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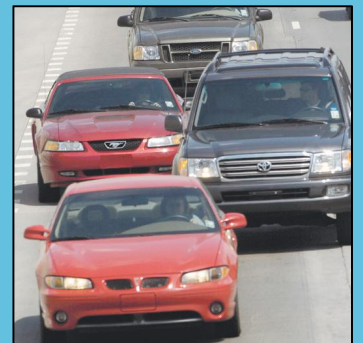
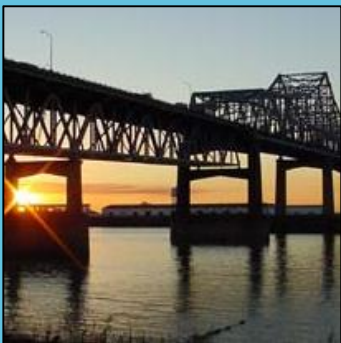
Louisiana Department of  
Transportation and Development

Transportation **AECOM**

April 2011

# FINAL

## Advanced Traffic Management System (ATMS) Concept of Operations



Louisiana Department of Transportation and Development  
Intelligent Transportation Systems  
Concept of Operations

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DOCUMENT CONTROL

Date	Version	Description
9/30/2010	1	Draft Sent to DOTD for Review
3/25/2011	2	Draft-Final Sent to DOTD for Review
4/4/2011	3	Draft-Final Sent to DOTD for Review
4/21/2011	4	Final Sent to DOTD

## Table of Contents

1	Scope.....	1
1.1	Project Need and Purpose .....	1
1.2	Document Contents .....	2
1.3	Document Audience.....	2
1.4	ATMS Vision.....	3
1.5	Overarching Goals and Objectives of the System.....	3
1.6	Utilization of the System .....	4
1.7	Louisiana ITS Architecture Documents.....	4
1.8	ITS Market Packages .....	4
2	Existing System and Processes .....	5
2.1	DOTD ITS Organization and Key Staff.....	5
2.2	DOTD Transportation Management Centers.....	7
2.2.1	TMC Facilities .....	7
2.2.2	Existing TMC Operations Software.....	7
2.3	ITS Infrastructure .....	10
2.3.1	ITS Field Devices.....	10
2.3.2	ITS Telecommunications Network Overview .....	10
2.4	ITS Services .....	12
2.4.1	511 Web site .....	12
2.4.2	Roadway Safety Incident Program .....	12
3	Proposed ATMS Software Concept.....	13
3.1	Background, Objectives and Scope .....	13
3.2	System Description .....	15
3.2.1	Regional TMC ITS Functions.....	15
3.2.2	Statewide TMC ITS Functions.....	16



4	Operational Needs.....	17
4.1	ATMS Performance Goals.....	18
5	Implementation, Operational and Support Environment.....	19
6	Operational Scenarios.....	20
6.1	Normal Scenario.....	20
6.2	Incident Scenario .....	20
6.3	Emergency Scenario.....	21
7	Reference Documents.....	22
7.1	Studies Identifying Operational Needs.....	22
7.2	Other Reference Documents .....	22
7.3	Concept of Operations Documents.....	22

List of Tables

Table 1 – DOTD ITS Devices .....	10
Table 2 - ITS Performance Goals .....	18

List of Figures

Figure 1 - ITS (Section 56) Organization Chart .....	6
Figure 2 - Existing TMC Software Application Diagram.....	9
Figure 3 - High Level ITS Telecommunications Infrastructure .....	11
Figure 4 - 511 Website Information .....	12
Figure 5 - FHWA "V" Diagram .....	14

## Acronyms

ANSI	American National Standards Institute
ATMS	Advanced Traffic Management System
AVL	Automated Vehicle Location
CAD	Computer-Aided Dispatch
CARS	Condition Acquisition and Reporting System
CCTV	Closed Circuit Television
CFR	Code of Federal Regulations
DCMS	Data Collection and Management System
DMS	Dynamic Message Sign
DOTD	Louisiana Department of Transportation and Development
FHWA	Federal Highway Administration
GIS	Geographic Information System
GOHSEP	Governor's Office of Homeland Security & Emergency Preparedness
GPS	Global Positioning System
HAR	Highway Advisory Radio
HITS	Houma Intelligent Transportation System
IEEE	Institute of Electrical and Electronics Engineers
ITS	Intelligent Transportation System
IVR	Interactive Voice Response
LOEP	Louisiana Office of Emergency Preparedness
LSP	Louisiana State Police
MOU	Memorandum of Understanding
MOT	Maintenance of Traffic

MPO	Metropolitan Planning Organization
MTBF	Mean Time Between Failures
NTCIP	National Transportation Communications for ITS Protocol
PTZ	Pan/Tilt/Zoom
O&M	Operations and Maintenance
OEP	Office of Emergency Preparedness
RFQ	Request For Qualifications
RSIP	Roadway Safety Incident Program (Motorist Assistance Patrol)
SONET	Synchronous Optical Network
SOP	Standard Operating Procedure
TIM	Traffic Incident Management
TMC	Transportation Management Center
VD	Vehicle Detector

## 1 Scope

Beginning with the passage of the federal “Transportation Equity Act for the 21<sup>st</sup> Century” (TEA 21), more than \$1.2 billion in ITS funding was made available to assist states in investing in technology to better manage the existing surface transportation system. In 1999, the State of Louisiana began developing their first coordinated ITS Business Plan in cooperation with the Baton Rouge, New Orleans, and Northwest Louisiana Metropolitan Planning Organizations (MPOs). This effort provided a roadmap for integration of ITS solutions in the state’s routine transportation infrastructure planning and deployment processes.

The Louisiana Department of Transportation and Development (DOTD) has made a significant investment in building an Intelligent Transportation Systems (ITS) infrastructure during the past decade. The goal of the ITS program is to improve transportation mobility, safety and reduce traffic congestion. Each of the transportation management centers (TMC) throughout the state have various software and hardware tools to monitor and control the ITS devices in the field. The purpose of this Concept of Operations document is to provide the framework in developing a single Advanced Traffic Management System (ATMS) software platform to improve the efficiency in statewide ITS TMC operations.

This Concept of Operations was created as a high-level document for the DOTD to establish the foundation and vision for an ATMS software solution to be fully functional within a one-year time frame. The document was based on the *Systems Engineering Guidebook for Intelligent Transportation System* version 3.0 created by Caltrans and FHWA in November 2009, as well as concepts from ANSI/AIAA G-043-1992 standard and IEEE Standard 1362 for Concept of Operations Development.

The systems engineering process integrates all the disciplines and specialty groups into a single condensed effort, forming a structured development process that proceeds from concept to production to operation. This Concept of Operations follows the Guidebook’s objectives as to documenting the total environment and use of the system in a relatively non-technical manner. It presents the information from multiple stakeholder viewpoints and creates a bridge from the problems identified and stakeholder needs to the system level requirements.<sup>1</sup>

### 1.1 Project Need and Purpose

The DOTD operates the ITS program from its TMCs, the co-located statewide and regional Baton Rouge TMCs, and regional TMCs located in New Orleans and Shreveport and a local TMC in Houma. The primary functions of these TMCs are:

- Surveillance of the interstates and primary roadways, (Interstates by Regional TMCs only)
- Incident and traffic management,
- Dissemination of traveler information through the use of 511 and the other systems,
- Planned and unplanned incident data entry, and
- Roadway Safety Incident Program (RSIP) vehicle coordination. (Regional TMCs only)

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<sup>1</sup> *Systems Engineering Guidebook for Intelligent Transportation System*

To aid in these functions, DOTD operates and maintains several ITS field device types - such as CCTV cameras, dynamic message signs (DMS), vehicle detectors (VD), ramp meters, and highway advisory radio (HAR) - installed throughout the state. Currently, multiple software packages are operated independently to manage the various ITS devices within the TMCs. As these are independent system packages, they do not allow for efficient incident response, TMC coordination, and standard operations throughout the state.

The purpose of the ATMS software is to provide improved operator efficiency by consolidating many of the functions which currently utilize separate software applications into a single platform. This enhanced software will provide integrated control as well as improved incident management, operations and maintenance capabilities currently not available to the TMCs, as well as consolidate current disparate databases.

## 1.2 Document Contents

The Concept of Operations is intended to guide the reader through the development of the ATMS needs for DOTD ITS TMC Operations through the following sections:

- Existing systems and processes - provides a brief overview of the existing DOTD ITS operations and deployment strategies, and how the system is utilized throughout the state. This description provides the reader a basic summary of the existing TMC operations, services provided and infrastructure utilized.
- Proposed ATMS software concept - identifies the goals, objectives, and operational needs to be addressed by the ATMS, as well as the required system support and maintenance concept for the ATMS.
- Implementation, Operation and Support Environment - presents the environment in which the ATMS will operate and the requirements to support operations.
- Operational Scenarios - illustrates how the ATMS will operate through various scenarios encountered by operators within the TMC.
- Reference documents - lists the supporting documentation and resources utilized in understanding the current system operations, strategic plans, and approved market packages that drive the goals of the system under development.

## 1.3 Document Audience

This document is intended to be read by:

- Federal Highway Administration (FHWA) and DOTD staff responsible for project funding and procurement of ATMS software.
- Managerial staff in DOTD's ITS Section 56.
- DOTD staff involved in ITS planning, deployment, operations, incident management, communications infrastructure, asset management of ITS as well as roadway safety.
- TMC operators and supervisors who will be utilizing the enhanced ATMS software on a routine basis.
- TMC system support staff.



## 1.4 ATMS Vision

The vision of the ATMS software is to provide a standardized and efficient system for TMC operations to effectively detect and confirm incidents; track and maintains field resources (equipment and personnel); disseminate information to field devices as well as to the motoring public and other agencies; all within a cost-effective solution that can be utilized statewide.

## 1.5 Overarching Goals and Objectives of the System

The *Louisiana Statewide ITS Implementation & Telecommunications Plan* was prepared to achieve the following vision:

- Major traveler delays on freeways and major arterial routes will be minimized through rapid detection, response, and clearance of all reported incidents.
- Citizens will be able to reach safe locations sooner during emergency evacuations through the continuous monitoring and management of traffic, and communication of best-route information to evacuees.
- Travelers will be able to avoid delays on freeways and major arterial routes by obtaining accurate, readily available information on work zone, construction area, and incident locations—both pre-trip and while en route.
- Travelers will be able to make informed decisions about each trip—as well as the best time, route, and mode to use—because they will be able to access accurate information on current traffic conditions and public transit options.
- Accidents will be reduced in work zone areas and at locations with historically high accident rates through advance warnings and effective speed control measures. These improvements will be made possible by additional DMS installations.
- Traveler delays on major arterial routes will be minimized through use of traffic signal control strategies that respond to changing traffic conditions.
- Louisiana's industry will realize lower transportation costs due to reduced congestion and shorter travel times.
- Quality of life will be improved because travel will become more predictable and less stressful.

The above vision produced the goals of the Louisiana DOTD's ITS program, which are documented in the *2010 DOTD ITS Strategic Business Plan*. The vision provides a system that:

- Improves transportation network safety
- Improves traffic management
- Reduces non-recurring congestion
- Effectively disseminates traffic information
- Improves emergency management
- Creates more efficient modal utilization
- Improves administrative efficiency, operational safety, and productivity for commercial vehicles

## 1.6 Utilization of the System

It is anticipated that the ATMS software will be utilized by operations personnel in all TMCs. The ATMS software will be accessible to authorized personnel over the ITS network, using the telecommunications infrastructure between TMCs, and the telecommunications infrastructure between ITS field devices and the TMCs. Future TMCs (e.g., Lake Charles and Alexandria) will utilize the ATMS software as determined by DOTD.

## 1.7 Louisiana ITS Architecture Documents

23 CFR 940, Section 940.9 Regional ITS architecture 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."*

The Louisiana DOTD has three ITS Architectures that aided in the development of this Concept of Operations, including:

Baton Rouge Regional ITS Architecture, September 2006 – This architecture serves as the Regional ITS Architecture for the Baton Rouge Region of Louisiana, DOTD Districts 61 and 62. As such it is intended to ensure that ITS technologies are deployed in manner that will allow for communication, interoperability, and compatibility among systems and entities. The Baton Rouge Regional ITS Architecture was developed in accordance with Version 5.1 of the National ITS Architecture. This plan is accessible at: <http://www.dotd.la.gov/operations/its/documents/ITS%20Deployment%20Plan/Baton%20Rouge%20Regional%20ITS%20Architecture.pdf>

Greater New Orleans ITS Architecture, June 2002 – This architecture developed the ITS element inventory, an ITS stakeholder list and associated ITS elements, a listing of local ITS "market packages", a high-level subsystem and several "interconnect diagrams." Cumulatively, the products constitute the core components of a New Orleans regional ITS architecture, categorizing the basic ITS components that will be implemented and identifying their high-level relationships.

Houma ITS Development Plan, June 2003 – This architecture illustrates that the TMC will monitor traffic data with the traffic control system, such as video and the signal systems. It will also share such information with other information centers in the system such as Louisiana Office of Emergency Preparedness (LOEP), State Police, the Parish Office of Emergency Preparedness (OEP), Good Earth Transit, the 911 systems and Data Management. The architecture flows, such as weather information, archive data, and incident information, travel between the different Houma Intelligent Transportation System (HITS) entities.

## 1.8 ITS Market Packages

A market package collects different subsystems, equipment packages, terminators, and architecture flows that provide the desired service required by the user agency. This information is utilized in

addressing transportation issues and ITS goals. The following market packages are applicable to the DOTD ATMS software:

- AD2 - ITS Data Warehouse
- ATIS01 - Broadcast Traveler Information
- ATIS02 - Interactive Traveler Information
- ATMS01 - Network Surveillance
- ATMS02 - Traffic Probe Surveillance
- ATMS04 - Freeway Control
- ATMS06 - Traffic Information Dissemination
- ATMS07 - Regional Traffic Management
- ATMS08 - Traffic Incident Management System
- ATMS21 - Roadway Closure Management
- EM01 - Emergency Call Taking and Dispatch
- EM02 - Emergency Routing
- EM04 - Roadway Service Patrols
- EM05 - Transportation Infrastructure Protection
- EM06 - Wide-Area Alert
- EM07 - Early Warning System
- EM08 Disaster Response and Recovery
- EM09 Evacuation and Reentry Management
- EM10 Disaster Traveler Information
- MC09 Work Zone Safety Monitoring

More detailed information on market packages can be accessed at:  
<http://www.iteris.com/itsarch/html/mp/mpindex.htm>.

## 2 Existing System and Processes

The following section provides a brief overview of DOTD exists ITS organizational structure, TMCs, ITS infrastructure, and services within the state. This will provide the reader with a high-level understanding of how the program currently operates and serves as the baseline in identifying the required changes to be implemented with the ATMS software.

### 2.1 DOTD ITS Organization and Key Staff

Section 56 of DOTD is dedicated to expanding and maintaining the ITS program. The Director of the ITS Division directly reports to the Assistant Secretary of Operations. Under his supervision, there are six groups responsible for system integration, ITS project management, maintenance and communication, ITS application development, ITS planning, and TMC operations. Four of these groups are discussed in

this document for the purpose of the ATMS. Figure 1 provides an overview of the Section 56 organization and staff.

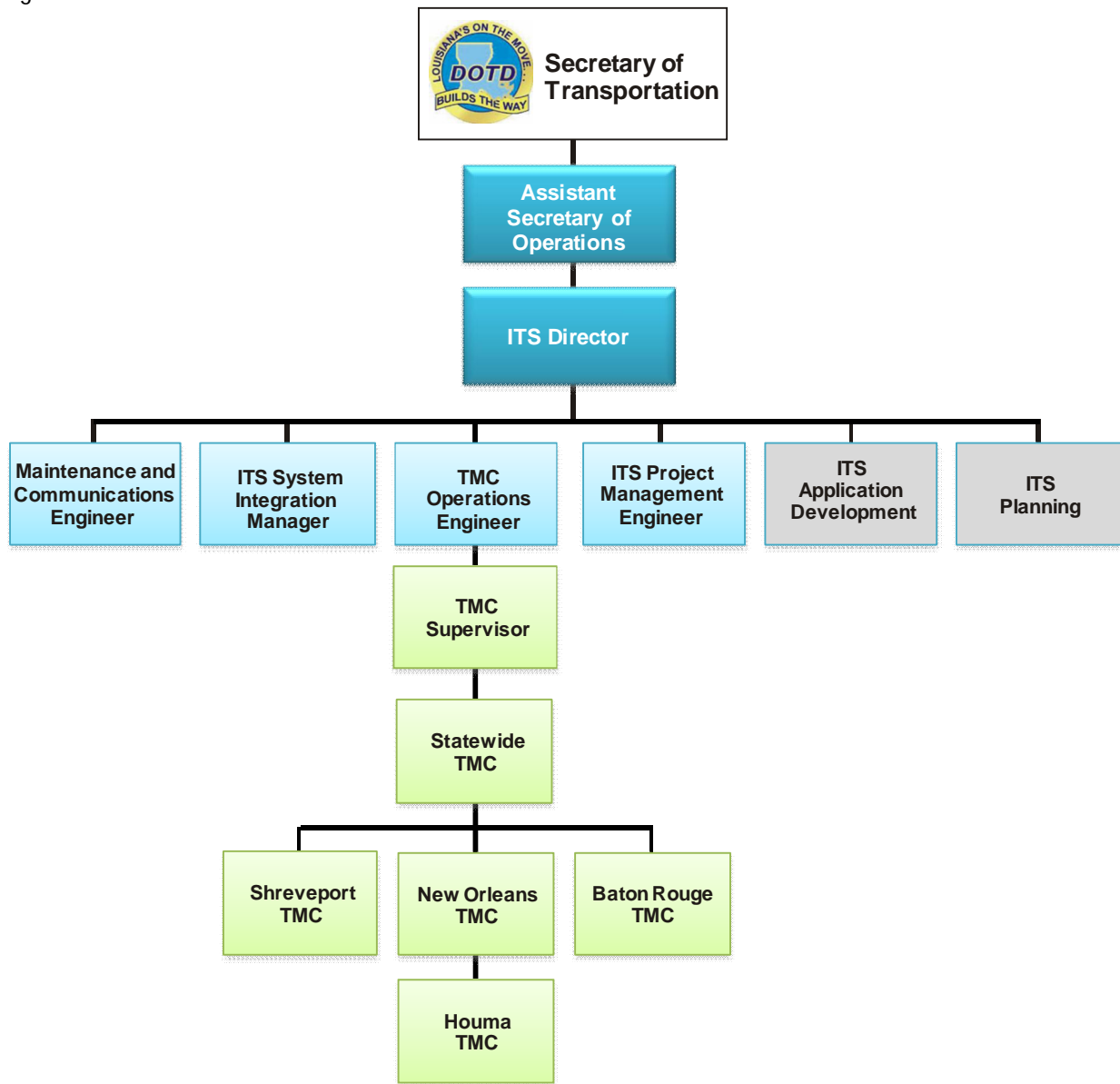


Figure 1 - ITS (Section 56) Organization Chart

The ITS Project Management Engineer is responsible for development of the ITS capital deployment program. This includes preparing procurement documents and managing “design-bid-build” and “design-build” contracts to expand the ITS program.

The TMC Operations Engineer’s responsibilities are to oversee the operations and maintenance of the RSIP and TMC programs. The Maintenance and Communications Engineer is responsible for day-to-day operations and maintenance of the telecommunications system as well as maintaining the ITS equipment. The existing DOTD ITS maintenance staff track network performance and provide emergency telecommunications equipment repairs and maintenance. In the near future, a state-wide ITS maintenance contract will be utilized.

The ITS System Integration Manager is responsible for overseeing integration of new devices into existing software suites, and assisting in the troubleshooting of system and equipment functions.

## 2.2 DOTD Transportation Management Centers

### 2.2.1 TMC Facilities

Currently, DOTD operates four TMCs within the state – a co-located statewide and regional TMC located in Baton Rouge, and regional TMCs in New Orleans, Shreveport, and a local TMC in Houma. Both the statewide TMC and New Orleans Regional TMC operate 24 hours per day, 7 days per week, and 365 days per year. Regional TMCs operate Monday through Friday, 6:00 a.m. – 10:00 p.m., while the Houma TMC is staffed 6:00 a.m. – 2:00 p.m. Monday through Friday. The statewide TMC and New Orleans regional TMC assumes control of the other TMCs when they are not staffed. The existing TMCs are primarily responsible for the following functions:

- Incident Management. TMC operators are responsible for monitoring and collecting incident information; documenting, activating, and updating information into the 511 server; dispatching RSIP vehicles (if not already on the scene); notifying emergency agencies and providing updates; posting messages, updating messages, and blanking DMSs; sending and updating incident e-mail alerts and twitter notifications; and locating incidents via CCTV cameras.
- Construction Management. TMC operators are responsible for the monitoring of construction work zones.
- RSIP Management. TMC operators monitor and report on RSIP activity in terms of the events noted and the motorists they are assisting. This encompasses information on RSIP schedules; abandoned vehicles, debris, and incidents; incidents involving injuries or fatalities; missing/malfunctioning equipment; RSIP accident involvement; and maintenance of traffic (MOT) activities.
- Emergency Management. The TMC operator's role prior to, during, and after an emergency depends on the type and severity of the event. For example, during a hurricane TMC operators are responsible for coordination with other DOTD sections, other agencies, and emergency responders within the region.
- Special Event Management. TMC operators are responsible for supporting special event management, including posting advance messages on DMSs and monitoring impacts along roadways within the system.
- Equipment Failure Monitoring. TMC operators monitor the "health status" of ITS equipment in the field. This includes monitoring the status of CCTV cameras, DMSs, vehicle detectors, and telecommunications.
- Amber Alerts. TMC operators are responsible for posting Amber Alerts in accordance with state policy.

### 2.2.2 Existing TMC Operations Software

DOTD operates and maintains several ITS field device types, such as CCTV cameras, DMS, vehicle detectors, ramp meters, and HAR installed throughout the state. Currently, multiple software packages such as MIST™, 360 Cameleon ITS, Streetwise, HIS Platinum, CARS/511 and Teleste VMXviewer as well as applications developed in-house, are operated independently to manage the various ITS devices within the TMC. Currently, TMC operators need to access and utilize each of these applications

separately and many times from different workstations. A brief description of existing software packages is provided below:

- 360 Cameleon ITS. This software application provides control and monitoring capabilities of ITS field devices such as CCTV cameras, vehicles detectors, and DMS.
- MIST™. The Management Information System for Transportation is another software application providing similar control and monitoring capabilities of ITS field devices such as CCTV cameras, vehicles detectors, and DMS. Currently, MIST™ is being phased-out of the TMCs throughout the state.
- Naztec Streetwise. Monitors roadways for traffic congestion and incident information and utilizes this information to operate the ramp meters.
- HIS Platinum. The HIS platinum software controls the HAR systems owned and operated by DOTD. The application allows the operator to customize or pre-program messages to be broadcast over AM signals to motorists.
- CARS/511. This software operates the 511 Interactive Voice Response (IVR) systems for DOTD. The operators input traveler information, incidents, and construction events into the system. The information is then published to the public via [www.511la.org](http://www.511la.org) as well as made available to the 511 phone system.
- Teleste VMXviewer. This application allows operators to view CCTV camera images at their workstation and on the video display wall.
- Locate IM. This application provides global position system (GPS) information on the RSIP vehicles that patrol specific roadways within the state.

Error! Reference source not found. illustrates how the operator interacts with each of these software applications, as well as the interfaces between the software applications and field, TMC and Web devices.

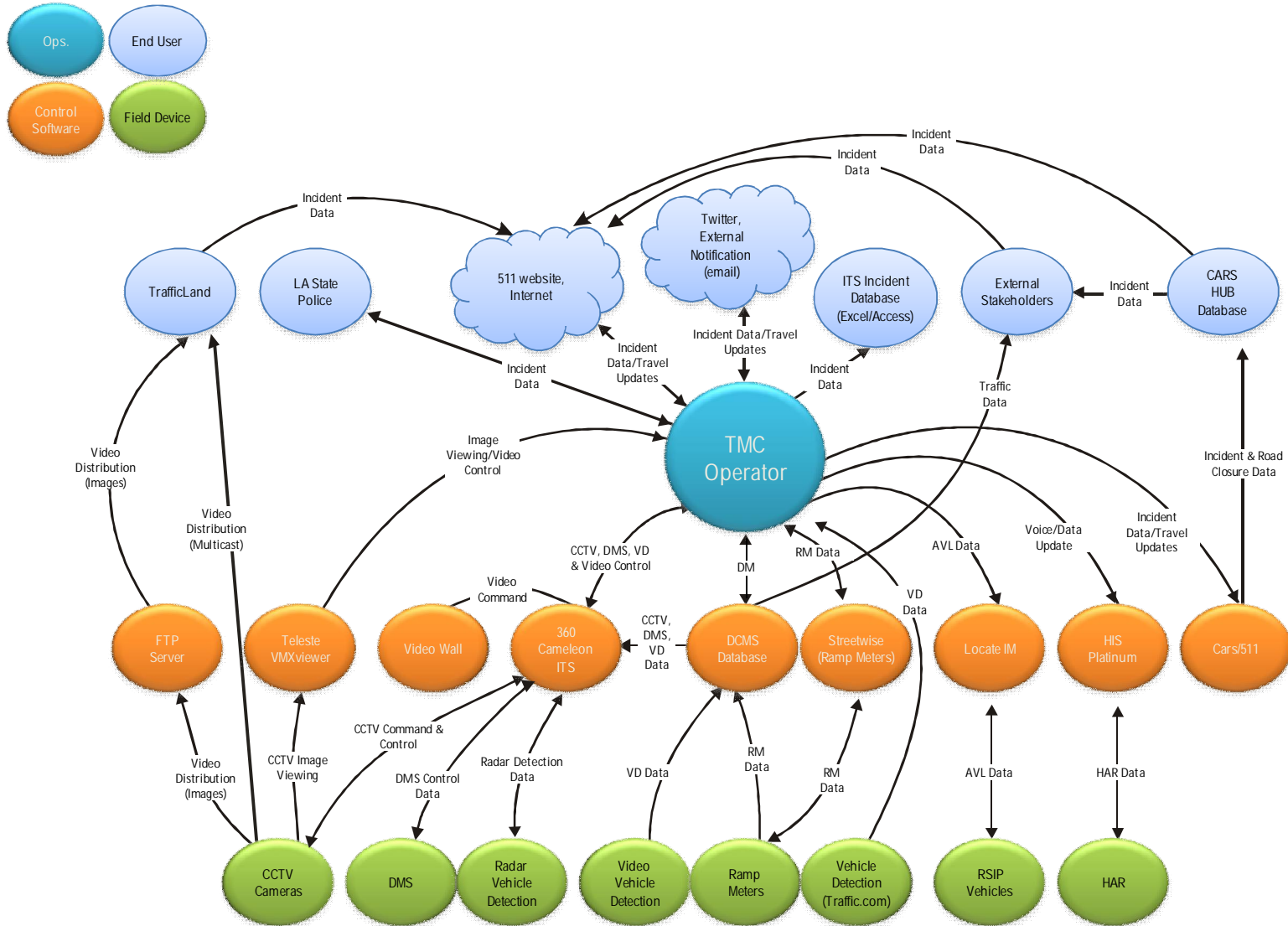


Figure 2 - Existing TMC Software Application Diagram

## 2.3 ITS Infrastructure

### 2.3.1 ITS Field Devices

The current ITS inventory has CCTV cameras, DMSs, HAR and vehicle detectors located along the major roadways surrounding the metropolitan regions of Baton Rouge, Shreveport, Lake Charles, Lafayette, Houma, Hammond, and New Orleans. These devices collect and transmit data to the TMCs as appropriate, providing operators a view of traffic flow within the region. The distribution of device types to be operated by DOTD by 2013 is illustrated in the below table.

Table 1 – DOTD ITS Devices

Region	Camera	DMS	Veh. Det.	Ramp Meter	HAR
Alexandria	15	10	0	0	0
Baton Rouge	100	20	75	30	0
Houma	15	5	10	0	0
Lake Charles	25	10	0	0	5
Lafayette	35	10	0	0	5
Monroe	20	10	0	0	0
New Orleans / North Shore	120	35	20	15	0
Shreveport	30	20	75	0	0
Total	360	120	180	45	10

### 2.3.2 ITS Telecommunications Network Overview

The current telecommunication system links the statewide and regional TMCs through various mediums including the DOTD's own fiber optic network consisting of an OC-192 gigabit (GB) network, leased metro gigabyte Ethernet circuits from AT&T (20MB – 100MB), a fractional DS-3 circuit from AT&T and circuits from the Louisiana Optical Network Initiative (LONI). DOTD continually provides improvements to the communications network, but the current high level infrastructure is depicted graphically in Figure 3.



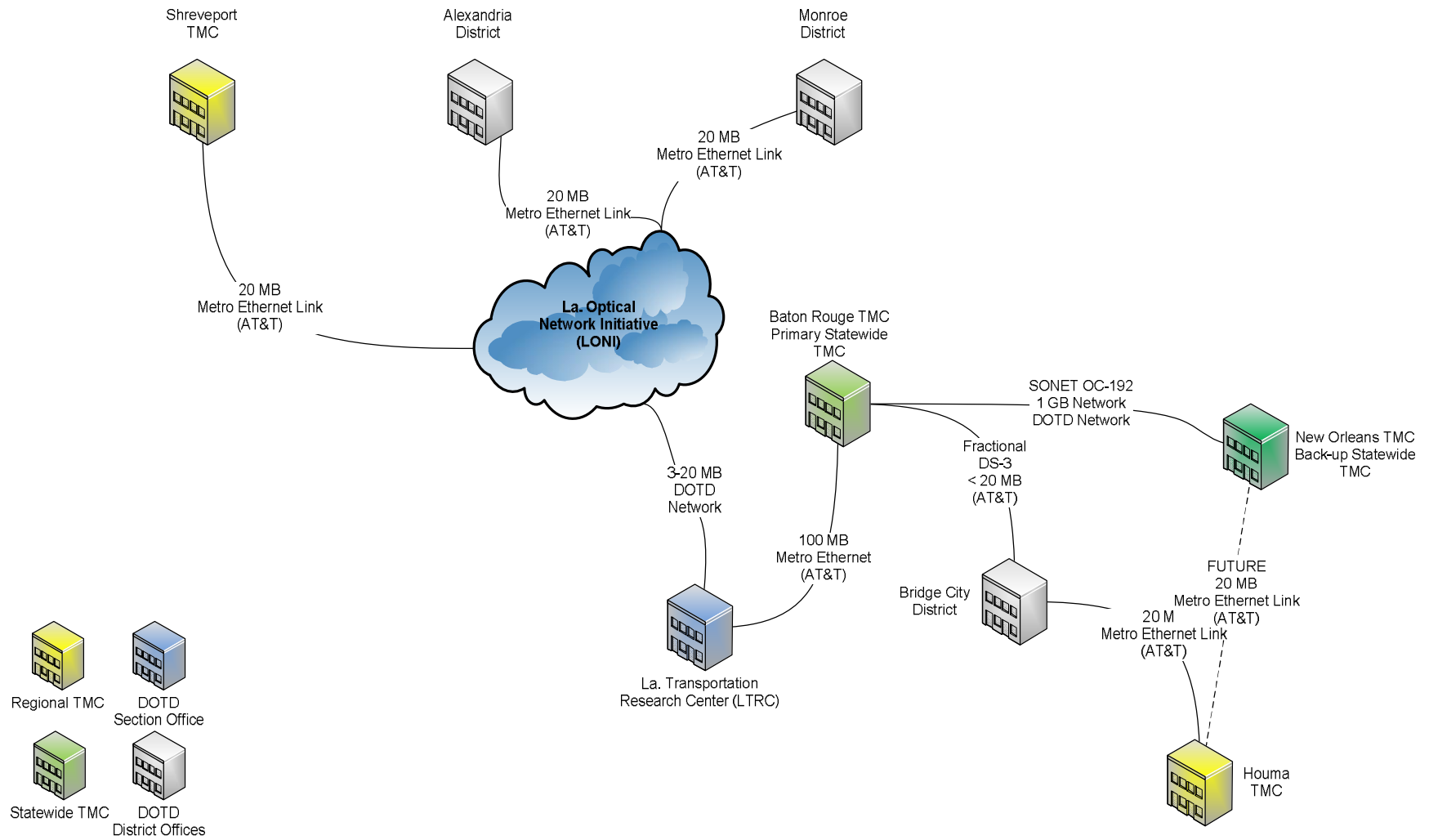


Figure 3 - High Level ITS Telecommunications Infrastructure

## 2.4 ITS Services

DOTD currently provides two types of ITS related services to the motoring public: the DOTD 511 traveler information Website ([www.511la.org](http://www.511la.org)) and the RSIP.

### 2.4.1 511 Web site

The 511 Website provides the public with current traveler information such as traffic speeds, closures, restrictions, crashes, traffic problems, weather, warnings, lane closures, roadway event information, and images from the CCTV cameras throughout the state.

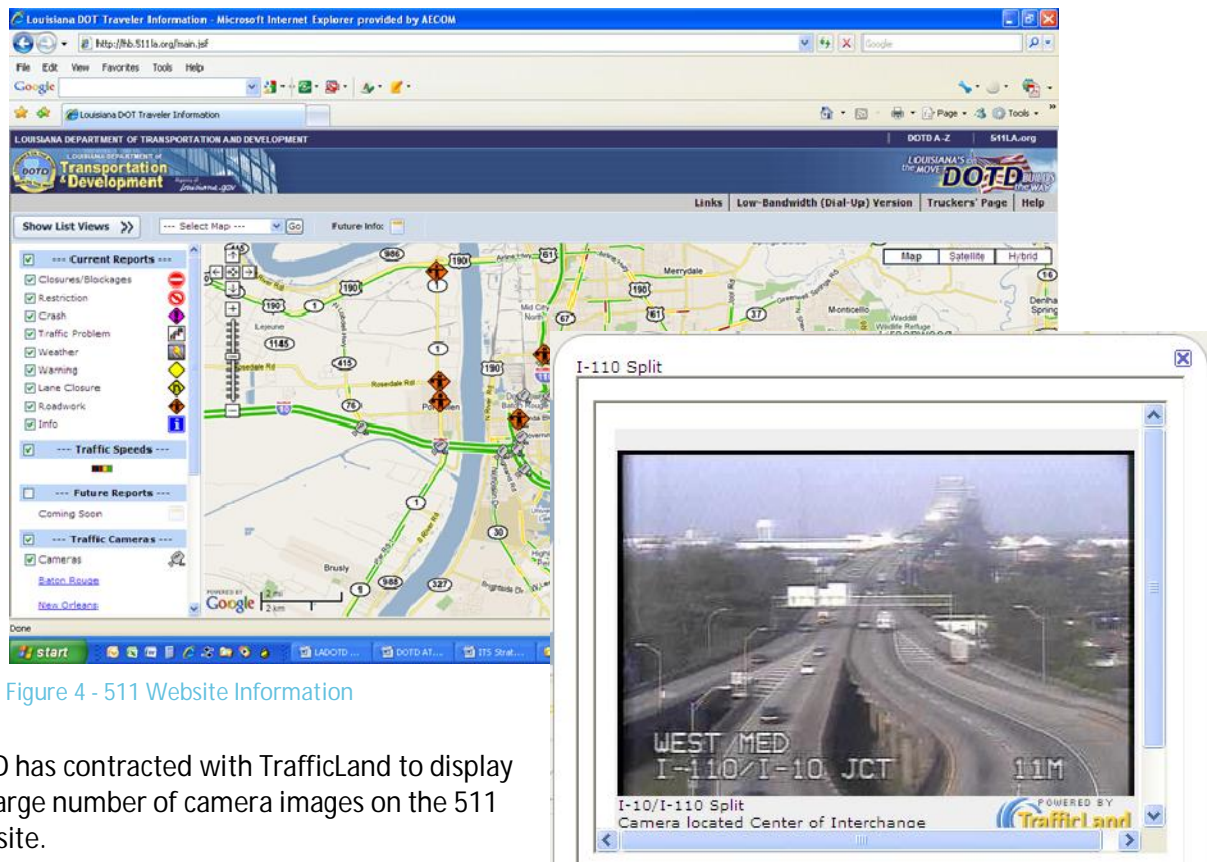


Figure 4 - 511 Website Information

DOTD has contracted with TrafficLand to display the large number of camera images on the 511 Website.

### 2.4.2 Roadway Safety Incident Program

The Roadway Safety Incident Program (RSIP) provides free assistance to stranded motorists. There are several RSIP vehicles deployed statewide, plus tow trucks and debris management pick-up vehicles. The program began as an outgrowth of major construction programs, and is focused on the interstate system.

RSIP vehicles currently provide an average 400-450 assists each week to stranded motorists within Baton Rouge (I-10, I-12, and I-110), Lake Charles (I-10), Shreveport-Bossier City (I-20), and New Orleans (I-10). These assists include the following:

- Provide one gallon of fuel
- Change a flat tire
- Jump-start a car

- Assist law enforcement with traffic control
- Render basic assistance to stranded vehicles
- Provide the use of a cellular phone to make a local call for additional assistance if needed

The success of the program is largely attributed to the RSIP patrollers, who must be qualified first responders, quick thinkers, and customer oriented. In addition to assisting with vehicle problems, these contracted employees are often the first to arrive at the scene of an accident.

### 3 Proposed ATMS Software Concept

This Concept of Operations was created as a high-level document for the DOTD to establish the foundation and vision for an ATMS software solution. From this Concept of Operations, high-level functional requirements for the ATMS software will be developed, and together these two documents will create the technical platform for a Request for Qualifications (RFQ) for procurement and integration of a software solution.

This chapter describes the concept for this proposed ATMS software, specifically covering the following topics:

- Background, Objectives and Scope,
- System Description, and
- TMC Operations.

#### 3.1 Background, Objectives and Scope

The Concept of Operations provides the framework in procuring the ATMS software to be utilized at all TMCs throughout the state. To reduce the risk of schedule and cost overruns, and increase the likelihood that the implementation will meet user's needs, DOTD follows the FHWA Systems Engineering Process (SEP) for procurement of the ATMS software.

Systems engineering provides a systematic process and tools that directly support project management. The system engineering process will comply with the "V" model (Figure 5) which illustrates the various phases of the system life-cycle and how they relate to one another.

Phase -1	Phase 0	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
Interfacing with Planning and the Regional Architecture	Concept Exploration and Benefits Analysis	Project Planning and Concept of Operations Development	System Definition and Design	System Development and Implementation	Validation, Operations and Maintenance, Changes & Upgrades	System Retirement / Replacement

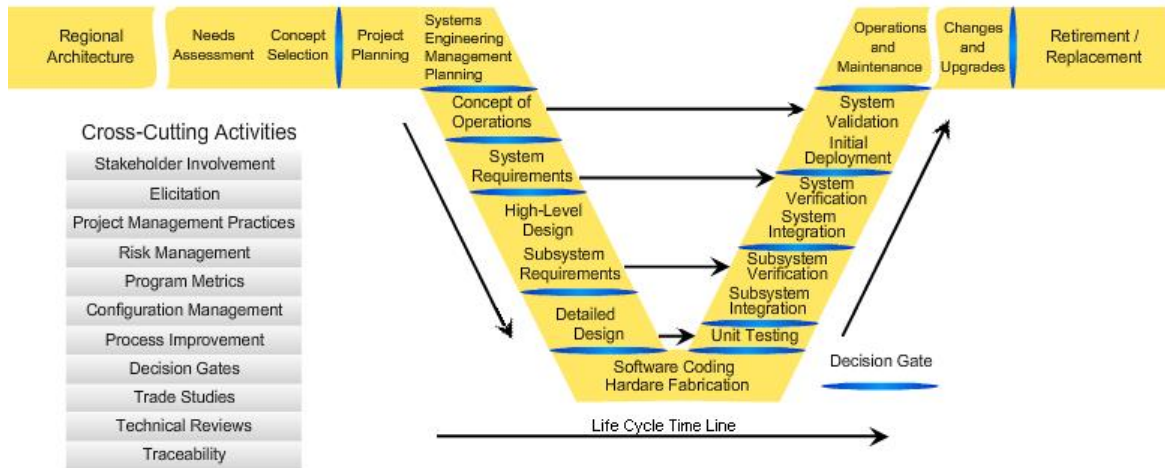


Figure 5 - FHWA "V" Diagram

The purpose of this Concept of Operations is to meet the following goals and objectives, as determined by consensus with the DOTD stakeholders:

- Increase operator efficiency due to a reduced need for control software interaction.
- At a minimum, add the following operational functions:
  - Produce and display automated travel times.
  - Create and maintain a central repository of data from multiple devices types through the entire state.
  - Create and utilize automated incident management response plans activation.
  - Provide data archiving capabilities for historical purposes.
  - Make available a two-way flow of data between the Maintenance Management System (MMS) and ATMS software.
  - Utilize automated event logging/reporting.
  - Create automated video detection and alerts.
  - Provide system and field equipment status reporting.
  - Streamline dissemination of traveler information through automated system processes.
- Improve efficiency in data sharing between the DOTD’s CARS/511 system and ATMS.
- Provide a less cumbersome system configuration for device management and system maintenance.

## 3.2 System Description

This section provides an overview of the system to be developed including its scope, the users of the system, and interfaces. The system overview provides a structure for describing the operations, in terms of where the operations will be conducted, and the lines of communication.

### 3.2.1 Regional TMC ITS Functions

The ATMS software will provide the majority of regional TMC functions, including network surveillance, traffic incident management, traffic information dissemination, traffic forecast and demand management, regional traffic control, freeway control, and surface street control.

- Traffic Network Surveillance
  - Monitor traffic and road conditions.
  - Identify and verify incidents.
  - Detect faults in operations.
  - Monitoring work zone areas.
- Traffic Incident Management
  - Maintain incident reporting system. This system will require minimum operator interaction, except the acknowledgment/selection of an incident, appropriate response, updating incident conditions and incident closure.
  - Manage both expected (planned events) and unexpected incidents.
  - Provide incident detection and verification through ITS devices and through regional coordination.
  - Automatically provide appropriate response scenarios and detour routing to be acknowledged by the operators.
  - Coordinate with RSIP vehicles.
  - Coordinate with local public agencies, tow trucks, and other response agencies.
- Traffic Information Dissemination
  - Provide a range of information to the public using roadside equipment (e.g., HAR and DMS), the 511 phone and Website, other service providers, and social media. This information includes:
    - Traffic and road conditions.
    - Travel times along corridors.
    - Closure and detour information.
    - Incident information.
    - Emergency alerts and driver advisories.
    - Emergency evacuation routes.
    - Bridge openings.
    - Ferry status.
- Rural Freeway Incident Management
  - Maintain incident reporting system.
  - Provide surveillance.
  - Coordinate with emergency response.
  - Provide traffic diversion information.
- Statewide Traveler Information (511)
  - Enter real-time incident and construction data into the 511 system.

- Traffic Forecast and Demand Management
  - Implement congestion management strategies.
  - Provide recommendations based on historical evaluation, real-time assessment, and forecast of the roadway network performance based on predicted travel demand patterns.
- Regional Traffic Control
  - Sharing of traffic information and control among regional TMCs to coordinate regional traffic management strategies.
  - Coordinate signal control within metropolitan areas.
  - Coordinate between freeway operations and arterial signal control within a corridor.

### 3.2.2 Statewide TMC ITS Functions

The statewide ITS functions include all regional TMC capabilities, in addition to hurricane evacuation coordination, statewide traveler information (511) and statewide ITS operations and maintenance.

- Traffic Network Surveillance:
  - Monitor traffic and road conditions.
  - Identify and verify incidents.
  - Detect faults in operations.
  - Monitor and control work zone areas.
- Statewide Coordination for Hurricane Evacuation
  - Monitor CCTV camera images at critical evacuation locations.
  - Provide real-time traffic information on major evacuation routes.
  - Archive traffic count data for post-event evaluation.
  - Monitor and control contra-flow lane operations on freeway evacuation routes.
  - Monitor (by CCTV cameras) cross-over operations involved in reversible freeway operations.
  - Operate strategically located DMS and HAR to direct evacuees to available routes and shelters.
- Rural Freeway Incident Management
  - Maintain incident reporting system.
  - Provide surveillance.
  - Coordinate with emergency response.
  - Provide traffic diversion.
- Statewide Traveler Information (511)
  - Maintain statewide traveler information Website operations and maintenance.
  - Provide rural traveler information devices (i.e. DMS and HAR).
  - Provide interstate freeway data exchange (construction, congestion and incidents).
- ITS Operations and Maintenance
  - Manage telecommunication system maintenance and repair.
  - Manage ITS device maintenance and repair.



## 4 Operational Needs

This section identifies the operational needs of the ATMS software. The operational needs were obtained from a review of existing documents, including the 5-Year ITS Strategic Business Plan, Regional ITS Architectures, and Regional ITS Deployment plans as well as discussions with stakeholders.

1. Command and Control Needs
  - a. Reduce multiple entries for events/notifications by operators and DOTD staff.
  - b. Control of DMS, CCTV cameras, HAR, and vehicle detectors from a single platform.
  - c. View the status of DMS, CCTV cameras, HAR, signal systems, and vehicle detectors on a single GIS-based map.
  - d. Ability to add devices by DOTD staff without input from the vendor.
  - e. Provide for automated incident detection and incident management response system for interstates and primary routes.
  - f. Provide for automated travel times to be displayed on DMS.
  - g. Control, receive, and distribute video images from CCTV cameras installed along designated highway sections.
  - h. Allow for automated and planned messages to be displayed on DMS, HAR and other appropriate ITS media in response to anticipated events. Responses will include predetermined messages and appropriate group notifications.
  - i. Create predetermined response plans for diversion routes and construction.
  - j. Provide secure access to the ATMS software.
  - k. Provide browser-accessible data to authorized personnel over the ITS network. Such data will include road status, DMS and HAR messages, video data, traffic data (traffic volume counts and speed information) and current incidents.
  - l. Provide users with a browser to input data on bridge and road closings and openings.
  - m. Alert a designated TMC when a device failure or other problem occurs at unattended TMCs. Escalate this alert to other TMCs if no first response is made.
  - n. Provide for automated notification by fax, pager, and/or email to designated individuals and/or groups of users (including media) in response to defined events.
  - o. Provide subscription email alerts for incident/travel information.
  - p. Consolidate reporting functions.
  - q. Allow the Statewide TMC in Baton Rouge to assume command and control over Regional TMCs during the overnight hours and during emergencies and evacuation scenarios.
    - i. The ATMS will allow the Statewide TMC to operate utilizing the existing DOTD telecommunications infrastructure by sharing a minimum of four CCTV images from each Regional TMC.
  - r. Allow the New Orleans TMC to operate as the backup Statewide TMC.
  - s. Allow the Regional TMCs the capability to operate independently, should a telecommunications infrastructure failure occur.
  - t. Provide for a "lite" Web-based version for use by DOTD staff when out of the facility as well as for use by approved external agencies.
  - u. Provide ability to set operator priorities for device operations.
2. Maintenance Needs
  - a. Monitor and report problems with all ITS devices and telecommunication networks.



3. Reporting Needs
  - a. Receive, record and distribute incident reports from all TMCs.
  - b. Provide for back-end performance reporting data on all incidents and events.
  - c. Allow for the collection and analysis of performance metrics.
  - d. Provide for multiple outputs to various agencies.
  - e. Provide for customized reporting capabilities.
  - f. Provide detector data
  - g. Provide for recording Mean Time between Failures (MTBF).
  - h. Provide for automated reporting for:
    - i. Device status
    - ii. Incidents
    - iii. All logged events
    - iv. Incident management database
    - v. Travel time index
    - vi. System up-times
4. Interface
  - a. Interface with all current ITS equipment.
  - b. Allow for effective data sharing between CARS/511 and the ATMS.
  - c. Interface with all DOTD software, such as MMS, and CARS/511.
  - d. Create a data feed (vehicle detector data) to an XML feed for external use.
  - e. Include an interface that will readily allow future integration with traffic signal and other legacy systems.
  - f. Interface with Locate IM.

It should be noted that not all of the operational needs will necessarily be satisfied by the ATMS software. These needs will be refined and prioritized during the functional requirements stage.

#### 4.1 ATMS Performance Goals

The Louisiana DOTD 5-Year ITS Strategic Business Plan established seven ITS-specific performance goals for the entire ITS system. Each performance goal was associated with one of the goal areas defined in the ITS Business Plan. The performance goals, and the corresponding goal areas, are identified in the below table. The performance of the ATMS software will be measured based on the performance goals set for the ITS system.

Table 2 - ITS Performance Goals

ITS Performance Goals	Metric
Increase Operator Efficiency	Within one minute: <ul style="list-style-type: none"> <li>• Identify an incident,</li> <li>• Select a specific response plan,</li> <li>• Enact the initial response plan,</li> <li>• Track response plan.</li> </ul>
Efficient and effective data sharing between the DOTD's CARS/511 system and ATMS.	Enable the operator to input data only once in the ATMS and have the information automatically and correctly propagated to CARS/511 and other traveler information tools such as Twitter and email, etc.





<p>Introduce the following system functionalities:</p> <ul style="list-style-type: none"> <li>• Produce and display automated travel times.</li> <li>• Create and maintain a central repository of data from multiple device types throughout the state.</li> <li>• Create and utilize automated incident management response plans activation.</li> <li>• Provide data archiving capabilities.</li> <li>• Make available two-way flow of data between Maintenance Management System (MMS) and ATMS.</li> <li>• Utilize automated event logging/reporting.</li> <li>• Create automated video detection alerts.</li> <li>• Provide system and field equipment status reporting.</li> </ul>	<p>ATMS to address each of these functions.</p>
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## 5 Implementation, Operational and Support Environment

This section describes the physical operational environment in terms of facilities, equipment, computing hardware, software, personnel, operational procedures, and support necessary to operate the ATMS software system.

- Facilities. ATMS software will be accessible to all TMCs as well as external agencies on the ITS network.
- Implementation. DOTD staff and the selected vendor will work to develop an implementation schedule that meets the DOTD’s expectations and the developer’s capabilities.
- Hardware and Software. Based on the vendors recommendations, DOTD will procure all hardware and third-party software if required for installation of the ATMS software.
- Maintenance. The vendor will provide a maintenance plan.
- Operational Procedures. TMC Operators and TMC Supervisors will play a critical role in the day-to-day and emergency operations of the ATMS software. The current roles and responsibilities, and the operational policies, procedures and protocols of the TMC operators and supervisors, are identified in Standard Operating Procedure (SOP) documents for each TMC. These operating procedures will be modified by DOTD to incorporate the ATMS software.

Several other facilities, hardware and software, and personnel, including IT and maintenance, will be required for the operations and maintenance of the ATMS software. These support environments, required for the ATMS software, will be determined during the later stages of the project.

## 6 Operational Scenarios

This section presents operational scenarios and how the TMC personnel are expected to operate during specific events using the new ATMS software. Each scenario describes a sequence of events, activities carried out by operators, the system, and the environment. It specifies what triggers the sequence, who or what performs each step, when communications occur and to whom or what (e.g., a log file), and what information is being communicated. The scenarios are not meant to be all-inclusive but they do provide an illustration of operations during certain events.

An underlying assumption for all the scenarios is that with the ATMS software, pre-determined response plans will have been developed, including appropriate documentation of the incident response resources. In addition, it is assumed that desktop scenario sessions will be used to prepare and train staff, then refine response plans for incidents, special events, weather, and evacuations.

Operational scenarios addressed in this section include the following:

1. Normal scenario (e.g., recurring congestion)
2. Incident scenario
3. Emergency scenario

### 6.1 Normal Scenario

It is a normal morning rush hour in May. There is typical peak period congestion with no unusual problems such as disabled vehicles or failed ITS devices as the ATMS software and pre-defined reports provide no errors or malfunctions. There are neither major incidents nor abnormal weather conditions.

The ATMS software consistently collects and processes field data to detect for incidents. The congestion/speed map, provided by the ATMS software, is consistently updated. In addition, the ATMS system receives inputs from vehicle detectors and 511 systems. The CCTV camera monitoring system is set on a "tours" mode so that TMC operators may scan images for abnormal traffic behaviors. The TMC operator and supervisor perform their day-to-day operations as identified in the SOPs. System support staff verifies daily reports of equipment status and monitor the system's health. Travel time information between pre-determined destinations points are displayed on appropriate DMSs. RSIP vehicles proactively patrol the roadway to detect and respond to incidents.

### 6.2 Incident Scenario

For most incidents/planned events, automated pre-planned responses have been identified and are part of the ATMS software during the implementation phase. The scenario below provides an example of a minor incident.

There is heavy rain occurring during a Friday evening rush hour and the presence of fog reduces visibility. Due to minimum visibility, two vehicles collide. There are no injuries to occupants in the vehicles, just bumper damage. The vehicles that were part of the incident occupy the right-most lane of a three-lane freeway. Other vehicles pass by the vehicles in the other two lanes. Traffic flow is reduced significantly.

The ATMS software detects the slow moving traffic and flashes an alert on the congestion/speed map and automatically activates the two closest CCTV camera images on the operator's screen. The operator reviews the subject location and confirms the incident by selecting an "acknowledge" button from the

ATMS software. The incident is now logged as active. The operator enters the exact incident location by either clicking on the GIS system map, or utilizes pull-down menus to select the incident location. The operator utilizes pull-down menus to select the affected lane(s), number of vehicles involved in the incident and responders (e.g., tow truck, fire, EMS, police, hazmat, etc.). At this point, the ATMS software provides the operator with various pre-determined incident management response plans. The operator selects the most appropriate response plan. Before the response plan is enacted, the ATMS software requires confirmation of the plan selected. The operator confirms and implements the plan. The following activities will occur as appropriate:

- DMS and HAR messages are activated to alert motorists of the incident.
- The nearest RSIP vehicle is notified by dispatch.
- Incident information is automatically populated into CARS/511.
- Automated email and twitter alerts are sent to the appropriate agencies, information service providers, and customers.

At this time, the TMC operator monitors the incident and logs the arrival time of the responders. Upon clearing the lanes of the two vehicles, the TMC operator logs the event and updates the response plan to indicate all lanes are open, but congestion is still prevalent. CARS/511 is automatically updated and other information service providers are notified. When traffic returns to normal operation, the TMC operator closes the incident and again CARS/511 is automatically updated as well as the other information service providers.

### 6.3 Emergency Scenario

Hurricanes pose a significant threat to coastal regions of the state, and to a lesser degree, to the entire Eastern seaboard. High winds and rain as well as coastal and inland flooding can have a devastating impact on affected populations and infrastructure.

The Statewide TMC assumes control of the entire operations, with support from other TMCs, and consistently coordinates with the required agencies. The Statewide TMC utilizes its surveillance equipment (CCTV cameras) and other sensor devices to monitor traffic flow on evacuation routes and report on the status of evacuation efforts. In addition, reports from field staff are compiled to evaluate the status of evacuation routes prior to, during, and after an event.

The Governor's Office of Homeland Security & Emergency Preparedness (GOHSEP) provides evacuation timelines based on storm conditions and clearance time estimates. Statewide TMC operators implement the pre-planned strategies, including contra-flow and reversible lane management strategies. The Statewide TMC disseminates the emergency information using DMS, HAR and the CARS/511 system. The local office of emergency preparedness and local public safety agencies coordinate with the Statewide TMC to implement the strategies.

The ATMS will be capable of providing automated volume and incident reports on the evacuation routes to appropriate agencies and personnel. In case the Statewide TMC in Baton Rouge is affected by the Hurricane, the New Orleans TMC will provide the statewide TMC functions.

## 7 Reference Documents

The following documents have been utilized as references during the development of this Concept of Operations:

### 7.1 Studies Identifying Operational Needs

Louisiana DOTD 5-Year ITS Strategic Business Plan, October 13, 2010 – This plan provides specific initiatives on the projects, processes, and strategies needed to achieve the vision and business goals of the DOTD ITS program. These initiatives will be incorporated into current and future contracts, as well as work program updates, then tracked on an annual basis to ensure that they are being accomplished.

### 7.2 Other Reference Documents

Louisiana Statewide ITS Implementation & Telecommunication Plan, January, 2002 – This plan builds upon the strategic vision and needs identified in the Louisiana ITS Business Plan. It furnishes specific projects as well as a statewide telecommunications design to implement the ITS services presented in the Concept of Operations and described in the functional requirements developed for Louisiana ITS implementation. This plan is accessible at:

(<http://www.dotd.la.gov/operations/its/documents/ITS%20Deployment%20Plan/Statewide%20ITS%20Implementation%20Plan.pdf>)

DOTD Policy on Management and Operations of Traffic Management Centers (TMCs) and Intelligent Transportation Systems (ITS), March, 2001 – This document states that DOTD will develop a regional and centralized TMC concept of operations. This document will be based on traffic and incident management in both urban and rural areas and will address local traffic management, emergency response, law enforcement, as well as DOTD representation.

Louisiana ITS Statewide Business Plan, Updated January 2006 – The initial and updated versions of this document defined the original ITS market packages considered by DOTD.

### 7.3 Concept of Operations Documents

The following section lists the reference documents utilized to prepare this Concept of Operations.

Systems Engineering Guidebook for Intelligent Transportation System version 3.0, created by Caltrans and FHWA in November 2009.

ANSI/AIAA G-043-1992 standard and IEEE Standard 1362 for Concept of Operations Development.