Regional ITS Architecture

Delaware Valley
Regional Planning
Commission

November 2000

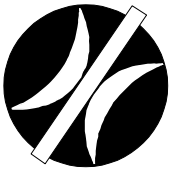
INSTITUTIONAL COORDINATION OF
INTELLIGENT TRANSPORTATION SYSTEMS
(ITS)
IN THE DELAWARE VALLEY

REGIONAL ITS ARCHITECTURE
VERSION 1.0

DELAWARE VALLEY REGIONAL PLANNING COMMISSION
The Bourse Building
111 South Independence Mall East
Philadelphia, PA 19106

March 2001

Created in 1965, the Delaware Valley Regional Planning Commission (DVRPC) is an interstate, intercounty and intercity agency that provides continuing, comprehensive and coordinated planning to shape a vision for the future growth of the Delaware Valley region. The region includes Bucks, Chester, Delaware, and Montgomery counties, as well as the City of Philadelphia, in Pennsylvania; and Burlington, Camden, Gloucester and Mercer counties in New Jersey. DVRPC provides technical assistance and services; conducts high priority studies that respond to the requests and demands of member state and local governments; fosters cooperation among various constituents to forge a consensus on diverse regional issues; determines and meets the needs of the private sector; and practices public outreach efforts to promote two-way communication and public awareness of regional issues and the Commission.



Our logo is adapted from the official DVRPC seal, and is designed as a stylized image of the Delaware Valley. The outer ring symbolizes the region as a whole, while the diagonal bar signifies the Delaware River. The two adjoining crescents represent the Commonwealth of Pennsylvania and the State of New Jersey.

DVRPC is funded by a variety of funding sources including federal grants from the U.S. Department of Transportation's Federal Highway Administration (FHWA) and Federal Transit Administration (FTA), the Pennsylvania and New Jersey departments of transportation, as well as by DVRPC's state and local member governments. The preparation of this document was funded by grants from the Federal Highway Administration and the Pennsylvania Department of Transportation. The authors, however, are solely responsible for its findings and conclusions, which may not represent the official views or policies of the funding agencies.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDICES

EXECUTIVE SUMMARY

The National Intelligent Transportation Systems (ITS) Architecture provides a common structure for the design of intelligent transportation systems. It is a resource to help state, local, and regional transportation agencies identify information sharing possibilities for their areas. It is intended to link four major surface transportation components: operations centers, travelers, vehicles, and roadsides. The National ITS Architecture addresses the complexity of tying together these subsystems by organizing and framing the connections between them.

Consistency with the National ITS Architecture is intended to help transportation agencies and travelers gain the benefits of systems integration. Integrating transportation systems enables more efficient use of resources, encourages stakeholder involvement, and improves operations for transportation agencies and their customers.

The National ITS Architecture and ITS standards will provide the following long term benefits to the region:

Interoperability: The ability of systems to provide and accept information from other systems in a satisfactory manner and to use the information so exchanged to enable them to operate effectively together. Furthermore, because the National ITS Architecture is serving as the common foundation for ongoing ITS standards development, factoring it into the region's current system enhancements will facilitate the transition to a standard interface definition, thus insuring national and regional interoperability and interchangeability of systems and devices used in ITS travel management.

Increased Competition: By requiring use of open (non-proprietary) standards, multiple vendors that can meet the standards will be able to respond to requests for proposals (RFPs). Support and upgrades can also be obtained from multiple sources, which will increase competition and will avoid the problems of being locked into one source.

Future Expandability: By designing within a common framework and using open standards, ITS implementors will create an environment that integrates legacy (existing non conforming) systems with new ITS applications and allows more functionality to be added as needed.

Lower Costs: Costs of deployment will decrease over time because economies of scale for off-the-shelf ITS equipment, and products will be available from multiple vendors.

Increased Transportation System Integration: The open nature and structure of the National ITS Architecture and use of standards-compliant components will permit effective information sharing and more effective use of resources. Seamless traveler services across agency lines will become a reality.

Regional Architecture

Each metropolitan area in the country is unique in terms of size, geography, demographics, and institutional arrangements. Because of these differences, there is a need to develop transportation operations systems to fit a region's specific problems and needs. These specific needs come to the forefront when dealing with systems that are already in place. A regional architecture maps out how the various ITS components are ultimately tied together and integrated, both physically as well as institutionally. Since a wide range of stakeholders are involved in its development, the regional architecture will assure consideration of local transportation needs and problems. This approach also allows systems to be built and installed progressively to accommodate the real world of incremental funding. To ensure that systems from different agencies work together in a region, it is imperative to have an ITS architecture tailored to the region's specific needs.

Development of the Regional ITS Architecture for the Delaware Valley

Development of the Regional ITS Architecture for the Delaware Valley Region was a cooperative process involving approximately 35 stakeholders over a one year period. Stakeholders represented a wide range of agencies including departments of transportation, toll authorities, transit authorities, police and fire departments, transportation management associations (TMAs), county planning staffs, and information service providers. Under the guidance of the Delaware Valley Regional Planning Commission (DVRPC), the ITS Technical Task Force (TTF) followed the procedures outlined in the National ITS Architecture to develop an architecture meeting local needs. Over the course of this effort the National ITS Architecture has been updated by the United States Department of Transportation (US DOT), federal ITS regulations were promulgated, and several major ITS projects were implemented. Consequently, this document will be periodically updated to reflect changing federal mandates and refinements to the architecture as ITS projects advance into design. As ITS systems are deployed in the Delaware Valley, it is incumbent upon ITS implementors to adhere to

the concept of operations specified in the ITS Regional Architecture. ITS policy and institutional issues are addressed in companion documents produced as part of the overall study of institutional coordination of ITS in the Delaware Valley.

The user services and market packages described in this Executive Summary indicate the elements of the National ITS Architecture that local ITS stakeholders felt would best meet the region's needs.

User Services

User services form the basis for the National ITS Architecture development. They document what ITS should accomplish from the user's perspective. A broad range of users were considered, including the traveling public as well as many different types of system operators. The concept of user services allows system or project definition to begin by establishing the high level services that will be provided to address identified problems and needs.

The National ITS Architecture recognizes 31 user services as the basis for ITS architecture development. The development of the regional architecture provides for the screening of these user services to identify those that are applicable to the needs of the region. The identification of the priority user services establishes the set of subsystems to be considered. Locally, the screening process identified 14 high priority and 7 medium priority user services. The Regional ITS Architecture grouped a majority of the priority user services into four bundles as described below:

> *Travel and Traffic Management*: This user service bundle provides the capability to efficiently manage the movement of traffic on streets and highways and provide travelers with travel condition information prior to embarking on a trip or while the traveler is en-route. It includes the following user services: Traffic Control, Incident Management, Pre-Trip and En-Route Information, Traveler Information Services, and Basic Route Guidance.
>
> *Public Transportation Management*: This user service bundle automates a wide range of transit operational and administrative functions such as automatic vehicle location (AVL), planning and scheduling services, traveler information and public security. Specific user services include Public Transportation Management, En-Route Transit Information, and Public Travel Security.
>
> *Emergency Management:* This bundle focuses on notifying appropriate authorities about an

incident and insuring emergency vehicles respond in a timely manner. It incorporates Emergency Notification and Personal Security and Emergency Vehicle Management user services.

Electronic Payment: This bundle includes both stand alone and integrated electronic payment applications for tolls, transit fares and parking charges.

Subsystems

Subsystems are the primary structural components of the ITS physical architecture. There are 19 subsystems in the National ITS Architecture which are grouped into four classes: Centers, Roadside, Vehicles, and Travelers. They perform transportation functions such as collecting data from the roadside devices, performing route planning, etc. Functions that are likely to be collected together by agency or physical unit (e.g., PennDOT District 6-0 Traffic Control Center, Philadelphia Police Department) are grouped together into a subsystem. This grouping is done to optimize the overall expected performance of the resulting ITS deployments taking into consideration institutional issues, anticipated communication technologies, and performance. A simplified physical architecture for the Delaware Valley showing major stakeholders associated with each subsystem is displayed in Figure 1.

The Regional ITS Architecture will focus on the following subsystems:

Traffic Management: The Traffic Management Subsystem operates within a traffic management center or other fixed locations. This subsystem communicates with the Roadway Subsystem to monitor and manage traffic flow. It can also share information with other traffic management centers.

Transit Management: The Transit Management Subsystem manages transit vehicle fleets and coordinates with other modes and transportation services.

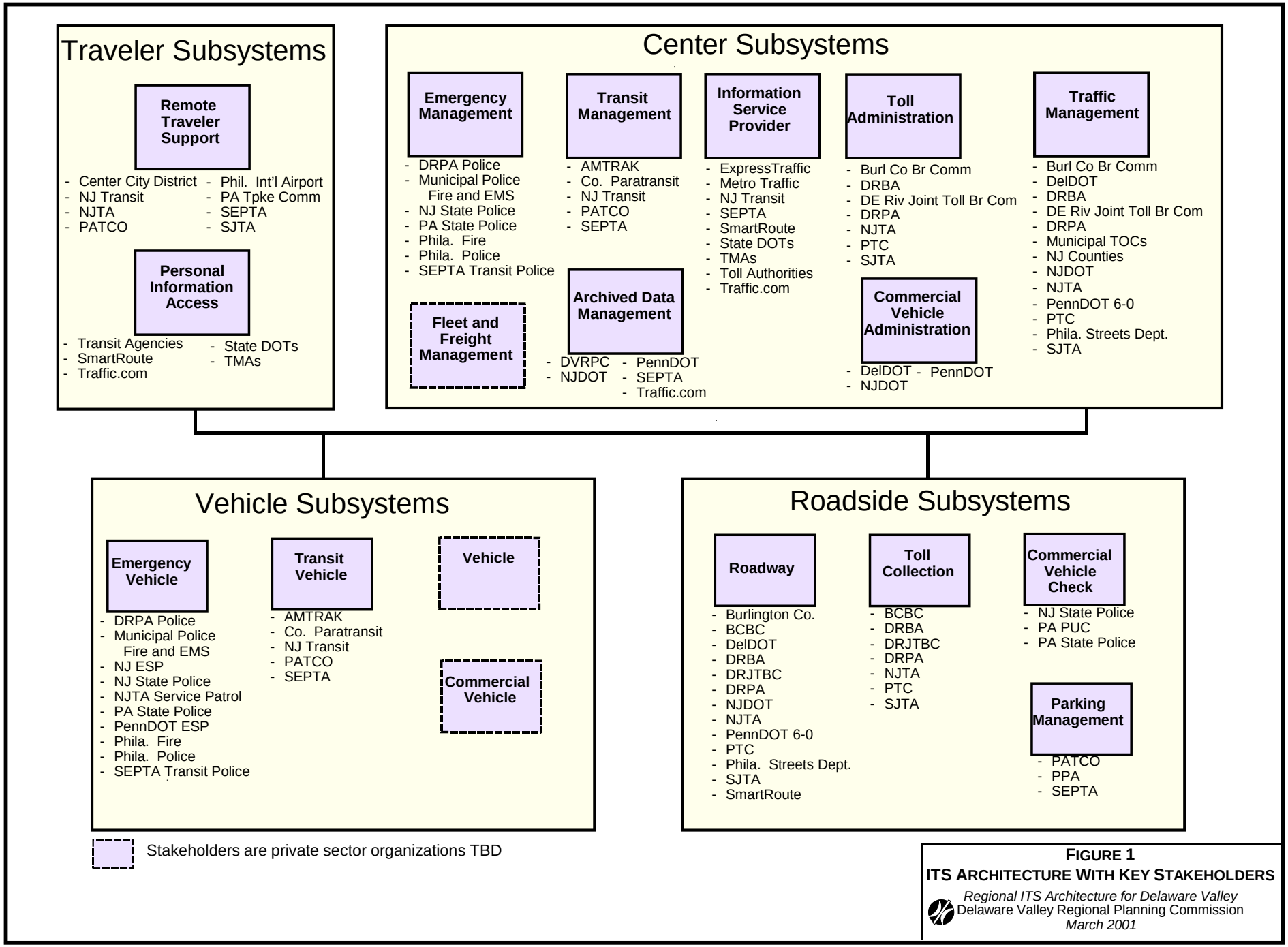


FIGURE 1
ITS ARCHITECTURE WITH KEY STAKEHOLDERS

Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Information Service Provider (ISP): This subsystem disseminates transportation information to system operators and the traveling public.

Toll Administration: The Toll Administration Subsystem provides general payment administration capabilities and supports the electronic transfer of authenticated funds from the customer to the transportation system operator.

Emergency Management: The Emergency Management Subsystem operates in various emergency centers supporting public safety including police and fire stations, and hazardous material (HAZMAT) response teams.

Roadway: This subsystem includes the equipment distributed on and along the roadway which monitors and controls traffic. Examples include closed circuit television cameras (CCTV), loop detectors, and variable message signs.

Remote Traveler Support / Personal Information Access: These subsystems include the equipment that is used by the traveler to gather information and access other personal information services prior to a trip and while en-route. They include kiosks, dynamic message boards, and the internet.

Even though private sector subsystems, such as Fleet and Freight Management, or Commercial Vehicle Check, are more suitably implemented at the state or national level, provisions have been made to incorporate them into the Regional ITS Architecture to insure interoperability.

Market Packages

Market packages provide an accessible, deployment oriented perspective to the ITS architecture. According to the National ITS Architecture, they are tailored to fit real world transportation problems and needs. Market packages collect together all the architecture flows between subsystems and other important external systems (terminators) that are required to implement a particular transportation service.

Some of the high priority market packages identified by the ITS Technical Task Force for the Regional ITS Architecture are listed below within their respective groupings:

Traffic Management

Network Surveillance: This is the most basic traffic management market package. It includes traffic detectors, CCTV, other surveillance equipment, and the supporting field equipment and communications apparatus to transmit the collected data back to the Traffic Management Subsystem.

Probe Surveillance: This market package provides an alternative approach for surveillance of the roadway network using probes to track vehicles. TRAMSMIT, a consortium in the New York City metropolitan area, uses E-ZPass probes to develop travel time profiles. Deviance from these profiles indicate congestion or a possible incident. A similar program may be effective in the Philadelphia region as E-ZPass becomes more widely used.

Surface Street Control: A wide range of urban traffic signal control systems is supported by this market package. It provides the central control and monitoring equipment, signal control equipment, and field-to-center communications that support local surface street control and/or arterial traffic management.

Freeway Control: In a similar manner to Surface Street Control, this package is consistent with typical urban traffic freeway control systems. It depends upon Network Surveillance to monitor traffic conditions. Freeway Control features supported include ramp metering, variable message signs, and interchange control for freeways. More advanced traffic management market packages build upon the infrastructure and control strategies supported by Freeway Control.

Traffic Information Dissemination: This market package facilitates dissemination of traffic information (i.e., delay and incident information) to drivers, transit agencies, emergency management agencies, and the media. It also includes variable message signs (VMS) and highway advisory radio (HAR).

Regional Traffic Control: Sharing of traffic information and operational control strategies among traffic management centers to support a regional control strategy is provided under this market package. For example, if a Delaware River bridge is closed due to an incident, this package will permit DRPA to contact both NJDOT and PennDOT to share information about detour routes and VMS postings. It also integrates Surface Street Control and Freeway

Control across jurisdictional boundaries. This is especially critical in Pennsylvania where traffic signal operations are a municipal responsibility and signal coordination among municipalities is a growing issue.

Incident Management System: When an incident occurs on a highway, this market package will permit an agency to detect and verify the incident and implement an appropriate response. It provides the Traffic Management Subsystem equipment that supports control center staff in developing an appropriate response in coordination with police and other incident response personnel. It is dependent upon the Network Surveillance, Freeway Control and Regional Traffic Control market packages for detection capabilities and for interfaces with other agencies.

Electronic Toll Collection: This market package provides toll operators with the ability to collect tolls electronically (i.e., E-ZPass) and to detect and process violators.

Road Weather Information System: During the winter, this package will allow NJDOT, PennDOT, and DRPA to monitor road and bridge conditions using data collected from environmental sensors or information from weather services. They can use the information to deploy crews to salt roads or remove snow. When appropriate, traveler alerts can be issued.

Standard Railroad Grade Crossing: This package manages traffic at highway-rail intersections using both traditional passive (i.e., the crossbuck sign) and active warning systems (i.e., flashing lights and gates).

Emergency Management

Emergency Response: This market package supports the emergency notification process and the coordination between emergency management agencies and other agencies who respond to incidents. This is very important to the Delaware Valley because of the multitude of municipal police departments, volunteer fire departments and emergency medical services in the region. When a major incident occurs on a highway it is not uncommon for multiple units to respond because of overlapping service areas and their location with respect to access to freeway entrance ramps.

Emergency Routing: This compliments the Emergency Response market package by allowing emergency management agencies to coordinate with traffic management centers in order to route the emergency vehicles based on real-time traffic conditions.

Mayday Support: This market package is divided into a public sector element and a private sector element. The former component predominately consists of emergency call boxes stationed along a road. The private sector element is an outgrowth of automobile manufacturers and cellular phone companies who are integrating automated distress signal capabilities in vehicles and cellular phones.

Traveler Information

Broadcast Traveler Information: This is the most basic form of traveler information where information such as traffic conditions, construction advisories, and general public transportation information, is disseminated over a wide area. This market package utilizes radio, television, and cable broadcasts to get travel information out to the public. There is no two-way interaction between the public and the information service provider (ISP).

Interactive Traveler Information: The next level in traveler information dissemination is tailored information in response to a traveler request. Information service providers are eventually expected to provide travelers with traffic information along their entire route of travel. The information can be received either before the trip has begun or en-route via phones, pagers, kiosks, or personal computers. The traveler can select their route based upon the travel condition information.

Autonomous Route Guidance: The next stage in traveler information is route guidance where the traveler is provided with step by step directions from one destination to another. Autonomous Route Guidance is the most basic route guidance market package. Under this package the user is supplied with directions based on a fixed map. Real time travel information is not available. More advanced route guidance packages, which were given a lower priority by the ITS Technical Task Force, incorporate real time travel information in determining the optimum route.

Transit Management

Transit Vehicle Tracking: SEPTA, NJ Transit and paratransit services can use this market package to monitor buses via an automatic vehicle location system to track the transit vehicle's real time schedule adherence and update the transit system's schedule in real-time. Through the use of other market packages the latest schedule information can be made available to the public.

Transit Fixed-route Operations: Using schedule adherence information from Transit Vehicle Tracking, this market package allows transit operators to perform automatic driver assignment, as well as dynamic vehicle routing and scheduling for fixed-route bus services.

Transit Passenger and Fare Management: This market package allows for electronic fare payments using either a stored value or credit card. On board sensors can process the transaction and keep the driver aware of passenger status. The information can also be transmitted back to a transit operations center so they can monitor passenger loadings.

Transit Security: The Transit Management Subsystem can use this market package to provide for the physical security of transit passengers both on board vehicles and in public areas (i.e. transit stops, park and ride lots, stations). It relies upon CCTV cameras, call boxes, panic buttons, and public address systems to perform surveillance and warn of potentially hazardous situations.

Transit Maintenance: Transit maintenance activities can be automated using on-board condition sensors to monitor the status of critical systems and to transmit the information to the Transit Management Subsystem. It also supports automatic maintenance scheduling and monitoring.

Transit Traveler Information: Provides transit users at transit stops and on transit vehicles with ready access to transit information, including transit stop announcements, imminent arrival signs, real-time transit schedule displays, and other information 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.

I. INTRODUCTION

The Transportation Equity Act for the 21st Century (TEA-21) directs the United States Department of Transportation (US DOT) to develop, implement and maintain a National ITS Architecture with supporting standards and protocols to promote the widespread use of ITS technology, ensuring interoperability and efficiency to the maximum extent practicable. The legislation further directs the US DOT to ensure that any ITS project using Highway Trust Funds conforms to the National ITS Architecture.

The National ITS Architecture, developed by US DOT in 1997, provides a common framework for planning, defining, and integrating intelligent transportation systems. It is not a system design nor is it a design concept. It defines the framework around which multiple design approaches can be developed, each one specifically tailored to meet the individual needs of the user while maintaining the benefits of a common architecture.

The National ITS Architecture defines: 1) the functions that must be performed to implement a given user service, 2) the physical entities or subsystems where these functions reside, and 3) the interfaces/information flows between the physical subsystems. In addition, it identifies and specifies requirements for standards needed to support national and regional interoperability.

To fulfill the congressional mandate of ITS conformity, the US DOT issued rules to foster integration of ITS. It requires: 1) development of a regional ITS architecture, 2) that specifications for ITS projects must incorporate national and/or regional architectural requirements and national ITS standards, and 3) that projects be monitored for compliance with the ITS regulations. In addition to the ITS regulations, it is expected that future revisions to the metropolitan planning regulations will insure ITS is one of the factors considered in the transportation planning process.

The Regional ITS Architecture for the Delaware Valley has been developed by interpreting the National ITS Architecture and adapting it to support integrated regional ITS solutions which are applicable to the stakeholders and the travelers of this region. It addresses the integration of ITS systems and components, the roles and responsibilities of a wide range of ITS stakeholders, the tailoring of ITS deployments and operations to local needs, the sharing of information between stakeholders, and the future expansion of ITS. The Regional ITS Architecture also identifies key

national ITS standards applicable to the local architecture. This document is targeted to professionals who require in-depth knowledge of the regional architecture for the Delaware Valley. Individuals who would like a broader understanding of ITS policy and issues are directed to other reports issued as part of the larger study of Institutional Coordination of ITS in the Delaware Valley.

Definition of Applicable Region

This Regional ITS Architecture is for the nine county metropolitan planning area covered by DVRPC: Chester, Delaware, Montgomery, and Philadelphia Counties in Pennsylvania, and Burlington, Camden, Gloucester, and Mercer Counties in New Jersey. Since a number of the participating stakeholders who developed the Regional ITS Architecture operate facilities extending outside the region, and an effort was made to involve stakeholders external to the region, many elements of the architecture have more widespread application than just the immediate DVRPC area.

Participating Agencies and Other Stakeholders

DVRPC has developed the Regional ITS Architecture for the Delaware Valley through a coordinated process with a wide array of stakeholders. This effort was guided by the Delaware Valley ITS Technical Task Force (TTF), a working group of approximately 36 stakeholders, which has met monthly since June 1998 to provide technical input to the development of the Regional ITS Architecture in accordance with guidance set forth in the National ITS Architecture. A listing of the members of the TTF can be found in Table 1. A policy level group, the ITS Coordinating Council, provided leadership to the TTF in several key areas. Supplementing the TTF were three focus group meetings targeted to specific special interest groups: information service providers (ISPs), emergency responders, and commercial vehicle operators. Because of the size and complexity of the region, it was impossible to have all stakeholders actively participating in the development of the Regional ITS Architecture. Cognizant of this situation, many non-participatory agencies have been directly referenced into the architecture. The appendixes of this document contain a complete listing of all the ITS stakeholders.

Layout of Regional Architecture

The Regional ITS Architecture contained in this document generally follows the physical

Table 1: Delaware Valley ITS Stakeholders

	TTF	CC		TTF	CC
AAA Mid Atlantic Region	✓		NJDOT Traffic Operations South	✓	✓
AMTRAK	✓	✓	New Jersey State Police	✓	✓
Burlington County	✓	✓	New Jersey Turnpike Authority	✓	✓
Burlington County Bridge Commission	✓		New Jersey Transit	✓	✓
Community Transit	✓	✓	PATCO	✓	✓
Chester County TMA	✓		PennDOT Central Office	✓	✓
Delaware County	✓	✓	PennDOT - District 6-0	✓	✓
Delaware River Joint Toll Bridge Commission	✓	✓	Penn State University Applied Research Laboratory	✓	
DelDOT		✓	Pennsylvania State Police	✓	✓
Delaware River Port Authority	✓	✓	Pennsylvania Turnpike Commission	✓	✓
Delaware Valley Regional Planning Commission	✓	✓	Philadelphia - Mayor's Office of Transportation	✓	✓
Drexel Univ. - Intelligent Infrastructure Institute	✓		Philadelphia Fire Department	✓	✓
FHWA - New Jersey	✓	✓	Philadelphia Parking Authority		✓
FHWA - Pennsylvania	✓	✓	Philadelphia Police Department	✓	✓
Gloucester County	✓	✓	Philadelphia Streets Department	✓	✓
Greater Valley Forge TMA	✓		SmartRoute Systems	✓	✓
Greater Mercer TMA	✓		SEPTA	✓	✓
Montgomery County	✓	✓	South Jersey Transportation Authority	✓	✓
NJDOT	✓	✓	TRANSCOM	✓	✓

architectural requirements of the National ITS Architecture: user services, subsystems, terminators, and market packages.

Elements of the Regional ITS Architecture are summarized below:

User Services: User services document what ITS should do from the user's perspective, whether it might be the traveling public or different types of system operators. The 31 user services identified in the National ITS Architecture were screened for their applicability to the Delaware Valley. The concept begins the system or project definition process by establishing the high level services that will be provided to address identified problems and needs. The user services chapter of the Regional ITS Architecture classifies user services into high, medium, and low regional priorities.

Subsystems: There are 19 subsystems in the National ITS Architecture which are grouped into four classes: Centers, Roadside, Vehicles, and Travelers. Examples of subsystems areTraffic Management, Toll Collection, Emergency Vehicles, and Remote Traveler Support. This chapter of the Regional ITS Architecture documents which subsystems are applicable to the region and the agencies or organizations that correspond to them.

Terminators: Terminators represent the people, systems, and general environment which interface with the Regional ITS Architecture. Essentially terminators define the boundary of the Regional ITS Architecture. All 73 terminators contained in the National ITS Architecture were screened for their applicability to the regional architecture. This chapter of the Regional ITS Architecture documents all relevant terminators and the local agencies or organizations that correspond to them.

Inventory of Existing and Planned ITS Resources: Locally, there has been a considerable investment of public and private resources into ITS. As one of the largest metropolitan areas in the county, with a multitude of transportation departments, transit agencies, and toll authorities, the breadth of ITS services deployed in the region is enormous. This chapter of the Regional ITS Architecture documents existing and planned deployments in the Delaware Valley.

Agency Roles and Responsibilities: The preceding sections of the Regional ITS Architecture concentrated on defining its various elements. For each element, applicable

local organizations were listed. In this chapter, the reverse approach is taken. For key agencies, their high level architectural requirements will be presented, showing institutional arrangements and existing and proposed architectural flows. Future refinements of the Regional ITS Architecture will analyze additional agencies in a similar manner.

Market Packages: The market packages identify the pieces of the physical architecture, such as subsystems, terminators and architectural flows which are required to implement a particular transportation service. They provide an accessible, deployment-oriented perspective to the Regional ITS Architecture. This chapter of the Regional ITS Architecture identifies those market packages that are considered high and medium regional priorities. Their descriptions have been altered by the TTF to reflect local needs and requirements.

National ITS Standards: ITS Standards are fundamental to the establishment of an open ITS environment. US DOT's ITS Joint Program Office is supporting an extensive standards development process in cooperation with a number of national organizations. This chapter of the Regional ITS Architecture identifies key standards which regional implementors must comply with.

Implementation Strategy: The Regional ITS Architecture presents a long-term vision of ITS needs and agency interactions. Most ITS projects will be advanced by individual agencies, others as regional initiatives. A sequence of projects required for implementation is listed. Philadelphia Regional Integrated Multi-modal Information Sharing (PRIMIS) is the cornerstone to foster information sharing and operational coordination among regional agencies. This chapter of the Regional ITS Architecture outlines initial concepts for PRIMIS's architectural requirements. As local agencies implement ITS projects and US DOT promulgates additional National ITS Architecture enhancements and standards, the Regional ITS Architecture will require continual updating. Therefore, this section also specifies procedures to update and refine the ITS Regional Architecture document.

II. USER SERVICES

User services are ITS components or activities that provide the benefits or services that a user of an ITS system might receive, describing what ITS should do from the user's perspective. A broad range of users are considered, including the traveling public as well as many different types of system operators. According to the National ITS Architecture, 31 user services, grouped into seven bundles or general categories, form the basis for ITS architecture development. Varying combinations of user services will be deployed to meet the diverse needs of different customers. The concept of user services allows system or project definition to begin by establishing the high level services to address identified problems and needs. No region's architecture will implement all 31 user services to the highest level of functionality and integration possible. User services act as a menu of ITS options that a specific region may choose to implement.

To determine which user services are appropriate for the Delaware Valley, members of the TTF were divided into groups where each of the user services were presented and discussed. The Task Force members were asked to rank each service as either a high, medium, or low priority in terms of its ability to meet the needs of the region. A composite priority rating was then derived from the breakout groups. In addition to these TTF groups, a series of focus group meetings were held to gather additional input from stakeholders who have a more specialized involvement with the region's transportation services. These special interest groups included: ISPs, emergency responders, and commercial vehicle operators. The participants of the focus groups are listed in Table 2. One of the objectives of these meetings was to determine their views about a particular user service's ability to meet the needs of the special interest groups. After the above exercise was completed, the National ITS Architecture added an additional user service: Information Management. The TTF determined this user service's priority separately. Table 3 presents the prioritized list of user services which includes input from the TTF and the focus groups.

To insure a consistent approach among the breakout and focus groups in evaluating user services, evaluation criteria was specifically developed to serve as a guide in the discussions. All groups were

TABLE 2: FOCUS GROUP PARTICIPANTS

Information Service Providers:

AAA Mid Atlantic

Express Traffic

SmartRoute

SEPTA

PennDOT District 6-0 - Public Affairs

COMCAST

Emergency Responders:

Chester County Emergency Services

Lower Pottsgrove Fire Department

Pennsylvania Department of Environmental Protection

Pennsylvania State Police

Upper Merion Fire Department

Commercial Vehicle Operators:

United Parcel Service

Pennsylvania Motor Truck Association

Roadway Express, Inc.

PennDOT Motor Carrier Division

Holt Cargo Systems

TABLE 3: USER SERVICE RANKINGS

User Service/ITS Function	Priority		
	High	**Medium**	**Low**
Travel and Traffic Management			
Pre-trip Travel Information	X		
En-route Driver Information	X		
Traffic Control	X		
Incident Management	X		
Highway-Rail Intersection	X		
Route Guidance		X	
Ride Matching and Reservation		X	
Traveler Services Information		X	
Travel Demand Management			X
Emissions Testing and Mitigation			X
Public Transportation Management			
Public Transportation Management	X		
En-Route Transit Information	X		
Public Travel Security	X		
Personalized Public Transit			X
Electronic Payment Services			
Electronic Payment Services	X		
Commercial Vehicle Operations			
Commercial Vehicle Electronic Clearance	X		
Automated Roadside Safety Inspection	X		
Hazardous Material Incident Response	X		
On-Board Safety Monitoring		X	
Commercial Vehicle Administrative Processes		X	
Commercial Fleet Management		X	
Emergency Management			
Emergency Notification and Personal Security	X		
Emergency Vehicle Management	X		
Advanced Vehicle Safety Systems			
Longitudinal Collision Avoidance			X
Lateral Collision Avoidance			X
Intersection Collision Avoidance			X
Vision Enhancement for Crash Avoidance			X
Safety Readiness			X
Pre-crash Restraint Deployment			X
Automated Vehicle Operation			X
Information Management			
Archived Data Function		X	

asked to consider the following questions when prioritizing the user services:

- Is the user service responsive to actual regional needs?
- Does the user service have wide-spread, or more limited application?
- Does the user service support or enhance existing projects or planned programs?
- Does maturity of technology and/or local expertise permit rapid deployment?
- Does the user service have political and institutional support?
- Is the user service appropriate to the DVRPC region or should it be implemented at a higher level?

User Services Descriptions

User service bundles represent a logical grouping of user services that provides a convenient way to discuss the range of requirements in a broad stakeholder area. There are six bundles: Travel and Transportation Management, Public Transportation Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle Safety Systems, and Information Management. The following section provides a detailed description of each of the user services based on descriptions contained in the National ITS Architecture. They are arranged by user service bundle and priority ranking within that bundle.

Travel and Traffic Management

Pre-trip Travel Information (High priority): Pre-trip travel information assists travelers in making mode choices, travel time estimates, and route decisions prior to trip departure. It consists of four major functions: 1) Available Services Information, which provides the latest information on transit routes, schedules, schedule adherence, and fares; 2) Current Situation Information, which includes real-time information on incidents, construction activity, event schedules, alternative routes, weather conditions, and speeds on specific routes; 3) Trip Planning Service, which has the capability to plan alternative tip itineraries based on location, destination, departure time, current and projected travel times, and user's preferences about mode and number of transfers; and 4) User Access, which provides capability to access information from home, work, major trip generation sites, and electronic media.

En-Route Driver Information (High priority): Once the trip has commenced, this user service provides vehicle drivers with information that allows alternative routes to be chosen for their destination. It consists of two major functions: 1) Driver Advisory, which has the capability

to provide travel options for avoiding congestion, including the availability of different modes; and 2) In-Vehicle Signing that augments existing signs, provides assistance to individuals needing local guidance in areas that the driver is unfamiliar with, and can be integrated with other ITS system capabilities.

Traffic Control (High priority): This service provides the capability to efficiently manage the movement of traffic on streets and highways. It consists of four functions: 1) Traffic Flow Optimization, which integrates signal system and control of freeways, optimizes signal timing for current and expected traffic demand, has ability to dissipate traffic congestion, and provides preferential treatment for transit vehicles; 2) Traffic Surveillance, which collects real-time traffic data from a number of sources and processes it for feedback to the traffic control center; 3) Control Function, which includes real-time adaptive control capability for traffic signals and dynamic control over ramp metering and VMS signs, supports other traffic control centers responding to incidents; and 4) Provide Information, which provides information to trip planning, route guidance, other ITS elements.

Incident Management (High priority): Incident Management User Service identifies incidents, formulates response actions, and supports ongoing coordination of those response actions. There are five major functions: 1) Identify Incidents, includes taking data from a wide variety of resources including traffic sensors, wether sensors, police, media, travelers, special event sponsors, and determine type, extent, severity, location and duration of the incident; 2) Formulate Response Actions, which includes dispatching emergency vehicles and maintenance vehicles, disseminating information to travelers, modifying signal timings, and rescheduling special events or maintenance activities; 3) Support Coordinated Implementation of Response Actions, which is the capability to select appropriate response procedures and communicate procedures to all responding agencies; 4) Support Initialization of Response to Actions, which allows maintenance of communication links with other agencies to disseminate incident status information, and provides status of all resources required to resolve the incident; and 5) Predict Hazardous Conditions, which permits determination of whether hazardous material are involved in the incident. Incident Management also supports special event activities.

Highway-Rail Intersection (High priority): This user service consists of two functions: 1) Provide Interface Between Highway and Rail Management, which is the capability of acquiring train schedules, determining highway-rail intersection closure times and duration,

providing closure data for in-vehicle traveler advisories, and interface with rail operations; and 2) Manage Traffic in the Intersection by augmenting standard highway traffic signal devices with intelligent intersection controllers, providing real time intersection traffic surveillance, and using roadside message devices to provide closure information and verify intersection status.

Route Guidance (Medium priority): Route Guidance will provide travelers with directions to selected destinations. It consists of the following four capabilities: 1) Provide Directions will give travelers directions based on current conditions through use of arrow displays or voice messages; 2) Static Mode, which will have the capability for two-way communications to receive traveler requests and to provide mapping information about roadways and scheduling information on transit; 3) Real-Time Mode, which will have enhanced capability over static mode to provide traffic condition information and dynamic transit schedule information; and 4) User Interface, which will give travelers the capability to access the system by utilizing interactive devices. Travelers will then be able to customize their route selection. Route selection processors can either be located on a vehicle or installed in the transportation system infrastructure

Ride Matching and Reservation (Medium priority): Ride Matching and Reservation will provide travel users with information on rideshare providers. It also include a billing service to the providers. Three major functions are provided: 1) Rider Request is the capability for a traveler to request a ride by placing a single request that includes information about date, time of pick-up, origin and destination; 2) Transportation Provider Services is the capability for providers (including taxis and vanpools) to have their billing arranged through a central clearinghouse, it includes the ability to generate needed reports and financial documentation; and 3) Information Processing, which consists of providing clearinghouse capabilities for rideshare financial transactions for all transportation modes. The Ride Request function will also have the capability to perform real-time ridematching of rider and driver.

Traveler Services Information (Medium priority): Traveler Services Information provides travelers with service and facility information either before or after embarking on a trip. This type of service provides "yellow pages" capability. The functions which are included in this user service are: 1) Information Receipt, which entails collection of information provided to travelers, providing and maintaining a database of local area services available to travelers, including condition, status, and availability of local traveler services; and 2) Information

Access, the capability for travelers to request and receive information about specific services in an area including: food, lodging, parking, tourist information, nearest gas station, and hospitals.

Travel Demand Management (Low priority): Travel Demand Management will support and facilitate the implementation of travel demand management programs, policies and regulations. It consists of two major functions: 1) Increase Efficiency of Transportation System, the capability to send and receive information needed to implement management and control strategies that respond to policies and regulations at parking facilities, transit centers, employment sites, or toll facilities, and 2) Provide Wide Variety of Mobility Option, to implement policies designed to address vehicle trip reduction, parking management, ridesharing, transit, and public awareness of travel alternatives.

Emissions Testing and Mitigation (Low priority): Emissions testing will provide state and local governments with the capability to enhance their air quality control strategies. It consists of: 1) Wide Area Pollution Monitoring, to assess ozone levels in all sectors of the region, determine those areas where emissions exceed standards, and provide air quality statistical data to the traffic management center; and 2) Roadside Pollution Assessment, which is capable of detecting moving vehicles whose emissions violate emissions standards and provide data on vehicle violations for enforcement.

Public Transportation Management

Public Transportation Management (High priority): Public Transportation Management provides transit operators the capability to automate the following transit operational and administrative functions: 1) Operation of Vehicles and Facilities is the capability for computer assisted control of vehicle operations, to receive and compare information with predetermined operating conditions; 2) Planning and Scheduling Services is the automation of planning and scheduling functions by collecting and storing real-time data and generating schedules based on run times, passenger loading and revenue information. This function also includes the ability to disseminate schedules to customer service systems, transportation centers, and kiosks; 3) Personnel Management, to facilitate management of drivers and maintenance personnel by automatically tracking vehicle miles for each vehicle, generating preventative maintenance schedules, and generating driver assignments based on seniority, driver preference, and qualifications; and 4) Communications Function, which consists of the

capability to establish two-way voice communication and two-way data communication between vehicles and a central facility.

En-Route Transit Information (High priority): En-Route Transit Information provides travelers with real-time transit and high-occupancy vehicle information allowing travel alternatives to be chosen once the traveler is en-route. It consists of three functions: 1) Information Distribution, the capability to furnish passengers with real time information, including information on transfers. Information at transit stops would include vehicle arrival notification and route information. Passengers on board a vehicle can access information through variable message signs or personal portable devices; 2) Information Receipt, the capability to update with real-time data the information used to generate En-Route Transit Information; and 3) Information Processing, to acquire transit operations information based on actual operating conditions, store and maintain data on-line.

Public Travel Security (High priority): This user service will create a safe public transportation environment. It encompasses all physical areas related to passenger use of public transit, including bus stops, train stations, park and ride areas, vehicle interiors, kiosks, and intermodal transfer locations. The following functions are included: 1) Security Sensors will be employed in all secure areas using sensor technology, including video and audio systems, to alert operators and police of potential incidents; 2) Personal Sensors Items, which will give transit passengers the capability to use electronic fare payment, reducing the need to carry cash; 3) Security Management and Control, which consists of the capability to receive alarm information and the ability to direct and control fleet to support enforcement, and generate coordinated, preplanned responses for incidents.

Personalized Public Transit (Low priority): Personalized Public Transit provides capability for the individual rider to request a trip, and for a transit agency to automate administrative functions. It consists of five functions: 1) a Rider Request, whereby an individual rider can request a trip by specifying trip origin, destination, time and date, and special equipment or handling requirements; 2) Vehicle Assignment, which is a real-time system for vehicle assignment based on vehicle availability, passenger information, and special needs; 3) Data Collection, the capability to use on-board sensors to monitor vehicle location, passenger loading, and fares with capability for real-time schedule adjustments; 4) Information Processing, used for route planning and driver assignments; and 5) Communications capability, for voice and data communications between vehicles and a central base.

Electronic Payment Services

Electronic Payment Services (High priority): Electronic Payment Services allow travelers to pay for transportation services by electronic means. Four functions are provided: 1) Electronic Toll Collection, the capability for vehicle operators to pay a toll without stopping, also provides transaction confirmation to the customer, identifies toll violators, and creates a single billing for commercial carriers; 2) Electronic Fare Collection, the capability to use a compatible fare medium for all applicable transportation services, the capability to implement variable and flexible fares, and the ability to collect the data required to determine accurate ridership levels; 3) Electronic Parking Payment, which permits parking without paying in cash, permits transit operators to charge both fare and parking costs at the same time, and provides the ability to vary parking fees; and 4) Electronic Payment Services Integration, which consists of the capability to combine electronic payments of various modes into a single integrated system, it also integrates the fare and toll pricing structures of multiple agencies.

Commercial Vehicle Operations

Commercial Vehicle Electronic Clearance (High priority): Commercial Vehicle Electronic Clearance is a voluntary program in which states can participate in. It is applicable to interstate and intrastate vehicles/carriers. The following functions are included: 1) Fixed Facilities, consisting of ports of entry, inspection stations, and weigh stations would have the capability for processing pull-in for safety inspection signals based on random or manually generated sampling; 2) a Vehicle System, which has the capability for each vehicle to establish two-way communications with the fixed facilities.

Automated Roadside Safety Inspection (High priority): Automated Roadside Safety Inspection system contains two features: 1) a Roadside Facility that automates roadside inspection tasks, including real-time on-line interactive access to vehicles' historical safety data, capability to receive identification data, including historical safety records, from each stopped vehicle, and the ability to notify enforcement personnel of deficient vehicles that need to be taken out of service; and 2) a Vehicle System, including sensors to check vehicle systems and driver condition, an on-board safety status monitoring system accessible from roadside, automated inspection capability to expedite and supplement the existing manual inspection process, and the capability to update vehicle safety records.

Hazardous Material Incident Response (High priority): Hazardous Materials Incident Response service provides real-time information on HAZMAT cargo and its condition to enforcement and emergency personnel. The following functions are provided: 1) HAZMAT Incident Notification the capability to provide enforcement and HAZMAT response teams with timely and accurate information on cargo contents, 2) Operation Focal Point the capability for dispatch center to determine response requirements and route information to predesignated responding agencies, and 3) Communications Function the capability to send distress signals to a focal point, who can the relay distress information to response units in real-time.

On-Board Safety Monitoring (Medium priority): On-Board Safety Monitoring provides monitoring and warnings of safety problems. A Fixed Facility provides the capability to receive and analyze data from approaching vehicles and the ability to automatically decide whether to allow a vehicle to pass or to require them to stop for inspection. It also will be able to notify a passing driver of any safety problems that have been identified. The Vehicle System provides the ability to collect, process, and supply information to roadside facilities on vehicle safety status, cargo safety status, driver safety status, and vehicle and driver identification while the vehicle maintains mainline speed. It is also capable of alerting the driver whenever there is a critical safety problem.

Commercial Vehicle Administrative Processes (Medium priority): The Commercial Vehicle Administrative Process provides an automated mechanism to electronically maintain vehicle credentials and to comply with vehicle reporting requirements. It consists of the following: 1) Electronic Purchase Of Credentials, including annual electronic credentials, temporary electronic credentials, multiple permits, electronic payment, and automatic processing of payments; 2) Automated Mileage and Fuel Reporting and Auditing, the capability to maintain electronic log and fuel purchase data and to create and audit tax reports; and 3) International Border Electronic Clearance, the ability to electronically clear drivers, vehicles, and cargo at international border crossings.

Commercial Fleet Management (Medium priority): Commercial Fleet Management function provides the capability for users to provide commercial drivers and dispatchers with real-time routing information in response to congestion or incidents. It also provides communications capability between vehicle drivers, dispatchers, and intermodal transportation providers.

Emergency Management

Emergency Notification and Personal Security (High priority): This user service consists of two functions that provide faster notification of travelers involved in an incident: 1) Driver and Personal Security, a manually initiated distress signal which provides a first-alert that an incident has occurred, and gives information on location, vehicle identification, breakdowns or whether medical services is required. It includes the capability for in-vehicle sensors to automatically detect vehicle problems. 2) Automated Collision Notification is an automatic collision notification function that sends information about extent of crash damage and vehicle location.

Emergency Vehicle Management (High priority): This user service has three components: 1) an Emergency Vehicle Fleet Management System, to maintain the availability status of emergency vehicles, determine the emergency response vehicles best suited to respond, and dispatch the appropriate emergency vehicles; 2) a Route Guidance System, to maintain real-time information on traffic conditions, emergency response vehicle locations, emergency response vehicle destinations, and to advise emergency response vehicles of appropriate routes; and 3) a Signal Priority System, to maintain real-time information on signal timing, emergency vehicle locations and emergency vehicle routing, and determine signal timing preemption for relevant signals.

Advanced Vehicle Safety Systems

Longitudinal Collision Avoidance (Low priority): Longitudinal Collision Avoidance Service provides information to motorists on how to safely maintain a vehicle in the traffic flow. It contains three subservices: 1) a Rear-End Subservice, to determine actions necessary to maintain the vehicle at a safe distance behind a lead vehicle; 2) a Backing Subservice, to notify driver of potentially hazardous situations and inform the driver of the need for immediate collision avoidance; and 3) a Head-On Passing Subservice, to notify the driver of the presence of a potentially hazardous situation.

Lateral Collision Avoidance (Low priority): Lateral Collision Avoidance Service provides information to motorists on how to safely change lanes and maintain a vehicle on the highway. It contains a Lane Change/Merge Subservice and a Single Vehicle Roadway Departure Subservice.

Intersection Collision Avoidance (Low priority): Intersection Crash Collision Avoidance Service notifies the driver of the presence of a potentially hazardous situation and the need for immediate collision action.

Vision Enhancement for Crash Avoidance (Low priority): Vision Enhancement for Crash Avoidance Service enhances the motorists ability to avoid a hazardous situation when visibility is poor.

Safety Readiness (Low priority): There are three subservices to ensure that driver and vehicle are in safe operating condition. A Driver Monitor Subservice determines driver's readiness to operate a vehicle, notifies the driver of the need to take corrective action, and safely stops the vehicle if the driver is unable to operate the vehicle safely. Vehicle Condition Subservice determines the condition of critical vehicle components and notifies the driver of the need to take corrective action. Finally, an Infrastructure Condition Subservice determines unsafe roadway conditions and notifies the driver of the need to take corrective action.

Pre-Crash Restraint Deployment (Low priority): Through an Automatic Activation System, the Pre-Crash Restraint Deployment will detect an impending collision with a moving or stationary object prior to a crash impact and initiate deployment of restraint devices to reduce injury severity.

Automated Vehicle Operation (Low priority): Automated Vehicle Operation includes an Automated Highway System (AHS) and a transitional Partially Automated Highway System. The former will have the capability to automatically control vehicles, including determining the condition, location, and motion of each vehicle on the automated lanes. It will be able to safely control access and egress from the AHS. The latter system will utilize capabilities of collision avoidance systems, driver alertness systems, and other systems to assist in managing vehicles in situations other than in full automatic operation.

Information Management

Archived Data Function (Medium priority): The Archived Data user service provides the Historical Data Archive Repositories and controls the archiving functionality for all ITS data. It performs five functions: 1) Operational Data Control, which manages operations data integrity; 2) Data Import and Verification, which acquires historical data from the Operational Data Control function; 3) Automatic Data Historical Archive, which permanently archives the data; 4) Data Warehouse Distribution, which integrates the planning, safety, operations, and research communities into ITS and processes data products for these communities; and 5) ITS Community Interface, which provides the ITS common interface to all ITS users for data products specification and retrieval.

III. ITS SUBSYSTEMS

Subsystems are the primary structural components of the ITS physical architecture. They perform transportation functions such as collecting data from the roadside and performing route planning. All of these functions are defined in the logical architecture as process specifications. Processes that are likely to be collected together under one agency, jurisdiction, or physical unit are grouped together into a subsystem. In the National ITS Architecture, ITS subsystems are grouped into four classes: Centers, Roadside, Vehicles, and Travelers. Within the four representative classes, there are nineteen total subsystems.

For the purposes of the Regional ITS Architecture, this chapter describes the function and elements of each subsystem and those components currently in place, or planned, for the greater Philadelphia region. Emphasis is given to center subsystems which are operated by various ITS stakeholders. Detailed agency level information on existing and planned ITS deployments related to roadside and traveler subsystems is given in Chapter V. A complete listing of all the subsystems is contained in Appendix A, ITS Subsystem Inventory. Appendix C lists the ITS stakeholders in the region with a composite listing of their respective subsystems. For those subsystems where implementation is a function of national or statewide initiatives, or is the responsibility of the private sector, appropriate links have been placed in the Regional ITS Architecture to permit an interface. Flexibility is provided in the architecture to take advantage of evolving private sector initiatives in the areas of traveler services and vehicle technology by providing hooks for a wide range of ITS capabilities that will become readily available over the next10-20 years.

Center Subsystems

The center subsystems provide management, administration, and support functions for the transportation system. They communicate with each other, enabling coordination between modes and across jurisdictions within the region. In addition, they communicate with roadside and vehicle subsystems to gather and provide information, with control coordinated by the center subsystems. Within the Philadelphia region the following center subsystems have been incorporated into the regional architecture: Traffic Management, Transit Management, Information Service Providers, Toll Administration, Emergency Management, and Archived Data Management. Two additional subsystems, Commercial Vehicle Administration and Fleet and Freight Management, have not been

formally incorporated into the regional architecture because their implementation responsibility lies either at the state level or with private sector. Emissions Management was not considered a high priority and will not be addressed in the regional architecture.

Traffic Management

The Traffic Management Subsystem operates within a traffic management center. This subsystem communicates with the Roadway Subsystem to monitor and manage traffic flow. Incidents are detected and verified and incident information is provided to the Emergency Management Subsystem, travelers, and to third party ISPs. The subsystem monitors maintenance work and disseminates maintenance work schedules and road closures. The Traffic Management Subsystem also communicates with other Traffic Management Subsystems in the region to coordinate traffic information and control strategies.

Architecture flows for the Traffic Management Subsystem is documented in Figure 2, which is an adaptation from the National ITS Architecture and modified to reflect regional needs. Architecture flows between the Roadway and Traffic Management Subsystems enables the monitoring of expressways and arterials through detectors, CCTV, or vehicle probes; implementation of traveler information via variable message signs or highway advisory radio; and centralized traffic signal operations. Information on traffic conditions and incidents can be disseminated to the media, Transit Management Subsystems, and Information Service Providers. The architecture also provides for extensive communication with emergency management, traffic operations, and maintenance personnel to manage incidents. Given the numerous organizations with traffic management responsibilities within the region, information coordination among operators is a critical architecture flow. Agency level Traffic Management Subsystem diagrams, which have been modified to reflect the needs of key highway agencies, is presented in Chapter VI of this document. A summary of all the Traffic Management Subsystems in the region is presented in Appendix A.

There was considerable debate by the TTF over whether traffic signal preemption capability for emergency vehicles or transit signals should be incorporated into the Regional ITS Architecture. Since this debate was not fully settled, preemption capability was incorporated into the architecture pending development of criteria for its use. Similarly, there was no consensus on using data probes; however, given the number of toll facilities and implementation of E-Z Pass, probe capabilities were also retained in the architecture. Highway rail intersections were identified by

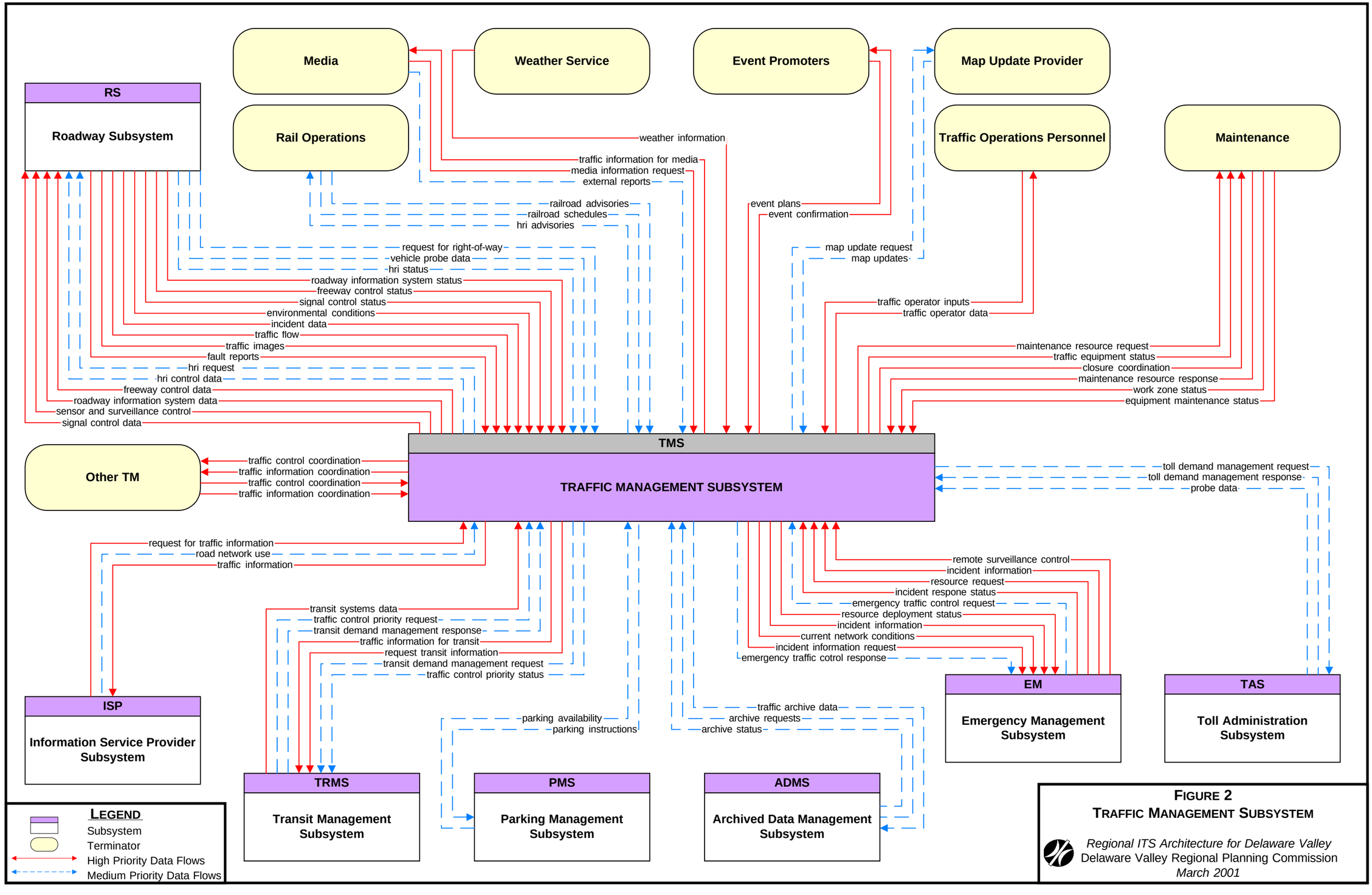


FIGURE 2
TRAFFIC MANAGEMENT SUBSYSTEM

Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

the TTF as a concern, therefore the architecture reflects information flows between Traffic Management Subsystems and roadside equipment and rail operations. Information sharing with Parking Management could be useful under special circumstances such as at the sports complex or at Philadelphia International Airport, and therefore has also been retained.

The following have been identified in the Regional ITS Architecture as operating or planned Traffic Management Subsystems:

Burlington County Bridge Commission (future): At both the Burlington-Bristol and Tacony-Palmyra Bridges, traffic control operations are monitored by the Commission's police department. Currently there are two portable variable message signs. The CCTV cameras are focused exclusively on the toll booths. There are tentative plans to install permanent variable message signs and CCTVs to monitor traffic. Therefore, for the purposes of the Regional ITS Architecture, a fully functioning traffic operations center (TOC) will be assumed.

Burlington County Traffic Operations Center (existing): A traffic operations center, located at the Burlington County Engineer's Office in Mount Laurel, manages closed loop traffic signal systems on county-owned roads.

Delaware Department of Transportation Traffic Management Center (existing): DelDOT's ITS programs includes CCTV cameras, VMS and HAR devices, closed loop traffic signal systems, motorist call boxes, a special cellular phone number for incident reporting, and programs to foster intermodal coordination. They are targeting implementation to a critical network, consisting of 250 miles of roads in New Castle, Kent and Sussex Counties. Construction will begin in FY 2001 on a new statewide traffic management system that will integrate the various elements of Delaware's ITS program. DelDOT also performs many ITS functions for the Delaware Turnpike Administration.

Delaware River and Bay Authority Centralized Operations Center (existing): DRBA operates the Delaware Memorial Bridge (I-295), providing a transportation link between Delaware and New Jersey. Bridge operations are centered in the Julia Center on the New Castle County side of the dual bridges. Traffic control operations are currently monitored by the DRBA's police department. A centralized operations center will control lane closures on both spans and monitor traffic flow utilizing CCTV camera systems on both bridges and

on approach roadways.

Delaware River Joint Toll Bridge Commission (future): Seven toll bridges and eleven non-toll facilities come under its jurisdiction. They extend from US 1 by Trenton to I-80 by the Delaware Water Gap. Current plans call for implementation of roadway surveillance and information dissemination on the toll facilities and eventually on the non-toll facilities. There are no current plans to establish a formal traffic operations center. However, for the purposes of the Regional ITS Architecture, a fully functioning TOC is assumed.

Delaware River Port Authority (existing): The sole focus of DRPA's highway operations is its four bridges and their approach roads. Through agreements with PennDOT and NJDOT, DRPA's patrol coverage, in some instances, extends up to 2-3 miles past the actual bridge along its approach roads. At each bridge, the primary responsibility for traffic and incident management lies with the DRPA Police Lieutenant responsible for that specific bridge. When the Lieutenant is not present a shift supervisor (normally a Sergeant) oversees police operations. All other bridge operations, including toll collection and maintenance, are the responsibility of the bridge manager.

Currently, each bridge has its own radio room, which acts as the focal point of communications. During slow periods (at night or off-peak weekends) radio rooms at the Commodore Barry and Betsy Ross bridges are closed with responsibilities assigned to the Walt Whitman and Ben Franklin bridges respectively. The Lieutenant or shift supervisor determines if an incident will affect other agencies and whether they need to be notified. While DRPA has an I-95 Information Exchange Network (IEN) work station that is centrally located at the Ben Franklin Bridge, it more commonly relies upon TRANSCOM, who is on the Delaware Valley Highway Operations Group's (DVHOG) fax list, to notify the traffic reporting services and the I-95 IEN.

Planning for a central operations center has just been initiated; the new centralized control center is intended to allow DRPA to increase their external coordination. Which responsibilities will reside at the bridges and which will be assigned to the operations center has not been decided at this time. For the purposes of this architecture the following assumptions were made: 1) all traffic surveillance and monitoring will be conducted at the operations center, 2) the operations center will be responsible for coordination with other traffic management centers and the initial notification to emergency management centers, 3)

traffic operators within the center will notify a police dispatcher in the center of all incidents, and 4) the police dispatcher will coordinate emergency management response with the individual bridge police and with external police/fire departments.

Municipal traffic operation centers (future): In Pennsylvania, traffic signals are owned and operated by the municipalities with little or no coordination across municipal boundaries. Neither PennDOT nor the counties (with few exceptions) operate traffic signals. With many municipalities in Pennsylvania planning or constructing closed loop traffic signal systems, the number of systems and extent of coverage is expected to grow as outdated traffic signal equipment is replaced. Placement of the central computer and the agency responsibility for its operations varies by municipality. For the purposes of the Regional ITS Architecture, it is assumed that most, if not all, of the closed loop systems will eventually be tied into the regional architecture. Special attention should be accorded to those municipalities abutting key regional highways. A listing of these municipalities, and the highways they border, is presented in Appendix E.

New Jersey county traffic operation centers (future): In New Jersey, traffic signals on key arterials are generally owned and operated by either NJDOT or the counties. The primary exception is Camden County where the signals are operated by the municipalities. This subsystem represents the traffic operations centers that will eventually become operative in each county (Burlington County already has a centralized traffic operations center which is listed separately in this section).

New Jersey Department Of Transportation Traffic Operations South (existing): NJDOT operates two traffic operation centers, one covering North Jersey, and one covering South Jersey. New Jersey Traffic Operations South, located in Mount Laurel, is responsible for traffic operations on major freeways and state roads in the New Jersey portion of the Delaware Valley region including I-76, I-295, NJ 42, NJ 70 and NJ 73. Its coverage also extends to most of the southern New Jersey shore areas where traffic congestion becomes a critical concern during summer weekends. Since the TOC covers an extensive area, 10 counties, they generally rely upon NJDOT maintenance personnel and state and local police for incident notification. NJDOT currently has limited traffic monitoring capabilities. It employs a number of permanent and transportable VMS signs. Its, Multi-Arterial Traffic System (MATS) is an expanding network of closed loop systems on state highways. A New Jersey State Police officer is assigned to the TOC is to facilitate incident management

coordination. A representative of SmartRoute Systems Inc. is also located there to facilitate dissemination of traffic condition information. Emergency service patrols (ESP) are used on the freeway system to address minor problems such vehicle breakdowns. For the most serious incidents, NJDOT supplements its maintenance crews with an Incident Management Response Team (IMRT). Their primary focus is the maintenance of traffic, which includes acting as a liaison with the incident commander, keeping the TOC up to date and insuring that the proper resources are available to clean up the accident site.

New Jersey Turnpike Authority Traffic Operations Center (existing): This traffic operations center is located at the Turnpike Authority's Administration Building by Exit 9 in New Brunswick. The centerpiece of the operations center is their Automatic Traffic Surveillance and Control System which receives data from CCTV cameras and approximately 1000 sensors along the length of the Turnpike. The majority of the surveillance equipment is located outside the Delaware Valley region. The system also controls dynamic speed limit signs, VMS signs, HAR devices, and lane usage controls in the dual-dual sections of roadway in North Jersey. Fiber optic cable has been installed along the entire length of the turnpike, which eventually will facilitate an expansion of ITS services. Incident management is performed in conjunction with Troop D of the New Jersey State Police.

Pennsylvania Department Of Transportation District 6-0 Traffic Control Center (existing): PennDOT's TCC focuses almost exclusively on the Interstate and expressway systems and immediately adjoining highways. Currently only portions of I-95, I-476 and I-676 are monitored; coverage will shortly expand to include sections of I-76, US 202, US 422, PA 63 and PA 309. Incident detection is largely limited to monitoring CCTV cameras and scanning municipal police and state police radio bands. The utilization of detectors is expected to become more prevalent with the upcoming projects. Traffic.com, with their extensive network of detectors, will shortly become a supplemental source of information to PennDOT. SmartRoute Systems Inc.is under contract with PennDOT to disseminate traveler information to the public. As part of this arrangement, they receive live feeds from PennDOT CCTV cameras. Video feeds from I-95 CCTVs are also shared with the Philadelphia Police Department Radio Room. A similar arrangement for cameras on I-476 has been made with the Pennsylvania State Police; however, due to operational issues they are not routinely used. Travel information can be disseminated through VMS signs and HAR devices. District 6-0 is a participating member of the I-95 Corridor Coalition's IEN network and the DVHOG's fax list.

Pennsylvania Turnpike Commission Communication Center (existing): Their communications center in Harrisburg serves as the statewide focal point of communications with police, maintenance and toll booth personnel for the entire turnpike including the Northeast Extension. All ITS field equipment including CCTV, HAR, VMS, weather sensors, and emergency call boxes are routed to the communications center. A proposed centralized computer control system will be capable of controlling these devices. A proposed incident management system will utilize traffic flow data to identify possible incidents and more effectively coordinate maintenance activities. The center also has a I-95 IEN work station. The center's staff, composed of non-police personnel, are charged with the task of dispatching the appropriate resources to respond to an incident and manage traffic conditions. The Eastern Regional Office, located in Upper Merion Township on Flint Hill Road, has the capability to function as a back-up communications center. A new operations center is currently under construction in Harrisburg.

City of Philadelphia Streets Department (existing): The Traffic Engineering Division of the Streets Department is constructing a control center largely to operate their closed loop traffic signal systems. The city has 2,800 signalized intersections. Due to its main emphasis on the traffic signal system, the operations center will not be as comprehensive, nor constantly staffed, like the other traffic management systems.

South Jersey Transportation Authority (existing): The SJTA currently operates a State Police communications center in Hammonton that is responsible for traffic and incident management on the Atlantic City Expressway. With the opening of the Brigantine Connector in 2001, the SJTA will open a second operations center specifically overseeing the tunnel. A joint traffic operations center housing SJTA, New Jersey State Police, NJDOT, New Jersey Highway Authority (Garden State Parkway) and the Atlantic City Police Department for the Atlantic City area is a long-range possibility.

Towamencin Township Traffic Operations Center (future): The center to be located in the Towamencin Transportation Center, will house the central computers and personnel to initially operate a multi-municipality closed-loop traffic signal system, incident management system, and emergency service management system. Full implementation of the Transportation Center will include electronic bus and parking fare collection, paratransit and demand-responsive dispatching of shuttle services between the Transportation Center and area employers, and traveler information services.

Transit Management

The Transit Management Subsystem manages transit vehicle fleets and coordinates with other modes and transportation services. It provides operations, maintenance, customer information, planning and management functions for a transit organization. It spans distinct central dispatch and garage management systems. The subsystem's interfaces allow for communication between transit agencies and with other operating entities such as emergency response services and traffic management systems. This subsystem receives real-time incident data from the Traffic Management Subsystem. It provides current transit operations data to other center subsystems. The Transit Management Subsystem collects and stores accurate ridership information, operational and maintenance data from transit vehicles, manages vehicle service histories, and assigns drivers and maintenance personnel to vehicles and routes.

The Transit Management Subsystem also provides the capability for automated planning and scheduling of public transit operations. It furnishes travelers with real-time travel information, continuously updated schedules, schedule adherence information, transfer options, and transit routes and fares. In addition, the monitoring of key transit locations with both video and audio systems is provided with automatic alerting of operators and police of potential incidents, including support for traveler activated alarms.

The Transit Management Subsystem Diagram, Figure 3, is an adaptation from the National Architecture and has been modified accordingly to satisfy the region's needs. Agency level diagrams for SEPTA and PATCO, customized to their specific needs, are presented in Chapter VI.

Transit Management Subsystems specific to the region are as follows:

> *Amtrak Centralized Traffic Electrical Control (existing)*: Amtrak's Northeast Corridor and Harrisburg lines pass through the Philadelphia metropolitan area. Commuter rail services operated by SEPTA and New Jersey Transit operate on rights-of-way owned by Amtrak. Amtrak's Centralized Traffic Electrical Control (CTEC), located at 30th Street Station, is responsible for managing both Amtrak and SEPTA rail operations using the lines between Washington and Trenton, and between Philadelphia and Harrisburg. Besides Philadelphia, there are two other regional CTEC operations centers, one in New York City and the other in Boston. The national CTEC operations center is located in Wilmington.

Media

Weather Service

Enforcement Agency

Map Update Provider

Transit Systems Operators

TRVS

Transit Vehicle Subsystem

EM

Emergency Management Subsystem

Transit Maintenance Personnel

Transit Fleet Manager

weather information

transit incidents for media

media information request

transit information for media

violation notification

map updates

map update request

transit emergency coordination data

transit emergency data

emergency notification

fare and payment status

transit vehicle passenger and use data

request for bad tag list

transit vehicle schedule performance

transit vehicle conditions

transit traveler request

transit vehicle location data

bad tag list

driver instructions

emergency acknowledgment

fare management information

request for vehicle measures

transit schedule information

transit traveler information

maintenance status

transit work schedule

transit fleet manager inputs

transit operations planning data

transit operator management data

transit operator display

payment request

transaction status

TRMS

TRANSIT MANAGEMENT SUBSYSTEM

Other TRMS

transit management systems coordination

transit management systems coordination

Financial Institution

Transit Driver

selected routes

transit information request

transit and fare schedules

transit incident information

transit driver availability

route assignment

traffic control priority status

transit demand management request

request transit information

traffic information for transit

transit demand management response

traffic control priority request

transit systems data

emergency acknowledge

secure area monitoring support

transit fare payment responses

transit traveler information

emergency notification

secure area surveillance data

transit fare payment requests

transit information user request

transit parking lot response

transit parking coordination

PMS

Parking Management Subsystem

TMS

Traffic Management Subsystem

ISP

Information Service Provider Subsystem

RTS

Remote Traveler Support Subsystem

transit information user request

personal transit information

transit archive data

archive requests

archive status

PIAS

Personal Information Access Subsystem

ADMS

Archived Data Management Subsystem

LEGEND

Subsystem

Terminator

High Priority Data Flows

Medium Priority Data Flows

FIGURE 3

TRANSIT MANAGEMENT SUBSYSTEM

Regional ITS Architecture for Delaware Valley

Delaware Valley Regional Planning Commission

March 2001

County Paratransit Operations (existing): In Pennsylvania paratransit services are offered by SEPTA either with their own personnel or by contract with outside transportation service providers. In Philadelphia, paratransit service is operated by SEPTA's own Customized Community Transportation (CCT); in Bucks, Delaware and Montgomery Counties by King Paratransit, and in Chester County by Krapf. In the city of Philadelphia, reservations can be made directly with SEPTA, and in the suburban counties either with SEPTA or directly with the private carriers. In New Jersey, paratransit services are offered by each county, each with their own eligibility restrictions based on age, trip purpose, and coverage area. Burlington County paratransit services are operated by Burlington County Transportation Systems (BCTS). The service is contracted out with Laidlaw, while BCTS oversees all operations. Three municipalities: Mt. Laurel, Willingboro, and Marlton, provide their own paratransit service in cooperation with BCTS. In Camden County, Camden County Han-Sen Transit handles all dispatching and transit services themselves. Mercer County paratransit is provided by the Transportation Resources to Aide the Disadvantaged and Elderly (TRADE).

New Jersey Transit Southern Division (existing): New Jersey Transit operates 178 bus routes and 12 rail lines statewide. Operationally, the state is divided into two divisions. The Southern Division is headquartered in at the Newton Garage in Camden. All dispatching for the Southern Division occurs there. The other principal garages in South Jersey include Hamilton, Turnersville, and Egg Harbor Township.

PATCO Central Tower (existing): PATCO maintains and operates a 14.2 mile rail line operating between Lindenwold and Center City. The Hi-Speedline has a total of 13 stations, 9 of which are in New Jersey and 4 are in Philadelphia. All of PATCO's operations are directed from the Central Tower operation center. Dispatchers monitor rail operations and have total authority over the entire line which may include rerouting trains or controlling the power sources. Personnel in Center Tower are also responsible for dispatching maintenance crews, PATCO Police officers, and handling passenger fare issues. Communication along the rail line is conducted via radio and all radio messages go through Central Tower.

Southeastern Pennsylvania Transit Authority Operations Center (existing): SEPTA is in the process of consolidating all command functions for its various operation divisions under one roof. The main operating divisions include Regional Rail Operations, City Bus and Rail Operations, and Suburban Bus and Rail Operations. Also located in the operations center are SEPTA Transit Police dispatchers. As the center becomes fully operational over the next

3-4 years, power dispatchers and SEPTA press officers will also be co-located there. SEPTA's operation center primarily functions as a command/control point. Operations center staff have the ability to monitor the transit system and reroute trains and buses as required. When an incident occurs, they notify a line or street supervisor (for rail or buses respectively), who then becomes responsible for investigating and managing the situation.

Information Service Providers (ISP)

This subsystem collects, processes, stores, and disseminates transportation information to system operators and the traveling public. The Information Service Provider Subsystem can play several different roles in an integrated Intelligent Transportation System. In one role, the ISP provides a general data warehousing function, collecting information from transportation system operators and redistributing this information to other system operators in the region and other ISPs. In this information redistribution role, the ISP provides a bridge between the various transportation systems that produce the information and the other ISPs and their subscribers that use the information.

Architecture flows for the Information Service Provider Subsystem is documented in Figure 4, which is an adaption from the National ITS Architecture and modified to reflect regional needs. The previously described first role of ISPs is evident within the Regional ITS Architecture based on the number of architecture flows between the ISP Subsystem and various other subsystems such as Transit Management, Traffic Management, and Emergency Management. The ISP is continually gathering transit, traffic and/or incident information. ISPs also gather information from Weather Services, Multimodal Transportation Service Providers and other ISPs. Locally, many Transit Management Subsystems double as ISPs, disseminating the information they collect directly to the public. A complete listing of all the ISPs is contained in Appendix A.

Once the travel information has been collected, the second role of an ISP is focused on delivery of traveler information to subscribers and the public at large. Information provided includes basic advisories, real time traffic conditions and transit schedule information, yellow pages information, ride matching information, and parking information. The subsystem also provides the capability to provide specific directions to travelers by receiving origin and destination requests from travelers, generating route plans, and returning the calculated plans to the users.

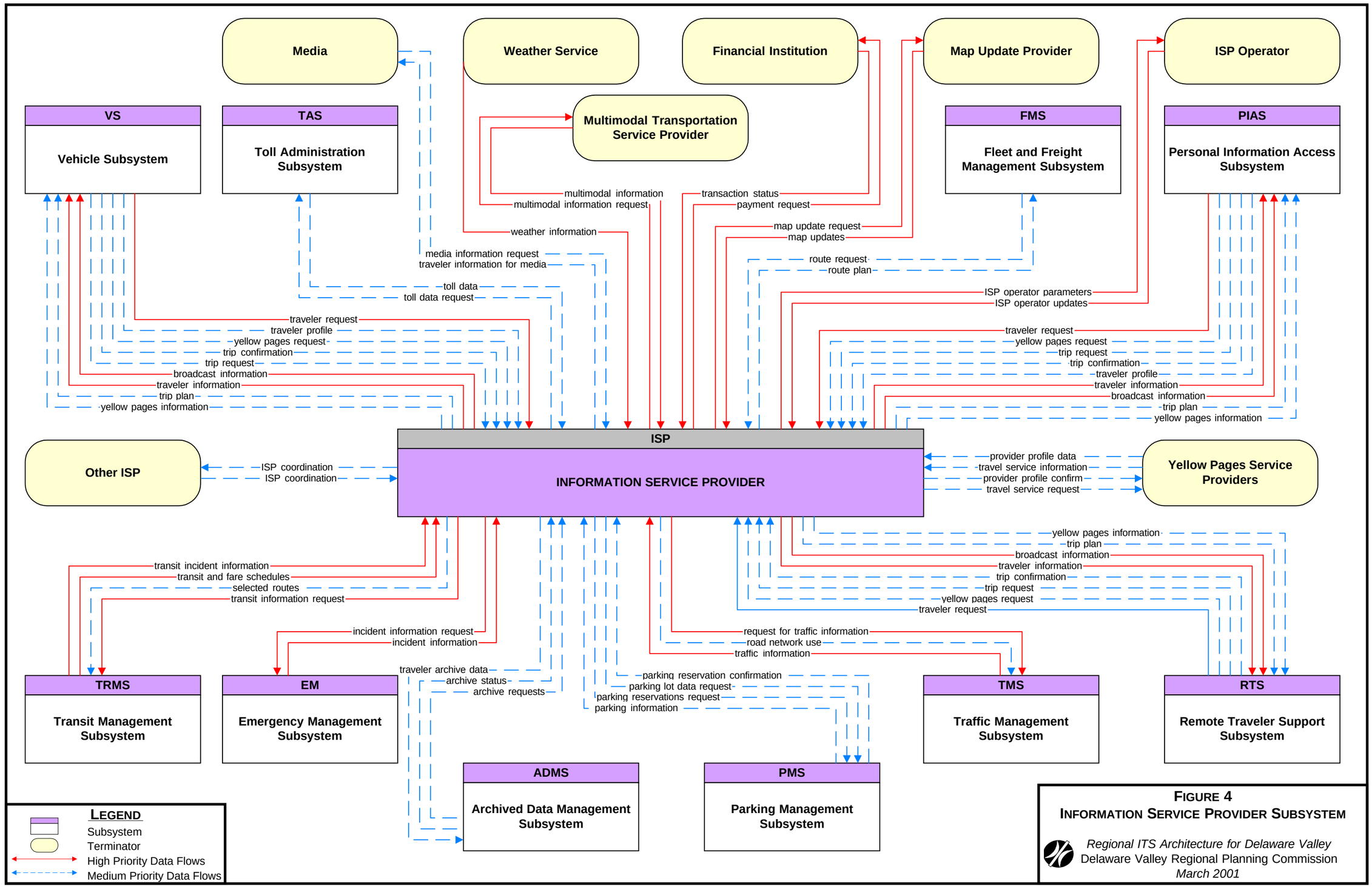


FIGURE 4
INFORMATION SERVICE PROVIDER SUBSYSTEM

Direct communication to the traveler is provided through architecture flows between the ISP Subsystem and the Personal Information Access, Remote Traveler Support and, Vehicle Subsystems. Both basic one-way (broadcast) and personalized two-way information provision is supported. Travel information, trip request and trip plans may be distributed to the traveler from the ISP via, the Internet, telephone, pagers, kiosks and/or other advanced communication technology.

In more advanced ISP applications, reservation services are also provided within the architecture. Communication between the ISP and a Yellow Pages Service Provider will allow for travelers to access information or make reservations at various restaurants, hotels and other services within the region.

Several of the national market packages provide the ISP with route planning capabilities. One specific application to emergency vehicles was rejected by the ITS Technical Task. Other applications, for example with commercial vehicles, may prove viable and useful. Therefore, the architecture flows between ISP and Fleet and Freight Management Subsystems has been retained for this purpose.

Listed below are examples of Information Service Provider Subsystems specific to the region. Almost half of the ISPs are Transportation Management Associations (TMAs) that were originally established as local transportation advocates. In that role, they are important intermediaries between the operating agencies and the local business communities.

> *Amtrak (existing)*: Amtrak provides travel information support both within their stations and external to their properties. Information is available at 30th Street Station via a large overhead dynamic message board showing arrivals and departures, a customer information counter, and a customer service office for more intricate problems. Passengers can purchase tickets from the ticket counter or several vending machines. Outside of Amtrak stations, the public can obtain information through the telephone and internet. Telephone service allows customers to make a quick reservation, obtain train arrival and departure information, or obtain fare and schedule information. These tasks can be accomplished in an automated mode or through an operator. Amtrak's website provides schedule and fare information, train arrival information, and descriptive material about their national routes. Browsers can download train schedules, purchase tickets over the Internet, and review previously made reservations.

Bucks County TMA (existing): The Bucks County TMA offers a roadway and construction advisory called TRANSBITS which can either be viewed on-line or e-mailed to a subscriber. TRANSBITS, which is updated weekly (Friday afternoon or Monday morning), lists road closures, detours, lane restrictions, and lane closures with the primary focus on Bucks County and major highways in Philadelphia. It contains the road name, duration of construction, and a brief description of detour routes.

Center City District (future): The primary objective of this agency is to provide services to promote a safe, clean and attractive Center City. They do not represent a traditional information service provider; however, as part of their role to promote Center City, they disseminate information geared toward both residents and tourists, including promotional materials on hotels, restaurants, events, and maps. They have one permanent information stand in the Convention Center and a mobile one which is set out during special events. Their website provides a calendar of events. They do not currently distribute information on traffic or transit conditions.

TMA of Chester County (existing): Their website contains information on traffic restrictions in Chester County. For the latest information on travel conditions, users are directed to a link with the SmartRoute.

Cross County Connection TMA (existing): The TMA serves Burlington, Camden and Gloucester Counties in New Jersey. Its website replicates NJDOT's weekly traffic report for South Jersey. Specifically, it lists NJDOT sponsored construction projects on state highways in Atlantic, Burlington, Camden, Cumberland, Gloucester, and Salem counties.

Delaware County TMA (existing): The TMA does not issue any information on travel conditions. However, its website offers links to SEPTA for transit information and to DVRPC for TravelSmart road construction advisories.

Delaware Department of Transportation (existing): The Department's website is a resource for information concerning transportation programs and activities in Delaware. The site is divided into ten major sections. Those sections which dispense travel information include: Information Center, Live Traffic, Beaches, Special Events, and Travel Advisory. Highlights of these sections include real-time traffic reports via live video cameras located in New Castle, Kent and Sussex counties, as well as a live broadcast of the Travelers Advisory Radio

System (TARS). Links are provided to access E-ZPass and DART First State, Delaware's bus, train and intermodal transportation provider. The DelDOT website also includes a special area for I-95 construction with information on alternate routes, transit and carpooling, construction status, and travel tips.

Express Traffic (existing): Express Traffic collects their data from a variety of sources, including monitoring police and fire radio bands, TV, radio, CCTV cameras, and helicopter reports. They are also in contact with several police departments. In addition to the above sources, field personnel rove the highways and call in incidents and other delays. Several radio and TV stations conduct traffic reports from their offices. The public can directly obtain travel information via land line and cellular phone.

Greater Mercer TMA (existing): This organization maintains one of the more comprehensive travel information services among the TMAs in the region. A construction alert website provides information on NJDOT and municipal projects in Mercer County. It also lists NJDOT projects in other areas of New Jersey, and provides links to the New Jersey Turnpike, Garden State Parkway and SmartRoute websites. The TMA's website also contains direct links to transit operators who serve Mercer County. Hot links tied to specific rail lines and bus services are offered. Two customized services are available for disseminating information about major incidents. A Member Fax Alert Network is targeted to businesses and a Commuter E-mail Network supplies the information to commuters at either their home or office. Under either option the subscriber can select which corridor(s) they are interested in.

Greater Valley Forge TMA (existing): The TMA serves the Valley Forge area bordering Chester and Montgomery Counties. It operates three internet home pages for PennDOT District 6-0: US 202.com, US 30.com and PhillyTraffic.com. US 202.com provides daily information on construction restrictions on US 202 and their projected impact on traffic. At this time the US 30 home page describes planned improvements to US 30 in Chester and Delaware counties. As construction commences it will begin issuing travel advisories. PhillyTraffic.com contains PennDOT construction schedules and road closure information and District 6-0's emergency detour routes. It also includes a option for personalized e-mail construction reports, issued every Sunday, for any major highway specified by the user. Occasionally, special faxes are issued for special events and/or major accidents.

Metro Traffic (existing): A private company that collects travel information from a number of sources and sells it to TV and radio stations.

New Jersey Department of Transportation (existing): The department's website provides a update of all NJDOT construction projects in the state. The site is divided into North and South Jersey to more quickly locate a particular highway. Information includes route, location, description of the project and its impact on traffic. Easy access to transit information is provided via links to all transit agencies operating within New Jersey. Motor Vehicle Services shares the webpage, supplying information on driver licencing, vehicle registration and inspections.

New Jersey Transit (existing): Schedule and fare information is available via phone or the Internet. Phone customers have a choice of separate phone numbers for North and South Jersey, and a 215 area code line is provided for individuals calling from Pennsylvania. Schedule and fare information is supplied by live operators. New Jersey Transit's website users have a number of alternatives for finding information. If they know the transit line they want information for, they can look up that route and obtain schedule and fare information. If they are unsure of the transit line, they can identify the route by either browsing by area, sorted by county and municipality, or landmarks, such as schools, hospitals, or shopping malls. Travel advisories provide information on construction and maintenance activities that could impact transit service, as well as information concerning special events and holiday service.

New Jersey Turnpike Authority (existing): The Turnpike provides three means of obtaining traveler information. All service plazas have a travel information area where there is a strip map of the turnpike showing interchanges and service areas. Brochures on attractions and nearby hotels and motels are available. There is no real-time information on travel conditions on the Turnpike and its feeder roads. Travel advisories on their website provide information on lane closures including location, dates, and duration. Other information available on the website includes a listing of hotels and motels in the vicinity of the interchanges, a map showing the interchanges and service plazas, and an application for a charge account (essentially a volume discount plan for heavy commercial vehicles). The Turnpike also operates a Highway Advisory Telephone service which provides information on any long term construction projects and special events that may impact traffic conditions. The caller can also obtain real-time traffic information, to assist the caller the turnpike is

divided into three sections (North Jersey, Central Jersey and South Jersey) by interchange number.

The Partnership TMA (existing): Their website contains two construction updates. One focuses on municipal highway projects in the North Penn area of Montgomery County, and the other on PennDOT projects throughout Montgomery County and on key highways in Philadelphia.

PATCO (existing): Their website contains general information regarding the PATCO system. Schedules, fare rates, station locations, and parking information is available. The site also includes information on other transit services available at PATCO stations, such as New Jersey Transit's buses, the Atlantic City Rail line, and SEPTA.

Pennsylvania Turnpike Commission (existing): The Turnpike maintains two telephone information lines, one for the general public and the other for truckers. Prerecorded information is available on weather and roadway surface conditions for different sections of the Turnpike (the Philadelphia region falls under the eastern section along with the Northeast Extension). Their website provides more extensive information, but no real-time traffic conditions. Weather information is available by interchange or city. Construction activities are posted by location; supporting information includes type of project, minimum lane widths available, hours, and impact on traffic. Truckers can apply for a commercial credit card with the Turnpike over the Internet. The card gives truckers a volume discount and the ease of a single monthly invoice. They can also review their account over the Internet.

Philadelphia International Airport (existing): Airport traveler information is dispensed via phone, website, and HAR. Arrival and departure information is available via the telephone; if the flight number is unknown, an operator will provide assistance. More extensive information is available over the Internet. The airport's website provides arrival and departure information, gate numbers, and static maps displaying access routes and parking lot locations. Accompanying text supplies information on parking charges, taxi/shuttle van services, public transit options, services available at the airport, and hotel and car rental information. An HAR operated by the airport allows motorists to obtain general information on parking, airlines, and airport conditions within a 5-mile radius of the Airport.

Philadelphia Redevelopment Authority (future): The core mission of the Redevelopment

Authority (RDA) is to facilitate the development of under-utilized property in the City of Philadelphia for housing, business purposes and open space, with a special emphasis on affordable housing. RDA obtained a special congressional earmark grant to build a Reading Terminal Headhouse Information Center. This information center will be located on the first floor of the main entrance area to the Reading Terminal Market and Philadelphia Convention Center. The information center will be staffed twenty-four hours, seven days a week and include an interactive component. There will be two or three interactive computer stations which will have direct connections to SEPTA.

SEPTA (existing): SEPTA's Travel Information Center is a sophisticated, fully automated system which permits a caller to obtain travel information without speaking to an operator. Through a series of menus, a caller is either directed to the Regional Rail system or all other routes. For the former, the caller can select the line number, origin station (using the station's first four letters), and direction. The system then generates the next departure time, or a departure time for a future day and time specified by the caller. For all other routes, after the route number is specified, the system gives the caller a choice of line segments for which travel times are given. On SEPTA's website, an on-line version of the Travel Information Center is available using e-mail. For more traditional computer users, either through a drop down button which lists all SEPTA routes or through a series of pages for each mode, a user can access all SEPTA routes and obtain schedule information (by weekday, Saturday or Sunday service), fare zones, and a route map. A composite fare page provides fare information for Regional Rail and other modes by zone and various discount packages. Information on daily, weekly and monthly passes is also provided. Even though travel advisory information is given, for up-to-date information, users are referred to a hot link to SmartRoute.

SmartRoute (existing): SmartRoute is a private company under contract with NJDOT and PennDOT to disseminate travel information to the public. SmartRoute has access to live video feeds from both agencies, and has an employee stationed at NJDOT Traffic Operations South. In addition to these sources of information, SmartRoute has its own CCTV cameras positioned to monitor highways not covered by NJDOT or PennDOT. Users can access travel information by means of cellular phone (*211), land line phone, or via the Internet. All three modes of communication follow a similar approach. The user selects a route by pressing the route number and then selecting a segment number, pressing the segment number directly, or clicking on the highway location on the Internet. The system generates

information on delays, approximate travel times by direction, and gives any scheduled construction. Besides major highways, information for the New Jersey Turnpike, Pennsylvania Turnpike, Center City, and the Philadelphia International Airport (traffic conditions only) is available. Real time transit information for SEPTA, New Jersey Transit and PATCO is also available. Other services provided by SmartRoute include live traffic reports on Channel 6 and special reports on traffic conditions at the sports complex. They are exploring originating live reports on cable television.

Traffic.com (existing): Traffic.com is a unique hybrid that is part ISP, part external reporting agency, and part archived data system. TEA-21 set aside $4 million for a public-private partnership that will enable a private company to collect real-time traffic information which would then be distributed to public agencies for their own use. At the same time the company would be permitted to market the same information to the public. Philadelphia and Pittsburgh were specified as the two initial test markets. Unlike other traditional traffic reporting services, the company has access to PennDOT's rights-of-way to install traffic monitoring equipment (radar sensors). Traffic.com, which won the contract, has recently become operational in Pittsburgh. During the Republican National Convention they established a temporary operation in Philadelphia, a more permanent service will become operational in 2001. Based on the Pittsburgh experience they will offer the public several products. A Live Traffic Map will display clear, moderate and heavy conditions. An Accident and Events map will provide alerts, advisories, and incident information in text format by clicking on icons displayed on the map. A Key Route summary presents average speeds, estimated travel times, and delays associated with congestion or incidents. They intend to market their services to TV and radio stations and eventually plan to provide a premium customized personalized service.

Toll Administration

The Toll Administration Subsystem provides general payment administration capabilities and supports the electronic transfer of authenticated funds from the customer to the transportation system operator. This subsystem supports traveler enrollment and collection of both pre-payment and post-payment transportation fees (i.e., E-ZPass) in coordination with the existing, and evolving financial infrastructure supporting electronic payment transactions. The system may establish and administer escrow accounts depending on the clearinghouse scheme and the type of payments involved. This subsystem posts a transaction to the customer account and generates a bill (for

post-payment accounts), debits an escrow account, or interfaces to the financial infrastructure to debit a customer designated account. It supports communications with the Toll Collection Subsystem to support fee collection operations. The electronic financial transactions, in which this subsystem is an intermediary between the customer and the financial infrastructure, will be crypto graphically protected and authenticated to preserve privacy and ensure authenticity and audit ability.

This subsystem plays a major role in the Delaware Valley region due to the unusual number of toll authorities. The Toll Administration Subsystem Diagram, Figure 5, is an adaption from the National ITS Architecture that has been somewhat modified to satisfy the region's specifications. It does not fully comply with the E-ZPass architecture. With many of the toll authorities in the process of implementing E-ZPass electronic toll collection systems on their facilities, the pivotal data flows deal with the communication between the Toll Administration and the Toll Collection Subsystems, toll operators, toll service providers, financial institutions, and enforcement agencies. With widespread implementation of E-ZPass, there may be the opportunity to use the electronic toll collection transponders as vehicle probes to determine travel conditions, such as travel times, vehicle speeds and to identify congestion points. The collection of this information is represented by the flow of probe data from Toll Administration to Traffic Management. A listing of toll agencies is presented in Appendix A.

Toll Administration Subsystems specific to the region are as follows:

Burlington County Bridge Commission (existing) : This agency operates the Burlington-Bristol Bridge and the Tacony-Palmyra Bridge, which cross the Delaware River between Pennsylvania and New Jersey. Each bridge has a toll plaza located on the New Jersey side of the river. Current plans call for E-ZPass to be installed by fall 2001.

Delaware River and Bay Authority (existing): This agency is a bi-state governmental agency that operates the Delaware Memorial Bridge along I-295 between New Castle, Delaware and Salem, New Jersey. There is one toll plaza which is located in Delaware. DRBA intends to implement E-ZPass.

Delaware River Joint Toll Bridge Commission (existing): Seven toll bridges and 11 non-toll facilities come under its jurisdiction. Within the DVRPC region, there are two toll

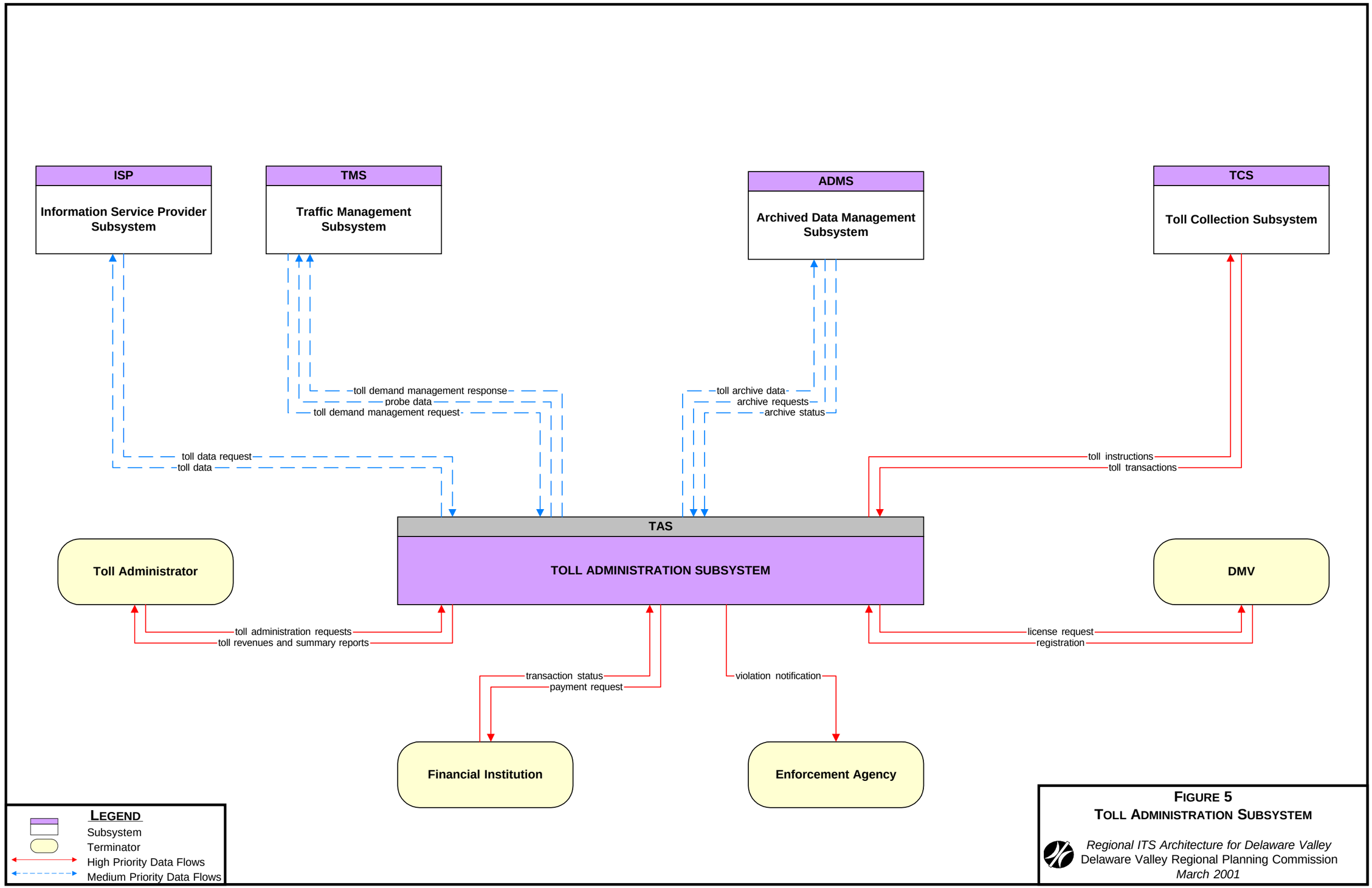


FIGURE 5
TOLL ADMINISTRATION SUBSYSTEM

Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

bridges, US 1 and US 202, with a total of 11 toll lanes. The commission has no current plans to install E-ZPass on their facilities.

Delaware River Port Authority (existing): DRPA operates four toll facilities: the Commodore Barry Bridge, Walt Whitman Bridge, Benjamin Franklin Bridge, and Betsy Ross Bridge. All bridges are equipped for E-ZPass.

New Jersey Turnpike Authority (existing): The Turnpike has 28 interchanges between I-295 in South Jersey and its terminus in northern New Jersey. Within the Philadelphia area, toll plazas are located at US 322 (Swedesboro), NJ 168 (Woodbury), NJ 73 (Camden-Philadelphia), CR 541 (Mount Holly), US 130, the Pennsylvania Turnpike, US 206 (Bordentown), I-195 (Trenton), and NJ 33 (Hightstown). It is a closed fare system, upon entering the turnpike motorists receive a magnetically encoded toll ticket which indicates the class of the vehicle and entrance point. The toll, which is based on entering/exiting interchanges and vehicle class, is calculated when the ticket is processed by the exit toll collector. E-ZPass became operational on the New Jersey Turnpike in 2000.

Pennsylvania Turnpike Commission (existing): The Turnpike has 55 fare collection facilities. Similar to the New Jersey Turnpike, the Pennsylvania Turnpike is a closed fare system whereby a vehicle obtains a ticket when entering and returns the ticket when exiting. Within the Philadelphia region there are 10 toll facilities, eight on the mainline and two on the Northeast Extension. The interchanges are: Downingtown, Valley Forge, Norristown, Fort Washington, Willow Grove, Philadelphia, Delaware Valley, Delaware River Bridge/New Jersey Turnpike, Lansdale, and Quakertown. A new slip ramp was recently opened in the Fort Washington area. The Pennsylvania Turnpike began implementing E-ZPass in 2000.

South Jersey Transportation Authority (*existing)*: SJTA operates a number of transportation facilities in the Atlantic City area including the Atlantic City Expressway. In November 1998, the SJTA installed E-ZPass at each of its toll plazas. Within the Philadelphia region, toll plazas are located at CR 689, CR 536 Spur and CR 723.

Emergency Management

The Emergency Management Subsystem operates in various emergency centers supporting public

safety, including police and fire stations, search and rescue special detachments, and HAZMAT response teams. This subsystem interfaces with other Emergency Management Subsystems to support coordinated emergency response involving multiple agencies. The subsystem creates, stores, and utilizes emergency response plans to facilitate coordinated response. It also tracks and manages emergency vehicle fleets using automated vehicle location technology and two way communications with the vehicle fleet. Real-time traffic information received from the Traffic Management Subsystem can be used to further aide the emergency dispatcher in selecting the emergency vehicle(s) and routes that will provide the most timely response. Interface with the Traffic Management Subsystem allows strategic coordination in tailoring traffic control to support en-route emergency vehicles. Interface with the Transit Management Subsystem allows coordinated use of transit vehicles to facilitate response to major emergencies.

The Emergency Management Subsystem Diagram, Figure 6, is an adaptation from the National ITS Architecture and has been modified for the region's specifications. More customized agency level diagrams, reflecting the specific needs of key agencies, is presented in Chapter VI, Agency Roles and Responsibilities. Within the Emergency Management Subsystem the architecture provides considerable amount of communication with both the Emergency Vehicle and the Traffic Management Subsystems. These data flows are important in tracking emergency vehicle locations, vehicle dispatching, and providing them with suggested routes based on current traffic conditions. The communication flows between these subsystems also results in the quick response to and clean up time of incidents. This process my be enhanced with the use of traffic management CCTV cameras to identify and verify any incident information. The architecture also allows for constant contact from an array of subsystems (such as Transit Management, Remote Traveler Support, Personal Information Access) to notify Emergency Management of emergencies or incidents. The potential to obtain HAZMAT information from Fleet and Freight Management Subsystems has been incorporated in the Regional ITS Architecture. An additional function of the Emergency Management Subsystem is the transferring of incident information to the media or an ISP for dissemination to the general public. A listing of all the Emergency Management Subsystems in the region is contained in Appendix A.

Several issues were raised by the TTF concerning Emergency Management. The first issue is whether or not there should be traffic signal preemption capability for emergency vehicles. While this issue has not been completely resolved, signal preemption has been tentatively incorporated into the Regional ITS Architecture pending development of criteria for its use. Another issue of concern examined by the TTF is the use of ISPs to route emergency vehicles. The architecture

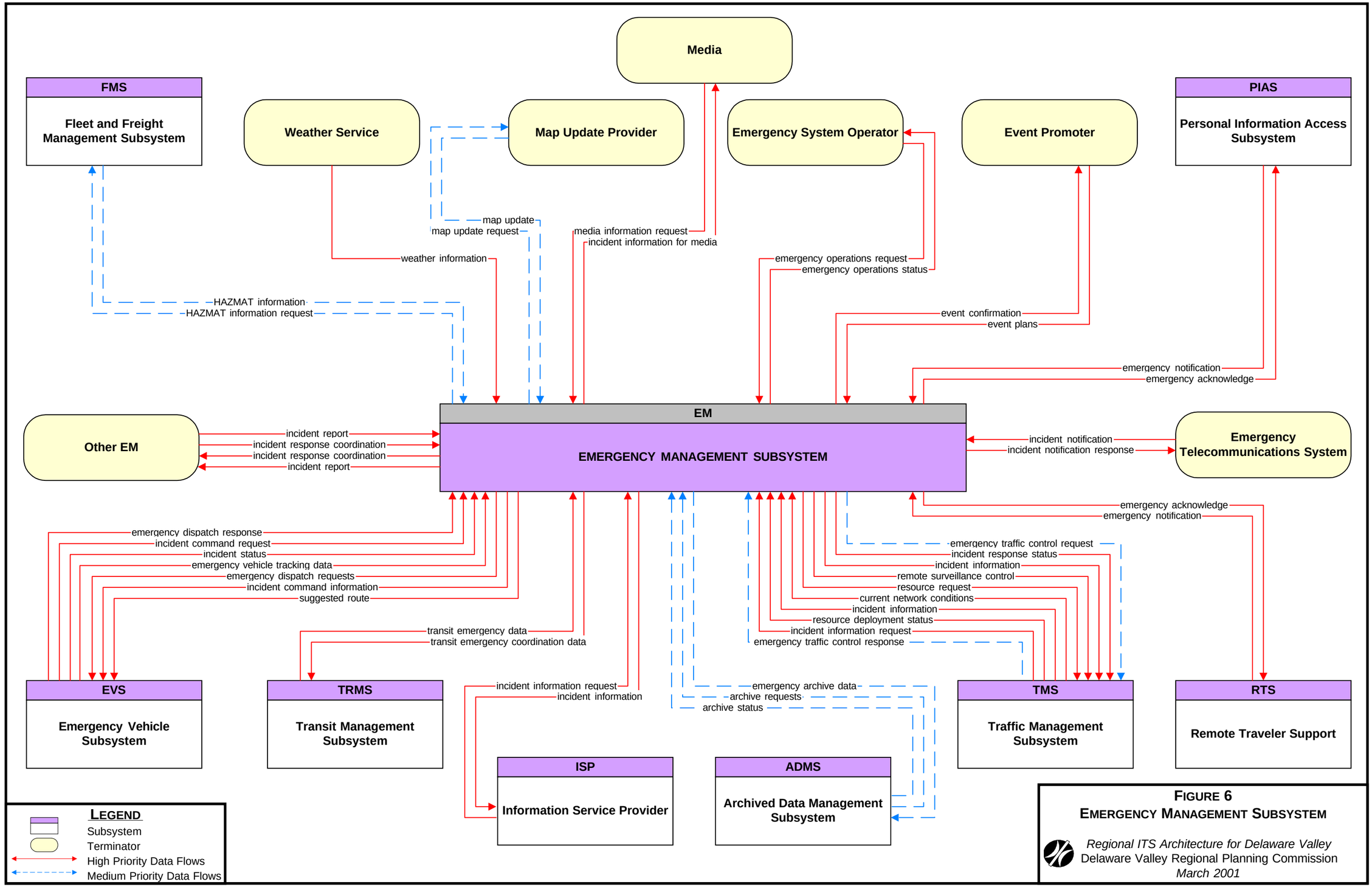


FIGURE 6
EMERGENCY MANAGEMENT SUBSYSTEM

calls for this function to be left up to the Emergency Management Subsystem. To help assist Emergency Management, the Regional ITS Architecture supplies it with traffic information from the Traffic Management Subsystems.

Examples of Emergency Management Subsystems specific to the region are as follows:

Amtrak Police (existing): Amtrak Police in Philadelphia are headquartered and dispatched from the Command Center on the eighth floor of 30th Street Station.

Delaware River and Bay Authority Police (existing): DRBA Police have full police authority in both Delaware and New Jersey. Troop 1 is stationed at the Delaware Memorial Bridge, and its two other troops are stationed at both termini of the Cape May Ferry. DRBA also uses Public Service Aides, assigned exclusively to the Delaware Memorial Bridge, to perform a variety of services such as tow vehicles, change tires, pick-up debris from the highway. They also respond to emergency calls, including helping control and direct traffic, suppressing fires until fire department apparatus arrives, and helping clean-up or control fuel spills.

Delaware River Port Authority Police (existing): DRPA Police have full police authority in New Jersey and Pennsylvania. A Lieutenant is assigned to each of DRPA's four bridges. Their responsibilities include supervising officers assigned to that particular bridge, incident management and traffic control. The communications hub of each bridge is its radio room where the officer staffing it receives incident notifications from officers patrolling the bridges, toll collectors, and 911 centers on both sides of the river. Under the direction of a shift supervisor, the radio room can dispatch officers to an incident, request additional assistance from officers stationed at adjoining bridges, or request assistance from outside agencies, such as Philadelphia EMS.

Local volunteer/professional fire/EMS departments (existing): In both New Jersey and Pennsylvania, many of the larger municipalities have their own, full time, professional fire departments. Smaller municipalities are covered by volunteer fire departments and EMS services. In many instances there are several volunteer fire departments/EMS services within the same municipality serving different neighborhoods. A listing of municipalities located along key highways in New Jersey and Pennsylvania are listed in Appendices D and E respectively.

Municipal police departments (existing): Most municipalities, except those in more rural areas, have their own police force who are responsible for local traffic needs including patrolling roads. With a few exceptions, responsibility for patrolling the expressway system belongs to the state police. A listing of municipalities located along key highways in New Jersey and Pennsylvania are listed in Appendices D and E respectively.

New Jersey State Police (existing): Troop A in Buena Vista Township, Atlantic County, oversees state police operations in southern New Jersey. It consists of nine stations with a complement of 411 officers. The Bellmawr Station is responsibility for approximately 35 miles of coverage on I-295, I-76, I-676, NJ 42 to the beginning of the Atlantic City Expressway, and 20 miles of coverage on NJ 55. The Atlantic City Expressway Station in Hammonton is responsible for patrolling the Atlantic City Expressway. Troop C, headquartered on US 1 near Princeton, is responsible for central New Jersey. It consists of 321 officers in seven stations. Stations located within the Philadelphia region are Bordentown, Fort Dix and Hightstown. All 911 state police calls in South Jersey are routed to Buena Vista, which also functions as a central dispatch. Similarly, State Police headquarters located in West Trenton functions as central dispatch for central New Jersey. Headquarter's functions include emergency management, the Motor Carrier Safety Assistance Program (MCSAP), and HAZMAT operations. Through a federal grant a state police officer is assigned to NJDOT's Traffic Operations South.

New Jersey Transit Police (existing): The New Jersey Transit Police are headquartered in Maplewood New Jersey, with regional offices throughout the state. The closest regional office is located in Camden. The police patrol both bus and train stations, in addition to having patrol officers on board vehicles. All of the emergency calls are taken at the Maplewood center, and then dispatched to the local offices. The agency is not affiliated with the State Police, although they are in contact with local police and other emergency agencies. If a New Jersey Transit Police Officer requires assistance, he must contact the central office, who is responsible for calling the local authorities. New Jersey Transit Police do not normally come into Philadelphia unless there is a major incident which requires their assistance.

New Jersey Turnpike (existing): Troop D of the New Jersey State Police is responsible for patrolling the Turnpike. Salaries and other expenses for Troop D are paid for by the Turnpike. The troop consists of over 400 troopers, assigned to three stations; two of them,

Moorestown and Cranbury, serve the Philadelphia area.

PATCO Police (existing): PATCO Police dispatchers are located in Center Tower. A facility for the police officers is located at the Rand Transportation Center in Camden.

Pennsylvania State Police (existing): Troop K located on Belmont Avenue in Philadelphia is primarily responsible for overseeing state police operations in the Philadelphia region. It consists of a headquarters unit and two barracks: Media and Skippack. Belmont Barrack is responsible for patrolling I-76 outside of Philadelphia, I-476, US 422, and PA 309. The Media Barracks patrols I-95 south of Philadelphia. I-95 north of Philadelphia is patrolled by the Trevose Barracks, which is part of Troop M, headquartered in Bethlehem. Avondale Barracks, belonging to Troop J, headquartered in Lancaster, performs local police duties for the rural municipalities in western Chester County.

Pennsylvania Turnpike Commission (existing): Troop T of the Pennsylvania State Police is responsible for patrolling the Pennsylvania Turnpike. Locally, the barracks, located in King of Prussia, is responsible for coverage from the Downingtown Interchange to New Jersey, including the Delaware River crossing, and along the Northeast Extension from the Plymouth Meeting Interchange to the Lehigh Valley Interchange. West of Downingtown, the Bowmansville Barracks, in Lancaster County, is responsible for patrol coverage. Responsibilities include routine patrol, traffic enforcement, incident management, and accident investigations. Normally, 911 calls are routed from the counties' services to the Turnpike's communication center in Harrisburg, as are all call box messages. Fire and ambulance services, which are contracted out to local organizations, have keys to emergency access gates.

Philadelphia Fire Department (existing): The Fire Department utilizes 61 engine companies and 30 ladder companies stationed throughout the City. In addition to fire response duties it also operates the City's Emergency Medical Services, which now represent about 70 percent of the demand for Fire Department services. The Fire Department's HAZMAT operations and administrative units handle any HAZMAT emergencies and enforce all state and federal HAZMAT regulations within the city.

Philadelphia Police Department (existing): In addition to 23 patrol districts, the Philadelphia Police Department operates several specialized units including Highway and Traffic patrols.

The Highway Patrol is responsible for patrolling the City's expressways including I-95, I-76, I-676, US Route 1, and PA 63. The Traffic Patrol responsibilities include street closures, traffic control, and traffic accident investigations. The Communications Bureau manages the Police Radio Room and 911 operations.

SEPTA Transit Police (existing): SEPTA Transit Police dispatchers are co-located in SEPTA's operation center, adjacent to the subway and bus dispatchers. The police are divided into six zones, each zone always has a supervisor present. The headquarters for each zone is more an assembly point than an actual operations center. All emergency call boxes in the SEPTA system are answered by the SEPTA Police dispatchers. A number of stations have CCTV cameras, however, they are mainly used for crowd control and to view an incident after it occurred. There is no active monitoring of station or platform areas. Philadelphia Police Department plays a large supporting role in SEPTA operations. It is not uncommon for both SEPTA and Philadelphia Police to respond to an incident called into Philadelphia 911. SEPTA Transit Police rely upon the Philadelphia Police Department for access to the state's computerized criminal history records system and other services.

Archived Data Management

The Archived Data Management Subsystem collects, archives, manages, and distributes data generated from ITS sources for use in transportation policy evaluation, safety, planning, performance monitoring, program assessment, operations, and research applications. According to the National ITS Architecture, data received is formatted, tagged with attributes that define the data source, conditions under which it was collected, data transformations, and other information necessary to interpret the data. The subsystem can fuse ITS generated data with data from non-ITS sources and other archives to generate information products utilizing data from multiple functional areas, modes, and jurisdictions. Due to the number of operating agencies in the region and the diverse number of agencies requiring data, it is envisioned an Archived Data Management Subsystem will reside within individual operational centers to provide focused access to a particular agency's data archives.

TEA-21 set aside funds for a private company to collect real-time travel information and to make that information available to public sector stakeholders. In accordance with the federal legislation, Traffic.com has established a virtual data warehouse to store information from their roadside detectors. Very tentative long-range plans call for a virtual centralized data warehouse, operated by the public sector organizations, to store and share their own data.

The Archived Data Management Subsystem Diagram, Figure 7, is an adaptation from the National ITS Architecture and has been modified for the region's specifications. Archived request represents a request to a data source for information on available data and/or a request that defines the data to be archived. Archive status is a notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, that data and the nature of the potential problem are identified. Archived data pertaining to traffic and transit conditions are transmitted in data flows entitled Traffic Achieve Data and Transit Archive Data.

Examples of agencies within the region requiring transportation data for planning, operational or performance monitoring purposes are:

Delaware Valley Regional Planning Commission (existing): DVRPC serves as the Metropolitan Planning Organization for the Philadelphia Metropolitan Region. As such it functions as the regional repository of transportation data including traffic counts, vehicle classification data, transit ridership numbers, vehicle occupancies and travel times. The agency conducts traffic counts for PennDOT, the counties, and for its own technical studies. It also conducts numerous studies to determine long-term traffic trends and travel patterns. Transportation data is archived in a number of databases and is available in GIS format. The databases are available for use by DVRPC member agencies.

New Jersey Department of Transportation Division of Transportation Data Technology (existing): The Division is responsible for the collection, verification and dissemination of basic data used for transportation related activities by NJDOT. It is responsible for maintaining data and information related to vehicular traffic characteristics, roadway characteristics, and crash incidents on public roadways. For each of these three data types three basic activities are performed: data collection, data warehousing, and data dissemination. Traffic characteristics include traffic volumes, traffic speeds, and truck weights.

New Jersey Transit (existing): New Jersey Transit relies upon ridership data to continually refine routes and schedules to meet ridership demand. The agency relies mainly upon revenue collection data to establish baseline information. Recording fare boxes on buses provide basic information on the total number of passengers using a particular route. Because New Jersey Transit utilizes a complex zone system, they can obtain fairly usable

information on origin-destination patterns.

Pennsylvania Department of Transportation (existing): Two divisions of PennDOT share responsibility for transportation data management. The Transportation Performance Monitoring Division maintains the highway performance monitoring system (HPMS), conducts traffic counts, truck counts using weigh in motion (WIM) equipment, and speed studies. They conduct technical studies and investigate travel trends. The Roadway Management Division maintains PennDOT's comprehensive database known as the Roadway Management System (RMS). RMS includes information on the physical characteristics of state highways, information of the various transportation management systems, and traffic data.

Philadelphia Streets Department Traffic Engineering Division (existing): The Streets Department maintains several databases for its various divisions, including traffic engineering and sanitation. Traffic Engineering conducts a citywide traffic counting program, through DVRPC. Different sections of the city are counted on a six-year cycle. The Department is in the process of consolidating its databases and converting them into GIS format for graphical display and analysis.

SEPTA Technical Services and Research (existing): SEPTA's Service Planning and Scheduling relies upon ridership data to continually refine routes and schedules to meet ridership demand. The agency relies mainly upon revenue collection data to establish baseline information. Recording fare boxes on buses and automated turnstiles on the heavy rail system provide basic information on the total number of passengers using a particular route. The data can be broken down into different category of user (e.g., senior citizen). When more detailed information is required, manual ridership checks are employed to yield detail information on passenger loadings on a per stop basis. Corner checks are a more simplified method to ascertain ridership at different points along a route. Revenue information is archived by transit route and run.

Traffic.com (existing): Traffic.com, under contract with FHWA and PennDOT, is installing microwave sensors at over 135 locations along the expressway network in the Pennsylvania portion of the region. Collected data will be archived in the National Transportation Data

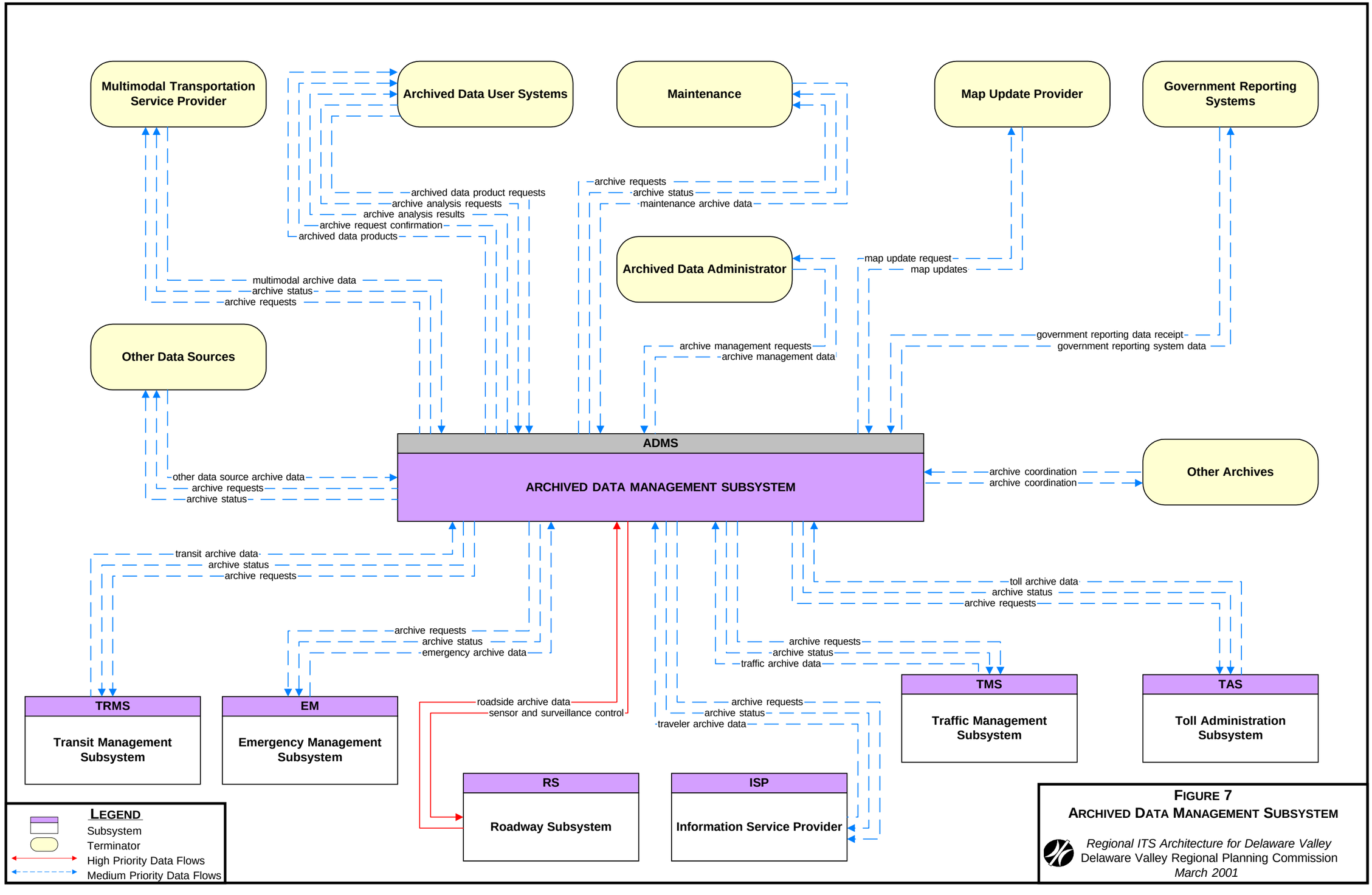


FIGURE 7
ARCHIVED DATA MANAGEMENT SUBSYSTEM

Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Center, a commercial computer facility, where it can be queried by public sector stakeholders at various levels of data aggregation. The data will include traffic volume, speeds, and lane occupancy by lane every 60 seconds for each detector location. The contract with Traffic.com specifies 16 stakeholders including the departments of transportation, toll authorities, and transit agencies.

Additional organizations such as the TMA may be added to the stakeholder list.

Commercial Vehicle Administration

The Commercial Vehicle Administration Subsystem will operate at one or more fixed locations within a region. This subsystem performs administrative functions supporting credentials, tax, and safety regulations. It issues credentials, collects fees and taxes, and supports enforcement of credential requirements. This subsystem communicates with the Fleet and Freight Management Subsystems associated with motor carriers to process credentials applications and collect fuel taxes, weight/distance taxes, and other taxes and fees associated with commercial vehicle operations. The subsystem also receives applications for, and issues, special Oversize/Overweight and HAZMAT permits in coordination with other relevant authorities. The subsystem also coordinates with other Commercial Vehicle Administration Subsystems in other states and regions to support nationwide access to credentials and safety information for administration and enforcement functions. This subsystem supports communications with Commercial Vehicle Check Subsystems operating at the roadside to enable credential checking and safety information collection. Information collected is processed, stored, and made available to qualified stakeholders to identify carriers and drivers that operate unsafely.

Policy and implementation decisions concerning the Commercial Vehicle Administration Subsystem will be have to be made at the state and multi-state level. As described below, New Jersey and Pennsylvania currently employ rudimentary Commercial Vehicle Subsystems. Both states are beginning to develop more advanced commercial vehicle initiatives that comply with the intent of ITS.

In New Jersey, Commercial Vehicle Administration responsibilities are shared by NJDOT's Motor Vehicle Services and the New Jersey State Police's Commercial Carrier/Safety Inspection Unit. Motor Vehicle Services issues commercial driver licenses (CDL) and commercial vehicle registrations. Its Motor Carriers Unit is responsible for collecting motor vehicle tax and the

supporting records submitted by individual motor carriers and fleet operators. The State Police Commercial Carrier/Safety Inspection Unit personnel are responsible for the implementation and enforcement of the federal regulations governing commercial vehicle drivers, related safety equipment, and the transportation of HAZMAT materials over highways.

In Pennsylvania, Commercial Vehicle Administration responsibilities are distributed among several agencies. PennDOT's Driver and Motor Vehicle Services is responsible for driver and vehicle registration. In accordance with the Federal Commercial Motor Vehicle Safety Act they test and license commercial motor vehicle drivers. Weighing and measuring of vehicles to determine their compliance with state and federal regulations is cooperatively performed by PennDOT and the Pennsylvania State Police. Both weigh stations and spot inspections fall under this activity. The Pennsylvania Public Utility Commission's Motor Carrier Services and Enforcement Division, which has a district office in Philadelphia, regularly inspects and audits companies to ensure that trucks comply with the Public Utility Code and Commission regulations. They also process all motor carrier applications, motor carrier tariff filings and ensure that all motor carriers operating in Pennsylvania maintain appropriate insurance. Lastly, the Department of Revenue collects road taxes from commercial operators and compiles the supporting documentation required to calculate the appropriate tax.

ROADSIDE SUBSYSTEMS

These infrastructure subsystems provide direct interface to the roadway network and vehicles traveling on the roadway network. Each of the Roadside Subsystems includes functions that must be located on or near the roadway to support direct surveillance, information provision, and control plan execution. All Roadside Subsystems interface to one or more of the Center Subsystems that govern overall operation of the Roadside Subsystems. The Roadside Subsystems also generally include direct user interfaces to drivers and other travelers on the roadway network and short-range interfaces to the Vehicle Subsystems to support operations.

Roadway

This subsystem's main function is to provide communication between the roadway and the Traffic Management System. Equipment is distributed on and along the roadway which monitors and controls traffic and feeds this information back to the traffic management center. Equipment includes vehicle detectors, CCTV cameras and video image processing systems for incident detection

and verification, variable message signs, highway advisory radios, traffic signals, freeway ramp metering systems and cellular call boxes.

The architecture flows for the Roadway Subsystem Diagram are shown in Figure 8 and have been modified from the National Architecture for the region's specifications. Some of the more significant data flows between Roadway and Traffic Management Subsystems are traffic images, signal and freeway control request/status, incident data and sensor and surveillance control. Information about the status of highway-rail intersections is another element of Roadway Subsystem. The Roadway Subsystem also provides the capability for environmental condition monitoring including weather sensors, pavement icing sensors, fog sensors etc.

As previously mentioned, the TTF has been debating whether or not to include signal preemption for both Emergency and Transit Vehicles within the Regional ITS Architecture. Since this debate has not been resolved, the data flows for these functions have been incorporated into the architecture. The use of E-ZPass transponders as a vehicle probe is another issue that is unresolved. Given the number of toll facilities in the region that already use E-ZPass, and the movement to install it on many of the remaining toll facilities, the data flows for probe surveillance have been preserved within the architecture.

A complete listing of the agencies which have or plan to deploy roadside equipment is listed below. For many agencies, a more detailed inventory of their existing and planned roadside equipment is provided in Chapter 5 of the Regional ITS Architecture entitled Inventory of Existing and Planned ITS Resources.

- Burlington County (existing)
- Burlington County Bridge Commission (existing)
- Delaware Department of Transportation (existing)
- Delaware River and Bay Authority (existing)
- Delaware River Joint Toll Bridge Commission (existing)
- Delaware River Port Authority (existing)
- Municipal traffic operation centers (future)
- New Jersey county traffic operation centers (future)
- New Jersey Department of Transportation (existing)
- New Jersey Turnpike Authority (existing)
- Pennsylvania Department of Transportation (existing)

- Pennsylvania Turnpike Commission (existing)
- Philadelphia Streets Department (existing)
- SmartRoute (existing)
- South Jersey Transportation Authority (existing)
- Towamencin Township (future)
- Traffic.com (existing)

Toll Collection

The Toll Collection Subsystem provides the capability for vehicle operators to pay tolls without stopping their vehicles using locally determined pricing structures and including the capability to implement various variable road pricing policies. Each transaction is accompanied by feedback to the customer which indicates the general status of the customer account. A record of the transaction is provided to the Toll Administration Subsystem for reconciliation and so that the customer can periodically receive a detailed record of the transactions.

The Toll Collection Subsystem Diagram, Figure 9, is an adaptation from the National Architecture. It has been modified accordingly for the region's specifications. This subsystem works in conjecture with Toll Administration Subsystem. Its main purpose is to collect the tolls at the various toll booth locations along each facility. This plays a more important role with the implementation of electronic toll collection and the onset of E-ZPass throughout the region.

Each of the various toll authorities in the region is operates a Toll Collection Subsystem. These toll authorities include:

- Burlington County Bridge Commission (E-ZPass proposed)
- Delaware River Bay Authority (E-ZPass existing)
- Delaware River Joint Toll Bridge Commission (E-ZPass proposed)
- Delaware River Port Authority (E-ZPass existing)
- New Jersey Turnpike Authority (E-ZPass existing)
- Pennsylvania Turnpike Commission (E-ZPass proposed)
- South Jersey Transportation Authority (E-ZPass existing)

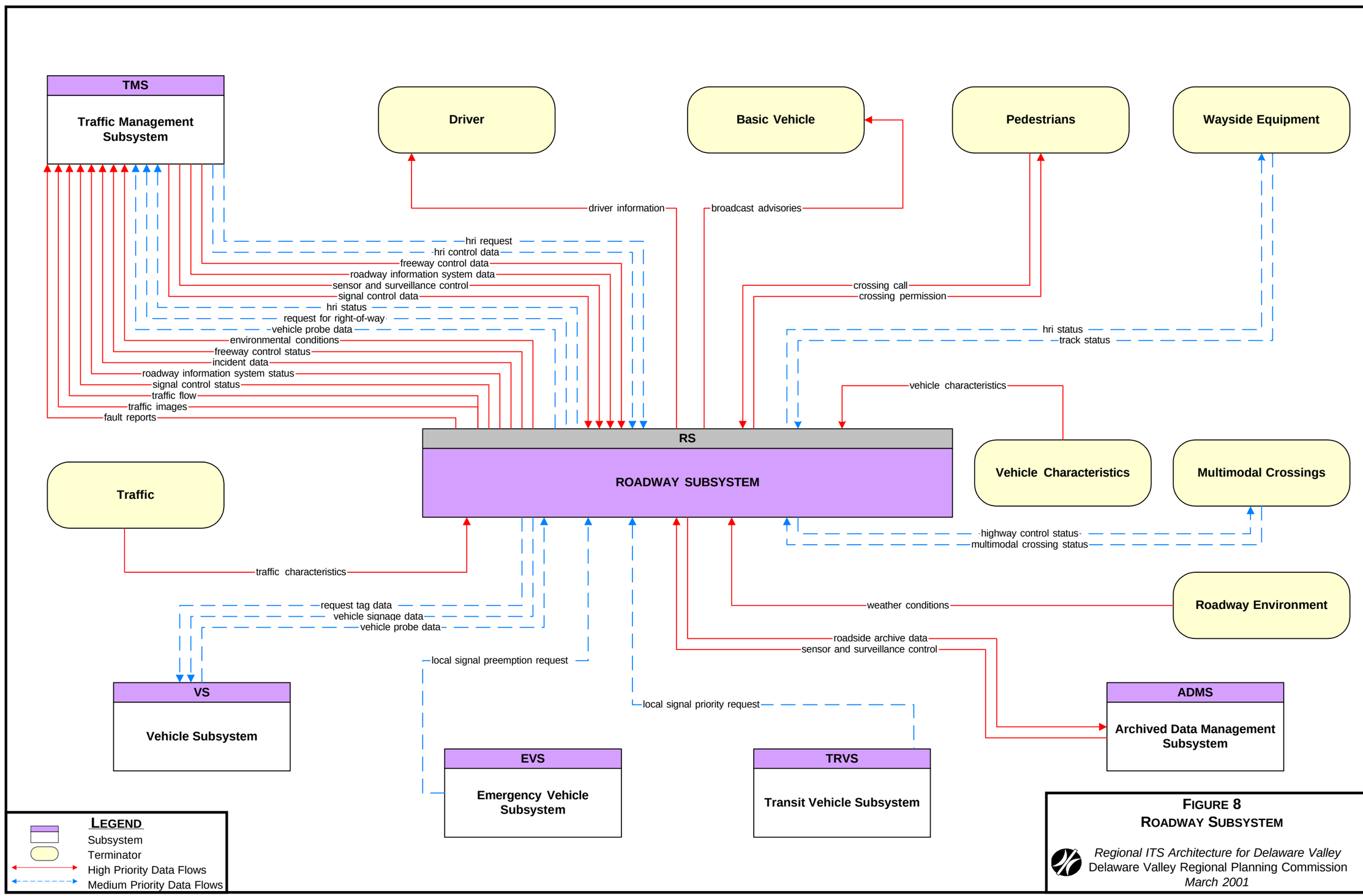


FIGURE 8
ROADWAY SUBSYSTEM

Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Parking Management

The Parking Management Subsystem provides the capability to provide parking availability and parking fee information, allow for parking payment without the use of cash with a multiple use medium, and support the detection, classification, and control of vehicles seeking parking.

Most parking lots in the region belong to private operators and fall outside the jurisdiction of the Regional ITS Architecture. The architecture focuses on a few select public agencies that operate extensive systems of parking lots, namely the transit agencies and the Philadelphia Parking Authority. It is further restricted to providing motorists information on parking availability. Agencies that own parking facilities include:

PATCO (existing): PATCO offers parking for more than 12,500 cars daily at seven of its nine New Jersey train stations. These stations include: Lindenwold, Ashland, Woodcrest, Haddonfield, Westmont, Collingswood and Ferry Avenue. Approximately sixty percent of all of the parking spaces are free of charge. There is a fee to park in the other forty percent, generally those closest to the stations.

Philadelphia Parking Authority (existing) - The mission of the Philadelphia Parking Authority (PPA) is to provide the City of Philadelphia with comprehensive parking management services and to support its economic development by contributing to the improvement of traffic flow and public safety, developing and managing an optimal supply of reasonably priced off-street parking, and regulating the use of on-street parking. The Authority operates a radio communications dispatch center to maintain contact with its personnel who enforce on-street parking regulations. Seven Center City parking lots are owned by the Authority but operated by outside contractors. The Philadelphia Airport garages and parking at the Sports Complex are also managed by the Authority.

SEPTA (existing) - Parking is available at most outlying stations on SEPTA's Regional Rail System. Availability of parking varies widely from less than 10 spaces at some stations to over 1000 spaces at Cornwells Heights.

Commercial Vehicle Check

The Commercial Vehicle Check Subsystem supports automated vehicle identification at mainline

speeds for credential checking, roadside safety inspections, and weigh-in-motion, using two-way data exchange. These capabilities include providing warnings to the commercial vehicle drivers, their fleet managers, and proper authorities of any safety problems that have been identified, accessing and examining historical safety data, and automatically deciding whether to allow the vehicle to pass or require it to stop with operator manual override. The Commercial Vehicle Check Subsystem also provides supplemental inspection services to current capabilities by supporting expedited brake inspections, the use of operator hand-held devices, on-board safety database access, and the enrollment of vehicles and carriers in the electronic clearance program.

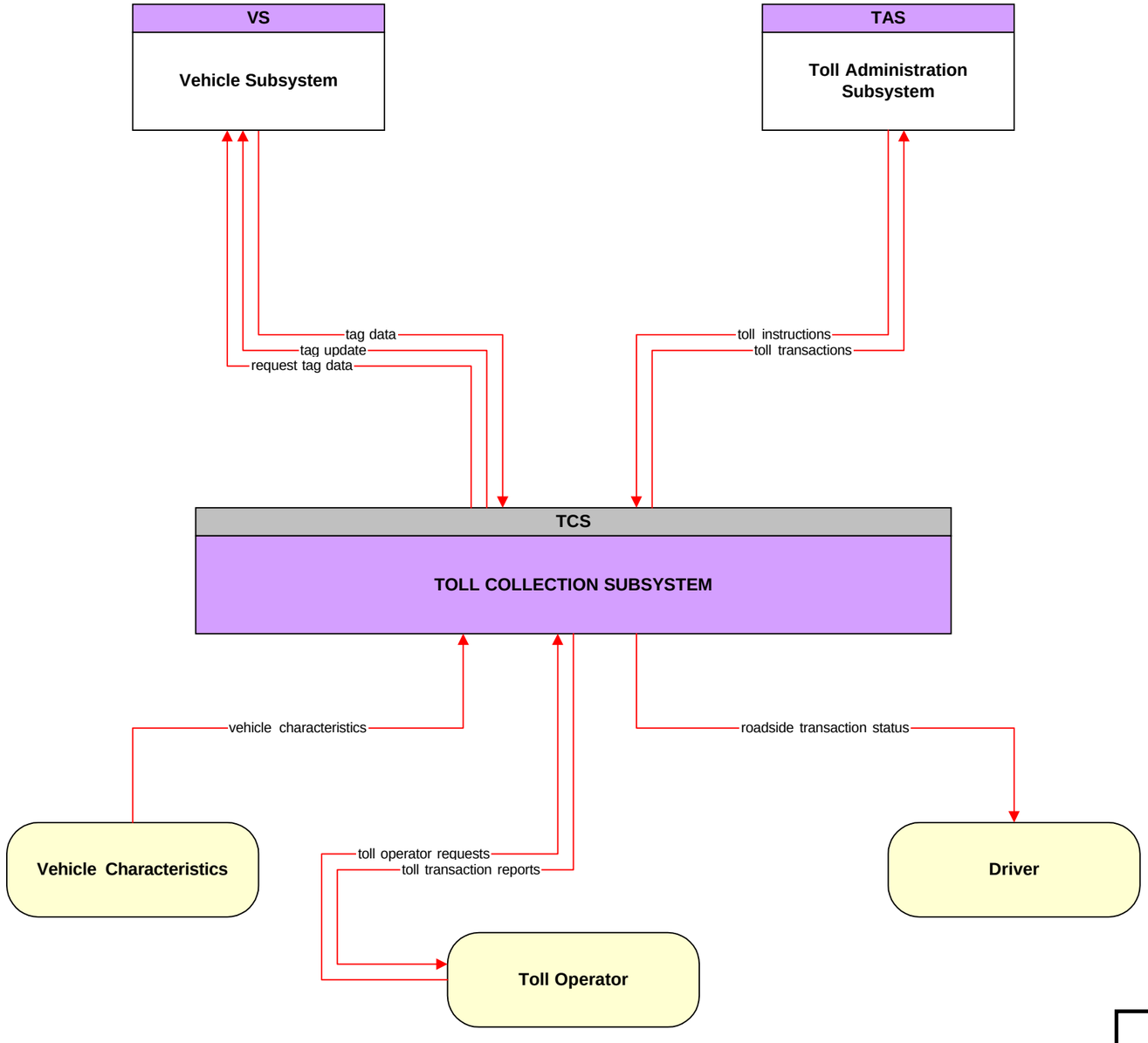
In New Jersey, the responsibility for Commercial Vehicle Check belongs to the Commercial Carrier/Safety Inspection Unit of the New Jersey State Police. In Pennsylvania, Commercial Vehicle Checks are performed by a special unit of the Pennsylvania State Police in cooperation with the Pennsylvania Public Utility Commission and PennDOT.

Traveler Subsystems

The Traveler Subsystems include the equipment that is used by the traveler to gather information and access other personal information services prior to a trip and while en-route. Included are elements that are owned and operated by the traveler as well as elements that are owned by transportation providers and information providers. Though the equipment owned by the traveler (e.g., personal computer, personal digital assistant) is often general purpose and used for a variety of tasks, this equipment is specifically used for gaining access to traveler information within the scope of the ITS architecture. These subsystems interface with the information provider (one of the Center Subsystems, most commonly the Information Service Provider Subsystem) to access traveler information. A range of service options and levels of equipment sophistication are supported.

Remote Traveler Support

This subsystem provides access to traveler information at transit stations, transit stops, other fixed sites along travel routes, and at major trip generators such as special event centers, hotels, office complexes, amusement parks, and theaters. Traveler information access points include kiosks and informational displays supporting varied levels of interaction and information access. At transit stops, simple displays providing schedule information and imminent arrival signals can be provided. This basic information may be extended to include multi-modal information including



LEGEND

- Subsystem
- Terminator
- High Priority Data Flows
- Medium Priority Data Flows

FIGURE 9
TOLL COLLECTION SUBSYSTEM

traffic conditions and transit schedules along with yellow pages information to support mode and route selection at major trip generation sites. Personalized route planning and route guidance information can also be provided based on criteria supplied by the traveler.

In addition to traveler information provision, the Remote Traveler Support Subsystem also supports public safety monitoring using CCTV cameras, or other surveillance equipment, and emergency notification within these public areas. Fare card maintenance, and other features which enhance traveler convenience may also be provided at the discretion of the deploying agency. The Remote Traveler Support Subsystem Diagram, Figure 10, is an adaptation from the National Architecture. It has been modified for the region's specifications.

Regionally, the most common examples of Remote Traveler Support Subsystems are cellular phone numbers for reporting incidents or obtaining traveler information, and various forms of displays situated in major SEPTA stations and all PATCO stations. Below is a complete listing of all Remote Traveler Support Subsystems in the region. A more descriptive listing is contained in the Information Service Provider Subsystems section of this chapter and in Chapter V of the Regional ITS Architecture, titled Inventory of Existing and Planned ITS Resources. The number and variety of remote traveler services is expected to grow as more private sector companies enter the ISP market in Philadelphia.

- Amtrak (existing): Traveler information dynamic display boards and surveillance/security systems.
- Center City District (future): Information kiosks.
- New Jersey Transit (existing): Information displays and surveillance/security systems at its rail stations.
- New Jersey Turnpike Authority (future): Information kiosks at its service plazas.
- PATCO (existing): Information displays and surveillance/security systems at its rail stations.
- Pennsylvania Turnpike Commission (existing): Emergency call boxes.
- Philadelphia International Airport (existing): Dynamic message boards.
- Philadelphia Redevelopment Authority (future): Information kiosks.
- SEPTA (existing): Information displays and surveillance/security systems and emergency call box at its rail stations.
- South Jersey Transportation Authority (existing): Emergency call boxes.

Personal Information Access

This subsystem provides the capability for travelers to receive formatted traffic advisories from their homes, place of work, major trip generation sites, personal portable devices, and over multiple types of electronic media. These capabilities also provide basic routing information and allow users to select those transportation modes that allow them to avoid congestion, or more advanced capabilities to allow users to specify transportation parameters unique to their individual needs and to receive travel information. The Personal Information Access Subsystem provides capabilities to receive route planning from the infrastructure at fixed locations such as in their homes, their place of work, and at mobile locations such as from personal portable devices and in the vehicle, or to perform the route planning process at a mobile information access location. This subsystem also provides the capability to initiate a distress signal and cancel a prior issued manual request for help. The Personal Information Access Subsystem Diagram, Figure 11, is an adaptation from the National Architecture. It has been modified for the region's specifications.

Internet websites are the most common form of Personal Information Access currently available. All highway departments, transit agencies and TMAs have websites that provide at least some rudimentary forms of traveler information. Currently, in this region highway and TMA websites focus more on construction advisories than real-time information. Transit websites provide basic information on routes, schedules, fares, and travel advisories. SmartRoute, and Traffic.com, provide realtime travel information to the public. Below is a complete listing of all the existing and proposed Personal Information Access Subsystems in the region. More detailed information on these services can either be found under Information Service Provider in this chapter or in Chapter V of the ITS Regional Architecture titled Inventory of Existing and Planned ITS Resources.

- Amtrak (existing): Interactive telephone information center and website.
- Bucks County TMA (existing): Traveler information website.
- TMA of Chester County (existing): Traveler information website.
- Cross County Connection TMA (existing): Traveler information website.
- Delaware County TMA (existing): Traveler information website.
- Delaware Department of Transportation (existing): Traveler information website
- Delaware River Port Authority (existing): Traveler information website.
- Express Traffic (existing): Traveler information via the telephone.
- Greater Mercer County TMA (existing): Traveler information website, faxes, and e-mails.

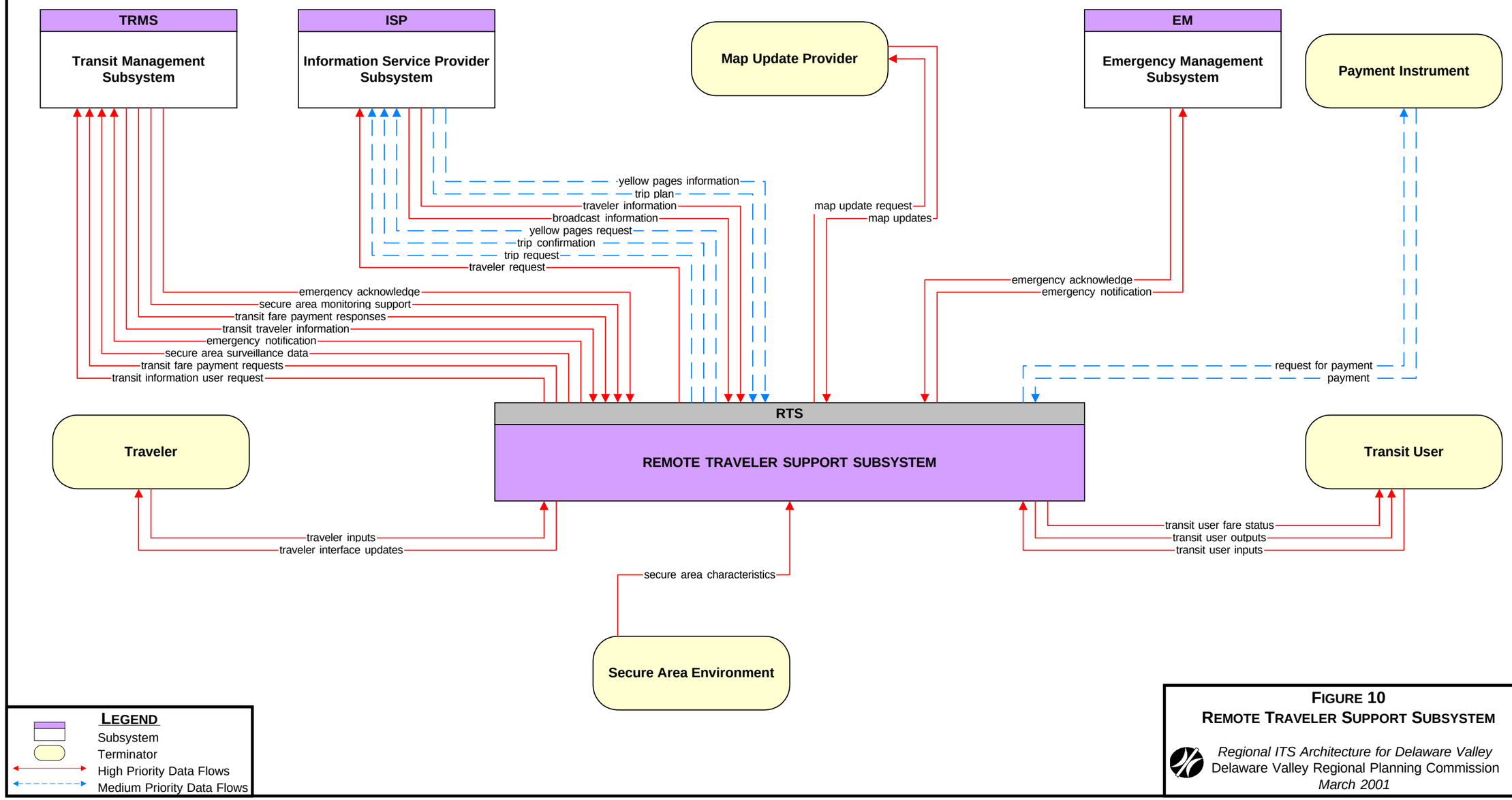
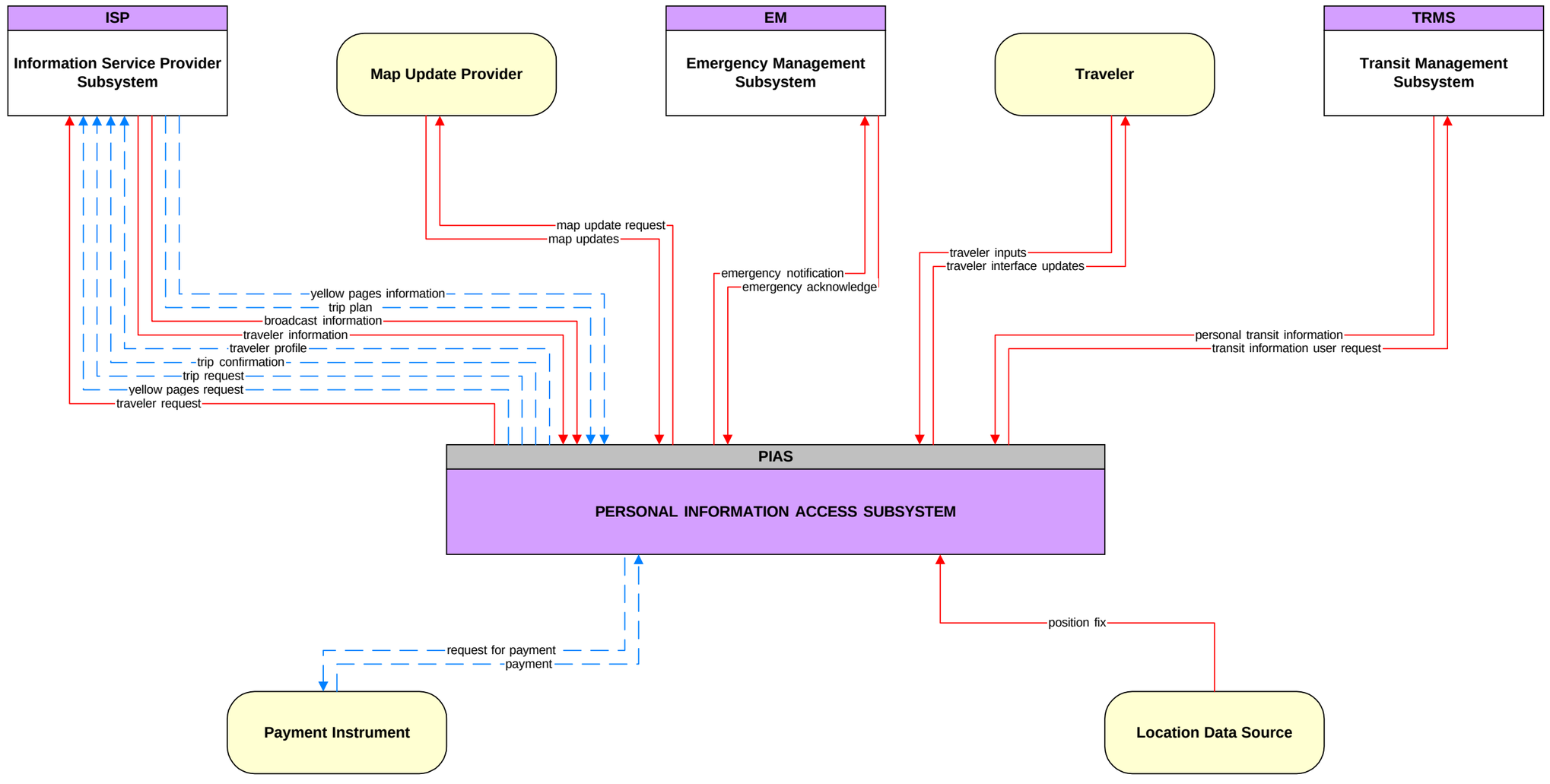


FIGURE 10
REMOTE TRAVELER SUPPORT SUBSYSTEM

Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001



LEGEND

- Subsystem
- Terminator
- High Priority Data Flows
- Medium Priority Data Flows

FIGURE 11
PERSONAL INFORMATION ACCESS SUBSYSTEM

- Greater Valley Forge TMA (existing): Traveler information website and e-mails.
- New Jersey Department of Transportation (existing): Traveler information website.
- New Jersey Transit (existing): Travel information via telephone and website.
- New Jersey Turnpike Authority (existing): Travel information via telephone and website.
- The Partnership TMA (existing): Traveler information website.
- PATCO (existing): Traveler information website.
- Pennsylvania Turnpike Commission (existing): Travel information via telephone and website.
- Philadelphia International Airport (existing): Travel information via telephone andwebsite.
- SEPTA (existing): Travel information via telephone and website.
- SmartRoute (existing): Travel information via telephone, website and television.
- South Jersey Transportation Authority (existing): Travel information by cellular phone.
- Traffic.com (existing): Traveler information website.
- TRANSCOM (existing): Travel information by pager, kiosks, and website.

Vehicle Subsystems

These subsystems are all vehicle-based and share many general driver information and vehicle navigation functions. The Vehicle Subsystems communicate with the Roadside Subsystems and Center Subsystems for provision of information to the driver. The fleet vehicle subsystems (Transit Vehicle, Emergency Vehicle and Commercial Vehicle) all include vehicle location and two-way communications functions that support efficient fleet operations. Each of the three fleet vehicle subsystems also include functions that support their specific service area.

Vehicle

According to the National ITS Architecture, this subsystem resides in an automobile and provides the sensory, processing, storage, and communications functions necessary to support ITS. Information services provide the driver with current travel conditions and the availability of services along the route and at the destination. Both one-way and two-way communications options support a spectrum of information services from low-cost broadcast services to advanced, pay for use personalized information services. Route guidance capabilities assist in formulation of an optimal route and step by step guidance along the travel route.

Vehicle Subsystem capabilities are ultimately up to the private sector, the auto makers and/or private

companies, to promote and install equipment compatible with more advanced ITS services. The Regional ITS Architecture assumes that many of these services such as two-way communications, and GPS will eventually become readily available and therefore incorporates their functionality.

Transit Vehicle

This subsystem resides in a transit vehicle and provides the sensory, processing, storage, and communications functions necessary to support safe and efficient movement of passengers. The Transit Vehicle Subsystem collects accurate ridership levels and supports electronic fare collection. An optional traffic signal prioritization function communicates with the Roadway Subsystem to improve on-schedule performance. Automated vehicle location functions enhance the information available to the Transit Management Subsystem enabling more efficient operations. On-board sensors support transit vehicle maintenance. The Transit Vehicle Subsystem also furnishes travelers with real-time travel information, continuously updated schedules, transfer options, routes, and fares.

New Jersey Transit and SEPTA are the major owner of bus fleets in the region, with smaller bus fleets owned by various county paratransit organizations. SEPTA and New Jersey Transit buses currently have limited ITS capabilities. As the United States Department of Transportation establishes and pays for more advanced buses, the fleets will eventually have most of the capabilities depicted in the National ITS Architecture. Due to the long life-span of buses, it could take well over a decade for the more advanced technological functions to become widely available. For the purpose of the Regional ITS Architecture, it is assumed that SEPTA, New Jersey Transit, and many of the larger paratransit agencies will eventually be capable of supporting ITS functions. Rail vehicles owned by New Jersey Transit, PATCO, and SEPTA will also gradually acquire advanced technology to monitor passenger levels, and impart traveler information.

Emergency Vehicle

This subsystem resides in an emergency vehicle and provides the sensory, processing, storage, and communications functions necessary to support safe and efficient emergency response. The Emergency Vehicle Subsystem includes two-way communications to support coordinated response to emergencies in accordance with an associated Emergency Management Subsystem. Emergency vehicles are equipped with automated vehicle location capability for monitoring by vehicle tracking and fleet management functions in the Emergency Management Subsystem. Using these capabilities, the appropriate emergency vehicle to respond to each emergency is determined. Route guidance

capabilities within the vehicle enable safe and efficient routing to the emergency. In addition, the emergency vehicle may be equipped to support signal preemption through communications with the roadside subsystem.

Some of the more significant emergency vehicle fleets belong to the Philadelphia Police Department, Philadelphia Fire Department, and the New Jersey and Pennsylvania State Police. DRPA, SEPTA and similar regional agencies operate smaller fleets for their police departments. All of these vehicles come equipped with two-way communication equipment and many have computers to receive license information and criminal history record information. The technology available on municipal police and local fire, rescue and EMS vehicles varies widely. For the purpose of the regional architecture it is assumed that the larger fleets and many local police, fire and EMS vehicles will eventually be equipped with appropriate ITS equipment. NJDOT, PennDOT, and the New Jersey Turnpike Authority also operate emergency service patrol vehicles, which fall under the broad category of emergency vehicles.

Commercial Vehicle

This subsystem resides in a commercial vehicle and provides the sensory, processing, storage, and communications functions necessary to support safe and efficient commercial vehicle operations. The Commercial Vehicle Subsystem provides two-way communications between the commercial vehicle drivers, their fleet managers, and roadside officials, and provides HAZMAT response teams with timely and accurate cargo contents information after a vehicle incident. This subsystem provides the capability to collect and process vehicle, cargo, and driver safety data and status and alert the driver whenever there is a potential safety problem. Basic identification and safety status data are supplied to inspection facilities at mainline speeds. In addition, the subsystem will automatically collect and record mileage, fuel usage, and border crossings.

The type of technology made available for commercial vehicles, and how rapidly it is deployed, is up to the manufacturers who develop the technology and the willingness of commercial fleets and drivers who pay for it.

IV. ITS TERMINATORS

Terminators define the boundaries of the ITS Architecture. They represent the people, systems, and general environment that is needed to communicate or interact with ITS subsystems. Essentially, each of the terminators represents an external entity that communicates data to, or receives data from the ITS functional process. Architecturally, no functional requirements are allocated to terminators. Terminators applicable to the Delaware Valley area are identified and defined in this chapter. A complete listing of all the terminators is contained in Appendix B, ITS Terminator Inventory. Appendix C lists all the ITS stakeholders in the region with a composite list of their respective subsystems and terminators.

For simplicity, the terminators have been grouped into categories emulating the subsystems. While most terminators represent governmental agencies or private sector companies interacting with a specific subsystem(s), there are a number of terminators contained in the ITS architecture that represent non-organizational features such as drivers, traffic, weather conditions, etc. These types of terminators are briefly described at the end of the chapter.

Traffic Terminators

Six terminators can be classified as traffic operations related. The first three are self explanatory. The next two terminators, Rail Operations and Wayside Equipment, focus on highway-rail intersections. Multimodal Crossings, the last traffic terminator, is very analogous to the highway-rail intersection terminators, but instead is directed at draw bridges.

Other Traffic Management

This terminator is intended to provide a source and destination for ITS data flows between intra-regional and inter-regional traffic management centers. It enables traffic management activities to be coordinated across different jurisdictional areas. In most instances it represents any traffic management system other than itself, for example PennDOT would consider NJDOT or DRPA as an Other Traffic Management terminator.

In addition to the traffic management centers listed in the ITS Subsystems Chapter, four ancillary traffic management operations located external to the region are anticipated to interact on a regular

basis with local traffic operation centers:

I-95 Corridor Coalition (existing): The I-95 Coalition, an organization of over 25 state departments of transportation and toll authorities, was established to create a seamless state-of-the art transportation system along the I-95 corridor between Virginia and Maine. It's I-95 Information Exchange Network (IEN) was implemented to communicate travel advisories and status of traveler information among transportation agencies in the corridor. Operating agencies along I-95 can transfer incident data to other participating agencies depending on their location and the relevance of the data. The IEN is a static map-based program that identifies and provides data about incidents and the status of VMS signs in the corridor.

New Jersey Department of Transportation Traffic Operations North (existing): This is the northern counterpart of New Jersey DOT Traffic Operations South.

PennDOT Statewide Operations Center (future): There is a proposal to establish a statewide clearinghouse for traffic and traveler information. The cornerstone of the operations center would be a centralized database of traffic information. The center would also facilitate data sharing among regional PennDOT operation centers and it would manage PennDOT's ITS equipment in rural areas where there are no local traffic operations centers.

TRANSCOM (existing): This organization, consisting of 15 highway, transit and public safety agencies, coordinates transportation management efforts in the New York-New Jersey-Connecticut metropolitan area. Its major activities include regional incident notification, construction coordination, and multi-agency technology development. TRANSCOM also has the contract to operate the I-95 Corridor Coalition Information Exchange Network.

Traffic Operations Personnel

This terminator represents the personnel in traffic operation centers who directly interact with traffic control systems, traffic surveillance systems, incident management systems, and maintenance crews to execute ITS programs. They provide operator data and command inputs to direct systems' operations. The degree of automation of traffic operation functions varies based

on the design of each operations center.

In the Delaware Valley region, the primary agencies that employ traffic operations personnel are:

- Delaware Department of Transportation Traffic Management Center (*existing*)
- Delaware River Port Authority (*future*)
- New Jersey Department of Transportation Traffic Operations South (*existing*)
- New Jersey Turnpike Authority Operations Center (*existing*)
- Pennsylvania Department of Transportation District 6-0 Traffic Control Center (*existing*)
- Pennsylvania Turnpike Commission Communications Center (*existing*)
- Philadelphia Streets Department (*existing*)
- South Jersey Transportation Authority (*future*)

Maintenance Personnel

This terminator represents the information systems that are used to manage and track maintenance crews. These maintenance systems are used by roadway maintenance personnel, roadway construction personnel, or other work crew personnel assigned to highway construction and maintenance activities. Coordination with these systems allows the ITS Architecture to rapidly correct incidents or back-ups noted through its surveillance capabilities and also improves the quality and accuracy of information available to travelers regarding closures and other roadway construction and maintenance activities. This terminator represents maintenance crews of all organizations identified under the traffic management subsystem. Construction work is typically contracted out by these entities, so the degree of flexibility in modifying work zones is a function of individual agency policies and the type of construction being undertaken.

Delaware River Port Authority (existing): Maintenance facilities are located at each DRPA bridge adjacent to its toll plaza.

New Jersey Department of Transportation (existing): Region 4 in Mount Laurel covers Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, and Salem Counties. Mercer County is covered by Region 3 headquartered in Freehold. Region 4 is co-located with Traffic Operations South. Maintenance yards located in the Delaware Valley include: Mercer County (Fernwood Service Station, Hamilton Township, Lawrence Township, Washington Township, West Trenton); Burlington County (Bordentown, Edgewater Park, Four Mile Circle, Mount Laurel Township, Red Lion); Camden County (Berlin, Cherry

Hill, Pennsauken) and Gloucester County (Bridgeport, Deptford, Glassboro, West Deptford).

New Jersey Turnpike Authority (existing): There are eight maintenance districts covering the length of the Turnpike. The Southern Division, consisting of Districts 1-3, covers most of the region. Coverage area of District 1, located in Swedesboro, extends from the southern terminus of the turnpike to just north of Interchange 3 (Woodbury/Camden). District 2, in Moorestown, extends from just north of Interchange 3 to just south of Interchange 6 (Pennsylvania Turnpike). District 3's mainline coverage extends from just south of Interchange 6 to just north of Interchange 8 (Hightstown). This district is also is responsible for maintenance activities on the Pennsylvania Turnpike Extension.

Pennsylvania Department of Transportation District 6 (existing): County maintenance offices are located in Doylestown (Bucks County), West Chester (Chester County), Media (Delaware County), Norristown (Montgomery County), and in Philadelphia.

Pennsylvania Turnpike Commission (existing): Four maintenance facilities serve the Philadelphia area. They include Devault (Morgentown to Valley Forge), Plymouth (Valley Forge to Ft Washington and Plymouth Meeting to Lansdale on the Northeast Extension), Trevose (Fort Washington to the Delaware River), and Quakertown (Northeast Extension north of Lansdale).

Philadelphia Streets Department (existing): The City of Philadelphia is divided into five traffic maintenance districts: Northwest, West, South, Southwest, and North Philadelphia. After hours 4 p.m., one crew covers the north and south districts, and after midnight one crew covers the entire city. Forty four people are assigned to signal maintenance/ construction activities.

South Jersey Transportation Authority (existing): Its primary maintenance facility is located in Hammonton, and a satellite yard is situated by Interchange 38 in Williamstown.

Rail Operations

This is the railroad equivalent to a highway traffic management center. It is a centralized control point for a substantial segment of a railroad's operations and is the source and destination of

information that can be used to coordinate rail and highway traffic management.

In the Philadelphia area the major railroad operators are:

- Amtrak
- Canadian Pacific
- CSX
- New Jersey Transit
- Norfolk Southern
- SEPTA

Wayside Equipment

This terminator represents train interface equipment maintained and operated by a railroad and physically located at or near a rail grade crossing. This terminator is the source and destination for highway rail intersection information about approaching trains (e.g. the time at which the train will arrive and the time it will take to clear a crossing, crossing status or warnings, etc.).

Locally, wayside equipment is operated by the rail operators listed above and a number of smaller short line operators that employ manual instead of automated equipment.

- Amtrak
- Canadian Pacific
- CSX
- New Jersey Transit
- Norfolk Southern
- SEPTA
- Philadelphia Belt Line
- Brandywine Railroad
- Southern Railroad of New Jersey
- New Hope and Ivyland Railroad

Multimodal Crossings

This terminator represents the control equipment that interfaces with draw bridges at rivers. The Talcony Palmyra Bridge, operated by the Burlington County Bridge Commission, is the most notable draw bridge in the region, carrying traffic between New Jersey and Pennsylvania. Like

highway-rail intersections, multimodal crossings take priority over the road traffic. Data provided by this terminator includes the time and duration of the bridge openings.

Transit Terminators

Five terminators fall under this category, Other Transit Management, Transit System Operators, Transit Fleet Manager, Transit Maintenance Personnel, and Transit Drivers. All Transit Terminators currently exist.

Other Transit Management

This terminator is intended to provide a source and destination for ITS architecture flows between intra-regional and inter-regional transit management centers. It enables transit management activities to be coordinated across jurisdictional boundaries. In most instances it represents any transit management system other than itself, for example SEPTA would consider Amtrak or PATCO as an Other Transit Management Terminator.

Besides the transit management centers listed in the ITS Subsystems Chapter, DART First State must also be considered as an Other Transit Management Terminator. Dart provides transportation services statewide within Delaware with over 320 buses and over 60 bus routes. Specifically, DART serves New Castle County with commuter rail service to and from Philadelphia via SEPTA's R2 Regional Rail Line.

Transit System Operators

This terminator represents the staff who are responsible for all aspects of the transit subsystem planning and management including monitoring, controlling, and modifying the transit fleet routes and schedules on a day to day basis to account for abnormal situations such as vehicle breakdown, vehicle delay, etc. All major transit operators in the region have staff in their transit operation centers represented by this terminator. County paratransit operations may not have dedicated transit system operations staff.

In the Philadelphia region, the primary agencies that employ transit system operators are:

- Amtrak
- New Jersey Transit

- PATCO
- SEPTA

Transit Fleet Manager

This terminator represents personnel responsible for planning the operation of transit fleets, including monitoring and controlling the transit fleet route schedules and the transit fleet maintenance schedules. All transit systems in the Philadelphia area, such as SEPTA or NJ Transit, and even the smaller county paratransit systems, have a person or office responsible for this function.

Transit Maintenance Personnel

The terminator represents personnel that are responsible for monitoring, controlling, and planning schedules for the maintenance of transit fleets. This applies to all transit properties listed under Transit Management Subsystems (Chapter III).

Transit Driver

This terminator represents the driver who operates a fixed route or flexible route transit vehicle. Fixed route drivers require minimal information such as run times and passenger loading. The flexible route drivers require additional information such as dynamically changing routes.

Information Service Provider Terminators

Five terminators are presented under this category. All of them, with the exception of Yellow Pagers Service Providers, currently exist.

Other Information Service Provider

This terminator represents other distinct Information Service Providers, and is intended to provide a source and destination for ITS data flows between peer information and service provider functions. It enables cooperative information sharing between providers as conditions warrant. In the Physical Architecture this terminator is a reciprocal Information Service Provider Subsystem.

In addition to the Information Service Providers listed in the ITS Subsystems Chapter, two other organizations play a significant role in the region:

I-95 Corridor Coalition (existing): I-95 Corridor Coalition's website serves as a portal to other traveler information websites offered by public agencies along the I-95 Corridor. Information is available by state, by metropolitan area (Boston, New York, Philadelphia, and Washington DC), and regional levels. The Delaware Valley section extends from Wilkes-Barre-Scranton to Delaware. A pamphlet and an on-line version entitled of ***Lane Closings, Bottlenecks & and Upcoming Events*** is produced by the Coalition in the summer and fall of each year.

TRANSCOM (existing): TRANSCOM also functions as an ISP and has developed three ways to get information out to the public. The first is a Travel Information Center which provides free internet and telephone service to the public. The second type is a Personalized Travel Center, which is a fee-based service using telephone call-in, e-mail, or pager, informing the traveler of problems along their pre-specified routes. The last information service is a Regional Transit Itinerary Planning System that links all modes of transit itineraries together to tell the user the particular routes, transfers and specific paths that are needed to get from point to point. Locally, many agencies rely upon TRANSCOM to disseminate traveler information via the I-95 Coalition's IEN, or to the local media, particularly after hours.

Public Affairs

The National ITS Architecture envisions media receiving reports on travel conditions directly from traffic and transit centers. However, most local agencies have a policy to filter the flow of information between the centers and the media through a public affairs officer. This policy was adopted in the era when continuous information on travel conditions was unavailable and the media generally only requested information during incident situations. As continuous information on travel conditions becomes available, there needs to be a differentiation between standard travel information and information related to incidents or similar situations. To address this issue, a new terminator called Public Affairs has been added to the Regional ITS Architecture.

Public Affairs Terminators are located at the following organizations:

- Delaware River Authority/PATCO (*existing*)

- Pennsylvania Department of Transportation District 6-0 (*existing*)
- SEPTA (*existing*)

Media

This terminator represents the companies that provide traffic reports, travel conditions, and other transportation-related news services to the traveling public through radio, TV, and other media. It is also a source for traffic flow information, incident and special event information, and other events which may have implications for the transportation system.

In the Philadelphia region some of the major media include:

- Newspapers (e.g., Philadelphia Inquirer, Philadelphia Daily News, the Metro, Camden Courier Post)
- Radio stations (e.g., KYW)
- Local network television stations

Multimodal Transportation Service Provider

This terminator provides for the exchange of data between transportation service operators with the ITS architecture. It specifically covers non-roadway or transit transportation systems such as the Philadelphia International Airport.

Yellow Pages Service Providers

This terminator represents organizations that provide traveler related services such as information about gas stations, restaurants, lodging, vehicle repair, or points of interest. The interface with the yellow pages service provider is necessary so that accurate, up-to-date information can be provided to the traveler and to support electronic reservation capabilities included in the ITS user services. There are currently no yellow pages service providers in the region. However, companies are starting to offer these types of services in other regions and soon should be available locally.

Toll Administration Terminators

Terminators associated with toll administration are listed under two categories: those solely related to tolls, such as toll operators and departments of motor vehicles listed below, and other

terminators that relate to the financial aspects of toll collection, which are listed under terminators applicable to multiple systems.

Toll Operator

The Toll Operator is the supervisor physically present at the toll plaza to monitor the operational status of the plaza. Each toll authority typically has a supervisor responsible for overseeing toll plaza operations and providing detailed reports on toll transactions, violations, and purchases of toll prepayments. In this region, the Toll Operator Terminator consists of the supervisory personnel of the seven toll authorities identified in the Toll Administration Subsystem.

Toll Administrator

The Toll Administrator is the person(s) that manages the back office payment administration systems for an electronic toll system. This terminator monitors the systems that support the electronic transfer of authenticated funds from the customer to the system operator. The terminator monitors customer enrollment and supports the establishment of escrow accounts depending on the clearinghouse scheme and the type of payments involved. The terminator also establishes and administers the pricing structures and policies. Locally it represents a combination of the E-ZPass Coalition and the back office personnel of each toll authority.

Department of Motor Vehicles (DMV)

This terminator represents exchange of vehicle identification from a department of motor vehicles to a toll operator to identify toll violators. In New Jersey the department of motor vehicles is NJDOT's Motor Vehicle Services and in Pennsylvania it is PennDOT's Driver and Vehicle Services.

Enforcement Agency

This terminator represents the appropriate entity which receives reports of a toll violations detected by ITS equipment. The regional E-ZPass Consortium operates a joint Customer Service Center and Violations Processing Center serving all toll facilities in New Jersey and Delaware.

Emergency Management Terminators

This group of terminators focuses on the secondary emergency management organizations that support the state police and municipal police and fire departments. It also accounts for the County 911 services and police dispatchers who are the cornerstone of the Emergency Management Subsystem.

Other Emergency Management

This terminator provides a source and destination for ITS data flows between various communications centers operated by public safety agencies such as police departments, fire departments, and emergency medical services. The interface represented by this terminator enables emergency management activities to be coordinated across jurisdictional boundaries and between functional areas. It supports coordination of incident management information between many different centers providing 911 services, emergency service dispatchers, emergency operations, and other functions that participate in the detection, verification, response, and clearance of highway incidents. This terminator also supports interface to other allied agencies like HAZMAT companies or utility companies that also participate in the coordinated response to selected highway-related incidents.

The following agencies represent county or state emergency management organizations who can contribute additional support to the primary emergency management subsystems. Many of the county agencies are part of the same organization that operates the 911 services.

Bucks County Emergency Management Agency (existing): Their primary role is to coordinate emergency response efforts throughout the county. They coordinate and institute emergency planning for the local municipalities. The agency is not typically involved with incident management, and only provides additional resources when necessary. The agency is not involved with the 911 services for the county. Calls are taken and dispatched at a separate location.

Burlington County Emergency Management Services (existing): The agency assists in coordinating resources in the case of an emergency. The county's 911 service operates out of this location for all but one municipality in Burlington County. In regards to incident management, Burlington County is only involved in major events. In addition to

dispatching 911 calls for the county, the agency is in contact with local police, fire and EMS services.

Camden County Office of Emergency Management (existing): When a problem arises that is too large for local services, Emergency Management get involved. The 911 calls for the county are dispatched from the Office of Emergency Management (OEM) for EMS and fire services. Most police calls are dispatched from OEM, a few municipalities still handle their own calls. Although the Emergency Management and 911 are located in the same building, the two agencies are completely separate.

Chester County Department of Emergency Services (existing): Chester County Department of Emergency Services was unable to provide any information.

Delaware County Emergency Services (existing): Their primary goal is to support local municipalities in the event of a large scale emergency. As such, their involvement in incident management is limited to large scale events. All 911 emergency calls, with the exception of two municipalities, are despatched from this location.

Gloucester County Emergency Response Center (existing): All 911 emergency calls dialed within the county are answered here. The center also dispatches 17 of the 24 municipalities' police departments. The other seven municipalities dispatch their own police calls. All of the fire and ambulance for the 24 municipalities in the county are also despatched by this agency.

Mercer County Office of Emergency Management (existing): Acts only as a liaison between the coordination efforts of state and local emergency management organizations. The agency has no involvement with incident management unless local resources have been exhausted. The 911 calls throughout the county are handled separately by each of the municipalities.

Montgomery County Emergency Preparedness (existing): The County Emergency Response Center is also the location of the county's 911 system. All 911 calls are handled by Emergency Preparedness with the exception of Abington, Upper Merion, and Cheltenham townships, who operate their own systems. The agency serves 62 municipalities. The building also houses the Hazardous Material Response Team, Flood

Mitigation, and the Regional Terrorism Task Force. The agency interacts with the local police and emergency departments.

New Jersey Office of Emergency Management (existing): OEM's primary role is to assist in the planning and training of officials to respond to disastrous events that are beyond local capabilities. OEM is a unit of the New Jersey State Police. Operationally, there are three subregions: North, Central, and South, that act as a center of coordination for county emergency management agencies. Each county in turn is responsible for coordinating municipal responders. OEM provides extensive training for county and municipal coordinators who are responsible for putting together emergency plans following state guidelines. Counties have a choice in routing cellular 911 telephone calls either to the county's public safety answering point or to a centralized cellular 911 telephone bank maintained by the state police. Most counties in South Jersey manage their cellular 911 calls, in North Jersey the calls are generally routed to the state police. The centralized 911 service is located in the same building as the Emergency Management and the OEM has the capability to monitor the calls. All counties are required to have a traffic rerouting plan.

Pennsylvania Emergency Management Agency (existing): PEMA is divided into two broad areas: emergency management and incident management. PEMA's role in emergency management is one of coordination. The state only becomes involved during large scale emergencies, or when requested to by local authorities. Their role is to pass information, oversee the state's disaster preparedness and response programs, and is responsible for communications and coordination; but not command and control. The agency is usually called for assistance when local or county agencies have used all their resources and are still in need of additional assistance. PEMA is also involved with incident management, although it is not involved in daily traffic operations. The agency; however, may be called if the incident is serious or requires extra equipment for cleanup or removal. It has a regional office located in the Philadelphia area. There is a central information center planned for the state of Pennsylvania to coordinate large-scale information sharing and cooperation. The Advanced Traveler Information Resource Center (ATIRC) will function as a statewide center to coordinate police, fire, and ambulance services. The Center will also provide information to citizens about incidents, road conditions, construction, and delays.

Emergency Telecommunications System

This terminator represents 911 services and motorist call boxes. In the Delaware Valley region it is represented by the following terminators:

- Bucks County 911 (*existing*)
- Burlington County 911 (*existing*)
- Camden County 911 (*existing*)
- Chester County 911 (*existing*)
- Delaware County 911 (*existing*)
- Gloucester County 911 (*existing*)
- Mercer County 911 (*existing*)
- Montgomery County 911 (*existing)*
- New Jersey State Police - West Trenton (*existing*)
- PATCO Center Tower (*existing*)
- Pennsylvania Turnpike Commission Communications Center (*existing*)
- Philadelphia Police Department Radio Room (*existing*)
- SEPTA Transit Police (*existing*)
- South Jersey Transportation Authority (*existing*)

Emergency System Operator

This terminator represents personnel that monitor all ITS emergency requests (including those from 911 Operators) and initiate pre-defined or improvised responses to be executed by emergency management agencies. This terminator includes dispatchers who manage an emergency fleet (police, fire, ambulance, HAZMAT, etc.) or higher order emergency managers who provide response coordination during emergencies.

In addition to the 911 operators listed above under Emergency Telecommunication System, the following are also considered Emergency System Operators:

- Municipal Police Dispatchers (*existing*)
- Delaware River Port Authority Police Dispatchers (*future*)
- Delaware River Port Authority Bridge Radio Rooms (*existing*)
- New Jersey State Police - Troop A (*existing*)
- New Jersey Transit - Maplewood (*existing*)
- PATCO Center Tower (*existing*)

- Pennsylvania State Police Barrack's Radio Dispatchers (*existing*)
- Philadelphia Municipal Radio Room (*existing*)
- SEPTA Transit Police - SEPTA Operations Center (*existing*)

Commercial Vehicle Terminators

The first two Commercial Vehicle Terminators involve CVO operations, namely field inspections and administrative responsibilities. The last terminator is Freight Shippers who interact with CVO operations.

Commercial Vehicle Operations Inspector

This terminator represents the officials who perform regulatory inspection of commercial vehicles in the field. CVO inspectors support the roadside inspection, weighing, and checking of credentials either through automated pre-clearance or manual methods. The following agencies employ CVO inspectors:

- New Jersey Sate Police Commercial Carrier/Safety Inspection Unit
- Pennsylvania State Police
- Pennsylvania Public Utility Commission

Government Administrators

This terminator represents governmental agencies who are responsible for issuance of licenses, permits and other credentials for pre-clearance, provide database information to support most CVO services, and will receive, distribute, and audit CVO related taxes. In New Jersey this responsibility lies with NJDOT, in Pennsylvania it is shared between PennDOT and the Pennsylvania Public Utility Commission.

Intermodal Freight Shipper

This terminator represents organizations that engage in the shipment of freight by means of rail, air, or sea. There are numerous shippers in the Delaware Valley who engage in this activity.

Terminators Applicable to Multiple Subsystems

A number of terminators have multiple applications that cut across subsystem boundaries. For example, Event Promoters input information into Traffic Management, Transit Management, and Emergency Management subsystems.

Archived Data User Systems

This terminator represents the systems that users employ to access archived data. The general interface provided from this terminator allows a broad range of users (e.g. planners, operators) and their systems (e.g. databases, models, analytical tools, user interface devices) to acquire data and analyze results from the archive.

Many organizations such as county planning departments, TMAs, environmental agencies, USDOT and operating agencies rely upon traffic and transit information. Among all these organizations, the following are most the data intensive users of transportation information:

- Delaware Valley Regional Planning Commission
- New Jersey Department of Transportation Division of Transportation Data Technology
- New Jersey Transit
- Pennsylvania Department of Transportation
- Philadelphia Streets Department
- SEPTA Technical Services and Research
- Traffic.com

Event Promoters

This terminator represents special event sponsors that have knowledge of events that may impact travel on roadways or other modes. These entities can interface with the Regional ITS Architecture to provide event information such as date, time, estimated duration, location, and any other information pertinent to traffic conditions.

A listing of the major event promoters in the Philadelphia region is given below. The Philadelphia Convention and Tourist Bureau, while not strictly a event promoter, is a excellent source of information about activities in the region.

- E-Center

- Penns Landing Corporation
- Pennsylvania Convention Center Authority
- Philadelphia Convention and Tourist Bureau
- Sports Complex (Philadelphia Department of Recreation and Philadelphia Industrial Development Corporation)

Financial Institution

This terminator represents the organization that handles all electronic fund transfer requests to enable the transfer of funds from the user of the service to the provider of the service. The functions and activities of financial clearinghouses are undertaken by this entity. Every toll authority and transit agency employs different financial institutions to conduct their financial transactions. E-ZPass's Customer Service Center, which serves multiple toll authorities, is the one exception. As information service providers offer more advanced fee based services, the number of financial institutions involved with transportation services is expected to increase.

Location Data Source

This terminator represents an external entity which provides accurate position information through GPS, terrestrial trilateration, or even driver inputs. This terminator contains sensors such as radio position receivers (GPS) and/or dead reckoning sensors (such as an odometer or a magnetic compass). It is used by a wide range of subsystems to locate private vehicles, transit vehicles, emergency vehicles, commercial vehicles and travelers for navigation purposes. Availability of GPS as standard equipment in motor vehicles is the responsibility of the private sector and market demand. It is anticipated as GPS becomes more readily available it will simultaneously become standard equipment in buses and emergency vehicles. Local alternatives include SEPTA buses and E-ZPass transponders which can serve as a vehicle probes.

Map Update Provider

This terminator represents a third-party developer and provider of digitized map databases used to support ITS services. It supports the provision of the databases that are required for route guidance as well as those that are used for display by operators and at kiosks. While many companies in the private sector are currently developing maps for navigation or to dynamically display congestion information, none have so far targeted the Philadelphia area. The TTF

recognizes that map update providers will eventually serve the region and it is as critical to provide up-to-date information to them for dissemination to the public as well as to receive up-to-date maps for use by traffic, transit and emergency personnel.

Other Archives

This terminator represents distributed archived data systems or centers whose data can be accessed and shared with a local archive. The interface between the Other Archives Terminator and the Archived Data Management Subsystem allows data from multiple archives to be accessed on demand or imported and consolidated into a single repository. Some of the more significant archives of transportation information reside at the agencies listed above under Archived Data User Systems Terminator.

Payment Instrument

This terminator represents the entity that enables the actual transfer of funds from the user of a service to the provider of the service. This terminator can be an account number or an electronic tag. E-ZPass, issued by the E-ZPass Consortium, is the only Payment Instrument Terminator currently available in the region.

> *E-ZPass Consortium (existing)*: This is an organization comprising five transportation agencies representing Delaware, New Jersey and New York. The agencies of the Regional Consortium include the Delaware Department of Transportation, the New Jersey Tumpike Authority, the New Jersey Highway Authority, the South Jersey Transportation Authority, and the Port Authority of New York and New Jersey. The Consortium was developed to allow E-ZPass users seamless travel across jurisdictional boundaries while using only one payment instrument. The consortium is the entity that reports and adjudicates all detected toll violations.

Weather Service

This terminator represents an external source of current and forecasted weather conditions. Externally derived weather data is integrated with the other information collected and disseminated by the ITS architecture to support operations and travel planning. The National Weather Service office in Mount Holly covers the Philadelphia metropolitan area. PennDOT, Pennsylvania

Turnpike Commission and SmartRoute, among other agencies, have contracted for supplemental weather forecasting services from AccuWeather.

Other Terminators

This section will briefly list those terminators such as vehicles, transportation users, and the environment, that are required to serve as basic inputs and outputs by the systems architecture but which do not represent specific public or private organizations.

Basic Vehicle

This terminator represents the basic vehicle platform that interfaces with and hosts ITS electronics. This interface allows general vehicle systems (e.g., the stereo speaker system) to be shared by ITS and non-ITS systems.

Traveler

This terminator represents any individual who uses transportation services and needs information for pre-trip planning or multi-modal personal guidance. Once a trip begins, the architecture treats the traveler as either a vehicle driver or transit user.

Transit User

This terminator represents individuals using public transit vehicles. They may be in the act of boarding or alighting the vehicles and are thus sensed for the purpose of determining passenger loading and fares, or are on a transit vehicles and require the ability to request and receive information.

Driver

This terminator represents the individual who operates a licensed vehicle and originates driver requests and receives driver information. Information and interactions which are unique to drivers of a specific vehicle type (e.g., fleet interactions with transit, commercial, or emergency vehicle drivers) are covered separately.

Commercial Vehicle Driver

This terminator represents the individual who operates vehicles transporting goods, including both long haul trucks and local pick up and delivery vans.

Roadway Environment

This terminator represents the physical conditions surrounding the roadway itself. These may include fog, ice, snow, rain, etc. which will influence the ways vehicles can be safely operated.

Pedestrians

This terminator provides input in the form of a pedestrian request for right of way at an intersection.

Traffic

The Traffic terminator represents the collective body of vehicles that travel on arterials, expressways, and toll facilities from which traffic flow surveillance information is collected (average occupancy, average speed, total volume, average delay, etc.), and to which traffic control indicators are applied (signals, ramp metering, variable speed limit indicators, etc.).

Vehicle Characteristics

This terminator represents vehicle characteristics such as height, width, length, weight, number of axles, and other properties that allow an individual vehicle to be detected and measured or classified.

V. INVENTORY OF EXISTING AND PLANNED ITS RESOURCES

In a previous chapter of the Regional ITS Architecture, a comprehensive list of regional ITS elements was presented subsystem by subsystem. For example, all the existing and planned traffic operation centers were described under the Traffic Management Subsystem. This chapter will inventory ITS deployments by agency to present a complete picture of ITS activity in the region from each agency's perspective. However, due to the rapid roll-out of ITS equipment in the region, and the number of organizations deploying ITS technologies, it is extremely difficult to keep this exhaustive list up-to-date for all the organizations. Consequently, the inventory focuses on selected key agencies, whose inventory will be periodically be updated.

The first section of this chapter describes the various ITS components listed in the inventory. They generally pertain to ITS technologies associated with the Roadway Subsystem and the Remote Traveler and Personal Information Access Subsystems. The second section contains the detailed agency-by-agency inventory.

Description of ITS Components

Some of the ITS components are exclusively either highway or transit oriented, while others are applicable to both. For those components mutually applicable to both, there may be significant differences. For example, variable message signs for highways and train stations may both impart traveler information, but are two substantially different devices. In the inventory, there are many instances where the component's name does not follow the nomenclature of the National ITS Architecture, but rather is reflective of the name assigned to it by the agencies. The following text describes the various categories of ITS elements deployed in the region.

Control Center: Control centers are the focal point and communications hub of an agency's operation. Almost all transit, highway and bridge agencies in the region have their own control centers. These facilities monitor and control an agency's highway or transit network and are responsible for incident management. While the equipment in each operating center varies by agency, the typical control center consists of any number of computer workstations, radio scanners, TV monitors, audiotext recording booths to record HAR messages, and fax machines for broadcasting information to other agencies. Depending on agency needs, a highway control center can include capabilities to operate

computerized traffic signal systems, variable message signs and highway advisory radios, monitor CCTVs, manage emergency service patrols, and coordinate incident management response teams. Composition of transit operation centers vary based upon whether rail or bus operations are involved. Power, tracks, and signals systems are integral components of rail operations.

Closed Circuit Television: CCTV is real-time video surveillance equipment, monitored and manipulated by operations personnel. For highways, CCTVs are installed at locations where accident rates and/or congestion levels are known to be high. The cameras dispatch real-time video images to the traffic operation centers so that in emergency situations a quicker response can be provided. Transit agencies deploy CCTV cameras to observe transit passengers for transit management (crowding levels), fare collection, and security purposes.

Vehicle Detection System: Vehicle detection systems are applicable to both highway and transit systems. For highways, traffic flow, capacity, volume information, speed data, vehicle weight, number of axles, etc. along a segment of roadway are considered essential data used to determine traffic demand, bottleneck locations, and the level of service. Traditionally, inductive loop detectors, installed in the pavement, have been the primary method of detecting traffic. However, high levels of maintenance and repair activities are common and can cause disruptions to traffic. Microwave detectors, installed above or to the side of the roadway to detect presence of a vehicle via microwave energy, are becoming a more viable approach to measure traffic conditions. Maintenance and repair activities are therefore much less disruptive to traffic.. Transit systems use vehicle detectors to locate trains with more accuracy than the traditional signal block system.

Roadway/Weather Sensors: Weather sensors are typically installed at locations that experience a higher-than-average number of accidents attributable to fog, snow or icy conditions. Sensor information can be used to more effectively deploy road maintenance resources, issue weather-specific warnings to drivers and general advisories to motorists. Weather sensors are connected to remote processing units located in the field which measure, collect, and pre-process environmental data and then transmit the information to an operations center where staff can act on the information.

Closed Loop Traffic Signal System: For this system, traffic signals are interconnected along specified corridors to provide for ease in traffic flow. The signals may be monitored by detectors and adjusted according to current traffic conditions, or preprogrammed with a number of signal timing plans that vary by time of day and day of week.

Aerial Traffic Surveillance: Some organizations employ helicopters and/or fixed winged aircraft, with radio communications, to monitor designated travel areas. Travel reporting organizations, and some highway agencies, find it more cost effective to perform aerial surveillance than to install detectors or CCTV cameras with limited coverage areas and high costs associated with data transmission. The aircraft can also patrol alternate routes and view traffic backups as they are occurring.

Variable Message Sign: The purpose of the VMSs is to provide real-time en-route travel advisories to travelers. For highways, the VMS signs are either centered over travel lanes or placed alongside the roadway. Messages on permanent VMS signs typically originate from a traffic control center. For transit systems, VMSs take the form of dynamic message boards located in waiting areas and/or platforms to provide information on train arrivals, departures, and platform locations.

Highway Advisory Radio: HAR provides travelers with real-time roadway information, including weather information, agency hotline numbers, incident information, and roadway construction advisories, directly over their car radio. The FCC reserves certain AM and FM frequencies specific to whatever jurisdiction in which they are located for public agencies to broadcast these special travel advisories.

Weigh-In-Motion Station: Weight measuring equipment, including fixed sensors embedded in the pavement, can ascertain the weight of a commercial vehicle at highway speeds to ensure the vehicle is operating within legal weight limits. Ultimately, WIM stations will be utilized to assess motor vehicle taxes on commercial carriers.

Ramp Metering: Ramp metering is designed to control the rate of traffic entering a freeway. The objective is to maintain a predetermined level of service on the freeway by adjusting the on-ramp traffic volume with a traffic control signal. Typical waiting times at ramp metering signals are between 5 to 6 seconds per vehicle.

E-ZPass: E-ZPass is an electronic toll collection system developed by a consortium of toll agencies located in the northeast United States. When a vehicle passes through an E-ZPass designated toll lane, an electronic tag, in the form of a small box mounted on a vehicle windshield, is detected by an antenna and the appropriate toll is deducted from the customer's prepaid E-ZPass account. Because of the alliance, E-ZPass will eventually be employed on all toll bridges and roads in the region.

Transit Vehicle Signal Priority: This technology allows transit vehicles to send direct control requests to signalized intersections. These messages result in preemption of the current signal control plan and grants right-of-way to the requesting transit vehicle.

Emergency Vehicle Signal Priority: This technology accommodates requests from emergency vehicles to signalized intersections for signal priority to grant right-of-way to the requesting emergency service vehicle.

Emergency Service Patrols: The ESP program is designed to improve the efficiency of the highway system through the quick resolution of minor incidents, including disabled vehicles, vehicles out of gas, and minor accidents, that impact traffic flow. ESP vans patrol along highways and provide assistance to disabled vehicles. ESP operators are equipped to perform minor repairs such as changing a flat tire or providing gasoline. When major repairs are needed, ESP operators can assist the motorist in contacting a towing company to remove the disabled vehicle. ESPs also reduce the risk of secondary accidents by deploying appropriate warning devices.

Incident Management Response Teams: IMRT's are units of specially trained personnel who respond to major incident scenes to expedite coordinated multi-agency remedial efforts. IMRT members function as liaisons to the incident commander in charge of the scene, and advise the commander of highway department resources available to help remedy the emergency situation. Their objective is to expeditiously restore normal traffic flow. While police, fire, and other emergency responders investigate the accident scene or remove victims from vehicles, the IMRT team is responsible for on-scene traffic management and coordination of alternative detour routes.

Emergency Call Boxes: Emergency call boxes permit travelers who do not have cellular phones a mechanism to report accidents and other emergency situations. They are used by

both highway and transit travelers. Call boxes are typically located along the side of an expressway at mile or half mile intervals. Transit agencies place them in waiting areas and on platforms to improve the security of passengers.

Cellular Phone Number for Incident Reporting: Several toll authorities have reserved cellular phone numbers, such as #95 for the New Jersey Tumpike, for use by motorists to report disabled vehicles or incidents while en-route. The numbers are usually toll-free and go directly to the agency's operations center. Several highway departments have posted signs directing motorists to dial cellular 911 to report incidents.

Telephone/Cellular Phone Travel Information Number: In a similar manner to cellular phone numbers for incident reporting, several agencies have dedicated a specific land line or cellular phone number for travelers to obtain travel information prior to starting their trip or during their trip. Types of information disseminated include real-time travel reports, special event information and construction information.

Travel Information Kiosks: A number of organizations have plans to install travel information kiosks at tourist centers, government buildings, and highway service areas. Travelers will be able to obtain current traffic and transit information, information about places to visit, route planning information, and hotel reservations. Generally kiosks will be more interactive and offer more choices than the static traveler information services currently available.

Travel Information Website: This type of website is used to access traveler information prior to starting a trip. Currently, most of the existing travel websites in the region offer only construction or special event information. Eventually, real- time, route-specific travel reports will be found on the websites. SmartRoute, under contract to PennDOT and NJDOT provides real-time travel information on selected highways and transit facilities in the region. DelDOT already offers CCTV images and live audio from HARs on their website.

Alpha Paging/E-mail: This service allows individuals or businesses to subscribe with an Information Service Provider to receive travel reports delivered directly to their alpha-numeric pager or e-mail address. The subscriber usually supplies the ISP with predetermined routes such as travel patterns to/from their workplace. They can request that

reports be sent at specific times throughout the day, such as just prior to driving to/from work, or only in the event of unusual conditions.

Travel Information Cable TV: Live cable TV broadcast programs provide full coverage of traffic conditions with live CCTV traffic camera images, route maps (with animation) and weather information.

Communications: Due to the high bandwidth requirements to push video images and other field-to-center and center-to-center communications, many agencies are employing high bandwidth fiber optic cables and/or T-1 Lines.

Automatic Vehicle Location: This technology is used by various agencies, including transit and emergency management agencies, to constantly monitor the location of their vehicles. Transit agencies utilize AVL as a management tool to track the progress of buses and to determine when remedial action is required if buses are not adhering to schedule. Emergency dispatchers rely upon AVL to help guide their selection of which vehicle to dispatch to a call. AVL technology relies upon GPS or triangulation as the mechanism for locating vehicles.

Smart Cards: This technology provides the capability for the traveler to use a common fare instrument for all surface transportation services (e.g., multiple transit agencies, parking facilities, toll roads), to pay without stopping, and have the payment media automatically identified as invalid or its eligibility verified. In addition, smart cards have the capability to provide expansion into other uses as payment for retail purchases, telephone services and for off-line billing for fares paid to agencies.

Broadcast Fax: Many agencies rely on broadcasts of incident-related information to other organizations through a fax network sponsored by the DVHOGs. Participating area agencies include police and fire communications centers and highway agencies.

Incident Congestion Prediction System: Using algorithms, this system will utilize current traffic flow data and combine it with historical traffic flow data to predict when and how quickly backups will form based on various types of incident occurrences. This system will also allow for better scheduling of maintenance operations to minimize impacts on traffic flow.

Pedestrian Actuated Traffic Signal with Handicapped Card Reader: An actuated pedestrian signal that is American Disability Act (ADA) compliant. It relies on a card reader to trigger the actuation.

"Talking" Pedestrian Traffic Signal: Audio signal to pedestrians, including those who are handicapped, indicating permission to cross the roadway. This type of signal is also ADA compliant.

Highway-Rail Intersection Warning System: This system manages highway traffic at highway-rail intersections (HRI), preventing entrance into these intersections by means of barrier gates when the warning system is activated. The HRI warning system may be activated by equipment that detects or communicates with the approaching train.

Commercial Vehicle Electronic Administration Processes: This process allows commercial vehicle operators to obtain necessary permits via computer and supports the exchange of safety and credentials data among multiple jurisdictions and between agencies within a single jurisdiction.

Volunteer Mobile Probe Reporting: The objective of this activity is to identify travel times and incidents through reports from volunteer travelers. These travelers primarily use their cellular phones for reporting purposes, and usually register their travel route with the agency gathering this information.

Inventory of Regional ITS Deployments

The following is an agency by agency inventory of ITS components deployed in the region. It includes all the10 Tier I agencies (as defined by the ITS Technical Task Force) and many of the Tier II organizations. Generally, the inventory represents the status of ITS deployments as of March 2001. Periodic updates of this inventory will be conducted to document the continual deployment of ITS technology in the Delaware Valley region.

Burlington County

Control Center: TOC, located at the Burlington County Mt. Laurel office, controls closed loop traffic signal systems on CR 541 (operational) and CR 630, CR 633 and CR 634 (operational 2001). A 340 ft. communications tower for the Traffic Operations Center will begin construction in February 2001.

Vehicle Detection System: Loop detectors and microwave detectors. Video vehicle detection systems - 14 total intersections are operational.

Closed Loop Traffic Signal System:
CR 541: from NJ 38 to US 130 (operational)
CR 630: Willingboro Twp. (operational 2001)
CR 633: Willingboro Twp. (operational 2001)
CR 634: Willingboro Twp. (operational 2001)
CR 537: Mt. Holly Twp. (operational spring 2001)
CR 691: Mt. Holly Twp. (operational spring 2001)
CR 626: Willingboro Twp. from CR 541 to US 130 (construction fall 2001)

Emergency Vehicle Signal Priority: Various intersections with manual activation.

Burlington County Bridge Commission

Control Center: At both the Burlington-Bristol and Tacony-Palmyra Bridges, traffic control operations are monitored by and under the jurisdiction of the Commission's police department related to normal traffic flows and all construction contracts and activities.

CCTV Cameras: At both the Burlington-Bristol and Tacony-Palmyra Bridges, video cameras are positioned to view the toll booths and resulting traffic.
Future plans include video capability on the bridge structures (operational 2002 or beyond).

Variable Message Signs: The Commission owns 2 portable VMS units that are equipped with cellular phones and radar. Typically, one unit is located at the Burlington-Bristol and one at the Tacony-Palmyra Bridge. Future plans include possible permanent VMS units at various locations on the Burlington-Bristol and Tacony-Palmyra bridge structures (operational 2002 or beyond).

E-ZPass: This electronic toll collection is currently being investigated for the Tacony-Palmyra and Burlington-Bristol Bridge.

Emergency Service Patrols: The Commission maintains a full-time 24 hour police department with staff assigned to both the Burlington-Bristol and Tacony-Palmyra Bridges. The Commission facilities are patrolled on a regular basis around the clock.

Incident Management Response Teams: Depending upon the specific incident, the Commission's police or maintenance departments would be involved in most cases. An outside on-call towing service would respond to any large vehicles that are disabled on Commission facilities. Likewise, an outside spill control company is on-call to address any HAZMAT incidents.

Delaware Department of Transportation

Control Center: A statewide transportation management center (TMC) operates 24 x7, and will be linked to a new statewide emergency management center. The TMC provides centralized control, monitoring and information points for highway and transit operations. It will oversee operation of adaptive signal system on 250 miles of arterials in New Castle, Kent, and Sussex Counties as well as operation on I-95 and I-495, and a Reach the Beach program.

CCTV Cameras:
New Castle Co.: Route 202 and Route 92 (Naamans Road)
New Castle Co.: Route 202 and Silverside Road
New Castle Co.: Route 202 and Route 141
New Castle Co.: Route 261 (Foulk Road) and Route 92 (Naamans Road)
New Castle Co.: I-95, I-495, Route 92 (Naamans Road)
New Castle Co.: Route 141 at the DuPont Experimental Station
New Castle Co.: I-495 and Route 13
New Castle Co.: I-95 and Route 202
New Castle Co.: Route 202 and Route 261 (Foulk Road)
New Castle Co.: Foulk and Silverside Road
New Castle Co.: I-95, South of Route 141
New Castle Co.: I-95 and Churchman's Road
New Castle Co.: I-95 and DE Route 7
New Castle Co.: Route 141 and Route 4
New Castle Co.: I-495 and Edgemoor Road
New Castle Co.: I-495 and 12th Street
New Castle Co.: DE Route 1 and DE Route 72
New Castle Co.: DE Route 1 and US Route 40
New Castle Co.: US Route 13 and DE Route 896
New Castle Co.: US Route 40 and DE Route 896
Kent Co.: US Route 13 and N. State Street
Sussex Co.: DE Route 1 and DE Route 26
Sussex Co.: DE Route 1 and DE Route 1A Dewey
Sussex Co.: DE Route 1 and DE Route 1A Rehoboth
Sussex Co.: DE Route 1 and DE Route 268A (Old Lewes)
Sussex Co.: DE Route 1 and DE Route 24
Sussex Co.: Five Points at Route 1 and Route 9 (near Lewes)

Closed Loop Traffic Signal System: DelDOT operates a number of computerized traffic signal control systems throughout the state, including the adaptive SCATS system for two corridors. Plans are underway by DelDOT in evolving a single statewide signal system.

Highway Advisory Radio: DelDOT operates a statewide Travelers Advisory Radio System (Station WTMC), 1380 AM. Transmitters are located in Wilmington and Rehoboth Beach. The system can also be accessed via live broadcast through their website http://www.deldot.net

E-ZPass: Currently operating E-ZPass equipment on I-95 and State Route 1.

Cellular Phone # for Incident Reporting: # 77

Telephone/Cellular Phone Travel Information: #Telephone: (302) 760-2080. For the DelDOT Construction Hotline, telephone: 1-888-INFO-I-95, cellular: #DEL95

Travel Information Website: http://www.deldot.net For real-time traffic information, construction hotline and real-time video feeds of selected roads.

Smart Cards: DelDOT was awarded funding for an operational test of a smart card fare collection system. The test was originally developed to evaluate the use of an open-system, stored value bank card on the Wilmington bus fleet, in facilitating the administration of an employer transit benefits program.

Commercial Vehicle Electronic Admin Processes: DelDOT is involved in the SAFER mailbox and electronic credentialing CVO initiatives. Delaware State Police is conducting a US DOT sponsored project which evaluates the use of portable computers and wireless communications technology for commercial vehicle inspections. DELDOT recently completed a project, under a US DOT grant, which through the use of GPS technology, integrated commercial vehicle accident data with the State's GIS.

Observation Balloon: Under a US DOT grant, DelDOT is evaluating the use of a 16-foot balloon carrying a traffic observation camera for incident and congestion management. The balloon is a cost-effective alternative to aircraft for traffic surveillance and can be useful in other instances such as search and rescue missions, identifying hot spots at a major brush fire, and enhanced police surveillance. Originally developed as a military tool, the balloon is capable of clearly recognizing vehicles at a distance of 4 miles.

DelDOT is implementing an Integrated Transportation Management System (ITMS) as an integral part of their program to manage the state's transportation system. In addition to some of the components identified above, The ITMS features the following systems which are either currently operational or planned: Vehicle Detection System, Roadway/Weather sensors, Aerial Traffic Surveillance, Variable Message Signs, Transit Vehicle Signal Priority, Emergency Service Patrols, Travel Information Kiosks, Travel Information Cable-TV, Fiber optic/wireless communication system, Automatic Vehicle Location, Automated Telephone Information system, Bus/Rail Stop Information System, Electronic Lane Use System, Parking Management System, Electronic Red Light Enforcement System, Interface to Police/Fire Computer Aided Dispatching, and Drawbridge Monitoring System.

Delaware River and Bay Authority

Control Center: Centralized operations center will control lane closures on both spans and monitor traffic flow utilizing CCTV camera systems on both bridges and on approach roadways (operational).

CCTV Cameras: Full view CCTV cameras will be installed throughout the DRBA facility and will monitor traffic flow, they will be utilized for incident management functions (operational spring 2001).

Aerial Traffic Surveillance: A helicopter is utilized by the DRBA police to monitor traffic.

Closed Loop Traffic Signal System: A closed system is currently in operation on both spans. This system is being replaced with a new system utilizing the latest technology, and will be operational in the spring of 2001.

E-ZPass: Currently installing E-ZPass at the bridge toll plaza (operational summer 2001).

Emergency Service Patrols: The DRBA operates 24 hour courtesy service patrols.

Incident Management Response Teams: The DRBA maintains personnel trained in all aspects of incident response and utilize specialized groups as needed.

Emergency Call Boxes: New call boxes are currently being installed on both spans of the Delaware Memorial Bridge as well as expanded service on the approach roadways leading to the Twin Spans (operational summer 2001).

Cellular Phone # for Incident Reporting: # 3722

Delaware River Joint Toll Bridge Commission

Vehicle Detection System: Inductance loops are installed in all lane of every bridge to detect and count vehicle presence. There are also axle-counting treadles installed in each toll lane. These devices are primarily used to obtain vehicle counts and axle counts for statistical and toll audit purposes. None of these devices are currently monitored for alarm conditions or to detect or identify traffic anomalies or incidents. The Commission is in the process of developing a program that will update this technology.

Emergency Service Patrols: There is a "Toll Sergeant" on duty 24 hours, seven days a week at each toll facility. The toll facilities in the Delaware Valley include the Trenton-Morrisville Toll Bridge (US 1) and the New Hope-Lambertville Toll Bridge (US 202). The Toll Sergeant at each of these facilities also oversees Bridge Officers assigned to a number of the Commission's other weight-restricted, toll-supported (non-toll) bridges, including the Lower Trenton Bridge and the Calhoun Street Bridge between Trenton and Morrisville, the Washington's Crossing Bridge, the New Hope-Lambertville Free Bridge, and the Centerville-Stockton Bridge. The Commission also operates the I-95 Bridge at Scudder Falls. The Commission's Toll Sergeants and Bridge Officers have statutory police powers, however, the Commission is not directly tied in with any 911services to the public.

Delaware River Port Authority

Bridge Control Center: A centralized control center will monitor traffic flow and perform incident detection and response

functions on all DRPA bridges (operational 2001).

CCTV Cameras: 16 cameras: Walt Whitman Bridge and approach roadways
15 cameras: Commodore Barry Bridge gantries
12 cameras: Betsy Ross Bridge gantries and buildings
5-10 cameras: Benjamin Franklin Bridge and gantries (operational 2001)

Roadway/Weather Sensors: Currently installed on the Commodore Barry Bridge, this system will be expanded to all other bridge facilities. It will be used for both operations and maintenance functions.

Closed Loop Traffic Signal System: Currently, lane traffic signal systems exist but in open loop form only. Once CCTV cameras are fully installed, system loop can be truly closed.

Changeable Message Signs: 8 signs on New Jersey and Pennsylvania approach roadways to Walt Whitman Bridge

Variable Message Signs: 1 sign at Pennsylvania terminus of the Benjamin Franklin Bridge
3 signs on Pennsylvania approach to the Walt Whitman Bridge

Highway Advisory Radio: During reconstruction of the Walt Whitman Bridge HAR was used, it is no longer in service.

Lane Use Signals: 19 locations on Walt Whitman Bridge gantries and approaches
10 locations on Benjamin Franklin Bridge gantries
10 locations on Betsy Ross Bridge gantries
15 locations on Commodore Barry Bridge gantries

E-ZPass: Currently operating E-ZPass equipment at all four DRPA bridges

Travel Information Website: DRPA currently has its own website; however, it does not currently display real time travel information. Planned for future (operational 2001).

Emergency Service Patrols: This function is currently performed by DRPA police units.

Incident Management Response Teams: This function is currently performed by DRPA police units.

Automatic Vehicle Locator: AVL systems will be installed in all DRPA police vehicles to improve incident response functionality.

Smart Cards: Currently in exploratory phase. Looking for specific smart card application which will best suit DRPA needs.

Greater Valley Forge TMA

Travel Information Website: (http://www.phillytraffic.com) This website is provided in conjunction with PennDOT and provides a weekly construction update for the five county area of Southeastern Pennsylvania. Visitors to the site select which routes they would like construction information on. If there is construction on the route, a map is available to locate the construction project.

(http://www.phillytraffic.com/emergency.html) This link from phillytraffic.com is PennDOT's site for emergency detour routing in Southeastern Pennsylvania. The site contains detour information and maps for Montgomery County (I-76, I-476, US 422, PA 100, and PA 309), Chester County (US 202, US 30, and US), and Bucks County (US 202, US 1, and US 13).

(http://www.us202.com) This website benefits commuters along all of US 202 in Chester Montgomery, and Bucks Counties. It contains daily construction updates and construction overviews.

New Jersey Department of Transportation

Control Center: The control center in Mount Laurel serves the 10 southernmost counties in New Jersey and operates computerized traffic signal systems, variable message signs, and highway advisory radio; monitors closed circuit TV cameras; operates emergency service patrols on major limited access highways; coordinates incident management response teams and responds to incidents.

CCTV Cameras:
I-76: 1 camera just north of I-295
US 1: 12 cameras operating, 2 video image detection cameras
NJ 42: 1 camera between NJ Turnpike and I-295
NJ 73: 14 cameras operating
NJ 37: 6 cameras operating
NJ 18: 2 cameras operating
NJ 55: Schooner Landing Rd & NJ 49
NJ 47: 3 cameras between mp 17.4 & mp 31.8
US 30: part of 21 camera system (Planned)
NJ 29: 14 cameras (Planned)
NJ 38: part of 21 camera system (Planned)
NJ 70: part of 21 camera system (Planned)
NJ 73: part of 21 camera system (Planned)

Vehicle Detection System:
US 1
NJ 73
NJ 37
US 30 (Planned)
NJ 38 (Planned)
NJ 70 (Planned)
NJ 73 (Planned)

Weigh-In-Motion Station: I-95: mp 1.2 and mp 2.1

I-295: mp 39.6
US 40: mp 28.3
US 206: mp 22.0
US 322: mp 27.5
NJ 55: mp 57.8
NJ 68: mp 3.15
NJ 72: mp 2.1
NJ 168: mp 1.3

Roadway/Weather Sensors:
I-295: mp 8.9 (over Oldman's Creek)
I-295: mp 34.7 (over NJ 70)
I-295: mp 49.7 (Springfield Rest Area)
US 30: mp 1.9
US 40: mp 26.8 (at Dutch Mill Rd)
US 322: mp 24.6 (at NJ 42)
NJ 29 and NJ 175
NJ 68: at Wrights Road

Closed Loop Traffic Signal System:
US 1: 37 intersections along 26 miles
NJ 73: 28 intersections along 17 miles, 6 speed monitoring and count stations
NJ 37: 24 intersections along 8 miles
US 30: part of 97 intersection/67 mile system (operational 2002-2003)
NJ 38: part of 97 intersection/67 mile system (operational 2002-2003)
NJ 70: part of 97 intersection/67 mile system (operational 2002-2003)
NJ 73: part of 97 intersection/67 mile system (operational 2002-2003)

Variable Message Signs:
I-295: 1 sign
NJ 73: 4 signs
NJ 37: 4 signs
I-95: 1 sign
NJ 42: 2 signs between NJ Turnpike and I-295 (one NB, one SB)
US 1: 6 signs
NJ 55: 2 portables on concrete pads, mp 25.8 & mp 39.96
Approximately 11 other signs planned on I-295, US 30, NJ 38, NJ 70 and NJ 73.

Highway Advisory Radio:
US 1: 2 station
I-295: 1 station
US 30: (Planned)
NJ 38: (Planned)

Emergency Call Boxes:
I-295: approximately one-half mile apart on both sides of the road
NJ 55: approximately one-half mile apart on both sides of the road

Emergency Service Patrols:
ESP vans proactively patrol along highways and stop to assist disabled vehicles at accident

scenes. The ESP operators are equipped to perform minor repairs such as changing a flat tire. When major repairs are needed, the ESP operators radio a dispatcher who calls a towing company to remove the disabled vehicle. The ESP Program is designed to improve the efficiency of the highway system through the expedited removal of incidents that impact traffic flow. ESPs operate on all of I-76and I-676, on I-295 from Exit 22 to I–95, I-95 from I-295 to Pennsylvania state line, on NJ 42 from Atlantic City Expressway to I-76, NJ 55 from Route 322 to Route 42, Route 29 from Duck Island to I-295, and I-195 from I-295 to Exit 7. The hours of operation are 4 am to 8:30 pm, Monday through Friday.

Incident Management Response Teams: NJDOT operates IMRTs, units of specially trained personnel who respond to major incident scenes to expedite coordinated multi-agency remedial efforts. IMRT members function as NJDOT's liaison to the incident commander in charge of the scene, advising of departmental resources that are available to help remedy the emergency at the accident scene, restore normal traffic patterns and obtain and oversee these resources. The following criteria is used in determining whether an IMRT response is necessary: overturned tractor trailers, any hazardous materials, regional/major power failure, motor vehicle accident causing structural damage to the roadway or bridge structure, motor vehicle accident with fatalities, total roadway closure, in one or both directions for three hours or more for any reason, fire/explosion adjacent to a state or interstate roadway, and any time an incident command post is established involving lane/roadway closures and unplanned events requiring DOT resources. If any of the above incidents have an expected duration less than 2-3 hours IMRTs are not activated.

Travel Information Website: NJDOT has a partnership with SmartRoute to provide free, realtime, route-specific travel reports and construction /special event information available 24 X 7. WWW.njcommuter.com provides construction and traffic detour information pertaining to NJDOT construction activities with an emphasis on high impact projects.

New Jersey Turnpike Authority

Control Center: The Traffic Operations Center, located in the Authority's Administration Building adjacent to Interchange 9 in New Brunswick, is staffed 24 x 7. The staff monitors roadway conditions; operates variable message signs, speed limit/speed warning signs, closed circuit TV cameras, roadway and weather sensors; dispatches information to police and field personnel; and initiate response plans for spilled cargo and hazardous materials or any other unusual conditions.

CCTV Cameras: Currently there are four CCTV cameras which transmit video images to the Traffic Operations Center. All four cameras are located outside the DVRPC area.

Vehicle Detection System: The Turnpike Authority currently utilizes over900 loop detectors, spaced at half mile increments, to collect traffic data. All loops are located outside the DVRPC region between Interchange 8A and the northern terminus of the turnpike.

Roadway/Weather Sensors: A roadway/weather system, currently under construction, will display pavement and subsurface conditions as well as atmospheric conditions.

Variable Message Signs: Currently, there is one overhead VMS sign located at milepost 58 for northbound traffic. This sign provides opportunities for an unlimited set of full text messages. Eleven additional signs of this type are currently being installed and are expected to be operational in early 2001. Three of these are located within the Delaware Valley Region: northbound at milepost 32, southbound at milepost 37 and southbound at milepost 64.5. In addition, there are 75 VMS that display a limited assortment of pre-set, fixed messages on a rotating drum. These VMS signs are primarily used to divert traffic between the inner and outer roadways in the dual-dual roadway area, north of the DVRPC region. There are also 136 other remotely-controlled signs that cover the entire turnpike. These signs have several pre-set messages which can be turned on or off as needed to display information such as construction ahead, congestion ahead, accident ahead, snow, fog or ice.

Highway Advisory Radio: Located at 1610 AM (in the south) and 590 AM (in the north), the system provides motorists with the latest, up-to-the-minute reports on road and traffic conditions along the entire length of the turnpike. The HAR remains on the air 24 hours a day, seven days a week. Nine fixed and two portable transmitting sites comprise the network. Special HAR informational signs have been placed strategically along the roadway, and are equipped with special flashing lights. The lights are activated, to alert motorists that an urgent message is being broadcast.

E-ZPass: The Turnpike is currently operating E-ZPass equipment at all turnpike interchanges. The weekday usage for E-Z Pass is about 53%.

Telephone/Cellular Phone Travel Information #: The Highway Advisory Telephone System (HAT) provides up to the minute information on traffic conditions, construction activities and weather conditions by dialing 1-800-33NJTPK. The system is updated three times daily under normal conditions and is updated immediately for unusual incidents.

Emergency Service Patrols: The New Jersey State Police patrols the turnpike and arranges for assistance when needed. In addition, the Authority's Maintenance Department vans patrol the highway providing motorists with water and fuel. Sunoco road service trucks are dispatched for minor problems. When vehicles experience mechanical problems, towing services are provided by garages under contract with the Turnpike. These garages are typically located near interchanges.

Incident Management Response Teams: New Jersey State Police Troop D, which is paid for by the Turnpike, is responsible for patrol functions. If additional resources is needed, members of the New Jersey Turnpike Authority operations, maintenance, or toll departments can be utilized.

Cellular Phone # for Incident reporting: Motorists can dial the Traffic Operations Center directly at #95 from their cell phone to report disabled vehicles/incidents, or 911 if they are involved in an emergency situation.

Travel Information Kiosks: Plans are underway to install kiosks in some service areas as a part of TRANSCOM'S "SATIN" project.

Travel Information Website: The website (http://www.state.nj.us/turnpike) currently provides information on construction projects, weekly traffic advisories and other general information but no real-time traffic/incident information. Real-time traffic conditions will be available in the future.

PATCO

Control Center: Center Tower, located in Camden, is PATCO's centralized control facility. It functions as the nerve center of the rail rapid transit system. Train dispatchers and customer service agents direct, control, and maintain train and passenger flow through the transit system directly and through field personnel. Center Tower personnel also control electrical power distribution for signals stations and traction power throughout the system.

CCTV Cameras: Each PATCO station is equipped with a CCTV camera in the vicinity of the fare collection equipment and in some stations on the platform level of the station. The customer service agent on duty in Center Tower observes the CCTV monitors to provide assistance to passengers who are using the fare collection equipment and to alert train dispatchers to unusual passenger volumes, which may require service adjustments.

Vehicle Detection System: PATCO's train signal system provides, through the system's track circuitry, the ability to identify the location of any train on the PATCO mainline. The train mimic board in Center Tower visually depicts the location of any train on the mainline and tracks the progress of the train through the system.

Variable Message Signs: PATCO completed the replacement of its public address system with a system that allows both voice and text public address announcements at each station. The system has the capability to broadcast messages that are either pre-recorded or real time and will be able to be targeted to a specific station/stations or broadcast system wide. The text messages are delivered through LED variable message signs. The system will also include automatic train announcements in both voice and text, which will announce train arriving information at each station.

Emergency Call Boxes: Each PATCO station fare collection equipment area is equipped with a call for aid phone. Customer service agents answer the phones to provide patron assistance with PATCO fare collection equipment, general information about the PATCO system and to record and respond to patron complaints and concerns.

Incident Management Response Teams: Incident Management on the PATCO system starts with Center Tower. All accidents or incidents occurring on PATCO property, causing property damage or affecting the operation of equipment on the PATCO mainline is reported to the dispatcher in Center Tower. The dispatcher then determines what action needs to be taken to respond to the accident/incident and notifies PATCO Police (and other emergency response personnel, if necessary) and other PATCO personnel as required. PATCO managers, including the general manager, police chief and operations, equipment, way & power, safety, risk and human resources managers are on-call via beeper, around the clock.

Pennsylvania Department of Transportation

Control Center: The new TCC at in King of Prussia coordinates incident management and provides traveler information for customers in Philadelphia, Delaware, Montgomery, Chester and Bucks counties in Southeastern Pennsylvania. The hours of operation are from 5:00 AM to 8:00 PM Monday through Friday with after-hours and weekend special event coverage as needed. The TCC operates and monitors closed circuit TV cameras, variable/dynamic message signs, an incident detection system, a highway advisory radio station, a mobile satellite truck, an Accu-Weather station and an I-95 information exchange network workstation. Through a contract with a private sector towing company they operate service patrols on the interstate expressways in Philadelphia. The TCC also coordinates with TRANSCOM and the I-95 Corridor Coalition on incidents affecting the eastern seaboard.

CCTV Cameras:
I-76: 14 cameras from I-676 to PA 291 (DVRPC FY 99-02 TIP #9764)
I-76: 14 cameras from I-676 to Pencoyd Bridge (DVRPC FY 99-02 TIP #9765)
I-76: 7 cameras from Belmont to Conshohocken Curve (DVRPC FY 99-02 TIP #8795)
I-76: 9 cameras from Conshohocken Curve to US 202 (US 202 Section 404 Project)
I-95: 12 cameras from Island Ave to Girard Ave (Exit 11 to Exit 18)
I-95: 16 cameras from Girard Ave to North of Woodhaven Rd (Exit 18 to Exit 23)
I-95: 7 cameras from Philadelphia International Airport to I-476 (DVRPC FY 99-02 TIP #7900)
I-95: 5 cameras from Grant Ave to Street Rd
I-476: 8 cameras from I-95 to I-76 (Exit 1 to Exit 6)
I-476: 11 cameras from I-95 to I-76 (DVRPC FY 99-02 TIP #7901)
I-476: 7 cameras from US 30 to PA Turnpike (US 202 Section 404 Project)
I-676: 9 cameras from I-95 to I-76
US 202: 17 cameras from US 30 Bypass to Henderson Rd (US 202 Section 400 Project)
US 202: 12 cameras on Expressway Segment (US 202 Section 700 Project)
PA 63: 1 camera at Millbrook Rd
PA 309: 21 cameras from PA 63 to PA 463 (US 202 Section 700 Project)
PA 309: 15 cameras from Philadelphia City Limit to PA 63 (PA 309 Reconstruction Project)
PA 422: 13 cameras from US 202 to PA 291 (US 202 Section 404 Project)

Vehicle Detection System:
I-76: 4 detectors from I-676 to PA 291 (DVRPC FY 99-02 TIP #9764)
I-76: 10 detectors from I-676 to Pencoyd Bridge (DVRPC FY 99-02 TIP #9765)
I-76: 8 detectors from Belmont to Conshohocken Curve (DVRPC FY 99-02 TIP #8795)
I-95: 10 detectors from Philadelphia International Airport to I-476 (DVRPC FY 99-02 TIP #7900)
I-95: 20 detectors from Lehigh Ave to Academy Rd (Exit 18 to Exit 23)(operational)
I-476: loop activation from I-95 to US 30 (DVRPC FY 99-02 TIP)
I-476: I-95 to PA Turnpike (System Integrator Project)
US 202: PA 252 to PA 422 (US 202 Section 404 Project)
PA 309: PA 63 to PA 463 (US 202 Section 700 Project)
US 202: Expressway Segment (US 202 Section 700 Project)

Closed Loop Traffic Signal System:
Closed loop systems on state highways maintained by municipalities
US 30: from PA 401 to US 1
PA 3: from US 1 to PA 252

PA 611: from Cheltenham Ave to PA 63

Variable Message Signs:
I-76: 1 sign EB W. of Montgomery Ave (Exit 35)
I-76: 1 sign WB W. of Passyunk Ave (Exit 35)
I-76: 1 sign from I-676 to PA 291 (DVRPC FY 99-02 TIP #9764)
I-76: 1 sign from I-676 to West of US 1(DVRPC FY 99-02 TIP #9765)
I-76: 2 signs from Belmont to Conshohocken Curve (DVRPC FY 99-02 TIP #8795)
I-76: 3 signs from Conshohocken Curve to US 202 (US 202 Section 404 Project)
I-95 1 sign from Cottman to Street Rd
I-95: 2 signs NB north of PA 420
I-95: 2 signs SB south of Betsy Ross Bridge
I-95: 4 signs from Girard Ave to Ashburner (Exit 18 to Exit 23)
I-95: 3 signs from Philadelphia International Airport to I-476 (DVRPC FY 99-02 TIP #7900)
I-476: 8 signs from I-95 to US 1 (DVRPC FY 99-02 TIP# 7901)
I-476: 3 signs from US 30 to PA Turnpike (US 202 Section 404 Project)
US 202: 5 signs from US 30 Bypass to PA Turnpike (US 202 Section 404 Project)
US 202: 8 signs from Expressway Segment (US 202 Section 700 Project)
PA 63: 1 sign EB at Academy Rd
PA 309: 4 signs from PA 63 to PA 463 (US 202 Section 700 Project)
PA 309: 5 signs from Philadelphia City Limit to PA 63 (PA 309 Reconstruction Project)
PA 422: 3 signs from US 202 to PA 291 (US 202 Section 404 Project)
US 30: 1 sign EB W. of PA 100 (US 202 Section 404 Project)

Highway Advisory Radio: I-95/I-676 Interchange (1) station

Weigh-In-Motion Station: I-476: 1 station between Exit 4 and Exit 5

Ramp Metering: I-476: Exit 1, Exit 2, Exit 3, Exit 4, Exit 5, Exit 7, Exit 8

Emergency Service Patrols: 3 trucks on I-76, I-95, I-676 in Philadelphia, operational 5:30am - 7:30pm Mon. through Fri.

Cellular Phone # for Incident reporting: 911 for all highways

Telephone/Cellular Phone Travel Information #: telephone: (215) 567-5678, cellular: #211 (Partnership with SmartRoute to provide this service)

Travel Information Website: http://www.SmarTraveler.com (Partnership with SmartRoute to provide this service) Free, real time, route-specific travel reports and construction /special event information available 24 x 7.

Accu-Weather Station: At District 6-0 Traffic Control Center and Welcome Centers Statewide.

Communications: 1 satellite truck capable of beaming video from a remote site to the TCC.
Fiber optics: along I-676

T-1 lines: CCTV linked to the TCC via leased T-1 lines

Pennsylvania Turnpike Commission

Control Center: The Operations Center in Harrisburg serves as the statewide control center for all ITS applications on the entire Turnpike and Northeast Extension. The Operations Center duty officers are charged with the responsibility of monitoring and updating the VMS and HAR systems to provide timely and accurate information to motorists on the turnpike. Standardized incident management plans have been developed to aid the Operations Center duty officers in determining appropriate messages for the VMS and HARs. (Phase I)
The Pennsylvania Turnpike Commission will be constructing a new Operations Center. Design of the new center was planned for summer 1999 with construction to begin in 2000.
A central computer control system will be designed which will be capable of controlling the devices (HAR, VMS, CCTV, RWIS) constructed in Phases I-III. The central computer control system will also include broadcast fax, internet communication, and the Turnpike's existing roadway and weather condition telephone service. Control of the Turnpike's existing CCTV systems at the Lehigh and Blue Mountain Tunnels will be incorporated into the central computer control system. (Phase III)
Implementation of an enhanced Geographic Information System or electronic map is also planned. (Phase IV)

CCTV Cameras: I-76: Valley Forge Interchange (Phase II)
I-276: Plymouth Meeting Maintenance (Phase II)
I-276: Fort Washington Interchange (Phase III)
I-276: Willow Grove Interchange (Phase III)
I-276: Philadelphia Interchange (Phase III)
Philadelphia area expansion (Phase IV)

Vehicle Detection System: I-276: Between Valley Forge Interchange and Norristown Interchange (Phase III)
I-276: Between Mid-County Interchange and Fort Washington Interchange (Phase III)
I-276: Between Fort Washington Interchange and Willow Grove Interchange (Phase III)
I-276: Between Willow Grove Interchange and Philadelphia Interchange (Phase III)
I-476: Between Mid-County Interchange and Lansdale Interchange (Phase III)
Philadelphia area expansion (Phase IV)

Incident Congestion Prediction System: This system will utilize data collected from the Traffic Flow Detection System and combine it with historical traffic flow data. The combined data sources will then be used to establish algorithms to predict when and how quickly backlogs will form based on incident occurrences. This system will also allow better scheduling of maintenance operations to minimize impacts on traffic flow. Finally, the system will use quantitative data in deciding incident related roadway closures. (Phase III)

Roadway/Weather Sensors: Enhancement of existing system to locations which experience recurring weather events such as fog, icing, and extreme temperatures, especially at critical bridge locations. (Phase IV)

Variable Message Signs:	I-76: milepost 323.1 EB West of Valley Forge Interchange (Phase I) I-276: milepost 337.0 WB East of Mid-County Interchange (Phase I) I-476: milepost A3.6 SB North of Mid-County Interchange (Phase I) I-76: milepost 308.7 EB West of Downingtown Interchange (Phase II)
Highway Advisory Radio:	I-76: Downingtown Interchange (Phase I) I-76: Valley Forge Service Plaza (Phase I) I-276: Mid-County Interchange (Phase I) I-276: Willow Grove Interchange (Phase I) I-476: Lansdale Interchange (Phase I) I-76: I-476 Interchange - located off the Turnpike system (Phase II) I-476: Philadelphia Interchange (Phase II)
E-Z Pass:	I-76: Harrisburg West Int. #18 to Delaware River Bridge Int. #30 (operational) I-476: Mid County Int. #25A to Lehigh Valley Int. #33 (operational)
Emergency Service Patrols:	The Turnpike currently operates Emergency First Responder vehicles in each of the maintenance districts. Each vehicle is equipped with communications equipment, emergency medical supplies, spill containment equipment, incident command kits, emergency generators and lighting sources.
Incident Response Vehicle:	This vehicle will be designed to provide on scene incident response and data transmission to the Operations Center. The vehicle will serve as a first response vehicle and portable incident command center. The vehicle will contain communication, video spill response equipment as well as additional incident response equipment. It will be based in the Philadelphia area and it will be capable of providing live video data to the Operations Center. The vehicle will include as a minimum the following: CCTV camera; cellular phone and fax; variable message sign; pump system; generator and lights; wheel lift and push bumper (Phase III).
Incident Management Response Teams:	Turnpike staff conduct regular incident review meetings where incident overviews are discussed as well as operational responses of personnel and equipment. Changes and operational improvements are developed as a result of these meetings.
Emergency Call Boxes:	Located along both sides of the Turnpike at one mile intervals, these call boxes provide an instant link to the Operations Center in Harrisburg.
Telephone/Cellular Phone Travel Information #:	*11 from cellular phone for emergency assistance; 1-800-932-0586 for State Police assistance or emergency road service; 1-800-331-3414 (in PA) or 717-939-9871 (outside PA) for roadway and weather conditions.

Travel Information Website: The website (http://www.paturnpike.com) currently provides information on current construction projects and other general information but no real-time traffic and incident information. In the future, real-time traffic and weather information will be dispersed through the Turnpike's website (Phase IV).

Commercial Vehicle Electronic Admin. Processes: An online computer permitting system for oversized and hazardous material loads may be deployed. The system would allow commercial vehicle operators to obtain necessary permits via computer and would be linked to PennDOT's and surrounding states' permitting systems (Phase IV).

Note:
Phase I - Operational
Phase II - Operational Fall 1999
Phase III - Operational Late 2001
Phase IV - Operational after 2001 (Conceptual ideas have been established. Once funding resources have been allocated a detailed plan will be established.

City of Philadelphia

Control Center: To be located at G Street and Ramona Street, with a small scale satellite Control Center at the Municipal Services Building.

Roadway/Weather Sensors:
Platt Bridge: over Schuylkill River
Bells Mill Road: over Wissahickon Creek
Pine Road: over Pennypack Creek

Closed Loop Traffic Signal System: *Existing:*

US 1 (Roosevelt Blvd)	(44 signals)
2nd Street	(5 signals)
52nd Street	(25 signals)
Arch Street	(10 signals)
Allegheny Avenue	(29 signals)
Chestnut Street	(10 signals)
Filbert Street	(3 signals)
Front Street (Walt Whitman)	(5 signals)
Industrial Highway	(3 signals)
Market Street	(19 signals)
Race Street	(10 signals)
South Broad Street	(42 signals)
Southampton Road	(3 signals)
Tyson Avenue	(5 signals)
University Ave./Civic Center Blvd	(8 signals)
Vine Street	(10 signals)

	Under Construction or Planned:	
	Academy Road	(16 signals)
	Bartram Avenue	(5 signals)
	Center City NE/SE Quadrants	(111 signals)
	Center City SW Quadrants	(81 signals)
	Christopher Columbus Blvd./Delaware Avenue	(21 signals)
	Frankford Avenue	(40 signals)
	Princeton Avenue	(5 signals)
	State Road	(13 signals)
	Washington Avenue	(21 signals)
	Total	(544 signals)
Transit Vehicle Signal Priority:	63rd Street and Malvern Avenue Island Avenue and Elmwood Avenue SEPTA Route 10 (Lancaster Ave/Lansdowne SEPTA Route 15 (Girard Ave) corridors currently under study.	
Emergency Vehicle Signal Priority:	Demonstration project of 3M Opticom System for fire vehicles exists on S. Broad Street (S. Penn Square to Washington Avenue).	
Pedestrian Actuated Traffic Signal with Handicapped Card Reader:	Belmont Avenue and Conshohocken Avenue	
"Audio" Pedestrian Traffic Signal:	Broad Street and Montgomery Avenue	
Demo Project Technologies:	Microloops, RTMS, Spread Spectrum, Sonic Detectors, Green LED's, Amber LED's, Video Detection	

SEPTA

Control Center: 1234 Market Street serves all subway-elevated lines, bus and light rail fleets and all Regional Rail lines. New control centers have been designed for bus and light rail fleets and Regional Rail lines. Construction contracts were awarded in early summer 1999 and construction is expected to last about two years. The central control project for the bus and light rail fleets will include a new computer-aided radio dispatch center and new mobile radios for all revenue and service vehicles. The Regional Rail control center will provide a centralized train control (CTC) and communication system.

CCTV Cameras: A master plan for CCTV for the subway-elevated, subway-surface lines and Regional Rail lines has recently been completed. The plan defines operational policies and provides a conceptual design. Phase I, an 11 station pilot, 7 subway-elevated stations and 4 Regional Rail stations, is scheduled to commence detailed design in March 2000.

Variable Message Signs: A new audio/visual public address and information system to bring certain key stations into compliance with Americans with Disabilities Act was awarded in December 1998. A total of 25 Regional Rail stations and 7 transit stations are included. The system will be operational by early summer 2000. Phase II design will commence in March 2000 and will include 19 Center City transit stations.

Transit Vehicle Signal Preemption: Route 10 Trolley Project on Lancaster Avenue and Lansdowne Avenue: design is 90% complete and ready for construction bids in March, 2001.
Media-Sharon Hill Light Rail route has installed a grade crossing system at the Walnut Crossing. An additional five crossings are scheduled to start design in early summer 1999.
Route 52 Trolley on 52nd and 54th streets: the design phase should begin in March 2001.
Route 15 Trolley on Girard/Richmond: Construction is proceeding with the duct bank repairs, and track work is scheduled to begin shortly. SEPTA is submitting a 100% preferential traffic signal design for the project. A loading island will be added at Girard and Parkside.

Telephone/Cellular Phone Travel Information #: (215) 580-7800

Travel Information Website: SEPTA's website is www.SEPTA.org Functions include travel advisory infomation, and printable timetables with maps.

Automatic Vehicle Locator: The central control project for the bus and light rail fleets will also provide for an AVL pilot on 50-100 buses.

SmartRoute Systems Inc.

Control Center: Within the Control Center located at 2001 Market Street, there are workstations with SmarTraveler database computers and UHF 2-way radio system controllers. The center also has 500-channel radio monitor scanners, sixteen-monitor video wall, two soundproof audiotext recording booths, cable TV studio, two broadcast fax machines and a conference room. The Control Center receives live video feeds from SmarTraveler CCTV cameras and from PennDOT CCTV cameras. The center operates on a 24 hours a day, 7 days a week basis.

CCTV Cameras: 22 SmarTraveler cameras located around the region.

Aerial Traffic Surveillance: Fixed winged aircraft with UHF radio communication patrolling all SmarTraveler monitored highways, alternate routes and other traffic related incidents.

Telephone/Cellular Phone Travel Information #: Telephone: (215) 567-5678, (610) 567-5678; cellular: #211. Free, real-time, route-specific travel reports from 5:30 AM to 7:30 PM. Construction/special event information available 24 hours

a day, 7 days a week.

Travel Information Website: http://www.SmarTraveler.com Free, real-time, route-specific travel reports and construction /special event information available 24 hours a day, 7 days a week.

Travel Information Cable TV: Co-anchored, live, 4-hour SmarTraveler TV program providing full Philadelphia coverage of AM traffic conditions with live CCTV traffic camera images, route maps (with animation) and weather information. Additional feeds possible during daytime and evening hours. Cable subscriber base includes area outside of Philadelphia metropolitan area. Launch To Be Announced.

Volunteer Mobile Probe Reporters: There approximately 200 cellular equipped reporters interacting toll-free with the SmarTraveler Control Center. Probe Information includes travel times, incident reports and alternate routes.

Cellular Phone # for Incident reporting: (215) 567-1212; Toll-free access number arranged through individual cellular carriers providing abbreviated dialing directly to the SmarTraveler Operations Center.

Broadcast Fax: Incident-based fax network to area agencies, police/fire communications centers, taxi companies, and other transportation-related groups.

Alpha Paging/E-mail: Customized service is being tested.

South Jersey Transportation Authority

Control Center: Currently operates a 24-hour State Police communications center. A TOC with NJ State Police, NJ DOT, NJ Highway Authority and Atlantic City Police Department is a future possibility for the Atlantic City Area.

CCTV Cameras: Atlantic City Expressway at the Pleasantville Toll Plaza
Atlantic City Expressway at the Egg Harbor Toll Plaza
Atlantic City terminus of the Expressway (future location)
Atlantic City Expressway between Atlantic City and Pleasantville (future location)
Atlantic City Expressway interchange with the Garden State Parkway (future location)
Atlantic City-Brigantine Connector (future location)

Vehicle Detection System: Atlantic City Expressway milepost 6.5 - east of Garden State Parkway interchange
Atlantic City Expressway milepost 24.5 - near Farley Service Plaza
Atlantic City Expressway near Atlantic City (possible future location)
Atlantic City Expressway NJ 73 ramps (possible future location)
Atlantic City Expressway NJ 42 terminus (possible future location)
Tag detection system using E-ZPass is being contemplated

Roadway/Weather Sensors: Atlantic City-Brigantine Connector (future location)

	Under consideration for the Atlantic City Expressway, no specific locations yet determined.
Advanced Highway Rail Intersection Warning System:	Will be installed with the Atlantic City-Brigantine Connector Project
Variable Message Signs:	Currently there are six portable VMS that are used when and where situations warrant. Future plans call for fixed VMS at yet to be specified locations. Atlantic City-Brigantine Connector (future location)
Highway Advisory Radio:	Operated by the Atlantic City Convention and Visitors Authority along the Expressway between The Garden State Parkway and Atlantic City for commercial traveler information. This system can be overridden by the Expressway State Police to broadcast special advisories.
E-ZPass:	Electronic toll collection is operational at all toll lanes at barrier plazas and all toll ramps at each interchange in both directions.
Emergency Service Patrols:	State Police patrol the road at all times and will assist motorists. When necessary, they will call for additional assistance.
Incident Management Response Teams:	Atlantic City-Brigantine Connector (future) Atlantic City Expressway: State Police call in the necessary support personnel.
Emergency Call Boxes:	One mile spacing in both directions for nearly the entire length of the Expressway.
Cellular Phone # for Incident reporting:	Signs are posted along the Expressway advising motorists to dial #ACE to report incidents.
Travel Information Kiosks:	A Visitor Information Center is in the median of the Expressway at approximately Milepost 3. Travel information kiosks are a potential future addition to the services available at the Center.
Travel Information Website:	SJTA has established a website (http://www.acexpressway.com) for general information purposes only.

VI. AGENCY ROLES AND RESPONSIBILITIES

The preceding chapters of the Regional ITS Architecture defined various local ITS architectural elements, namely subsystems, terminators, and agency deployments. For each of these elements the applicable local organizations were identified. In this chapter the reverse approach will be taken. For key regional agencies their high level architectural requirements will be presented showing institutional arrangements and architectural flows. Instances where the customized agency architecture deviates from the National ITS Architecture or the generic local architecture, described in the ITS Subsystems Chapter, will be noted.

Because this is the first attempt to document agency level ITS architecture, many assumptions and simplifications were made. This chapter therefore comes with several limitations and caveats described below:

Number of Agencies Documented: Agency documentation is limited to the 10 Tier I agencies identified by the ITS Technical Task Force. In future versions of the Regional ITS Architecture additional agencies will be documented.

Multiple Agency Components: From an ITS perspective most agencies are composed of multiple subsystems and terminators. For example, SEPTA's Operations Center consists of three separate, but overlapping, subsystems: Transit Management, which manages SEPTA's bus, rail and commuter rail systems; Emergency Management, representing the SEPTA Transit Police co-located in the operations center; and Information Service Provider, which manages operation of remote traveler support services like dynamic display boards and SEPTA's internet site. In the first generation of the architecture only critical agency center subsystems will be diagrammatically displayed.

Architecture Flow Limitations: Ideally the agency level architecture diagrams should display the interconnections to each individual agency, identifying which ones currently exist and which are proposed. However, because this is the first version of the Regional ITS Architecture, and a large number of interactions need to be accounted for, it is not possible to develop agency-to-agency architectural flows. Instead the agency level architecture diagrams display architecture flows to various subsystems and terminators; an accompanying table identifies which agencies they represent. The architecture flows are classified as high

or medium priority based upon comments received from the ITS Technical Task Force during their review of market packages. In some cases the architecture flows may be misleading because they are not applicable to all agencies represented by that subsystem. For example, PennDOT District 6-0 Traffic Control Center's diagram specifies the capability to provide video feeds to Emergency Management Subsystems. While some agencies listed under emergency management will have this capability (e.g., Pennsylvania State Police), it is not applicable to others (e.g., municipal police departments). When agency-to-agency architecture flows are eventually developed this situation will be rectified.

As agencies become more familiar with the concepts of the ITS architecture, and actually begin developing their own agency architectures, substantial modifications to the premises contained in this chapter are anticipated.

Delaware River Port Authority

DRPA's traffic management and emergency management functions are currently decentralized, overseen by police lieutenants at each bridge. DRPA eventually plans to consolidate some functions in a centralized operations center. It is unknown at this time which functions will become centralized and which ones will still reside at the bridges. Therefore the DRPA architecture includes a large number of assumptions.

For the purposes of this architecture a central traffic operations staff and a centralized police dispatcher was assumed. All roadway information including video images, sensor information, etc., will feed into the central operations center. The center will then be responsible for communications with other traffic management centers, such as NJDOT or PennDOT, and with the maintenance supervisor at each bridge. Incident notification will be relayed from the centralized traffic operations center to the centralized DRPA police dispatcher as well as to external organizations, such as the Philadelphia Police Department. The DRPA police dispatcher in turn is responsible for coordination with the bridge police radio rooms and external police departments. These assumptions will be revised as DRPA develops a conceptual plan for their operations center. From an architecture perspective, DRPA is composed of three key subsystems: Traffic Management, Emergency Management, and Toll Administration.

DRPA Traffic Management Subsystem

A description of the DRPA Traffic Management Subsystem architecture is contained in Figure 12 and Table 4. Based upon the assumptions described above, there are minimal changes to the standard Traffic Management Subsystem architecture diagram. Highlights of the architecture, including major modifications, are described below:

- DRPA does not operate traffic signals, therefore Roadway Subsystem flows associated with traffic signals and highway-rail intersections are not included
- Reversible Lane Status has been added to the Roadway Subsystem to account for DRPA's ability to change lane configurations on their bridges.
- Due to the long-term option of monitoring traffic via E-Z Pass probes, the Probe Data flow to Toll Administration is included.
- Since all of New Jersey Transit's bus service to Philadelphia uses the Ben Franklin Bridge, basic information on transit service, such Traffic Information for Transit, has been retained to keep New Jersey Transit aware of traffic conditions.
- Because its bridges cross a state line, and are consequently used as traffic control points by DVRPC, NJDOT and PennDOT, these agencies are included in the Archive Data Management Subsystem.
- If DRPA's Information Service Provider Subsystem is expanded, the Information Service Providers listed could eventually obtain information through that subsystem's function instead of the Traffic Management Subsystem.
- Traffic operation centers listed under the Other Traffic Management Terminator are those agencies anticipated to have direct contact with DRPA. Other traffic operation centers in the region are envisioned to receive traffic information through the I-95 Coridor Coalition's IEN or the DVHOG's fax list.

DRPA Emergency Management Subsystem

The Emergency Management Subsystem architecture was modified to incorporate a centralized police dispatcher and to eliminate duplicate functions offered by the Traffic Management Subsystem. A description of the DRPA Emergency Management Subsystem architecture is contained in Table 5 and Figure 13. The major modifications to the standard Emergency Management Subsystem architecture include:

- Information Service Provider, Weather Service Terminator, and Map Update Provider Terminator linkages are not included because they duplicate similar services provided under the Traffic Management Subsystem.
- Toll collectors are a major means for motorists to notify DRPA personnel about an incident on the bridges. Therefore the Toll Collector Terminator was added with an Incident Notification architecture flow assigned to it.
- Toll collectors essentially represent Remote Traveler Support, and any messages from Personal Information Access and Vehicle Subsystems will go to the county 911 services, therefore these subsystems are not included as a source of Emergency Notification.

DRPA Toll Administration Subsystem

A description of the DRPA Toll Administration Subsystem architecture is contained in Table 6 and Figure 14. Modifications to the standard Toll Administration Subsystem architecture include:

- The National ITS Architecture assumed selling advanced toll payments, such as E-Z Pass would be one of the services offered by Information Service Providers. In New Jersey this role is the exclusive responsibility of E-Z Pass Customer Service Centers.
- Toll demand management flows have been retained to preserve the option of congestion pricing in the future.

New Jersey Department of Transportation Traffic Operations South

NJDOT Traffic Operations South manages a full spectrum of traffic management functions including a closed loop traffic signal system, arterial and expressway surveillance monitoring, emergency service patrols, and incident management response teams. Consequently a very robust architecture is required to correspond to all of their functions. A description of the NJDOT Traffic Operations South Traffic Management Subsystem architecture is contained in Table 7 and Figure 15. It should be noted that even though Traffic Operations South covers southern New Jersey, the overall architecture, and more explicitly the agencies listed in Table 7, is focused on the Philadelphia suburban portion of their service area. Highlights include:

- All Parking Management Subsystems linkages have been removed. When NJDOT considers its architecture for the Atlantic City area this function may need to be added.

- The option for traffic signal priority treatment for emergency vehicles (police, fire, ambulance) and transit vehicles is retained.
- Highway-rail intersection linkages were included to manage the limited number of highway-rail intersections in South Jersey.
- Emergency Vehicle Subsystem architecture flows were added to facilitate communications to the emergency service patrol vehicles and IMRT teams.
- A New Jersey State Police officer is currently co-located at NJDOT Traffic Operations South where incidents can be monitored via CCTV. While this has proven a very effective short term option to improve coordination with state and local police departments, other options might become just effective in the long term. Accordingly, the architecture contains the capability to provide live video feeds to other agencies, such as DRPA or the New Jersey Turnpike, as well as individual state police stations. An extensive list of emergency management organizations that are recommended to be linked with NJDOT Traffic Operations South has been identified.
- Connections with the Transit Management Subsystem may need to be considered when developing the architecture for the Atlantic City region to account for casino bus operations.
- Probe data offers a long-term cost-effective approach to monitoring traffic conditions. This is especially true in South Jersey, where the arterial network represents the primary means of travel, and its difficult to monitor arterial roadways via other means. Until the Philadelphia region makes a joint decision on whether to adopt probe detectors, and on which technology to use, the architecture currently limits probes to toll facilities that employ E-Z Pass.

Pennsylvania Department of Transportation District 6-0 Traffic Control Center

A description of PennDOT's Traffic Management Subsystem architecture is contained in Table 8 and Figure 16. Several significant modifications were made to the standard Traffic Management Subsystem architecture diagram reflecting PennDOT's almost exclusive focus on the expressway system. The changes are as follows:

- Since PennDOT does not operate or manage traffic signals, all references to traffic signals applying to Roadway Subsystems and Emergency Management Subsystems have been eliminated.
- The Rail Operations Terminator is not included for the same reason as described above.

- Parking Management at the Sports Complex is an issue that impacts traffic congestion on I-95 and I-76, however it was assumed Parking Management coordination resides with Philadelphia Streets Department, not with PennDOT.
- Vehicle probes can offer a cost effective long-term approach to monitoring traffic conditions. The Regional ITS Architecture contains a probe data interface with SEPTA to use buses as traffic probes. Until the region makes a joint decision on whether to adopt probe detectors, and on which technology to use, the architecture currently limits probes to those toll facilities that employ E-Z Pass.
- Demand Management architecture flows have been added to the Transit Management Subsystem as a mechanism to upgrade coordination with SEPTA. In those instances when traffic must be diverted off of a highway due to a long-term incident, transit becomes a travel demand management tool.
- The list of traffic operation centers was limited to those organizations with which PennDOT typically has direct contact. Other operation centers in the region can get information of incident situations either through the I-95 Corridor Coalition and/or TRANSCOM.
- Transit System architecture flows, such as transit schedules and fare data, are not included in the Transit Management Subsystem.
- External Reports architecture flow represents traffic/incident information inputs from Traffic.com and other external private sector companies.
- Emergency Vehicle Subsystem flows were added to facilitate communications to PennDOT's emergency service patrol vehicles

Philadelphia Streets Department

Even though the Streets Department's primary traffic management function is traffic signals operations, their architecture provides supplemental support in a number of areas, including traffic management, emergency vehicle priority treatment, transit vehicle priority treatment, and improved interconnection with the police and fire departments. The Streets Department's architecture is contained in Table 9 and Figure 17. Key elements of the architecture include:

- To help support expressway detours on local streets, the Roadway Subsystem includes freeway control linkages (i.e., VMS and HAR devices). These devices can be used to impart real-time detour information to motorists.

- Reversible lane capabilities have been added to the Roadway Subsystem to facilitate the possibility of more flexible lane configurations, such as overhead lane signals on Pattison Avenue and other nearby streets at the Sports Complex.
- Rail Operations Terminator is included to enable traffic-rail coordination in South Philadelphia by the Packer Avenue Marine Terminal and the Tioga Marine Terminal in Port Richmond.
- Since DRPA facilities directly impact city streets, Toll Demand Management capabilities were included to permit the Streets Department to communicate with DRPA on metering traffic crossing the bridges. This functionality is especially important when there is an incident in the vicinity of a bridge that requires traffic detours.
- Extensive coordination capabilities are provided for within the Emergency Management Subsystem. These include sharing of surveillance images (if and when the Streets Department acquires CCVT cameras) and traffic signal preemption for emergency vehicles. The level of coordination is anticipated to vary among the different emergency management agencies. For example, the Philadelphia Police Department will likely utilize all the capabilities offered, while the linkage with the Pennsylvania State Police will probably be more limited to incident notification.
- Parking Management Subsystem coordination is included to improve traffic flow in and out of the Sports Complex.
- Both SEPTA and New Jersey Transit buses have a substantial presence on many city streets. Recognizing transit's ability to remove vehicles from congested streets, the Streets Department has worked with SEPTA to provide bus priority signal treatment on several corridors. Priority treatment enabling architecture flows in the Roadway and Transit Management Subsystems is therefore retained.
- To further strengthen the Streets Department's relationship with transit agencies, the full array of architecture flows in the National ITS Architecture between Traffic Management and Transit Management Subsystems is preserved.

PATCO

Because PATCO operates a single line, self-contained system between New Jersey and Philadelphia, and its service is so frequent that interconnections with feeder transit services is not an problem, PATCO's interactions with outside agencies is minimal. Its proposed architecture reflects this situation. The only area of the architecture which calls for any extensive coordination is with Information Service Providers. Even then, because of its history of strict schedule adherence, the

proposed information flows only entail travel advisories and incident information. A description of PATCO's Transit Management architecture is contained in Table 10 and Figure 18. The following modifications were made to the standard Transit Management Subsystem architecture:

- Since PATCO fare collection activities reside in the stations, not on the trains, fare payment flows were reassigned to the Remote Traveler Support Subsystem.
- Similarly, interactive travel support functions will occur at the station and not on the vehicles.
- With PATCO managing extensive parking facilities, Parking Management Subsystem interconnections are included.
- The only architecture flow with the Traffic Management Subsystem that is included is Traffic Information for Transit. This flow enables NJDOT to feed PATCO information about road conditions around their stations.

SEPTA

Because SEPTA's Control Center is composed of three overlapping subsystems (Transit Management, Emergency Management, and Information Service Provider), SEPTA's architecture was substantially modified to appropriately show how the three subsystems function together. Consequently many architectural flows were reassigned from one subsystem to another, and duplicate flows were assigned to the subsystem most closely aligned with their use.

SEPTA Transit Management Subsystem

SEPTA's Control Center is the primary command and control point for their bus, rail and Regional Rail operations. This management function is most appropriately represented by the Transit Management Subsystem. A description of SEPTA's Transit Management architecture is contained in Table 11 and Figure 19. Changes to the standard Transit Management Subsystem architecture include:

- Interactions between Transit Management and Remote Traveler Support/Personal Information Access Subsystems, which primarily involve traveler information and passenger security, have been reassigned to the Information Service Provider and Emergency Management Subsystems.
- Similarly, interactions between Transit Management and the Transit Vehicle Subsystem

pertaining to emergency conditions were reassigned to the Emergency Management Subsystem, traveler information interactions were reassigned to the Information Service Provider Subsystem.

- The architecture assumes passengers requesting paratransit services will make that request through SEPTA's ISP Subsystem. Requests originating in Philadelphia will be directed to the SEPTA Operations Center for dispatching. Requests originating in the suburban counties will be forwarded to the private transportation service provider serving that county.
- A Power System Terminator has been added to integrate power supply operators into the architecture. This terminator is somewhat analogous to the Transit Systems Operator Terminator.
- An additional architecture flow has been added to the Other Transit Management Terminator enabling SEPTA to obtain Regional Rail train location information from Amtrak's Central Traffic Electrical Control.
- A Multimodal Transportation Service Provider Terminator has been added to facilitate communications between SEPTA and the Philadelphia International Airport. SEPTA operates the R1 Regional Rail Line and several bus routes to the airport.
- Parking capacity at the average SEPTA station is very limited. Therefore, wholesale implementation of parking management capabilities is not cost effective. However for the more substantial parking facilities, such as Cornwells Heights and the Sports Complex, Parking Management capabilities have been incorporated into the architecture.
- Traffic control priority is retained to enable SEPTA to implement bus priority treatments in cooperation with the Philadelphia Streets Department and any suburban municipality who implements such a program.
- Provisions are available for SEPTA to obtain video images from PennDOT and ultimately from the Philadelphia Streets Department if the Streets Department decides to implement a traffic surveillance program.
- PennDOT District 6-0 has expressed an interest in using vehicle probe data from SEPTA buses as a tool in monitoring traffic conditions. SEPTA funded a demonstration project to test the concept of bus vehicle probes. If the demonstration proves successful and SEPTA decides to expand the program, it would be up to SEPTA and PennDOT to determine the procedures for sharing bus probe data. The architecture provides a hook for this eventuality.
- Public Affairs Terminator will be addressed as part of the Information Service Provider and Emergency Management Subsystems.

SEPTA Emergency Management Subsystem

SEPTA Police dispatchers are co-located in the operations center. A description of SEPTA's Emergency Management Subsystem architecture is contained in Table 12 and Figure 20. Modifications to this subsystem include the following:

- Interconnections with the Weather Service and Map Update Provider Terminators have been provided for in other SEPTA subsystems and are therefore not included in the Emergency Management Subsystem.
- Surveillance of stations and other SEPTA property has been reassigned from Transit Management to Emergency Management. This functionality is provided through Remote Traveler Support.
- Emergency notifications between the Transit Vehicle Subsystem and Emergency Management Subsystem are contained in the architecture.
- Linkages to the Personal Information Access Subsystem were not included in SEPTA's Emergency Management Subsystem architecture because 911 phone calls go to the county 911 services, not the SEPTA Transit Police. These calls indirectly show up in the architecture through the Emergency Telecommunication System Terminator who take the 911 calls.
- Improved emergency vehicle dispatching capabilities, including tracking transit police vehicles, is supported by the architecture.

SEPTA Information Service Provider

Substantial changes were made to the standard ISP Subsystem architecture to reflect specialized services offered by SEPTA. These services include their Telephone Information Center and website, posting information on dynamic display boards in stations, paratransit trip registration, and selling transit passes and parking permits. Besides acquiring almost all of the Transit Management Subsystem's travel information functions, the Information Provider Subsystem itself offers a wide range of generalized traveler services that complement the functions its inheriting. A description of SEPTA's Transit Management architecture is contained in Figure 21 and Table 13. Modifications to this subsystem include the following:

- Paratransit functionality has been added to the ISP Subsystem. Demand responsive requests are routed to SEPTA's Transit Management System or to paratransit service

providers, depending upon which agency is servicing the call.
- Transit Vehicle Subsystem architecture flows relating to traveler information were reassigned from the Transit Management Subsystem to the ISP Subsystem.
- All architecture flows to the Remote Traveler and Personal Information Access Subsystems, with the exception of security information, have been assigned to the ISP Subsystem.
- All yellow pages functions have been removed. It is assumed that yellow pages functions will be offered by private sector ISPs.
- Parking Management Subsystems functionality has been added to support SEPTA's parking program at its largest lots.
- A linkage with Philadelphia International Airport is provided through the Multimodal Transportation Service Provider Terminator.
- Information on transit delays and other advisories will be sent to SEPTA Public Affairs via the ISP Subsystem. Incident information will go directly to Public Affairs from SEPTA's Emergency Management Subsystem.
- The Information Service Provider Subsystem has been assigned the responsibility for notifying external Information Service Providers, such as SmartRoute or Metro Traffic, about incidents or delays.

New Jersey State Police

A description of the New Jersey State Police architecture is contained in Table 14 and Figure 22. Highlights of the New Jersey State Police architecture include:

- Emergency call boxes located on the Atlantic City Expressway are supported by Emergency Notification flows from the Remote Travel Support Subsystem.
- Specialized cellular phone numbers used on the Atlantic City Expressway and on the New Jersey Turnpike are supported by the Personal Information Access Subsystem.
- The option for emergency priority treatment at signalized intersections is provided for with interconnections to the Traffic Management Subsystem.
- Interconnections for obtaining video feeds from NJDOT and the toll authorities are also included in the architecture.
- Since the New Jersey State Police have stations scattered throughout South Jersey, the list of Other Emergency Management agencies includes provisions for the various stations to coordinate among themselves as well as with Troop A Headquarters and West Trenton

central communications.

Pennsylvania State Police

Pennsylvania State Police architectural requirements presented in Table 15 and Figure 23 are applicable to all three barracks serving the Pennsylvania portion of the region. Key architecture modifications from the standard Emergency Management Subsystem include:

- The vast majority of emergency calls for incidents on expressways go through the county 911 operations. Therefore Personal Information Access and Remote Traveler Support have been eliminate from the Pennsylvania State Police architecture.
- Emergency Traffic Control has been eliminated because of the fractured ownership of the traffic signal system in Pennsylvania.
- Interconnections with Transit Management Subsystems have been eliminated.
- Although the Pennsylvania State Police are responsible for patrolling only expressways, they must interact with a large number of other emergency management organizations including local police, fire and emergency medical services and departments, like the Delaware State Police, who border their jurisdiction.

Philadelphia Police Department

A description of the Philadelphia Police Department's architecture is contained in Figure 24 and Table 16. For the Philadelphia Police Department the standard architecture for Emergency Management was only slightly modified as follows:

- Interconnections with Personal Information Access and the Vehicle Subsystem were included, however those with Remote Traveler Support Subsystem were not. Remote Traveler Support is associated with emergency call boxes, and there are no plans to install call boxes because of vandalism and maintenance problems. Technology advances are increasing the use of other two subsystems, but how they will interface with Emergency Management is currently unclear. Therefore, the Personal Information Access Subsystem and Vehicle Subsystem architecture flows were preserved as hooks until the institutional issues are addressed.
- The architecture provides linkages with a wide range of agencies, especially in the areas of emergency management, transit management, and traffic management.

- The Police Department's interconnection with Traffic Management will allow the Streets Department and PennDOT District 6-0 to share video images with the police, provide up-to-date information on the availability of resources to clean-up an incident, and provide right-of-way to emergency vehicles if necessary.
- Connections with Information Service Providers represent linkages that currently do not exist.

SmartRoute

SmartRoute is in a unique situation. While its services are largely funded by NJDOT and PennDOT, it is not recognized as the "official" ISP for the region. Yet as a private company it offers customized services outside those basic services funded by the public agencies. The proposed SmartRoute architecture reflects this duality by deleting certain public sector type functions contained in the national architecture (i.e., linkages with the media) while enabling fee-based subscriber services that SmartRoute currently does not provide. A description of SmartRoute's architecture is contained in Table 17 and Figure 25. The degree to which SmartRoute must comply to the Regional ITS Architecture is questionable. As an organization receiving federal funds, there is a legal obligation to be consistent with National and Regional ITS Architectures; however, for those services funded exclusively with private resources, there is no such requirement. For simplicity, the Regional ITS Architecture ignores this distinction. Changes to the standard Information Service Provider architecture include:

- Video linkages to the Roadway and Traffic Management Subsystems have been added because SmartRoute monitors the highway network with its own CCTV cameras and with live video feeds from PennDOT and NJDOT.
- A non-conforming terminator titled "Road Reporter" was added to account for volunteer road reporters.
- In this region the selling and marketing of advanced toll payments, including E-ZPass, has been assigned to other organizations, therefore the Toll Administration Subsystem was deleted from SmartRoute's architecture.
- A wide array of information flows are supported between SmartRoute and Personal Information Access and Remote Travel Support Subsystems. These include basic traveler information, interactive trip planning and Yellow Pages information. Advanced route guidance was not included because the regional agencies felt this was not a high priority to be subsidized with government resources.

- Parking Management Subsystem was retained for SmartRoute to expand its specialized services for those motorists headed to the Sports Complex.

TABLE 4: STAKEHOLDERS FOR DELAWARE RIVER PORT AUTHORITY TRAFFIC MANAGEMENT SYSTEM

Subsystems:

Archived Data Management Subsystems (ADMS)
Delaware River Port Authority
Delaware Valley Regional Planning Commission
New Jersey Department of Transportation
Pennsylvania Department of Transportation
Traffic.com

Emergency Management Subsystems (EM)
Camden City Police Department
Delaware River Port Authority
New Jersey State Police
Philadelphia Fire Department
Philadelphia Police Department

Information Service Provider Subsystems (ISP)
Center City District
Cross County Connection TMA
Delaware River Port Authority
Express Traffic
I-95 Corridor Coalition
Metro Traffic
Philadelphia International Airport
SmartRoute
Traffic.com
TRANSCOM
Private Sector To Be Determined

Toll Administration Subsystem (TAS)
Delaware River Port Authority

Transit Management Subsystems (TRMS)
New Jersey Transit Southern Division

Terminators:

Event Promoters
E Center
Pennsylvania Convention Center
Penns Landing Corporation
Philadelphia Convention and Tourist Bureau
Sports Complex (Phila. Dept. of Recreation & PIDC)

Maintenance
DRPA - Commodore Barry Bridge Maintenance
DRPA - Ben Franklin Bridge Maintenance
DRPA - Betsy Ross Bridge Maintenance
DRPA - Walt Whitman Bridge Maintenance

Map Update Provider
To Be Determined

Other Traffic Management
Burlington County Bridge Commission
I-95 Corridor Coalition
Municipal Traffic Operations Centers
New Jersey County Traffic Operation Centers
NJDOT Traffic Operations South
PennDOT District 6-0 Traffic Control Center
Philadelphia Streets Department
South Jersey Transportation Authority

Public Affairs
DRPA Public Affairs Staff

Traffic Operations Personnel
DRPA Staff

Weather Service
National Weather Service

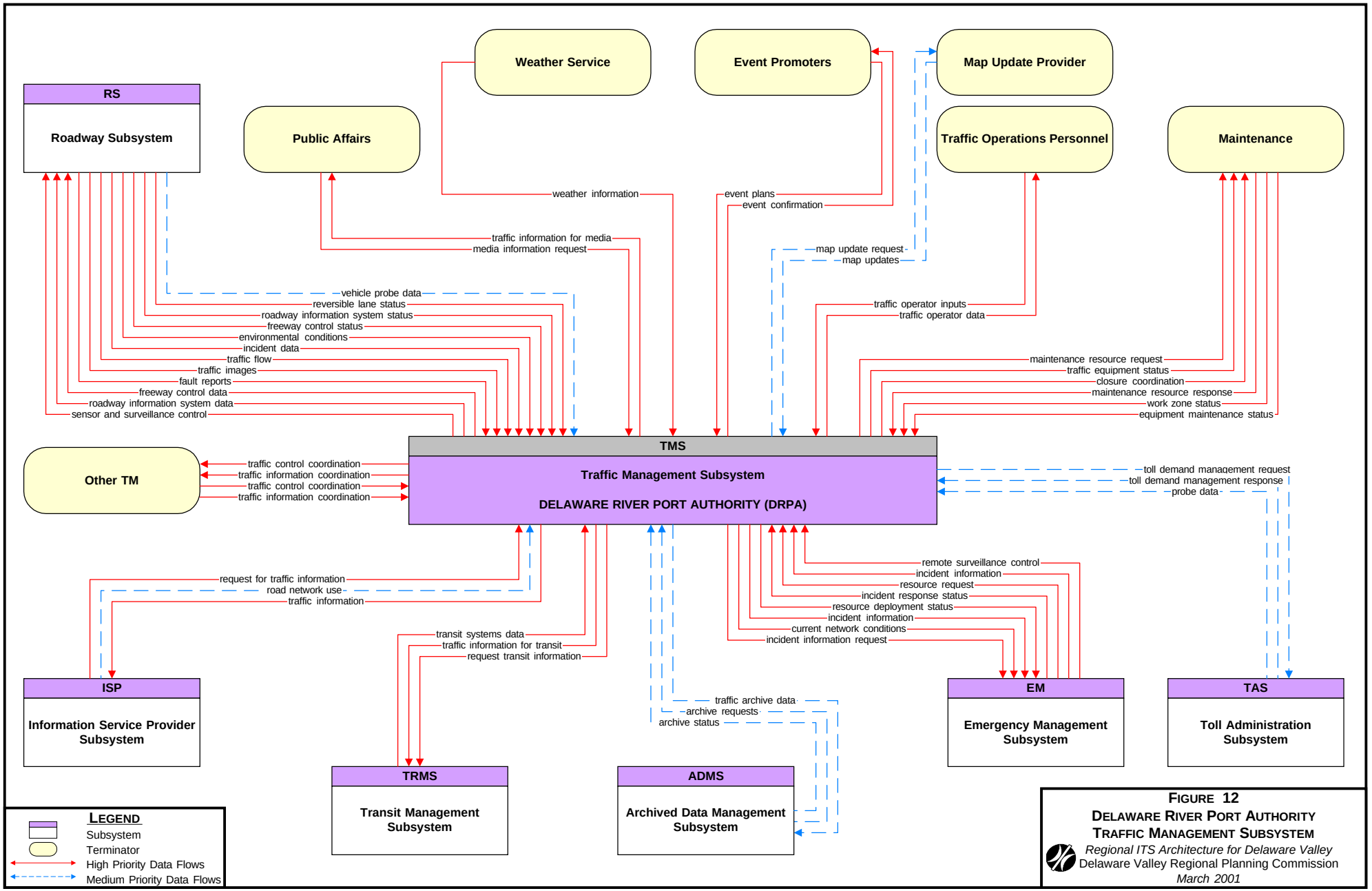


FIGURE 12
DELAWARE RIVER PORT AUTHORITY
TRAFFIC MANAGEMENT SUBSYSTEM
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

TABLE 5: STAKEHOLDERS FOR DELAWARE RIVER PORT AUTHORITY EMERGENCY MANAGEMENT SUBSYSTEM

Subsystems:

Archived Data Management Subsystems (ADMS)
Delaware River Port Authority

Emergency Vehicle Subsystems (EVS)
Delaware River Port Authority Police Vehicles

Fleet and Freight Management Subsystems (FMS)
Private Sector

Traffic Management Subsystems (TMS)
Delaware River Port Authority

Transit Management Subsystems (TRMS)
New Jersey Transit Southern Division

Terminators:

Emergency System Operator
DRPA Police Dispatcher

Emergency Telecommunications System
Camden County 911
Cloucesester County 911
Delaware County 911
Philadelphia Police Department Radio Room

Other Emergency Management
Camden City Police Department
DRPA - Comm. Barry Bridge Police Radio Room
DRPA - Ben Franklin Bridge Police Radio Room
DRPA - Betsy Ross Bridge Police Radio Room
DRPA - Walt Whitman Bridge Police Radio Room
Municipal Police Departments
New Jersey State Police
Pennsylvania State Police
Philadelphia Fire Department
Philadelphia Police Department

Public Affairs
DRPA Public Affairs Staff

Toll Collector
DRPA Toll Booth Attendants

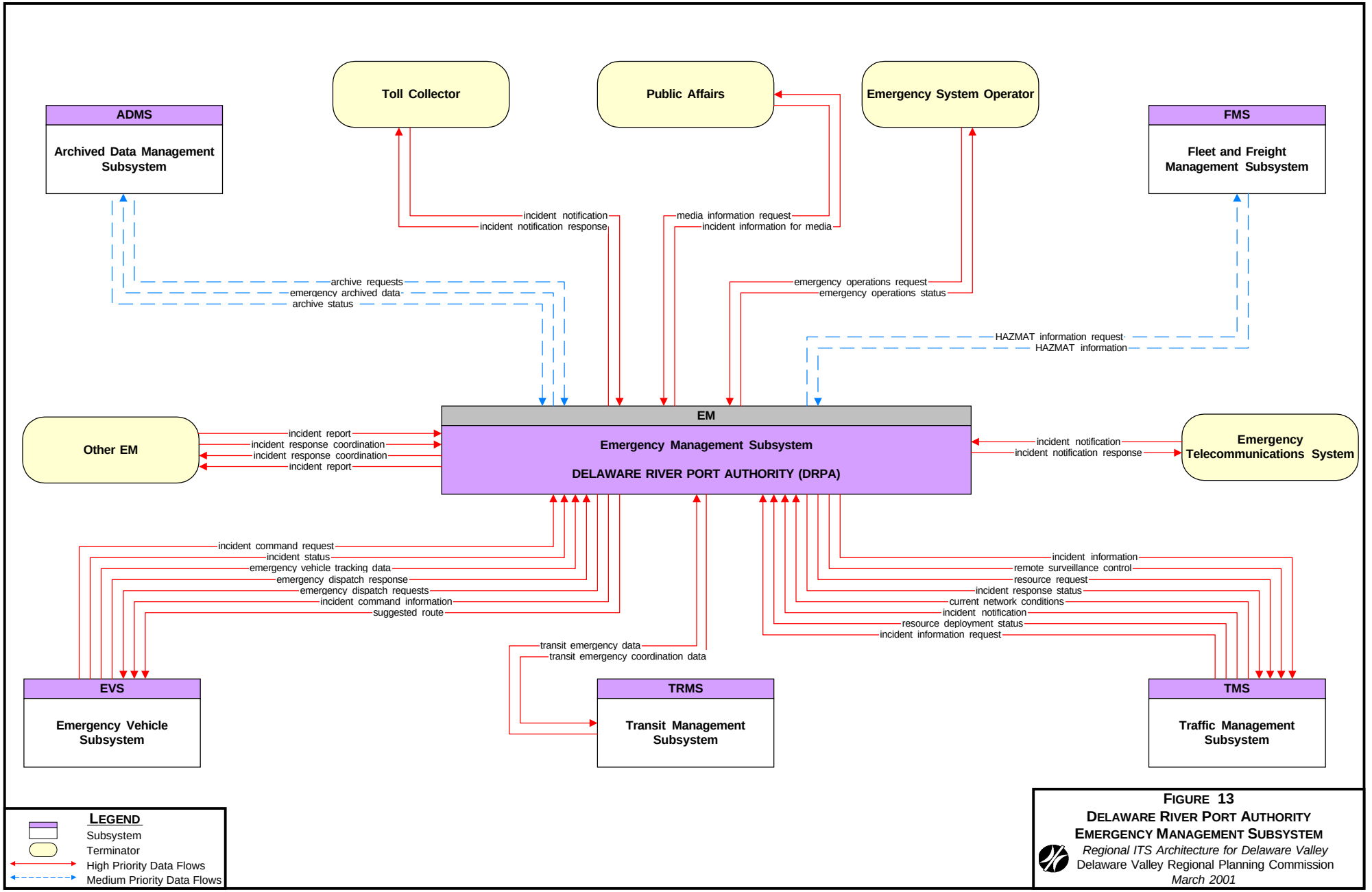


FIGURE 13
DELAWARE RIVER PORT AUTHORITY
EMERGENCY MANAGEMENT SUBSYSTEM
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

TABLE 6: STAKEHOLDERS FOR DELAWARE RIVER PORT AUTHORITY TOLL ADMINISTRATION SUBSYSTEM

Subsystems:

Archived Data Management Subsystem (ADMS)
Delaware River Port Authority

Information Service Providers Subsystem (ISP)
Delaware River Port Authority
E-Z Pass Customer Service Center

Toll Collection Subsystem (TCS)
Delaware River Port Authority

Traffic Management Subsystem (TMS)
Delaware River Port Authority

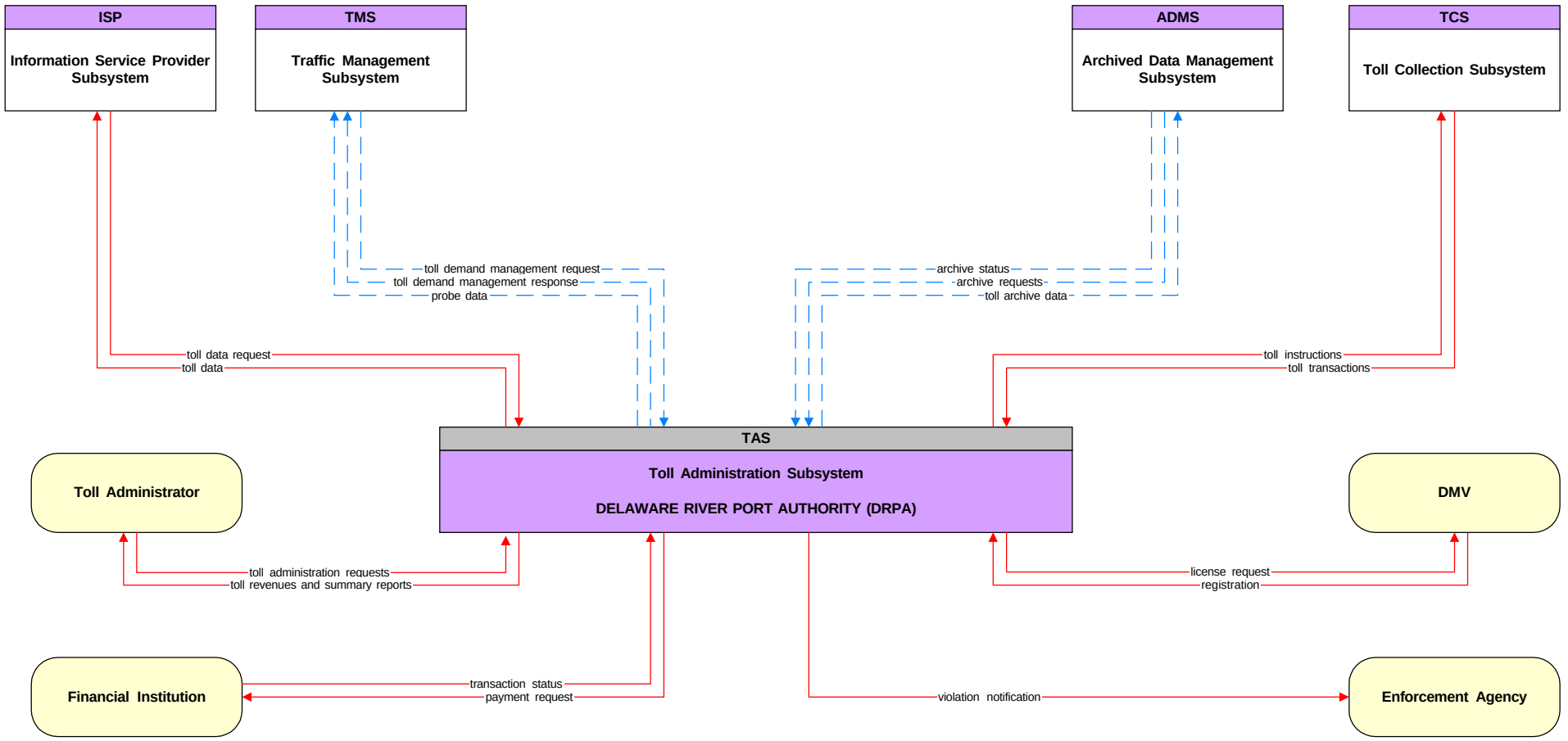
Terminators:

Department of Motor Vehicles (DMV)
NJDOT Motor Vehicle Services
PennDOT Driver and Vehicle Services

Enforcement Agency
E-Z Pass Customer Violation Center

Financial Institution
E-Z Pass Customer Service Center

Toll Administrator
DRPA Management Information Systems Staff



LEGEND

- Subsystem
- Terminator
- High Priority Data Flows
- Medium Priority Data Flows

FIGURE 14
DELAWARE RIVER PORT AUTHORITY
TOLL ADMINISTRATION SUBSYSTEM
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

TABLE 7: STAKEHOLDERS FOR NEW JERSEY DEPARTMENT OF TRANSPORTATION TRAFFIC OPERATIONS CENTER SOUTH TRAFFIC MANAGEMENT SUBSYSTEM

Subsystems:

Archived Data Management Subsystem (ADMS)
Delaware Valley Regional Planning Commission
New Jersey Department of Transportation
Traffic.com

Emergency Management Subsystem (EM)
Local volunteer/professional fire/EMS departments
Municipal Police Departments
New Jersey State Police - West Trenton
New Jersey State Police - Troop A
New Jersey State Police - Troop D
New Jersey State Police - Atlantic City Expressway
New Jersey State Police - Bellmawr Station
New Jersey State Police - Bordentown Station
New Jersey State Police - Fort Dix Station
New Jersey State Police - Hightstown Station
Professional Fire/EMS Departments

Emergency Vehicle Subsystem (EVS)
Emergency Service Patrol Vehicle
Incident Management Response Team Vehicle

Information Service Provider Subsystem (ISP)
Center City District
Cross County Connection TMA
Express Traffic
Greater Mercer TMA
I-95 Corridor Coalition
Metro Traffic
New Jersey Department of Transportation
Philadelphia International Airport
SmartRoute
Traffic.com
TRANSCOM
Private Sector To Be Determined

Transit Management Subsystem (TRMS)
New Jersey Transit Southern Division
PATCO

Terminators:

Event Promoters
E Center
Philadelphia Convention and Tourist Bureau

Maintenance
NJDOT Maintenance - Region 3 - Mercer County (Fernwood Service Station, Hamilton Twp., Lawrence Twp., Washington Twp., West Trenton)
NJDOT Maintenance - Region 4 - Burlington County (Bordentown, Edgewater Park, Four Mile Circle, Mount Laurel Twp., Red Lion)
NJDOT Maintenance - Region 4 - Camden County (Berlin, Cherry Hill, Pennsauken)
NJDOT Maintenance - Region 4 - Gloucester County (Bridgeport, Deptford, Glassboro, West Deptford)

Map Update Provider
To Be Determined

Media
Newspapers, Radio, TV

Other TM
Burlington County Bridge Commission
Burlington County Traffic Operations Center
DelDOT Traffic Management Center
DRBA Centralized Operations Center
Delaware River Joint Bridge Commission
Delaware River Port Authority
I-95 Corridor Coalition
Municipal Traffic Operation Centers
New Jersey County Traffic Operations Centers
NJDOT Traffic Operations North
NJ Turnpike Authority Traffic Operations Center
PennDOT District 6-0 Traffic Control Center
Philadelphia Streets Department
South Jersey Turnpike Authority
TRANSCOM

Rail Operations
CSX, NJ Transit, Norfolk Southern

Traffic Operations Personnel
NJDOT Traffic Operations South Staff

Weather Service
National Weather Service

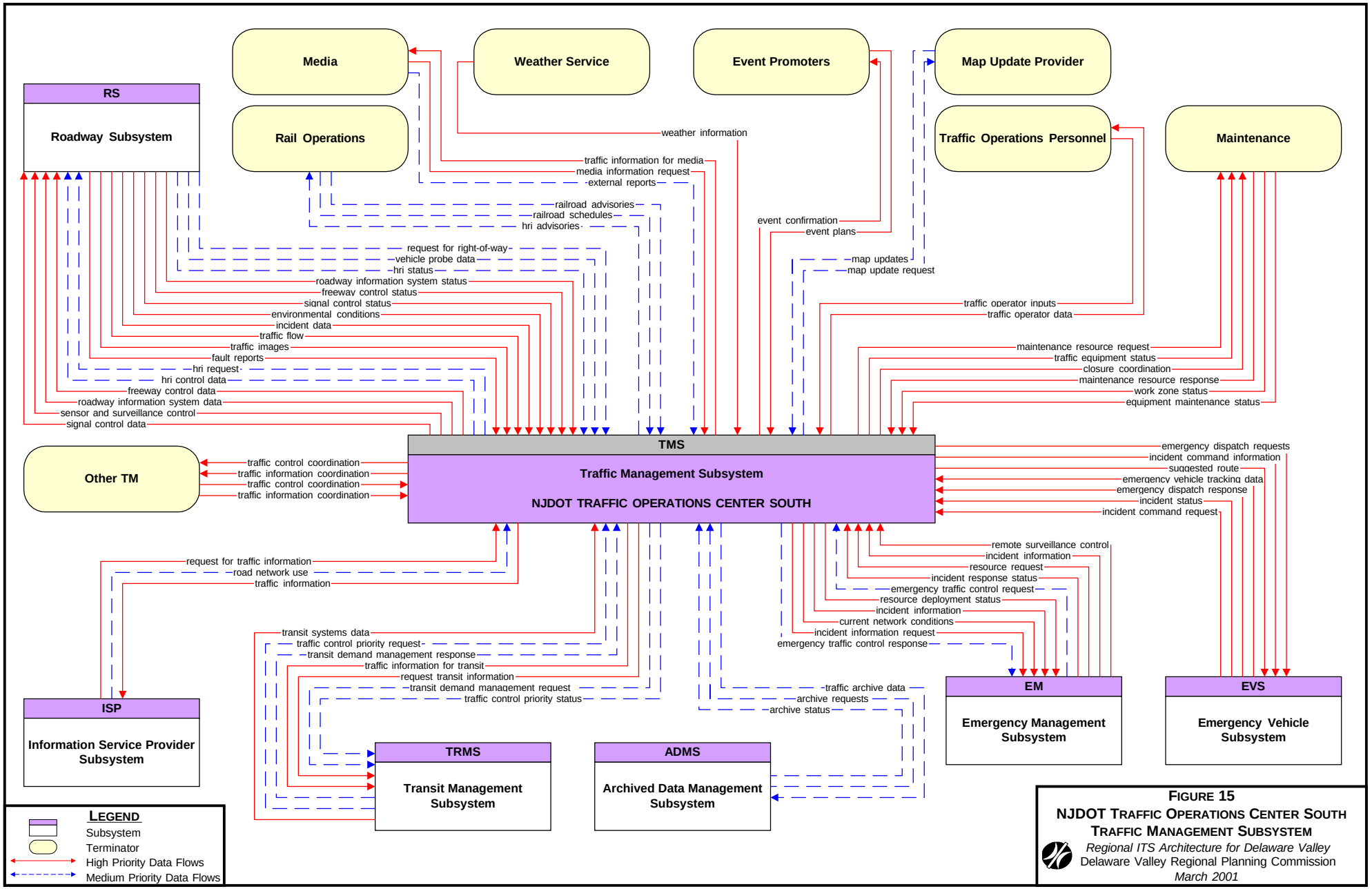


FIGURE 15
NJDOT TRAFFIC OPERATIONS CENTER SOUTH TRAFFIC MANAGEMENT SUBSYSTEM
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

TABLE 8: STAKEHOLDERS FOR PENNSYLVANIA DEPARTMENT OF TRANSPORTATION DISTRICT 6-0 TRAFFIC MANAGEMENT SUBSYSTEM

Subsystems:

Archived Data Management Subsystems (ADMS)
Delaware Valley Regional Planning Commission
PennDOT - Harrisburg
Traffic.com

Emergency Management Subsystems (EMS)
Local/Professional Fire/EMS Departments
Municipal Police Departments
Pennsylvania State Police- Belmont Barracks
Pennsylvania State Police - Media Barracks
Pennsylvania State Police - Trevose Barracks
Philadelphia Police Department

Emergency Vehicle Subsystem (EVS)
Emergency Service Patrol Vehicle

Information Service Provider Subsystems (ISP)
Bucks County TMA
Center City District
TMA of Chester County
Delaware County T MA
Express Traffic
Greater Valley Forge TMA
I-95 Corridor Coalition
Metro Traffic
The Partnership TMA
Philadelphia International Airport
Philadelphia Redevelopment Authority
SmartRoute
Traffic.com
TRANSCOM
Private Sector To Be Determined

Transit Management Subsystems (TRMS)
SEPTA Operations Center

Terminators:

Event Promoters
Penn's Landing
Pennsylvania Convention Center
Philadelphia Convention and Tourist Bureau
Sports Complex (PIDC, Phila. Dept. of Recreation)

External Traffic Information
SmartRoute
Traffic.com

Maintenance
PennDOT - Bucks County Maintenance
PennDOT - Chester County Maintenance
PennDOT - Delaware County Maintenance
PennDOT - Montgomery County Maintenance
PennDOT - Philadelphia County Maintenance

Map Update Provider
To Be Determined

Other Traffic Management
Burlington County Bridge Commission
DelDOT Traffic Management Center
Delaware River Joint Toll Bridge Commission
Delaware River Port Authority
I-95 Corridor Coalition
Municipal Traffic Operation Centers
NJDOT Traffic Operations South
PennDOT Statewide Traffic Control Center
PA Turnpike Commission Communications Center
Philadelphia Streets Department
TRANSCOM

Public Affairs
PennDOT District 6-0 Public Affairs staff

Traffic Operations Personnel
PennDOT District 6-0 Traffic Control Center Staff

Weather Service
AccuWeather

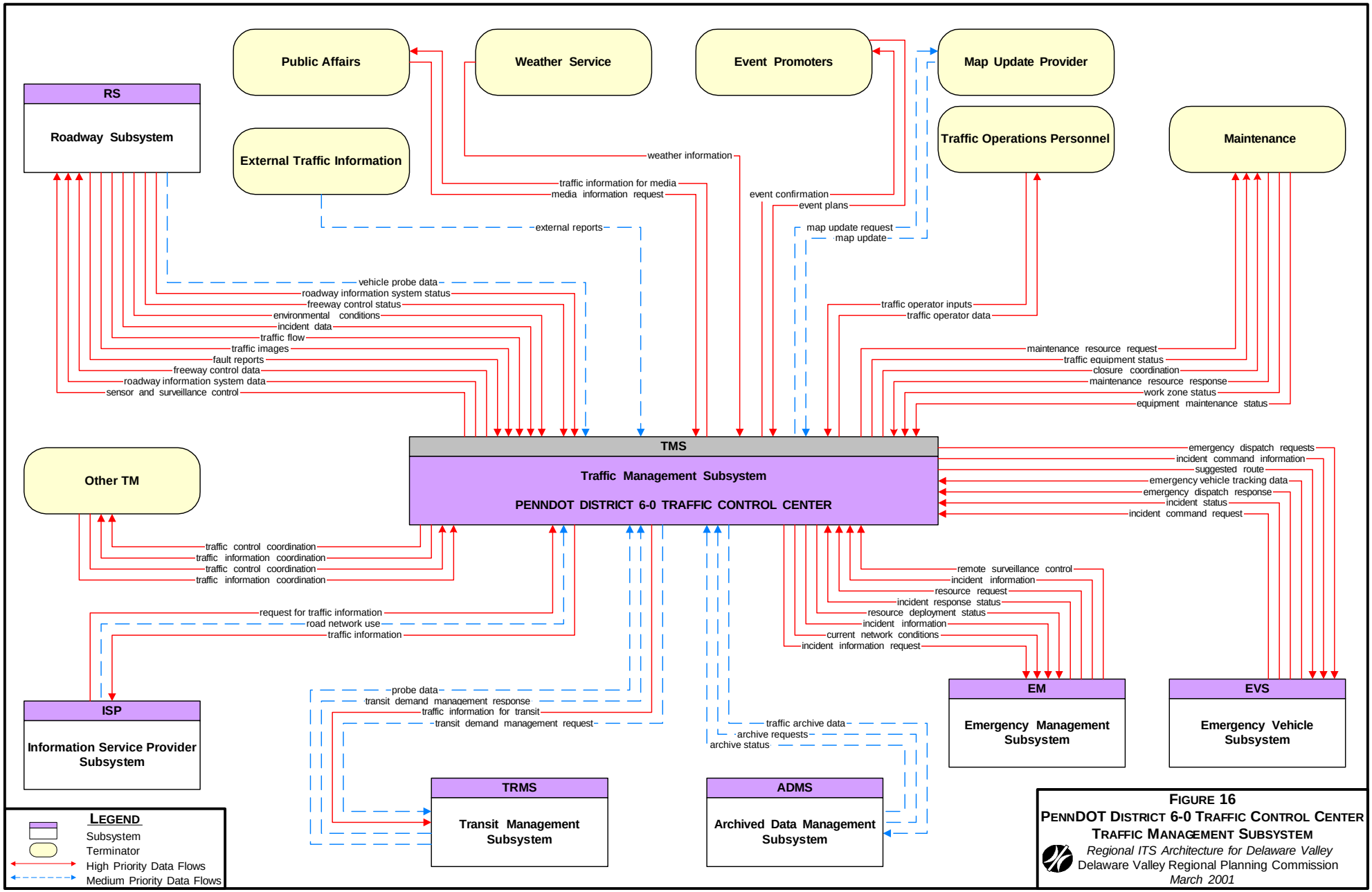


FIGURE 16
PENNDOT DISTRICT 6-0 TRAFFIC CONTROL CENTER
TRAFFIC MANAGEMENT SUBSYSTEM
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

TABLE 9: STAKEHOLDERS FOR PHILADELPHIA STREETS DEPARTMENT TRAFFIC MANAGEMENT SUBSYSTEM

Subsystems:

Archived Data Management Subsystems (ADMS)
Delaware Valley Regional Planning Commission
PennDOT - Harrisburgh
Philadelphia Streets Department
Traffic.com

Emergency Management Subsystems (EM)
SEPTA Police Department
Philadelphia Fire Department
Philadelphia Police Department

Information Service Provider Subsystems (ISP)
Bucks County TMA
Center City District
Delaware County TMA
Express Traffic
Greater Valley Forge TMA
I-95 Corridor Coalition
Metro Traffic
Philadelphia International Airport
Philadelphia Redevelopment Authority
SmartRoute
Traffic.com
TRANSCOM
Private Sector To Be Determined

Toll Administration Subsystems (TAS)
Delaware River Port Authority

Transit Management Subsystems (TRMS)
New Jersey Transit Southern Division
SEPTA Operations Center

Parking Management Subsystems (PMS)
Philadelphia Parking Authority

Terminators:

Event Promoters
Penns Landing Corporation
Pennsylvania Convention Center
Philadelphia Convention and Tourist Bureau
Sports Complex (PIDC, Phila. Depart. of Recreation)

Maintenance
Philadelphia Streets Department - North District
Philadelphia Streets Department - Northwest District
Philadelphia Streets Department - West District
Philadelphia Streets Department - South District
Philadelphia Streets Department - Southwest District
PennDOT - Philadelphia County Maintenance

Map Update Provider
To Be Determined

Media
Newspapers, Radio, TV

Other Traffic Management
Burlington County Bridge Commission
Delaware River Port Authority
I-95 Corridor Coalition
NJDOT Traffic Operations South
PennDOT District 6-0 Traffic Control Center

Rail Operations
Canadian Pacific
CSX
Norfolk Southern

Traffic Operations Personnel
Philadelphia Streets Department Staff

Weather Service
National Weather Service

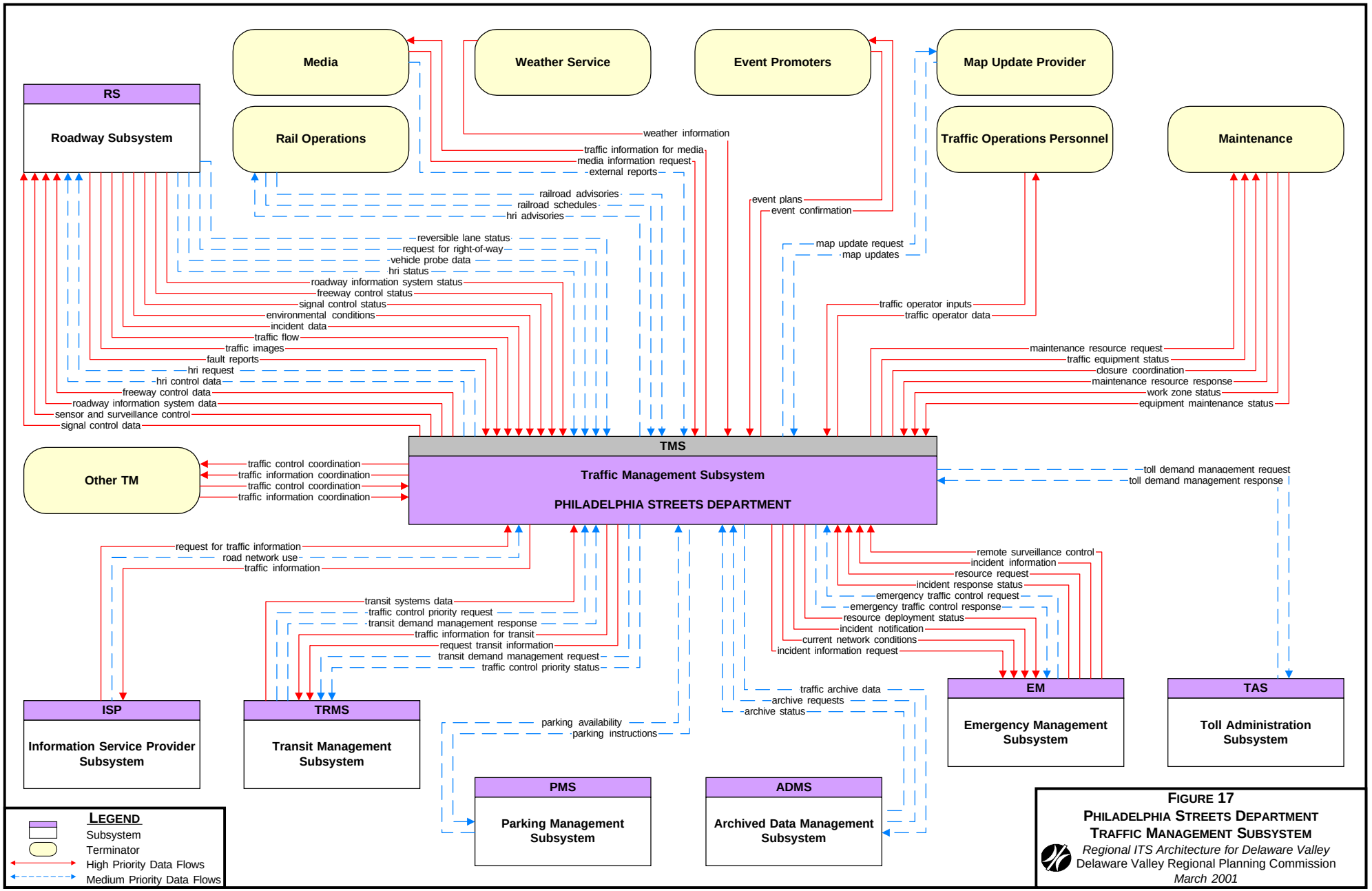


FIGURE 17
PHILADELPHIA STREETS DEPARTMENT
TRAFFIC MANAGEMENT SUBSYSTEM
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

TABLE 10: STAKEHOLDERS FOR PATCO TRANSIT MANAGEMENT SUBSYSTEM

Subsystems:

Archived Data Management Subsystem (ADMS)
Delaware Driver Port Authority

Emergency Management Subsystem (EM)
Camden County 911
Local Volunteer/Professional Fire/EMS Departments
Municipal Police Departments
New Jersey Transit Police
PATCO Police
Philadelphia Police Department
SEPTA Transit Police

Information Service Provider Subsystem (ISP)
Center City District
Cross County Connection TMA
Delaware River Port Authority
Express Traffic
Metro Traffic
Philadelphia Redevelopment Authority
SmartRoute
Traffic.com
Private Sector To Be Determined

Parking Management (PMS)
PATCO

Traffic Management Subsystem (TMS)
NJDOT Traffic Operations South

Transit Vehicle Subsystem (TRVS)
PATCO trains

Terminators:

Enforcement Agency
PATCO Police

Financial Institution
To Be Determined

Other TRMS
New Jersey Transit
SEPTA

Public Affairs
DRPA Public Affairs Staff

Transit Driver
Vehicle Operator

Transit Fleet Manager
PATCO Yard Manager

Transit Maintenance Personnel
PATCO Maintenance Personnel

Transit Systems Operators
PATCO Center Tower staff

Weather Service
National Weather Service

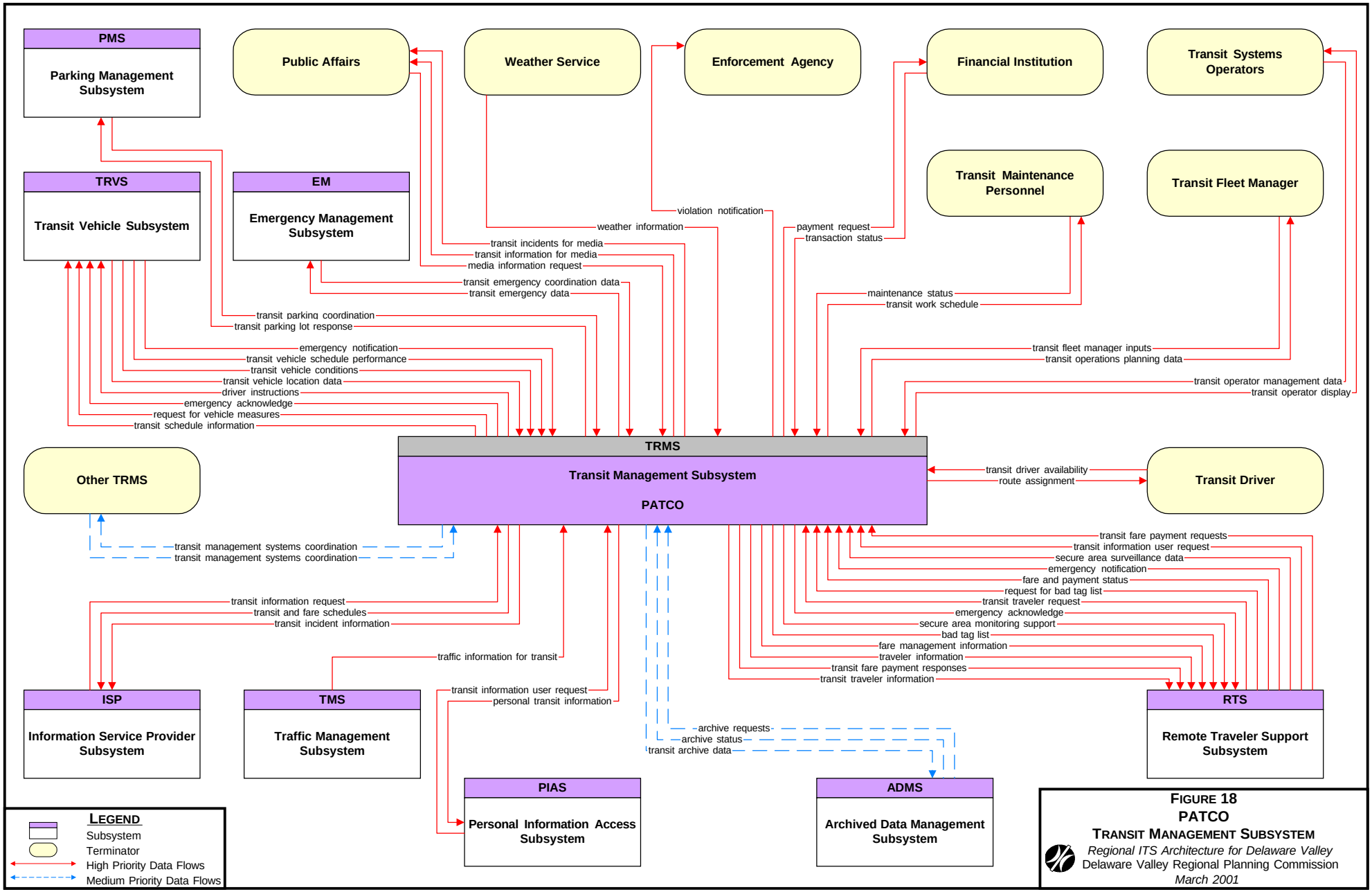


FIGURE 18
PATCO
TRANSIT MANAGEMENT SUBSYSTEM
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

TABLE 11: STAKEHOLDERS FOR SEPTA TRANSIT MANAGEMENT SUBSYSTEM

Subsystems:

Archived Data Management Subsystem (ADMS)
DVRPC
SEPTA
Traffic.com

Emergency Management (EM)
Philadelphia Police Department
SEPTA Transit Police

Information Service Provider (ISP)
SEPTA Operations Center

Parking Management Subsystem (PMS)
SEPTA

Traffic Management Subsystem (TMS)
Municipal traffic operation centers
PennDOT District 6-0 Traffic Control Center (TCC)
Philadelphia Streets Department

Transit Vehicle Subsystem (TRVS)
SEPTA transit vehicles

Terminators:

Event Promoters
Penns Landing Corporation
Pennsylvania Convention Center
Philadelphia Convention and Tourist Bureau
Sports Complex (PIDC, Phila. Dept. of Recreation)

Financial Institution
To be determined

Map Update Provider
To be determined

Multimodal Transportation Service Provider
Philadelphia International Airport

Other TRMS
Amtrak
Dart First State
New Jersey Transit
PATCO

Power System
SEPTA

Transit Driver
SEPTA bus drivers and train engineers

Transit Fleet Manager
SEPTA line and street supervisors

Transit Maintenance Personnel
SEPTA maintenance supervisors

Transit Systems Operators
SEPTA Operations Center staff

Weather Service
National Weather Service

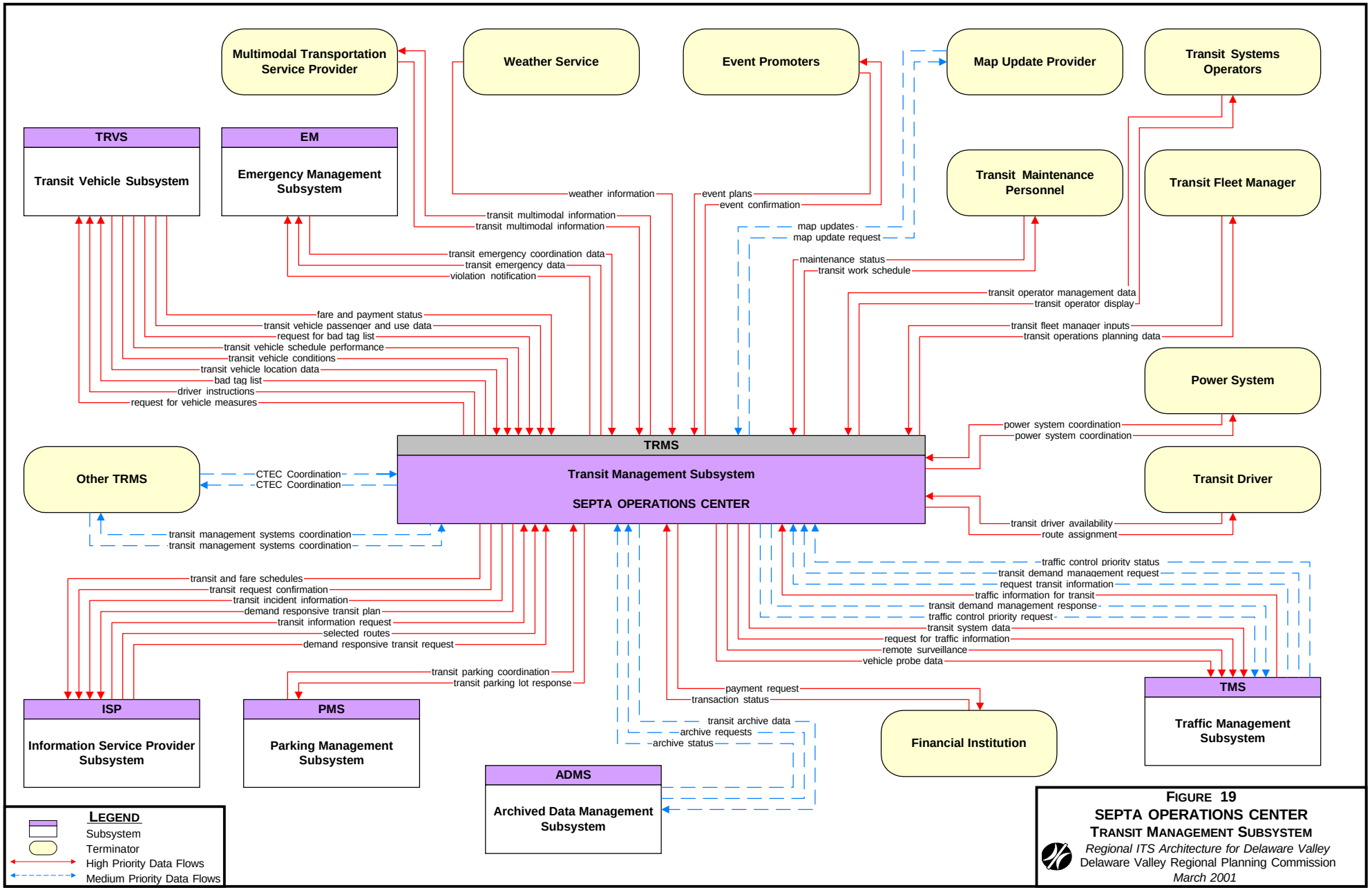


FIGURE 19
SEPTA OPERATIONS CENTER
TRANSIT MANAGEMENT SUBSYSTEM
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

TABLE 12: STAKEHOLDERS FOR SEPTA EMERGENCY MANAGEMENT SUBSYSTEM

Subsystems:

Archived Data Management Subsystem (ADMS)
SEPTA

Emergency Vehicle Subsystem (EVS)
SEPTA Transit Police Vehicles

Transit Management Subsystem (TRMS)
SEPTA Operations Center

Transit Vehicle Subsystem (TRVS)
SEPTA Transit Vehicles

Terminators:

Emergency System Operator
SEPTA Transit Police (at SEPTA Operations Center)

Emergency Telecommunications System
Philadelphia Police Department Radio Room
SEPTA Transit Police (at SEPTA Operations Center)

Other EM
Amtrak Police
Municipal Police Departments
PATCO Police
Philadelphia Fire Department
Philadelphia Police Department

Public Affairs
SEPTA

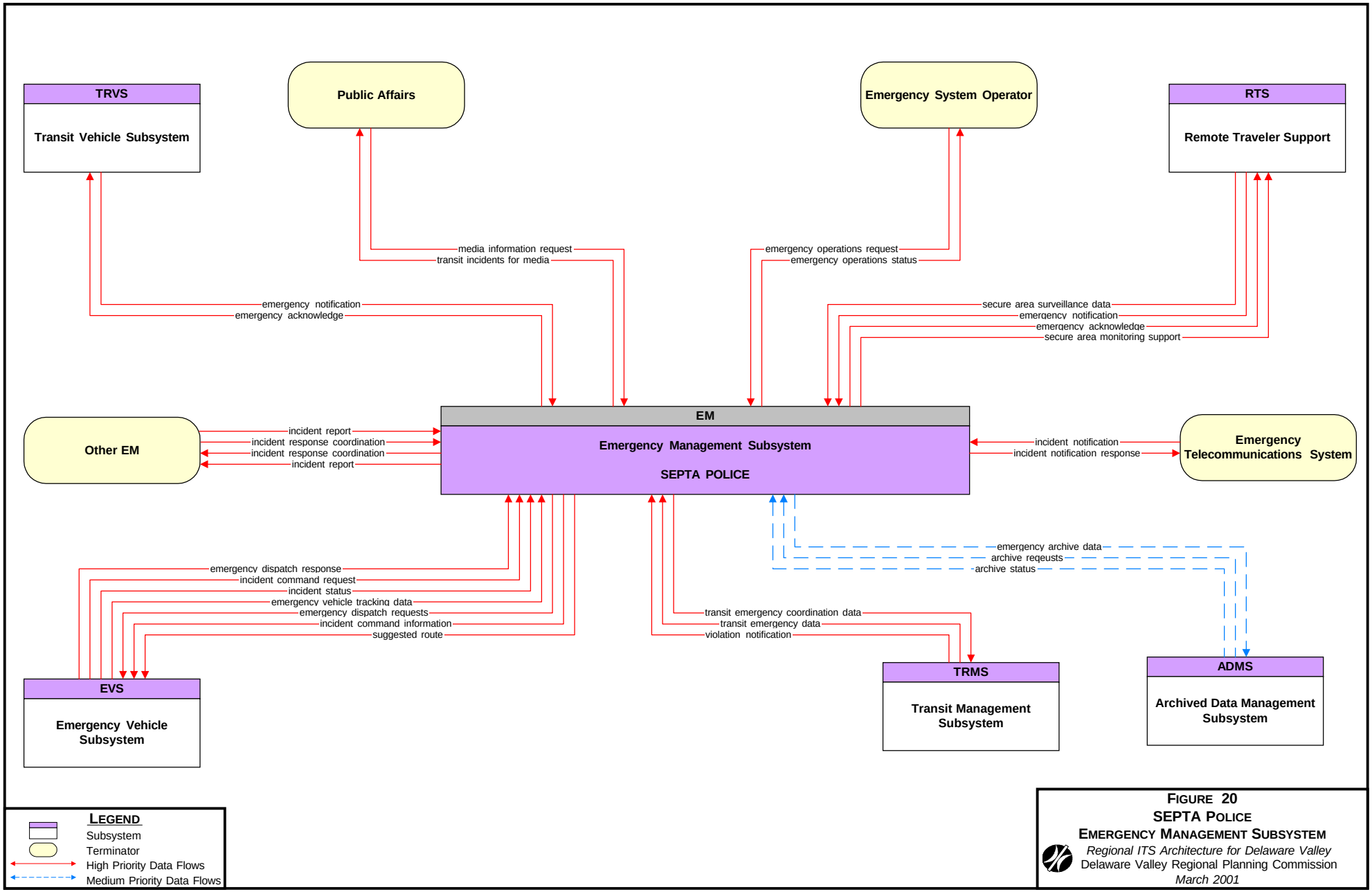


FIGURE 20
SEPTA POLICE
EMERGENCY MANAGEMENT SUBSYSTEM
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

TABLE 13 : STAKEHOLDERS FOR SEPTA INFORMATION SERVICE PROVIDER SUBSYSTEM

Subsystems:

Emergency Management (EM)
SEPTA Transit Police

Parking Management Subsystem (PMS)
SEPTA

Transit Management Subsystem (TRMS)
County paratransit operators
SEPTA Operations Center

Transit Vehicle Subsystem (TRVS)
County Paratransit Services
SEPTA Paratransit Service

Terminators:

Map Update Provider
To Be Determined

Multimodal Transportation Service Provider
Philadelphia International Airport

Other ISP
County Paratransit Services
Amtrak
Bucks County TMA
Center City District
TMA of Chester County
Delaware County TMA
Express Traffic
Greater Valley Forge TMA
I-95 Corridor Coalition
Metro Traffic
New Jersey Transit
The Partnership TMA
PATCO
Philadelphia International Airport
Philadelphia Redevelopment Authority
SmartRoute
Traffic.com
TRANSCOM
Private Sector To Be Determined

Public Affairs
SEPTA

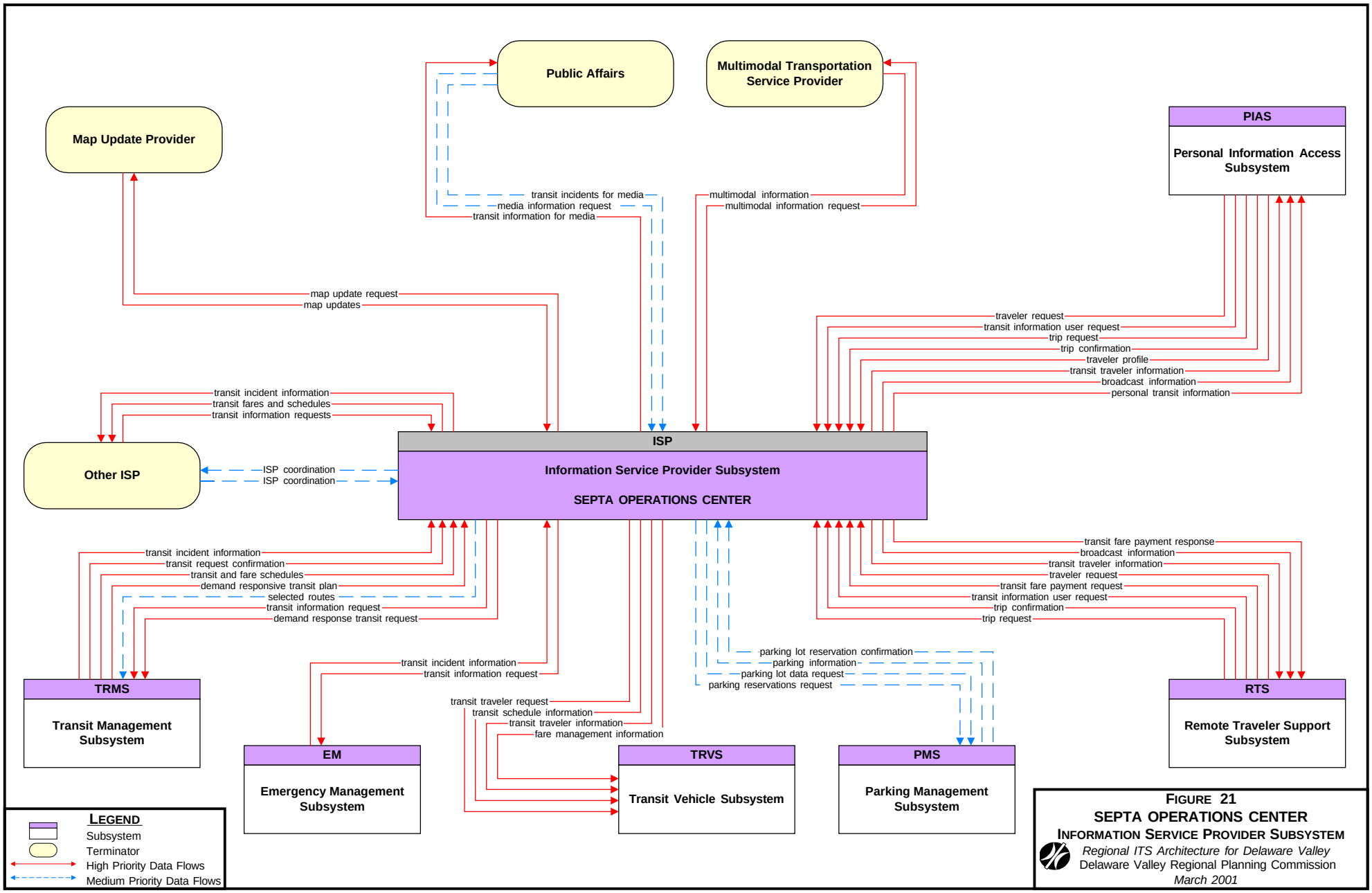


FIGURE 21
SEPTA OPERATIONS CENTER
INFORMATION SERVICE PROVIDER SUBSYSTEM
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

TABLE 14: STAKEHOLDERS FOR NEW JERSEY STATE POLICE EMERGENCY MANAGEMENT SUBSYSTEM

Subsystems:

Archived Data Management Subsystem (ADMS)
New Jersey State Police

Emergency Vehicle Subsystem (EVS)
New Jersey State Police Vehicles

Fleet and Freight Management Subsystem (FMS)
Private Sector To Be Determined

Information Service Provider (ISP)
Cross County Connection
Express Traffic
Greater Mercer TMA
I-95 Corridor Coalition
Metro Traffic
New Jersey Department of Transportation
PATCO
SmartRoute
Traffic.com
TRANSCOM
Private Sector To Be Determined

Traffic Management Subsystem (TMS)
Burlington County Traffic Operations Center
Delaware River and Bay Authority
Delaware River Joint Toll Bridge Commission
Delaware Driver Port Authority
I-95 Corridor Coalition
Municipal traffic operation centers
New Jersey county traffic operation centers
New Jersey Traffic Operations North
NJDOT Traffic Operations South
New Jersey Turnpike Authority
South Jersey Transportation Authority

Transit Management Subsystem (TRMS)
New Jersey Transit Southern Division

Terminators:

Emergency System Operator
New Jersey State Police Dispatchers

Emergency Telecommunications System
Burlington County 911
Camden County 911
Gloucester County 911
Mercer County 911
New Jersey State Police - West Trenton

Event Promoters
E Center
Philadelphia Convention and Tourist Bureau

Map Update Provider
Private Sector To Be Determined

Media
Newspapers, TV, Radio

Other EM
Burlington County Emergency Management Services
Camden County Office of Emergency Management
Delaware River and Bay Authority Police
DRPA Police dispatcher
DRPA Police - Commodore Barry Bridge
DRPA Police - Walt Whitman Bridge
DRPA Police - Ben Franklin Bridge
DRPA Police - Betsy Ross Bridge
Gloucester County Emergency Response Center
Local Volunteer/Professional Fire/EMS Departments
Municipal Police Departments
NJ Office of Emergency Management
NJ State Police - Atlantic City Expressway Station
NJ State Police - Bellmawr Station
NJ State Police - Bordentown Station
NJ State Police - Buena Vista Station
NJ State Police - Hightstown Station
NJ State Police - Troop D Headquarters
NJ State Police - West Trenton Station
NJ Transit Police
Mercer County Office of Emergency Management
Pennsylvania State Police

Weather Service
National Weather Service

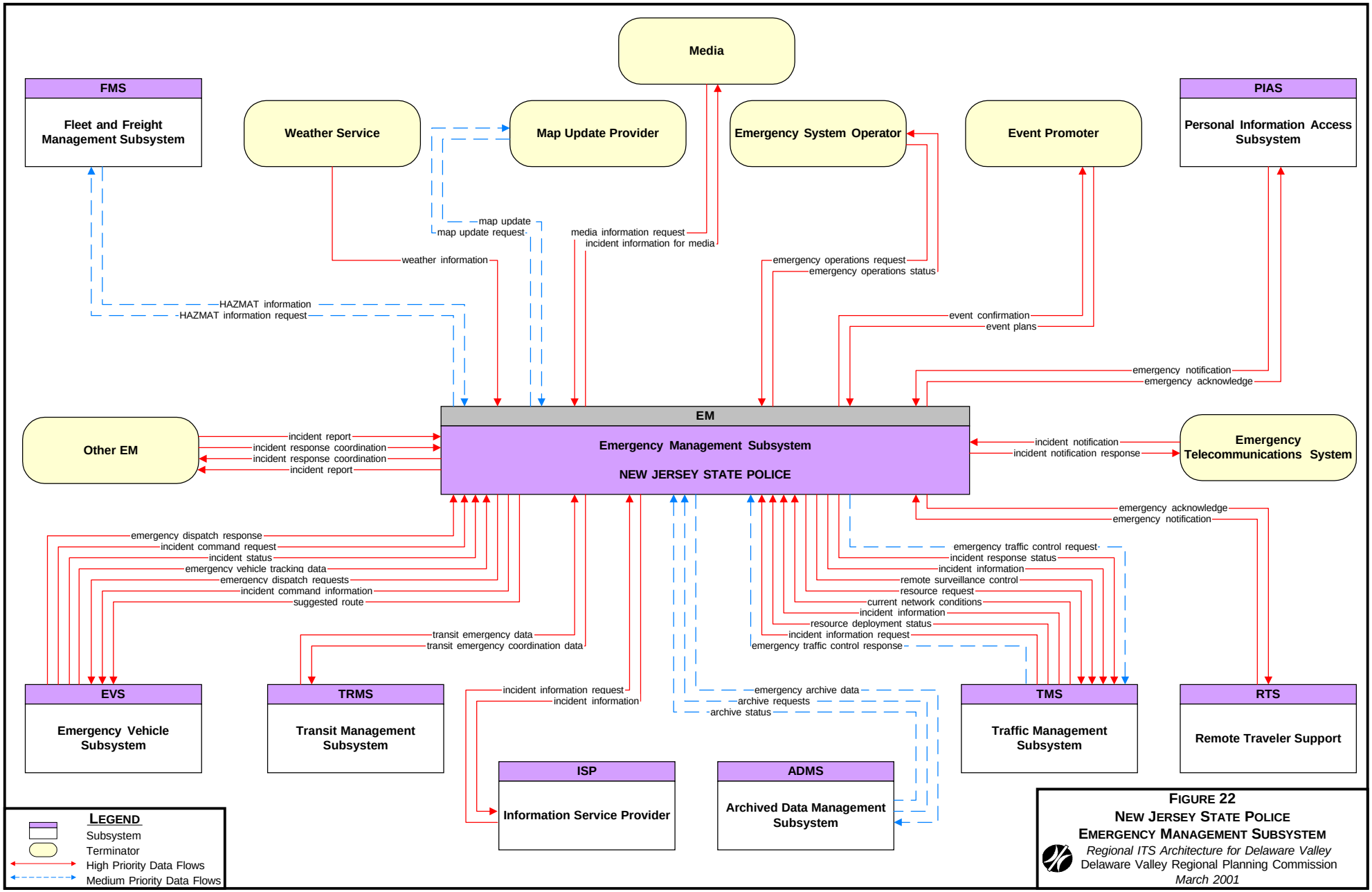


FIGURE 22
NEW JERSEY STATE POLICE
EMERGENCY MANAGEMENT SUBSYSTEM
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

TABLE 15: STAKEHOLDERS FOR PENNSYLVANIA STATE POLICE EMERGENCY MANAGEMENT SUBSYSTEM

Subsystems:

Archived Data Management Subsystems (ADMS)
Pennsylvania State Police

Emergency Vehicle Subsystems (EVS)
Pennsylvania State Police Vehicles

Fleet and Freight Management Subsystem (FMS)
Private Sector To Be Determined

Information Service Provider Subsystems (ISP)
Bucks County TMA
Center City District
TMA of Chester County
Delaware County TMA
Express Traffic
Greater Valley Forge TMA
I-95 Corridor Coalition
Metro Traffic
The Partnership TMA
Philadelphia International Airport
SmartRoute
Traffic.com
TRANSCOM
Private Sector To Be Determined

Traffic Management Subsystems (TMS)
DelDOT Traffic Management Center
Delaware River Joint Toll Bridge Commission
Delaware River Port Authority
Municipal Traffic Operations Centers
PennDOT District 6-0 Traffic Operations Center
PA Turnpike Commission Communications Center
Philadelphia Streets Department

Terminators:

Emergency System Operator
Belmont Barracks Radio Dispatchers
Media Barracks Radio Dispatchers
Trevose Barracks Radio Dispatchers

Emergency Telecommunications System
Bucks County 911
Chester County 911
Delaware County 911
Montgomery County 911

Event Promoters
Philadelphia Convention and Tourist Bureau

Map Update Provider
To Be Determined

Media
Newspapers, Television Stations, Radio Stations

Other EM
Bucks County Emergency Management Agency
Chester County Department of Emergency Services
Delaware County Emergency Services
Delaware State Police
DRPA Police Dispatcher
DRPA Police - Commodore Barry Bridge
Local Volunteer/Professional Fire/EMS Departments
Montgomery County Emergency Preparedness
Municipal Police Departments
New Jersey State Police
Pennsylvania State Police - Belmont Barracks
Pennsylvania State Police - Media Barracks
Pennsylvania State Police - Trevose Barracks
Pennyslvania State Police - Troop T
Pennsylvania Emergency Management Agency
Philadelphia Police Department

Weather Service
National Weather Service

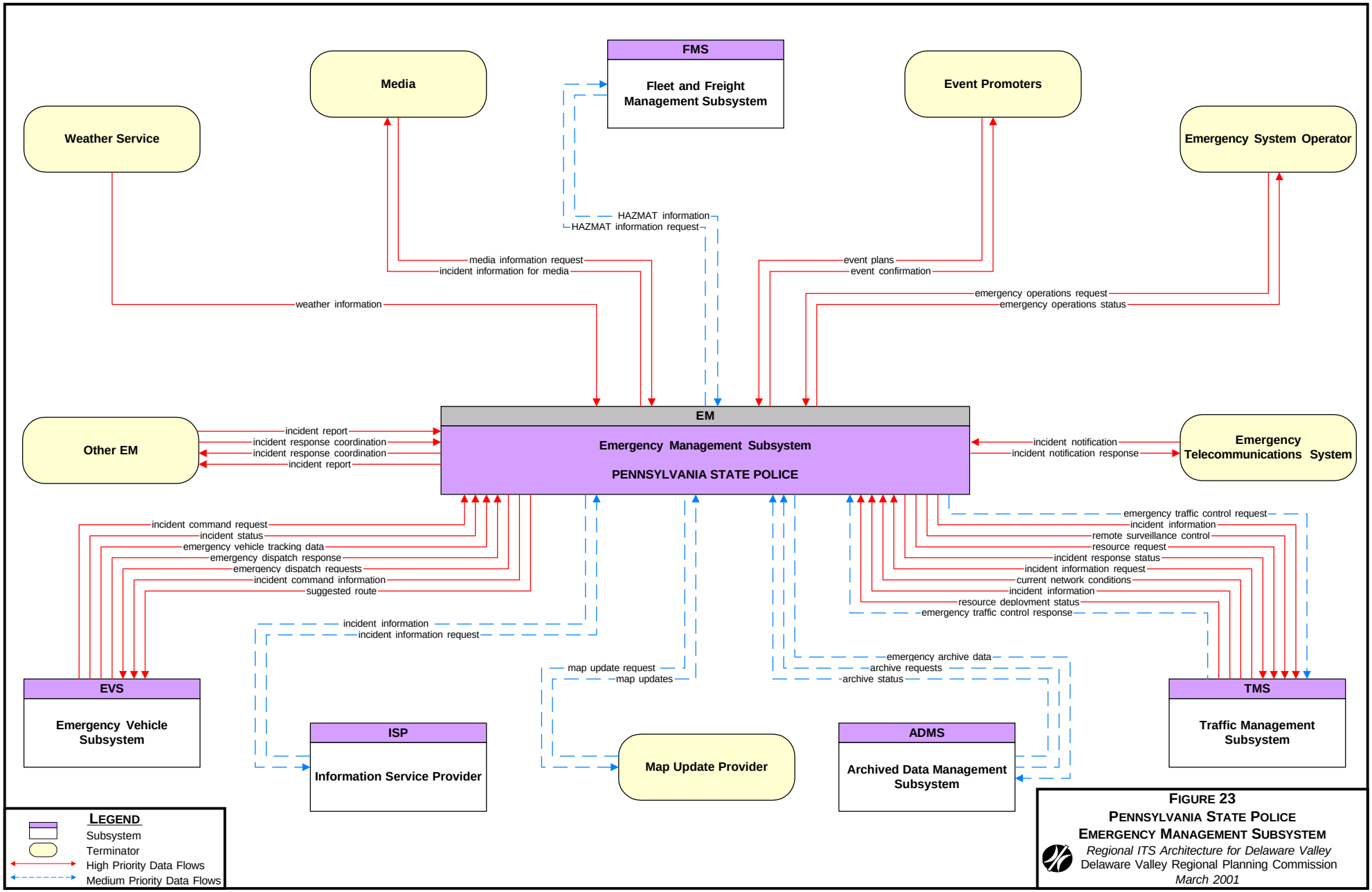


FIGURE 23
PENNSYLVANIA STATE POLICE
EMERGENCY MANAGEMENT SUBSYSTEM
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

TABLE 16: STAKEHOLDERS FOR PHILADELPHIA POLICE DEPARTMENT EMERGENCY MANAGEMENT SUBSYSTEM

Subsystems:

Archived Data Management Subsystem (ADMS)
Philadelphia Police Department
Traffic.com

Emergency Vehicle Subsystem (EVS)
Philadelphia Highway Patrol
Philadelphia Traffic Police

Fleet and Freight Management Subsystem (FMS)
Private Sector To Be Determined

Information Service Provider (ISP)
Center City District
Bucks County TMA
Delaware County TMA
Express Traffic
Greater Valley Forge TMA
I-95 Corridor Coalition
Metro Traffic
Philadelphia International Airport
Philadelphia Redevelopment Authority
SmartRoute
Traffic.com
TRANSCOM
Private Sector To Be Determined

Traffic Management Subsystem (TMS)
Burlington County Bridge Commission
Delaware River Port Authority
PennDOT District 6-0 TCC
Philadelphia Streets Department

Transit Management Subsystem (TRMS)
Amtrak
New Jersey Transit Southern Division
PATCO Center Tower
SEPTA Operations Center

Vehicle Subsystem (VS)
Philadelphia Police Vehicles

Terminators:

Emergency System Operator
Philadelphia Police Department Radio Room staff

Emergency Telecommunications System
Philadelphia Police Department Radio Room

Event Promoters
Penns Landing Corporation
Pennsylvania Convention Center Authority
Philadelphia Convention and Tourist Bureau
Sports Complex (Phila. Dept. of Recreation & PIDC)

Map Update Provider
To Be Determined

Media
Newspapers, TV, Radio

Other EM
DRPA Police dispatcher
DRPA Police - Walt Whitman Bridge
DRPA Police - Ben Franklin Bridge
DRPA Police - Betsy Ross Bridge
PATCO Police
Pennsylvania State Police - Belmont Barracks
Pennsylvania State Police - Media Barracks
Pennsylvania State Police - Trevose Barracks
Philadelphia Fire Department
SEPTA Transit Police

Weather Service
National Weather Service

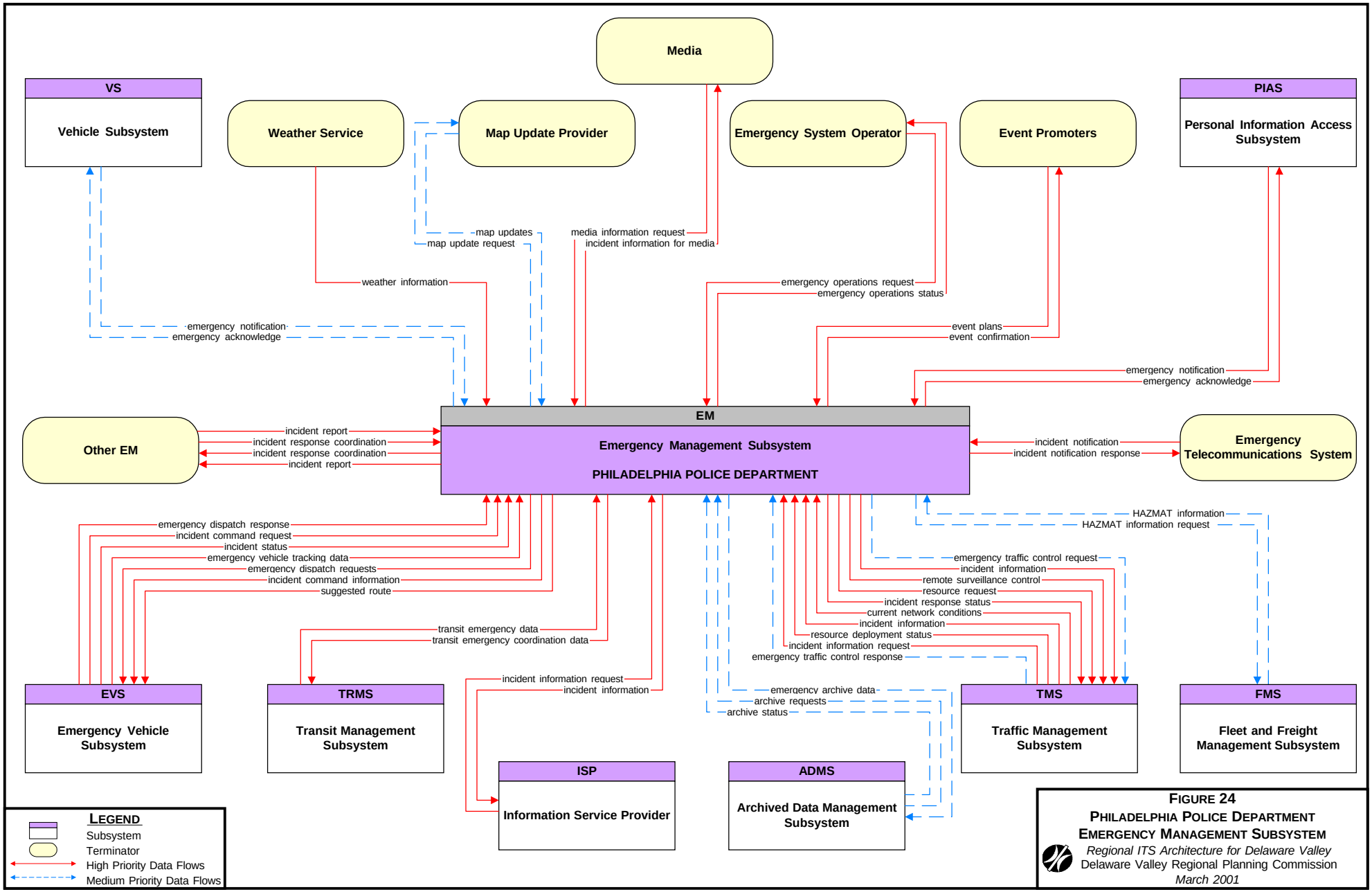


FIGURE 24
PHILADELPHIA POLICE DEPARTMENT
EMERGENCY MANAGEMENT SUBSYSTEM
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

TABLE 17: STAKEHOLDERS FOR SMARTROUTE INFORMATION SERVICE PROVIDER SUBSYSTEM

Subsystems:

Archived Data Management Subsystem (ADMS)
SmartRoute

Emergency Management Subsystems (EM)
Municipal Police Departments
New Jersey State Police
Pennsylvania State Police
Philadelphia Fire Department
Philadelphia Police Department

Fleet and Freight Management Subsystems (FMS)
Private Sector To Be Determined

Parking Management Subsystems (PMS)
Sports Complex (Phila. Parking Authority)

Traffic Management Subsystems (TMS)
Burlington County Bridge Commission
Burlington County Traffic Operations Center
DelDOT Traffic Management Center
DRBA Centralized Operations Center
Delaware River Joint Toll Bridge Commission
Delaware River Port Authority
Municipal traffic Operation centers
New Jersey county traffic operation centers
NJDOT Traffic Operations Center South
NJ Turnpike Authority Operations Center
PennDOT District 6-0 Traffic Control Center
PA Turnpike Commission Communications Center
Philadelphia Streets Department
South Jersey Transportation Authority

Transit Management Subsystems (TRMS)
Amtrak Central Traffic Electrical Control
New Jersey Transit Southern Division
PATCO Center Tower
SEPTA Operations Center

Terminators:

Financial Institution
To Be Determined

ISP Operator
SmartRoute staff

Map Update Provider
To Be Determined

Multimodal Transportation Service Provider
Philadelphia International Airport

Other ISP
I-95 Corridor Coalition
Other SmartRoute Operations
TRANSCOM

Road Reporter
Volunteer motorists who report travel information

Weather Service
AccuWeather

Yellow Pages Service Providers
To Be Determined

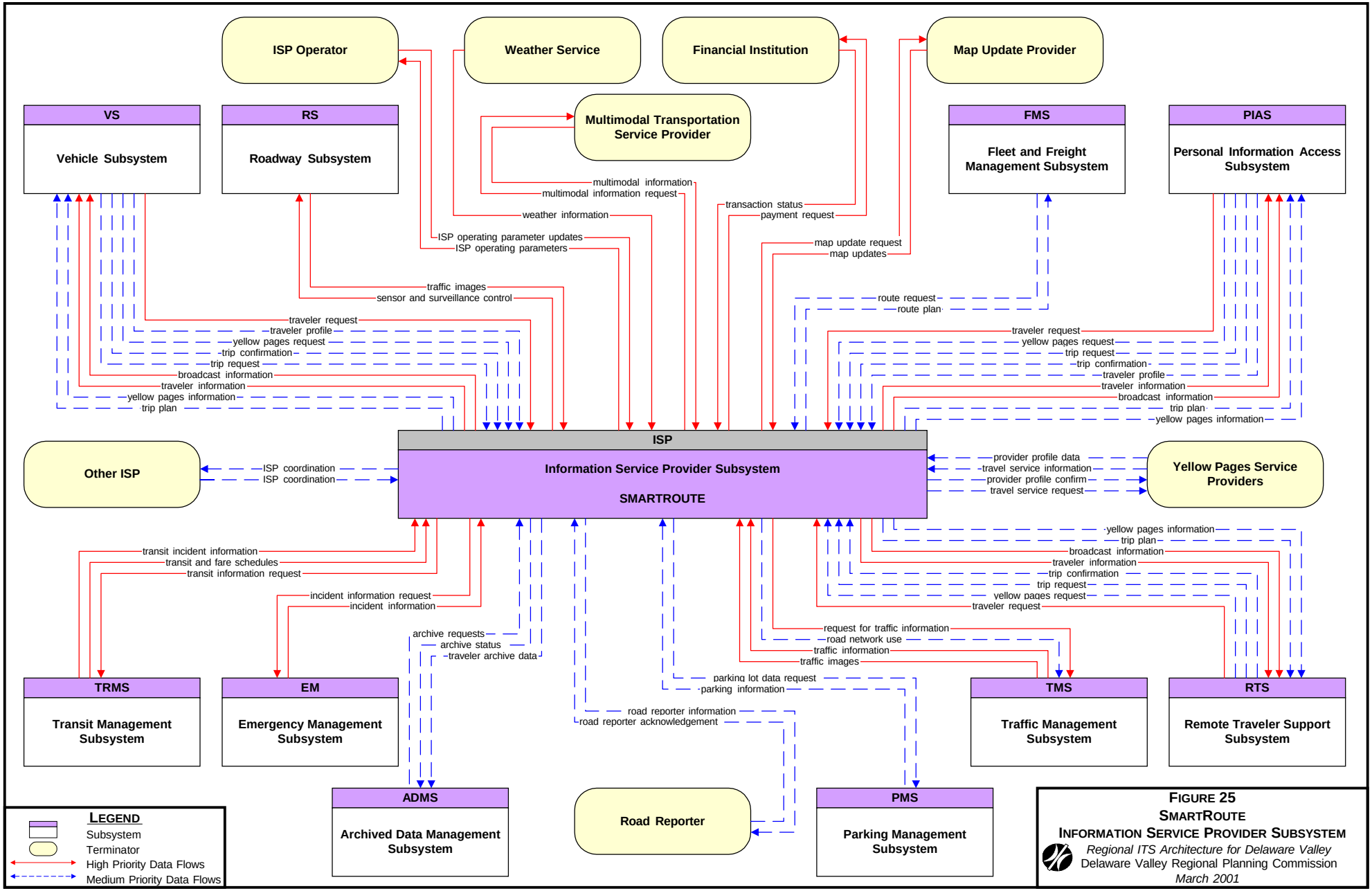


FIGURE 25
SMARTROUTE
INFORMATION SERVICE PROVIDER SUBSYSTEM
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

VII. MARKET PACKAGES

Market packages are composed of sets of subsystems required to work together to deliver a given transportation service, and the major architecture flows between them and other important external systems. In other words, they identify the pieces of the National ITS Architecture required to implement a service. As such, they are directly grounded in the definition of the architecture. Market packages are designed to address specific transportation problems and needs and can be related back to the 31 user services and their more detailed functional requirements.

For example, the functionality of the broad user service named "traffic control" was divided into several market packages to allow for consideration of:

- Basic functions, such as surveillance, which is represented by the "network surveillance" and "probe surveillance" market packages.
- Institutional settings, by separating control functions typically performed by different agencies into the "surface street control" and "freeway control" market packages.
- Functional levels of service, by including a "regional traffic control" market package that provides for coordination of control strategies across jurisdictions.

The National ITS Architecture development effort identified a total of 63 market packages that reflect the current definition of ITS and the evolving technology market. Table 18 contains a complete listing of these, grouped under "bundles" according to their respective major application areas. The specific set of market packages defined by the National ITS Architecture does not represent the only way to combine the functions and equipment in order to provide ITS services. However, on a macro level they represent a guide to implement a given user service that a region or agency may want to implement. As a guide, they are intended be modified to reflect local needs and situations.

An initial screening of the market packages was conducted by correlating the market packages with their corresponding user service priorities. Market packages that were obviously low priority, like those related to advanced vehicle safety systems were eliminated from further consideration. Over the course of several Technical Task Force meeting members were presented with approximately two-thirds of the market packages and reviewed each one in detail to determine which market packages are appropriate for the Delaware Valley. The task force members were asked to rate each

TABLE 18: NATIONAL ARCHITECTURE - MARKET PACKAGES

Traffic Management
- Network Surveillance
- Probe Surveillance
- Surface Street Control
- Freeway Control
- HOV Lane Management
- Traffic Information Dissemination
- Regional Traffic Control
- Incident Management System
- Traffic Forecast and Demand Management
- Electronic Toll Collection
- Emissions Monitoring and Management
- Virtual TMC and Smart Probe Data
- Standard Railroad Grade Crossing
- Advanced Railroad Grade Crossing
- Railroad Operations Coordination
- Parking Facility Management
- Reversible Lane Management
- Road Weather Information System
- Regional Parking Management

Emergency Management
- Emergency Response
- Emergency Routing
- Mayday Support

Traveler Information
- Broadcast Traveler Information
- Interactive Traveler Information
- Autonomous Route Guidance
- Dynamic Route Guidance
- ISP Based Route Guidance
- Integrated Transportation Management & Route Guidance
- Yellow Pages and Reservation
- Dynamic Ridesharing
- In-Vehicle Signing

Public Transportation
- Transit Vehicle Tracking
- Transit Fixed-Route Operations
- Demand Response Transit Operations
- Transit Passenger and Fare Management
- Transit Security
- Transit Maintenance
- Multi-modal Coordination
- Transit Traveler Information

Commercial Vehicle Operations
- Fleet Administration
- Freight Administration
- Electronic Clearance
- CV Administrative Processes
- International Border Electronic Clearance
- Weigh-In-Motion
- Roadside CVO Safety
- On-board CVO Safety
- CVO Fleet Maintenance
- HAZMAT Management

Archived Data Management
- ITS Data Mart
- ITS Data Warehouse
- ITS Virtual Data Warehouse

Advanced Vehicle Safety System
- Vehicle Safety Monitoring
- Driver Safety Monitoring
- Longitudinal Safety Warning
- Lateral Safety Warning
- Intersection Safety Warning
- Pre-Crash Restraint Deployment
- Driver Visibility Improvement
- Advanced Vehicle Longitudinal Control
- Advanced Vehicle Lateral Control
- Intersection Collision Avoidance
- Automated Highway System

market package as either a high or medium priority in terms of its ability to meet the needs of the region. The following list presents those Market Packages chosen as high and medium priority for the Regional ITS Architecture.

Traffic Management

High Priority:

- Network Surveillance
- Probe Surveillance
- Surface Street Control
- Freeway Control
- Traffic Information Dissemination
- Regional Traffic Control
- Incident Management System
- Electronic Toll Collection
- Standard Railroad Grade Crossing
- Road Weather Information System

Medium Priority:

- Traffic Forecast and Demand Management
- Virtual Traffic Management Center and Smart Probe Data
- Railroad Operations Coordination

Traveler Information

High Priority:

- Broadcast Traveler Information
- Interactive Traveler Information
- Dynamic Route Guidance

Medium Priority:

- Autonomous Route Guidance
- Information Service Provider-Based Route Guidance
- Integrated Transportation Management and Route Guidance
- Yellow Pages and Reservation
- Dynamic Ridesharing
- In-Vehicle Signing

Emergency Management

High Priority:

- Emergency Response
- Emergency Routing
- Mayday Support

Medium Priority

- None

Public Transportation Management

High Priority:

- Transit Vehicle Tracking
- Transit Fixed-Route Operations
- Transit Passenger and Fare Management
- Transit Security
- Transit Maintenance
- Transit Traveler Information

Medium Priority:

- Demand Response Transit Operations
- Multi-Modal Coordination

Commercial Vehicles

High Priority:

- Freight Administration
- Electronic Clearance
- Commercial Vehicle Administrative Processes
- Weigh-In-Motion
- Roadside Commercial Vehicle Operations Safety
- HAZMAT Management

Medium Priority:

- Fleet Administration
- On-board Commercial Vehicle Operations Safety
- Commercial Vehicle Operations Fleet Maintenance

Archived Data Management

High Priority:

- None

Medium Priority:

- ITS Archived Data Management
- ITS Data Warehouse
- ITS Virtual Data Warehouse

The following section reviews each of the high and medium priority market packages describing its purpose and function, the market packages required to be in place prior to its implementation, what market packages it shares information with, the user service(s) it implements, and its priority as established by the ITS Technical Task Force. Its theory of operation, a narrative of how the market package functions, is also presented. Accompanying the description is a graphic diagrammatically showing the architecture flows between subsystems. For simplicity, only the most significant subsystems and architecture flows are displayed. Numbering on the diagram corresponds to the theory of operation. The actual order of information exchange may not necessarily correspond to that presented in the theory of operation, which because of space

limitations, has been greatly simplified. The market packages are arranged by service bundle, for example traffic management or emergency management, and then by priority within that bundle (high priority market packages before medium priority market packages).

Network Surveillance

Market Package Priority: High

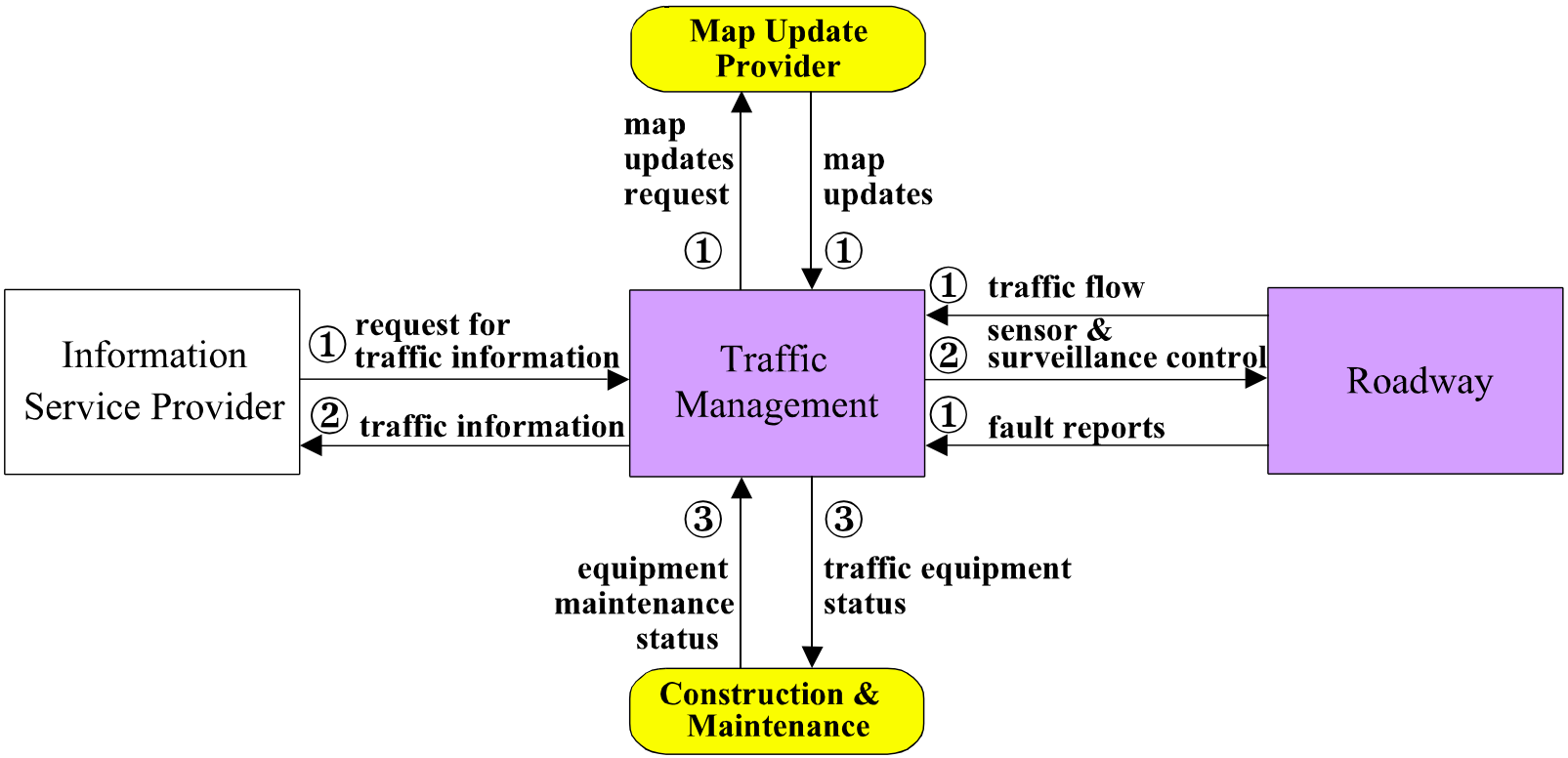
Purpose and Function:
This market package is an essential component to monitor traffic and road conditions and identify incidents. It includes detectors, environmental sensors, and other surveillance equipment, and can also be used as input for traffic signal controls. Data can be made available to users and Information Service Providers.

Required Capabilities:
None.

Data Sharing:
Surface Street Control, Freeway Control, Broadcast Traveler Information, Traffic Forecast and Demand

Operations:
1. The Roadway Subsystem sends traffic images, traffic information and fault reports to the Traffic Management Subsystem. The Information Service Provider requests information on traffic and roadway usage either as a subscription service or as a one time request. The Map Update Provider continually receives map update requests, and issues map updates.
2. The Traffic Management Subsystem analyzes the traffic flow data received from the Roadway Subsystem and based upon that analysis sends sensor and surveillance control instructions to the Roadway Subsystem. The Traffic Management Subsystem sends current traffic information, road/weather conditions and incident information to the Information Service Provider.
3. Equipment fault reports received from the Roadway Subsystem are sent to construction and maintenance personnel for repair.

User Service Requirements Implemented:
Traffic Control



LEGEND

- Primary Subsystem
- Secondary Subsystem
- Terminator
- Architecture Flow
- ⑧ Architecture Flow Sequence

FIGURE 26
NETWORK SURVEILLANCE MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Probe Surveillance

Market Package Priority: High

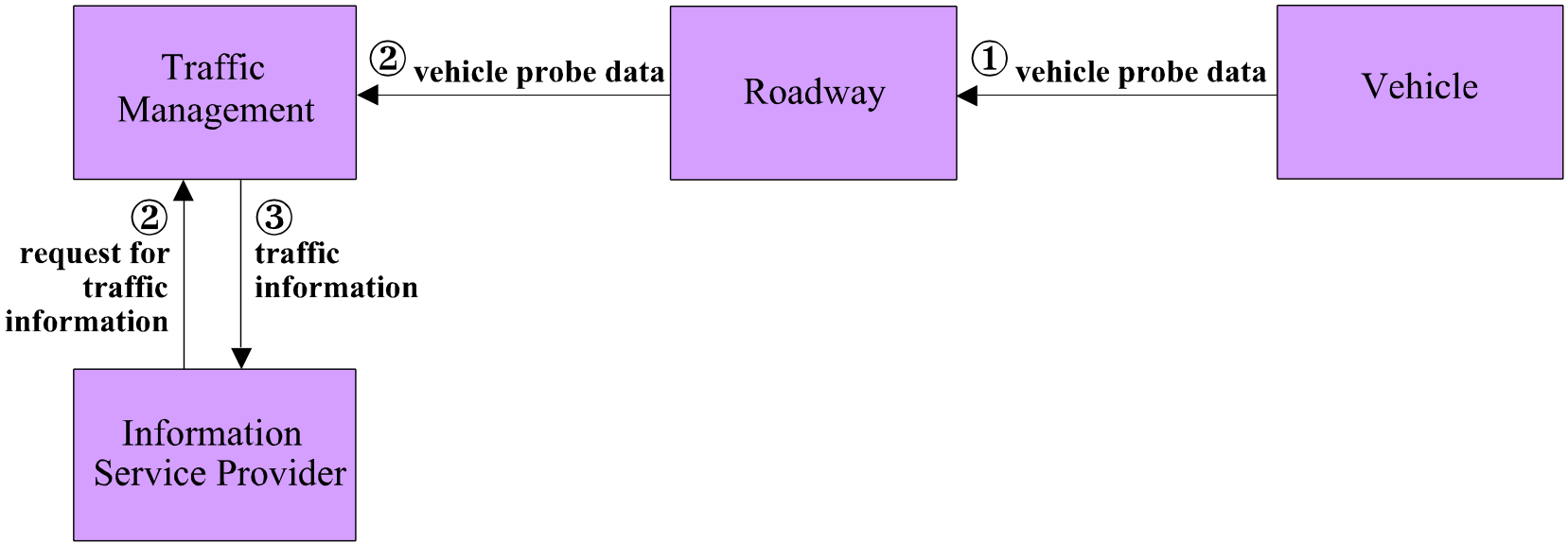
Purpose and Function:
This market package serves as an alternate to Roadway Network Surveillance. It utilizes transponders, such as E-ZPass, to act as probes.

Required Capabilities:
None.

Data Sharing:
Freeway Control, Surface Street Control

Operations:
1. The Vehicle Subsystem sends probe data to a roadside device.
2. The Roadway Subsystem sends probe data, including identity, route segment identity, link time and location, to the Traffic Management Subsystem where it is analyzed. The Information Service Provider requests information on traffic and roadway conditions either as a subscription service or as a one time request.
3. The Traffic Management Subsystem, in response to the Information Service Provider request, sends traffic information to the Information Service Provider.

User Service Requirements Implemented:
Traffic Control



LEGEND

- Primary Subsystem
- Secondary Subsystem
- Terminator
- Architecture Flow
- ⑧ Architecture Flow Sequence

FIGURE 27
PROBE SURVEILLANCE MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Surface Street Control

Market Package Priority: High

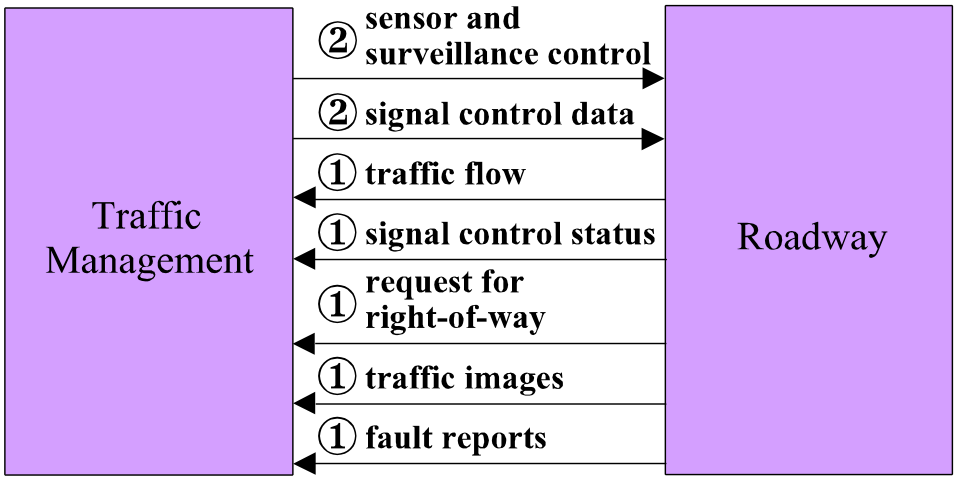
Purpose and Function:
This market package provides central control and monitoring functions and implements advanced traffic signal operations. A wide range of traffic signal control systems, consistent with typical urban traffic signal control systems, is represented by this market package. It is also enables coordination of traffic signals across jurisdictional boundaries.

Required Capabilities:
Network Surveillance

Data Sharing:
Regional Traffic Control, Traffic Information Dissemination, Standard Railroad Grade Crossing

Operations:
1. The Roadway Subsystem sends the Traffic Management Subsystem traffic flow data (traffic detector information), fault reports, traffic images, signal control status, and requests for right-of-way from transit and/or emergency vehicles.
2. The Traffic Management Subsystem analyzes the information and sends the Roadway Subsystem signal control data (information used to configure and control traffic signal control systems), and sensor and surveillance control information that can be used to configure and control sensor and surveillance systems at the roadside.

User Service Requirements Implemented:
Traffic Control, Incident Management



LEGEND

- Primary Subsystem
- Secondary Subsystem
- Terminator
- Architecture Flow
- ⑧ Architecture Flow Sequence

FIGURE 28
SURFACE STREET CONTROL
MARKET PACKAGE

Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Freeway Control

Market Package Priority: High

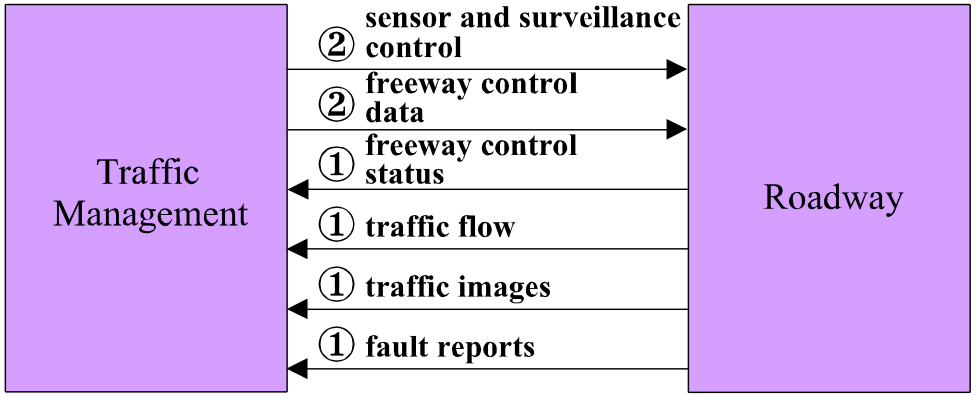
Purpose and Function:
This market package supports freeway monitoring and adaptive strategies. It provides equipment for ramp, lane and interchange control, and is consistent with typical urban traffic freeway control systems.

Required Capabilities:
Network Surveillance

Data Sharing:
Regional Traffic Control, Traffic Information Dissemination

Operations:
1. The Roadway Subsystem sends the Traffic Management Subsystem traffic images, fault reports, traffic flow data, and freeway control status (operating parameters for ramp meters, variable message signs, and mainline lane controls).
2. The Traffic Management Subsystem analyzes the information and sends the Roadway Subsystem freeway control data (control commands and operating parameters for ramp meters, variable message signs, mainline lane controls), and sensor and surveillance control data (information used to configure and control sensor and surveillance systems at the roadside).

User Service Requirements Implemented:
Traffic Control, Incident Management, Travel Demand Management



LEGEND

- Primary Subsystem
- Secondary Subsystem
- Terminator
- Architecture Flow
- ⑧ Architecture Flow Sequence

FIGURE 29
FREEWAY CONTROL
MARKET PACKAGE

Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Traffic Information Dissemination

Market Package Priority: High

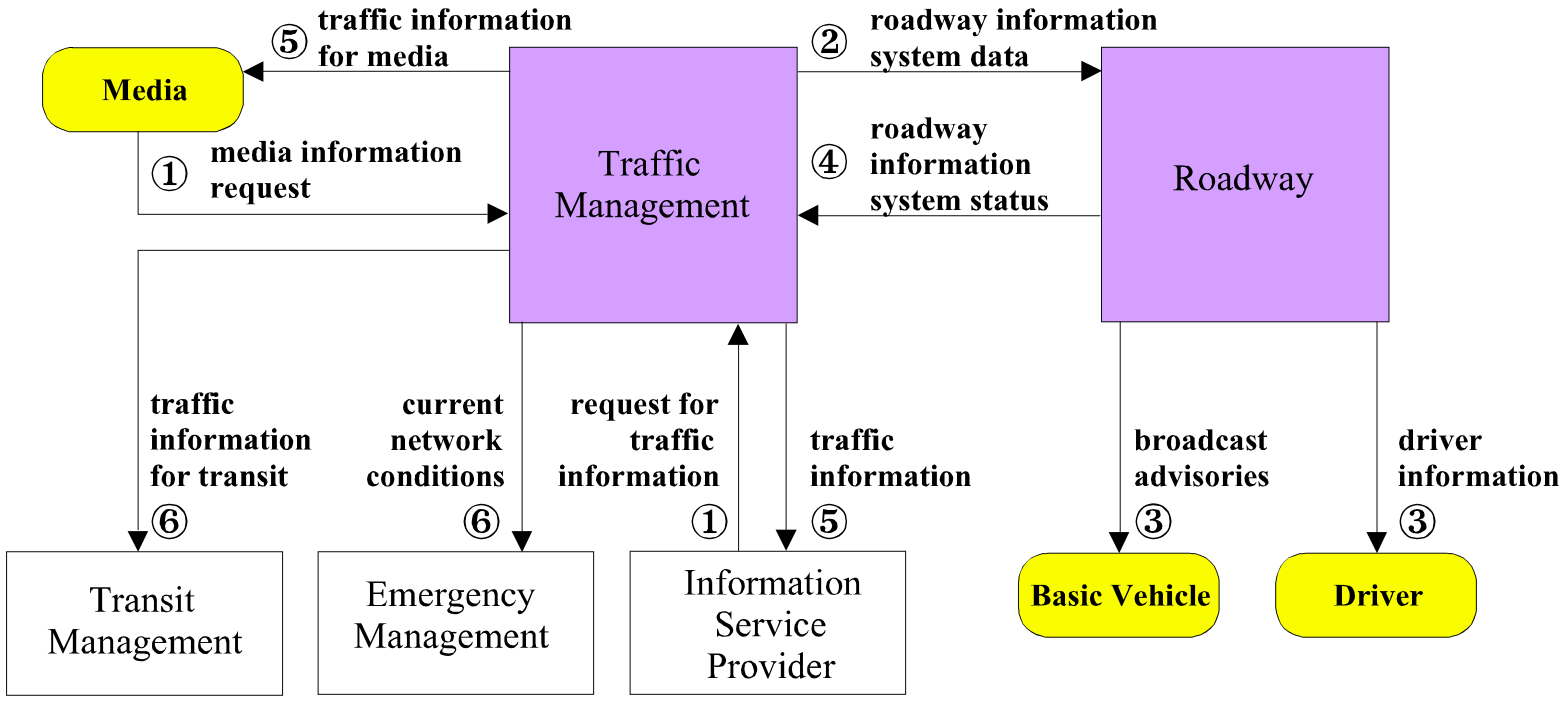
Purpose and Function:
This market package allows traffic information to be disseminated to drivers and vehicles. It is a tool that can be used to notify drivers of incidents using equipment such as VMS or HAR devices. Careful placement of equipment at decision points can encourage drivers to divert to alternate routes. It also includes interfaces from the Traffic Management Subsystem to the media and the Transit Management, Emergency Management, and Information Service Provider Subsystems.

Required Capabilities:
Freeway Control, Surface Street Control

Data Sharing:
Incident Management System, Standard Railroad Grade Crossing

Operations:
1. Media and Information Service Providers request information from the Traffic Management Subsystem either as a subscription service or on an as-needed basis.
2. Based on surveillance information taken of the roadway, the Traffic Management Subsystem determines if an unusual condition exists. If an unusual condition does exist, it notifies the Roadway Subsystem to issue information to the motorists via VMS and/or HAR devices.
3. Messages issued by the Roadway Subsystem are broadcast over wide-area wireless communications directly to the vehicle's radio while the driver is en-route.
4. The Roadway Subsystem confirms the operating status of the variable message signs and highway advisory radio.
5. The Traffic Management Subsystem disseminates current and/or predicted traffic information to the media and Information Service Providers.
6. The Traffic Management Subsystem also notifies the appropriate Transit Management and Emergency Management Subsystems about current network conditions, including traffic and incident information.

User Service Requirements Implemented:
Traffic Control, Incident Management, Highway-Rail Intersection



LEGEND

- Primary Subsystem
- Secondary Subsystem
- Terminator
- Architecture Flow
- ⑧ Architecture Flow Sequence

FIGURE 30
TRAFFIC INFORMATION DISSEMINATION MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Regional Traffic Control

Market Package Priority: High

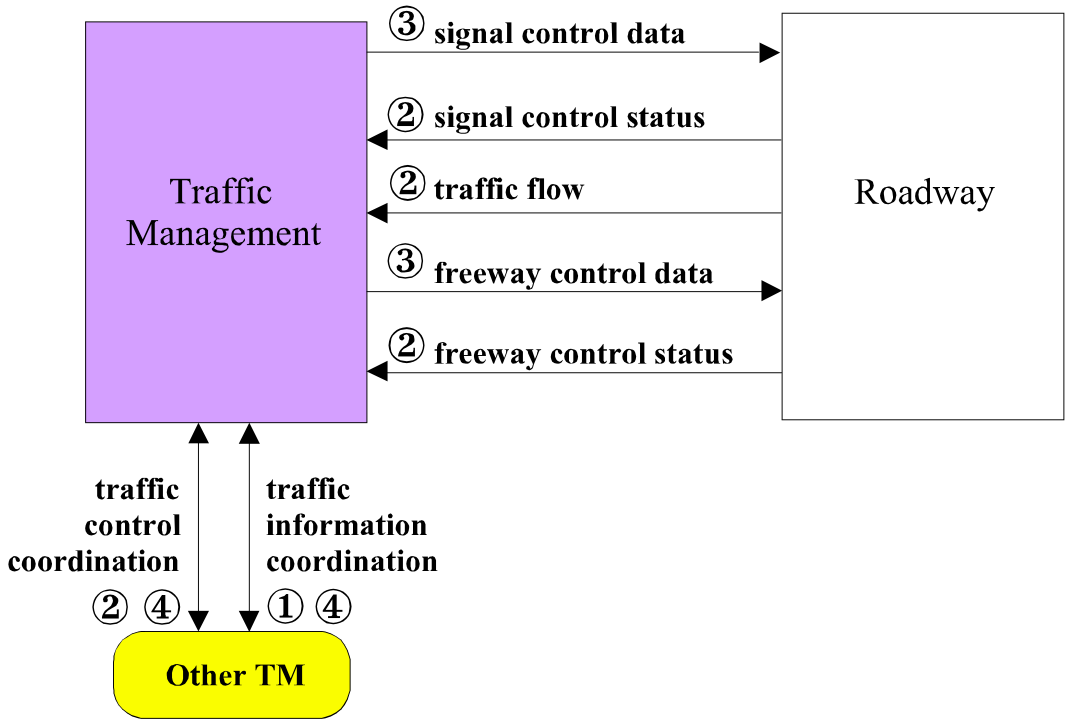
Purpose and Function:
This market package integrates inter-jurisdictional surface street control and freeway control, thus supporting a regional traffic control strategy. It provides for sharing information and control among traffic centers. Several levels of interagency coordination are supported.

Required Capabilities:
Surface Street Control, Freeway Control

Data Sharing:
Incident Management System, Multi-Modal Coordination

Operations:
1. The Traffic Management Subsystem solicits traffic information (incidents, congestion data, real-time traffic signal control information) from Other Traffic Management Subsystems that are either inter-regional or across different jurisdictional areas.
2. The Other Traffic Management Subsystems respond with traffic control coordination information. The Traffic Management Subsystem also continuously monitors traffic flow, signal control status, and freeway control status information received from the Roadway Subsystem.
3. Based upon information received from Other Management Subsystems and from the Roadway Subsystem, the Traffic Management Subsystem can reconfigure roadway operations through signal control data (information used to configure and control traffic signal systems) and freeway control data (commands and operating parameters for ramp meters, variable message signs, mainline metering/lane controls and other systems associated with freeway operations).
4. If the Traffic Management Subsystem determines than an incident has occurred, based on information from the Roadway Subsystem, it will notify the Other Traffic Management Subsystems and request traffic control coordination.

User Service Requirements Implemented:
Traffic Control



LEGEND

- Primary Subsystem
- Secondary Subsystem
- Terminator
- Architecture Flow
- ⑧ Architecture Flow Sequence

FIGURE 31
REGIONAL TRAFFIC CONTROL MARKET PACKAGE

Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Incident Management System

Market Package Priority: High

Purpose and Function:
This market package manages both predicted and unexpected incidents. Information is collected to detect and verify incidents and implement an appropriate response. Responses include traffic control and gathering data for information dissemination. This package supports coordination with Emergency Management Subsystems and field personnel.

Required Capabilities:
Surface Street Control, Freeway Control

Data Sharing:
Traffic Information Dissemination, Regional Traffic Control, Emergency Response

Operations:
1. Traffic Management Subsystem (TMS) receives real-time traffic images, and information from event promoters, the media, weather services and Other Traffic Management Subsystems. If the TMS is the first entity to identify an incident, information is sent to the Emergency Management Subsystem (EM). If the EM is notified about an incident through a 911 call or from Other EMs, it notifies the TMS. EMs will continually exchange incident reports, which may include incident location, type, or severity, and exchange incident response coordination (incident procedures, resource coordination, and incident status). If an ISP identifies an incident from its own monitoring resources, it notifies the EM.
2. TMS requests and receives additional video images and other surveillance information from the Roadway Subsystem (RS).
3. The EM receives status information from Emergency Vehicles, the information is forwarded to the TMS. The TMS can request additional incident information from the EM.
4. TMS sends the RS roadway system information data to configure/control roadside systems that provide driver information. The EM sends command information to Emergency Vehicles. Coordination between the TMS and construction and maintenance crews is transmitted with regards to construction and maintenance closure times and durations. The TMS also issues a maintenance resource request, a request for road maintenance resources that can be used in the diversion of traffic, clearance of an incident, and repair of ancillary damage, to construction and maintenance crews.
5. TMS sends traffic information to ISP and Other TMSs. Construction and maintenance personnel respond to the TMS request with a maintenance resource response (current status of maintenance resources including availability and deployment status) and work zone status (status of maintenance work zone). EM responds to an ISP request with the latest incident information.

User Service Requirements Implemented:
Traffic Control, Incident Management

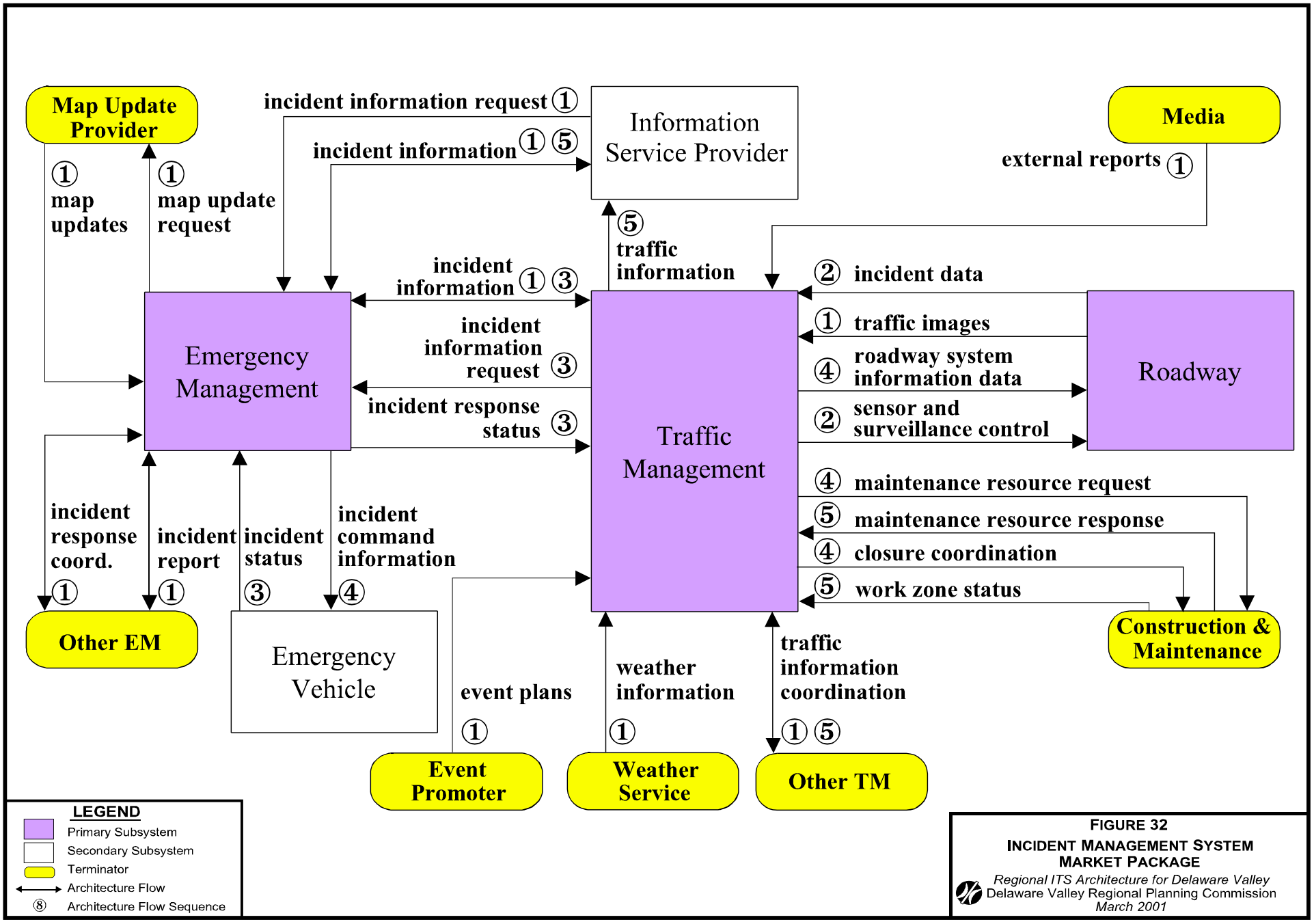


FIGURE 32
INCIDENT MANAGEMENT SYSTEM MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Electronic Toll Collection

Market Package Priority: High

Purpose and Function:
This market package enables toll operators to collect tolls electronically and to detect and process violators. Vehicle tags of toll violators are electronically read and posted to vehicle owners. It also facilitates standards, inter-agency coordination, and financial clearinghouse capabilities. Data is collected as a natural by-product of the toll collection process or by separate readers that are dedicated to probe data collection. The processes described in this market package do not fully reflect how E-ZPass currently operates in the Philadelphia area.

Required Capabilities:
None.

Data Sharing:
Interactive Traveler Information

Operations:
1. The Toll Administration Subsystem (TAS) issues toll instructions messages to the Toll Collection Subsystem (TCS), which identifies toll rates as well as the serial numbers of lost, stolen, and defective toll tags. Lists of pre-authorized charge, credit, and debit cards may also be issued.
2. When a vehicle enters a toll plaza, the TCS requests tag information including credit identity and stored value card balance from the Vehicle Subsystem.
3. Financial institution and account information is transferred between a payment instrument and the Vehicle Subsystem.
4. Tag data is sent from the Vehicle Subsystem to the TCS identifying the toll tag serial number and remaining value (positive balance).
5. Confirmations are issued to the driver indicating that the tag and the stored value on the card is valid.
6. A toll transaction message is sent to the TAS, it includes toll violation data.
7. Requests for payment are issued to the Financial Institution.
8. The Financial Institution secures funds and confirms the transaction.
9. The TAS may request license information from the DMV if violations have occurred.
10. The DMV sends the specific vehicle registration information requested.
11. Toll violation notification messages are sent to the appropriate enforcement agency.
12. The Toll Operator supervises toll plaza operations. TMS can request toll demand management actions, including congestion pricing and changing the number of lanes in operation.
13. Advanced payment of tolls can be requested and confirmed by an ISP who is responsible for selling payment instruments (toll tags) to the public.

User Service Requirements Implemented:
Electronic Payment Services, Travel Demand Management

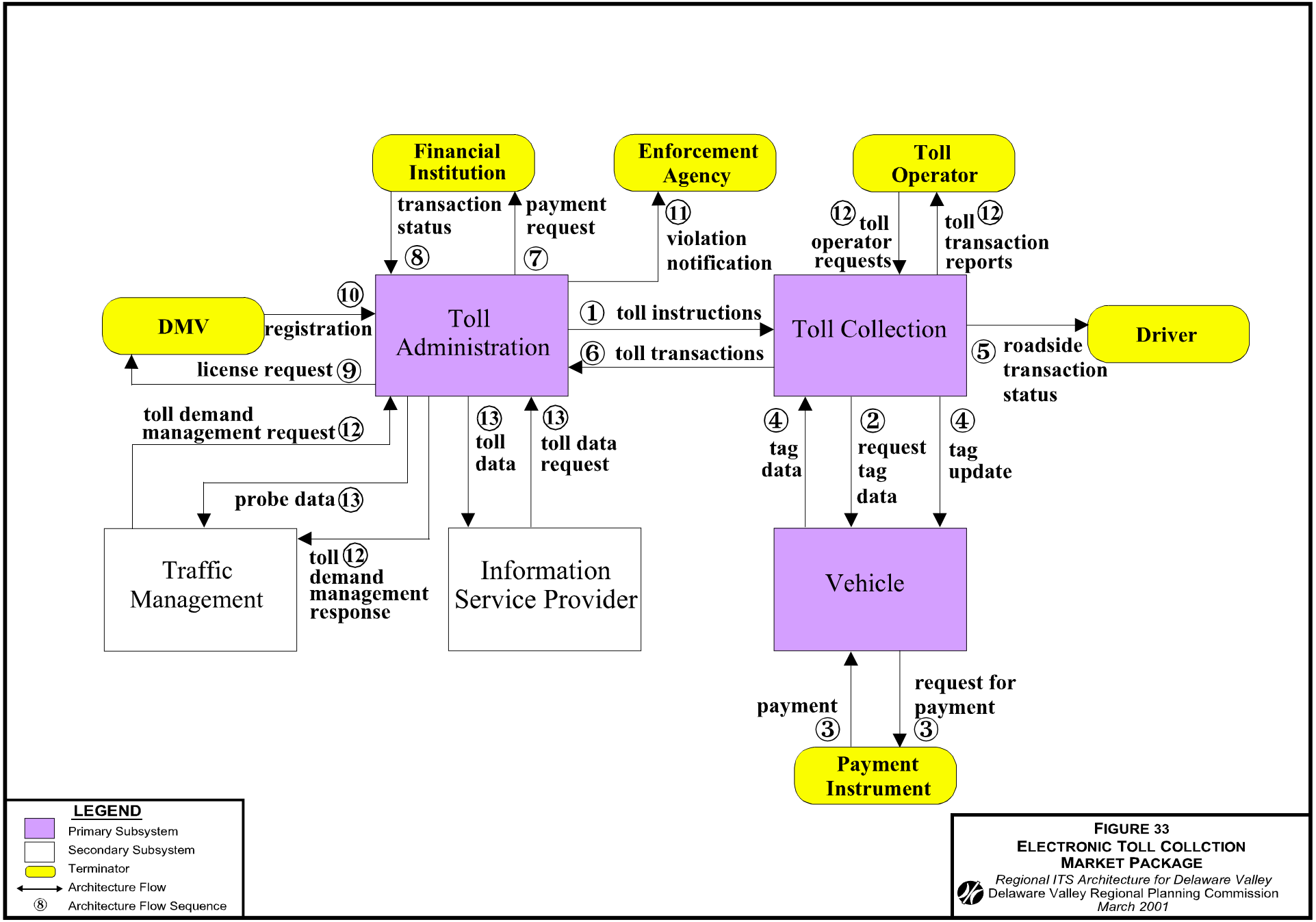


FIGURE 33
ELECTRONIC TOLL COLLCTION MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Standard Railroad Grade Crossing

Market Package Priority: High

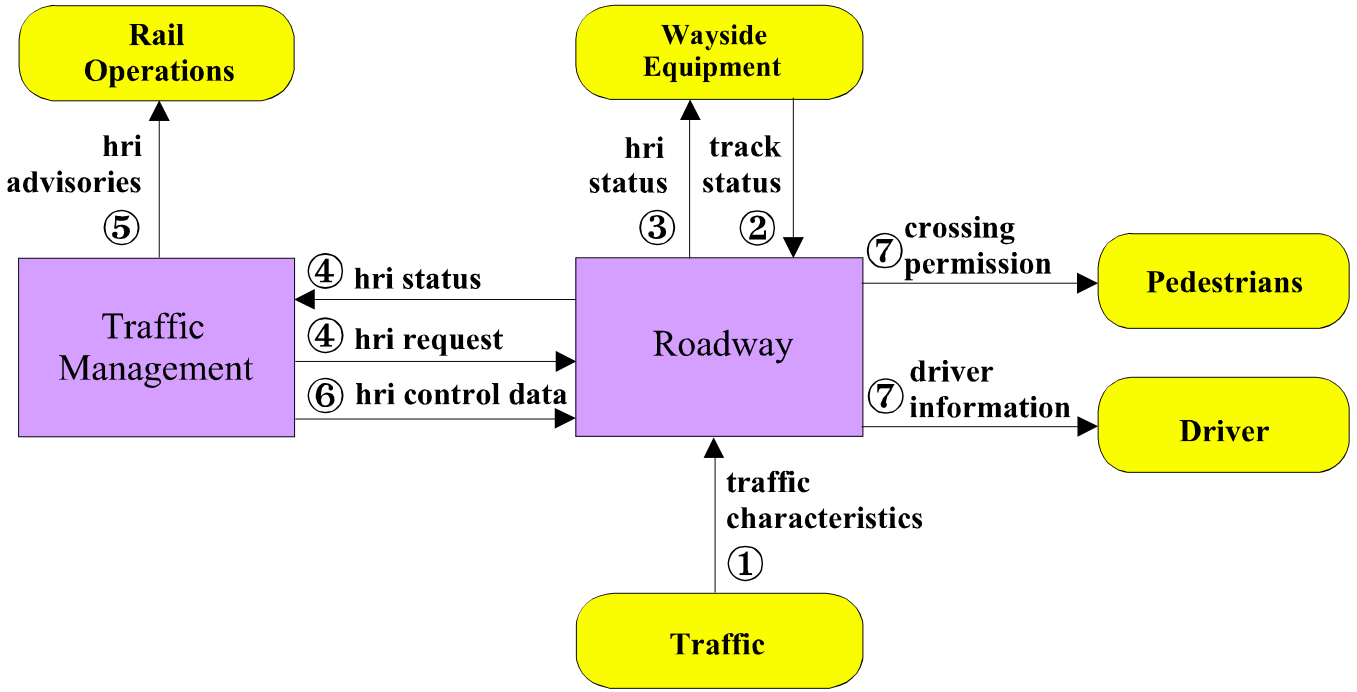
Purpose and Function:
This market package manages traffic at low speed highway-rail intersections. Both passive and active warning systems, such as crossbuck signs and flashing gates, are supported. Traditional warning systems are augmented with traffic management devices through interconnections with adjacent signalized intersections.

Required Capabilities:
Surface Street Control

Data Sharing:
Railroad Operations Coordination, Advanced Railroad Grade Crossing, Traffic Information Dissemination

Operations:
1. Traffic characteristics, including occupancy, volume, and average speed, are collected by the Roadway Subsystem.
2. Wayside Equipment (train interface maintained and operated by a railroad and located at grade crossing, it functions as a resource for information about approaching trains) notifies the Roadway Subsystem of the arrival of a train.
3. The Roadway Subsystem notifies the Wayside Equipment about the status of current mode of operation and equipment condition.
4. The Traffic Management Subsystem requests and receives information from the Roadway Subsystem about the status of current mode of operation and equipment condition.
5. The Traffic Management informs the Rail Operations Terminator about any conditions requiring attention (i.e., system failures).
6. The Traffic Management Subsystem sends highway-rail intersection control information to the Roadway Subsystem.
7. The Roadway Subsystem provides advisories for pedestrians and vehicles (VMS, signal preemptions, lane control signs).

User Service Requirements Implemented:
Highway-Rail Intersection



LEGEND

- Primary Subsystem
- Secondary Subsystem
- Terminator
- Architecture Flow
- ⑧ Architecture Flow Sequence

FIGURE 34
STANDARD RAILROAD GRADE CORSSING MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Road Weather Information System

Market Package Priority: High

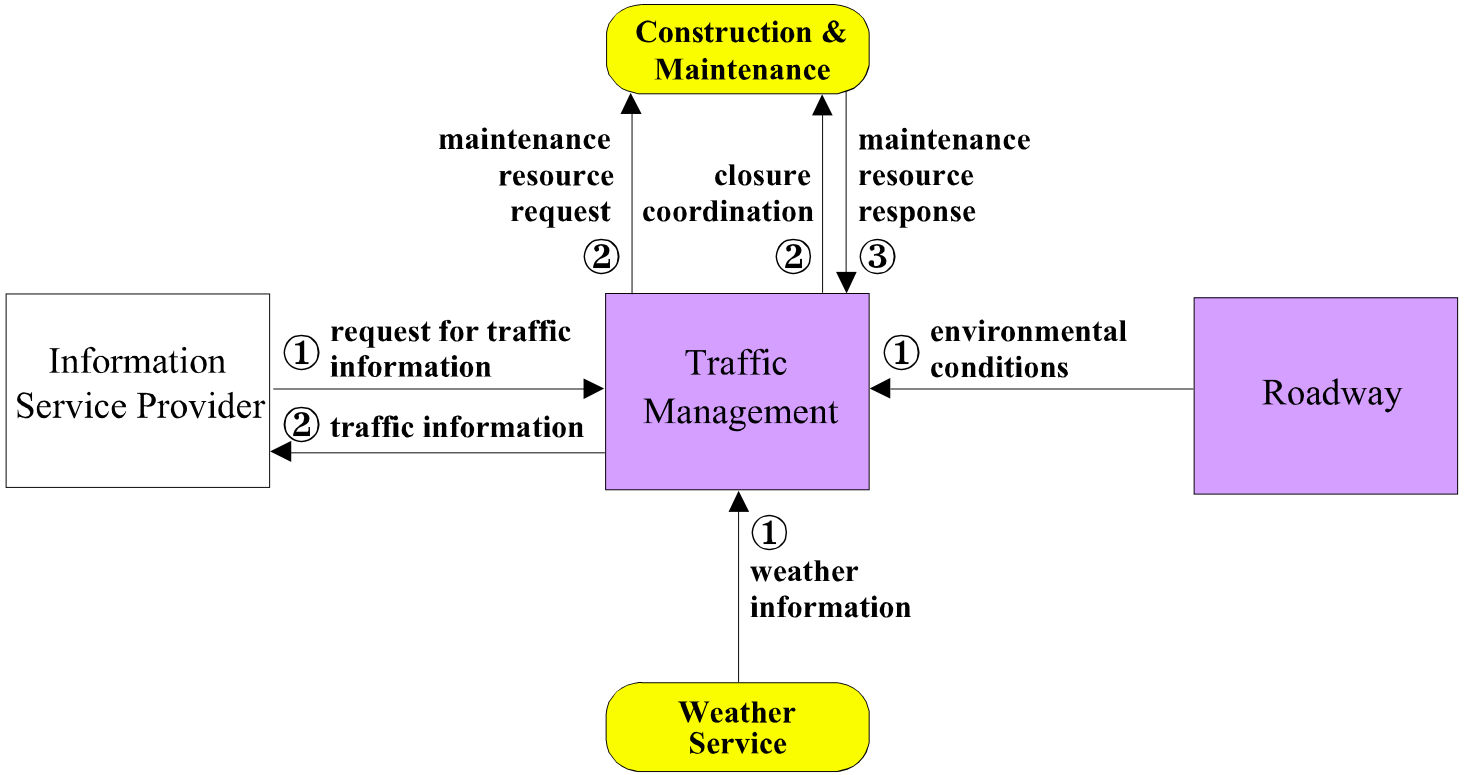
Purpose and Function:
This market package monitors current and forecasted road and weather conditions. General traveler advisories are issued, and location specific warnings are supported. With more detailed knowledge of road and weather conditions, road maintenance resources can be more effectively deployed.

Required Capabilities:
None

Data Sharing:
Traffic Information Dissemination

Operations:
1. The Roadway Subsystem sends the Traffic Management Subsystem environmental data, including wind, temperature, humidity, precipitation, visibility, and pavement sensor information. A weather service sends the Traffic Management Subsystem weather information. Information Service Providers request traffic information.
2. The Traffic Management Subsystem identifies any weather-related problems and requests cooperation from maintenance and/or construction personnel in the form of a maintenance resource request or closure coordination. The Traffic Management Subsystem sends traffic information and weather condition/roadway information to Information Service Providers.
3. Maintenance and/or construction personnel send a maintenance resource response back to the Traffic Management Subsystem.

User Service Requirements Implemented:
Traffic Control



LEGEND

- Primary Subsystem
- Secondary Subsystem
- Terminator
- Architecture Flow
- ⑧ Architecture Flow Sequence

FIGURE 35
ROAD WEATHER INFORMATION SYSTEM MARKET PACKAGE

Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Traffic Forecast and Demand Management

Market Package Priority: Medium

Purpose and Function:
Short term prediction of travel demand patterns by advanced algorithms can be achieved with this market package. Data is provided which supports the implementation of travel demand management programs and policies. Longer range forecasts that can be used in transportation planning are also possible. Historical evaluation and storage of real-time information is supported.

Required Capabilities:
Freeway Control, Surface Street Control

Data Sharing:
Regional Traffic Control, Incident Management System

Operations:
1. Based on information from the Roadway Subsystem, Other Traffic Management Subsystems, event promoters, and Parking Management Subsystems, the Traffic Management Subsystem can predict future conditions and determine if there is a need to take actions to modify travel conditions.
2. The Traffic Management Subsystem requests the Transit Management Subsystem to implement transit management strategies, including providing additional transit services. The Traffic Management Subsystem notifies Other Traffic Management Subsystems about projected conditions and requests coordination. Parking instructions are issued to Parking Management Subsystems to change operational strategies.
3. The Transit Management Subsystem responds to the Traffic Management Subsystem request by indication level of compliance. Traffic information, road and weather conditions, incident information, and parking information is sent to Information Service Providers.
4. The Traffic Management Subsystem monitors roadway conditions to determine validity of traffic predictions and the effectiveness of traffic demand management strategies.

User Service Requirements:
Traffic Control, Archived Data Function, Travel Demand Management

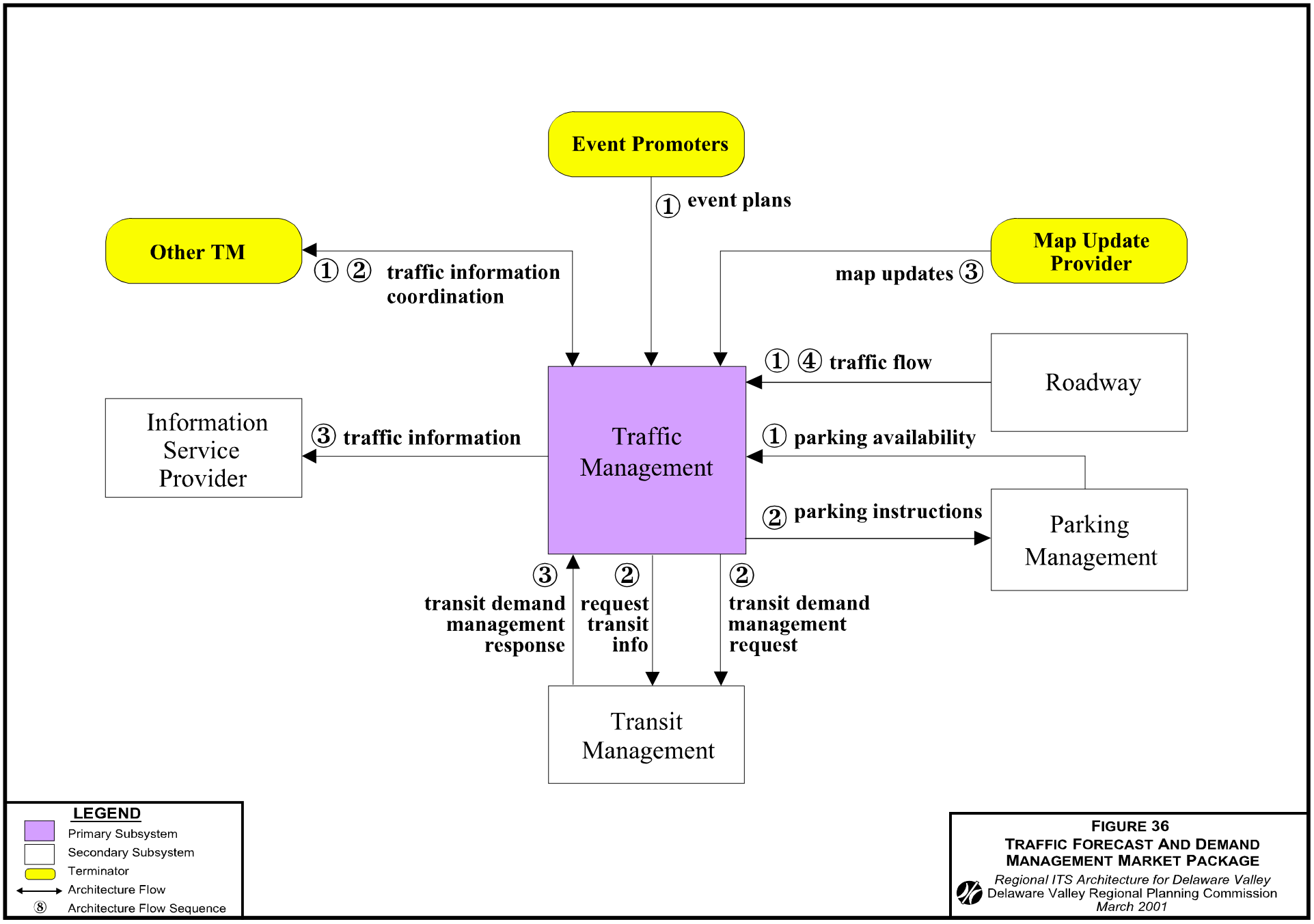


FIGURE 36
TRAFFIC FORECAST AND DEMAND MANAGEMENT MARKET PACKAGE

Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Virtual Traffic Management Center and Smart Probe Data

Market Package Priority: Medium

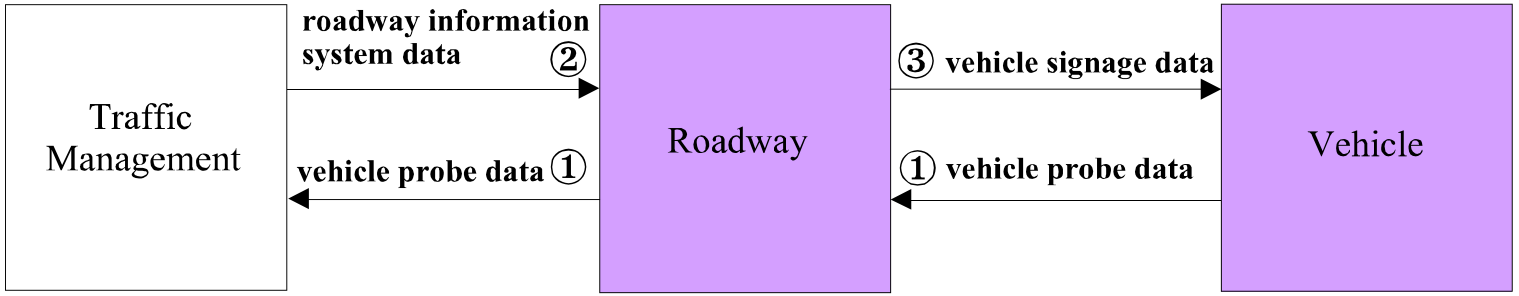
Purpose and Function:
This market package provides for special requirements of rural road systems: instead of a centralized traffic management center, traffic management is distributed over a very wide area (e.g., a whole state or collection of states). Each locality has the capability of accessing available information for assessment of road conditions. Vehicles are used as smart probes, capable of measuring road conditions and providing this information to the Roadway Subsystem for relay to the Traffic Management Subsystem. In-vehicle signing is used to inform drivers of detected road conditions.

Required capabilities:
Probe Surveillance

Data sharing:
None.

Operations:
1. Vehicle probe data indicating identity, route segment identity, link time and location is gathered and forwarded to the Traffic Management Subsystem via the Roadway Subsystem.
2. The Traffic Management Subsystem sends the Roadway Subsystem data, which includes information used to initialize, configure, and control devices that provides drivers with information from variable message signs, highway advisory radio, and beacon systems.
3. In-vehicle signage data generated by the Roadway Subsystem indicates road conditions and special information which will be useful for a vehicle passing a specific point on the roadway.

User Service Requirements Implemented:
En-Route Driver Information, Traffic Control, Incident Management



LEGEND

- Primary Subsystem
- Secondary Subsystem
- Terminator
- Architecture Flow
- ⑧ Architecture Flow Sequence

FIGURE 37
VIRTUAL TRAFFIC MANAGEMENT CENTER AND SMART PROBE DATA MARKET PACKAGE

Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Railroad Operations Coordination

Market Package Priority: Medium

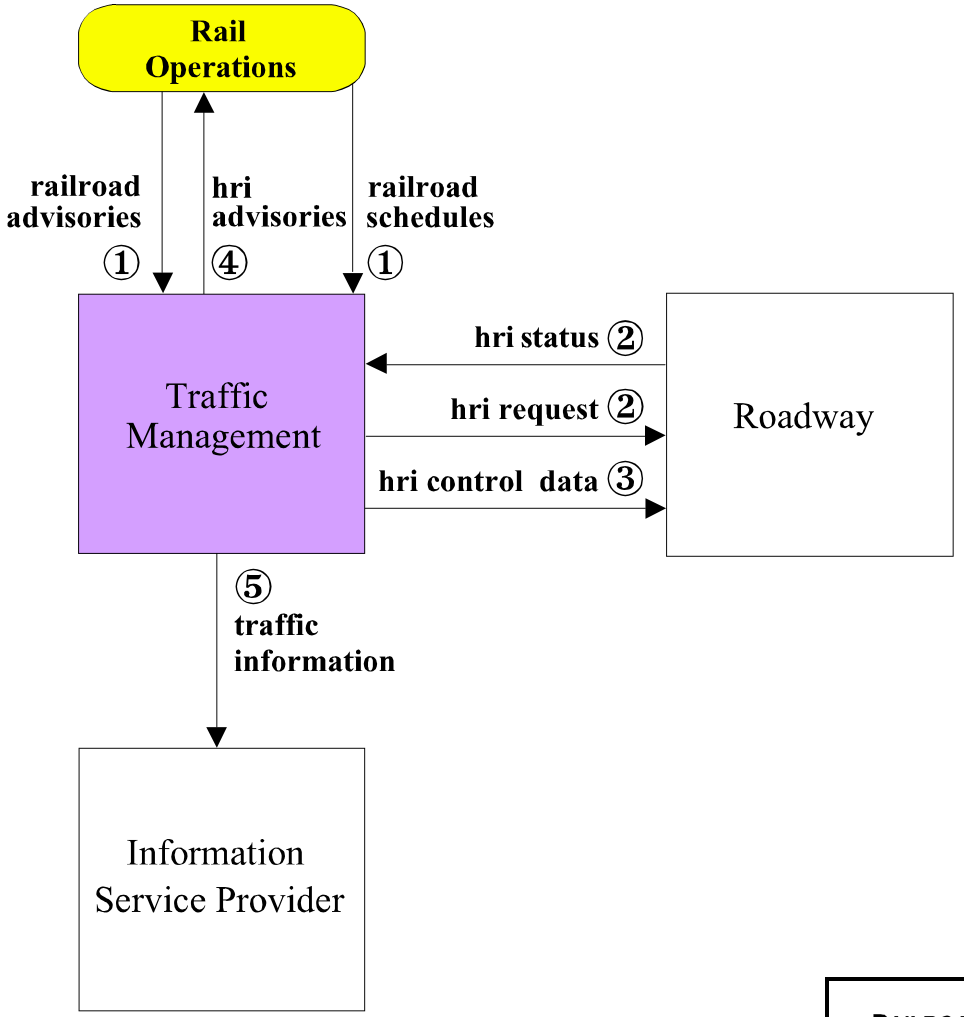
Purpose and Function:
With this market package, additional levels of strategic coordination with rail operations can be achieved. Information from train schedules will predict highway-rail intersection closures. The capability will be available to inform motorists of time and duration of closures.

Required Capabilities:
Standard Railroad Grade Crossing

Data Sharing:
Information Service Providers

Operations:
1. The Traffic Management Subsystem receives railroad schedules and advisories from Rail Operations.
2. The Traffic Management Subsystem requests and receives highway-rail intersection status information (traffic condition, equipment status and condition) from the Roadway Subsystem.
3. The Traffic Management Subsystem sends the Roadway Subsystem highway-rail intersection control data (operation instructions designed to implement a specific control plan) .
4. The Traffic Management Subsystem informs Rail Operations about the conditions at the rail crossing (blockages at nearby intersections, equipment failures, maintenance activities).
5. The Traffic Management Subsystem sends Information Service Providers the status of railroad closings, including locations, times, and durations.

User Service Requirements Implemented:
Highway Rail Intersection



LEGEND

- Primary Subsystem
- Secondary Subsystem
- Terminator
- Architecture Flow
- ⑧ Architecture Flow Sequence

FIGURE 38
RAILROAD OPERATIONS COORDINATION MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Emergency Response

Market Package Priority: High

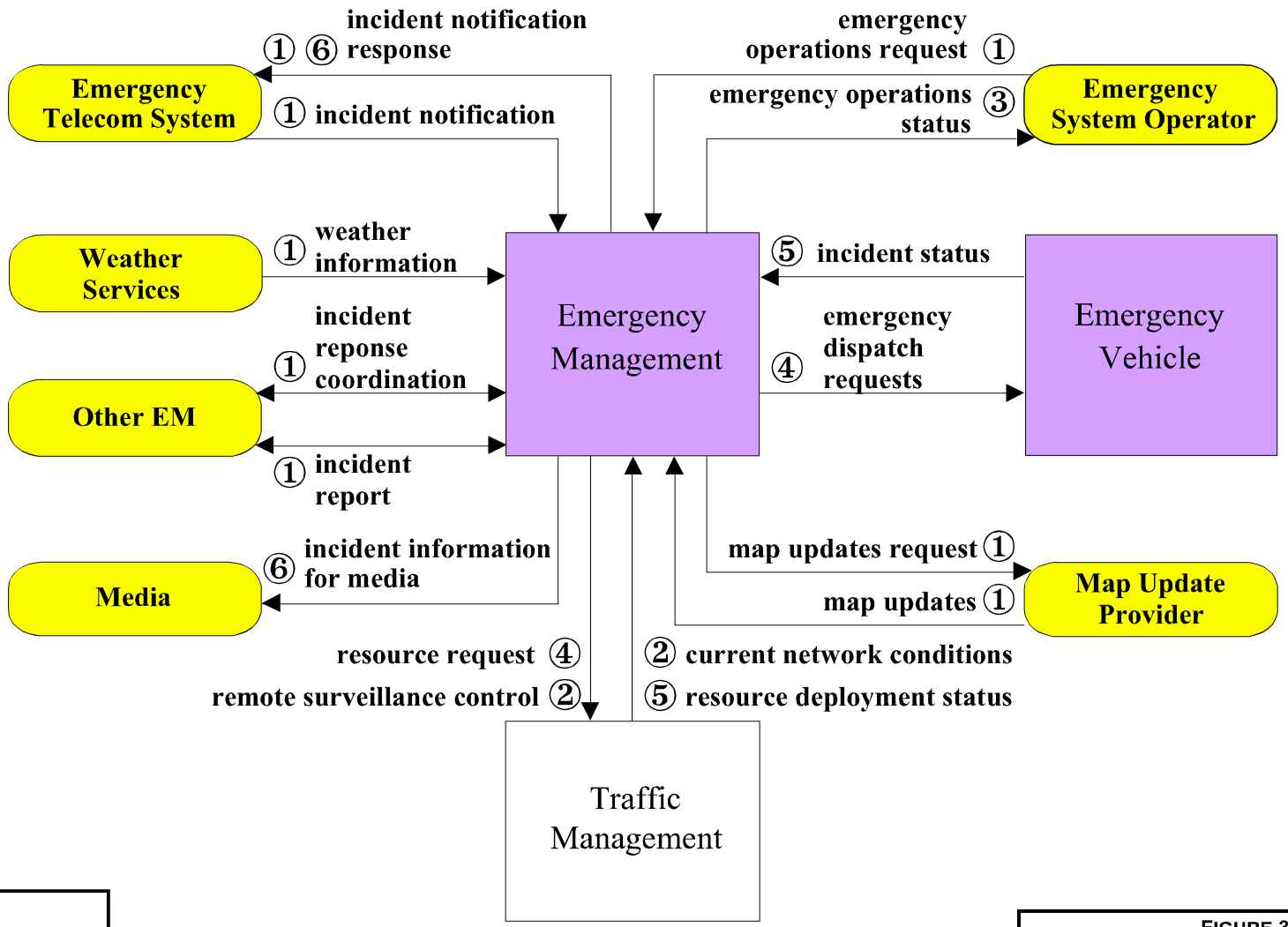
Purpose and Function:
This market package provides the computer-aided dispatch systems, emergency vehicle equipment, and wireless communications that enables safe and rapid deployment of appropriate resources to an emergency. The Emergency Management Subsystem includes hardware and software for tracking the emergency vehicles. Provision is made for public safety, traffic management, and other allied agencies to participate in the coordinated response managed by this package.

Required Capabilities:
None.

Data Sharing:
HAZMAT Management, Mayday Support, Emergency Routing, Transit Security, Incident Management System, ITS Data Warehouse

Operations:
1. Current conditions are gathered from weather services, Other Emergency Management Subsystems, and the Emergency Telecommunications System (the system that connects a caller with a public safety entity via 911, cellular 911, or motorist call boxs). EM may issue an incident notification response to the Emergency Telecommunications System verifying the receipt of the incident notification. The Emergency System Operator sends an operations request to the EM to assess the current emergency status. The EM coordinates incident responses with Other Emergency Management Subsystems throughout the emergency response process. The Map Update Provider receives map update requests and issues map updates on a continuous basis.
2. Remote surveillance control commands are sent to the TMS from the EM to remotely operate sensors or surveillance equipment to assess and verify incident conditions. Network conditions are then sent to the EM from the TMS, indicating current traffic information and road conditions, along with the camera images.
3. The Emergency System Operator receives emergency operations status.
4. The EM issues emergency dispatch requests to the Emergency Vehicle Subsystem (EVS) which includes instructions on incident location and available information concerning the incident. The EM sends a message to the TMS, requesting resources to implement special traffic control measures, assist in clean up, and/or verify an incident.
5. The EVS sends incident status information to the EM. The TMS issues a response to the EM, identifying the emergency resources available and their current deployment status.
6. The Emergency Telecommunications System may receive another incident notification response from the EM, indicating general information on incident response status. The media receives incident information data from the EM.

User Service Requirements Implemented:
Incident Management, Emergency Vehicle Management



LEGEND

- Primary Subsystem
- Secondary Subsystem
- Terminator
- Architecture Flow
- ⑧ Architecture Flow Sequence

FIGURE 39
EMERGENCY RESPONSE
MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Emergency Routing

Market Package Priority: High

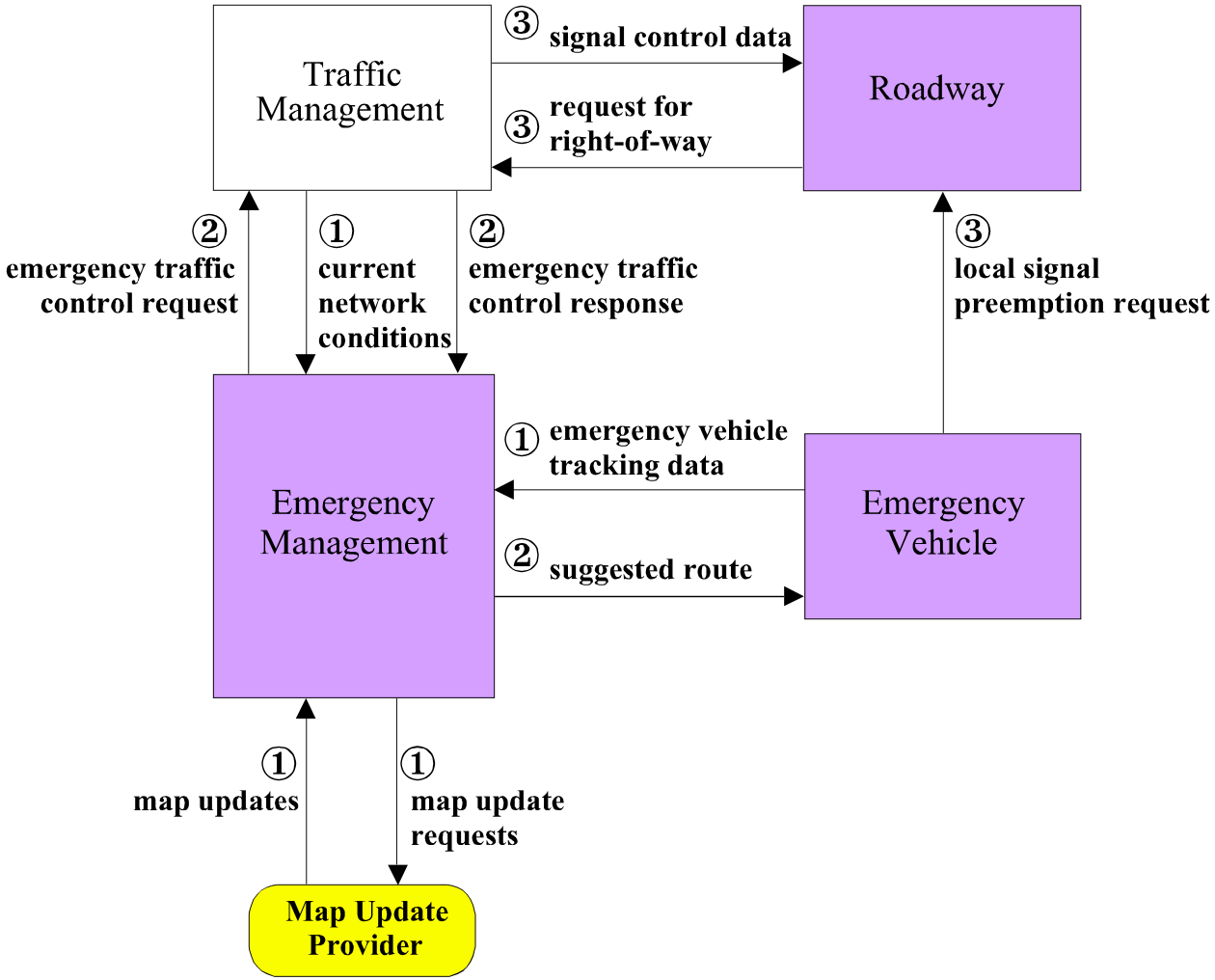
Purpose and Function:
This market package supports dynamic routing of emergency vehicles. It coordinates with the Traffic Management Subsystem for special priority on selected route(s). Also, emergency vehicles would optionally be equipped with dedicated short range communications for local traffic signal preemption.

Required Capabilities:
None.

Data Sharing:
Emergency Response, Mayday Support, HAZMAT Management, Incident Management System

Operations:
1. The current location and operating status of an emergency vehicle is sent to the Emergency Management Subsystem by the Emergency Vehicle Subsystem. The Traffic Management Subsystem forwards current traffic information, road conditions, and any camera images that can be used to locate and verify reported incidents, to the Emergency Management Subsystem. Upon request, the Map Update Provider issues map updates showing the latest traffic conditions.
2. Based upon current traffic conditions and any emergency traffic control requests for signal preemption sent the Traffic Management System, the Emergency Management Subsystem will suggest routes to the dispatched emergency vehicle(s).
3. Emergency vehicle(s) makes a request for local traffic signal preemption. Based upon the Emergency Subsystem request for emergency traffic control and/or the local emergency vehicle request, the Traffic Management Subsystem will send signal control data to the Roadway Subsystem to reconfigure traffic signals.

User Service Requirements Implemented:
Emergency Vehicle Management



LEGEND

- Primary Subsystem
- Secondary Subsystem
- Terminator
- Architecture Flow
- ⑧ Architecture Flow Sequence

FIGURE 40
EMERGENCY ROUTING
MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Mayday Support

Market Package Priority: High

Purpose and Function:
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. Requests from the traveler needing assistance may be manually initiated or automated and linked to vehicle sensors.

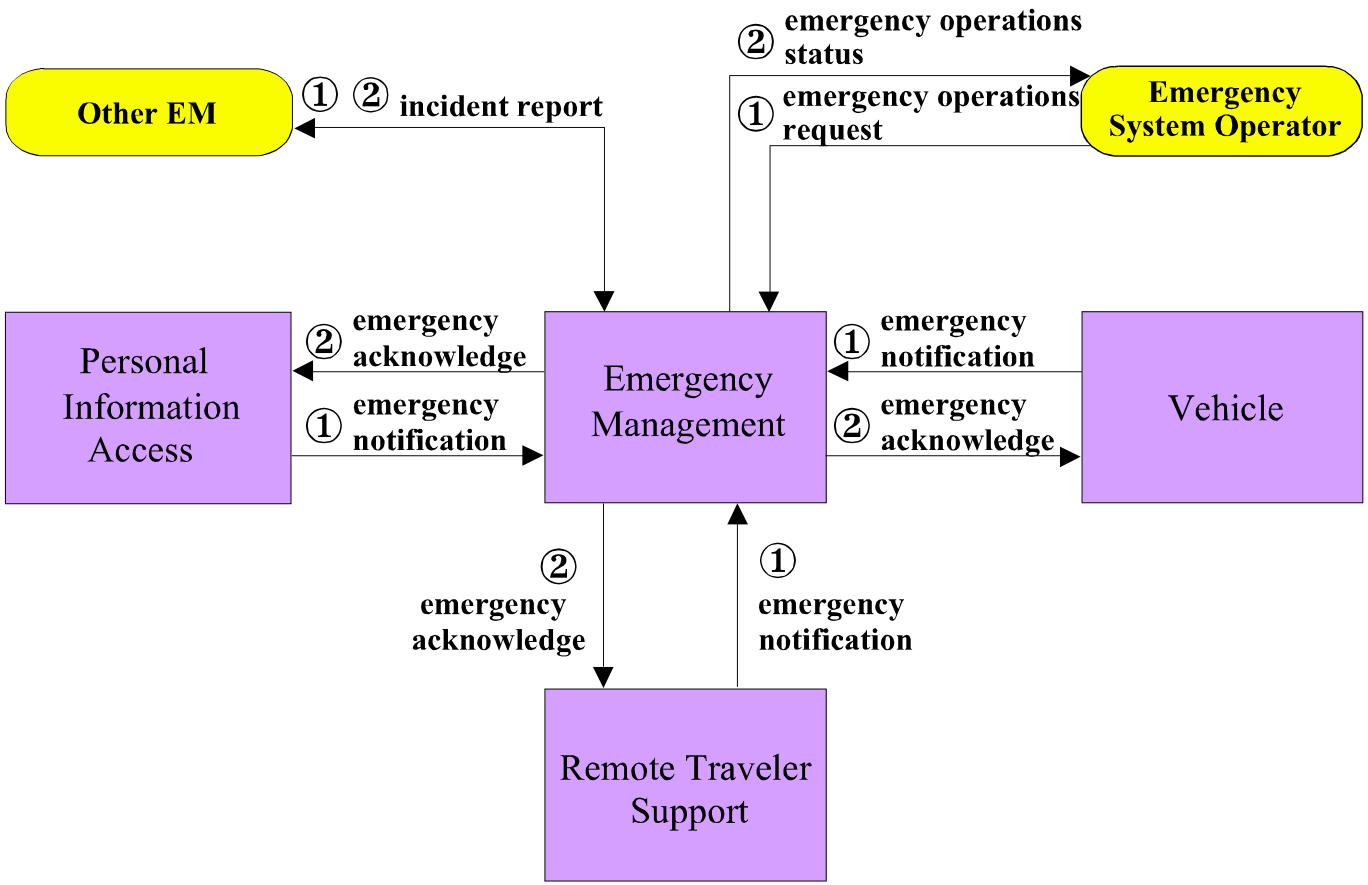
Required Capabilities:
Transit Security, HAZMAT Management

Data Sharing:
Emergency Response, Interactive Traveler Information, Transit Security

Operations:
1. The user (driver or non-driver) initiates a request for emergency assistance via the Personal Information Access Subsystem, Remote Traveler Support Subsystem, or the Vehicle Subsystem. Incident reports can also come in via Other Emergency Management Subsystems.

2. The Emergency Management Subsystem acknowledges the request for emergency assistance and provides additional details to the user regarding actions and verification requirements.

User Service Requirements Implemented:
Emergency Notification and Personal Security, Emergency Vehicle Management



LEGEND

- Primary Subsystem
- Secondary Subsystem
- Terminator
- Architecture Flow
- ⑧ Architecture Flow Sequence

FIGURE 41
MAYDAY SUPPORT
MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Broadcast Traveler Information

Market Package Priority: High

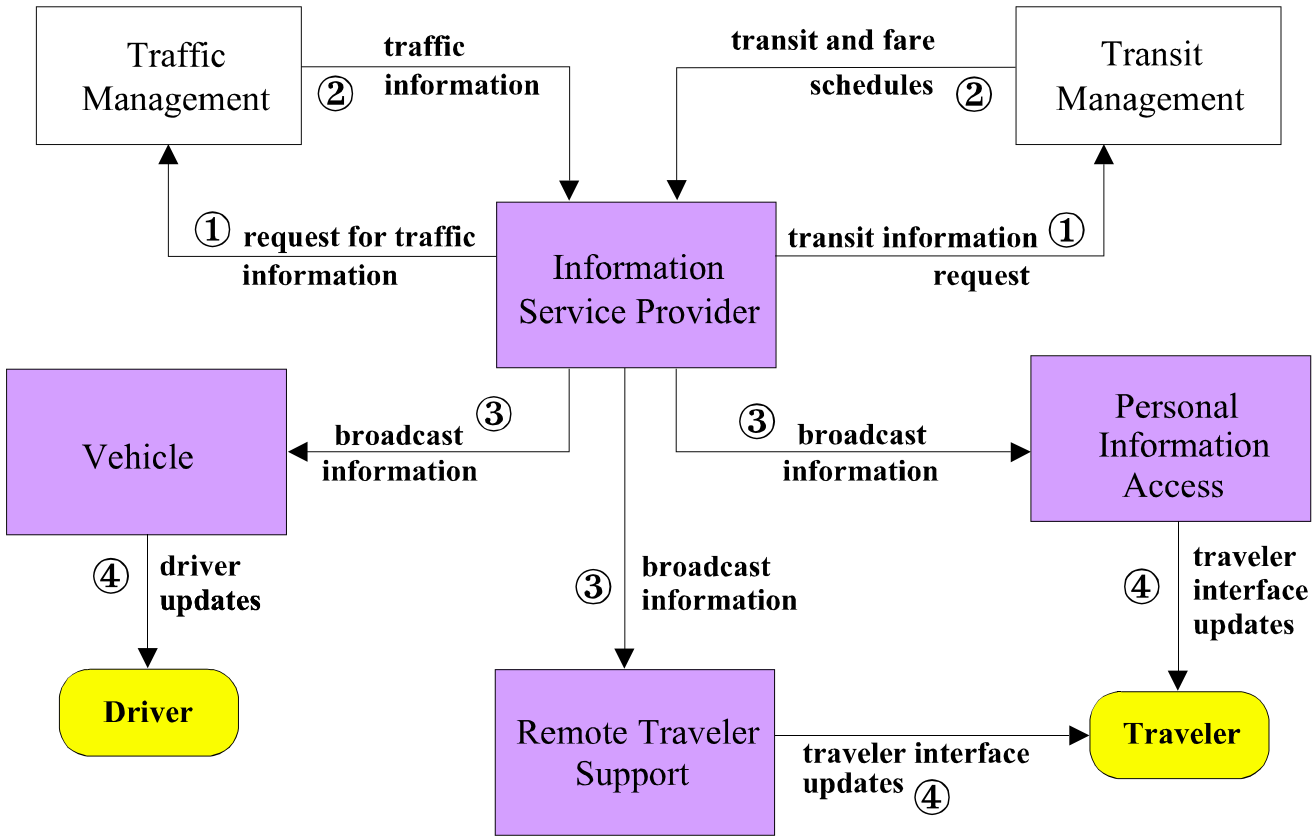
Purpose and Function:
This market package provides the user with a basic set of traveler information services. It involves collection of traffic conditions, advisories, and general public transportation information. It also provides for near real-time traveler information dissemination over a wide area through existing infrastructures and low cost user equipment.

Required Capabilities:
Network Surveillance, Transit Vehicle Tracking

Data Sharing:
Interactive Traveler Information, Dynamic Route Guidance

Operations:
1. The Information Service Provider requests traffic and transit information.
2. The Information Service Provider receives transit and fare schedules from the Transit Management Subsystem and traffic information from the Traffic Management Subsystem.
3. The Information Service Provider broadcasts traffic and transit information to Vehicle, Personal Information Access and Remote Traveler Support Subsystems.
4. Drivers receive traffic updates from the Vehicle Subsystem and travelers receive travel updates from the Personal Information Access and Remote Traveler Support Subsystems.

User Service Requirements Implemented:
En-Route Driver Information, En-Route Transit Information, Pre-trip Travel Information



LEGEND

- Primary Subsystem
- Secondary Subsystem
- Terminator
- Architecture Flow
- ⑧ Architecture Flow Sequence

FIGURE 42
BROADCAST TRAVELER INFORMATION MARKET PACKAGE

Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Interactive Traveler Information

Market Package Priority: High

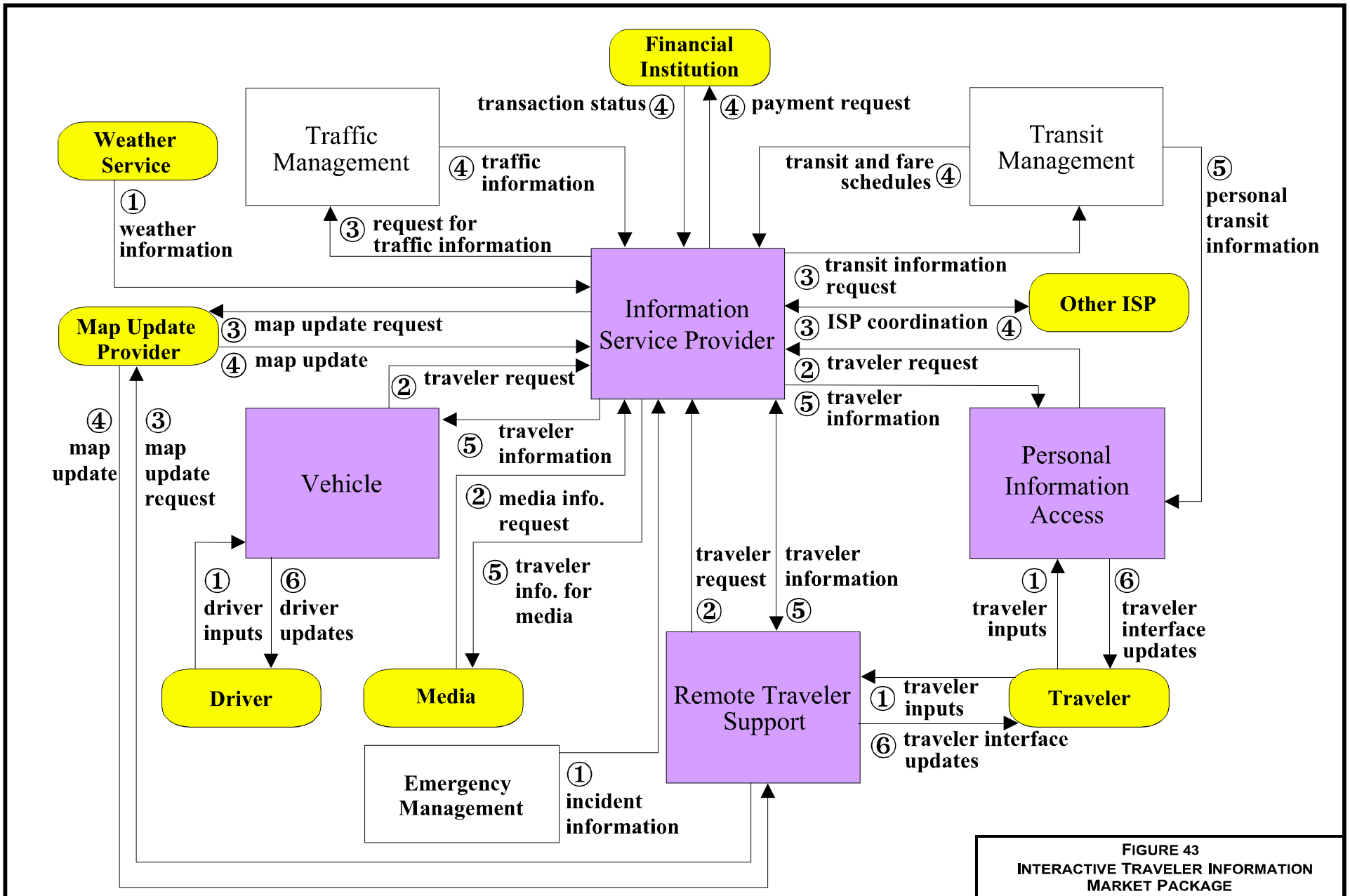
Purpose and Function:
This market package provides tailored information in response to a traveler request. It provides current traffic conditions, transit services, and traveler services. It also utilizes pre-trip or en-route interactive devices including phone, kiosk, personal digital assistant, personal computer, and a variety of in-vehicle devices.

Required Capabilities:
Broadcast Traveler Information

Data Sharing:
ISP-based Route Guidance, Yellow Pages and Reservation, Dynamic Ridesharing, Mayday Support, Demand Responsive Transit Operations, Transit Passenger and Fare Management, Electronic Toll Collection

Operations:
1. The Personal Information Access and Remote Traveler Support Subsystems receives requests from travelers. Vehicle Subsystem receives requests from drivers. Information Service Provider receives incident information from the Emergency Management Subsystem and weather information from the weather service.
2. The Information Service Provider receives traveler requests from the Vehicle, Personal Information Access and Remote Traveler Support Subsystems.
3. Information Service Provider requests transit information from the Transit Management Subsystem, traffic information from the Traffic Management Subsystem, and other travel information from Other Information Service Providers. The Map Update Provider receives map update requests.
4. Information Service Provider receives map updates, transit and fare schedules, and traffic information. If this is a fee based service, the Information Service Provider receives payment from a financial institution.
5. The Information Service Provider sends traveler information to the Vehicle, Personal Information Access and Remote Traveler Support Subsystems. The Personal Information Access Subsystem can also receive transit information directly from the Transit Management Subsystem.
6. Drivers and travelers receive travel updates, including routes, messages, and guidance in visual and/or audio format, from the Vehicle, Personal Information Access and Remote Traveler Support Subsystems.

User Service Requirements Implemented:
En-Route Driver Information, En-Route Transit Information, Electronic Payment Services, Pre-trip Travel Information, Ride Matching and Reservation, Personalized Public Transit



*Legend: Please refer to previous figures of this type.

FIGURE 43
INTERACTIVE TRAVELER INFORMATION MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Dynamic Route Guidance

Market Package Priority: High

Purpose and Function:
This market package offers the user advanced route planning and guidance which is responsive to current travel conditions. It combines the autonomous route guidance user equipment with a digital receiver capable of receiving real-time traffic, transit, and road condition information.

Required Capabilities:
Broadcast Traveler Information, Autonomous Route Guidance

Data Sharing:
ISP Based Route Guidance

Operations:
1. The Information Service Provider requests transit and traffic information from the Transit Management and Traffic Management Subsystems.
2. The Information Service Provider receives transit and fare information from the Transit Management Subsystem and traffic information from the Traffic Management Subsystem.
3. The Information Service Provider broadcasts information to Vehicle and Personal Information Access Subsystems.
4. Vehicle Subsystems receive input from drivers and Personal Information Access Subsystems receive requests from travelers.
5. Map Update Provider updates maps based upon requests from Vehicle and Personal Information Access Subsystems.
6. Drivers receive travel updates from the Vehicle Subsystem and travelers receive travel updates from the Personal Information Access Subsystem. Travel updates can include routes, messages, and other guidance in visual or audio format.

User Service Requirements Implemented:
En-Route Driver Information, Route Guidance

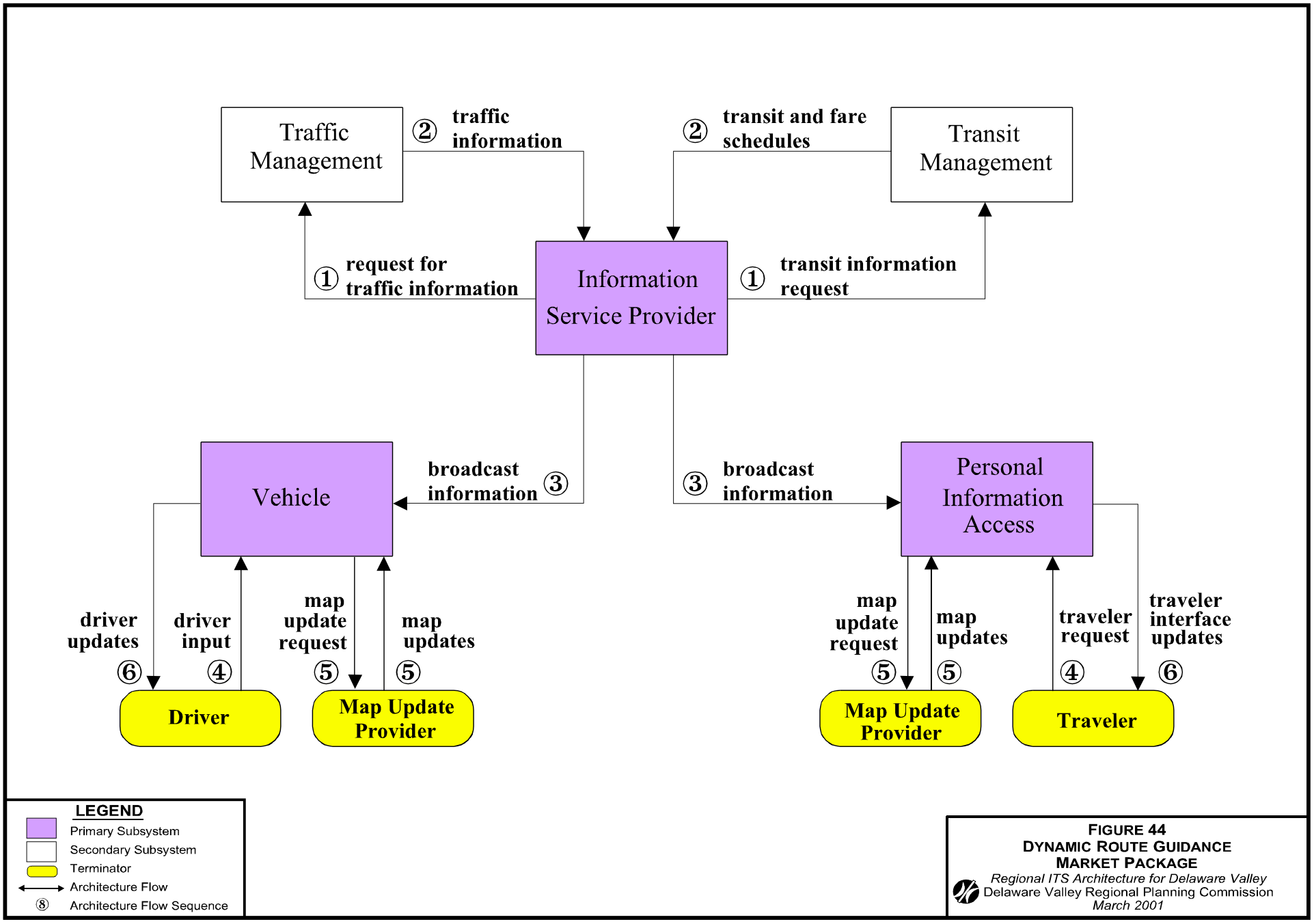


FIGURE 44
DYNAMIC ROUTE GUIDANCE MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Autonomous Route Guidance

Market Package Priority: Medium

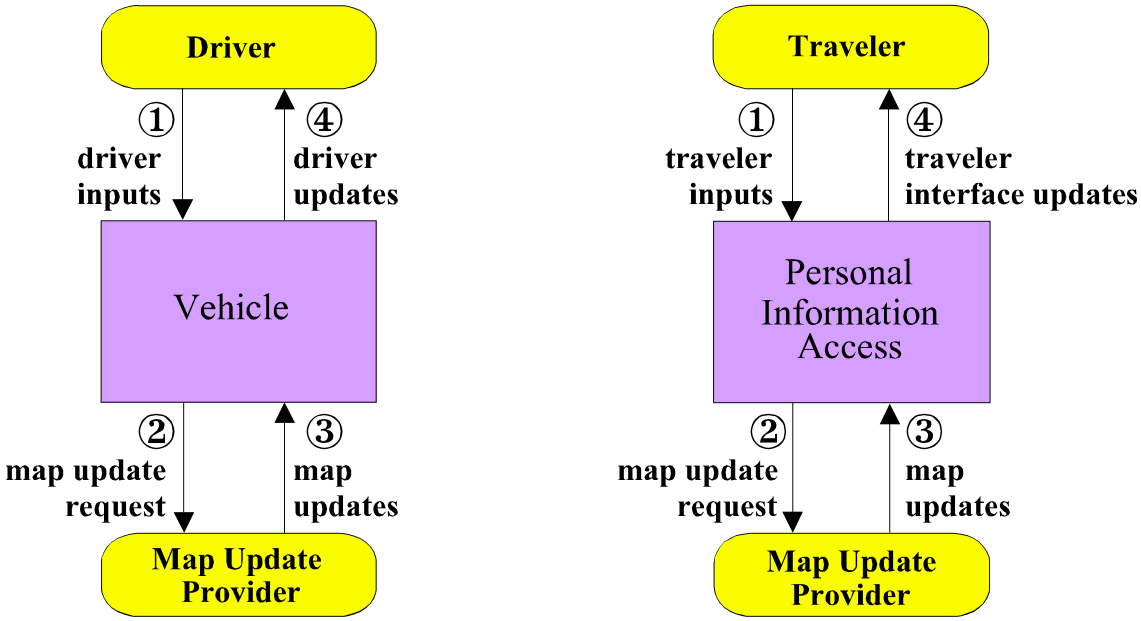
Purpose and Function:
This market package provides route guidance based on in-vehicle sensory equipment, location determination algorithms, a map database, and interactive driver interface equipment. It enables route planning and detailed route guidance based on static, stored information. No communication with the infrastructure is assumed or required.

Required Capabilities:
None.

Data Sharing:
Dynamic Route Guidance

Operations:
1. The Vehicle Subsystem receives driver inputs. The Personal Information Access Subsystem receives traveler inputs.
2. Map Update Provider receives requests for map updates from the Vehicle and Personal Information Access Subsystems.
3. Vehicle and Personal Information Access Subsystems receive map updates.
4. Drivers receive updates from the Vehicle Subsystem and travelers receive route updates from the Personal Information Access Subsystem. The updates can be in visual and/or audio format.

User Service Requirements Implemented:
En-Route Driver Information, Route Guidance



LEGEND

- Primary Subsystem
- Secondary Subsystem
- Terminator
- Architecture Flow
- ⑧ Architecture Flow Sequence

FIGURE 45
AUTONOMOUS ROUTE GUIDANCE MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Information Service Provider-Based Route Guidance

Market Package Priority: Medium

Purpose and Function:
This market package offers advanced route planning and guidance responsive to current conditions. It moves the route planning function from the user to the Information Service Provider. It also includes two way data communications, vehicles are equipped with databases, location determination capability, and display technology to support turn by turn route guidance.

Required Capabilities:
Interactive Traveler Information, Dynamic Route Guidance

Data Sharing:
Integrated Transportation Management / Route Guidance

Operations:
1. The Vehicle Subsystem receives input from drivers on their proposed trip. The Personal Information Access Subsystem receives inputs from travelers. Information Service Provider coordinates with Other Information Service Providers.
2. Information Service Provider receives trip requests from Vehicle and Personal Information Access Subsystems.
3. Information Service Provider requests transit information including schedules and fares from the Transit Management Subsystem, traffic information from the Traffic Management Subsystem, and map updates from the Map Update Provider.
4. Information Service Provider receives fare and schedule information from the Transit Management Subsystem and traffic information from the Traffic Management Subsystem. Map updates are sent to Vehicle, Personal Information Access, and Information Service Provider Subsystems.
5. Based upon current information, the Information Service Provider sends trip plans to Vehicle and Personal Information Access Subsystems.
6. Drivers receive updates from the Vehicle Subsystem, and travelers receive updates from the Personal Information Access Subsystem. The updates include proposed routes, messages, and route guidance in visual and/or audio format.
7. The Information Service Provider receives an acknowledge that the user accepts the proposed routing.

User Service Requirements Implemented:
En-Route Driver Information, Route Guidance

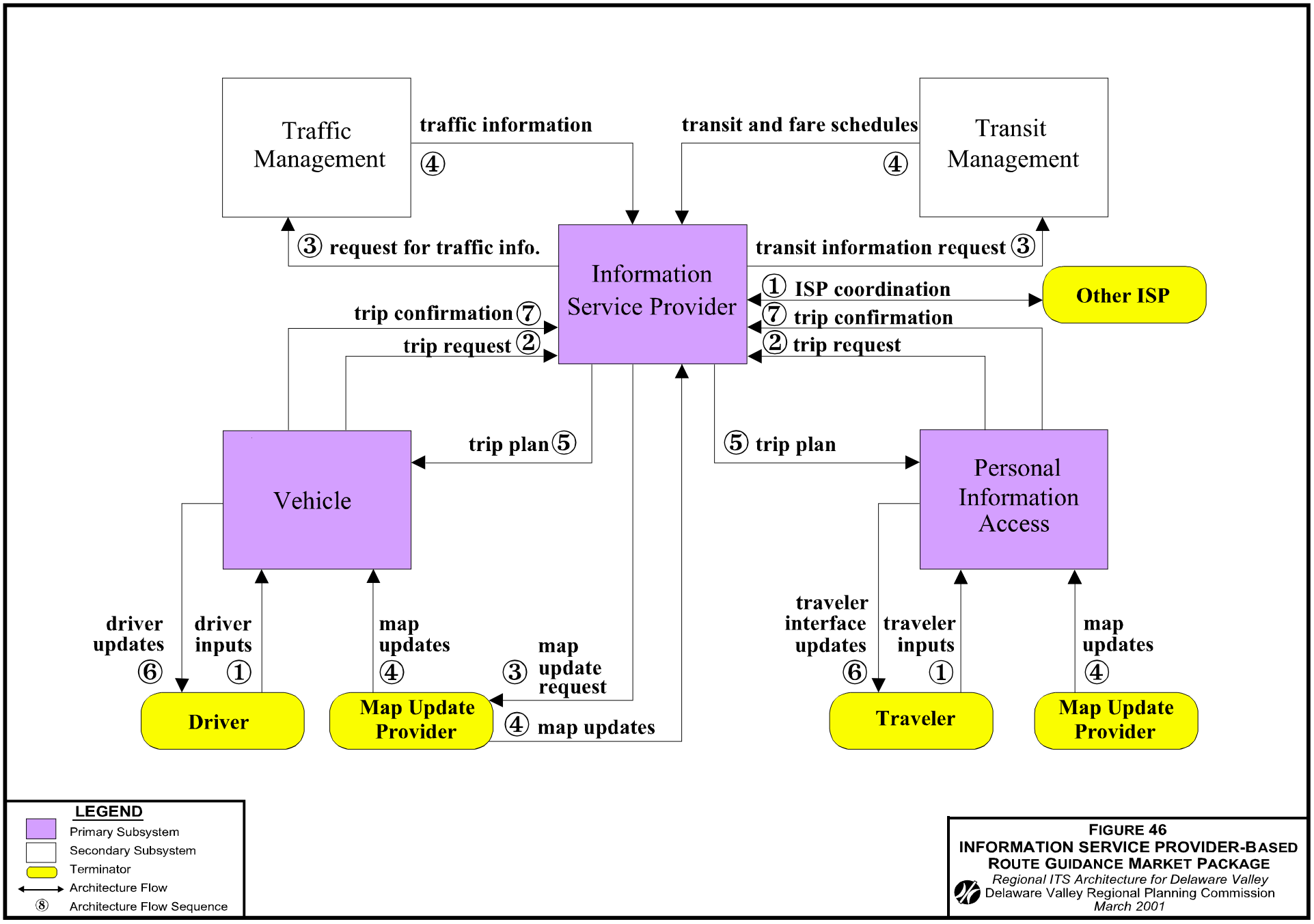


FIGURE 46
INFORMATION SERVICE PROVIDER-BASED ROUTE GUIDANCE MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Integrated Transportation Management and Route Guidance

Market Package Priority: Medium

Purpose and Function:
This market package is very similar to Information Service Provider Based Route Guidance in that the Information Service Provider decides upon the optimum routing based upon current conditions. When a user confirms acceptance of the proposed routing, this information is passed to the Traffic Management Subsystem allowing it to continuously optimize traffic control strategy based on near-real time travel information.

Required Capabilities:
Information Service Provider Based Route Guidance

Data Sharing:
Regional Traffic Control

Operations:
1. The Vehicle Subsystem receives input from drivers on their proposed trip. Information Service Provider coordinates with other Information Service Providers.
2. Information Service Provider receives trip requests from Vehicle and Personal Information Access Subsystems.
3. Information Service Provider requests transit information from the Transit Management Subsystem, traffic information from the Traffic Management Subsystem, and map updates from the Map Update Provider.
4. Information Service Provider receives transit information from the Transit Management Subsystem, traffic information from the Traffic Management Subsystem. Map updates are sent to the Vehicle and Information Service Provider Subsystems.
5. Vehicle and Personal Information Access Subsystems receive trip plans from the Information Service Provider.
6. Driver receives information on proposed routes from the Vehicle Subsystem.
7. Information Service Provider receives trip confirmations from the Vehicle and Personal Information Access Subsystems.
8. Traffic and Transit Management Subsystems receive information on which roads and transit routes were selected for travel from the Information Service Provider.

User Service Requirements Implemented:
En-Route Driver Information, Route Guidance

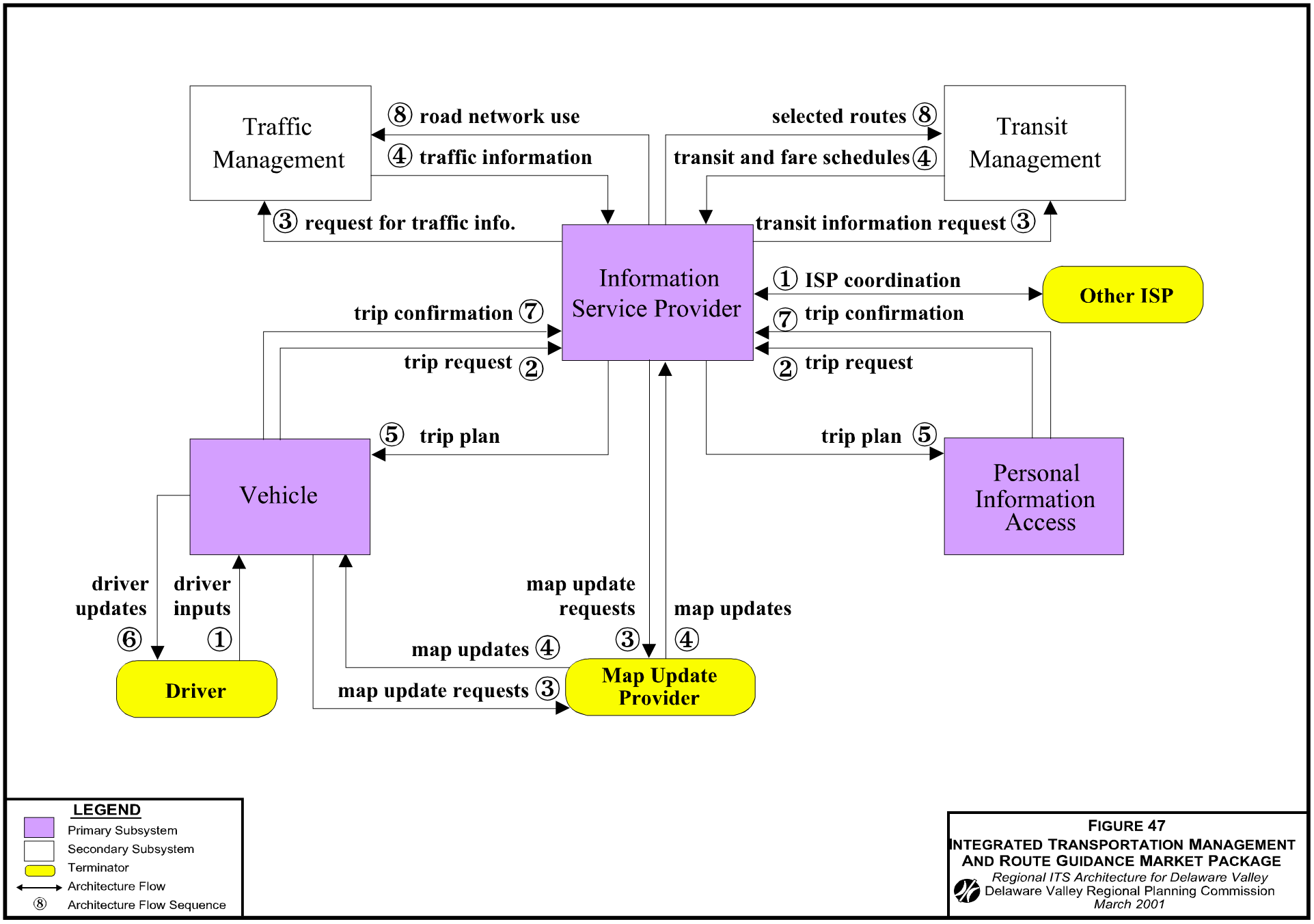


FIGURE 47
INTEGRATED TRANSPORTATION MANAGEMENT AND ROUTE GUIDANCE MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Yellow Pages and Reservation

Market Package Priority: Medium

Purpose and Function:
This market package adds yellow pages and reservation capabilities to tailored requests. Provisions exist in this package to access information either en-route or pre-trip.

Required Capabilities:
Interactive Traveler Information

Data Sharing:
None.

Operations:
1. Provider profile data, including list of services and establishments, is continually collected and then stored at the Information Service Provider. The Map Update Provider continually receives map update requests and issues map updates to the Information Service Provider and Remote Traveler Support Subsystems. Other Information Service Providers continually coordinate with each other.
2. Drivers or travelers issue a yellow pages request message to the Information Service Provider either through the Vehicle, Remote Traveler Support, or Personal Information Access Subsystems. The request can be exclusively for information, or it can request a reservation with optional payment in support of the reservation.
3. The Information Service Provider issues specific traveler service requests to the Yellow Pages Service Provider and/or parking reservations requests to the Parking Management Subsystem.
4. Yellow Pages Service Provider sends travel information to Information Service Provider and the Parking Management Subsystem issues confirmation of reservation.
5. The Information Service Provider issues a payment request message to the Financial Institution to transact payment for travel services/reservations. The Financial Institution issues an acknowledgment that payment was transacted or denied.
6. After the financial transaction, the Information Service Provider disseminates yellow pages information to the Vehicle, Remote Traveler Support and Personal Information Access Subsystems.

User Service Requirements Implemented:
En-Route Driver Information, Electronic Payment Services, Pre-trip Travel Information, Ride Matching and Reservation, Traveler Services Information

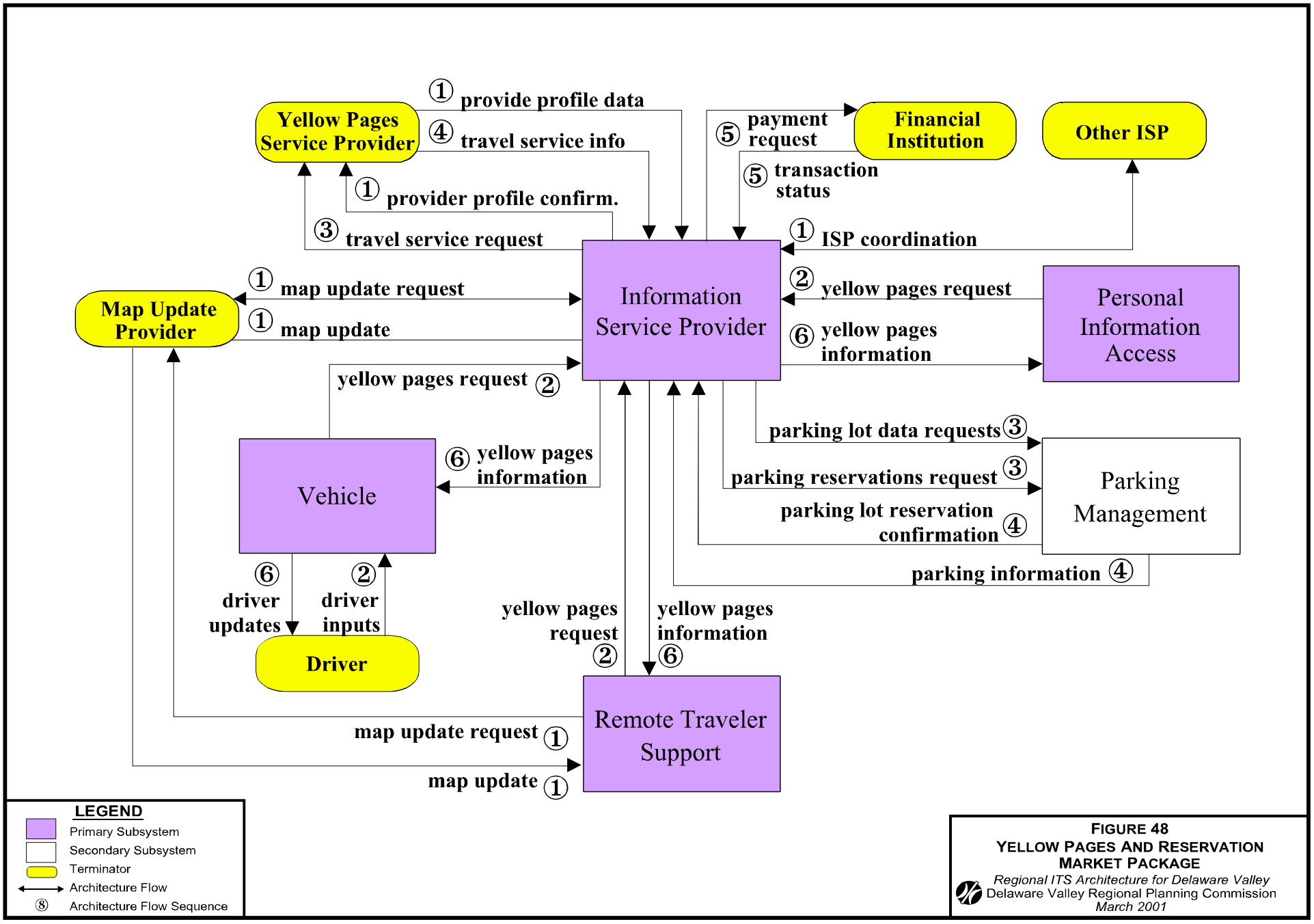


FIGURE 48
YELLOW PAGES AND RESERVATION MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Dynamic Ride Sharing

Market Package Priority: Medium

Purpose and Function:
This market package enhances the Interactive Traveler Information package. It provides dynamic ridesharing capability to tailored requests. Specifically, it provides information regarding transit services, paratransit services, and ride matching.

Required Capabilities:
Interactive Traveler Information

Data Sharing:
Demand Response Transit Operations

Operations:
1. The Information Service Provider requests and receives demand responsive transit schedules and deployment plans from the Transit Management Subsystem. Map Update Provider continually receives map update requests and issues map updates to the Information Service Provider. Information Service Providers continually coordinate with each other.
2. Drivers and travelers make a request for paratransit or ride matching services to a Information Service Provider through the Vehicle, Remote Traveler Support, or Personal Information Support Subsystems.
3. Based upon the information available, the Information Service Provider sends a trip plan to the traveler through the Vehicle, Remote Traveler Support, and Personal Information Access Subsystems.
4. Drivers and travelers acknowledge acceptance of the plan.
5. The Information Service Provider issues a payment request message to the Financial Institution to transact payment for travel services. The Financial Institution issues an acknowledgment that payment was transacted or denied.

User Service Requirements Implemented:
En-Route Driver Information, En-Route Transit Information, Electronic Payment Services, Pre-trip Travel Information, Route Guidance, Ride Matching and Reservation, Traveler Services Information

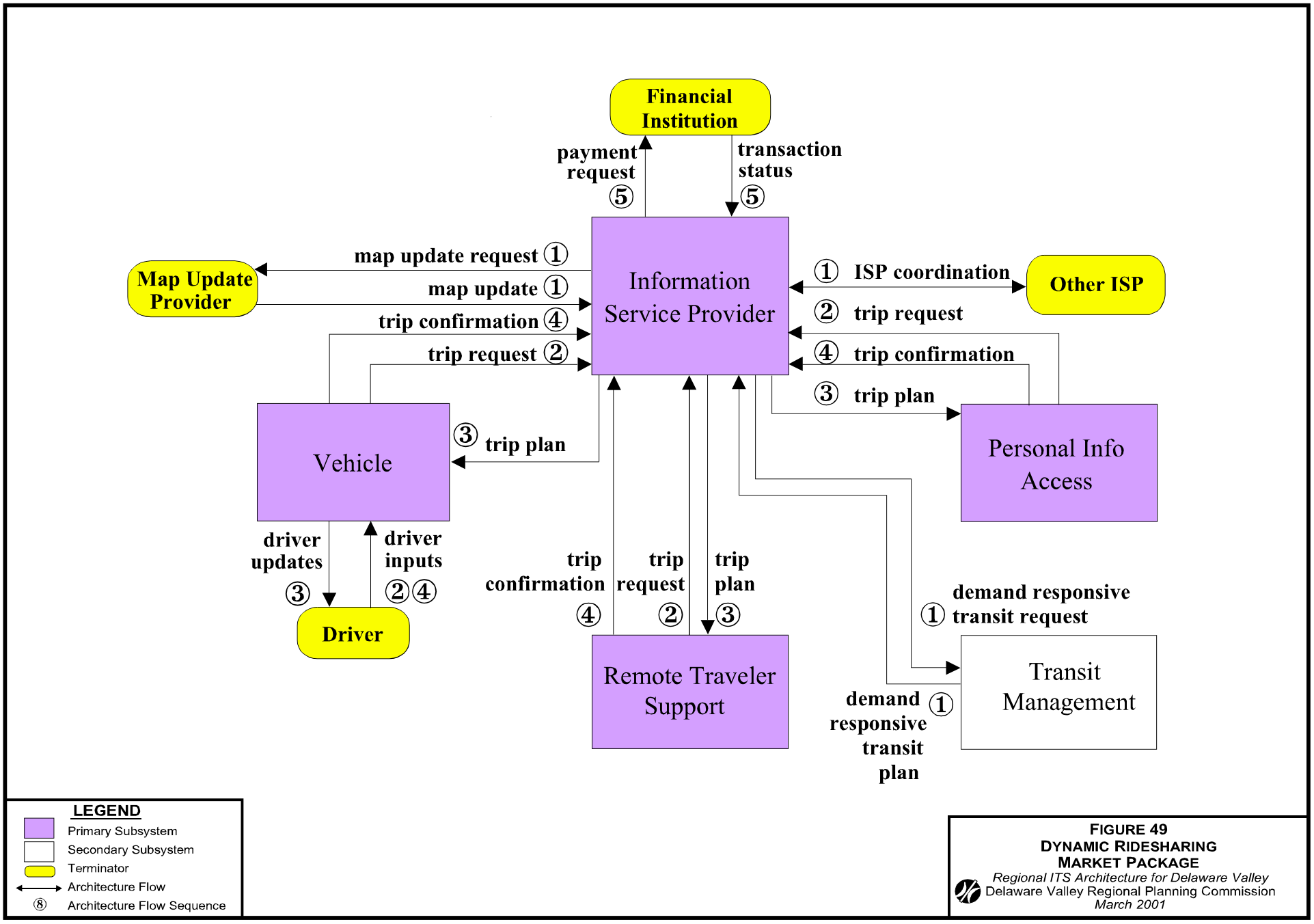


FIGURE 49
DYNAMIC RIDESHARING MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

In-Vehicle Signing

Market Package Priority: Medium

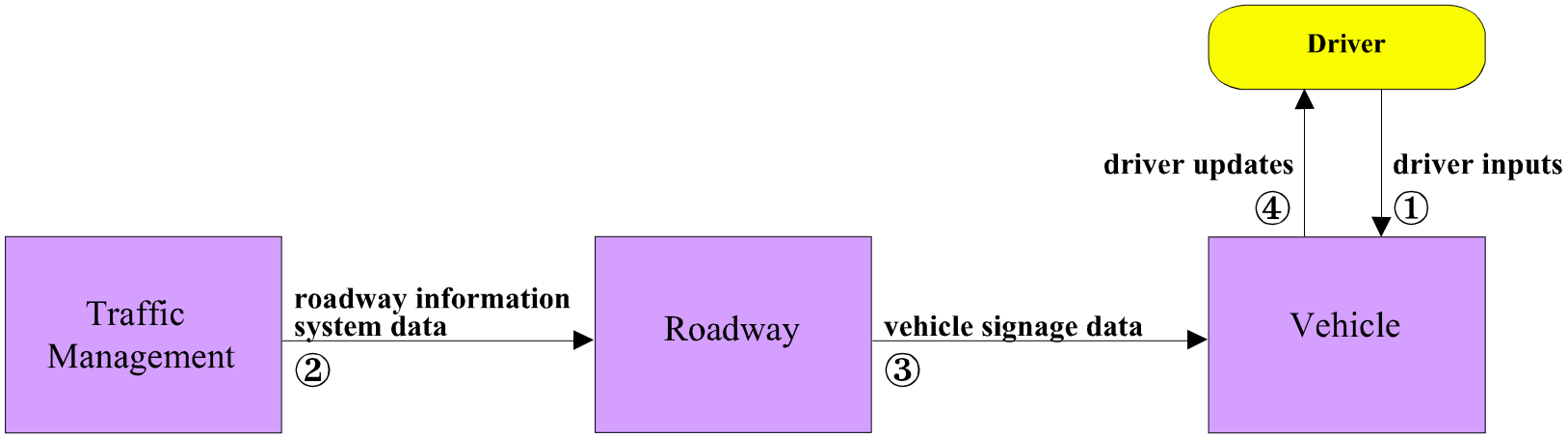
Purpose and Function:
This market package supports distribution of traffic and travel advisory information to drivers through in-vehicle devices. It includes short range communications between roadside equipment and the vehicle. It also informs the driver of both highway-highway and highway-rail intersection status.

Required Capabilities:
Traffic Information Dissemination

Data Sharing:
Traffic Information Dissemination, Intersection Safety Warning

Operations:
1. The driver inputs data to the Vehicle Subsystem requesting information.
2. The Traffic Management Subsystem sends the Roadway Subsystem information system data, including information used to initialize, configure, and control roadside systems that provide driver information, such as variable message signs, highway advisory radio, and beacon systems.
3. The Roadway Subsystem sends the Vehicle Subsystem signage data, including road conditions, street names, or special information which will be useful for a vehicle passing a specific point on the roadway.
4. The Vehicle Subsystem sends the driver information updates.

User Service Requirements Implemented:
En-Route Driver Information, Highway-Rail Intersection



LEGEND

- Primary Subsystem
- Secondary Subsystem
- Terminator
- Architecture Flow
- ⑧ Architecture Flow Sequence

FIGURE 50
IN-VEHICLE SIGNING
MARKET PACKAGE

Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Transit Vehicle Tracking

Market Package Priority: High

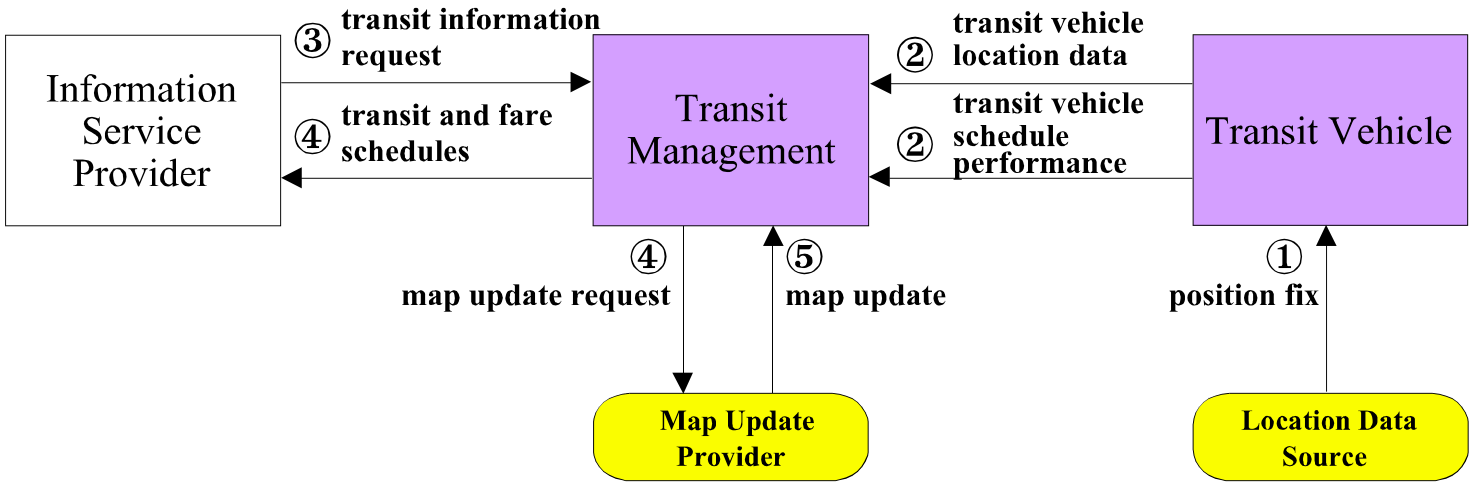
Purpose and Function:
This is the basic transit market package that enables the other transit services. An automated vehicle location system is used to track transit vehicles' real-time schedule adherence. Transit schedules are updated in real-time mode, and real-time schedule information is made available to Information Service Providers.

Required Capabilities:
None

Data Sharing:
Transit Fixed Route Operations, Demand Responsive Transit Operations, Passenger and Fare Management, Transit Security, Broadcast Traveler Information, Transit Traveler Information

Operations:
1. The position of the transit vehicle, from a GPS system, is sent to the Transit Vehicle Subsystem.
2. Current transit vehicle location and related operational conditions data is provided to Transit Management Subsystem. Estimated times of arrival and anticipated schedule deviations are also reported to the Transit Management Subsystem.
3. Information Service Provider requests transit operations information including schedule and fare information.
4. The Transit Management Subsystem provides the Information Service Provider with specific transit and fare schedule information including schedule adherence. The Map Update Provider receives map update requests from the Transit Management Subsystem.
5. The Map Update Provider issues map updates.

User Service Requirements Implemented:
Public Transportation Management, En-Route Transit Information, Public Travel Security



LEGEND

- Primary Subsystem
- Secondary Subsystem
- Terminator
- Architecture Flow
- ⑧ Architecture Flow Sequence

FIGURE 51
TRANSIT VEHICLE TRACKING
MARKET PACKAGE

Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Transit Fixed-Route Operations

Market Package Priority: High

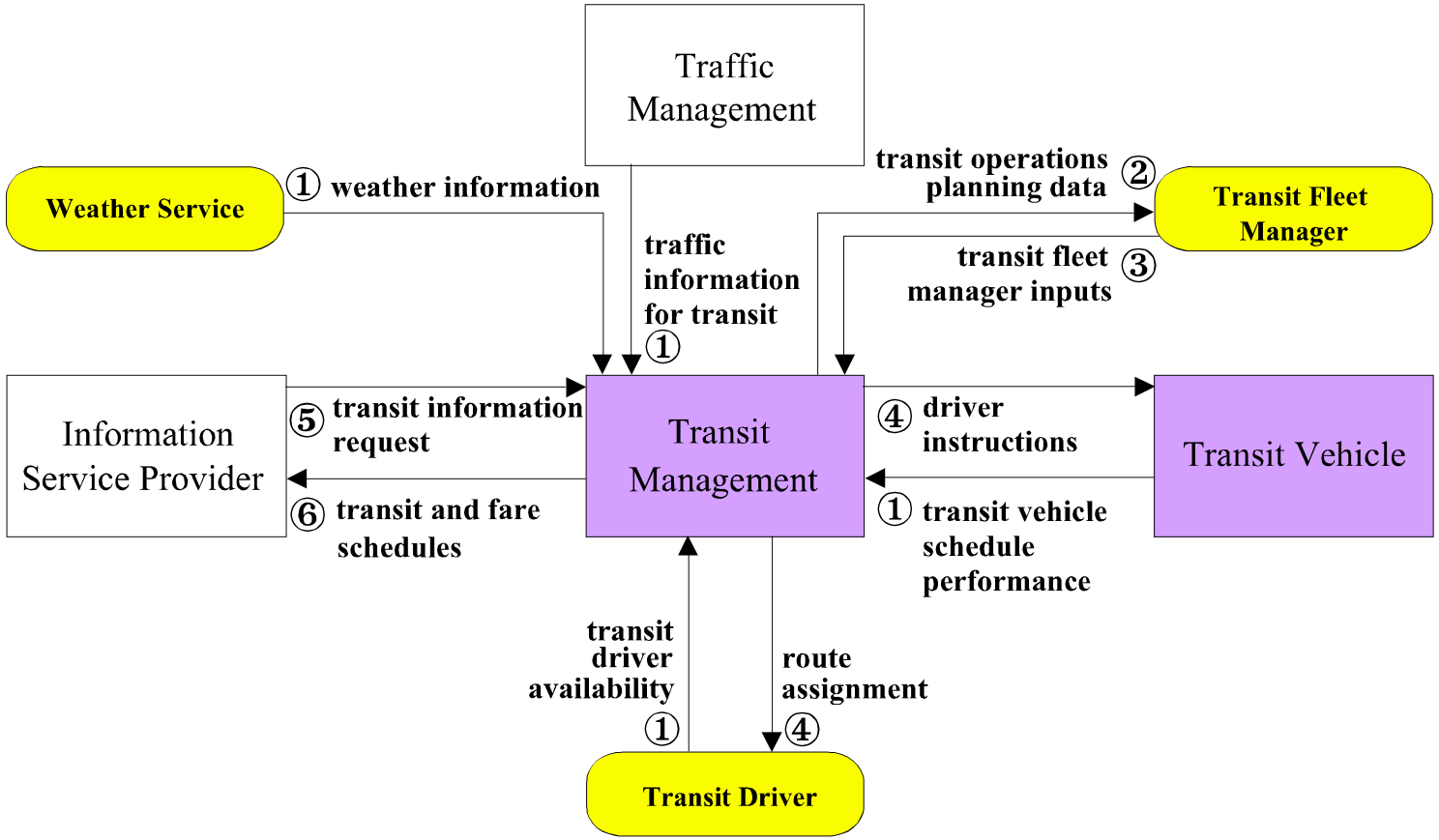
Purpose and Function:
This market package performs automatic driver assignment, and vehicle routing and scheduling. It uses the existing AVL database as a source for current schedule performance data. Real-time schedule information is made available to the Information Service Provider. This package also provides the public with dynamic transit schedules.

Required Capabilities:
Transit Vehicle Tracking

Data Sharing:
Transit Maintenance, Multi-Modal Coordination

Operations:
1. Transit vehicle schedule performance (anticipated schedule deviation), transit driver availability, traffic information, and weather information are sent to the Transit Management Subsystem.
2. The accumulated information pertaining to transit operations and management is sent to the Transit Fleet Manager.
3. Instructions from the Transit Fleet Manager pertaining to schedules, assignments, or emergency response plans are given to the Transit Management Subsystem.
4. Route assignments are relayed to the transit drivers and Transit Vehicle Subsystems.
5. Information Service Provider requests transit information including schedule and fare information.
6. Transit information including schedule adherence is given to the Information Service Provider.

User Service Requirements Implemented:
Public Transportation Management, En-Route Transit Information



LEGEND

- Primary Subsystem
- Secondary Subsystem
- Terminator
- Architecture Flow
- ⑧ Architecture Flow Sequence

FIGURE 52
TRANSIT FIXED-ROUTE OPERATIONS MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Transit Passenger and Fare Management

Market Package Priority: High

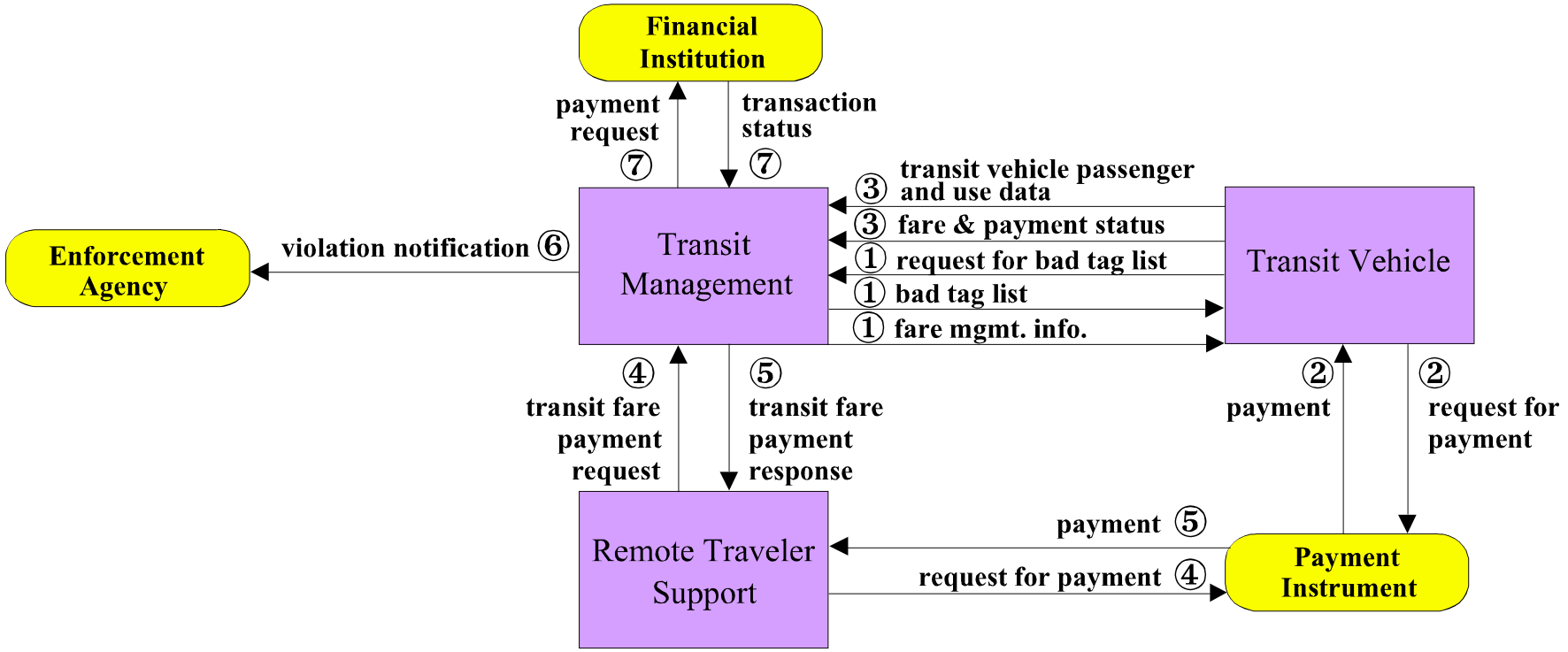
Purpose and Function:
This market package provides management of passenger loading and fare payments on-board vehicles using either a stored value card or credit card. Readers located on-board the transit vehicle allows fare payment, mounted sensors permit the driver to determine vehicle loads.

Required Capabilities:
Transit Vehicle Tracking, Transit Traveler Information

Data Sharing:
Interactive Traveler Information

Operations:
1. Transit Vehicle Subsystem requests bad tag list form the Transit Management Subsystem. Transit tag information and fare management information is transmitted from the Transit Management Subsystem to the Transit Vehicle Subsystem.
2. When a transit user uses a stored value card or credit card there is a financial transaction between the Payment Instrument and the Transit Vehicle Subsystem.
3. Current fare collection information, including the operational status of the fare collection equipment, financial payment transaction data, and passenger usage, is sent from the Transit Vehicle Subsystem to the Transit Management Subsystem.
4. When a passenger uses a payment instrument at a fare machine, the Remote Traveler Support Subsystem will request payment from the Payment Instrument and notify the Transit Management Subsystem of the transaction. For more complex fare structures, it will request fare information from the Transit Management Subsystem.
5. Payment Instrument and Transit Management Subsystem confirm the transaction.
6. If necessary, a notification is made to an enforcement agency of transit tag violations.
7. The Transit Management Subsystem requests payment from a Financial Institution.

User Service Requirements Implemented:
En-Route Transit Information, Electronic Payment Services



LEGEND

- Primary Subsystem
- Secondary Subsystem
- Terminator
- Architecture Flow
- ⑧ Architecture Flow Sequence

FIGURE 53
TRANSIT PASSANGER and FARE MANAGEMENT MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Transit Security

Market Package Priority: High

Purpose and Function:
This market package deploys on-board security systems to perform surveillance and/or warn of potentially hazardous situations. Public areas, including bus stops, park and ride lots, and stations, are also monitored. Security related information is transmitted to the Emergency Management Subsystem.

Required Capabilities:
Transit Vehicle Tracking

Data Sharing:
Emergency Response, Mayday Support

Operations:
1. The Transit Vehicle Subsystem sends an emergency notification to the Transit Management Subsystem.
2. Either through surveillance equipment, emergency call boxes or other forms of emergency notification, the Transit Management Subsystem is notified of an incident in a public area of the transit property.
3. The Transit Management Subsystem acknowledges the emergency notification.
4. Emergency data is sent to the Emergency Management Subsystem.
5. The Emergency Management Subsystem coordinates a response and informs the Transit Management Subsystem of actions taken.
6. The Transit Management Subsystem notifies the Transit Fleet Manager about the incident.
7. The Transit Fleet Manager modifies schedules and routes appropriately.
8. The Transit Management Subsystem notifies the public about unusual conditions via general alerts or more specific warnings via the Remote Traveler Support Subsystem.
9. The Transit Management Subsystem notifies the media and Information Service Provider about the transit incident.

User Service Requirements Implemented:
Public Transportation Management, Public Travel Security

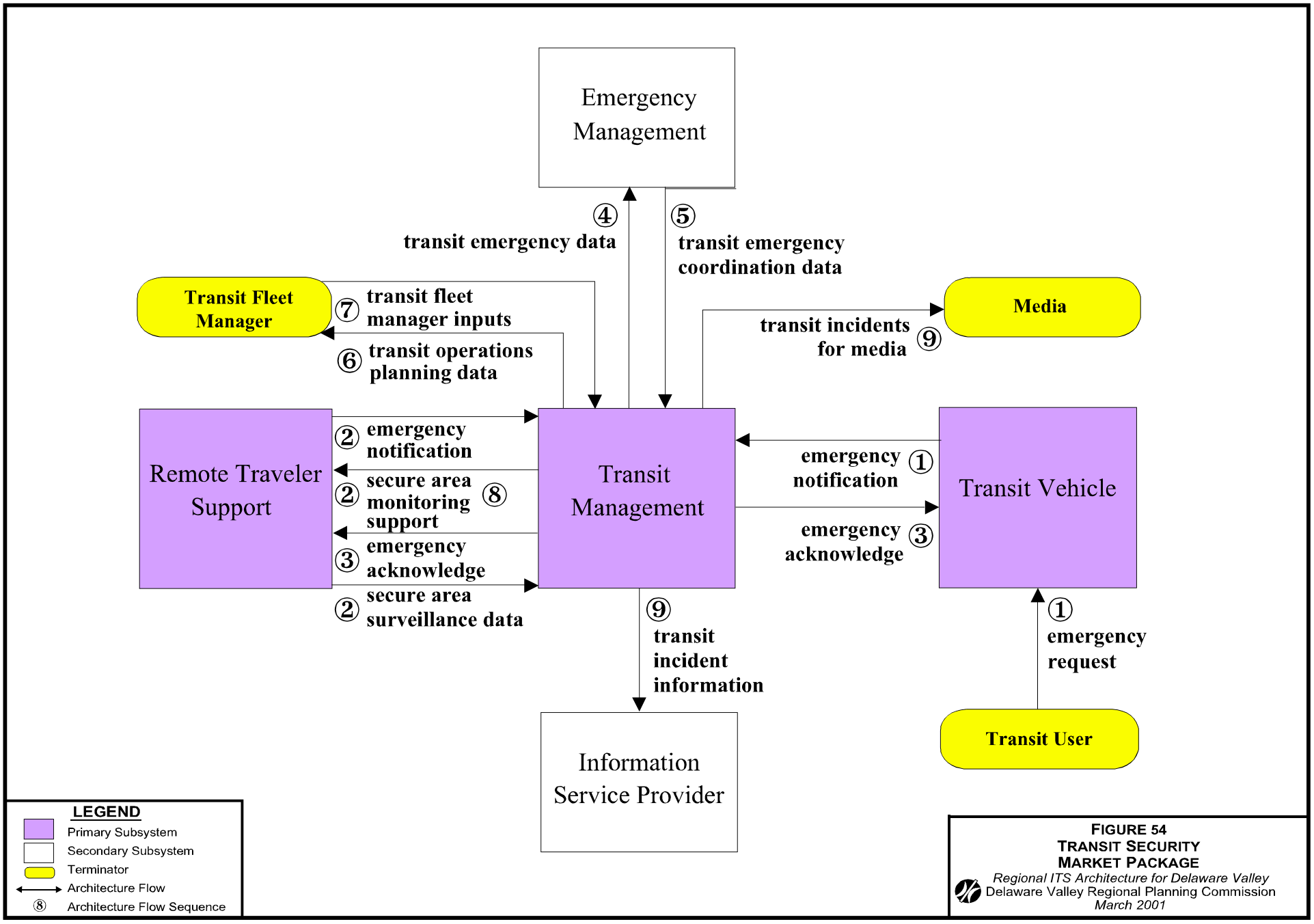


FIGURE 54
TRANSIT SECURITY MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Transit Maintenance

Market Package Priority: High

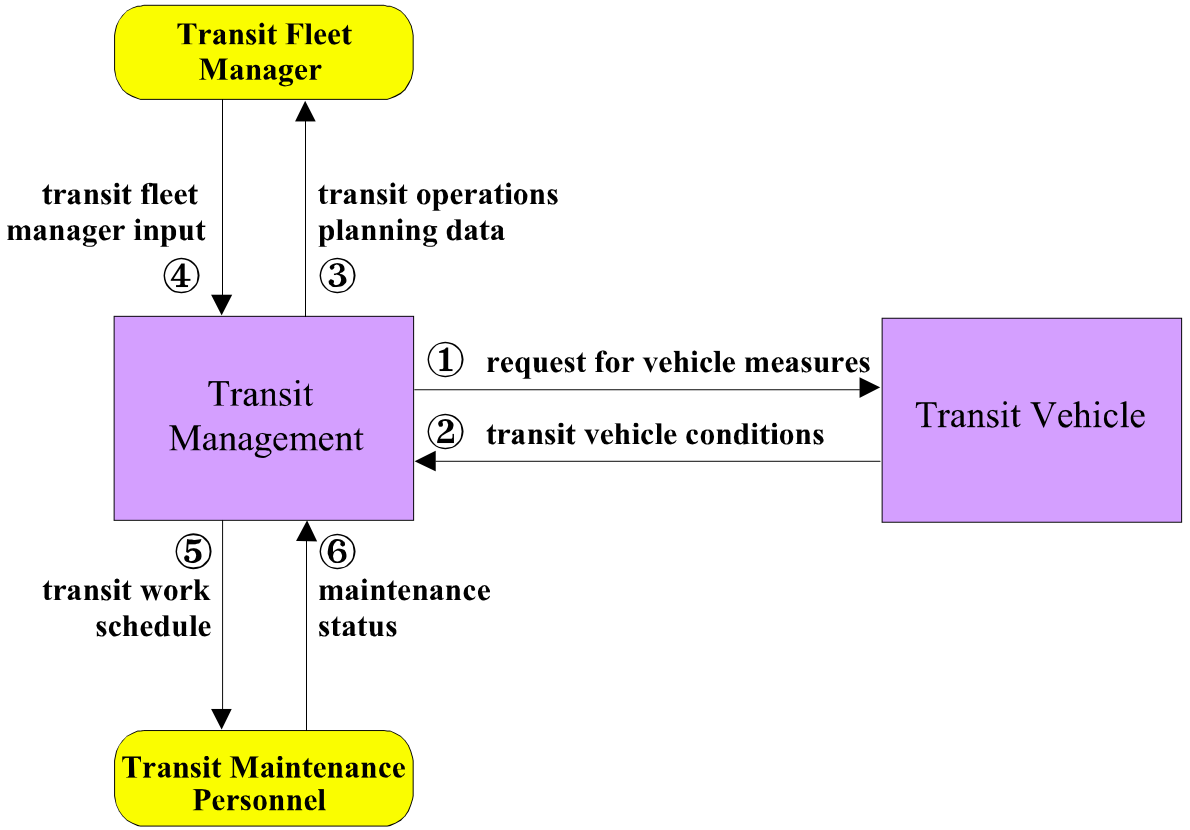
Purpose and Function:
This market package supports automatic maintenance scheduling and monitoring. On-board sensors monitor critical transit vehicle systems, and the Transit Management Subsystem schedules maintenance activities accordingly.

Required Capabilities:
Transit Fixed Route Operations, Demand Responsive Transit Operations

Data Sharing:
None

Operations:
1. The Transit Management Subsystem requests vehicle performance and maintenance status information from the Transit Vehicle Subsystem.
2. The Transit Vehicle Subsystem responds with the transit vehicle condition and maintenance status.
3. The Transit Management Subsystem provides transit vehicle status and maintenance records to the Transit Fleet Manager.
4. The Transit Fleet Manager modifies schedules and routes or orders maintenance work based upon status of the transit vehicle.
5. The Transit Management Subsystem schedules repair or maintenance work for transit vehicles.
6. Transit Maintenance Personnel report the status of repair and maintenance activity to the Transit Management Subsystem.

User Service Requirements Implemented:
Public Transportation Management, Public Travel Security



LEGEND

- Primary Subsystem
- Secondary Subsystem
- Terminator
- Architecture Flow
- ⑧ Architecture Flow Sequence

FIGURE 55
TRANSIT MAINTENANCE MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Transit Traveler Information

Market Package Priority: High

Purpose and Function:
This market package provides transit users ready access to transit information at transit stops and on-board transit vehicles. It includes transit stop annunciation, imminent arrival signs and real-time transit schedule displays.

Required Capabilities:
Transit Vehicle Tracking

Data Sharing:
Passenger and Fare Management

Operations:
1. The Transit Vehicle Subsystem and the Remote Traveler Support Subsystem receive transit information requests from transit users.
2 The Transit Management Subsystem receives the transit user information requests from the Transit Vehicle and Remote Traveler Support Subsystems. Information Service Providers and the media also request transit information.
3 The Transit Vehicle and Remote Traveler Support Subsystems receive transit traveler information. The Transit Management Subsystem also sends transit information to Information Service Providers and the media.
4. Transit users receive transit traveler information from the Transit Vehicle Subsystem or the Remote Traveler Support Subsystem.

User Service Requirements Implemented:
En-Route Transit Information

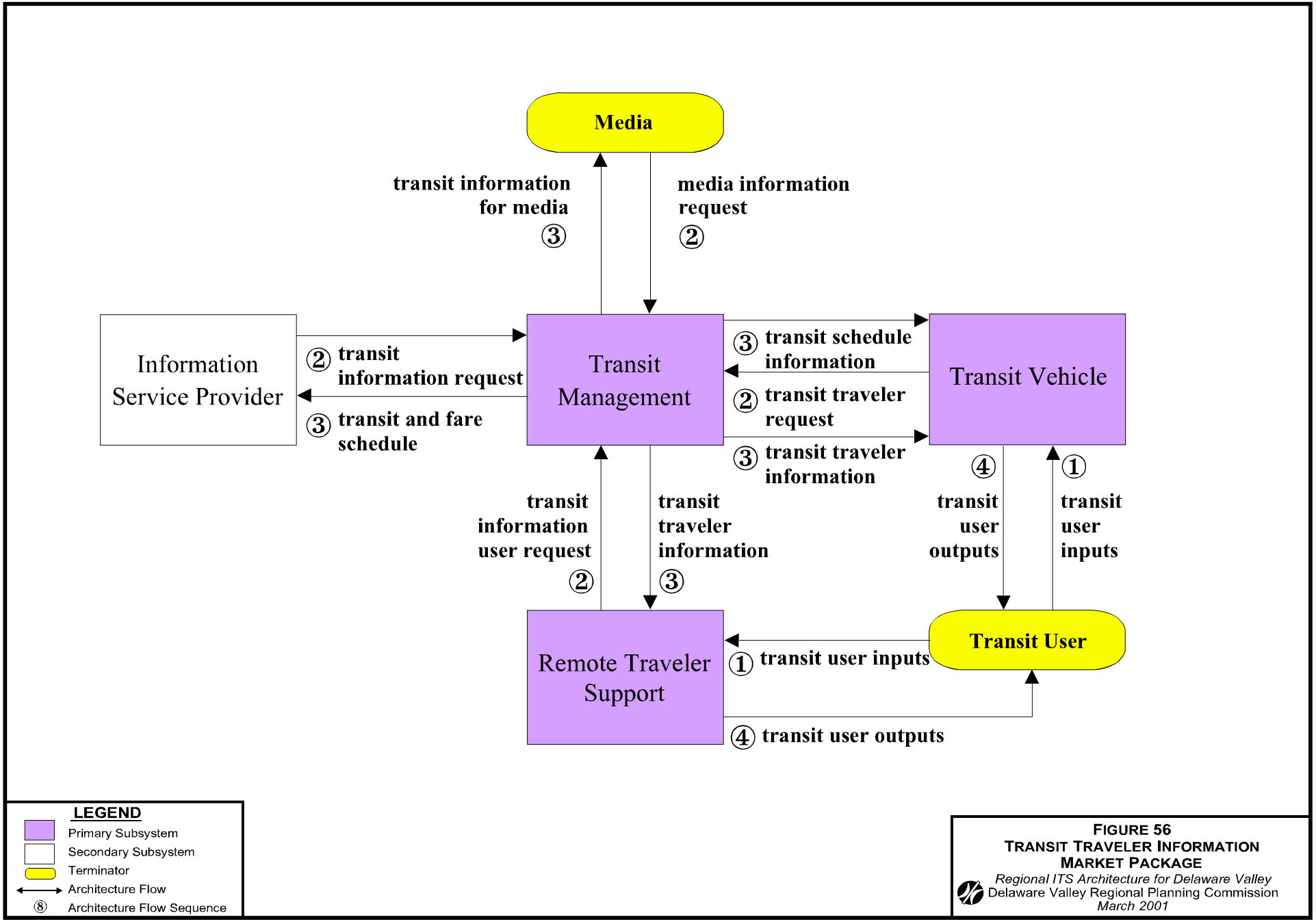


FIGURE 56
TRANSIT TRAVELER INFORMATION MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Demand Response Transit Operations

Market Package Priority: Medium

Purpose and Function:
This market package performs automatic driver assignment and monitoring as well as vehicle routing and scheduling for demand response transit services. It utilizes the existing automatic vehicle location database to monitor current status of the transit fleet while also considering traffic conditions.

Required Capabilities:
Transit Vehicle Tracking, Transit Traveler Information

Data Sharing:
Interactive Traveler Information, Transit Maintenance, Multi-Modal Coordination

Operations:
1. The Transit Management Subsystem receives the following information: requests for paratransit service from Information Service Providers, status information from the Transit Vehicle Subsystem, and traffic condition information from the Traffic Management Subsystem.
1. The information is reviewed by the Transit Fleet Manager who establishes priorities.
2. The Transit Fleet Manager sends instructions governing service availability, schedules, and transit personnel assignments to the Transit Management Subsystem.
3. Demand responsive transit schedules and deployment plans are sent to Information Service Providers.
4. Information Service Providers report back the selected routes to the the Transit Management Subsystem.
5. The Transit Management Subsystem sends instructions to the Transit Vehicle Subsystem and the transit drivers.

User Service Requirements Implemented:
Public Transportation Management, En-Route Transit Information, Personalized Public Transit

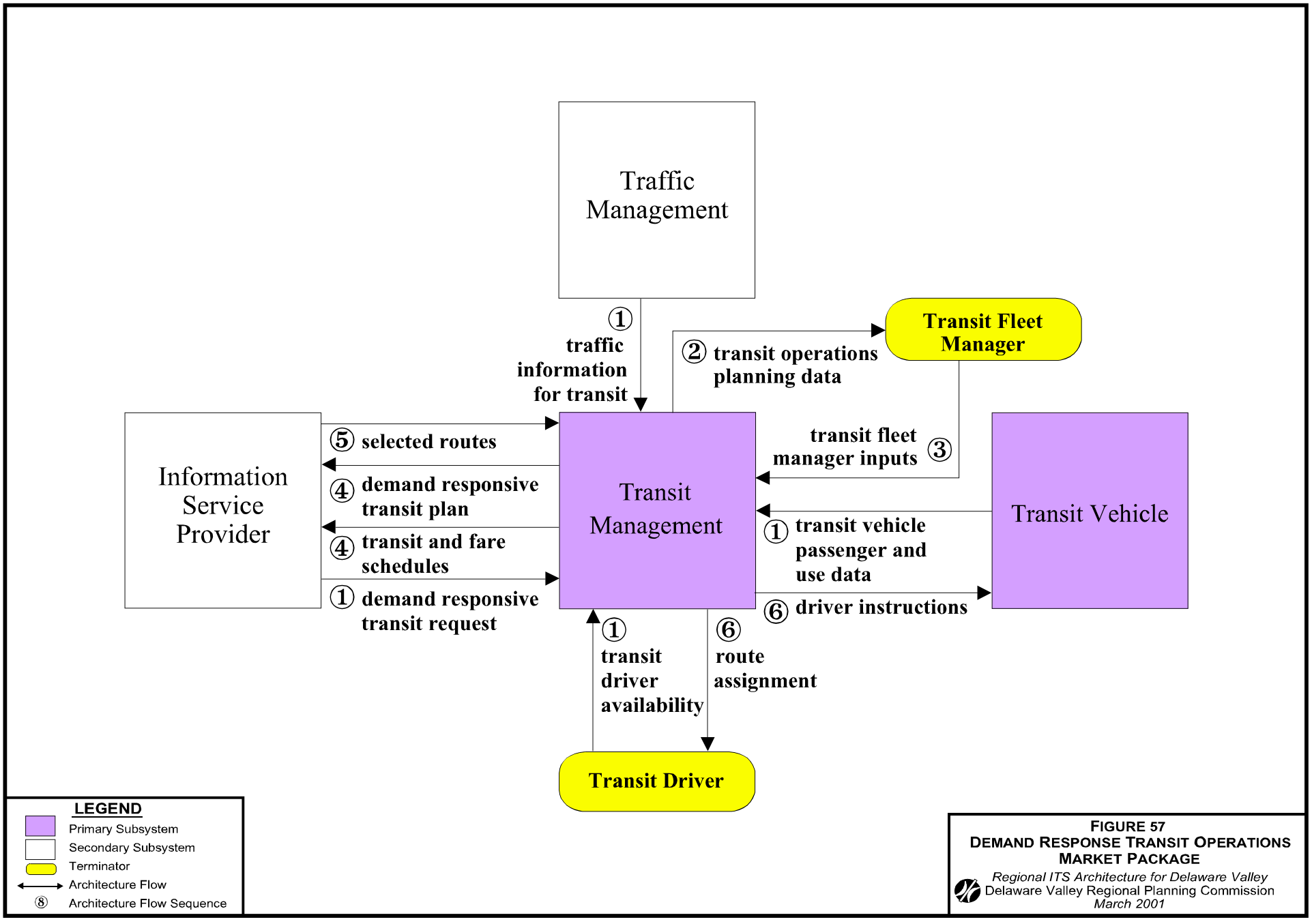


FIGURE 57
DEMAND RESPONSE TRANSIT OPERATIONS MARKET PACKAGE

Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Multi-Modal Coordination

Market Package Priority: Medium

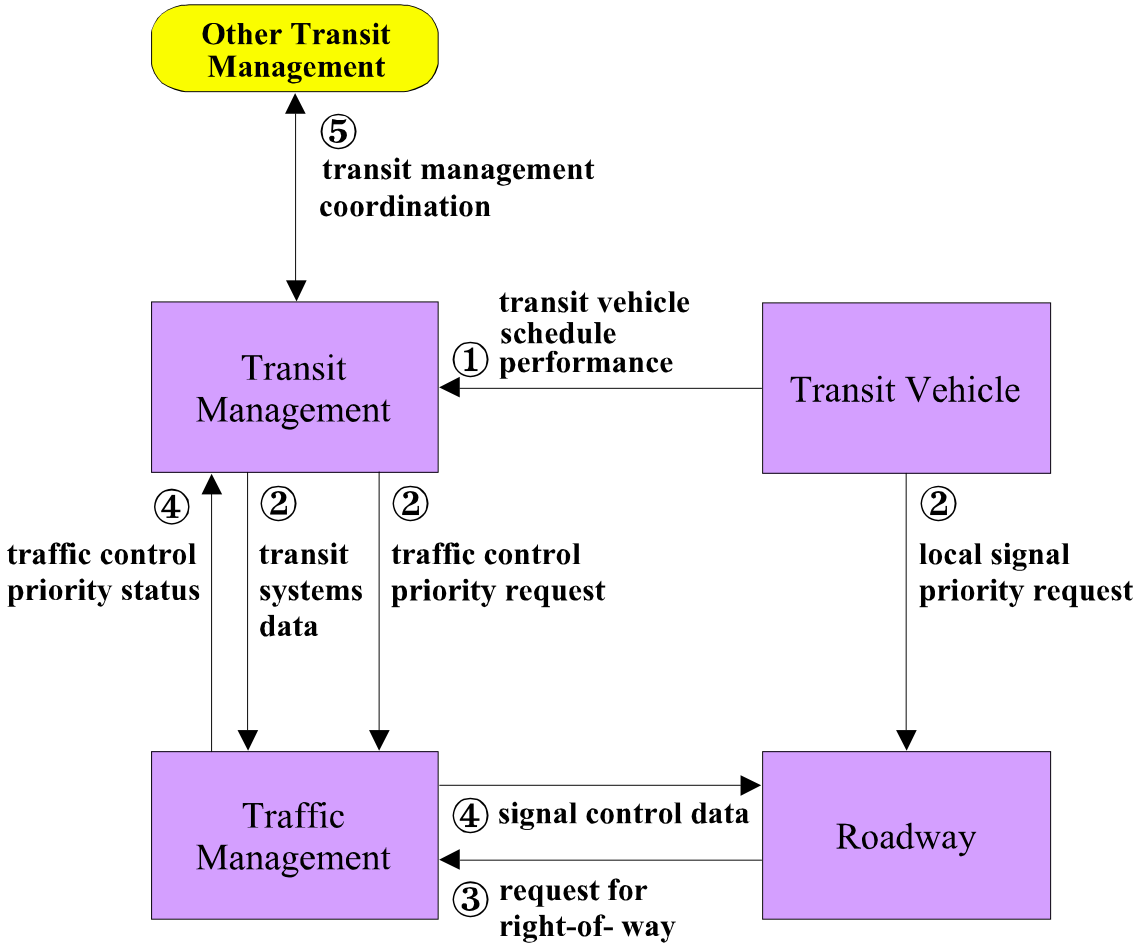
Purpose and Function:
This market package establishes two way communications between transit and traffic agencies with the intent to improve on-time performance of the transit system. More limited local control between transit vehicles and individual intersections is enabled by this market package.

Required capabilities:
Regional Traffic Control, Demand Responsive Transit Operations, Transit Fixed Route Operations

Data Sharing:
None.

Operations:
1. The Transit Vehicle Subsystem sends to the Transit Management Subsystem information on vehicle schedule performance, such as whether a vehicle is on time.
2. The Transit Management Subsystem sends a request for traffic control priority for a particular route or intersection to the Traffic Management Subsystem. The Transit Management Subsystem also sends to the Traffic Management Subsystem system operations information indicating current transit routes, the level of service on each route, and the progress of individual vehicles along their routes. For more isolated intersections, the Transit Vehicle Subsystem requests signal priority directly at the intersection.
3. The Roadway Subsystem notifies the Traffic Management Subsystem of a signal right-of-way request.
4. The Traffic Management Subsystem decides whether to grant the right-of-way request, and it sends signal control data to the Roadway Subsystem. It also notifies the Transit Management Subsystem if priority is given.
5. On a continual basis, Transit Management Subsystems coordinate among themselves, sharing information on schedules, schedule adherence, and ridership.

User Service Requirements Implemented:
Traffic Control, Public Transportation Management, Travel Demand Management



LEGEND

- Primary Subsystem
- Secondary Subsystem
- Terminator
- Architecture Flow
- ⑧ Architecture Flow Sequence

FIGURE 58
MULTI-MODAL COORDINATION MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Freight Administration

Market Package Priority: High

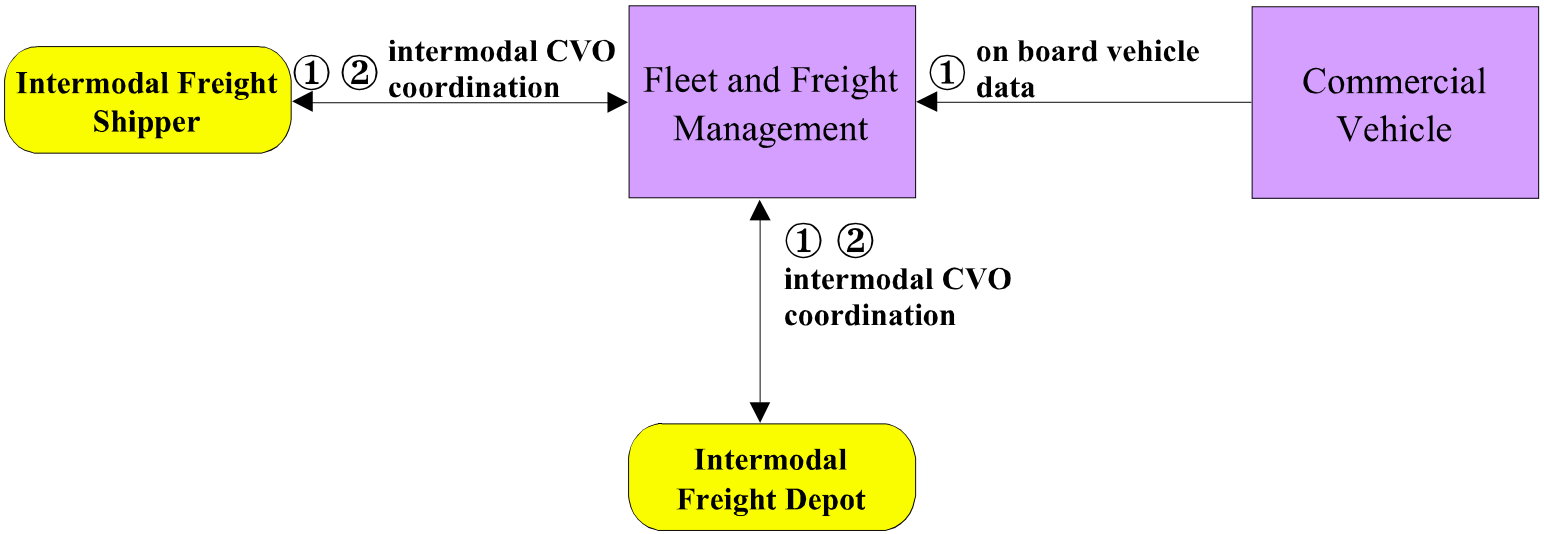
Purpose and Function:
This market package tracks cargo and the cargo condition with information communicated to the Fleet and Freight Management Subsystem. Interconnections are provided to Intermodal Shippers and Intermodal Freight Depots.

Required Capabilities:
Fleet Administration

Data Sharing:
HAZMAT Management

Operations:
1. On-board vehicle data, including cargo movement logs and cargo identification, is sent to the Fleet and Freight Management Subsystem from the Commercial Vehicle Subsystem. Intermodal Freight Shippers and Intermodal Freight Depots request commercial vehicle information either as a one-time request or on a subscription basis.
2. Intermodal Freight Shippers and Intermodal Freight Depots a receive information on the status of the vehicle and its cargo from the Fleet and Freight Management Subsystem.

User Service Requirements Implemented:
Hazardous Material Incident Response



LEGEND

- Primary Subsystem
- Secondary Subsystem
- Terminator
- Architecture Flow
- ⑧ Architecture Flow Sequence

FIGURE 59
FREIGHT ADMINISTRATION MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Electronic Clearance

Market Package Priority: High

Purpose and Function:
This market package provides for automated clearance at roadside check facilities. The roadside check facility receives carrier, vehicle, and driver data from the Commercial Vehicle Administration Subsystem, permitting a good driver/vehicle/carrier to pass roadside facilities at highway speeds.

Required Capabilities:
Commercial Vehicle Administrative Process

Data Sharing:
Roadside CVO Safety, Weight-in-Motion

Operations:
1. The Commercial Vehicle Check Subsystem requests tax and credential information, including regional or inter-state pre-clearance data, from passing commercial vehicles. The Commercial Vehicle Check Subsystem periodically requests the latest credential information from the Commercial Vehicle Administration Subsystem. The Commercial Vehicle Administration Subsystem solicits credential information from Commercial Vehicle Administration Subsystems in other states.
2. Commercial Vehicle Driver updates trip and credential information in the Commercial Vehicle Subsystem. The Commercial Vehicle Administration Subsystem sends credential information to Commercial Vehicle Check Subsystem.
3. The Commercial Vehicle Subsystem sends credential information to the Vehicle Check Subsystem.
4. Based upon information received from the Commercial Vehicle Administration Subsystem and the Commercial Vehicle Subsystem, the Commercial Vehicle Check Subsystem will determine whether to permit a vehicle to pass or to require the vehicle to pull in. Commands are sent to the Commercial Vehicle Subsystem or directly to the driver to pull into the inspection station for inspection and/or verification.
5. A Commercial Vehicle Inspector can manually override the automated pass/pull in signage.
6. Reports of inspection activity and any violations are sent to the Commercial Vehicle Administration Subsystem from the Commercial Vehicle Check Subsystem.
7. The Commercial Vehicle Administration updates its database and sends the updated data to the Commercial Vehicle Check Subsystem. Activity reports are also sent to the Fleet and Freight Management Subsystem. The Commercial Vehicle Subsystem also updates its activity records.

User Service Requirements Implemented:
Commercial Vehicle Electronic Clearance, Commercial Vehicle Administrative Process

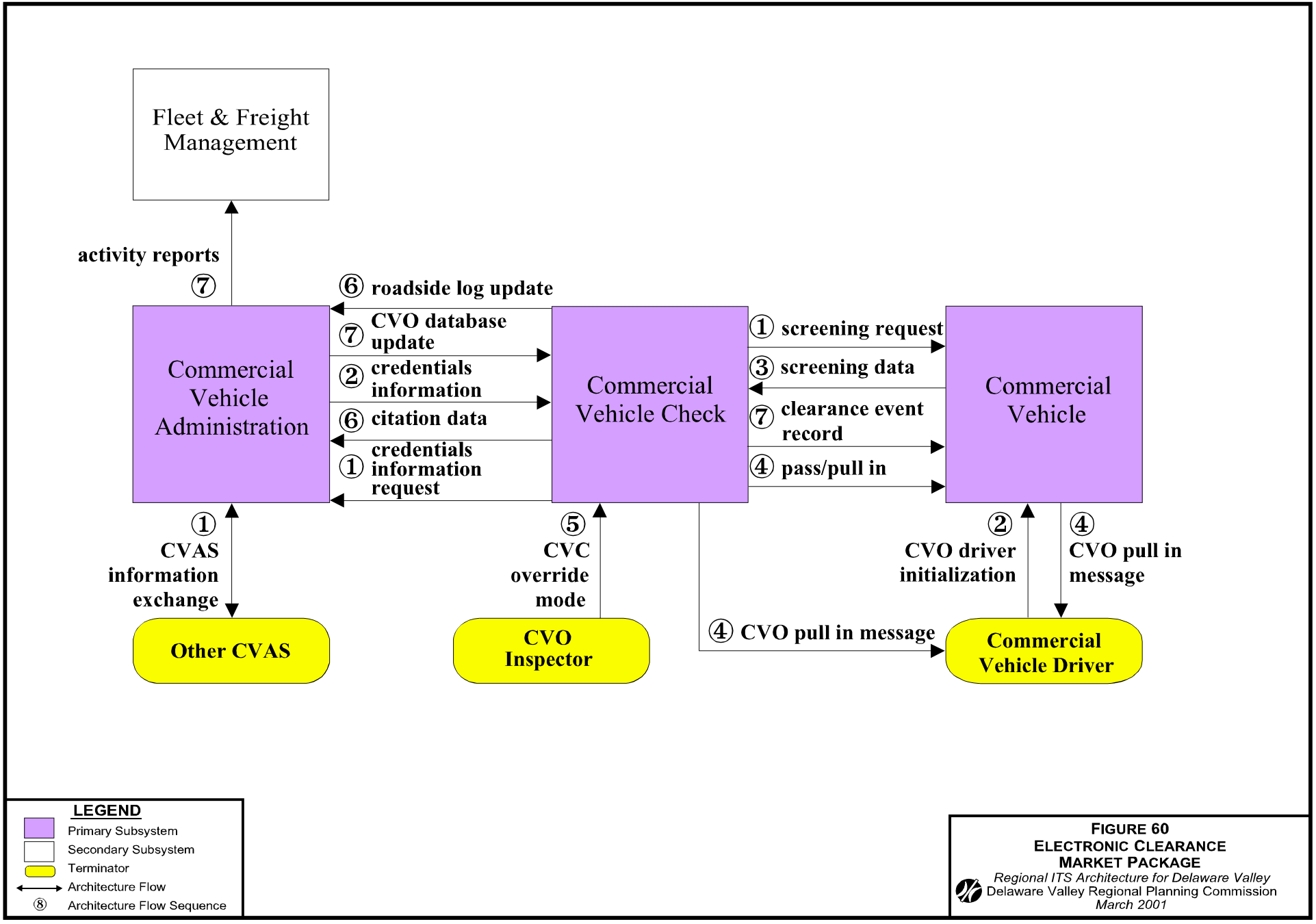


FIGURE 60
ELECTRONIC CLEARANCE MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Commercial Vehicle Administrative Process

Market Package Priority: High

Purpose and Function:
This market package provides for electronic application, processing, fee collection, issuance, and distribution of commercial vehicle operations credential and tax filings. Through this process, carriers, drivers, and vehicles may be enrolled in an electronic clearance program.

Required Capabilities:
None.

Data Sharing:
Fleet Administration, Electronic Clearance

Operations:
1. The Commercial Vehicle Administration Subsystem requests and receives carrier safety ratings, tax and credential fee information, and other regulatory information from regulatory agencies. The Commercial Vehicle Administration Subsystem also exchanges similar information with Commercial Vehicle Administration Subsystems in other states.
2. The Fleet and Freight Management Subsystem requests and receives accident information and clearance and safety information that was obtained at roadside stops. This can be a one time request or an on-going subscription with the Commercial Vehicle Administration Subsystem.
3. The Fleet and Freight Management Subsystem applies for and receives electronic credentials from the Commercial Vehicle Administration Subsystem.
4. The Fleet and Freight Management Subsystem deducts the cost of payment for electronic credential filings and taxes from a payment instrument.
5. Alternatively, the Commercial Vehicle Administration Subsystem can obtain payment for the cost of electronic credentials and tax payments from a financial institution.
6. To support credential and safety functions, the Commercial Vehicle Administration Subsystem may periodically require additional information from Other Commercial Vehicle Administration Subsystems.
7. If safety violations are found, the Commercial Vehicle Administration Subsystem wil request and receive license information from the Department of Motor Vehicles.

User Service Requirements Implemented:
Electronic Payment Services, Commercial Vehicle Electronic Clearance, Commercial Vehicle Administrative Process

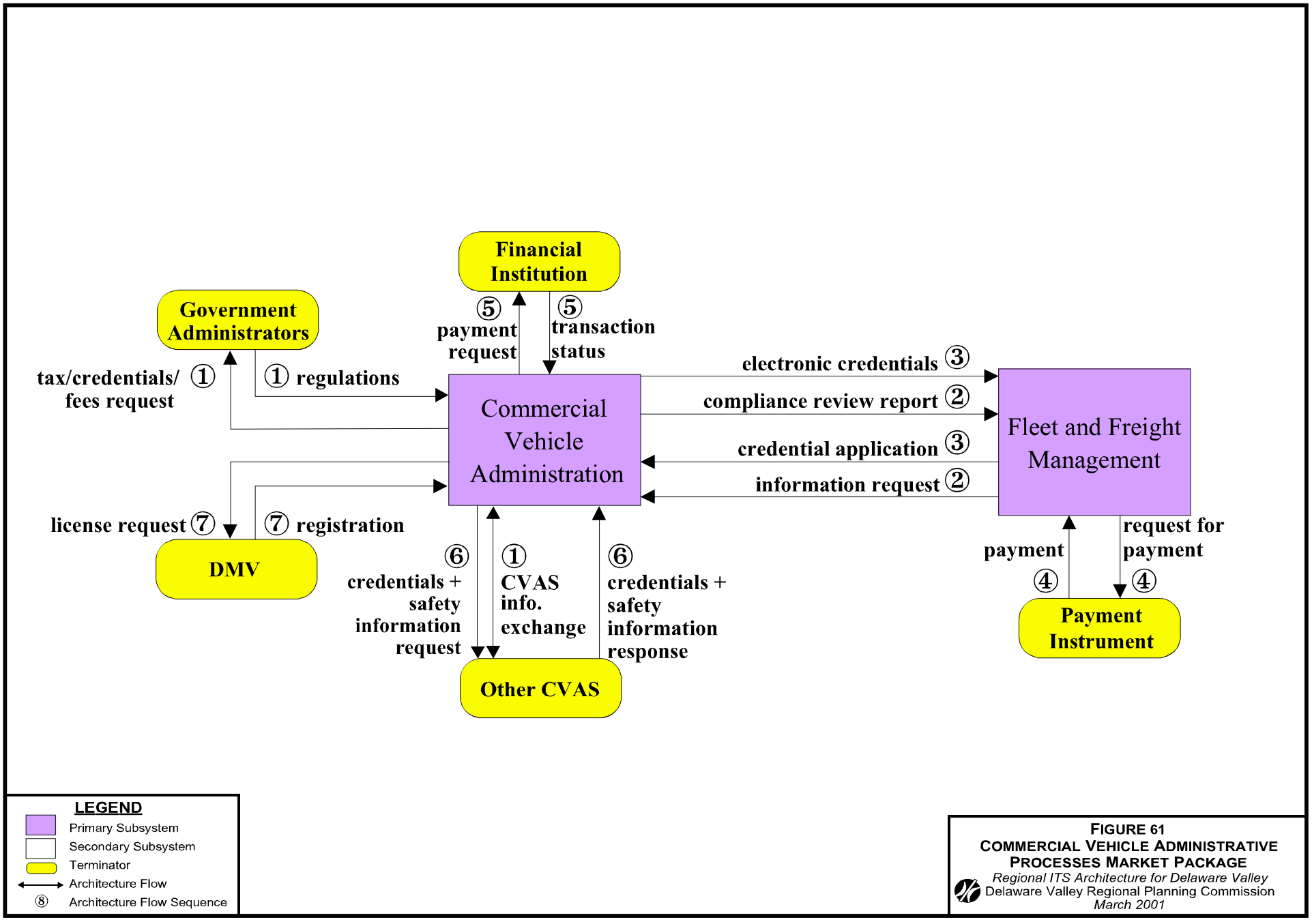


FIGURE 61
COMMERCIAL VEHICLE ADMINISTRATIVE PROCESSES MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Weigh-In-Motion

Market Package Priority: High

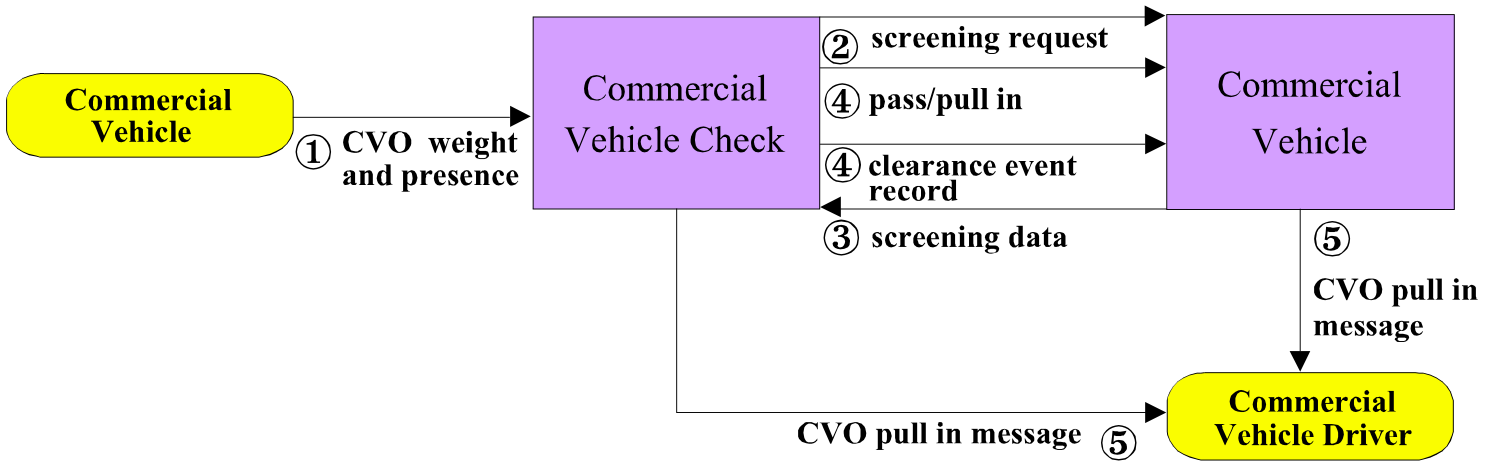
Purpose and Function:
This market package provides for high speed weigh-in-motion. It primarily provides commercial vehicle check stations with additional equipment to support automatic vehicle inspections.

Required Capabilities:
None.

Data Sharing:
Electronic Clearance

Operations:
1. A weigh-in-motion device measures the presence and weight of commercial vehicles. This information is sent to the Commercial Vehicle Check Subsystem.
2. The Commercial Vehicle Check Subsystem requests information about the vehicle and its cargo.
3. Results of the screening is sent back to the Commercial Vehicle Check Subsystem.
4. After evaluating the information supplied by the vehicle and its measured weight, the Commercial Vehicle Check Subsystem determines whether to pass or pull in a vehicle. Results of this screening is passed back to the Commercial Vehicle Subsystem. A record of the screening is sent to the Commercial Vehicle Subsystem.
5. If a vehicle is to be pulled in, a message is sent to the commercial vehicle driver requesting the driver to pull in for an inspection.

User Service Requirements Implemented:
Commercial Vehicle Electronic Clearance



LEGEND

- Primary Subsystem
- Secondary Subsystem
- Terminator
- Architecture Flow
- ⑧ Architecture Flow Sequence

FIGURE 62
WEIGH-IN-MOTION
MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Roadside Commercial Vehicle Operations Safety

Market Package Priority: High

Purpose and Function:
This market package provides for automated roadside safety monitoring and reporting. It automates commercial vehicle safety inspections at the commercial vehicle check station. It also 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.

Required Capabilities:
Commercial Administrative Process, Electronic Clearance

Data Sharing:
On-Board CVO Safety

Operations:
1. The Commercial Vehicle Administration Subsystem solicits safety information from Commercial Vehicle Administration Subsystems in other states. A weigh-in-motion device measures the presence and weight of commercial vehicles and sends this information to the Commercial Vehicle Check Subsystem. The Commercial Vehicle Driver updates trip and credential information in the Commercial Vehicle Subsystem.
2. The Commercial Vehicle Subsystem sends information about its credentials, cargo and its safety record to the Commercial Vehicle Check Subsystem.
3. Based upon information received from the Commercial Vehicle Administration Subsystem, the Commercial Vehicle Subsystem, and the weigh-in-motion detector, the Commercial Vehicle Check Subsystem decides whether to permit a vehicle to pass or to require the vehicle to pull in. Commands are sent to the Commercial Vehicle Subsystem or directly to the driver to pull into the inspection station.
4. A Commercial Vehicle Inspector can manually override the automated pass/pull-in signage.
5. Reports of inspection activity and any violations are sent to the Commercial Vehicle Subsystem.
6. During the safety inspection, the Commercial Vehicle Check Subsystem may request safety information about a vehicle from the Commercial Vehicle Administration Subsystem.
7. The Commercial Vehicle Check Subsystem sends a log of activities and inspections to the Commercial Vehicle Administration Subsystem. The Commercial Vehicle Administration Subsystem updates its database with inspection and safety information and sends the updated database to the Commercial Vehicle Check Subsystem.

User Service Requirements Implemented:
Automated Roadside Safety Inspection

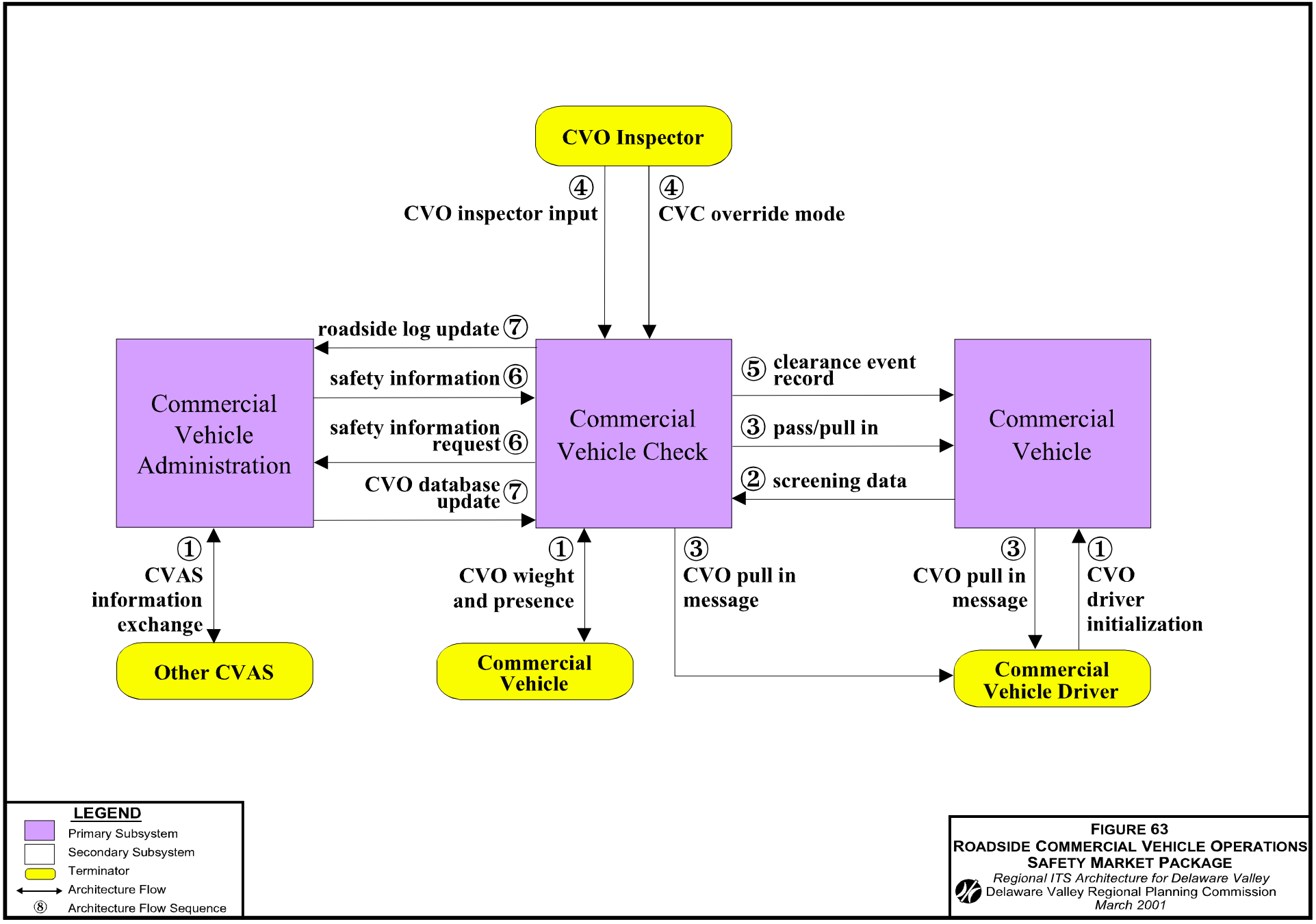


FIGURE 63
ROADSIDE COMMERCIAL VEHICLE OPERATIONS SAFETY MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

HAZMAT Management

Market Package Priority: High

Purpose and Function:
This market package integrates incident management capabilities with commercial vehicle tracking. HAZMAT tracking is performed by the Fleet and Freight Management Subsystem. This HAZMAT information can be provided prior to the beginning of the trip or gathered following an incident.

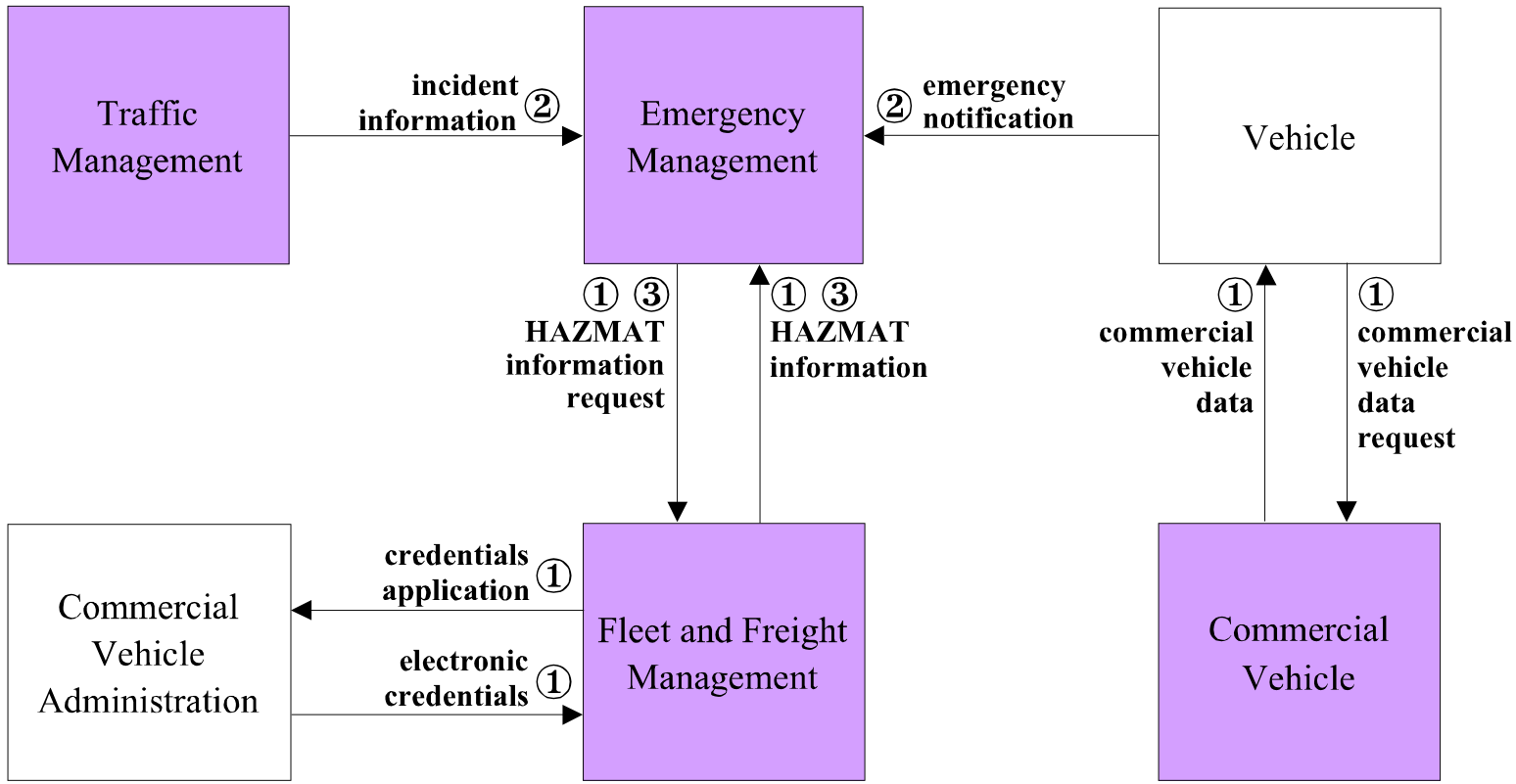
Required Capabilities:
Mayday Support, Freight Administration, Fleet Administration

Data Sharing:
Emergency Response, On-Board CVO Safety

Operations:

1. The Vehicle Subsystem is given information about the vehicle's cargo. Information about a vehicle, its cargo and a particular trip are stored electronically. At the request of the Emergency Management Subsystem, the Fleet and Freight Management Subsystem supplies the Emergency Management Subsystem with information on HAZMAT cargos and their vehicle routing.
2. When an incident occurs, the Vehicle Subsystem issues an emergency request for assistance to the Emergency Management Subsystem. At a minimum the request will containing information about the vehicle's location, more advanced systems could contain information about the accident and severity. When the Traffic Management Subsystem identifies an accident, it notifies the Emergency Management Subsystem.
3. When the Emergency Management Subsystem determines a HAZMAT carrying vehicle is involved in an incident, it requests and receives information about that particular HAZMAT load from the Fleet and Freight Management Subsystem.

User Service Requirements Implemented:
Incident Management, Hazardous Material Incident Response, Emergency Notification and Personal Security



LEGEND

- Primary Subsystem
- Secondary Subsystem
- Terminator
- Architecture Flow
- ⑧ Architecture Flow Sequence

FIGURE 64
HAZMAT MANAGEMENT MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Fleet Administration

Market Package Priority: Medium

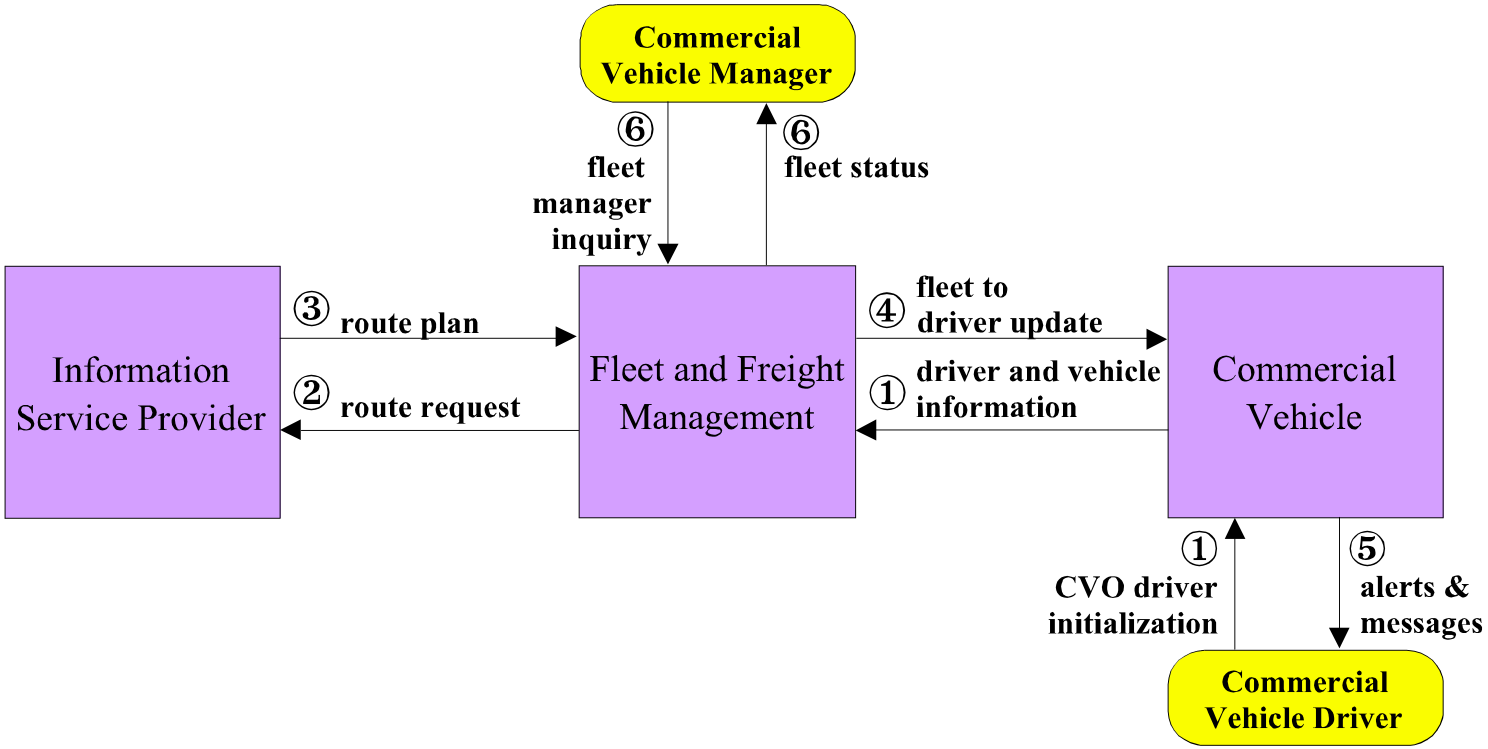
Purpose and Function:
This market package keeps track of vehicle location, itineraries, and fuel usage at the Fleet and Freight Management Subsystem. It provides the vehicle with dispatch instructions, and can process and respond to requests for assistance and general information from the vehicle. It also provides the Fleet Manager with connectivity to intermodal transportation providers.

Required Capabilities:
Freight Administration

Data Sharing:
CV Administrative Process, CVO Fleet Maintenance

Operations:
1. The Commercial Vehicle Driver updates information about the vehicle, credentials, and about a particular trip. Relevant information is relayed from the Commercial Vehicle Subsystem to the Fleet and Freight Management Subsystem.
2. A request for tailored routes based on given constraints is sent to the Information Service Provider.
3. The Information Service Provider provides routing information to the Fleet and Freight Management Subsystem.
4. Updated instructions are sent to the Commercial Vehicle Subsystem, including dispatching, routing, and special instructions.
5. Specific alerts and messages are relayed to the driver from the Commercial Vehicle Subsystem.
6. The Commercial Vehicle Manager is updated with routing information, current vehicle information, and emergency information.

User Service Requirements Implemented:
Commercial Fleet Management



LEGEND

- Primary Subsystem
- Secondary Subsystem
- Terminator
- Architecture Flow
- ⑧ Architecture Flow Sequence

FIGURE 65
FLEET ADMINISTRATION
MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

On-Board Commercial Vehicle Operation Safety

Market Package Priority: Medium

Purpose and Function:
This market package provides for on-board commercial vehicle safety monitoring and reporting. It enhances the roadside Commercial Vehicle Operations Safety Monitoring market package.

Required Capabilities:
Roadside CVO Safety

Data Sharing:
Vehicle Safety Monitoring

Operations:
1. The Commercial Vehicle Check Subsystem requests and receives safety information from the Commercial Vehicle Administration Subsystem. The Commercial Vehicle Subsystem continually receives safety information from on-board safety sensors.
2. The Commercial Vehicle Check Subsystem obtains on-board safety data from a passing commercial vehicle.
3. Based upon information received from the Commercial Vehicle Administration Subsystem and the on-board safety information, the Commercial Vehicle Check Subsystem will decide whether to permit a vehicle to pass or to require the vehicle to pull in. Commands are issued to the Commercial Vehicle Subsystem or directly to the driver for the vehicle to pull into the inspection station.
4. A Commercial Vehicle Inspector can manually override the automated pass/pull in signage.
5. Safety inspection information is sent to the Commercial Vehicle Subsystem for its records.
6. The Commercial Vehicle Check Subsystem sends a log of its activities and inspections to the Commercial Vehicle Administration Subsystem. The Commercial Vehicle Administration Subsystem updates its database with inspection and safety information and sends the updated database to the Commercial Vehicle Check Subsystem.

User Service Requirements Implemented:
On-Board Safety Monitoring

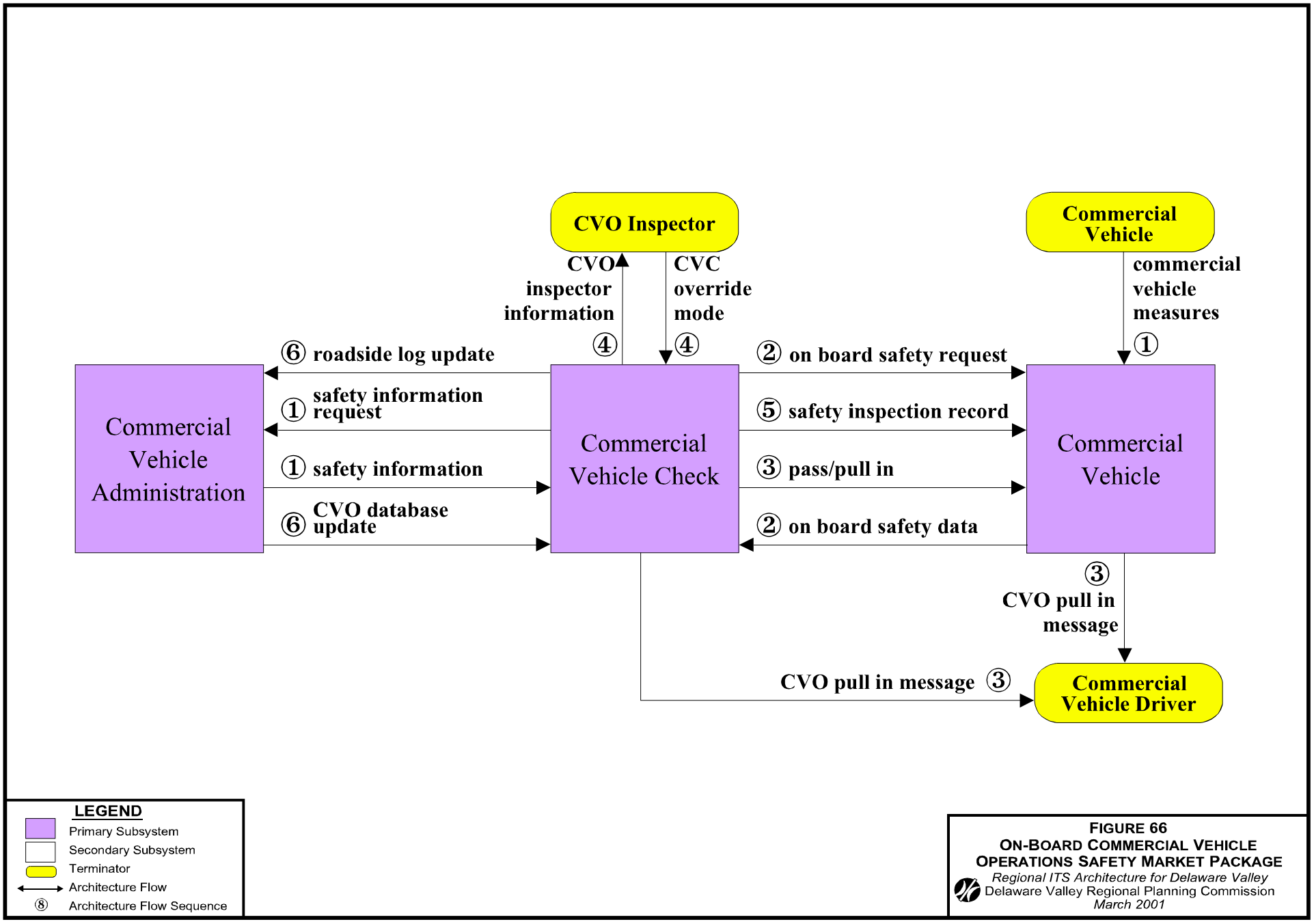


FIGURE 66
ON-BOARD COMMERCIAL VEHICLE OPERATIONS SAFETY MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Commercial Vehicle Operation Fleet Maintenance

Market Package Priority: Medium

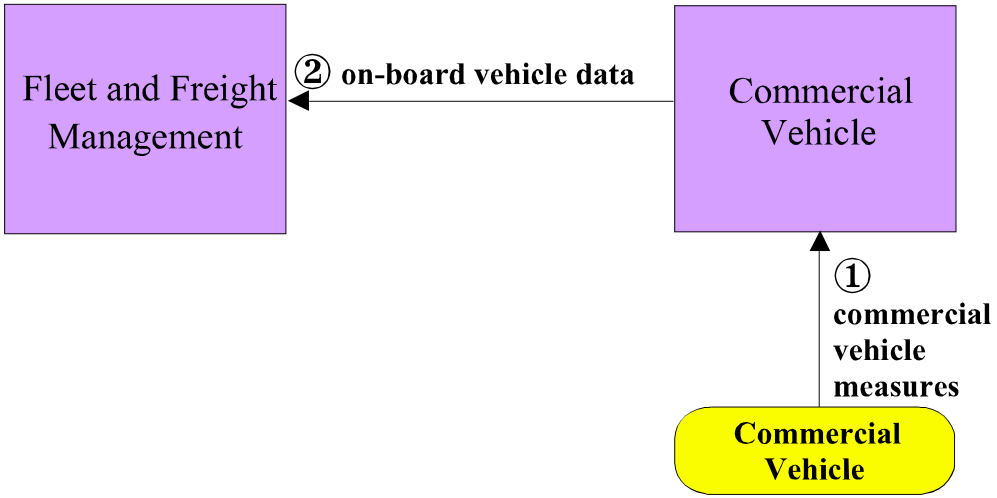
Purpose and Function:
This market package supports the maintenance of commercial vehicle fleets through close interface with on-board monitoring equipment and automated vehicle location capabilities. Records of vehicle mileage, repairs, and safety violations are maintained to assure safe vehicles on the highways.

Required Capabilities:
Fleet Administration

Data Sharing:
On-Board CVO Safety

Operations:
1. On-board sensing information from sensors provide diagnostic information on brake, throttle, steering conditions, etc. to the Commercial Vehicle Subsystem.
2. The Condition of the commercial vehicle is sent to the Fleet and Freight Management Subsystem by the Commercial Vehicle Subsystem.

User Service Requirements Implemented:
Automated Roadside Safety Inspection, On-Board Safety Monitoring, Commercial Fleet Management



LEGEND

- Primary Subsystem
- Secondary Subsystem
- Terminator
- Architecture Flow
- ⑧ Architecture Flow Sequence

FIGURE 67
COMMERCIAL VEHICLE OPERATIONS FLEET MAINTENANCE MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

ITS Data Mart

Market Package Priority: Medium

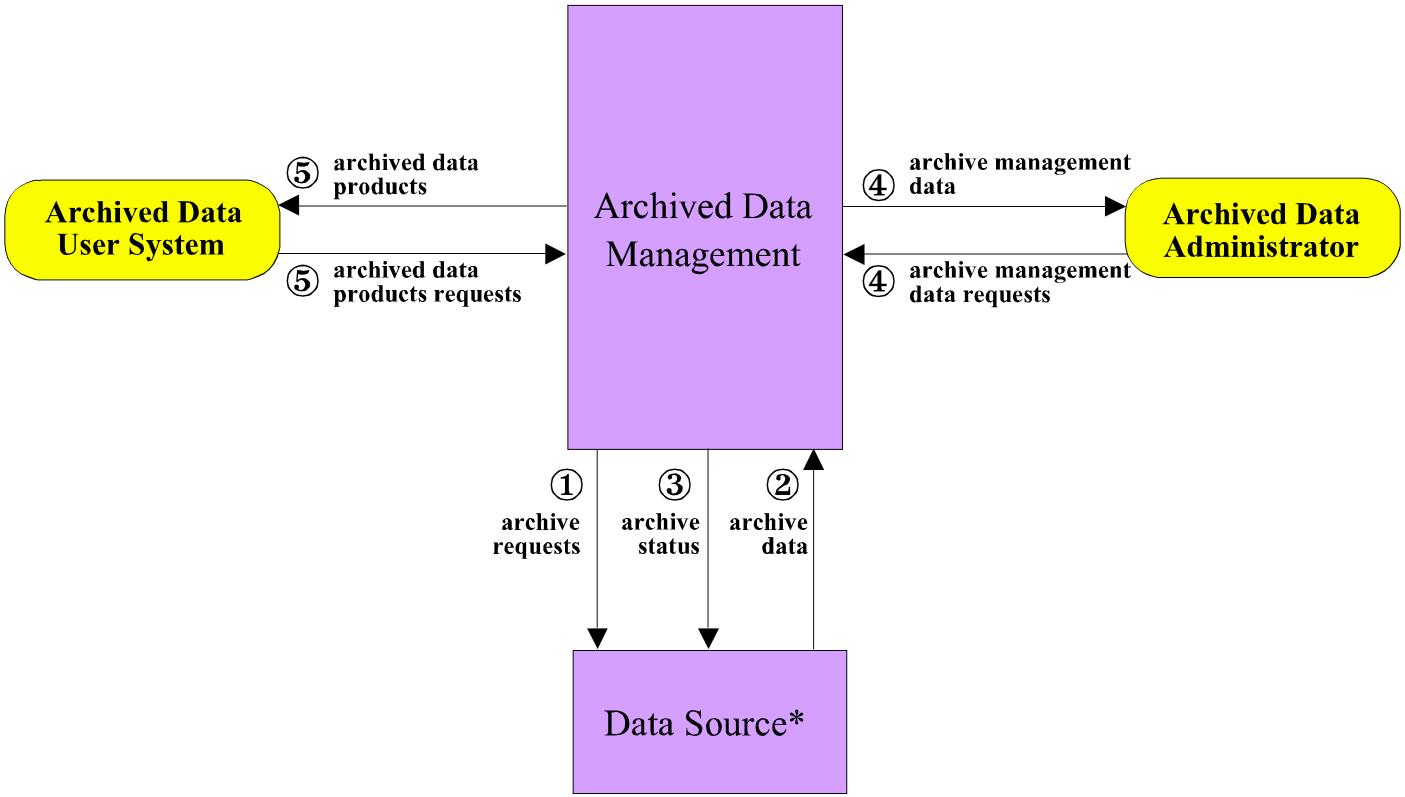
Purpose and Function:
This market package supports the housing of data collected and owned by a single agency, private sector provider, research institution, or other organizations. The archive typically includes data covering a single transportation mode that is collected from an operational data source 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.

Required Capabilities:
None.

Data Sharing:
ITS Data Warehouse, ITS Virtual Data Warehouse

Operations:
1. The Archived Data Management Subsystem makes a request to a data source such as a subsystem or terminator. The request can ask for information on available data or it can define the data to be archived. It can be a one-time event or a subscription for continuous data.
2. The requested information is sent from the data source to the Archived Data Management Subsystem. The type of data to be provided varies by data source. The content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.
3. The Archived Data Management Subsystem will notify the data source about any problems associated with the data, such as erroneous or suspicious data.
4. The Archived Data Administrator makes queries to ascertain the status of the archived data. The Archived Data Management Subsystem supplies the Archived Data Manager with reports on the condition and quality of the archived data, status of the data collection process, and reports that monitor archive usage.
5. Users can request and receive products from the Archived Data Management Subsystem.

User Service Requirements Implemented:
Traffic Control, Public Transportation Management, Archived Data Function, Travel Demand Management



LEGEND

- Primary Subsystem
- Secondary Subsystem
- Terminator
- Architecture Flow
- ⑧ Architecture Flow Sequence

* Data Source can consist of information from a subsystem or a terminator.

FIGURE 68
ITS DATA MART MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

ITS Data Warehouse

Market Package Priority: Medium

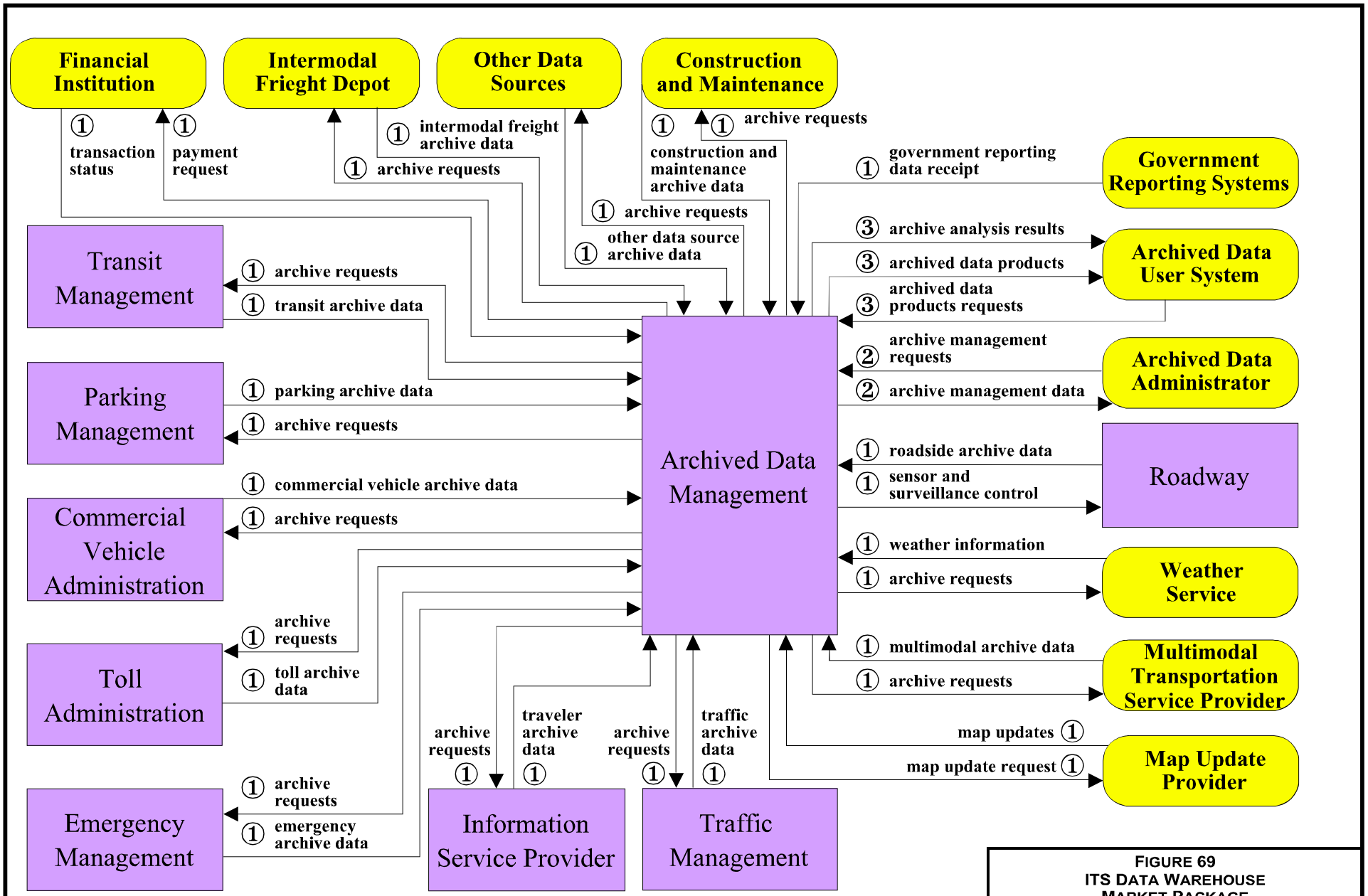
Purpose and Function:
This market package includes all the data collection and management capabilities provided by the ITS Data Mart, and adds the functionality and interface definitions that allow collection of data from multiple agencies and data sources spanning across modal and jurisdictional boundaries. It performs the additional transformations and provides the additional meta data management features that are necessary so that all of this data can be managed in a single repository with consistent formats.

Required Capabilities
ITS Data Mart

Data Sharing:
ITS Virtual Data Warehouse

Operations:
1. The Archived Data Management Subsystem makes a request to one or more data sources, consisting of subsystems and terminators. The request can ask for information on available data or define the data to be archived. It can be a one-time event or a subscription for continuous data. The requested information is sent from the data source(s) to the Archived Data Management Subsystem. The type of data sent varies by data source.
2. The Archived Data Administrator makes queries to ascertain the status of the archived data. The Archived Data Management Subsystem supplies the Archived Data Manager with reports on the condition and quality of the archived data, status of the data collection process, and reports that monitor archive usage.
3. Users request and receive products from the Archived Data Management Subsystem.

User Service Requirements Implemented:
Traffic Control, Public Transportation Management, Archived Data Function, Travel Demand Management



*Legend: Please refer to previous figures of this type.

FIGURE 69
ITS DATA WAREHOUSE MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

ITS Virtual Data Warehouse

Market Package Priority: Medium

Purpose and Function:
This market package provides the same broad access to multimodal, multidimensional data from varied data sources as in the ITS Data Warehouse market package, but provides this access using enhanced interoperability between physically distributed ITS archives that are each locally managed. Requests for data to a single repository are analyzed by local archives and dynamically translated to remote archives which relay the data necessary to satisfy the request.

Required Capabilities:
ITS Data Mart

Data Sharing:
None.

Operations:
1. Users request products from the Archived Data Management Subsystem.
2. The Archived Data Management Subsystem determines which archive stores the requested information, it then queries the appropriate archive.
3. When it receives the information, it relays the archive product to the Archived Data User System.
4. The Archived Data Management request the latest mapping updates to serve as base maps upon which it can display archived data products.
5. The Archived Data Administrator makes inquires to ascertain the status of the archived data. The Archived Data Management Subsystem supplies the Archive Data Manager with reports on the condition and quality of the archived data, status of the data collection process, and reports that monitor archive usage.

User Service Requirements Implemented:
Traffic Control, Public Transportation Management, Archived Data Function, Travel Demand Management

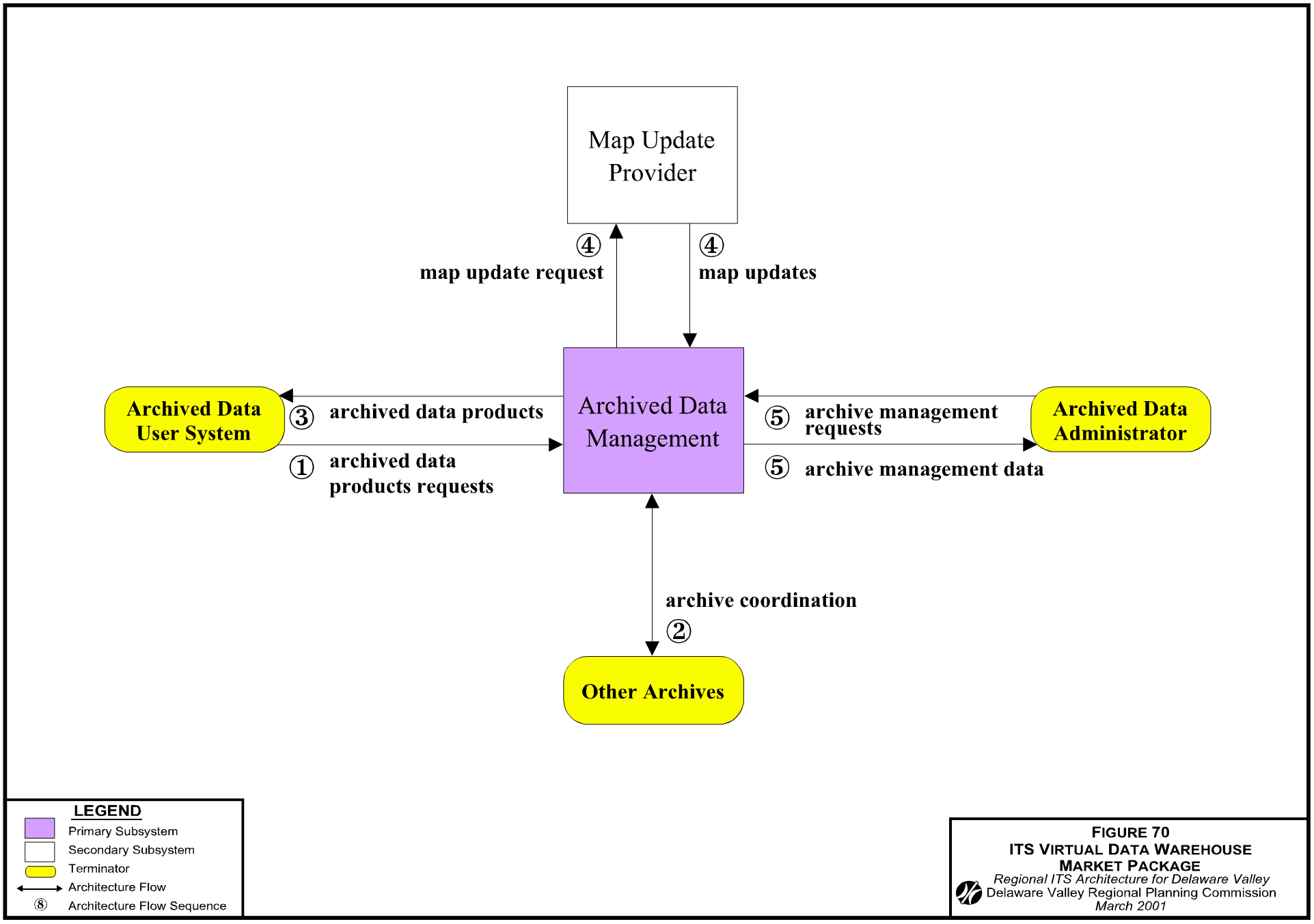


FIGURE 70
ITS VIRTUAL DATA WAREHOUSE MARKET PACKAGE
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

VIII. NATIONAL ITS STANDARDS

TEA-21, which established the goal of national interoperability, directed US DOT to develop ITS standards and protocols to accomplish this mandate. Accordingly, US DOT requires that all Regional ITS Architectures funded through the Highway Trust Fund must conform to the National ITS Architecture and applicable ITS standards. Furthermore, the ITS consistency requirements, issued by US DOT, requires Regional ITS Architectures identify all national ITS standards applicable to their architecture.

Standards can be defined as documented agreements containing technical specifications or other precise criteria to be used consistently as rules or guidelines to ensure that materials, products, or processes and services fit their purposes. Standards specify how to do things consistently to speed acceptance and development of products and services, enable compatibility, interchangeability and interoperability, contain costs, minimize confusion, and assure quality. Standards benefit users by providing the ability to obtain components from different manufacturers and lower prices through increased competition in the marketplace, which results in compatibility and interoperability. Standards benefit producers by encouraging investment and involvement, lowering market risk and product liability risk, and by helping to build confidence in marketplace stability.

The goal is to accelerate the development of consensus ITS standards, thereby helping to ensure interoperability and to foster widespread use of ITS. Developing a uniform set of standards is more cost effective and is essential in creating national consistency. With the use of ITS standards, transportation agencies can implement systems to cost-effectively exchange data and accommodate equipment replacements, systems upgrades, and system expansions. The traveling public benefits from ITS standards through products that function consistently and reliable anywhere in the country. The standards contribute to a safer and more efficient transportation system, facilitate national and regional interoperability, and promote the creation of an innovative and competitive market for transportation services and products. As new standards are developed and current standards are deployed and tested, new technologies are constantly being introduced. Therefore, standards can be added, modified, or discontinued as ITS progresses into the future.

US DOT's Joint Program Office is responsible for the development, testing, and implementation of national ITS standards. Early in the development process they recognized that for the standards to be successful, an extensive outreach program involving a wide variety of stakeholders would be

necessary. To accomplish this goal they delegated standards development to Standards Development Organizations (SDO). SDOs are composed of professional and engineering societies, industry associations, standards-specific organizations, and special charters. Each organization is typically responsible to some specific community. The following agencies are responsible for the development of ITS standards used in the Regional ITS Architecture:

- American Association of State Highway and Transportation Officials (AASHTO)
- American National Standards Institute (ANSI)
- American Society for Testing and Materials (ASTM)
- Institute of Electrical and Electronic Engineers (IEEE)
- Institute of Transportation Engineers (ITE)
- National Electrical Manufacturers Association (NEMA)
- Society of Automotive Engineers (SAE)

A comprehensive list of all promulgated ITS standards applicable to the Regional ITS Architecture for the Delaware Valley is contained in Appendix F. Standards are related to specific architecture flows between subsystems or between subsystems and terminators. Each architecture flow has an associated standard. However, a particular standard can apply to more than one architecture flow. The standard identity is represented by the standard development organization and a numerical reference. The standard title is composed of a descriptive title of the standard and the SDO name.

To demonstrate how to interpret Appendix F, one standard for a single architectural flow is replicated in Table 19. The source of the architecture flow is the Emergency Management Subsystem and the destination is the Information Service Provider Subsystem. In ITS terminology, an emergency management (EM) agency is providing incident information to an ISP. The standard is documented by an ID (AASHTO-21) and a Title (NTCIP - Octet Encoding Rules), and was developed by the American Association of State Highway and Transportation Officials.

TABLE 19: SAMPLE NATIONAL ARCHITECTURE STANDARDS

Source	Destination	Architecture Flow	Standard ID	Standard Title	SDO
EM	ISP	incident information	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO

IX. IMPLEMENTATION STRATEGY

The implementation strategy consists of three elements: a regional approach to information sharing and operational coordination, an ITS deployment plan, and a mechanism to modify and update the Regional ITS Architecture.

Philadelphia Regional Integrated Multi-modal Information Sharing (PRIMIS)

Recognizing the difficulties in sharing information and facilitating interagency coordination, the ITS Technical Task Force developed a framework for institutional coordination of ITS in the Delaware Valley. This framework provides the region's ITS stakeholders with opportunities to share and disseminate information on travel conditions and coordinate responses to incidents or other unusual conditions. It is a three-phase concept entitled Philadelphia Regional Integrated Multi-modal Information Sharing (PRIMIS).

The first phase is envisioned as an initial low-tech, non-capital intensive approach to building the relationships among the stakeholders necessary for effective coordination. It is essentially a continuation of existing conditions but with much greater emphasis on fostering interagency contacts. As such, the Regional ITS Architecture can be used as a guide to identify which agencies need to coordinate with each other. Since no application of advanced technology is envisioned, there is no need to refine the architecture for PRIMIS Phase I.

Phase II represents a concept that utilizes and focuses the I-95 Corridor Coalition's Information Exchange Network to facilitate communications using a computer message/digital message system to notify agencies about incidents or unusual conditions that affect them. The information will be used to support coordinated transportation management through a component of the I-95 IEN that is focused on the Delaware Valley. As envisioned, the highway and rail network of the I-95 IEN will be modified to increase the number of transportation facilities in the Delaware Valley and increase accessibility to the IEN by additional organizations. Workstations will be located at operation centers or other designated stakeholder sites. The workstations can be connected to one another via the I-95 Corridor Coalition's wide area network (WAN). Each agency would provide local information via their workstation. The workstations handle the transport of agency data (via the communications network) to a regional server(s) where it is combined with data from other agencies.

The regional server(s) then distributes the regional/corridor information to each agency for display on their IEN workstation.

Phase III represents an enhancement over the IEN by incorporating an interactive database and graphical user interface to view congestion levels, incident information, and video feeds from various partners. Besides information sharing, the WAN will provide a mechanism for operating agencies to confidentially share information and request assistance from each other. From a communications perspective, the interactive database will use Internet protocols and off-the-self software to transmit and store information including graphics, database updates, video feeds, and e-mail messages. Translation software at each agency's workstation will merge individual agency databases into the regional database. A website with real-time regional travel information and condition data will be developed. However, migration to the third phase of this concept is not a given. If Phase II sufficiently meets the region's goals of information sharing and interagency coordination, and if the cost of implementing Phase III remains prohibitively expensive, the region's ITS stakeholders may collectively decide not to pursue Phase III.

The preceding chapters of the Regional ITS Architecture defined the various ITS subsystems and terminators, identified who needed to coordinate with whom, and the types of architectural flows to be accommodated. PRIMIS was not included in this discussion because its architectural requirements have not yet been defined. It was also felt that its architectural definition should be derived from the Regional ITS Architecture and not drive the architecture. Lastly, the pace of ITS deployment is rapidly increasing and projects can not wait hold until PRIMIS is operational. This section therefore tries to bridge this gap by outlining a preliminary architecture for PRIMIS. It should be noted that the architecture has not been fully vented by the PRIMIS stakeholders. However, any systems integrator designing a project consistent with the Regional ITS Architecture and cognizant of the following discussions should be able to integrate PRIMIS into their project.

PRIMIS II

The underlying concept of PRIMIS II is center-to-center distribution of incident-driven information. The four key Center Subsystems critical to this process are Traffic Management, Emergency Management, Transit Management and Information Service Providers. To keep implementation and operating costs at a moderate level and to implement this concept at a controlled pace, a number of concessions will be necessary in the capabilities of PRIMIS II, particularly in terms of bandwidth, the ability to archive information, and the graphical user interface. Consequently, basic information

on travel conditions (e.g., current travel times, current traffic volumes, transit schedules and fares) will not be incorporated into PRIMIS II. The transition from low tech communications among agencies to a more technological approach will take some time before the stakeholders make it their standard operating procedure. It is therefore assumed that direct phone contact will still be an alternative for traffic agencies to communicate with emergency agencies when an incident occurs on their facility.

The PRIMIS II architectural flows are diagrammatically depicted on Figure 71. This phase of PRIMIS will initially focus on 10 Tier I agencies involved in the center-to-center exchange of incident information. Tier II agencies are expected to begin participating in PRIMIS II after it becomes fully operational. Each flow in the diagram is segmented, one segment represents the flow from the origin subsystem to PRIMIS, and the other from PRIMIS to the destination subsystem. A fuller description of the architectural flows and their data are provided below. Since PRIMIS II is an interim program, many of its architecture flows will not possess the full functionality associated with the flow as described in the National ITS Architecture. Therefore, the architecture flow descriptions will highlight those data elements most clearly associated with PRIMIS II. Lastly, in many instances there is a symmetry associated with the flows, for example a request from one subsystem will solicit a response from another.

Information Flows Between Traffic Management Centers and PRIMIS:

Traffic Information Coordination (TMS→TMS): This is traffic information exchanged between traffic management centers. For PRIMIS II it would include: incident information, planned event data, and limited congestion information related to unusual conditions rather that recurring congestion.

Traffic Control Coordination (TMS→TMS): Normally this flow enables the remote monitoring and control of traffic management devices; it is intended to allow cooperative access to, and control of, field equipment during incidents, special events, and during day-to-day operations. However, for PRIMIS II, Traffic Control Coordination is anticipated to be limited to sharing information on the status of HAR and VMS devices and for interagency requests to change messages.

Traffic Information for Transit (TMS→TRMS): This flow provides basic traffic, incident and environmental condition information.

Incident Information (TMS→EM, EM→TMS): This architecture flow can be sent from a Traffic Management Center to an Emergency Management Center or from an Emergency Management Center to a Traffic Management Center. It represents a notification of the existence, location, type, and severity of an incident; and the expected duration and its projected impact on traffic.

Information Flows Between Transit Management Centers and PRIMIS:

Transit Management System Coordination (TRMS→TRMS): Coordination of basic information among transit agencies including scheduling and on-time information. This flow does not represent sharing of Amtrak's CTEC data with other operators who use Amtrak's lines; sharing of CTEC information is provided for in PRIMIS III.

Traffic Information for Transit (TMS→TRMS): This flow provides basic traffic, incident and environmental condition information.

Transit Emergency Data (TRMS→EM): This flow represents the initial notification of a transit emergency at a transit station or on transit vehicles and for the further coordination by the transit agency as additional details become available.

Transit Emergency Coordination Data (EM→TRMS): This is coordination information sent to a transit agency on ways to deal with a transit related incident.

Transit Incident Information (TRMS→ISP): This information, for public dissemination, is composed of data on transit incidents that impact public transportation services. It contains information on location, duration, and impact on service. It is subject to constraints applied by the transit agency in providing information to outside sources.

Information Flows Between Emergency Management Centers and PRIMIS:

Incident Report (EM→EM): This flow contains the report of an identified incident including incident location, type, severity and other information necessary to initiate an appropriate incident response. This architecture flow, sent to other emergency centers, contains the identity of the center that is providing the local response.

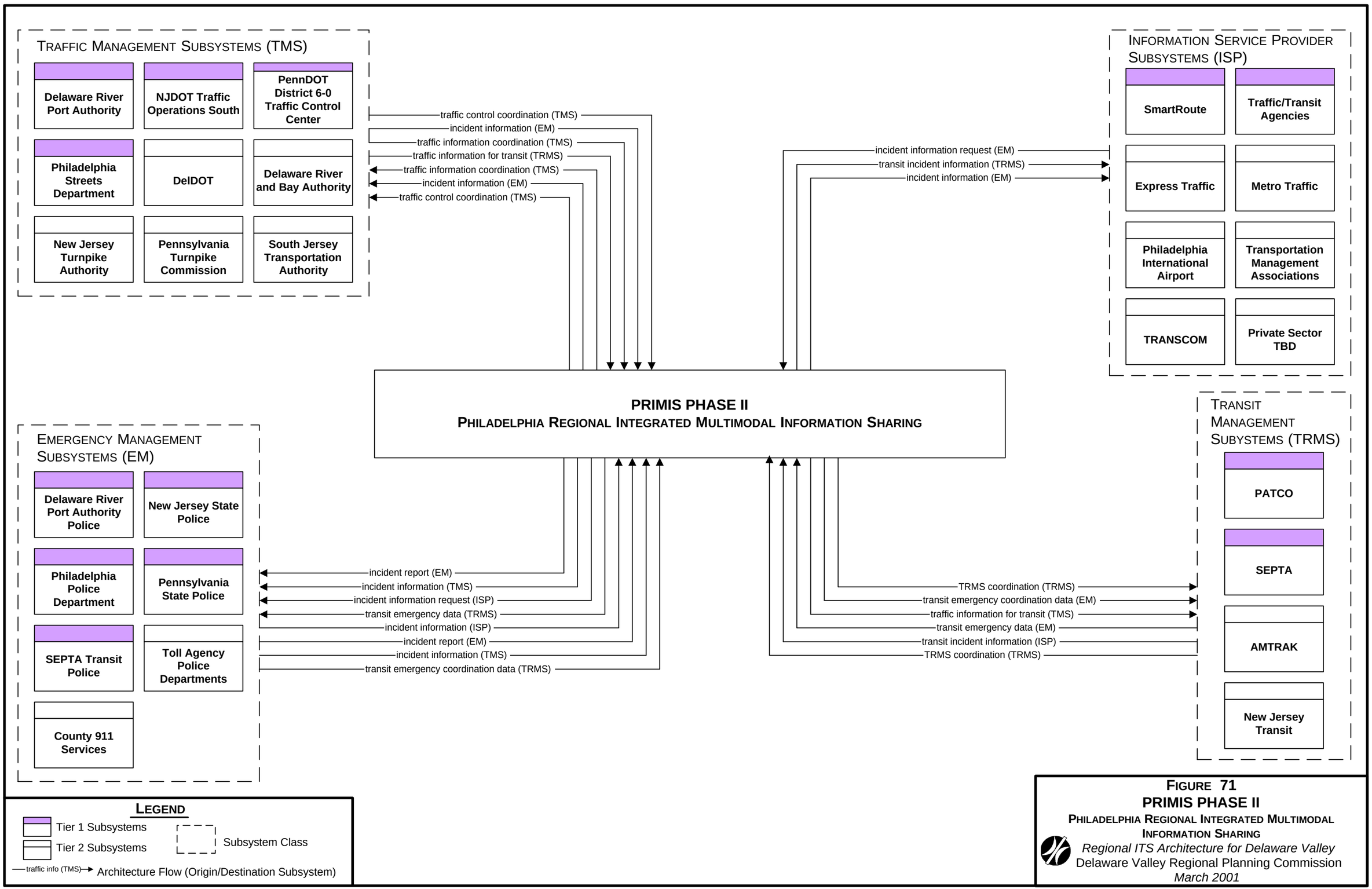


FIGURE 71
PRIMIS PHASE II
PHILADELPHIA REGIONAL INTEGRATED MULTIMODAL INFORMATION SHARING
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Incident Information (TMS→EM, EM→TMS): This architecture flow can be sent from a Traffic Management Center to an Emergency Management Center or from an Emergency Management Center to a Traffic Management Center. It represents a notification of the existence, location, type, and severity of an incident; and the expected duration and its projected impact on traffic.

Transit Emergency Data (TRMS→EM): This flow represents the initial notification of a transit emergency at a transit station or on transit vehicles and for the further coordination by the transit agency as additional details become available.

Transit Emergency Coordination Data (EM→TRMS): This is coordination information sent to a transit agency on ways deal with a transit related incident.

Incident Information Request (ISP→EM): This is a request from an Information Service Provider to an Emergency Management Center for incident information such as clearing time or severity.

Incident Information (EM→ISP): This architecture flow is a response to a request for incident information from an Information Service Provider. It consists of the following items: incident location, incident start time, duration, type, severity and traffic impact.

Information Flows Between Information Service Providers and PRIMIS:

Transit Incident Information (TRMS→ISP): This information, for public dissemination, is composed of data on transit incidents that impact public transportation services. It contains information on location, duration, and impact on service. It is subject to constraints applied by the transit agency in providing information to outside sources.

Incident Information Request (ISP→EM): This is a request from an Information Service Provider to an Emergency Management Center for incident information such as clearing time or severity.

Incident Information (EM→ISP): This architecture flow is a response to a request for incident information from an Information Service Provider. It consists of the following items: incident location, incident start time, duration, type, severity and traffic impact.

PRIMIS III

PRIMIS III offers several robust improvements both in terms of the type of information to be shared but also in terms of the magnitude of information. Some of the more significant improvements include: 1) the ability to carry video, 2) data archiving capabilities to store and share information, 3) a graphical user interface, 4) the addition of real-time traffic condition data flows, 5) enhancements to information flows offered in PRIMIS II (i.e., increased functionality with additional data elements), and 6) the capability of the media to tap into the PRIMIS network to obtain real-time travel information. The PRIMIS III architectural flows are diagrammatically depicted on Figure 72. A fuller description of the anticipated architectural flows and their data are provided below. Like PRIMIS II, PRIMIS III will initially focus on 10 Tier I agencies.

Information Flows Between Traffic Management Centers and PRIMIS:

Traffic Information Coordination (TMS→TMS): This is traffic information exchanged between traffic management centers. It includes incident data, traffic flow state, video images, probe information (if probes are employed in the region), sensor information, planned events, and long-term historical data.

Traffic Control Coordination (TMS→TMS): This flow enables the remote monitoring and control of traffic management devices (i.e., HAR and VMS); it is intended to allow cooperative access to, and control of, field equipment during incidents and special events and during day-to-day operations. It also permits 24-hour traffic operation centers to monitor and control assets of other centers during off-hours.

Traffic Information for Transit (TMS→TRMS): This flow provides basic traffic information to transit operators. Types of information include traffic flow status, current incidents, roadway environmental conditions, and predicted speeds and delays. In addition to the standard definition of this architecture flow, video images from traffic surveillance cameras will be transmitted to transit agencies.

Request Transit Information (TMS→TRMS): This flow represents a request for basic transit information and current transit status. The request can be tailored for a particular route, subarea, and/or for a specific time of day.

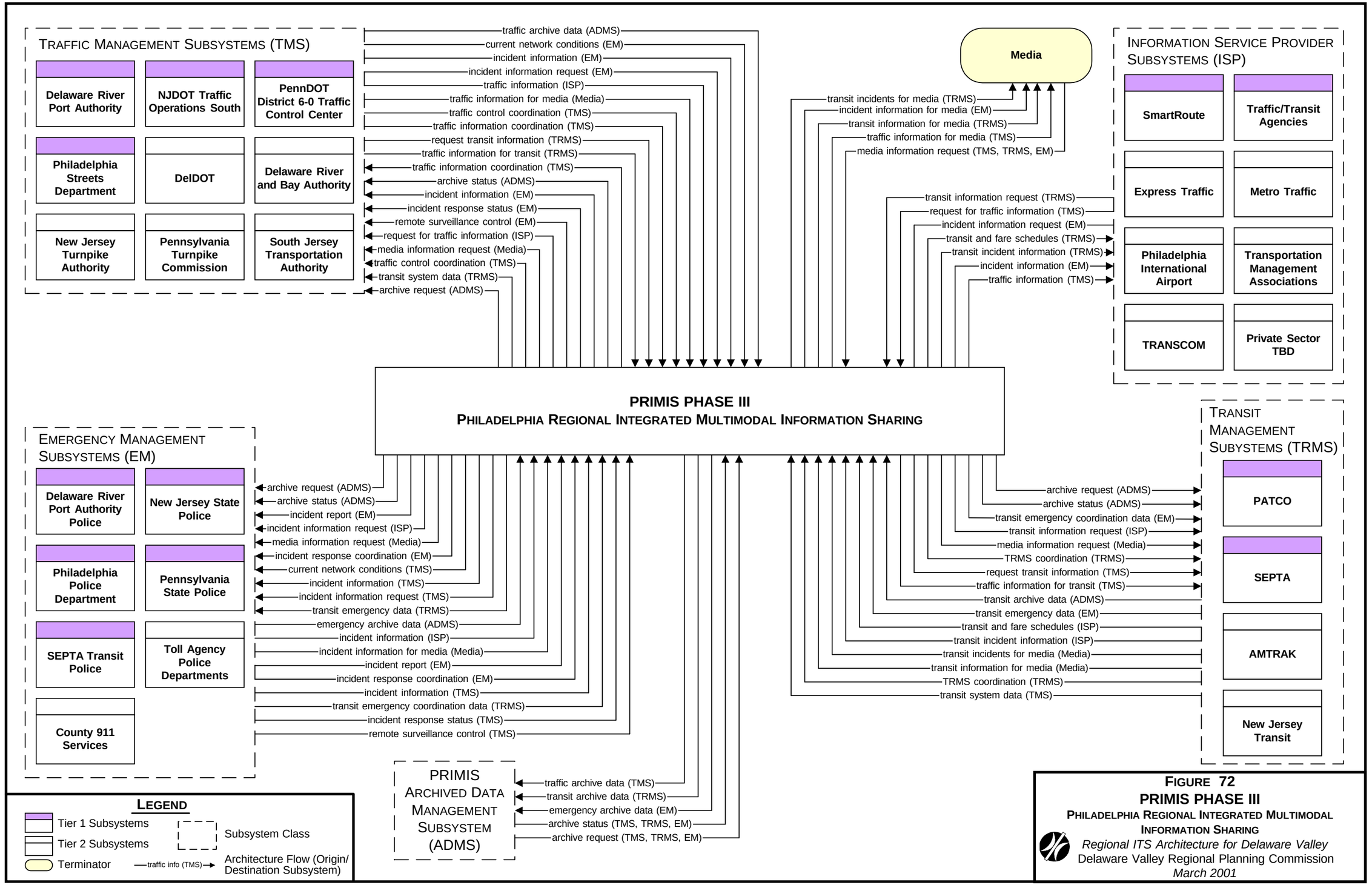


FIGURE 72
PRIMIS PHASE III
PHILADELPHIA REGIONAL INTEGRATED MULTIMODAL INFORMATION SHARING
Regional ITS Architecture for Delaware Valley
Delaware Valley Regional Planning Commission
March 2001

Transit System Data (TRMS→TMS): This flow is a response to a request for transit information. It contains operational information such as current transit routes, level of service on each route, and bus probe information, if buses are equipped as probes.

Incident Information (TMS→EM, EM→TMS): This architecture flow can be sent from a Traffic Management Center to an Emergency Management Center or from an Emergency Management Center to a Traffic Management Center. It represents a notification of the existence, location, type, and severity of an incident; and the expected duration and its impact on traffic.

Incident Information Request (TMS→EM): This flow represents an on-going subscription for incident information and/or additional information about a specific incident.

Incident Response Status (EM→TMS): The current status of incident response indicating site management strategies, incident clearance status, and traffic management strategies (i.e., closures and diversions) is provided.

Remote Surveillance Control (EM→TMS): This flow allows roadside surveillance cameras to be shared with other agencies, in this case specifically emergency management agencies.

Current Network Conditions (TMS→EM): Current traffic information and road conditions are provided. It also includes camera images to help identify and verify an incident, and to plan and implement an appropriate response.

Request for Traffic Information (ISP→TMS): This flow represents a request for traffic information. The request can be tailored for a particular route, subarea, and/or for specific time of day. It can be a subscription or a one-time request.

Traffic Information (TMS→ISP): This is a response to a Request for Traffic Information. It contains current and forecasted traffic conditions, road and weather conditions, and incident information.

Archive Request (ADMS→TMS): A request to a data source for information on available data (i.e., catalog) or a request that defines the data to be archived. The request can be in subscription format or a one-time request to solicit specific information.

Traffic Archive Data (TMS→ADMS): Information containing traffic sensor data, traffic flow characteristics and the traffic management strategies employed. This architecture flow consists of the actual traffic information, a catalog describing the information, and an assortment of meta data that describes the archived information.

Archive Status (ADMS→TMS): Notification that data provided to an archive contains erroneous, missing, or suspicious data, or verification that the data provided appears valid. If an error had been detected, the offending data, and the nature of the problem, will be identified.

Media Information Request (Media→TMS): A request for current traffic information relating to traffic conditions or incidents.

Traffic Information for Media (TMS→Media): Reports of traffic condition, incident, and maintenance activity information for dissemination through the media.

Information Flows Between Transit Management Centers and PRIMIS:

Transit Management System Coordination (TRMS→TRMS): Coordination of basic information among transit agencies including scheduling and on-time information. PRIMIS III will include provisions for real-time sharing of Amtrak's CTEC data with other operators who use their lines.

Traffic Information for Transit (TMS→TRMS): This flow provides basic traffic information to transit operators. Types of information include traffic flow status, current incidents, roadway environmental conditions, and predicted speeds and delays. In addition to the standard definition of this architecture flow, video images from traffic surveillance cameras will be transmitted to transit agencies.

Request Transit Information (TMS→TRMS): This flow represents a request for transit information and current transit status. The request can be tailored for a particular route, subarea, and/or for specific time of day.

Transit System Data (TRMS→TMS): This flow is a response to a request for transit information. It contains operational information such as current transit routes, level of

service on each route, and bus probe information, if buses are equipped as probes.

Transit Emergency Data (TRMS→EM): This flow represents the initial notification of a transit emergency at a transit station or on transit vehicles and for the further coordination by the transit agency as additional details become available.

Transit Emergency Coordination Data (EM→TRMS): This is coordination information sent to a transit agency on ways to deal with a transit related incident. It may include specific instructions for the transit fleet or it may initiate a pre-planned response to an incident.

Transit Incident Information (TRMS→ISP): This information, for public dissemination, is composed of data on transit incidents that impact public transportation services. It contains information on location, duration, and impact on service. It is subject to constraints applied by the transit agency in providing information to outside sources.

Transit Information Request (ISP→TRMS): Request for basic schedule and fare information, travel service advisories, and schedule deviations.

Transit and Fare Schedules (TRMS→ISP): A response to a Transit Information Request, including schedule and fare information, travel service advisories, and schedule deviations.

Archive Request (ADMS→TRMS): A request to a data source for information on available data (i.e., catalog) or a request that defines the data to be archived. The request can be in subscription format or a one-time request to solicit specific information.

Transit Archive Data (TRMS→ADMS): Information used to monitor transit demand, fares, operations, and system performance. This architecture flow consists of the actual transit information, a catalog describing the information, and an assortment of meta data that describes the archived information.

Archive Status (ADMS→TRMS): Notification that data provided to an archive contains erroneous, missing, or suspicious data, or verification that the data provided appears valid. If an error had been detected, the offending data, and the nature of the problem, will be identified.

Transit Incidents for Media (TRMS→Media): Report of an incident impacting transit operations for public dissemination through the media. The report will include the location of the incident (vehicle or station location) and details of the incident subject to constraints imposed on the information by the transit operator.

Media Information Request (Media→TRMS): Request for transit information relating to schedule deviations, incidents, or planned events.

Transit Information for Media (TRMS→Media): Reports of transit schedule deviations for dissemination through the media.

Information Flows Between Emergency Management Centers and PRIMIS:

Incident Report (EM→EM): This flow contains the report of an identified incident including incident location, type, severity and other information necessary to initiate an appropriate incident response. It is sent to other emergency centers and contains the identity of the center that is providing the local response.

Incident Response Coordination (EM→EM): Incident response procedures, resource coordination, and current incident response status are shared among emergency management agencies to support a coordinated response to incidents.

Incident Information (TMS→EM, EM→TMS): This architecture flow can be sent from a Traffic Management Center to an Emergency Management Center or from an Emergency Management Center to a Traffic Management Center. It represents a notification of the existence, location, type, and severity of an incident; and the expected duration and its impact on traffic.

Incident Information Request (TMS→EM): This flow represents an on-going subscription for incident information and/or additional information about a specific incident.

Incident Response Status (EM→TMS): The current status of incident response indicating site management strategies, incident clearance status, and traffic management strategies (i.e., closures and diversions) is provided.

Remote Surveillance Control (EM→TMS): This flow allows roadside surveillance cameras to be shared with other agencies, in this case specifically emergency management agencies.

Current Network Conditions (TMS→EM): Current traffic information and road conditions are provided. It also includes camera images to help identify and verify an incident, and to plan and implement an appropriate response.

Transit Emergency Data (TRMS→EM): This flow represents the initial notification of a transit emergency at a transit station or on transit vehicles and for the further coordination by the transit agency as additional details become available.

Transit Emergency Coordination Data (EM→TRMS): This is coordination information sent to a transit agency on ways to deal with a transit related incident. It may include specific instructions for the transit fleet or it may initiate a pre-planned response to an incident.

Incident Information Request (ISP→EM): This is a request from an Information Service Provider to an Emergency Management Center for incident information such as clearing time or severity. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.

Incident Information (EM→ISP): This architecture flow is a response to a request for incident information from an Information Service Provider. It consists of the following: incident location, incident start time, duration, type, severity and traffic impact.

Archive Request (ADMS→EM): A request to a data source for information on available data (i.e., catalog) or a request that defines the data to be archived. The request can be in subscription format or a one-time request to solicit specific information.

Emergency Archive Data (EM→ADMS): Information identifying incidents and the corresponding incident response. This architecture flow consists of the actual incident information, a catalog describing the information, and an assortment of meta data that describes the archived information.

Archive Status (ADMS→EM): Notification that data provided to an archive contains erroneous, missing, or suspicious data, or verification that the data provided appears valid.

If an error had been detected, the offending data, and the nature of the problem, will be identified.

Media Information Request (Media→EM): A request for incident information based on geographic area, and/or severity of incident or type of incident.

Incident Information for Media (EM→Media): Report of desensitized incident information for dissemination through the media.

Information Flows Between Information Service Providers and PRIMIS:

Request for Traffic Information (ISP→TMS): This flow represents a request for traffic information. The request can be tailored for a particular route, subarea, and/or for specific time of day. It can be a subscription or a one-time request.

Traffic Information (TMS→ISP): This is a response to a Request for Traffic Information. It contains current and forecasted traffic conditions, road and weather conditions, and incident information.

Transit Incident Information (TRMS→ISP): This information, for public dissemination, is composed of data on transit incidents that impact public transportation services. It contains information on location, duration, and impact on service. It is subject to constraints applied by the transit agency in providing information to outside sources.

Transit Information Request (ISP→TRMS): Request for basic schedule and fare information, travel service advisories, and schedule deviations.

Transit and Fare Schedules (TRMS→ISP): This is a response to a Transit Information Request, including schedule and fare information, travel service advisories, and schedule deviations.

Incident Information Request (ISP→EM): This is a request from an Information Service Provider to an Emergency Management Center for incident information such as clearing time or severity. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.

Incident Information (EM→ISP): This architecture flow is a response to a request for incident information from an Information Service Provider. It consists of the following: incident location, incident start time, duration, type, severity and traffic impact.

Information Flows Between Achieved Data Management and PRIMIS

Archive Request (ADMS→TMS, ADMS→TRMS, ADMS→EM): A request is made to a data source for information on available data (i.e., catalog) or a request that defines the data to be archived. The request can be in subscription format or a one-time request to solicit specific information.

Traffic Archive Data (TMS→ADMS): This is information containing traffic sensor data, traffic flow characteristics and the traffic management strategies employed. This architecture flow consists of the actual traffic information, a catalog describing the information, and an assortment of meta data that describes the archived information.

Transit Archive Data (TRMS→ADMS): This is information used to monitor transit demand, fares, operations, and system performance. This architecture flow consists of the actual transit information, a catalog describing the information, and an assortment of meta data that describes the archived information.

Emergency Archive Data (EM→ADMS): This is information identifying incidents and the corresponding incident response. This architecture flow consists of the actual incident information, a catalog describing the information, and an assortment of meta data that describes the archived information.

Archive Status (ADMS→TMS, ADMS→TRMS, ADMS→EM): Notification that data provided to an archive contains erroneous, missing, or suspicious data, or verification that the data provided appears valid. If an error had been detected, the offending data, and the nature of the problem, will be identified.

Information Flows Between the Media and PRIMIS

Media Information Request (Media→TMS, Media→TRMS, Media→EM): This is a request for current traffic information (traffic conditions or incidents), transit information (schedule deviations, incidents, or planned events), or incident information (based on geographic area, and/or severity or type of incident).

Traffic Information for Media (TMS→Media): Reports of traffic condition, incident, and maintenance activity information for dissemination through the media are provided.

Transit Incidents for Media (TRMS→Media): This is a report of an incident impacting transit operations for public dissemination through the media. The report will include the location of the incident (vehicle or station location) and details of the incident subject to constraints imposed on the information by the transit operator.

Transit Information for Media (TRMS→Media): Reports of transit schedule deviations for dissemination through the media are provided.

Incident Information for Media (EM→Media): Reports of desensitized incident information for dissemination through the media are provided.

ITS Deployment Plan

The Deployment Plan is a time table for the completion of planned ITS projects and has been divided into several categories according to their expected completion dates. Short term projects generally represent those projects that will be completed by 2002. The projects identified as long term represent those projects expected to be completed by 2004. Future projects are those projects that have no set time schedule for completion, but are planned.

Short Term Projects

Burlington County

Traffic Operations Center

Establish an operations center in Mt. Laurel to control closed loop traffic signal systems

Closed Loop Traffic Signal Systems

Implement closed loop traffic signal systems on the following roads:

CR 537 in Mt. Holly Twp.; CR 626 in Willingboro Twp. from CR 541 to US 130; CR 630 in Willingboro Twp.; CR 633 in Willingboro Twp.; CR 634 in Willingboro Twp. and CR 691 in Mt. Holly Twp.

Burlington County Bridge Commission

E-ZPass

Install electronic toll collection equipment at the bridge toll plaza

Delaware River and Bay Authority

Closed Circuit TV

Install cameras throughout the DRBA facility

Closed Loop Traffic Signal System

- Replace old lane control system with new closed loop system

E-ZPass

Install electronic toll collection equipment at the bridge toll plaza

Emergency Call Boxes

Install call boxes on both spans of the Delaware Memorial Bridge as well as expanded service on the approach roadways leading to the Twin Spans

Delaware River Port Authority

Closed Circuit TV

Install 5 - 10 cameras on the Benjamin Franklin Bridge

Traffic Operations Center

Develop a centralized control center to monitor traffic flow and perform incident detection and response functions on all DRPA bridges

New Jersey Department of Transportation

Arterial Traffic Management System

Install an integrated system of 21 closed circuit TV cameras, vehicle detectors variable message signs and highway advisory radio on the following arterial highways: US 30, NJ 38, NJ 70 and NJ 73.

I-295 Freeway Traffic Management System

Install variable message signs

NJ 29 Closed Circuit TV

Install 14 cameras

New Jersey Turnpike Authority

Travel Information Website

Develop website to display real-time traffic conditions

Pennsylvania Department of Transportation

ITS Systems Integrator Project

Integrate existing ITS components

City of Philadelphia

Closed Loop Traffic Signal Systems

Implement closed loop traffic signal systems on the following roads:
Academy Road (16 signals); Bartram Avenue (5 signals); Center City NE/SE Quadrants (111 signals); Center City SW Quadrant (81 signals); Christopher Columbus Blvd./Delaware Avenue (21 signals); Frankford Avenue (40 signals); Princeton Avenue; (5 signals); State Road (13 signals) and Washington Avenue (21 signals).

South Jersey Transportation Authority

Atlantic City-Brigantine Connector Project

Install and integrate the following ITS components onto the project: closed circuit TV cameras, roadway/weather sensors, an advanced highway rail intersection warning system, variable message signs and an incident management response team.

Long Term Projects

Burlington County Bridge Commission

Traffic Management System

Install closed circuit TV cameras and variable message signs on the Burlington-Bristol and Tacony-Palmyra bridges

New Jersey Department of Transportation

Closed Loop Traffic Signal Systems (TIP # 0014A)

Implement closed loop traffic signal systems on 97 intersections on the following roads:

US 30, NJ 38, NJ 70 and NJ 73.

Pennsylvania Department of Transportation

Freeway Traffic Management System

On I-76, between I-676 and PA 291, install 1 variable message sign, 14 closed circuit TV cameras and 4 detectors. (TIP # 9764)

On I-76, between I-676 and Pencoyd Bridge, install 1 variable message sign, 14 closed circuit TV cameras and 10 detectors. (TIP # 9765)

On I-76, between Belmont Ave. and the Conshohocken Curve, install 2 variable message signs, 7 closed circuit TV cameras and 8 detectors. (TIP # 8795)

On I-95, between I-476 and the Philadelphia International Airport and install 2 variable message signs, 7 closed circuit TV cameras and 10 detectors (TIP # 7900)

On I-476, between I-95 and US 1 install 6 variable message signs, 11 closed circuit TV cameras and activate loop detectors. (TIP # 7901)

US 202 Section 400 Project (TIP #8382)

Install and integrate the following ITS components onto the project

Closed Circuit TV Cameras:

US 202 between US 30 Bypass and Henderson Rd (17 cameras)
I-76 between Conshohocken Curve and US 202 (9 cameras)
I-476 between US 30 and PA Turnpike (7 cameras)
PA 422 between US 202 and PA 29 (13 cameras)

Variable Message Signs

US 202 between US 30 Bypass and PA Turnpike (5 signs)
I-76 between Conshohocken Curve and US 202 (3 signs)
I-476 between US 30 and PA Turnpike (3 signs)
PA 422 between US 202 and PA 29 (3 signs)
US 30 west of PA 100 (1 sign)

Vehicle Detection System

US 202 from PA 252 to PA 422

PA 309 Reconstruction Project (TIP # 8572)

Install and integrate the following ITS components onto the project

Closed Circuit TV Cameras:

PA 309 between Philadelphia City Limit and PA 63 (15 cameras)

Variable Message Signs

PA 309 between Philadelphia City Limit and PA 63 (5 signs)

Vehicle Detection System

PA 309 between Philadelphia City Limit and PA 63

City of Philadelphia

Transit Vehicle Signal Priority:

SEPTA Route 10 Trolley

SEPTA Route 15 Trolley

SEPTA Route 52 Trolley

Delaware Valley Region

PRIMIS II

Future Projects:

New Jersey Department of Transportation

Freeway Traffic Management System

On I-76, I-295, I-676, NJ 42 and NJ 55, install variable message signs, closed circuit TV cameras, highway advisory radio and detection technology to improve incident management detection and response.

Pennsylvania Department of Transportation

US 202 Section 700 Project

Install and integrate the following ITS components onto the project

Closed Circuit TV Cameras:

US 202 Expressway Segment (12 cameras)

PA 309 between PA 63 and PA 463 (21 cameras)

Variable Message Signs

PA 309 between PA 63 and PA 463 (4 signs)

US 202 on the Expressway Segment (8 signs)

Vehicle Detection System
US 309 between PA 63 and PA 463
US 202 Expressway Segment

Freeway Traffic Management System

On I-95, between PA 413 and New Jersey State Line install variable message signs, closed circuit TV cameras and vehicle detectors

On I-95, between I-476 and Delaware State Line install variable message signs, closed circuit TV cameras and vehicle detectors

South Jersey Transportation Authority

Freeway Traffic Management System

On the Atlantic City Expressway, install closed circuit TV Cameras at the Atlantic City terminus of the Expressway, between Atlantic City and Pleasantville and in the vicinity of the interchange with the Garden State Parkway. Install a Vehicle Detection System near Atlantic City, near NJ 73 and near NJ 42.

Delaware Valley Region

PRIMIS III

Guidelines for Updating and Modifying the Regional ITS Architecture

A significant effort was exerted to make this document as comprehensive as possible in identifying and documenting all the appropriate and applicable exchanges of data and information. However, since the intent is for the Regional ITS Architecture to be a living document, changes are anticipated. Periodic updates will be required as ITS technologies are deployed and new Information Service Providers begin serving the region. Major format changes are not envisioned but continual tweaking of architecture flows and agency level linkages are expected. The ITS Technical Task Force has been designated as the appropriate entity to oversee updates to the architecture. All changes to the architecture must go through the TTF and be agreed upon by its membership. DVPRC staff will maintain the architecture, making changes and updating the document as part of their staff support to the TTF. The following events are triggers for updates to the Regional Architecture:

- *A Change in the National ITS Architecture Sanctioned by US DOT:* If additional user services or market packages are developed for the National ITS Architecture, consideration must be given for their inclusion into the Regional ITS Architecture to maintain consistency. Any types of changes in scope or format to the National ITS Architecture must be applied, as applicable, to the Regional ITS Architecture.

- *Provision of New Services and Stakeholders:* It is anticipated additional stakeholders and services will continually be incorporated into the architecture. This is especially true for Information Service Providers because as this market matures and Information Service Providers begin to offer new products in this region, these services will have to be accounted for in the architecture.

- *Deployment of New ITS Projects:* As stakeholders deploy new ITS projects which result in their participation in new subsystems or terminators, a review of the Regional ITS Architecture should take place to insure that the appropriate architecture flows exist in the architecture. The stakeholders deploying the new ITS projects will be responsible to submit any potential architectural changes to the Technical Task Force for review. According to the federal ITS Conformity Regulations, if the stakeholder uses federal funds in deploying the new ITS projects, they must demonstrate the project's consistency with the Regional ITS Architecture to Federal Highway Administration or Federal Transit Administration. Deployment of new ITS components by specific organizations will also require updates to Chapter V Inventory of ITS Resources. DVRPC staff will systematically update the inventory at specific times during the year to keep it current.

- *Implementation of Major Transportation Projects with ITS Components:* As stakeholders make improvements to the region's transportation infrastructure, the inclusion of ITS components into the overall transportation improvement is expected to occur more frequently. The use of these ITS components must be integrated with other existing ITS components to broaden the scope of the region's system. The stakeholders implementing the new project will be responsible to submit any potential new architectural changes to the ITS Technical Task Force for review.

APPENDIX A

ITS SUBSYSTEM INVENTORY

Subsystem	ITS Stakeholder	Status
Traffic Management Subsystems	Burlington County Bridge Commission	Future
	Burlington County Traffic Operations Center	Existing
	Delaware Department of Transportation Traffic Management Center	Existing
	Delaware River and Bay Authority Centralized Operations Center	Existing
	Delaware River Joint Toll Bridge Commission	Future
	Delaware River Port Authority	Existing
	Municipal traffic operation centers	Future
	New Jersey county traffic operation centers	Future
	New Jersey Department of Transportation Traffic Operations South	Existing
	New Jersey Turnpike Authority Traffic Operations Center	Existing
	Pennsylvania Department of Transportation District 6-0 Traffic Control Center	Existing
	Pennsylvania Turnpike Commission Communications Center	Existing
	City of Philadelphia Streets Department	Existing
	South Jersey Transportation Authority	Existing

Subsystem	ITS Stakeholder	Status
	Towamencin Township Traffic Operations Center	Future
Transit Management Subsystems	Amtrak Centralized Traffic Electrical Control	Existing
	County paratransit operations	Existing
	New Jersey Transit Southern Division	Existing
	PATCO Center Tower	Existing
	SEPTA Operations Center	Existing
Information Service Provider Subsystems	Amtrak	Existing
	Bucks County TMA	Existing
	Center City District	Future
	TMA of Chester County	Existing
	Cross County Connection TMA	Existing
	Delaware County TMA	Existing
	Delaware Department of Transportation	Existing
	Express Traffic	Existing
	Greater Mercer TMA	Existing
	Greater Valley Forge TMA	Existing
	Metro Traffic	Existing
	New Jersey Department of Transportation	Existing
	New Jersey Transit	Existing
	New Jersey Turnpike Authority	Existing
	The Partnership TMA	Existing
	PATCO	Existing

Subsystem	ITS Stakeholder	Status
	Pennsylvania Turnpike Commission	Existing
	Philadelphia International Airport	Existing
	Philadelphia Redevelopment Authority	Future
	SEPTA	Existing
	SmartRoute	Existing
	Traffic.com	Existing
Toll Administration Subsystems	Burlington County Bridge Commission	Existing
	Delaware River and Bay Authority	Existing
	Delaware River Joint Toll Bridge Commission	Existing
	Delaware River Port Authority	Existing
	New Jersey Turnpike Authority	Existing
	Pennsylvania Turnpike Commission	Existing
	South Jersey Transportation Authority	Existing
Emergency Management Subsystems	Amtrak Police	Existing
	Delaware River and Bay Authority Police	Existing
	Delaware River Port Authority Police - Commodore Barry Bridge	Existing
	Delaware River Port Authority Police - Walt Whitman Bridge	Existing

Subsystem	ITS Stakeholder	Status
	Delaware River Port Authority Police - Ben Franklin Bridge	Existing
	Delaware River Port Authority Police - Betsy Ross Bridge	Existing
	Local volunteer/ professional fire/EMS departments	Existing
	Municipal police departments	Existing
	New Jersey State Police - West Trenton	Existing
	New Jersey State Police - Troop A	Existing
	New Jersey State Police - Troop D (New Jersey Turnpike)	Existing
	New Jersey State Police - Atlantic City Expressway Station	Existing
	New Jersey State Police - Bellmawr Station	Existing
	New Jersey State Police - Bordentown Station	Existing
	New Jersey State Police - Fort Dix Station	Existing
	New Jersey State Police - Hightstown Station	Existing
	New Jersey Transit Police	Existing
	PATCO Police	Existing
	Pennsylvania State Police - Troop K (Belmont Barracks)	Existing
	Pennsylvania State Police - Media Barracks	Existing

Subsystem	ITS Stakeholder	Status
	Pennsylvania State Police - Trevose Barracks	Existing
	Pennsylvania State Police Troop T (Pennsylvania Turnpike)	Existing
	Philadelphia Fire Department	Existing
	Philadelphia Police Department	Existing
	SEPTA Transit Police	Existing
Archived Data Management Subsystems	Delaware Valley Regional Planning Commission	Existing
	New Jersey Department of Transportation - Division of Transportation Data Technology	Existing
	New Jersey Transit	Existing
	Pennsylvania Department of Transportation - Roadway Management Division	Existing
	Pennsylvania Department of Transportation - Transportation Performance Monitoring Division, Roadway Management Division	Existing
	Philadelphia Streets Department - Traffic Engineering Division	Existing
	SEPTA - Technical Services and Research	Existing
	Traffic.com	Existing
Commercial Vehicle Administration	New Jersey Department of Transportation - Motor Vehicle Services	Existing

Subsystem	ITS Stakeholder	Status
	New Jersey State Police - Commercial Carrier/Safety Inspection Unit	Existing
	Pennsylvania Department of Transportation - Driver and Vehicle Services	Existing
Roadway Subsystems	Burlington County	Existing
	Burlington County Bridge Commission	Existing
	Delaware Department of Transportation	Existing
	Delaware River and Bay Authority	Existing
	Delaware River Joint Toll Bridge Commission	Existing
	Delaware River Port Authority	Existing
	Municipal traffic operation centers	Future
	New Jersey county traffic operation centers	Future
	New Jersey Department of Transportation Traffic Operations South	Existing
	New Jersey Turnpike Authority	Existing
	Pennsylvania Department of Transportation District 6-0 Traffic Control Center	Existing
	Pennsylvania Turnpike Commission	Existing
	Philadelphia Streets Department	Existing

Subsystem	ITS Stakeholder	Status
	SmartRoute	Existing
	South Jersey Transportation Authority	Existing
	Towamencin Township	Future
	Traffic.com	Existing
Toll Collection Subsystems	Burlington County Bridge Commission	Future
	Delaware River and Bay Authority	Existing
	Delaware River Joint Toll Bridge Commission	Future
	Delaware River Port Authority	Existing
	New Jersey Turnpike Authority	Existing
	Pennsylvania Turnpike Commission	Existing
	South Jersey Transportation Authority	Existing
Parking Management Subsystems	PATCO	Existing
	Philadelphia Parking Authority	Existing
	SEPTA	Existing
Commercial Vehicle Check Subsystems	New Jersey State Police - Commercial Carrier/Safety Inspection Unit	Existing
	Pennsylvania Public Utility Commission - Motor Carrier Services and Enforcement Division	Existing
	Pennsylvania Department of Transportation	Existing

Subsystem	ITS Stakeholder	Status
	Pennsylvania State Police	Existing
Remote Traveler Support Subsystems	Amtrak information displays	Existing
	Amtrak surveillance/ security systems	Existing
	Center City District information kiosks	Future
	New Jersey Transit information displays	Existing
	New Jersey Transit surveillance/security systems	Existing
	New Jersey Turnpike Authority information kiosks	Future
	PATCO information displays	Existing
	PATCO surveillance/ security systems and emergency call boxes	Existing
	Pennsylvania Turnpike Commission emergency call boxes	Existing
	Philadelphia International Airport information displays	Existing
	Philadelphia Redevelopment Authority traveler information kiosk	Future
	SEPTA information displays	Existing
	SEPTA surveillance/ security systems and emergency call boxes	Existing
	South Jersey Transportation Authority emergency call boxes	Existing

Subsystem	ITS Stakeholder	Status
Personal Information Access Subsystems	Amtrak telephone information center/website	Existing
	Bucks County TMA website	Existing
	TMA of Chester County website	Existing
	Cross County Connection TMA website	Existing
	Delaware County TMA website	Existing
	Delaware Department of Transportation website	Existing
	Delaware River Port Authority website	Existing
	Express Traffic telephone information	Existing
	Greater Mercer TMA website, faxes, e-mail	Existing
	Greater Valley Forge TMA website, e-mail	Existing
	New Jersey Department of Transportation website	Existing
	New Jersey Transit website and telephone Transit Information Center	Existing
	New Jersey Turnpike Authority Highway Advisory Telephone System and website	Existing
	The Partnership TMA website	Existing
	PATCO website	Existing

Subsystem	ITS Stakeholder	Status
	Pennsylvania Turnpike Commission website, emergency cellular phone service, and a recorded roadway/weather conditions phone number	Existing
	Philadelphia International Airport telephone information center and website	Existing
	SEPTA Travel Information Center and website	Existing
	SmartRoute interactive telephone system and website	Existing
	South Jersey Transportation Authority emergency cellular phone number	Existing
	Traffic.com	Existing
	TRANSCOM	Existing
Transit Vehicles	County paratransit vehicles	Future
	New Jersey Transit buses	Future
	PATCO trains	Future
	SEPTA vehicles	Future
Emergency Vehicles	Delaware River Port Authority Police vehicles	Existing
	Local volunteer/ professional fire/EMS vehicles	Existing
	Municipal police vehicles	Existing
	New Jersey Department of Transportation Traffic Operations South ESP	Existing

Subsystem	ITS Stakeholder	Status
	New Jersey State Police vehicles	Existing
	New Jersey Transit	Existing
	New Jersey Turnpike Authority emergency service patrol vehicles	Existing
	Pennsylvania State Police vehicles	Existing
	Pennsylvania Department of Transportation District 6-0 ESP	Existing
	Philadelphia Fire Department vehicles	Existing
	Philadelphia Police Department vehicles	Existing
	SEPTA Transit Police vehicles	Existing

APPENDIX B

ITS TERMINATOR INVENTORY

Terminator	ITS Stakeholder	Status
Other Traffic Management	I-95 Corridor Coalition	Existing
	NJDOT Traffic Operations North	Existing
	PennDOT Statewide Operations Center	Future
	TRANSCOM	Existing
Traffic Operations Personnel	Delaware Department of Transportation Traffic Management Center staff	Existing
	Delaware River Port Authority staff	Future
	New Jersey Department of Transportation Traffic Operations South staff	Existing
	New Jersey Turnpike Authority Traffic Operations Center staff	Existing
	Pennsylvania Department of Transportation District 6-0 Traffic Control Center staff	Existing
	Pennsylvania Turnpike Commission Communication Center staff	Existing
	Philadelphia Streets Department staff	Existing
	South Jersey Transportation Authority staff	Future
Maintenance Personnel	Delaware River Port Authority - Commodore Barry Bridge	Existing
	Delaware River Port Authority - Walt Whitman Bridge	Existing

Terminator	ITS Stakeholder	Status
	Delaware River Port Authority - Ben Franklin Bridge	Existing
	Delaware River Port Authority - Betsy Ross Bridge	Existing
	New Jersey Department of Transportation - Region 3 - Mercer County (Fernwood Service Station)	Existing
	New Jersey Department of Transportation - Region 3 - Mercer County (Hamilton)	Existing
	New Jersey Department of Transportation - Region 3 - Mercer County (Lawrence)	Existing
	New Jersey Department of Transportation - Region 3 - Mercer County (Washington)	Existing
	New Jersey Department of Transportation - Region 3 - Mercer County (West Trenton)	Existing
	New Jersey Department of Transportation - Region 4 - Burlington County (Bordentown)	Existing
	New Jersey Department of Transportation - Region 4 - Burlington County (Edgewater Park)	Existing
	New Jersey Department of Transportation - Region 4 - Burlington County (Four Mile Circle)	Existing

Terminator	ITS Stakeholder	Status
	New Jersey Department of Transportation - Region 4 - Burlington County (Mount Laurel)	Existing
	New Jersey Department of Transportation - Region 4 - Burlington County (Red Lion)	Existing
	New Jersey Department of Transportation - Region 4 - Camden County (Berlin)	Existing
	New Jersey Department of Transportation - Region 4 - Camden County (Cherry Hill)	Existing
	New Jersey Department of Transportation - Region 4 - Camden County (Cherry Hill)	Future
	New Jersey Department of Transportation - Region 4 - Camden County (Pennsauken)	Existing
	New Jersey Department of Transportation - Region 4 - Gloucester County (Bridgeport)	Existing
	New Jersey Department of Transportation - Region 4 - Gloucester County (Deptford)	Existing
	New Jersey Department of Transportation - Region 4 - Gloucester County (Glassboro)	Existing
	New Jersey Department of Transportation - Region 4 - Gloucester County (West Deptford)	Existing
	New Jersey Turnpike Authority - District 1 (Swedesboro)	Existing

Terminator	ITS Stakeholder	Status
	New Jersey Turnpike Authority - District 2 (Moorestown)	Existing
	New Jersey Turnpike Authority - District 3 (Crosswick)	Existing
	Pennsylvania Department of Transportation - Bucks County (Doylestown)	Existing
	Pennsylvania Department of Transportation - Chester County (West Chester)	Existing
	Pennsylvania Department of Transportation - Delaware County (Media)	Existing
	Pennsylvania Department of Transportation - Montgomery County (Norristown)	Existing
	Pennsylvania Department of Transportation - Philadelphia	Existing
	Pennsylvania Turnpike Commission - Devault	Existing
	Pennsylvania Turnpike Commission - Plymouth	Existing
	Pennsylvania Turnpike Commission - Trevose	Existing
	Pennsylvania Turnpike Commission - Quakertown	Existing
	Philadelphia Streets Department - North District	Existing
	Philadelphia Streets Department - Northwest District	Existing
	Philadelphia Streets Department - West District	Existing

Terminator	ITS Stakeholder	Status
	Philadelphia Streets Department - South District	Existing
	Philadelphia Streets Department - Southwest District	Existing
	South Jersey Transportation Authority - Hammonton	Existing
	South Jersey Transportation Authority - Williamstown	Existing
Rail Operations	Amtrak	Existing
	Canadian Pacific	Existing
	CSX	Existing
	New Jersey Transit	Existing
	Norfolk Southern	Existing
	SEPTA	Existing
Wayside Equipment	Amtrak	Existing
	Canadian Pacific	Existing
	CSX	Existing
	New Jersey Transit	Existing
	Norfolk Southern	Existing
	SEPTA	Existing
	Brandywine Railroad	Existing
	New Hope and Ivyland Railroad	Existing
	Philadelphia Belt Line	Existing
	Southern Railroad of New Jersey	Existing
Multimodal Crossings	Burlington County Bridge Commission (Betsy Ross Bridge)	Existing

Terminator	ITS Stakeholder	Status
Other Transit Management	DART First State	Existing
Transit System Operators	Amtrak CTEC staff	Existing
	New Jersey Transit staff	Existing
	PATCO Center Tower staff	Existing
	SEPTA Operations Center staff	Existing
Transit Fleet Manager	Amtrak	Existing
	New Jersey Transit	Existing
	PATCO Yard Manager	Existing
	SEPTA Line and Street Supervisors	Existing
Transit Maintenance Personnel	Amtrak	Existing
	New Jersey Transit	Existing
	PATCO	Existing
	SEPTA	Existing
Transit Driver	New Jersey Transit bus drivers	Existing
	PATCO train operators	Existing
	SEPTA bus drivers and train engineers	Existing
Other Information Service Provider	I-95 Corridor Coalition	Existing
	TRANSCOM	Existing
Public Affairs	Delaware River Port Authority/ PATCO	Existing
	Pennsylvania Department of Transportation District 6-0	Existing
	SEPTA	Existing
Media	Newspapers	Existing

Terminator	ITS Stakeholder	Status
	Radio stations	Existing
	TV stations	Existing
Multimodal Transportat-ion Service Provider	Philadelphia International Airport	Existing
Yellow Pages Service Providers	Private Sector (To be determined)	Future
Toll Operator	Burlington County Bridge Commission	Existing
	Delaware River and Bay Authority	Existing
	Delaware River Joint Toll Bridge Commission	Existing
	Delaware River Port Authority	Existing
	New Jersey Turnpike Authority	Existing
	Pennsylvania Turnpike Commission	Existing
	South Jersey Transportation Authority	Existing
DMV	New Jersey Department of Transportation - Motor Vehicle Services	Existing
	Pennsylvania Department of Transportation - Driver and Vehicle Services	Existing
Enforcement Agency	E-Z Pass Consortium Customer Service Center and Violations Processing Center	Existing
Other Emergency Management	Bucks County Emergency Management Agency	Existing

Terminator	ITS Stakeholder	Status
	Burlington County Emergency Management Services	Existing
	Camden County Office of Emergency Management	Existing
	Chester County Department of Emergency Services	Existing
	Delaware County Emergency Services	Existing
	Gloucester County Emergency Response Center	Existing
	Mercer County Office of Emergency Management	Existing
	Montgomery County Emergency Preparedness	Existing
	New Jersey Office of Emergency Management	Existing
	Pennsylvania Emergency Management Agency	Existing
Emergency Telecom-munication System	Bucks County 911	Existing
	Burlington County 911	Existing
	Camden County 911	Existing
	Chester County 911	Existing
	Delaware County 911	Existing
	Gloucester County 911	Existing
	Mercer County 911	Existing
	Montgomery County 911	Existing
	New Jersey State Police - West Trenton	Existing
	PATCO Center Tower	Existing

Terminator	ITS Stakeholder	Status
	Pennsylvania Turnpike Commission Communications Center	Existing
	Philadelphia Police Department Radio Room	Existing
	South Jersey Transportation Authority	Existing
Emergency System Operator	Municipal police dispatchers	Existing
	Delaware River Port Authority Police dispatchers	Future
	Delaware River Port Authority Bridge Radio Rooms	Existing
	New Jersey State Police - Troop A	Existing
	New Jersey State Police - West Trenton	Existing
	New Jersey Transit - Maplewood	Existing
	PATCO Center Tower	Existing
	Pennsylvania State Police Barrack's radio dispatchers	Existing
	Pennsylvania Turnpike Commission Communications Center	Existing
	Philadelphia Police Department Radio Room	Existing
	Philadelphia Municipal Radio Room	Existing
	SEPTA Transit Police (SEPTA Operations Center)	Existing

Terminator	ITS Stakeholder	Status
Commercial Vehicle Operations Inspector	New Jersey State Police - Commercial Carrier/Safety Inspection Unit	Existing
	Pennsylvania State Police	Existing
	Pennsylvania Public Utility Commission - Motor Carrier Services and Enforcement Division	Existing
Archived Data User Systems	Delaware Valley Regional Planning Commission	Existing
	New Jersey Department of Transportation - Division of Transportation Data Technology	Existing
	New Jersey Transit	Existing
	Pennsylvania Department of Transportation - Roadway Management Division	Existing
	Pennsylvania Department of Transportation - Transportation Performance Monitoring Division	Existing
	Philadelphia Streets Department - Traffic Engineering Division	Existing
	SEPTA Technical Services and Research	Existing
	Traffic.com - National Transportation Data Center	Existing
Event Promoters	E Center	Existing
	Penns Landing Corporation	Existing
	Pennsylvania Convention Center Authority	Existing

Terminator	ITS Stakeholder	Status
	Philadelphia Convention and Tourist Bureau	Existing
	Philadelphia Department of Recreation	Existing
	Philadelphia Industrial Development Corporation	Existing
Financial Institution	E-Z Pass Customer Service Center	Existing
	Private sector	Existing
Location Data Source	E-Z Pass	Future
	Private sector	Future
	SEPTA buses	Future
Map Update Provider	Private sector	Future
Payment Instrument	E-Z Pass Consortium	Existing
Weather Service	AccuWeather	Existing
	National Weather Service	Exising

APPENDIX C

ITS STAKEHOLDERS AND THEIR SUBSYSTEM AND TERMINATOR COMPONENTS

AccuWeather
Weather Service Terminator (existing)

Amtrak
Emergency Management Subsystem (existing)
Information Service Provider Subsystem (existing)
Personal Information Access Subsystem (existing)
Remote Traveler Support Subsystem (existing)
Transit Management Subsystem (existing)
Rail Operations Terminator (existing)
Transit Fleet Manager Terminator (existing)
Transit Maintenance Personnel Terminator (existing)
Transit System Operator Terminator (existing)
Wayside Equipment Terminator (existing)

Brandywine Rail Road
Wayside Equipment Terminator (existing)

Bucks County
Emergency Telecommunication System Terminator (existing)
Other Emergency Management Terminator (existing)

Bucks County TMA
Information Service Provider Subsystem (existing)
Personal Information Access Subsystem (existing)

Burlington County
Roadway Subsystem (existing)
Traffic Management Subsystem (existing)
Emergency Telecommunication System Terminator (existing)
Other Emergency Management Terminator (existing)

Burlington County Bridge Commission
Roadway Subsystem (existing)
Toll Administration Subsystem (existing)
Toll Collection Subsystem (future)
Traffic Management Subsystem (future)
Multimodal Crossings Terminator (existing)
Toll Operator Terminator (existing)

Camden County
Roadway Subsystem (future)
Traffic Management Subsystem (future)
Emergency Telecommunication System Terminator (existing)
Other Emergency Management Terminator (existing)

Canadian Pacific
Rail Operations Terminator (existing)
Wayside Equipment Terminator (existing)

Center City District
Information Service Provider Subsystem (future)
Remote Traveler Support Subsystem (future)

Chester County
Emergency Telecommunication System Terminator (existing)
Other Emergency Management Terminator (existing)

TMA of Chester County
Information Service Provider Subsystem (existing)
Personal Information Access Subsystem (existing)

County Paratransit Services
Transit Management Subsystem (existing)
Transit Vehicle Subsystem (future)

Cross County Connection TMA
Information Service Provider Subsystem (existing)
Personal Information Access Subsystem (existing)

CSX
Rail Operations Terminator (existing)
Wayside Equipment Terminator (existing)

DART First State
Other Transit Management Terminator (existing)

Delaware County
Emergency Telecommunication System Terminator (existing)
Other Emergency Management Terminator (existing)

Delaware County TMA
Information Service Provider Subsystem (existing)
Personal Information Access Subsystem (existing)

Delaware Department of Transportation
Information Service Provider Subsystem (existing)
Personal Information Access Subsystem (existing)
Roadway Subsystem (existing)
Traffic Management Subsystem (existing)
Traffic Operations Personnel Terminator (existing)

Delaware River and Bay Authority
Emergency Management Subsystem (existing)
Roadway Subsystem (existing)
Toll Administration Subsystem (existing)
Toll Collection Subsystem (existing)
Traffic Management Subsystem (existing)
Toll Operator Terminator (existing)

Delaware River Joint Toll Bridge Commission
Roadway Subsystem (existing)
Toll Administration Subsystem (existing)
Toll Collection Subsystem (future)
Traffic Management Subsystem (future)
Toll Operator Terminator (existing)

Delaware River Port Authority
Emergency Management Subsystem (existing)
Emergency Vehicle Subsystem (existing)
Personal Information Access Subsystem (existing)
Roadway Subsystem (existing)
Toll Administration Subsystem (existing)
Toll Collection Subsystem (existing)
Traffic Management Subsystem (existing)
Emergency System Operator Terminator (existing)
Maintenance Personnel Terminator (existing)
Public Affairs Terminator (existing)
Toll Operator Terminator (existing)
Traffic Operations Personnel Terminator (future)

Delaware Valley Regional Planning Commission
Archived Data Management Subsystem (existing)
Archived Data User Systems Terminator (existing)

E Center
Event Promoters Terminator (existing)

Express Traffic
Information Service Provider Subsystem (existing)
Personal Information Access Subsystem (existing)

E-Z Pass Consortium
Enforcement Agency Terminator (existing)
Financial Institution Terminator (existing)
Location Data Source Terminator (future)
Payment Instrument Terminator (existing)

Gloucester County
Roadway Subsystem (future)
Traffic Management Subsystem (future)
Emergency Telecommunication System Terminator (existing)
Other Emergency Management Terminator (existing)

Greater Mercer TMA
Information Service Provider Subsystem (existing)
Personal Information Access Subsystem (existing)

Greater Valley Forge TMA
Information Service Provider Subsystem (existing)
Personal Information Access Subsystem (existing)

I-95 Corridor Coalition
Other Information Service Provider Terminator (existing)
Other Traffic Management Terminator (existing)

Local Volunteer/Professional Fire/EMS Departments
Emergency Management Subsystem (existing)
Emergency Vehicle Subsystem (existing)

Mercer County
Roadway Subsystem (future)
Traffic Management Subsystem (future)

Emergency Telecommunication System Terminator (existing)
Other Emergency Management Terminator (existing)

Metro Traffic
Information Service Provider Subsystem (existing)

Montgomery County
Emergency Telecommunication System Terminator (existing)
Other Emergency Management Terminator (existing)

Municipal Police Departments
Emergency Management Subsystem (existing)
Emergency Vehicle Subsystem (existing)
Emergency System Operator Terminator (existing)

Municipal Traffic Operation Centers
Roadway Subsystem (future)
Traffic Management Subsystem (future)

National Weather Service
Weather Service Terminator (existing)

New Hope and Ivyland
Wayside Equipment Terminator (existing)

New Jersey Department of Transportation (Trenton)
Archived Data Management Subsystem (existing)
Commercial Vehicle Administration Subsystem (existing)
Information Service Provider Subsystem (existing)
Personal Information Access Subsystem (existing)
Archived Data User Systems Terminator (existing)
DMV Terminator (existing)

New Jersey Department of Transportation Traffic Operations South
Emergency Vehicle Subsystem (existing)
Roadway Subsystem (existing)
Traffic Management Subsystem (existing)
Maintenance Personnel Terminator (existing)
Traffic Operations Personnel Terminator (existing)

New Jersey Department of Transportation Traffic Operations North
Other Traffic Management Terminator (existing)

New Jersey Office of Emergency Management
Other Emergency Management Terminator (existing)

New Jersey State Police
Commercial Vehicle Administration Subsystem (existing)
Commercial Vehicle Check Subsystem (existing)
Emergency Management Subsystem (existing)
Emergency Vehicle Subsystem (existing)
Commercial Vehicle Operations Inspector Terminator (existing)
Emergency System Operator Terminator (existing)
Emergency Telecommunications System Terminator (existing)

New Jersey Transit
Archived Data Management Subsystem (existing)
Emergency Management Subsystem (existing)
Emergency Vehicle Subsystem (existing)
Information Service Provider Subsystem (existing)
Personal Information Access Subsystem (existing)
Remote Traveler Support Subsystem (existing)
Transit Management Subsystem (existing)
Transit Vehicle Subsystem (future)
Archived Data User Systems Terminator (existing)
Emergency System Operator Terminator (existing)
Rail Operations Terminator (existing)
Transit Driver Terminator (existing)
Transit Fleet Manager Terminator (existing)
Transit Maintenance Personnel Terminator (existing)
Transit System Operator Terminator (existing)
Wayside Equipment Terminator (existing)

New Jersey Turnpike Authority
Emergency Vehicle Subsystem (existing)
Information Service Provider Subsystem (existing)
Personal Information Access Subsystem (existing)
Remote Traveler Support Subsystem (future)
Roadway Subsystem (existing)
Toll Administration Subsystem (existing)
Toll Collection Subsystem (existing)
Traffic Management Subsystem (existing)
Maintenance Personnel Terminator (existing)
Toll Operator Terminator (existing)
Traffic Operations Personnel Terminator (existing)

Norfolk Southern
Rail Operations Terminator (existing)
Wayside Equipment Terminator (existing)

The Partnership TMA
Information Service Provider Subsystem (existing)
Personal Information Access Subsystem (existing)

PATCO
Emergency Management Subsystem (existing)
Information Service Provider Subsystem (existing)
Parking Management Subsystem (existing)
Personal Information Access Subsystem (existing)
Remote Traveler Support Subsystem (existing)
Transit Management Subsystem (existing)
Transit Vehicle Subsystem (future)
Emergency Telecommunication System Terminator (existing)
Emergency System Operator Terminator (existing)
Public Affairs Terminator (existing)
Transit Driver Terminator (existing)
Transit Fleet Manager Terminator (existing)
Transit Maintenance Personnel Terminator (existing)
Transit System Operator Terminator (existing)

Penns Landing Corporation
Event Promoters Terminator (existing)

Pennsylvania Convention Center Authority
Event Promoters Terminator (existing)

Pennsylvania Department of Transportation (Harrisburg)
Archived Data Management Subsystem (existing)
Commercial Vehicle Administration Subsystem (existing)
Commercial Vehicle Check Subsystem (existing)
Archived Data User Systems Terminator (existing)
DMV Terminator (existing)
Other Traffic Management Terminator (future)

Pennsylvania Department of Transportation District 6-0
Emergency Vehicle Subsystem (existing)
Roadway Subsystem (existing)
Traffic Management Subsystem (existing)

Maintenance Personnel Terminator (existing)
Public Affairs Terminator (existing)
Traffic Operations Personnel Terminator (existing)

Pennsylvania Emergency Management Agency
Other Emergency Management Terminator (existing)

Pennsylvania Public Utility Commission
Commercial Vehicle Check Subsystem (existing)
Commercial Vehicle Operations Inspector Terminator (existing)

Pennsylvania State Police
Commercial Vehicle Check Subsystem (existing)
Emergency Management Subsystem (existing)
Emergency Vehicle Subsystem (existing)
Commercial Vehicle Operations Inspector Terminator (existing)
Emergency System Operator Terminator (existing)

Pennsylvania Turnpike Commission
Information Service Provider Subsystem (existing)
Personal Information Access Subsystem (existing)
Remote Traveler Support Subsystem (existing)
Roadway Subsystem (existing)
Toll Administration Subsystem (existing)
Toll Collection Subsystem (existing)
Traffic Management Subsystem (existing)
Emergency Telecommunication System Terminator (existing)
Emergency System Operator Terminator (existing)
Maintenance Personnel Terminator (existing)
Toll Operator Terminator (existing)
Traffic Operations Personnel Terminator (existing)

Philadelphia Belt Line
Wayside Equipment Terminator (existing)

Philadelphia Convention and Tourist Bureau
Event Promoters Terminator (existing)

Philadelphia Department of Recreation
Event Promoters Terminator (existing)

Philadelphia Fire Department
Emergency Management Subsystem (existing)
Emergency Vehicle Subsystem (existing)

Philadelphia Industrial Development Corporation
Event Promoters Terminator (existing)

Philadelphia International Airport
Information Service Provider Subsystem (existing)
Personal Information Access Subsystem (existing)
Remote Traveler Support Subsystem (existing)
Multimodal Transportation Service Provider Terminator (existing)

Philadelphia Parking Authority
Parking Management Subsystem (existing)

Philadelphia Police Department
Emergency Management Subsystem (existing)
Emergency Vehicle Subsystem (existing)
Emergency System Operator Terminator (existing)
Emergency Telecommunication System Terminator (existing)

Philadelphia Redevelopment Authority
Information Service Provider Subsystem (future)
Remote Traveler Support Subsystem (future)

Philadelphia Streets Department
Archived Data Management Subsystem (existing)
Roadway Subsystem (existing)
Traffic Management Subsystem (existing)
Archived Data Management Systems Terminator (existing)
Maintenance Personnel Terminator (existing)
Traffic Operations Personnel Terminator (existing)

SEPTA
Archived Data Management Subsystem (existing)
Emergency Management Subsystem (existing)
Emergency Vehicle Subsystem (existing)
Information Service Provider Subsystem (existing)
Parking Management Subsystem (existing)
Personal Information Access Subsystem (existing)
Remote Traveler Support Subsystem (existing)

Transit Management Subsystem (existing)
Transit Vehicle Subsystem (future)
Archived Data User Systems Terminator (existing)
Emergency System Operator Terminator (existing)
Location Data Source Terminator (future)
Public Affairs Terminator (existing)
Rail Operations Terminator (existing)
Transit Driver Terminator (existing)
Transit Fleet Manager Terminator (existing)
Transit Maintenance Personnel Terminator (existing)
Transit System Operator Terminator (existing)
Wayside Equipment Terminator (existing)

SmartRoute
Information Service Provider Subsystem (existing)
Personal Information Access Subsystem (existing)
Roadway Subsystem (existing)

South Jersey Transportation Authority
Personal Information Access Subsystem (existing)
Remote Traveler Support Subsystem (existing)
Roadway Subsystem (existing)
Toll Administration Subsystem (existing)
Toll Collection Subsystem (existing)
Traffic Management Subsystem (existing)
Emergency Telecommunications System Terminator (existing)
Maintenance Personnel Terminator (existing)
Toll Operator Terminator (existing)
Traffic Operations Personnel Terminator (future)

Southern Rail Road of New Jersey
Wayside Equipment Terminator (existing)

Towamencin Township
Roadway Subsystem (future)
Traffic Management Subsystem (future)

Traffic.com
Archived Data Management Subsystem (existing)
Information Service Provider Subsystem (existing)
Personal Information Access Subsystem (existing)
Roadway Subsystem (existing)

Archived Data User Systems Terminator (existing)

TRANSCOM
Personal Information Access Subsystem (existing)
Other Information Service Provider Terminator (existing)
Other Traffic Management Terminator (existing)

APPENDIX D

KEY MUNICIPALITIES ALONG STATE HIGHWAYS IN NEW JERSEY

Burlington County:

Municipality	Highways
Bordentown (Borough)	US 130, US 206
Bordentown (Township)	I-295, US 130, US 206
Burlington (Borough)	US 130
Burlington (Township)	I-295, US 130
Cinnaminson	NJ 73, NJ 90, NJ 130
Delanco	US 130
Delran	US 130
East Hampton	US 206
Edgewater Park	US 130
Evesham	NJ 70, NJ 73
Florence	US 130
Hainsport	NJ 38
Lumberton	NJ 38
Mansfield	I-295, US 130, US 206
Maple Shade	NJ 38, NJ 73

Municipality	Highways
Medford	NJ 70
Moorestown	US 38
Mount Holly	NJ 38
Mount Laurel	I-295, NJ 38
Palmyra	NJ 73
Pemberton (Borough)	NJ 70
Pemberton (Township)	NJ 70
Shamong	US 206
Southampton	US 206, NJ 38, NJ 70
Springfield	I-295, US 206
Tabernacle	US 206
Westhampton	I-295
Willingboro	US 130
Woodland	NJ 70, NJ 72

Camden County:

Municipality	Highways
Audubon	US 30
Audubon Park	NJ 168
Barrington	I-295, NJ 41
Bellmawr	I-295, NJ 42, NJ 168
Berlin (Borough)	NJ 30, NJ 73
Berlin (Township)	NJ 73
Brooklawn	US 130
Camden	I-676, US 30, NJ 168
Chesilhurst	US 30
Cherry Hill	I-295, NJ 38, NJ 41, NJ 70
Clementon	US 30
Collingswood	US 30, NJ 130
Gloucester	NJ 42, NJ 168
Gloucester City	NJ 76, NJ 130
Haddon (Township)	US 30, NJ 168
Haddonfield	NJ 41

Municipality	Highways
Haddon Heights	I-295, US 30, NJ 41
Laurel Springs	US 30
Lawnside	I-295, US 30
Lindenwold	US 30
Magnolia	US 30
Mount Ephrain	NJ 168
Oaklyn	US 30
Pennsauken	US 130, NJ 73, NJ 90
Runnemede	NJ 42, NJ 168
Somerdale	US 30
Stratford	US 30
Voorhees	NJ 73
Waterford	US 30
Winslow	US 30, NJ 73
Woodlynne	US 130, NJ 168

Gloucester County:

Municipality	Highways
Clayton	I-295, US 130, US 322
Depford	NJ Routes 41,42,47,55
Elk	NJ 55, NJ 77
Franklin	US 40, NJ 55,NJ 47
Glassboro	US 322, NJ 47
Greenwich	I-295, NJ 44
Harrison	US 322, NJ 45, NJ 55, NJ 77
Logan	I-295, US 130, US 322
Mantua	NJ 45, NJ 55
Monroe	US 322, NJ 42

Municipality	Highways
Paulsboro	I-295, NJ 44
Pitman	NJ 47
South Harrison	NJ 45
Washington	NJ 42, NJ 47
West Depford	I-295, NJ 44, NJ 45
Westville	I-295, NJ 45, NJ 47
Woodbury	NJ 45
Woodbury Heights	NJ 45
Woolwich	US 322

Mercer County:

Municipality	Highways
East Windsor	US 130, NJ 33
Ewing	I-295, NJ 31
Hamilton	I-195, I-295, US 130, US 206, NJ 129
Hightstown	NJ 33
Hopewell	NJ 31
Lawrence	I-295, US 1, US 206

Municipality	Highways
Pennington	**NJ 31**
Princeton (Borough)	**NJ 37, NJ 206**
Princeton (Township)	**NJ 37, NJ 206**
Trenton	US 1, US 206, NJ 31, NJ 33, NJ 129
Washington	I-195, US 1230, NJ 33
West Windsor	US 1

APPENDIX E

KEY MUNICIPALITIES ALONG STATE HIGHWAYS IN PENNSYLVANIA

Bucks County:

Municipality	Highways
Bensalem	I-95, I-276, PA 63
Bristol	I-95, I-276, PAT Bridge
Falls	US 1
Lower Makefield	I-95, I-95 Bridge

Municipality	Highways
Middletown	I-95, US 1
Morrisville	US 1, US 1 Bridge
Nether Providence	I-476
Upper South Hampton	I-276

Chester County:

Municipality	Expressways
Caln	US 30
Downington	US 30
East Caln	US 30
East Goshen	US 202
East Whiteland	I-76, US 30, US 202
Easttown	I-76
Elverson	I-76
North Coventry	US 422

Municipality	Expressways
Sadsbury	US 30
Tredyffrin	I-76, US 202, US 422
Uwchlan	I-76
Valley	US 30
Wallace	I-76
West Caln	US 30
West Goshen	US 202
West Whiteland	US 30, US 202

Delaware County:

Municipality	Highways
Chester	I-95, US 322 Bridge
Chester City	I-95
Haverford	I-476
Lower Chichester	I-95
Marple	I-476, US 1
Middletown	I-95, US 1
Plymouth	I-476
Randor	I-476

Municipality	Highways
Ridley	I-95, I-476
Ridley Park	I-95
Springfield	I-476, US 1
Tinicum	I-95
Upland	I-95
Upper Chichester	I-95
Upper Providence	US 1

Montgomery County:

Municipality	Highways
Cheltenham	PA 309
Limerick	US 422
Lower Gwynedd	PA 309
Lower Merion	I-76, I-476
Lower Pottsgrove	US 422
Lower Providence	US 422
Salford	I-476
Springfield	PA 309
Towamenan	I-476

Municipality	Highways
Upper Dublin	I-276, PA 309
Upper Merion	I-76, I-276, US 202
Upper Moreland	I-276
Upper Providence	US 422
West Conshohocken	I-76, I-476
West Norriton	US 422
West Pottsgrove	US 422
Whitemarsh	I-276, PA 309
Whitpain	I-276

APPENDIX F

NATIONAL ITS STANDARDS APPLICABLE TO REGIONAL ITS ARCHITECTURE

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
ADMS	Archived Data (X69)	archive analysis results	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ADMS	TAS	archive status	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ADMS	TMS	archive status	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ADMS	Archived Data (X69)	archived data products	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ADMS	Archived Data (X69)	archive request confirmation	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ADMS	TMS	archive requests	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ADMS	TAS	archive status	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ADMS	TAS	archive requests	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ADMS	PMS	archive status	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ADMS	PMS	archive requests	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ADMS	ISP	archive status	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ADMS	ISP	archive requests	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ADMS	PMS	archive status	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ADMS	EM	archive requests	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ADMS	TRMS	archive status	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ADMS	Construction and Maintenance (X09)	archive status	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ADMS	Construction and Maintenance (X09)	archive requests	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ADMS	RS	sensor and surveillance control	S-30	NTCIP - Transportation System Sensor Objects	AASHTO
ADMS	RS	sensor and surveillance control	S-80	NTCIP - Data Collection & Monitoring Devices	AASHTO
ADMS	EM	archive requests	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ADMS	EM	archive status	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ADMS	ISP	archive requests	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ADMS	ISP	archive status	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ADMS	PMS	archive requests	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ADMS	PMS	archive status	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ADMS	TAS	archive requests	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ADMS	EM	archive status	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ADMS	EM	archive requests	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ADMS	TAS	archive requests	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ADMS	TAS	archive status	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ADMS	TMS	archive requests	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ADMS	TMS	archive status	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ADMS	TRMS	archive requests	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
ADMS	TRMS	archive status	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ADMS	Multimodal TSP (X02)	archive requests	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ADMS	Multimodal TSP (X02)	archive status	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ADMS	Construction and Maintenance (X09)	archive requests	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ADMS	Construction and Maintenance (X09)	archive status	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ADMS	Archived Data (X69)	archive analysis results	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ADMS	TAS	archive requests	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ADMS	Archived Data (X69)	archived data products	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ADMS	TRMS	archive requests	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ADMS	EM	archive status	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ADMS	ISP	archive status	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ADMS	PMS	archive requests	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ADMS	PMS	archive status	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ADMS	Archived Data (X69)	archived data products	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ADMS	Archived Data (X69)	archive request confirmation	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ADMS	Archived Data (X69)	archive analysis results	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ADMS	Construction and Maintenance (X09)	archive status	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ADMS	Construction and Maintenance (X09)	archive requests	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ADMS	Multimodal TSP (X02)	archive status	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ADMS	Multimodal TSP (X02)	archive requests	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ADMS	TMS	archive status	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ADMS	Archived Data (X69)	archive request confirmation	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ADMS	TRMS	archive status	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ADMS	TAS	archive status	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ADMS	Multimodal TSP (X02)	archive status	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ADMS	Multimodal TSP (X02)	archive requests	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ADMS	TRMS	archive status	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ADMS	TRMS	archive requests	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ADMS	TMS	archive status	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ADMS	Archived Data (X69)	archived data products	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ADMS	Archived Data (X69)	archive request confirmation	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ADMS	Archived Data (X69)	archive analysis results	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ADMS	Construction and Maintenance (X09)	archive status	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
ADMS	Construction and Maintenance (X09)	archive requests	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ADMS	EM	archive status	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ADMS	Multimodal TSP (X02)	archive requests	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ADMS	ISP	archive requests	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ADMS	TRMS	archive requests	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ADMS	TMS	archive status	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ADMS	TMS	archive requests	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ADMS	TAS	archive status	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ADMS	TAS	archive requests	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ADMS	PMS	archive status	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ADMS	PMS	archive requests	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ADMS	ISP	archive status	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ADMS	ISP	archive requests	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ADMS	EM	archive status	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ADMS	EM	archive requests	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ADMS	TMS	archive requests	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ADMS	Multimodal TSP (X02)	archive status	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ADMS	Construction and Maintenance (X09)	archive status	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ADMS	ISP	archive requests	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ADMS	TRMS	archive requests	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ADMS	TRMS	archive status	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ADMS	Multimodal TSP (X02)	archive requests	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ADMS	Multimodal TSP (X02)	archive status	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ADMS	Construction and Maintenance (X09)	archive requests	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ADMS	Construction and Maintenance (X09)	archive status	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ADMS	Archived Data (X69)	archive analysis results	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ADMS	Archived Data (X69)	archive request confirmation	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ADMS	Archived Data (X69)	archived data products	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ADMS	Archived Data (X69)	archived data products	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ADMS	EM	archive requests	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ADMS	Archived Data (X69)	archive analysis results	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ADMS	TMS	archive requests	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ADMS	Construction and Maintenance (X09)	archive requests	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
ADMS	Multimodal TSP (X02)	archive status	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ADMS	Multimodal TSP (X02)	archive requests	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ADMS	TRMS	archive status	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ADMS	TRMS	archive requests	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ADMS	TMS	archive status	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ADMS	TMS	archive requests	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ADMS	TAS	archive status	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ADMS	TAS	archive requests	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ADMS	PMS	archive status	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ADMS	PMS	archive requests	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ADMS	ISP	archive status	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ADMS	Archived Data (X69)	archive request confirmation	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ADMS	TAS	archive status	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ADMS	EM	archive requests	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ADMS	TAS	archive status	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ADMS	TMS	archive requests	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ADMS	TMS	archive status	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ADMS	TRMS	archive requests	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ADMS	PMS	archive status	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ADMS	Multimodal TSP (X02)	archive requests	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ADMS	PMS	archive requests	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ADMS	TAS	archive requests	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ADMS	PMS	archive status	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ADMS	PMS	archive requests	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ADMS	ISP	archive status	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ADMS	ISP	archive requests	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ADMS	EM	archive status	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ADMS	TRMS	archive status	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ADMS	TRMS	archive status	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ADMS	Archived Data (X69)	archived data products	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ADMS	Archived Data (X69)	archive request confirmation	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ADMS	Archived Data (X69)	archive analysis results	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ADMS	Construction and Maintenance (X09)	archive status	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
ADMS	Construction and Maintenance (X09)	archive requests	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ADMS	TAS	archive requests	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ADMS	Multimodal TSP (X02)	archive requests	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ADMS	ISP	archive status	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ADMS	TRMS	archive requests	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ADMS	TMS	archive status	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ADMS	TMS	archive requests	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ADMS	EM	archive requests	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ADMS	ISP	archive requests	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ADMS	PMS	archive requests	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ADMS	Multimodal TSP (X02)	archive status	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ADMS	Construction and Maintenance (X09)	archive status	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ADMS	Archived Data (X69)	archive analysis results	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ADMS	EM	archive requests	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ADMS	EM	archive status	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ADMS	Construction and Maintenance (X09)	archive requests	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ADMS	ISP	archive status	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ADMS	ISP	archive requests	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ADMS	EM	archive status	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ADMS	Archived Data (X69)	archived data products	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ADMS	Archived Data (X69)	archive request confirmation	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ADMS	Multimodal TSP (X02)	archive status	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Archived Data (X69)	ADMS	archive analysis requests	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Archived Data (X69)	ADMS	archive analysis requests	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
Archived Data (X69)	ADMS	archive analysis requests	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Archived Data (X69)	ADMS	archived data product requests	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Archived Data (X69)	ADMS	archived data product requests	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Archived Data (X69)	ADMS	archive analysis requests	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Archived Data (X69)	ADMS	archived data product requests	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Archived Data (X69)	ADMS	archive analysis requests	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Archived Data (X69)	ADMS	archive analysis requests	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Archived Data (X69)	ADMS	archived data product requests	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Archived Data (X69)	ADMS	archived data product requests	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
Archived Data (X69)	ADMS	archived data product requests	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Archived Data (X69)	ADMS	archive analysis requests	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Archived Data (X69)	ADMS	archived data product requests	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Archived Data (X69)	ADMS	archived data product requests	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Archived Data (X69)	ADMS	archive analysis requests	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Construction and Maintenance (X09)	TMS	work zone status	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Construction and Maintenance (X09)	TMS	equipment maintenance status	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Construction and Maintenance (X09)	ADMS	construction and maintenance archive data	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Construction and Maintenance (X09)	TMS	equipment maintenance status	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
Construction and Maintenance (X09)	TMS	work zone status	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Construction and Maintenance (X09)	TMS	maintenance resource response	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Construction and Maintenance (X09)	TMS	equipment maintenance status	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Construction and Maintenance (X09)	ADMS	construction and maintenance archive data	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Construction and Maintenance (X09)	TMS	equipment maintenance status	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Construction and Maintenance (X09)	TMS	work zone status	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
Construction and Maintenance (X09)	TMS	maintenance resource response	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Construction and Maintenance (X09)	ADMS	construction and maintenance archive data	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Construction and Maintenance (X09)	TMS	equipment maintenance status	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Construction and Maintenance (X09)	TMS	maintenance resource response	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Construction and Maintenance (X09)	TMS	work zone status	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Construction and Maintenance (X09)	TMS	maintenance resource response	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
Construction and Maintenance (X09)	TMS	maintenance resource response	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Construction and Maintenance (X09)	TMS	maintenance resource response	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
Construction and Maintenance (X09)	TMS	work zone status	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
Construction and Maintenance (X09)	TMS	work zone status	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Construction and Maintenance (X09)	TMS	maintenance resource response	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Construction and Maintenance (X09)	TMS	equipment maintenance status	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Construction and Maintenance (X09)	TMS	equipment maintenance status	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
Construction and Maintenance (X09)	TMS	work zone status	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Construction and Maintenance (X09)	TMS	maintenance resource response	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Construction and Maintenance (X09)	TMS	equipment maintenance status	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Construction and Maintenance (X09)	ADMS	construction and maintenance archive data	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Construction and Maintenance (X09)	TMS	work zone status	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
Construction and Maintenance (X09)	ADMS	construction and maintenance archive data	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Construction and Maintenance (X09)	TMS	maintenance resource response	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
Construction and Maintenance (X09)	TMS	equipment maintenance status	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
Construction and Maintenance (X09)	ADMS	construction and maintenance archive data	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Construction and Maintenance (X09)	ADMS	construction and maintenance archive data	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Construction and Maintenance (X09)	TMS	work zone status	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Construction and Maintenance (X09)	TMS	maintenance resource response	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Construction and Maintenance (X09)	TMS	equipment maintenance status	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Construction and Maintenance (X09)	ADMS	construction and maintenance archive data	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
Construction and Maintenance (X09)	TMS	work zone status	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
DMV (X64)	TAS	registration	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
DMV (X64)	TAS	registration	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
DMV (X64)	TAS	registration	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
DMV (X64)	TAS	registration	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
DMV (X64)	TAS	registration	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
DMV (X64)	TAS	registration	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
DMV (X64)	TAS	registration	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
DMV (X64)	TAS	registration	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
EM	ADMS	emergency archive data	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
EM	TRMS	transit emergency coordination data	IEEE7	Standard for Common Incident Management Message Sets (IMMS) for use	IEEE
EM	TMS	incident response status	IEEE7	Standard for Common Incident Management Message Sets (IMMS) for use	IEEE
EM	Event Promoters (X19)	event confirmation	IEEE7	Standard for Common Incident Management Message Sets (IMMS) for use	IEEE
EM	Media (X27)	incident information for media	IEEE7	Standard for Common Incident Management Message Sets (IMMS) for use	IEEE
EM	TMS	incident information	IEEE7	Standard for Common Incident Management Message Sets (IMMS) for use	IEEE
EM	ISP	incident information	IEEE7	Standard for Common Incident Management Message Sets (IMMS) for use	IEEE
EM	Other EM (X30)	incident report	IEEE7	Standard for Common Incident Management Message Sets (IMMS) for use	IEEE
EM	Other EM (X30)	incident report	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
EM	Other EM (X30)	incident response coordination	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
EM	FMS	HAZMAT information request	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
EM	ISP	incident information	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
EM	TMS	emergency traffic control request	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
EM	TMS	incident information	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
EM	TMS	incident response status	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
EM	TMS	remote surveillance control	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
EM	Other EM (X30)	incident response coordination	IEEE7	Standard for Common Incident Management Message Sets (IMMS) for use	IEEE
EM	TMS	remote surveillance control	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
EM	Media (X27)	incident information for media	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
EM	Map Update Provider (X23)	map update request	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
EM	Event Promoters (X19)	event confirmation	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
EM	TRMS	transit emergency coordination data	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
EM	TMS	resource request	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
EM	ISP	incident information	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
EM	TMS	emergency traffic control request	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
EM	Other EM (X30)	incident response coordination	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
EM	TRMS	transit emergency coordination data	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
EM	TMS	incident response status	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
EM	Media (X27)	incident information for media	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
EM	ADMS	emergency archive data	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
EM	TMS	resource request	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
EM	Other EM (X30)	incident report	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
EM	TMS	resource request	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
EM	FMS	HAZMAT information request	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
EM	TMS	remote surveillance control	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
EM	Event Promoters (X19)	event confirmation	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
EM	Map Update Provider (X23)	map update request	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
EM	TMS	incident information	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
EM	ADMS	emergency archive data	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
EM	Event Promoters (X19)	event confirmation	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
EM	Map Update Provider (X23)	map update request	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
EM	Media (X27)	incident information for media	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
EM	Other EM (X30)	incident report	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
EM	Other EM (X30)	incident response coordination	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
EM	ADMS	emergency archive data	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
EM	FMS	HAZMAT information request	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
EM	ISP	incident information	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
EM	TMS	emergency traffic control request	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
EM	Other EM (X30)	incident response coordination	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
EM	Other EM (X30)	incident report	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
EM	TMS	incident response status	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
EM	TMS	emergency traffic control request	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
EM	TMS	emergency traffic control request	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
EM	TMS	emergency traffic control request	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
EM	Map Update Provider (X23)	map update request	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
EM	Event Promoters (X19)	event confirmation	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
EM	TRMS	transit emergency coordination data	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
EM	TMS	resource request	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
EM	TMS	remote surveillance control	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
EM	TMS	incident information	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
EM	TMS	incident information	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
EM	TMS	incident response status	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
EM	ISP	incident information	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
EM	Event Promoters (X19)	event confirmation	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
EM	TMS	resource request	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
EM	TMS	remote surveillance control	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
EM	FMS	HAZMAT information request	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
EM	TMS	remote surveillance control	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
EM	TMS	incident response status	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
EM	Other EM (X30)	incident report	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
EM	TRMS	transit emergency coordination data	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
EM	TMS	incident information	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
EM	TMS	incident response status	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
EM	TMS	remote surveillance control	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
EM	TRMS	transit emergency coordination data	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
EM	ISP	incident information	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
EM	Media (X27)	incident information for media	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
EM	FMS	HAZMAT information request	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
EM	Other EM (X30)	incident response coordination	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
EM	Other EM (X30)	incident response coordination	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
EM	Other EM (X30)	incident report	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
EM	Media (X27)	incident information for media	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
EM	Map Update Provider (X23)	map update request	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
EM	Event Promoters (X19)	event confirmation	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
EM	Map Update Provider (X23)	map update request	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
EM	TMS	incident information	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
EM	TRMS	transit emergency coordination data	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
EM	TMS	incident response status	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
EM	TMS	incident information	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
EM	TMS	emergency traffic control request	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
EM	ISP	incident information	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
EM	TMS	emergency traffic control request	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
EM	ADMS	emergency archive data	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
EM	TMS	resource request	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
EM	TMS	resource request	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
EM	TMS	remote surveillance control	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
EM	TMS	incident response status	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
EM	Media (X27)	incident information for media	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
EM	TMS	incident information	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
EM	ADMS	emergency archive data	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
EM	FMS	HAZMAT information request	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
EM	TMS	resource request	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
EM	ISP	incident information	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
EM	TMS	remote surveillance control	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
EM	TRMS	transit emergency coordination data	tcip-im	TCIP - Incident Management (IM) Business Area Standard	ITE
EM	TMS	resource request	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
EM	TRMS	transit emergency coordination data	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
EM	TMS	emergency traffic control request	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
EM	TMS	incident information	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
EM	FMS	HAZMAT information request	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
EM	TMS	remote surveillance control	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
EM	TMS	incident response status	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
EM	Event Promoters (X19)	event confirmation	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
EM	TRMS	transit emergency coordination data	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
EM	Map Update Provider (X23)	map update request	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
EM	Media (X27)	incident information for media	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
EM	Other EM (X30)	incident report	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
EM	Other EM (X30)	incident response coordination	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
EM	TMS	resource request	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
EM	Event Promoters (X19)	event confirmation	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
EM	TMS	incident response status	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
EM	Other EM (X30)	incident report	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
EM	ISP	incident information	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
EM	FMS	HAZMAT information request	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
EM	ADMS	emergency archive data	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
EM	Media (X27)	incident information for media	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
EM	Other EM (X30)	incident response coordination	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
EM	TMS	emergency traffic control request	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
EM	TMS	incident information	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
EM	ADMS	emergency archive data	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
EM	Map Update Provider (X23)	map update request	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Emergency Tele Systems (X13)	EM	incident notification	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Emergency Tele Systems (X13)	EM	incident notification	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Emergency Tele Systems (X13)	EM	incident notification	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
Emergency Tele Systems (X13)	EM	incident notification	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Emergency Tele Systems (X13)	EM	incident notification	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Emergency Tele Systems (X13)	EM	incident notification	IEEE7	Standard for Common Incident Management Message Sets (IMMS) for use	IEEE
Emergency Tele Systems (X13)	EM	incident notification	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Emergency Tele Systems (X13)	EM	incident notification	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Emergency Tele Systems (X13)	EM	incident notification	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Event Promoters (X19)	EM	event plans	IEEE7	Standard for Common Incident Management Message Sets (IMMS) for use	IEEE
Event Promoters (X19)	EM	event plans	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Event Promoters (X19)	TMS	event plans	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Event Promoters (X19)	EM	event plans	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Event Promoters (X19)	TMS	event plans	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
Event Promoters (X19)	EM	event plans	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Event Promoters (X19)	EM	event plans	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
Event Promoters (X19)	TMS	event plans	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Event Promoters (X19)	EM	event plans	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
Event Promoters (X19)	TMS	event plans	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Event Promoters (X19)	TMS	event plans	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Event Promoters (X19)	EM	event plans	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Event Promoters (X19)	TMS	event plans	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
Event Promoters (X19)	TMS	event plans	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Event Promoters (X19)	EM	event plans	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Event Promoters (X19)	TMS	event plans	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Event Promoters (X19)	TMS	event plans	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Event Promoters (X19)	EM	event plans	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Event Promoters (X19)	TMS	event plans	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
EVS	RS	local signal preemption request	ASTM2	Standard Specification for DSRC - Data Link Layer	ASTM
EVS	RS	local signal preemption request	ASTM1	Standard Specification for DSRC - Physical Layer 902-928 MHz	ASTM
Financial Institution (X21)	TRMS	transaction status	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Financial Institution (X21)	TAS	transaction status	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Financial Institution (X21)	TAS	transaction status	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Financial Institution (X21)	TRMS	transaction status	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Financial Institution (X21)	ISP	transaction status	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Financial Institution (X21)	ISP	transaction status	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Financial Institution (X21)	TRMS	transaction status	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Financial Institution (X21)	TAS	transaction status	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Financial Institution (X21)	ISP	transaction status	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Financial Institution (X21)	ISP	transaction status	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Financial Institution (X21)	TAS	transaction status	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Financial Institution (X21)	TRMS	transaction status	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Financial Institution (X21)	TRMS	transaction status	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Financial Institution (X21)	TRMS	transaction status	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
Financial Institution (X21)	TAS	transaction status	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
Financial Institution (X21)	ISP	transaction status	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
Financial Institution (X21)	ISP	transaction status	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Financial Institution (X21)	TAS	transaction status	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Financial Institution (X21)	TRMS	transaction status	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
Financial Institution (X21)	TAS	transaction status	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Financial Institution (X21)	ISP	transaction status	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Financial Institution (X21)	ISP	transaction status	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Financial Institution (X21)	TAS	transaction status	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Financial Institution (X21)	TRMS	transaction status	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Financial Institution (X21)	TRMS	transaction status	tcip-fc	TCIP - Fare Collection (FC) Business Area Standard	ITE
FMS	ISP	route request	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
FMS	EM	HAZMAT information	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
FMS	EM	HAZMAT information	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
FMS	ISP	route request	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
FMS	ISP	route request	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
FMS	ISP	route request	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
FMS	ISP	route request	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
FMS	ISP	route request	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
FMS	EM	HAZMAT information	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
FMS	EM	HAZMAT information	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
FMS	EM	HAZMAT information	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
FMS	EM	HAZMAT information	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
FMS	ISP	route request	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
FMS	ISP	route request	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
FMS	EM	HAZMAT information	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
FMS	ISP	route request	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
FMS	EM	HAZMAT information	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
FMS	ISP	route request	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
ISP	FMS	route plan	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ISP	TRMS	selected routes	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ISP	EM	incident information request	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ISP	PMS	parking lot data request	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ISP	PMS	parking reservations request	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ISP	ADMS	traveler archive data	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ISP	ADMS	traveler archive data	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ISP	TMS	request for traffic information	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ISP	RTS	broadcast information	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
ISP	TMS	road network use	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ISP	TRMS	demand responsive transit request	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ISP	TAS	toll data request	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ISP	PIAS	broadcast information	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
ISP	TMS	road network use	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ISP	TMS	request for traffic information	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ISP	PMS	parking reservations request	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ISP	RTS	traveler information	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
ISP	EM	incident information request	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ISP	PIAS	trip plan	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
ISP	FMS	route plan	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ISP	PIAS	traveler information	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
ISP	TRMS	transit information request	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ISP	FMS	route plan	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
ISP	ADMS	traveler archive data	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
ISP	VS	yellow pages information	SAE-J1764	ISP-Vehicle Location Referencing Message Profiles	SAE
ISP	VS	trip plan	SAE-J1764	ISP-Vehicle Location Referencing Message Profiles	SAE
ISP	VS	traveler information	SAE-J1764	ISP-Vehicle Location Referencing Message Profiles	SAE
ISP	VS	broadcast information	SAE-J1764	ISP-Vehicle Location Referencing Message Profiles	SAE
ISP	PIAS	trip plan	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
ISP	Other ISP (X31)	ISP coordination	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ISP	Financial Institution (X21)	payment request	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ISP	Map Update Provider (X23)	map update request	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ISP	Yellow Pages (X24)	provider profile confirm	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ISP	Yellow Pages (X24)	travel service request	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ISP	Media (X27)	traveler information for media	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ISP	Other ISP (X31)	ISP coordination	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ISP	TRMS	demand responsive transit request	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ISP	PIAS	yellow pages information	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
ISP	TRMS	selected routes	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ISP	Media (X27)	traveler information for media	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ISP	Yellow Pages (X24)	travel service request	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ISP	Yellow Pages (X24)	provider profile confirm	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
ISP	Map Update Provider (X23)	map update request	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ISP	Financial Institution (X21)	payment request	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ISP	Multimodal TSP (X02)	multimodal information request	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ISP	TRMS	transit information request	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
ISP	PMS	parking lot data request	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
ISP	VS	yellow pages information	SAE-J2369	Standard for ATIS Message Sets Delivered Over Bandwidth Restricted	SAE
ISP	Media (X27)	traveler information for media	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
ISP	TRMS	selected routes	tcip-pi	TCIP - Passenger Information (PI) Business Area Standard	ITE
ISP	PIAS	broadcast information	CEMA-1	Data Radio Channel (DARC) System	EIA/CEMA
ISP	RTS	broadcast information	CEMA-1	Data Radio Channel (DARC) System	EIA/CEMA
ISP	VS	broadcast information	CEMA-1	Data Radio Channel (DARC) System	EIA/CEMA
ISP	PIAS	broadcast information	CEMA-2	Subcarrier Traffic Information Channel (STIC) System	EIA/CEMA
ISP	RTS	broadcast information	CEMA-2	Subcarrier Traffic Information Channel (STIC) System	EIA/CEMA
ISP	TRMS	transit information request	tcip-pi	TCIP - Passenger Information (PI) Business Area Standard	ITE
ISP	EM	incident information request	IEEE7	Standard for Common Incident Management Message Sets (IMMS) for use	IEEE
ISP	ADMS	traveler archive data	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ISP	TMS	request for traffic information	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
ISP	TMS	road network use	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
ISP	VS	traveler information	SAE-J2369	Standard for ATIS Message Sets Delivered Over Bandwidth Restricted	SAE
ISP	VS	broadcast information	SAE-J2369	Standard for ATIS Message Sets Delivered Over Bandwidth Restricted	SAE
ISP	RTS	broadcast information	SAE-J2369	Standard for ATIS Message Sets Delivered Over Bandwidth Restricted	SAE
ISP	PIAS	broadcast information	SAE-J2369	Standard for ATIS Message Sets Delivered Over Bandwidth Restricted	SAE
ISP	PIAS	broadcast information	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
ISP	VS	broadcast information	CEMA-2	Subcarrier Traffic Information Channel (STIC) System	EIA/CEMA
ISP	TRMS	demand responsive transit request	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ISP	Other ISP (X31)	ISP coordination	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ISP	Media (X27)	traveler information for media	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ISP	Yellow Pages (X24)	travel service request	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ISP	Yellow Pages (X24)	provider profile confirm	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ISP	Map Update Provider (X23)	map update request	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ISP	Financial Institution (X21)	payment request	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ISP	Multimodal TSP (X02)	multimodal information request	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ISP	ADMS	traveler archive data	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
ISP	TRMS	selected routes	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ISP	Yellow Pages (X24)	travel service request	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
ISP	TMS	road network use	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ISP	TMS	request for traffic information	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ISP	TAS	toll data request	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ISP	PMS	parking reservations request	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ISP	PMS	parking lot data request	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ISP	FMS	route plan	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ISP	EM	incident information request	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ISP	TRMS	transit information request	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
ISP	VS	yellow pages information	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
ISP	Other ISP (X31)	ISP coordination	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
ISP	PMS	parking lot data request	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ISP	PIAS	traveler information	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
ISP	FMS	route plan	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
ISP	ADMS	traveler archive data	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
ISP	Other ISP (X31)	ISP coordination	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
ISP	Media (X27)	traveler information for media	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
ISP	TMS	request for traffic information	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ISP	Yellow Pages (X24)	provider profile confirm	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
ISP	TAS	toll data request	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ISP	VS	trip plan	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
ISP	VS	traveler information	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
ISP	VS	broadcast information	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
ISP	TRMS	transit information request	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
ISP	TRMS	selected routes	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
ISP	TMS	request for traffic information	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
ISP	RTS	yellow pages information	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
ISP	Yellow Pages (X24)	travel service request	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
ISP	RTS	trip plan	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
ISP	Yellow Pages (X24)	provider profile confirm	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
ISP	VS	yellow pages information	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
ISP	EM	incident information request	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
ISP	FMS	route plan	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ISP	VS	trip plan	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
ISP	VS	traveler information	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
ISP	VS	broadcast information	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
ISP	PIAS	yellow pages information	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
ISP	RTS	yellow pages information	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
ISP	RTS	trip plan	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
ISP	RTS	traveler information	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
ISP	RTS	broadcast information	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
ISP	PMS	parking lot data request	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
ISP	TMS	request for traffic information	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
ISP	TMS	road network use	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
ISP	PMS	parking lot data request	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ISP	PMS	parking reservations request	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ISP	TMS	request for traffic information	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
ISP	TRMS	transit information request	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ISP	TRMS	demand responsive transit request	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ISP	Other ISP (X31)	ISP coordination	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ISP	Media (X27)	traveler information for media	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ISP	Media (X27)	traveler information for media	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ISP	Other ISP (X31)	ISP coordination	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ISP	PMS	parking lot data request	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ISP	FMS	route plan	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ISP	EM	incident information request	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ISP	ADMS	traveler archive data	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ISP	Yellow Pages (X24)	travel service request	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ISP	Yellow Pages (X24)	provider profile confirm	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ISP	Map Update Provider (X23)	map update request	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ISP	TAS	toll data request	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ISP	Multimodal TSP (X02)	multimodal information request	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ISP	TMS	request for traffic information	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ISP	TRMS	selected routes	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ISP	TRMS	demand responsive transit request	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
ISP	TMS	road network use	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ISP	Other ISP (X31)	ISP coordination	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ISP	Media (X27)	traveler information for media	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ISP	Yellow Pages (X24)	travel service request	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ISP	Yellow Pages (X24)	provider profile confirm	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ISP	Map Update Provider (X23)	map update request	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ISP	Multimodal TSP (X02)	multimodal information request	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ISP	Multimodal TSP (X02)	multimodal information request	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ISP	TRMS	selected routes	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ISP	Financial Institution (X21)	payment request	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ISP	Multimodal TSP (X02)	multimodal information request	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ISP	Financial Institution (X21)	payment request	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ISP	Yellow Pages (X24)	provider profile confirm	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ISP	TRMS	transit information request	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ISP	TRMS	selected routes	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ISP	TRMS	demand responsive transit request	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ISP	TMS	road network use	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ISP	TMS	request for traffic information	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ISP	TAS	toll data request	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ISP	PMS	parking reservations request	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ISP	PMS	parking lot data request	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ISP	FMS	route plan	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ISP	Financial Institution (X21)	payment request	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ISP	Map Update Provider (X23)	map update request	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ISP	EM	incident information request	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ISP	PMS	parking reservations request	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ISP	Other ISP (X31)	ISP coordination	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ISP	TRMS	transit information request	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ISP	Yellow Pages (X24)	travel service request	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ISP	TAS	toll data request	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
ISP	Media (X27)	traveler information for media	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ISP	Other ISP (X31)	ISP coordination	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ISP	Yellow Pages (X24)	travel service request	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
ISP	Yellow Pages (X24)	provider profile confirm	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ISP	Map Update Provider (X23)	map update request	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ISP	Financial Institution (X21)	payment request	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ISP	Multimodal TSP (X02)	multimodal information request	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ISP	TRMS	transit information request	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ISP	TRMS	selected routes	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ISP	TRMS	demand responsive transit request	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ISP	TMS	road network use	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
ISP	ADMS	traveler archive data	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
ISP	TAS	toll data request	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ISP	TRMS	selected routes	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ISP	TRMS	demand responsive transit request	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ISP	EM	incident information request	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ISP	TMS	road network use	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ISP	TMS	request for traffic information	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ISP	ADMS	traveler archive data	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ISP	EM	incident information request	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ISP	TRMS	transit information request	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ISP	Yellow Pages (X24)	provider profile confirm	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ISP	Media (X27)	traveler information for media	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ISP	PMS	parking reservations request	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ISP	PMS	parking lot data request	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ISP	FMS	route plan	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
ISP	Map Update Provider (X23)	map update request	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ISP	Financial Institution (X21)	payment request	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ISP	TMS	road network use	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ISP	ADMS	traveler archive data	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ISP	Yellow Pages (X24)	travel service request	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
ISP	TMS	request for traffic information	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ISP	PMS	parking lot data request	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ISP	TAS	toll data request	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ISP	PMS	parking reservations request	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
ISP	FMS	route plan	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
Map Update Provider (X23)	ISP	map updates	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Map Update Provider (X23)	TRMS	map updates	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Map Update Provider (X23)	EM	map updates	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Map Update Provider (X23)	TMS	map updates	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Map Update Provider (X23)	TRMS	map updates	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Map Update Provider (X23)	EM	map updates	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
Map Update Provider (X23)	ISP	map updates	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Map Update Provider (X23)	ISP	map updates	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
Map Update Provider (X23)	TRMS	map updates	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Map Update Provider (X23)	EM	map updates	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Map Update Provider (X23)	TMS	map updates	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Map Update Provider (X23)	EM	map updates	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Map Update Provider (X23)	TMS	map updates	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Map Update Provider (X23)	TRMS	map updates	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
Map Update Provider (X23)	ISP	map updates	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Map Update Provider (X23)	EM	map updates	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Map Update Provider (X23)	EM	map updates	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Map Update Provider (X23)	TMS	map updates	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Map Update Provider (X23)	TRMS	map updates	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Map Update Provider (X23)	ISP	map updates	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Map Update Provider (X23)	ISP	map updates	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Map Update Provider (X23)	TMS	map updates	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Map Update Provider (X23)	TMS	map updates	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
Map Update Provider (X23)	TRMS	map updates	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Map Update Provider (X23)	TRMS	map updates	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Map Update Provider (X23)	TMS	map updates	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Map Update Provider (X23)	ISP	map updates	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Map Update Provider (X23)	EM	map updates	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Map Update Provider (X23)	EM	map updates	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Map Update Provider (X23)	ISP	map updates	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Map Update Provider (X23)	TMS	map updates	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Map Update Provider (X23)	TRMS	map updates	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Media (X27)	ISP	media information request	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
Media (X27)	EM	media information request	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
Media (X27)	ISP	media information request	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Media (X27)	EM	media information request	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Media (X27)	EM	media information request	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Media (X27)	ISP	media information request	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Media (X27)	EM	media information request	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Media (X27)	TMS	external reports	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Media (X27)	TMS	media information request	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Media (X27)	TMS	media information request	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Media (X27)	EM	media information request	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Media (X27)	TMS	external reports	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Media (X27)	EM	media information request	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Media (X27)	ISP	media information request	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Media (X27)	TMS	external reports	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Media (X27)	TMS	media information request	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Media (X27)	TRMS	media information request	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Media (X27)	TMS	external reports	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Media (X27)	TMS	media information request	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Media (X27)	TRMS	media information request	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Media (X27)	TRMS	media information request	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Media (X27)	EM	media information request	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Media (X27)	TMS	media information request	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Media (X27)	TRMS	media information request	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Media (X27)	TMS	media information request	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Media (X27)	TRMS	media information request	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Media (X27)	EM	media information request	IEEE7	Standard for Common Incident Management Message Sets (IMMS) for use	IEEE
Media (X27)	TRMS	media information request	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Media (X27)	TMS	media information request	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Media (X27)	TMS	external reports	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Media (X27)	ISP	media information request	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Media (X27)	TMS	external reports	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Media (X27)	TRMS	media information request	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
Media (X27)	TMS	media information request	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
Media (X27)	TMS	external reports	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
Media (X27)	ISP	media information request	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
Media (X27)	ISP	media information request	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Media (X27)	EM	media information request	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Media (X27)	TRMS	media information request	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Media (X27)	ISP	media information request	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Media (X27)	TMS	external reports	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Multimodal Crossings (X29)	RS	multimodal crossing status	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
Multimodal Crossings (X29)	RS	multimodal crossing status	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Multimodal Crossings (X29)	RS	multimodal crossing status	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Multimodal Crossings (X29)	RS	multimodal crossing status	NEMA TS3.4	NTCIP - Global Object Definitions	AASHTO
Multimodal TSP (X02)	ISP	multimodal information	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Multimodal TSP (X02)	ISP	multimodal information	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Multimodal TSP (X02)	TRMS	transit multimodal information	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Multimodal TSP (X02)	TRMS	transit multimodal information	tcip-cc	TCIP - Control Center (CC) Business Area Standard	ITE
Multimodal TSP (X02)	ISP	multimodal information	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
Multimodal TSP (X02)	ADMS	multimodal archive data	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Multimodal TSP (X02)	ISP	multimodal information	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Multimodal TSP (X02)	TRMS	transit multimodal information	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Multimodal TSP (X02)	ADMS	multimodal archive data	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Multimodal TSP (X02)	ADMS	multimodal archive data	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Multimodal TSP (X02)	TRMS	transit multimodal information	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Multimodal TSP (X02)	TRMS	transit multimodal information	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
Multimodal TSP (X02)	ADMS	multimodal archive data	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Multimodal TSP (X02)	ISP	multimodal information	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Multimodal TSP (X02)	ADMS	multimodal archive data	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Multimodal TSP (X02)	ADMS	multimodal archive data	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Multimodal TSP (X02)	ISP	multimodal information	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Multimodal TSP (X02)	TRMS	transit multimodal information	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Multimodal TSP (X02)	ISP	multimodal information	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Multimodal TSP (X02)	TRMS	transit multimodal information	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Multimodal TSP (X02)	TRMS	transit multimodal information	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Multimodal TSP (X02)	ADMS	multimodal archive data	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
Multimodal TSP (X02)	ISP	multimodal information	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Multimodal TSP (X02)	ADMS	multimodal archive data	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Multimodal TSP (X02)	TRMS	transit multimodal information	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Other EM (X30)	EM	incident response coordination	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Other EM (X30)	EM	incident response coordination	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
Other EM (X30)	EM	incident report	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Other EM (X30)	EM	incident response coordination	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Other EM (X30)	EM	incident response coordination	IEEE7	Standard for Common Incident Management Message Sets (IMMS) for use	IEEE
Other EM (X30)	EM	incident report	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Other EM (X30)	EM	incident report	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Other EM (X30)	EM	incident response coordination	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Other EM (X30)	EM	incident report	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Other EM (X30)	EM	incident report	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
Other EM (X30)	EM	incident response coordination	tcip-im	TCIP - Incident Management (IM) Business Area Standard	ITE
Other EM (X30)	EM	incident response coordination	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Other EM (X30)	EM	incident report	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Other EM (X30)	EM	incident report	IEEE7	Standard for Common Incident Management Message Sets (IMMS) for use	IEEE
Other EM (X30)	EM	incident response coordination	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Other EM (X30)	EM	incident report	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Other EM (X30)	EM	incident response coordination	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Other EM (X30)	EM	incident report	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Other EM (X30)	EM	incident response coordination	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Other ISP (X31)	ISP	ISP coordination	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Other ISP (X31)	ISP	ISP coordination	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Other ISP (X31)	ISP	ISP coordination	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Other ISP (X31)	ISP	ISP coordination	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
Other ISP (X31)	ISP	ISP coordination	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
Other ISP (X31)	ISP	ISP coordination	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Other ISP (X31)	ISP	ISP coordination	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Other ISP (X31)	ISP	ISP coordination	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
Other ISP (X31)	ISP	ISP coordination	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Other ISP (X31)	ISP	ISP coordination	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Other TM (X35)	TMS	traffic control coordination	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
Other TM (X35)	TMS	traffic information coordination	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Other TM (X35)	TMS	traffic control coordination	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Other TM (X35)	TMS	traffic control coordination	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Other TM (X35)	TMS	traffic control coordination	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Other TM (X35)	TMS	traffic control coordination	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Other TM (X35)	TMS	traffic information coordination	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Other TM (X35)	TMS	traffic control coordination	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
Other TM (X35)	TMS	traffic information coordination	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
Other TM (X35)	TMS	traffic information coordination	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Other TM (X35)	TMS	traffic control coordination	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
Other TM (X35)	TMS	traffic information coordination	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Other TM (X35)	TMS	traffic control coordination	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Other TM (X35)	TMS	traffic information coordination	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
Other TM (X35)	TMS	traffic information coordination	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Other TM (X35)	TMS	traffic information coordination	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Other TM (X35)	TMS	traffic control coordination	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Other TM (X35)	TMS	traffic information coordination	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
Other TM (X35)	TMS	traffic control coordination	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Other TM (X35)	TMS	traffic information coordination	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Other TRM (X33)	TRMS	TRMS coord	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Other TRM (X33)	TRMS	TRMS coord	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Other TRM (X33)	TRMS	TRMS coord	tcip-cc	TCIP - Control Center (CC) Business Area Standard	ITE
Other TRM (X33)	TRMS	TRMS coord	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Other TRM (X33)	TRMS	TRMS coord	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Other TRM (X33)	TRMS	TRMS coord	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Other TRM (X33)	TRMS	TRMS coord	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
Other TRM (X33)	TRMS	TRMS coord	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Other TRM (X33)	TRMS	TRMS coord	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Payment Instrument (X61)	TRVS	payment	tcip-fc	TCIP - Fare Collection (FC) Business Area Standard	ITE
PIAS	ISP	traveler request	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
PIAS	ISP	trip request	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
PIAS	ISP	yellow pages request	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
PIAS	ISP	trip confirmation	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
PIAS	ISP	traveler profile	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
PIAS	ISP	traveler request	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
PIAS	ISP	trip confirmation	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
PIAS	ISP	trip request	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
PIAS	ISP	yellow pages request	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
PIAS	ISP	traveler profile	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
PIAS	TRMS	transit information user request	tcip-pi	TCIP - Passenger Information (PI) Business Area Standard	ITE
PMS	VS	tag update	ASTM2	Standard Specification for DSRC - Data Link Layer	ASTM
PMS	TMS	parking availability	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
PMS	ISP	parking information	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
PMS	TMS	parking availability	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
PMS	ISP	parking information	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
PMS	VS	tag update	ASTM1	Standard Specification for DSRC - Physical Layer 902-928 MHz	ASTM
PMS	TRMS	transit parking coordination	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
PMS	VS	request tag data	ASTM1	Standard Specification for DSRC - Physical Layer 902-928 MHz	ASTM
PMS	TRMS	transit parking coordination	tcip-pi	TCIP - Passenger Information (PI) Business Area Standard	ITE
PMS	ISP	parking information	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
PMS	ISP	parking information	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
PMS	TRMS	transit parking coordination	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
PMS	TRMS	transit parking coordination	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
PMS	TRMS	transit parking coordination	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
PMS	TRMS	transit parking coordination	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
PMS	TRMS	transit parking coordination	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
PMS	TMS	parking availability	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
PMS	TMS	parking availability	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
PMS	TMS	parking availability	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
PMS	TMS	parking availability	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
PMS	TMS	parking availability	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
PMS	ISP	parking information	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
PMS	TMS	parking availability	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
PMS	ISP	parking information	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
PMS	ISP	parking information	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
PMS	TMS	parking availability	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
PMS	TRMS	transit parking coordination	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
PMS	TRMS	transit parking coordination	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
PMS	TMS	parking availability	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
PMS	ISP	parking information	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
PMS	VS	request tag data	P1455	Message Sets for DSRC ETTM & CVO	IEEE
PMS	VS	request tag data	ASTM2	Standard Specification for DSRC - Data Link Layer	ASTM
PMS	ISP	parking information	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
PMS	ISP	parking information	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
PMS	VS	tag update	P1455	Message Sets for DSRC ETTM & CVO	IEEE
Rail Operations (X67)	TMS	railroad advisories	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Rail Operations (X67)	TMS	railroad schedules	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Rail Operations (X67)	TMS	railroad advisories	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
Rail Operations (X67)	TMS	railroad advisories	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Rail Operations (X67)	TMS	railroad advisories	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Rail Operations (X67)	TMS	railroad schedules	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Rail Operations (X67)	TMS	railroad schedules	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
Rail Operations (X67)	TMS	railroad advisories	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Rail Operations (X67)	TMS	railroad schedules	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Rail Operations (X67)	TMS	railroad schedules	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Rail Operations (X67)	TMS	railroad schedules	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Rail Operations (X67)	TMS	railroad advisories	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Rail Operations (X67)	TMS	railroad schedules	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Rail Operations (X67)	TMS	railroad schedules	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Rail Operations (X67)	TMS	railroad advisories	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Rail Operations (X67)	TMS	railroad advisories	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
RS	TMS	environmental conditions	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
RS	TMS	request for right-of-way	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
RS	TMS	roadway information system status	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
RS	TMS	fault reports	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
RS	TMS	freeway control status	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
RS	TMS	incident data	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
RS	TMS	incident data	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
RS	TMS	reversible lane status	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
RS	TMS	freeway control status	AASHTO1-3	NTCIP - Ramp Meter Controller Objects	AASHTO
RS	TMS	roadway information system status	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
RS	TMS	signal control status	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
RS	TMS	traffic flow	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
RS	TMS	freeway control status	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
RS	TMS	fault reports	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
RS	TMS	request for right-of-way	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
RS	TMS	fault reports	AASHTO1-7	NTCIP - Object Definitions for Environmental Sensor Stations & Roadside	AASHTO
RS	TMS	fault reports	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
RS	TMS	vehicle probe data	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
RS	TMS	environmental conditions	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
RS	TMS	traffic flow	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
RS	TMS	signal control status	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
RS	TMS	roadway information system status	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
RS	TMS	vehicle probe data	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
RS	TMS	environmental conditions	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
RS	TMS	vehicle probe data	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
RS	TMS	reversible lane status	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
RS	TMS	freeway control status	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
RS	TMS	environmental conditions	AASHTO1-7	NTCIP - Object Definitions for Environmental Sensor Stations & Roadside	AASHTO
RS	TMS	traffic images	AASHTO1-5	NTCIP - Data Dictionary for Closed Circuit Television (CCTV)	AASHTO
RS	TMS	incident data	AASHTO1-5	NTCIP - Data Dictionary for Closed Circuit Television (CCTV)	AASHTO
RS	TMS	fault reports	AASHTO1-5	NTCIP - Data Dictionary for Closed Circuit Television (CCTV)	AASHTO
RS	TMS	fault reports	AASHTO1-3	NTCIP - Ramp Meter Controller Objects	AASHTO
RS	TMS	traffic flow	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
RS	TMS	signal control status	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
RS	TMS	roadway information system status	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
RS	TMS	reversible lane status	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
RS	TMS	incident data	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
RS	TMS	traffic flow	NEMA-TS3.p	NTCIP - Point to Multi-Point Protocol Using RS-232 Subnetwork Profile	AASHTO
RS	ADMS	roadside archive data	S-30	NTCIP - Transportation System Sensor Objects	AASHTO
RS	VS	request tag data	P1455	Message Sets for DSRC ETTM & CVO	IEEE
RS	TMS	vehicle probe data	NEMA-TS3.p	NTCIP - Point to Multi-Point Protocol Using RS-232 Subnetwork Profile	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
RS	TMS	environmental conditions	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
RS	TMS	fault reports	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
RS	TMS	freeway control status	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
RS	TMS	incident data	AASHTO-16	NTCIP - Class A and Class C Communications Profiles	AASHTO
RS	TMS	request for right-of-way	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
RS	TMS	traffic flow	S-30	NTCIP - Transportation System Sensor Objects	AASHTO
RS	TMS	signal control status	NEMA-TS3.p	NTCIP - Point to Multi-Point Protocol Using RS-232 Subnetwork Profile	AASHTO
RS	TMS	roadway information system status	NEMA-TS3.p	NTCIP - Point to Multi-Point Protocol Using RS-232 Subnetwork Profile	AASHTO
RS	TMS	reversible lane status	NEMA-TS3.p	NTCIP - Point to Multi-Point Protocol Using RS-232 Subnetwork Profile	AASHTO
RS	TMS	request for right-of-way	NEMA-TS3.p	NTCIP - Point to Multi-Point Protocol Using RS-232 Subnetwork Profile	AASHTO
RS	TMS	incident data	NEMA-TS3.p	NTCIP - Point to Multi-Point Protocol Using RS-232 Subnetwork Profile	AASHTO
RS	TMS	freeway control status	NEMA-TS3.p	NTCIP - Point to Multi-Point Protocol Using RS-232 Subnetwork Profile	AASHTO
RS	TMS	incident data	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
RS	TMS	freeway control status	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
RS	TMS	request for right-of-way	AASHTO-16	NTCIP - Class A and Class C Communications Profiles	AASHTO
RS	TMS	reversible lane status	AASHTO-16	NTCIP - Class A and Class C Communications Profiles	AASHTO
RS	TMS	roadway information system status	AASHTO-16	NTCIP - Class A and Class C Communications Profiles	AASHTO
RS	TMS	signal control status	AASHTO-16	NTCIP - Class A and Class C Communications Profiles	AASHTO
RS	TMS	traffic flow	AASHTO-16	NTCIP - Class A and Class C Communications Profiles	AASHTO
RS	TMS	vehicle probe data	AASHTO-16	NTCIP - Class A and Class C Communications Profiles	AASHTO
RS	TMS	incident data	S-30	NTCIP - Transportation System Sensor Objects	AASHTO
RS	TMS	fault reports	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
RS	TMS	reversible lane status	S-30	NTCIP - Transportation System Sensor Objects	AASHTO
RS	TMS	incident data	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
RS	TMS	reversible lane status	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
RS	TMS	roadway information system status	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
RS	TMS	traffic flow	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
RS	TMS	vehicle probe data	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
RS	ADMS	roadside archive data	S-80	NTCIP - Data Collection & Monitoring Devices	AASHTO
RS	ADMS	roadside archive data	NEMA-TS3.p	NTCIP - Point to Multi-Point Protocol Using RS-232 Subnetwork Profile	AASHTO
RS	TMS	vehicle probe data	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
RS	TMS	roadway information system status	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
RS	TMS	fault reports	NEMA-TS3.p	NTCIP - Point to Multi-Point Protocol Using RS-232 Subnetwork Profile	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
RS	TMS	signal control status	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
RS	TMS	traffic flow	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
RS	TMS	vehicle probe data	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
RS	TMS	vehicle probe data	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
RS	TMS	traffic images	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
RS	TMS	reversible lane status	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
RS	TMS	signal control status	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
RS	TMS	environmental conditions	NEMA TS3.3	NTCIP - Class B Profile	AASHTO
RS	TMS	reversible lane status	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
RS	TMS	request for right-of-way	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
RS	TMS	incident data	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
RS	TMS	freeway control status	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
RS	TMS	fault reports	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
RS	TMS	environmental conditions	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
RS	ADMS	roadside archive data	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
RS	TMS	traffic flow	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
RS	TMS	traffic flow	NEMA TS3.3	NTCIP - Class B Profile	AASHTO
RS	TMS	fault reports	S-30	NTCIP - Transportation System Sensor Objects	AASHTO
RS	TMS	roadway information system status	NEMA-TS3.6	NTCIP - Object Definitions for Dynamic Message Signs	AASHTO
RS	TMS	freeway control status	NEMA-TS3.6	NTCIP - Object Definitions for Dynamic Message Signs	AASHTO
RS	TMS	fault reports	NEMA-TS3.6	NTCIP - Object Definitions for Dynamic Message Signs	AASHTO
RS	TMS	signal control status	NEMA TS3.5	NTCIP - Object Definitions for Actuated Traffic Signal Controller Units	AASHTO
RS	TMS	fault reports	NEMA TS3.5	NTCIP - Object Definitions for Actuated Traffic Signal Controller Units	AASHTO
RS	TMS	roadway information system status	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
RS	TMS	vehicle probe data	NEMA TS3.3	NTCIP - Class B Profile	AASHTO
RS	TMS	environmental conditions	NEMA-TS3.p	NTCIP - Point to Multi-Point Protocol Using RS-232 Subnetwork Profile	AASHTO
RS	TMS	signal control status	NEMA TS3.3	NTCIP - Class B Profile	AASHTO
RS	TMS	roadway information system status	NEMA TS3.3	NTCIP - Class B Profile	AASHTO
RS	TMS	reversible lane status	NEMA TS3.3	NTCIP - Class B Profile	AASHTO
RS	TMS	request for right-of-way	NEMA TS3.3	NTCIP - Class B Profile	AASHTO
RS	TMS	incident data	NEMA TS3.3	NTCIP - Class B Profile	AASHTO
RS	TMS	freeway control status	NEMA TS3.3	NTCIP - Class B Profile	AASHTO
RS	TMS	fault reports	NEMA TS3.3	NTCIP - Class B Profile	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
RS	TMS	signal control status	NEMA TS3.4	NTCIP - Global Object Definitions	AASHTO
RS	VS	request tag data	ASTM1	Standard Specification for DSRC - Physical Layer 902-928 MHz	ASTM
RS	TMS	freeway control status	AASHTO-16	NTCIP - Class A and Class C Communications Profiles	AASHTO
RS	VS	vehicle signage data	ASTM2	Standard Specification for DSRC - Data Link Layer	ASTM
RS	VS	request tag data	ASTM2	Standard Specification for DSRC - Data Link Layer	ASTM
RS	TMS	freeway control status	S-80	NTCIP - Data Collection & Monitoring Devices	AASHTO
RS	TMS	traffic flow	S-80	NTCIP - Data Collection & Monitoring Devices	AASHTO
RS	TMS	traffic flow	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
RS	TMS	environmental conditions	AASHTO-16	NTCIP - Class A and Class C Communications Profiles	AASHTO
RS	TMS	fault reports	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
RS	TMS	freeway control status	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
RS	TMS	request for right-of-way	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
RS	TMS	fault reports	S-80	NTCIP - Data Collection & Monitoring Devices	AASHTO
RS	TMS	vehicle probe data	S-80	NTCIP - Data Collection & Monitoring Devices	AASHTO
RS	TMS	environmental conditions	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
RS	ADMS	roadside archive data	AASHTO-16	NTCIP - Class A and Class C Communications Profiles	AASHTO
RS	TMS	signal control status	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
RS	TMS	fault reports	AASHTO-16	NTCIP - Class A and Class C Communications Profiles	AASHTO
RS	TMS	freeway control status	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
RS	TMS	incident data	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
RS	TMS	incident data	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
RS	TMS	request for right-of-way	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
RS	TMS	fault reports	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
RS	TMS	roadway information system status	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
RS	VS	vehicle signage data	ASTM1	Standard Specification for DSRC - Physical Layer 902-928 MHz	ASTM
RS	TMS	vehicle probe data	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
RS	TMS	traffic flow	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
RS	TMS	reversible lane status	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
RS	TMS	reversible lane status	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
RTS	TRMS	transit information user request	tcip-pi	TCIP - Passenger Information (PI) Business Area Standard	ITE
RTS	TRMS	secure area surveillance data	tcip-ob	TCIP - Onboard (OB) Business Area Standard	ITE
RTS	ISP	trip request	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
RTS	ISP	yellow pages request	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
RTS	ISP	traveler request	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
RTS	ISP	traveler request	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
RTS	ISP	trip confirmation	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
RTS	ISP	trip request	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
RTS	TRMS	transit fare payment requests	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
RTS	ISP	yellow pages request	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
RTS	TRMS	emergency notification	tcip-im	TCIP - Incident Management (IM) Business Area Standard	ITE
RTS	TRMS	transit information user request	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
RTS	TRMS	transit fare payment requests	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
RTS	TRMS	transit information user request	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
RTS	ISP	trip confirmation	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
RTS	TRMS	transit fare payment requests	tcip-fc	TCIP - Fare Collection (FC) Business Area Standard	ITE
TAS	DMV (X64)	license request	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TAS	DMV (X64)	license request	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TAS	TCS	toll instructions	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TAS	TMS	probe data	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TAS	TMS	toll demand management response	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TAS	DMV (X64)	license request	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TAS	Financial Institution (X21)	payment request	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TAS	ADMS	toll archive data	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TAS	ISP	toll data	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TAS	ADMS	toll archive data	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TAS	ADMS	toll archive data	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TAS	TMS	toll demand management response	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TAS	TMS	probe data	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TAS	Financial Institution (X21)	payment request	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TAS	ISP	toll data	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TAS	TCS	toll instructions	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TAS	Enfrorcement Agency (X62)	violation notification	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TAS	TCS	toll instructions	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TAS	ADMS	toll archive data	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TAS	ISP	toll data	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TAS	TCS	toll instructions	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
TAS	TMS	probe data	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TAS	TMS	toll demand management response	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TAS	Financial Institution (X21)	payment request	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TAS	Enfrorcement Agency (X62)	violation notification	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TAS	DMV (X64)	license request	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TAS	Enfrorcement Agency (X62)	violation notification	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TAS	Financial Institution (X21)	payment request	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TAS	DMV (X64)	license request	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TAS	ISP	toll data	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TAS	ISP	toll data	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TAS	TMS	probe data	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TAS	TMS	toll demand management response	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TAS	Enfrorcement Agency (X62)	violation notification	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TAS	Enfrorcement Agency (X62)	violation notification	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TAS	DMV (X64)	license request	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TAS	Enfrorcement Agency (X62)	violation notification	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TAS	Financial Institution (X21)	payment request	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TAS	TMS	toll demand management response	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TAS	TMS	probe data	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TAS	TCS	toll instructions	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TAS	ADMS	toll archive data	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TAS	TMS	toll demand management response	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TAS	TMS	toll demand management response	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TAS	Financial Institution (X21)	payment request	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TAS	Enfrorcement Agency (X62)	violation notification	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TAS	DMV (X64)	license request	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TAS	Enfrorcement Agency (X62)	violation notification	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TAS	Financial Institution (X21)	payment request	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TAS	TCS	toll instructions	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TAS	ISP	toll data	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TAS	ISP	toll data	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TAS	ADMS	toll archive data	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TAS	DMV (X64)	license request	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
TAS	TMS	probe data	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TAS	TMS	probe data	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TAS	ADMS	toll archive data	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TAS	TMS	toll demand management response	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TAS	TMS	probe data	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TAS	TMS	toll demand management response	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
TAS	TMS	probe data	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
TAS	TCS	toll instructions	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TAS	ISP	toll data	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TAS	ADMS	toll archive data	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TAS	Financial Institution (X21)	payment request	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TAS	TMS	probe data	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
TAS	TMS	toll demand management response	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
TAS	TCS	toll instructions	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TCS	TAS	toll transactions	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TCS	VS	request tag data	ASTM1	Standard Specification for DSRC - Physical Layer 902-928 MHz	ASTM
TCS	VS	request tag data	P1455	Message Sets for DSRC ETTM & CVO	IEEE
TCS	VS	request tag data	ASTM2	Standard Specification for DSRC - Data Link Layer	ASTM
TCS	TAS	toll transactions	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TCS	VS	tag update	ASTM2	Standard Specification for DSRC - Data Link Layer	ASTM
TCS	VS	tag update	ASTM1	Standard Specification for DSRC - Physical Layer 902-928 MHz	ASTM
TCS	VS	tag update	P1455	Message Sets for DSRC ETTM & CVO	IEEE
TCS	TAS	toll transactions	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TCS	TAS	toll transactions	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TCS	TAS	toll transactions	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TCS	TAS	toll transactions	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TCS	TAS	toll transactions	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TCS	TAS	toll transactions	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TMS	EM	current network conditions	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TMS	EM	resource deployment status	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TMS	ISP	traffic information	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TMS	TAS	toll demand management request	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TMS	RS	signal control data	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
TMS	TAS	toll demand management request	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TMS	TRMS	request transit information	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TMS	TRMS	traffic control priority status	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TMS	TRMS	traffic information for transit	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TMS	TRMS	transit demand management request	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TMS	EM	incident information request	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TMS	EM	incident information	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TMS	RS	freeway control data	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TMS	PMS	parking instructions	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TMS	EM	incident information	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TMS	EM	emergency traffic control response	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TMS	Construction and Maintenance (X09)	traffic equipment status	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TMS	Construction and Maintenance (X09)	closure coordination	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TMS	EM	current network conditions	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TMS	ADMS	traffic archive data	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TMS	RS	freeway control data	S-80	NTCIP - Data Collection & Monitoring Devices	AASHTO
TMS	RS	sensor and surveillance control	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TMS	RS	roadway information system data	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TMS	EM	incident information request	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TMS	Media (X27)	traffic information for media	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TMS	Other TM (X35)	traffic control coordination	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TMS	Other TM (X35)	traffic information coordination	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TMS	Rail Operations (X67)	hri advisories	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TMS	TRMS	request transit information	tcip-cc	TCIP - Control Center (CC) Business Area Standard	ITE
TMS	RS	freeway control data	AASHTO-16	NTCIP - Class A and Class C Communications Profiles	AASHTO
TMS	RS	roadway information system data	AASHTO-16	NTCIP - Class A and Class C Communications Profiles	AASHTO
TMS	RS	sensor and surveillance control	AASHTO-16	NTCIP - Class A and Class C Communications Profiles	AASHTO
TMS	RS	signal control data	AASHTO-16	NTCIP - Class A and Class C Communications Profiles	AASHTO
TMS	Rail Operations (X67)	hri advisories	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TMS	TAS	toll demand management request	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TMS	Other TM (X35)	traffic control coordination	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TMS	Event Promoters (X19)	event confirmation	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TMS	Map Update Provider (X23)	map update request	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
TMS	Event Promoters (X19)	event confirmation	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TMS	Construction and Maintenance (X09)	traffic equipment status	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TMS	Construction and Maintenance (X09)	maintenance resource request	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TMS	Construction and Maintenance (X09)	closure coordination	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TMS	TRMS	transit demand management request	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TMS	TRMS	traffic information for transit	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TMS	TRMS	traffic control priority status	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TMS	Map Update Provider (X23)	map update request	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TMS	Other TM (X35)	traffic information coordination	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TMS	RS	sensor and surveillance control	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TMS	TRMS	traffic information for transit	tcip-tm	TCIP - Traffic Management (TM) Business Area Standard	ITE
TMS	ADMS	traffic archive data	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TMS	EM	current network conditions	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TMS	EM	emergency traffic control response	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TMS	EM	incident information	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TMS	EM	incident information request	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TMS	EM	resource deployment status	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TMS	ISP	traffic information	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TMS	PMS	parking instructions	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TMS	Media (X27)	traffic information for media	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TMS	RS	roadway information system data	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TMS	Map Update Provider (X23)	map update request	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TMS	RS	signal control data	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TMS	TAS	toll demand management request	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TMS	TRMS	request transit information	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TMS	TRMS	traffic control priority status	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TMS	TRMS	traffic information for transit	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TMS	TRMS	transit demand management request	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TMS	Construction and Maintenance (X09)	closure coordination	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TMS	Construction and Maintenance (X09)	maintenance resource request	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TMS	Construction and Maintenance (X09)	traffic equipment status	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TMS	RS	signal control data	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TMS	RS	freeway control data	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
TMS	EM	emergency traffic control response	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TMS	EM	emergency traffic control response	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TMS	Event Promoters (X19)	event confirmation	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TMS	EM	resource deployment status	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TMS	Media (X27)	traffic information for media	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TMS	Other TM (X35)	traffic control coordination	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TMS	Other TM (X35)	traffic information coordination	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TMS	Rail Operations (X67)	hri advisories	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TMS	ISP	request fare and price information	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TMS	EM	resource deployment status	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TMS	TRMS	request transit information	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TMS	EM	incident information	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TMS	TRMS	transit demand management request	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TMS	EM	current network conditions	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TMS	ADMS	traffic archive data	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TMS	Rail Operations (X67)	hri advisories	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TMS	Other TM (X35)	traffic information coordination	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TMS	Other TM (X35)	traffic control coordination	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TMS	Media (X27)	traffic information for media	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TMS	Map Update Provider (X23)	map update request	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TMS	Event Promoters (X19)	event confirmation	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TMS	Construction and Maintenance (X09)	traffic equipment status	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TMS	EM	incident information request	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TMS	ISP	traffic information	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TMS	RS	sensor and surveillance control	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TMS	RS	roadway information system data	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TMS	RS	freeway control data	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TMS	PMS	parking instructions	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TMS	ISP	traffic information	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TMS	ADMS	traffic archive data	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TMS	EM	current network conditions	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TMS	EM	emergency traffic control response	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TMS	EM	incident information	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
TMS	Construction and Maintenance (X09)	maintenance resource request	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TMS	EM	resource deployment status	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TMS	Construction and Maintenance (X09)	closure coordination	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TMS	PMS	parking instructions	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TMS	RS	freeway control data	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TMS	RS	roadway information system data	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TMS	RS	sensor and surveillance control	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TMS	RS	signal control data	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TMS	TAS	toll demand management request	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TMS	TRMS	request transit information	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TMS	TRMS	traffic control priority status	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TMS	TRMS	traffic information for transit	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TMS	Construction and Maintenance (X09)	maintenance resource request	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TMS	EM	incident information request	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TMS	TRMS	traffic information for transit	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TMS	EM	resource deployment status	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TMS	ISP	traffic information	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TMS	PMS	parking instructions	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TMS	RS	freeway control data	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TMS	RS	roadway information system data	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TMS	RS	sensor and surveillance control	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TMS	RS	signal control data	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TMS	TAS	toll demand management request	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TMS	Other TM (X35)	traffic information coordination	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TMS	TRMS	traffic control priority status	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TMS	EM	emergency traffic control response	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TMS	TRMS	transit demand management request	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TMS	Construction and Maintenance (X09)	closure coordination	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TMS	Construction and Maintenance (X09)	maintenance resource request	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TMS	Construction and Maintenance (X09)	traffic equipment status	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TMS	Event Promoters (X19)	event confirmation	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TMS	Map Update Provider (X23)	map update request	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TMS	Media (X27)	traffic information for media	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
TMS	Construction and Maintenance (X09)	maintenance resource request	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TMS	TRMS	request transit information	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TMS	PMS	parking instructions	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TMS	Construction and Maintenance (X09)	closure coordination	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TMS	TRMS	transit demand management request	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TMS	TRMS	traffic information for transit	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TMS	TRMS	traffic control priority status	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TMS	TRMS	request transit information	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TMS	TAS	toll demand management request	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TMS	RS	signal control data	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TMS	RS	sensor and surveillance control	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TMS	EM	incident information request	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TMS	RS	freeway control data	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TMS	EM	incident information	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TMS	ISP	traffic information	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TMS	EM	resource deployment status	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TMS	EM	incident information request	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TMS	EM	incident information	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TMS	EM	current network conditions	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TMS	Media (X27)	traffic information for media	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
TMS	ADMS	traffic archive data	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TMS	EM	current network conditions	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TMS	Rail Operations (X67)	hri advisories	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TMS	RS	roadway information system data	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TMS	TRMS	traffic information for transit	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
TMS	EM	incident information request	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
TMS	EM	resource deployment status	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
TMS	ISP	traffic information	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
TMS	PMS	parking instructions	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
TMS	RS	roadway information system data	AASHTO1-5	NTCIP - Data Dictionary for Closed Circuit Television (CCTV)	AASHTO
TMS	RS	freeway control data	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
TMS	RS	roadway information system data	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
TMS	TAS	toll demand management request	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
TMS	Other TM (X35)	traffic control coordination	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TMS	TRMS	traffic control priority status	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
TMS	EM	incident information request	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
TMS	EM	incident information	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
TMS	EM	emergency traffic control response	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
TMS	EM	current network conditions	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
TMS	Construction and Maintenance (X09)	closure coordination	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
TMS	Other TM (X35)	traffic information coordination	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
TMS	Other TM (X35)	traffic control coordination	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
TMS	Construction and Maintenance (X09)	traffic equipment status	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
TMS	Event Promoters (X19)	event confirmation	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
TMS	RS	freeway control data	AASHTO1-3	NTCIP - Ramp Meter Controller Objects	AASHTO
TMS	Construction and Maintenance (X09)	closure coordination	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
TMS	EM	incident information	IEEE7	Standard for Common Incident Management Message Sets (IMMS) for use	IEEE
TMS	ISP	traffic information	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TMS	ADMS	traffic archive data	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TMS	EM	incident information request	IEEE7	Standard for Common Incident Management Message Sets (IMMS) for use	IEEE
TMS	EM	current network conditions	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
TMS	Other TM (X35)	traffic information coordination	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
TMS	Other TM (X35)	traffic control coordination	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
TMS	Media (X27)	traffic information for media	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
TMS	EM	incident information	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
TMS	Construction and Maintenance (X09)	traffic equipment status	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
TMS	EM	emergency traffic control response	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
TMS	TRMS	traffic information for transit	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
TMS	TRMS	traffic control priority status	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
TMS	TAS	toll demand management request	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
TMS	RS	roadway information system data	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
TMS	RS	freeway control data	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
TMS	PMS	parking instructions	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
TMS	ISP	traffic information	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
TMS	EM	resource deployment status	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
TMS	EM	emergency traffic control response	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
TMS	Event Promoters (X19)	event confirmation	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
TMS	RS	signal control data	NEMA TS3.5	NTCIP - Object Definitions for Actuated Traffic Signal Controller Units	AASHTO
TMS	Rail Operations (X67)	hri advisories	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TMS	TRMS	traffic information for transit	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TMS	TRMS	transit demand management request	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TMS	Construction and Maintenance (X09)	closure coordination	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TMS	Construction and Maintenance (X09)	maintenance resource request	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TMS	RS	sensor and surveillance control	S-30	NTCIP - Transportation System Sensor Objects	AASHTO
TMS	RS	signal control data	NEMA-TS3.p	NTCIP - Point to Multi-Point Protocol Using RS-232 Subnetwork Profile	AASHTO
TMS	RS	sensor and surveillance control	NEMA-TS3.p	NTCIP - Point to Multi-Point Protocol Using RS-232 Subnetwork Profile	AASHTO
TMS	RS	roadway information system data	NEMA-TS3.p	NTCIP - Point to Multi-Point Protocol Using RS-232 Subnetwork Profile	AASHTO
TMS	RS	freeway control data	NEMA-TS3.p	NTCIP - Point to Multi-Point Protocol Using RS-232 Subnetwork Profile	AASHTO
TMS	TRMS	request transit information	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TMS	RS	freeway control data	NEMA-TS3.6	NTCIP - Object Definitions for Dynamic Message Signs	AASHTO
TMS	ADMS	traffic archive data	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TMS	ADMS	traffic archive data	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TMS	RS	sensor and surveillance control	NEMA TS3.3	NTCIP - Class B Profile	AASHTO
TMS	Construction and Maintenance (X09)	traffic equipment status	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TMS	RS	freeway control data	NEMA TS3.3	NTCIP - Class B Profile	AASHTO
TMS	Construction and Maintenance (X09)	traffic equipment status	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TMS	Event Promoters (X19)	event confirmation	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TMS	Map Update Provider (X23)	map update request	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TMS	Media (X27)	traffic information for media	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TMS	Other TM (X35)	traffic control coordination	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TMS	Other TM (X35)	traffic information coordination	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TMS	RS	roadway information system data	NEMA-TS3.6	NTCIP - Object Definitions for Dynamic Message Signs	AASHTO
TMS	Other TM (X35)	traffic control coordination	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TMS	PMS	parking instructions	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TMS	TAS	toll demand management request	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TMS	TRMS	request transit information	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TMS	TRMS	traffic control priority status	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TMS	TRMS	traffic information for transit	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TMS	TRMS	transit demand management request	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
TMS	Construction and Maintenance (X09)	closure coordination	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TMS	Construction and Maintenance (X09)	maintenance resource request	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TMS	Construction and Maintenance (X09)	traffic equipment status	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TMS	Event Promoters (X19)	event confirmation	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TMS	TRMS	traffic control priority status	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TMS	Media (X27)	traffic information for media	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TMS	RS	roadway information system data	NEMA TS3.3	NTCIP - Class B Profile	AASHTO
TMS	Other TM (X35)	traffic information coordination	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TMS	Enfrorcement Agency (X62)	violation notification	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TMS	Rail Operations (X67)	hri advisories	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TMS	PMS	parking instructions	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TMS	ISP	traffic information	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TMS	EM	resource deployment status	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TMS	EM	incident information request	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TMS	EM	incident information	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TMS	EM	emergency traffic control response	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TMS	EM	current network conditions	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TMS	Map Update Provider (X23)	map update request	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TMS	Other TM (X35)	traffic information coordination	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TMS	RS	signal control data	NEMA TS3.3	NTCIP - Class B Profile	AASHTO
TMS	Rail Operations (X67)	hri advisories	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TMS	Other TM (X35)	traffic control coordination	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TMS	Event Promoters (X19)	event confirmation	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TMS	Map Update Provider (X23)	map update request	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TMS	Media (X27)	traffic information for media	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Transit Vehicle (X51)	TRVS	transit vehicle measures	tcip-ob	TCIP - Onboard (OB) Business Area Standard	ITE
TRMS	Map Update Provider (X23)	map update request	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TRMS	TRVS	transit schedule information	tcip-sch	TCIP - Scheduling/Runcutting (SCH) Business Area Standard	ITE
TRMS	ISP	transit and fare schedules	tcip-sch	TCIP - Scheduling/Runcutting (SCH) Business Area Standard	ITE
TRMS	TRVS	transit traveler information	tcip-pi	TCIP - Passenger Information (PI) Business Area Standard	ITE
TRMS	Media (X27)	transit information for media	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TRMS	Media (X27)	transit incidents for media	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TRMS	Multimodal TSP (X02)	transit multimodal information	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
TRMS	Financial Institution (X21)	payment request	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TRMS	RTS	secure area monitoring support	AASHTO1-5	NTCIP - Data Dictionary for Closed Circuit Television (CCTV)	AASHTO
TRMS	Media (X27)	transit incidents for media	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TRMS	Media (X27)	transit information for media	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TRMS	Other TRM (X33)	TRMS coord	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TRMS	Map Update Provider (X23)	map update request	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TRMS	ISP	transit incident information	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TRMS	Map Update Provider (X23)	map update request	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TRMS	Financial Institution (X21)	payment request	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TRMS	Multimodal TSP (X02)	transit multimodal information	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TRMS	TMS	transit system data	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TRMS	TMS	transit demand management response	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TRMS	RTS	transit fare payment responses	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
TRMS	PMS	transit parking lot response	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TRMS	TRVS	transit traveler information	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
TRMS	ISP	transit and fare schedules	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TRMS	ISP	demand responsive transit plan	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TRMS	EM	transit emergency data	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TRMS	PIAS	personal transit information	tcip-pi	TCIP - Passenger Information (PI) Business Area Standard	ITE
TRMS	ADMS	transit archive data	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TRMS	RTS	transit traveler information	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
TRMS	TMS	traffic control priority request	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TRMS	TMS	traffic control priority request	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TRMS	RTS	transit fare payment responses	tcip-fc	TCIP - Fare Collection (FC) Business Area Standard	ITE
TRMS	TRVS	bad tag list	tcip-fc	TCIP - Fare Collection (FC) Business Area Standard	ITE
TRMS	TRVS	fare management information	tcip-fc	TCIP - Fare Collection (FC) Business Area Standard	ITE
TRMS	Financial Institution (X21)	payment request	tcip-fc	TCIP - Fare Collection (FC) Business Area Standard	ITE
TRMS	TMS	transit system data	tcip-tm	TCIP - Traffic Management (TM) Business Area Standard	ITE
TRMS	Enfrorcement Agency (X62)	violation notification	tcip-fc	TCIP - Fare Collection (FC) Business Area Standard	ITE
TRMS	Enfrorcement Agency (X62)	violation notification	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
TRMS	TMS	transit demand management response	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TRMS	Financial Institution (X21)	payment request	tcip-cc	TCIP - Control Center (CC) Business Area Standard	ITE
TRMS	PMS	transit parking lot response	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
TRMS	ISP	transit request confirmation	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TRMS	ISP	transit incident information	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TRMS	ISP	transit and fare schedules	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TRMS	ISP	demand responsive transit plan	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TRMS	ADMS	transit archive data	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TRMS	TMS	transit system data	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TRMS	ADMS	transit archive data	tcip-cc	TCIP - Control Center (CC) Business Area Standard	ITE
TRMS	EM	transit emergency data	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TRMS	Other TRM (X33)	TRMS coord	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TRMS	TRVS	request for vehicle measures	tcip-ob	TCIP - Onboard (OB) Business Area Standard	ITE
TRMS	RTS	secure area monitoring support	tcip-ob	TCIP - Onboard (OB) Business Area Standard	ITE
TRMS	Enfrorcement Agency (X62)	violation notification	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
TRMS	EM	transit emergency data	IEEE7	Standard for Common Incident Management Message Sets (IMMS) for use	IEEE
TRMS	EM	transit emergency data	tcip-im	TCIP - Incident Management (IM) Business Area Standard	ITE
TRMS	RTS	emergency acknowledge	tcip-im	TCIP - Incident Management (IM) Business Area Standard	ITE
TRMS	Other TRM (X33)	TRMS coord	tcip-cc	TCIP - Control Center (CC) Business Area Standard	ITE
TRMS	ISP	transit incident information	tcip-im	TCIP - Incident Management (IM) Business Area Standard	ITE
TRMS	TMS	transit system data	tcip-cc	TCIP - Control Center (CC) Business Area Standard	ITE
TRMS	TRVS	driver instructions	tcip-cc	TCIP - Control Center (CC) Business Area Standard	ITE
TRMS	TRVS	request for vehicle measures	tcip-cc	TCIP - Control Center (CC) Business Area Standard	ITE
TRMS	TRVS	transit schedule information	tcip-cc	TCIP - Control Center (CC) Business Area Standard	ITE
TRMS	Multimodal TSP (X02)	transit multimodal information	tcip-cc	TCIP - Control Center (CC) Business Area Standard	ITE
TRMS	RTS	transit traveler information	tcip-pi	TCIP - Passenger Information (PI) Business Area Standard	ITE
TRMS	TRVS	emergency acknowledge	tcip-im	TCIP - Incident Management (IM) Business Area Standard	ITE
TRMS	TMS	transit demand management response	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TRMS	ISP	transit incident information	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TRMS	ISP	transit and fare schedules	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TRMS	ISP	demand responsive transit plan	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TRMS	EM	transit emergency data	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TRMS	ADMS	transit archive data	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TRMS	ADMS	transit archive data	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TRMS	EM	transit emergency data	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TRMS	ISP	demand responsive transit plan	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
TRMS	ISP	transit and fare schedules	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TRMS	ISP	transit incident information	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TRMS	ISP	transit request confirmation	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TRMS	Map Update Provider (X23)	map update request	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TRMS	TMS	traffic control priority request	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TRMS	TMS	traffic control priority request	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TRMS	TMS	transit system data	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TRMS	Multimodal TSP (X02)	transit multimodal information	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TRMS	Financial Institution (X21)	payment request	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TRMS	Map Update Provider (X23)	map update request	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TRMS	Media (X27)	transit incidents for media	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TRMS	Media (X27)	transit information for media	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TRMS	Other TRM (X33)	TRMS coord	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TRMS	Enfrorcement Agency (X62)	violation notification	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TRMS	Enfrorcement Agency (X62)	violation notification	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TRMS	Other TRM (X33)	TRMS coord	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TRMS	Media (X27)	transit information for media	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TRMS	Media (X27)	transit information for media	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TRMS	PMS	transit parking lot response	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
TRMS	Media (X27)	transit information for media	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TRMS	ADMS	transit archive data	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TRMS	EM	transit emergency data	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TRMS	ISP	demand responsive transit plan	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TRMS	ISP	transit and fare schedules	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TRMS	ISP	transit incident information	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TRMS	ISP	transit request confirmation	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TRMS	PMS	transit parking lot response	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TRMS	TMS	traffic control priority request	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TRMS	TMS	transit demand management response	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TRMS	TMS	transit system data	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TRMS	Multimodal TSP (X02)	transit multimodal information	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TRMS	Financial Institution (X21)	payment request	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TRMS	ISP	transit request confirmation	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
TRMS	Media (X27)	transit incidents for media	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TRMS	PMS	transit parking lot response	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TRMS	Other TRM (X33)	TRMS coord	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TRMS	Enfrorcement Agency (X62)	violation notification	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TRMS	Enfrorcement Agency (X62)	violation notification	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TRMS	Other TRM (X33)	TRMS coord	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TRMS	Media (X27)	transit information for media	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TRMS	Media (X27)	transit incidents for media	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TRMS	Map Update Provider (X23)	map update request	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TRMS	Financial Institution (X21)	payment request	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TRMS	Multimodal TSP (X02)	transit multimodal information	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TRMS	TMS	transit system data	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TRMS	TMS	transit demand management response	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
TRMS	Financial Institution (X21)	payment request	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TRMS	Map Update Provider (X23)	map update request	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
TRMS	TMS	traffic control priority request	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TRMS	Media (X27)	transit incidents for media	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TRMS	Multimodal TSP (X02)	transit multimodal information	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TRMS	Financial Institution (X21)	payment request	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TRMS	Media (X27)	transit incidents for media	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TRMS	Other TRM (X33)	TRMS coord	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TRMS	Enfrorcement Agency (X62)	violation notification	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TRMS	TMS	transit system data	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
TRMS	ADMS	transit archive data	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TRMS	EM	transit emergency data	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TRMS	ISP	demand responsive transit plan	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TRMS	ISP	transit and fare schedules	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TRMS	ISP	transit incident information	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TRMS	TMS	transit demand management response	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TRMS	PMS	transit parking lot response	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TRMS	TMS	traffic control priority request	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TRMS	TMS	transit demand management response	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TRMS	TMS	transit system data	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
TRMS	Multimodal TSP (X02)	transit multimodal information	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TRMS	Financial Institution (X21)	payment request	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TRMS	Map Update Provider (X23)	map update request	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TRMS	Media (X27)	transit incidents for media	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TRMS	Media (X27)	transit information for media	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TRMS	Other TRM (X33)	TRMS coord	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TRMS	Enfrorcement Agency (X62)	violation notification	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TRMS	TMS	transit system data	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
TRMS	RTS	transit fare payment responses	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
TRMS	RTS	transit traveler information	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
TRMS	ISP	transit request confirmation	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
TRMS	ISP	demand responsive transit plan	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TRMS	Multimodal TSP (X02)	transit multimodal information	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TRMS	TMS	transit system data	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TRMS	TMS	transit demand management response	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TRMS	TMS	traffic control priority request	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TRMS	PMS	transit parking lot response	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TRMS	ISP	transit request confirmation	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TRMS	TMS	transit system data	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TRMS	ISP	transit and fare schedules	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TRMS	TRVS	transit traveler information	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
TRMS	EM	transit emergency data	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TRMS	ISP	transit and fare schedules	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TRMS	PMS	transit parking lot response	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TRMS	ISP	transit request confirmation	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TRMS	ISP	transit incident information	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TRMS	ISP	transit incident information	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TRMS	ISP	demand responsive transit plan	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TRMS	EM	transit emergency data	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TRMS	ADMS	transit archive data	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
TRMS	ADMS	transit archive data	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
TRVS	TRMS	emergency notification	tcip-im	TCIP - Incident Management (IM) Business Area Standard	ITE
TRVS	TRMS	request for bad tag list	tcip-fc	TCIP - Fare Collection (FC) Business Area Standard	ITE

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
TRVS	TRMS	transit vehicle conditions	tcip-ob	TCIP - Onboard (OB) Business Area Standard	ITE
TRVS	TRMS	transit vehicle location data	tcip-ob	TCIP - Onboard (OB) Business Area Standard	ITE
TRVS	TRMS	transit vehicle passenger and use data	tcip-ob	TCIP - Onboard (OB) Business Area Standard	ITE
TRVS	TRMS	transit traveler request	tcip-pi	TCIP - Passenger Information (PI) Business Area Standard	ITE
TRVS	TRMS	transit vehicle schedule performance	tcip-ob	TCIP - Onboard (OB) Business Area Standard	ITE
TRVS	TRMS	fare and payment status	tcip-fc	TCIP - Fare Collection (FC) Business Area Standard	ITE
TRVS	Payment Instrument (X61)	request for payment	tcip-fc	TCIP - Fare Collection (FC) Business Area Standard	ITE
TRVS	TRMS	transit vehicle schedule performance	tcip-cc	TCIP - Control Center (CC) Business Area Standard	ITE
VS	TCS	tag data	P1455	Message Sets for DSRC ETTM & CVO	IEEE
VS	TCS	tag data	ASTM1	Standard Specification for DSRC - Physical Layer 902-928 MHz	ASTM
VS	RS	vehicle probe data	ASTM1	Standard Specification for DSRC - Physical Layer 902-928 MHz	ASTM
VS	ISP	trip request	SAE-J1764	ISP-Vehicle Location Referencing Message Profiles	SAE
VS	TCS	tag data	ASTM2	Standard Specification for DSRC - Data Link Layer	ASTM
VS	ISP	yellow pages request	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
VS	ISP	trip request	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
VS	PMS	tag data	ASTM2	Standard Specification for DSRC - Data Link Layer	ASTM
VS	PMS	tag data	P1455	Message Sets for DSRC ETTM & CVO	IEEE
VS	ISP	traveler profile	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
VS	RS	vehicle probe data	ASTM2	Standard Specification for DSRC - Data Link Layer	ASTM
VS	RS	vehicle probe data	P1455	Message Sets for DSRC ETTM & CVO	IEEE
VS	PMS	tag data	ASTM1	Standard Specification for DSRC - Physical Layer 902-928 MHz	ASTM
VS	ISP	trip confirmation	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
VS	ISP	yellow pages request	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
VS	ISP	trip confirmation	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
VS	ISP	trip request	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
VS	EM	emergency notification	SAE-J2313	On-Board Land Vehicle Mayday Reporting Interface	SAE
VS	ISP	traveler request	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
VS	ISP	traveler profile	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
VS	ISP	traveler request	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
Weather Service (X58)	TRMS	weather information	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Weather Service (X58)	TMS	weather information	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Weather Service (X58)	ISP	weather information	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Weather Service (X58)	EM	weather information	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
Weather Service (X58)	TMS	weather information	ITE-9604-1	Message Set for External TMC Communication (MS/ETMCC)	ITE
Weather Service (X58)	ISP	weather information	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Weather Service (X58)	TMS	weather information	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Weather Service (X58)	TRMS	weather information	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Weather Service (X58)	TRMS	weather information	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Weather Service (X58)	TMS	weather information	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Weather Service (X58)	ISP	weather information	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Weather Service (X58)	EM	weather information	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Weather Service (X58)	EM	weather information	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Weather Service (X58)	TMS	weather information	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Weather Service (X58)	EM	weather information	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Weather Service (X58)	ISP	weather information	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Weather Service (X58)	TMS	weather information	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Weather Service (X58)	TRMS	weather information	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Weather Service (X58)	EM	weather information	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Weather Service (X58)	ISP	weather information	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Weather Service (X58)	TMS	weather information	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Weather Service (X58)	TRMS	weather information	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Weather Service (X58)	TRMS	weather information	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Weather Service (X58)	ISP	weather information	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Weather Service (X58)	TMS	weather information	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Weather Service (X58)	TRMS	weather information	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Weather Service (X58)	EM	weather information	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
Weather Service (X58)	ISP	weather information	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
Weather Service (X58)	TMS	weather information	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
Weather Service (X58)	TRMS	weather information	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
Weather Service (X58)	EM	weather information	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Weather Service (X58)	ISP	weather information	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Weather Service (X58)	TMS	weather information	ITE103	Standard for Functional Level Traffic Management Data Dictionary	ITE
Weather Service (X58)	EM	weather information	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Yellow Pages (X24)	ISP	travel service info	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE
Yellow Pages (X24)	ISP	provider profile data	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
Yellow Pages (X24)	ISP	provider profile data	SAE-J2353	Advanced Traveler Information System (ATIS) Data Dictionary	SAE

SOURCE	DESTINATION	ARCHITECTURE FLOW	STANDARD ID	STANDARD TITLE	SDO
Yellow Pages (X24)	ISP	travel service info	SAE-J2354	Advanced Traveler Information System (ATIS) Message Set	SAE
Yellow Pages (X24)	ISP	provider profile data	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Yellow Pages (X24)	ISP	travel service info	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Yellow Pages (X24)	ISP	provider profile data	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Yellow Pages (X24)	ISP	travel service info	AASHTO-18	NTCIP - Application Profile for Trivial File Transfer Protocol	AASHTO
Yellow Pages (X24)	ISP	provider profile data	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Yellow Pages (X24)	ISP	travel service info	AASHTO-20	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO
Yellow Pages (X24)	ISP	travel service info	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Yellow Pages (X24)	ISP	travel service info	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO
Yellow Pages (X24)	ISP	travel service info	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Yellow Pages (X24)	ISP	travel service info	AASHTO1-9	NTCIP - Applications Profile for Common Object Request Broker	AASHTO
Yellow Pages (X24)	ISP	provider profile data	AASHTO-17	NTCIP - Application Profile for File Transfer Protocol (FTP)	AASHTO
Yellow Pages (X24)	ISP	provider profile data	NEMA TS3.2	NTCIP - Simple Transportation Management Framework (STMF)	AASHTO
Yellow Pages (X24)	ISP	provider profile data	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Yellow Pages (X24)	ISP	travel service info	S-85	NTCIP - Application Profile for Simple Transportation Management	AASHTO
Yellow Pages (X24)	ISP	provider profile data	S-88	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO
Yellow Pages (X24)	ISP	provider profile data	AASHTO-21	NTCIP - Base Standard: Octet Encoding Rules (OER)	AASHTO

APPENDIX G

ITS ACRONYMS

24 x 7	Twenty Four Hours of Operation, Seven Days a Week
AAA	American Automobile Association
AASHTO	American Association of State Highway and Transportation Officials
ADA	Americans with Disabilities Act
ADMS	Archived Data Management Subsystem
AHS	Automated Highway System
ANSI	American National Standards Institute
ASTM	American Society of Testing and Materials
ATIRC	Advanced Traveler Information Resource Center
AVL	Automatic Vehicle Location
BCBC	Burlington County Bridge Commission
BCTS	Burlington County Transportation System
CC	Coordinating Council
CCT	Customized Community Transit
CCTV	Closed Circuit Television
CDL	Commercial Drivers License
CORBA	Common Object Request Broker Architecture
CP	Canadian Pacific Railway
CTEC	Central Traffic Electrical Control
CTC	Centralized Train Control
CVAS	Commercial Vehicle Administration Subsystem
CVC	Commercial Vehicle Check
CVISN	Commercial Vehicle Information Systems and Networks
CVO	Commercial Vehicle Operations
DelDOT	Delaware Department of Transportation
DMS	Dynamic Message Signs
DMV	Department of Motor Vehicles
DOT	Department of Transportation
DRBA	Delaware River and Bay Authority
DRJTBC	Delaware River Joint Toll Bridge Commission
DRPA	Delaware River Port Authority
DVHOGs	Delaware Valley Highway Operations Group
DVIEN	Delaware Valley Information Exchange Network
DVRPC	Delaware Valley Regional Planning Commission
EM	Emergency Management Subsystem
EMS	Emergency Medical Services
ESP	Emergency Service Patrol
ETC	Electronic Toll Collection
EVS	Emergency Vehicle Subsystem
E-ZPASS	Electronic toll collection system used by a consortium of toll authorities in northeast United States

FCC	Federal Communication Commission
FHWA	Federal Highway Administration
FMS	Fleet and Freight Management Subsystem
FTA	Federal Transit Administration
GIS	Geographic Information System
GPS	Global Positioning System
GVFTMA	Greater Valley Forge Transportation Management Association
HAR	Highway Advisory Radio
HAT	Highway Advisory Telephone System
HAZMAT	Hazardous Materials
HRI	Highway Rail Intersection
HOV	High Occupancy Vehicle
IEN	Information Exchange Network
IMRT	Incident Management Response Team
ISP	Information Service Provider
ITE	Institute of Transportation Engineers
ITMS	Integrated Transportation Management System
ITS	Intelligent Transportation System
LED	Light Emitting Diode
MATS	Multi-Arterial Traffic System
MCSAP	Motor Carrier Safety Assistance Program
MOE	Measures of Effectiveness
MOU	Memorandum of Understanding
m.p.	Milepost
NEMA	National Electrical Manufacturers Association
NFS	Norfolk Southern Railroad
NJDOT	New Jersey Department of Transportation
NJSP	New Jersey State Police
NJT	New Jersey Transit
NJTA	New Jersey Turnpike Authority
NTCIP	National Transportation Communications for ITS Protocols
NWS	National Weather Service
O & M	Operations and Maintenance
OEM	Office of Emergency Management
PA PUC	Pennsylvania Public Utility Commission
PASP	Pennsylvania State Police
PATCO	Port Authority Transit Corporation
PEMA	Pennsylvania Emergency Management Agency
PennDOT	Pennsylvania Department of Transportation
PIAS	Personal Information Assess Subsystem
PMS	Parking Management Subsystem

PPA	Philadelphia Parking Authority
PRIMIS	Philadelphia Regional Integrated Multi-modal Information Sharing
PTC	Pennsylvania Turnpike Commission
RFP	Request for Proposal
RMS	Roadway Management System
RS	Roadway Subsystem
RTS	Remote Traveler Support Subsystem
RWIS	Road Weather Information System
SAE	Society of Automotive Engineers
SATIN	Service Area Travelers Interactive Network
SDO	Standards Development Organization
SEPTA	Southeastern Pennsylvania Transportation Authority
SJTA	South Jersey Transportation Authority
SPEN	State Police Emergency Network
T-1	High Bandwidth Telephone Line
TARS	Travelers Advisory Radio System
TAS	Toll Administration Subsystem
TDM	Travel Demand Management
TEA-21	Transportation Equity Act for the 21st Century
TCC	Traffic Control Center
TCS	Toll Collection Subsystem
TIP	Transportation Improvement Plan
TMA	Transportation Management Association
TMC	Transportation Management Center
TMC	Traffic Management Center
TOC	Traffic Operations Center
TMS	Traffic Management Subsystem
TRANSCOM	Transportation Operations Coordinating Committee
TRANSMIT	TRANSCOM Probe Surveillance System for Determining Travel Speeds
TRMS	Transit Management Subsystem
TRVS	Transit Vehicle Subsystem
TTF	Technical Task Force
US DOT	United States Department of Transportation
VMS	Variable Message Signs
VS	Vehicle Subsystem
WIM	Weigh in Motion

Title of Report Institutional Coordination of Intelligent Transportation Systems (ITS) In the Delaware Valley
Regional ITS Architecture - Version 1.0

Publication No.: 00028

Date Published: March 2001

Geographic Area Covered: Delaware Valley Region

Key Words: Intelligent Transportation Systems, architecture, user services, subsystems, terminators, market packages, data flows, implementation strategies, Philadelphia Regional Integrated Multi-modal Information Sharing (PRIMIS), institutional coordination, stakeholders,

ABSTRACT
The purpose of this document is to present the Regional ITS Architecture for the Delaware Valley. This structure, modeled after and consistent with the National ITS Architecture developed by US DOT, maps out how the various ITS components in the Delaware Valley should be ultimately tied together and integrated - both physically as well as institutionally. This architecture was developed for the Delaware Valley through a coordinated process with a wide array of stakeholders and addresses 1) the integration of ITS systems and components, 2) the roles and responsibilities of a wide range of ITS stakeholders, 3) the tailoring of ITS deployment and operations to local needs, 4) the sharing of information between stakeholders, and 5) the future expansion of ITS. The Regional ITS Architecture also identifies key national ITS standards applicable to the local architecture. The document is targeted to professionals who require in-depth knowledge of the regional architecture for the Delaware Valley.

Delaware Valley Regional Planning Commission
8th Floor — The Bourse Building
111 South Independence Mall East
Philadelphia, PA 19106-2582

Phone: 215-592-1800
Fax: 215-592-9125
Internet: www.dvrpc.org

Staff contact: Stan Platt
Direct phone: (215) 238-2851
E-mail: splatt@dvrpc.org