.6	Integrate lane rental into TMC 2
				OPS4.2.7	Full concept scope and design for uniform smart work zone
				OPS4.2.8	Implementation of a standard smart work zone across the corridor

	Goals		Objectives		Project
		OPS.G4.O3	Deploy projects to better respond to HAZMAT situations	OPS4.3.1	Increased training for emergency responders along I-10 (nuclear in the SW/ petrochemicals in the Gulf Coast region)
		OPS.G4.O4	Develop and deploy projects to enhance vehicle safety	OPS4.4.1	Pilot test automated crash reporting with a private service provider
				OPS4.4.2	Combine automated crash reporting with material load information
		OPS.G4.O5	Develop and deploy travel time systems for rural areas to improve incident information sharing	OPS4.5.1	Use cell phones for probes in rural New Mexico to generate travel times for use in incident information sharing
				OPS4.5.2	Use cell phones for probes in rural Texas to generate travel times for use in incident information sharing
				OPS4.5.3	Increased use of license plate readers in Florida
OPS.G5	Enhance security	OPS.G5.O1	Coordinate with regional and national businesses to improve security within the larger federal programs	OPS5.1.1	Set up committee to coordinate with businesses to look for joint opportunities

	Goals		Objectives		Project
				OPS5.1.2	Increase use of credentialing and checking around petroleum facilities along I-10
		OPS.G5.O2	Coordinate with regional and national law enforcement to target areas of concern	OPS5.2.1	See OPS.G1
OPS.G6	Reduce congestion	OPS.G6.O1	Implement projects to reduce congestion in and around ports and multimodal facilities	OPS6.1.1	Establish stakeholder group with port facilities and determine where improvements are possible
				OPS6.1.2	Deploy project to reduce congestion in and around a port facility
				OPS6.1.3	Deploy project to reduce congestion in and around a multimodal facility
		OPS.G6.O2	Create a corridorwide information exchange network	OPS6.2.1	Increase capability, range, and size of existing service patrols
				OPS6.2.2	Expand use of rapid incident scene clearance (RISC) in Florida
				OPS6.2.3	New service patrols in location A
				OPS6.2.4	Pilot test video from service patrol to TMC in state A

Information

	Goals		Objectives		Project
INF.G1	Improved use and coordination of existing field infrastructure	INF.G1.O1	Expand use of CMS signs for traveler information on I-10, primary routes, and other strategic locations	INF1.1.1	See INF.G2.O3
		INF.G1.O2	Coordinated 511 allowing seamless transition across state boundaries	INF1.2.1	Deploy a project that provides ability to get 511 information across multiple states from one state
				INF1.2.2	Deploy 511 corridor information in all corridor states
		INF.G1.O3	Complete fiber or other communications installations to provide communications with all relevant agencies along the corridor	INF1.3.1	Deploy fiber connections to provide state to state connectivity where appropriate
INF.G2	Promote the exchange of all relevant information along the entire corridor	INF.G2.O1	Develop/deploy a corridorwide information exchange clearinghouse which includes transportation data management information for effective communication between all the corridor agencies	INF2.1.1	Create a web site with links to web sties for all states within the corridor
				INF2.1.2	Enhance the existing web site with an email alert system

	Goals		Objectives		Project
				INF2.1.3	Provide upgrades and enhancements to the corridor web site
		INF.G2.O2	Develop/deploy real time, en-route weather information provision	INF2.2.1	Integrate weather information into corridor web site
		INF.G2.O3	Develop/deploy Wi-Fi spots along I-10 for emergency response data transfer	INF2.3.1	Deploy test Wi-Fi for emergency response along selected sections of corridor
		INF.G2.O4	Create a corridorwide information exchange network	INF2.4.1	Establish a means of sharing information between TMCs along the corridor
				INF2.4.2	Create an instant messaging network
				INF2.4.3	Create a “Warmap”
		INF.G2.O5	Provide 511 coverage for all of I-10	INF2.5.1	Deployment of 511 in states without 511
				INF2.5.2	Multi-state coordination and seamless integration
		INF.G2.O6	Develop/deploy media coverage of road closure plans	INF2.6.1	Enhance coordination with media through web site
INF.G3	Provide services to aid commercial vehicle traffic throughout the corridor	INF.G3.O1	Provide positive guidance to appropriate parking facilities	INF3.1.1	Smart Park demonstration in state 1
				INF3.1.2	Smart Park demonstration in state 2

	Goals		Objectives		Project
		INF.G3.O2	Provide information of value to truck drivers at facilities they use	INF3.2.1	Provide localized and regional weather and traffic at parking facilities

Appendix G

Detailed Project Descriptions

Project code	Project	Description
ADM.1.1.1	I-10 project management contract	This project will provide for consultant support for the overall I-10 corridor management structure. This will include administration of committees and programs support for task forces and management, and some potential minor studies, designs, and implementations; although the majority of the projects will be let and procured through a public agency's normal process.
ADM2.1.1	Implement quick clearance policies (shoulder or in-lane?)	Implement policies in all eight states to both allow DOTs to require vehicles to be removed from shoulders within a short time frame (e.g., 4 hours).
ADM2.1.2	Enact legislation to limit liability for moving vehicles	Implement legislation in all eight states to limit the liability of the state DOTs or other responding agencies in damages to vehicles that are moved to prevent congestion or hazards for secondary accidents.
ADM2.1.3	Move-it laws	Implement legislation in all eight states that requires people involved in minor accidents to move their vehicles from the roadway before exchanging information. Typically, insurance companies tell their customers to stay in place until the police arrive – even if it is in traffic. This law will require people to relocate to a safe area to exchange information or wait for police or repairs.
ADM2.1.4	Move over laws for emergency responders	Implement legislation that requires traffic to move one lane over or slow down for emergency vehicles that are operating on the roadside. This is specifically for stopped vehicles, not the current laws that require traffic to stop to allow an emergency vehicle to pass them.
ADM2.1.5	Create standard polices and procedures for planned special events	Planned special events include everything from road construction and maintenance to golf outings and marathons. This project would create standard procedures for use by public agencies from initial event identification through event cleanup. This guide will cover issues such as media contacts, agency coordination, and standard signing for the event.
ADM2.3.1	Multistate OW/OS vehicle permit (standard envelope)	Create a standard envelope (height, width, length, weight) for commercial vehicles that applies along all of I-10. Any vehicle that is within the envelope will be able to more quickly and easily get permits throughout the corridor.
ADM2.3.2	Pilot test for one-stop credentialing along the Gulf Coast	Create a center that will allow commercial vehicles to obtain all permits and credentials for trips across state boundaries within the gulf coast region
ADM2.3.3	Create a corridorwide credentialing center	Create a center that will allow commercial vehicles to obtain all permits and credentials for trips across state boundaries within all eight states.

Project code	Project	Description
ADM2.3.4	Pilot test OS/OW automated permitting across multiple states	This project is to allow one stop shopping for OS/OW permits. They do not have to fit the standard envelop, and this does not involve other credentialing – just the OS/OW permits
ADM2.3.5	Add automated permitting to a corridor wide credentialing center	DROP – if the center in ADM2.3.3 is created first, then project ADM2.3.4 will be piloted in the center. If the pilot is completed first, this project should be included as a task in ADM2.3.3.
ADM2.4.1	Share response plans and determine areas for increased coordination	The DOTs need to meet and share response plans for anticipated emergencies (e.g., hurricanes, nuclear accidents, etc.). This project could be administered under the overall corridor contract management contract or could be a separated working group.
ADM2.5.1	Plan/design a corridorwide data archiving system	Many third party vendors and commercial fleets depend on historical data to help better plan their routes and services. The sharing of real time information rarely provides a useable archive of historic data. This project will assemble the traffic related data (real time traffic, incidents, road construction, etc.) and put them in a format that interested parties can easily use. This project is for the initial design of the system.
ADM2.5.2	Build the initial corridor archiving system	Building from ADM2.5.1, this project will create the initial deployment of an archiving system.
ADM2.5.3	Evolution 1 of archiving system	This will build from ADM2.5.2 and provide additional features and enhancements
FI1.1.1	New Gulfport TMC	A new TMC in the Gulfport region. Includes all software, hardware, and field devices.
FI1.1.2	Deploy TMC 2	This is a place holder for another TMC that may be created in the region.
FI1.1.3	Deploy TMC 3	This is a place holder for another TMC that may be created in the region.
FI1.2.1	Identify key assets along corridor that are not covered as part of an urban TMC	This report will work with the eight states along the corridor to identify key assets that may not be already managed by a TMC. This would include remote bridges, tunnels, or key interchanges. The intent is to identify which locations require some form of traffic management or surveillance
FI1.2.2	Integrate key asset surveillance into existing TMC	This project will deploy field equipment at the key assets, and provide integration into the nearest TMC
FI2.4.1	Upgrading fog detection on Bayway Bridge	This project will design and replace the existing fog detection system on the Bayway Bridge. It includes design and deployment.
FI2.4.2	Additional dust warning system locations in Arizona	This will include the design and deployment of additional dust warning systems in designated locations in Arizona
FI2.4.3	Initial deployment of dust warning system in New Mexico	This project will include full design and deployment of dust warning systems similar to those used in Arizona for New Mexico

Project code	Project	Description
FI2.4.4	Initial deployment of dust warning system in Texas	This project will include full design and deployment of dust warning systems similar to those used in Arizona for Texas
FI2.4.5	Integrating the systems into regional information sharing	This project will take the information available from the dust warning systems and integrate them into a regional information sharing system – either a regional TMC or an information exchange network.
FI2.5.1	Pilot Test WIM in Mississippi	This project involves the design and deployment of an initial virtual weigh station along I-10 in Mississippi.
FI2.5.2	Additional WIM deployments in Florida	This project will deploy additional virtual weigh stations similar to those already deployed.
FI2.5.3	Pilot Test WIM in State 2	This project involves the design and deployment of an initial virtual weigh station along I-10 in Mississippi.
FI2.5.4	Integrate WIM with TMC1	The virtual weigh station in one location will be integrated so that all information is transmitted in real time to the local TMC. Enforcement is still expected to occur in the field, but the TMC will monitor the system and provide a tool for determining targeted enforcement
FI2.5.5	Integrate WIM with TMC2	The virtual weigh station in one location will be integrated so that all information is transmitted in real time to the local TMC. Enforcement is still expected to occur in the field but the TMC will monitor the system and provide a tool for determining targeted enforcement
FI2.5.6	Integrate with PrePass	This project would integrate information from the virtual weigh stations with PrePass. This could include verifying the PrePass trucks are near in weight what they currently say they are at. This would help PrePass check its customers and give the states more confidence in PrePass.
OPS1.1.1	Pilot test integrated signals in State 1	This project would pilot test integrating signals with freeway operations. The intent is to help move cargo in and out of intermodal facilities faster and more efficiently
OPS1.2.1	Pilot test automated incident detection in State 1	This project will design and deploy and AID system in one TMC, with a focus on I-10.
OPS1.3.1	THETA - Implement basic capabilities with state of Florida.	Create and deploy a system to provide real time information to specific locations to aid in evacuation activities and real time planning
OPS1.3.2	THETA - Implement basic capabilities with state of Mississippi; implement “almost real time” map updates with traffic and weather	Create and deploy a system to provide real time information to specific locations to aid in evacuation activities and real time planning in Mississippi.

Project code	Project	Description
OPS1.3.3	THETA - Collaborate with all sponsoring states to achieve capabilities, economies of scale, and system architectures	This effort will take the work completed in Florida and Mississippi and will expand its use throughout the entire Gulf region. The system will provide an initial system for the region
OPS1.3.4	THETA - Develop Stage 2 capabilities (evacuation across state lines, contra flow, evacuation shelters)	This effort will build upon the initial deployment work to create additional features that are necessary for THETA to function as a regional resource for all.
OPS1.3.5	THETA - Implement stage 2 with Alabama, Louisiana	This effort will build upon the initial deployment work to create additional features that are necessary for THETA to function as a regional resource for all.
OPS1.3.6	THETA - Implement stage 2 with Texas	This effort will build upon the initial deployment work to create additional features that are necessary for THETA to function as a regional resource for all.
OPS1.4.1	TIMTOW - Private sector certification for towers	Uses existing proposed program to provide a means of certifying towers for work on critical links. Towing companies must attend training and demonstrate they have the right equipment before getting the appropriate certification. For incidents on I-10, only approved towers will be contacted.
OPS1.4.2	Create a Gulf region incident management system	A new system in the Gulf region to coordinate incident management across state lines. This could be a separate system or operation, or it could be included as part of an existing system.
OPS1.4.3	Share communications infrastructure with emergency providers	This project would identify specific locations where emergency responders would benefit by having access to transportation communications infrastructure. The project would first find several locations where this is needed and then deploy a single test within one of those regions.
OPS1.5.1	Provide EM training for DOT staff throughout the corridor	While DOT staff members are always looking for EM stakeholders to join the DOT committees, it is important that the DOT staff know what the EM staff responsibilities are. This training will illustrate the needs of the EM staff so the DOT staff. It will create awareness and understanding. This will allow the DOT staff to interact well with the new staff.
OPS2.1.1	Add major special event information to the corridor web site	In addition to construction information, add information on planned special events. These would be any events that impact I-10.
OPS2.1.2	Develop a smart planned special event system for the corridor	This would be a module or server within a more complex regional system.
OPS2.1.3	Pilot test a smart planned special event system in State 1	This would be a system or server within an existing TMC that deals exclusively with planned special events. This would be full functionality to collect all information and manage the data.

Project code	Project	Description
OPS2.1.4	Pilot test a smart planned special event system in State 2	This would be a system or server within an existing TMC that deals exclusively with planned special events. This would be full functionality to collect all information and manage the data.
OPS2.2.1	Integrate REGIONAL TMC with two major regional agencies	This project would integrate two major regional agencies into a TMC. This could be transit agencies or EM providers or toll authorities.
OPS2.2.2	Integrate REGIONAL TMC with two major regional agencies	This project would integrate two major regional agencies into a TMC. This could be transit agencies or EM providers or toll authorities.
OPS2.2.3	Integrate REGIONAL TMC with minor local agencies	There may be more minor systems that still have value to the corridor. This could include signal systems from a city that connect a major intermodal facility.
OPS2.2.4	Integrate REGIONAL TMC with minor local agencies	There may be more minor systems that still have value to the corridor. This could include signal systems from a city that connect a major intermodal facility.
OPS2.2.5	STUDY in-state integration (FL, TX, CA, AZ) vs. statewide TMC (MS)	This project is a study to examine the value of integrating TMCs within a state, vs. having a single TMC to control all statewide traffic management functions.
OPS2.2.6	Biloxi/Mobile TMC integration	This will create changes in both systems to allow for joint control of some devices as well as the sharing of information.
OPS2.2.7	Mobile/Pensacola TMC integration	This will create changes in both systems to allow for joint control of some devices as well as the sharing of information.
OPS2.2.8	Pilot test a rural alternate route plan for I-10	This project would determine alternate routes in a rural area for one location. This would identify the routes and place static signs for those routes.
OPS2.2.9	Pilot test an urban alternate route plan for I-10	This project would determine alternate routes in an urban area for one location. This would identify the routes and place static signs for those routes.
OPS3.1.1	Horizon project with port of Jacksonville	This project uses technology to identify cargo on ships before they enter the port to allow operators the opportunity to plan their operations before the cargo arrives.
OPS3.2.1	Deploy WIMs at all Florida Gulf coast ports	This project would install WIMS at certain ports to verify weights before the trucks leave the port. This will reduce the strain on law enforcement.
OPS3.3.1	Pilot test HAZMAT routing database across multiple states	This would create a central database for tracking and routing HAZMAT shipments. It would require knowledge of restricted areas and have to have the ability to provide information on shipments when queried.
OPS3.3.2	Create initial corridor management center HAZMAT database	This project takes the database and creates a management structure around it. This may require a new center or may be integrated into am existing center

Project code	Project	Description
OPS3.4.1	Coordinate with federal agencies to ensure consistent operations of ports and crossings along border and through ports – admin. contract	This project is to provide the necessary administration to coordinate with a wide variety of federal agencies concerning the operations of ports and border crossings.
OPS3.4.2	Deploy FAST at locations A, B, C, and D	This project will take the current FAST border crossing program and make sure it is deployed at all border crossing opportunities.
OPS3.4.3	Deploy next generation federal security project at locations A, B, C, and D	As the federal government has continued to develop new security projects for border crossings, this project assumes that a new program will be created and initiated along the I-10 corridor within the next ten years
OPS3.4.4	Expand combined points of entry program across all Gulf states	Take the existing combined point of entry program that is in operation at selected ports, and deploy to all port facilities throughout the gulf coast.
OPS3.5.1	Work with federal agencies to create a secure commercial vehicle credentialing database	This will be a coordinated effort under the corridor administration contract.
OPS3.5.2	Pilot test of roadside safety inspection in State 1	This is a CVISN project to automate roadside safety inspection and sharing of information.
OPS3.5.3	Apply roadside safety application across multiple states	This is an expansion of OPS3.5.2 across more states.
OPS4.1.1	See INF.G2.O5	
OPS4.2.1	Pilot smart work zone in State 1	Design and deploy a smart work zone tailored for the specific construction project. This will include roadway sensors, CCTV, DMS, and other technologies as required.
OPS4.2.2	Pilot smart work zone in State 2	Design and deploy a smart work zone tailored for the specific construction project. This will include roadway sensors, CCTV, DMS, and other technologies as required.
OPS4.2.3	Integrate smart work zone into corridor web site	A smart work zone is sometimes integrated into the local TMC, but only in terms of CCTV and possibly data. This project will take all of the outputs available from the smart work zone and make them available on the corridor web site.
OPS4.2.4	Integrate smart work zone into TMC 1	Often times, smart work zones are stand alone. Sometimes the vendor will provide a web site with information but the equipment is not integrated into the local TMC. This project will provide for complete integration of all smart work zone systems into the local TMC to provide full functionality and control.

Project code	Project	Description
OPS4.2.5	Lane Rental Demonstration in State 1	Lane rental is a way of monitoring lane closures in a work zone. The owner must know the lane/mile/hours of closures and then the contractor will be charged for each lane/mile/hour of closure. This way, the contractor has an incentive to minimize the closures to expedite construction.
OPS4.2.6	Integrate lane rental into TMC 2	Lane rental can typically be done outside of the operations group. However, the operations staff members are usually the ones that have the CCTV that can verify the contactors timing. This project will integrate the lane closure mechanism into the TMC for management and verification.
OPS4.2.7	Full concept scope and design for uniform smart work zone	Study the best of the work zones across the corridor and determine a possible uniform smart work zone standard for the entire corridor.
OPS4.2.8	Implementation of a standard smart work zone across the corridor	Implementing the standard designed in OPS4.2.7. No project required.
OPS4.3.1	Increased training for emergency responders along I-10 (nuclear in the SW/ petrochemicals in the Gulf Coast region)	Provide increased training for emergency responders in how to work with transportation agencies. Use existing federal courses or pay to develop one.
OPS4.4.1	Pilot test automated crash reporting with a private service provider	Similar to Onstar, this system would provide a notification to a center when a commercial vehicle has crashed. This will be done with a private sector provider.
OPS4.4.2	Combine automated crash reporting with material load information	This will combine a proven system for OPS4.4.1 with a database of material loads (OPS3.3.1) so that emergency responders know what load is on the truck before they arrive at the scene.
OPS4.5.1	Use cell phones for probes in rural New Mexico to generate travel times for use in incident information sharing	There are several pilot test of using cell phones for probes. None have demonstrated large-scale success to date. This will use the cell phones in a rural environment which addresses many of the operational issues of the current tests. It will supply travel times and test the ability to use for automated incident notification.
OPS4.5.2	Use cell phones for probes in rural Texas to generate travel times for use in incident information sharing	There are several pilot test of using cell phones for probes. None have demonstrated large-scale success to date. This will use the cell phones in a rural environment which addresses many of the operational issues of the current tests. It will supply travel times and test the ability to use for automated incident notification.
OPS4.5.3	Increased use of license plate readers in Florida	License plate readers are already used in Florida for work zones and other projects. This will expand their usage to other applications.
OPS5.1.1	Set up committee to coordinate with businesses to look for joint opportunities	Part of the corridor management contract.

Project code	Project	Description
OPS5.1.2	Increase use of credentialing and checking around petroleum facilities along I-10	The petroleum facilities along the gulf coast are potential terrorist targets. This would use credentialing and other activities to increase security.
OPS5.2.1	See OPS.G1	
OPS6.1.1	Establish stakeholder group with port facilities and determine where improvements are possible	Covered as part of the corridor administration contract.
OPS6.1.2	Deploy project to reduce congestion in and around a port facility	These will be follow up projects to those identified in OPS5.1.1
OPS6.1.3	Deploy project to reduce congestion in and around a multimodal facility	These will be follow up projects to those identified in OPS5.1.1
OPS6.2.1	Increase capability, range, and size of existing service patrols	Increase number of vehicles, their size, and their capabilities to provide more service on traditional service patrols.
OPS6.2.2	Expand use of Rapid Incident Scene Clearance (RISC) in Florida	This is a specialized program in Florida. Expand its use statewide, and throughout the corridor.
OPS6.2.3	New service patrols in location A	Implementation of service patrols in areas that do not have any currently.
OPS6.2.4	Pilot test video from service patrol to TMC in State A	This project would use video from "cop cams" to send back to a TMC when necessary.
INF1.2.1	Deploy a project that provides ability to get 511 information across multiple states from one state	This project will integrate information from all states via 511.
INF1.2.2	Deploy 511 corridor information in all corridor states	Build out 511 systems in all states.
INF1.3.1	Deploy fiber connections to provide state to state connectivity where appropriate	Where there are gaps in state-owned fiber or communications networks, close those gaps to allow agencies to share information directly.
INF2.1.1	Create a web site with links to web sites for all states within the corridor	A simple corridor web site that just provides a single source to all available state and local traffic information sites.
INF2.1.2	Enhance the existing web site with an email alert system	Provide email alerts to motorists and carriers that sign up for it. They will receive an email any time something unusual is happening on their chosen routes.

Project code	Project	Description
INF2.1.3	Provide upgrades and enhancements to the corridor web site	This is an enhancement for project INF2.1.1.
INF2.2.1	Integrate weather information into corridor web site	Weather information – especially about storms and warnings – will be added to the web site.
INF2.3.1	Deploy test Wi-Fi for emergency response along selected sections of corridor	Install Wi-Fi along sections of the corridor for use by emergency responders (e.g., I-35 bridge collapse used a local wi-fi for sharing information).
INF2.4.1	Establish a means of sharing information between TMCs along the corridor	Create an information exchange network among the corridor TMCs to share information critical to operations.
INF2.4.2	Create an instant messaging network	This is a subset of INF2.4.1.
INF2.4.3	Create a "Warmap"	This will create a single web site for all agencies that has all available information along I-10.
INF2.5.1	Deployment of 511 in states without	Deploy 511 where it is not deployed.
INF2.5.2	Multi-state coordination and seamless integration	Combination of INF1.2.1 and INF1.2.2.
INF2.6.1	Enhance coordination with media through web site	Included in corridor maintenance contract.
INF3.1.1	Smart Park demonstration in State 1	Demonstrate a project that provides advanced notice of parking availability for trucks.
INF3.1.2	Smart Park demonstration in State 2	Demonstrate a project that provides advanced notice of parking availability for trucks.
INF3.2.1	Provide localized and regional weather and traffic at parking facilities	Provide a local web site through Wi-Fi and kiosks that address regional weather and traffic information at rest stops.

Appendix H

SWOT Analysis

Project Code		Cost	Description	Strength	Weakness	Opportunity	Threat	Champ	Ease of Implement	Oper. Feas.	Enabling	Multi-State	Total	Rank
ADM.1.1.1	I-10 Project Management Contract		This project will provide for consultant support for the overall I-10 corridor management structure. This will include administration of committees and programs, support for task forces and management, and potential minor studies, designs, and implementations. The majority of the projects will be let and	Required for corridor to continue to work together	Requires formal agreement for how to cooperate and consensus on how to move forward	Allows the corridor to pursue multistate opportunities that they otherwise would not be able to	May limit flexibility for future work because of the formal structure	4	5	4	5	5	462.862	1
ADM2.1.1	Implement Quick Clearance policies		Implement policies in all eight states to both allow DOTs to require vehicles to be removed from shoulders within a short time frame (e.g., 4 hours).	By removing obstacles, accidents and congestion will be reduced	Requires similar policies be implemented in agencies in all eight states	Will serve as a national model and create consistency along the corridor	May raise visibility of legal issues and open the states to larger lawsuits	4	5	4	3	3	371.432	37
ADM2.1.2	Enact legislation to limit liability for moving vehicles		Implement legislation in all eight states to limit the liability of the state DOTs or other responding agencies in damages to vehicles that are moved to prevent congestion or hazards for secondary accidents	By removing obstacles, accidents and congestion will be reduced	Requires similar legislation in all eight states; may be difficult to educate people	Will serve as a national model and create consistency along the corridor	May raise visibility of legal issues and open the states to larger lawsuits	4	3	4	3	3	337.146	66
ADM2.1.3	Move-it laws		Implement legislation in all eight states that requires people involved in minor accidents to move their	Prevents secondary accidents and reduces exposure of pedestrians to traffic	Difficult to educate people on the correct thing to do	Will serve as a national model and create consistency along the corridor	May raise issues with insurance companies that may lobby against these laws	4	5	4	3	3	371.432	38
ADM2.1.4	Move over laws for emergency responders		Implement legislation that requires traffic to move one lane over or slow down for emergency vehicles that are operating on the roadside. This is specifically for stopped vehicles, not the current laws that require traffic to stop to allow an emergency vehicle to pass them.	Provides a safer work environment for emergency responders as well as reduces the potential for secondary accidents	Difficult to educate people on the correct thing to do	Will serve as a national model and create consistency along the corridor		4	5	4	3	3	371.432	39
ADM2.1.5	Create standard polices and procedures for planned special events		Planned special events include everything from road construction and maintenance, to golf outings and marathons. This project would create standard procedures for use by public agencies from initial event identification, through event cleanup. This guide will cover issues such as media contacts, agency coordination, and standard signing for the event.	Creating a standard approach will improve notification and driver understanding which will reduce confusion and improve safety	This will take a long time to get each agency to change (even slightly) their procedures for such events	Will serve as a national model and create consistency along the corridor	There are often different views on how to best accomplish these goals – may raise concerns from some sectors of the industry	3	4	4	2	4	337.146	67

Project Code	Cost	Description	Strength	Weakness	Opportunity	Threat	Champ	Ease of Implement	Oper. Feas.	Enabling	Multi-State	Total	Rank
ADM2.3.1	Multi-state OW/OS vehicle permit (standard envelope)	Create a standard envelope (height, width, length, weight) for commercial vehicles that applies along all of I-10. Any vehicle that is within the envelope will be able to more quickly and easily get permits throughout the corridor.	Expedites permitting across the corridor	In order to meet all state requirements, the envelope may be too small	Will serve as a national model and create consistency along the corridor	May create future pressure from commercial vehicle industry to increase the envelope	3	4	4	3	4	358.575	52
ADM2.3.2	Pilot test for one-stop credentialing along the Gulf Coast	Create a center that will allow commercial vehicles to obtain all permits and credentials for trips across state boundaries within the Gulf Coast region.	Improves commercial vehicle operations and efficiencies	Individual state laws and credentials may be difficult to consolidate into one operation	Will serve as a national model	Raises the risk that an operator unfamiliar with a state policy or law may allow an illegal permit	3	3	2	3	4	307.146	87
ADM2.3.3	Create a corridorwide credentialing center	Create a center that will allow commercial vehicles to obtain all permits and credentials for trips across state boundaries within all eight states.	Improves commercial vehicle operations and efficiencies	Individual state laws and credentials may be difficult to consolidate into one operation	Will serve as a national model	Raises the risk and consequences of a mistake. Also, may be difficult to manage with all eight states	3	2	2	4	5	335.718	68
ADM2.3.4	Pilot test OS/OW automated permitting across multiple states	This project is to allow one-stop shopping for OS/OW permits. They do not have to fit the standard envelope. Tthis does not involve other credentialing, just the OS/OW permits	Improves commercial vehicle operations and efficiencies				3	2	2	3	5	314.289	81
ADM2.3.5	Add automated permitting to a corridorwide credentialing center	DROP – if the center in ADM2.3.3 is created first, then project ADM2.3.4 will be piloted in the center. If the pilot is completed first, this project should be included as a task in ADM2.3.3.					3	3	4	2	5	344.289	63
ADM2.4.1	Share response plans and determine areas for increased coordination	The DOTs need to meet and share response plans for anticipated emergencies (e.g., hurricanes, nuclear accidents, etc.). This project could be administered under the overall corridor contract management contract, or could be a separated working group.	This is a core function of the corridor: to coordinate multi-state activities	More than just the DOTs need to be involved for it to be effective	May open door to increased coordination with other groups	The coordination may identify new areas that require additional unplanned resources	3	3	4	2	4	320.003	77
ADM2.5.1	Plan/design a corridorwide data archiving system	Many third party vendors and commercial fleets depend on historical data to help better plan their routes and services. The sharing of real time information rarely provides a useable archive of historic data. This project will assemble the traffic related data (real time traffic, incidents, road construction, etc.) and put them in a format that interested parties can easily use. This project is for the initial design of the system.	Builds from other information sharing projects. Involves new groups to I-10 Corridor	Must work from inventory of data available from legacy systems	Will serve as a national model	May have influence of different universities or national labs looking for this work	3	4	3	2	4	320.003	78
ADM2.5.2	Build the initial corridor archiving system	Building from ADM2.5.1, this project will create the initial deployment of an archiving system.	Builds from other information sharing projects	Requires a long-term commitment and a customer service focus	Provides a valuable source of data for a wide range of applications	Many different agencies must also make a long-term commitment to share information	3	2	3	4	5	352.861	56

Project Code	Cost	Description / Strength	Weakness	Opportunity	Threat	Champ	Ease of Implement	Oper. Feas.	Enabling	Multi-State	Total	Rank
ADM2.5.3	Evolution 1 of archiving system	This will build from ADM2.5.2 and provide additional features and enhancements				3	3	3	2	5	327.146	74
		Will be developed from a working system using needs of users	Requires a working system first	Can benefit from what other systems are doing throughout the industry	May have specific demands from some user groups if another service is being provided by another agency							
FI1.1.1	New Gulfport TMC	A new TMC in the Gulfport region. Includes all software, hardware, and field devices.				4	4	5	3	4	395.718	17
		TMCs are a core tool for managing traffic – all urban areas benefit from a TMC	Software, especially if the first time for an agency, is expensive and difficult to manage	There are several other TMCs in the region that can provide input on requirements	Too many demands from management can cause scope creep and make the project unwieldy							
FI1.1.2	Deploy TMC 2	This is a place holder for another TMC that may be created in the region.				3	4	5	3	4	375.718	31
		TMCs are a core tool for managing traffic – all urban areas benefit from a TMC	Software, especially if the first time for an agency, is expensive and difficult to manage	There are several other TMCs in the region that can provide input on requirements	Too many demands from management can cause scope creep and make the project unwieldy							
FI1.1.3	Deploy TMC 3	This is a place holder for another TMC that may be created in the region.				3	4	5	3	4	375.718	32
		TMCs are a core tool for managing traffic – all urban areas benefit from a TMC	Software, especially if the first time for an agency, is expensive and difficult to manage	There are several other TMCs in the region that can provide input on requirements	Too many demands from management can cause scope creep and make the project unwieldy							
FI1.2.1	Identify key assets along corridor that are not covered as part of an urban TMC	This report will work with the eight states along the corridor to identify key assets that may not be already managed by a TMC. This would include remote bridges, tunnels, or key interchanges. The intent is to identify which locations require some form of traffic management or surveillance				3	5	4	3	4	375.718	33
		This report will meet the key operational focus of the corridor by identifying gaps in coverage	There are a wide variety of interests among the eight states that may create too many key assets	Will serve as a national model for remote management	Remote management may not be feasible							
FI1.2.2	Integrate key asset surveillance into existing TMC	This project will deploy field equipment at the key assets, and provide integration into the nearest TMC.				3	4	4	5	4	401.433	14
		Leverages existing TMC infrastructure	May have long lines of communication	Will serve as a national model	There may be jurisdictional issues to contend with.							
FI2.4.1	Upgrading fog detection on Bayway Bridge	This project will design and replace the existing fog detection system on the Bayway Bridge. It includes design and deployment.				5	4	4	5	3	417.147	8
		Many lessons learned and local experience with the current system	May have to make design concessions to leverage some legacy equipment	Can use information from other systems deployed around the world	The new system must exceed the capabilities of the old system							
FI2.4.2	Additional dust warning system locations in Arizona	This will include the design and deployment of additional dust warning systems in designated locations in Arizona.				4	4	4	5	3	397.147	16
		This system will use a proven technology from current deployments	May not be an opportunity for many upgrades or enhancements	Will be useful in many other locations	May need to deploy over larger stretches of I-10 for which funding is not yet available							

Project Code	Cost	Description / Strength	Weakness	Opportunity	Threat	Champ	Ease of Implement	Oper. Feas.	Enabling	Multi-State	Total	Rank
FI2.4.3	Initial deployment of dust warning system in New Mexico	This project will include full design and deployment of dust warning systems similar to those used in Arizona for New Mexico.				3	4	4	5	3	377.147	29
		This system will use a proven technology from current deployments in neighbor states	The state may not know all of the requirements for such a system	Will have an opportunity to tie several states together	The learning curves on an initial technology deployment for an agency are steep							
FI2.4.4	Initial deployment of dust warning system in Texas	This project will include full design and deployment of dust warning systems similar to those used in Arizona for Texas.				3	4	4	5	3	377.147	30
		This system will use a proven technology from current deployments in neighbor states	The state may not know all of the requirements for such a system	Will have an opportunity to tie several states together	The learning curves on an initial technology deployment for an agency are steep							
FI2.4.5	Integrating the systems into regional information sharing	This project will take the information available from the dust warning systems and integrate them into a regional information sharing system – either a regional TMC or an information exchange network.				2	5	4	5	4	398.576	15
		The field systems are working and proven	Software always has issues, especially when integrating into legacy systems	Can become a new regional standard	May be cause issues with the existing regional information system							
FI2.5.1	Pilot test WIM in Mississippi	This project involves the design and deployment of an initial virtual weigh station along I-10 in Mississippi.				3	5	4	3	3	351.432	57
		WIM and virtual weigh stations are becoming more mature and commonplace	The learning curves on an initial technology deployment for an agency are steep	May be integrated with other states in the near future for a corridor system	Other agencies involved in operations and enforcement may have issues with the project							
FI2.5.2	Additional WIM deployments in Florida	This project will deploy additional virtual weigh stations similar to those already deployed.				3	5	4	3	3	351.432	58
		Proven technology in Florida		May be integrated with other states in the near future for a corridor system								
FI2.5.3	Pilot Test WIM in state 2	This project involves the design and deployment of an initial virtual weigh station along I-10 in Mississippi.				2	4	4	3	3	314.289	82
		WIM and virtual weigh stations are becoming more mature and commonplace	The learning curves on an initial technology deployment for an agency are steep	May be integrated with other states in the near future for a corridor system	Other agencies involved in operations and enforcement may have issues with the project							

Project Code	Cost	Description / Strength	Weakness	Opportunity	Threat	Champ	Ease of Implement	Oper. Feas.	Enabling	Multi-State	Total	Rank
FI2.5.4	Integrate WIM with TMC1	The virtual weigh station in one location will be integrated so that all information is transmitted in real time to the local TMC. Enforcement is still expected to occur in the field, but the TMC will monitor the system and provide a tool for determining targeted enforcement.				2	3	4	3	3	297.146	91
		Most WIM systems have the ability to send the information to another computer built in	Software	May provide additional information for archiving or real time systems in the future	May be cause issues with the existing TMC							
FI2.5.5	Integrate WIM with TMC2	The virtual weigh station in one location will be integrated so that all information is transmitted in real time to the local TMC. Enforcement is still expected to occur in the field, but the TMC will monitor the system and provide a tool for determining targeted enforcement.				2	3	4	3	3	297.146	92
		Most WIM systems have the ability to send the information to another computer built in	Software	May provide additional information for archiving or real time systems in the future	May be cause issues with the existing TMC							
FI2.5.6	Integrate with PrePass	This project would integrate information from the virtual weigh stations with PrePass. This could include verifying the PrePass trucks are near in weight what they currently say they are at. This would help PrePass check its customers and give the states more confidence in PrePass.				2	3	4	5	5	388.576	21
		Both systems use the same technology	Requires integrating two legacy software packages: one local and one national	Could provide a national means of expanding PrePass or other systems with greater confidence	PrePass may not want to participate; they get paid by making sure their customers bypass stations; virtual WIM may negatively impact their revenue							
OPS1.1.1	Pilot test integrated signals in state 1	This project would pilot test integrating signals with freeway operations. The intent is to help move cargo in and out of intermodal facilities faster and more efficiently.				1	3	4	4	3	298.575	90
		Signal systems have been integrated into TMCs in other locations	Software	May prove to be a model of how intermodal facilities interact with local ITS systems	Need to find ideal location for it to be beneficial							
OPS1.2.1	Pilot test automated incident detection in state 1	This project will design and deploy and AID system in one TMC, with a focus on I-10.				1	2	4	2	3	238.574	103
		AID systems have been around for decades, so the concept is mature	Requires specific operations to prove effective	If proven, could be effectively used in other locations	Cell phones often work faster, so may have limited success							
OPS1.3.1	THETA - Implement basic capabilities with state of Florida	Create and deploy a system to provide real time information to specific locations to aid in evacuation activities and real time planning				5	3	4	4	3	378.575	27
		Uses some legacy equipment and systems	Initial emphasis is just for selected facilities	Can provide good information across the entire Gulf region when fully deployed								

Project Code	Cost	Description	Strength	Weakness	Opportunity	Threat	Champ	Ease of Implement	Oper. Feas.	Enabling	Multi-State	Total	Rank
OPS1.3.2	THETA - Implement basic capabilities with state of Mississippi; implement "almost real time" map updates with traffic and weather	Create and deploy a system to provide real time information to specific locations to aid in evacuation activities and real time planning in Mississippi.	Leverage work completed in Florida	Initial emphasis is just for selected facilities	Can provide good information across the entire Gulf region when fully deployed		5	3	4	4	3	378.575	28
OPS1.3.3	THETA - Collaborate with all sponsoring states to achieve capabilities, economies of scale, and system architectures	This effort will take the work completed in Florida and Mississippi and will expand its use throughout the entire Gulf region. The system will provide an initial system for the region.	Leverages work already completed	There will be a lot of stakeholders that need to be involved	Can provide good information across the entire Gulf region when fully deployed	May have to broaden the number of stakeholders and increase the complexity of the system	5	3	4	3	4	381.432	24
OPS1.3.4	THETA - Develop stage 2 capabilities (evacuation across state lines, contra flow, (evacuation shelters)	This effort will build upon the initial deployment work to create additional features that are necessary for THETA to function as a regional resource for all.	Leverages work already completed and provides features that take it beyond current TMC capabilities	The complexity of this system is more than the other stages	Can provide good information across the entire Gulf region when fully deployed	When dealing with multiple legacy systems, there may be increased costs and delays	5	3	4	4	5	427.147	3
OPS1.3.5	THETA - Implement stage 2 with Alabama, Louisiana	This effort will build upon the initial deployment work to create additional features that are necessary for THETA to function as a regional resource for all.	Leverages work already completed and provides features that take it beyond current TMC capabilities	The complexity of this system is more than the other stages	Can provide good information across the entire Gulf region when fully deployed	When dealing with multiple legacy systems, there may be increased costs and delays	5	3	4	3	4	381.432	25

Project Code	Cost	Description Strength	Weakness	Opportunity	Threat	Champ	Ease of Implement	Oper. Feas.	Enabling	Multi-State	Total	Rank
OPS1.3.6	THETA - Implement stage 2 with Texas	This effort will build upon the initial deployment work to create additional features that are necessary for THETA to function as a regional resource for all.				5	3	4	3	4	381.432	26
		Leverages work already completed and provides features that take it beyond current TMC capabilities	The complexity of this system is more than the other stages	Can provide good information across the entire Gulf region when fully deployed	When dealing with multiple legacy systems, there may be increased costs and delays							
OPS1.4.1	TIMTOW - private sector certification for towers	Uses existing proposed program to provide a means of certifying towers for work on critical links. Towing companies must attend training and demonstrate they have the right equipment before getting the appropriate certification. For incidents on I-10, only approved towers will be contacted.				3	4	4	4	5	404.29	13
		The program exists and has been successfully implemented in other states	It requires a new level of cooperation and communication between the public agencies and the towing companies	Faster and safer removal of incidents along all of I-10	May be significant political pressure from the towing industry against this							
OPS1.4.2	Create a Gulf region incident management system	A new system in the Gulf region to coordinate incident management across state lines. This could be a separate system or operation, or it could be included as part of an existing system.				3	3	3	4	5	370.004	40
		Regional coordination is critical near state boundaries	Only applies to events in specific locations or beyond a certain size	Fills a needed gap in coordination	May overlap some other system's responsibilities							
OPS1.4.3	Share communications infrastructure with emergency providers	This project would identify specific locations where emergency responders would benefit by having access to transportation communications infrastructure. The project would first find several locations where this is needed and then deploy a single test within one of those regions.				2	2	3	4	5	332.861	69
		Optimal. use of limited resources	May strain communications network	May be able to use funding for redundant communications on other projects	Additional users may require upgrades to system that otherwise would not be required							
OPS1.5.1	Provide EM training for DOT staff throughout the corridor	While DOT staff are always looking for EM stakeholders to join the DOT committees, it is important that the DOT staff know what the EM staff responsibilities are. This training will illustrate the needs of the EM staff so the DOT staff. It will create awareness and understanding. This will allow the DOT staff to interact well with the new staff.				3	5	4	3	4	375.718	34
		Inexpensive and allows DOT staff to better understand the responsibilities of EM staff during emergency situations	DOT staff are already overloaded	With greater understanding comes better ideas for how to work together								
OPS2.1.1	Add major special event information to the corridor web site	In addition to construction information, add information on planned special events. These would be any events that impact I-10.				3	3	4	4	4	362.861	50
		Special events can have a major impact on I-10, so information on them is important	It is difficult to maintain current information since the information is often collected by different groups within an agency	Will serve as a national example and will provide information on events that otherwise fall between the gaps	If the information is not maintained, you can lose credibility quickly							

Project Code	Cost	Description Strength	Weakness	Opportunity	Threat	Champ	Ease of Implement	Oper. Feas.	Enabling	Multi-State	Total	Rank
OPS2.1.2	Develop a smart planned special event system for the corridor	This would be a module or server within a more complex regional system.				3	2	3	3	4	307.146	88
		Takes project OPS2.1.1 from information to management	Requires some existing regional system	Will serve as a national example and allows the corridor to function as a corridor	Requires an operational focus for all states to work properly							
OPS2.1.3	Pilot test a smart planned special event system in state 1	This would be a system or server within an existing TMC that deals exclusively with planned special events. This would be full functionality to collect all information and manage the data.				2	2	3	2	3	241.431	100
		Increased capabilities for current systems	Increased responsibilities for maintaining information	Will serve as a national example	Often the information relies on a completely separate group within the organization							
OPS2.1.4	Pilot test a smart planned special event system in state 2	This would be a system or server within an existing TMC that deals exclusively with planned special events. This would be full functionality to collect all information and manage the data.				2	2	3	2	3	241.431	101
		Increased capabilities for current systems	Increased responsibilities for maintaining information	Will serve as a national example	Often the information relies on a completely separate group within the organization							
OPS2.2.1	Integrate REGIONAL TMC with two major regional agencies	This project would integrate two major regional agencies into a TMC. This could be transit agencies or EM providers or toll authorities.				3	3	3	5	4	367.147	42
		This is the best evolution of TMCs	Legacy systems always require special care when integrating	Will serve as a model for the rest of the corridor	Depending on the agency and their system, the relative value may not be cost effective							
OPS2.2.2	Integrate REGIONAL TMC with two major regional agencies	This project would integrate two major regional agencies into a TMC. This could be transit agencies or EM providers or toll authorities.				3	3	3	5	4	367.147	43
		This is the best evolution of TMCs	Legacy systems always require special care when integrating	Will serve as a model for the rest of the corridor	Depending on the agency and their system, the relative value may not be cost effective							
OPS2.2.3	Integrate REGIONAL TMC with minor local agencies	There may be more minor systems that still have value to the corridor. This could include signal systems from a city that connect a major intermodal facility.				2	2	3	4	4	308.575	85
		This is the best evolution of TMCs	Legacy systems always require special care when integrating	Will serve as a model for the rest of the corridor	Depending on the agency and their system, the relative value may not be cost effective							

Project Code	Cost	Description	Strength	Weakness	Opportunity	Threat	Champ	Ease of Implement	Oper. Feas.	Enabling	Multi-State	Total	Rank
OPS2.2.4	Integrate REGIONAL TMC with minor local agencies	There may be more minor systems that still have value to the corridor. This could include signal systems from a city that connect a major intermodal facility.	This is the best evolution of TMCs	Legacy systems always require special care when integrating	Will serve as a model for the rest of the corridor	Depending on the agency and their system, the relative value may not be cost effective	2	2	3	4	4	308.575	86
OPS2.2.5	STUDY in-state integration (FL, TX, CA, AZ) vs. statewide TMC (MS)	This project is a study to examine the value of integrating TMCs within a state versus having a single TMC to control all statewide traffic management functions.	This is critical for the evolution of the corridor ITS systems and how they will interact	The result may be that conditions within individual states determine what is best for that state	By having a single philosophy, it will make it easier to plan for integration in the corridor for the future	If a recommendation is made, some states may need to change their way of approaching integrations	3	5	4	5	4	418.576	6
OPS2.2.6	Biloxi/Mobile TMC integration	This will create changes in both systems to allow for joint control of some devices as well as the sharing of information.	This is the purpose of a corridor - to provide multistate traffic management	Working with two different software systems to get both improved is difficult	Will serve as a model for the corridor	May not have much to apply across the entire corridor	3	2	4	5	4	367.147	44
OPS2.2.7	Mobile/Pensacola TMC integration	This will create changes in both systems to allow for joint control of some devices as well as the sharing of information.	This is the purpose of a corridor - to provide multistate traffic management	Working with two different software systems to get both improved is difficult	Will serve as a model for the corridor	May not have much to apply across the entire corridor	3	2	4	5	4	367.147	45
OPS2.2.8	Pilot test a rural alternate route plan for I-10	This project would determine alternate routes in a rural area for one location. This would identify the routes and place static signs for those routes.	Provides needed work as part of managing incidents on I-10		Will serve as a national or corridor example	May require the cooperation of many agencies that are not used to cooperating	2	4	3	3	4	321.432	75
OPS2.2.9	Pilot test an urban alternate route plan for I-10	This project would determine alternate routes in an urban area for one location. This would identify the routes and place static signs for those routes.	Provides needed work as part of managing incidents on I-10		Will serve as a national or corridor example	May require the cooperation of many agencies that are not used to cooperating.	2	4	3	3	4	321.432	76
OPS3.1.1	Horizon project with port of Jacksonville	This project uses technology to identify cargo on ships before they enter the port to allow operators the opportunity to plan their operations before the cargo arrives.	Improves port operations significantly	Requires information sharing with private providers	Could become a national or regional model	Initial project is with just one carrier	3	3	4	4	4	362.861	51
OPS3.2.1	Deploy WIMs at all Florida Gulf Coast ports	This project would install WIMS at certain ports to verify weights before the trucks leave the port. This will reduce the strain on law enforcement.	Will improve port operations as well as enforcement activities	Need a formal agreement with the port operators and potentially the shippers and carriers	Will serve as a corridor model	May have issues with some carriers or shippers	4	5	4	4	3	392.861	19

Project Code	Cost	Description	Strength	Weakness	Opportunity	Threat	Champ	Ease of Implement	Oper. Feas.	Enabling	Multi-State	Total	Rank
OPS3.3.1	Pilot test HAZMAT routing database across multiple states	This would create a central database for tracking and routing HAZMAT shipments. It would require knowledge of restricted areas and have to have the ability to provide information on shipments when queried.	This is a needed gap in incident management	Security measures must be in place for safety`	This could serve as a national example and even be expanded to a larger effort at a later date	Requires existing information on many routes throughout the corridor; this may not be readily available	2	2	3	4	5	332.861	70
OPS3.3.2	Create initial corridor management center HAZMAT database	This project takes the database and creates a management structure around it. This may require a new center or may be integrated into am existing center.	This is the first evolution of the pilot test	A new center may be required but will be expensive	Will serve as a national or regional model	May require new procedures for carriers that will require education	3	2	4	3	5	348.575	60
OPS3.4.1	Coordinate with federal agencies to ensure consistent operations of ports and crossings along border and through ports - admin. contract	This project is to provide the necessary administration to coordinate with a wide variety of federal agencies concerning the operations of ports and border crossings.	This project provides the skills necessary to navigate through the federal agencies and their requirements so that projects may move forward	Need someone familiar with all border and port issues	Providing this kind of coordination support is likely to build great relationships for many future efforts	Since there are many different federal (and state) agencies involved, it may be difficult to get all of them on board	3	3	4	5	5	408.576	9
OPS3.4.2	Deploy FAST at locations A, B, C, and D	This project will take the current FAST border crossing program and make sure it is deployed at all border crossing opportunities	The system has been proven in other locations	May be expensive to implement?	It will provide national consistency		2	3	4	4	5	367.147	46
OPS3.4.3	Deploy next generation federal security project at locations A, B, C, and D	As the federal government has continued to develop new security projects for border crossings, this project assumes that a new program will be created and initiated along the I-10 corridor within the next ten years.					1	1	1	1	1	100.001	104
OPS3.4.4	Expand combined points of entry program across all Gulf states	Take the existing combined point of entry program that is in operation at selected ports and deploy to all port facilities throughout the Gulf Coast.	It is a proven system that should be relatively easy to implement	Cost?	It will provide a unified approach for all ports, easing shipping administration	There may be operational issues or institutional issues at some ports that prevent the adoption of this program.	3	3	4	5	4	384.29	23
OPS3.5.1	Work with Federal agencies to create a secure commercial vehicle credentialing database	This will be a coordinated effort under the corridor administration contract.					2	2	3	3	5	311.432	84
OPS3.5.2	Pilot test of roadside safety inspection in state 1	This is a CVISN project to automate roadside safety inspection and sharing of information.	Provides enhanced information sharing to expedite roadside inspections		Provides an opportunity to match other similar programs around the nation		1	1	1	1	1	100.001	105

Project Code	Cost	Description	Strength	Weakness	Opportunity	Threat	Champ	Ease of Implement	Oper. Feas.	Enabling	Multi-State	Total	Rank
OPS3.5.3	Apply roadside safety application across multiple states	This is an expansion of OPS3.5.2 across more states.	Provides enhanced information sharing to expedite roadside inspections		Provides an opportunity to match other similar programs around the nation		2	2	2	4	5	315.718	79
OPS4.1.1	See INF.G2.O5						1	1	1	1	1	100.001	106
OPS4.2.1	Pilot smart work zone in state 1	Design and deploy a smart work zone tailored for the specific construction project. This will include roadway sensors, CCTV, DMS and other technologies as required.	Some COTS packages exist; most technologies used are not new	Must be tailored to the project – do not create a generic system	The overall concept and any integration efforts can be shared with other agencies in the I-10 corridor	Work zones are highly visible and active areas where problems occur on a regular basis; make sure the work zone capabilities are well defined in advance	2	3	4	3	3	297.146	93
OPS4.2.2	Pilot smart work zone in state 2	Design and deploy a smart work zone tailored for the specific construction project. This will include roadway sensors, CCTV, DMS and other technologies as required.	Some COTS packages exist; most technologies used are not new	Must be tailored to the project – do not create a generic system	The overall concept and any integration efforts can be shared with other agencies in the I-10 corridor	Work zones are highly visible and active areas where problems occur on a regular basis; make sure the work zone capabilities are well defined in advance	2	3	4	3	3	297.146	94
OPS4.2.3	Integrate smart work zone into corridor web site	A smart work zone is sometimes integrated into the local TMC, but only in terms of CCTV and possibly data. This project will take all of the outputs available from the smart work zone and make them available on the corridor web site.	This is a critical piece of information for the users	Information from work zones is often less complete than regular sensors – need to temper expectations	Can be applied throughout the corridor	Agencies may have a reluctance to allow others to “see” into their work zone	2	4	4	5	5	405.719	11
OPS4.2.4	Integrate smart work zone into TMC 1	Often times, smart work zones are stand alone. Sometimes the vendor will provide a web site with information but the equipment is not integrated into the local TMC. This project will provide for complete integration of all smart work zone systems into the local TMC to provide full functionality and control.	This is a critical element for operators	Software	Once completed, future work zones should be easily integrated into the same TMC	TMC vendor may have issues with rights	2	2	3	5	3	305.718	89

Project Code	Cost	Description / Strength	Weakness	Opportunity	Threat	Champ	Ease of Implement	Oper. Feas.	Enabling	Multi-State	Total	Rank
OPS4.2.5	Lane rental demonstration in state 1	Lane rental is a way of monitoring lane closures in a work zone. The owner must know the lane/mile/hours of closures, and then the contractor will be charged for each lane/mile/hour of closure. This way, the contractor has an incentive to minimize the closures to expedite construction.				2	3	3	4	5	350.004	59
		Operationally provides incentive for contractors to improve the way they manage traffic in the work zones	This is a new concept to many agencies and may require some administrative changes	Very successful in Europe and other locations	Contractor industry may have issues with this concept							
OPS4.2.6	Integrate lane rental into TMC 2	Lane rental can typically be done outside of the operations group. However, the operations staff are usually the ones that have the CCTV that can verify the contactors timing. This project will integrate the lane closure mechanism into the TMC for management and verification.				2	2	3	5	5	354.29	53
		It is an evolution of the lane rental concept	Software and administrative changes within an agency may be required	Could be applied throughout the corridor								
OPS4.2.7	Full concept scope and design for uniform smart work zone	Study the best of the work zones across the corridor and determine a possible uniform smart work zone standard for the entire corridor.				2	3	3	5	5	371.433	35
		Should be many existing efforts to get lessons learned from	There may be unique characteristics in various states that prevent a single standard from working over the corridor	Uniform look and feel of work zones will help long distance carriers with expectations and therefore improve safety	Vendor community may have issues or concerns							
OPS4.2.8	Implementation of a standard smart work zone across the corridor	Implementing the standard designed in OPS4.2.7. No project required.				2	3	2	5	5	354.29	54
OPS4.3.1	Increased training for emergency responders along I-10 (nuclear in the SW/petrochemicals in the Gulf Coast region)	Provide increased training for emergency responders in how to work with transportation agencies. Use existing federal courses or pay to develop one.				3	5	5	3	3	368.575	41
		Multi-agency cooperation is critical to successful operations in an emergency	May have difficulty convincing them to attend	Could be used across the entire corridor and nationally								
OPS4.4.1	Pilot test automated crash reporting with a private service provider	Similar to Onstar, this system would provide a notification to a center when a commercial vehicle has crashed. This will be done with a private sector provider.				2	1	3	4	4	291.432	95
		Onstar has proven very effective over the years; safety will be increased and response times decreased	Commercial vehicles may have special needs that the private sector may be reluctant to be involved with	Huge potential market	Liability may be a larger issue							

Project Code	Cost	Description / Strength	Weakness	Opportunity	Threat	Champ	Ease of Implement	Oper. Feas.	Enabling	Multi-State	Total	Rank
OPS4.4.2	Combine automated crash reporting with material load information	This will combine a proven system for OPS4.4.1 with a database of material loads (OPS3.3.1) so that emergency responders know what load is on the truck before they arrive at the scene				2	2	2	4	5	315.718	80
		Leap ahead in incident management	Must combine two new systems	Huge potential market	Maintaining the database in real time will be difficult							
OPS4.5.1	Use cell phones for probes in rural New Mexico to generate travel times for use in incident information sharing	There are several pilot test of using cell phones for probes. None have demonstrated large scale success to date. This will use the cell phones in a rural environment which addresses many of the operational issues of the current tests. It will supply travel times and test the ability to use for automated incident notification.				2	2	2	5	4	312.861	83
		A relatively cheap alternative	If it works	Applicable across the corridor and nation	Requires a detailed investigation into the AID portion							
OPS4.5.2	Use cell phones for probes in rural Texas to generate travel times for use in incident information sharing	There are several pilot test of using cell phones for probes. None have demonstrated large scale success to date. This will use the cell phones in a rural environment which addresses many of the operational issues of the current tests. It will supply travel times and test the ability to use for automated incident notification.				2	2	2	5	5	337.147	65
		A relatively cheap alternative	If it works	Applicable across the corridor and nation	Requires a detailed investigation into the AID portion							
OPS4.5.3	Increased use of license plate readers in Florida	License plate readers are already used in Florida for work zones and other projects. This will expand their usage to other applications.				3	3	3	4	4	345.718	61
		Using a proven technology and application	Must make sure application is appropriate	Large potential for use in other states and nationally	What works in Florida may not work in other states (particularly outside of the I-10 Corridor)							
OPS5.1.1	Set up committee to coordinate with businesses to look for joint opportunities	Part of the corridor management contract.				2	2	3	5	5	354.29	55
OPS5.1.2	Increase use of credentialing and checking around petroleum facilities along I-10	The petroleum facilities along the gulf coast are potential terrorist targets. This would use credentialing and other activities to increase security .				3	4	3	3	4	341.432	64
		May have potential for funding from homeland security	Not typical DOT projects	Potential for application in other corridors	Will have to work with several agencies and private providers – will be difficult							
OPS5.2.1	See OPS.G1					1	1	1	1	1	100.001	107
OPS6.1.1	Establish stakeholder group with port facilities and determine where improvements are possible	Covered as part of the corridor administration contract.				3	4	5	5	4	418.576	7

Project Code	Cost	Description / Strength	Weakness	Opportunity	Threat	Champ	Ease of Implement	Oper. Feas.	Enabling	Multi-State	Total	Rank
OPS6.1.2	Deploy project to reduce congestion in and around a port facility	This will have to follow up from OPS5.1.1.				2	2	4	3	3	280.003	97
OPS6.1.3	Deploy project to reduce congestion in and around a multimodal facility	This will have to follow up from OPS5.1.1.				2	2	4	3	3	280.003	98
OPS6.2.1	Increase capability, range, and size of existing service patrols	Increase number of vehicles, their size, and their capabilities to provide more service on traditional service patrols.				2	3	4	5	4	364.29	48
		Service patrols are proven very cost effective means of addressing incidents and congestion	Expensive and may require administrative changes within an organization		Traditional problems with towing industry							
OPS6.2.2	Expand use of Rapid Incident Scene Clearance (RISC) in Florida	This is a specialized program in Florida. Expand its use statewide and throughout the corridor.				3	5	4	5	3	394.29	18
		Proven program		Can be applied across the corridor								
OPS6.2.3	New service patrols in location A	Implementation of service patrols in areas that don't have any currently.				2	2	3	2	3	241.431	102
		Service patrols are proven very cost effective means of addressing incidents and congestion	Expensive and may require administrative changes within an organization		Traditional problems with towing industry							
OPS6.2.4	Pilot test video from service patrol to TMC in state A	This project would use video from "cop cams" to send back to a TMC when necessary.				2	3	4	5	4	364.29	49
		This is critical information for responders	New technology – may require extensive infrastructure.	Application in all markets across the corridor and nation	Unsure how users will react							
INF1.2.1	Deploy a project that provides ability to get 511 information across multiple states from one state	This project will integrate information from all states via 511.				2	2	4	5	5	371.433	36
		511 is implemented in most regions along the corridor	Implementation and enhancements have been typically slower than expected	Application nationally	Must deal with all carriers and systems							
INF1.2.2	Deploy 511 corridor information in all corridor states	Build out 511 systems in all states.				2	2	3	4	5	332.861	71
		Proven technology	Where there are issues, they are often time consuming to solve	Application nationally	May be some issues specific to certain states							

Project Code	Cost	Description	Strength	Weakness	Opportunity	Threat	Champ	Ease of Implement	Oper. Feas.	Enabling	Multi-State	Total	Rank
INF1.3.1	Deploy fiber connections to provide state to state connectivity where appropriate	Where there are gaps in state-owned fiber or communications networks, close those gaps to allow agencies to share information directly.	Excellent shared use of resources	Fiber may be expensive	Working towards a larger long-term vision of full interconnectivity	May have legal or policy issues with interstate trade and communications	3	4	4	5	5	425.719	4
INF2.1.1	Create a web site with links to web sties for all states within the corridor	A simple corridor web site that just provides a single source to all available state and local traffic information sites	Small and quick	Lack of uniformity	First step to larger shared information projects		3	5	5	5	5	460.005	2
INF2.1.2	Enhance the existing web site with an email alert system	Provide email alerts to motorists and carriers that sign up for it. They will receive an email any time something unusual is happening on their chosen routes.	Already in use in several locations		Easy access to many people to share incident and event information	Requires a commitment on the operations people to keep the system up and running	3	4	4	5	5	425.719	5
INF2.1.3	Provide upgrades and enhancements to the corridor web site	This is an enhancement for project INF2.1.1.	Will begin with a proven system	Needs and features unknown at this time	Second step to a larger shared information system		2	3	4	3	5	345.718	62
INF2.2.1	Integrate weather information into corridor web site	Weather information, especially about storms and warnings, will be added to the web site.	Already in use in several locations	What and how to display information is personal	More steps to larger shared information system		2	2	3	4	5	332.861	72
INF2.3.1	Deploy test Wi-Fi for emergency response along selected sections of corridor	Install Wi-Fi along sections of the corridor for use by emergency responders (e.g., I-35 bridge collapse used a local wi-fi for sharing information).	Relatively proven technology	Expensive	May have ability to share with public or tap into private providers	If shared, need controls for emergencies	2	2	3	3	4	287.146	96
INF2.4.1	Establish a means of sharing information between TMCs along the corridor	Create an information exchange network among the corridor TMCs to share information critical to operations.	Similar to the successful use in I-95	May have firewall issues with some agencies	Provides a service to the entire corridor	If used properly, may require changes in operations at some agencies	3	2	4	5	5	391.433	20
INF2.4.2	Create an instant messaging network	This is a subset of INF2.4.1.					2	4	3	5	5	388.576	22

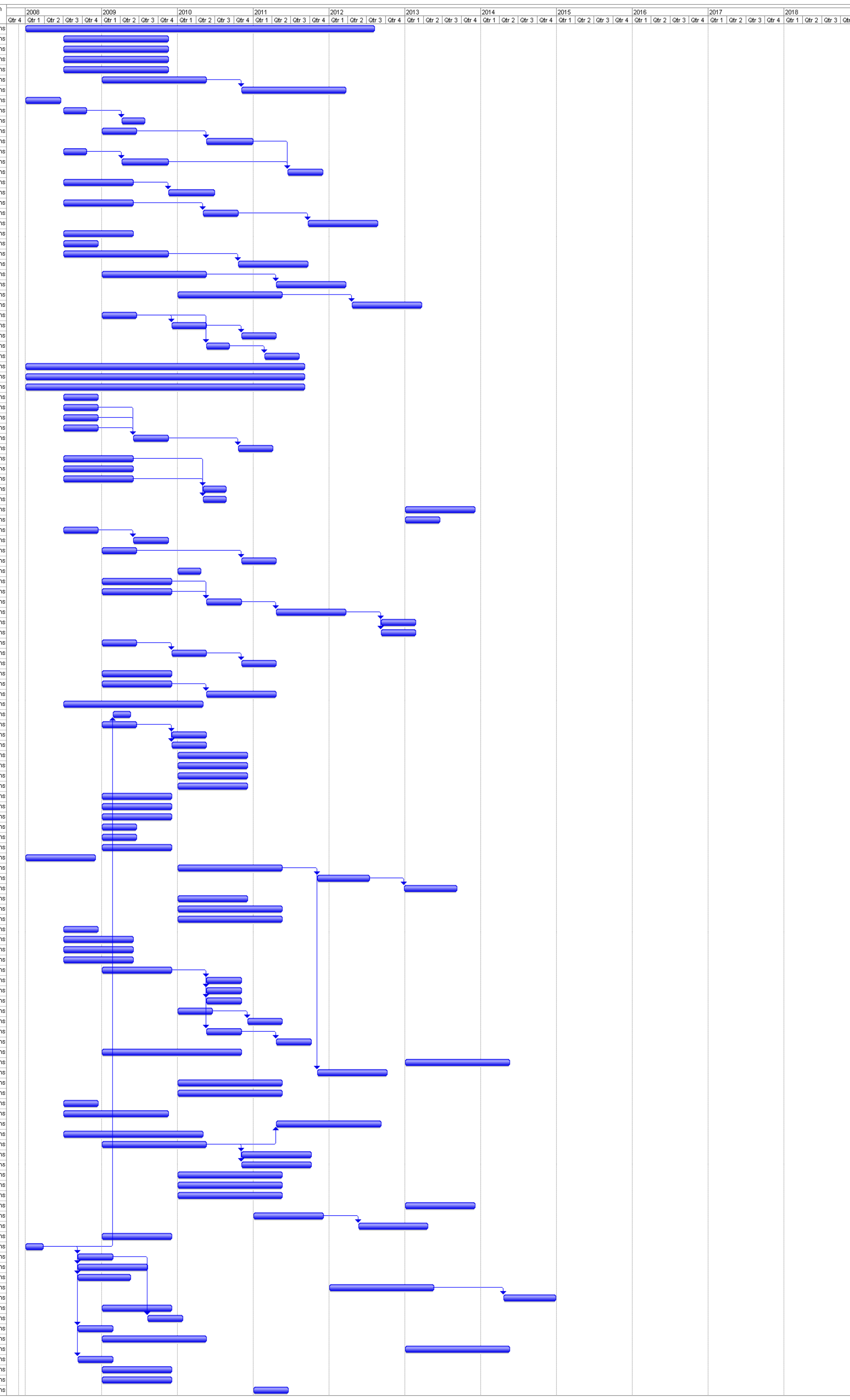
Project Code	Cost	Description	Strength	Weakness	Opportunity	Threat	Champ	Ease of Implement	Oper. Feas.	Enabling	Multi-State	Total	Rank
INF2.4.3	Create a "Warmap"	This will create a single web site for all agencies that has all available information along I-10.	Builds off of INF2.1.3	Sometimes it is too busy to be useful	Provides a service to the entire corridor	Requires some change in operations for most agencies	2	4	4	5	5	405.719	12
INF2.5.1	Deployment of 511 in states without 511	Deploy 511 where it is not deployed.	Proven technology	Where there are problems with deployments, those problems are usually time consuming to solve	Provide complete coverage across the entire corridor		2	2	3	3	3	262.86	99
INF2.5.2	Multi-state coordination and seamless integration	Combination of INF1.2.1 and INF1.2.2.					2	2	3	4	5	332.861	73
INF2.6.1	Enhance coordination with media through web site	Included in corridor maintenance contract.					3	4	3	3	5	365.718	47
INF3.1.1	Smart Park demonstration in state 1	Demonstrate a project that provides advanced notice of parking availability for trucks.	Build off other projects nationally	Not a proven system yet	Has corridor application	Requires cooperation between private and public sector	1	1	1	1	1	100.001	108
INF3.1.2	Smart Park demonstration in state 2	Demonstrate a project that provides advanced notice of parking availability for trucks.	Build off other projects nationally	Not a proven system yet	Has corridor application	Requires cooperation between private and public sector	1	1	1	1	1	100.001	109
INF3.2.1	Provide localized and regional weather and traffic at parking facilities	Provide a local web site through Wi-Ki and kiosks that address regional weather and traffic information at rest stops.	Proven technology and ease of implementation	Must build off of INF1.2.1 and INF1.2.2, as well as integrate with kiosk	Corridorwide application		3	3	4	5	5	408.576	10

Appendix I

Initial Project Schedule

Attached

ID	Task Name	Duration
1	ADM.1.1.1 I-10 Project Management Contract	60 mons
2	ADM2.1.1 Implement Quick Clearance policies (shoulder or in-lane?)	18 mons
3	ADM2.1.2 Enact legislation to limit liability for moving vehicles	18 mons
4	ADM2.1.3 Move-it laws	18 mons
5	ADM2.1.4 Move over laws for emergency responders	18 mons
6	ADM2.1.5 Create Demo standard polices and procedures for planned special events	18 mons
7	ADM2.1.5 Full Deployment of standard polices and procedures for planned special events	18 mons
8	ADM2.2.1 Develop a memorandum of understanding	6 mons
9	ADM2.3.1 Multi-state OW/OS vehicle permit (standard envelop) DEMO	4 mons
10	ADM2.3.1 Multi-state OW/OS vehicle permit (standard envelop) Full deployment	4 mons
11	ADM2.3.2 Pilot test for one-stop credentialing along the Gulf Coast DEMO	6 mons
12	ADM2.3.3 Create a corridor-wide credentialing center Full deployment	8 mons
13	ADM2.3.4 Pilot test OS/OW automated permitting across multiple states DEMO	4 mons
14	ADM2.3.4 Pilot test OS/OW automated permitting across multiple states Full deployment	8 mons
15	ADM2.3.5 Add automated permitting to a corridor wide credentialing center	6 mons
16	ADM2.4.1 Share response plans and determine areas for increased coordination. Internal	12 mons
17	ADM2.4.1 Share response plans and determine areas for increased coordination. Full formal	8 mons
18	ADM2.5.1 Plan/design a corridor wide data archiving system	12 mons
19	ADM2.5.2 Build the initial corridor archiving system	6 mons
20	ADM2.5.3 Evolution 1 of archiving system	12 mons
21	***Develop common ITS Planning objectyives for the corridor***	12 mons
22	***Apply for corridor funding***	6 mons
23	INF1.1.1 New Gulfport TMC	18 mons
24	INF1.1.1 New Gulfport TMC Enhancements	12 mons
25	INF1.1.2 Deploy TMC 2	18 mons
26	INF1.1.2 Deploy TMC 2 Enhancements	12 mons
27	INF1.1.3 Deploy TMC 3	18 mons
28	INF1.1.3 Deploy TMC 3 Enhancements	12 mons
29	INF1.2.1 Identify key assets along corridor that are not covered as part of an urban TMC DEMO	6 mons
30	INF1.2.1 Identify key assets along corridor that are not covered as part of an urban TMC DEPLOY	6 mons
31	INF1.2.1 Identify key assets along corridor that are not covered as part of an urban TMC FULL DEPLOY	6 mons
32	INF1.2.2 Integrate key asset surveillance into existing TMC INITIAL	4 mons
33	INF1.2.2 Integrate key asset surveillance into existing TMC FULL	6 mons
34	INF2.1.1 0 deploy CCTV	48 mons
35	INF2.2.1 0 deploy traffic detecotrs	48 mons
36	INF2.3.1 0 deploy DMS	48 mons
37	INF2.4.1 Upgrading fog detection on Bayway Bridge	6 mons
38	INF2.4.2 Additional dust warning system locations in Arizona	6 mons
39	INF2.4.3 Initial deployment of dust warning system in New Mexico	6 mons
40	INF2.4.4 Initial deployment of dust warning system in Texas	6 mons
41	INF2.4.5 Integrating the systems into regional information sharing DEMO	6 mons
42	INF2.4.5 Integrating the systems into regional information sharing FULL Deployment	6 mons
43	INF2.5.1 Pilot Test WIM in Mississippi	12 mons
44	INF2.5.2 Additional WIM deployments in Florida	12 mons
45	INF2.5.3 Pilot Test WIM in State 2	12 mons
46	INF2.5.4 Integrate WIM with TMC1	4 mons
47	INF2.5.5 Integrate WIM with TMC2	4 mons
48	INF2.5.6 Integrate with PrePass DEMO	12 mons
49	INF2.5.6 Integrate with PrePass Deployment	6 mons
50	INF2.6.1 Develop/deploy oversize vehicle detection system DEMO	6 mons
51	INF2.6.1 Develop/deploy oversize vehicle detection system Initial Deployment	6 mons
52	OPS1.1.1 Pilot test integrated signals in State 1	6 mons
53	OPS1.1.1 Pilot test integrated signals in three more states	6 mons
54	OPS1.2.1 Pilot test automated incident detection in State 1	4 mons
55	OPS1.3.1 THETA - Implement basic capabilities with state of Florida.	12 mons
56	OPS1.3.2 THETA - Implement basic capabilities with state of Mississippi. Implement 'almost real time' ma	12 mons
57	OPS1.3.3 THETA - Collaborate with all sponsoring states to achieve capabilities, economies of scale, ar	6 mons
58	OPS1.3.4 THETA - Develop stage 2 capabilities (evac. Across state lines, contra flow, evac. shelters).	12 mons
59	OPS1.3.5 THETA - Implement stage 2 with Alabama, Louisiana,	6 mons
60	OPS1.3.6 THETA - Implement stage 2 with Texas.	6 mons
61	OPS1.4.1 TIMTOW - private sector certification for towers Pilot test	6 mons
62	OPS1.4.1 TIMTOW - private sector certification for towers Initial Deployment	6 mons
63	OPS1.4.1 TIMTOW - private sector certification for towers Full deployment	6 mons
64	OPS1.4.2 Create a Gulf region incident management system	12 mons
65	OPS1.4.3 Share communications infrastructure with emergency providers DEMO	12 mons
66	OPS1.4.3 Share communications infrastructure with emergency providers Deploy in other states	12 mons
67	OPS1.5.1 Provide EM training for DOT staff throughout the corridor	24 mons
68	OPS2.1.1 Add major special event information to the corridor web site	3 mons
69	OPS2.1.2 Develop a smart planned special event system for the corridor	6 mons
70	OPS2.1.3 Pilot test a smart planned special event system in State 1	6 mons
71	OPS2.1.4 Pilot test a smart planned special event system in State 2	6 mons
72	OPS2.2.1 Integrate REGIONAL TMC with 2 major regional agencies	12 mons
73	OPS2.2.2 Integrate REGIONAL TMC with 2 major regional agencies	12 mons
74	OPS2.2.3 Integrate REGIONAL TMC with minor local agencies	12 mons
75	OPS2.2.4 Integrate REGIONAL TMC with minorlocal agencies	12 mons
76	OPS2.2.5 Examine the Ways the States Are Currently Deploying TMCs for Suggested Improvements	12 mons
77	OPS2.2.6 Biloxi/Mobile TMC integration	12 mons
78	OPS2.2.7 Mobile/Pensacola TMC integration	12 mons
79	OPS2.2.8 Pilot test a rural alternate route plan for I-10	6 mons
80	OPS2.2.9 Pilot test an urban alternate route plan for I-10	6 mons
81	OPS3.1.1 Horizon project with port of Jacksonville	12 mons
82	OPS3.2.1 Deploy WIMs at all Florida Gulf coast ports	12 mons
83	OPS3.3.1 Pilot test HAZMAT routing database across multiple states DESIGN	18 mons
84	OPS3.3.1 Pilot test HAZMAT routing database across multiple states INITIAL DEPLOYMENT	9 mons
85	OPS3.3.1 Pilot test HAZMAT routing database across multiple states FURTHER DEPLOYMENT	9 mons
86	OPS3.3.2 Create initial corridor management center HAZMAT database DESIGN	12 mons
87	OPS3.4.2 Deploy FAST at locations A, B, C, and D	18 mons
88	OPS3.4.3 Deploy New Federal Project at locations A, B, C, and D	18 mons
89	OPS3.4.4 Expand combined points of entry program across all Gulf states	6 mons
90	OPS3.5.1 Work with Federal agencies to create a secure commercial vehicle credentialling database.	12 mons
91	OPS3.5.2 Pilot test of roadside safety inspection in State 1	12 mons
92	OPS3.5.3 Apply roadside safety application across multiple states.	12 mons
93	OPS4.2.1 Pilot smart work zone in State 1 DESIGN AND DEPLOY	12 mons
94	OPS4.2.2 Pilot smart work zone in State 2 DEPLOY	6 mons
95	OPS4.2.3 Integrate smart work zone into corridor web site	6 mons
96	OPS4.2.4 Integrate smart work zone into TMC 1	6 mons
97	OPS4.2.5 Lane Rental Demonstration in State 1	6 mons
98	OPS4.2.6 Integrate lane rental into TMC 2	6 mons
99	OPS4.2.7 Full concept scope and design for uniform smart work zone	6 mons
100	OPS4.2.8 Implementation of a standard smart work zone across the corridor	6 mons
101	OPS4.3.1 Increased training for emergency responders along I-10 (nuclear in the SW / petrochemicals i	24 mons
102	OPS4.4.1 Pilot test automated crash reporting with a private service provider	18 mons
103	OPS4.4.2 Combine automated crash reporting with material load information	12 mons
104	OPS4.5.1 Use cell phones for probes in rural New Mexico to generate travel times for use in incident inf	18 mons
105	OPS4.5.2 Use cell phones for probes in rural Texas to generate travel times for use in incident informati	18 mons
106	OPS4.5.3 Increased use of license plate readers in Florida	6 mons
107	OPS5.1.1 Set up committee to coordinate with businesses to look for joint opportunities	18 mons
108	OPS5.1.2 Increase use of credentialing and checking around petroleum facilities along I-10	18 mons
109	OPS5.2.1 Coordinate with law enforcement to target areas of concern	24 mons
110	OPS6.1.1 Establish stakeholder group with port facilities and determine where improvements are possib	18 mons
111	OPS6.1.2 Deploy project to reduce congestion in and around a port facility	12 mons
112	OPS6.1.3 Deploy project to reduce congestion in and around a multimodal facility	12 mons
113	OPS6.2.1 Increase capability, range, and size of existing service patrols	18 mons
114	OPS6.2.2 Expand use of Rapid Incident Scene Clearance (RISC) in Florida	18 mons
115	OPS6.2.3 New service patrols in location A	18 mons
116	OPS6.2.4 Pilot test video from service patrol to TMC in State A	12 mons
117	INF1.2.1 Deploy a project that provides ability to get 511 information across multiple states from 1 state	12 mons
118	INF1.2.2 Deploy 511 corridor information in all corridor states	12 mons
119	INF1.3.1 Deploy fiber connections to provide state to state connectivity where appropriate	12 mons
120	INF2.1.1 Create a web site with links to web sties for all states within the corridor	3 mons
121	INF2.1.2 Enhance the existing web site with an email alert system	6 mons
122	INF2.1.3 Provide upgrades and enhancements to the corridor web site	12 mons
123	INF2.2.1 Integrate weather information into corridor web site	9 mons
124	INF2.3.1 Deploy test Wi-Fi for emergency response along selected sections of corridor PILOT	18 mons
125	INF2.3.1 Deploy test Wi-Fi for emergency response along selected sections of corridor DEPLOY IN 3 ST	9 mons
126	INF2.4.1 Establish a means of sharing information between TMCs along the corridor DESIGN ONLY	12 mons
127	INF2.4.2 Create an instant messaging network	6 mons
128	INF2.4.3 Create a "Warmap"	6 mons
129	INF2.5.1 Deployment of 511 in states without	18 mons
130	INF2.5.2 Multi-state coordination and seamless integration of 511	18 mons
131	INF2.6.1 Enhance coordination with media through web site	6 mons
132	INF3.1.1 Smart Park demonstration in State 1	12 mons
133	INF3.1.2 Smart Park demonstration in State 2	12 mons
134	INF3.2.1 Provide localized and regional weather and traffic at parking facilities	6 mons



Appendix J

Project Cost Estimates

Assumptions

- Average hourly consultant rates are $125 fully loaded.
- Travel costs are $1,000 per person per trip.
- Equipment costs are from the USDOT National ITS Deployment Database.
- Unless otherwise noted, no facilities costs are assumed.
- Unless otherwise noted, maintenance costs are assumed to be by DOT staff. They are identified but not included in the total cost.
- Staff costs assume mid to senior level hours to manage or implement a project at a straight $100 per hour.

Summary costs are shown below. The full cost estimate spreadsheet is included on the accompanying CD.

Project code	Project	Demonstration Total Costs	Initial Deployment Total Costs	Full Deployment Total Cost	Total Project Cost
ADM.1.1.1	I-10 project management contract	-	-	411,000	411,000
ADM2.1.1	Implement quick clearance policies (shoulder or in-lane?)	-	-	-	-
ADM2.1.2	Enact legislation to limit liability for moving vehicles	-	-	-	-
ADM2.1.3	Move-it laws	-	-	-	-
ADM2.1.4	Move over laws for emergency responders	-	-	-	-
ADM2.1.5	Create standard polices and procedures for planned special events	35,250	-	-	35,250
ADM2.2.1	Task under ADM1.1.1	35,250	-	39,000	74,250
ADM2.3.1	Multi-state OW/OS vehicle permit (standard envelope)	35,250	-	64,000	99,250

Project code	Project	Demonstration Total Costs	Initial Deployment Total Costs	Full Deployment Total Cost	Total Project Cost
ADM2.3.2	Pilot test for one-stop credentialing along the Gulf Coast	35,250	-	-	35,250
ADM2.3.3	Create a corridorwide credentialing center	-	-	221,000	221,000
ADM2.3.4	Pilot test OS/OW automated permitting across multiple states	35,250	-	221,000	256,250
ADM2.3.5	Add automated permitting to a corridorwide credentialing center	35,250	-	221,000	256,250
ADM2.4.1	Share response plans and determine areas for increased coordination			58,000	58,000
ADM2.5.1	Plan/design a corridorwide data archiving system	191,500			191,500
ADM2.5.2	Build the initial corridor archiving system		241,500		241,500
ADM2.5.3	Evolution 1 of archiving system			134,000	134,000
	Task under ADM1.1.1				-
	Task under ADM1.1.1				-
FI1.1.1	New Gulfport TMC		937,000	154,000	1,091,000
FI1.1.2	Deploy TMC 2		937,000	154,000	1,091,000
FI1.1.3	Deploy TMC 3		937,000	154,000	1,091,000
FI1.2.1	Identify key assets along corridor that are not covered as part of an urban TMC	54,000	251,000	903,000	1,208,000
FI1.2.2	Integrate key asset surveillance into existing TMC		84,500	451,500	536,000

Project code	Project	Demonstration Total Costs	Initial Deployment Total Costs	Full Deployment Total Cost	Total Project Cost
FI2.1.1					-
FI2.2.1					-
FI2.3.1					-
FI2.4.1	Upgrading fog detection on Bayway Bridge			77,000	77,000
FI2.4.2	Additional dust warning system locations in Arizona			77,000	77,000
FI2.4.3	Initial deployment of dust warning system in New Mexico			77,000	77,000
FI2.4.4	Initial deployment of dust warning system in Texas			77,000	77,000
FI2.4.5	Integrating the systems into regional information sharing	64,500		156,000	220,500
FI2.5.1	Pilot test WIM in Mississippi	441,500			441,500
FI2.5.2	Additional WIM deployments in Florida		2,525,000		2,525,000
FI2.5.3	Pilot test WIM in State 2	441,500			441,500
FI2.5.4	Integrate WIM with TMC1	77,000			77,000
FI2.5.5	Integrate WIM with TMC2	77,000			77,000
FI2.5.6	Integrate with PrePass	291,500	1,362,000		1,653,500
FI2.6.1	Develop/deploy oversize vehicle detection systems to selected sites along I-10				-
OPS1.1.1	Pilot test integrated signals in State 1	249,500	408,000		657,500
OPS1.2.1	Pilot test automated incident detection in State 1	63,500			63,500

Project code	Project	Demonstration Total Costs	Initial Deployment Total Costs	Full Deployment Total Cost	Total Project Cost
OPS1.3.1	THETA - Implement basic capabilities with state of Florida		431,000		431,000
OPS1.3.2	THETA - Implement basic capabilities with state of Mississippi; implement "almost real time" map updates with traffic and weather		431,000		431,000
OPS1.3.3	THETA - Collaborate with all sponsoring states to achieve capabilities, economies of scale, and system architectures	154,000			154,000
OPS1.3.4	THETA - Develop stage 2 capabilities (evacuation across state lines, contra flow, evacuation shelters).	229,000			229,000
OPS1.3.5	THETA - Implement stage 2 with Alabama, Louisiana	353,000			353,000
OPS1.3.6	THETA - Implement stage 2 with Texas	353,000			353,000
OPS1.4.1	TIMTOW - private sector certification for towers	78,000			78,000
OPS1.4.2	Create a Gulf region incident management system		156,000		156,000
OPS1.4.3	Share communications infrastructure with emergency providers		-		-

Project code	Project	Demonstration Total Costs	Initial Deployment Total Costs	Full Deployment Total Cost	Total Project Cost
OPS1.5.1	Provide EM training for DOT staff throughout the corridor	50,000		1,150,000	1,200,000
OPS2.1.1	Add major special event information to the corridor web site		12,500		12,500
OPS2.1.2	Develop a smart planned special event system for the corridor	254,000			254,000
OPS2.1.3	Pilot test a smart planned special event system in State 1		100,000		100,000
OPS2.1.4	Pilot test a smart planned special event system in State 2		100,000		100,000
OPS2.2.1	Integrate REGIONAL TMC with two major regional agencies		306,000		306,000
OPS2.2.2	Integrate REGIONAL TMC with two major regional agencies		306,000		306,000
OPS2.2.3	Integrate REGIONAL TMC with minor local agencies		306,000		306,000
OPS2.2.4	Integrate REGIONAL TMC with minor local agencies		306,000		306,000
OPS2.2.5	Examine the ways the states are currently deploying TMCs for suggested improvements		312,000		312,000
OPS2.2.6	Biloxi/Mobile TMC integration		302,000		302,000

Project code	Project	Demonstration Total Costs	Initial Deployment Total Costs	Full Deployment Total Cost	Total Project Cost
OPS2.2.7	Mobile/Pensacola TMC integration		302,000		302,000
OPS2.2.8	Pilot test a rural alternate route plan for I-10	70,500			70,500
OPS2.2.9	Pilot test an urban alternate route plan for I-10	70,500			70,500
OPS3.1.1	Horizon project with port of Jacksonville		352,000		352,000
OPS3.2.1	Deploy WIMs at all Florida Gulf coast ports		3,350,000		3,350,000
OPS3.3.1	Pilot test HAZMAT routing database across multiple states	483,000	156,000	206,000	845,000
OPS3.3.2	Create initial corridor management center HAZMAT database	189,500			189,500
OPS3.4.1	Coordinate with federal agencies to ensure consistent operations of ports and crossings along border and through ports – admin. contract				-
OPS3.4.2	Deploy FAST at locations A, B, C, and D		508,000		508,000
OPS3.4.3	Deploy New Federal Project at locations A, B, C, and D		508,000		508,000
OPS3.4.4	Expand combined points of entry program across all Gulf states		108,000		108,000

Project code	Project	Demonstration Total Costs	Initial Deployment Total Costs	Full Deployment Total Cost	Total Project Cost
OPS3.5.1	Work with federal agencies to create a secure commercial vehicle credentialing database	368,500			368,500
OPS3.5.2	Pilot test of roadside safety inspection in State 1	356,000			356,000
OPS3.5.3	Apply roadside safety application across multiple states		352,000		352,000
OPS4.1.1	See INF.G2.O5				-
OPS4.2.1	Pilot smart work zone in State 1	203,000			203,000
OPS4.2.2	Pilot smart work zone in State 2		100,000		100,000
OPS4.2.3	Integrate smart work zone into corridor web site	53,000			53,000
OPS4.2.4	Integrate smart work zone into TMC 1		153,000		153,000
OPS4.2.5	Lane Rental Demonstration in State 1	53,000			53,000
OPS4.2.6	Integrate lane rental into TMC 2		153,000		153,000
OPS4.2.7	Full concept scope and design for uniform smart work zone	103,000			103,000
OPS4.2.8	Implementation of a standard smart work zone across the corridor	100,000			100,000
OPS4.3.1	Increased training for emergency responders along I-10 (nuclear in the SW/petrochemicals in the Gulf Coast region)	60,000	120,000	300,000	480,000

Project code	Project	Demonstration Total Costs	Initial Deployment Total Costs	Full Deployment Total Cost	Total Project Cost
OPS4.4.1	Pilot test automated crash reporting with a private service provider	-			-
OPS4.4.2	Combine automated crash reporting with material load information	243,500			243,500
OPS4.5.1	Use cell phones for probes in rural New Mexico to generate travel times for use in incident information sharing	356,000			356,000
OPS4.5.2	Use cell phones for probes in rural Texas to generate travel times for use in incident information sharing	356,000			356,000
OPS4.5.3	Increased use of license plate readers in Florida		678,000		678,000
OPS5.1.1	Set up committee to coordinate with businesses to look for joint opportunities	-			-
OPS5.1.2	Increase use of credentialing and checking around petroleum facilities along I-10	-			-
OPS5.2.1	See OPS.G1				-
OPS6.1.1	Establish stakeholder group with port facilities and determine where improvements are possible	-			-

Project code	Project	Demonstration Total Costs	Initial Deployment Total Costs	Full Deployment Total Cost	Total Project Cost
OPS6.1.2	Deploy project to reduce congestion in and around a port facility		203,000		203,000
OPS6.1.3	Deploy project to reduce congestion in and around a multimodal facility		203,000		203,000
OPS6.2.1	Increase capability, range, and size of existing service patrols		1,500,000		1,500,000
OPS6.2.2	Expand use of Rapid Incident Scene Clearance (RISC) in Florida		750,000		750,000
OPS6.2.3	New service patrols in location A		2,500,000		2,500,000
OPS6.2.4	Pilot test video from service patrol to TMC in State A	233,000			233,000
INF1.2.1	Deploy a project that provides ability to get 511 information across multiple states from one state	258,000			258,000
INF1.2.2	Deploy 511 corridor information in all corridor states		306,000	458,000	764,000
INF1.3.1	Deploy fiber connections to provide state to state connectivity where appropriate		$ 30,156,000		$ 30,156,000
INF2.1.1	Create a web site with links to web sties for all states within the corridor			101,000	101,000
INF2.1.2	Enhance the existing web site with an email alert system		101,000		101,000

Project code	Project	Demonstration Total Costs	Initial Deployment Total Costs	Full Deployment Total Cost	Total Project Cost
INF2.1.3	Provide upgrades and enhancements to the corridor web site	202,000			202,000
INF2.2.1	Integrate weather information into corridor web site	102,000			102,000
INF2.3.1	Deploy test Wi-Fi for emergency response along selected sections of corridor	333,000	756,000		1,089,000
INF2.4.1	Establish a means of sharing information between TMCs along the corridor		262,000		262,000
INF2.4.2	Create an instant messaging network		101,000		101,000
INF2.4.3	Create a “Warmap”		101,000		101,000
INF2.5.1	Deployment of 511 in states without				-
INF2.5.2	Multistate coordination and seamless integration				-
INF2.6.1	Enhance coordination with media through web site		101,000		101,000
INF3.1.1	Smart Park demonstration in State 1	295,500			295,500
INF3.1.2	Smart Park demonstration in State 2	295,500			295,500
INF3.2.1	Provide localized and regional weather and traffic at parking facilities	113,500			113,500
		$ 8,532,000	$ 54,631,500	$ 5,864,500	$ 69,028,000

Appendix K

Relevant ITS Standards

Identifier Code	Name	Description
ANSI TS284	Commercial Vehicle Safety Reports	An electronic data interchange (EDI) transaction set to allow authorized parties to electronically request and send reports on information related to the safe operation of commercial road vehicles, such as inspection reports, safety and compliance review reports, and hazardous material incident reports.
ANSI TS285	Commercial Vehicle Safety and Credentials Information Exchange	An EDI transaction set to permit enforcement officials, government administrators, and other authorized parties to retrieve information electronically on the safety performance, regulatory compliance, and credentials status of commercial motor vehicles, carriers, and drivers.
ANSI TS286	Commercial Vehicle Credentials	An EDI transaction set that can be used by owners, leasers, and drivers of commercial motor vehicles to apply electronically for credentials necessary to legally operate those vehicles and by authorizing jurisdictions to electronically transmit credential data to applicants and other authorized entities.
IEEE 1455-1999	Standard for Message Setting for Vehicle/ Roadside Communications	Standard messages for commercial vehicle, electronic toll, and traffic management applications.
IEEE 1512-2006	Standard for Common Incident Management Message Sets for use by Emergency Management Centers	Standards describing the form and content of the incident management messages sets for emergency management systems (EMS) to traffic management systems (TMS) and from emergency management systems to the emergency telephone system (ETS) or (E911).
IEEE 1512.1-2006	Standard for Common Incident Management Message Sets for use by Emergency Management Centers	Enables consistent standardized communications among incident management centers, fleet and freight management centers, information service providers, emergency management centers, planning subsystems, traffic management centers, and transit management centers.
IEEE 1512.3-2006	Standard for Hazardous Material Incident Management for use by Emergency Management Centers	Enables consistent standardized communications among incident management centers, HAZMAT teams, police, local government, fire, special emergency, and emergency management centers.

Identifier Code	Name	Description
IEEE 1909.1-2006	Standard for Wireless Access in Vehicular Environments (WAVE) Resource Manager	This standard describes a resource manager that arbitrates requests for transponder usage.
IEEE P1512.4	Standard for Common Traffic Incident Management messages Sets for use in Entities External to Centers	This standard will address traffic incident management message sets which will be exchanged by and between mobile data terminals in response vehicles including mobile command posts and to their respective response and/or dispatch centers such that the exchange of information will be standard and produce the needed response(s). This standard will be limited to common message sets for use by emergency management including transportation, fire/rescue, enforcement, HazMat, etc.
ITE TM 1.03	Standard for Functional Level Traffic Management Data Dictionary	This document contains data elements for roadway links and for incidents and traffic-disruptive roadway events. Includes data elements for traffic control, ramp metering, traffic modeling, video camera control traffic, parking management and weather forecasting, as well as data elements related to detectors, actuated signal controllers, vehicle probes, and dynamic message signs.
ITE TM 2.01	Message Sets for External TMC Communications	A message set standard for communication between traffic management centers and other ITS centers, including information service providers, emergency management systems, missions management systems, and transit management systems.
ITE TMDD 2.1	Traffic Management Data Dictionary and Message Sets for External TMC Communications	This document contains data elements for roadway links and for incidents and traffic-disruptive roadway events. Includes data elements for traffic control, ramp metering, traffic modeling, video camera control traffic, parking management and weather forecasting, as well as data elements related to detectors, actuated signal controllers, vehicle probes, and dynamic message signs. The document also contains the message sets for communication between traffic management centers and other intelligent transportation system (ITS) centers, including information service providers, emergency management systems, missions management systems, and transit management systems.
NTCIP 1101	Simple Transportation Management Framework	A set of rules and protocols for organizing, describing, and exchanging transportation management information between transportation management applications and transportation equipment such that they interoperate with each other. (Formerly TS 3.2)

Identifier Code	Name	Description
NTCIP 1103	Transportation Management Protocols	Specifies a set of rules and procedures for exchanging information with a minimum of overhead to provide an interoperability standard for transportation-related devices that operate over bandwidth-limited communications links.
NTCIP 1201	Global Object Definitions	This document defines those pieces of data that are likely to be used in multiple device types such as actuated signal controllers and dynamic message signs. Examples of this data include time, report generation, scheduling concepts, etc. (Formerly TS 3.4)
NTCIP 1205	Object Definitions for Closed Circuit Television Camera Control	Database for closed circuit television systems. The format of the database is identical to other NTCIP devices and uses ASN.1 representation. Targeted devices include cameras, lenses, video switches, and positioning controls for aiming and identification, such as video text overlays. The standard will support various levels of conformance. (Formerly TS 3.CCTV)
NTCIP 1206	Object Definitions for Data Collection and Monitoring Devices	Specifies object definitions that may be supported by data collection and monitoring devices, such as roadway loop detectors. (Formerly TS 3.DCM)
NTCIP 1207	Object Definitions for Ramp Meter Control Units	This standard deals with the data required to control and monitor a ramp meter.
NTCIP 1208	Object Definitions for Closed Circuit Television Switching	Deals with the data needed to control a video switch enabling multiple monitors to view multiple video feeds.
NTCIP 1209	Data Element Definitions for Transportation Sensor Systems	Object definitions that are specific to and guide the data exchange content between advanced sensors and other devices in an NTCIP network. Advanced sensors include video-based detection sensors, inductive loop detectors, sonic detectors, infrared detectors, and microwave/radar detectors. (Formerly TS 3.EP- TSS)
NTCIP 1210	Field Management Stations-Part 1: Object Definitions for Signal System Master	This document will define the objects necessary to manage a field master. A field management station would be used to implement a polling scheme whereby the field management station could be programmed by a central controller (or other management stations) to poll its agents. These agents could be actuated signal controllers, ramp meters, dynamic message signs, or other NTCIP conformant equipment.
NTCIP 1402	TCIP Incident Management (IM) Objects	Data objects for detecting, verifying, prioritizing, responding to and clearing unplanned events (accidents, weather conditions, crime, etc.), as well as information for travelers. (Formerly TS 3.TCIP-IM)

Identifier Code	Name	Description
NTCIP 2001	Class B Profile	This communications protocol standard can be used for interconnecting transportation and traffic control equipment over low bandwidth channels. It establishes a common method of interconnecting ITS field equipment such as traffic controllers and dynamic message signs, defines the protocol and procedures for establishing communications between those components, and references common data sets to be used by all such equipment.
SAE J1746	ISP-Vehicle Location Referencing Standard	A referencing format for information service provider (ISP)-to-vehicle and vehicle-to-ISP references. This standard will reflect the cross-streets profile of the current location reference message specification (LRMS) document as expressed in the National Location Referencing Information Report (SAE J2374).
SAE J2313	On-Board Land Vehicle Mayday Reporting Interface	A general specification that prescribes protocol methods which enable vendors with different communication methods to communicate with response agencies in a standard format.
SAE J2354	Message Set for Advanced Traveler Information System (ATIS)	A basic message set using the data elements from the ATIS data dictionary needed by potential information service providers to deploy ATIS services and to provide the basis for future interoperability of ATIS devices.
SAE J2366/1	ITS Data Bus - IDB-C Physical Layer	A physical interface device (connector) that will ensure compatibility between vehicles and aftermarket devices. Physical interface performance requirements, circuit identification and configuration, and electrical requirements for the physical layer of the ITS data bus.
SAE J2369	Standard for ATIS Message Sets Delivered over Reduced Bandwidth Media	A general framework allowing transmission of traveler information via bandwidth reduced media such as found in wireless applications. Creates a uniform coding and message structure for link travel times, incident text, weather, and transit for broadcast delivery.
SAE J2395	ITS In-Vehicle Message Priority	Specifies orderly temporal and spatial presentation of ITS information to the driver.
SAE J2400	Human Factors in Forward Collision Warning System: Operation Characteristics and User Interface Requirements	Minimum safety and human factor requirements for front collision warning (FCW) operating characteristics and driver interfaces to ensure consistency across vehicles so that drivers can quickly understand and safely use a FCW-equipped vehicle.

Appendix L

Summary Descriptions of NTCIP Protocols

NTCIP Number	Type	Title
1101	Base Standard	Simple Transportation Management Framework (STMF)
1102	Base Standard	NTCIP Octet Encoding Rules (OER)
1103	Base Standard	NTCIP Transportation Management Protocol (TMP)
1104	Base Standard	C2C Naming Convention Specification
1105	Base Standard	NTCIP CORBA Security Service Specification
1106	Base Standard	NTCIP CORBA Near Real Time Data Service Specification
1201	Device Data Dictionary	NTCIP Global Object (GO) Definitions
1202	Device Data Dictionary	NTCIP Object Definitions for ASC
1203	Device Data Dictionary	Object Definitions for Dynamic Message Signs (DMS)
1204	Device Data Dictionary	NTCIP Environmental Sensor Station Interface Standard
1205	Device Data Dictionary	NTCIP Objects for CCTV Camera Control
1206	Device Data Dictionary	NTCIP Object Definitions for Data Collection
1207	Device Data Dictionary	NTCIP Object Definitions for Ramp Meter Control (RMC)
1208	Device Data Dictionary	NTCIP Object Definitions for Video Switches
1209	Device Data Dictionary	Object Definitions for Transportation Sensor Systems (TSS)
1210	Device Data Dictionary	NTCIP Objects for Signal System Masters
1211	Device Data Dictionary	NTCIP Objects for SCP
1212	Device Data Dictionary	NTCIP Objects for Network Camera Operation
1213	Device Data Dictionary	NTCIP Objects for ELMS
1301	Message Set	Weather Report Message Set for ESS
1400	Device Data Dictionaries	Transit Communications Interface Profiles
1601	Interface Definition	CORBA Base Object Model for TMS
1602	Interface Definition	Generic Reference Model (GRM) for Traffic Management
1603	Interface Definition	CORBA-Specific Reference Model (CSRM) for Traffic Management
2001	Comm. Class Profile	NTCIP Class B Profile
2002	Comm. Class Profile	NTCIP Class A and Class C Profiles
2101	Subnetwork Profile	NTCIP SP-PMPP/RS232
2102	Subnetwork Profile	NTCIP SP-PMPP/FSK
2103	Subnetwork Profile	NTCIP SP-PPP/RS232
2104	Subnetwork Profile	NTCIP SP-Ethernet
2201	Transport Profile	NTCIP TP-Transportation Transport Profile
2202	Transport Profile	NTCIP TP-Internet (TCP/IP and UDP/IP)
2301	Application Profile	NTCIP AP-STMF
2302	Application Profile	NTCIP AP-TFTP
2303	Application Profile	NTCIP AP-FTP
2304	Application Profile	NTCIP AP-DATEX-ASN
2305	Application Profile	NTCIP AP-CORBA

NTCIP Number	Type	Title
2306	Application Profile	Application Profile for XML in ITS Center-to-Center Communications (AP-C2CXML)
2500	Center Information Profile	NTCIP InP-C2C
2501	Center Information Profile	NTCIP InP-DATEX
2502	Center Information Profile	NTCIP InP-CORBA
2801	System Information for Profiles	Systems Engineering Information for NTCIP Communications Profiles
7001	Registry	NTCIP Assigned Numbers (NAN) - Part 1
7002	Registry	NTCIP Assigned Numbers (NAN) - Part 2
8001	Process, Control, and Information Management Policy	NTCIP Standards Development Process
8002	Process, Control, and Information Management Policy	NTCIP Standards Publications Format
8003	Process, Control, and Information Management Policy	NTCIP Profile Framework
8004	Process, Control, and Information Management Policy	NTCIP Structure & Identification of Management Info (SMI)
8005	Process, Control, and Information Management Policy	Procedures for Creating MIB Files and a FADD
8006	Process, Control, and Information Management Policy	NTCIP Administrative Policy and Procedure
8007	Process, Control, and Information Management Policy	Testing and CA Documentation within NTCIP Standards

Appendix M

Center-To-Center (C2C) Communications Survey
I-10 Corridor Traffic Management Centers (TMCs)

APPENDIX M
CENTER-TO-CENTER (C2C) COMMUNICATIONS SURVEY
I-10 CORRIDOR TRAFFIC MANAGEMENT CENTERS (TMCs)

Please fill out and return by ***August 10, 2007*** *(address at end)*

Center Name & Location	
Person Completing Survey	
Phone No.	
e-mail	

1. Are you today actively communicating with other TMCs? _____

a. Please indicate type of communications (check all that apply):

____ Voice ____ Active ____ Planned

____ Data ____ Active ____ Planned

____ Video ____ Active ____ Planned

b. Did you (check one if applicable):

____ plan for C2C communications in original system design, or

____ evolve into it after initial TMC implementation?

c. Do you have an Interface Control Document ?
____ Yes _____ No

d. What communications protocol standards have you adopted for this:

____ DATEX ____ Active ____ Planned

____ CORBA ____ Active ____ Planned

____ XML ____ Active ____ Planned

____ Not standardized, custom interfaces - please briefly describe:

____

____

____

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e. What specific NTCIP Standards are you using (see www.ntcip.org for detailed list):

____ 2304 AP-DATEX-ASN	____ Active	____ Planned
____ 2306 Application Profile for C2C XML	____ Active	____ Planned
____ Other__________________	____ Active	____ Planned
____ Other__________________	____ Active	____ Planned

f. Please briefly describe any pitfalls encountered/"lessons learned" in implementation, or cite/provide pertinent documents, references or memos:

____

____

____

g. How have you dealt with location referencing to allow devices/event locations, etc., to be understandable across software systems? (mark a C for Currently using or a P for Planning to use):

____ With lat-longs

____ With state plane coordinate systems

____ With centerline mileposts

____ With cross streets

____ Other: ____

____

h. Between TMCs, please indicate if you (mark all that apply - mark a C for Currently doing or a P for Planning to do):

____ Share traveler information

____ Allow posting of information to another TMC traveler information system

____ Share device status information

____ Allow other agency to control your devices, to some degree; please briefly describe the command-and-control structure for this:

____

____

____

Please provide any other comments or further clarification of Q #1:

____

____

____

____

2. What types of physical communications do you use between your **TMC and field devices**?

____ Fiber Optic Cable	____ Active	____ Planned
____ Copper Wire	____ Active	____ Planned
Wireless at _____ MHz	____ Active	____ Planned
Wireless at _____ GHz	____ Active	____ Planned
____ Cellular	____ Active	____ Planned
Other _______________	____ Active	____ Planned

a. Is this ?

_____ Agency-Owned	____ Shared with Other Agency or Private Entity	____ Leased

3. What types of physical communications do you use between your **TMC and other TMCs**?

____ Fiber Optic Cable	____ Active	____ Planned
____ Copper Wire	____ Active	____ Planned
Wireless at _____ MHz	____ Active	____ Planned
Wireless at _____ GHz	____ Active	____ Planned
____ Cellular	____ Active	____ Planned
Other _______________	____ Active	____ Planned

a. Is this ?

_____ Agency-Owned ____ Shared with Other Agency or Private Entity ____ Leased

b. Please identify the other TMC(s) with which you communicate and add any further clarifications to Q #2 and #3:

____

____

____

____

4. What types of connections might you have for **future interstate communications**?

____ Fiber Optic Cable	____ Active	____ Planned
Wireless at _____ MHz	____ Active	____ Planned
Wireless at _____ GHz	____ Active	____ Planned
____ Leased Line	____ Active	____ Planned
____ Internet	____ Active	____ Planned
Other ________________	____ Active	____ Planned

5. Do you share communication infrastructure with **other governmental agencies** (e.g., shared fiber, state trunked microwave, etc.)?
____ yes ____no

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a. If yes, please describe your arrangement (e.g., type of physical system, agreements, maintenance, cost sharing, etc.)

____

____

____

____

6. Do you have arrangements for the use of communications infrastructure of **private communications providers**?

_____ yes _____no

a. If yes, please describe your arrangement (e.g., type of physical system, shared ROW use, agreements, maintenance, cost sharing, etc.)

____

____

____

____

Please add any needed clarifications to Q #4 through #6:

____

____

____

____

7. Please describe how maintenance for your communications system is managed (e.g., privately contracted, internal, maintenance agreement with other agencies, etc.)

____

____

____

____

Thanks!

Please mail to: Jim Powell
Wilbur Smith Associates
801 Warrenville Road, #260
Lisle, IL 60532

Or scan/e-mail to: jlpowell@wilbursmith.com

Or fax to: 630-434-8163 (attn Jim Powell)

Advanced Traveler Information Systems

WHITE PAPER

For the I-10 National Freight Corridor
June 2007

I. PURPOSE

This white paper provides background information on Advanced Traveler Information Systems (ATIS) user services and the possibilities that it can offer to the corridor from the public sector perspective. It is intended to support the I-10 Freight Corridor Technical Advisory Committee (TAC) in its decisions regarding development of the corridor ITS architecture and identification of potential projects for the initial corridor program. Toward this end, it provides background material on ATIS and a discussion of related issues in the I-10 Corridor. It also discusses the anticipated benefits of deploying ATIS, along with potential challenges that may be encountered in the process of deployment.

This paper focuses on the ATIS efforts of public sector entities. In addition to these efforts, many regions and various private entities are aggressively pursuing and supporting private sector data collection and information distribution efforts. The challenges of private sector initiatives will not be addressed in this paper, although integration between the public and private sector information providers is expected to increase.

II. ATIS BACKGROUND

ATIS provides information to travelers, including commercial vehicle (CV) operators, concerning the travel environment and traffic conditions. Information provided is intended to reduce traveler uncertainty and support travelers and operators in their itinerary and scheduling decisions. ATIS does not include advertising or "yellow pages" services, although those functions are often provided along with other traffic demand or management information.

A. Types of information

Traveler information generally falls into one of two basic types: pre-trip and en-route. Pre-trip information is available to travelers before they begin their trip, and can be accessed via phone, computer, radio, or other means. En-route information can be accessed by the traveler during the trip. Examples of en-route include radio broadcasts, dynamic message signs, cell phones, etc.

There are several types of information that can be useful to the traveling public, including congestion information, incident/event information, travel time, and weather. Caltrans reports that weather, lane closures, and congestion are the most frequently demanded forms of traveler information. Users of this information include CV operators in the I-10 Corridor. While many CV operators are familiar with the roadway network and traffic patterns, at any given time a significant number of drivers on the road are unfamiliar with the area. Material presented in this white paper will address information for both familiar and unfamiliar or visiting operators.

Congestion information tells highway users which sections of their route are experiencing delays. This type of information is particularly useful to CV operators and other time-sensitive users. From a commercial vehicle operations (CVO) perspective, most congestion information is received while en-route. With accurate congestion information available to them, CV operators who are familiar with an area's road network are better able to choose an alternate route or adjust their travel times to avoid the congestion. When congestion is unavoidable, communicating accurate and timely information regarding its severity, extent, and anticipated duration can reduce operator uncertainty and help drivers evaluate potential alternative routes. The availability of congestion information has been shown to help reduce secondary accidents related to nonrecurring congestion.

Incident/event information provides travelers with information regarding traffic incidents and disruptions along the intended route. The types of events may include both planned and unplanned events. Planned or anticipated events include special events (e.g., parades) and road work. Unplanned events (incidents) may include accidents or emergency repairs. CV operators may obtain this type of information before the trip begins or while underway, and CVO dispatch centers may collect this information and share it with affected drivers. If the operator or dispatcher is familiar with the local roadway network, he or she may then be able to select an alternate route, or reschedule stops to minimize delays. As with congestion information, having access to accurate incident or event information will aid in reducing driver uncertainty regarding the delay.

Travel time information provides estimates of the time needed to travel a particular segment of a corridor. Travel time information is typically conveyed while en-route, and may take several forms. One type of travel time information conveys the estimated time it will take a driver along a certain route to reach a landmark. Travel time information may also indicate how long it will take a motorist to traverse a congested area on a particular route. Travel time information is more useful when it is accompanied by recommended alternate routes and estimated travel times for the alternates.

Weather information is similar to incident information in that it can include anticipated events, such as hurricanes, or unanticipated events, such as flash floods. The impact of weather events can vary in its spatial extent, ranging from highly localized to spanning several states. The usefulness of weather information can likewise vary. Short duration events of extreme intensity are likely to be of interest only within a limited range, but more intense events may be of broader interest. As with travel time information, the utility of weather information can be increased by providing it in conjunction with other forms of ATIS information, such as recommended alternate routes and anticipated travel times for alternates.

B. Implementation

Operationally, implementation of traveler information projects can range from relatively simple to extremely complex. Some implementations may be as simple as a web site that incorporates third-party data and information services. For example, information on lane closures on freeways is typically known in advance (planned) and updated daily; therefore, as long as the right person is contacted, it can be easy to obtain or transmit the information. On the more complex end of the scale, developing and conveying real time congestion information can require a large-scale deployment of equipment, systems, and personnel. Real time incident information is generally dependent on integration with emergency management dispatch systems. In these cases, the information that results can be very simple while the back-end systems needed to collect, process, and distribute the information require significant resources to build and maintain. As with many ITS projects, the institutional barriers to implementation can pose a far greater challenge to implementation than the technical issues.

III. CATEGORIES OF COMMERCIAL VEHICLE ATIS USER SERVICES

The National ITS Architecture includes a number of general categories of ATIS. The following categories are generally applicable to commercial vehicle users:

1. *Broadcast and Interactive Traveler Information*
2. *Autonomous and Dynamic Route Guidance*
3. *In-Vehicle Signing*
4. *Traffic Control Centers*
5. *Information Delivery Systems*

Broadcast and Interactive Traveler Information services convey information to travelers, both in advance of and during the trip. Broadcasted traveler information services are best known in the form of radio traffic reports. Interactive traveler information services are largely web-based or subscription-based.

Autonomous and Dynamic Route Guidance services provide the traveler with real time means of planning a route or modifying a route during a trip. Autonomous route guidance services are self-supporting and require no connection to a central server, thereby allowing a traveler to identify his or her current position using on-board equipment and databases. Dynamic route guidance systems employ a real time connection to a central server, allowing route guidance systems to respond to current traffic and weather conditions.

In-Vehicle Signing provides for transmission of traffic and travel information, such as weather, construction, or traffic congestion information, to drivers via devices inside the vehicle. In-vehicle signing infrastructure includes the entire communications network needed to support this system, up to and including wireless connections to the vehicle. In-vehicle signing refers both to current commercial vehicle applications use among large trucking operations, as well as future information transmission from various government agencies, toll facility operators, and others.

Traffic Control Centers are typically associated with large metropolitan areas or statewide highway networks. Communication of information may be but one of many responsibilities of these centers and the actual responsibilities of each center may vary considerably from state to state and from one metro area to another.

Information Delivery Systems include all the various multifunction and dedicated technologies that may be used to convey information to travelers. Multifunction systems include public and private traffic web sites, local radio and television broadcasters, and subscription broadcast outlets such as satellite radio providers. Dedicated systems include systems designed specifically for traffic and traveler information, such as 511 systems, and private sector mayday/concierge service such as OnStar™.

IV. POTENTIAL ATIS APPLICATIONS AND BENEFITS

This section identifies some potential long-term ATIS commercial vehicle projects for the corridor and discusses how they may be accomplished.

A. Interregional information sharing and systems coordination efforts

These projects are intended to facilitate and streamline information sharing efforts between various entities along the corridor.

1. Integrated ATIS databases and data dictionaries

This future project requires a corridorwide agreement on the sharing of elements in the various ATIS databases. Sharing of the data/information within the databases allows state-by-state autonomy of every database along the corridor while allowing motorists seemingly uninterrupted access to corridorwide travel information. This will work best when data collection is more mature, the states along the corridor collect and disseminate similar types of travel information, and travel information is collected and shared for the primary and alternate routes.

For the CV operator, having access to corridorwide information can be of great value for increasing the efficiency of long-distance travel. When reliable travel information is shared throughout the network, drivers can make better informed routing choices and reduce or better use their travel time. Accidents involving commercial vehicles can also be reduced when informed operators are able to avoid or plan around congested areas, incidents, and inclement weather. Drivers and trucking companies also have a strong interest in minimizing truck idle time and increasing the reliability of planned travel times. Having accurate travel time information available enables operators and operating companies to more accurately plan routes without needing to build in large amounts of delay recovery time.

Interagency coordination across the corridor regarding data standards and formats is critical to the successful implementation of information sharing and system coordination. Where data systems are standardized in their elements and structure, the time and cost required to integrate them is minimized. Successful integration of corridor data does not require that all state and local entities agree on one common data standard for all. However, it does require identifying a standard for transmitting between entities that is consistent with federal standards and best systems engineering practices.

2. "No Boundaries" ATIS information across each state line

As an interim toward integration of ATIS databases along the corridor, this project aims at integration of ATIS databases by multistate region. The motorist will benefit from consistent traveler information available in segments of the corridor. The benefits of this deployment will be similar to the fully integrated ATIS database project, but on a smaller scale for long-distance motorists.

3. Agreement on travel information to be disseminated

As travel time information becomes more prevalent in the nation, more and more states will disseminate this information as part of the ATIS offerings. When this information is offered along a cross-country corridor, long-distance drivers may reasonably expect that the information is presented in a similar format along the length of the corridor and is consistent in its quality and accuracy. As with other travel time projects, this one will be enhanced as travel times are available for the primary and alternate routes. However, most users will not be traveling the full length of the corridor, and will have greater use for more localized information.

Benefits of consistent travel information along the corridor include a reduction of driver confusion and uncertainty. Travel time and other information along the primary route can aid in reducing driver frustration, but only insofar as complementary information is available and accurate. For example, long-distance travelers may find little use for travel time information that includes only the main route and does not provide information regarding alternate routes. Without that information, drivers are unable to accurately evaluate the alternate routes.

4. Integrated 511/DMS information systems for drivers and CVO dispatch

This future project is closely tied to the ATIS database integration project. In this project, the states would determine whether to deploy one corridor web site that contains all corridor information, or to have each state provide corridor information on their existing web sites. It is also possible for states to do both, as long as the information on all sites is internally consistent and does not result in different information outlets telling different stories.

Web-based dissemination systems as currently deployed are typically oriented toward CVO dispatchers, other systemwide dispatchers, and drivers for pre-trip consultation. However, future web-based applications are likely to be more oriented toward en-route use, using data on on-board applications and devices. This will make that information available to the driver while the trip is in progress, and permit the driver to make real time use of real time information.

For these systems to be useful, they will need to address some of the problems of predicting travel time for trips of more than a few hours. With current methods, travel time predictions tend to be very accurate for short-distance and short-duration trips, but that accuracy diminishes as trip time and distance are scaled up to long-distance, multiday trips.

B. Public/private efforts to inform freight community

These projects include both public sector and private sector initiatives to make information more accessible and useful to drivers, operations staff, and other CVO stakeholders.

1. "Push" ATIS with corridor-specific information

As operational deployments are maturing, private sector entrepreneurs may offer subscription-based "push" ATIS for specific segments of the corridor. These systems will contact opt-in subscribers via preferred communication options during registered travel times.

To date, these types of systems have not proven commercially viable. In order for these systems to become widely used, the private sector will need to become more involved in the collection, cleaning, and quality assurance of travel data. At present, the public sector is the principle source for most of this type of data; however, public sector entities typically do not have the resources to monitor data quality. As the private sector becomes more involved in collecting, packaging, and distributing traffic data, this type of information is expected to become more robust, refined, and reliable.

2. Integrated ATIS and navigation systems (to supplement alternate route information)

This future project involves integration among public sector programs with private sector programs. Integration of real time travel information with navigation systems will increase the value of information provided. This system is envisioned to be more useful for CVO and other fleet operators who have the aid of dispatchers, motorists who have passengers in the car, and solo drivers who momentarily stop driving to access this level of detailed information. This private sector deployment is currently available on a very limited basis and currently does not contain the robust data supply necessary for high accuracy and reliability. The current navigation system maps out a selected route and then recalculates the desired route when the driver maneuvers off the original route. When integrated with real time data, the driver will be offered more than one route based on current traffic conditions. When the driver selects an alternate route, the navigation portion of the system recalculates the new primary route and alternate routes based on current conditions. When reliable and accurate, these integrated systems will greatly reduce driver frustrations and optimize trip and fuel efficiency. This, in turn, will help to ensure on-time deliveries, which reduces costs to shippers.

V. POTENTIAL DEPLOYMENT OBSTACLES

This section highlights some of the difficulties in developing and deploying ATIS systems, including both institutional and technical obstacles. In deployment of new information technologies, institutional issues can often prove more difficult to address than technical issues. However, technical issues remain, with reductions in the cost of equipment often offset by increases in the costs of labor and associated technical services.

A. Institutional obstacles

Perhaps the greatest obstacle to integrating the identified traveler information is that the groups that are primarily responsible for various pieces of information typically do not work in ITS operations. For example, daily lane closure and construction information typically comes from construction, traffic, and public information bureaus at various agencies. Obstacles may arise as different agencies have different needs for accuracy and compatibility of data, and may communicate data in ways that are contradictory or insufficiently complete for operations needs. Weather and special event information often comes from groups that are not directly related to transportation agencies, and transportation may not be the focus of those entities' dissemination efforts. Private sector shippers and carriers may have concerns regarding sharing proprietary information, and may encounter internal conflicts between making information available to customers who may value it versus making it available to competitors.

To ensure that integration efforts are effectively and equitably shared, these issues are best approached during the institutional discussions among the corridor agencies. One approach would be to hire a single consultant team for the entire corridor and equitably split the cost of the integrations among the affected agencies based on an agreed-upon formula. Another is for each state to be responsible for all interfaces within that state, while bordering states may consider sharing the costs of cross-state integration.

Whichever approach is taken, the corridorwide approach may be documented in a memorandum of understanding (MOU) among the states and agencies. The MOU will address which state is responsible for the necessary efforts needed to deploy a system. The process leading up to signing of the MOU typically encourages states to consider how to address potential disagreements before they develop. Participating agencies should be encouraged to web-publish their traveler information data via accepted national standards (e.g., SAE J2354 XML for ATIS message set and location referencing) over publicly accessible Internet feeds for other agencies and commercial/media access. This approach allows the source agency to report only the information it wants to distribute, and, as a one-way distribution, it enables the agency to look after its own computer systems security. It further allows any neighboring ATIS or private sector navigation or traffic reporting company equal access to the source data.

1. Example: Sharing data within a state

A recent example of an ITS system deployment within one state took nearly a decade to progress from final acceptance testing to full system deployment. This provides an extreme example of the difficulty of resolving institutional conflicts. The technology of the system was available for deployment a full 10 years before the institutional issues allowed the system to reach its full operational deployment. In this example, the agencies were both in the same state, but one of the agency databases contained personal information, which constrained that agency's ability to share the information.

2. Example: GIS data sharing between agencies

Another institutional effort that attempted to bridge jurisdictional and agency boundaries involved agreement regarding location information. Geographic coordinates can serve as a ready standard for communicating location information, but may be of limited use to agencies that do not have fully developed geographic information system (GIS) capabilities. Even where systems are in place, different data standards may make it difficult to transmit location information among different agencies. As a result, geographically referenced data systems have not proven to be a reliable means of relaying information outside of agency boundaries.

B. Technical obstacles

Technical obstacles include those where the limitation is technical in nature. These include obstacles where technology is unavailable for a given cost, or for any cost, as well as those where the obstacle may be surmounted with an appropriate deployment of technical resources. Managing and scaling ever larger sensor networks provides an example of a technical obstacle. Data and database systems designed and implemented on a local scale can work as intended as a single system, but problems may result as localized sensor data is aggregated into and merged with other localized data to provide information on network performance.

Data accuracy and availability are representative technical obstacles. Lane closures necessary for construction or special events provide one example. Much of this information is typically kept in nonelectronic form and often not integrated into traffic management centers (TMCs). Additionally, information on daily closures may not always be accurate or up to date, leading to closures at very late notice or no notice to the TMC. Other closures may go beyond their allotted time frame. For systems to gain users' trust, it will be necessary to develop and implement measures and goals for accuracy of data and information.

Once institutional issues have been addressed, each system in the corridor will need to address the necessary data input reliability goals and tolerances. Many systems will retain a certain level of manual data input, such as for special and pre-planned events that impact travel. Some degree of integration among the various agencies within each of the states to populate the databases will be necessary.

This is especially true with private sector data supplementation. Data integration of transportation provider data with emergency service provider data provides one illustrative example. Anecdotal information suggests that emergency management databases contain approximately 10 percent of information that may be useful to transportation service providers – while nearly 100 percent of the information in the transportation databases is useful to emergency service providers. Appropriate assurances and reliability testing addressing database security, especially regarding emergency and law enforcement databases, will be increasingly necessary as more agencies integrate their systems.

C. Other obstacles

Intellectual property rights bring a new complexity to sharing and distributing traveler information. This complexity is compounded as the number of agencies and states sharing data increases and private sector concerns are introduced. Establishing a fair and equitable means of sharing data and information with private sector information providers will require agreement from state and county/local agencies, vendors, and private sector providers. If each agency maintains data and information from within their own state's/agency's database, then agreement on intellectual property rights may not be necessary. An agreement could be reached that no agency is allowed to distribute or sell data or information from another state's or agency's data or information. Adjoining states will need to reach an agreement on how to best manage dissemination of data and information. Organizations seeking to access travel data and information may find it cumbersome to contact multiple agencies to obtain information that can currently be found on one database.

These conflicts can be resolved, but resolution may require a legal agreement, MOU, or intergovernmental agreement to establish and clarify ground rules regarding technical, funding, management, and information sharing. Because it can take months or years to develop and execute these agreements, it is preferable to begin the process as soon as possible, well in advance of anticipated deployments.

Emergency Management

WHITE PAPER

For the I-10 National Freight Corridor

June 2007

I. PURPOSE

This white paper provides background information on emergency management user services, and is intended to support the Technical Advisory Committee (TAC) in its decisions regarding the ITS architecture and the initial program. Toward this end, this paper provides a definition of emergency management along with a discussion of the potential benefits and barriers to deploying ITS technologies to support emergency management functions.

II. DEFINITION

Emergency management includes the incident management, disaster response and evacuation, security monitoring, and related applications that deal with disasters and disruptions affecting traffic operations. Emergencies can range from relatively minor events such as hazardous material (HAZMAT) leaks and power outages to major events such as hurricanes and national security incidents.

The key concept of emergency management is to provide for a coordinated, multiagency response, with transportation typically in a supportive role. As an example, a freeway traffic management center may be an ideal location for command and control, as it often connects to basic monitoring and control equipment such as detectors, closed-circuit television (CCTV) cameras, dynamic message signs, and highway advisory radio. Co-located traffic management and police/fire dispatch centers can greatly enhance management effectiveness. Emergency management thus covers public safety, traffic management, and other agency systems operating in unison.

Management activities include those activities associated with fixed and mobile public safety communications centers, such as public safety call taker and dispatch centers operated by police, fire, and emergency medical services. Emergency operations centers activated at local, regional, state, and federal levels fall in its purview, as well as portable systems that support the Incident Command System[1], such as mobile communications centers. Emergency management also relates to towing and recovery, freeway service patrols, HAZMAT response teams, and "mayday" service providers.

Emergency management systems monitor alerts, advisories, and other threat information. This involves developing, storing, using, and refining emergency response plans that are the core of coordinated, multiagency action. As the emergency progresses, situational information on damage assessments, response status, evacuation information, and resource information are shared to keep all allied agencies apprised of the response. Interface with transit agencies, for example, may call for coordinated use of transit vehicles to support evacuation efforts. Emergency management is also the focal point for providing emergency and evacuation information to the traveling public, including wide-area alerts when immediate public notification is warranted.

[1] For a broad perspective on the *Incident Command System,* see http://www.osha.gov/SLTC/etools/ics/index.html. For a transportation perspective, see *Simplified Guide to the Incident Command System for Transportation Professionals*, Federal Highway Administration Report No. FHWA-HOP-06-004, February 2006.

Ideally, emergency management tracks and manages emergency vehicle fleets using real time road network status and routing information. In this way, emergency vehicles can be assigned to the best available route for the timeliest response. Operations staff from traffic management centers (TMCs) can tailor traffic control and signal displays to support emergency vehicle ingress and egress, implement special traffic restrictions and closures, activate evacuation traffic control plans, and perform other tasks as needed to meet the unique demands of an emergency.

Another aspect is sensor and surveillance equipment to enhance transportation security of both the roadway infrastructure (e.g., bridges, tunnels, and interchanges) and the public transportation system (e.g., transit vehicles, rail, bridges, tunnels, yards, and public areas such as stops and stations). Emergency management handles sensitive information, must "operate through" and be available in distressed environments, and is subject to numerous threats, including both physical and cyber attacks. The reach of activity also covers private sector telematics (wireless automobile) service providers, service patrol dispatch systems, and security monitoring systems. Freight operations, potentially involving railroads, track, and yards, may be included. The operating environment thus ranges from tightly controlled, secure command centers to open field environments where command posts are established near a major incident. Throughout emergency management practice, sensitive information must be protected by appropriate security safeguards.

III. EXISTING EFFORTS

The National ITS Architecture includes three general areas of emergency management user services: Emergency Notification and Personal Security, Emergency Vehicle Management, and Disaster Response and Evacuation. Existing emergency management infrastructure includes facilities and capabilities that can facilitate one or more of these capabilities:

Emergency Notification and Personal Security: The National Architecture defines this service as providing for travelers to communicate any emergency or nonemergency need for assistance to appropriate emergency response personnel. These services can include one-way or two-way communication. For example, in communications from a vehicle, the vehicle may notify emergency services about a collision. In communications from a center to a vehicle, a vehicle may be notified of emergencies ahead that may cause a delay or warrant a reroute.

Emergency Vehicle Management: This user service minimizes the response time of emergency vehicles to incidents. The service includes improvement of communications between response vehicles and dispatch centers, improved real time communication of emergency vehicle location, and automated dispatch support.

Disaster Response and Evacuation: This service works to improve transportation system performance during natural and manmade disasters. Aspects of the service include improved response time for first responders and streamlined evacuation systems and procedures.

A. Categories of existing efforts

Existing efforts and facilities can generally be grouped into the following categories:

911 Emergency Call and Dispatch Centers: Various counties and municipalities in the corridor maintain 911 call systems to handle routine emergency calls. These centers may also be used for disaster or large-scale emergency call intake.

State DOT Emergency Operations Centers: These emergency operation centers are typically staffed only during emergencies by representatives of responding agencies. They may be operated out of a state central office or district office.

State Emergency Management Agency Operation Centers: These centers receive and relay information relating to natural disasters such as hurricanes, floods, and earthquakes. They may also be used for more routine responses to inclement weather or other situations requiring coordinated responses from multiple agencies.

County Emergency Operations Centers: These centers are similar in function to state emergency operations centers. County EOCs may be staffed during large-scale emergencies as well as during smaller-scale weather or other situations requiring a coordinated response.

State Police Dispatch Centers: These centers process and coordinate incident response efforts. They may be specifically oriented toward the highway network or encompass broader responsibilities.

County/Local/Regional Fire Dispatch Centers: These centers provide emergency notification to agency response personnel and coordinate responses to large-scale fire and other emergencies.

Bridge/Tunnel/Toll Route Control Dispatch Systems: These facility-specific incident response centers detect incidents and dispatch response vehicles, as needed.

County/Local/Regional Police Dispatch Centers: These centers coordinate emergency notification and dispatch, as well as other efforts at the county, regional, or local level.

IV. POTENTIAL LONG-TERM APPLICATIONS AND BENEFITS

This section identifies some potential longer-term projects for the corridor and discusses how they may be accomplished.

Certain types of recurring weather and geologic events along the I-10 Corridor figure strongly in the emergency management user service. Examples include hurricanes along the Gulf Coast, dust storms and flash floods throughout the Southwest, and earthquakes in Southern California. Security events can also fall into this category, although security is covered in a separate white paper. The common factor in these events is their large-scale and random timing.

One purpose of the I-10 Corridor is to address multistate coordination in emergency situations. All states in the corridor have an emergency management agency, and all counties are generally required to have an emergency management plan. The plans should be tailored for the needs of the individual county. They may include evacuation plans for nuclear power stations, military bases, or other localized needs. Coordination of almost all plans begins at the county level, and reaches to the state and federal levels.

The following preliminary projects are intended to support these efforts of the emergency management user service. Each includes a brief description of the project's intent, suggestions on how to implement the project, and a discussion of the project's benefits and applications.

A. Resource sharing between agencies

This future project would require a corridorwide agreement on the sharing of elements in the various emergency management data systems. If properly implemented, each state would be able to share data and information with other states, enabling states to incorporate information from other states in their operations while retaining control over their own systems.

Agency-to-agency information sharing will work best when data collection is more mature, the states along the corridor collect and disseminate similar types of emergency management information, and when emergency management information is collected and shared for the entire region (rather than just on specific routes).

For the commercial vehicle operations (CVO) organization, this type of corridorwide information can be very valuable for safe and efficient long-distance travel. This project does not necessarily involve sharing of integrated information with anyone other than agencies; however, when agencies share information to better fulfill their operational duties, all motorists will benefit. Incident management and clearance times will be reduced, overall traffic volumes will be minimized during noted emergency situations when there is prior knowledge, and safety (as evidenced by reduced secondary accidents) will be increased. For the motorists, overall travel time is also likely to be reduced.

One important step toward this end is for agencies along the corridor to agree on the data to be used within the databases. The more each database has in common in terms of elements and structure, the easier (i.e., less time and less cost) it will be to integrate the systems together. It is not necessary that all states agree on one common data set for this deployment to be successful, just more economical and more in line with the federal standards and the systems engineering approach.

During emergencies with advanced warning, it has come to the nation's attention over the past few years how information regarding a wide variety of fleet inventory and shelter information would have been helpful to the affected emergency warning areas. While this type of information is not necessary from a day-to-day operations standpoint, the channels/interfaces should be in place to be used during emergencies.

B. Information sharing within the corridor

This project aims at dissemination of emergency management information on a corridorwide basis. The motorist will benefit from the multistate availability of emergency management information available along the corridor. Dissemination of the data/information within the databases allows state-by-state autonomy of every database along the corridor and also allows motorists seemingly uninterrupted access to corridorwide emergency management information. As the information is shared by agencies, the typical ITS tools may be used to inform motorists. This includes dynamic message signing (DMS), highway advisory radio (HAR), and 511. All systems should be able to receive emergency information and know what to do with it. This may require the hardening of some communications and critical system components.

The benefits of this deployment will be similar to the benefits realized by emergency management deployments. For the motorists, overall travel time is likely to be reduced when reliable emergency management information is shared throughout the road network supporting the corridor so the drivers can make educated choices. Delays and accidents involving CVO vehicles will be reduced if informed operators avoid congested areas and areas where incidents, emergencies, and inclement weather are detected.

C. Coordinated communication in evacuation efforts

Evacuation efforts would be implemented on a regional basis for those emergencies with advanced warning where evacuation is ordered. Besides shared information, recommended operational improvements would include coordinated communication channels and site-specific detection and automated technologies. The purposes of these projects would be to improve communications within the transportation agencies and with other responding agencies, and to avoid operations staff and emergency responders needing to communicate across agency boundaries and being unable to do so.

During emergencies with advanced warning, information regarding a wide variety of fleet inventory and shelter information would be helpful to the affected emergency warning areas. While this type of information is not necessary for day-to-day operations, the channels, protocols, and interfaces would be in place and ready to be used during emergencies. This would represent an expanded role for a TMC or Advanced Traveler Information Systems (ATIS) system, as they would be used for both day-to-day traffic information and emergency situations, and would have immediate access to information and procedures needed in the event of an emergency.

Some of the site-specific deployments that would enhance evacuation efforts include HAR, automated gate systems to allow effective and safe evacuation routes away from the affected areas (in-bound travel can be accommodated on alternate, nonemergency evacuation routes), and effective ATIS elements to advise motorists of conditions. When planning these systems, consideration should be given to ensure full functionality in actual emergencies. For example, traffic sensors may need to work with vehicles moving in either direction on a section of road, and DMS equipment would need to be positioned so as to be visible to contra-flowing traffic.

D. Enhanced resources for managing emergencies

As previously noted, there have been many recent examples of emergency responders at emergency situations without the ability to communicate across agencies. Dispatchers are required to enter information into every agency's system and to relay information. So many communication challenges, such as high levels of manual entry and manual communication reliance, frequently appear on post-situation "room for improvement" lists. It is extremely important for the states and agencies along the I-10 Corridor to establish an emergency communication channel dedicated to evacuation and emergency activities.

V. POTENTIAL DEPLOYMENT OBSTACLES

For many emergencies, the primary focus will remain on the emergency responders. However, effective functioning of the transportation system can be critical to getting resources to and from an emergency, as well as in evacuating civilians. The Federal Highway Administration (FHWA) has recently published the results of their nationwide workshops on best practices for Emergency Transportation Operations, and underscored this role in a recent publication (FHWA-HOP-07-076).

Potentially, the most significant institutional issue is ensuring that emergency responders increase their coordination with the transportation agencies. The concern is that while the desire to better coordinate exists from the transportation perspective, it is often not viewed as a high priority from the emergency responder perspective.

Many of the technical aspects of this are focused on seamlessness. The last thing emergency responders want to do is to be forced to do additional work while in the middle of addressing an emergency. Ideally, ITS projects will foster coordination and information sharing without requiring responders to do anything different or unusual.

This section highlights needed actions and potential problems to share information or achieve necessary coordination.

A. Agency-specific practices inconsistent with TMC policies

Each system described, once the institutional issues have been addressed, will need to address the necessary data input reliability aims/tolerances that will employed. Emergencies are not the time and place to discover glitches in agency systems. Regularly scheduled testing of the various systems should be worked into annual operating plans for each affected agency. While TMCs may participate in emergency simulation exercises, they may not often practice and rehearse emergency procedures. Many do not have these situations included in the policies and procedures manuals. These obstacles can be addressed by integrating agency-specific emergency preparedness practices into current TMC policies.

B. Necessary institutional agreements may not be in place

Institutional agreements may be the most difficult to address. A recent example of full system technical capabilities being deployed within one state resulted in nearly a decade from final acceptance testing to full system deployment. The technology of the system existed 10 years before the institutional issues allowed the system to reach its full operational deployment. In this example, the agencies were both in the same state but one of the agency databases contained personal information. Aggressively pursuing necessary institutional agreements well in advance of implementation may help shorten the time necessary to accomplish this effort.

C. Cost of integration may not be equitably allocated

During discussions among agencies, how to share the costs of integration will likely be a key concern for each agency. One approach is to hire one consultant team for the entire corridor, and split the cost among the affected agencies based on a previously agreed-upon formula. Another is for each state to bear the cost of all interfaces within that state, while bordering states may consider sharing the integration costs across state lines. Whichever approach is taken, the corridorwide approach may be documented in appropriate memoranda of understanding (MOU) among the states and agencies. The MOU will address which state is responsible for which effort, and help agencies anticipate and resolve conflicts in advance of the implementation.

D. Differences in information standards among agencies

Another institutional effort that has delayed operational improvements that cross jurisdictional and agency boundaries is obtaining agreement among the affected agencies regarding location information. Geographic information system (GIS) coordinates have emerged as a de facto standard; however, agencies that do not have fully developed GIS platforms may find implementation to be an expensive and time-consuming endeavor. Additionally, data interfaces among various systems have not proven to be a reliable means of accurately relaying location information. The states will need to reach agreement on appropriate improvements to data interfaces, and will need to reach concurrence on a timeframe for coordinated corridorwide geographic information.

E. Agencies may lack formal mutual aid agreements

Joint use of resources so that overlap of resources is minimized is desirable for effective emergency management. This challenge can be addressed with thorough discussions where agreements are documented in MOUs among affected agencies.

Typically, many emergency responders have formal mutual aid agreements, but transportation departments do not. By entering into formal agreements with each other, transportation agencies can have many of these challenges addressed in advance.

As previously noted, there have been many recent examples of emergency responders at emergency situations without the ability to communication across agencies. This challenge can be addressed in two ways: through discussions where agreements are documented in MOUs among affected agencies, and through the deployment of new and updated communication systems. Establishing an emergency communications network may not be necessary on a corridorwide basis, but if implemented on a regional basis, it could provide a useful first step.

Security

WHITE PAPER

For the I-10 National Freight Corridor

June 2007

I. PURPOSE

This white paper provides background information on security-related ITS implementations, with emphasis on port security, border security, and general commercial vehicle security.

The intent of this paper is to provide supporting information to the corridor's Technical Advisory Committee (TAC) in its decisions regarding the ITS architecture and initial program. Toward these ends, this paper provides a background discussion of security issues and a discussion of likely benefits and potential problems relating to systems deployment in the I-10 Corridor.

II. BACKGROUND

Security has long been a concern with respect to goods movement. Today, with approximately 80 percent of trade conducted over seas, ports, and highways in the journey to the final destination, security concerns remain significant to shippers. Goods lost to theft result in significant costs to private industry, while the transport of illegal goods and the evasion of taxes cost the federal government money and create security holes that endanger everyone.

If one takes a look at the various vehicles used to complete transport of an item, it becomes increasingly evident that security in goods movement plays a key role in homeland security efforts. Examining the potential roles of ships and the shipping network in security threats reveals a wide range of potential threats that necessitate appropriate security measures. A ship could be used as weapon or be used to carry deadly weapons, transport a dangerous cargo, or be a potential target if its cargo could cause potential large-scale loss of life. Adding in the potential of nuclear, bacteriological, or chemical threats by sea underscores the scale of the concern.

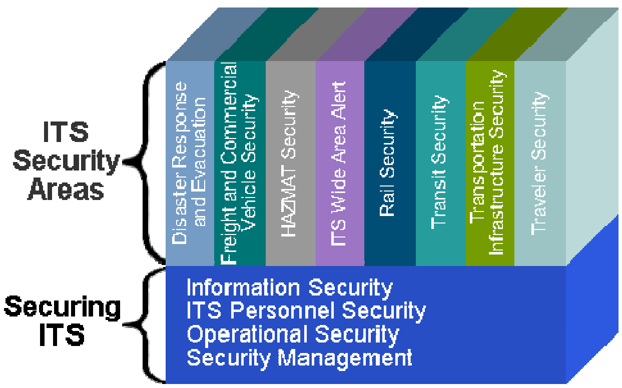
Security efforts are significant even after the cargo arrives in its country of destination. Cargoes that arrive by sea must then be tracked to ensure that illicit goods are not shipped via the roadway system. The U.S. highway system provides many alternate routes to nearly any location. The vast scale of the global shipping network necessitates a global approach to a homeland security system to ensure that ports and highways are protected.

As a vital economic link in the national economy, the I-10 Corridor is also a vital link in the global security chain of goods movement between the United States and the rest of the world, and the I-10 Corridor states must play an active role in ensuring the security of the global supply chain. The security issues that directly face I-10 are related to border crossings, port operations, and customs. The issues that are addressed in this white paper reflect this position.

A. Definition

Security is treated differently from other user services in the National ITS Architecture. There are several user services defined as "ITS Security Areas" that spread out among the user service bundles. Each area has defined subsystems, architecture flows, market packages, and supporting physical and logical architectures. The items defined as "Securing ITS" are more operational concerns that need to be addressed for the ITS Security Areas to function properly.

Figure 1. ITS Security and the National ITS Architecture



http://www.iteris.com/itsarch/html/security/securityhome.htm

The security areas that are of most concern to the I-10 Freight Corridor include:

- *Disaster Response and Evacuation – tied to traveler information concerning events such as hurricanes and earthquakes*
- *Freight and Commercial Vehicle Security – port and border operations, as well as general freight security*
- *ITS Wide-Area Alert – more a function of traveler information*
- *Transportation Infrastructure Security – protecting critical portions of the I-10 Corridor (e.g., the bridge over Lake Pontchartrain)*

B. General security issues

The "Securing ITS" items shown in Figure 1 include a wide variety of areas, including some from outside of the traditional ITS and transportation areas that deal with more general security issues. These are described below:

Information Security is related to the general security of data, specifically, the origin, transmittal, and destination of the information itself. The items listed on the ITS architecture include confidentiality, integrity, availability, accountability, authentication, auditing, and access control. Most of these areas are general Information Technology responsibilities.

Operational Security is related to the protection of the ITS physical infrastructure: This includes protecting ITS assets against both physical and environmental threats. This area provides monitoring, access control, configuration control, and security incident and materials management of critical ITS assets. The use of ITS to protect transportation infrastructure is one of the security areas listed above. This area is once removed from those issues and can be defined as protecting the assets that are protecting the assets.

Personnel Security relates to the management of the personnel associated with ITS: It is intended to ensure that ITS personnel do not inadvertently or maliciously cause harm to ITS assets and that all personnel have proper training in the event there is a security-related incident. Much of what is listed on the ITS architecture web site is well beyond the focus of this white paper. Items such as personnel screening, supervisory controls, privileges, and accountability should be designed into all ITS systems. Their success is more a function of the management of a particular system.

Security Management is closely related to Personnel Security: It focuses on the management of the centers, the personnel, and the systems. It includes policies, procedures, roles, and responsibilities. As with Personnel Security, it is not a focus of this white paper.

All these definitions can be summarized as they apply to the I-10 Freight Corridor. The issues of importance to this corridor are border crossings, port operations, commercial vehicle operations (CVO) security, and inspections – either for illegal goods or the sum of administrative responsibilities that are required for customs and taxation.

C. Sources of threats

There are numerous threats that must be considered when evaluating global supply chain security. While all of these areas apply to the I-10 Corridor, the majority of the threats are assumed to occur outside of the I-10 Corridor. The possibility that the contents of a container might be tampered with or that documentation might be modified is a threat that can most effectively be addressed when the container is outside of U.S. jurisdiction. I-10 stakeholders typically assume a secondary role with respect to this area. It is assumed that the I-10 stakeholders would fully cooperate with federal or other authorities in these matters, but that other agencies would be the lead.

D. Necessary processes for security

In order to sustain a security system, the following activities must be practiced:

Engage all partners, custodians in the process: Because I-10 shipments cross numerous jurisdictions, it is important to identify and include as many stakeholders as possible. These include a wide variety of public and private sector personnel.

Create economic incentives for compliance: Efforts to improve security often impose costs, and where security requirements are added on to pre-existing processes, those costs may provide an incentive to circumvent the process. Reinventing processes to emphasize cost savings for full compliance can greatly reduce the incentive to bypass security procedures.

Reach across the entire supply chain: As previously discussed, many of the potential threats to I-10 shipments and facilities are outside of U.S. jurisdiction, while potential targets can be found at any number of points along a shipment's path. Involving people and process along the entire supply chain can help identify weaknesses in supply chain security.

Improve cooperation between government and the private sector: The need to improve security has provided both government agencies and private sector shippers and carriers with incentives to take a greater interest in each other's roles.

E. Border security

While I-10 itself does not cross any international borders, the I-10 Corridor serves ports that handle international maritime shipments and much of the commercial vehicle traffic between the United States and Mexico uses I-10. Border crossings are assumed to be included as vital links with this corridor.

For promoting and maintaining security, the most obvious areas that apply to I-10 are with intergovernmental cooperation. As a multistate corridor, intergovernmental cooperation is integral to I-10 operations. To further enhance security and improve intergovernmental cooperation and coordination, it will be necessary to ensure that federal and state agencies, as well as private sector entities, are included as stakeholders.

Ensuring the security of the I-10 Corridor will require a network of system integration and processes oriented around global supply chain security. This network approach is similar to current traffic management center (TMC) integration efforts. Items that comprise a global security system include the following:

- *Net-centric enterprise open architecture*
- *Physical security of supply source*
- *Technology*
- *Real time alarms and alerts*
- *Data security (IT policies and procedures)*
- *Preventative detention and actionable intelligence*

The role of these components will become more prominent as TMC integration (with other TMCs, with CAD systems, and with law enforcement) becomes more prevalent. The individual items may not directly apply, but the concept of shared security is important to TMC operations.

III. EXISTING EFFORTS

As previously mentioned, many of the border crossing initiatives are not directly along I-10, nor do they involve the major I-10 stakeholders. However, many of these initiatives are in place at maritime ports in Southern California and along the Gulf of Mexico. As these technologies and projects become more commonplace, their importance and relevance to I-10 will grow. The technologies listed below are among those currently in use or under consideration for a complete global security system.

A. Container and vehicle tracking

- *eSeal*
- *GPS (Global Positioning System)*
- *GLS (Global Location Services)*
- *RFID (Radio Frequency Identification)*
- *EPC (Electronic Product Code)*

All of these are included in either private sector initiatives or larger federal efforts. eSeal will affect all future container movements along I-10. The other efforts are generally more focused on fleet management from a private sector experience. They could be used partially for public sector applications, such as HAZMAT tracking, where I-10 stakeholders could benefit from joint use of a technology.

B. Nonintrusive inspection

Nonintrusive inspection is expected to become routine at border crossings, and is already in use in some areas. Florida currently uses nonintrusive inspection in its mobile VACIS systems. Use of nonintrusive inspection is expected to increase at maritime ports. The impact of these implementations is expected to be largely felt within port operations, and will therefore have minimal impact on the operations of I-10. Increased use of systems on a more targeted basis is also expected.

Nonintrusive technologies likely to be implemented at corridor ports and border crossings include the following:

- *X-Ray*
- *Gamma*

- *Infrared*
- *UWB (ultra-wideband)*

C. Intrusion detection

As with the previous category, these are expected to be more prevalent at border crossings and within ports. Mobile or sporadic applications along I-10 are not expected in the near term. Intrusion detection technologies likely to be implemented at corridor ports and border crossings include systems capable of detecting the following threats:

- *Nuclear*
- *Biological*
- *Chemical*

D. Other technologies

Many of the security deployments are very similar to ITS. Closed-circuit television (CCTV) cameras, for example, can service both ITS and security needs. In both security and transportation operations, the equipment is often the same, though the use and intent are often different.

- *CCTV*
- *biometrics*
- *digital pictures*

E. Operation safe commerce (OSC)

OSC was a Transportation Security Administration (TSA) initiative to capitalize public-private partnerships for end-to-end supply chain security to protect against acts of terrorism. It was a private, public, government, and industry initiative to increase global cargo security and provide evolving policy sets for future intermodal cargo security standards. OSC is not a pure technology effort, but is instead concerned with evaluation and enhancement of policies (governmental), procedures (logistics), and processes (physical).

IV. POTENTIAL LONG-TERM APPLICATIONS AND BENEFITS

This section identifies some longer-term ITS projects for the corridor, and discusses how they may be implemented. Examples of various technologies are provided in the accompanying illustrations.

A. Mexico border

Several existing efforts are currently found at border crossings. Many of these are intended to help make the crossing as efficient as possible. Others are in place to provide sufficient security. All are assumed to become more prevalent, and possibly required, for crossing the border. Future border crossing operations will likely feature increased use of biometrics and other methods of verifying operator identities. Federal efforts to make inspections seamless and efficient will need the capability to identify smugglers quickly, while allowing other travelers and truckers to cross with minimal delays. In light of the volume of vehicles and people crossing the border daily, any time savings will quickly result in significant cost savings for government inspection services as well as for shippers and travelers.

The major obstacles to implementation of these efforts are largely technological. They include identifying and implementing secure methods of quickly verifying identity and developing cost-effective methods of remotely scanning containers and cargoes.

B. Port operations projects

The maritime ports along the I-10 Corridor fall into two distinct classes. The ports of Southern California typically handle large volumes of containers arriving from Asia, while Gulf Coast ports typically handle smaller volumes of trade between the United States and Latin America. In addition to the different scale of trade, the different regions typically process different types of goods.

In both cases, commercial vehicle traffic will need to be processed within the port more efficiently. Much of the daily effort of port operations relates to traffic management, and movement of vehicles within the port is generally the concern of the port operator. The I-10 Corridor can share experiences to help improve the operations, but the general flow is more dependent on the physical constraints of the facility and the willingness of the facility operator to make changes.

Moving goods efficiently yet securely through customs inspection is one area where ITS efforts may be helpful. Most projects aimed at this goal are federal initiatives. As such, they are more guided by federal interests than by local interests. Still, local stakeholders should be involved in these projects wherever possible.

C. CVISN credentialing projects

Many Commercial Vehicle Information Systems and Networks (CVISN) efforts address the administrative end of commercial vehicle and goods movements. These procedures can be of great value in ensuring security, and as they become more integrated into both the local and global supply chain, it will become increasingly more difficult for security breaches to go unnoticed. The increased use of electronics to verify loads, combined with the previously mentioned security of the data networks themselves, will create an environment that will be more difficult for entities to violate laws.

D. Joint efforts with private sector

The security needs of the private sector are somewhat different from those of the public sector. Theft of goods is a central concern to shippers and carriers, but in the public sector, this concern is addressed not as a transportation issue, but as one of law enforcement. However, in addressing transportation and public security concerns, the public sector could often benefit from joint use of some information or allowing an installation of additional equipment to take advantage of this technology for additional uses such as special preclearance or faster inspections.

E. Faster inspection points, possibly beyond the border with rail

The diagrams in the appendix illustrate some of the larger concepts within freight security. They are included as representations of potential teaming opportunities. The I-10 Corridor recognizes that the corridor states are a vital link in the global supply chain, even if the efforts are generally led by another group.

V. BENEFITS TO OWNERS, AUTHORITIES, AND OPERATORS

The benefits to commercial vehicle owners and operators are generally viewed from the financial perspective. They include concerns such as improving competitive advantages, increasing throughput, improved operational efficiency, reduced losses (time, material, etc.), and reduced costs. Indirect benefits can include better asset tracking and visibility and improvements in accountability, verification of cargo movement, and supply chain documentation.

All of these items relate to the financial aspects of goods movement. While this is important for the corridor, the public sector participants have a different view of what is important. For the public sector, the needs of the public in general are addressed by making the roads safer and by preventing terrorist acts. Some potential public sector interest projects include the detection, record keeping, and handling of hazardous materials and cargo, and the documentation and information relating to asset tracking and visibility. Tracking of hazardous materials is critical for the public safety and well being. Accidents related to hazardous materials can cause considerable congestion and endanger many. The ability to monitor hazardous materials, and quickly identify what the emergency responders have to deal with at an accident, is an important tool for reducing congestion along I-10.

VI. POTENTIAL DEPLOYMENT OBSTACLES

Institutional issues are generally more difficult to address than technical issues, even more so when they involve security. Institutional issues are compounded by the large number of entities involved. Where many other projects can be accomplished in a relatively small multistate demonstration project, security projects often involve one or more federal agencies, increasing the complexity of institutional issues. This also may dilute the value of the I-10 Corridor; i.e., if the federal government wants to do something nationally, other corridors may benefit before I-10. This issue may also require the involvement of law enforcement at various levels. It is also primarily an issue for those other agencies, so transportation cannot take the lead on many of these issues.

A. Mexico border

Border crossing initiatives typically require involvement of the federal government, and may also involve international agencies. The increased number of participants necessarily increases institutional complexity. These issues will be solved primarily through continuous interaction with the other groups, and can be expected to diminish over time as the various agencies become more accustomed to working together.

Another concern is that issues at the border may be viewed as more of a national effort, leading to a reduced role for local stakeholders. While it is likely the state DOTs will be invited, other stakeholders may have a hard time participating in committees and being recognized. The state DOTs will need to work to ensure that they represent the greater interests of the I-10 Corridor.

Continuity is also a concern. It is assumed that the federal government will eventually ensure that all border crossings have similar systems and programs. However, this will likely be accomplished over time. It is important for the corridor that this continuity is a major goal of the federal government.

B. Port operations

Due to the different nature of the ports of Southern California versus those of the Gulf Coast, there may be different operational improvements that need to be instituted to improve operations. The ports of Southern California have a large steady stream of trucks leaving with containers. The efficient management of those containers is critical to the success of the port. The operations of the ports along the Gulf Coast may not require similar projects or initiatives.

Many of the issues with maritime ports can be addressed within the port facilities themselves. There is often little that can be done as a corridor within these constraints. Those operational efficiencies within the ports do not require much interaction between agencies, but can be accomplished solely by the operators themselves. This may lead to later problems with a lack of integration on efforts that otherwise appear to be best accomplished through coordination.

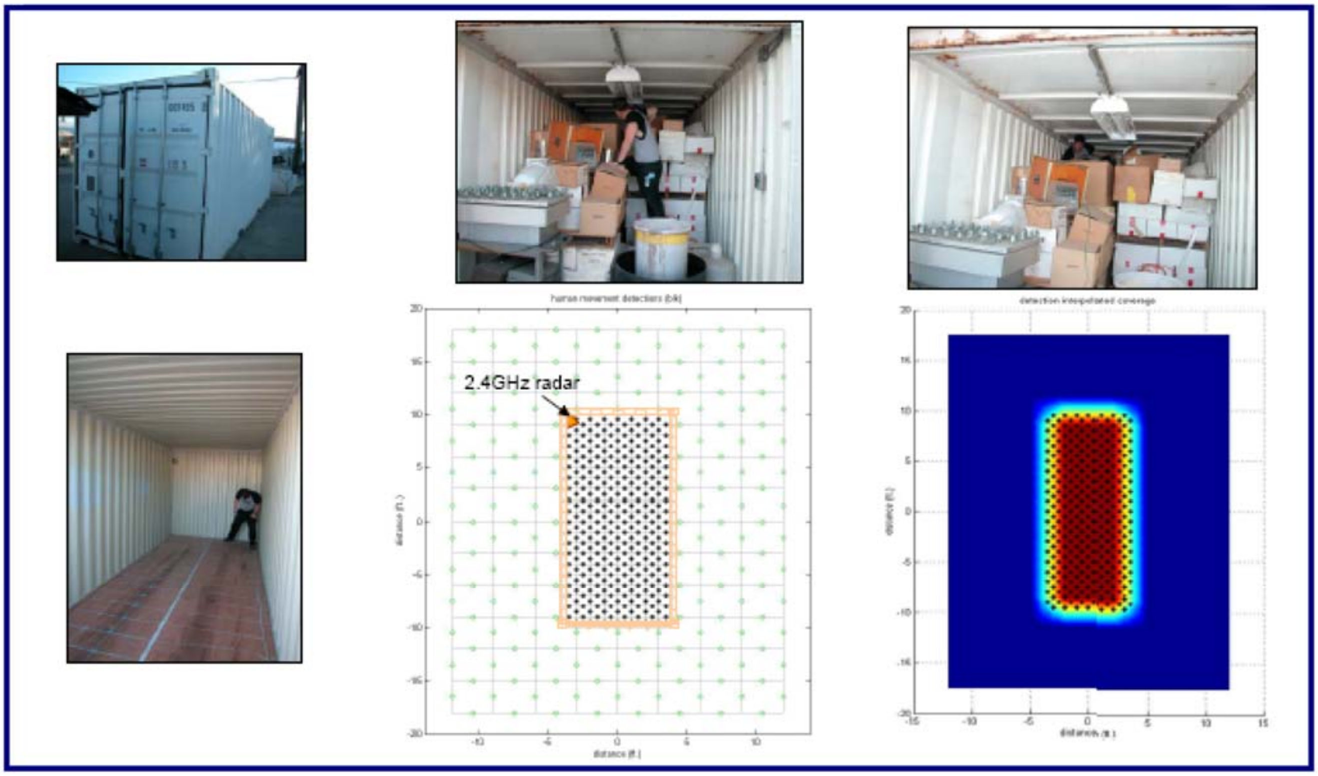
C. Dealing with private sector community

Numerous projects – both internal to companies and in cooperative groups – are aimed at finding competitive advantages to streamlining international shipping operations. These can be specific to security; i.e., how to demonstrate compliance with a minimal impact on operations. The private sector is not always willing to share their results and may be less willing to participate in a project unless they see a competitive advantage. Getting good information from them will be a challenge.

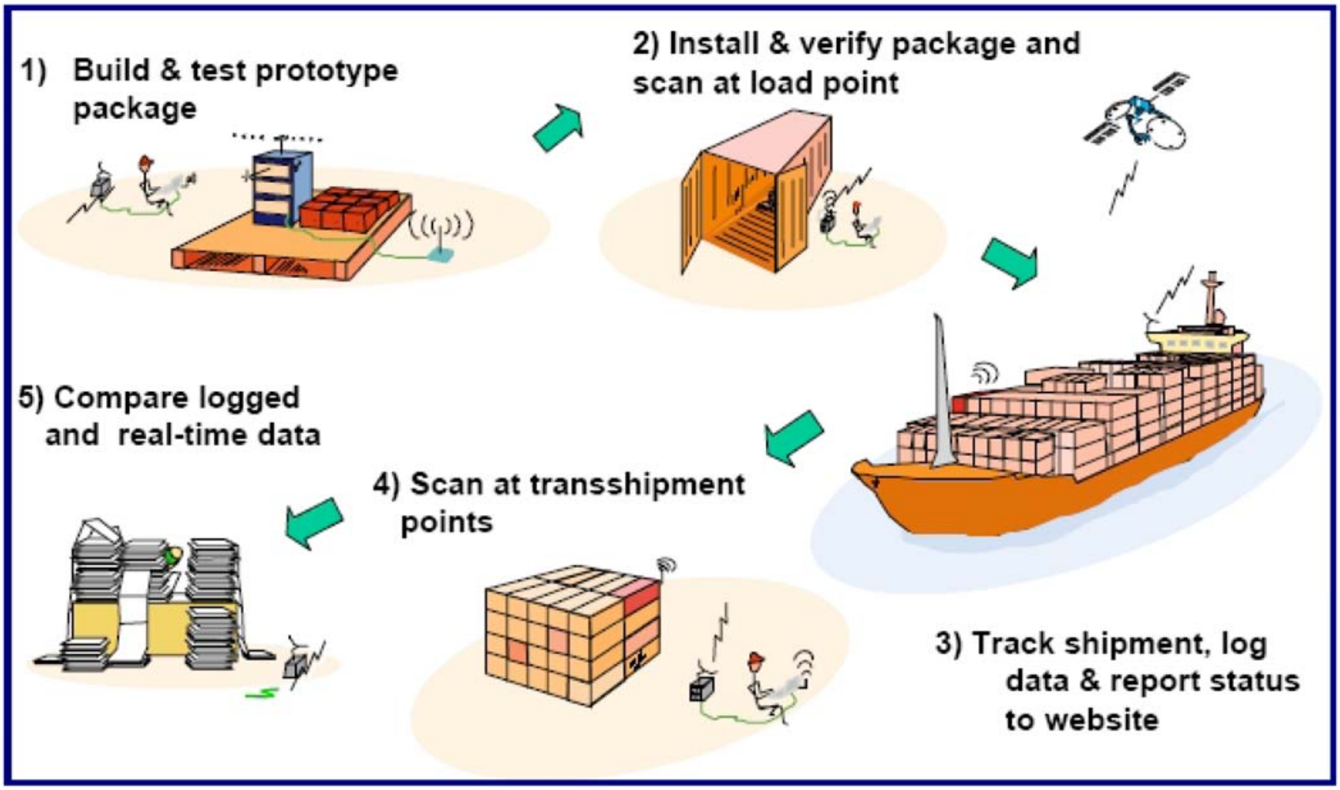
D. Information sharing

Many of the participants in security area have different levels of willingness to share information. As demonstrated in traffic operations and traveler information, sharing of information is what promotes efficiencies and enables integration. Law enforcement agencies have become more open to sharing information among themselves. This does not necessarily translate to sharing with transportation agencies. Also, as mentioned above, the private sector may not be very willing to share information.

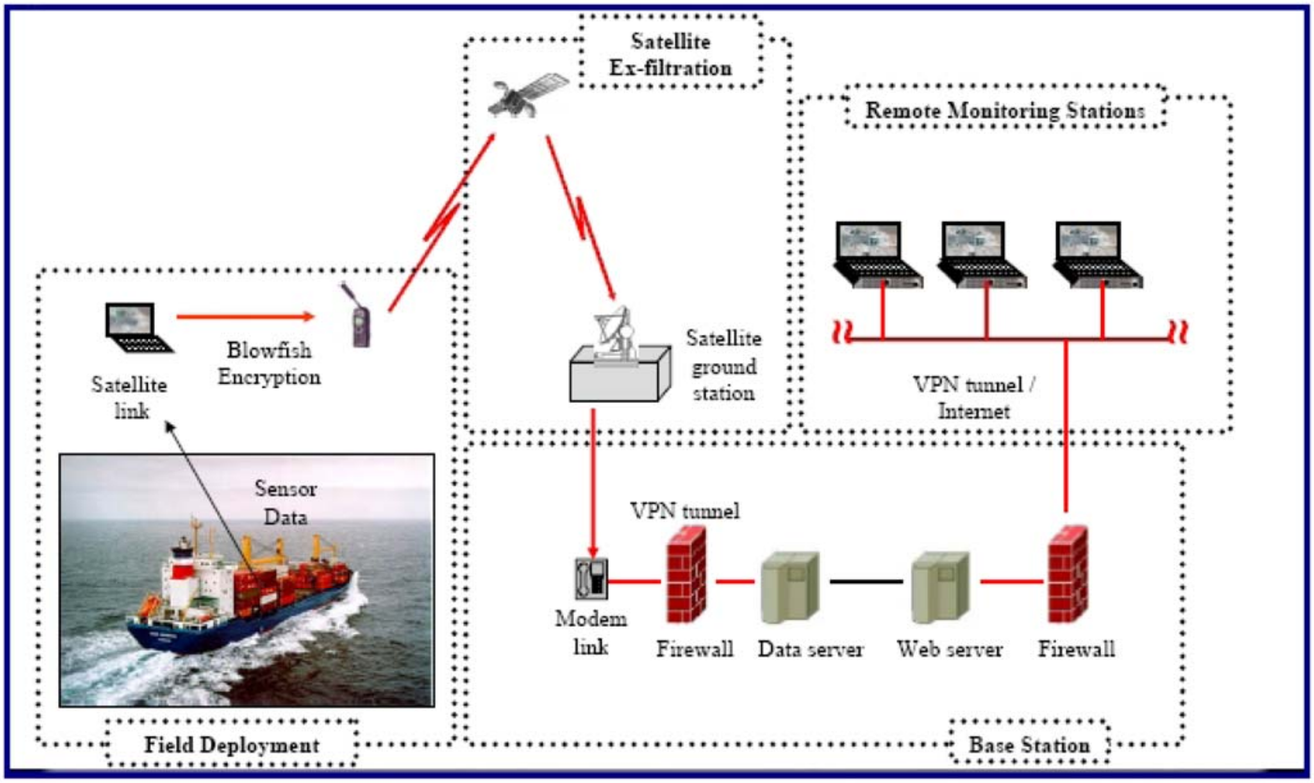
Guardian sensor used in shipping containers



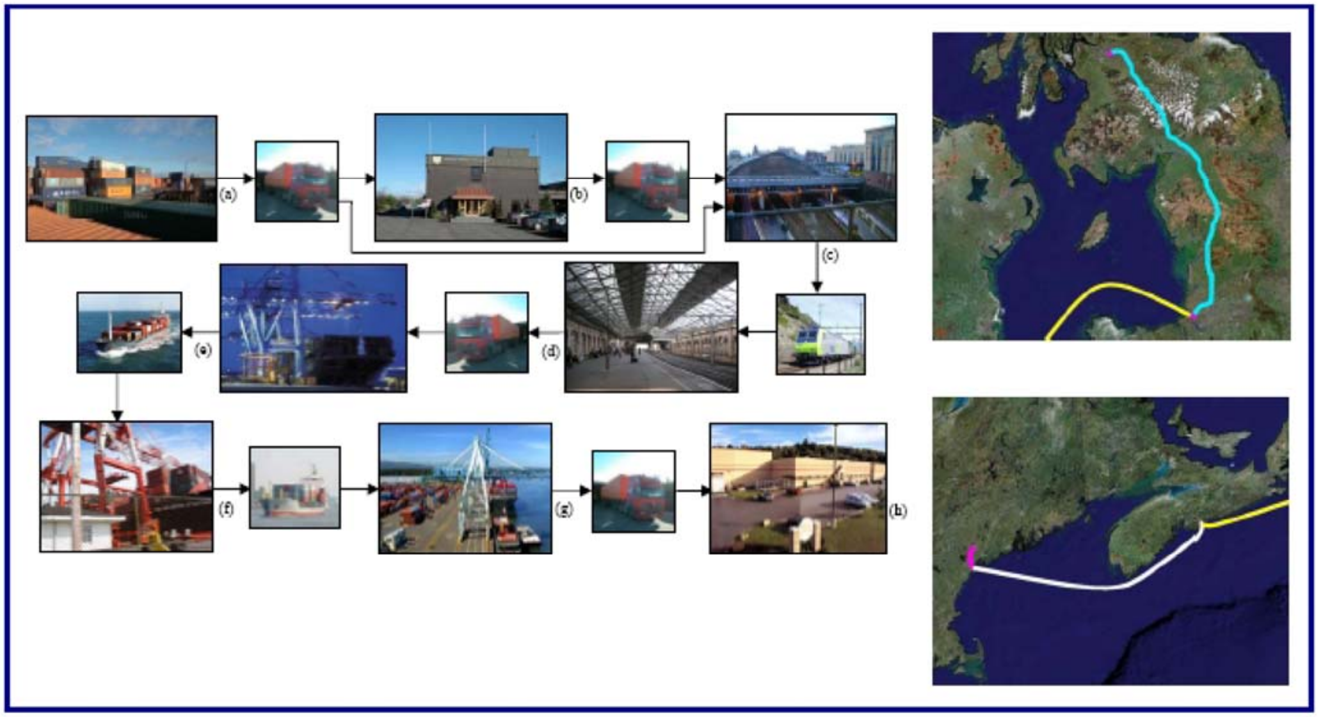
Track and Monitor Complete Shipping Cycle



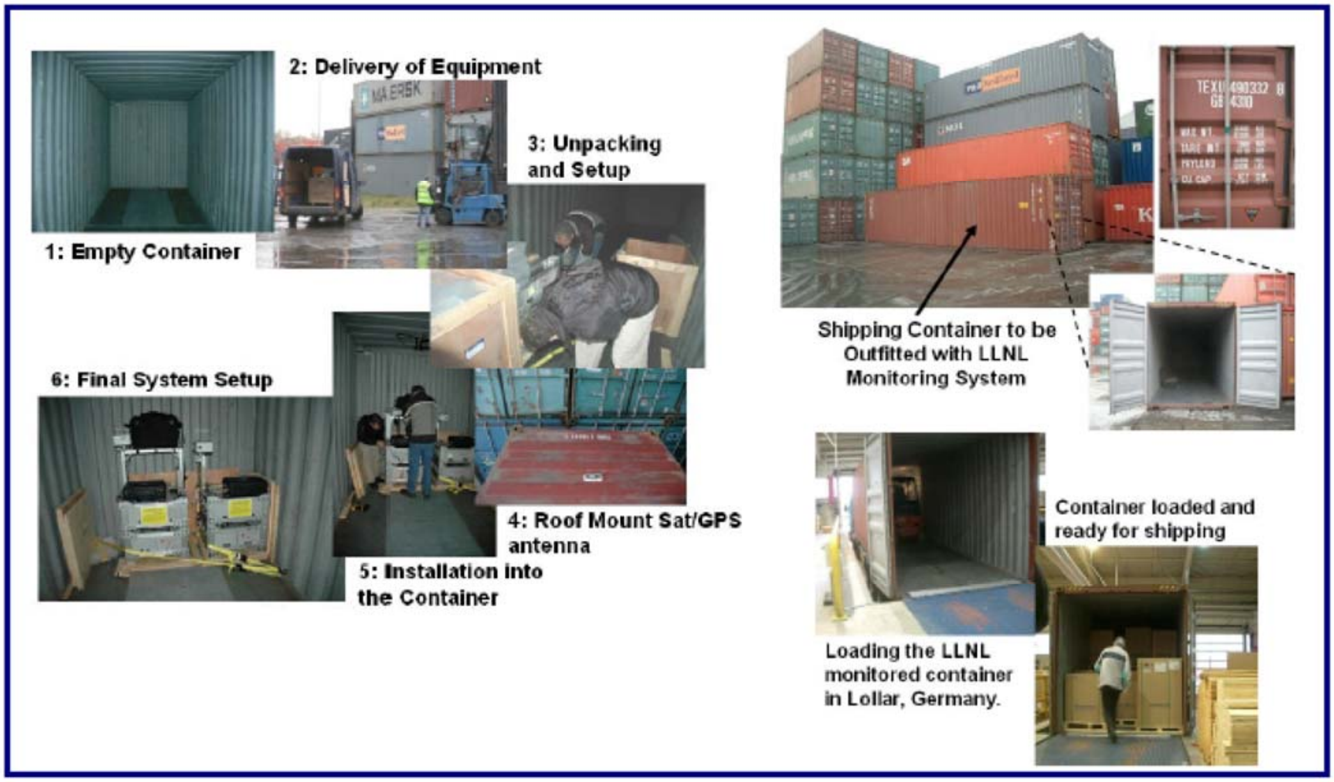
Secure, Real Time Adaptive Communications



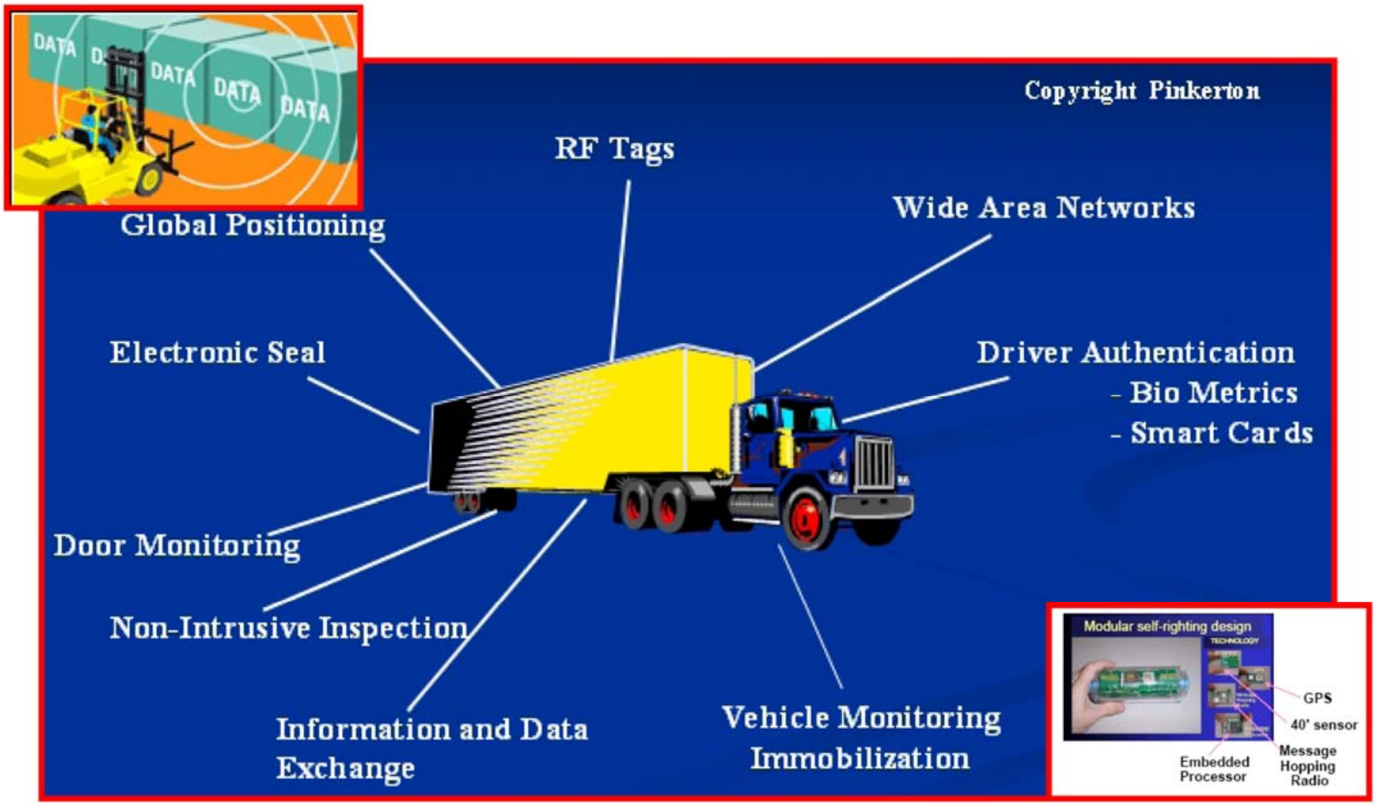
Complex Distribution System



Equipment Installation and Monitoring



Total Asset Visibility and Authentication



Incident Management

WHITE PAPER

For the I-10 National Freight Corridor

January 2008

I. PURPOSE

This white paper provides information on incident management (IM) user services. It is intended to support the Technical Advisory Committee (TAC) in its decisions regarding the corridor's ITS architecture and initial program. Toward this end, this paper provides a definition of incident management and summarizes technical and institutional aspects of IM in the I-10 Corridor and potential actions and applications. Barriers to deploying ITS technologies are also examined, along with their potential solutions.

II. DEFINITION

A traffic incident is a nonrecurring event that causes a reduction of roadway capacity or an abnormal increase in demand. Incidents can result in traveler delay, increased fuel consumption, and reduced air quality. Secondary crashes can be a related problem. Traffic incidents can also pose a danger to response personnel on the scene.[2]

IM is the systematic, planned, and coordinated use of human, institutional, mechanical, and technical resources to reduce the duration and impact of traffic incidents. IM is intended to improve the safety of motorists, crash victims, and traffic incident responders. Thus, the overall aims are the mutually supporting safety of everyone involved in a traffic incident and the minimization of adverse impacts on traffic flow. IM is closely related to special event management and emergency management, with the main differences found in the depth of response, the degree of advanced notice, and the geographic extent of the response.

Effective IM features structured, interjurisdictional, multidisciplinary, and fully documented procedures. More than just technologies and their use, successful IM must be fully integrated into the culture of the stakeholder institutions. Effective use of available resources increases the overall operating efficiency, safety, and mobility of the highway.

Although often associated most prominently with limited access roadways, IM broadly applies to all types of roadways. An IM program covers an integrated set of management activities tailored to a specific geographic area. The I-10 ITS program should recognize the existing coverage of traffic IM activities within each state and region, and address gaps and overlaps in that coverage.

III. EXISTING EFFORTS

In the National ITS Architecture, the IM user service has four major functions: incident identification, response formulation, response implementation, and prediction of hazardous conditions. These functions can be handled at the strategic, tactical, and technical/ communications levels, as detailed in Section IV.

In the last few years, a number of related publications and reference materials have become available. The Traffic Incident Management Handbook is a primary reference that provides in-depth discussion of traffic

[2] *Freeway Management and Operations Handbook*, Chapter 10, "Traffic Incident Management." Federal Highway Administration, September 2003.

incident management.[3] The National Traffic Incident Management Coalition (NTIMC) is a relatively new assembly of associated agencies and stakeholders. Their web site provides a wealth of materials, including a listing of participating agencies and related activities.[4]

In 2004, the U.S. Department of Homeland Security published an overview of IM-related activities. The National Incident Management System (NIMS) recommends many of the concepts of the National ITS Architecture, including concepts such as interoperability, coordination, and technology advancement.[5] NIMS also emphasizes concepts such as incident command, comprehensive communications, and information dissemination. However, the NIMS title co-opts the transportation meaning of "incident management," changing it from traffic accidents/flow disruptions to broader security activities. Many recent transportation publications thus use the term "traffic incident management" to clarify scope.

Most urban areas along I-10 have formal incident management programs, including service patrols. Incident management programs may include coordination efforts with incident responders and local Traffic Management Centers (TMCs). IM programs can also include policies and procedures. Florida Turnpike Enterprise's Roadway Incident Scene Clearance (RISC) program resulted from policy changes and legislation that enabled the DOT to contract with private tow operators, greatly improving the agency's ability to clear the roads quickly after an incident. An innovative aspect of this program is a $2,500 bonus to the towing company if accident response time is less than an hour and clearance time is under 90 minutes.[6] The SunGuide ITS program for South Florida has numerous resource materials covering ongoing IM activities.[7]

California's ITS efforts provide another example. Caltrans includes operational roles and responsibilities for traffic management in its statewide ITS deployment plan, including the roles of the various Caltrans districts, Caltrans headquarters, local police, regional agencies, and the California Highway Patrol. In April 2007, the state convened a California Highway Incident Management Summit that brought together various participating agencies, including transportation, law enforcement, fire, ambulance, coroner, local agencies, and towing and media representatives. The director of Caltrans and others expressed the goal of clearing highway incidents within 90 minutes.[8]

IV. POTENTIAL APPLICATIONS AND BENEFITS

This section identifies potential applications for the corridor and discusses how they may be accomplished. Anticipated benefits of these applications include

[3] *Traffic Incident Management Handbook*, Federal Highway Administration, November 2000, http://www.itsdocs.fhwa.dot.gov/jpodocs/rept_mis/13286.pdf.

[4] National Traffic Incident Management Coalition, http://timcoalition.org.

[5] *National Incident Management System*, U.S. Department of Homeland Security, draft revised version, August 2007, http://www.fema.gov/emergency/nims/nims_doc.shtm.

[6] "Utilize clearance time incentives when contracting with towing service providers to reduce incident clearance times," http://www.itslessons.its.dot.gov/its/benecost.nsf/Lesson?OpenForm&C6D2B17220D963028525707E0061C53B%5ELLCats.

[7] SunGuide Traffic Incident web page, http://www.sunguide.org/trafficincident.asp?area=tim.

[8] California Highway Incident Management Summit, April 3-4, 2007, Riverside, CA, http://www.dot.ca.gov/hq/traffops/summit.html.

making IM more responsive and efficient, ultimately minimizing the adverse effects of these disruptive occurrences, thus improving both safety and efficiency.

IM can be thought of as including three general areas of activity. Strategic activities cover planning and institutional issues, tactical activities include on-site management, while technical and communications activities deal with critical support components. All of these activities include some degree of overlap.

A. Strategic activities

Strategic activities include the following:

Interagency Coordination: The key players are law enforcement, fire and rescue, emergency medical services, towing and recovery, environmental protection (for hazardous materials), and transportation agencies. It is critical that all of these agencies work closely together. The most important overall action is ensuring that the key players have a strong working relationship that enables and facilitates coordination. This can begin with a critical review of the status of interagency coordination throughout the I-10 Corridor, with an eye toward identifying weak spots and "lessons learned" from past IM experience.

International Practices and Lessons: Innovative international practices should be investigated, recognizing institutional and cultural differences, for applicability to the I-10 Corridor. [9]

B. Tactical activities

Incident Command System (ICS): With emerging NIMS and SAFETEA-LU requirements, a greater emphasis on the ICS can be expected from national directives and funding agencies, and the strategic agencies active in the I-10 Corridor need to actively participate in its local application.

Improved Site Management: As emergency responders and traffic personnel improve coordination, more proactive onsite management should evolve. In addition, to better vehicle positioning, many IM personnel feel that less use of flashing lights and more use of standardized vest colors by on-site role (e.g., medical, fire, traffic management) will enhance incident response.

Quick Clearance Policies and "Move It" Laws: These should be reviewed throughout the I-10 states, with the goal of removing vehicles from the interstate as quickly as possible. The cited Florida SunGuide system that offers a cash bonus to towing companies that quickly remove incidents is an example of how to minimize incident impact on the general traveling public and reduce likelihood of secondary incidents.

Real Time Performance Measurement: Real time monitoring of volumes, speeds, and delays is needed to help manage ongoing incidents as well as for planning future IM deployments.[10] Initial levels of corridor traffic activity and incidents should be evaluated, and recommendations developed for additional detector coverage on both I-10 and major alternate routes.

[9] "Traffic Incident Response Scan April 8-24, 2005," in *World Highways,* 8/15/2005, http://www.nysmpos.org/pdf/Safety%20Forum/FHWA%20AASHTO%20European%20scan%20report%20final.pdf.

[10] *Incident Management Performance Measures*, TTI, K. Balke, D. Fenno, and B. Ullman, FHWA Contract Number: DTFH61-01-C-000182, November 2002, http://ops.fhwa.dot.gov/incidentmgmt/docs/impmrptf.pdf.

Review of National IM Experience: As at the strategic level, experience sources such as the NTIMC should be consulted by I-10 agencies on an ongoing basis.

C. Technical and communications activities

Interoperability and Communications among First Responders: While steadily improving at the national level, further advances are needed.[11] The I-10 Corridor agencies again can learn from the technical and institutional lessons.

Information Dissemination: Advanced Traveler Information Systems are constantly improving for normal traffic operations, but incidents require especially quick and accurate pre-trip and in-vehicle information during travel. All avenues to provide the most timely, accurate, and complete information possible should be evaluated and expanded for the corridor, including highway advisory radio and dynamic message signs, commercial AM/FM radio, web pages, and portable text-capable equipment such as personal digital assistants (PDAs) or cell phones.

Software Evolution: Many commercially available tools can help an agency prepare for and manage incidents. Ensuring compatibility between the software tools used by coordinating agencies can greatly enhance communication. One initiative is to integrate the computer-aided dispatch (CAD) software used by incident responders with the TMC software used for freeway management. A status review of agency software along the entire corridor will aid in recommending improvements and enhancements.

V. POTENTIAL DEPLOYMENT OBSTACLES

Potential obstacles for IM are essentially the same as those for emergency management, as identified in the Emergency Management (EM) white paper. Because dealing with small-scale occurrences across a region demands a localized response, the obstacles for IM tend to be more localized. EM, by contrast, generally has a greater emphasis on large-scale events with a regional scope, such as hurricanes and other weather-related events.

For many incidents, the primary focus will remain on the incident responders. At the same time, effective functioning of the transportation system can be critical for getting resources to and from an incident. Perhaps the most significant institutional issue is ensuring that incident responders increase their coordination with the transportation agencies. The concern is that while the desire to better coordinate exists from the transportation perspective, it is often not viewed as a high priority from the incident responder perspective.

The corresponding technical aspect is seamless operations. The last thing incident responders want to do is to be forced to do additional work while in the middle of an incident. Ideally, ITS projects will foster coordination and information sharing without requiring responders to do anything different or extraneous.

This section highlights potential issues and actions to share information or achieve necessary coordination.

[11] "Slow going for DHS' interoperability effort," *Government Computer News*, 1/26/06, http://www.gcn.com/vol1_no1/daily-updates/38101-1.html.

A. Agency-specific practices inconsistent with TMC policies

Each system described, once the institutional issues have been addressed, will need to address the necessary data input reliability aims/tolerances that will be employed during incidents. Live incidents are not the time and place to discover glitches in agency systems. Agency-specific incident preparedness practices should be fully integrated into current TMC policies, including routine post-incident reviews of "lessons learned."

B. Necessary institutional agreements may not be in place

Institutional agreements may be the most difficult to address. A recent example of full system technical capabilities being deployed within one state resulted in nearly a decade from final acceptance testing to full system deployment. In this case, the agencies were in the same state, but one of the agency databases contained personal information. Aggressively pursuing necessary institutional agreements well in advance of implementation should help shorten the time necessary to accomplish the effort.

C. Cost of integration may not be equitably allocated

During agency discussions, how to share the costs of integration will likely be a key concern. One approach is to hire one consultant team for an entire region, and split the cost among the affected agencies based on a previously agreed-to formula. Another is for each subarea within the region to bear the cost of all interfaces within the subarea, while bordering subareas may consider sharing the integration costs across subarea lines. Regardless of the approach, it should be documented in appropriate memoranda of understanding (MOU) among the agencies. The MOU will address which subarea is responsible for which effort, and help agencies anticipate and resolve conflicts in advance of implementation.

D. Differences in location standards among agencies

Another institutional effort that has delayed operational improvements that cross jurisdictional and agency boundaries is obtaining agreement among the affected agencies regarding location information. Decimal degree coordinates (latitude and longitude) have emerged as a de facto standard, but agencies that do not have fully developed GIS platforms may find implementation to be expensive and time consuming. Additionally, data interfaces among various systems have not proven to be a reliable means of accurately relaying location information. Subareas will need to reach agreement on appropriate improvements to data interfaces, and will need to reach concurrence on a time frame for coordinated regionwide geographic information.

E. Agencies may lack formal mutual aid agreements

Joint use of resources so that overlap of resources is minimized is desirable for effective incident management. This challenge can be addressed with discussions among the parties, followed by MOUs documenting the commitments. Typically, many incident responders have formal mutual aid agreements, but transportation departments do not. By entering into formal agreements with each other, transportation agencies can anticipate many of the challenges in advance.

There are some recent examples of incident responders at incident sites without the ability to communicate between agencies. This challenge can be addressed through documented agreements that lay out on-site operational procedures among affected agencies, and through the deployment of new and updated communication systems. Providing an emergency communications network on a regionwide or even corridorwide basis could be a useful step.

Public-Private Partnerships

WHITE PAPER

For the I-10 National Freight Corridor
January 2008

I. PURPOSE

This white paper provides background information on public-private partnerships (PPPs) and the opportunities that PPPs can offer to the I-10 Corridor. It is intended to support the I-10 Freight Corridor Technical Advisory Committee (TAC) in its decisions regarding how to fulfill the corridorwide program plan. The paper focuses on PPP efforts of public sector entities and related issues in the I-10 Corridor. It also briefly describes the anticipated benefits of a PPP, as well as the potential challenges that must be addressed to successfully use PPPs as a means of fulfilling the corridor's program plan.

In July 2007, the Federal Highway Administration (FHWA) released a *"User Guidebook on Implementing Public-Private Partnerships for Transportation Infrastructure Projects in the United States"* and *"Case Studies of Transportation Public-Private Partnerships in the United States."* The first document, the users' guide, is summarized in this white paper. Information from the U.S. case studies and other sources are referenced as footnotes in this white paper.

II. PPP DEFINITION AND BACKGROUND

For the purposes of this paper, PPPs are assumed to be a means of developing and implementing transportation infrastructure projects. By one definition, PPPs are contractual agreements under which the public and private sectors join together in a partnership to use the best skills and capabilities of each to better serve the public and to provide the highest quality service at optimal cost.[12] In general, the ITS community has often taken a more strict interpretation – one where a significant amount of the total cost is assumed by the private sector. For the purpose of this paper, the more liberal view is taken. The intent is to illustrate a variety of financing options available to the I-10 states.

Although federal monies for transportation have increased, the various transportation needs in the United States continue to exceed the funding available. This disparity has led the FHWA to look to the private sector for expertise that may not be readily available in the public sector to bring a greater degree of innovation and efficiency to transportation project implementation. PPPs can provide new, innovative sources of funding that can facilitate needed transportation projects. PPPs can also provide a means to more efficiently allocate risks between the public sector and the private sector.

Through innovative financing, PPPs can provide greater flexibility in the design, construction, and maintenance of transportation facilities.[13] In the 2007 users' guide, the U.S. Department of Transportation and its surface transportation administrations encourage their counterparts at the state and local government levels to consider the use of PPP approaches to accomplish more projects in their work programs.

[12] "Critical Choices: The Debate Over Public-Private Partnerships and What it Means for America's Future," The National Council for Public-Private Partnerships, September 2003.
[13] "Manual for Using Public-Private Partnerships on Highway Projects," U.S. Department of Transportation Federal Highway Administration, November 2005.

A. PPP selection potential criteria

There is no single set of criteria for determining whether a PPP is right for a particular project. However, the criteria listed below are potential considerations for PPP at the beginning of the project planning process. These criteria can help determine whether a project is suitable for a PPP and, if so, the kind of contract and project delivery arrangements that would be deemed most appropriate to the project.

Legal authority to use various PPP approaches. Not all states or agencies have the legal authority to execute PPP contracts and different states may have differing approaches to PPP.

Stakeholder desire: A PPP should only be considered if an agency is concerned that their current contracting process will not address the possible unique characteristics of a project. If the agency is not willing to try a different process, the PPP will ultimately not be successful.

Demonstrated transportation need: Congestion, safety, pollution, and travel reliability.

Sponsoring agency lacking resources to fund or deliver the project on its own. This lack of resources should not be a short-term issue (e.g., this program year there is less money available than last), but must be considered within the long-term program (i.e., there is no commitment from the public agency over the long term to invest more than a certain amount in a project).

Strong commitment by key stakeholders: Political leaders (project champion), public agency officials, facility users, and the general public.

Large and complicated project warranting substantial private participation and assumption of project risks; generally over $500 million in construction costs for capital projects but lower amounts for ITS.

Adequate funding potential: Tolls, availability payments, joint development, and right of way.

Strong partner relationships: Competence and trust among members of the PPP.

Level playing field for bidding teams: Unbiased procurement process.

Public sector and private sector selection criteria can overlap in some areas, even as each side has its own distinct priorities. It is important for both sides to understand each other's priorities in evaluating projects as candidates for PPPs and determining whether it is advantageous to pursue them through some kind of partnering arrangement. However, given the FHWA encouragement for state and local agencies to consider using PPPs as delivery mechanisms, there are five related questions that are to be addressed by project sponsors and prospective private partners before proceeding with PPPs as a delivery option:

1. *Are the necessary legal, political, and institutional frameworks (enabling state or local government to undertake this PPP project) in place?*
2. *What kind of PPP approach best suits this project or set of projects (e.g., how should the agreement be structured)?*
3. *Does the PPP approach offer greater potential public benefits than traditional project delivery approaches?*

4. ***Does the PPP approach selected provide a reasonable balance between public and private responsibilities, risks, and rewards?***
5. ***Is the PPP approach in the public's overall best interest (requiring a full examination of engineering and social costs and benefits) while meeting private feasibility requirements?***

Table 1 provides a summary of criteria for selecting PPP approaches. The left two columns summarize the criteria used by prospective sponsoring agencies to determine if a project is suitable for delivery as a PPP project: project scale and public demand. If the result is affirmative, the right two columns can help determine which type of project delivery and financing approaches to pursue, including the development stage of the project, the risk profile, and the potential for funding from traditional and alternative sources.

Table 1. Project-Based Criteria for Selecting PPP Approaches

Threshold Criteria for Considering PPPs		Decision Factors for Selecting PPP Approach	
Project Scale	Public Demand	Project Stage and Risk Profile	Project Revenue and Funding Potential
The higher the cost, the more likely the private sector will be needed to bridge the financing gap	Urgency of project to satisfy transportation mobility need	Preliminary concept planning favors PPP approaches that lower cost and maximize potential value capture	Scarce public funding sources to meet transportation program budgets are enhanced by pooling multiple modal program resources
Project complexity: the more complex design and sophisticated financing = greater the potential role for private partners	Significant transportation-related economic development potential	Public sector takes responsibility for environmental clearance and right-of-way acquisition	PPPs enhance ability of project to secure adequate funding and financing
Broader functional scope makes it more likely private partners can leverage public resources	Broad public support for PPP approach to project delivery, financing, and funding approaches used	Design is at less than 30 percent to optimize best practice input by PPP team	Legal authority must exist to permit sponsoring agency to engage in PPPs that include use of private capital financing
Capability of sponsoring public agency not adequate to deliver project by itself in a timely manner	Broad political support for PPP approaches to leverage scarce public funds and expedite project delivery	Post-construction responsibility for operation and maintenance transfers; significant project performance risk to the PPP team	Projects with high initial costs and long-range revenue potential can be more readily obtained through PPP approaches
Low risk tolerance of sponsoring public agency for large, complex projects	Presence of project in state or local transportation improvement plans (STIPs or TIPs)	More project risk, more public sponsor risk aversion = more suitable for PPP	Projects that lack financial feasibility will not attract private sector interest

According to the most recent publications, all of the I-10 Corridor states except New Mexico have the legal authority to use PPPs for transportation projects (legislation is pending in Louisiana). All of the I-10 Corridor states except Alabama have design-build project delivery authority and have completed at least one design-build project in their state. California, Texas, and Florida all have projects operating and projects under development using FHWA's Value Pricing Pilot Program.

B. PPP approaches

Some of the more common approaches to PPP are described below, in ascending order of private sector responsibility, risk, and reward potential. Approaches that may not be applicable to the I-10 corridorwide improvements are not included. Note that PPP approaches continue to evolve to meet both the needs of project sponsors and the circumstances associated with specific projects, and that new approaches continue to be identified and implemented.

The design-bid-build (DBB) process is the traditional approach to delivering transportation projects in the United States. DBB is used as a source of comparison in the following PPP approaches. Several of the PPP approaches described below in this section may not yet be in use in the United States and include:

Private Contract Fee Services/Maintenance Contract: Public agencies can contract with private sector entities for services that traditionally have been performed in-house, such as planning and environmental studies and program and financial management, and also for operations and maintenance. Contracts are generally awarded in a competitive bid process to the contractor offering the best price and qualifications. The potential benefits of private contract fee services include reduced workload for agency staff, potential for reduced costs, and opportunities to apply innovative technologies, efficiencies, and private sector expertise.

Construction Manager at Risk: Construction Manager at Risk (CM@Risk) uses a separate contract for a construction manager (CM). The CM begins work on the project during the design phase to provide constructability, pricing, and sequencing analysis of the design. The project sponsor generally holds a separate contract with the design team through these initial phases of the CM contract. The CM then becomes the contractor when a guaranteed maximum price is agreed upon by the project sponsor and CM (the risk that the drawings and specifications are free from error is assumed by the CM@Risk, now the contractor). The potential benefits of the CM@Risk approach include the continued advancement of the project during price negotiations, a thorough understanding of project requirements/a shared set of project expectations by the project sponsor and the CM@Risk, and the potential for more optimal teaming because the CM can negotiate will all firms, rather than the project sponsor having to select from a limited number of firms that propose to construct the project.

Design-Build: Unlike DBB, where project design and construction functions are procured sequentially, design-build (DB, sometimes called design-construct) combines the design and construction phases into one fixed-fee contract. Under a DB contract, the design-builder, not the project sponsor, assumes the risk that the drawings and specifications are free from error. In this approach, the design-builder may be one company or a team of companies working together. The potential benefits of DB delivery compared to traditional DBB delivery include time savings, cost savings, risk sharing, and quality improvement.

Design-Build with a Warranty: Under the DB with a warranty approach, the design-builder guarantees to meet material, workmanship, and performance measures for a specified period after the project has been delivered. The warranties typically are from five to 20 years. The potential benefits of the DB with a warranty approach include the assigning of additional risk to the design-builder and reducing the project sponsor's need for inspections and testing during project delivery.

Design-Build-Operate-Maintain: Under a design-build-operate-maintain (DBOM) delivery approach, the selected contractor is responsible for the design, construction, operation, and maintenance of the facility for a specified time. The contractor must meet all agreed-upon performance standards relating to physical condition, capacity, congestion, and ride quality. The potential benefits of the DBOM approach are the increased incentives for the delivery of a higher quality plan and project because the design-builder is responsible for the performance of the facility for a specified period of time after construction is completed. The project sponsor retains ownership of the facility as well as the operating revenue risk and any surplus operating revenues.

Design-Build-Finance or Design-Build-Finance-Operate: These approaches are variations of DB and DBOM, respectively, except that the DB or DBOM team provides some or all of the project financing. The potential benefits of the design-build-finance (DBF) or design-build-finance-operate (DBFO) approaches are the same as those under the DB and DBOM approaches, but also include the transfer of the financial risks to the design-builder during the contract period. While the project sponsor retains ownership of the facility, the DBF and DBFO approaches attract private financing for the project. The private financing can be repaid with revenues generated during the facility's operation. The project sponsor retains ownership of the facility as well as the operating revenue risk and any surplus operating revenues.

Build-Operate-Transfer or Build-Transfer-Operate: Build-operate-transfer (BOT) is similar to the DBFO approach whereby the contract team is responsible for the design, construction, and operation of the facility for a specified time, after which the ownership and operation of the project is returned to the project sponsor. The potential benefits of using the BOT or build-transfer-operate (BTO) approaches are similar to the benefits associated with using a DBOM contract: increased incentives for the delivery of a higher quality plan and project because the contractor is responsible for the operation of the facility for a specified time period after construction. Under the BTO approach, the project sponsor retains ownership of the facility as well as the operating revenue risk and any surplus operating revenues.

Build-Own-Operate: Under the build-own-operate (BOO) project delivery approach, the design, construction, operation, and maintenance of a facility is the responsibility of the contractor. Under the similar build-own-operate-transfer (BOOT) approach, asset transfer occurs after a specified operating period when the private provider transfers ownership to a public agency. The major difference between the BOO and the DBOM, DBFO, BOT, and BOOT approaches is that ownership of the facility remains with the private contractor in the case of the BOO approach. As a result, the potential benefits associated with a BOO approach are that the contractor is assigned all operating revenue risk and any surplus revenues for the life of the facility.

Long-Term Lease Agreements/Concessions: Long-term lease agreements involve the lease of publicly financed facilities to a private sector concessionaire for a specified time period. Under the lease, the private sector concessionaire agrees to pay an upfront fee to the public agency to obtain the rights to collect the revenue generated by the facility for a defined period of time (usually from 25 to 99 years). In addition to the concession fee, the concessionaire agrees to operate and maintain the facility, which may include capital improvements in some instances. The potential benefits of long-term lease agreements include transferring responsibility for increases in user fees to the private sector; generating large up-front revenues for the public agency; transferring most project, financial, operational, and other risks to the private concessionaire; and gaining private sector efficiencies in operations and maintenance activities.

C. PPP innovative financing techniques[14]

This section identifies financing approaches that may be used for PPP highway projects. Innovative financing techniques complement and enhance existing pay-as-you-go financing. Techniques range from fairly modest strategies that permit states greater flexibility in satisfying the standard matching requirements for receipt of federal funds to very ambitious credit enhancement strategies. Advantages of these financing techniques include better leverage of federal capital dollars, more effective use of existing funds, faster construction than possible with traditional financing mechanisms, and enabling some major infrastructure projects to go forward that might not otherwise receive financing.

Following are brief summaries of some innovative financing approaches for PPP projects:

SEP-15 (Special Experimental Project No. 15) addresses utilization of different methodologies to fulfill federal requirements regarding project delivery. SEP-15's experimental authority requires applicants to fully comply with all requirements of the National Environmental Policy Act (NEPA) and other state and federal environmental laws and regulations. The difference is that the applicant may be permitted to experiment with the procedures used to accomplish such requirements. All SEP-15 applications must come from a state DOT.

Flexible Match relates to the Federal-Aid Highway Program, which statutorily requires recipients of federal assistance to contribute toward the total cost of any given project. In addition, the state typically must provide matching state funds to receive federal funds for a project. Federal-aid provisions allow a wide variety of public and private contributions–including cash, land, materials, and services - to be counted as match. Whether the contribution is eligible depends on the nature of the contribution and the source.

[14] "Manual for Using Public-Private Partnerships on Highway Projects", US DOT Federal Highway Administration, November 2005.

Toll Credits were first authorized with ISTEA in 1991, and as of May 31, 2007, more than $18 billion in toll credits have been approved. Toll credits are designed to encourage states to increase capital investment in transportation infrastructure and enable states to simplify program administration. The amount of credit earned is based on the amount of toll revenues used to build, improve, or maintain highways, bridges, or tunnels that serve interstate commerce.[15]

The I-10 Corridor does not currently plan to implement tolls on the existing mainline route. However, each state that operates a toll facility can take advantage of toll credits. As a quick definition, toll credits are earned by prior expenditure of nonfederal funds to build interstates. Toll credits from prior toll projects in the I-10 Corridor states may be used as a local match for projects in that state. As an example, Florida has been using toll revenues for state match credits on a statewide basis since 1993. This has effectively increased the federal share of Florida's highway program to nearly 100 percent. Other state revenue sources can now be used to help fund other projects.

Infrastructure Banks are a revolving fund mechanism for financing transportation projects through loans and credit enhancement. State Infrastructure Banks (SIBs) typically provide loan assistance or interest subsidies for eligible projects. Legislation for a National Infrastructure Bank is currently under consideration in Congress, but has not yet been passed.[16]

TIFIA (Transportation Infrastructure Finance and Innovation Act) provides federal credit assistance to the private partners for large-scale projects of regional or national significance and that have some type of dedicated revenue source. TIFIA support can include secured direct loans, loan guarantees, or standby lines of credit. TIFIA may offer more flexible repayment terms and more favorable interest rates than would be available from other lenders. TIFIA credit assistance has many features that make it attractive to private investors, most of which reflect the flexibility and potential long-term nature of the loans and repayment terms.

Section 129(a) loans provide states with a means to recycle federal-aid highway funds by lending them out, obtaining repayments from project revenues, and then reusing the repaid funds on other highway projects. This gives states the opportunity to get more mileage out of the annual apportionments. Once the federal requirements have been satisfied, the repaid federal funds do not have to meet any federal requirements, because federal requirements are not attached to projects advanced with loan repayments. Any federal-aid highway project is a potential candidate for a Section 129(a) loan, so long as the project sponsor pledges revenues from a dedicated source for repayment of the loan. Loans can be up to 80 percent of the project cost, provided that a state has sufficient obligation authority to fund the loan.

Private Activity Bonds are tax-exempt bonds that fund privately developed and operated facilities, including highway facilities. Qualified projects include surface transportation projects eligible under Title 23 that are already receiving federal assistance. These bonds are not subject to the general annual volume

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[15] FHWA's "Innovative Finance Quarterly," Spring 2007, "What's New in Toll Credits."

[16] The AASHTO Journal, Vol. 107, No. 31, August 3, 2007.

cap for private activity bonds for state agencies and other issuers, but are subject to a separate national cap of $15 billion. Passage of Private Activity Bond legislation demonstrates the federal government's desire to increase private sector investment in the nation's highway infrastructure. The legislation requires that at least 95 percent of the net proceeds of bond issues be expended for qualified highways or surface freight transfer facilities within a five-year period from the date of issue. Any surface transportation project which receives Title 23 assistance is qualified to benefit from private activity bonds. Because projects that receive TIFIA credit assistance are Title 23 projects, this means that TIFIA projects are also eligible to receive this tax-exempt bonding authority.[17]

Highways for LIFE is a new program that is intended to provide an additional incentive for more rapid highway construction. The program has a total of $75 million authorized through 2009 for incentive grants to fund up to 15 projects. As of June 2007, only Arizona (out of the eight I-10 Corridor states) had received a Highway for LIFE grant.

III. EXISTING EFFORTS

Although a number of PPP projects can be found in the various I-10 states, only a few are directly related to freight movement in the I-10 Corridor. One of these is the South Bay Expressway, a toll road that opened in November 2007. The expressway links the Otay Mesa border crossing to the regional freeway system and I-10, allowing border traffic to bypass much of the San Diego metropolitan area. The total project cost of $768 million was partially financed with $140 million in TIFIA loans.[18]

IV. POTENTIAL BENEFITS OF PPP IN THE CORRIDOR

This section presents potential benefits from a well-executed PPP. It is importation to remember that quality projects may be enhanced with a PPP approach, unfeasible projects are unlikely to become viable even with a PPP approach, and the private sector will avoid "bad" projects if it bears the risk of failure.

Some key advantages of PPPs for transportation projects are the ability to harness additional financial resources and operating efficiencies from the private sector and to expedite development and preservation of public use infrastructure. Table 2 describes the potential benefits of PPPs for surface transportation projects.

If properly developed and executed, PPP projects offer significant potential benefits to sponsors of transportation infrastructure projects. Table 3 summarizes the potential benefits and risks to the public sponsor and private partner. The table shows the complementary nature of the potential advantages of using PPP approaches, and shows which partner is likely to be most sensitive to the various project risks.

[17] USDOT Federal Highway Administration Public-Private Partnership web site; Private Activity Bonds, http://www.fhwa.dot.gov/ppp/private_activity_bonds.htm.

[18] "PPP Case Studies," http://www.fhwa.dot.gov/ppp/case_studies.htm.

Table 2. Summary of PPP Benefits

Additional Resources and Capacity	Accelerated Project Delivery	Reduced Costs and Increased Efficiency	Transfer of Selected Risks to the Private Sector	Greater Access to Technology and Innovation	Increased Accountability for Performance
Leverage scarce public resources	Consolidate sequential functions through concurrent processing	Increase functional coordination to enhance project delivery efficiency	Transfer project cost, schedule, and quality risks to private sector if it can better manage them	Apply most cost-effective technology to reduce project capital and operating costs	Apply performance-based standards, rather than prescriptive- or quantity-based
Provide ready access to additional staff and specialized expertise on a cost-effective, as-needed basis	Improve coordination and communication among partners with aligned incentives	Accelerate project delivery schedule to reduce potential for increased material costs due to inflation	Public sector retains risks associated with environmental clearance, permitting, and right-of-way acquisition	Use asset management tools to reduce life cycle costs at defined levels of service	Apply performance-based material and workmanship warranties
Expand access to private capital markets for debt and equity to increase capability to more promptly finance projects	Reduce potential for claims and extra work order requests	Apply business best practices from domestic and international industry experts with broad exposure to innovative approaches	Recognize risks for both public and private sectors relating to gaining public, political, and institutional support	Use innovative technology that best serves the public	Apply performance-based standards, requirements, and milestones defined in PPP contract
Conserve limited public debt capacity by using private debt and equity in project financing	Provide monetary incentives for early project delivery or service initiation	Apply lifecycle-asset management principles, (i.e., greater investment up front=savings from more durable facility	Avoid moral hazard risks relating to improper actions or corruption in procurement and performance reporting	Access specialized expertise and technical tools	Apply performance-based incentives based on project completion schedule and cost, or project traffic and revenues

Table 3. Potential Benefits and Risks of PPP Approaches by Partner

Potential Benefits to Public Sponsor	Potential Risks to Public Sponsor
• Reduced financial constraints/increased financial capacity • Expedited project initiation and faster delivery • Access to innovative techniques and specialized expertise • Integration of project development and delivery with life cycle cost incentives • Greater choices in project approaches • Increased competition and accountability • Risk transfer to entity better able to manage	• Transaction/administrative costs to procure and monitor PPPs • Taxation constraints • Moral hazard • Control over transportation assets and toll rates • Public acceptance • Compensation and termination clauses • Environmental/archeological clearance • Permitting costs • Right-of-way costs
Potential Benefits to Private Partner	**Potential Risks to Private Partner**
• Higher rate of return compared to conventional project delivery approach • Greater control over assets/operation/user fees • Lower life cycle costs • Increased revenues from financial transactions • Opportunity to apply best practices and new technology to increase productivity and meet performance standards at lowest life cycle costs • Opportunity for value capture from direct users and indirect beneficiaries	• Change in law • Economic shifts • Public acceptance/protectionism • Currency/foreign exchange • Political support/stability • Moral hazard • Project development/maintenance costs • Project delivery schedule • Financial feasibility/traffic and revenue levels • Liability for latent defects • Prohibition against noncompete clauses • Compensation/termination clauses • Transparency requirements

V. POTENTIAL OBSTACLES AND CHALLENGES TO PPP IN THE CORRIDOR

A. Critical success factors

In developing PPP programs and applying PPP approaches to transportation projects, the following factors listed in priority order are critical to the success of the resulting projects:

1. *Public and market support for the project and the proposed delivery approach based on demonstrated transportation needs*
2. *Political support from elected officials, including one or more project champions*
3. *Legal authority through established statutes that permit the application of PPPs to transportation projects*
4. *Institutional cooperation from sponsoring agencies lacking the resources (staff, technical, financial) to deliver large or complex projects in a timely manner*
5. *Adequate funding potential from tolls, availability payments, or economic development*
6. *Competitive private sector resources with a level playing field for bidding teams*
7. *Strong partner relationships during contract term based on competence and trust among the members of a PPP*

Many of these are very project-specific (e.g., adequate funding potential). The risks associated with these are not unique to the I-10 Corridor. Two issues are very relevant to the I-10 Corridor. The first issue is political support. The I-10 Corridor exists as a cooperative effort among the 10 states. In entering their agreement, the states do recognize that each will do its part to advance the whole. However, if one state or region has great success with a certain approach, it is possible that political support may shift, and the expectations of others within the corridor may change. The second issue is that the Corridors of the Future program is specifically looking for alternative financing methods. The FHWA is expected to strongly encourage the eight states to look at this approach for financing some of the projects within the corridor. If so, those that have the ability to move forward quickly may see some key projects focused in their regions first.

More specifically, the following key ingredients represent public sector guides toward creating a successful PPP project implementation:

1. *Determine the relative scope and feasibility of the project early on*
2. *Identify a public champion to steer the project from start to completion*
3. *Understand the capabilities of the public sponsor to accomplish the project in a timely manner and the potential advantages of a PPP arrangement*
4. *Involve private sector partners in project conceptualization as soon as possible to gain maximum advantage of their insights and suggestions*
5. *Collaborate and communicate among public and private sector stakeholders from the start of project development and throughout the project*
6. *Enable each party in the PPP to be responsible for those functions it is best able to perform, resulting in the most cost-effective balance between public*

and private sector responsibilities, risks, and rewards

7. *Institute an open, transparent, and fair process to solicit and evaluate PPP proposals from private providers to ensure equal opportunity for all interested bidders and select on the basis of best life cycle value*

8. *Look for receptive partners eager to build a successful long-term partnership with compatible project objectives that reinforce each other*

9. *Apply a flexible project delivery approach, recognizing that all projects are unique and may require unique approaches; focus on performance outcomes/benefits of the project – not the just the procedures*

10. *Ensure that all project risks are understood by all; also ensure that risk mitigation and identification of which party is responsible for such mitigation is clearly understood*

11. *Enable private sector partner(s) to make a reasonable return on their investment – no profit potential means no private capital will be put to risk*

12. *Have each party scrutinize the financial elements of any proposal and subsequent contract, including risk factors and responsibility for addressing financial project risks, approaches to be used for cost management, and performance monitoring and reporting methods and responsibilities*

13. *Keep PPP projects moving forward by having both public and private participants promptly work out issues and problems as partners, with the common goal of successful project completion*

14. *Hold all parties to the PPP accountable for the terms of the contract agreement, while providing flexibility to accommodate changes in site conditions and project scope, and enabling technology for better performance results*

15. *Institute an ongoing project performance monitoring and reporting process to ensure project accountability by both public and private partners*

Again, most of these issues are project specific and are not unique to the I-10 Corridor. The exception may be that each contracting agency or authority must pay attention to where their responsibilities end. In particular, no state or region should be able to bind the corridor as a whole to any agreement without the full agreement of all eight states. It is easy when applying the "I-10 National Freight Corridor" label to projects to potentially incorrectly reference the true role of the corridor coalition.

B. Risks and threats to successful completion

Various risks to consider that can impact the cost and feasibility, as well as the revenue potential and financial feasibility of a PPP and its ultimate success, are described below. One of the features of a PPP is the ability to allocate project risks to the partner best able to manage and mitigate these risks. All participants in a PPP should understand these risks and how they can affect a proposed project. All PPPs carry additional risks in a wide variety of areas. The following list represents the greatest potential risks to a PPP arrangement in the I-10 Corridor:

Public Acceptance: Perhaps the greatest risk to a proposed PPP project is the degree of public acceptance of the project. Greater public acceptance and political support reduces the risk of project development failure or default following completion.

Control of Assets: Concerns have been expressed over the perceived loss of control over transportation infrastructure assets. This risk needs to be addressed early in the PPP process.

Protectionism: An emerging factor in the United States is the nationality of the firms comprising the PPP provider team, especially the lead project development firm and financing companies. This may result in legislative efforts to limit foreign involvement in certain types of PPP projects, or political and public grassroots efforts to oppose PPP projects with significant and highly visible foreign involvement and control.

Political Stability/Support: Continuity of political support for a PPP project is essential to successful development and implementation. Changes in the political structure or composition in an area can significantly impact the success potential of a PPP project, particularly if the status of the project becomes a major issue in a political campaign.

Moral Hazard: It is imperative that the public sponsor maintain complete integrity and transparency throughout the life of the PPP to avoid both the appearance and the reality of conflicts of interest and fraudulent activities. A lapse in one PPP project can negatively impact the potential for the success of that project as well as in other projects in the region and the nation where PPP approaches are novel. The appearance or actuality of distrustful operation of a project will likely result in greater scrutiny and doubt, not only for that project, but for others that follow in its footsteps.

Revenue: The timing of proceeds from tolls, concession, and other nontoll revenues such as advertising, can pose risks to the viability of the project.

Maintenance Costs: For PPP contracts including operations and maintenance, the cost of maintenance and repair activities that may be impacted by the quality of the design and construction, changes in traffic volumes, the weight limits of vehicles using the facility, geological conditions, and adequacy and condition of drainage structures need to be taken into consideration.

Regulatory/Contractual Risks: Address changes in laws, regulations, or contract provisions that impact the cost exposure of one or more of the partners and their responsibility for their costs.

I-10 National Freight Corridor ITS Architecture

Prepared for the National I-10 Freight Corridor Coalition

by

Wilbur Smith Associates

January 2008

1. Introduction

1.1 Background

Rapid advances in technology have created many new opportunities for transportation professionals to deliver safer and more efficient transportation services, and to respond proactively to increasing demand for transportation services in many areas and mounting customer expectations; however, many of these new opportunities are predicated upon effective coordination between organizations at both an institutional and technical level.

To encourage this coordination, USDOT has developed the National ITS Architecture and related tools to help identify and exploit these opportunities for cost-effective cooperation.

In 1997, Congress passed the Transportation Equity Act for the 21st century (TEA-21) to address the need to begin to work toward regionally integrated transportation systems. In January 2001, FHWA published Rule 23 CFR 940 and FTA published a companion policy to implement section 5206(e) of TEA-21. This rule/policy seeks to foster regional integration by requiring that all ITS projects funded from the Highway Trust Fund be in conformance with the National ITS Architecture and appropriate standards.

"Conformance with the National ITS Architecture" is defined in the final rule/policy as using the National ITS Architecture to develop a "regional ITS architecture" that would be tailored to address the local situation and ITS investment needs, and the subsequent adherence of ITS projects to the regional ITS architecture.

FHWA Rule 23 CFR 940.9 Regional ITS Architecture states, in part:

> "(a) A regional ITS architecture shall be developed to guide the development of ITS projects and programs and be consistent with ITS strategies and projects contained in applicable transportation plans. The National ITS Architecture shall be used as a resource in the development of the regional ITS architecture. The regional ITS architecture shall be on a scale commensurate with the scope of ITS investment in the region. Provision should be made to include participation from the following agencies, as appropriate, in the development of the regional ITS architecture: highway agencies; public safety agencies (e.g., police, fire, emergency/medical); transit operators; federal lands agencies; state motor carrier agencies; and other operating agencies necessary to fully address regional ITS integration.
>
> (b) Any region that is currently implementing ITS projects shall have a regional ITS architecture by April 8, 2005."

This report makes frequent references to the National ITS Architecture as provided by the FHWA. This reference document can be found on the Internet at: http://www.its.dot.gov/arch/arch.htm.

1.1.1 I-10 Corridor Architecture Background

The I-10 Corridor spans across eight states and 16 major cities along the southern boundary of the United States. The entire I-10 Corridor is more than 2,400 miles with approximately 700 miles traversing through urban areas. Currently, the average daily traffic throughout the entire corridor is more than 41,000 with a maximum of more than 300,000. Average daily truck traffic is more than 8,000 with a maximum of more than 55,000. Among the 700-mile urban segments, more than 53 percent are currently under heavy congestion. Considering the vast nature of the overall corridor transportation system, it is critical to ensure seamless communication between ITS systems along the corridor so the end user gets beneficial services irrespective of the stretch of the corridor one is traveling through.

The I-10 Corridor Architecture will provide a conceptual information exchange framework for multistate coordination and communication to deploy and leverage ITS infrastructure along the corridor. Statewide, regional, and local ITS architectures exist for individual jurisdictions along the I-10 Corridor, but there is a need to address the ITS architecture from a corridor perspective including developing a conceptual framework for corridor-specific ITS systems services.

To leverage previous work along the corridor as well as other statewide and local ITS architectures along the corridor, significant input was derived from these architectures and stakeholder interaction.

1.1.2 ITS Architecture Time Frame

Regional ITS architecture is an evolving document guiding efficient integration of ITS systems over time. For purposes of this activity, a five-year timeframe is selected. A five-year horizon is long enough to include most of the system integration opportunities that can be clearly anticipated by the region's stakeholders per plans and needs identified currently. Although a five-year timeframe helps define architecture vision, it is extremely important to understand that an architecture document is a living document, in need of periodic update corresponding to ITS deployment growth in the corridor.

The ITS architecture time frame will need to be adjusted as necessary to match the vision of the stakeholders. It shall not be used to unnecessarily constrain the stakeholders to near-term options, since it is difficult to anticipate exactly when a well-supported idea will be implemented. Viable integration opportunities should be included in the regional ITS architecture and then reevaluated periodically as the architecture is maintained over time.

1.2 Purpose of Report

This document will serve as the "Corridor ITS Architecture" for the I-10 Freight Corridor, which includes the I-10 freeway corridor passing through 10 different states. As such, it is intended to ensure that ITS technologies are deployed in manner that will allow for communication, interoperability, and compatibility among systems and entities operated by different states along the I-10 Corridor. The terminology "ITS Architecture" comes from the United States Department of Transportation (USDOT) that has set forth a framework for how ITS should be planned and deployed across the nation. This framework allows each agency to design and develop its own systems (freeway management, commercial vehicle operations, etc.) with an understanding of the data structure needed to support a corridorwide effort to share data.

The I-10 Corridor ITS Architecture is being developed in accordance with Version 5.1 of the National ITS

Architecture. Version 5.1 was released in October 2005 in response to the need to improve coverage of transportation security in the National ITS Architecture. Development of the corridor architecture is using Version 3.1 of FHWA's Turbo Architecture tool. This software package was released in May 2004.

Significant input to the architecture development process was provided by the regional/statewide architecture documents developed by several states along the I-10 Corridor, which identified regional stakeholders, existing ITS assets, and planned ITS-related projects along the corridor. The resulting corridor ITS architecture will provide a basic ITS architecture to support further discussions with other stakeholders, as the architecture continues to grow and evolve in the future.

In order to comply with 23 CFR 940, the I-10 Corridor ITS Architecture report addresses the following topics:

1. Architecture Scope and Region Description
2. Stakeholder Identification
3. System Inventory
4. Needs and Services
5. Operational Concept
6. Interfaces/Information Flows
7. Maintenance Plan
8. Potential Agreements
9. Standards Identification
10. Implementation Strategy

1.3 Report Structure

The I-10 Corridor ITS Architecture report is organized into seven key sections:

- ***Section 1 – Introduction***

  This section provides an overview of the project background and purpose of this report. Abbreviations and ITS terms used in the report are also listed.

- ***Section 2 – Regional Overview***

  This section includes a geographic overview of the region, identifies stakeholders in the region, and provides an inventory of existing ITS assets in the region.

- ***Section 3 – Corridor Transportation Needs***

  This section provides a summary of the transportation needs and services in the region, identifies planned ITS systems, and lists ITS market packages relevant to the region's needs.

- ***Section 4 – Regional Architecture***

  This section summarizes the tasks undertaken to develop the corridor ITS architecture. An appendix provides interconnect and interface diagrams for the regional ITS architecture.

- ***Section 5 – Operational Concepts***

  An operational concept has been prepared that discusses the key functions and services of the envisioned ITS for the region. As part of this concept, operational scenarios are described and roles and responsibilities of stakeholders are discussed. Potential agreements that could be required to support integration and information

sharing are described, as well as functional requirements.

- *Section 6 – Architecture Maintenance Plan*

  This section provides some background on the need for architecture maintenance and addresses key issues for the successful maintenance of a regional architecture.

The I-10 Corridor ITS Architecture report also contains two appendices:

- *Appendix A – Customized Market Packages*
- *Appendix B – Context Interface Diagrams from Turbo Architecture*

1.4 ITS Architecture Abbreviations and Terms

The National ITS Architecture and Turbo Architecture use a variety of abbreviations and terms to describe the many components and relationships represented by the architecture. Some of the abbreviations and terms are listed in tables 1 and 2, respectively. The abbreviations shown include those specific to the various I-10 Corridor jurisdictions.

Table 1. List of Abbreviations

Abbreviation	Meaning
AASHTO	American Association of State Highway and Transportation Officials
ASTM	American Society for Testing and Materials
ATMS	Advanced Traffic Management System
AVL	Automatic Vehicle Location
CCTV	Closed-Circuit Television
CMS	Changeable Message Sign
CRPC	Capital Region Planning Commission
CVO	Commercial Vehicle Operations
DOC	District Operations Center
EIA	Electronic Industries Association
ECC	Emergency Communications Center
EOC	Emergency Operations Center
EOP	Emergency Operations and Preparedness
EV	Emergency Vehicle
FHWA	Federal Highway Administration
HAR	Highway Advisory Radio
HAZMA	Hazardous Materials
I/F	Interface
ISP	Information Service Provider
ITE	Institute of Transportation Engineers
ITS	Intelligent Transportation System
MCM	Maintenance and Construction Management
MCV	Maintenance and Construction Vehicle
MOU	Memorandum of Understanding
MPO	Metropolitan Planning Organization
NEMA	National Electrical Manufacturers Association
NOAA	National Oceanic and Atmospheric Administration
NTCIP	National Transportation Communications for ITS Protocol
RTA	Regional Transportation Authority
RWIS	Road Weather Information System
SAE	Society of Automotive Engineers
SDO	Standards Development Organization
STC	Smart Traffic Center
TCIP	Transit Communication Interface Protocol
TEA-21	Transportation Equity Act for the 21st Century
TEOC	Transportation Emergency Operations Center
TM	Traffic Management
TOC	Traffic Operations Center
USDOT	United States Department of Transportation
USGS	United States Geological Survey

Table 2. ITS Architecture Terms

Term	Definition
Stakeholders	Anyone who is influenced or has influence on the transportation system in the region.
Terminators	Represent the people, agencies, systems, and general environment that the architecture serves. Seen as the boundary points for the architecture; everything in the architecture either starts or ends at a terminator.
User Services	Represent what the ITS system should do from a user's perspective. The entry point into the architecture from stakeholder needs. There are currently 33 user services defined by the National ITS Architecture.
Flow	The exchange of information from one system or group to another system or group.
Equipment Package	Groups of similar processes or systems that are put together in an implementable package. The National ITS Architecture currently defines 198 equipment packages.
Market Package	Combinations of equipment packages that are used to provide a defined service. The National ITS Architecture currently defines 85 market packages.
Layers	The National ITS Architecture defines three "layers" in the architecture: institutional, communication, and transportation.
Institutional Layer	This layer represents the existing and emerging institutional constraints and arrangements that will govern the deployment of ITS in the region. "Flows" in the institutional layer are referred to as "information flows."
Communication Layer	The communication layer includes all communication equipment, media, and related information needed for the transfer of information among devices, systems, stakeholders, etc.
Transportation Layer	This layer defines the operational relationships between devices, systems, and users.
Architecture	A framework within which a system can be built. The National Architecture is represented by two architectures (physical and logical).
Physical Architecture	High-level physical representation of the architecture, its major components, and flows. The major purpose of this architecture is to allow users to quickly understand the overall functionality of the ITS system.
Logical Architecture	The portion of an ITS architecture that defines what functions should be performed by the ITS system, and the relationships between those systems. This architecture goes into more detail regarding the linkages between the system components and interactions.

2. Regional Overview

This section describes the geographic region, identifies the stakeholders in the region, and lists all existing and planned ITS systems. It concludes with an identification of National ITS Architecture subsystems and terminators that relate to the identified regional systems.

Figure 1. National I-10 Freight Corridor

Documentation of the system inventory is an essential initial task in the development of a regional ITS architecture for several reasons:

- *It provides a baseline of existing and planned ITS projects and systems in the region*
- *It outlines which agencies are currently deploying and operating ITS, as well as those planning to implement ITS programs*
- *It provides a foundation to identify needed elements or agency participation for a 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*

2.1 Geographic Overview

The region for which this ITS architecture is being developed corresponds to the I-10 freeway corridor spanning across several states along the southern boundary of the United States. The representation of the region is illustrated in Figure 1.

2.1.1 General Description of the Corridor

As part of its prior work on the National I-10 Freight Corridor Study, the Wilbur Smith Associates team has developed a technical memorandum describing the corridor definition and all the transportation facilities in the corridor (the 'Corridor Definition' document can be accessed at

http://www.i10freightstudy.org/assets/Technical%20 Memorandum%201.pdf). The I-10 Corridor focuses on all elements of freight transportation, including roadways, ports, airports, railroads, and intermodal facilities along the I-10 Corridor.

2.1.2 Initial Service Scope

While specific identification of ITS services occurs later in the process, it is anticipated that operational responsibilities along the I-10 Corridor are, or will be, supported by the application of ITS technologies including:

- *Traffic Control and Management*
- *Commercial Vehicle Operations*

- ***Incident Management***
- ***Emergency Management***
- ***Traveler Information***
- ***Intermodal Facilities***

2.2 Regional Stakeholders

The development of any ITS architecture is driven by a variety of different stakeholders and their roles/responsibilities in planning, operations, and maintenance of ITS facilities. To facilitate the development of the I-10 Corridor architecture, this section organizes a variety of stakeholders into functional groups as depicted in Table 3. All of the information regarding stakeholders and transportation inventory items was developed based on review of various regional and statewide architectures developed for states along the corridor. Additionally, the I-10 Corridor group representatives for each state provided valuable input via periodic meetings and teleconferences; state representatives were divided into two groups – gulf states (Texas, Louisiana, Alabama, Mississippi, and Florida), and border states (California, Arizona, New Mexico, and Texas).

The success of the ITS architecture depends on participation by a diverse set of stakeholders. Stakeholders in the I-10 Corridor are listed in Table 3, with a summary of their roles and responsibilities.

Many of the represented states already have statewide or regional ITS architectures developed which focus on an individual state or a major metropolitan area along the corridor; however, the purpose of this "corridor architecture" is to provide a perspective from the corridor level. The corridor architecture presented will serve as a framework for information exchange to facilitate corridor operations to the extent that only corridor-specific elements or operations most relevant to corridorwide operations will be considered in detail. For focused information about any specific state or region, please refer to the appropriate regional or statewide architecture document. To limit complexity, all the stakeholder agencies have been grouped under a generic stakeholder group consistent with their operational responsibilities. Such functional grouping will reduce the complexity of the architecture document making it easy to follow and use.

Table 3.

Stakeholder (or Group) Name	Role and Responsibility
State Departments of Transportation (DOTs) District Offices	• Planning, construction, operations, and maintenance of the state transportation elements (interstate facilities, primary and secondary routes) in the portion of the corridor within each state's boundaries • Coordinating construction, operations, and maintenance with adjoining states • Coordination with adjacent districts for traffic management operations and evacuation planning
State Departments of Transportation (DOTs) Central Offices	• Operation of Statewide TMC, 511 system, etc.
State DOT ITS Divisions	• Transportation data collection elements, data management, and distribution • 511 info center management and operations • Any and all transportation technology elements
State DOT Planning Divisions	• Transportation infrastructure as well as technology deployment planning
State DOT, Traffic Services, and Traffic Engineering	• Incident detection and response • Reporting and logging incidents • TMC operations • Signal systems operations, etc.
State Motor Carrier Regulatory Agencies	• Communicate to other states regarding regulatory and enforcement matters • Communicate to federal regulatory agencies
State Departments of Emergency Preparedness and Response	• Regional and statewide evacuation planning and management • Planning and managing emergency statewide response to disasters
State Environment Agencies	• Enforce environmental regulations • Communicate with other agencies regarding compliance with and violations of environmental regulations
State Police Agencies	• Operation of state police centers in respective states, including operation of computer-aided dispatch databases; collection of incident and emergency detection data; and dispatch, response, and status information related to the state police agency officers, vehicles, and equipment
University Transportation Research Centers	• Conducting research on transportation technology • Providing training and continuing education • Technology transfer and problem-solving services for system users
Tourism and Travel Service	• Communicate traffic and other information to service users

Table 3.

Stakeholder (or Group) Name	Role and Responsibility
Tourism and Travel Service Information Providers	• Communicate traffic and other information to service users • Transmit any appropriate information to local DOT district
Toll Road Agencies and Operators	• Provide traffic and toll, construction, and Incident Information • Communicate with state enforcement and other government agencies
Metropolitan Planning Organizations (MPOs)	• Regional coordination and prioritization of transportation and land use planning efforts
Port and Airport Districts	• Operation of field devices, parking management, emergency parking, and traffic management within facilities • Coordination with district offices regarding freight, load, and other data
City/Local Traffic Management agencies	• Operation of local municipality field devices, including traffic signal systems and parking systems
Local Media	• Communicate traffic and other information • Transmit emergency information
County/Parish and Local Police and Public Safety Agencies	• Operation of local police, fire, and EMS offices and vehicles
Archived Data Users	This stakeholder group includes all the local, county, and state agencies along the I-10 Corridor using the archived data from variety of transportation systems for analysis, planning, research, and deployments, etc. Some examples could include use of freeway traffic data for travel time and/or incident detection algorithms.
City/County Emergency Management Services	This stakeholder group includes all major city/county emergency management services involved in providing incident response services along the corridor.
City/County Police	City/county public safety agencies.
City/County Public Safety Agencies	This stakeholder group includes city/county public safety agencies involved in public safety activities along the corridor.
City/County Traffic Management Centers	This stakeholder group includes city/county TMCs involved in planning, monitoring, and operations of ITS elements along or in the immediate vicinity of the corridor.
Commercial Vehicle Operators	This stakeholder group includes all private freight/commercial vehicle operators operating along the I-10 Corridor.
County/City Department of Transportation	DOTs of major counties/cities along the corridor involved in planning and operations of transportation elements along and/or in the immediate vicinity of the corridors.
HAZMAT Regulatory Agencies	This stakeholder group includes all the regulatory agencies involved in regulating and enforcement of hazardous material transportation.
I-10 Corridor Task Force	This stakeholder group involves a joint committee represented by all states to ensure appropriate communications and coordination for smooth operations along the I-10 Corridor. This stakeholder group will oversee any elements designed to facilitate data/information.

Table 3.

Stakeholder (or Group) Name	Role and Responsibility
Media	This stakeholder group includes all local media resources involved in distribution of transportation (traffic, emergency, etc.) information to the drivers.
Port Operations	This stakeholder group includes all the agencies involved in port operations along the corridor in applicable regions.
Information Service Providers	This stakeholder group includes private sector traveler information service providers involved in traveler information distribution along the corridor.
Private Towing or Wrecker Services	This stakeholder group involves private towing or wrecker services involved in incident response along the I-10 Corridor.
Regional 511 Operators	This stakeholder group includes all the regional 511 operators in states along the corridor. The primary examples include one-call system in Florida or local lead 511 operators in states operating 511 or similar traveler information systems.
Regional MPOs	This stakeholder group includes regional Metropolitan Planning Organizations involved in long- and short-range planning of the transportation facilities in the corridor. MPOs are also usually involved in maintaining and enforcing the regional ITS architectures.
Travelers	This stakeholder group includes travelers using the I-10 freeway corridor.
U.S. Customs and Border Protection Agencies	This stakeholder group represents the customs and border security efforts in the bordering states.

2.3 Regional ITS Systems

As part of its prior work on the National I-10 Freight Corridor Study, the Wilbur Smith Associates team has developed a technical memorandum describing existing and planned ITS technologies along the corridor.

Existing, planned, and future systems in the I-10 Corridor were identified in the following categories:

- *Travel and Traffic Management – includes state and local traffic operations centers, traffic signal systems, detection systems, closed-circuit television (CCTV), fixed and portable changeable message signs, signal preemption, and other related technologies*
- *Public Transportation Management – includes transit AVL, dial-a-ride automated dispatch, and kiosk transit information systems*
- *Electronic Payment – includes toll tags (Smart Tag/E-ZPass) and electronic fare cards for transit and parking*
- *Commercial Vehicle Operations – includes weigh-in-motion and on-board monitoring systems*
- *Emergency Management – includes dispatch for police, fire, rescue, emergency operations/ management centers, and motorist assistance vehicles*
- *Information Management – includes electronic data management and archiving systems*
- *Maintenance and Construction Operations – includes maintenance vehicle tracking systems*

2.4 Corridor ITS Inventory

The Corridor ITS inventory is presented in terms of:

- *stakeholders*
- *physical elements*
- *ITS entities (subsystems/terminators)*

The meaning of ITS subsystems and terminators is discussed in the following section of this document. The inventory is then listed, first sorted by stakeholder name and then by ITS entity.

2.4.1 Regional ITS Subsystems and Terminators

Each identified system or component in the I-10 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*
- *vehicles*
- *field*
- *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. The 22 National ITS Architecture subsystems are shown as rectangles in Figure 2, within the four previously listed major classes. The most recent subsystem to be added the National ITS Architecture was security monitoring, which was incorporated in the October 2003 architecture update.

Figure 2, also known as the "sausage diagram," is a standard interconnect diagram, showing the relationships of the various subsystems within the architecture. Communication functions between the subsystems are represented in the ovals. It should be noted that "wire line" 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.

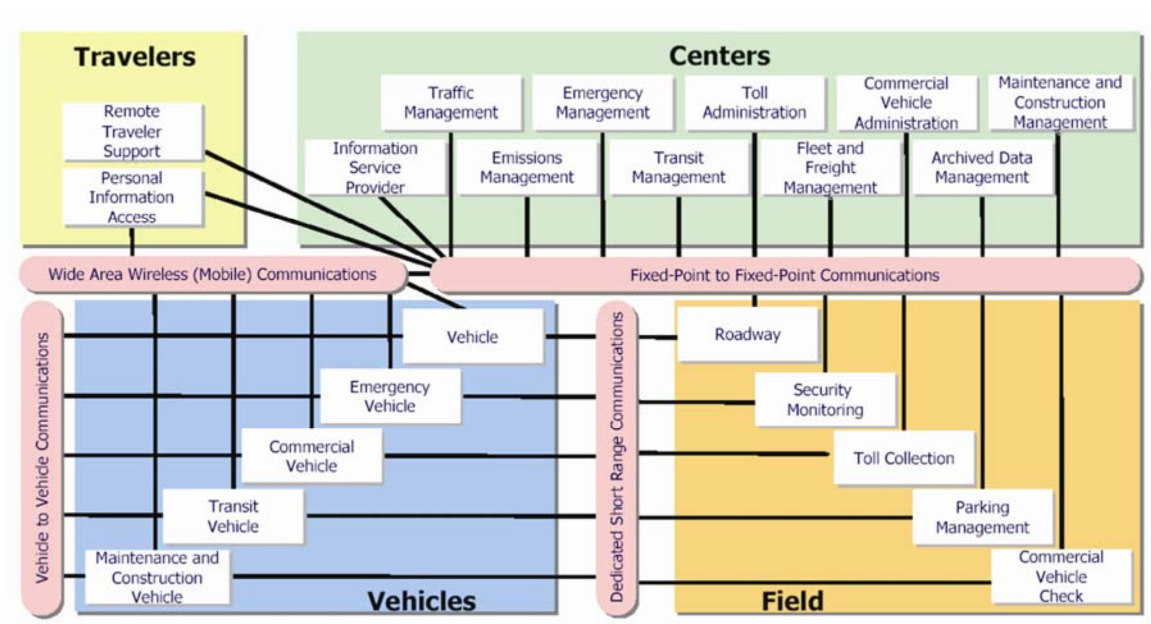
National ITS Architecture, as well as a regional system. Examples of terminators include drivers, traffic operations personnel, information service providers, weather effects (snow, rain, fog), telecommunications systems, and government reporting systems, among others.

A customized interconnect diagram for the corridor is included.

2.4.2 Corridor ITS Inventory by Stakeholder

Each stakeholder is associated with one or more systems or elements (subsystems and terminators) that make up the transportation/ITS system/facility in the I-10 Corridor. Appendix A provides a detailed

Figure 2. National ITS Architecture, Physical Subsystem Interconnect Diagram



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

inventory report developed using Turbo Architecture software. It is important to note that only elements that affect corridorwide operations and contribute to corridor information exchange framework are considered under this architecture.

3. Corridor Transportation Needs

This section provides a summary of the transportation needs of the corridor as identified in discussions with the stakeholder representatives and by review of documents (regional as well as statewide ITS architectures, TIP/STIP planning documents, etc.) provided by the stakeholder group. This section focuses on ITS-related needs to provide input to subsequent activities leading to development of a regional ITS architecture. It focuses on summarizing the transportation needs that may be impacted or addressed to a degree by the application of ITS architecture requirements.

This section presents the transportation needs in two main headings:

- ***Identified ITS Needs***
- ***Identification of Regional Market Packages***

3.1 Identified Regional Needs

ITS needs for the I-10 Corridor have been identified through discussions and review of materials provided by the coalition stakeholder group:

- ***State/regional ITS architecture documents provided by all the coalition states***
- ***National I-10 Freight Corridor Study Final Report, February 2002***

As a result of stakeholder input and the review of materials listed earlier, ITS needs in the I-10 Corridor have been updated and are summarized and categorized into functional areas in Table 4. Needs shown in Table 4 are not listed in order of priority or ranking.

These needs, along with existing and planned ITS systems and components, form the basis for the development of a corridor ITS architecture for the I-10 Corridor.

Table 4. I-10 Corridor Transportation/ITS Needs

Institutional Issues/Needs
• Need to identify keeper/manager of the corridor ITS architecture (IN-1) • Need to develop and use a checklist for ITS project deployments by regional/state agencies to cover its relevance and compliance with the corridor architecture (IN-2) • Need to coordinate between several regional/state agencies to resolve transportation issues (IN-3) • Need to develop memoranda of understanding for sharing data and agency roles (IN-4) • Need to develop common ITS planning objectives to better coordinate ITS efforts along the corridor (IN-5) • Need improved coordination between traffic management agencies and emergency response agencies for evacuation, traffic data exchange, and traveler information purposes (IN-6) • Need for a corridorwide information exchange clearinghouse for effective communication between all the corridor agencies; this may be a database called I-10 Gateway (IN-7)
Travel and Traffic Management Needs
• Need for a centralized traffic management system for any specific part of the corridor that is not covered by any of the existing regional or statewide TMC (TTM-1) • Need for enhanced traffic detectors, environmental sensors, and expanded data collection network for traveler information, transportation planning, and operations along the corridor (TTM-2) • Need for a corridorwide clearinghouse for transportation data management (traffic data, CCTV, CMS, incident management, etc.) (TTM-3) • Need interconnected, coordinated signal systems and interagency signal system coordination for traffic control in major cities and towns (TTM-4) • Need CCTV video coverage of I-10 Corridor, primary roadways (TTM-5) • Need CCTV video coverage for major structures like bridges, tunnels, etc. along I-10 Corridor for safety and homeland security purposes (TTM-6) • Need expanded use of CMS signs for traveler information on I-10, primary routes, and other strategic locations (TTM-7) • Need for automated incident detection and management system for I-10 and primary routes (TTM-8) • Need for incident response coordination (TTM-9) • Need incident management interagency notification for traffic control (TTM-10) • Need subscription e-mail alerts for incident/travel information (TTM-11) • Need for congestion management strategies (TTM-12)
Public Transportation Management Needs
• Need for coordination with regional transit agencies to facilitate major evacuation efforts (PT-1)

Table 4. I-10 Corridor Transportation/ITS Needs

Commercial Vehicle Operations Needs

- Need overweight vehicle detection systems in CBD areas (CV-1)
- Need for weigh-in-motion systems along the corridor (CV-2)
- Need for electronic verification and regulatory check systems for commercial vehicles (CV-3)
- Need for electronic clearance systems at the border crossing sections and ports (CV-4)
- Need for automated message alerts about incidents along the corridor and potential impacts on commercial vehicle travel (CV-5)
- Need for corridorwide electronic toll payment solution (CV-6)

Emergency Management Needs

- Need for communications infrastructure across state jurisdictions for emergency response coordination (EM-1)
- Need for Wi-Fi spots along I-10 for emergency response data transfer (EM-2)
- Need for emergency vehicles preemption system in CBD areas (EM-3)
- Need interoperable communications between local police/fire/rescue along the corridor (EM-4)
- Need for coordination between regional emergency response agencies (EM-5)
- Need for evacuation plans for separate stretches of the corridor (EM-6)

Information Management Needs

- Need for corridorwide clearinghouse for transportation data management (traffic data, CCTV, CMS, incident management, etc.) (IM-1)
- Need for seamless information exchange across the corridor (IM-2)

Maintenance and Construction Operations Needs

- Need media coverage of road closure plans (MC-1)
- Need real time vehicle tracking and conditions reporting systems (MC-2)
- Need smart ITS work zones for long-term construction projects (MC-3)

3.2 Identification of Regional Market Packages

Market packages represent slices of the physical architecture that address specific services like surface street control. A market package collects together several different subsystems, equipment packages, terminators, and architecture flows that provide the desired service. The National ITS Architecture provides a menu of 85 different market packages bundled in eight user service bundles; Table 5 depicts all the market packages.

Based on the ITS needs and the existing/planned ITS systems, the following market packages were selected for the I-10 Corridor ITS architecture:

Table 5. Selected I-10 Corridor ITS Market Packages

MP ID	Market Package Name		MP ID	Market Package Name	
Archived Data Management			**Traffic Management**		
AD1	ITS Data Mart	●	ATMS01	Network Surveillance	●
AD2	ITS Data Warehouse	●	ATMS02	Probe Surveillance	●
AD3	ITS Virtual Data Warehouse	●	ATMS03	Surface Street Control	●
Public Transportation			ATMS04	Freeway Control	●
APTS1	Transit Vehicle Tracking		ATMS05	HOV Lane Management	●
APTS2	Transit Fixed-Route Operations		ATMS06	Traffic Information Dissemination	●
APTS3	Demand Response Transit Operations	●	ATMS07	Regional Traffic Control	●
APTS4	Transit Passenger and Fare Management		ATMS08	Traffic Incident Management System	●
APTS5	Transit Security		ATMS09	Traffic Forecast and Demand Management	●
APTS6	Transit Maintenance		ATMS10	Electronic Toll Collection	●
APTS7	Multimodal Coordination		ATMS11	Emissions Monitoring and Management	●
APTS8	Transit Traveler Information		ATMS12	Virtual TMC and Smart Probe Data	●
Traveler Information			ATMS13	Standard Railroad Grade Crossing	●
ATIS1	Broadcast Traveler Information		ATMS14	Advanced Railroad Grade Crossing	●
ATIS2	Interactive Traveler Information		ATMS15	Railroad Operations Coordination	●
ATIS3	Autonomous Route Guidance		ATMS16	Parking Facility Management	●
ATIS4	Dynamic Route Guidance		ATMS17	Regional Parking Management	●
ATIS5	ISP-Based Route Guidance		ATMS18	Reversible Lane Management	●
ATIS6	Integrated Transportation Management/Route Guidance		ATMS19	Speed Monitoring	●
ATIS7	Yellow Pages and Reservation		ATMS20	Drawbridge Management	●
ATIS8	Dynamic Ridesharing		ATMS21	Roadway Closure Management	●
ATIS9	In-Vehicle Signing				

Table 5. Selected I-10 Corridor ITS Market Packages

Vehicle Safety			**Emergency Management**		
AVSS01-AVSS11	None Selected for Corridor Architecture		EM01	Emergency Call-Taking and Dispatch	●
			EM02	Emergency Routing	●
Commercial Vehicle Operations			EM03	Mayday Support	●
CVO01	Fleet Administration	●	EM04	Roadway Service Patrols	●
CVO02	Freight Administration	●	EM05	Transportation Infrastructure Protection	●
CVO03	Electronic Clearance	●	EM06	Wide-Area Alert	●
CVO04	CV Administrative Processes	●	EM07	Early Warning System	●
CVO05	International Border Electronic Clearance	●	EM08	Disaster Response and Recovery	●
CVO06	Weigh-In-Motion	●	EM09	Evacuation and Reentry Management	●
CVO07	Roadside CVO Safety	●	EM10	Disaster Traveler Information	●
CVO08	On-Board CVO and Freight Safety and Security	●	**Maintenance and Construction Management**		
CVO09	CVO Fleet Maintenance	●	MC01	Maintenance and Construction Vehicle and Equipment Tracking	●
CVO10	HAZMAT Management	●	MC02	Maintenance and Construction Vehicle Maintenance	●
CVO11	Roadside HAZMAT Security Detection and Mitigation	●	MC03	Road Weather Data Collection	●
CVO12	CV Driver Security Authentication	●	MC04	Weather Information Processing and Distribution	●
CVO13	Freight Assignment Tracking	●	MC05	Roadway Automated Treatment	●
			MC06	Winter Maintenance	●
			MC07	Roadway Maintenance and Construction	●
			MC08	Work Zone Management	●
			MC09	Work Zone Safety Monitoring	●
			MC10	Maintenance and Construction Activity Coordination	●

4. Regional Architecture

This section summarizes the tasks undertaken to develop the I-10 Corridor ITS architecture. A strawman architecture was developed and presented to the stakeholder group in a meeting to arrive at the material presented in this document. The architecture was reviewed in detail for all regional ITS elements, including interconnect diagrams and information flows, which are presented in this section.

This section is presented in three main headings:

- *Architecture Inputs*
- *Architecture Description*
- *Architecture Output*

4.1 Architecture Inputs

Inputs to the development of the I-10 Corridor ITS architecture include representative ITS market packages, regional stakeholders, ITS inventory elements and assets, as well as descriptions of each of these inputs. All of this information was described in detail in chapters 2 and 3 of this document. Turbo Architecture was used to compile the inputs and develop the I-10 Corridor regional ITS architecture.

The regional transportation needs have been mapped to the national ITS market packages. The I-10 Corridor regional market packages that were selected and used as input to the architecture are shown in Table 5.

Input to the ITS architecture for the I-10 Corridor includes:

- *27 major stakeholders or stakeholders groups*
- *64 market packages, including:*
- *advanced public transportation systems: one package*
- *advanced traffic management systems: 21 packages*
- *advanced traveler information systems: six packages*
- *advanced vehicle safety systems: zero packages*
- *archived data management: three packages*
- *commercial vehicle operations: 13 packages*
- *emergency management: 10 packages*
- *maintenance and construction: 10 packages*

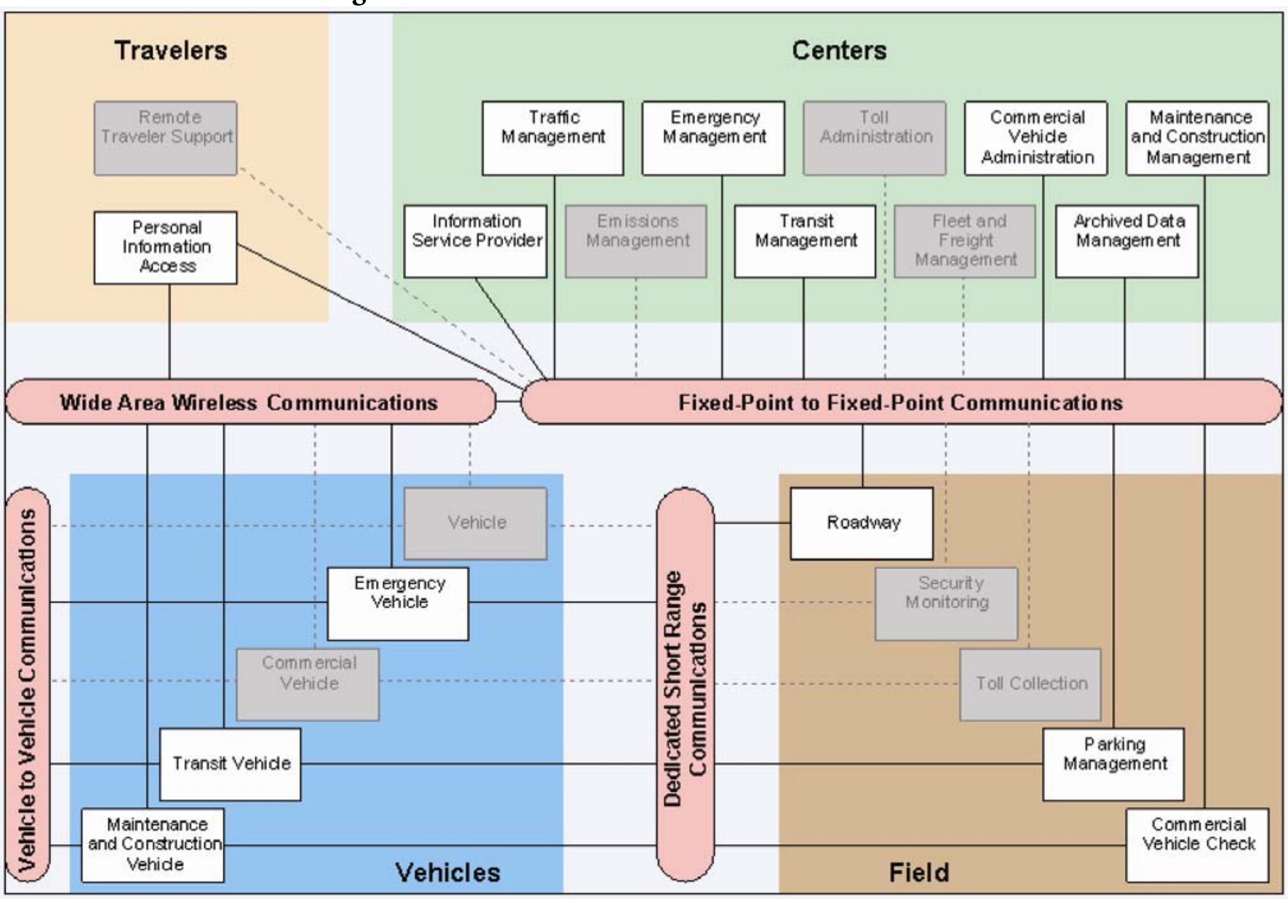
4.2 Architecture Description

The identification of stakeholders, existing inventory/needs, and selected market packages represent major inputs to the ITS architecture development process. This information was entered into Turbo Architecture version 3.1 to facilitate subsequent steps in the development process. The National ITS Architecture and Turbo Architecture use a variety of abbreviations and terms to describe the many components and relationships represented by the architecture.

The I-10 Corridor ITS architecture may be represented by a series of interconnect diagrams, which show existing and planned connections between the various physical elements of the ITS architecture. These interconnect diagrams were presented to the stakeholder group for review and discussion to ensure accuracy.

The ITS architecture framework for the I-10 Corridor is shown in Figure 3. Those elements in Figure 3 that are highlighted apply to the I-10 Corridor.

Figure 3. I-10 Corridor ITS Architecture Framework



4.3 Architecture Output

As mentioned in Section 4.2, the I-10 Corridor architecture is presented, in addition to this document, in a series of interconnect and information flow diagrams generated by Turbo Architecture application. Appendices B and C present the interconnect and information flow diagrams for the I-10 Corridor.

5. Operational Concept

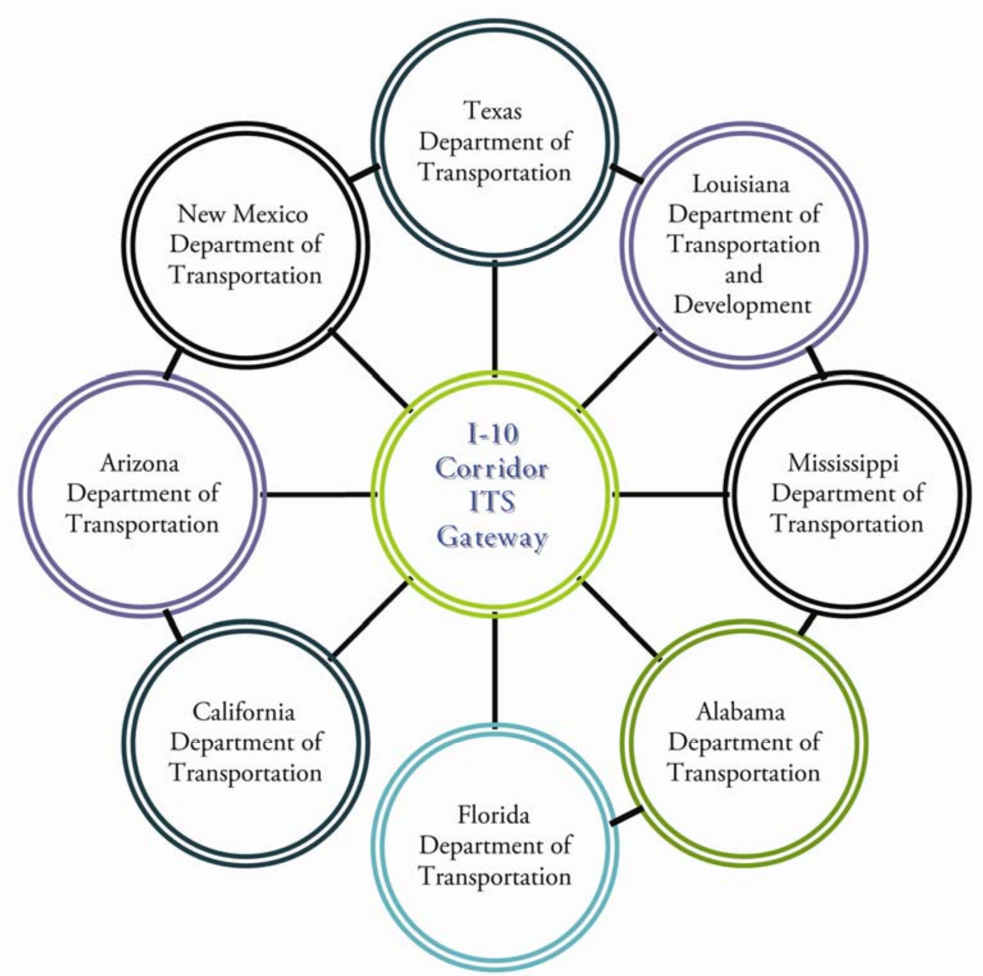
This section describes the concept of operations for the existing and planned ITS subsystems within the I-10 Corridor within a five-year timeframe. The concept of operations is a description of the roles and responsibilities of the stakeholder groups as they relate to the operation of the systems that exist or are being proposed. This operational concept provides an executive summary type perspective of the way the I-10 Corridor ITS systems will work together, and it identifies the roles and assignments for each of the services that the intelligent transportation system will provide. It is important to understand that this is a conceptual framework. Detailed planning will happen at the project planning level. Having such a conceptual framework will ensure necessary coordination for existing as well as future ITS deployments and will maximize their leverage from a corridor perspective.

5.1 Broad Operational Concept

The goal of the concept of operations is to deliver seamless communication throughout the I-10 Corridor, irrespective of jurisdictional boundaries. Although a daunting challenge (given the length and complexity of the corridor), end users expect services to be available regardless of jurisdiction or location.

Comprehensive planning and coordination along the entire corridor is the key to an efficient transportation system along this vast corridor. Corridorwide information exchange will ensure maximum leverage from existing as well as future ITS deployments within the corridor, the operational concept proposes information exchange on two separate levels – one at the corridor level through a clearinghouse or a "corridor gateway," and secondly at the adjacent states level through state-to-state coordination. Such a 2-layered approach will ensure that adjacent states coordinate and cooperate more closely for day-to-day operations as well as through emergencies, and any incident or system information that has corridorwide relevance will be communicated to the entire corridor through a variety of ITS systems in operation along the corridor. Figure 4 represents the proposed broad concept of operations for the ITS communications and information exchange along the I-10 Corridor.

Figure 4. ITS Corridor – Concept of Operations



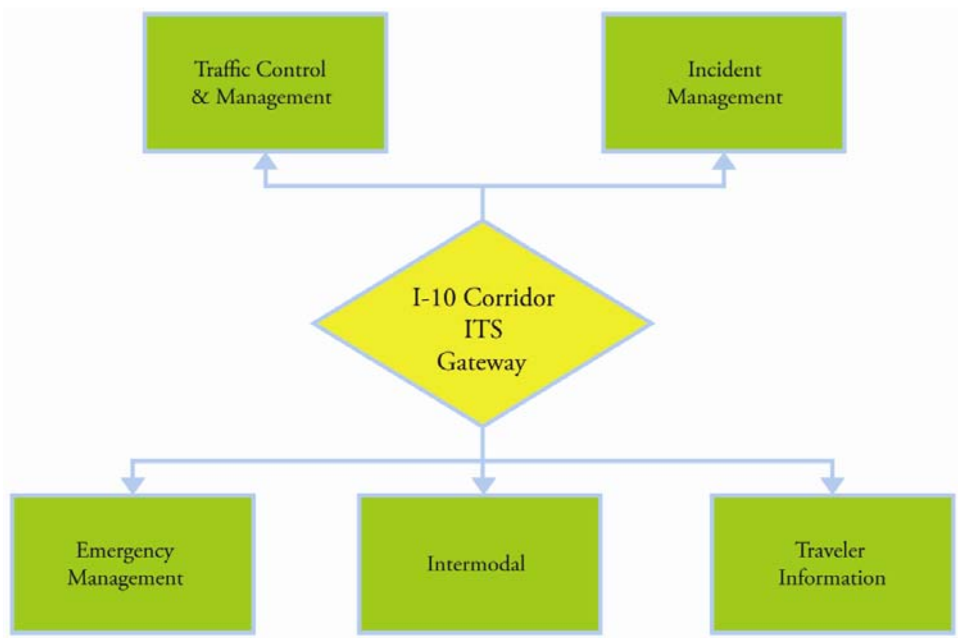
The operational responsibilities that will be supported by existing and planned ITS subsystems along the corridor are as follows:

- *Traffic Control and Management*
- *Incident Management*
- *Emergency Management*
- *Intermodal Facilities*
- *Traveler Information*

A key element for the corridor operational concept is the coordination between statewide traffic management centers (TMCs). This will support several of the other ITS needs such as field devices, including CMS, CCTV, traffic signal interconnection, and highway advisory radio (HAR). Establishment of an incident management committee for special events and no-notice events is another key element. Creating interoperability among systems and subsystems will tend to reduce the level of capital investment required to provide high quality ITS services to stakeholders and the traveling public. To the extent that increasing levels of interoperability are achieved, flexibility in roles and responsibilities can also result. This concept of operations focuses on the basic, desirable roles and responsibilities. Numerous variations can and likely will emerge in the future as subsystems and enhancements are deployed. The concept of operations will be dynamically adjusted, as needed and determined by the stakeholders, to reflect the growth and evolution of the corridor ITS systems.

5.2 Roles and Responsibilities

Under normal and event-driven operating conditions, a number of agencies will be required to coordinate closely to perform their operational responsibilities. The key agencies (or groups) that have a major role or responsibility during operations are listed in Table 3 of this document. While it is recognized that other



Key features include:

- *a corridorwide information gateway*
- *the gateway is the clearinghouse hub of transportation information and is a key asset in emergency management as well as incident detection and response along at a corridor level*
- *the flow of data through the gateway supports all of the transportation operational information gathered by a variety of ITS systems along the corridor*

agencies may be involved during a scenario in addition to the ones listed in Table 3, it is not expected that they will play as critical a role in operations.

5.3 Roles and Responsibilities by Functional Area

In considering the operational roles, the stakeholders are grouped into the following functional areas of responsibilities and roles:

- *Traffic Control and Management*
- *Incident Management*
- *Emergency Management*
- *Intermodal Facilities*
- *Traveler Information*

5.3.1 Traffic Control and Management

Travel and traffic management addresses a wide swath of activities associated with monitoring traffic flows, identifying flow abnormalities, and detecting (as well as verifying to the extent technologically possible) incidents. Normal operational procedures include collection and archiving of traffic data, management of pre-planned events, ITS device control, and exchanging information with partner stakeholders.

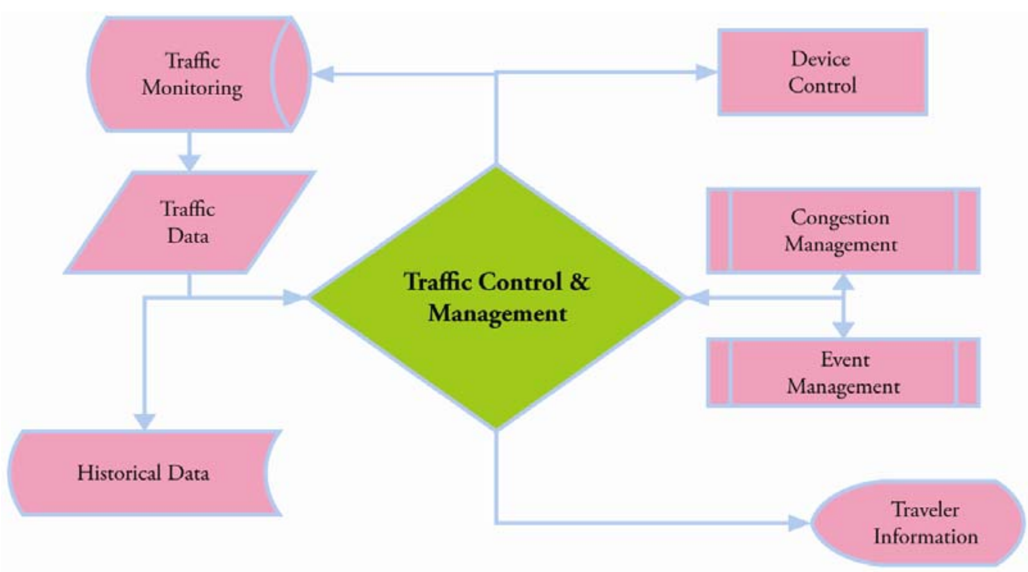
The efforts are broken into two distinct components of the roadway network: surface streets and access controlled routes.

Surface Street Management

This is particularly important where the I-10 Corridor travels through major metropolitan areas. A variety of local city/county agencies monitor traffic flow for local corridors and signalized control systems. These agencies are responsible for ensuring that surface street operations do not impede the freeway operations along the I-10 Corridor during normal operations as well as major incidents, special events, emergencies, and long-term construction projects.

Freeway Management

Eight different state DOTs (or statewide TMCs) are primarily responsible for monitoring real-time traffic flow conditions for different stretches of the I-10 Corridor through their states, providing road network and incident conditions to the 511 system, information service providers, and local traffic operations. Many of the DOTs operate one or more changeable message signs, portable highway advisory radio, weather/visibility stations, and a variety of other freeway operations-related ITS field components.



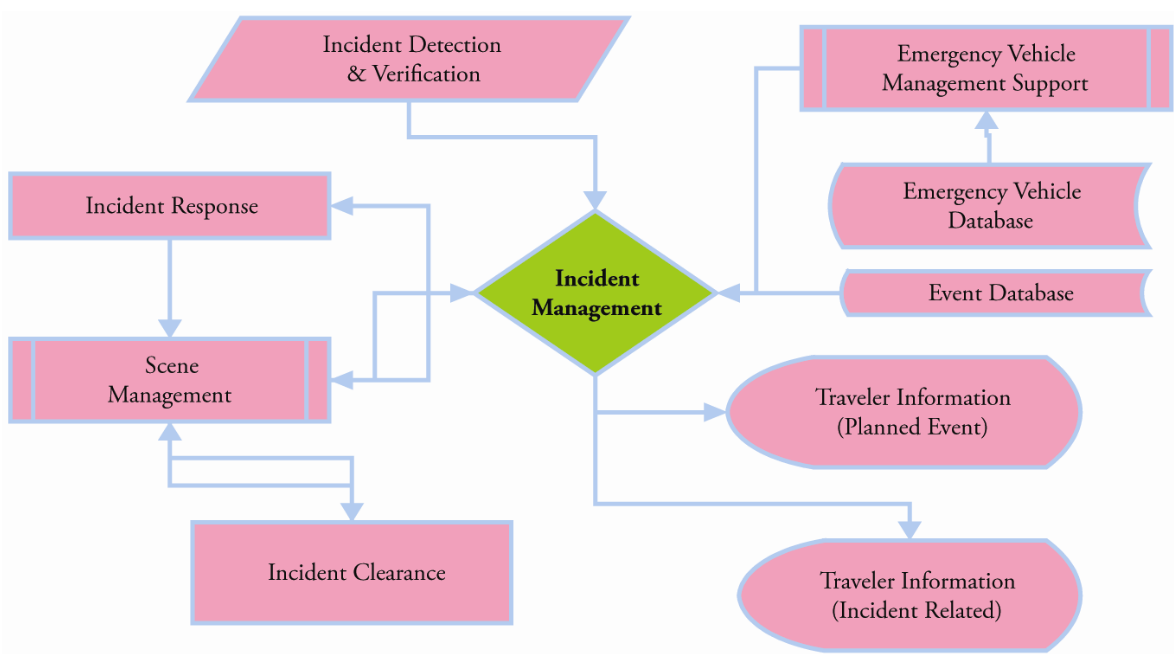
There will be a need for significant data or information exchange between these TMCs to ensure efficiency of the I-10 Corridor operations.

5.3.2 Incident Management

The following agencies coordinate incident management and emergency response activities for local and freeway situations:

- *Local Public Safety Agencies*
- *Local Traffic Operations*
- *State DOTs*
- *Local and Statewide Emergency Management Agencies*
- *Emergency Operations Centers*
- *State and Local Police Agencies*

Public safety agencies are responsible for responding to incidents and notifying other agencies including traffic operations agencies. Traffic operations agencies along the corridor will provide each other and public safety agencies with road network conditions, adjust signal timings where appropriate, and alert motorists through field devices. Public safety personnel will provide routine status updates on incident clearing activities to traffic operations agencies where the information continues to be disseminated to the traveling public. There will be a need for corridorwide information exchange to ensure that any major incidences (emergencies and evacuations) are conveyed to the users all through the entire I-10 Corridor. It may be beneficial to form a corridorwide incident management committee to ensure more focused coordination for incident management purposes.

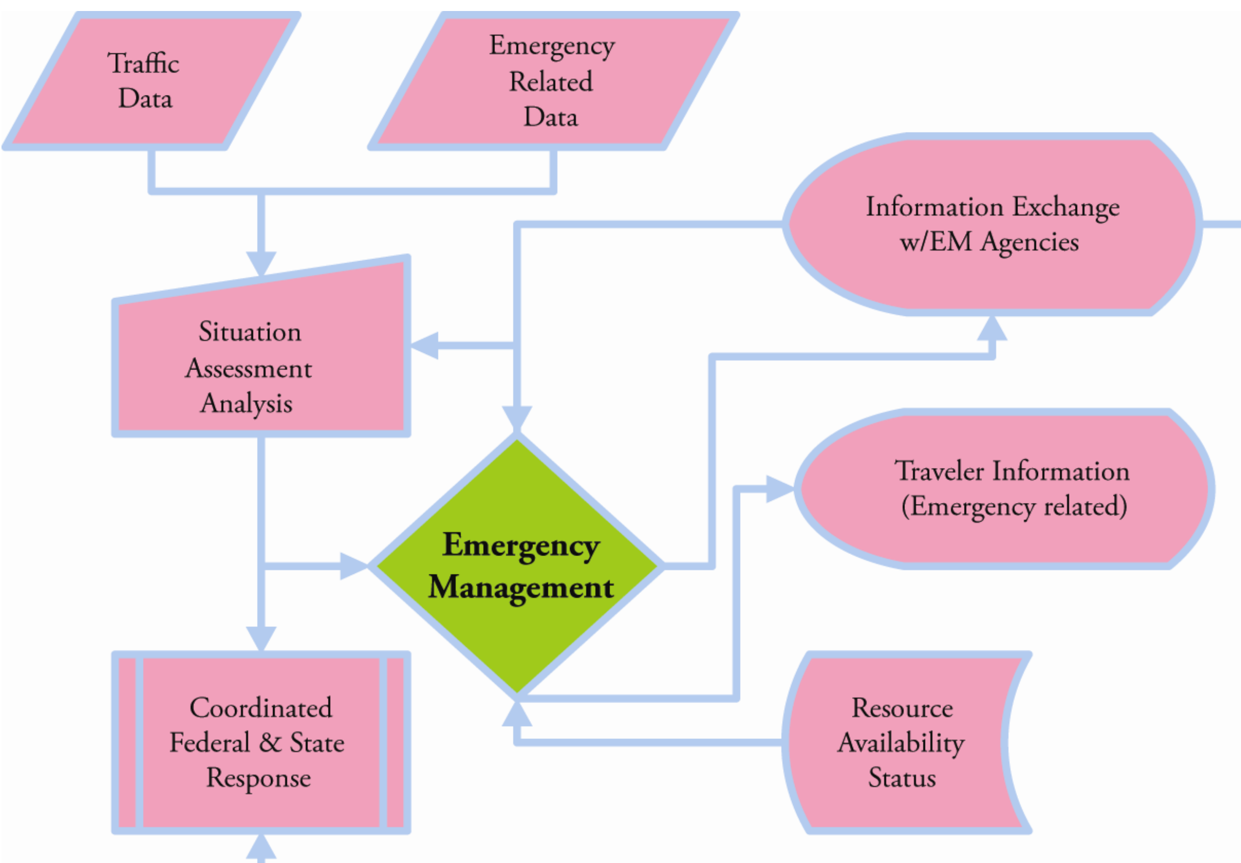


5.3.3 Emergency Management

The following agencies/divisions receive and provide information on incidents to the I-10 Corridor ITS gateway:

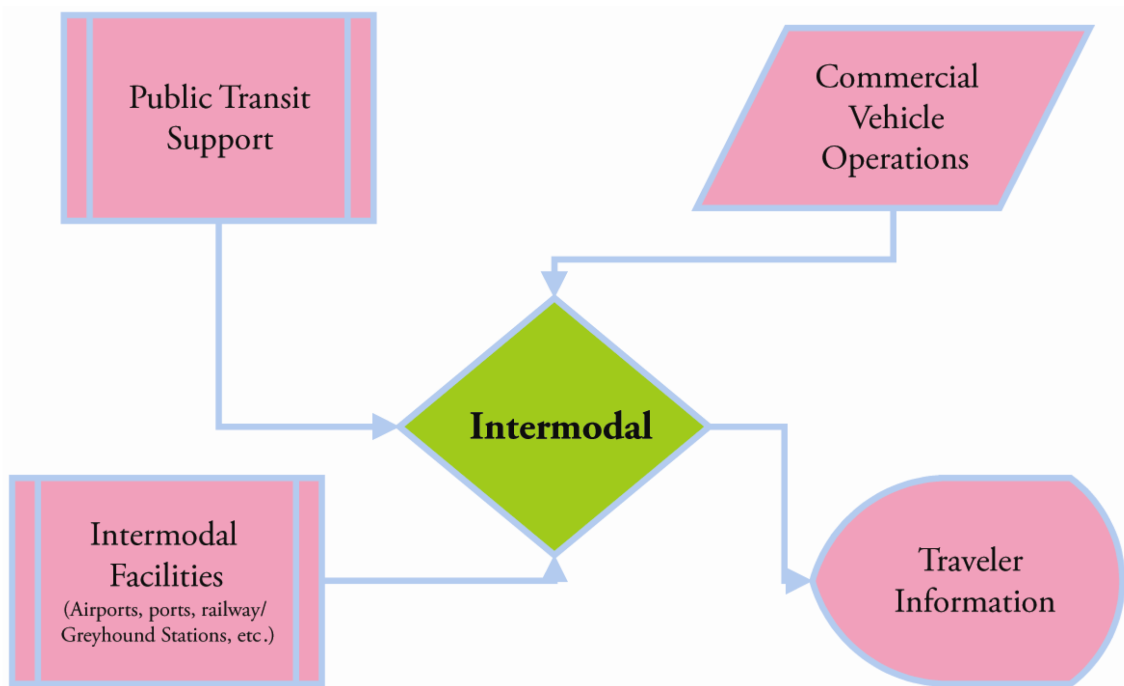
- *Local Public Safety Agencies*
- *Local E-911 Call Centers*
- *State Emergency Operations Centers (EOC)*
- *State District Offices*
- *District Residency Offices*
- *State Police Agencies*
- *Local Police Agencies*

Public safety will provide information on incidents to surrounding state districts through computer aided dispatch interface(s). The EOCs orchestrate wide-area coordination efforts involving multiple emergency response organizations and traffic management personnel. Such coordination would involve adjacent state DOTs as well as I-10 Corridor gateway for major emergencies.



5.3.4 Intermodal Facilities

This section is relevant to all other modes of travel along the I-10 Corridor and its interface with the transportation system. Intermodal coordination relates to ports, airports, railway centers, and transit stations. Transit is particularly important in case of evacuation planning. Commercial vehicle operations (CVO) along the corridor also form an important part of the coordination element to ensure a seamless transportation system along the corridor.



5.3.5 Traveler Information

The purpose of this functional area is to provide travelers with real time roadway network status and incident/emergency information so that travelers can make informed decisions as to routes and modes of travel. Two principle systems are focused on traveler information:

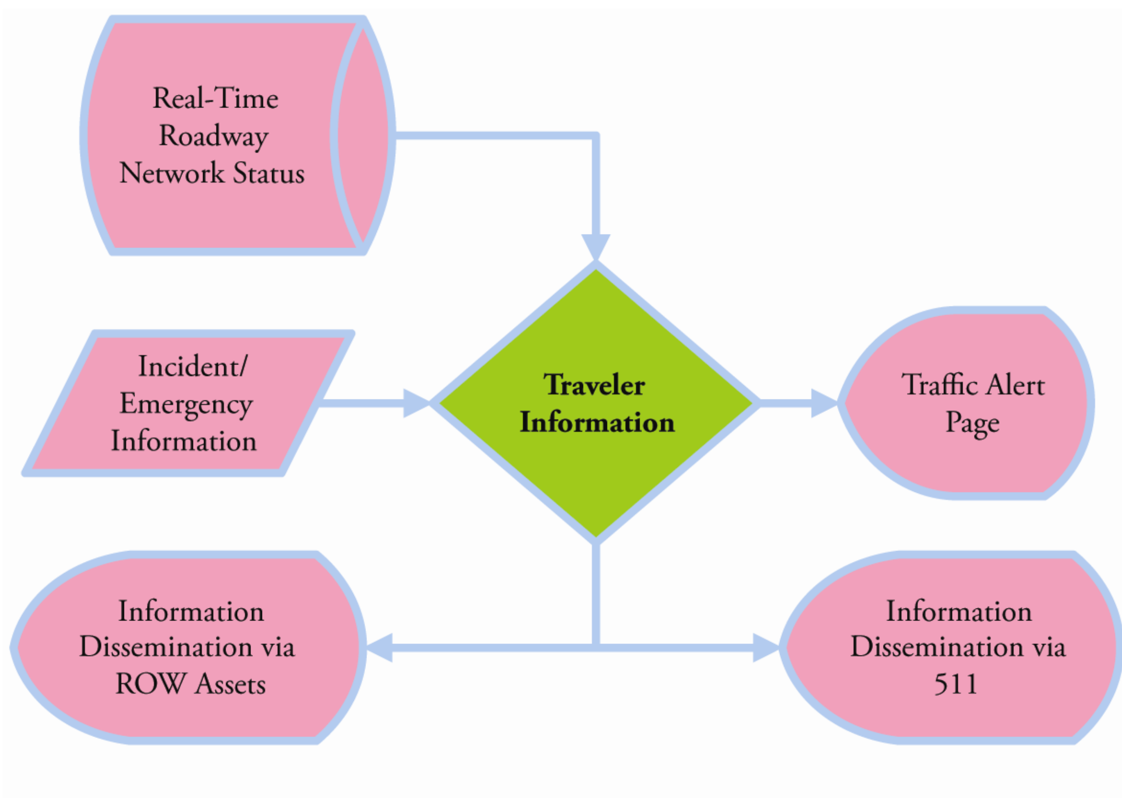
- *State Operations Information Systems*
- *511 Traveler Information Systems*

A variety of DOT elements have read/write access to the state operations information databases, with write privileges being limited to the agency's areas of responsibilities. Many other non-DOT agencies and organizations have read-only access to such systems.

The following agencies generate and share information to enable educated decisions for all modes of transportation:

- *Transit Providers*
- *Information Service Provider*
- *Media*
- *Municipality/County*
- *Airport*
- *Convention Center/Visitors Bureau*
- *DOT – Traffic Management Centers*

There may be a case for an I-10 Corridor integrated traveler information web portal. These agencies would be responsible for providing the road network



conditions, transit schedule information, fare/toll information, special events, airport information/ schedules, construction/maintenance/lane closure activities, incidents, and other travel-related information.

5.4 Operational Scenarios

One approach to describing the concept of operations is to present specific examples of operational scenarios for different broad categories of operational applications. The operational scenarios can be used to describe and define the stakeholders' general roles together with the applicable resources that are needed to provide these resources.

5.4.1 Operational Scenario 1: I-10 Corridor Major Incident between Baton Rouge, Louisiana and Houston, Texas

The first operational scenario describes how ITS technologies and stakeholders would cooperatively address an incident along the I-10 Corridor; for example, one which involves a major accident involving a hazardous material spill that closes multiple lanes for an extended duration somewhere near the state line between Texas and Louisiana. The scenario will require state-to-state coordination, with both LA DOTD and TxDOT as well as information update to travelers and commercial vehicle operators along the entire I-10 Corridor. In this scenario the I-10 Corridor is equipped with some ITS devices that include DMS signs. It is assumed that connections between TxDOT, LADOTD, I-10 Corridor ITS gateway, major cities along subject stretch of I-10 Corridor, and other key public safety agencies are established. As information is received by statewide or district TMCs, it is assimilated and packaged so it can be disseminated to the public with HAR, media, and the statewide 511 system and I-10 ITS Corridor gateway applications.

Scenario Details: During an early weekday winter morning, a tanker truck eastbound on I-10 carrying liquid dimethylamine loses control and jack knifes. The truck slides into the median, overturns, and ends up in the westbound lanes, with a fractured tank that begins to spill dimethylamine. As vehicles attempt to avoid the tanker, there is a chain reaction of vehicle accidents involving 20 passenger cars on eastbound as well as westbound lanes. The truck cab has trapped the driver and when the cab becomes engulfed in flames, the driver perishes. There are at least 10 serious injuries and three entrapments in the vehicle pileup. Both the eastbound and westbound lanes are fully blocked and the hazardous material spill is growing. Motorists attempting to assist feel the effects of the hazardous material and feel nauseous, teary eyed, and dizzy. Motorists use cell phones to contact 911 and truckers broadcast the accident conditions over their CB radios.

Regional/Corridor Scenario Operations: The first stage of this incident is response and assessment of the incident. Emergency 911 initially dispatches LSP, TxDPS, and local fire and EMS. TxDOT and/or LA DOTD district maintenance crews are summoned to assist with traffic control as vehicle backups along I-10 grow. As emergency personnel travel to the scene they attempt to gain an understanding of the conditions. LSP arrives first and request motorists to move at least 1,000 feet from the scene. Local police assist with detours to reroute traffic and move motorists away from the scene. Fire professionals arrive second and approach with caution to extinguish the fire. The local fire chief employs the incident command system (ICS) as other fire personnel assess and identify the hazardous material. The fire chief requests help from DOTs and hazmat officials to request assistance to contain the material. EMS establishes an on-site triage for accident victims and those affected by the chemical spill. Media reports the incident as breaking news on the morning news. Statewide 511 for Texas as well as Louisiana has received the accident information and downloads the information to travelers. The TxDOT and LA DOTD traffic management centers feed the incident information and real time updates into the I-10 ITS Corridor gateway and provide live video on the I-10 Corridor web portal. Thus, all the users along the I-10 Corridor are aware of this major incident and subsequent closing of I-10 for a considerable duration.

DOT maintenance crews use portable and permanent DMS to notify motorists of the incident. DOTs contact the cities of Baton Rouge, Houston, and Lake Charles to request assistance to help divert motorists seeking to use I-10 in that stretch and set up alternate routing. Understanding the severity of the situation, DOT requests a long-term commitment from the local municipalities to assist with traffic control and alternate routing messaging.

The second stage of this scenario is recovery and long-term impacts. The incident and scene have been stabilized in terms of injuries and containment of the hazardous material. Alternate routing has been established and traffic control has cleared the scene of traffic. LSP and TxDPS conduct their investigation. Hazardous material crews work to clean up the scene. Portable DMS display messages route motorists along alternative routes. LA DOTD and TxDOT districts coordinate the traffic control effort, 511 messaging, real time updates in to I-10 Corridor gateway, and media information.

5.4.2 Operational Scenario 2: Major Evacuation in Mobile, Alabama

The second operational scenario describes how ITS technologies and stakeholders would cooperatively address a hurricane emergency event in Mobile, Alabama that would require an evacuation of the surrounding area. The scenario will require state-to-state coordination, with both Florida and Mississippi. The state of Alabama has a specific evacuation plan. The plan involves an emergency planning zone (EPZ) and, should an emergency occur, the radio station and TV channels will inform residents of specific locations and locations designated as evacuation assembly centers to house evacuees. Emergency portable signs located within the 10-mile EPZ are a primary means of alerting the public. It is assumed that connections between the Mississippi DOT, city of Mobile, cities along I-10, 511, state EOC, and other key public safety agencies are established. As information is received by Alabama DOT, it is assimilated and packaged so it can be disseminated to the public with HAR, I-10 Corridor ITS gateway, media, and the statewide 511 systems.

Scenario Details: On a summer day, a category 5 hurricane lands ashore near the city of Mobile, Alabama. The local agencies are caught a little bit off guard as the earlier prediction of landfall was at a distant location and was revised in the last six to eight hours. The media is notifying local residents within the EPZ that the hurricane is coming ashore and they need to evacuate immediately.

Regional Scenario Operations: Preparedness and readiness in hurricane planning has trained the public agency staff on the specific efforts to follow. Unfortunately, short notice on actual location of landfall is threatening to take over the situation and there are already long backups on I-10. However, through their involvement with the incident management committee, state, local, and state police and transportation agencies respond immediately to assist in the evacuation activities.

DOTs (Florida, Alabama, and Mississippi) start coordinating and communicating for reversible lane operations plan along I-10 for certain stretches to support evacuation. The Mississippi DOT and Florida DOT start distributing messages via 511, DMS, I-10 Corridor gateway applications, and media informing travelers not to proceed toward Alabama and to expect potential rerouting to support reversible lanes and reverse direction flows to assist evacuation. Thus, all the users along the I-10 Corridor are aware of this major incident and subsequent closing of I-10 for a considerable duration. Several major cities and town agencies are supporting FDOT and MDOT activities in allowing reverse flow to assist in efficient evacuation travel in one specific direction.

Local and state DOTs in Alabama contact local transit agencies to dispatch buses for mass evacuations. Major cities surrounding I-10 provide favorable signal timing plans to get the traffic off I-10 efficiently. The local media, both radio and television, use the emergency broadcast systems to alert residents in the Mobile area of the emergency and need for immediate evacuation.

5.4.3 Operational Scenario 3: Severe Desert Storm in Arizona

The third operational scenario describes how ITS technologies and stakeholders would cooperatively address special event management owing to a severe sand storm and related incidents along I-10 between Phoenix and Tucson in Arizona. This would involve traffic management along I-10 and all adjacent major roadways. This event requires coordination between Arizona DOT, local DOTs for Phoenix and Tucson, Caltrans, and New Mexico DOT.

Scenario Details: A severe desert/sand storm between Phoenix and Tucson area impeded I-10 operations and created a severe backup along I-10. High winds, poor highway visibility, and vehicle accidents on I-10 caused a huge traffic backup in the eastbound and westbound lanes. Stormy conditions created chain reaction-type collisions along I-10; 42 vehicles were involved with several injuries and emergency response needs. The I-10 Corridor was closed for several hours in both the eastbound and westbound directions

Regional Scenario Operations: The first stage of this incident is response and assessment of the incident. Emergency 911 initially dispatches local police and local fire and EMS. Arizona DOT district maintenance crews are summoned to assist with traffic control as vehicle backups grow along I-10. As emergency personnel travel to the scene they attempt to gain an understanding of the conditions. Arizona state police arrive first and request motorists to move at least 1,000 feet from the scene. Local police assist with detours to reroute traffic and move motorists away from the scene.

Arizona DOT coordinates with the cities of Phoenix and Tucson to assist with the traffic management and rerouting of I-10 traffic. The DOT also communicates the incident information and subsequent closure information to Caltrans and New Mexico DOT. Caltrans and New Mexico DOT start distributing the information through 511 and DMS signs to the travelers. Arizona DOT also feeds the information into I-10 Corridor gateway and provides real time video of the situation. Media reports the incident as breaking news on the news. Thus, all the users along the I-10 Corridor are aware of this major incident and subsequent closing of I-10 for a considerable duration.

Arizona DOT maintenance crews use portable and permanent DMS to notify motorists of the incident. DOTs contact the cities of Phoenix and Tucson to request assistance to help divert motorists seeking to use I-10 in that stretch and set up alternate routing.

The second stage of this scenario is recovery and long-term impacts. The incident and scene have been stabilized in terms of injuries. Alternate routing has been established and traffic control has cleared the scene of traffic. Portable DMS display messages route motorists along alternative routes. Arizona DOT districts coordinate the traffic control effort, 511 messaging, real time updates in to I-10 Corridor gateway, and media information.

5.4.4 Operational Scenario 4: Major Construction Activity between Phoenix, Arizona and Palm Springs, California

The fourth operational scenario describes how ITS technologies and stakeholders would cooperatively address a planned road construction project along the I-10 Corridor.

Scenario Details: This is a widening project that will occur over a two-year period, requiring lane closures and temporary shifts in traffic flows. Multiple phases of construction are required to develop the additional lanes and modify major interchanges. This scenario occurs with limited ITS field devices located along I-10; however, the project will include new DMS, RWIS, permanent count stations, and CCTV at major interchanges. It is assumed that connections between towns, counties, Arizona DOT and Caltrans, and other key public safety entities have been established. The existing and limited subsystems and field ITS elements are monitored by the DOTs. Information gathered at the California and Arizona TMCs is assimilated and "packaged" so that it can be effectively disseminated to the public through limited DMS sites, regional HAR, and the statewide 511 system.

Regional Scenario Operations: The first phase of the project includes implementation of a maintenance of traffic plan that includes deployment of temporary ITS field devices which includes portable CMS, portable detection stations, portable HAR, and installation of CCTV at existing interchanges. Maintenance of traffic plans have been developed for I-10 and both the DOTs are working with several local agencies for rerouting of the I-10 traffic and providing alternative travel modes. The local media has been included in the project to use as a source of information sharing to the community. Media has been briefed on the sequence and schedule for construction and will be provided weekly updates of progress and changes. Strategies for use of local transit and park-and-ride facilities is part of the traffic management plan. The overall plan for the widening and maintenance of traffic through the entire period is updated through the I-10 Corridor gateway; thus, all the potential users, especially commercial operators, are aware of the project activities and relevant change of travel patterns.

During the second phase of the project, construction is underway. Lane closures and the use of temporary roadways are typical. Travel and construction information is disseminated through several devices. Portable DMS provide information along I-10 and other key roadways. Portable HAR broadcast construction and road closure-related information. Media sources receive information from the contractor through the DOTs regarding weekly construction activities. The media use television, radio, and the newspaper to disseminate the information to the public. Both Arizona DOT and Caltrans assimilate and disseminate information on the statewide 511 systems and DOT web sites. State DOT districts assist with construction activities by field adjustments of transportation elements as necessary. Through the use of detection systems, the TMCs monitor traffic and provide alternate routing information via the portable DMS and HAR. Local transit providers transport people from the park-and-ride lot to preidentified locations in the nearby cities. Construction zones are monitored by TMCs for incidents with response measures predetermined by DOT, state police, and local area law enforcement and emergency responders.

As the new and permanent ITS field devices are installed, the new equipment is integrated with the existing baseline equipment at the California and Arizona state TMCs. The new field devices are used to augment the portable and temporary equipment, until the permanent equipment completely replaces the temporary devices.

5.5 I-10 Corridor Agreements

This section 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 I-10 Corridor for the I-10 Corridor gateway. Interfaces and data flows among public and private entities along the corridor 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 operational concept.

With the implementation of I-10 Corridor gateway and other ITS technologies, integrating systems from one or more agencies, the anticipated level of information exchange identified in the architecture, it is likely that formal agreements will be needed. These agreements, while perhaps not all requiring a financial commitment from agencies in the corridor, should outline specific roles, responsibilities, data exchanges, levels of authority, and other facets of corridor operations. Some agreements will also outline specific funding responsibilities, where appropriate and applicable.

Table 6 provides a list of potential agreements for the I-10 Corridor based on the interfaces identified in the corridor architecture. It is important to note that as ITS services and systems are implemented along the corridor, 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 6. Potential Agreements for the I-10 Corridor

Data Sharing and Usage for I-10 Corridor ITS Gateway (Public) State DOTs and Public Agencies within the Corridor	Future	This agreement would define the parameters, guidelines, and policies for inter-and intra-agency ITS data sharing required for I-10 Corridor gateway. This data sharing would support corridor activites related to traffic management, incident management, traveler information, and other functions. Data would also include video images from CCTV cameras. The terms of this agreement should generally address such items as: • Types of data information to be shared • Repository for information (i.e., Regional Traveler Information Database/ Clearinghouse) • 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 6. Potential Agreements for the I-10 Corridor

Resource Sharing (Public-Public) Between Public Agencies	Future	This agreement would define the parameters, guidelines, and policies for establishing a corridor ITS-related communication backbone (e.g.,fiber optics) from municipal/county systems as well as the DOT TMC.	These agreements can be mutual-aid agreements, where funding is jointly derived, or they can identify infrastructure to be completed by each respective agency with their own funding as part of a regional collaboration.
Data Sharing and Usage (Public-Private) Public Agencies and Private Media/Information Service Providers	Existing Statewide Initiative	This agreement would define the parameters, guidelines, and policies for private media use of regional ITS-related information from I-10 Corridor gateway. This type of agreement is recommended between public agencies (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.	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. These agreements also typically include a sunset clause to allow the agency to periodically review the agreement and make any modifications prior to renewal.

Table 6. Potential Agreements for the I-10 Corridor

Shared Video Monitoring (Public-Private) State DOTs and Local Agencies	Future	This agreement would enable shared video monitoring of multiple agencies' CCTV cameras by public safety and emergency services along the corridor for incident management purposes. This agreement would define the parameters and policies for public safety agencies to access video images via the TMC video switch. It is recommended that the agreement include any state DOT 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.
Architecture Maintenance	Future	This agreement would define the parameters, guidelines, and policies for maintenance of the corridor architecture.	
Pooled Funding	Future	This agreement would define the parameters, guidelines, and policies for interagency and interstate funding initiatives to encompass wide-area ITS initiatives along the corridor.	

6. Architecture Maintenance Plan

This section discusses the proposed maintenance plan for the I-10 Corridor ITS architecture.

FHWA's Final Rule on ITS Architecture and Standards (23 CFR Part 940) requires development of an architecture maintenance plan. Paragraph 940.9(f) states that:

> "The agencies and other stakeholders participating in the development of the regional ITS architecture shall develop and implement procedures and responsibilities for maintaining it, as needs evolve within the region."

In January 2004, FHWA issued guidance[1] on what should be contained in an architecture maintenance plan, in order to be compliant with FHWA requirements. The white paper on this subject is available at http://ops.fhwa.dot.gov/its_arch_imp/guidance.htm. The maintenance plan for the I-10 Corridor ITS architecture is based on the guidelines provided by FHWA's white paper.

This report provides some background on the need for architecture maintenance and addresses key issues under the following headings:

- ***Why maintain a corridor ITS architecture?***
- ***Who will maintain the architecture?***
- ***When will the architecture be updated?***
- ***What will be maintained?***
- o ***How will the architecture be maintained?***

[1] FHWA-HOP-04-004, Regional ITS Architecture Maintenance White Paper, prepared by the National ITS Architecture Team, January 31, 2004.

6.1 Why Maintain a Corridor ITS Architecture?

A regional ITS architecture is "a regional framework for ensuring institutional agreement and technical integration for the implementation of ITS projects or groups of projects." Paragraph 940.9(a) states that:

> "A regional ITS architecture shall be developed to guide the development of ITS projects and programs and be consistent with ITS strategies and projects contained in applicable transportation plans. The National ITS Architecture shall be used as a resource in the development of the regional ITS architecture. The regional ITS architecture shall be on a scale commensurate with the scope of ITS investment in the region. Provision should be made to include participation from the following agencies, as appropriate, in the development of the regional ITS architecture: highway agencies; public safety agencies (e.g., police, fire, emergency/medical); transit operators; federal lands agencies; state motor carrier agencies; and other operating agencies necessary to fully address regional ITS integration."

As ITS projects are implemented, the regional ITS architecture will need to be updated to reflect new ITS priorities and strategies that emerge through the transportation planning process, to account for expansion in ITS scope, and to allow for the evolution and incorporation of new ideas. The goal of the maintenance plan is to guide controlled updates to the regional ITS architecture baseline so that it continues to accurately reflect the region's existing ITS capabilities and future plans.

6.1.1 Events Requiring Architecture Updates

The regional ITS architecture is not static. It must change as plans change, ITS projects are implemented, and the ITS needs and services evolve in the region. The regional ITS architecture must be maintained so it continues to reflect the current and planned ITS systems, interconnections, and other aspects of architecture. The following list includes many of the events that may cause change to a regional ITS architecture:

Changes in Regional Needs: Regional ITS architectures are created to support transportation planning in addressing regional needs. Over time these needs can change and the corresponding aspects of the regional ITS architecture that address these needs may need to be updated. These changes in needs should be expressed in updates to planning documents such as the regional transportation plan.

New stakeholders: New stakeholders become active in ITS and the regional ITS architecture should be updated to reflect their place in the regional view of ITS elements, interfaces, and information flows. New stakeholders might represent new organizations that were not in place during the original development of the regional ITS architecture.

Changes in scope of services considered: The range of services considered by the regional ITS architecture expands. This might happen because the National ITS Architecture has been expanded and updated to include new user services or to better define how existing elements satisfy the user services. The National ITS Architecture may have expanded to include a user service that has been discussed in a region, but not in the regional ITS architecture, or was included in only a very cursory manner. Changes in the National ITS Architecture are not of themselves a reason to update a regional ITS architecture, but a region may want to consider any new services in the context of their regional needs.

Changes in stakeholder or element names: An agency's name or the name used to describe their element(s) undergoes change. Transportation agencies occasionally merge, split, or rename themselves. In addition, element names may evolve as projects are defined. The regional ITS architecture should be updated to use the currently correct names for both stakeholders and elements.

Changes in other architectures: A regional ITS architecture covers not only elements and interfaces within a region, but also interfaces to elements in adjoining regions. Changes in the regional ITS architecture in one region may necessitate changes in the architecture in an adjoining region to maintain consistency between the two. Architectures may also overlap (e.g., a statewide ITS architecture and a regional ITS architecture for a region within the state) and a change in one might necessitate a change in the other.

There are several changes relating to project definition that will cause the need for updates to the regional ITS architecture:

Changes due to project definition or implementation: When actually defined or implemented, a project may add, subtract, or modify elements, interfaces, or information flows from the regional ITS architecture. Because the regional ITS architecture is meant to describe the current and future regional implementations of ITS, it must be updated to correctly reflect how the developed projects integrate into the region.

Changes due to project addition/deletion: Occasionally a project will be added or deleted through the planning process or through project delivery and some aspects of the regional ITS architecture that are associated with the project may be expanded, changed, or removed.

Changes in project priority: Due to funding constraints, or other considerations, the planned project sequencing may change. Delaying a project may have a ripple effect on other projects that depend on it. Raising the priority for a project's implementation may impact other projects that are related to it.

6.2 Who Will Maintain the Architecture?

To maintain a consensus regional ITS architecture, ideally all stakeholders should participate in the process. In practice, typically, one or two agencies take the lead responsibility to maintain the regional ITS architecture.

It is important that the responsibility for architecture maintenance should not be delegated to an individual person, but should instead be assigned to an agency or institutional group in the region. Maintenance is recurring, and necessarily is a long-term effort. The responsibility may be delegated to an individual at any given time, but the overall responsibility should be a stated role of an institution or agency in the region. Sometimes this responsibility can be shared by agencies.

6.2.1 Requirement of the Architecture Maintainer

There are two key considerations in selecting a maintainer for a regional ITS architecture:

- *Does the maintainer have the necessary skills/resources?*
- *Does the maintainer have the mission and authority to maintain the architecture?*

Skills and Resources: Maintaining a regional ITS architecture uses a range of skills. To properly evaluate changes to the architecture the maintainer must have staff members that:

- *are knowledgeable of the existing regional ITS architecture, implying a detailed technical understanding of the various parts of the architecture and how changes would affect each part*
- *have an understanding of transportation systems in the region, although this understanding can reside jointly in the group of agencies/stakeholders who participate in the maintenance process*
- *have an understanding of the tools used to create (and to update) the architecture, which might include knowledge of the Turbo Architecture tool, if that is used to hold some of the architecture information*

The agency responsible for maintaining the architecture needs to have the skills within its own organization or consider acquiring the skills. In either case, the agency needs the necessary funding to support the maintenance effort.

Missions and Authority: The agency that maintains a regional ITS architecture ideally is one that has broad functional responsibilities across the full scope of the regional ITS architecture. In this case, "scope" represents the geographic area of the region, the transportation functions in the region, and the time frame for deployment of new ITS elements and interfaces in the region.

6.2.2 Maintainer for the Regional Architecture

Given that the geographic scope of this corridor ITS architecture corresponds to the entire stretch of the I-10 Corridor through several states, and many of the region's ITS assets will be operated by a variety of different agencies, the most appropriate group to lead architecture maintenance activities is the I-10 Corridor task force or stakeholder group for this project. It is recommended that one of the state representatives' staff undertake this role in close coordination with the other major stakeholder partners.

When one agency or institution takes responsibility for architecture maintenance, they may use agreements to create a management/oversight function (e.g., a "regional ITS architecture maintenance committee") to oversee regional ITS architecture maintenance work, which would have representation from the key stakeholders to the agreement as listed above. This management/oversight function might be given management authority over the maintenance process. In this way, the stakeholders are investing in and controlling their own regional ITS architecture, and they will have direct responsibility for the quality of the product.

Evaluating and Approving Changes: It is proposed that the Regional ITS Architecture Maintenance Committee, or a subgroup of that Committee, be responsible for evaluating and approving the changes made to the architecture by the maintaining agency. The group evaluating and approving changes should include representatives of key stakeholders, ideally members from the areas of traffic, transit, public safety, and maintenance.

6.3 When will the Architecture be Updated?

Alternative Approaches

How often will the regional ITS architecture be modified or updated? There are two basic approaches to the issue of update interval: periodic maintenance and exception maintenance. Each has their advantages and disadvantages. They are not mutually exclusive, and an approach can be developed that is a combination of the two basic models.

Periodic Maintenance: This approach ties the maintenance of the regional ITS architecture to one of the recurring activities of the transportation planning process. For example, if an MPO is the lead maintenance agency for a region, it's natural that the regional ITS architecture would be updated at the same frequency as the regional transportation plan is updated (every three to five years) or the transportation improvement program is updated (at least every two years). Publication and versioning costs are minimized for the periodic maintenance approach since there is a new version only once in the maintenance cycle.

Exception Maintenance: This approach considers and makes changes to the regional ITS architecture in a process that is initiated as needed. This is very convenient for Rule 940 consistency issues, but may be more costly than a periodic process, where requests for changes are queued until they are all addressed at once. Publication and versioning costs are dependent on the frequency of changes made to the regional ITS architecture.

Combined Periodic and Exception Maintenance: This approach is the most responsive to stakeholder needs, and perhaps the most likely to succeed with regard to use of the regional ITS architecture; however, it implies the greatest cost. Specific stakeholder requests are dispatched immediately, and a more thorough process of analysis is periodically applied to discover and incorporate new ITS requirements.

6.4 What Will be Maintained?

What aspects of the regional ITS architecture will be maintained? Those constituent parts of a regional ITS architecture that will be maintained are referred to as the "baseline." This section considers the different "parts" of the regional ITS architecture and whether they should be a part of the baseline. The parts discussed are:

- *description of region*
- *list of stakeholders*
- *operational concepts*
- *list of ITS elements*
- *list of agreements*
- *interfaces between elements*
- *system functional requirements*
- *applicable ITS standards*
- *project sequencing*

One of the benefits of a regional ITS architecture is to enable the efficient exchange of information between ITS elements in a region and with elements outside the region. Efficiency refers to the economical deployment of ITS elements and their interfaces. The result of these ITS deployments should be contributions to the safe and efficient operation of the surface transportation network. Each of the components in the regional ITS architecture below have a role in this economy, and appropriate effort should be levied to maintain them.

6.4.1 Description of Region

This description includes the geographic scope, functional scope, and architecture time frame, and helps frame each of the following parts of a regional ITS architecture. Geographic scope defines the ITS elements that are "in" the region, although additional ITS elements outside the region may be necessary to describe if they communicate ITS information to elements inside the region. Functional scope defines which services are included in a regional ITS architecture. Architecture time frame is the distance (in years) into the future that the regional ITS architecture will consider. The description of the region is usually contained in an architecture document, but may reside in a database containing aspects of the regional ITS architecture, and should certainly be a part of the baseline.

6.4.2 List of Stakeholders

Stakeholders play a key role in the definition of the architecture. Within a region they may consolidate or separate and such changes should be reflected in the architecture. Furthermore, stakeholders that have not been engaged in the past might be approached through outreach to be sure that the regional ITS architecture represents their ITS requirements as well. The stakeholders should be described in architecture documentation (and may also reside in a database representing aspects of the regional ITS architecture). Their listing and description should be part of the baseline.

6.4.3 Operational Concepts

It is crucial that the operational concepts (which might be represented as roles and responsibilities or as customized market packages) in a regional ITS architecture accurately represent the consensus vision of how the stakeholders want their ITS to operate for the benefit of surface transportation users. These should be reviewed, and if necessary, changed to represent both what has been deployed (which may have been shown as "planned" in the earlier version of the regional ITS architecture) and to represent the current consensus view of the stakeholders. Many of the remaining maintenance efforts will depend on the outcome of the changes made here. The operational concept will reside in the architecture documentation and possibly in a diagramming tool, if a customized market package approach is used, and should be part of the baseline.

6.4.4 List of ITS Elements

The inventory of ITS elements is a key aspect of the regional ITS architecture. Changes in stakeholders as well as operational concepts may impact the inventory of ITS elements. Furthermore, recent implementation of ITS elements may change their individual status (e.g., from planned to existing). The list of elements is often contained in architecture documentation, and is key information in any architecture database. It is a key aspect of the baseline.

6.4.5 List of Agreements

One of the greatest values of a regional ITS architecture is to identify where information will cross an agency boundary, which may indicate a need for an agency agreement. An update to the list of agreements can follow the update to the operational concept and/or interfaces between elements. The list of agreements will usually be found in the architecture documentation. This listing should be a part of the baseline.

6.4.6 Interfaces between Elements

Interfaces between elements define the "details" of the architecture. They are the detailed description of how the various ITS systems are or will be integrated throughout the time frame of the architecture. These details are usually held in an architecture database. They are a key aspect of the architecture baseline, and one that will likely see the greatest amount of change during the maintenance process.

6.4.7 System Functional Requirements

High-level functions are allocated to ITS elements as part of the regional ITS architecture. These can serve as a starting point for the functional definition of projects that map to portions of the regional ITS architecture. Because of the level of detail, these are usually held in spreadsheets or databases, but may be included in the architecture document. They are a part of the baseline.

6.4.8 Applicable ITS Standards

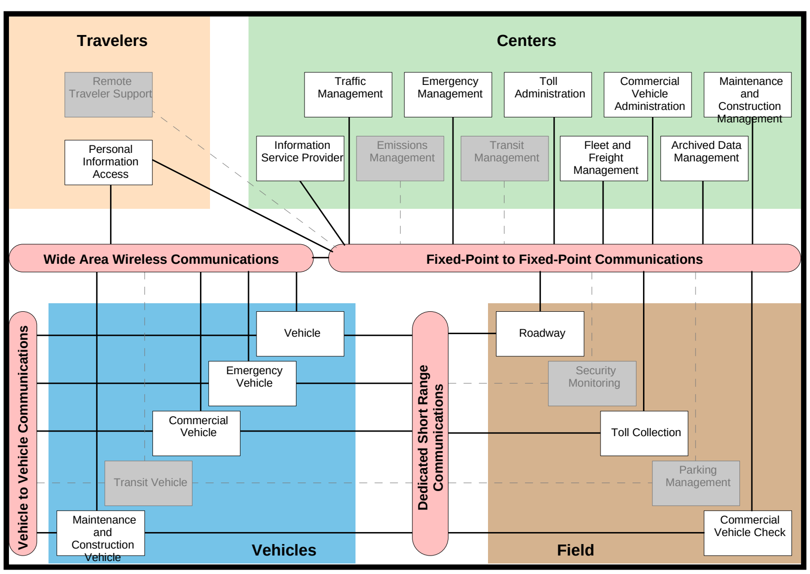
The selection of standards depends on the information exchange requirements. The maintenance process should consider how ITS standards may have evolved and matured since the last update, and consider how any change in the standards environment may impact previous regional standards choices, especially where competing standards exist. For example, if XML-based center-to-center standards reach a high level of maturity, reliability, and cost-effectiveness, then a regional standards technology decision may be made to transition from investments in other standards technologies (e.g., CORBA to XML). The description of the standards environment for the region, as well as the details of which standards apply to the architecture, should be part of the baseline.

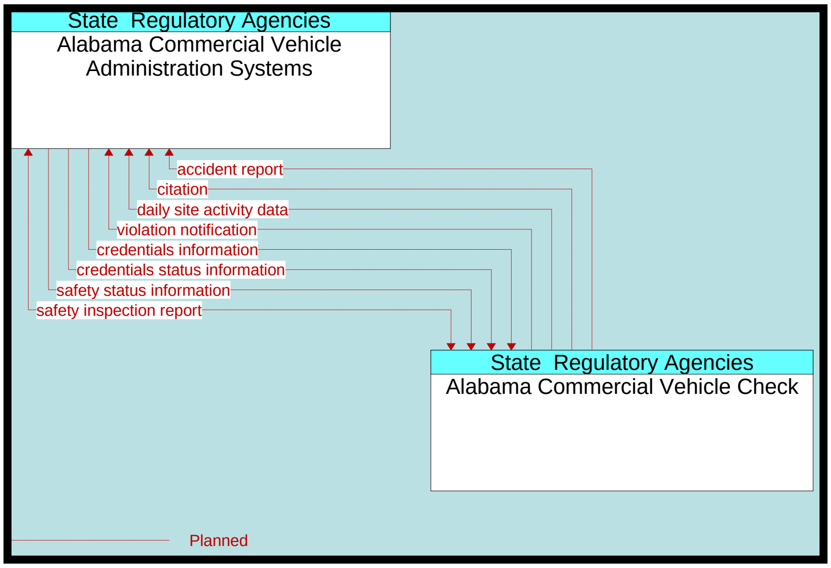
6.5 How will the Architecture be Maintained?

The I-10 Corridor task force, in coordination with the corridor ITS architecture maintenance committee, will maintain the architecture in accordance with guidelines contained within FHWA's Regional ITS Architecture Maintenance White Paper. In addition to detailing the recommended maintenance process, the white paper also contains examples of maintenance plans developed by a range of agencies and regions throughout the country.

I-10 Corridor ITS Architecture Flow Diagrams

October 2007

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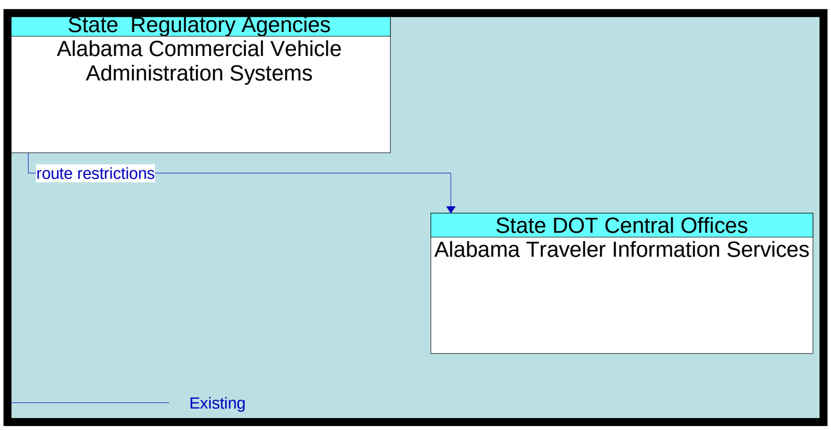
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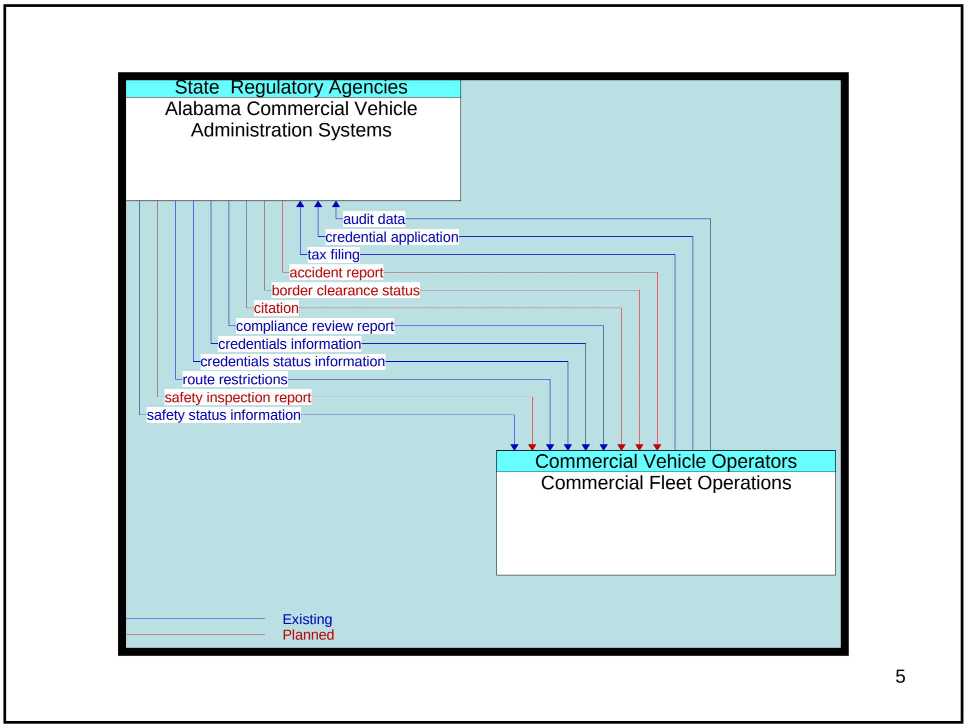
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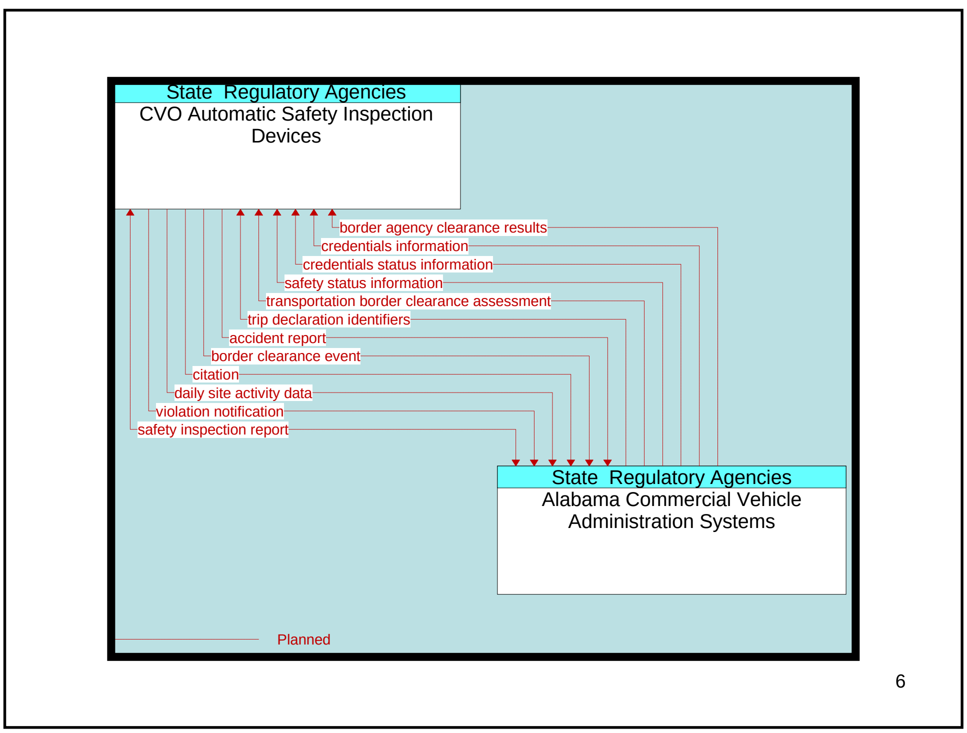
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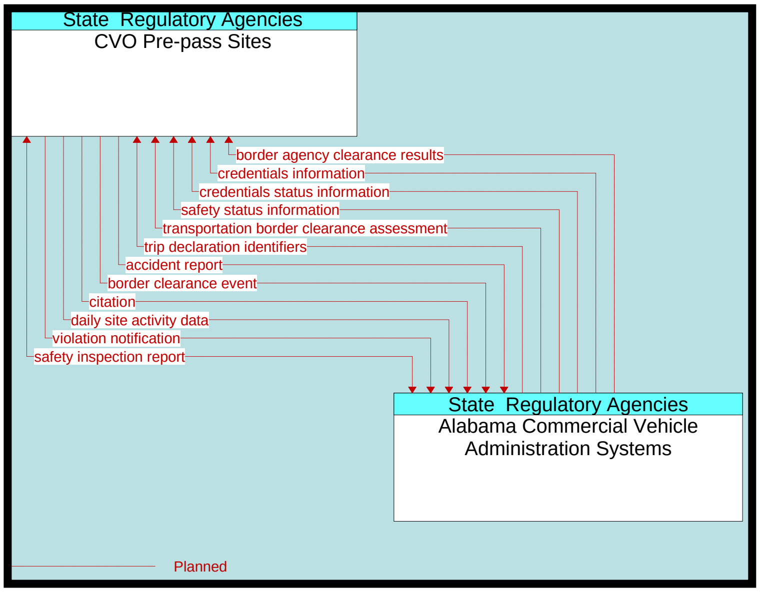
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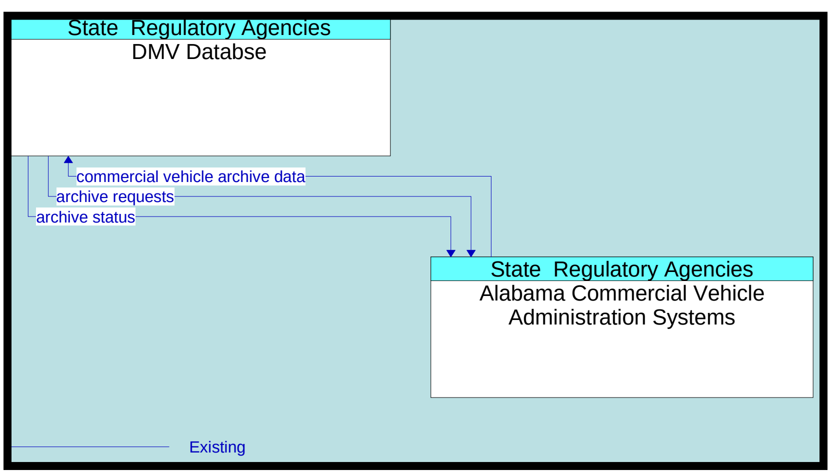
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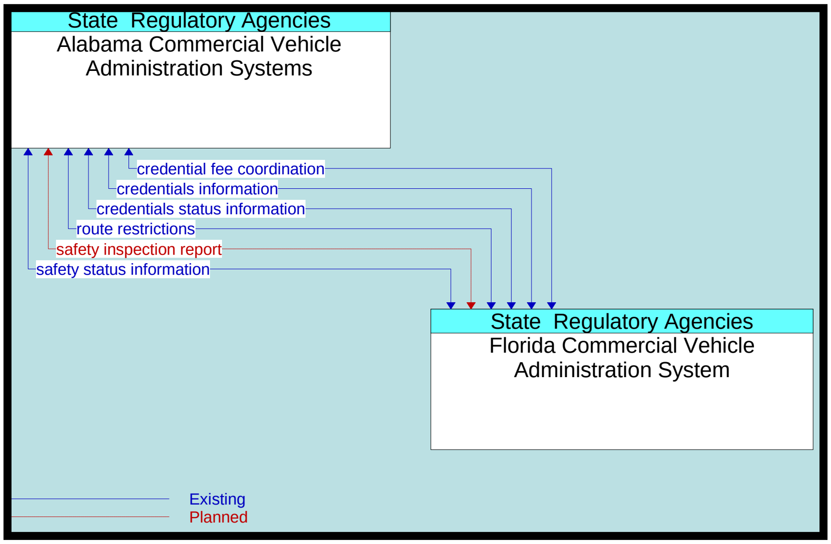
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Planned

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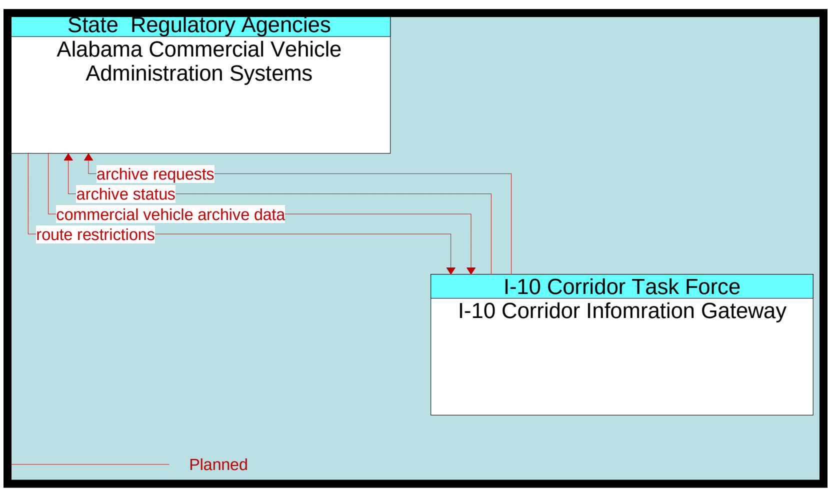
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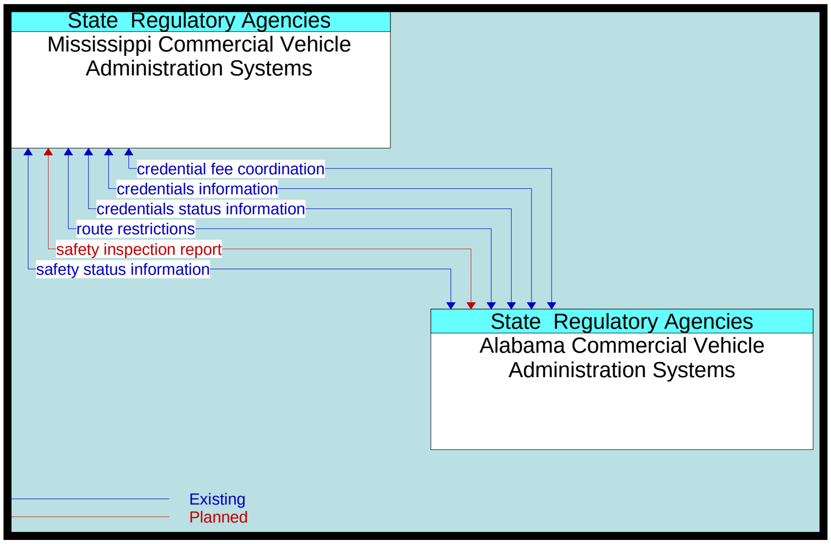
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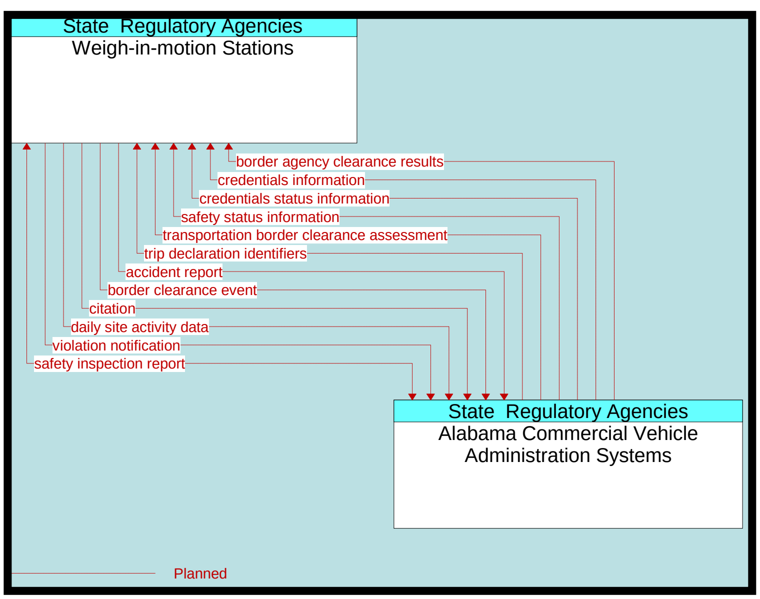
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Planned

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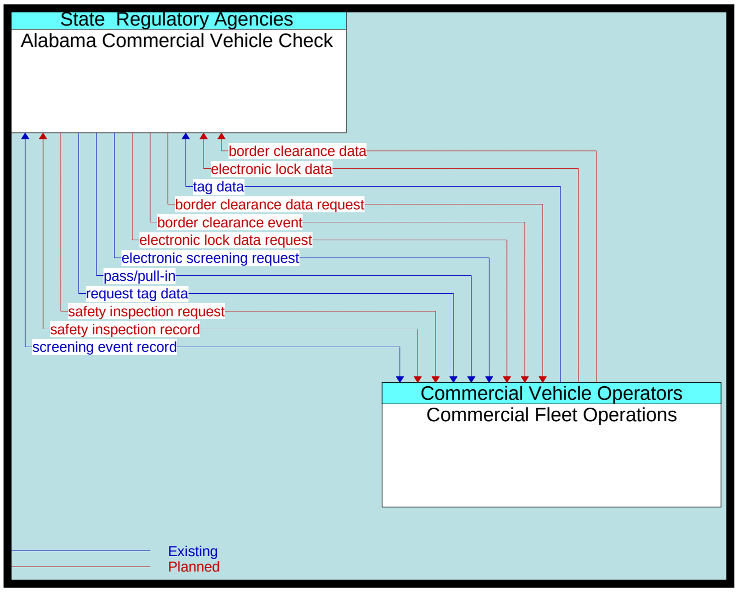

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Existing
Planned

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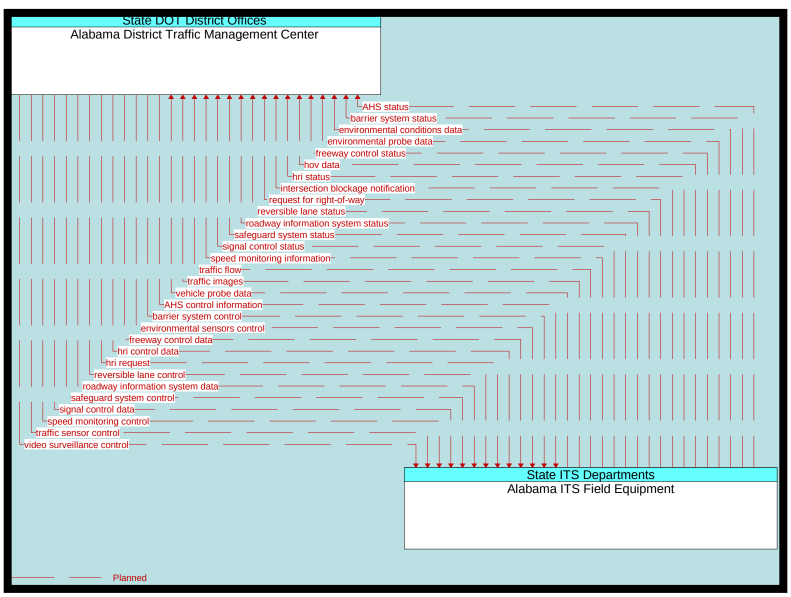

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speed monitoring information
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traffic images
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barrier system control
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Planned

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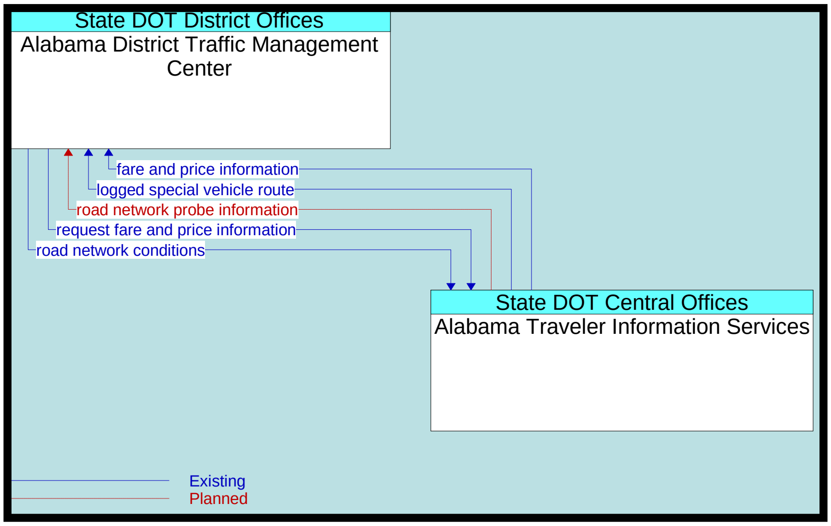

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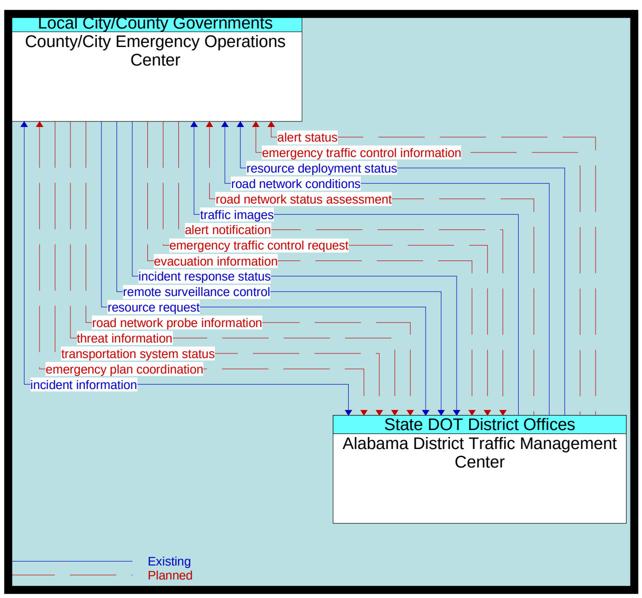
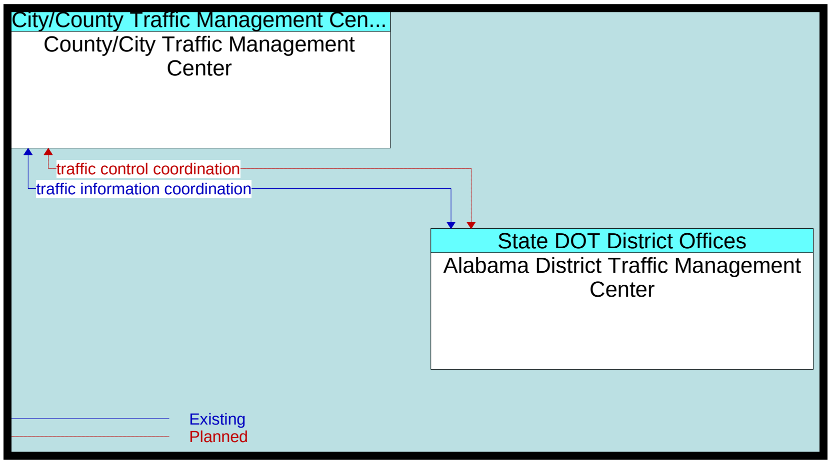
Alabama Traveler Information Services
Existing
Planned

15

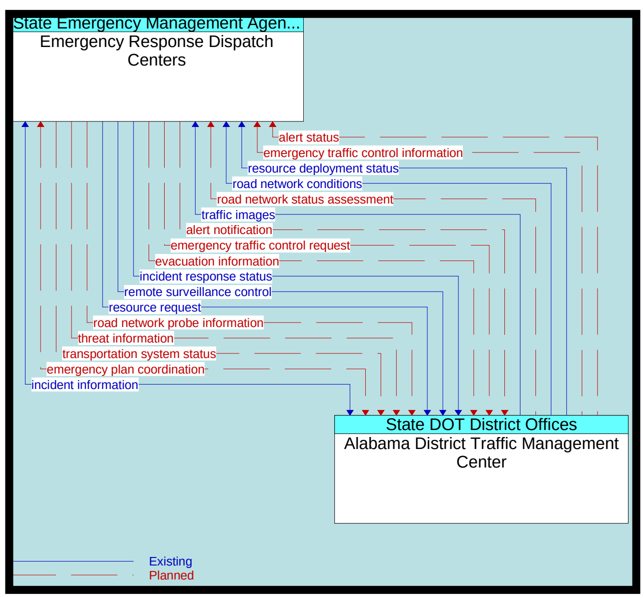


Local City/County Governments
County/City Emergency Operations Center
alert status
emergency traffic control information
resource deployment status
road network conditions
road network status assessment
traffic images
alert notification
emergency traffic control request
evacuation information
incident response status
remote surveillance control
resource request
road network probe information
threat information
transportation system status
emergency plan coordination
incident information
State DOT District Offices
Alabama District Traffic Management Center
Existing
Planned

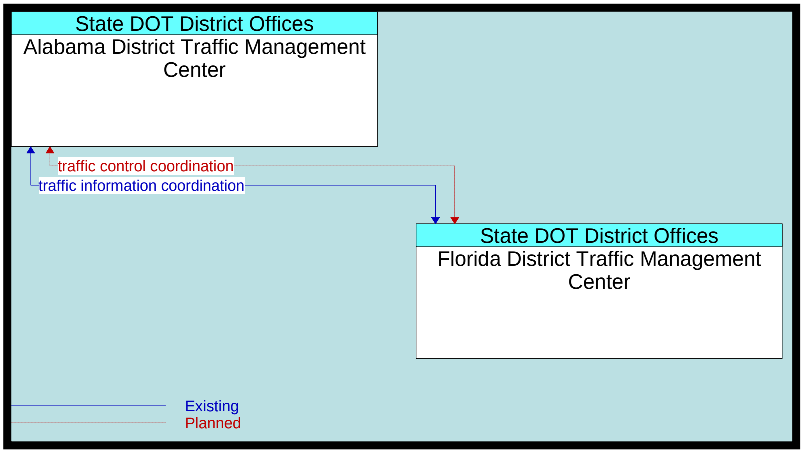
16


City/County Traffic Management Cen...
County/City Traffic Management Center
traffic control coordination
traffic information coordination
State DOT District Offices
Alabama District Traffic Management Center
Existing
Planned

17

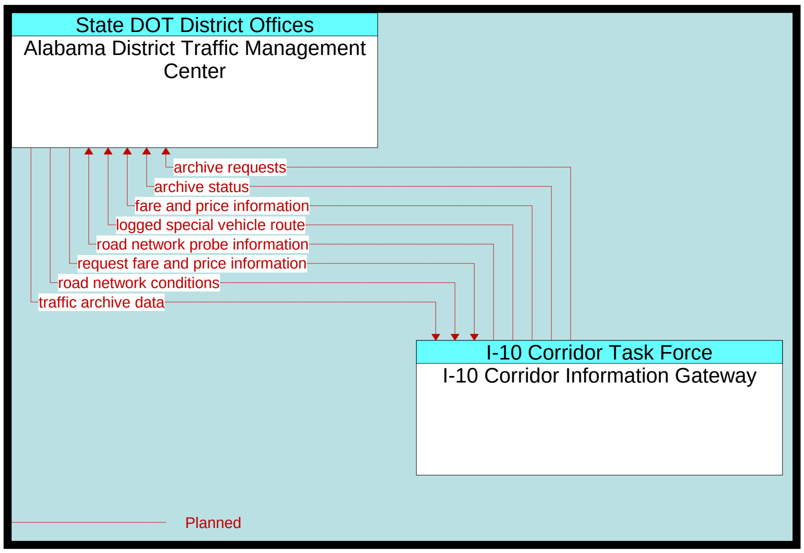

State Emergency Management Agen...
Emergency Response Dispatch Centers
alert status
emergency traffic control information
resource deployment status
road network conditions
road network status assessment
traffic images
alert notification
emergency traffic control request
evacuation information
incident response status
remote surveillance control
resource request
road network probe information
threat information
transportation system status
emergency plan coordination
incident information
State DOT District Offices
Alabama District Traffic Management Center
Existing
Planned

18



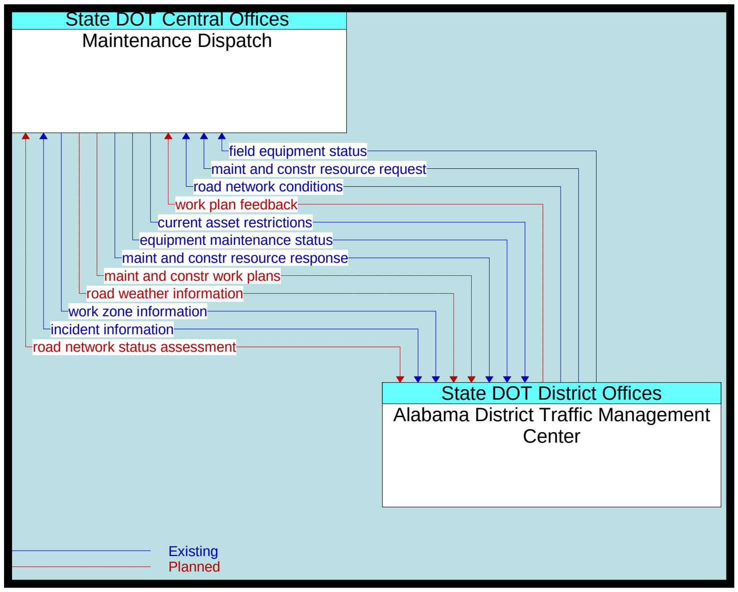
State DOT District Offices
Alabama District Traffic Management Center
traffic control coordination
traffic information coordination
State DOT District Offices
Florida District Traffic Management Center
Existing
Planned

19

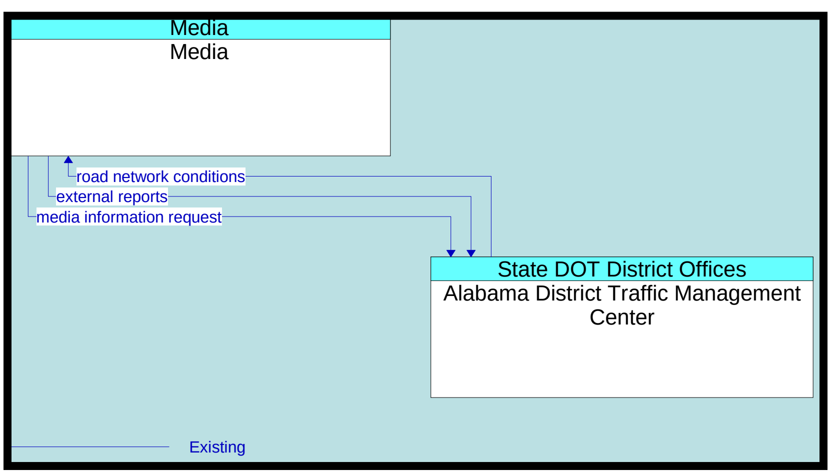


State DOT District Offices
Alabama District Traffic Management Center
archive requests
archive status
fare and price information
logged special vehicle route
road network probe information
request fare and price information
road network conditions
traffic archive data
I-10 Corridor Task Force
I-10 Corridor Information Gateway
Planned

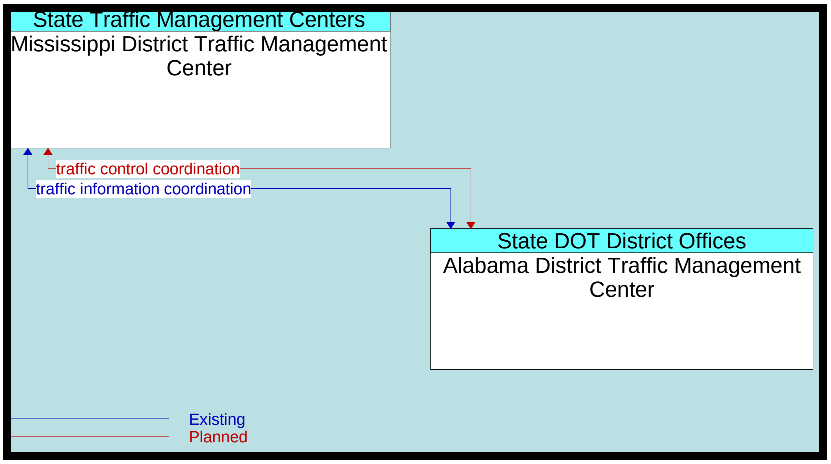
20


State DOT Central Offices
Maintenance Dispatch
field equipment status
maint and constr resource request
road network conditions
work plan feedback
current asset restrictions
equipment maintenance status
maint and constr resource response
maint and constr work plans
road weather information
work zone information
incident information
road network status assessment
State DOT District Offices
Alabama District Traffic Management Center
Existing
Planned

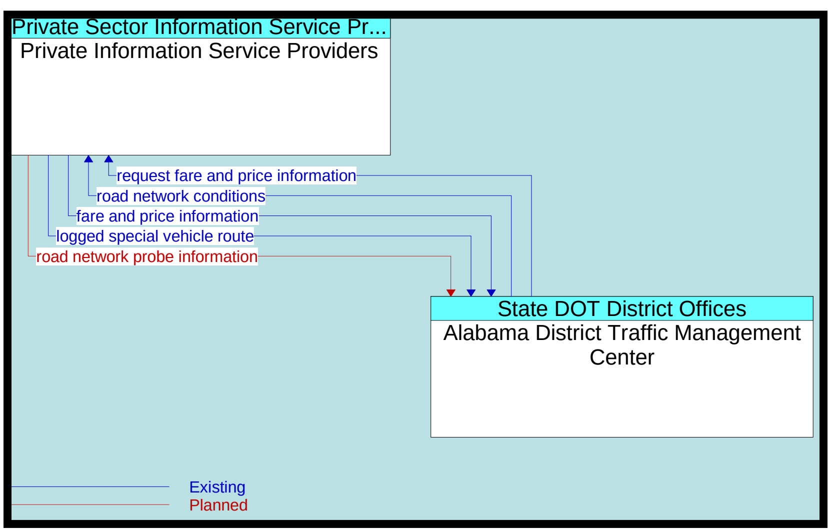
21


Media
Media
road network conditions
external reports
media information request
State DOT District Offices
Alabama District Traffic Management Center
Existing

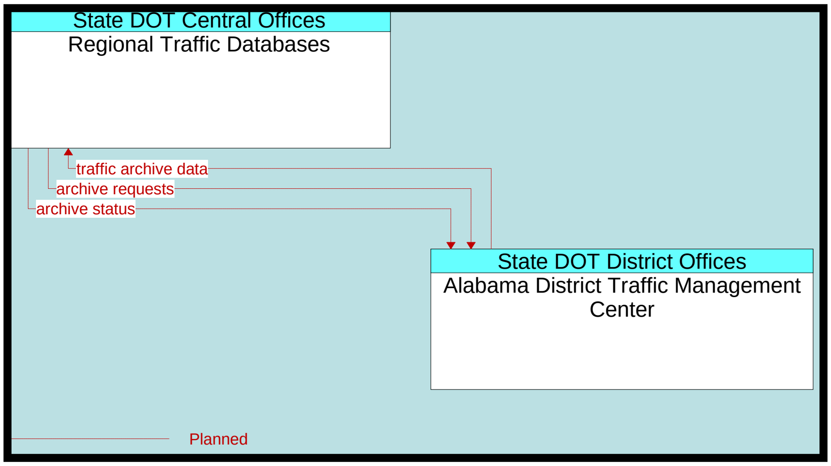
22


State Traffic Management Centers
Mississippi District Traffic Management Center
traffic control coordination
traffic information coordination
State DOT District Offices
Alabama District Traffic Management Center
Existing
Planned

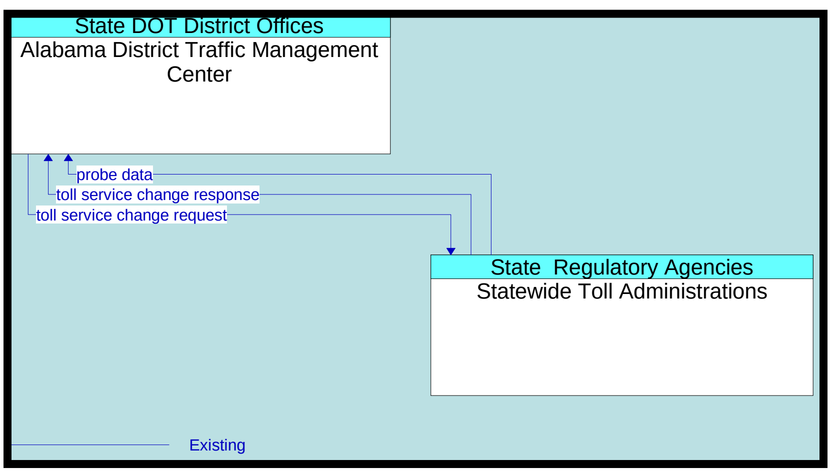
23


Private Sector Information Service Pr...
Private Information Service Providers
request fare and price information
road network conditions
fare and price information
logged special vehicle route
road network probe information
State DOT District Offices
Alabama District Traffic Management Center
Existing
Planned

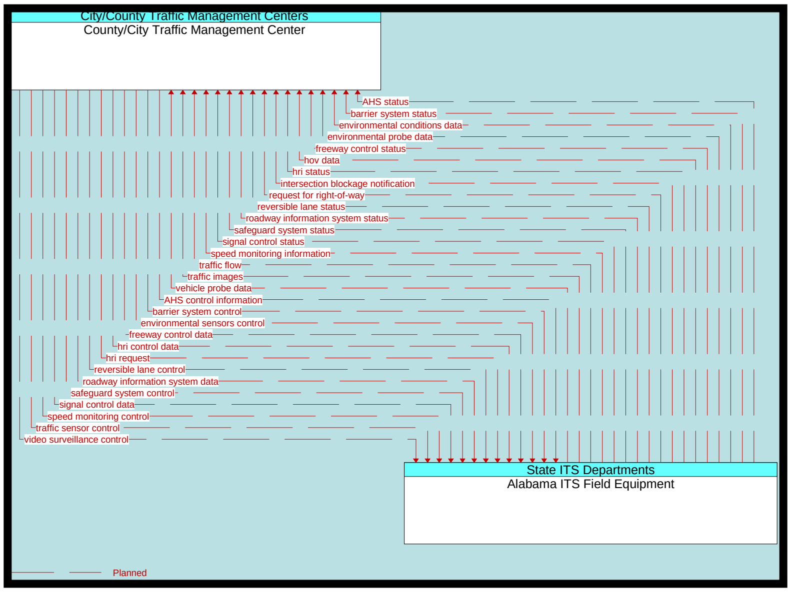
24


State DOT Central Offices
Regional Traffic Databases
traffic archive data
archive requests
archive status
State DOT District Offices
Alabama District Traffic Management Center
Planned

25

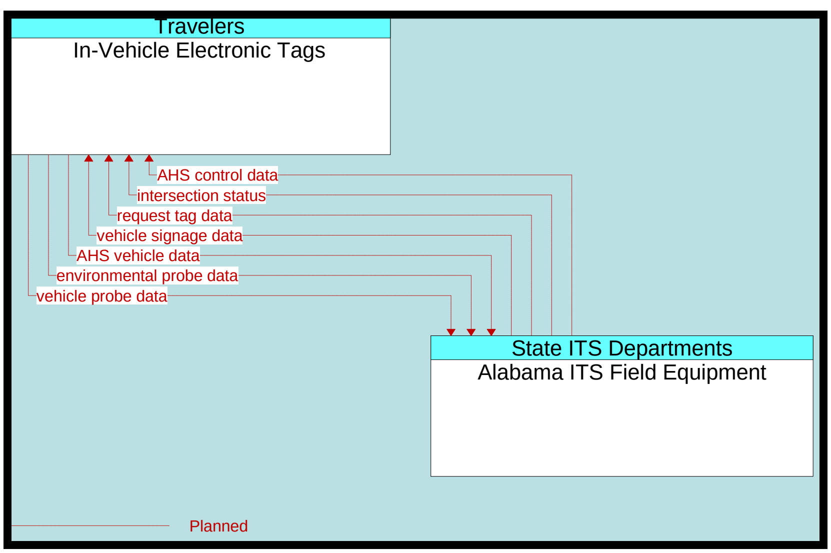

State DOT District Offices
Alabama District Traffic Management Center
probe data
toll service change response
toll service change request
State Regulatory Agencies
Statewide Toll Administrations
Existing

26



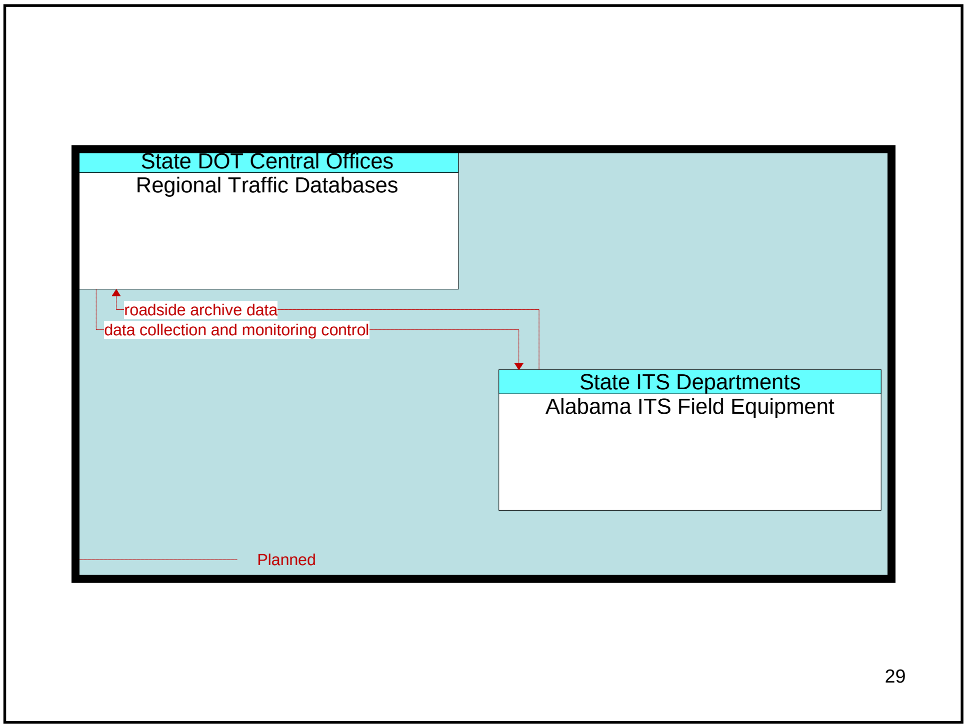
City/County Traffic Management Centers
County/City Traffic Management Center
AHS status
barrier system status
environmental conditions data
environmental probe data
freeway control status
hov data
hri status
intersection blockage notification
request for right-of-way
reversible lane status
roadway information system status
safeguard system status
signal control status
speed monitoring information
traffic flow
traffic images
vehicle probe data
AHS control information
barrier system control
environmental sensors control
freeway control data
hri control data
hri request
reversible lane control
roadway information system data
safeguard system control
signal control data
speed monitoring control
traffic sensor control
video surveillance control
State ITS Departments
Alabama ITS Field Equipment
Planned

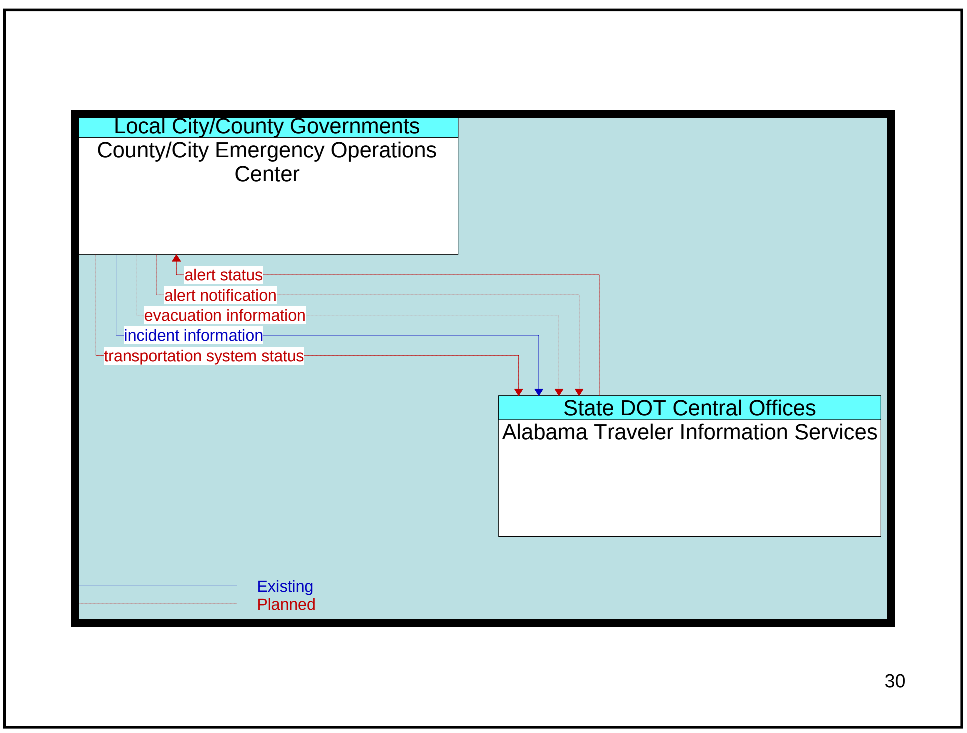
27

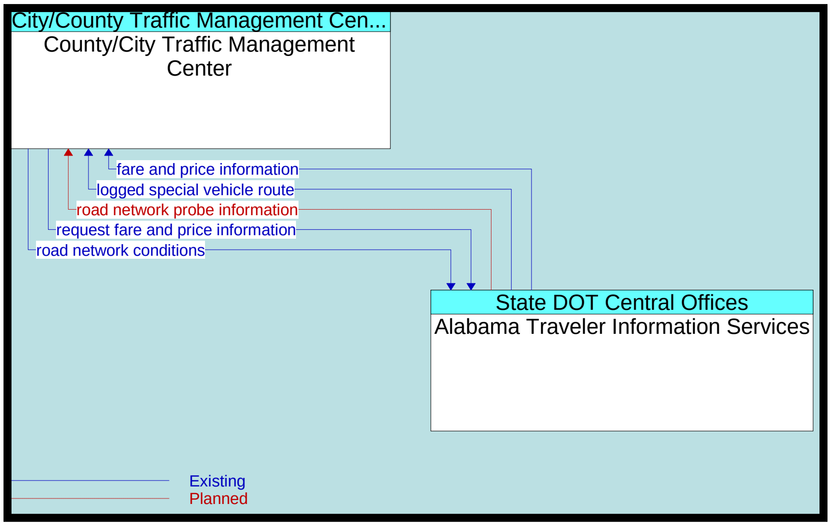


Travelers
In-Vehicle Electronic Tags
AHS control data
intersection status
request tag data
vehicle signage data
AHS vehicle data
environmental probe data
vehicle probe data
State ITS Departments
Alabama ITS Field Equipment
Planned

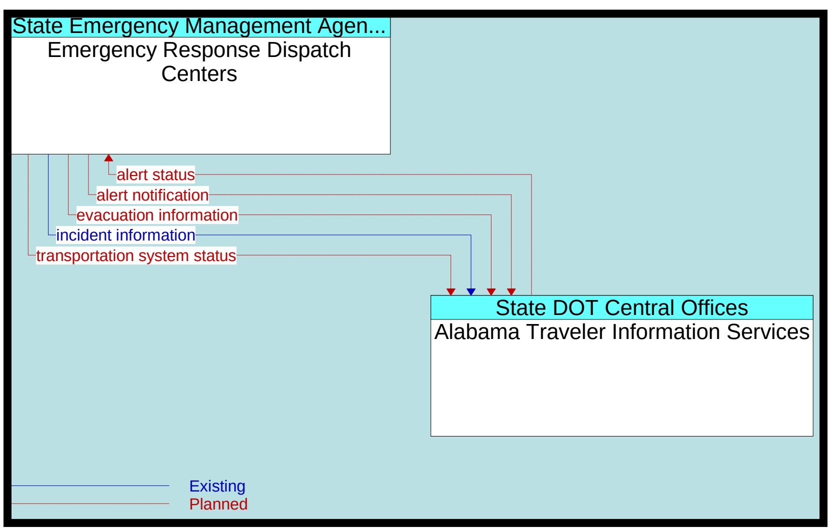
28


State DOT Central Offices
Regional Traffic Databases
roadside archive data
data collection and monitoring control
State ITS Departments
Alabama ITS Field Equipment
Planned
29

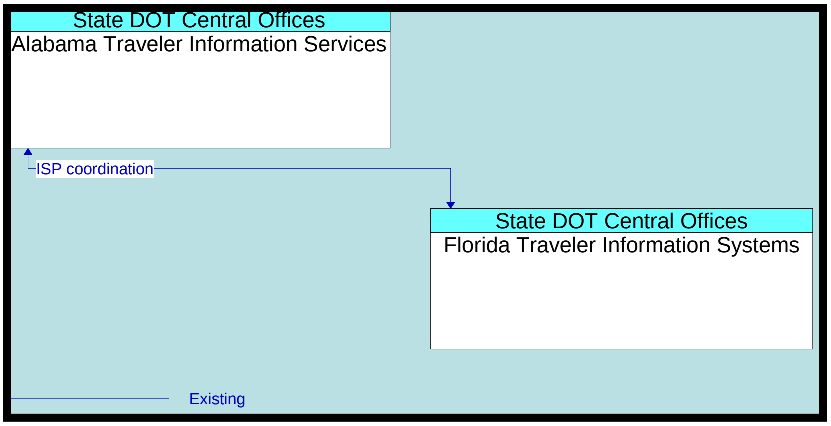

Local City/County Governments
County/City Emergency Operations Center
alert status
alert notification
evacuation information
incident information
transportation system status
State DOT Central Offices
Alabama Traveler Information Services
Existing
Planned
30


City/County Traffic Management Cen...
County/City Traffic Management Center
fare and price information
logged special vehicle route
road network probe information
request fare and price information
road network conditions
State DOT Central Offices
Alabama Traveler Information Services
Existing
Planned

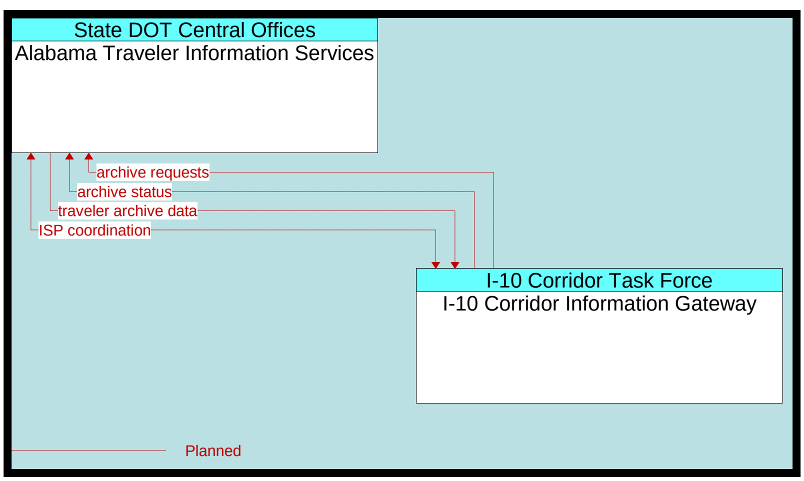
31


State Emergency Management Agen...
Emergency Response Dispatch Centers
alert status
alert notification
evacuation information
incident information
transportation system status
State DOT Central Offices
Alabama Traveler Information Services
Existing
Planned

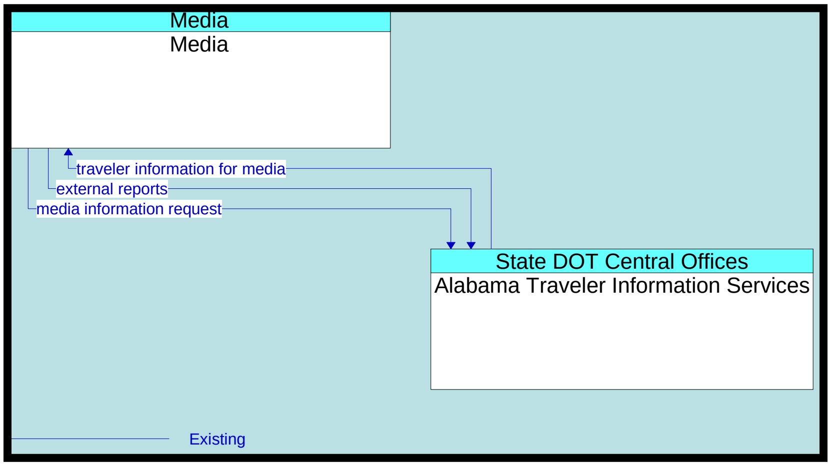
32


State DOT Central Offices
Alabama Traveler Information Services
ISP coordination
State DOT Central Offices
Florida Traveler Information Systems
Existing

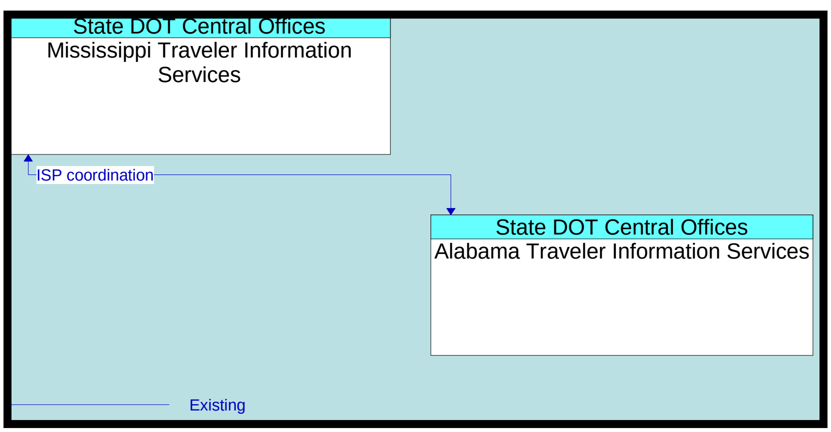
33


State DOT Central Offices
Alabama Traveler Information Services
archive requests
archive status
traveler archive data
ISP coordination
I-10 Corridor Task Force
I-10 Corridor Information Gateway
Planned

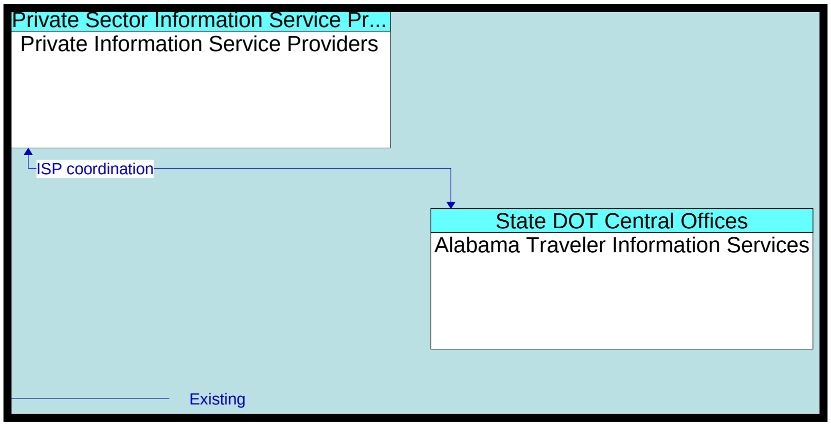
34


Media
Media
traveler information for media
external reports
media information request
State DOT Central Offices
Alabama Traveler Information Services
Existing

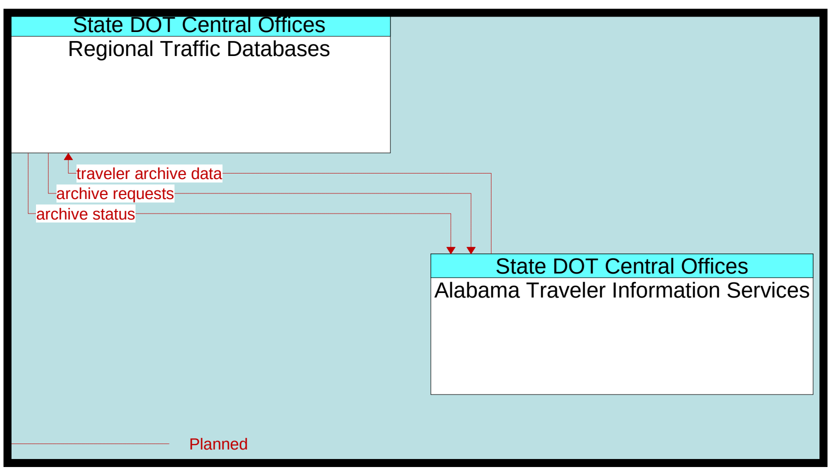
35


State DOT Central Offices
Mississippi Traveler Information Services
ISP coordination
State DOT Central Offices
Alabama Traveler Information Services
Existing

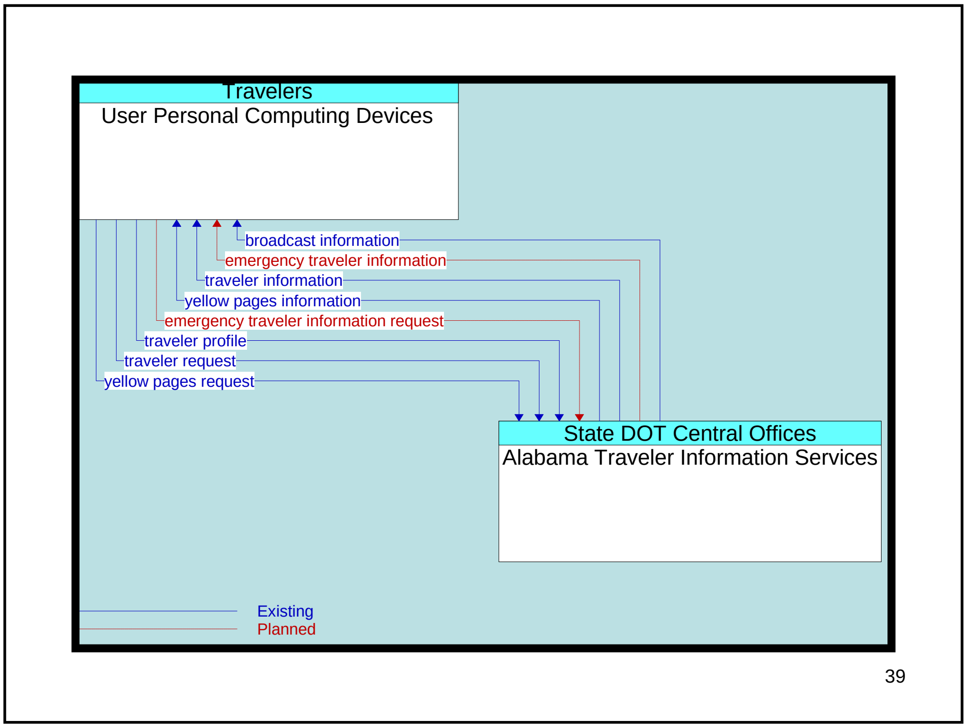
36

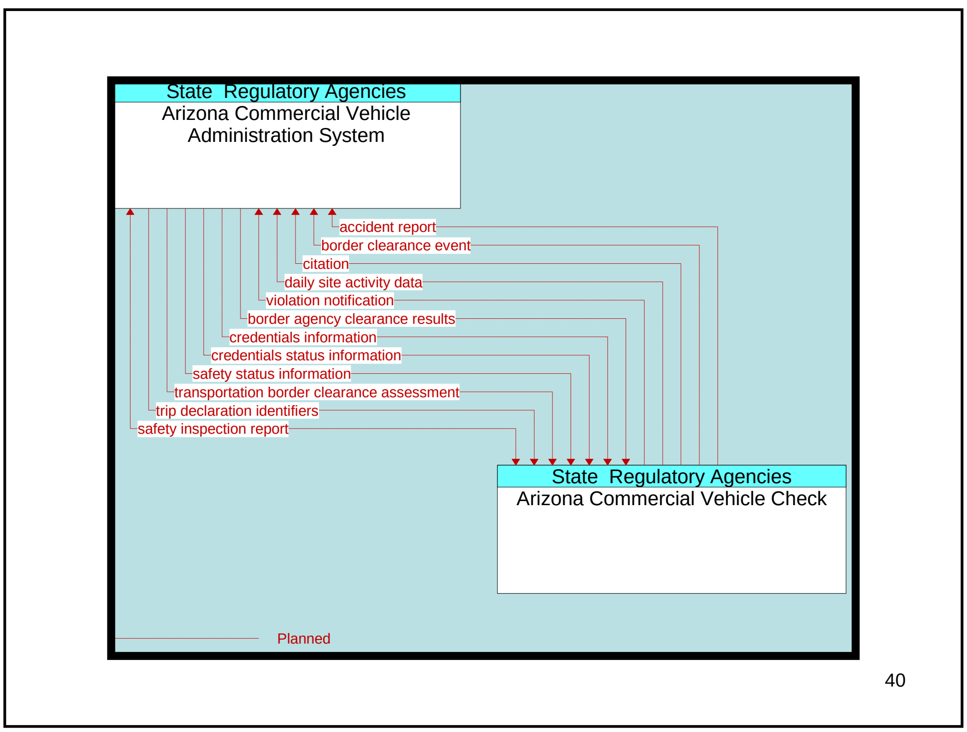

Private Sector Information Service Pr...
Private Information Service Providers
ISP coordination
State DOT Central Offices
Alabama Traveler Information Services
Existing

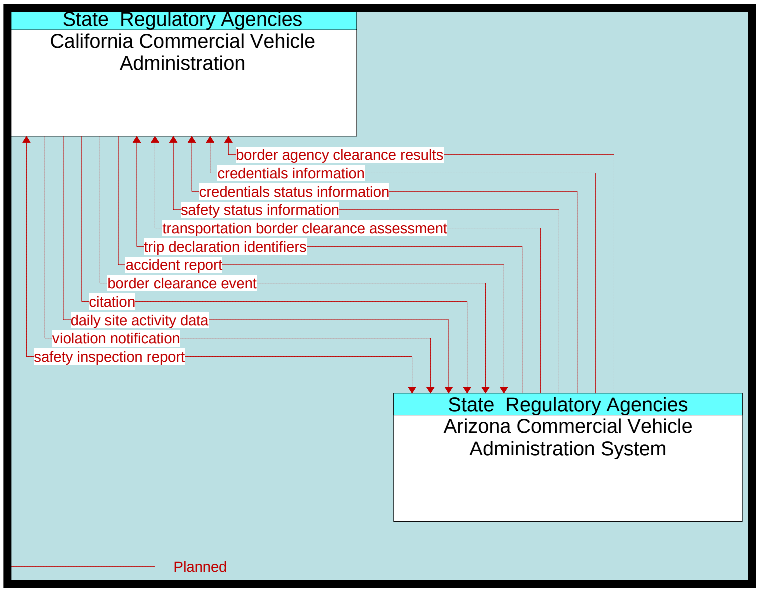
37


State DOT Central Offices
Regional Traffic Databases
traveler archive data
archive requests
archive status
State DOT Central Offices
Alabama Traveler Information Services
Planned

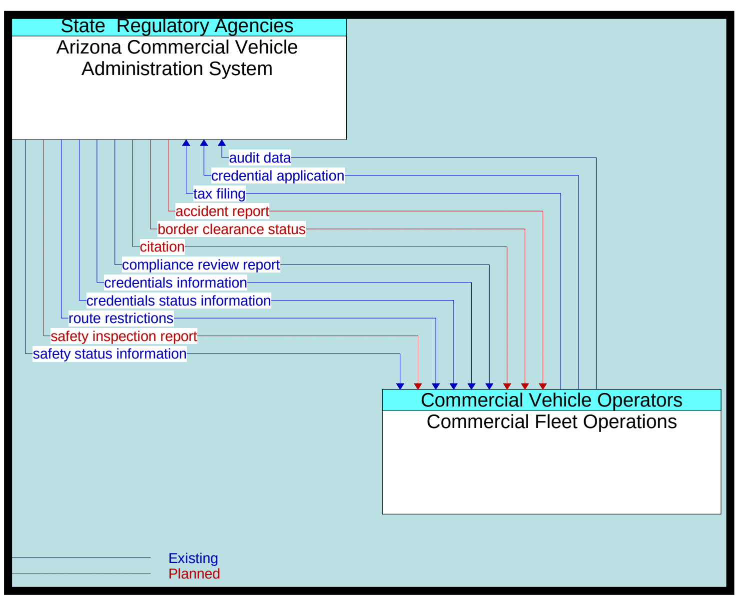
38


Travelers
User Personal Computing Devices
broadcast information
emergency traveler information
traveler information
yellow pages information
emergency traveler information request
traveler profile
traveler request
yellow pages request
State DOT Central Offices
Alabama Traveler Information Services
Existing
Planned
39

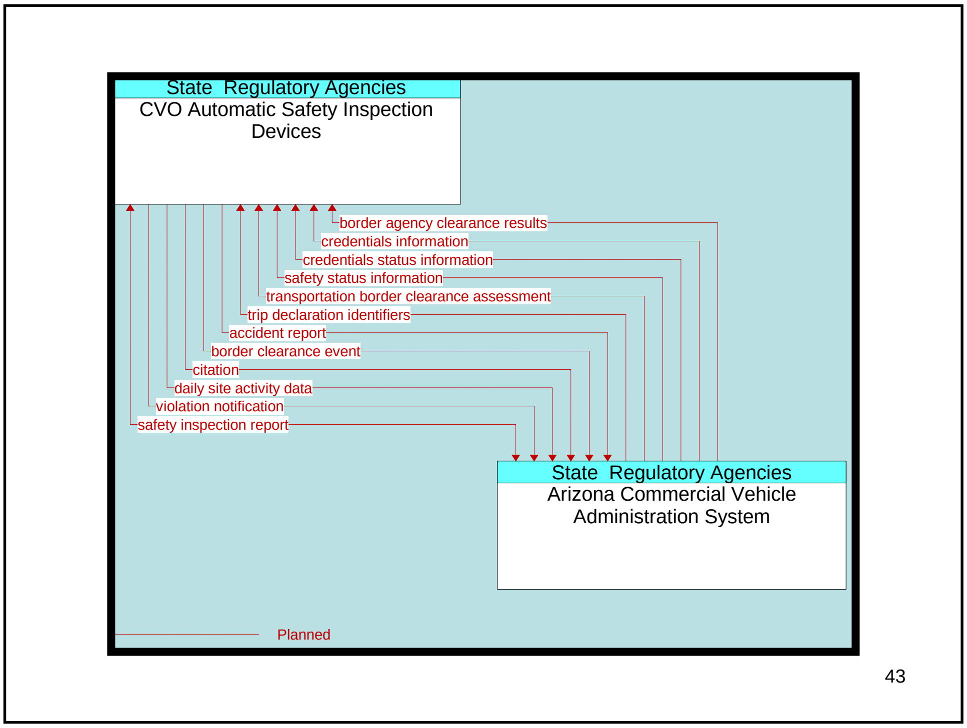

State Regulatory Agencies
Arizona Commercial Vehicle
Administration System
accident report
border clearance event
citation
daily site activity data
violation notification
border agency clearance results
credentials information
credentials status information
safety status information
transportation border clearance assessment
trip declaration identifiers
safety inspection report
State Regulatory Agencies
Arizona Commercial Vehicle Check
Planned
40


State Regulatory Agencies
California Commercial Vehicle Administration
border agency clearance results
credentials information
credentials status information
safety status information
transportation border clearance assessment
trip declaration identifiers
accident report
border clearance event
citation
daily site activity data
violation notification
safety inspection report
State Regulatory Agencies
Arizona Commercial Vehicle Administration System
Planned

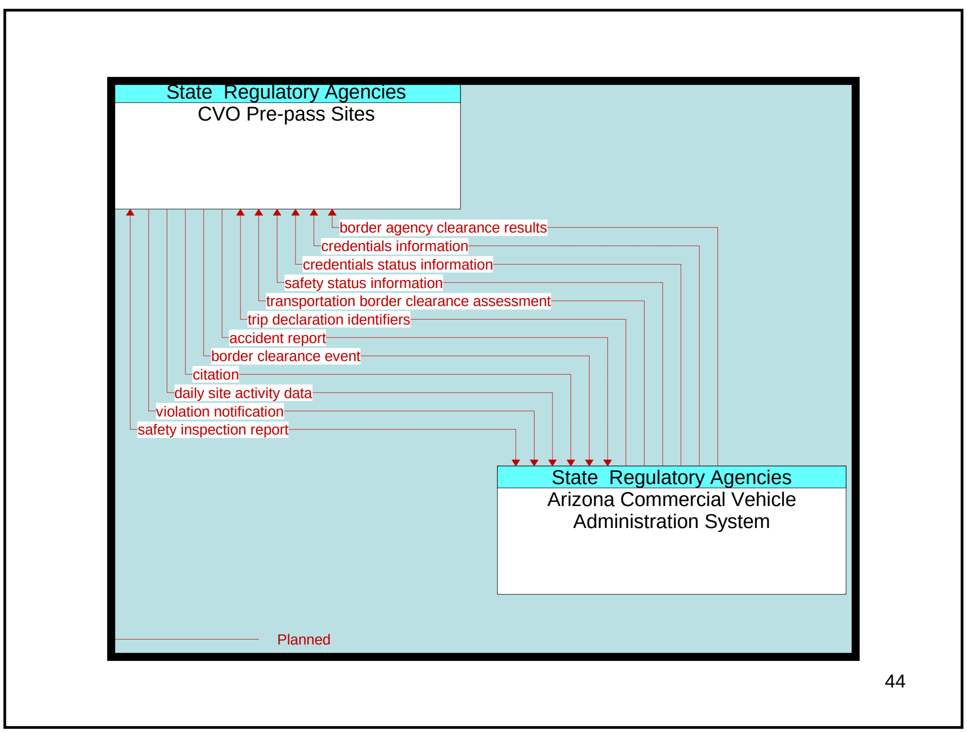
41


State Regulatory Agencies
Arizona Commercial Vehicle Administration System
audit data
credential application
tax filing
accident report
border clearance status
citation
compliance review report
credentials information
credentials status information
route restrictions
safety inspection report
safety status information
Commercial Vehicle Operators
Commercial Fleet Operations
Existing
Planned

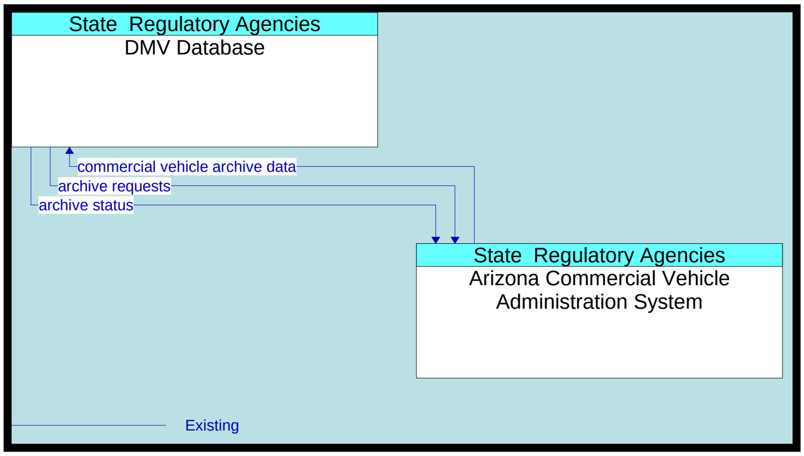
42



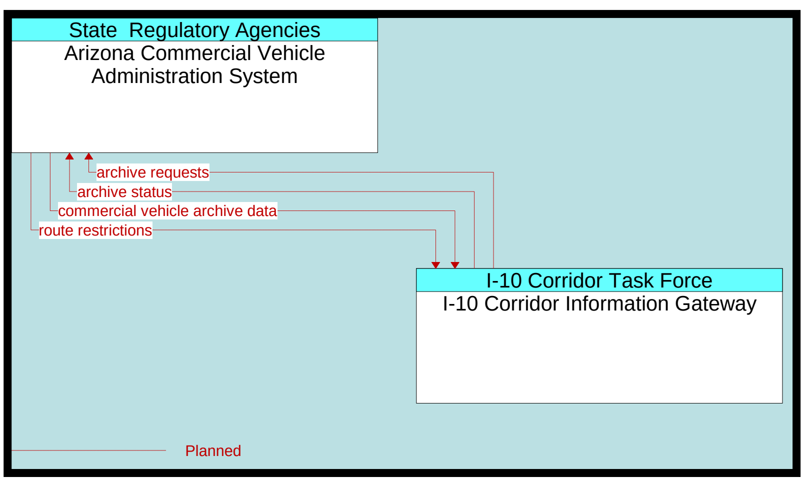
State Regulatory Agencies
CVO Automatic Safety Inspection Devices
border agency clearance results
credentials information
credentials status information
safety status information
transportation border clearance assessment
trip declaration identifiers
accident report
border clearance event
citation
daily site activity data
violation notification
safety inspection report
State Regulatory Agencies
Arizona Commercial Vehicle Administration System
Planned
43



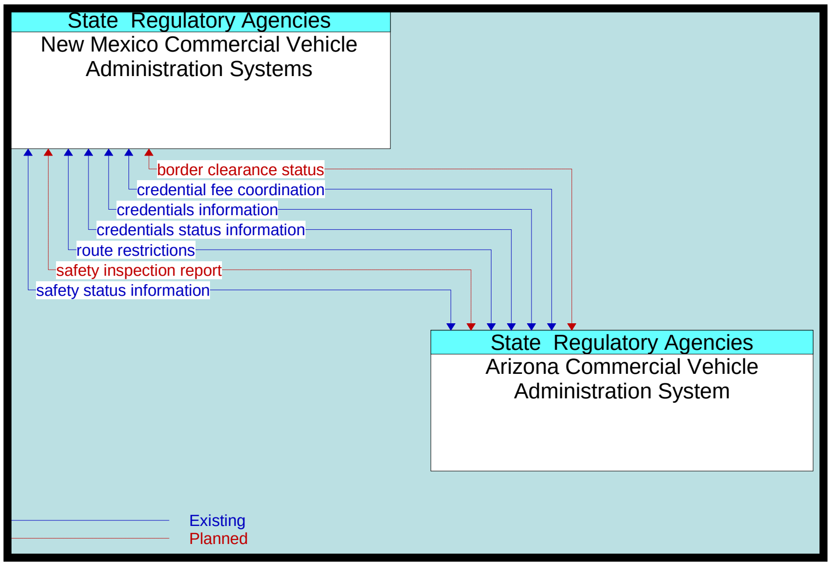
State Regulatory Agencies
CVO Pre-pass Sites
border agency clearance results
credentials information
credentials status information
safety status information
transportation border clearance assessment
trip declaration identifiers
accident report
border clearance event
citation
daily site activity data
violation notification
safety inspection report
State Regulatory Agencies
Arizona Commercial Vehicle Administration System
Planned
44


State Regulatory Agencies
DMV Database
commercial vehicle archive data
archive requests
archive status
State Regulatory Agencies
Arizona Commercial Vehicle Administration System
Existing

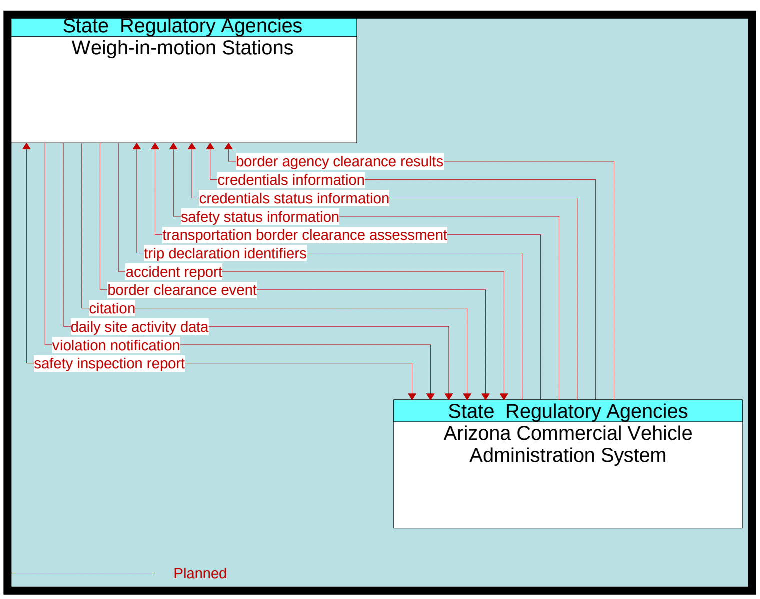
45


State Regulatory Agencies
Arizona Commercial Vehicle Administration System
archive requests
archive status
commercial vehicle archive data
route restrictions
I-10 Corridor Task Force
I-10 Corridor Information Gateway
Planned

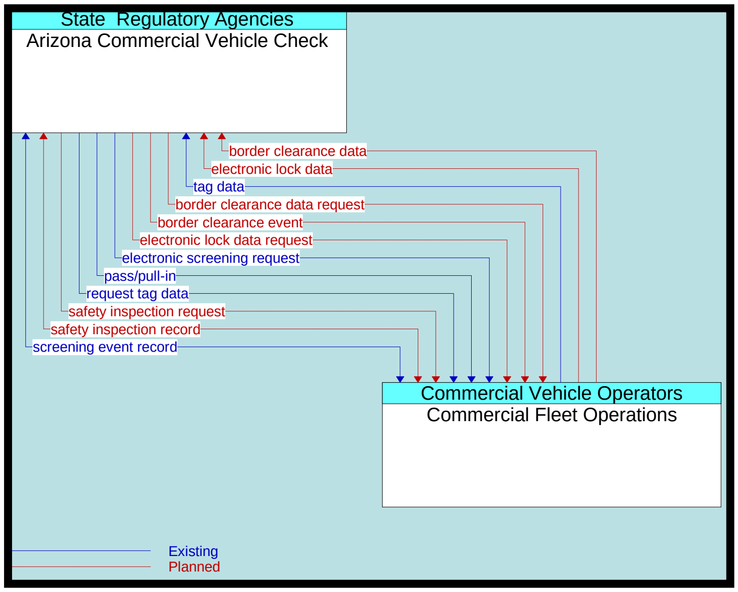
46


State Regulatory Agencies
New Mexico Commercial Vehicle Administration Systems
border clearance status
credential fee coordination
credentials information
credentials status information
route restrictions
safety inspection report
safety status information
State Regulatory Agencies
Arizona Commercial Vehicle Administration System
Existing
Planned

47

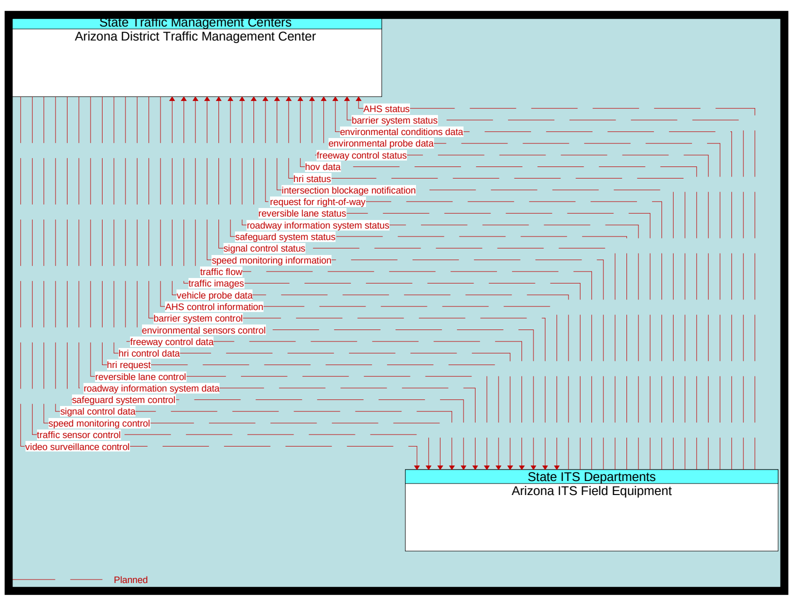

State Regulatory Agencies
Weigh-in-motion Stations
border agency clearance results
credentials information
credentials status information
safety status information
transportation border clearance assessment
trip declaration identifiers
accident report
border clearance event
citation
daily site activity data
violation notification
safety inspection report
State Regulatory Agencies
Arizona Commercial Vehicle Administration System
Planned

48



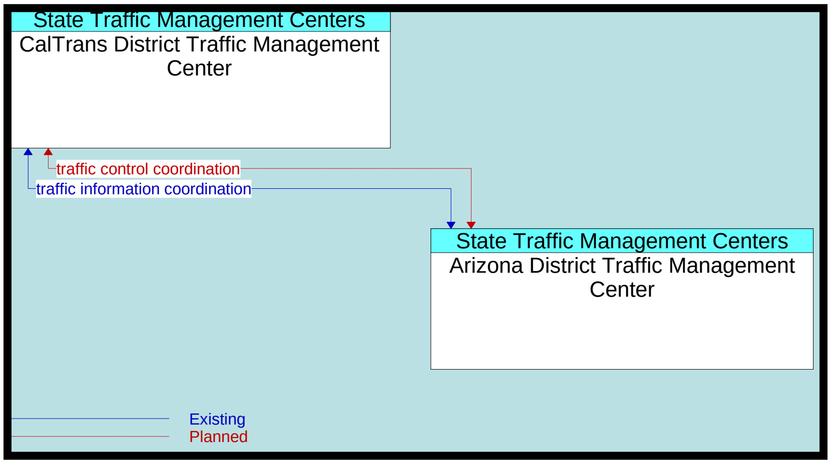
State Regulatory Agencies
Arizona Commercial Vehicle Check
border clearance data
electronic lock data
tag data
border clearance data request
border clearance event
electronic lock data request
electronic screening request
pass/pull-in
request tag data
safety inspection request
safety inspection record
screening event record
Commercial Vehicle Operators
Commercial Fleet Operations
Existing
Planned

49

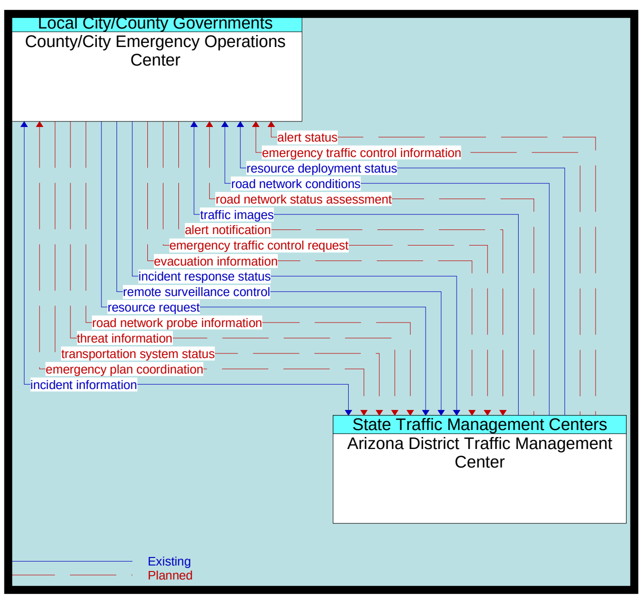


State Traffic Management Centers
Arizona District Traffic Management Center
AHS status
barrier system status
environmental conditions data
environmental probe data
freeway control status
hov data
hri status
intersection blockage notification
request for right-of-way
reversible lane status
roadway information system status
safeguard system status
signal control status
speed monitoring information
traffic flow
traffic images
vehicle probe data
AHS control information
barrier system control
environmental sensors control
freeway control data
hri control data
hri request
reversible lane control
roadway information system data
safeguard system control
signal control data
speed monitoring control
traffic sensor control
video surveillance control
State ITS Departments
Arizona ITS Field Equipment
Planned

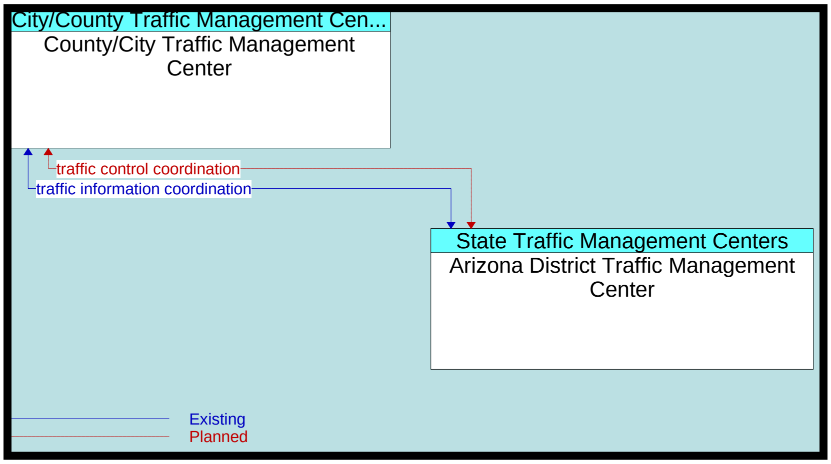
50


State Traffic Management Centers
CalTrans District Traffic Management Center
traffic control coordination
traffic information coordination
State Traffic Management Centers
Arizona District Traffic Management Center
Existing
Planned

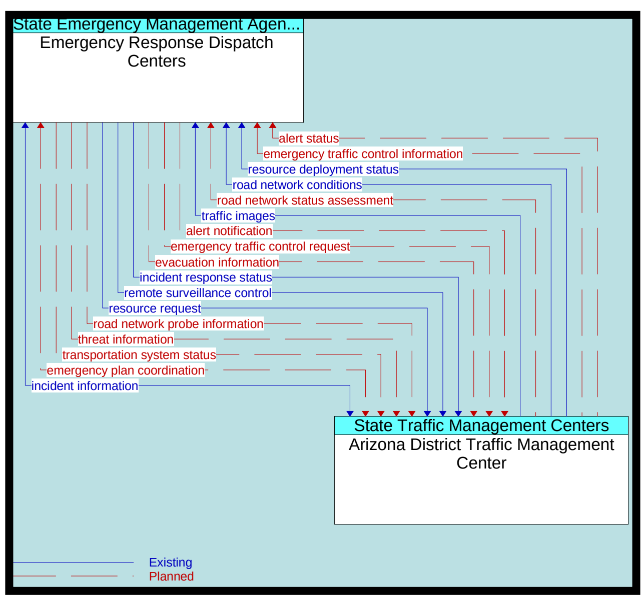
51


Local City/County Governments
County/City Emergency Operations Center
alert status
emergency traffic control information
resource deployment status
road network conditions
road network status assessment
traffic images
alert notification
emergency traffic control request
evacuation information
incident response status
remote surveillance control
resource request
road network probe information
threat information
transportation system status
emergency plan coordination
incident information
State Traffic Management Centers
Arizona District Traffic Management Center
Existing
Planned

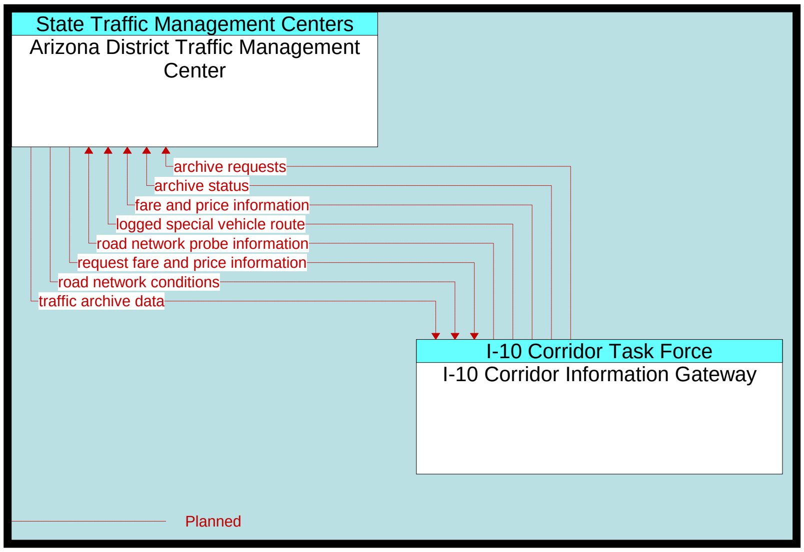
52


City/County Traffic Management Cen...
County/City Traffic Management Center
traffic control coordination
traffic information coordination
State Traffic Management Centers
Arizona District Traffic Management Center
Existing
Planned

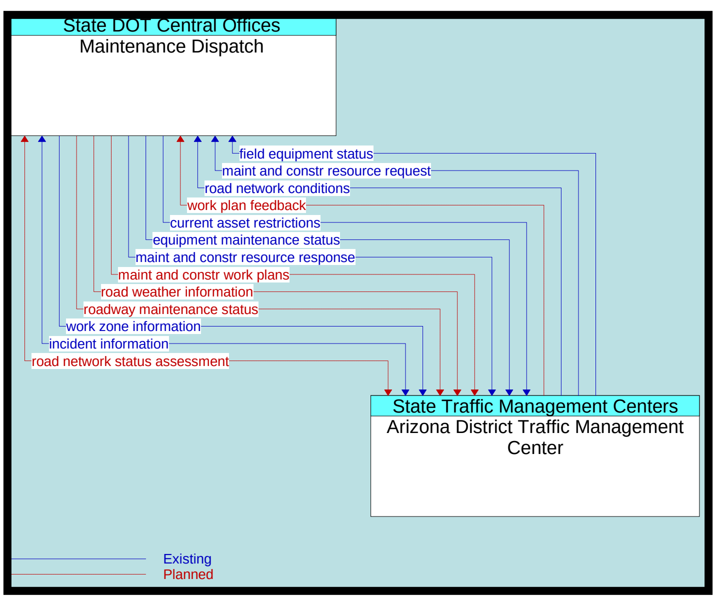
53


State Emergency Management Agen...
Emergency Response Dispatch Centers
alert status
emergency traffic control information
resource deployment status
road network conditions
road network status assessment
traffic images
alert notification
emergency traffic control request
evacuation information
incident response status
remote surveillance control
resource request
road network probe information
threat information
transportation system status
emergency plan coordination
incident information
State Traffic Management Centers
Arizona District Traffic Management Center
Existing
Planned

54


State Traffic Management Centers
Arizona District Traffic Management Center
archive requests
archive status
fare and price information
logged special vehicle route
road network probe information
request fare and price information
road network conditions
traffic archive data
I-10 Corridor Task Force
I-10 Corridor Information Gateway
Planned

55


State DOT Central Offices
Maintenance Dispatch
field equipment status
maint and constr resource request
road network conditions
work plan feedback
current asset restrictions
equipment maintenance status
maint and constr resource response
maint and constr work plans
road weather information
roadway maintenance status
work zone information
incident information
road network status assessment
State Traffic Management Centers
Arizona District Traffic Management Center
Existing
Planned

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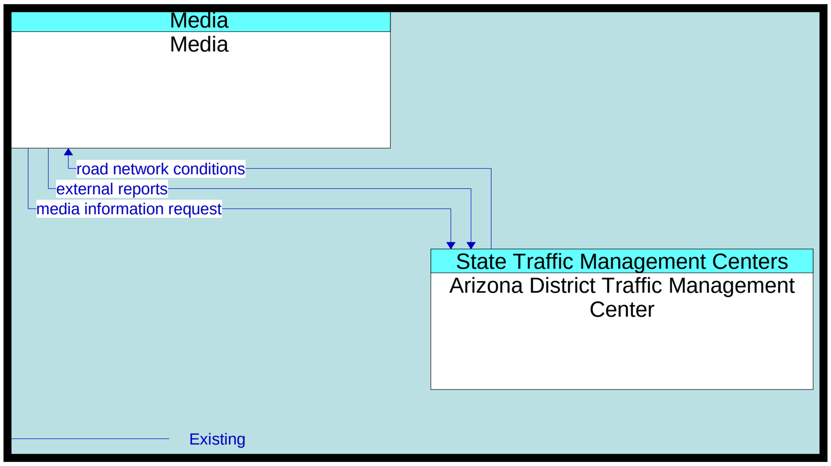
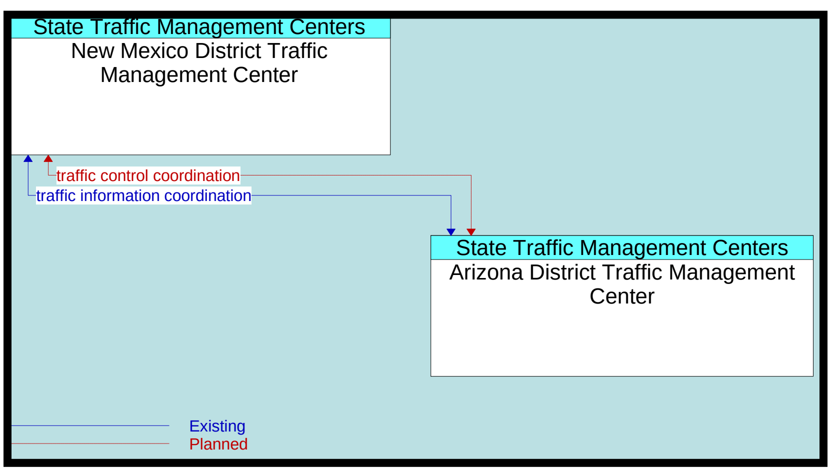
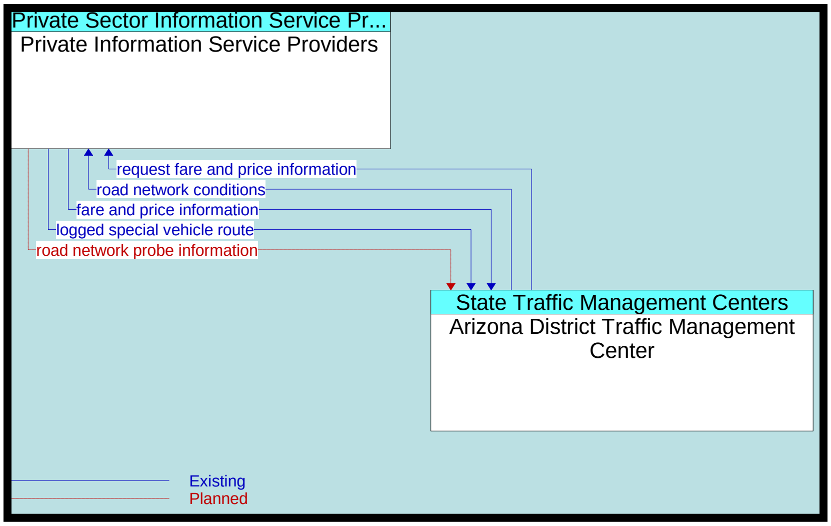

Media
Media
road network conditions
external reports
media information request
State Traffic Management Centers
Arizona District Traffic Management Center
Existing

57

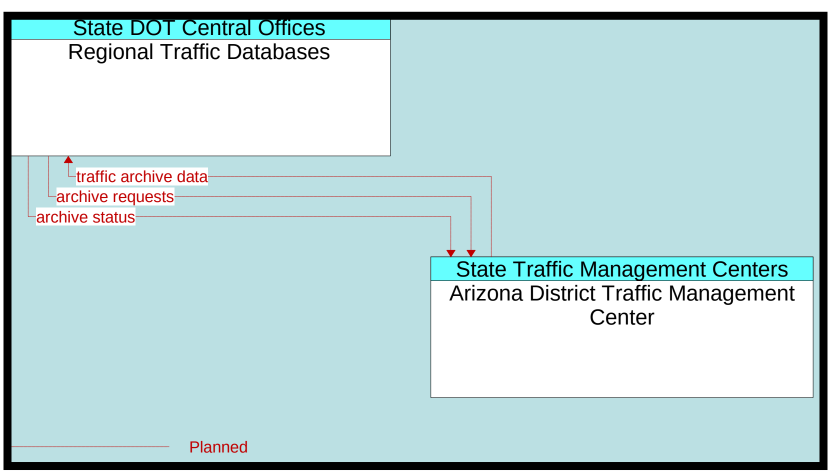

State Traffic Management Centers
New Mexico District Traffic Management Center
traffic control coordination
traffic information coordination
State Traffic Management Centers
Arizona District Traffic Management Center
Existing
Planned

58



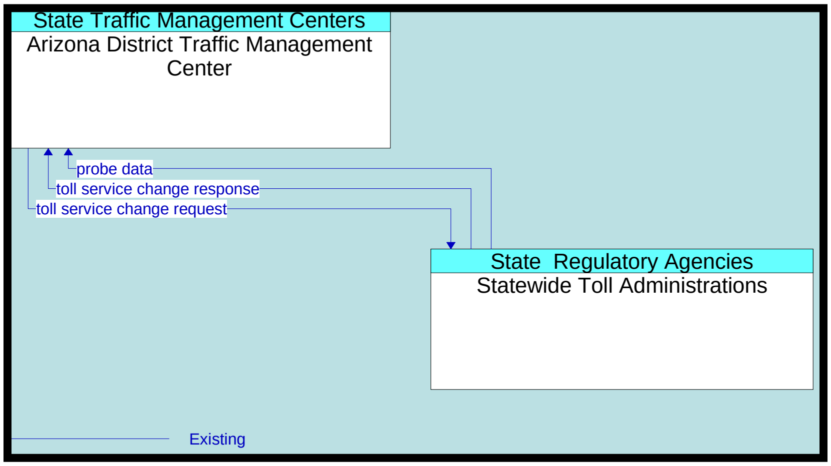
Private Sector Information Service Pr...
Private Information Service Providers
request fare and price information
road network conditions
fare and price information
logged special vehicle route
road network probe information
State Traffic Management Centers
Arizona District Traffic Management Center
Existing
Planned

59

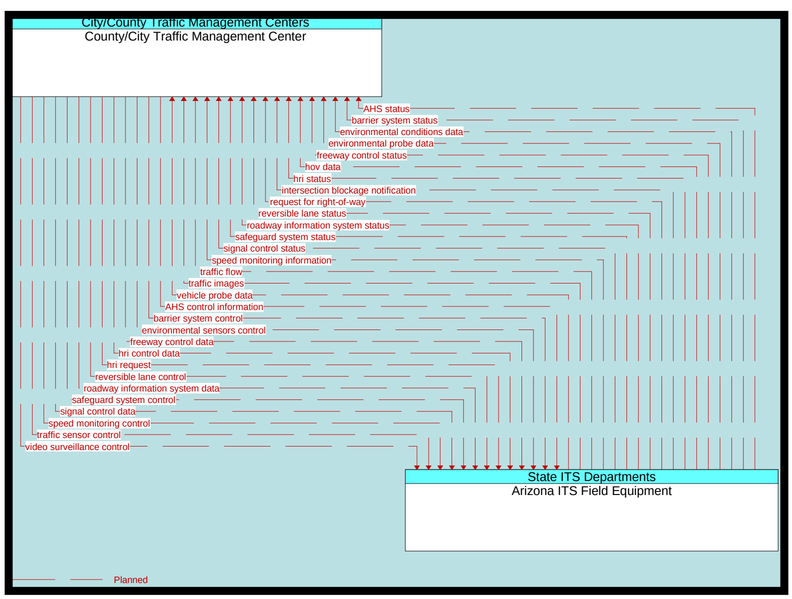


State DOT Central Offices
Regional Traffic Databases
traffic archive data
archive requests
archive status
State Traffic Management Centers
Arizona District Traffic Management Center
Planned

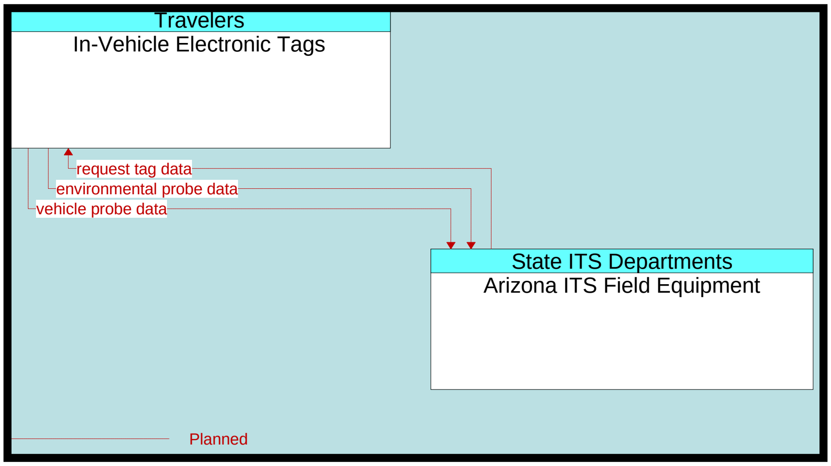
60


State Traffic Management Centers
Arizona District Traffic Management Center
probe data
toll service change response
toll service change request
State Regulatory Agencies
Statewide Toll Administrations
Existing

61

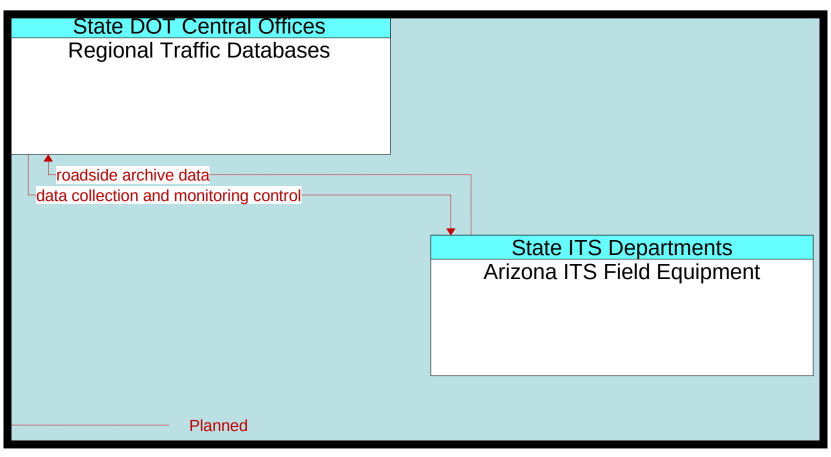

City/County Traffic Management Centers
County/City Traffic Management Center
AHS status
barrier system status
environmental conditions data
environmental probe data
freeway control status
hov data
hri status
intersection blockage notification
request for right-of-way
reversible lane status
roadway information system status
safeguard system status
signal control status
speed monitoring information
traffic flow
traffic images
vehicle probe data
AHS control information
barrier system control
environmental sensors control
freeway control data
hri control data
hri request
reversible lane control
roadway information system data
safeguard system control
signal control data
speed monitoring control
traffic sensor control
video surveillance control
State ITS Departments
Arizona ITS Field Equipment
Planned

62



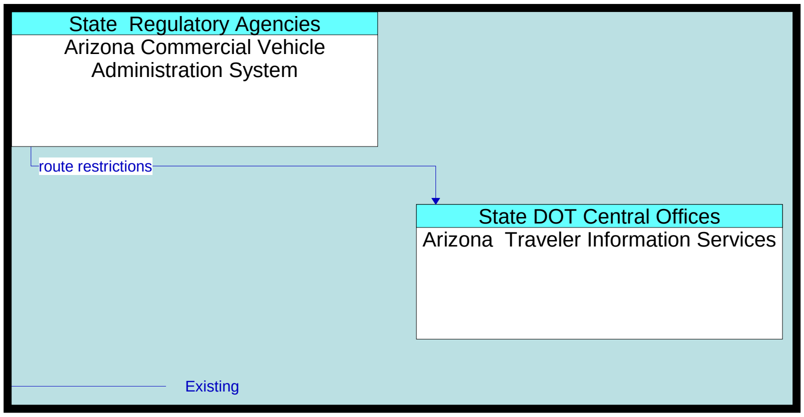
Travelers
In-Vehicle Electronic Tags
request tag data
environmental probe data
vehicle probe data
State ITS Departments
Arizona ITS Field Equipment
Planned

63

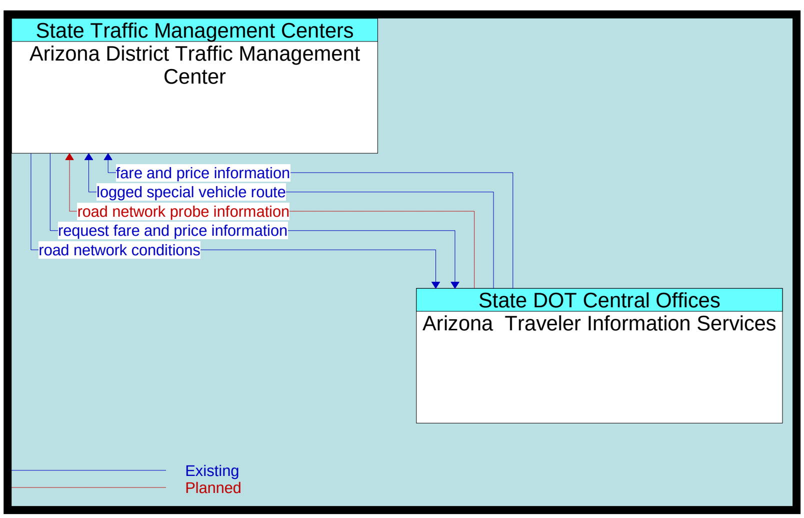


State DOT Central Offices
Regional Traffic Databases
roadside archive data
data collection and monitoring control
State ITS Departments
Arizona ITS Field Equipment
Planned

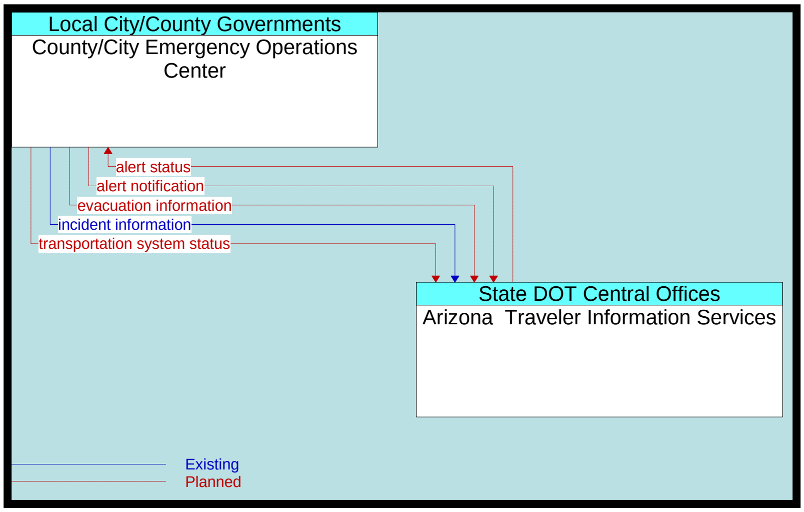
64


State Regulatory Agencies
Arizona Commercial Vehicle Administration System
route restrictions
State DOT Central Offices
Arizona Traveler Information Services
Existing

65

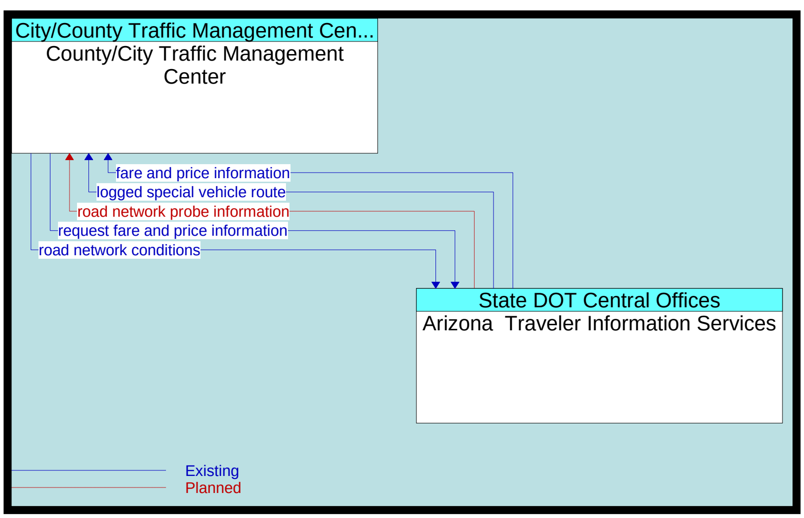

State Traffic Management Centers
Arizona District Traffic Management Center
fare and price information
logged special vehicle route
road network probe information
request fare and price information
road network conditions
State DOT Central Offices
Arizona Traveler Information Services
Existing
Planned

66



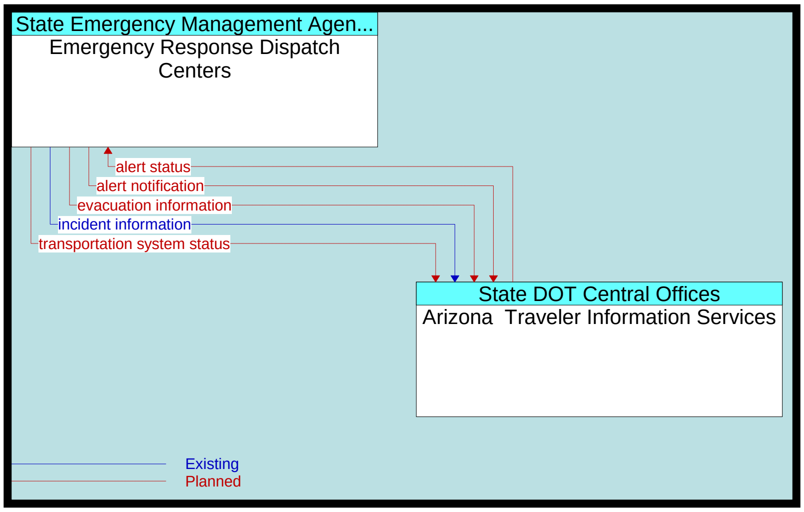
Local City/County Governments
County/City Emergency Operations Center
alert status
alert notification
evacuation information
incident information
transportation system status
State DOT Central Offices
Arizona Traveler Information Services
Existing
Planned

67

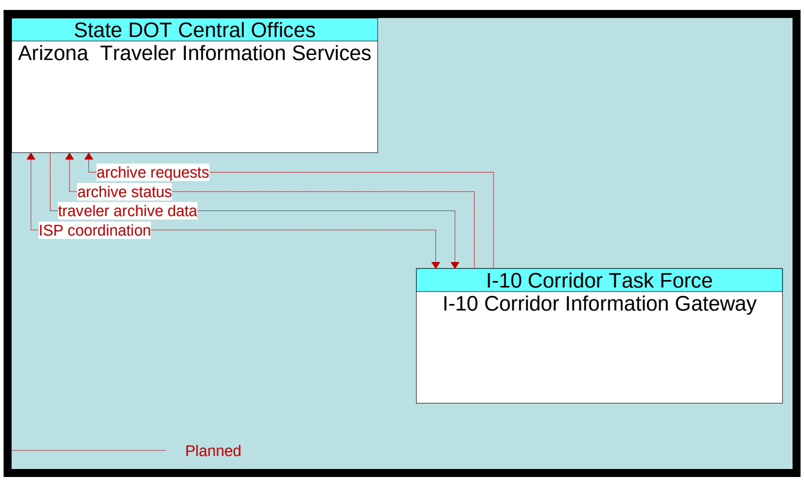


City/County Traffic Management Cen...
County/City Traffic Management Center
fare and price information
logged special vehicle route
road network probe information
request fare and price information
road network conditions
State DOT Central Offices
Arizona Traveler Information Services
Existing
Planned

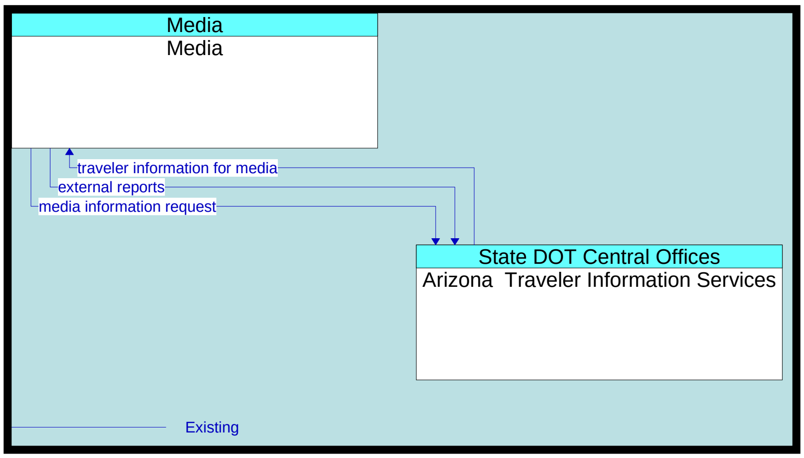
68


State Emergency Management Agen...
Emergency Response Dispatch Centers
alert status
alert notification
evacuation information
incident information
transportation system status
State DOT Central Offices
Arizona Traveler Information Services
Existing
Planned

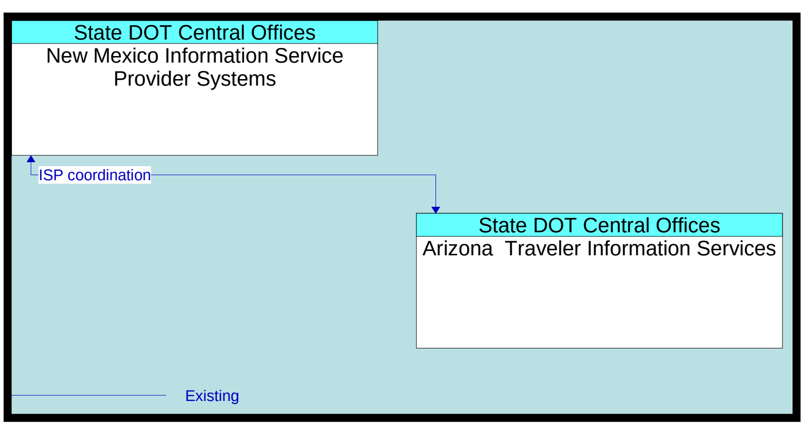
69


State DOT Central Offices
Arizona Traveler Information Services
archive requests
archive status
traveler archive data
ISP coordination
I-10 Corridor Task Force
I-10 Corridor Information Gateway
Planned

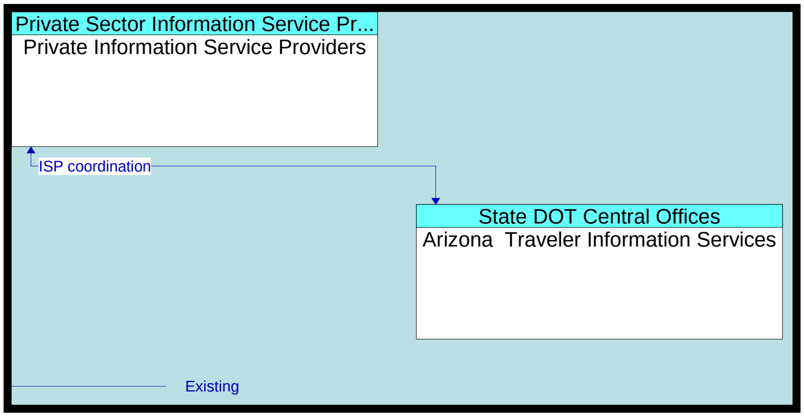
70


Media
Media
traveler information for media
external reports
media information request
State DOT Central Offices
Arizona Traveler Information Services
Existing

71

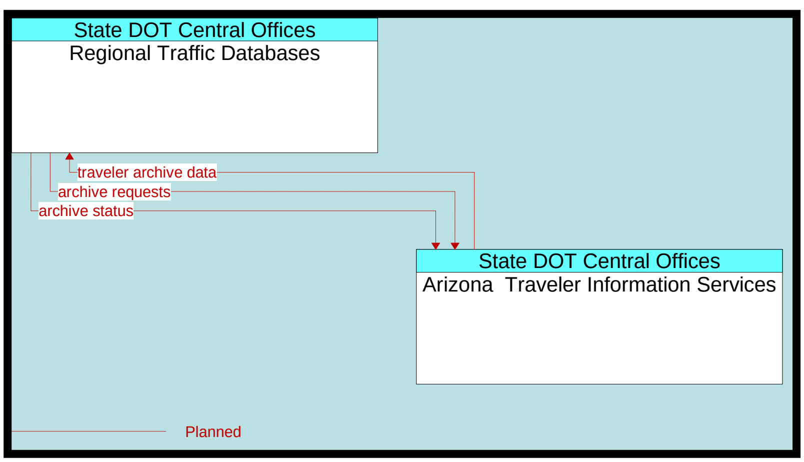

State DOT Central Offices
New Mexico Information Service Provider Systems
ISP coordination
State DOT Central Offices
Arizona Traveler Information Services
Existing

72



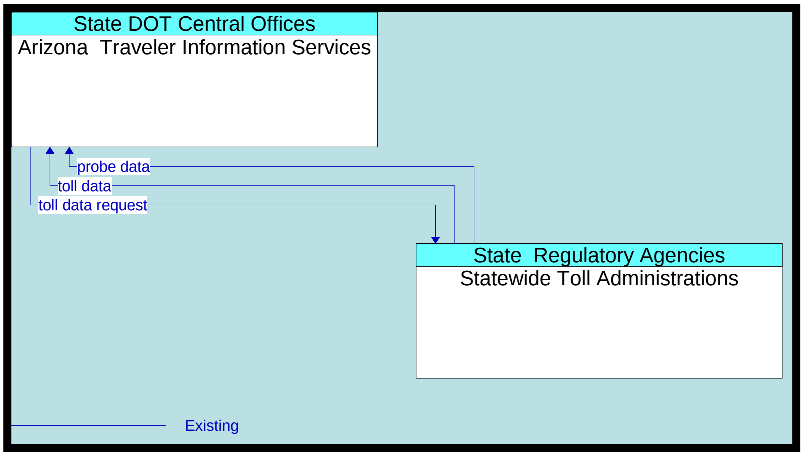
Private Sector Information Service Pr...
Private Information Service Providers
ISP coordination
State DOT Central Offices
Arizona Traveler Information Services
Existing

73

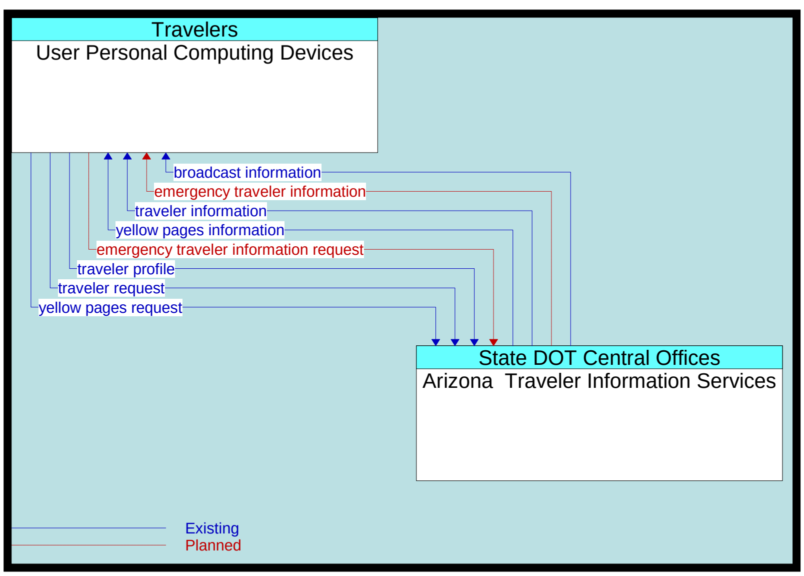


State DOT Central Offices
Regional Traffic Databases
traveler archive data
archive requests
archive status
State DOT Central Offices
Arizona Traveler Information Services
Planned

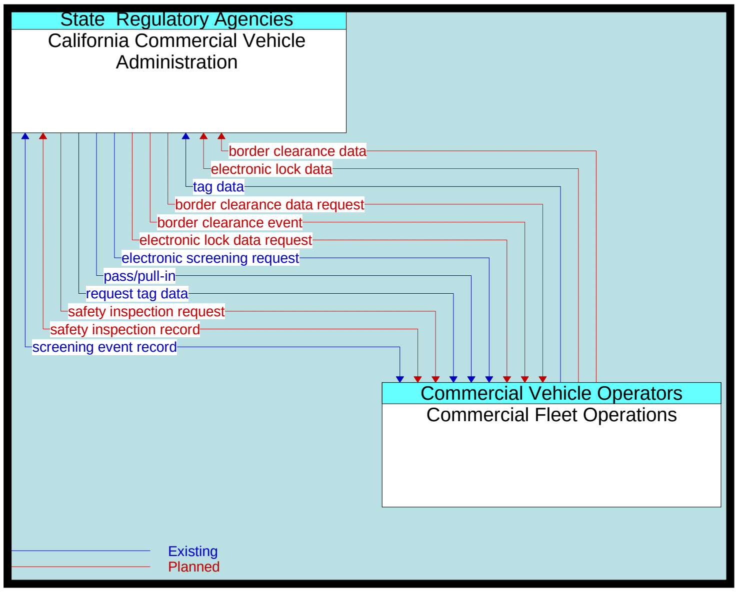
74


State DOT Central Offices
Arizona Traveler Information Services
probe data
toll data
toll data request
State Regulatory Agencies
Statewide Toll Administrations
Existing

75

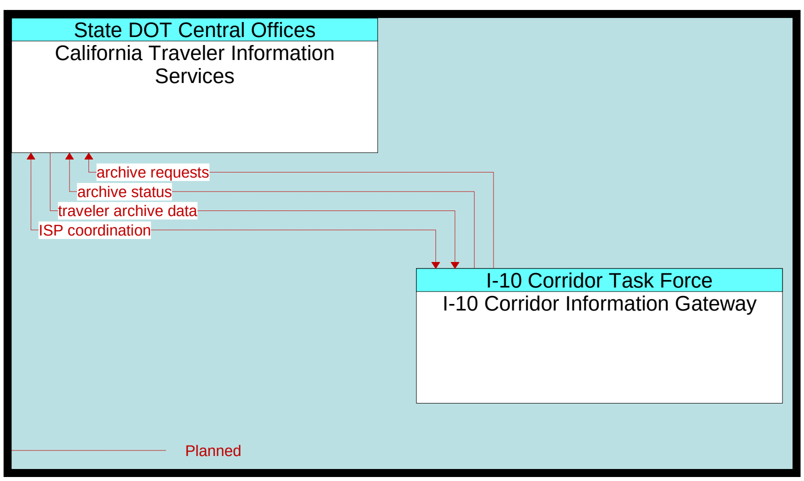

Travelers
User Personal Computing Devices
broadcast information
emergency traveler information
traveler information
yellow pages information
emergency traveler information request
traveler profile
traveler request
yellow pages request
State DOT Central Offices
Arizona Traveler Information Services
Existing
Planned

76



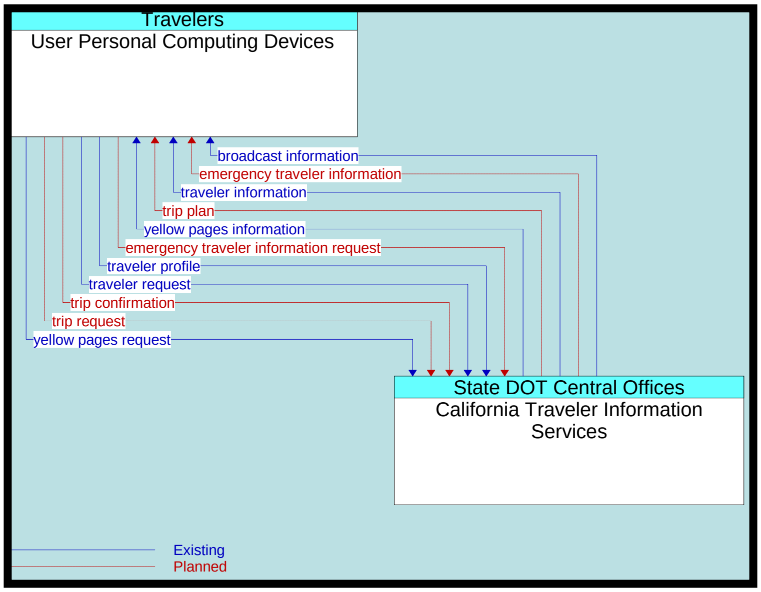
State Regulatory Agencies
California Commercial Vehicle Administration
border clearance data
electronic lock data
tag data
border clearance data request
border clearance event
electronic lock data request
electronic screening request
pass/pull-in
request tag data
safety inspection request
safety inspection record
screening event record
Commercial Vehicle Operators
Commercial Fleet Operations
Existing
Planned

77

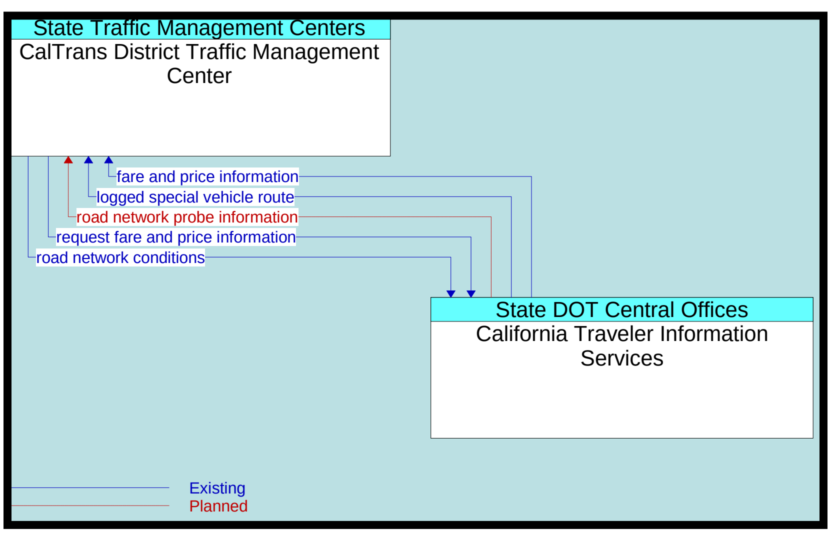


State DOT Central Offices
California Traveler Information Services
archive requests
archive status
traveler archive data
ISP coordination
I-10 Corridor Task Force
I-10 Corridor Information Gateway
Planned

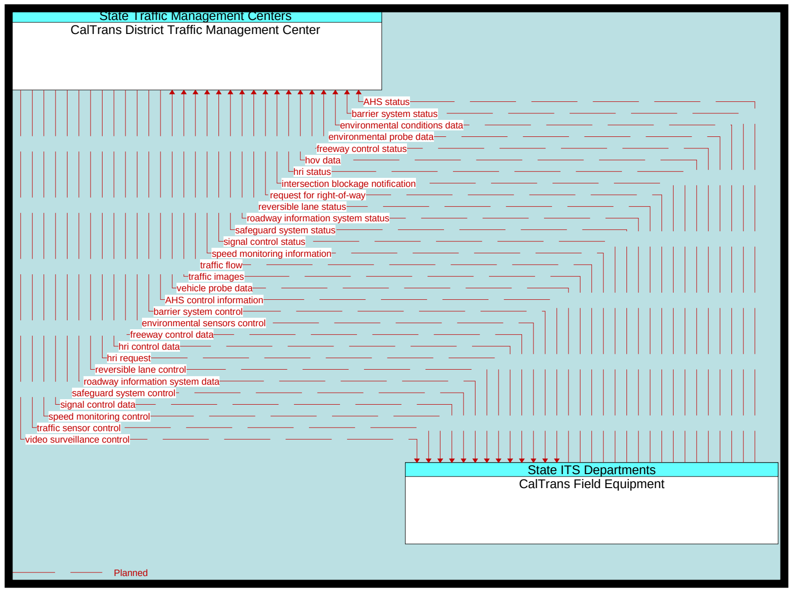
78


Travelers
User Personal Computing Devices
broadcast information
emergency traveler information
traveler information
trip plan
yellow pages information
emergency traveler information request
traveler profile
traveler request
trip confirmation
trip request
yellow pages request
State DOT Central Offices
California Traveler Information Services
Existing
Planned

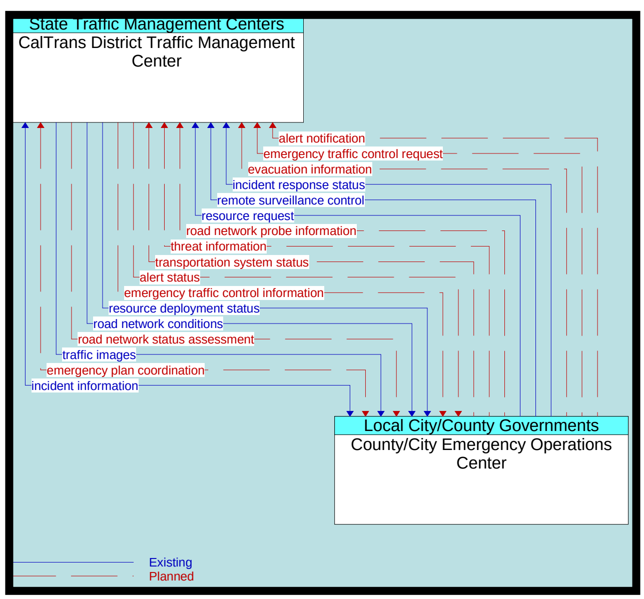
79


State Traffic Management Centers
CalTrans District Traffic Management Center
fare and price information
logged special vehicle route
road network probe information
request fare and price information
road network conditions
State DOT Central Offices
California Traveler Information Services
Existing
Planned

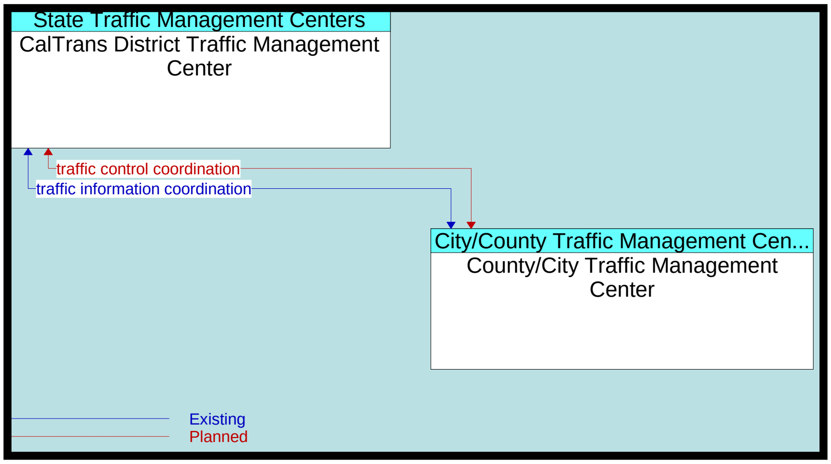
80


State Traffic Management Centers
CalTrans District Traffic Management Center
AHS status
barrier system status
environmental conditions data
environmental probe data
freeway control status
hov data
hri status
intersection blockage notification
request for right-of-way
reversible lane status
roadway information system status
safeguard system status
signal control status
speed monitoring information
traffic flow
traffic images
vehicle probe data
AHS control information
barrier system control
environmental sensors control
freeway control data
hri control data
hri request
reversible lane control
roadway information system data
safeguard system control
signal control data
speed monitoring control
traffic sensor control
video surveillance control
State ITS Departments
CalTrans Field Equipment
Planned

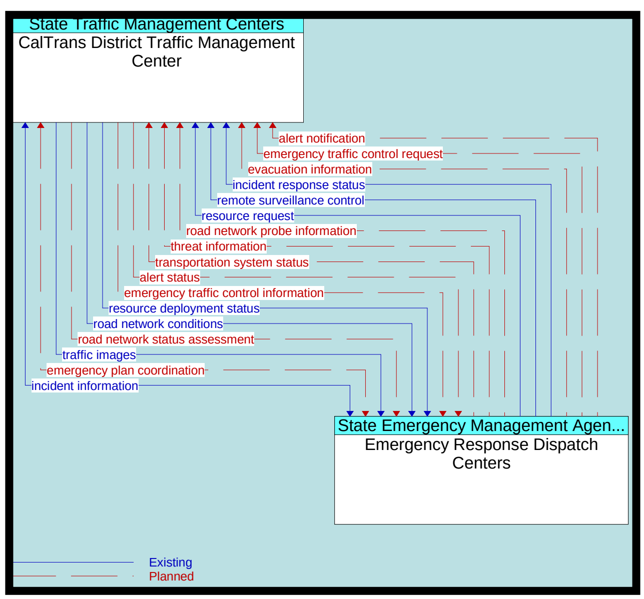
81


State Traffic Management Centers
CalTrans District Traffic Management Center
alert notification
emergency traffic control request
evacuation information
incident response status
remote surveillance control
resource request
road network probe information
threat information
transportation system status
alert status
emergency traffic control information
resource deployment status
road network conditions
road network status assessment
traffic images
emergency plan coordination
incident information
Local City/County Governments
County/City Emergency Operations Center
Existing
Planned

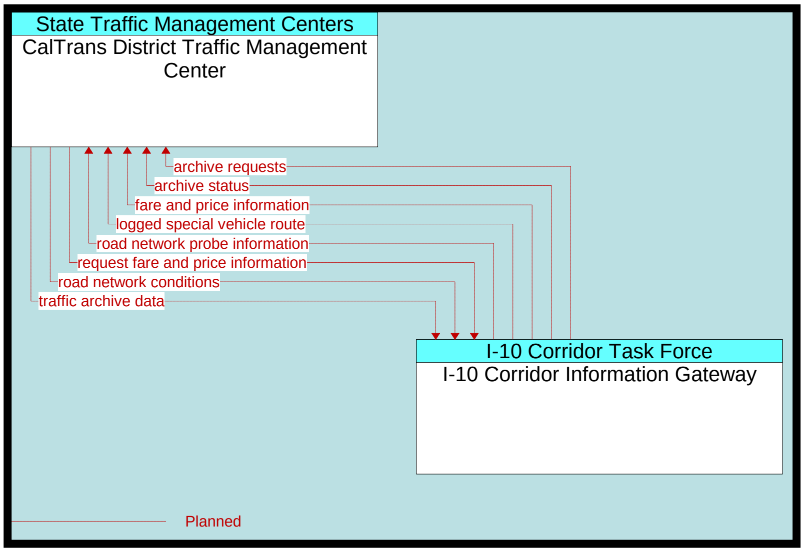
82


State Traffic Management Centers
CalTrans District Traffic Management Center
traffic control coordination
traffic information coordination
City/County Traffic Management Cen...
County/City Traffic Management Center
Existing
Planned

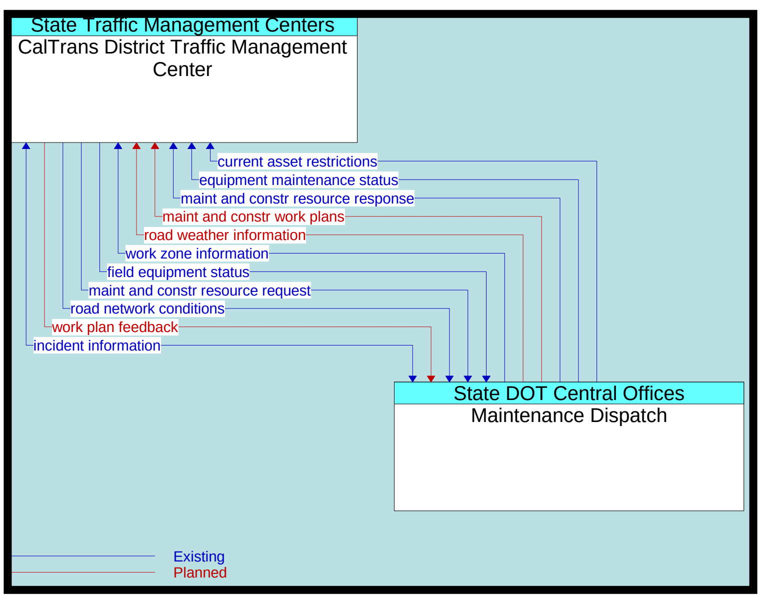
83


State Traffic Management Centers
CalTrans District Traffic Management Center
alert notification
emergency traffic control request
evacuation information
incident response status
remote surveillance control
resource request
road network probe information
threat information
transportation system status
alert status
emergency traffic control information
resource deployment status
road network conditions
road network status assessment
traffic images
emergency plan coordination
incident information
State Emergency Management Agen...
Emergency Response Dispatch Centers
Existing
Planned

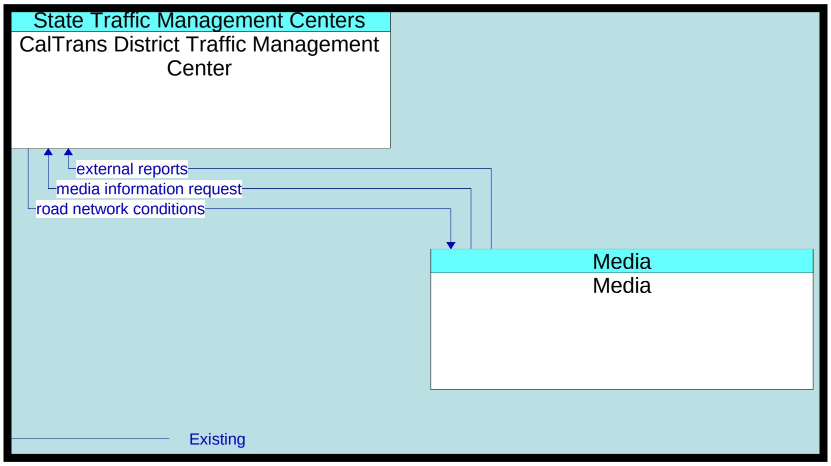
84


State Traffic Management Centers
CalTrans District Traffic Management Center
archive requests
archive status
fare and price information
logged special vehicle route
road network probe information
request fare and price information
road network conditions
traffic archive data
I-10 Corridor Task Force
I-10 Corridor Information Gateway
Planned

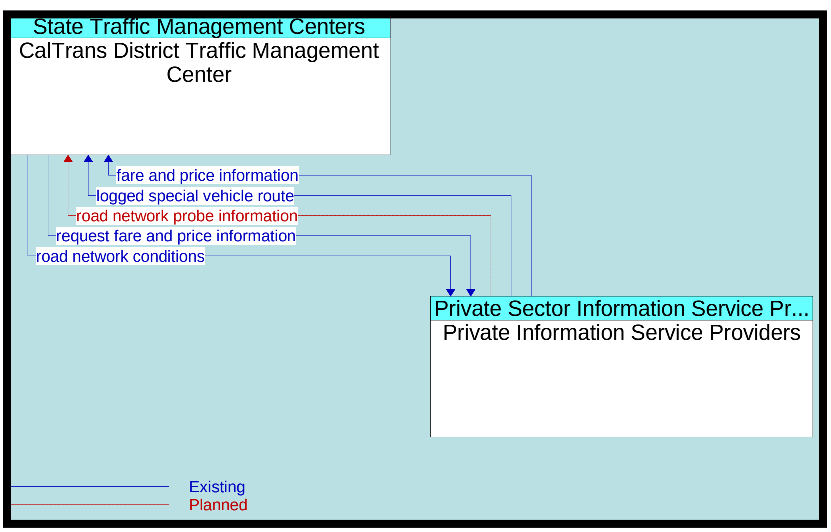
85


State Traffic Management Centers
CalTrans District Traffic Management Center
current asset restrictions
equipment maintenance status
maint and constr resource response
maint and constr work plans
road weather information
work zone information
field equipment status
maint and constr resource request
road network conditions
work plan feedback
incident information
State DOT Central Offices
Maintenance Dispatch
Existing
Planned

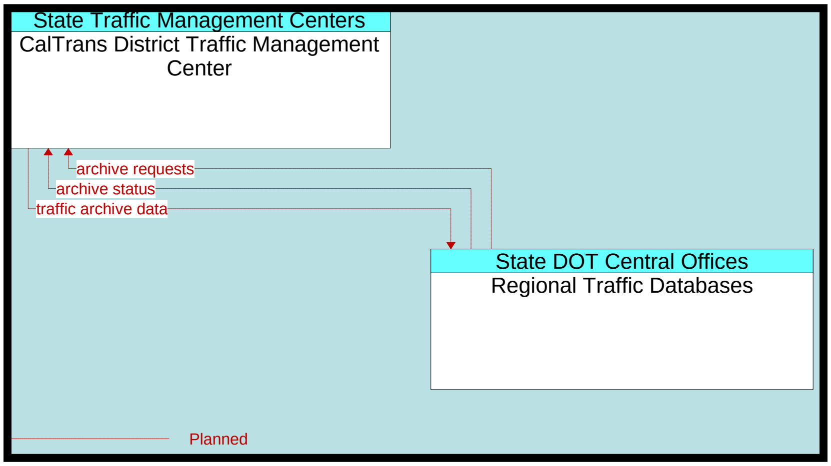
86


State Traffic Management Centers
CalTrans District Traffic Management Center
external reports
media information request
road network conditions
Media
Media
Existing

87

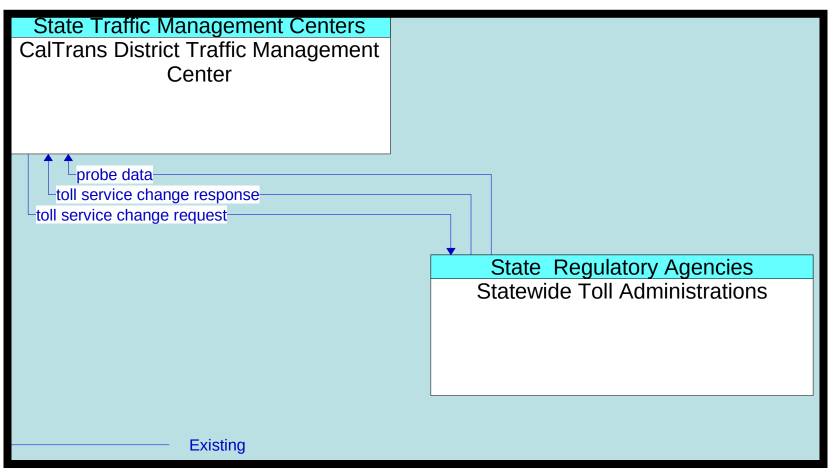

State Traffic Management Centers
CalTrans District Traffic Management Center
fare and price information
logged special vehicle route
road network probe information
request fare and price information
road network conditions
Private Sector Information Service Pr...
Private Information Service Providers
Existing
Planned

88



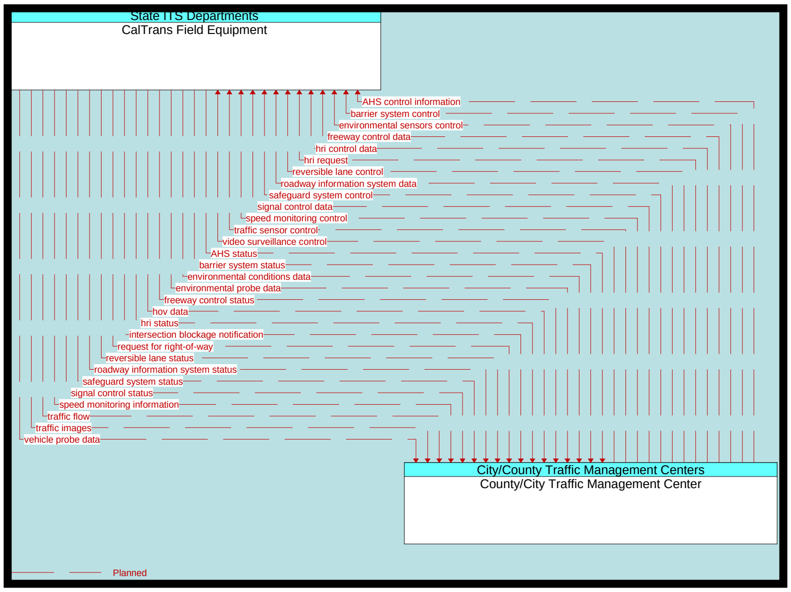
State Traffic Management Centers
CalTrans District Traffic Management Center
archive requests
archive status
traffic archive data
State DOT Central Offices
Regional Traffic Databases
Planned

89



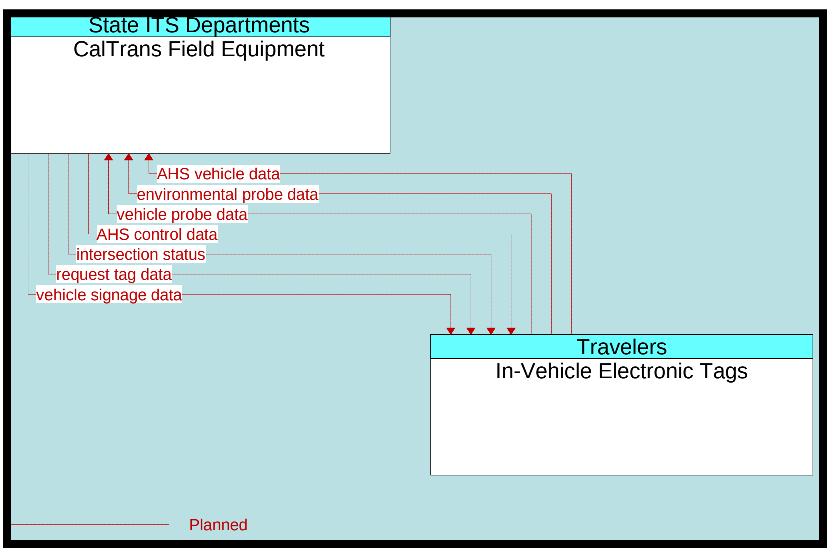
State Traffic Management Centers
CalTrans District Traffic Management Center
probe data
toll service change response
toll service change request
State Regulatory Agencies
Statewide Toll Administrations
Existing

90



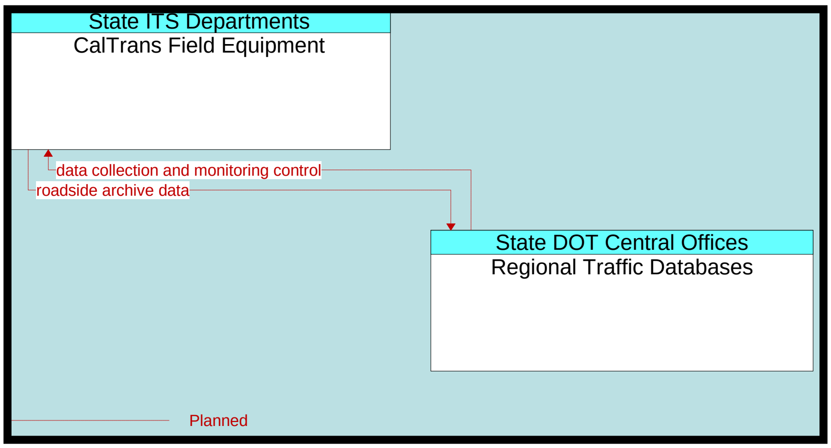
State ITS Departments
CalTrans Field Equipment
AHS control information
barrier system control
environmental sensors control
freeway control data
hri control data
hri request
reversible lane control
roadway information system data
safeguard system control
signal control data
speed monitoring control
traffic sensor control
video surveillance control
AHS status
barrier system status
environmental conditions data
environmental probe data
freeway control status
hov data
hri status
intersection blockage notification
request for right-of-way
reversible lane status
roadway information system status
safeguard system status
signal control status
speed monitoring information
traffic flow
traffic images
vehicle probe data
City/County Traffic Management Centers
County/City Traffic Management Center
Planned

91

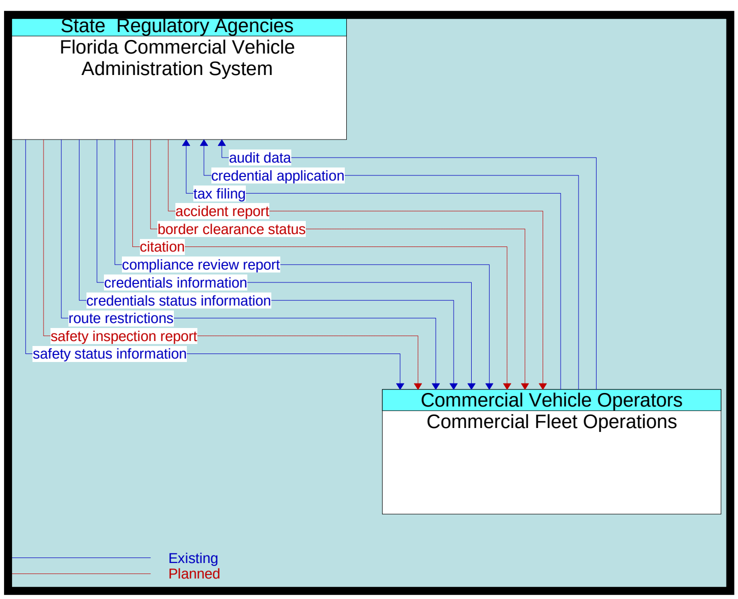


State ITS Departments
CalTrans Field Equipment
AHS vehicle data
environmental probe data
vehicle probe data
AHS control data
intersection status
request tag data
vehicle signage data
Travelers
In-Vehicle Electronic Tags
Planned

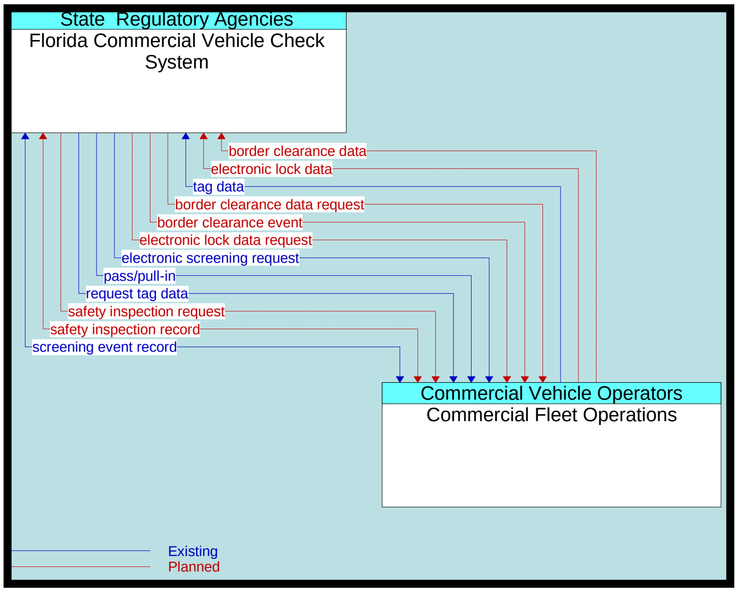
92


State ITS Departments
CalTrans Field Equipment
data collection and monitoring control
roadside archive data
State DOT Central Offices
Regional Traffic Databases
Planned

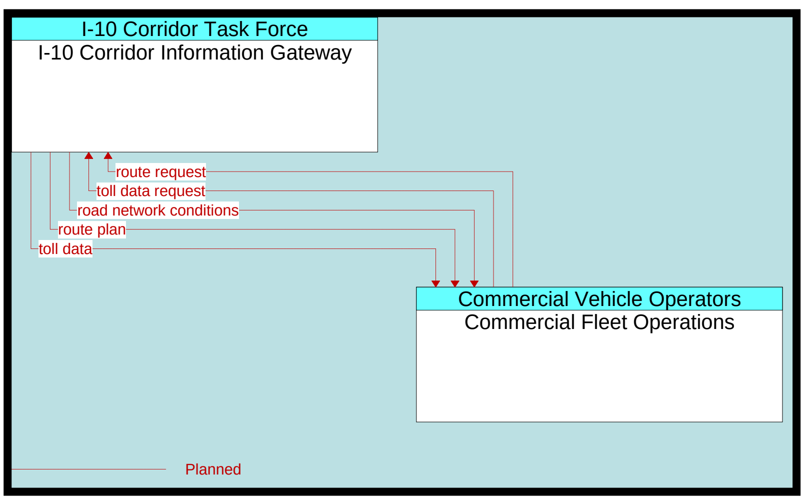
93


State Regulatory Agencies
Florida Commercial Vehicle Administration System
audit data
credential application
tax filing
accident report
border clearance status
citation
compliance review report
credentials information
credentials status information
route restrictions
safety inspection report
safety status information
Commercial Vehicle Operators
Commercial Fleet Operations
Existing
Planned

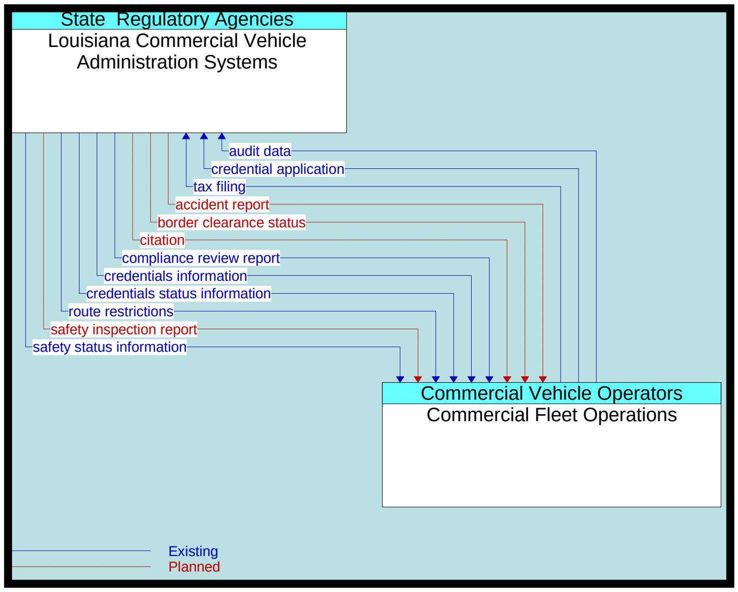
94


State Regulatory Agencies
Florida Commercial Vehicle Check System
border clearance data
electronic lock data
tag data
border clearance data request
border clearance event
electronic lock data request
electronic screening request
pass/pull-in
request tag data
safety inspection request
safety inspection record
screening event record
Commercial Vehicle Operators
Commercial Fleet Operations
Existing
Planned

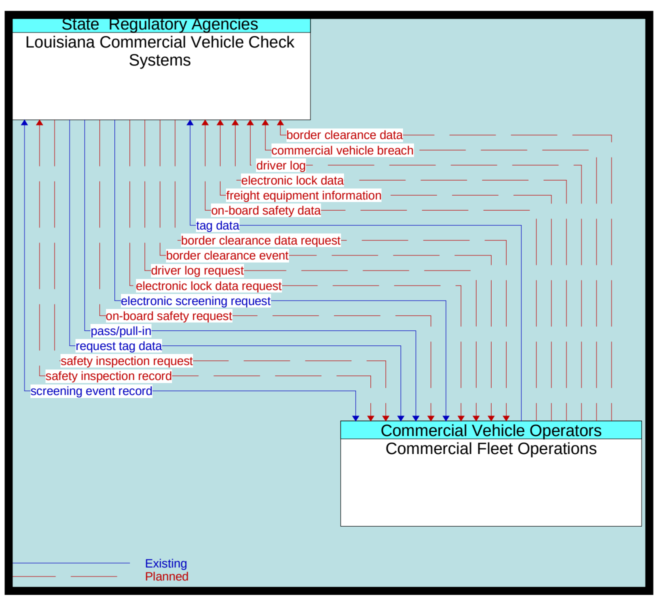
95


I-10 Corridor Task Force
I-10 Corridor Information Gateway
route request
toll data request
road network conditions
route plan
toll data
Commercial Vehicle Operators
Commercial Fleet Operations
Planned

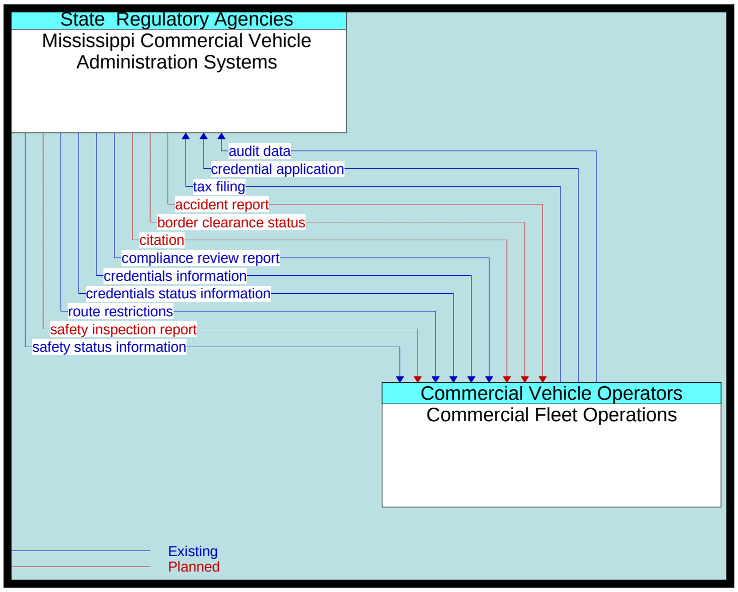
96


State Regulatory Agencies
Louisiana Commercial Vehicle Administration Systems
audit data
credential application
tax filing
accident report
border clearance status
citation
compliance review report
credentials information
credentials status information
route restrictions
safety inspection report
safety status information
Commercial Vehicle Operators
Commercial Fleet Operations
Existing
Planned

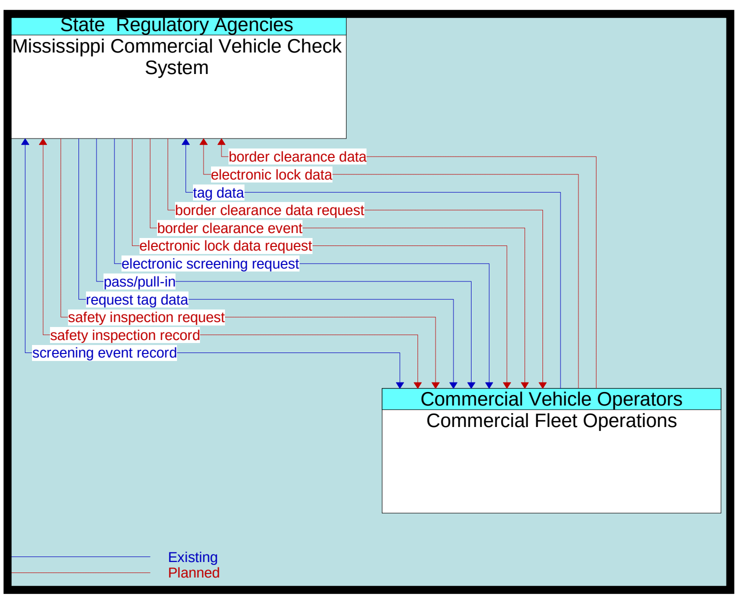
97


State Regulatory Agencies
Louisiana Commercial Vehicle Check Systems
border clearance data
commercial vehicle breach
driver log
electronic lock data
freight equipment information
on-board safety data
tag data
border clearance data request
border clearance event
driver log request
electronic lock data request
electronic screening request
on-board safety request
pass/pull-in
request tag data
safety inspection request
safety inspection record
screening event record
Commercial Vehicle Operators
Commercial Fleet Operations
Existing
Planned

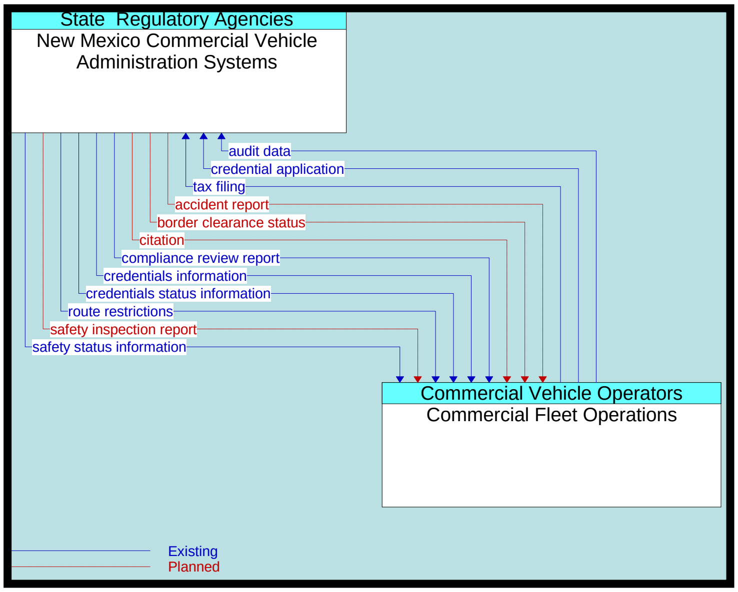
98


State Regulatory Agencies
Mississippi Commercial Vehicle Administration Systems
audit data
credential application
tax filing
accident report
border clearance status
citation
compliance review report
credentials information
credentials status information
route restrictions
safety inspection report
safety status information
Commercial Vehicle Operators
Commercial Fleet Operations
Existing
Planned

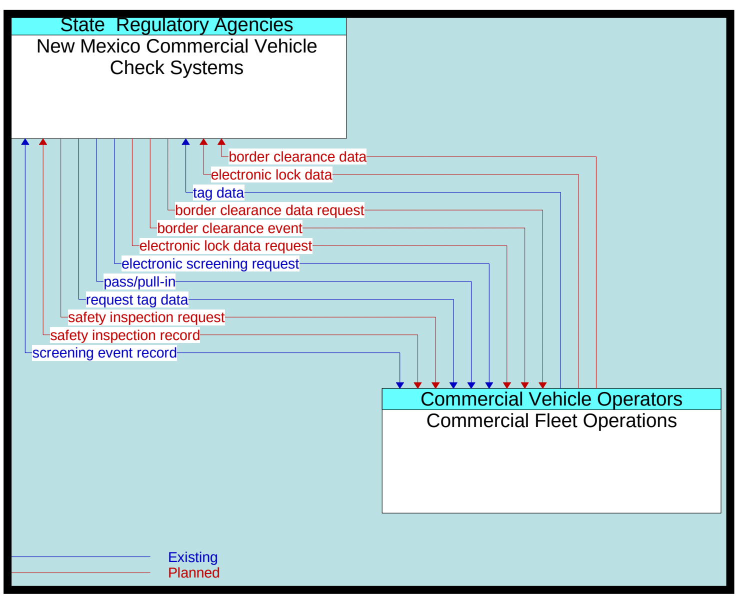
99


State Regulatory Agencies
Mississippi Commercial Vehicle Check System
border clearance data
electronic lock data
tag data
border clearance data request
border clearance event
electronic lock data request
electronic screening request
pass/pull-in
request tag data
safety inspection request
safety inspection record
screening event record
Commercial Vehicle Operators
Commercial Fleet Operations
Existing
Planned

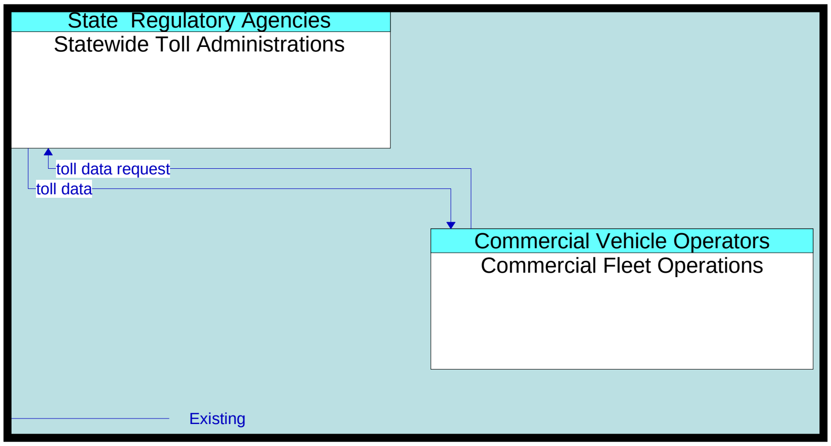
100


State Regulatory Agencies
New Mexico Commercial Vehicle Administration Systems
audit data
credential application
tax filing
accident report
border clearance status
citation
compliance review report
credentials information
credentials status information
route restrictions
safety inspection report
safety status information
Commercial Vehicle Operators
Commercial Fleet Operations
Existing
Planned

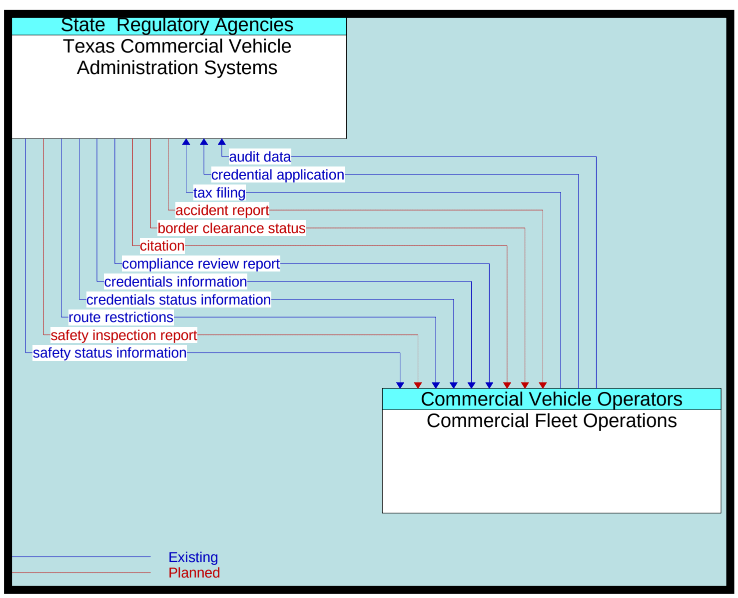
101


State Regulatory Agencies
New Mexico Commercial Vehicle Check Systems
border clearance data
electronic lock data
tag data
border clearance data request
border clearance event
electronic lock data request
electronic screening request
pass/pull-in
request tag data
safety inspection request
safety inspection record
screening event record
Commercial Vehicle Operators
Commercial Fleet Operations
Existing
Planned

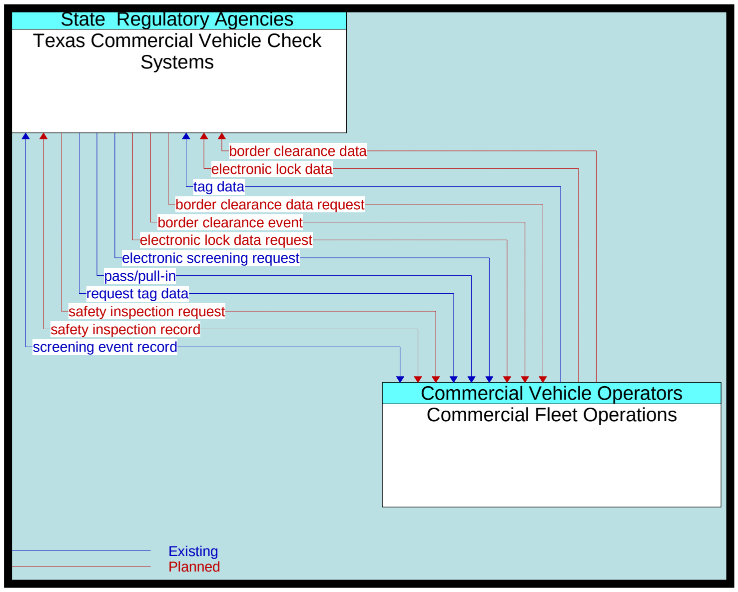
102


State Regulatory Agencies
Statewide Toll Administrations
toll data request
toll data
Commercial Vehicle Operators
Commercial Fleet Operations
Existing

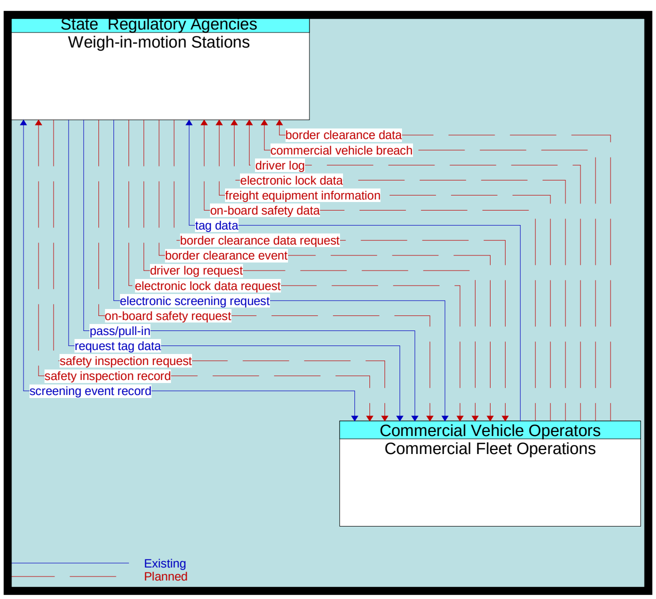
103


State Regulatory Agencies
Texas Commercial Vehicle Administration Systems
audit data
credential application
tax filing
accident report
border clearance status
citation
compliance review report
credentials information
credentials status information
route restrictions
safety inspection report
safety status information
Commercial Vehicle Operators
Commercial Fleet Operations
Existing
Planned

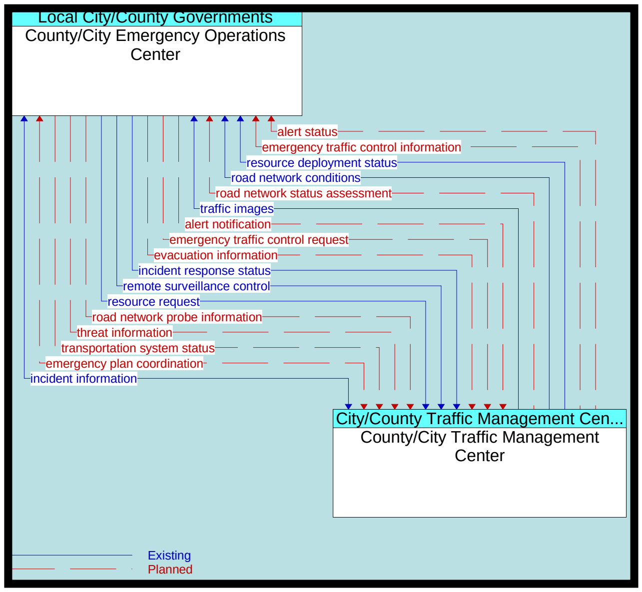
104


State Regulatory Agencies
Texas Commercial Vehicle Check Systems
border clearance data
electronic lock data
tag data
border clearance data request
border clearance event
electronic lock data request
electronic screening request
pass/pull-in
request tag data
safety inspection request
safety inspection record
screening event record
Commercial Vehicle Operators
Commercial Fleet Operations
Existing
Planned

105

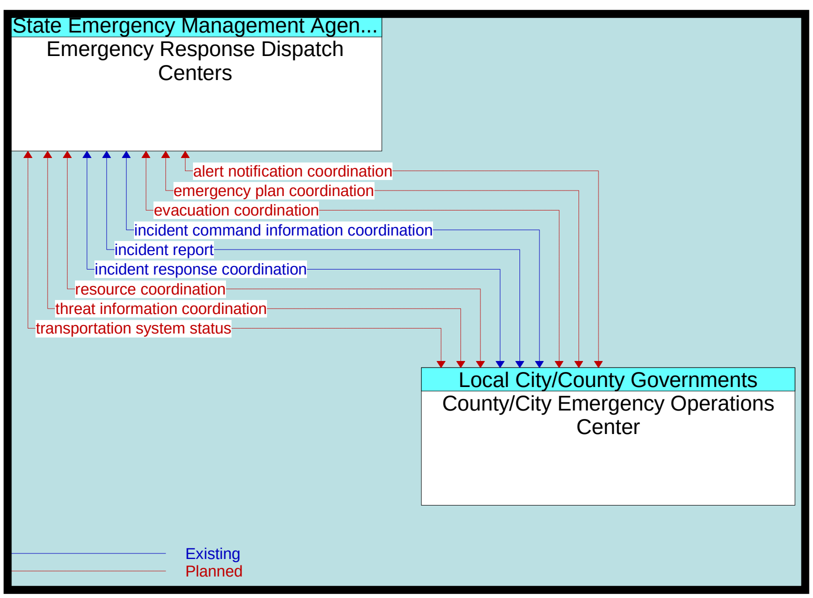

State Regulatory Agencies
Weigh-in-motion Stations
border clearance data
commercial vehicle breach
driver log
electronic lock data
freight equipment information
on-board safety data
tag data
border clearance data request
border clearance event
driver log request
electronic lock data request
electronic screening request
on-board safety request
pass/pull-in
request tag data
safety inspection request
safety inspection record
screening event record
Commercial Vehicle Operators
Commercial Fleet Operations
Existing
Planned

106



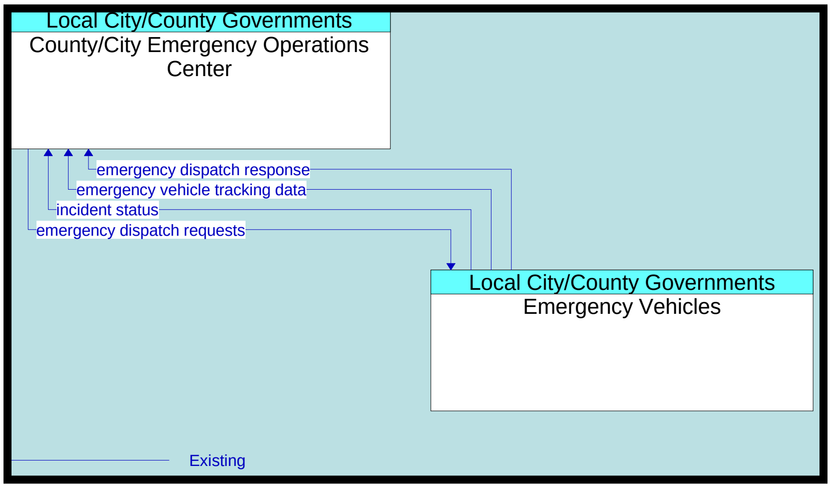
Local City/County Governments
County/City Emergency Operations Center
alert status
emergency traffic control information
resource deployment status
road network conditions
road network status assessment
traffic images
alert notification
emergency traffic control request
evacuation information
incident response status
remote surveillance control
resource request
road network probe information
threat information
transportation system status
emergency plan coordination
incident information
City/County Traffic Management Cen...
County/City Traffic Management Center
Existing
Planned

107

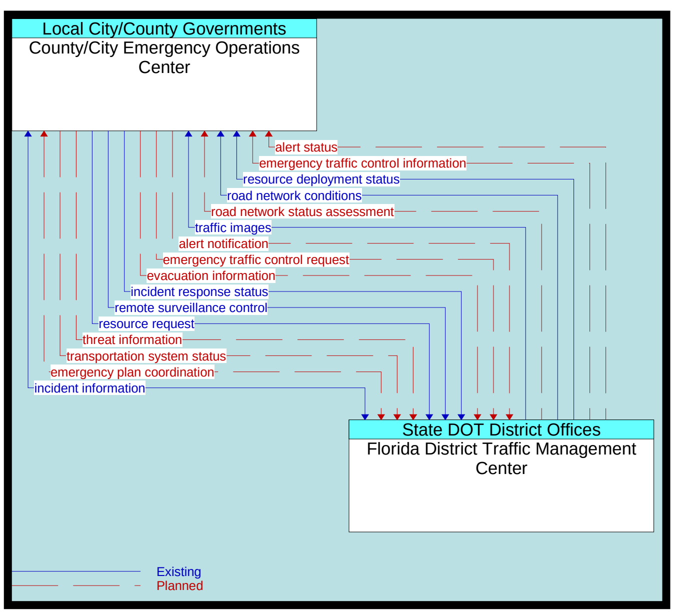


State Emergency Management Agen...
Emergency Response Dispatch Centers
alert notification coordination
emergency plan coordination
evacuation coordination
incident command information coordination
incident report
incident response coordination
resource coordination
threat information coordination
transportation system status
Local City/County Governments
County/City Emergency Operations Center
Existing
Planned

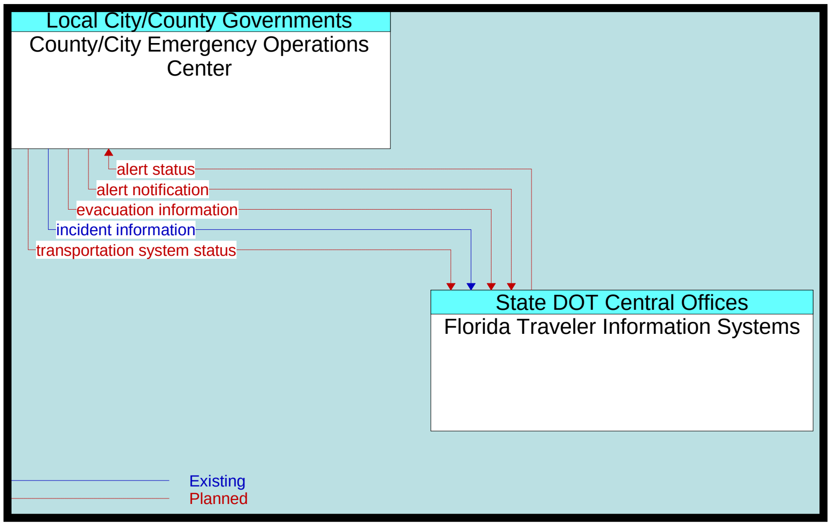
108


Local City/County Governments
County/City Emergency Operations Center
emergency dispatch response
emergency vehicle tracking data
incident status
emergency dispatch requests
Local City/County Governments
Emergency Vehicles
Existing

109

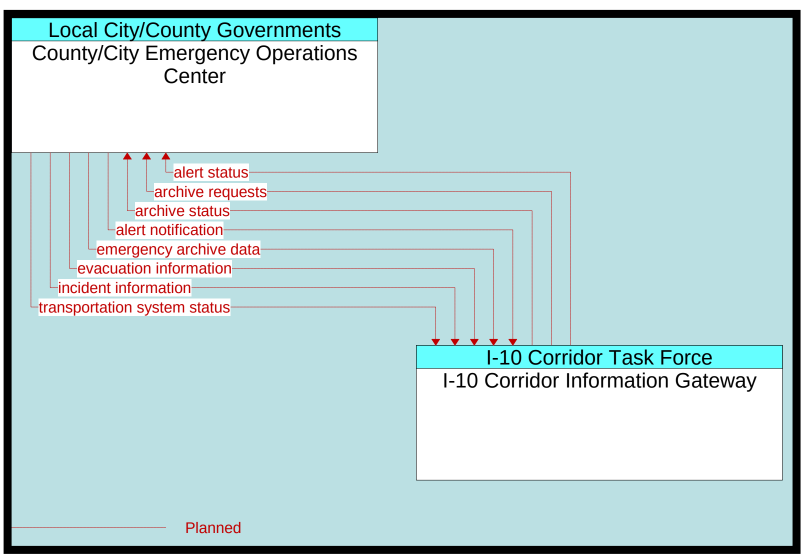

Local City/County Governments
County/City Emergency Operations Center
alert status
emergency traffic control information
resource deployment status
road network conditions
road network status assessment
traffic images
alert notification
emergency traffic control request
evacuation information
incident response status
remote surveillance control
resource request
threat information
transportation system status
emergency plan coordination
incident information
State DOT District Offices
Florida District Traffic Management Center
Existing
Planned

110



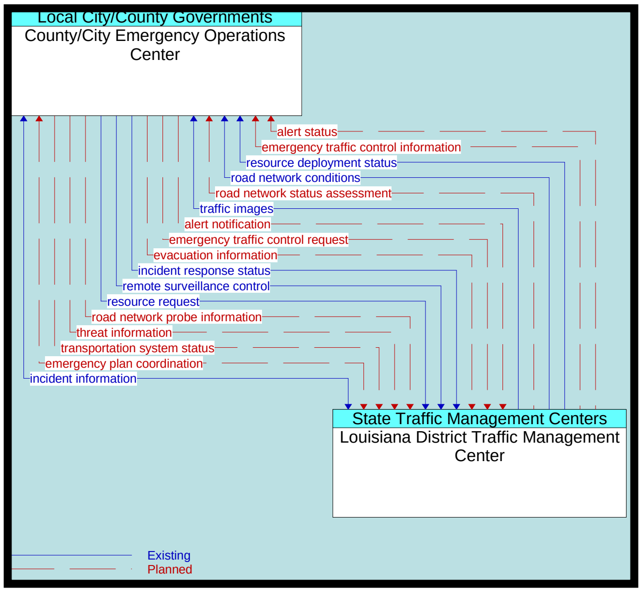
Local City/County Governments
County/City Emergency Operations Center
alert status
alert notification
evacuation information
incident information
transportation system status
State DOT Central Offices
Florida Traveler Information Systems
Existing
Planned

111

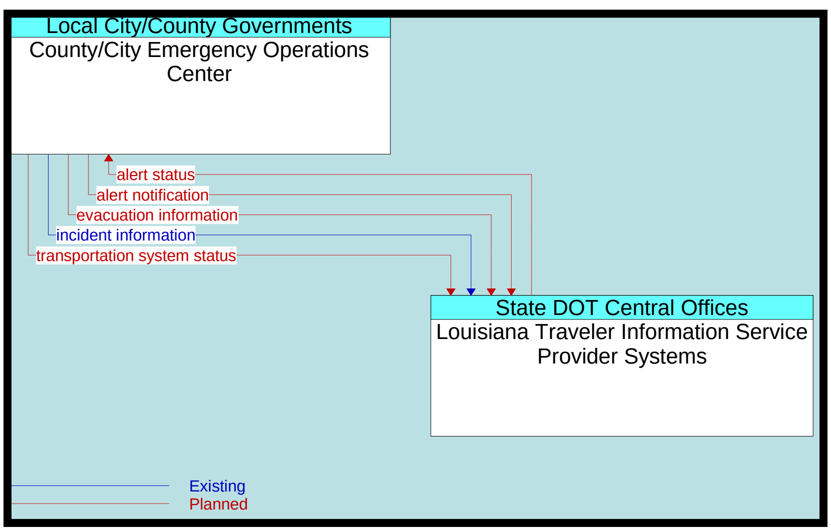


Local City/County Governments
County/City Emergency Operations Center
alert status
archive requests
archive status
alert notification
emergency archive data
evacuation information
incident information
transportation system status
I-10 Corridor Task Force
I-10 Corridor Information Gateway
Planned

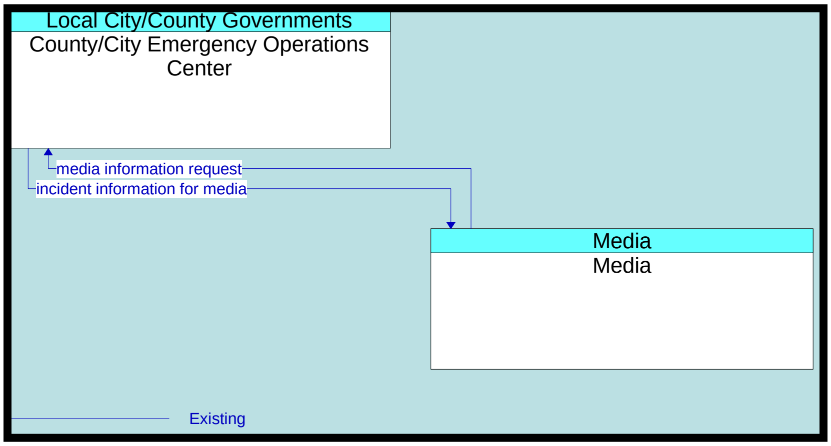
112


Local City/County Governments
County/City Emergency Operations Center
alert status
emergency traffic control information
resource deployment status
road network conditions
road network status assessment
traffic images
alert notification
emergency traffic control request
evacuation information
incident response status
remote surveillance control
resource request
road network probe information
threat information
transportation system status
emergency plan coordination
incident information
State Traffic Management Centers
Louisiana District Traffic Management Center
Existing
Planned

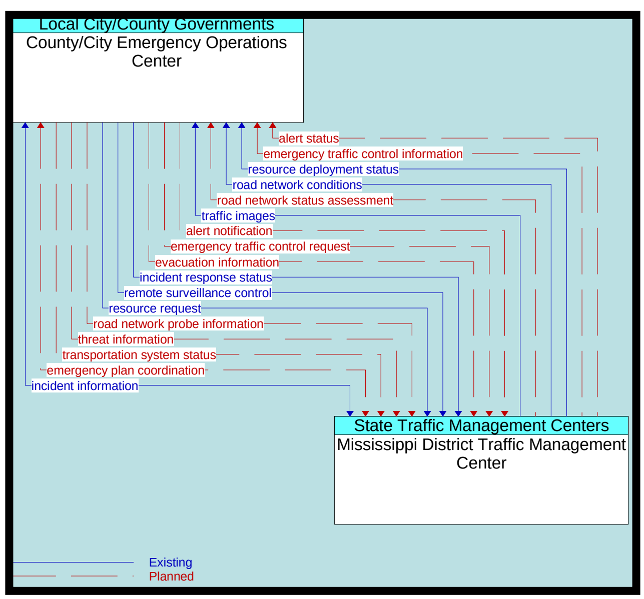
113


Local City/County Governments
County/City Emergency Operations Center
alert status
alert notification
evacuation information
incident information
transportation system status
State DOT Central Offices
Louisiana Traveler Information Service Provider Systems
Existing
Planned

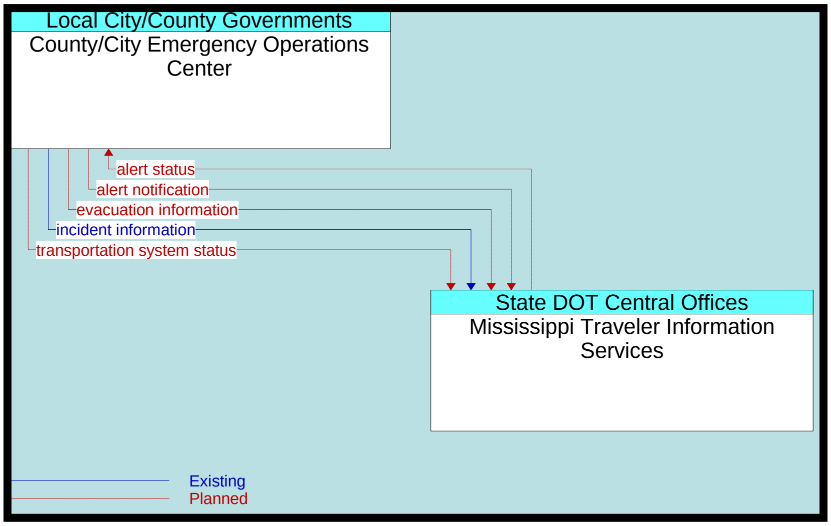
114


Local City/County Governments
County/City Emergency Operations Center
media information request
incident information for media
Media
Media
Existing

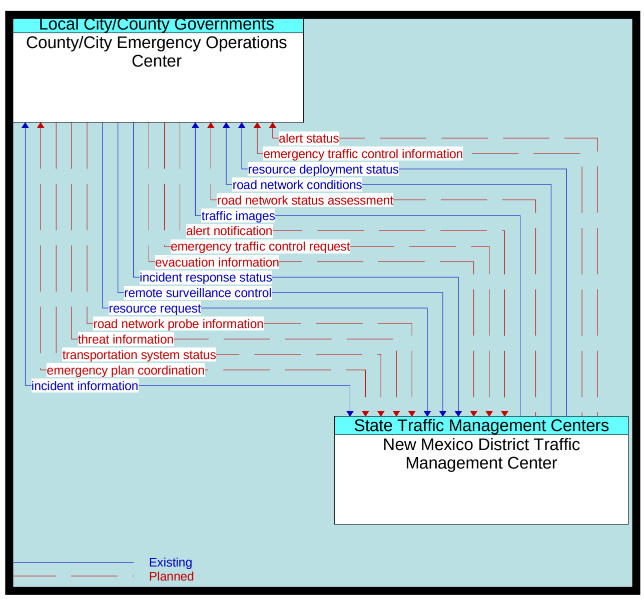
115


Local City/County Governments
County/City Emergency Operations Center
alert status
emergency traffic control information
resource deployment status
road network conditions
road network status assessment
traffic images
alert notification
emergency traffic control request
evacuation information
incident response status
remote surveillance control
resource request
road network probe information
threat information
transportation system status
emergency plan coordination
incident information
State Traffic Management Centers
Mississippi District Traffic Management Center
Existing
Planned

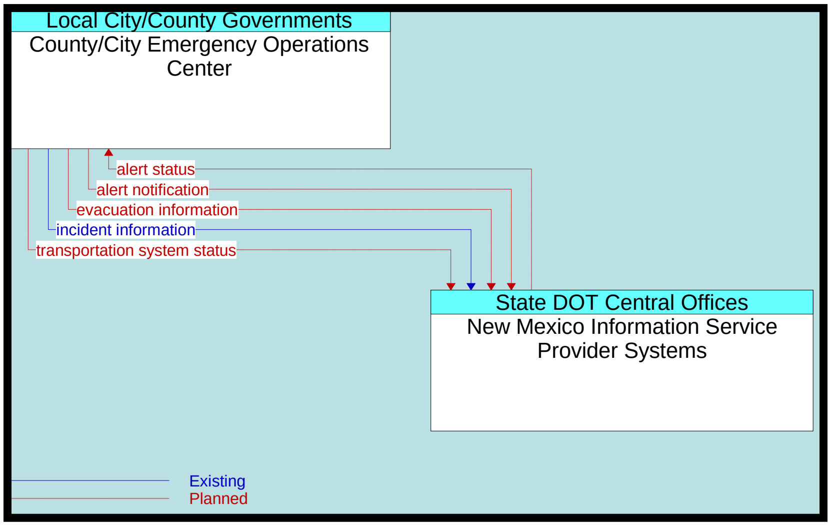
116


Local City/County Governments
County/City Emergency Operations Center
alert status
alert notification
evacuation information
incident information
transportation system status
State DOT Central Offices
Mississippi Traveler Information Services
Existing
Planned

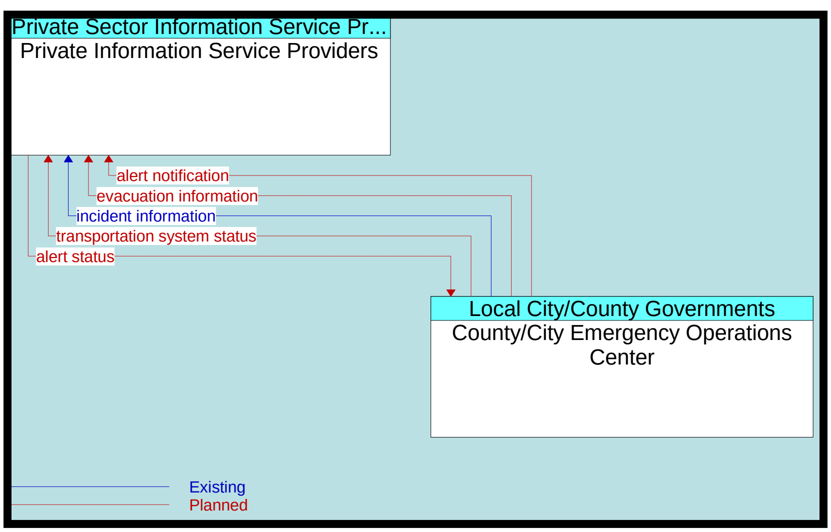
117


Local City/County Governments
County/City Emergency Operations Center
alert status
emergency traffic control information
resource deployment status
road network conditions
road network status assessment
traffic images
alert notification
emergency traffic control request
evacuation information
incident response status
remote surveillance control
resource request
road network probe information
threat information
transportation system status
emergency plan coordination
incident information
State Traffic Management Centers
New Mexico District Traffic Management Center
Existing
Planned

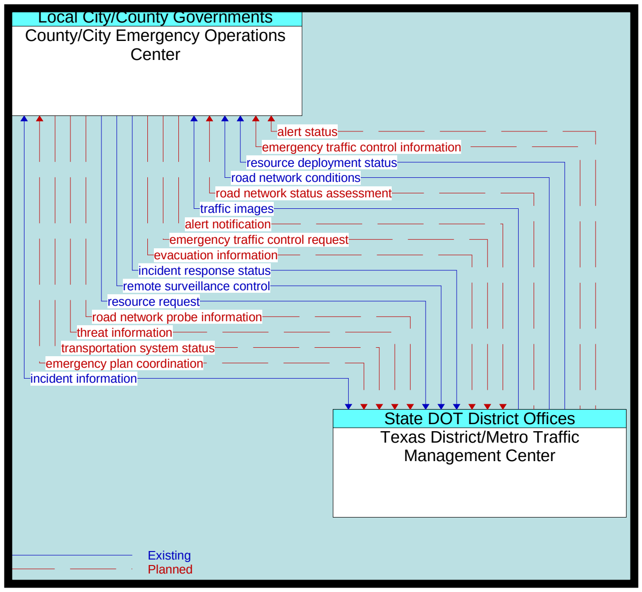
118


Local City/County Governments
County/City Emergency Operations Center
alert status
alert notification
evacuation information
incident information
transportation system status
State DOT Central Offices
New Mexico Information Service Provider Systems
Existing
Planned

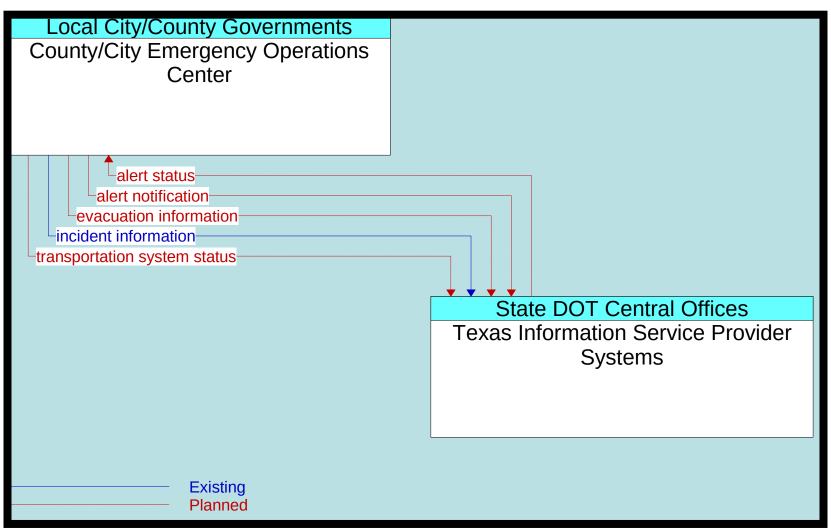
119


Private Sector Information Service Pr...
Private Information Service Providers
alert notification
evacuation information
incident information
transportation system status
alert status
Local City/County Governments
County/City Emergency Operations Center
Existing
Planned

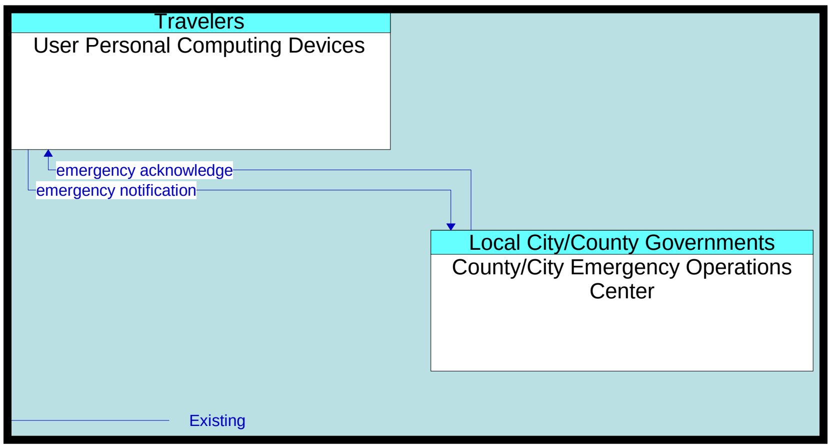
120


Local City/County Governments
County/City Emergency Operations Center
alert status
emergency traffic control information
resource deployment status
road network conditions
road network status assessment
traffic images
alert notification
emergency traffic control request
evacuation information
incident response status
remote surveillance control
resource request
road network probe information
threat information
transportation system status
emergency plan coordination
incident information
State DOT District Offices
Texas District/Metro Traffic Management Center
Existing
Planned

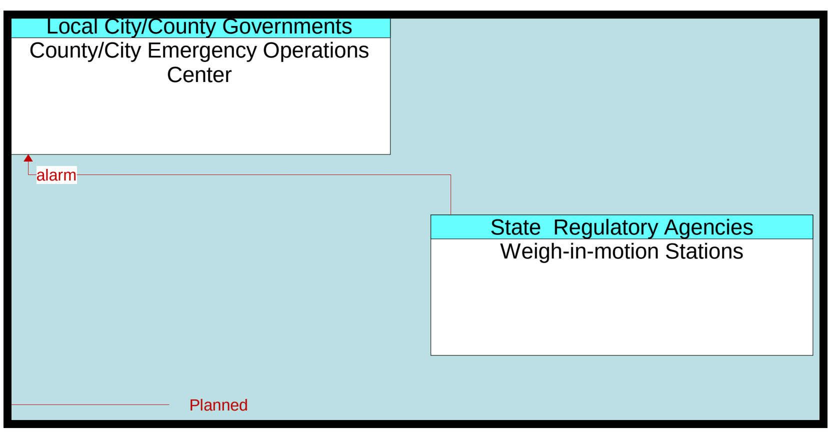
121


Local City/County Governments
County/City Emergency Operations Center
alert status
alert notification
evacuation information
incident information
transportation system status
State DOT Central Offices
Texas Information Service Provider Systems
Existing
Planned

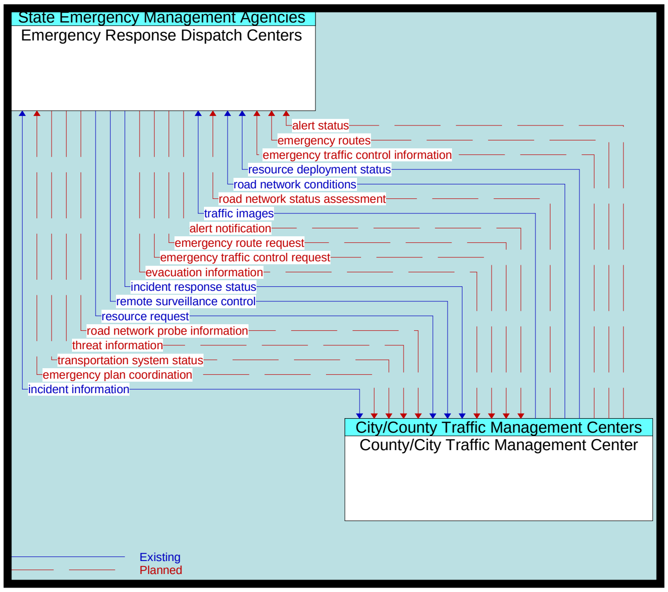
122


Travelers
User Personal Computing Devices
emergency acknowledge
emergency notification
Local City/County Governments
County/City Emergency Operations Center
Existing

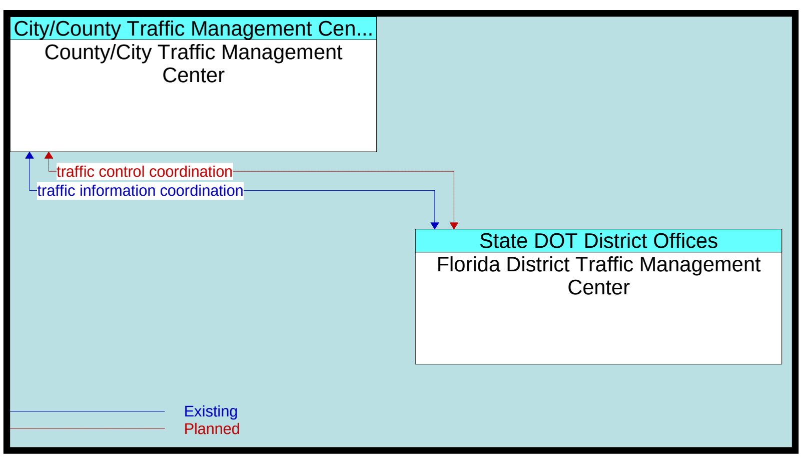
123


Local City/County Governments
County/City Emergency Operations Center
alarm
State Regulatory Agencies
Weigh-in-motion Stations
Planned

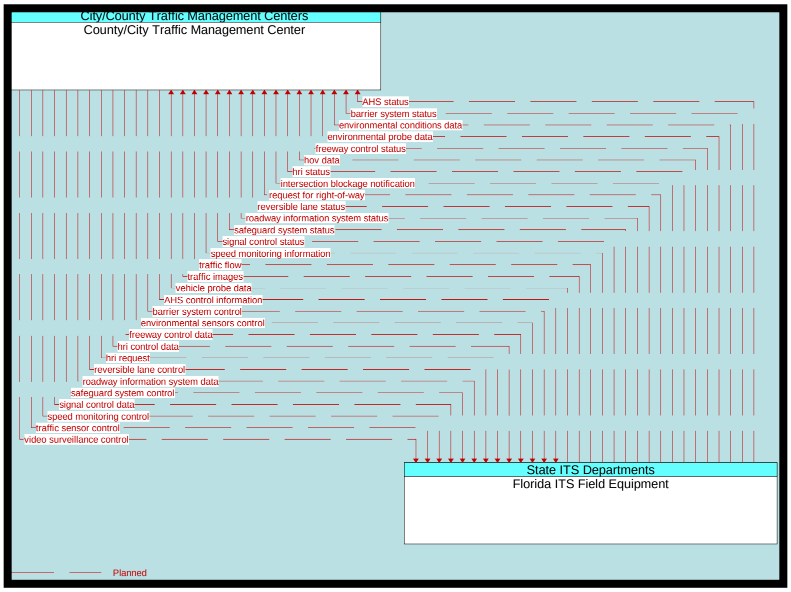
124


State Emergency Management Agencies
Emergency Response Dispatch Centers
alert status
emergency routes
emergency traffic control information
resource deployment status
road network conditions
road network status assessment
traffic images
alert notification
emergency route request
emergency traffic control request
evacuation information
incident response status
remote surveillance control
resource request
road network probe information
threat information
transportation system status
emergency plan coordination
incident information
City/County Traffic Management Centers
County/City Traffic Management Center
Existing
Planned

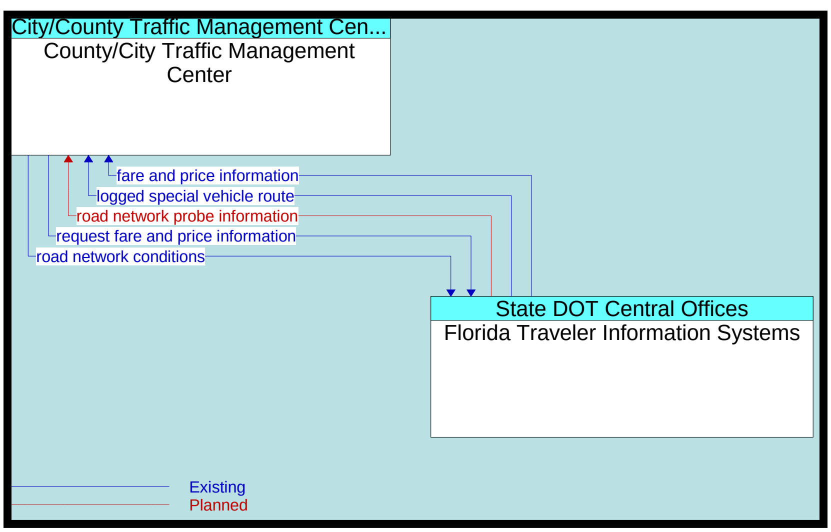
125


City/County Traffic Management Cen...
County/City Traffic Management Center
traffic control coordination
traffic information coordination
State DOT District Offices
Florida District Traffic Management Center
Existing
Planned

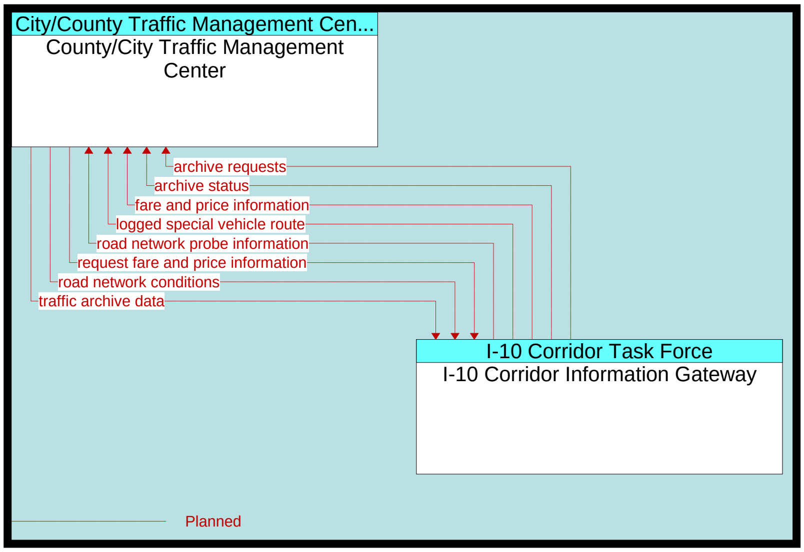
126


City/County Traffic Management Centers
County/City Traffic Management Center
AHS status
barrier system status
environmental conditions data
environmental probe data
freeway control status
hov data
hri status
intersection blockage notification
request for right-of-way
reversible lane status
roadway information system status
safeguard system status
signal control status
speed monitoring information
traffic flow
traffic images
vehicle probe data
AHS control information
barrier system control
environmental sensors control
freeway control data
hri control data
hri request
reversible lane control
roadway information system data
safeguard system control
signal control data
speed monitoring control
traffic sensor control
video surveillance control
State ITS Departments
Florida ITS Field Equipment
Planned

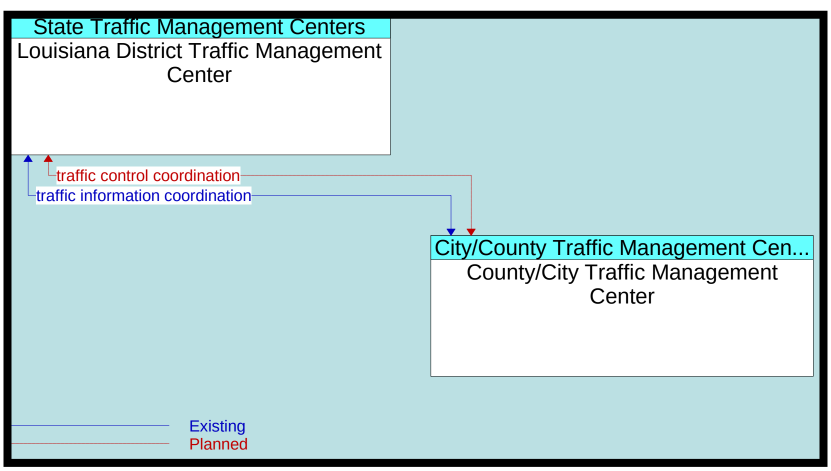
127


City/County Traffic Management Cen...
County/City Traffic Management Center
fare and price information
logged special vehicle route
road network probe information
request fare and price information
road network conditions
State DOT Central Offices
Florida Traveler Information Systems
Existing
Planned

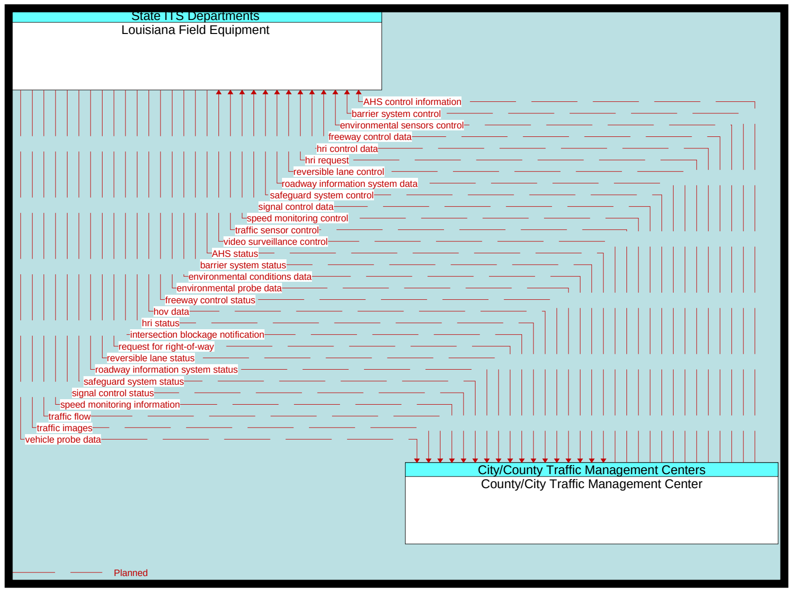
128


City/County Traffic Management Cen...
County/City Traffic Management Center
archive requests
archive status
fare and price information
logged special vehicle route
road network probe information
request fare and price information
road network conditions
traffic archive data
I-10 Corridor Task Force
I-10 Corridor Information Gateway
Planned

129

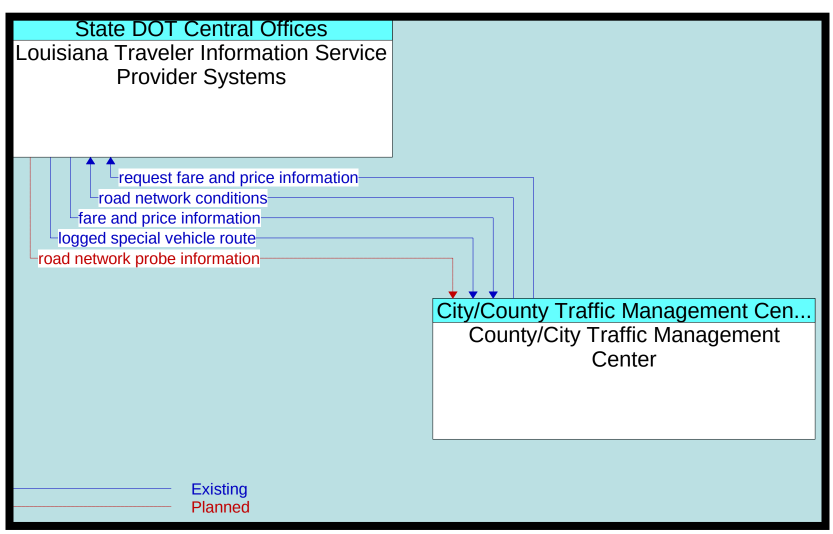

State Traffic Management Centers
Louisiana District Traffic Management Center
traffic control coordination
traffic information coordination
City/County Traffic Management Cen...
County/City Traffic Management Center
Existing
Planned

130



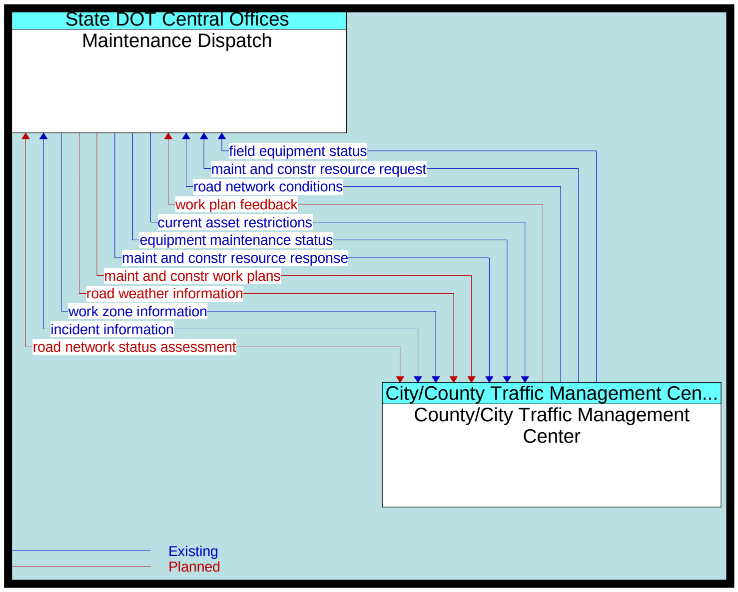
State ITS Departments
Louisiana Field Equipment
AHS control information
barrier system control
environmental sensors control
freeway control data
hri control data
hri request
reversible lane control
roadway information system data
safeguard system control
signal control data
speed monitoring control
traffic sensor control
video surveillance control
AHS status
barrier system status
environmental conditions data
environmental probe data
freeway control status
hov data
hri status
intersection blockage notification
request for right-of-way
reversible lane status
roadway information system status
safeguard system status
signal control status
speed monitoring information
traffic flow
traffic images
vehicle probe data
City/County Traffic Management Centers
County/City Traffic Management Center
Planned

131

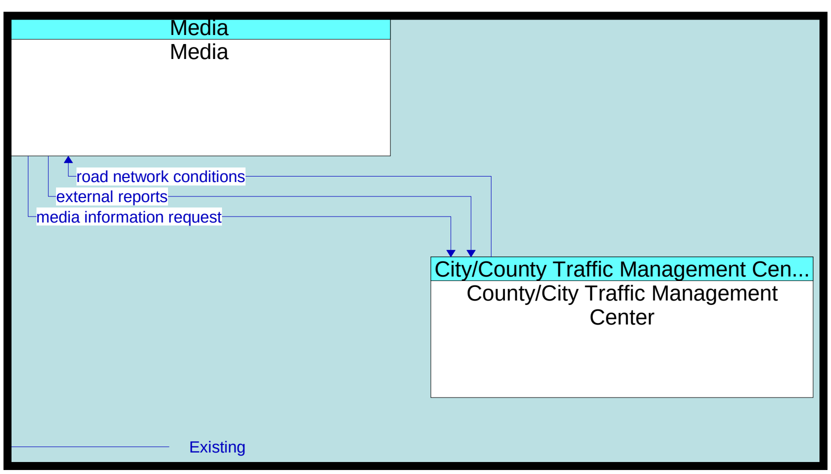


State DOT Central Offices
Louisiana Traveler Information Service Provider Systems
request fare and price information
road network conditions
fare and price information
logged special vehicle route
road network probe information
City/County Traffic Management Cen...
County/City Traffic Management Center
Existing
Planned

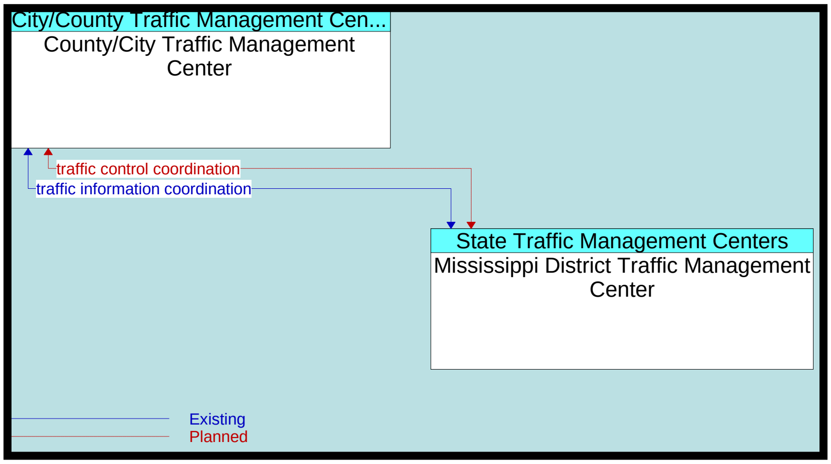
132


State DOT Central Offices
Maintenance Dispatch
field equipment status
maint and constr resource request
road network conditions
work plan feedback
current asset restrictions
equipment maintenance status
maint and constr resource response
maint and constr work plans
road weather information
work zone information
incident information
road network status assessment
City/County Traffic Management Cen...
County/City Traffic Management Center
Existing
Planned

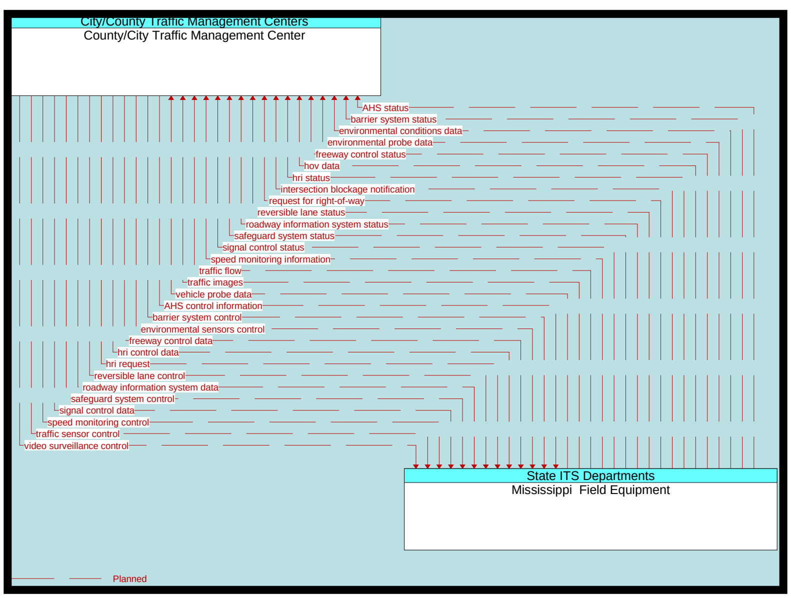
133


Media
Media
road network conditions
external reports
media information request
City/County Traffic Management Cen...
County/City Traffic Management Center
Existing

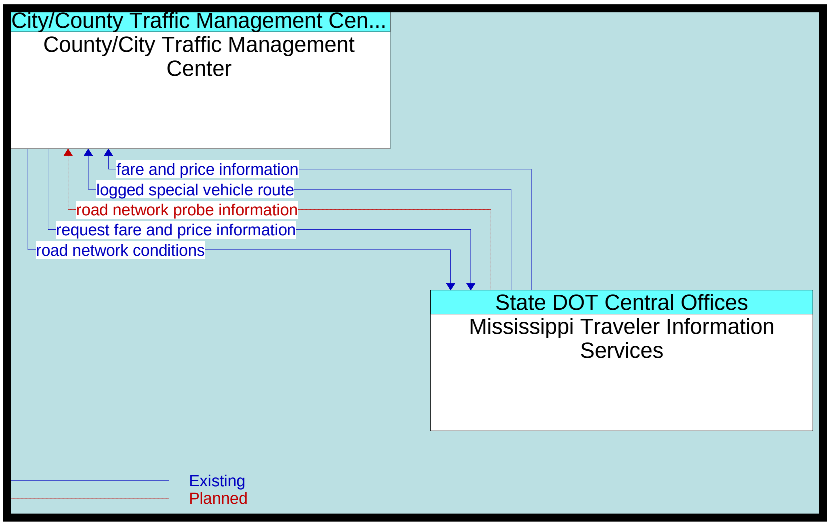
134


City/County Traffic Management Cen...
County/City Traffic Management Center
traffic control coordination
traffic information coordination
State Traffic Management Centers
Mississippi District Traffic Management Center
Existing
Planned

135

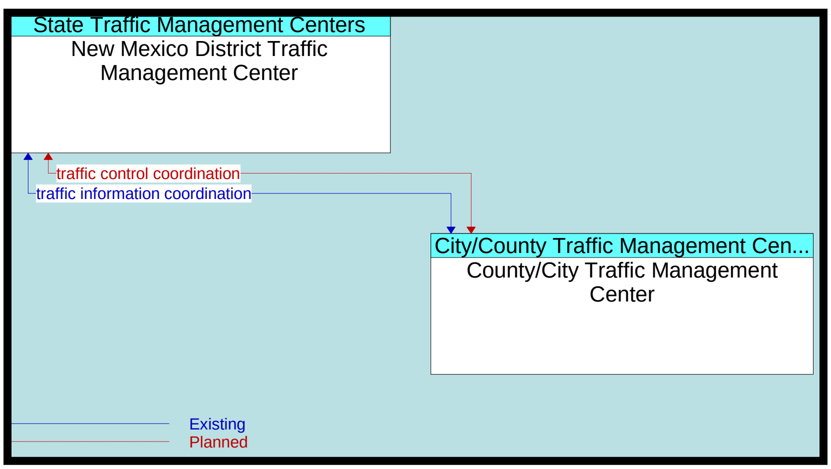

City/County Traffic Management Centers
County/City Traffic Management Center
AHS status
barrier system status
environmental conditions data
environmental probe data
freeway control status
hov data
hri status
intersection blockage notification
request for right-of-way
reversible lane status
roadway information system status
safeguard system status
signal control status
speed monitoring information
traffic flow
traffic images
vehicle probe data
AHS control information
barrier system control
environmental sensors control
freeway control data
hri control data
hri request
reversible lane control
roadway information system data
safeguard system control
signal control data
speed monitoring control
traffic sensor control
video surveillance control
State ITS Departments
Mississippi Field Equipment
Planned

136



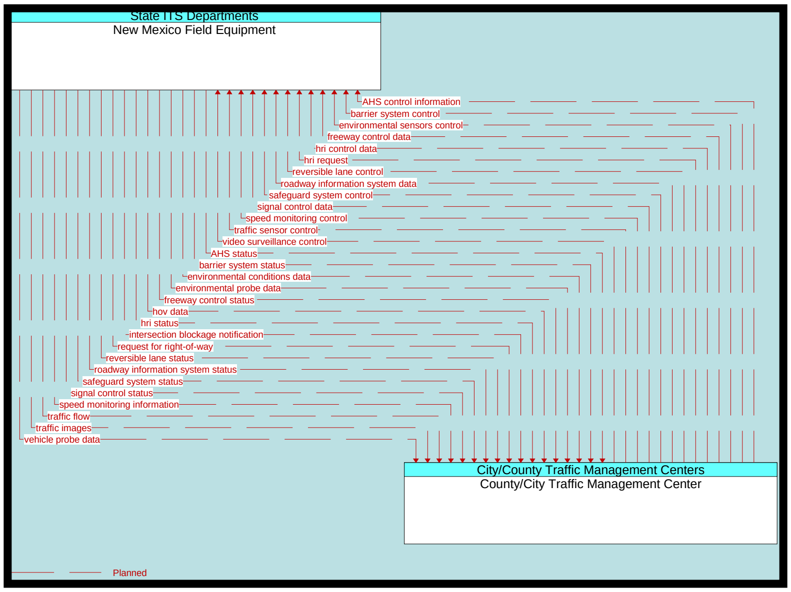
City/County Traffic Management Cen...
County/City Traffic Management Center
fare and price information
logged special vehicle route
road network probe information
request fare and price information
road network conditions
State DOT Central Offices
Mississippi Traveler Information Services
Existing
Planned

137

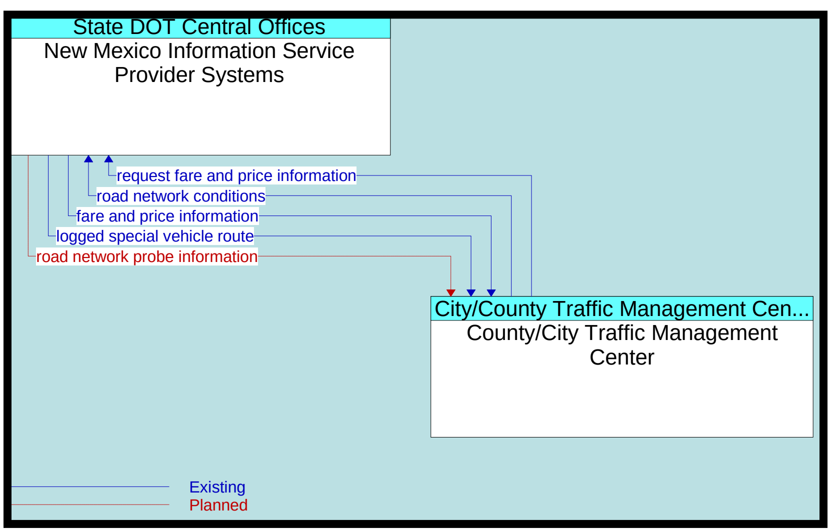


State Traffic Management Centers
New Mexico District Traffic Management Center
traffic control coordination
traffic information coordination
City/County Traffic Management Cen...
County/City Traffic Management Center
Existing
Planned

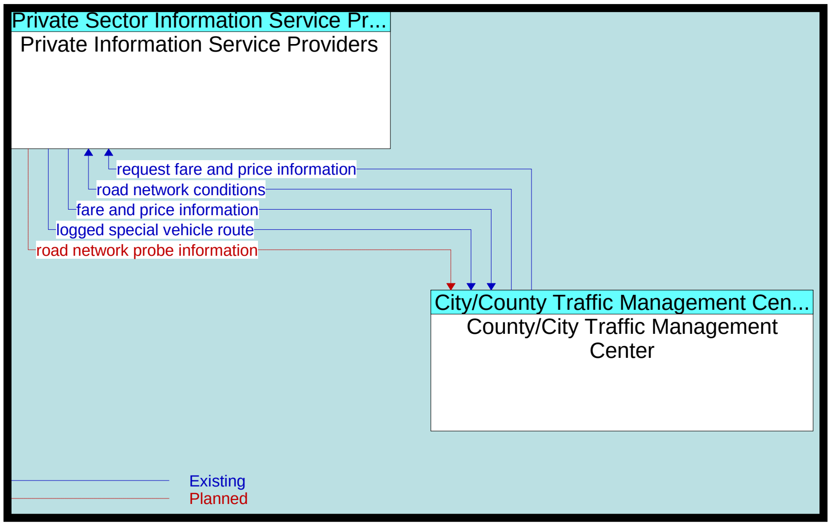
138


State ITS Departments
New Mexico Field Equipment
AHS control information
barrier system control
environmental sensors control
freeway control data
hri control data
hri request
reversible lane control
roadway information system data
safeguard system control
signal control data
speed monitoring control
traffic sensor control
video surveillance control
AHS status
barrier system status
environmental conditions data
environmental probe data
freeway control status
hov data
hri status
intersection blockage notification
request for right-of-way
reversible lane status
roadway information system status
safeguard system status
signal control status
speed monitoring information
traffic flow
traffic images
vehicle probe data
City/County Traffic Management Centers
County/City Traffic Management Center
Planned

139

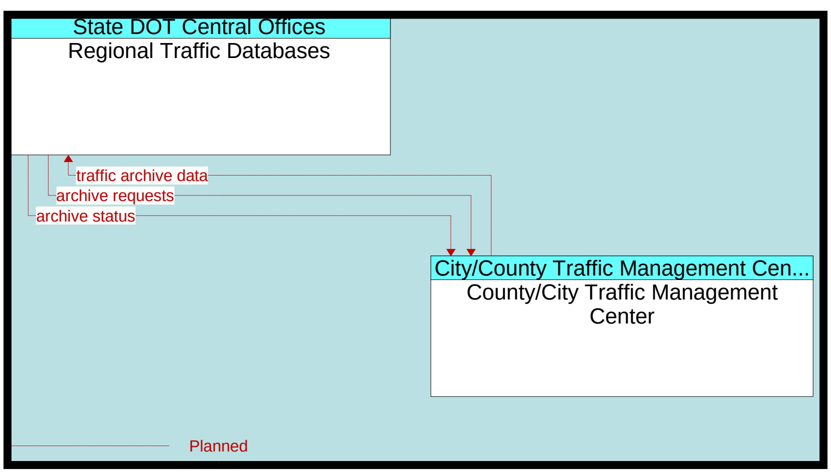

State DOT Central Offices
New Mexico Information Service Provider Systems
request fare and price information
road network conditions
fare and price information
logged special vehicle route
road network probe information
City/County Traffic Management Cen...
County/City Traffic Management Center
Existing
Planned

140



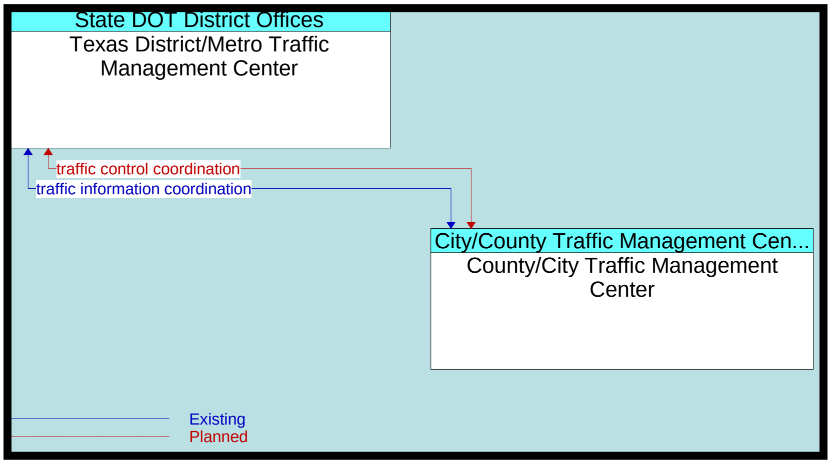
Private Sector Information Service Pr...
Private Information Service Providers
request fare and price information
road network conditions
fare and price information
logged special vehicle route
road network probe information
City/County Traffic Management Cen...
County/City Traffic Management Center
Existing
Planned

141



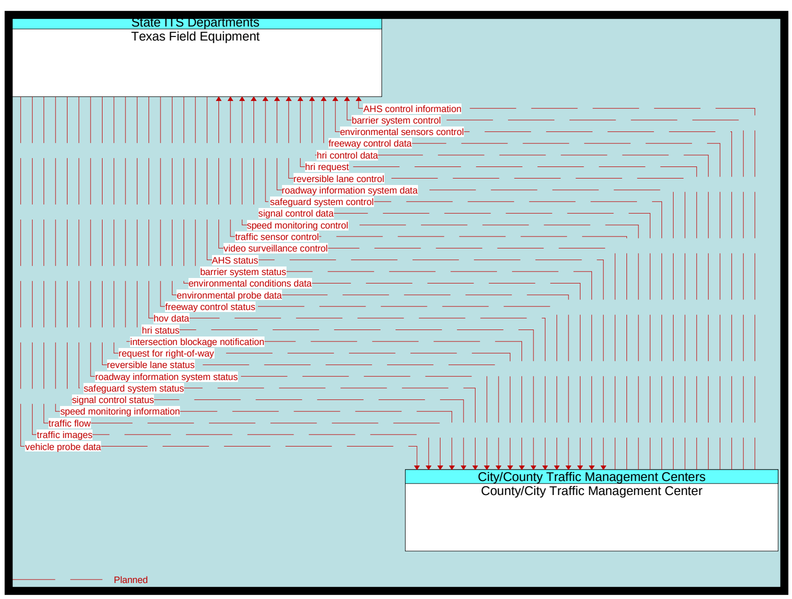
State DOT Central Offices
Regional Traffic Databases
traffic archive data
archive requests
archive status
City/County Traffic Management Cen...
County/City Traffic Management Center
Planned

142



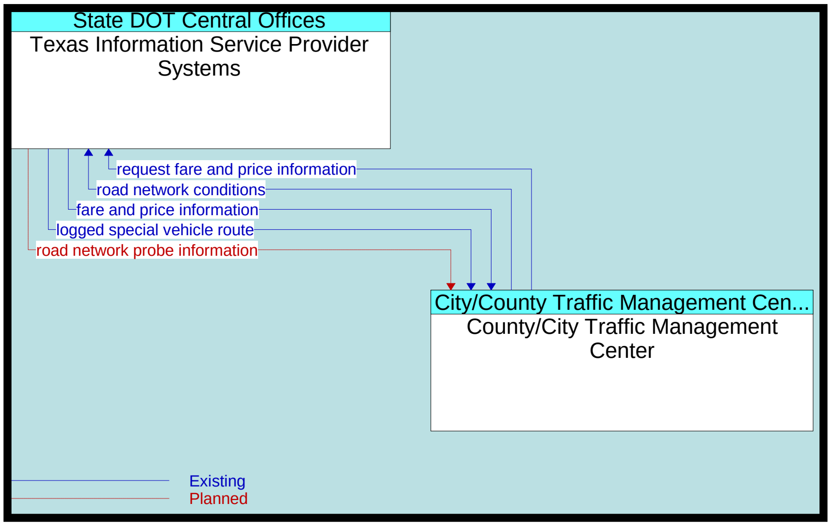
State DOT District Offices
Texas District/Metro Traffic Management Center
traffic control coordination
traffic information coordination
City/County Traffic Management Cen...
County/City Traffic Management Center
Existing
Planned

143

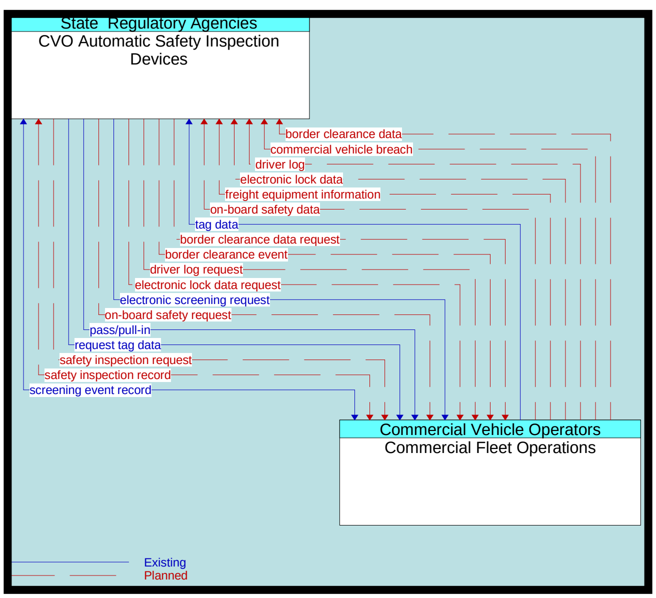


State ITS Departments
Texas Field Equipment
AHS control information
barrier system control
environmental sensors control
freeway control data
hri control data
hri request
reversible lane control
roadway information system data
safeguard system control
signal control data
speed monitoring control
traffic sensor control
video surveillance control
AHS status
barrier system status
environmental conditions data
environmental probe data
freeway control status
hov data
hri status
intersection blockage notification
request for right-of-way
reversible lane status
roadway information system status
safeguard system status
signal control status
speed monitoring information
traffic flow
traffic images
vehicle probe data
City/County Traffic Management Centers
County/City Traffic Management Center
Planned

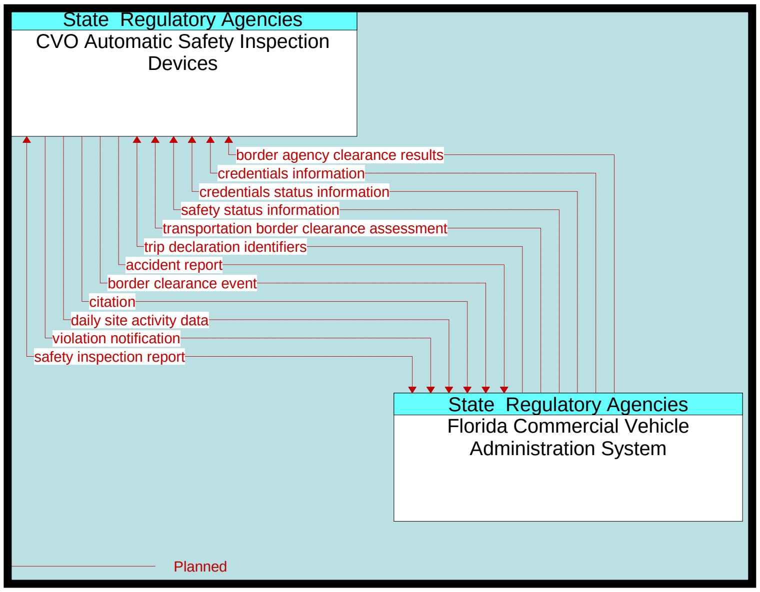
144


State DOT Central Offices
Texas Information Service Provider Systems
request fare and price information
road network conditions
fare and price information
logged special vehicle route
road network probe information
City/County Traffic Management Cen...
County/City Traffic Management Center
Existing
Planned

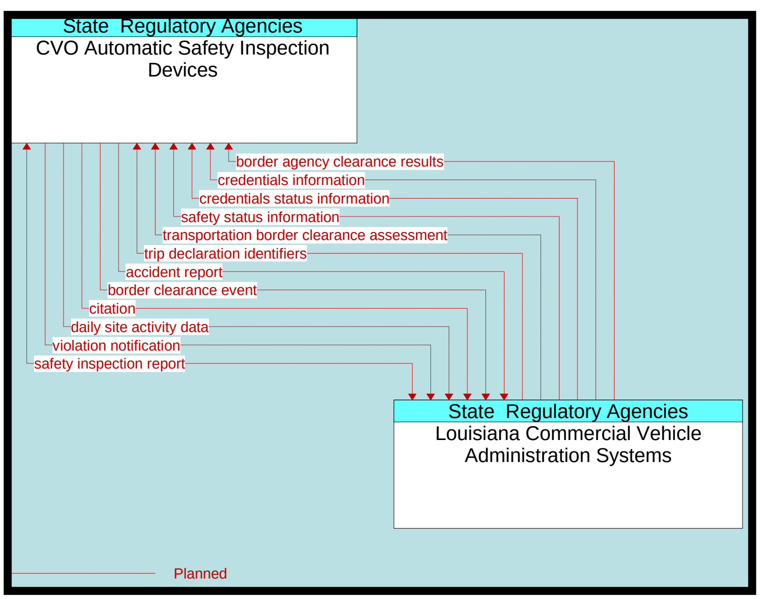
145


State Regulatory Agencies
CVO Automatic Safety Inspection Devices
border clearance data
commercial vehicle breach
driver log
electronic lock data
freight equipment information
on-board safety data
tag data
border clearance data request
border clearance event
driver log request
electronic lock data request
electronic screening request
on-board safety request
pass/pull-in
request tag data
safety inspection request
safety inspection record
screening event record
Commercial Vehicle Operators
Commercial Fleet Operations
Existing
Planned

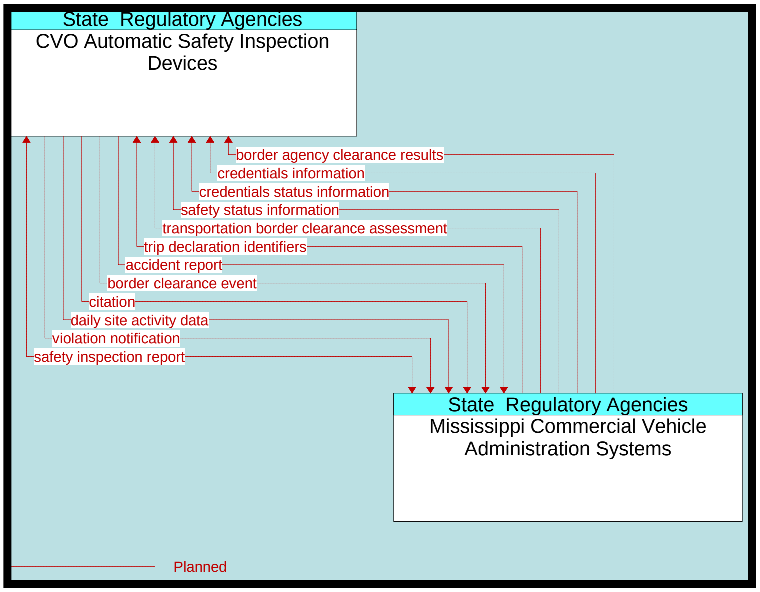
146


State Regulatory Agencies
CVO Automatic Safety Inspection Devices
border agency clearance results
credentials information
credentials status information
safety status information
transportation border clearance assessment
trip declaration identifiers
accident report
border clearance event
citation
daily site activity data
violation notification
safety inspection report
State Regulatory Agencies
Florida Commercial Vehicle Administration System
Planned

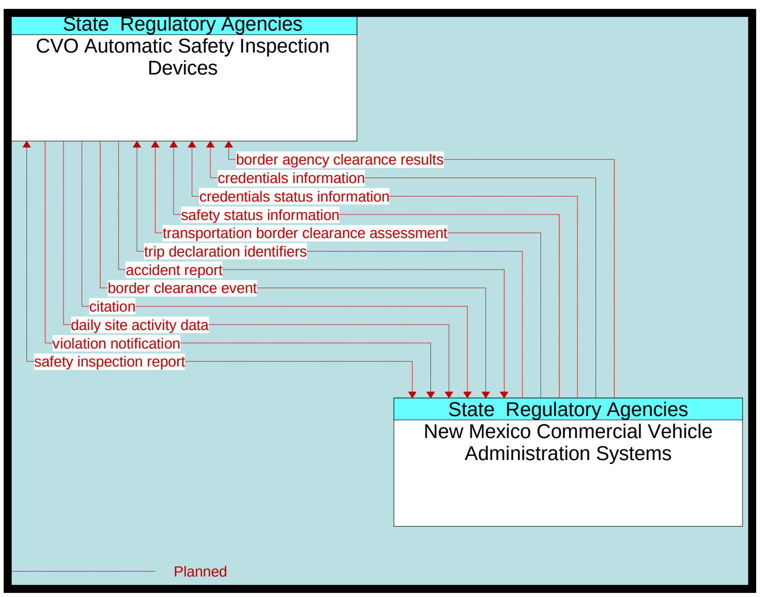
147


State Regulatory Agencies
CVO Automatic Safety Inspection Devices
border agency clearance results
credentials information
credentials status information
safety status information
transportation border clearance assessment
trip declaration identifiers
accident report
border clearance event
citation
daily site activity data
violation notification
safety inspection report
State Regulatory Agencies
Louisiana Commercial Vehicle Administration Systems
Planned

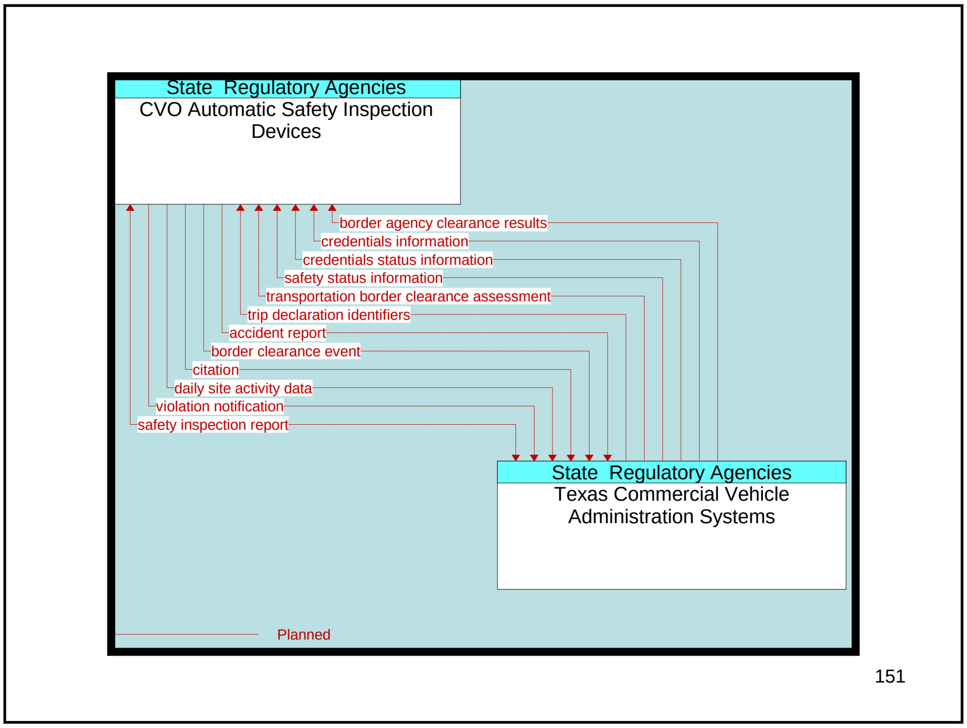
148

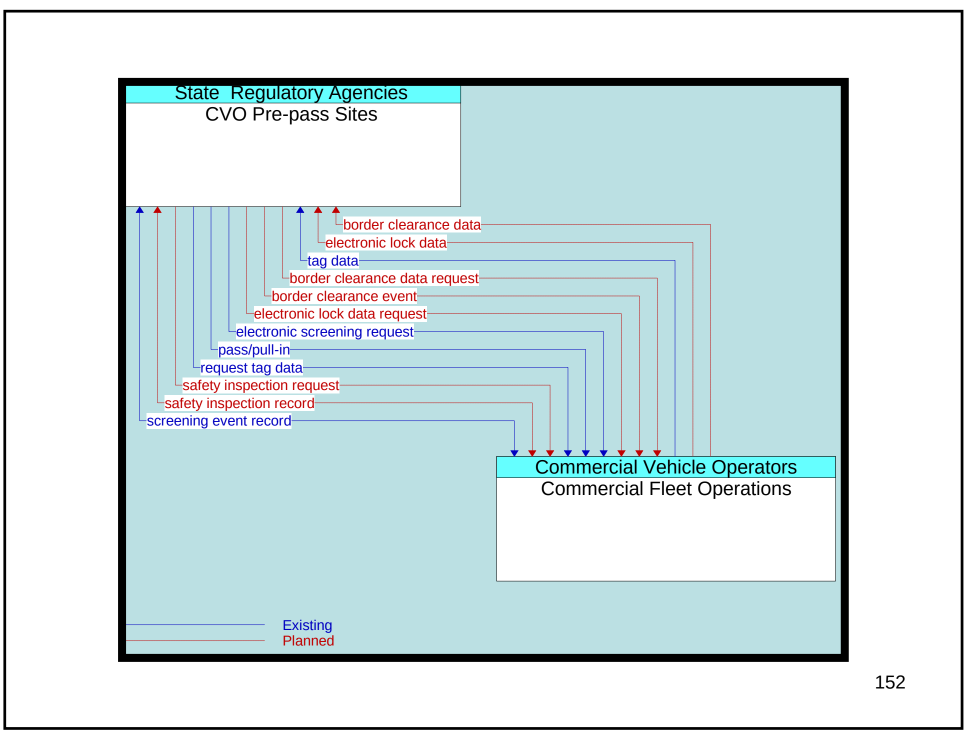

State Regulatory Agencies
CVO Automatic Safety Inspection Devices
border agency clearance results
credentials information
credentials status information
safety status information
transportation border clearance assessment
trip declaration identifiers
accident report
border clearance event
citation
daily site activity data
violation notification
safety inspection report
State Regulatory Agencies
Mississippi Commercial Vehicle Administration Systems
Planned

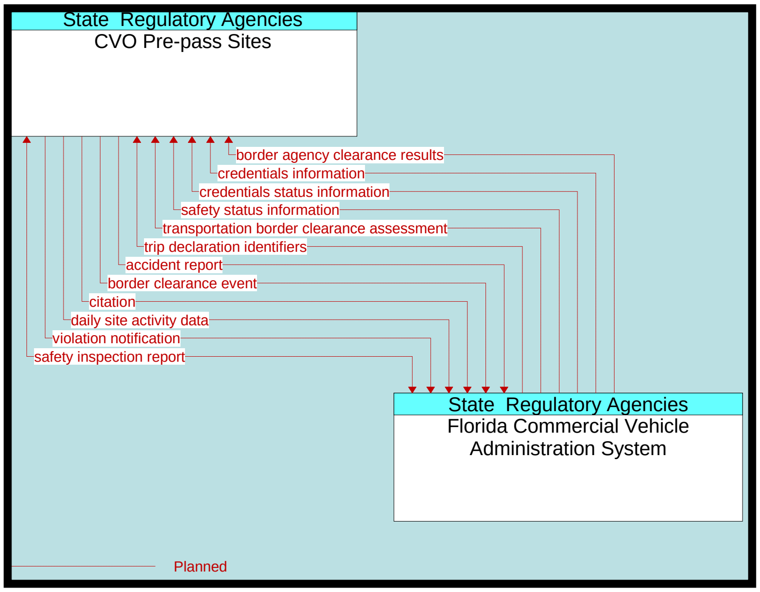
149


State Regulatory Agencies
CVO Automatic Safety Inspection Devices
border agency clearance results
credentials information
credentials status information
safety status information
transportation border clearance assessment
trip declaration identifiers
accident report
border clearance event
citation
daily site activity data
violation notification
safety inspection report
State Regulatory Agencies
New Mexico Commercial Vehicle Administration Systems
Planned

150

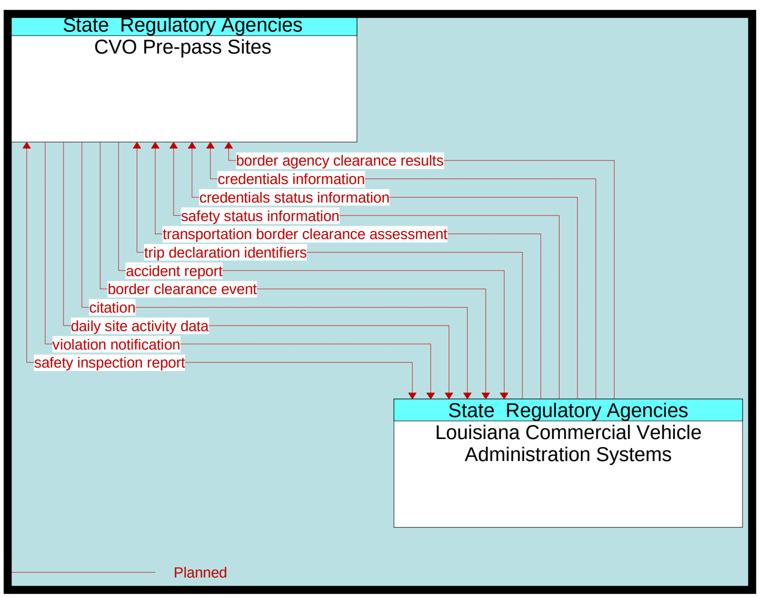

State Regulatory Agencies
CVO Automatic Safety Inspection Devices
border agency clearance results
credentials information
credentials status information
safety status information
transportation border clearance assessment
trip declaration identifiers
accident report
border clearance event
citation
daily site activity data
violation notification
safety inspection report
State Regulatory Agencies
Texas Commercial Vehicle Administration Systems
Planned
151


State Regulatory Agencies
CVO Pre-pass Sites
border clearance data
electronic lock data
tag data
border clearance data request
border clearance event
electronic lock data request
electronic screening request
pass/pull-in
request tag data
safety inspection request
safety inspection record
screening event record
Commercial Vehicle Operators
Commercial Fleet Operations
Existing
Planned
152



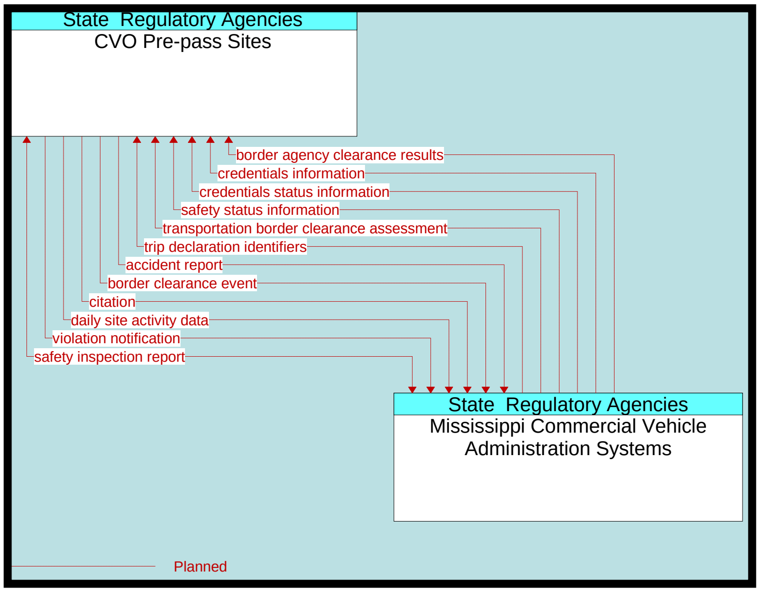
State Regulatory Agencies
CVO Pre-pass Sites
border agency clearance results
credentials information
credentials status information
safety status information
transportation border clearance assessment
trip declaration identifiers
accident report
border clearance event
citation
daily site activity data
violation notification
safety inspection report
State Regulatory Agencies
Florida Commercial Vehicle Administration System
Planned

153

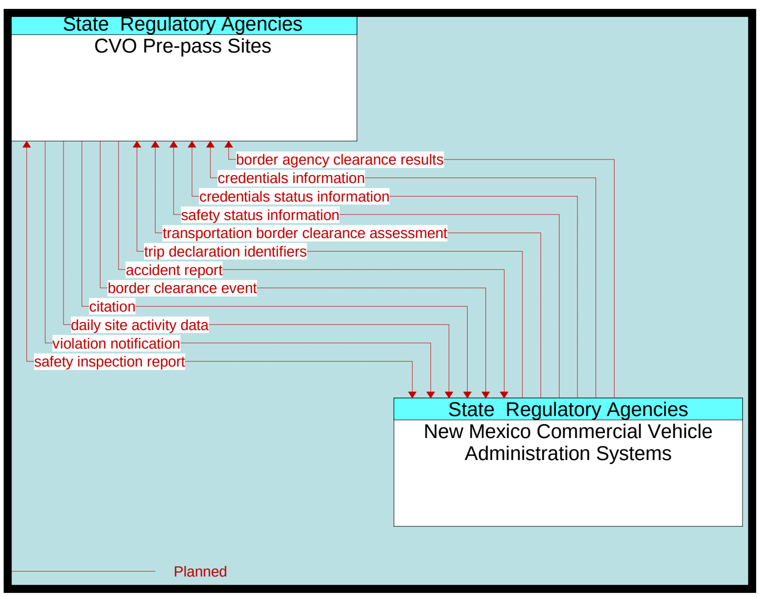


State Regulatory Agencies
CVO Pre-pass Sites
border agency clearance results
credentials information
credentials status information
safety status information
transportation border clearance assessment
trip declaration identifiers
accident report
border clearance event
citation
daily site activity data
violation notification
safety inspection report
State Regulatory Agencies
Louisiana Commercial Vehicle Administration Systems
Planned

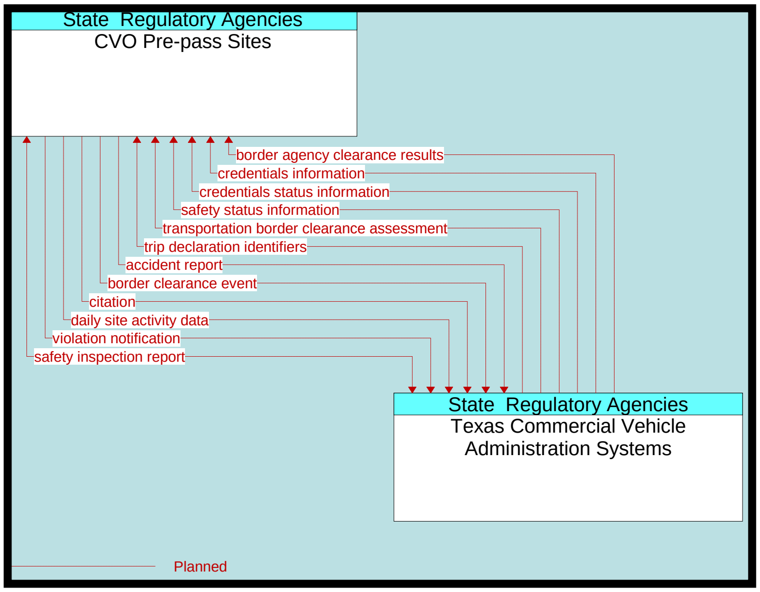
154


State Regulatory Agencies
CVO Pre-pass Sites
border agency clearance results
credentials information
credentials status information
safety status information
transportation border clearance assessment
trip declaration identifiers
accident report
border clearance event
citation
daily site activity data
violation notification
safety inspection report
State Regulatory Agencies
Mississippi Commercial Vehicle Administration Systems
Planned

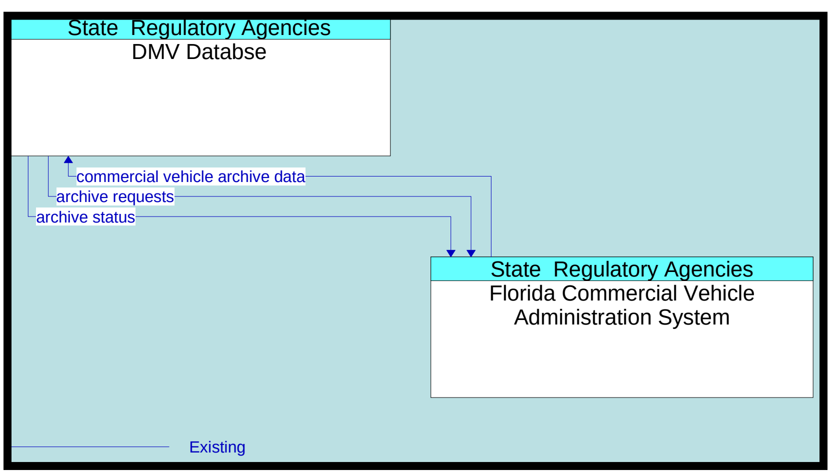
155


State Regulatory Agencies
CVO Pre-pass Sites
border agency clearance results
credentials information
credentials status information
safety status information
transportation border clearance assessment
trip declaration identifiers
accident report
border clearance event
citation
daily site activity data
violation notification
safety inspection report
State Regulatory Agencies
New Mexico Commercial Vehicle Administration Systems
Planned

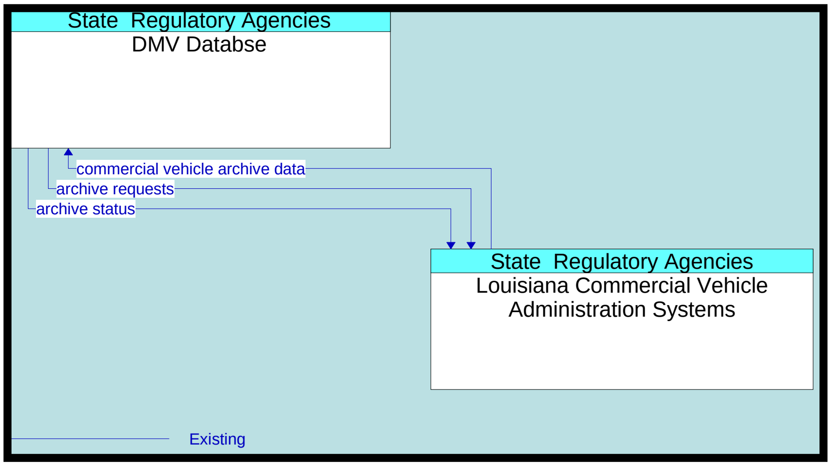
156


State Regulatory Agencies
CVO Pre-pass Sites
border agency clearance results
credentials information
credentials status information
safety status information
transportation border clearance assessment
trip declaration identifiers
accident report
border clearance event
citation
daily site activity data
violation notification
safety inspection report
State Regulatory Agencies
Texas Commercial Vehicle Administration Systems
Planned

157

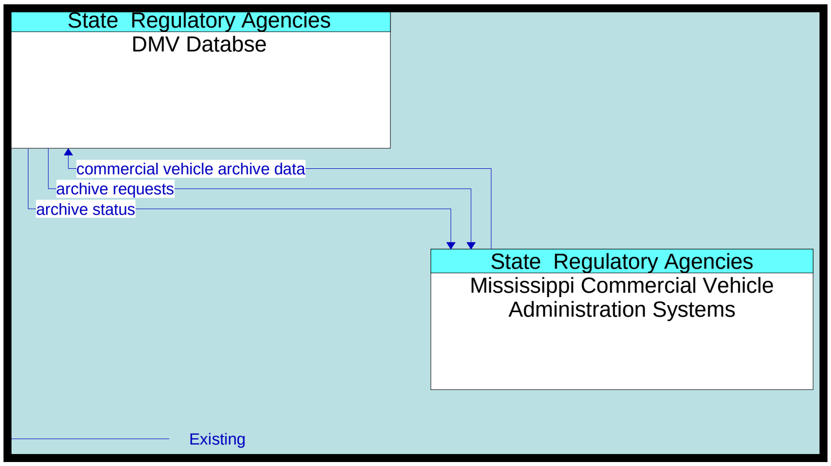

State Regulatory Agencies
DMV Databse
commercial vehicle archive data
archive requests
archive status
State Regulatory Agencies
Florida Commercial Vehicle Administration System
Existing

158



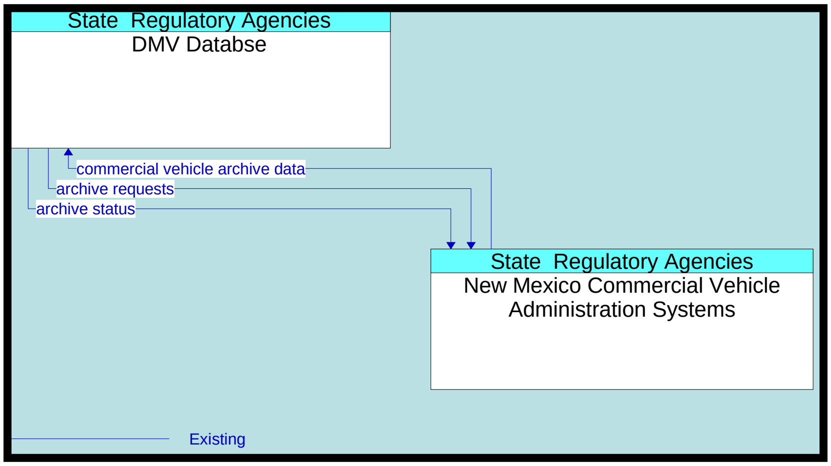
State Regulatory Agencies
DMV Databse
commercial vehicle archive data
archive requests
archive status
State Regulatory Agencies
Louisiana Commercial Vehicle Administration Systems
Existing

159

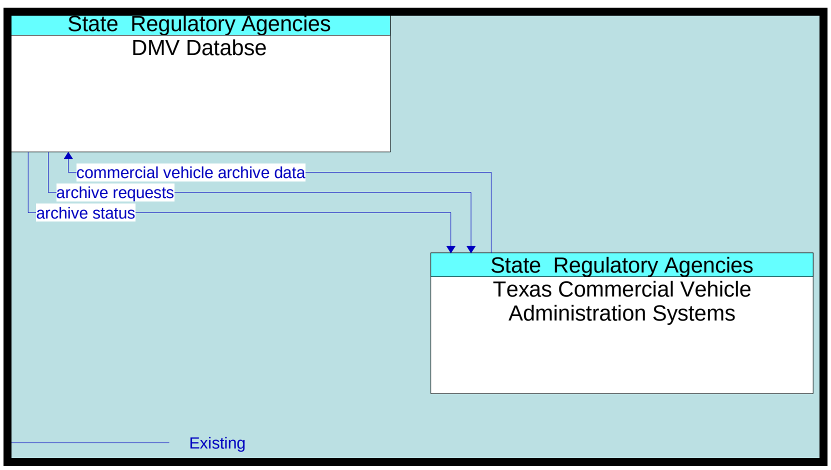


State Regulatory Agencies
DMV Databse
commercial vehicle archive data
archive requests
archive status
State Regulatory Agencies
Mississippi Commercial Vehicle Administration Systems
Existing

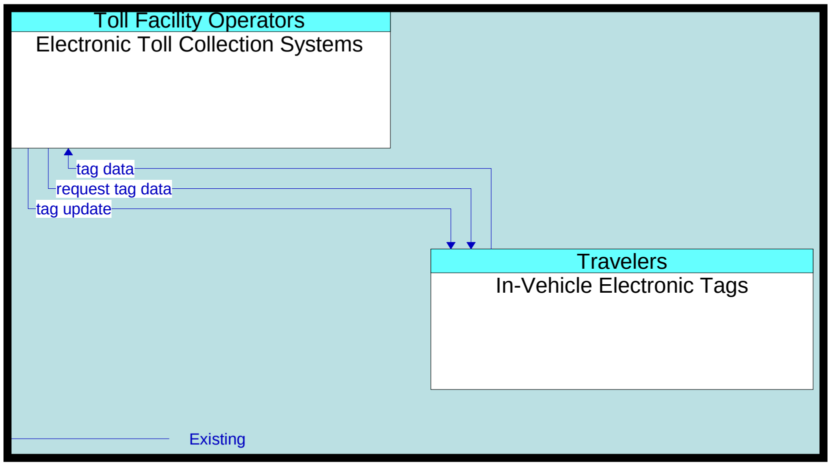
160


State Regulatory Agencies
DMV Databse
commercial vehicle archive data
archive requests
archive status
State Regulatory Agencies
New Mexico Commercial Vehicle Administration Systems
Existing

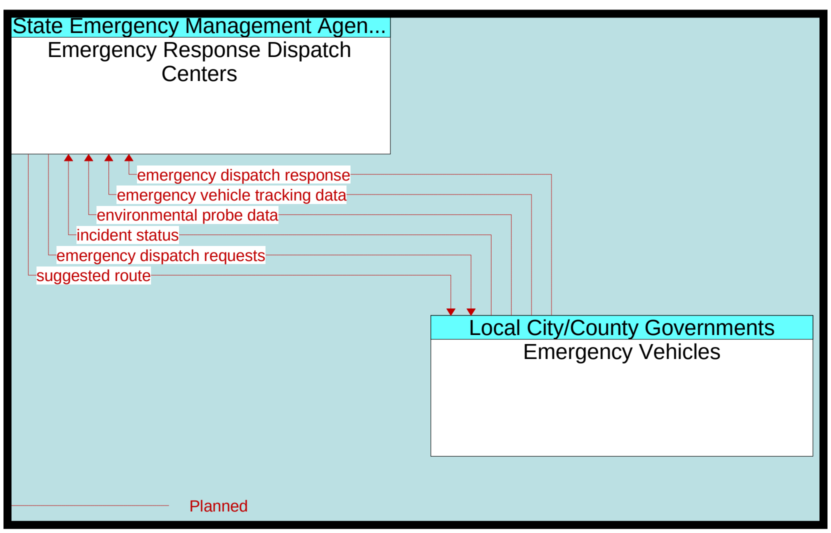
161


State Regulatory Agencies
DMV Databse
commercial vehicle archive data
archive requests
archive status
State Regulatory Agencies
Texas Commercial Vehicle Administration Systems
Existing

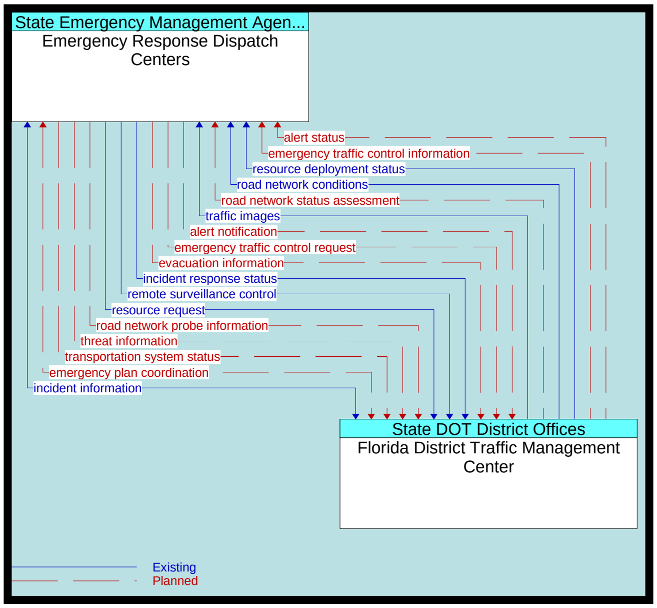
162


Toll Facility Operators
Electronic Toll Collection Systems
tag data
request tag data
tag update
Travelers
In-Vehicle Electronic Tags
Existing

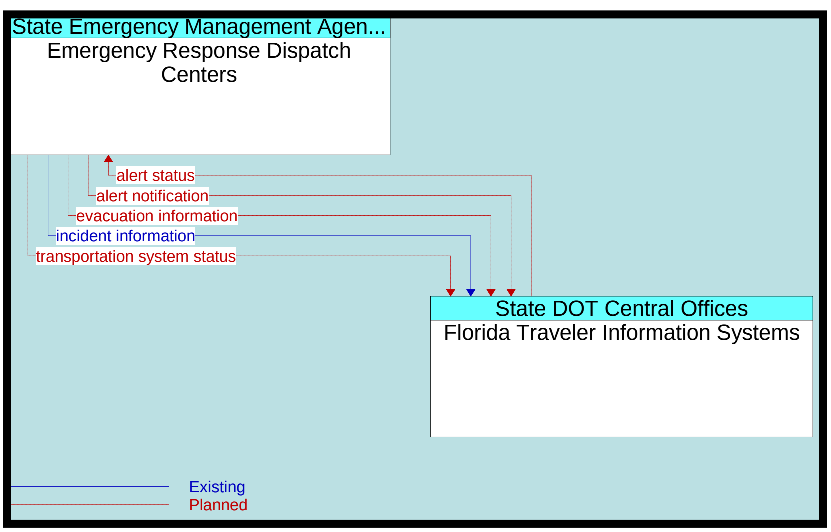
163


State Emergency Management Agen...
Emergency Response Dispatch Centers
emergency dispatch response
emergency vehicle tracking data
environmental probe data
incident status
emergency dispatch requests
suggested route
Local City/County Governments
Emergency Vehicles
Planned

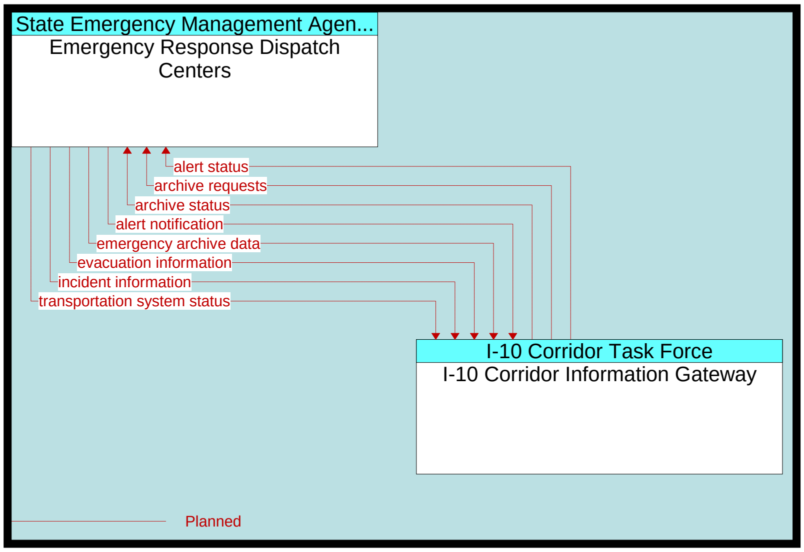
164


State Emergency Management Agen...
Emergency Response Dispatch Centers
alert status
emergency traffic control information
resource deployment status
road network conditions
road network status assessment
traffic images
alert notification
emergency traffic control request
evacuation information
incident response status
remote surveillance control
resource request
road network probe information
threat information
transportation system status
emergency plan coordination
incident information
State DOT District Offices
Florida District Traffic Management Center
Existing
Planned

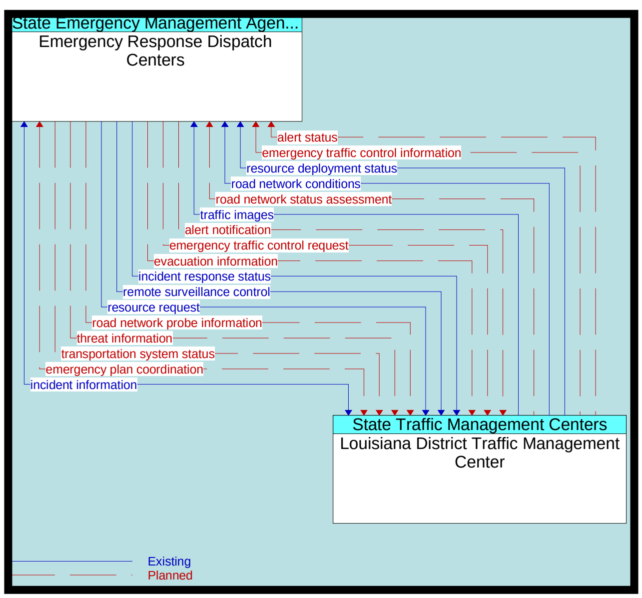
165


State Emergency Management Agen...
Emergency Response Dispatch Centers
alert status
alert notification
evacuation information
incident information
transportation system status
State DOT Central Offices
Florida Traveler Information Systems
Existing
Planned

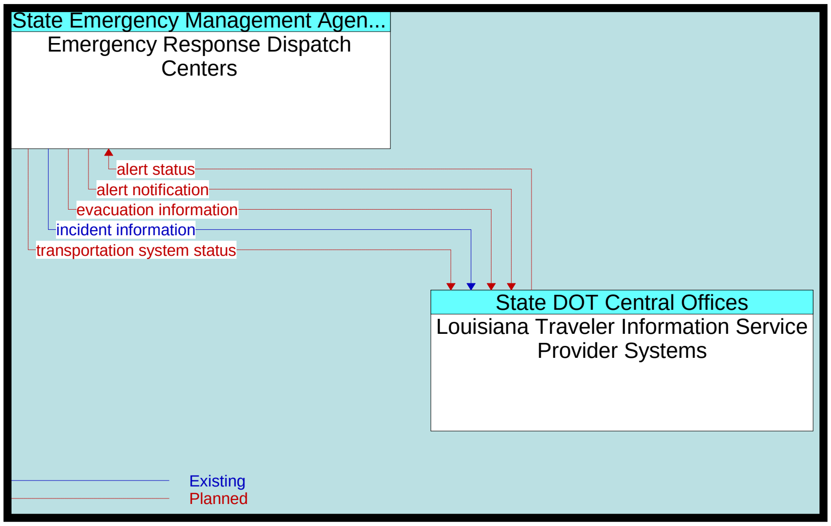
166


State Emergency Management Agen...
Emergency Response Dispatch Centers
alert status
archive requests
archive status
alert notification
emergency archive data
evacuation information
incident information
transportation system status
I-10 Corridor Task Force
I-10 Corridor Information Gateway
Planned

167

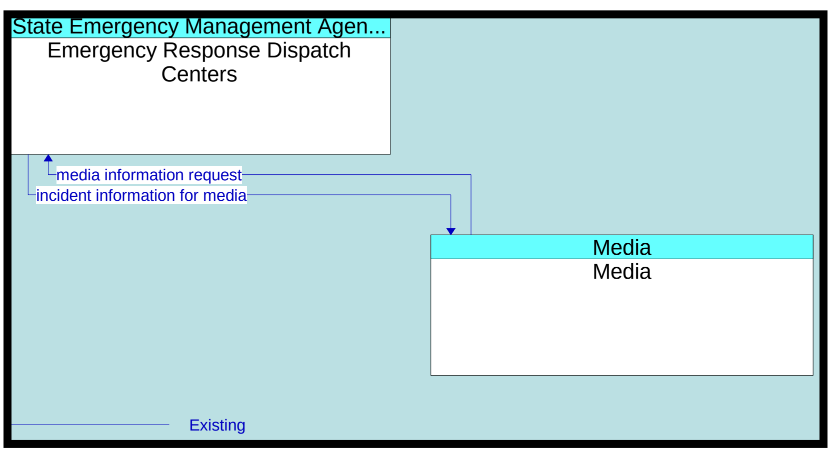

State Emergency Management Agen...
Emergency Response Dispatch Centers
alert status
emergency traffic control information
resource deployment status
road network conditions
road network status assessment
traffic images
alert notification
emergency traffic control request
evacuation information
incident response status
remote surveillance control
resource request
road network probe information
threat information
transportation system status
emergency plan coordination
incident information
State Traffic Management Centers
Louisiana District Traffic Management Center
Existing
Planned

168



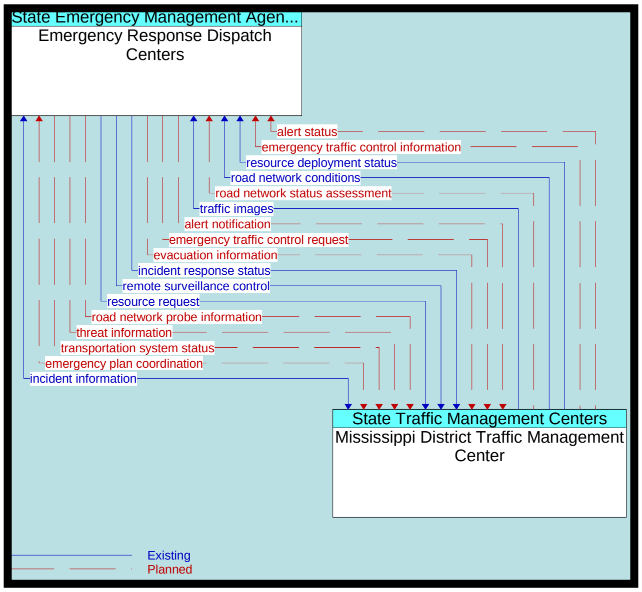
State Emergency Management Agen...
Emergency Response Dispatch Centers
alert status
alert notification
evacuation information
incident information
transportation system status
State DOT Central Offices
Louisiana Traveler Information Service Provider Systems
Existing
Planned

169

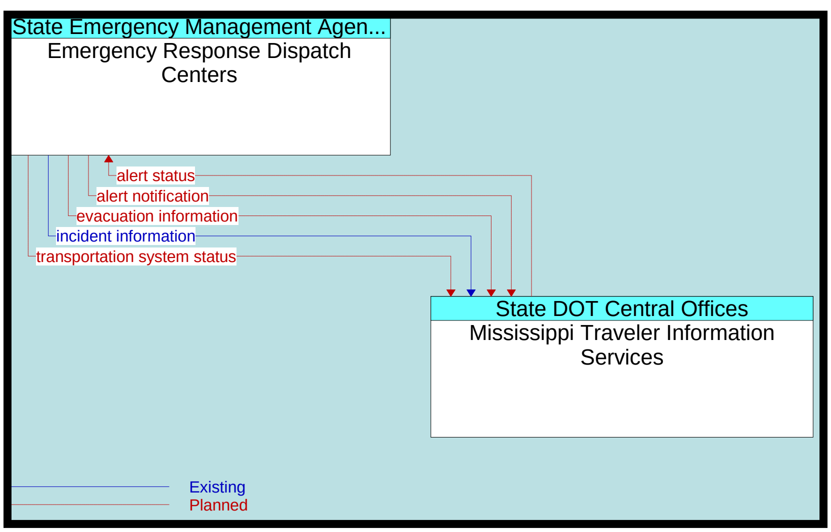


State Emergency Management Agen...
Emergency Response Dispatch Centers
media information request
incident information for media
Media
Media
Existing

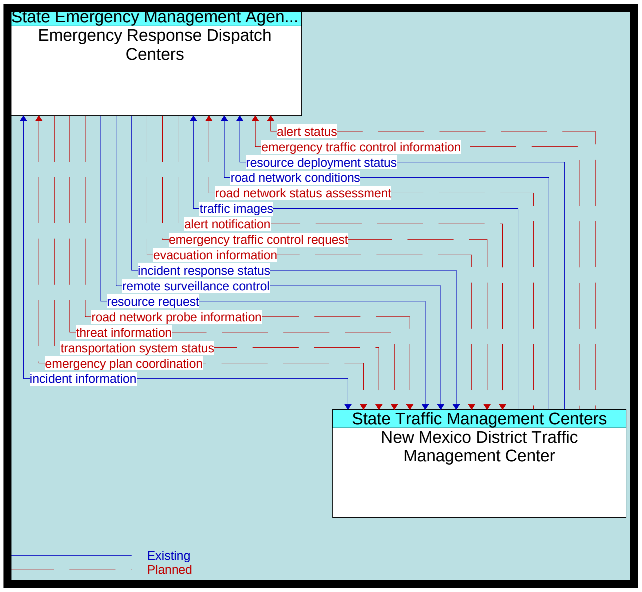
170


State Emergency Management Agen...
Emergency Response Dispatch Centers
alert status
emergency traffic control information
resource deployment status
road network conditions
road network status assessment
traffic images
alert notification
emergency traffic control request
evacuation information
incident response status
remote surveillance control
resource request
road network probe information
threat information
transportation system status
emergency plan coordination
incident information
State Traffic Management Centers
Mississippi District Traffic Management Center
Existing
Planned

171

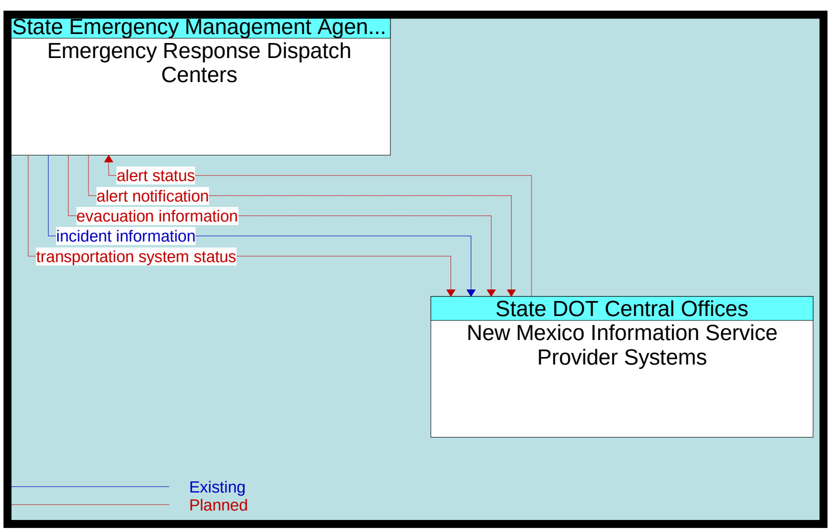

State Emergency Management Agen...
Emergency Response Dispatch Centers
alert status
alert notification
evacuation information
incident information
transportation system status
State DOT Central Offices
Mississippi Traveler Information Services
Existing
Planned

172



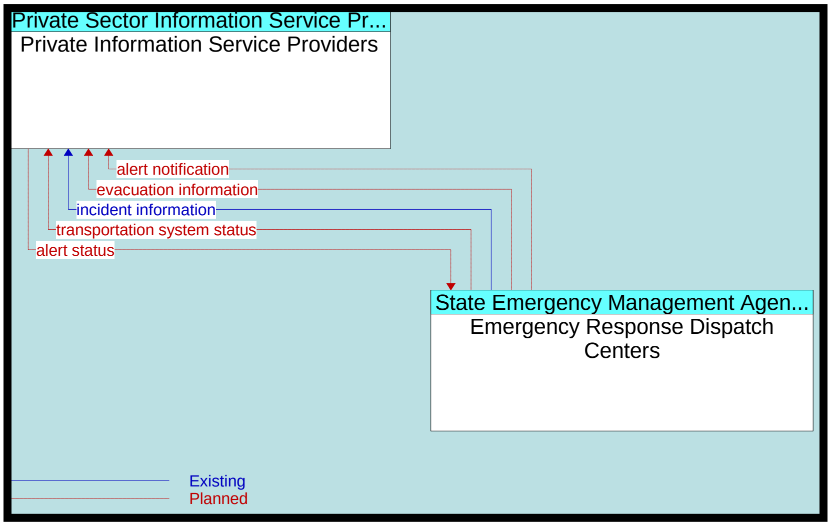
State Emergency Management Agen...
Emergency Response Dispatch Centers
alert status
emergency traffic control information
resource deployment status
road network conditions
road network status assessment
traffic images
alert notification
emergency traffic control request
evacuation information
incident response status
remote surveillance control
resource request
road network probe information
threat information
transportation system status
emergency plan coordination
incident information
State Traffic Management Centers
New Mexico District Traffic Management Center
Existing
Planned

173

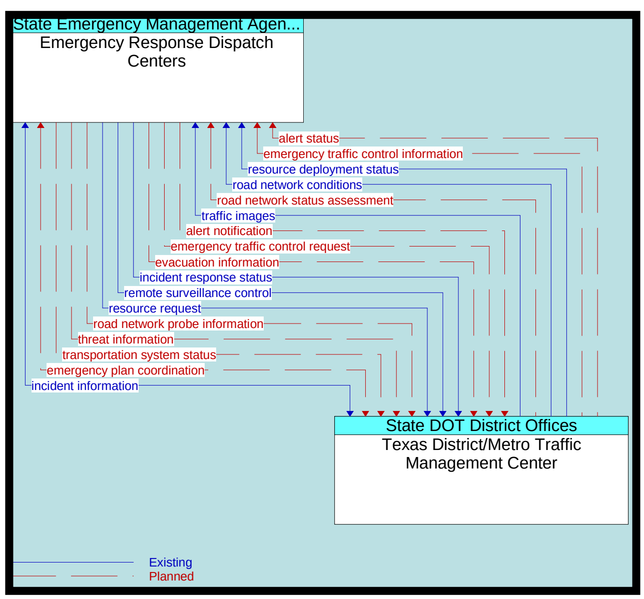


State Emergency Management Agen...
Emergency Response Dispatch Centers
alert status
alert notification
evacuation information
incident information
transportation system status
State DOT Central Offices
New Mexico Information Service Provider Systems
Existing
Planned

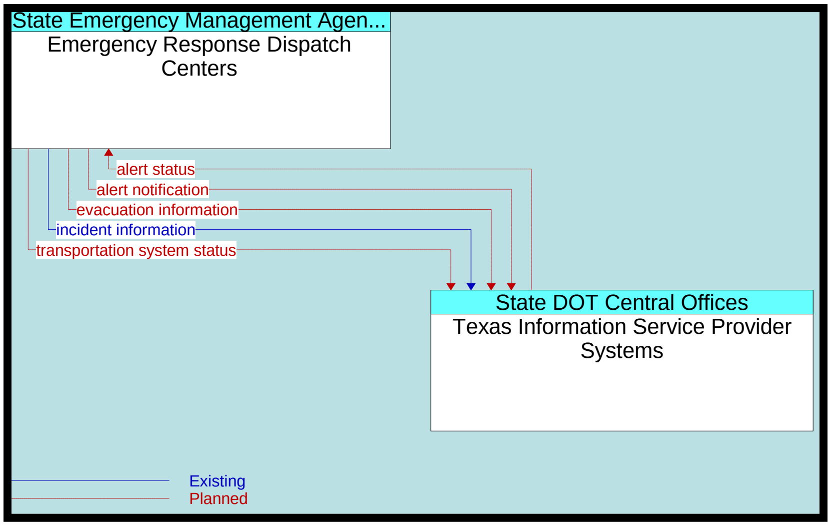
174


Private Sector Information Service Pr...
Private Information Service Providers
alert notification
evacuation information
incident information
transportation system status
alert status
State Emergency Management Agen...
Emergency Response Dispatch Centers
Existing
Planned

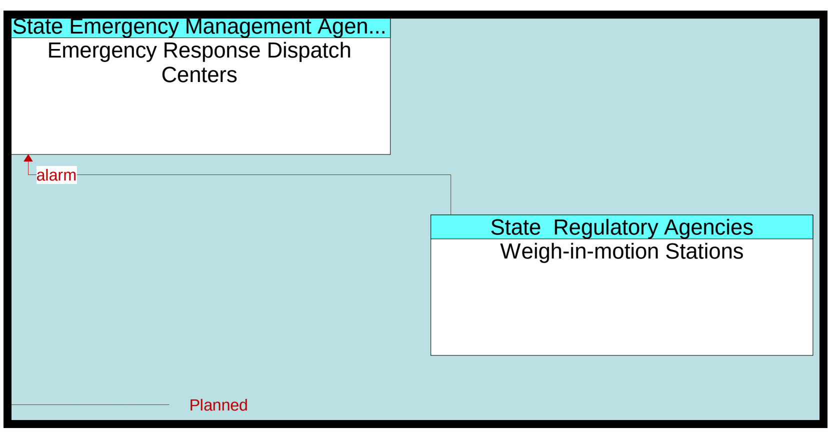
175


State Emergency Management Agen...
Emergency Response Dispatch Centers
alert status
emergency traffic control information
resource deployment status
road network conditions
road network status assessment
traffic images
alert notification
emergency traffic control request
evacuation information
incident response status
remote surveillance control
resource request
road network probe information
threat information
transportation system status
emergency plan coordination
incident information
State DOT District Offices
Texas District/Metro Traffic Management Center
Existing
Planned

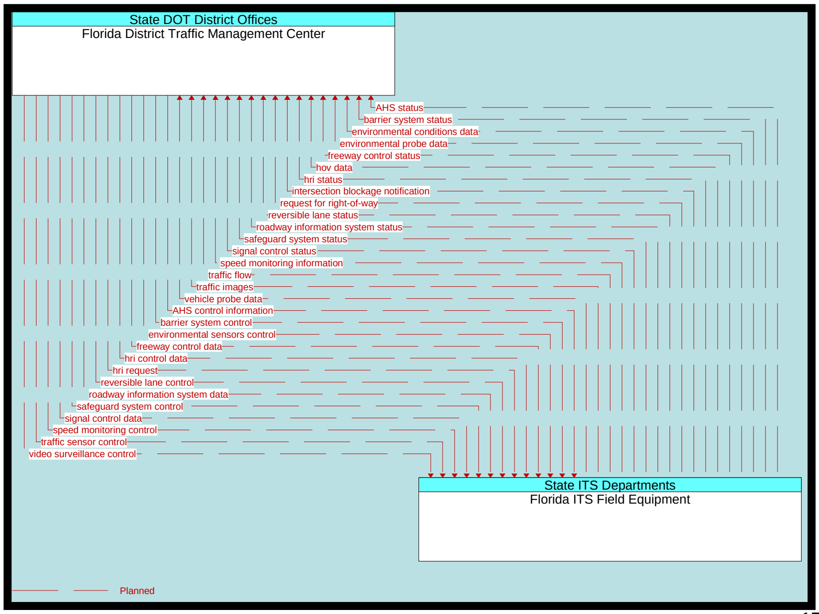
176


State Emergency Management Agen...
Emergency Response Dispatch Centers
alert status
alert notification
evacuation information
incident information
transportation system status
State DOT Central Offices
Texas Information Service Provider Systems
Existing
Planned

177

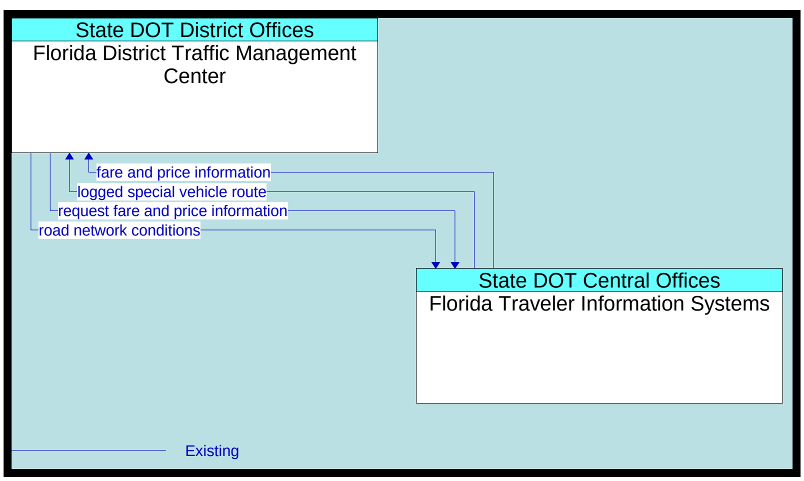

State Emergency Management Agen...
Emergency Response Dispatch Centers
alarm
State Regulatory Agencies
Weigh-in-motion Stations
Planned

178



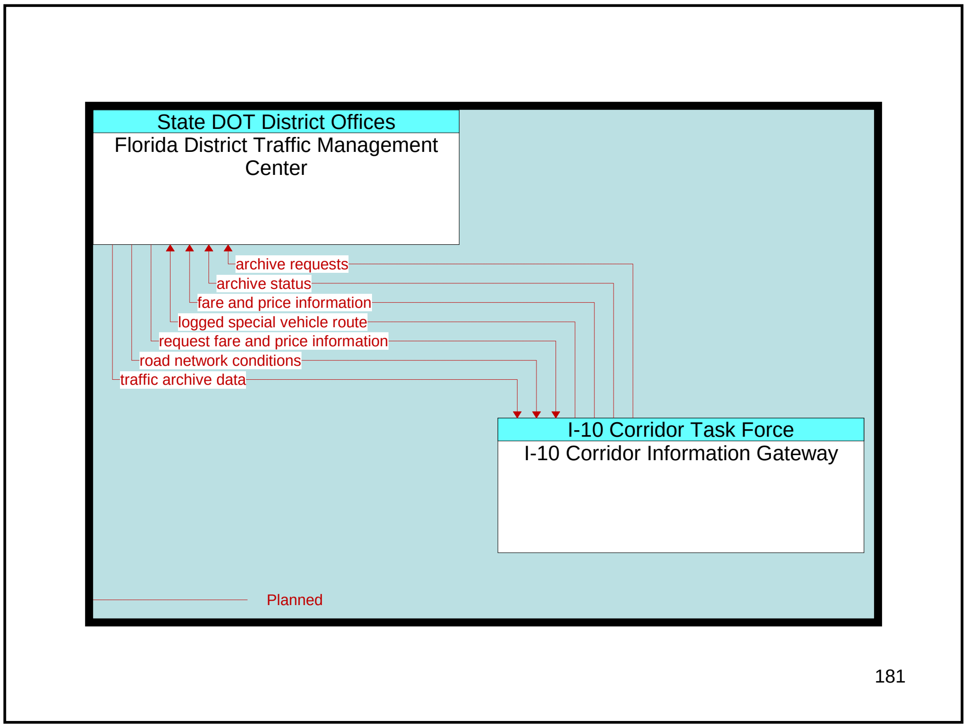
State DOT District Offices
Florida District Traffic Management Center
AHS status
barrier system status
environmental conditions data
environmental probe data
freeway control status
hov data
hri status
intersection blockage notification
request for right-of-way
reversible lane status
roadway information system status
safeguard system status
signal control status
speed monitoring information
traffic flow
traffic images
vehicle probe data
AHS control information
barrier system control
environmental sensors control
freeway control data
hri control data
hri request
reversible lane control
roadway information system data
safeguard system control
signal control data
speed monitoring control
traffic sensor control
video surveillance control
State ITS Departments
Florida ITS Field Equipment
Planned

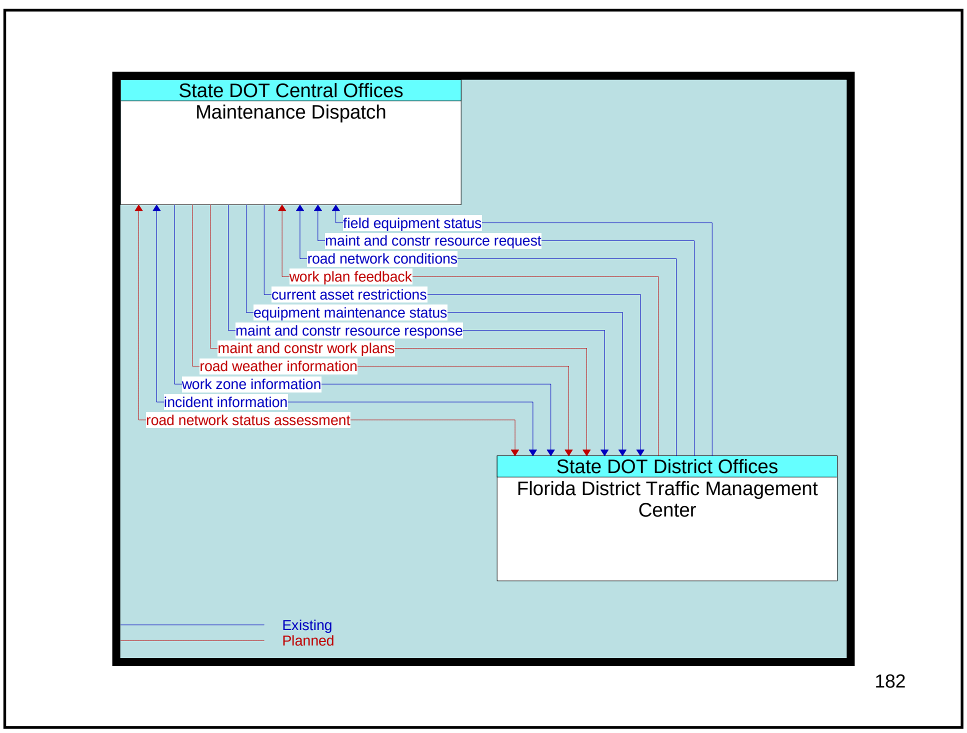
179

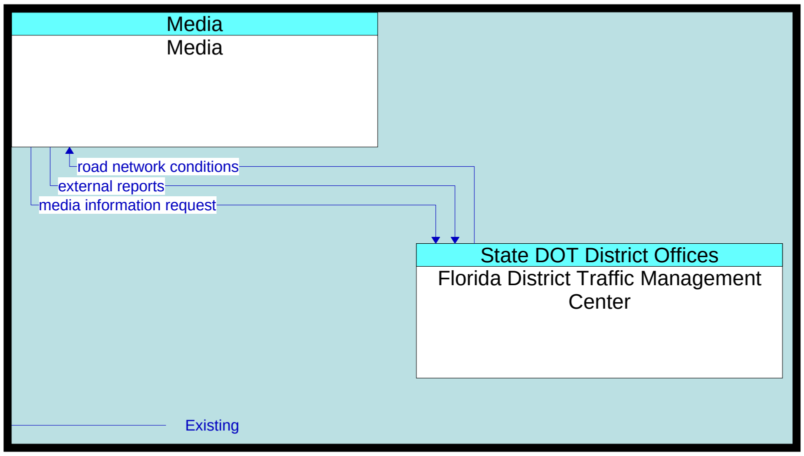


State DOT District Offices
Florida District Traffic Management Center
fare and price information
logged special vehicle route
request fare and price information
road network conditions
State DOT Central Offices
Florida Traveler Information Systems
Existing

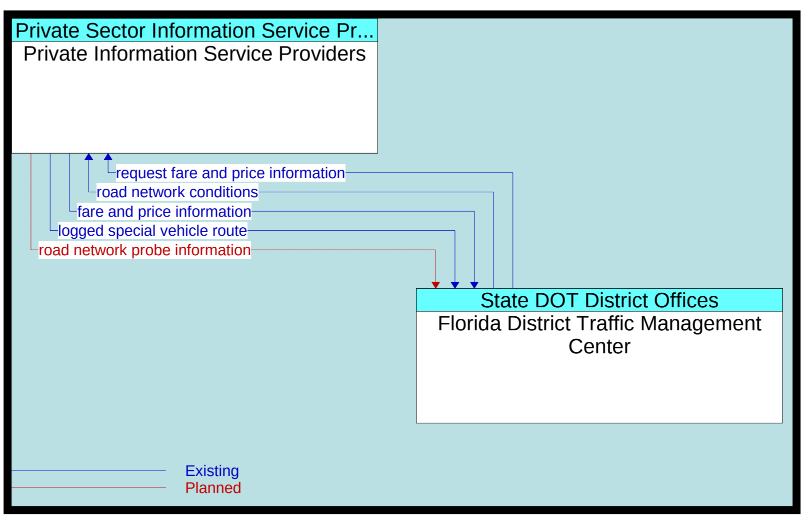
180


State DOT District Offices
Florida District Traffic Management Center
archive requests
archive status
fare and price information
logged special vehicle route
request fare and price information
road network conditions
traffic archive data
I-10 Corridor Task Force
I-10 Corridor Information Gateway
Planned
181

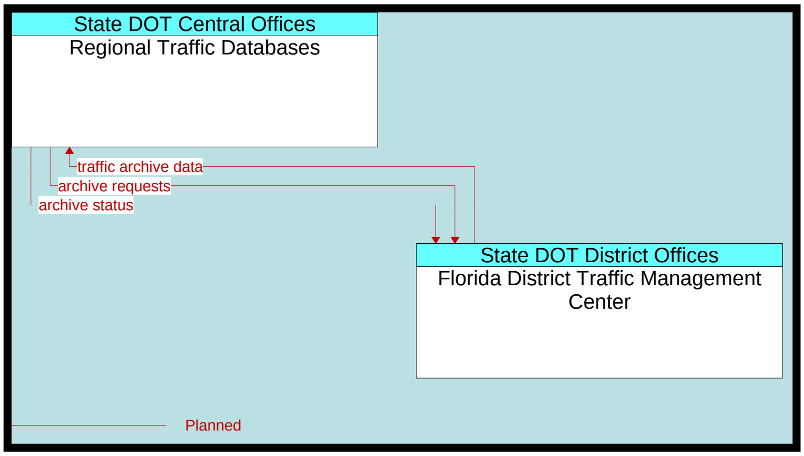

State DOT Central Offices
Maintenance Dispatch
field equipment status
maint and constr resource request
road network conditions
work plan feedback
current asset restrictions
equipment maintenance status
maint and constr resource response
maint and constr work plans
road weather information
work zone information
incident information
road network status assessment
State DOT District Offices
Florida District Traffic Management Center
Existing
Planned
182


Media
Media
road network conditions
external reports
media information request
State DOT District Offices
Florida District Traffic Management Center
Existing

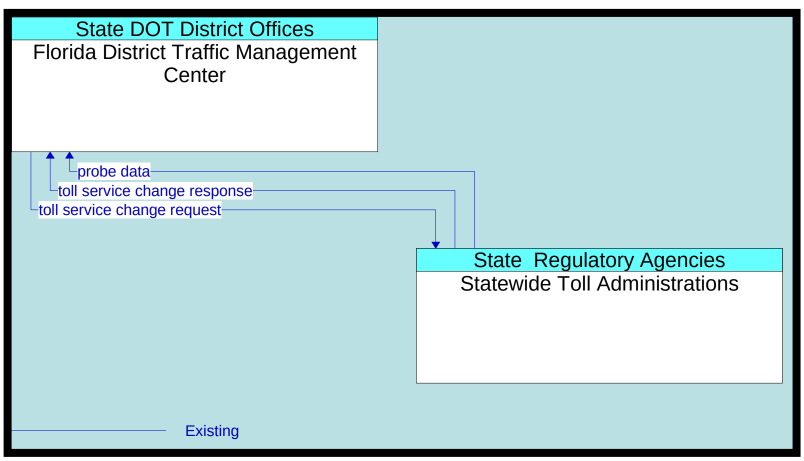
183


Private Sector Information Service Pr...
Private Information Service Providers
request fare and price information
road network conditions
fare and price information
logged special vehicle route
road network probe information
State DOT District Offices
Florida District Traffic Management Center
Existing
Planned

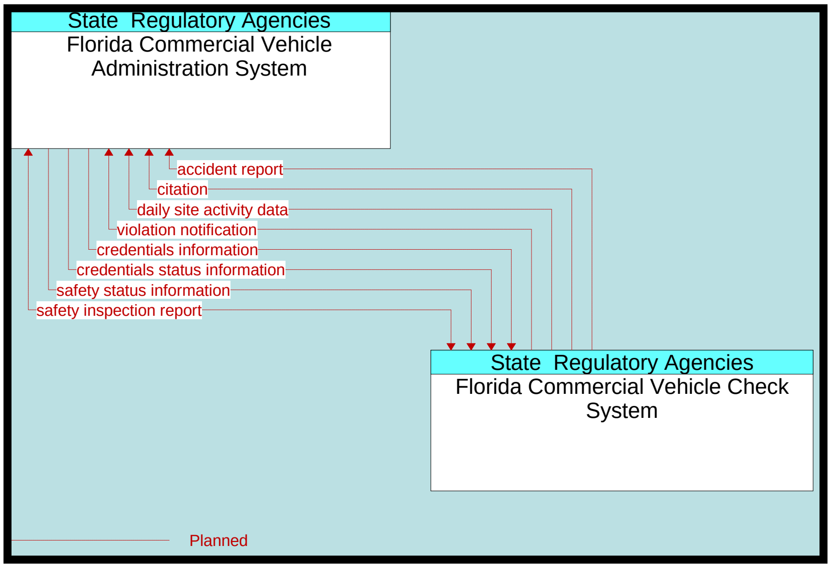
184


State DOT Central Offices
Regional Traffic Databases
traffic archive data
archive requests
archive status
State DOT District Offices
Florida District Traffic Management Center
Planned

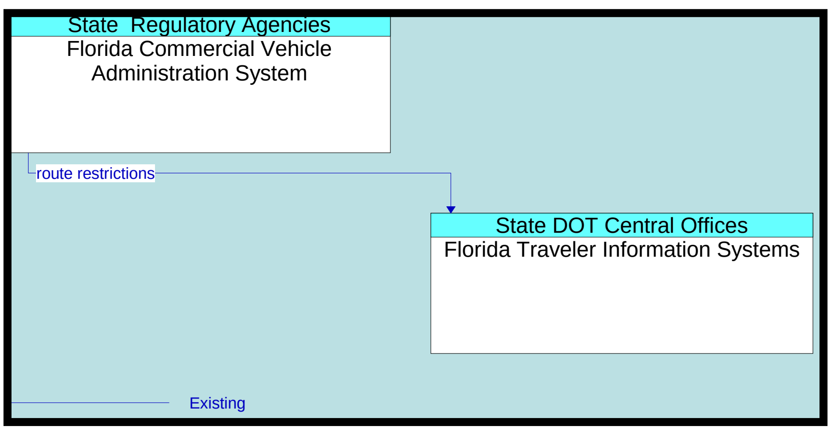
185


State DOT District Offices
Florida District Traffic Management Center
probe data
toll service change response
toll service change request
State Regulatory Agencies
Statewide Toll Administrations
Existing

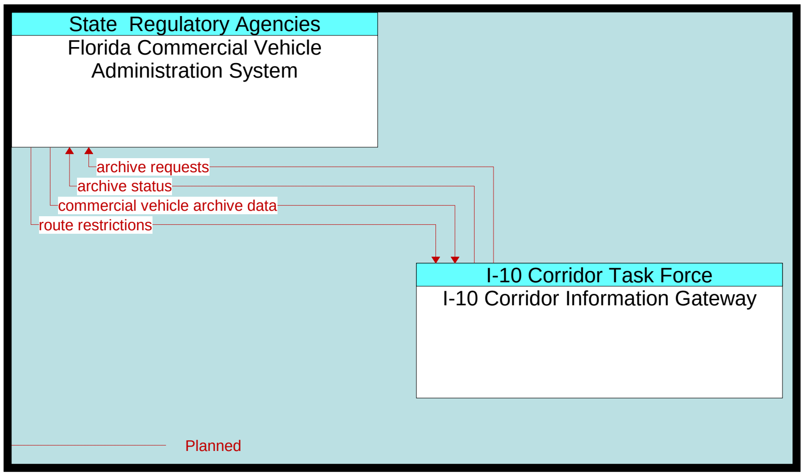
186


State Regulatory Agencies
Florida Commercial Vehicle Administration System
accident report
citation
daily site activity data
violation notification
credentials information
credentials status information
safety status information
safety inspection report
State Regulatory Agencies
Florida Commercial Vehicle Check System
Planned

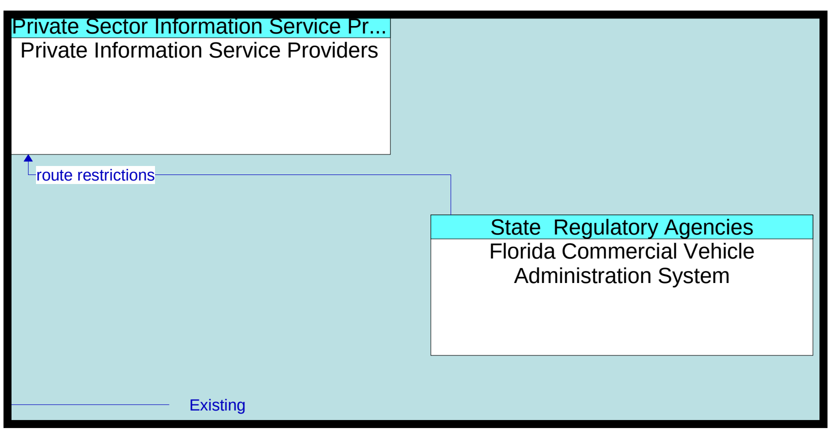
187


State Regulatory Agencies
Florida Commercial Vehicle Administration System
route restrictions
State DOT Central Offices
Florida Traveler Information Systems
Existing

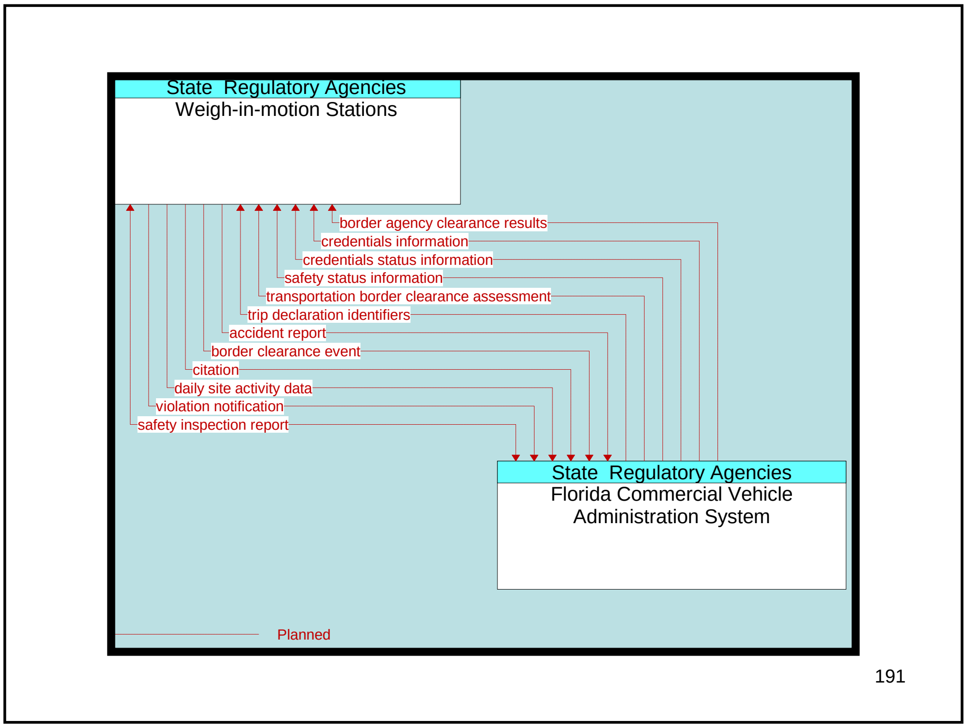
188

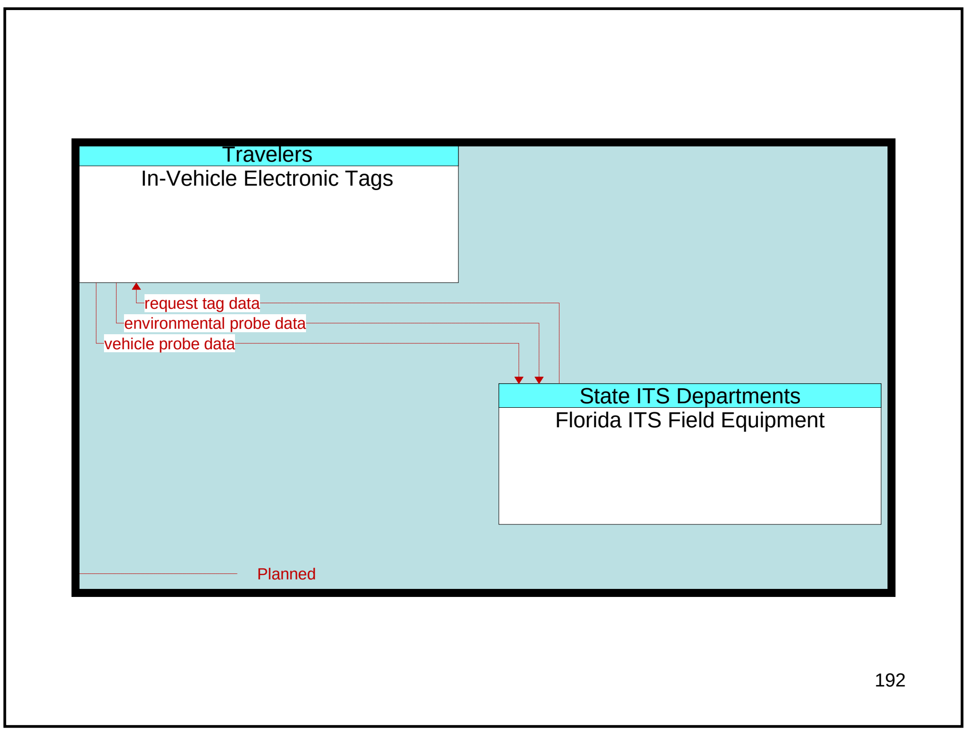

State Regulatory Agencies
Florida Commercial Vehicle Administration System
archive requests
archive status
commercial vehicle archive data
route restrictions
I-10 Corridor Task Force
I-10 Corridor Information Gateway
Planned

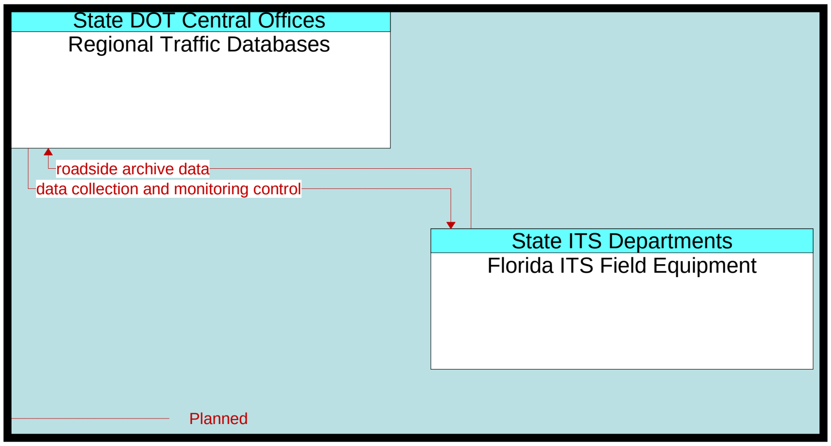
189


Private Sector Information Service Pr...
Private Information Service Providers
route restrictions
State Regulatory Agencies
Florida Commercial Vehicle Administration System
Existing

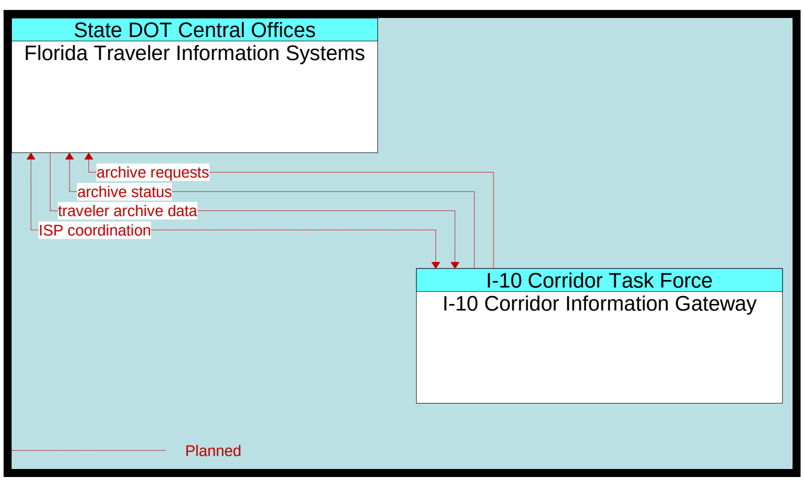
190


State Regulatory Agencies
Weigh-in-motion Stations
border agency clearance results
credentials information
credentials status information
safety status information
transportation border clearance assessment
trip declaration identifiers
accident report
border clearance event
citation
daily site activity data
violation notification
safety inspection report
State Regulatory Agencies
Florida Commercial Vehicle Administration System
Planned
191

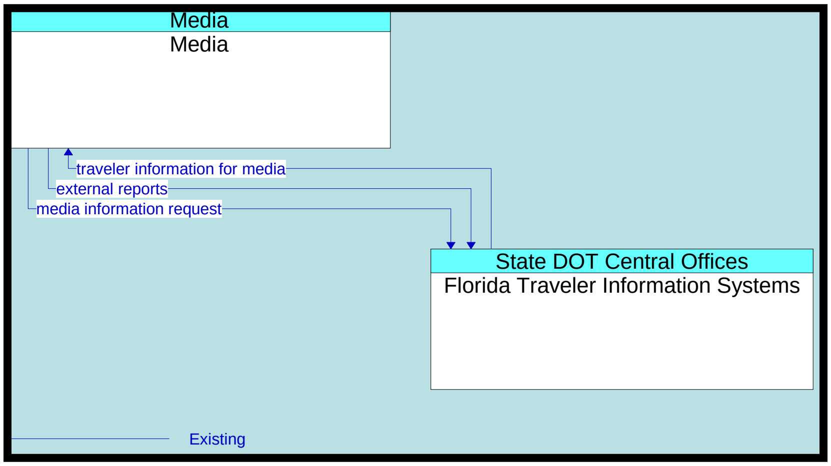

Travelers
In-Vehicle Electronic Tags
request tag data
environmental probe data
vehicle probe data
State ITS Departments
Florida ITS Field Equipment
Planned
192


State DOT Central Offices
Regional Traffic Databases
roadside archive data
data collection and monitoring control
State ITS Departments
Florida ITS Field Equipment
Planned

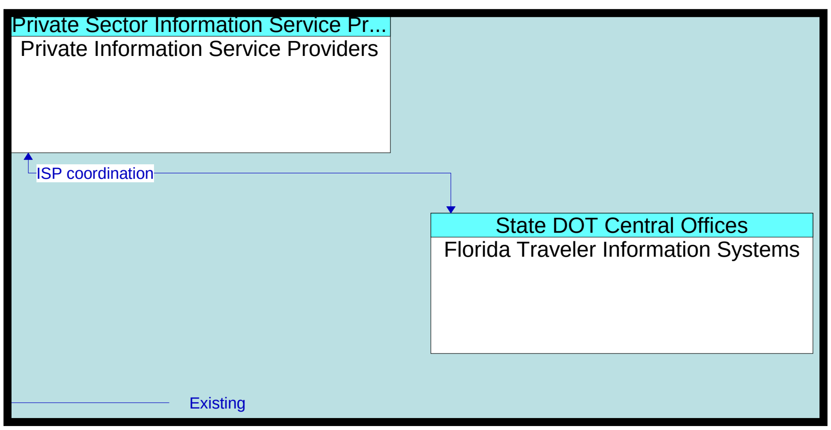
193


State DOT Central Offices
Florida Traveler Information Systems
archive requests
archive status
traveler archive data
ISP coordination
I-10 Corridor Task Force
I-10 Corridor Information Gateway
Planned

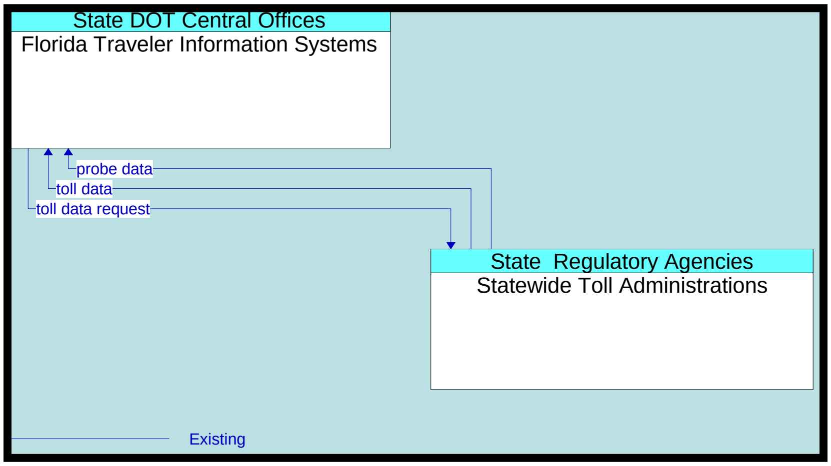
194


Media
Media
traveler information for media
external reports
media information request
State DOT Central Offices
Florida Traveler Information Systems
Existing

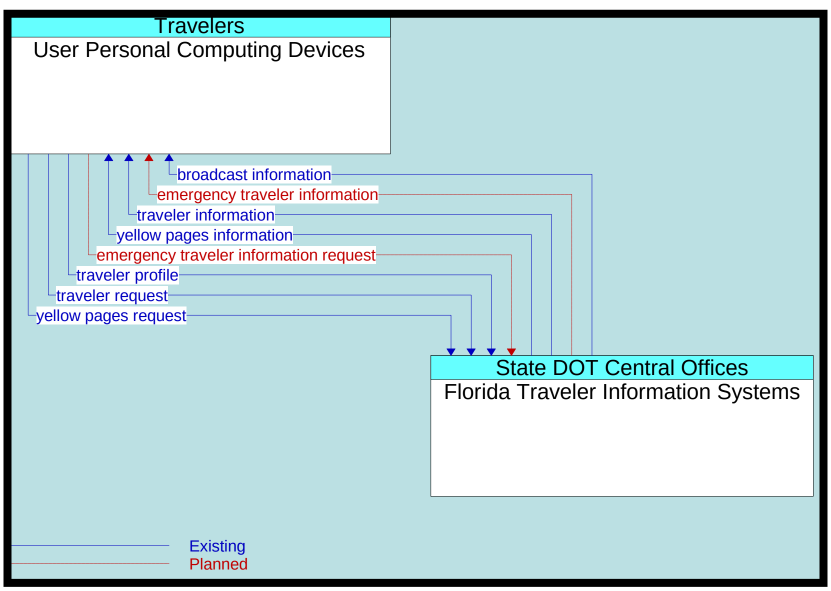
195


Private Sector Information Service Pr...
Private Information Service Providers
ISP coordination
State DOT Central Offices
Florida Traveler Information Systems
Existing

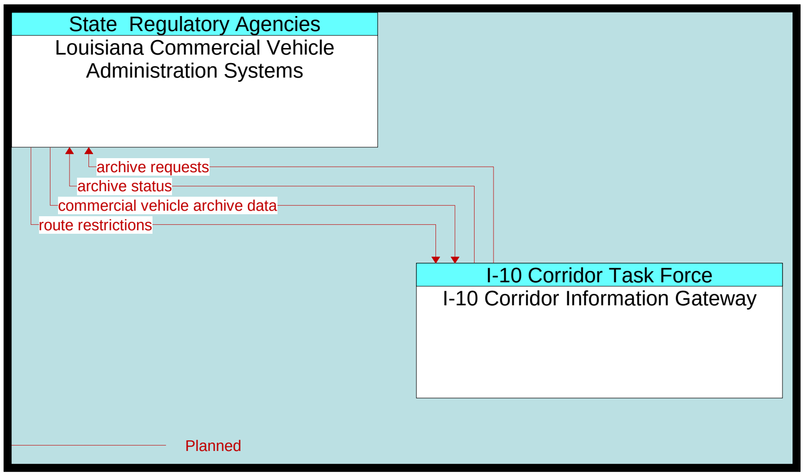
196


State DOT Central Offices
Florida Traveler Information Systems
probe data
toll data
toll data request
State Regulatory Agencies
Statewide Toll Administrations
Existing

197

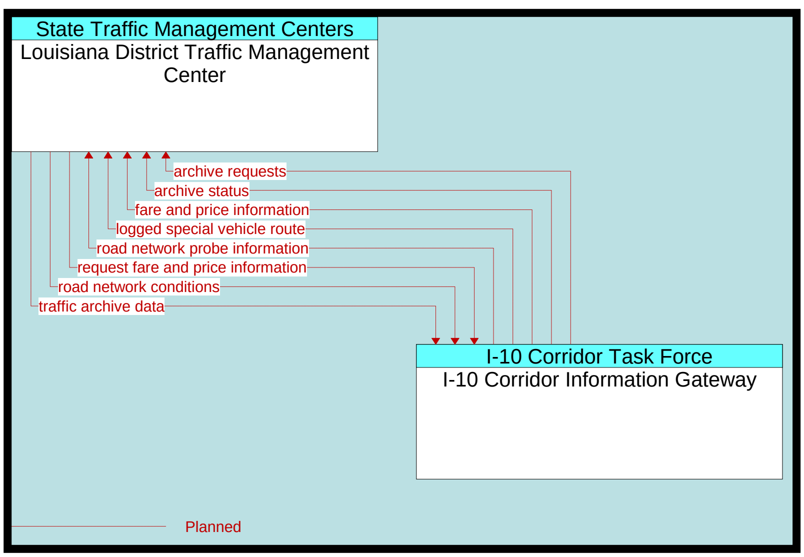

Travelers
User Personal Computing Devices
broadcast information
emergency traveler information
traveler information
yellow pages information
emergency traveler information request
traveler profile
traveler request
yellow pages request
State DOT Central Offices
Florida Traveler Information Systems
Existing
Planned

198



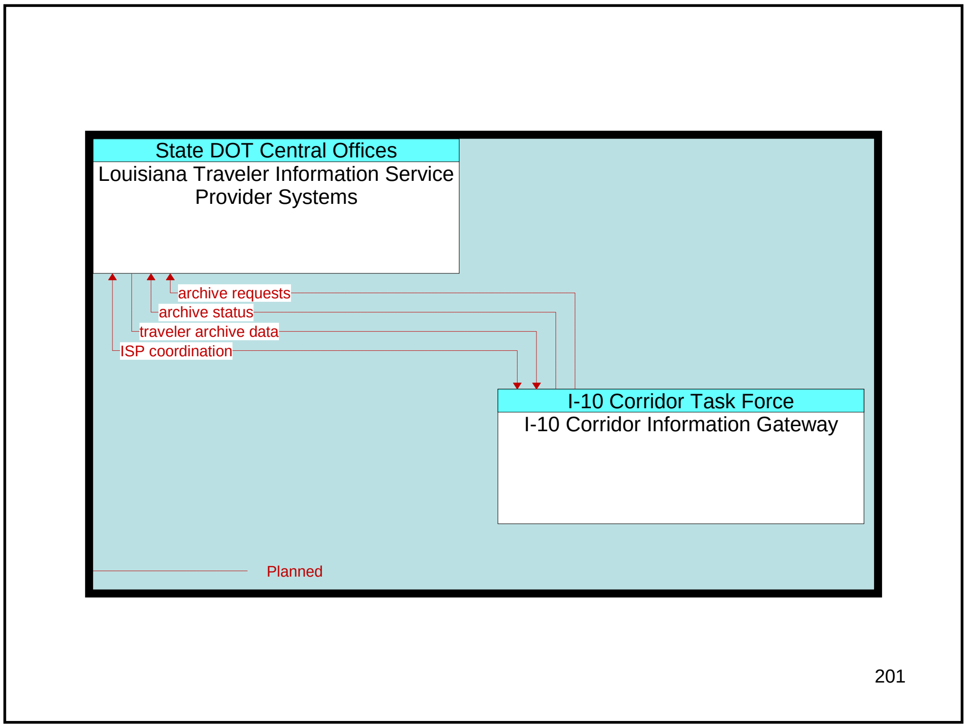
State Regulatory Agencies
Louisiana Commercial Vehicle Administration Systems
archive requests
archive status
commercial vehicle archive data
route restrictions
I-10 Corridor Task Force
I-10 Corridor Information Gateway
Planned

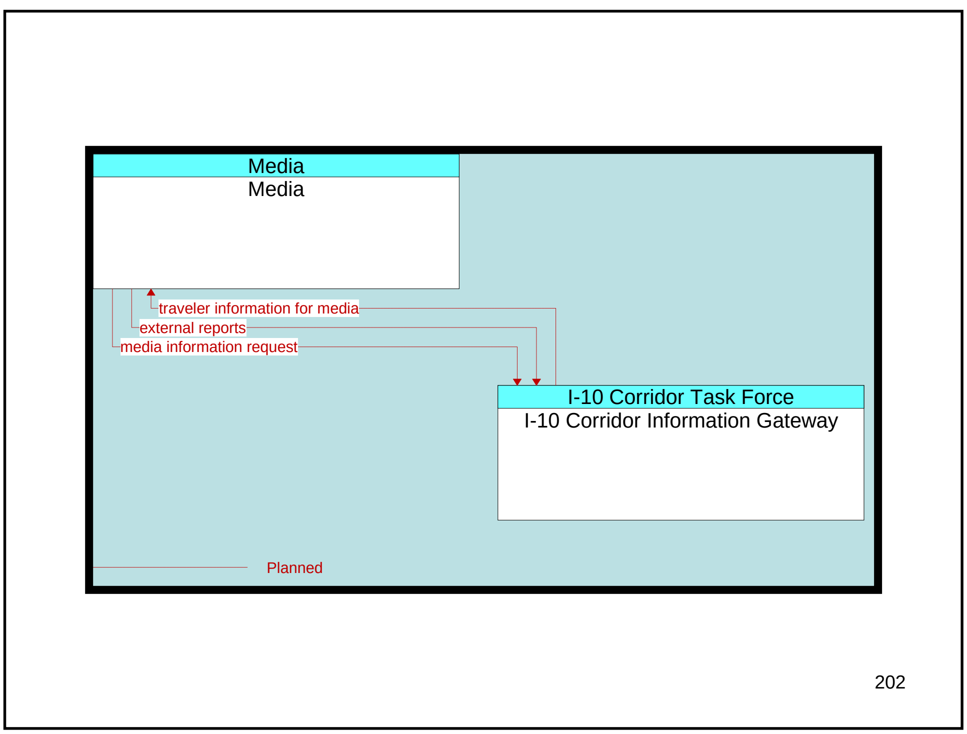
199

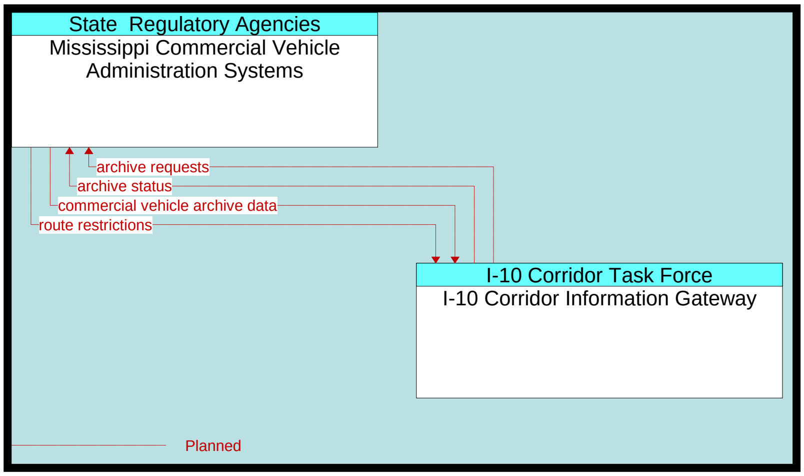


State Traffic Management Centers
Louisiana District Traffic Management Center
archive requests
archive status
fare and price information
logged special vehicle route
road network probe information
request fare and price information
road network conditions
traffic archive data
I-10 Corridor Task Force
I-10 Corridor Information Gateway
Planned

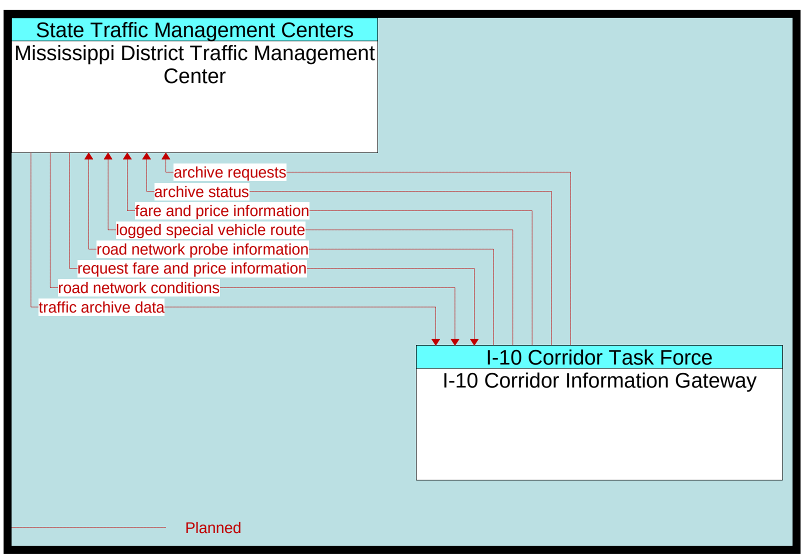
200


State DOT Central Offices
Louisiana Traveler Information Service Provider Systems
archive requests
archive status
traveler archive data
ISP coordination
I-10 Corridor Task Force
I-10 Corridor Information Gateway
Planned
201

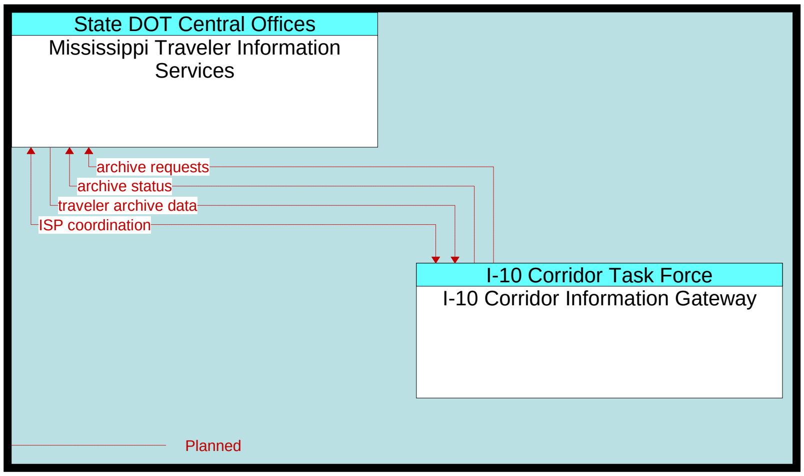

Media
Media
traveler information for media
external reports
media information request
I-10 Corridor Task Force
I-10 Corridor Information Gateway
Planned
202


State Regulatory Agencies
Mississippi Commercial Vehicle Administration Systems
archive requests
archive status
commercial vehicle archive data
route restrictions
I-10 Corridor Task Force
I-10 Corridor Information Gateway
Planned

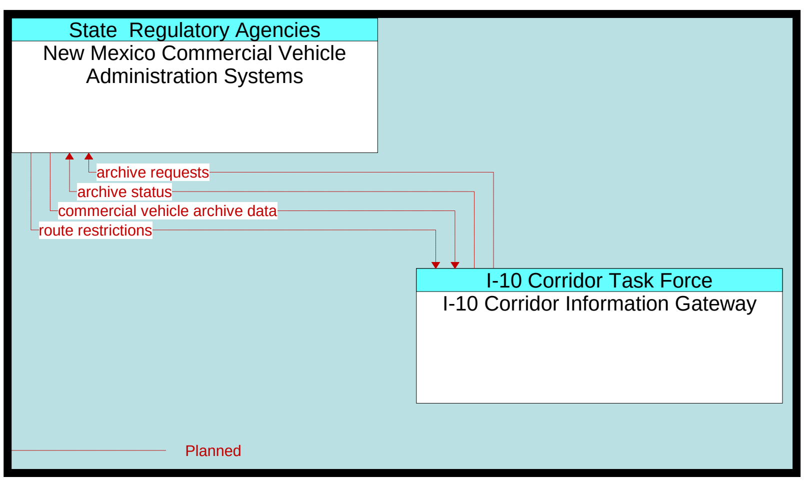
203


State Traffic Management Centers
Mississippi District Traffic Management Center
archive requests
archive status
fare and price information
logged special vehicle route
road network probe information
request fare and price information
road network conditions
traffic archive data
I-10 Corridor Task Force
I-10 Corridor Information Gateway
Planned

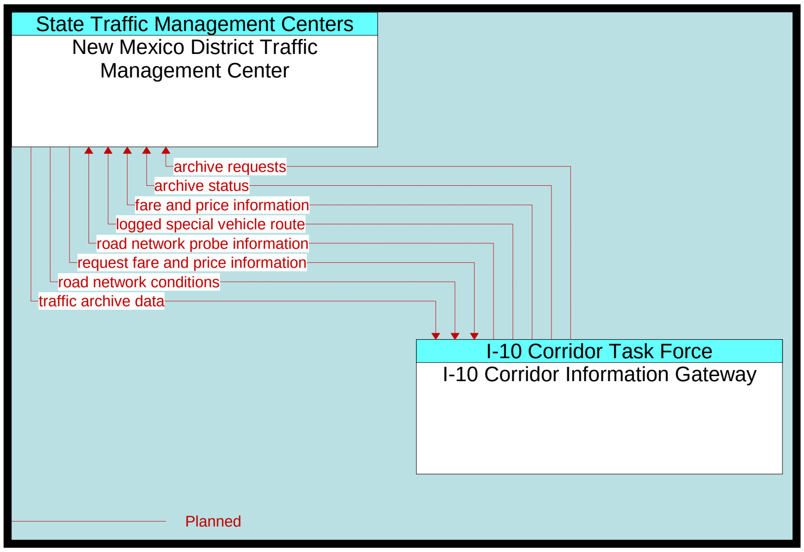
204


State DOT Central Offices
Mississippi Traveler Information Services
archive requests
archive status
traveler archive data
ISP coordination
I-10 Corridor Task Force
I-10 Corridor Information Gateway
Planned

205

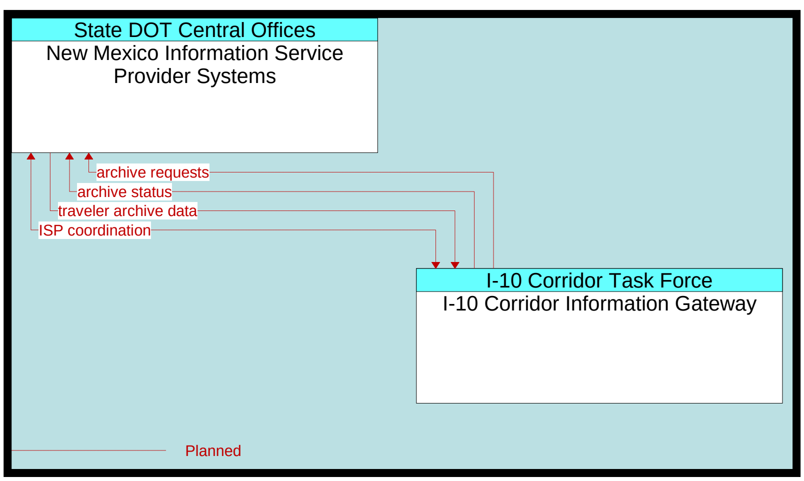

State Regulatory Agencies
New Mexico Commercial Vehicle Administration Systems
archive requests
archive status
commercial vehicle archive data
route restrictions
I-10 Corridor Task Force
I-10 Corridor Information Gateway
Planned

206



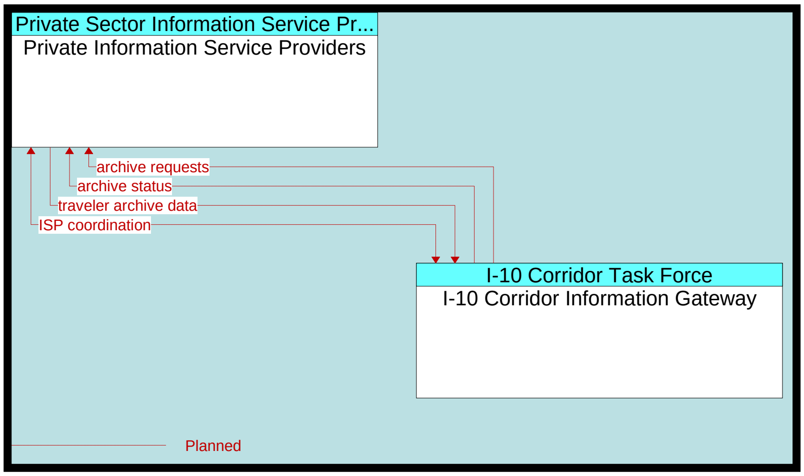
State Traffic Management Centers
New Mexico District Traffic Management Center
archive requests
archive status
fare and price information
logged special vehicle route
road network probe information
request fare and price information
road network conditions
traffic archive data
I-10 Corridor Task Force
I-10 Corridor Information Gateway
Planned

207



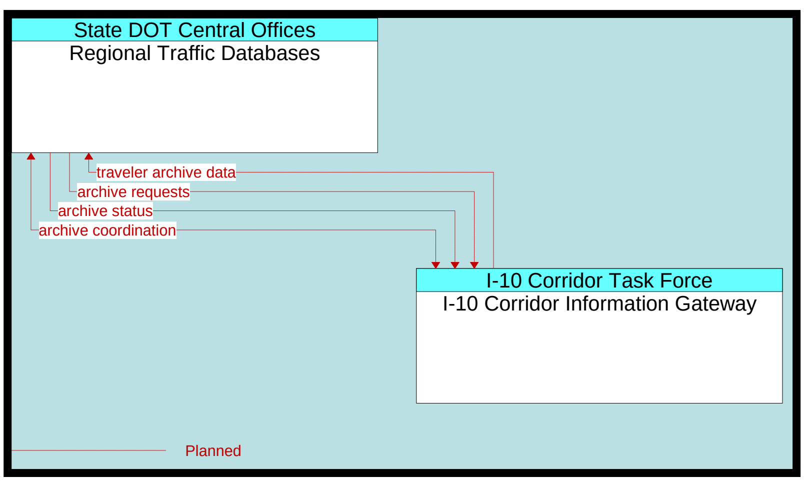
State DOT Central Offices
New Mexico Information Service Provider Systems
archive requests
archive status
traveler archive data
ISP coordination
I-10 Corridor Task Force
I-10 Corridor Information Gateway
Planned

208



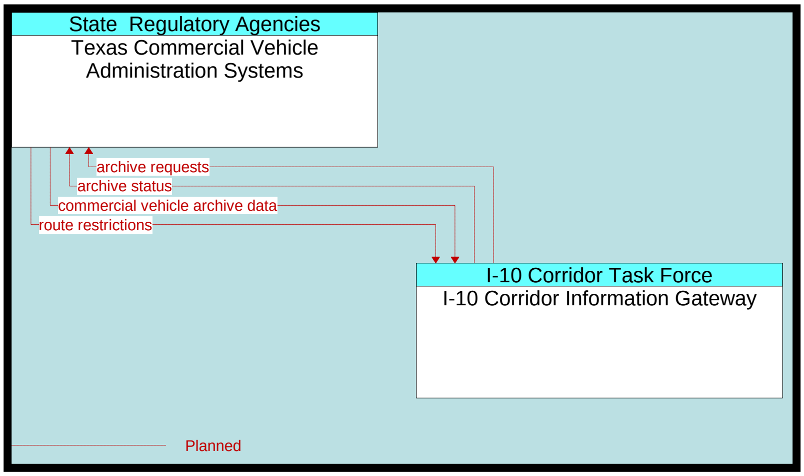
Private Sector Information Service Pr...
Private Information Service Providers
archive requests
archive status
traveler archive data
ISP coordination
I-10 Corridor Task Force
I-10 Corridor Information Gateway
Planned

209

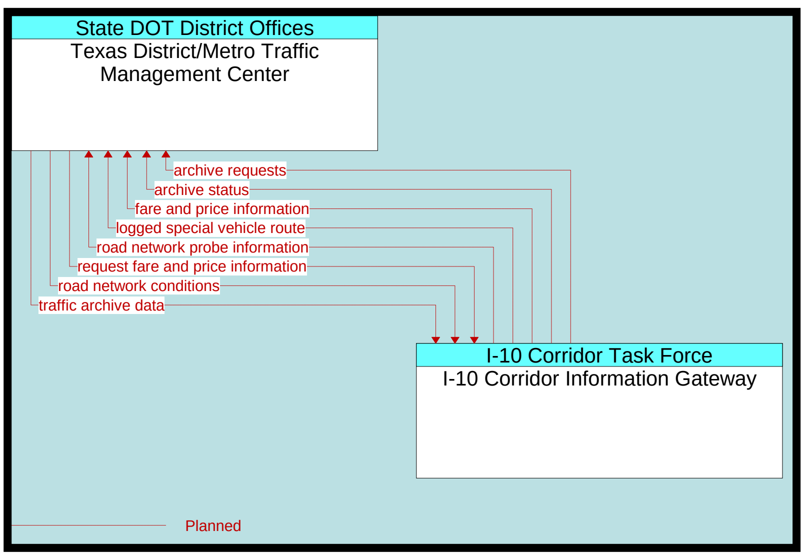


State DOT Central Offices
Regional Traffic Databases
traveler archive data
archive requests
archive status
archive coordination
I-10 Corridor Task Force
I-10 Corridor Information Gateway
Planned

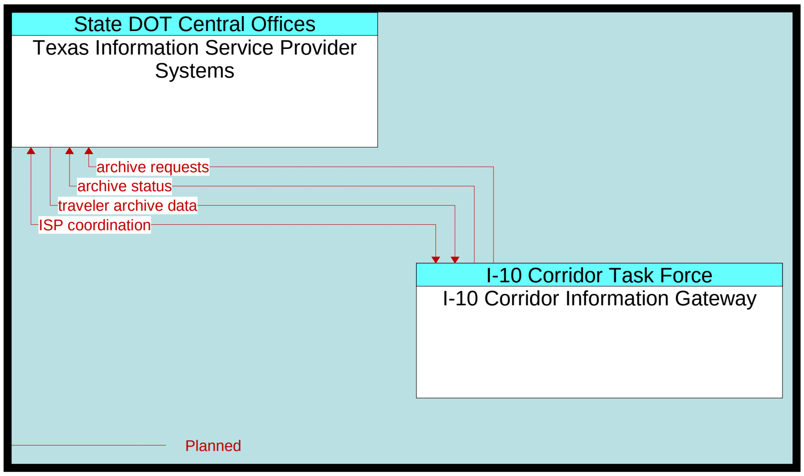
210


State Regulatory Agencies
Texas Commercial Vehicle Administration Systems
archive requests
archive status
commercial vehicle archive data
route restrictions
I-10 Corridor Task Force
I-10 Corridor Information Gateway
Planned

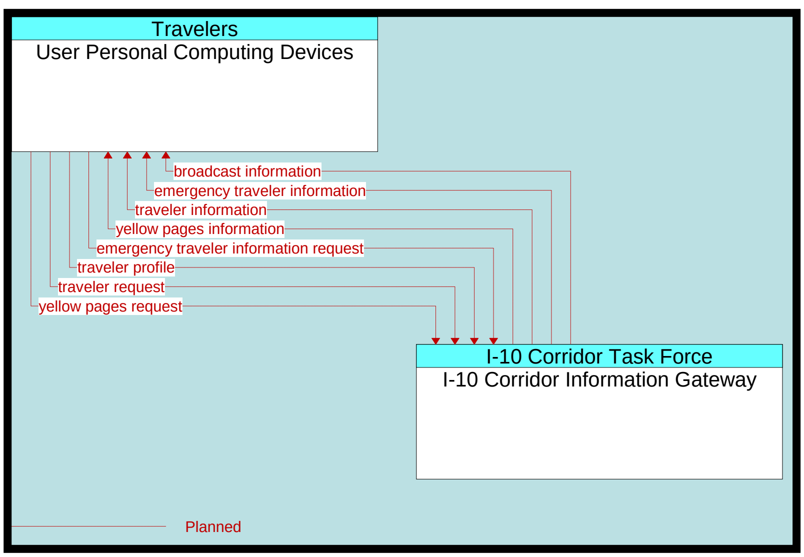
211


State DOT District Offices
Texas District/Metro Traffic Management Center
archive requests
archive status
fare and price information
logged special vehicle route
road network probe information
request fare and price information
road network conditions
traffic archive data
I-10 Corridor Task Force
I-10 Corridor Information Gateway
Planned

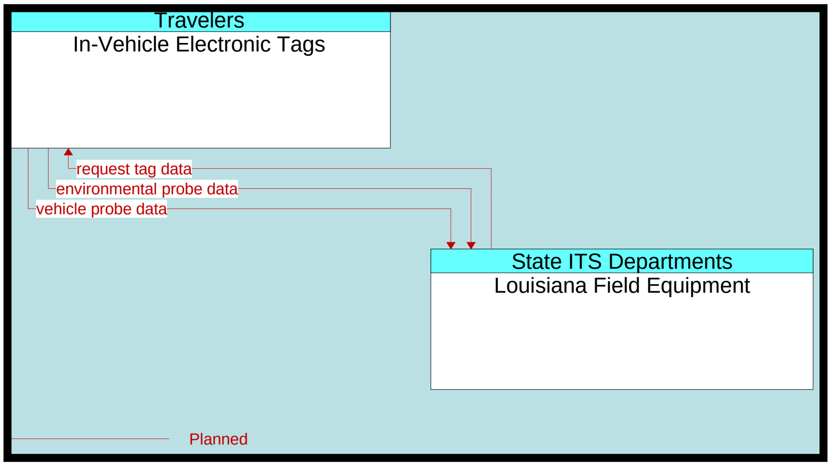
212


State DOT Central Offices
Texas Information Service Provider Systems
archive requests
archive status
traveler archive data
ISP coordination
I-10 Corridor Task Force
I-10 Corridor Information Gateway
Planned

213

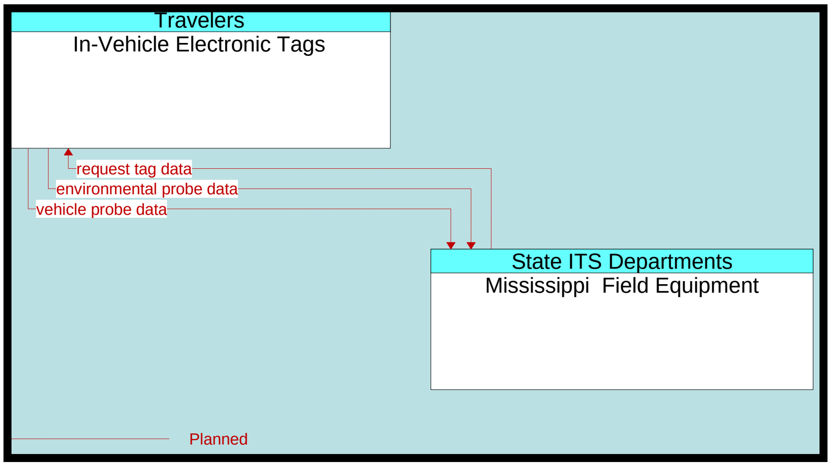

Travelers
User Personal Computing Devices
broadcast information
emergency traveler information
traveler information
yellow pages information
emergency traveler information request
traveler profile
traveler request
yellow pages request
I-10 Corridor Task Force
I-10 Corridor Information Gateway
Planned

214



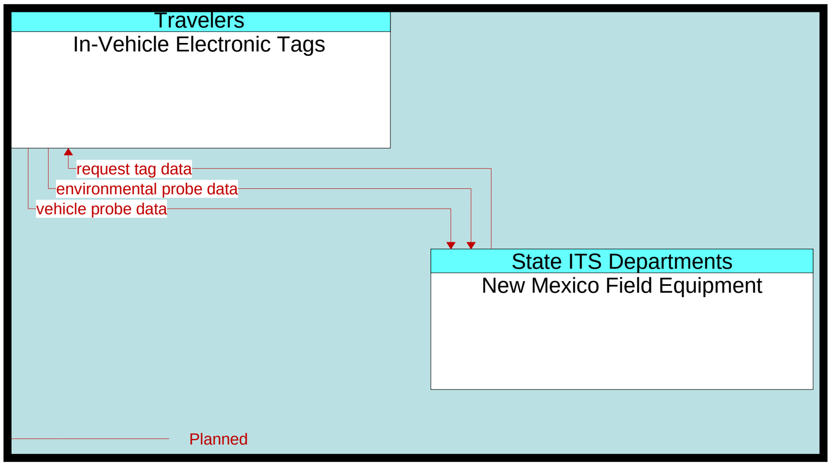
Travelers
In-Vehicle Electronic Tags
request tag data
environmental probe data
vehicle probe data
State ITS Departments
Louisiana Field Equipment
Planned

215

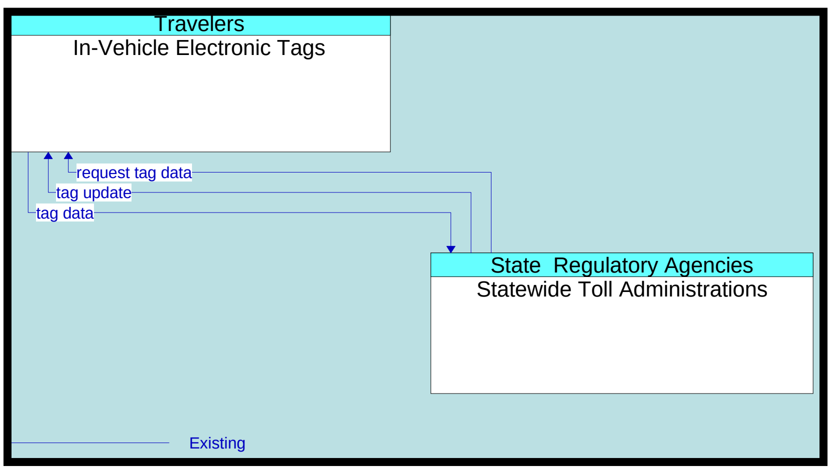


Travelers
In-Vehicle Electronic Tags
request tag data
environmental probe data
vehicle probe data
State ITS Departments
Mississippi Field Equipment
Planned

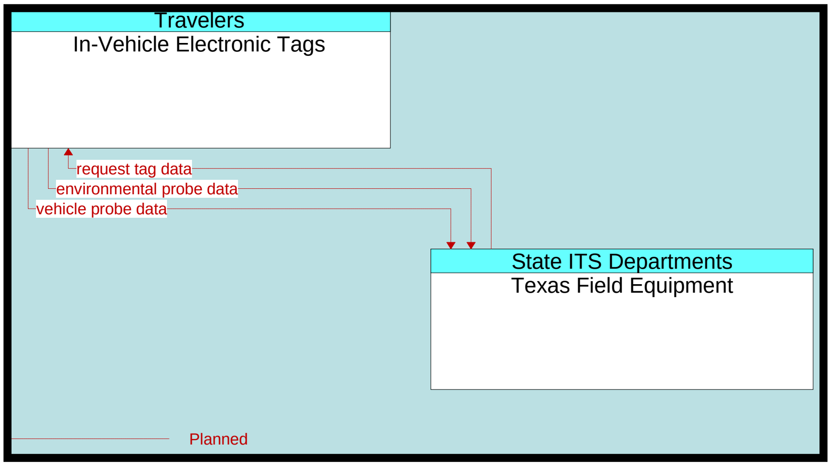
216


Travelers
In-Vehicle Electronic Tags
request tag data
environmental probe data
vehicle probe data
State ITS Departments
New Mexico Field Equipment
Planned

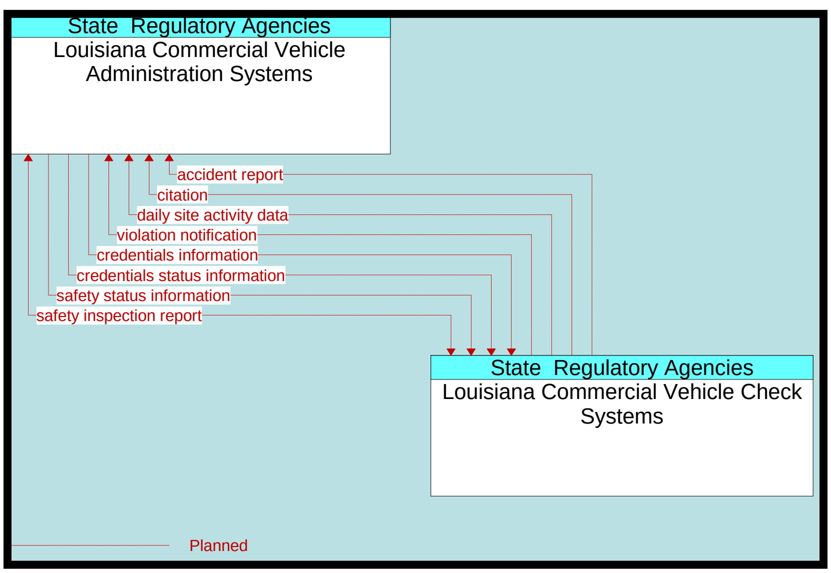
217


Travelers
In-Vehicle Electronic Tags
request tag data
tag update
tag data
State Regulatory Agencies
Statewide Toll Administrations
Existing

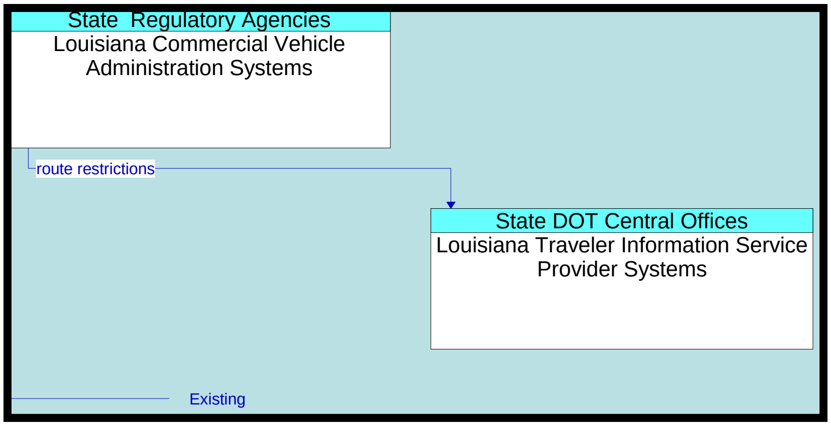
218


Travelers
In-Vehicle Electronic Tags
request tag data
environmental probe data
vehicle probe data
State ITS Departments
Texas Field Equipment
Planned

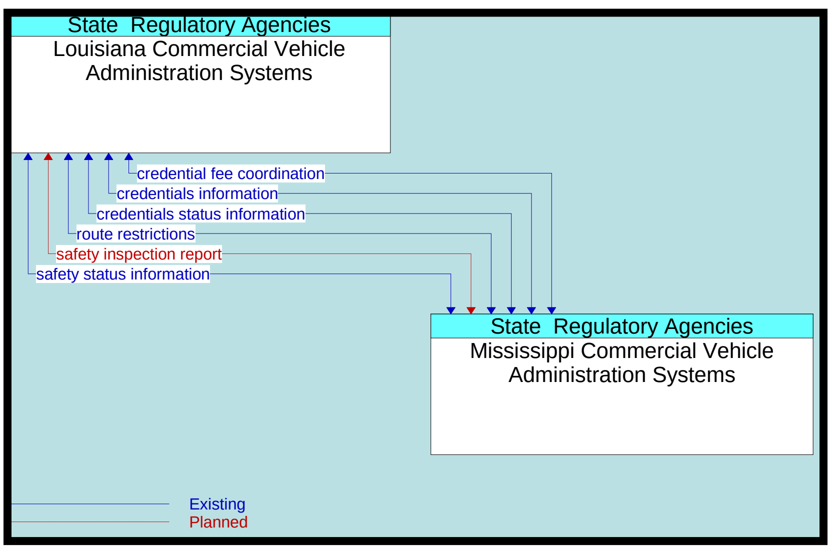
219


State Regulatory Agencies
Louisiana Commercial Vehicle Administration Systems
accident report
citation
daily site activity data
violation notification
credentials information
credentials status information
safety status information
safety inspection report
State Regulatory Agencies
Louisiana Commercial Vehicle Check Systems
Planned

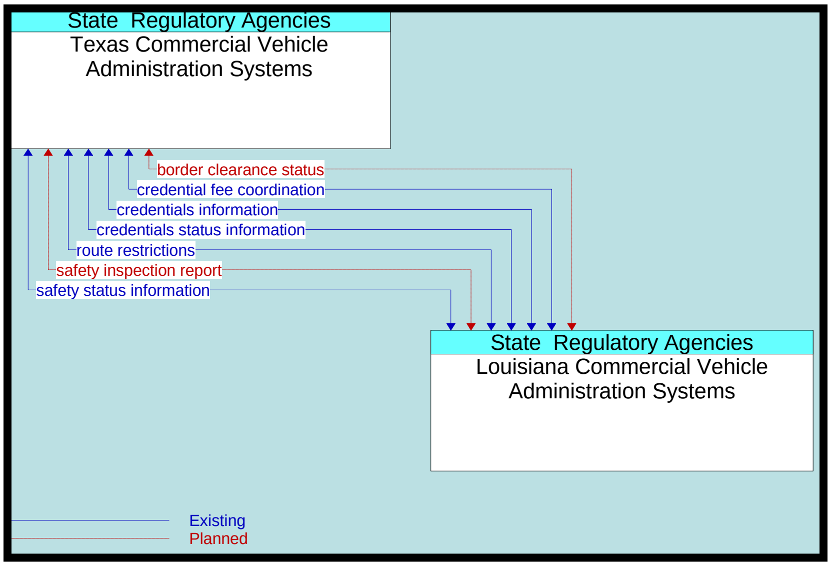
220


State Regulatory Agencies
Louisiana Commercial Vehicle Administration Systems
route restrictions
State DOT Central Offices
Louisiana Traveler Information Service Provider Systems
Existing

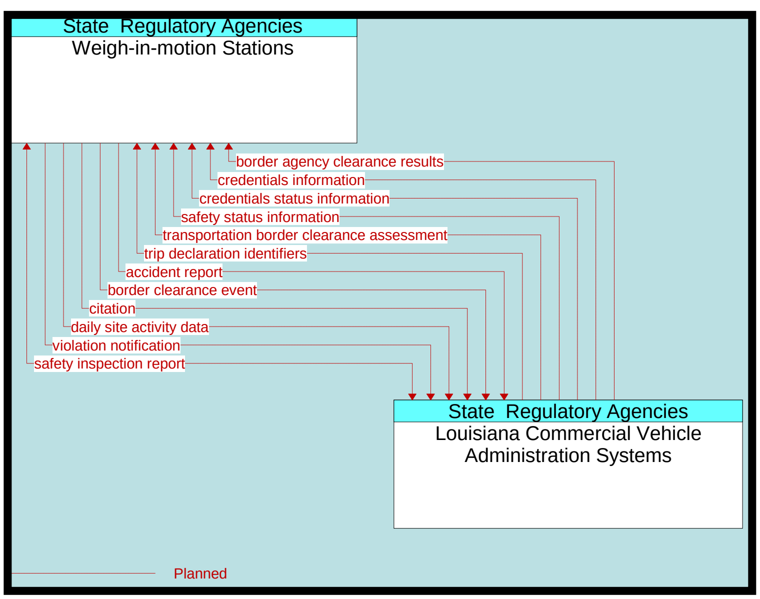
221


State Regulatory Agencies
Louisiana Commercial Vehicle Administration Systems
credential fee coordination
credentials information
credentials status information
route restrictions
safety inspection report
safety status information
State Regulatory Agencies
Mississippi Commercial Vehicle Administration Systems
Existing
Planned

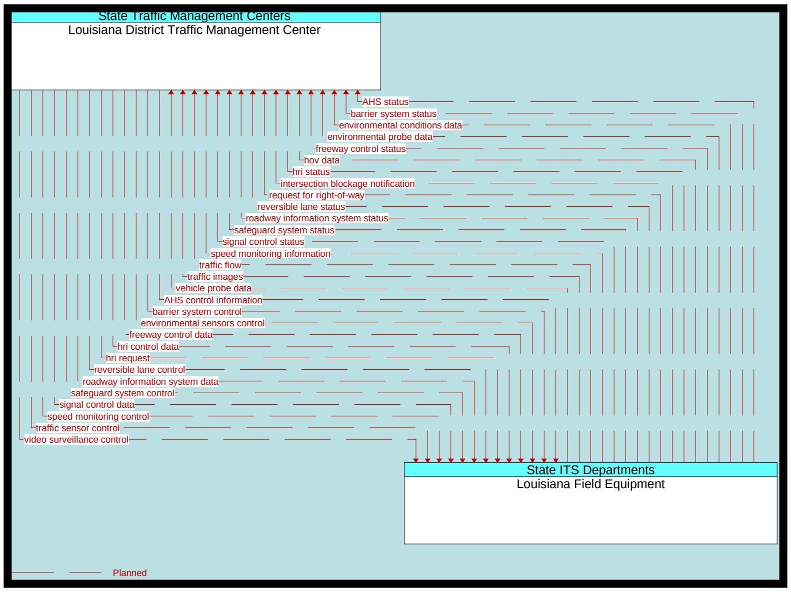
222


State Regulatory Agencies
Texas Commercial Vehicle Administration Systems
border clearance status
credential fee coordination
credentials information
credentials status information
route restrictions
safety inspection report
safety status information
State Regulatory Agencies
Louisiana Commercial Vehicle Administration Systems
Existing
Planned

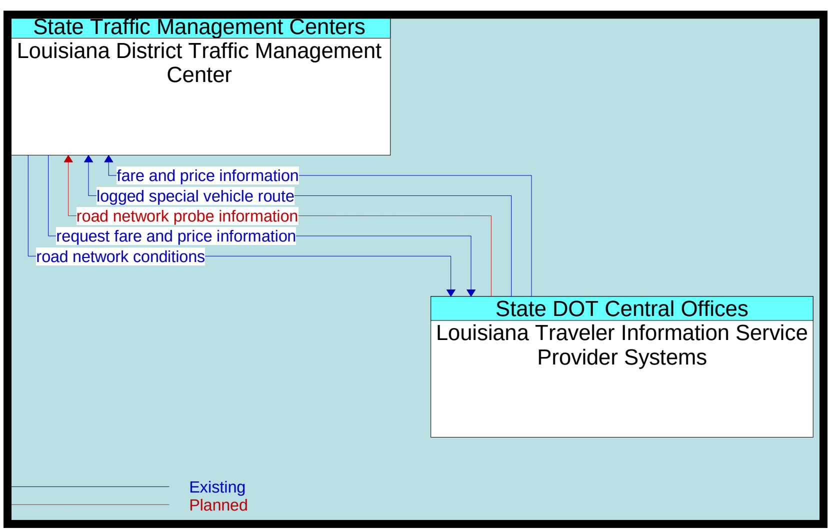
223


State Regulatory Agencies
Weigh-in-motion Stations
border agency clearance results
credentials information
credentials status information
safety status information
transportation border clearance assessment
trip declaration identifiers
accident report
border clearance event
citation
daily site activity data
violation notification
safety inspection report
State Regulatory Agencies
Louisiana Commercial Vehicle Administration Systems
Planned

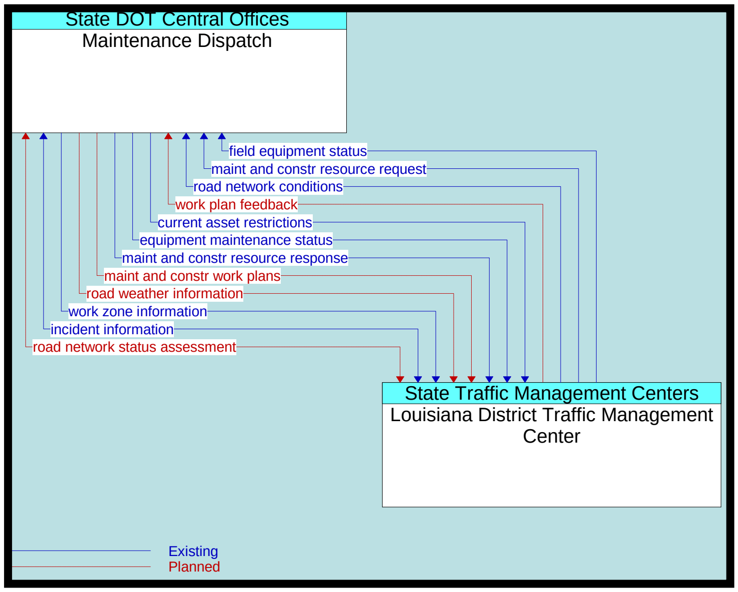
224


State Traffic Management Centers
Louisiana District Traffic Management Center
AHS status
barrier system status
environmental conditions data
environmental probe data
freeway control status
hov data
hri status
intersection blockage notification
request for right-of-way
reversible lane status
roadway information system status
safeguard system status
signal control status
speed monitoring information
traffic flow
traffic images
vehicle probe data
AHS control information
barrier system control
environmental sensors control
freeway control data
hri control data
hri request
reversible lane control
roadway information system data
safeguard system control
signal control data
speed monitoring control
traffic sensor control
video surveillance control
State ITS Departments
Louisiana Field Equipment
Planned

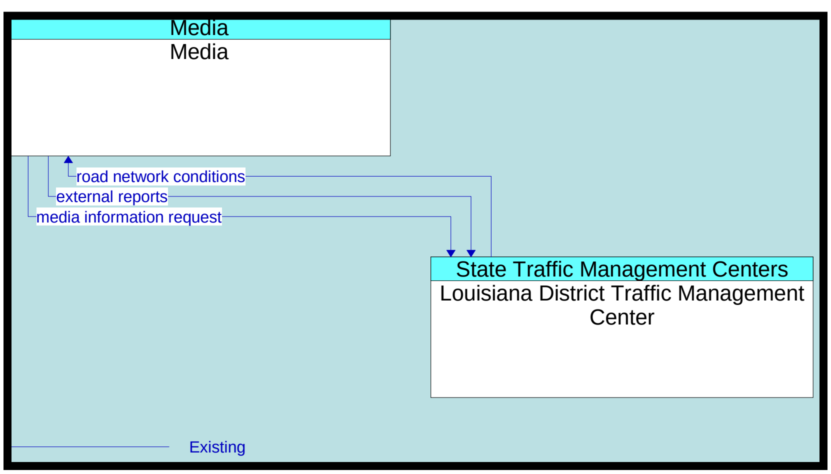
225


State Traffic Management Centers
Louisiana District Traffic Management Center
fare and price information
logged special vehicle route
road network probe information
request fare and price information
road network conditions
State DOT Central Offices
Louisiana Traveler Information Service Provider Systems
Existing
Planned

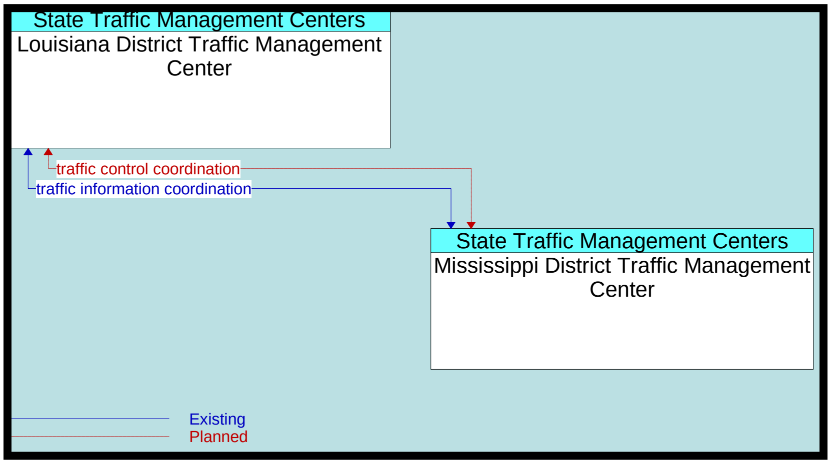
226


State DOT Central Offices
Maintenance Dispatch
field equipment status
maint and constr resource request
road network conditions
work plan feedback
current asset restrictions
equipment maintenance status
maint and constr resource response
maint and constr work plans
road weather information
work zone information
incident information
road network status assessment
State Traffic Management Centers
Louisiana District Traffic Management Center
Existing
Planned

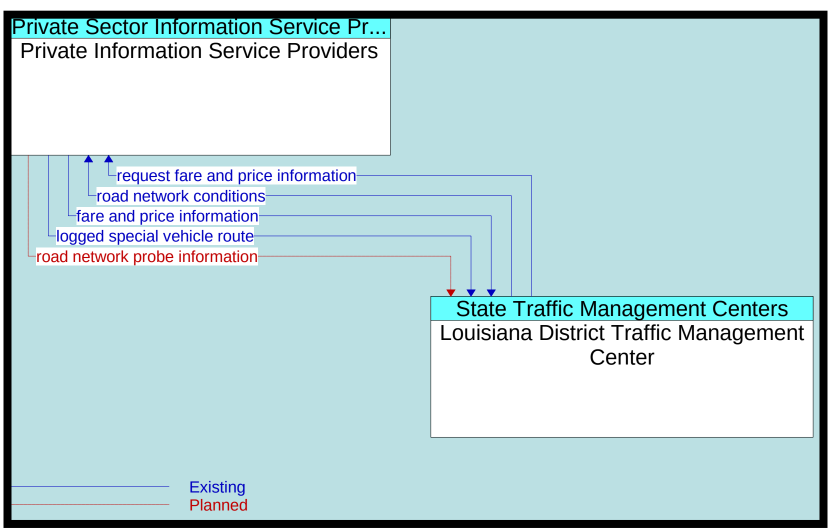
227


Media
Media
road network conditions
external reports
media information request
State Traffic Management Centers
Louisiana District Traffic Management Center
Existing

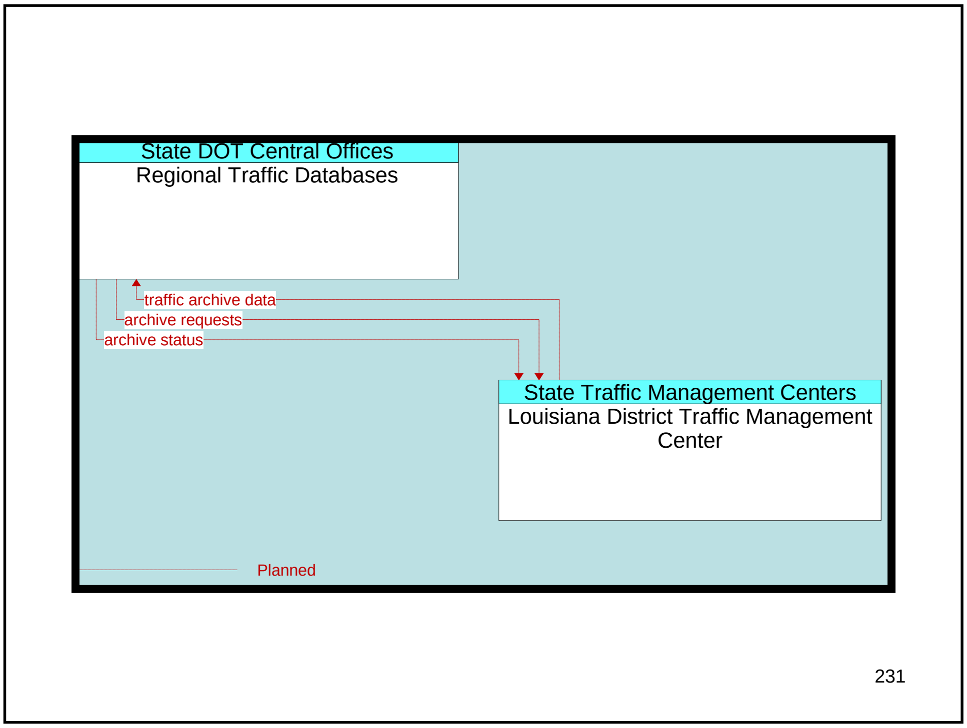
228

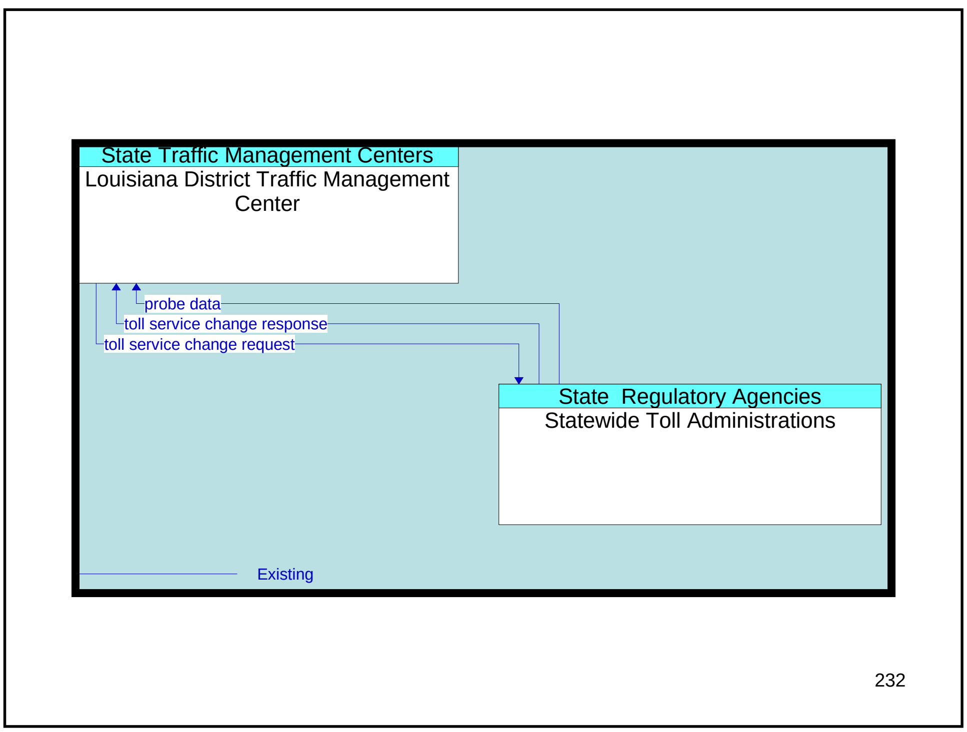

State Traffic Management Centers
Louisiana District Traffic Management Center
traffic control coordination
traffic information coordination
State Traffic Management Centers
Mississippi District Traffic Management Center
Existing
Planned

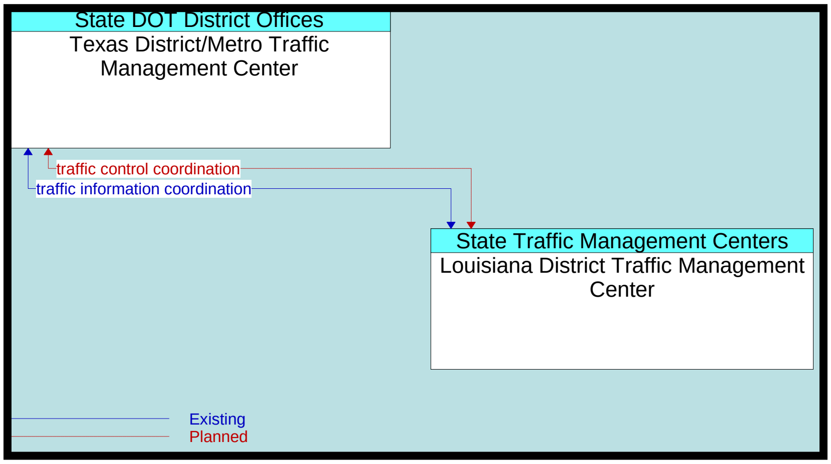
229


Private Sector Information Service Pr...
Private Information Service Providers
request fare and price information
road network conditions
fare and price information
logged special vehicle route
road network probe information
State Traffic Management Centers
Louisiana District Traffic Management Center
Existing
Planned

230

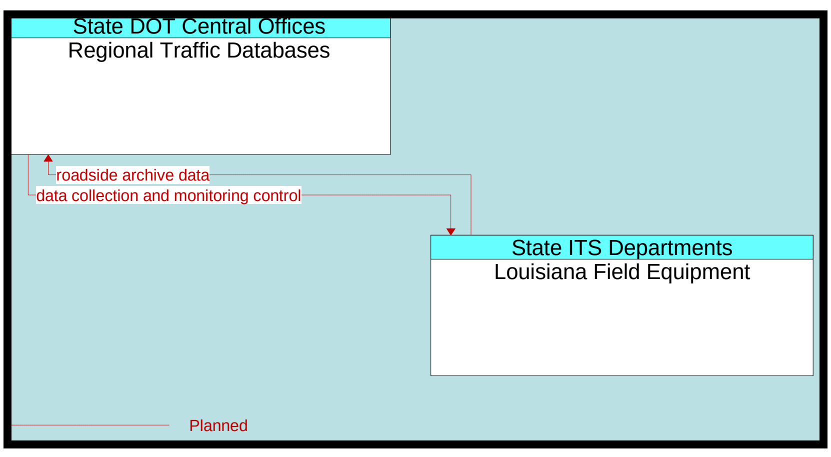

State DOT Central Offices
Regional Traffic Databases
traffic archive data
archive requests
archive status
State Traffic Management Centers
Louisiana District Traffic Management Center
Planned
231


State Traffic Management Centers
Louisiana District Traffic Management Center
probe data
toll service change response
toll service change request
State Regulatory Agencies
Statewide Toll Administrations
Existing
232



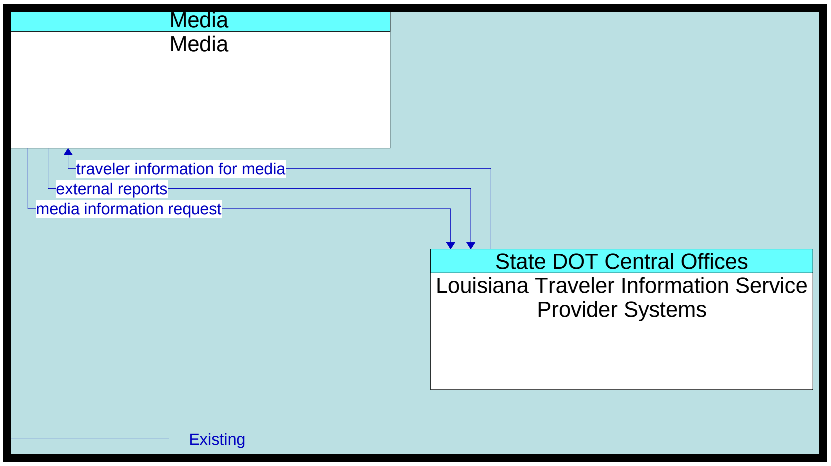
State DOT District Offices
Texas District/Metro Traffic Management Center
traffic control coordination
traffic information coordination
State Traffic Management Centers
Louisiana District Traffic Management Center
Existing
Planned

233

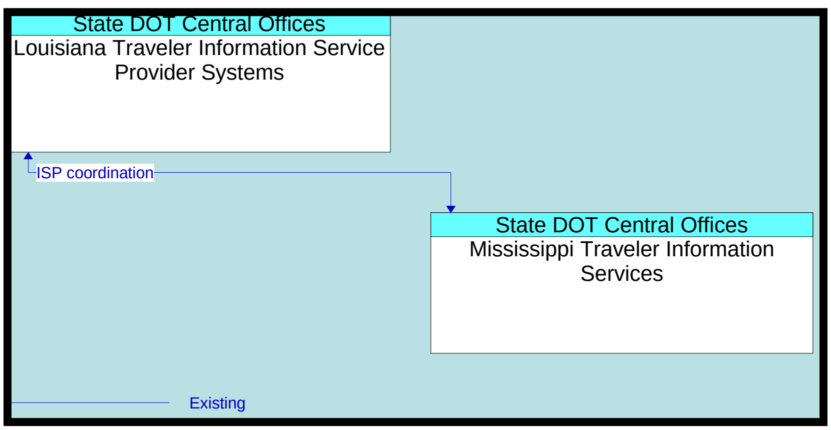


State DOT Central Offices
Regional Traffic Databases
roadside archive data
data collection and monitoring control
State ITS Departments
Louisiana Field Equipment
Planned

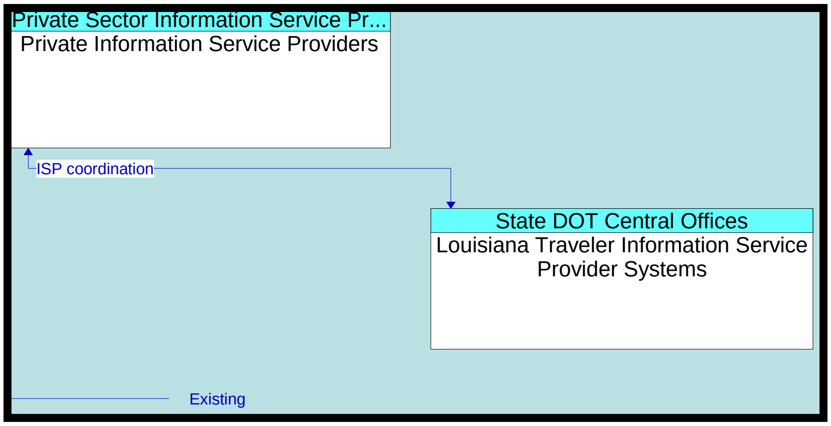
234


Media
Media
traveler information for media
external reports
media information request
State DOT Central Offices
Louisiana Traveler Information Service Provider Systems
Existing

235

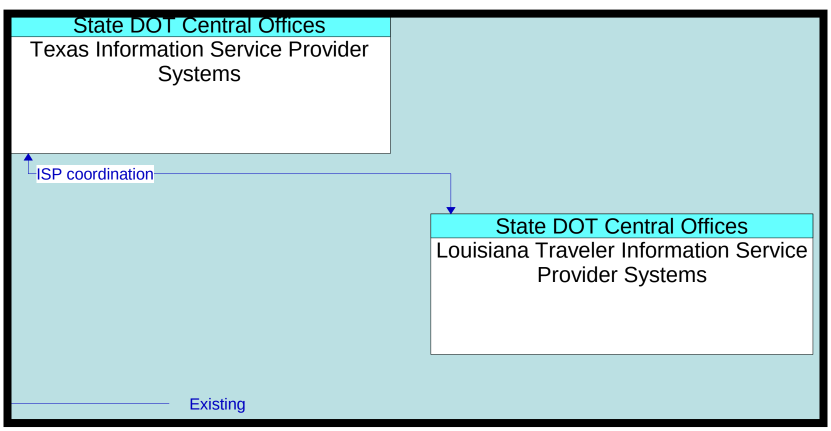

State DOT Central Offices
Louisiana Traveler Information Service Provider Systems
ISP coordination
State DOT Central Offices
Mississippi Traveler Information Services
Existing

236



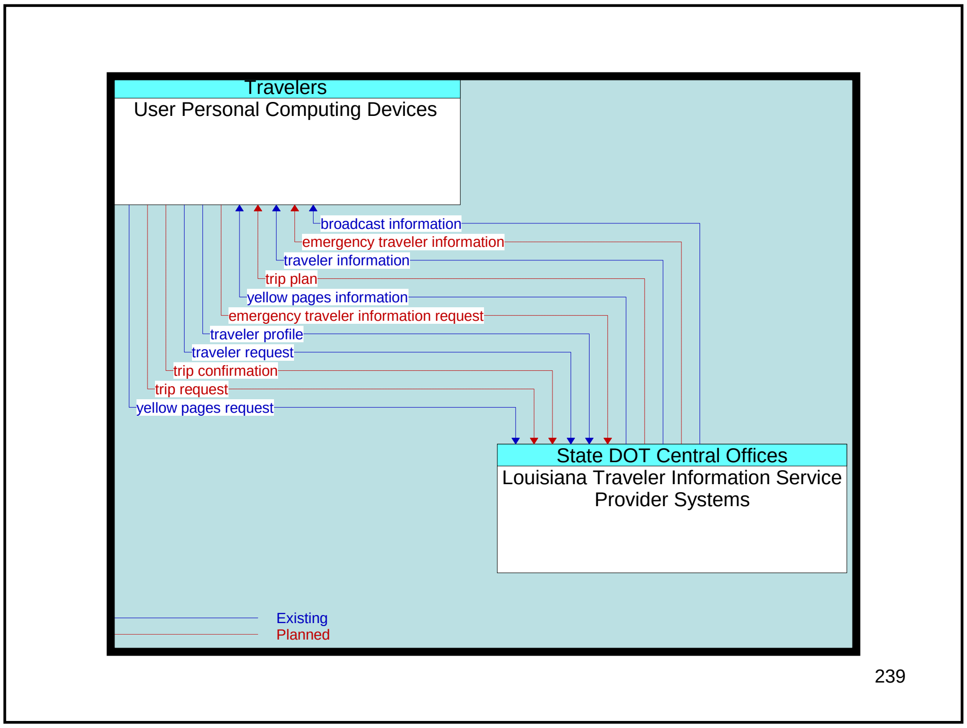
Private Sector Information Service Pr...
Private Information Service Providers
ISP coordination
State DOT Central Offices
Louisiana Traveler Information Service Provider Systems
Existing

237

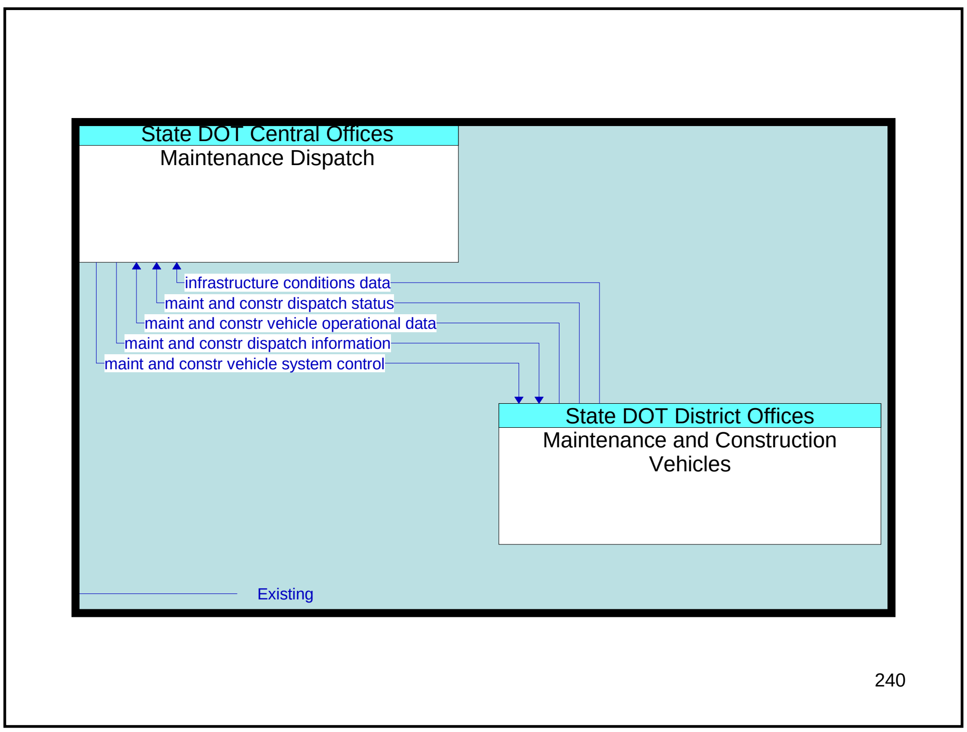


State DOT Central Offices
Texas Information Service Provider Systems
ISP coordination
State DOT Central Offices
Louisiana Traveler Information Service Provider Systems
Existing

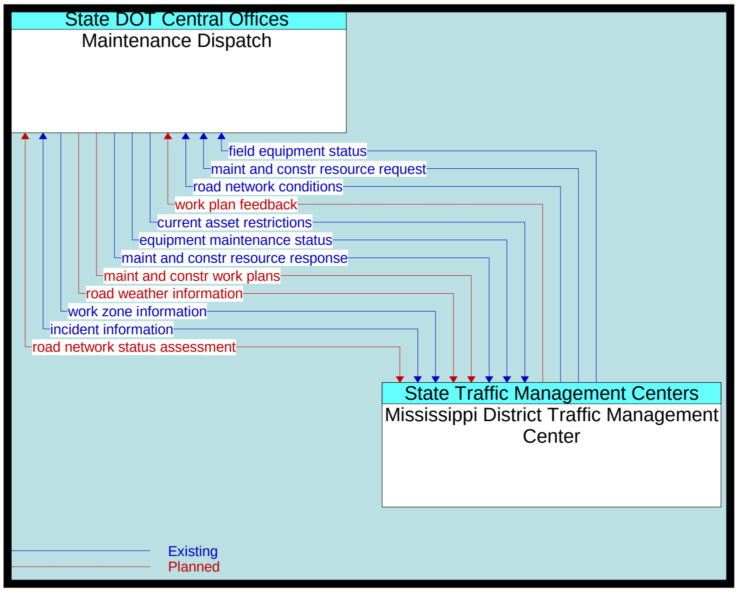
238



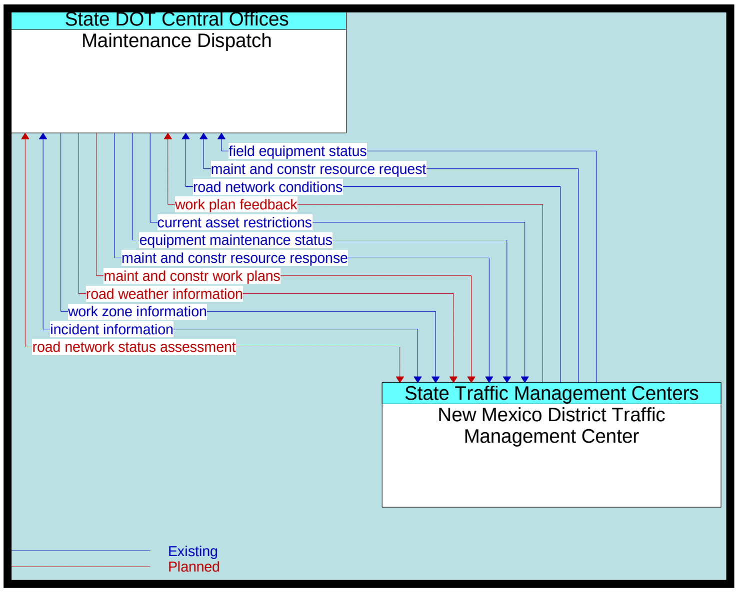
Travelers
User Personal Computing Devices
broadcast information
emergency traveler information
traveler information
trip plan
yellow pages information
emergency traveler information request
traveler profile
traveler request
trip confirmation
trip request
yellow pages request
State DOT Central Offices
Louisiana Traveler Information Service Provider Systems
Existing
Planned
239



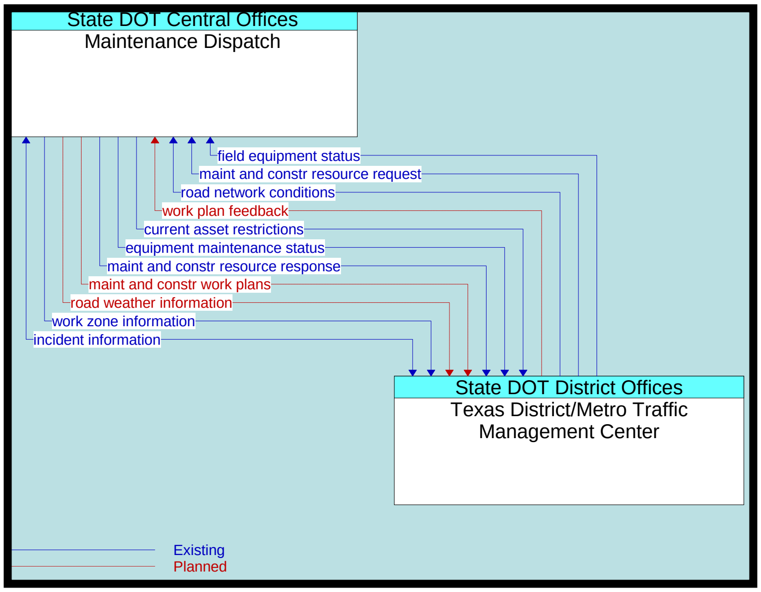
State DOT Central Offices
Maintenance Dispatch
infrastructure conditions data
maint and constr dispatch status
maint and constr vehicle operational data
maint and constr dispatch information
maint and constr vehicle system control
State DOT District Offices
Maintenance and Construction Vehicles
Existing
240


State DOT Central Offices
Maintenance Dispatch
field equipment status
maint and constr resource request
road network conditions
work plan feedback
current asset restrictions
equipment maintenance status
maint and constr resource response
maint and constr work plans
road weather information
work zone information
incident information
road network status assessment
State Traffic Management Centers
Mississippi District Traffic Management Center
Existing
Planned

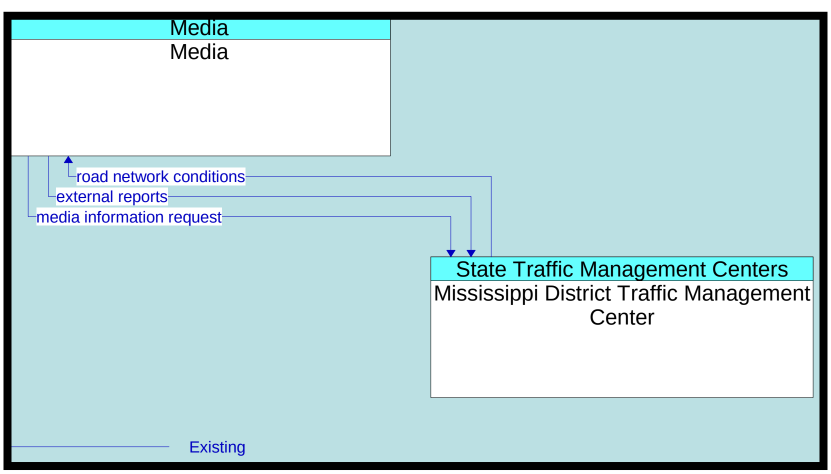
241


State DOT Central Offices
Maintenance Dispatch
field equipment status
maint and constr resource request
road network conditions
work plan feedback
current asset restrictions
equipment maintenance status
maint and constr resource response
maint and constr work plans
road weather information
work zone information
incident information
road network status assessment
State Traffic Management Centers
New Mexico District Traffic Management Center
Existing
Planned

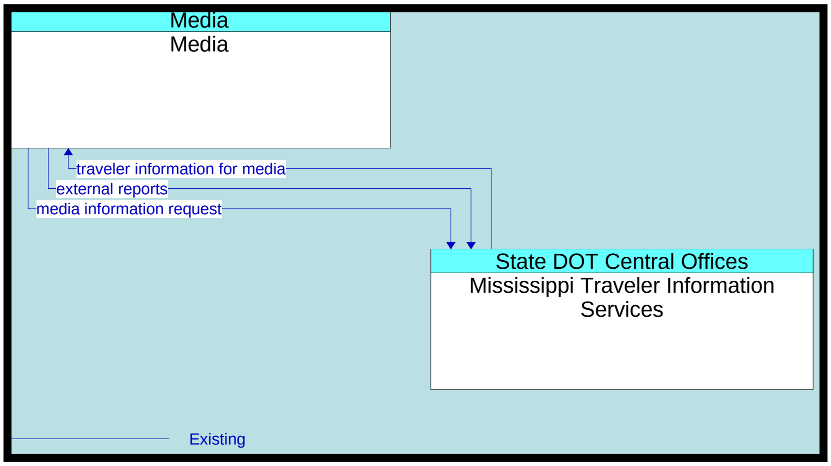
242


State DOT Central Offices
Maintenance Dispatch
field equipment status
maint and constr resource request
road network conditions
work plan feedback
current asset restrictions
equipment maintenance status
maint and constr resource response
maint and constr work plans
road weather information
work zone information
incident information
State DOT District Offices
Texas District/Metro Traffic Management Center
Existing
Planned

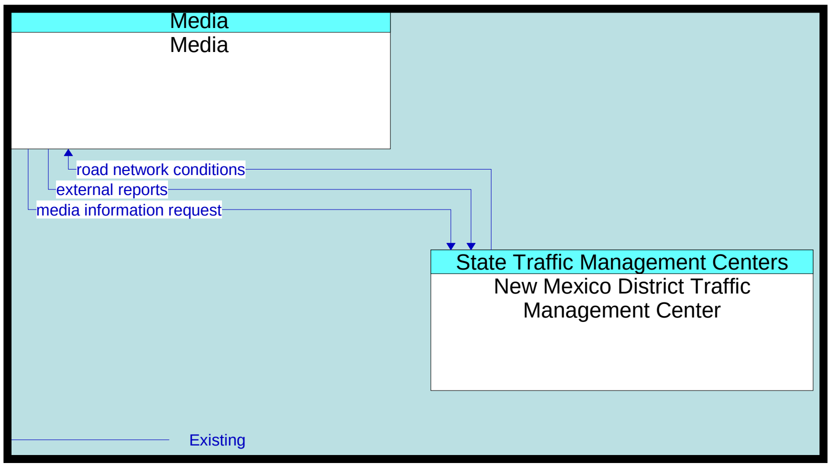
243


Media
Media
road network conditions
external reports
media information request
State Traffic Management Centers
Mississippi District Traffic Management Center
Existing

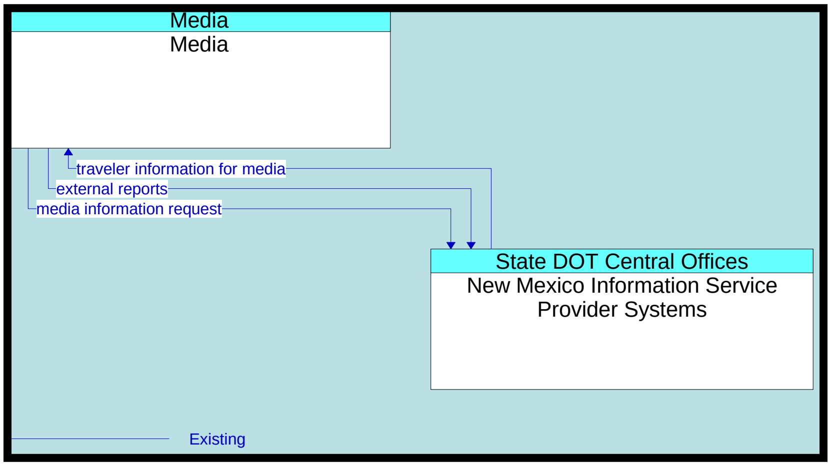
244


Media
Media
traveler information for media
external reports
media information request
State DOT Central Offices
Mississippi Traveler Information Services
Existing

245

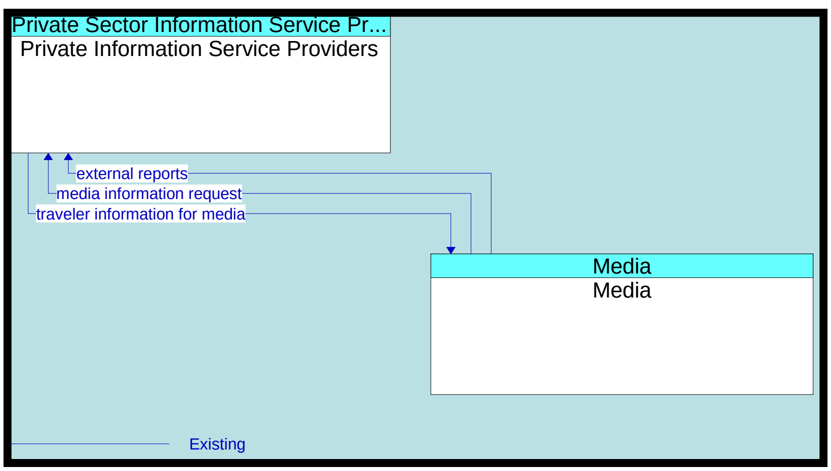

Media
Media
road network conditions
external reports
media information request
State Traffic Management Centers
New Mexico District Traffic Management Center
Existing

246



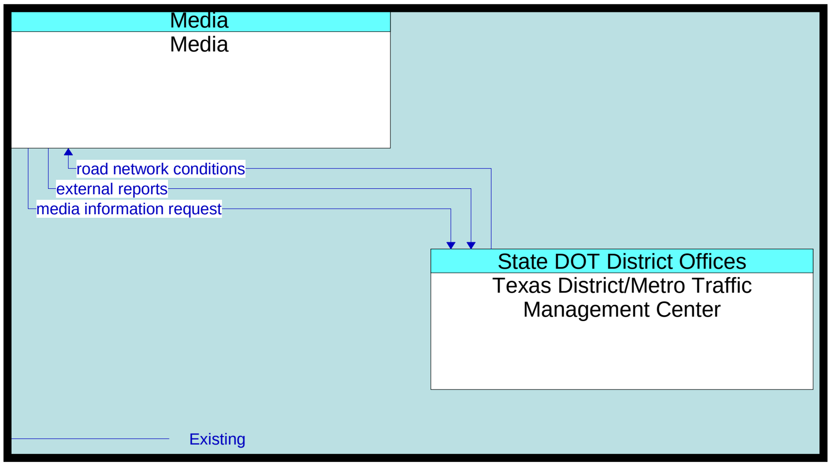
Media
Media
traveler information for media
external reports
media information request
State DOT Central Offices
New Mexico Information Service Provider Systems
Existing

247

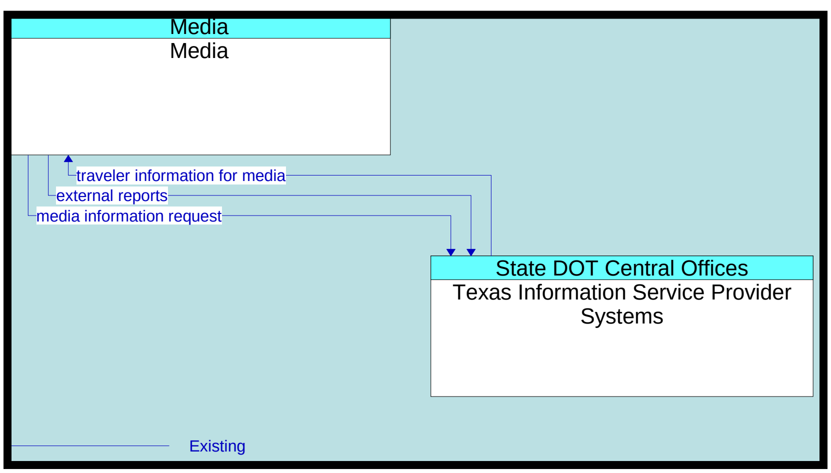


Private Sector Information Service Pr...
Private Information Service Providers
external reports
media information request
traveler information for media
Media
Media
Existing

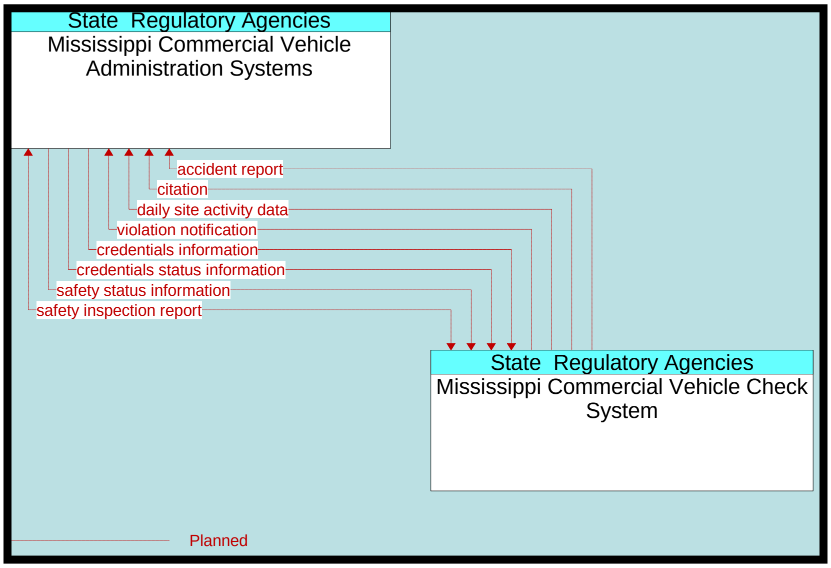
248


Media
Media
road network conditions
external reports
media information request
State DOT District Offices
Texas District/Metro Traffic Management Center
Existing

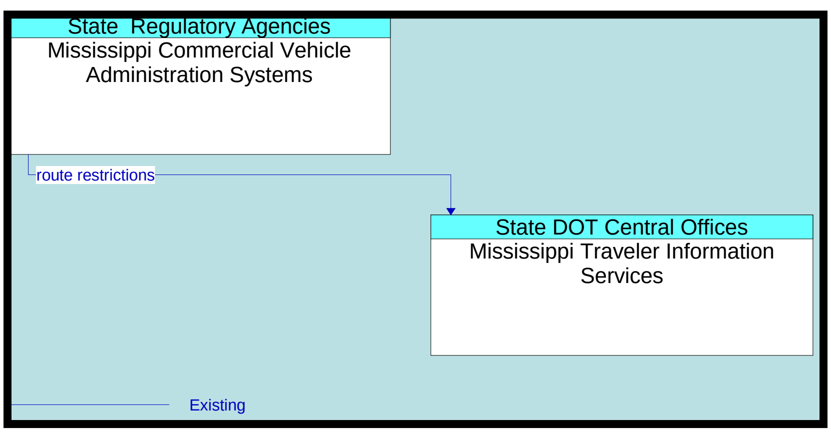
249


Media
Media
traveler information for media
external reports
media information request
State DOT Central Offices
Texas Information Service Provider Systems
Existing

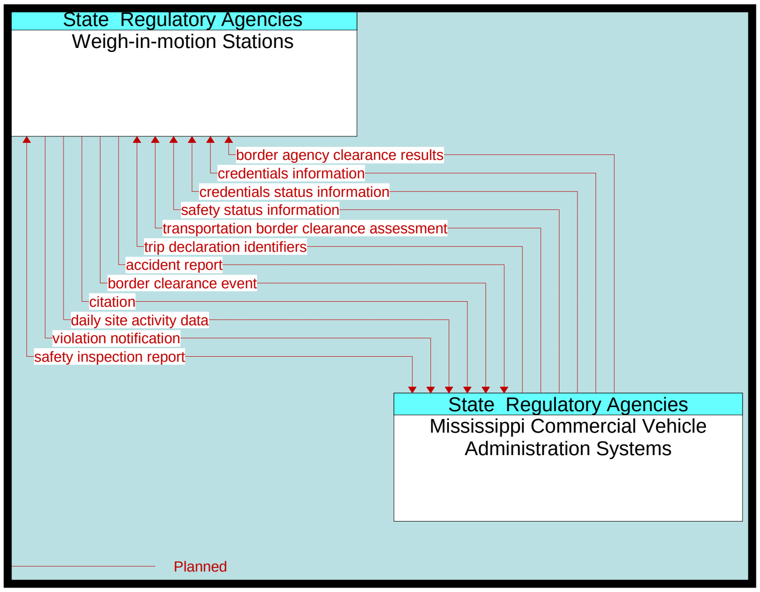
250


State Regulatory Agencies
Mississippi Commercial Vehicle Administration Systems
accident report
citation
daily site activity data
violation notification
credentials information
credentials status information
safety status information
safety inspection report
State Regulatory Agencies
Mississippi Commercial Vehicle Check System
Planned

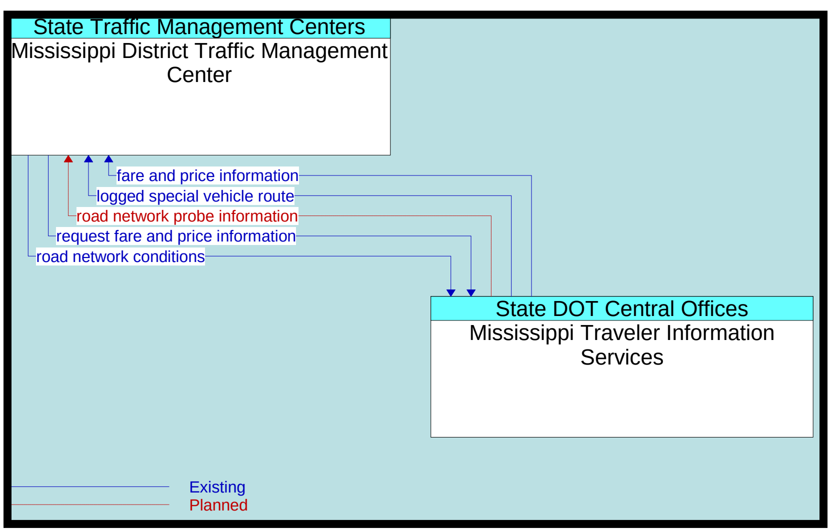
251


State Regulatory Agencies
Mississippi Commercial Vehicle Administration Systems
route restrictions
State DOT Central Offices
Mississippi Traveler Information Services
Existing

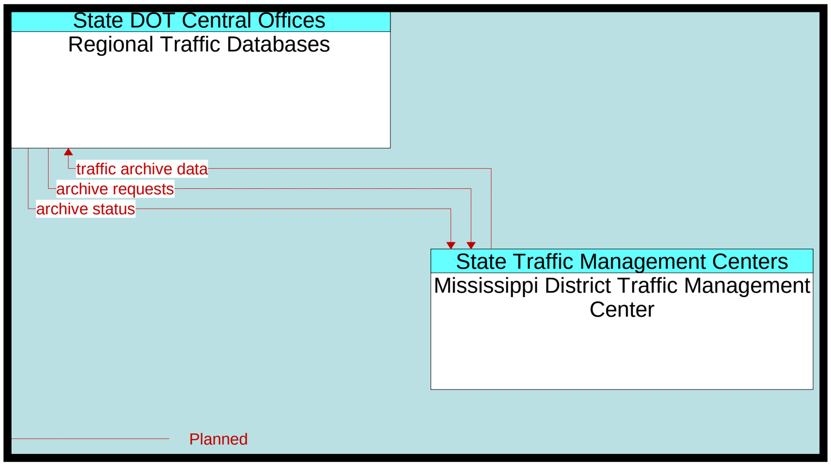
252


State Regulatory Agencies
Weigh-in-motion Stations
border agency clearance results
credentials information
credentials status information
safety status information
transportation border clearance assessment
trip declaration identifiers
accident report
border clearance event
citation
daily site activity data
violation notification
safety inspection report
State Regulatory Agencies
Mississippi Commercial Vehicle Administration Systems
Planned

253

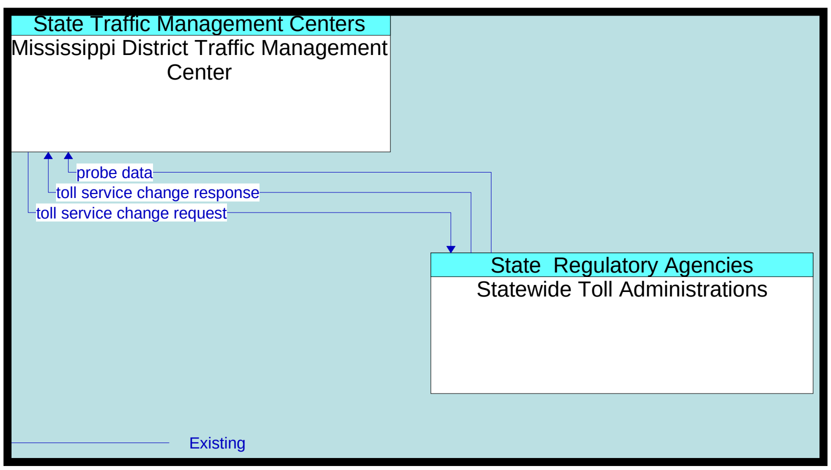

State Traffic Management Centers
Mississippi District Traffic Management Center
fare and price information
logged special vehicle route
road network probe information
request fare and price information
road network conditions
State DOT Central Offices
Mississippi Traveler Information Services
Existing
Planned

254



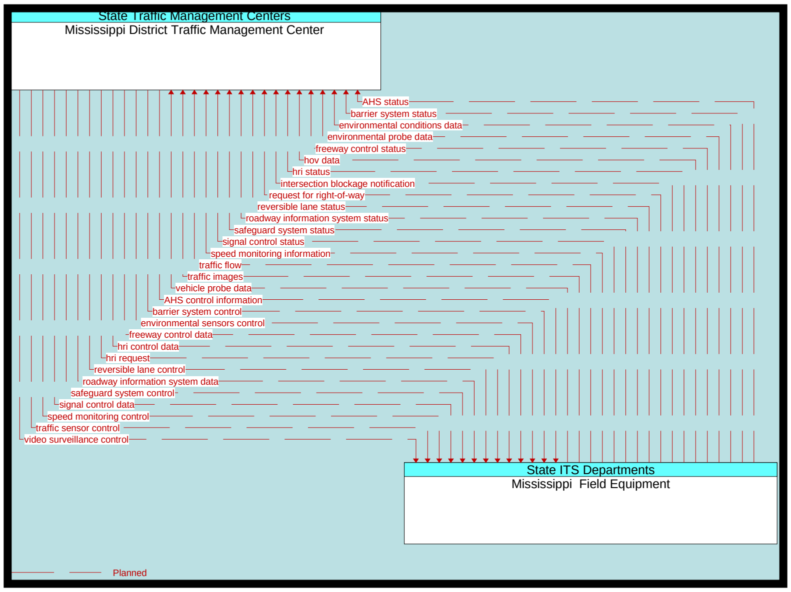
State DOT Central Offices
Regional Traffic Databases
traffic archive data
archive requests
archive status
State Traffic Management Centers
Mississippi District Traffic Management Center
Planned

255

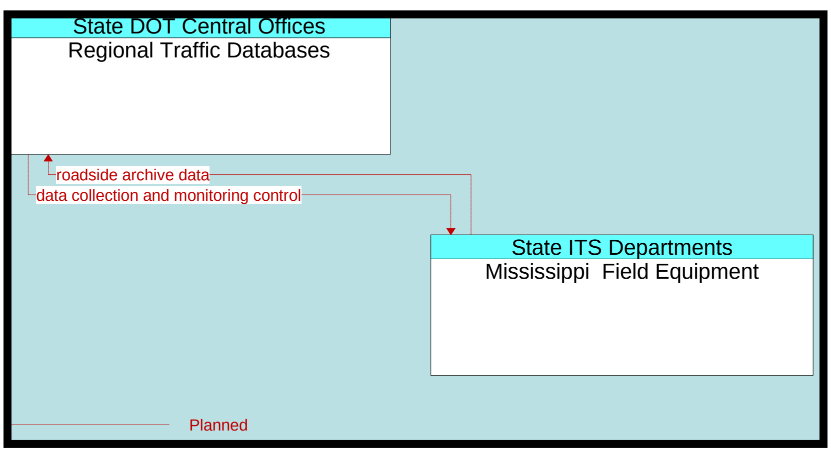


State Traffic Management Centers
Mississippi District Traffic Management Center
probe data
toll service change response
toll service change request
State Regulatory Agencies
Statewide Toll Administrations
Existing

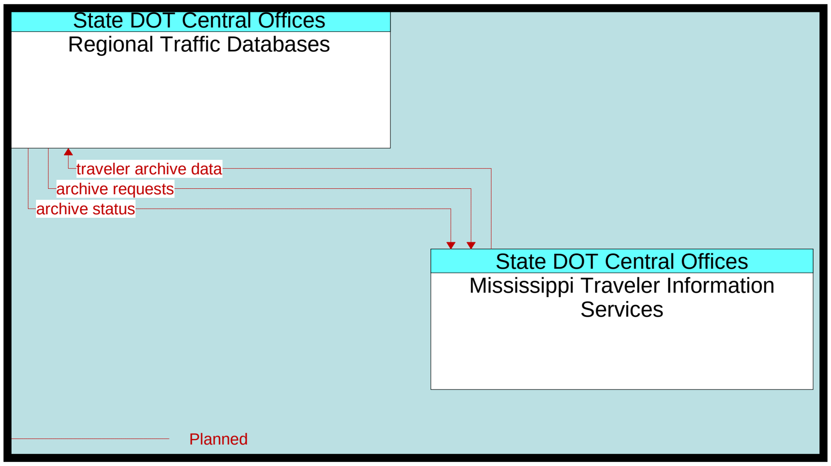
256


State Traffic Management Centers
Mississippi District Traffic Management Center
AHS status
barrier system status
environmental conditions data
environmental probe data
freeway control status
hov data
hri status
intersection blockage notification
request for right-of-way
reversible lane status
roadway information system status
safeguard system status
signal control status
speed monitoring information
traffic flow
traffic images
vehicle probe data
AHS control information
barrier system control
environmental sensors control
freeway control data
hri control data
hri request
reversible lane control
roadway information system data
safeguard system control
signal control data
speed monitoring control
traffic sensor control
video surveillance control
State ITS Departments
Mississippi Field Equipment
Planned

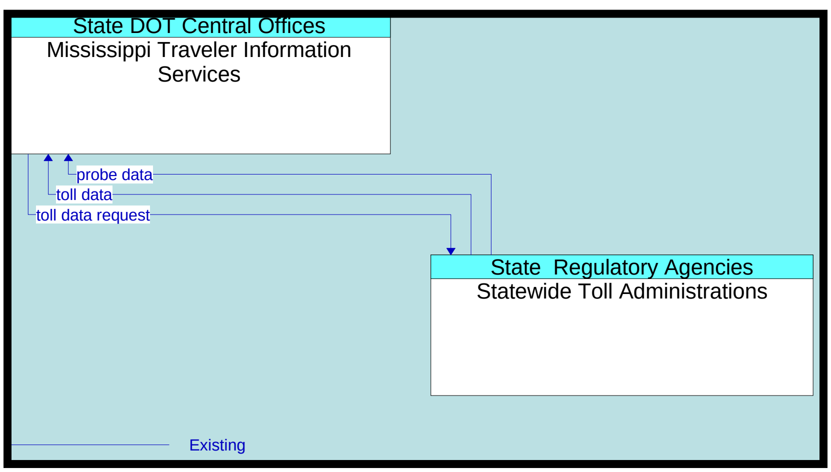
257


State DOT Central Offices
Regional Traffic Databases
roadside archive data
data collection and monitoring control
State ITS Departments
Mississippi Field Equipment
Planned

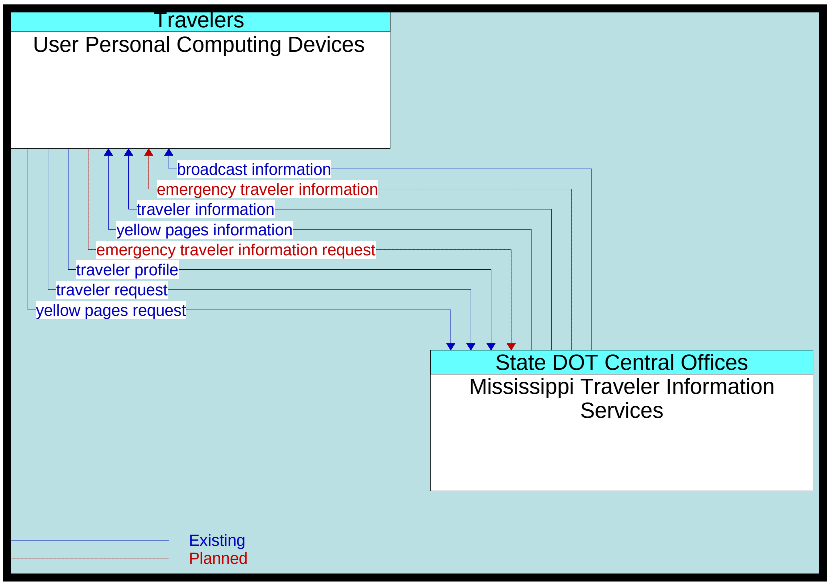
258


State DOT Central Offices
Regional Traffic Databases
traveler archive data
archive requests
archive status
State DOT Central Offices
Mississippi Traveler Information Services
Planned

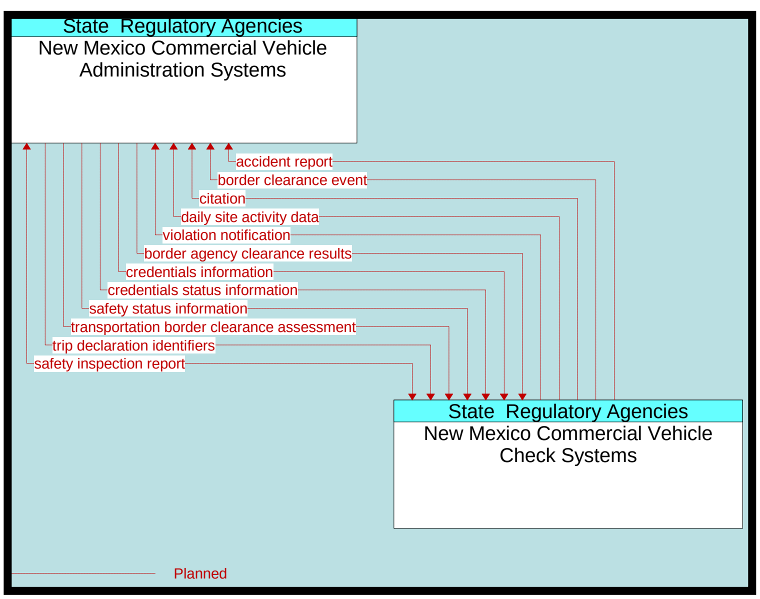
259


State DOT Central Offices
Mississippi Traveler Information Services
probe data
toll data
toll data request
State Regulatory Agencies
Statewide Toll Administrations
Existing

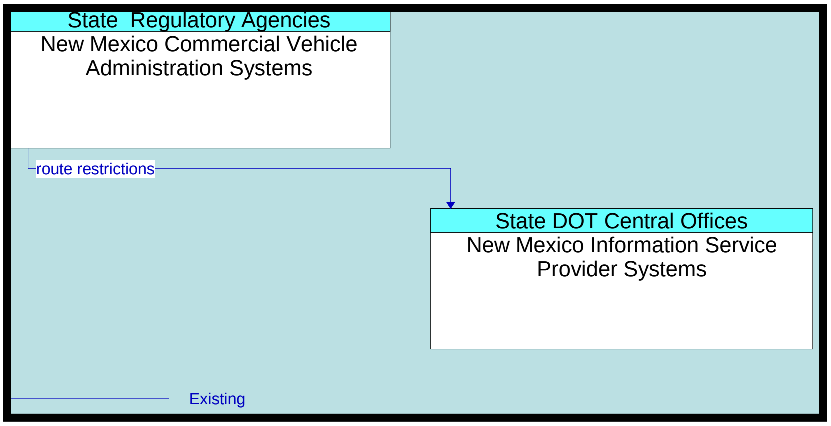
260


Travelers
User Personal Computing Devices
broadcast information
emergency traveler information
traveler information
yellow pages information
emergency traveler information request
traveler profile
traveler request
yellow pages request
State DOT Central Offices
Mississippi Traveler Information Services
Existing
Planned

261

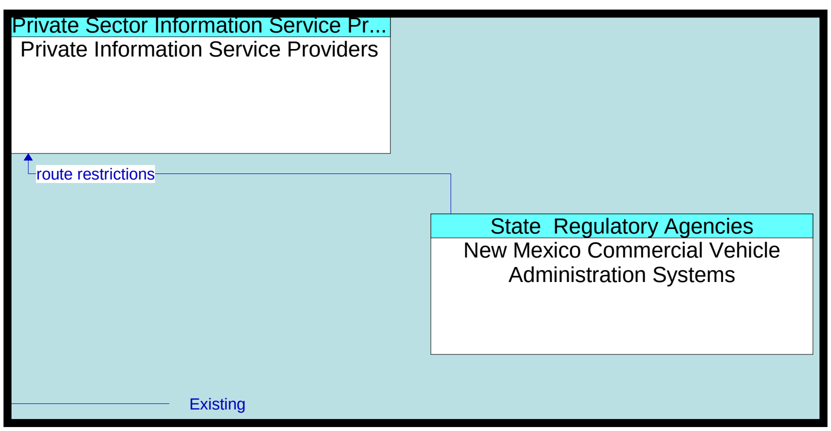

State Regulatory Agencies
New Mexico Commercial Vehicle Administration Systems
accident report
border clearance event
citation
daily site activity data
violation notification
border agency clearance results
credentials information
credentials status information
safety status information
transportation border clearance assessment
trip declaration identifiers
safety inspection report
State Regulatory Agencies
New Mexico Commercial Vehicle Check Systems
Planned

262



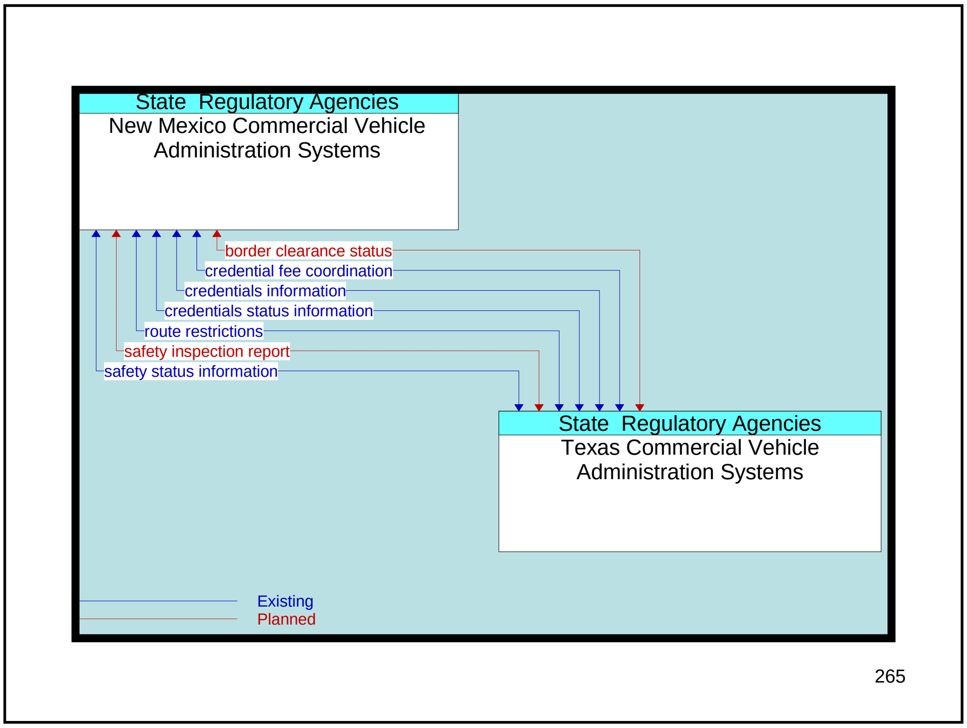
State Regulatory Agencies
New Mexico Commercial Vehicle Administration Systems
route restrictions
State DOT Central Offices
New Mexico Information Service Provider Systems
Existing

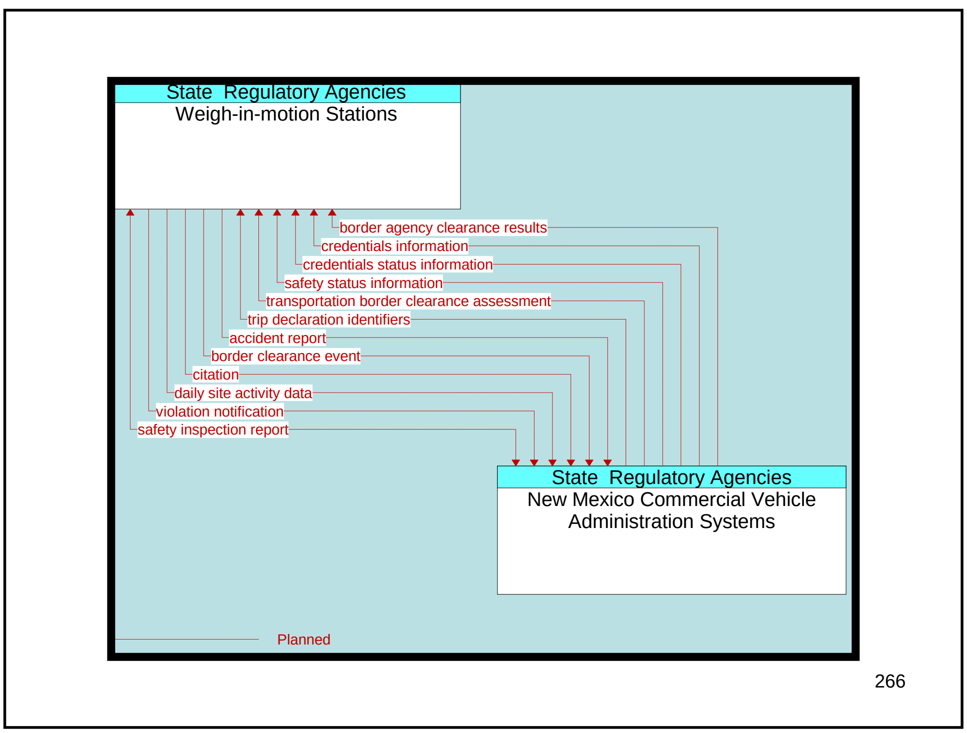
263

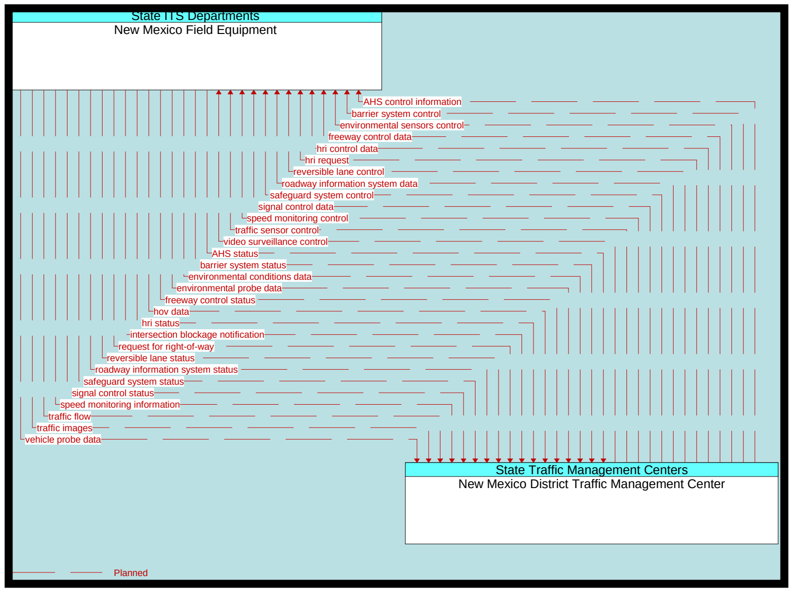


Private Sector Information Service Pr...
Private Information Service Providers
route restrictions
State Regulatory Agencies
New Mexico Commercial Vehicle Administration Systems
Existing

264

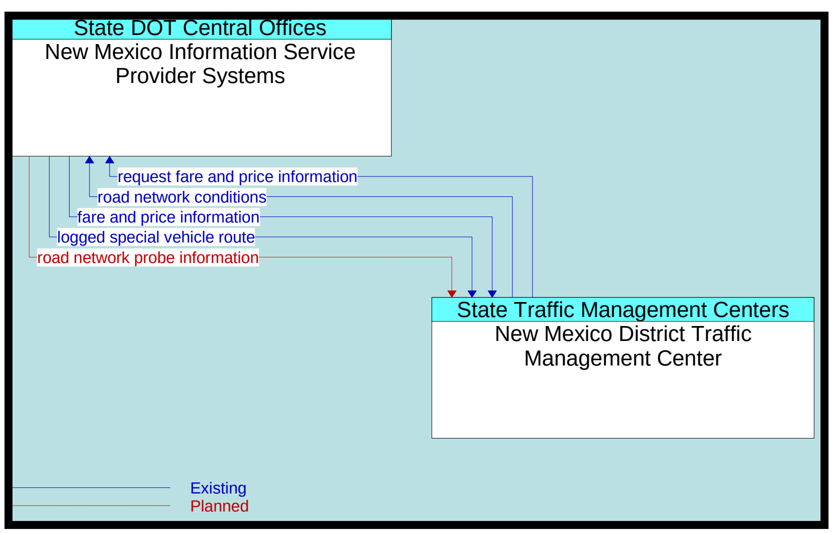

State Regulatory Agencies
New Mexico Commercial Vehicle Administration Systems
border clearance status
credential fee coordination
credentials information
credentials status information
route restrictions
safety inspection report
safety status information
State Regulatory Agencies
Texas Commercial Vehicle Administration Systems
Existing
Planned
265


State Regulatory Agencies
Weigh-in-motion Stations
border agency clearance results
credentials information
credentials status information
safety status information
transportation border clearance assessment
trip declaration identifiers
accident report
border clearance event
citation
daily site activity data
violation notification
safety inspection report
State Regulatory Agencies
New Mexico Commercial Vehicle Administration Systems
Planned
266



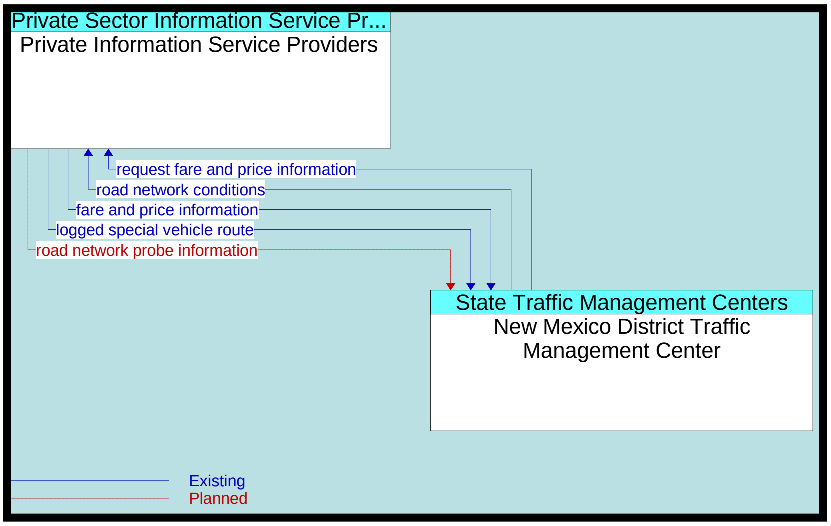
State ITS Departments
New Mexico Field Equipment
AHS control information
barrier system control
environmental sensors control
freeway control data
hri control data
hri request
reversible lane control
roadway information system data
safeguard system control
signal control data
speed monitoring control
traffic sensor control
video surveillance control
AHS status
barrier system status
environmental conditions data
environmental probe data
freeway control status
hov data
hri status
intersection blockage notification
request for right-of-way
reversible lane status
roadway information system status
safeguard system status
signal control status
speed monitoring information
traffic flow
traffic images
vehicle probe data
State Traffic Management Centers
New Mexico District Traffic Management Center
Planned

267



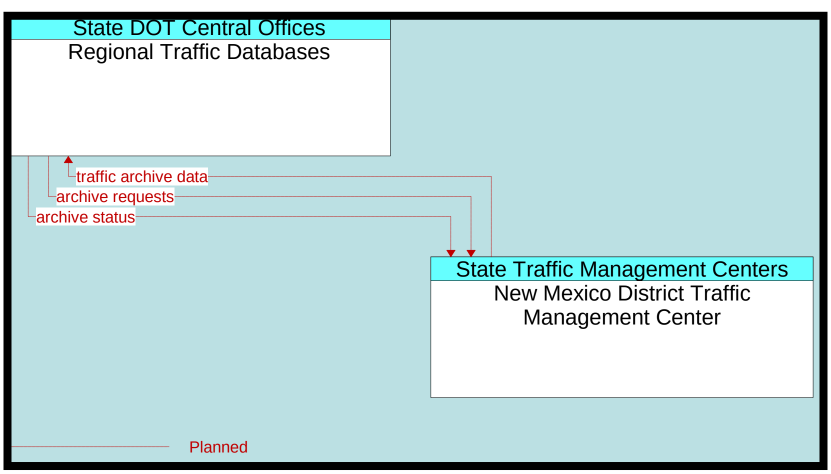
State DOT Central Offices
New Mexico Information Service Provider Systems
request fare and price information
road network conditions
fare and price information
logged special vehicle route
road network probe information
State Traffic Management Centers
New Mexico District Traffic Management Center
Existing
Planned

268



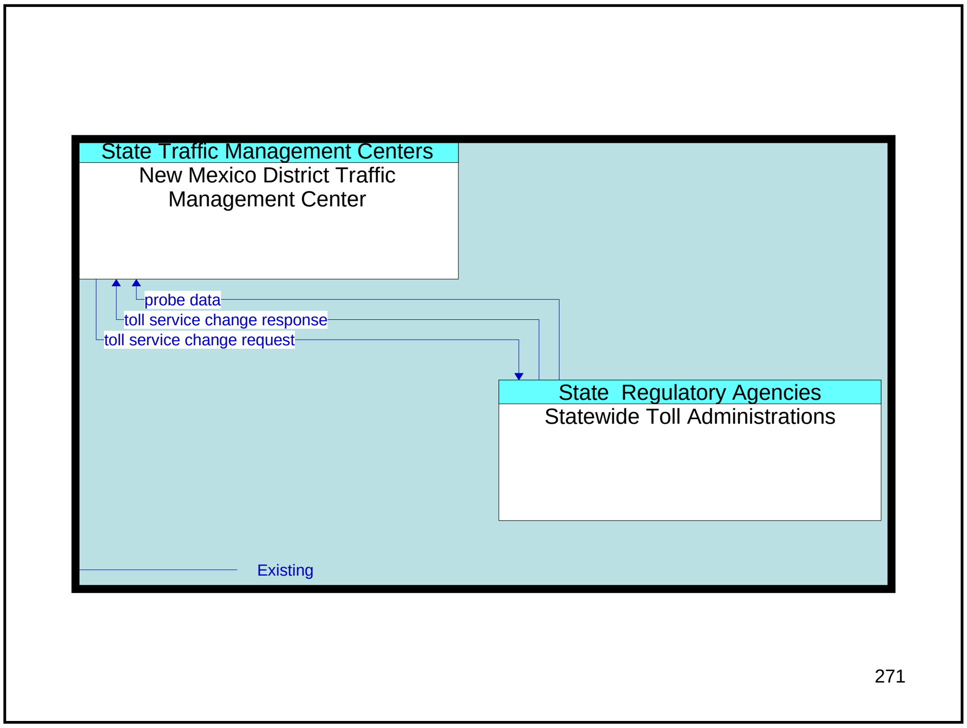
Private Sector Information Service Pr...
Private Information Service Providers
request fare and price information
road network conditions
fare and price information
logged special vehicle route
road network probe information
State Traffic Management Centers
New Mexico District Traffic Management Center
Existing
Planned

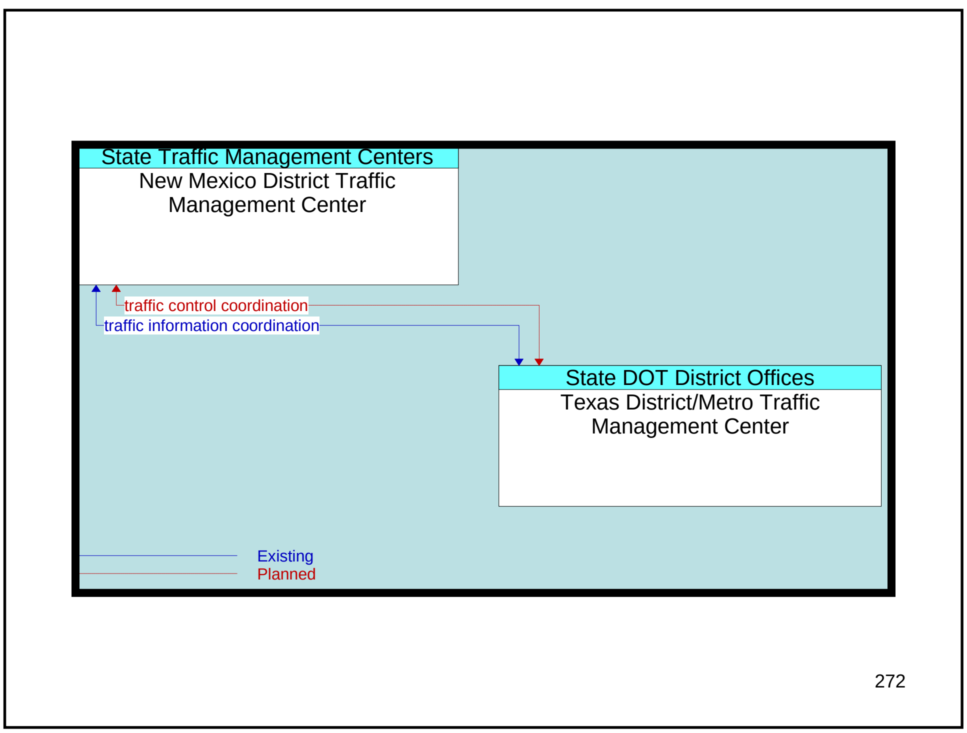
269

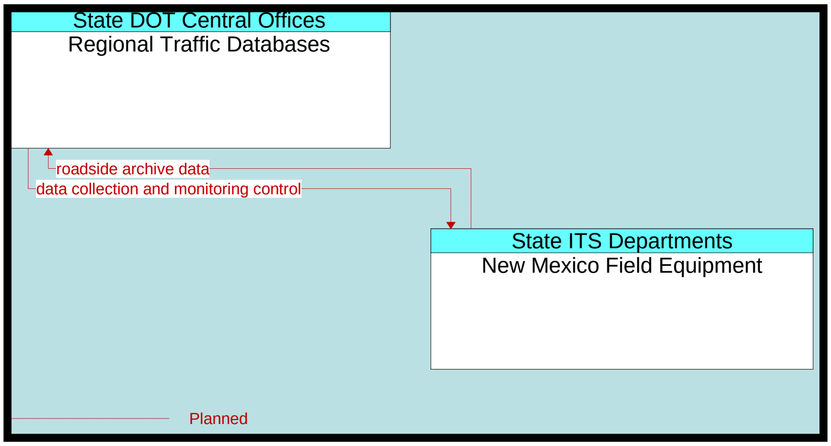


State DOT Central Offices
Regional Traffic Databases
traffic archive data
archive requests
archive status
State Traffic Management Centers
New Mexico District Traffic Management Center
Planned

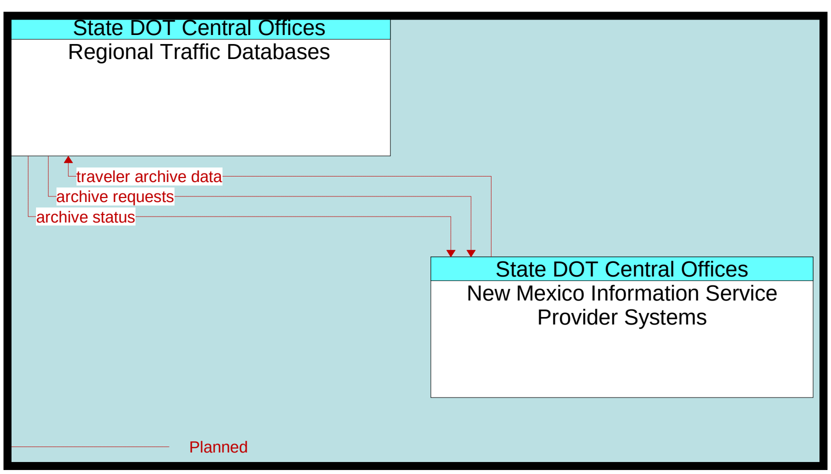
270


State Traffic Management Centers
New Mexico District Traffic Management Center
probe data
toll service change response
toll service change request
State Regulatory Agencies
Statewide Toll Administrations
Existing
271

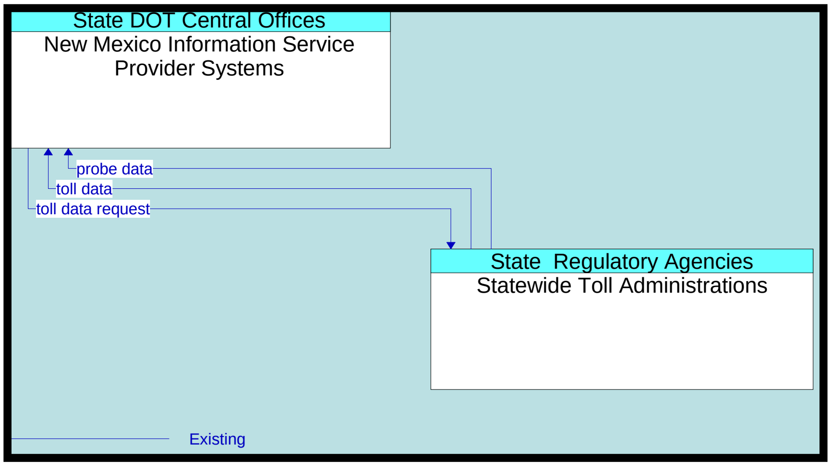

State Traffic Management Centers
New Mexico District Traffic Management Center
traffic control coordination
traffic information coordination
State DOT District Offices
Texas District/Metro Traffic Management Center
Existing
Planned
272


State DOT Central Offices
Regional Traffic Databases
roadside archive data
data collection and monitoring control
State ITS Departments
New Mexico Field Equipment
Planned

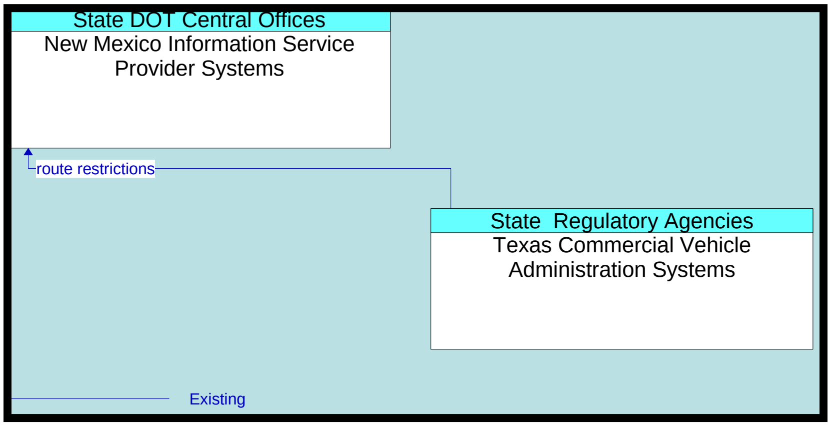
273


State DOT Central Offices
Regional Traffic Databases
traveler archive data
archive requests
archive status
State DOT Central Offices
New Mexico Information Service Provider Systems
Planned

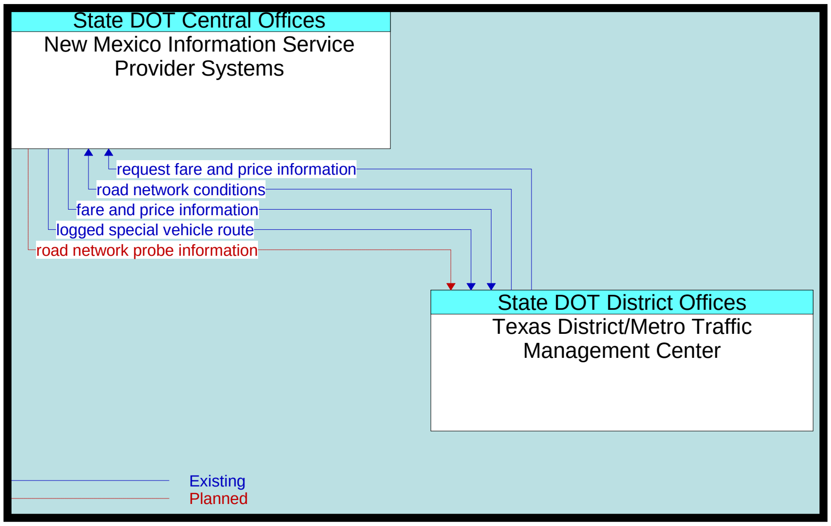
274


State DOT Central Offices
New Mexico Information Service Provider Systems
probe data
toll data
toll data request
State Regulatory Agencies
Statewide Toll Administrations
Existing

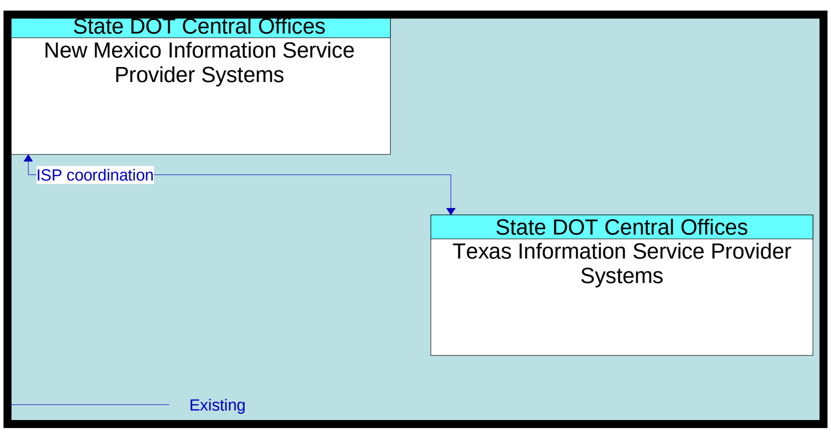
275


State DOT Central Offices
New Mexico Information Service Provider Systems
route restrictions
State Regulatory Agencies
Texas Commercial Vehicle Administration Systems
Existing

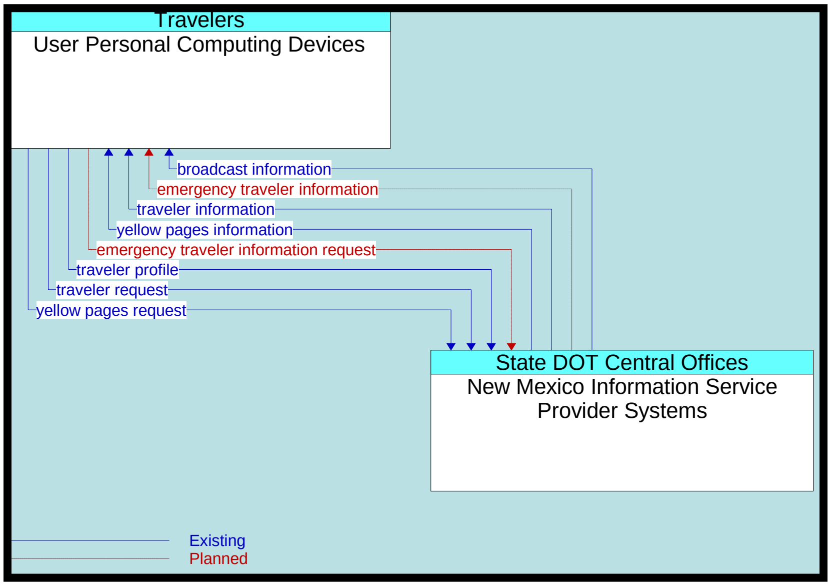
276


State DOT Central Offices
New Mexico Information Service Provider Systems
request fare and price information
road network conditions
fare and price information
logged special vehicle route
road network probe information
State DOT District Offices
Texas District/Metro Traffic Management Center
Existing
Planned

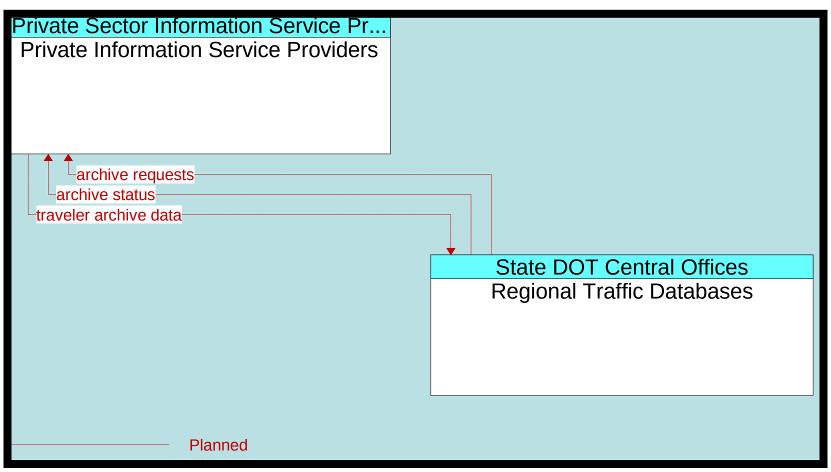
277


State DOT Central Offices
New Mexico Information Service Provider Systems
ISP coordination
State DOT Central Offices
Texas Information Service Provider Systems
Existing

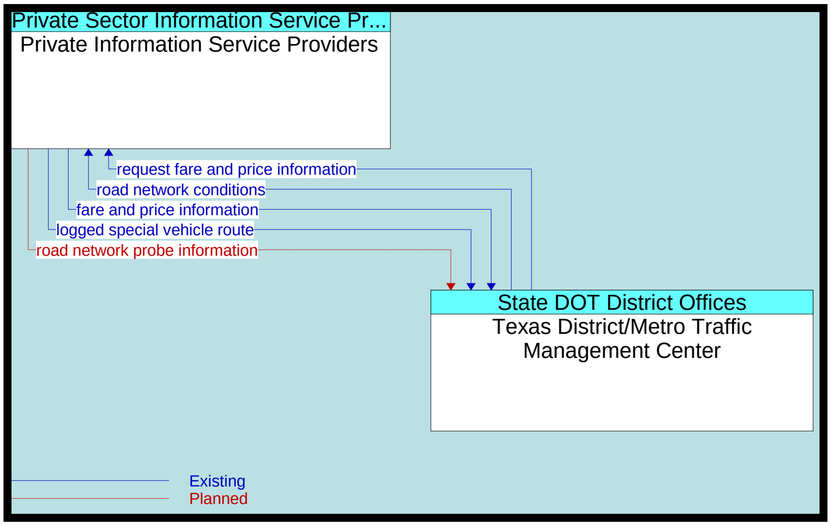
278


Travelers
User Personal Computing Devices
broadcast information
emergency traveler information
traveler information
yellow pages information
emergency traveler information request
traveler profile
traveler request
yellow pages request
State DOT Central Offices
New Mexico Information Service Provider Systems
Existing
Planned

279

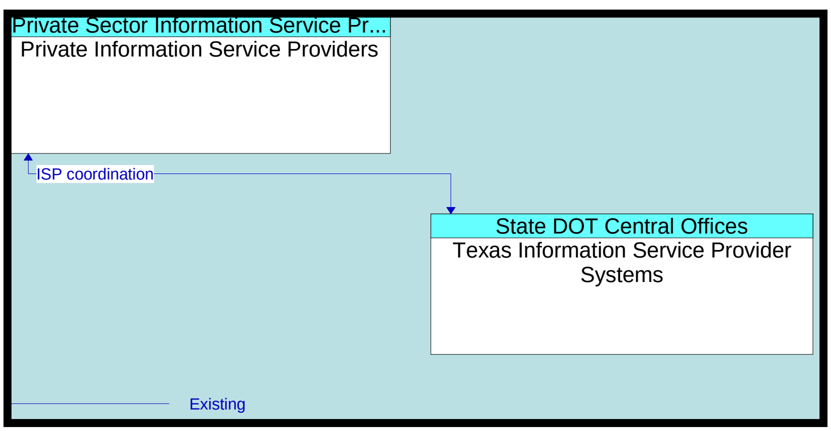

Private Sector Information Service Pr...
Private Information Service Providers
archive requests
archive status
traveler archive data
State DOT Central Offices
Regional Traffic Databases
Planned

280



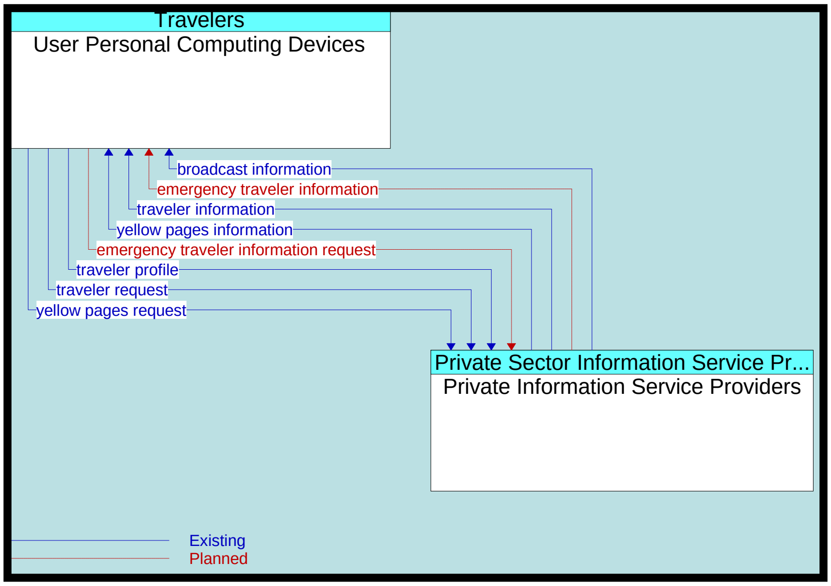
Private Sector Information Service Pr...
Private Information Service Providers
request fare and price information
road network conditions
fare and price information
logged special vehicle route
road network probe information
State DOT District Offices
Texas District/Metro Traffic Management Center
Existing
Planned

281

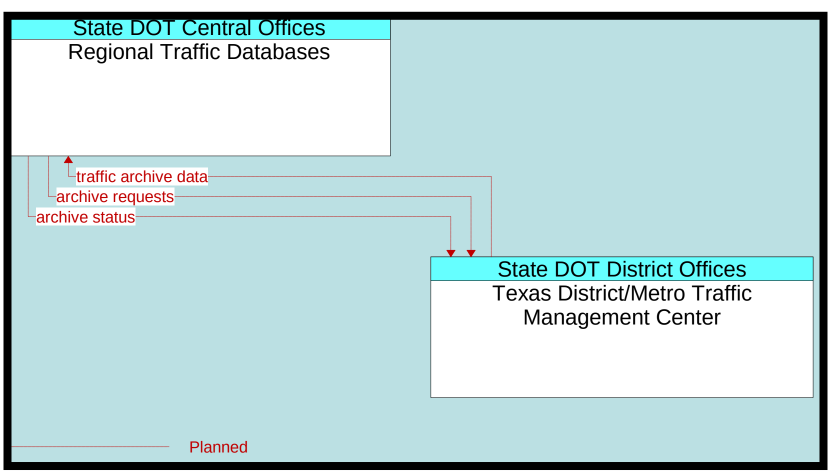


Private Sector Information Service Pr...
Private Information Service Providers
ISP coordination
State DOT Central Offices
Texas Information Service Provider Systems
Existing

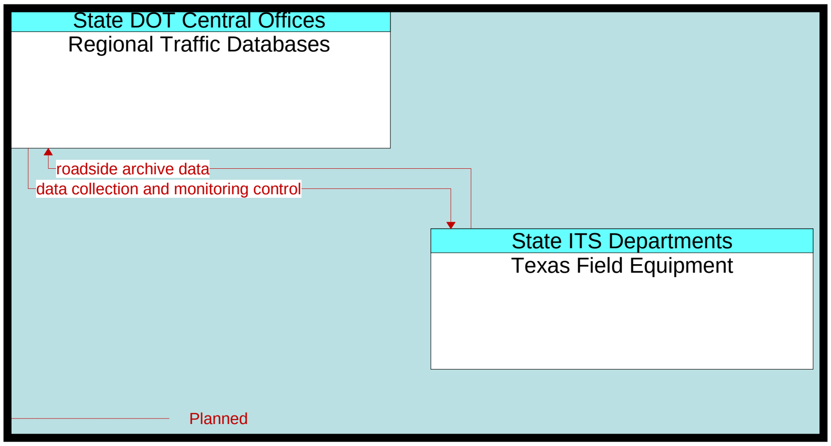
282


Travelers
User Personal Computing Devices
broadcast information
emergency traveler information
traveler information
yellow pages information
emergency traveler information request
traveler profile
traveler request
yellow pages request
Private Sector Information Service Pr...
Private Information Service Providers
Existing
Planned

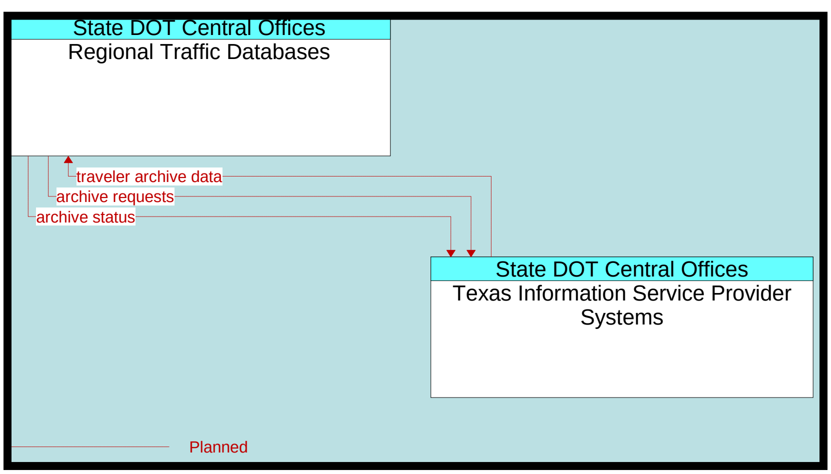
283


State DOT Central Offices
Regional Traffic Databases
traffic archive data
archive requests
archive status
State DOT District Offices
Texas District/Metro Traffic
Management Center
Planned

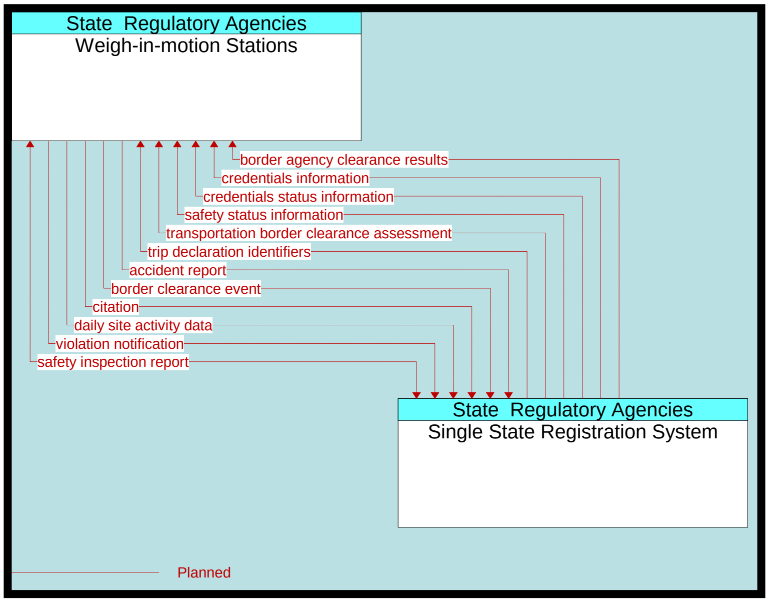
284


State DOT Central Offices
Regional Traffic Databases
roadside archive data
data collection and monitoring control
State ITS Departments
Texas Field Equipment
Planned

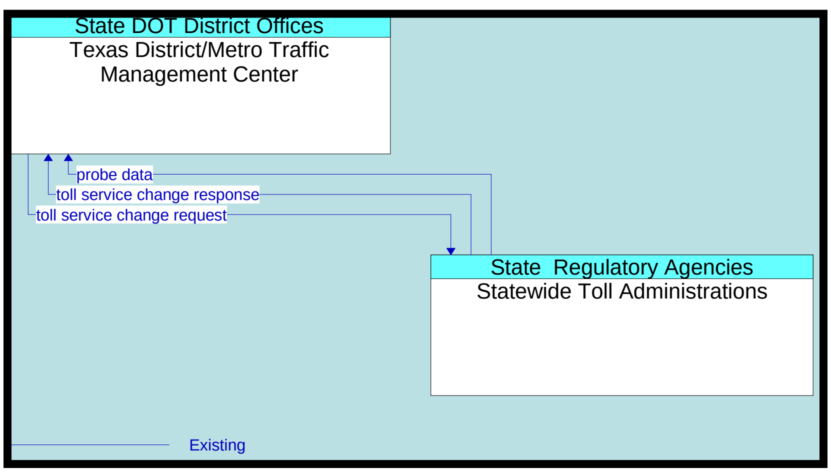
285


State DOT Central Offices
Regional Traffic Databases
traveler archive data
archive requests
archive status
State DOT Central Offices
Texas Information Service Provider Systems
Planned

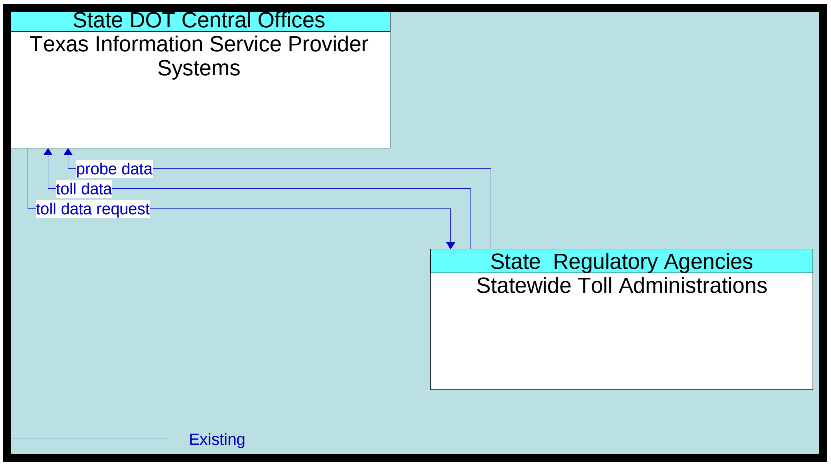
286


State Regulatory Agencies
Weigh-in-motion Stations
border agency clearance results
credentials information
credentials status information
safety status information
transportation border clearance assessment
trip declaration identifiers
accident report
border clearance event
citation
daily site activity data
violation notification
safety inspection report
State Regulatory Agencies
Single State Registration System
Planned

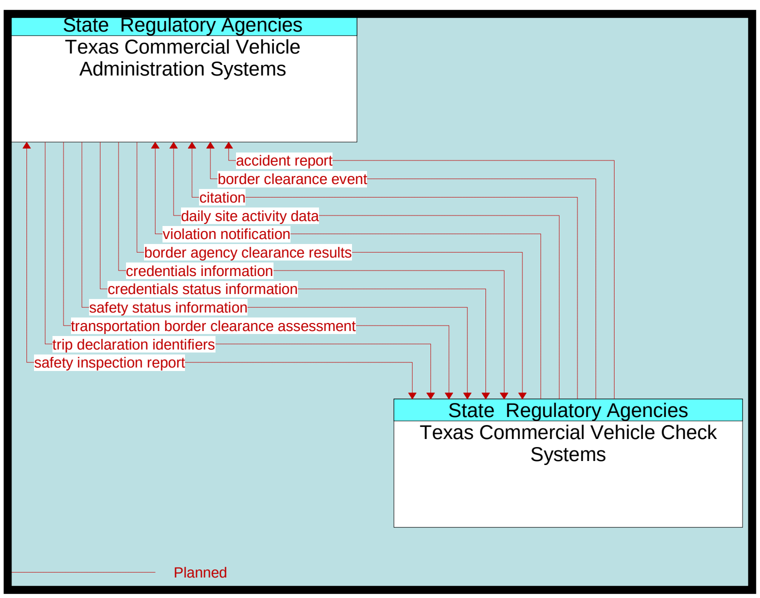
287


State DOT District Offices
Texas District/Metro Traffic Management Center
probe data
toll service change response
toll service change request
State Regulatory Agencies
Statewide Toll Administrations
Existing

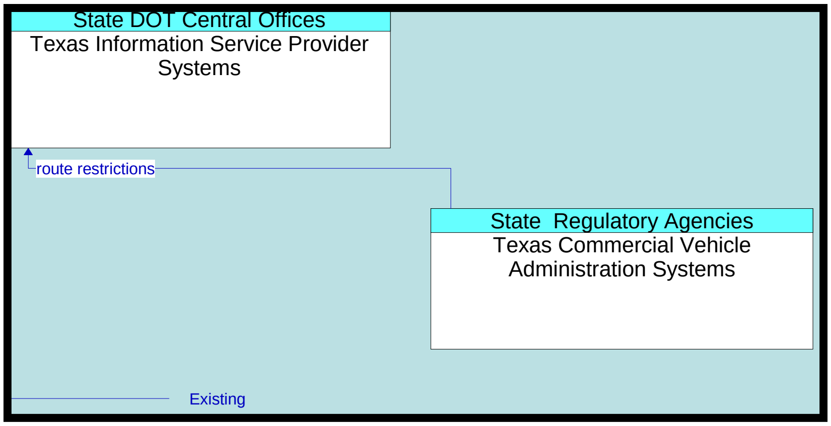
288


State DOT Central Offices
Texas Information Service Provider Systems
probe data
toll data
toll data request
State Regulatory Agencies
Statewide Toll Administrations
Existing

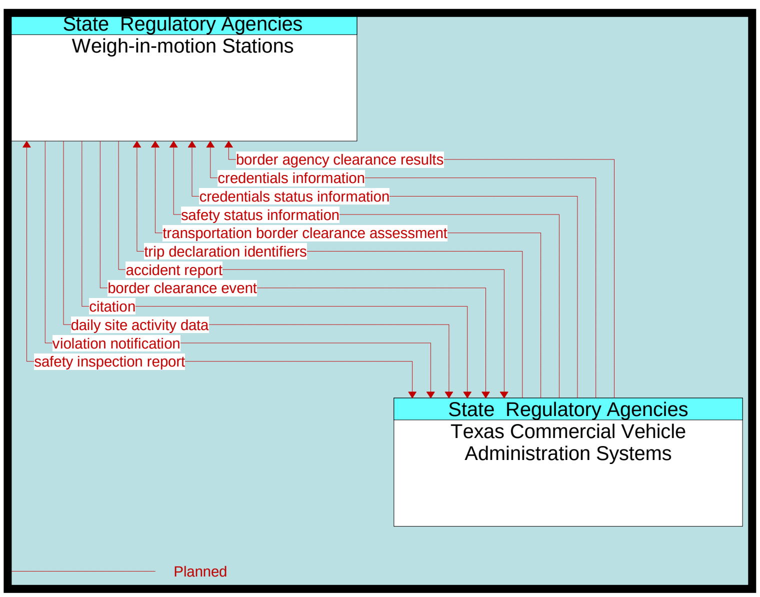
289


State Regulatory Agencies
Texas Commercial Vehicle Administration Systems
accident report
border clearance event
citation
daily site activity data
violation notification
border agency clearance results
credentials information
credentials status information
safety status information
transportation border clearance assessment
trip declaration identifiers
safety inspection report
State Regulatory Agencies
Texas Commercial Vehicle Check Systems
Planned

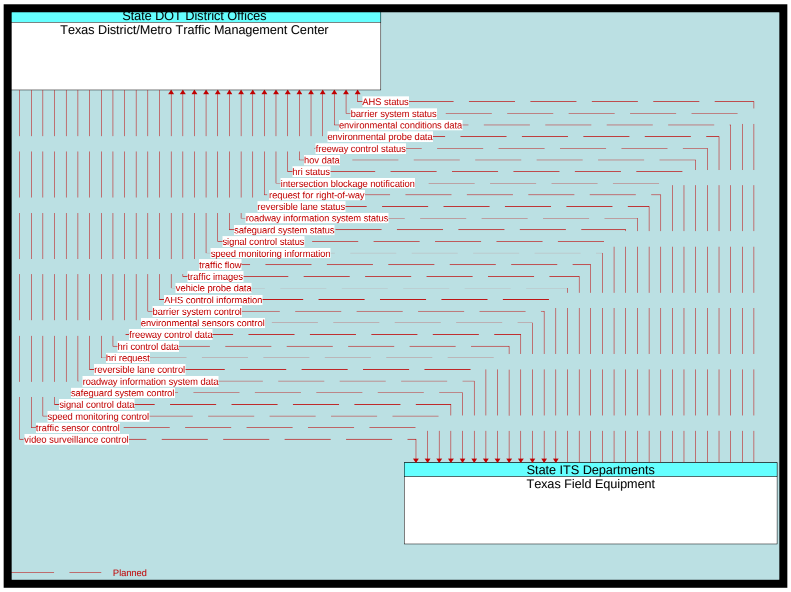
290


State DOT Central Offices
Texas Information Service Provider Systems
route restrictions
State Regulatory Agencies
Texas Commercial Vehicle Administration Systems
Existing

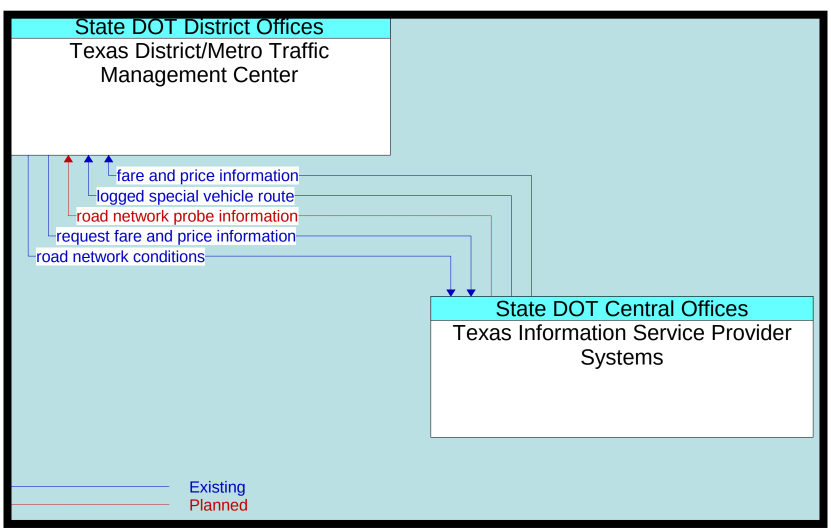
291


State Regulatory Agencies
Weigh-in-motion Stations
border agency clearance results
credentials information
credentials status information
safety status information
transportation border clearance assessment
trip declaration identifiers
accident report
border clearance event
citation
daily site activity data
violation notification
safety inspection report
State Regulatory Agencies
Texas Commercial Vehicle Administration Systems
Planned

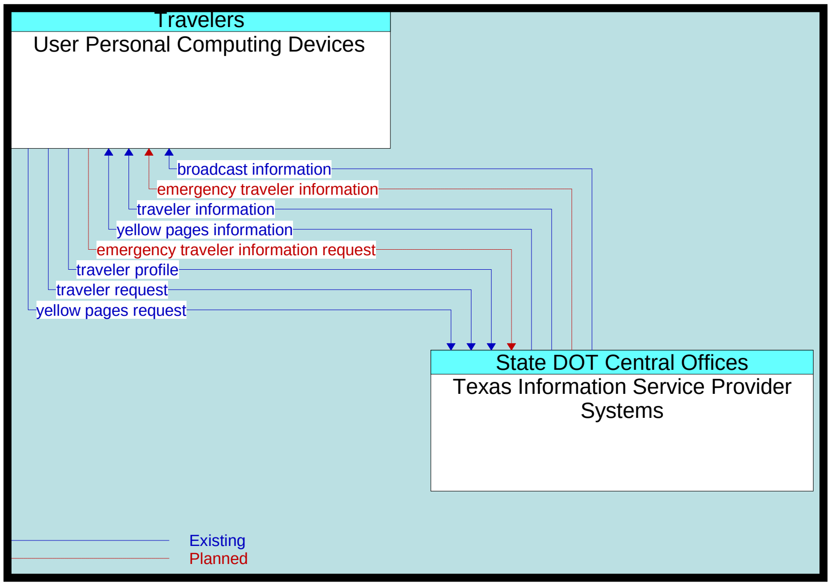
292


State DOT District Offices
Texas District/Metro Traffic Management Center
AHS status
barrier system status
environmental conditions data
environmental probe data
freeway control status
hov data
hri status
intersection blockage notification
request for right-of-way
reversible lane status
roadway information system status
safeguard system status
signal control status
speed monitoring information
traffic flow
traffic images
vehicle probe data
AHS control information
barrier system control
environmental sensors control
freeway control data
hri control data
hri request
reversible lane control
roadway information system data
safeguard system control
signal control data
speed monitoring control
traffic sensor control
video surveillance control
State ITS Departments
Texas Field Equipment
Planned

293

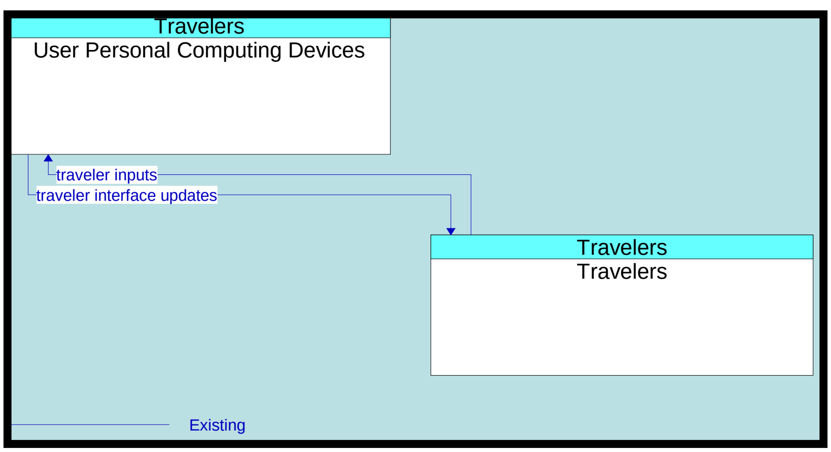

State DOT District Offices
Texas District/Metro Traffic Management Center
fare and price information
logged special vehicle route
road network probe information
request fare and price information
road network conditions
State DOT Central Offices
Texas Information Service Provider Systems
Existing
Planned

294



Travelers
User Personal Computing Devices
broadcast information
emergency traveler information
traveler information
yellow pages information
emergency traveler information request
traveler profile
traveler request
yellow pages request
State DOT Central Offices
Texas Information Service Provider Systems
Existing
Planned

295



Travelers
User Personal Computing Devices
traveler inputs
traveler interface updates
Travelers
Travelers
Existing

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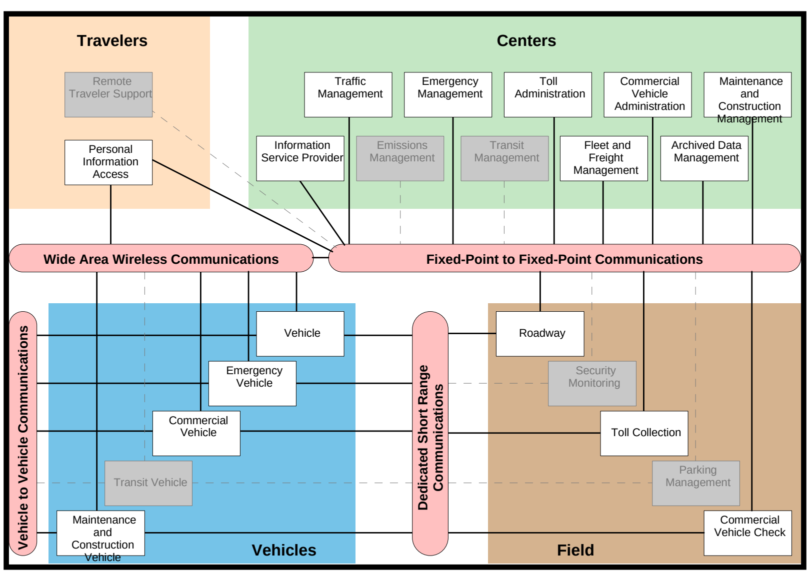
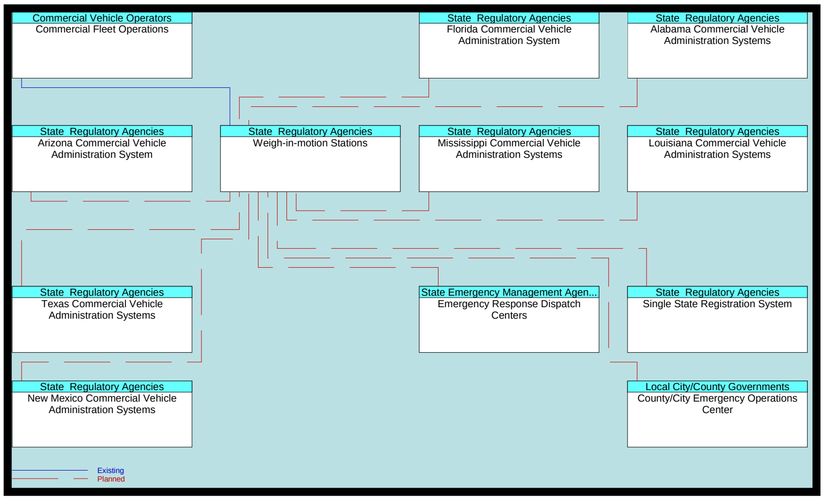
I-10 Corridor ITS Architecture Interconnect Diagrams

March 2008





Commercial Vehicle Operators
Commercial Fleet Operations
State Regulatory Agencies
Florida Commercial Vehicle Administration System
State Regulatory Agencies
Alabama Commercial Vehicle Administration Systems
State Regulatory Agencies
Arizona Commercial Vehicle Administration System
State Regulatory Agencies
Weigh-in-motion Stations
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Mississippi Commercial Vehicle Administration Systems
State Regulatory Agencies
Louisiana Commercial Vehicle Administration Systems
State Regulatory Agencies
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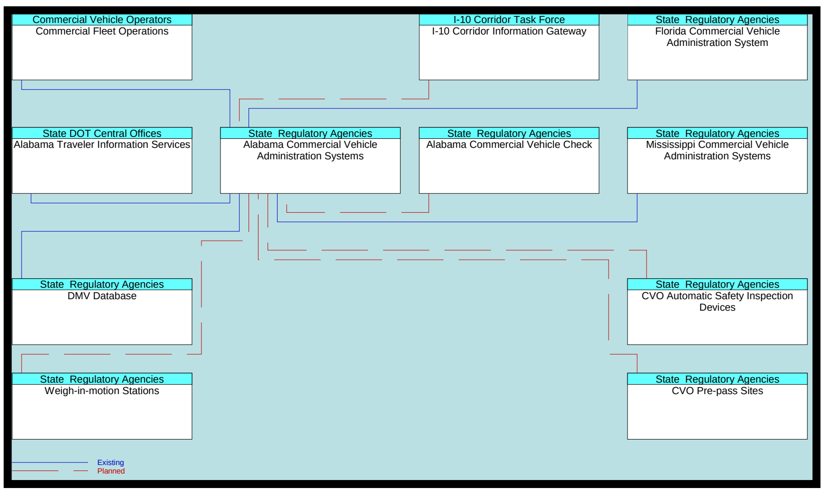
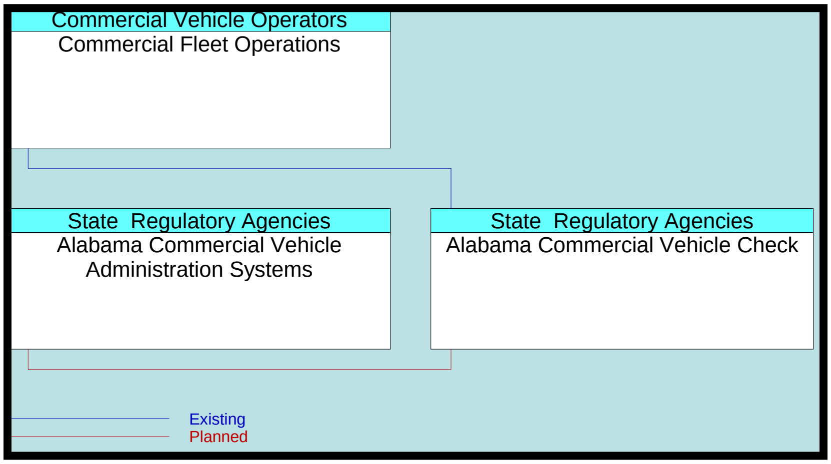
Emergency Response Dispatch Centers
State Regulatory Agencies
Single State Registration System
State Regulatory Agencies
New Mexico Commercial Vehicle Administration Systems
Local City/County Governments
County/City Emergency Operations Center
Existing
Planned

3

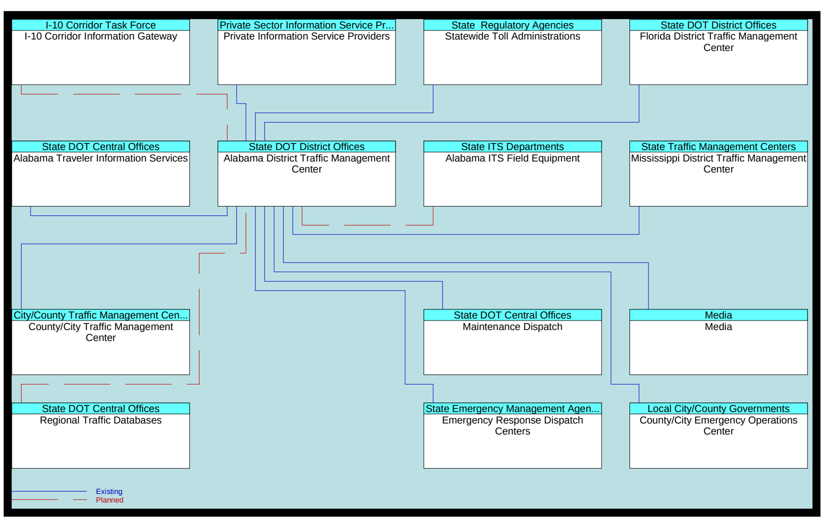


Commercial Vehicle Operators
Commercial Fleet Operations
I-10 Corridor Task Force
I-10 Corridor Information Gateway
State Regulatory Agencies
Florida Commercial Vehicle Administration System
State DOT Central Offices
Alabama Traveler Information Services
State Regulatory Agencies
Alabama Commercial Vehicle Administration Systems
State Regulatory Agencies
Alabama Commercial Vehicle Check
State Regulatory Agencies
Mississippi Commercial Vehicle Administration Systems
State Regulatory Agencies
DMV Database
State Regulatory Agencies
CVO Automatic Safety Inspection Devices
State Regulatory Agencies
Weigh-in-motion Stations
State Regulatory Agencies
CVO Pre-pass Sites
Existing
Planned

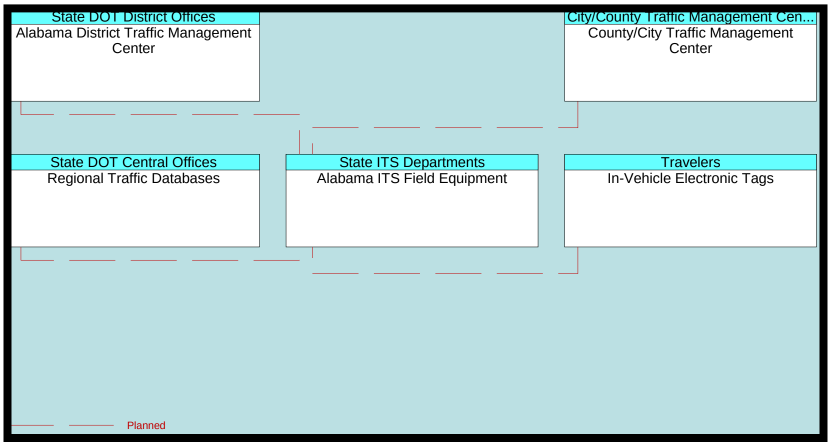
4


Commercial Vehicle Operators
Commercial Fleet Operations
State Regulatory Agencies
Alabama Commercial Vehicle Administration Systems
State Regulatory Agencies
Alabama Commercial Vehicle Check
Existing
Planned

5

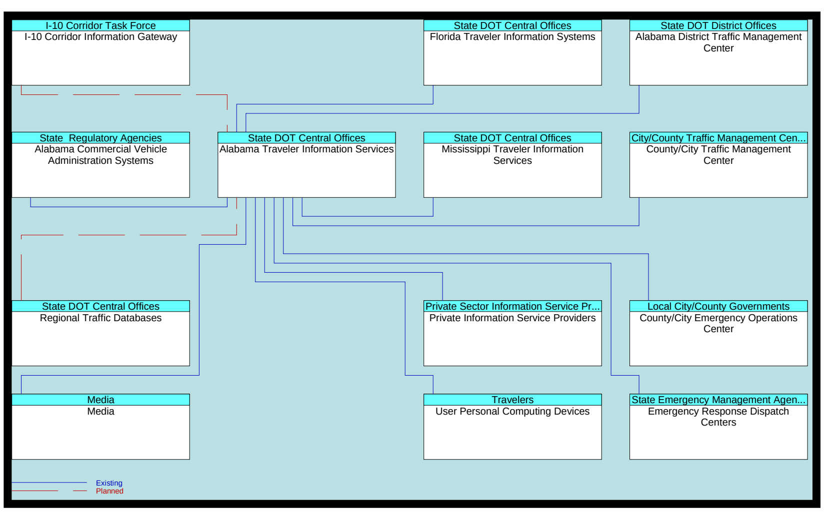

I-10 Corridor Task Force
I-10 Corridor Information Gateway
Private Sector Information Service Pr...
Private Information Service Providers
State Regulatory Agencies
Statewide Toll Administrations
State DOT District Offices
Florida District Traffic Management Center
State DOT Central Offices
Alabama Traveler Information Services
State DOT District Offices
Alabama District Traffic Management Center
State ITS Departments
Alabama ITS Field Equipment
State Traffic Management Centers
Mississippi District Traffic Management Center
City/County Traffic Management Cen...
County/City Traffic Management Center
State DOT Central Offices
Maintenance Dispatch
Media
Media
State DOT Central Offices
Regional Traffic Databases
State Emergency Management Agen...
Emergency Response Dispatch Centers
Local City/County Governments
County/City Emergency Operations Center
Existing
Planned

6



State DOT District Offices
Alabama District Traffic Management Center
City/County Traffic Management Cen...
County/City Traffic Management Center
State DOT Central Offices
Regional Traffic Databases
State ITS Departments
Alabama ITS Field Equipment
Travelers
In-Vehicle Electronic Tags
Planned

7



I-10 Corridor Task Force
I-10 Corridor Information Gateway
State DOT Central Offices
Florida Traveler Information Systems
State DOT District Offices
Alabama District Traffic Management Center
State Regulatory Agencies
Alabama Commercial Vehicle Administration Systems
State DOT Central Offices
Alabama Traveler Information Services
State DOT Central Offices
Mississippi Traveler Information Services
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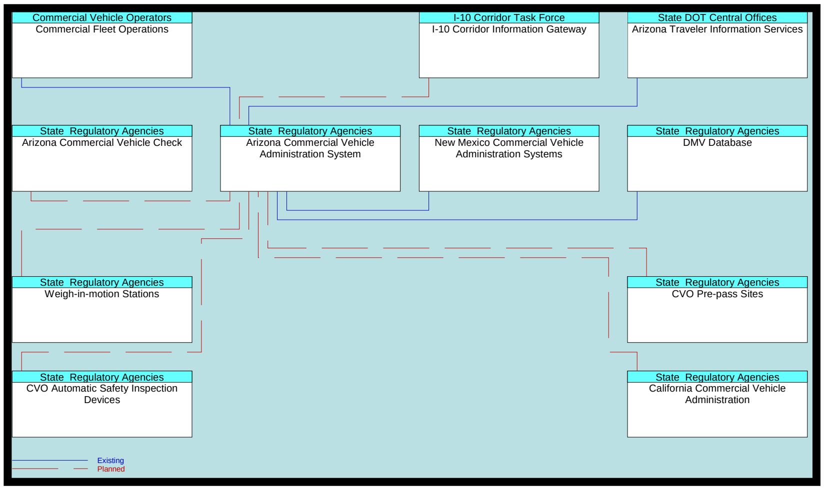
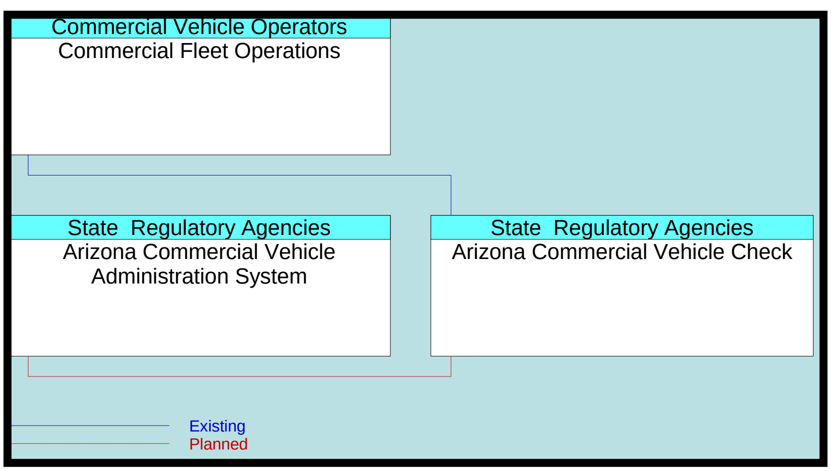
County/City Traffic Management Center
State DOT Central Offices
Regional Traffic Databases
Private Sector Information Service Pr...
Private Information Service Providers
Local City/County Governments
County/City Emergency Operations Center
Media
Media
Travelers
User Personal Computing Devices
State Emergency Management Agen...
Emergency Response Dispatch Centers
Existing
Planned

8



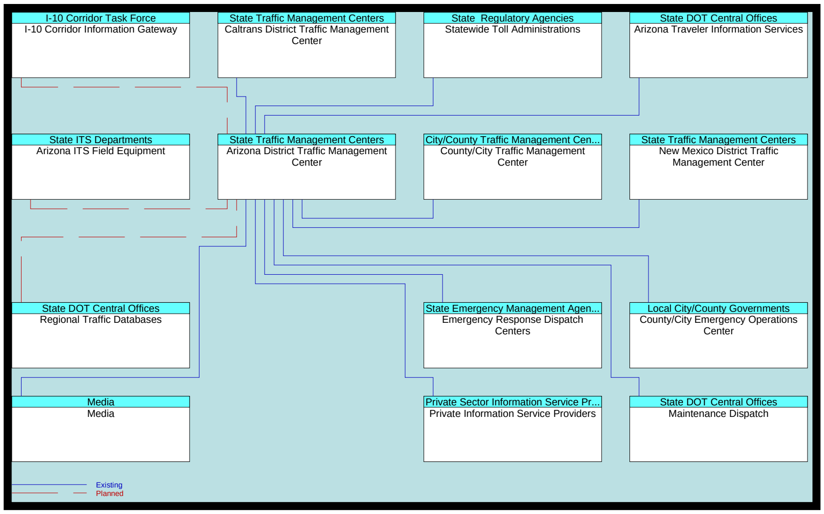
Commercial Vehicle Operators
Commercial Fleet Operations
I-10 Corridor Task Force
I-10 Corridor Information Gateway
State DOT Central Offices
Arizona Traveler Information Services
State Regulatory Agencies
Arizona Commercial Vehicle Check
State Regulatory Agencies
Arizona Commercial Vehicle Administration System
State Regulatory Agencies
New Mexico Commercial Vehicle Administration Systems
State Regulatory Agencies
DMV Database
State Regulatory Agencies
Weigh-in-motion Stations
State Regulatory Agencies
CVO Pre-pass Sites
State Regulatory Agencies
CVO Automatic Safety Inspection Devices
State Regulatory Agencies
California Commercial Vehicle Administration
Existing
Planned

9



Commercial Vehicle Operators
Commercial Fleet Operations
State Regulatory Agencies
Arizona Commercial Vehicle Administration System
State Regulatory Agencies
Arizona Commercial Vehicle Check
Existing
Planned

10



I-10 Corridor Task Force
I-10 Corridor Information Gateway
State Traffic Management Centers
Caltrans District Traffic Management Center
State Regulatory Agencies
Statewide Toll Administrations
State DOT Central Offices
Arizona Traveler Information Services
State ITS Departments
Arizona ITS Field Equipment
State Traffic Management Centers
Arizona District Traffic Management Center
City/County Traffic Management Cen...
County/City Traffic Management Center
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New Mexico District Traffic Management Center
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State Emergency Management Agen...
Emergency Response Dispatch Centers
Local City/County Governments
County/City Emergency Operations Center
Media
Media
Private Sector Information Service Pr...
Private Information Service Providers
State DOT Central Offices
Maintenance Dispatch
Existing
Planned

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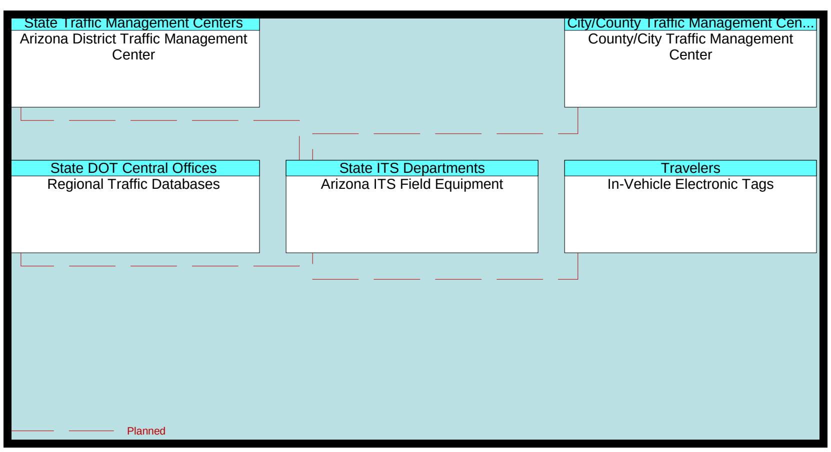

State Traffic Management Centers
Arizona District Traffic Management Center
City/County Traffic Management Cen...
County/City Traffic Management Center
State DOT Central Offices
Regional Traffic Databases
State ITS Departments
Arizona ITS Field Equipment
Travelers
In-Vehicle Electronic Tags
Planned

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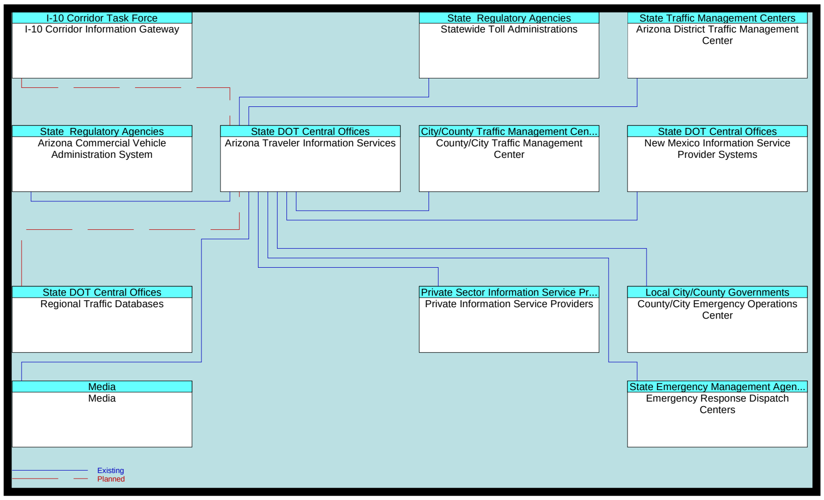
I-10 Corridor Task Force
I-10 Corridor Information Gateway
State Regulatory Agencies
Statewide Toll Administrations
State Traffic Management Centers
Arizona District Traffic Management Center
State Regulatory Agencies
Arizona Commercial Vehicle Administration System
State DOT Central Offices
Arizona Traveler Information Services
City/County Traffic Management Cen...
County/City Traffic Management Center
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State DOT Central Offices
Regional Traffic Databases
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Private Information Service Providers
Local City/County Governments
County/City Emergency Operations Center
Media
Media
State Emergency Management Agen...
Emergency Response Dispatch Centers
Existing
Planned

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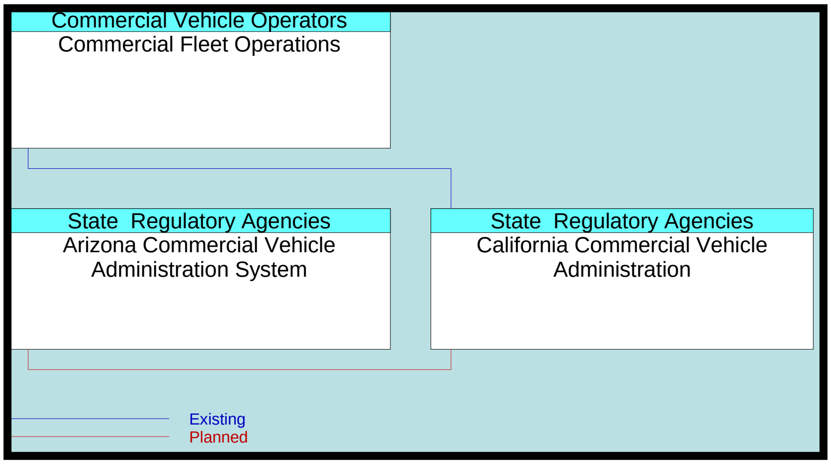
Commercial Vehicle Operators
Commercial Fleet Operations
State Regulatory Agencies
Arizona Commercial Vehicle Administration System
State Regulatory Agencies
California Commercial Vehicle Administration
Existing
Planned

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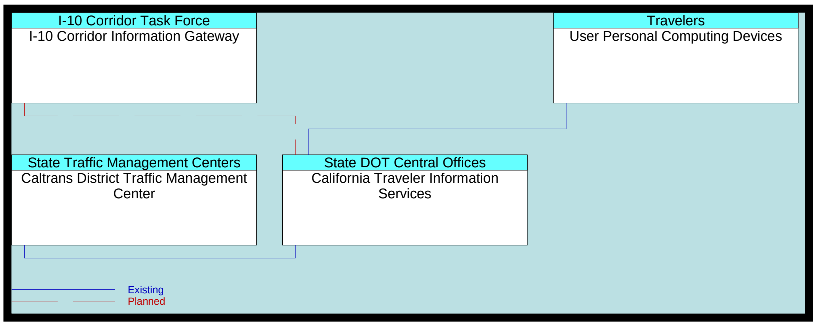
I-10 Corridor Task Force
I-10 Corridor Information Gateway
Travelers
User Personal Computing Devices
State Traffic Management Centers
Caltrans District Traffic Management Center
State DOT Central Offices
California Traveler Information Services
Existing
Planned

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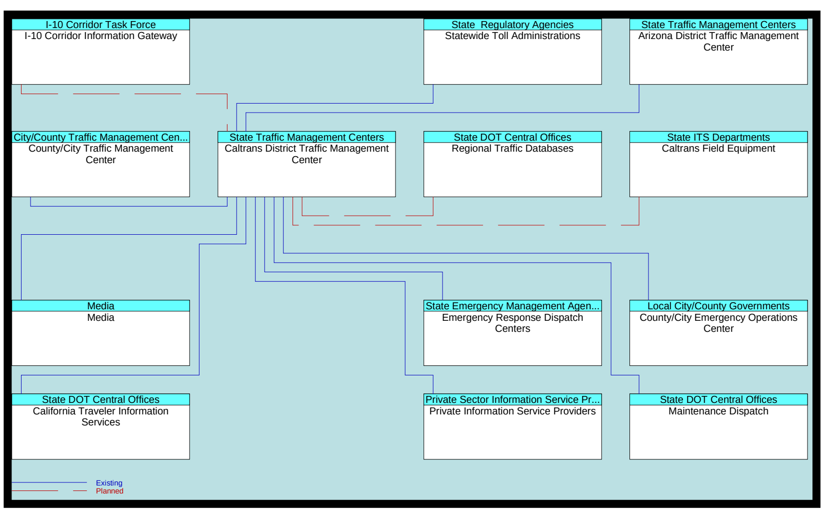
I-10 Corridor Task Force
I-10 Corridor Information Gateway
State Regulatory Agencies
Statewide Toll Administrations
State Traffic Management Centers
Arizona District Traffic Management Center
City/County Traffic Management Cen...
County/City Traffic Management Center
State Traffic Management Centers
Caltrans District Traffic Management Center
State DOT Central Offices
Regional Traffic Databases
State ITS Departments
Caltrans Field Equipment
Media
Media
State Emergency Management Agen...
Emergency Response Dispatch Centers
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County/City Emergency Operations Center
State DOT Central Offices
California Traveler Information Services
Private Sector Information Service Pr...
Private Information Service Providers
State DOT Central Offices
Maintenance Dispatch
Existing
Planned

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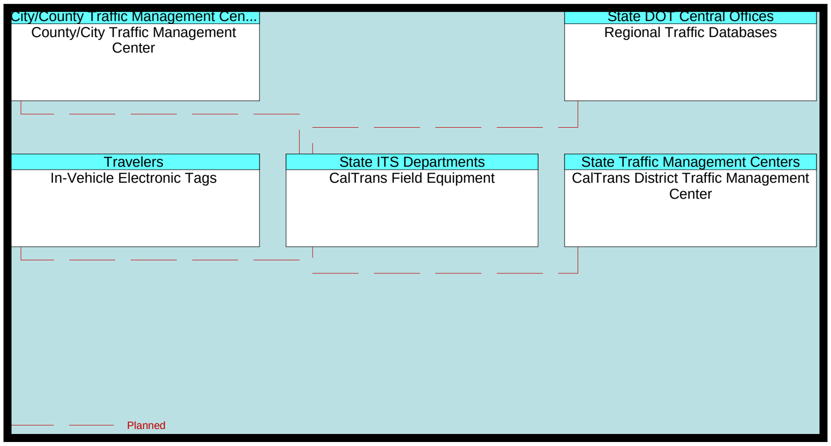
City/County Traffic Management Cen...
County/City Traffic Management Center
State DOT Central Offices
Regional Traffic Databases
Travelers
In-Vehicle Electronic Tags
State ITS Departments
CalTrans Field Equipment
State Traffic Management Centers
CalTrans District Traffic Management Center
Planned

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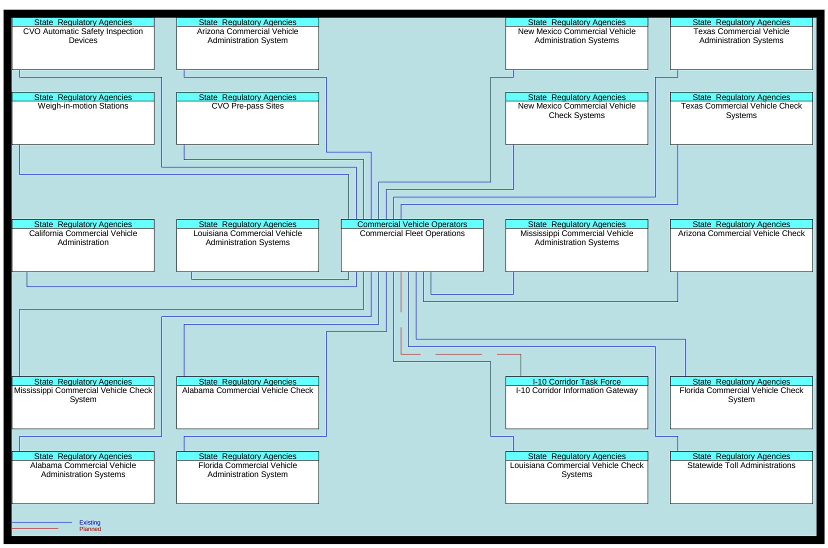
State Regulatory Agencies
CVO Automatic Safety Inspection Devices
State Regulatory Agencies
Arizona Commercial Vehicle Administration System
State Regulatory Agencies
New Mexico Commercial Vehicle Administration Systems
State Regulatory Agencies
Texas Commercial Vehicle Administration Systems
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New Mexico Commercial Vehicle Check Systems
State Regulatory Agencies
Texas Commercial Vehicle Check Systems
State Regulatory Agencies
California Commercial Vehicle Administration
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Louisiana Commercial Vehicle Administration Systems
Commercial Vehicle Operators
Commercial Fleet Operations
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Mississippi Commercial Vehicle Administration Systems
State Regulatory Agencies
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Mississippi Commercial Vehicle Check System
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Alabama Commercial Vehicle Administration Systems
State Regulatory Agencies
Florida Commercial Vehicle Administration Systems
State Regulatory Agencies
Louisiana Commercial Vehicle Check Systems
State Regulatory Agencies
Statewide Toll Administrations
Existing
Planned

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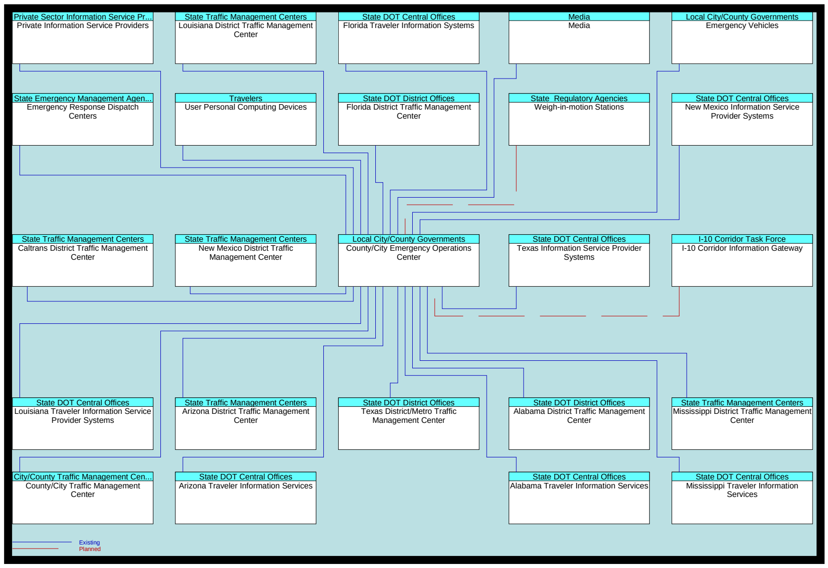

Private Sector Information Service Pr...
Private Information Service Providers
State Traffic Management Centers
Louisiana District Traffic Management Center
State DOT Central Offices
Florida Traveler Information Systems
Media
Media
Local City/County Governments
Emergency Vehicles
State Emergency Management Agen...
Emergency Response Dispatch Centers
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State Regulatory Agencies
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New Mexico Information Service Provider Systems
State Traffic Management Centers
Caltrans District Traffic Management Center
State Traffic Management Centers
New Mexico District Traffic Management Center
Local City/County Governments
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State DOT Central Offices
Texas Information Service Provider Systems
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State DOT District Offices
Texas District/Metro Traffic Management Center
State DOT District Offices
Alabama District Traffic Management Center
State Traffic Management Centers
Mississippi District Traffic Management Center
City/County Traffic Management Cen...
County/City Traffic Management Center
State DOT Central Offices
Arizona Traveler Information Services
State DOT Central Offices
Alabama Traveler Information Services
State DOT Central Offices
Mississippi Traveler Information Services
Existing
Planned

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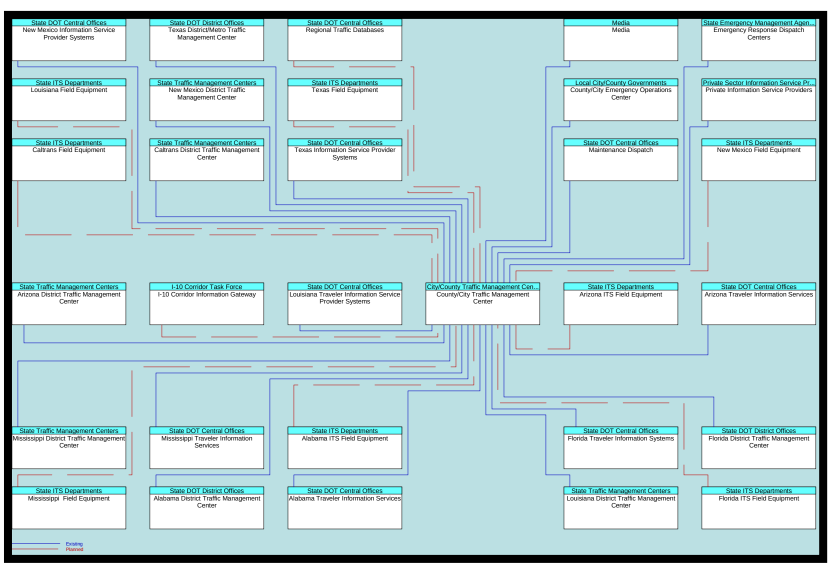

State DOT Central Offices
New Mexico Information Service Provider Systems
State DOT District Offices
Texas District/Metro Traffic Management Center
State DOT Central Offices
Regional Traffic Databases
Media
Media
State Emergency Management Agen...
Emergency Response Dispatch Centers
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Private Sector Information Service Pr...
Private Information Service Providers
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Caltrans Field Equipment
State Traffic Management Centers
Caltrans District Traffic Management Center
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State ITS Departments
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State Traffic Management Centers
Mississippi District Traffic Management Center
State DOT Central Offices
Mississippi Traveler Information Services
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State DOT District Offices
Alabama District Traffic Management Center
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Alabama Traveler Information Services
State Traffic Management Centers
Louisiana District Traffic Management Center
State ITS Departments
Florida ITS Field Equipment
Existing
Planned

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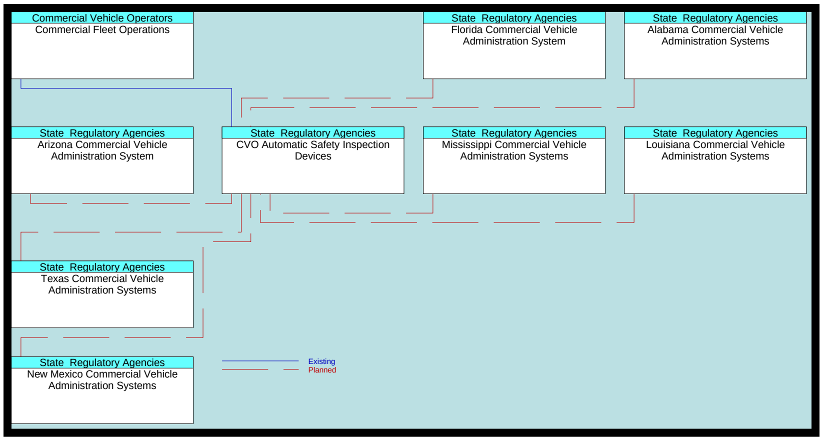
Commercial Vehicle Operators
Commercial Fleet Operations
State Regulatory Agencies
Florida Commercial Vehicle Administration System
State Regulatory Agencies
Alabama Commercial Vehicle Administration Systems
State Regulatory Agencies
Arizona Commercial Vehicle Administration System
State Regulatory Agencies
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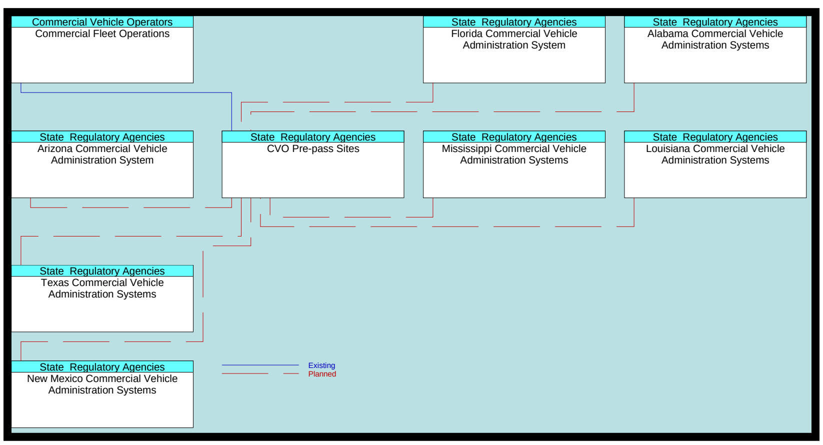
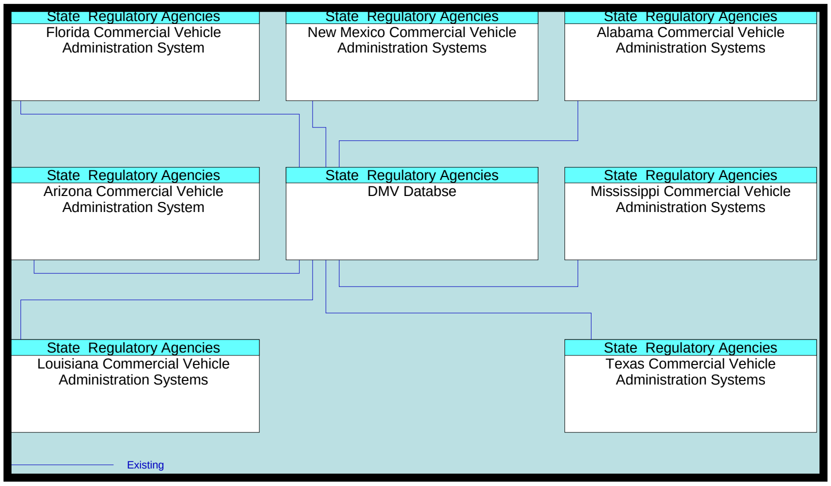
State Regulatory Agencies
New Mexico Commercial Vehicle Administration Systems
Existing
Planned

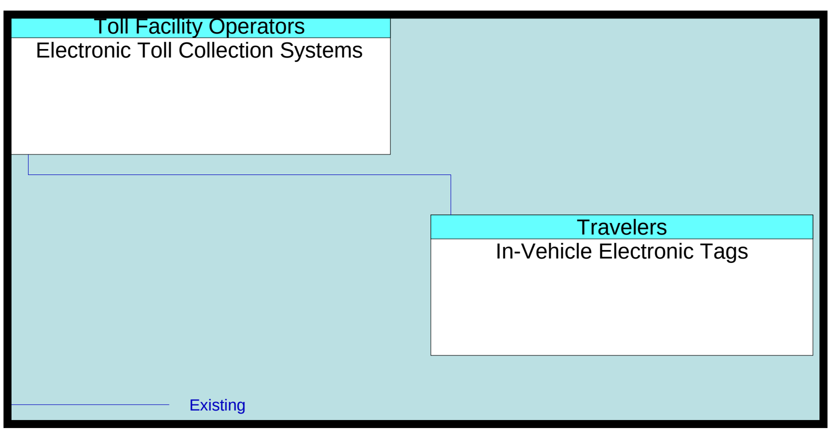
21


Commercial Vehicle Operators
Commercial Fleet Operations
State Regulatory Agencies
Florida Commercial Vehicle Administration System
State Regulatory Agencies
Alabama Commercial Vehicle Administration Systems
State Regulatory Agencies
Arizona Commercial Vehicle Administration System
State Regulatory Agencies
CVO Pre-pass Sites
State Regulatory Agencies
Mississippi Commercial Vehicle Administration Systems
State Regulatory Agencies
Louisiana Commercial Vehicle Administration Systems
State Regulatory Agencies
Texas Commercial Vehicle Administration Systems
State Regulatory Agencies
New Mexico Commercial Vehicle Administration Systems
Existing
Planned

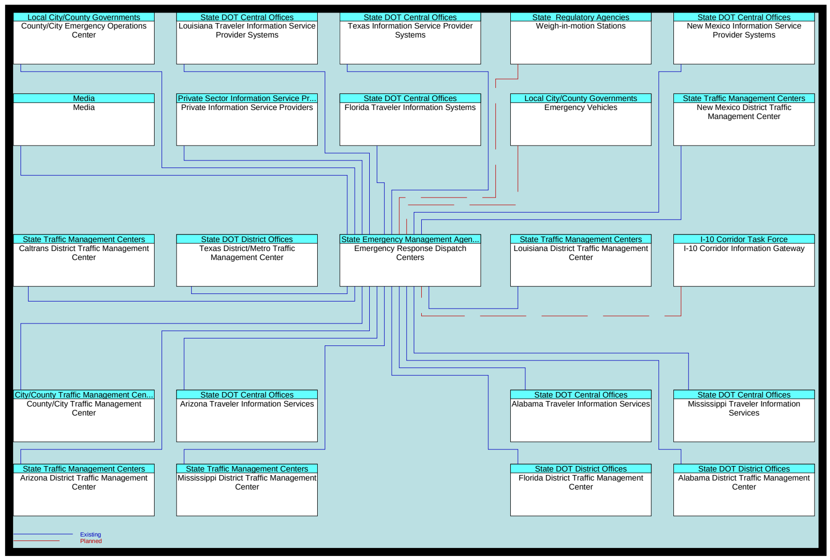
22


State Regulatory Agencies
Florida Commercial Vehicle Administration System
State Regulatory Agencies
New Mexico Commercial Vehicle Administration Systems
State Regulatory Agencies
Alabama Commercial Vehicle Administration Systems
State Regulatory Agencies
Arizona Commercial Vehicle Administration System
State Regulatory Agencies
DMV Databse
State Regulatory Agencies
Mississippi Commercial Vehicle Administration Systems
State Regulatory Agencies
Louisiana Commercial Vehicle Administration Systems
State Regulatory Agencies
Texas Commercial Vehicle Administration Systems
Existing

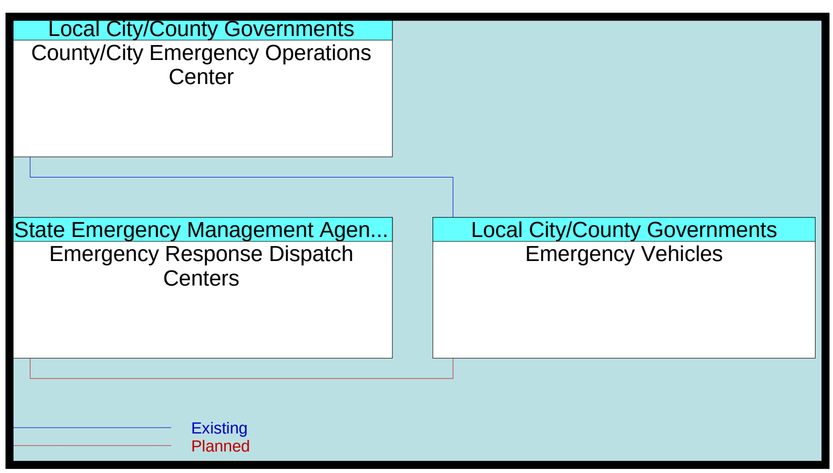
23


Toll Facility Operators
Electronic Toll Collection Systems
Travelers
In-Vehicle Electronic Tags
Existing

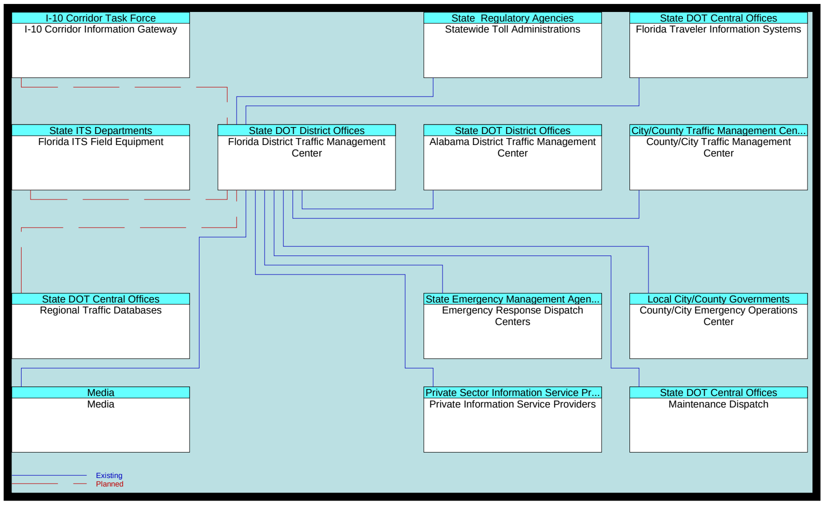
24


Local City/County Governments
County/City Emergency Operations Center
State DOT Central Offices
Louisiana Traveler Information Service Provider Systems
State DOT Central Offices
Texas Information Service Provider Systems
State Regulatory Agencies
Weigh-in-motion Stations
State DOT Central Offices
New Mexico Information Service Provider Systems
Media
Media
Private Sector Information Service Pr...
Private Information Service Providers
State DOT Central Offices
Florida Traveler Information Systems
Local City/County Governments
Emergency Vehicles
State Traffic Management Centers
New Mexico District Traffic Management Center
State Traffic Management Centers
Caltrans District Traffic Management Center
State DOT District Offices
Texas District/Metro Traffic Management Center
State Emergency Management Agen...
Emergency Response Dispatch Centers
State Traffic Management Centers
Louisiana District Traffic Management Center
I-10 Corridor Task Force
I-10 Corridor Information Gateway
City/County Traffic Management Cen...
County/City Traffic Management Center
State DOT Central Offices
Arizona Traveler Information Services
State DOT Central Offices
Alabama Traveler Information Services
State DOT Central Offices
Mississippi Traveler Information Services
State Traffic Management Centers
Arizona District Traffic Management Center
State Traffic Management Centers
Mississippi District Traffic Management Center
State DOT District Offices
Florida District Traffic Management Center
State DOT District Offices
Alabama District Traffic Management Center
Existing
Planned

25

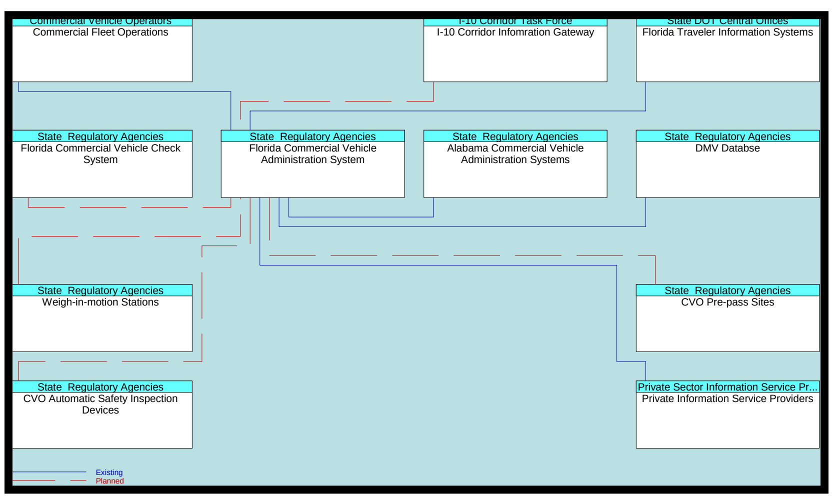

Local City/County Governments
County/City Emergency Operations Center
State Emergency Management Agen...
Emergency Response Dispatch Centers
Local City/County Governments
Emergency Vehicles
Existing
Planned

26



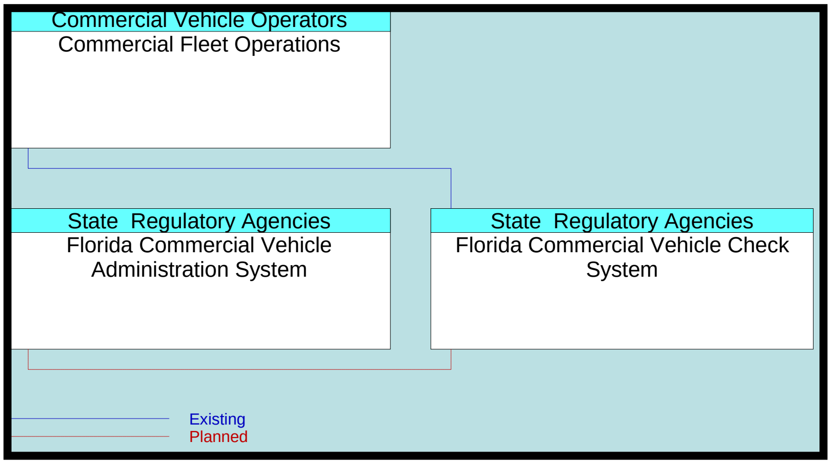
I-10 Corridor Task Force
I-10 Corridor Information Gateway
State Regulatory Agencies
Statewide Toll Administrations
State DOT Central Offices
Florida Traveler Information Systems
State ITS Departments
Florida ITS Field Equipment
State DOT District Offices
Florida District Traffic Management Center
State DOT District Offices
Alabama District Traffic Management Center
City/County Traffic Management Cen...
County/City Traffic Management Center
State DOT Central Offices
Regional Traffic Databases
State Emergency Management Agen...
Emergency Response Dispatch Centers
Local City/County Governments
County/City Emergency Operations Center
Media
Media
Private Sector Information Service Pr...
Private Information Service Providers
State DOT Central Offices
Maintenance Dispatch
Existing
Planned

27

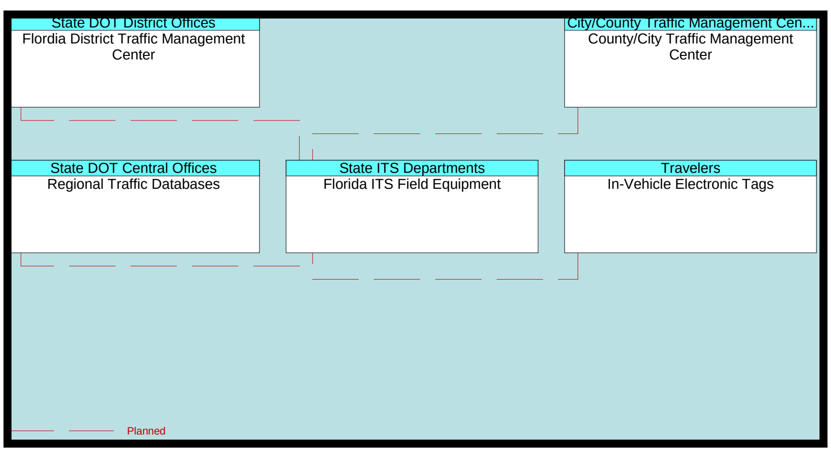


Commercial Vehicle Operators
Commercial Fleet Operations
I-10 Corridor Task Force
I-10 Corridor Infomration Gateway
State DOT Central Offices
Florida Traveler Information Systems
State Regulatory Agencies
Florida Commercial Vehicle Check System
State Regulatory Agencies
Florida Commercial Vehicle Administration System
State Regulatory Agencies
Alabama Commercial Vehicle Administration Systems
State Regulatory Agencies
DMV Databse
State Regulatory Agencies
Weigh-in-motion Stations
State Regulatory Agencies
CVO Pre-pass Sites
State Regulatory Agencies
CVO Automatic Safety Inspection Devices
Private Sector Information Service Pr...
Private Information Service Providers
Existing
Planned

28


Commercial Vehicle Operators
Commercial Fleet Operations
State Regulatory Agencies
Florida Commercial Vehicle Administration System
State Regulatory Agencies
Florida Commercial Vehicle Check System
Existing
Planned

29


State DOT District Offices
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City/County Traffic Management Cen...
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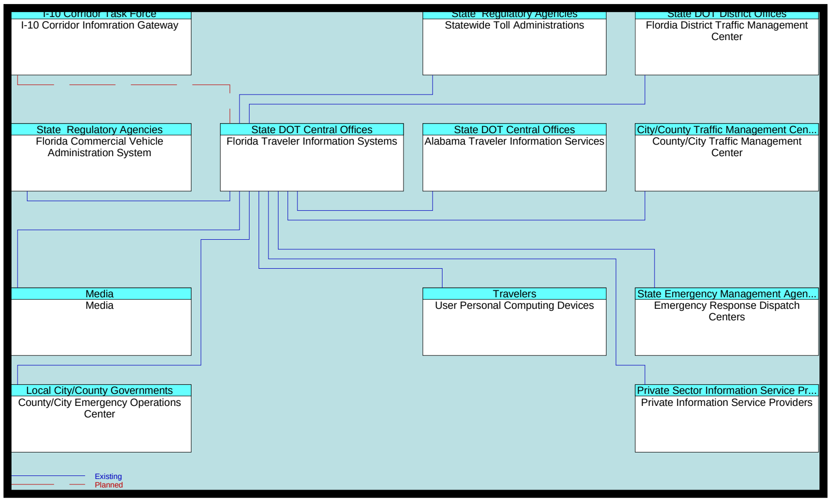
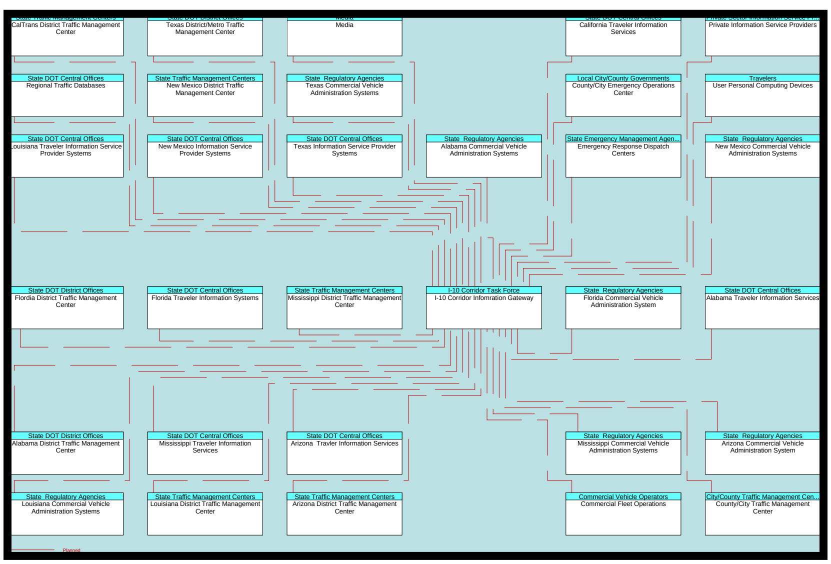
State DOT Central Offices
Regional Traffic Databases
State ITS Departments
Florida ITS Field Equipment
Travelers
In-Vehicle Electronic Tags
Planned

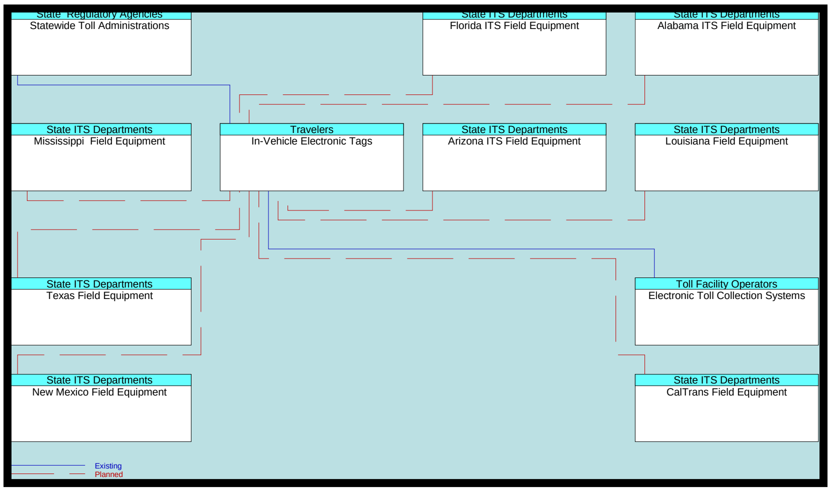
30


I-10 Corridor Task Force
I-10 Corridor Infomration Gateway
State Regulatory Agencies
Statewide Toll Administrations
State DOT District Offices
Flordia District Traffic Management Center
State Regulatory Agencies
Florida Commercial Vehicle Administration System
State DOT Central Offices
Florida Traveler Information Systems
State DOT Central Offices
Alabama Traveler Information Services
City/County Traffic Management Cen...
County/City Traffic Management Center
Media
Media
Travelers
User Personal Computing Devices
State Emergency Management Agen...
Emergency Response Dispatch Centers
Local City/County Governments
County/City Emergency Operations Center
Private Sector Information Service Pr...
Private Information Service Providers
Existing
Planned

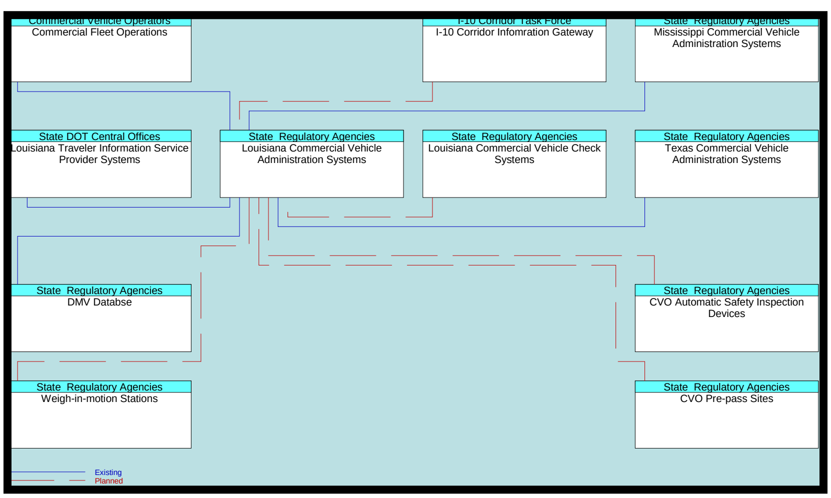
31


CalTrans District Traffic Management Center
Texas District/Metro Traffic Management Center
Media
California Traveler Information Services
Private Information Service Providers
State DOT Central Offices
Regional Traffic Databases
State Traffic Management Centers
New Mexico District Traffic Management Center
State Regulatory Agencies
Texas Commercial Vehicle Administration Systems
Local City/County Governments
County/City Emergency Operations Center
Travelers
User Personal Computing Devices
State DOT Central Offices
Louisiana Traveler Information Service Provider Systems
State DOT Central Offices
New Mexico Information Service Provider Systems
State DOT Central Offices
Texas Information Service Provider Systems
State Regulatory Agencies
Alabama Commercial Vehicle Administration Systems
State Emergency Management Agen...
Emergency Response Dispatch Centers
State Regulatory Agencies
New Mexico Commercial Vehicle Administration Systems
State DOT District Offices
Flordia District Traffic Management Center
State DOT Central Offices
Florida Traveler Information Systems
State Traffic Management Centers
Mississippi District Traffic Management Center
I-10 Corridor Task Force
I-10 Corridor Infomration Gateway
State Regulatory Agencies
Florida Commercial Vehicle Administration System
State DOT Central Offices
Alabama Traveler Information Services
State DOT District Offices
Alabama District Traffic Management Center
State DOT Central Offices
Mississippi Traveler Information Services
State DOT Central Offices
Arizona Travler Information Services
State Regulatory Agencies
Mississippi Commercial Vehicle Administration Systems
State Regulatory Agencies
Arizona Commercial Vehicle Administration System
State Regulatory Agencies
Louisiana Commercial Vehicle Administration Systems
State Traffic Management Centers
Louisiana District Traffic Management Center
State Traffic Management Centers
Arizona District Traffic Management Center
Commercial Vehicle Operators
Commercial Fleet Operations
City/County Traffic Management Cen...
County/City Traffic Management Center
Planned

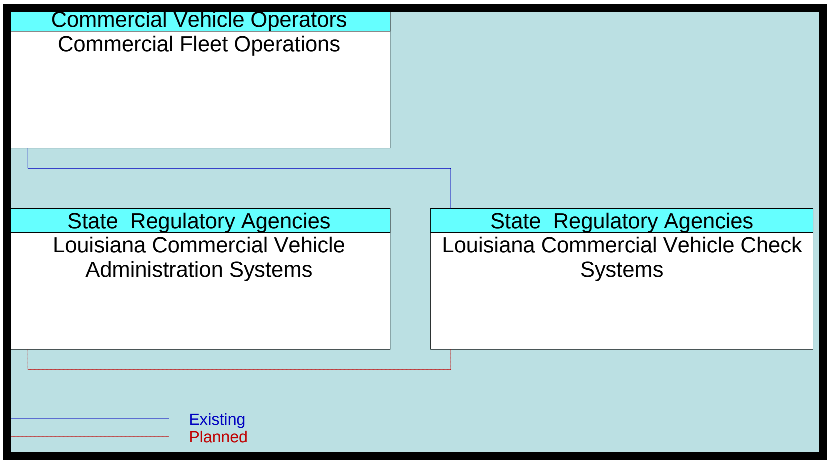
32


State Regulatory Agencies
Statewide Toll Administrations
State ITS Departments
Florida ITS Field Equipment
State ITS Departments
Alabama ITS Field Equipment
State ITS Departments
Mississippi Field Equipment
Travelers
In-Vehicle Electronic Tags
State ITS Departments
Arizona ITS Field Equipment
State ITS Departments
Louisiana Field Equipment
State ITS Departments
Texas Field Equipment
Toll Facility Operators
Electronic Toll Collection Systems
State ITS Departments
New Mexico Field Equipment
State ITS Departments
CalTrans Field Equipment
Existing
Planned

33

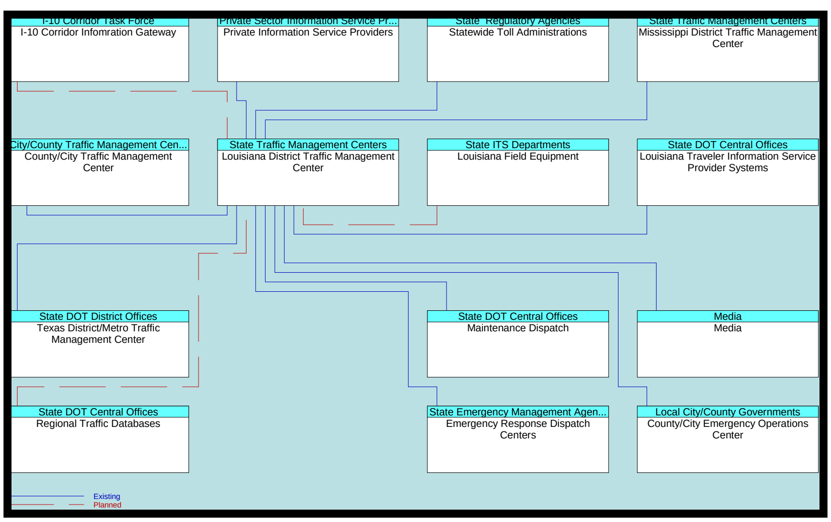

Commercial Vehicle Operators
Commercial Fleet Operations
I-10 Corridor Task Force
I-10 Corridor Infomration Gateway
State Regulatory Agencies
Mississippi Commercial Vehicle Administration Systems
State DOT Central Offices
Louisiana Traveler Information Service Provider Systems
State Regulatory Agencies
Louisiana Commercial Vehicle Administration Systems
State Regulatory Agencies
Louisiana Commercial Vehicle Check Systems
State Regulatory Agencies
Texas Commercial Vehicle Administration Systems
State Regulatory Agencies
DMV Databse
State Regulatory Agencies
CVO Automatic Safety Inspection Devices
State Regulatory Agencies
Weigh-in-motion Stations
State Regulatory Agencies
CVO Pre-pass Sites
Existing
Planned

34



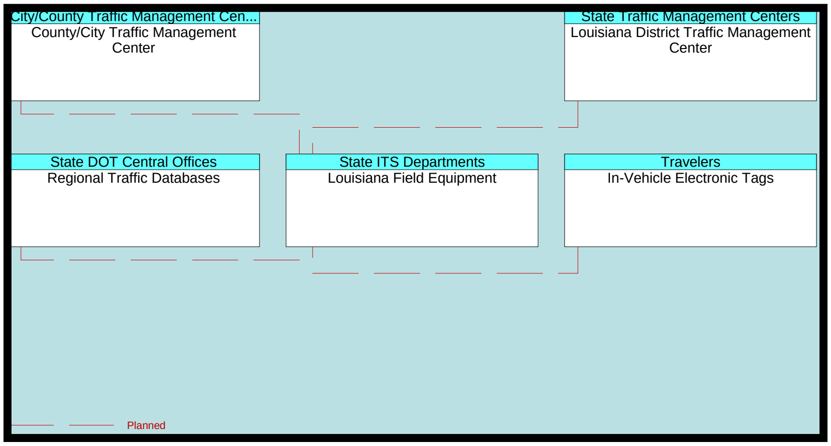
Commercial Vehicle Operators
Commercial Fleet Operations
State Regulatory Agencies
Louisiana Commercial Vehicle Administration Systems
State Regulatory Agencies
Louisiana Commercial Vehicle Check Systems
Existing
Planned

35

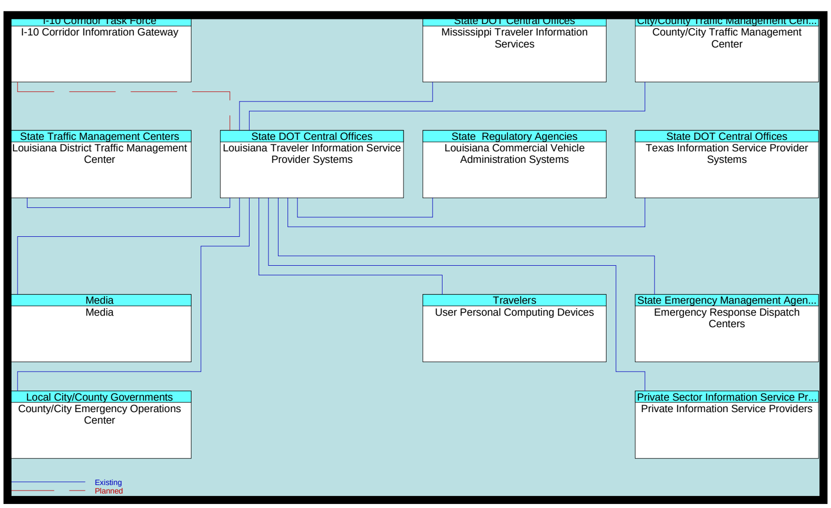


I-10 Corridor Task Force
I-10 Corridor Infomration Gateway
Private Sector Information Service Pr...
Private Information Service Providers
State Regulatory Agencies
Statewide Toll Administrations
State Traffic Management Centers
Mississippi District Traffic Management Center
City/County Traffic Management Cen...
County/City Traffic Management Center
State Traffic Management Centers
Louisiana District Traffic Management Center
State ITS Departments
Louisiana Field Equipment
State DOT Central Offices
Louisiana Traveler Information Service Provider Systems
State DOT District Offices
Texas District/Metro Traffic Management Center
State DOT Central Offices
Maintenance Dispatch
Media
Media
State DOT Central Offices
Regional Traffic Databases
State Emergency Management Agen...
Emergency Response Dispatch Centers
Local City/County Governments
County/City Emergency Operations Center
Existing
Planned

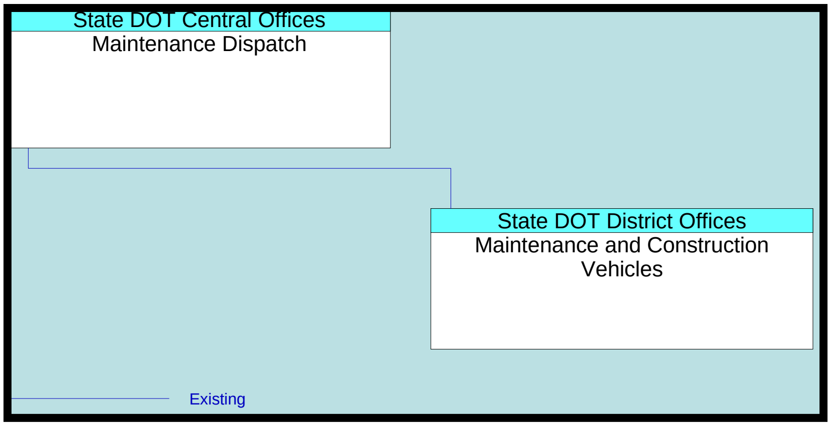
36


City/County Traffic Management Cen...
County/City Traffic Management Center
State Traffic Management Centers
Louisiana District Traffic Management Center
State DOT Central Offices
Regional Traffic Databases
State ITS Departments
Louisiana Field Equipment
Travelers
In-Vehicle Electronic Tags
Planned

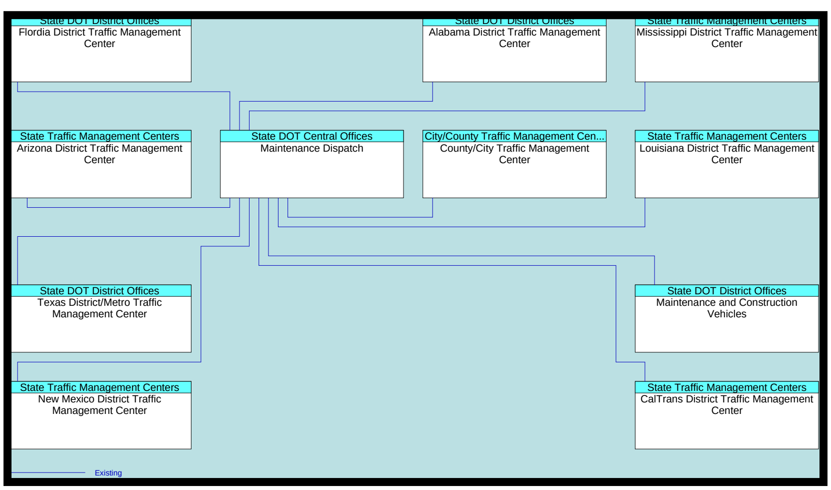
37


I-10 Corridor Task Force
I-10 Corridor Infomration Gateway
State DOT Central Offices
Mississippi Traveler Information Services
City/County Traffic Management Cen...
County/City Traffic Management Center
State Traffic Management Centers
Louisiana District Traffic Management Center
State DOT Central Offices
Louisiana Traveler Information Service Provider Systems
State Regulatory Agencies
Louisiana Commercial Vehicle Administration Systems
State DOT Central Offices
Texas Information Service Provider Systems
Media
Media
Travelers
User Personal Computing Devices
State Emergency Management Agen...
Emergency Response Dispatch Centers
Local City/County Governments
County/City Emergency Operations Center
Private Sector Information Service Pr...
Private Information Service Providers
Existing
Planned

38


State DOT Central Offices
Maintenance Dispatch
State DOT District Offices
Maintenance and Construction Vehicles
Existing

39


State DOT District Offices
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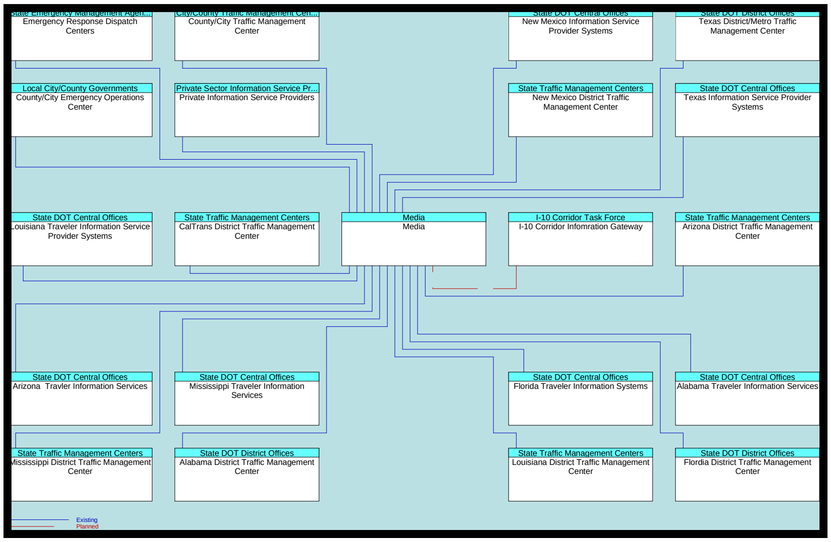
State DOT District Offices
Alabama District Traffic Management Center
State Traffic Management Centers
Mississippi District Traffic Management Center
State Traffic Management Centers
Arizona District Traffic Management Center
State DOT Central Offices
Maintenance Dispatch
City/County Traffic Management Cen...
County/City Traffic Management Center
State Traffic Management Centers
Louisiana District Traffic Management Center
State DOT District Offices
Texas District/Metro Traffic Management Center
State DOT District Offices
Maintenance and Construction Vehicles
State Traffic Management Centers
New Mexico District Traffic Management Center
State Traffic Management Centers
CalTrans District Traffic Management Center
Existing

40


State Emergency Management Agen...
Emergency Response Dispatch Centers
City/County Traffic Management Cen...
County/City Traffic Management Center
State DOT Central Offices
New Mexico Information Service Provider Systems
State DOT District Offices
Texas District/Metro Traffic Management Center
Local City/County Governments
County/City Emergency Operations Center
Private Sector Information Service Pr...
Private Information Service Providers
State Traffic Management Centers
New Mexico District Traffic Management Center
State DOT Central Offices
Texas Information Service Provider Systems
State DOT Central Offices
Louisiana Traveler Information Service Provider Systems
State Traffic Management Centers
CalTrans District Traffic Management Center
Media
Media
I-10 Corridor Task Force
I-10 Corridor Infomration Gateway
State Traffic Management Centers
Arizona District Traffic Management Center
State DOT Central Offices
Arizona Travler Information Services
State DOT Central Offices
Mississippi Traveler Information Services
State DOT Central Offices
Florida Traveler Information Systems
State DOT Central Offices
Alabama Traveler Information Services
State Traffic Management Centers
Mississippi District Traffic Management Center
State DOT District Offices
Alabama District Traffic Management Center
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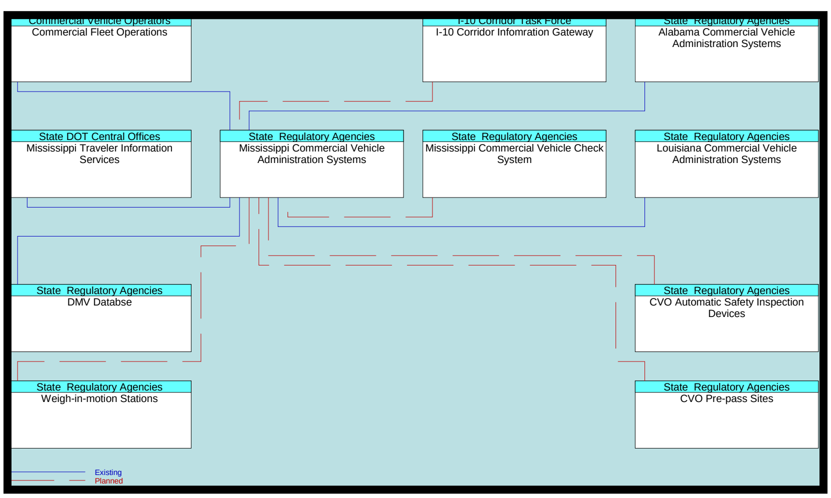
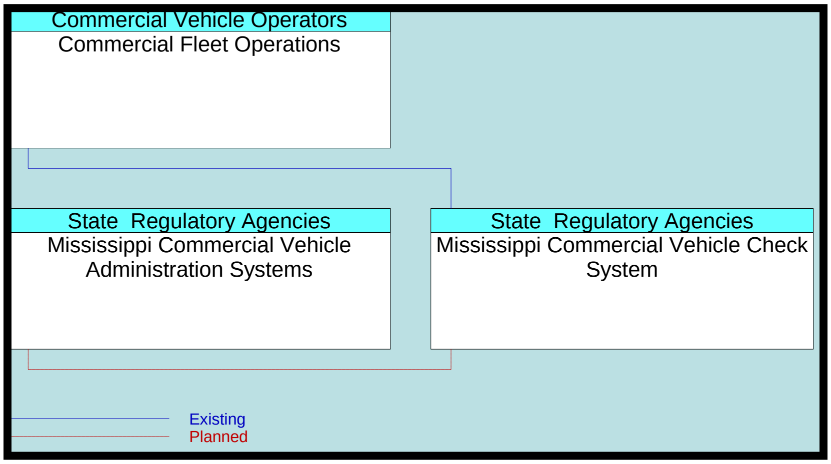
Louisiana District Traffic Management Center
State DOT District Offices
Flordia District Traffic Management Center
Existing
Planned

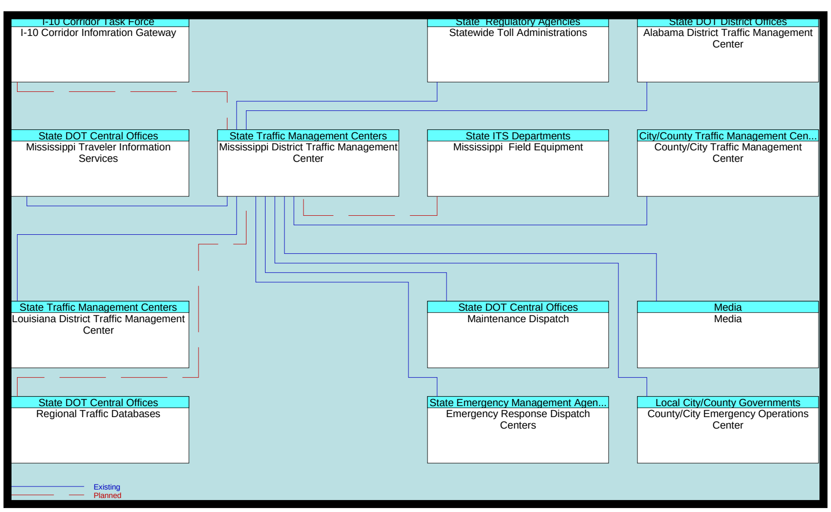
41


Commercial Vehicle Operators
Commercial Fleet Operations
I-10 Corridor Task Force
I-10 Corridor Infomration Gateway
State Regulatory Agencies
Alabama Commercial Vehicle Administration Systems
State DOT Central Offices
Mississippi Traveler Information Services
State Regulatory Agencies
Mississippi Commercial Vehicle Administration Systems
State Regulatory Agencies
Mississippi Commercial Vehicle Check System
State Regulatory Agencies
Louisiana Commercial Vehicle Administration Systems
State Regulatory Agencies
DMV Databse
State Regulatory Agencies
CVO Automatic Safety Inspection Devices
State Regulatory Agencies
Weigh-in-motion Stations
State Regulatory Agencies
CVO Pre-pass Sites
Existing
Planned

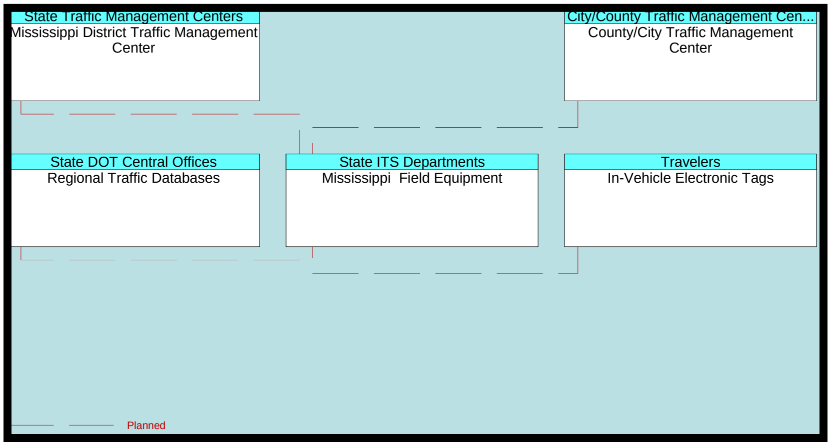
42


Commercial Vehicle Operators
Commercial Fleet Operations
State Regulatory Agencies
Mississippi Commercial Vehicle Administration Systems
State Regulatory Agencies
Mississippi Commercial Vehicle Check System
Existing
Planned

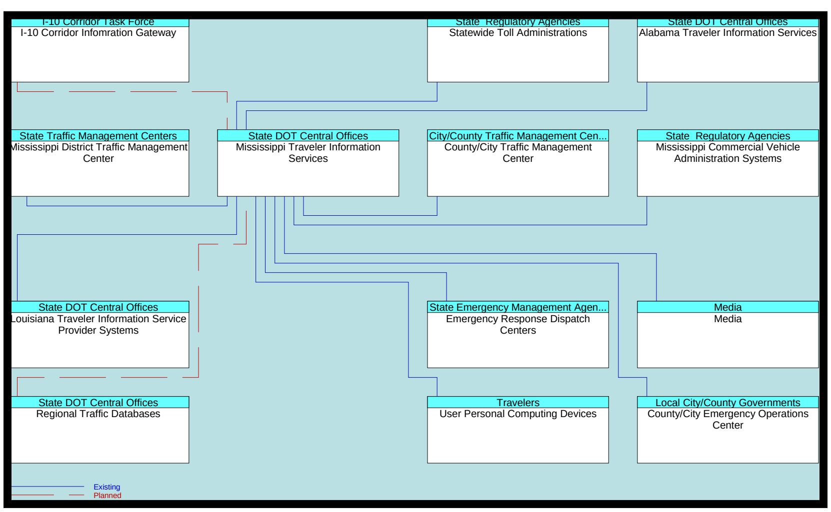
43


I-10 Corridor Task Force
I-10 Corridor Infomration Gateway
State Regulatory Agencies
Statewide Toll Administrations
State DOT District Offices
Alabama District Traffic Management Center
State DOT Central Offices
Mississippi Traveler Information Services
State Traffic Management Centers
Mississippi District Traffic Management Center
State ITS Departments
Mississippi Field Equipment
City/County Traffic Management Cen...
County/City Traffic Management Center
State Traffic Management Centers
Louisiana District Traffic Management Center
State DOT Central Offices
Maintenance Dispatch
Media
Media
State DOT Central Offices
Regional Traffic Databases
State Emergency Management Agen...
Emergency Response Dispatch Centers
Local City/County Governments
County/City Emergency Operations Center
Existing
Planned

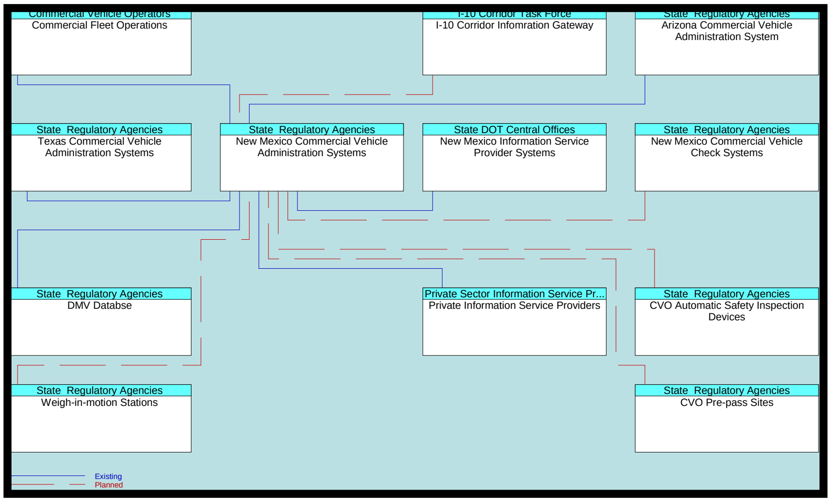
44


State Traffic Management Centers
Mississippi District Traffic Management Center
City/County Traffic Management Cen...
County/City Traffic Management Center
State DOT Central Offices
Regional Traffic Databases
State ITS Departments
Mississippi Field Equipment
Travelers
In-Vehicle Electronic Tags
Planned

45

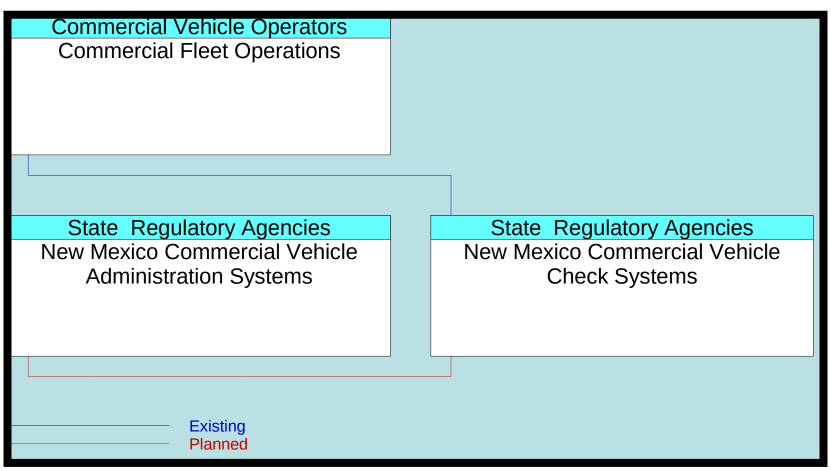

I-10 Corridor Task Force
I-10 Corridor Infomration Gateway
State Regulatory Agencies
Statewide Toll Administrations
State DOT Central Offices
Alabama Traveler Information Services
State Traffic Management Centers
Mississippi District Traffic Management Center
State DOT Central Offices
Mississippi Traveler Information Services
City/County Traffic Management Cen...
County/City Traffic Management Center
State Regulatory Agencies
Mississippi Commercial Vehicle Administration Systems
State DOT Central Offices
Louisiana Traveler Information Service Provider Systems
State Emergency Management Agen...
Emergency Response Dispatch Centers
Media
Media
State DOT Central Offices
Regional Traffic Databases
Travelers
User Personal Computing Devices
Local City/County Governments
County/City Emergency Operations Center
Existing
Planned

46



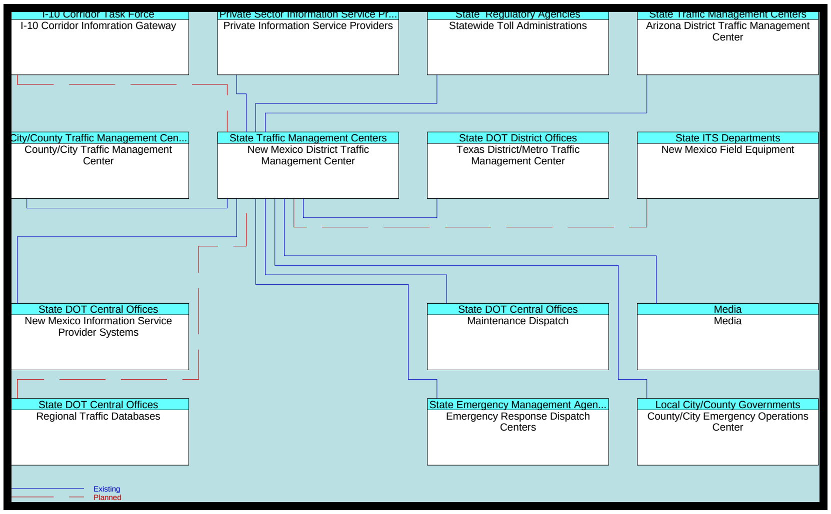
Commercial Vehicle Operators
Commercial Fleet Operations
I-10 Corridor Task Force
I-10 Corridor Infomration Gateway
State Regulatory Agencies
Arizona Commercial Vehicle Administration System
State Regulatory Agencies
Texas Commercial Vehicle Administration Systems
State Regulatory Agencies
New Mexico Commercial Vehicle Administration Systems
State DOT Central Offices
New Mexico Information Service Provider Systems
State Regulatory Agencies
New Mexico Commercial Vehicle Check Systems
State Regulatory Agencies
DMV Databse
Private Sector Information Service Pr...
Private Information Service Providers
State Regulatory Agencies
CVO Automatic Safety Inspection Devices
State Regulatory Agencies
Weigh-in-motion Stations
State Regulatory Agencies
CVO Pre-pass Sites
Existing
Planned

47



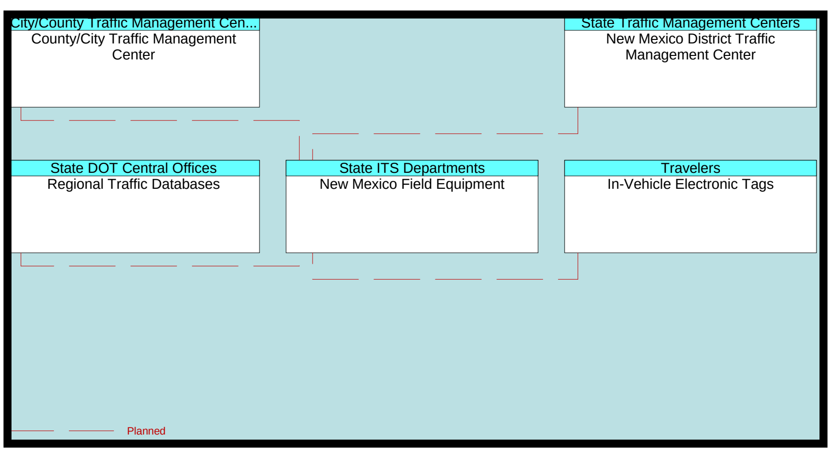
Commercial Vehicle Operators
Commercial Fleet Operations
State Regulatory Agencies
New Mexico Commercial Vehicle Administration Systems
State Regulatory Agencies
New Mexico Commercial Vehicle Check Systems
Existing
Planned

48



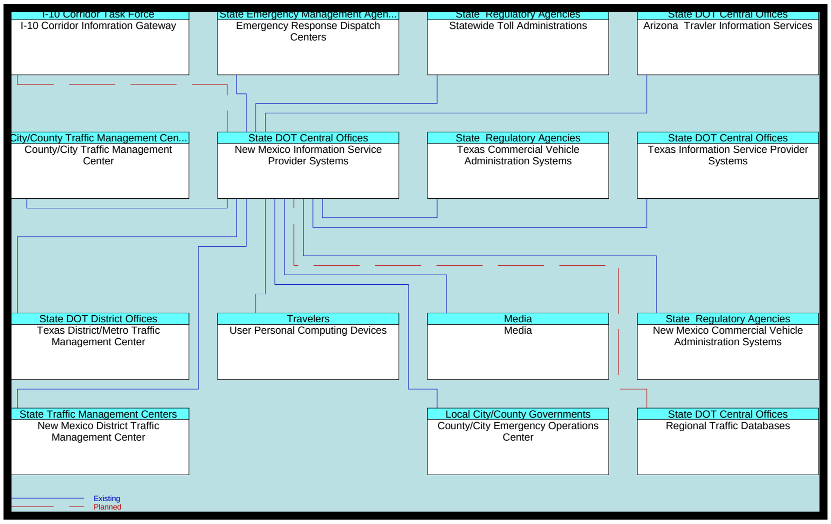
I-10 Corridor Task Force
I-10 Corridor Infomration Gateway
Private Sector Information Service Pr...
Private Information Service Providers
State Regulatory Agencies
Statewide Toll Administrations
State Traffic Management Centers
Arizona District Traffic Management Center
City/County Traffic Management Cen...
County/City Traffic Management Center
State Traffic Management Centers
New Mexico District Traffic Management Center
State DOT District Offices
Texas District/Metro Traffic Management Center
State ITS Departments
New Mexico Field Equipment
State DOT Central Offices
New Mexico Information Service Provider Systems
State DOT Central Offices
Maintenance Dispatch
Media
Media
State DOT Central Offices
Regional Traffic Databases
State Emergency Management Agen...
Emergency Response Dispatch Centers
Local City/County Governments
County/City Emergency Operations Center
Existing
Planned

49



City/County Traffic Management Cen...
County/City Traffic Management Center
State Traffic Management Centers
New Mexico District Traffic Management Center
State DOT Central Offices
Regional Traffic Databases
State ITS Departments
New Mexico Field Equipment
Travelers
In-Vehicle Electronic Tags
Planned

50


I-10 Corridor Task Force
I-10 Corridor Infomration Gateway
State Emergency Management Agen...
Emergency Response Dispatch Centers
State Regulatory Agencies
Statewide Toll Administrations
State DOT Central Offices
Arizona Travler Information Services
City/County Traffic Management Cen...
County/City Traffic Management Center
State DOT Central Offices
New Mexico Information Service Provider Systems
State Regulatory Agencies
Texas Commercial Vehicle Administration Systems
State DOT Central Offices
Texas Information Service Provider Systems
State DOT District Offices
Texas District/Metro Traffic Management Center
Travelers
User Personal Computing Devices
Media
Media
State Regulatory Agencies
New Mexico Commercial Vehicle Administration Systems
State Traffic Management Centers
New Mexico District Traffic Management Center
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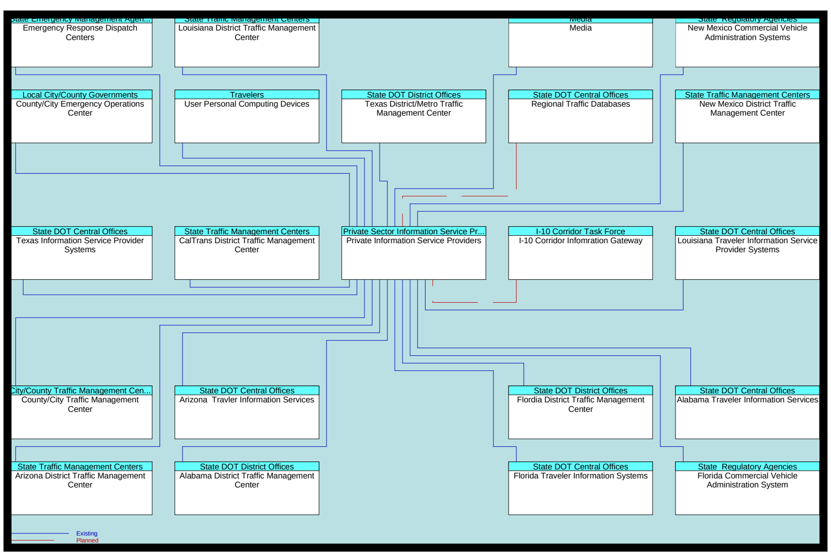
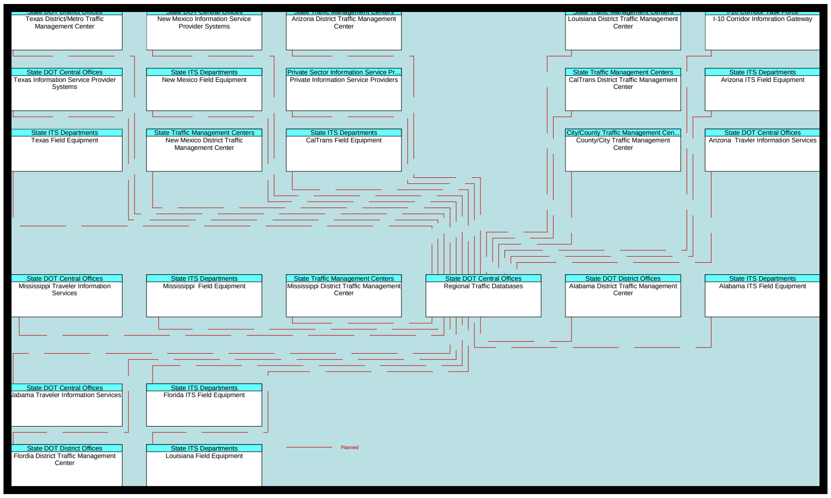
County/City Emergency Operations Center
State DOT Central Offices
Regional Traffic Databases
Existing
Planned

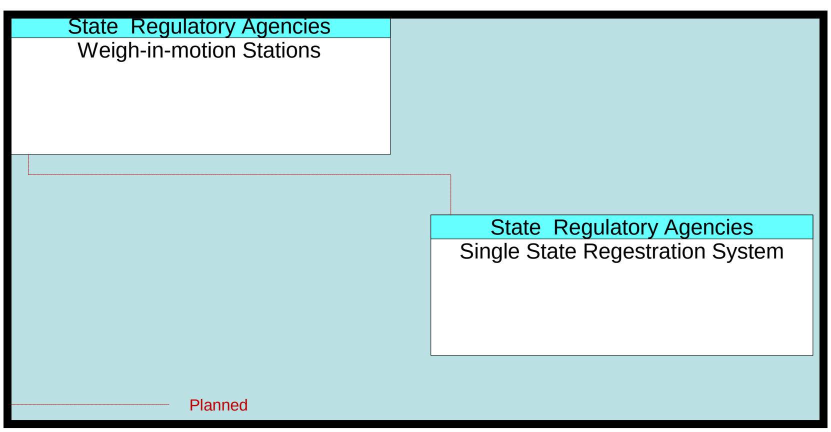
51


Emergency Response Dispatch Centers
Louisiana District Traffic Management Center
Media
New Mexico Commercial Vehicle Administration Systems
Local City/County Governments
County/City Emergency Operations Center
Travelers
User Personal Computing Devices
State DOT District Offices
Texas District/Metro Traffic Management Center
State DOT Central Offices
Regional Traffic Databases
State Traffic Management Centers
New Mexico District Traffic Management Center
State DOT Central Offices
Texas Information Service Provider Systems
State Traffic Management Centers
CalTrans District Traffic Management Center
Private Sector Information Service Pr...
Private Information Service Providers
I-10 Corridor Task Force
I-10 Corridor Infomration Gateway
State DOT Central Offices
Louisiana Traveler Information Service Provider Systems
City/County Traffic Management Cen...
County/City Traffic Management Center
State DOT Central Offices
Arizona Travler Information Services
State DOT District Offices
Florida District Traffic Management Center
State DOT Central Offices
Alabama Traveler Information Services
State Traffic Management Centers
Arizona District Traffic Management Center
State DOT District Offices
Alabama District Traffic Management Center
State DOT Central Offices
Florida Traveler Information Systems
State Regulatory Agencies
Florida Commercial Vehicle Administration System
Existing
Planned

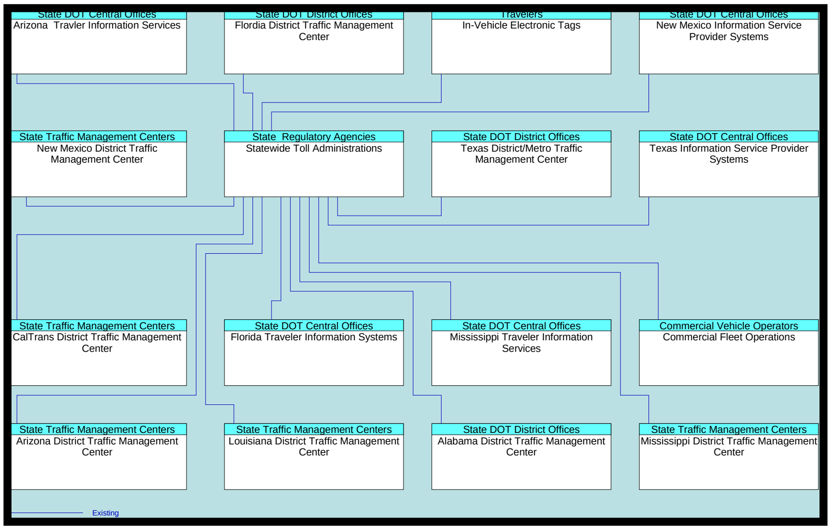
52


Texas District/Metro Traffic Management Center
State DOT Central Offices
New Mexico Information Service Provider Systems
Arizona District Traffic Management Center
Louisiana District Traffic Management Center
I-10 Corridor Infomration Gateway
State DOT Central Offices
Texas Information Service Provider Systems
State ITS Departments
New Mexico Field Equipment
Private Sector Information Service Pr...
Private Information Service Providers
State Traffic Management Centers
CalTrans District Traffic Management Center
State ITS Departments
Arizona ITS Field Equipment
State ITS Departments
Texas Field Equipment
State Traffic Management Centers
New Mexico District Traffic Management Center
State ITS Departments
CalTrans Field Equipment
City/County Traffic Management Cen...
County/City Traffic Management Center
State DOT Central Offices
Arizona Travler Information Services
State DOT Central Offices
Mississippi Traveler Information Services
State ITS Departments
Mississippi Field Equipment
State Traffic Management Centers
Mississippi District Traffic Management Center
State DOT Central Offices
Regional Traffic Databases
State DOT District Offices
Alabama District Traffic Management Center
State ITS Departments
Alabama ITS Field Equipment
State DOT Central Offices
labama Traveler Information Services
State ITS Departments
Florida ITS Field Equipment
Planned
State DOT District Offices
Flordia District Traffic Management Center
State ITS Departments
Louisiana Field Equipment

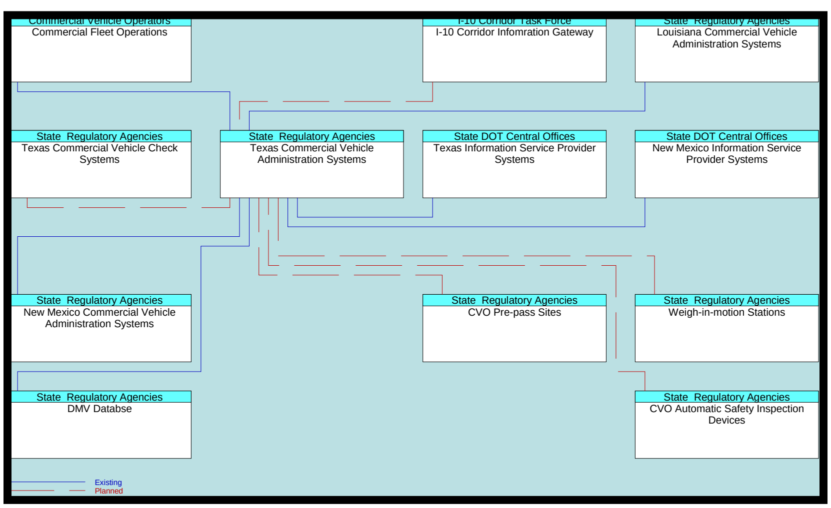
53


State Regulatory Agencies
Weigh-in-motion Stations
State Regulatory Agencies
Single State Regestration System
Planned

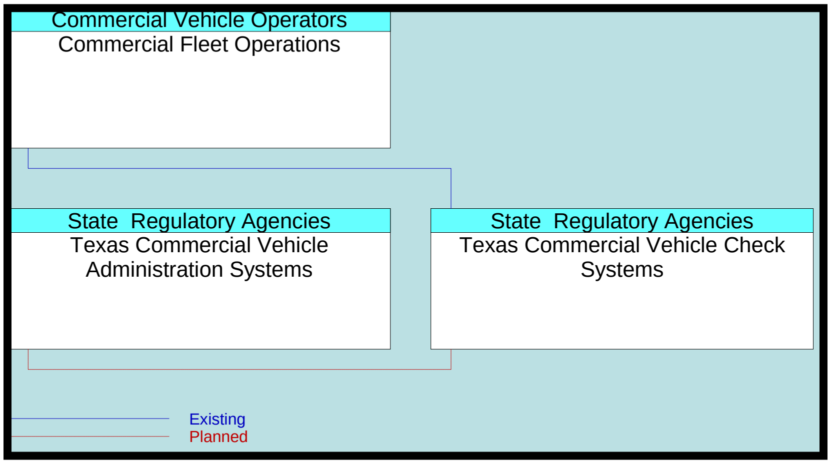
54


State DOT Central Offices
Arizona Travler Information Services
State DOT District Offices
Flordia District Traffic Management Center
Travelers
In-Vehicle Electronic Tags
State DOT Central Offices
New Mexico Information Service Provider Systems
State Traffic Management Centers
New Mexico District Traffic Management Center
State Regulatory Agencies
Statewide Toll Administrations
State DOT District Offices
Texas District/Metro Traffic Management Center
State DOT Central Offices
Texas Information Service Provider Systems
State Traffic Management Centers
CalTrans District Traffic Management Center
State DOT Central Offices
Florida Traveler Information Systems
State DOT Central Offices
Mississippi Traveler Information Services
Commercial Vehicle Operators
Commercial Fleet Operations
State Traffic Management Centers
Arizona District Traffic Management Center
State Traffic Management Centers
Louisiana District Traffic Management Center
State DOT District Offices
Alabama District Traffic Management Center
State Traffic Management Centers
Mississippi District Traffic Management Center
Existing

55

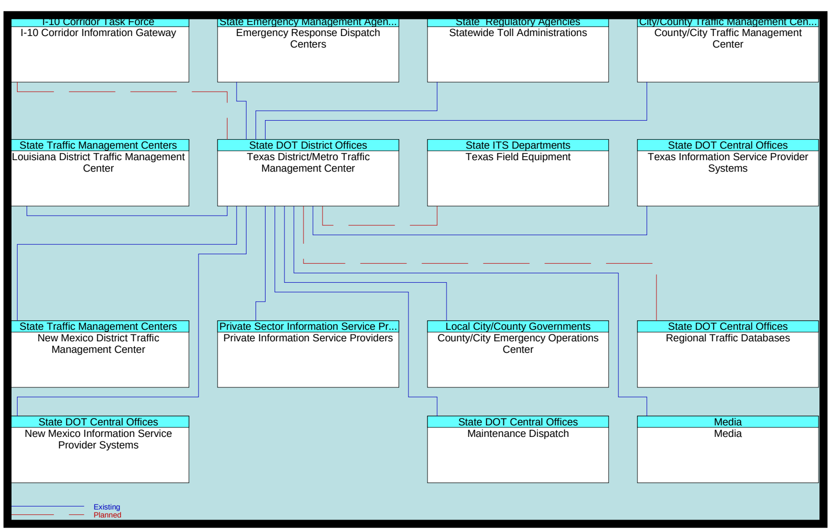

Commercial Vehicle Operators
Commercial Fleet Operations
I-10 Corridor Task Force
I-10 Corridor Infomration Gateway
State Regulatory Agencies
Louisiana Commercial Vehicle Administration Systems
State Regulatory Agencies
Texas Commercial Vehicle Check Systems
State Regulatory Agencies
Texas Commercial Vehicle Administration Systems
State DOT Central Offices
Texas Information Service Provider Systems
State DOT Central Offices
New Mexico Information Service Provider Systems
State Regulatory Agencies
New Mexico Commercial Vehicle Administration Systems
State Regulatory Agencies
CVO Pre-pass Sites
State Regulatory Agencies
Weigh-in-motion Stations
State Regulatory Agencies
DMV Databse
State Regulatory Agencies
CVO Automatic Safety Inspection Devices
Existing
Planned

56



Commercial Vehicle Operators
Commercial Fleet Operations
State Regulatory Agencies
Texas Commercial Vehicle Administration Systems
State Regulatory Agencies
Texas Commercial Vehicle Check Systems
Existing
Planned

57



I-10 Corridor Task Force
I-10 Corridor Infomration Gateway
State Emergency Management Agen...
Emergency Response Dispatch Centers
State Regulatory Agencies
Statewide Toll Administrations
City/County Traffic Management Cen...
County/City Traffic Management Center
State Traffic Management Centers
Louisiana District Traffic Management Center
State DOT District Offices
Texas District/Metro Traffic Management Center
State ITS Departments
Texas Field Equipment
State DOT Central Offices
Texas Information Service Provider Systems
State Traffic Management Centers
New Mexico District Traffic Management Center
Private Sector Information Service Pr...
Private Information Service Providers
Local City/County Governments
County/City Emergency Operations Center
State DOT Central Offices
Regional Traffic Databases
State DOT Central Offices
New Mexico Information Service Provider Systems
State DOT Central Offices
Maintenance Dispatch
Media
Media
Existing
Planned

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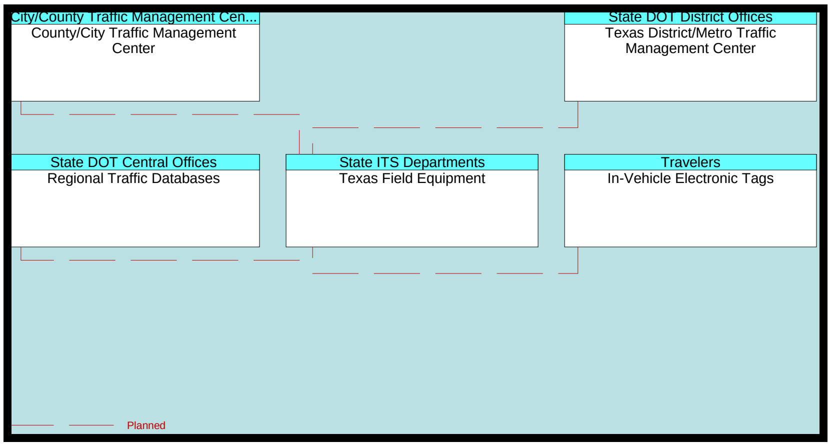
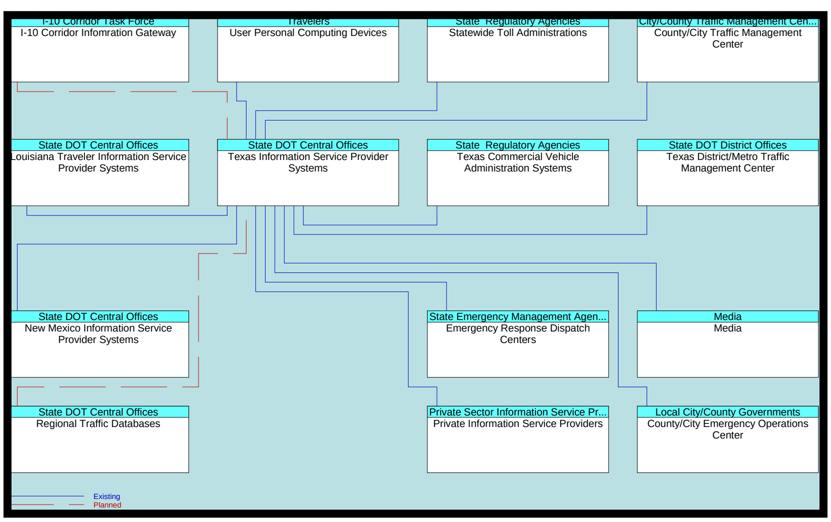
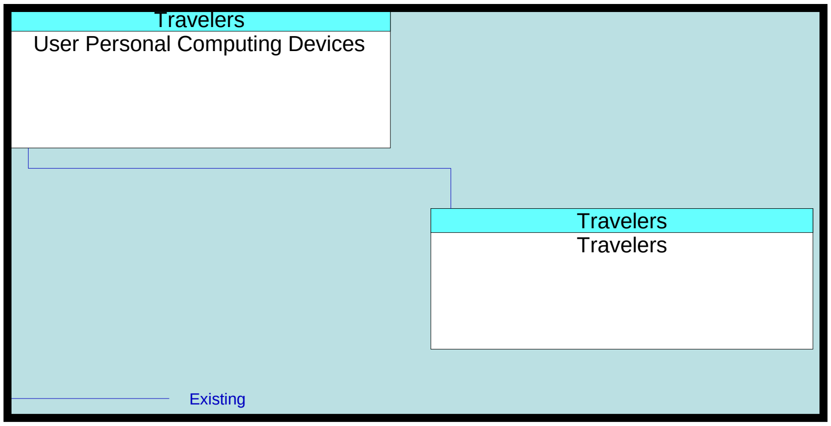

City/County Traffic Management Cen...
County/City Traffic Management Center
State DOT District Offices
Texas District/Metro Traffic Management Center
State DOT Central Offices
Regional Traffic Databases
State ITS Departments
Texas Field Equipment
Travelers
In-Vehicle Electronic Tags
Planned

59


I-10 Corridor Task Force
I-10 Corridor Infomration Gateway
Travelers
User Personal Computing Devices
State Regulatory Agencies
Statewide Toll Administrations
City/County Traffic Management Cen...
County/City Traffic Management Center
State DOT Central Offices
Louisiana Traveler Information Service Provider Systems
State DOT Central Offices
Texas Information Service Provider Systems
State Regulatory Agencies
Texas Commercial Vehicle Administration Systems
State DOT District Offices
Texas District/Metro Traffic Management Center
State DOT Central Offices
New Mexico Information Service Provider Systems
State Emergency Management Agen...
Emergency Response Dispatch Centers
Media
Media
State DOT Central Offices
Regional Traffic Databases
Private Sector Information Service Pr...
Private Information Service Providers
Local City/County Governments
County/City Emergency Operations Center
Existing
Planned

60


Travelers
User Personal Computing Devices
Travelers
Travelers
Existing

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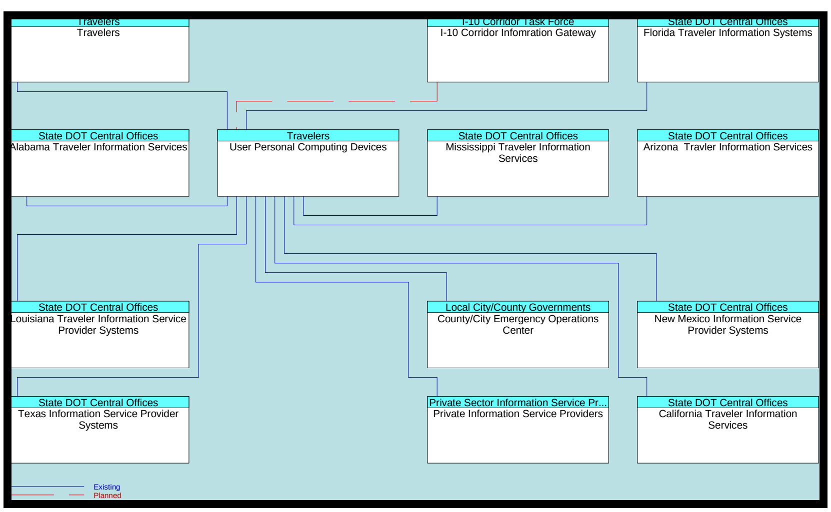
Travelers
Travelers
I-10 Corridor Task Force
I-10 Corridor Infomration Gateway
State DOT Central Offices
Florida Traveler Information Systems
State DOT Central Offices
Alabama Traveler Information Services
Travelers
User Personal Computing Devices
State DOT Central Offices
Mississippi Traveler Information Services
State DOT Central Offices
Arizona Travler Information Services
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Local City/County Governments
County/City Emergency Operations Center
State DOT Central Offices
New Mexico Information Service Provider Systems
State DOT Central Offices
Texas Information Service Provider Systems
Private Sector Information Service Pr...
Private Information Service Providers
State DOT Central Offices
California Traveler Information Services
Existing
Planned

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