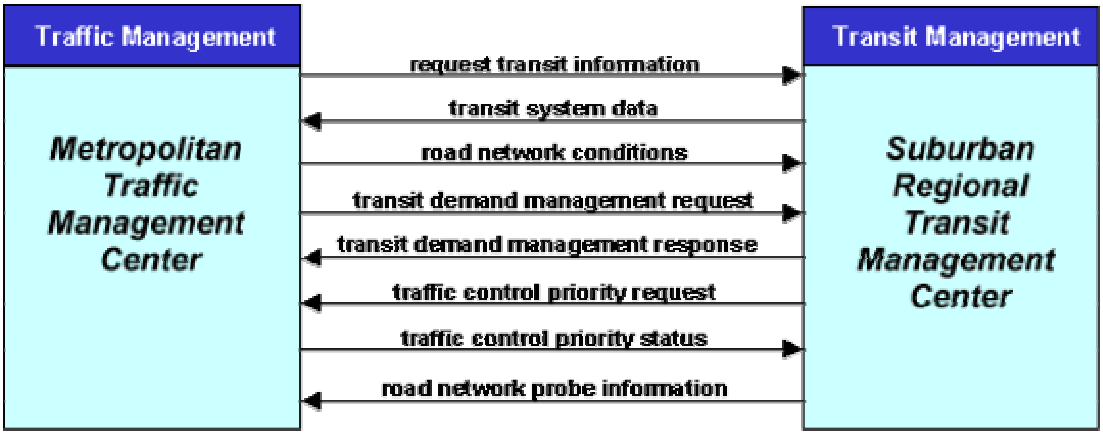
National ITS Architecture Glossary

Architecture

A framework within which a system can be built. Requirements dictate what functionality the architecture must satisfy. An architecture functionally defines what the pieces of the system are and the information that is exchanged between them. An architecture is functionally oriented and not technology-specific which allows the architecture to remain effective over time. It defines "what must be done," not "how it will be done."

Architecture Flow

Information that is exchanged between subsystems and terminators in the physical architecture view of the National ITS Architecture. Architecture flows are the primary tool that is used to define the Regional ITS Architecture interfaces. These architecture flows and their communication requirements define the interfaces which form the basis for much of the ongoing standards work in the national ITS program. The terms "information flow" and "architecture flow" are used interchangeably.



From the main menu, select "Hypertext View" and then "Architecture Flows" to see a comprehensive list of architecture flows. View the Architecture Flows Page

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Architecture Interconnect

Communications paths that carry information between subsystems and terminators in the physical architecture view of the National ITS Architecture. Several different types of interconnects are defined in the National ITS Architecture to reflect the range of interface requirements in ITS. The majority of the interconnects are various

types of communications links that are defined in the communications layer. Four different types of communications links are defined: fixed-point to fixed-point communications, wide area wireless communications, dedicated short range communications, and vehicle to vehicle communications. In addition to these types, several specialized interconnects are also defined to reflect other interface requirements. These include human interface (e.g., what the system user sees and hears) and physical/environmental (e.g., what the ITS sensors sense).

Browser

A type of software that allows viewing of and navigation through HTML pages.

Center Subsystems

Subsystems that provide management, administrative, and support functions for the transportation system. The center subsystems each communicate with other centers to enable coordination between modes and across jurisdictions. Some examples of center subsystems are Traffic Management, Transit Management, Commercial Vehicle Administration, Archived Data Management, Emissions Management, Toll Administration, Emergency Management, Information Service Provider, and Fleet and Freight Management. One of four general subsystem classes defined in the National ITS Architecture.

Select "Physical Architecture" from the main menu for access to the Center Subsystems. View the Physical Architecture Page

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Communications Document

This document provides a thorough analysis of the communications requirements of the National ITS Architecture, and ITS in general, and includes a discussion of options for implementing various communications links. It is an important document for those involved in detailed design and integration during the systems engineering process.

Select "Document View" from the main menu for access to this document. View the Document View Page

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Communications Layer

One of three layers (along with the transportation and institutional layers) defined by the National ITS Architecture. The communications layer includes all of the communications equipment (e.g., wireline and wireless transmitters and receivers) and the information management and transport capabilities necessary to transfer information among entities in the transportation layer. The application data content and the transportation application requirements are generally transparent to the communications layer. The communication layer's view of ITS is that of many distributed users, some of them mobile, which require communication services.

Cost Analysis

The Cost Analysis document has two purposes. First, it develops a high level cost estimate of the expenditures that are associated with implementing ITS components. Second, it is a costing tool for implementers, by providing unit prices and systems costs of ITS subsystems. There is significant correlation between the Cost Analysis and the Evaluatory Design documents; the cost analysis is based largely on the assumptions made for the three deployment scenarios (urban, interurban, and rural).

Select "Document View" from the main menu for access to this document. View the Document View Page

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Data Dictionary Entry

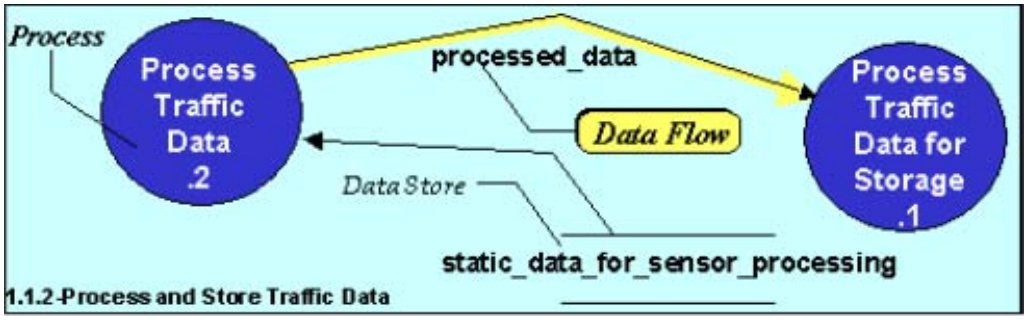
Every data flow included in the logical architecture view of the National ITS Architecture is defined in a data dictionary entry. Each data dictionary entry contains a textual description of the data flow and identifies any lower level data elements that make up the data flow.

Select "Hypertext View" from the main menu and then select "Data Flows". Selecting any of the data flows brings up the corresponding DDE. View a sample data dictionary entry.

Data Flow

Data flows represent a pipeline along which information of known composition is passed. Data flows are modeled in the logical architecture view of the National ITS Architecture. Data flows represent data flowing between processes or between a process and a terminator. A data flow is shown as an arrow on a data flow diagram

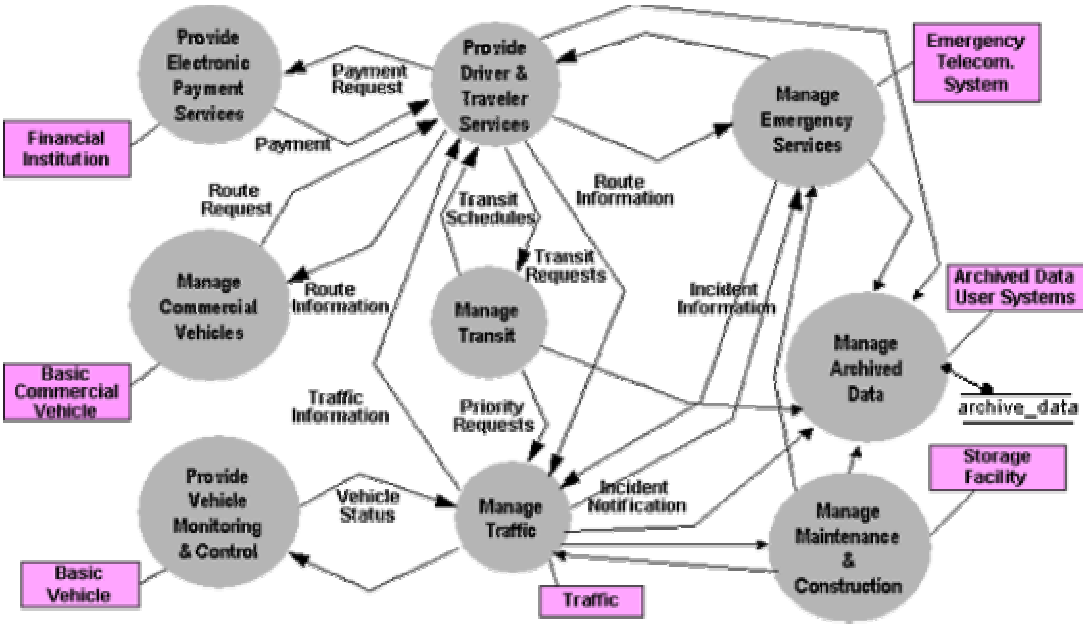
and is defined in a data dictionary entry in the logical architecture. Data flows are aggregated together to form high-level architecture flows in the physical architecture view of the National ITS Architecture.



Select "Hypertext View" from the main menu and then select "Data Flows" to see a complete list of the data flows defined in the Logical Architecture. View the list of Data Flows.

Data Flow Diagram

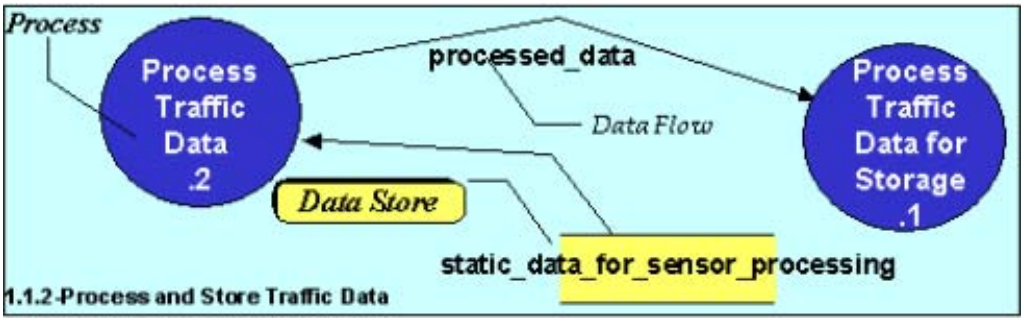
The diagrams in the logical architecture view of the National ITS Architecture that show the functions that are required for ITS and the information that moves between these functions. Only four different symbols are used on the diagrams. Circles represent the processes or functions that do the work. Arrows represent the data flows that show how data moves through the system. Parallel lines represent data stores that represent "data at rest" in the system. Finally, rectangles represent the terminators that define the architecture boundary. A hierarchy of these diagrams depict the ITS functionality and data flow requirements in successively greater detail until "primitive" processes are defined.



The data flow diagrams are directly viewable as GIF images and also available as editable WMF graphics. Select "Logical Architecture" from the main menu, then select a data flow diagram from the provided list. View a sample data flow diagram available for downloading in wmf format.

Data Store

A data store represents a reservoir in which data can be held for an indefinite period. Data stores are shown on the data flow diagrams where data repositories are required to support data aggregation or archival services.



Dedicated Short Range Communications

A wireless communications channel used for close-proximity communications between vehicles and the immediate infrastructure. It supports location-specific

communications for ITS capabilities such as toll collection, transit vehicle management, driver information, and automated commercial vehicle operations. One of the types of architecture interconnects defined in the National ITS Architecture.

Element

This is the basic building block of Regional ITS Architectures and Project ITS Architectures. It is the name used by stakeholders to describe a system or piece of a system.

EMF

Enhanced Metafile. A graphics file format, originated by Microsoft Corporation, that has many advantages over the older Windows metafiles (WMF). Images in EMF format can be resized without distortion and loss of detail. Available for download for selected diagrams (e.g., subsystem and terminator diagrams). Many diagrams displayed on the National ITS Architecture CD-ROM and web site are actually in GIF format.

Equipment Package

Equipment packages are the building blocks of the physical architecture subsystems. Equipment Packages group similar processes of a particular subsystem together into an “implementable” package. The grouping also takes into account the user services and the need to accommodate various levels of functionality. The equipment packages were used as a basis for estimating deployment costs (as part of the evaluation that was performed). Since equipment packages are both the most detailed elements of the physical architecture view of the National ITS Architecture and tied to specific market packages, they provide the common link between the interface-oriented architecture definition and the deployment-oriented market packages.

Select "Hypertext View" from the main menu and then "Equipment Packages" to see a complete list of equipment packages. A integrated view of the equipment packages associated with a particular subsystem is available by selecting "Physical Architecture" on the main menu and then selecting a Subsystem. View the Equipment Packages Page.

Evaluation Results

This document contains a concise summary of the various evaluations that were performed in five other National ITS Architecture documents: Evaluatory Design, Communications Document, Cost Analysis, Performance and Benefits Study, and Risk Analysis.


Select "Document View" from the main menu for access to this document.
View the Document View Page

Evaluatory Design

The Evaluatory Design document is intended to evaluate the National ITS Architecture's performance, benefits, and costs for three conceptual scenarios at various points in time. The scenarios consist of "typical" deployment environments: urban, inter-urban, and rural. The entire document will assist you in developing an evaluation methodology for the architecture that you have developed for your particular region.


Select "Document View" from the main menu for access to this document.
View the Document View Page

Executive Summary

This document provides an overview of the most important aspects of the National ITS Architecture including the logical architecture, physical architecture and the implementation strategy.


Select "Document View" from the main menu for access to this document.
View the Document View Page

Federal Highway Administration

An agency of the United States Department of Transportation that funds highway planning and programs.

Federal Transit Administration

An agency of the United States Department of Transportation that funds transit planning and programs.

Field Subsystems

Intelligent infrastructure distributed along the transportation network which perform surveillance, information provision, and plan execution control functions and whose operation is governed by center subsystems. Field subsystems also directly interface to vehicle subsystems. One of the four general subsystem classes defined in the National ITS Architecture.

Fixed-Point to Fixed-Point Communications

A communication link serving stationary entities. It may be implemented using a variety of public or private communication networks and technologies. It can include, but is not limited to, twisted pair, coaxial cable, fiber optic, microwave relay networks, spread spectrum, etc. In Fixed-Point to Fixed-Point (FP2FP) communication the important issue is that it serves stationary entities. Both dedicated and shared communication resources may be used. One of the types of architecture interconnects defined in the National ITS Architecture.

GIF

Graphic Interchange Format. A widely used graphics file format, developed by CompuServe. Many images found on the National ITS Architecture CD-ROM and web site are in GIF format and can be typically be copied by right-clicking on them with your mouse. Unlike WMF files, GIF files are not well suited for resizing or other modifications.

HTML

HyperText Markup Language. A language for marking up documents with a set of tags that designate the design and display intention of the author and how sections or documents are linked together. These documents are displayed as pages with text and graphics that can be viewed through the use of a browser.

Implementation Strategy

The Implementation Strategy document presents a scheme for implementing ITS services in a phased approach. This is part of an overall strategy that includes recommendations for future research and development, operational tests, standards activities, and training. The Implementation Strategy analysis and guidance is all based on market packages. It identifies the market packages that provide certain ITS services and recommends a phased deployment of those market packages to provide the most needed and most feasible user services initially, and less needed/feasible user services at a later date. The Implementation Strategy considers several items and issues regarding deployment, such as legacy systems, politics, funding, market package synergy, technology requirements, and standards requirements. Much of the market package-related analysis that is contained in the Implementation Strategy has been updated and included in the new Market Packages Document. The Market Packages Document is the authoritative source for all current information on the National ITS Architecture market packages.

Select "Document View" from the main menu for access to this document.
View the Document View Page

Information Flow

Information that is exchanged between subsystems and terminators in the physical architecture view of the National ITS Architecture. These information flows are normally identical to the architecture flows in the National ITS Architecture. The terms "information flow" and "architecture flow" are used interchangeably.

Institutional Layer

An integral component of the National ITS Architecture analysis, the institutional layer represents the existing and emerging institutional constraints and arrangements that are the context for all ITS deployments. The transportation layer and communications layer together provide the technical framework within which interoperable systems may be implemented. The institutional layer introduces the policies, funding incentives, working arrangements, and jurisdictional structure that support the technical layers of the architecture. This institutional layer provides the basis for understanding who the stakeholders will be and the roles these implementers could take in implementing architecture-based ITS systems.

Intelligent Transportation System

The system defined as the electronics, communications or information processing used singly or integrated to improve the efficiency or safety of surface transportation.

Interconnect

See architecture interconnect.

Inventory

See system inventory.

ITS Architecture

Defines an architecture of interrelated systems that work together to deliver transportation services. An ITS architecture defines how systems functionally operate and the interconnection of information exchanges that must take place between these systems to accomplish transportation services.

ITS Project

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.

ITS Security Area

Areas of ITS which can be used to enhance surface transportation security. The National ITS Architecture provides entities (subsystems and terminators), functions, and interfaces that cover aspects of the eight ITS security areas.

Joint Program Office

The office of the United States Department of Transportation (USDOT) established to oversee and guide the multi-modal National ITS program.

Legacy System

Existing transportation systems, communications systems, and institutional processes.

Life cycle

A term used when denoting a progression through a series or sequence of differing stages of development.

Logical Architecture

The logical architecture view of the National ITS Architecture defines what has to be done to support the ITS user services. It defines the processes that perform ITS functions and the information or data flows that are shared between these processes. The logical architecture was developed using Structured Analysis techniques and consists of data flow diagrams, process specifications, and data dictionary entries. The logical architecture has also been called an "Essential Model" because it is not technology specific, nor does it dictate a particular implementation. This implementation independence makes the logical architecture accommodating to innovation, scalable from small scale implementations to large regional systems, and supportive of widely varied system designs.

Logical Architecture Document

The Logical Architecture document contains three volumes: Description (Volume 1), Process Specifications (Volume 2), and Data Dictionary (Volume 3). These documents present a functional view of the ITS user services, contain diagrams that show processes and data flows among them, and define data elements, respectively.

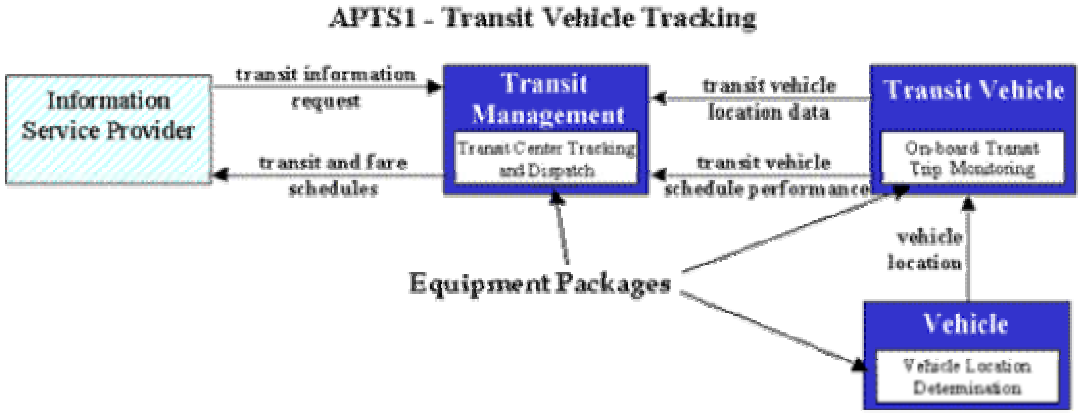
Major ITS Project

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.

Market Package

The market packages provide an accessible, service-oriented perspective to the National ITS Architecture. They are tailored to fit, separately or in combination, real

world transportation problems and needs. Market packages collect together one or more equipment packages that must work together to deliver a given transportation service and the architecture flows that connect them and other important external systems. In other words, they identify the pieces of the physical architecture that are required to implement a particular transportation service.



Select "Market Packages" from the main menu and then select from the provided list of market packages. Also available in the "Document View" (select the "Implementation Strategy") and the "Database View". View the list of Market Packages.

Market Packages Document

The Market Packages document expands upon the market package discussion in the Implementation Strategy document by providing a comprehensive review of each of the market packages describing how market packages can be used to plan and implement integrated transportation systems customized to local needs. This document includes a number of examples that illustrate ways market packages can be applied in Regional ITS Architecture and Project ITS Architecture development activities. Through these definitions, analyses, and examples, the Market Packages document provides a comprehensive review of the market packages and how they can be used to plan and implement integrated transportation systems customized to local needs.

Metropolitan Planning Organization

The forum for cooperative decision making for the metropolitan planning area.

Mission Definition

The first of the technical documents, the Mission Definition document covers a broad range of ITS related issues. It contains the overall mission of ITS deployment, as well as the operational concept, which deals with specific ITS goals and objectives; ITS user groups and other stakeholders; ITS user services; and potential sources for funding, operations and maintenance. The document also defines operational requirements at the system level, user requirements, performance requirements, and program requirements. These concepts are important aspects of the National ITS Architecture since they provide the overall direction for the ITS program.

Select "Document View" from the main menu for access to this document.
View the Document View Page

National ITS Architecture

A common, established framework for developing integrated transportation systems. The National ITS Architecture is comprised of the logical architecture and the physical architecture, which satisfy a defined set of user service requirements. The National ITS Architecture is maintained by the United States Department of Transportation (USDOT).

National Program Plan

Jointly developed by US DOT and ITS America with substantial involvement from the broader ITS community. The purpose of the National Program Plan was to guide the development and deployment of ITS. It defined the first 29 user services and their corresponding user service requirements.

Performance and Benefits Study

This document assesses the technical performance of the National ITS Architecture on a number of system-level and operational-level criteria. It could be helpful in supporting the case for ITS deployment, as it provides a measure of the degree to

which ITS can help achieve some regional transportation goals.


Select "Document View" from the main menu for access to this document.
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Physical Architecture

The physical architecture is the part of the National ITS Architecture that provides agencies with a physical representation (though not a detailed design) of the important ITS interfaces and major system components. It provides a high-level structure around the processes and data flows defined in the logical architecture. The principal elements in the physical architecture are the subsystems and architecture flows that connect these subsystems and terminators into an overall structure. The physical architecture takes the processes identified in the logical architecture and assigns them to subsystems. In addition, the data flows (also from the logical architecture) are grouped together into architecture flows. These architecture flows and their communication requirements define the interfaces required between subsystems, which form the basis for much of the ongoing standards work in the ITS program.

Physical Architecture Document

The Physical Architecture document describes the transportation and communications layers resulting from the partitioning of the processes within the logical architecture, presents architecture flow diagrams that show data passing among physical subsystems, and provides characteristics and constraints on the data flows.

Physical Entities

Entities are the persons, places, and things that make up an intelligent transportation system. In the physical architecture, an entity represents a National ITS Architecture subsystem or terminator.

Project ITS Architecture

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

Region

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. In metropolitan areas, a region should be no less than the boundaries of the metropolitan planning area.

Regional ITS Architecture

A specific, tailored framework for ensuring institutional agreement and technical integration for the implementation of ITS projects or groups of projects in a particular region. It functionally defines what pieces of the system are linked to others and what information is exchanged between them.

Security Threat

Security threats are events or circumstances that adversely impact a surface transportation system or communication between systems.

Stakeholders

A widely used term that notates a public agency, private organization or the traveling public with a vested interest, or a "stake" in one or more transportation elements within a Regional ITS Architecture.

Standards

Documented technical specifications sponsored by a Standards Development Organization (SDO) to be used consistently as rules, guidelines, or definitions of characteristics for the interchange of data. A broad array of ITS standards is currently under development that will specifically define the interfaces identified in the National ITS Architecture.

Standards Development Plan

This document discusses the issues that are involved in the development of system interface standards. It was primarily intended as a planning document for US DOT and the Standards Development Organizations.

Statewide Transportation Plan

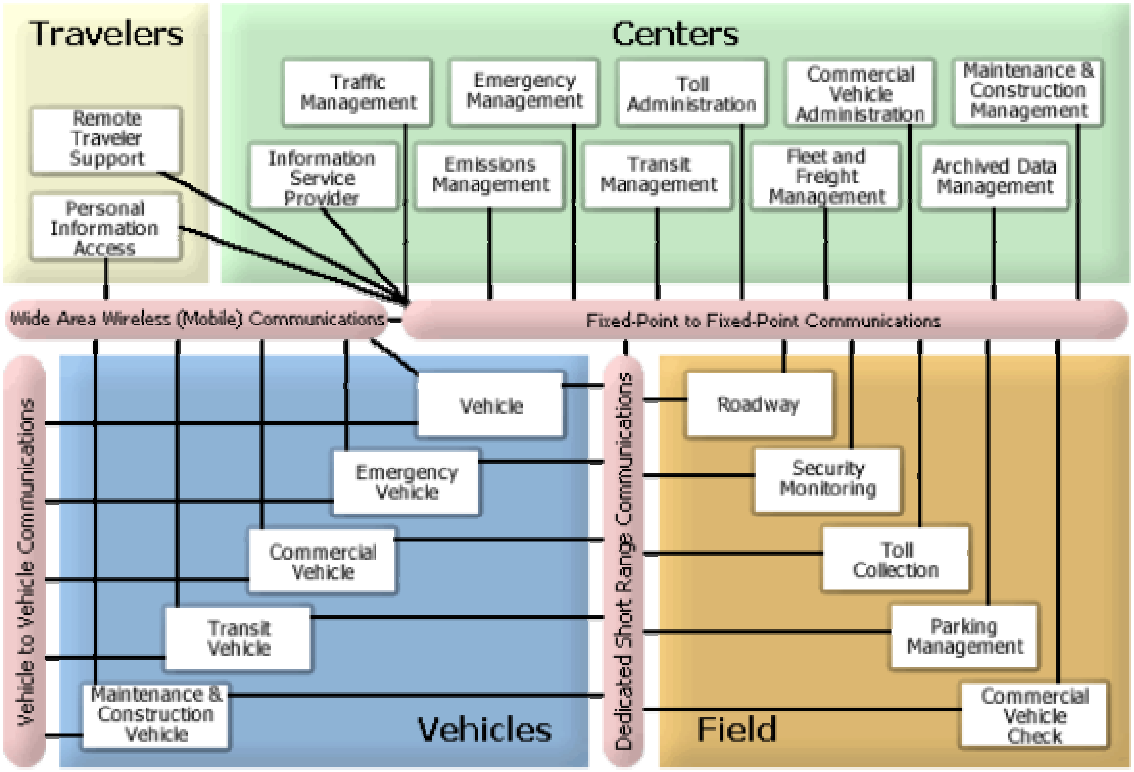
This document is the official statewide intermodal transportation plan that is developed through the statewide transportation process.

Subsystem

The principle structural element of the physical architecture view of the National ITS Architecture. Subsystems are individual pieces of the Intelligent Transportation System defined by the National ITS Architecture. Subsystems are grouped into four classes: Centers, Field, Vehicles, and Travelers. Example subsystems are the Traffic Management Subsystem, the Vehicle Subsystem, and the Roadway Subsystem. These correspond to the physical world: respectively traffic operations centers, automobiles, and roadside signal controllers. Due to this close correspondence between the physical world and the subsystems, the subsystem interfaces are prime candidates for standardization.

Subsystem Diagram

A diagram which depicts all subsystems in the National ITS Architecture and the basic communication channels between these subsystems. The subsystem diagram is a top-level architecture interconnect diagram. Variations of the subsystem diagram are sometimes used to depict Regional ITS Architectures at a high level.



System

A collection of hardware, software, data, processes, and people that work together to achieve a common goal. Note the scope of a "system" depends on one's viewpoint. To a sign manufacturer, a dynamic message sign is a "system". To a state DOT, the same sign is only a component of a larger Freeway Management "System". In a Regional ITS Architecture, a Freeway Management System is a part of the overall surface transportation "system" for the region.

System Inventory

The collection of all ITS-related elements in a Regional ITS Architecture.

Systems Engineering

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.

Terminator

Terminators define the boundary of an architecture. The National ITS Architecture terminators represent the people, systems, and general environment that interface to ITS. The interfaces between terminators and the subsystems and processes within the National ITS Architecture are defined, but no functional requirements are allocated to terminators. The logical architecture and physical architecture views of the National ITS Architecture both have exactly the same set of terminators. The only difference is that logical architecture processes communicate with terminators using data flows, while physical architecture subsystems use architecture flows.

Theory of Operations

This document provides a detailed description of how the National ITS Architecture supports the services described by the Market Packages. Transaction set diagrams and accompanying narrative are used to provide the detailed description. These transaction set diagrams provide sequential dependencies among the information flows in each Market Package. It is a technical document, intended for engineers, operators, and others involved in the development of regional ITS architectures or project ITS architectures.

Traceability

A cornerstone of the National ITS Architecture is the traceability between its components. Microsoft Access databases are used to maintain these connections. The hyperlinked National ITS Architecture relies on this traceability to build the links that allows traversal between user services, logical architecture, and physical architecture.

Transportation Layer

One of three layers (along with the communications layer and the institutional layer) defined by the physical architecture. The transportation layer shows the relationships among the transportation related elements. It is composed of subsystems for travelers, vehicles, transportation management centers, and field devices, as well as external system interfaces (terminators) at the boundaries.

Transportation Plan

Also called the "Long Range Transportation Plan", this plan defines the state or metropolitan area's long-term approach to constructing, operating, and maintaining the multi-modal transportation system.

Traveler Subsystems

Equipment used by travelers to access ITS services pre-trip and en-route. This includes services that are owned and operated by the traveler as well as services that are owned by transportation and information providers. One of four general subsystem classes defined in the National ITS Architecture.

Turbo Architecture

An automated software tool used to input and manage system inventory, market packages, architecture flows and interconnects with regard to a Regional ITS Architecture and/or multiple Project ITS Architectures.

United States Department of Transportation

The principal direct federal funding agency for transportation facilities and programs. The United States Department of Transportation (USDOT) includes the Federal Highway Administration (FHWA), the Federal Transit Administration (FTA), the Federal Railroad Administration (FRA), and others.

User Service Requirement

A specific functional requirement statement of what must be done to support the ITS user services. The user service requirements were developed specifically to serve as a requirements baseline to drive National ITS Architecture development. The user service requirements are not to be construed as mandates to system/architecture implementers, but rather are directions to the National Architecture Team. As a requirements baseline, the user service requirements include little narrative or background material. For a general introduction to the user services, consult the National Program Plan.

User Services

User services document what ITS should do from the user's perspective. A broad range of users are considered, including the traveling public as well as many different types of system operators. User services, including the corresponding user service requirements, form the basis for the National ITS Architecture development effort. The initial user services were jointly defined by USDOT and ITS America with significant stakeholder input and documented in the National Program Plan. The concept of user services allows system or project definition to begin by establishing the high level services that will be provided to address identified problems and needs. New or updated user services have been and will continue to be satisfied by the National ITS Architecture over time.

User Services Bundle

A logical grouping of user services that provides a convenient way to discuss the range of requirements in a broad stakeholder area. In the National Program Plan's user service requirements, the user services are grouped into eight bundles: Travel and Traffic Management, Public Transportation Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle Safety Systems, Information Management, and Maintenance and Construction Operations.

Vehicle Subsystems

Covers ITS related elements on vehicle platforms. Vehicle subsystems include general driver information and safety systems applicable to all vehicle types. Four fleet vehicle subsystems (Transit, Emergency, Commercial and Maintenance and Construction Vehicles) add ITS capabilities unique to these special vehicle types. One of four general subsystem classes defined in the National ITS Architecture.

Vehicle to Vehicle Communications

Dedicated wireless system handling high data rate, low probability of error, line of sight communications between vehicles. Advanced vehicle services may use this link in the future to support advanced collision avoidance implementations, road condition information sharing, and active coordination to advanced control systems. One of the types of architecture interconnects defined in the National ITS Architecture.

Vision Statement

Written in "magazine style", the Vision Statement sketches a number of possible scenarios of ITS development over the next 20 years. It describes how travelers and system operators may be able to use and benefit from ITS technologies in their day.

Wide Area Wireless Communications

A communications link that provides communications via a wireless device between a user and an infrastructure-based system. Both broadcast (one-way) and interactive (two-way) communications services are grouped into wide-area wireless communications in the National ITS Architecture. These links support a range of services in the National ITS Architecture including real-time traveler information and various forms of fleet communications. One of the types of architecture interconnects defined in the National ITS Architecture.

WMF

Windows Metafile. A graphics file format, originated by Microsoft Corporation. Images in WMF format can be resized without distortion and loss of detail. Available for download for selected diagrams (e.g., data flow diagrams and architecture flow diagrams). Many diagrams displayed on the National ITS Architecture CD-ROM and web site are actually in GIF format.