California Department Of
Transportation
Division Of Mass Transportation

Caltrans

CALIFORNIA

INTELLIGENT TRANSPORTATION SYSTEMS (ITS)

RURAL/NON-URBAN TRANSIT STATEWIDE PLAN

SEPTEMBER 2012

SYSTEM METRICS GROUP, INC.

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CALIFORNIA

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ITS STATEWIDE PLAN

September 2012

Contents

1. Overview

The California Department of Transportation (Caltrans) Division of Mass Transportation (DMT) is delegated the State's responsibility for the implementation and administration of the five Federal Transit Administration (FTA) grant programs: Section 5310 (Elderly and Disabled Specialized Transit); Section 5311 (Rural and Small Urban Transit); Section 5316 (Job Access and Reverse Commute); Section 5317 (New Freedom) and the American Recovery and Reinvestment Act (ARRA) of 2009 – Non-Urbanized Area Formula (Section 5311) program. To implement and administer the five FTA grant programs accordingly, the State must be in compliance with the Federal requirements under FTA Circulars: C 9070.1F, C 9040.1F, C 9050.1, C 9045.1 and the ARRA 2009 under Federal Register Volume 74, Issue No.42 (March 5, 2009). In April of 2010, the FTA identified specific shortcomings that DMT must address in order to fully comply with federal grant management and program requirements.

The Intelligent Transportation Systems (ITS) Rural/Non-Urban Transit Plan, the ITS Plan, is the second deliverable in the effort to develop a comprehensive statewide rural and non-urban transit ITS strategy to ensure compliance with the National ITS Architecture Final Rule and Final Policy requirements. The ITS Plan describes a process that allows rural/non-urban transit providers to manage and develop their services, while allowing the state to identify the systems that are considered ITS and ensure that they meet all federal requirements.

The FTA National ITS Architecture Policy on Transit Projects[1] [Federal Register: January 8, 2001 (Volume 66, Number 5)] was provided to ensure that intelligent transportation system projects carried out using Mass Transit Funds from the Highway Trust Fund to conform to the National ITS Architecture and applicable standards. (**Appendix A** of this Plan contains the FTA policy concerning ITS projects.)

Section VI of the policy details the requirements for implementing projects. Specifically, it states:

a. All ITS projects funded with Mass Transit Funds from the Highway Trust Fund shall be based on a systems engineering analysis;
b. The analysis should be on a scale commensurate with the project scope;
c. The systems engineering analysis shall include, at a minimum:
    1. Identification of portions of the regional ITS architecture being implemented (or if a regional ITS architecture does not exist, the applicable portions of the National ITS Architecture);
    2. Identification of participating agencies' roles and responsibilities;
    3. Requirements definitions;
    4. Analysis of alternative system configurations and technology options to meet requirements;
    5. Analysis of financing and procurement options;
    6. Identification of applicable ITS standards and testing procedures; and

[1] http://www.ops.fhwa.dot.gov/its_arch_imp/policy_2.htm

7. Procedures and resources necessary for operations and management of the system;

d. Upon completion of the regional ITS architecture required in section V, the final design of all ITS projects funded with highway trust funds shall accommodate the interface requirements and information exchanges as specified in the regional ITS architecture. If the final design of the ITS project is inconsistent with the regional ITS architecture, then the regional ITS architecture shall be updated as per the process defined in V(f) to reflect the changes;
e. Prior to completion of the regional ITS architecture, any major ITS project funded with highway trust funds that advances to final design shall have a project level ITS architecture that is coordinated with the development of the regional ITS architecture. The final design of the major ITS project shall accommodate the interface requirements and information exchanges as specified in this project level ITS architecture. If the project final design is inconsistent with the project level architecture, then the project level ITS architecture shall be updated to reflect the changes. The project level ITS architecture is based on results of the systems engineering analysis, and includes the following:
    1. A description of the scope of the ITS project;
    2. An operational concept that identifies the roles and responsibilities of participating agencies and stakeholders in the operation and implementation of the ITS project;
    3. Functional requirements of the ITS project;
    4. Interface requirements and information exchanges between the ITS project and other planned and existing systems and subsystems; and
    5. Identification of applicable ITS standards;
f. All ITS projects funded with Mass Transit Funds from the Highway Trust Funds shall use applicable ITS standards and interoperability tests that have been officially adopted through rulemaking by the United States Department of Transportation (US DOT); and
g. Any ITS project that has advanced to final design by (effective date of policy) is exempt from the requirements of VI.

The ITS Plan builds upon the foundation of the first deliverable, the Existing Documentation Review. The review identified and summarized federally-funded rural/non-urban transit ITS and the regional architectures in which they were included. It also documented how the ITS projects are implemented. This Plan uses that information to understand how the California transit providers use ITS and their basic understanding of its capabilities. It then expands by describing how ITS can be used to further enhance rural and non-urban transit operations.

1.1 ITS Rural/Non-Urban Transit Statewide Plan Status

The development of the ITS Rural/Non-Urban Transit Plan is being developed through five tasks. This section contains a brief description of those tasks and their status.

Task 1 – Review ITS Architecture Plans – This task has been completed. The resulting summary report identified California's federally-funded rural/non-urban transit ITS and determined deficiencies in regional architectures. The summary report described each ITS project and the regional architecture that represented it. A small subset of ITS projects was not represented in any architecture and the report summarized the steps required in order for them to meet federal ITS Architecture requirements.

Task 2 – Develop statewide Transit Rural and Non-urban Transit ITS Plan – This document represents the results of Task 2. The Plan identifies rural/non-urban transit needs that can be addressed by ITS, and the types of projects that can address those needs. The Plan also identifies factors that frequently impact rural/non-urban ITS implementations, and how the factors may be mitigated. The document also identifies strategies to ensure that future rural/non-urban transit ITS projects are integrated into regional ITS Architecture processes.

Task 3 – Critical Success Factors and Project Sequencing – This task will proceed after completion of the ITS Plan. The project team will identify factors that impact the success of ITS in the rural and non-urban environment and how to mitigate potential obstacles. The logical sequence for typical transit ITS projects will be described to help transit providers build upon the foundation established by earlier projects.

Task 4 – Draft and Final Documents – This task will formalize the deliverables of previous tasks and consolidate them into usable, concise documents.

Task 5 – Training Materials – In this final task, the project team will develop presentation materials, including a checklist for DMT staff that indicates what to look for when reviewing grant applications that request ITS project funding. These materials will help Caltrans DMT present ITS strategies, and simplify the guidance for future rural/non-urban transit ITS projects.

1.2 Existing Statewide Rural/Non-urban Transit ITS

The Existing Documentation Review completed in Task 1 identified 37 rural/non-urban projects that received federal funding assistance and appeared to have some ITS elements. The projects are listed in **Section 2** of this Plan with more detailed descriptions in **Appendix B**. The review of ITS projects provided an assessment and understanding of California's rural/non-urban transit providers' ITS needs and how they deploy and use ITS.

An objective of the first task was to determine whether rural/small-urban transit providers were complying with federal ITS Architecture requirements by participating and being included in regional ITS Architectures. After detailed review, it was determined that more than 90% of the

reviewed ITS projects were compliant. The Plan discusses how those providers can continue to be included and participate in regional ITS planning and architecture development.

During the review, the study identified a small subset of projects deployed without being formally involved in a regional ITS Architecture process. The ITS Plan explains the process for creating project level ITS architectures for these types of projects as described in **Section 4.**

1.3 Caltrans Goals and Objectives

Table 1 lists the goals of Caltrans and how transit ITS can be an effective tool in achieving them.

Table 1: Mapping Transit ITS to Caltrans Goals

Caltrans Goal	Transit ITS
SAFETY Provide the safest transportation system in the nation for users and workers.	Transit ITS includes systems such as on-board security cameras and silent alarms that improve the safety of transit for passengers and drivers. Vehicle tracking allows transit and emergency management to remotely track vehicles and monitor conditions.
MOBILITY Maximize transportation system performance and accessibility.	Transit ITS includes systems to improve Fixed-route and demand-response management. They provide transit providers with more accurate information for planning and scheduling, thereby improving on-time performance and increase service.
DELIVERY Efficiently deliver quality transportation projects and services	Transit ITS can improve efficiency by generating more complete information for planning and scheduling, and by giving rural/non-urban transit providers the ability to respond more quickly to customer needs.
STEWARDSHIP Preserve and enhance California's resources and assets	Transit ITS includes many systems, such as real-time transit information, that encourage increased transit ridership, thereby reducing congestion and single-passenger trips.
SERVICE Promote quality service through an excellent workforce	Transit ITS can provide transit staff with improved tools and more comprehensive data with which to perform their jobs, resulting in a more productive workforce.

2. Needs Assessment

The Federal Transit Administration provides guidance on assessing the feasibility of ITS for rural and non-urban transit in the *Technology in Rural Transit Guidebook*[2] attached as **Appendix E**. The guide was developed in 2002, and in the subsequent years, technology has advanced and become more feasible in rural areas due to wider acceptance and availability of wireless communications, maturity in transit ITS technology that has improved reliability and lowered costs, and increasing technology sophistication in rural and non-urban areas. However, the guide provides a framework for evaluating rural and non-urban transit needs and selecting appropriate, cost-effective technologies. This section uses a framework provided by the *Guidebook* to identify rural and non-urban transit needs.

2.1 The Need for Transit Technology

In order for rural and non-urban transit providers to implement the appropriate technologies, the agencies must have a strong understanding of their existing and future needs. The needs are based on perceived issues and opportunities for the agency to improve its service, efficiency and safety. This requires the input of all stakeholders, including customers, maintenance, drivers, dispatchers, security and administration. For small providers, many of these roles overlap.

Key questions that should be asked by rural/non-urban transit providers include:

- Is the agency meeting its service demand?
- Are the providers' potential passengers getting good information to make travel decisions?
- Are there customer complaints and what is their nature?
- Does the provider want to increase ridership?
- Does the provider want to reduce complaints?
- Does the provider want to increase employee job satisfaction?
- Does the provider want to lower operating costs?
- Does the provider want to provide more service for the same or less cost?

2.2 Identifying Future Needs

After identifying the basic needs of a rural/non-urban transit provider, it is important to examine the changes that may occur within the region. Future needs may be influenced by:

- Changing demographics.
- Changes in agency services.

[2] http://www.fta.dot.gov/documents/RuralITSTechnologyGuidebook.pdf, January 2002

- Technologies planned and implemented by neighboring transit providers and partners and the type of technology planned.
- Planning of other regional transportation providers.
- Advancements in technologies and availability of communications in the region.
- Anticipated funding levels.

Table 2 summarizes common needs and the transit ITS technologies that have been successfully deployed by rural/non-urban transit providers throughout the United States to address them. The needs are listed in five categories:

- Fixed route management;
- Demand response management;
- Transit traveler information;
- Fare and passenger management; and
- Passenger, vehicle and operator safety.

Table 2: Common Rural/Non-Urban Transit Needs and Associated Technologies

Need Category	Need	Related Transit Technology
Fixed Route Management	• Track bus location.	• Automated Vehicle Location (AVL) system
	• Monitor schedule and route adherence.	• AVL system
	• Have accurate performance data for planning.	• AVL system • Automated Passenger Counters
	• Improve scheduling and routing efficiency.	• Fixed-route management software
	• Improve communications with bus operators.	• Mobile Data Terminal
	• Improve coordination among dispatch, field supervisors and bus operators.	• AVL system • Mobile Data Terminal
	• Improve maintenance monitoring and tracking.	• AVL system • Maintenance software
	• Simplify reporting.	• Fixed-route management software
Demand Response Management	• Track bus location.	• AVL system
	• Monitor schedule adherence.	• AVL system
	• Improve scheduling and routing efficiency.	• AVL system • Demand-response management software
	• Improved communications with bus operators.	• Mobile Data Terminal
	• Improve maintenance monitoring and tracking.	• AVL system • Maintenance software
	• Improve speed and accuracy of the booking and scheduling processes.	• Demand-response management software

Need Category	Need	Related Transit Technology
	• Automate booking and scheduling processes.	• Demand-response management software
	• Improve record-keeping and simplify reporting.	• Demand-response management software
Transit Traveler Information	• Improve information about vehicle locations and schedules.	• AVL system • Dynamic stop signage
	• Increase automated information dissemination.	• Transit Traveler Information
	• Improve on-board passenger information.	• Automated Stop announcement
	• Improve trip planning	• Transit Traveler Information
Fare and Passenger Management	• More efficient, accurate cash handling.	• Electronic farebox
	• Collect more information about passenger trips (e.g., passenger counts)	• Electronic farebox • Demand-response transit management software
	• Provide payment flexibility	• Electronic farebox
	• Simplify bookkeeping	• Electronic farebox
	• Automate payments and invoicing.	• Accounting software
Passenger, Vehicle and Operator Safety	• Monitor onboard activity.	• Transit surveillance (e.g., live video to law enforcement)
	• Replay bus trips (e.g. review time bus visited each stop and the path taken).	• AVL system
	• Improve response to onboard incidents.	• AVL system • Transit surveillance • Mobile Data Terminal
	• Locate off-route buses.	• AVL system
	• Improve communications with bus operators	• Mobile Data Terminals (MDT)

2.3 Typical Rural/Non-Urban Transit ITS

Table 3 provides a summary description of the transit technologies that have been identified as addressing typical rural/non-urban transit needs. Following the descriptions, the table identifies California's rural/non-urban providers who have received federal funding to deploy the technology type.

It should be noted that the descriptions are general and that there are many ways that each technology may be implemented. They may be implemented to address one or several of the needs associated with them in **Table 2**. In addition, the identified projects are those that received federal funding in recent years. The list may not include all technologies deployed by California's rural/non-urban transit providers.

The last column of **Table 3** identifies other transit ITS technologies that are associated with the described technology. The associated technologies are listed as "Dependent" or "Complementary". Dependent technologies are those that can only be deployed in conjunction with the technology described in the first column. Complementary technologies are those that can be deployed independently, but are enhanced by the technology described in the first column.

Table 3: Typical Rural/Non-Urban Transit ITS

Technology	California Rural/non-urban Providers Using The Technology	Associated Transit ITS Technologies
Accounting Software Electronically processes, stores, tracks, and reports standard accounting data. This is typically applicable to rural and non-urban providers with complex accounting, such as multiple service payers or complex funding structures.		**Complementary** Electronic Payment Systems – Can automatically upload fare and passenger information to the accounting software for billing, reconciliation and reporting
Automated Passenger Counter Collect data on passenger boarding and alighting by time and location. This information can be used to increase the overall operating efficiency through better service planning. APC is intended for fixed-route service and, in conjunction with Automated Vehicle Location, can count passenger boarding alighting by time, route and location. It is typically only used on routes with large ridership.	• City of Arvin (Kern County) • SunLine Transit Agency (Riverside County) • San Diego Metropolitan Transit System (San Diego County)	**Complementary** AVL – AVL greatly enhances passenger counting by adding time and location information to boardings and alightings.

Technology	California Rural/non-urban Providers Using The Technology	Associated Transit ITS Technologies
Automated Stop Announcement Automated stop announcement systems can provide text, graphical and audible announcements of the next stop location. They may be integrated with odometers or AVL to automatically identify the vehicle location to trigger announcements. The systems may also be used to make other automated on-board announcements such as rules, fare information or upcoming service changes.		**Dependent** AVL – AVL greatly enhances passenger counting by adding time and location information to boardings and alightings. Mobile Data Terminal – Stop Announcement data is typically stored on the Mobile Data Terminal. The terminal communicates with on-board signs to display or make audible stop announcements.

Technology	California Rural/non-urban Providers Using The Technology	Associated Transit ITS Technologies
AVL Measure real-time positions of vehicles using onboard computers and a positioning system (such as global positioning system, signpost, or dead reckoning) and relay the information to a central location. AVL is applicable to both demand-response and fixed-route service and can be deployed by any sized service provider. It requires a robust wireless data communication network in the provider's service area. *Note that many—but not all—AVL projects include Mobile Data Terminals for vehicles.*	• City of Escalon (San Joaquin County) • City of Lincoln (Placer County) • City of Ridgecrest (Kern County) • City of Santa Rosa (Sonoma County) • City of Tulare (Tulare County) • Eastern Sierra Nevada Transit Authority (Inyo County) • Kings County Area Public Transit Agency (Kings, Fresno, Tulare, Kern, Madera Counties) • Lake Transit Authority (Lake County) • Lifesteps Foundation (Los Angeles County) • Merced County Transit (Mariposa, Merced and Mono Counties) • Monterey-Salinas Transit (Monterey County) • Paratransit, Inc. (Sacramento County) • Pride Industries (Placer County) • San Benito County Local Transportation Authority (San Benito County) • San Diego Metropolitan Transit System (San Diego County) • SunLine Transit Agency (Riverside County) • Tarzana Treatment Centers, Inc. (Los Angeles County) • Trinity County Transit (Trinity County) • United Cerebral Palsy of San Luis Obispo (San Luis Obispo County) • Valley Village (Los Angeles and part of Ventura County)	**Complementary** Mobile Data Terminals – Most AVL deployments include Mobile Data Terminals that bus operators use to view messages and manifest, schedule and navigation information. However, can be deployed without Mobile Data Terminals, usually in real-time arrival prediction systems. Fixed-Route Management Software – Management software allows for monitoring buses and communicating with bus operators as well as archiving and reporting AVL data. Demand-Response Management Software – Management software allows for monitoring demand-response vehicles and communications with vehicle operators regarding manifests, schedules, special instructions and navigation.

Technology	California Rural/non-urban Providers Using The Technology	Associated Transit ITS Technologies
Demand-Response Management Software Expedites call taking; automatically schedules trips and routes vehicles; collects and maintains client service and vehicle data; and generates standard and customized reports. Current systems are usually coordinated with AVL and accommodate for online reservations, automated call reminders to passengers and tracking the location and schedule adherence of demand-response vehicles. Rural and non-urban transit providers with limited vehicles frequently find demand-response transit software effective in improving the efficiency of scheduling their limited number of vehicles and drivers.	• City of Ridgecrest (Kern County) • Easy Lift Services (Santa Barbara County) • Kings County Area Public Transit Agency (Kings, Fresno, Tulare, Kern, Madera Counties) • Lifesteps Foundation (Los Angeles County) • Merced County Transit (Mariposa, Merced and Mono Counties) • Milestones Adult Development (Solano County) • Paratransit, Inc. (Sacramento County) • Pride Industries (Placer County) • Petaluma Transit (Sonoma County) • San Joaquin Regional Transit District (San Joaquin County) • SunLine Transit Agency (Riverside County) • Tarzana Treatment Centers, Inc. (Los Angeles County) • United Cerebral Palsy of San Luis Obispo (San Luis Obispo County) • Valley Village (Los Angeles and part of Ventura County)	**Complementary** AVL – AVL allows dispatchers to monitor vehicles, which provides better information for managing vehicles and developing manifests. It also can automate the reporting of demand-response vehicle trips, arrival and departure times.

Technology	California Rural/non-urban Providers Using The Technology	Associated Transit ITS Technologies
Electronic Payment Systems Allows travelers to pay for transportation services with electronic cards or tags. One goal of ITS is to provide travelers with a common electronic payment medium for all transportation modes and functions. This includes automated fare payment systems such as Smart Cards, bar codes, and magnetic stripe cards.	• Fresno County Transportation Authority (Fresno County) • Humboldt Transit Authority (Humboldt and Trinity Counties) • Sage State (Modoc County) • San Luis Obispo Regional Transit Authority (San Luis Obispo County and northern Santa Barbara County) • Santa Cruz Metropolitan Transit District (Santa Cruz County) • Siskiyou County Transit (Siskiyou County) • Stanislaus County Public Works (Stanislaus County) • Trinity county Transit (Trinity County) • Yolo County Transportation District (Yolo County) • Yosemite Area Regional Transportation System (Mariposa and Merced Counties, Yosemite National Park)	**Complementary** AVL – AVL can provide location information to each fare collected, enabling an agency to locate the boarding of each paying passenger.
Fixed-Route Management Software Manages the scheduling and dispatching of fixed-route transit service. Usually, it is coordinated with AVL to track schedule adherence and collect passenger and route information. Rural/non-urban transit providers with significant fixed-route service that requires data collection for planning and scheduling may benefit from fixed-route management software.	• Kings County Area Public Transit Agency (Kings, Fresno, Tulare, Kern, Madera Counties) • Merced County Transit (Mariposa, Merced and Mono Counties) • San Diego Metropolitan Transit System (San Diego County) • San Luis Obispo Regional Transit Authority (San Luis Obispo County and northern Santa Barbara County) • Stanislaus County Public Works (Stanislaus County) • SunLine Transit Agency (Riverside County)	**Complementary** AVL – AVL allows dispatchers to monitor vehicles, which provides better information for tracking schedule adherence. AVL can also archive data to allow for historical comparisons of route performance, and information for planning future service. Automated Passenger Counters – Passenger counts are useful information for planning and reporting, as well as allowing dispatchers to determine in real-time the status of vehicles and when additional service is needed.

Technology	California Rural/non-urban Providers Using The Technology	Associated Transit ITS Technologies
Maintenance Software Electronically processes, stores, and reports detailed vehicle maintenance and repair data, including parts and supplies inventories. Can be integrated with AVL, engine diagnostics readers or odometers to automatically notify maintenance staff of when maintenance is due.		**Complementary** AVL – Vehicle location information allows maintenance to automatically log miles traveled by vehicles and then determine the maintenance services needed. AVL also lets maintenance immediately locate disabled vehicles, thereby reducing response time.
Mobile Data Terminal Serves as the information link between control center and driver to relay relevant information such as dispatch, trip, route, and rider data. This can be a self-contained computer with communications, a smart phone or other mobile device.	• Fresno Area Express (Fresno County) *Note that this list includes providers who indicated Mobile Data Terminals but not AVL.*	**Dependent** AVL – Vehicle location data enables a Mobile Data Terminal to provide navigation information to vehicle operators, and to display schedule adherence information. **Complementary** Automated Passenger Counter – Passenger counting typically uses a Mobile Data Terminal to store, integrate with location information and exchange passenger count information with an agency's data warehouse and fixed-route management software.
Transit Traveler Information When applied to rural transit, traveler information can take many forms, including pre-trip information, in-vehicle information, and in-terminal/wayside information. Examples are automated trip itineraries, in-vehicle announcements, variable message signs and monitors, and interactive information kiosks.	• Eastern Sierra Nevada Transit Authority (Inyo County) • Regional Rideshare (Santa Cruz County) • San Luis Obispo Regional Transit Authority (San Luis Obispo County and northern Santa Barbara County) • SunLine Transit Agency (Riverside County)	**Complementary** AVL – Transit Traveler Information can use real-time vehicle locations to provide accurate bus-stop arrival time predictions. It can also be used to display vehicle locations to the public via the web, telephone or handheld device.

Technology	California Rural/non-urban Providers Using The Technology	Associated Transit ITS Technologies
Transit Security Monitor conditions on and around the vehicle to detect incidents and potential threats to the vehicle, driver and passengers. Transit surveillance may take the form of security cameras that capture images in and around the vehicle and store them for later review, or transmit them via wireless network to an operations center. It may also be a discreet system such as hidden alarm and hidden microphones that allows an operations center or emergency responder to monitor on-board conditions.	• City of Arvin (Kern County) • Sage Stage (Modoc County) • San Joaquin Regional Transit District (San Joaquin County) • Trinity county Transit (Trinity County) • United Cerebral Palsy of San Luis Obispo (San Luis Obispo County)	**Complementary** AVL – Some transit security, such as a silent alarm function can be enhanced by allowing dispatchers and emergency responders to identify the vehicle location when the alarm is triggered. Mobile Data Terminal – Transit surveillance, both audible and video can be transmitted to dispatchers and emergency responders through a mobile data terminal.

3. Alternatives Assessment

The procurement process can often be a major obstacle to implementing technology by rural/non-urban transit providers. The procurement of ITS technologies requires an understanding of not only the needs of the provider, but must also answer the following questions:

- What is ITS?
- What is available on the market?
- What does it do?
- Will it work in my geographic area?
- How will it be used?
- How will it integrate with other systems?
- How do I request the technology?

There are strategies used by other part of the country that can help rural/non-urban transit providers manage technology procurements. The following discussion assesses several alternative strategies for planning and procuring technology used by other regions.

Procurement Document Archive – Rural/non-urban transit providers have difficulty developing contracting documents that describe precisely the technologies they need and how they expect the technologies to be implemented. A library of contracting documents developed by the state's rural/non-urban transit providers could serve as a basis for new contracting documents.

To limit the number of paper files or electronic storage space, Caltrans can select sample contracts that illustrate best practices for California subrecipients. These contracting documents can be used to help small providers understand how to develop system requirements that can precisely meet their needs. Portions of existing procurement documents can be used by providers seeking new deployments, thereby reducing the level of effort.

The archived procurement documents can come from providers beyond California. They should represent the best practices of rural/non-urban transit providers throughout the state. The documents can be collected through monitoring and saving Requests for Proposals (RFP) issued by other providers.

In addition to RFPs, there is significant value in archiving the questions asked by vendors and consultants. These provide insight into which portions of previous RFPs were unclear or not consistent with current practices. The RFPs also provide contact information for the procuring

agency. That information can be invaluable resources to contact agencies in order to learn which vendors proposed, why the selected vendor was chosen, and lessons learned from the procurement and deployment processes.

Recommendation: A procurement document archive should be centralized and available to agencies during their technology planning. The archive should be curated in order to identify best practices and eliminate RFPs that are no longer useful because of technological evolution or changes in business practices.

User Groups – Rural/non-urban transit providers can benefit from participating in a peer user group. They provide a forum to discuss common issues, but also to learn from the experiences of peers. The value of a user group is especially great for technology where many of the peers have little to no experience. By communicating with their peers, rural/non-urban transit providers can share their experiences and technology needs.

A subcommittee of an existing group, or a group that already meets regularly is a useful starting point for this type of user group. Examples of existing groups include the Rural Transit Task Force or the California Association for Coordinated Transportation (CalACT)[3]. User groups can be easily established and can operate with virtually no cost or management effort. The groups must be promoted and the participants should be encouraged to participate through existing outlets, such as newsletters and web sites.

Recommendation: California's rural/non-urban transit providers should be encouraged to form regional and statewide user groups for transit technology.

ITS Architecture – The value of participation in regional architecture goes beyond ensuring a rural or small-urban transit agency meets federal funding requirements. **Section 4** of this plan provides a discussion of the value of regional ITS architecture for rural/non-urban transit providers.

Recommendation: Rural/non-urban transit providers should be encouraged to participate in their regional ITS architecture, and to be aware of ITS architecture training provided by the Federal Highway Administration (FHWA) (coordinated with Federal Transit Administration (FTA)), or the National Transit Institute (NTI)[4] through workshops and webinars. Caltrans DMT currently does, and should continue to, require providers requesting funding for transit ITS projects to include architecture documentation with their funding requests.

[3] http://www.calact.org/

[4] http://www.ntionline.com/

Joint and Regional Procurements – As illustrated in **Section 2**, many of California's rural/non-urban transit providers have similar needs and have deployed similar systems. In states such as Idaho, Iowa and North Carolina, rural/non-urban transit providers have teamed at the regional and statewide level to jointly procure technology. The reasons for joint procurements include:

- Economies of scale – by procuring as a group, the providers have been able to negotiate lower costs through coordinated purchase of devices and installation of hardware and software.
- Shared systems – providers have been able to share systems such as fixed-route management software and digital maps. By using the same systems, providers also have a larger pool of spare parts available in their region. The providers can also potentially provide backup operations for each other.
- Coordinated service – providers who serve some of the same customers were able to use a shared platform to share information such as demand-response schedule information or fare payment collection and management.
- Shared procurement resources – by teaming, small providers have been able to develop, or contract to develop, procurement documents, including system requirements, that would have required too much labor and technical expertise for any of the individual providers.

There are drawbacks to regional and joint procurements. Specifically, providers often find that their needs and preferences are different enough to justify procuring distinct systems. This can be resolved through preliminary meetings and developing memorandums of understanding that clearly define the technology and its expected functionality. A larger issue encountered in other states is often in differing approaches to procurement. Local rules and regulations may prevent an agency from procuring equipment and systems for other providers, or from allowing other providers to procure for them. Similarly, some providers do not want to assume the responsibility of procuring technology for other providers.

Recommendation: Rural/non-urban transit providers should work with Caltrans DMT and other transit in their region to determine if there are opportunities for joint procurement. It should be noted that the regional ITS architecture process and technology user groups can serve as forums for identifying potential teaming partners.

4. Rural/Non-urban Transit ITS Architecture Strategy

Participation in a regional ITS architecture is a requirement for ITS projects that are deployed with federal funding, either in whole or in part. This can, and has, posed an issue for rural/non-urban transit providers as they deploy technology. In many cases, small transit providers are not aware of ITS or that the technology they want to deploy is considered ITS. Some providers learn about a new hardware or a software program, identify a potential need for it, but do not realize that there are pre-requisites required before the product will operate. In other cases, they do not know how to participate in regional ITS architecture activities, and are not encouraged to become involved.

However, a regional ITS architecture development process can be beneficial for rural/non-urban transit providers. The architecture development is usually part of a larger ITS planning activity that brings regional stakeholders together to identify their individual and collective needs. The ITS architecture can provide a forum for transit providers to learn of other activities that are planned for the region and consider how those plans may impact them. The providers can also share their near and long-term plans and learn how to plan and implement them in a way to increase efficiency, maximize interoperability, and interconnectivity for improving intra- and inter-regional transit.

For example, a rural transit agency planning to install security cameras on its vehicles may learn of the existing and planned surveillance systems and the capabilities of local emergency responders to monitor video feeds or vehicle location data. An agency may also learn of other regional needs for transit travel times to be used to measure traffic levels, or of maintenance systems that can provide automated, advance notice of planned construction and road maintenance activity that may impact service schedules. In some cases, transit providers have been able to work with regional non-transit stakeholders to procure vehicle tracking systems that work for transit, maintenance and emergency vehicles.

A significant value of the ITS architecture process is participating in strategic ITS planning. ITS planning gives the rural/non-urban providers access to ITS experts and a forum to share their needs with other regional stakeholders. During the process, the rural/non-urban providers can see the entire range of transit ITS capabilities and how components of various systems may interact. Planning through the ITS architecture improves regional stakeholder coordination and provides transit providers an understanding of how the technologies they deploy now may complement future technologies, and how various components are dependent upon each other. The architecture process enables providers to develop strategies that ensure the systems they procure to address current needs have the interoperability and capability to address other needs in the future.

4.1 California Regional ITS Architectures

Table 4 summarizes the California state and regional ITS architectures that included projects for Rural and Non-urban transit. **Table 5** is a list of counties along with the reference ID for the appropriate Architectures for that county. These two tables can be used to identify which plan a subrecipient needs to update with proposed ITS projects. Some of these architectures are dated and have been superseded by more recent activities; however, the documents were reviewed to understand how the projects evolved. **Figure 1** is a map that shows the coverage of California's counties and Caltrans Districts. This map is provided for additional reference.

Table 4 shows the update frequency and procedures for each plan where applicable. Section V of the FTA National ITS Architecture Policy on Transit Projects[5] requires that all regions must have a regional ITS architecture in place within four years of the first ITS project for that region advancing to final design. Section V also stipulates that agencies and other stakeholders participating in the development of the regional ITS architecture will develop and implement procedures and responsibilities for maintaining the regional ITS architecture, as needs evolve within the region.

[5] http://www.ops.fhwa.dot.gov/its_arch_imp/policy_2.htm

Table 4: California State and Regional ITS Architectures

Ref ID	Architecture	Caltrans District	Geographic Coverage	Year	Update Frequency	Relevant Architecture Website(s)	Update Procedures	Contact Information
A	California-Oregon Advanced Transportation Systems (COATS)	1	Del Norte, Humboldt, Lake, Mendocino	2001	None	www.westerntransportationinstitute.org/documents/reports/COATS/index.htm	None	John Carson Caltrans District 1 Tel: (707) 445-6385 John_Carson@dot.ca.gov Rex Jackman Caltrans District 1 Tel: (707) 445-6412 Rex_Jackman@dot.ca.gov
B	Caltrans District 2 ITS Arch. & Strategic Deployment Plan	2	Butte (District 3), Siskiyou, Modoc, Trinity, Shasta, Lassen, Tehama, Plumas	2008	Major Updates bi-annually or in advance of various District/County planning documents. Minor updates occur at least annually.	www.dot.ca.gov/dist2/planning/comregplan.htm	Architecture Change Request (ACR) must be completed. ACR requires following inputs: Contact info, date, descriptive title, detailed description, name of system, status. Change Request form is in Appendix#1 "Tab 24 – ITS Architecture Maintenance Plan"	Michelle Millette - Caltrans District 2 Tel: (530) 229-0517 michelle_millette@dot.ca.gov
C	Modoc County Regional ITS Architecture	2	Modoc County	2006				
D	Shasta County Regional ITS Arch. & Strategic Deployment Plan	2	Shasta County	2006				
E	Tahoe Gateway Counties ITS Strategic Deployment Plan	3	El Dorado, Nevada, Placer, Sierra	2002	Approx. every 4 years	www.pctpa.net/tahoegateway	Sacramento Area Council of Governments (SACOG) provides architecture maintenance. Architecture Plan project add/change instructions located in Chapter 5 of SACOG Architecture. Caltrans District 2 maintains Butte County Plan (See Reference ID=B)	Mark Heiman, SACOG ITS/511 Manager (916) 340-6232 mheiman@sacog.org Butte County - Michelle Millette - Caltrans District 2 Tel: (530) 229-0517
F	North Valley Regional ITS Architecture	3	Butte, Colusa, Glenn	2005		n/a		

Ref ID	Architecture	Caltrans District	Geographic Coverage	Year	Update Frequency	Relevant Architecture Website(s)	Update Procedures	Contact Information
G	ITS Strategic Deployment Plan for the Sacramento Region	3	El Dorado, Placer, Sacramento, northern Solano, Sutter, Yolo, Yuba	2005		www.sacog.org/websites/kimley-horn/		michelle_millette@dot.ca.gov
H	Bay Area ITS Architecture	4	Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, Sonoma	2007	Approx. every 4 years	www.mtc.ca.gov/planning/ITS/	Submit project information online "addition/change request form". Include contact information, additional documentation describing project (e.g., Concept of Operations, TIP description, funding application description). Website has FAQ. Change form online: www.mtc.ca.gov/planning/ITS/form.htm	Pierce Gould, MTC (510) 817-5863 pgould@mtc.ca.gov
I	Central Coast ITS (CCITS Architecture	5	Santa Cruz, San Benito, Monterey, San Luis Obispo, Santa Barbara	2007 & 2010	n/a	www.ambag.org/programs/met_transp_plann/its.html www.dot.ca.gov/dist05/planning/its.htm www.iteris.com/ccits-admin/	Three CCITS Architecture Maintenance Plans for AMBAG, SLOCOG, and SBCAG. Change Form requires: (1) Contact info, (2) Date, (3) Description of proposed change, (4) What is to be added, deleted, or modified?, (5) Type of change (e.g. new project, new stakeholder), (6) Name of project being implemented or modified, (7) Status. Appendix A is change form.	Kathy Urlie, AMBAG (831) 883-3750 kurlie@ambag.org James Worthley SLOCOG Tel: (805) 788-2002 jworthley@slogcog.org Peter Imhoff SBCAG Tel: (805) 961-8900 pimhoff@sbcag.org
J	San Joaquin Valley ITS Strategic Deployment Plan	6, 10	Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus, Tulare	2001	Councils of Govts should consider updating every 2 years	www.kerncog.org/cms/publications/publications/261-intelligent-transportation-reports	Maintenance Plan (March 2005) has instructions to update/add projects. Appendix A of San Joaquin Valley ITS Architecture Maintenance Plan.	Contact individual Council of Government (COG)
K	Los Angeles County Regional ITS Architecture	7	Los Angeles County	2004		www.riits.net	Chapter 10 of the Architecture discusses the maintenance update procedures.	See RIITS website or contact: riitsnetwork@riits.net

Ref ID	Architecture	Caltrans District	Geographic Coverage	Year	Update Frequency	Relevant Architecture Website(s)	Update Procedures	Contact Information
L	Southern California Association of Governments (SCAG)	7, 8, 11, 12	Los Angeles, Orange, Riverside, San Bernardino, Ventura, Imperial	2008	Every 3-5 years in conjunction with bi-annual Congestion Management Plan process	www.scag.ca.gov/its/	In coordination with SCAG, each county updates plans as follows: Imperial Valley Association of Governments (IVAG) leads project updates. Orange County Transportation Authority (OCTA) and Caltrans District 12 update the architecture. Section 11 of Orange County architecture, and Section 10 of SCAG Regional ITS Arch. describe update guidelines. Inland Empire – See Reference ID=M for update procedures. Los Angeles County - See Reference ID=K for update procedures. Ventura - Ventura County Transportation Commission (VCTC) is lead agency for architecture. Section 11 of Ventura County architecture, and Section 10 of SCAG Regional ITS Architecture describe general requirements.	Naresh Amatya, SCAG Tel: (213) 236-1885 Amatya@scag.ca.gov
M	Inland Empire Regional ITS Architecture	8	Riverside, San Bernardino	2003	Every 3 years in coordination with the SCAG RTP Update	www.iteris.com/inlandempire-its/	Chapter 8 of the ITS Architecture Project Final Report is the Maintenance Plan. Updates done in coordination with SCAG ITS Architecture Update (See Reference ID=L)	Mr. Bill Mosby Senior Transportation Planner Caltrans, District 8 Phone: 909-383-5921 Fax: 909- 383-7934 Bill_Mosby@dot.ca.gov
N	Sierra Nevada ITS Strategic Deployment Plan	9, 10	Alpine, Amador, Calaveras, Inyo, Mariposa, Mono, Tuolumne	2002	Unspecified other than "on a regular basis"	n/a	"Section 4: Operations and Project Implementation" of Plan details steps to add/modify projects. Architecture project updating done by Caltrans District 9 and District 10 staff.	Caltrans District 9 and 10 staff
O	San Diego Region ITS Strategic Deployment Plan	11	San Diego County	2003	In conjunction with RTP Development	http://sandag.org/index.asp?projectid=258&fuseaction=projects.detail	n/a	Contact San Diego Association of Governments (SANDAG)

Table 5: California Counties and Associated Architectures

County	Reference ID for Table 4	County	Reference ID for Table 4
Alameda	H	**Orange**	L
Alpine	N	**Placer**	E,G
Amador	N	**Plumas**	B
Butte	F	**Riverside**	L,M
Calaveras	N	**Sacramento**	G
Colusa	F	**San Benito**	I
Contra Costa	H	**San**	L,M
Del Norte	A	**San Diego**	O
El Dorado	E,G	**San Francisco**	H
Fresno	J	**San Joaquin**	J
Glenn	F	**San Luis**	I
Humboldt	A	**San Mateo**	H
Imperial	L	**Santa Barbara**	I
Inyo	N	**Santa Clara**	H
Kern	J	**Santa Cruz**	I
Kings	J	**Shasta**	B,D
Lake	A	**Sierra**	E
Lassen	B	**Siskiyou**	B
Los Angeles	K,L	**Solano**	H
Madera	J	**Sonoma**	H
Marin	H	**Stanislaus**	J
Mariposa	N	**Sutter**	G
Mendocino	A	**Tehama**	B
Merced	J	**Trinity**	B
Modoc	B,C	**Tulare**	J
Mono	N	**Tuolumne**	N
Monterey	I	**Ventura**	L
Napa	H	**Yolo**	G
Nevada	E	**Yuba**	G

Figure 1: Map of California Counties and Caltrans Districts

4.2 Architecture Participation by Rural/non-urban Transit Providers

The regional ITS architecture planning process is an important part of regional planning, and any transit agency seeking to deploy ITS should be a part of this process. This is not to say that it should replace other planning activities, such as Master Plans and Transportation Improvement Programs (TIP). Rather, the ITS architecture process should complement those activities. The architecture should be used to further develop and integrate technology identified through other planning activities.

In many regions and states, the ITS architecture development and update processes is coordinated with other planning activities such that funding and deployment can be integrated into the TIP or other master plans.

Regional ITS architectures are living documents and will continually evolve. When ITS implementation at a rural or small-urban transit agency does not coincide with the development or updating of the regional architecture, there is a process for integrating the new plans and projects into the architecture, as described in **Table 4**.

This section discusses how California's rural/non-urban transit providers who have or will deploy transit ITS projects in the future can participate in regional ITS planning in order to qualify for federal grant funding.

4.2.1 Long-term ITS Architecture Participation

All rural/non-urban transit agencies that have, or will, deploy transit ITS will be considered stakeholders in their corresponding regional ITS architecture. In order to become a stakeholder, the agency will identify a "champion" from among its staff to be the key contact for regional ITS architecture activities.

The responsibilities of the ITS champion will include:

- Insuring that the transit agency is recognized as a regional ITS stakeholder.
- Leading the transit agency's participation in regional ITS activities.
- Verifying that the transit agency's ITS plans and deployments are accurately reflected in the regional ITS architecture.
- Managing communications with the regional ITS architecture team, including participating in mail lists, stakeholder meetings.

Regional ITS architectures have update cycles that can vary but are usually several years between updates. The development and update processes may require one to two weeks of staff time for a transit agency every cycle, with much less effort in other years. Therefore, the ITS

champion responsibilities will not require any significant level of effort and should not require additional staff. It should also be noted that while it is beneficial for the ITS champion to have an understanding of ITS architecture, it is not necessary. The ITS champion can represent the transit agency's needs and plans in transit terms and have them properly incorporated into the regional ITS architecture.

The champion may come from any staffing group at the transit agency. The likely types of staff to participate are management, planning or information technology (IT). Each staff type has its advantages and disadvantages, and an agency should consider its own needs and resources in selecting a champion. For example, a planner may have a strong understanding of needs and activities planned by a transit agency while an IT person may best understand the agency's current technologies and capabilities.

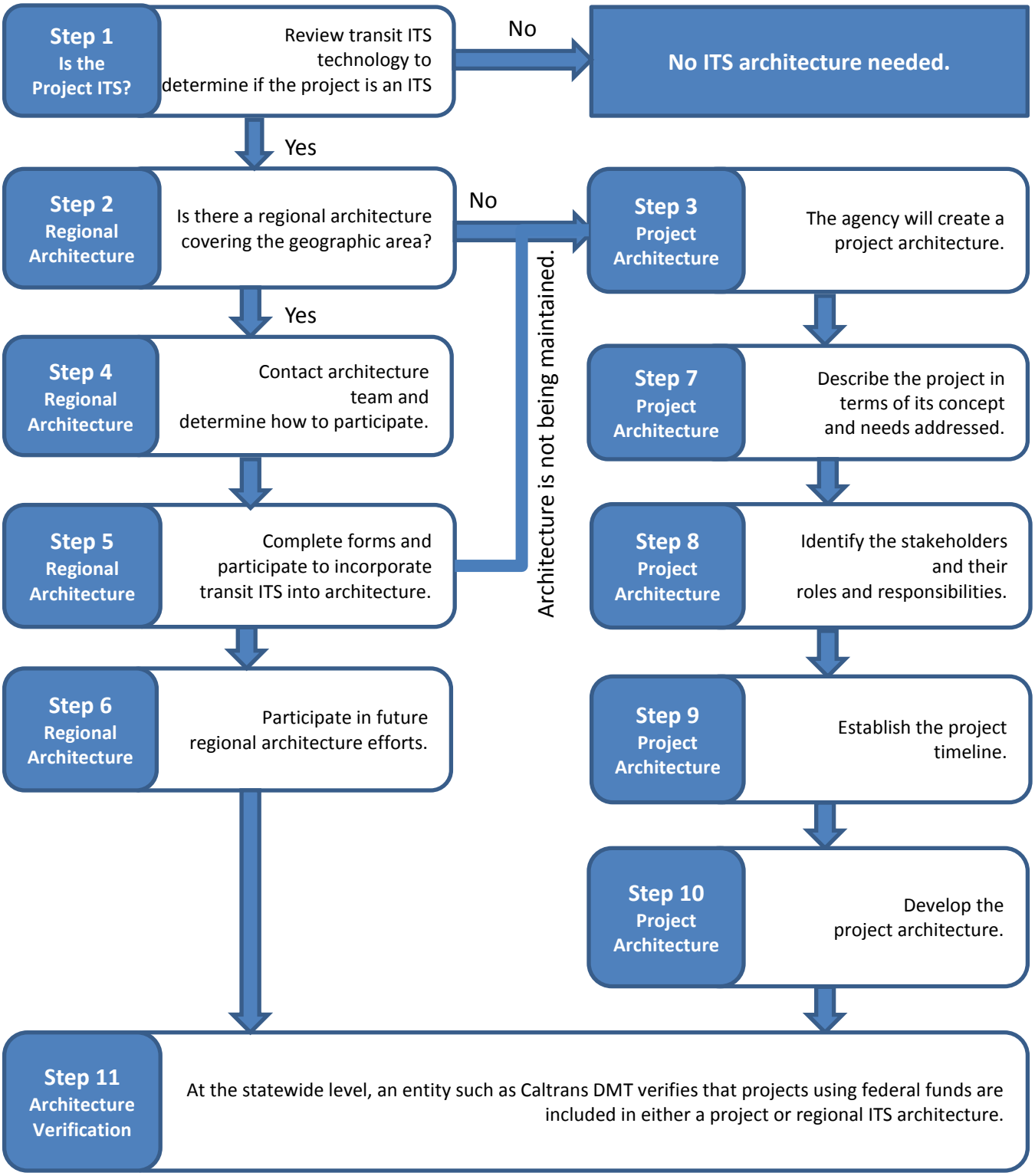
When requesting federal funding for projects that can be considered ITS, the rural/non-urban transit providers will identify the ITS champion who will lead the agency's participation in regional ITS architecture. The agency will also verify that its champion is in communication with the entity responsible for the regional ITS architecture.

4.2.2 Short-term ITS Architecture Participation

Each year, federal funds are used for rural/non-urban transit projects. Many of the transit providers think of technology solutions in terms of needs without fully understanding whether or not they are considered ITS and therefore subject to the federal ITS requirements. In some cases, rural/non-urban transit providers are not made aware of ITS architecture activities in their region.

Figure 2 provides a flowchart of the steps to include all transit ITS projects in a regional or project ITS architecture. Following the flowchart is a narrative of each step that describes how California's rural/non-urban transit providers should participate in regional ITS architecture for all future ITS projects.

Figure 2: ITS Architecture Process for Transit Providers



1. Determine whether the planned project may be considered ITS – **Appendix C** is the Caltrans questionnaire that rural/non-urban transit providers must complete to determine whether the project may be ITS.

2. Determine the regional ITS architecture point of contact – as described in **Section 4.2.1**, each agency will have an ITS champion who will be the key contact for ITS. That champion will identify and communicate with the regional ITS architecture development and maintenance team.

3. If there is no regional ITS architecture then develop a project architecture – the transit agency will develop a project ITS architecture as part of the planning process to insure that the project is consistent with the national ITS architecture and maximizes interoperability and uses open standards as much as possible.

4. If there is a regional ITS architecture, inform the ITS architecture team of the transit ITS plans – The ITS champion will contact the regional ITS architecture team to inform them of the transit agency's plans and determine the specific requirements and forms needed to integrate the project into the regional ITS architecture.

5. Work with the regional ITS architecture team to insure the project's inclusion in the regional architecture – the transit agency, led by the ITS champion, will participate in the regional ITS architecture update or change management process to insure that the project is documented and integrated into the regional ITS architecture. At the end of this step, there should be formal recognition of the project in regional ITS documentation. ***An ITS project does not meet federal requirements simply by requesting to be included in a regional architecture***. Federal requirements are only satisfied when a regional architecture formally includes a project, or individual project architecture is developed. Therefore, if the regional ITS architecture team is non-responsive or is no longer maintaining a regional architecture, the transit agency should develop a project-level ITS architecture.

6. Participate in Future Regional ITS Architecture Updates – Once the transit ITS project has been incorporated into the regional ITS Architecture, the stakeholders will participate in future updates. Make sure that all appropriate approvals have been secured after each step including certifications and assurances by subrecipient agencies.

7. For a project ITS architecture, describe the project – At a high level, the transit agency will describe the project and the needs it addresses. This will include a brief concept of operations, which is a narrative description of how the system will work and how it will meet the needs. This may be done by working with the regional ITS architecture team.

8. For a project ITS architecture, identify the stakeholders – The transit agency will identify the project stakeholders, particularly those who will be exchanging data, such as transit providers, traffic management centers and emergency management centers.

9. Establish the timeline for the ITS project architecture – The project may be existing, or it may be planned with funding, or planned but without funding. The timeline establishes when the transit agency plans to implement the system.

10. Develop the project architecture – Create an architecture following the regional ITS architecture guidelines[6]. The architecture will define the ITS elements, the interconnects and data flows, relevant standards for data exchange, system functional requirements and other architecture information. This primer is attached as **Appendix F**.

11. Verify regional and project ITS architecture participation at the state level – With this ITS Plan as a guidance document along with Federal ITS training courses, Caltrans DMT will verify that projects identified as transit ITS have followed the appropriate steps and are accurately reflected in regional or project ITS architectures. All subrecipient agencies must also comply with FTA ITS certifications and assurances as described in the Federal Register Federal Register Volume 76, Number 211 (Tuesday, November 1, 2011)[7]. Sections of the Federal Register Notice are included as **Appendix D** of this plan. The relevant ITS Assurance is noted in "Group 14" of this notice.

5. ITS Planning Next Steps

The Rural/non-urban Transit ITS Plan allows small transit providers to identify and address their needs through their individual regional transportation and transit planning processes while insuring the providers will participate in regional and project ITS architecture. The plan also describes how Caltrans can implement strategies to document ITS planning and monitor rural/non-urban transit ITS activity.

The next step is to implement the plan. This will include requiring additional documentation from transit providers and regional transportation planning agencies who request funding for projects that may be considered ITS, and tracking those projects and providers to verify that each

[6] http://www.ops.fhwa.dot.gov/publications/fhwahop12001/index.htm

[7] http://www.gpo.gov/fdsys/pkg/FR-2011-11-01/html/2011-28293.htm

is participating in their regional ITS architecture development and update processes. For the rural/non-urban transit providers that do not have a regional ITS architecture covering their areas, or where regional ITS architecture teams are inactive, and ITS architecture plans are not being updated as required, a project level ITS architecture will be required. This plan describes that process, and the providers will have to plan the funding and other resources required to develop project architectures.

Because Caltrans and the rural/non-urban transit providers have limited resources, ITS architecture efforts should be streamlined and integrated as much as possible into existing ITS architecture plans or the region's current planning efforts to document and track projects.

Appendix A-FTA ITS Architecture & Standard Conformity Policy

On January 8, 2001 the Final Rule on ITS Architecture and Standards Conformity (Final Rule) and the Final Policy on Architecture and Standards Conformity (Final Policy) were enacted by the FHWA and FTA respectively. This policy, along with more details, can be found at: http://ops.fhwa.dot.gov/its_arch_imp/policy_2.htm.

The Final Rule/Final Policy ensures that Intelligent Transportation Systems (ITS) projects carried out using funds from the Highway Trust Fund including the Mass Transit Account conform to the National ITS Architecture and applicable ITS standards. This will be accomplished through the development of regional ITS architectures and using a systems engineering process for ITS project development.

This appendix includes the FTA Policy on ITS Architecture and Standards Conformity.

Federal Transit Administration National ITS Architecture Policy on Transit Projects

AGENCY(S): Federal Transit Administration (FTA), DOT. ACTION: Notice

[Federal Register: January 8, 2001 (Volume 66, Number 5)]

[Notices]

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From the Federal Register Online via GPO Access [wais.access.gpo.gov]

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DEPARTMENT OF TRANSPORTATION

Federal Transit Administration National ITS Architecture Policy on Transit Projects

AGENCY: Federal Transit Administration (FTA), DOT.

ACTION: Notice.

I. Purpose

This policy provides procedures for implementing section 5206(e) of the Transportation Equity Act for the 21st Century, Public Law 105-178, 112 Stat. 547, pertaining to conformance with the National Intelligent Transportation Systems Architecture and Standards.

II. Definitions

Intelligent Transportation Systems (ITS) means electronics, communications or information processing used singly or in combination to improve the efficiency or safety of a surface transportation system.

ITS project means 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 ITS Architecture.

Major ITS project means any ITS project that implements part of a regional ITS initiative that is multi-jurisdictional, multi-modal, or otherwise affects regional integration of ITS systems

National ITS Architecture (also "national architecture") means a common framework for ITS interoperability. The National ITS Architecture comprises the logical architecture and physical architecture which satisfy a defined set of user services. The National ITS Architecture is maintained by U.S. DOT (Department of Transportation) and is available on the DOT web site at http://www.its.dot.gov.

Project level ITS architecture is a framework that identifies the institutional agreement and technical integration necessary to interface a major ITS project with other ITS projects and systems.

Region is the geographical area that identifies the boundaries of the regional ITS architecture and is defined by and based on the needs of the participating agencies and other stakeholders. A region can be specified at a metropolitan, Statewide, multi-State, or corridor level. In metropolitan areas, a region should be no less than the boundaries of the metropolitan planning area.

Regional ITS architecture means a regional framework for ensuring institutional agreement and technical integration for the implementation of ITS projects or groups of projects.

Systems engineering is a structured process for arriving at a final design of a system. The final design is selected from a number of alternatives that would accomplish the same objectives and considers the total life-cycle of the project including not only the technical merits of potential solutions but also the costs and relative value of alternatives.

III. Policy

ITS projects shall conform to the National ITS Architecture and standards in accordance with the requirements contained in this part. Conformance with the National ITS Architecture is interpreted to mean the use of the National ITS Architecture to develop a regional ITS architecture in support of integration and the subsequent adherence of all ITS projects to that regional ITS architecture. Development of the regional ITS architecture should be consistent with the transportation planning process for Statewide and Metropolitan Transportation Planning (49 CFR Part 613 and 621).

IV. Applicability

a. All ITS projects that are funded in whole or in part with the Highway Trust Fund (including the Mass Transit Account) are subject to these provisions.

b. The Secretary may authorize exceptions for:

    1. Projects designed to achieve specific research objectives outlined in the National ITS Program Plan under section 5205 of the Transportation Equity Act for the 21st Century or the Surface Transportation Research and Development Strategic Plan developed under section 5208 of Title 23, United States Code; or

    2. The upgrade or expansion of an ITS system in existence on the date of enactment of the Transportation Equity Act for the 21st Century if the Secretary determines that the upgrade or expansion --

        i. Would not adversely affect the goals or purposes of Subtitle C (Intelligent Transportation Systems) of the Transportation Equity Act for the 21st Century and

        ii. Is carried out before the end of the useful life of such system; and

        iii. Is cost-effective as compared to alternatives that would meet the conformity requirement of this rule

c. These provisions do not apply to funds used for Operations and Maintenance of an ITS system in existence on June 9, 1998.

V. Regional ITS Architecture

a. A regional ITS architecture shall be developed to guide the development of ITS projects and programs and be consistent with ITS strategies and projects contained in applicable transportation plans. The National ITS Architecture shall be used as a resource in the development of the regional ITS architecture. The regional ITS architecture shall be on a scale commensurate with the scope of ITS investment in the region. Provision should be made to include participation from the following agencies, as appropriate, in the development of the regional ITS architecture: highway agencies; public safety agencies (e.g., police, fire, emergency/medical); transit agencies; federal lands agencies; state motor carrier agencies; and other operating agencies necessary to fully address regional ITS integration.

b. Any region that is currently implementing ITS projects shall have a regional ITS architecture February 7, 2005.

c. All other regions not currently implementing ITS projects shall have a regional ITS architecture within four years of the first ITS project for that region advancing to final design.

d. The regional ITS architecture shall include, at a minimum, the following:

    1. A description of the region;

    2. Identification of participating agencies and other stakeholders;

    3. An operational concept that identifies the roles and responsibilities of participating agencies and stakeholders in the operation and implementation of the systems included in the regional ITS architecture;

4. Any agreements (existing or new) required for operations, including at a minimum those affecting integration of ITS projects; interoperability of different ITS technologies, utilization of ITS-related standards, and the operation of the projects identified in the regional ITS architecture;
5. System functional requirements;
6. Interface requirements and information exchanges with planned and existing systems and subsystems (for example, subsystems and architecture flows as defined in the National ITS Architecture);
7. Identification of ITS standards supporting regional and national interoperability;
8. The sequence of projects required for implementation of the regional ITS architecture.

e. Existing regional ITS architectures that meet all of the requirements of section V(d) shall be considered to satisfy the requirements of V(a).

f. The agencies and other stakeholders participating in the development of the regional ITS architecture shall develop and implement procedures and responsibilities for maintaining the regional ITS architecture, as needs evolve within the region.

VI. Project Implementation

a. All ITS projects funded with Mass Transit Funds from the Highway Trust Fund shall be based on a systems engineering analysis.

b. The analysis should be on a scale commensurate with the project scope.

c. The systems engineering analysis shall include, at a minimum:

1. Identification of portions of the regional ITS architecture being implemented (or if a regional ITS architecture does not exist, the applicable portions of the National ITS Architecture).
2. Identification of participating agencies' roles and responsibilities;
3. Requirements definitions:
4. Analysis of alternative system configurations and technology options to meet requirements;
5. Analysis of financing and procurement options;
6. Identification of applicable ITS standards and testing procedures; and
7. Procedures and resources necessary for operations and management of the system;

d. Upon completion of the regional ITS architecture required in section V, the final design of all ITS projects funded with highway trust funds shall accommodate the interface requirements and information exchanges as specified in the regional ITS architecture. If the final design of the ITS project is inconsistent with the regional ITS architecture, then

the regional ITS architecture shall be updated as per the process defined in V(f) to reflect the changes.

e. Prior to completion of the regional ITS architecture, any major ITS project funded with highway trust funds that advances to final design shall have a project level ITS architecture that is coordinated with the development of the regional ITS architecture. The final design of the major ITS project shall accommodate the interface requirements and information exchanges as specified in this project level ITS architecture. If the project final design is inconsistent with the project level architecture, then the project level ITS architecture shall be updated to reflect the changes. The project level ITS architecture is based on results of the systems engineering analysis, and includes the following:

    1. A description of the scope of the ITS project
    2. An operational concept that identifies the roles and responsibilities of participating agencies and stakeholders in the operation and implementation of the ITS project;
    3. Functional requirements of the ITS project;
    4. Interface requirements and information exchanges between the ITS project and other planned and existing systems and subsystems; and
    5. Identification of applicable ITS standards

f. All ITS projects funded with Mass Transit Funds from the Highway Trust Funds shall use applicable ITS standards and interoperability tests that have been officially adopted through rulemaking by the United States Department of Transportation (US DOT).

g. Any ITS project that has advanced to final design by (effective date of policy) is exempt from the requirements of VI.

VII. Project Oversight

a. Prior to authorization of Mass Transit Funds from the Highway Trust Fund for acquisition or implementation of ITS projects, grantees shall self-certify compliance with sections V and VI. Compliance with this policy shall be monitored under normal FTA oversight procedures, to include annual risk assessments, triennial reviews, and program management oversight reviews as applicable.

b. Compliance with the following FTA Circulars shall also be certified:

- C5010.1C, Grant Management Guidelines
- C6100.1B, Application Instructions and Program Management Guidelines

VIII. FTA Guidance

FTA will develop appropriate guidance materials regarding the National ITS Architecture Consistency Policy.

Appendix B-California Rural/Non-urban Transit ITS Projects

Caltrans District 1 Projects

Project 1: Lake Transit Authority Vehicle Tracking

Provider: Lake Transit Authority	**Size**: Small (< 10 vehicles)
Geographic Area Served: Lake County	**Population**: 64,665
Project Description: The project supported the implementation of AVL on transit vehicles.	
Caltrans Standard Agreement # 649303	**Grant Program:** 5311ARRA
Stakeholders: Lake Transit Authority	**Status**: Existing
Technological Complexity: Low	
ITS Architecture Market Packages: APTS01: Transit Vehicle Tracking	
ITS Architecture Elements: Lake Transit Authority Transit Vehicles, Lake Transit Authority Management Center	
Included in Regional Architecture? This project is in the California/Oregon Advanced Transportation Systems (COATS).	

California District 2 Projects

Project 2: Modoc County Regional Transportation Planning Agency Fare Collection

Provider: Sage Stage	**Size**: Medium (>10 and <25 vehicles)
Geographic Area Served: Modoc County	**Population**: 9,686
Project Description: This project supported the implementation of electronic fare boxes with technology for tracking payments.	
Caltrans Standard Agreement # 645406	**Grant Program:** 5311
Stakeholders: Sage Stage, Modoc County Regional Transportation Planning	**Status**: Existing
Technological Complexity: Medium	
ITS Architecture Market Packages: APTS04: Transit Fare Collection	
ITS Architecture Elements: Sage Stage Transit Vehicles, Sage Stage Management Center	
Included in the Caltrans District 2 or Modoc Architecture? Yes. Electronic fareboxes identified by the District as an element for update to the District 2 Architecture on Page 1 of the District ITS Change Worksheet. It is also identified in the California/Oregon Advanced Transportation Systems (COATS).	

Project 3: Modoc County Regional Transportation Planning Agency Surveillance / Security

Provider: Sage Stage	**Size**: Medium (>10 and <25 vehicles)
Geographic Area Served: Modoc County	**Population**: 9,686
Project Description: The project supported the implementation of cameras for transit security.	
Caltrans Standard Agreement # 649860	**Grant Program:** 5311ARRA
Stakeholders: Sage Stage, Modoc County Regional Transportation Planning	**Status**: Existing
Technological Complexity: Low	
ITS Architecture Market Packages: APTS05: Transit Security	
ITS Architecture Elements: Sage Stage Transit Vehicles, Sage Stage Management Center	
Included in the Caltrans District 2 or Modoc Architecture? Yes. Transit security has been identified by the District as an element for update to the District 2 Architecture on Page 1 of the District ITS Change Worksheet. It is also identified in the California/Oregon Advanced Transportation Systems (COATS).	

Project 4: Siskiyou County Transit Electronic Farebox

Provider: Siskiyou County Transit	**Size**: Small (< 10 vehicles)
Geographic Area Served: Siskiyou County	**Population**: 44,900
Project Description: The project supported the implementation of electronic fare boxes on the buses operated by Siskiyou County.	
Caltrans Standard Agreement # 649955	**Grant Program:** 5311ARRA
Stakeholders: Siskiyou County	**Status**: Existing
Technological Complexity: Medium	
ITS Architecture Market Packages: APTS04: Transit Fare Collection Management	
ITS Architecture Elements: Siskiyou County Transit Vehicles, Siskiyou County Management Center	
Included in the Caltrans District 2 Architecture? Yes. Electronic fareboxes have been identified by the District as an element for update to the District 2 Architecture on Page 1 of the District ITS Change Worksheet. It is also identified in the California/Oregon Advanced Transportation Systems (COATS).	

Project 5: Trinity County Vehicle Tracking System

Provider: Trinity County	**Size**: Small (< 10 vehicles)
Geographic Area Served: Trinity County, including the Cities of Redding, Willow Creek and Weaverville	**Population**: 13,786
Project Description: The project supported the implementation of vehicle tracking equipment on Trinity County transit vehicles.	
Caltrans Standard Agreement # 649312	**Grant Program:** 5311ARRA
Stakeholders: Trinity County	**Status**: Existing
Technological Complexity: Low	
ITS Architecture Market Packages: APTS01: Transit Vehicle Tracking	
ITS Architecture Elements: Trinity County Transit Vehicles, Trinity County Management Center	
Included in the Caltrans District 2 Architecture? Yes, the need and project are identified in the Architecture, beginning with needs assessment in Tab 06, Page 15.	

Project 6: Trinity County Vehicle Surveillance System and Fare Collection

Provider: Trinity County	**Size**: Small (< 10 vehicles)
Geographic Area Served: Trinity County, including the Cities of Redding, Willow Creek and Weaverville	**Population**: 13,786
Project Description: The project is supporting the implementation of onboard surveillance cameras, fareboxes and emergency radio equipment. The cameras are an ITS element.	
Caltrans Standard Agreement # 640452	**Grant Program:** 5311F
Stakeholders: Trinity County	**Status**: Planned
Technological Complexity: Low	
ITS Architecture Market Packages: APTS05: Transit Security	
ITS Architecture Elements: Trinity County Transit Vehicles, Trinity County Management Center	
Included in the Caltrans District 2 Architecture? Yes. Transit security has been identified by the District as an element for update to the District 2 Architecture on Page 1 of the District ITS Change Worksheet.	

Caltrans District 3 Projects

Project 7: City of Lincoln Hardware / Software

Provider: City of Lincoln	**Size**: Small (< 10 vehicles)
Geographic Area Served: City of Lincoln and part of Placer County	**Population**: 42,819 (city), 348,432 (County)
Project Description: The project supported the implementation of a GPS-based automated vehicle location system.	
Caltrans Standard Agreement # 649820	**Grant Program:** 5311ARRA
Stakeholders: City of Lincoln, Placer County Transportation Commission	**Status**: Existing
Technological Complexity: Medium	
ITS Architecture Market Packages: APTS01: Transit Vehicle Tracking	
ITS Architecture Elements: Lincoln Transit Management Systems, Lincoln Transit Vehicles	
Included in Tahoe Gateway ITS Architecture? Yes. The Tahoe Gateway Counties ITS Strategic Plan includes the transit vehicle tracking market package in Report 1 on Page 30. The project is identified in Report 2 on Page 66.	

Project 8: Paratransit, Inc. Management

Provider: Paratransit Inc.	**Size**: Large (>25 vehicles)
Geographic Area Served: Sacramento County	**Population**: 1,418,788
Project Description: The project is supporting the implementation of vehicle tracking and demand response management and dispatching.	
Caltrans Standard Agreement # Existing: 648536, 645549; Planned: 649543	**Grant Program:** 5310
Stakeholders: SACOG, Paratransit, Inc.	**Status**: Planned and Existing
Technological Complexity: Medium	
ITS Architecture Market Packages: APTS01: Transit Vehicle Tracking	
ITS Architecture Elements: Paratransit Inc. Transit Vehicles, Paratransit Inc. Management Center	
Included in the SACOG Regional ITS Architecture? Yes. The SACOG ITS Strategic Deployment Plan identifies the elements on Pages 43 and 53. The Market Package is identified on Page 54.	

Project 9: Yolo County Transportation District Computer Hardware

Provider: Yolo County Transportation District	**Size**: Large (>25 vehicles)
Geographic Area Served: Yolo County	**Population**: 200,849
Project Description: This project supported the implementation of electronic fare boxes with advanced technology for tracking payments.	
Caltrans Standard Agreement # 649975	**Grant Program:** 5311ARRA
Stakeholders: Yolo County Transportation District	**Status**: Existing
Technological Complexity: Medium	
ITS Architecture Market Packages: APTS04: Transit Fare Collection Management	
ITS Architecture Elements: Yolo County Buses, Yolo Bus Dispatch Center	
Included in SACOG ITS Architecture? Yes. The SACOG ITS Strategic Deployment Plan identifies the elements on Pages 46 and 53. The Market Package is identified on Page 54. The project is identified on Page 120.	

Project 10: Pride Industries, Inc. Hardware / Software

Provider: Pride Industries, Inc. (CTSA of Placer County)	**Size**: Large (> 25 vehicles)
Geographic Area Served: Western Placer County & portions of Sacramento County (Granite Bay, Rocklin, Loomis, Hwy 49 Corridor from downtown Auburn to the Bell Road areas)	**Population**: 348,432
Project Description: Implement in-vehicle and center hardware and software for tracking vehicles and managing demand-response transit.	
Caltrans Standard Agreement # 646553, 646555, 649546 (urban)	**Grant Program:** 5310
Stakeholders: Pride Industries, Inc., Placer County Transportation Commission	**Status**: Existing
Technological Complexity: Medium	
ITS Architecture Market Packages: APTS01: Transit Vehicle Tracking, APTS03: Demand Response Transit Management	
ITS Architecture Elements: Pride Industries, Inc. Dispatch, Pride Industries Inc. Transit Vehicles	
Included in Tahoe Gateway ITS Architecture? Yes. Pride Industries as the Consolidated Transportation Services Agency (CTSA) for Placer County is specifically mentioned in the architecture on Page A-8, Figure 2-4, and Figure 2-8.	

Caltrans District 4 Projects

Project 11: Milestones Adult Development Demand Response Management

Provider: Milestones Adult Development	**Size**: Small (<10 vehicles)
Geographic Area Served: Solano County	**Population**: 413,344
Project Description: The project supported the implementation of demand-response software for managing demand response trips.	
Caltrans Standard Agreement # 648527	**Grant Program:** 5310
Stakeholders: Milestones Adult Development Center	**Status**: Existing
Technological Complexity: Low	
ITS Architecture Market Packages: APTS03: Demand-Response Transit Operations	
ITS Architecture Elements: Milestones Adult Development Center Management Center	
Included in the Bay Area Regional ITS Architecture? Yes. Page 21 of the Bay Area ITS Projects identifies APTS03 for Solano County. Page 13 and 14 of the Bay Area ITS Inventory identify regional and subregional transit elements.	

Project 12: City of Petaluma Demand Response Management (Urban Project)

Provider: Petaluma Transit	**Size**: Medium (>10 vehicles and <25 vehicles)
Geographic Area Served: City of Petaluma and portions of Sonoma County	**Population**: 57,941 (city); 483,878 (county)
Project Description: The project is supporting the implementation of demand-response software for managing demand response trips.	
Caltrans Standard Agreement # 640716	**Grant Program:** 5317
Stakeholders: City of Petaluma	**Status**: Planned
Technological Complexity: Low	
ITS Architecture Market Packages: APTS03: Demand Response Transit Operations	
ITS Architecture Elements: City of Petaluma Transit Management Center	
Included in the Bay Area Regional ITS Architecture? Yes. Page 21 of the Bay Area ITS Projects identifies APTS03 for Solano County. Page 13 and 14 of the Bay Area ITS Inventory identify regional and subregional transit elements.	

Project 13: City of Santa Rosa Vehicle Tracking (Urban Project)

Provider: City of Santa Rosa	**Size**: Large (>25 vehicles)
Geographic Area Served: City of Santa Rosa and portions of Sonoma County	**Population**: 167,815 (city); 483,878 (county)
Project Description: The project is supporting the implementation of vehicle tracking and fixed route management.	
Caltrans Standard Agreement # 648542	**Grant Program:** 5310
Stakeholders: City of Santa Rosa	**Status**: Planned
Technological Complexity: Low	
ITS Architecture Market Packages: APTS01: Transit Vehicle Tracking; APTS02: Transit Fixed-route Operations	
ITS Architecture Elements: City of Santa Rosa Transit Management Center and Transit Vehicles	
Included in the Bay Area Regional ITS Architecture? Yes. Page 19 of the Bay Area ITS Projects identifies APTS01 and APTS02 for the City of Santa Rosa. Page 13 and 14 of the Bay Area ITS Inventory identify regional and subregional transit elements.	

Caltrans District 5 Projects

Project 14: Monterey-Salinas Automatic Vehicle Location

Provider: Monterey-Salinas Transit	**Size**: Large (>25 vehicles)
Geographic Area Served: Monterey County – Paso Robles and Big Sur to Watsonville and San Jose	**Population**: 415,057
Project Description: This project is supporting the implementation of GPS based automatic vehicle location systems and navigation software.	
Caltrans Standard Agreement # Existing: 648714, 648715; Planned: 649425, 649536	**Grant Program:** 5310, 5311, 5316, 5317
Stakeholders: Monterey-Salinas Transit, City of Salinas, Transportation Agency for Monterey County	**Status**: Existing and Planned
Technological Complexity: Low	
ITS Architecture Market Packages: APTS01: Transit Vehicle Tracking , APTS03: Demand Response Transit Operations	
ITS Architecture Elements: Monterey-Salinas Transit Buses	
Included in the Central Coast Regional ITS Architecture? Yes. Page 3-10 of the Central Coast ITS Implementation Plan identifies transit vehicle tracking and fixed route transit operations. The project is not specifically recommended.	

Project 15: San Benito County Vehicle Tracking

Provider: San Benito County Local Transportation Authority	**Size**: Medium (>10 vehicles, <25 vehicles)
Geographic Area Served: San Benito County	**Population**: 55,269
Project Description: The project supported the implementation of management center GPS elements and computers.	
Caltrans Standard Agreement # 649885	**Grant Program:** 5311ARRA
Stakeholders: San Benito County Local Transportation Authority, other transit agencies	**Status**: Existing
Technological Complexity: Low	
ITS Architecture Market Packages: APTS01: Transit Vehicle Tracking	
ITS Architecture Elements: San Benito County Local Transportation Authority Transit Management Center	
Included in the Central Coast Regional ITS Architecture? Yes. Page 3-10 of the Central Coast ITS Implementation Plan identifies transit vehicle tracking. The project is specifically identified on 3-16.	

Project 16: San Luis Obispo APTS

Provider: San Luis Obispo Regional Transit Authority	**Size**: Medium (>10 vehicles, <25 vehicles)
Geographic Area Served: San Luis Obispo County and northern Santa Barbara County	**Population**: 269,637 (SLO), 423,895 (SB)
Project Description: This project is supporting the implementation of electronic fare systems, upgrading and replacing existing dispatch software, and providing new dispatch systems to a portion of the service. In addition, traveler trip planning systems are being implemented.	
Caltrans Standard Agreement # Existing: 646604, 648720, 649892, 649898; Planned: 640723, 641471	**Grant Programs:** 5311ARRA, 5311F, 5316, 5317
Stakeholders: San Luis Obispo Regional Transit Authority, San Luis Obispo Council of Governments, other transit agencies, Central Coast 511	**Status**: Existing and Planned
Technological Complexity: Medium	
ITS Architecture Market Packages: APTS02: Transit Fixed Route Operations, APTS03: Demand Response Transit Operations, APTS04: Transit Fare Collection Management, APTS08: Transit Traveler Information	
ITS Architecture Elements: San Luis Obispo Transit Management Center; San Luis Obispo Transit Management Center, Central Coast 511 Information Service Provider	
Included in the Central Coast Regional ITS Architecture? Yes. Page 3-10 of the Central Coast ITS Implementation Plan identifies transit management, fare collection and transit traveler information. The project is specifically identified on Page 3-18.	

Project 17: United Cerebral Palsy of San Luis Obispo Computer Hardware and Radios

Provider: United Cerebral Palsy of San Luis Obispo	**Size**: Large (> 25 vehicles)
Geographic Area Served: San Luis Obispo County	**Population**: 269,637
Project Description: The project supported the implementation of Mobile Data Terminals and communications on vehicles, demand response management systems and surveillance cameras.	
Caltrans Standard Agreement # 648540	**Grant Program:** 5310
Stakeholders: United Cerebral Palsy of San Luis Obispo	**Status**: Existing
Technological Complexity: Medium	
ITS Architecture Market Packages: APTS01: Transit Vehicle Tracking; APTS03: Demand Response Transit Operations	
ITS Architecture Elements: United Cerebral Palsy Transit Management and Transit Vehicles	
Included in Central Coast Regional ITS Architecture? Yes. Page 3-10 of the Central Coast ITS Implementation Plan identifies transit vehicle tracking and demand response transit operations. The project is not specifically recommended.	

Project 18: Santa Cruz Electronic Fare Box

Provider: Santa Cruz Metropolitan Transit District	**Size**: Large (>25 vehicles)
Geographic Area Served: Santa Cruz County	**Population**: 262,382
Project Description: The project supported the implementation of electronic fare box systems.	
Caltrans Standard Agreement # 649951	**Grant Program:** 5311ARRA
Stakeholders: Santa Cruz Metropolitan Transit District, Santa Cruz County	**Status**: Existing
Technological Complexity: Medium	
ITS Architecture Market Packages: APTS04: Transit Fare Collection Management	
ITS Architecture Elements: Santa Cruz Metro Transit Management Center and Buses	
Included in the Central Coast Regional ITS Architecture? Yes. Page 3-10 of the Central Coast ITS Implementation Plan identifies transit fare management. The project is specifically identified on Page 3-15.	

Project 19: Regional Rideshare of San Luis Obispo

Provider: Regional Rideshare	**Size**: Small (<10 vehicles)
Geographic Area Served: San Luis Obispo and surrounding area	**Population**: 59,946 (city)
Project Description: The project supported the implementation of a 511 transit web application integration.	
Caltrans Standard Agreement # 646604, 646608	**Grant Program:** 5316
Stakeholders: San Luis Obispo Area	**Status**: Existing
Technological Complexity: Low	
ITS Architecture Market Packages: APTS08: Transit Traveler Information	
ITS Architecture Elements: UC Santa Cruz Transit Center, Central Coast 511 Information Service Provider	
Included in the Central Coast Regional ITS Architecture? Yes. The project and stakeholder are identified in the regional architecture on Page 11 of 14.	

Project 20: Easy Lift Demand Response Management (Urban Project)

Provider: Easy Lift Services	**Size**: Small (<10 vehicles)
Geographic Area Served: City of Goleta and portions of Santa Barbara County	**Population**: 29,888 (city); 423,895 (county)
Project Description: The project is supporting the implementation of demand-response transit management software.	
Caltrans Standard Agreement # 649521	**Grant Program:** 5310
Stakeholders: Easy Lift Services, City of Goleta, County of Santa Barbara	**Status**: Planned
Technological Complexity: Low	
ITS Architecture Market Packages: APTS03: Demand Response Transit Operations	
ITS Architecture Elements: Easy Lift Transit Management Center	
Included in the Central Coast Regional ITS Architecture? Yes. Page 3-10 of the Central Coast ITS Implementation Plan identifies transit demand response management. The project is not specifically recommended.	

Caltrans District 6 Projects

Project 21: City of Escalon Automated Vehicle Location

Provider: City of Escalon	**Size**: Small (<10 vehicles)
Geographic Area Served: City of Escalon and surrounding unincorporated county areas	**Population**: 7,132
Project Description: The project supported the implementation of automated vehicle location systems including GPS equipment.	
Caltrans Standard Agreement # 649816	**Grant Program:** 5311ARRA
Stakeholders: City of Escalon, San Joaquin County	**Status**: Existing
Technological Complexity: Medium	
ITS Architecture Market Packages: APTS01: Transit Vehicle Tracking; APTS02: Fixed Route Transit Operations	
ITS Architecture Elements: City of Escalon Transit Vehicle; City of Escalon Transit Management Center	
Included in San Joaquin Valley Regional ITS Architecture? Yes. The San Joaquin Valley ITS Strategic Deployment Plan identifies transit vehicle tracking and transit fixed-route operations market packages on Page 7-5. Inventory is in the architecture's Appendix A.	

Project 22: Fresno Area Express Mobile Data Terminals (Urban Project)

Provider: Fresno Area Express (Fresno County Transportation Authority)	**Size**: Large (>25 vehicles)
Geographic Area Served: Cities of Fresno and Clovis	**Population**: 494,665 (Fresno); 95,63 (Clovis)
Project Description: The project supported the implementation of mobile data terminals for tracking of Fresno Area Express vehicles	
Caltrans Standard Agreement # 648519	**Grant Program:** 5310
Stakeholders: Fresno Area Express	**Status**: Existing
Technological Complexity: Medium	
ITS Architecture Market Packages: APTS01: Transit Vehicle Tracking; APTS02: Fixed Route Transit Operations	
ITS Architecture Elements: FAX Transit Vehicles; FAX Management Center	
Included in San Joaquin Valley Regional ITS Architecture? Yes. The San Joaquin Valley ITS Strategic Deployment Plan identifies transit vehicle tracking and transit fixed-route operations inventory and market packages on Page 7-5. Inventory is in the architecture's Appendix A.	

Project 23: Fresno County Electronic Fare Boxes

Provider: Fresno County Transportation Authority	**Size**: Small (<10 vehicles)
Geographic Area Served: Fresno County	**Population**: 930,450
Project Description: This project supported the implementation of electronic fare boxes for rural transit vehicles.	
Caltrans Standard Agreement # 647006	**Grant Program:** 5311
Stakeholders: Fresno County Transportation Authority	**Status**: Existing
Technological Complexity: Low	
ITS Architecture Market Packages: APTS04: Transit Fare Collection Management	
ITS Architecture Elements: Fresno County Transit Buses	
Included in San Joaquin Valley Regional ITS Architecture? Yes. The San Joaquin Valley ITS Strategic Deployment Plan identifies transit fare collection management market package on Page 7-5. Inventory is in the architecture's Appendix A.	

Project 24: Kings County Mobile Data Terminals

Provider: Kings County Area Public Transit Agency	**Size**: Large (>25 vehicles)
Geographic Area Served: Kings, Fresno, Tulare, Kern, Madera Counties	**Population**: 2,516,107
Project Description: This project supported the implementation of mobile data terminals on KCAPTA vehicles.	
Caltrans Standard Agreement # 649851	**Grant Program:** 5311ARRA
Stakeholders: KCAPTA, Fresno, Tulare, Kern, Madera Counties	**Status**: Existing
Technological Complexity: Medium	
ITS Architecture Market Packages: APTS01: Transit Vehicle Tracking, APTS02: Fixed Route Transit Operations, APTS03: Demand Response Transit Operations	
ITS Architecture Elements: KCAPTA Transit Management Center, KCAPTA Transit Vehicles	
Included in San Joaquin Valley Regional ITS Architecture? Yes. The San Joaquin Valley ITS Strategic Deployment Plan identifies transit vehicle tracking, transit fixed-route operations and demand response transit operations market packages on Page 7-5. Inventory is in the architecture's Appendix A.	

Project 25: City of Ridgecrest Demand Response Management

Provider: City of Ridgecrest	**Size**: Small (<10 vehicles)
Geographic Area Served: The city of Ridgecrest in Kern County	**Population**: 27,616
Project Description: This project supported the implementation of upgraded paratransit vehicle tracking and management.	
Caltrans Standard Agreement # 646019	**Grant Program:** 5311
Stakeholders: City of Ridgecrest	**Status**: Existing
Technological Complexity: Low	
ITS Architecture Market Packages: APTS01: Transit Vehicle Tracking; APTS03: Demand-Response Transit Operations	
ITS Architecture Elements: City of Ridgecrest Paratransit Vehicles; City of Ridgecrest Paratransit Management Center	
Included in San Joaquin Valley Regional ITS Architecture? Yes. The San Joaquin Valley ITS Strategic Deployment Plan identifies transit vehicle tracking and demand response transit operations market packages on Page 7-5. Inventory is in the architecture's Appendix A.	

Project 26: City of Tulare Automatic Vehicle Location

Provider: City of Tulare	**Size**: Medium (>10 and <25 vehicles)
Geographic Area Served: Tulare County	**Population**: 442,179
Project Description: This project supported the implementation of automated vehicle location system.	
Caltrans Standard Agreement # 646026	**Grant Program:** 5311
Stakeholders: City of Tulare, Tulare County	**Status**: Existing
Technological Complexity: Medium	
ITS Architecture Market Packages: APTS01: Transit Vehicle Tracking	
ITS Architecture Elements: Tulare Transit Management Center and Buses	
Included in San Joaquin Valley Regional ITS Architecture? Yes. The San Joaquin Valley ITS Strategic Deployment Plan identifies transit vehicle tracking market packages on Page 7-5. Inventory is in the architecture's Appendix A.	

Project 27: City of Arvin Passenger Counting and Surveillance

Provider: City of Arvin	**Size**: Medium <10 vehicles)
Geographic Area Served: City of Arvin and the Tejon Industrial Complex	**Population**: 15,185
Project Description: This project is supporting the implementation of onboard surveillance cameras.	
Caltrans Standard Agreement # 640602	**Grant Program:** 5316
Stakeholders: City of Arvin, Emergency Management	**Status**: Planned
Technological Complexity: Low	
ITS Architecture Market Packages: APTS05: Transit Security	
ITS Architecture Elements: Arvin Transit Management Center and Buses, Emergency Management Center	
Included in San Joaquin Valley Regional ITS Architecture? The San Joaquin Valley ITS Strategic Deployment Plan identifies Transit security as a Priority 2 Market Package on Page 4-21.	

Caltrans District 7 Projects

Project 28: Valley Village Transit Vehicle Tracking (Urban Project)

Provider: Valley Village	**Size**: Small (<10 vehicles)
Geographic Area Served: City of Burbank in the City of Los Angeles and part of Ventura County	**Population**: 103,340 (city), 823,318 (Ventura County)
Project Description: The project is supporting the implementation of GPS-based vehicle tracking for urban provider Valley Village demand response vehicles.	
Caltrans Standard Agreement # Existing: 648572; Planned: 649567	**Grant Program:** 5310
Stakeholders: Valley Village	**Status**: Planned and Existing
Technological Complexity: Low	
ITS Architecture Market Packages: APTS01: Transit Vehicle Tracking; APTS03: Demand Response Transit Operations	
ITS Architecture Elements: Valley Village Transit Vehicles, Valley Village Management Center	
Included in SCAG Regional ITS Architecture? The Los Angeles/Ventura Region ITS Strategic Deployment Plan does not identify this stakeholder or specific project, but does identify the market packages.	

Project 29: Tarzana Treatment Centers Vehicle Tracking (Urban Project)

Provider: Tarzana Treatment Centers, Inc.	**Size**: Small (<10 vehicles)
Geographic Area Served: City of Tarzana in the County of Los Angeles	**Population**: 27,407
Project Description: The project supported the implementation of GPS-based vehicle tracking for urban provider Tarzana Treatment Centers demand response vehicles.	
Caltrans Standard Agreement # 645562	**Grant Program:** 5310
Stakeholders: Valley Village	**Status**: Existing
Technological Complexity: Low	
ITS Architecture Market Packages: APTS01: Transit Vehicle Tracking; APTS03: Demand Response Transit Operations	
ITS Architecture Elements: Tarzana Treatment Centers Transit Vehicles, Tarzana Treatment Centers Management Center	
Included in SCAG Regional ITS Architecture? The Los Angeles/Ventura Region ITS Strategic Deployment Plan does not identify this stakeholder or specific project, but does identify the market packages.	

Project 30: Lifesteps Foundation Demand Response Management ((Urban Project)

Provider: Lifesteps Foundation	**Size**: Small (<10 vehicles)
Geographic Area Served: Culver City in the County of Los Angeles	**Population**: 38,883
Project Description: The project supported the implementation of vehicle tracking and demand response transit management.	
Caltrans Standard Agreement # 649533	**Grant Program:** 5310
Stakeholders: Lifesteps Foundation	**Status**: Planned
Technological Complexity: Low	
ITS Architecture Market Packages: APTS01: Transit Vehicle Tracking; APTS03: Demand Response Transit Operations	
ITS Architecture Elements: Lifesteps Foundation Transit Vehicles, Lifesteps Foundation Management Center	
Included in SCAG Regional ITS Architecture? The Los Angeles/Ventura Region ITS Strategic Deployment Plan does not identify this stakeholder or specific project, but does identify the market packages.	

Caltrans District 8 Projects

Project 31: SunLine Advanced Transit Systems (Urban Project)

Provider: SunLine Transit Agency	**Size**: Large (>25 vehicles)
Geographic Area Served: Coachella Valley – Desert Hot Springs to Mecca	**Population**: 2,189,641 (Riverside County)
Project Description: The project supported the implementation of automatic vehicle location and GPS systems; automatic passenger counters; automated stop annunciation and advanced passenger transportation systems.	
Caltrans Standard Agreement # 649965	**Grant Program:** 5311ARRA
Stakeholders: SunLine Transit, Riverside County, Coachella Valley Association of Governments	**Status**: Existing
Technological Complexity: High	
ITS Architecture Market Packages: APTS01: Transit Vehicle Tracking, APTS02: Fixed Route Transit Operations, APTS03: Demand Response Transit Operations, APTS08: Transit Traveler Information, APTS10: Transit Passenger Counting	
ITS Architecture Elements: SunLine Transit Management Center, SunLine Transit Vehicles	
Included in Inland Empire ITS Architecture? Yes. The market packages are identified as existing on page 4-13 of the Inland Empire ITS Architecture. ITS elements are identified in Appendix C-4.	

Caltrans District 9 Projects

Project 32: Eastern Sierra Nevada Transit Information

Provider: Eastern Sierra Nevada Transit Authority (ESTA)	**Size**: Small (<10 vehicles)
Geographic Area Served: Inyo County, including Lone Pine, Mammoth and Bishop.	**Population**: 18,546
Project Description: The project supported the implementation of vehicle tracking and arrival prediction systems for providing real-time transit vehicle location information to the public.	
Caltrans Standard Agreement # 649301	**Grant Program:** 5311ARRA
Stakeholders: ESTA, NextBus	**Status**: Existing
Technological Complexity: Medium	
ITS Architecture Market Packages: APTS01: Transit Vehicle Tracking; APTS08: Transit Traveler Information	
ITS Architecture Elements: NextBus Information Service Provider, ESTA Transit Vehicles, ESTA Management Center.	
Included in the Sierra Nevada ITS Architecture? Yes. Transit Vehicle Tracking and Transit Traveler Information are identified on page 3-41, further description is on Page 3-59. Inventory is listed in the Solutions Diagrams #3.	

Caltrans District 10 Project

Project 33: Merced County Automated Vehicle Location

Provider: Merced County Transit	**Size**: Small (<10 vehicles)
Geographic Area Served: Mariposa, Merced and Mono Counties	**Population**: 288,246
Project Description: This project supported the implementation of automated vehicle location systems including GPS equipment.	
Caltrans Standard Agreement # 649858	**Grant Program:** 5311ARRA
Stakeholders: Merced County Transit	**Status**: Existing
Technological Complexity: Low	
ITS Architecture Market Packages: APTS01: Transit Vehicle Tracking, APTS02: Fixed Route Transit Operations, APTS03: Demand Response Transit Operations	
ITS Architecture Elements: Merced County Transit Management Center, Merced County Transit Vehicles	
Included in San Joaquin Valley Regional ITS Architecture? Yes. The San Joaquin Valley ITS Strategic Deployment Plan identifies transit vehicle tracking, transit fixed-route operations and demand response transit operations market packages on Page 7-5. Inventory is in the architecture's Appendix A.	

Project 34: San Joaquin County Transit Dispatch and Surveillance (Urban Project)

Provider: San Joaquin Regional Transit District	**Size**: Small (<10 vehicles)
Geographic Area Served: San Joaquin County	**Population**: 685,306
Project Description: This project supported the implementation of hardware and software for a flex route dispatch system.	
Caltrans Standard Agreement # 646718 (urban)	**Grant Programs:** 5317
Stakeholders: San Joaquin County	**Status**: Existing
Technological Complexity: Medium	
ITS Architecture Market Packages: APTS03: Demand Response Transit Operations	
ITS Architecture Elements: San Joaquin Transit Management Center and Buses	
Included in San Joaquin Valley Regional ITS Architecture? The San Joaquin Valley ITS Strategic Deployment Plan identifies demand response transit operations as a Priority 1 market package on Page 4-21.	

Project 35: Stanislaus County Transit Fare Boxes and Route Planning Software

Provider: Stanislaus County Public Works	**Size**: Large (>25 vehicles)
Geographic Area Served: Stanislaus County	**Population**: 514,453
Project Description: This project supported the implementation of route planning software, on-board electronic fare boxes and fare box data systems.	
Caltrans Standard Agreement # 647431, 649963, 649964	**Grant Programs:** 5311, 5311ARRA
Stakeholders: Stanislaus County Public Works	**Status**: Existing
Technological Complexity: Medium	
ITS Architecture Market Packages: APTS02: Transit Fixed Route Operations, APTS04: Transit Fare Collection Management	
ITS Architecture Elements: Stanislaus County Transit Management Center and Buses	
Included in San Joaquin Valley Regional ITS Architecture? Yes. The San Joaquin Valley ITS Strategic Deployment Plan identifies transit fixed route operations and transit fare collection management market packages on Page 7-5. Inventory is in the architecture's Appendix A.	

Project 36: Yosemite Area Regional Transportation System (YARTS) Electronic Fareboxes

Provider: YARTS	**Size**: Large (<25 vehicles)
Geographic Area Served: Mariposa and Merced Counties, Yosemite National Park	**Population**: 18,251 (Mariposa); 255,793 (Merced)
Project Description: This project is supporting the implementation of electronic fareboxes.	
Caltrans Standard Agreement # 649422	**Grant Program:** 5311
Stakeholders: YARTS, National Park Service, AMTRAK	**Status**: Planned
Technological Complexity: Medium	
ITS Architecture Market Packages: APTS04: Transit Passenger and Fare Management	
ITS Architecture Elements: YARTS vehicles, AMTRAK stations, YARTS management center	
Included in San Joaquin Valley Regional ITS Architecture? Yes. The San Joaquin Valley ITS Strategic Deployment Plan identifies and transit fare collection management market packages on Page 7-5. Inventory is in the architecture's Appendix A.	

Caltrans District 11 Projects

Project 37: City of El Cajon Vehicle Location (Urban Project)

Provider: San Diego Metropolitan Transit System	**Size**: Large (>25 vehicles)
Geographic Area Served: City of El Cajon and rural surrounding area	**Population**: 99,478 (city)
Project Description: The project supported the implementation of GPS-based vehicle tracking, fixed-route management and automated passenger counting on vehicles and at the center (yard).	
Caltrans Standard Agreement # 649310	**Grant Program:** 5311ARRA
Stakeholders: San Diego Metropolitan Transit System	**Status**: Existing
Technological Complexity: Medium	
ITS Architecture Market Packages: APTS01: Transit Vehicle Tracking, APTS02: Transit Fixed Route Operations, APTS10: Transit Passenger Counting	
ITS Architecture Elements: San Diego MTS Transit Vehicles; San Diego MTS Management Center	
Included in San Diego Regional ITS Architecture? Yes. Transit vehicle tracking and transit fixed route operations are identified on Pages 66-69, Figure 7-4 and Figure 9-2.	

Appendix C-California IT/ITS Compliance Plan

The form on the following pages is the Caltrans DMT ITS Compliance Plan for ITS projects. This compliance form provides a way for California's rural/non-urban transit providers to briefly describe projects they seek funding to implement. The information gathered can be used by the providers and Caltrans to determine if the project qualifies as Intelligent Transportation Systems (ITS), and whether the project also needs to be part of a regional or project ITS architecture.

Information Technology / Intelligent Transportation Systems Compliance Plan

(Examples include: Hardware, Software, Fareboxes, Global Positioning Systems (GPS), Automatic Vehicle Locators (AVL), computer-aided dispatch (CAD), Electronic Fare payment (Smart Card), and Vehicle Maintenance Systems.)

According to the annual "Certifications and Assurances," and consistent with the National ITS Architecture, all requests for ITS projects by an awarding agency must have an ITS Plan. ITS is referenced in SAFETEA-LU Subtitle C, Section 5301, Paragraph 512.

For more information about ITS, visit these websites:

http://www.iteris.com/itsarch/
www.pcb.its.dot.gov/factsheets/avl/avlRur.pdf
www.itslessons.its.dot.gov/its/benecost.nsf/DisplayLessonCategory
http://www.itsdeployment.its.dot.gov/nationwidelist.asp?State=CA
http://www.resourceguide.its.dot.gov/default.asp
http://www.itscosts.its.dot.gov/
http://itsweb.mitretek.org/aptsmatrix

Agency Name: _____County:_____Caltrans District # _____

Standard Agreement #: _____ Standard Agreement Amount $_____ Total Project Cost $_____

Fund Source: ☐ ARRA ☐ 5311 ☐ 5311(f) ☐ 5310 ☐ 5316 ☐ 5317

Contact Name: _____ Title: _____

Address: _____ City _____ Zip code_____

Phone #: _____ Email Address: _____

Please respond to all questions. If more space is needed, please attach additional pages. If a question does not apply to your purchase, briefly explain if possible, or state "not applicable."

1. Briefly describe the following:
   a. Item(s) being purchased
   b. The business function(s) or process the items will support
   c. How the item(s) will be used

2. Indicate whether the project requires one or more of the following, estimate the percentage of each:
   - Commercial-off-the-shelf (COTS) ☐ No ☐ Yes/Percentage_____
   - Modified-off-the-shelf (MOTS) ☐ No ☐ Yes/Percentage_____
   - Custom software/hardware development (CSD) ☐ No ☐ Yes/Percentage_____

   COTS = Computer software, hardware, technology, or computer products that are ready-made and available for sale, lease, or license to the general public.
   MOTS = Computer software, hardware, technology, or computer products that can be purchased and then modified by the customer, vendor, third party to meet the specific need/use.
   CSD = Software and/or hardware is procured from a customized scope of work developed by the agency.)

3. Is the project a proprietary system? ☐ No ☐ Yes

4. If the IT/ITS system is a MOTS or a CSD, will the Awarding Agency retain all rights to software development? Specifically, all intellectual property rights to the source code, as distinguished from a license to use the software limited in time. Briefly explain.

5. Please describe in detail how the project is consistent with your Local or Regional ITS Architecture Plan and based on the requirements of the National ITS Architecture? (National ITS Architecture provides a common framework for planning defining, and integrating intelligent transportation systems. For more information, go to http://www.iteris.com/itsarch/.)

6. Please provide the contact information for the agency in charge of the Local or Regional ITS Architecture Plan:

   Name of ITS Architecture Plan _____
   Contact Name _____
   Title _____
   Telephone Number _____
   E-mail _____

7. Indicate whether the project requires integration or whether the project is a stand-alone system with minimal integration.

8. If the project requires integration, what systems will be integrated?

9. What other entities (public or private) will be a part of the systems integration?

10. If the agency plans to integrate systems now or in the future, is the agency coordinating this IT/ITS project with a Local or Regional ITS plan? ☐ No ☐ Yes

11. Data Collection:
    a. Does the agency intend to collect data with their IT/ITS System? ☐ No ☐ Yes
    b. If yes, what will the data be used for?
    c. If the agency plans to collect data, is it for public use or private use or both? Please explain.
    d. If another public or private entity is interested in their data, will they give the data away for free or charge a fee for it?
    e. How will the data be stored?

12. Does the agency have a license for use? ☐ No ☐ Yes
    If multiple systems are to be integrated, do all entities have a license for use, an agreement, permit, or approval by the vendor?

13. Briefly describe the implementation plan for the procurement of the IT/ITS Project as follows:
    - Procurement and Installation Schedule
    - Testing and Acceptance Plan/Schedule
    - System Maintenance Plan
    - Type of Warranties and Length of Warrantees
    - Training Plan

14. List any special hardware devices or equipment this system must interface or "connect to" and how this special hardware will be interfaced with the project equipment.

15. Describe your agency's policies to protect the federal investment throughout useful life and ensure adequate system performance to minimize repairs and replacements.

16. Describe how the agency will administer and manage the acquisition once a contract is awarded.

17. Has your agency established a process for the systems engineering analysis of ITS projects?
    ☐ No ☐ Yes

Certifying Representative:

I certify the requested commodities and/or services are correct and any items purchased comply with 49 CFR Part 18, Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments, or 49 CFR Part 19, Uniform Administrative Requirements for Grants and Agreements with Institutions of Higher Education, Hospitals, and Other Non-Profit Organizations, FTA Circular 4220.1F- Third Party Contracting Guidance, and the FTA Best Practices Procurement Manual.

By signing below, I have read and acknowledged that my agency is in compliance with the National ITS Architecture, PL 105-178 Section 5206(e), Federal Register, January 2, 2001 (Volume 66, No. 5, pp 1455-1459).

(Please Print)

Name: _____ Title: _____

Signature: _____ Date: _____
(**Original** signature in **BLUE** ink only)

Appendix D–Federal Register Volume 76, Number 211

Under separate cover (See "App D-Federal Register FTA 2012 C&A"), is the Federal Register Volume 76, Number 211, dated Tuesday, November 1, 2011.

The Federal Transit Administration (FTA) has consolidated and updated the various pre-award Certifications and Assurances required for its Federal transit assistance (funding) programs in Federal fiscal year (FY) 2012.

The relevant ITS Assurance is noted in "Group 14" of this Notice.

Appendix E–Technology in Rural Transit: Linking People With Their Community

Under separate cover (See "App E-Rural ITS Technology Guidebook.pdf"); this document presents the work performed for the Federal Transit Administration's Office of Research, Innovation and Demonstration. The goal of this report is to provide rural transit systems with the tools to implement Rural Intelligent Transportation System (ITS) applications to help improve their ability to link people with their community. The report identifies and documents transit agencies that illustrate best practices in implementation of technology to advance rural transit.

Appendix F–Regional ITS Architecture to Support Planning for Operations

Under separate cover (See "App F-FHWA Regional ITS Primer (fhwahop12001).pdf"), this primer offers transportation planners and operations managers a menu of opportunities for applying the regional ITS architecture. It centers on the use of an objectives-driven, performance-based approach to planning for operations; an approach that can leverage regional ITS architectures given the approach's emphasis on operational objectives and performance measures and the architecture's use of data and services to address operational needs. Additionally, the primer leads planners and operators through techniques to make a regional ITS architecture relevant and more accessible to practitioner needs in planning for operations.