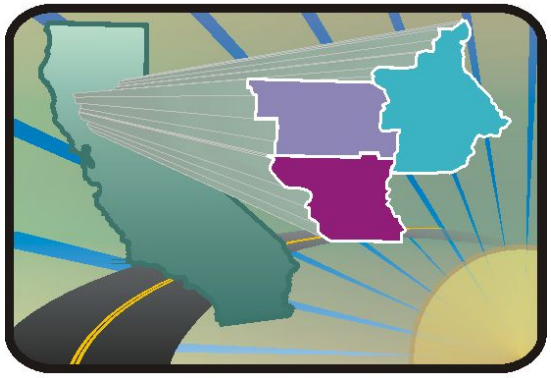
North Valley



Regional ITS Architecture

DRAFT

ITS Services, Market Packages, Interconnects and Information Flows

SUBMITTED TO:

Butte County Association of Governments, Project Development Team and North Valley ITS Stakeholders

SUBMITTED BY:

ITERIS

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Iteris, Inc.

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1.0 Introduction

This project establishes a Regional Intelligent Transportation Systems (ITS) Architecture and develops an Integration and Strategic Deployment Plan for the North Valley area. The overall objective of this project is to ensure that all ITS investments in North Valley will have established common communication protocols, avoid duplication of investments in infrastructure, provide the ability to share data sources between agencies, and bring North Valley into compliance with the nationally established ITS standards and architecture. Maintaining compliance with these standards and having a regional architecture of ITS elements for the North Valley region, is a requirement for continuing to use federal funds for highway projects in the region.

The Integration and Strategic Deployment Plan provides a framework for current ITS elements in the region and provides a strategic approach to all future ITS investments. Iteris, Inc. is performing this work effort under a contract with the Butte County Association of Governments (BCAG), in close consultation with the Glenn County, Colusa County, the California Department of Transportation (CALTRANS) and the Federal Highway Administration (FHWA). A Project Development Team (PDT) made up of several representatives from each of these agencies was developed early in this project and continues to oversee all tasks and deliverables.

This project is being conducted through multiple tasks and deliverables. This deliverable represents the results of activities that have taken place to gather regional inventory, surveys and meetings to assess needs as well as inputting that regional inventory into a software that maps regional inventory to the National ITS Architecture. This task contains the following actions that have resulted in this report:

- Evaluate potential user services and needs for the region.
- Develop marketing package plan.
- Use Turbo Architecture to map the North Valley regional inventory and transportation services to the market packages within the National ITS Architecture.
- Develop and deliver tailored physical architecture and interconnect diagrams and market package data flows for stakeholder review and comment.

The intent of this Report is to map the North Valley regional inventory of ITS and future ITS needs to the National ITS Architecture; more specifically to the market

packages contained in the National ITS Architecture. This is an iterative process in which data is developed for stakeholder review and adjustments are made as stakeholder input is received. This report is based on the most recent services and needs identified through meetings with stakeholders and discussions both in person and through stakeholder review.

2.0 ITS Services / Market Packages

This section provides details on certain concepts from the National ITS Architecture, including Subsystems and Market Packages. In addition, the Market Packages for North Valley are presented.

2.1 National ITS Architecture Subsystems

The National ITS Architecture contains many different concepts and is rich in transportation industry terminology and acronyms that describe and depict integrated systems. One of the strengths of National ITS Architecture is the introduction of a consistent "language" that can be spoken by transportation professionals nationally, to assure that everyone is "on the same page" with systems implementation, integration, and operation. But if consistent terms and acronyms are a strength, there is an equal challenge in that this language is new to most people. Like any new language, the language or dialect of "National Architecture-ease", is often awkward to use and understand.

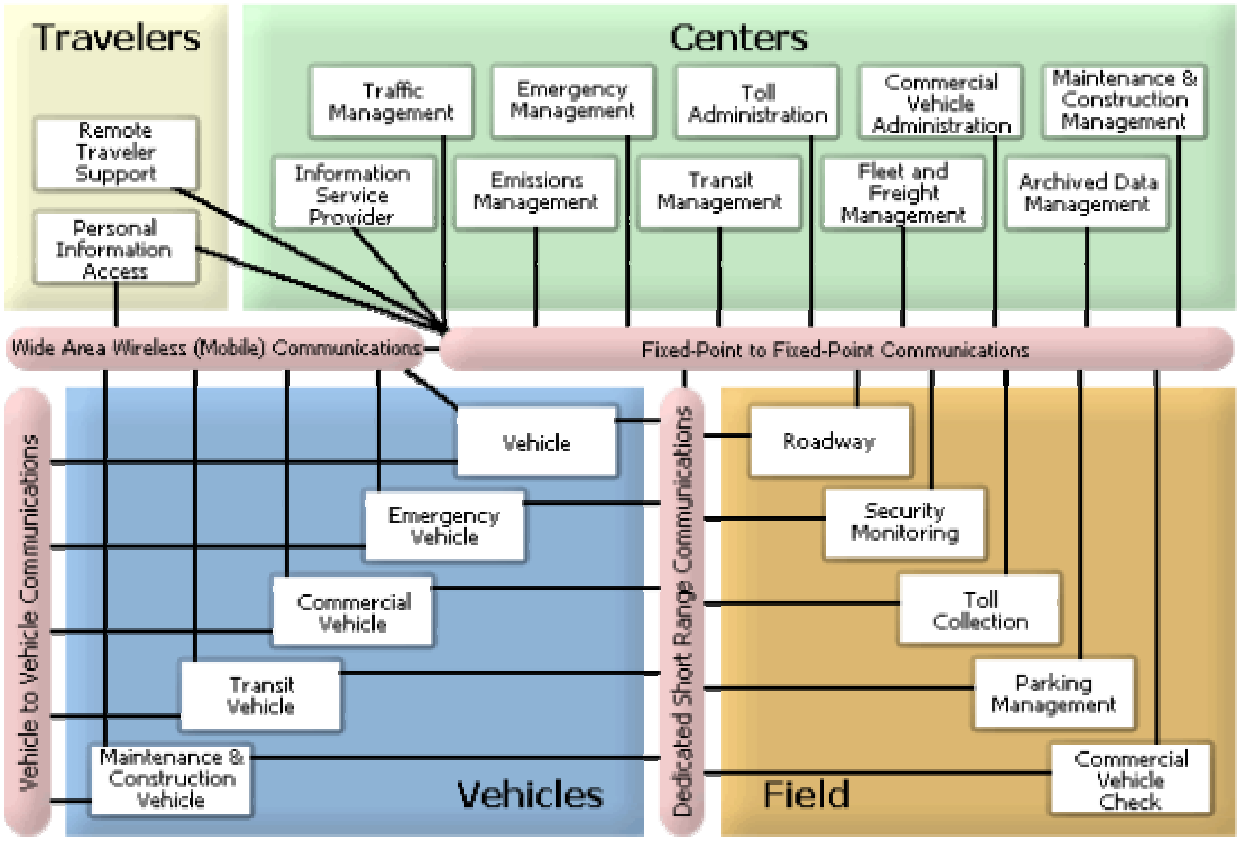
Figure 1 is a generic, high level depiction of the world of ITS according to the National ITS Architecture, version 5.0. This depiction is called a “sausage diagram[1]”. The diagram breaks up ITS into four types of Subsystems: Travelers, Centers, Vehicles and Field. (A sausage diagram that specifically depicts North Valley ITS is presented later in this Report, in Figure 3.) In Figure 1, the oblong bubbles between the various subsystems types represent the communications media that is typically used to connect the various subsystems.

The Subsystem theme is carried throughout the National ITS Architecture, by organizing functions that occur within ITS deployments. For example, referring to Figure 1, the Caltrans Regional Traffic Management Center (RTMC) in Sacramento manages the ITS elements of highways that pass through the North Valley region. The RTMC would be identified primarily with the Center Subsystem in the National ITS Architecture known as "Traffic Management" because this is the Subsystem where the primary functions of the RTMC take place. The roadway monitoring cameras (CCTV), dynamic message signs (DMS), ice and fog sensors and other

[1] The Sausage Diagram derived its name because of the sausage shape of the communications bubbles. It is also said that “like sausage, everything goes into them” (the communications bubbles).

field equipment that gather or disseminate information for the RTMC in the North Valley region (existing and planned) are identified with the Field Subsystem called “Roadway”. While Subsystems should not be thought of as "brick and mortar" entities, the physical place where the transportation functions occur can be a building. In fact, the same building that hosts a Traffic Management Subsystem could also host other Subsystems such as Information Service Provider (used to provide traveler information), Maintenance and Construction Operations (road weather information, construction management), Emergency Management (police, State Highway Patrol) and Archived Data Management – or any combination of the available Subsystems. The RTMC is a good example because it is not only a Traffic Management Subsystem but, the building itself also houses the State Highway Patrol as well as several other Subsystems (functions) provided by Caltrans.

Figure 1: National ITS Architecture Sausage Diagram



2.2 National ITS Architecture Market Packages

Market Packages are another concept taken from the National ITS Architecture. Market Packages, comprised of one or more subsystems, provide accessible,

deployment-oriented, integrated services from the framework of the National ITS Architecture that respond directly to regional needs. These Market Packages are the underlying deployment mechanism for implementing the functions that take place in the various Subsystems found in the National ITS Architecture sausage diagram depicted above.

Once a region has identified specific ITS service needs, Market Packages that correlate most directly to ITS "services" that address those needs can be pulled out of the National ITS Architecture to serve as a beginning point of discussion for project deployment. Market Packages are then tailored to fit, separately or in combination, real world local transportation problems and needs identified during the ITS planning process.

Every ITS service selected for the region is associated with one or more regional stakeholders that supports or will be supporting that service. This association between ITS services and organizations serves as a starting point for operational concepts, which will be discussed in January timeframe for this project.

Market Packages contain certain items:

1. **Subsystems** and **Terminators** so that the regional Stakeholders can identify or map to local systems.

2. **Information Flows** that go between systems and show the types of information that will be exchanged between Stakeholders' systems.

Subsystems & Terminators – Subsystems are a cohesive set of functional definitions with required interfaces to other Subsystems. Subsystems are defined functionally, not physically. Subsystems as defined by the National ITS Architecture are typically related to transportation management or information processing. A Terminator, unlike the Subsystems, cannot be defined by the transportation industry. An example of a Terminator is a banking institution that may be utilized during the purchase of fare cards for transit. The banking institution subscribes to their own industry standards, but they are critical to fare card payment, toll collection and other services provided in a region.

Examples:

- *A regional implementation may include a single physical center that collocates the capabilities from several Subsystems. The example of Caltrans Traffic Management System which takes place at the RTMC was provided above. Using the "blue print" of the National ITS Architecture as a guideline, a single building may be identified or "mapped to" numerous Subsystems or functionalities. The Sacramento RTMC is mapped to the National Architecture subsystems Traffic Management, it's mapped as an Information Service Provider and a Maintenance and Construction System.*

- *On the other hand, a single Subsystem may be replicated in many different physical Traffic Management centers. Staying with the same RTMC theme, an example of this would be that although the Caltrans RTMC is mapped to the National Traffic Management Center, the Chico Traffic Management Center is also mapped to this Subsystem, as is the Local Cities/Counties Signal Systems.*

  Likewise, there are also many different examples of Emergency Management Subsystem mappings in the regional North Valley Architecture: Butte County Office of Emergency Management, Colusa County Office of Emergency Management, California Highway Patrol, Glenn County Office of Emergency Management and so on…, all identified or "mapped" to the National Architecture as Emergency Management Subsystems.

- *Multiple traffic management services, not necessarily integrated with each other but each being mapped to the National ITS Architecture may be implemented in a region a separate services identified as separate Market Packages. This is a reflection of distinct State freeway and local arterial traffic management that happens in the region. Caltrans operates a different system than the City of Chico but both have traffic management systems.*

Terminators are on the outside of what a region defines as transportation, but are frequently used by transportation to accomplish a mission or perform specific functions.

Example:

- *Financial institutions are planned for use in the region in order to implement fare card purchase. These financial institution services are called Terminators because the transportation industry does not define their functions or how that information will be provided, it just uses the information. It is a "take it or leave it" proposition that makes financial services a commonly used Terminator for many stakeholders in regions where transit cards are purchased. .*

Information Flows – Information flows are defined as the information and data exchange between and among various Stakeholders systems that have been mapped to Subsystems and/or Terminators. Information Flows allow for a coordinated overall system operation by following pre-defined interfaces between Subsystems, which may be deployed by different procuring and operating sectors.

Example:

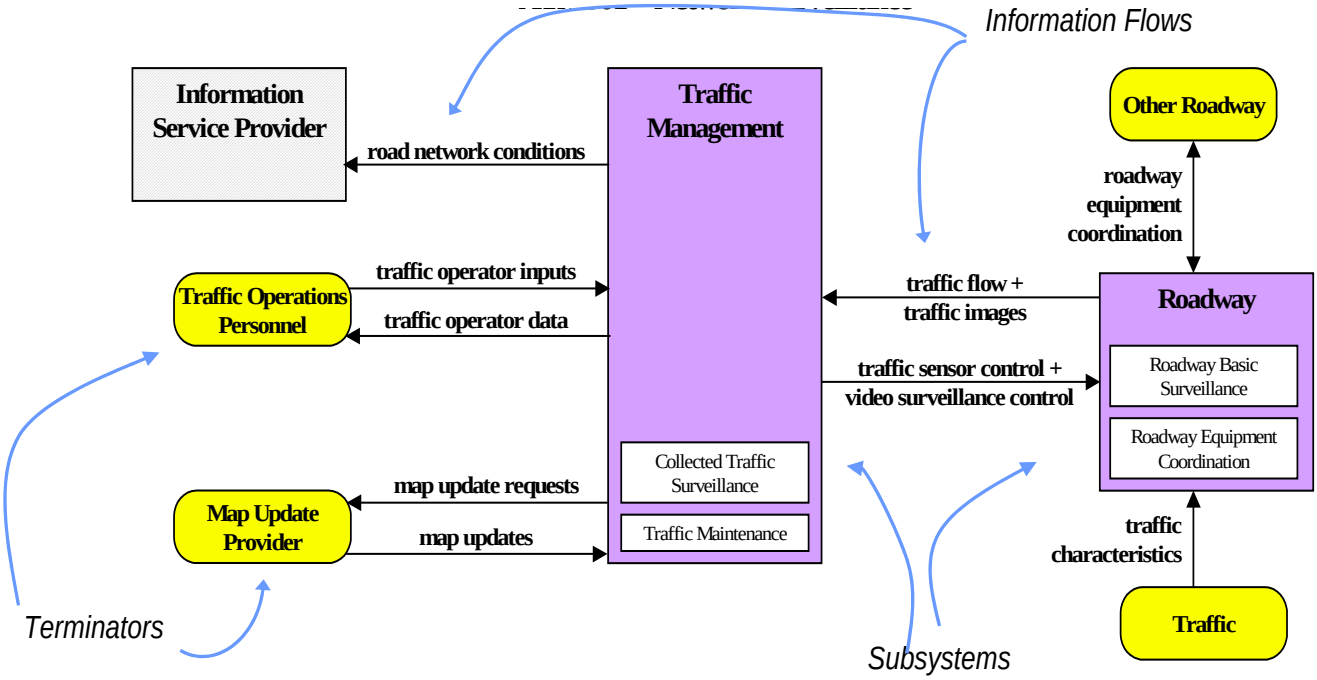
- *This example cites two complementary information flows: "signal control data" and "signal control status." The "signal control data" information flow starts at the Traffic Management Subsystem (the traffic signal control system) and flows to the Roadway Subsystem (the traffic signal controller in the field). "Signal control data" is information used to configure and control traffic signal systems. In*

response, the Roadway Subsystem returns the "signal control status" information flow to the Traffic Management Subsystem. "Signal control status" is the status of surface street signal controls. This service identified as ATMS01: Network Surveillance. Network Surveillance is a Market Package service that is provided both by the City of Chico and Caltrans.

Market Packages bring together elements that must work together to deliver a given transportation service as well as the information flows between Subsystems inside a region and those that connect them to other important external systems. In other words, Market Packages identify the pieces of the Physical Architecture that are required to implement a particular transportation service.

To provide a more detailed visual understanding of a Market Package, Figure 2 shows a traffic management Market Package. Only the most salient elements from the Architecture definition (e.g., directly involved Subsystems, system Terminators, and the highest level Information Flows) are depicted in the graphic to ensure clarity.

Figure 2: Sample Market Package



In Version 5.0 of the National ITS Architecture there are 85 Market Packages, in eight groupings. Table 1 contains a summary listing of all current (v5.0) National ITS Architecture Market Packages, by group. Each of the Market Packages is described in the National ITS Architecture documentation and has an accompanying diagram. To further review the National ITS Architecture Market Package descriptions and diagrams, please refer to http://itsarch.iteris.com/itsarch/ and click on Market

Packages. Those Market Packages that are included in the North Valley Regional ITS Architecture (existing or planned) are highlighted with an asterisk *.

Table 1: National ITS Architecture Market Packages (*North Valley ITS Architecture)

ARCHIVED DATA MANAGEMENT
Archived Data (AD)
***AD1 ITS Data Mart**
AD2 ITS Data Warehouse
AD3 ITS Virtual Data Warehouse

PUBLIC TRANSPORTATION
Advanced Public Transportation Systems (APTS)
***APTS1 Transit Vehicle Tracking**
***APTS2 Transit Fixed-Route Operations**
***APTS3 Demand Response Transit Operations**
***APTS4 Transit Passenger and Fare Management**
***APTS5 Transit Security**
***APTS6 Transit Maintenance**
***APTS7 Multi-modal Coordination**
***APTS8 Transit Traveler Information**

TRAVELER INFORMATION
Advanced Traveler Information Systems (ATIS)
***ATIS1 Broadcast Traveler Information**
ATIS2 Interactive Traveler Information
ATIS3 Autonomous Route Guidance
ATIS4 Dynamic Route Guidance
***ATIS5 ISP Based Route Guidance**
ATIS6 Integrated Transportation Mgmt/Route Guidance
ATIS7 Yellow Pages and Reservation
ATIS8 Dynamic Ridesharing
ATIS9 In Vehicle Signing

TRAFFIC MANAGEMENT
Advanced Transportation Management Systems (ATMS)
***ATMS01 Network Surveillance**
ATMS02 Probe Surveillance
***ATMS03 Surface Street Control**
***ATMS04 Freeway Control**
ATMS05 HOV Lane Management
***ATMS06 Traffic Information Dissemination**
***ATMS07 Regional Traffic Control**
***ATMS08 Traffic Incident Management System**
ATMS09 Traffic Forecast and Demand Management
ATMS10 Electronic Toll Collection
ATMS11 Emissions Monitoring and Management
ATMS12 Virtual TMC and Smart Probe Data
ATMS13 Standard Railroad Grade Crossing
ATMS14 Advanced Railroad Grade Crossing
ATMS15 Railroad Operations Coordination
ATMS16 Parking Facility Management
ATMS17 Regional Parking Management
ATMS18 Reversible Lane Management
***ATMS19 Speed Monitoring**
ATMS20 Drawbridge Management
ATMS21 Roadway Closure Management

From the National ITS Architecture (v5.0)

VEHICLE SAFETY
Advanced Vehicle Safety Systems (AVSS)
AVSS01 Vehicle Safety Monitoring
AVSS02 Driver Safety Monitoring
AVSS03 Longitudinal Safety Warning
AVSS04 Lateral Safety Warning
AVSS05 Intersection Safety Warning
AVSS06 Pre-Crash Restraint Deployment
AVSS07 Driver Visibility Improvement
AVSS08 Advanced Vehicle Longitudinal Control
AVSS09 Advanced Vehicle Lateral Control
AVSS10 Intersection Collision Avoidance
AVSS11 Automated Highway System

COMMERCIAL VEHICLE OPERATIONS
Commercial Vehicle Operations (CVO)
CVO01 Fleet Administration
CVO02 Freight Administration
CVO03 Electronic Clearance
CVO04 CV Administrative Processes
CVO05 International Border Electronic Clearance
CVO06 Weigh-In-Motion
CVO07 Roadside CVO Safety
CVO08 On-board CVO and Freight Safety & Security
CVO09 CVO Fleet Maintenance
CVO10 HAZMAT Management
CVO11 Roadside HAZMAT Security Detection & Mitigation
CVO12 CV Driver Security Authentication
CVO13 Freight Assignment Tracking

EMERGENCY MANAGEMENT
Emergency Management (EM)
***EM01 Emergency Call-Taking and Dispatch**
EM02 Emergency Routing
EM03 Mayday Support
EM04 Roadway Service Patrols
EM05 Transportation Infrastructure Protection
***EM06 Wide-Area Alert**
***EM07 Early Warning System**
***EM08 Disaster Response and Recovery**
***EM09 Evacuation and Reentry Management**
***EM10 Disaster Traveler Information**

MAINTENANCE & CONSTRUCTION OPERATIONS
Maintenance & Construction Operations (MCO)
***MC01 Maint. & Construction Vehicle & Equip Tracking**
***MC02 Maintenance and Construction Vehicle Maintenance**
***MC03 Road Weather Data Collection**
***MC04 Weather Information Processing and Distribution**
MC05 Roadway Automated Treatment
***MC06 Winter Maintenance**
***MC07 Roadway Maintenance and Construction**
***MC08 Work Zone Management**
MC09 Work Zone Safety Monitoring
***MC10 Maintenance and Construction Activity Coordination**

2.3 North Valley Market Packages

Table 2 is a summary of Market Packages for North Valley. The table shows the entire listing of Market Packages from the National ITS Architecture and their respective status in the region. Table 2 also includes the prioritization of the Market Packages. The priority for the Market Packages for North Valley was derived based on the priority assigned to the needs by Stakeholders, as noted in the Report on Inventory and Needs released in October 2004. This analysis is performed in an iterative manner and has been updated based on stakeholder input and multiple iterations of the Turbo Architecture database. Some additional minor modifications may be made before the project concludes, again, based on stakeholder input and results from running the Turbo Architecture software tool. Appendix A of this Report contains the descriptions for the Market Packages selected for North Valley from version 5.0 of the National ITS Architecture. Appendix B is a specific list of the stakeholders involved in each of the Market Packages (regional ITS services).

Table 2: North Valley Market Package Analysis

[Priority: H (High), M (Medium), L (Low), N/A (Not Applicable)]

Market Packages		Existing	Planned	Not Planned	Priority
ARCHIVED DATA MANAGEMENT *Archived Data (AD)*					
AD1	ITS Data Mart	x			M
AD2	ITS Data Warehouse			x	N/A
AD3	ITS Virtual Data Warehouse			x	N/A
PUBLIC TRANSPORTATION *Advanced Public Transportation Systems (APTS)*					
APTS1	Transit Vehicle Tracking		x		M
APTS2	Transit Fixed-Route Operations	x			H
APTS3	Demand Response Transit Operations (Paratransit)	x			H
APTS4	Transit Passenger and Fare Management	x			H
APTS5	Transit Security		x		M
APTS6	Transit Maintenance		x		M
APTS7	Multi-modal Coordination		x		M
APTS8	Transit Traveler Information		x		M
TRAVELER INFORMATION *Advanced Traveler Information Systems (ATIS)*					
ATIS1	Broadcast Traveler Information		x		H
ATIS2	Interactive Traveler Information		x		M
ATIS3	Autonomous Route Guidance			x	L
ATIS4	Dynamic Route Guidance			x	L
ATIS5	ISP Based Route Guidance		x		L
ATIS6	Integrated Transportation Management/Route Guidance			x	N/A
ATIS7	Yellow Pages and Reservation			x	N/A
ATIS8	Dynamic Ridesharing			x	N/A

[Priority: H (High), M (Medium), L (Low), N/A (Not Applicable)]

Market Packages		Existing	Planned	Not Planned	Priority
ATIS9	In Vehicle Signing			**x**	**N/A**
TRAFFIC MANAGEMENT *Advanced Transportation Management Systems (ATMS)*					
ATMS01	Network Surveillance	**x**			**H**
ATMS02	Probe Surveillance			**x**	**N/A**
ATMS03	Surface Street Control	**x**			**H**
ATMS04	Freeway Control		**x**		**M**
ATMS05	HOV Lane Management			**x**	**N/A**
ATMS06	Traffic Information Dissemination		**x**		**H**
ATMS07	Regional Traffic Control		**x**		**M**
ATMS08	Traffic Incident Management System		**x**		**H**
ATMS09	Traffic Forecast and Demand Management			**x**	**L**
ATMS10	Electronic Toll Collection			**x**	**N/A**
ATMS11	Emissions Monitoring and Management			**x**	**L**
ATMS12	Virtual TMC and Smart Probe Data			**x**	**N/A**
ATMS13	Standard Railroad Grade Crossing			**x**	**N/A**
ATMS14	Advanced Railroad Grade Crossing			**x**	**N/A**
ATMS15	Railroad Operations Coordination			**x**	**N/A**
ATMS16	Parking Facility Management			**x**	**N/A**
ATMS17	Regional Parking Management			**x**	**N/A**
ATMS18	Reversible Lane Management			**x**	**N/A**
ATMS19	Speed Monitoring		**x**		**M**
ATMS20	Drawbridge Management			**x**	**N/A**
ATMS21	Roadway Closure Management	**x**			**M**
VEHICLE SAFETY *Advanced Vehicle Safety Systems (AVSS)*					
AVSS01	Vehicle Safety Monitoring			**x**	**N/A**
AVSS02	Driver Safety Monitoring			**x**	**N/A**
AVSS03	Longitudinal Safety Warning			**x**	**N/A**
AVSS04	Lateral Safety Warning			**x**	**N/A**
AVSS05	Intersection Safety Warning			**x**	**N/A**
AVSS06	Pre-Crash Restraint Deployment			**x**	**N/A**
AVSS07	Driver Visibility Improvement			**x**	**N/A**
AVSS08	Advanced Vehicle Longitudinal Control			**x**	**N/A**
AVSS09	Advanced Vehicle Lateral Control			**x**	**N/A**
AVSS10	Intersection Collision Avoidance			**x**	**N/A**
AVSS11	Automated Highway System			**x**	**N/A**
COMMERCIAL VEHICLE OPERATIONS *Commercial Vehicle Operations (CVO)*					
CVO01	Fleet Administration			**x**	**N/A**
CVO02	Freight Administration			**x**	**N/A**
CVO03	Electronic Clearance			**x**	**N/A**
CVO04	CV Administrative Processes			**x**	**N/A**
CVO05	International Border Electronic Clearance			**x**	**N/A**
CVO06	Weigh-In-Motion			**x**	**N/A**
CVO07	Roadside CVO Safety			**x**	**N/A**

[Priority: H (High), M (Medium), L (Low), N/A (Not Applicable)]

Market Packages		Existing	Planned	Not Planned	Priority
CVO08	On-board CVO and Freight Safety & Security			**x**	**N/A**
CVO09	CVO Fleet Maintenance			**x**	**N/A**
CVO10	HAZMAT Management			**x**	**N/A**
CVO11	Roadside HAZMAT Security Detection & Mitigation			**x**	**N/A**
CVO12	CV Driver Security Authentication			**x**	**N/A**
CVO13	Freight Assignment Tracking			**x**	**N/A**
EMERGENCY MANAGEMENT *Emergency Management (EM)*					
EM1	Emergency Call-Taking and Dispatch	**x**			**H**
EM2	Emergency Routing			**x**	**M**
EM3	Mayday Support			**x**	**H**
EM4	Roadway Service Patrols			**x**	**L**
EM05	Transportation Infrastructure Protection			**x**	**L**
EM06	Wide-Area Alert		**x**		**M**
EM07	Early Warning System		**x**		**M**
EM08	Disaster Response and Recovery		**x**		**M**
EM09	Evacuation and Reentry Management		**x**		**L**
EM10	Disaster Traveler Information		**x**		**H**
MAINTENANCE & CONSTRUCTION OPERATIONS *Maintenance & Construction Operations (MCO)*					
MC01	Maintenance and Construction Vehicle Tracking	**x**			**M**
MC02	Maintenance and Construction Vehicle Maintenance	**x**			**M**
MC03	Road Weather Data Collection	**x**			**H**
MC04	Weather Information Processing and Distribution	**x**			**H**
MC05	Roadway Automated Treatment			**x**	**N/A**
MC06	Winter Maintenance		**x**		**M**
MC07	Roadway Maintenance and Construction		**x**		**H**
MC08	Work Zone Management	**x**			**M**
MC09	Work Zone Safety Monitoring			**x**	**L**
MC10	Maintenance and Construction Activity Coordination		**x**		**M**

3.0 Interconnects and Information Flows

Interconnect Diagrams and Information Flow Diagrams are very important in documenting and understanding a regional ITS architecture. Interconnect Diagrams graphically depict the various systems in a given region that are connected to other systems. Information Flow Diagrams graphically depict the type of information flowing between the connected systems. Both of these types of diagrams (among others) are generated from the Turbo Architecture tool, which is used to document the regional ITS architecture. This section describes Interconnect Diagrams, Information Flows and the Turbo Architecture tool in more detail.

3.1 Use of Turbo Architecture

Turbo Architecture (Turbo) is a software application that supports development of regional and project ITS architectures using the National ITS Architecture as a starting point. It uses the Microsoft Access database application as the underlying foundation.

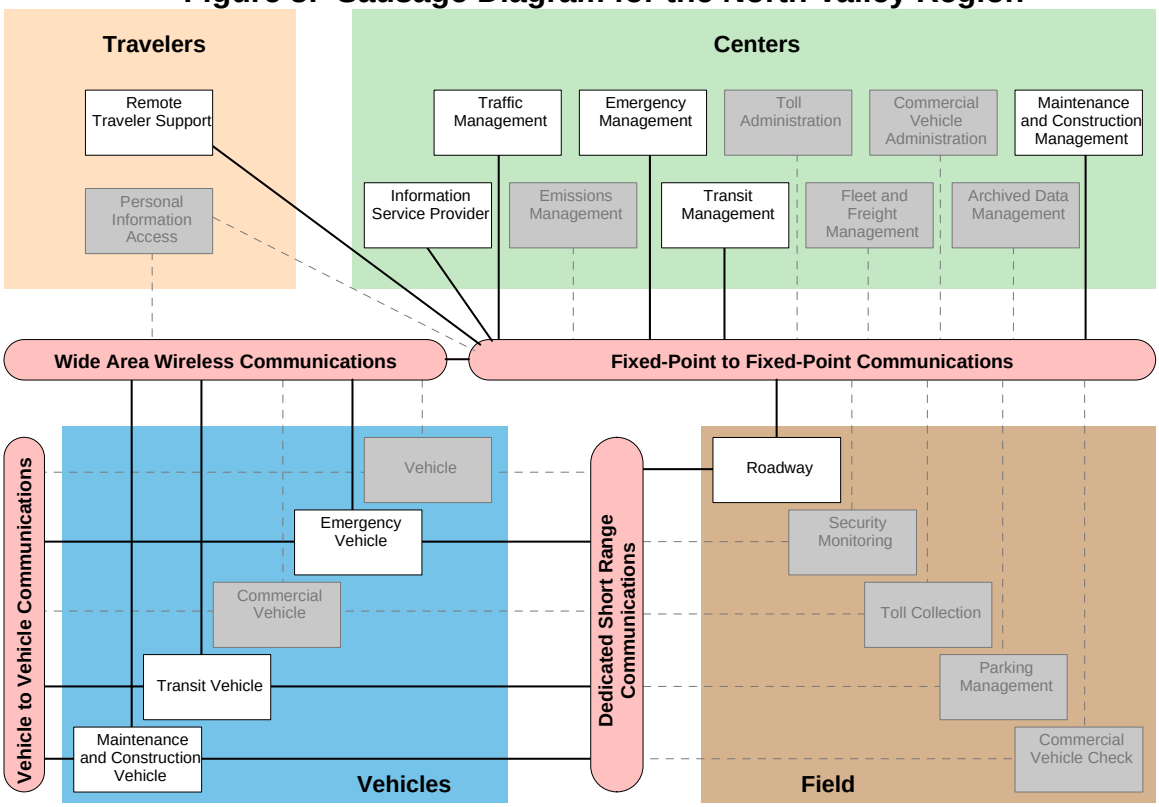
Information can be entered into Turbo version 3.0 using either an interview or tabular forms. The interview guides the user through a series of questions and options that result in the creation of an ITS inventory and a set of services. In creation of the North Valley Regional ITS Architecture development, the information was used as a basis for the architecture and we went directly to the tabular forms to create this inventory and set of services.

Once the initial data input is complete, Turbo provides powerful customization tools that allow the user to customize the architecture to match their specific requirements. Many reports and diagrams are available for display, print, or publication in other documents. The user is not limited, instead, the user can customize by extending the National ITS Architecture and adding their own information flows and transportation elements for those areas not covered by the National ITS Architecture. However, while the regional architecture is developed with a 10 year timeframe in mind for whether to include planned ITS elements, the National ITS Architecture was developed and is maintained with an aggregated 20 year timeframe for including ITS entities. There has been very little, if any, need to expand on what is existing for mapping regional ITS elements.

3.2 High Level North Valley Architecture

Based on the systems inventory, the Market Package analysis and the Turbo Architecture work completed to date, Figure 3 shows a high level view of the North Valley Regional ITS Architecture. This figure is the “sausage diagram” for North Valley. It shows the four types of subsystems (Travelers, Centers, Vehicles and Field) for North Valley ITS.

Figure 3: Sausage Diagram for the North Valley Region



All Subsystems identified in white are either existing or planned in the North Valley Regional ITS Architecture. Those elements in gray are NOT existing or planned over the next 10 year timeframe.

Note that all Commercial Vehicle Subsystems (Administration, Check and Vehicle) are included in the Statewide Architecture and not in this regional architecture. Also, there are no Toll Road, Parking Management or ITS Security Systems monitoring in the North Valley Regional Architecture. While individual agencies do have archive databases for their own systems (i.e., Caltrans, CHP, Chico Traffic Management, all Offices of Emergency Management) there are no regional plans over the next 10 years to develop a regional database warehouse to share data among stakeholders. The Archive Management Subsystem requires some sharing of data archive systems. As the region expands in size, need and complexity, this is one element that may be reconsidered in future maintenance updates of the regional architecture.

3.3 North Valley Interconnect Diagrams and Information Flow Diagrams

Interconnect Diagrams and Information Flow Diagrams are standard outputs from Turbo. The Interconnect Diagram depicts how a particular element of a regional ITS architecture interconnects to other elements in the regional architecture.

Interconnect diagrams are less detailed than Information Flow diagrams. The Interconnect Diagram simply shows a connection between two elements. An Information Flow diagram, on the other hand, shows the detailed information exchange between the two elements.

The two most typical interconnects present in a regional architecture are the link between a center and some type of field element (fixed or mobile); and the link between two centers. Figure 4 is an example of an Interconnect Diagram in the North Valley Regional ITS Architecture using "Transit Vehicles Managed by BCAG". Figure 5 is an example of this same ITS element, "Transit Vehicles Managed by BCAG" and the Information Flow Diagram for this element. Both Figure 4 and Figure 5 are centered around the "Transit Vehicles Managed by BCAG" – called a centric view. Each ITS element in the North Valley Regional ITS Architecture will have diagrams representing the interconnect and information flows.

The Interconnect Diagrams and Information Flow Diagrams for the North Valley Regional ITS are in the process of being completed and will be handed out to stakeholders for approval at the February 3rd, 2005 Stakeholder meeting in Butte. The PDT will have a draft of these diagrams by January 24th for early review.

Interconnects and flows are a tailored product of the Market Package selection for the region. The Market Package Appendix attached to this document represents the regional services, both existing and planned. These selections are critical in the tailoring of interconnects and information flows because these interconnects and flows support the selection of regional services.

The Project Development Team (PDT) are invited to make comments and initiate modifications of Market Package selection (which will impact the interconnects and flows) by January 7th. Since the architecture development is an iterative process, comments received on those diagrams at the February 3rd meeting will also bring about revisions. The revised (final) versions of those diagrams will be distributed in the Final Architecture Report at the end of the project.

PLEASE NOTE that just because a Market Package is listed in the regional architecture, it doesn't commit the region or stakeholders to implement the entire Market Package service. In most of the Market Packages listed below, only a portion of the service is existing or planned for implementation. The specific tailoring of the services will be reflected in the interconnects and architecture flows.

Figure 4: Interconnect Diagram Example

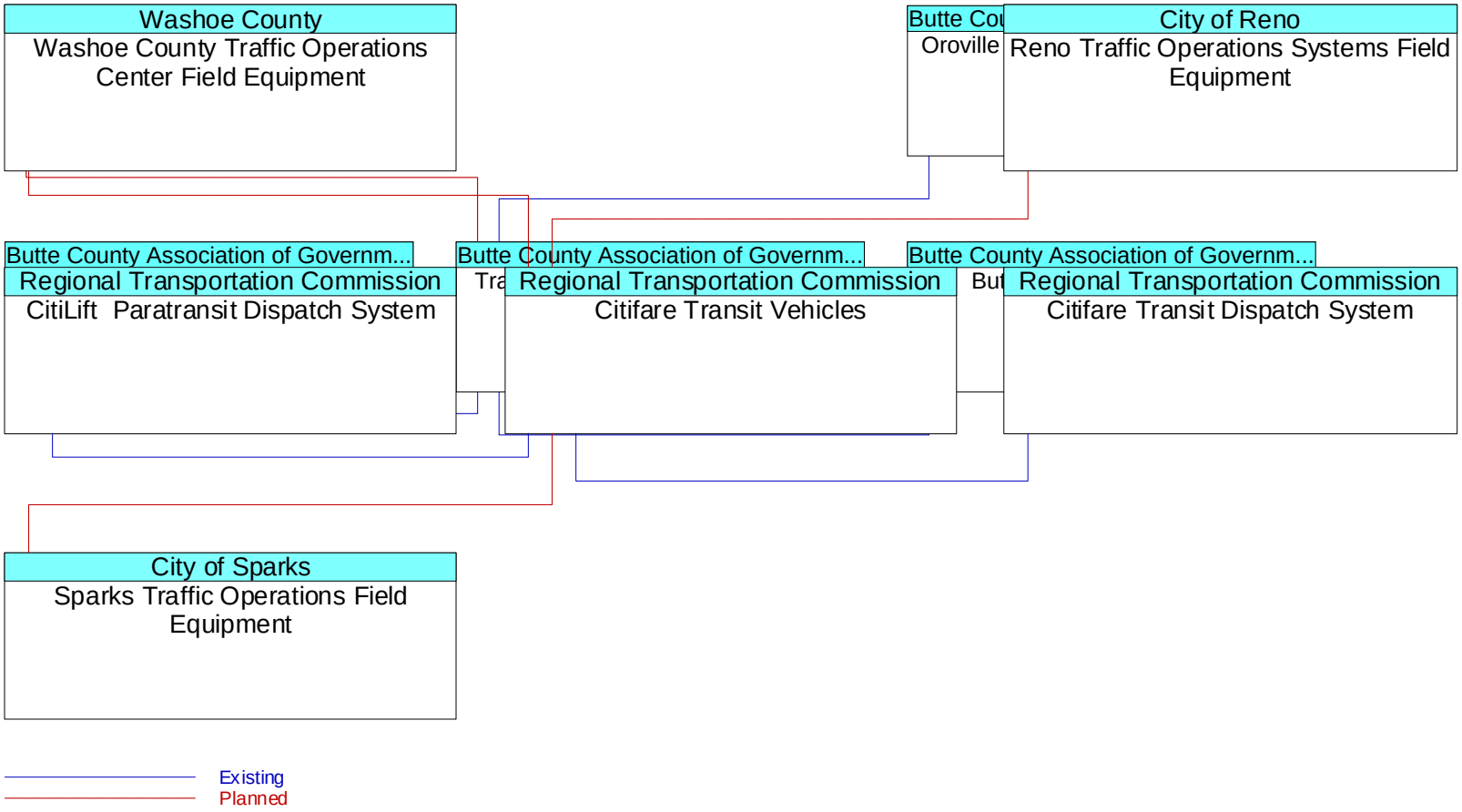
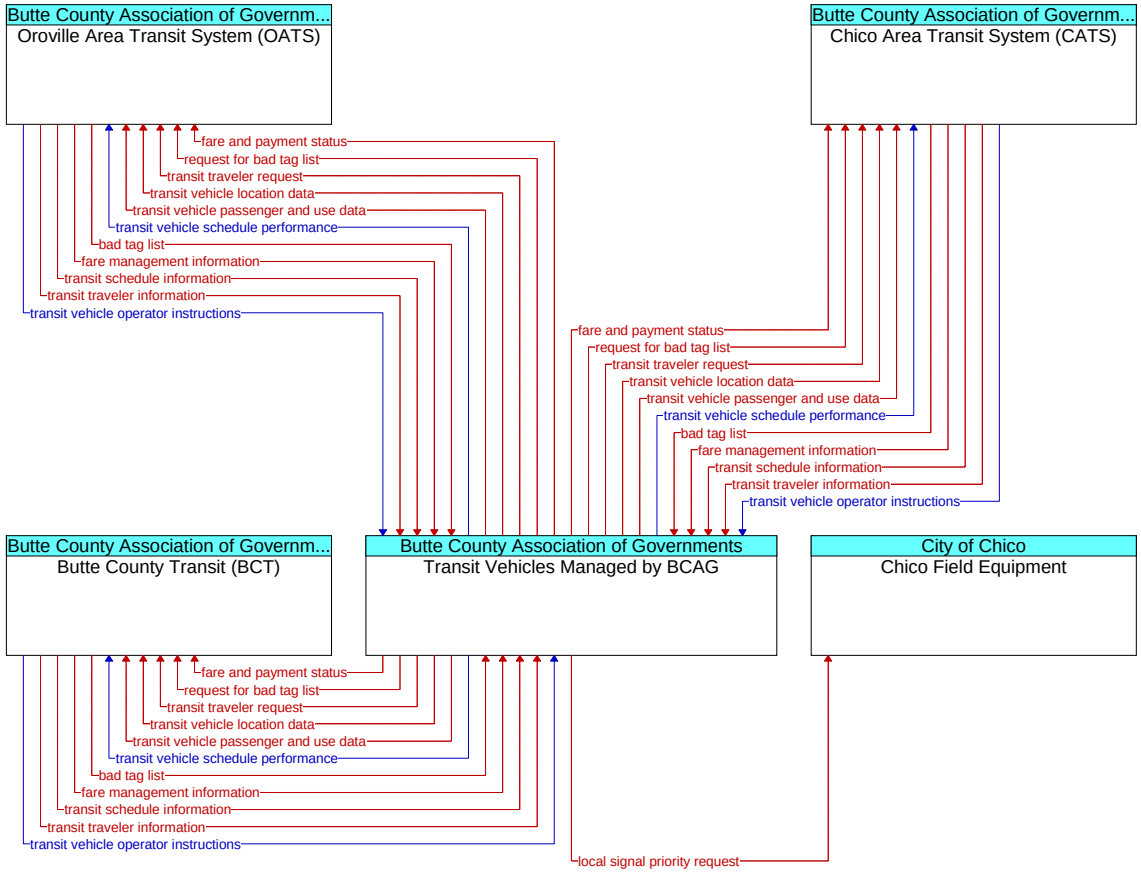


Figure 5: Information Flow Diagram



Example

Appendix A: North Valley Market Package Descriptions

Market Packages		Description
ARCHIVED DATA MANAGEMENT *Archived Data (AD)*		
AD1	ITS Data Mart	This market package provides a focused archive that houses data collected and owned by a single agency, district, private sector provider, research institution, or other organization. This focused archive typically includes data covering a single transportation mode and one jurisdiction that is collected from an operational data store and archived for future use. It provides the basic data quality, data privacy, and meta data management common to all ITS archives and provides general query and report access to archive data users.
PUBLIC TRANSPORTATION *Advanced Public Transportation Systems (APTS)*		
APTS1	Transit Vehicle Tracking	This market package monitors current transit vehicle location using an Automated Vehicle Location System. The location data may be used to determine real time schedule adherence and update the transit system's schedule in real-time. Vehicle position may be determined either by the vehicle (e.g., through GPS) and relayed to the infrastructure or may be determined directly by the communications infrastructure. A two-way wireless communication link with the Transit Management Subsystem is used for relaying vehicle position and control measures. Fixed route transit systems may also employ beacons along the route to enable position determination and facilitate communications with each vehicle at fixed intervals. The Transit Management Subsystem processes this information, updates the transit schedule and makes real-time schedule information available to the Information Service Provider.
APTS2	Transit Fixed-Route Operations	This market package performs vehicle routing and scheduling, as well as automatic operator assignment and system monitoring for fixed-route and flexible-route transit services. This service determines current schedule performance using AVL data and provides information displays at the Transit Management Subsystem. Static and real time transit data is exchanged with Information Service Providers where it is integrated with that from other transportation modes (e.g. rail, ferry, air) to provide the public with integrated and personalized dynamic schedules.
APTS3	Demand Response Transit Operations	This market package performs vehicle routing and scheduling as well as automatic operator assignment and monitoring for demand responsive transit services. In addition, this market package performs similar functions to support dynamic features of flexible-route transit services. This package monitors the current status of the transit fleet and supports allocation of these fleet resources to service incoming requests for transit service while also considering traffic conditions. The Transit Management Subsystem provides the necessary data processing and information display to assist the transit operator in making optimal use of the transit fleet. This service includes the capability for a traveler request for personalized transit services to be made through the Information Service Provider (ISP) Subsystem. The ISP may either be operated by a transit management center or be independently owned and operated by a separate service provider. In the first scenario, the traveler makes a direct request to a specific paratransit service. In the second scenario, a third party service provider determines that the paratransit service is a viable means of satisfying a traveler request and makes a reservation for the traveler.

Market Packages		Description
APTS4	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. Sensors mounted on the vehicle permit the operator and central operations to determine vehicle loads, and readers located either in the infrastructure or on-board the transit vehicle allow electronic fare payment. Data is processed, stored, and displayed on the transit vehicle and communicated as needed to the Transit Management Subsystem. Two other market packages, ATMS10: Electronic Toll Collection and ATMS16: Parking Facility Management also provide electronic payment services. These three market packages in combination provide an integrated electronic payment system for transportation services.
APTS5	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. The surveillance equipment includes video (e.g., CCTV cameras), audio systems and/or event recorder systems. The sensor equipment includes threat sensors (e.g., chemical agent, toxic industrial chemical, biological, explosives, and radiological sensors) and object detection sensors (e.g., metal detectors). Transit user or transit vehicle operator activated alarms are provided on-board. Public areas (e.g., transit stops, park and ride lots, stations) are also monitored with similar surveillance and sensor equipment and provided with transit user activated alarms. In addition this market package provides surveillance and sensor monitoring of non-public areas of transit facilities (e.g., transit yards) and transit infrastructure such as bridges, tunnels, and transit railways or bus rapid transit (BRT) guideways. The surveillance equipment includes video and/or audio systems. The sensor equipment includes threat sensors and object detection sensors as described above as well as, intrusion or motion detection sensors and infrastructure integrity monitoring (e.g., rail track continuity checking or bridge structural integrity monitoring). The surveillance and sensor information is transmitted to the Emergency Management Subsystem, as are transit user activated alarms in public secure areas. On-board alarms, activated by transit users or transit vehicle operators are transmitted to both the Emergency Management Subsystem and the Transit Management Subsystem, indicating two possible approaches to implementing this market package. In addition the market package supports remote transit vehicle disabling by the Transit Management Subsystem and transit vehicle operator authentication.
APTS6	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.

Market Packages		Description
APTS7	Multi-modal Coordination	This market package establishes two way communications between multiple transit and traffic agencies to improve service coordination. Multimodal coordination between transit agencies can increase traveler convenience at transit transfer points and clusters (a collection of stops, stations, or terminals where transfers can be made conveniently) and also improve operating efficiency. Transit transfer information is shared between Multimodal Transportation Service Providers, Transit Agencies, and ISPs. Coordination between traffic and transit management is intended to improve on-time performance of the transit system to the extent that this can be accommodated without degrading overall performance of the traffic network. More limited local coordination between the transit vehicle and the individual intersection for signal priority is also supported by this package.
APTS8	Transit Traveler Information	This market package provides transit users at transit stops and on-board transit vehicles with ready access to transit information. The information services include transit stop annunciation, imminent arrival signs, and real-time transit schedule displays that are of general interest to transit users. Systems that provide custom transit trip itineraries and other tailored transit information services are also represented by this market package.
TRAVELER INFORMATION *Advanced Traveler Information Systems (ATIS)*		
ATIS1	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). The information may be provided directly to travelers or provided to merchants and other traveler service providers so that they can better inform their customers of travel conditions. Different from the market package ATMS6 - Traffic Information Dissemination, which provides localized HAR and DMS information capabilities, ATIS1 provides a wide area digital broadcast service. Successful deployment of this market package relies on availability of real-time traveler information from roadway instrumentation, probe vehicles or other sources.
ATIS5	ISP Based Route Guidance	This market package offers the user pre-trip route planning and turn-by-turn route guidance services. Routes may be based on static information or reflect real time network conditions. Unlike ATIS3 and ATIS4, where the user equipment determines the route, the route determination functions are performed in the Information Service Provider Subsystem in this market package. This approach simplifies the user equipment requirements and can provide the infrastructure better information on which to predict future traffic. The package includes two way data communications and optionally also equips the vehicle with the databases, location determination capability, and display technology to support turn by turn route guidance.
TRAFFIC MANAGEMENT *Advanced Transportation Management Systems (ATMS)*		

Market Packages		Description
ATMS01	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). The data generated by this market package enables traffic managers to monitor traffic and road conditions, identify and verify incidents, detect faults in indicator operations, and collect census data for traffic strategy development and long range planning. The collected data can also be analyzed and made available to users and the Information Service Provider Subsystem.
ATMS03	Surface Street Control	This market package provides the central control and monitoring equipment, communication links, and the signal control equipment that support local surface street control and/or arterial traffic management. A range of traffic signal control systems are represented by this market package ranging from fixed-schedule control systems to fully traffic responsive systems that dynamically adjust control plans and strategies based on current traffic conditions and priority requests. Additionally, general advisory and traffic control information can be provided to the driver while en route. This market package is generally an intra-jurisdictional package that does not rely on real-time communications between separate control systems to achieve area-wide traffic signal coordination. Systems that achieve coordination across jurisdictions by using a common time base or other strategies that do not require real time coordination would be represented by this package. This market package is consistent with typical urban traffic signal control systems.
ATMS04	Freeway Control	This market package provides the communications and roadside equipment to support ramp control, lane controls, and interchange control for freeways. Coordination and integration of ramp meters are included as part of this market package. This package is consistent with typical urban traffic freeway control systems. This package incorporates the instrumentation included in the Network Surveillance Market Package to support freeway monitoring and adaptive strategies as an option. This market package also includes the capability to utilize surveillance information for detection of incidents. Typically, the processing would be performed at a traffic management center; however, developments might allow for point detection with roadway equipment. For example, a CCTV might include the capability to detect an incident based upon image changes. Additionally, this market package allows general advisory and traffic control information to be provided to the driver while en route.
ATMS06	Traffic Information Dissemination	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. Careful placement of the roadway equipment provides the information at points in the network where the drivers have recourse and can tailor their routes to account for the new information. This package also covers the equipment and interfaces that provide traffic information from a traffic management center to the media (for instance via a direct tie-in between a traffic management center and radio or television station computer systems), Transit Management, Emergency Management, and Information Service Providers. A link to the Maintenance and Construction Management subsystem allows real time information on road/bridge closures due to maintenance and construction activities to be disseminated.

Market Packages		Description
ATMS07	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. The nature of optimization and extent of information and control sharing is determined through working arrangements between jurisdictions. This package relies principally on roadside instrumentation supported by the Surface Street Control and Freeway Control Market Packages and adds hardware, software, and fixed-point to fixed-point communications capabilities to implement traffic management strategies that are coordinated between allied traffic management centers. Several levels of coordination are supported from sharing of information through sharing of control between traffic management centers.
ATMS08	Traffic Incident Management System	This market package manages both unexpected incidents and planned events so that the impact to the transportation network and traveler safety is minimized. The market package includes incident detection capabilities through roadside surveillance devices (e.g. CCTV) and through regional coordination with other traffic management, maintenance and construction management and emergency management centers as well as rail operations and event promoters. Information from these diverse sources is collected and correlated by this market package to detect and verify incidents and implement an appropriate response. This market package supports traffic operations personnel in developing an appropriate response in coordination with emergency management, maintenance and construction management, and other incident response personnel to confirmed incidents. The response may include traffic control strategy modifications or resource coordination between center subsystems. Incident response also includes presentation of information to affected travelers using the Traffic Information Dissemination market package and dissemination of incident information to travelers through the Broadcast Traveler Information or Interactive Traveler Information market packages. The roadside equipment used to detect and verify incidents also allows the operator to monitor incident status as the response unfolds. The coordination with emergency management might be through a CAD system or through other communication with emergency field personnel. The coordination can also extend to tow trucks and other allied response agencies and field service personnel.
ATMS19	Speed Monitoring	This market package monitors the speeds of vehicles traveling through a roadway system. If the speed is determine to be excessive, roadside equipment can suggest a safe driving speed. Environmental conditions may be monitored and factored into the safe speed advisories that are provided to the motorist. This service can also support notifications to an enforcement agency to enforce the speed limit on a roadway system.
ATMS21	Roadway Closure Management	This market package closes roadways to vehicular traffic when driving conditions are unsafe, maintenance must be performed, and other scenarios where access to the roadway must be prohibited. The market package includes automatic or remotely controlled gates or barriers that control access to roadway segments including ramps and traffic lanes. Remote control systems allow the gates to be controlled from a central location, improving system efficiency and reducing personnel exposure to unsafe conditions during severe weather and other situations where roads must be closed. Surveillance systems allow operating personnel to visually verify the safe activation of the closure system and driver information systems (e.g., DMS) provide closure information to motorists in the vicinity of the closure. The equipment managed by this market package includes the control and monitoring systems, the field devices (e.g., gates, warning lights, DMS, CCTV cameras) at the closure location(s), and the information systems that notify other systems of a closure. This market package covers general road closure applications; specific closure systems that are used at railroad grade crossings, drawbridges, reversible lanes, etc. are covered by other ATMS market packages.

Market Packages		Description
EMERGENCY MANAGEMENT *Emergency Management (EM)*		
EM1	Emergency Call-Taking and Dispatch	This market package provides basic public safety call-taking and dispatch services. It includes emergency vehicle equipment, equipment used to receive and route emergency calls, and wireless communications that enable safe and rapid deployment of appropriate resources to an emergency. Coordination between Emergency Management Subsystems supports emergency notification between agencies. Wide area wireless communications between the Emergency Management Subsystem and an Emergency Vehicle supports dispatch and provision of information to responding personnel.
EM06	Wide-Area Alert	This market package uses ITS driver and traveler information systems to alert the public in emergency situations such as child abductions, severe weather events, civil emergencies, and other situations that pose a threat to life and property. The alert includes information and instructions for transportation system operators and the traveling public, improving public safety and enlisting the public's help in some scenarios. The ITS technologies will supplement and support other emergency and homeland security alert systems such as the Emergency Alert System (EAS). When an emergency situation is reported and verified and the terms and conditions for system activation are satisfied, a designated agency broadcasts emergency information to traffic agencies, transit agencies, information service providers, toll operators, and others that operate ITS systems. The ITS systems, in turn, provide the alert information to transportation system operators and the traveling public using ITS technologies such as dynamic message signs, highway advisory radios, in-vehicle displays, transit displays, 511 traveler information systems, and traveler information web sites.
EM07	Early Warning System	This market package monitors and detects potential, looming, and actual disasters including natural disasters (hurricanes, earthquakes, floods, winter storms, tsunamis, etc.) and technological and man-made disasters (hazardous materials incidents, nuclear power plant accidents, and acts of terrorism including nuclear, chemical, biological, and radiological weapons attacks). The market package monitors alerting and advisory systems, ITS sensors and surveillance systems, field reports, and emergency call-taking systems to identify emergencies and notifies all responding agencies of detected emergencies.
EM08	Disaster Response and Recovery	This market package enhances the ability of the surface transportation system to respond to and recover from disasters. It addresses the most severe incidents that require an extraordinary response from outside the local community. All types of disasters are addressed including natural disasters (hurricanes, earthquakes, floods, winter storms, tsunamis, etc.) and technological and man-made disasters (hazardous materials incidents, nuclear power plant accidents, and national security emergencies such as nuclear, chemical, biological, and radiological weapons attacks). The market package supports coordination of emergency response plans, including general plans developed before a disaster as well as specific tactical plans with short time horizon that are developed as part of a disaster response. The market package provides enhanced access to the scene for response personnel and resources, provides better information about the transportation system in the vicinity of the disaster, and maintains situation awareness regarding the disaster itself. In addition, this market package tracks and coordinates the transportation resources - the transportation professionals, equipment, and materials – that constitute a portion of the disaster response.

Market Packages		Description
EM08 (cont'd)	Disaster Response and Recovery (cont'd)	The market package identifies the key points of integration between transportation systems and the public safety, emergency management, and other allied organizations that form the overall disaster response. In this market package, the Emergency Management subsystem represents the federal, regional, state, and local Emergency Operations Centers and the Incident Commands that are established to respond to the disaster. The interface between the Emergency Management Subsystem and the other center subsystems provides situation awareness and resource coordination among transportation and other allied response agencies. In its role, traffic management implements special traffic control strategies and detours and restrictions to effectively manage traffic in and around the disaster. Maintenance and construction provides damage assessment of road network facilities and manages service restoration. Transit management provides a similar assessment of status for transit facilities and modifies transit operations to meet the special demands of the disaster. As immediate public safety concerns are addressed and disaster response transitions into recovery, this market package supports transition back to normal transportation system operation, recovering resources, managing on-going transportation facility repair, supporting data collection and revised plan coordination, and other recovery activities. This market package builds on the basic traffic incident response service that is provided by ATMS08, the Traffic Incident Management market package. This market package addresses the additional complexities and coordination requirements that are associated with the most severe incidents that warrant an extraordinary response from outside the local jurisdictions and require special measures such as the activation of one or more emergency operations centers. Many users of the National ITS Architecture will want to consider both ATMS08 and this market package since every region is concerned with both day-to-day management of traffic-related incidents and occasional management of disasters that require extraordinary response. Disaster Response and Recovery is also supported by EM10, the "Disaster Traveler Information" market package that keeps the public informed during a disaster response. See that market package for more information.

Market Packages		Description
EM09	Evacuation and Reentry Management	This market package supports evacuation of the general public from a disaster area and manages subsequent reentry to the disaster area. The market package addresses evacuations for all types of disasters, including disasters like hurricanes that are anticipated and occur slowly, allowing a well-planned orderly evacuation, as well as disasters like terrorist acts that occur rapidly, without warning, and allow little or no time for preparation or public warning. This market package supports coordination of evacuation plans among the federal, state, and local transportation, emergency, and law enforcement agencies that may be involved in a large-scale evacuation. All affected jurisdictions (e.g., states and counties) at the evacuation origin, evacuation destination, and along the evacuation route are informed of the plan. Information is shared with traffic management agencies to implement special traffic control strategies and to control evacuation traffic, including traffic on local streets and arterials as well as the major evacuation routes. Reversible lanes, shoulder use, closures, special signal control strategies, and other special strategies may be implemented to maximize capacity along the evacuation routes. Transit resources play an important role in an evacuation, removing many people from an evacuated area while making efficient use of limited capacity. Additional shared transit resources may be added and managed in evacuation scenarios. Resource requirements are forecast based on the evacuation plans, and the necessary resources are located, shared between agencies if necessary, and deployed at the right locations at the appropriate times. Evacuations are also supported by EM10, the "Disaster Traveler Information" market package, which keeps the public informed during evacuations. See that market package for more information.
EM10	Disaster Traveler Information	This market package uses ITS to provide disaster-related traveler information to the general public, including evacuation and reentry information and other information concerning the operation of the transportation system during a disaster. This market package collects information from multiple sources including traffic, transit, public safety, emergency management, shelter provider, and travel service provider organizations. The collected information is processed and the public is provided with real-time disaster and evacuation information using ITS traveler information systems. A disaster will stress the surface transportation system since it may damage transportation facilities at the same time that it places unique demands on these facilities to support public evacuation and provide access for emergency responders. Similarly, a disaster may interrupt or degrade the operation of many traveler information systems at the same time that safety-critical information must be provided to the traveling public. This market package keeps the public informed in these scenarios, using all available means to provide information about the disaster area including damage to the transportation system, detours and closures in effect, special traffic restrictions and allowances, special transit schedules, and real-time information on traffic conditions and transit system performance in and around the disaster.

Market Packages		Description
EM10 (cont'd)	Disaster Traveler Information (cont'd)	This market package also provides emergency information to assist the public with evacuations when necessary. Information on mandatory and voluntary evacuation zones, evacuation times, and instructions are provided. Available evacuation routes and destinations and current and anticipated travel conditions along those routes are provided so evacuees are prepared and know their destination and preferred evacuation route. Information on available transit services and traveler services (shelters, medical services, hotels, restaurants, gas stations, etc.) is also provided. In addition to general evacuation information, this market package provides specific evacuation trip planning information that is tailored for the evacuee based on origin, selected destination, and evacuee-specified evacuation requirements and route parameters. This market package augments the ATIS market packages that provide traveler information on a day-to-day basis for the surface transportation system. This market package provides focus on the special requirements for traveler information dissemination in disaster situations.
MAINTENANCE & CONSTRUCTION OPERATIONS *Maintenance & Construction Operations (MCO)*		
MC01	Maintenance and Construction Vehicle Tracking	This market package will track the location of maintenance and construction vehicles and other equipment to ascertain the progress of their activities. These activities can include ensuring the correct roads are being plowed and work activity is being performed at the correct locations.
MC02	Maintenance and Construction Vehicle Maintenance	This market package performs vehicle maintenance scheduling and manages both routine and corrective maintenance activities on vehicles and other maintenance and construction equipment. It includes on-board sensors capable of automatically performing diagnostics for maintenance and construction vehicles, and the systems that collect this diagnostic information and use it to schedule and manage vehicle maintenance.
MC03	Road Weather Data Collection	This market package collects current road and weather conditions using data collected from environmental sensors deployed on and about the roadway (or guideway in the case of transit related rail systems). In addition to fixed sensor stations at the roadside, sensing of the roadway environment can also occur from sensor systems located on Maintenance and Construction Vehicles and on-board sensors provided by auto manufacturers. The collected environmental data is used by the Weather Information Processing and Distribution Market Package to process the information and make decisions on operations.
MC04	Weather Information Processing and Distribution	This market package processes and distributes the environmental information collected from the Road Weather Data Collection market package. This market package uses the environmental data to detect environmental hazards such as icy road conditions, high winds, dense fog, etc. so system operators and decision support systems can make decision on corrective actions to take. The continuing updates of road condition information and current temperatures can be used by system operators to more effectively deploy road maintenance resources, issue general traveler advisories, issue location specific warnings to drivers using the Traffic Information Dissemination market package, and aid operators in scheduling work activity.
MC06	Winter Maintenance	This market package supports winter road maintenance including snow plow operations, roadway treatments (e.g., salt spraying and other anti-icing material applications), and other snow and ice control activities. This package monitors environmental conditions and weather forecasts and uses the information to schedule winter maintenance activities, determine the appropriate snow and ice control response, and track and manage response operations.

Market Packages		Description
MC07	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. Maintenance services would include landscape maintenance, hazard removal (roadway debris, dead animals), routine maintenance activities (roadway cleaning, grass cutting), and repair and maintenance of both ITS and non-ITS equipment on the roadway (e.g., signs, traffic controllers, traffic detectors, dynamic message signs, traffic signals, CCTV, etc.). Environmental conditions information is also received from various weather sources to aid in scheduling maintenance and construction activities.
MC08	Work Zone Management	This market package directs activity in work zones, controlling traffic through portable dynamic message signs (DMS) and informing other groups of activity (e.g., ISP, traffic management, other maintenance and construction centers) for better coordination management. Work zone speeds and delays are provided to the motorist prior to the work zones.
MC10	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.

APPENDIX “B”
North Valley Market Package (Services)
Listed by Stakeholder