STATEWIDE ITS VISION

Mississippi is one of the first states to incorporate a strategic plan for Intelligent Transportation Systems (ITS) fully within the framework of its long-range multimodal transportation plan. To this end, MDOT is focused on applying ITS technology where such applications contribute to statewide goals and objectives and support the state's other non-ITS policies, investments, and initiatives. While MDOT realizes the importance of continuing to expand its capital infrastructure (e.g. roadways, intermodal ports, airports and transit facilities), the state views ITS as a tool to better operate and manage these capital assets. Thus Mississippi believes that the success of its capital program will be closely linked with the technology and management (including ITS) strategies it adopts.

Accordingly, MDOT is working to increase the participation of non-traditional stakeholders, such as emergency service providers, port operators, tourism industry representatives, the media, and others in the transportation decision-making processes throughout the state. MDOT also recognizes that the state's transportation challenges vary from region to region and that locally tailored ITS solutions must be developed. As such, Mississippi will continue to work with MPO's and other local agencies and transportation providers to plan, design, and implement flexible and scaleable ITS strategies. At the same time, MDOT realizes that ITS solutions are most effective when systems are integrated, information is shared, and regional strategies are coordinated at the statewide level. Such coordination will minimize duplication of effort, help local agencies achieve economies of scale when procuring technologies, and lower the risk of deploying incompatible components by promoting the use of established ITS standards. Since few ITS applications have been deployed in Mississippi to date, the state recognizes the opportunity to think strategically since we are starting with a relative "blank slate" and thus the complexities of retrofitting existing equipment is not a significant challenge.

Development of the ITS Vision: Using Stakeholder Issue Statements to Define ITS Objectives

The Mississippi ITS Vision was formulated after consulting MDOT and meeting with transportation stakeholders representing the state and the Jackson, Gulf Coast, Hattiesburg, and Desoto County metropolitan areas in April and May of 2001. These workshops explored the key transportation issues and challenges in the regions and resulted in the development of 178 issue statements. To better understand and prioritize the overarching transportation concerns throughout the state, several high-level ITS objectives were identified that were representative of the issue statements received. All the issues could be mapped to one or more of the following objectives:

- Improve traveler information services;
- Improve incident and emergency management operations;
- Better manage and mitigate congestion;

- Promote and improve transit service and travel demand management alternatives;
- Improve the efficiency and safety of goods movement and intermodal operations;
- Improve arterial traffic management and signal operations; and
- Provide for locally specific goals/needs.

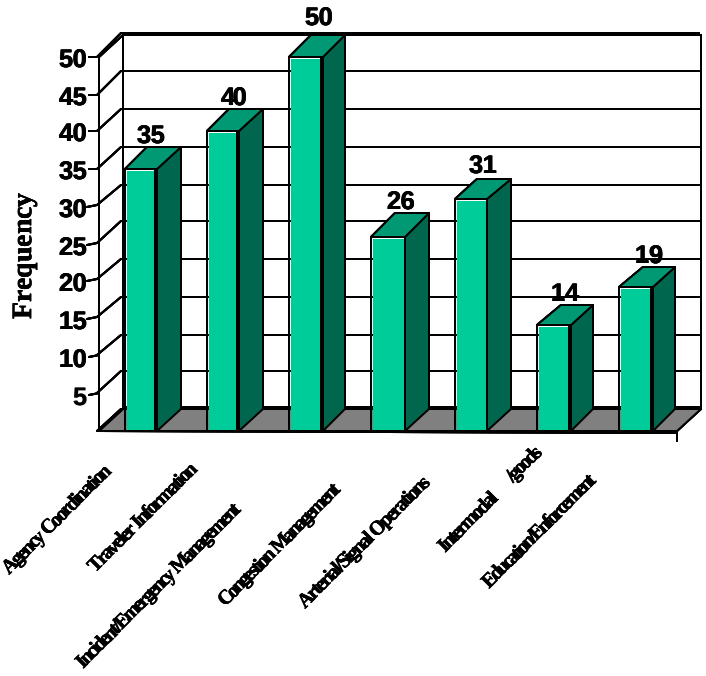
In addition to these high-level ITS objectives that were synthesized from the full set of recorded issue statements, two additional priorities were revealed. While these (as well as several of the specific local concerns) may not be readily addressed through ITS, they were voiced frequently enough to warrant inclusion in this Vision. MDOT will develop recommendations for these objectives as the MULTIPLAN effort evolves. The two additional "non-ITS" objectives identified are:

- Improve interagency/interjurisdictional coordination, cooperation, and information sharing; and
- Increase driver education, compliance with traffic laws, and driver performance.

To gain some perspective on the relative importance stakeholders assigned to the various objectives, a tabulation of the number of issue statements related to each of the objectives was performed. **Figure 11-1** shows the frequency distribution of the results of this tabulation. Note that since one issue statement could be mapped to several objectives, the total frequency of all the objectives exceeds the total number of issue statements (178). The data in **Figure 11-1** should be viewed with some caution for a couple of reasons. First, most issues cut across functional areas. For example, while the need to improve traffic signal operations most naturally addresses the "Arterial Operations" objective, it can also support the congestion management, incident management, and other objectives. Although an attempt was made to appropriately map the issues to objectives, this process is somewhat subjective and thus some margin of variability should be assumed in the final numerical "scores" shown.

Second, to a large extent, the priorities that emerged from the stakeholder workshops were reflective of the particular stakeholders who participated. Thus, the relatively low tally of intermodal/goods related issue statements is probably indicative of the fact that this community was not strongly represented in the workshops. Notwithstanding these statistical considerations, the figure does provide some clues as to the types of ITS strategies that appear to have broad support among MULTIPLAN constituents. This information will help set the priorities for future MULTIPLAN tasks, such as identifying candidates for early-start projects and determining the central functions of the Statewide ITS Architecture.

Figure 11-1
BREAKDOWN OF MISSISSIPPI STAKEHOLDER TRANSPORTATION ISSUES



ITS Multiplan High-Level Objectives

Definition of Mississippi ITS Vision

Mission Statement

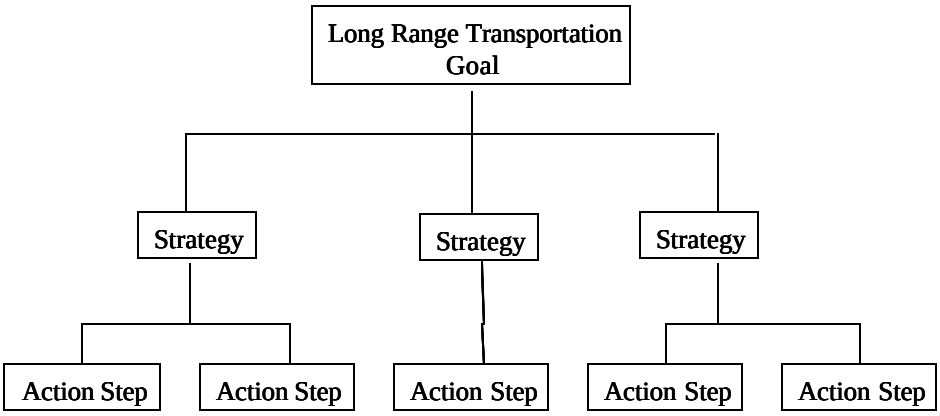
Unlike other states whose metropolitan (and in some cases even non-metropolitan) regions suffer from extreme traffic congestion on a regular basis, the general view from the stakeholders interviewed throughout Mississippi was that, with the exception of some localized areas, regularly occurring traffic congestion was not one of the most pressing challenges in the state. Rather, themes such as providing more timely and useful traveler information, improving hurricane evacuation coordination, improving the perception of public transit, and providing more effective incident management were touted to be the critical needs for improving transportation services. Based on the themes represented in the individual issue statements, the following unifying Mississippi Statewide ITS Mission Statement was formulated:

> ***It is the Mission of the Mississippi Department of Transportation to use ITS technologies to improve the quality of life for state residents and visitors by providing more reliable, informative, safer, and flexible passenger and freight multi-modal transportation services.***

Linking Stakeholder Issues Statements to User Services and MULTIPLAN Goals

To facilitate the mapping of stakeholder issue statements to ITS User Services and to ensure that the ITS Vision is consistent with the overall framework of MULTIPLAN, the full set of issues was distilled down into 14 representative ITS strategies that will support the problems and concerns reflected in the issue statements. As shown in **Figure 11-2**, MULTIPLAN identifies long-range transportation goals, strategies to achieve these goals, and action steps to implement the strategies.

Figure 11-2
MULTIPLAN GOAL FRAMEWORK



The following seven long-range transportation goals are defined in MULTIPLAN:

1. Improve mobility for Mississippi's people, commerce, and industry
2. Ensure high standards of safety in the transportation system.
3. Maintain and preserve Mississippi's transportation system.
4. Ensure that transportation system development is sensitive to human and natural environment concerns.
5. Provide a transportation system that encourages and support Mississippi's economic development.
6. Create effective transportation partnerships and cooperative processes that enhance awareness of the needs and benefits of an intermodal system.
7. Provide a sound financial basis for the transportation system.

For each goal, a set of strategies and action steps are defined to achieve the goals envisioned. Thus the formulated ITS strategies can be directly incorporated into the MULTIPLAN goal framework. Using the same goals for the ITS strategies and those developed for the overall transportation plan will further promote the mainstreaming of ITS initiatives in Mississippi. The ITS action steps will be represented by the prioritized Market Packages identified in subsequent tasks.

The *National ITS Program Plan* describes 31 ITS User Services that identify particular needs that can be addressed by ITS. The User Services represent the inputs to the National ITS Architecture, and by extension, the state and regional ITS architectures developed throughout the country. **Table 11-1** lists the ITS strategies derived from stakeholder comments, the User Services that can fully or partially address the strategy,

and the MULTIPLAN goal that is supported by the strategy (numbered according to the list above) and User Service. As shown in **Table 11-1**, 19 User Services have been identified. One of these, *Disaster Response and Evacuation,* is not a User Service defined in the National ITS Program Plan. As such, it represents a locally (i.e. Mississippi) defined User Service.

As noted earlier, several of the individual issue statements focused on issues that, to a large degree, cannot be directly addressed through ITS. Three consolidated issue statements for these non-ITS needs were defined as follows:

- Politicians/decision-makers place emphasis on local/parochial concerns and have less enthusiasm for overall regional needs;
- More stringent driver education and law enforcement activities are needed; and
- Roadway and/or parking infrastructure capacity is inadequate (e.g. two lane roads, parking garage space limitations).

Table 11-1
MISSISSIPPI ITS STRATEGIES, RELATED ITS USER SERVICES, AND MULTIPLAN GOALS SUPPORTED BY THE STRATEGY

ITS STRATEGY	MULTIPLAN GOALS SUPPORTED BY STRATEGY	RELATED USER SERVICE(S)
Provide travelers with better, more accurate information such as construction, alternative routes, transit, tourism, airport, HRI lane closures, and parking.	1,5	• *En route driver information* • *Route guidance traveler services information* • *En route transit information pre-trip travel information* • *Pretrip travel information* • *Regional Parking Management* • *Parking Facility Management*
Improved incident and event multi-jurisdictional management, procedures, coordination, telecommunications, and information exchange.	1,2, 6	• *Incident management* • *Traffic control* • *Emergency notification and personal security* • *Regional Parking Management*
Improve interagency coordination on signal and system operations.	1	• *Traffic control*
Make transit a more viable transportation option by improving public perception, improving transit traveler information, and operations (e.g. signal priority).	1,4	• *Public transportation management* • *Personalized public transit*

ITS STRATEGY	MULTIPLAN GOALS SUPPORTED BY STRATEGY	RELATED USER SERVICE(S)
Improve highway-rail intersection operations to reduce accident risks and make arterial traffic operations more efficient.	1,2	• *Highway rail intersection*
Improve commercial vehicle information/routing/management better efficiency and improved safety.	1,2,4,5	• *Commercial fleet management* • *Commercial vehicle administrative processes* • *En-route driver information* • *Pre-trip travel information* • *Route guidance*
Optimize signal timing, operations, and coordination at the interface between neighboring jurisdictions.	1	• *Traffic control*
Collect better, more complete historic traffic and travel data to improve planning and analysis.	3	• *Archived data function*
Provide emergency responders with real time traffic data, easier accessibility to scenes (e.g. around grade crossings), and better route guidance capabilities.	1,2	• *Incident management* • *Emergency vehicle management* • *Route Guidance*
Expand travel demand management (e.g. ridesharing) opportunities	1,4	• *Travel demand management* • *Public transportation management* • *Traffic control*
Establish better information and coordination among agencies during disasters and weather emergencies	1,2, 6	• *Disaster response and evacuation**
Utilize lane and speed control strategies in certain situations (e.g. evacuations, severe weather).	1,2	• *Traffic control* • *Disaster response and evacuation**
Improve the management of hazardous materials shipments and consider additional HAZMAT route restrictions.	2	• *Hazardous material incident response* • *Commercial vehicle administrative processes*
Develop comprehensive and well-coordinated evacuation plans.	1,2, 6	• *Disaster response and evacuation**
Improve the efficiency of inspections and container-tracking processes at intermodal terminals.	1,5	• *Commercial vehicle electronic clearance* • *Commercial vehicle administrative processes*

*This User Service must be locally defined. No such service exists in the National ITS Program Plan.

Relationship Between Statewide and Regional ITS Planning and Operations

MDOT will play a leading role in providing the strategic direction and coordination for ITS within the state. This will help ensure that the benefits of compatibility, consistency and statewide systems integration are realized. MDOT will oversee the development and implementation of guidelines for statewide project development and resource allocation. MDOT will focus on statewide and multi-regional functions and priorities, while facilitating consistent program implementation by local operators. The statewide stakeholder workshop participants provided several broad recommendations to help guide MDOT's ITS program. Many of these recommendations are reflected in the ITS strategies and User Services previously identified and are generally applicable throughout the state. Other observations, including some non-ITS considerations, raised by the statewide constituents are as follows:

Statewide

- The "distance learning" concept was provided as an example of how specific needs could be addressed without requiring travel. Opportunities for using the Internet to support tourists (e.g. information on state traffic laws, real-time conditions, and other travel services information) should also be explored.

- Much can be gained by educating the public so that they can make more informed travel decisions. The "GO MDOT" website should be as comprehensive and complete as possible and travelers should be educated in its information and functions.

- Better incident detection and notification is needed in rural areas.

- The focus of ITS initiatives should not be centered on technology, but rather ITS should be promoted as a tool to improve operations and management and to provide improved customer service.

- Many drivers lack fundamental driving skills and understanding and/or are unwilling to abide by the "rules of the road". As such, education must be a part of the strategies that are generated as part of MULTIPLAN.

- The media is a potentially valuable outlet for both delivering traveler information and for educating the public. Thus far, however, they have not been sufficiently utilized.

- Fatal / injury accident investigations at crash sites should be completed more quickly and result in less traffic disturbance.

- Telematics applications (e.g., in-vehicle navigation and communications services using Wireless Internet or similar technologies) were not found appealing due to their perceived adverse safety implications. It is noted these are largely being developed by the private sector and the major implication to the public sector would be the desire for a standard information interface accessible by the various service providers.

- A statewide geo-reference standard is needed to achieve effective agency coordination opportunities.

Despite the importance of statewide consistency, MDOT recognizes the unique needs, challenges, and circumstances of various regions. As such, the issue statements collected that have particular regional or local implications need to be considered. The following statements represent the major locally specific concerns raised during the workshops:

Gulf Coast

- There is inadequate advance information on specific weather conditions (flooding, smoke, fog).

- Casino industry interest in providing door-to-door delivery of passengers is not compatible with Coast Transit Authority operations.

- There is inadequate cooperation from other states in emergency management. One cause of the difficulty is that Louisiana is in a different FEMA region.

- Current fixed route transit services do not adequately address casino employee shift changes and lunch-time travel of CBD workers.

- Coast Transit believes they are often not invited to participate in local planning (such as event planning) activities.

- There is a need to provide improved guidance to available parking at the airport, casinos, and CBD attractions.

Jackson

- Travelers to special events, especially at the Fairgrounds, are not provided with adequate guidance and parking information.

- Parking capacity at the airport is not sufficient to meet demand, especially for holidays.

- Remote areas (e.g. parts of Hinds County) have unreliable and incomplete communications coverage.

- In some areas of the region, insufficient transportation capacity is provided to accommodate new development (basic planning is lacking).

- Predicting train arrivals at grade crossings is difficult due to the high number of non-scheduled train service in Jackson.

- Parking capacity at the airport is not sufficient to meet demand.

- The mix of commuter traffic and airport ingress/egress traffic results in heavy congestion and a significant number of flow conflicts.

- Improved information needs to be provided to the public related to the status of flights at the airport.

- The increased number of travelers during college breaks (e.g., Spring Break) increases traffic congestion and overwhelms the airport parking facilities.

Hattiesburg

- High truck volumes through the downtown area negatively affects traffic flow.

- US 49 is subject to flash flooding. Improved flood warning systems are needed.

- Roadway capacity in an east-west direction is not sufficient.

- There is insufficient parking capacity.

- Despite traffic signal timing improvements, many arterials in Lamar County do not adequately handle congestion because they are only two-lane facilities.

- Emergency evacuation plans needs to be formulated for unanticipated events, such as a potential leakage or fire at the gas plant in Petal.

Desoto County

- Although interagency coordination is a general statewide concern, the issue is especially acute in Desoto County which needs use and funding agreements to address issues such as procurement, staffing, and control issues concerning systems that cross *state* boundaries.

- Increasing truck distribution centers off US 78 will increase the intensity of truck activity.

- Air quality concerns are increasing.

- Road capacity expansion has not kept pace with development.

- Traffic volume growth and change in vehicle composition has exceeded capacity of current interchanges.

Incorporating ITS into Traditional Project Development Activities

Although almost universal support for ITS was expressed by the stakeholders interviewed throughout Mississippi, all the regions noted that expanded transportation infrastructure would be needed. That is, while ITS can serve as an important tool for improving transportation services, basic capacity constraints dictate that ITS can not substitute for traditional improvements, such as road building, parking facility construction, and transit expansion.

Given that traditional transportation construction and maintenance will continue to be a top priority for the state and local jurisdictions, strategies for including ITS

equipment/technologies into these programs and projects need to be developed. MDOT will work to establish guidelines to assist in "mainstreaming" ITS in this manner. Some ways ITS infrastructure can be matched to traditional capital projects include:

- Installing fiber optic cable, CCTV cameras, variable message, and highway advisory radio equipment during roadway and bridge reconstruction/rehabilitation;

- Installing loop and video detection, CCTV cameras, fiber optic and twisted pair infrastructure during intersection / interchange improvements;

- Installing "smart parking" equipment, transit information signs, and information kiosks during parking facility / garage construction; and

- Procuring transit vehicle priority, automatic vehicle location technology, and electronic payment equipment as part of the specifications for new buses to be purchased.

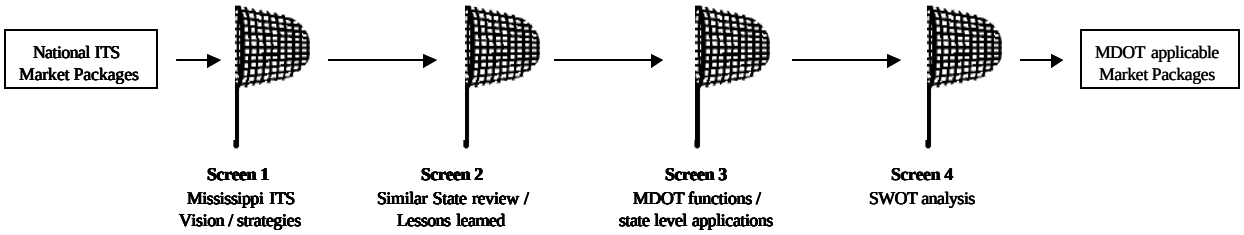
This Vision Statement will be used as the foundation to begin identifying ITS market packages, which represent deployment-oriented ITS architecture elements. The market packages in turn will be used as the building blocks for development of the Statewide ITS Architecture and for defining the early start ITS project(s). These market packages will form the basis for development of a preliminary concept of operations for ITS in Mississippi, including statewide and regional functions.

MARKET PACKAGES

This section identifies and evaluates ITS Market Packages (as defined by the U.S. DOT in the National ITS Architecture) that will support the goals and ITS strategies developed through the statewide ITS Vision process. A Market Package represents a collection of equipment capabilities that interact to deliver a specific transportation service. The National ITS Architecture defines 63 Market Packages in the following general groups: Traffic Management, Traveler Information, Commercial Vehicle Operations, Archived Data, Emergency Management, and Advanced Vehicle Safety Systems.

A screening process, as illustrated in **Figure 11-3**, was used to prioritize the Market Packages for Mississippi and to ensure that market packages selected for consideration are appropriate and applicable to MDOT's business practices. The screening process utilized four screens. The first involved relating the market packages to the ITS strategies identified through the Statewide ITS Vision process. The second screen separated those Market Packages that will likely be planned and deployed at the local level vs. those that will be planned and deployed at the state level. This review identified the applications in which MDOT will play a leading role. The third screen considered the viability of the Market Packages and their potential to generate benefits based on experiences of other states. The fourth and most critical screen involved an analysis of Strengths, Weaknesses, Opportunities, and Threats (SWOT). This analysis examines the potential for each Market Package to be implemented successfully in Mississippi. Areas where further work may be needed (e.g. institutional arrangements) and the potential for benefits are among the results noted in the SWOT analysis.

Figure 11-3
MARKET PACKAGE SCREENS



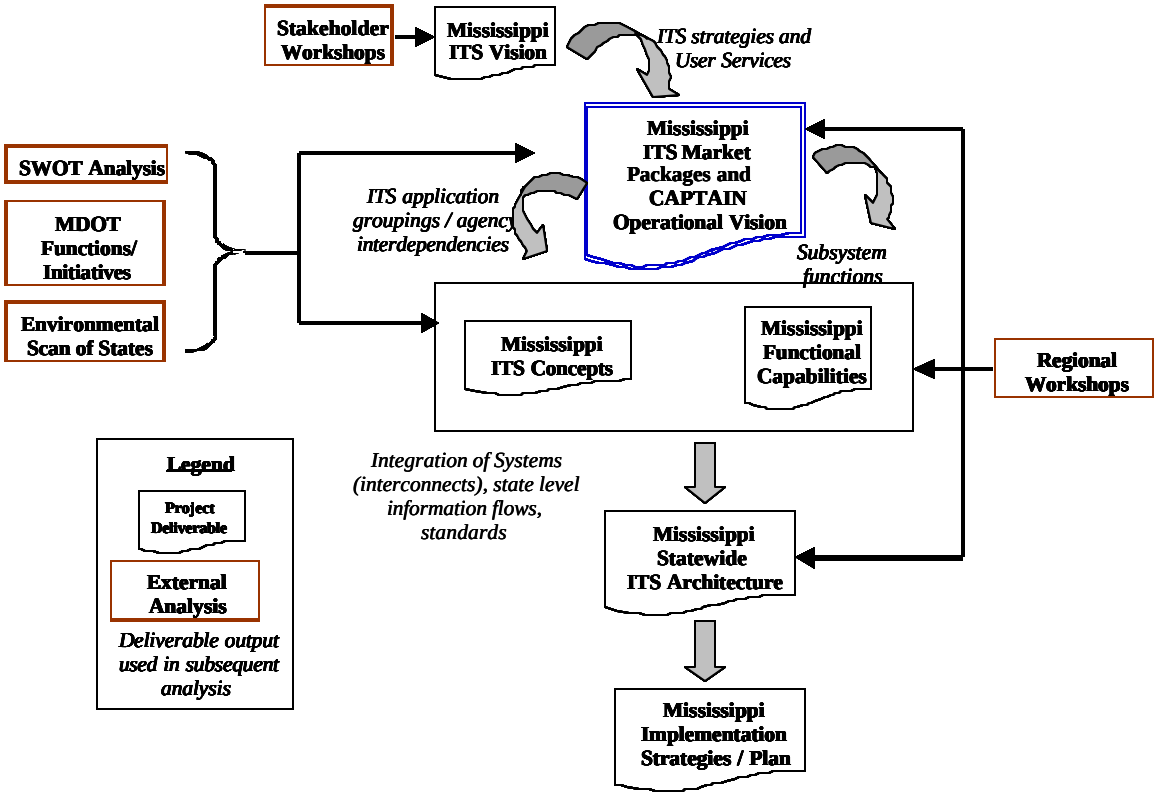
Relationship of Market Packages to CAPTAIN

In parallel with this Market Package assessment, an operational vision for an integrated ITS deployment in the Jackson metropolitan area is also being developed to identify "early start" initiatives. The planning process for this integrated system called CAPTAIN (Capital Area Traffic and Incident Network) will identify, through typical day-to-day scenarios, short, medium and long term ITS applications. Thus, an iterative relationship exists between defining the operational concept for CAPTAIN and defining the ITS Market Packages. Short, medium and long term Market Packages developed through the screening process were used to establish the deployment time-frames for the initial CAPTAIN operational concepts. Conversely, as the operational concept for CAPTAIN is refined, updates to this Market Package document may be required.

Relationship of Market Packages to Vision, ITS Concepts Plan, and Architecture

The Market Package analysis is a central element of the statewide ITS planning process. It serves as a bridge to link the high-level statewide ITS strategies identified through the visioning exercise with the more detailed functional, operational, and organizational considerations necessary for successful ITS deployment. As shown in **Figure 11-4**, the results of the Market Package Analysis will be used to directly support subsequent elements of the Mississippi Strategic Plan; i.e., the Operational Concepts and Functional Capabilities.

Figure 11-4
ITS PLANNING PRODUCT RELATIONSHIPS



Situation Analysis

Current Mississippi ITS Inventory and Institutional Context

The foundation for developing a strategic plan to guide ITS investment in Mississippi is identifying the physical inventory and institutional practices and policies that will provide the technical and administrative support to carry out the prioritized ITS services. Thus the situational analysis catalogues the following elements:

- System elements (i.e. architecture entities) that perform the data collection, processing, and information sharing functions. Typically this infrastructure can be grouped into one of four categories: field elements, in-vehicle devices, management center equipment and systems, and traveler interface devices;
- Agencies and stakeholders that provide administrative and policy support to ITS programs and projects;
- Communications infrastructure for data transmission; and
- Agency policies, practices, and rules that govern institutional agendas.

The following sections describe the existing conditions in Mississippi with regard to these four areas.

Mississippi System Elements (i.e. Architecture Entities)

Subsequent analyses to be performed as part of the ITS Strategic Plan will develop the complete systems inventory for Mississippi. In particular, the Statewide ITS Architecture development process will involve a thorough analysis of all potential ITS stakeholder and system integration opportunities. However, in the course of analyzing applicable Market Packages, an initial identification of the core agency and physical infrastructure elements can be made. **Table 11-2** lists the stakeholders and their respective assets (management centers, field devices and vehicles) expected to be reflected in the Statewide ITS Architecture.

Table 11-2
MISSISSIPPI ITS ARCHITECTURE ELEMENTS

Mississippi System Element	State (S) or Local (L) Level Element	Corresponding National ITS Architecture Entity
*HP Cellular Telephone System	S	Emergency Telecommunications System
Coast Transit Buses	L	Transit Vehicle
Coast Transit Operations Center	L	Transit Management
Coast Transit Website	L	Information Service Provider
County Emergency Operations Centers	L	Emergency Management
Evacuation shelters and service centers	L	Evacuation shelters and service centers
Genfare Smart Card	L	Payment Instrument
Greyhound, AMTRAK and other intercity carriers	S	Multimodal Transportation Service Provider
Highway Performance Monitoring System	S	Archived Data Management
Jackson TMC	L	Traffic Management
Jackson Traffic Signal System	L	Roadway
Jackson Video Surveillance	L	Roadway
Jatran Buses	L	Transit Vehicle
Jatran Operations Center	L	Transit Management
Local E-911 Centers	L	Emergency Management
Local Parking Facilities	L	Parking Management
Local Police, Fire, Rescue Centers	L	Emergency Management
Local Police, Fire, Rescue Vehicles	L	Emergency Vehicle
Local traffic signals and field equipment	L	Roadway
MDOT Closed Loop Signal Systems	S	Roadway

Mississippi System Element	State (S) or Local (L) Level Element	Corresponding National ITS Architecture Entity
MDOT District Offices	S	Traffic Management
MDOT Fatal Accident Reporting Database	S	Archived Data Management
MDOT HPMS Database	S	Archived Data Management
MDOT Office of Enforcement	S	Commercial Vehicle Administration
MDOT GoMDOT Website	S	Information Service Provider
MDOT TOC in Jackson	S	Traffic Management
MDOT Video Surveillance	S	Roadway
MDOT WIM sites	S	Commercial Vehicle Check
Miss. Emergency Management Ass. Central Office	S	Emergency Management
Miss. Public Service Commission Commercial Veh..	S	Commercial Vehicle Administration
Miss. State Tax Commission Commercial Veh.. Databases	S	Commercial Vehicle Administration
Motorist Assistance Call Boxes	S	Emergency Telecommunications System
Neighboring State Emergency Management Center	S	Emergency Management
Port of Entry Scales	S	Commercial Vehicle Check
Rail Operations Centers	L	Rail Operations
Regional Airport Information Systems	L	Multimodal Transportation Service Provider
Regional Planning Data Systems	L	Archived Data Management
State Police Dispatch	S	Emergency Management
State Police Vehicles	S	Emergency Vehicle
Traveler Information Kiosks (Existing)	S	Remote Traveler Support
Traveler Information Kiosks	S	Remote Traveler Support
University of Mississippi CAIT	L	Archived Data Management
University of Mississippi CAIT	S	Map Update Provider

Existing Agency Agreements and Institutional Processes/Coordination

Table 11-3 identifies some of the key aspects of the current institutional context in Mississippi that could offer opportunities for deployment or present barriers to ITS deployment.

TABLE 11-3
EXISTING BASELINE ITS INFORMATION: INSTITUTIONAL ELEMENTS

TRAFFIC VIDEO SHARING

- A local agreement between Jackson and MDOT for sharing of traffic video has been created. Video images from each agency are provided to the other agency. MDOT camera images from Lakeland Drive and I-55 Waterworks are brought back to the city on city fiber backbone.

RESOURCE SHARING

- MDOT is using some of the City of Jackson's Cell towers for the GoMDOT cameras.
- Jackson Transit is working with the Traffic Engineering department to expand the fiber optic cable to bus routes / stops for future transit ITS applications.

INCIDENT MANAGEMENT

- No formal incident command management procedures are in place and MDOT does not participate in an incident management program.
- MDOT does not share information on incidents with other agencies.
- The Mississippi Highway Patrol has authority at incident scenes on the freeway.
- Currently only District 5 (metro Jackson) calls in with construction induced lane closures to be shown on the GoMDOT web site.
- Coast Transit drivers are instructed to call in accidents, but Jackson transit drivers are not.

TRAFFIC SIGNAL CONTROL

- MDOT operates signals on state routes; however, cities over 20,000 in population operate all signals (including those on State routes) within their jurisdiction

COMMERCIAL VEHICLE OPERATIONS

- MDOT's Office of Enforcement has an MOU with the Public Service Commission and State Tax Commission on CVISN. MDOT is working with the State Tax Commission on one stop shopping project. Commercial operators will be able to obtain licenses, certifications, and other credentials.
- Pre-pass allows commercial vehicles to travel on State routes with minimal credential or weight stops.

ITS MANAGEMENT "CENTERS"

- Currently ITS operations are very decentralized within MDOT. The Information Systems Division oversees the GoMDOT operations while Traffic Engineering monitors the traffic video from Lakeland Drive, though with no dedicated staff. CVO issues are managed by the Office of Enforcement.

EMERGENCY MANAGEMENT

- MEMA coordinates traffic with the Highway Patrol and MDOT in the case of emergencies

Existing Mississippi Technologies and Systems

Table 11-4 catalogues the current equipment and technology inventory that will serve as a baseline for future ITS expansion.

TABLE 11-4
EXISTING BASELINE ITS INFORMATION: PHYSICAL ELEMENTS

SYSTEMS INTEGRATION

- MDOT and the City of Jackson shared limited video images. The City of Jackson receives images from Lakeland Drive and I-55 Waterworks Curve and can control these cameras as well. MDOT currently gets one camera image from the City but cannot control it.

COMMERCIAL VEHICLE OPERATIONS

- MDOT has 10 Port of entry scales using PrePass (WIM). Weight enforcement officers are able to access the data collected by the WIM sites using laptops.

EMERGENCY SERVICES

- Jackson, Hattiesburg, and Southaven have signal preemption. Jackson and Southaven require all newly constructed signals to have traffic signal preemption. Currently about 20% of the Jackson's signals are equipped with pre-emptive devices for emergency vehicles.
- Jackson emergency services are developing a vehicle tracking system through GPS. No other emergency providers have AVL.
- Mississippi Highway Patrol has a *HP Cellular Telephone Program.
- As part of the application for the Jackson ITS earmark, it is planned that the Hinds County EOC will integrate ITS elements.

SIGNAL SYSTEMS

- MDOT has about 20 closed loop systems with over 100 controlled intersections. The systems are monitored by the Districts. These systems are generally hardwire connected with microwave communications to MDOT's central computer system in Jackson.
- MDOT has recently installed an ACTRA system, which ties together all the closed loop systems (monitoring and downloading of signal plans). The MDOT signal project (16 signals with ITS components) in Jackson is expected to be completed in 2002.
- The City of Jackson has 7 closed loop systems with 156 signals (out of 352). All controllers are Eagle. Approximately 150 signals are connected through an old Eagle MARC system. Communication to these is dial up with copper hardwire connecting the Masters to the controllers. The others (about 15) are on a new Eagle ACTRA system and these are connected through the fiber. The plan is to have fiber communications to all signals by the end of next year.
- The City of Clinton will soon have a closed loop system via radio interconnection along Clinton Parkway from I-20 to College Street, which includes 5 traffic signals.
- The City of West Point has a closed loop system, which includes a fiber interconnection with video cameras at several intersections. MDOT is tied into this system via radio interconnection.
- MDOT has several closed loop systems along the Coast including US Highway 49 at Gulfport and US 90 throughout the coast area
- Hattiesburg has a traffic office on Walnut Street that will evolve into a TMC with the planned fiber project. Spread spectrum radio interconnect is used for limited communication with 8 intersections on a closed loop system. The City will be connecting another 7 signalized intersections.
- MDOT will be upgrading signals in Hattiesburg (Hardy Street project). Video surveillance, video detection, and emergency vehicle preemption will be added.

COMMUNICATIONS INFRASTRUCTURE

- MDOT has 30 miles of twisted pair cable and 10 miles of fiber optic cable, with 900 Mhz at 50 Intersections.
- Jackson is installing a 50-mile fiber optic backbone, with completion expected in Summer 2002.
- The City of Ridgeland and Madison will soon have access to MDOT's and the City of Jackson's fiber optic backbone along US Highway 51, which will be installed as part of the widening project through both cities.
- Video cameras are planned for several major intersections along the route including Lake Harbour Drive, Jackson Street, Madison Avenue and MS 463.

- The City of Hattiesburg will be connecting 7 intersections with 12,500 feet of fiber cable.
- MDOT will be upgrading signals in Hattiesburg, which will add 8,000 feet of fiber.

MULTIMODAL TRANSIT CENTERS

- An old train station is being converted to a multi-transit center in Jackson ("Union Station Transfer Center"). Renovation has already begun. The center will house Jackson Transit, AMTRAK, Greyhound, rural providers, and taxis. Information and operations will be integrated. The plan is for this hub to be the first deployment of the "Jackson Traveler Information Center".
- Meridian is redeveloping its Union Station to provide access to bus and train transportation. The station will also create links among different transportation modes in the area. The Union Station Multimodal Transportation Center will centralize Meridian's transportation services.
- Similarly on the Gulf Coast, plans for 2 facilities are moving forward. One will be in Biloxi and one in Gulfport. These centers will house all regional transit operators including Coast, Greyhound, taxi, and Casino Park and Ride.

PUBLIC TRANSIT

- No automated vehicle tracking system exists at this time in Jackson or the Coast. Jackson Transit plans on starting with tracking its 7 demand responsive vehicles, and will then move to its fixed route fleet. An FTA grant is currently being prepared for the demand response vehicle tracking project.
- Jackson Transit is installing a computer aided dispatch system from Multisystems, which provides automated route selection for the demand response vehicles. Drivers receive their itinerary in the morning based on the service needs that have been called in. AVL is being proposed as part of grant application.
- Jackson Transit has installed swipe cards that serve as monthly passes. The agency envisions expanding this system to allow more advanced passenger and fare management applications.
- Jackson Transit is currently developing a website. Coast Transit has a website (www.coastransit.com) which provides maps and schedules but no real time information is provided.
- Jackson Transit would like to provide real time information to travelers at bus stops, the multi-modal center, and ultimately the internet.

INCIDENT MANAGEMENT

- The City of Jackson TMC has 8 video screens that display images from 10 cameras.
- MDOT has a total of 6 video screens with that display images from 16

cameras.

- MDOT has installed motorist call boxes on I-10 and 110 along Gulf Coast.

CLOSED CIRCUIT TELEVISION CAMERAS

- There are 11 cameras in use in the Metro Jackson Tri-County area as part of GoMDOT. These locations include: Nissan Plant/I-55, MS 463/I-55, Old Agency Road/I-55, Waterworks Curve/I-55, I-220/I-20, Highway 49 South, Pearl/I-20, Stack. The City of Jackson has 10 video cameras. There are also two video cameras located at the Beau River Casino near I-110/US 90 in Biloxi.
- MDOT camera images are carried back to the State TOC in analog format, digitized and sent to the web server to be displayed on GoMDOT.

Market Package Prioritization Process

Mapping Statewide ITS Market Packages to Vision

The first step in identifying relevant Market Packages for Mississippi was to link the priority strategies developed during the ITS Vision process to National ITS Architecture Market Packages. This was accomplished by first identifying the relevant ITS User Services that support the Strategies. The User Service / Market Package relationships defined in the National ITS Architecture were then applied to tag potentially applicable Market Packages. The ITS Strategies developed through the Statewide Vision exercise are:

- Provide travelers with better, more accurate information such as construction, alternative routes, transit, tourism, airport, HRI lane closures, and parking.
- Improve incident and event multi-jurisdictional management, procedures, coordination, telecommunications and information exchange.
- Improve interagency coordination on signal and system operations.
- Make transit a more viable transportation option by improving public perception, improving transit traveler information, and operations (e.g. signal priority).
- Improve highway-rail intersection operations to reduce accident risks and make arterial traffic operations more efficient.
- Improve commercial vehicle information/routing/management for better efficiency and improved safety.
- Optimize signal timing, operations and coordination at the interface between neighboring jurisdictions.

- Collect better, more complete historic traffic and travel data to improve planning and analysis.

- Provide emergency responders with real time traffic data, easier accessibility to scenes (e.g. around grade crossings), and better route guidance capabilities.

- Expand travel demand management (e.g. ridesharing) opportunities.

- Establish better information and coordination among agencies during disasters and weather emergencies.

- Utilize lane and speed control strategies as appropriate (e.g. evacuations, severe weather).

- Improve the management of hazardous materials shipments and consider additional HAZMAT route restrictions.

- Develop comprehensive and well-coordinated evacuation plans.

- Improve the efficiency of inspections and container-tracking processes at intermodal terminals.

Table 11-5 classifies Market Packages according their applicability from a state or local perspective or both. Designation of a service as "local" (i.e., not statewide) does not imply that it is not as important as a state service. This designation simply helps MDOT focus on those ITS applications in which it will have significant influence.

The Statewide ITS Architecture will represent both state and local ITS elements and services. However, the state elements and services will be described in greater detail. Subsequent regional architecture and planning activities can start with the local elements and services reflected in the statewide architecture and then proceed to tailor them to the specific conditions in the regions. **Figure 11-5** depicts the relationship between the statewide and regional Market Packages. Elements denoted by an **(S)** represent state entities that will be specifically defined. Elements denoted by a **(L)** represent local entities that will generally defined. **Figure 11-6** illustrates the linkage between the statewide and regional ITS Architectures, which will be formed by combining the individual Market Packages. Thus the resulting Statewide ITS Architecture will provide the department's district offices and local government officials with the overall guidance necessary for the development of regional Market Packages and architectures that will eventually lead to regional ITS deployment plans. Various components of the planned district ITS infrastructure will be able to integrate and become part of larger statewide components.

TABLE 11-5
NATIONAL ITS MARKET PACKAGES RELATED TO MISSISSIPPI ITS STRATEGIES

Market Package	State (i.e. MDOT) or Local Application
Broadcast Traveler Information	Both
Interactive Traveler Information	Both
Yellow Pages and Reservation	State
Dynamic Ridesharing	Local
Network Surveillance	Both
Probe Surveillance	Both
Surface Street Control	Both
Traffic Information Dissemination	State
Regional Traffic Control	Both
Incident Management System	Both
Standard Railroad Grade Crossing	Local
Railroad Operations Coordination	Both
Parking Facility Management	Local
Reversible Lane Management	State
Road Weather Information Systems	State
Electronic Clearance	State
Commercial Vehicle Administration Process	State
Weigh in Motion	State
HAZMAT Management	State
Emergency Response	Both
Emergency Routing	Local
Mayday Support	Local
Evacuation Planning and Traffic Control	State
ITS Data Warehouse	State
Transit Vehicle Tracking	Local
Transit Fixed Route Operations	Local
Demand Response Transit Operations	Both
Transit Passenger and Far Management	Local
Transit Security	Local
Transit Maintenance	Local
Multi-modal Coordination	Both
Transit Traveler Information	Both

Figure 11-5
ILLUSTRATION OF CONNECTIVITY BETWEEN STATEWIDE (S) AND LOCAL (L) MARKET PACKAGES ELEMENTS

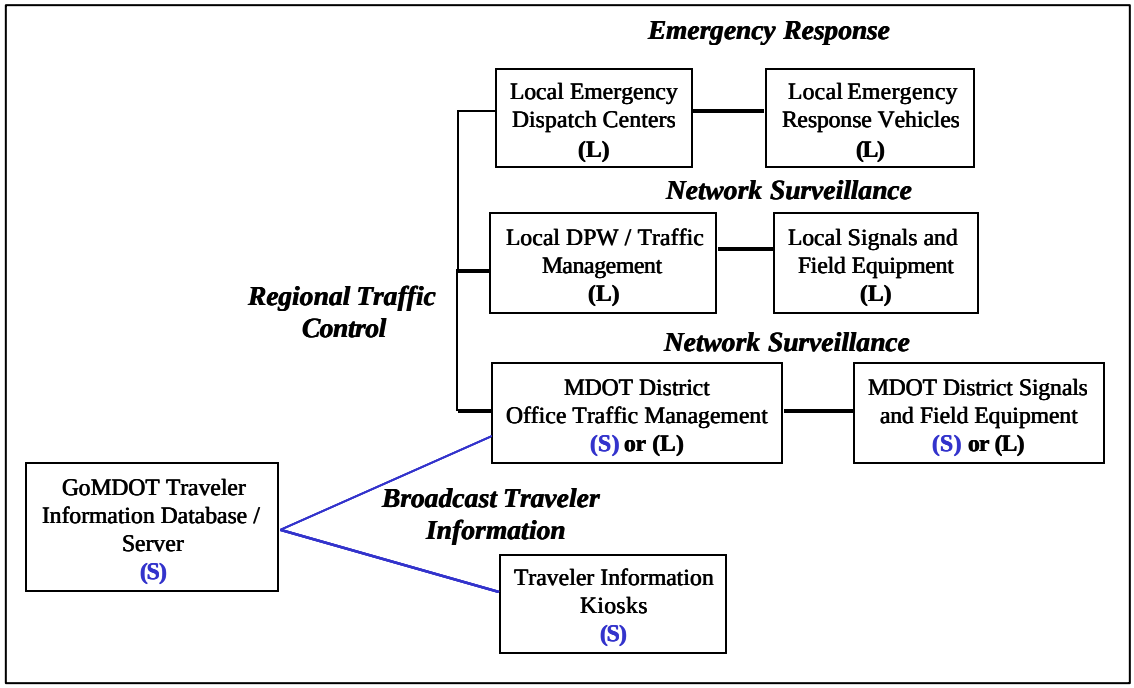
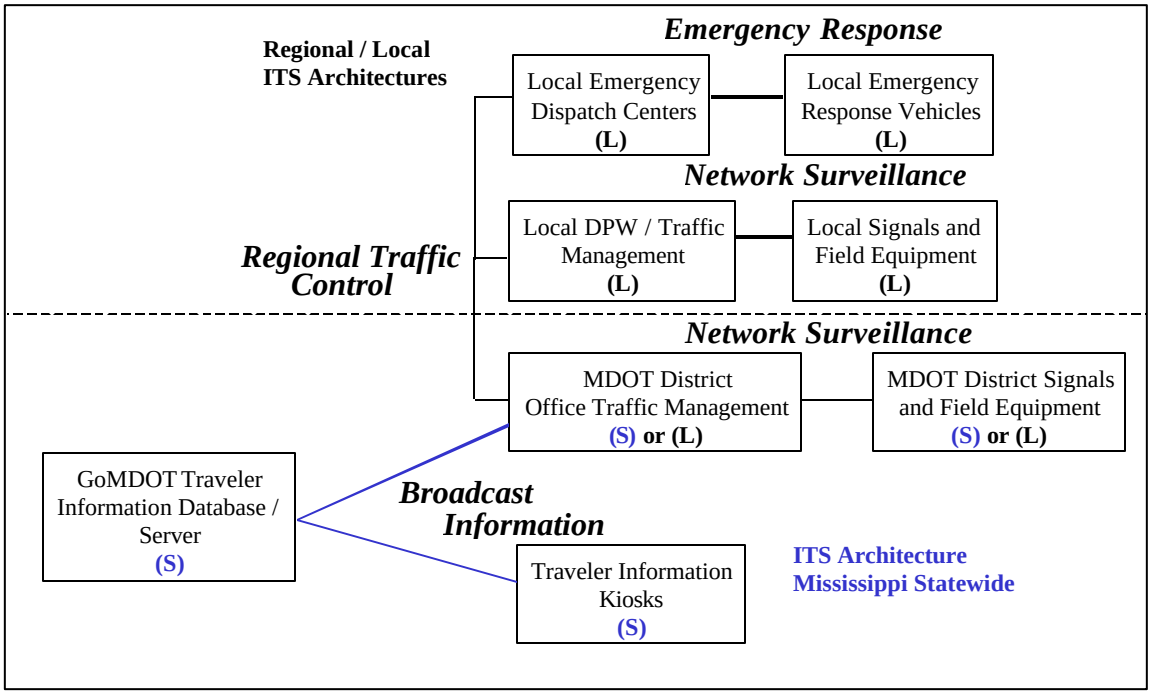


FIGURE 11-6
ILLUSTRATION OF STAT EWIDE AND REGIONAL ITS ARCHITECTURE BOUNDARY



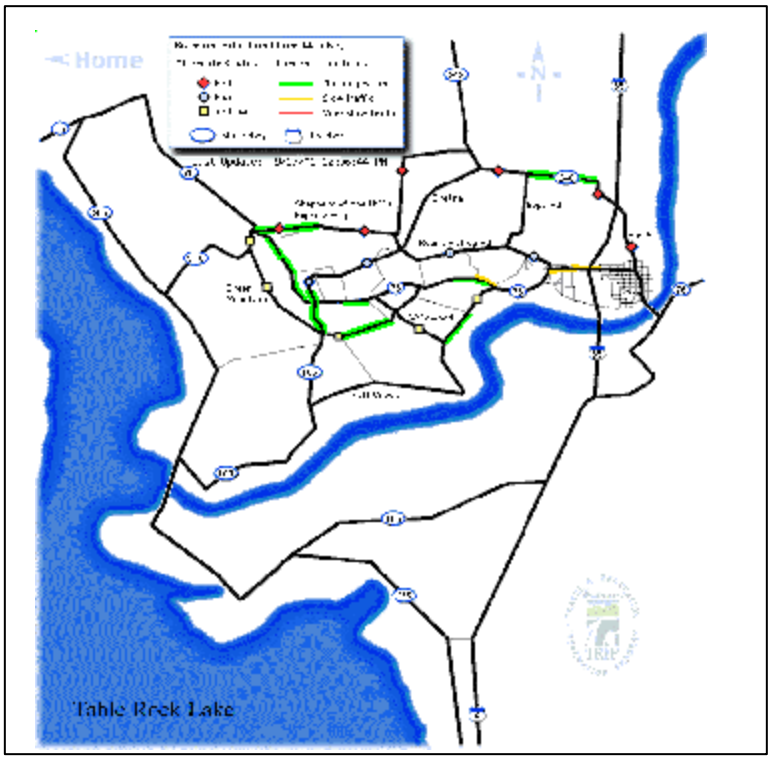
Environmental Scan

The purpose of this assessment was to gain insights on how ITS deployment in Mississippi could be facilitated and/or be more effective based on the insights gained from ITS initiatives in other states. Several examples were reviewed to identify applications that could be potential Market Package candidates in Mississippi. This environmental scan represents an initial investigation of how ITS is being planned and implemented in other regions of the country. Additional references will be reviewed throughout the duration of the project. Subsequent work on the Mississippi ITS Strategic Plan (e.g. developing the operational concepts and implementation strategies) will further draw the full set of examples. In addition, the planned Traffic Management Center scanning tours, which will be conducted with MDOT, will shed additional light on potential ITS deployments in Mississippi.

Branson TRIP (Travel and Recreation Information Program)

This program is designed to give residents and visitors to this popular Ozark Mountain village instant information on weather and traffic conditions. TRIP links information from microwave traffic detectors, cameras, weather stations and pavement sensors to a central TMC. The TMC then sends information to information kiosks, changeable message signs, Traveler Information Radio, and an internet website (www.branson.tripusa.com). This service, which is oriented towards tourists, could serve as a model for traveler information in tourist areas in Mississippi, such as the Gulf Coast.

Figure 11-7
Branson Travel and Recreation Information Program



Kansas Highway Patrol AVL System

The Kansas Highway Patrol has introduced an AVL system for 60 of their patrol cars in northeast Kansas. The AVL system makes deployment of personnel more efficient, streamlines dispatch operations, enhances officer safety, and increases the accuracy of crash location identification. GPS is utilized to identify the latitude and longitude of the patrol car. This information is transmitted to the communications center via the existing 800 Mhz radio system. The Kansas Highway Patrol plans to equip all of its patrol cars, approximately 500 vehicles, with the AVL system, making it the first state patrol in the country to do so. This example could serve as a reference for Mississippi Highway Patrol should AVL be identified during the Jackson Operational Vision Workshop as a high priority component of the CAPTAIN (Capital Area Traffic and Incident Network) system.

Florida

Florida has developed an ITS Strategic Plan that offers some interesting models for consideration in Mississippi. For example, it recognizes the separation of responsibilities between the Statewide and District Programs. It is recommended that the central office ITS division have responsibility for policy/program development/budgeting, ITS architecture and standards, intergovernmental and public/private stakeholder input and coordination, and commercial vehicle operations. The District ITS functions include ITS planning, integration, production, construction and operations. The plan also estimates the staffing needs using an approach (based on empirical data) that could be applied to estimating Mississippi resource requirements. In addition, the Florida Strategic Plan includes an ITS Business Plan in which several initial actions for the State ITS program are recommended:

- Develop statewide ITS specifications, standards, and guidelines;
- Define project implementation procedures;
- Develop guidance for ITS procurement;
- Develop a rural/interurban ITS element; and
- Develop guidance for ITS maintenance, operations, and management.

These Florida procedural and implementation guidelines will be analyzed in subsequent tasks by the study team to assess their applicability to Mississippi. They will be reflected as appropriate in developing the Mississippi Concepts, Operations and Implementation Strategies, and Implementation Plan. For the purposes of this Market Package review, the focus is on some of the specific applications reflected in the Florida ITS Plan and ITS Architecture.

Florida Market Packages

FDOT has developed statewide and district level ITS architectures, including an identification of Market Packages. Several of the Market Packages represent extensions or modifications to the National ITS Architecture. Some of the unique Market Packages that may be considered for Mississippi include:

- *Probe Surveillance Using Cellular Tracking* -- This Florida Market Package reflects advances in mobile telephone tracking technology. Vehicle location is determined by the mobile wireless infrastructure. It is especially useful as a means of reducing the cost of detection infrastructure in areas where high-density detection may not be necessary.

- *Parking Facility Management* -- This Market Package is a variation on the National ITS Architecture Market Package in that CVO parking facilities will send parking information (e.g. the availability of parking) to private traveler information service providers, who would then, in turn, notify fleet managers or commercial operators directly.

- *Draw Bridge Management* – This Market Package does not exist in the National ITS Architecture. In this application, the US Coast Guard would send draw bridge status information to emergency managers to support emergency evacuations and local traffic management centers who can pass the information on to travelers.

- *Maintenance Management / Dispatch* – This Market Package does not exist in the National ITS Architecture. In this application, construction and maintenance dispatchers would send automated dispatching information (e.g. maintenance activity requests) and maintenance vehicle operators would provide information on resources used, time spent, etc. to dispatchers.

Some additional initiatives in Florida may be of interest to Mississippi. One is that the state is pursuing partnerships with wireless telephone service providers (with incentives for added wireless coverage) so that emergency response in rural areas can be improved. Florida is also implementing a Traveler Information Radio Network (TIRN). Under the partnership, Florida gets one minute for every ten minute segment to report traffic incidents, lane closures, work zones, etc. During natural disasters and emergencies, Florida DOT has the authority to take over TIRN Broadcasting to disseminate emergency traveler information. In turn, broadcasters can erect signs and sell four minutes of each 10-minute segment as commercials. Currently, Orlando and Brevard counties have operation stations. The plan is for all limited access highways in Florida to have coverage.

Maryland

The Coordinated Highways Action Response Team (CHART) program, Maryland's statewide ITS program, is managed from the Statewide Operations Center (SOC). The SOC functions 24 hours per day, seven days per week with four satellite Traffic Operations Centers located in other areas of the state to handle peak period traffic. The CHART program includes several elements including traffic monitoring, traveler information, incident management, and traffic management. Some of the deployments that have been successful to the Maryland CHART program include:

- Traffic speed detectors deployed along 155 centerline miles of the heaviest traveled freeways. These detectors provide the average speed of traffic along a segment of

roadway. This information is used for early detection of traffic congestion and incidents.

- A #77 cellular call in system by which individual motorists can report disabled vehicles and accidents. This service, coordinated through the Maryland State Police and Maryland Thruway Authority police and traffic management services, receives more than 10,000 calls annually.
- Emergency Traffic Patrols to provide emergency motorist assistance and to relocate disabled vehicles out of travel lanes.
- Emergency Response Units used to set up overall traffic control at accident locations.
- Freeway Incident Traffic Management Trailers, pre-stocked with traffic control tools such as detour signs, cones, and trailblazers used to quickly set up pre-planned detour routes when incidents require full roadway closure.
- A "Clear the Road" policy which provides for the rapid removal of vehicles from the travel lanes rather than waiting for a private tow service or time consuming off-loading of disabled trucks which block traffic.
- Variable message signs.
- Highway Advisory Radio stations.
- Commercial radio and television broadcasts.
- Travelers Advisory Telephone is currently used for summer beach traffic, and is in the planning phase for possible broader application.

A variety of other tools are used to facilitate incident management. These include portable arrow boards, portable variable message signs, and portable travelers advisory radio transmitters for traffic management; front end loaders, tow rigs and push bumpers to move vehicles; and training exercises to maintain a high competency level for teams working under hazardous conditions.

The Maryland State Highway Administration (MDSHA) also used an innovative system design contracting approach for upgrading its system (CHART II). MDSHA formulated a procurement competition using contractor teams working under a statewide ITS services task order contract. The state's previous experience in developing the original CHART system revealed problems such as:

- Inadequate definition of system requirements;
- A desire to use existing software that could not meet the system objectives;
- The evolution of system requirements to the point at which the system objectives exceeded the ability of the initial system to satisfy them; and
- Flawed "low-bid" procurement method.

The implemented procurement strategy was intended to avoid these problems. It featured cooperative development of system requirements between the system

integrator and MDSHA. It also included an activity intended to identify future, long-term requirements in order to avoid unintended growth in the initial requirements.

Maryland could serve as a model in terms of organizational structure should a state (i.e., MDOT) centralized architecture be desired. Maryland has also successfully implemented several ITS elements that are of interest to Mississippi. As the Mississippi Architecture and Implementation Plan and Strategies are developed, Maryland's experiences and lessons learned will be further investigated to help fine-tune the Mississippi ITS Plan.

Analysis of Market Package Strengths, Weaknesses, Opportunities, and Threats (SWOT)

A matrix is provided in **Appendix B** that presents the SWOT characteristics for each Market Package that was identified as a potentially relevant ITS application, based on the ITS Strategies defined through the development of the ITS Vision for Mississippi. Short-term Market Packages resulting from the SWOT analysis represent a subset of Market Packages that appear to be early winners due to a promising combination of low risk implementation characteristics, developing public and private markets, and tangible system or user benefits. Short term Market Packages are those whose deployment time frame is recommended to be within the next 5 years, medium term Market Packages are those that would appear to be best deployed in 6-10 years, and long term Market Packages are those that will be deployed at least 10 years from now (2011).

Mississippi Candidate ITS Market Packages

The preceding analyses explored potential ITS applications (i.e., Market Packages) for consideration by MDOT based on the following criteria:

- Mississippi ITS strategies resulting from the statewide visioning process;
- MDOT services, business practices, and current ITS implementations;
- Scan of other state ITS initiatives; and
- Market Package SWOT analysis.

As a result of these analyses, Market Packages can be classified to assist in developing the phasing plans and operational concepts for ITS in Mississippi. **Table 11-6** classifies the Market Package by deployment time frame and MDOT role. Those Market Packages listed in the upper left quadrant of the matrix are those which are emphasized by MDOT since they represent services that correspond to current needs and also fall under the purview of state (i.e., MDOT) responsibility and influence. Some Market Packages are shown more than once reflecting multiple levels of sophistication and/or jurisdictional responsibility. The local Market Packages will serve as the basis for defining the regional ITS architecture frameworks.

TABLE 11-6
MARKET PACKAGE CLASSIFICATION BY TIME AND STATEWIDE VS. LOCAL SERVICE

MDOT Involvement in Market package	Short Term (0-5 years)	Medium and Long Term (> 5 years)
MDOT to serve in a Leading Role	• Broadcast Traveler Information (Large Metro areas) • Network Surveillance (Large Metro areas) • Surface Street Control (outside Metro Areas) • Traffic Information Dissemination • Regional Traffic Control • Incident Management • Railroad Operations Coordination (Large Metro Areas) • Commercial Vehicle Administration • Electronic Clearance •	• Broadcast Traveler Information (Statewide) • Network Surveillance (Statewide) • Regional Traffic Control • Incident Management • Standard Railroad Grade Crossing • Railroad Operations Coordination (Statewide) • Transit Vehicle Tracking • Road Weather Information System • Reversible Lane Management
MDOT to serve in a Supporting Role	• Interactive Traveler Information (Large Metro areas) • Yellow Pages and Reservation • Probe Surveillance (Large Metro areas) • Railroad Operations Coordination • HAZMAT Management • Emergency Response • Evacuation Planning and Traffic Control • ITS Data Warehouse • Multi-modal Coordination • Transit Traveler Information	• Interactive Traveler Information (Statewide) • Dynamic Ridesharing • Probe Surveillance (Statewide) • Standard Railroad Grade Crossing • Parking Facility Management • Mayday Support • ITS Data Warehouse • Transit Vehicle Tracking • Transit Fixed Route Operations • Transit Traveler Information • Demand Responsive

MDOT Involvement in Market package	Short Term (0-5 years)	Medium and Long Term (> 5 years)
		Transit Operations • Transit Passenger and Fare Management • Transit Security • Transit Maintenance • Emergency Response • Emergency Routing

In addition to those listed above, the additional Market Packages defined in Florida will be considered in subsequent analyses for their applicability to Mississippi:

- Probe Surveillance using Cellular Tracking;
- CVO Parking Facility Management;
- Draw Bridge Management; and
- Maintenance Management / Dispatch.

The Market Packages that have been identified will be used as the basis for defining the ITS Concepts and functional capabilities that need be provided. The ITS Concepts will define the Program Areas that will be used to structure, institutionally and technically, the ITS program in MDOT. Groupings of Market Packages will define the Program Areas. The functional capabilities will also be derived from the Market Packages by extracting the Equipment Packages from the National ITS Architecture. For example for the Incident Management Market Package, the following functional capabilities need to be implemented:

Table 11-7
FUNCTIONAL CAPABILITIES

Location Where Function Is Performed	Functional Capability
Emergency Management Center	Emergency Response Management
Roadway Infrastructure	Roadway Incident Detection
Traffic Management Center	TMC Incident Detection
	TMC Incident Dispatch Coordination/Communication

ITS CONCEPTS PLAN

This ITS Concepts Plan synthesizes the findings associated with the first two tasks of the Mississippi ITS strategic planning effort. The purpose of the Concepts Plan is to organize and prioritize Market Packages based on the analyses performed, where Market Packages relevant to the Mississippi environment were identified. Thirty-five Market Packages were identified as applications that support the ITS objectives formulated in the Statewide ITS Vision. The Concepts Plan organizes the Market

Packages into recommended Program Areas to assist MDOT in structuring its ITS program and in clarifying roles and responsibilities with respect to multi-agency coordination. In other words, having developed a list of relevant Market Packages, the Concepts Plan establishes the high level framework to ensure that a coherent implementation strategy is developed. For example, for MDOT to successfully move forward with implementing the Market Packages, several questions need to be answered. These include:

- What should be MDOT's role in implementing the various Market Packages? Should MDOT provide administrative and funding support, provide technical support to local implementation, or have primary responsibility for controlling the ITS infrastructure?

- What should be the role of various MDOT Divisions with ITS planning and project development? What organization structure is most appropriate? What are the staffing implications?

- What performance measures and criteria are appropriate for considering potential Market Packages and evaluating their effectiveness?

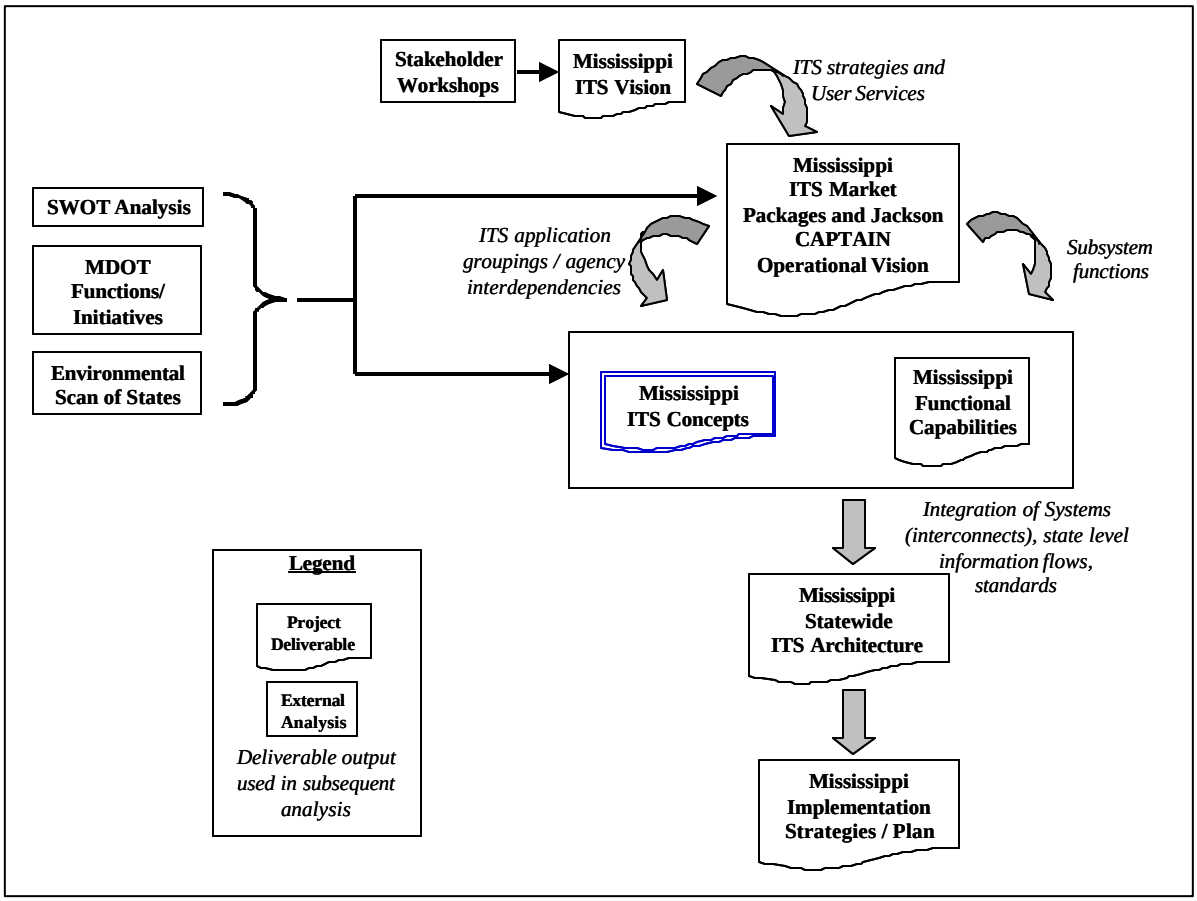
- What Market Packages are appropriate across the various geographic areas of the state?

- What interagency relationships are necessary to implementing the prioritized services?

- What specific projects would be undertaken in each of the defined Program Areas?

This section provides guidance on these questions. More specific implementation considerations such as specific technologies, project definition, costs, and information exchanges between agencies will be identified as the Statewide ITS Architecture, Technology Assessment, and Implementation Plan are developed in subsequent tasks. However, this section serves as a "road map" for the Mississippi ITS deployment strategy by defining the direction of the activities relative to state and regional needs, deployed infrastructure, and MDOT's business practices. **Figure 11-8** shows the relationship of the Concepts Plan to the overall ITS strategic planning study effort. Essentially, the individual ITS applications represented by the Market Packages are grouped to carve out appropriate Program Areas at the statewide level. The lessons learned from establishing the Operational Vision for Jackson (CAPTAIN) will be used to further refine these Program Areas and determine the key interagency connections needed to facilitate ITS deployment across the state.

Figure 11-8
RELATIONSHIP OF STRATEGIC PLAN COMPONENTS



The Concepts Plan contains the following sections:

- Overview of MDOT's Role in Statewide ITS Development;
- Organizational Structure Considerations;
- Recommended ITS Program Areas;
- Agency Roles and Responsibilities; and
- Performance Measures for each of the Program Areas

Overview of MDOT's Role in Statewide ITS Development

The Statewide ITS Visioning Process resulted in the formulation of MDOT's ITS Mission Statement:

> *MDOT will use ITS technologies to improve the quality of life for state residents and visitors by providing more reliable, informative, safer, and flexible passenger and freight multi-modal transportation services.*

Although several other states have prepared ITS Strategic Plans, several characteristics of Mississippi require that the state's ITS program chart a different course than that

followed elsewhere. Mississippi is still in the midst of a large-scale road building program (the "Four-Lane" initiative). Accordingly, many of Mississippi's ITS strategies should be coordinated with, or used to complement, these capital investments. Particular problems encountered around work zones should be explored for potential ITS solutions. Such applications can be designed to be converted to permanent installations once construction is completed. Alternatively, portable devices installed to improve work zone operations can be redeployed, once construction is completed, to other routes as conditions warrant. Additionally, MDOT can take advantage of major road construction activity to install communication infrastructure required by ITS applications.

Subsequent sections of this report will outline the specific program areas, performance measures, organizational implications, and the typical Market Packages and projects in each of the program areas. Some of the cornerstones of MDOT's ITS Program should be:

- Building upon the Statewide Transportation Operations Center to expand the management and operations functions it performs in the Jackson metropolitan area and to prepare it to serve as the gateway to the MDOT District traffic management centers.

- Creating an ITS coordinator position within the Department, either on a full time basis or as a collateral duty and establish an ITS function in the District offices to be handled by one or more employees. The Central office will be responsible for ITS policy, planning, and design and the districts will oversee ITS operations and maintenance. The Central Office will be responsible for coordinating with State Police and the Mississippi Emergency Management Agency

- Designing, deploying and operating incident, safety, and commercial vehicle detection and information systems in rural areas with links to urban and statewide transportation management centers.

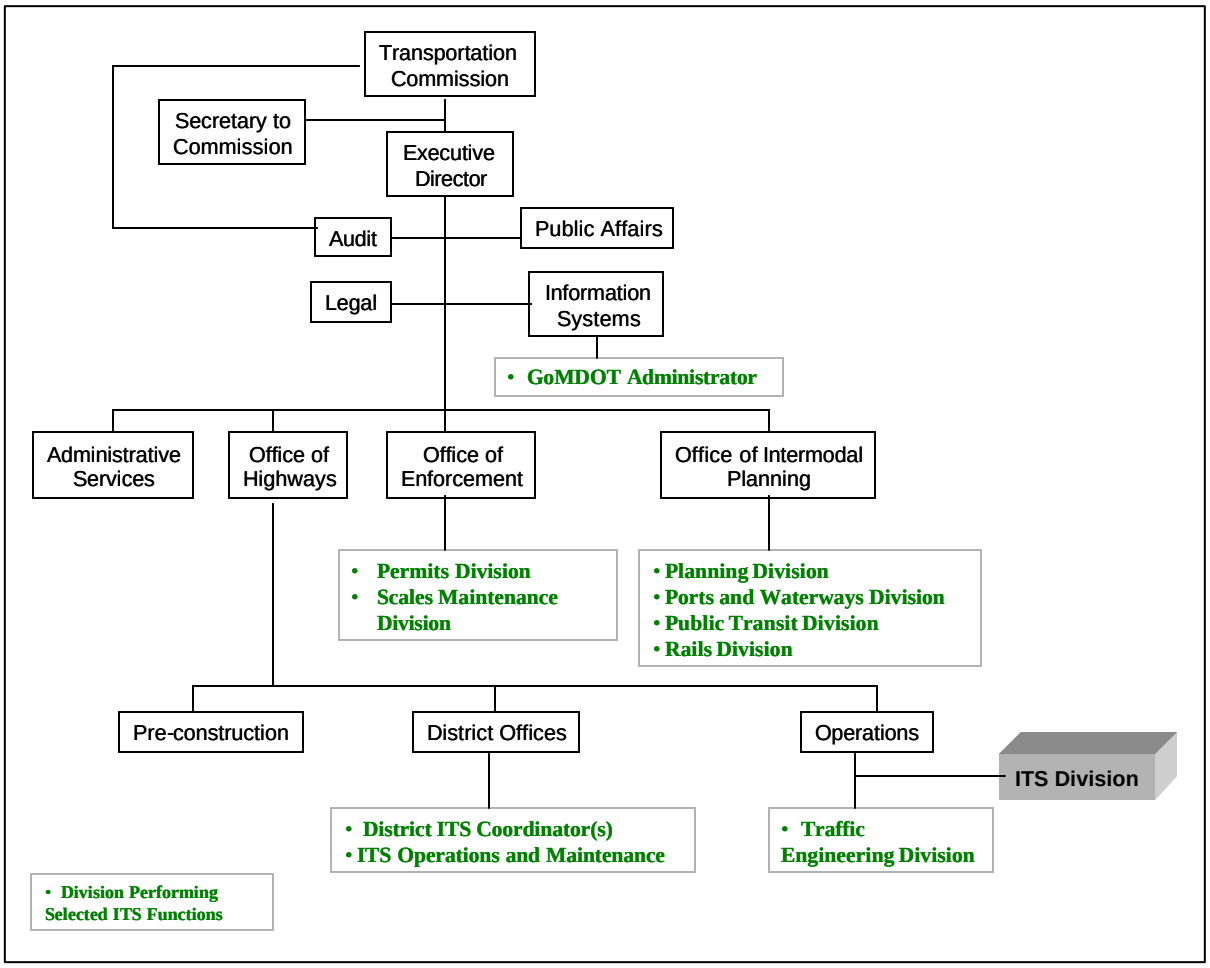
- Expanding and continuing to operate the GoMDOT statewide advanced traveler information (ATIS) program via the Internet and other communications media providing real-time traveler information to urban transportation management centers and points of public interest.

Implications on MDOT Organizational Structure

Several organizational models can be established to manage MDOT's ITS program. One option is to create an ITS division within the Central Office that has its own staff that would manage the planning, design, and implementation of all the ITS programs throughout the state. This would centralize the ITS program. A second option would be to retain the current decentralized structure in which multiple MDOT Divisions (e.g. Information Systems, Planning, and Traffic Engineering) perform various ITS functions, but to create an ITS Coordinator position, either as a primary or collateral duty. The ITS Coordinator would work with staff in various divisions to manage the ITS program and ensure that integration opportunities and the synergies between projects are achieved. A third alternative is to subsume the ITS program within a current Division. All the alternatives assume that District Engineers will provide the day-to-day operations and maintenance support.

Figure 11-9 shows an example organizational chart for MDOT reflecting the establishment of an ITS Division (or more simply an ITS Coordinator position). As shown, the MDOT ITS program would be administered out of the Office of Operations (primarily due to the close relationship that ITS is expected to have with Traffic Engineering), although various ITS functions may be performed by staff operating out of other Divisions and Offices (e.g. Information Systems, Intermodal Planning, Enforcement, and Traffic Engineering).

Figure 11-9
EXAMPLE ITS DIVISION PLACEMENT IN MDOT ORGANIZATIONAL STRUCTURE



Program Areas

Organizing the Statewide Market Packages into Program Areas provides a clearer definition of the functionality required for development of the statewide ITS activities and will help to more efficiently coordinate and carry out the ITS program in Mississippi. It is recommended that program areas be classified into two broad categories:

- Metropolitan / District ITS programs; and
- Statewide, rural, and inter-urban ITS programs.

This breakdown is intended to maximize the opportunity for MDOT to support both localized transportation needs and systems throughout the state as well providing the mechanisms for ensuring statewide coordination, consistency and integration. It also recognizes the different needs and constraints associated with rural vs. urban ITS applications (e.g. lack of telecommunications infrastructure in many rural settings). The distinctions, however, are not absolute. For example, while advanced traveler information services (ATIS) are proposed as a statewide, rural, and inter-urban function, *intra*-regional ATIS applications are also expected to serve as a key local ITS strategy supported by MDOT. The general guideline for placing a Program Area within a particular category is that if the program is not necessarily specific to one region and/or crosses regional boundaries, it is considered a Statewide Program. The following MDOT Program Areas have been identified:

Statewide, Rural, and Inter-urban ITS Programs

- Advanced Traveler Information Systems
- Regional Traffic Operation Center Integration (Centralized State Signal Operations)
- Interurban Corridor Operations (Includes Evacuation Management, Statewide Emergency Management Coordination, Inter-Urban Surveillance and Communications
- Intercity Transit
- State Telecommunications
- Goods Movement (Port Facility and Commercial Vehicle Operations)
- ITS Planning / Policy / Administration

Metropolitan / District ITS Programs

- Regional Incident Management (District TOC Integration with Local TM, EM and Surveillance)
- Regional Traffic Management (Freeway Management, State Signal) Operations
- Regional Performance Monitoring
- Transit Management
- Systems Operations / Maintenance

Advanced Traveler Information Systems

This Program Area is focused on providing real-time information that improves upon what is currently available from the broadcast media, in terms of timeliness and accuracy, along with geographic and multimodal coverage. Hence, the success of this program hinges upon the success of deploying the traffic surveillance elements of the interurban corridor operations (Statewide) and Regional Incident Management and Regional Traffic Management (Metro) Program Areas. The following elements will provide comprehensive availability of this information to local and long-distance travelers in Mississippi.

Internet - MDOT has made excellent strides in providing traveler information over the internet. The GoMDOT site provides real-time traffic images from surveillance camera images and construction information in the Jackson area. Opportunities exist for expanding the functionality coverage on the web site, such as: expanding the geographic coverage of the information beyond Jackson, establishing a clearinghouse

for real time incident and travel speed information, and information on transit service and commercial vehicle operator information.

Public Kiosks - A public kiosk can conveniently provide traveler information at important transportation locations, and is especially useful for tourists, visitors or transit users. Typical kiosk locations include tourist centers, airports, bus terminals, truck stops, shopping malls, and convention centers. The use of interactive menus can permit a traveler to select a travel origin and destination, and receive directional or travel information through a text and graphical printout along with the kiosk graphical display. Kiosks may be deployed by the public sector (particularly for transit-related information services) or through the private sector (permitting advertising or listing of specific services on the kiosks). Possible deployment locations include State Welcome Centers and/or the multi-modal transit facilities being established in Jackson, Biloxi and Gulfport.

Cable TV - The provision of a "Traffic Channel" through a local cable television service provider is a very quick way of reaching the traveler at home prior to beginning a trip.

Improved Media Coordination - Improving the quality and timeliness of information available to the current sources of traffic information (radio and TV stations) is highly desirable. Key facets of this activity include providing improved accessibility to real-time information from the roadway network and from public agencies, along with the improved ability to exchange information with traffic reporters regarding an observed incident or congestion location. The means of providing improved coordination includes the ability to share traffic congestion information (e.g., color maps available across the Internet or some shared communications network) as well as video images from the roadway network showing accidents or congestion. MDOT is currently developing policies for sharing video with the media.

The MDOT Information Systems Division will continue to expand the functionality as well as the geographic and modal coverage of the GoMDOT web site. MDOT will coordinate with Jackson Transit, Coast Transit and the other intracity and intercity transit providers to provide transit service information and/or hypertext links to other transit web sites. MDOT will investigate potential kiosk locations and will seek to integrate kiosk information with the GoMDOT internet database. MDOT will seek out partnership agreements with the media and will coordinate to have statewide traveler information transmitted to neighboring states.

District Traffic Operation Center Integration

This program area focuses on planning the communications network necessary to bring together the District and urban area traffic operations centers so their localized capabilities might be collectively utilized as a statewide ITS initiative. The State TOC in Jackson currently has the capability of monitoring and loading timing plans into the closed loop signal systems throughout Mississippi. This program area will specify the communications standards necessary to facilitate center-to-center data exchange such as the ITE standard *Message Sets For External Traffic Management Center Communication (MS/ETMCC)*. This program will also develop guidelines and specifications for allowing MDOT's central TOC in Jackson to control ITS equipment in the Districts (e.g. when District offices are closed).

Other activities performed in this Program Area include:

- Ensuring proposed projects are consistent with the state and regional ITS architectures; and

- Identifying opportunities to reuse software components and databases (i.e., precluding the need to maintaining unique systems or to build new, unique systems for all state and local traffic management centers).

Inter-Urban Corridor Operations

This program area will develop strategies for providing ITS services in the rural and interurban regions of the state. Issues to be handled within this program area include:

- Rural incident detection;

- Ensuring seamless traffic management, emergency management, and traveler services during hurricane evacuations;

- Developing and implementing telecommunications strategies to improve communications throughout the state; and

- Maintaining an inventory of portable traffic control and maintenance resources to enable rapid deployment.

Inter-Urban ITS Transit

This Program Area will be integrated into the activities of the Public Transit Division. Applications such as demand responsive transit operations and automatic vehicle location will be addressed in this Program Area. The Public Transit Division will also take lead responsibility in developing the intercity transit traveler information network identified as a priority ITS project.

Goods Movement (Port Facility Operations / Commercial Vehicle Operations)

This Program Area will cover the ITS applications intended to improve the efficiency and safety of freight transportation and intermodal facilities in the state. Activities in this area will be largely administered by MDOT's Office of Enforcement (for CVO regulatory issues) and the Ports and Waterways Division.

Telecommunications and Power

This Program Area will assess communications requirements in each of the MDOT districts and identify communication infrastructure requirements and opportunities to meet the communications requirements of the regional ITS architectures. Recommendations on commercial power extensions to service new ITS field devices will also be handled in this program area.

One-way and two-way communications links will be evaluated including wide area wireless communications technologies such as cellular phone, broadcast radio and TV, radio broadcast digital services (RBD), digital spread spectrum radio, and others to facilitate mobile communication. Stationary (infrastructure-to-infrastructure)

communication will also be evaluated, such as dial-up public telephone, Integrated Services Digital Network (ISDN), Synchronous Optical Networks (SONET), digital microwave, satellite communications systems, spread spectrum, packet radio, commercial wireline, jurisdictional networks (LANs, MANs, and WANs), and hybrid combinations.

This program area will develop standards and procedures for the statewide ITS telecommunications infrastructure and manage installation of telecommunications equipment.

ITS Planning / Policy / Administration

This Program Area focuses on the coordination of all the other Program Areas and is responsible for identifying synergies across Program Areas and across divisions in MDOT. This Program Area also serves as the administrative bridge between the district ITS programs and MDOT management, and encompasses the following types of activities:

- Leading and promoting the development of regional architectures;
- Leading role in regional ITS planning, programming, and project development (in coordination / consultation with the MPOs);
- Verifying compliance with STIP and TIP requirements; and
- Developing technology transfer and outreach materials as necessary to successfully market ITS solutions such as press kits, newsletters, research site tours, articles for publications, videos, CDs, etc.

It is expected that activities performed under this ITS Program Area would be carried out through the proposed ITS Division / ITS coordinator staff position.

Metropolitan / District ITS Programs

Regional Incident Management (District TOC Integration with Local Traffic and Emergency Management)

Incident management results in reduced time required to detect, respond, and clear an incident. In the various discussions during the course of developing the Strategic Plan for Mississippi, incident management has been identified as one of the most critical short-term areas of interest. This is logical, given the role of nonrecurring incidents (e.g., accidents, weather, roadwork) in contributing to overall regional travel delay, along with the number of law enforcement and emergency services entities that need to be coordinated. This Program Area will develop recommendations for leading the development of incident management programs in Mississippi's metropolitan areas.

Specific subareas of focus for incident management programs in Mississippi include the following:

Interagency Communications and Fleet Management - The agencies involved in incident management, including MDOT, police, emergency services (fire and rescue), county and local transportation engineering/public works officials, must be able to communicate efficiently in order to respond quickly to an incident. This involves both agency-to-agency communications and improved coordination of field communications. These activities facilitate incident response through coordinating the appropriate resources to provide rescue services and clear the incident in an expeditious manner. The coordination of fleet management (knowing the presence of ambulances, other rescue vehicles) is critical in terms of expediting response. Currently, Jackson Transit is deploying a GPS-based Automatic Vehicle Location (AVL) system supporting its demand responsive vehicles. Providing a common GPS-platform for all agencies would assist in assuring that multijurisdictional coordination, where needed for incident management, is facilitated.

Links to Wireless Phone Information - Increasingly, the use of wireless (digital and cellular) phones by drivers has provided better and more timely information regarding incidents. The existing *HP services operated by the Mississippi Highway Patrol, plus call-ins to radio stations or other sources (e.g., Public Safety E-911), provide a ready source of information that can facilitate detection and confirmation of incidents.

Service Patrols on Major Routes - This activity has been a popular success in other metropolitan areas where it has been implemented. Different types of Service Patrols have been implemented throughout North America. These range from "samaritan patrols" that may be implemented by the private sector (providing fuel, flat tire repair and lost-driver assistance) to more elaborate state DOT-operated services including highly-trained personnel experienced in scene management and physical incident removal. Through the use of "patrol beats" (one or two vehicles patrolling a fixed segment of road over a specific time period), incidents can be confirmed, detected and cleared more quickly; the more serious incidents can be coordinated effectively at an early stage.

Accident Investigation Sites - These sites allow vehicles involved in accidents to be removed from the roadway and out of driver view so that delay does not accrue unnecessarily due to the "rubberneck factor," when drivers slow to view the scene of an accident.

Call Boxes - Call boxes may either be "bundled" with Accident Investigation Sites or considered as a separate element. MDOT has installed motorist call boxes on I-10 and I-110 along the Gulf Coast. Call boxes permit a traveler involved in an accident or stranded on the roadway to directly contact a responding agency regarding a stall or accident they are involved in. These boxes are typically located in such a manner that travelers do not have to walk across any exit or entrance ramps. In regions that have utilized call boxes extensively (in particular, Southern California), minimum 1/4 mile spacing for call boxes is provided, and specific call box numbers are provided and referenced to milepost. In general, however, call boxes are becoming increasingly redundant as wireless phone services become more frequently used. The use of improved milepost markings in conjunction with wireless phone use could effectively duplicate the effectiveness of call boxes at a lower cost to the public agency.

Traffic Advisory - Once an incident is confirmed, various information resources may be used to advise travelers of the situation, including potential delays, slower speeds, stopped traffic, and diversion routes. The information resources include elements from

the Pre-Trip and En-Route Traveler Information programs (including variable message signs, traveler advisory radio, and enhanced media coordination).

Regional Traffic Management (Freeway Management, State Signal) Operations

Although the MDOT TOC in Jackson will perform some statewide traffic management functions such as coordinating emergency evacuation plans and monitoring the state's closed loop traffic signal system, it is expected that each of MDOT's six districts will provide localized traffic management functions. This Program Area will be responsible for defining and establishing traffic management centers that will monitor and control ITS devices and integrate MDOT operations with city traffic management centers and local emergency service providers. It is expected that particular District TOC functions will vary from region to region. In general, these facilities will manage and operate the freeway systems, traffic control signals on state routes, dispatch service patrols, and participate in incident and emergency response plans.

The most basic component of any ITS system is the collection of real-time travel condition information. This Program Area will oversee the planning and design of traffic surveillance devices. Collection of traffic flow data can be accomplished via an array of sensors and surveillance devices. The three main varieties of real-time traffic data collection include traffic sensors (providing quantitative flow information for data collection and for automated traffic control strategies), video surveillance (providing visual information for confirming and monitoring conditions), and traffic probes (providing a sampling of traffic data to support data collection and information requirements). Each is described in more detail below.

Traffic Sensors - There are numerous types of traffic sensors to choose from, including in-pavement devices such as the commonly-used inductive loop detector and "non-intrusive" devices, including overhead sensors (radar and microwave technologies), video image processing systems, and acoustic sensors. Non-intrusive detection is gaining in popularity due to the reduced maintenance costs compared to loops, which typically require lane closures for installation and maintenance and often deteriorate rapidly if the pavement is cracked or is deteriorating. Typically, traffic sensors are first implemented in critical sections of the roadway network (heavy congestion, prone to accidents, etc.), thus supporting the most critical and frequent system information needs. Since almost all ITS systems are predicated on real-time information, the provision of real-time traffic flow data is of the utmost importance.

Video Cameras - The Closed-Circuit Television (CCTV) camera provides the ability to confirm specific conditions (e.g., incidents, lane blockages, congestion) and can aid in dispatching appropriate resources or formulating an appropriate traffic response. They assist in detecting and clearing incidents, detecting congestion, assuring proper variable message sign displays, and other related traffic control oversight. Communications are the most crucial (and potentially expensive) component in a centralized video camera system. Temporary communications (with reduced video resolution) can be provided over leased telephone lines until a more permanent solution is implemented. Although generally implemented by the operating agencies based on specific traffic control and incident management requirements, the use of video is increasingly popular as a traveler information medium, with either agency-owned cameras or privately-owned cameras (located adjacent to the highway right-of-way) being transmitted over broadcast TV.

Monitor Vehicle Tracking Systems - Once an Automated Vehicle Location (AVL) system is implemented, the equipped vehicles can serve as traffic probes to provide additional traffic flow data to the ITS systems. With a GPS-based system (the most common technique for vehicle tracking), vehicle location can be provided to a central traffic management system. Using appropriate software-based algorithms, travel times can be determined for roadway segments. As more vehicles (buses, service patrols, maintenance vehicles, etc.) are outfitted with an AVL system, more information will be available. These activities are most cost-effective on routes whose typical conditions may not otherwise justify the cost of traffic sensors or video cameras.

Weather Sensors – The use of weather sensors is important in terms of ascertaining visibility and pavement conditions. Providing advance information reduces "surprise" conditions and thus reduces the chance of incidents due to unexpected situations. TDOT currently maintains weather sensors at the west edge of the Urban Area. Additional sensors within the Urban Area could be deployed, and communication links can be established with TDOT sensors in rural areas attracting tourist and other visitor traffic. Together, this provides a network of pavement, visibility and other weather information that could be disseminated through various pre-trip and en-route information means.

Transportable Sensors - Any of the monitoring elements above may be implemented in the form of transportable sensors that do not require physical power or communications infrastructure. Such sensors may use battery, generator or solar power and may be implemented using wireless communications at locations where there is road work or temporary closures. As an interim measure, transportable sensors may be deployed as a "test" to identify if permanent sensors may offer benefits.

This Program Area will identify en route traveler information applications such as:

Variable Message Signs - The most commonly used en route traveler information device is the variable message sign. The ability to provide short informational messages to drivers in an easy-to-read manner allows for information from delays and congestion to route diversions to be displayed. Although primarily installed on interstate highways, variable message signs can also be used on arterials where the need exists.

Variable Trailblazer Signs - Variable trailblazer signs form a directionally-oriented signing system on surface streets. This can provide necessary information to bypass heavily congested or closed interstate freeway entrance ramps or segments (for appropriate alternate routes), as well as keep traffic moving towards specific destinations (such as parking lots or special event centers, e.g. Jackson Coliseum). These signs combine route shields or destination symbols with variable directional arrow displays to provide travelers with the necessary directional information to reduce the chances of getting lost and tying up traffic due to quick movements.

Traveler Advisory Radio - Another common dissemination device is traveler advisory radio (TAR). Traveler advisory radio permits a more detailed message to be presented than is possible through VMS or variable trailblazer signage as discussed above. This permits more detailed alternate route information or other advisories as necessary. TAR is best-used for "narrowcasting" (providing specific information for a specific group of travelers); typical 10-watt transmitters have a 4 to 5 mile radius, but can be "depowered"

to serve a more specific zone. The major constraint to TAR is the availability of radio frequencies on the AM or FM dial.

Regional Performance Monitoring

This Program Area will collect, archive, and summarize operational data to assess the effectiveness of ITS deployments and track the operational performance (e.g. congestion, speed, incident delay, accident frequency) of the transportation network in each of the six MDOT Districts.

The primary goal of this Program Area is to use the real-time data provided by ITS components to enhance both the ability to evaluate the transportation network and to provide more (and improved) testimony for use in the transportation planning process.

Data Collection (from other program areas) - With the data being collected from sensors, traffic probes, and other inputs, it will be collected and stored for use by transportation planners. The ability to have such a database will enable planners to have reliable data and take away the added costs of collecting data on those roadways manually.

Evaluation of Traffic Data - The use of existing traffic modeling software will still allow for evaluation of the current traffic conditions and forecasting into the future. However, with the extent of historical data (and real-time data) that will be provided by the ITS components, new software will most likely be available towards the long term for more advanced (and real-time) modeling. This will provide enhanced planning tools and easier evaluation of ITS projects.

Update of ITS Strategic Assessment - With the ability to use automatically stored historical data on the transportation system and current and future evaluation techniques, the ITS Strategic Assessment should be updated regularly to note both positive results and areas where more work needs to be done.

Metropolitan Area Transit Management

This Program Area provides technical and financial assistance to local transit agencies in metropolitan areas to promote the application of technologies to improve transit operations. The Program Area also helps to identify opportunities to integrate transit ITS applications into traffic, emergency, and other transportation functions in metropolitan areas.

This Program Area will also identify multimodal opportunities. Multimodal ITS activities involve coordination between transportation agencies, especially between road-oriented operations agencies (such as MDOT, plus county and city transportation / public works departments) and transit agencies. Traffic, incident and event data can be shared and coordinated between each of these agencies that facilitates access to traveler information as well as information that may benefit the operation of all elements of the network. A primary area of coordination involves real-time information sharing between agencies and in traffic signal priority systems that support more efficient and predictable transit operations.

Automatic Vehicle Location Systems - The use of Automatic Vehicle Location (AVL) systems provides transportation operators with the location of their fleet, and can be

used for a number of different purposes. The principal use of AVL is for fleet management of transit and other services. For example, the provision of real-time location information can provide transit operators with the ability to track schedule adherence, evaluate routing, and provide transit riders with real-time bus arrival information. Another activity is actually part of the Traffic Monitoring program area -- the use of AVL-equipped vehicles as "traffic probes" to provide certain traffic information in lieu of extensive traffic monitoring infrastructure investment on specific routes.

Integrated Multimodal Information Services – Real-Time and Static – This provides a multi-faceted information capability designed to use real-time information via AVL equipment on transit (and paratransit) vehicles to provide more timely information to the transit user. This supports the transit component of pre-trip traveler information activities. Information can also be offered to transit riders while en-route, by providing small variable signs or voice annunuciators at stops that identify how long it will be until the next bus approaches, for example. Information services can also be shared with paratransit and rideshare reservation systems through interactive kiosks, web sites, traveler advisory telephone, or other pre-trip information activities as described above. Such services could provide “one-stop shopping” for alternative transportation mode information.

Traffic Signal Priority -- At strategic locations, this will allow for transit and/or emergency vehicles to receive priority at intersections (in the form of an extended green phase or red truncation) when the effect on traffic will not be detrimental. Priority may also be operated as a simple or complex system. Simple priority involves a vehicle sending the traffic signal (through a strobe light device or other local detection tool) a warning that it is in the vicinity of the signal. Complex priority, which may provide more efficient traffic operations, may involve coordination between a transit management system and a traffic signal control system in order to assess, for example, whether the bus is on schedule and if it is fully-loaded. (If a bus is fully-loaded and behind schedule, it is typically more appropriate to provide priority than otherwise).

Systems operations / maintenance

This Program Area supports the day-to-day operations and routine, preventative, and unscheduled maintenance requirements of district ITS elements. The program area also manages vendor maintenance contracts and warranties.

Market Packages Relevant to Program Areas

Earlier in the chapter Market Packages most relevant to Mississippi were identified based the state’s needs and goals, and the strengths, weaknesses, opportunities and threats of the respective Market Packages. To efficiently manage the delivery of the Market Package applications, Program Areas were defined to help MDOT structure its ITS program. Now the Market Packages relevant to each of the Program Areas are identified. The groupings will help determine the staffing skill sets needed *within* each program area and where synergies exist *across* program areas.

Selected Market Packages in Statewide Program Areas

Program Area Market Package

Advanced Traveler Information Systems

- Transit Traveler Information
- Broadcast Traveler Information (Statewide)
- Drawbridge Management
- CVO Parking Facility Management
- Parking Facility Management
- Yellow Pages And Reservation
- Interactive Traveler Information (Statewide)
- Traffic Information Dissemination
- Incident Management

Goods Movement (Port Facility And Commercial Vehicle Operations)

- Standard Railroad Grade Crossing
- Drawbridge Management
- Electronic Clearance
- Railroad Operations Coordination (Statewide)
- Commercial Vehicle Administration
- Interactive Traveler Information (Statewide)
- Broadcast Traveler Information (Statewide)
- HAZMAT Management
- CVO Parking Facility Management

Intercity Transit

- Transit Security
- Broadcast Traveler Information (Statewide)
- Yellow Pages And Reservation
- Demand Responsive Transit Operations
- Dynamic Ridesharing
- Transit Vehicle Tracking
- Transit Traveler Information
- Interactive Traveler Information (Statewide)
- Transit Passenger And Fare Management·
- Transit Maintenance
- Transit Fixed Route Operations

Interurban Corridor Operations (Includes Evacuation Management)

- Traffic Information Dissemination
- Drawbridge Management
- Broadcast Traveler Information (Statewide)
- Road Weather Information System
- Reversible Lane Management
- Yellow Pages And Reservation
- Regional Traffic Control
- Interactive Traveler Information (Statewide)
- Evacuation Planning And Traffic Control
- Railroad Operations Coordination (Statewide)
- Incident Management
- Network Surveillance (Statewide)

ITS Planning / Policy / Administration

- ITS Data Warehouse

Regional Traffic Operation Center Integration (Centralized State)

- Emergency Response
- Incident Management
- Interactive Traveler Information (Statewide)
- Traffic Information Dissemination
- ITS Data Warehouse
- Broadcast Traveler Information (Statewide)
- Regional Traffic Control

Telecommunications

- Interactive Traveler Information (Statewide)
- Broadcast Traveler Information (Statewide)
- Network Surveillance (Large Metro areas)·
- Probe Surveillance (Statewide)
- Regional Traffic Control
- Network Surveillance (Statewide)

Selected Market Packages in Regional Program Areas

Program Area Market Package

Regional Incident Management (District TOC Integration with Local Traffic and Emergency Management)

- Incident Management
- Mayday Support
- Emergency Response
- Emergency Routing
- HAZMAT Management

Regional Performance Monitoring

- ITS Data Warehouse

Regional Traffic Management (Freeway Management, State Signal Operations)

- ITS Data Warehouse
- HAZMAT Management
- Network Surveillance (Large Metro areas)
- Parking Facility Management
- Probe Surveillance (Large Metro areas)
- Reversible Lane Management
- Road Weather Information System
- Standard Railroad Grade Crossing
- Surface Street Control (Outside Metro Areas)
- Traffic Information Dissemination
- Regional Traffic Control
- Incident Management

Systems Operations / Maintenance

- Maintenance Management / Dispatch
- ITS Data Warehouse

Transit Management

- Transit Maintenance
- Transit Vehicle Tracking
- Transit Traveler Information
- Transit Security

- Mayday Support
- Multi-modal Coordination
- Broadcast Traveler Information (Large Metro areas)
- Transit Passenger and Fare Management
- Interactive Traveler Information (Large Metro areas)
- Demand Responsive Transit Operations

Performance Measures Relevant To Program Areas

The previous tasks identified 12 ITS Program Areas encompassing the ITS Market Packages relevant to Mississippi based on their strengths, weaknesses, opportunities, and threats (SWOT) and other analyses performed. ITS performance measures, or measures of the effectiveness of the ITS Market Packages and Program Areas, are identified here. Since the Market Packages are traceable to the ITS goals and objectives defined previously, the performance measures support ITS objectives determined by stakeholders throughout the state through the ITS Vision exercise.

ITS Performance Measures

ITS benefits are depicted through six measures adopted by the Federal Highway Administration (FHWA) for use in analyzing the effects of ITS. These are:

- Travel Time
- Accidents
- Fatalities
- Throughput
- Cost
- User Satisfaction

This list of performance measures was adopted by FHWA for the following reasons:

- They have proven to be acceptable to stakeholders;
- They are easily understandable;
- They are applicable to all of the goals of ITS;
- They are readily measurable or associated with a surrogate that is readily measurable; and
- Collectively they represent a broad range of transportation user services and functions.

Table 11-8 below presents these six broad performance measures together with a comprehensive listing of performance measure subcategories. The presentation of subcategories provides a level of detail from which the relative importance of the six performance measures can be assessed.

Table 11-8
ITS PERFORMANCE MEASURES

Travel Time	**Accidents**
Individual Travel Time Individual Travel time Variability Congestion and Incident related Delay Travel Time Savings Intermodal Transfer Times	Number of Incidents Number of Accidents Number of Injuries Property Damage Exposure to Accidents and Incidents
Fatalities	**Throughput**
Number of Incidents Number of Accidents Number of Fatalities	Traffic Flows/Volumes/Number of Vehicles Lane Carrying Capacity Volume to Capacity Ratio Incident related Capacity Restrictions Vehicle-hours Delay Incident Clearance Time Average Vehicle Occupancy Use of Transit and HOV modes
Cost	**User Satisfaction**
Infrastructure Operating Costs Travel Cost Personal Accident Costs Fuel Consumption Operation Cost Savings Administrative and Regulatory Cost Savings Information-gathering Costs	Accessibility of Traveler Information Accuracy of Traveler Information Number of Trips Taken Vehicle Miles Traveled Accessibility to Transportation Number of Security Incidents Emissions

Adapted from ITS Deployment Guidance Traveler Information Systems Technical Edition, TransCore, August 1997.

Table 11-8 (continued)

Program Area	Performance Category	Performance Measure
Advanced Traveler Information Systems	Travel Time	Individual Travel Time
	Travel Time	Individual Travel time Variability
	Travel Time	Congestion and Incident related Delay
	User Satisfaction	Accuracy of Traveler Information
	User Satisfaction	Accessibility of Traveler Information
	User Satisfaction	Information-gathering Costs
Regional Traffic Operation Center Integration	Cost	Administrative and Regulatory Cost Savings
	Cost	Infrastructure Operating Costs
	Throughput	Incident Clearance Time
	Throughput	Incident related Capacity Restrictions Vehicle-hours Delay
	Travel Time	Individual Travel Time
	Travel Time	Individual Travel time Variability
	Travel Time	Congestion and Incident Related Delay
	Travel Time	Travel Time Savings
	User Satisfaction	Accuracy of Traveler Information
	User Satisfaction	Information-gathering Costs
Interurban Corridor Operations (includes evacuation management, statewide emergency management coordination, inter-urban surveillance and communications)	Fatalities	Number of Fatalities
	Fatalities	Number of Accidents
	Throughput	Lane Carrying Capacity
	Throughput	Traffic Flows/Volumes/Number of Vehicles
	Throughput	Average Vehicle Occupancy
	Throughput	Incident Related Capacity Restrictions Vehicle-hours Delay
	Throughput	Volume to Capacity Ratio
	Travel Time	Individual Travel Time
	Travel Time	Congestion and Incident Related Delay
Intercity Transit	Travel Time	Individual Travel Time
	Travel Time	Intermodal Transfer Times
	User Satisfaction	Accuracy of Traveler Information
	User Satisfaction	Accessibility to Transportation
	User Satisfaction	Number of Trips Taken
	User Satisfaction	Accessibility of Traveler Information
	User Satisfaction	Vehicle Miles Traveled
Goods Movement (port facility and commercial vehicle operations)	Cost	Administrative and Regulatory Cost Savings
	Cost	Infrastructure Operating Costs
	Cost	Operation Cost Savings

Program Area	Performance Category	Performance Measure
Regional Incident Management (district TOC integration with local TM, EM and surveillance	Accidents	Number of Incidents
	Accidents	Number of Accidents
	Accidents	Number of Injuries
	Accidents	Property Damage
	Accidents	Exposure to Accidents and Incidents
	Cost	Administrative and Regulatory Cost Savings
	Cost	Infrastructure Operating Costs
	Cost	Travel Cost
	Cost	Personal Accident Costs
	Cost	Fuel Consumption
	Cost	Operation Cost Savings
	Fatalities	Number of Incidents
	Fatalities	Number of Fatalities
	Fatalities	Number of Accidents
	Travel Time	Individual Travel time Variability
	Travel Time	Congestion and Incident Related Delay
Regional Traffic Management (freeway management, state signal operations)	Throughput	Incident Clearance Time
	Throughput	Traffic Flows/Volumes/Number of Vehicles
	Throughput	Incident Related Capacity Restrictions Vehicle-hours Delay
	Throughput	Volume to Capacity Ratio
	Travel Time	Individual Travel Time
	Travel Time	Individual Travel Time Variability
	Travel Time	Congestion and Incident Related Delay
	Travel Time	Travel Time Savings
	Travel Time	Intermodal Transfer Times
	User Satisfaction	Accuracy of Traveler Information
	User Satisfaction	Information-gathering Costs
	User Satisfaction	Emissions
Metro Area Transit Management	Throughput	Use of Transit and HOV modes
	Travel Time	Individual Travel Time
	Travel Time	Individual Travel Time Variability
	Travel Time	Intermodal Transfer Times
	User Satisfaction	Accuracy of Traveler Information
	User Satisfaction	Accessibility to Transportation
	User Satisfaction	Number of Trips Taken
	User Satisfaction	Accessibility of Traveler Information
Systems Operations / Maintenance	Cost	Administrative and Regulatory Cost Savings
	Cost	Operation Cost Savings

Program Area	Performance Category	Performance Measure
ITS Planning / Policy / Administration		
Telecommunications		

MDOT Architecture Considerations

The day-to-day traffic operations functions in Mississippi could be carried out by MDOT with different levels of responsibilities shared by the district and central offices. There are several advantages to a distributed traffic management approach. Two advantages include:

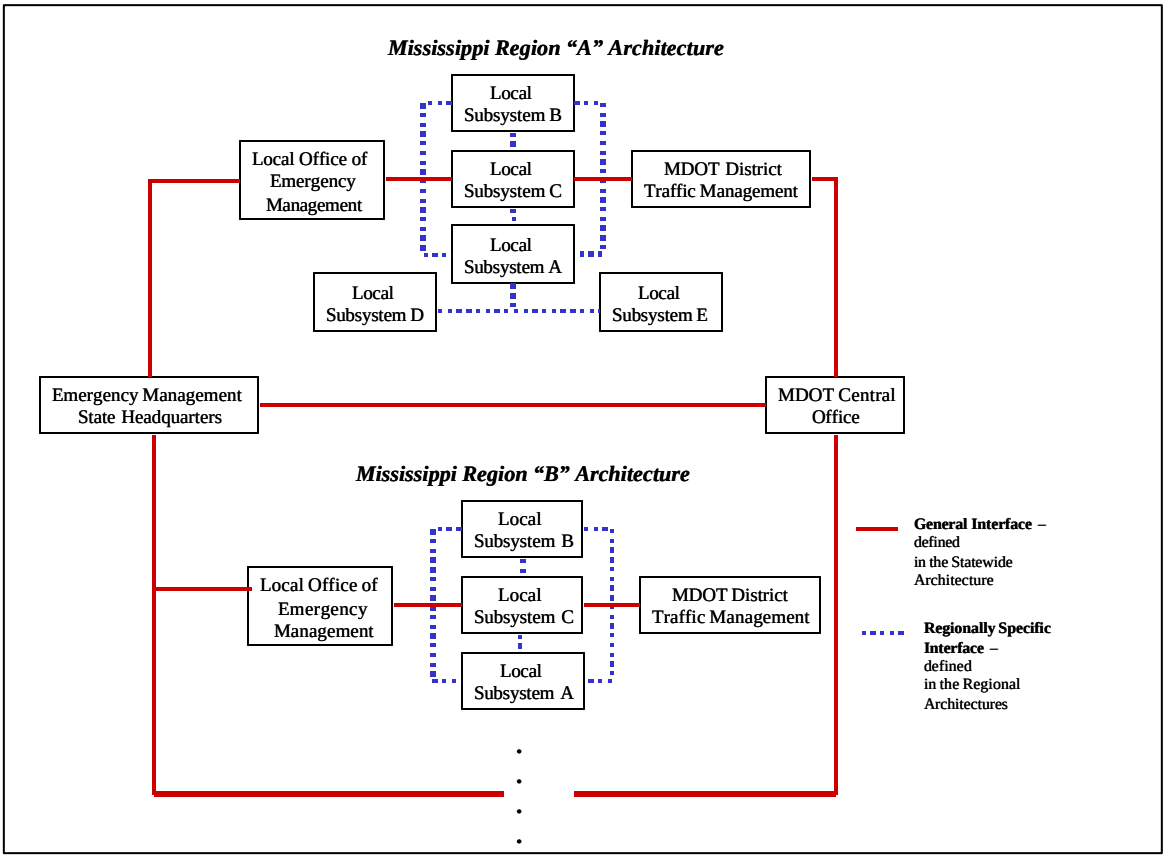
- A distributed TMC approach could be quickly implemented at a lower cost than a centralized TMC approach (in this case, existing facilities could be used with minimal modifications); and

- With a distributed TMC approach, each agency could continue to operate as they currently do using their existing management structure. Each agency could provide the level of service that they desire or their funding provides.

The primary disadvantage of the two distributed TMC approaches in a metropolitan area is that it is less cost effective in that each location has to retrieve data, video, and voice communications instead of a shared, common communications architecture as in a centralized TMC approach. Another disadvantage is that there is less opportunity for personnel to work and interact with each other. Given the anticipated scope of MDOT's ITS program and the importance of not altering current operations dramatically, the decentralized architecture is probably the most appropriate model for Mississippi, at least during the early phases of ITS deployment.

Figure 11-10 depicts how individual regional ITS architectures could be "virtually" connected to form the Statewide ITS Architecture. The structure of the Statewide Architecture will be more fully defined during the architecture task.

Figure 11-10
PROPOSED RELATIONSHIP BETWEEN REGIONAL AND STATEWIDE TRANSPORTATION FUNCTIONS



Required Agreements, Roles and Responsibilities

To lay the institutional groundwork for deploying ITS in Mississippi, various policies and procedures will be necessary. In particular, formal policies and procedures should be developed for (1) the type, use, location, and maintenance of equipment, (2) the use, ownership, and transmittal of data generated by the systems, (3) any legal or contractual items, such as intellectual property rights, privacy liability, and task revisions or contract change orders, and (4) the roles and responsibilities of the participants.

For example, equipment policies should be established to delineate: (1) who would be responsible for the maintenance and replacement of equipment, (2) what criteria should be used for prioritizing the location of the kiosks, (3) what information would be allowed on dynamic message signs, and (4) how the CCTV cameras can be used.

Data policy issues might include: (1) who owns the data that is generated, (2) how will the information be shared among partners and to whom this information will be released, (3) how will confidential information be protected, and (4) what is the proper use and retention time frame for the data.

Liability issues should also be addressed through formal policies and procedures. Guidelines should be developed for the control modification of traffic signal systems and for intellectual property rights.

For regional, multi-agency deployment initiatives, it is typically necessary for multiple jurisdictions to be involved in identifying and scoping the proposed projects. Federal funding for ITS projects requires coordination between all pertinent agencies in the deployment of specific initiatives and requires development of a regional ITS Architecture as a precursor to further ITS implementation activities.

The above activities should be coordinated through a Regional ITS Steering Committee, perhaps operating under the auspices of the Central Mississippi Planning and Development District. In addition to the "traditional" stakeholders (e.g. cities and county public works departments, MDOT, and transit agencies), it is recommended that local police and fire departments be invited to be part of the expanded Regional ITS Steering Committee, such that future Program Area initiatives, as well as other proposed future ITS activities, can be accomplished.

Stakeholders and Their Roles

In planning and deploying ITS throughout Mississippi, multiple stakeholders should participate in solutions generated in the twelve program areas. **Table 11-9** below provides a listing of the key types of stakeholders and their primary functions.

Table 11-9
STAKEHOLDERS AND FUNCTIONS

Stakeholder	Expected Roles and Responsibilities
MDOT Traffic Operations Center in Jackson	In Jackson, overall planning and implementation of incident management program, assist in incident detection and verification, initiate traffic management strategies on incident impacted facilities, control signals on state routes outside of Jackson, provide traffic control, assist motorists with disabled vehicles, provide motorist information (HAR, VMS), determine incident clearance and roadway repair needs, establish and operate alternate routes, dispatch freeway service patrols, dispatch maintenance resources such as dump trucks and sweepers, operate the GoMDOT web server, share video and data with Jackson TMC, media and police agencies. MDOT's TOC in Jackson will also receive data from the district TOC's for statewide dissemination. The Jackson TOC will also coordinate with the State Police and Mississippi Emergency Management Agency during statewide emergencies. Finally, the MDOT Jackson TOC will monitor the state closed loop signal systems and download signal timing plans.

Stakeholder	Expected Roles and Responsibilities
MDOT District Traffic Operations Centers	The district TOC's will operate and maintain the ITS equipment deployed in the six MDOT districts. The district TOC's will also participate in local incident management programs, assist in incident detection and verification, initiate traffic management strategies on incident impacted facilities, provide motorist information (HAR, VMS), determine incident clearance and roadway repair needs, establish and operate alternate routes, dispatch maintenance resources such as dump trucks and sweepers. Data, voice, and (possibly) video will be shared with the MDOT's Jackson TOC, operate the GoMDOT web server, share video and data with Jackson TMC, media and police agencies.
Local Traffic Management Centers	Traffic signal control within city limits, implement route diversion plans and coordinate with city police and DPW Maintenance for assistance with freeway incidents, signals with emergency vehicle pre-emption.
Local Transit Providers	Implement traveler information web site – share with MDOT for GoMDOT web site and kiosk implementation, special event transit service planning, smart card development, transit signal priority plan and implementation coordinated with local traffic management centers, provide en-route buss arrival information.
Media – TV / Radio Stations, Newspapers,	Report traffic incidents, broadcast information on delays, provide alternate route information.
Mississippi Highway Patrol	Lead authority at incident scenes on freeways, assist in incident detection, secure incident scene, direct traffic, conduct accident investigations, serve as incident commander, supervise scene clearance, share computer-aided dispatch (CAD) information
Kansas City Southern Railway	Provide advisories regarding train incidents and schedule information (to the extent possible) to regional traffic management centers.
Local City and County Departments of Public Works	Operations and maintenance of traffic signals and ITS equipment, deployment of cones and portable signs, clean-up of roadway debris.
Local Police Departments	Assist in incident detection, secure incident scene, direct traffic, conduct accident investigations, serve as incident commander, supervise scene clearance
Local Fire Departments	Protect incident scene, provide emergency medical care, fire suppression, crash victim rescue, assistance in clearance.

Stakeholder	Expected Roles and Responsibilities
Public Safety 911 Centers	Take emergency calls and dispatching the most appropriate police and fire resources, share CAD information
Local Special Event Organizers	Share knowledge of events (date, time, location, duration, etc.) that may impact travel on roadways with MDOT TOC, Jackson TMC and emergency service providers.
Metropolitan Planning Organizations	Forum under which Jackson ITS Steering Committee will operate, reflect ITS recommendation in planning products (e.g. UPWP, TIP).
Mississippi Emergency Management Agency (MEMA)	Coordinate, plan, and work with local emergency service providers to respond to threats from technological, man-made and natural origins. MEMA will notify the Department or Environmental Quality in the event of a truck or train hazardous material incident.
Department of Environmental Quality (DEQ) Emergency Services Branch	Work with MEMA to respond and clean up hazardous materials spills.
MDOT mstraffic.com Web Page Administrators	Strategic planning of GoMDOT traveler information content. Work with Jackson Transit and MDOT TOC to add pre-trip transit service, incident, and speed information to web site. Identify potential traveler information kiosk locations.
Private Emergency Medical Services	Provide triage, treatment, and transport of crash victims.
Towing and Recovery Service Providers	Remove vehicles from incident scene, remove debris from roadway, provide transportation for uninjured vehicle occupants

SUMMARY

This Concepts Plan identified recommended ITS Program Areas, or areas of ITS activity, that will provide an organizing tool for MDOT in developing and implementing ITS throughout the State. The prioritized Market Packages were used as a basis for determining logical groupings of services. The recommended ITS Program Areas are:

Local / District Programs

- Systems Operations / Maintenance;
- Metro Area Transit Management;
- Regional Performance Monitoring;

- Regional Traffic Management (Freeway Management, State Signal Operations) Regional Incident Management (District TOC Integration with Local TM, EM and Surveillance; and
- Telecommunications.

Statewide Programs

- ITS Planning / Policy / Administration;
- Goods Movement (Port Facility and Commercial Vehicle Operations);
- Intercity Transit;
- Interurban Corridor Operations (Includes Evacuation Management, Statewide Emergency Management Coordination, Interurban Surveillance and Communications;
- Regional Traffic Operation Center Integration; and
- Advanced Traveler Information Systems.

The Program Areas were then used to investigate alternative structures within MDOT and alternative transportation management center architectures to support the Program Areas. Finally, typical projects that will fall under the purview of the Program Areas were noted.

The Concepts Plan provides the roadmap for moving forward for developing more detailed strategic planning recommendations for MDOT. The Program Areas, Market Packages and representative projects will be used to generate the detailed Statewide ITS Architecture and Implementation Strategy. The focus of the remainder of the study will be on defining the information exchanges between agencies, technologies, and project deployment locations and phasing for Mississippi.