AUSTIN REGIONAL
INTELLIGENT TRANSPORTATION SYSTEMS
ARCHITECTURE & OPERATIONAL CONCEPT

Prepared For:

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Executive Summary

The primary mission of the Texas Department of Transportation (TxDOT) Austin District Intelligent Transportation System (ITS) initiative is to enhance the safety and efficiency of transportation throughout the Austin region. This will be accomplished by the application of traffic, transportation, and emergency management technology to reducing traveler frustrations associated with recurring ("peak"-type), non-recurring ("surprise"-type), and construction-related congestion. Additionally, TxDOT Austin District working with the City of Austin and Travis County to implement an integrated regional emergency communications and transportation management center for the Austin Region (The 9-1-1 RDMT Project). The project will also upgrade the communications systems (voice and data communications) and the dispatch system used by the project partners.

The 9-1-1 RDMT project presents a unique opportunity to integrate emergency management and traffic management. To guild the integration of these systems, a regional ITS architecture was developed based on the National ITS Architecture.

This document contains the Austin Region ITS Architecture and presents the following information:

- Section 2 - Integration Strategy. The integration strategy provides a systematic plan for achieving an integrated regional transportation system based on the architecture.
- Section 3 - Regional ITS Architecture Development Process. This section describes the processed used to create the regional architecture.
- Section 4 - Operational Concept. This section identifies the roles and responsibilities of the agencies participating in implementing the regional architecture.
- Section 5 - Conceptual Design. This section provides the systems inventory, market packages, interconnections, and interface definitions of the regional architecture.
- Appendix A - Austin Region Stakeholder Interview Highlights
- Appendix B - TxDOT Media Access Agreement.

A companion document, "The Austin Region ITS Deployment Plan," provides information on current and future projects needed to implement the Austin Region ITS Architecture.

Table of Contents

SECTION 1

INTRODUCTION

The primary mission of the Texas Department of Transportation (TxDOT) Austin District Intelligent Transportation System (ITS) initiative is to enhance the safety and efficiency of driving throughout the Austin region. This is to be accomplished by the application of traffic, transportation, and emergency management to existing and planned methods for reducing traveler frustrations associated with recurring ("peak"-type), non-recurring ("surprise"-type), and construction-related congestion.

The TxDOT Austin District working with the City of Austin and Travis County are implementing an integrated regional emergency communications and transportation management center for the Austin Region. This new center will integrate public safety, transportation, and public service operations and systems.

1.1 DOCUMENT OVERVIEW

This document presents TxDOT Austin's Operational Vision and Regional ITS Architecture as expressed by its program partners, likely users, and related agencies. The architecture and concept of operations is the direct outcome of interviews with regional stakeholders. A Steering Committee was convened to select and prioritize a set of Market Packages. Participants in the Steering Committee included regional law enforcement, Austin Fire Department, Austin Emergency Medical Service, TxDOT, the Capital Area Metropolitan Plan Organization (CAMPO), and others.

This document consists of the following sections:

- Section 2 - Integration Strategy. The ITS integration strategy provides a systematic plan for achieving an integrated regional transportation system.
- Section 3 - Regional ITS Architecture Development Process. This section describes the processed used to create the regional architecture.
- Section 4 - Operational Concept. This section identifies the roles and responsibilities of the agencies participating in implementing the regional architecture.
- Section 5 - Conceptual Design. This section provides the systems inventory, market packages, interconnections, and interface definitions of the regional architecture.
- Appendix A - Austin Region Stakeholder Interview Highlights
- Appendix B - TxDOT Media Access Agreement.

1.2   DEFINITION OF THE AUSTIN REGION

The region defined for the architecture includes the City of Austin, Round Rock, Travis County, and Williamson County. Figure 1-1 shows a map of the Region.
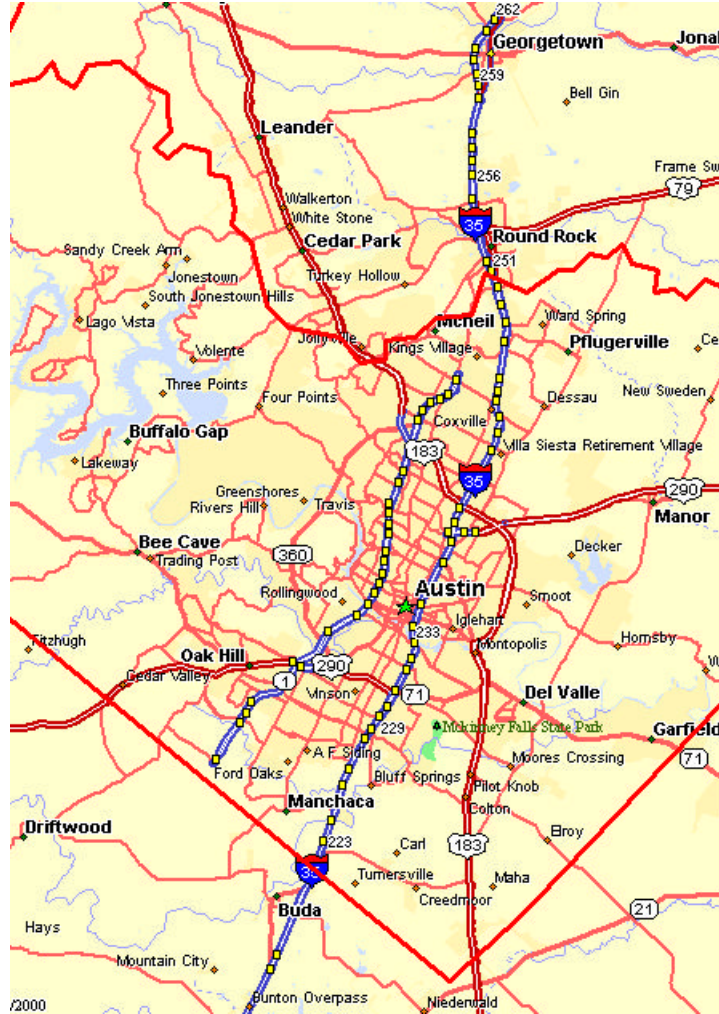
Figure 1-1 Austin Region

SECTION 2

INTEGRATION STRATEGY

The ITS integration strategy provides a vision for implementing an integrated regional intelligent transportation system. The integration strategy addresses how existing and future systems can be optimized by using the synergy between Market and Equipment Packages. The ITS integration strategy is general in content and addresses key policies.

2.1 GOALS AND OBJECTIVES[1]

Achieving an integrated regional ITS system is a long-term process that must be based upon sound goals and objectives in order to maintain proper project momentum and to produce consistently demonstrable benefits. As such, it is appropriate to document an applicable series of goals and objectives for guiding those whose future tasks will be to transform this document's concept into an actual regional ITS system. To facilitate achieving this, the following paragraphs present eleven goals organized within five major objective themes.

Incident-Oriented Objective Themes

The following incident-oriented goals and associated measures of effectiveness criteria relate to those portions of the vision that address incident congestion and incident management activities.

Goal #1: Reduce Incident Related Congestion

> Measures of Effectiveness:
> 1. Number and severity of incidents; especially, secondary crashes
> 2. Lane closures due to incidents, including duration of closure and number of lanes closed
> 3. Time to incident clearance
> 4. Vehicle-hours of delay due to incidents
> 5. Person-hours of delay due to incidents
> 6. Congestion severity (level of service) due to incidents
> 7. Congestion duration due to incidents
> 8. Success of pre-planned events, including quantitative assessment based on estimated hours of delay avoided, and qualitative assessment based on agency and public perception

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[1] Information in this section was derived from ITS Architecture, Performance and Benefits Study, June 1996

Goal #2: Enhance/Facilitate Incident Management

Measures of Effectiveness:
1. Capability to detect incident and identify incident location
2. Accuracy of incident detection system
3. Response time for detection of incident and identification of incident location
4. Capability to verify incident and identify kind of equipment needed
5. Response time for emergency equipment
6. Qualitative assessment of agency coordination and cooperation

Capacity-Oriented Objective Theme

The following capacity-oriented goals and associated measures of effectiveness criteria relate to those portions of the vision that address recurring congestion and transportation efficiency.

GOAL #3: Reduce Recurring Congestion

Measures of Effectiveness:
1. Travel time
2. Vehicle-hours of delay
3. Person-hours of delay
4. Congestion severity (level of service)
5. Congestion duration

GOAL #4: Increase Transportation Efficiency

Measures of Effectiveness:
1. Vehicle-miles traveled per lane-mile in peak and off-peak periods
2. Person-miles traveled per lane-mile in peak and off-peak periods
3. Vehicle-hours of delay in peak and off-peak periods
4. Person-hours of delay in peak and off-peak periods
5. Travel speeds and trip times
6. Ton miles of goods moved

Institutional/Agency-Oriented Objective Theme

The following institutional/agency-oriented goals and associated measures of effectiveness criteria relate to those portions of the vision that address activities within an agency and the coordination of the activities of various agencies.

Goal #5: Enhance Institutional/Agency Activities

Measures of Effectiveness:
1. Capability to identify current regional conditions (traffic, roadway, weather, etc.)
2. Capability to identify current location of equipment and inventory
3. Reduction in personnel hours required to perform necessary functions
4. Expansion of managerial and/or operational capabilities
5. Availability of new information to enhance managerial and operating decisions
6. Internal communications capabilities
7. External communications capabilities

Goal #6: Integrated Transportation Services

Measures of Effectiveness:
1. Number of coordinating agencies
2. Number of coordinated programs or services
3. Geographic extent of coordinated system
4. Qualitative assessment of the benefits that may accrue to coordinating agencies, and/or to system users

Safety-Oriented Objective Theme

The following safety-oriented goals and associated measures of effectiveness criteria relate to those portions of the vision that address the safety of emergency personnel at an incident site and the safety of the public while in private vehicles and on public transit.

Goal #7: Improve Safety of Emergency Personnel at Incident Site

Measures of Effectiveness:
1. Volume of traffic adjacent to incidents
2. Speed of traffic adjacent to incidents
3. Capability to identify hazardous material
4. Capability to communicate situation with motorists
5. Qualitative assessment of agency coordination and cooperation

Goal #8: Increase Traveling Safety

Measures of Effectiveness:
1. Number of accidents or incidents
2. Accident rate (especially, secondary crashes)
3. Accident severity
4. Type of accidents or incidents
5. Cause of accidents
6. Qualitative assessment of user/non-user perception of safety and security

User/Public-Oriented Objective Theme

The following user/public-oriented goals and associated measures of effectiveness criteria relate to those portions of the vision that address user convenience, communications with users, and impacts on user behavior (e.g., route and mode choice).

Goal #9: Enhance Communications with the User/Public

Measures of Effectiveness:
1. Number and percentage of the public (including motorists and transit patrons) with access to information
2. Frequency with which information is accessed (daily, weekly, only when there is an incident, etc.)
3. Type of information available (i.e., traffic conditions, roadway conditions, traveler and weather advisories, construction activities, route alternatives, mode alternatives)
4. Extent of system information (number of facility miles for which travel speeds and roadway conditions are available, number of transit routes included in system, geographic area served by system, etc.)

Goal #10: Improve User/Public Convenience

Measures of Effectiveness:
1. Reduction in person-hours that are due to delay and/or vehicle hours that are due to delay (for example, delay caused by payment collection, inspection, or administrative processes)
2. Qualitative assessment of convenience (for example, convenience of accessing information and clarity of information presentation, or convenience of inspection and administrative processes)

Goal #11: Affect Traveler Behavior

Measures of Effectiveness:
1. Number and percentage of commuters who change travel route
2. Number and percentage of commuters who change time of travel
3. Number and percentage of commuters who change travel mode
4. Number and percentage of commuters who eliminate a trip

2.2 IDENTIFICATION OF MAJOR ITS SYSTEMS IN AUSTIN REGION

In order to develop an integration strategy, existing, major ITS systems must be identified and taken into consideration. These systems include the 9-1-1 Radio system, Dispatch system, Mobile data, Transportation and Transit systems (9-1-1 RDMT) project, the pre-existing ITS subsystems in the Austin region, and TxDOT's Center-to-Center communications system. Additionally, the synergies between these existing systems and the planned market and equipment packages can be used to reduce the time and cost of developing an integrated regional ITS system (for example, the existing Network Surveillance market package enable Traffic Information Dissemination).

The 9-1-1 RDMT Project

Several public safety agencies in the Austin/Travis County region and TxDOT Austin have established a joint project office to upgrade and integrate crucial public safety systems and facilities (the 9-1-1 RDMT project). The project is upgrading the 9-1-1 system, the Radio system, the Mobile data computers, the Dispatch System, and Transportation and Transit services of the combined agencies. Included in this project is the construction of a Combined Emergency Communications Center (CECC) that will serve as the dispatch center for the City of Austin, Travis County, and TxDOT Austin Courtesy Patrol. The CECC will also house the TxDOT Austin Traffic Management Center. The 9-1-1 RDMT project provides an opportunity to integrate several of the regional ITS subsystems that will be sharing a common facility that is managed by a joint project team.

Regional ITS Subsystems

Several major subsystems required to implement the Austin Regional ITS Architecture have been or are currently being deployed as "stovepipe" systems. These systems include: a freeway traffic management being deployed by TxDOT Austin, a surface street management system being deployed by the City of Austin, and a new emergency management system being deployed by the 9-1-1 RDMT project. By basing the integration strategy on these existing stovepipe systems, it ensures the maximum benefit per ITS cost expended.

The Austin District of TxDOT is deploying a Freeway Traffic Management (FTM) system that will ultimately be controlled from the CECC. The FTM system will eventually monitor all expressways in the District (IH 35, US 183, US 290, and Loop 1). The system allows TxDOT to monitor expressway traffic using video surveillance and loop detectors installed along the expressways. The system also has Dynamic Message Signs, Lane Control Signs, and Highway Advisory Radios. As part of the 9-1-1 RDMT project, the new CAD system will be interfaced to the TxDOT Austin's Automated Traffic Management System (ATMS) software. This interface will allow the CAD system and the ATMS software to exchange incident and traffic data.

The City of Austin is deploying a Traffic Management system. The system allows for instantaneous adjustments and monitoring of traffic signals from the Traffic Management Center (TMC). The system is currently monitoring 64 of the heaviest traveled intersections using video surveillance and loop detectors. The system will eventually control 232 intersections in the City of Austin.

The 9-1-1 RDMT project is deploying a new Computer Aided Dispatch (CAD) system that will be used by all of the project team members. The new CAD system will allow the CAD users to exchange electronic messages about incidents, request assistance from other agencies, and access the City of Austin and Travis County Geographic Information System (GIS) mapping.

Table 2-1 lists other ITS subsystems that exist or are under development in the Austin region. When integrating these systems, the National ITS Architecture should be referenced to ensure compatibility.

Table 2-1. Other ITS Subsystems Underway in Austin Region

ITS Subsystem	Involved Agencies
Transit Management	Capital Metropolitan Transit Authority (CapMetro)
Electronic Fare Payment	Texas Turnpike Authority and CapMetro
Electronic Toll Collection	Texas Turnpike Authority and CapMetro
Highway-Rail Intersection Control	TxDOT
Emergency Management	Travis County and the City of Austin
Paratransit and Demand-Responsive Transit	Capital Metropolitan Transit Authority (CapMetro)
Regional Multi-Modal Traveler Information	TxDOT, Regional Broadcasters, Metro Networks

Center-To-Center Communications System

In addition to the 9-1-1 RDMT project, TxDOT Traffic Operations Division has developed a Center-to-Center communications system that will be used to interface the subsystems inside the CECC and to interface the TxDOT Austin TMC to other ITS systems external to the CECC. The Center-to-Center system is based on ITS standards, allows dissimilar systems to exchange data, supports remote command and control, and promotes the reuse of existing interfaces.

Market Package Synergy

One of the attributes of the National ITS Architecture is the inter-relationships, or synergies that are present for each of the market and equipment packages. Taking advantage of these synergies can reduce the cost and time required to deploy ITS services over time. There are four types of synergies between the market packages and equipment packages. The four types of synergies are:

- Interdependent – Interdependent equipment packages are equipment packages required to deploy a single ITS service. Since interdependent equipment packages are not allocated to different market packages, there are no interdependent market packages.
- Common Functions – Common functions reflect the potential for sharing hardware and/or software that performs a function and is required by more than one equipment package. Common functions improve deployment efficiency over time by building on existing capabilities.
- Shared Information – Some equipment packages rely on information provide by an equipment package in a separate subsystem. If the equipment package, which supplies the information, is not deployed, the equipment package, which relies on the information, may be degraded.
- Complementary – Complementary equipment packages provide compatible services which taken together, enhance net system performance. In most cases, this relationship reflects the sharing of optional information between equipment packages within the architecture definition.

Table 5-4 shows the synergies between the market packages selected by the Steering Committee for the Austin region.

2.3 AUSTIN INTEGRATION STRATEGY

Based on the existing ITS subsystems in the region, the functionality provided by TxDOT's Center-to-Center system, and the synergies between market packages selected by the ITS Steering committee, the following strategy should be used to implement the Austin Regional ITS Architecture:

Traffic Management
- Continue expansion of Network Surveillance by TxDOT Austin and the City of Austin. The expansion of Network Surveillance should include integration of TxDOT Austin, City of Austin, and City of Round Rock network surveillance subsystems.
- Continue expansion of the City of Austin computerized signal control system.
- Link together the City of Austin TMC, City of Round Rock Signal System and the TxDOT Austin TMC to enable regional traffic control.

Emergency Management
- Continue integration of the CECC CAD system and TxDOT Austin ATMS. Expand the integration to include the City of Round Rock CAD system and Williamson County CAD system.
- Extend existing City of Austin and TxDOT Austin fiber optic networks to support video surveillance of key CapMetro service points.

Traveler Information Dissemination
- Continue the installation of Dynamic Message Signs, Line Control Signals, and Highway Advisory Radios.

- Establish public/private sector initiative to develop a regional traveler information via a pagers, SMS messaging (PCS and GMS Cellular Phones), and web site.
- Establish Kiosk network to provide traveler and transit information to Austin Bergstrom International Airport (ABIA) and CapMetro customers.

Archive Data Management
- Automate the collection of data by the TxDOT Austin ATMS software.

Integration Polices
- Future ITS projects will take advantage of the synergies between the market packages selected by the Steering Committee (see Section 5.5).
- The Austin Regional ITS Architecture provides the framework for the integration of ITS systems in the region.
- The Austin Regional ITS Architecture is a "living document" that will be updated, as user needs change.
- The requirements for the development or procurement of new regional ITS systems will be based on the Austin Regional ITS Architecture.
- Regional ITS systems will be integrated/interfaced using approved ITS standards identified by the National ITS Architecture.

2.4 REGIONAL STAKEHOLDERS

The first step in the development of the Austin ITS Regional Architecture was to identify and schedule interviews with the stakeholders. The stakeholders were selected based on their involvement in transportation and public safety in the Austin region. Based on the results of the interviews, the members of the Steering Committee were selected from the group of stakeholders. Their knowledge and experience were key to the development of an effective ITS Architecture for the Austin region. The Table 2-2 identifies the Steering Committee members and provides contact information.

Table 2-2 - Steering Committee Members

Name	Agency	Phone	Email
David Belknap	Austin Fire Department	(512) 416-3323	david.belknap@ci.austin.tx.us
Charlie Brindell	TxDOT Traffic Operations Division	(512) 416-3268	cbrinde@dot.state.tx.us
Brian Burk	TxDOT Austin District Traffic Operations Division	(512) 832-7014	bburk@dot.state.tx.us
Carl Burklund	TxDOT Maintenance	(512) 385-0862	cburklu@dot.state.tx.us
Kelley Cook	Austin Police Department – 911	(512) 974-1697	kelley.cook@ci.austin.tx.us
Sam Cox	TxDOT Austin District Courtesy Patrol	(512) 832-7310	scox4@dot.state.tx.us

Name	Agency	Phone	Email
Michael Dutton	Capitol Area Metro Planning Org	(512) 974-2881	michael.dutton@ci.austin.tx.us
David Gerard	City of Austin Public Works Signals	(512) 974-7022	david.gerard@ci.austin.tx.us
Mike Hooffstetter	Travis County Sheriff Dept.	(512) 974-6083	mike.hooffstetter@ci.austin.tx.us
John Lancaster	Capital Metro	(512) 389-7586	john.lancaster@capmetro.org
Roland Merz	TxDOT Traffic Operations	(512) 416-3299	rmerz@dot.state.tx.us
Greg Middleton	City of Austin Emergency Medical Services	(512) 974-1695	greg.middleton@ci.austin.tx.us
David Powell	TxDOT Texas Turnpike Authority	(512) 225-1357	dpowel3@dot.state.tx.us
Teresa Reel	Travis County Justice and Public Safety	(512) 708-4416	teresa.reel@co.travis-tx.us
Tom Rioux	University of Texas	(512) 471-0513	rioux@mail.utexas.edu
Russ Rumney	City of Austin Police Department - Computer Aided Dispatch	(512) 974-3323	russ.rumney@ci.austin.tx.us
Geniva Simpson	Williamson County EMS	(512) 943-1399	gsimpson@wilco.org
Scott Swearengin	Office of Emergency Management	(512) 370-8862	scott.swearengin@ci.austin.tx.us
David Walther	Round Rock Public Works Department	(512) 218-5566	davidw@round-rock.tx.us
Catherine Wolff	TxDOT Planning/Programs	(512) 486-5124	cwolff@dot.state.tx.us

SECTION 3

REGIONAL ITS ARCHITECTURE DEVELOPMENT PROCESS

3.1 SUMMARY OF THE NATIONAL ITS ARCHITECTURE[2]

As background, this section explains the essential terminology and concepts needed to understand, navigate, and use the National ITS Architecture. It then provides a summary of the key documents produced under the National ITS Architecture development effort that results in a fully customized regional ITS architecture. The following concepts and terms are explained in this section:

- Logical Architecture
- Physical Architecture
- Standards

Logical Architecture

A logical architecture is best described as a tool that assists in organizing complex entities and relationships. It focuses on the functional processes and information flows of a system. Developing a logical architecture helps identify the system functions and information flows, and guides development of functional requirements for new systems and improvements. A logical architecture should be independent of institutions and technology. That is, it should not define where or by whom functions are performed in the system, nor should it identify how functions are to be implemented.

The logical architecture of the National ITS Architecture defined a set of functions (or processes) and information flows (or data flows) that are mapped to the Market Packages. Processes and data flows are grouped to form particular transportation management functions (e.g., manage traffic) and are represented graphically by data flow diagrams (DFDs), or bubble charts, which decompose into several levels of detail. In these diagrams, processes are represented as bubbles and data flows as arrows. Figure 3-1 and Figure 3-2 depict simplified data flow diagrams from the National ITS Architecture documents. Note that each bubble in the logical architecture is a process that describes some logical function to be performed.

For example, as shown in Figure 3-1, at the highest level of the National ITS Architecture, the manage traffic process (which includes traffic signal control functions) interacts with seven other processes.

Figure 3-2 illustrates how the manage traffic process is then further broken down into five sub-processes; how one of those processes, Provide Traffic Surveillance, is broken down into seven

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[2] Information from this section was taken directly from the *Key Concepts of the National ITS Architecture* found at http://www.its.dot.gov/arch/arch.htm

sub-processes; and so on. Each of these processes is then broken down even further so that a complete functional view of a system emerges. At the lowest level of detail in the functional hierarchy are the process specifications (referred to as Pspecs in the documentation). These process specifications can be thought of as the elemental functions to be performed in order to satisfy the user service requirements (i.e., they are not broken out any further). The information exchanges between processes and between Pspecs are called the (logical) data flows.
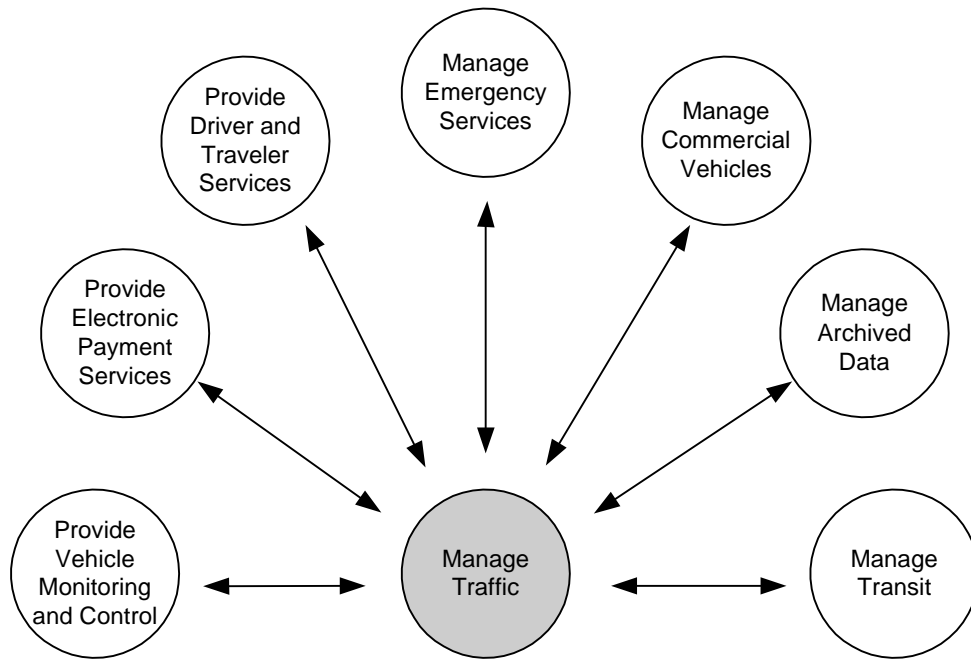
Figure 3-1. The Eight Major Processes within the Logical Architecture
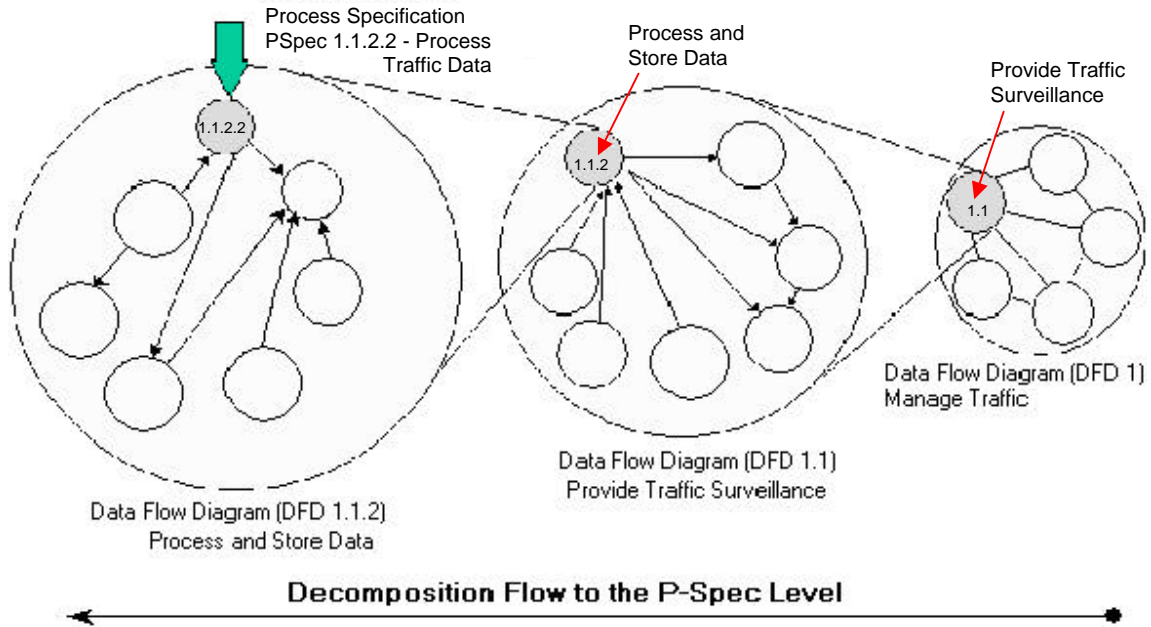
Figure 3-2. Example of Logical Architecture Functional Decomposition

Physical Architecture

A physical architecture is the physical (versus functional) view of a system. A physical architecture provides agencies with a physical representation (though not a detailed design) of how the system should provide the required functionality. A physical architecture takes the processes (or Pspecs) identified in the logical architecture and assigns them to physical entities (called subsystems in the National ITS Architecture). In addition, the data flows (from the logical architecture) that originate from one subsystem and end at another are grouped together into (physical) architecture flows. In other words, one architecture flow may contain a number of more detailed data flows. These architecture flows and their communication requirements define the interfaces required between subsystems, which form the basis for much of the ongoing standards work in the ITS program. Development of a physical architecture will identify the desired communications and interactions between different transportation management organizations. Figure 3-3 depicts the relationship between the logical and physical architecture. In the National ITS Architecture, the physical architecture is described by two layers: the transportation layer and the communications layer. Each of these is briefly described below.
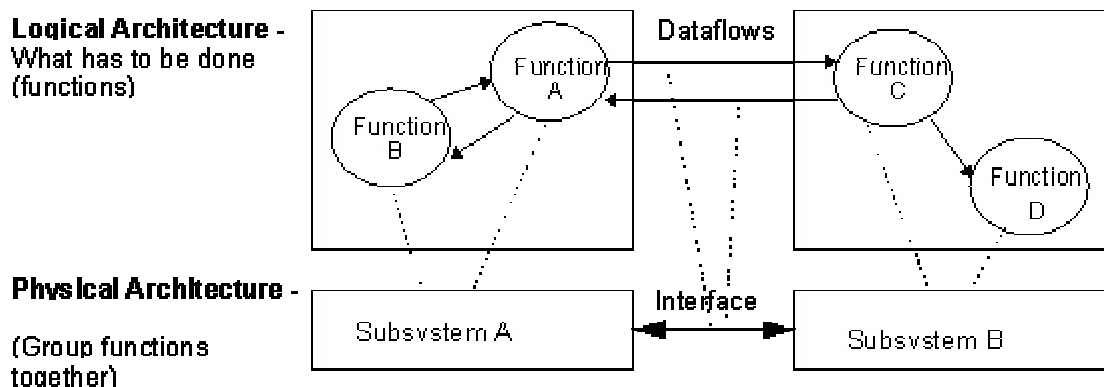
Figure 3-3. Representative Logical and Physical Architecture

Transportation Layer

The transportation layer of the physical architecture shows the relationships among the transportation-management-related elements. It is composed of subsystems for travelers, vehicles, transportation management centers, and field devices, as well as external system interfaces at the boundaries (called terminators in the National ITS Architecture). It may include:

- Field devices for traffic surveillance and motorist information dissemination
- Traffic signal and ramp metering controllers
- Transportation management centers
- Emergency management centers

Communications Layer

The communications layer of the physical architecture provides the communications services that connect the transportation layer components. This layer depicts all of the communications necessary to transfer information and data among transportation entities, traveler information and emergency service providers, and other service providers such as towing and recovery. The communications layer clearly identifies system interface points where national standards and communications protocols can be used.

Wireline communications includes the equipment necessary for the various subsystems of the architecture, including the Traffic Management and Roadway subsystems, to exchange data to perform their transportation functions. These communications services may be provided by agency-owned communications plants (e.g. twisted pair, coaxial, fiber, or spread-spectrum radio), or may be leased from a communications service provider. It should be noted that the term "wireline communication" as used in the National ITS Architecture, refers to communication between stationary points, (e.g. traffic signal control central and field

equipment). In this context, wireline communication may include wireless communication systems.

Standards

The architecture structure is a means through which relatively independent standards activities can proceed with harmonious results. Because the standards will be developed based on the architecture interfaces and data flows, information that cuts across standards activities is identified. This knowledge allows standards organizations to be aware of overlapping activities. It also permits the effective coordination of activities.

3.2 DEVELOPMENT PROCESS

Many different processes can be used to develop a regional ITS architecture. The development process used to create the Austin Regional ITS Architecture is shown in Table 3-1. Although these steps are shown in series, steps five through seven were repeated several times to build the architecture. The eight steps are described in this section.

Table 3-1. Eight Steps for Architecture Development

1.	Identify and Interview Stakeholders
2.	Formalize ITS theme priorities
3.	Build Systems Inventory for region
4.	Determine Market Packages to be implemented in plan
5.	Determine relevant equipment packages for region
6.	Determine relevant Process Specifications for region
7.	Determine relevant Architecture Flows for region
8.	Build list of Standards relevant for region

Identify and Interview Stakeholders

The first step in the development of the regional architecture is the establishment of the core stakeholder coalition - the ITS Advisory Committee. The committee is a collection of representatives for the various parties that have an interest in the future of the region. The knowledge and experiences of the committee members play a key role in the development of an ITS vision. The role of the committee is to guide the ITS planning efforts being performed to prepare the ITS Master Plan.

Interviews with the advisory committee members serve as the primary source for identifying current problems and defining and prioritizing appropriate ITS goals and objectives. The discussions provide an understanding of the impediments to the region's operations and the relationships with other agencies. In addition, ITS-related activities that are already in progress are identified.

Formalize ITS Theme Priorities

This step is used to build consensus on needs and services for the region. In prioritizing the needs and services (or ITS "themes"), a process called a Delphi Survey is used. The Delphi Survey is a decision-making process used to help a group of experts move toward consensus on subjective decisions. Delphi is an attempt to elicit expert opinion in a systematic manner for useful results. It usually involves iterative questionnaires administered to individual experts in a manner protecting the anonymity of their responses. Feedback of results accompanies each iteration of the questionnaire, which continues until convergence of opinion, or a point of diminishing returns, is reached. The end product is the consensus of experts, including their commentary, on each of the items, usually organized as a written report by the Delphi investigator(s).

Market packages are used as the ITS themes to be prioritized. Within the National ITS Architecture, groups of Market Packages have been developed in order to address the needs of those who will be planning ITS activities. Market packages are designed to address specific transportation problems and needs. The National ITS Architecture includes a total of 63 market packages that reflect the current definition of ITS and the evolving technology market.

Build Systems Inventory for Region

A systems inventory is built using the notes from the Stakeholder interviews and data that may already be documented in Regional ITS Plans, ITS studies, ITS Project documentation, Request For Proposals (RFPs), or any other relevant documents. The inventory items consist of identified systems (existing or planned) and the owning agency. Each item is mapped to the National ITS Architecture subsystems and terminators. The National ITS Architecture is used to identify inventory gaps and identify additional inventory items to fill the gaps.

Determine Market Packages to be Implemented in Plan

Based upon the Market Package priority ranking results of the Delphi Survey, determine which market packages are to be considered as part of the regional architecture. Typically, a ten-year planning period is used. Therefore, only those market packages that realistically can be implemented in that time frame (given budget and appropriate resources) should be taken into consideration for the region.

Determine Relevant Equipment Packages for Region

The Market packages are defined by sets of equipment packages (i.e., smallest units of ITS that can be purchased and deployed) required to work together to deliver a given transportation service and the major architecture flows between them and other important external systems. They identify the pieces of the National ITS Architecture required to implement a service.

Referencing documents published in relation to the National ITS Architecture for Federal Highway Systems, equipment packages can be mapped to the relevant market packages selected for the regional plan.

Determine Relevant Process Specifications for Region

Develop a high-level description of the required functionality for the region. The information employed to determine what functionality is required is gathered from the systems inventory, selected market packages, and information exchanges defined by the architecture flows. This step involves several iterations between the three inputs as well as key stakeholders.

Determine Relevant Architecture Flows for Region

Identify and document the connections between systems in the region. This is determined by the systems inventory and the selected market packages for the region. This step also involves several iterations between the inputs as well as key stakeholders.

Build List of Standards Relevant for Region

Identify the ITS Standards that support the interfaces depicted in the regional ITS architecture. There are standards associated with several of the architecture flows in the National ITS Architecture. Standards for the exchange of information between ITS Systems are important not only from an interoperability point of view; it also reduces risk and cost since a region can select among multiple vendors for deployment products.

SECTION 4

OPERATIONAL CONCEPT

This section presents the operational concept for the Austin Region. The institutional relationships are addressed by discussing the existing or required agreements and the roles and responsibilities of participating agencies. An initial estimates of the near term cost for implementing the regional architecture are contained in the Austin Region ITS Deployment Plan.

4.1 OVERVIEW

In keeping with the Integration Strategy detailed in Section 2, the following subsections present the key operational elements of Austin ITS Regional Architecture organized into four categories. These categories are Detection, Verification/Dispatch, Response/Clearance, and Data archive/planning. See Figure 4-1 for a summary of the categories.
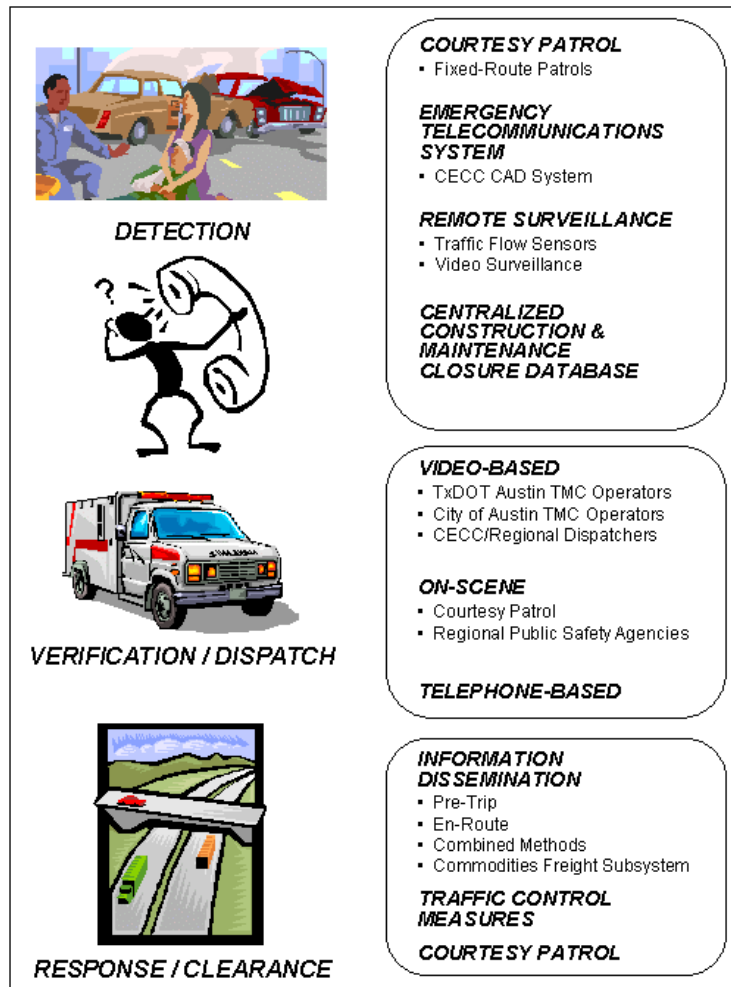
Figure 4-1. Summary of Key Operational Elements

4.2 DETECTION

The first step in being able to manage non-recurring, and/or recurring, event congestion is detecting that something has "happened" to the traffic stream. This "something" can be caused by a stalled vehicle, a crash, or a roadway construction/maintenance operation. The flow of traffic can also be reduced due to increased travel demand from urban/suburban commuting or a downtown concert/regional sporting event. In all cases, increasing safety and reducing travel delays and associated driver frustrations is contingent on the timely and efficient detection of all such "happenings."   Accordingly, traffic management in the Austin region will use multiple approaches to achieve this detection. These approaches are listed in Table 4-1 and discussed in subsequent sections.

Table 4-1. Approaches For Detecting Traffic Flow

Freeway service patrol discovery;
Public and private-driver call-ins via cellular/wireless and land-line 9-1-1 and associated emergency telecommunication systems;
Automated incident/recurring congestion detection via algorithms analyzing installed traffic flow sensors;
Video Surveillance of freeways and key intersections; and
Inputs to a centralized statewide construction and maintenance and special event road restrictions/road closure "clearinghouse."

TxDOT Austin Courtesy Patrol

The Austin District of TxDOT operates a freeway service patrol that operates on the major State and Federal freeways in the region. Figure 4-2 shows the routes covered by the Courtesy Patrol. The service patrol assists stranded motorists, reports abandoned vehicles found along the freeway to the appropriate agency, and report other incidents that occur along the freeway. As such, each service patrol vehicle must carry an inventory of equipment. Table 4-2 lists the equipment on board each service patrol vehicle to assist patrons.
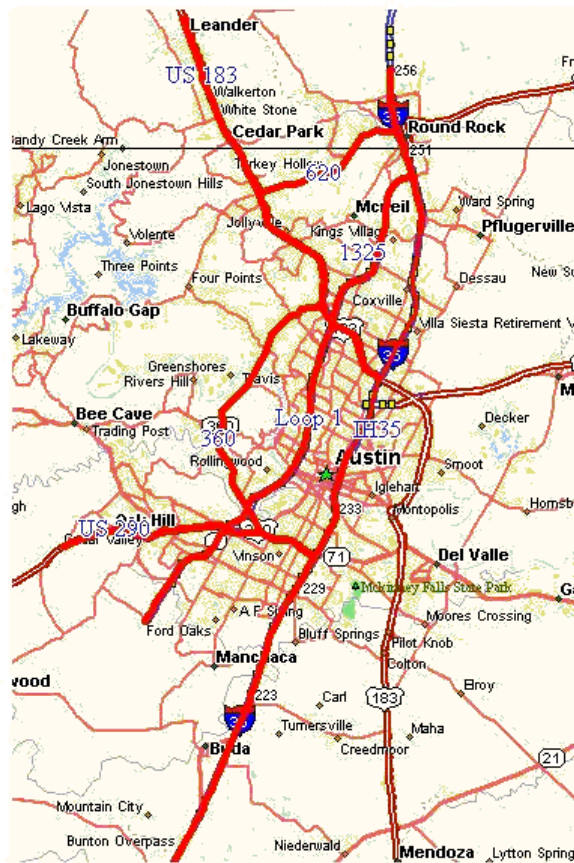
Figure 4-2. Freeway Service Patrol Routes

Table 4-2. Equipment Onboard Each Service Patrol Vehicle

Tool Box with a basic set of tools
First Aid Kit
Fire Extinguishers
Fire Axe
Pry Bar
Mechanical and Hydraulic Jacks
Wood Blocks
Lug Wrenches
Rope and Chains
5 Gallon Water Can
2 Gallon Gas Can
Plug-N-Dike Cement
Hand Held Stop Signs
Traffic Cones
Red Flag
Flares
Maps
Brooms
Shovel

Each service patrol vehicle will also be equipped with a new radio system and Mobile Data Computer (MDC) as part of the 9-1-1 RDMT project. This new equipment combined with the shared CAD system at the CECC will allow TxDOT and the CECC partners to dispatch the service patrol, track their status, and share incident data reported by the service patrol operator. The service patrol operator can use the radio system or MDC to request additional help should it be required.

Emergency Telecommunications System

Wireless/Cellular phone usage has recently become so widespread that many emergency services agencies verify that the vast majority of reported incidents are not discovered by police or freeway service patrols. They are instead reported to emergency authorities by passing drivers via cellular phones. Accordingly, the new Public Safety Answering Point (PSAPs) and associated CAD system being installed by the 9-1-1 RDMT project will be the key components for incident detection.

The CECC dispatch center is divided into 9-1-1 call-takers and dispatchers for each Travis County and City of Austin public safety agency. Upon receipt of a call, the 9-1-1 call-taker determines the emergency service that the caller needs and forwards the call to the appropriate dispatcher. As the incident data is entered in the CAD system, it will be sent to the TxDOT ATMS via the Center-to-Center software if appropriate. Should it be necessary to dispatch a service patrol vehicle to the incident, the dispatcher can dispatch a service patrol vehicle via the radio system or MDC.

Remote Surveillance

The remote surveillance systems installed in the Austin region consists of loop detectors and video cameras. Remote surveillance will allow the TxDOT Austin and the City of Austin TMC personnel to monitor freeway traffic conditions, surface street traffic conditions, and verify an incident. Remote surveillance could make it possible to detect incidents in areas of the Austin region were it could take longer than ten minutes to be reported by telephone[3].

Automated processes can monitor the output of remote traffic sensors and report abnormal traffic flow conditions to TMC personnel. These same processes can also detect conditions that indicate a possible incident and notify TMC personnel. Figure 4-3 shows a TxDOT Austin video camera

Figure 4-3 TxDOT Austin District Video Camera

Centralized Construction & Maintenance Closure Database

Highway construction, maintenance, and various utility company activities that occur within a freeway's right-of-way can cause traffic delays due to lane and/or shoulder restrictions that limit vehicle throughput along a given highway corridor. Accordingly, the Austin region should include a strategy to "detect" occurrences of these scheduled incidents.

A centralized construction and maintenance closure database for the Austin region will allow the TxDOT and the City of Austin TMC to plan for road closures and inform Travis County and City of Austin public service agencies of road closures.

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[3] According to Salvucci, A., Presentation at the National Emergency Number Association Annual Conference, June 2001, the time delay for reporting 20% of rural crashes and 6% of urban crashes to a 9-1-1 center will exceed 10 minutes.

A regional centralized construction and maintenance closure database could provide single common location for managing closure data. This will reduce the number of forms submitted by contractors. For those with Internet capabilities, the database should be capable of receiving updates directly from each contractor's field representative. The database could also be linked to TxDOT's Motor Carrier Division vehicle route programs to enhance TxDOT's oversize/overweight permitting process. This type of central database can greatly enhance abilities for current traffic information to be disseminated in the vicinity of each project, which can also include pre-notification to the traveling public of anticipated start and end dates, and times of these scheduled projects.

4.3 VERIFICATION AND DISPATCH

Once a potential incident or planned event has been detected, it is necessary to verify that the information is correct. This is a crucial first follow-up procedure to incident detection that ensures emergency response personnel are dispatched to the correct location, with the appropriate equipment. This includes directing them via the most efficient routings for the particular traffic conditions at that time. For example, it might be faster to send response vehicles the "wrong-way" down an exit ramp in order to avoid incident congestion. In short, verification mitigates incident response "confusion" that can originate when cellular call-ins from the public do not have sufficiently accurate roadway names, directions, or other needed location information reported[4]. Verification also mitigates situations when duplicate or conflicting messages have been received by 9-1-1 call-takers such that they need to determine if conflicts might actually be because two different incidents are closely spaced to each other. Similarly, it can determine if an automated incident detection has generated a false incident detection alarm. Incident verification occurs "at the incident scene" or remotely via CCTV video.

Video-Based

The primary users of video feeds for incident verification will be the CECC, City of Round Rock, and Williamson County dispatchers. Public safety answering points are often the first to detect freeway incidents due to the historically large percentage of freeway incidents that the public reports to them via cellular phone calls and private-sector "mayday" service centers such as OnStar[TM]. As such, it is envisioned that real-time CCTV camera video feeds from TxDOT and the City of Austin; including secondary control capabilities, can enable emergency service personnel to accurately dispatch proper response assets. This is because confirmation could be performed visually prior to emergency personnel getting on-scene. Video will be especially beneficial for enabling dispatchers to see if any HAZMAT placards are on commercial vehicles involved in a given incident. Similarly, video will enable location and situational confirmation for cases where it might be quicker to dispatch vehicles the "wrong way" down highway interchange ramps.

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[4] It is envisioned that supplemental reference markers installed at 2/10-mile intervals along monitored urban roadways and at 1/2-mile intervals along rural/suburban roadways to help cellular callers more effectively report the actual location of an incident.

On-Scene

If a Courtesy Patrol operator or public safety personnel were the original "detector" of a given incident, then verification is essentially a moot point. This is because a properly trained person would already be located at the incident scene with abilities to obtain and transmit additional desired details to a CECC dispatcher. For incidents that are detected by other means and cannot be verified by video, a CECC dispatcher would send an alert to the nearest available Courtesy Patrol operator or public safety officer.

Telephone-Based

Telephone-based verification would be used to verify scheduled incidents such as major concert, sporting, and other special events. Planned roadway restrictions "detected" via a centralized construction and maintenance closure database are also verified by telephone. TxDOT or the City of Austin TMC Operators would verify the scheduled incident by calling a contact person (e.g., construction/maintenance field engineer, event promoter, utility personnel, etc.) for all incidents scheduled for a particular day. Thus, for example, it can be verified that a construction activity is actually going to happen, and/or a special event will or will not have as large a traffic impact as originally anticipated (e.g., revised attendance figures).

4.4 RESPONSE AND CLEARANCE

After an incident or congestion-causing event has been detected, verified, and any required emergency services, direct TMC actions will begin. As detailed in the following subsections, this includes:

- Traffic information dissemination via highway advisory radio, dynamic message signs, pagers, Internet web sites, and phones;
- Traffic signal control strategies on linked arterials; and
- Courtesy Patrol personnel providing on-scene assistance to Incident Commanders with traffic control and safety measures.

In all cases, however, it must be emphasized that the response measures may continue well after a given incident has been physically cleared from a roadway. If a roadway's capacity has been reduced for an extended length of time, it will cause congestion to build up. To address this residual congestion, response measures should continue until such time that all queues are dissipated and traffic levels have returned to normal.

Information Dissemination

In discussing information dissemination, a distinction must be made between traditional en route dissemination elements such as HARs and DMSs, and pre-trip elements such as Internet websites and kiosks. Items such as pagers that can be used for both cases are grouped into a third category.

Figure 4-4 TxDOT Austin District DMS

En Route

It is envisioned that TxDOT Austin TMC key operational philosophy for activating individual dynamic message signs and/or lane control signals be based on a concept "area of influence." When an incident or recurring traffic congestion is detected, the ATMS software will calculate a variable radius around the detected location, which is to be based upon categories of severity and anticipated time to clear for a given incident or congestion level. Then, all available devices within this radius would be activated to provide traffic information. For example Table 4-3 describes a small subset of incident characteristics and the resultant action to be taken by the TMC.

Table 4-3. Examples of TMC Actions by Incident Characteristics

Time of Incident	Blockage	Expected Clearance	Resultant Action
Between 6:00 AM and 10:00 AM	1 Lane	Less than 2 Hrs.	Activate DMS signs and lane control signals within 1 major interchange/decision point prior to incident
Between Midnight and 6:00 AM	1 Lane	Less than 2 Hrs.	No special action due to limited amount of traffic for time period

Time of Incident	Blockage	Expected Clearance	Resultant Action
Between 10:00 AM and 3:00 PM	1 Lane	More than 4 Hrs.	Activate DMS signs and lane control signals within 2 major interchange/decision point prior to incident
Between 3:00 PM and 7:00 PM	More than 2 Lanes	Between 30 Min. and 2 Hrs.	Activate all DMS signs and lane control signals in the direction of the incident

As appropriate for each situation, sign messages should include items such as exit number and/or street name where congestion starts and eases, travel times on alternate routes, and reasons to expect delays and/or to take specified alternate routes (if available). Other more detailed information can be recorded onto the HARs. Finally, DMS messages should be no more than two frames long; especially, for large DMSs.

When no traffic events are taking place that warrant messages to be placed onto a DMS they will be blank. For the HARs, Public Service Announcements (PSAs) could be broadcast when no traffic alerts are needed.

Pre-Trip

The Austin Regional ITS will use an Internet website for disseminating pre-trip traffic information. This site may be operated by a third party ISP (e.g., MetroNetworks or News8). The website will be kept constantly updated via TxDOT Austin's Center-To-Center subsystem. The website should include color-coded maps of route-based travel speeds and travel times and live "snapshot" images of traffic conditions as taken directly from CCTV cameras. Figure 4-5 shows a sample Internet website from Atlanta, which highlights real-time color-coded average traffic speeds. Figure 4-6 is a CCTV camera web page snapshot taken from the KYTC TRIMARC website. It is envisioned that the Austin Regional ITS Internet website will also allow users to directly link to related websites. This can include sites for regional transit, weather, and/or tourist information. The Austin Regional ITS Internet web site could be made available at free-standing kiosks to be deployed by TxDOT at area rest stops, service stations along IH35, Toll road service plazas, and ABIA. Public/private partnerships could be used facilitate the development of the web site and the deployment of kiosks.

The data needed to keep the public informed of traffic conditions in the Austin Region could be used by a "Commodities Freight" application. This application would help business in the Austin region that use "Just-in-Time" manufacturing to schedule the delivery of materials and/or re-route delivery vehicles around major incidents or construction work zones. Regional freight companies and delivery services could also use this application. As with the Austin Region ITS web site, the "Commodities Freight" application could be developed through a Public/Private partnership.
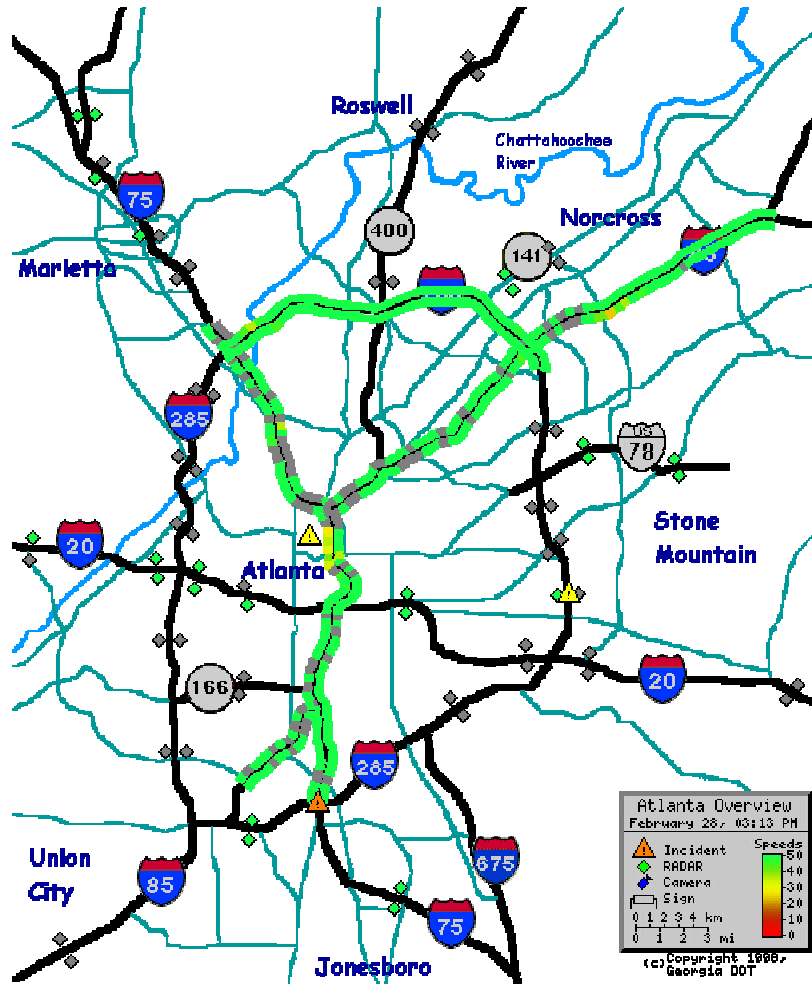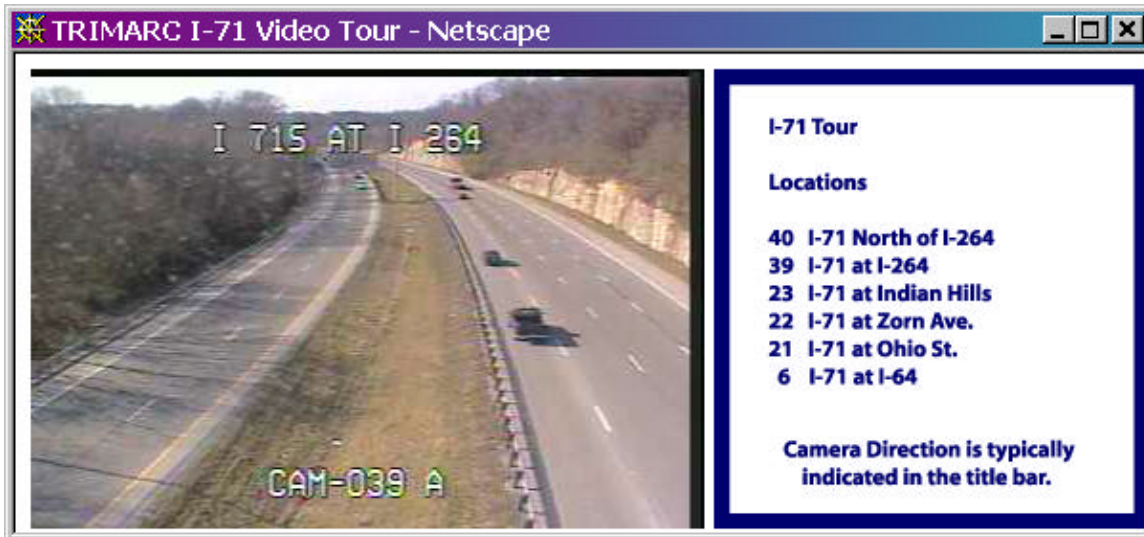
Figure 4-5. GDOT Atlanta Web Map

Figure 4-6. KYTC TRIMARC Video Camera Web Page

Combined Methods

It is recommended that the Austin Regional ITS could disseminate traffic information via alphanumeric pagers, PCS cellular phones, or GSM cellular phone to those desiring to subscribe to this service. Users would be able to use the Austin Regional ITS website or a Commercial ISP website to subscribe for traffic alerts for the routes and time-of-day/day-of-week periods they desire. Similar options for information to be sent to their E-mail accounts should also be made available. It is also envisioned that small applets using the Wireless Application Protocol (WAP) be made available to those who want to access information via wireless devices. Finally, since all such information disseminated will ultimately be obtained from the same computerized data server that supports the Austin Regional ITS Internet website, it is envisioned that some type of data-to-voice synthesis software package also be made available so that travelers can dial-in for up-to-the-minute, automated, route-specific travel time and average travel speed information.

Traffic Control Measures

The Austin TMC ATMS could be linked to the City of Austin and City of Round Rock computerized traffic signal systems for monitoring and/or remotely initiating signal timing plans. This can help to mitigate traffic congestion in areas that have alternate routes around incidents and recurring congestion events.

Courtesy Patrol

During major freeway incidents, the Courtesy Patrol personnel will be available to provide support to on-scene public safety/emergency services Incident Commanders. This can include setting-up formal road closures with cones, barrels, tapers, arrow boards, and portable variable message signs. Finally, assistance can include being additional "eyes" for the TMC or CECC by entering updated incident information via an MDC-based interface to the ATMS.

4.5 ARCHIVED DATA MANAGEMENT/PLANNING

Data from installed traffic flow sensors not only provide required inputs to functions for automated congestion alerting and associated incident detection algorithms, but they are also a consistent source of valuable and otherwise hard-to-obtain information for transportation planning. By enabling "status views" of an entire roadway network over multiple time periods and during a variety of events, traffic/incident management engineers can more efficiently and effectively formulate improved means for implementing appropriate response, necessary diversion plan actions, and/or associated traffic information messages to be disseminated through connected subsystems (e.g., highway advisory radio transmitters, dynamic message signs, pagers, etc.). This data can also be especially valuable for TxDOT-affiliated researchers such as those associated with the Texas Transportation Institute. Accordingly, it is envisioned that the TxDOT Austin TMC should include features that maintain detection subsystem data in an

accessible archive for research-related analysis, project evaluation, future planning, traffic modeling/simulation activities, and for generating any needed management reports.

For example, Figure 4-7 suggests how data generated by TxDOT Austin can be used to supplement or replace existing traffic data sources for selected applications.
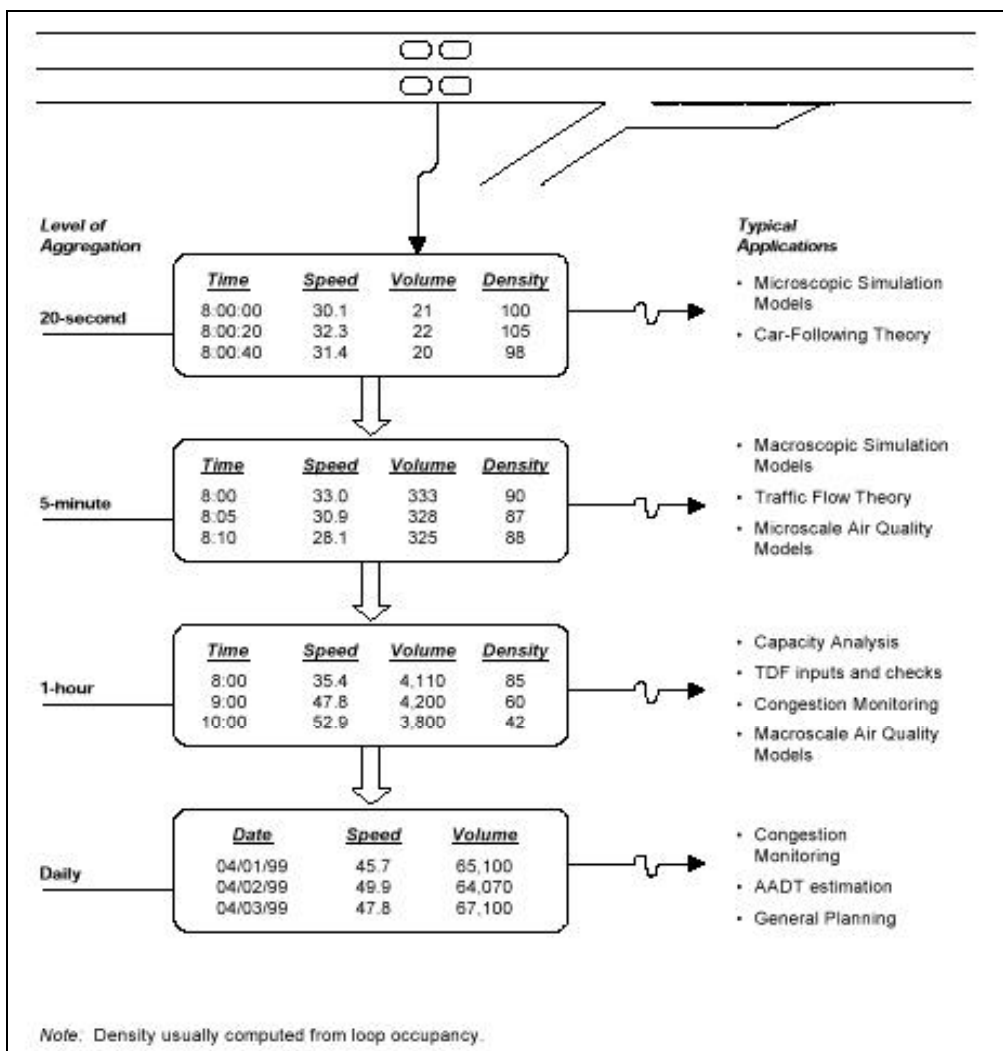
Figure 4-7. Use of Archived Data for Multiple Applications[5]

As further described by the National ITS Architecture Program, several general observations can be made concerning the use of data for other related purposes:[6]

- The continuous nature of most data generated by ITS removes temporal sampling bias from estimates and allows the study of variability.

[5] Margiotta, R., "ITS as a Data Resource: Preliminary Requirements for a User Service," Federal Highway Administration Office of Highway Information Management, April 1998, p. 19.
[6] Ibid. pp. 15-20.

- Data to meet emerging requirements and for input to new modeling procedures will have to be more detailed than what is now collected.
- The use of data generated by ITS for multiple purposes is a way to stimulate the support of other stakeholders for ITS initiatives.
- Promoting the use of archived data for multiple purposes complements the initiative for integrating ITS in general.
- Other uses of the data already being collected can enable a value-added component to ITS.
- The creation and use of multiple *system performance measures* that ITS can provide via included data is taking on greater significance in traditional highway operations.

In this concept traffic volumes, speeds, and vehicle classification data can be recorded either periodically or cumulatively for use as accurate input to GIS-based traffic planning models and for related management systems. This can help evaluate options related to future transportation facilities and/or traffic control system projects. Similarly, the combination of vehicle crash data and traffic violation data with traffic engineering data can help plan safety improvement programs and/or to indicate the locations of any related infrastructure deficiencies that might need to be addressed.

4.6 EXISTING AGREEMENTS

The Texas Department of Transportation Austin District, Travis County, the City of Austin, and Capital Metropolitan Transportation Authority have all signed an agreement to participate in the 9-1-1 RDMT Project. The agreement provides for the development of a unified pubic safety communication system that could include 9-1-1 operations, computer-aided dispatch, mobile data information transfer, public safety and public service radio communications, and intelligent transportation management, all of which might be operated from a fully-integrated combined center. This agreement also includes the Austin Independent School District and the Austin Bergstrom International Airport.

The Texas Department of Transportation Austin District has a "service-for-service" agreement with local television stations. The agreement is with KEYE, KVUE, and News 8. KXAN is interested in signing an agreement with TxDOT if the current technical issues can be resolved.

4.7 FUTURE AGREEMENTS

The Texas Department of Transportation Austin District will need the following agreements to implement the features of the Austin Regional ITS Architecture:

- City of Austin Traffic Management Center – For the exchange of traffic data and control of signal plans.
- City of Round Rock – For the integration of the City of Round Rock CAD system and TxDOT Austin ATMS.

- Williamson County – For the integration of the County's CAD system and TxDOT Austin ATMS.
- Information Service Provider – To provide traffic and transit data to the public on a "service-for-service" basis. The information would be provided to the public via a web site, pagers, SMS messaging (PCS and GMS cellular phones), and Personal Digital Assistant.
- Steering Committee – A Memorandum of Understanding stating that the Steering Committee members agree to continue meeting to maintain the architecture and to implement the architecture.

The "Standard Agreement" that TxDOT uses to exchange traffic data for services can be found in Appendix B.

SECTION 5

CONCEPTUAL DESIGN

5.1 SYSTEMS INVENTORY

The Systems Inventory maps the agencies in the Austin Region and their systems to the subsystems and terminators of the National ITS Architecture. Table 5-1 presents the System Inventory sorted by subsystem/terminator. Table 5-2 presents the System Inventory sorted by stakeholder.

Table 5-1. Inventory of Regional Subsystems/Terminators Sorted by System

Subsystem or Terminator	System	Owning Stakeholder	Status
Archived Data Administrator	TxDOT Austin CECC Archive System Administrator	TxDOT Austin District	Planned
Archived Data Management Subsystem	TxDOT Austin Historical Incident Data Repository	TxDOT Austin District	Planned
	TxDOT Austin Historical Traffic Data Repository	TxDOT Austin District	Existing
	Record Management System (Police, Fire, EMS)	CECC/TMC Stakeholders	Planned
Archived Data User Systems	Emergency Management Scenario Training	Austin Office of Emergency Management	Existing
	TxDOT Researchers	TxDOT	Planned
	Academic / Research Organizations	Various Ownerships	Existing
Basic Vehicle	Individual Vehicle Car Radio / CB-Radio	Individual	Existing
Construction and Maintenance	City of Austin Maintenance System	City of Austin	Existing
	City of Round Rock Maintenance System	City of Round Rock	Existing
	Travis County Construction and Maintenance Management System	Travis County Natural Resources and Transportation	Existing
	TxDOT Highway Maintenance Management System	TxDOT Maintenance	Existing
	Williamson County Highway Maintenance Management System	Williamson County Transportation	Existing
Driver	Driver Operating A Vehicle	Individual	Existing
Emergency Management	Austin CECC/TMC Dispatch System	CECC/TMC Stakeholders	Planned
Emergency Personnel	Turnpike Courtesy Patrol	Texas Turnpike Authority	Planned

Subsystem or Terminator	System	Owning Stakeholder	Status
	TxDOT Austin Courtesy Patrol	TxDOT Austin District	Existing
	Travis County Emergency Personnel	Travis County Public Safety	Existing
	Austin Police, Fire, EMS Responders	Austin Department of Public Safety	Existing
	ABIA (Airport) Police	Austin Bergstrom International Airport	Existing
Emergency System Operator	Austin CECC/TMC Dispatchers	CECC/TMC Stakeholders	Planned
	Emergency Call 911 Operator	CECC/TMC Stakeholders	Existing
Emergency Telecommunications System	Emergency Call 911 PSAP	CECC/TMC Stakeholders	Planned
Emergency Vehicle Subsystem	Travis County Emergency Vehicle Radio Communications	CECC/TMC Stakeholders	Planned
	Emergency Vehicles Equipped with AVL	CECC/TMC Stakeholders	Existing
	TxDOT Austin Courtesy Vehicle Mobile Data Terminal	CECC/TMC Stakeholders	Planned
	TxDOT Austin Courtesy Vehicle Radio Communications	CECC/TMC Stakeholders	Planned
	Turnpike Authority Courtesy Vehicle Mobile Data Terminal	CECC/TMC Stakeholders	Planned
	Travis County Emergency Vehicle Mobile Data Terminal	CECC/TMC Stakeholders	Planned
	Austin Police, Fire, EMS Vehicle Radio Communications	CECC/TMC Stakeholders	Existing
	Austin Police, Fire, EMS Vehicle Mobile Data Terminal	CECC/TMC Stakeholders	Planned
	Turnpike Authority Courtesy Vehicle Radio Communications	CECC/TMC Stakeholders	Planned
	3M Opticom Signal Preemption System	Austin Fire Department	Existing
	ABIA (Airport) Vehicle Mobile Data Terminal	Austin Bergstrom International Airport	Existing
	ABIA (Airport) Vehicle Radio Communications	Austin Bergstrom International Airport	Existing
Event Promoters	Special Event Sponsors and Promoters	Various Ownerships	Existing
Fleet and Freight Management	Motor Carrier CVO System	Department of Public Safety	Existing
Government Reporting Systems	Highway Performance Monitoring System	Federal Highway Administration	Existing
	Fatal Analysis Reporting System	Department of Public Safety	Existing
Information Service Provider	Travel and Traffic Information Provider	Metro Networks	Existing
ISP Operator	Travel and Traffic Information Operator	Metro Networks	Existing

Subsystem or Terminator	System	Owning Stakeholder	Status
Location Data Source	Device That Provides Accurate Position Information	City of Austin	Existing
Map Update Provider	City of Austin GIS Agency	Various Ownerships	Existing
Media	Traffic and Travel Information System	Various Ownerships	Existing
Other Archives	Statewide Historic Incident Data Network	TxDOT Traffic Operations Division	Planned
	Statewide Historic Traffic Data Network	TxDOT Traffic Operations Division	Planned
Other EM	Texas Highway Patrol Dispatch Center	Texas Department of Public Safety	Existing
	Round Rock Dispatch System	Round Rock Public Safety Agencies	Existing
	Williamson County Dispatch Center	Williamson County EMS/EOC	Existing
Other TM	Austin Signal Control Center	Austin DPW and Transportation	Existing
	Round Rock TMC	City of Round Rock	Planned
Personal Information Access	Individual Pagers	Individual	Planned
	Internet Browser	Individual	Planned
	Individual Fax	Individual	Planned
	Individual Cell- and Land-Line Telephones	Individual	Planned
Remote Traveler Support	Traveler Kiosk Network	TxDOT Austin District	Planned
	Distress Signal Wireline Communications	CapMetro	Planned
	Transit Secure Area Monitoring System	CapMetro	Planned
Roadway Environment	Conditions that may Affect ITS Equipment Operations	TxDOT Austin District	Planned
	Conditions that will Impact Driving	TxDOT Austin District	Existing
Roadway Subsystem	Texas Turnpike Authority Sensors, Cameras, DMS, and HAR w/Flashers	Texas Turnpike Authority	Planned
	Austin Flood Early Warning System	Austin Office of Emergency Management	Existing
	Austin Signals	City of Austin	Existing
	TxDOT Austin Signals	TxDOT Austin District	Existing
	Austin Sensors, Cameras, and HAR	City of Austin	Existing
	TxDOT Austin Sensors, Cameras, DMS, and HAR w/Flashers	TxDOT Austin District	Existing
	RWIS Network	TxDOT Austin District	Existing
Secure Area Environment	Transit Stops and Stations	CapMetro	Planned
Traffic	Vehicles on the Road	Various Ownerships	Existing
Traffic Management	TxDOT Austin TMC	TxDOT Austin District	Existing
Traffic Operations Personnel	TMC Operators / Dispatchers	TxDOT Austin District	Existing

Subsystem or Terminator	System	Owning Stakeholder	Status
Transit Driver	Transit Vehicle Drivers	CapMetro	Existing
Transit Management	CapMetro Dispatch System	CapMetro	Existing
Transit User	Individual Using Transportation Services	Individual	Existing
Transit Vehicle Subsystem	Transit Vehicle Monitoring System	CapMetro	Existing
Traveler	Pre-Trip Individual Using Transportation Services	Individual	Existing
Vehicle	System That Provides Accurate Position Information	City of Austin	Existing
Weather Service	Weather Network Subscription	Various Ownerships	Existing

Table 5-2. Inventory of Regional Subsystems/Terminators Sorted by Stakeholder

Owning Stakeholder	System	Subsystem or Terminator	Status
Austin Bergstrom International Airport	ABIA (Airport) Police	Emergency Personnel	Existing
	ABIA (Airport) Vehicle Mobile Data Terminal	Emergency Vehicle Subsystem	Existing
	ABIA (Airport) Vehicle Radio Communications	Emergency Vehicle Subsystem	Existing
Austin Department of Public Safety	Austin Police, Fire, EMS Responders	Emergency Personnel	Existing
Austin DPW and Transportation	Austin Signal Control Center	Other TM	Existing
Austin Fire Department	3M Opticom Signal Preemption System	Emergency Vehicle Subsystem	Existing
Austin Office of Emergency Management	Austin Flood Early Warning System	Roadway Subsystem	Existing
Austin Office of Emergency Management	Emergency Management Scenario Training	Archived Data User Systems	Existing
CapMetro	CapMetro Dispatch System	Transit Management	Existing
	Distress Signal Wireline Communications	Remote Traveler Support	Planned
	Transit Secure Area Monitoring System	Remote Traveler Support	Planned
	Transit Stops and Stations	Secure Area Environment	Planned
	Transit Vehicle Drivers	Transit Driver	Existing
	Transit Vehicle Monitoring System	Transit Vehicle Subsystem	Existing
CECC/TMC Stakeholders	Austin CECC/TMC Dispatch System	Emergency Management	Planned
	Austin CECC/TMC Dispatchers	Emergency System Operator	Planned
	Austin Police, Fire, EMS Vehicle Mobile Data Terminal	Emergency Vehicle Subsystem	Planned
	Austin Police, Fire, EMS Vehicle Radio Communications	Emergency Vehicle Subsystem	Existing

Owning Stakeholder	System	Subsystem or Terminator	Status
	Emergency Call 911 Operator	Emergency System Operator	Existing
	Emergency Call 911 PSAP	Emergency Telecommunications System	Planned
	Emergency Vehicles Equipped with AVL	Emergency Vehicle Subsystem	Existing
	Record Management System (Police, Fire, EMS)	Archived Data Management Subsystem	Planned
	Travis County Emergency Vehicle Mobile Data Terminal	Emergency Vehicle Subsystem	Planned
	Travis County Emergency Vehicle Radio Communications	Emergency Vehicle Subsystem	Planned
	Turnpike Authority Courtesy Vehicle Mobile Data Terminal	Emergency Vehicle Subsystem	Planned
	Turnpike Authority Courtesy Vehicle Radio Communications	Emergency Vehicle Subsystem	Planned
	TxDOT Austin Courtesy Vehicle Mobile Data Terminal	Emergency Vehicle Subsystem	Planned
	TxDOT Austin Courtesy Vehicle Radio Communications	Emergency Vehicle Subsystem	Planned
City of Austin	Austin Sensors, Cameras, and HAR	Roadway Subsystem	Existing
	Austin Signals	Roadway Subsystem	Existing
	City of Austin Maintenance System	Construction and Maintenance	Existing
	Device That Provides Accurate Position Information	Location Data Source	Existing
	System That Provides Accurate Position Information	Vehicle	Existing
City of Round Rock	City of Round Rock Maintenance System	Construction and Maintenance	Existing
	Round Rock TMC	Other TM	Planned
Department of Public Safety	Fatal Analysis Reporting System	Government Reporting Systems	Existing
	Motor Carrier CVO System	Fleet and Freight Management	Existing
Federal Highway Administration	Highway Performance Monitoring System	Government Reporting Systems	Existing
Individual	Driver Operating A Vehicle	Driver	Existing
	Individual Cell- and Land-Line Telephones	Personal Information Access	Planned
	Individual Fax	Personal Information Access	Planned
	Individual Pagers	Personal Information Access	Planned
	Individual Using Transportation Services	Transit User	Existing

Owning Stakeholder	System	Subsystem or Terminator	Status
	Individual Vehicle Car Radio / CB-Radio	Basic Vehicle	Existing
	Internet Browser	Personal Information Access	Planned
	Pre-Trip Individual Using Transportation Services	Traveler	Existing
Metro Networks	Travel and Traffic Information Operator	ISP Operator	Existing
	Travel and Traffic Information Provider	Information Service Provider	Existing
Round Rock Public Safety Agencies	Round Rock Dispatch System	Other EM	Existing
Texas Department of Public Safety	Texas Highway Patrol Dispatch Center	Other EM	Existing
Texas Turnpike Authority	Texas Turnpike Authority Sensors, Cameras, DMS, and HAR w/Flashers	Roadway Subsystem	Planned
	Turnpike Courtesy Patrol	Emergency Personnel	Planned
Travis County Natural Resources and Transportation	Travis County Construction and Maintenance Management System	Construction and Maintenance	Existing
Travis County Public Safety	Travis County Emergency Personnel	Emergency Personnel	Existing
TxDOT	TxDOT Researchers	Archived Data User Systems	Planned
TxDOT Austin District	Conditions that may Affect ITS Equipment Operations	Roadway Environment	Planned
	Conditions that will Impact Driving	Roadway Environment	Existing
	RWIS Network	Roadway Subsystem	Existing
	TMC Operators / Dispatchers	Traffic Operations Personnel	Existing
	Traveler Kiosk Network	Remote Traveler Support	Planned
	TxDOT Austin CECC Archive System Administrator	Archived Data Administrator	Planned
	TxDOT Austin Courtesy Patrol	Emergency Personnel	Existing
	TxDOT Austin Historical Incident Data Repository	Archived Data Management Subsystem	Planned
	TxDOT Austin Historical Traffic Data Repository	Archived Data Management Subsystem	Existing
	TxDOT Austin Sensors, Cameras, DMS, and HAR w/Flashers	Roadway Subsystem	Existing
	TxDOT Austin Signals	Roadway Subsystem	Existing
	TxDOT Austin TMC	Traffic Management	Existing
TxDOT Maintenance	TxDOT Highway Maintenance Management System	Construction and Maintenance	Existing
TxDOT Traffic Operations Division	Statewide Historic Incident Data Network	Other Archives	Planned
	Statewide Historic Traffic Data Network	Other Archives	Planned

Owning Stakeholder	System	Subsystem or Terminator	Status
Various Ownerships	Academic / Research Organizations	Archived Data User Systems	Existing
	City of Austin GIS Agency	Map Update Provider	Existing
	Special Event Sponsors and Promoters	Event Promoters	Existing
	Traffic and Travel Information System	Media	Existing
	Vehicles on the Road	Traffic	Existing
	Weather Network Subscription	Weather Service	Existing
Williamson County EMS/EOC	Williamson County Dispatch Center	Other EM	Existing
Williamson County Transportation	Williamson County Highway Maintenance Management System	Construction and Maintenance	Existing

5.2 REGIONAL MARKET PACKAGES

The market packages for the Austin Region were selected prioritized by the Steering Committee using the Delphi process described in Section 3.2. The selected market packages have specific subsystems and terminators (entities) associated with them. These entities are derived from the systems inventory covered in the section above. To view a particular entity's status refer to Table 5-1 above. The market packages and their associated architecture entities selected for the Austin region are listed in Table 5-3.

Table 5-3. List of Regional Market Packages

Market Package Name	Market Package	Entity Name
Network Surveillance	ATMS01	Construction and Maintenance
		Information Service Provider
		Map Update Provider
		Roadway Subsystem
		Traffic
		Traffic Management
		Traffic Operations Personnel
Freeway Control	ATMS04	Construction and Maintenance
		Driver
		Roadway Subsystem
		Traffic
		Traffic Management
		Traffic Operations Personnel
Emergency Response	EM1	Emergency Management
		Emergency Personnel
		Emergency System Operator
		Emergency Telecommunications System
		Emergency Vehicle Subsystem
		Map Update Provider
		Media
		Other EM
		Traffic Management
		Transit Management
		Weather Service
Incident Management System	ATMS08	Construction and Maintenance
		Emergency Management
		Emergency System Operator
		Emergency Vehicle Subsystem

Market Package Name	Market Package	Entity Name
		Event Promoters
		Information Service Provider
		Map Update Provider
		Media
		Other EM
		Other TM
		Roadway Subsystem
		Traffic
		Traffic Management
		Traffic Operations Personnel
		Weather Service
Emergency Routing	EM2	Emergency Management
		Emergency Personnel
		Emergency System Operator
		Emergency Vehicle Subsystem
		Map Update Provider
		Roadway Subsystem
		Traffic Management
		Vehicle
Surface Street Control	ATMS03	Construction and Maintenance
		Driver
		Emergency Management
		Roadway Subsystem
		Traffic
		Traffic Management
		Traffic Operations Personnel
Traffic Information Dissemination	ATMS06	Basic Vehicle
		Driver
		Emergency Management
		Information Service Provider
		Media
		Roadway Subsystem
		Traffic Management
		Traffic Operations Personnel
		Transit Management
ITS Data Mart	AD1	Archived Data Administrator
		Archived Data Management Subsystem
		Archived Data User Systems
		Construction and Maintenance
		Emergency Management
		Government Reporting Systems

Market Package Name	Market Package	Entity Name
		Information Service Provider
		Map Update Provider
		Roadway Subsystem
		Traffic Management
		Transit Management
		Weather Service
HAZMAT Management	CVO10	Basic Vehicle
		Emergency Management
		Fleet and Freight Management
		Traffic Management
		Vehicle
Transit Security	APTS5	Emergency Management
		Information Service Provider
		Media
		Remote Traveler Support
		Secure Area Environment
		Transit Driver
		Transit Management
		Transit User
		Transit Vehicle Subsystem
Broadcast Traveler Information	ATIS1	Driver
		Emergency Management
		Information Service Provider
		ISP Operator
		Media
		Personal Information Access
		Remote Traveler Support
		Traffic Management
		Transit Management
		Traveler
		Vehicle
		Weather Service
Road Weather Information System	ATMS18	Construction and Maintenance
		Roadway Environment
		Roadway Subsystem
		Traffic Management
		Traffic Operations Personnel
		Weather Service
Regional Traffic Control	ATMS07	Other TM
		Roadway Subsystem
		Traffic Management

Market Package Name	Market Package	Entity Name
		Traffic Operations Personnel
ITS Data Warehouse	AD2	Archived Data Administrator
		Archived Data Management Subsystem
		Archived Data User Systems
		Construction and Maintenance
		Emergency Management
		Government Reporting Systems
		Information Service Provider
		Map Update Provider
		Roadway Subsystem
		Traffic Management
		Transit Management
		Weather Service
Mayday Support	EM3	Basic Vehicle
		Driver
		Emergency Management
		Emergency System Operator
		Other EM
		Personal Information Access
		Remote Traveler Support
		Traveler
		Vehicle
Transit Traveler Information	APTS8	Information Service Provider
		Media
		Personal Information Access
		Remote Traveler Support
		Traffic Management
		Transit Management
		Transit User
		Transit Vehicle Subsystem
		Vehicle
Traffic Forecast and Demand Management	ATMS09	Event Promoters
		Information Service Provider
		Map Update Provider
		Other TM
		Roadway Subsystem
		Traffic Management
		Traffic Operations Personnel
		Transit Management

5.3 INTERCONNECTIONS

The interconnections identify subsystem and terminator connectivity. Each interconnection represents information exchanges between the entities. These exchanges are further detailed through architecture flows. The architecture flows represent a physical perspective of the functionality required.

Top Level Diagram

Figure 5-1 shows the top-level connectivity. The diagram presents the National ITS Architecture Program compatible ITS functional elements, while highlighting only those entities that are within the scope of this document and whose connectivity and functionality will be specified in greater detail throughout the remaining sections.
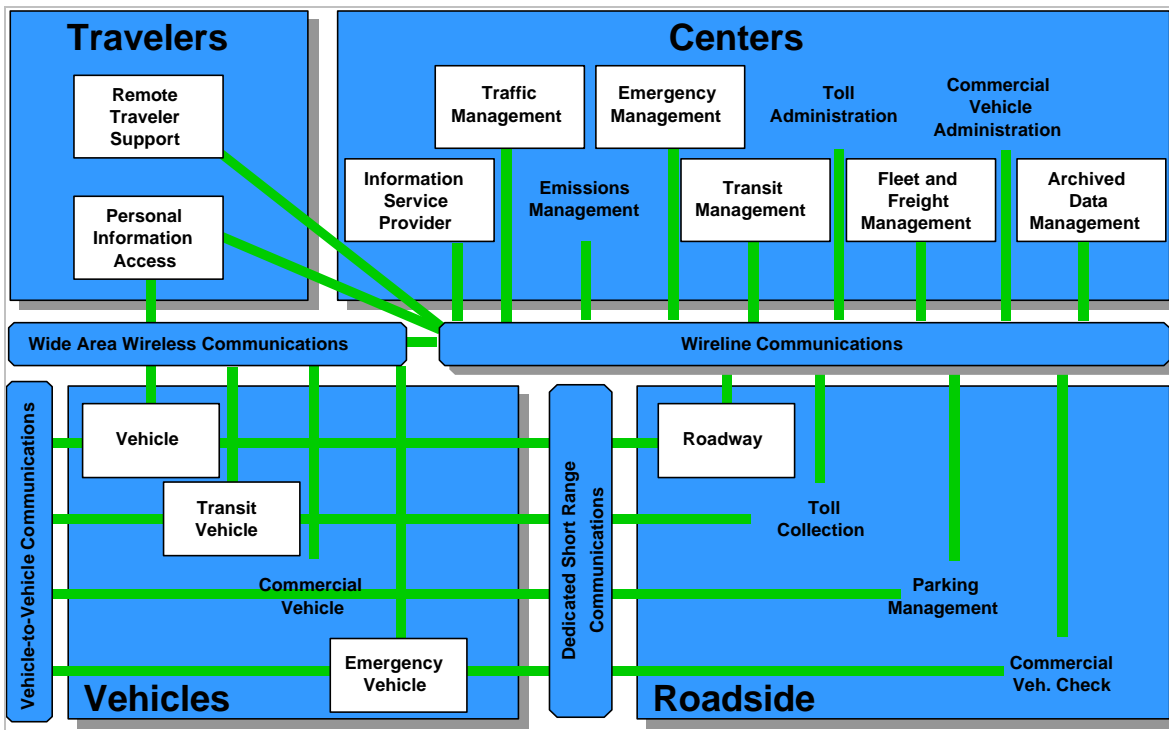
Figure 5-1. Top Level Region System Interconnect Diagram

Customized Market Packages

Each selected market package has been customized for the Austin Regional Architecture. Each subsystem and terminator box contains the relevant inventory items from the Austin region. The information flows between the boxes represent the architecture flows selected from the National ITS Architecture within the market package. Figure 5-2 through Figure 5-18 depict the selected market packages for the region.

Figure 5-2. Network Surveillance (ATMS01)

Figure 5-3. Freeway Control (ATMS04)

Emergency Management

Austin CECC/TMC Dispatch System

Emergency Call-Tracking

Emergency Response Management

Emergency Vehicle

Travis County Emergency Vehicle Radio Communications

Travis County Emergency Vehicle Mobile Data Terminal

TxDOT Austin Courtesy Vehicle Radio Communications

TxDOT Austin Courtesy Vehicle Mobile Data Terminal

Austin Police, Fire, EMS Vehicle Radio Communications

Austin Police, Fire, EMS Vehicle Mobile Data Terminal

ABIA (Airport) Vehicle Radio Communications

ABIA (Airport) Vehicle Mobile Data Terminal

Turnpike Authority Courtesy Vehicle Radio Communications

Turnpike Authority Courtesy Vehicle Mobile Data Terminal

On-board EV Incident Management Communication

Other EM

Texas Highway Patrol Dispatch Center

Round Rock Dispatch System

Williamson County Dispatch Center

incident report

incident status

emergency dispatch requests

resource request + remote surveillance control

current network conditions + resource deployment status

Traffic Management

TxDOT Austin TMC

Figure 5-4. Emergency Response (EMS1)
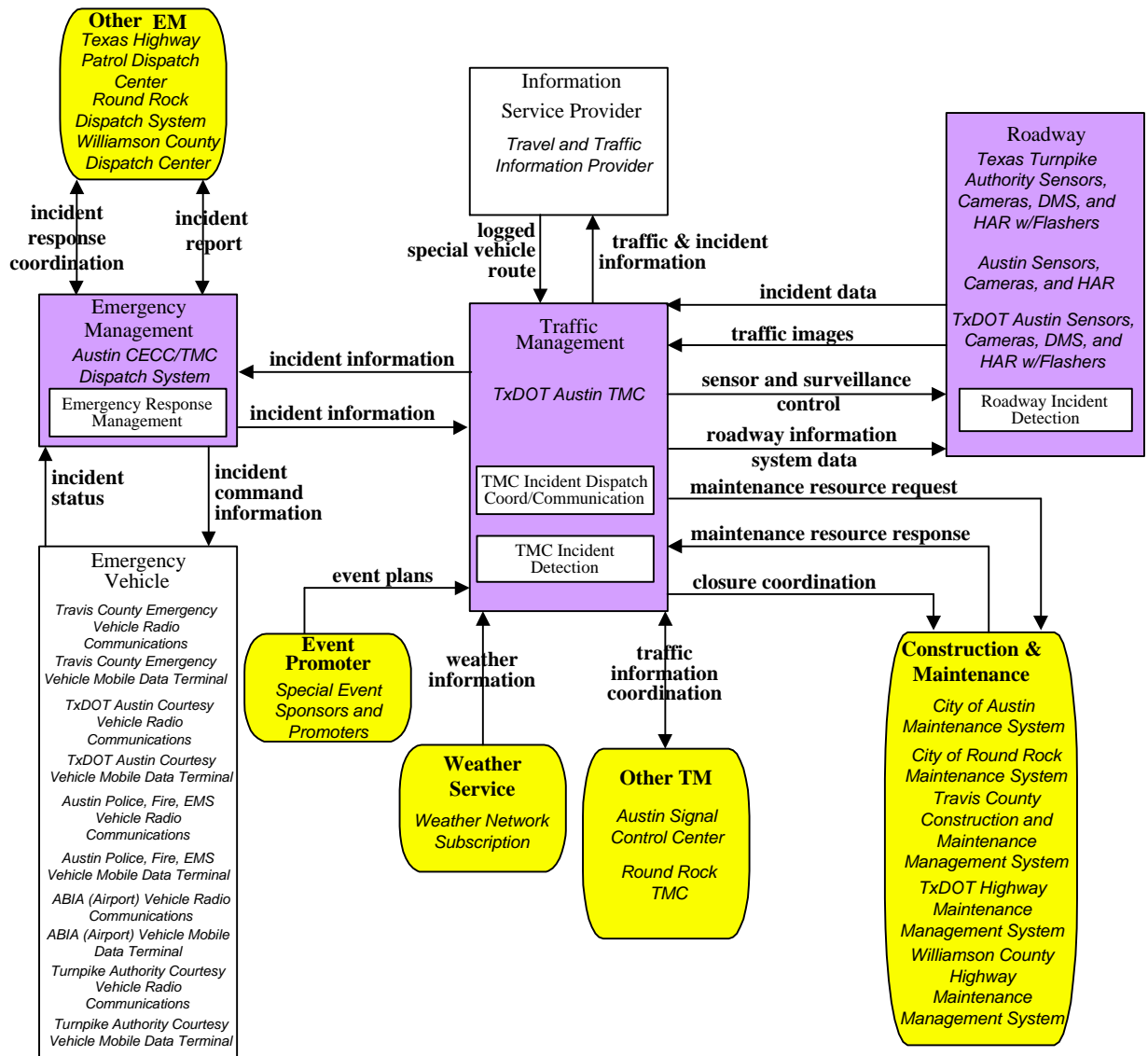
Figure 5-5. Incident Management System (ATMS08)
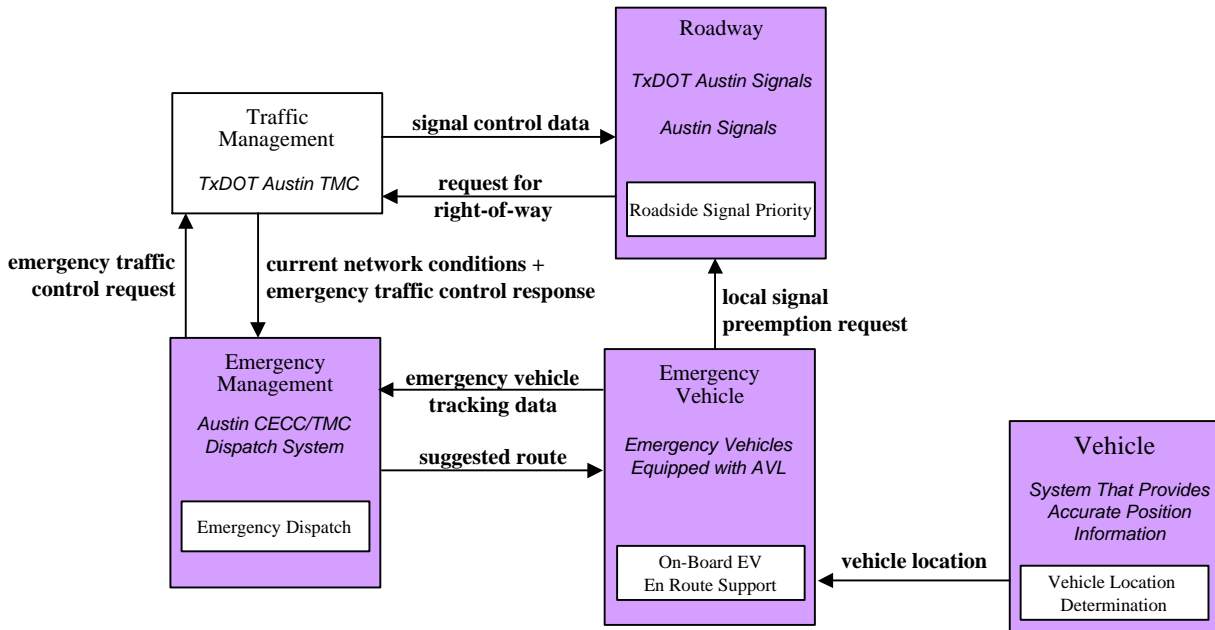
Figure 5-6. Emergency Routing (EMS2)
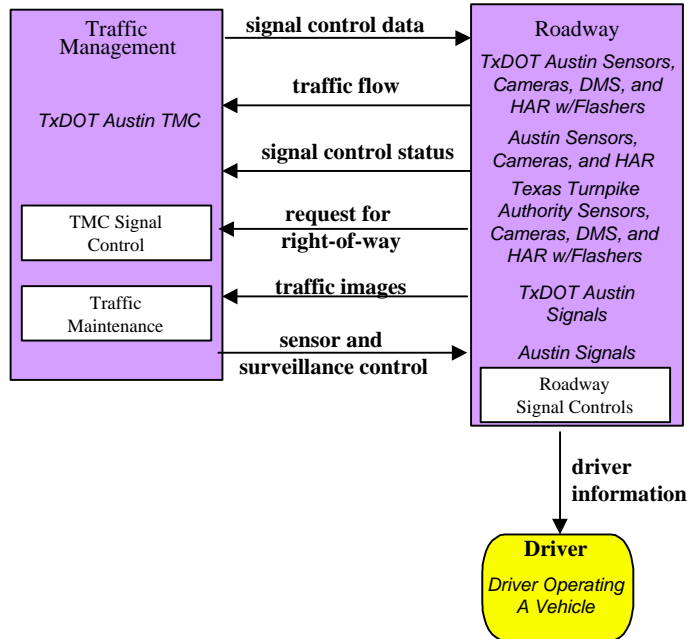
Figure 5-7. Surface Street Control (ATMS03)

Media
Traffic and Travel Information System

Traffic Management

TxDOT Austin TMC

TMC Traffic Info Dissemination

Roadway

TxDOT Austin Sensors, Cameras, DMS, and HAR w/Flashers

Austin Sensors, Cameras, and HAR

Texas Turnpike Authority Sensors, Cameras, DMS, and HAR w/Flashers

Roadway Traffic Info Dissemination

traffic information for media

roadway information system data

roadway information system status

traffic information for transit

Transit Management

CapMetro Dispatch System

current network conditions

traffic information

broadcast advisories

driver information

Emergency Management

Austin CECC/TMC Dispatch System

Information Service Provider

Travel and Traffic Information Provider

Basic Vehicle

Individual Vehicle Car Radio / CB-Radio

Driver

Driver Operating A Vehicle

Figure 5-8. Traffic Information Dissemination (ATMS06)

Traffic
Management

TxDOT Austin TMC

TMC Incident
Dispatch Coordination
/Communication

**incident
information** →

Emergency
Management

*Austin CECC/TMC
Dispatch System*

Emergency Response
Management

↑ **Hazmat
information**

Fleet and Freight
Management

*Motor Carrier
CVO System
(TLETS)*

Fleet HAZMAT
Management

Figure 5-9. HAZMAT Management (CVO10)

Figure 5-10. ITS Data Mart (AD1)

Figure 5-11. Transit Security (APTS5)

```
┌─────────────────┐
│     Traffic     │          traffic
│   Management    │            &
│                 │         incident
│ TxDOT Austin TMC│        information
└─────────────────┘
        ↑
  request for traffic information
```

Figure 5-12. Broadcast Traveler Information (ATIS1)

Figure 5-13. Road Weather Information System (ATMS18)

Figure 5-14. Regional Traffic Control (ATMS07)

Figure 5-15. ITS Data Warehouse (AD2)
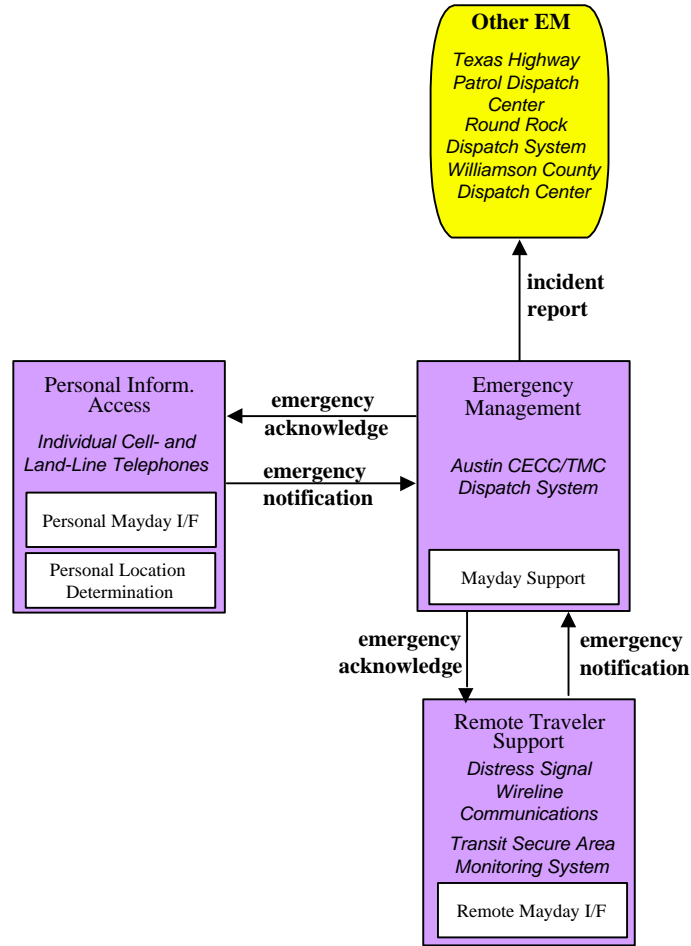
Figure 5-16. Mayday Support (EM3)
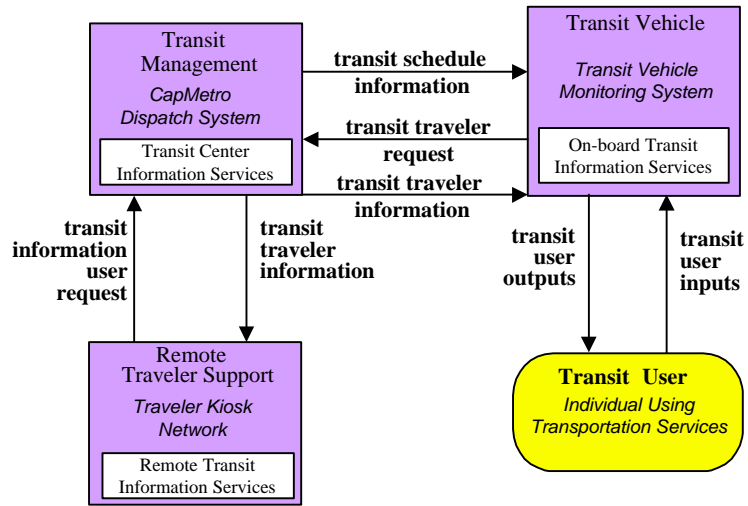
Figure 5-17. Transit Traveler Information (APTS8)
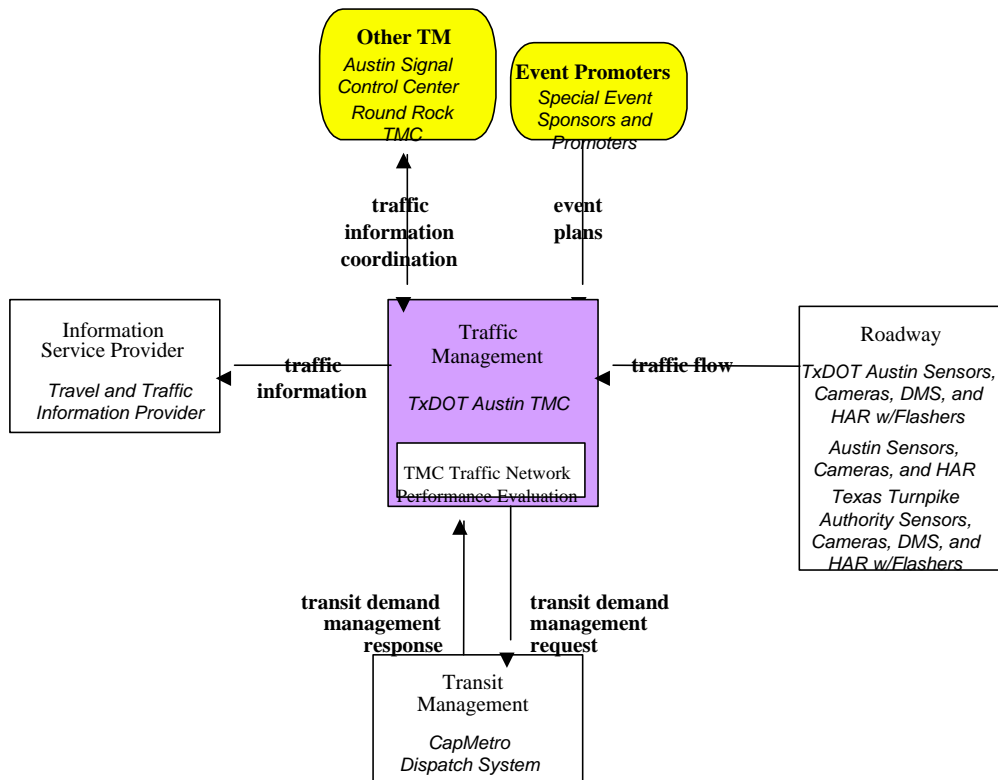
Figure 5-18. Traffic Forecast and Demand Management (ATMS09)

Physical Subsystem Architecture Flow Diagrams

The physical subsystem architecture flow diagrams display the information flows between the subsystems and terminators that have been customized for the Austin region. Each box represents a specific system extracted from the Austin systems inventory. The associated arrows represent the selected architecture flows between the subsystems and/or terminators. Figure 5-19 through Figure 5-54 show the major subsystems of the Austin region and their associated architecture flows.

A: emergency archive data
B: archive requests, archive status
C: government reporting data receipt
D: government reporting system data
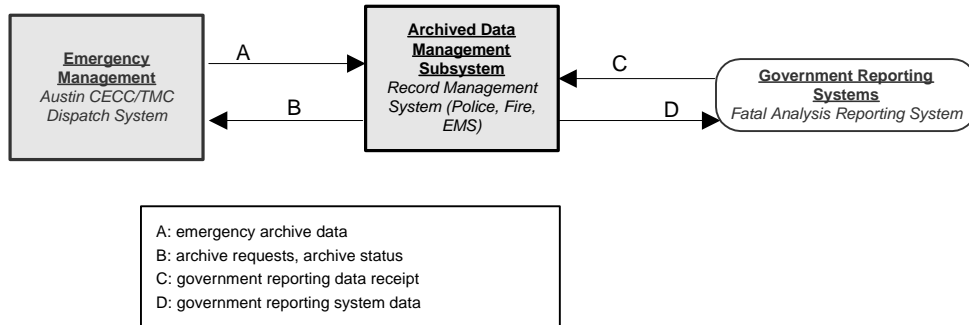
Figure 5-19. ADMS *Record Management System (Police, Fire, EMS)*

A: emergency archive data
B: archive requests, archive status
C: traffic archive data
D: archive analysis requests,archived data product requests
E: archived data products, archive request confirmation, archive analysis results
F: archive coordination
G: archive management requests
H: archive management data
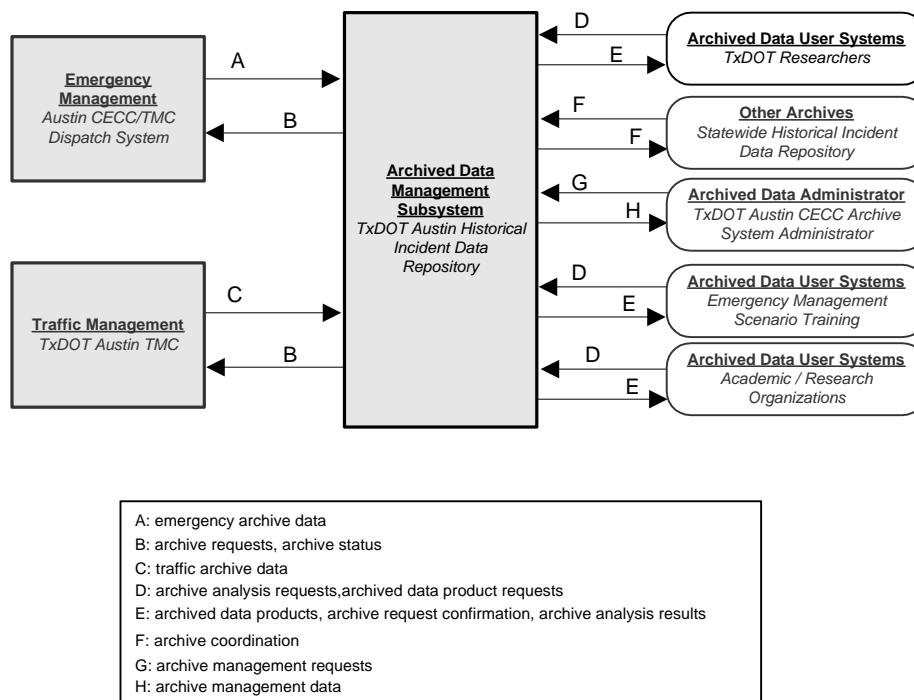
Figure 5-20. ADMS *TxDOT Austin Historical Incident Data Repository*

A: roadside archive data

B: traffic archive data

C: archive requests, archive status

D: archive analysis requests,archived data product requests

E: archived data products, archive request confirmation, archive analysis results
F: archive coordination

G: archive management requests

H: archive management data

I: government reporting data receipt

J: government reporting system data

K: Construction and maintenance archive data

Figure 5-21. ADMS *TxDOT Austin Historical Traffic Data Repository*
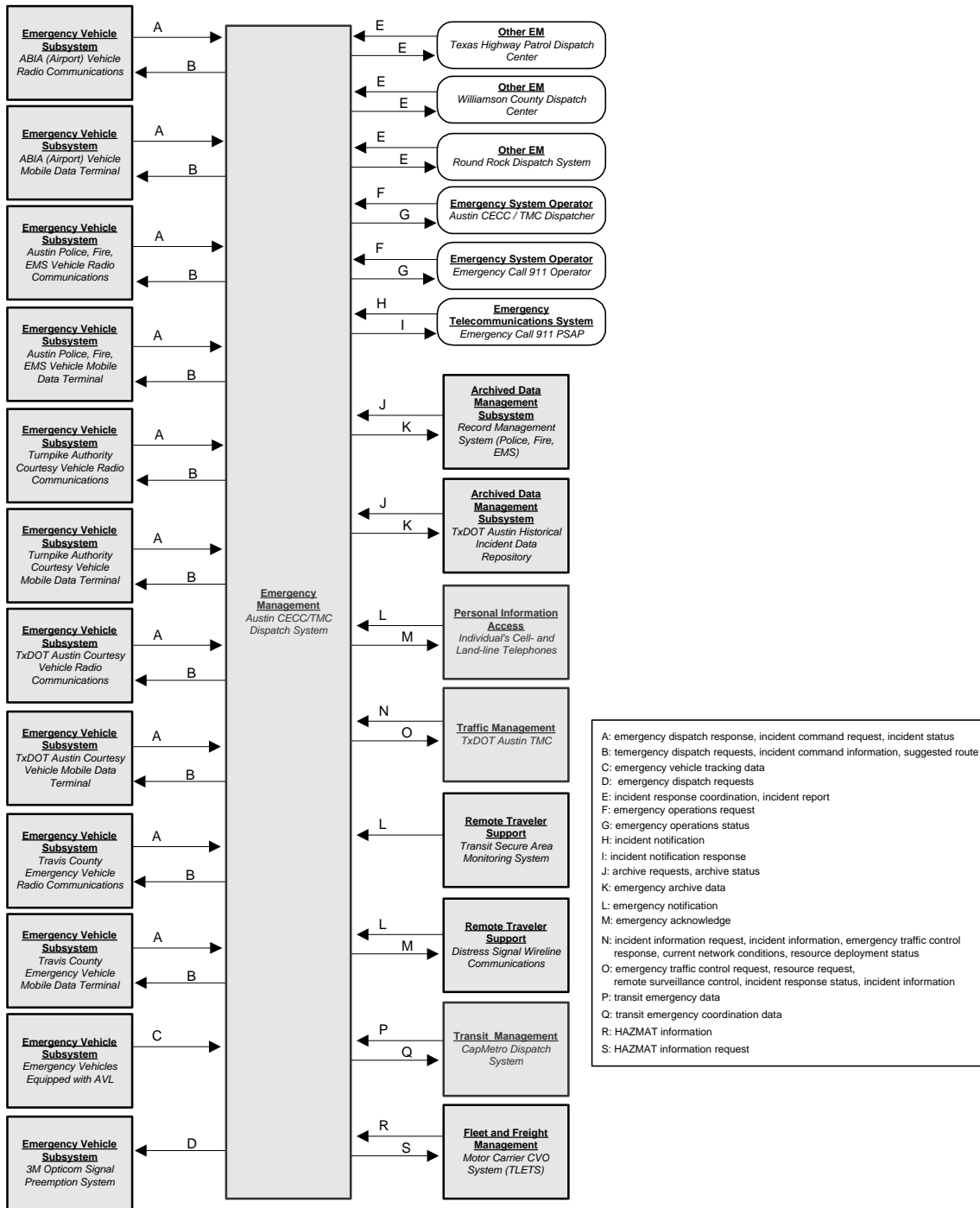
Figure 5-22. EMS *Austin CECC/TMC Dispatch System*
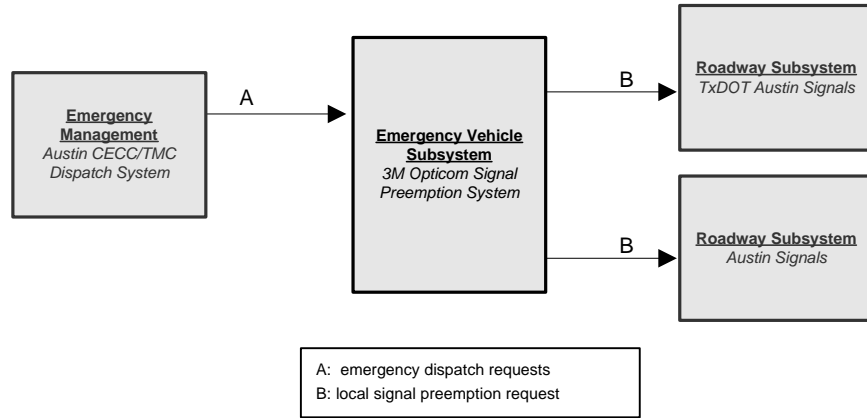
Figure 5-23. EVS *3M Opticom Signal Preemption System*
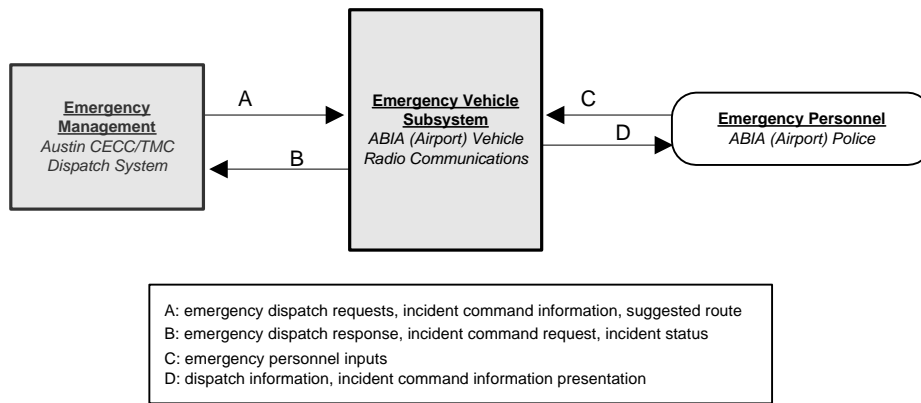
Figure 5-24. EVS *ABIA (Airport) Vehicle Radio Communications*

A: emergency dispatch requests, incident command information, suggested route
B: emergency dispatch response, incident command request, incident status
C: emergency personnel inputs
D: dispatch information, incident command information presentation
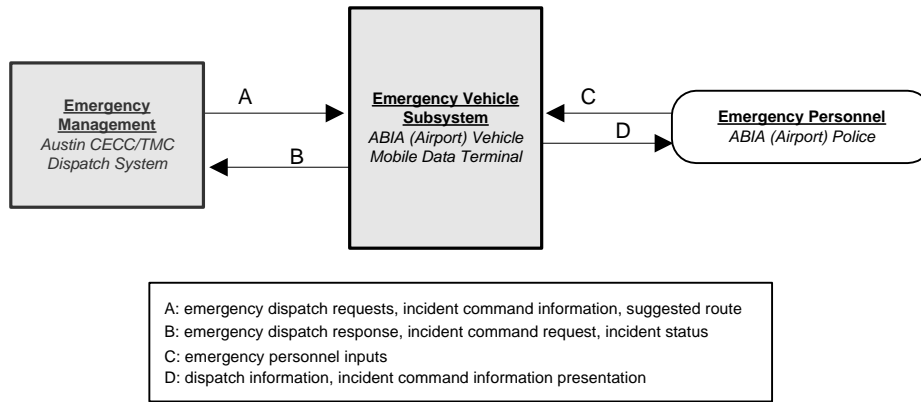
Figure 5-25. EVS *ABIA (Airport) Vehicle Mobile Data Terminal*

A: emergency dispatch requests, incident command information, suggested route
B: emergency dispatch response, incident command request, incident status
C: emergency personnel inputs
D: dispatch information, incident command information presentation
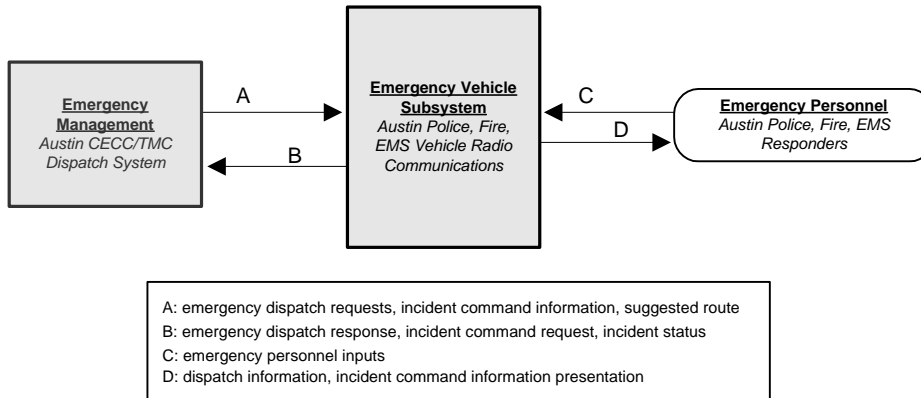
Figure 5-26. EVS *Austin Police, Fire, EMS Vehicle Radio Communications*

A: emergency dispatch requests, incident command information, suggested route
B: emergency dispatch response, incident command request, incident status
C: emergency personnel inputs
D: dispatch information, incident command information presentation
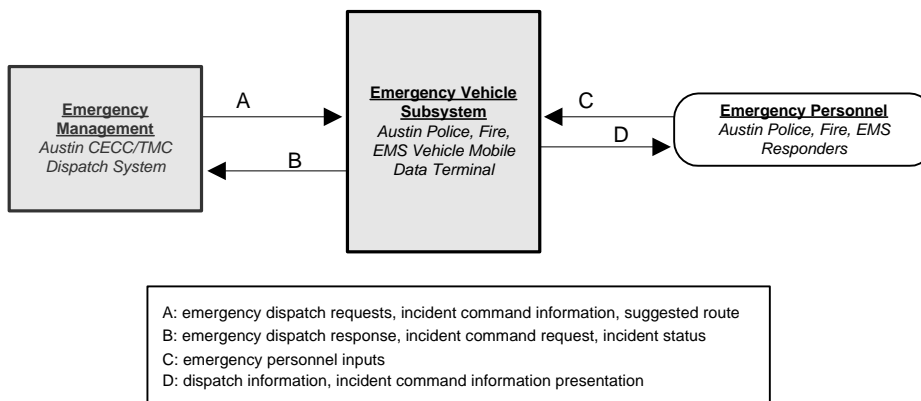
Figure 5-27. EVS *Austin Police, Fire, EMS Vehicle Mobile Data Terminal*
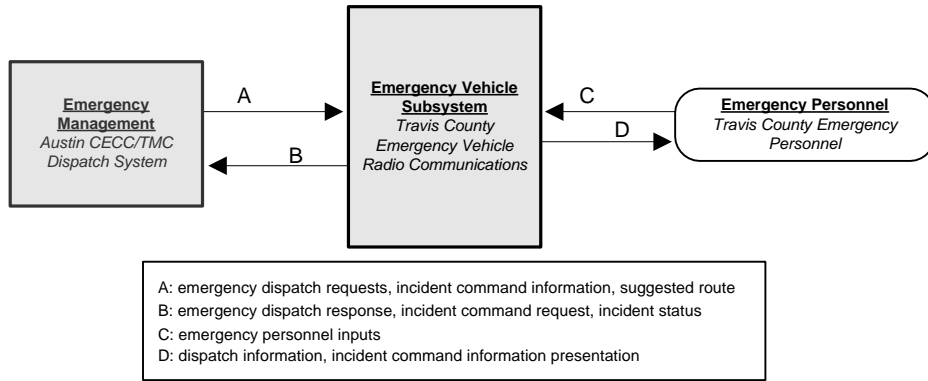
Figure 5-28. EVS *Travis County Emergency Vehicle Radio Communications*
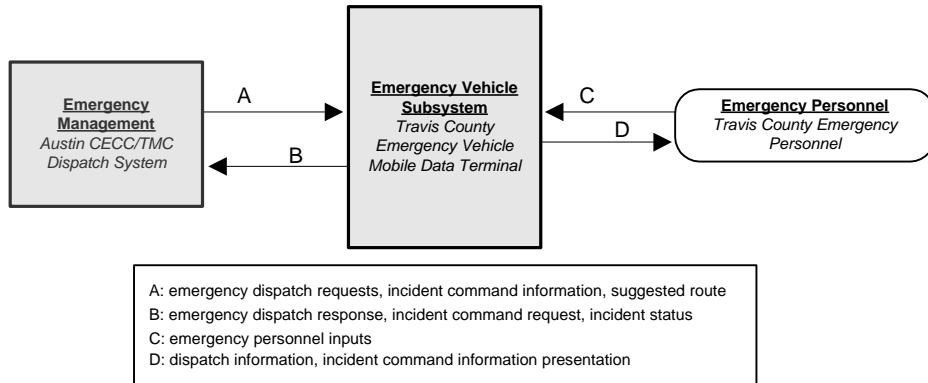
Figure 5-29. EVS *Travis County Emergency Vehicle Mobile Data Terminal*
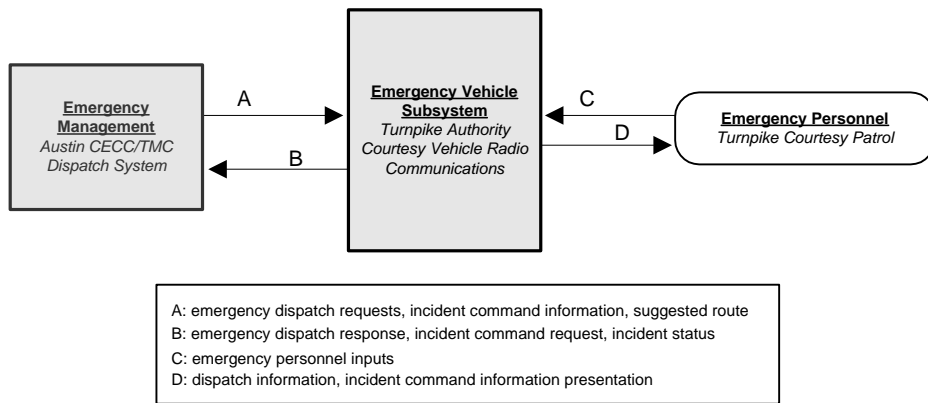
Figure 5-30. EVS *Turnpike Authority Courtesy Vehicle Radio Communications*
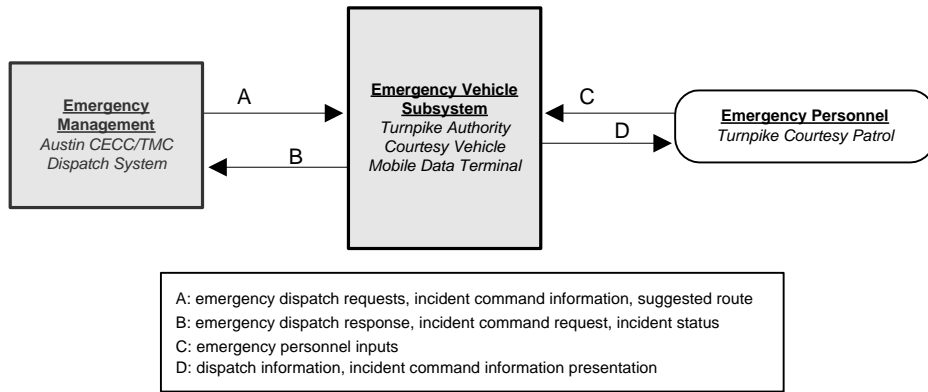
Figure 5-31. EVS *Turnpike Authority Courtesy Vehicle Mobile Data Terminal*
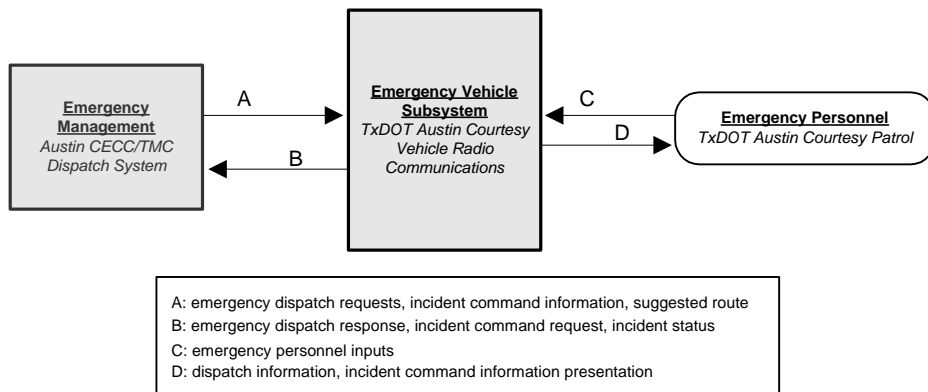
Figure 5-32. EVS *TxDOT Austin Courtesy Vehicle Radio Communications*
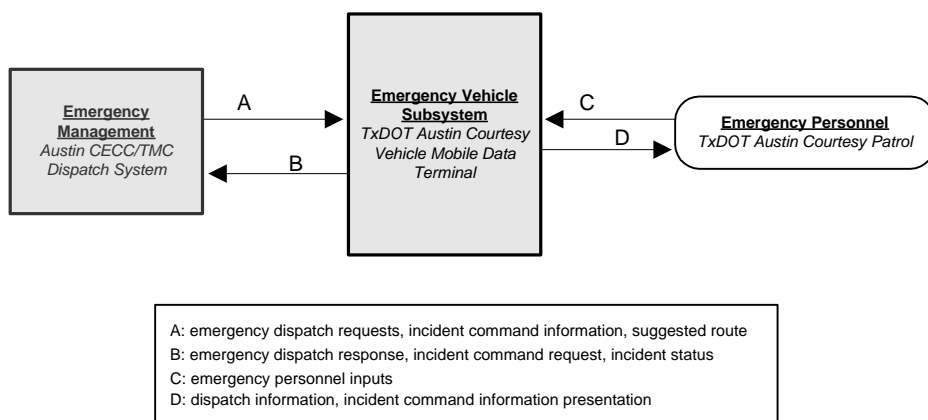
Figure 5-33. EVS *TxDOT Austin Courtesy Vehicle Mobile Data Terminal*
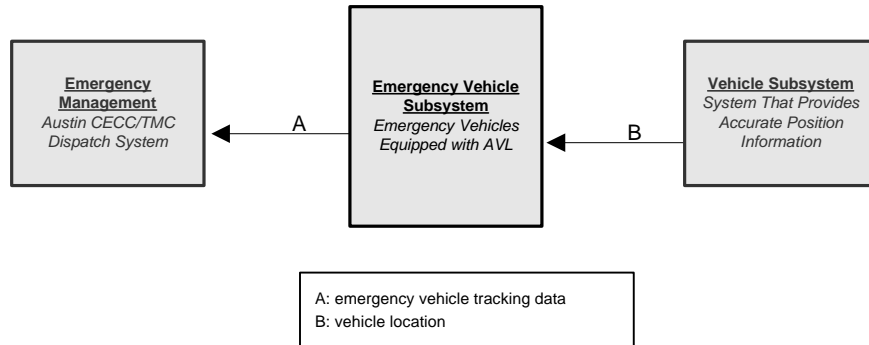
Figure 5-34. EVS *Emergency Vehicles Equipped with AVL*
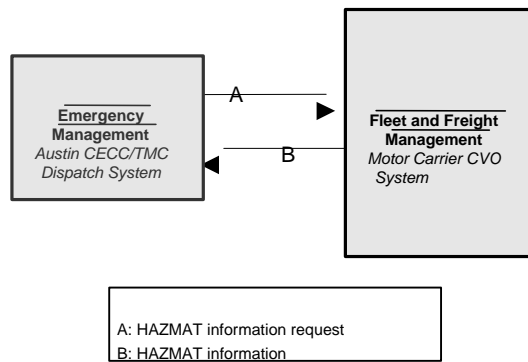
Figure 5-35. FMS *Motor Carrier CVO System*

A: broadcast information
B: ISP operating parameter updates
C: ISP operating parameters
D: traveler information for media
E: traffic information
F: logged special vehicle route, request for traffic information, road network use
G: transit and fare schedules
H: transit information request
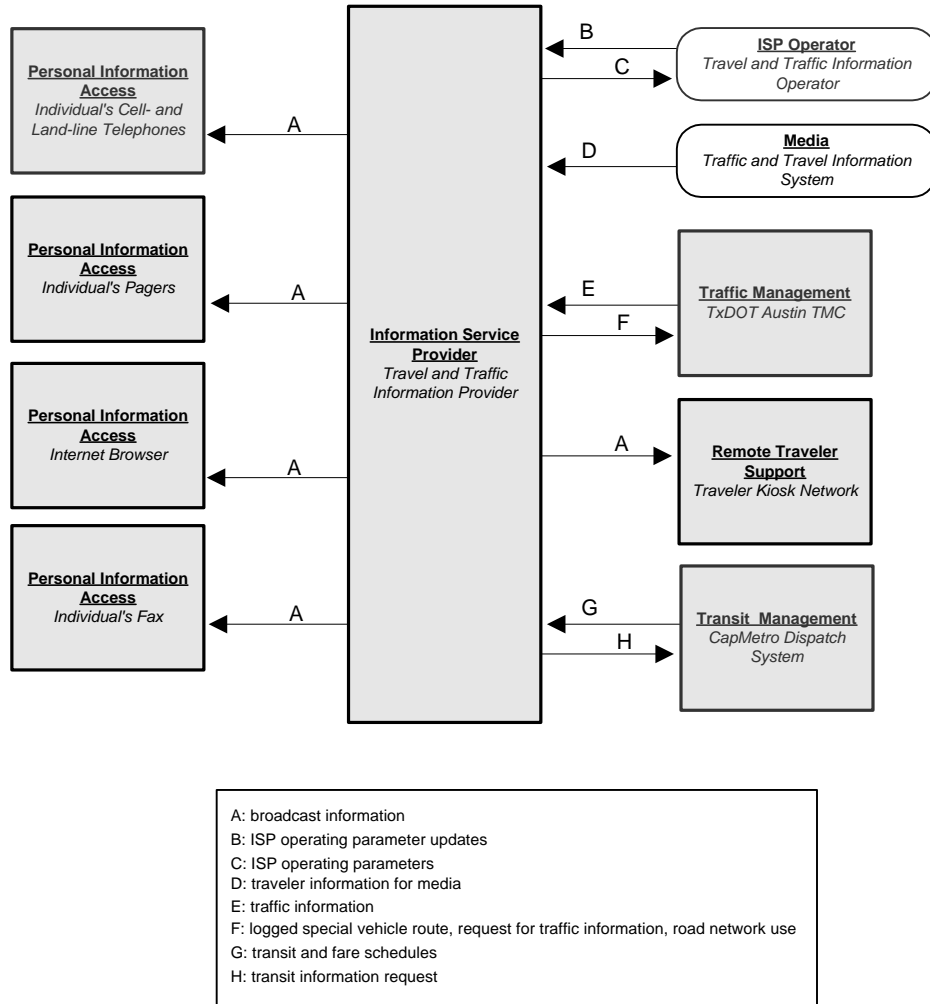
Figure 5-36. ISP *Travel and Traffic Information Provider*

A: emergency acknowledge
B: emergency notification
C: broadcast information
D: traveler inputs
E: traveler interface updates
F: personal transit information
G: transit information user request
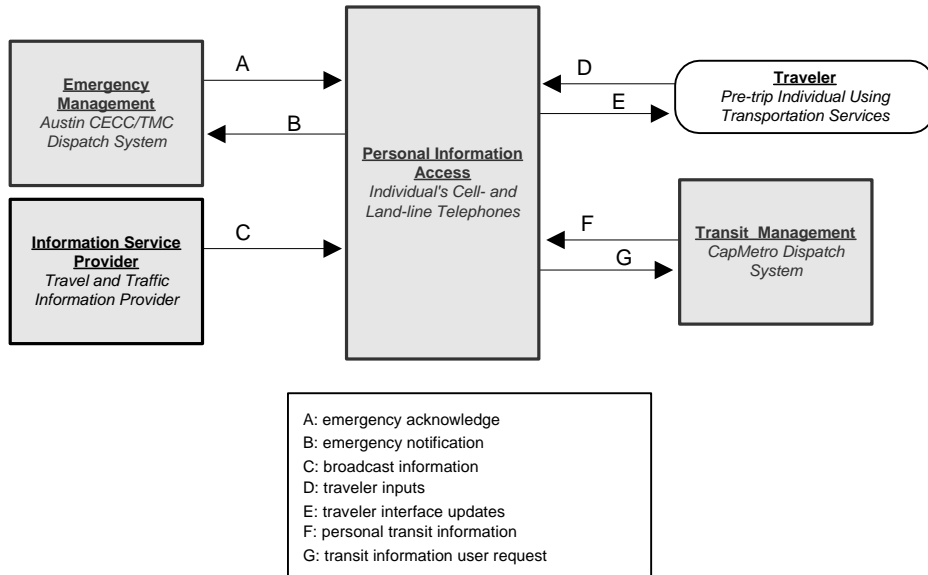
Figure 5-37. PIAS *Individual's Cell- and Land-line Telephones*

A: broadcast information
B: traveler inputs
C: traveler interface updates
D: personal transit information
E: transit information user request
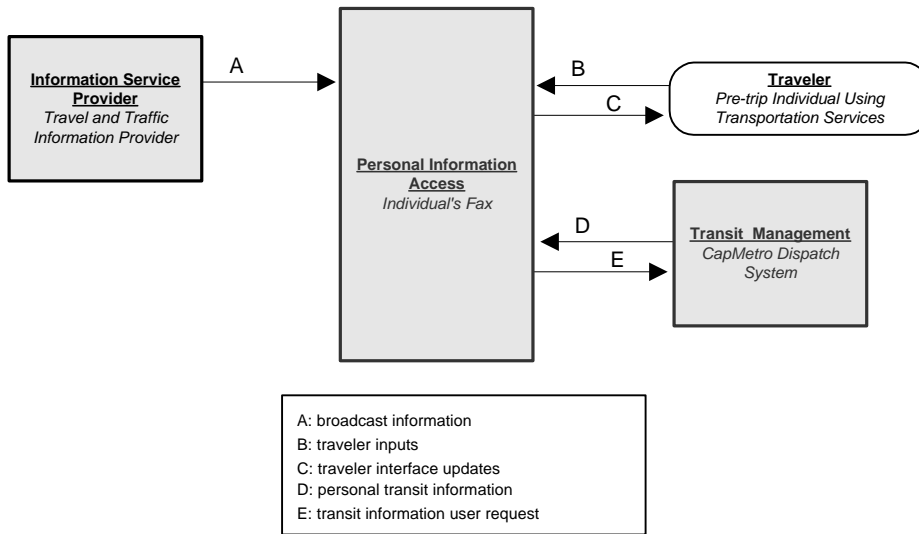
Figure 5-38. PIAS *Individual's Fax*
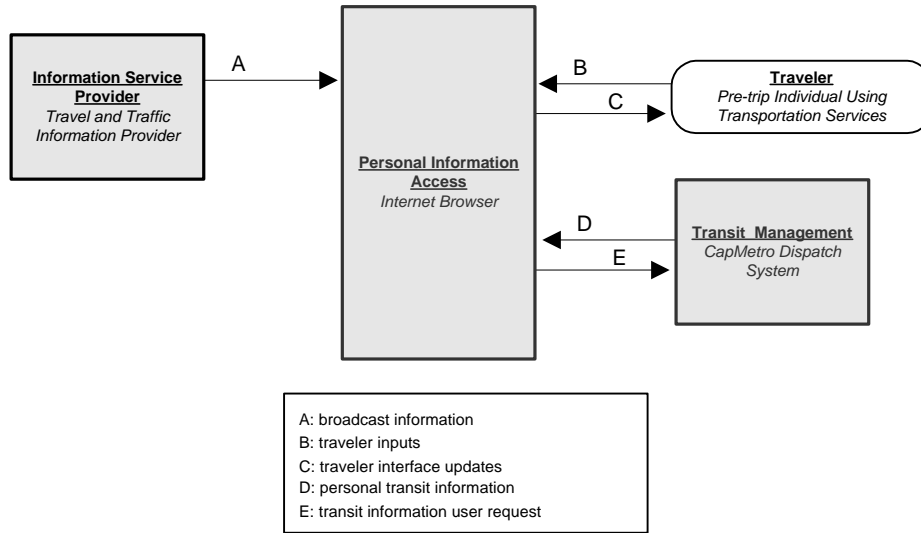
Figure 5-39. PIAS *Internet Browser*
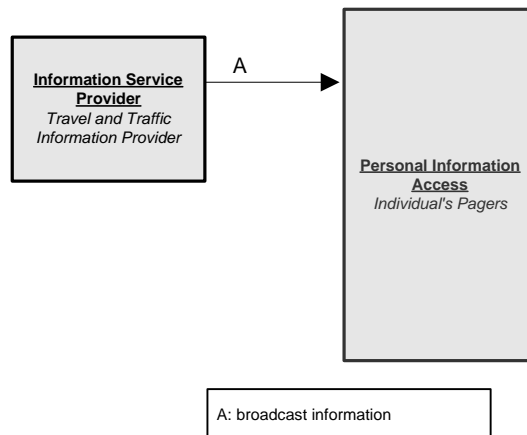
Figure 5-40. PIAS *Individual's Pagers*

A: emergency acknowledge
B: emergency notification
C: secure area characteristics
D: secure area monitoring support
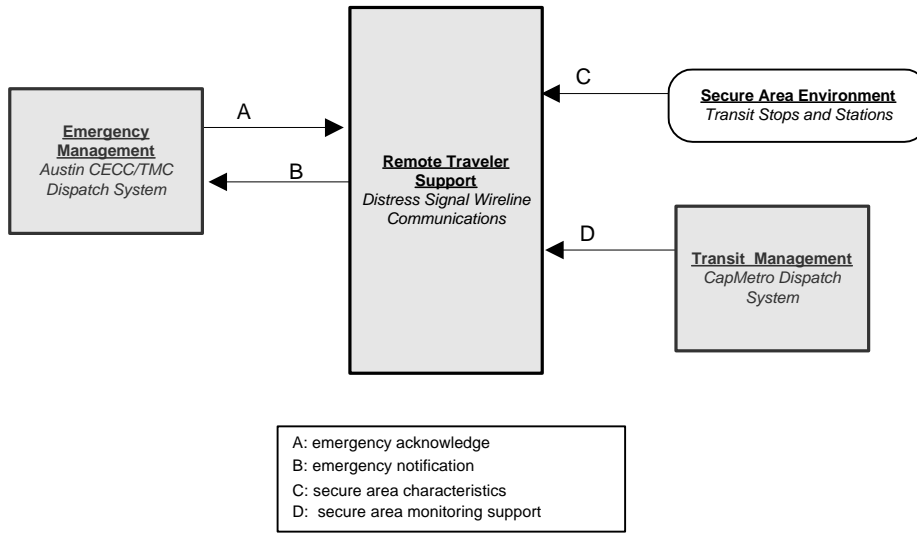
Figure 5-41. RTS *Distress Signal Wireline Communications*

A: emergency acknowledge
B: secure area characteristics
C: secure area monitoring support
D: emergency notification, secure area surveillance data
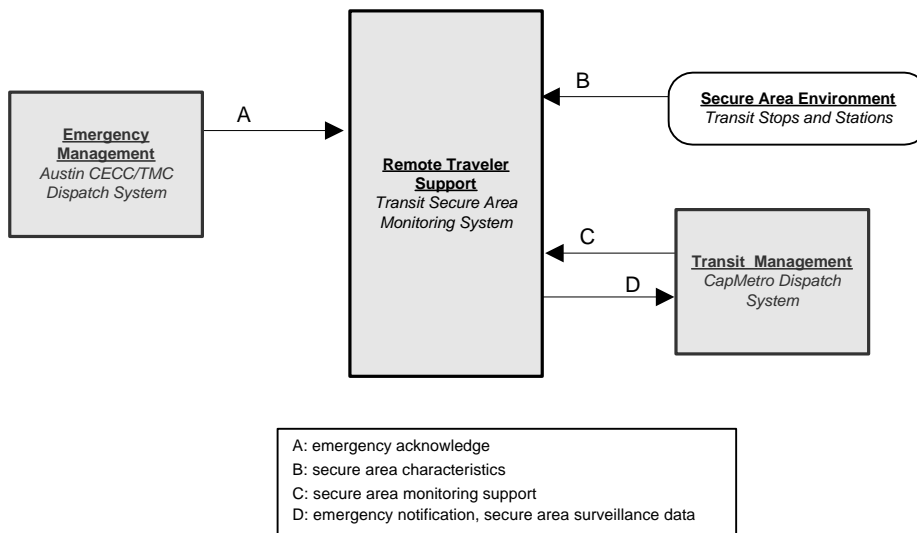
Figure 5-42. RTS *Transit Secure Area Monitoring System*

A: broadcast information

B: traveler interface updates

C: transit user inputs

D: transit user outputs

E: emergency acknowledge, transit traveler information

F: transit information user request
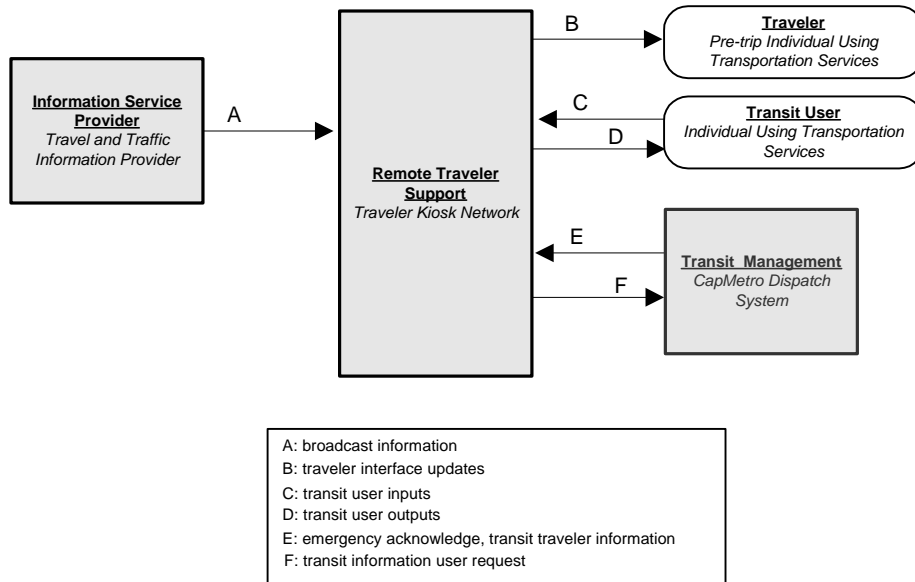
Figure 5-43. RTS *Traveler Kiosk Network*

A: roadside archive data

B: sensor and surveillance control

C: environmental conditions, fault reports

D: weather conditions
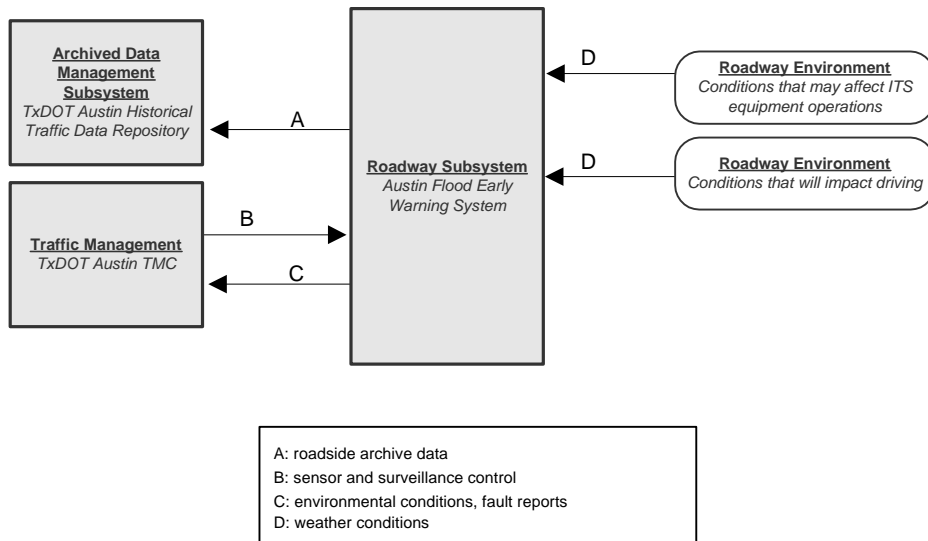
Figure 5-44. RS *Austin Flood Early Warning System*
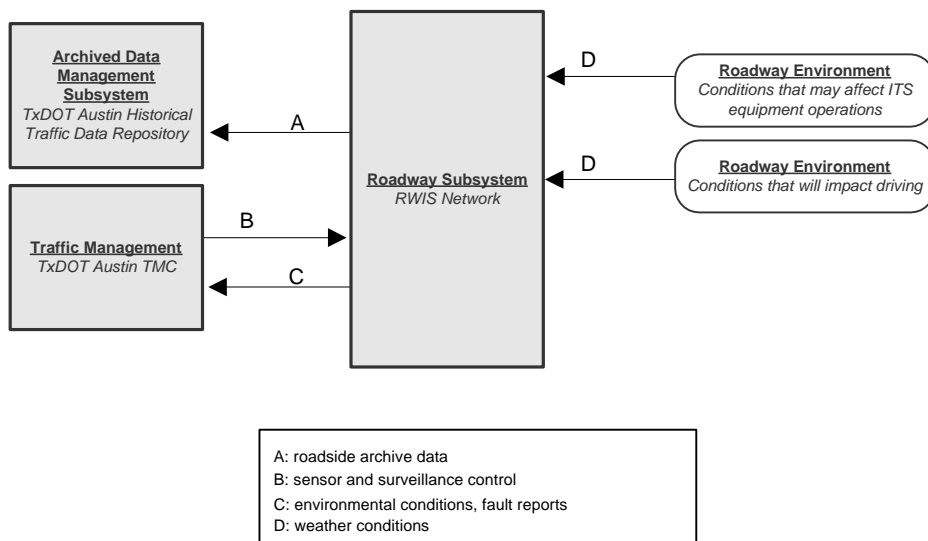
Figure 5-45. RS *RWIS Network*
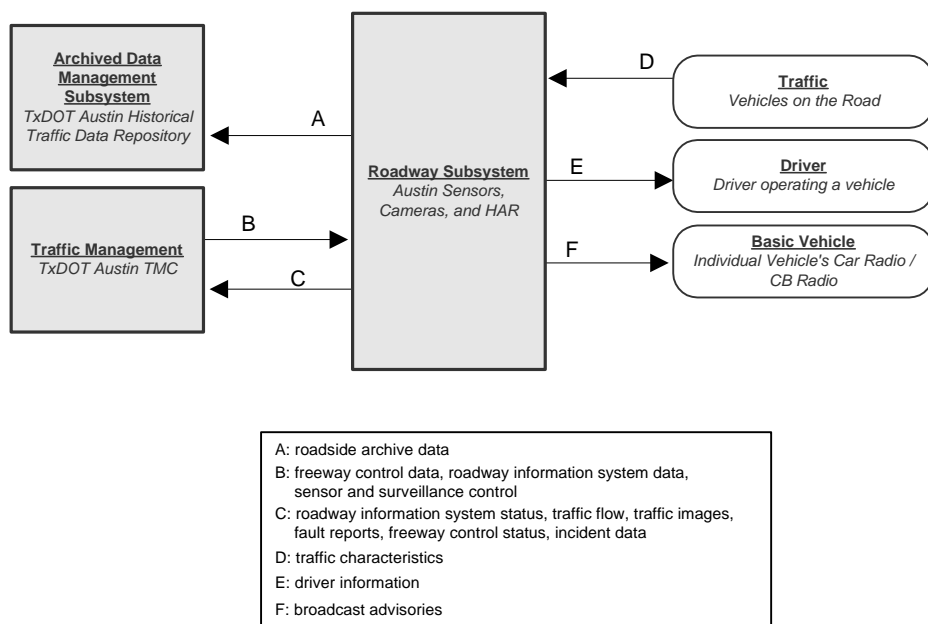
Figure 5-46. RS *Austin Sensors, Cameras, and HAR*

A: roadside archive data

B: freeway control data, roadway information system data,
   sensor and surveillance control

C: roadway information system status, traffic flow, traffic images,
   fault reports, freeway control status, incident data

D: traffic characteristics

E: driver information

F: broadcast advisories
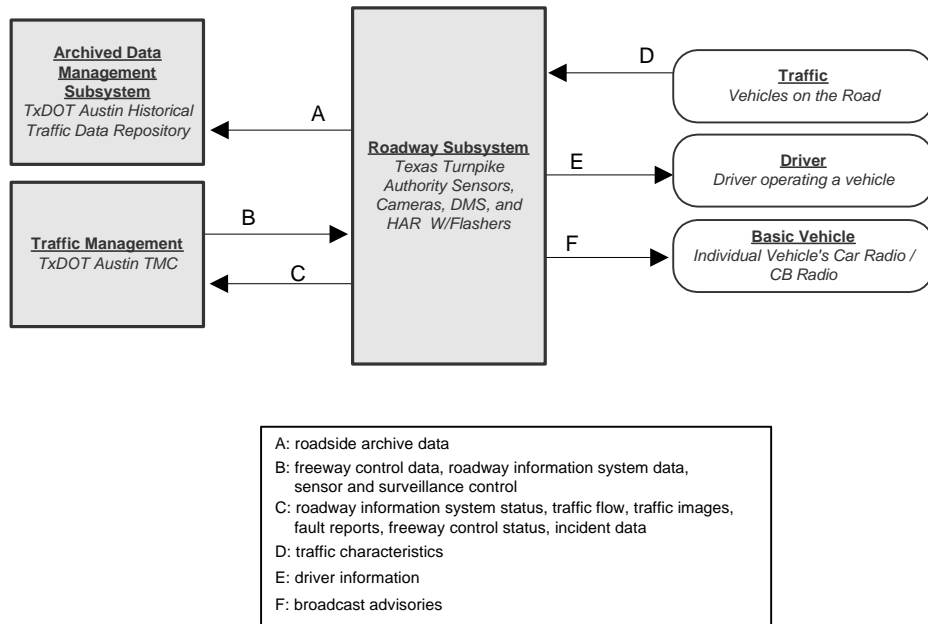
Figure 5-47. RS *Texas Turnpike Authority Sensors, Cameras, DMS, and HAR W/Flashers*

A: roadside archive data

B: freeway control data, roadway information system data,
   sensor and surveillance control

C: roadway information system status, traffic flow, traffic images,
   fault reports, freeway control status, incident data

D: traffic characteristics

E: driver information

F: broadcast advisories
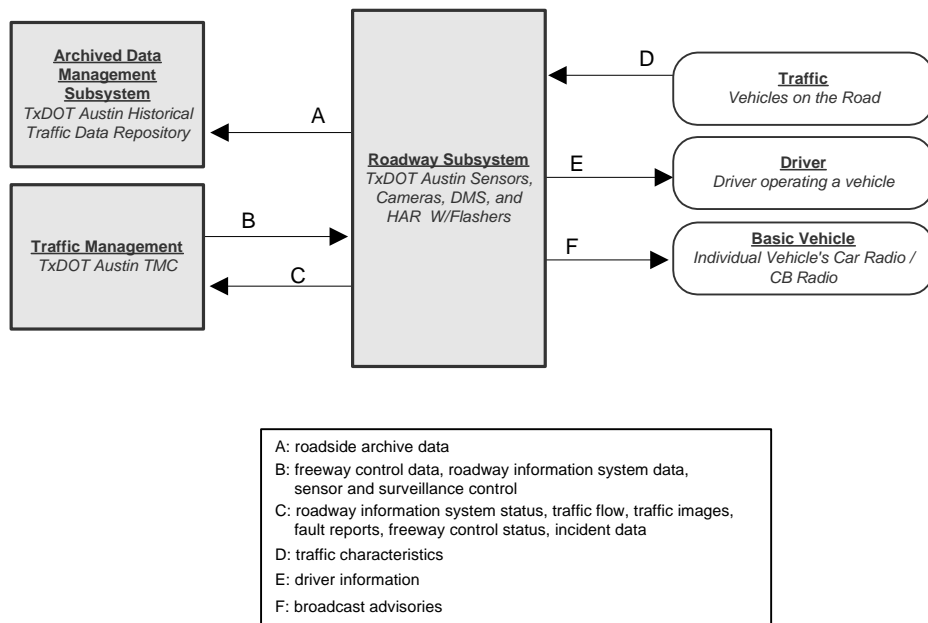
Figure 5-48. RS *TxDOT Austin Sensors, Cameras, DMS, and HAR W/Flashers*
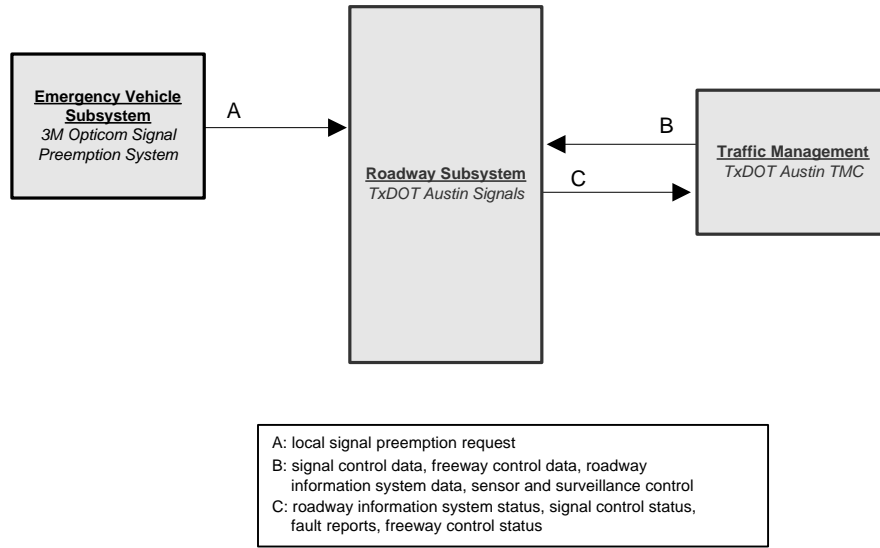
Figure 5-49. RS *TxDOT Austin Signals*
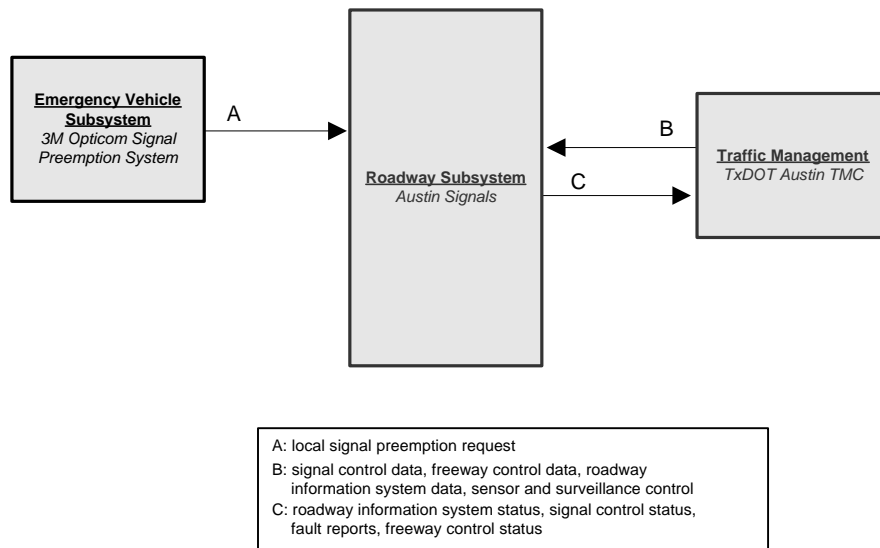
Figure 5-50. RS *Austin Signals*
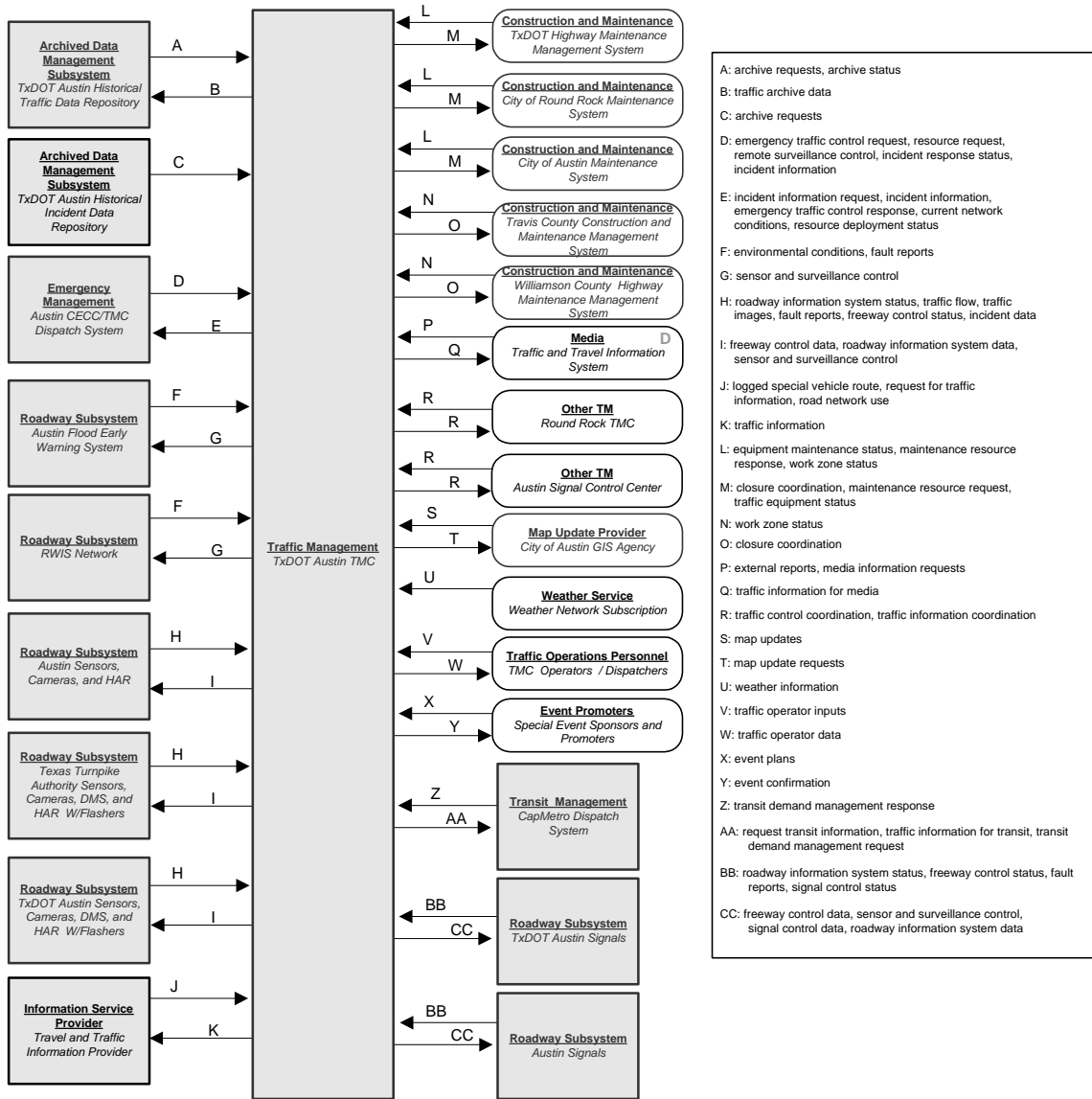
Figure 5-51. TMS *TxDOT Austin TMC*
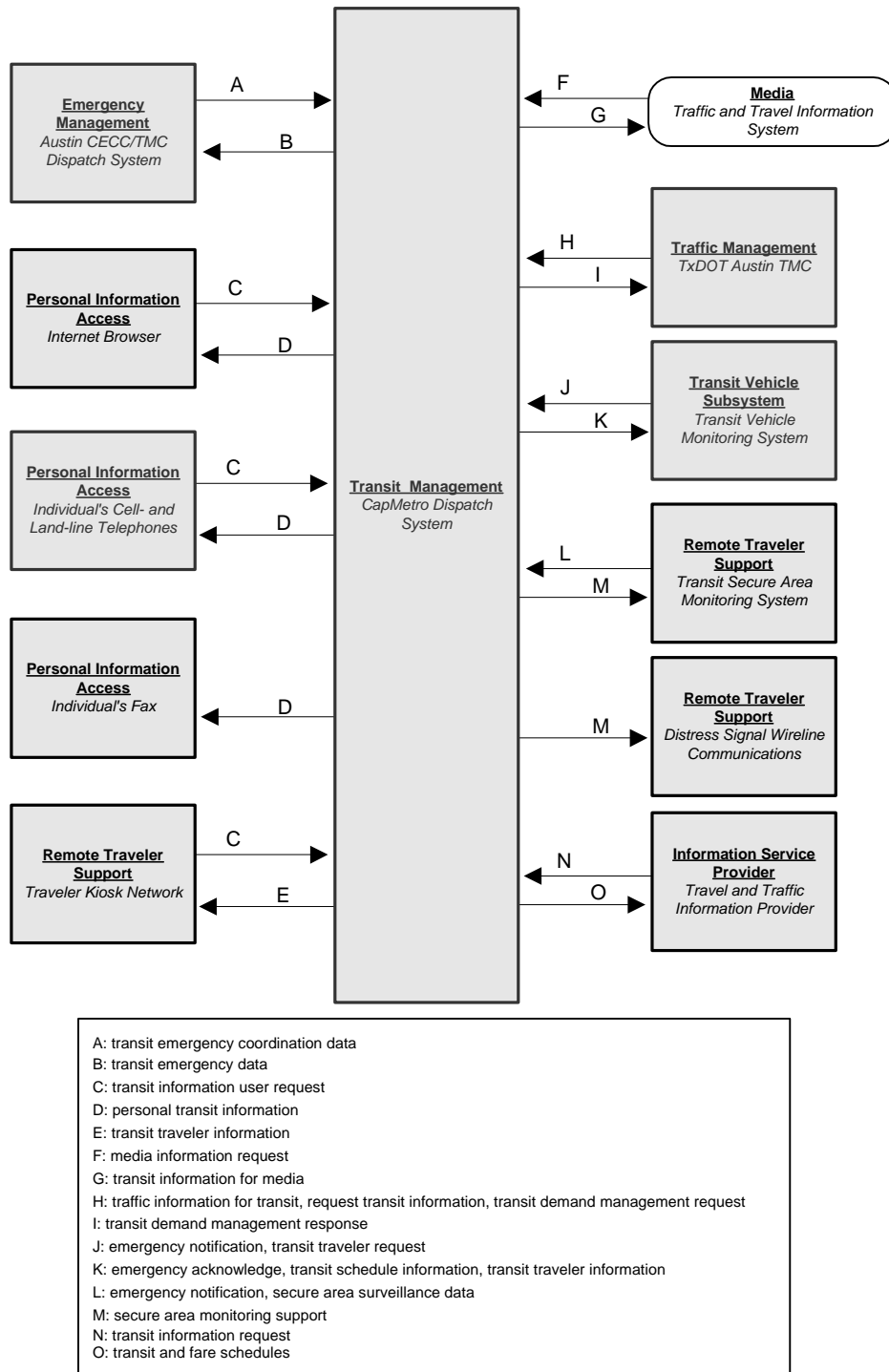
Figure 5-52. TRMS *CapMetro Dispatch System*

A: transit emergency coordination data
B: transit emergency data
C: transit information user request
D: personal transit information
E: transit traveler information
F: media information request
G: transit information for media
H: traffic information for transit, request transit information, transit demand management request
I: transit demand management response
J: emergency notification, transit traveler request
K: emergency acknowledge, transit schedule information, transit traveler information
L: emergency notification, secure area surveillance data
M: secure area monitoring support
N: transit information request
O: transit and fare schedules

A: emergency acknowledge, transit schedule information, transit traveler information
B: emergency notification, transit traveler request
C: transit driver inputs
D: transit driver outputs
E: emergency request, transit user inputs
F: transit user outputs

Figure 5-53. TRVS *Transit Vehicle Monitoring System*

A: vehicle location
B: driver updates
C: position fix
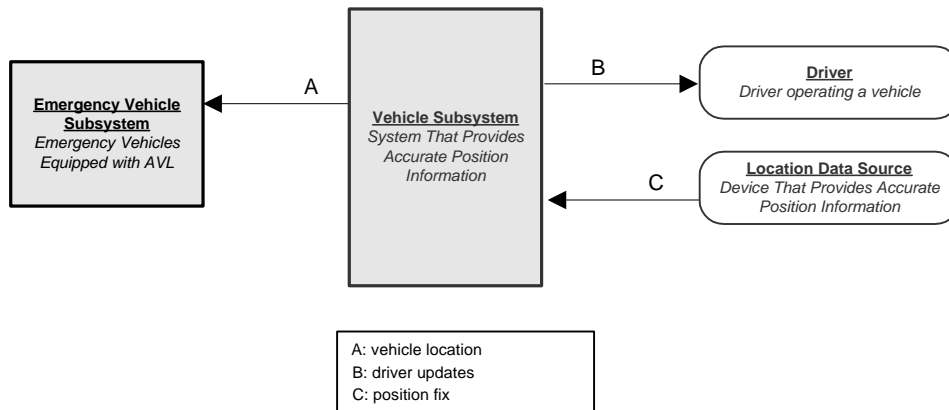
Figure 5-54. VS *System That Provides Accurate Position Information*

5.4 INTERFACE DEFINITIONS AND STANDARDS

Each of the architecture flows shown in the previous section are briefly defined in alphabetical order. The associated standards for each architecture flow according to version 3.0 of the National ITS Architecture are also listed.

archive analysis requests

A user request that initiates data mining, analytical processing, aggregation or summarization, report formulation, or other advanced processing and analysis of archived data. The request also includes information that is used to identify and authenticate the user and support electronic payment requirements, if any.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)

archive analysis results

Processed information products, supporting meta data, and any associated transaction information resulting from data mining, analytical processing, aggregation or summarization, report formulation, or other on-line processing and analysis of archived data.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
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- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)

archive coordination

Catalog data, meta data, published data, and other information exchanged between archives to support data synchronization and satisfy user data requests.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA)

(Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
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- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)

archive management data

Information used to support the management of an ITS archive including database reports on the condition and quality of the archived data, status of the import and collection process, reports that monitor archive usage, and any special requests that require direct action by the administrator (e.g., requests for access to new data sources).

Standards:
- None

archive management requests

Commands, requests, and queries that support the administration and management of an ITS data archive.

Standards:
- None

archive request confirmation

Confirmation that an archive request has been received and processed with information on the disposition of the request

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
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- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)

archive requests

A request to a data source for information on available data (i.e. "catalog") or a request that defines the data to be archived. The request can be a general subscription intended to initiate a continuous or regular data stream or a specific request intended to initiate a one-time response from the recipient.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA)

(Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)

archive status

Notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, the offending data and the nature of the potential problem are identified.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
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- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)

archived data product requests

A user-specified request for archived data products (i.e. data, meta data, or data catalogs). The request also includes information that is used to identify and authenticate the user and support electronic payment requirements, if any.

Standards:
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- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
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- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)

archived data products

Raw or processed data, meta data, data catalogs and other data products provided to a user system upon request. The response may also include any associated transaction information.

Standards:
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- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)

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broadcast advisories

General broadcast advisories that are provided over wide-area wireless communications direct to the vehicle radio. These analog advisory messages may provide similar content to ITS broadcast information flows, but include no digital data component. Existing Highway-Advisory Radio (HAR) advisory messages are a prime example of this flow.

Standards:
- None

broadcast information

General broadcast information that contains link travel times, incidents, advisories, transit services and a myriad of other traveler information.

Standards:
- (EIA/CEA) Data Radio Channel (DARC) System (Communications Protocol)
- (EIA/CEA) Subcarrier Traffic Information Channel (STIC) System (Communications Protocol)
- (SAE) Advanced Traveler Information System (ATIS) Data Dictionary (Data Dictionary)
- (SAE) Advanced Traveler Information System (ATIS) Message Set (Message Set)
- (SAE) ISP-Vehicle Location Referencing Message Profiles (Data Dictionary)
- (SAE) Standard for ATIS Message Sets Delivered Over Bandwidth Restricted Media (Communications Protocol, Data Dictionary, Message Set)

closure coordination

Coordination between subsystems regarding construction and maintenance closure times and durations.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (ITE) Message Set for External TMC Communication (MS/ETMCC) (Message Set)
- (ITE) Standard for Functional Level Traffic Management Data Dictionary (TMDD) (Data Dictionary)

construction and maintenance archive data

Information describing road construction and maintenance activities identifying the type of activity, the location of the activity, and the activity status. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
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- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)

current network conditions

Current traffic information, road conditions, and camera images that can be used to locate and verify reported incidents, and plan and implement an appropriate response.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (ITE) Message Set for External TMC Communication (MS/ETMCC) (Message Set)
- (ITE) Standard for Functional Level Traffic Management Data Dictionary (TMDD) (Data Dictionary)

dispatch information

Dispatch information and command to emergency personnel.

Standards:
- None

driver information

General advisory and traffic control information provided to the driver while en-route.

Standards:
- None

driver updates

Information displayed or otherwise conveyed by the vehicle to the driver.

Standards:
- (SAE) Adaptive Cruise Control: Operating Characteristics and User Interface (Human Factors)
- (SAE) Forward Collision Warning: Operating Characteristics and User Interface (Human Factors)
- (SAE) ITS In-Vehicle Message Priority (Human Factors)
- (SAE) Measurement of Driver Visual Behavior Using Video Based Methods (Def. &

Meas.) (Human Factors)
- (SAE) Standard for Navigation and Route Guidance Function Accessibility While Driving (Human Factors)

emergency acknowledge

Acknowledge request for emergency assistance and provide additional details regarding actions and verification requirements.

Standards:
- (ITE) TCIP - Incident Management (IM) Business Area Standard (Data Dictionary, Message Set)
- (SAE) On-Board Land Vehicle Mayday Reporting Interface (Data Dictionary, Message Set)

emergency archive data

Logged incident information that characterizes the identified incidents and provides a record of the corresponding incident response. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)

emergency dispatch requests

Emergency vehicle dispatch instructions including incident location and available information concerning the incident.

Standards:
- None

emergency dispatch response

Request for additional emergency dispatch information (e.g., a suggested route) and provision of en-route status.

Standards:
- None

emergency notification

An emergency request for assistance originated by a traveler using an in-vehicle, public access, or personal device. Sufficient information is provided so that the recipient can determine the location of the emergency as a minimum. Additional information identifying

the requestor and requesting device and the nature and severity of the emergency may also be provided (and required) by some systems.

Standards:
- (ITE) TCIP - Incident Management (IM) Business Area Standard (Data Dictionary, Message Set)
- (SAE) On-Board Land Vehicle Mayday Reporting Interface (Data Dictionary, Message Set)

emergency operations request

Emergency operator inputs supporting call taking, dispatch, and other operations and communications center operator functions.

Standards:
- None

emergency operations status

Emergency operations data supporting a range of emergency operating positions including call taker, dispatch, and various other operations and communications center operator positions.

Standards:
- None

emergency personnel inputs

Current incident status information and requests from emergency personnel in the field for information and/or resources.

Standards:
- None

emergency request

An emergency assistance request originated by a transit traveler using an in-vehicle, public access, or personal device.

Standards:
- None

emergency traffic control request

Special request to preempt the current traffic control strategy in effect at one or more signalized intersections or highway segments. For example, this flow can request all signals to red-flash, request a progression of traffic control preemptions along an emergency vehicle route, or request another special traffic control plan.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA)

(Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (ITE) Message Set for External TMC Communication (MS/ETMCC) (Message Set)
- (ITE) Standard for Functional Level Traffic Management Data Dictionary (TMDD) (Data Dictionary)

emergency traffic control response

Status of the special traffic signal control strategy implemented in response to the emergency traffic control request.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (ITE) Message Set for External TMC Communication (MS/ETMCC) (Message Set)
- (ITE) Standard for Functional Level Traffic Management Data Dictionary (TMDD) (Data Dictionary)

emergency vehicle tracking data

The current location and operating status of the emergency vehicle.

Standards:
- None

environmental conditions

Current environment conditions (e.g., air temperature, wind speed, surface temperature) as measured by environmental sensors and communicated by supporting field equipment.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Simple Transportation Management Framework (STMF) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Class B Profile (Communications Protocol)
- (AASHTO) NTCIP - Global Object Definitions (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Object Definitions for Environmental Sensor Stations & Roadside Weather Information System (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Point to Multi-Point Protocol Using RS-232 Subnetwork Profile (Communications Protocol)
- (AASHTO) NTCIP - Simple Transportation Management Framework (STMF) (Data Dictionary, Message Set)

- (AASHTO) NTCIP - Simple Transportation Management Protocol (STMP) (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Subnetwork Profile for Point-to-Point Protocol using RS 232 (Data Dictionary, Message Set)

equipment maintenance status
Current status of field equipment maintenance actions.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (ITE) Message Set for External TMC Communication (MS/ETMCC) (Message Set)
- (ITE) Standard for Functional Level Traffic Management Data Dictionary (TMDD) (Data Dictionary)

event confirmation
Confirmation that special event details have been received and processed.

Standards:
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- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (IEEE) Standard for Common Incident Management Message Sets (IMMS) for use by EMCs (Data Dictionary, Message Set)
- (ITE) Message Set for External TMC Communication (MS/ETMCC) (Message Set)
- (ITE) Standard for Functional Level Traffic Management Data Dictionary (TMDD) (Data Dictionary)

event plans
Plans for major events possibly impacting traffic.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)

- (IEEE) Standard for Common Incident Management Message Sets (IMMS) for use by EMCs (Data Dictionary, Message Set)
- (ITE) Message Set for External TMC Communication (MS/ETMCC) (Message Set)
- (ITE) Standard for Functional Level Traffic Management Data Dictionary (TMDD) (Data Dictionary)

external reports

Traffic and incident information that is collected by the media through a variety of mechanisms (e.g., radio station call-in programs, air surveillance).

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)

fault reports

Reports from field equipment (sensors, signals, signs, controllers, etc.) which indicate current operational status.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Simple Transportation Management Framework (STMF) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Class B Profile (Communications Protocol)
- (AASHTO) NTCIP - Data Collection & Monitoring Devices (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Data Dictionary for Closed Circuit Television (CCTV) (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Global Object Definitions (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Object Definitions for Actuated Traffic Signal Controller Units (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Object Definitions for Dynamic Message Signs (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Object Definitions for Environmental Sensor Stations & Roadside Weather Information System (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Object Definitions for Video Switches (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Point to Multi-Point Protocol Using RS-232 Subnetwork Profile (Communications Protocol)
- (AASHTO) NTCIP - Ramp Meter Controller Objects (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Simple Transportation Management Framework (STMF) (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Simple Transportation Management Protocol (STMP) (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Subnetwork Profile for Point-to-Point Protocol using RS 232 (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Transportation System Sensor Objects (Data Dictionary, Message Set)

freeway control data

Control commands and operating parameters for ramp meters, dynamic message signs, mainline metering/lane controls and other systems associated with freeway operations.

<u>Standards:</u>
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Simple Transportation Management Framework (STMF) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Class B Profile (Communications Protocol)
- (AASHTO) NTCIP - Data Collection & Monitoring Devices (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Global Object Definitions (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Object Definitions for Dynamic Message Signs (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Point to Multi-Point Protocol Using RS-232 Subnetwork Profile (Communications Protocol)
- (AASHTO) NTCIP - Ramp Meter Controller Objects (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Simple Transportation Management Framework (STMF) (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Simple Transportation Management Protocol (STMP) (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Subnetwork Profile for Point-to-Point Protocol using RS 232 (Data Dictionary, Message Set)

freeway control status

Current operational status and operating parameters for ramp meters, dynamic message signs, mainline metering/lane controls and other control equipment associated with freeway operations.

<u>Standards:</u>
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Simple Transportation Management Framework (STMF) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
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- (AASHTO) NTCIP - Data Collection & Monitoring Devices (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Global Object Definitions (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Object Definitions for Dynamic Message Signs (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Point to Multi-Point Protocol Using RS-232 Subnetwork Profile (Communications Protocol)
- (AASHTO) NTCIP - Ramp Meter Controller Objects (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Simple Transportation Management Framework (STMF) (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Simple Transportation Management Protocol (STMP) (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Subnetwork Profile for Point-to-Point Protocol using RS 232 (Data Dictionary, Message Set)

government reporting data receipt

The acknowledgement of satisfactory receipt of information used as input to government data systems or a report identifying problems or issues with the data submittal.

<u>Standards:</u>
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)

government reporting system data

Information provided by an ITS archive, formatted as appropriate, that can be used as input to government data reporting systems.

<u>Standards:</u>
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
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- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)

HAZMAT information

Information about a particular HAZMAT load including nature of the load and unloading instructions. May also include HAZMAT vehicle route and route update information

<u>Standards:</u>
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- **(AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)**
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)

HAZMAT information request

Request for information about a particular HAZMAT load.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)

incident command information

Information that supports local management of an incident. It includes resource deployment status, hazardous material information, traffic, road, and weather conditions, evacuation advice, and other information that enables emergency personnel in the field to implement an effective, safe incident response.

Standards:
- None

incident command information presentation

Presentation of information to emergency personnel in the field that supports local tactical decision-making within an incident command system structure.

Standards:
- None

incident command request

Request for resources, commands for relay to other allied response agencies, and other requests that reflect local command of an evolving incident response.

Standards:
- None

incident data

Data and imagery from the roadside supporting incident detection and verification.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Simple Transportation Management Framework (STMF) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Class B Profile (Communications Protocol)
- (AASHTO) NTCIP - Data Dictionary for Closed Circuit Television (CCTV) (Data Dictionary, Message

Set)
- (AASHTO) NTCIP - Global Object Definitions (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Object Definitions for Video Switches (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Point to Multi-Point Protocol Using RS-232 Subnetwork Profile (Communications Protocol)
- (AASHTO) NTCIP - Simple Transportation Management Framework (STMF) (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Simple Transportation Management Protocol (STMP) (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Subnetwork Profile for Point-to-Point Protocol using RS 232 (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Transportation System Sensor Objects (Data Dictionary, Message Set)

incident information

Notification of existence of incident and expected severity, location, time and nature of incident.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (IEEE) Standard for Common Incident Management Message Sets (IMMS) for use by EMCs (Data Dictionary, Message Set)
- (ITE) Message Set for External TMC Communication (MS/ETMCC) (Message Set)
- (ITE) Standard for Functional Level Traffic Management Data Dictionary (TMDD) (Data Dictionary)

incident information request

Request for incident information, clearing time, severity. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (IEEE) Standard for Common Incident Management Message Sets (IMMS) for use by EMCs (Data Dictionary, Message Set)
- (ITE) Message Set for External TMC Communication (MS/ETMCC) (Message Set)

- (ITE) Standard for Functional Level Traffic Management Data Dictionary (TMDD) (Data Dictionary)

incident notification

The notification of an incident including its nature, severity, and location.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (IEEE) Standard for Common Incident Management Message Sets (IMMS) for use by EMCs (Data Dictionary, Message Set)

incident notification response

Interactive acknowledgement and verification of the incident information received, requests for additional information, and general information on incident response status.

Standards:
- None

incident report

Report of an identified incident including incident location, type, severity and other information necessary to initiate an appropriate incident response.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (IEEE) Standard for Common Incident Management Message Sets (IMMS) for use by EMCs (Data Dictionary, Message Set)

incident response coordination

Incident response procedures, resource coordination, and current incident response status that are shared between allied response agencies to support a coordinated response to incidents. This flow also coordinates a positive hand off of responsibility for all or part of an incident response between agencies.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (IEEE) Standard for Common Incident Management Message Sets (IMMS) for use by EMCs (Data Dictionary, Message Set)
- (ITE) TCIP - Incident Management (IM) Business Area Standard (Data Dictionary, Message Set)

incident response status

Status of the current incident response including traffic management strategies implemented at the site (e.g., closures, diversions, traffic signal control overrides).

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (IEEE) Standard for Common Incident Management Message Sets (IMMS) for use by EMCs (Data Dictionary, Message Set)
- (ITE) Message Set for External TMC Communication (MS/ETMCC) (Message Set)
- (ITE) Standard for Functional Level Traffic Management Data Dictionary (TMDD) (Data Dictionary)

incident status

Information gathered at the incident site that more completely characterizes the incident and provides current incident response status.

Standards:
- None

ISP operating parameter updates

Tuning and performance enhancement parameters to ISP algorithms

Standards:
- None

ISP operating parameters

Parameters provided to the ISP Operator by the ISP including broadcast information settings, route selection controls, and travel optimization algorithms.

Standards:
- None

local signal preemption request

Direct control signal or message to a signalized intersection that results in preemption of the current control plan and grants right-of-way to the requesting vehicle.

Standards:
- (ASTM) Standard Specification for DSRC - Data Link Layer (Communications Protocol)
- (ASTM) Standard Specification for DSRC - Physical Layer 902-928 MHz (Communications Protocol)

logged special vehicle route

Anticipated route information for special vehicles (e.g., oversize vehicles) or groups of vehicles (e.g., governer's motorcade) that may require changes in traffic control strategy.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (ITE) Message Set for External TMC Communication (MS/ETMCC) (Message Set)
- (ITE) Standard for Functional Level Traffic Management Data Dictionary (TMDD) (Data Dictionary)
- (SAE) Advanced Traveler Information System (ATIS) Data Dictionary (Data Dictionary)
- (SAE) Advanced Traveler Information System (ATIS) Message Set (Message Set)

maintenance resource request

Request for road maintenance resources that can be used in the diversion of traffic (cones, portable signs), clearance of an incident, and repair of ancillary damage.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)

maintenance resource response
    Current status of maintenance resources included availability and deployment status.

    <u>Standards:</u>
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (ITE) Message Set for External TMC Communication (MS/ETMCC) (Message Set)
- (ITE) Standard for Functional Level Traffic Management Data Dictionary (TMDD) (Data Dictionary)

map update request
    Request for a map update which could include a new underlying map or map layer updates.

    <u>Standards:</u>
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)

map updates
    Map update which could include a new underlying static or real-time map or map layer(s) update.

    <u>Standards:</u>
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)

media information request
    Request from the media for current transportation information.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (IEEE) Standard for Common Incident Management Message Sets (IMMS) for use by EMCs (Data Dictionary, Message Set)

personal transit information

General and personalized transit information for a particular fixed route, flexible route, or paratransit system.

Standards:
- (ITE) TCIP - Passenger Information (PI) Business Area Standard (Data Dictionary, Message Set)

position fix

Information which provides a traveler or vehicles geographical position.

Standards:
- None

remote surveillance control

The control commands used to remotely operate another center's sensors or surveillance equipment so that roadside surveillance assets can be shared by more than one agency.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (ITE) Message Set for External TMC Communication (MS/ETMCC) (Message Set)
- (ITE) Standard for Functional Level Traffic Management Data Dictionary (TMDD) (Data Dictionary)

request for traffic information

Request for traffic information that specifies the region/route of interest, the desired effective time period, and other parameters that allow preparation of a tailored response. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (ITE) Message Set for External TMC Communication (MS/ETMCC) (Message Set)
- (ITE) Standard for Functional Level Traffic Management Data Dictionary (TMDD) (Data Dictionary)
- (SAE) Advanced Traveler Information System (ATIS) Data Dictionary (Data Dictionary)
- (SAE) Advanced Traveler Information System (ATIS) Message Set (Message Set)

request transit information

Request for transit service information and current transit status.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (ITE) TCIP - Control Center (CC) Business Area Standard (Data Dictionary, Message Set)

resource deployment status

Status of traffic management center resource deployment identifying the resources available and their current deployment status.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (ITE) Message Set for External TMC Communication (MS/ETMCC) (Message Set)
- (ITE) Standard for Functional Level Traffic Management Data Dictionary (TMDD) (Data Dictionary)

resource request

A request for traffic management resources to implement special traffic control measures, assist in clean up, verify an incident, etc.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (ITE) Message Set for External TMC Communication (MS/ETMCC) (Message Set)
- (ITE) Standard for Functional Level Traffic Management Data Dictionary (TMDD) (Data Dictionary)

road network use

Aggregated route usage and associated travel data from clients for planning and analysis.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (ITE) Message Set for External TMC Communication (MS/ETMCC) (Message Set)
- (ITE) Standard for Functional Level Traffic Management Data Dictionary (TMDD) (Data Dictionary)

roadside archive data

A broad set of data derived from roadside sensors that includes current traffic conditions, environmental conditions, and any other data that can be directly collected by roadside sensors. This data also indicates the status of the sensors and reports of any identified sensor faults.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Simple Transportation Management Framework (STMF) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Class B Profile (Communications Protocol)
- (AASHTO) NTCIP - Data Collection & Monitoring Devices (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Global Object Definitions (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Point to Multi-Point Protocol Using RS-232 Subnetwork Profile (Communications Protocol)
- (AASHTO) NTCIP - Simple Transportation Management Framework (STMF) (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Simple Transportation Management Protocol (STMP) (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Subnetwork Profile for Point-to-Point Protocol using RS 232 (Data Dictionary, Message Set)

- (AASHTO) NTCIP - Transportation System Sensor Objects (Data Dictionary, Message Set)

roadway information system data

Information used to initialize, configure, and control roadside systems that provide driver information (e.g., dynamic message signs, highway advisory radio, beacon systems). This flow can provide message content and delivery attributes, local message store maintenance requests, control mode commands, status queries, and all other commands and associated parameters that support remote management of these systems.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Simple Transportation Management Framework (STMF) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Class B Profile (Communications Protocol)
- (AASHTO) NTCIP - Data Dictionary for Closed Circuit Television (CCTV) (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Global Object Definitions (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Object Definitions for Dynamic Message Signs (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Object Definitions for Video Switches (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Point to Multi-Point Protocol Using RS-232 Subnetwork Profile (Communications
- Protocol)
- (AASHTO) NTCIP - Simple Transportation Management Framework (STMF) (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Simple Transportation Management Protocol (STMP) (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Subnetwork Profile for Point-to-Point Protocol using RS 232 (Data Dictionary, Message Set)

roadway information system status

Current operating status of dynamic message signs, highway advisory radios, beacon systems, or other configurable field equipment that provides dynamic information to the driver.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Simple Transportation Management Framework (STMF) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Class B Profile (Communications Protocol)
- (AASHTO) NTCIP - Global Object Definitions (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Object Definitions for Dynamic Message Signs (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Point to Multi-Point Protocol Using RS-232 Subnetwork Profile (Communications Protocol)
- (AASHTO) NTCIP - Simple Transportation Management Framework (STMF) (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Simple Transportation Management Protocol (STMP) (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)

- (AASHTO) NTCIP - Subnetwork Profile for Point-to-Point Protocol using RS 232 (Data Dictionary, Message Set)

secure area characteristics

Characteristics (visual, audible, other) that are monitored by surveillance security systems via sensors.

Standards:
- None

secure area monitoring support

Commands that control surveillance equipment and security sensors that monitor secure public transportation areas. Also includes information for general advisories and alerts intended for general dissemination in these same public areas.

Standards:
- (AASHTO) NTCIP - Data Dictionary for Closed Circuit Television (CCTV) (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Global Object Definitions (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Object Definitions for Video Switches (Data Dictionary, Message Set)
- (ITE) TCIP - Onboard (OB) Business Area Standard (Data Dictionary, Message Set)

secure area surveillance data

Data collected from surveillance systems used to monitor secure areas. Includes video, audio, and other security sensor outputs.

Standards:
- (ITE) TCIP - Onboard (OB) Business Area Standard (Data Dictionary, Message Set)

sensor and surveillance control

Information used to configure and control sensor and surveillance systems at the roadside.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Simple Transportation Management Framework (STMF) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Class B Profile (Communications Protocol)
- (AASHTO) NTCIP - Data Collection & Monitoring Devices (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Global Object Definitions (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Point to Multi-Point Protocol Using RS-232 Subnetwork Profile (Communications Protocol)
- (AASHTO) NTCIP - Simple Transportation Management Framework (STMF) (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Simple Transportation Management Protocol (STMP) (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Subnetwork Profile for Point-to-Point Protocol using RS 232 (Data Dictionary, Message Set)

- (AASHTO) NTCIP - Transportation System Sensor Objects (Data Dictionary, Message Set)

signal control data
Information used to configure and control traffic signal systems.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Simple Transportation Management Framework (STMF) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Class B Profile (Communications Protocol)
- (AASHTO) NTCIP - Global Object Definitions (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Object Definitions for Actuated Traffic Signal Controller Units (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Point to Multi-Point Protocol Using RS-232 Subnetwork Profile (Communications Protocol)
- (AASHTO) NTCIP - Simple Transportation Management Framework (STMF) (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Simple Transportation Management Protocol (STMP) (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Subnetwork Profile for Point-to-Point Protocol using RS 232 (Data Dictionary, Message Set)

signal control status
Status of surface street signal controls.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Simple Transportation Management Framework (STMF) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Class B Profile (Communications Protocol)
- (AASHTO) NTCIP - Global Object Definitions (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Object Definitions for Actuated Traffic Signal Controller Units (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Point to Multi-Point Protocol Using RS-232 Subnetwork Profile (Communications Protocol)
- (AASHTO) NTCIP - Simple Transportation Management Framework (STMF) (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Simple Transportation Management Protocol (STMP) (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Subnetwork Profile for Point-to-Point Protocol using RS 232 (Data Dictionary, Message Set)

suggested route
Suggested route for a dispatched emergency vehicle that may reflect current network conditions and the additional routing options available to en-route emergency vehicles that are

not available to the general public.

Standards:
- None

traffic archive data

Information describing the use and vehicle composition on transportation facilities and the traffic control strategies employed. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)

traffic characteristics

Physical traffic characteristics which are monitored and translated into macroscopic measures like occupancy, volume, density, and average speed. Point measures support presence detection and individual vehicle measures like speed.

Standards:
- None

traffic control coordination

Information transfers that enable remote monitoring and control of traffic management devices. This flow is intended to allow cooperative access to, and control of, field equipment during incidents and special events and during day-to-day operations. This flow also allows 24-hour centers to monitor and control assets of other centers during off-hours, allows system redundancies and fail-over capabilities to be established, and otherwise enables integrated traffic control strategies in a region.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)

- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (ITE) Message Set for External TMC Communication (MS/ETMCC) (Message Set)
- (ITE) Standard for Functional Level Traffic Management Data Dictionary (TMDD) (Data Dictionary)

traffic equipment status

Identification of field equipment requiring repair and known information about the associated faults.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (ITE) Message Set for External TMC Communication (MS/ETMCC) (Message Set)
- (ITE) Standard for Functional Level Traffic Management Data Dictionary (TMDD) (Data Dictionary)

traffic flow

Raw and/or processed traffic detector information which allows derivation of traffic flow variables (e.g., speed, volume and density measures).

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Simple Transportation Management Framework (STMF) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Class B Profile (Communications Protocol)
- (AASHTO) NTCIP - Data Collection & Monitoring Devices (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Global Object Definitions (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Point to Multi-Point Protocol Using RS-232 Subnetwork Profile (Communications Protocol)
- (AASHTO) NTCIP - Simple Transportation Management Framework (STMF) (Data Dictionary,
- Message Set)
- (AASHTO) NTCIP - Simple Transportation Management Protocol (STMP) (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Subnetwork Profile for Point-to-Point Protocol using RS 232 (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Transportation System Sensor Objects (Data Dictionary, Message Set)

traffic images

High fidelity, real-time traffic images suitable for surveillance monitoring by the operator or for use in machine vision applications.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)

- (AASHTO) NTCIP - Application Profile for Simple Transportation Management Framework (STMF) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Data Dictionary for Closed Circuit Television (CCTV) (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Global Object Definitions (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Object Definitions for Video Switches (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Simple Transportation Management Framework (STMF) (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Simple Transportation Management Protocol (STMP) (Data Dictionary, Message Set)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)

traffic information

Current and forecasted traffic information, road and weather conditions, incident information, and pricing data. Either raw data, processed data, or some combination of both may be provided by this architecture flow.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (ITE) Message Set for External TMC Communication (MS/ETMCC) (Message Set)
- (ITE) Standard for Functional Level Traffic Management Data Dictionary (TMDD) (Data Dictionary)

traffic information coordination

Traffic information exchanged between TMC's. Normally would include incidents, congestion data, traffic data, signal timing plans, and real-time signal control information.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (ITE) Message Set for External TMC Communication (MS/ETMCC) (Message Set)
- (ITE) Standard for Functional Level Traffic Management Data Dictionary (TMDD) (Data Dictionary)

traffic information for media

Report of current traffic conditions, incidents, maintenance activities and other traffic-related information prepared for public dissemination through the media.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (ITE) Message Set for External TMC Communication (MS/ETMCC) (Message Set)
- (ITE) Standard for Functional Level Traffic Management Data Dictionary (TMDD) (Data Dictionary)

traffic information for transit
Current and forecasted traffic information and incident information.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (ITE) Message Set for External TMC Communication (MS/ETMCC) (Message Set)
- (ITE) Standard for Functional Level Traffic Management Data Dictionary (TMDD) (Data Dictionary)
- (ITE) TCIP - Traffic Management (TM) Business Area Standard (Data Dictionary, Message Set)

traffic operator data
Presentation of traffic operations data to the operator including traffic conditions, current operating status of traffic control equipment, maintenance activity status, incident status, and other information. This data keeps the operator appraised of current road network status, provides feedback to the operator as traffic control actions are implemented, and supports review of historical data and preparation for future traffic operations activities.

Standards:
- None

traffic operator inputs
Traffic operations requests for information, configuration changes, commands to adjust current traffic control strategies (e.g, adjust signal timing plans, change DMS messages), and other traffic operations data entry.

Standards:
- None

transit and fare schedules
Specific transit and fare schedule information including schedule adherence.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (ITE) TCIP - Scheduling/Runcutting (SCH) Business Area Standard (Data Dictionary, Message Set)

transit demand management request
Request to change the demand for transit facility use through pricing or other mechanisms.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)

transit demand management response
Response to transit demand management change requests indicating level of compliance with request.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)

transit driver display
Display (either video or audio) to transit driver containing status of various ITS services.

Standards:
- None

transit driver inputs
Transit driver emergency request as well as fare transaction data.

Standards:
- None

transit emergency coordination data

Data exchanged between centers dealing with a transit-related incident.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (IEEE) Standard for Common Incident Management Message Sets (IMMS) for use by EMCs (Data Dictionary, Message Set)
- (ITE) TCIP - Incident Management (IM) Business Area Standard (Data Dictionary, Message Set)

transit emergency data

Initial notification of transit emergency at a transit stop or on transit vehicles and further coordination as additional details become available and the response is coordinated.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (IEEE) Standard for Common Incident Management Message Sets (IMMS) for use by EMCs (Data Dictionary, Message Set)
- (ITE) TCIP - Incident Management (IM) Business Area Standard (Data Dictionary, Message Set)

transit information for media

Report of transit schedule deviations for public dissemination through the media.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)

transit information request

Request for transit operations information including schedule and fare information.   The

request can be a subscription that initiates as-needed information updates as well as a one-time request for information.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (ITE) TCIP - Passenger Information (PI) Business Area Standard (Data Dictionary, Message Set)
- (SAE) Advanced Traveler Information System (ATIS) Data Dictionary (Data Dictionary)
- (SAE) Advanced Traveler Information System (ATIS) Message Set (Message Set)

transit information user request

Request for special transit routing, real-time schedule information, and availability information.

Standards:
- (ITE) TCIP - Passenger Information (PI) Business Area Standard (Data Dictionary, Message Set)
- (SAE) Advanced Traveler Information System (ATIS) Data Dictionary (Data Dictionary)
- (SAE) Advanced Traveler Information System (ATIS) Message Set (Message Set)

transit schedule information

Current and projected transit schedule adherence.

Standards:
- (ITE) TCIP - Control Center (CC) Business Area Standard (Data Dictionary, Message Set)
- (ITE) TCIP - Scheduling/Runcutting (SCH) Business Area Standard (Data Dictionary, Message Set)

transit traveler information

Transit information prepared to support transit users and other travelers. It contains transit schedules, real-time arrival information, fare schedules, and general transit service information.

Standards:
- (ITE) TCIP - Passenger Information (PI) Business Area Standard (Data Dictionary, Message Set)
- (SAE) Advanced Traveler Information System (ATIS) Data Dictionary (Data Dictionary)
- (SAE) Advanced Traveler Information System (ATIS) Message Set (Message Set)

transit traveler request

Request by a Transit traveler to summon assistance, request transit information, or request any other transit services.

Standards:
- (ITE) TCIP - Passenger Information (PI) Business Area Standard (Data Dictionary, Message Set)

transit user inputs
>Requests from transit user through either an on-board or fixed location traveler information station.

>**Standards:**
>- None

transit user outputs
>Information for traveler from either an on-board or fixed location traveler information station.

>**Standards:**
>- None

traveler information for media
>General traveler information regarding incidents, unusual traffic conditions, transit issues, or other advisory information that has been desensitized and provided to the media.

>**Standards:**
>- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
>- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
>- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
>- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
>- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
>- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
>- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
>- (SAE) Advanced Traveler Information System (ATIS) Data Dictionary (Data Dictionary)
>- (SAE) Advanced Traveler Information System (ATIS) Message Set (Message Set)

traveler inputs
>Request by a traveler to summon assistance, request travel information, make a reservation, or request any other traveler service.

>**Standards:**
>- None

traveler interface updates
>Visual or audio information (e.g., routes, messages, guidance) to the traveler.

>**Standards:**
>- None

vehicle location
>Location of vehicle and other vehicle characteristics which are exchanged between vehicle subsystems.

Standards:
- (ITE) TCIP - Onboard (OB) Business Area Standard (Data Dictionary, Message Set)

weather conditions

Collected weather condition data from sensors.

Standards:
- None

weather information

Accumulated forecasted and current weather data (e.g., temperature, pressure, wind speed, wind direction, humidity, precipitation, visibility, light conditions, etc.).

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (ITE) Message Set for External TMC Communication (MS/ETMCC) (Message Set)
- (ITE) Standard for Functional Level Traffic Management Data Dictionary (TMDD) (Data Dictionary)

work zone status

Status of maintenance work zone.

Standards:
- (AASHTO) NTCIP - Application Profile for File Transfer Protocol (FTP) (Communications Protocol)
- (AASHTO) NTCIP - Application Profile for Trivial File Transfer Protocol (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Common Object Request Broker Architecture (CORBA) (Communications Protocol)
- (AASHTO) NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX) (Communications Protocol)
- (AASHTO) NTCIP - Base Standard: Octet Encoding Rules (OER) (Communications Protocol)
- (AASHTO) NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile (Communications Protocol)
- (AASHTO) NTCIP - Subnetwork Profile for Ethernet (Data Dictionary, Message Set)
- (ITE) Message Set for External TMC Communication (MS/ETMCC) (Message Set)
- (ITE) Standard for Functional Level Traffic Management Data Dictionary (TMDD) (Data Dictionary)

5.5 PHASES OF IMPLEMENTATION

Table 5-4 shows the dependencies between the subsystems. The sequence of implementation of future projects should be based on these dependencies.

Table 5-4. List of Regional Market Package Dependencies

Code	Market Package Name	Prerequisite Packages:	Enables Packages:	Common Functionality with Package	Shared Information with Package
ATMS01	Network Surveillance	None	Freeway Control Surface Street Control Incident Management System Traffic Information Dissemination	Freeway Control Surface Street Control	Broadcast Traveler Information
ATMS04	Freeway Control	Network Surveillance	Traffic Forecast and Demand Management	Network Surveillance	Traffic Information Dissemination
EM1	Emergency Response	None	Transit Security Incident Management System Mayday Support HAZMAT Management	Transit Security	Incident Management System HAZMAT Management Emergency Routing ITS Data Warehouse
ATMS08	Incident Management System	Network Surveillance Emergency Response	None	Traffic Information Dissemination	Emergency Response Regional Traffic Control
EM2	Emergency Routing	None	None	None	Emergency Response
ATMS03	Surface Street Control	Network Surveillance	Traffic Forecast and Demand Management	Network Surveillance Regional Traffic Control	Traffic Information Dissemination
ATMS06	Traffic Information Dissemination	Network Surveillance	None	Incident Management System Road Weather Information System	Freeway Control Surface Street Control

Code	Market Package Name	Prerequisite Packages:	Enables Packages:	Common Functionality with Package	Shared Information with Package
AD1	ITS Data Mart	None	ITS Data Warehouse	ITS Data Warehouse	Traffic Forecast and Demand Management
CVO10	HAZMAT Management	Emergency Response	None		Emergency Response
APTS5	Transit Security	Emergency Response	None	Mayday Support Emergency Response	None
ATIS1	Broadcast Traveler Information	None	None		Network Surveillance
ATMS18	Road Weather Information System	None	None	Traffic Information Dissemination	None
ATMS07	Regional Traffic Control	Freeway Control	None	Surface Street Control	Incident Management System
AD2	ITS Data Warehouse	ITS Data Mart	None	ITS Data Mart	Traffic Forecast and Demand Management Emergency Response
EM3	Mayday Support	Emergency Response	None	Transit Security	Emergency Response
APTS8	Transit Traveler Information	None	None	None	None
ATMS09	Traffic Forecast and Demand Management	Freeway Control Surface Street Control	None	Network Surveillance	ITS Data Mart ITS Data Warehouse

APPENDIX A

Stakeholder interview highlights

APPENDIX A

STAKEHOLDER INTERVIEW HIGHLIGHTS

A.1 Overview

The first step in the development of the Austin ITS Master Plan was to identify and schedule interviews with the stakeholders. The stakeholders are a collection of parties that have an interest in transportation and public safety in the Austin region. A steering committee was also established to guide the ITS Master Plan development. The members of the Steering Committee were selected from the group of stakeholders. Their knowledge and experience are key to the development of an effective ITS vision that describes the ITS future for the Austin region.

The purpose of the stakeholder interviews was to identify the transportation and public safety-related systems in the region, determine how the various public safety and transportation agencies in the region interact, and determine the stakeholders' initial perceptions of the Combined Emergency Communication Center/Traffic Management Center (CECC/TMC). Interviews with the stakeholders served as a source for identifying current problems and potential ITS goals and objectives. Because the stakeholders interviews were completed in August of 2001, the issues presented in the following sections may no longer be valid.

A.2 Information Dissemination

The interview discussion on Information Dissemination focused on transportation-related information, such as traffic data, incident information, road closure notices, and traveler information. The interview addressed how data is transferred from one agency to another, what data an agency would like to obtain, and how an agency provides information to their customers.

Austin Area Media

In the Austin area, most of the television stations have access to TxDOT Traffic Cameras via an "equipment for access" agreement. The television stations use the cameras to support their traffic reporting. All of the television stations are interested in improving their reporting capabilities by receiving sensor data and incident reports (e.g., establishing web sites showing highway conditions based on sensor data).

KXAN currently does not have access to the cameras due to network issues. The KXAN News Director did indicate that KXAN would like to have access to TxDOT cameras.

Metro Networks monitors traffic conditions and provides traffic reporting in the Austin area. Currently, they depend on their own sources for traffic data. Metro Networks indicated that they are interested in working with TxDOT to improve the services they provide to the Austin area.

Austin-Bergstrom International Airport Police Department

The Austin-Bergstrom International Airport Police Department (ABIA PD) is part of the Austin Police Department. When the new **R**adio trunking, computer aided **D**ispatch, **M**obile data computer, and **T**ransportation and transit services (RDMT) Computer Aided Dispatch (CAD) system is installed, they will become an independent police department. The ABIA PD priority is security first (enforcing FAA regulations), then law enforcement. They receive their funding from the airlines that use the airport.

The ABIA PD expressed interest in receiving traffic data about the roads around the airport. Data for US 183 and SH 71 around and near the airport would be used by ABIA PD in support of their mission. They are also interested in receiving traffic data across the Austin area for distribution to airport customers. ABIA PD would like to distribute traffic information via:

- FAX copy to the airlines (This is the method currently used to send what little traffic data they receive.)
- A "wireless device" such as a "Palm," to the ground transportation managers (Cabs and Capitol Metro)
- Kiosks set up around the airport
- Electronic signs (A large number of deaf people use the airport. Providing information to them is a problem the airport has been trying to solve.)
- The airport's web site

The ABIA PD would like access to the TxDOT cameras for incident verification and to support their officers should they respond to an incident off the airport grounds. They do not have the personnel to use the cameras for incident detection.

Austin Emergency Medical Service

The Austin Emergency Medical Service (EMS) provides emergency medical services for all of Travis County. During severe weather conditions such as flooding, they provide assistance outside Travis County.

Austin EMS does not currently receive road closure information (The Austin Fire Department stated they do receive information on incident-based road closures). They would like to receive scheduled road closure information and event-triggered closure information. The Austin EMS would also like to receive road closure information for outlying counties such as Hayes, Williamson, Bastrop, Comal, and Guadalupe.

The Austin EMS would like to have access to the Dynamic Message Signs (DMS) to display collision incident information.

Austin Independent School District Police Department

The Austin Independent School District Police Department (AISD PD) is responsible for the city of Austin Public Schools. They are an independent Police Department. The department would like to receive information on traffic conditions, traffic incidents, and road closures and flooding. The information would be used to assist AISD PD officers and school bus drivers.

Austin Police Department

The Austin Police Department (APD) is responsible for patrolling and responding to incidents on all the roadways within the city of Austin. To provide information to the public, they have dial-up access to two DMS. Supervisors may call TxDOT to have them change signs or they may do it themselves. The APD would like to see this access expanded to all DMS.

Capitol Metro

Capitol Metro operates the city of Austin's Public Transit system and Paratransit system. They maintain a customer call line for schedule information and trip planning. They are planning to add an automated trip planner program to their web site. This program would allow a user to enter departure and destination information along with other criteria, and then the program would develop and present an itinerary to the user.

Capitol Metro uses an Automatic Vehicle Location (AVL) system for the in-vehicle annunciation system. Announcements are made based on the vehicle's position as it approaches a stop. They do not use it to track buses or for schedule monitoring. Capitol Metro does have plans to track buses using AVL in the future.

Capitol Metro would like to automate the interface to TxDOT to facilitate receiving information on incidents and planned road closures.

Office of Emergency Management

The Office of Emergency Management (OEM) is responsible for managing community-wide unplanned events (incidents) and non-recurring planned events (such as conferences that attract hostile crowds). The OEM also maintains and operates the city of Austin's Emergency Operations Center (EOC). They are also responsible for providing the public with warnings and information on major incidents. To provide information to the public, the OEM owns and operates a single Highway Advisory Radio (HAR). Through an agreement with TxDOT, the OEM also has access to the TxDOT HAR. The reciprocal agreement gives TxDOT access to the OEM HAR. In addition to the HAR, the OEM can broadcast information from the EOC on channel 6 of the Time Warner cable system. The OEM would like to establish a web site to provide information to the public.

Texas Turnpike Authority

The Texas Turnpike Authority (TTA) is responsible for the design and development of SH 130. The TTA is planning to use a web site to disseminate information on SH 130 to the public. The TTA is also planning to use DMS located on the non-toll highways with hopes of directing traffic onto the toll way.

Travis County Constables

The Travis County Constables would like to have a system that will automatically inform them of road closures. They would like to see more DMS installed displaying lane closures and travel times.

TxDOT Traffic Operations Division

The TxDOT Traffic Operations Division (TRF) provided the Automated Traffic Management System (ATMS) software used by the Austin District. The TxDOT ATMS software provides the user an application for communicating information to the public by the DMS it controls. The application provides the operator with a library of messages that can be displayed on a DMS. The division would like to interface with regional DMS located 20-30 miles outside of the city limits in order to provide traffic data and suggested alternative routes to the public.

The TxDOT ATMS software does not come with web support. The traffic systems that do have web sites (such as Dallas/Ft. Worth) added the capability to their system. The division believes the Austin web site should be region-wide (Hayes, Williamson counties), not just Austin specifically.

The Traffic Operations Division has tried to implement kiosks in the past, but they had problems finding the proper locations to install the kiosks. There were problems with maintenance/vandalism of the kiosks. They are interested in trying to implement kiosks in the future at transportation centers (such as airports).

TxDOT Maintenance Austin District

TxDOT Maintenance Austin District anticipates holding coordination meetings between the Maintenance department and the Traffic Management Center (TMC) to discuss where they could help each other. They also see a great benefit in sharing information with the TMC regarding highway damage or obstructions that may result in a short-term shutdown or delay. They would provide this information as it becomes available so it should be presented to the public on a web site or DMS.

Williamson County EMS/EOC

The Williamson County EMS receives a large number of 911 calls from people looking for traffic information, especially when there are major slow downs along the highway. To solve this problem, EMS is interested in establishing an alternative way of informing the public about

traffic problems without the use of the 911 system. A 511 system and the ability to put their traffic information on the HAR are some of the options considered. They would also like the ability to place emergency information on the HAR during Williamson County EOC activations.

EMS would like to see lane control signals and dynamic message signs extended throughout Williamson County. They would like to have direct access to the DMS and have the courtesy patrol expand its operations in the county. They think this would help reduce traffic congestion and improve public relations.

When the county requires TxDOT Maintenance assistance, the request is made by telephone. EMS would like an automated method of notification.

A.3 Maintenance Operations

The interview discussion on Maintenance Operations focused on the services provided and coverage areas of the Highway Maintenance Departments located in the Austin area.

Travis County Natural Resources and Transportation

Travis County Natural Resources and Transportation has jurisdiction over all roads outside incorporated areas of Travis County except for state-controlled highways. Their primary responsibilities are road maintenance, road construction, and road planning and design. The department provides information on non-emergency closures through the Travis County Commissioners Court, while emergency closures are reported to the department dispatcher, who in turn notifies other agencies. The department maintains a vehicle to respond to incidents on a 24-hour per day basis. The vehicle is equipped to remove debris from the road and perform minor repairs.

TxDOT Maintenance Austin District

The Austin District is broken down into 15 maintenance sections, with five area engineers. Of these 15 sections, some have a very limited number of maintenance vehicles. There are also some special crew operations. Each of the maintenance supervisors within a section dispatches their own vehicles.

The District receives calls on roadway damage and obstructions from the general public, the courtesy patrol, and/or from their own vehicles. If a maintenance person needs to clarify a problem, they may call and ask the TMC to obtain additional information by using a camera to view the problem.

The District anticipates holding coordination meetings with the TMC to discuss areas where they can help each other. They see a benefit in sharing information with the TMC regarding highway damage or obstruction that may result in a short-term shutdown or delay. They would provide this information as it becomes available so it can be presented to the public by a web site or DMS.

Williamson County Engineering Department

Williamson County Engineering Department is responsible for the roads in the unincorporated areas of Williamson County. Since Williamson County is primarily rural, they are responsible for a large portion of the county. Currently, Williamson County has set up $350 million in bonds for improvements and new construction (see http://www.roadbonds.org for details on the projects).

Part of the Williamson County bond issue addresses railroad crossing safety improvements. They are looking at installing automated signals at grade level crossings. They would like to explore the possibility of partnering with TxDOT and the Railroad Company on improving railroad-crossing safety.

The County Engineer would like to see better coordination of road closures and maintenance. They would like the ability to schedule road closures and maintenance to create as little an impact on traffic as possible while ensuring work is completed.

A.4 Commercial Vehicle Operations (CVO)

The interview discussion on Commercial Vehicle Operations focused on these topics,

- Electronic credentials
- Administrative services
- Vehicle inspections
- Weight-In-Motion

Texas Highway Patrol

The Texas Highway Patrol is part of the Department of Public Safety (DPS). Within DPS, the Highway Patrol is part of the Traffic Division. The Traffic Division consists of three organizations: Vehicle Inspection, Licenses and Weight, and the Highway Patrol.

The License and Weights Division handles most of the CVO functions for the DPS. They perform roadside inspections and operate weigh stations. The Licenses and Weights Division provides the city of Austin with License and Weight read and update access to the DPS Database. The Highway Patrol assists the License and Weights Division in performing roadside inspections of commercial vehicles.

TxDOT Planning/Programs

The department operates 16 weigh-in-motion stations in rural areas. The weigh-in-motion stations are used to collect data on commercial vehicles and are not used for enforcement. None of these stations are located in the Austin area. They do have plans to increase the number of weigh-in-motion stations.

TxDOT Motor Carrier Division

The Motor Carrier Division (MCD) currently performs electronic credentialing through their web site for oversize/overweight loads. They currently are running a pilot program to extend electronic credentialing and have funding in place for a production system when the pilot project is completed.

The Division operates a web site for providing information to the carriers. They would be willing to include links to the TMC for traffic and weather information that would be of interest to a carrier on a short-term basis.

MCD also would like to have a notification system through the District Coordinator to inform them of major road construction projects, road/lane closures, and lane width restrictions.

A.5 Incident and Emergency Management

The interview discussion on Incident Management and Emergency Management focused on the functions of Incident Detection and Verification, Incident Management, Emergency Response, and Emergency Management.

Austin-Bergstrom International Airport Police Department

The ABIA PD will be receiving two CAD terminals as part of the CECC project. These CAD terminals will have a network connection to the RDMT CAD system. The RDMT CAD system will be used to coordinate minor incidents with the APD. They will continue using the phone system to coordinate major incidents with the APD (e.g., If they need the SWAT team, the phone system would be used). The ABIA PD has nine patrol vehicles equipped with MDTs and plan to install AVL in the near future. The airport has over 100 cameras monitoring the terminal building and the roadways within the airport (US 183 and SH 71 block the view of the roads just outside of the airport). They will be using the CECC's 800MHz radio system when it is operational.

Austin Independent School District Police Department

Currently, AISD PD receives incident information by monitoring the Austin Police Department on a scanner or by a dedicated telephone link with the APD. Occasionally, the AISD PD will miss an APD incident near a school or involving a school because the AISD PD dispatcher is not familiar with all of the streets near a school. They would like to upgrade their CAD and radio system to improve their interaction with APD. They would also like to have access to the TxDOT's traffic cameras and the city of Austin's traffic cameras.

Austin Emergency Medical Service

The Austin EMS believes displaying TxDOT's traffic cameras on the video wall and on desktops in the CECC/TMC will be very beneficial in confirming the address and location of an incident. Views of fly-overs, on-and-off ramps, and traffic along a dispatched route may also prove

beneficial. They are concerned about the amount of time the dispatchers will spend trying to interpret a camera's view.

Austin Fire Department

Currently, the AFD can only access the TxDOT cameras through the TxDOT web site. The AFD would like TxDOT to implement a few changes to the cameras that would help the AFD dispatchers. These changes are:

- Providing data to the dispatchers on the best camera to view an incident.
- Views of the fly-overs and the ramps along a dispatched route.
- An indicator that shows which direction a camera is pointing.

Austin Police Department

The APD wants the capability to see all cameras within the new CECC. They believe this will help to confirm address and location of an incident. In addition, they believe this will help clear the 911-call taker queue faster when an accident is reported on the highway. The first call taker/dispatcher can display the incident for any subsequent calls about the incident.

CECC/TMC Project

The primary goal of the CECC is to deliver the correct service as quickly as possible. Co-locating the different agencies in the CECC will improve interoperability and information sharing. It will also allow the management of the different agencies to develop common processes and procedures for managing incidents.

The minor incidents will be managed using the current day-to-day procedures (usually via CAD with supervisor-to-supervisor communications via telephone). Major incidents will be handled by the EOC. The procedures for handling in-between incidents will evolve over time (primarily via the "Joint Operations Centers").

Office of Emergency Management

The OEM's Emergency Operations Center is activated when a major incident occurs. The EOC acts as a clearinghouse to coordinate management of the incident with multiple agencies. The EOC manages an incident by collecting data from multiple agencies on an incident. Using the data collected, they work with the agencies to resolve the incident. The OEM also manages community-wide unplanned events (incidents) and non-recurring planned events (such as conferences that attract hostile crowds). They are also responsible for providing the public with warnings and information on major incidents.

The EOC would like to have web-based access to "rolled up" information on traffic flow and incidents. The application would have the capability to "drill down" into an incident to obtain additional information (e.g., camera views and control, incident type, units on the scene). In addition to incident information, the EOC also needs access to weather information.

The OEM believes it would be helpful to have a TxDOT person in the EOC to control the HAR and DMS. In general, having a dispatcher from each of the agencies involved in an incident would be very helpful. They also believe the integration of traffic signals on access roads and arterials would help move traffic in emergencies.

Round Rock Police Department

Round Rock PD is purchasing a new CAD and Records Management System (RMS). The period of performance for the contract is October 2001 through December 2002. Although the PD would like to have an incident data interface with the TxDOT ATMS system, it is not a priority. There is no requirement for dynamic routing ("Round Rock is too small"). The other interface they would like to have is access to the cameras along IH 35, but this is a long-term goal. Currently, there are no TxDOT cameras installed along IH 35 in Round Rock.

The new CAD system will add AVL/MDC with GIS access to the police cruisers. They also have a new 800MHz trunk system that may be compatible with the new 800MHz system at the CECC. There has been some discussion about sharing a tower site with the CECC.

Texas Highway Patrol

The Texas Highway Patrol primary patrol area is the unincorporated area of a county. In Travis County, the Sheriff and the Texas Highway Patrol service the unincorporated areas of the county. Because of the overlap in jurisdiction between the Patrol and the Travis County Sheriff's Office, the Patrol interacts primarily with the Travis County Sheriff's Office. Otherwise, the Patrol has limited interaction with other Public Safety agencies in Travis County. The AFD and EMS do respond to incidents in the area patrolled by the Texas Highway Patrol.

Presently, the Patrol communicates with the city of Austin over the current radio system. The Patrol will lose this capability when city of Austin switches to the new 800MHz Radio System. After the switch, all communications with the city of Austin will be done via dispatcher-to-dispatcher phone communications.

Texas Turnpike Authority

The Texas Turnpike Authority (TTA) would like to dispatch emergency response vehicles from the CECC/TMC. They would like to have their own courtesy patrol staff and vehicles but have them dispatched by the APD (the APD dispatches the TxDOT Austin Courtesy Patrol). They would also look into manning the center to maintain 24-hour operations within the TMC portion.

Emergency vehicles would be able to gain uninhibited access to the toll road by the Express lanes at the toll plazas. They are looking into equipping local emergency vehicles with a non-revenue transponder in order to maintain accurate information on roadway usage.

The actual planning of the roadway will be accomplished by the Traffic Division at the Riverside Campus. The Traffic Division is holding planning and coordination meetings on these issues,

and the TTA believes it would be beneficial to revisit these issues after these meetings have been completed.

TxDOT Austin Traffic Management Center

The TxDOT Austin District is in the process of building a freeway management system. The initial system will cover IH 35, US 183, US 290, and Loop 1 when completed.

The freeway management system will include loop detectors installed in the mainline and in ramps, cameras, HAR, DMS, ATMS Software developed by TxDOT, and a courtesy patrol. The control center and the courtesy patrol are currently located in the Austin District office of TxDOT and eventually will be located in the CECC.

The new Communications Center project includes a new (CAD) system that will be interfaced to the TxDOT ATMS software. The interface will provide traffic data to the CAD system. The traffic data will be used by the CAD system to perform dynamic routing of emergency vehicles. The interface will also exchange incident data with the TxDOT ATMS.

TxDOT Maintenance Austin District

The Maintenance Division believes they need to be able to communicate and share information with the TMC during an activation of the EOC. They typically take part in EOC activations for:

- Evacuations of the coastline
- Major flooding event
- Ice Storms/Snow
- Called in on other events as necessary

Williamson County EMS/EOC

The Williamson County dispatch center provides dispatch support for several agencies within the county. These agencies are Williamson County EMS, Fire, and Sheriff along with several of the smaller city Police, Fire, and EMS departments. They are currently on a different CAD than anyone else in the county. All the major entities across the county are looking at the possibility of building a combined center in the near future.

They do not have any TxDOT representation during EOC activations. They simply contact TxDOT by phone when they require information or assistance from TxDOT. They feel it would be very beneficial to have a TxDOT representative in the EOC during activations.

They are considering a Regional Combined Emergency Center for Williamson county and all the agencies within the county.

A.6 Freeway and Arterial Traffic Management

The interview discussion on the management of Freeway and Arterial traffic focused on incident detection and verification, TMC integration, signal controls, and the courtesy patrol.

Austin Fire Department

The AFD believes TxDOT could help resolve a few issues in responding to incidents on freeway system. One of the issues that AFD has is locating an incident on the freeway. Motorists have a hard time identifying the location of an incident on the freeway. One approach to resolving this problem are signs with the cross street name on bridges, extended mile markers, and ramp signs with unique identifiers for each fly-over.

City of Austin Signals

The Signal Control Center at Toomey Road is the culmination of a two-year project to design and build the center and design and install the signal control video and data networks. When completed, the Signal Control Center will be able to monitor and control signals throughout the city of Austin.

The system consists of cameras, loops, and signal controllers. The control center is connected to the field devices by six hubs located throughout the city. Each hub is connected back to Toomey Road via ATM over OC-12 SONET. The system can capture and store traffic data.

The Signal Control Center would like to be able to receive data feeds from the loops on the IH 35 main lanes in order to change/control signal plans on the access roads when necessary. They would like access to the TxDOT cameras with PTZ control. This would possibly be a shared control with TxDOT using a priority, similar to what the news media now has.

Office of Emergency Management

The OEM is interested in using the courtesy patrol and other agencies to obtain information on road conditions during ice storms and similar emergencies.

Round Rock Police Department

The Round Rock PD would like to have the courtesy patrol available in the Round Rock area. Currently, the courtesy patrol has limited availability in the Round Rock area. The Round Rock PD has had problems with the courtesy patrol responding to the Round Rock area ("It is too far north").

Round Rock Public Works Department

The Round Rock Public Works Department would like to build a TMC/Dispatch Center that would house dispatchers for traffic management, police, and fire. Currently, fire and police are co-located. They also would like to interface to the Austin TMC to share traffic and incident

data. This interface could also be used to automate changing the signal plan based on the incident. The primary concern of the department is the integration of three different signal controllers. The city uses primary Eagle controllers. TxDOT uses three different controllers (at least one of the controllers is limited in the data it can provide). The department is also concerned about the time frame of implementing the interface to the TMC.

The department can collect vehicle counts, speed, and occupancy data using their signal system. Currently, the department can manually change the signal plan in response to an incident. The department would like to automate the control of their signals. They also use portable loops for doing spot checks of traffic counts.

The department has installed 14 fixed cameras throughout the city. They also plan to install two cameras on Pan-Tilt-Zoom mounts along IH 35. The department has been experimenting with spread spectrum wireless communications with a signal system and cameras.

Texas Turnpike Authority

The Texas Turnpike Authority is planning to install loop detectors, cameras (traffic and security) along the turnpike. They are also planning to only meter ramps where toll plazas would be located, but they are open to the idea of metering all ramps if this data can and will be used by other entities. Lane control signals will only be installed at the tollbooths. They are willing to share access to cameras that are monitoring traffic, such as queues on the on-ramps.

Travis County Natural Resources and Transportation

Travis County has approximately 12 traffic signals. They are maintained and operated by the city of Austin. The city also maintains the signal plans for the county's traffic signals. Currently, pre-emption capability has not been installed on these signals.

Except for county parks, Travis County does not have any permanent roadside data collection equipment.

TxDOT Planning/Programs

The department operates 25 continuously operating AVC sites in the Texas/Mexico Border area. They also operate a network of 144 continuously counting sites statewide. These count stations are located in rural areas of Texas. In addition to vehicle count, the TPP collects axle spacing to support Federal Highway Administration vehicle classification requirements. They plan to convert as many ATR sites as possible to AVC over the next four years. The TPP does not maintain a historical database of traffic data.

Currently, the department does not receive any data from any TMC. The department would be interested in sharing data with the Austin TMC to satisfy the FHWA request for urban vehicle data. They are concerned that the error rate of the data collected by the Austin system is too high.

TxDOT is currently evaluating a real-time, record-per-vehicle classifier system on IH 35 in Austin. The evaluation is being accomplished via a research project with Texas Transportation Institute (TTI). The system is called SmartLoops and is produced by PEEK Traffic Inc.

TxDOT Traffic Operations Division

The TxDOT Traffic Operations Division has started a project to integrate the existing Traffic Management Centers together. The Division plans to eventually integrate all the TMCs along the border and major metropolitan areas. To support this effort, the Southwest Research Institute, under the TxDOT Statewide Integrator Contract, has developed a center-to-center system. It currently provides basic status information (traffic and equipment status) and remote access to roadside equipment (such as video cameras). The center-to-center software will be the "interface engine" between the new RTMD CAD system and the Austin TMC.

The ATMS software collects traffic data and performs limited classification based on TxDOT's own algorithms. The Division is interested in sharing traffic data collected by the ATMS software with the TxDOT Planning and Programs Division. The Austin ATMS software currently does a once a week manual archive process. The data is provided to the Texas Traffic Institute/Texas A&M. TRF is developing an archive module for the ATMS software that would automate the archive process. The module would also be used as part of a statewide archive process.

Williamson County Engineering Department

Williamson County Engineering Department currently has less than 10 signals, all of which are on the outskirts of Austin and are managed and controlled by the city of Austin Public Works Signals office. They are planning to add additional signals to their system. As the County installs signals away from the city of Austin, they are planning to contract out the management of the signals. When it becomes cost effective, the County will build, staff, and operate their own signals center.

Williamson County does not own any permanent count stations, cameras, or any other ITS equipment. The county does own and operate a portable count station used to perform road usage studies.

Williamson County EMS/EOC

Williamson County EMS/EOC does not have direct access to the TxDOT traffic cameras. They use the TxDOT web site or KVUE News to view the cameras, neither of which is timely enough to meet their needs. They would like to have some method of viewing the cameras directly.

If TxDOT installs traffic sensors through Williamson County, EMS/EOC would like to receive sensor data to improve routing of emergency vehicles. Dispatchers currently route vehicles based on information they receive form multiple sources in a variety of ways (e.g., phone, fax, and radio). They would like a capability to receive road closure and construction reports directly into the CAD system.

EMS/EOC currently does not have an AVL or mobile data system. They are looking into using a Motorola mobile data solution to implement AVL along with the mobile data.

A.7 Environmental Monitoring and Management

The interview discussion on Environmental Monitoring and Management focused on roadside weather and environmental systems. These systems monitor road surface conditions, flooding, vehicle emissions, and general air quality. The data collected by these systems are sent back to a central location for processing.

Travis County Natural Resources and Transportation

Travis County maintains environmental monitors owned by the city of Austin on Brodie Lane to monitor run-off water quality. They also operate passive pollution abatement controls owned by the city of Austin in the Edward Aquifer.

Office of Emergency Management

The OEM operates several rain and stream gages to detect flooding. The sensors are part of a system called the Flood Early Warning System. The data collect by the sensors are sent back to the EOC were it is analyzed by an engineer. Based on the analysis, an Austin public safety unit (most likely a fire engine) is dispatched to check the water level and report to the EOC.

The OEM would like to install cameras and automated gates at low water crossings. This would reduce dependence on sending AFD personnel to a low water crossing. This should help reduce the number of motorist caught in high water.

Williamson County EMS/EOC

Williamson County does not perform any automated weather, flood, or environmental monitoring. For low water crossings and flooding, they rely on their staff's knowledge of the area and on weather service information. When deemed necessary, they send people out to check for flooding.

Williamson County Engineering Department

The county does not operate any environmental sensors (air quality, water quality, or flood warning). The department depends on the experience of the staff to know which roads may flood and when to check for flooding. The county has looked at the existing flood control tax board to raise the money to improve flood control and monitoring. The flood control system would be based on the existing dams and flood control ponds.

Monitoring of stream levels in Williamson County would probably not have much benefit for Austin and Travis County, as there is very little drainage from Williamson County into Travis County

A.8 Other Items of Interest (Needs and Concerns)

The CECC/TMC stakeholders were asked what they believed the advantages of the CECC/TMC are and its disadvantages. Most of the stakeholders shared the same opinion on the advantages of the CECC/TMC. These advantages are:

- The CECC/TMC improves coordination between the different agencies in Austin.
- There is improved communications via face-to-face interaction.
- Procedures may be streamlined via process improvement.
- The combined center will provide access to facilities any one agency would not be able to afford.
- Coordination of HAZMAT incidents will be improved.

Like the advantages, the CECC/TMC stakeholders shared common views about the disadvantages about the CECC/TMC. The disadvantages expressed by the principal stakeholders are:

- The different agencies that will be co-located in the CECC have different operating procedures and personnel polices. This could be a source of conflict between the agencies.
- No backup site for the CECC/TMC.
- A shared facility will limit an agency's ability to upgrade their systems without coordinating with the other agencies in the facility.
- The physical separation between the CECC and the city of Austin Management and the city Public Information Officer will increase the difficulty in keeping the city management and public informed about an incident.
- The physical separation between any of the organizations in the CECC/TMC and their parent organization could cause a "loss of cohesion."

It is interesting to note that one stakeholder believes there are no disadvantages to the new CECC/TMC.

There were a few operational issues identified by the stakeholders. One of the issues was the need to establish operation flows and work flows for different scenarios. Another stakeholder was concerned about training of CAD operators and coordinating the use of the training facility.

APPENDIX B

TxDOT Media Access Agreement

LICENSE AGREEMENT FOR THE USE OF THE
TEXAS DEPARTMENT OF TRANSPORTATION AUSTIN DISTRICT INTELLIGENT TRANSPORTATION SYSTEM INFRASTRUCTURE

STATE OF TEXAS   *
                        *
COUNTY OF TRAVIS   *

THIS AGREEMENT is made by and between the State of Texas, acting by and through the Texas Department of Transportation, hereinafter called the "State," and NAME, located at ADDRESS, hereinafter called the "Licensee."

W I T N E S S E T H

WHEREAS, the State, in accordance with Transportation Code, §201.205, may:

1. Apply for, register, secure, hold, and protect patents, copyrights, trademarks, or other evidence of protection or exclusivity;
2. Enter into nonexclusive license agreements with any third party for the receipt of fees, royalties, or other thing of monetary or nonmonetary value; and
3. Waive or reduce the amount of fees if it determines that such waiver will further the goals and missions of the department and result in a net benefit to the State; and

WHEREAS, Transportation Code, §202.052 authorizes the State to lease highway assets if the area to be leased is not needed for highway purposes during the term of the lease and the State charges fair market value for the leased asset, and authorizes the State to waive such fees in leases for social, economic, and environmental mitigation purposes; and

WHEREAS, the State is the owner of Intelligent Transportation (IT) Infrastructure constructed along segments of the state highway system in Travis and Williamson County, Texas, and has produced, and produces transportation related information that is used for the purpose of Intelligent Transportation System (ITS) management, generally known as "Austin District ITS," and in which the State owns certain rights, title, and interests related thereto, including copyrights; and

WHEREAS, the Licensee desires to obtain a non-exclusive license from the State to receive and use Austin District ITS transportation related information, and to use Austin District IT Infrastructure; and

WHEREAS, the State is agreeable to provide a non-exclusive, non-transferable license to the Licensee to use the Austin District ITS information and IT Infrastructure, provided the Licensee agrees to the terms and conditions established in this agreement.

NOW, THEREFORE, in consideration of the premises and of the mutual covenants and agreements of the parties hereto, to be by them respectively kept and performed as hereinafter set forth, it is agreed as follows:

A G R E E M E N T

ARTICLE I. CONTRACT PERIOD. This agreement becomes effective upon the date of final execution by the State and shall be automatically renewed annually, unless terminated or modified as hereinafter provided.

ARTICLE II. RIGHTS GRANTED. The State hereby grants to the Licensee a non-exclusive right, license, and privilege worldwide to use Austin District ITS information and Austin District IT Infrastructure for the purpose of obtaining and sharing transportation related information. The Licensee agrees to give the State voice or visual credit (TxDOT logo, if possible) for sharing the information. The State may transmit Austin District ITS transportation related information to the Licensee with an embedded logo. The Licensee shall not block, modify, or remove that logo. The Licensee agrees that this License does not transfer or convey any ownership or any other rights other than those rights expressly granted by this agreement.

In addition, the State hereby grants to the Licensee a nonexclusive right of access to the State's Austin District facility and a nonexclusive right to use space located in the facility, as shown in the installation plans required by Article V of this agreement. The Licensee acknowledges that it is using space located on the State's facility "as is", with all faults, and that the State has not made any representations or warranties as to the condition of the facility. The Licensee hereby waives any and all causes of action, claims, demands, damages, and liens based on any warranty, express or implied, including, but not limited to, any implied warranty of suitability for a particular purpose, any and all warranties of habitability, and any other implied warranties not expressly set forth in this agreement. The Licensee acknowledges and agrees that it has fully exercised the right to inspect the facility for any defects and to determine the suitability of the space for the purpose for which the Licensee intends to use it. This agreement is subject to all covenants, easements, reservations, restrictions, and other matters of record applicable to the State's facility. A more detailed description of rights granted is provided in Exhibit A to this agreement, which is attached hereto and incorporated herein for all purposes.

ARTICLE III. PROVISION OF INFRASTRUCTURE. The Licensee is responsible for providing and maintaining any hardware, software, and additional infrastructure that are necessary to obtain Austin District ITS information. For purposes of obtaining and transmitting the Austin District ITS information, the Licensee will install additional infrastructure, as shown in the installation plans required by Article V of this agreement, on the State's Austin District facility used to produce Austin District ITS information. The State will provide unused IT Infrastructure and State facilities to support the additional infrastructure. As the use of the Austin District ITS information and State facilities will result in social, economic, and environmental mitigation, by increasing mobility and reducing congestion on public highways, the State agrees to waive any fees

associated with the use of State property. A more detailed description of infrastructure provided by each party is shown in Exhibit A.

IV. INSTALLATION OF EQUIPMENT. The Licensee shall install any necessary hardware, software, or other infrastructure at its sole cost and risk, and pursuant to the installation plans and standards prescribed in Articles V and VI of this agreement. Any equipment installation or engineering design provided by the Licensee shall be subject to the State's review and approval to ensure compatibility with existing equipment and software. All equipment shall be clearly labeled to identify it as equipment installed by the Licensee. The Licensee shall provide all interface items required to maintain the equipment. Access by the Licensee's employees or contractors to equipment located in the State's facility will be by appointment only and will be in the company of designated personnel of the State.

V. INSTALLATION PLANS. Preliminary plans and specifications representing the pertinent features of any and all equipment to be installed by the Licensee, and the relationship of such equipment to the State's facility shall be delivered to the State concurrently with the Licensee's execution of this agreement. The installation of all equipment proposed to be placed on or in the State's facility shall substantially comply with and reflect the design set out in the plans and specifications attached to this agreement as Exhibit C. All such plans and specifications shall be approved by the State before any installation of equipment begins. During the course of the work, any substantial changes or alterations must also be submitted to the State for prior written approval. All work shall be done in conformity with the approved plans and specifications.

VI. INSTALLATION STANDARDS. Any installation of equipment, and any repairs thereto, replacement thereof, or other work with regard thereto shall be performed in accordance with the following standards:

1. All such work shall be performed in a manner in accordance with industry practice for the type of work in question;
2. At the Licensee's sole cost and expense, all such work shall be done in compliance with all applicable building codes, ordinances, and other laws, rules, or regulations of governmental authorities having jurisdiction over such work, including, but not limited to, the Americans with Disabilities Act and the Texas Architectural Barriers Act;
3. The Licensee must obtain all required governmental licenses, permits, and authorizations prior to beginning any such work and shall provide copies of the same to the State upon request;
4. Prior to beginning any installation of equipment, the Licensee shall have obtained, and shall thereafter maintain in full force and effect during all such installation, insurance coverage in the amounts set forth herein, and shall furnish evidence of such insurance to the State;
5. After commencement of installation of equipment, the Licensee covenants and agrees that such work will be prosecuted with due diligence to its completion; and

6. The Licensee is solely responsible for meeting and adhering to the above standards, notwithstanding the State's approval of plans and specifications.

VII. INTERFERENCE WITH OTHER LICENSES. The Licensee acknowledges and agrees that its use of the State's facility is of a nonexclusive nature and the State has the right to grant other licenses, or rights of use, of any kind or nature, to parties other than the Licensee. The Licensee's equipment shall be of such type and frequencies, and shall be operated in such a manner as not to cause measurable interference with any other licensee's use of the Austin District ITS information. If, in the State's sole opinion, the Licensee's use of the State's facility interferes with or disrupts the State's use of its facility, the State may disconnect the Licensee's equipment until the cause of the interference is corrected by the Licensee.

VIII. COMPLIANCE WITH LAWS. The Licensee, at its own expense, will comply with all Federal, State, municipal, and other laws, ordinances, rules, and regulations applicable to the State's facility; will comply with such regulations as the State may promulgate regarding sanitation, cleanliness, and other health and/or environmental matters, including, without limitation, removal of garbage, trash, and other waste caused directly or indirectly by the Licensee; and will use the highest degree of care and all proper safeguards to prevent pollution of air, soil and water in, on, under, and around the State's facility. The Licensee shall not commit any act or permit any act that creates or may create a nuisance in or upon the State's facility during the term of this agreement.

IX. STATE'S RIGHTS AND RELEASE OF CLAIMS. In the event the State determines there is a condition or omission with respect to the Licensee's equipment, which is a hazard to the safety of the public, the State shall notify the Licensee of this condition and shall specify a reasonable time for curative action to be completed; provided, however, that in the event such condition or omission creates an emergency, as determined by the State, the State may, but is not obligated to, mitigate such condition in any manner deemed necessary or desirable by the State. Should the Licensee fail to correct the situation within the time provided for in the notice, the State may, but is not obligated to, mitigate the condition. The Licensee hereby expressly releases the State from any and all damages and claims that may result from such mitigation by the State.

X. IMPOSITIONS. The term "impositions", as used herein, shall mean all fees and other charges of any kind or nature whatsoever that are assessed, levied, charged, or imposed during the term of this agreement and that accrue from any use or occupancy of the State's facility by the Licensee, or that are related to any installation performed by the Licensee under this agreement. The term "impositions" shall also include all penalties, interest, and other charges payable by reason of any delay or any failure or refusal by the Licensee to make timely payments as required herein. During the term of this agreement, the Licensee will pay all impositions as and when they become due. The Licensee will pay for all connection fees, transfer fees, and deposits levied or charged against or in connection with the Licensee's installation activities, and will pay all charges for utility services required in connection with its use of the State's facility and the Austin District

ITS information. In no event will the State be liable to the Licensee for any interruption or failure in the supply of any utilities to the State's facility.

XI. INSURANCE. At all times during the term of this agreement, the Licensee, at its sole cost and expense, shall carry commercial general liability insurance coverage in a minimum amount of $1,000,000.00 each occurrence, $2,000,000.00 general aggregate, which policy shall insure against bodily injury, death, and property damage and shall include coverage for the State's facility and its operation. The liability insurance policy required herein shall name the State as an additional insured and shall include a waiver of subrogation endorsement in favor of, and in a form acceptable to the State. The Licensee shall furnish the State with a certificate of insurance evidencing all coverage required herein prior to the commencement of any work under this agreement. The Licensee shall cause its insurance carrier to certify that such insurance will not be canceled without thirty (30) days prior written notice to the State. The Licensee's obligation to carry and pay for the insurance described in this agreement will continue beyond the term of this agreement in the event the Licensee remains in possession of the leased space in the State's facility for any reason. The Licensee may not use or occupy, permit the State's facility to be used or occupied, nor do or permit anything to be done in or on the facility in a manner that would in any way make void or voidable any insurance then in force with respect thereto, or that would make it impossible to obtain the insurance required to be furnished by the Licensee hereunder.

ARTICLE XII. LICENSE FEE. The State agrees to waive any monetary fee associated with the use of the license. The State shall be provided nonmonetary compensation for the licensed Austin District ITS information and the use of Austin District IT Infrastructure as described in this agreement. A detailed description of the nonmonetary compensation is contained in Exhibit D to this agreement, which is attached hereto and incorporated herein for all purposes.

ARTICLE XIII. COPYRIGHT INFRINGEMENT. The Licensee shall notify the State of any infringement or potential infringement by a third party of the copyright or any other rights owned by the State relating to the Austin District ITS information or Austin District IT Infrastructure, or of any breach of this agreement by any third party. Each party shall assist and cooperate in resolving any and all such breaches or infringements.

ARTICLE XIV. ASSIGNMENT PROHIBITION. The Licensee is prohibited from assigning the licensed rights to the Austin District ITS information or IT Infrastructure, or licensing any of the rights conferred by this agreement, to any third party. Notwithstanding the foregoing, the Licensee may assign its licensed rights to an affiliated corporate entity or to a purchaser of substantially all its assets without the State's consent, provided that the State's rights under this agreement remain unaffected. Any assignment shall be subject to the terms and conditions of this agreement.

ARTICLE XV. INDEMNIFICATION. The Licensee shall indemnify and save harmless the State from any and all losses, liabilities, damages, claims, demands, costs, expenses, or other liabilities arising out of or connected with the Licensee's possession or use of the

ITS information during the term of this agreement including, but not limited to, any illegal or improper use of the information or any violation of right to privacy. The Licensee shall also indemnify and save harmless the State and its officers and employees against any and all proceedings, suits, actions, claims, damages, judgments, liabilities, awards, expenses, and attorneys' fees arising out of any claim that may be brought or instituted on account of or growing out of any and all injuries or damages, including death, to persons or property relating directly or indirectly to the Licensee's use or occupancy of the State's facility, except to the extent such claim arises out of an act of the State or its officers, employees, or agents. The Licensee's indemnification of the State shall continue beyond the date of termination of this agreement in the event the Licensee remains in possession of the leased space in the State's facility for any reason, or for a period of three (3) years beyond the date of termination of this agreement, whichever is longer.

XVI. RELATIONSHIP BETWEEN THE PARTIES. The Licensee acknowledges that it is not an agent, servant, or employee of the State and that it is responsible for its own acts, deeds, errors and omissions, and for those of its agents, employees, or contractors during the performance of the activities authorized in this agreement.

ARTICLE XVII. AMENDMENTS. Any changes in the contract period, character, or agreement terms shall be enacted by a written amendment executed by both parties. Amendments must be executed during the contract period established in Article I.

ARTICLE XVIII. TERMINATION. Including the provisions established herein, this agreement may be terminated by mutual agreement and consent of the parties hereto or by the State for reasons of its own and not subject to the approval of the Licensee upon not less than thirty (30) days written notice to the Licensee. Termination of the agreement shall extinguish all rights, duties, obligations and liabilities of the State and the Licensee under this agreement. All rights granted to the Licensee shall revert to the State as owner of the information. Upon termination of this agreement, the Licensee will immediately cease obtaining and sharing the information. Termination or expiration of this agreement shall not extinguish any of the Licensee's or the State's obligations under this agreement which by their terms continue after the date of termination or expiration.

ARTICLE XIX. REMEDIES. Violation or breach of contract by the Licensee shall be grounds for termination of the agreement and any increased costs arising from the Licensee's default, breach of contract or violation of contract terms shall be paid by the Licensee.

XX. LEGAL CONSTRUCTION. In case one or more of the provisions contained in this agreement shall for any reason be held invalid, illegal or unenforceable in any respect, such invalidity, illegality or unenforceability shall not affect any other provision thereof and this agreement shall be construed as if such invalid, illegal or unenforceable provision had never been contained herein.

XXI. PRIOR AGREEMENTS SUPERSEDED. This agreement constitutes the sole and only agreement between the parties and supersedes any prior understandings and/or written or oral agreements between the State and the Licensee respecting the within subject matter.

ARTICLE XXII. NOTICES. All notices to either party by the other party required under this agreement shall be delivered personally or sent by certified or U.S. Mail, postage prepaid, addressed to such party at the following respective physical addresses:

State: Texas Department of Transportation
          Austin District Transportation Operations
          ATTN: Director of Transportation Operations
          7901 N. IH 35
          Austin, Texas 78753

Copy to: Texas Department of Transportation
          Director, General Services Division
          125 E. 11th Street
          Austin, Texas 78701

Licensee: Licensee
          ATTN: Name
          Address
          City, State Zip

Copy to: Licensee Copy
          ATTN: Name
          Address
          City, State Zip

and shall be deemed to be received by the addressee on the date so delivered or so deposited in the mail, unless otherwise provided herein. Either party hereto may change the above address by sending written notice of such change to the other.

[Remainder of Page Intentionally left Blank]

IN TESTIMONY WHEREOF, the State and the Licensee have executed triplicate counterparts of this agreement.

LICENSEE

By: _____

_____
Typed Name and Title

Date: _____

STATE OF TEXAS

Executed for the Executive Director and approved for the Texas Transportation Commission for the purpose and effect of activating and/or carrying out the orders, established policies or work programs heretofore approved and authorized by the Texas Transportation Commission.

By: _____

William C. Garbade, P.E
District Engineer, Austin District

Date: _____

E X H I B I T 'A'

Rights Granted	
By State:	By Licensee:
1. Right to connect to TxDOT Austin District ATMS local area network as a client at a secure level to be determined by TxDOT. 2. Right to use TxDOT ATMS software as a client at a secure level to be determined by TxDOT. 3. Right to be configured as a client workstation on the TxDOT Austin District CCTV control software with privilege for camera selection and access to pan, tilt, and zoom at a secure level to be determined by TxDOT to obtain transportation related information in accordance with the guidelines established in Exhibit B. Access to pan, tilt, and zoom may be withdrawn at any time by TxDOT without notice if access is determined to not be in the best interest of TxDOT.	1. None

Provision of Infrastructure	
By State:	By Licensee:
1. Provide facilities to house and support infrastructure equipment provided by Licensee.	1. Provide any and all infrastructure needed to acquire the rights granted by State including 3rd party software and hardware. 2. Provide quarterly evaluation reports during the first calendar year of the agreement detailing how and when the rights and infrastructure granted have been used. After the first calendar year, only annual evaluation reports shall be provided.

E X H I B I T 'B'

TxDOT AUSTIN DISTRICT
CLOSED CIRCUIT TELEVISION
ACCESS TO PAN, TILT, AND ZOOM
GUIDELINES

1. During an incident, access shall normally be limited to TxDOT and local emergency service agencies. An incident is defined as any condition in which traffic flow is not normal. As an example, abnormal traffic flow could be caused by debris in the road, such as a mattress or board, or could be caused by non-recurring congestion, such as on-lookers to an automobile accident, public gathering, construction, or roadway maintenance. The duration of the incident shall be considered complete once traffic flow has returned to normal and any TxDOT and/or emergency service personnel and vehicles have departed from the incident scene.

2. During periods of peak traffic flow, access shall normally be limited to TxDOT. Peak traffic flow is normally considered to exist regularly during two periods of the day, Monday through Friday. In general, one period of peak traffic flow exists in the early morning and the other period of peak traffic flow exists in the late afternoon. Additional periods of peak traffic flow may exist at other times during the weekday and weekend due to special events and public gatherings. Precise times of regular and additional anticipated peak periods of traffic flow shall be the sole determination of TxDOT and may change from time to time.

3. During periods described above in which TxDOT normal daily operations have ceased or local emergency service agencies do not operate the pan, tilt, and zoom, access shall be limited to obtaining broad general traffic information. Panning, tilting, or zooming to obtain visual detailed information of an incident scene or traffic flow is limited to TxDOT and emergency service agencies at all times.

4. During all other periods, not described above, access shall be limited to obtaining transportation related information. Panning, tilting, and zooming for enforcement and any non-transportation related information purpose is forbidden at any time. A single breach of any of the above guidelines shall be grounds to immediately withdraw the privilege of pan, tilt, and zoom.

FLOOR PLAN

GENERAL NOTES
1. ALL DIMENSIONS SHOWN ARE FROM THE CENTER LINE OF COLUMNS, THE FACE OF
   MASONRY, AND THE FACE OF METAL STUDS, UNLESS NOTED OTHERWISE.

2. ALL INTERIOR GYP. BD. PARTITIONS TO BE 3 5/8" METAL STUDS @ 16" O.C.
   W/ 5/8" GYP. BD. BOTH SIDES, EXTEND TO 1' ABOVE CLG. (U.N.O.)

ELECTRONIC EQUIPMENT RACKS DETAILS

LAYOUT IS SHOWN FOR INFORMATION ONLY. ENGINEER
SHALL VERIFY ALL EQUIPMENT LOCATIONS. CABLE RACKS
WILL BE REQUIRED PER NEC. THE CONTRACTOR
IS RESPONSIBLE FOR CABLE RACKS AND LAYOUT.

PLAN
EXHIBIT C
Equipment
Installation
Texas Department of Transportation

E X H I B I T 'D'

NONMONETARY COMPENSATION

To satisfy the nonmonetary compensation provided in Article XII, Licensee agrees to