

APPENDIX A: MARKET PACKAGES

The material contained herein was adopted from the National ITS System Architecture documents published by FHWA in 1996 and have been modified only slightly to better complement the ITSEDP and future ITS efforts for the Greater Metropolitan Portland Region.

Detailed Market Package Definitions

To provide visibility into the deployment options that must be considered by the ITS Implementor, a set of Market Packages have been defined. The Market Packages provide an accessible, service-oriented perspective to the national architecture as well as to the regional architecture. They address the specific service requirements of traffic managers, transit operators, travelers, and other ITS stakeholders. To achieve an implementation orientation, the Market Packages were defined with enough granularity to support specific benefits analysis and clearties to transportation problems. Some of the ITS User Services are too broadly defined to allow this sort of evaluation. The complete set of Market Packages are identified in Table A-1. In order to more accurately specify Market Packages in tables, each is given an abbreviation indicating the general class of stakeholder and an index (e.g., ATMS01 is a Market Package primarily of interest to transportation managers).

Table A-1: Market Packages Summary

Market Package	Market Package Name
ATMS01	Network Surveillance
ATMS02	Probe Surveillance
ATMS03	Surface Street Control
ATMS04	Freeway Control
ATMS05	HOV and Reversible Lane Management
ATMS06	Traffic Information Dissemination
ATMS07	Regional Traffic Control
ATMS08	Incident Management System
ATMS10	Traffic Network Performance Evaluation
ATMS11	Emissions and Environmental Hazards Sensing
ATMS12	Virtual TMC and Smart Probe Data
ATMS13	Standard Railroad Grade Crossing
ATMS14	Advanced Railroad Grade Crossing
ATMS15	Railroad Operations Coordination
APTS1	Transit Vehicle Tracking
APTS2	Transit Fixed-Route Operations
APTS3	Demand Response Transit Operations
APTS4	Transit Passenger and Fare Management
APTS5	Transit Security
APTS6	Transit Maintenance
APTS7	Multi-modal Coordination

Market Package	Market Package Name
ATIS1	Broadcast Traveler Information
ATIS2	Interactive Traveler Information
ATIS3	Autonomous Route Guidance
ATIS4	Dynamic Route Guidance
ATIS5	ISP Based Route Guidance
ATIS6	Integrated Transportation Management/Route Guidance
ATIS7	Yellow Pages and Reservation
ATIS8	Dynamic Ridesharing
ATIS9	In Vehicle Signing
AVSS01	Vehicle Safety Monitoring
AVSS02	Driver Safety Monitoring
AVSS03	Longitudinal Safety Warning
AVSS04	Lateral Safety Warning
AVSS05	Intersection safety Warning
AVSS06	Pre-Crash Restraint Deployment
AVSS07	Driver Visibility Improvement
AVSS08	Advanced Vehicle Longitudinal Control
AVSS09	Advanced Vehicle Lateral Control
AVSS10	Intersection Collision Avoidance
AVSS11	Automated Highway System
CVO01	Fleet Administration
CVO02	Freight Administration
CVO03	Electronic Clearance
CVO04	CV Administration
CVO05	International Border Electronic Clearance
CVO06	Weigh-In-Motion
CVO07	Roadside CVO Safety
CVO08	On-board CVO Safety
CVO09	CVO Fleet Maintenance
CVO10	HAZMAT Management
EM1	Emergency Response
EM2	Emergency Routing
EM3	Mayday Support
ITS1	ITS Planning

The deployment oriented Market Packages are traceable to the interface-oriented architecture definition. Once a particular Market Package is selected for implementation, the required subsystems, Equipment Packages, and interface requirements are readily identified due to this traceability. This approach allows the implementor to first consider service needs and later concentrate on those pieces of the architecture necessary to provide the selected service.

It is important to note that the Market Packages are illustrative rather than prescriptive. The actual implementation variations that are possible across the country are myriad and cannot be enumerated through a finite set of packages. The Market Packages are tools that allow for a

discussion of incremental deployment of ITS services in a manner that is relevant to the underlying architecture definition.

The remainder of this appendix defines each of the Market Packages in more detail. A description of the service offered by each Market Package is coupled with a graphic that identifies how the architecture framework supports the Market Package. Where several major implementation options are supported by the Market Package, these are also identified and differentiated in the descriptions.

Figure A-1 provides a legend to assist in interpretation of the Market Package diagrams. In general, only the most salient elements from the architecture definition (e.g., directly involved subsystems, system terminations, and the highest level data flows) are depicted in each graphic to provide more clarity.

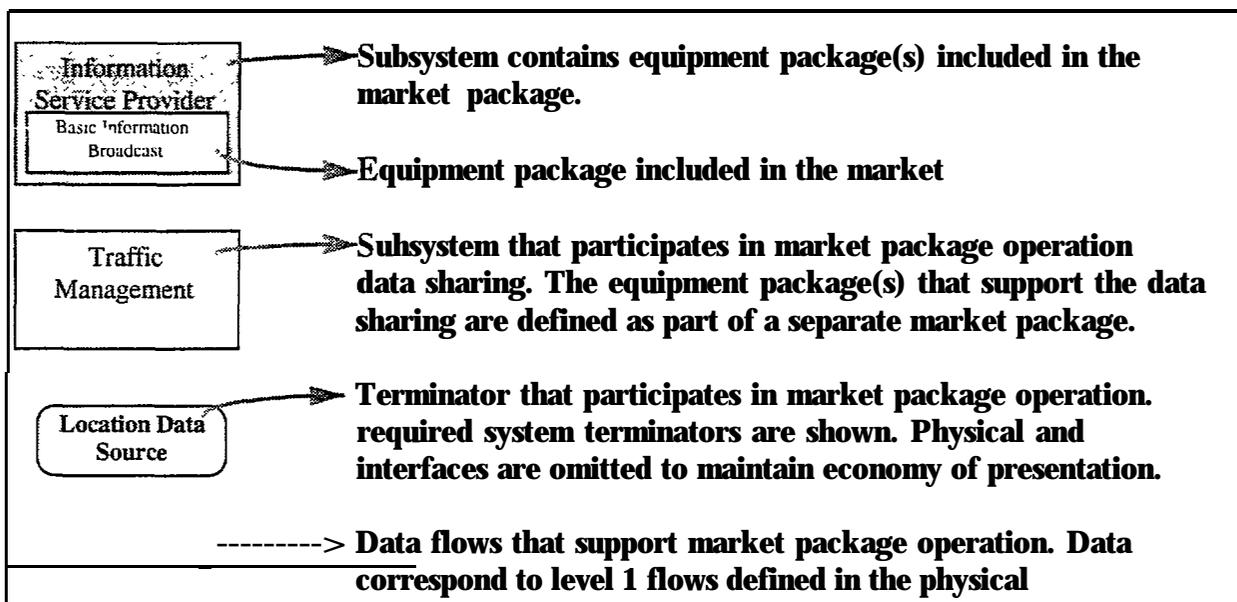


Figure A- 1: Market Package Diagram Elements

A. 1 **Traffic Management Market Packages**

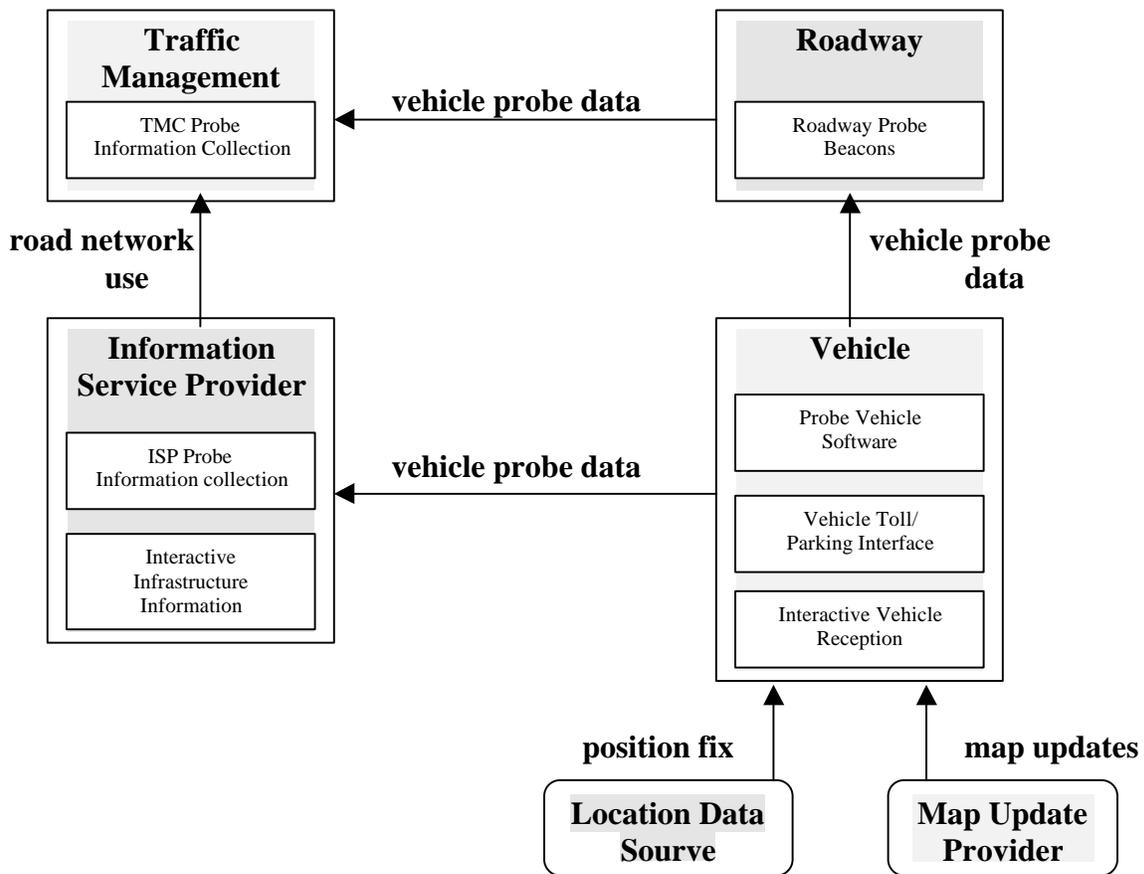
Network Surveillance (ATMS1)

This basic Market Package provides the fixed roadside surveillance elements utilizing wireline communication to transmit the surveillance data. It can be used completely in a local sense such as loop detection connected with signal control or it can be CCTVs sending back data to the traffic management centers. This enables traffic managers to monitor road conditions, identify and verify incidents, analyze and reduce the collected data, and make it available to users and private information providers. It requires road sensors; communication links between the sensors and the traffic management system; and data reduction software, and utilizes the existing wireline links between the Traffic Management Center and the traveler information providers.



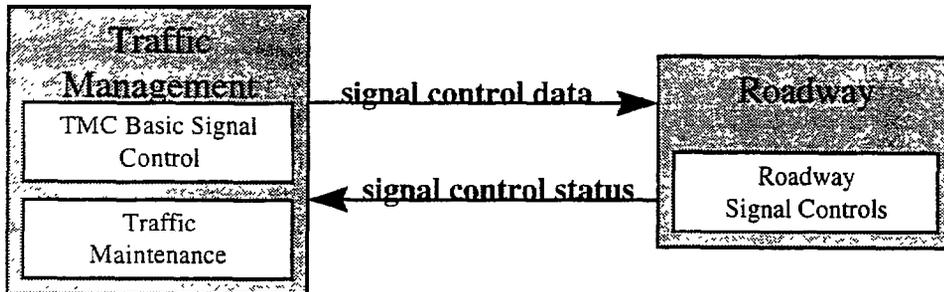
Probe Surveillance (ATMS2)

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 ISP are used to communicate current vehicle location and status, and 2) dedicated short range communications between the vehicle and roadside are used to provide equivalent information back 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 short-range communications; and data reduction software, and utilizes wireline links between the traffic management subsystem and information service provider 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 in this Market Package which include the ability to identify and filter out-of-bounds or extreme data reports.



Surface Street Control (ATMS3)

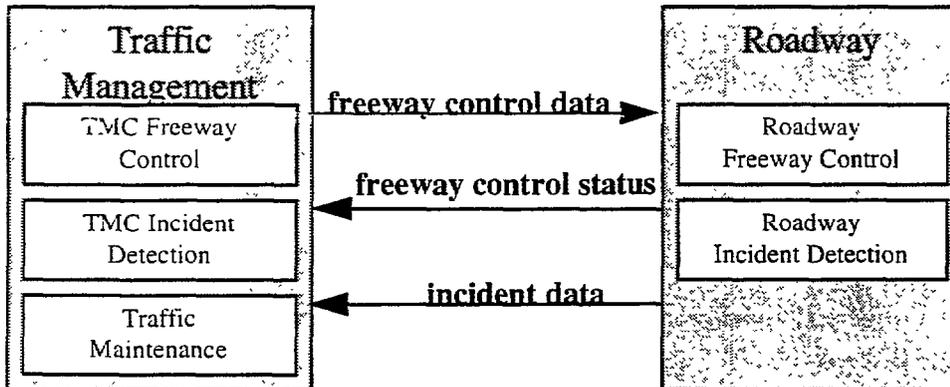
This Market Package provides the communication links and the signal control equipment for completely local surface street control and/or arterial traffic management control. An example would be arterial signalization control. This Market Package is considered as an intra-jurisdictional package since coordination between adjacent cities is required to coordinate signal control along arterials. This package is consistent with typical urban traffic signal control systems.



Freeway Control (ATMS4)

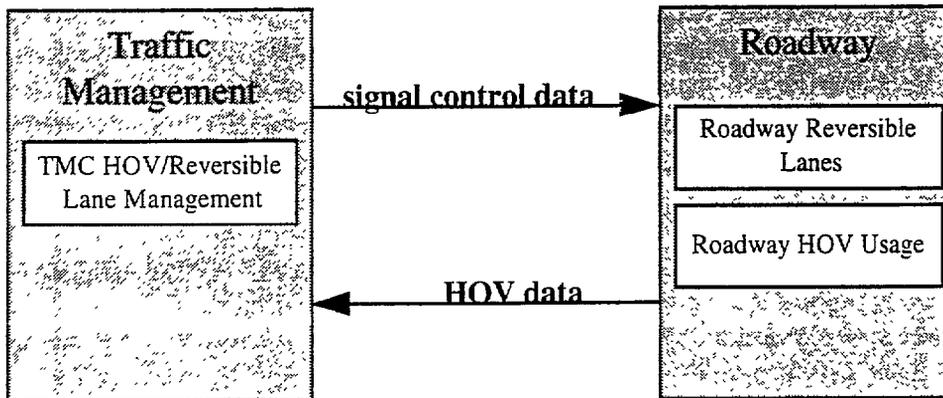
This Market Package provides the communications and roadside equipment to support ramp control, lane controls, and interchange control for freeways. Coordination and integration of ramp meters are included as part of this Market Package. This package is consistent with typical urban traffic freeway control systems. This package also 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. The equipment associated with incident detection that is distributed along the roadway and included within the Traffic Management Center is separately identified within the architecture so that incident detection may be considered and analyzed as an elective based on local needs and preferences.



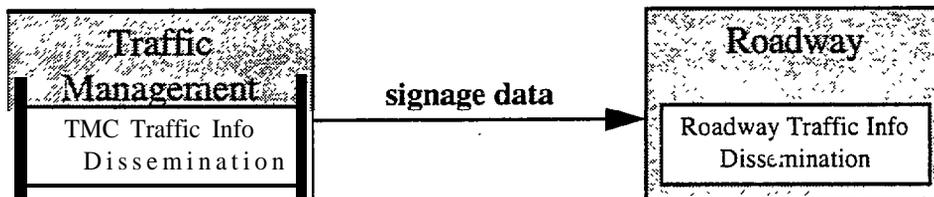
HOV and Reversible Lane Management (ATMS5)

This Market Package provides management of HOV lanes by coordinating freeway ramp meters and connector signals with HOV lane usage signals. Preferential treatments are given to HOV lanes. Vehicle occupancy detectors may be installed to determine if vehicles are HOVs. This Market Package also provides the capability for the traffic managers to access and manage reversible lane facilities. Additional hardware and software is needed to process traffic information and control reversible lane activities. This also includes the hardware to electronically reconfigure intersections to manage dynamic demand changes and special events.



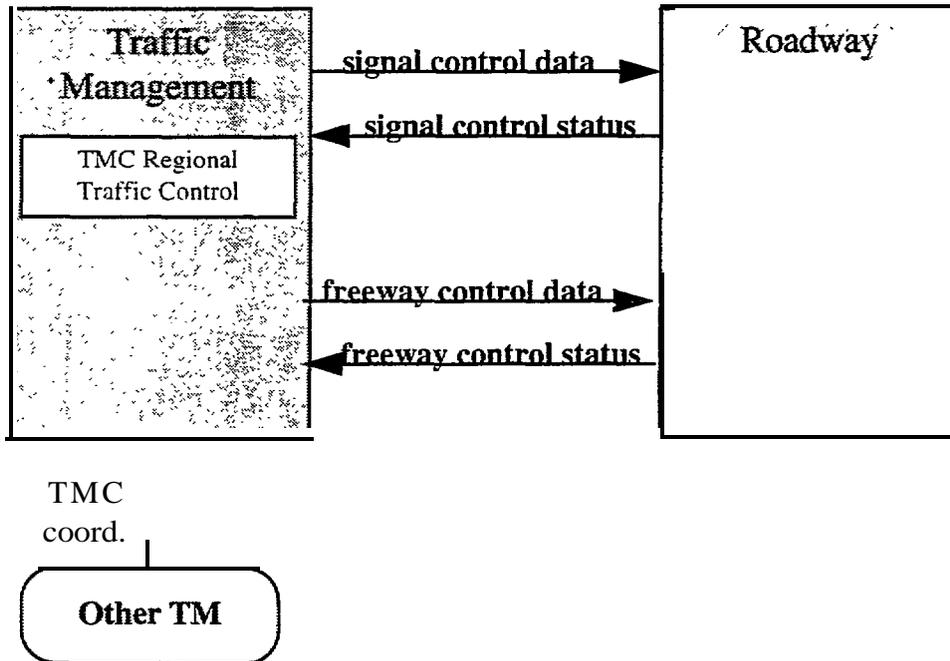
Traffic Information Dissemination (ATMS6)

This Market Package allows traffic information to be disseminated using roadway equipment such as changeable message signs or highway advisory radio. The emphasis is on provision of basic traffic information or other advisories by means which require minimal or no in-vehicle equipment to receive the information. 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 could also ensure that information is available in a format for media usage, such as a fax output or a direct tie-in to radio and television station computer systems.



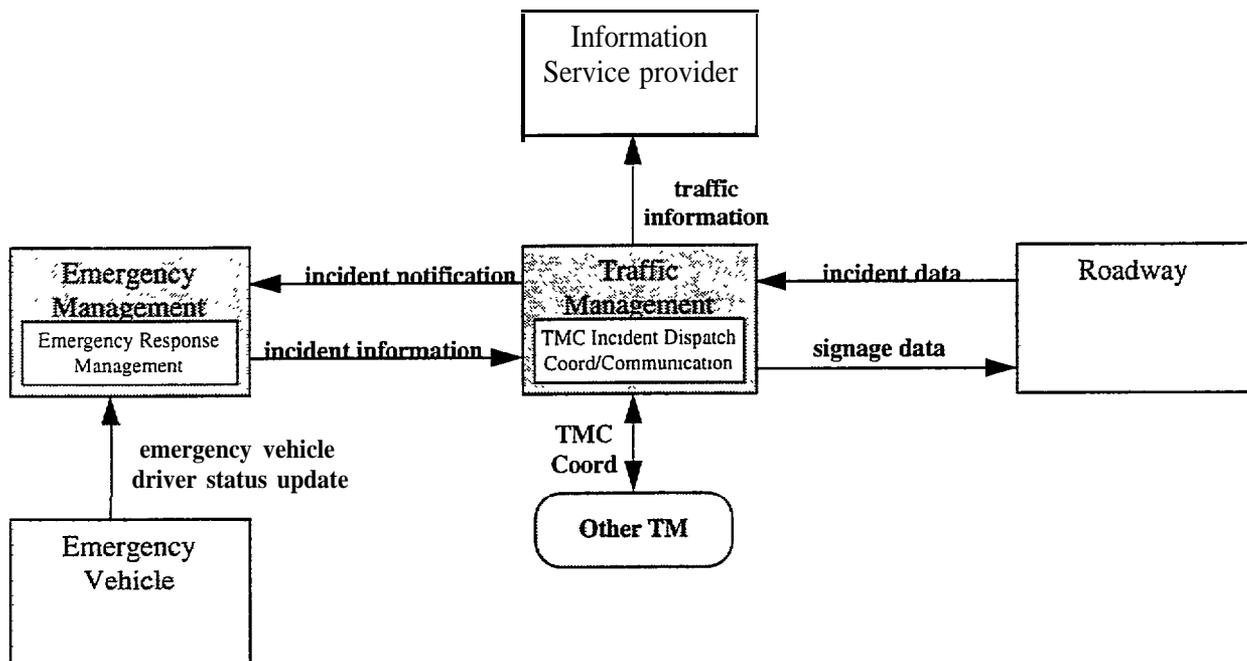
Regional Traffic Control (ATMS7)

This Market Package advances the Surface Street Control and Freeway Control Market Packages by allowing integrated interjurisdictional traffic control. This Market Package provides for the sharing of traffic information and control among traffic management centers to support a regional control strategy. 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 which are coordinated between neighboring Traffic Management Subsystems. Several levels of coordination are supported from sharing of information through sharing of control between traffic management subsystems.



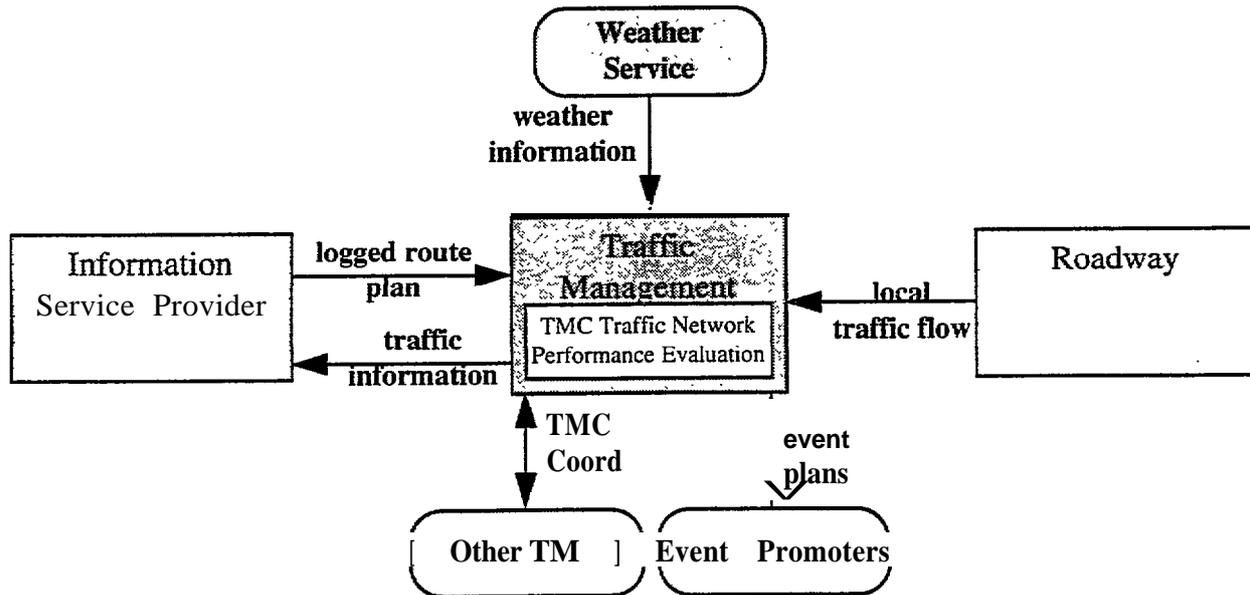
Incident Management System (ATMS8)

This Market Package manages both predicted and unexpected incidents so that the impact to the transportation network and traveler safety is minimized. Requisite incident detection capabilities are included in the freeway control Market Package and through the regional coordination with other traffic management and emergency management centers supported by this Market Package. Information from these diverse sources is collected and correlated by this Market Package to detect and verify incidents. This Market Package provides traffic management center equipment that supports traffic operations personnel in developing an appropriate response in coordination with emergency management and other incident response personnel to confirmed incidents. The response may include traffic control strategy modifications and presentation of information to affected travelers using the Traffic Information Dissemination Market Package. The same equipment assists the operator by monitoring 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 field service personnel.



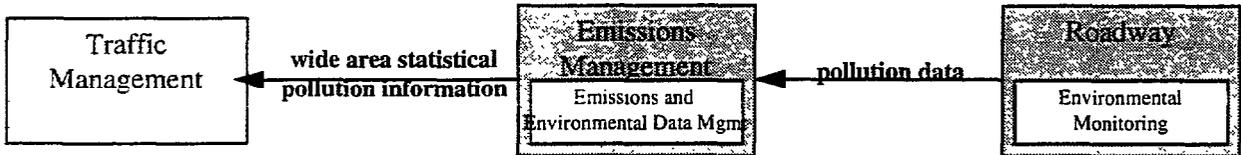
Traffic Network Performance Evaluation (ATMS9)

This Market Package includes advanced algorithms, processing, and mass storage capabilities that support historical evaluation, real-time assessment, and forecast of traffic network performance. This includes the prediction of travel demand patterns to support better link travel times for route planning customers. The source data would come from the traffic management center itself as well as emergency management plans and predicted traffic loads derived from route plans supplied by the ISP. In addition, interface with transportation planners is required. This Market Package provides data that supports the implementation of TDM programs, and policies managing both traffic and the environment. Information on vehicle pollution levels, parking availability, usage levels, and vehicle occupancy are collected by monitoring sensors to support these functions.



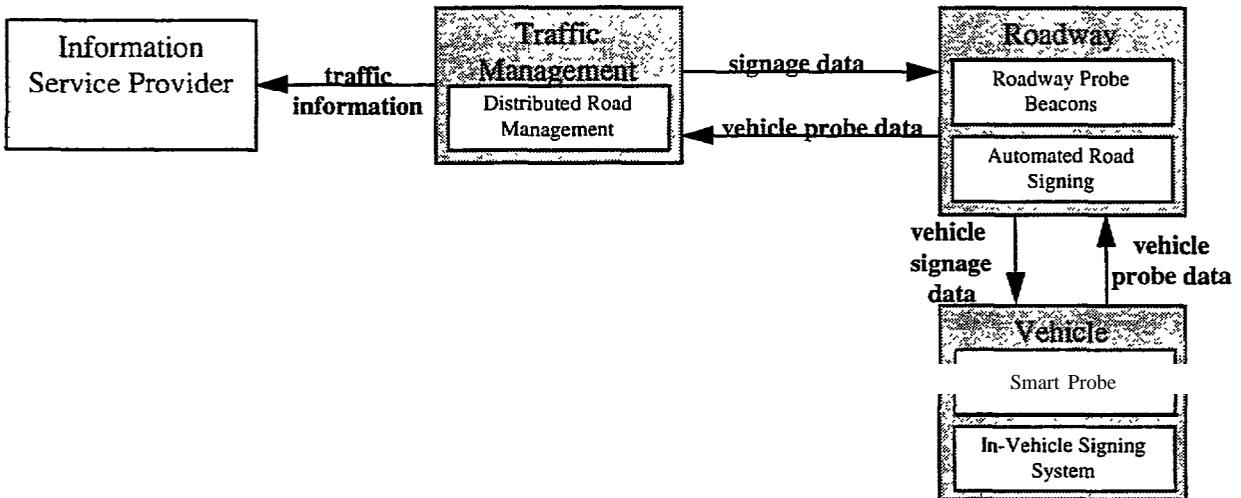
Emissions and Environmental Hazards Sensing (ATMS11)

This Market Package provides monitoring of the emissions levels using roadway sensors to collect the data. The data are transmitted to a center for processing and used by traffic management. It may include machine vision-based equipment to identify violators' license plates for appropriate actions. This Market Package also includes sensors to detect environmental hazards such as icy road conditions and dense fog, and communications equipment to transmit data to a center. The gathered information can be used to implement environmentally sensitive TDM programs, policies, and regulations.



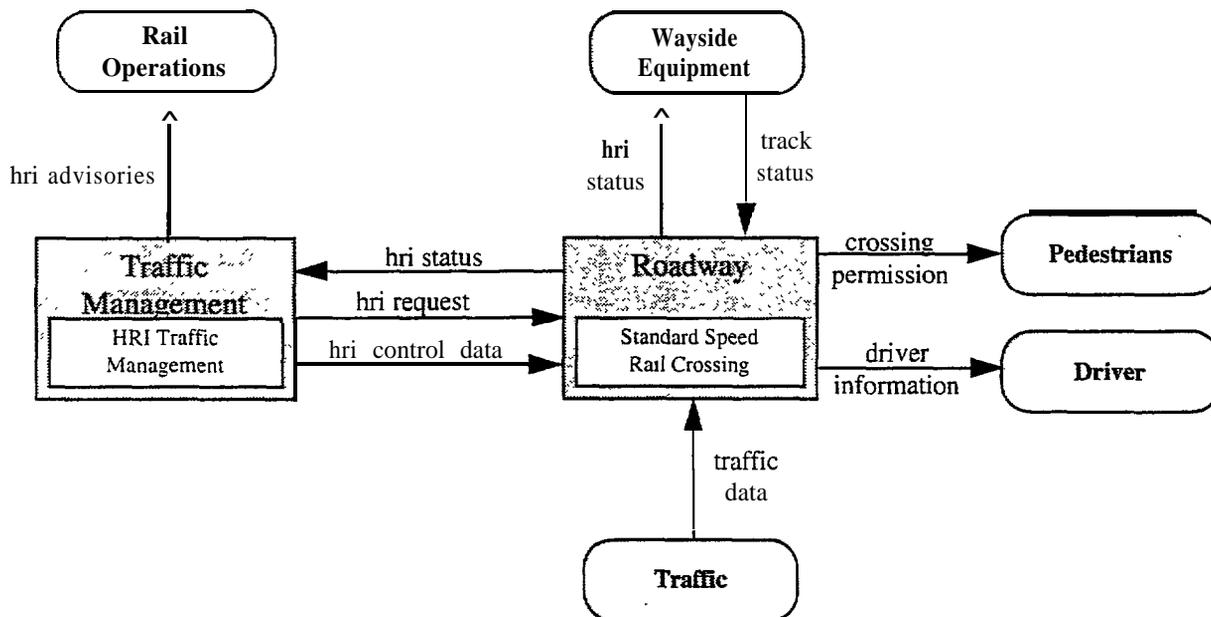
Virtual TMC and Smart Probe Data (ATMS12)

This Market Package provides for the special requirements of a rural road system. 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 to potentially direct relay to following vehicles (e.g., the automated road signing equipment is capable of autonomous operation). In-vehicle signing is used to inform drivers of detected road conditions.



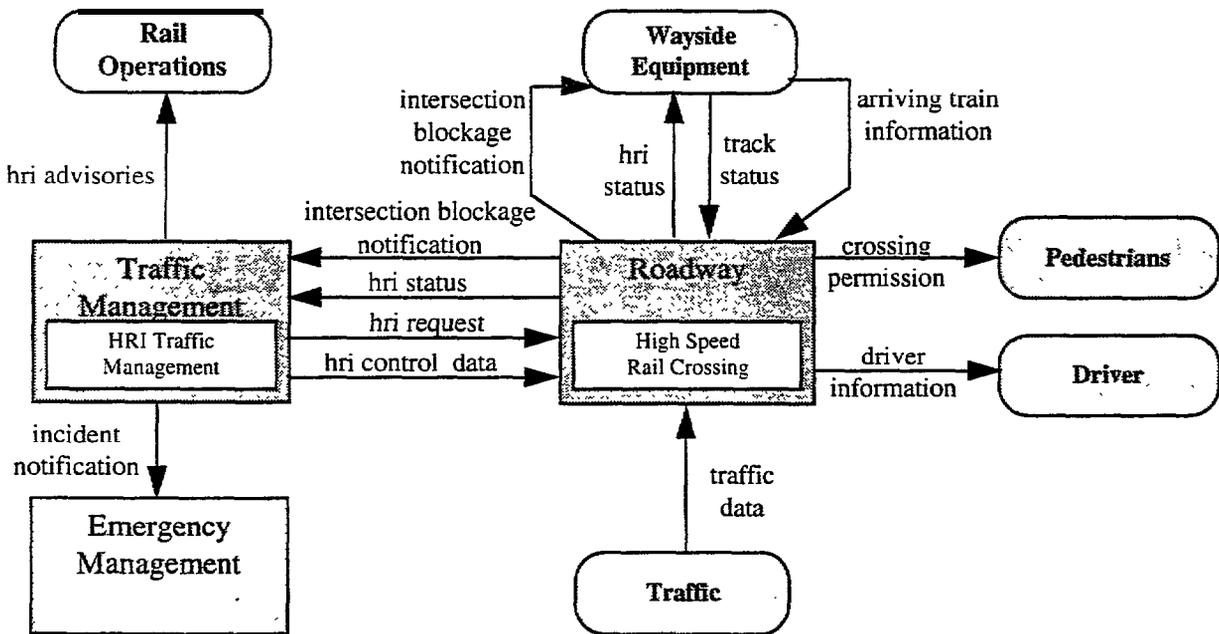
Standard Railroad Grade Crossing (**ATMS13**)

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 and detected abnormalities are reported to both highway and railroad officials through wayside interfaces and interfaces to the traffic management subsystem.



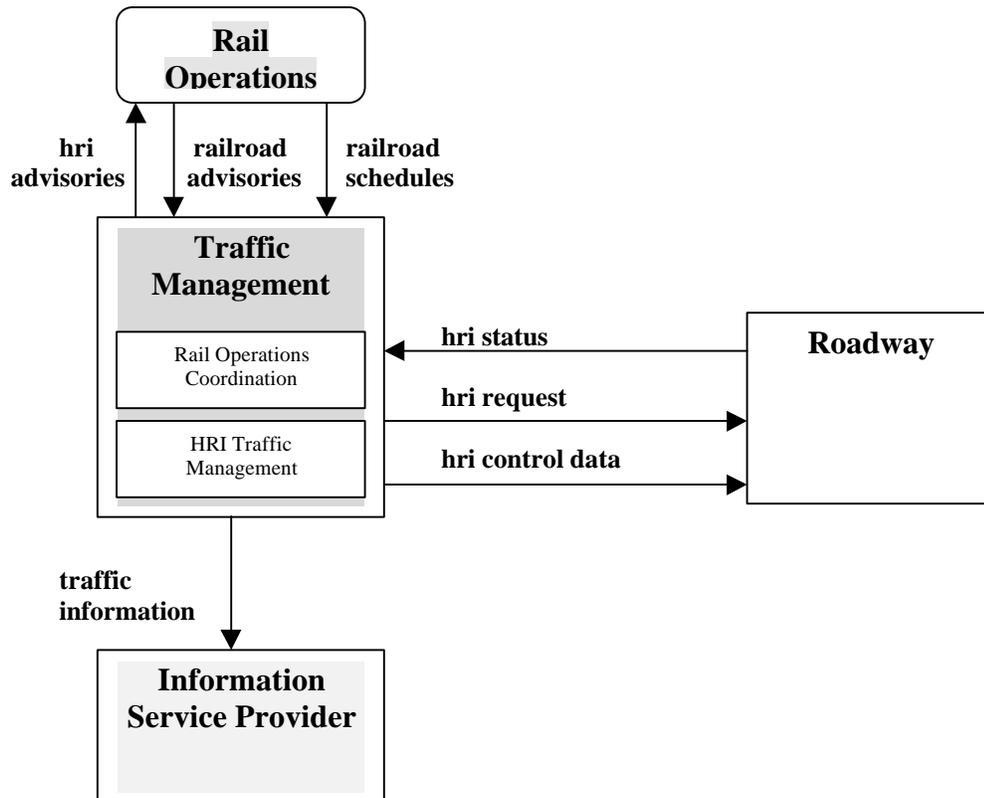
Advanced Railroad Grade Crossing (ATMS14)

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, which preclude entrance into the intersection when the barriers are activated. Like the Standard Speed package, the HRI equipment is activated on notification by wayside interface equipment which detects, or communicates with the approaching train. In this Market Package, additional information about the arriving train is also provided by the wayside interface equipment so that the train's direction of travel, its estimated time of arrival, and the 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.



Railroad Operations Coordination (ATMS15)

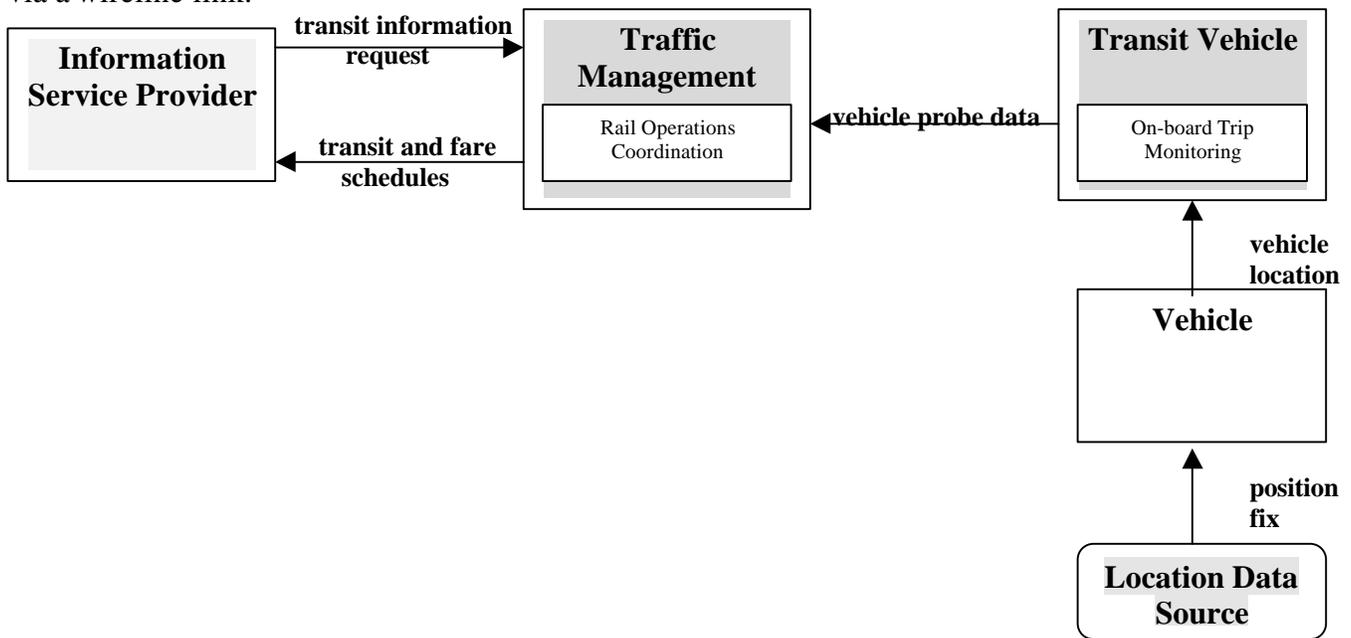
This Market Package provides an additional level of strategic coordination between rail operations and traffic management centers. Rail operations provide train schedules, maintenanceschedules and any other forecast events that will result in highway-rail intersection (HRI)closures. This information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



A.2 Public Transportation Market Packages

Transit Vehicle Tracking (APTS1)

This Market Package provides for an Automated Vehicle Location system to track the transit vehicle’s real-time schedule adherence and updates 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 center 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. In this implementation, communications between the transit vehicle and transit management center include both dedicated short-range and wireline communications components. The transit management center processes this information, updates the transit schedule and makes real-time schedule information available to the information service provider via a wireline link.



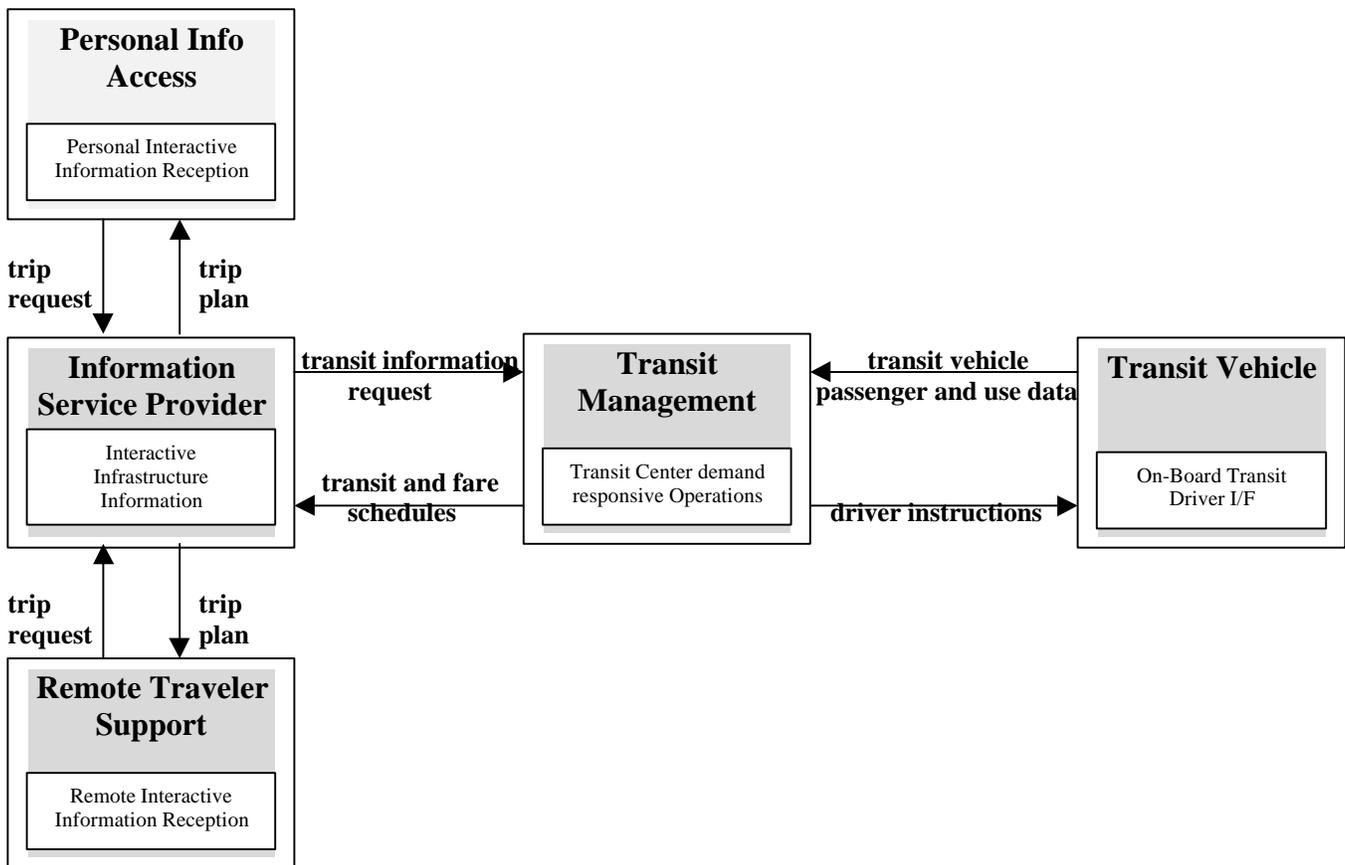
Transit Fixed-Route Operations (APTS2)

This Market Package performs automatic driver assignment and monitoring as well as vehicle routing and scheduling for fixed-route services. This service uses the existing AVL database as a source for current schedule performance data, and is implemented through data processing and information display at the transit management subsystem. This data is exchanged using the existing wireline link to the information service provider 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.



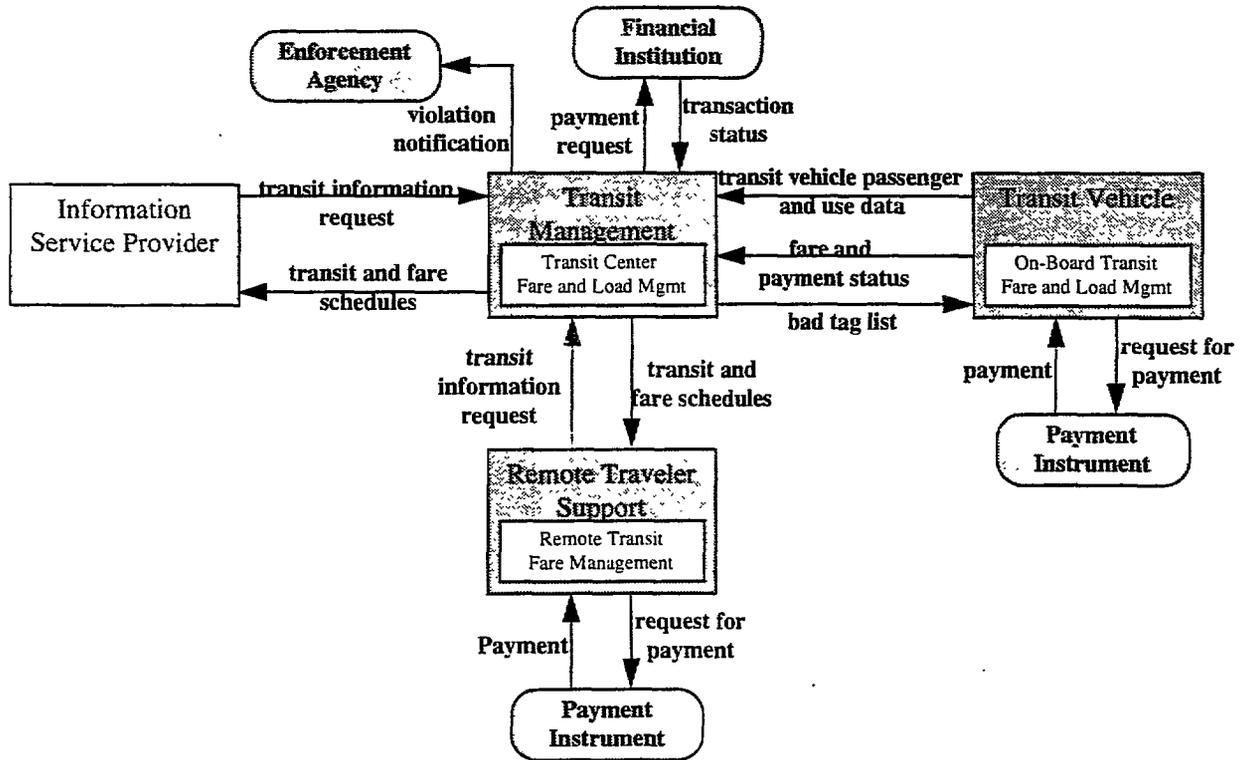
Demand Response Transit Operations (APTS3)

This Market Package performs automatic driver assignment and monitoring as well as vehicle routing and scheduling for demand response transit services. This package uses the existing AVL database to monitor current status of the transit fleet and supports allocation of these fleet resources to service incoming requests for transit service. 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. Traveler equipment is also included within this Market Package to enable traveler requests for flexible route transit and paratransit service. The Information Service Provider that provides the interface to the traveler devices may be either part and parcel of the 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 uses wireline communications to make a reservation for the traveler.



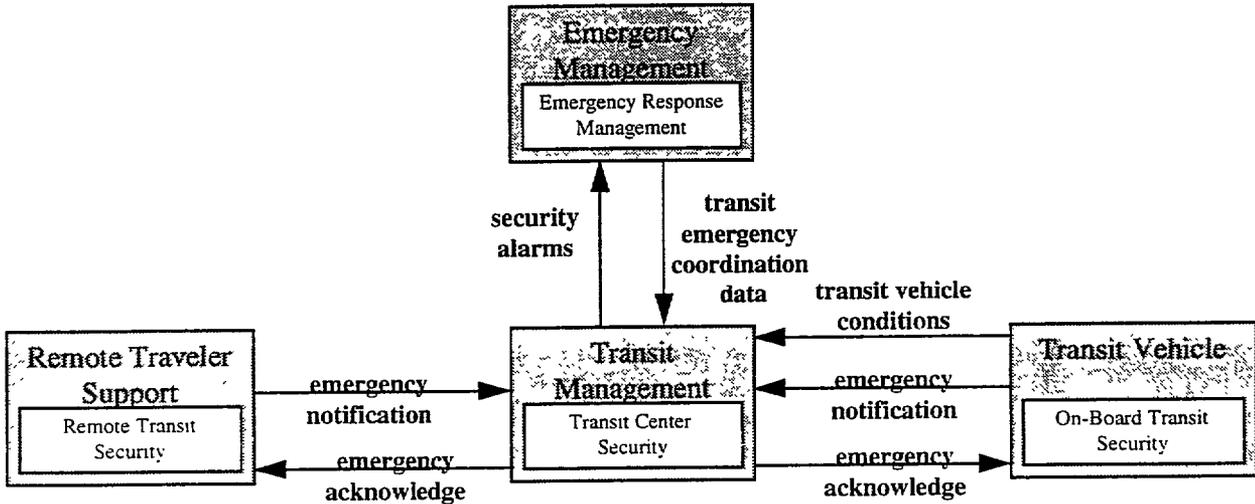
Transit Passenger and Fare Management (APTS4)

This Market Package allows for the management of passenger loading and fare payments on-board vehicles using electronic means. The payment instrument may be either a stored value or credit card. This package is implemented with sensors mounted on the vehicle to permit the driver and central operations to determine vehicle loads, and readers located either in the infrastructure or on-board the transit vehicle to allow fare payment. Data is processed, stored and displayed on the transit vehicle and communicated as needed by the Transit Management Center, using existing wireless infrastructure.



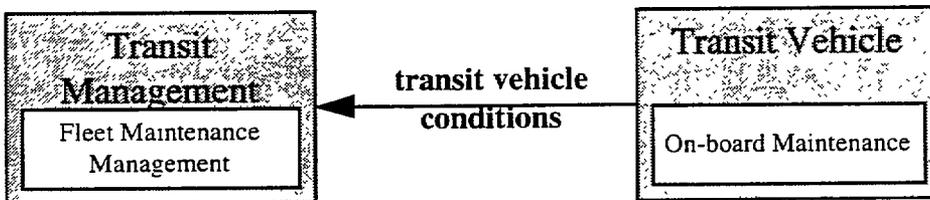
Transit Security (APTS5)

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. Transit areas (e.g. stops, park and ride lots, stations) are also monitored. Information is communicated to the Transit Management Center 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 Center when an emergency is identified that requires an external response.



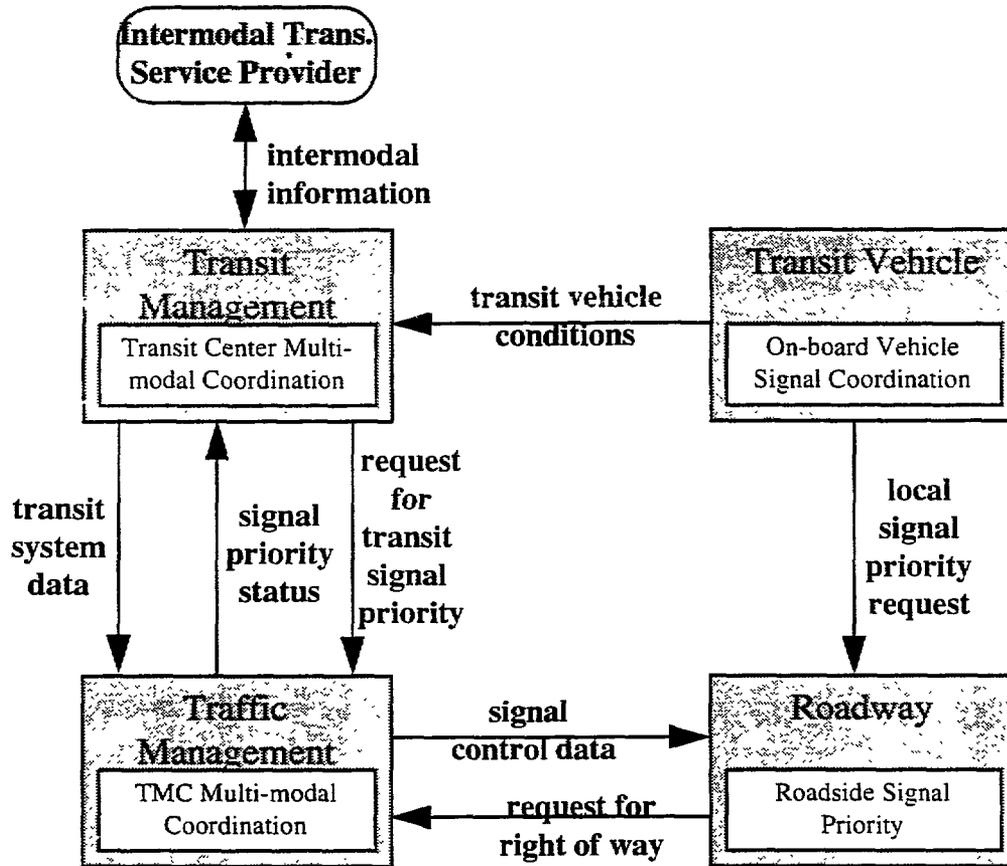
Transit Maintenance (APTS6)

This Market Package supports automatic maintenance scheduling and monitoring. On-board condition sensors monitor critical system status and transmit critical status information to the transit management center. Hardware and software in the transit management center processes this data and schedules maintenance activities.



Multi-modal Coordination (APTS7)

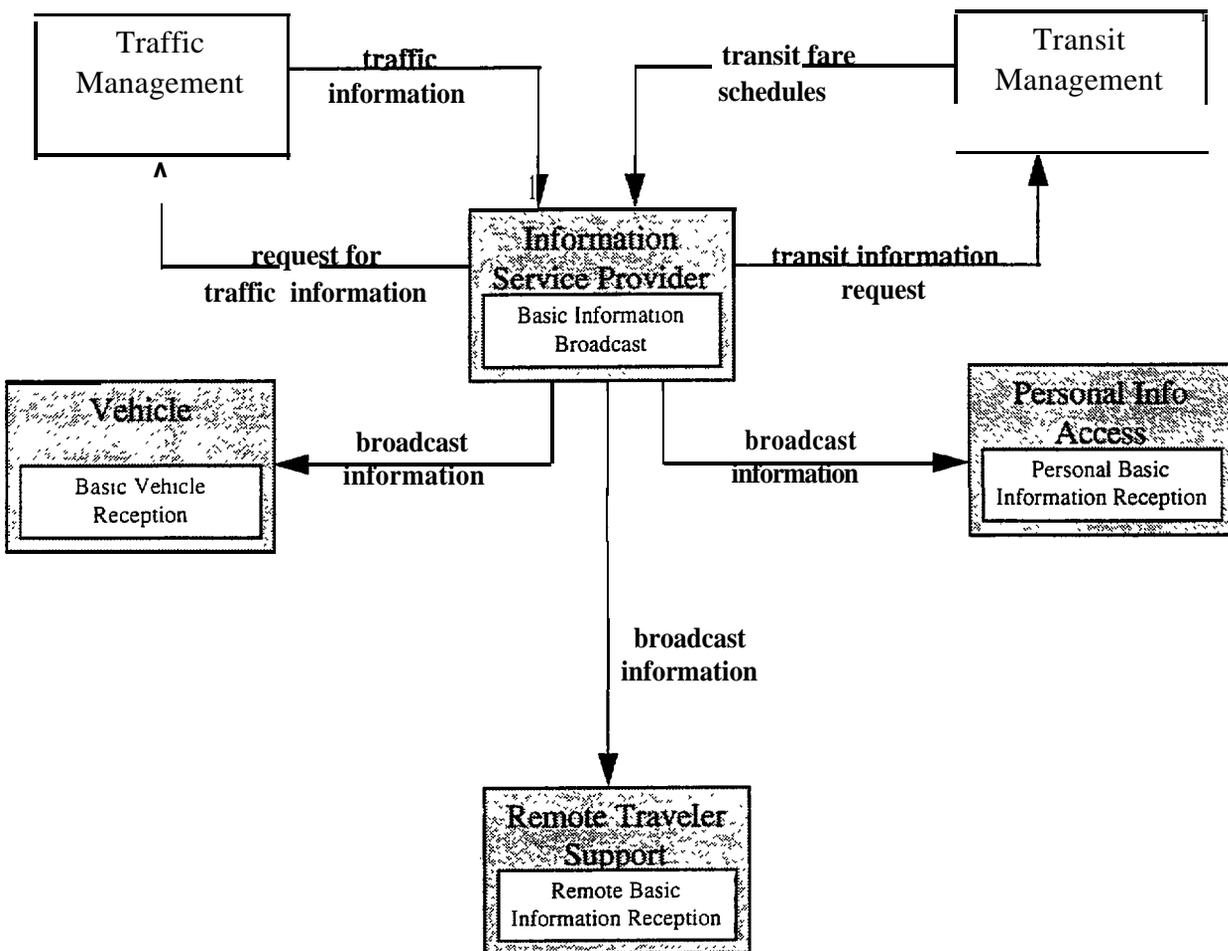
This Market Package establishes two-way communications between multiple transit and traffic agencies to improve service coordination. Intermodal coordination between transit agencies can increase traveler convenience at transfer points and also improve operating efficiency. Coordination between traffic 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.



A.3 **Traveler Information Market Packages**

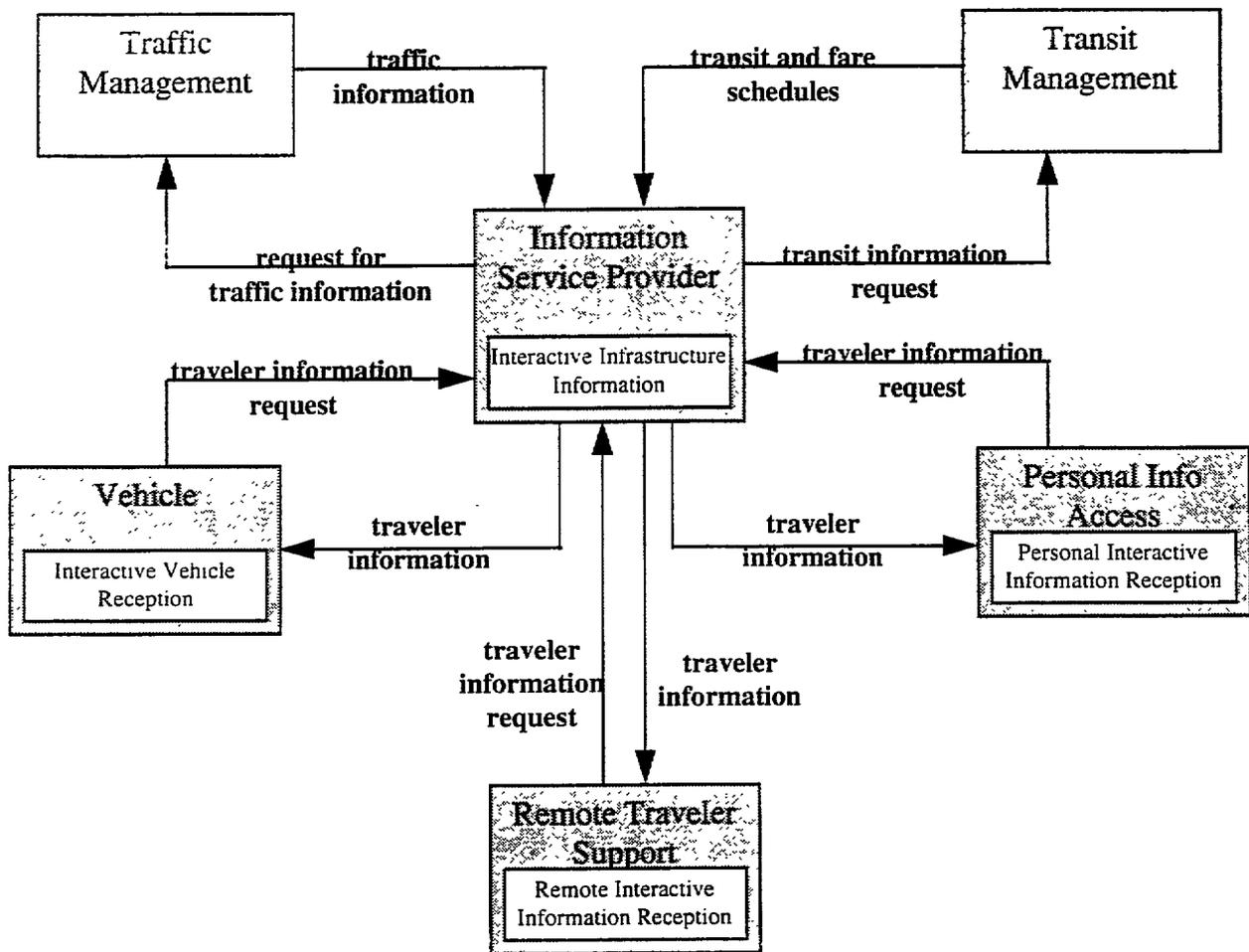
Broadcast Traveler Information (ATIS)

This Market Package provides the user with a basic set of ATIS services; its objective is early acceptance. It involves the collection of traffic conditions; advisories; general public transportation and parking information; and the near real-time dissemination of this information over a wide area through existing infrastructures and low cost user equipment (e.g., FM subcarrier, cellular data broadcast). Different from the Market Package ATMS&-Traffic Information Dissemination--that provides the more basic HAR and VMS information capabilities, ATIS 1 provides the more sophisticated digital broadcast service. Successful deployment of this Market Package relies on availability of real-time transportation data from roadway instrumentation, probe vehicles or other means.



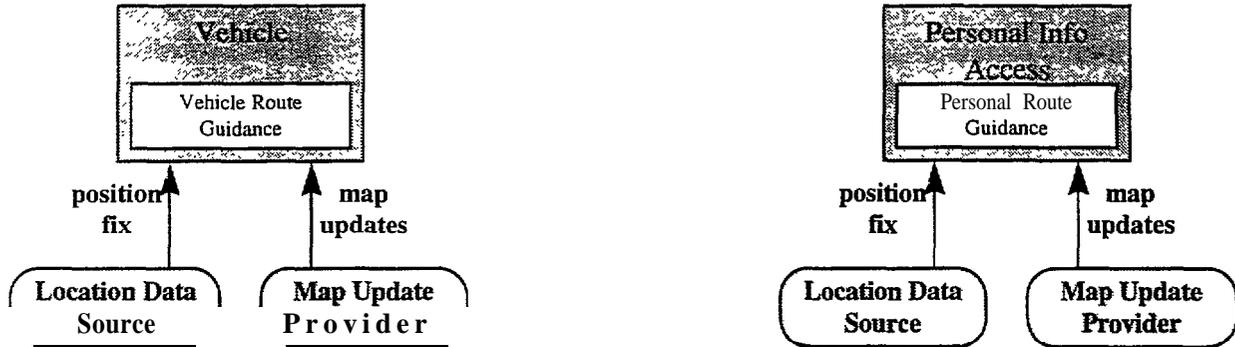
Interactive Traveler Information (ATIS2)

This Market Package provides tailored information in response to a traveler request. The user can request and obtain current information regarding traffic conditions, transit services, traveler 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 digital communications between traveler and the information service provider. A variety of interactive devices may be used by the traveler to access information prior to a trip or en-route to include phone, kiosk, Personal Digital Assistant, home computer, and a variety of in-vehicle devices. Successful deployment of this Market Package relies on availability of real-time transportation data from roadway instrumentation, probe vehicles or other means.



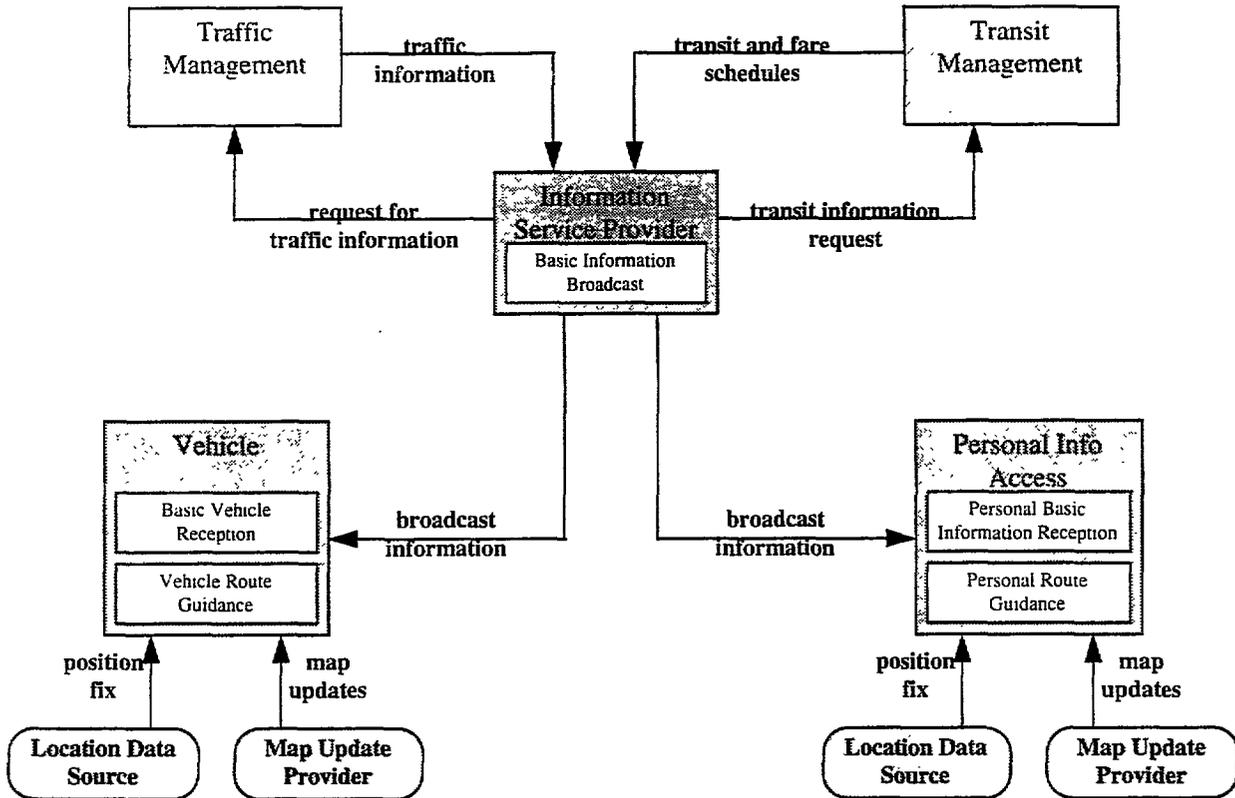
Autonomous Route Guidance (ATIS3)

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.



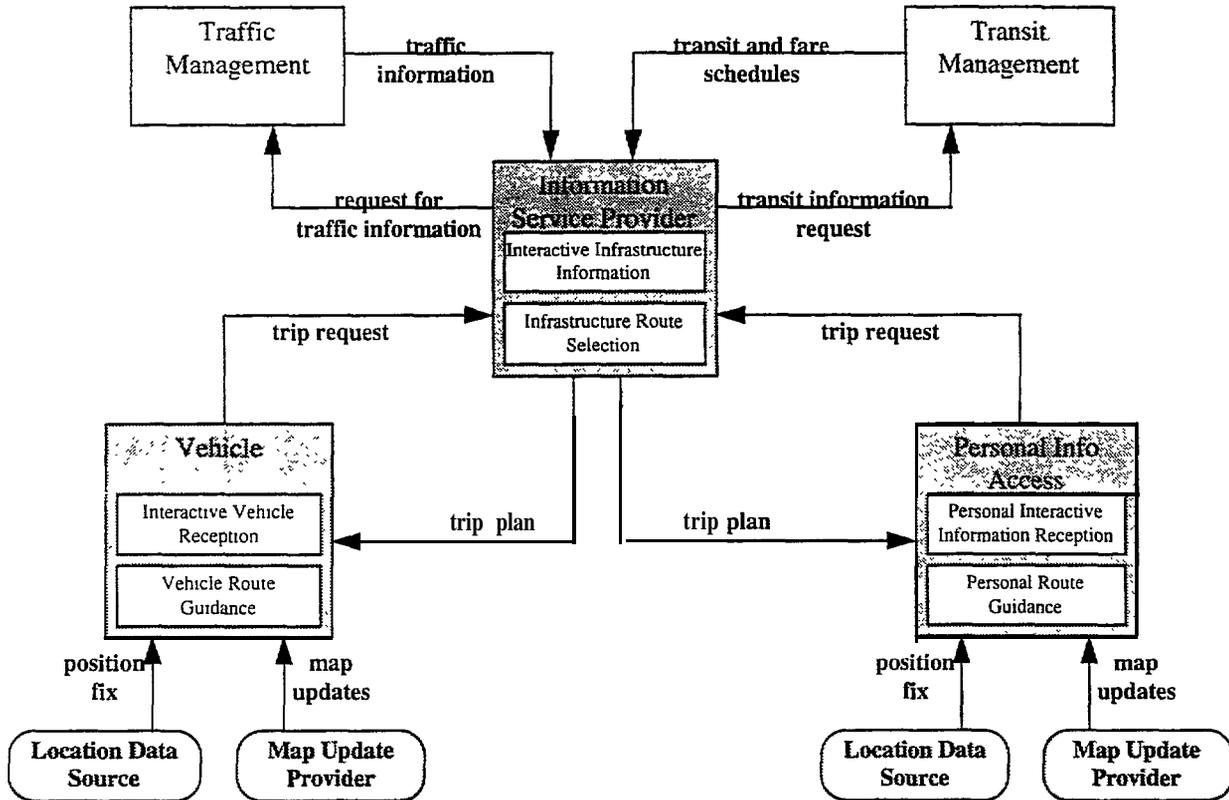
Dynamic Route Guidance (ATIS4)

This Market Package offers the user advanced route planning and guidance which is responsive to current conditions. The package combines the autonomous route guidance user equipment with a digital receiver capable of receiving real-time traffic, transit, and road condition information which is considered by the user equipment in provision of route guidance.



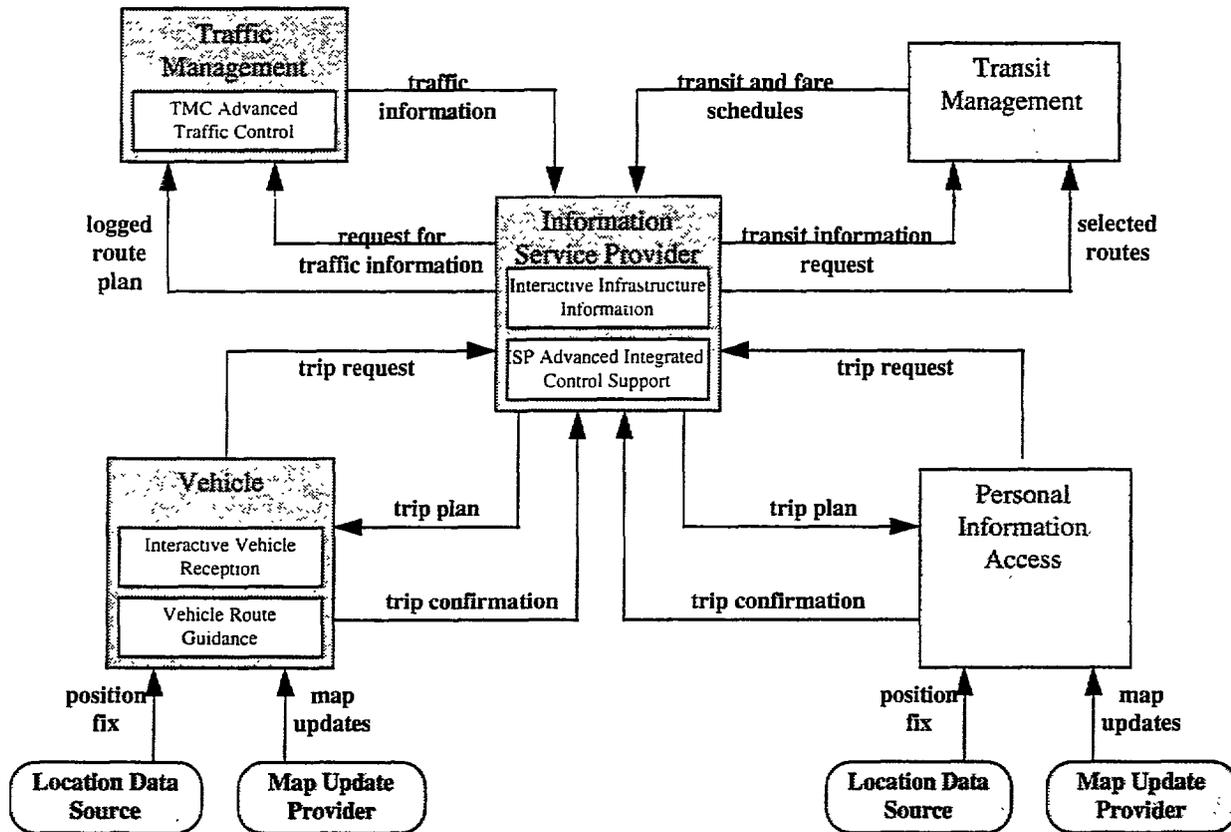
HP-Based Route Guidance (ATIS5)

This Market Package moves the route planning function from the user device to the information service provider. This approach simplifies the user equipment requirements and can provide the infrastructure better information by which to predict future traffic and appropriate control strategies. 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.



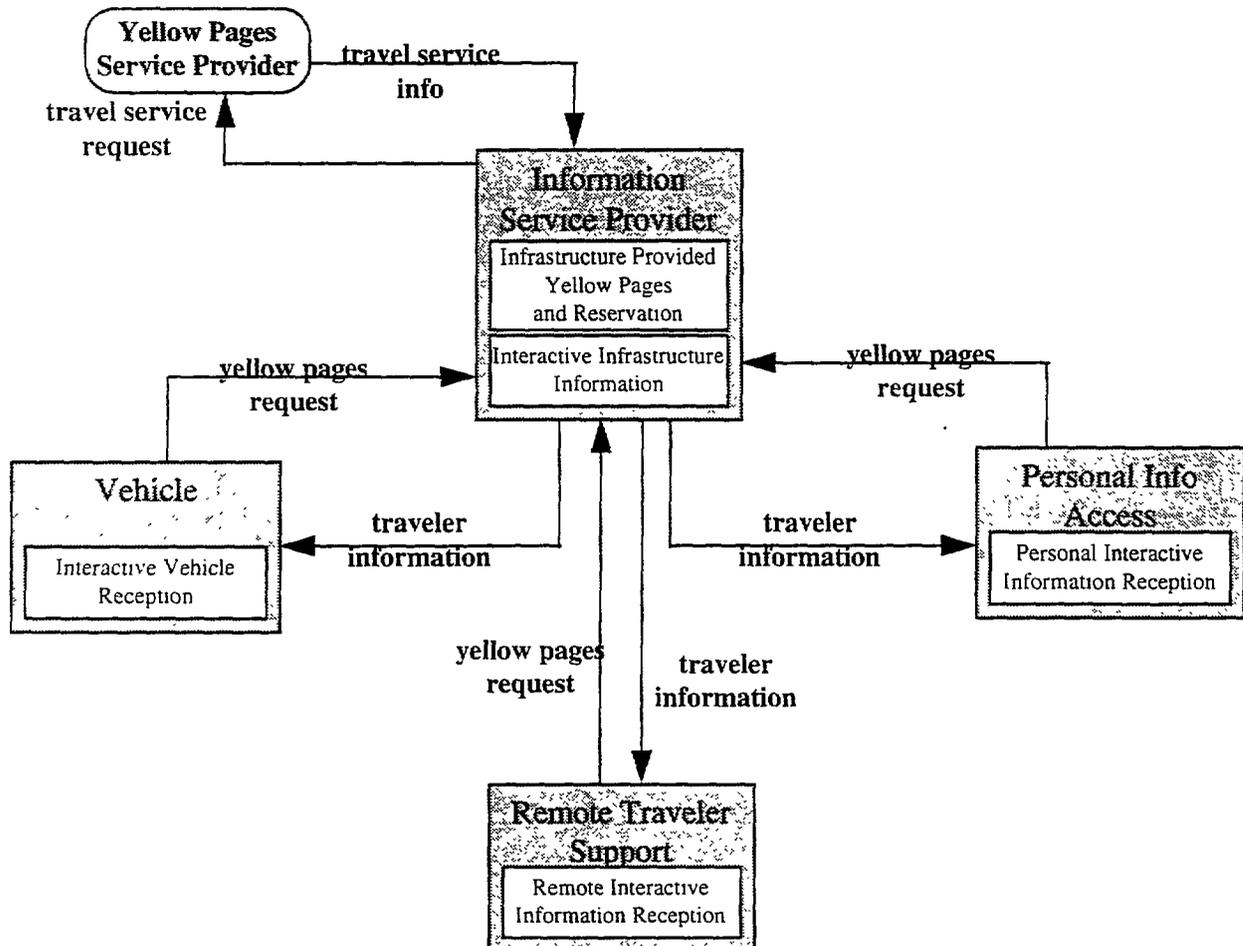
Integrated Transportation Management/Route Guidance (ATIS6)

This Market Package allows a traffic management center to continuously optimize the traffic control strategy based on near-real time information on intended routes for a proportion of the vehicles within their network. It represents an extension to the ISP-Based Route Guidance Market Package which improves the level of coordination between ISP and Traffic Management Subsystem so that the planned routes can be factored into near-future traffic management strategies. It would utilize the individual and ISP route planning information to optimize signal timing while at the same time providing updated signal timing information to allow optimized route plans. The use of predictive link times for this Market Package are possible through utilizing the Market Package ATMS9--Traffic Network Performance Evaluation--at the traffic management center.



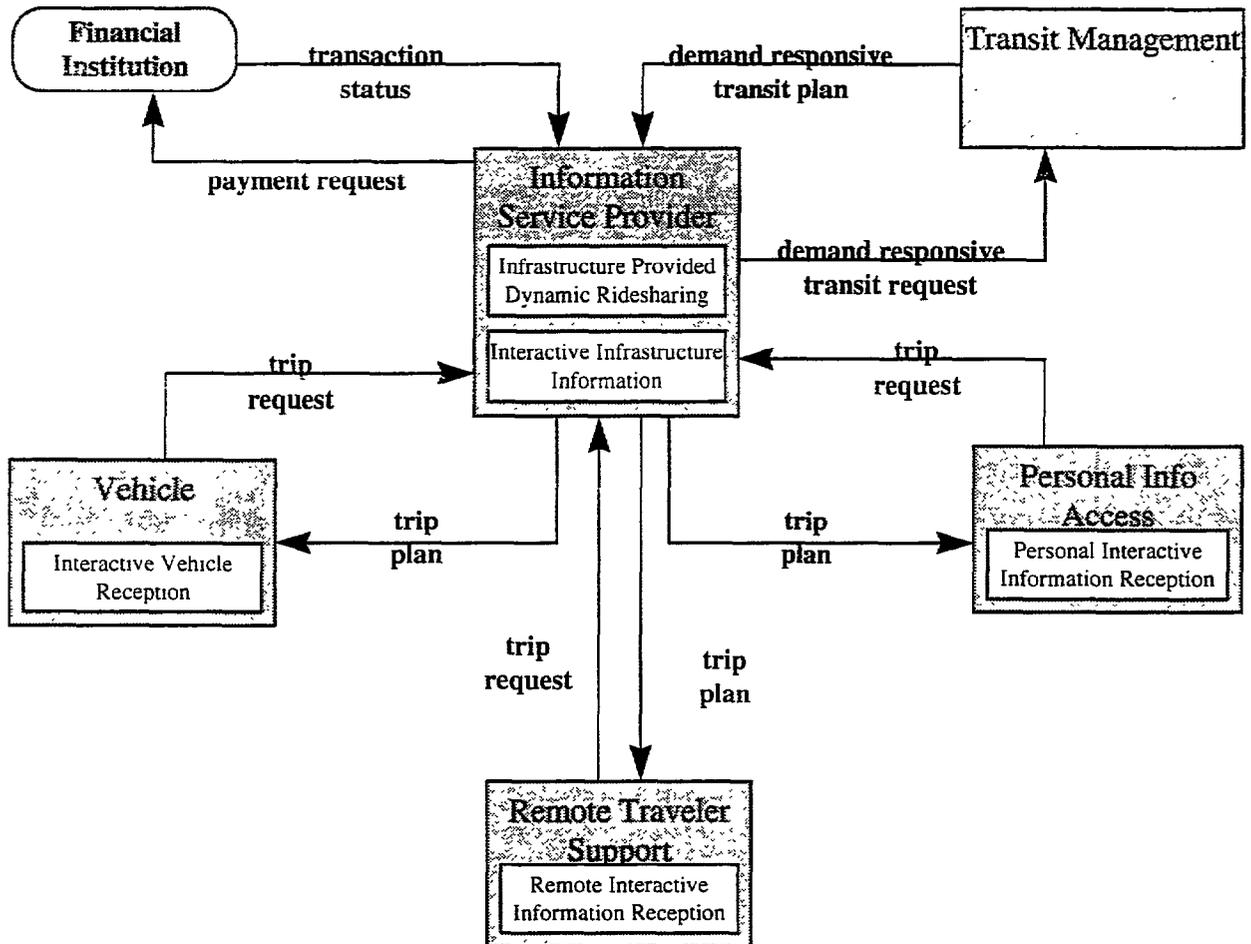
Yellow Pages and Reservation (ATIS7)

This Market Package enhances the Interactive Traveler Information Market Package by adding infrastructure-provided Yellow Pages and reservation capabilities. The same basic user equipment is included; service or advertising fees should allow recovery of the ISP investment. This Market Package provides different ways for accessing information, either while en-route in a vehicle, or pre-trip via wireline connections, etc.



Dynamic Ridesharing (ATISS)

This Market Package enhances the Interactive ATIS with Infrastructure Driver and Traveler Information package by adding infrastructure provided dynamic ridesharing capability. The investment to the driver or traveler should not increase. If this service is provided by a private ISP, service fees may be required to allow for recovery of the ISP investment. In terms of equipment requirements, ATISS is similar to ATIS7.



In Vehicle Signing (ATIS9)

This Market Package supports distribution of advisory information to drivers through in-vehicle devices regarding road conditions and status. It includes short-range communications to the vehicle and wireline connections to the TMS for coordination and control. This Market Package includes information distribution to inform the driver of both highway-highway and highway-rail intersection status.



A.4 Advanced Vehicle Safety System Market Packages

Many of the advanced vehicle Market Packages are autonomous systems that do not interact with other systems within the architecture definition. Each of these autonomous packages is briefly described in the following. The most advanced implementations that do require communication between the infrastructure and vehicle (e.g., AHS) are described at the end of this section.

Vehicle Safety Monitoring (AVSSI)

This Market Package will diagnose critical components of the vehicle and warn the driver of potential dangers. On-board sensors will determine the vehicle's condition and performance determine on-board safety data and display information.

Driver Safety Monitoring (AVSS2)

This Market Package will determine the driver's condition, and warn the driver of potential dangers. On-board sensors will determine the driver's condition and performance determine on-board safety data and display information.

Longitudinal Safety Warning (AVSS3)

This Market Package allows for longitudinal warning. It utilizes safety sensors and collision sensors. It requires on-board sensors to monitor the areas in front of and behind the vehicle and present warnings to the driver about potential hazards.

Lateral Safety Warning (AVSS4)

This Market Package allows for lateral warning. It utilizes safety sensors and collision sensors. It requires on-board sensors to monitor the areas to the sides of the vehicle and present warnings to the driver about potential hazards.

Pre-Crash Restraint Deployment (AVSS6)

This Market Package provides in-vehicle sensors to monitor the vehicle's local environment, determine collision probability and deploy a pre-crash safety system. It will include on-board sensors to measure lateral and longitudinal gaps and, together with weather and roadway conditions, will determine lateral and longitudinal collision probability. It will have the mechanism to deploy a pre-crash safety system.

Driver Visibility Improvement (AVSS7)

This Market Package will enhance driver visibility using an enhanced vision system. On-board display hardware is needed

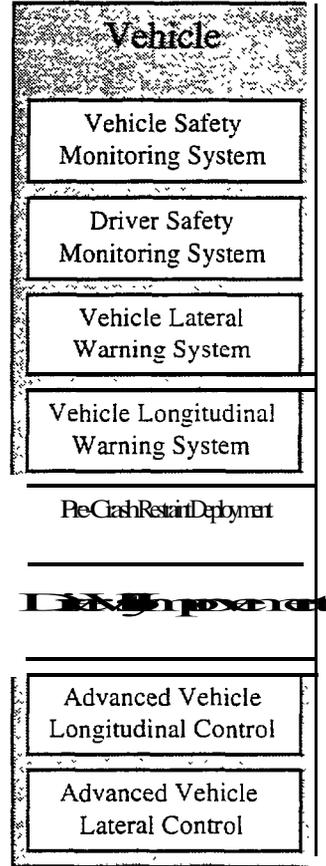
Advanced Vehicle Longitudinal Control (AVSS8)

This Market Package automates the speed and headway control functions on-board the vehicle. It utilizes safety sensors and collision sensors combined with vehicle dynamics processing to control the throttle and brakes. It requires on-board sensors to measure longitudinal gaps and a processor for controlling the vehicle speed.

Advanced Vehicle Lateral Control (AVSS9)

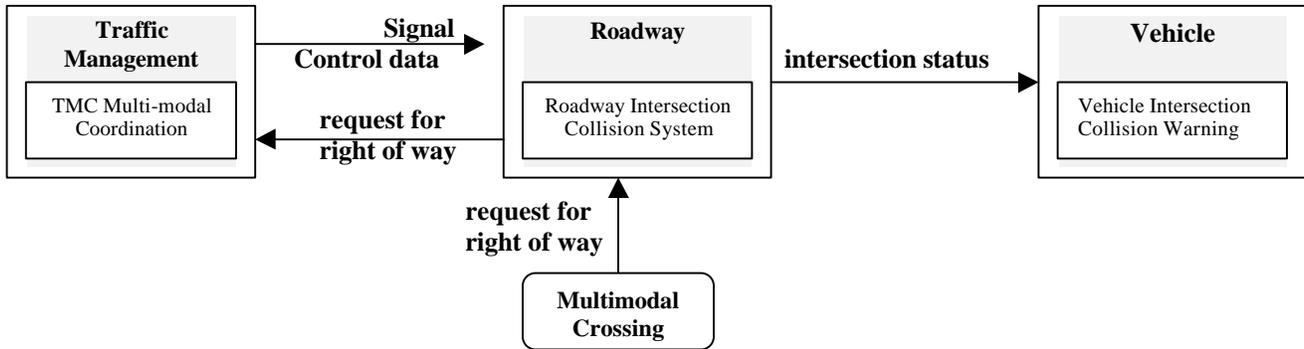
This Market Package automates the steering control on-board the vehicle. It utilizes safety sensors and collision sensors combined with vehicle dynamics processing to control the steering. It requires on-board sensors to measure lane position and lateral deviations and a processor for controlling the vehicle steering.

Many of the vehicle safety system market packages are autonomous vehicle systems that involve only vehicle equipment. Note that human (driver) and physical (sensor) interfaces exist but are excluded from these diagrams by convention. Each of the market packages includes one of the identified equipment packages.



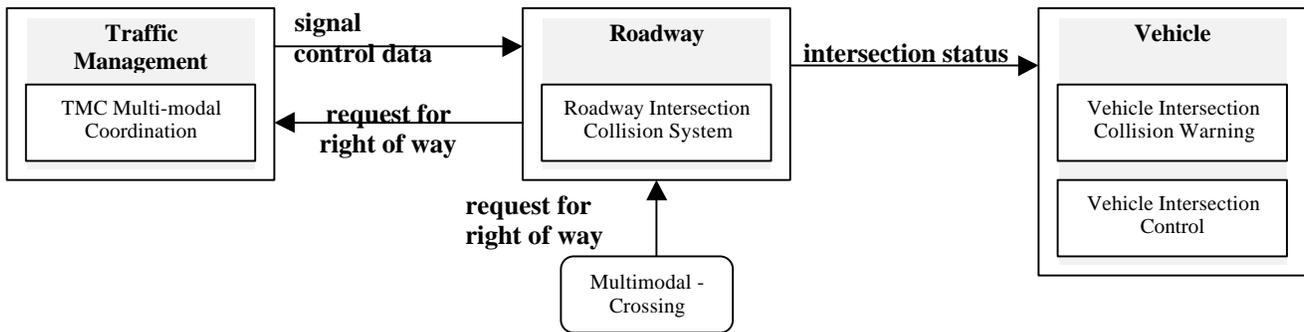
Intersection Safety Warning (AVSS10)

This Market Package will determine the probability of a collision in an equipped intersection (either highway-highway or highway-rail) and provide timely warnings to drivers in response to hazardous conditions. Monitors in the roadway infrastructure are needed to assess vehicle locations and speeds near an intersection. Using this information, a warning is determined and communicated to the approaching vehicle using a short-range communications system. Information can be provided to the driver through the Market Package ATIS9--In--Vehicle Signing.



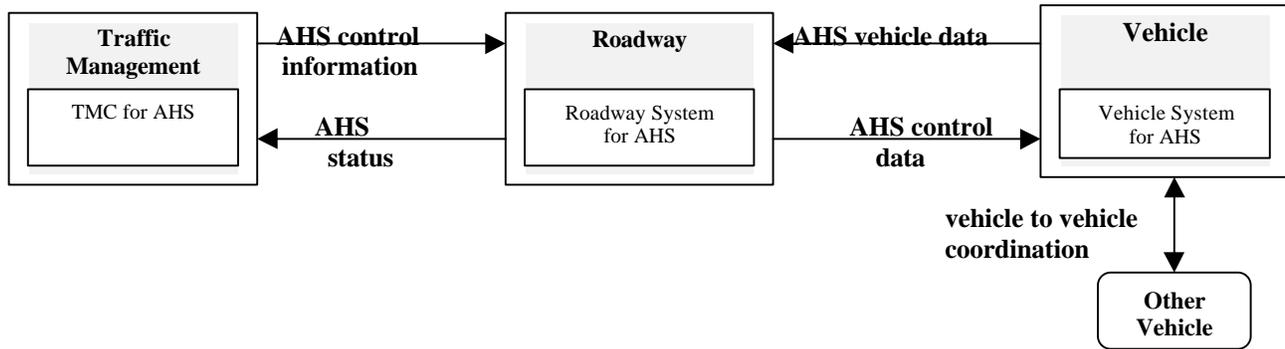
Intersection Collision Avoidance (AVSS10)

This Market Package will determine the probability of an intersection collision and provide timely warnings to approaching vehicles so that avoidance actions can be taken. This Market Package builds on the Intersection Collision Warning infrastructure and in-vehicle equipment and adds equipment in the vehicle that can take control of the vehicle in emergency situations. The same monitors in the roadway infrastructure are needed to assess vehicle locations and speeds near an intersection. This information is determined and communicated to the approaching vehicle using a short-range communications system. The vehicle uses this information to develop control actions which alter the vehicle’s speed and steering control and potentially activate its pre-crash safety system.



Automated Highway System (AVSS11)

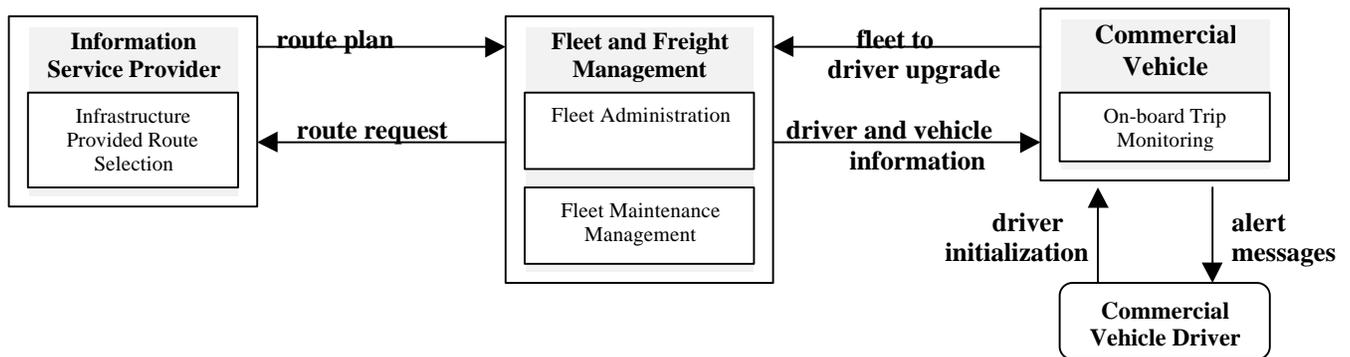
This Market Package enables “hands-off” operation of the vehicle on the automated portion of the highway system. Implementation requires lateral lane holding, vehicle speed and steering control, and Automated Highway System check-in and checkout. This Market Package currently supports a balance in intelligence allocation between infrastructure and the vehicle pending selection of a single operational concept by the AHS consortium



A.5 Commercial Vehicle Operations Market Packages

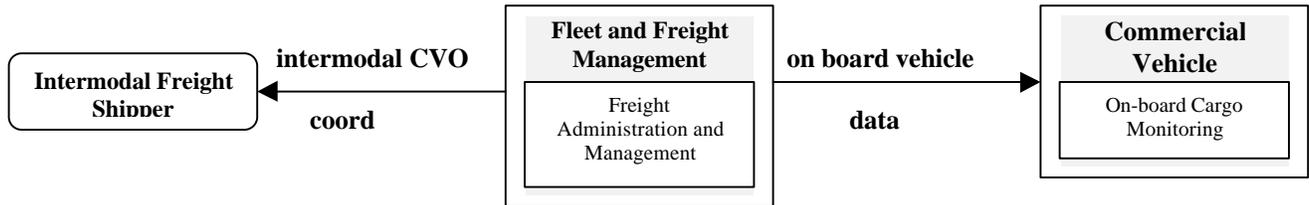
Fleet Administration (CVO1)

This Market Package keeps track of vehicle location, itineraries, and fuel usage at the Fleet and Freight Management Center using a cell-based or satellite data link and the preexisting wireless infrastructure. The vehicle has a processor to interface to its sensor (e.g., a fuel gauge) and to the cellular data link. The Fleet and Freight Management Center can provide the vehicle with dispatch instructions, and can process and respond to requests for assistance and general information from the vehicle via the cellular data link. The Market Package also provides the Fleet Manager with connectivity to intermodal transportation providers using the existing wireline infrastructure.



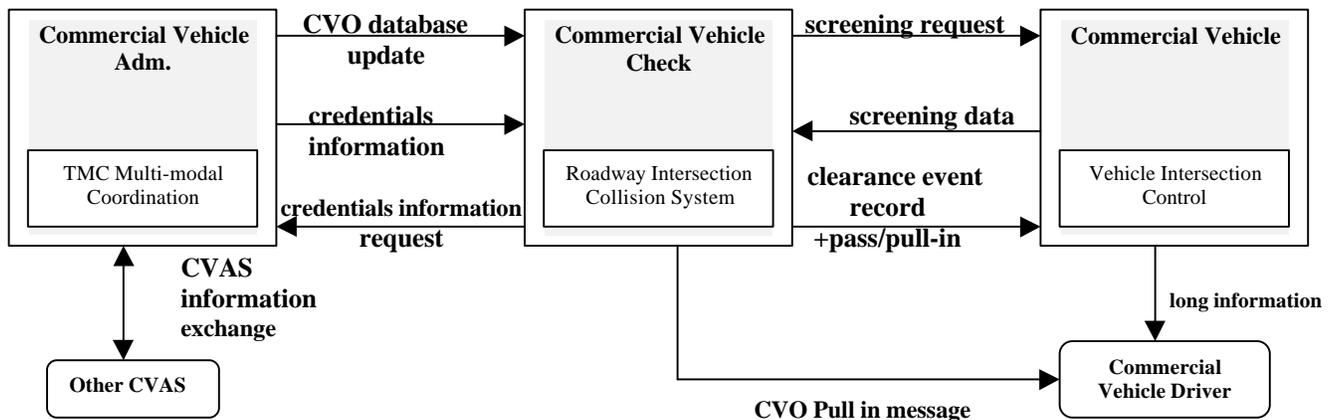
Freight Administration (CVO2)

This Market Package tracks cargo location and condition. This information is communicated with the Fleet and Freight Management Center via the existing wireless infrastructure. Interconnections are provided to inter-modal freight shippers for tracking cargo across modes as it travels from source to destination.



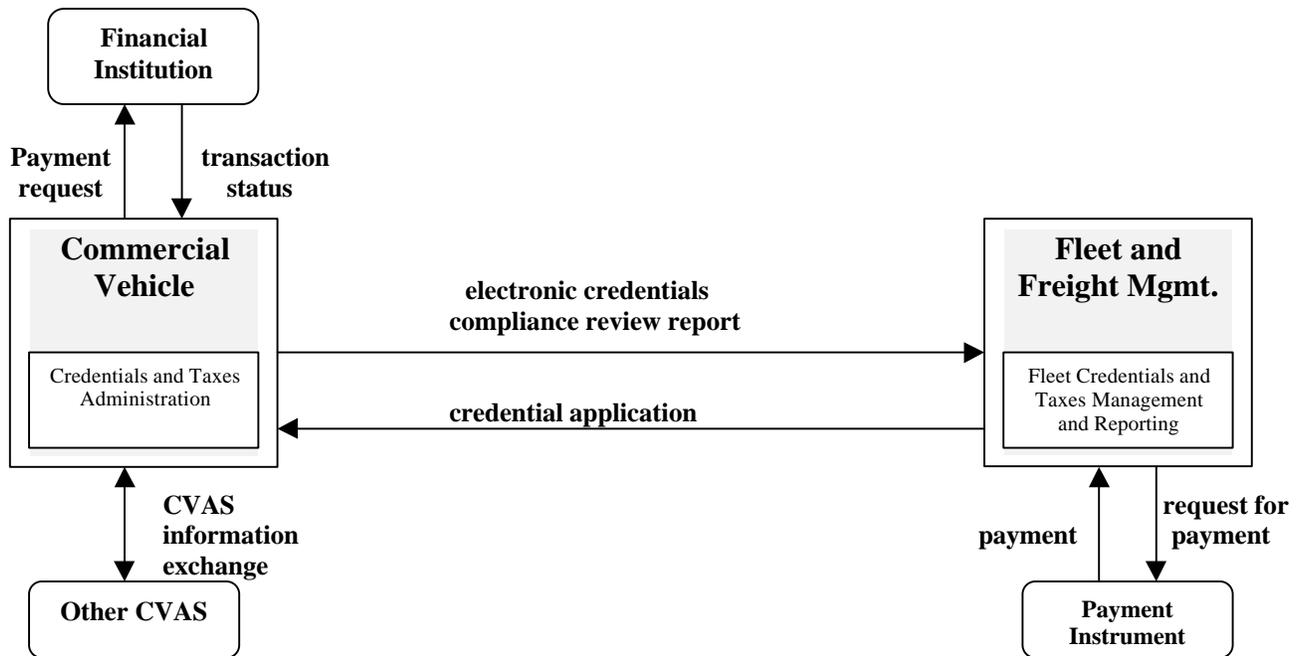
Electronic Clearance (CVO3)

This Market Package provides for automated clearance at roadside check facilities. The roadside check facility communicates with the Commercial Vehicle Administration subsystem over wireline to retrieve infrastructure snapshots of critical carrier, vehicle and driver data to be used to sort passing vehicles. This package allows a good driver/vehicle/carrier to pass roadside facilities at highway speeds using transponders and dedicated short-range communications to the roadside. The roadside check facility may be equipped with AVI, weighing sensors, transponder read/write devices, computer workstation processing hardware, software, and databases.



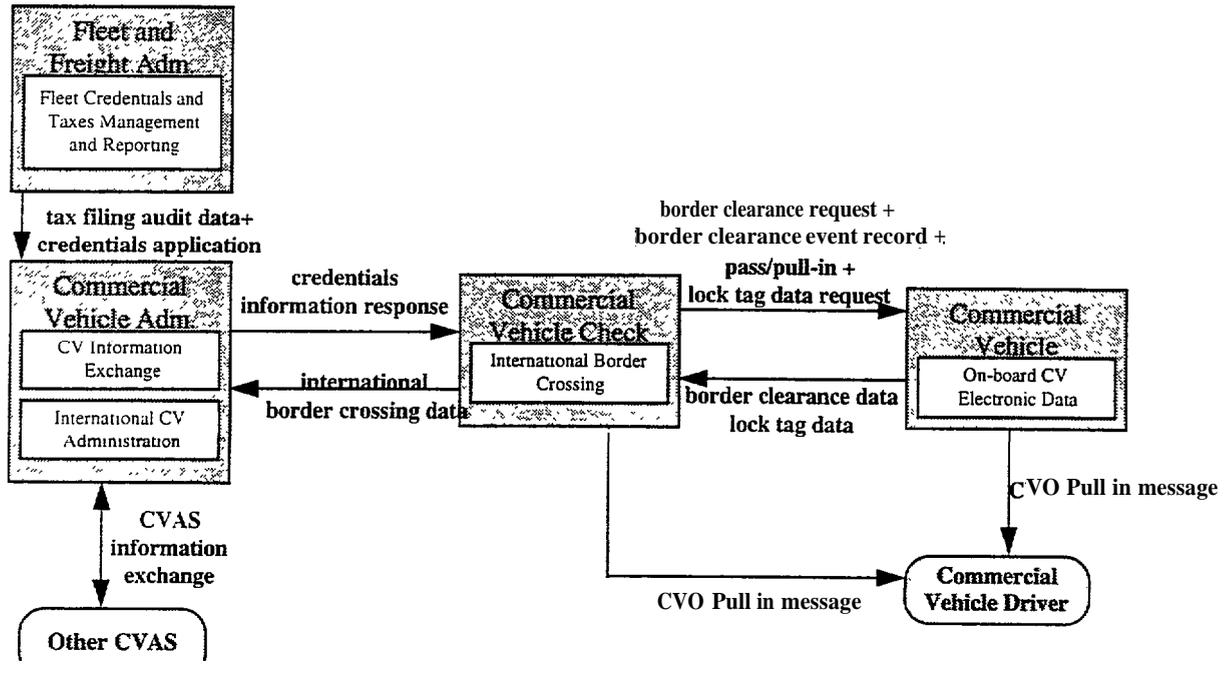
CV Administrative Processes (CVO04)

This Market Package provides for electronic application, processing, fee collection, issuance and distribution of CVO credential and tax filing. Through this process, carriers, drivers, and vehicles are enrolled in the electronic clearance program provided by a separate Market Package which allows commercial vehicles to be screened at mainline speeds at commercial vehicle check points. Through this enrollment process, current profile databases are maintained in the Commercial Vehicle Administration Subsystem and snapshots of this database are made available to the commercial vehicle check facilities at the roadside to support the electronic clearance process.



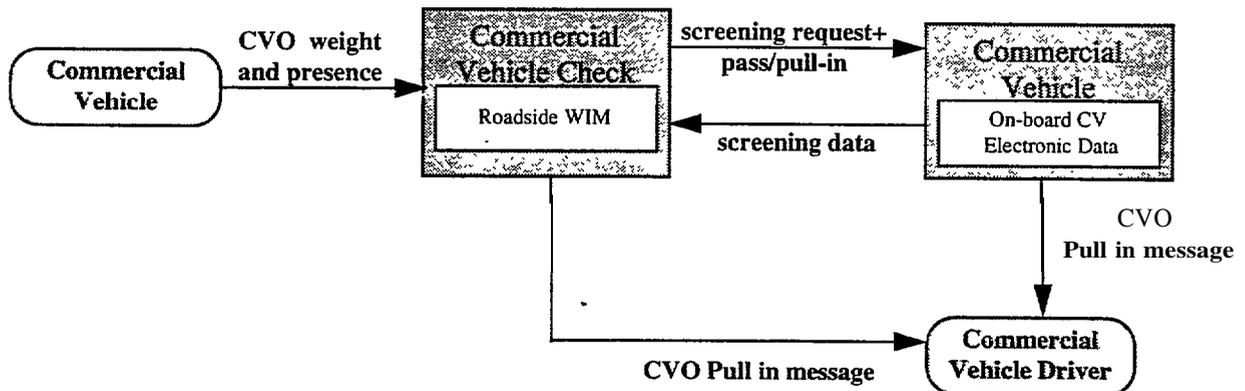
International Border Electronic Clearance (CVO05)

This Market Package provides for automated clearance specific to international border crossings. This package augments the electronic clearance package by allowing interface with customs-related functions and by permitting NAFTA required entry and exit from the United States to Canada and Mexico.



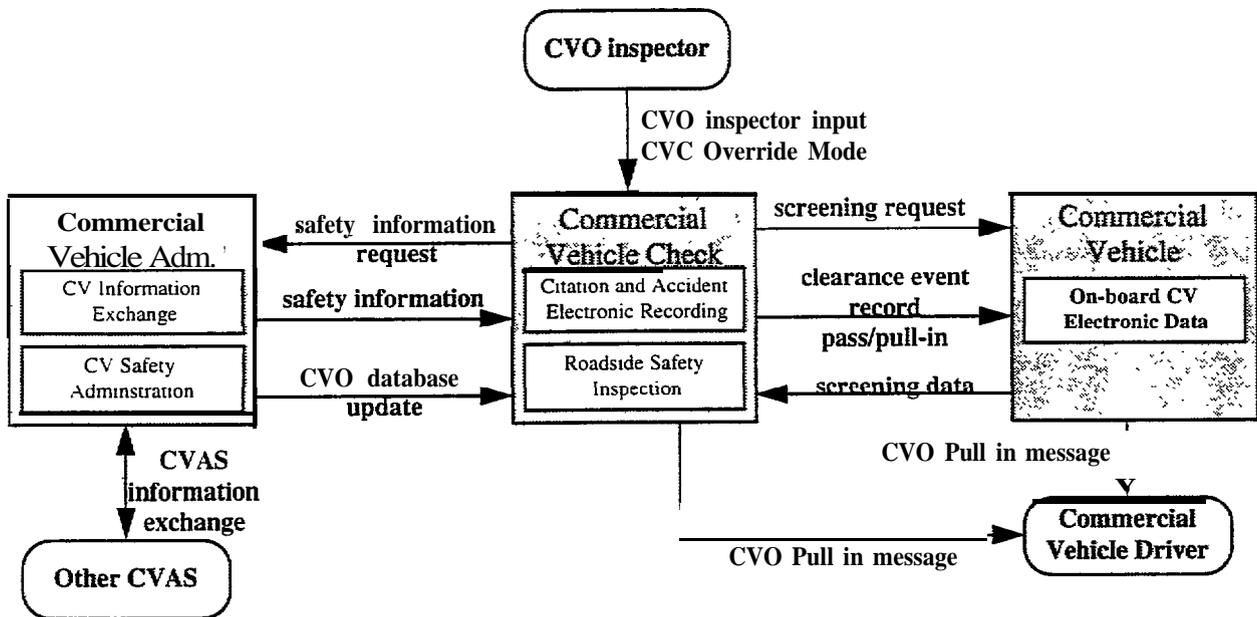
Weigh-In-Motion (CVO06)

This Market Package provides for high-speed weigh-in-motion with or without AVI attachment. Primarily this Market Package provides the roadside with additional equipment, either fixed or removable. Fixed implementations are typically thought to be an addition to the electronic clearance and would work in conjunction with the AVI and AVC equipment in place.



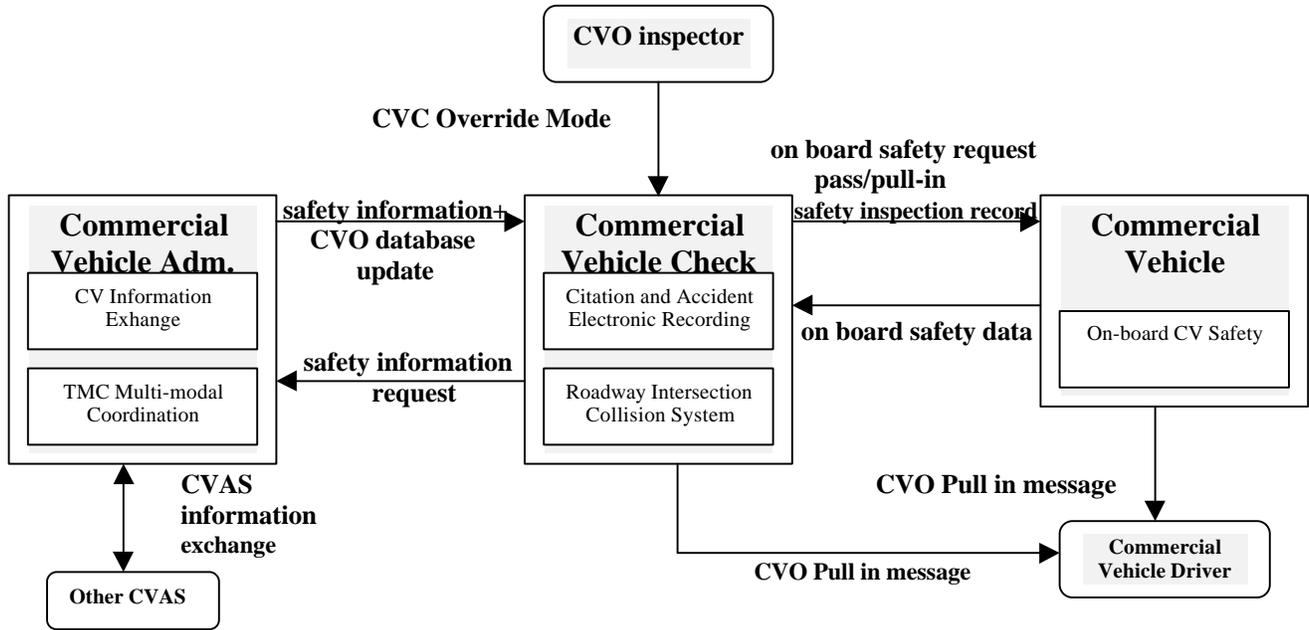
Roadside CVO Safety (CVO07)

This Market Package provides for automated roadside safety monitoring and reporting. It automates commercial vehicle safety inspections at the commercial vehicle check subsystem. The capabilities for performing the safety inspection are shared between this Market Package and the On-Board CVO Safety Market Package which enables a variety of implementation options. The basic option, directly supported by this Market Package, facilitates safety inspection of vehicles that have been pulled in, perhaps as a result of the automated screening process provided by the Electronic Clearance Market Package. In this scenario, only basic identification data and status information is read from the electronic tag on the commercial vehicle. The identification data from the tag enables access to additional safety data maintained in the infrastructure which is used to support the safety inspection, and may also inform the pull-in decision if system timing requirements can be met. More advanced implementations, supported by the On-Board CVO Safety Market Package, utilize additional vehicle safety monitoring and reporting capabilities in the commercial vehicle to augment the roadside safety check.



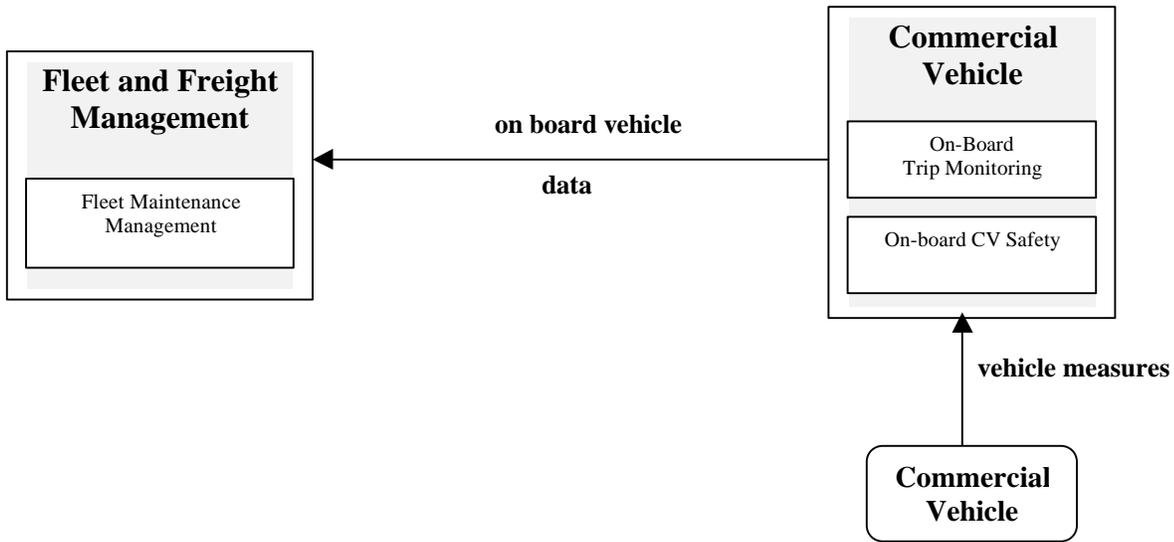
On-board CVO Safety (CVO08)

This Market Package provides for on-board commercial vehicle safety monitoring and reporting. It is an enhancement of the Roadside CVO Safety Market Package and includes roadside support for reading on-board safety data via tags. This Market Package uses the same communication links as the Roadside CVO Safety Market Package, and provides the commercial vehicle with a cellular link (data and possibly voice) to the Fleet and Freight Management and the Emergency Management Centers. Safety warnings are provided to the driver as a priority with secondary requirements to notify the Fleet and Freight Management and Commercial Vehicle Check roadside elements.



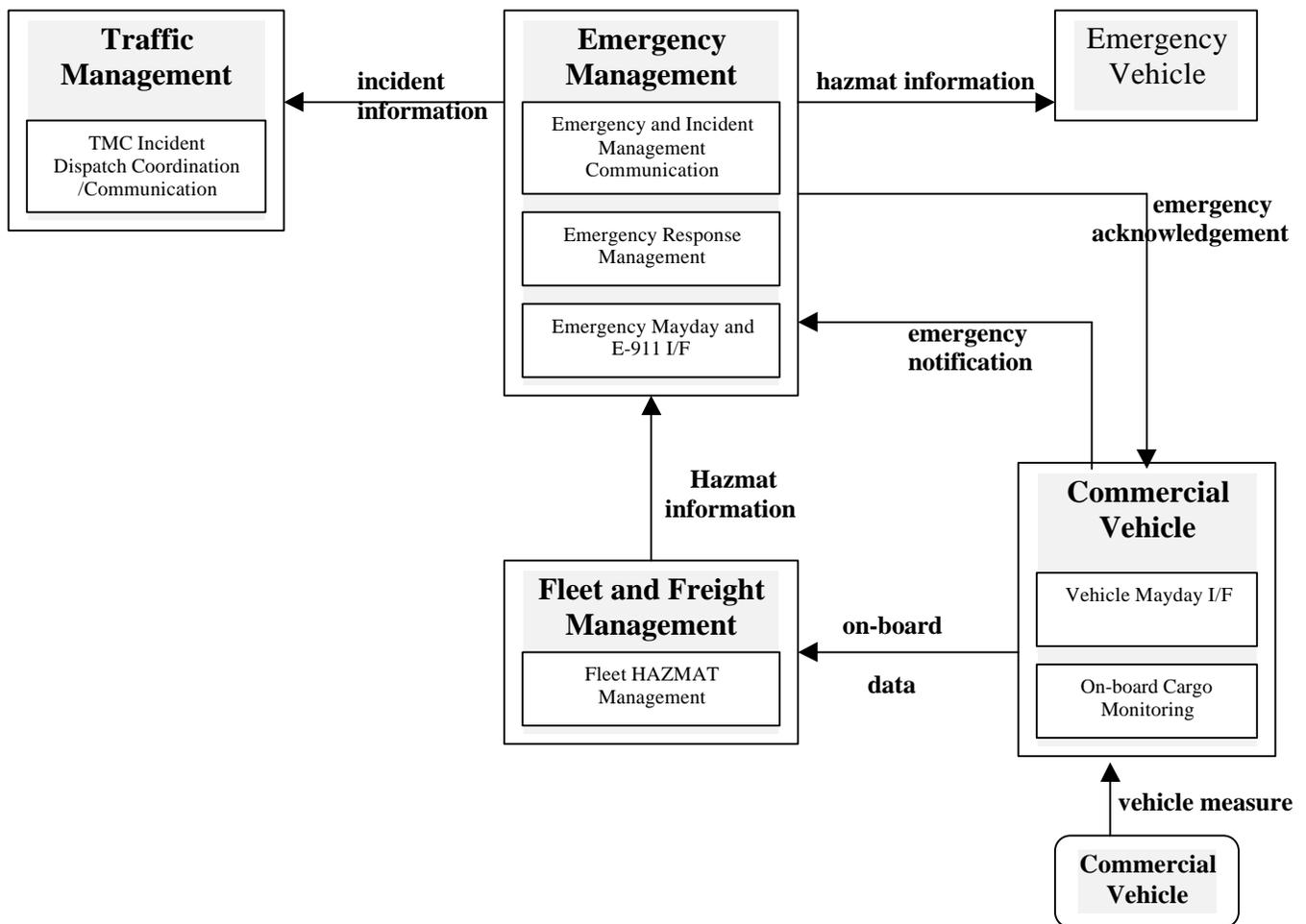
CVO Fleet Maintenance (CVO09)

This Market Package supports maintenance of CVO fleet vehicles through close interface with on-board monitoring equipment and AVLS capabilities within the Fleet and Freight Management Center. Records of vehicle mileage, repairs, and safety violations are maintained to assure safe vehicles on the highway.



HAZMAT Management (CVO10)

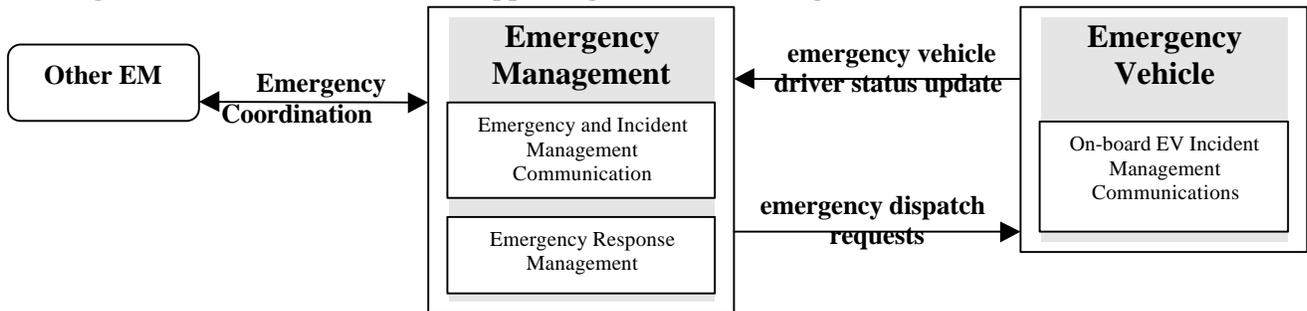
This Market Package integrates incident management capabilities with commercial vehicle tracking to assure effective treatment of HAZMAT material and incidents. HAZMAT tracking is performed by the Fleet and Freight Management Subsystem. The Emergency Management subsystem is notified by the Commercial 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.



A.6 Emergency Management Market Packages

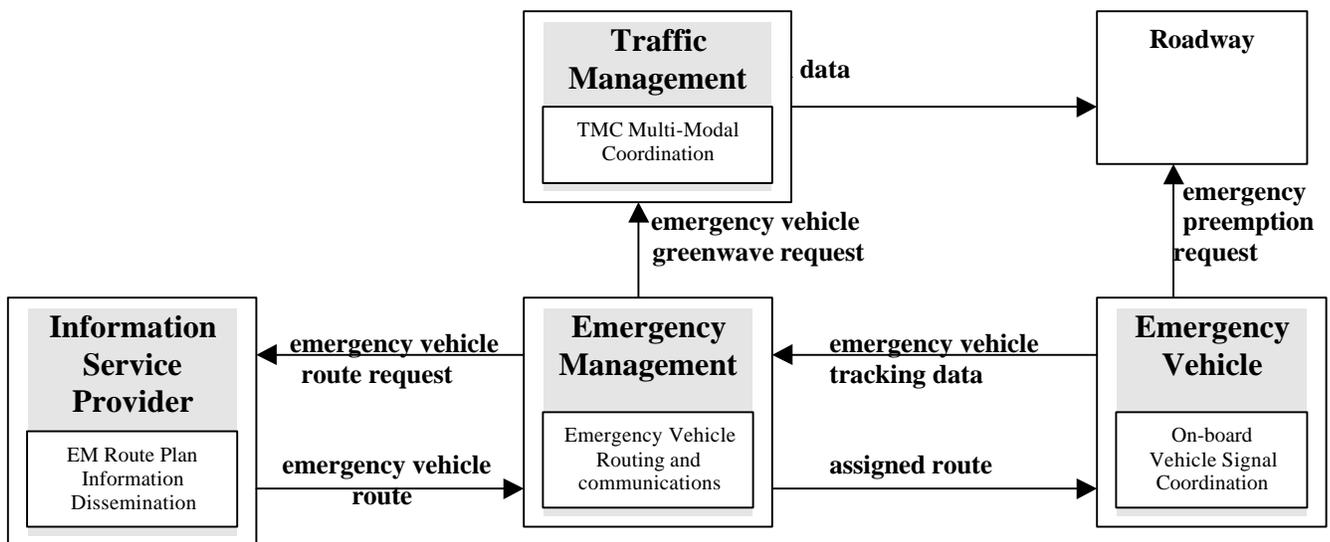
Emergency Response (EMI)

This Market Package automates emergency vehicle notification upon verification of the location and nature of an incident by the Emergency Management subsystem. This package uses existing and emerging wireline interconnects to sensors, and vehicle position locators for incident detection. 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, which enables coordination with the emergency fleet. The Emergency Management Center would include hardware and software for tracking the emergency vehicles. Law Enforcement would normally be an integral part of this package as well as processing violation notifications and supporting incident clearing efforts.



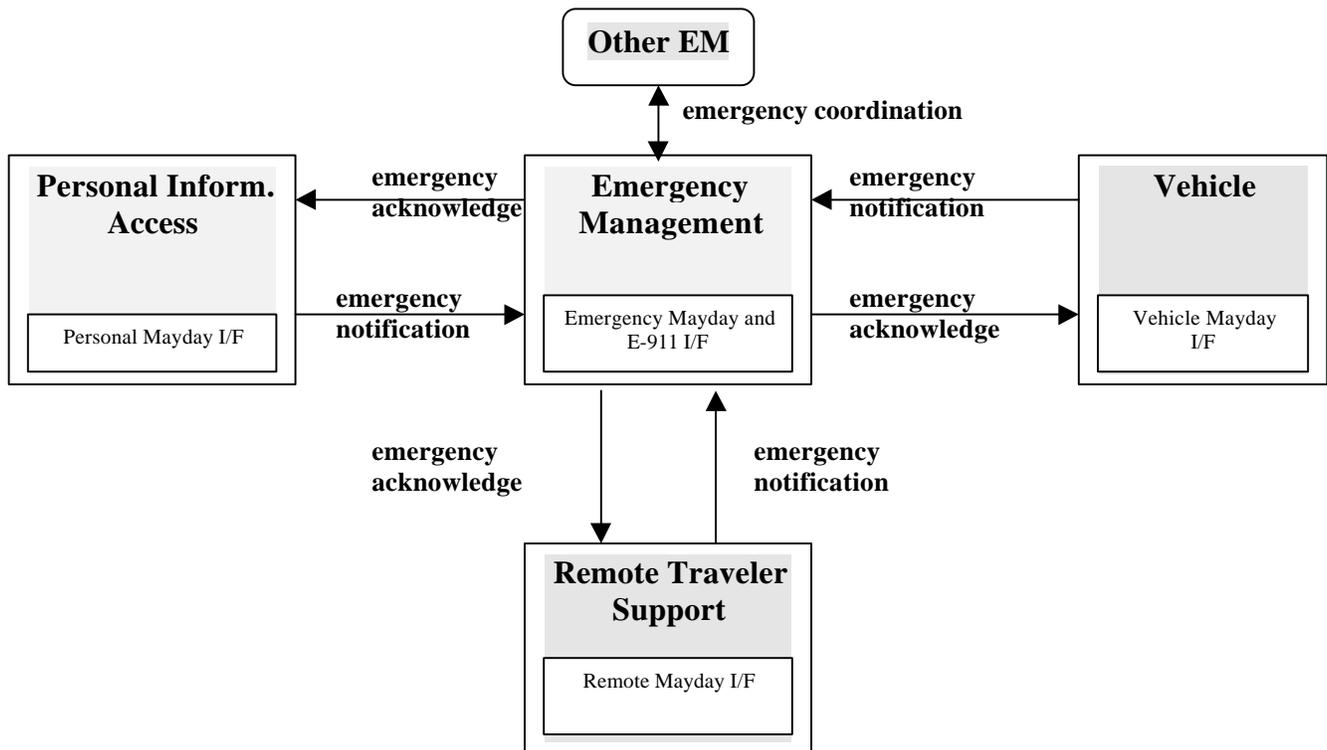
Emergency Routing (EV2)

This Market Package supports dynamic routing of emergency vehicles and coordination with the Traffic Management subsystem for special priority on the selected route(s). The ISP provides the route planning function for the emergency fleet based on real-time traffic conditions and the emergency routes assigned to other responding vehicles. The Emergency vehicle would also optionally be equipped with dedicated short-range communications for local signal coordination.



Mayday Support (EM3)

This 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. 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 data is sent to the Emergency Management subsystem using wide area wireless communications with voice as an option. Providing user location implies either a location technology within the user device or location determination within the communications infrastructure.



A-7 ITS Planning Market Package

ITS Planning (ITS1)

This Market Package supports ITS planning functions. It accepts data from every centersubsystem and uses this data to plan new deployments and new Market Packages. This data also supports policy decision-making, allocation of funding, allocation of resources and other planning activities.

