



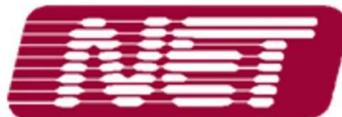
# **SOUTHERN CALIFORNIA REGIONAL ITS ARCHITECTURE**

**Phase 2.1 – Development of Southern California  
Regional ITS Architecture - Multi-County Issues**

**FINAL Version 6.0**

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## CONTRACT INFORMATION

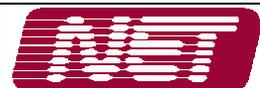
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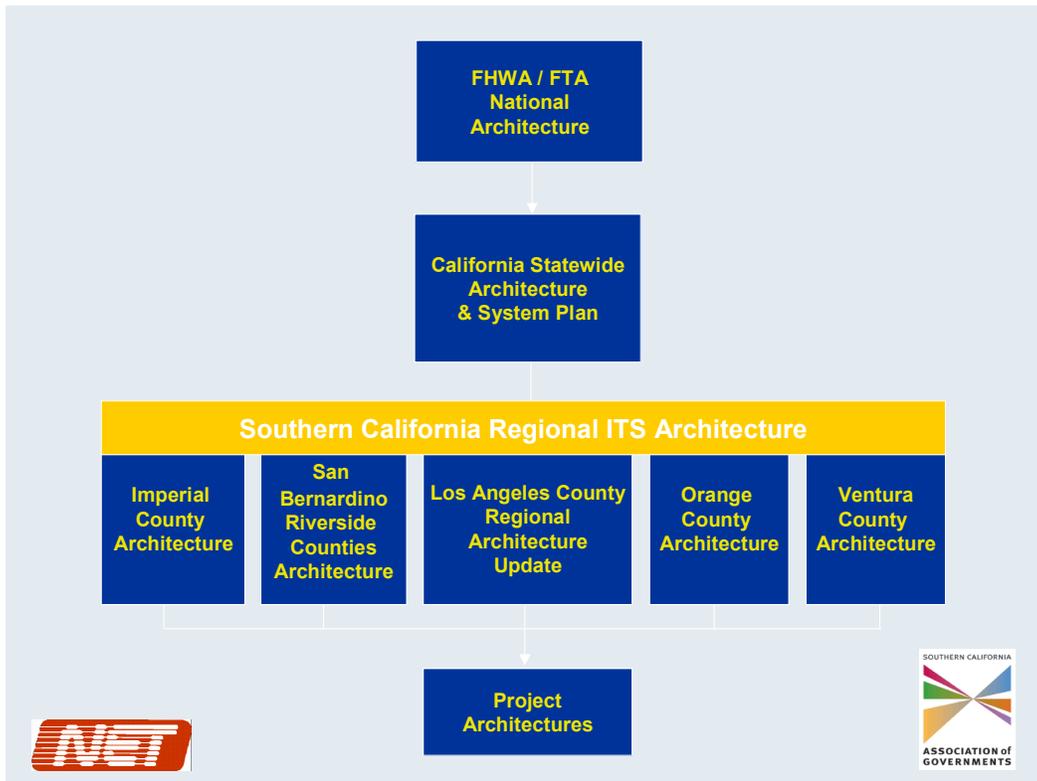
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# 1 INTRODUCTION

## 1.1 Project Purpose and Background

A regional Intelligent Transportation System (ITS) architecture is a structured view of the world of transportation technology and is intended to help optimize the benefit of individual investments. That is, it tries to capitalize on years of previous investment in transportation technology by identifying the interfaces and paths that will make it possible to integrate many systems in the future. Sharing information in this way multiplies the value of the original investment many times over while promoting the efficiency of regional transportation operations.

The Southern California Regional ITS Architecture provides a framework that includes a vision for the future deployment of ITS applications throughout the region. The Regional ITS Architecture incorporates the existing and planned ITS projects, and it effectively provides a path to be followed as new projects are conceived, designed and deployed. This ITS architecture approach is shown in Figure 1-1.



**Figure 1-1: Structure of the Regional Architecture**

As can be seen in Figure 1-1, the National Architecture developed by the Federal Government is the source of structure for the architecture documents developed by the individual counties. Each county regional ITS architecture represents a complete statement of the county approach to their vision for ITS. Each one is different and

represents different levels of maturity and scale. There is also a need to link these individual county architectures through consideration of multi-county issues that cross the internal borders of the extensive Southern California region. These issues are documented in the Southern California Regional ITS Architecture statement on Multi-County issues. Collectively the five County-level Regional ITS Architectures and this Multi-County Issues document represent the complete statement of the Southern California Regional ITS Architecture. This statement meets the requirements of the Transportation Equity Act for the 21<sup>st</sup> Century (TEA-21) the Federal Highway Administration (FHWA) / Federal Transportation Agency (FTA) Rule (“Rule”), now implemented as 5206(e), which requires that all ITS projects funded from the Highway Trust Fund (including transit projects funded from the Mass Transit Account) be in conformance with the National ITS Architecture and appropriate standards.

Definitions of the term “Regional” are troublesome in the context of this project. The county-level architectures have been historically developed with the term “Regional” in their titles. The “Rule” however refers to a “region” as being, at a minimum, the area within the Metropolitan Planning Organization (MPO). *This document will therefore use the expression “Southern California Regional ITS Architecture to refer to the collective, multi-county set of documentation.* To help distinguish the different architectural levels this document will refer to county-level architectures when meaning the individual county regional ITS Architectures. This architecture document, which addresses only those issues that cross the county borders, will be referred to as the multi-county or multi-county issues document.

**1.2 Organization**

This document sets out the statement on Multi-County Issues for the Southern California Regional Architecture and is organized in the following sections:

- |                                       |   |
|---------------------------------------|---|
| 1. Introduction                       | 7. Information Flows and Interface Requirements |
| 2. Regional Description               | 8. Project Sequencing                           |
| 3. Regional Stakeholders              | 9. Identification of Required Standards         |
| 4. ITS Inventory                      | 10. Architecture Maintenance                    |
| 5. ITS Needs and Operational Concepts | 11. Agency Agreements                           |
| 6. Functional Requirements            |   |

Appendices:

- |                      |                        |
|----------------------|------------------------|
| • Acronyms and Terms | • ITS Flows            |
| • Inventory Report   | • Comments Disposition |
| • Stakeholder Report |                        |

## 2 REGIONAL DESCRIPTION

### 2.1 Introduction

This section provides the context for the development of the Southern California Regional ITS Architecture. We begin with a consideration of the general demographic and geographic characteristics of the area and the existing transportation systems of the region. It is important to recognize from the outset the immense size, diversity, and complexity of the region for which the Southern California Regional ITS Architecture will be developed and deployed. The general characteristics of the region are identified and will be used as a frame of reference throughout the Southern California Regional ITS Architecture Document.

The Southern California Association of Governments (SCAG) is the Metropolitan Planning Organization (MPO) for six Southern California counties: Los Angeles, Orange, Ventura, Imperial, Riverside, and San Bernardino. The region includes 187 cities and constitutes the nation’s second largest MPO by population and the largest MPO by land area. It includes the County of San Bernardino which is the largest county in the nation by land area and the County of Los Angeles, the largest county in the nation by population. This is shown in Figure 2-1.

## SCAG REGION



Figure 2-1: The Six County SCAG Region

The extent of the SCAG region means that it also has many neighbors. The Inland Empire, which includes San Bernardino and Riverside, has borders with the States of Arizona and Nevada to the east and Kern County to the north. Imperial County has both an international border with Mexico, a state border with Arizona and a county border with San Diego County. San Diego County is outside the SCAG region but is an integral part of the Southern California region and the urban development that stretches from the United States/Mexico border to Ventura County to the north. Orange County connects directly to San Diego County at its southern border. Three counties, Ventura, Los Angeles, and Orange all have the Pacific coastline at their edge, which gives rise to both dense concentrations of population and major transportation gateways to the Pacific.

The SCAG region encompasses a population of 17 million (49 percent of California’s population) in an area of more than 38,000 square miles. FHWA forecasts that the SCAG region will add an additional five million residents over the next 20 years. In 2002, the region’s Gross Regional Product was \$615 billion and ranked 10<sup>th</sup> among all National Economies.

This large population, mostly confined to areas surrounded by mountainous terrain, with a vibrant economy and predominately auto-oriented travel, goes hand in hand with severe traffic congestion and air quality problems. Extensive commuting in a hot region with a natural physical landscape that encourages smog formation only exacerbates the air quality problems.

Freight movement through the region is also a critical aspect of the region’s transportation network. Southern California is home to the nation’s largest container port complex within the Ports of Long Beach and Los Angeles plus Port Hueneme, the U.S. Port of Entry for California’s Central Coast. Additionally, a major air cargo center at Los Angeles International Airport and the growing cargo center of Ontario International Airport, a West Coast rail hub, and numerous regional distribution centers, generate tremendous freight movement activity. The largest intermodal facility, the Burlington Northern/Santa Fe (BNSF) Hobart Yard in downtown Los Angeles, is within 20 miles of four of the above-mentioned “worst interchanges” in the region. The I-710, the major access route to the Ports of Los Angeles and Long Beach, experiences an average of five traffic accidents daily, each resulting in delays.

The region’s transportation system, which includes the networks and support infrastructure, are of the utmost importance to the mobility, safety, security, and economic vitality of both the region and its inhabitants. Throughout the region significant investment in ITS technologies is being used to help increase the efficient management of the transportation networks. While ITS alone will not solve the region’s transportation problems, ITS applications provide key management tools that help the operational efficiency of the network. ITS applications are also expected to significantly contribute to security and safety, e.g. on high truck volume freeways and at rail/highway crossings. The greatest challenges and perhaps the greatest benefits lie in integrating major systems across the entire region.

## 2.2 Major Roadways

By 2002, the SCAG region had 8,700 lane-miles freeway (non-carpool), 700 lane-miles of carpool lanes (High Occupancy Vehicle (HOV) lanes and High Occupancy Toll (HOT) lanes), and 42,500 lane-miles of arterial roads. The region's freeway networks are equipped with Vehicle Detection Stations (VDS), Closed-Circuit Television (CCTV) cameras, Changeable Message Signs (CMS), Ramp Meter Stations (RMS), Highway Advisory Radio (HAR), and Environmental Sensor Stations (also known as road weather information systems (RWIS)) are employed in strategic locations. These ITS field elements are connected to the Transportation Management Centers (TMCs) for the California Department of Transportation (Caltrans) Districts 7, 8 and 12.

In summary, the SCAG region maintains and operates an extensive roadway and freeway system within its vast area. These are identified through individual county architectures that contain a listing of the significant roadways for their respective areas. Please refer to those documents for the roadways, as the lists are not included in this document.

## 2.3 Highway Use and Congestion

The total vehicle miles traveled (VMT) in the region exceeded 144 billion in 2001. From 1999 to 2001, the region consistently ranked as the most congested metropolitan region in the nation. Residents in the coastal counties (Los Angeles, Ventura, and Orange) experienced a total of 52 hours of delay per person in 2001 compared to 34 hours of delay in San Bernardino and Riverside counties. Los Angeles County has four of the ten most congested highway locations in the U.S., namely the I-405 at the I-10 interchange, U.S. 101 at the I-405 interchange, State Route 55 at the State Route 22 Interchange, and the I-10 at the I-5 interchange. Each location average ten (10) minutes of delay per vehicle per trip during peak hours. Trucks are significant contributors to congestion but are also affected by congestion, and the resultant costs ultimately affect all residents and consumers.

## 2.4 Emergency Management Services

The California Highway Patrol (CHP) provides traffic patrols and response to incidents and emergencies with responsibility for all freeways, conventional state routes, and some roadways in unincorporated areas of the county. They also provide service under contract to the Toll Roads in Orange County. Both CHP and Caltrans staff monitor traffic conditions and incident information at the Caltrans TMCs for dissemination to field staff. Information disseminated may include CCTV camera images, status reports from field crews, traffic flow data, weather data, CHP incident reports, or summaries of 911 calls. The field staff may include CHP officers, Caltrans maintenance crews, local agencies, including police and transit officials, and private contractors involved in towing, roadside maintenance, or hazardous material spill cleanups.

In addition to CHP, each county has Sheriff and Fire Departments that provide law enforcement, fire protection, and Emergency Medical Services (EMS) in unincorporated areas of the county, as well as to certain city jurisdictions under contract arrangements.

These departments are dispatched through county 9-1-1 centers. These centers are equipped with Computer Aided Dispatch (CAD) systems, which allow dispatchers to initiate emergency response through radio dispatch communications and then track response activities performed by field personnel. Many of the larger cities also have their own police and/or fire departments, which handle law enforcement, fire protection, and EMS for their jurisdictions. The larger agencies are most often but not always CAD-equipped.

**2.5 Transit Use and Performance**

In 2001, there were 4,400 public transit buses in this region. In 2002, the total number of transit boardings was nearly 660 million, with 38 transit trips per capita. Expanded transit services, particularly the heavy rail, light rail and commuter rail, attracted additional transit riders. Nevertheless, transit usage in the region currently accounts for nearly 5% of the total work trips and 2% of the total person trips.

The two basic types of transit service are fixed route and demand-responsive. The first type allows buses to operate on fixed schedules on a fixed route. Demand-responsive service allows route changes based on individual trip requests. The fixed route service also accommodates commuters using long-distance routes (also referred to as Express Routes), which provide trips to and from a single destination without intermittent stops. Demand-responsive services for the elderly and disabled are offered in the region. For both large and small fixed route systems, ITS applications are multi-faceted and may integrate two or more of the following functions: automatic vehicle location, vehicle and equipment monitoring, customer information, signal priority, fare box summaries, and central dispatch center facilities. For demand-responsive systems, the primary ITS application is automated trip scheduling and in some cases in conjunction with Automatic Vehicle Location (AVL) systems.

**2.6 Metrolink**

Metrolink is a premier regional rail system linking communities to employment and activity centers. In August 1991, the Southern California Regional Rail Authority (SCRRA), a Joint Powers Agency (JPA), was formed. The purpose of SCRRA was to plan, design, construct and administer the operation of regional passenger rail lines serving the counties of Los Angeles, Orange, Riverside, San Bernardino and Ventura. The SCRRA named the regional commuter rail system "Metrolink." Today, Metrolink serves over 35,000 passengers in 50 cities throughout Southern California.

There are 11 SCRRA board members from five member agencies. These agencies are: Los Angeles County Metropolitan Transportation Authority, Orange County Transportation Authority, Riverside County Transportation Commission, San Bernardino Associated Governments, and Ventura County Transportation Commission. Metrolink has about 630 employees throughout its service areas.

**2.7 Amtrak**

The Pacific Surfliner Route is one of three passenger rail routes financially supported by the State of California. The route runs generally southeast to northwest along the Pacific Coast of California, connecting the cities of San Diego, Los Angeles, Oxnard, Santa Barbara and San Luis Obispo.

**2.8 Freight Multimodal Corridors**

Freight movement in Southern California consists of three major markets:

- Regional and local distribution, that accounts for about 30% of the total freight shipped in the region
- Domestic trade and national distribution, that accounts for over 60% of the freight shipped in the region
- International trade. Over 11% of the nation’s trade (by value) passes through the region and it collects over 37% of the nation’s import duties.

The modes of freight transportation include truck, air, water, and rail. An extensive network of multimodal facilities has developed in order to link the large cargo volumes of both domestic and international trade moving between Southern California and the rest of the country. The regional air cargo system also serves the domestic trade system. Southern California is a major rail hub with both Western Class I railroads operating on mainlines that connect the region to the national rail network.

The Alameda Corridor is perhaps the nation’s largest freight-oriented public works project. It consolidates harbor-related rail traffic from four separate branch lines into a 20-mile, fully grade-separated route. The corridor connects the Ports of Los Angeles and Long Beach to the transcontinental rail line near downtown Los Angeles, eliminating 200 at-grade crossings and doubling rail speeds. The Alameda Corridor has helped the port area cope with growth in international trade and roadway/railroad congestion by facilitating more efficient on-dock rail movements to and from the ports and reducing delays at rail grade crossings. Increased on-dock rail will also have positive air quality implications as rail movements emit fewer pollutants per ton-mile than trucks. The elimination of 200 at-grade rail-roadway crossings will reduce accidents along the Corridor and improve the safety of the freight transportation system.

The region includes six rail-truck intermodal facilities, including Burlington Northern Santa Fe’s (BNSF) Hobart Intermodal Facility, the busiest in the U.S. (handling over 90,000 lifts per month). There are three major interstate highway corridors in the region: I-5 (providing linkages to the rest of the West Coast of the U.S., Canada, and Mexico); I-15/I-40 (providing links to the interior U.S.); and I-10 (the “Southwest Passage” to the rest of the Sun Belt). Each of these interstates ranks among the highest truck volume corridors in the Western U.S.

**2.9 Airports**

The region is a major air cargo center, home to two International airports (Los Angeles International Airport and Ontario International Airport) and numerous commercial

airports. Most of the region's air cargo moves through Los Angeles International Airport (LAX), making it the third busiest air cargo facility in the world. Air cargo is critical for many manufacturing operations both in the U.S. and abroad. The high-value cargo typically shipped by air explains why LAX handles more exports by dollar value (\$36.5 billion in 1997) than the nearby Ports of Long Beach and Los Angeles (\$35.2 billion).

LAX is administered by the Los Angeles World Airports (LAWA) agency, a department of the City of Los Angeles. LAX accommodates passengers as well as freight movement. LAX operates as two distinct functional areas of responsibility, airside operations and groundside operations. The airside operations group is concerned with air traffic control and air terminal operations. The groundside operations group controls and monitors vehicular traffic in and around the Central Terminal Area (CTA). Their TMC is linked to the Los Angeles Department of Transportation Automated Traffic Surveillance and Control (ATSAC), which also controls signals on airport right of way.

In addition to freight transportation, total air passengers in the SCAG region were 78 million in 2002. The annual passengers for just LAX dropped to 56 million in 2002 due to the impact of 9/11, but still ranked 5<sup>th</sup> in total passenger traffic behind Atlanta, Chicago, London, and Tokyo. Meanwhile, smaller reliever airports experienced recovery. For example, Orange County Airport (John Wayne) experienced an increase of more than half a million annual passengers in 2002.

## 2.10 Ports

Southern California is home to three international deepwater port facilities that comprise the Los Angeles Customs Region. The Ports of Los Angeles and Long Beach, respectively the first and second largest container port facilities in the United States, together form the third largest container port complex in the world, following Hong Kong and Singapore. Their share of West Coast container cargo is an astounding 50 percent and growing, and they handle 35 percent of all waterborne cargo in the U.S. Port Hueneme is the only deepwater harbor between Los Angeles and the San Francisco Bay Area. It is the top seaport in the United States for citrus exports and ranks among the top 10 ports in the country for imports of automobiles and bananas.

The Port of Long Beach (POLB) is a department of the City of Long Beach, and the Port of Los Angeles (POLA) is a department of the City of Los Angeles. POLB and POLA transfer container freight between ship and land-based carriers involving multiple organizations. The ports operate in coordination with organizations such as the California Trucking Association and the Steamship Association of Southern California. The ports have a joint project involving the use of vehicle detection, CMS and CCTV for monitoring port access routes. In 2002, the total traffic at the Ports of Los Angeles and Long Beach increased to 152.2 million tons. Close to 84% of all cargo shipments were through containers. In April 2002, the Alameda Corridor was opened and allowed faster transfer of cargo from the twin ports to eastern destinations.

In addition to the Alameda Corridor, two major highways serve the twin port complex. Interstate 710, the Long Beach Freeway, is a heavy trucking corridor that carries traffic from the busy Port of Los Angeles north to downtown Los Angeles, with a connection to transcontinental Interstate 10. The numbering of I-710 as a spur of I-10 is related to the fact that both I-110 and I-710 connect that freeway with the port. The northern terminus of I-710 is temporary. Plans call for extension of I-710 from Alhambra north to I-210 in Pasadena, but the construction has yet to begin due to ongoing controversy of the selected route of the freeway. To relieve congestion on the I-710, a proposal has recently been adopted by the Los Angeles County Metropolitan Transportation Authority (Metro) to install elevated additional truck lanes. It is not clear when this freeway will be constructed. As planned, there will not be an interchange at the point where I-710 would meet I-110, which would render this route less useful to freight traffic. The southern terminus of I-710 is fractured into three separate spur freeways: the Terminal Island Spur, Downtown Long Beach Spur, and the Queen Mary Spur. I-110 carries traffic from the Port of Long Beach to downtown Los Angeles and connects to I-10. The Pasadena Freeway continues north of I-10 as CA-110. In 1996, the \$498 million Harbor Freeway Transitway opened with 10.3 miles of bus and carpool lanes in the I-110 median with room for a light rail as well. A 2.6 mile-long viaduct on Y-shaped columns rises up to 50 feet above the roadway and the surface streets that overpass the regular I-110 lanes. These lanes have separate ramps to the I-105 HOV lanes.

## 2.11 International Ports of Entry

The U.S. Department of Homeland Security, Customs and Border Protection Division, oversees the Port(s) of Entry (POE) department. There are three landside POEs, all of which are in Imperial County. They are: are Andrade (eastern Imperial County on Interstate 8), Calexico East (cargo only) on SR – 7, and Calexico West (passengers and cargo). Table 2-1 indicates their current traffic volumes, which are expected to increase dramatically in the future.

**Table 2-1: 2004 Imperial County POE Traffic Volumes**

Mode of Transportation	Calexico West (Downtown) POE	Calexico East POE	Andrade POE
<b>Persons Total</b>	<b>15,950,571</b>	<b>6,991,620</b>	<b>3,628,255</b>
Pedestrians on Foot	5,339,244	3,195	1,953,513
Passengers in Vehicles	10,590,421	6,587,376	1,667,227
In Commercial Trucks	0	390,154	5,824
In Buses	13,572	9,131	1,691
In Trains	0	1,764	0
In Private Aircraft	7,334	0	0

Mode of Transportation	Calexico West (Downtown) POE	Calexico East POE	Andrade POE
<b>Vehicles Total</b>	<b>5,657,189</b>	<b>3,538,023</b>	<b>765,525</b>
Passenger Vehicles	5,652,330	3,228,938	762,815
Commercial Trucks	0	300,041	2,670
Buses	1,621	404	40
Trains	0	252	0
Rail Containers	0	8,388	0
Private Aircraft	3,238	0	0

## 2.12 Traveler Information Services

No review of the Southern California Region would be complete without recognition of the enormous variety of traveler information resources available throughout the region. The provision of timely, reliable and relevant information to Southern California's travelers has evolved to become an important component of the region's Transportation Systems Management (TSM) and Travel Demand Strategies (TDM). The expansion of traveler information services has gone hand in hand with long term investments in traffic, transit, incident, and weather monitoring and management systems that create the information sources. These powerful resources are now being made available via a variety of existing and planned networks that enable the information to be widely disseminated. Traveler information is delivered to the public via: commercial radio and TV broadcasts, community cablevision broadcasts, public agency telephone and web services and through the many activities of the private sector who use the web, pagers, cell phones, PDAs and other in-vehicle devices. Information is, or will increasingly be available about: current traffic conditions, incidents, scheduled and real-time location of buses and trains, ridesharing opportunities, parking availability, weather, weather related emergencies, fires and earthquakes and security alerts that could impact the transportation system in the region.

## 2.13 Institutional Complexity

The complexity of ITS planning in the Southern California region is a reflection of the complicated web of governmental institutions and responsibilities for transportation policy, planning and operations. Table 2-2 attempts to summarize the network of institutions and entities that must be considered in developing and deploying ITS. The SCAG Board alone consists of 90 representatives, most of whom are locally elected officials. A quick glance at Table 2-2 indicates why achieving region-wide consensus on anything, much less use of scarce local funding for ITS deployment and operations is difficult. The real challenge lies in trying to bridge the interests of the individual institutions and the constituencies that they represent in order to build support for

needed projects that cross all the county borders. In recognition of the political reality of the task, this element of the Southern California Regional ITS Architecture is approached at an extremely high level and is more general in nature than the county-level regional architectures.

**Table 2-2: Transportation Policy, Planning and Operations Entities in Southern California**

Metropolitan Planning Organization	Southern California Association of Governments						Region Total
Counties	Los Angeles	Orange	Riverside	San Bernardino	Ventura	Imperial	6
Subregional Councils/ Associations of Government	8	1	2	1	1	1	14
Transportation Stakeholders							
Transportation Commissions	1	1	1	1	1		5
Transportation Authorities	1	1	1	1			4
Caltrans Districts	District 7	District 12	District 8	District 8	District 7	District 11	4
Ports	2				1		3
Commercial/General Airports <sup>1</sup>	15	2	13	17	3	6	56
Transit Operators <sup>2</sup>	24	2	7	6	8	6	53
Toll Road Authorities		3					3
International Ports of Entry						3	3
California Highway Patrol							
Local Jurisdictions							
Cities <sup>3</sup>	88	34	24	24	10	7	187
Law Enforcement (Police/Sheriff) <sup>4</sup>	74	25	15	17	11	7	149
Fire Departments/Districts	42	14	34	45	5	14	154
Regulating/Resource Agencies							
Air Quality/Air Pollution Control Districts	Mojave Desert South Coast	South Coast	Mojave Desert Salton Sea South Coast	Mojave Desert South Coast	Ventura	Salton Sea	4

**Reference:**

“Southern California Regional Freight Study”, FHWA office of Freight Management and Operations, 2004,  
[http://ops.fhwa.dot.gov/freight/freight\\_analysis/reg\\_ind\\_studies/so\\_cal\\_study.htm](http://ops.fhwa.dot.gov/freight/freight_analysis/reg_ind_studies/so_cal_study.htm)

<sup>1</sup> Source: Federal Aviation Administration Airport Data (5010) Reports, Public-Use Airports only

<sup>2</sup> Source: State of California Controller’s Office, Transit Service Operators and/or Claimants Receiving Transportation Development Act (TDA) funds

<sup>3</sup> Source: State of California Department of Finance

<sup>4</sup> Source: Police Officer Standards and Training (POST), includes local police, county sheriffs, airport/port police, school district/college/university police

### 3 REGIONAL STAKEHOLDERS

The development of ITS Plans and architectures varies greatly between the six counties. Effectively a bottoms-up approach has been adopted with county-level architectures being established first. Each county-level regional architecture has an extensive Stakeholder list and in most cases a core group of champion agencies. For the Multi-County Team a small group was assembled representing primarily the Transportation Commissions and Caltrans Districts. This group was deliberately kept small to facilitate the consensus building that had to take place in an abbreviated time-period. Multiple means of outreach were employed at all levels.

Regular meetings were held to discuss the development of the local architectures, and the attention was consistently drawn to the concept of the Southern California Regional ITS Architecture. The progress of the upper level architecture intended to treat issues of cross-county significance was also explained. The project website: [www.nateng.com/scagarch](http://www.nateng.com/scagarch) was used for posting all information, agendas, minutes, presentations and deliverables with their comment dispositions. Special presentations, interviews and outreach meetings that took place were documented and posted on the web site as well. Every attempt was made to inform those involved and take in as much feedback as possible within the time constraints of the project. See Appendix C for a complete Stakeholder listing for the Southern California Regional ITS Architecture.

The Multi-County Team was represented by local ITS champions from the following agencies:

- Southern California Association of Governments (SCAG)
- Caltrans District 7\*
- Caltrans District 8\*
- Caltrans District 12\*
- Los Angeles County Metropolitan Transportation Authority (Metro)
- San Bernardino Associated Governments (SANBAG)
- Riverside County Transportation Commission (RCTC)
- Ventura County Transportation Commission (VCTC)
- Orange County Transportation Authority (OCTA)
- Imperial County Association of Governments (represented by their consultant team developing their local architecture).
- Imperial Valley Association of Governments (IVAG)

Note\*: The Caltrans districts also represent the interests of the CHP in line with Caltrans TMC Master Plan which recognizes co-location of facilities and some joint responsibilities.

## 4 ITS INVENTORY

### 4.1 Inventory Approach

Each of the county-level architectures has created inventories of existing and planned systems within their county. Also, this multi-county level of architecture is, by its nature focused on “center-to-center” integration. The field elements of most agencies are captured in their county architectures and need not be repeated in the regional architecture. The exceptions to this are multi-county agencies not captured effectively at the local level such as SCRRA and its Metrolink services. Therefore, the ITS inventory for the Multi-County architecture level of the Southern California Regional ITS Project only focuses on systems or generic categories of systems with projects that involve (or potentially involve) integration across the six county region.

An example of this high level thinking is the classification of the Regional Traveler Information Systems in the inventory. This high level group includes all means and methods of disseminating traveler information regardless of whether they are public or private systems. It covers all modes of transportation and all types of information. The various Market Packages associated with the very high level systems are included. “Systems” as used in this context is a general concept that may include hardware, software, communication, and dissemination devices. For further information concerning this ITS inventory, please refer to Appendix B, which contains the TurboArchitecture™ generated inventory report.

## 5 ITS NEEDS AND OPERATIONAL CONCEPTS

### 5.1 Needs

The identification of needs provides the essential framework for architectural development at the highest level. A number of potential concerns were discussed in Multi-County group meetings. Some of these concerns arose from the latest version of the National Architecture which, emphasizes the relationship of security to ITS. Also the county-level architectures and discussions with Stakeholders identified issues to be considered in the broader context of the six- county region. The issues discussed were:

- Emergency Management/Security and ITS;
- Caltrans District Interfaces;
- Regional Data Exchange Standards;
- Advanced Traveler Information Systems and 511;
- Regional Fare Systems;
- Goods Movement
- Arterial Cross Boundary Data Exchange; and,
- Regional Archives.

Through discussion, the following needs listed below were identified as consensus items. These needs are classified in the following sections.

#### 5.1.1 Traffic Management

- Interfaces between the Caltrans Districts that create District networks and support coordination between the Districts.
- Interface to provide arterial traffic information exchange between local jurisdictions.
- Traffic Management System(s) to control field devices for the ports.

#### 5.1.2 Data Information Management

- Common data dictionary for all modes that supports information exchange across the six-county region. (Later identified as a standards project.)

#### 5.1.3 Commercial Vehicle Traveler Information

- Traveler information in support of improved commercial vehicle operations including access to the ports, railroad crossings, and other needs.

**5.1.4 Transit Operations and Maintenance**

- Operational and maintenance projects in support of rail.
- Improved integration of transit services across the region

**5.1.5 Regional Data Archive**

- Creation of data archives for planning and evaluation purposes

Two of the list of topics lacked consensus and were the subject of continuing dialogue in terms of how they should be handled and are discussed below.

**5.2 Emergency Management/Security and ITS Needs**

Each county-level regional architecture, has recognized the emerging importance of emergency management and security and the role that ITS can play. Close coordination between the institutions exists but there are often gaps in understanding of the potential role that could be played by the electronic exchange of data from the transportation systems that have been deployed. Furthermore, separate funding sources, proprietary systems, divided responsibilities and the lack of a transportation coordinating agency that crosses all institutional barriers make it hard to develop the impetus for consensus on needs and projects that will deliver ITS benefits to the emergency management and security services. This problem is even more pronounced at the six-county regional level.

In California one important step forward in integration of transportation and emergency services has been the legislated Statewide Emergency Management System (SEMS). In the case of Caltrans such support is offered through the Transportation Management Centers (TMCs). The ever-increasing trend toward collocation of CHP with Caltrans in TMC facilities greatly strengthens coordination of emergency and security response activities even though the ability to integrate data sources is frequently lacking. County Sheriff’s Departments are frequently responsible for coordination of all other emergency services in support of SEMS and coordinate closely with Caltrans and CHP. However, in most cases they lack integrated access to critical electronic data sources such as traffic conditions on freeways and arterial streets, information on incidents, locations of transit vehicles, numbers of passengers on-board and camera views of conditions of streets, freeways and infrastructure such as bridges. The potential value of the exchange of such information for managing such major events as fires and earthquakes has been graphically illustrated in Southern California in recent years.

The National ITS Architecture identifies eight entities that deal with different aspects of security as illustrated below.

1. Disaster Response and Evacuation

- Uses ITS to respond to and recover from natural disasters, terrorist acts and other catastrophic events.
- Southern California experiences more than its fair share of such occurrences and the potential for significant disruptive events of a terrorist nature is also widely acknowledged.

- The transportation agencies have no lead coordinating responsibility or funding provided to tackle such expanded planning and organization associated with these most recent security needs.



**Figure 5-1: National Architecture Security Classifications**

2. Freight and Commercial Vehicle Security

- Responsibility for this area of security lies primarily with the private companies, and the U.S. Department of Homeland Security, Customs and Border Protection Division, and is clearly an area of concern for the seaports and landside Ports of Entry.
- It is not currently within the realm of responsibility of the transportation stakeholders developing this architecture document.

3. HAZMAT Security

- A state level responsibility and is referenced in the California Statewide ITS Architecture
- This has emerged at the local regional level in the context of rail HAZMAT freight information that could be made available to local emergency services.
- This has been identified as an initiative that could be pursued in Imperial County and if successful extended across the region.

4. ITS Wide Area Alerts

- Currently issued by the CHP when they involve the abduction of minors. Weather watches and warnings also fall in this category, as could all manner of disasters.
- This function is recognized in the local regional architectures. The extended use of wide area alerts through ITS dissemination channels requires only further coordination and the further enabling of intra-regional data exchange.

5. Rail Security

- Focuses on rail freight (passenger security it dealt with under transit security).
- Highway rail intersections are covered in the local regional architectures.

6. Transit Security

- Addresses passenger, facility and asset security for passenger rail and bus systems.
- The newly realized significance of this topic brings the need for new resources commensurate with the scale of the system operated in the region
- No new resources to operate and maintain the necessary ITS associated systems have been identified.

7. Transportation Infrastructure Security

- Can be monitored and protected by a broad array of ITS technologies to support monitoring of bridges, tunnels and management centers.
- No new resources have been identified to support the operations and maintenance of such systems.

8. Traveler Security

- Focuses on responsibility for increasing the safety and security of travelers in public areas.
- It draws the same comments as applied to the above security categories.

From the above it is concluded that there are clear needs across the region for improvements in ITS security areas. At the local level some specific needs have been translated into potential projects. At the regional level lack of coordinated responsibility, lack of resources commensurate with the scale of the needs, lack of strategies and an overall commitment to a regional concept of operations are all in evidence. The conclusion is that a planning study is required to examine in detail, the institutional, technical and funding issues associated with these needs prior to outlining the topic within the architecture at the multi-county issues level. An outline for such a study is therefore included in the project sequence. However, market packages, interconnects and flows are not included at this stage and would be products of such a study.

### 5.3 Advanced Traveler Information Systems

A discussion paper that presented an inventory of current Southern California Traveler Information Programs aided discussion of this issue. This paper demonstrated that there are a myriad of traveler information resources available in the region that can be accessed by web and phone based systems. Both public agencies and private Information Service Providers (ISPs) provide the services. A conceptual view was offered on approaches to a 511 system for the region. However, there was no agreement that a specific approach should be adopted. Indeed one interpretation is that the services available are so extensive that they effectively are a 511 service. However, stakeholders would not wish to rule out any future regional initiatives. Indeed they would like to leave the door open to future projects without specifying roles and responsibilities or a concept of operations. To enable this approach a generic project has been included in the project sequencing section and market package diagrams are included in Section 7. The relationship of region wide traveler information to emergency management and security is also obvious and should be included in the planning project that is proposed in Section 8.

### 5.4 User Services

Southern California Multi-County ITS User Services were narrowed down to reflect only the needs identified above and the existing systems capable of Multi-County integration. This architecture document includes only those projects that fell within the above categories and were anticipated in a ten-year time line. The topics fall into the following User Service Bundle categories:

- Travel and Traffic Management
- Information Management
- Commercial Vehicle Operations
- Public Transportation Management
- Emergency Management

Individual user services are identified below.

**Table 5-1: Selected Market Packages**

User Service	Market Package	Market Package Name & Description
<b>Archived data Management System</b>	AD 2	ITS Data Warehouse
	AD3	ITS Virtual Data Warehouse
<b>Public Transportation</b>	APTS4	Transit Passenger and Fare Management
	APTS 5	Transit Security
	APTS6	Transit Maintenance

<b>User Service</b>	<b>Market Package</b>	<b>Market Package Name &amp; Description</b>
<b>Traffic Management</b>	ATMS 1	Network Surveillance
	ATMS 6	Traffic Information Dissemination
	ATMS 7	Regional Traffic Control
	ATMS13	Standard Railroad Grade Crossing
	ATMS 14	Advanced Railroad Grade Crossing
	ATMS 15	Railroad Operations Coordination
<b>Traveler Information</b>	ATIS 1	Broadcast Traveler Information
	ATIS 2	Interactive Traveler Information
<b>Commercial Vehicle</b>	CVO 1	Fleet Administration
<b>Maintenance &amp; Construction Management</b>	MC 7	Roadway Maintenance and Construction
	MC 10	Maintenance and Construction Activity Coordination

### 5.5 Operational Concepts

From the needs analysis, the market packages of relevance to the Southern California regional architecture have been identified. These in turn become the basis for the operational concepts that link market packages to agencies and their roles and responsibilities within them.

The operational concept process develops and documents Stakeholders' current and future roles and responsibilities in the implementation and operation of ITS based on a common regional architecture. An operational concept is one of the required components of a regional ITS architecture. A useful function of the concept is helping to identify areas of content for multi-agency agreements.

**Table 5-2: Southern California Multi-County ITS Operational Concepts**

<b>Market Package</b>	<b>Contents</b>	<b>Organization</b>	<b>Roles/Responsibilities</b>
AD 2 ITS Data Warehouse	Collection of data from multiple agencies and data sources spanning across modal and jurisdictional boundaries	Regional Partners	<ul style="list-style-type: none"> <li>• Collect data in demand</li> <li>• Provide for regular maintenance of data warehouse</li> </ul>
AD3 ITS Virtual Warehouse	Provide for a regional archiving warehouse for long term planning	Regional Partners	<ul style="list-style-type: none"> <li>• Provide a definition of the data to be archived</li> <li>• Provide for regular maintenance of data warehouse</li> </ul>
* ATPS4 Transit Passenger and Fare Management	Receive and process passenger and fare information Receive and process passenger and fare information	SCRRA	<ul style="list-style-type: none"> <li>• Provide for installation of communications infrastructure</li> <li>• Provide for installation of new ticket vending machines and validator machines</li> <li>• Provide for enhancements to electronic passenger information system (supplemented by GPS)</li> </ul>
APTS 5 Transit Security	Provides for the physical security of transit passengers and transit vehicle operators	SCRRA	<ul style="list-style-type: none"> <li>• Monitor train security</li> <li>• Monitor train station</li> <li>• Receive security call from train operators</li> <li>• Maintain the communication network with transit vehicles and emergency services</li> </ul>
* APTS6 Transit Maintenance	Coordinate maintenance activities at transit sites	SCRRA	<ul style="list-style-type: none"> <li>• Provide for acquisition of new vehicles</li> <li>• Provide for rehabilitation of existing vehicles</li> </ul>

<b>Market Package</b>	<b>Contents</b>	<b>Organization</b>	<b>Roles/Responsibilities</b>
<p>ATIS 1 Broadcast Traveler Information</p>	<p>Broadly disseminates traveler information through existing infrastructures and low cost user equipment such as radio and cell phone</p>	<p>Regional Partners</p>	<ul style="list-style-type: none"> <li>• Provide roadway/rail traffic and incident information to travelers</li> <li>• Share traffic information with each other and emergency agencies</li> <li>• Share control of field equipment with other transportation and emergency agencies</li> <li>• Maintain AVI/AVL systems for maintenance vehicles</li> <li>• Update information to ISP and Media Outlets (Websites, TV, etc.) and send alerts on CMS and HAR equipment</li> </ul>
<p>ATIS 2 Interactive Traveler Information</p>	<p>Provides tailored traveler information in response to a traveler request</p>	<p>Regional Partners</p>	<ul style="list-style-type: none"> <li>• Establish and maintain interactive traveler information systems such as itinerary planning website</li> </ul>
<p>ATMS01 Network Surveillance</p>	<p>Receive information from field devices</p>	<p>I-5 JPA/ Ports</p>	<ul style="list-style-type: none"> <li>• Provide communications infrastructure for field devices</li> <li>• Receive field device information (CCTV and CMS)</li> <li>• Receive detection and monitoring information concerning the port gate queue</li> <li>• Receive regional traveler information from local agencies</li> </ul>

<b>Market Package</b>	<b>Contents</b>	<b>Organization</b>	<b>Roles/Responsibilities</b>
ATMS 06 Traffic Information Dissemination	Provides driver information using roadway equipment such as CMS or HAR	Regional Partners	<ul style="list-style-type: none"> <li>• Install and maintain the traffic information dissemination equipment</li> <li>• Update information to ISP and Media Outlets (Websites, TV, etc.) and send alerts on CMS and HAR equipment</li> </ul>
ATMS07 Regional Traffic Control	Sharing of traffic information among traffic management centers to support a regional control strategy	Caltrans	<ul style="list-style-type: none"> <li>• Make the following information available to other Caltrans Districts:                             <ul style="list-style-type: none"> <li>• Real-time congestion</li> <li>• Real-time incident</li> <li>• CMS with messages (active CMSs)</li> <li>• All CCTV real-time video images</li> </ul> </li> <li>• Provide a consistent source of data to other Caltrans Districts.</li> <li>• Potential future shared control of field devices</li> </ul>
		Local Jurisdictions	<ul style="list-style-type: none"> <li>• Make real-time arterial traffic information available to other agencies</li> </ul>
ATMS13 Standard Railroad Grade Crossing	Installation of grade crossing system	SCRRA	<ul style="list-style-type: none"> <li>• Provide for installation of new grade crossing monitor analyzer system</li> </ul>
ATMS14 Advanced Railroad Grade Crossing	Manages highway traffic at highway-rail intersections where demands advanced features (e.g. rail operational speeds >80 mph).	SCRRA	<ul style="list-style-type: none"> <li>• Design advanced railroad grade crossing safety enhancement strategy</li> <li>• Install advanced railroad crossing equipment</li> </ul>
		Arterial Traffic Agencies	<ul style="list-style-type: none"> <li>• Coordinate with SCRRA in local traffic operation</li> </ul>

<b>Market Package</b>	<b>Contents</b>	<b>Organization</b>	<b>Roles/Responsibilities</b>
ATMS 15 Railroad Operations Coordination	Provides an additional level of strategic coordination between freight rail operations and traffic management centers	SCRRA	<ul style="list-style-type: none"> <li>• Design railroad operation coordination strategy</li> <li>• Provide for installation of equipment for operation coordination</li> </ul>
CVO01 Fleet Administration	Make real-time traffic conditions at the ports available to commercial vehicle disseminators	Ports and Local Jurisdictions	<ul style="list-style-type: none"> <li>• Disseminate conditions (queue backup, etc.) for the ports to commercial vehicle operators</li> <li>• Maintain communications infrastructure for information dissemination</li> </ul>
MC07 Roadway Maintenance and Construction	Coordinate maintenance activities at transit roadways (i.e. railroad tracks)	SCRRA	<ul style="list-style-type: none"> <li>• Provide for installation of communications infrastructure</li> <li>• Provide coordination for track improvements (track, bridges, tunnels, etc)</li> <li>• Provide coordination for grade crossing improvements</li> </ul>
* MC10 Maintenance and Construction Activity Coordination	Coordinate maintenance activities at transit storage facilities	SCRRA	<ul style="list-style-type: none"> <li>• Provide for the installation of communications infrastructure</li> <li>• Provide coordination of maintenance and construction activities at transit stations</li> <li>• Provide coordination of construction activities for new storage facilities</li> <li>• Provide for maintenance activities on existing maintenance facilities</li> </ul>

\* NOTE: Transit in this instance refers to rail systems as well as bus.

## 6 FUNCTIONAL REQUIREMENTS

At this point the needs, services and market packages as well as the roles of the agencies have been defined in order to continue to developing ITS services. The next step is to list the tasks or activities that are performed by the systems themselves. This can be either the existing systems or those that are planned. Functional requirements can be high level in nature for a plan such this. For a project architecture leading to the procurement of a system, they will, of necessity, be very detailed.

1. Stakeholder: Caltrans HQ (Headquarters)  
System: California Highway Information
  - The system shall provide to the user real-time traffic information
2. Stakeholder: Local Jurisdictions  
System: Arterial Traffic Information
  - The system(s) that support cross boundary data exchange shall be consistent with the county-level regional ITS Architecture
3. Stakeholder: ISPs  
System: Regional Traveler Information Systems
  - The system(s) shall provide all and any information to users that will support travel time savings, safety and modal choice.
4. Stakeholder: Regional Caltrans  
System: Caltrans TMC Interfaces
  - The system shall provide real-time traffic congestion information to adjacent Caltrans Districts
  - The system shall provide real-time incident information to adjacent Caltrans Districts
  - The system shall provide real-time active CMS messages to adjacent Caltrans Districts
  - The system shall provide real-time active CCTV cameras to adjacent Caltrans Districts
  - The system shall provide notification of system maintenance activities that impact the supply of traffic information to other Caltrans Districts
5. Stakeholder: SCAG  
System: Data Archive
  - The system shall provide appropriate information as may be determined by a regional data archival consensus
  - The Stakeholder shall participate in regular management forums concerning Operations and Maintenance of the data archive
6. Stakeholder: SCRRA  
System: Rail Management Improvement System

- The system shall provide upgraded ticket vending machines and validation throughout the system
- The system shall provide overall improvement in fare management and ticketing alternatives
- The system shall provide for an electronic passenger information system (supplemented by GPS) throughout the system
- The system shall provide for improved software and hardware for maintenance management
- The system shall provide for the application of upgraded maintenance management to way facilities
- The system shall enable procurement to incorporate ITS elements where appropriate to new rolling stock
- The system shall enable rehabilitation of existing rolling stock to incorporate ITS elements where appropriate in order to enhance operations and passenger security, safety and convenience
- The system shall provide for the installation of fiber optic communications system throughout the system in support of ITS systems
- The system shall provide for the installation of ITS systems as appropriate, such as passenger information systems in new track and platforms
- The system shall provide for the installation of ITS systems as appropriate, in parking and station platform and access improvements throughout the system
- The system shall provide for the installation of fiber optic communications system throughout the system that is capable of supporting ITS systems where appropriate
- The system shall include a grade crossing monitor analyzer system to be used throughout the system
- The system shall perform track, signal, and communications improvements including rehabilitation of existing track, signal, and communications throughout the system
- The system shall perform grade crossing improvements throughout the system
- The system shall provide for the improvement of existing layovers throughout the system
- The system shall provide for the building of new layovers in Orange and Ventura Counties

7. Stakeholder: SCRRRA

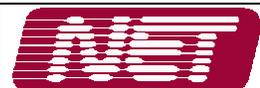
System: Wayside Hotbox

- The system shall provide maintenance information to the Maintenance facility.

8. Stakeholder: SCRRA

System: Rail Data Archive

- The system shall extract Information to be made available to local government agencies, as well as federal agencies.

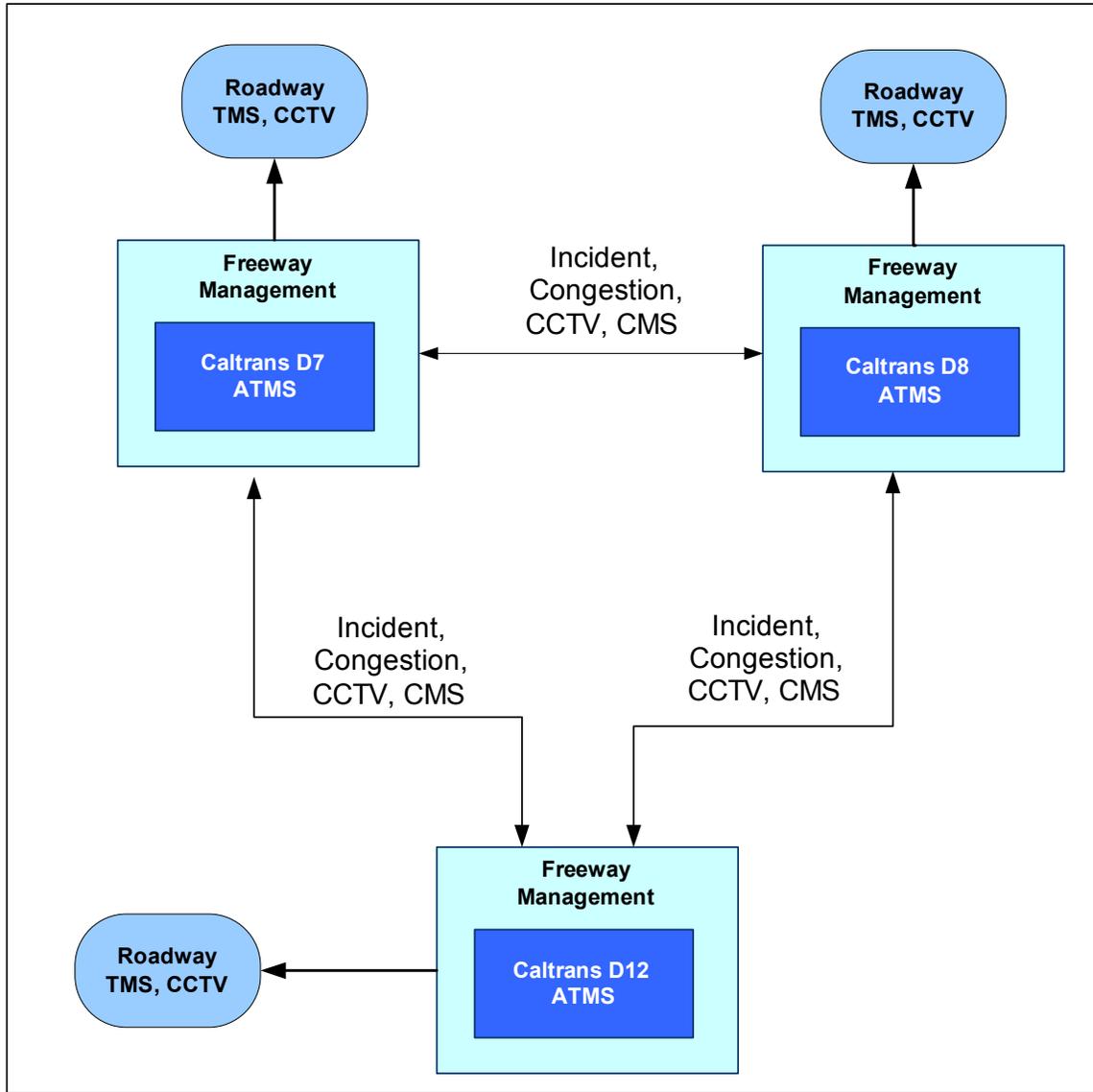


## 7 INFORMATION FLOWS AND INTERFACE REQUIREMENTS

Finally the point is reached in the architecture where it is possible to view the outline of a framework for integrating systems that will reap the benefits of sharing data. The National Architecture Interconnects and Information Flows is the point at which the framework for integration is identified and the potential flows are examined.

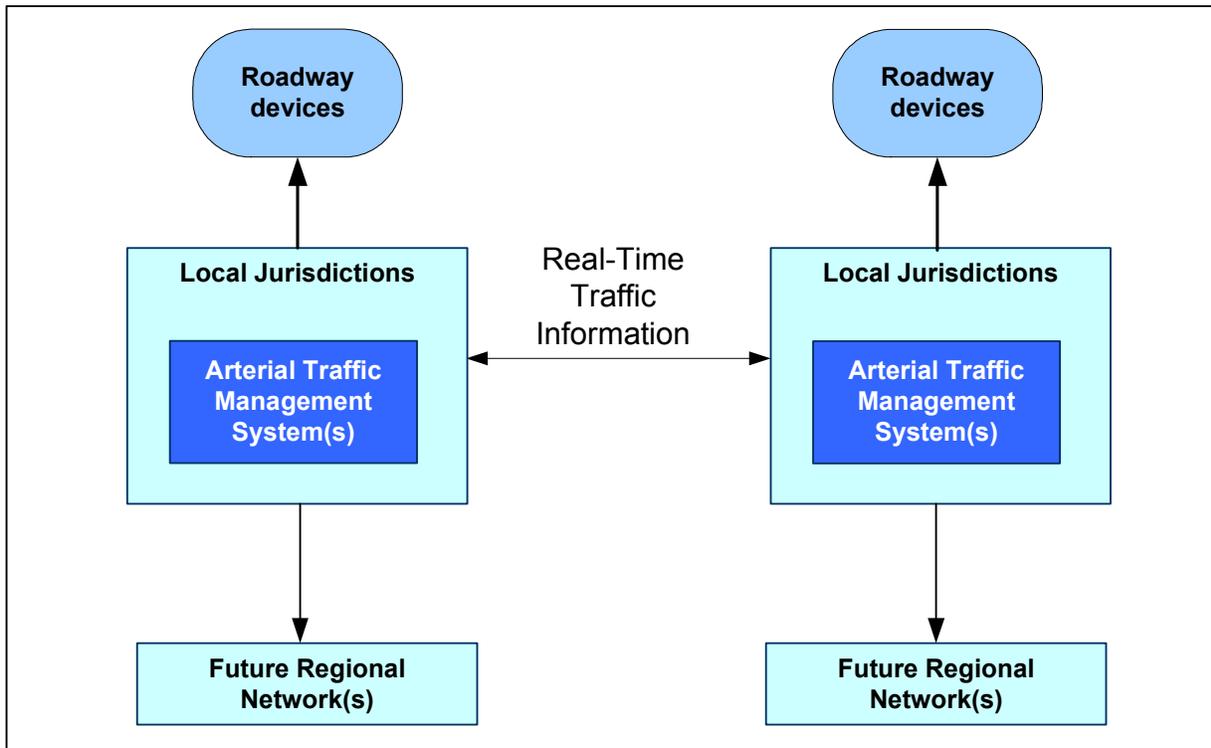
There are many ways to represent the potential data flows between systems. US DOT Regional ITS Architecture Guidance (2001) discusses the alternatives. The differences between the various alternatives largely reflect the level of detail of the flows described. Interconnects and data flows are first illustrated at a fairly high level using customized market package diagrams from the National Architecture. In this approach the information flows are only broadly described, i.e. the flows depict “bundles” of data. The following diagrams, Figure 7-1 to Figure 7-6, represent at a high level the information flows for the suggested ITS concepts. Figure 7-7 to Figure 7-22 represent the National ITS Architecture Market Packages that have been applied or could be implemented region wide Southern California.

In Figure 7-23, the interconnects are graphically illustrated using TurboArchitecture™ and in Appendix D, the detailed flows are illustrated using TurboArchitecture™ for the sequencing of projects identified in Section 8.



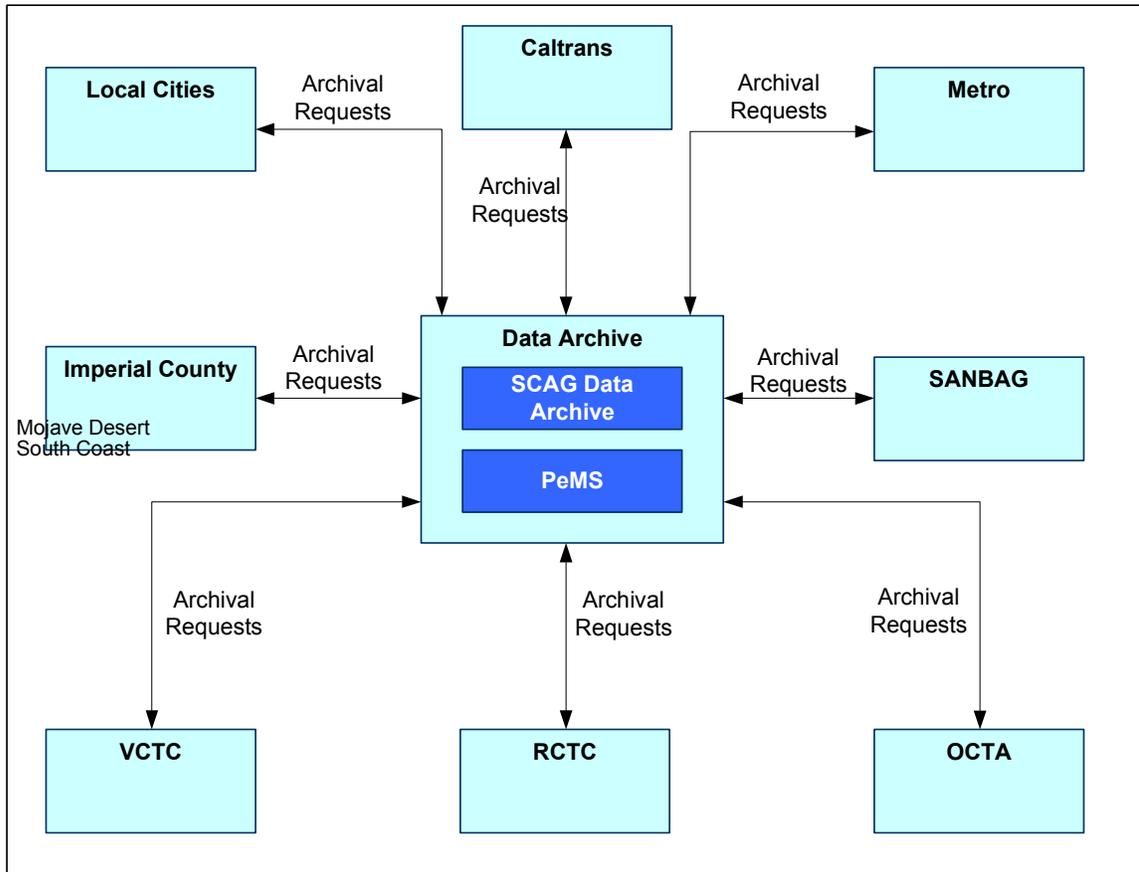
**Figure 7-1: Multi Caltrans Districts Interfaces**

Figure 7-1 illustrates the intended result of the creation of the Caltrans District interfaces. The project will realize the integrated exchange of data and potential interoperability. Not included in the illustration is the addition of District 11 that will complete the full six-county potential network for information exchange



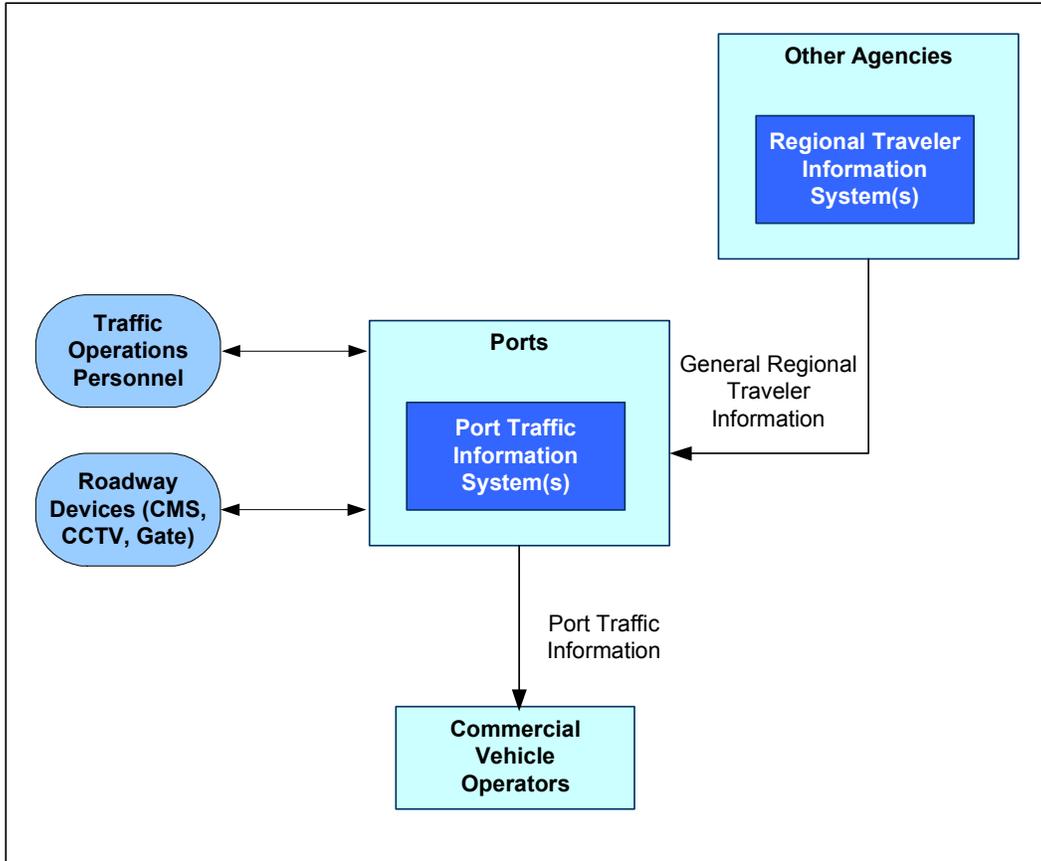
**Figure 7-2: Arterial Cross Boundary Data Exchange**

Figure 7-2 generically illustrates projects that will involve the exchange of real-time traffic information originating from traffic control systems separated by any one of the county borders. The inclusion of future regional network(s) indicates that if such unspecified networks are or become available they could be used to convey such information to a wider group of users on either side of the border.



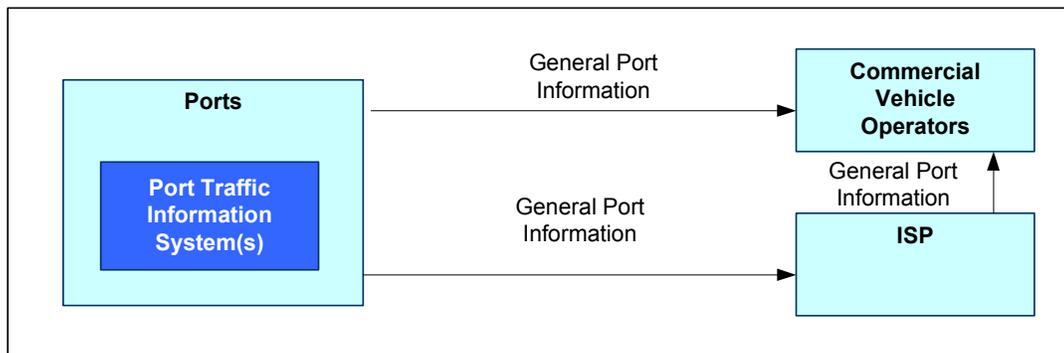
**Figure 7-3: Data Archive System(s)**

Figure 7-3 illustrates the regional potential to exchange data with a regional archive. SCAG is located as a central system for the region. However we have also added a statewide system the Performance Management System (PeMS) since it is already used as a statewide repository that is contributed to by the Caltrans Districts and can be accessed by regional users including ISPs.

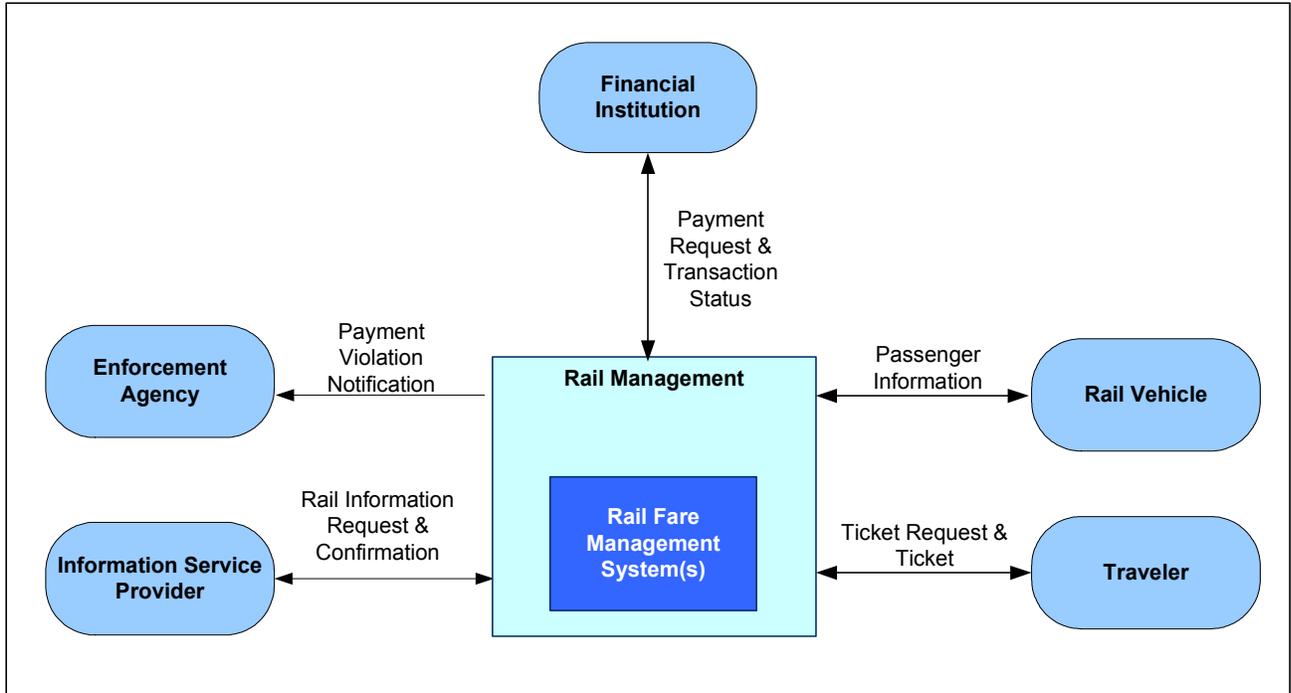


**Figure 7-4: Port Traffic Information**

Figure 7-4 illustrates the ambitious Ports Information System that specifically will deliver traffic information to commercial vehicle operators. Figure 7-5 is then a complimentary illustration of the Port general information systems that will work with the private sector ISPs to provide information to commercial vehicle operators.

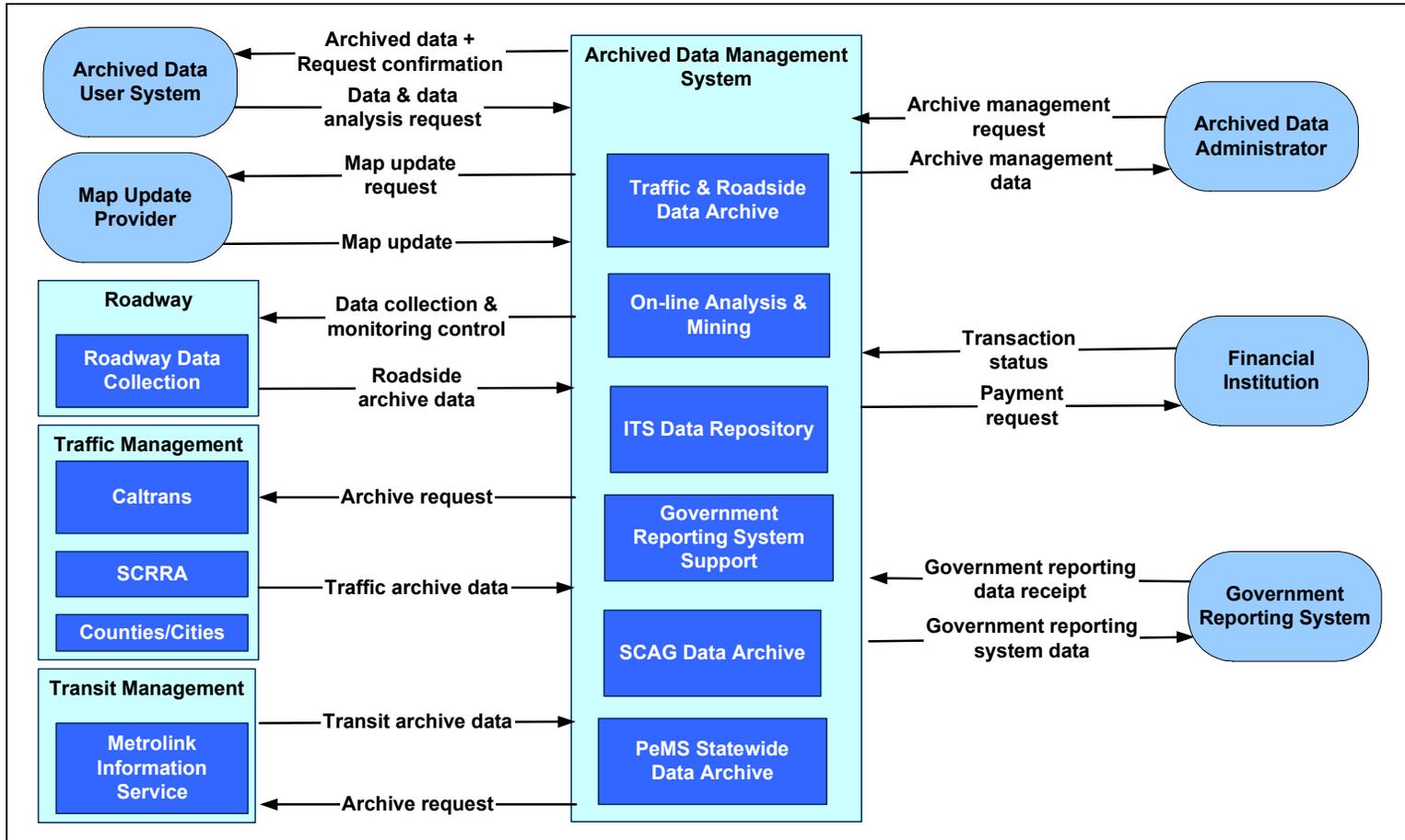


**Figure 7-5: Commercial Traveler Information**



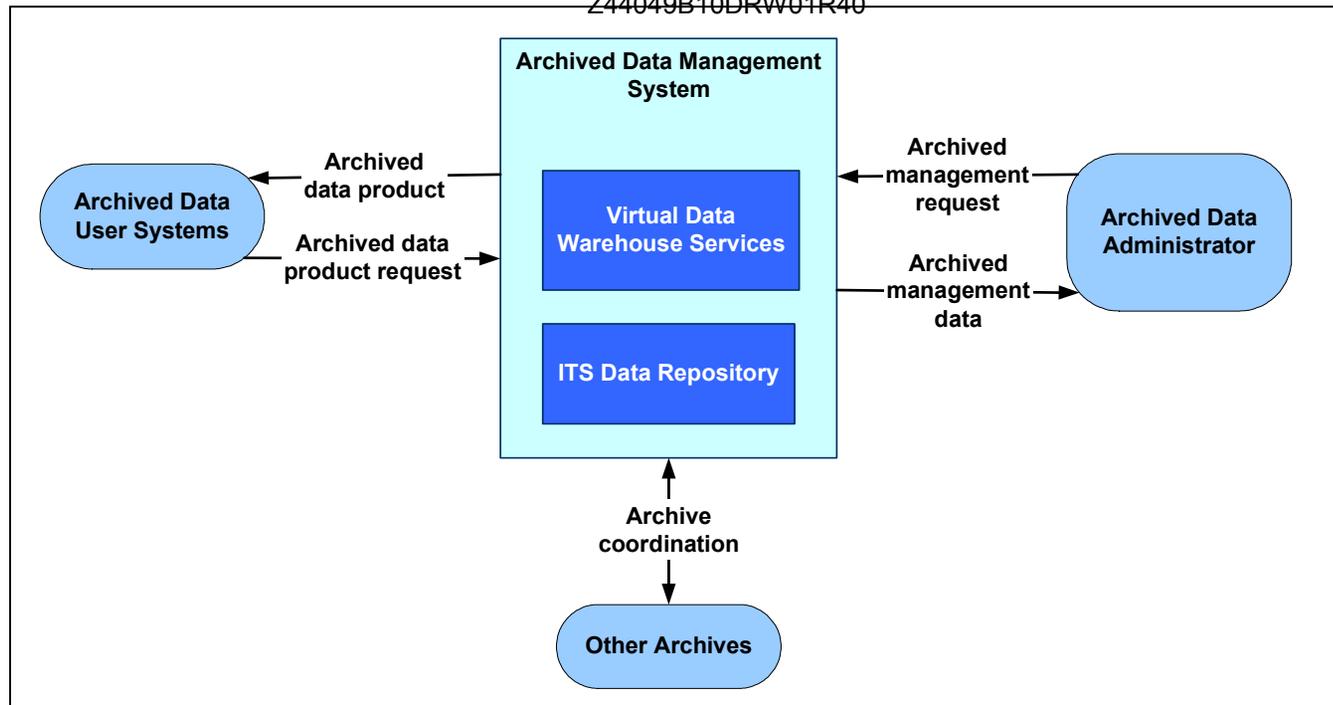
**Figure 7-6: Rail Fare System Enhancement**

Figure 7-6 illustrates a regional rail system project that involves modernization and upgrades to the fare management system for Metrolink.



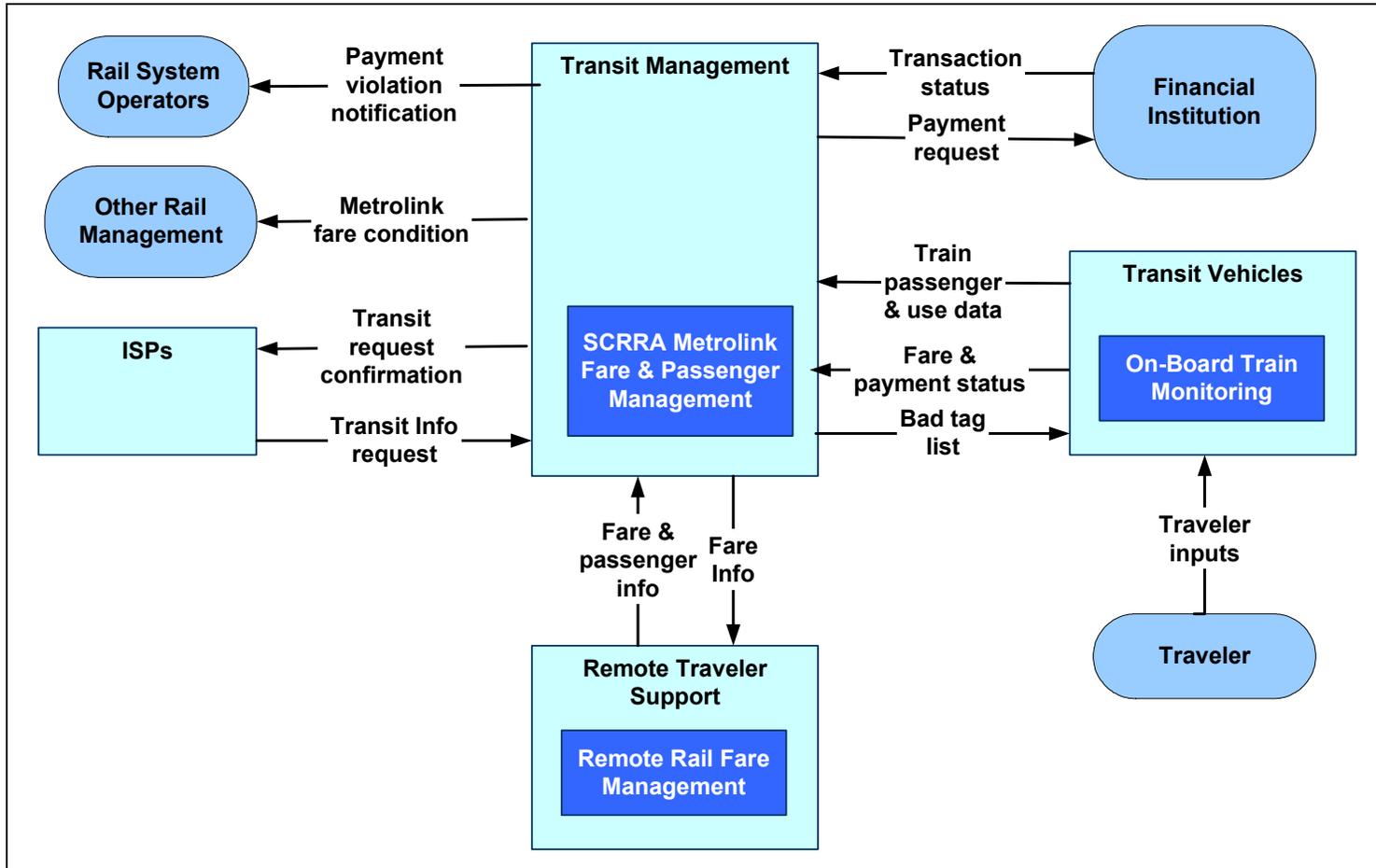
**Figure 7-7: AD 2-- ITS Data Warehouse**

This market package includes the data collection and management capabilities and the functionality and interface definitions that allow collection of data from multiple agencies and data sources spanning across modal and jurisdictional boundaries.



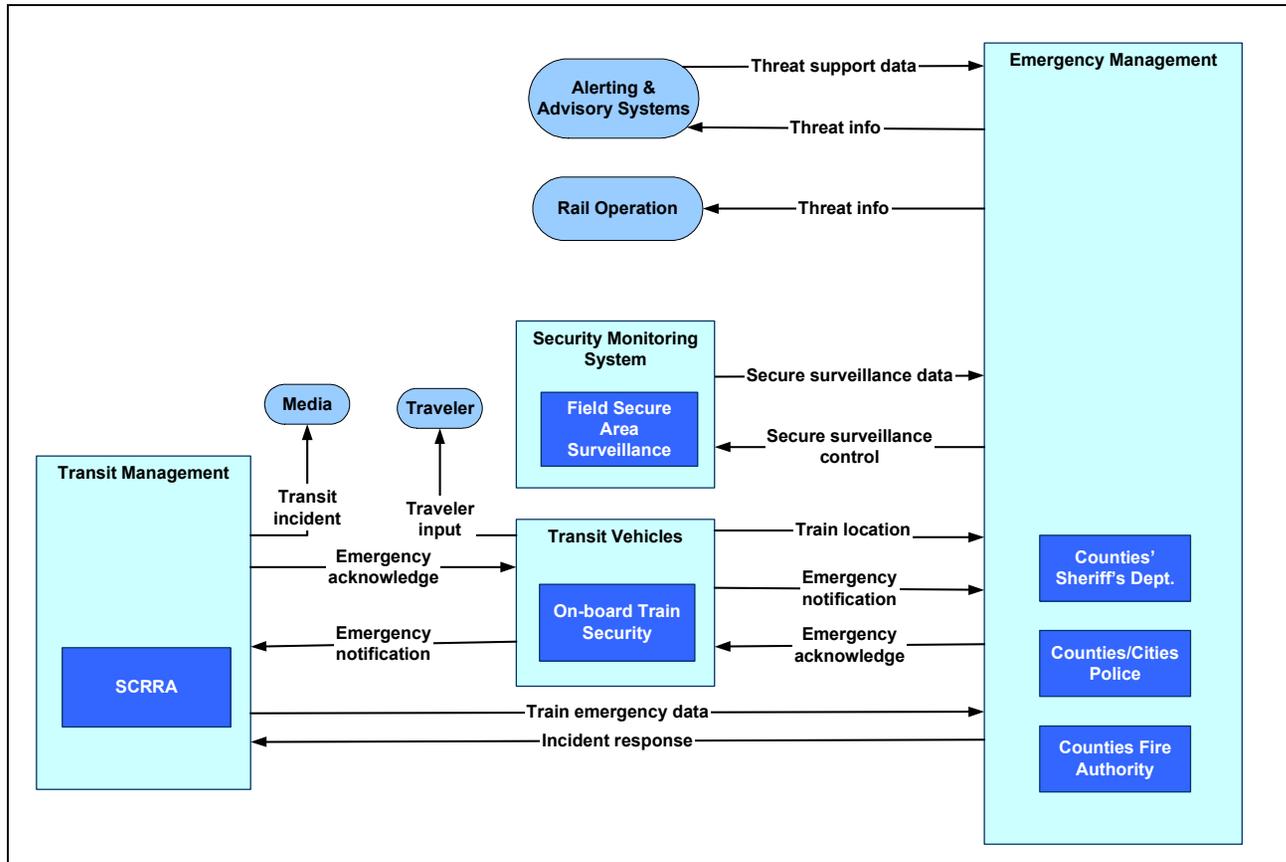
**Figure 7-8: AD 3 – ITS Virtual Data Warehouse**

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.



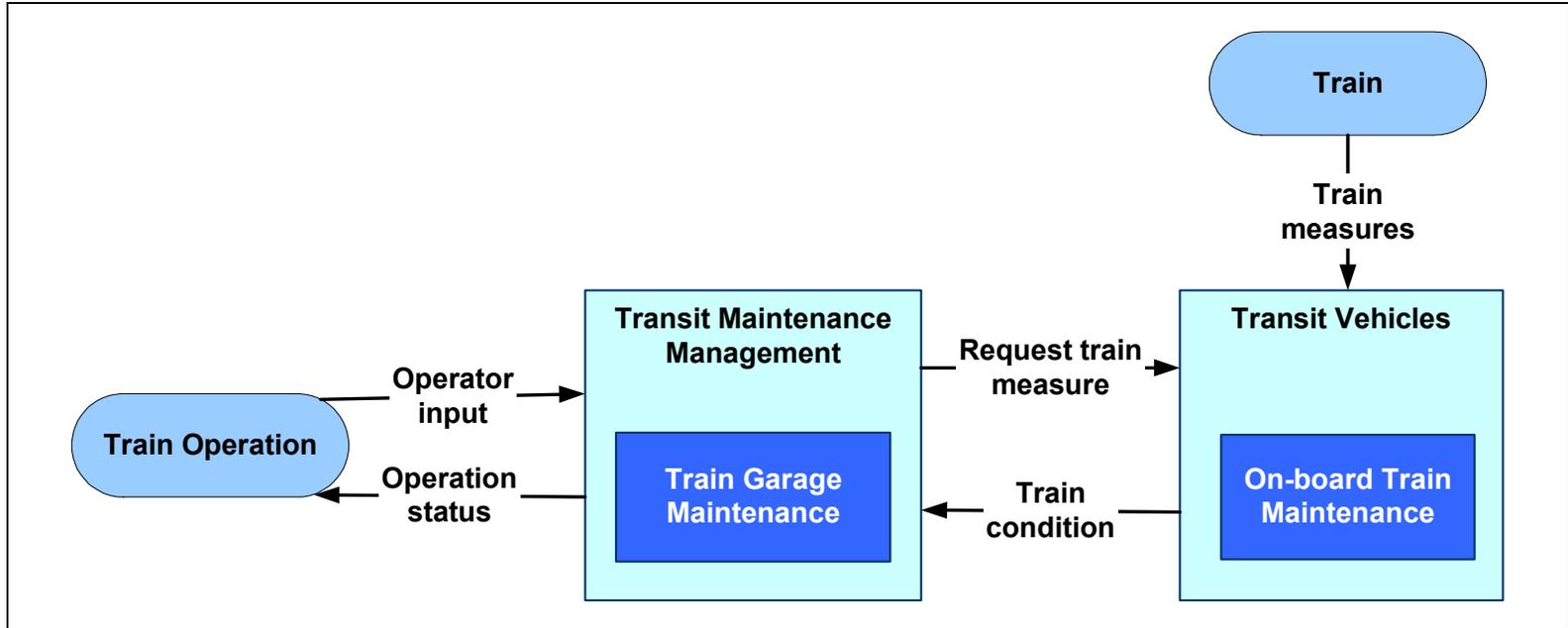
**Figure 7-9: APTS 4—Transit Passenger and Fare Management**

This market package manages passenger loading and fare payments on-board transit vehicles using electronic means. It allows transit users to use a traveler card or other electronic payment device.



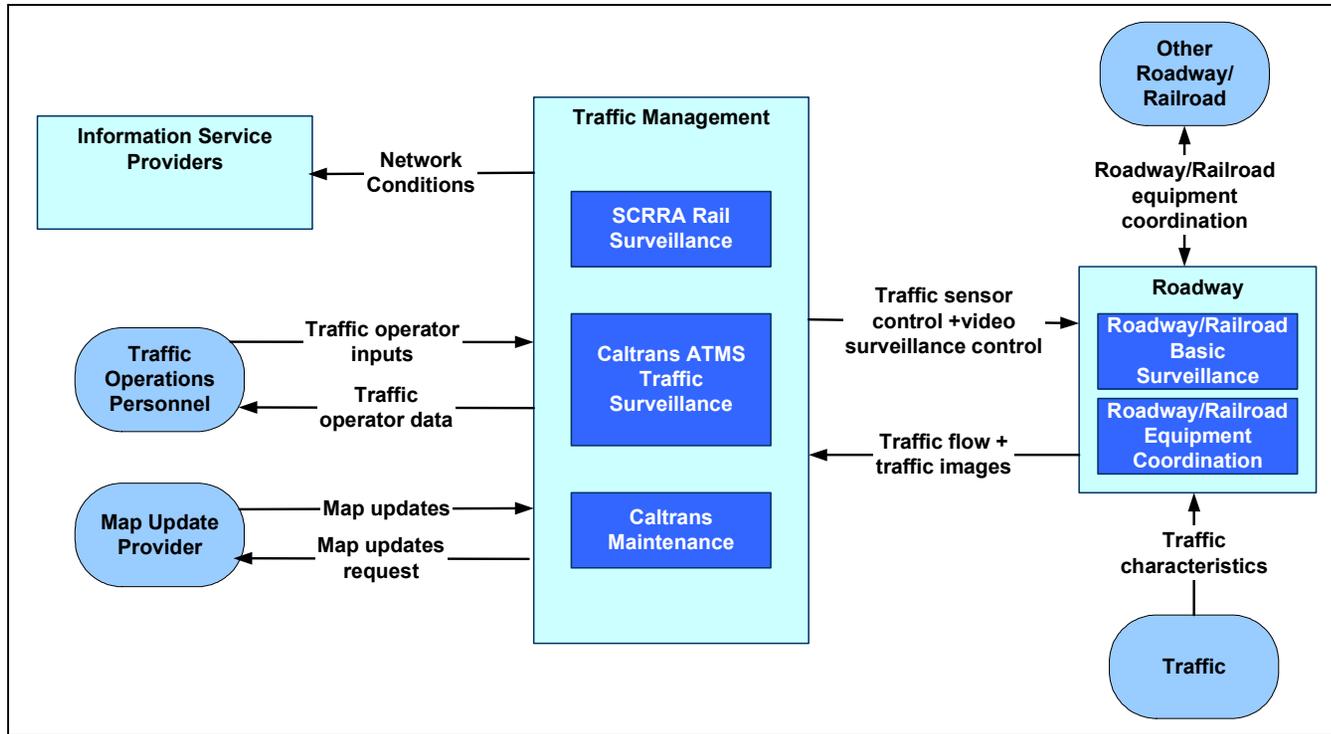
**Figure 7-10: APTS 5 – Transit Security**

This market package provides for the physical security of transit passengers and transit vehicle operators. On-board equipment is deployed to perform surveillance and sensor monitoring in order to warn of potentially hazardous situations.



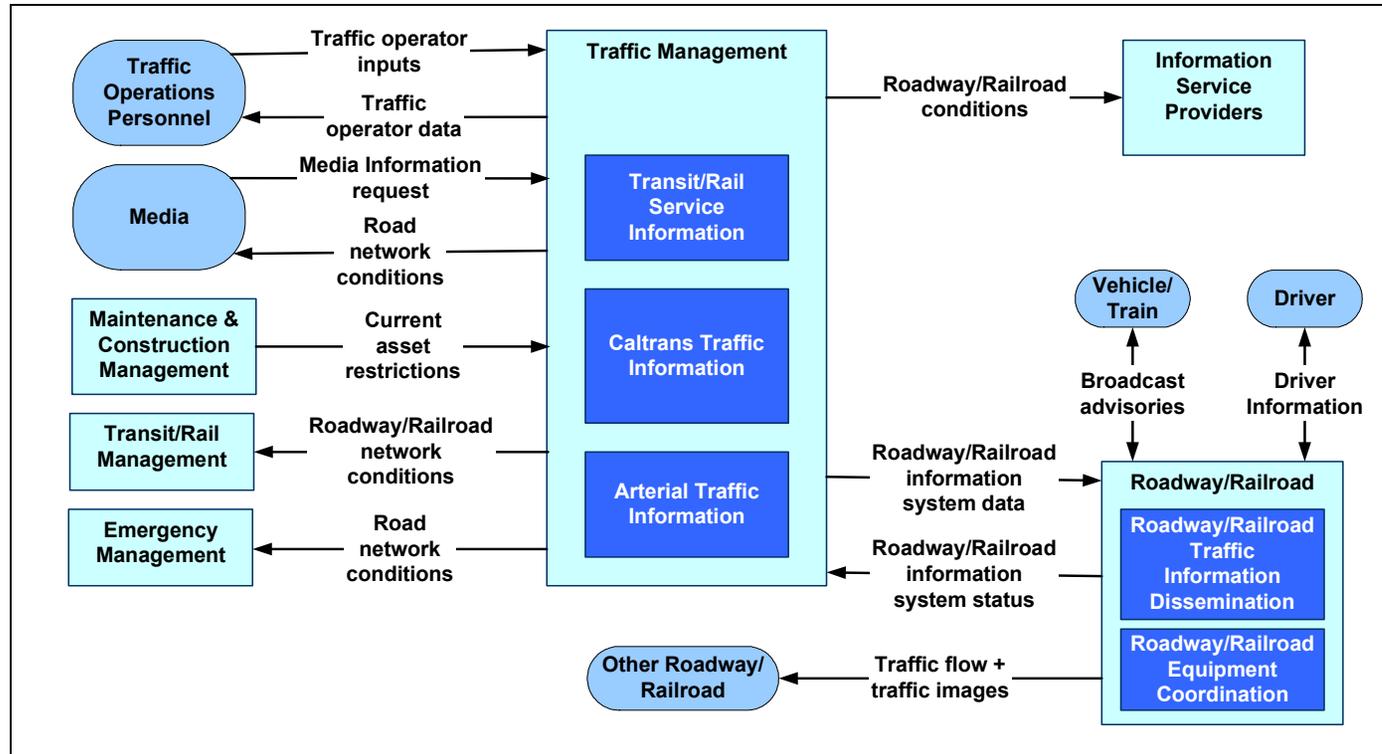
**Figure 7-11: APTS 6 – Transit Maintenance**

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



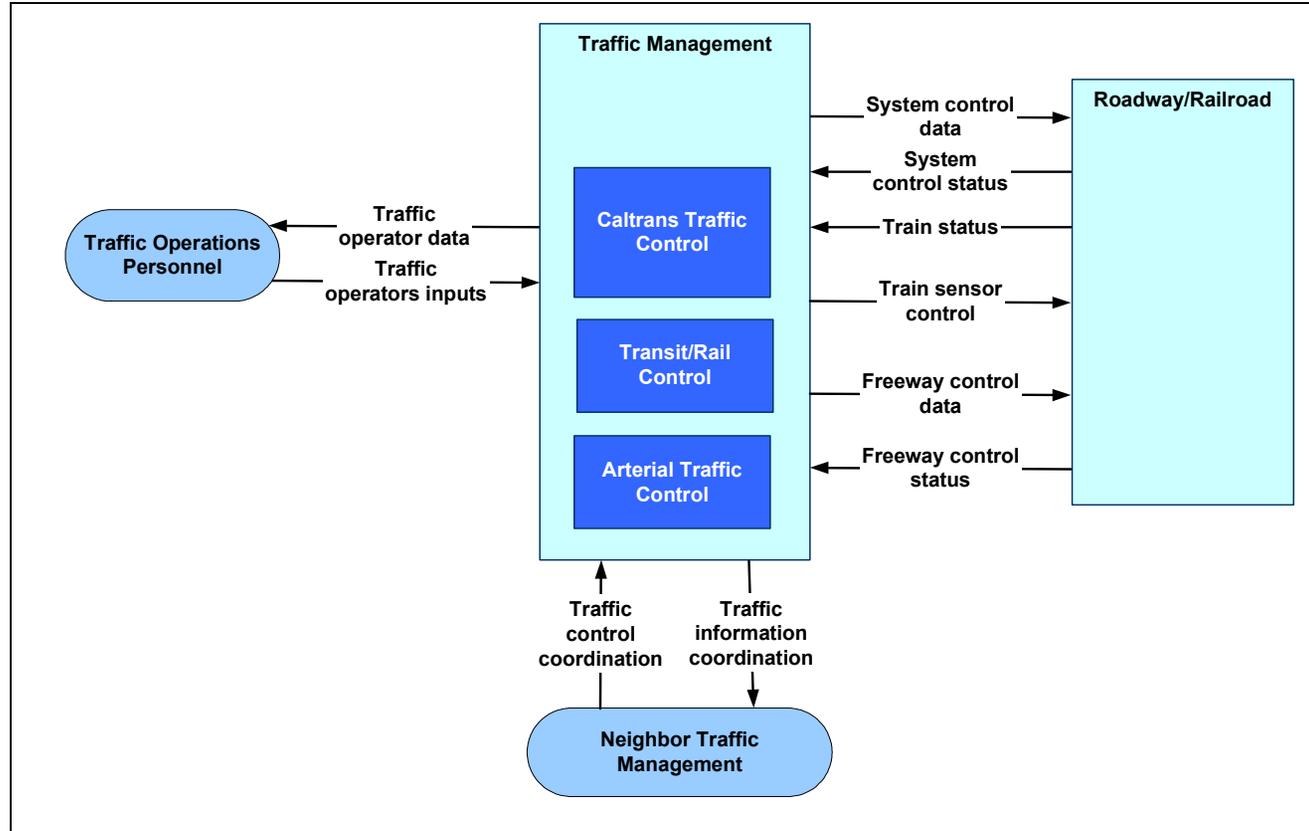
**Figure 7-12: ATMS 1 – Network Surveillance**

This market package includes traffic detectors, other surveillance equipment, the supporting field equipment, and fixed-point to fixed-point communications to transmit the collected data back to the Traffic Management Subsystem. The derived data can be used locally such as when traffic detectors are connected directly to a signal control system or remotely (e.g., when a CCTV system sends data back to the Traffic Management Subsystem).



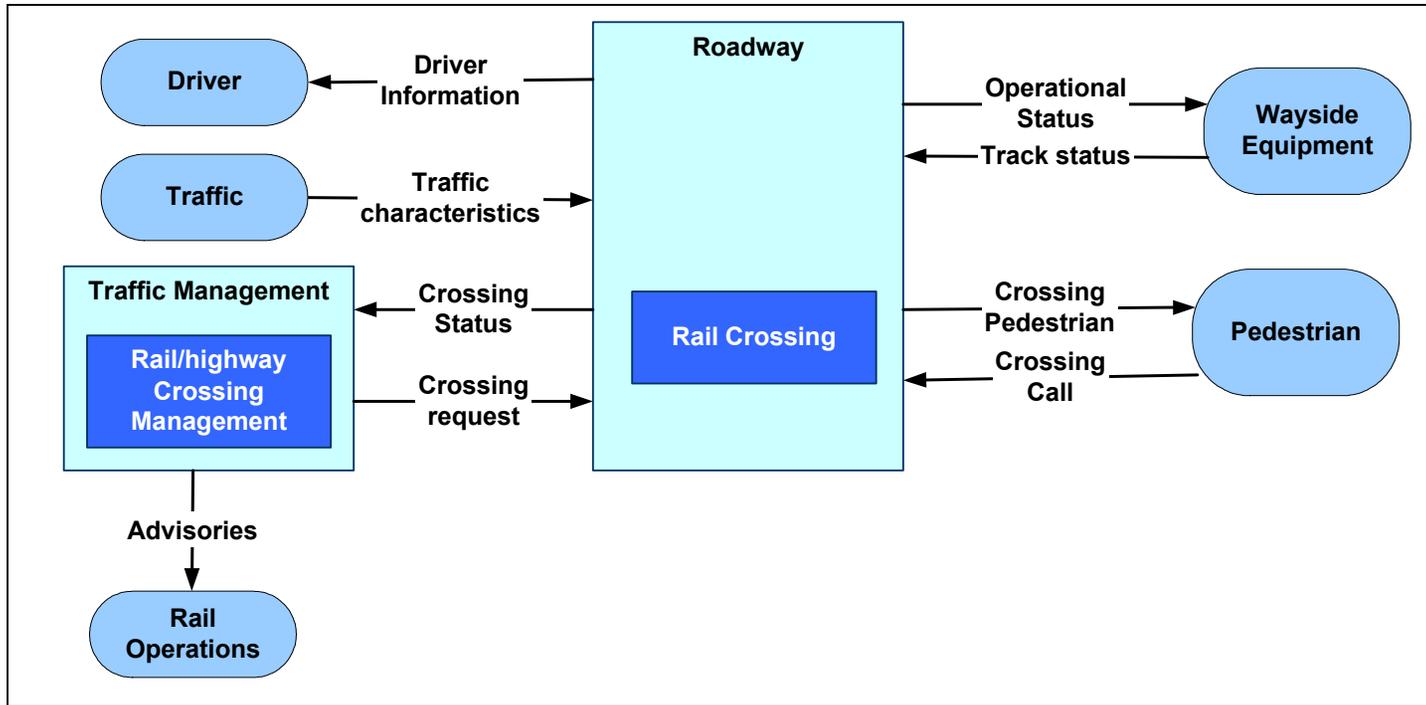
**Figure 7-13: ATMS 6 – Network Surveillance**

This market package provides driver information using roadway equipment such as dynamic message signs or highway advisory radio. A wide range of information can be disseminated including traffic and road conditions, closure and detour information, incident information, and emergency alerts and driver advisories. This package provides information to drivers at specific equipped locations on the road network.



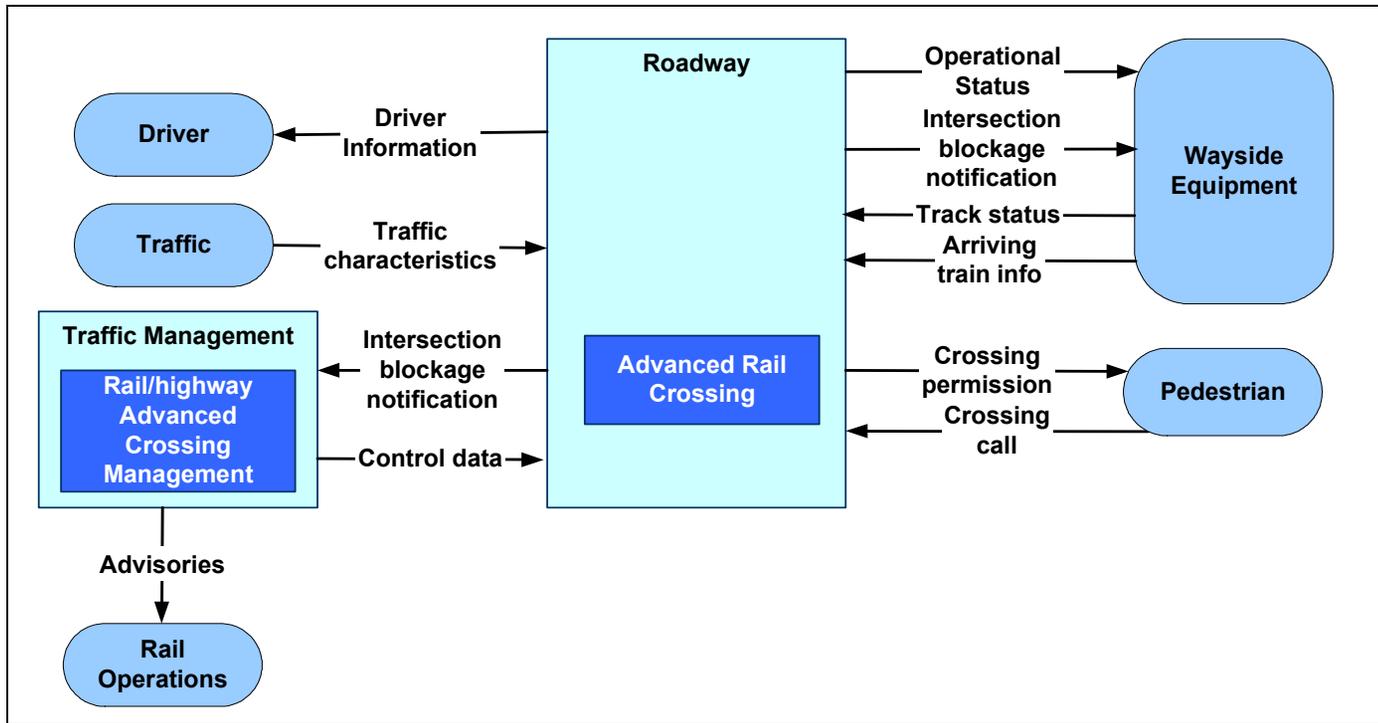
**Figure 7-14: ATMS 7 – Regional Traffic Control**

This market package provides for the sharing of traffic information and control among traffic management centers to support a regional control strategy. This market package advances the Surface Street Control and Freeway Control Market Packages by adding the communications links and integrated control strategies that enable integrated interjurisdictional traffic control.



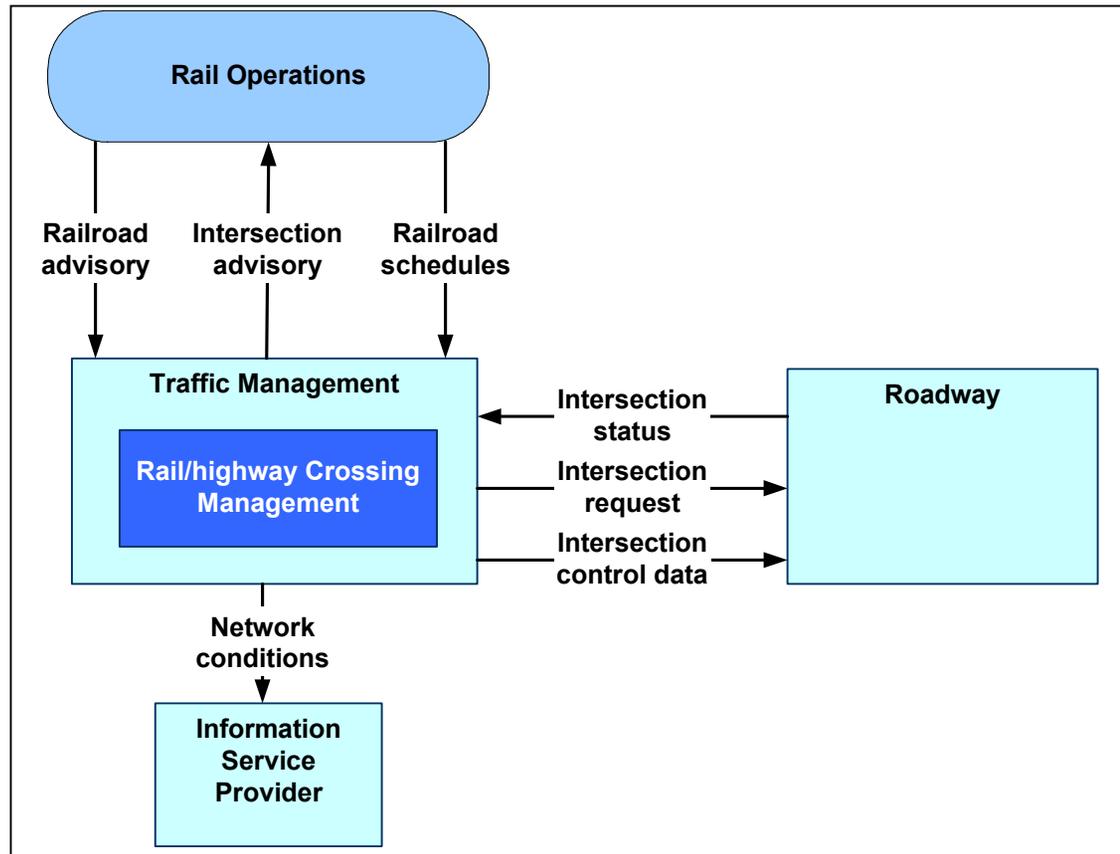
**Figure 7-15: ATMS 13 – Standard Railroad Grade Crossing**

This market package manages highway traffic at highway-rail intersections (HRIs) where operational requirements do not dictate more advanced features (e.g., where rail operational speeds are less than 80 miles per hour). Both passive (e.g., the crossbuck sign) and active warning systems (e.g., flashing lights and gates) are supported.



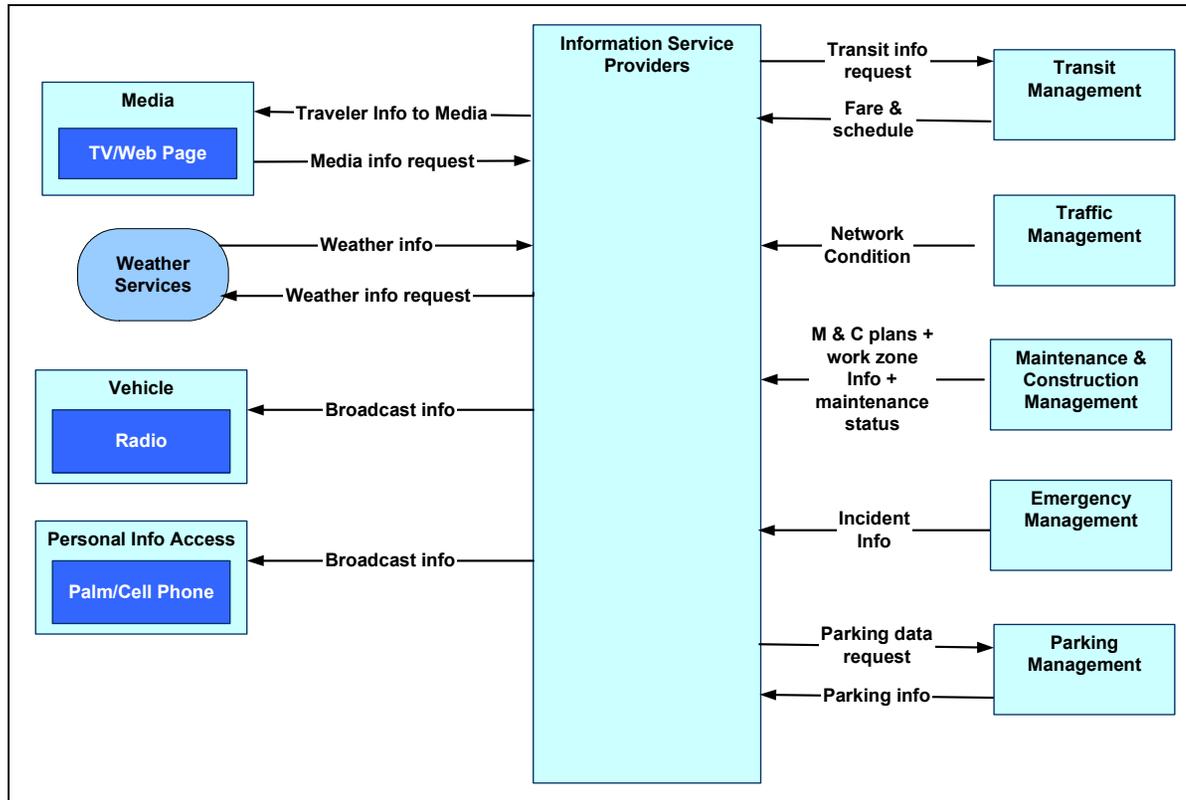
**Figure 7-16: ATMS 14 – Advanced Railroad Grade Crossing**

This market package manages highway traffic at highway-rail intersections (HRIs) where operational requirements demand advanced features (e.g., where rail operational speeds are greater than 80 miles per hour). This market package includes all capabilities from the Standard Railroad Grade Crossing Market Package and augments these with additional safety features to mitigate the risks associated with higher rail speeds.



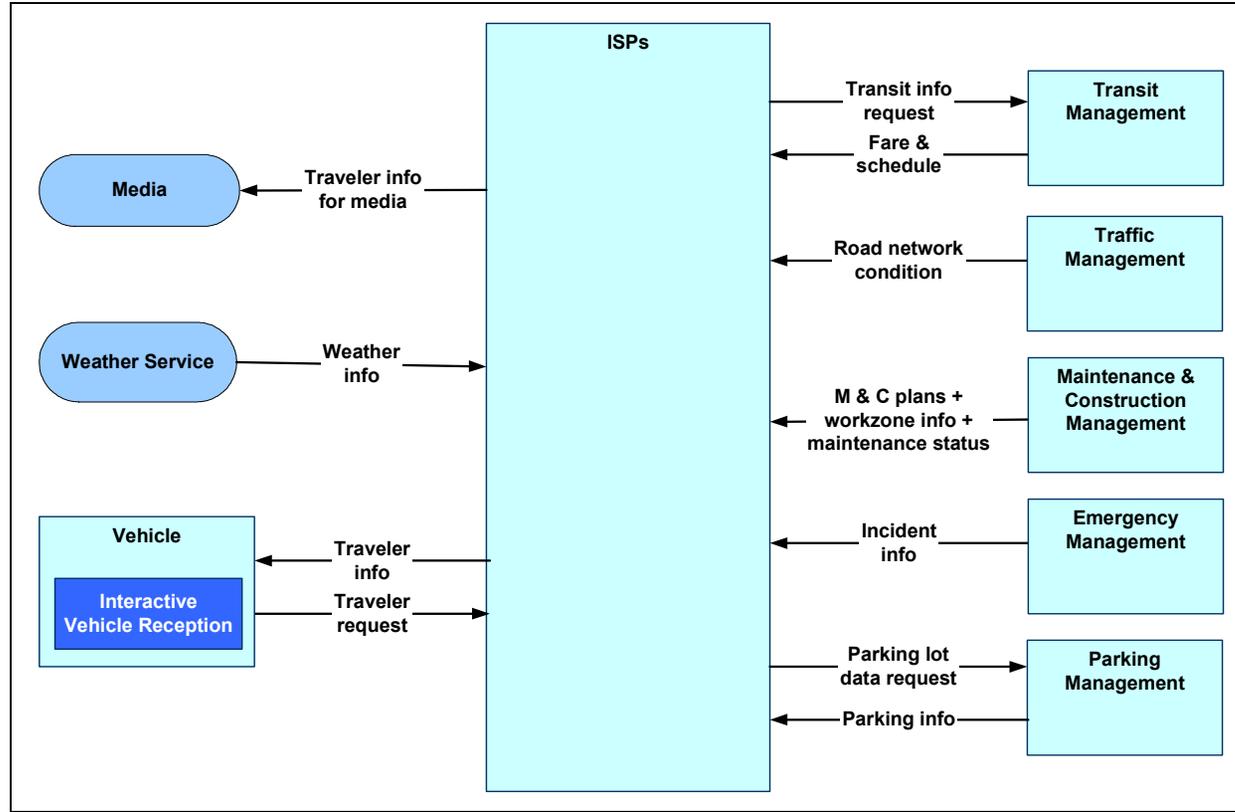
**Figure 7-17: ATMS 15 – Railroad Operations Coordination**

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



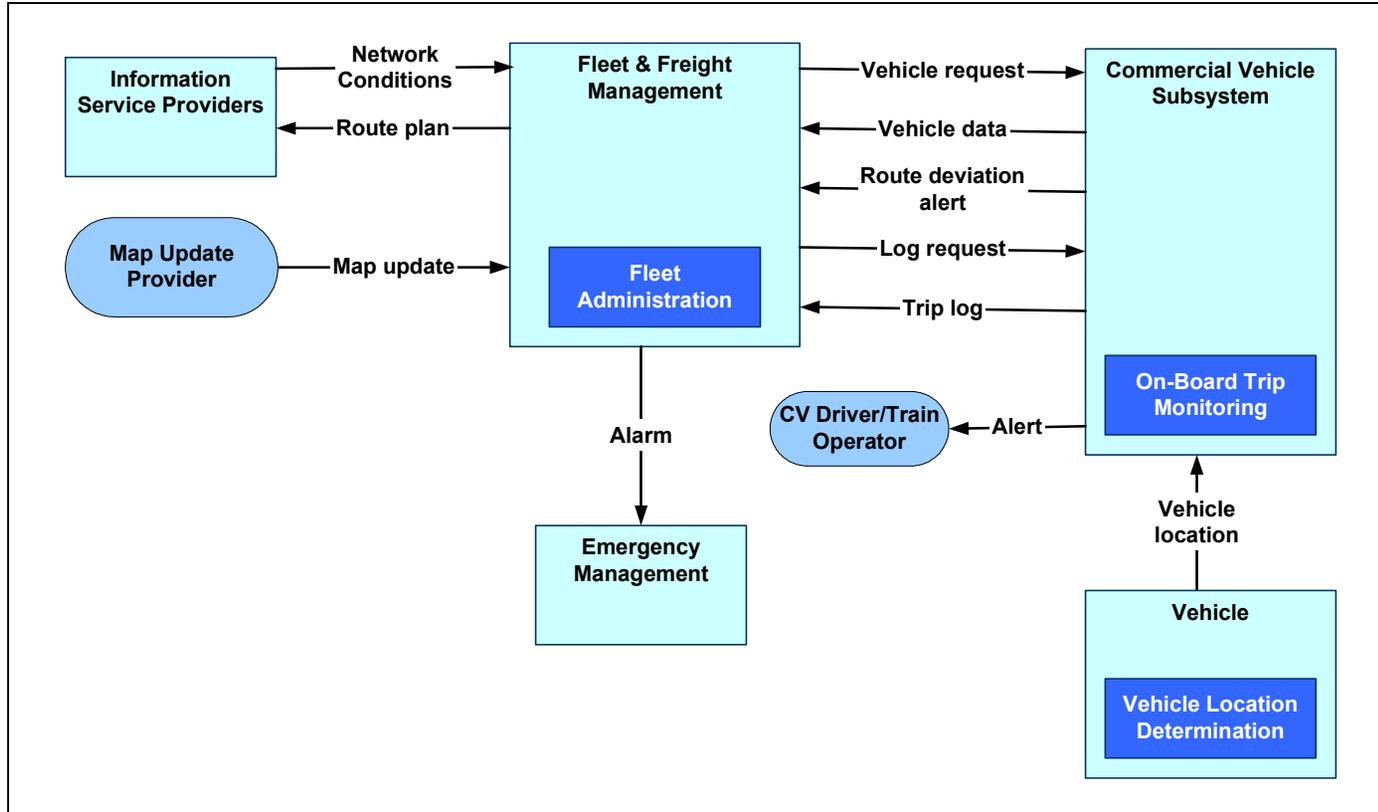
**Figure 7-18: ATIS 1 – Broadcast Traveler Information**

This market package collects traffic conditions, advisories, general public transportation, toll and parking information, incident information, roadway maintenance and construction information, air quality and weather information, and broadly disseminates this information through existing infrastructures and low cost user equipment (e.g., FM subcarrier, cellular data broadcast).



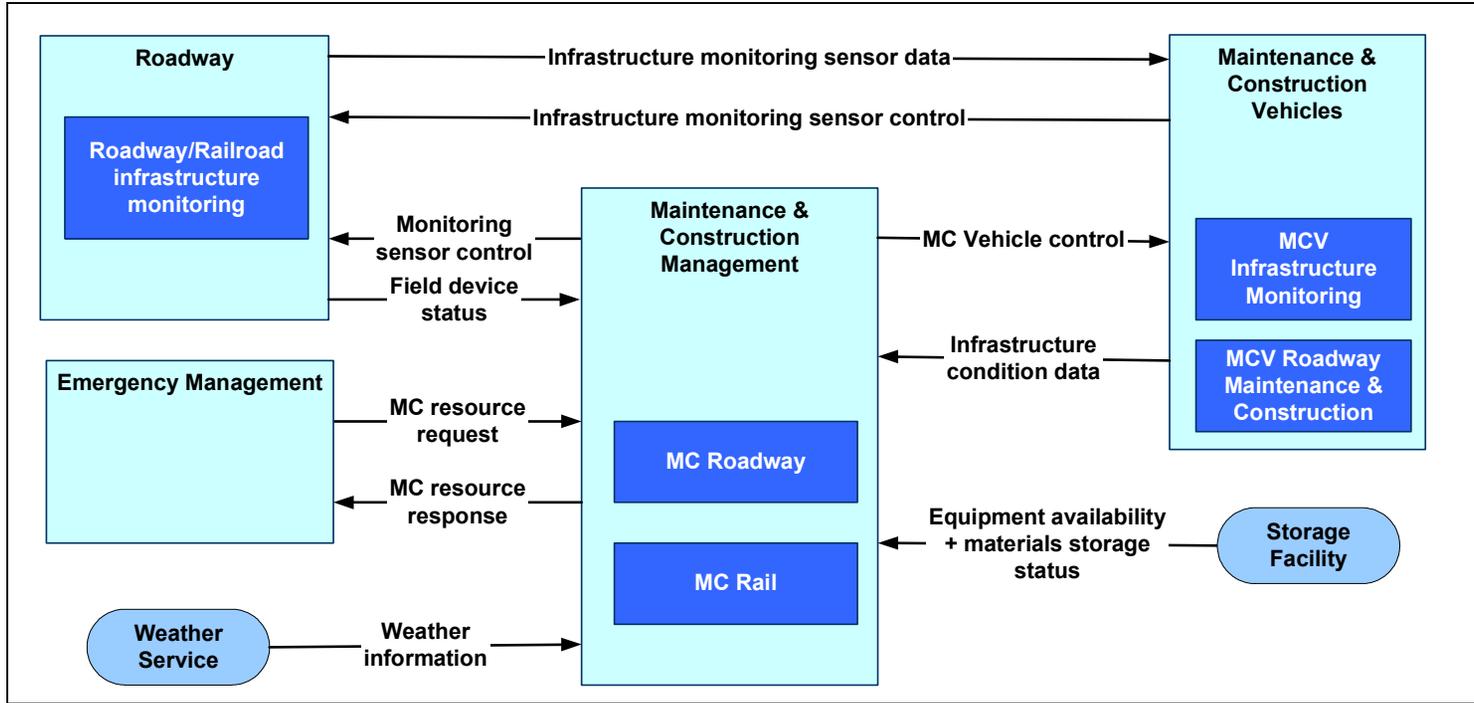
**Figure 7-19: ATIS 2 – Interactive Traveler Information**

This market package provides tailored information in response to a traveler request. Both real-time interactive request/response systems and information systems that "push" a tailored stream of information to the traveler based on a submitted profile are supported.



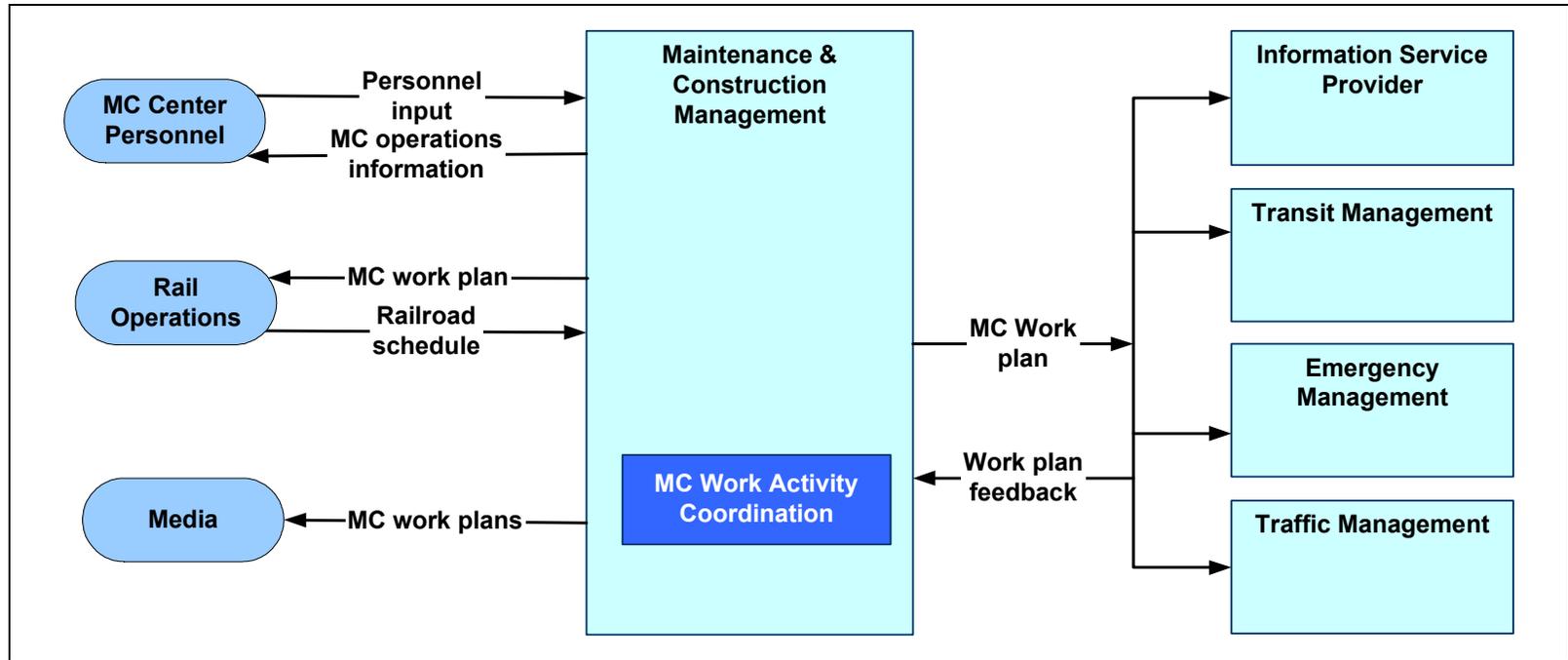
**Figure 7-20: CVO 1 –Fleet Administration**

This market package provides the capabilities to manage a fleet of commercial vehicles. The Fleet and Freight Management subsystem provides the route for a commercial vehicle by either utilizing an in-house routing software package or an Information Service Provider.



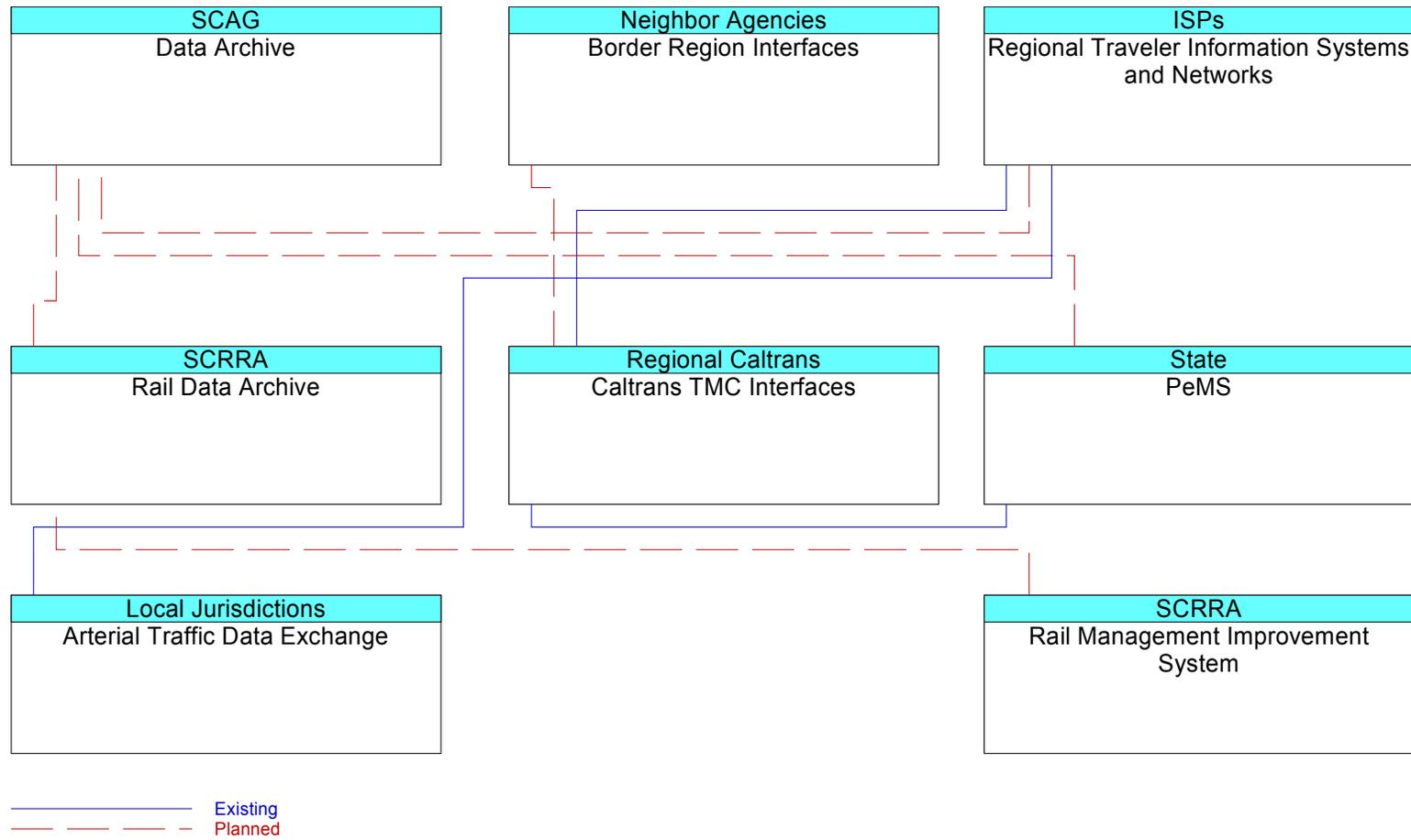
**Figure 7-21: MC 7—Roadway Maintenance and Construction**

This market package supports numerous services for scheduled and unscheduled maintenance and construction on a roadway system or right-of-way.



**Figure 7-22: MC 10 – Maintenance and Construction Activity Coordination**

This market package supports the dissemination of maintenance and construction activity to centers that can utilize it as part of their operations, or to the Information Service Providers who can provide the information to travelers.



**Figure 7-23: Southern California Multi-County Interconnect Diagram**

## 8 PROJECT SEQUENCING

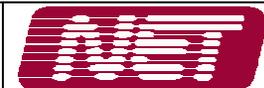
The regional ITS architecture is implemented through many individual ITS projects that occur over years, or even decades. In this step of the Regional ITS architectural development, a sequence of ITS projects that will contribute to the integrated regional transportation system is identified. An ITS project is defined by FHWA as “Any project that in whole or in part funds the acquisition of technologies or systems of technologies that provide or significantly contribute to the provision of one or more ITS user services as defined in the National Architecture.” Since these projects are regional in concept, they generally represent the highest stages of ITS development, i.e. Caltrans interfaces represent the integration of data exchange between the four (4) Caltrans District systems. They tend to represent the top level of sequencing of projects. Lower level projects are to be found in the County level architectures.

The FHWA Regional ITS Guidance Document also refers to project sequencing as representing consensus building about setting priorities that show how ITS projects can build one another. For this document, Stakeholder meetings and discussions were used to identify the projects listed below.

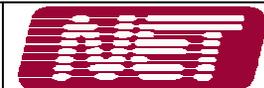
Table 8-1 contains the listing of projects by title, market package, Stakeholder(s), simple description, and the expected timing (S= short term, M=medium term, L=long term). All projects are listed irrespective of whether or not they will be funded through federal sources.

**Table 8-1: Project Sequencing**

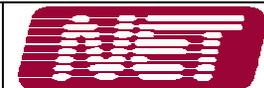
<b>Project Title</b>	<b>Market Package(s)</b>	<b>Stakeholder(s)</b>	<b>Description</b>	<b>Timing</b>
Multi Caltrans Districts Interfaces	ATMS7: Regional Traffic Control	Caltrans	Sharing of traffic information among the Southern California Caltrans districts to support a regional control strategy.	M
Arterial Interfaces	ATMS7: Regional Traffic Control	Local Jurisdictions	Sharing of real-time traffic conditions across county boundaries by local agencies.	L
Data Archive	AD3: ITS Virtual Data Warehouse	Regional Partners	Provide for a regional archiving capability for long term planning.	L
Data Dictionary	Standards Development	Regional Partners	Develop and maintain a data dictionary for the region. The resulting output of the data dictionary will be standards that the region could use to promote consistency of data exchange. No market package is currently available now to describe this project. It might lead to the development of a new market package in Archived Data Management System	M/L
Ports Traffic Information	ATMS01: Network Surveillance	I-5 JPA/Ports	The Ports are currently planning to install Closed Circuit Television (CCTV) cameras, Changeable Message Signs (CMS), and gate queue detectors. These devices will allow the ports to disseminate real-time port information to commercial vehicle operators. The ports will be receiving real-time traffic conditions from local agencies.	M
Ports General Traffic Dissemination	CVO01: Fleet Administration	I-5 JPA/Ports	Disseminate general port information to the Commercial Vehicle Operators.	M



Project Title	Market Package(s)	Stakeholder(s)	Description	Timing
Upgraded Rail Fare System	APTS4: Transit Passenger and Fare Management	SCRRA	Includes future capital projects entailing the following: <ul style="list-style-type: none"> <li>• Ticket vending machine and validator purchase/upgrade</li> </ul>	M
Upgraded Passenger Information system	APTS4: Transit Passenger and Fare Management	SCRRA	Includes future capital projects entailing the following: <ul style="list-style-type: none"> <li>• Electronic passenger information system</li> </ul>	M
Rail Sealed Corridor	ATMS 14: Advanced Railroad Grade Crossing	SCRRA	Various alternatives will be studied including quad gates for the best line protection to prevent drivers from penetrating the line as trains approach and enhance safety. The first priority locations are the Antelope Valley Line and Ventura County Line. These segments are also within the California High Speed Rail Corridor	S
Quad Gate Synchronization	ATMS 14: Advanced Railroad Grade Crossing	SCRRA	Investigate alternate means of clearing the crossing by detecting vehicles that are still in the crossing as the first barrier is lowered and synchronize actions with traffic signal systems in the vicinity	S
Rail Fiber Communication	ATMS 15: Railroad Operations Coordination	SCRRA	A fiber communication backbone is gradually being installed throughout the system to enable both voice and data transmission linking to central dispatch in Pomona	S/M
Rail Camera Surveillance	ATMS 1: Network Surveillance ATMS 15: Railroad Operations Coordination	SCRRA	Camera to be installed at Union station using a Homeland Security grant.	S/M



<b>Project Title</b>	<b>Market Package(s)</b>	<b>Stakeholder(s)</b>	<b>Description</b>	<b>Timing</b>
GPS Train Location System	ATMS 15: Railroad Operations Coordination	SCRRA	Project is underway and will be on-going for some time. The completion of the fiber communication is of importance. Human interpretation of information remains of importance in understanding train delays before posting of information. There is no fully automated on-time performance system.	S
Rail Information Dissemination	ATMS 6: Traffic Information Dissemination	SCRRA	Future real-time information projects including PDAs, e-mail and pagers, displays in trains. The current website has only static displays.	L
Rail Ticket Vending Machines (TVMS) & Validation Equipment	APTS 4: Transit Passenger and Fare Management	SCRRA	Future upgraded systems will take multiple media for interoperability including Metro's Universal Fare System (UFS).	L
Rail Automated Passenger Counters	APTS 4: Transit Passenger and Fare Management	SCRRA	These sub-systems would be capable of monitoring all boarding and alighting and down loading information for central processing.	L
Parking and Electronic Signage at Metrolink Stations	ATMS 15: Railroad Operations Coordination	SCRRA	Pursuing funding to support this project.	L



Project Title	Market Package(s)	Stakeholder(s)	Description	Timing
Rail Automated Maintenance Support	APTS 6: Transit Maintenance	SCRRA	Long-term goal as funding becomes available.	L
Rail Data Archiving	AD 2: ITS Data Warehouse	SCRRA	Long-term, electronic collection and delivery of Section XV data	L
Emergency Management / Security Region Wide Integration	To be determined	Regional Partners	A study under planning to examine the components of integration including concept of operation, roles and responsibilities, functional requirements. To arrive at a regional architecture for the topic plus the identification of the projects.	L
Regional Traveler Information	ATIS 1: Broadcast Traveler Information ATIS 2: Interactive Traveler Information	Regional Partners	A general project category that covers potential multi-agency initiatives to increase integrated dissemination of traveler information as widely as possible throughout the Southern California Region.	S/M

## 9 IDENTIFICATION OF REQUIRED STANDARDS

The standards section of a Regional ITS Architecture is required by “The Rule”. There are two main objectives: (1) to identify ITS standards that support the interfaces and flows defined in the architecture and, (2) to help Stakeholders understand more about standards and their potential value and benefits. That being the case, standards and their development is not a simple subject and both the full development and testing of standards and their effective adoption by vendors is in some cases still some time in the future.

The Southern California Regional ITS Architecture differs from other architectural efforts, in that it seeks to actively develop and agree on regional standards for center-to-center data exchanges throughout Southern California. In this case this also extends to San Diego and the wish to enable data exchange throughout the area using whatever communication paths may be deemed appropriate. This necessitates the development of a data dictionary that could be applied to future Southern California Regional Integration projects. Output from this project will be incorporated into future updates of this regional architecture.

The core of the standards effort will be to develop and maintain a common data dictionary that covers all modes. The regional partners will oversee the project. At this point the activities and organization have yet to be defined. One project that is highly related to this effort is the creation of interfaces between the Caltrans Districts. First the Advanced Transportation Management Systems (ATMS) at Districts 8 and 12 will be upgraded to include the same suite of functionality that District 7 and District 11 (San Diego) currently have deployed. Once these upgrades have taken place agreed standard interfaces will be developed and deployed to allow center-to-center exchange of information between the Districts. These data standards employed will become part of the data dictionary. Other major regional projects will likely contribute arterial and transit data.

## 10 ARCHITECTURE MAINTENANCE

A discussion on the approach of maintaining the Regional ITS Architectures is a required element for each of the documents. The intent of this requirement is to promote the following:

- Use of the architectures;
- Maintenance of Stakeholder dialogue and understanding;
- Support for seeking funding;
- Support for project implementation;
- Progression of regional integration;
- Support for updates to the documentation; and
- Communication of updates, revisions and changes to the MPO.

Since the history of developing the deployment of ITS in Southern California varies greatly from county to county (reflecting different levels of maturity) it is to be expected that different approaches to organizing maintenance will also be adopted. The following is an overview of the approaches being adopted by the six counties. It should be noted that while tri-annual updates to coordinate with the RTIP process will be required by all counties, interim submission of changes are also facilitated. In the final phase of this Southern California Regional Architecture project a maintenance plan will be completed that will outline procedures to be followed when changes are made. The intent is that these procedures be simple, flexible and easy to follow and allow the architecture documents to be modified to reflect both political and technological developments.

### 10.1 Los Angeles County

There are two linked efforts in Los Angeles County. Los Angeles is the only county that at this point has developed a recognized Regional network for multi-agency, multi-system data exchanges. This is referred to as the regional Integration of ITS (RIITS) network. The Metropolitan Transportation Authority (Metro) has established a formal configuration management process for the network whose voting membership is all agencies that contribute source data. The Los Angeles Regional ITS Architecture is one of the documents managed by the configuration management process and will be maintained with support from the RIITS administrator which is staffed by the Metro. In addition, the County of Los Angeles is developing a very large project the Information Exchange Network (IEN) which when fully deployed will support the exchange of arterial based data across the county. An interface between the IEN and the RIITS network is part of the future vision. The IEN will also create a configuration management team drawing from all of the participating traffic forum members. Coordination between the two sets of activities will be maintained through Metro participating staff. In addition, the Metro has adopted a policy that will require all ITS projects funded by any source administered by the Metro to be consistent with the Los Angeles Regional ITS Architecture and to utilize systems engineering and standards as required. The Metro

will have lead responsibility for forwarding updated information to SCAG and this will include the project sequencing information required for RTP updates.

**10.2 Inland Empire – San Bernardino and Riverside Counties**

The Inland Empire Regional ITS Architecture was the first of the county-level architectures to be completed. They propose to manage architecture maintenance through an Inland Empire Architecture Maintenance Team, which includes San Bernardino Associated Governments, Riverside County Transportation Commission, SCAG, Caltrans Traffic Operations and Caltrans Transportation Planning. The Maintenance Team will operate by consensus in agreeing on any changes that needed to be made to the architecture. They would receive input from the individual county Technical Advisory Groups (TACs.) It is agreed that one lead agency will take responsibility for making physical changes for maintaining the architecture. All maintenance Stakeholders will be involved in decision making regarding changes to the architecture.

The authors of the architecture document identified the following approach to architecture updates. They plan on the most significant portions of the architecture being maintained through updates in the electronic database using TurboArchitecture™. Also the following documents would be updated at regular intervals on an as needed basis:

- Project Sequencing;
- Operational Concept;
- Functional Requirements; and
- List of Agency Agreements.

The Inland Empire is committed to updating the architecture every three years to support the RTP process and ensuring that SCAG receives all necessary documentation.

**10.3 Ventura County**

Ventura County has a very different history of ITS planning, development and deployment. The ITS Deployment Plan, and now their Regional ITS Architecture, is firmly linked to their Congestion Management Program that is updated every three years. Their intent is to maintain and update their architecture in line with their Congestion Management Program update initiatives. The Ventura County Transportation Commission (VCTC) takes lead responsibility for these activities that include close coordination with all of the cities, county and Caltrans Stakeholders. VCTC will take responsibility for maintaining the project sequencing and forwarding this information to SCAG in support of the RTP process. Any other significant changes to the documentation would also be forwarded to SCAG.

### 10.4 Imperial County

The Imperial County Regional ITS Architecture is the first ITS planning effort in the County and some ninety Stakeholders have been contacted in its development. The County and Cities lack knowledgeable ITS staff and will need leadership to help maintain the progress that has been made and support Regional ITS Architecture maintenance activities. Lack of funding will likely mean that progress is measured and architectural changes will be few in the early years. Maintenance activities will be simple and will support RTP updates and local needs. Imperial Valley Association of Governments (IVAG) will be responsible for the maintenance of the document and the stakeholder lists. IVAG will also be responsible for forwarding updates to SCAG for the tri-annual RTIP process, when requested to do so. The continuance of the dialogue that has been established will be promoted through Stakeholders sharing the facilitation of meeting opportunities. Continued dialogue will also be supported by groups of stakeholders proceeding with project development. Caltrans will be available to lend their technical advice when requested. FHWA has volunteered to continue to support Imperial Valley Stakeholders understanding of ITS when requested to do so.

### 10.5 Orange County

Orange County is a relatively advanced county in terms of ITS deployments and in the past has had both a Traffic Forum and an ITS Management Group that have taken leadership roles in ITS development. Both groups have now lapsed. A large group of stakeholders has been assembled for the Regional ITS Architecture development and discussions are underway with potential leadership agencies.

OCTA has agreed to take responsibility for maintaining the documentation and stakeholder lists and forwarding updates to SCAG. Caltrans has agreed to continue with the ITS transportation forums working with the expanded stakeholder base. It is anticipated that these activities will grow over time and lead to improved stakeholder coordination in support of the architecture.

### 10.6 Multi-County Issues

To fulfill the maintenance requirements at the MPO level, SCAG should have electronic copies of all of the county-level Regional ITS Architecture documentation including the electronic databases in TurboArchitecture™. It would be appropriate that these be posted on SCAG’s website in .PDF format and would be available in one location for all Stakeholders in the six-counties. SCAG should also keep on file all significant modifications to the documentation. Only when major revisions are made to the individual architectures would electronic replacements for the website be submitted.

To maintain the Multi-County issues documentation the Stakeholder group should meet regularly to review progress made on projects and decide at what point documentation updates need to be produced. At a minimum, such updates would be made tri-annually in support of the RTP process.

SCAG will be responsible for issuing timely notification of the need for county-level Regional ITS Architecture updates to support the tri-annual RTP process. Project sequencing updates and any other significant updates that the county Stakeholders have made will need to be submitted to SCAG.

A separate Update and Maintenance Plan for the Southern California Regional Architecture is being prepared and will relate all maintenance activities for the county-level architectures to the needs of SCAG as the MPO. The process for the maintenance process to be followed for the Southern California Regional ITS Architecture will be set out in this document.

## 11 AGENCY AGREEMENTS

Agreements among the different Stakeholder agencies and organizations are required to implement the integration described in the Regional ITS Architecture. According to the FHWA Regional ITS Architecture Guidance, any agreements (existing or new) required for operations, including at a minimum those affecting ITS projects interoperability, utilization of ITS related standards, and the operation of the projects identified in the Regional ITS Architecture are required by the Rule/Policy. The requirement however is only to provide a list of agreements and not the agreements themselves. Experience shows that it takes an actual project deployment to initiate the agreements process.

The typical process of agreements list development starts from existing agreements that support sharing of information, funding, or specific ITS projects. These agreements are reviewed and assessed to determine if they can be extended and used to support the cooperative implementation and operation of ITS. The list of the required agreements was developed based on the regional operational concepts, knowledge of the types of ITS existing or planned for implementation in the county, and the information that needs to be exchanged in order to operate those systems. The detailed agreement work, including the preparation and execution of the identified agreements will be performed to support ITS projects as they are implemented in the future.

There is considerable variation between ITS projects and among Stakeholders regarding the types of agreements that are created to support ITS integration. Some common types of agreements provided by the Regional ITS Architecture Guidance are shown in Table 11-1.

**Table 11-1: Agreement Types**

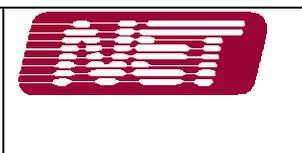
Type of Agreement	Description
Handshake Agreement	<ul style="list-style-type: none"> <li>▪ Early agreement between one or more partners</li> <li>▪ Not recommended for long-term operations.</li> </ul>
Memorandum of Understanding (MOU)	<ul style="list-style-type: none"> <li>▪ Initial agreement used to provide minimal detail and usually demonstrating a general consensus.</li> <li>▪ Used to expand a more detailed agreement like an Interagency Agreement that may be broad in scope but contains all of the standard contract clauses required by a specific agency.</li> <li>▪ May serve as a means to modify a much broader Master Funding Agreement, allowing the master agreement to cover various ITS projects throughout the region and the MOUs to specify the scope and differences between the projects.</li> </ul>

Type of Agreement	Description
Interagency Agreement	<ul style="list-style-type: none"> <li>▪ Between public agencies (e.g., transit authorities, cities, counties, etc.) for operations, services or funding.</li> <li>▪ Documents responsibility, functions and liability at a minimum.</li> </ul>
Intergovernmental Agreement	<ul style="list-style-type: none"> <li>▪ Between governmental agencies (e.g., Agreements between universities and State DOT, MPOs, etc.).</li> </ul>
Operational Agreement	<ul style="list-style-type: none"> <li>▪ Between any agency involved in funding, operating, maintaining or using the right-of-way of another public or private agency.</li> <li>▪ Identifies respective responsibilities for all activities associated with shared systems being operated and/or maintained.</li> </ul>
Funding Agreement	<ul style="list-style-type: none"> <li>▪ Documents the funding arrangements for ITS projects (and other projects).</li> <li>▪ Includes at a minimum standard funding clauses, detailed scope, services to be performed, detailed project budgets, etc.</li> </ul>
Master Agreements	<ul style="list-style-type: none"> <li>▪ Standard contract and/or legal verbiage for a specific agency and serving as a master agreement by which all business is done. These agreements can be found in the legal department of many public agencies.</li> <li>▪ Allows states, cities, transit agencies, and other public agencies that do business with the same agencies on a regular basis (e.g., cities and counties) to have one Master Agreement that uses smaller agreements (e.g., MOUs, Scope-of-Work and Budget Modifications, Funding Agreements, Project Agreements, etc.) to modify or expand the boundaries of the larger agreement to include more specific language.</li> </ul>

Table 11-2 presents the list of agreements for Southern California regional ITS development. Each entry identifies the ITS service addressed by the agreement, the Stakeholders involved, the type of agreement anticipated, high-level status (near-term or long-term), and a concise description of the purpose of the agreement. Another column can be added to the table in the future to note any issues or barriers in agreement execution during the architecture maintenance cycle.

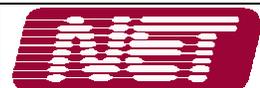
**Table 11-2: Regional List of Agreements**

ITS Service	Stakeholder	Type of Agreement	Status	Agreement Description
Multi Caltrans Districts Interfaces	Caltrans Districts	MOU	Long Term	Specifies interface requirement, responsibilities, and functions for all participating Caltrans districts
Arterial Traffic Control Interfaces	Jurisdictions	Interagency Agreement	Near Term	Specifies interface requirement, responsibilities, and functions for all participating and neighboring cities
Data Archive System	Regional Partners	Interagency Agreement	Near Term	Specifies data source, access control, and configuration requirement
Emergency Management / Security Region Wide Integration	Regional Partners	Interagency Agreement/or MOU	Long Term	Provides the guidelines of the integration of emergency management system, including the roles and responsibilities of each agency as well as the functions required for each of their systems



# APPENDIX A

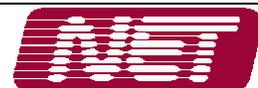
## ACRONYMS AND TERMS



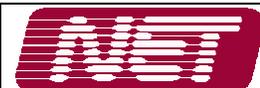
<b>Number</b>	<b>TERM</b>	<b>DEFINITION</b>
1	AD	Archived Data
2	APTS	Advanced Public Transportation Systems
3	ATIS	Advanced Traveler Information System
4	ATMS	Advanced Traffic / Transportation Management System
5	AVI	Automated Vehicle Identification
6	AVL	Automated Vehicle Locator
7	AVSS	Advanced Vehicle Safety Systems
8	CAD	Computer Aided Dispatch
9	Caltrans	California Department of Transportation
10	CCTV	Closed Circuit Television – generic term often used to refer to many different types of camera systems.
11	CenterLine	An OCTA proposed light rail line.
12	CHP	California Highway Patrol
13	CMS	Changeable Message Signs are electronic signs that can change the message they display. They are also referred to as Dynamic Message Signs (DMS) or Variable Message Signs (VMS)
14	Common Object Request Broker Architecture (CORBA)	A National Architecture data exchange standard adopted and used by Showcase.
15	CTC	County Transportation Council
16	CVISN	Commercial Vehicle Information Systems & Networks
17	CVO	Commercial Vehicle Operations
18	DMS	Dynamic Message Signs are electronic signs that can change the message they display. They are also referred to as Changeable Message Signs (CMS) or Variable Message Signs (VMS)
19	DOT	Department of Transportation
20	EMS	Emergency Management Services / Systems

<b>Number</b>	<b>TERM</b>	<b>DEFINITION</b>
21	Extensible Markup Language (XML)	The data exchange standard that is gradually replacing CORBA in Southern California.
22	FHWA	Federal Highway Administration
23	FMCSA	Federal Motor Carrier Safety Administration
24	FTA	Federal Transit Authority
25	GIS	Geographic Information Systems used for a variety of emergency management and transportation planning tools with a digital map of the area being analyzed
26	GPS	Global Positioning Systems – determines the real time position of vehicles using communications with a satellite. Also refers more specifically to a government owned system of 24 Earth orbiting satellites that transmit data to ground based receivers and provides extremely accurate latitude/longitude ground positions.
27	HAR	Highway Advisory Radio – mechanism for broadcasting traveler information to motorists.
28	HOV	High Occupancy Vehicle, also known as carpool lane or diamond lane.
29	ISP	Information Service Provider
30	IVAG	Imperial Valley Association of Governments. IVAG is comprised of elected officials with one part time employee
31	IVECA	Imperial Valley Emergency Communications Authority. IVECA is comprised of appointed officials with one part time project manager
32	Information Exchange Network (IEN)	A major sub-system developed for the exchange of arterial system data for the County of Los Angeles.
33	ITS Architecture	A framework for ensuring institutional agreement and technical integration of technologies for the implementation of projects or groups of projects under an ITS strategy.
34	IVHS	The precursor to ITS. Stands for Intelligent Vehicle Highway Systems.

Number	TERM	DEFINITION
35	IVT	Imperial Valley Transit
36	JPA	Joint Powers Authority
37	Market Packages	Represent slices of the Physical Architecture that address specific services such as surface street control.
38	Measure M	Orange County local sales tax dedicated to transportation.
39	Metro	Metrolink, regional commuter rail service
40	MCO	Maintenance & Construction Operations
41	MOU	Memorandum of Understanding
42	MPO	Metropolitan Planning Organization
43	National ITS Architecture	A common framework for ITS interoperability. The National ITS Architecture comprises the logical architecture and physical architecture that satisfy a defined set of User Services. The National ITS Architecture is maintained by the United States Department of Transportation (DOT) and is available on the DOT web site at <a href="http://www.its.dot.gov">http://www.its.dot.gov</a> . The National Architecture has been developed over time and the current version is 5.0.
44	NTCIP	National Transportation Communications for ITS protocol. Required for Traffic Management Operations. Allowing for wire line communications between traffic management centers and field equipment.
45	O & M	Operations and Maintenance.
46	POE	Port of Entry
47	Regional Integration of ITS (RIITS)	A Los Angeles County Metropolitan Transportation Authority (Metro) project which integrates data from multiple systems and is the core project within the Los Angeles County Regional ITS Architecture.
48	Regional Transportation Improvement Program (RTIP)	The federally required programming document that becomes a part of the Statewide Transportation Improvement Program (STIP). Projects must be included in this document if they are to receive



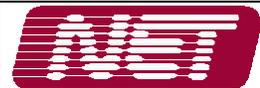
Number	TERM	DEFINITION
		federal funding and the document must be consistent with the RTP.
49	Regional Transportation Plan (RTP)	A federally required long-term vision document that is updated every three years.
50	RTPA	Regional Transportation Planning Authority.
51	Rule/Policy	An abbreviated reference to Department of Transportation 23 CFR Parts 655 and 940, January 8 <sup>th</sup> 2001 that provides policies and procedures for implementing section 5206(e) of the Transportation Equity Act for the 21 <sup>st</sup> Century (TEA-21).
52	RWIS	Road Weather Information System
53	SANBAG	San Bernardino Associated Governments
54	SANDAG	San Diego Association of Governments in San Diego County
55	SCAG	Southern California Association of Governments
56	SCRRA	Southern California Regional Rail Authority
57	Showcase	A federally funded ITS project for Southern California that included an architecture and set of projects. The architecture was based on a center-to-center concept of operations.
58	SOV	Single Occupancy Vehicle.
59	Strategic Deployment Plan (SDP)	SDPs were usually precursor plans for ITS based on earlier versions of the National Architecture. In the SCAG region they reflect the original work that defined the baseline for later Regional ITS Architectures.
60	TestBed	A Caltrans project that supports the development of improved freeway operations and incident management, located at UC Irvine Institute of transportation Studies.
61	Travel Probe	An OCTA transit project intended to collect information on road congestion by tracking bus speeds. The project is no longer operational.
62	TravelTip	A traveler information system for Orange County that is no longer operational.



Number	TERM	DEFINITION
63	TMC	Traffic / Transportation Management Center
64	TOC	Traffic / Transportation Operations Center
65	TurboArchitecture™	A software tool developed by DOT to support the development of regional architectures. Also a long-term development. The current version is 3.0.
66	User Service	User services document describing what ITS should do from the user's perspective. There are currently eight high level classifications: Travel and Traffic Management, Public Transportation Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle Safety Systems, Information Management and Maintenance and Construction Operations.
67	VMS	Variable Message Signs are electronic signs that can change the message they display. They are also referred to as Changeable Message Signs (CMS) or Dynamic Message Signs (DMS)

# APPENDIX B

## INVENTORY REPORT



## Inventory Report

### Arterial Traffic Data Exchange

Status: Existing

Description: Real-time arterial traffic information

Associated Stakeholder: Local Jurisdictions

Mapped to Entity: Roadway Subsystem

Mapped to Entity: Traffic Management

Mapped to Entity: Traffic Operations Personnel

### Caltrans TMC Interfaces

Status: Planned

Description: Provide to other Caltrans Districts in the SCAG region, real-time traffic information.

Associated Stakeholder: Regional Caltrans



Stakeholders in this group:

Caltrans District 7

Caltrans District 8

Caltrans District 12

Caltrans District 11

Mapped to Entity: Maintenance and Construction Management

Mapped to Entity: Roadway Subsystem

Mapped to Entity: Traffic Management

Mapped to Entity: Traffic Operations Personnel

### Data Archive

Status: Existing

Description: Various transportation and transit data is collected and archived by SCAG to satisfy various federal and state performance monitoring and data reporting requirements for the Region

Associated Stakeholder: SCAG

Mapped to Entity: Archived Data Management Subsystem

### PeMS

Status: Existing

Description: The Freeway Performance Measurement System (PeMS) is a consolidated database of information collected via Caltrans loop detectors from traffic management centers (TMCs) throughout the state

Associated Stakeholder: State

Mapped to Entity: Archived Data User Systems

**Rail Data Archive**

*Status:* Existing

*Description:* Data archive - currently in the process of being upgraded. Information is manually extracted and made available to local government agencies, as well as federal agencies.

*Associated Stakeholder:* SCRRRA

*Mapped to Entity:* Archived Data Administrator

*Mapped to Entity:* Archived Data Management Subsystem

*Mapped to Entity:* Government Reporting Systems

**Rail Management Improvement System**

*Status:* Existing

*Description:* Including Upgraded Fare Management, Maintenance Enhancement, Rolling Stock Enhancement, Station Security Surveillance Enhancement, Parking Information, Communication Improvement, Grade Crossing Analyzer

*Associated Stakeholder:* SCRRRA

*Mapped to Entity:* Transit Management

**Regional Traveler Information Systems**

*Status:* Existing

*Description:* Represents traveler information systems both public and private

*Associated Stakeholder:* ISPs

*Mapped to Entity:* Information Service Provider

**Wayside Hotbox**

*Status:* Existing

*Description:* Maintenance detection system that provides low-tech maintenance information to the Maintenance facility.

*Associated Stakeholder:* SCRRRA

*Mapped to Entity:* Basic Transit Vehicle

*Mapped to Entity:* Fleet and Freight Management

*Mapped to Entity:* Roadway Subsystem

# APPENDIX C

## STAKEHOLDER REPORT

## Stakeholders Report

### Arizona State DOT

*Description:* San Bernardino Associated Governments (SANBAG) is the council of governments and transportation planning agency for San Bernardino County. SANBAG is responsible for cooperative regional planning and furthering an efficient multi-modal transportation system countywide.

### Caltrans District 11

*Description:* Caltrans District 11 covers both San Diego and Imperial Counties. As such it falls into two MPOs. District 11 is responsible for monitoring and maintaining freeway systems and field devices throughout Imperial County

### Caltrans District 12

*Description:* Caltrans district 12 encompasses the entirety of Orange County. It operates and maintains field devices in Orange County. Located in Irvine, the TMC is shared with CHP.

### Caltrans District 5

*Description:* Central Coast district, including counties of Monterey, San Benito, San Luis Obispo, Santa Barbara, and Santa Cruz. District 5 borders Ventura County on North, and has major highways connected to Southern California Region.

### Caltrans District 6

*Description:* San Joaquin Valley district, including counties of Fresno, Kern, Kings, Madera, and Tulare. This district borders Counties of Los Angeles, and Ventura from North and has major highways connected to the Southern California Region.

### Caltrans District 7

*Description:* District 7, which includes Los Angeles and Ventura Counties. In conjunction with CHP, District 7 has implemented the TMC to rapidly detect and respond to incidents while managing the resulting congestion. The TMC is located in the Caltrans District Office Building in downtown Los Angeles. A new facility, under construction in Glendale, will be freestanding and is slated to open in 2005.

### Caltrans District 8

*Description:* Caltrans District 8 covers Riverside and San Bernardino Counties, which includes 49 incorporated cities. The TMC is located in San Bernardino and is co-located with the CHP.

### Caltrans District 9

*Description:* This district includes the Counties of Inyo and Mono. It borders San Bernardino County from North and has highways connected to the Southern California Region.

**Commercial Vehicle Owners**

*Description:* The generic group that represents all carrier companies that operate in the Southern California Region.

 **CTC/RTPA**

*Description:* County Transportation Commission or Regional Transportation Planning Authority. This stakeholder group is regional commissions.

*Stakeholders in this group:*

- SANBAG
- METRO
- VCTC
- RCTC
- OCTA

**ISPs**

*Description:* All the Information Service Providers in the region including public and private

*Associated Element:* Regional Traveler Information Systems

**IVAG**

*Description:* Imperial Valley Association of Governments (IVAG) is for Imperial County which extends over 4,597 square miles, bordering on Mexico to the south, Riverside County to the north, San Diego County on the west, and the State of Arizona on the east.

**Local Emergency/Security Agencies**

*Description:* Stakeholder group that represents local level of Emergency Management Agencies including CHP, law enforcement, and fire department.

**Metro**

*Description:* Los Angeles County Metropolitan Transportation Authority (Metro) serves as transportation planner and coordinator, designer, builder and operator for LA County. Metro operates over 2,000 peak-hour buses on an average weekday. It also designed, built and operates 73.1 miles of Metro Rail.

In addition, Metro funds 16 municipal bus operators and funds a wide array of transportation projects.

**Local Jurisdictions**

*Description:* Counties or local cities that are adjacent to county boundaries.

*Associated Element:* Arterial Traffic Data Exchange

**Los Angeles County**

*Description:* Los Angeles County Department of Public Works (LACDPW) is responsible for the design, construction, operation,

maintenance, and repair of roads, bridges, airports, sewers, water supply, flood control, water quality, and water conservation facilities and for the design and construction of capital projects.

 **Neighbor Agencies**

*Description:* Transportation agencies bordering SCAG region

*Stakeholders in this group:*

- State
- Arizona State DOT
- Nevada State DOT
- Caltrans District 6
- Caltrans District 5
- Caltrans District 9

**Nevada State DOT**

*Description:* State of Nevada Department of Transportation. The state of Nevada borders the San Bernardino County from East and has major highways connected to the Southern California Region.

**OCTA**

*Description:* The Orange County Transportation Authority (OCTA) is the county’s primary transportation agency. OCTA creates, funds and delivers efficient transportation for Orange County.

**RCTC**

*Description:* The Riverside County Transportation Commission (RCTC) fulfills the following responsibilities: coordinate state highway planning, adopt short range transit plans, coordinate transit service, allocate transportation development act funds, identify projects for state and federal grant funds, and coordinate county highway and transit plans with regional and state agencies.

 **Regional Caltrans**

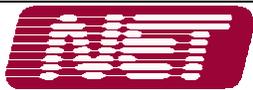
*Description:* This stakeholder group is the local Caltrans districts. These four districts cover six of the Southern California counties (Los Angeles, Orange, Ventura, San Bernardino, Riverside, and Imperial).

*Stakeholders in this group:*

- Caltrans District 7
- Caltrans District 8
- Caltrans District 12
- Caltrans District 11

*Associated Element:* Caltrans TMC Interfaces

**SANBAG**

	<p>Southern California Regional ITS Architecture</p> <p>Pages C-4</p>	
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*Description:* San Bernardino Associated Governments (SANBAG) is the council of governments and transportation planning agency for San Bernardino County. SANBAG is responsible for cooperative regional planning and furthering an efficient multi-modal transportation system countywide.

**SCAG**

*Description:* The Southern California Association of Governments (SCAG) has evolved as the largest of nearly 700 councils of government in the United States, functioning as the Metropolitan Planning Organization (MPO) for six counties: Los Angeles, Orange, San Bernardino, Riverside, Ventura and Imperial. The region encompasses a population exceeding 15 million persons in an area of more than 38,000 square miles. As the designated Metropolitan Planning Organization, the Association of Governments is mandated by the federal government to research and draw up plans for transportation, growth management, hazardous waste management, and air quality. Additional mandates exist at the state level.

*Associated Element:* Data Archive

**SCRRA**

*Description:* The purpose of Southern California Regional Rail Authority (SCRRA) was to plan, design, construct and administer the operation of regional passenger rail lines serving the counties of Los Angeles, Orange, Riverside, San Bernardino and Ventura. SCRRA is comprised of MTA, VCTC, OCTA, SANBAG, and RCTC. The regional commuter rail system "Metrolink." has 2 Centers: Operations Center in Pomona and Maintenance Facility in Glendale.

*Associated Element:* Rail Management Improvement System

*Associated Element:* Rail Data Archive

*Associated Element:* Wayside Hotbox

**State**

*Description:* The State of California

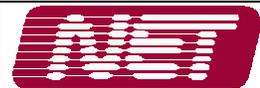
*Associated Element:* PeMS

**VCTC**

*Description:* Ventura County Transportation Authority (VCTC) is the county's primary transportation agency. It creates, funds and delivers efficient transportation for Ventura County.

## APPENDIX D

## ITS FLOWS



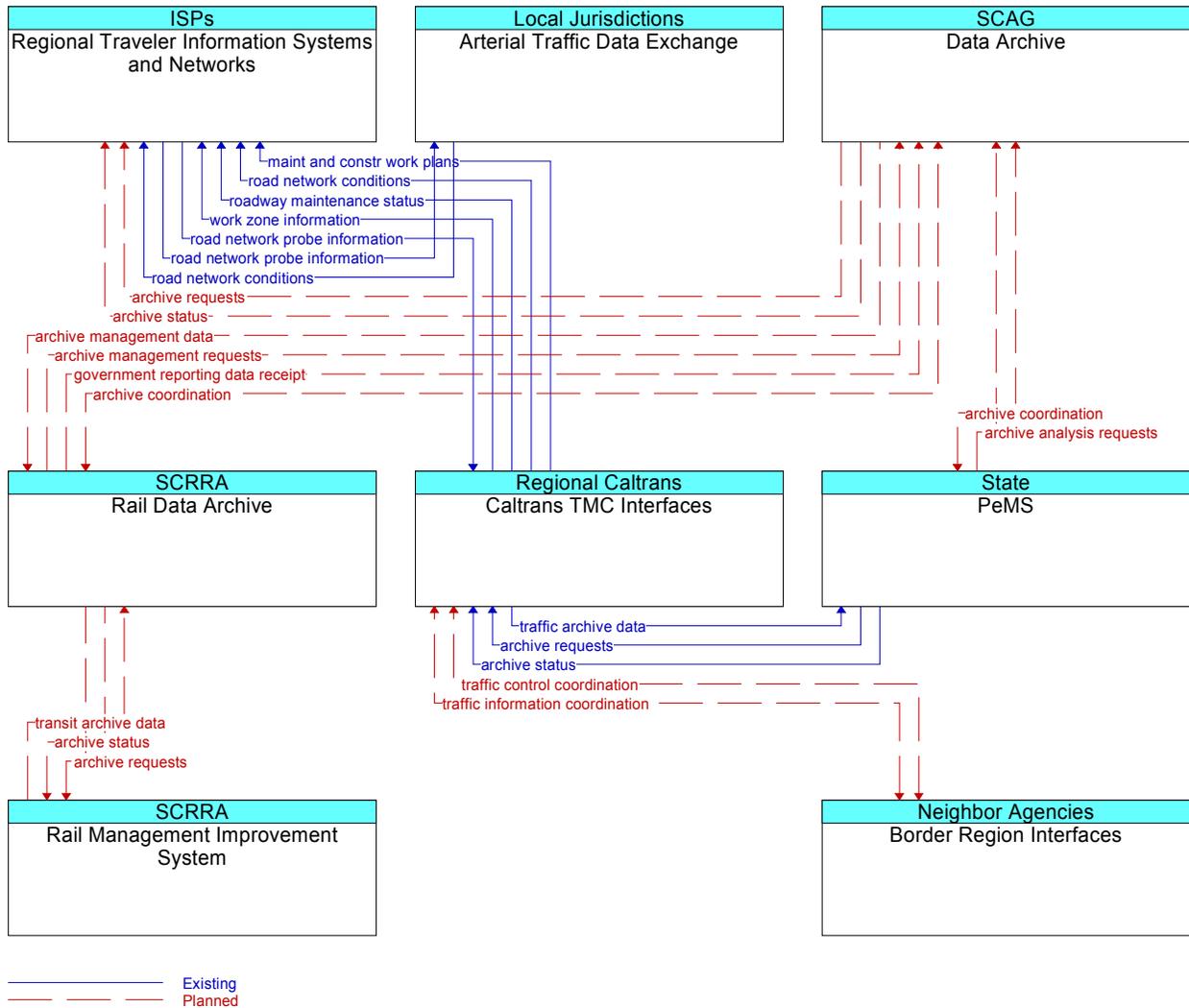
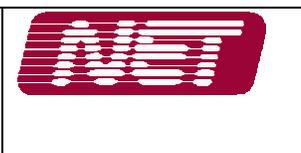


Figure D-1: Caltrans TMC Interfaces ITS Data Flows

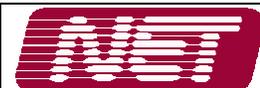
# APPENDIX E

## COMMENTS DISPOSITION

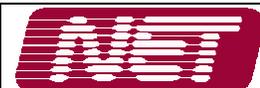
Stakeholder	Agency	Document	Comment	Action
Melissa Hewitt	Kimley-Horn, on behalf of OCTA	Phase 3	What is the responsibility of the "Steering Committee"? How other stakeholders would be incorporated and impacted? Is consensus building responsibility of the "Steering Committee" or "Project Team"	To add
			Page 1-4, Standards, paragraph 1, last sentence contains different meaning from the OC PM plan. Suggest clarify	To clarify
Michelle Kirkhoff	SANBAG	Page 2-11	Modification of description of transit services	Adopted
		Section 2.5	Add more San Bernardino transit services	Adopted
		Table 2.2	Correct description of San Bernardino	Adopted
		Page 3-1	Correct description of IE ITS Architecture	Adopted
		Page 3-1	Change Metro.net to Trip Planner	No change as MTA says this is the name that applies to public interface to a wide range of information including real-time information.
		Table 4.1	Correct description of 1800commute	Adopted
		General	Not to include website (smart traveler) info	Adopted
Marilyn Williams	RCTC	General	Exclude websites only providing links	Adopted
		General	Delete participants of 800-commute	Need to keep stakeholders, as they are critical to success of 800-commute
			No interface for the Smart Traveler website, references for all the entities should be deleted	Adopted
		Figure 7-1	Caltrans D8 will ultimately be linked to D7	Adopted
		Page A-2	HOV, suggest adding "... also known as a carpool lane or diamond lane	Adopted
		Inventory Report	Suggest deleting FHWA website	Adopted
		Inventory Report	suggest deleting references to CTCs	
		Inventory Report	Metro Trip Planner - suggest changing to Trip Planner	No Change
		Inventory Report	Suggest deleting the smart traveler website reference; RCTC is definitely not involved	Adopted
		Section 1.1	Delete sentence: "Each County Regional Definitions of the word "Regional" are troublesome in the context of this project."	Adopted
		Section 6	Correct first paragraph	Adopted



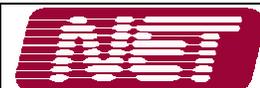
		General	Several places rephrase to be more smooth and clear	Adopted
		Table 2-1	Transit services description should be consistent	Adopted
		General	Add more Transit service from Riverside	Adopted
		Section 2.12	Inconsistency in Table 2-2	Adopted
		Section 7	Turbo is absolutely necessary	Adopted
Peter Liu	MTA	Page 1-1	Unfinished sentence	Adopted
		Table 2-1	Improve consistency	Adopted
		Table 4-2	Add more description to Metro.net	Adopted
		Section 5	Add Arterial Data Exchange across county borders	Adopted
		Figure 7-1	Add connection between D7 and D8	Adopted
		General	Question the use of Turbo Diagrams	Will be delivered separately from the document
Lori Huddleston	MTA	Section 1.1	Define purpose of the document	Added
		General	Are only current ITS elements and projects included?	The purpose of this document is only to identify multi-county projects all others should be in the county-level architectures. A wider range of issues was discounted at the previous meeting.
		Section 2.5	Disabled replaces Handicapped	Added
		Section 2.5	the transit listed are not regional	All transit services were included with thought of the issue of improved transit coordination across the region.
		Section 2.5	Specify if ADA available to each transit service	Added
		Section 2.5	Correct descriptions of several transit services	Adopted
		Table 2-2	Which Air Quality District does LA county belong to?	
		Section 4.1	CommuteView is missing	Added
		Section 5.1.1	Adding cross-county arterial corridors?	
		Page 7-1	Define Information flow and interfaces	
Melissa Hewitt	Kimley-Horn, on behalf of OCTA	Table 2-1	Add more transit services in Orange County	Added
		Table 4-1	Complete Market Package list	Adopted
		Table 5-2	Define "Regional Partners"	



		Section 6	Suggest that the major systems that relate to the market packages that will comprise the architecture would be listed here ultimately as in the inventory section	Added
Jesse Glazer	FHWA	General	Include Private ISPs	Added
		General	No Regional Traveler Information??	Added
		General	Data Dictionary should not be removed, but it is not a system or MP, it is a Standard and should be discussed in Section 9	Adopted
		General	Document needs more than tri-annual maintenance	Stakeholder group will monitor and review comments also inserted in OC doc
		General	Describe 800-commute as a "gateway" rather than "telephone tree"	Adopted
		General	Terminator can exchange control & coordination info	Added
		General	Include PeMS and element's underlying systems	Added
		Table 2-1	Include only substantial transit services	Unchanged
		Section 5.1	No Emergency Management??	Added
		Section 5.1.4	Only Rail Interfaces and no transit interfaces?	Added
		Table 5-2	Operational Concept should also describe the activities needed to operate these services	This section follows the FHWA "Guidance"
		Section 6	Some functional requirement should belong to Operational Concept	The Functional Requirements were generated by Turbo and have been customized. They don't belong to Operational Concept
		Section 7	Add diagram for ATIS 2	Added
		Section 7	Add Arizona, Nevada TMCs and D11	Added
		Figure 7-2	Add "Signal Coordination" between 2 ATMSs	
		Figure 7-3	Include PeMS and flow from Caltrans to SCAG	Added
		Figure 7-6	Change Enhancement to Management	Adopted
		Table 8-1	Add 4th timing other than S/M/L?	Not necessary
		Section 10.6	Many "Should"/"Would" need to be clarified	Adopted
Michelle Kirkhoff & Marilyn Williams	SANBAG & RCTC	General	Not every element is mapped to National ITS Entities	Added
		General	Will CHP be inserted into this layer of architecture	CHP is represented via Caltrans



	General	Element description need to be more succinct	Adopted
	General	Some elements don't appear to be Systems	Some parts were modified, but some major elements, e.g. Caltrans TMC interfaces, is interpreted as a system.
	General	Include PeMS	Adopted
	General	Other regions and states should be included	Added
	Elements	800-Commute, modify description	Adopted
	Elements	Use stakeholder groups	Adopted
	Elements	Is "Arterial Traffic Information" an actual system	Kept as a System
	Elements	Combine CHIN & Cal. Hwy Info Web Page	Adopted
	Elements	Is Caltrans State Web Page a System?	Modified, combined with other websites and represented as a high level traveler information system
	Elements	Is Caltrans TMC Interface a System?	Kept as a System
	Elements	Add CommuteView, its stakeholder and other information	It is combined into Regional Traveler Information
	Elements	Is Data Dictionary a System	Removed from System but add to Standards
	Elements	Is Rail Data a System	Currently referenced on in Project Sequence
	Elements	Ridematch Website, should be called RidePro and designated as an ISP	It is combined into Regional Traveler Information
	Stakeholder Report	Add SCRRA as stakeholder of MetroLink	Adopted
	Stakeholder Report	CommuteView should be called CommuteCall	It is combined into Regional Traveler Information
	Stakeholder Report	Duplication by identifying both Regional Commissions and Transportation Commissions	Adopted
	Stakeholder Report	Include IVAG or Imperial County in Stakeholder Groups	Adopted
Michelle Kirkhoff	SANBAG	General	Change "Local Cities" to "Local Jurisdictions"
		General	Change status of "Arterial Traffic Info" to Existing



		General	Why data archive is a system	Data archives containing digital information have the potential to be shared and accessed electronically by multiple parties. Such is the intent with both the SCAG Archives and the Metrolink archives in the future. The National Architecture does not exclude historical data from ITS indeed it specifically includes it.
		Inventory Report	SCAG and IVAG are not CTC	Adopted
		Inventory Report	Add SANBAG	Adopted
		Inventory Report	Make stakeholder description consistent	Adopted
		Page 2-4	Not all larger agencies are CAD equipped	Adopted
		Section 2.5	Taking out all transit agencies	Removed
		Table 2-3	All counties have CTC but Imperial, all counties have Transportation. Authority except Ventura and Imperial	Adopted
		Figure 7-3	How exchange data ISPs becomes an ITS system?	We don't understand this comment as there are no ISPs in the graphic referred to
		Page 8-2	Data Dictionary should be medium-long term	Adopted
		General	Correct SANBAG name	Adopted
		Section 10.6	Insist on keeping architecture document on county's own website	Maintenance Issue to be determined if IE likes to keep the document
		Appendix A	Add CTC to Acronyms	Adopted
Emmanuel V. Aggreh	Office of Advance Planning, Caltrans District 7	General	Consider including Homeland Security	Recommend to be included in the future expanded Stakeholder Groups.
		Stakeholder Report	Add an "umbrella" stakeholder to represent emergency/security agencies	Adopted

