

Monroe Regional ITS

Architecture 2021

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This document and the information contained herein is prepared solely for the purpose of identifying, evaluating and planning safety improvements on public roads which may be implemented utilizing federal aid highway funds and is therefore exempt from discovery or admission into evidence pursuant to 23 U.S.C. 409.

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1 Introduction

This document describes the Intelligent Transportation System (ITS) architecture for the Monroe region. 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.”

This architecture conforms to Federal Highway Administration (FHWA) Final rule 940 Part 11, which mandates that projects planning to use federal funds in their ITS deployments must have established an ITS Architecture for the region. Regional ITS Architectures have been promoted by the United States Department of Transportation (USDOT) as descriptive tools, using a standard vocabulary and set of concepts for regional deployments in order to aid the integration of User Services and Service packages in addressing regional transportation problems. Regional ITS Architectures are also used to constrain projects, funded by the FHWA using high technology products, to highway or transit applications.

A comprehensive review of the regional Intelligent Transportation Systems (ITS) architecture is recommended every five years. The Louisiana Department of Transportation and Development (LADOTD) requested an update to the Monroe Regional ITS Architecture document, which was last updated in 2014. The purpose of this update is to provide additional documentation of the updates required for the regional ITS architecture. The updates document significant changes to the architecture to ensure that project deployments are relevant and emerging needs are met. The following are the updates for the Monroe Regional ITS Architecture document.

1.1 Background

What are Intelligent Transportation Systems or ITS? Simply put, they are the application of technology to highway or transit applications. The formal description states:

“ITS improves transportation safety and mobility and enhances productivity through the use of advanced information and communication technologies. Intelligent transportation systems (ITS) encompass a broad range of wireless and wire line communications-based information and electronics technologies. When integrated into the transportation system's infrastructure, and in vehicles themselves, these technologies relieve congestion, improve safety and enhance American productivity.”

To effectively apply ITS to highway and transit projects, the National ITS Architecture, initiated in 1991 and sponsored by USDOT, describes a wide range of likely ITS applications, using high technology products, for highway and transit projects. In 2001 the FHWA and Federal Transit Administration (FTA) established 23 Code of Federal Regulations (CFR) 940 Part 11, which required agencies using federal funds to establish ITS Architectures for their regions. The architecture must contain the following elements:

-
- 1) Description of the region – **Section 3**
 - 2) Identification of the participating agencies and other stakeholders – **Section 5**
 - 3) Roles and responsibilities of the participating agencies and other stakeholders – **Section 9**
 - 4) Agreements needed for operation – **Section 12**
 - 5) System functional requirements – **Section 11** (also see the Monroe Regional ITS Architecture Turbo Architecture source file)
 - 6) Interface requirements and information exchanges with planned and existing systems – **Appendix B**
 - 7) Identification of applicable standards (ITS Standards) – **Section 11**
 - 8) Sequence of projects necessary for implementation traceable to a portion of the regional architecture – **Section 9**

The products derived from architecture development processes provide a number of benefits to the transportation planners and engineers. The following are examples of these benefits:

- 1) Establishes a common terminology for the various ITS elements needed to implement and operate ITS applications.
- 2) Defines those elements and the functions they perform, and identifies, in theory, all of the possible interrelationships among the ITS elements.
- 3) The National ITS Architecture does not dictate a specific approach to implementing or operating any ITS application; rather, it provides a common set of terms and concepts that local ITS implementers are encouraged to utilize in describing their specific ITS activities.
- 4) Provides a “living” planning document that promotes modularity and integration, and minimizes impacts when needs to regional issues change.
- 5) Promotes a thorough, coordinated and multi-jurisdictional “systems” approach to ITS and the use of a Systems Engineering process to its deployment.
- 6) Fosters the utilization of the “standards” that are being developed through the USDOT National ITS Architecture program.

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2 Acronyms and Abbreviations

ASC – Actuated Traffic Signal Controller
ATIS – Advanced Traveler Information Systems
ATMS – Advanced Traffic Management Systems
AVL – Automated Vehicle Location
CAD – Computer Aided Dispatch
CCTV – Closed Circuit Television
CFR – Code of Federal Regulations
CMU – Conflict Monitor Units
DCM – Data Collection and Monitoring
DMS – Dynamic Message Signs
DOTD – Department of Transportation and Development
ESS – Environmental Sensor Stations
FHWA – Federal Highway Administration
FMS – Field Management Stations
FTA – Federal Transit Administration
HAR – Highway Advisory Radio
HRI – High-rail Intersection
ITS – Intelligent Transportation Systems
LADOTD – Louisiana Department of Transportation and Development
LSP – Louisiana State Police
MAP – Motorist Assistance Patrol
MPO – Metropolitan Planning Organization
MTP – Metropolitan Transportation Plan
MS/ETMCC – Message Sets for External Traffic Management Center Communications
ND - North Delta Regional Planning & Development District
NTCIP – National Transportation Communications for Intelligent Transportation System Protocol
O & M – Operations and Maintenance
OHSEP – Office of Homeland Security and Emergency Preparedness
PCMS – Portable Changeable Message Signs
PDA – Personal Digital Assistant
RR – Roles and Responsibilities
SCP – Signal Control and Prioritization
SDO – Standards Development Organizations
SSM – Signal System Master
SSL – Signal System Local
TDM – Travel Demand Management
TIM – Traffic Incident Management
TIP – Transportation Improvement Program
TMC – Traffic Management Center
TMDD – Traffic Management Data Dictionary
TSS – Transportation Sensor Systems
USDOT – United States Department of Transportation
XML – Extensive Markup Language
VHT – Vehicle Hours Traveled
VMT – Vehicle Miles Traveled

3 Architecture Scope

The Monroe Regional ITS Architecture is a roadmap for transportation systems integration. The architecture was developed through a cooperative effort by the region's transportation agencies, covering all modes and all roads in the region. It represents a shared vision of how each agency's systems will work together in the future, sharing information and resources to provide a safer, more efficient, and more effective transportation system for travelers in the region.

The architecture provides an overarching framework that spans all of the region's transportation organizations and individual transportation projects. Using the architecture, each transportation project can be viewed as an element of the overall transportation system, providing visibility into the relationship between individual transportation projects and ways to cost-effectively build an integrated transportation system over time. This section establishes the scope of the architecture in terms of its geographic breadth, the scope of services that are covered, and the time horizon that is addressed.

3.1 Timeframe

Five years

3.2 Geographic Scope

The region for which this ITS Architecture is being developed corresponds with the Monroe Urbanized Metropolitan Planning Organization boundary hosted by North Delta Regional Planning and Development District.

3.3 Service Scope

This Regional ITS Architecture covers a range of ITS services for developing a Regional ITS Architecture. The services are intended to address the Monroe region's existing and future ITS needs.

3.4 Maintainer

Louisiana Department of Transportation and Development (LADOTD), with the assistance of North Delta Regional Planning and Development, will take the lead role to maintain the Monroe Regional ITS Architecture.

Figure 1: Monroe Regional ITS Architecture Boundary

MONROE METROPOLITAN AREA

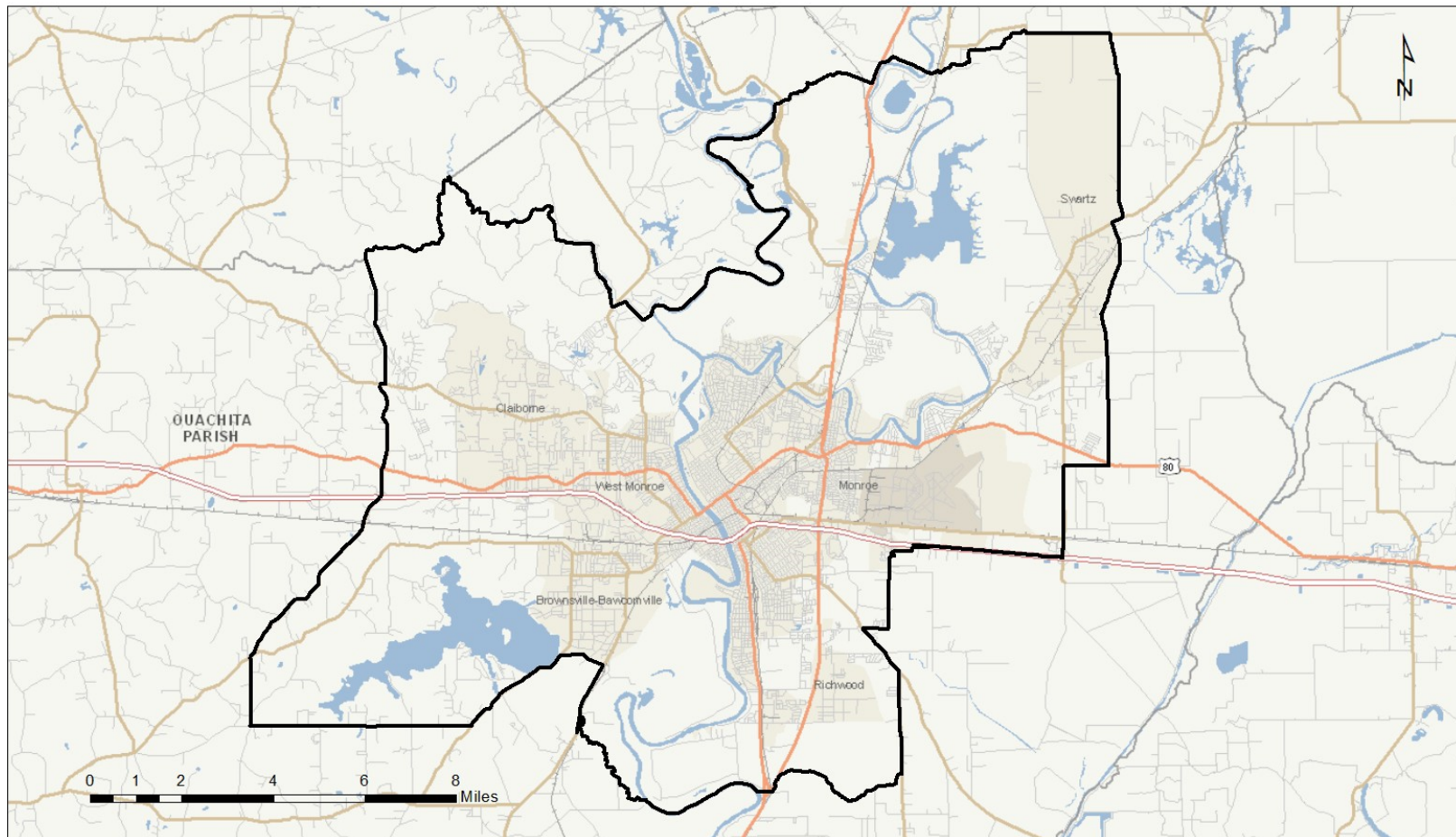


Figure 2: Louisiana Parish Map



4 Relationship to Regional Planning

The Monroe Regional ITS Architecture is an integral part of planning for the operations and maintenance strategies that are addressed by the regional transportation planning process. The architecture provides a framework that connects operations and maintenance objectives and strategies with the integrated transportation system improvements that are implemented as a progressive series of ITS projects. The Architecture is also used to define the data needs associated with performance monitoring that supports an informed planning process. This section identifies the planning objectives, strategies, and associated performance measures from the regional plan. These planning elements are connected with ITS services in the Turbo Architecture database.

Table 1: Relationship to Planning

Name	Description	Source	PM Category	Performance Measure
Increase mobility	Invest in the development of a regional transportation system that serves to increase the mobility and efficiency of the movement of persons and freight in and through the region. This is to improve things such as: quality of life, economy, and environmental impacts on the region.	Monroe Urbanized Area Metropolitan Transportation Plan	Mobility	Vehicle hours traveled (VHT)
			Mobility	Vehicle miles traveled (VMT)
Enhance Safety	Enhance the safety of the transportation system during both normal travel patterns and emergency evacuations. Enhance the security of the transportation system especially related to emergency evacuation from either natural or manmade disasters.	Monroe Urbanized Area Metropolitan Transportation Plan	Crashes	Crashes per year
		Monroe Urbanized Area Metropolitan Transportation Plan	Crashes	Number of Fatalities
Maintain Existing Infrastructure	Support systematic and coordinated maintenance programs, and make available the adequate resources to preserve existing roadways and transit systems as well as future expansions.	Monroe Urbanized Area Metropolitan Transportation Plan	Pavement Bridges	Pavement Condition Index
				Bridge Condition Rating
				Remaining Service Life

5 ITS Stakeholders

Identifying stakeholders is an important task in ITS architecture development because effective ITS involves the integration of multiple stakeholders and their transportation systems. This section describes the stakeholders who either participated in the creation of the Monroe Regional ITS Architecture or whom the participating stakeholders felt were necessary to include in the architecture. Some stakeholders have been grouped in order to better reflect mutual participation or involvement in transportation services and elements. Stakeholders in this section may be related to one or more of the transportation inventory elements described in Section 6 either as an individual stakeholder or as a member of a stakeholder group.

Table 2: ITS Stakeholders

Stakeholder Name	Stakeholder Description
City of Monroe	The City of Monroe is responsible for traffic management, incident management, emergency response and management, and other transportation system management activities within its jurisdiction.
City of West Monroe	The City of West Monroe is responsible for traffic management, incident management, emergency response and management, and other transportation system management activities within its jurisdiction.
LADOTD	Louisiana Department of Transportation and Development (LA DOTD) is an arm of the Louisiana government responsible for maintaining public transportation, roadways, bridges, canals, select levees, floodplain management, port facilities, commercial vehicles, and aviation in the state of Louisiana. This stakeholder group includes all DOTD units (ITS, Office of Planning Programming, Highway Safety, Weights and Standards, Traffic Services, and Traffic Engineering) involved in transportation planning, operations, and maintenance. Some of the typical responsibilities include incident detection and response, evacuation planning and management, transportation data collection, management, and distribution for the local region as well as for the entire state.
Local Emergency Medical Providers	This includes local hospitals and emergency medical service providers (i.e., ambulance, air vac, etc) that are components of emergency management.
Local Public Safety Agencies	Responsible for operating local police, fire, and EMS offices and vehicles throughout region. This stakeholder group includes all the regional agencies that are involved in emergency, fire, police, and other public safety/emergency response activities.
Local Railroad	The local railroad companies in the Monroe regional consists of Kansas City Southern, Union Pacific and Delta Southern. Other rail companies may also be included as they may have small segments of tracks or use the listed company's tracks.
Louisiana State Police	Louisiana State Police agency is responsible for operating Louisiana State Police Centers. Includes Computer Aided Dispatch database, which collects incident/emergency detection, dispatch, response, and status information related to the Louisiana State Police officers/equipment. Also responsible for Louisiana State Police vehicles.
Media	This stakeholder group includes local TV/radio channels and print media responsible for receiving and distributing transportation information such as traffic conditions, incidents and road weather conditions.
North Delta Regional Planning and Development District	Serves the parishes of Caldwell, East Carroll, Franklin, Jackson, Madison, Morehouse, Ouachita, Richland, Tensas, Union and West Carroll. North Delta (ND) is the Monroe/ West Monroe area's designated Metropolitan Planning Organization (MPO), which each metropolitan area must have in order to carry out regional transportation planning efforts and receive federal highway funds. As the regional MPO, the North Delta Regional Planning and Development District focuses a great deal of its resources on transportation planning issues and activities, which includes highway planning, the regional ridesharing program, and air quality issues. In addition, ND is a regional planning and resource center for the State of Louisiana that is dedicated to serving the people, businesses, communities, and local governmental units within the 11 parishes (counties) of northeast Louisiana. ND is one of eight sub-state planning and development districts which cover all 64 parishes in the state of Louisiana. To that end, ND provides technical assistance for economic development, comprehensive planning, and zoning to its members.
Ouachita Parish Police Jury	The Ouachita Parish Police Jury is one of the primary regional government agencies responsible for emergency response and management, and other transportation system management activities within its jurisdiction.
Public	Members of the general public own and operate various devices/systems to access ITS information, including personal digital assistants (PDAs), cell phones, and personal computers.
Tourism and Traveler Information Service Providers	Various tourism agencies, chambers of commerce, hotel associations, motorist services, and MapQuest.

6 ITS System Inventory

An inventory of existing and planned transportation systems is the basis for the Monroe Regional ITS Architecture. The transportation system inventory was developed based on input from stakeholders throughout the region. The inventory includes a list of ITS elements and the associated stakeholder responsible for system operation.

This section describes every surface transportation inventory element for the region. A transportation element can be a center, vehicle, traveler or field equipment. Each transportation element listed below has one or more stakeholders associated with it from **Section 5**. In order to reduce the complexity of the architecture, some transportation elements with like functionality have been grouped together. Each transportation inventory element is mapped to at least one National ITS Architecture entity.

Table 3: ITS Inventory

Element Name	Element Description	Stakeholder	Element Status
City of Monroe Engineering	This element represents traffic operations or traffic engineering within the city that is responsible for traffic management activities within the jurisdiction. The typical activities include traffic monitoring, traffic data collection, operation of traffic signal operations, and other traffic management related activities.	City of Monroe	Existing
City of Monroe Police Department	This element represents the City of Monroe Police dispatch center	City of Monroe	Existing
City of Monroe Traffic Signal System	This element represents traffic signals operated and maintained by the City of Monroe	City of Monroe	Existing
City of West Monroe Police Department	This element represents the City of West Monroe Police dispatch center	City of West Monroe	Existing
DOTD District 05 Traffic Operations	This element represents traffic operations or traffic engineering within the district office that is responsible for traffic management activities within the district jurisdiction. The typical activities include traffic monitoring, traffic data collection, operation of traffic signal operations, and other traffic management related activities. This also includes communicating with TMCs and other departments like maintenance for roadway maintenance activities.	LADOTD	Existing
DOTD District 05 Traffic Signal System	This element represents traffic signals operated and maintained by the District	LADOTD	Existing
DOTD Drawbridge Control	Drawbridge control will give the LADOTD the capability to remotely monitor and control the opening and closing of the drawbridge from the Traffic Management Center.	LADOTD	Planned
DOTD ITS Field Equipment	This element includes the equipment distributed on and along the roadway that monitors and controls traffic and monitors and manages the roadway itself. Equipment includes traffic signals, traffic detectors, environmental sensors, highway advisory radios, dynamic message signs, closed circuit television (CCTV) cameras and video image processing systems, and grade crossing warning systems.	LADOTD	Planned
DOTD ITS Section	This element represents ITS Section (Section 56) under the LADOTD. The ITS section is responsible for statewide operations center located in DOTD headquarters. Also, the ITS section is responsible for management information system for transportation; statewide ITS elements operations, and maintenance. The ITS section is also responsible for maintenance of all ITS equipment in the state.	LADOTD	Existing
DOTD MAP	This element represents the Motorist Assistance Patrol (MAP) vehicles contracted by DOTD's ITS Section, but operated and maintained by the DOTD's District Offices.	LADOTD	Planned
DOTD Social Media	Facebook and Twitter	LADOTD	Existing

Element Name	Element Description	Stakeholder	Element Status
DOTD Statewide TMC	This element represents the traffic operations center that is responsible for traffic management activities throughout the state. The typical activities include traffic monitoring, traffic data collection, operation of ITS elements (CCTV, dynamic messaging signs (DMS), etc.), detection and verification of incidents, traffic signal monitoring, and other traffic management-related activities. This also includes communicating with other agencies, districts, traffic management centers (TMCs), and DOTD departments such as maintenance for roadway maintenance activities.	LADOTD	Existing
Local Emergency Medical	Local hospitals as well as local emergency medical service providers (e.g., emergency rescue, ambulance, etc.)	Local Emergency Medical Providers	Existing
Local Emergency Operations Centers	This element represents emergency dispatch centers operated by local agencies including 911, emergency, and fire response dispatch center.	Local Public Safety Agencies	Existing
Local Print and Broadcast Channels	Local newspapers as well as radio and television broadcast providing transportation information.	Media	Existing
Louisiana 511/Website	This element provides traveler information services supplied by the LA DOTD in conjunction with a private partner.	LADOTD	Existing
LSP Troop F	This element represents Louisiana State Police (LSP) department; the Monroe metropolitan area is covered by Troop F.	Louisiana State Police	Existing
Monroe TMC	This element represents traffic operations center that is responsible for local traffic management activities. The typical activities include traffic monitoring, traffic data collection, operation of ITS elements (CCTV, DMS, etc.), detection and verification of incidents, traffic signal monitoring, and other traffic management related activities. This also includes communicating with other agencies, districts, TMCs, and DOTD departments like maintenance for roadway maintenance activities. The Monroe TMC is a local TMC as it only provides operations for the Monroe area	LADOTD	Planned
Monroe Transit Administration	Since 1906, Monroe Transit, the nation's oldest publicly-owned transportation system, has been continuously owned and operated by the City of Monroe. More than 100 years after its inception, Monroe Transit remains the public transportation provider to the City, offering 13 fixed routes and paratransit services to the community.	City of Monroe	Existing
Monroe Transit Fleet	This element represents the fleet of buses, trolleys, paratransit vans, etc. used to provide service to motorists.	City of Monroe	Existing
OCOG Database	This element represents Ouachita Council of Governments (OCOG) data service, which directly or indirectly collects and provides transportation system data.	North Delta Regional Planning and Development District	Planned
Other Local Public Safety Agencies	These are the local police/sheriff departments and 911 centers for the agencies that do not have a primary role in Traffic incident management and enforcement on major highways in the area	Local Public Safety Agencies	Existing
Ouachita Parish 911 Administration	This element represents the parish emergency response operations including City fire, police, 911, and any other emergency response operators.	Ouachita Parish Police Jury	Existing
Ouachita Parish OHSEP	The Office of Homeland Security And Emergency Preparedness leads, coordinates, and supports the emergency management system, in order to protect lives and prevent the loss of property from all hazards. The parish Office of Homeland Security and Emergency Preparedness (OHSEP) coordinates directly with the Governor's Office of Homeland Security and Emergency Preparedness (GOHSEP) for planning and managing emergency response to major disasters on a statewide basis.	Ouachita Parish Police Jury	Existing
Ouachita Parish Sheriff's Office	This element represents the Ouachita Parish Sheriff's Office dispatch center	Local Public Safety Agencies	Existing
Railroad At Grade Crossing Controller	Railroad at grade crossing controllers identify if a train is currently present at the intersection. This status allows for systems to be aware of active traffic management.	Local Railroad	Planned

Element Name	Element Description	Stakeholder	Element Status
Tourism and Travel Service Information Sources	Private tourism and traveler information websites, local hotel associations, visitor centers, etc.	Tourism and Traveler Information Service Providers	Existing
Traveler	Motorist or user of the regional transportation system	Public	Planned

6.1 EXISTING REGIONAL ITS SYSTEMS AND OPERATIONS

Currently Monroe does not have a regional architecture but has ITS elements that impact the area. These elements have been compiled in **Table 4**. The existing ITS equipment table serves as examples of low level systems, whereas the ITS Inventory (**Table 3**), is a much higher, broader level of planning. Monroe ITS Implementation Phases 1 and 2 have been completed and these changes have been updated in the ITS Architecture file. The current list of ITS devices is shown below.

The following sections further describe the existing equipment.

Table 4: Inventory of ITS Elements

ITS Equipment	Description	Stakeholder	Element Name
Statewide 511	Construction, major incidents, freeway speed	LADOTD	Louisiana 511
CCTV Cameras	I-20 Corridor: I-20@Jackson street I-20@5th Street I-20@Stella Street T I-20@Thomas Road I-20@Well Road I-20@LA 15 I-20@Texas Ave. I-20/US 165 (2 cameras) I-20@Pecanland Mall US-80 Corridor: US 80/Cypress St. US 80/US 165 US-165 Corridor: US 165 @ Richwood Rd US 165 @ LA 15 US 165 @ Renwick US 165 @ Northeast Dr US 165 @ Forsythe Bypass US 165 @ Finks Hideaway	LADOTD	DOTD ITS Field Equipment

ITS Equipment	Description	Stakeholder	Element Name
Traffic Signals	157 traffic signals / 10 flashing beacons	LADOTD/City of Monroe	LADOTD District 05/City of Monroe
Dynamic Message Signs(DMS)	I-20@Pecanland Mall (westbound) I-20@Well Road (eastbound) US 165 @ Forsythe Bypass (southbound) US 165 @ Breard (southbound)	LADOTD	LADOTD District 05
Portable Changeable Message Signs (PCMS)	4 PCMS: the PCMS have no remote capability	LADOTD	DOTD ITS Field Equipment

6.1.1 Traveler Information System

The 511 Traveler Information System allows drivers to actively engage in smart travel, by choosing less congested routes and avoiding incident areas. 511 can be reached by most cell phones and landlines or accessed on the internet at www.511LA.org. The Information provided for Statewide 511 from Monroe is limited to construction and lane closures on state routes and bridges. Usually law enforcement provides incidents information. All 511 information is provided to TMC via email when public notices are sent. It has been inaccurate and untimely. Construction projects are currently not up to date. With its own Public Information Officer, the district could provide additional information about other local activities that would be valuable.

The 511 lane closure and construction information is communicated from the DOTD District 05 to the statewide 511. Incidents that occur on the state routes are communicated from the State Police to the statewide 511 center in Baton Rouge. The speed information for the Monroe area is extracted from Google speed data.

6.2 Transportation Issues

6.2.1 High congestion and incidents

In Monroe, the following three major routes have high incidents and congestion:

US Route 165

US route 165 is the main north-south route and has been identified in the Transportation Plan as one of the most critical routes. The route has the highest incident rate at Renwick Street and the 8th highest incident rate at Northeast Drive. The traffic signals have recently been upgraded and coordinated and are part of the existing closed loop signal system, which includes video detection.

US Route 80

US Route 80 (Louisville Avenue) is a major east-west alternative route to I-20. There are several “hot spots” along the route that have high incident rates. Between N. 7th Street and Well Road, five hot spots have been identified. Also between N. 21st Street and Cypress Street intersections, seven hot spots have been identified. Furthermore, US 80 has a draw bridge across the Ouachita River. Improved bridge management, signal upgrade, coordination, and surveillance would improve safety and mobility along this corridor.

I-20

I-20 is the only interstate freeway through Monroe, and there are two main hot spots: one at Thomas Road (2nd highest rate of incidents) and the other at Jackson Street (5th highest rate of incidents). These two locations already have CCTV cameras monitoring the interchanges.

6.2.2 Bridges

The opening of the two bridges over the Ouachita River, US 80 (Louisville Avenue) and Endom Bridge, are synchronized with the opening of the railroad bridge. The Coast Guard requires the bridge to be open to vessel traffic within two hours of notification. This time requirement has not always been met as a result of delays by the railway bridge operators. Traffic on the US 80 has seven hot spots of high incidents between N. 21st Street and Cypress Street, with limited or no alternative routes for motorists.

6.2.3 Current Maintenance and Future Construction

Over the next several years, a number of new construction projects are planned according to the *Monroe Urbanized Area Metropolitan Transportation Plan (MTP) 2035*. In addition to the currently active maintenance projects, ITS can support these activities with technologies such as portable field devices for traffic and work zone management.

7 ITS Services

ITS services describe what can be done to improve the efficiency, safety, and convenience of the regional transportation system through better information, advanced systems, and new technologies. Some services are specific to one primary stakeholder while others require broad stakeholder participation. This section describes the ITS services that meet the transportation needs in the region. For the full description of the Service package, please see the National ITS Architecture.

The North Delta Regional Planning and Development has expressed interest in a Motorist Assistance Patrol (MAP) service, and is currently engaged in securing the funding for their portion of the service. It is still planned so it is still included in the project sequence table below

Monroe Transit is launching a contactless fare collection system called MTSPay. The new system is expected to improve the safety and efficiency of its public transit.

Control of the Monroe ITS Devices is currently through the Shreveport TMC in DOTD District 04, and the Statewide TMC at DOTD Headquarters monitors them. It is still included in the project sequence table.

Table 5: ITS Services

Service package	Service package Name	Service package Description	Service package Status	Included Elements
AD1	ITS Data Mart	This service package provides a focused archive that houses data collected and owned by a single agency, district, private sector provider, research institution, or other organization. This focused archive typically includes data covering a single transportation mode and one jurisdiction that is collected from an operational data store and archived for future use. It provides the basic data quality, data privacy, and meta data management common to all ITS archives and provides general query and report access to archive data users.	Planned	DOTD Statewide TMC
				Monroe TMC
				OCOG Database
				Ouachita Parish OHSEP
AD2	ITS Data Warehouse	This service package includes all the data collection and management capabilities provided by the ITS Data Mart, and adds the functionality and interface definitions that allow collection of data from multiple agencies and data sources spanning across modal and jurisdictional boundaries. It performs the additional transformations and provides the additional meta data management features that are necessary so that all this data can be managed in a single repository with consistent formats. The potential for large volumes of varied data suggests additional on-line analysis and data mining features that are also included in this service package in addition to the basic query and reporting user access features offered by the ITS Data Mart.	Planned	City of Monroe Engineering
				DOTD District 05 Traffic Operations
				DOTD Statewide TMC
				Local Emergency Operations Centers
				LSP Troop F
				Monroe TMC
				Monroe Transit Administration
				OCOG Database
				Ouachita Parish 911 Administration
TS01	Transit Vehicle Tracking	This service package monitors current transit vehicle location using an Automated Vehicle Location System. The location data may be used to determine real time schedule adherence and update the transit system's schedule in real-time. Vehicle position may be determined either by the vehicle (e.g., through GPS) and relayed to the infrastructure or may be determined directly by the communications infrastructure. A two-way wireless communication link with the Transit Management Subsystem is used for relaying vehicle position and control measures. Fixed route transit systems may also employ beacons along the route to enable position determination and facilitate communications with each vehicle at fixed intervals. The Transit Management Subsystem processes this information, updates the transit schedule and makes real-time schedule information available to the Information Service Provider.	Planned	Monroe Transit Administration
				Monroe Transit Fleet

Service package	Service package Name	Service package Description	Service package Status	Included Elements
APTS02	Transit Fixed-Route Operations	This service package performs automated dispatch and system monitoring for fixed-route and flexible-route transit services. This service performs scheduling activities including the creation of schedules, blocks and runs, as well as operator assignment. This service determines the transit vehicle trip performance against the schedule using AVL data and provides information displays at the Transit Management Subsystem. Static and real time transit data is exchanged with Information Service Providers where it is integrated with that from other transportation modes (e.g. rail, ferry, air) to provide the public with integrated and personalized dynamic schedules.	Planned	Monroe Transit Administration
				Monroe Transit Fleet
APTS04	Transit Fare Collection Management	This service package manages transit fare collection on-board transit vehicles and at transit stops using electronic means. It allows transit users to use a traveler card or other electronic payment device. Readers located either in the infrastructure or on-board the transit vehicle allow electronic fare payment. Data is processed, stored, and displayed on the transit vehicle and communicated as needed to the Transit Management Subsystem. Two other service packages, ATMS10: Electronic Toll Collection and ATMS16: Parking Facility Management also provide electronic payment services. These three service packages in combination provide an integrated electronic payment system for transportation services.	Planned	Monroe Transit Administration
				Monroe Transit Fleet
APTS06	Transit Fleet Management	This service package supports automatic transit maintenance scheduling and monitoring. On-board condition sensors monitor system status and transmit critical status information to the Transit Management Subsystem. Hardware and software in the Transit Management Subsystem processes this data and schedules preventative and corrective maintenance. The service package also supports the day to day management of the transit fleet inventory, including the assignment of specific transit vehicles to blocks.	Planned	Monroe Transit Administration
				Monroe Transit Fleet
APTS08	Transit Traveler Information	This service package provides transit users at transit stops and on-board transit vehicles with ready access to transit information. The information services include transit stop annunciation, imminent arrival signs, and real-time transit schedule displays that are of general interest to transit users. Systems that provide custom transit trip itineraries and other tailored transit information services are also represented by this service package.	Planned	Louisiana 511/Website
				Monroe Transit Administration
				Monroe Transit Fleet
				Traveler
APTS09	Transit Signal Priority	This service package determines the need for transit priority on routes and at certain intersections and requests transit vehicle priority at these locations. The signal priority may result from limited local coordination between the transit vehicle and the individual intersection for signal priority or may result from coordination between transit management and traffic management centers. Coordination between traffic and transit management is intended to improve on-time performance of the transit system to the extent that this can be accommodated without degrading overall performance of the traffic network.	Planned	Monroe Transit Administration
				Monroe Transit Fleet
				DOTD Social Media

Service package	Service package Name	Service package Description	Service package Status	Included Elements
ATIS01	Broadcast Traveler Information	This service package collects traffic conditions, advisories, general public transportation, toll and parking information, incident information, roadway maintenance and construction information, air quality and weather information, and broadcasts the information to travelers using technologies such as FM subcarrier, satellite radio, cellular data broadcasts, and Internet web casts. The information may be provided directly to travelers or provided to merchants and other traveler service providers so that they can better inform their customers of travel conditions. Different from the service package ATMS6 - Traffic Information Dissemination, which provides localized HAR and DMS information capabilities, ATIS1 provides a wide area digital broadcast service. Successful deployment of this service package relies on availability of real-time traveler information from roadway instrumentation, probe vehicles or other sources.	Planned	Local Print and Broadcast Channels
				Louisiana 511/Website
				LSP Troop F
				Tourism and Travel Service Information Sources
				Traveler
ATIS02	Interactive Traveler Information	This service package provides tailored information in response to a traveler request. Both real-time interactive request/response systems and information systems that "push" a tailored stream of information to the traveler based on a submitted profile are supported. The traveler can obtain current information regarding traffic conditions, roadway maintenance and construction, transit services, ride share/ride match, parking management, detours and pricing information. Although the Internet is the predominate network used for traveler information dissemination, a range of two-way wide-area wireless and fixed-point to fixed-point communications systems may be used to support the required data communications between the traveler and Information Service Provider.	Planned	Traveler
ATIS06	Transportation Operations Data Sharing	This service package makes real-time transportation operations data available to transportation system operators. The Information Service Provider collects, processes, and stores current information on traffic and travel conditions and other information about the current state of the transportation network and makes this information available to transportation system operators, facilitating the exchange of qualified, real-time information between agencies. Using the provided information, transportation system operators can manage their individual systems based on an overall view of the regional transportation system. The regional transportation operations data resource represented by the Information Service Provider may be implemented as a web application that provides a web-based access to system operators, an enterprise database that provides a network interface to remote center applications, or any implementation that supports regional sharing of real-time transportation operations data.	Planned	City of Monroe Engineering
				DOTD District 05 Traffic Operations
				DOTD ITS Section
				DOTD Statewide TMC
				Monroe TMC
ATMS01	Network Surveillance	This service package includes traffic detectors, other surveillance equipment, the supporting field equipment, and fixed-point to fixed-point communications to transmit the collected data back to the Traffic Management Subsystem. The derived data can be used locally such as when traffic detectors are connected directly to a signal control system or remotely (e.g., when a CCTV system sends data back to the Traffic Management Subsystem). The data generated by this service package enables traffic managers to monitor traffic and road conditions, identify and verify incidents, detect faults in indicator operations, and collect census data for traffic strategy development and long range planning. The collected data can also be analyzed and made available to users and the Information Service Provider Subsystem.	Existing	City of Monroe Engineering
				DOTD District 05 Traffic Operations
				DOTD Drawbridge Control
				DOTD ITS Field Equipment
				DOTD Statewide TMC
				Louisiana 511/Website
				Monroe TMC

Service package	Service package Name	Service package Description	Service package Status	Included Elements
ATMS02	Traffic Probe Surveillance	This service package provides an alternative approach for surveillance of the roadway network. Two general implementation paths are supported by this service package: 1) wide-area wireless communications between the vehicle and center is used to communicate vehicle operational information and status directly to the center, and 2) dedicated short range communications between passing vehicles and the roadside is used to provide equivalent information to the center.	Planned	DOTD Statewide TMC
				Monroe TMC
ATMS03	Surface Street Control	This service package provides the central control and monitoring equipment, communication links, and the signal control equipment that support local surface street control and/or arterial traffic management. A range of traffic signal control systems are represented by this service package ranging from fixed-schedule control systems to fully traffic responsive systems that dynamically adjust control plans and strategies based on current traffic conditions and priority requests. This service package is generally an intra-jurisdictional package that does not rely on real-time communications between separate control systems to achieve area-wide traffic signal coordination. Systems that achieve coordination across jurisdictions by using a common time base or other strategies that do not require real time coordination would be represented by this package. This service package is consistent with typical urban traffic signal control systems.	Existing	City of Monroe Engineering
				City of Monroe Traffic Signal System
				DOTD District 05 Traffic Operations
				DOTD District 05 Traffic Signal System
				Monroe TMC
ATMS04	Freeway Control	This service package provides central monitoring and control, communications, and field equipment that support freeway management. It supports a range of freeway management control strategies including ramp metering, interchange metering, mainline lane controls, mainline metering, and other strategies including variable speed controls. This package incorporates the instrumentation included in the Network Surveillance Service package to support freeway monitoring and adaptive strategies as an option.	Planned	DOTD ITS Field Equipment
				DOTD Statewide TMC
				Monroe TMC
ATMS06	Traffic Information Dissemination	This service package provides driver information using roadway equipment such as dynamic message signs or highway advisory radio. A wide range of information can be disseminated including traffic and road conditions, closure and detour information, incident information, and emergency alerts and driver advisories. This package provides information to drivers at specific equipped locations on the road network. This package also covers the equipment and interfaces that provide traffic information from a traffic management center to the media (for instance via a direct tie-in between a traffic management center and radio or television station computer systems), Transit Management, Emergency Management, and Information Service Providers.	Planned	DOTD ITS Field Equipment
				DOTD Statewide TMC
				Monroe TMC
ATMS07	Regional Traffic Management	This service package provides for the sharing of traffic information and control among traffic management centers to support regional traffic management strategies. Regional traffic management strategies that are supported include coordinated signal control in a metropolitan area and coordination between freeway operations and arterial signal control within a corridor. This service package advances the Surface Street Control and Freeway Control Service packages by adding the communications links and integrated control strategies that enable integrated interjurisdictional traffic management. The nature of optimization and extent of information and control sharing is determined through working arrangements between jurisdictions.	Planned	City of Monroe Engineering
				DOTD District 05 Traffic Operations
				DOTD ITS Field Equipment
				DOTD Statewide TMC
				Monroe TMC

Service package	Service package Name	Service package Description	Service package Status	Included Elements
ATMS08	Traffic Incident Management System	This service package manages both unexpected incidents and planned events so that the impact to the transportation network and traveler safety is minimized. The service package includes incident detection capabilities through roadside surveillance devices (e.g. CCTV) and through regional coordination with other traffic management, maintenance and construction management and emergency management centers as well as rail operations and event promoters. Information from these diverse sources is collected and correlated by this service package to detect and verify incidents and implement an appropriate response	Planned	City of Monroe Police Dept
				City of West Monroe Police Dept
				DOTD District 05 Traffic Operations
				DOTD ITS Field Equipment
				DOTD ITS Section
				DOTD Statewide TMC
				LSP Troop F
				Monroe TMC
				Other Local Public Safety Agencies
				Ouachita Parish 911 Administration
ATMS09	Traffic Decision Support and Demand Management	This service package recommends courses of action to traffic operations personnel based on an assessment of current and forecast road network performance. Recommendations may include predefined incident response plans and regional surface street and freeway control strategies that correct network imbalances. Where applicable, this service package also recommends transit, parking, and toll strategies to influence traveler route and mode choices to support travel demand management (TDM) programs and policies managing both traffic and the environment.	Planned	DOTD Statewide TMC
				Monroe TMC
ATMS13	Standard Railroad Grade Crossing	This service package manages highway traffic at highway-rail intersections (HRI) where operational requirements do not dictate more advanced features (e.g., where rail operational speeds are less than 80 miles per hour). Both passive (e.g., the crossbuck sign) and active warning systems (e.g., flashing lights and gates) are supported (note that passive systems exercise only the single interface between the roadway subsystem and the driver in the architecture definition). These traditional HRI warning systems may also be augmented with other standard traffic management devices. The warning systems are activated on notification by interfaced wayside equipment of an approaching train. The equipment at the HRI may also be interconnected with adjacent signalized intersections so that local control can be adapted to highway-rail intersection activities. Health monitoring of the HRI equipment and interfaces is performed; detected abnormalities are reported to both highway and railroad officials through wayside interfaces and interfaces to the traffic management subsystem.	Planned	City of Monroe Traffic Signal System
				DOTD District 05 Traffic Operations
				DOTD District 05 Traffic Signal System
				DOTD ITS Field Equipment
				RR At Grade Crossing Controller
ATMS19	Speed Monitoring	This service package monitors the speeds of vehicles traveling through a roadway system. If the speed is determine to be excessive, roadside equipment can suggest a safe driving speed. Environmental conditions may be monitored and factored into the safe speed advisories that are provided to the motorist. This service can also support notifications to an enforcement agency to enforce the speed limit on a roadway system.	Planned	DOTD ITS Field Equipment
				DOTD Statewide TMC
				Monroe TMC

Service package	Service package Name	Service package Description	Service package Status	Included Elements
ATMS20	Drawbridge Management	This service package supports systems that manage drawbridges at rivers and canals and other multimodal crossings (other than railroad grade crossings which are specifically covered by other service packages). The equipment managed by this service package includes control devices (e.g., gates, warning lights, dynamic message signs) at the drawbridge as well as the information systems that are used to keep travelers apprised of current and forecasted drawbridge status.	Planned	DOTD Drawbridge Control
				DOTD ITS Field Equipment
				DOTD Statewide TMC
				Louisiana 511/Website
				Monroe TMC
EM01	Emergency Call-Taking and Dispatch	This service package provides basic public safety call-taking and dispatch services. It includes emergency vehicle equipment, equipment used to receive and route emergency calls, and wireless communications that enable safe and rapid deployment of appropriate resources to an emergency. Coordination between Emergency Management Subsystems supports emergency notification between agencies. Wide area wireless communications between the Emergency Management Subsystem and an Emergency Vehicle supports dispatch and provision of information to responding personnel.	Planned	DOTD MAP
				DOTD Statewide TMC
				Local Emergency Medical
				Other Local Public Safety Agencies
				Ouachita Parish 911 Administration
EM04	Roadway Service Patrols	This service package supports roadway service patrol vehicles that monitor roads that aid motorists, offering rapid response to minor incidents (flat tire, accidents, out of gas) to minimize disruption to the traffic stream. If problems are detected, the roadway service patrol vehicles will provide assistance to the motorist (e.g., push a vehicle to the shoulder or median). The service package monitors service patrol vehicle locations and supports vehicle dispatch to identified incident locations. Incident information collected by the service patrol is shared with traffic, maintenance and construction, and traveler information systems.	Existing	City of Monroe Police Dept
				City of West Monroe Police Dept
				DOTD ITS Section
				DOTD MAP
				DOTD Statewide TMC
				Monroe TMC
				Ouachita Parish 911 Administration
EM06	Wide-Area Alert	This service package uses ITS driver and traveler information systems to alert the public in emergency situations such as child abductions, severe weather events, civil emergencies, and other situations that pose a threat to life and property. The alert includes information and instructions for transportation system operators and the traveling public, improving public safety and enlisting the public's help in some scenarios. The ITS technologies will supplement and support other emergency and homeland security alert systems such as the Emergency Alert System (EAS).	Planned	DOTD Statewide TMC
				Monroe TMC
				Ouachita Parish 911 Administration
				Ouachita Parish OHSEP
EM08	Disaster Response and Recovery	This service package enhances the ability of the surface transportation system to respond to and recover from disasters. It addresses the most severe incidents that require an extraordinary response from outside the local community. All types of disasters are addressed including natural disasters (hurricanes, earthquakes, floods, winter storms, tsunamis, etc.) and technological and man-made disasters (hazardous materials incidents, nuclear power plant accidents, and national security emergencies such as nuclear, chemical, biological, and radiological weapons attacks).	Planned	DOTD Statewide TMC
				Local Emergency Medical
				LSP Troop F
				Ouachita Parish OHSEP

Service package	Service package Name	Service package Description	Service package Status	Included Elements
EM09	Evacuation and Reentry Management	This service package supports evacuation of the general public from a disaster area and manages subsequent reentry to the disaster area. The service package addresses evacuations for all types of disasters, including disasters like hurricanes that are anticipated and occur slowly, allowing a well-planned orderly evacuation, as well as disasters like terrorist acts that occur rapidly, without warning, and allow little or no time for preparation or public warning.	Planned	DOTD District 05 Traffic Operations
				DOTD Statewide TMC
				Local Emergency Medical
				Local Emergency Operations Centers
				LSP Troop F
				Monroe TMC
				Ouachita Parish OHSEP
EM10	Disaster Traveler Information	This service package uses ITS to provide disaster-related traveler information to the general public, including evacuation and reentry information and other information concerning the operation of the transportation system during a disaster. This service package collects information from multiple sources including traffic, transit, public safety, emergency management, shelter provider, and travel service provider organizations. The collected information is processed and the public is provided with real-time disaster and evacuation information using ITS traveler information systems.	Planned	Local Emergency Operations Centers
				Local Print and Broadcast Channels
				Ouachita Parish OHSEP
				Tourism and Travel Service Information Sources
MC07	Roadway Maintenance and Construction	This service package supports numerous services for scheduled and unscheduled maintenance and construction on a roadway system or right-of-way. Maintenance services would include landscape maintenance, hazard removal (roadway debris, dead animals), routine maintenance activities (roadway cleaning, grass cutting), and repair and maintenance of both ITS and non-ITS equipment on the roadway (e.g., signs, traffic controllers, traffic detectors, dynamic message signs, traffic signals, CCTV, etc.). Environmental conditions information is also received from various weather sources to aid in scheduling maintenance and construction activities.	Existing	DOTD District 05 Traffic Operations
				DOTD ITS Section
				DOTD Statewide TMC
				Monroe TMC
MC08	Work Zone Management	This service package manages work zones, controlling traffic in areas of the roadway where maintenance, construction, and utility work activities are underway. Traffic conditions are monitored using CCTV cameras and controlled using dynamic message signs (DMS), Highway Advisory Radio (HAR), gates and barriers. Work zone information is coordinated with other groups (e.g., ISP, traffic management, and other maintenance and construction centers). Work zone speeds and delays are provided to the motorist prior to the work zones. This service package provides control of field equipment in all maintenance and construction areas, including fixed, portable, and truck-mounted devices supporting both stationary and mobile work zones.	Existing	DOTD District 05 Traffic Operations
				DOTD ITS Field Equipment
				DOTD ITS Section
				DOTD Statewide TMC
				Monroe TMC
MC12	Infrastructure Monitoring	This service package monitors the condition of pavement, bridges, tunnels, associated hardware, and other transportation-related infrastructure (e.g., culverts) using both fixed and vehicle-based infrastructure monitoring sensors. Fixed sensors monitor vibration, stress, temperature, continuity, and other parameters and mobile sensors and data logging devices collect information on current infrastructure condition. This service package also monitors vehicle probes for vertical acceleration data and other probe data that may be used to determine current pavement condition.	Planned	DOTD ITS Field Equipment
				DOTD ITS Section

8 Interfaces between Systems

The interfaces of the transportation systems in Monroe Regional ITS Architecture are based on the National ITS Architecture and tailored to reflect the plan for that region. Architecture diagrams display the transportation systems in the Monroe Regional ITS Architecture and, more importantly, how these systems are and will be connected with one another so that information can be exchanged and transportation services can be coordinated. Stakeholders may use these diagrams to identify integration opportunities. Each system in the region can be represented with two types of diagrams: an overall interconnect context diagram or element specific architecture flow context diagram as described below.

The interconnect context diagram shows the connections between systems (i.e., Elements). Interconnects are represented as single lines and indicate information sharing without specifying the type of information being shared or the direction of the information movement, shown as planned or existing. An architecture flow context diagram shows a particular system and all other systems with which it is interconnected, the information being shared (i.e. architecture flows), and the direction of the flow. Descriptions of the architecture flows are included in **Appendix A**. An architecture flow context diagram or interconnect context diagram for each element has been included as part of **Appendix B**.

Information about the interfaces of the systems in the region is contained in the Turbo Architecture™ database. Turbo Architecture™ can be used to create tailored interconnect and architecture flow context diagrams for any system in the database

9 Operational Concept

The Operational Concept lists the roles and responsibilities (RR) that each participating agency must take on to provide the ITS services included in the ITS Architecture. Changing needs may arise that will require an agreement to be formed between all affected parties that defines new or additional roles and responsibilities. Defining the roles and responsibilities of the participating stakeholders in the region and the willingness of agencies to accept their roles and responsibilities is an important step in realizing the common goal of an interoperable ITS system throughout the region.

Table 6: Operational Concept

RR Area Name	Stakeholder	RR Description	RR Status
Archived Data Systems for Monroe Regional ITS Architecture	LADOTD	Traffic data collection	Planned
	Local Emergency Medical Providers	Medical response	Existing
	Louisiana State Police	Incident response	
		Speed enforcement	
		Emergency response	Planned
	North Delta Regional Planning and Development District	Transportation planning	Existing
		Archive data management	Planned
Emergency Management for Monroe Regional ITS Architecture	City of Monroe	Incident response	Existing
		Speed enforcement	
		Emergency response	
		Incident management	Planned
	City of West Monroe	Incident response	Existing
		Speed enforcement	
		Emergency response	
		Incident management	Planned
	LADOTD	Traffic operations	Existing
		Traffic Control	
		Infrastructure monitoring	Planned
		Event monitoring	
	Local Emergency Medical Providers	Medical response	Existing
	Louisiana State Police	Emergency response	
	Media	Motorist information	
	Public	End user of traveler information	
	Tourism and Traveler Information Service Providers	Motorist information	
Freeway Management for Monroe Regional ITS Architecture	City of Monroe	Incident response	Existing
		Incident management	Planned
		Speed enforcement	
	City of West Monroe	Incident response	Existing
		Incident management	
		Speed enforcement	
	LADOTD	Traffic operations	
		Event monitoring	
		Traffic data collection	Planned
		Infrastructure monitoring	
		Motorist information systems	

RR Area Name	Stakeholder	RR Description	RR Status
		Traffic Control	Existing
		ITS Field Equipment maintenance and construction	Planned
	Louisiana State Police	Incident response	Existing
		Speed enforcement	
	Media	Motorist information	
	North Delta Regional Planning and Development District	Transportation planning	Planned
		Archive data management	
	Tourism and Traveler Information Service Providers	Motorist information	Existing
Incident Management for Monroe Regional ITS Architecture	City of Monroe	Incident response	Existing
		Traffic control	
		Incident management	Planned
		Speed enforcement	
	City of West Monroe	Incident response	Existing
		Incident management	
		Speed enforcement	
		Traffic control	
	LADOTD	Traffic operations	Existing
		Event monitoring	
		Motorist information systems	Planned
		Infrastructure monitoring	
		Traffic Control	
	Local Emergency Medical Providers	Medical response	Existing
	Local Public Safety Agencies	Traffic control	Planned
	Louisiana State Police	Incident response	Existing
		Speed enforcement	
		Emergency response	
	Media	Motorist information	
	North Delta Regional Planning and Development District	Transportation planning	Existing
		Crash data collection	Planned
		Crash data	
		Traffic data collection	
	Tourism and Traveler Information Service Providers	Motorist information	Existing
Maintenance and Construction for Monroe Regional ITS Architecture	City of Monroe	Traffic signal system maintenance and construction	Existing
		Surface street maintenance and construction	
	City of West Monroe	Traffic signal system maintenance and construction	
		Surface street maintenance and construction	
	LADOTD	Traffic signal system maintenance and construction	
		Roadway maintenance and construction	

RR Area Name	Stakeholder	RR Description	RR Status
		Infrastructure monitoring	Planned
		ITS Software and hardware maintenance	
		ITS Field Equipment maintenance and construction	
	Media	Motorist information	Existing
	North Delta Regional Planning and Development District	Archive data management	Planned
	Ouachita Parish Police Jury	Surface street maintenance and construction provider	Planned
	Tourism and Traveler Information Service Providers	Motorist information	Existing
Surface Street Management for Monroe Regional ITS Architecture	City of Monroe	Traffic operations	Existing
	City of West Monroe	Traffic operations	Existing
		Traffic signal system maintenance and construction	Planned
	LADOTD	Traffic operations	Existing
	Media	Motorist information	
	North Delta Regional Planning and Development District	Transportation planning	
		Traffic data collection	Planned
	Ouachita Parish Police Jury	Surface street maintenance and construction provider	Existing
	Tourism and Traveler Information Service Providers	Motorist information	
Transit Services for Monroe Regional ITS Architecture	City of Monroe	Transit Provider	Existing
Traveler Information for Monroe Regional ITS Architecture	LADOTD	Motorist information systems	Planned
	Media	Motorist information	Existing
	Public	End user of traveler information	
	Tourism and Traveler Information Service Providers	Motorist information	

9.1 ITS Deployment Plan-Sequence of planned Projects

The Monroe Regional ITS Architecture will be implemented one ITS project at a time. This section lists the projects that have been identified as part of the regional ITS architecture definition. Additional detail for each of these ITS projects is included in the Turbo Architecture database.

Table 7: Project Sequence

Name	Description	Service Scope	Geographic Scope	Time Frame	Market Packages	Design Cost	Capital Cost	O&M	Total Cost
Motorist Assistance Patrol Deployment	Project to deploy Motorist Assistance Patrol vehicles and services	Freeway Service Patrol including the following services: - Motorist Services (e.g., chilled water, change tires, fuel, first aid, etc) - Tow service on bridge (if deemed critical) - Emergency vehicle fleet - Traffic Incident Management services - TMC Support - General contract management	Along I-20 between Well Rd. and Millhaven Rd.	1 Year	ATMS01 ATMS02 ATMS04 ATMS06 ATMS07 ATMS08 ATMS19 EM01 EM04 EM06 EM08 EM09 EM10	\$5,000 - \$16,000	\$100,000 - \$200,000	\$15,000 - \$50,000	\$120,000 - \$266,000
Monroe Region Communications	Deployment of dedicated communications for 911 Centers, TMC, and engineering	Communications may include fiber optic and/or wireless mediums of communication and required equipment.	Regional	2-4 years	ATMS03 ATMS07 EM08 EM09	\$25,000 - \$80,000	\$500,000- \$1,000,000	\$75,000 - \$250,000	\$250,000 - \$600,000
Monroe TMC	Local Traffic Management Center (TMC)	TMC Operations to include: -Active monitoring of traffic conditions on state and federal routes -Disseminating information for emergencies, incidents and amber alerts -Coordination for Traffic Incident Management -Agency outreach -Dispatching MAP	Monroe area - Coverage to include state and federal routes	2-4 years	AD1 AD2	\$5,000 - \$16,000	\$112,500 - \$230,000	\$15,000 - \$50,000	\$120,000 - \$266,000

Name	Description	Service Scope	Geographic Scope	Time Frame	Market Packages	Design Cost	Capital Cost	O&M	Total Cost
Monroe ITS Deployment Phase 3	US 80 Traffic Signal Coordination Upgrade project and ITS field equipment	US 80 corridor is made up of multiple interconnected signal systems using twisted pair cable for communications. This project would upgrade traffic signal systems with communications with a central computer system. In addition, this project would include deployment of CCTV Cameras and DMS for monitoring and providing messages on the corridor. Additionally, a railroad crossing status system will be deployed to provide motorist advisory of a train present at an at-grade crossing. Operations of equipment envisioned to be provided by the Monroe TMC and the Statewide TMC. Maintenance is to be provided by DOTD ITS Section 56.	US 0 (Well Rd to Kansas Ln)	4-5 years	ATMS03	\$112,500 - \$220,000	\$ 2,250,000 - \$2,750,000	\$ 337,500 - \$687,500	\$ 2,700,000 - \$3,657,500
Monroe ITS Deployment Phase 4	Deployment of ITS Field Equipment on other major roadways	Deploy ITS field equipment including but not limited to arterial DMS, CCTV Cameras, Vehicle Detection and railroad crossing status system. Operations of equipment envisioned to be provided by the Monroe TMC and the Statewide TMC. Maintenance is to be provided by DOTD ITS Section 56.	Thomas Rd (LA 617), Forsythe Ave (LA 840)	5 Years	AD1 AD2 APTS08 ATOS01 ATOS02 ATMS01 ATMS03 ATMS04 ATMS06 ATMS07 ATMS08 ATMS20 EM01 EM04 EM06 EM08 EM09 EM10	\$132,400 - \$260,000	\$2,648,000 - \$3,250,000	\$ 397,200 - \$812,500	\$ 3,177,000 - \$4,322,000
Monroe Transit Priority System	Bus priority system in signalized corridor	Provide pre-emption for buses to received movement priority on signalized route.	City of Monroe	5 years	APTS09	,000-\$160,000	\$1,000,000-\$2,000,000	\$150,000-\$500,000	\$1,200,000-\$2,700,000

9.2 Operations and Maintenance of Regional ITS

Currently, LADOTD ITS Section (Section 56) is responsible for providing statewide ITS equipment O&M support for equipment on state and federal routes. LADOTD O&M for DOTD Traffic Signals are maintained by the district office or by a municipality through an agreement. On other routes, the agency responsible for the ITS is the facility owner. Typically, ITS maintenance activities are performed on an as-needed basis. Every regional ITS does not have dedicated funding source/structure for periodic maintenance of the system. As the transportation funding resources struggle to keep up with the demand, it is critical to understand the capital cost versus O&M cost balance over the life-cycle of any ITS. As the Monroe region prepares to expand and enhance existing ITS, it is critical to identify which agency will be responsible for a proposed ITS and how much resources will be required for O&M of the system. Considering a dedicated annual budget for ITS deployment in the region, it is understandable that the more ITS deployment in the region, the less money will be available for new ITS deployment in successive time periods.

In this document, subject O&M resource/responsibilities have been covered under two different sections: one defining agency O&M responsibilities and the other specifying O&M funding requirements. In **Table 6**, maintenance responsibilities have been identified/assigned to a particular agency for each applicable service package. Although, such O&M arrangements may differ at a project level based on specific agencies involved, the operations and maintenance requirements section under each service package provides guidelines on which agency should assume the maintenance responsibilities for each ITS component.

As far as the long term funding is considered, there is currently no dedicated long term maintenance funding for any ITS in the region. LADOTD currently has a statewide maintenance budget of \$2 million, which serves for both routine and emergency maintenance. **Table 7** above not only identifies capital cost requirements for ITS but also provides O&M funding requirements for all the planned ITSs. For most systems, an estimated dollar figure is provided as the O&M cost; in the case where a dollar value is not provided, 10% of capital cost shall be assumed as the O&M cost per year.

9.3 ITS Funding

As mentioned earlier, currently there is no dedicated funding source for ITS deployments in the Monroe region. LADOTD ITS Section is budgeted \$10 million each year as part of highway funding program, which is allocated statewide on a prioritized basis depending on immediate need. Although, some part of this money is typically allocated to each region, there is currently no dedicated funding source for ITS in Monroe regional Transportation Improvement Program (TIP) to cover all the identified projects. As part of the follow-up to this architecture effort, it is recommended that North Delta Regional Planning Commission (ND), being the regional planning entity, work together with LADOTD and the other Monroe stakeholders and pursue funding sources for the ITS deployment within the region.

10 Architecture Maintenance Plan

This section discusses the proposed Maintenance Plan for the regional 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 http://ops.fhwa.dot.gov/its_arch_imp/guidance.htm. The Maintenance Plan for the Monroe Regional ITS Architecture is based on the guidelines provided by FHWA's White Paper. 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. This report provides some background on the need for architecture maintenance and addresses key issues under the following headings:

- Why Maintain a Regional ITS Architecture?
- Who Will Maintain the Architecture?
- When will the Architecture be updated?
- What will be maintained?
- How will the Architecture be maintained?

10.1 Why Maintain a Regional ITS Architecture

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. It will also need to be updated 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.

10.2 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. The primary requirements of the regional architecture maintainer are the mission/authority to perform such functions and the necessary skills to perform the same. The mission of the ITS architecture maintainer most closely resembles a regional planning body that, as consistent with its mission, has the authority to initiate, update, and document changes in regional planning documents. For the Monroe Regional ITS Architecture, the LADOTD will assume the role of the ITS Architecture keeper and maintainer as indicated in Section 3.4.

Like the regional transportation plans, architecture maintenance is recurring, and is a necessary long-term effort. To be effective in ITS architecture maintenance, LADOTD will need to have staff that:

- Is knowledgeable of the existing regional ITS architecture. This implies a detailed technical understanding of the various parts of the architecture and how changes would affect each part.
- Has an understanding of transportation systems in the region. This understanding can reside jointly in the group of agencies/ stakeholders who participate in the maintenance process.

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- Has an understanding of the tools used to create (and to update) the architecture. This might include, for example, knowledge of the Turbo Architecture™ tool, if that is used to hold some of the architecture information.

As the agency responsible for maintaining the architecture, the LADOTD needs to have the skills within its own organization and/or use a qualified consultant. In either case, the agency needs the necessary funding to support the maintenance effort. The following are the recommended minimum resources for ITS architecture maintenance management:

- One individual to be the ITS architecture manager
- Two individuals trained in Turbo Architecture™ and ITS Planning (Considering this is a new functional/skill area, the training will need to be comprehensive and will require resources: three work days for Turbo™ training and four weeks spread over the month to study regional and national architecture documents)
- Approximately 16 man-hours per month for ITS architecture maintenance activities. This may be performed by the manager or designee.
- Manage the update of the Regional ITS Architecture Turbo Architecture source file with project level ITS architectures
- Facilitate ITS Steering Committee meetings annually. The ITS Steering Committee is made up of representative from each stakeholder in the region.

Additionally, LADOTD will use a qualified consultant to assist with the ITS architecture maintenance activities. LADOTD has on a retainer contract a professional engineer consulting firm to provide ITS TIM Program TMC Operations Staffing and Systems Engineering Support.

Although LADOTD will lead the architecture maintenance activities, like all other regional planning activities, ITS architecture maintenance will take close coordination between several agencies. LADOTD will need to coordinate with other major stakeholders* in the region, including:

- Louisiana Department of Transportation and Development (LADOTD) District 5
- LADOTD ITS Section
- Louisiana State Police (Troop F)
- OCOG/North Delta Regional Planning Commission (ND)

*Note – Other stakeholders may be included as necessary based on ITS development and deployment activities.

As LADOTD takes responsibility for architecture maintenance, they will 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. At minimum, such a committee will include two LADOTD representative, one ND representative, and one FHWA representative.

It is proposed that such a Regional ITS Architecture Maintenance Committee will be responsible for recommending/presenting the proposed changes to the MPO Technical Advisory Committee. (Same committee that approves regional planning documents). The Regional ITS Architecture Maintenance Committee will meet annually to report/discuss any changes to ITSs in the region. All the regional stakeholders will be responsible for informing/updating the regional maintenance committee about new ITS deployments in their region. The architecture maintenance committee will also be responsible for following up with all of the regional stakeholders to ensure that any and all ITS deployments are reported and documented in the regional plan.

Following this architecture adoption by the MPO, it is recommended that the Regional ITS Architecture Maintenance Committee meet at least once a year to:

- Review progress in ITS implementation projects
- Verify that the regional ITS architecture Turbo Architecture™ source file is kept up to date with the region's ITS projects
- Update plans for future deployments by each regional stakeholder
- Review changes in State and National ITS Architectures, regulations, and requirements, if any
- Determine any needs for an update to the Monroe Regional ITS Architecture

10.3 When will the architecture be updated?

The regional ITS architecture is not static. It must change as plans change, as ITS projects are implemented, and as the ITS needs and services evolve in the region.

At a minimum, the regional ITS architecture will be reviewed annually by the Regional ITS Architecture Maintenance Committee. The Regional ITS Architecture Maintenance Committee may meet and perform architecture updates more frequently to keep with the pace of the region's ITS implementation. Annual or more frequent updates will include integrating completed projects into the regional ITS architecture Turbo Architecture™ source file. A one page summary of the change will be added as an appendix to the regional ITS architecture document.

Regardless of the frequency selected for periodic updates, it is recommended that the Committee recognize the potential need for "Exception Maintenance" to occur in the event of major project implementations, major revisions to the National ITS Architecture, or to meet the requirements of future regulations.

It is recommended that the regional ITS architecture is fully updated every five years, prior to the periodic updating of the Regional Transportation Improvement Program, which occurs once a year.

Upon recommendation of the Regional Architecture Maintenance Committee, the MPO Technical Advisory Committee will make a resolution to accept any revisions/changes/updates to the ITS architecture.

The following list includes many of the events that may cause change to a regional ITS architecture:

10.3.1 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 addresses 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.

10.3.2 New Stakeholders

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 addresses 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.

10.3.3 Changes in scope of service 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.

10.3.4 Changes in stakeholder of element names

An agency's name or the name used to describe their element(s) undergoes change. Transportation agencies occasionally merge, split, or just renames them. In addition, element names may evolve as projects are defined. The regional ITS architecture should be updated to use the current, correct names for both stakeholders and elements.

10.3.5 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.

10.3.6 Changes due to Project Definitions 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, as well as future, regional implementation of ITS, it must be updated to correctly reflect how the developed projects integrate into the region.

10.3.7 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.

10.3.8 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.

10.4 What 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. Baseline parts are annually updated within the regional ITS architecture Turbo file and every five years within the document. The parts discussed are:

- Description of Region
- List of Stakeholders
- Operational Concepts
- List of ITS Elements
- List of Agreements
- Interfaces between Elements

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- 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 an appropriate effort should be levied to maintain them.

10.4.1 Description of Region

This description includes the geographic scope, functional scope, and architecture timeframe, 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 need to be described if they communicate ITS information to elements inside the region. Functional scope defines which services are included in a regional ITS architecture. Architecture timeframe 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.

10.4.2 List of Stakeholders

Stakeholders are of great importance to 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 may 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.

10.4.3 Operational Concepts

It is crucial that the operational concepts which might be represented as roles and responsibilities or as customized service 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 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 service package approach is used, and should be part of the baseline.

10.4.4 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.

10.4.5 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.

10.4.6 Interfaces between Elements

Interfaces between elements define the “details” of the architecture. They are the detailed description of how the various ITSs are or will be integrated throughout the timeframe 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.

10.4.7 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.

10.4.8 Applicable ITS Standards

The selection of standards depends on the information exchange requirements. But in addition, 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 there are competing standards exist). For example, if Extensive Markup Language (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. Common Object Request Broker Architecture (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.

10.4.9 Project Sequencing

While project sequencing is partly determined by functional dependencies (e.g. “surveillance” must be a precursor to “traffic management”), the reality is that most project sequences are local policy decisions. Project sequences should be reviewed to make sure that they are in line with current policy decisions. Furthermore, policy makers should be informed of the sequences and their input should be sought to make the project sequences coincide with their expectations. This is crucial to eliminate the possibility of the regional ITS architecture becoming irrelevant. The project sequencing should be included in the architecture documentation and may also be held in a spreadsheet or database. These should be part of the architecture baseline.

10.5 How will the architecture be maintained?

LADOTD ITS Section (Section 56) will oversee and ensure that the regional architecture is maintained. LADOTD will utilize its contracted consulting services contract for ITS Traffic Incident Management (TIM) Program TMC Operations Staffing and Systems Engineering Support for this effort. The guidelines contained within FHWA’s Regional ITS Architecture Maintenance White Paper will be helpful in guiding the maintenance effort. 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.

11 Functional Requirements

Each ITS operated by the stakeholders must perform certain functions to effectively deliver the ITS services desired by the region. The primary functions that each system needs to perform are broadly defined in the Monroe Regional ITS Architecture. The high-level requirements are grouped into functional areas that identify requirements associated with each selected ITS service.

Due to the sheer magnitude of the functional requirements, the document requirements have not been included within the written regional ITS architecture. However, the functional requirements are available by running a report from the regional ITS architecture Turbo Architecture source file which can be made available upon request to LADOTD ITS Section.

Table 8: Functional Requirements (Sample)

Element Name	Entity Name	Functional Area	Requirement ID	Requirement	Status
City of Monroe Engineering	Traffic Management	Collect Traffic Surveillance	1	The center shall monitor, analyze, and store traffic sensor data (speed, volume, occupancy) collected from field elements under remote control of the center.	Planned
			2	The center shall monitor, analyze, and distribute traffic images from CCTV systems under remote control of the center.	Planned
			3	The center shall monitor, analyze, and store multimodal crossing and high occupancy vehicle (HOV) lane sensor data under remote control of the center.	Planned
			4	The center shall distribute road network conditions data (raw or processed) based on collected and analyzed traffic sensor and surveillance data to other centers.	Planned
			5	The center shall respond to control data from center personnel regarding sensor and surveillance data collection, analysis, storage, and distribution.	Planned
			6	The center shall maintain a database of surveillance and sensors and the freeways, surface street and rural roadways, e.g. where they are located, to which part(s) of the network their data applies, the type of data, and the ownership of each link (that is, the agency or entity responsible for collecting and storing surveillance of the link) in the network.	Planned
For the entire table of functional requirements, see the regional ITS architecture Turbo Architecture source file.					

12 Standards

Standardizing the flow of information between the systems is essential to cost-effectively integrating ITS throughout the region. ITS standards are fundamental to the establishment of an open ITS environment that achieves the goal of interoperability for ITS. Standards facilitate deployment of interoperable systems at local, regional, and national levels without impeding innovation as technology advances and new approaches evolve.

Establishing standards for exchanging information among ITS systems is important not only from an interoperability point of view; it also provides interchangeability and expandability thereby reducing risk and cost. Since an agency using standardized interfaces can select among multiple vendors for products and applications, competition is maintained and prices are lower in the long term.

Standards Development Organizations (SDO) is developing ITS standards that support interoperability and interchangeability. Several of the communication standards overlap in applicability. This provides flexibility in the design of ITS systems allowing agencies to choose the most applicable standard for their needs. Before systems are designed, all stakeholders involved in the applicable ITS service(s) should decide upon the standards and their specifics that will be used. Once a decision is made, all future systems should use the agreed upon standards.

Table 9: ITS Standards

Group	SDO	Document ID	Standard Title
No	AASHTO/ITE	ITE TMDD	Traffic Management Data Dictionary (TMDD) and Message Sets for External Traffic Management Center Communications (MS/ETMCC)
No	AASHTO/ITE/NEMA	NTCIP 1201	Global Object Definitions
No	AASHTO/ITE/NEMA	NTCIP 1202	Object Definitions for Actuated Traffic Signal Controller (ASC) Units
No	AASHTO/ITE/NEMA	NTCIP 1203	Object Definitions for Dynamic Message Signs (DMS)
No	AASHTO/ITE/NEMA	NTCIP 1205	Object Definitions for Closed Circuit Television (CCTV) Camera Control
No	AASHTO/ITE/NEMA	NTCIP 1206	Object Definitions for Data Collection and Monitoring (DCM) Devices
No	AASHTO/ITE/NEMA	NTCIP 1207	Object Definitions for Ramp Meter Control (RMC) Units
No	AASHTO/ITE/NEMA	NTCIP 1208	Object Definitions for Closed Circuit Television (CCTV) Switching
No	AASHTO/ITE/NEMA	NTCIP 1209	Data Element Definitions for Transportation Sensor Systems (TSS)
No	AASHTO/ITE/NEMA	NTCIP 1210	Field Management Stations (FMS) - Part 1: Object Definitions for Signal System Masters
No	AASHTO/ITE/NEMA	NTCIP 1211	Object Definitions for Signal Control and Prioritization (SCP)
No	AASHTO/ITE/NEMA	NTCIP 1214	Object Definitions for Conflict Monitor Units (CMU)
No	APTA	APTA TCIP-S-001 3.0.3	Standard for Transit Communications Interface Profiles
No	ASTM	ASTM E2468-05	Standard Practice for Metadata to Support Archived Data Management Systems
No	ASTM	ASTM E2665-08	Standard Specifications for Archiving ITS-Generated Traffic Monitoring Data
Yes	AASHTO/ITE/NEMA	NTCIP C2C	NTCIP Center-to-Center Standards Group
Yes	AASHTO/ITE/NEMA	NTCIP C2F	NTCIP Center-to-Field Standards Group
Yes	ASTM/IEEE/SAE	DSRC 5GHz	Dedicated Short Range Communication at 5.9 GHz Standards Group
Yes	IEEE	IEEE IM	Incident Management Standards Group
Yes	SAE	ATIS General Use	Advanced Traveler Information Systems (ATIS) General Use Standards Group

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Appendix A **Architecture Flow Definitions**

Architecture Flow Definitions

Flow Name	Flow Description
alert notification	Notification of a major emergency such as a natural or man-made disaster, civil emergency, or child abduction for distribution to the public. The flow identifies the alert originator, the nature of the emergency, the geographic area affected by the emergency, the effective time period, and information and instructions necessary for the public to respond to the alert. This flow may also identify specific information that should not be released to the public.
alert notification coordination	Coordination of emergency alerts to be distributed to the public. This includes notification of a major emergency such as a natural or man-made disaster, civil emergency, or child abduction for distribution to the public and status of the public notification.
alert status	Information indicating the current status of the emergency alert including identification of the traveler and driver information systems that are being used to provide the alert.
archive requests	A request to a data source for information on available data (i.e. "catalog") or a request that defines the data to be archived. The request can be a general subscription intended to initiate a continuous or regular data stream or a specific request intended to initiate a one-time response from the recipient.
archive status	Notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, the offending data and the nature of the potential problem are identified.
archived data product requests	A user-specified request for archived data products (i.e. data, meta data, or data catalogs). The request also includes information that is used to identify and authenticate the user and support electronic payment requirements, if any.
archived data products	Raw or processed data, meta data, data catalogs and other data products provided to a user system upon request. The response may also include any associated transaction information.
barrier system control	Information used to configure and control barrier systems that are represented by gates, barriers and other automated or remotely controlled systems used to manage entry to roadways.
barrier system status	Current operating status of barrier systems. Barrier systems represent gates, barriers and other automated or remotely controlled systems used to manage entry to roadways. Status of the systems includes operating condition and current operational state.
current asset restrictions	Restrictions levied on transportation asset usage based on infrastructure design, surveys, tests, or analyses. This includes standard facility design height, width, and weight restrictions, special restrictions such as spring weight restrictions, and temporary facility restrictions that are imposed during maintenance and construction.
data collection and monitoring control	Information used to configure and control data collection and monitoring systems.
emergency archive data	Logged emergency information including information that characterizes identified incidents (routine highway incidents through disasters), corresponding incident response information, evacuation information, surveillance data, threat data, and resource information. Content may include a catalog of available information, the actual information to be archived and associated meta data that describes the archived information.
emergency operations inputs	Emergency operator inputs supporting call taking, dispatch, emergency operations, security monitoring, and other operations and communications center operator functions.
emergency plan coordination	Information that supports coordination of emergency management plans, continuity of operations plans, emergency response and recovery plans, evacuation plans, and other emergency plans between agencies. This includes general plans that are coordinated prior to an incident and shorter duration tactical plans that are prepared during an incident.
emergency traffic control information	Status of a special traffic control strategy or system activation implemented in response to an emergency traffic control request, a request for emergency access routes, a request for evacuation, a request to activate closure systems, a request to employ driver information systems to support public safety objectives, or other special requests. Identifies the selected traffic control strategy and system control status.
emergency traffic control request	Special request to preempt the current traffic control strategy in effect at one or more signalized intersections or highway segments, activate traffic control and closure systems such as gates and barriers, activate safeguard systems, or use driver information systems. For example, this flow can request all signals to red-flash, request a progression of traffic control preemptions along an emergency vehicle route, request a specific evacuation traffic control plan, request activation of a road closure barrier system, or place a public safety or emergency-related message on a dynamic message sign.
equipment maintenance status	Current status of field equipment maintenance actions.

Flow Name	Flow Description
evacuation coordination	Coordination of information regarding a pending or in-process evacuation. Includes evacuation zones, evacuation times, evacuation routes, forecast network conditions, and reentry times.
evacuation information	Evacuation instructions and information including evacuation zones, evacuation times, and reentry times.
event information	Special event information for travelers. This would include a broader array of information than the similar "event plans" that conveys only information necessary to support traffic management for the event.
event information request	Request for special event information.
external reports	Traffic and incident information that is collected by the media through a variety of mechanisms (e.g., radio station call-in programs, air surveillance).
fare and price information	Current transit, parking, and toll fee schedule information.
field device status	Reports from field equipment (sensors, signals, signs, controllers, etc.) which indicate current operational status.
field equipment status	Identification of field equipment requiring repair and known information about the associated faults.
freeway control data	Control commands and operating parameters for ramp meters, mainline metering/lane controls and other systems associated with freeway operations.
incident command information coordination	Information that supports local management of an incident. It includes resource deployment status, hazardous material information, traffic, road, and weather conditions, evacuation advice, and other information that enables emergency or maintenance personnel in the field to implement an effective, safe incident response.
incident information	Notification of existence of incident and expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system.
incident report	Report of an identified incident including incident location, type, severity and other information necessary to initiate an appropriate incident response.
incident response coordination	Incident response procedures and current incident response status that are shared between allied response agencies to support a coordinated response to incidents. This flow provides current situation information, including a summary of incident status and its impact on the transportation system and other infrastructure, and current and planned response activities. This flow also coordinates a positive hand off of responsibility for all or part of an incident response between agencies.
incident response status	Status of the current incident response including a summary of incident status and its impact on the transportation system, traffic management strategies implemented at the site (e.g., closures, diversions, traffic signal control overrides), and current and planned response activities.
interactive traveler information	Traveler information provided in response to a traveler request. The provided information includes traffic and road conditions, advisories, incidents, payment information, transit services, parking information, weather information, and other travel-related data updates and confirmations.
ISP coordination	Coordination and exchange of transportation information between centers. This flow allows a broad range of transportation information collected by one ISP to be redistributed to many other ISPs and their clients.
logged vehicle routes	Anticipated route information for guided vehicles, special vehicles (e.g., oversized vehicles) or groups of vehicles (e.g., governor's motorcade) that may require changes in traffic control strategy.
maintenance and construction archive data	Information describing road construction and maintenance activities identifying the type of activity, the work performed, and work zone information including work zone configuration and safety (e.g., a record of intrusions and vehicle speeds) information. For construction activities, this information also includes a description of the completed infrastructure, including as-built plans as applicable. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.
maintenance and construction resource coordination	Request for road maintenance and construction resources that can be used in the diversion of traffic (cones, portable signs), clearance of a road hazard, repair of ancillary damage, or any other incident response.
maintenance and construction resource request	Request for road maintenance and construction resources that can be used in the diversion of traffic (cones, portable signs), clearance of a road hazard, repair of ancillary damage, or any other incident response. The request may poll for resource availability or request pre-staging, staging, or immediate dispatch of resources.

Flow Name	Flow Description
maintenance and construction resource response	Current status of maintenance and construction resources including availability and deployment status. General resource inventory information covering vehicles, equipment, materials, and people and specific resource deployment status may be included.
maintenance and construction work plans	Future construction and maintenance work schedules and activities including anticipated closures with anticipated impact to the roadway, alternate routes, anticipated delays, closure times, and durations.
map update request	Request for a map update which could include a new underlying map or map layer updates.
map updates	Map update which could include a new underlying static or real-time map or map layer(s) update.
probe archive data	Probe data that allows calculation of travel times, volumes, and other measures that support transportation planning. Optionally, this flow also includes origin and destination information for vehicles that opt to provide this information.
remote surveillance control	The control commands used to remotely operate another center's sensors or surveillance equipment so that roadside surveillance assets can be shared by more than one agency.
resource coordination	Coordination of resource inventory information, specific resource status information, resource prioritization and reallocation between jurisdictions, and specific requests for resources and responses that service those requests.
resource deployment status	Status of resource deployment identifying the resources (vehicles, equipment, materials, and personnel) available and their current status. General resource inventory information and specific status of deployed resources may be included.
resource request	A request for resources to implement special traffic control measures, assist in clean up, verify an incident, etc. The request may poll for resource availability or request pre-staging, staging, or immediate deployment of resources. Resources may be explicitly requested or a service may be requested and the specific resource deployment may be determined by the responding agency.
road network conditions	Current and forecasted traffic information, road and weather conditions, and other road network status. Either raw data, processed data, or some combination of both may be provided by this architecture flow. Information on diversions and alternate routes, closures, and special traffic restrictions (lane/shoulder use, weight restrictions, width restrictions, HOV requirements) in effect is included along with a definition of the links, nodes, and routes that make up the road network.
road network status assessment	Assessment of damage sustained by the road network including location and extent of the damage, estimate of remaining capacity, required closures, alternate routes, necessary restrictions, and time frame for repair and recovery.
road network traffic probe data	Aggregated route usage, travel times, and other aggregated data collected from probe vehicles that can be used to estimate current traffic conditions.
roadside archive data	A broad set of data derived from roadside sensors that includes current traffic conditions, environmental conditions, and any other data that can be directly collected by roadside sensors. This data also indicates the status of the sensors and reports of any identified sensor faults.
roadway equipment coordination	The direct flow of information between field equipment. This includes transfer of information between sensors and driver information systems (e.g., DMS, HAR) or control devices (e.g., traffic signals, ramp meters), direct coordination between adjacent control devices, interfaces between detection and warning or alarm systems, and any other direct communications between field equipment. This includes information exchanged between a Signal System Master (SSM) and the Signal System Local (SSL) equipment.
roadway information system data	Information used to initialize, configure, and control roadside systems that provide driver information (e.g., dynamic message signs, highway advisory radio, beacon systems). This flow can provide message content and delivery attributes, local message store maintenance requests, control mode commands, status queries, and all other commands and associated parameters that support remote management of these systems.
roadway information system status	Current operating status of dynamic message signs, highway advisory radios, beacon systems, or other configurable field equipment that provides dynamic information to the driver.
roadway maintenance status	Summary of maintenance fleet operations affecting the road network. This includes the status of winter maintenance (snow plow schedule and current status).
security equipment maintenance status	Current status of security surveillance and sensor field equipment maintenance actions.
security field equipment status	Identification of security sensors and surveillance equipment requiring repair and known information about the associated faults.
signal control data	Information used to configure and control traffic signal systems.
signal control status	Status of surface street signal controls including operating condition and current operational state.

Flow Name	Flow Description
speed monitoring control	Information used to configure and control automated speed monitoring, speed warning, and speed enforcement systems.
speed monitoring information	System status including current operational state and logged information including measured speeds, warning messages displayed, and violation records.
traffic archive data	Information describing the use and vehicle composition on transportation facilities and the traffic control strategies employed. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.
traffic control coordination	Information transfers that enable remote monitoring and control of traffic management devices. This flow is intended to allow cooperative access to, and control of, field equipment during incidents and special events and during day-to-day operations. This flow also allows 24-hour centers to monitor and control assets of other centers during off-hours, allows system redundancies and fail-over capabilities to be established, and otherwise enables integrated traffic control strategies in a region.
traffic flow	Raw and/or processed traffic detector data which allows derivation of traffic flow variables (e.g., speed, volume, and density measures) and associated information (e.g., congestion, potential incidents). This flow includes the traffic data and the operational status of the traffic detectors.
traffic images	High fidelity, real-time traffic images suitable for surveillance monitoring by the operator or for use in machine vision applications. This flow includes the images and the operational status of the surveillance system.
traffic information coordination	Traffic information exchanged between TMC's. Normally would include incidents, congestion data, traffic data, signal timing plans, and real-time signal control information.
traffic probe data	Vehicle data that is used to determine traffic conditions. In a basic implementation, the data could be limited to time stamped unique identifiers that can be used to measure a vehicle's progress through the network. In more advanced implementations, the vehicle may report current position, speed, and heading and snapshots of recent events including route information, starts and stops, speed changes, and other information that can be used to estimate traffic conditions.
traffic sensor control	Information used to configure and control traffic sensor systems.
transit archive data	Data used to describe and monitor transit demand, fares, operations, and system performance. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.
transportation information for operations	Information on the state of transportation system operations including traffic and road conditions, advisories, incidents, transit service information, weather information, parking information, and other related data.
transportation system status	Current status and condition of transportation infrastructure (e.g., tunnels, bridges, interchanges, TMC offices, maintenance facilities). In case of disaster or major incident, this flow provides an assessment of damage sustained by the surface transportation system including location and extent of the damage, estimate of remaining capacity and necessary restrictions, and time frame for repair and recovery.
traveler alerts	Traveler information alerts reporting congestion, incidents, adverse road or weather conditions, parking availability, transit service delays or interruptions, and other information that may impact the traveler. Relevant alerts are provided based on traveler-supplied profile information including trip characteristics and preferences.
traveler archive data	Data associated with traveler information services including service requests, facility usage, rideshare, routing, and traveler payment transaction data. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.
traveler information for media	General traveler information regarding incidents, unusual traffic conditions, transit issues, or other advisory information that has been desensitized and provided to the media.
traveler profile	Information about a traveler including equipment capabilities, personal preferences, and traveler alert subscriptions.
traveler request	A request for traveler information including traffic, transit, toll, parking, road weather conditions, event, and passenger rail information. The request identifies the type of information, the area of interest, parameters that are used to prioritize or filter the returned information, and sorting preferences.
video surveillance control	Information used to configure and control video surveillance systems.
work zone information	Summary of maintenance and construction work zone activities affecting the road network including the nature of the maintenance or construction activity, location, impact to the roadway, expected time(s) and duration of impact, anticipated delays, alternate routes, and suggested speed limits. This information may be augmented with images that provide a visual indication of current work zone status and traffic impacts.

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Appendix B

Monroe Regional ITS Architecture Context Diagrams

Appendix B - Monroe Regional ITS Architecture Context Diagrams

Please note interconnect diagrams may be shown in place of context diagrams for elements that are not clearly viewable.

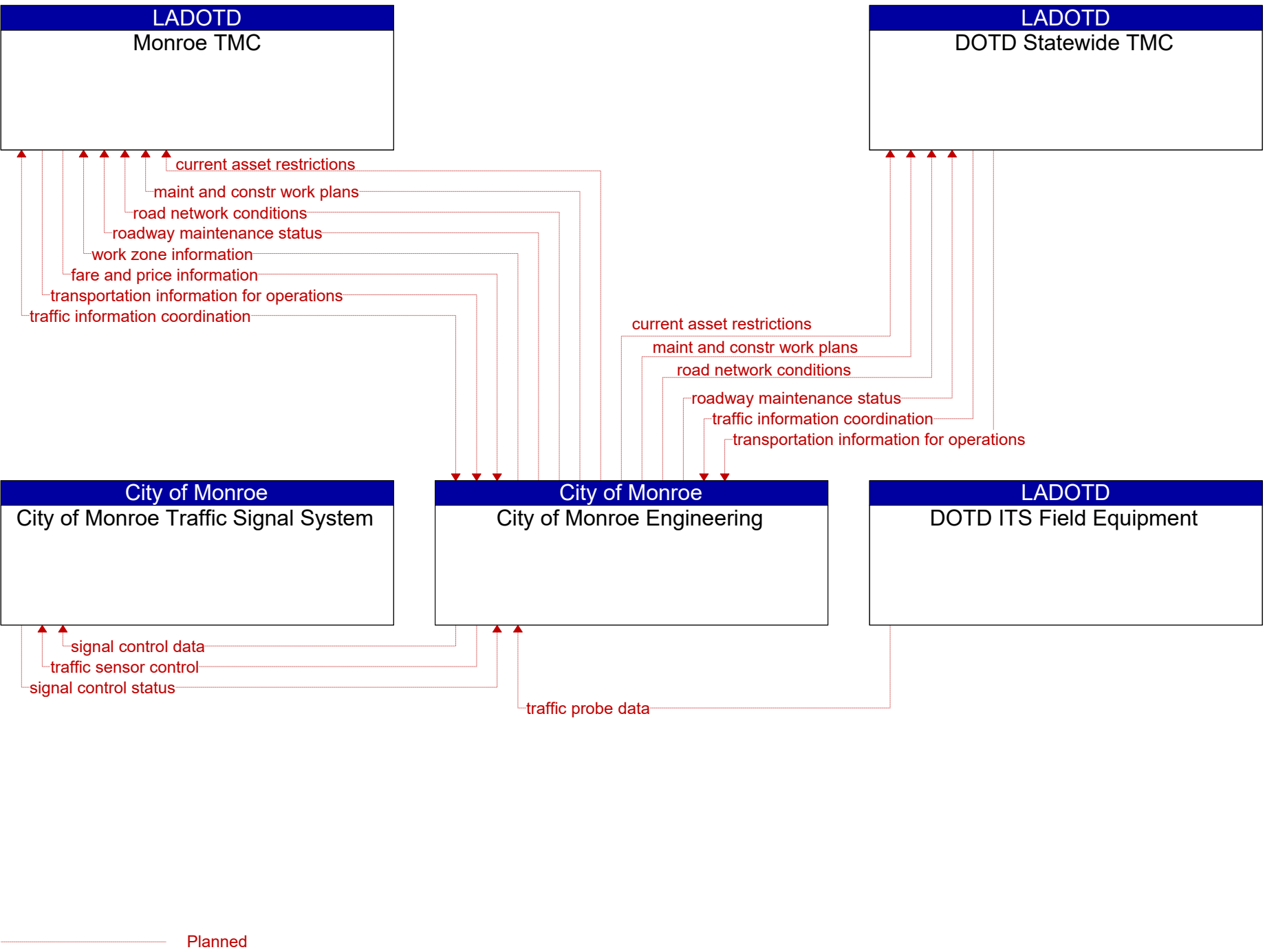


Figure 3: City of Monroe Engineering Flow Context Diagram

Notes: 1. See Appendix A for architecture flow descriptions.

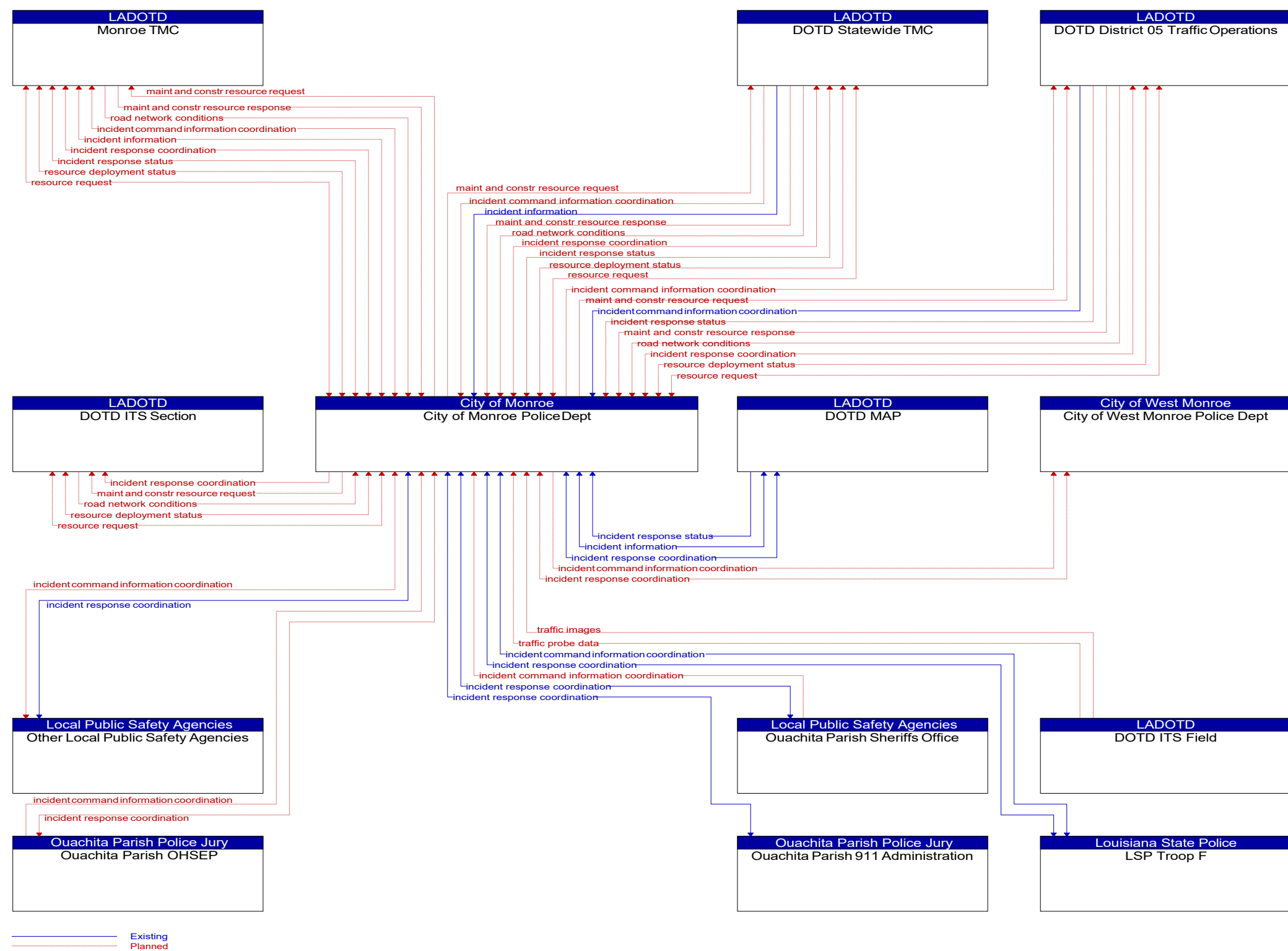


Figure 4: City of Monroe Police Department Flow Context Diagram

Notes: 1. See Appendix A for architecture flow descriptions.

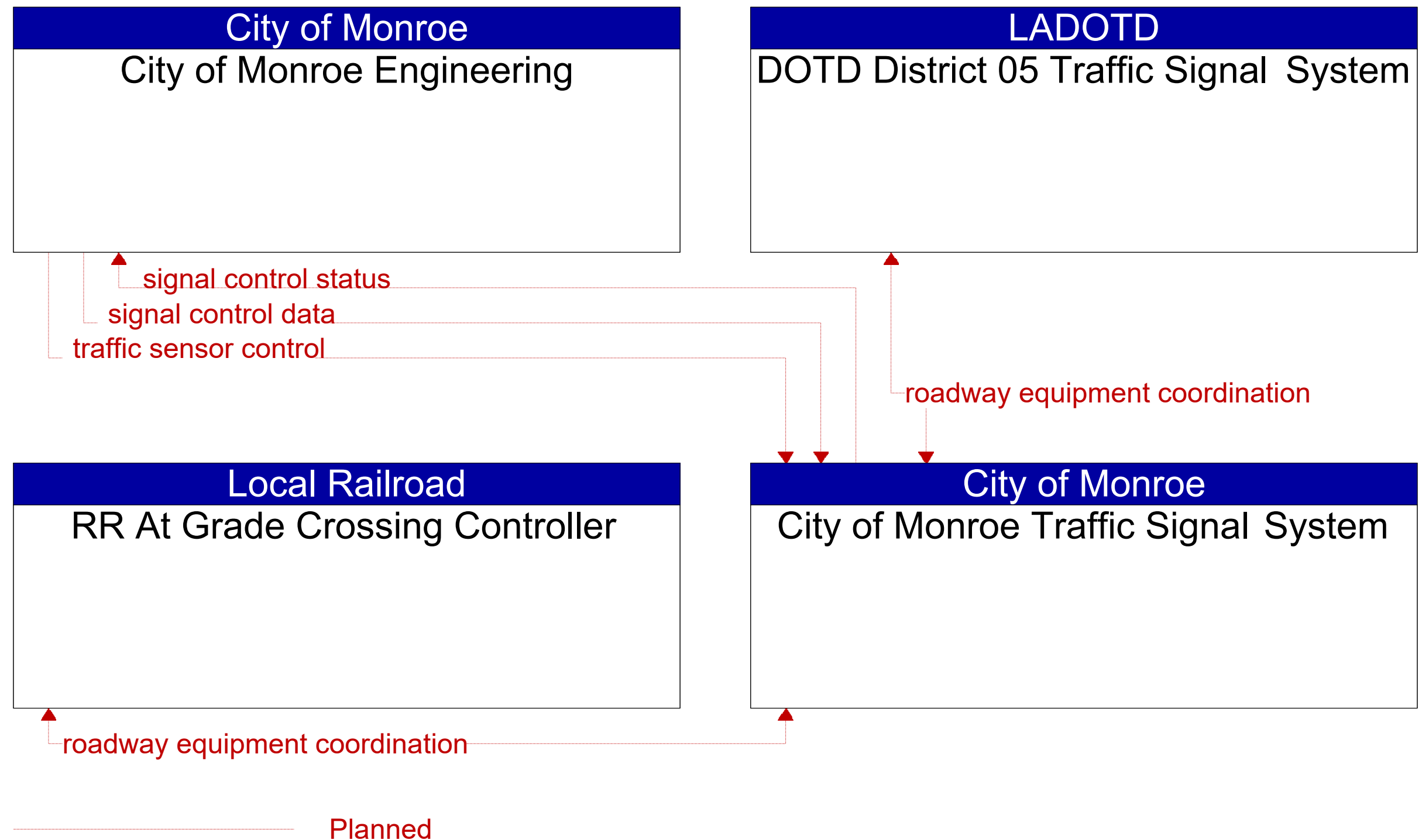


Figure 5: City of Monroe Traffic Signal System Flow Context Diagram

Notes: 1. See Appendix A for architecture flow descriptions.



Figure 6: City of West Monroe Police Department Flow Context Diagram

Notes: 1. See Appendix A for architecture flow descriptions.

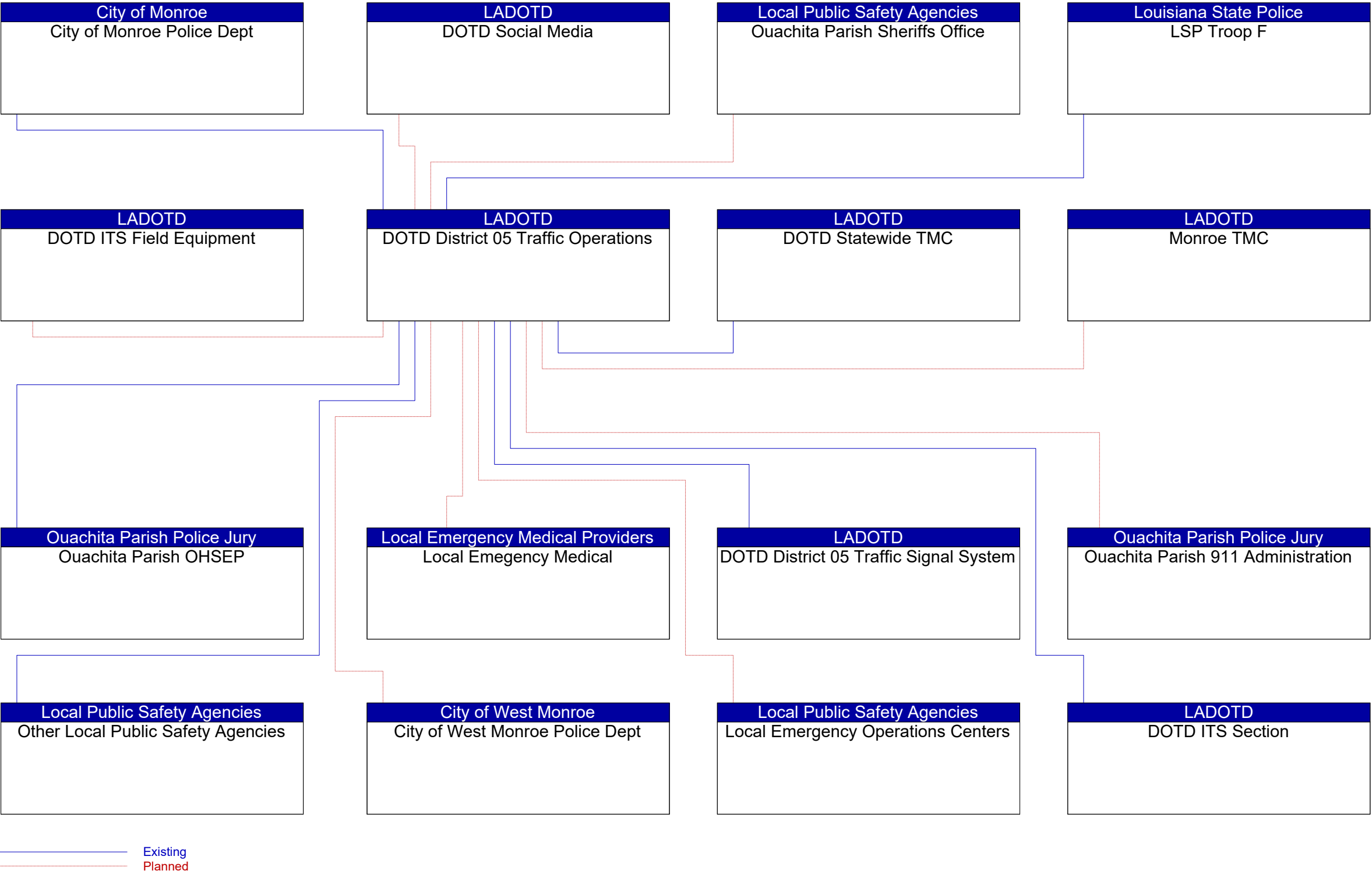


Figure 7: DOTD District 05 Traffic Operations Interconnect Context Diagram

Notes: 1. See Appendix A for architecture flow descriptions.

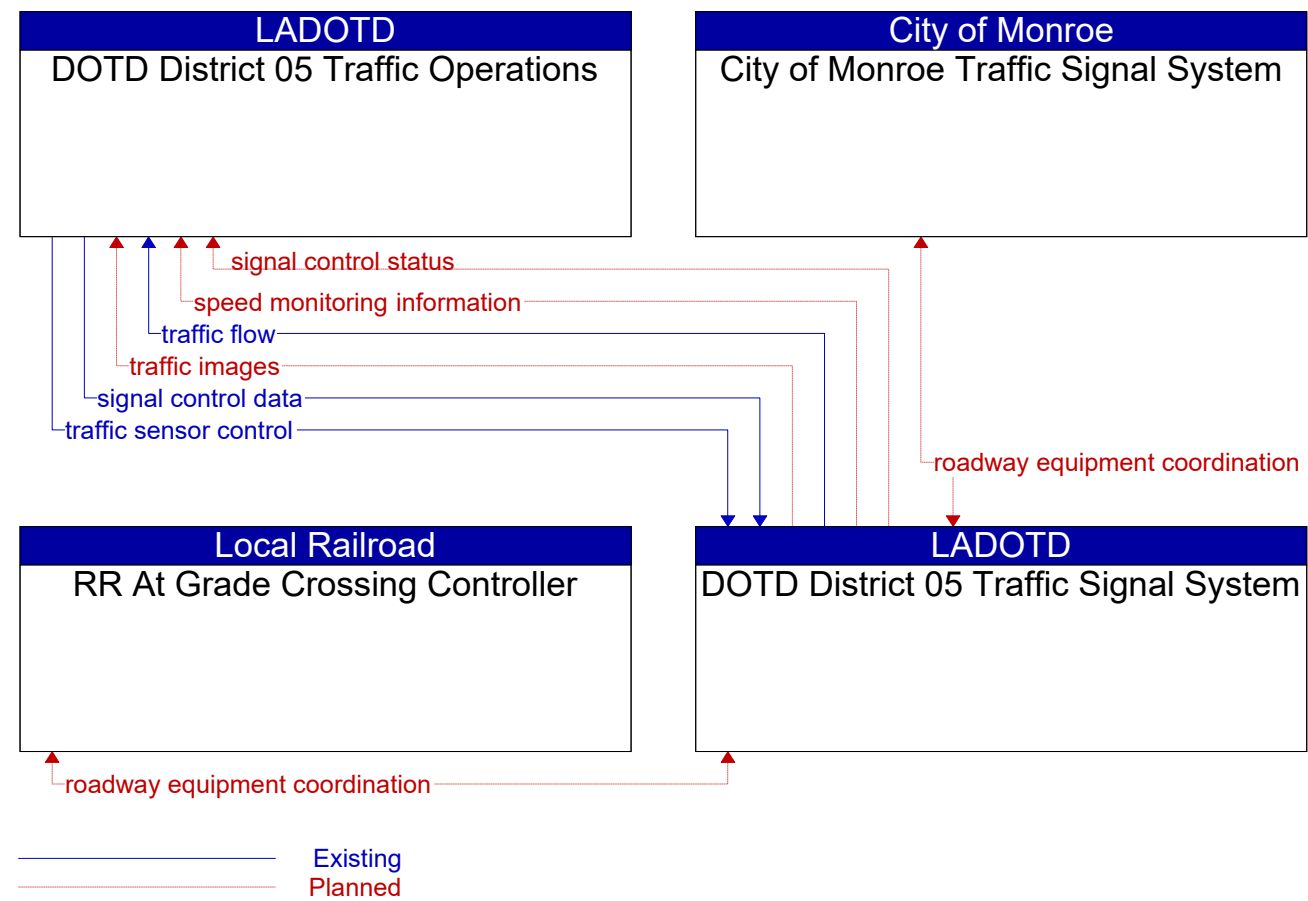


Figure 8: DOTD District 05 Traffic Signal System Flow Context Diagram

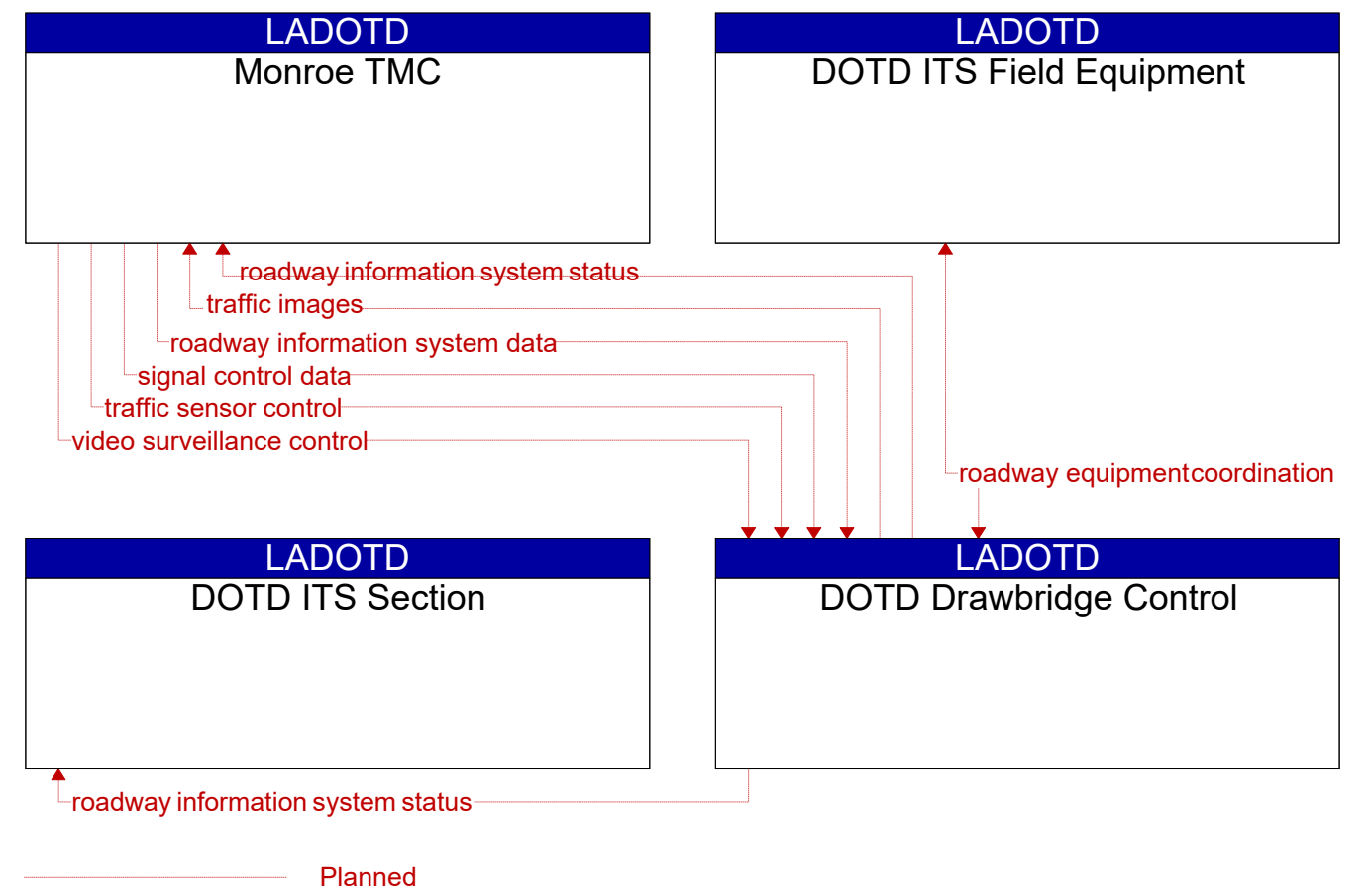


Figure 9: DOTD Drawbridge Control Flow Context Diagram

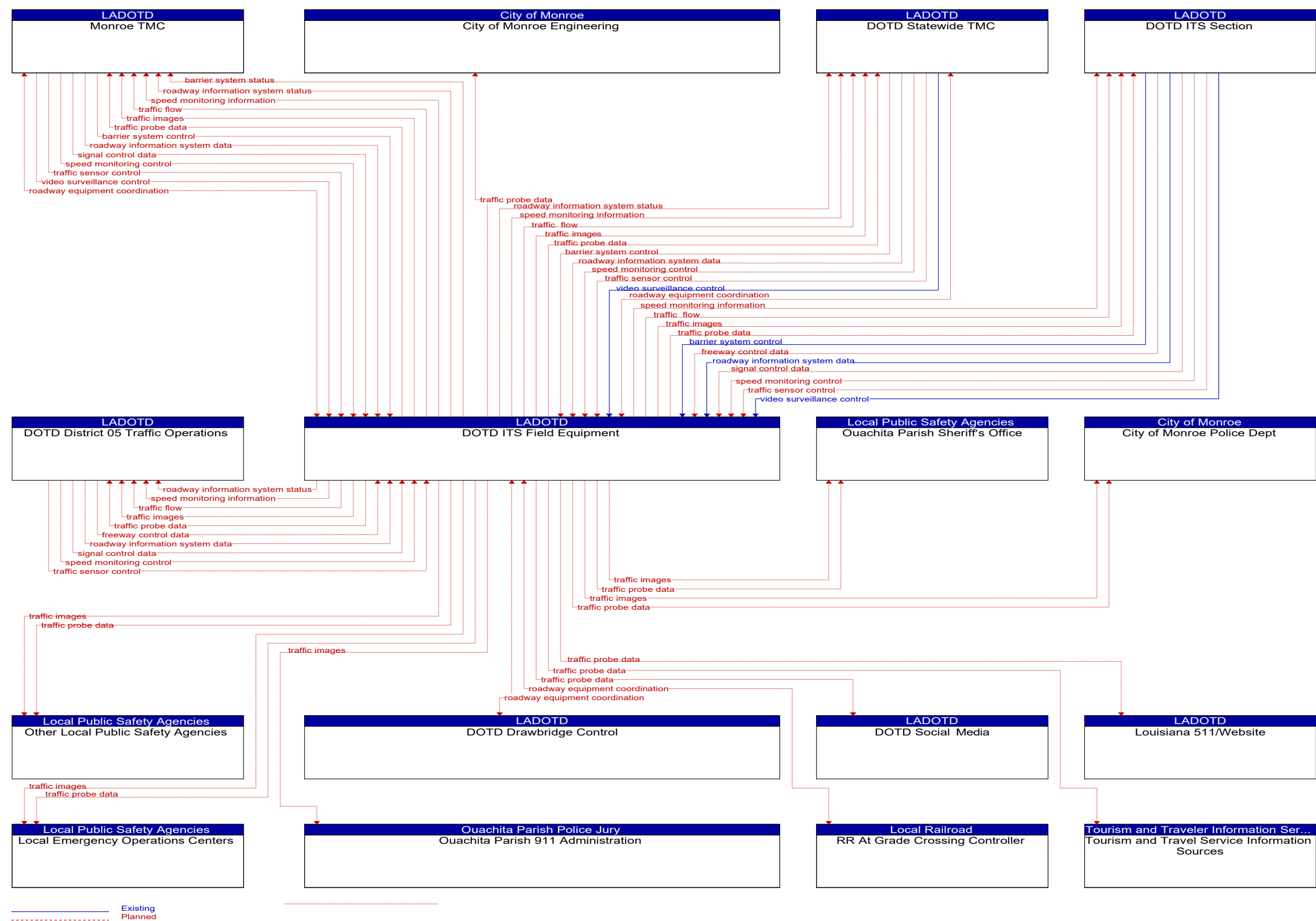


Figure 10: DOTD ITS Field Equipment Flow Context Diagram

Notes: 1. See Appendix A for architecture flow descriptions.

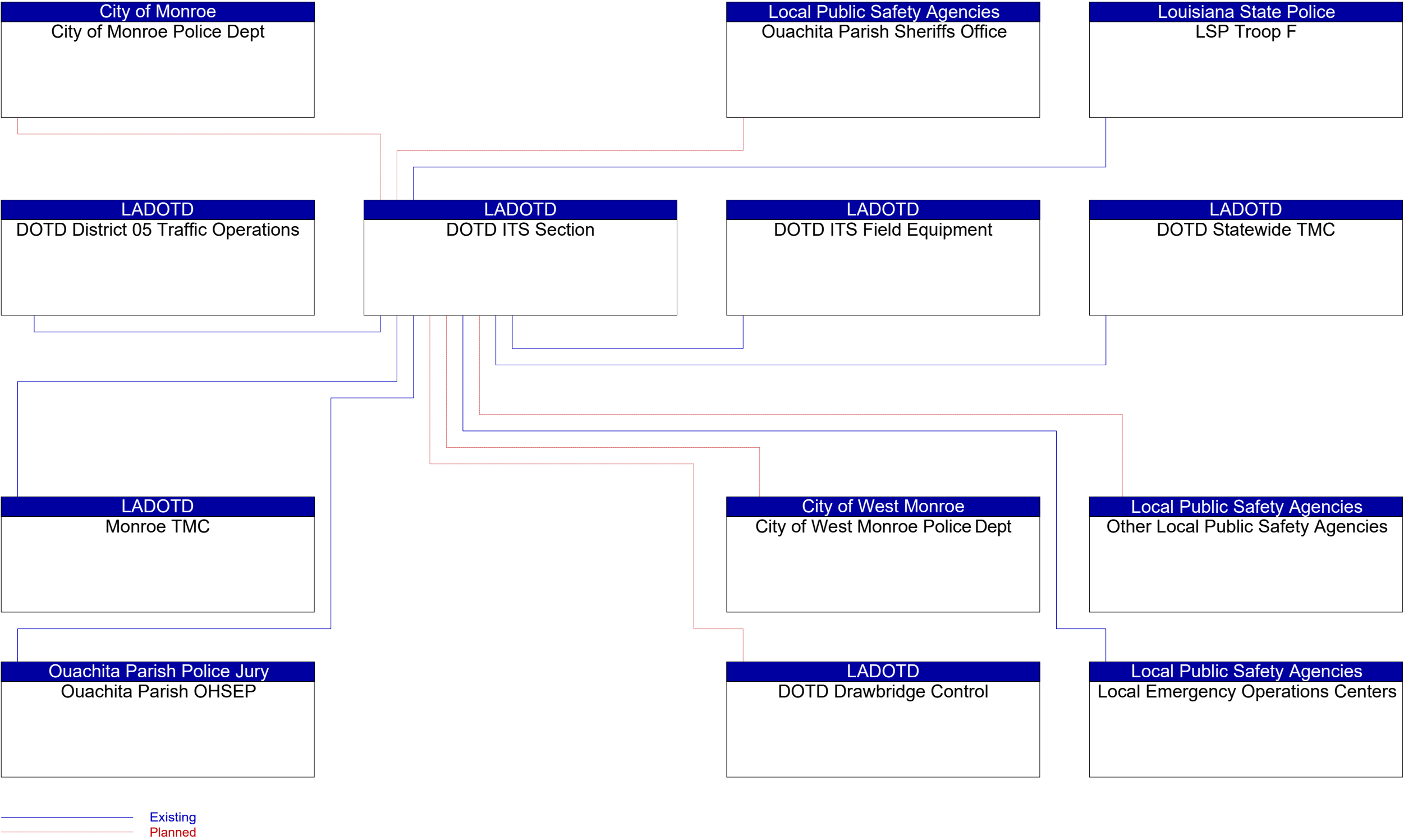


Figure 11: DOTD ITS Section Interconnect Context Diagram

Notes: 1. See Appendix A for architecture flow descriptions.

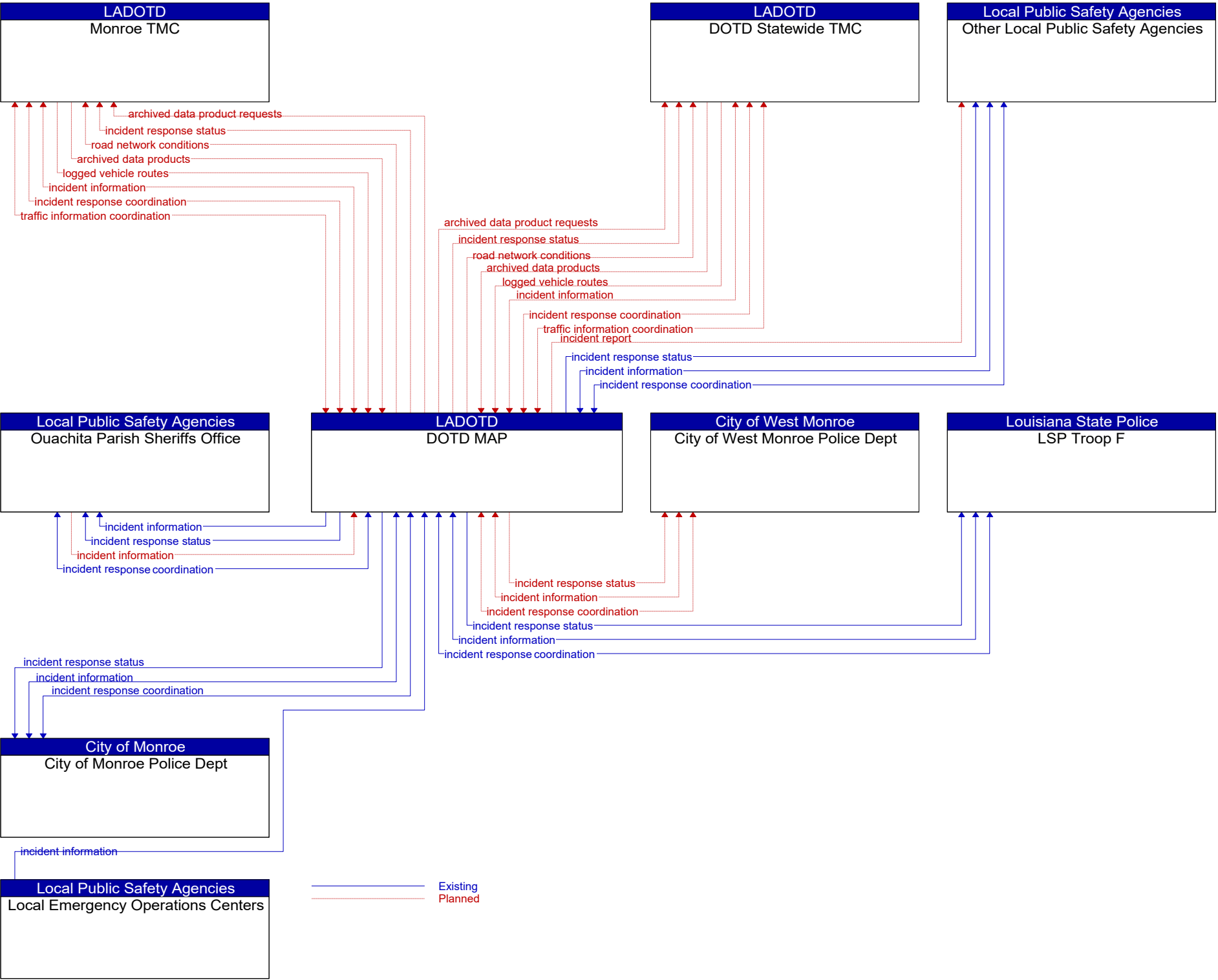


Figure 12: DOTD MAP Flow Context Diagram

Notes: 1. F See Appendix A for architecture flow descriptions.

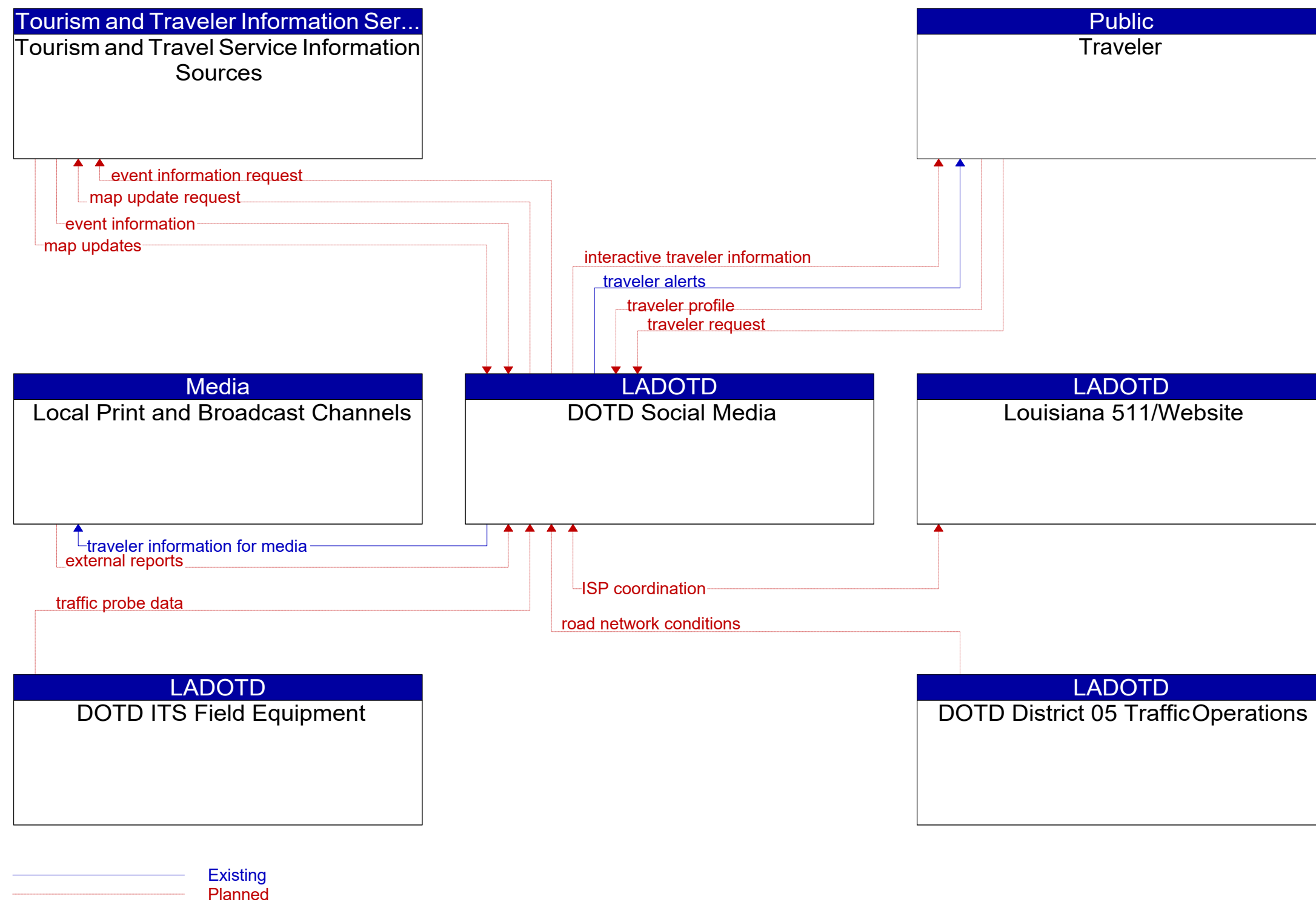


Figure 13: DOTD Social Media Flow Context Diagram

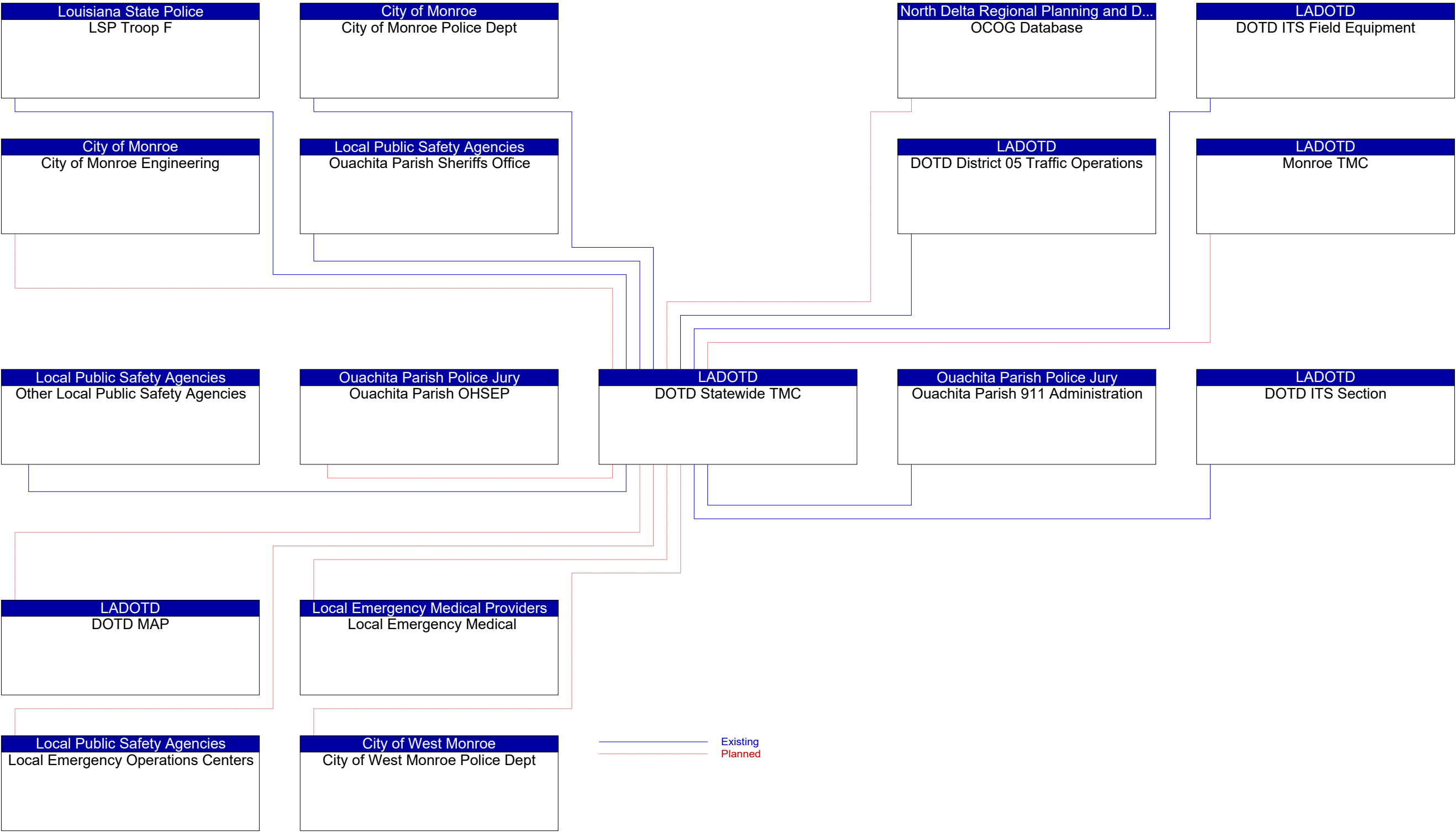


Figure 14: DOTD Statewide TMC Interconnect Context Diagram

Notes: 1. See Appendix A for architecture flow descriptions.

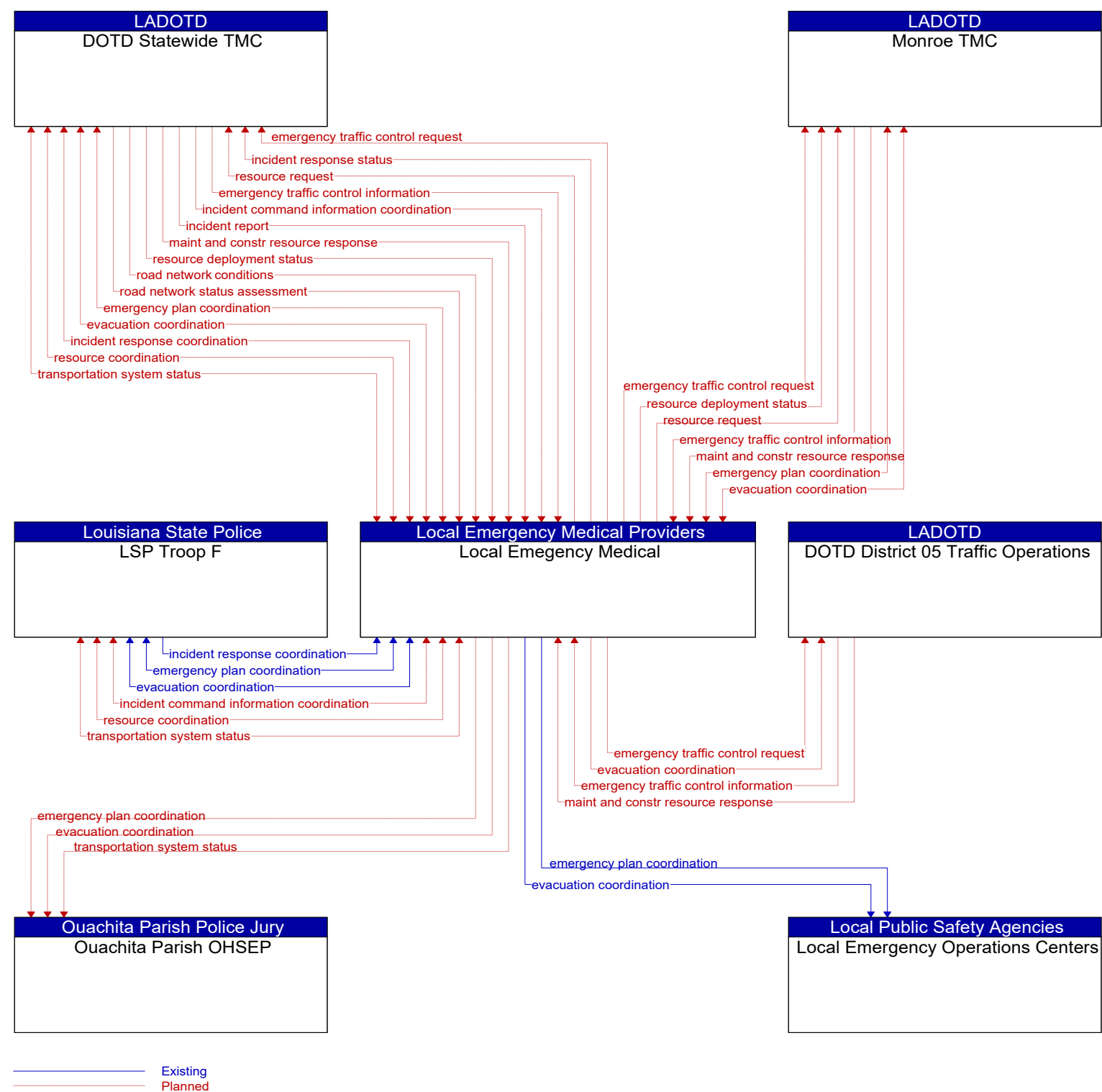


Figure 15: Local Emergency Medical Flow Context Diagram

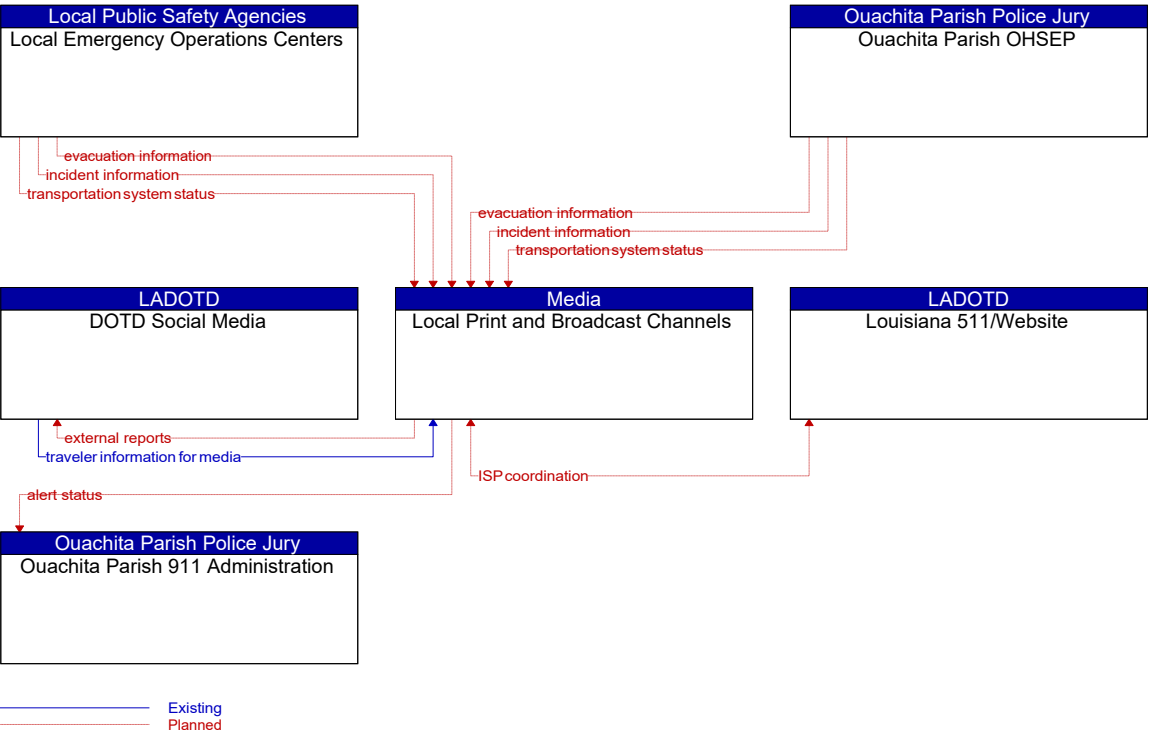


Figure 17: Local Print and Broadcast Channels Flow Context Diagram

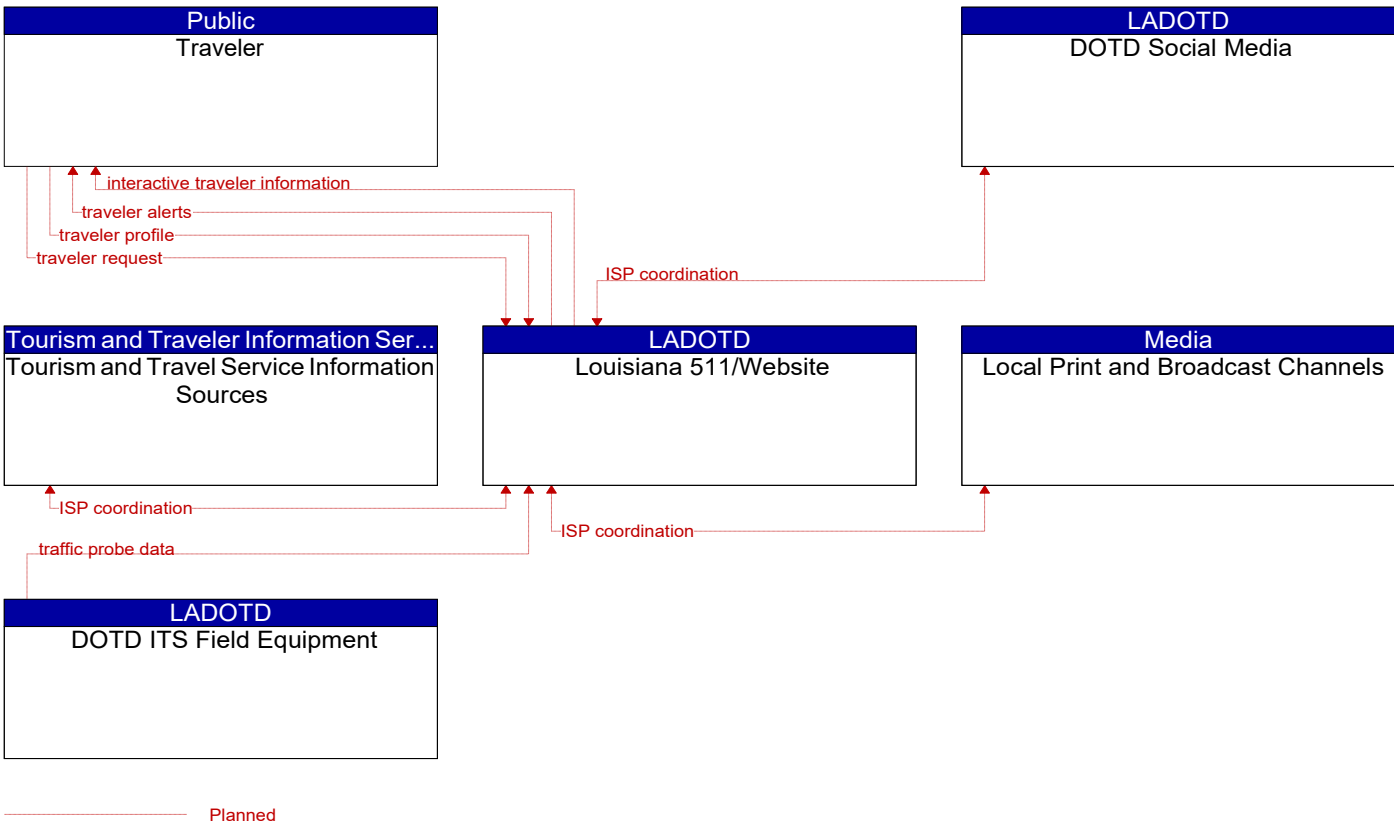


Figure 18: Louisiana 511/Website Flow Context Diagram

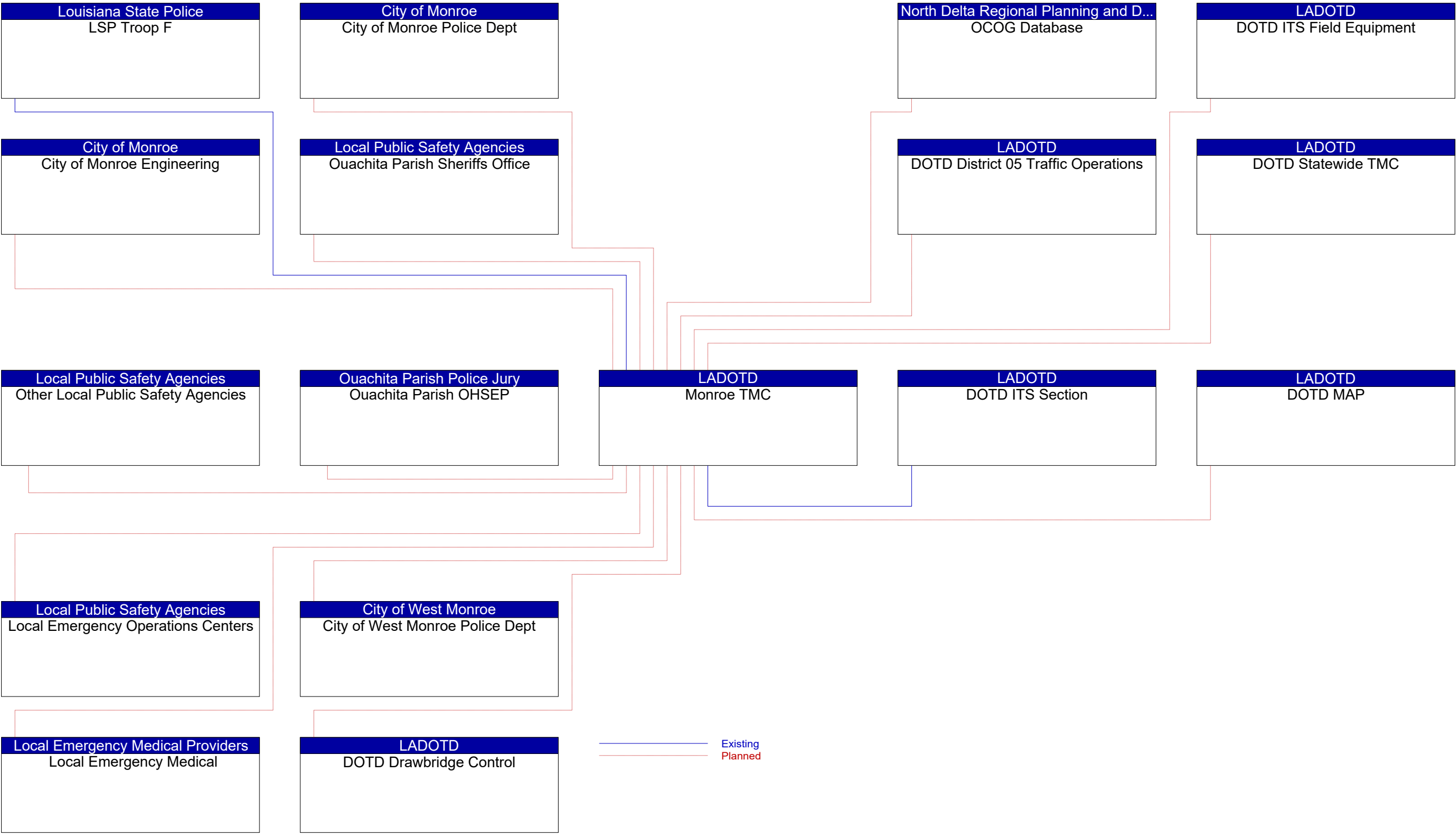


Figure 20: Monroe TMC Interconnect Context Diagram

Notes: 1. See Appendix A for architecture flow descriptions.

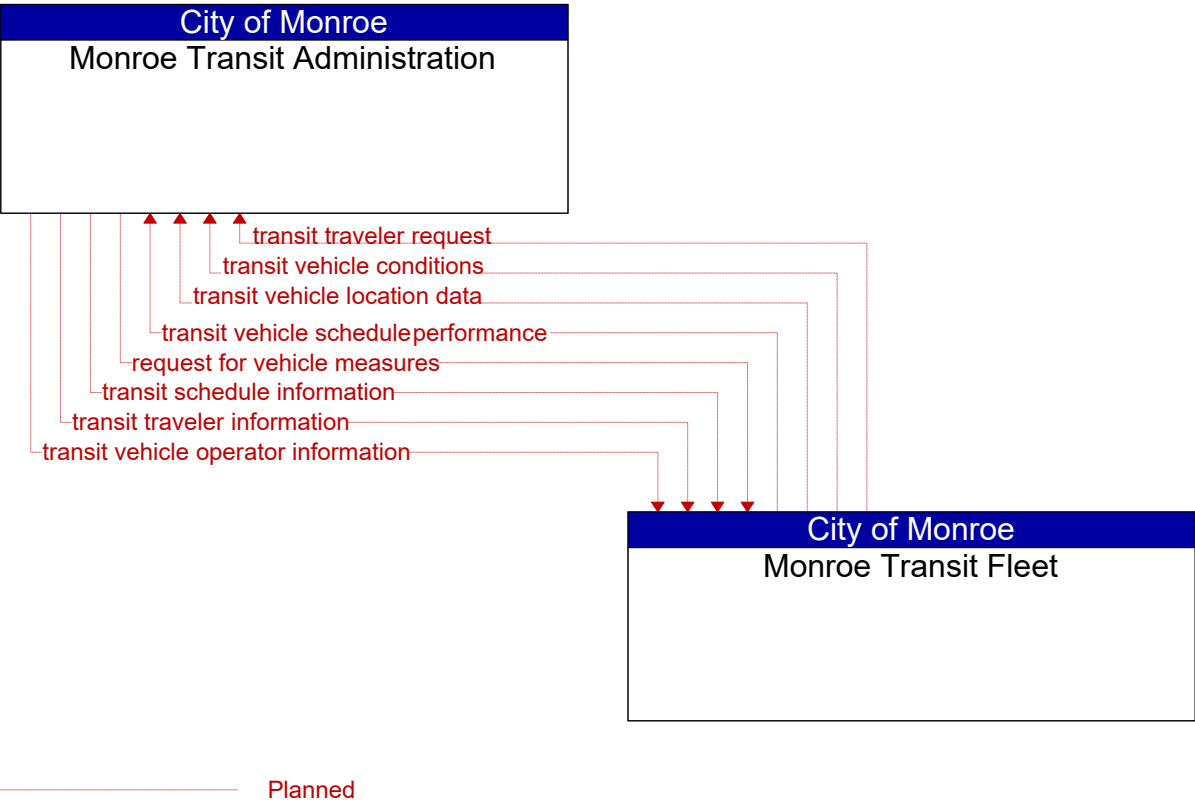


Figure 21: Monroe Transit Administration Flow Context Diagram

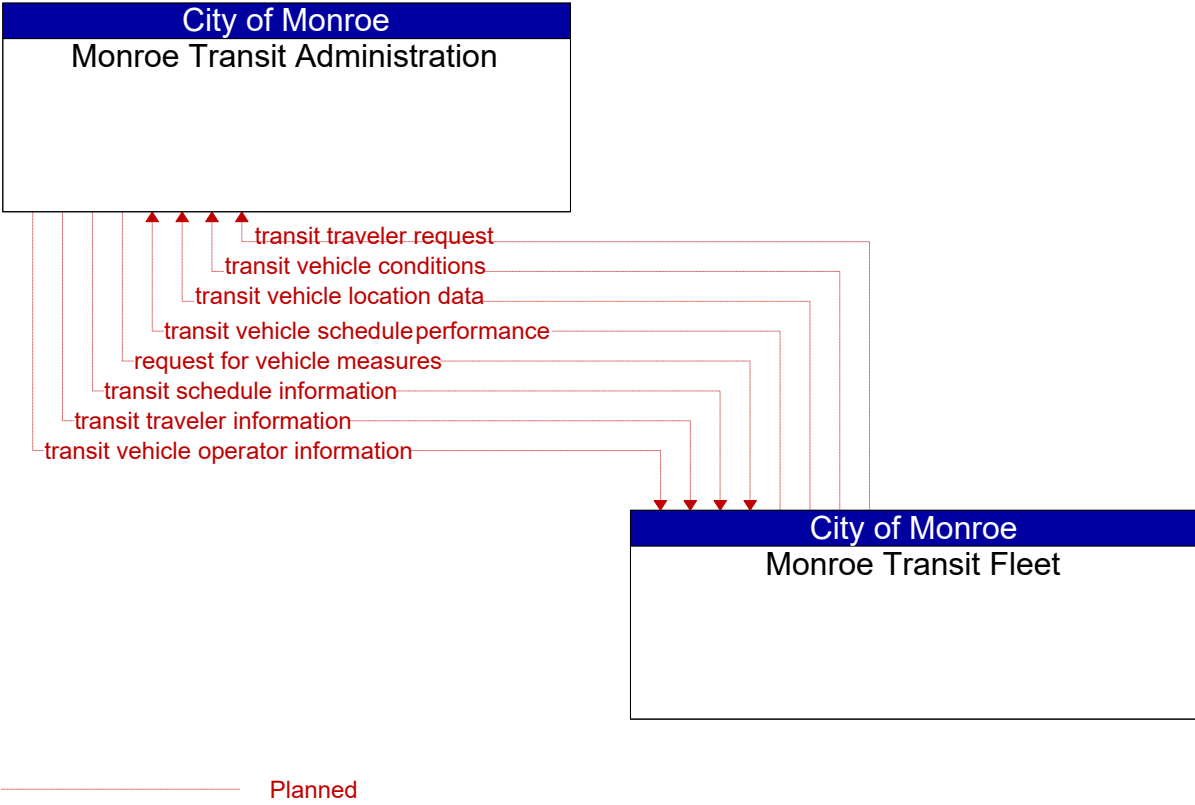


Figure 22: Monroe Transit Fleet Flow Context Diagram

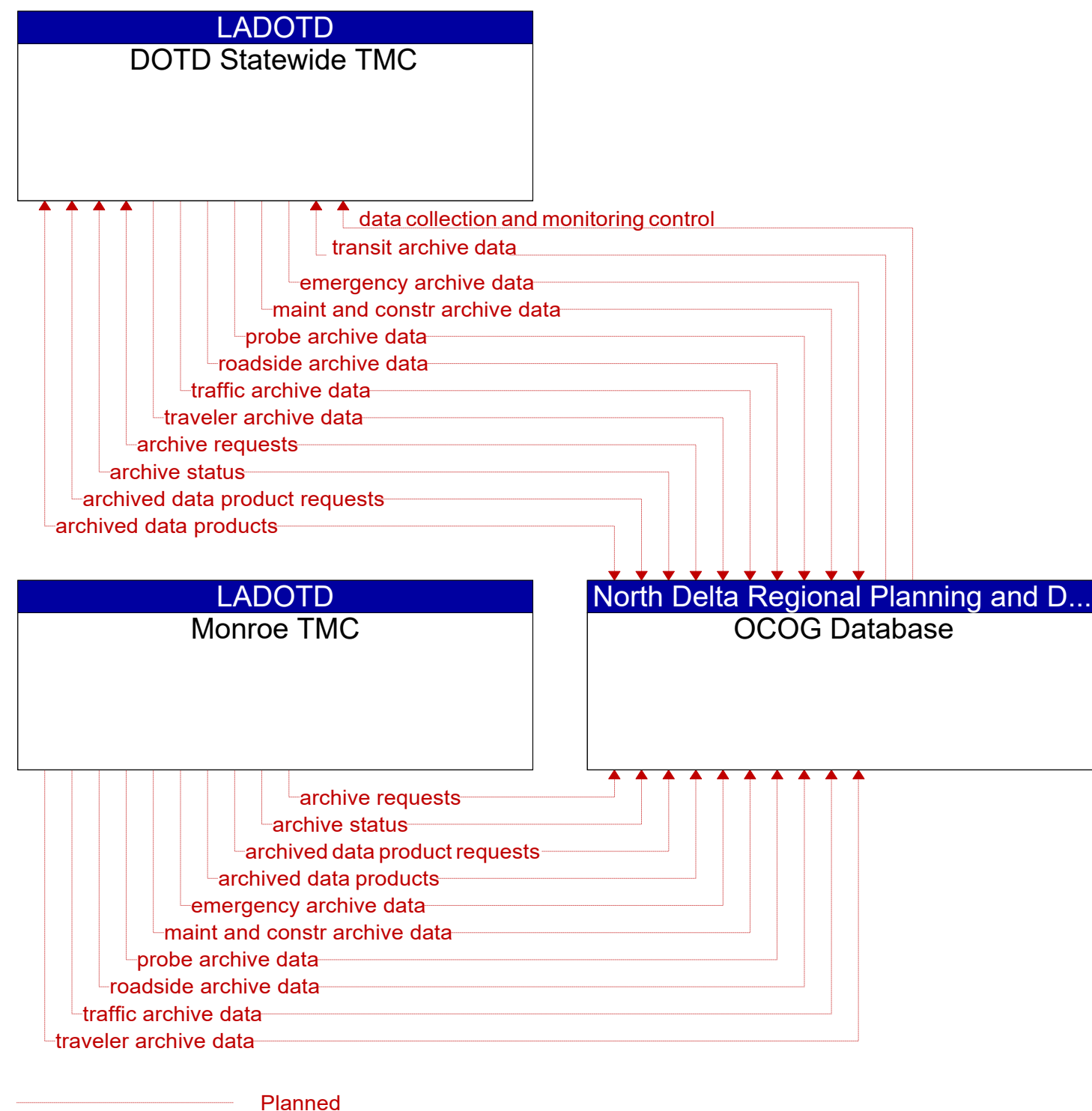


Figure 23: OCOG Database Flow Context Diagram

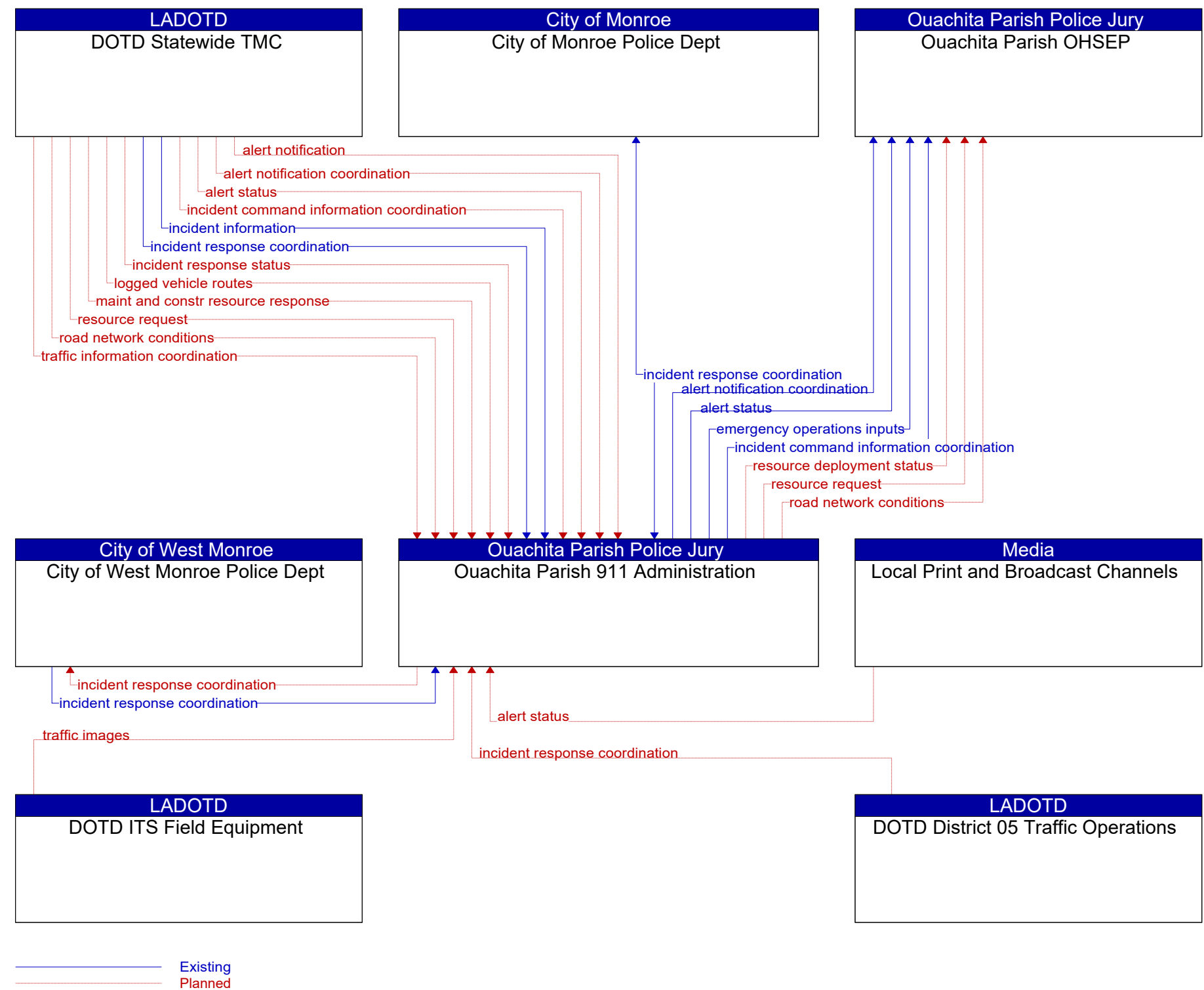


Figure 25: Ouachita Parish 911 Administration Flow Context Diagram

Notes: 1. See Appendix A for architecture flow descriptions.

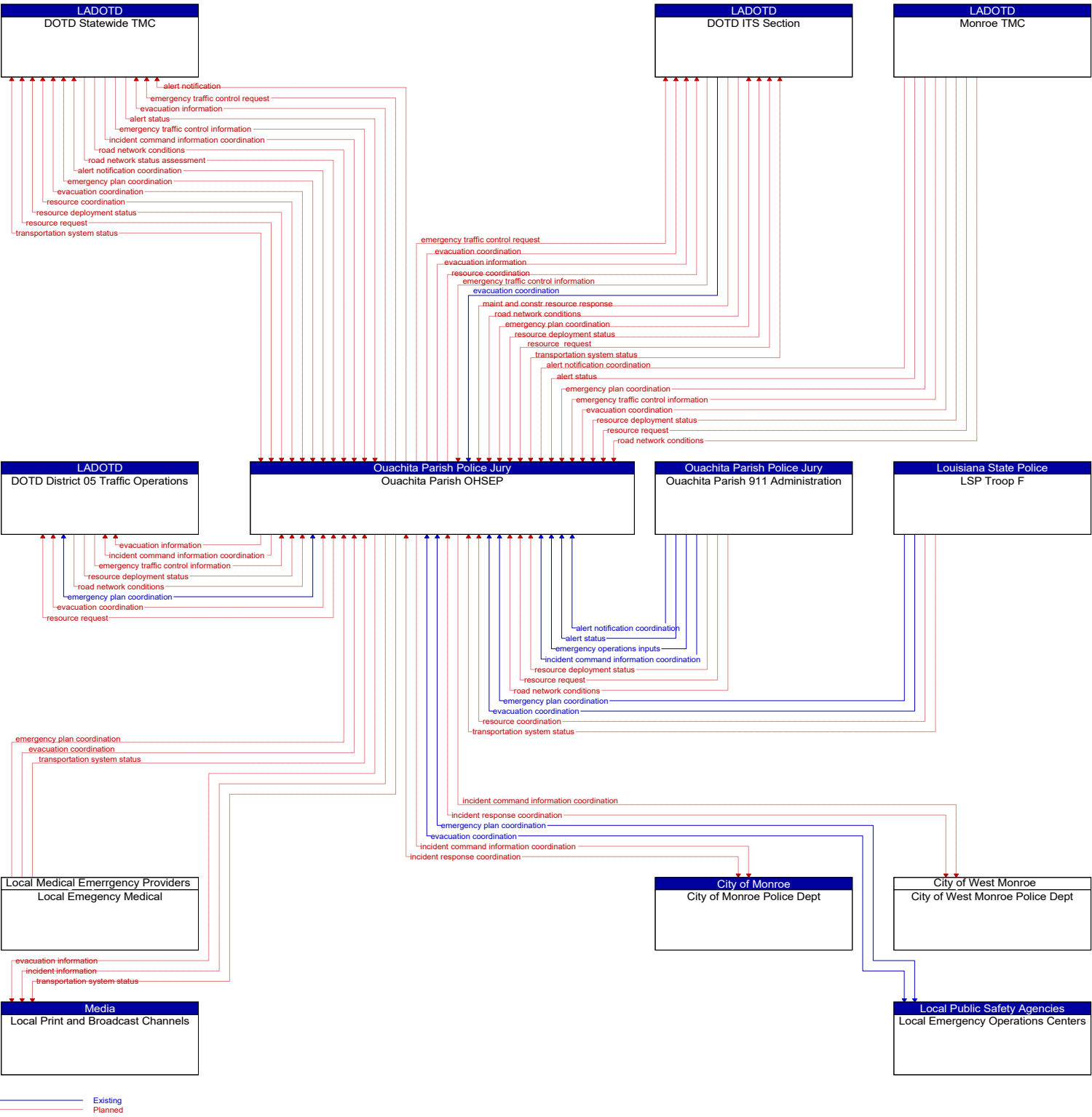


Figure 26: Ouachita Parish OHSEP Flow Context Diagram

Notes: 1. See Appendix A for architecture flow descriptions

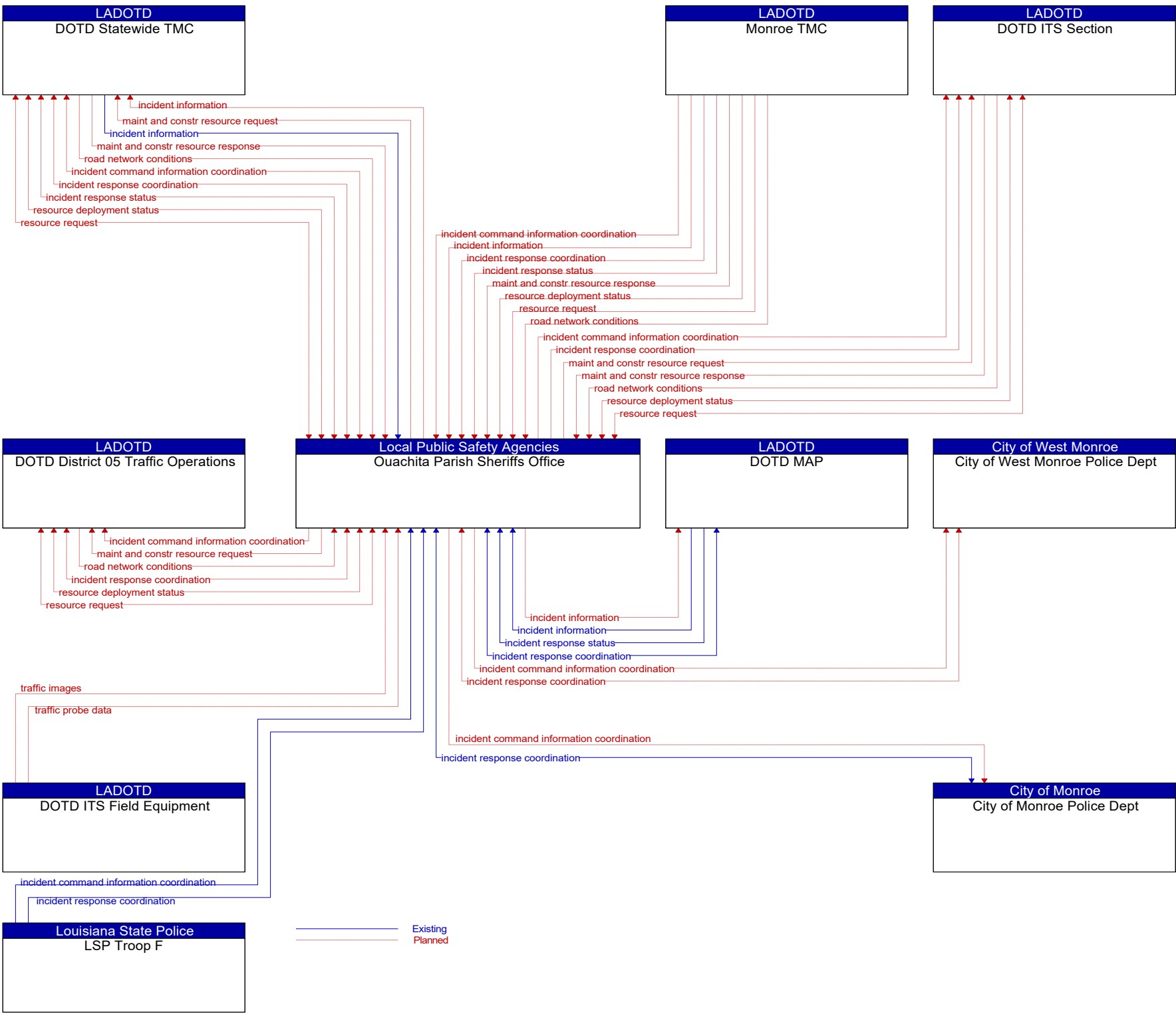


Figure 27: Ouachita Parish Sheriff’s Office Flow Context Diagram

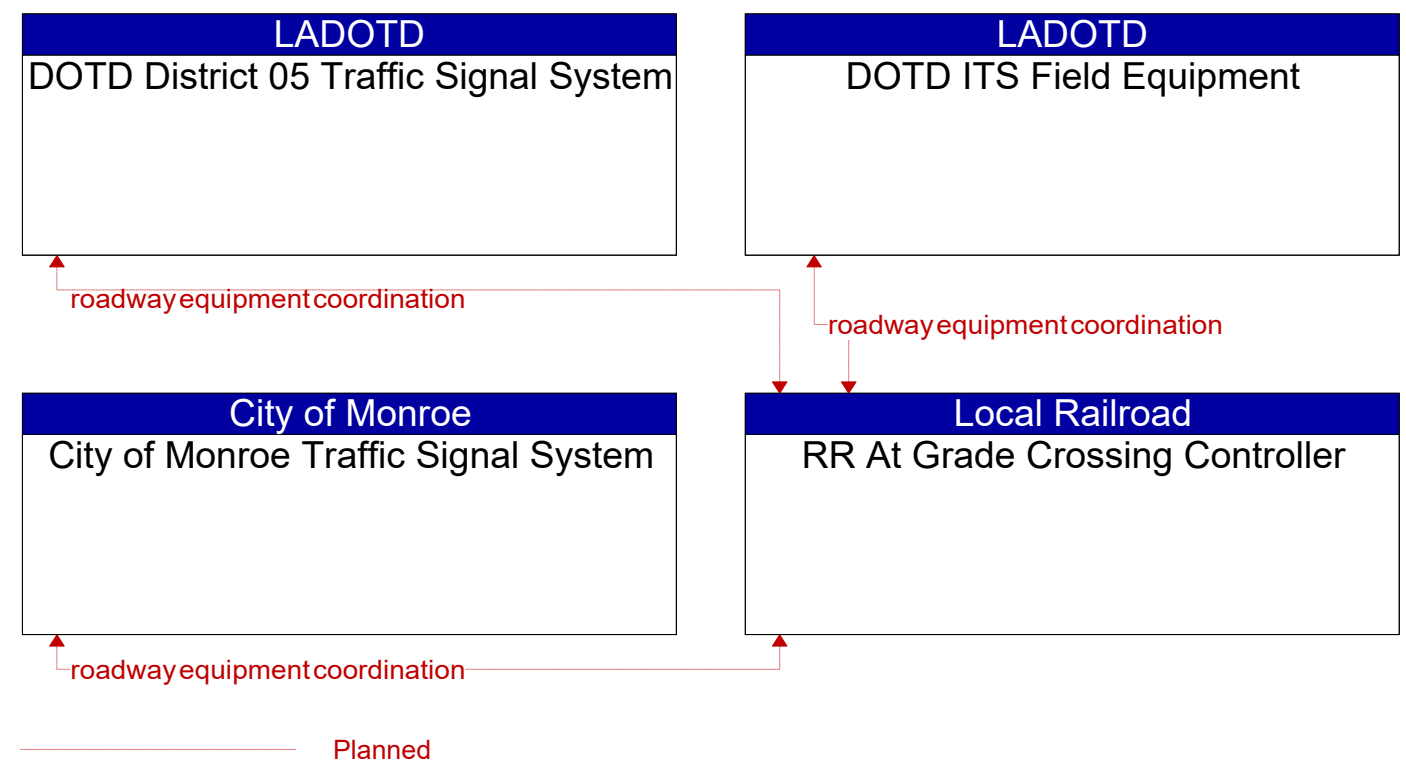


Figure 28: RR at Grade Crossing Controller Flow Context Diagram

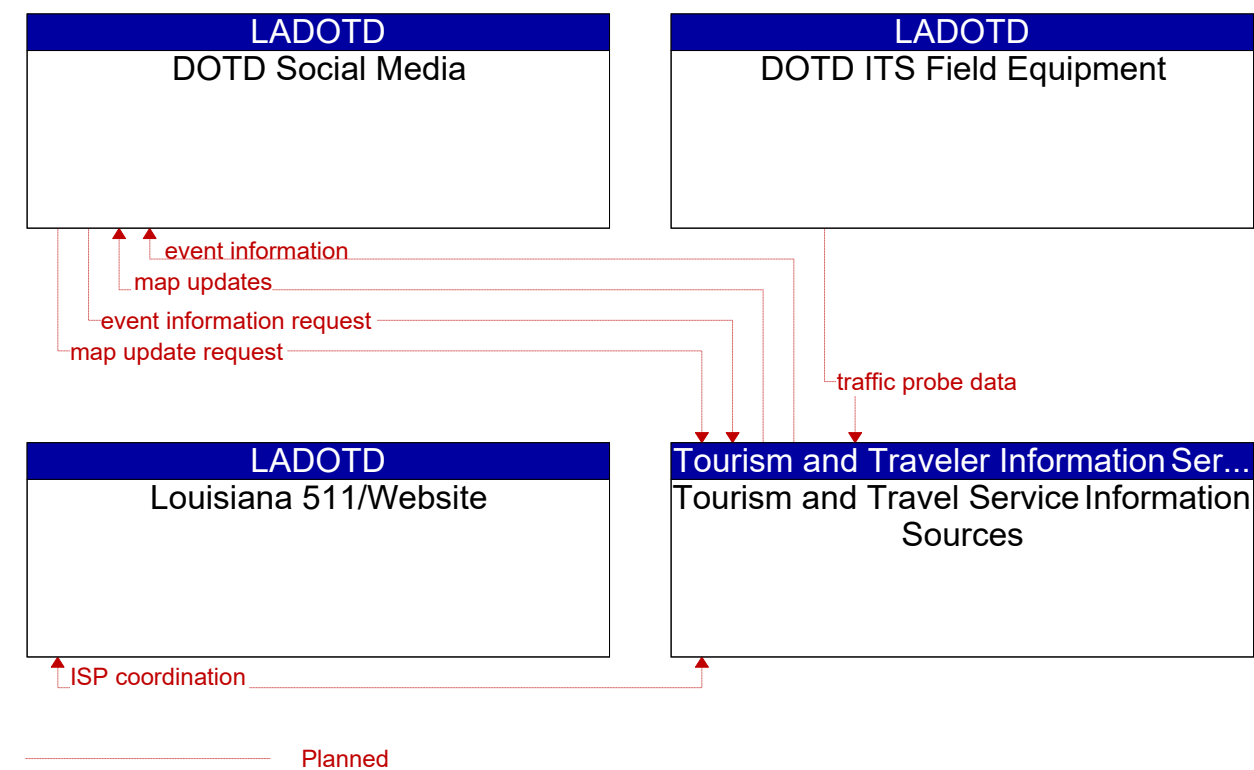


Figure 29: Tourism and Travel Service Information Sources Flow Context Diagram

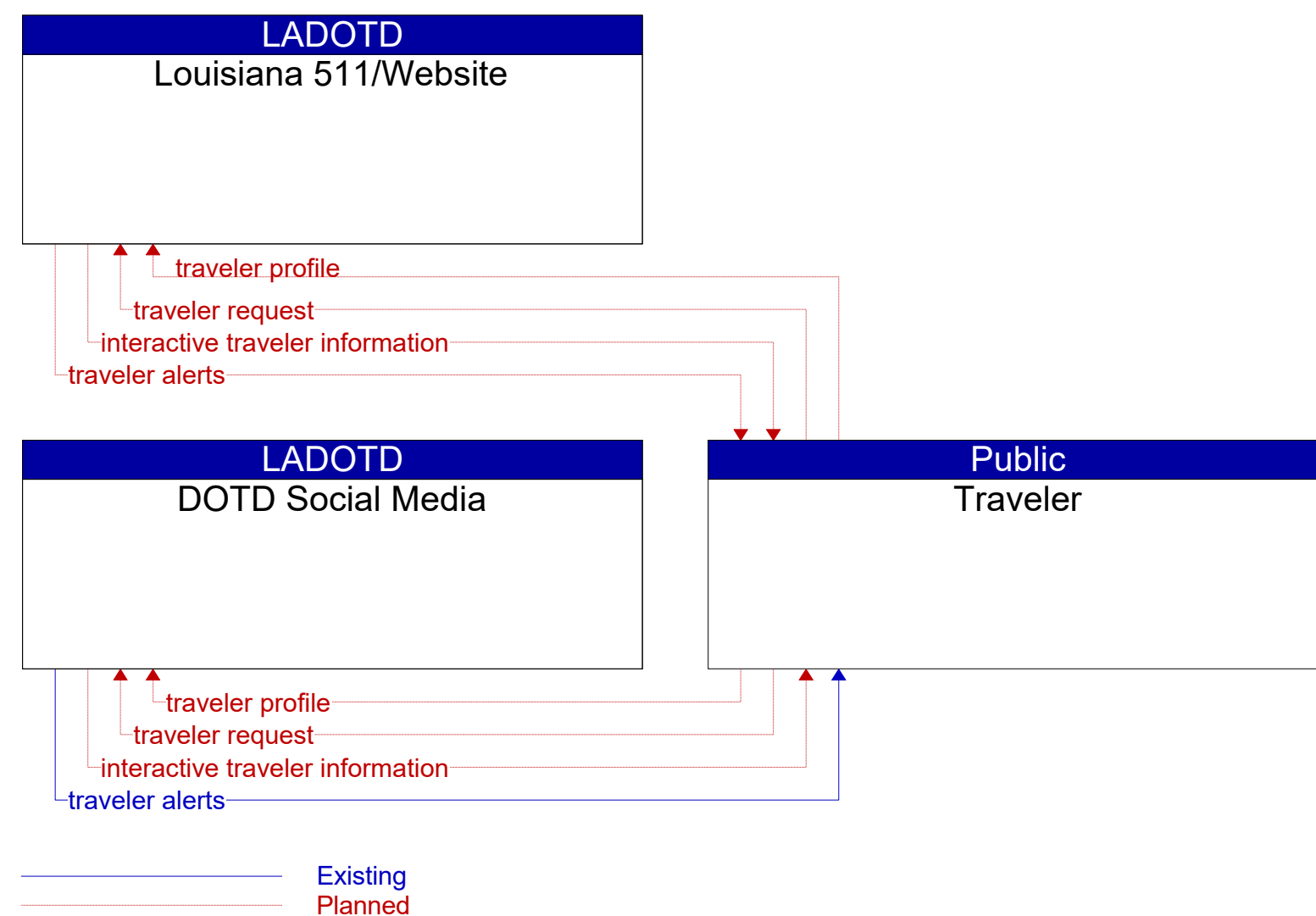


Figure 30: Traveler Flow Context Diagram

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Appendix C

ITS Deployment Plan Detailed Schematic

Figure 31: Monroe ITS Deployment Detail Schematic

Devices not installed are circled. Associate phase (if known) are included inside the associated symbol.

