United States Department of Transportation
Federal Transit Administration

National ITS Architecture Consistency Policy for Transit Projects

Additional Grantee Guidance

2003

National ITS Architecture Consistency Policy for Transit Projects Additional Grantee Guidance Executive Summary

2003

The **Federal Transit Administration (FTA) National Intelligent Transportation Systems (ITS) Architecture Policy on Transit Projects** and its companion Federal Highway Administration (FHWA) Rule went into effect in April 2001. The recommended activities and actions that grantees should be carrying out in order to understand and meet its requirements are described in the guidance that follows and include:

1. Become Familiar with the National ITS Architecture Policy on Transit Projects.

The Policy was developed to implement the TEA – 21 requirement that all ITS projects funded from the Highway Trust Fund conform to the National ITS Architecture. It directs that:

- Areas must have a **regional ITS architecture** in place by **April 8, 2005,** if they are now operating or implementing **ITS Projects**, or within four years from the date their first ITS project advances to final design if no ITS projects currently exist;
- ITS projects funded by the Highway Trust Fund and the Mass Transit Account **must conform to a regional ITS Architecture once it is adopted**;
- Prior to the adoption of a regional ITS architecture, "**Major ITS Projects**" must include the development of a project level architecture;
- All ITS Projects must be based upon a **Systems Engineering Analysis** and use U.S. DOT adopted ITS standards as appropriate[1];
- Regional ITS architecture development must be **consistent with the area's transportation planning process** (Long Range Plan and Transportation Improvement Program); and
- FTA grantees will **self-certify** compliance. No specific documentation is defined, however, each grantee (area) must be able to demonstrate compliance and provide for maintenance and updating of the architecture as needed.

In order to more fully understand the implications of the above requirements grantees, should: Read and find out more about the policy at (http://www.its.dot.gov/aconform/aconform.htm); Take advantage of existing training opportunities, including the new National Transit Institute Course: "Complying with the FTA's Policy on ITS Architecture Consistency;" and Obtain technical assistance, as needed, through the ITS Peer-to-Peer program, the FTA ITS Architecture and Technical Assistance program, or other direct technical assistance.

2. Assess how the Policy is applicable to projects and grants, and participate in Regional ITS Architecture Development.

The Policy is applicable if the projects and grants are "ITS Projects" (or projects with ITS), which receive funding from the Federal Highway Trust Fund. ITS Projects are any project that includes the implementation and operation of one or more of the ITS User Services defined in the National ITS Architecture. Examples of transit related services that are considered ITS are: traveler information, automatic vehicle location (AVL) and computer aided dispatch (CAD),

[1] To date the U.S. DOT has not adopted any ITS standards, and a formal rulemaking process will precede any such adoption.

electronic payment systems, transit signal priority, automatic passenger counters (APC), security surveillance both within stations and on vehicles, highway/rail intersection protection, collision warning and driver assistance, vehicle system monitoring, advanced scheduling and run-cutting, and ITS data archiving. With few exceptions, if your current or planned projects include these services and receive funds from the U.S. DOT, then, the Policy is applicable.

Transit agencies should participate in the development of a Regional ITS Architecture if their projects or plans include ITS, or if others in their area are planning ITS systems that will impact their operations (e.g. advanced signal systems and traffic management centers, regional traveler information, etc.). A **Regional ITS Architecture** is: "A regional framework for ensuring institutional agreement and technical integration for the implementation of ITS projects or groups of projects." The stakeholders define the "region" locally, but at a minimum it should be the area covered by the metropolitan planning organization. The regional ITS architecture must include the participation of all stakeholders concerned with implementing and operating the region's ITS systems. It captures the region's plans for ITS and the phasing of the ITS components, and how the stakeholders will work together to insure their implementation and operation. The regional ITS architecture also must include any agreements between agencies necessary to implement and operate the ITS systems described within it.

3. Meet the Project Level Requirements

The project level requirements include undergoing a **Systems Engineering Analysis** for the ITS and communications components of the project or grant, and **developing ITS Project Architectures for all Major ITS Projects** (prior to the adoption of the regional ITS architecture). The ITS components and Policy conformity status also should be included in FTA grant applications within TEAM.

A systems engineering analysis is "A structured process for arriving at a final design of a system," and is a method for identifying needs and developing/procuring the best possible configuration for a particular situation. The Policy requires that the systems engineering analysis include how the project fits into the regional (or National) ITS architecture, how the system will be implemented and operated (roles, requirements), and analyses of alternatives for system configuration, financing, and procurement. Applicable ITS standards also must be identified.

Prior to the adoption of a regional ITS architecture, all Major ITS Projects must also include the development of a project level architecture. Major ITS Projects are any projects that implement part of a regional ITS initiative that is multi-jurisdictional, multi-modal, or otherwise affects regional integration of ITS systems. Examples include regional traveler information, regional electronic payment, new AVL systems that may set the standard for the region, or transit signal priority systems. A project architecture is similar to a regional ITS architecture but focuses on the project and its implementation. Again, all agreements that are needed to implement and operate the ITS systems must be included as part of the project architecture.

Please contact your FTA Regional Office, or Ron Boenau, Chief Advanced Public Transportation Division, at FTA Headquarters (202-366-0195), if there are additional questions or concerns after reading this guidance.

National ITS Architecture Consistency Policy for Transit Projects Additional Grantee Guidance

The **Federal Transit Administration (FTA) National Intelligent Transportation Systems (ITS) Architecture Policy on Transit Projects,** and its companion Federal Highway Administration (FHWA) Rule went into effect in April 2001. This document summarizes the recommended activities and actions that grantees should be carrying out in order to understand and meet its requirements. These activities include:

- Become familiar with the Policy and its requirements and implications for your area. One way to do this is to take advantage of training and technical assistance offered through National Transit Institute (NTI), National Highway Institute (NHI), FTA, and the ITS Joint Program Office (JPO);
- Assess how the rule is applicable to your projects and grants, and participate in Regional ITS Architecture Development for your area; and
- Meet the project level requirements, including the use of a Systems Engineering Approach for project development of the ITS and communications components of your transit system and services.

Each of these is briefly explained below.

1. BECOME FAMILIAR WITH THE NATIONAL ITS ARCHITECTURE POLICY ON TRANSIT PROJECTS.

- Read and find out about the Policy at: (http://www.its.dot.gov/aconform/aconform.htm)
- Take Advantage of Training Opportunities
- Obtain Technical Assistance

Based on the development and deployment of Intelligent Transportation Systems (ITS) on a wide-scale basis in the United States, and the desire to integrate these systems in a seamless manner, the United States Department of Transportation (U.S. DOT) developed the National ITS Architecture. The National ITS Architecture now serves as a tool to help transportation agencies develop and deploy ITS. Congress incorporated into the Transportation Equity Act for the 21st Century (TEA – 21) the requirement for conformity to the National ITS Architecture to underscore its importance and the creation integrated systems as a whole.

TEA-21 Title V, Sec. 5206(e) States:

> "The Secretary shall ensure that intelligent transportation system projects carried out using funds made available from the Highway Trust Fund, … conform to the national architecture, applicable standards or provisional standards, and protocols developed under subsection(a)."

As a result, the U.S. DOT developed the **Federal Transit Administration National ITS Architecture Policy on Transit Projects** and its companion FHWA Rule, which both went into effect in April 2001. Consequently, one of the first actions that grantees should take is to

become familiar with the policy and its basic concepts and requirements. The Policy directed that:

- Regions currently implementing or operating **ITS projects** must have a **regional ITS architecture** in place in four years. Regions not currently implementing ITS projects must develop a regional ITS architecture within four years from the date their first ITS project advances to final design;
- ITS projects funded by the Highway Trust Fund and the Mass Transit Account must conform to a regional ITS Architecture;
- Prior to the adoption of a regional ITS architecture, "**Major ITS Projects**" not in Final Design by April 8, 2001, must include the development of a project level architecture that clearly reflects consistency with the National ITS Architecture;
- All ITS Projects not in Final Design by April 8, 2001, must be based upon a **Systems Engineering Analysis** on a scale commensurate with the project's scope and use U.S. DOT adopted ITS standards as appropriate[2]; and
- No specific documentation is required. However, regions (grantees) must be able to demonstrate compliance, account for Architecture maintenance and updating, and coordinate with Federal field offices.

Development of the regional ITS architecture should also be consistent with the transportation planning process for Statewide and Metropolitan Transportation Planning (49 CFR Part 613 and 621)." Monitoring compliance with the Policy will be in accordance with existing FTA oversight procedures used for all projects**.** FTA grantees will self-certify compliance.

To assist agencies and grantees in understanding the Policy the, U.S. DOT provides a website where the Policy and additional outreach materials can be found:

ITS Architecture Conformity website, http://www.its.dot.gov/aconform/aconform.htm .

This location includes:

- The Final Policy and Rule as published in the Federal Register as well as highlights of their requirements in summary form;
- Case studies of regional ITS architecture development and recommendations and guidance on how to develop one for your area;
- Current training opportunities; and
- List of frequently asked questions and their answers.

In addition, training opportunities (some free) and technical assistance also are provided through the National Transit Institute (NTI), the National Highway Institute (NHI), FTA and the U.S. DOT ITS Joint Program Office (JPO). The training courses and resources are designed to assist grantees in understanding ITS architecture and standards in general as well as the specific requirements of the Policy. Training on ITS architecture and the Policy is offered though NTI (www.ntionline.com), NHI (www.nhi.fhwa.dot), and the ITS JPO Professional Capacity Building Program (http://www.pcb.its.dot.gov/). Training on standards is offered

[2] To date the U.S. DOT has not adopted any ITS standards, and a formal rulemaking process will precede any such adoption.

through the Institute of Transportation Engineers (www.ite.org) and the Transit Standards Consortium (TSC) (www.tsconsortium.org). Specific courses include:

- Complying with the FTA's Policy on ITS Architecture Consistency (NTI);
- Transit Communications Interface Profiles (TCIP) Courses (TSC);
- Vehicle Area Networks (TSC);
- ITS Architecture Standards and Conformity Course (NHI);
- Introduction to Systems Engineering (NHI); and
- Turbo Architecture Course (NHI).

You may also be eligible for technical assistance on general ITS and architecture and specific issues and concerns. Technical assistance opportunities include:

- The ITS Peer-to-Peer Program provides short duration technical assistance on specific topics. See the Peer-to-Peer website (http://www.its.dot.gov/peer/peer.htm) for more information and to submit requests for assistance.
- Support through U.S. DOT ITS Service Plan for your area. Each year coordinated services plans are developed that describe how FHWA and FTA will provide technical support in an area (Metropolitan or Rural) for deploying and integrating ITS technologies and procedures. Typical activities include provision of training courses in an area, architecture workshops and stakeholder meetings, and scanning reviews. Work with your FTA Regional Office to develop and submit requests for your area.
- Direct technical assistance is also provided by the FTA through the FTA Architecture Oversight and Technical Assistance, and advanced technologies technical assistance contractors. The need for this support is determined through the annual FTA Risk Assessments and other oversight activities or requests through the FTA Regions.

For additional information on available technical assistance and resources, please contact your FTA Regional Office, or Ronald Boenau, Chief, FTA Advanced Public Transportation Division (202-366-0195), in Washington D.C.

2. ASSESS HOW THE POLICY IS APPLICABLE TO PROJECTS AND GRANTS AND PARTICIPATE IN REGIONAL ITS ARCHITECTURE DEVELOPMENT.

- Assess Project Level Applicability
- Assess Region Wide Applicability and concerns
- Participate in Regional ITS Architecture Development and Maintenance

Once a basic understanding of the Policy is developed grantees, need to determine if the National ITS Architecture Policy requirements are applicable to their specific operations and proposed projects or plans, or their area and its transit operations in general. If so , they need to begin (continue) to participate in the development of the regional ITS architecture for the area.

2.1 PROJECT LEVEL POLICY APPLICABILITY:

- Does the Project Use Highway Trust Fund Dollars?
- Is the Project An ITS Project?
- Is the Project A Major ITS Project?
- Do Any Exceptions Apply?

In general, if a project uses funds from the U.S. Highway Trust Fund (including FTA funding) and includes ITS elements, then the project must conform to an ITS Architecture and the Policy is applicable. However, the requirements found in the Policy that must be followed may vary depending on the type of project and ITS elements; stage of development when the project entered into final design; or if the project is supporting existing ITS systems when they became operational and the degree of change the project introduces. This leads to a series of questions on applicability that can be answered in order.

Does the Project Use Funds from the U.S. Highway Trust Fund?

The Policy only applies to projects that are carried out using funds made available from the U.S. Highway Trust Fund. This includes the Mass Transit Account and virtually all other funds distributed by the FTA and FHWA. FTA grant programs funded wholly or in part from the Highway Trust Fund which may include ITS are:

- USC 5303 Metropolitan Planning
- USC 5313 State Planning & Research
- USC 5314 National Planning & Research
- USC 5307 Urbanized Area Formula
- USC 5311 Nonurbanized Area Formula
- USC 5312 Research Development & Demonstration
- USC 5309 Capital Program
- New Starts
- Fixed Guideway Modernization
- Bus and Bus Related Facilities
- USC 5310 Elderly/Persons with Disabilities
- TEA-21 3037 Job Access

Moneys from other Highway Trust Fund accounts and programs may also be transferred to the FTA for administration or managed by the FHWA or other Federal Agencies (e.g. FRA, U.S. Park Service, etc.). Examples include projects funded through:

- ITS Deployment Program (Earmarks)
- Congestion Mitigation and Air Quality
- Surface Transportation Program
- National Highway System
- Interstate Maintenance Program
- Federal Lands Program

Other Federal program funds may, or may not, come from the Highway Trust Fund. Thus, if a grantee uses other Federal funds, and no funds from the above listed sources, it is recommended that the grantee consult with the Federal Agency administering the program in question to verify if Highway Trust Funds are being used or not. Additionally, FTA encourages all federally funded ITS projects to comply with the policy.

Is the Project an ITS Project?

ITS, as defined by TEA-21, is a broad array of advanced technologies and systems[3]. Consequently, for purposes of conformity to the National ITS Architecture, FTA has refined the definition of an ITS project to be the ITS User Services that the Architecture implements.

An **ITS Project** is "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."

Thus, if the project includes ITS components that implement any of the defined User Services it is considered an "ITS Project." There are currently 31 User Services organized in 7 User Service Bundles represented within the National ITS Architecture. Attachment A shows the current User Services and highlights those most likely to be proposed and implemented by a grantee.

However, it is important to point out that as the implementation of Transit ITS advances many of the other User Services may also become part of a grantee's project and overall ITS plans. This is especially true for the Transit Intelligent Vehicle Initiative (IVI) services found in the Automated System Control and Safety User Service Bundle (Attachment A, Bundle 6). Equally important is the fact that in defining the Public Transportation Management User Services, the National Program Plan originally described public transportation as "all forms of short distance transportation not involving a single occupant vehicle" including " urban, suburban, and rural transit in fixed route, route deviation and demand-responsive modes and operated by bus, heavy rail, light rail, commuter rail and van or carpool or shared ride taxi." Thus, the public transit ITS systems are not simply limited to bus operations.

The grantee should therefore review each project's components with respect to the User Services described above and also in Appendix A. This review should be carried out for both projects that are 100% ITS, and others that may include ITS in their design (e.g. New Starts, Bus Purchases, Bus Rapid Transit and Rail Projects). Additional insight towards what should be considered "ITS" can be gained by examining the National ITS Architecture and its Market Packages for implementing the User Services (see www.its.dot.gov/arch/arch.htm).

Examples of transit related systems that may be implemented as part of ITS Projects are:

- **Pre-trip traveler information systems** through phone, 511 systems, kiosks, the web and other electronic channels that help provide route and fare information or itinerary planning;
- **En-route transit information** through 511 systems, variable message signs, enunciators, or personal devices that provide next vehicle and stop information, or route and itinerary planning;
- **Multi-modal traveler information systems** that integrate transit information with highway, rail, and other options; and
- **Personalized public transit** for route deviation, flex route, and para-transit services;

[3] Intelligent Transportation Systems means "electronics, communications or information processing used singly or in combination to improve the efficiency or safety of a surface transportation system" (TEA-21).

- **Transit management systems and management centers** using AVL, computer aided dispatch, GIS, and surveillance of network conditions to improve the travel time and reliability of the transit system, and provide for transfer connection protection;
- **Transit Signal Priority** to improve the travel time and reliability of the transit vehicles operating in mixed flow, or crossing major arterials at grade.
- **Carpool Ride Matching & Reservation systems**;
- **Electronic payment systems** both at transit centers and stations and on vehicles that include both fare payment and the ability to pay for other services (parking or toll charges);
- **Communications systems** that provide the backbone for the vehicle and wayside communication to each other and to the transportation management center;
- **Automatic Passenger Counters** for performance monitoring and service planning;
- **Vehicle and system monitoring** that tracks system functions and provides warning of likely malfunction or maintenance needs;
- **Vehicle, stop, or wayside surveillance** to provide for passenger, driver and system safety and security. Silent alarms to notify authorities of an incident or emergency;
- **Highway/Rail Intersection Protection** to improve the safety of rail-transit operations and buses that travel through rail intersections;
- **Collision warning/avoidance, vision enhancement, and driver assistance** to ensure safe transit operations in increasingly congested conditions, or limited right of ways; and
- **Data archiving and information management systems** to store and analyze the real time system data and assist in service planning, system monitoring, and other decisions.

If doubts remain on whether a project is or is not an ITS Project, it is suggested that they be resolved through consultation with the FTA Regional ITS contact or FTA Headquarters.

Is the Project a "Major ITS Project"?

A Major ITS Project is any project that implements part of a regional ITS initiative that is multi-jurisdictional, multi-modal, or otherwise affects regional integration of ITS systems. These are the significant projects that may provide the basic structure of the integrated ITS system for a region and enable the deployment of other ITS systems throughout the area.

Examples of Major ITS projects are:

- A regional traveler information system that includes transit information;
- The construction or functional expansion of a transit or transportation management center;
- Installation or expansion of the functional capability of a communications system;
- A regional electronic fare payment system, or a single transit agency fare system that crosses multiple jurisdictions;
- The purchase of an AVL-equipped bus fleet; and
- A multi-agency project which aims to integrate transportation systems (e.g., traffic-transit integration and signal priority, connection protection between rail and bus systems).

It also is likely in today's world that a major new rail or Bus Rapid Transit (BRT) system will include ITS technologies and actions that cause it to be a catalyst project that affects regional integration.

As explained later, prior to the adoption of a regional ITS architecture, all Major ITS projects must be developed using a system engineering analysis and have a Project ITS Architecture.

Do any exceptions apply?

There are some instances where the Policy may not be applicable, even though a project uses funds from the Highway Trust Fund and it is an ITS project. These exceptions depend on when the ITS systems that are involved became operational and the amount and type of change the project introduces. They are shown in Table 1.

Table 1 Exemptions and Exceptions to Policy Requirements

Date	Type	Exception
Systems in existence on 9 June 1998[1]	Operations and Maintenance of ITS	All Policy Provisions
Systems in existence on 9 June 1998[1]	Upgrades and Expansions of Existing ITS	U.S. Secretary of Transportation authorized Exemptions if: Consistent with goals of TEA-21 Subtitle C on ITS Within usable life of ITS components being modified Is cost effective compared to options that will meet conformity
Systems in Final Design on 8 April 2001	All ITS components	Section VI Policy requirements on Project Implementation: Systems Engineering Analysis Major ITS Project Architectures.
Proposed Systems	Research Projects to meet TEA-21 Section 5204	U.S. Secretary of Transportation authorized Exemptions

1. Date of TEA-21 Enactment

Exceptions will be determined on a case by case basis. If a grantee believes that their project qualifies for an exception, they must consult with their FTA Regional ITS contact to determine the level of justification required.

2.2 REGION WIDE APPLICABILITY

Non Transit ITS systems that can impact transit Operations

- Advanced signal systems
- Transportation management centers
- Communications backbones
- Electronic payment systems
- Archived data management systems
- Multi-modal traveler information.

If ITS exists, or is contemplated, in the region and is or will be funded by the Highway Trust Fund (see below), then the Policy will apply to the region in general. If this is the case, grantees should participate in the development of the regional ITS architecture at some level even if it is only minimal. This is critical to ensure that the regional ITS architecture includes transit's needs and coordination with

non-transit ITS projects that may have a profound effect on transit operations or future ITS options. For instance, 511 traveler information systems can provide both real-time and static transit and highway information. It is also necessary to ensure that it includes all of the proposed Transit ITS efforts.

2.3 REGIONAL ITS ARCHITECTURE PARTICIPATION (DEVELOPMENT AND MAINTENANCE)

A **Regional ITS Architecture** is: "A regional framework for ensuring institutional agreement and technical integration for the implementation of ITS projects or groups of projects." The stakeholders define the "region" locally; but, at a minimum, it is the area covered by the metropolitan planning organization. The Policy requires that each region with ITS projects using funds from the Highway Trust Fund have a regional ITS architecture adopted by its stakeholders by April 8, 2005, or within four years of the date that its first ITS project advances to final design. The Policy requires that, at a minimum, a regional ITS architecture shall include:

- Description of the region;
- Identification of the participating agencies and stakeholders;
- An operational concept that identifies roles and responsibilities of stakeholders;
- Any agreements required for operations;
- System functional requirements (high level);
- Interface requirements and information exchanges with planned and existing systems and subsystems;
- Identification of ITS standards supporting regional and national interoperability; and
- Sequence of projects required for implementation

The regional ITS architecture must be consistent with the region's transportation plans and improvement programs. A process and the roles and responsibilities for maintaining the regional ITS architecture after it is adopted must also be established.

As discussed in the previous section, the need for and level of grantee participation in the development of the regional ITS architecture depends upon its ITS projects and the other projects which may impact transit operations in the area. Grantees should participate at some level, however, even though it may be minimal. Ultimately, it is up to the grantee to insure that the requirements are met and Transit ITS included in the regional ITS architecture. However, the FTA Regional ITS contact, FTA headquarters, and other participants (FHWA Districts, FHWA ITS Resource Centers,) may also have a support and collaboration role.

Guidance and tools that have been developed to assist areas in the overall development of regional ITS architectures and can be found at: Regional ITS Architecture Guidance: (http://www.itsdocs.fhwa.dot.gov//JPODOCS/REPTS_TE//13598.pdf) and Turbo Architecture (http://www-mctrans.ce.ufl.edu/featured/turbo/).

Questions and activities that grantees should carry out with regards to the regional ITS architecture development include:

- Work with all transit agencies and providers within the area to develop integrated and coordinated transit ITS systems as appropriate;

- Become Transit champions by being aware of and participating in non-Transit ITS project development;
- Help define the ITS regional boundaries;
- Participate in the development and maintenance of the regional ITS architecture and it's inclusion of all transit ITS components;
- Adopt inter-agency agreements to ensure the successful implementation and operation of the regional ITS architecture;
- Prior to adoption of a regional ITS architecture coordinate the Major ITS Project Architectures as appropriate;
- Participate in agreements necessary to support the regional ITS architecture; and
- Incorporate Transit ITS into the regional and State Transportation Plan, Transportation Improvement Plan, and Statewide Transportation Improvement Plan.

In carrying out the above, grantees should be particularly aware of several issues:

First, they should be concerned about how the boundaries of the architectures that affect them are defined. Often transit agency service or patronage areas cross several metropolitan planning areas (MPOs), and State and corridor boundaries; and, in such cases, both the grantee and FTA regions should work to ensure that the region chosen for the architecture is expanded to include the complete transit system.

Second, if a regional ITS architecture already exists for an area agencies must work to see that it is updated and reflects their projects and plans now. Once an architecture has been adopted and is in place, all ITS projects must be consistent with it, even if this is sooner than the four years allowed by the Policy for architecture development.

Last, the project level requirements of the Policy, such as the use of Systems Engineering Analysis, must be complied with NOW. These are discussed next.

3. MEET THE PROJECT LEVEL REQUIREMENTS

As the project is developed and implemented, the project level requirements of the Policy must also be met. These are:

- The incorporation of the project within the regional ITS architecture or its development;
- The development of a systems engineering analysis on the ITS elements of the project;
- If a regional ITS architecture is not in place, the identification of Major ITS projects and the preparation of project ITS architectures for them.

The ITS components of the project and their status within Regional ITS Architecture also should be included within the FTA Grant Application and TEAM submittal, and necessary inter-agency agreements should be adopted to implement and operate the systems.

- Use A Systems Engineering Approach
- Update the Regional ITS Architecture as Needed or If One Does Not Currently Exist create Project ITS Architectures for all Major ITS Projects
- Include ITS and Architecture Conformity Status in FTA Grant Applications and TEAM submittals
- Adopt inter-agency agreements to ensure successful implementation and operation

The level of detail and documentation is dependent on the "scope" of the project. A major ITS project that requires the cooperation, agreement, sharing of information and data, and coordinated operations of several agencies will require much more analysis and supporting documentation, and will receive more oversight than one that is implemented within a single agency for its own use. Examples of efforts that may need more development, documentation, and analysis include:

- A corridor or regional Transit Signal Priority System that operates in several municipalities, and on routes used by more than one agency;
- An electronic payment system that will provide the first part of a regional electronic fare system, and later an integrated transportation payment system (tolls, parking and transit, etc.); and
- A coordinated communication backbone and radio system for the region that will provide shared communications for transit agencies, emergency service providers, and public safety agencies.

Likewise, the level of oversight also will depend on the "scope" of the project. Grantees are expected to self-certify that their projects are in compliance with the Policy. Consequently, oversight will in general be carried out as part of the FTA Triennial Reviews and other ongoing oversight efforts. However, for ITS projects that are also FTA New Start Projects and are "major ITS projects" additional reviews and assistance may also be provided as part of the PMO project management, the ITS Oversight and Technical Assistance, or deployment technical assistance. Grantees desiring additional assistance should contact their Regional FTA offices. FTA Regional Offices and Headquarters will work closely together to identify these more significant projects and track their progress and needs.

3.1 SYSTEMS ENGINEERING ANALYSIS

All ITS projects must also undergo a Systems Engineering Analysis, which is "A structured process for arriving at a final design of a system." The systems engineering analysis evaluates a number of alternatives for the configuration of the ITS and communications systems associated with the project and ways to meet the design objectives considering total life-cycle costs, technical merit and reliability, and relative value of each option. It also helps identify risks and develop contingencies to overcome them.

The Policy requires that the systems engineering analysis include:

- **Reference to Regional ITS Architecture.** Show where in the regional ITS architecture the project's ITS systems are identified;
- **Agency roles responsibilities**. The specific agency roles and responsibilities for developing, deploying, and operating each ITS component. This is a refinement, but should be consistent with, the regional ITS architectures Operational Concepts;
- **Requirements definition**. What each ITS system needs to do (as opposed to how it is done);
- **Analysis of systems configuration**. Are there different ways that the ITS systems can be implemented, or the information flows carried out to achieve the same goals? What are their costs, risks, and benefits;
- **Analysis of financing and procurement**. How will the systems be paid for, purchased, and maintained? What options are available;

- **ITS Standards**. This is a refinement and update of the standards identified in the regional ITS architecture;
- **Procedures for operations and management.** These are the rules that will be used to operate and mange the Project's ITS systems; and
- **Updates to the regional ITS architecture.** As projects are further refined, there is potential that there may be a need to change the regional ITS architecture to maintain consistency. Prior to implementation of the project, these changes must take place and be reflected through updated agreements, operational concepts, etc. This systems engineering analysis requirement documents those changes.

Additional information on Systems Engineering Analysis principals and procurement of ITS systems is available through courses now being developed and offered by the ITS Joint Program Office and the National Highway and Transit Institutes. See the ITS website (www.its.dot.gov) for further information on when and where these courses will be offered.

The leading applicable Transit ITS standards include the SAE J1708 Vehicle Area Network Standard and the Transit Communications Interface Profiles (TCIP) standards. The Vehicle area network standard provides a common backbone by which ITS systems and data can be linked on a vehicle. The TCIP standards are data definition standards and include a framework document and standards for public transportation objects, incident management, passenger information, scheduling and runcutting, spatial representation, vehicle on-board systems, fare collection, transit control center, and traffic management. Other ITS standards that are most applicable to transit include the Advanced Traveler Information Systems (ATIS) standards, the National Transportation Communications for ITS Protocols (NTCIP) Dynamic Messaging Sign standard, and the NTCIP Center to Center standard. For the entire list of ITS standards, fact sheets, and other implementation guidance, consult the www.its-standards.net website.

3.2 MAJOR ITS PROJECTS

Prior to the development and adoption of a regional ITS architecture, all "Major ITS Projects" that were not in final design by April 8, 2001 must include the development of a project level architecture that clearly reflects consistency with the National ITS Architecture. Again, a Major ITS Project is any project that implements part of a regional ITS initiative that is multi-jurisdictional, multi-modal, or otherwise affects regional integration of ITS systems. These projects should have been defined as part of the applicability assessment.

Project ITS Architectures are "A framework that identifies the institutional agreement and technical integration necessary to interface a major ITS project with other ITS projects and systems." The project level ITS architecture needs to be based on results of the systems engineering analysis, and should include at a minimum:

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

The project ITS architecture has many of the same components found in regional ITS architectures and in fact can become the base for a subsequent regional ITS architecture. The main differences are that the project architectures are tailored to the specific project at hand, and include more detail regarding its operations and design, a region definition is not required as part of a project ITS architecture, and the stakeholder identification has become part of the Systems Engineering Analysis that must be the foundation of the project architecture.

It is important for grantees and FTA regions to work with other agencies in their areas prior to the adoption of the regional ITS architecture to identify all Major ITS Projects and how they may impact each other. A likely source for these projects are the major transportation projects identified for corridor analyses (formerly Major Investment Studies) that may include ITS elements. It is also likely that any FTA New Start Projects requiring "Alternatives Analysis" with ITS components will be Major ITS projects. Once the Major ITS projects for a region are identified their sponsors can work together to determine how their Project ITS Architectures must relate to one another and to coordinate their systems as they are implemented.

3.3 FTA GRANT APPLICATIONS AND TEAM

The FTA Transportation Electronic Award and Management (TEAM) System for grant management is used to administer and manage FTA grants[4]. As stated, grantees are expected to self certify compliance with all requirements for ITS Architecture Conformity as described in TEA-21 and the FTA Policy for Transit Projects. Consequently, grantees will be expected to identify whether or not each grant application includes ITS projects; and, if so, does a regional ITS architecture exist, or is one in development; and does each ITS project meet the ITS Architecture Conformity requirements. For ITS tracking purposes, grantees also are asked to identify the type of ITS that the project grant is for: ITS Fleet Management, ITS Electronic Fare Payment, ITS Traveler Information, or ITS Architecture Development (to be added).

Within TEAMWEB, the "Project Description" and "Project Detail" text fields and the "non-add" budget codes are used to identify and describe the ITS components within a grant application. The description should identify that the grant includes ITS components and a description of what they are. The "non-add' budget codes capture the type of ITS included and its portion of the grant budget.

Under the Policy a grant with ITS elements may be:

- Exempt
- An ITS project consistent with an existing Regional Architecture and a completed or planned ITS Systems Engineering Analysis.
- A Major ITS project with a Project Architecture (if no Regional Architecture has been developed) and a completed or planned ITS Systems Engineering Analysis.
- An ITS project consistent with the National ITS Architecture (if no Regional Architecture has been developed) and with a completed or planned ITS Systems Engineering Analysis.

[4] See FTA Circular 5010.1C Grant Management Guidelines and other FTA circulars for specific grant application instructions (e.g. C9030.1C, C9040.1E, C9300.1B)

It is recommended that a statement be made within the project description regarding the ITS projects included and their conformity status such as "this grant contains funding for the ITS elements which are in conformity with the FTA National ITS Architecture Policy on Transit Projects. They are…" and then provide a list of ITS elements and how they meet the Policy requirements.

Though used infrequently prior to the Policy, the current version of TEAM also has the ability to track ITS projects by type using "non-add" scope codes. Chapter VII of the FTA Circular 9030.1C, "Urbanized Area Formula Program: Grant Application Instructions," provides the following instructions on their use:

> "Intelligent Transportation Systems (ITS) Projects. New "non-add" scope codes have been developed to track the incremental cost of the Intelligent Transportation System (ITS) technologies. These are to be used in the same manner as other non-add codes are used for ADA and CAA items.
>
> - 993-00 ITS Fleet Management
> - 994-00 ITS Electronic Fare Collection
> - 995-00 ITS Traveler Information
>
> Each of these codes should be used in conjunction with the standard activity line items. For example, to capture the incremental cost of ITS type electronic fare collection equipment on a bus purchase, the 994-00 scope code along with the bus line item would be used and the **incremental cost** of the fare collection portion of the purchase price would be used."

The recommended process for ITS within TEAMWEB is thus:

- Identify if the project is an ITS project.
- Assign each major ITS component of the Grant to its major ITS category
- Determine the ITS budget elements or the ITS percentage if part of larger budget line items.
- Identify that the project has ITS elements as part of the Grant application
- Provide details on the ITS elements, their value and type, and architecture conformity status through the use of 'non-add' scope codes.
- During the grant application review check to see that the budget line items that are likely to be ITS (see FTA ALI codes) do in fact have ITS elements identified. If not ask questions.
- During the grant application review check to see if the ITS type and budget details are complete.

3.4 INTER-AGENCY AGREEMENTS

Evidence of the necessary agreements to meet the obligations described in the Operational Concept must also be part of the regional ITS architecture. This should include existing agreements and also those that must be put in place in the future to develop, implement, operate and maintain the regional architecture's ITS systems. These agreements should be further refined as the individual projects are deployed and go through a Systems Engineering Analysis.

The Policy does not define the type of agreements that must be made. Many different factors influence the form the agreements will take, including past relationships, legislative mandates and authority, and funding restrictions. Types of agreements include:

- Memorandum of Understanding;

- Interagency;
- Intergovernmental;
- Operational;
- Public – Private; and
- Funding agreements that include both project scopes, liabilities, and operations

At the project level the agreements should capture the roles and responsibilities of each entity as well as the rules and principals on how they will interact with each other. These, are critical for the successful implementation of many Transit ITS services such as Transit Signal Priority, Regional Electronic Payment Systems, Multi-Modal Traveler Information Systems, or Archived Data Management Systems. Issues to resolve include: who is responsible for maintaining each component; how will information will be collected and shared; the service operating principals and rules; data ownership and privacy and access issues; and what happens during service disruptions, emergencies, or other unusual events.

Of critical importance is making sure that agreements upon which Transit ITS systems will depend on are made by those with the authority to implement them. It is possible that agreements made on the technical level as part of the regional architecture development may represent policy commitments of the overall agency, or their political decision bodies. Likewise, transit representatives should make sure that the agreements they make also are approved by their general managers and other policy makers (boards of directors) as appropriate.

4. SUMMARY OF PLANNED FTA OVERSIGHT ACTIVITIES

FTA is monitoring compliance and providing oversight and subsequent technical assistance using a two-level approach: First, existing oversight processes are used to review self-certifications and to identify grantees that may be at risk of meeting the policy requirements. Second, as determined through the oversight efforts, technical assistance is being provided to help grantees needing assistance in understanding and meeting the policy requirements. The ITS Architecture Oversight and Technical Assistance program is viewed as a partnership between FTA and our grantees. Three consultant teams have been chosen for this "Oversight and Technical Assistance" program to minimize the potential for conflicts of interest as potential sites and activities are identified.

The Policy states that prior to authorization of Mass Transit Funds from the Highway Trust Fund for acquisition or implementation, grantees will self-certify compliance with its requirements and: "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." The self-certification for this policy is part of the annual list of certifications issued by the FTA (http://www.fta.dot.gov/library/legal/federalregister/2002/fr1202.html). The triennial review questions for 2002 have been revised accordingly, and are:

- Is the grantee attempting to deploy ITS technologies?
- Has the grantee established a plan that will allow them to be part of a locally-approved regional ITS Architecture by April 8, 2005?

- Has the grantee established a process for the systems engineering analysis of ITS projects? Have they applied the process?
- Has the grantee met requirements of the FTA National ITS Architecture Policy for Transit Projects that became effective April 8, 2001?

Candidates for oversight and subsequent technical assistance are identified based upon the above and the annual risk assessment of grantees within each FTA region. If they feel that a need exists, **grantees may also request an oversight assessment** through their FTA regional offices or FTA headquarters. If the grantee is struggling to meet and understand the ITS Architecture Policy requirements, this may be an untapped opportunity for a grantee to bring additional resources to planning for ITS and conforming to the National ITS Architecture.

Oversight contractors are assigned to grantees based upon the level of their needs, and work with them to carry out an initial assessment of their status and issues in meeting the Policy requirements. This effort can include: determining the major regional ITS efforts in the grantee's area, assessing the status of the regional ITS architecture development and the grantee's role within it, and identifying key stakeholders and training needs. If called for, initial technical assistance is then provided. This has included delivery of training, help in identifying data flows for and grantee participation in the regional ITS architecture development, procurement specification review, and support in planning and phasing integrated ITS. The initial oversight and subsequent technical assistance efforts also are being used to identify needs for more specific or in-depth assistance provided by other U.S. DOT Programs such as the ITS Peer-to-Peer Program, and direct FTA Technology Assistance.

National ITS Program ITS User Services		
User Service Bundles and Definitions		**Description**
	TRAVEL AND TRAFFIC MANAGEMENT	
1.1	**Pre-Trip Travel Information**	**Provides information for selecting the best transportation mode, departure time, and route.**
1.2	En-Route Driver Information	Driver advisories and in-vehicle signing for convenience and safety during travel.
1.3	**Route Guidance**	**Provides travelers with simple instructions on how to best reach their destinations.**
1.4	**Ride Matching and Reservation**	**Makes ride sharing easier and more convenient.**
1.5	Traveler Services Information	Provides a business directory, or "yellow pages," of service information.
1.6	**Traffic Control**	**Manages the movement of traffic on streets and highways.**
1.7	**Incident Management**	**Helps public and private organizations quickly identify incidents and implement a response to minimize their effects on traffic.**
1.8	**Travel Demand Management**	**Supports policies and regulations designed to mitigate the environmental and social impacts of traffic congestion.**
1.9	Emissions Testing and Mitigation	Provides information for monitoring air quality and developing air quality improvement strategies.
1.10	**Highway-Rail Intersection (HRI)**	**Integrates ITS technology into already existing HRI warning systems to enhance their safety effectiveness and operational efficiency. At railroad grade crossings, HRI technologies located both in-vehicle and along the roadside ensure that train movements are coordinated with traffic signals and that drivers are alerted to approaching trains.**
	PUBLIC TRANSPORTATION MANAGEMENT	
2.1	**Public Transportation Management**	**Automates operations, planning, and management functions of public transit systems.**
2.2	**En-Route Transit Information**	**Provides information to travelers using public transportation after they begin their trips.**
2.3	**Personalized Public Transit**	**Flexibly routed transit vehicles offer more convenient service to customers.**
2.4	**Public Travel Security**	**Creates a secure environment for public transportation patrons and operators.**
	ELECTRONIC PAYMENT	
3.1	**Electronic Payment Services**	**Allows travelers to pay for transportation services electronically.**
	COMMERCIAL VEHICLE OPERATIONS	
4.1	Commercial Vehicle Electronic Clearance	Facilitates domestic and international border clearance, minimizing stops.
4.2	Automated Roadside Safety Inspection	Facilitates roadside inspections for CVO vehicles.
4.3	On-Board Safety Monitoring	Senses the safety status of a commercial vehicle, cargo, and driver.
4.4	Commercial Vehicle Administrative Processes	Provides electronic purchasing of credentials and automated mileage and fuel reporting and auditing.
4.5	Hazardous Material Incident Response	Provides immediate description of hazardous materials to emergency responders.
4.6	Commercial Fleet Management	Provides real time communications for vehicle location, dispatching, and tracking between drivers, dispatchers, and inter-modal transportation providers.
	EMERGENCY MANAGEMENT	
5.1	**Emergency Notification and Personal Security**	**Provides immediate notification of an incident and an immediate request for assistance.**

National ITS Program ITS User Services		
User Service Bundles and Definitions		**Description**
5.2	Emergency Vehicle Management	Reduces the time it takes emergency vehicles to respond to an incident.
	ADVANCED VEHICLE SAFETY SYSTEMS	
6.1	**Longitudinal Collision Avoidance**	**Helps prevent head-on, rear-end or backing collisions between vehicles, or between vehicles and other objects or pedestrians.**
6.2	**Lateral Collision Avoidance**	**Helps prevent collisions when vehicles leave their lane of travel.**
6.4	Vision Enhancement for Crash Avoidance	Improves the driver's ability to see the roadway and objects that are on or along the roadway.
6.5	**Safety Readiness**	**Provides warnings about the condition of the driver, the vehicle, and the roadway.**
6.6	Pre-Crash Restraint Deployment	Anticipates an imminent collision and activates passenger safety systems before the collision occurs, or much earlier in the crash event than is currently feasible.
6.7	**Automated Highway Systems**	**Provides a fully automated, "hands-off," operating environment.**
	INFORMATION MANAGEMENT	
7.1	**Archived Data User Service (ADUS)**	**This user service will provide an ITS Historical Data Archive for all relevant ITS data and will incorporate the planning, safety, operations, and research communities into ITS. It will provide the data collection, manipulation, and dissemination functions of these groups, as they relate to data generated by ITS. The ITS Historical Data Archive will function as a data warehouse or repository to support stakeholder functions.**