



STATEWIDE INTEGRATED ITS BUSINESS AND DEPLOYMENT PLAN

Metropolitan Kansas City Regional ITS Architecture

Prepared for:

The Missouri Department of Transportation
2211 St. Mary's Boulevard
Jefferson City, MO 65109

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Prepared by:

TransCore
920 W. 47th Street
Kansas City, MO 64112

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Foreword

The Federal Highway Administration (FHWA) issued a final rule to implement Section 5206(e) of the Transportation Equity Act for the 21st Century (TEA-21) in January of 2001. Federal Rule 940 requires that Intelligent Transportation Systems (ITS) projects funded through the Highway Trust Fund conform to the National ITS Architecture and applicable standards. FHWA has further established a deadline of April 2005 for regions to have an ITS architecture in place.

To meet the requirement and ensure federal funding eligibility for ITS, the Missouri Department of Transportation (MoDOT) initiated the development and documentation of Regional Architectures for several regions in the State of Missouri including Springfield, St. Louis and Kansas City. These Regional ITS Architectures provide frameworks for ITS systems, services, integration, and interoperability.

The material presented here documents the Regional ITS Architecture for the Metropolitan Kansas City area in the states of Missouri and Kansas. This architecture is unique to other regional architectures in Missouri due to the bi-state region defining the metropolitan Kansas City area. Both MoDOT and the Kansas Department of Transportation (KDOT) have supported the development of this regional ITS architecture lead by the Mid America Regional Council (MARC).

MARC is the metropolitan planning organization for the Kansas City area. MARC is the Regional ITS Architecture Champion and has taken the lead in documenting and maintaining the architecture since the beginning of the Tier I and Tier II workshops. MARC has developed and maintained the architecture using a web-based application (www.marc.org/transportation/ITS). By proving the Regional ITS Architecture via the web, all stakeholders have access to the most recent revisions of the documentation. This Regional ITS Architecture developed by MoDOT is captured from the architecture, as it exists in May 2004. This document, in large part, pulls information directly from the MARC ITS Website.

Introduction

Intelligent Transportation Systems are the application of interrelated systems of computers, electronics, and communication technologies and management strategies, to improve the safety and efficiency of the surface transportation system. Since many ITS projects seek to optimize the use of existing systems and investments, cooperation and integration between different agencies and systems is essential.

The Kansas City Regional ITS Architecture provides a specific, tailored structure for facilitating institutional agreement and technical integration for the implementation of ITS projects in the region by defining how systems functionally operate and the interconnection of information exchanges that must take place between these systems to accomplish transportation services.

By providing an opportunity for coordination of activities and sharing of information among regional transportation systems, the Regional ITS Architecture:

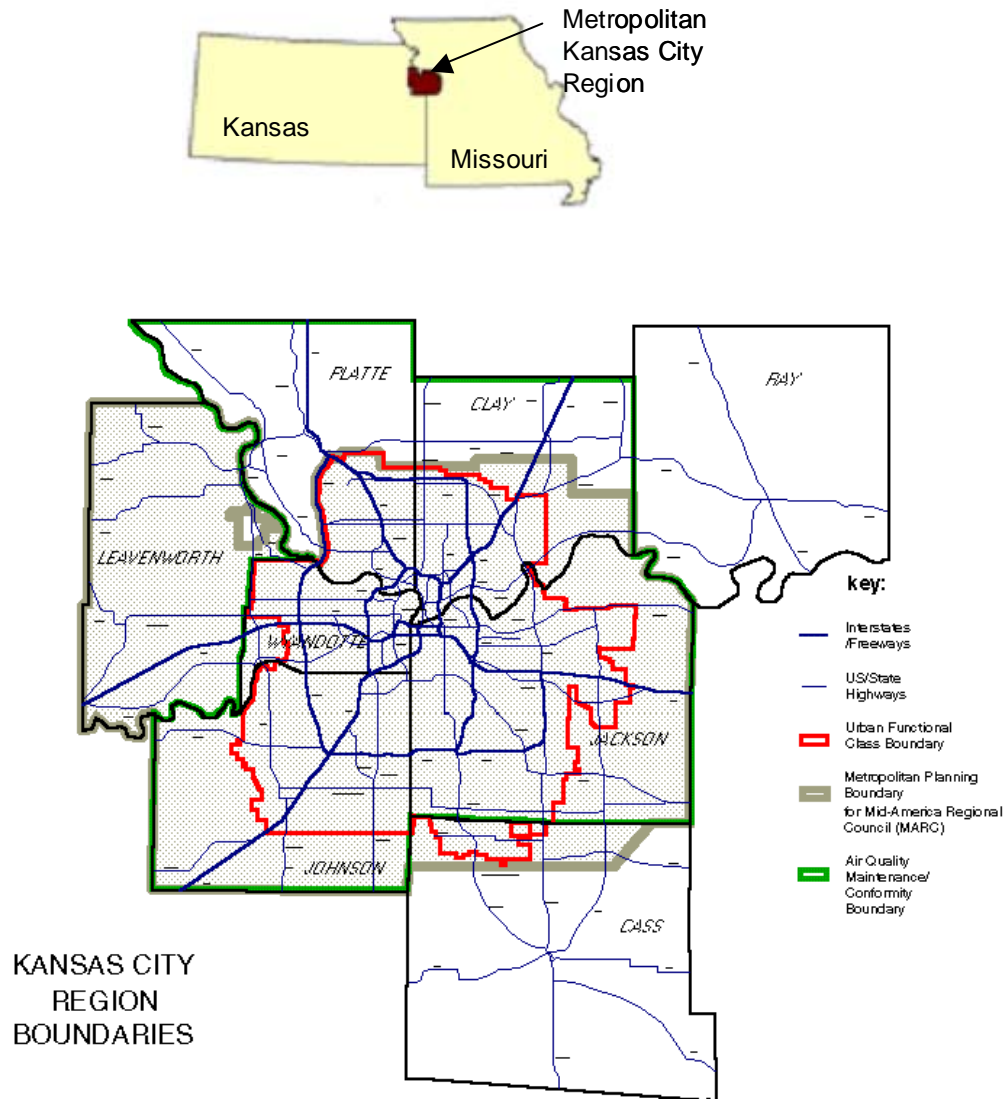
- Promotes system efficiency and effectiveness
- Provides a basis for planning the evolution of existing systems and the definition of future systems over time
- Provides a framework within which regional stakeholders can address transportation issues collectively
- Identifies opportunities for making ITS investments in a more cost-effective manner by utilizing inter-agency cooperation.

For more information about the Kansas City Regional ITS Architecture, contact Ron Achelpohl, MARC's Assistant Director of Transportation, at (816) 474-4240.

1. Regional Description

The Metropolitan Kansas City Region

The Kansas City Regional ITS Architecture includes the existing and planned intelligent transportation systems in all of Wyandotte and Johnson counties in Kansas, and Jackson County in Missouri. It also includes portions of Leavenworth County in Kansas and Platte, Clay, and Cass Counties in Missouri. This corresponds to the metropolitan planning area covered by the Mid-America Regional Council.



2. Regional ITS Stakeholders

The Kansas City Regional ITS architecture development process began with the Tier I (April 26, 2000) and Tier II (September 25, 2000) workshops held in Kansas City. After these workshops, MARC began the formal process of documenting the regional architecture using a web-based tool. The documentation of stakeholders involved in the regional architecture comes from the material collected during the Tier I and Tier II process. This architecture focuses on those projects that currently exist or were short-term funded programs brought forward in the Tier I and II process.

MoDOT, KDOT, and MARC have taken lead roles in both the development of ATMS projects in the metropolitan Kansas City region and in planning and developing ITS in the region. MARC has invested great resources in maintaining the architecture and developing the web based tool. MARC is the ITS Architecture Champion for maintaining and monitoring the Metropolitan Kansas City Regional ITS Architecture.

Regional stakeholders involved in the planning of ITS in the greater Kansas City area and participants in the early workshops include:

Emergency Medical Service

Life Flight Eagle
Local Ambulance Service Providers
Other Allied Agencies

Life Net
Metropolitan Ambulance Services Trust (MAST)

Governmental Agencies/Entities

Adjacent Region Traffic Operations Centers
Kansas Turnpike Authority (KTA)
Mid-America Regional Council (MARC)

Kansas Department of Transportation (KDOT)
KDOT/MoDOT
Missouri Department of Transportation (MoDOT)

Information Services

511 Number Operator
Local Transit Services
Metro Networks
National Weather Service
Regional Event Managers

KDOT & Kansas Highway Patrol
Media
MoDOT & Missouri State Highway Patrol (MSHP)
Private Information Service Providers
Unified Government, International Speedway Corporation, KDOT, & KHP

Multi-Modal

Kansas City Terminal Railroad
KCMO Department of Aviation
Railroad Companies

KC SmartPort
Private Intermodal Depot Operators
Various Trucking Companies

Public Safety

Kansas Department of Emergency Preparedness
Local Fire Departments
Local Law Enforcement

Kansas Highway Patrol (KHP)
Local Jurisdiction Public Safety Departments
Missouri Department of Public Safety

Missouri State Emergency Management Agency
Overland Park, Johnson County, and KCMO

Overland Park Police Department
Private Mayday Services

Public Works

City of Olathe, KS
Local Jurisdiction Public Works Departments
Overland Park Public Works

KCMO Public Works
Olathe, Overland Park, and KDOT

Transit

Johnson County Transit
Private Paratransit Providers
Unified Government Transit

Kansas City Area Transportation Authority (KCATA)
TBD Transit Agency

Elements of the Architecture

Subsystems are the principal structural element of the ITS architecture and represent the individual pieces of the intelligent transportation system. They are grouped into the following four classes with the associated stakeholders involved:

- **Center** - Subsystems that provide management, administrative, and support functions for the transportation system. The center subsystems each communicate with other centers to enable coordination between modes and across jurisdictions. Some examples of center subsystems are Traffic Management, Transit Management, and Emergency Management.

Archived Data Management

KDOT Traffic Data Warehouse
MoDOT Transportation Management System

MARC Congestion Management System

Commercial Vehicle Administration

Kansas CVISN System

Missouri CVISN System

Emergency Management

Agency Operations Centers
Emergency Notification & Evacuation System
Kansas City Motorist Assist (KS)
Kansas Highway Patrol Dispatch
Law Enforcement Dispatch
Local 911 Call Center
Local Fire Dispatch
Missouri State Highway Patrol Dispatch
Regional Ambulance Service

Eagle EMS
KCIA Emergency Services
Kansas City Motorist Assist (MO)
Kansas State Emergency Command Center
Life Net EMS
Local Ambulance Service
Missouri State Emergency Management Center
Private Mayday Services

Emissions Management

Heartland Sky Emissions Management System

Fleet and Freight Management

Commercial Vehicle Management

Information Service Provider

511 Number Call-In System

Conditions Acquisition and Reporting System

Kansas 800# for Traveler Information	KC Metro Web Page
KC Scout	KDOT Office of Transportation Information
KDOT Web Site	Media
Metro Networks	Missouri 800# for Traveler Information
MoDOT Customer Service	Private ISP Systems
Regional Call Center for Transit Information	Rideshare
Road Conditions and Construction Detours Reporting System	

Maintenance and Construction Management

KCMO Public Works Maintenance Facility	KDOT Construction and Maintenance
Maintenance Vehicle Dispatch	MoDOT Operations

Toll Administration

K-TAG Service Center

Traffic Management

Adjacent Region TOC's	Kansas City International Airport
Kansas Turnpike Authority ATMS	KC Metro Road Weather Information System
KC Scout	KDOT Road Weather Information System
Local Traffic Signal System	MoDOT Road Weather Information System
MoDOT Traffic Signal System	NASCAR Event Management
Olathe ATMS	Operation Green Light (All Phases)
Overland Park ATMS	

Transit Management

Commuter Rail Operations Center	KCATA Facilities Maintenance
KCIA Transit Dispatch	Metro Dispatch Center
Private Paratransit Dispatch	The JO
Unified Government Transit	

- **Roadside-** Intelligent infrastructure distributed along the transportation network which perform surveillance, information provision, and plan execution control functions and whose operation is governed by center subsystems. Roadside subsystems also directly interface to vehicle subsystems.

Commercial Vehicle Check

Kansas Scales and Inspection Facilities	KC SmartPort
Missouri Scales and Inspection Facilities	

Parking Management

KCMO Parking Management

Roadway

Flood Warning System	KC Scout Field Equipment
KDOT Field Equipment	KTA Field Equipment
Local Field Equipment	MoDOT Field Equipment
Olathe ATMS Field Equipment	Operation Green Light Field Equipment
Overland Park ATMS Field Equipment	

Toll Collection

K-TAG Field Equipment

- **Travelers-** Equipment used by travelers to access ITS services pre-trip and en-route. This includes services that are owned and operated by the traveler as well as services that are owned by transportation and information providers.

Remote Traveler Support

Transit Kiosks

- **Vehicles-** Covers ITS related elements on vehicle platforms. Vehicle subsystems include general driver information and safety systems applicable to all vehicle types. Three fleet vehicle subsystems (Transit, Emergency, and Commercial Vehicles) add ITS capabilities unique to these special vehicle types.

Commercial Vehicle

Commercial Vehicles

Emergency Vehicle

Kansas Highway Patrol Vehicles

Maintenance and Construction Vehicles

KCMO Public Works Vehicles

Maintenance Vehicles

KDOT Maintenance Vehicles

MoDOT Maintenance Vehicles

Transit Vehicles

KCATA Transit Vehicles

3. Operational Concept

The Kansas City region has many agencies with diverse operational roles and responsibilities for various transportation functions. Of those agencies most share basic information and in some situations resources to address regional transportation issues. A regional “operational concept” provides a definition to the roles each agency performs and begins the process of describing how the agencies interact.

The Kansas City regional “Operational Concept” identifies the different stakeholder agency roles as they exist now and how they are envisioned over the coming 5-year timeframe. To establish a regional concept stakeholders are first defined by their primary regional functions. Thus each stockholder’s roles are more easily identified. Using this information a basic organizational picture of how the region addresses transportation issues is developed. The combination of identifying the agency roles and interactions with other regional stakeholders completes the operational concept.

Regional Stakeholder Roles

Stakeholders represent different backgrounds and perform a range of transportation related functions. They are made up of public and private entities, which typically operate out of a

control, dispatch, or other center of operations. To identify and define the different stakeholders, [eight](#) categories (based on the National ITS Architecture) were adopted, which define the primary roles of the different regional agencies. The following briefly describes each category and list the associated regional stakeholders.

Traffic Management: Agencies that operate roadway equipment and serve to improve transportation system operation efficiency and safety. Traffic management agencies typically coordinate with the other agencies by relaying pertinent traffic conditions and incidents and alerting the traveling public.

Emergency Management: Agencies that operate in a public safety capacity, often coordinating efforts involving emergency response.

Toll Administration: Agencies that manage, operate, and maintain general payment administration capabilities and support the electronic transfer of authenticated funds from the customer to the transportation system operator.

Transit Management: Agencies that manage, operate, and maintain transit vehicle fleets and/or coordinate other transportation service modes.

Media Outlet: Agencies that provide traffic reports, travel conditions, and other transportation-related news services to the traveling public through radio, TV, and other media.

Information Service Provider: Agencies that assemble, process, archive, and communicate transportation-related data and information to motorist or other information dissemination outlets. The information can be provided in near real time or as a historical reference. Typical information collected and distributed includes, road conditions, weather, construction and maintenance activities, transit schedules, parking, and special event alerts.

Multi-Modal Transportation Service Provider: These represent agencies that represent or exchange information with other transportation providers. Typically taxi, ride sharing, transit, paratransit, rental vehicle operator, airport facilities, ferry service, and rail systems. Generally these are operators of non-roadway transportation systems. By sharing transportation information efficient movement of passengers or individuals between services is enhanced.

Emission Management: Typical emission management agencies monitor and manage air quality, which includes collecting, measuring, and sharing information on pollution levels for local and regional zones or individual vehicles. The information is used to determine acceptable levels of pollutants or engage plans to curb pollution when levels are unsafe.

Commercial Vehicle Administrators: Commercial vehicle administrators perform several regulatory functions including operating facilities that monitor and track credentials and permits, process applications and regulation violations, and collect fee and tax revenue. They also perform enforcement activities to insure regulation compliance.

Identification of each stakeholder function in the region further facilitates understanding and translation of agency needs into the regional architecture.

Regional Stakeholder Interactions – Market Package Approach

After categorizing the agencies by their responsibilities, stakeholder interactions, both existing and future are identified and documented. Using the National ITS Architecture and the corresponding Market Packages as a foundation provides a simple yet effective method for describing how regional agencies are/will operate together. Market packages are a collection of systems involving center(s), roadway, vehicle, or traveler elements that work in combination to describe a transportation function. An example of this might include a dispatch center and a vehicle and the need to track a vehicle's location. By themselves the center and vehicle are only elements, but because market packages also detail information exchanges between these elements, a better understanding of how these elements interact to address the need or function (track vehicle's location) is possible.

Through discussions with local stakeholders, 35 individual market packages were identified for the Kansas City region. Those 35 packages are grouped into seven market package categories. Not all agencies participate in each market package.

To present the regional operational concept the identified market packages are presented here, along with associated agencies that participate and typical system element interactions. Market packages are presented broken into seven categories, which include advance traffic management, maintenance and construction management, advance public transportation, emergency management, advance traveler information systems, commercial vehicle operations, and archived data management.

Market Packages Utilized in Regional Operations

The following provide a description and listing of the market packages that are utilized for regional operations in the Metropolitan Kansas City Regional ITS Architecture. Not all market packages identified under the National ITS Architecture are applicable to the region. Out of a potential 75 different packages, 35 are pertinent to the region. Each of these is categorized and listed below as a quick reference.

Advanced Traffic Management Systems

Advanced Traffic Management Systems (ATMS) market packages focus on roadway operations. Typically involved agencies include a traffic operations center that monitors roadway conditions and identifies breakdowns in traffic flow caused by planned or unplanned incidents and initiates responses necessary to moderate the impact to the traveling public. Of the market packages identified under the National ITS Architecture fourteen are applicable to the Kansas City region and are highlighted below.

- ATMS01 - Network Surveillance
- ATMS02 – Probe Surveillance

- ATMS03 - Surface Street Control
- ATMS04 - Freeway Control
- ATMS06 - Traffic Information Dissemination
- ATMS07 - Regional Traffic Control
- ATMS08 - Incident Management System
- ATMS10 – Electronic Toll Collection
- ATMS11 - Emissions Monitoring and Management
- ATMS12 – Virtual TMC and Smart Probe Data
- ATMS13 - Standard Railroad Grade Crossing
- ATMS14 – Advanced Railroad Grade Crossing
- ATMS15 – Railroad Operations Coordination
- ATMS16 – Parking Facility Management

Maintenance and Construction Systems

The Maintenance and Construction Management market packages monitor and manage roadway infrastructure construction and maintenance activities. These systems manage fleets of maintenance, construction, or special service vehicles (e.g., snow and ice control equipment). These systems also participate in incident response by deploying maintenance and construction resources to an incident scene, in coordination with other agencies. The systems manage the repair and maintenance of both non-ITS and ITS equipment including the traffic controllers, detectors, dynamic message signs, signals, and other equipment associated with the roadway infrastructure. Additional interfaces to weather information providers are also part of these systems.

- MC04 - Weather Information Processing and Distribution

Advance Public Transportation Systems

Advance Public Transportation System (APTS) market packages address select needs and issues surrounding the public transportation industry. Issues such as locating, monitoring, operating, and maintaining vehicles are undertaken. There are 8 market packages identified under the National ITS Architecture. All 8 apply to the Kansas City region. A description and diagram detailing each packages is shown below.

- APTS01 - Transit Vehicle Tracking
- APTS02 - Transit Fixed-Route Operations
- APTS03 - Demand Response Transit Operations
- APTS04 - Transit Passenger and Fare Management
- APTS05 - Transit Security
- APTS06 - Transit Maintenance
- APTS07 - Multi-modal Coordination
- APTS08 - Transit Traveler Information

Emergency Management Systems

Emergency Management (EM) market packages typically serve the needs of law enforcement, fire, search and rescue, and HAZMAT operations. The packages also address

coordination between the various agencies' personnel, vehicles, and response plans. There are several market packages identified under the National ITS Architecture, [three of which](#) apply to the Kansas City region and are highlighted below.

- EM01 - Emergency Response
- EM02 - Emergency Routing
- EM03 – Mayday Support

Advance Traveler Information Systems

Market packages under the Advanced Traveler Information Systems (ATIS) category work to supply traveler with information on existing traffic conditions, weather, construction, maintenance, and special events activities that could impact their travel plans. The information could be supplied in a variety of ways including television, hardware located along the roadway, or through an electronic mechanism. Under the National ITS Architecture there are [five](#) packages that are applicable to the Kansas City region.

- ATIS01 - Broadcast Traveler Information
- ATIS02 - Interactive Traveler Information
- ATIS03 – Autonomous Route Guidance
- ATIS05 - ISP Based Route Guidance
- ATIS08 – Dynamic Ridesharing

Commercial Vehicle Operations

Market packages under the commercial vehicle operation (CVO) category perform functions necessary to monitor and process information about various operations including regulatory and safety management and compliance. Under the National ITS Architecture there are currently [two](#) packages that are applicable to the Kansas City region, these include:

- CVO05 – International Border Electronic Clearance
- CVO10 - HAZMAT Management

Archived Data Management

Archived Data Management market packages perform the functions of collecting, storing, and retrieving local or regional data both current and historical. The type of data collected is typically roadway or transportation system performance data such as schedules, volumes, speed, etc. There are [two](#) market packages that are currently applicable to the Kansas City region. Those market packages are as follows:

- AD01 - ITS Data Mart
- AD02 - ITS Data Warehouse

Regional Market Packages Defined

Each market package identified for the Kansas City region is described in greater detail here. A short definition, typical graphic showing interconnections between system elements, and

preliminary list of agencies that would participate or use the package function is provided so a greater understanding of different agency operational roles can be identified.

AD1 – ITS Data Mart

National ITS Architecture Definition:

This market package provides a focused archive that houses data collected and owned by a single agency, district, private sector provider, research institution, or other organization. This focused archive typically includes data covering a single transportation mode and one jurisdiction that is collected from an operational data store and archived for future use. It provides the basic data quality, data privacy, and meta data management common to all ITS archives and provides general query and report access to archive data users.

Participating Regional Elements

KDOT Traffic Data Warehouse
 MoDOT Transportation Management System
 MARC Congestion Management System

National ITS Architecture Graphic:

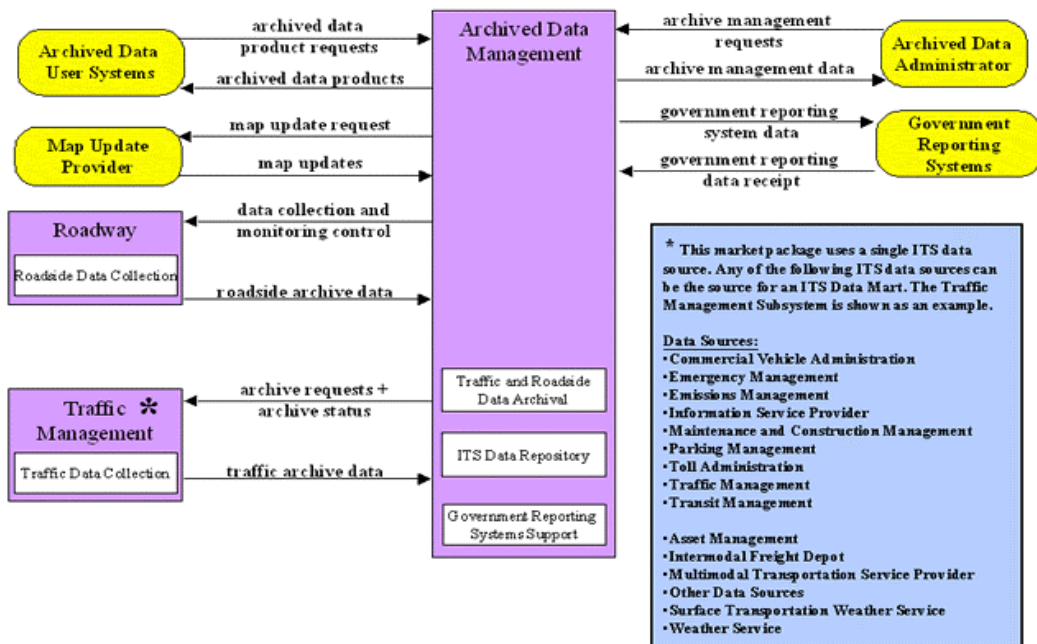


Figure 3-1: AD1 – ITS Data Mart Market Package

AD2 – ITS Data Warehouse

National ITS Architecture Definition:

This market package includes all the data collection and management capabilities provided by the ITS Data Mart, and adds the functionality and interface definitions that allow collection of data from multiple agencies and data sources spanning across modal and jurisdictional boundaries. It performs the additional transformations and provides the additional meta data management features that are necessary so that all this data can be managed in a single repository with consistent formats. The potential for large volumes of varied data suggests additional on-line analysis and data mining features that are also included in this market package in addition to the basic query and reporting user access features offered by the ITS Data Mart.

Participating Regional Elements

KDOT Traffic Data Warehouse
 MoDOT Transportation Management System
 MARC Management System
 KC Scout

National ITS Architecture Graphic:

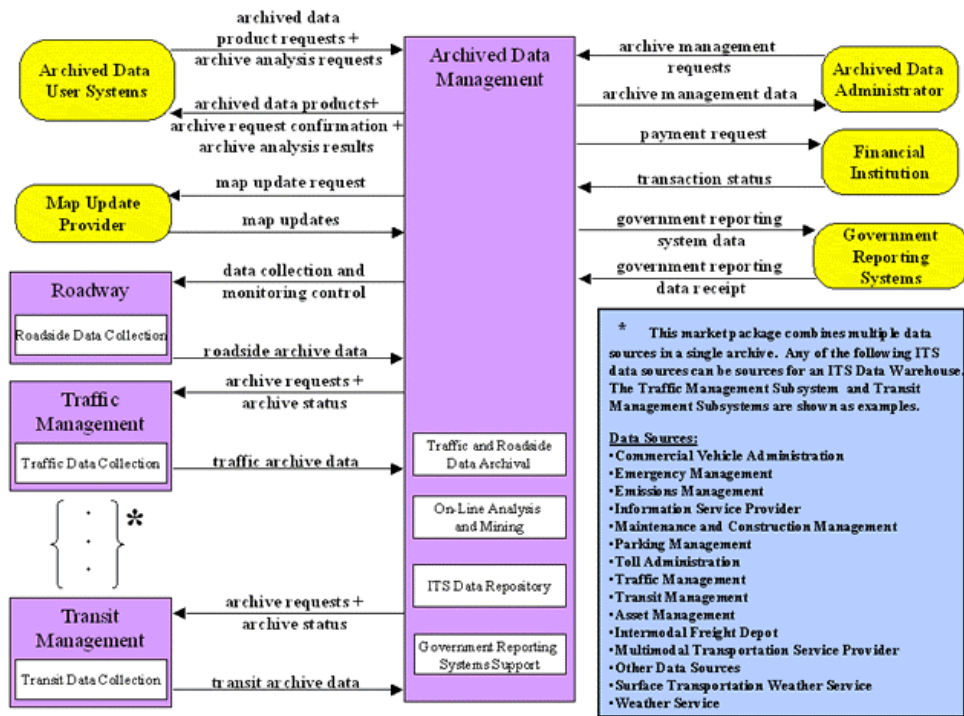


Figure 3-2: AD2 – ITS Data Warehouse Market Package

APTS1 – Transit Vehicle Tracking

National ITS Architecture Definition:

This market package monitors current transit vehicle location using an Automated Vehicle Location System. The location data may be used to determine real time schedule adherence and update the transit system's schedule in real-time. Vehicle position may be determined either by the vehicle (e.g., through GPS) and relayed to the infrastructure or may be determined directly by the communications infrastructure. A two-way wireless communication link with the Transit Management Subsystem is used for relaying vehicle position and control measures. Fixed route transit systems may also employ beacons along the route to enable position determination and facilitate communications with each vehicle at fixed intervals. The Transit Management Subsystem processes this information, updates the transit schedule and makes real-time schedule information available to the Information Service Provider.

Participating Regional Elements

Commuter Rail Operations Center
 KCIA Transit Dispatch
 Private Paratransit Dispatch
 Unified Government Transit
 KCATA Facilities Maintenance
 Metro Dispatch Center
 The JO
 KCATA Transit Vehicles

National ITS Architecture Graphic:

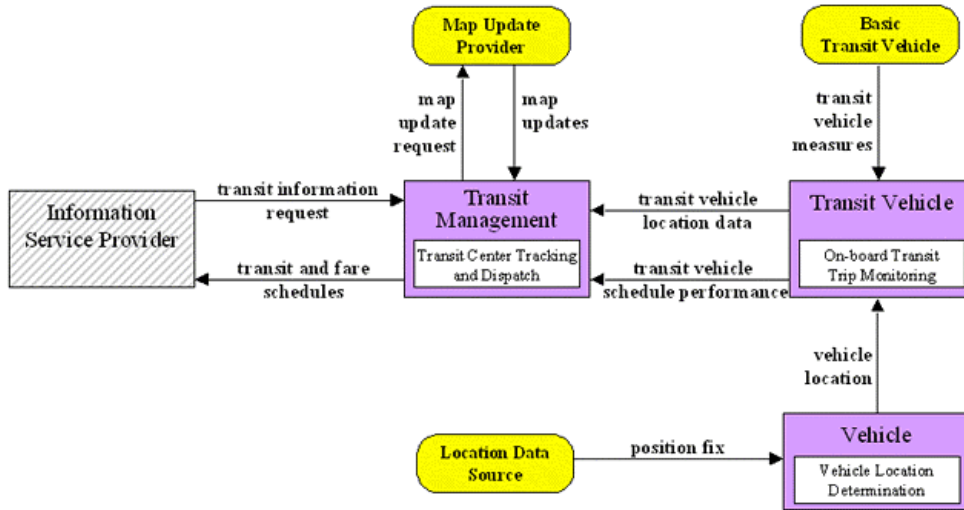


Figure 3-3: APTS1 – Transit Vehicle Tracking Market Package

APTS2 – Transit Fixed-Route Operations

National ITS Architecture Definition:	Participating Regional Elements
<p>This market package performs vehicle routing and scheduling, as well as automatic driver assignment and system monitoring for fixed-route transit services. This service determines current schedule performance using AVL data and provides information displays at the Transit Management Subsystem. Static and real time transit data is exchanged with Information Service Providers where it is integrated with that from other transportation modes (e.g. rail, ferry, air) to provide the public with integrated and personalized dynamic schedules.</p>	<ul style="list-style-type: none"> Commuter Rail Operations Center KCIA Transit Dispatch Private Paratransit Dispatch Unified Government Transit KCATA Facilities Maintenance Metro Dispatch Center The JO KCATA Transit Vehicles

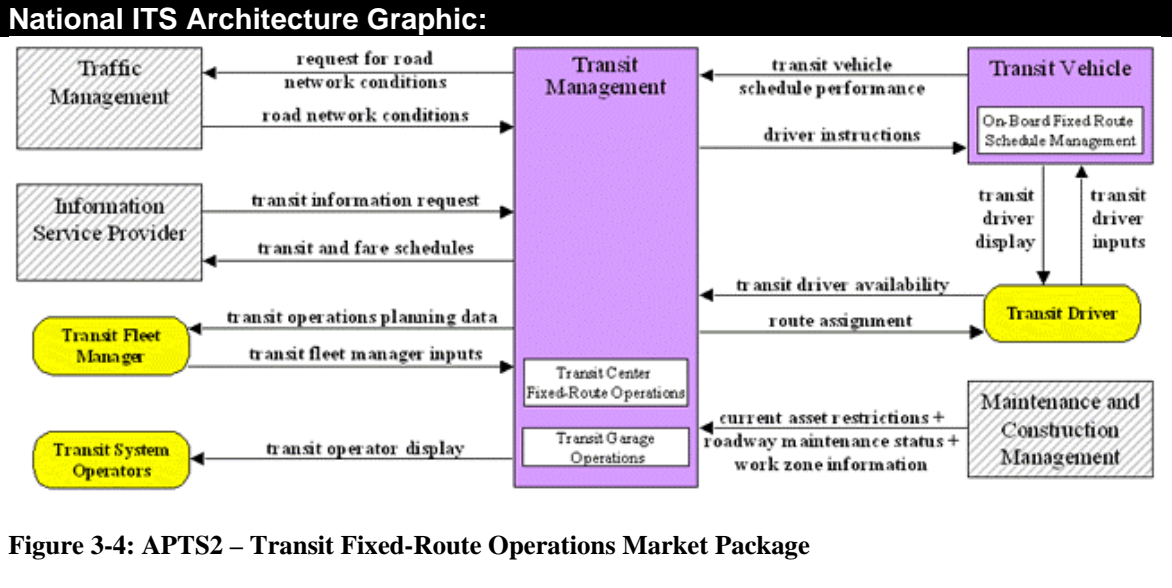


Figure 3-4: APTS2 – Transit Fixed-Route Operations Market Package

APTS3 – Demand Response Transit Operations

National ITS Architecture Definition:

This market package performs vehicle routing and scheduling as well as automatic driver assignment and monitoring for demand responsive transit services. This package monitors the current status of the transit fleet and supports allocation of these fleet resources to service incoming requests for transit service while also considering traffic conditions. The Transit Management Subsystem provides the necessary data processing and information display to assist the transit operator in making optimal use of the transit fleet. This service includes the capability for a traveler request for personalized transit services to be made through the Information Service Provider (ISP) Subsystem. The ISP may be either be operated by transit management center or be independently owned and operated by a separate service provider. In the first scenario, the traveler makes a direct request to a specific paratransit service. In the second scenario, a third party service provider determines the paratransit service is a viable means of satisfying a traveler request and makes a reservation for the traveler.

Participating Regional Elements

Commuter Rail Operations Center
 KCIA Transit Dispatch
 Private Paratransit Dispatch
 Unified Government Transit
 KCATA Facilities Maintenance
 Metro Dispatch Center
 The JO
 KCATA Transit Vehicles

National ITS Architecture Graphic:

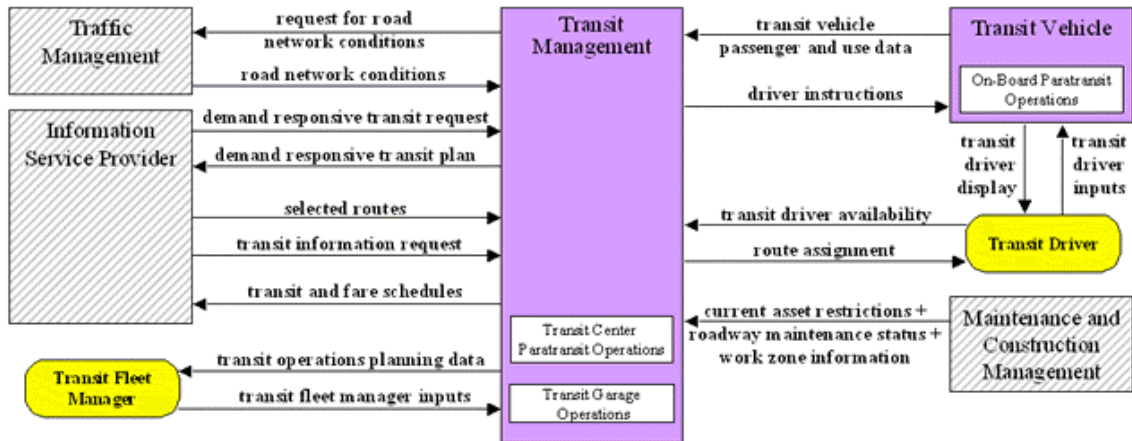


Figure 3-5: APTS3 – Demand Response Transit Operations Market Package

APTS4 – Transit Passenger and Fare Management

National ITS Architecture Definition:

This market package manages passenger loading and fare payments on-board vehicles using electronic means. It allows transit users to use a traveler card or other electronic payment device. Sensors mounted on the vehicle permit the driver and central operations to determine vehicle loads, and readers located either in the infrastructure or on-board the transit vehicle allow electronic fare payment. Data is processed, stored, and displayed on the transit vehicle and communicated as needed to the Transit Management Subsystem.

Participating Regional Elements

Commuter Rail Operations Center
 KCIA Transit Dispatch
 Private Paratransit Dispatch
 Unified Government Transit
 KCATA Facilities Maintenance
 Metro Dispatch Center
 The JO
 KCATA Transit Vehicles
 Transit Kiosks

National ITS Architecture Graphic:

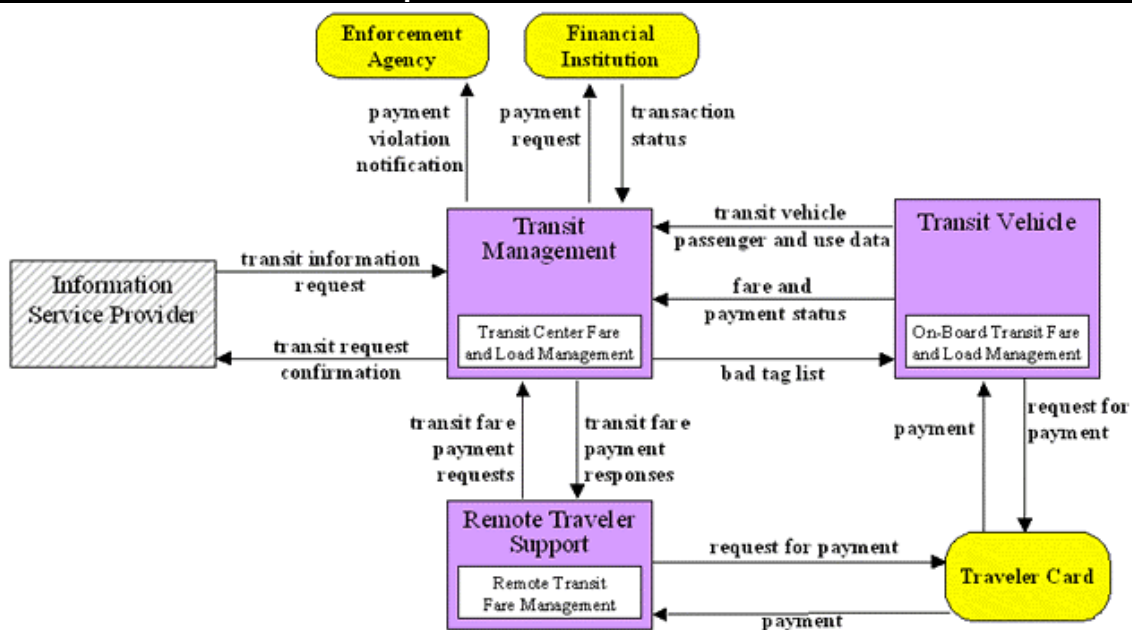


Figure 3-6: APTS4 – Transit Passenger and Fare Management Market Package

APTS5 – Transit Security

National ITS Architecture Definition:

This market package provides for the physical security of transit passengers. An on-board security system is deployed to perform surveillance and warn of potentially hazardous situations. Public areas (e.g. stops, park and ride lots, stations) are also monitored. Information is communicated to the Transit Management Subsystem using the existing or emerging wireless (vehicle to center) or wireline (area to center) infrastructure. Security related information is also transmitted to the Emergency Management Subsystem when an emergency is identified that requires an external response. Incident information is communicated to the Information Service Provider.

Participating Regional Elements

Commuter Rail Operations Center
 KCIA Transit Dispatch
 Private Paratransit Dispatch
 Unified Government Transit
 KCATA Facilities Maintenance
 Metro Dispatch Center
 The JO
 KCATA Transit Vehicles

National ITS Architecture Graphic:

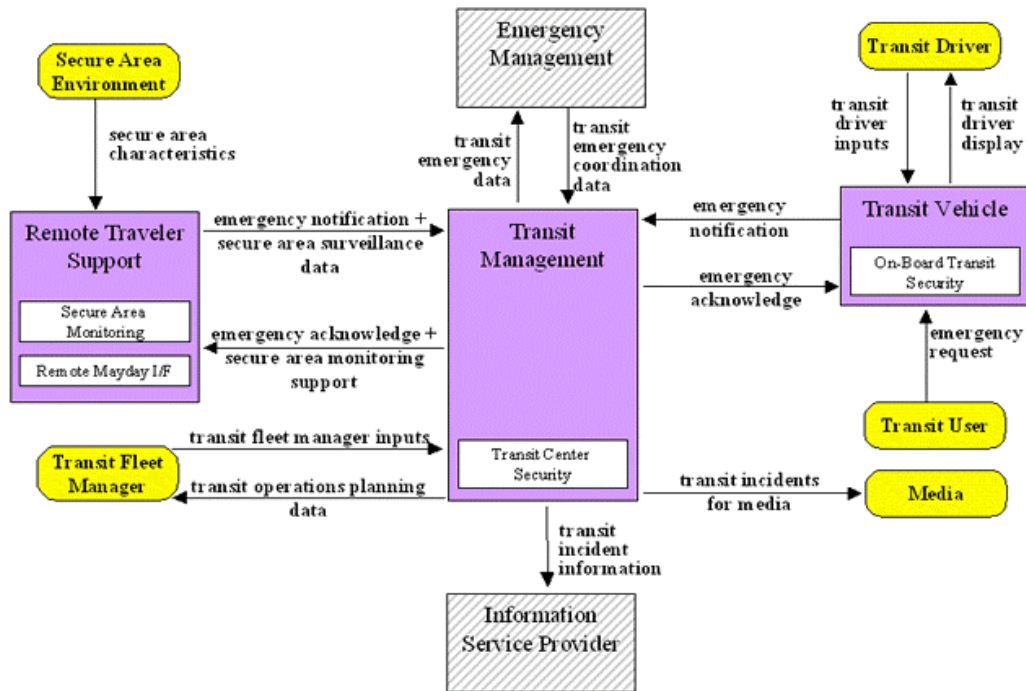


Figure 3-7: APTS5 – Transit Security Market Package

APTS6 – Transit Maintenance

National ITS Architecture Definition:

This market package supports automatic transit maintenance scheduling and monitoring. On-board condition sensors monitor system status and transmit critical status information to the Transit Management Subsystem. Hardware and software in the Transit Management Subsystem processes this data and schedules preventative and corrective maintenance.

Participating Regional Elements

Commuter Rail Operations Center
 KCIA Transit Dispatch
 Private Paratransit Dispatch
 Unified Government Transit
 KCATA Facilities Maintenance
 Metro Dispatch Center
 The JO
 KCATA Transit Vehicles

National ITS Architecture Graphic:

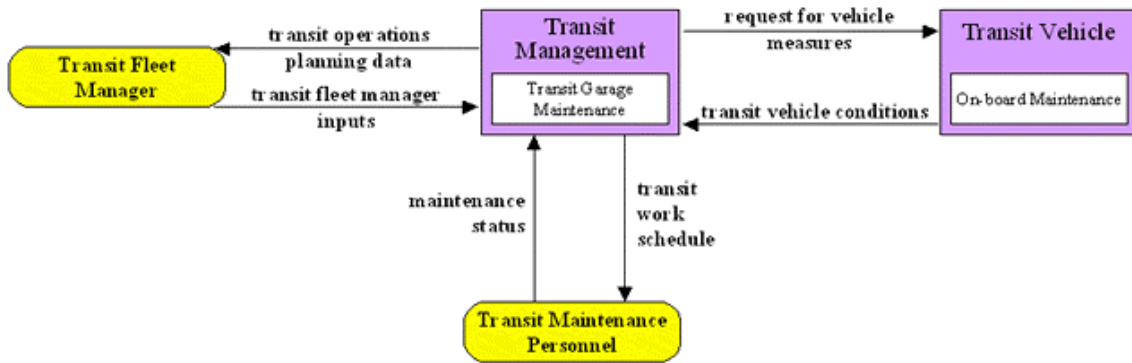


Figure 3-8: APTS6 – Transit Maintenance Market Package

APTS7 – Multi-modal Coordination

National ITS Architecture Definition:

This market package establishes two way communications between multiple transit and traffic agencies to improve service coordination. Multimodal coordination between transit agencies can increase traveler convenience at transfer points and also improve operating efficiency. Coordination between traffic and transit management is intended to improve on-time performance of the transit system to the extent that this can be accommodated without degrading overall performance of the traffic network. More limited local coordination between the transit vehicle and the individual intersection for signal priority is also supported by this package.

Participating Regional Elements

KC Scout
 Commuter Rail Operations Center
 KCIA Transit Dispatch
 Private Paratransit Dispatch
 Unified Government Transit
 KCATA Facilities Maintenance
 Metro Dispatch Center
 The JO
 KCATA Transit Vehicles

National ITS Architecture Graphic:

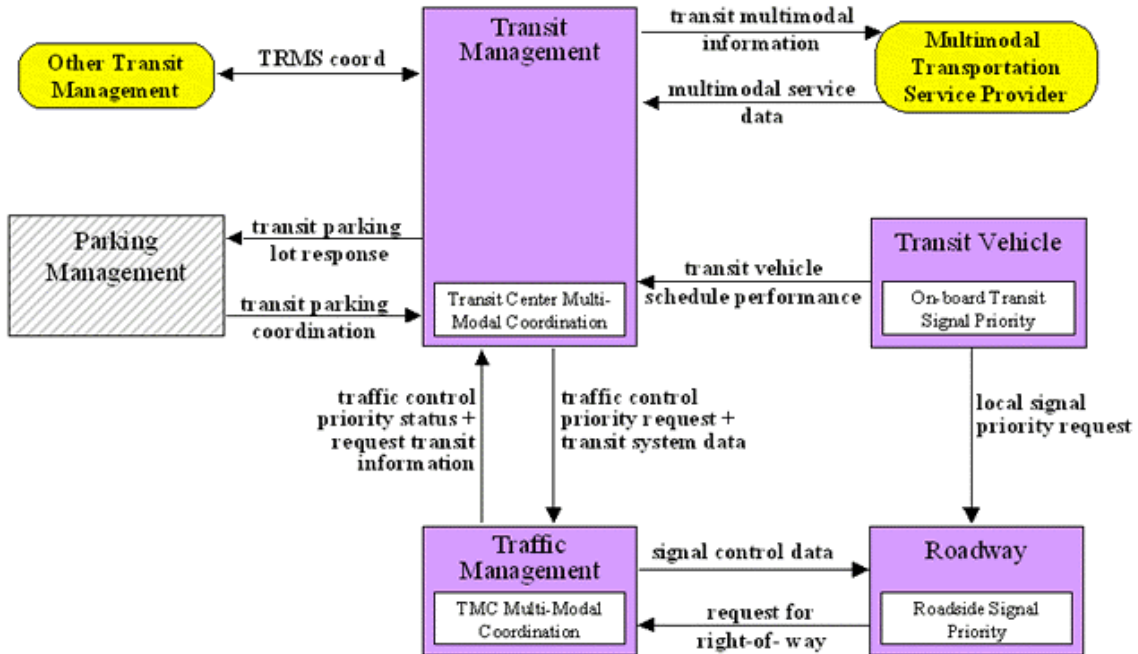


Figure 3-9: APTS7 – Multi-modal Coordination Market Package

APTS8 – Transit Traveler Information

National ITS Architecture Definition:

This market package provides transit users at transit stops and on-board transit vehicles with ready access to transit information. The information services include transit stop annunciation, imminent arrival signs, and real-time transit schedule displays that are of general interest to transit users. Systems that provide custom transit trip itineraries and other tailored transit information services are also represented by this market package.

Participating Regional Elements

Commuter Rail Operations Center
 KCIA Transit Dispatch
 Private Paratransit Dispatch
 Unified Government Transit
 KCATA Facilities Maintenance
 Metro Dispatch Center
 The JO
 KCATA Transit Vehicles

National ITS Architecture Graphic:

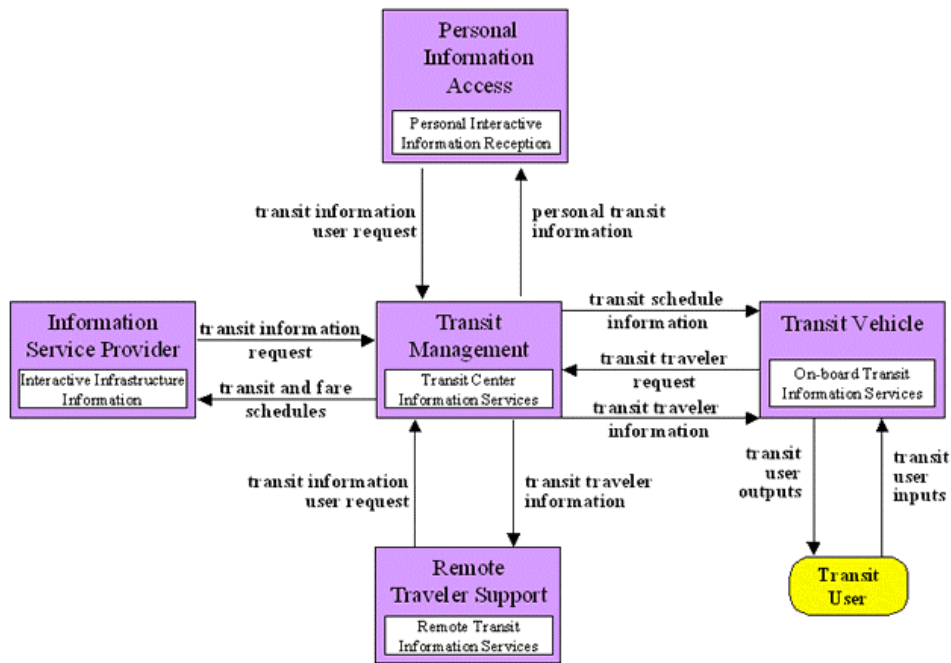


Figure 3-10: APTS8 – Transit Traveler Information

ATIS1 – Broadcast Traveler Information

National ITS Architecture Definition:

This market package collects traffic conditions, advisories, general public transportation, toll and parking information, incident information, air quality and weather information, and broadly disseminates this information through existing infrastructures and low cost user equipment (e.g., FM subcarrier, cellular data broadcast). The information may be provided directly to travelers or provided to merchants and other traveler service providers so that they can better inform their customers of travel conditions. Different from the market package ATMS6 - Traffic Information Dissemination, which provides localized HAR and DMS information capabilities, ATIS1 provides a wide area digital broadcast service. Successful deployment of this market package relies on availability of real-time traveler information from roadway instrumentation, probe vehicles or other sources.

Participating Regional Elements

511 Number Call-In System
 Kansas 800# for Traveler Information
 KC Scout
 KDOT Web Site
 Metro Networks
 MoDOT Customer Service
 Regional Call Center for Transit Information
 Road Conditions and Construction Detours Reporting System
 Conditions Acquisition and Reporting System
 KC Metro Web Page
 KDOT Office of Transportation Information Media
 Missouri 800# for Traveler Information
 Private ISP Systems
 Rideshare

National ITS Architecture Graphic:

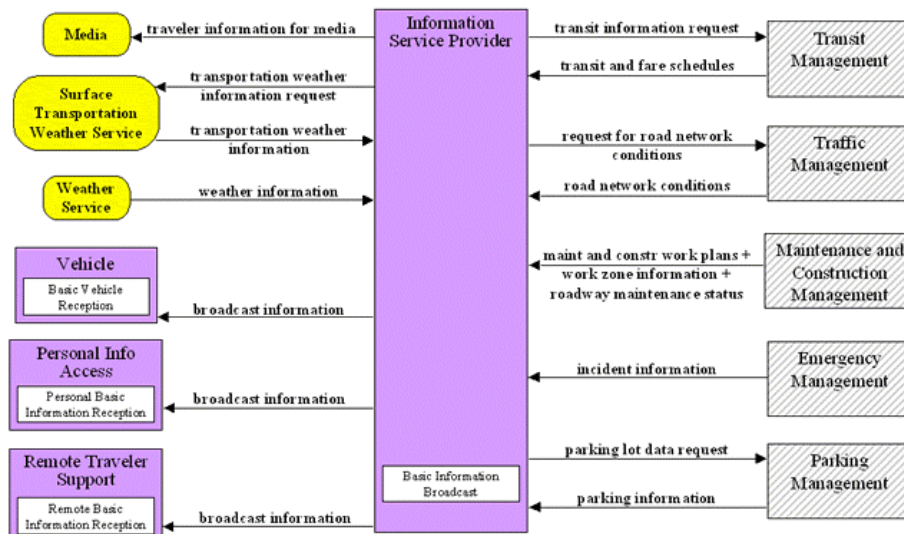


Figure 3-11: ATIS1 – Broadcast Traveler Information Market Package

ATIS2 – Interactive Traveler Information

National ITS Architecture Definition:	Participating Regional Elements
<p>This market package provides tailored information in response to a traveler request. Both real-time interactive request/response systems and information systems that "push" a tailored stream of information to the traveler based on a submitted profile are supported. The traveler can obtain current information regarding traffic conditions, transit services, ride share/ride match, parking management, and pricing information. A range of two-way wide-area wireless and wireline communications systems may be used to support the required data communications between the traveler and Information Service Provider. A variety of interactive devices may be used by the traveler to access information prior to a trip or en route including phone, kiosk, Personal Digital Assistant, personal computer, and a variety of in-vehicle devices. This market package also allows merchants to receive traffic information to their personal devices or remote traveler systems to better inform customers of road travel conditions. Successful deployment of this market package relies on availability of real-time transportation data from roadway instrumentation, probe vehicles or other means. A traveler may also input personal preferences and identification information via a "traveler card" that can convey information to the system about the traveler as well as receive updates from the system so the card can be updated over time.</p>	<ul style="list-style-type: none"> 511 Number Call-In System Kansas 800# for Traveler Information KC Scout KDOT Web Site Metro Networks MoDOT Customer Service Regional Call Center for Transit Information Road Conditions and Construction Detours Reporting System Conditions Acquisition and Reporting System KC Metro Web Page KDOT Office of Transportation Information Media Missouri 800# for Traveler Information Private ISP Systems Rideshare Adjacent Region TOC's Kansas Turnpike Authority ATMS KC Scout Local Traffic Signal System MoDOT Traffic Signal System Olathe ATMS Overland Park ATMS Kansas City International Airport KC Metro Road Weather Information System KDOT Road Weather Information System MoDOT Road Weather Information System NASCAR Event Management Operation Green Light (All Phases)

National ITS Architecture Graphic:

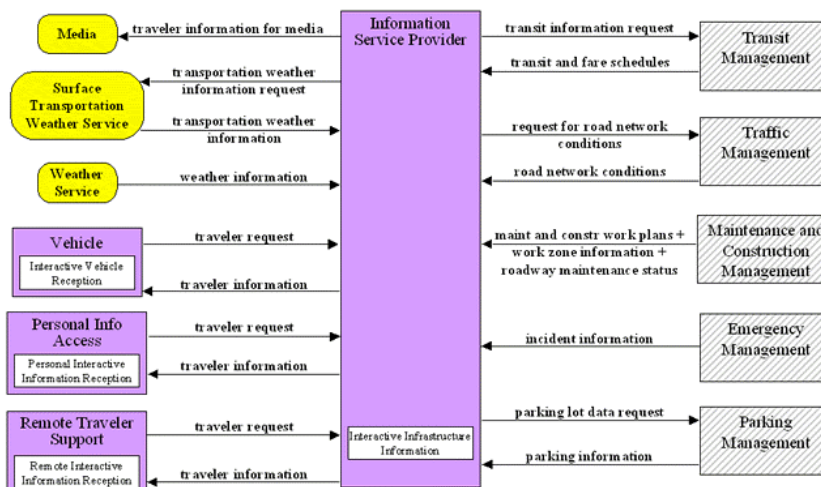
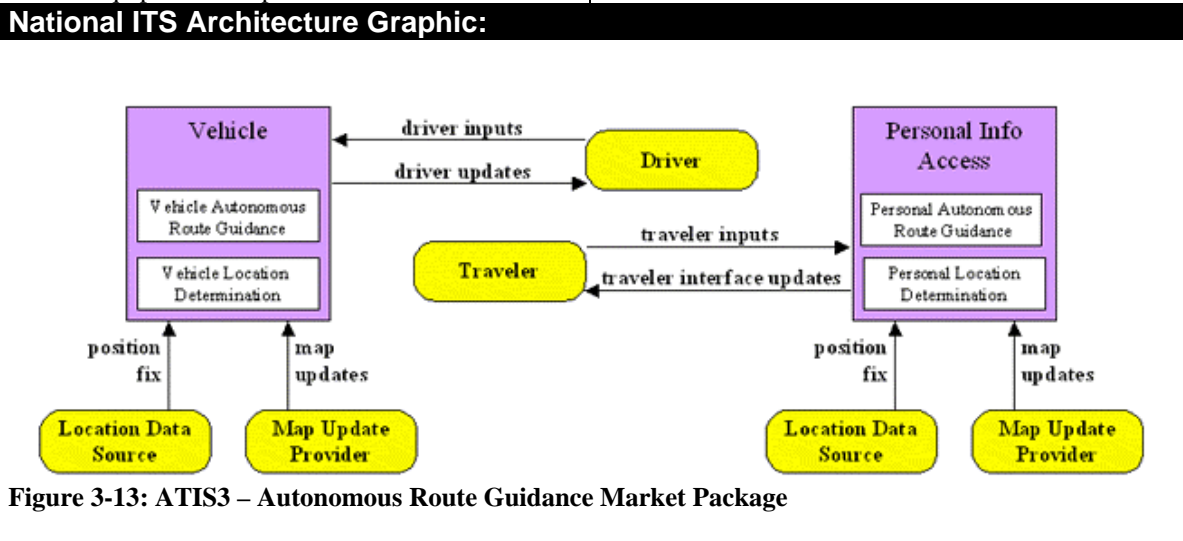


Figure 3-12: ATIS2 – Interactive Traveler Information Market Package

ATIS3 – Autonomous Route Guidance

National ITS Architecture Definition:	Participating Regional Elements
<p>This market package relies on in-vehicle sensory, location determination, computational, map database, and interactive driver interface equipment to enable route planning and detailed route guidance based on static, stored information. No communication with the infrastructure is assumed or required. Identical capabilities are available to the traveler outside the vehicle by integrating a similar suite of equipment into portable devices.</p>	<p>Commercial Vehicles Kansas Highway Patrol Vehicles</p>



ATIS5 – ISP Based Route Guidance

National ITS Architecture Definition:

This market package offers the user pre-trip route planning and turn-by-turn route guidance services. Routes may be based on static information or reflect real time network conditions. Unlike ATIS3 and ATIS4, where the user equipment determines the route, the route determination functions are performed in the Information Service Provider Subsystem in this market package. This approach simplifies the user equipment requirements and can provide the infrastructure better information on which to predict future traffic. The package includes two way data communications and optionally also equips the vehicle with the databases, location determination capability, and display technology to support turn by turn route guidance.

Participating Regional Elements

511 Number Call-In System
 Kansas 800# for Traveler Information
 KC Scout
 KDOT Web Site
 Metro Networks
 MoDOT Customer Service
 Regional Call Center for Transit Information
 Road Conditions and Construction Detours Reporting System
 Conditions Acquisition and Reporting System
 KC Metro Web Page
 KDOT Office of Transportation Information
 Media
 Missouri 800# for Traveler Information
 Private ISP Systems
 Rideshare
 Commercial Vehicles
 Kansas Highway Patrol Vehicles

National ITS Architecture Graphic:

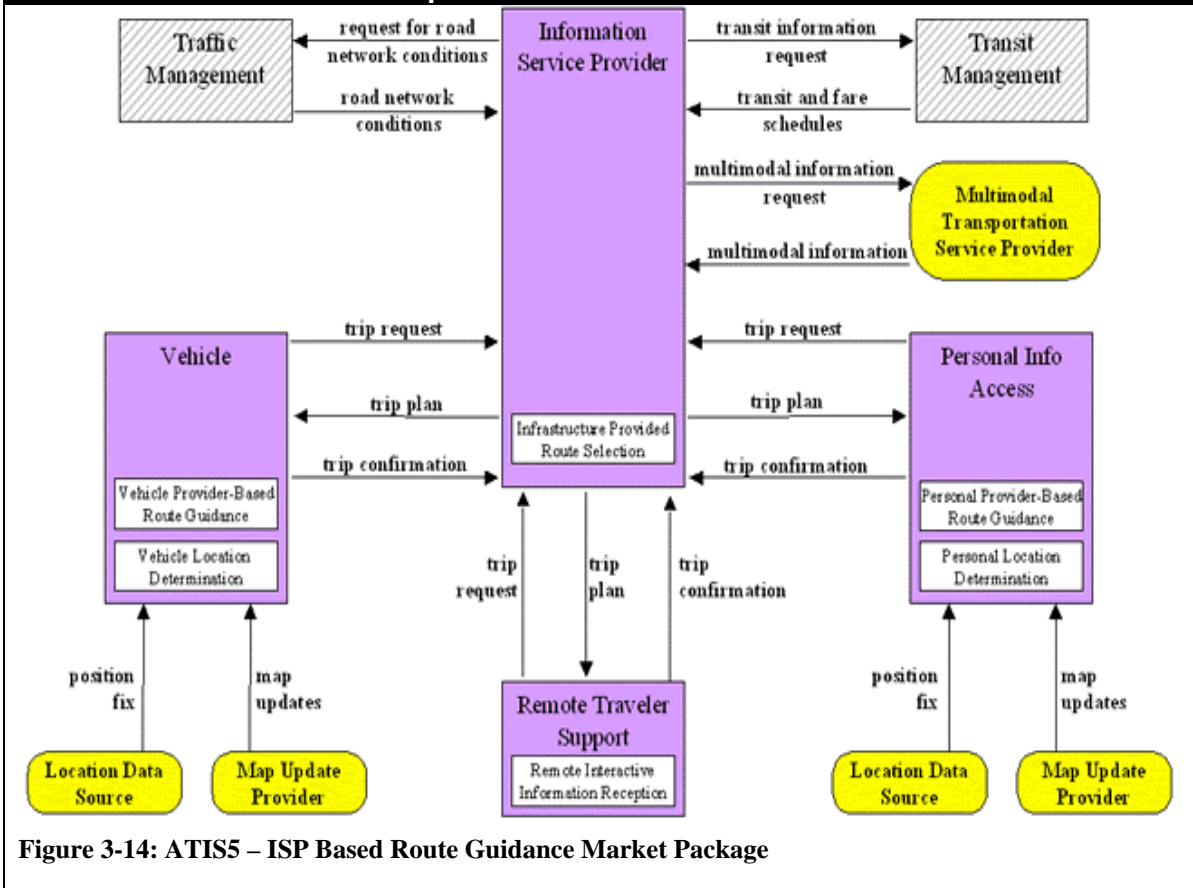


Figure 3-14: ATIS5 – ISP Based Route Guidance Market Package

ATIS8 – Dynamic Ridesharing

National ITS Architecture Definition:

This market package provides dynamic ridesharing/ride matching services to travelers. This service could allow near real time ridesharing reservations to be made through the same basic user equipment used for Interactive Traveler Information. This ridesharing/ride matching capability also includes arranging connections to transit or other multimodal services.

Participating Regional Elements

511 Number Call-In System
 Kansas 800# for Traveler Information
 KC Scout
 KDOT Web Site
 Metro Networks
 MoDOT Customer Service
 Regional Call Center for Transit Information
 Road Conditions and Construction Detours Reporting System
 Conditions Acquisition and Reporting System
 KC Metro Web Page
 KDOT Office of Transportation Information Media
 Missouri 800# for Traveler Information
 Private ISP Systems
 Rideshare
 Transit Kiosks

National ITS Architecture Graphic:

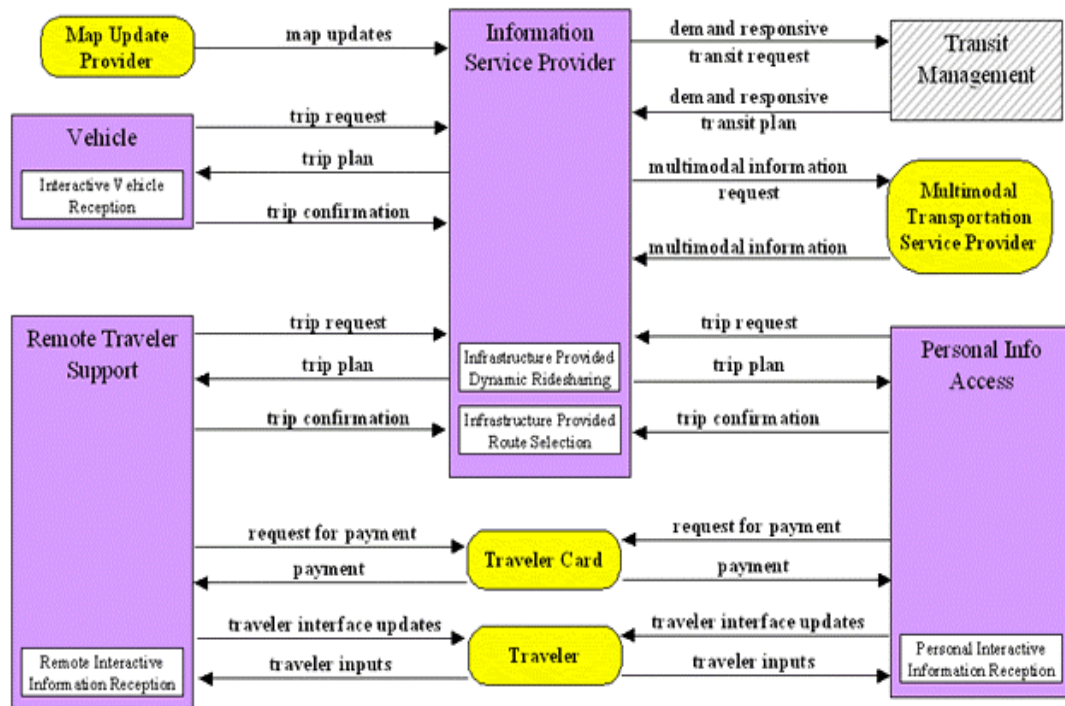


Figure 3-15: ATIS8 – Dynamic Ridesharing Market Package

ATMS01 – Network Surveillance

National ITS Architecture Definition:

This market package includes traffic detectors, other surveillance equipment, the supporting field equipment, and wireline communications to transmit the collected data back to the Traffic Management Subsystem. The derived data can be used locally such as when traffic detectors are connected directly to a signal control system or remotely (e.g., when a CCTV system sends data back to the Traffic Management Subsystem). The data generated by this market package enables traffic managers to monitor traffic and road conditions, identify and verify incidents, detect faults in indicator operations, and collect census data for traffic strategy development and long range planning. The collected data can also be analyzed and made available to users and the Information Service Provider Subsystem.

Participating Regional Elements

Adjacent Region TOC's
 Kansas Turnpike Authority ATMS
 KC Scout
 Local Traffic Signal System
 MoDOT Traffic Signal System
 Olathe ATMS
 Overland Park ATMS
 Kansas City International Airport
 KC Metro Road Weather Information System
 KDOT Road Weather Information System
 MoDOT Road Weather Information System
 NASCAR Event Management
 Operation Green Light (All Phases)
 Kansas Scales and Inspection Facilities
 KC SmartPort
 Missouri Scales and Inspection Facilities
 KCMO Parking Management
 Flood Warning System
 KDOT Field Equipment
 Local Field Equipment
 Olathe ATMS Field Equipment
 Overland Park ATMS Field Equipment
 KC Scout Field Equipment
 KTA Field Equipment
 MoDOT Field Equipment
 Operation Green Light Field Equipment
 K-TAG Field Equipment

National ITS Architecture Graphic:

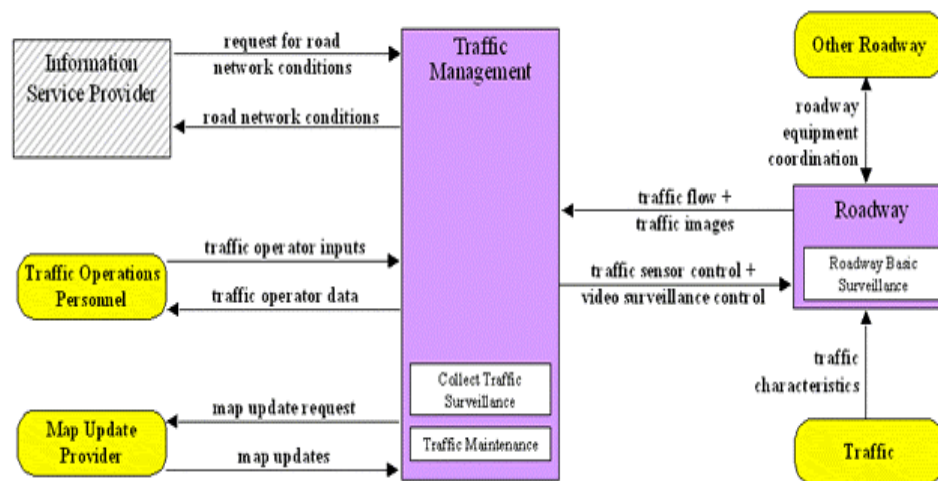


Figure 3-16: ATMS01 – Network Surveillance Market Package

ATMS02 – Probe Surveillance

National ITS Architecture Definition:

This market package provides an alternative approach for surveillance of the roadway network. Two general implementation paths are supported by this market package: 1) wide-area wireless communications between the vehicle and Information Service Provider is used to communicate current vehicle location and status, and 2) dedicated short range communications between the vehicle and roadside is used to provide equivalent information directly to the Traffic Management Subsystem. The first approach leverages wide area communications equipment that may already be in the vehicle to support personal safety and advanced traveler information services. The second approach utilizes vehicle equipment that supports toll collection, in-vehicle signing, and other short range communications applications identified within the architecture. The market package enables traffic managers to monitor road conditions, identify incidents, analyze and reduce the collected data, and make it available to users and private information providers. It requires one of the communications options identified above, roadside beacons and wireline communications for the short range communications option, data reduction software, and utilizes wireline links between the Traffic Management Subsystem and Information Service Provider Subsystem to share the collected information. Both “Opt out” and “Opt in” strategies are available to ensure the user has the ability to turn off the probe functions to ensure individual privacy. Due to the large volume of data collected by probes, data reduction techniques are required, such as the ability to identify and filter out-of-bounds or extreme data reports.

Participating Regional Elements

KC Scout

National ITS Architecture Graphic:

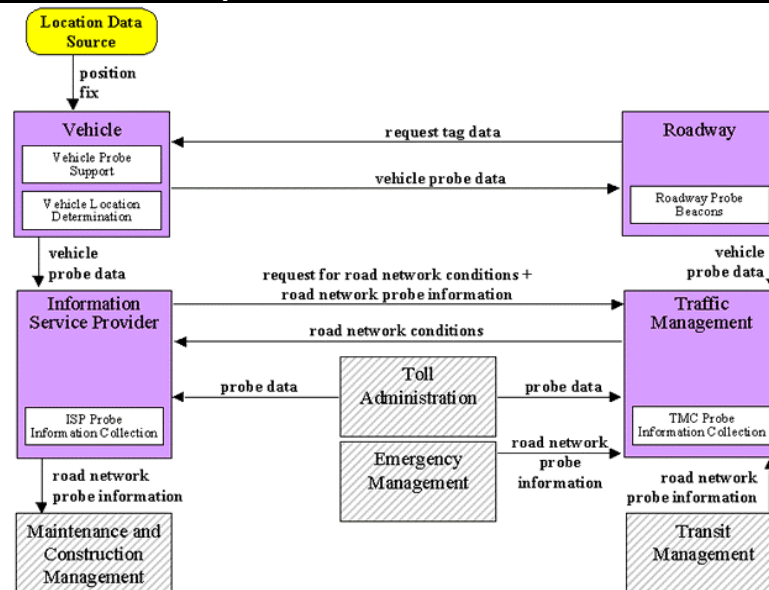


Figure 3-17: ATMS02 – Probe Surveillance Market Package

ATMS03 – Surface Street Control

National ITS Architecture Definition:

This market package provides the central control and monitoring equipment, communication links, and the signal control equipment that support local surface street control and/or arterial traffic management. A range of traffic signal control systems are represented by this market package ranging from static pre-timed control systems to fully traffic responsive systems that dynamically adjust control plans and strategies based on current traffic conditions and priority requests. Additionally, general advisory and traffic control information can be provided to the driver while en route. This market package is generally an intra-jurisdictional package that does not rely on real-time communications between separate control systems to achieve area-wide traffic signal coordination. Systems that achieve coordination across jurisdictions by using a common time base or other strategies that do not require real time coordination would be represented by this package. This market package is consistent with typical urban traffic signal control systems.

Participating Regional Elements

Operation Green Light

National ITS Architecture Graphic:

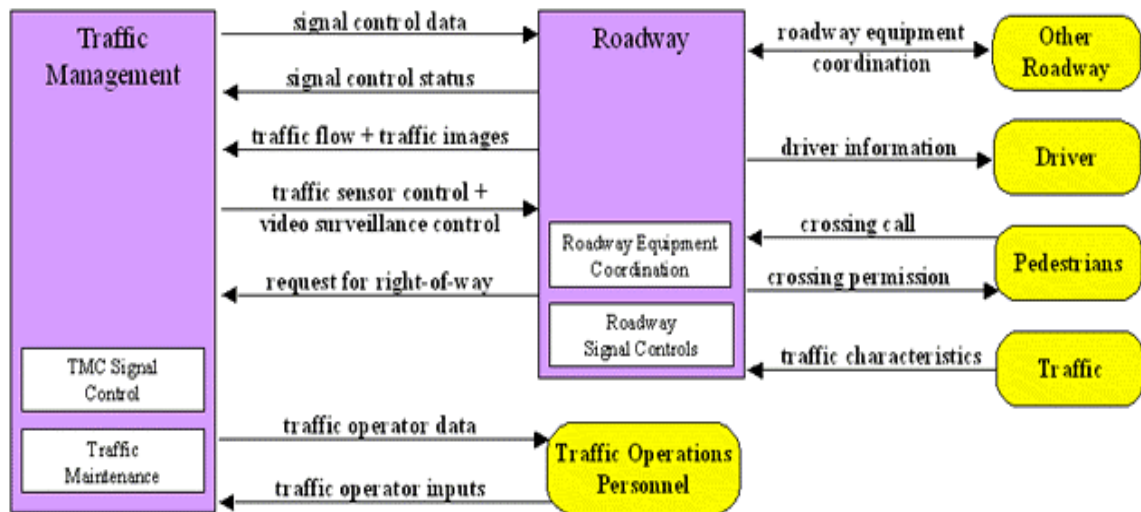


Figure 3-18: ATMS03 – Surface Street Control Market Package

ATMS04 – Freeway Control

National ITS Architecture Definition:

This market package provides the communications and roadside equipment to support ramp control, lane controls, and interchange control for freeways. Coordination and integration of ramp meters are included as part of this market package. This package is consistent with typical urban traffic freeway control systems. This package incorporates the instrumentation included in the Network Surveillance Market Package to support freeway monitoring and adaptive strategies as an option. This market package also includes the capability to utilize surveillance information for detection of incidents. Typically, the processing would be performed at a traffic management center; however, developments might allow for point detection with roadway equipment. For example, a CCTV might include the capability to detect an incident based upon image changes. Additionally, this market package allows general advisory and traffic control information to be provided to the driver while en route.

Participating Regional Elements

KC Scout

National ITS Architecture Graphic:

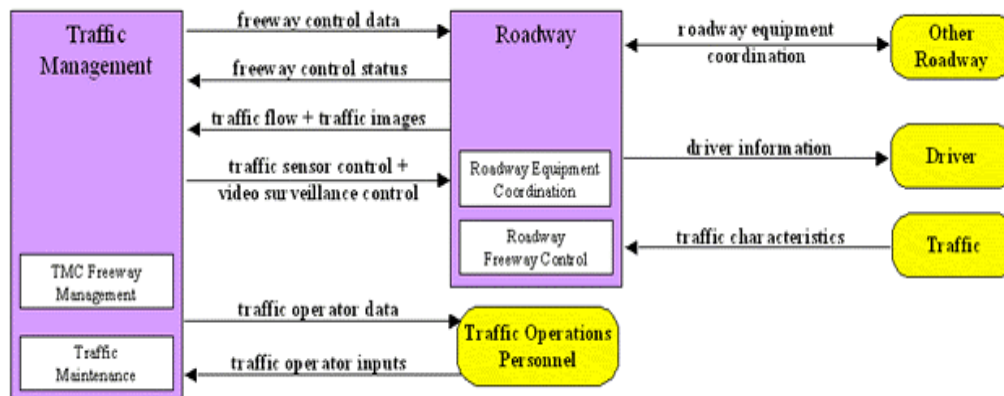


Figure 3-19: ATMS04 – Freeway Control Market Package

ATMS06 – Traffic Information Dissemination

National ITS Architecture Definition:

This market package allows traffic information to be disseminated to drivers and vehicles using roadway equipment such as dynamic message signs or highway advisory radio. This package provides a tool that can be used to notify drivers of incidents; careful placement of the roadway equipment provides the information at points in the network where the drivers have recourse and can tailor their routes to account for the new information. This package also covers the equipment and interfaces that provide traffic information from a traffic management center to the media (for instance via a direct tie-in between a traffic management center and radio or television station computer systems), Transit Management, Emergency Management, and Information Service Providers. A link to the Maintenance and Construction Management subsystem allows real time information on road/bridge closures due to maintenance and construction activities to be disseminated.

Participating Regional Elements

KC Scout
 Adjacent Region TOC's
 Kansas Turnpike Authority ATMS
 Local Traffic Signal System
 MoDOT Traffic Signal System
 Olathe ATMS
 Overland Park ATMS
 Kansas City International Airport
 KC Metro Road Weather Information System
 MoDOT Road Weather Information System
 NASCAR Event Management
 Operation Green Light (All Phases)
 Kansas Scales and Inspection Facilities
 KC SmartPort
 Missouri Scales and Inspection Facilities
 KCMO Parking Management
 Flood Warning System
 DKOT Field Equipment
 Local Field Equipment
 Olathe ATMS Field Equipment
 Overland Park ATMS Field Equipment
 KC Scout Field Equipment
 KTA Field Equipment
 MoDOT Field Equipment
 Operation Green Light Field Equipment
 K-TAG Field Equipment

National ITS Architecture Graphic:

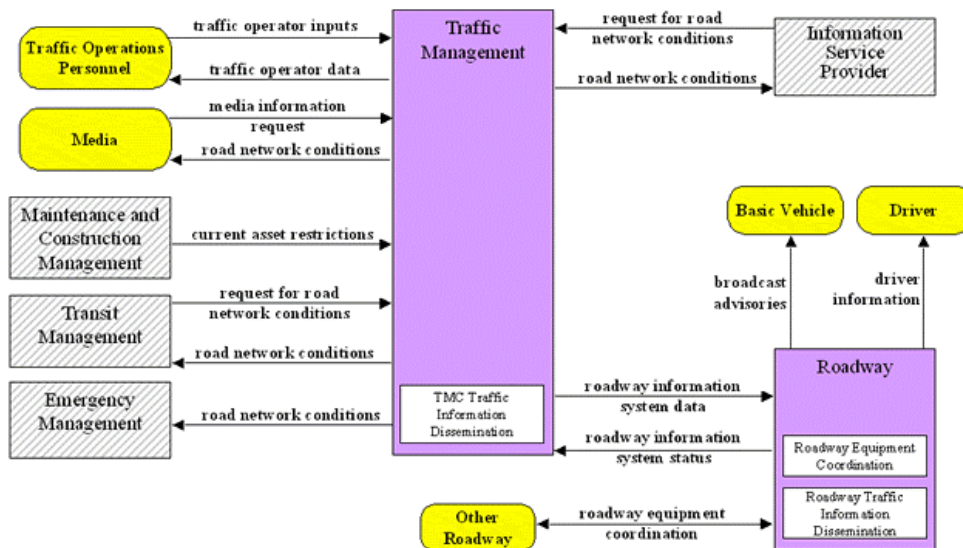


Figure 3-20: ATMS06 – Traffic Information Dissemination Market Package

ATMS07 – Regional Traffic Control

National ITS Architecture Definition:

This market package provides for the sharing of traffic information and control among traffic management centers to support a regional control strategy. This market package advances the Surface Street Control and Freeway Control Market Packages by adding the communications links and integrated control strategies that enable integrated Interjurisdictional traffic control. The nature of optimization and extent of information and control sharing is determined through working arrangements between jurisdictions. This package relies principally on roadside instrumentation supported by the Surface Street Control and Freeway Control Market Packages and adds hardware, software, and wireline communications capabilities to implement traffic management strategies that are coordinated between allied traffic management centers. Several levels of coordination are supported from sharing of information through sharing of control between traffic management centers.

Participating Regional Elements

Adjacent Region TOC's
 Kansas Turnpike Authority ATMS
 KC Scout
 Local Traffic Signal System
 MoDOT Traffic Signal System
 Olathe ATMS
 Overland Park ATMS
 Kansas City International Airport
 KC Metro Road Weather Information System
 KDOT Road Weather Information System
 MoDOT Road Weather Information System
 NASCAR Event Management
 Operation Green Light (All Phases)

National ITS Architecture Graphic:

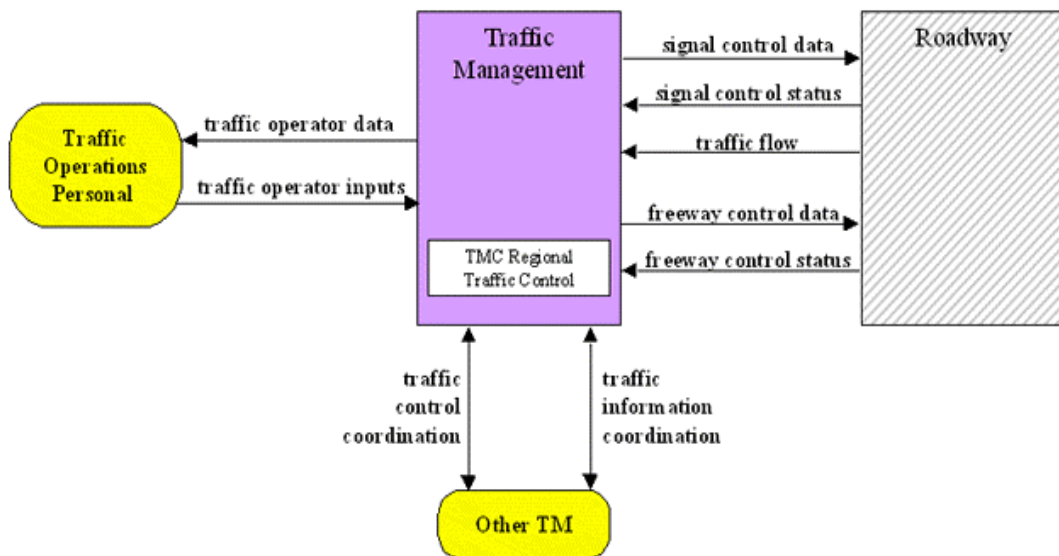


Figure 3-21: ATMS07 – Regional Traffic Control Market Package

ATMS08 – Incident Management System

National ITS Architecture Definition: Participating Regional Elements

This market package manages both unexpected incidents and planned events so that the impact to the transportation network and traveler safety is minimized. The market package includes incident detection capabilities through roadside surveillance devices (e.g. CCTV) and through regional coordination with other traffic management, maintenance and construction management and emergency management centers as well as weather service entities and event promoters. Information from these diverse sources are collected and correlated by this market package to detect and verify incidents and implement an appropriate response. This market package supports traffic operations personnel in developing an appropriate response in coordination with emergency management, maintenance and construction management, and other incident response personnel to confirmed incidents. The response may include traffic control strategy modifications or resource coordination between center subsystems. Incident response also includes presentation of information to affected travelers using the Traffic Information Dissemination market package and dissemination of incident information to travelers through the Broadcast Traveler Information or Interactive Traveler Information market packages. The roadside equipment used to detect and verify incidents also allows the operator to monitor incident status as the response unfolds. The coordination with emergency management might be through a CAD system or through other communication with emergency field personnel. The coordination can also extend to tow trucks and other allied response agencies and field service personnel.

- Agency Operations Centers
- Emergency Notification and Evacuation System
- Kansas City Motorist Assist (KS)
- Kansas Highway Patrol Dispatch
- Law Enforcement Dispatch
- Local 911 Call Center
- Local Fire Dispatch
- Missouri State Highway Patrol Dispatch
- Regional Ambulance Service
- KCIA Emergency Services
- Kansas City Motorist Assist (MO)
- Kansas State Emergency Command Center
- Life Net EMS
- Local Ambulance Service
- Missouri State Emergency Management Center
- Private Mayday Services
- Adjacent Region TOC's
- Kansas Turnpike Authority ATMS
- KC Scout
- Local Traffic Signal System
- Olathe ATMS
- Overland Park ATMS
- Kansas City International Airport
- KC Metro Road Weather Information System
- KDOT Road Weather Information System
- MoDOT Road Weather Information System
- NASCAR Event Management
- Operation Green Light (All Phases)
- KCMO Public Works Vehicles
- KDOT Maintenance Vehicles
- Maintenance Vehicles
- MoDOT Maintenance Vehicles
- Missouri and Kansas Scales and Inspection Facilities
- KC SmartPort
- KCMO Parking Management
- Flood Warning System
- KDOT Field Equipment
- Local Field Equipment
- Olathe ATMS Field Equipment
- Overland Park ATMS Field Equipment
- KC Scout Field Equipment
- KTA Field Equipment
- MoDOT Field Equipment
- Operation Green Light Field Equipment

National ITS Architecture Graphic:

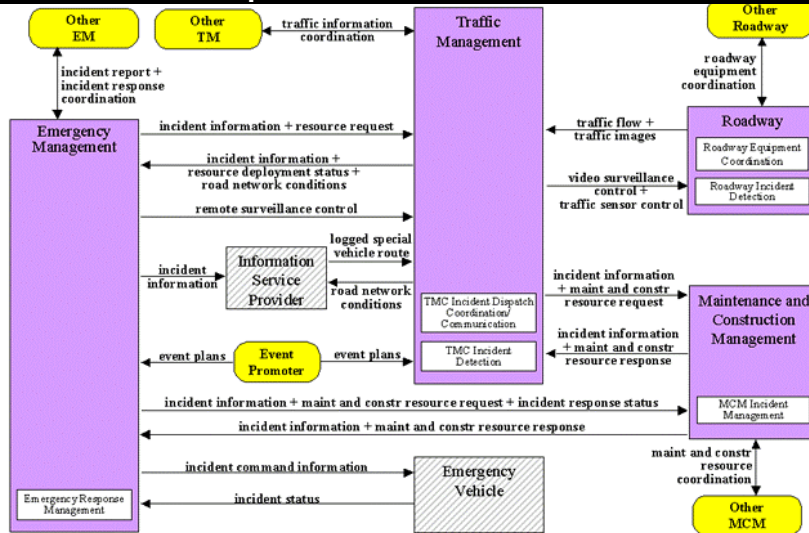


Figure 3-22: ATMS08 – Incident Management System Market Package

ATMS10 – Electronic Toll Collection

National ITS Architecture Definition:

This market package provides toll operators with the ability to collect tolls electronically and detect and process violations. The fees that are collected may be adjusted to implement demand management strategies. Dedicated short range communication between the roadway equipment and the vehicle is required as well as wireline interfaces between the toll collection equipment and transportation authorities and the financial infrastructure that supports fee collection. Vehicle tags of toll violators are read and electronically posted to vehicle owners. Standards, inter-agency coordination, and financial clearinghouse capabilities enable regional, and ultimately national interoperability for these services. The toll tags and roadside readers that these systems utilize can also be used to collect road use statistics for highway authorities. This data can be collected as a natural by-product of the toll collection process or collected by separate readers that are dedicated to probe data collection.

Participating Regional Elements

K-TAG Service Center
K-TAG Field Equipment

National ITS Architecture Graphic:

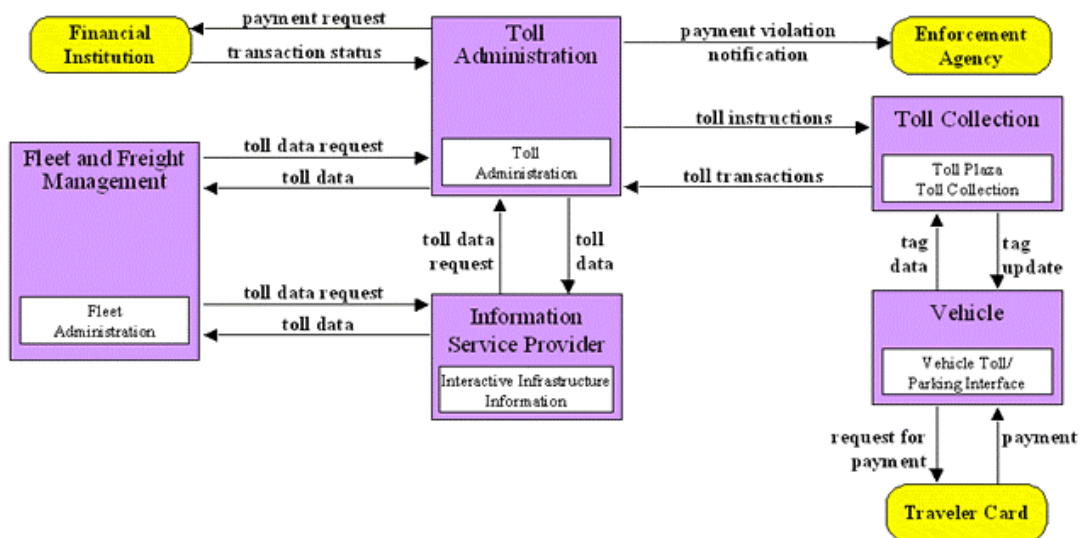


Figure 3-23: ATMS10 – Electronic Toll Collection Market Package

ATMS11 – Emissions Monitoring and Management

National ITS Architecture Definition:

This market package monitors individual vehicle emissions and provides general air quality monitoring using distributed sensors to collect the data. The collected information is transmitted to the emissions management subsystem for processing. Both area wide air quality monitoring and point emissions monitoring are supported by this market package. For area wide monitoring, this market package measures air quality, identifies sectors that are non-compliant with air quality standards, and collects, stores and reports supporting statistical data. For point emissions monitoring, this market package measures tail pipe emissions and identifies vehicles that exceed emissions standards. The gathered information can be used to implement environmentally sensitive TDM programs, policies, and regulations.

Participating Regional Elements

Heartland Sky Emissions Management System

National ITS Architecture Graphic:

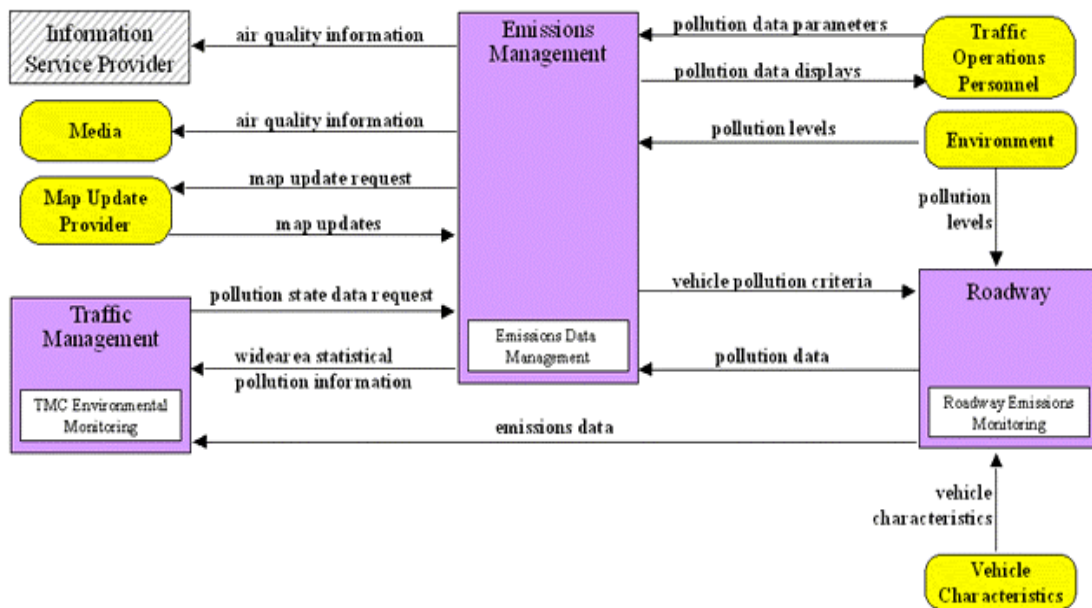


Figure 3-24: ATMS11 – Emissions Monitoring and Management Market Package

ATMS12 – Virtual TMC and Smart Probe Data

National ITS Architecture Definition:

This market package provides for special requirements of rural road systems. Instead of a central TMC, the traffic management is distributed over a very wide area (e.g., a whole state or collection of states). Each locality has the capability of accessing available information for assessment of road conditions. The package uses vehicles as smart probes that are capable of measuring road conditions and providing this information to the roadway for relay to the Traffic Management Subsystem and potentially direct relay to following vehicles (i.e., the automated road signing equipment is capable of autonomous operation). In-vehicle signing is used to inform drivers of detected road conditions.

Participating Regional Elements

Kansas Scales and Inspection Facilities
 KC SmartPort
 Missouri Scales and Inspection Facilities
 KCMO Parking Management
 Flood Warning System
 KDOT Field Equipment
 Local Field Equipment
 Olathe ATMS Field Equipment
 Overland Park ATMS Field Equipment
 KC Scout Field Equipment
 KTA Field Equipment
 MoDOT Field Equipment
 Operation Green Light Field Equipment
 K-TAG Field Equipment
 Commercial Vehicles
 Kansas Highway Patrol Vehicles
 KCMO Public Works Vehicles
 KDOT Maintenance Vehicles
 Maintenance Vehicles
 MoDOT Maintenance Vehicles
 KCATA Transit Vehicles

National ITS Architecture Graphic:

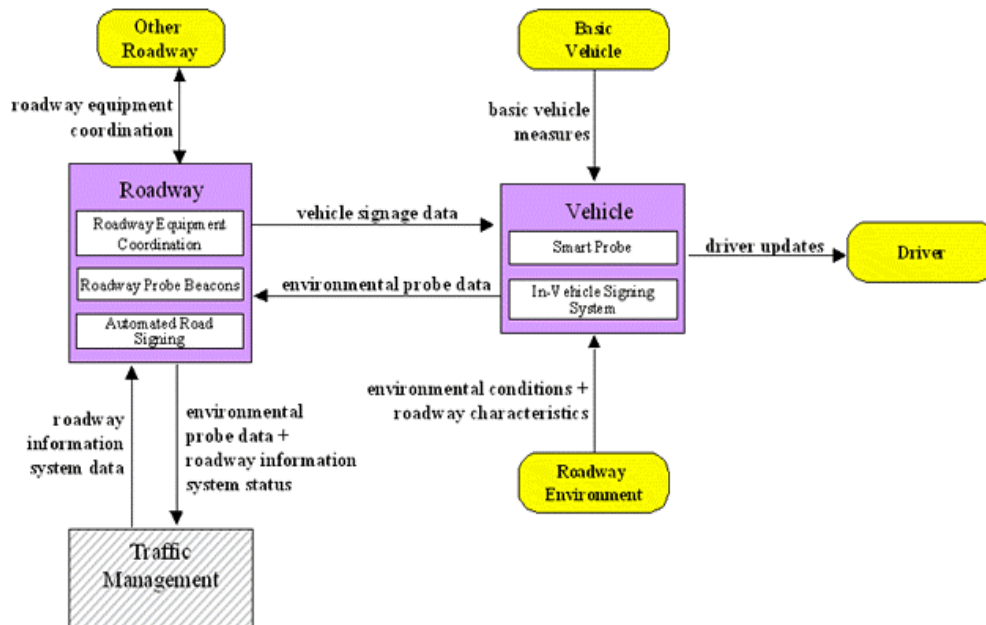


Figure 3-25: ATMS12 – Virtual TMC and Smart Probe Data Market Package

ATMS13 – Standard Railroad Grade Crossing

National ITS Architecture Definition:

This market package manages highway traffic at highway-rail intersections (HRIs) where operational requirements do not dictate more advanced features (e.g., where rail operational speeds are less than 80 miles per hour). Both passive (e.g., the crossbuck sign) and active warning systems (e.g., flashing lights and gates) are supported. (Note that passive systems exercise only the single interface between the roadway subsystem and the driver in the architecture definition.) These traditional HRI warning systems may also be augmented with other standard traffic management devices. The warning systems are activated on notification by interfaced wayside equipment of an approaching train. The equipment at the HRI may also be interconnected with adjacent signalized intersections so that local control can be adapted to highway-rail intersection activities. Health monitoring of the HRI equipment and interfaces is performed; detected abnormalities are reported to both highway and railroad officials through wayside interfaces and interfaces to the traffic management subsystem.

Participating Regional Elements

Olathe ATMS

National ITS Architecture Graphic:

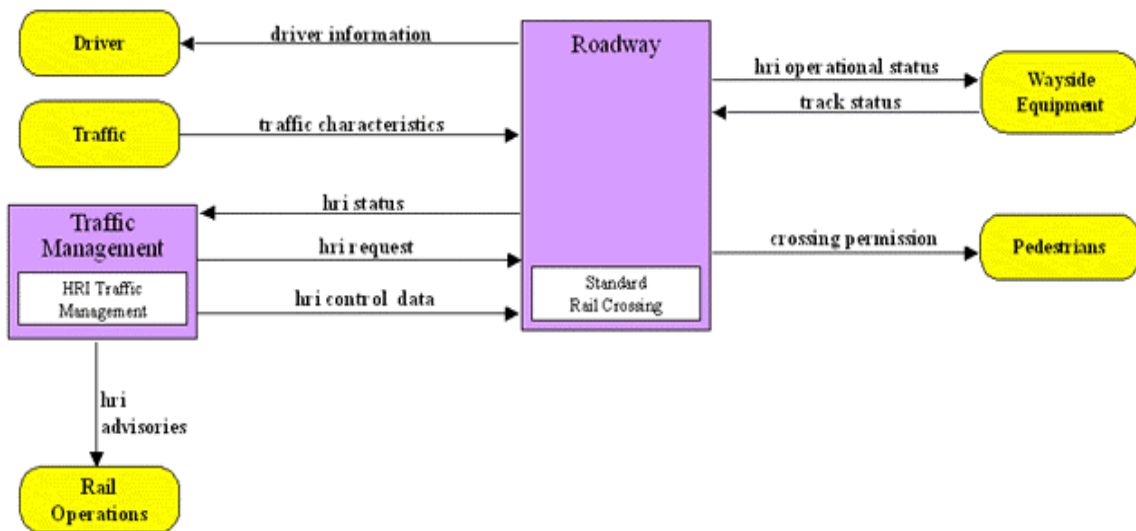


Figure 3-26: ATMS13 – Standard Railroad Grade Crossing Market Package

ATMS14 – Advanced Railroad Grade Crossing

National ITS Architecture Definition:

This market package manages highway traffic at highway-rail intersections (HRIs) where operational requirements demand advanced features (e.g., where rail operational speeds are greater than 80 miles per hour). This market package includes all capabilities from the Standard Railroad Grade Crossing Market Package and augments these with additional safety features to mitigate the risks associated with higher rail speeds. The active warning systems supported by this market package include positive barrier systems that preclude entrance into the intersection when the barriers are activated. Like the Standard Package, the HRI equipment is activated on notification by wayside interface equipment which detects, or communicates with the approaching train. In this market package, the wayside equipment provides additional information about the arriving train so that the train's direction of travel, estimated time of arrival, and estimated duration of closure may be derived. This enhanced information may be conveyed to the driver prior to, or in context with, warning system activation. This market package also includes additional detection capabilities that enable it to detect an entrapped or otherwise immobilized vehicle within the HRI and provide an immediate notification to highway and railroad officials.

Participating Regional Elements

Olathe ATMS

National ITS Architecture Graphic:

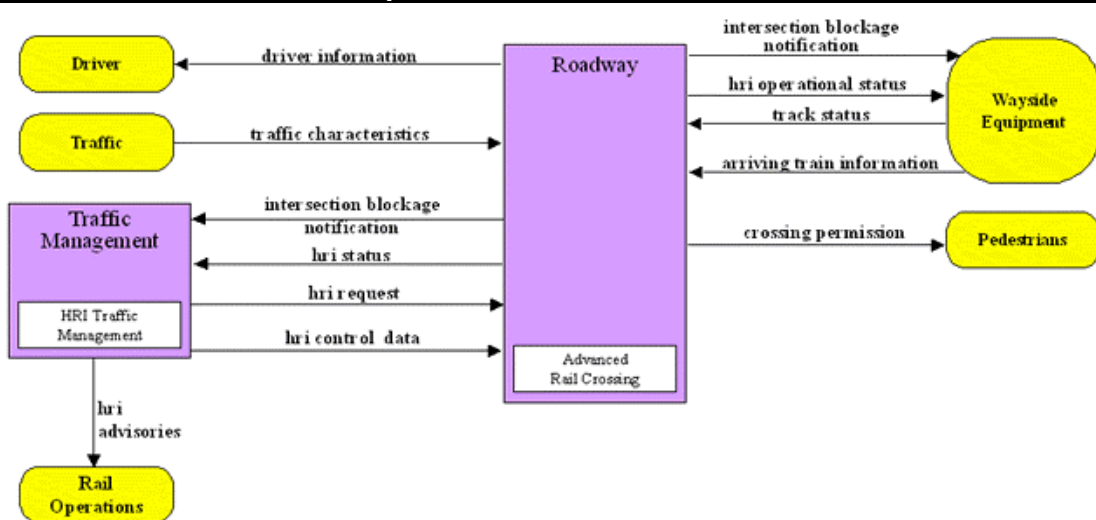


Figure 3-27: ATMS14 – Advanced Railroad Grade Crossing Market Package

ATMS15 – Railroad Operations Coordination

National ITS Architecture Definition:

This market package provides an additional level of strategic coordination between rail operations and traffic management centers. Rail operations provides train schedules, maintenance schedules, and any other forecast events that will result in highway-rail intersection (HRI) closures. This information is used to develop forecast HRI closure times and durations that may be used in advanced traffic control strategies or to enhance the quality of traveler information.

Participating Regional Elements

Olathe ATMS

National ITS Architecture Graphic:

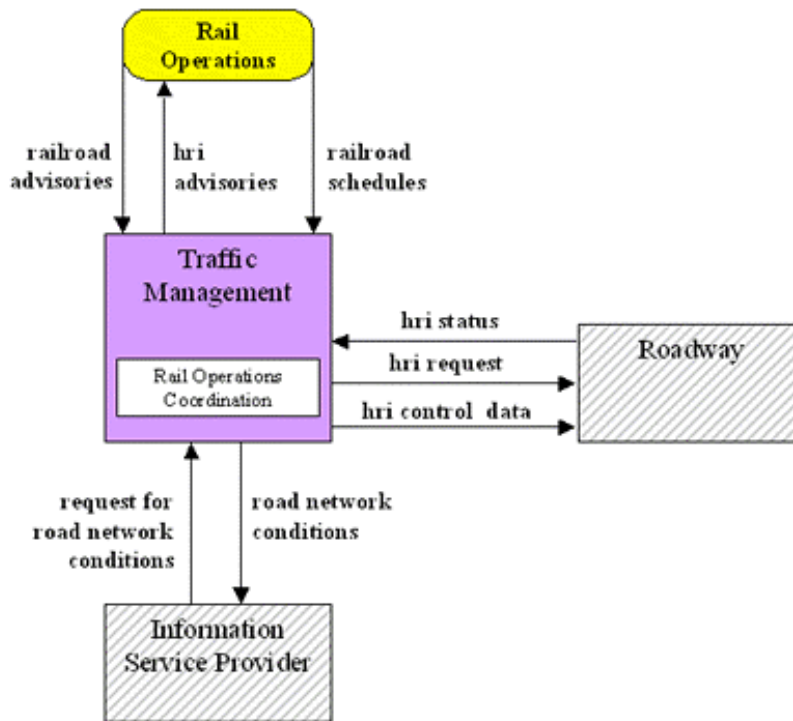


Figure 3-28: ATMS15 – Railroad Operations Coordination Market Package

ATMS16 – Parking Facility Management

National ITS Architecture Definition:

This market package provides enhanced monitoring and management of parking facilities. It assists in the management of parking operations, coordinates with transportation authorities, and supports electronic collection of parking fees. This market package collects current parking status, shares this data with Information Service Providers and Traffic Management, and collects parking fees using the same in-vehicle equipment utilized for electronic toll collection or contact or proximity traveler cards used for electronic payment.

Participating Regional Elements

KCMO Parking Management

National ITS Architecture Graphic:

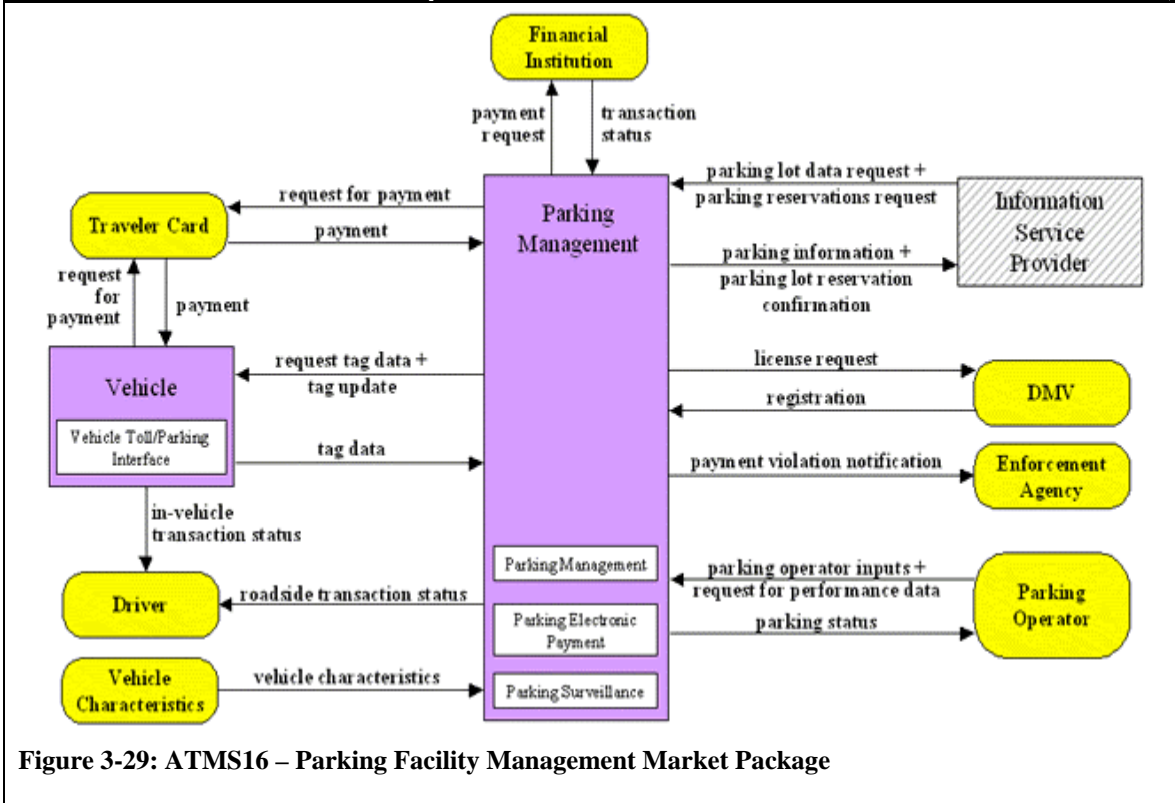


Figure 3-29: ATMS16 – Parking Facility Management Market Package

CVO05 – International Border Electronic Clearance

National ITS Architecture Definition:

This market package provides for automated clearance at international border crossings. This package augments the electronic clearance package by allowing interface with customs related functions.

Participating Regional Elements

Kansas CVISN System
 Missouri CVISN System
 Kansas Scales and Inspection Facilities
 KC SmartPort
 Missouri Scales and Inspection Facilities
 Commercial Vehicles

National ITS Architecture Graphic:

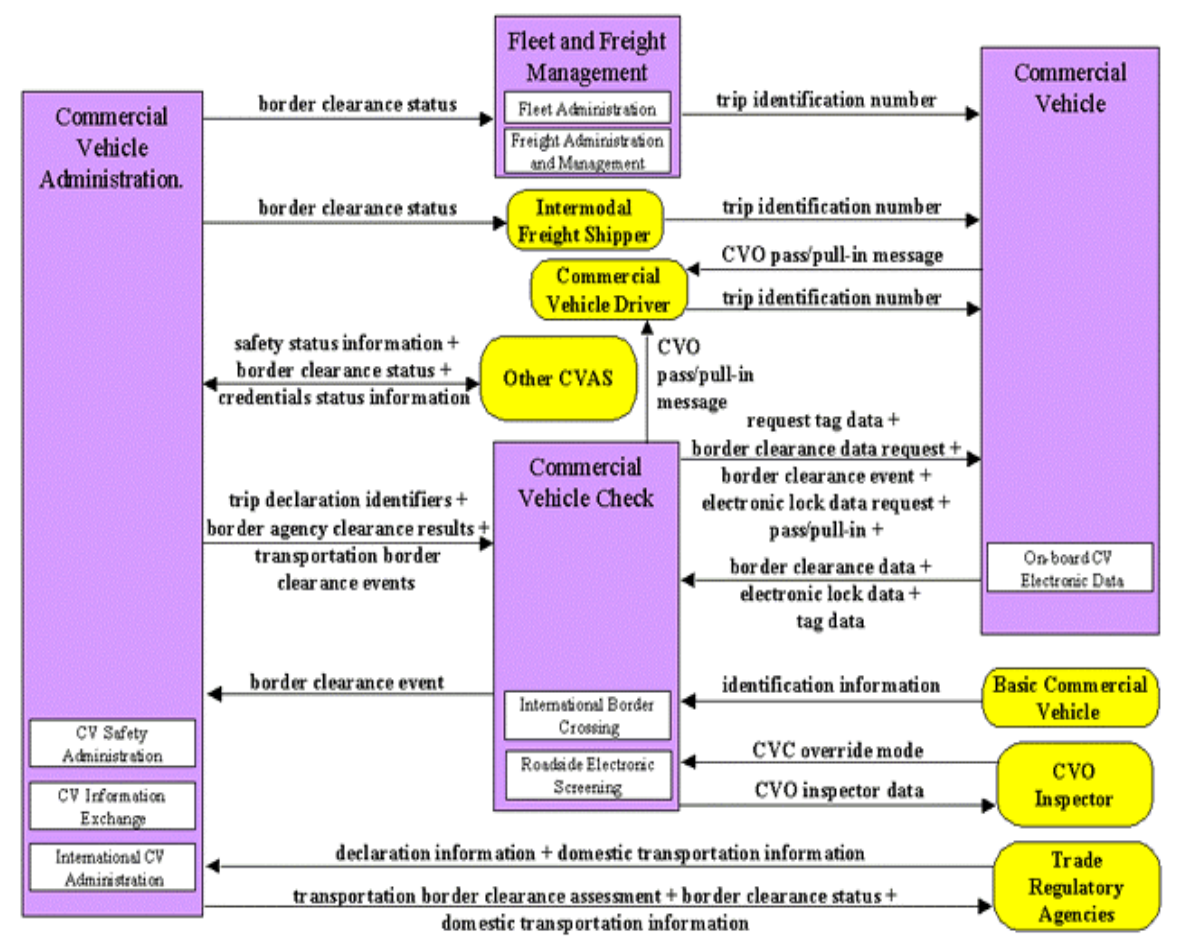


Figure 3-30: CVO05 – International Border Electronic Clearance Market Package

CVO10 – HAZMAT Management

National ITS Architecture Definition:

This market package integrates incident management capabilities with commercial vehicle tracking to assure effective treatment of HAZMAT material and incidents. HAZMAT tracking is performed by the Fleet and Freight Management Subsystem. The Emergency Management subsystem is notified by the Commercial Vehicle if an incident occurs and coordinates the response. The response is tailored based on information that is provided as part of the original incident notification or derived from supplemental information provided by the Fleet and Freight Management Subsystem. The latter information can be provided prior to the beginning of the trip or gathered following the incident depending on the selected policy and implementation.

Participating Regional Elements

Agency Operations Centers
 Emergency Notification and Evacuation System
 Kansas City Motorist Assist (KS)
 Kansas Highway Patrol Dispatch
 Law Enforcement Dispatch
 Local 911 Call Center
 Local Fire Dispatch
 Missouri State Highway Patrol Dispatch
 Regional Ambulance Service
 Eagle EMS
 KCIA Emergency Services
 Kansas City Motorist Assist (MO)
 Kansas State Emergency Command Center
 Life Net EMS
 Local Ambulance Service
 Missouri State Emergency Management Center
 Private Mayday Services
 Kansas CVISN System
 Missouri CVISN System
 Kansas Scales and Inspection Facilities
 KC SmartPort
 Missouri Scales and Inspection Facilities
 Commercial Vehicles

National ITS Architecture Graphic:

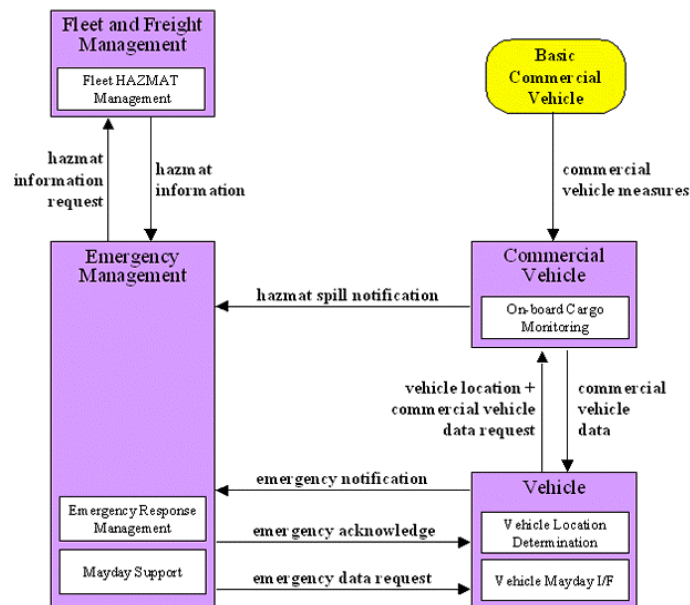


Figure 3-31: CVO10 – HAZMAT Management Market Package

EM1 – Emergency Response

National ITS Architecture Definition:

This market package includes emergency vehicle equipment, equipment used to receive and route emergency calls, and wireless communications that enable safe and rapid deployment of appropriate resources to an emergency. Coordination between Emergency Management Subsystems supports emergency notification and coordinated response between agencies. Existing wide area wireless communications would be utilized between the Emergency Management Subsystem and an Emergency Vehicle to enable an incident command system to be established and supported at the emergency location. Public safety, traffic management, and many other allied agencies may each participate in the coordinated response managed by this package.

Participating Regional Elements

Agency Operations Centers
 Emergency Notification and Evacuation System
 Kansas City Motorist Assist (KS)
 Kansas Highway Patrol Dispatch
 Law Enforcement Dispatch
 Local 911 Call Center
 Local Fire Dispatch
 Missouri State Highway Patrol Dispatch
 Regional Ambulance Service
 Eagle EMS
 KCIA Emergency Services
 Kansas City Motorist Assist (MO)
 Kansas State Emergency Command Center
 Life Net EMS
 Local Ambulance Service
 Missouri State Emergency Management Center
 Private Mayday Services
 Kansas Highway Patrol Vehicles

National ITS Architecture Graphic:

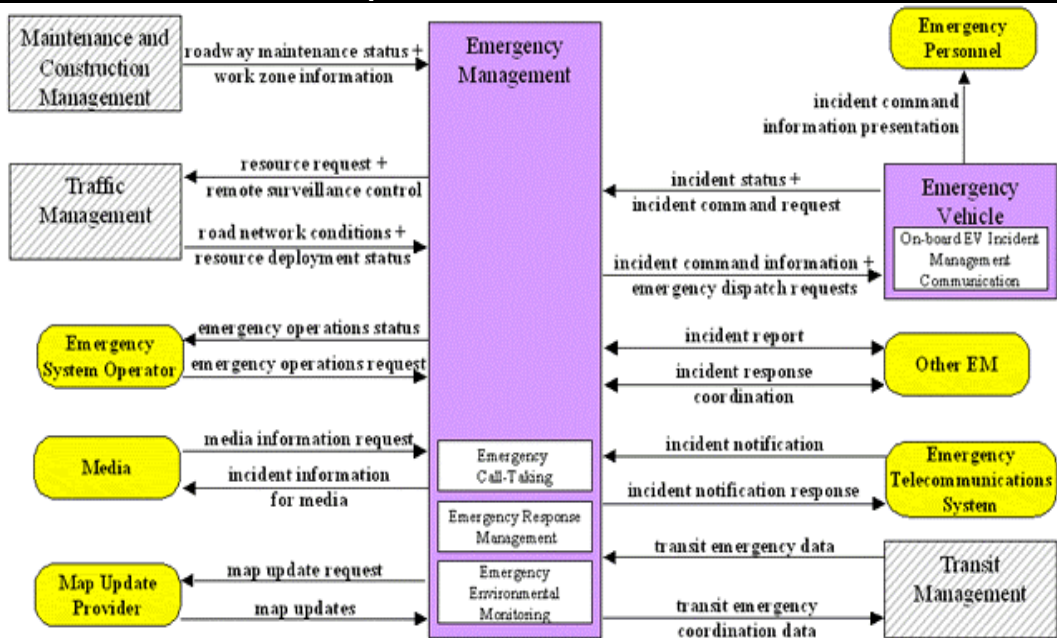


Figure 3-32: EM1 – Emergency Response Market Package

EM2 – Emergency Routing

National ITS Architecture Definition:

This market package supports automated vehicle location and dynamic routing of emergency vehicles. The service also supports coordination with the Traffic Management Subsystem, collecting detailed road network conditions and requesting special priority or other specific emergency traffic control strategies on the selected route(s). The Emergency Management Subsystem provides the routing for the emergency fleet based on real-time traffic conditions. The Emergency Vehicle may also be equipped with dedicated short range communications for local signal preemption. The service provides for information exchange between care facilities and both the Emergency Management Subsystem and emergency vehicles.

Participating Regional Elements

Agency Operations Centers
 Emergency Notification and Evacuation System
 Kansas City Motorist Assist (KS)
 Kansas Highway Patrol Dispatch
 Law Enforcement Dispatch
 Local 911 Call Center
 Local Fire Dispatch
 Missouri State Highway Patrol Dispatch
 Regional Ambulance Service
 Eagle EMS
 KCIA Emergency Services
 Kansas City Motorist Assist (MO)
 Kansas State Emergency Command Center
 Life Net EMS
 Local Ambulance Service
 Missouri State Emergency Management Center
 Private Mayday Services
 Kansas Highway Patrol Vehicles
 KC Scout

National ITS Architecture Graphic:

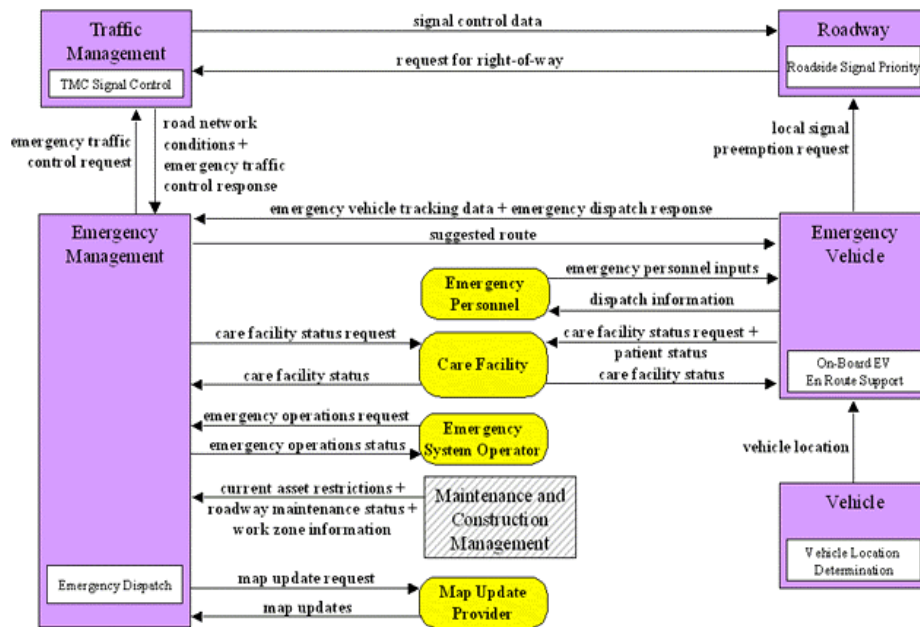


Figure 3-33: EM2 – Emergency Routing Market Package

EM3 – Mayday Support

National ITS Architecture Definition:

This market package allows the user (driver or non-driver) to initiate a request for emergency assistance and enables the Emergency Management Subsystem to locate the user and determine the appropriate response. This market package also includes general surveillance capabilities that enable the Emergency Management Subsystem to remotely monitor public areas (e.g., rest stops, parking lots) to improve security in these areas. The Emergency Management Subsystem may be operated by the public sector or by a private sector provider. The request from the traveler needing assistance may be manually initiated or automated and linked to vehicle sensors. The surveillance data and any requests for assistance are sent to the Emergency Management subsystem using both data and voice communications.

Participating Regional Elements

Agency Operations Centers
 Emergency Notification and Evacuation System
 Kansas City Motorist Assist (KS)
 Kansas Highway Patrol Dispatch
 Law Enforcement Dispatch
 Local 911 Call Center
 Local Fire Dispatch
 Missouri State Highway Patrol Dispatch
 Regional Ambulance Service
 Eagle EMS
 KCIA Emergency Services
 Kansas City Motorist Assist (MO)
 Kansas State Emergency Command Center
 Life Net EMS
 Local Ambulance Service
 Missouri State Emergency Management Center
 Private Mayday Services
 Kansas Highway Patrol Vehicles

National ITS Architecture Graphic:

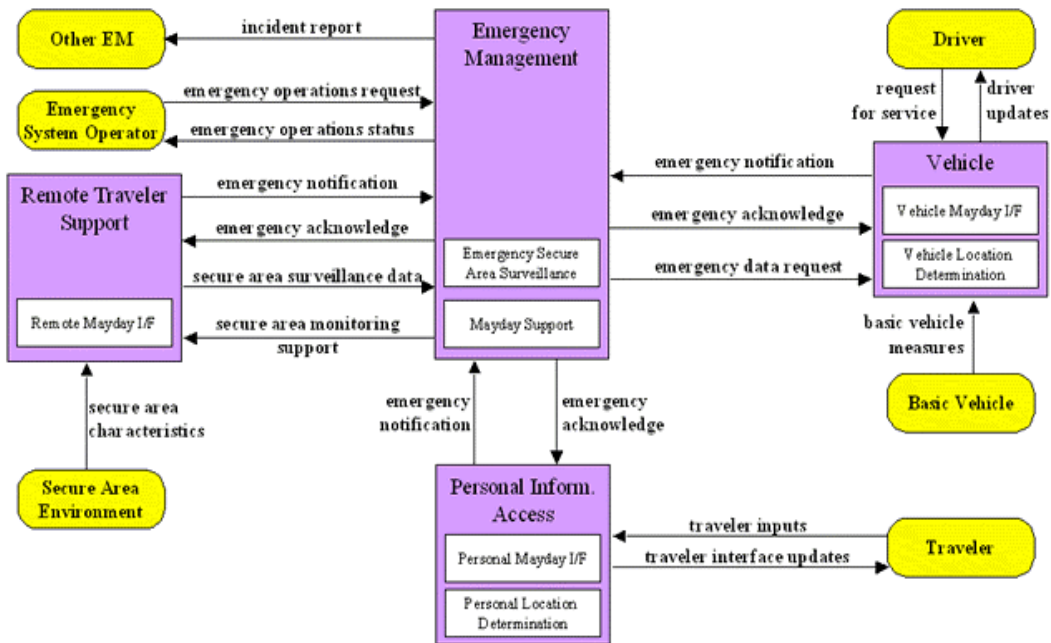


Figure 3-34: EM3 – Mayday Support Market Package

MC04 – Weather Information Processing and Distribution

National ITS Architecture Definition:

This market package processes and distributes the environmental information collected from the Road Weather Data Collection market package. This market package uses the environmental data to detect environmental hazards such as icy road conditions, high winds, dense fog, etc. so system operators and decision support systems can make decision on corrective actions to take. The continuing updates of road condition information and current temperatures can be used by system operators to more effectively deploy road maintenance resources, issue general traveler advisories, issue location specific warnings to drivers using the Traffic Information Dissemination market package, and aid operators in scheduling work activity.

Participating Regional Elements

KC Scout
 KCMO Public Works Vehicles
 KDOT Maintenance Vehicles
 Maintenance Vehicles
 MoDOT Maintenance Vehicles

National ITS Architecture Graphic:

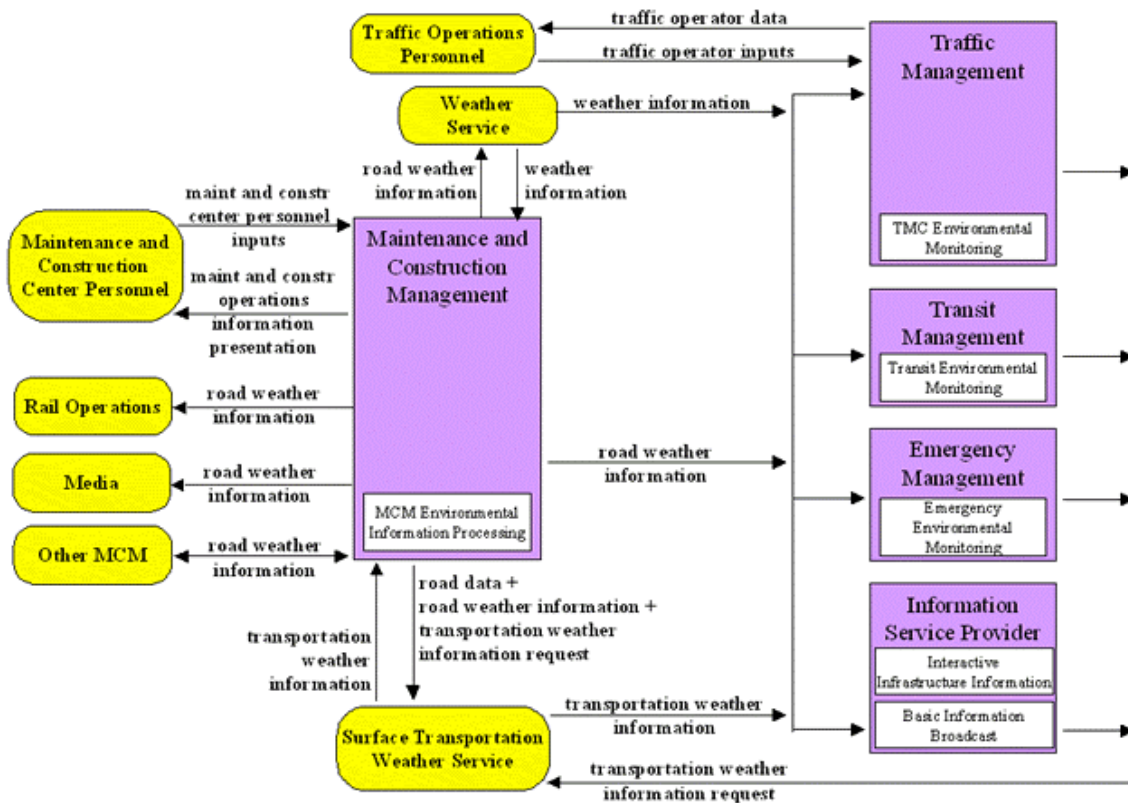


Figure 3-35: MC04 – Weather Information Processing and Distribution Market Package

4. Agreements

Agreements among the different stakeholders, agencies and organizations are required to realize the integration shown in the Kansas City Regional ITS Architecture. The work completed as part of this architecture investigated existing agreements, memorandum of understanding (MOU) and guidance established as it relates to information sharing between the Missouri Department of Transportation, Kansas Department of Transportation, MARC and various transportation stakeholders. Agreements to date have been compiled and are contained in the table below. This table will be integral to maintaining the architecture and will be revised and added to as additional agreements are generated and the architecture matures.

Kansas City Regional ITS Architecture Interagency Agreement Status			
Element	Stakeholders	Agreement Type(s)	Status
Kansas City Scout ATMS	KDOT, MoDOT, MARC, FHWA	MOU, Operational	Existing, Planned
Operation Green Light ATMS	MARC, KDOT, MoDOT, KCATA, Participating Local Governments	Funding, Operational	Existing, Planned
Kansas City SmartPort ITS	Kansas City SmartPort, Inc., MARC, KDOT, MoDOT, FHWA	MOU	Planned
KCATA AVL	KCATA, FTA, MoDOT, KDOT, Johnson County, Unified Government	MOU	Planned
Johnson County Transit AVL	KCATA, FTA, MoDOT, KDOT, Johnson County, Unified Government	MOU	Planned
Overland Park ATMS	Overland Park, KDOT, MARC	Funding, Operational	Existing, Planned
Olathe ATMS	Olathe, KDOT, MARC	Funding, Operational	Existing, Planned
KCATA BRT	KCATA, FTA, MoDOT, Kansas City, Missouri, MARC	MOU	Existing
Unified Government Transit AVL	KCATA, FTA, MoDOT, KDOT, Johnson County, Unified Government	MOU	Planned
511 ATIS	KDOT, MoDOT, MARC, FHWA, FTA, KCATA, Johnson County, Unified Government	MOU	Planned

Table 4-1: Existing Agreements (MOUs)

As future guidance for the Missouri Department of Transportation the material contained in Table 4-2 provides guidance for agreements and information for long-range operations and information sharing agreements.

Type of Agreement	Description
Handshake Agreement	<ul style="list-style-type: none"> Early agreement between one or more partners.

	<ul style="list-style-type: none"> • Not recommended for long term operations.
Memorandum of Understanding	<ul style="list-style-type: none"> • Initial agreement used to provide minimal detail and usually demonstrating a general consensus. • Used to expand a more detailed agreement like a Interagency Agreement which may be broad in scope but contains all of the standard contract clauses required by a specific agency. • May serve as a means to modify a much broader Master Funding Agreement, allowing the master agreement to cover various ITS projects throughout the region and the MOUs to specify the scope and differences between the projects.
Interagency Agreement	<ul style="list-style-type: none"> • Between public agencies (e.g., transit authorities, cities, counties, etc.) for operations, services or funding. • Documents responsibility, functions and liability, at a minimum. Intergovernmental Agreement. • Between governmental agencies (e.g., <i>Agreements between universities and State DOT, MPOs and State DOT, etc.</i>)
Operational Agreement	<ul style="list-style-type: none"> • Between any agency involved in funding, operating, maintaining or using the right-of-way of another public or private agency. • Identifies respective responsibilities for all activities associated with shared systems being operated and/or maintained.
Funding Agreement	<ul style="list-style-type: none"> • Documents the funding arrangements for ITS projects (<i>and other projects</i>). • Includes at a minimum standard funding clauses, detailed scope, services to be performed, detailed project budgets, etc.
Master Agreements	<ul style="list-style-type: none"> • Standard contract and/or legal verbiage for a specific agency and serving as a master agreement by which all business is done. These agreements can be found in the legal department of many public agencies. • Allows states, cities, transit agencies, and other public agencies that do business with the same agencies over and over (e.g., cities and counties) to have one <i>Master Agreement</i> that uses smaller agreements (e.g., <i>MOUs, Scope-of-Work and Budget Modifications, Funding Agreements, Project Agreements, etc.</i>) to modify or expand the boundaries of the larger agreement to include more specific language.

Table 4-2: Types of Agreements

5. System Functional Requirements

System functional requirements are high-level detailed definitions of system utilities or resources that support ITS services. Requirements provide a list of statements that define major functions and support regional deployment and integration of various services. Functional requirement are generally provided in a text-based format as a series of statements.

Detailed system requirements are developed during ITS project scope and later integrated into the project design. When developing a regional architecture, functional requirements are

generic and typically developed at a high level. The purpose of the regional architecture is to determine what ITS services are needed for the region and which ITS systems support them.

System Functional Requirements – Equipment Package Approach

System functional requirements for Kansas City were determined by identifying existing and future ITS systems within the region, and associating them with the National ITS Architecture “Market Packages”. Market packages are a collection of different products and services that work together to address transportation needs or issues. To illustrate what a market package is consider an office workstation. A typical workstation has a monitor, keyboard, mouse, central processor, software, etc. Much like a market package the workstation is a collection of different products working together to address a need.

Market packages by themselves only provide a limited amount of information on what functions an ITS system provides. As in our example, a workstation package does not detail what functions that system can provide. To provide more detail “equipment packages” can be used to detail the individual components that make up the overall market package. Again, in our example the mouse, keyboard, and monitor are each equipment packages that make up the larger market package. Generating requirements for the monitor design or mouse configuration would provide a more detailed workstation description or essentially better system functional requirements.

The National ITS Architecture provides a list of previously identified and documented market packages as well as the equipment packages that support them for common transportation-related functions. Equipment packages are further documented and defined in greater detail using process specifications (PSpec), which provide a complete set of inputs and outputs.

Regional Market Packages

To begin the process of defining the regional system requirements, National ITS Architecture market packages that address local needs and issues were identified. [Thirty-five \(35\)](#) different packages covering advance traffic management, maintenance and construction management, advance public transportation, emergency management and advance traveler information systems were needed to support regional transportation functions. The market packages identified as applicable for the Kansas City region are listed below:

- ATMS01 - Network Surveillance
- ATMS02 – Probe Surveillance
- ATMS03 - Surface Street Control
- ATMS04 - Freeway Control
- ATMS06 - Traffic Information Dissemination
- ATMS07 - Regional Traffic Control
- ATMS08 - Incident Management System
- ATMS10 – Electronic Toll Collection
- ATMS11 - Emissions Monitoring and Management
- ATMS12 – Virtual TMC and Smart Probe Data
- ATMS13 - Standard Railroad Grade Crossing
- ATMS14 – Advanced Railroad Grade Crossing
- ATMS15 – Railroad Operations Coordination
- ATMS16 – Parking Facility Management

- MC04 - Weather Information Processing and Distribution
- APTS01 - Transit Vehicle Tracking
- APTS02 - Transit Fixed-Route Operations
- APTS03- Demand Responsive Transit Operations
- APTS04- Transit Passenger and Fare Management
- APTS05 - Transit Security
- APTS06- Transit Maintenance
- APTS07 - Multi-modal Coordination
- APTS08- Transit Traveler Information
- EM01 - Emergency Response
- EM02 - Emergency Routing
- EM03 – Mayday Support
- ATIS01 - Broadcast Traveler Information
- ATIS02 - Interactive Traveler Information
- ATIS03 – Autonomous Route Guidance
- ATIS05 - ISP Based Route Guidance
- ATIS08 – Dynamic Ride Sharing
- CVO05 – International Border Electronic Clearance
- CVO10 - HAZMAT Management
- AD01 - ITS Data Mart
- AD02 - ITS Data Warehouse

6. Interface Requirements

Interface requirements for the Kansas City region involve detailed diagrams of agency interactions and information exchanges. There are three types of diagrams that describe at various levels the connections and associations between the various regional agency stakeholder elements. Each diagram is explained here in greater detail with each stakeholder's representative diagrams illustrated in [Appendix A](#).

ITS Interconnect Diagrams

One of the most recognized architecture representations is the "sausage diagram" depicted below. This overview diagram depicts all possible ITS subsystems that can be deployed on-board a vehicle, at central locations, along the roadside, and at remote sites. The "sausages" in the diagram describe communications technologies and how subsystems in the architecture are connected together.

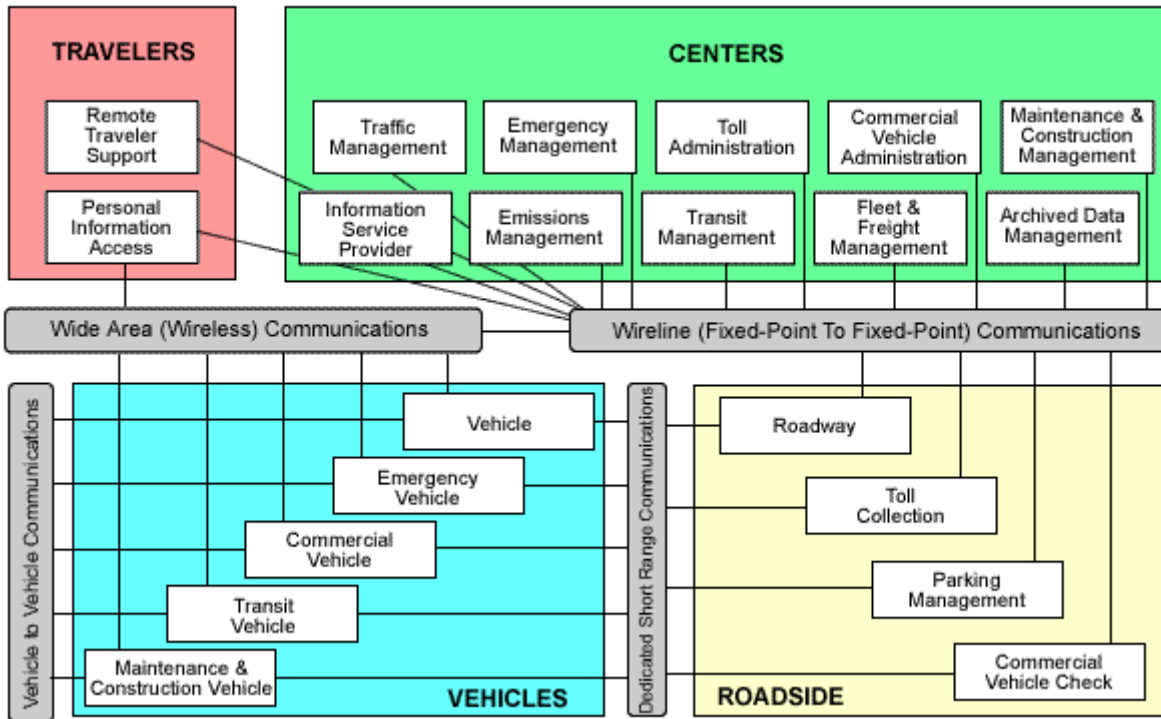


Figure 6-1: Sausage Diagram of the Kansas City Regional ITS Elements

Interconnect Flow Diagram

The interconnect flow diagram highlights the communication interaction between multiple subsystems or between a subsystem and terminators. The diagram details communication paths between the architecture elements showing how information is routed. The type of communications system reflected by the interconnect flow can be one of four types that include wireline, wide area wireless, dedicated short range, or vehicle to vehicle. Additional communications types such as human and physical/environmental interfaces can also be represented by interconnect flows.

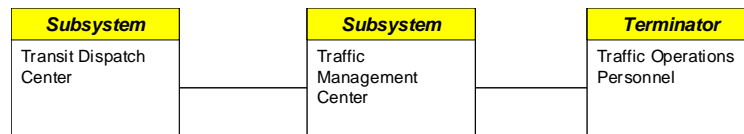


Figure 6-2: Typical Interconnect Diagram

Each Kansas City regional stakeholder has a representative interconnect diagram which details the other agency subsystems they currently or will connect to in the future. These diagrams can be found in [Appendix A](#).

Architecture Flow Diagram

The architecture flow diagram further elaborates on the information provided by the interconnect flow diagram. Whereas, the interconnect diagram indicates the communication path between elements, the architecture flow diagram details the information exchanged on that path. Typically a single interconnect flow represents one or more architecture flows, which detail the type and direction information exchanges on the interconnect take between subsystems or terminators in the system.

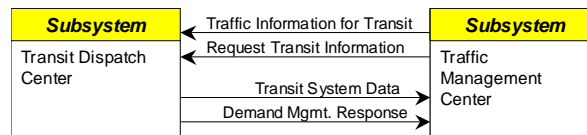


Figure 6-3: Typical Architecture Flow Diagram

Each Kansas City regional stakeholder has a representative architecture flow diagram which details the other agency subsystems they communicate with now or in the future along with the information to be exchanged. These diagrams can be found in [Appendix A](#).

7. Standards

ITS Standards are fundamental to the establishment of an open ITS environment that achieves the goals originally envisioned by the U.S. Department of Transportation. Standards facilitate deployment of interoperable systems at local, regional, and national levels without impeding innovation as technology advances and new approaches evolve.

Standards help create competition, better products, and lower prices. The example that best exhibits this is the telecommunications and computer industries. The openness of the ITS Architecture standards allow considerable latitude in the selection of technologies for use in systems, and also urges manufactures to continually improve their products and develop new ones. ITS standards:

- Facilitate interoperability of basic functionality
- Promote system integration
- May be linked to federal funding in the future

Standards can be applied to the different elements of intelligent transportation systems:

- ITS Standards
- Communication standards
- Data standards
- Message set standards
- Equipment Standards
- Software Standards

Standard Development Organizations

The U.S. Department of Transportation's ITS Joint Program Office is supporting Standards Development Organizations (SDOs) with an extensive, multi-year program of accelerated

standards development to facilitate successful ITS deployment. The program supports and accelerates the ITS consensus-based volunteer standards processes that are underway in the U.S.

The following is a list of the current standard development organizations working on developing ITS standards:

- American National Standards Institute (ANSI)
- American Society for Testing and Materials (ASTM)
- Electronic Industries Alliance (EIA)
- Institute of Electrical and Electronics Engineers (IEEE)
- Institute of Transportation Engineers (ITE)
- Society of Automotive Engineers (SAE)
- National Transportation Communications for ITS Protocol (NTCIP)

NTCIP is a joint product of the National Electronics Manufacturers Association (NEMA), the American Association of State Highway and Transportation Officials (AASHTO), and the Institute of Transportation Engineers (ITE).

NTCIP Standards

NTCIP is a family of standards that provides both the rules for communicating (called protocols) and the vocabulary (called objects) necessary to allow electronic traffic control equipment from different manufacturers to operate with each other as a system. NTCIP is the first set of standards for the transportation industry that allows traffic control systems to be built using a "mix and match" approach with equipment from different manufacturers. Therefore, NTCIP standards reduce the need for reliance on specific equipment vendors and customized one-of-a-kind software. To assure both manufacturer and user community support, NTCIP is jointly developed by NEMA, AASHTO, and ITE.

Applicable Standards for Metropolitan Kansas City Regional ITS Architecture

Looking at the ITS Standards as a foundation for building the systems identified in the regional architecture, [Table 7-1](#) highlights the applicable standards for the Metropolitan Kansas City Regional ITS Architecture and indicates its status.

Table 7-1: Kansas City Regional ITS Standards

Lead SDO	Standard Name	Document ID
AASHTO/ITE/NEMA	Global Object Definitions	NTCIP 1201
AASHTO/ITE/NEMA	Object Definitions for Actuated Traffic Signal Controller Units	NTCIP 1202
AASHTO/ITE/NEMA	Object Definitions for Dynamic Message Signs	NTCIP 1203
AASHTO/ITE/NEMA	Object Definitions for Environmental Sensor Stations & Roadside Weather Information System	NTCIP 1204
AASHTO/ITE/NEMA	Data Dictionary for Closed Circuit Television (CCTV)	NTCIP 1205
AASHTO/ITE/NEMA	Data Collection & Monitoring Devices	NTCIP 1206
AASHTO/ITE/NEMA	Ramp Meter Controller Objects	NTCIP 1207
AASHTO/ITE/NEMA	Object Definitions for Video Switches	NTCIP 1208
AASHTO/ITE/NEMA	Transportation System Sensor Objects	NTCIP 1209
AASHTO/ITE/NEMA	Objects for Signal Systems Master	NTCIP 1210
AASHTO/ITE/NEMA	Objects for Signal Control Priority	NTCIP 1211
AASHTO/ITE/NEMA	Message Set for Weather Reports	NTCIP 1301
AASHTO/ITE/NEMA	TCIP - Common Public Transportation (CPT) Business Area Standard	NTCIP 1401
AASHTO/ITE/NEMA	TCIP - Incident Management (IM) Business Area Standard	NTCIP 1402
AASHTO/ITE/NEMA	TCIP - Passenger Information (PI) Business Area Standard	NTCIP 1403
AASHTO/ITE/NEMA	TCIP - Scheduling/Runcutting (SCH) Business Area Standard	NTCIP 1404
AASHTO/ITE/NEMA	TCIP - Spatial Representation (SP) Business Area Standard	NTCIP 1405
AASHTO/ITE/NEMA	TCIP - Onboard (OB) Business Area Standard	NTCIP 1406
AASHTO/ITE/NEMA	TCIP - Control Center (CC) Business Area Standard	NTCIP 1407
AASHTO/ITE/NEMA	TCIP - Fare Collection (FC) Business Area Standard	NTCIP 1408
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	
AASHTO/ITE/NEMA	NTCIP Center-to-Field Standards Group	
ANSI	Commercial Vehicle Safety Reports	ANSI TS284
ANSI	Commercial Vehicle Safety and Credentials Information Exchange	ANSI TS285
ANSI	Commercial Vehicle Credentials	ANSI TS286
ASTM	Standard Specification for 5.9 GHz Data Link Layer	ASTM 5 GHz Data Link
ASTM	Standard Specification for 5.9 GHz Physical Layer	ASTM 5 GHz Phys
ASTM	ADMS Data Dictionary Specifications	ASTM DD 17.54.00.2
ASTM	Specification for Dedicated Short Range Communication (DSRC) Data Link Layer: Medium Access and Logical Link Control	ASTM PS 105-99
ASTM	Specification for Dedicated Short Range Communication (DSRC) Physical Layer using Microwave in the 902-928 MHz	ASTM PS 111-98
EIA/CEA	Data Radio Channel (DARC) System	CEA/EIA-794
EIA/CEA	Subcarrier Traffic Information Channel (STIC) System	CEA/EIA-795
IEEE	Standard for Traffic Incident Management Message Sets for Use by EMCs	IEEE P1512.1
IEEE	Standard for Public Safety IMMS for use by EMCs	IEEE P1512.2
IEEE	Standard for Hazardous Material IMMS for use by EMCs	IEEE P1512.3
IEEE	Standard for Emergency Management Data Dictionary	IEEE P1512.a
IEEE	Standard for Common Incident Management Message Sets (IMMS) for use by EMCs	IEEE P1512-2000
IEEE	Security/Privacy of Vehicle/RS Communications including Smart Card Communications	IEEE P1556
ITE	Standard for Functional Level Traffic Management Data Dictionary (TMDD)	ITE TM 1.03
ITE	Message Sets for External TMC Communication (MS/ETMCC)	ITE TM 2.01
ITE	TCIP - Traffic Management (TM) Business Area Standard	ITE TS 3.TM
SAE	ISP-Vehicle Location Referencing Standard	SAE J1746
SAE	Data Dictionary for Advanced Traveler Information System (ATIS)	SAE J2353
SAE	Message Set for Advanced Traveler Information System (ATIS)	SAE J2354
SAE	Standard for ATIS Message Sets Delivered Over Bandwidth Restricted Media	SAE J2369
SAE	Rules for Standardizing Street Names and Route IDs	SAE J2529
SAE	Messages for Handling Strings and Look-Up Tables in ATIS Standards	SAE J2540

8. Project Sequencing

Both the traditional planning process and the regional ITS architecture process have the same goal: to use a local knowledge and consensus process to determine the best sequence of projects to create a transportation network that best meets the needs of the region. The regional ITS architecture is implemented with many individual ITS projects, stakeholders, and private sector initiatives over several years. The architecture assists in this process by establishing a sequence, or ordering, of ITS projects that contributes to the integrated regional transportation system. This system is what is depicted in the regional ITS architecture. For the greater Kansas City region, a sequence of projects defined in the short term is defined in the architecture and those projects defined in the following sequencing table.

Project	Legacy System	Planned or Expansion	Begin Date	End Date
KC SCOUT				
KC Scout Traffic Operation Center	X	X	July-97	
KC Scout Field Elements	X	X	July-99	
MoDOT				
Operation Green Light		X	August-05	
Intermodal ITS		X	July-05	
Motorist Assist	X		January-94	
KDOT				
Operation Green Light		X	August-05	
Overland Park ATMS		X	August-04	
Olathe ATMS		X	December-04	
KCK/Speedway ITS	X		July-01	
Motorist Assist	X		January-96	
MARC				
Operation Green Light		X	August-05	
SmartPort ITS		X	March-05	
KCATA				
Transit AVL		X	December-04	
Bus Rapid Transit		X	June-05	