New York Statewide Services ITS Architecture

Version 2

Architecture Document

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Submitted By:

ConSysTec

www.consystec.com

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Revision History

Filename	Version	Date	Author	Comment
New York Statewide ITS Architecture-2.0.doc	2.0	12/31/08	Chan, Eisenhart	Complete document

1. Introduction

The ***New York Statewide Services Intelligent Transportation Systems (ITS) Architecture*** is a roadmap for the integration of transportation systems in the State of New York over the next 10 years. The architecture has been developed through a cooperative effort by the state's transportation agencies, covering all modes and all roads in the state. The architecture represents a shared vision of how each agency's systems will work together in the future, sharing information and resources to provide a safer, more efficient, and more effective transportation system for travelers in the state.

The architecture is an important tool that will be used by:

- Operating Agencies to recognize and plan for transportation integration opportunities in the state and, more importantly, in their specific region;
- Planning Agencies to better reflect integration opportunities and operational needs into the transportation planning process; and
- Other organizations and individuals that use the transportation system in the state.

The architecture provides an overarching framework that spans all of these organizations and individual transportation projects. Using the architecture, each transportation project can be viewed as an element of the overall transportation system, providing visibility into the relationship between individual transportation projects and ways to cost-effectively build an integrated transportation system over time. The architecture is not static, but will be revised and updated as plans change, ITS projects are implemented, and the ITS needs and services evolve in the region. This document, which describes the architecture, is a "living document" that will be updated each time the architecture is updated.

This New York Statewide Services ITS Architecture, Version 2, is an update of a preliminary New York Statewide Services ITS Architecture originally created in 2000. That architecture was subsequently updated to reflect the CVO/CVSN program. This update brings the Statewide Services ITS Architecture to the current version of the National ITS Architecture (Version 6.0), conforms to FHWA Final Rule, 23 CFR 940, as well as adds several major new systems and functions such as the New York 5-1-1 Traveler Information System.

1.1. Background

In October 2003, Consensus Systems Technologies Corp. (ConSysTec), was sub-contracted by Gardner Engineering of New York, P.C., to provide technical support for New York State Department of Transportation's Statewide ITS Program. This work was performed under a contract between Gardner Engineering of New York, P.C. and New York State Department of Transportation, Contract D015186, PIN S148.00, Technical Support and Strategic Plan Development Services for NYSDOT Statewide ITS Program.

This New York Statewide Services ITS Architecture Document was prepared to satisfy the requirements of Subtask 2.10, Update the Statewide Services ITS Architecture. A hyperlinked website containing the contents of New York Statewide Services ITS Architecture was also created, and the link can be found at http://www.consystec.com.

1.2. Purpose

The New York Statewide Services ITS Architecture represents a consensus blueprint for ITS investments in the state. The Statewide Services ITS Architecture starts by identifying the potential ITS agencies (stakeholders) within the state. It goes on to define possible integration opportunities between agencies within the state and identifies how cooperation between the agencies in the deployment of ITS systems can be used to satisfy the state's transportation needs.

This Statewide Services ITS Architecture can be used to efficiently structure implementations of ITS technologies. By creating a long range plan for the implementation of these systems and technologies, agencies can:

- Prepare for future expansion;
- Develop coordinated deployment of ITS;
- Leverage funding; and
- Identify standard interfaces.

In addition to structuring implementations of ITS technologies, the New York Statewide Services ITS Architecture allows New York to comply with the FHWA Rule/FTA Policy on Architecture and Standards. The FHWA Final Rule, 23 CFR 940, (and corresponding FTA policy) to implement Section 5206(e) of the TEA-21 requires that ITS projects funded through the Highway Trust Fund conform to the National ITS Architecture and applicable standards. The Rule/Policy requires that the National ITS Architecture be used to develop a local implementation of the National ITS Architecture, which is referred to as a "Regional ITS Architecture." Although the federal deadline for conformance to this Final Rule/Policy was April 8, 2005, the development of this Statewide Services ITS Architecture will allow identified existing and planned statewide projects in the entire State of New York to be fully compliant with this Rule/Policy, which will facilitate the approval of federal funds to support ITS projects in the state.

1.3. Document Overview

This document is organized into nine (9) main sections. Section 1 provides introductory information on the project, this document and discusses the scope of the architecture. Section 2 describes the process used to develop the New York Statewide Services ITS architecture. Section 3 gives a brief introduction and overview of the National ITS Architecture, and how it relates to this Statewide Services ITS Architecture. The stakeholders are identified in Section 4, while their systems are inventoried in Section 5.

The needs addressed by ITS and the services used to address those needs are covered in Section 6. The interfaces and information exchanges are described in Section 7. Applications of the Statewide Services ITS Architecture (including functional requirements, standards and agreements) are covered in Section 8. Finally, Section 9 presents how this ITS architecture is to be maintained.

1.4. Scope of the Architecture

The geographic scope of the architecture is the State of New York. Regarding the scope of services, the Statewide Services ITS Architecture covers those ITS services that are statewide in nature (e.g. Commercial Vehicle Operations or Electronic Toll Payment) as well as those services that are managed from and by the main offices of New York State Department of Transportation (NYSDOT) or by statewide agencies such as the New York State Thruway Authority (NYSTA). Those ITS projects that are regional or local in nature are addressed in their respective regional ITS architectures.

There are currently 6 regional ITS architectures within the State of New York for the Statewide Services ITS Architecture to harmonize with, and connect to. Figure 1 shows the geographic scope of the Statewide Services ITS Architecture with an indication of the geographic scope of the existing six (6) regional ITS architectures in the state. The existing regional ITS architectures are: the Capital District Regional ITS Architecture (Region 1); the Buffalo-Niagara Bi-National Regional ITS Architecture (Region 5); the Hudson Valley Regional ITS Architecture (Region 8); the Long Island Regional ITS Architecture (Region 10); the New York City Sub-Regional ITS Architecture (Region 11); and the Rochester Regional ITS Architecture (Region 4).

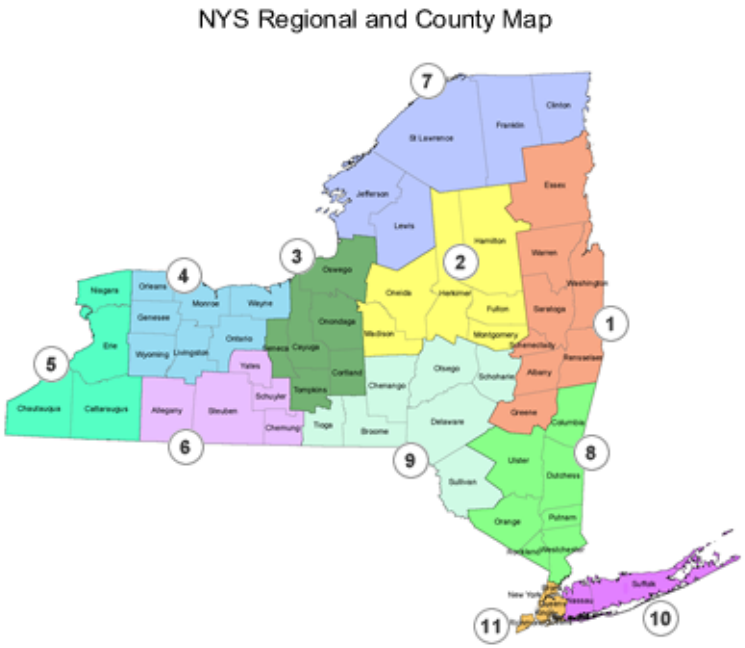


Figure 1. New York Regional and Statewide ITS Architectures Geographic Scopes

As mentioned in the introduction, the timeframe considered for the New York Statewide Services ITS Architecture is a 10-year outlook for ITS activities in the state. This means that the architecture addresses existing ITS systems as well as those planned for development over the next 10 years. More specifically though, this Statewide Services ITS Architecture focuses on ITS systems or elements that will be deployed over the next 5 years. Still, the Statewide Services ITS Architecture represents a snapshot of the currently anticipated ITS and other projects based on information gathered from stakeholders, research from agency websites, and published agency documents. As such, the architecture will require regular updates to ensure that it maintains accurate representation throughout the state, and accurate interfaces with each of the regional ITS architectures within the state. This is addressed in more detail in Section 9, Maintaining the Architecture.

2. Architecture Development Process

2.1. Process to Create the Architecture

Development of the New York Statewide Services ITS Architecture relied heavily on stakeholder input to ensure that the ITS architecture reflected statewide needs and plans. The following five-step process was used to develop the ITS architecture:

- Conduct a kickoff and technical review meeting to gather information regarding inventory and services;
- Create an initial draft inventory of architecture elements and a draft set of customized ITS Services;
- Conduct a series of stakeholder meetings to review specific areas of interest or specific projects;
- Create a draft Statewide Services ITS Architecture for review (web based);
- Allow stakeholder review of the draft Statewide Services ITS architecture and conduct a one-day architecture review meeting; and
- Finalize the ITS architecture based on review comments.

2.1.1. Kickoff and Technical Review Meeting

A one day kick-off meeting was held on October 24, 2008. The overall objective of the meeting was that the resultant Statewide Services ITS Architecture should be a *consensus architecture*, that is, each of the participants *understands and agrees* to the ITS elements and specific information exchanges between the ITS elements identified in the architecture that they participated in defining. This is not to say that the resulting ITS Architecture has credible funding identified that would lead to full deployment. The ITS architecture only identifies ITS elements and interfaces that the stakeholders agree to. Existing funding processes will continue to be used to decide how to allocate limited resources to which ITS elements and interfaces for deployment. Key participants in this meeting was Ed Roberts, Director of the NYSDOT Systems Optimization Bureau and members of his staff (John Bassett and Ola Fawumi).

The meeting also included a review of specific NYSDOT statewide ITS projects that need to be included in the Statewide Services ITS Architecture, and the identification of the points of contacts for each of those ITS projects.

2.1.2. Creation of an Initial Inventory and Services

An initial draft set of ITS elements, services and interconnections were created based upon a review of existing documentation regarding NYSDOT's statewide ITS projects, and from a

brief review of the NYSDOT website. This initial draft set was further refined at the kickoff meeting.

The Statewide Services ITS Architecture elements identified and defined through this review were mapped to National ITS Architecture Version 6.0 entities (subsystems and terminators). This created an initial inventory for New York mapped to the National ITS Architecture entities. The existing and planned ITS projects were used to establish an initial list of services that the elements of the architecture would provide. The elements, the element definitions, and their mapping to National ITS Architecture entities (one or more) were entered into the software tool Turbo Architecture, Version 4.0.

For each existing or future ITS service operating or expected in the state, the market package diagram (the collection of ITS elements, equipment packages, and functions that work together to perform a specific ITS service – see Section 3 for details on the National ITS Architecture) for that service from the National ITS Architecture was edited so that each National ITS Architecture subsystem or terminator was associated with the local stakeholder element name. In some cases, multiple instances of the market package were developed where the service had more than one instance in the state. This would be the case if there were multiple agencies performing the same service within the state. This set of customized market packages using the draft elements created previously, was created in preparation for stakeholder outreach so that each could be reviewed and further refined based on actual operating procedures (or theories) for each agency.

2.1.3. Stakeholder Outreach Meetings

A series of stakeholder meetings were held with various stakeholders to review specific statewide ITS projects. Each stakeholder meeting began with an overview or training in the National ITS Architecture and Statewide Services ITS Architecture, and the identification of ITS needs for the state, so that stakeholders would understand and be able to more fully participate in the ITS architecture development process. Stakeholders were introduced to what an ITS Architecture is, how it should be used, and how to approach the development of the New York Statewide Services ITS Architecture. This included a brief discussion on the services planned at the statewide level and how they were to fit into the Statewide Services ITS Architecture. The second part of the stakeholder meetings was spent reviewing the customized market package diagrams, adding or deleting diagrams, elements, and interconnections when necessary.

The projects reviewed, stakeholder representatives, and dates of these stakeholder meetings were:

- STICC – Robert Limoges - December 3, 2008
- IIMS – Ed Mark, Paul Russ, Dennis Brunge, Raj Sood, Jason Bechtel - December 4, 2008
- TSIP, BRT – Jim Davis - December 8, 2008.

- CVO – Richard McDonough, Chris Scharl - December 8, 2008.
- MAMIS – Steve Wilcox – December 8, 2008
- NYSDOT IEN / VEN - Ed Roberts, John Bassett, Chris Jones, John Mioducki, Ola Fawumi - December 10, 2008.
- NYSDOT Asset Management System – Joe Doherty, John Meducki, Mike Lashmet, Gene Taillie and Tim Timbrook - December 10, 2008.
- NYSDOT MDSS/RWIS – Joe Doherty, John Meducki, Mike Lashmet, Gene Taillie and Tim Timbrook - December 10, 2008.
- Streetwise – Guillermo Ramos, December 11, 2008.

All the above meetings were held at NYSDOT Main Offices at 50 Wolf Road in Albany, NY, except for the TSIP and BRT meeting, which were held at NYSDOT Region 11's offices in Long Island City, NY, and Streetwise, which was held in Washington, DC.

2.1.4. Creation of a Draft Architecture for Review

Following the series of stakeholder meetings, the customized market packages were revised and a draft architecture was created. Using the customized market package diagrams (as modified during the stakeholder meetings), the Turbo Architecture database was updated, "built", and utilized to create a draft ITS architecture. This involved the following activities:

- Updating the ITS inventory (and stakeholders when necessary);
- Revising the customized market packages; and
- Creating a Turbo Architecture database that represents the sum of all of the customized market packages.

In addition to creating the Turbo Architecture database and the customized set of market package diagrams, a hypertext version of the complete Turbo Architecture database that was created and placed on a generally accessible website (http://www.consystec.com/newyork/web/). This website described each element of the ITS architecture and all of their interconnections with other elements. The website was developed using additional software tools that go beyond the basic Turbo Architecture software.

Stakeholders were notified at the Stakeholder Review meeting that a review period for the Statewide Services ITS Architecture had commenced, and feedback was solicited. Stakeholders were encouraged to review the Statewide Services ITS Architecture on the website, and were encouraged to provide feedback electronically from the website. Comments received during the course of this project were summarized and maintained in a database, along with its disposition.

2.1.5. Conduct Stakeholder Review of the Draft ITS Architecture

In addition to the stakeholder website review, a review of architecture material was held at a stakeholder review meeting held on December 15, 2008 at NYSDOT's offices in Albany, NY. During the meeting, stakeholders reviewed the purpose of this update of the Statewide Services ITS Architecture, clarified some ambiguities that were found in the draft ITS architecture, were instructed on how to find information and provide comments on the project website, and were introduced to and commented on a draft maintenance plan.

2.1.6. Finalize the Architecture Based on Review Comments

Following the architecture review meetings, the draft architecture was revised based on comments received during the meeting, comments sent through the project website and further stakeholder discussions after the meeting. The architecture and its documentation were updated as the final deliverables for the updated New York Statewide Services ITS Architecture.

2.2. Requirements of the Final FHWA Rule and FTA Policy on Architecture

2.2.1. Specific Requirements of the Final FHWA Rule or FTA Policy

The FHWA Final Rule (23CFR 940) and FTA Policy on Intelligent Transportation System Architecture and Standards, which took effect on April 8, 2001, defines a set of requirements that regional or statewide ITS architectures should meet. The following is a list of specific requirements from the FHWA Rule/FTA Policy:

- A description of the region (scope)
- Identification of participating agencies and their systems (inventory)
- Operations concepts
- Agreements required for implementation
- System functional requirements
- Interface requirements
- Identification of ITS Standards
- Sequence of projects required for implementation
- Develop a Process for maintaining your regional ITS Architecture

2.2.2. How the Final Rule and FTA Policy Requirements are Met

Table 1 shows how the requirements of the rule are met by the outputs developed for the Statewide Services ITS Architecture.

Table 1. Mapping of Requirements to Architecture Outputs

Regional ITS Architecture Requirements	Where Requirements Are Documented
Description of region	Geographic definition, identification of services and a timeframe are given in Section 1.4 of this document.
Identification of participating agencies and other stakeholders	Listing of stakeholders and their definitions is given in Section 4.2 of this document. An inventory of the elements operated by the stakeholders is contained in Section 5 of this document. The same information is also available in the hyperlinked web site and in the Turbo Architecture database.
An operational concept that identifies the roles and responsibilities of participating agencies and stakeholders	The operational concept is defined in Section 4.3 of this document.
A list of any agreements (existing or new) required for operations	A complete discussion of existing and potential agreements is given in Section 8.4 of this document.
System functional requirements	The functional requirements of the ITS systems are described in an overview in Section 8.2 of this document. They are also provided in detail in the hyperlinked web site and in the Turbo Architecture database.
Interface requirements and information exchanges with planned and existing systems and subsystems	The Interfaces and information flows are described in an overview in Section 7 of this document, and are described in detail in the hyperlinked web site and in the Turbo Architecture database.
Identification of ITS standards supporting regional and national interoperability	The identification of standards for ITS in New York is contained in Section 8.3 of this document.
The sequence of projects required for implementation	Projects, and their sequencing, are covered in Section 8.1 of this document.
Develop and implement procedures and responsibilities for maintaining the architecture as needs evolve within the region.	The Maintenance Plan is contained in Section 9 of this document.

3. ITS Architecture Concepts

The New York Statewide Services ITS Architecture is an example of a regional ITS architecture, which has been defined by FHWA Rule 940 as a “regional framework for ensuring institutional agreement and technical integration for implementation of ITS projects”. Regional ITS architectures, including the New York Statewide Services ITS Architecture, are developed in order to provide a guide for the integration of transportation systems. This Statewide Services ITS Architecture is based upon the US National ITS Architecture Version 6.0. A complete description of this architecture can be found at http://www.iteris.com/itsarch. What are some of the main parts of an ITS architecture? They are made of the following:

- Organizations
- Systems operated
- Services provided
- Functions performed
- Information exchanged

The organizations that operate systems in the region covered by the architecture are referred to as stakeholders. These are public agencies, private organizations or the traveling public with a vested interest, or a "stake" in one or more transportation elements within a regional ITS architecture.

The systems operated by the stakeholders are referred to as elements. In the Statewide Services ITS Architecture the elements represent actual systems, such as the NYSDOT Statewide Transportation Information Coordination Center (STICC). An element may also represent field devices, for example the element NYSDOT Traffic Signals. A more thorough discussion of the architecture elements is contained in Section 5. The Statewide Services ITS Architecture uses a set of common concepts or terms drawn from the National ITS Architecture to describe the parts of the architecture. Since these National ITS Architecture terms show up repeatedly in later discussion they will be defined here.

The National ITS Architecture uses two terms to describe the systems that make up an architecture. They are:

- **Subsystems**, which represent the primary systems described by the architectures. For example the TMC element mentioned above represents a regional ITS architecture example of the Traffic Management Subsystem defined in the National ITS Architectures. Version 6.0 of the National ITS Architecture has 22 subsystems defined.
- **Terminators**, which represent systems that are on the boundary of the architecture. In general only interfaces to the terminators are described in the national architectures. An example of a terminator from the National ITS Architecture is the

Weather Service. Version 6.0 of the National ITS Architecture has 76 terminators defined.

As a part of developing a regional ITS architecture, each element of the region is mapped to the subsystems and/or terminators that most closely define the functions of the element. This mapping allows the regional version to use the details associated with the subsystems and terminators in the National ITS Architecture. As an example, the element in the New York Statewide Services ITS Architecture called National Weather Service is mapped to the National ITS Architecture terminator Weather Service.

The information exchanged between elements (in the Statewide Services ITS Architecture) or between subsystems and terminators in the National ITS Architecture is described by information flows or architecture flows. There are hundreds of these flows defined in the National ITS Architecture, and it is this information that is used to create the interface definitions in the Statewide Services ITS Architecture. For example in Figure 2, the top two boxes show an interface between two subsystems, with its information flows defining the exchange of information. A corresponding interface in Statewide Services ITS Architecture is shown in the bottom two boxes.

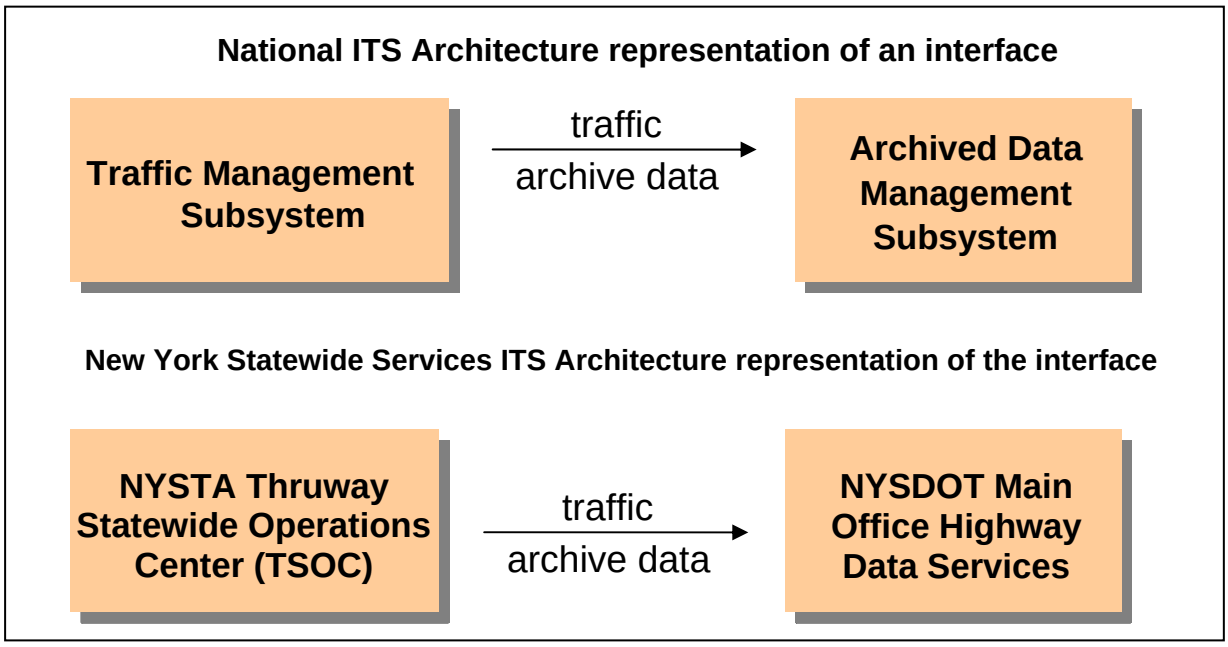


Figure 2. Information Flows

By mapping the Statewide Services ITS Architecture elements (e.g., NYSTA Thruway Statewide Operations Center (TSOC)) to National ITS Architecture subsystems (or terminators) (e.g. Traffic Management Subsystem), the interfaces defined in the National ITS Architecture can be used as the basis for defining the interfaces in the Statewide Services ITS Architecture.

The next key concept used by the architectures is that of market packages. These represent slices of an architecture that provide a transportation service. In the National ITS architecture, these market packages are combinations of subsystems and information flows that are used to provide the service. An example of a National ITS Architecture market package is shown in Figure 3. This shows the subsystems and information flows (some of which go to terminators) that perform the monitoring and control of roadway devices from a traffic management system used to control a street network. In the development of Statewide Services ITS Architecture, a set of customized market packages were created that define the elements and interfaces used to provide the service in Statewide Services ITS Architecture.

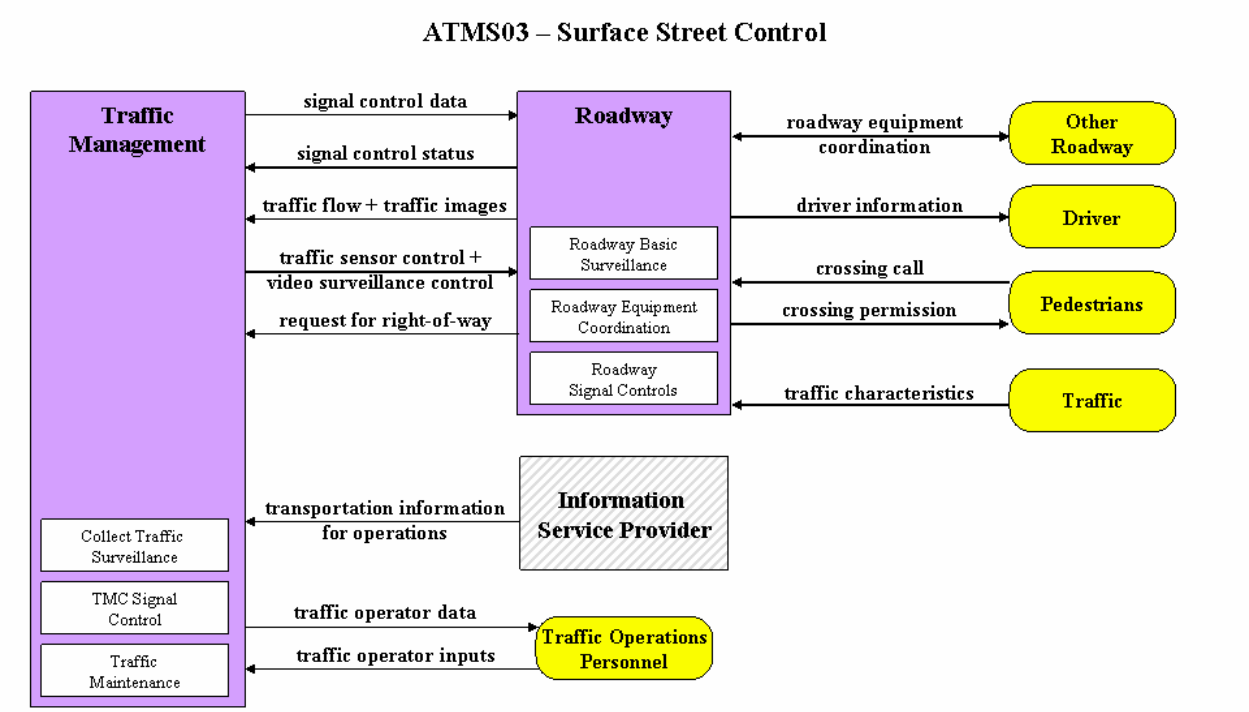


Figure 3. Example of National ITS Architecture Market Package

Figure 4 shows one of the customized market packages, in this case for the NYSDOT Regional Streetwise Servers. This diagram shows how NYSDOT Streetwise project might implement this service.

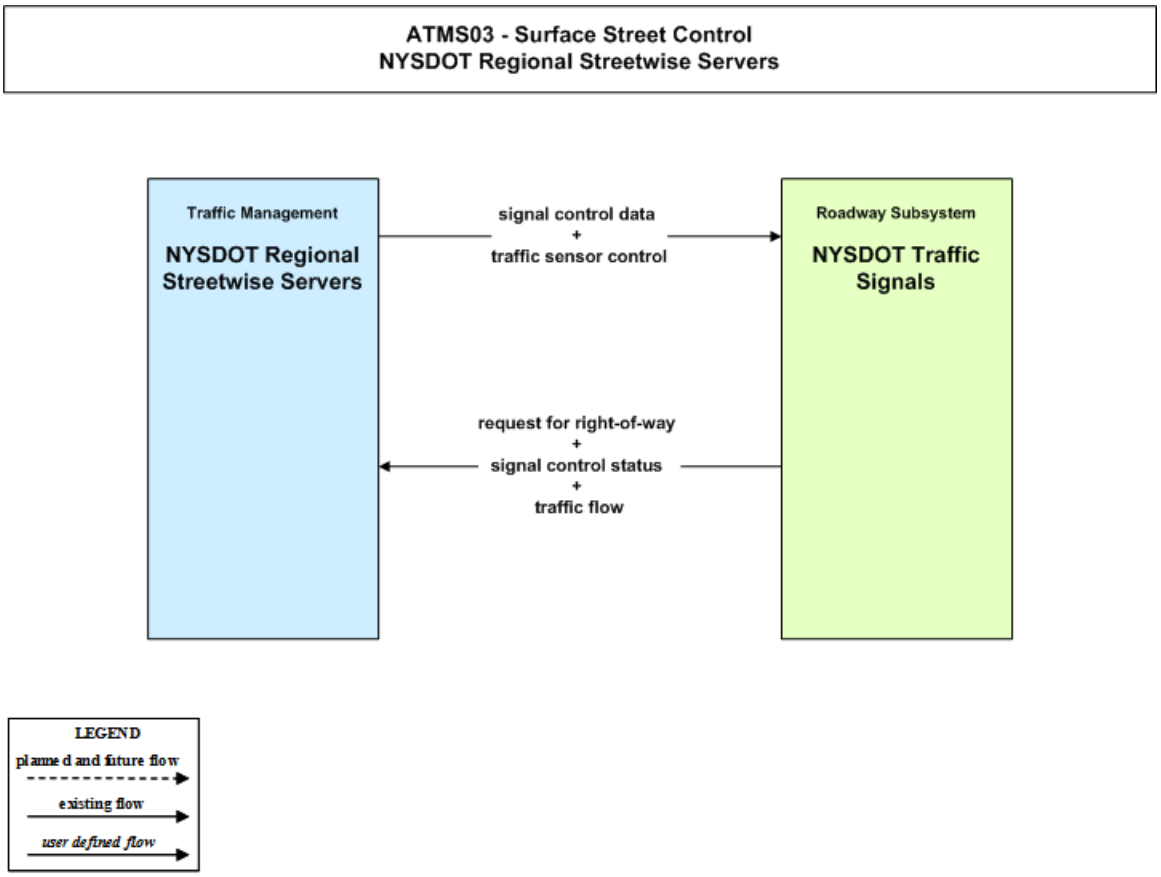


Figure 4. Example of A Customized Market Package

Notice that the customized market package includes only some of the interfaces that were in the National ITS Architecture market package. It does not include interfaces to personnel or a map update provider element. Elements mapping to these are not planned for the near future in New York and thus are not included in the Statewide Services ITS Architecture.

One final concept to mention relates to the functions performed by the elements in the architecture. The National ITS Architecture has the concept of an equipment package, which define a piece of functionality within a subsystem. For example in Figure 3, Collect Traffic Surveillance is a function (or equipment package) that is performed by the Traffic Management Subsystem in performing the Surface Street Control Service. In the Statewide Services ITS Architecture functions have been identified for the key elements using a mapping of equipment packages to each element. For example, the NYSDOT Regional Streetwise Servers (shown in Figure 4) will implement the Collect Traffic Surveillance equipment package (shown in Figure 3 as functionality in the Traffic Management Subsystem). Further information regarding how functions are defined for each element is found in Section 8.2 on Functional Requirements.

4. Identification of Stakeholders

4.1. Champion

In order to successfully develop a Statewide Services ITS Architecture, it is necessary to have a "champion" who can lead the effort from the state's viewpoint. This individual, or group of individuals, should have the following skills/capabilities:

- They must have a vision for interconnectivity, partnership and regional integration;
- They must have knowledge of the local and statewide ITS systems and projects;
- They must understand what a regional or statewide ITS architecture is and how to use it most effectively in the planning process;
- They must be a consensus builder or facilitator; and
- They must have executive level access to resources in order to gain the support of various regional or statewide agencies.

The champion for the development of the New York Statewide Services ITS Architecture is the Director of the Systems Optimization Bureau for NYSDOT. This champion is supported by other members of the bureau and by the Director of the Bureau of ITS for NYSTA. The Director of the Systems Optimization Bureau will continue to champion the use and maintenance of the New York Statewide Services ITS Architecture beyond the timeframe of this development effort.

4.2. Stakeholders

Stakeholder coordination and involvement is one of the key elements of the development of an ITS architecture. Because ITS often transcends traditional transportation infrastructure, it is important to consider a range of stakeholders beyond the traditional traffic, transit, and maintenance areas.

The Statewide Services ITS Architecture includes a wide range of stakeholders. The Statewide Services ITS Architecture is defined by a set of elements (or systems), each of which is owned (or operated or maintained) by a stakeholder. Table 2 provides a listing of the full range of stakeholders assigned to elements in the Statewide Services ITS Architecture. The table provides a name and description of the agency, department, or organization represented by the stakeholder.

Table 2. Stakeholders

Stakeholder	Stakeholder Description
Archived Data Users	Represents users of archived data.

Stakeholder	Stakeholder Description
CHEMTREC	CHEMTREC® was established in 1971 by the chemical industry as a public service hotline for emergency responders, such as fire fighters and law enforcement, to obtain information and assistance for emergency incidents involving chemicals and hazardous materials. Registration with CHEMTREC helps assist shippers of hazardous materials to comply with the US Department of Transportation hazardous materials regulation 49 CFR § 172.604, which requires hazmat shippers to provide a 24-hour emergency telephone number on shipping documents for use in the event of an emergency involving hazardous materials.
Clarus	The Clarus initiative is a federal project and system that provides qualified weather observation data from local and regional road and rail weather observations to serve a greater community of transportation system operators.
Financial Institutions	Financial and banking institutions that play a role in the transfer of funds for fare collection as well as for other fee based transportation services.
FMCSA - Federal Motor Carrier Administration	A separate administration within the United States Department Of Transportation, its primary mission is to reduce crashes, injuries, and fatalities involving large trucks and buses. In carrying out its safety mandate, FMCSA develops and enforces data-driven regulations that balance motor carrier (truck and bus companies) safety with industry efficiency; harnesses safety information systems to focus on higher risk carriers in enforcing the safety regulations; and targets educational messages to carriers, commercial drivers, and the public. FMCSA partners with stakeholders including Federal, State, and local enforcement agencies, the motor carrier industry, safety groups, and organized labor on efforts to reduce bus and truck-related crashes.
Government Agencies	Represents national, state, and local government reporting agencies.
I-95 Corridor Coalition	The I-95 Corridor Coalition is an alliance of transportation agencies, toll authorities, and related organizations, including public safety, from the State of Maine to the State of Florida, with affiliate members in Canada. The Coalition provides a forum for key decision and policy makers to address transportation management and operations issues of common interest. This volunteer, consensus-driven organization enables its myriad state, local and regional member agencies to work together to improve transportation system performance far more than they could working individually.
Local DPW	Represents the local public works departments responsible for the maintenance of roadways and ITS field equipment.
Local Public Safety Agencies	Represents the local public safety providers. This includes local law enforcement providers, fire services and emergency responders.
Local Traffic Management	Represents the local public agencies responsible for traffic management.
Local Transit Operators	Represents local transit agencies that operate in the state.

Stakeholder	Stakeholder Description
MPO - Metropolitan Planning Organizations	Represents the local metropolitan planning organization (MPO). MPOs are a transportation policy-making organization made up of representatives from local government and transportation authorities.
NOAA - National Oceanic and Atmospheric Administration	National Oceanic and Atmospheric Administration. Includes the National Weather Service and the National Hurricane Center.
NYS Department of Highway Safety and Motor Vehicles	
NYS Department of Motor Vehicles	New York State Department of Motor Vehicles is the agency responsible for motor vehicle licensing and registration.
NYS Emergency Management Office (SEMO)	The New York State Emergency Management Office (SEMO) coordinates emergency management services with other federal and State agencies to support county and local governments. SEMO routinely assists local government, volunteer organizations, and private industry through a variety of emergency management programs. These programs involve hazard identification, loss prevention, planning, training, operational response to emergencies, technical support, and disaster recovery assistance. During disasters, SEMO coordinates the emergency response of all State agencies to ensure that the most appropriate resources are dispatched to impacted areas.
NYS Police	The New York State Police is the law enforcement provider for the State of New York.
NYSDEC - New York State Department of Environmental Conservation	The New York State Department of Environmental Conservation pursues scientific assessment and vigorous action to protect and enhance New York's environment and natural resources
NYSDOT - New York State Department of Transportation	New York State Department of Transportation (NYSDOT). Responsible for the transportation system within the State of New York, including the highways, railways, transit, aviation and port facilities.
NYSTA - New York Thruway Authority	Authority responsible for the operation and maintenance of the Governor Thomas E. Dewey Thruway, the 641-mile superhighway crossing New York State, which is the longest toll superhighway system in the United States.
Private Automated Vehicle Location System Providers	Private collectors and providers of vehicle location information.
Private Commercial Vehicle Freight and Fleet Operators	Private owners of commercial vehicles that carry goods throughout the region.
Private Mayday/Concierge Service Providers	National services (e.g., GM On-Star) that provide Mayday and traveler information services for their customers.
Private News Media	Television, Radio, and Print Media. Includes TV network affiliates
Private Rail Operations	Private companies that operate freight rail within the State of New York.
Private Road Weather Information System Providers	Private providers of roadway weather and weather information.
Private Traveler Information Providers	Local, regional and national information service providers that provide travel information to the traveling public (both subscription service and general broadcast information). Includes internet sites, service bureaus, etc.

Stakeholder	Stakeholder Description
Private Travelers	Traveling public accessing various modes of transportation, including surface street, air, rail/transit, and non-motorized.
Private Weather Service Providers	Private vendor systems that collect and disseminate road weather information from mobile and fixed data sources and weather information services.
Regional Airport Authorities	Represents regional airport facilities and operators in the state.
Regional Bus Rapid Transit Operators	Operators of Bus Rapid Transit systems. This may be a separate authority or consortium of agencies.
Regional Event Promoters	http://www.consystec.com/nm/web/el/el_214.htmPromoters and sponsors of special events. They coordinate with traffic and emergency providers.
Regional Hospital Organizations	Represents hospitals and trauma centers in the state.
Regional Multimodal Transportation Service Provider	Represents Amtrak, Metro-North, and inter-city bus terminals.
Regional Parking Providers	Represents parking providers and operators within the State of New York.
TRANSCOM	Consortium of transportation and emergency management agencies in the tri-state region (New York, New Jersey and Connecticut).
TRANSMIT Agencies	Transportation agency/operators of TRANSMIT.

The stakeholders listed in Table 2 represent a mix of specific agencies or organizations and generic names used to represent a variety of stakeholders. Examples of specific agencies or organizations would be NYS Police. An example of a generic stakeholder name would be Local Traffic Management, which represents all local agencies or authorities responsible for managing traffic either at a regional, county, or municipal level.

4.3. Operational Concept

An Operational Concept documents each stakeholder's current and future roles and responsibilities in the operation of the statewide ITS system. The operational concept documents these roles and responsibilities across a range of transportation services. The services covered by the Statewide Services ITS Architecture are:

- **Traffic Signal Control**. The development of signaling systems that react to changing traffic conditions and provide coordinated intersection timing over a corridor, an area, or multiple jurisdictions.
- **Highway Management.** The development of systems to monitor freeway (or tollway) traffic flow and roadway conditions, and provide strategies such as ramp metering or lane access control to improve the flow of traffic on the freeway. Includes systems to provide information to travelers on the roadway.
- **Incident Management.** The development of systems to provide rapid and effective response to incidents. Includes systems to detect and verify incidents, along with coordinated agency response to the incidents.

- **Transit Management.** The development of systems to more efficiently manage fleets of transit vehicles or transit rail. Includes systems to provide transit traveler information both pre-trip and during the trip as well as electronic fare payment systems used on transit vehicles.
- **Traveler Information.** The development of systems to provide static and real time transportation information to travelers.
- **Emergency Management.** The development of systems to provide emergency call taking, public safety dispatch, and emergency operations center operations.
- **Maintenance and Construction Management.** The development of systems to manage the maintenance of roadways in the region, including winter snow and ice clearance. Includes the managing of construction operations.
- **Archive Data Management.** The development of systems to collect transportation data for use in non-operational purposes (e.g. planning and research).
- **Electronic Payment.** The development of systems for performing electronic toll collection (this concept is covered in various other transportation service).
- **Commercial Vehicle Operations.** The development of systems to administer permits, check credentials and safety information, and enforce commercial vehicle regulations throughout the state so as to make it safer to operate a private or commercial vehicle on the state roadways.

Table 3 identifies the roles and responsibilities of key stakeholders for the specified range of transportation services.

Table 3. Stakeholder Roles and Responsibilities

Transportation Service	Stakeholder	Roles/ Responsibilities
Traffic Signal Control	Local Traffic Management	Provide transit signal priority for regional bus rapid transit vehicles.
		Coordinate traffic information with Regional TOCs.
	NYSDOT – New York State Department of Transportation	Operate network monitoring equipment (CCTV cameras, field sensors, etc.) on designated municipal, county, and state owned streets.
		Operate traffic signal systems on designated city, county, and state owned streets, including traffic signals, sensor systems (CCTV), and right of way requests.
		Provide traffic information reports to regional information service providers, private information service providers, and the NYSDOT Traveler Information System (511NY.ORG).
		Provide traffic information to regional agencies including transit, emergency management, maintenance and construction, and the media.

Transportation Service	Stakeholder	Roles/ Responsibilities
		Coordinate traffic information and control with local TOCs, regional TOCs, and the NYSDOT STICC.
		Coordinate HRI signal adjustments with private rail operators.
		Provide transit signal priority for regional bus rapid transit vehicles.
		Provide emergency signal preemption for local fire and EMS vehicles and local police/sheriffs vehicles.
Highway Management	NYSDOT – New York State Department of Transportation	Operate network surveillance equipment (CCTV Cameras, field sensors, etc.) on state owned highways.
		Operate ramp metering devices and lane control equipment on state owned highways.
		Provide traffic information reports to regional information service providers, private information service providers, and the NYSDOT Traveler Information System (511NY.ORG).
		Provide traffic information to regional transportation agencies and the general public through traffic information devices (DMS, Highway Advisory Radio).
		Provide traffic information to regional maintenance departments and regional transit providers.
		Operate reversible lane signals and controls on NYSDOT arterials, highways, and bridges.
		Coordinate traffic information and control with local TOCs, regional TOCs, and the NYSDOT STICC.
	NYSTA – New York State Thruway Authority	Operate network surveillance equipment (CCTV Cameras, field sensors, etc.) on Authority highways.
		Provide traffic information reports to regional information service providers, private information service providers, and the NYSDOT Traveler Information System (511NY.ORG).
		Provide traffic information to regional transportation agencies and the general public through traffic information devices (DMS, Highway Advisory Radio).
		Provide traffic information to regional maintenance departments and regional transit providers.
		Coordinate traffic information and control with Local TOCs, NYSDOT Regional TOCs, and the NYSDOT STICC.
	TRANSMIT Agencies	Operate probe surveillance equipment on roadways.
		Provide traffic probe data to TRANSMIT Servers.
Incident Management (Traffic)	NYSDOT – New York State Department of Transportation	Perform network monitoring for detection and verification of incidents on State owned highways and arterials.
		Provide incident information to travelers via traffic information devices on highways (e.g., DMS, NYSDOT Traveler Information System (511NY.ORG), etc).

Transportation Service	Stakeholder	Roles/ Responsibilities
		Provide incident information to local emergency responders through the NYSDOT Statewide Information Exchange Network (IEN).
		Share incident information with local TOCs, regional TOCs, and the NYSDOT STICC.
		Provide incident information to local emergency responders through the NYSDOT Integrated Incident Management System (IIMS).
		Provide CCTV images of incidents to other regional transportation agencies and local emergency responders through the NYSDOT Video Exchange Network (VEN).
		Coordinate maintenance resources for incident response with the NYSDOT Maintenance Department.
	NYSTA – New York State Thruway Authority	Perform network monitoring for detection and verification of incidents on Authority operated highways.
		Provide incident information to travelers via traffic information devices on highways (e.g., DMS, NYSDOT Traveler Information System (511NY.ORG), etc).
		Provide incident information to local emergency responders through the NYSDOT Statewide Information Exchange Network (IEN).
		Share incident information with local TOCs, NYSDOT Regional TOCs, and the NYSDOT STICC.
		Provide incident information to local emergency responders through the NYSDOT Integrated Incident Management System (IIMS).
		Provide CCTV images of incidents to other regional transportation agencies and local emergency responders through the NYSDOT Video Exchange Network (VEN).
		Coordinate maintenance resources for incident response with the Authority's Maintenance group.
	TRANSCOM	Share incident information with regional traffic management agencies.
Incident Management (Emergency)	Local Public Safety Agencies	Coordinate public safety resources for incident response with local traffic management agencies.
		Coordinate incident response with all local public safety agencies (police, fire and EMS).
		Dispatch local public safety vehicles (and track their location), as well as coordinate with all other local public safety agencies.
		Perform incident detection and verification for the streets and provide this information to local traffic and other public safety agencies (including state and local agencies).
		Coordinate an incident response with regional rail operations for incidents involving rail.
		Coordinate maintenance resources in response to incidents.

Transportation Service	Stakeholder	Roles/ Responsibilities
		Coordinate with ambulance services in response to incidents.
	NYS Police	Dispatch State Police vehicles for incidents on state highways.
		Coordinate incident response with other public safety agencies (police, fire, EMS, sheriff, etc.) as well as with other NYS Police units.
		Perform incident detection and verification for the highways within the region, and provide this information to traffic and other public safety agencies (including state and local agencies).
		Coordinate maintenance resources in response to incidents on state highways with regional maintenance providers.
		Coordinate an incident response with regional rail operations for incidents involving rail.
	NYSDOT – New York State Department of Transportation	Dispatch the NYSDOT's courtesy patrol vehicles (HELP) and track their location.
		Perform incident detection and verification on state highways, and provide this information to the regional TOCs.
		Coordinate incident response with the state police and local public safety providers.
	NYSTA – New York State Thruway Authority	Dispatch the NYSDOT's courtesy patrol vehicles (HELP) and track their location.
		Perform incident detection and verification on state highways, and provide this information to the TSOC.
		Coordinate incident response with the state police and local public safety providers.
Transit Management	Local Traffic Management	Provide traffic incident reports and road network conditions to Regional Bus Rapid Transit Operators.
	Local Transit Agencies	Track vehicle location and evaluate schedule performance on all agency transit vehicles.
		Provide transit schedule, ridership and fare information to the NYSDOT TSIP and to transit data archives.
		Count the number of passengers entering and exiting transit vehicles.
		Coordinate emergency plans with Local EOCs and the New York SECC and provide emergency transit services for evacuations, fires, and disasters (including re-entry).
	NYSDOT – New York State Department of Transportation	Provide transit schedule, ridership and fare information between transit agencies within the state, to transit data archives, to the NYSDOT Traveler Information System (511NY.ORG), to TRIPS123, to regional traveler information providers, and to private sector traveler information service providers.
		Provide traffic incident reports and road network conditions to Regional Bus Rapid Transit Operators.

Transportation Service	Stakeholder	Roles/ Responsibilities
	Regional Bus Rapid Transit Operators	Track vehicle location and evaluate schedule performance on all agency fixed route transit vehicles.
		Provide transit schedule, ridership and fare information to the NYSDOT TSIP and to transit data archives.
		Provide fixed route bus service along bus rapid transitways.
		Provide transit passenger electronic fare payment on all agency fixed route transit vehicles.
		Provide transit security on all agency transit vehicles and at transit transfer centers through silent alarms, sensors, and monitoring systems.
		Share transit incident information with Regional TOCs and local emergency responders.
		Provide automated transit maintenance scheduling through automated vehicle condition reports on all agency fixed route transit vehicles.
		Obtain traffic signal priority for all fixed route transit vehicles along the bus rapid transit routes.
		Coordinate transit service with park and ride lots and other regional parking management systems.
		Coordinate transit service with other regional transit providers, as well as regional intermodal terminals and regional airports.
		Provide transit traveler information on all customer information systems, on fixed route transit vehicle, transit information kiosks, regional kiosks, and at regional transportation centers.
		Count the number of passengers entering and exiting transit vehicles.
		Coordinate emergency plans with Local EOCs and the New York SECC and provide emergency transit services for evacuations, fires, and disasters (including re-entry).
Traveler Information	NYSDOT - New York State Department of Transportation	Operate the NYSDOT Traveler Information System (511NY.ORG).
		Operate the NYSDOT Regional Public Information Offices and at the Main Office.
		Collect traffic, maintenance and construction information, emergency and transit schedule and fare information from regional providers.
		Collect traffic, maintenance and construction information, and emergency information from statewide providers.
		Collect transit information from regional transit providers.
		Provide traffic, maintenance and construction, road network conditions and transit information to the media, private travelers, and various traveler information services (including the agency website, regional kiosks, etc.).
		Provide broadcast information to travelers.

Transportation Service	Stakeholder	Roles/ Responsibilities
		Coordinate and share traveler information with all other traveler information providers within the region.
		Provide traveler information to private travelers (in vehicle, personal computing device, or kiosk) upon request.
		Provide traveler information to the media.
	NYSTA - New York State Thruway Authority	Provide traffic, maintenance and construction, and road network conditions to the media, private travelers, and various traveler information services (including the agency website, regional kiosks, etc.).
		Provide broadcast information to travelers.
		Coordinate and share traveler information with all other traveler information providers within the region.
		Provide traveler information to private travelers (in vehicle, personal computing device, or kiosk) upon request.
		Provide traveler information to the media.
	Private Traveler Information Service Providers	Collect traffic, incident, transit schedule, road maintenance and weather information and provide it to the media and private travelers.
		Coordinate and share traveler information with all other traveler information providers within the region.
	TRANSCOM	Coordinate and share traveler information with all other traveler information providers within the region.
Emergency Management	NYS Police	Dispatch New York State Police vehicles (and track their location) as well as coordinate with all other public safety agencies.
		Participates in the incident response, coordination, and reporting of the Statewide Information Exchange Network in a coordination effort only (no dispatch function).
		Coordinate with regional hospitals for care facility status.
		Receive local signal preemption from municipal and state-operated traffic signals.
		Receive and respond to threat information from state agencies and local TOCs regarding critical infrastructure.
		Generate Amber Alerts and distribute them to regional emergency management agencies, transit agencies, traffic agencies, and the media.
		Aid in the coordination of region wide emergency plans, evacuation and reentry plans, and disaster management plans.
		Receive early warning information and threat information from the New York SECC.
	Local Public Safety Agencies	Participate in the incident response, coordination, and reporting on the Statewide Information Exchange Network in a coordination effort only.
		Coordinate with regional hospitals for care facility status.

Transportation Service	Stakeholder	Roles/ Responsibilities
		Dispatch local public safety vehicles (and track their location) as well as coordinate with all other public safety agencies.
		Receive and respond to (i.e. dispatch) threat information from the Local and Regional TOCs regarding critical infrastructure.
		Receive Amber Alert and other Wide Area Alert information from New York State Police.
		Operate the Local EOCs.
		Receive Wide Area Alert information from the New York SECC and the Local EOCs.
		Receive early warning information and threat information from the New York SECC.
		Respond to transit emergencies/alarms on-board transit vehicles or at regional transit facilities.
		Aid in the coordination of region wide emergency plans, evacuation and reentry plans, and disaster management plans.
		Provide evacuation, incident, and transportation system status information to regional public information systems.
		Plan and coordinate region wide emergency plans, evacuation and reentry plans, and disaster management plans dealing with HAZMAT incidents.
	New York State Emergency Management Office	Generate and coordinate wide area alerts and distribute them to regional emergency management agencies, transit agencies, traffic agencies, regional information service providers, and the media.
		Plan and coordinate region wide emergency plans, evacuation and reentry plans, and disaster management plans.
		Provide regional traffic, transit, emergency management, and maintenance operations with disaster information to disseminate to the traveling public.
		Provide evacuation, incident, and transportation system status information to regional public information systems.
		Aid in the coordination of region wide emergency plans, evacuation and reentry plans, and disaster management plans.
		Operate the New York State Emergency Coordination Center (SECC).
	NYSDEC – New York State Department of Environmental Conservation	Collect and monitor environmental and air emissions data.
		Plan and coordinate region wide emergency plans, evacuation and reentry plans, and disaster management plans dealing with HAZMAT incidents.
	NYSDOT - New York State Department of Transportation	Participate in the incident response, coordination, and reporting of the Statewide Information Exchange Network in a coordination effort only (no dispatch function).

Transportation Service	Stakeholder	Roles/ Responsibilities
		Dispatch the NYSDOT's courtesy patrol vehicles (HELP) and track their location, and coordinate with all other public safety agencies and communications centers within the Region.
		Provide local signal preemption to public safety vehicles.
		Receive Amber Alert and other Wide Area Alert information from the New York State Police and post alert information on NYSDOT Motorist Information Systems.
		Receive Wide Area Alert information the New York SECC.
		Receive early warning information and threat information from the New York SECC.
		Aid in the coordination of region wide emergency plans, evacuation and reentry plans, and disaster management plans.
		Provide evacuation, incident, and transportation system status information to regional public information systems, the media, and on the NYSDOT Traveler Information System (511NY.ORG).
	NYSTA – New York State Thruway Authority	Participates in the incident response, coordination, and reporting of the Statewide Information Exchange Network in a coordination effort only (no dispatch function).
		Dispatch the NYSDOT's courtesy patrol vehicles (HELP) and track their location, and coordinate with all other public safety agencies and communications centers within the Region.
		Provide local signal preemption to public safety vehicles.
		Receive Amber Alert and other Wide Area Alert information from the New York State Police and post alert information on NYSDOT Motorist Information Systems.
		Receive Wide Area Alert information the New York SECC.
		Receive early warning information and threat information from the New York SECC.
		Aid in the coordination of region wide emergency plans, evacuation and reentry plans, and disaster management plans.
	Private Mayday / Concierge Service Center	Provide mayday services to private travelers.
		Dispatch the private ambulances and other EMS vehicles (and track their location) and coordinate with all other public safety agencies and communications centers within the Region.
Maintenance and Construction Management	Local DPW	Receive a request for maintenance resources for incident response from Local and Regional TOCs.
		Coordinate maintenance resources for incidents with other regional maintenance providers.
		Receive vehicle location information from agency maintenance and construction vehicles.

Transportation Service	Stakeholder	Roles/ Responsibilities
		Provide winter road maintenance for all local streets and provide roadway maintenance status information to regional public safety agencies, regional transit agencies, and Local and Regional TOCs.
		Provide maintenance of local streets, including pavement maintenance and all construction activities.
		Provide maintenance status to regional transit agencies, regional public safety agencies, and to travelers (through ISPs).
		Provide maintenance to all field equipment owned and operated by local municipalities.
		Coordinates maintenance and construction activities with other regional maintenance and construction agencies.
		Distributes maintenance and construction plans and work zone information to regional information service providers, regional traffic operations, emergency operations, rail operations, and the media.
	NYSDOT – New York State Department of Transportation	Receive a request for maintenance resources for incident response from regional emergency management agencies.
		Coordinate maintenance resources for incidents with other regional maintenance providers.
		Collect road weather information with other weather services, including the National Weather Service, CLARUS and other private providers and distribute it to regional traffic, maintenance and transit agencies as well as the national weather service.
		Collect road weather information with agency field equipment and distribute it to regional traffic, maintenance and transit agencies as well as the national weather service, the media, and to travelers (through ISPs).
		Provide winter road maintenance for all agency arterials and highways and provide roadway maintenance status information to regional public safety agencies, regional transit agencies, and the agency's traffic centers.
		Provide maintenance of state highways within the region, including pavement maintenance and all construction activities.
		Provide maintenance status to regional transit agencies, regional emergency management agencies, and to travelers (through ISPs).
		Dispatch agency maintenance vehicles.
		Provide maintenance to all field equipment owned and operated by the agency.
		Coordinates maintenance and construction activities with other regional maintenance and construction agencies.

Transportation Service	Stakeholder	Roles/ Responsibilities
		Distributes maintenance and construction plans and work zone information to regional information service providers, regional traffic operations, emergency operations, rail operations, and the media.
	NYSTA – New York State Thruway Authority	Receive a request for maintenance resources for incident response from regional emergency management agencies.
		Coordinate maintenance resources for incidents with other regional maintenance providers.
		Receive vehicle location information from agency maintenance and construction vehicles.
		Receive vehicle maintenance conditions from agency maintenance and construction vehicles and coordinate fleet maintenance with agency equipment repair facility/garage.
		Collect road weather information with agency field equipment and distribute it to regional traffic, maintenance and transit agencies as well as the national weather service and the media.
		Provide road weather information to regional emergency management providers, regional traffic agencies, regional transit agencies, and regional public information services.
		Provide winter road maintenance for Authority roadways and provide roadway maintenance status information to regional public safety agencies, regional transit agencies, and the TSOC.
		Provide maintenance of Authority roadways, including pavement maintenance and all construction activities.
		Provide maintenance status to regional transit agencies, regional public safety agencies, and to travelers (through ISPs).
		Dispatch Authority maintenance vehicles.
		Provide maintenance to all field equipment owned and operated by the Authority.
		Manage work zones on all Authority maintenance and construction activities, as well as monitors work zone safety with agency field devices and vehicles.
		Coordinates maintenance and construction activities with other regional maintenance and construction agencies.
		Distributes maintenance and construction plans and work zone information to regional information service providers, regional traffic operations, emergency operations, rail operations, and the media.
Archive Data Management	NYS Department of Motor Vehicles	Collect and archive emergency safety and crash information from regional and statewide emergency management providers.
	NYSDOT – New York State Department of Transportation	Collect and archive roadside date (weather data and traffic sensor data) and traffic information to the Highway Data Services and the Archive Management System.

Transportation Service	Stakeholder	Roles/ Responsibilities
		Collect and archive traffic safety and emergency information.
		Collect and archive maintenance and construction information and asset information from the agency's maintenance garage, regional maintenance offices and Regional TOCs.
		Collect and archive transit information about transit services within each region and across the state.
		Coordinate with other NYSDOT archives.
		Coordinate with other statewide archives (e.g. DMV).
		Coordinate with other regional traffic and MPO databases.
		Function as a data warehouse as well as coordinate with other regional travel information and traffic safety databases, transit databases, emergency databases, etc. so as to allow one access point for all archive databases.
	NYSTA – New York State Thruway Authority	Collect and archive roadside date (weather data and traffic sensor data) and traffic information to the agency's Archive Management System.
		Collect and archive traffic safety and emergency information.
		Collect and archive maintenance and construction information and asset information from the agency's maintenance garage, and district maintenance offices.
		Coordinate with other statewide archives (e.g. DMV).
		Coordinate with other regional traffic and MPO databases.
	Regional MPOs	Coordinate with NYSDOT and NYSTA archive databases.
Commercial Vehicle Operations	CHEMTREC	Provide second responders to guide HAZMAT containment and clean-up.
		Provide first response information to commercial vehicle incidents and coordinate with DEM and CST for HAZMAT conditions/clean-up.
	NYSDOT – New York State Department of Transportation	Provide electronic clearance at weight stations and provide weight inspections for private fleet systems and their commercial vehicles.
		Operate the New York CVIEW system, which coordinates with regional and national databases as well as the local DMV (for electronic clearance), and roadside inspection systems to process and issue online credentials applications.
		Provide mobile and fixed point weigh-in-motion for private fleet systems and their commercial vehicles, and provide daily feedback on activities and violations at inspection sites.
		Provide for mobile or stationary roadside safety inspections on all roads in New York. Coordinate with other regional databases for additional information and reporting.

Transportation Service	Stakeholder	Roles/ Responsibilities
		Send daily site activity information to the New York CVIEW System, FMCSA SAFER and FMCSA COMPASS.
		Provides an electronic (web based) credentials interface for purchasing and processing of commercial vehicle credentials applications (OSCAR).
		Provide enforcement of regional permits for OS/OW or HAZMAT, safety inspections, and for credential violations.
		Provide E-citations to violators within the state.
		Provide an interface with SAFER, IFTA, HUT, COMPASS and other regional and national databases.
	NYSTA – New York State Thruway Authority	Provide electronic clearance at weight stations and provide weight inspections for private fleet systems and their commercial vehicles on the Authority's highways.
		Provide mobile and fixed point weigh-in-motion for private fleet systems and their commercial vehicles, and provide daily feedback on activities and violations at inspection sites along the Authority's highways.
		Provide for mobile or stationary roadside safety inspections on the Authority's highways.
		Provide enforcement of regional permits for OS/OW or HAZMAT, safety inspections, and for credential violations.

5. Systems Inventory

Each stakeholder agency, company, or group owns, operates, maintains or plans ITS systems in the region. The New York Statewide Services ITS Architecture inventory is a list of "elements" that represent all existing and planned ITS systems in a region as well as non-ITS systems that provide information to or get information from the ITS systems. The focus of the inventory is on those systems that support, or may support, interfaces that cross stakeholder boundaries (e.g. inter-agency interfaces, public/private interfaces).

The vast majority of the inventory represents ITS systems within the State of New York, but the inventory does contain some elements that represent federal systems. An example of an federal system element would be the FMCSA SAFER and COMPASS system, which represents an existing national system to support CVO operations. The significance of having the national system in the Statewide Services ITS Architecture is because it would interface with the statewide NYS Commercial Vehicle Information Exchange Window (CVIEW) system.

Each element in the inventory is described by a name, the associated stakeholder, a description, general status (e.g. existing or planned), and the associated subsystems or terminators from the National ITS Architecture that the elements is mapped to for modeling purposes.

5.1. Systems by Stakeholder

Table 4 sorts the inventory by stakeholder so that each stakeholder can easily identify all the relevant elements that are defined in the architecture. For each element in the inventory, the table provides an element description and an indication of whether the element exists or is planned.

The majority of elements in the inventory represent a specific existing or planned system. Some examples of specific systems are the "TRANSCOM TRIPS123" and "NYSTA Thruway Statewide Operations Center (TSOC)".

Some of the elements represent sets of devices, rather than a single specific system or device. An example of this type of element is the element "NYSDOT CCTV". This element represents all of the CCTV that are or will be operated by NYSDOT. The element describes the type of field device, not the specific number of devices.

A third type of element in the inventory is a "generic" element that represents all of the systems of a certain type in the region. An example of this type of element is "Local Police/Sheriff Dispatch" which represents the police (or sheriff) dispatch functions at the municipal or county level. These generic elements have been created for two primary reasons. First, they represent elements with similar types of interfaces. So, from a standardization standpoint, describing how one of the major elements in the region (e.g. the NYSDOT Regional Traffic Operations Center (RTOC)) interfaces with various public safety

dispatch functions would be the same. Second, describing many systems with a single element helps keep the architecture from growing too large.

Table 4. Inventory Sorted by Stakeholder

Stakeholder	Element	Element Description	Status
Archived Data Users	Archived Data User Systems	This represents the systems that are used to access archived transportation, maintenance, construction, transit, and crash data for research, planning, and other off-line uses.	Planned
CHEMTREC	CHEMTREC / CANUTEC	Hazardous material information specialist used by public safety agencies in the United States to plan and effect a safe Hazmat response	Existing
Clarus	Clarus	The Clarus initiative is a federal project and system that provides qualified weather observation data from local and regional road and rail weather observations to serve a greater community of transportation system operators.	Planned
Financial Institutions	Financial Institutions	Represents the financial institutions the regional transit agencies will use as part of electronic fare payment systems.	Planned
FMCSA - Federal Motor Carrier Administration	FMCSA SAFER and COMPASS	An on-line system that will be available to users over a nationwide data network which will return a standard carrier safety fitness record to the requesters.	Planned
	NYS Commercial Vehicle Information Exchange Window (CVIEW)	Commercial Vehicle Information Exchange Window (CVIEW) routes Inspection Reports in near real-time and stores and distributes intrastate and interstate carrier and vehicle snapshots within a state. CVIEW connects to SAFER for exchange of interstate snapshots and other reports and data. CVIEW is an electronic data exchange system or 'portal' that connects the various systems in the State of New York.	Existing
	NYS IFTA and NYS HUT	IFTA is a national clearinghouse designed to allocate fuel taxes between multiple states for motor carrier activities across jurisdictional lines, in accordance with the International Fuel Tax Agreement (IFTA). The HUT system collects Highway Use Taxes (HUT) from motor carriers associated with commercial vehicle operations in the State of New York.	Existing
Government Agencies	Government Reporting Systems	This general element is used in the ITS architecture to represent various government agency systems that require transportation reports.	Existing
I-95 Corridor Coalition	I-95 CC Information Exchange Network	I-95 Corridor Coalition (eastern states) incident, traffic, and traveler information exchange network.	Existing

Stakeholder	Element	Element Description	Status
Local DPW	Local DPW Dispatch	This includes city, county, and agency specific maintenance dispatch systems.	Existing
	Local DPW Maintenance and Construction Vehicles	Represents the ITS equipment, such as mobile data terminals, in the maintenance vehicles that are dispatched by the maintenance departments for local municipalities and counties.	Planned
Local Public Safety Agencies	Local 911 Call Centers	Represents the Public Safety Answering Points (PSAP) for the municipality and/or county. These PSAPs are centers where emergency calls are received and entered into a system database. The center then routes the information to the appropriate public safety agency for dispatch or response. The center is sometimes also the dispatch center.	Existing
	Local EOC	This element represents county, municipal, and other local emergency operations centers that coordinate emergency response with New York SECC and the NYSDOT STICC.	Existing
	Local Fire/EMS Dispatch	This includes local city, county fire and EMS dispatch systems.	Existing
	Local Fire/EMS Vehicles	Represents the ITS equipment, such as mobile data terminals, in municipal and county emergency fire and EMS vehicles.	Existing
	Local Police/Sheriff Dispatch	Represents city, town, village police departments, and county sheriffs departments dispatch functions.	Existing
	Local Police/Sheriffs Vehicles	Represents the ITS equipment, such as mobile data terminals, in municipal and county law enforcement vehicles.	Planned
Local Traffic Management	Local Traffic Control Center	Central control and operation of city and county ITS field equipment, including traffic signals, CCTV cameras and dynamic message signs.	Existing
	Local Traffic Field Equipment	ITS field equipment operated by municipal and county traffic management centers.	Existing
Local Transit Operators	Local Transit Operators Systems	Represent regional, city, or county-operated transit systems.	Planned
	Local Transit Operators Transit Data Archives	This archive includes ridership, maintenance data, and operational data (e.g., route coverage) for transit properties in New York. This database can support federal reporting requirements (Section 5311). System designers may use the data to validate their work.	Existing
	Local Transit Vehicles	Represents the ITS equipment, such as mobile data terminals and AVL equipment, in transit vehicles operated by municipal or county transit systems not specifically called out in the regional ITS architecture.	Planned

Stakeholder	Element	Element Description	Status
MPO - Metropolitan Planning Organizations	MPO Data Collection and Reporting System	A multimodal transportation data archive operated by the MPO for the Greater Buffalo metropolitan area.	Planned
NOAA - National Oceanic and Atmospheric Administration	National Weather Service	Service for national, regional, and local weather information.	Existing
NYS Department of Highway Safety and Motor Vehicles	CVO Inspector	Responsible for the inspection of commercial vehicles within the region.	Existing
NYS Department of Motor Vehicles	NYS DMV Accident Reporting System	A database of collision information collected by law enforcement and maintained by the Department of Motor Vehicles in New York	Existing
	NYS DMV Licensing and Registration System	This system provides commercial driver's license and vehicle registration in New York. This system provides a traditional interface to the motor carrier which will be augmented by an electronic interface through the OSCAR system.	Existing
NYS Emergency Management Office (SEMO)	New York State Disaster LAN	Network used for information exchange and coordination between emergency management and. public safety during disasters.	Existing
	New York State Emergency Operations Center (SEMO)	Statewide emergency operations center in Albany, activated for major emergencies within the State of New York.	Existing
	NYAlerts System	System provides transportation incident alerts via e-mail and personal information devices (PDAs, phones).	Existing
NYS Police	NYS Police Commercial Vehicle Enforcement Unit	The back office systems operated by the NY State Police for commercial vehicle enforcement.	Existing
	NYS Police Dispatch	Dispatch center for New York State Police and Highway Patrol.	Existing
	NYS Police Safety and Accident System	Traffic records database including collision data, maintained by the DMV.	Existing
	NYS Police Vehicles	Represents the ITS equipment, such as mobile data terminals, in Ohio State Highway Patrol vehicles.	Existing
NYSDEC - New York State Department of Environmental Conservation	NYSDEC Field Equipment	Field equipment owned and operated by NYSDEC. Includes emissions monitoring stations throughout the region.	Existing
	NYSDEC Regional Office	This regional office is one of the allied agencies that is involved in incident response, specifically those with potential for environmental impact because hazardous materials are involved, or for other reasons.	Existing

Stakeholder	Element	Element Description	Status
NYSDOT - New York State Department of Transportation	511NY.ORG	Traveler information system, including web site and interactive voice response (IVR), for traffic, transit, roadway, and weather information providing New York State travelers with up-to-date information on road conditions, traffic, construction, transit itinerary planning and other activity affecting transportation managed by NYSDOT.	Existing
	Maintenance and Construction Operations Personnel	Maintenance and Construction Operations Personnel.	Existing
	New York State CV Safety Roadside Inspection Operations	Local scales and commercial vehicle inspection facilities operated in New York State.	Existing
	NYSDOT Bridge Management System	This database identifies all bridges and identifies all pertinent information about the bridges including dimensional and weight limitations and a record of all bridge inspections.	Existing
	NYSDOT CCTV	Traffic monitoring CCTV cameras.	Planned
	NYSDOT HELP Vehicles	Courtesy patrol vehicles operated by NYSDOT and NYSTA on New York State roads.	Existing
	NYSDOT Highway Work Permit System	The NYSDOT permit system that must be completed prior to any work being done within the NYSDOT right-of-way.	Existing
	NYSDOT Infrastructure Restrictions Database	This database contains a comprehensive highway restrictions (lane closures, shoulder work, etc. caused my scheduled construction and maintenance or incidents) and dimensional limitations (width, height, turning radius) for NYSDOT highways and roads. This database represents a single up-to-date source of the current highway configuration for the roads managed by NYSDOT.	Existing
	NYSDOT Infrastructure Security Monitoring Equipment	Represents security monitoring equipment for NYSDOT transportation assets.	Planned
	NYSDOT Integrated Incident Management System (IIMS)	The Integrated Incident Management System (IIMS) provides an interface between emergency and maintenance vehicles and centers involved in incident management.	Planned
	NYSDOT ITS and Traffic Signal Asset Management System	NYSDOT system manages the attributes of ITS assets.	Existing
	NYSDOT Main Office Environmental Analysis Bureau	The systems operated by this bureau collect air quality data and make this data available for archival, planning, and analysis.	Existing

Stakeholder	Element	Element Description	Status
	NYSDOT Main Office Highway Data Services	This system collects traffic data from a statewide system of dedicated traffic count stations and also from the NYSDOT regional offices. This system collects vehicle classification, weight, and other traffic measures. It also includes the roadway characteristics and condition ratings for the highways. Data services also collects "Photolog" information, which is a series of photos of the state highway system.	Existing
	NYSDOT Main Office PPMIS	The PPMIS, consisting of the Program Support System (PSS) and the Project Management Information System (PMIS), supports the planning, management, implementation and monitoring of the Department's capital program. PPMIS maintains planning, finance, and pr	Existing
	NYSDOT Maintenance	Represents the dispatch function for maintenance and construction for routine and emergency road maintenance.	Existing
	NYSDOT Maintenance Asset Management Information System (MAMIS)	Roadway asset and maintenance work order management system.	Existing
	NYSDOT Maintenance Decision Support System (MDSS)	The Maintenance Decision Support System (MDSS) is a decision support tool that integrates relevant road weather forecasts, coded maintenance rules of practice, and maintenance resource data to provide winter maintenance managers with recommended road treatment strategies.	Planned
	NYSDOT Maintenance Vehicles	Represents the ITS equipment, such as mobile data terminals, in the maintenance vehicles that are dispatched by NYSDOT.	Planned
	NYSDOT Motorist Information Systems	Includes NYSDOT dynamic message signs and highway advisory radio.	Existing
	NYSDOT One Stop Credentialing and Registration (OSCAR)	Provides a single point of entry and information for CVO credentialing and registration.	Planned
	NYSDOT Oversize and Overweight System	This system provides permits to all overweight vehicles with normal dimensions. Divisible loads include logs, sand, asphalt, gravel, etc.	Existing
	NYSDOT Public Information Office - Main Office	NYSDOT Main Office Public Information Officer distributes information to media. All the Regional Public Information Officers are part of the same department as the Main Office Public Information Officer.	Existing

Stakeholder	Element	Element Description	Status
	NYSDOT Regional Public Information Office	NYSDOT regional public information office distributes information to media. The NYSDOT Regional Public Information Officer is part of the same department as the Main Office Public Information Officer.	Existing
	NYSDOT Regional Streetwise Servers	Provides central approach to closed loop traffic signal control.	Planned
	NYSDOT Regional Traffic Operations Center (RTOC)	Central control and operation of roadways using ITS devices such as CCTV, DMS, and traffic signals, and ramp meters. Traffic operations centers perform traffic incident management functions and coordination with emergency responders.	Existing
	NYSDOT Statewide Information Exchange Network (IEN)	The Statewide Information Exchange Network (IEN) provides for the interchange of traffic and incident information between regional TOCs, NYSTA TSOC, and the STICC. Incident information is collected from public safety via the IEN. Traffic, incident and emergency information is shared with transit operators via the IEN. Information is shared with the 511NY.ORG for traveler information. The system will migrate from a CARS implementation to SMARTNET.	Existing
	NYSDOT Statewide Operations Center Archive Management System	The archive management system for the NYSDOT. Functionally located within the STICC.	Planned
	NYSDOT Statewide Transportation Information Coordination Center (STICC)	Central statewide traffic operations center for New York State.	Existing
	NYSDOT Statewide Video Exchange Network (VEN)	NYSDOT video exchange between TOCs and STICC.	Planned
	NYSDOT Traffic Count Stations	Traffic count stations owned and operated by NYSDOT.	Existing
	NYSDOT Traffic Monitoring Section Office	NYSDOT office receives traffic count and commercial vehicle operational data.	Existing
	NYSDOT Traffic Sensors	Real-time traffic count, volume, occupancy, and speed monitoring equipment.	Existing
	NYSDOT Traffic Signal Inventory and Maintenance System	Inventories each traffic signal intersection including equipment at that intersection as well as maintenance and dispatch history. The maintenance and dispatch data will be collected in the future.	Existing
	NYSDOT Traffic Signals	Signal controllers operated and maintained by NYSDOT.	Existing

Stakeholder	Element	Element Description	Status
	NYSDOT Transit Service Information Portal (TSIP)	New York statewide information exchange system and archive for schedule, ridership, and fare information.	Planned
NYSTA - New York Thruway Authority	NYSTA CCTV	Traffic Monitoring CCTV cameras	Existing
	NYSTA CVO Inspection Station	Commercial vehicle inspection stations operated by NYSTA	Planned
	NYSTA Division Traffic Office	The local division traffic offices operated by NYSTA that oversee operations and maintenance activities for NYSTA operated roadways in conjunction with the NYSTA Statewide Operations Center.	Existing
	NYSTA Electronic Toll Collection Equipment	Represents the toll collection field equipment. E-ZPass is the beacon-tag system used for toll collection.	Existing
	NYSTA E-ZPass Service Center	The NYSTA CSC (Customer Service Center) is one of a network of CSCs that allow reciprocity for E-ZPass travelers across several toll systems across the North East. These cooperating agencies are all members of the Inter-Agency Group (IAG).	Existing
	NYSTA E-ZPass Web Page	Web site and information portal (including account information) for E-ZPass customers.	Existing
	NYSTA Freeway Control Devices	Any ITS roadside field devices used to control the traffic flow on NYSTA's highway. These may include lane control devices, variable speed limit signs, etc.	Planned
	NYSTA Infrastructure Inventory and Inspection System	This database includes all highway infrastructure data including rock slope, culvert, and bridge information.	Existing
	NYSTA Maintenance and Construction Vehicles	Vehicles used by NYSTA to manage and perform road maintenance and construction.	Existing
	NYSTA Maintenance Management System	The NYSTA's maintenance management system.	Existing
	NYSTA Maintenance Storage Facility	Represent the various maintenance facilities that are used to store the materials. Material may be located at one of the approximately 25 Maintenance and Operations facilities, but there are also locations in-between that house materials.	Existing
	NYSTA Motor Equipment Maintenance	Equipment repair facilities/shops for NYSTA maintenance and construction vehicles.	Existing
	NYSTA Motorist Information Systems	Represents roadside field devices that provide traveler information to motorists. Includes dynamic messages signs, variable message signs, and highway advisory radios.	Existing
	NYSTA Occupancy and Work Permit System	This system manages contractor permits for NYSTA.	Existing

Stakeholder	Element	Element Description	Status
	NYSTA Operations and Maintenance	Represents the dispatch function for Thruway maintenance and construction vehicles for routine and emergency road maintenance.	Existing
	NYSTA RWIS/SWIS	Environmental sensor stations operated by NYSTA.	Existing
	NYSTA Service Plaza Kiosks	Interactive kiosks operated by the NYSTA and located at roadside service plazas.	Planned
	NYSTA Tandem Program Database	This system is used to manage the list of carriers who are certified to operate tandem (two trailer) vehicles on specially designated roads in New York State.	Existing
	NYSTA Thruway Statewide Operations Center (TSOC)	Thruway statewide management center that coordinates information and local Thruway operations center activities.	Existing
	NYSTA Thruway Statewide Operations Center Archive Management System	The archive management system for the Thruway Authority. Functionally located within the statewide operations center.	Existing
	NYSTA Toll Plaza	Toll Plaza offices, which operate and monitor the toll plazas on the NYSTA.	Existing
	NYSTA Toll Plaza Lane Equipment	Toll plaza lane equipment, which controls the toll plaza lanes. Includes equipment to indicate whether the lane is open or closed to on-coming traffic.	Existing
	NYSTA TOPS	New York State Thruway Authority's Over-Dimensional Permit System (TOPS). Automated Special Hauling Permit System. This system issues permits for overdimension and overweight vehicles.	Existing
	NYSTA Traffic Sensors	Real-time traffic count, volume, occupancy, and speed monitoring equipment.	Existing
	NYSTA Work Zone Equipment	Represents the ITS field equipment at work zones.	Existing
Private Automated Vehicle Location System Providers	Private AVL Vendor Servers	Private vendor systems that collect and disseminate automated vehicle location (AVL) and vehicle operational data.	Existing
Private Commercial Vehicle Freight and Fleet Operators	Commercial Vehicle Driver	Operators of commercial vehicles.	Existing
	Commercial Vehicle Fleet Dispatch Systems	Charter bus fleets, major truck fleet operators, taxi services, limo services, etc. Note that the dispatch may actually be outside the state.	Existing
	Commercial Vehicles	Private commercial and fleet vehicles.	Existing
Private Mayday/Concierge Service Providers	Private Mayday/Concierge Service Center	National services (e.g., GM On-Star) that provide Mayday and traveler information services for their customers.	Existing
Private News Media	Private Newspaper, Television, and Radio Stations	Local television, radio, and newspapers.	Existing

Stakeholder	Element	Element Description	Status
Private Rail Operations	Rail Wayside Equipment	The rail operated equipment at highway rail intersections.	Existing
Private Road Weather Information System Providers	Private RWIS Vendor Servers	Private vendor systems that collect and disseminate road weather information from mobile and fixed data sources and weather information services.	Existing
Private Traveler Information Providers	Private Traveler Information Systems	Represents the private traveler information providers serving the region. This element could, in the future, provide support to the National Traveler Information 511 number since it collects information from a broad array of operating centers. Could also include a website.	Planned
Private Travelers	Private Traveler Information Device	Personal devices used by the traveling public. Includes PCs, pagers, etc.	Planned
	Private Traveler Vehicles	Vehicles owned by travelers.	Existing
Private Weather Service Providers	Private Weather Service Systems	Private weather information providers.	Existing
Regional Airport Authorities	Regional Airports	Regional airports that are owned and operated by the local municipalities or counties where they reside.	Planned
Regional Bus Rapid Transit Operators	Regional BRT Customer Information System	Customer and traveler information systems for regional bus rapid transit operations.	Planned
	Regional BRT Kiosks	Point of sale and traveler information kiosks located in regional BRT facilities.	Planned
	Regional BRT Operations Control Center	Regional Bus Rapid Transit (BRT) transit operations center systems. Transit center performs the dispatch function sand coordination point for transit, emergency, public safety, and traffic management.	Planned
	Regional BRT Security Systems	Represents on-board and fixed location security systems such as CCTV and alerting systems.	Planned
	Regional BRT Transit Data Archive	This archive includes ridership, maintenance data, and operational data (e.g., route coverage) for transit properties in New York. This database can support federal reporting requirements (Section 5311). System designers may use the data to validate their work.	Existing
	Regional BRT Traveler Card	Transit fare payment card.	Planned
	Regional BRT Vehicles	Bus rapid transit vehicles.	Planned
Regional Event Promoters	Regional Event Promoters	Represents statewide and regional event information systems.	Planned
Regional Hospital Organizations	Regional Medical Centers	Medical centers (e.g. hospitals and trauma centers) throughout the region.	Existing
Regional Multimodal	Regional Ferry Terminals	Represents transportation ferry terminals.	Existing

Stakeholder	Element	Element Description	Status
Transportation Service Provider	Regional Rail and Bus Terminals	Represents Amtrak, Metro-North, and inter-city bus terminals.	Planned
Regional Parking Providers	Regional Parking Management Systems	Represents systems of parking providers, usually adjacent or closely associated with multi-modal facilities such as airport, transit, and ferry terminals.	Existing
TRANSCOM	TRANSCOM RA Servers	The TRANSCOM regional architecture (TRA) is a program. It coordinates the collection and redistribution of traffic flow, origin-destination, incident, construction, equipment status and special event information data between transportation management centers running the TRANSCOM regional architecture. Both highway and transit facility data is distributed via TRA.	Existing
	TRANSCOM TRIPS123	Regional transit itinerary planning and traveler information system operating in New York, New Jersey, and Connecticut.	Existing
TRANSMIT Agencies	TRANSMIT Agencies Field Equipment	TRANSMIT transponder readers.	Existing
	TRANSMIT Agencies TRANSMIT Servers	TRANSMIT agencies central equipment that interconnect with TRANSMIT field equipment. Agencies with TRANSMIT Servers include NYSTA and NYSDOT.	Existing

5.2. Systems by Architecture Entity

Each element in the New York Statewide Services ITS Architecture inventory is mapped to one or more entities from the National ITS Architecture. In version 6.0 of the National ITS Architecture (on which this architecture is based) there are 98 entities defined. These 22 subsystems and 76 terminators describe a wide array of systems that provide ITS services, or interface with systems that provide ITS services. The mapping of Statewide Services ITS Architecture elements to National ITS Architecture entities has two primary benefits. First, it allows the full set of information flows contained in the National ITS Architecture to be used in the description of statewide services ITS architecture interfaces. Secondly, it allows the elements of the Statewide Services ITS Architecture to be grouped by like entity.

Table 5 provided just such a sorting of inventory elements by entity. This table allows the users of the architecture to immediately identify all the elements that have functions relating to transit management, or traffic management, or any other subsystem or terminator defined by the National ITS Architecture.

The New York Statewide Services ITS Architecture inventory contains the following number of elements mapped to different types of entities (note that some elements are mapped to more than one entity since they perform functions that are covered by more than one entity in the National ITS Architecture):

- Archived Data Management: 14

- Commercial Vehicle Administration: 10
- Emergency Management: 15
- Information Service Providers: 15
- Maintenance and Construction Management: 11
- Roadway Subsystem: 15
- Traffic Management: 12
- Transit Management: 4

Table 5. Element Inventory Sorted by Entity

Entity	Element	Stakeholder
Archived Data Management Subsystem	Local Transit Operators Transit Data Archives	Local Transit Operators
	MPO Data Collection and Reporting System	MPO - Metropolitan Planning Organizations
	NYS DMV Accident Reporting System	NYS Department of Motor Vehicles
	NYS Police Safety and Accident System	NYS Police
	NYSDOT Bridge Management System	NYSDOT
	NYSDOT Infrastructure Restrictions Database	NYSDOT
	NYSDOT Main Office Highway Data Services	NYSDOT
	NYSDOT Main Office PPMIS	NYSDOT
	NYSDOT Statewide Operations Center Archive Management System	NYSDOT
	NYSDOT Traffic Signal Inventory and Maintenance System	NYSDOT
	NYSDOT Transit Service Information Portal (TSIP)	NYSDOT
	NYSTA Infrastructure Inventory and Inspection System	NYSTA
	NYSTA Thruway Statewide Operations Center Archive Management System	NYSTA
	Regional BRT Transit Data Archive	Regional Bus Rapid Transit Operators
Archived Data User Systems	Archived Data User Systems	Archived Data Users
Asset Management	NYSDOT ITS and Traffic Signal Asset Management System	NYSDOT
	NYSTA Maintenance Management System	NYSTA
Care Facility	Regional Medical Centers	Regional Hospital Organizations
Commercial Vehicle Administration	FMCSA SAFER and COMPASS	FMCSA - Federal Motor Carrier Administration

Entity	Element	Stakeholder
	NYS Commercial Vehicle Information Exchange Window (CVIEW)	FMCSA - Federal Motor Carrier Administration
	NYS DMV Licensing and Registration System	NYS Department of Motor Vehicles
	NYS IFTA and NYS HUT	FMCSA - Federal Motor Carrier Administration
	NYS Police Commercial Vehicle Enforcement Unit	NYS Police
	NYSDOT One Stop Credentialing and Registration (OSCAR)	NYSDOT
	NYSDOT Oversize and Overweight System	NYSDOT
	NYSDOT Traffic Monitoring Section Office	NYSDOT
	NYSTA Tandem Program Database	NYSTA
	NYSTA TOPS	NYSTA
Commercial Vehicle Check	New York State CV Safety Roadside Inspection Operations	NYSDOT
	NYSTA CVO Inspection Stations	NYSTA
Commercial Vehicle Driver	Commercial Vehicle Driver	Private Commercial Vehicle Freight and Fleet Operators
Commercial Vehicle Subsystem	Commercial Vehicles	Private Commercial Vehicle Freight and Fleet Operators
CVO Inspector	CVO Inspector	NYS Department of Highway Safety and Motor Vehicles
DMV	NYS DMV Licensing and Registration System	NYS Department of Motor Vehicles
Emergency Management	Local 911 Call Centers	Local Public Safety Agencies
	Local EOC	Local Public Safety Agencies
	Local Fire/EMS Dispatch	Local Public Safety Agencies
	Local Police/Sheriff Dispatch	Local Public Safety Agencies
	New York State Disaster LAN	NYS Emergency Management Office (SEMO)
	New York State Emergency Coordination Center (SECC)	NYS Emergency Management Office (SEMO)
	NYS Police Dispatch	NYS Police
	NYSDEC Regional Office	NYSDEC - New York State Department of Environmental Conservation
	NYSDOT Integrated Incident Management System (IIMS)	NYSDOT
	NYSDOT Regional Traffic Operations Center (RTOC)	NYSDOT
	NYSDOT Statewide Information Exchange Network (IEN)	NYSDOT
	NYSDOT Statewide Transportation Information Coordination Center (STICC)	NYSDOT

Entity	Element	Stakeholder
	NYSTA Thruway Statewide Operations Center (TSOC)	NYSTA
	Private Mayday/Concierge Service Center	Private Mayday/Concierge Service Providers
	TRANSCOM RA Servers	TRANSCOM
Emergency Vehicle Subsystem	Local Fire/EMS Vehicles	Local Public Safety Agencies
	Local Police/Sheriffs Vehicles	Local Public Safety Agencies
	NYS Police Vehicles	NYS Police
	NYSDOT HELP Vehicles	NYSDOT
	NYSDOT Maintenance Vehicles	NYSDOT
Emissions Management	NYSDOT Main Office Environmental Analysis Bureau	NYSDOT
Enforcement Agency	Local Police/Sheriff Dispatch	Local Public Safety Agencies
	NYS Police Commercial Vehicle Enforcement Unit	NYS Police
	NYS Police Dispatch	NYS Police
Equipment Repair Facility	NYSTA Motor Equipment Maintenance	NYSTA
Event Promoters	Regional Event Promoters	Regional Event Promoters
Financial Institution	Financial Institutions	Financial Institutions
Fleet and Freight Management	CHEMTREC / CANUTEC	CHEMTREC
	Commercial Vehicle Fleet Dispatch Systems	Private Commercial Vehicle Freight and Fleet Operators
Government Reporting Systems	Government Reporting Systems	Government Agencies
Information Service Provider	511NY.ORG	NYSDOT
	I-95 CC Information Exchange Network	I-95 Corridor Coalition
	NYAlerts System	NYS Emergency Management Office (SEMO)
	NYSDOT Public Information Office - Main Office	NYSDOT
	NYSDOT Regional Public Information Office	NYSDOT
	NYSDOT Regional Traffic Operations Center (RTOC)	NYSDOT
	NYSDOT Statewide Information Exchange Network (IEN)	NYSDOT
	NYSDOT Statewide Video Exchange Network (VEN)	NYSDOT
	NYSDOT Transit Service Information Portal (TSIP)	NYSDOT
	NYSTA E-ZPass Web Page	NYSTA
	NYSTA Thruway Statewide Operations Center (TSOC)	NYSTA

Entity	Element	Stakeholder
	Private Traveler Information Systems	Private Traveler Information Providers
	Regional BRT Customer Information System	Regional Bus Rapid Transit Operators
	TRANSCOM RA Servers	TRANSCOM
	TRANSCOM TRIPS123	TRANSCOM
Maintenance and Construction Administrative Systems	NYSDOT Maintenance Asset Management Information System (MAMIS)	NYSDOT
Maintenance and Construction Center Personnel	Maintenance and Construction Operations Personnel	NYSDOT
Maintenance and Construction Management	Local DPW Dispatch	Local DPW
	NYSDOT Highway Work Permit System	NYSDOT
	NYSDOT Integrated Incident Management System (IIMS)	NYSDOT
	NYSDOT Maintenance	NYSDOT
	NYSDOT Regional Traffic Operations Center (RTOC)	NYSDOT
	NYSDOT Statewide Information Exchange Network (IEN)	NYSDOT
	NYSTA Occupancy and Work Permit System	NYSTA
	NYSTA Operations and Maintenance	NYSTA
	NYSTA Thruway Statewide Operations Center (TSOC)	NYSTA
	Private AVL Vendor Servers	Private Automated Vehicle Location System Providers
	Private RWIS Vendor Servers	Private Road Weather Information System Providers
Maintenance and Construction Vehicle	Local DPW Maintenance and Construction Vehicles	Local DPW
	Local Police/Sheriffs Vehicles	Local Public Safety Agencies
	Local Transit Vehicles	Local Transit Operators
	NYS Police Vehicles	NYS Police
	NYSDOT Maintenance Vehicles	NYSDOT
	NYSTA Maintenance and Construction Vehicles	NYSTA
Media	Private Newspaper, Television, and Radio Stations	Private News Media
Multimodal Transportation Service Provider	Regional Airports	Regional Airport Authorities
	Regional Ferry Terminals	Regional Multimodal Transportation Service Provider
	Regional Rail and Bus Terminals	Regional Multimodal Transportation Service Provider

Entity	Element	Stakeholder
Parking Management	Regional Parking Management Systems	Regional Parking Providers
Personal Information Access	Private Traveler Information Device	Private Travelers
Remote Traveler Support	NYSTA Service Plaza Kiosks	NYSTA
	Regional BRT Kiosks	Regional Bus Rapid Transit Operators
	Regional BRT Security Systems	Regional Bus Rapid Transit Operators
Roadway Subsystem	Local Traffic Field Equipment	Local Traffic Management
	NYSDEC Field Equipment	NYSDEC - New York State Department of Environmental Conservation
	NYSDOT CCTV	NYSDOT
	NYSDOT Motorist Information Systems	NYSDOT
	NYSDOT Traffic Count Stations	NYSDOT
	NYSDOT Traffic Sensors	NYSDOT
	NYSDOT Traffic Signals	NYSDOT
	NYSTA CCTV	NYSTA
	NYSTA Freeway Control Devices	NYSTA
	NYSTA Motorist Information Systems	NYSTA
	NYSTA RWIS/SWIS	NYSTA
	NYSTA Toll Plaza Lane Equipment	NYSTA
	NYSTA Traffic Sensors	NYSTA
	NYSTA Work Zone Equipment	NYSTA
	TRANSMIT Agencies Field Equipment	TRANSMIT Agencies
Security Monitoring Subsystem	NYSDOT Infrastructure Security Monitoring Equipment	NYSDOT
Storage Facility	NYSTA Maintenance Storage Facility	NYSTA
Surface Transportation Weather Service	Clarus	Clarus
	National Weather Service	NOAA - National Oceanic and Atmospheric Administration
	NYSDOT Maintenance Decision Support System (MDSS)	NYSDOT
	Private Weather Service Systems	Private Weather Service Providers
Toll Administration	NYSTA E-ZPass Service Center	NYSTA
Toll Collection	NYSTA Electronic Toll Collection Equipment	NYSTA
Traffic Management	I-95 CC Information Exchange Network	I-95 Corridor Coalition
	Local Traffic Control Center	Local Traffic Management
	NYSDOT Regional Streetwise Servers	NYSDOT
	NYSDOT Regional Traffic Operations Center (RTOC)	NYSDOT
	NYSDOT Statewide Information Exchange Network (IEN)	NYSDOT

Entity	Element	Stakeholder
	NYSDOT Statewide Transportation Information Coordination Center (STICC)	NYSDOT
	NYSDOT Statewide Video Exchange Network (VEN)	NYSDOT
	NYSTA Division Traffic Office	NYSTA
	NYSTA Thruway Statewide Operations Center (TSOC)	NYSTA
	NYSTA Toll Plaza	NYSTA
	TRANSCOM RA Servers	TRANSCOM
	TRANSMIT Agencies TRANSMIT Servers	TRANSMIT Agencies
Transit Management	Local Transit Operators Systems	Local Transit Operators
	NYSDOT Transit Service Information Portal (TSIP)	NYSDOT
	Regional BRT Operations Control Center	Regional Bus Rapid Transit Operators
	TRANSCOM TRIPS123	TRANSCOM
Transit Vehicle Subsystem	Local Transit Vehicles	Local Transit Operators
Transit Vehicle Subsystem	Regional BRT Vehicles	Regional Bus Rapid Transit Operators
Traveler Card	Regional BRT Traveler Card	Regional Bus Rapid Transit Operators
Vehicle	Commercial Vehicles	Private Commercial Vehicle Freight and Fleet Operators
	Private Traveler Vehicles	Private Travelers
Wayside Equipment	Rail Wayside Equipment	Private Rail Operations
Weather Service	Clarus	Clarus
	National Weather Service	NOAA - National Oceanic and Atmospheric Administration
	Private Weather Service Systems	Private Weather Service Providers

6. Services

The ITS systems in the state currently provide a wide array of transportation services and that list will grow as more systems are developed or upgraded. The current and planned services can be described by the set of market packages that are shown in Table 6. This set of services is a subset of the services contained in the National ITS Architecture, and represent all of the selected services (market packages) based on information gathered at stakeholder meetings, needs assessments, and review of planning documents. Each of the market packages is currently implemented, or planned for implementation, on a very small scale throughout the state. And for some services there are one or more stakeholders who have implemented a service, while it is planned for the other stakeholders. In this case the service will be listed as "existing" to show that some implementation of the service is taking place in the state.

Table 6. Selected Statewide Market Packages

Market Package	Market Package Name	Status
AD1	ITS Data Mart	Existing
AD2	ITS Data Warehouse	Planned
AD3	ITS Virtual Data Warehouse	Planned
APTS01	Transit Vehicle Tracking	Planned
APTS02	Transit Fixed-Route Operations	Planned
APTS04	Transit Fare Collection Management	Planned
APTS05	Transit Security	Planned
APTS06	Transit Fleet Management	Planned
APTS07	Multi-modal Coordination	Planned
APTS08	Transit Traveler Information	Planned
APTS09	Transit Signal Priority	Planned
APTS10	Transit Passenger Counting	Planned
ATIS01	Broadcast Traveler Information	Existing
ATMS01	Network Surveillance	Existing
ATMS02	Traffic Probe Surveillance	Existing
ATMS03	Surface Street Control	Existing
ATMS04	Freeway Control	Existing
ATMS06	Traffic Information Dissemination	Existing
ATMS07	Regional Traffic Management	Existing
ATMS08	Traffic Incident Management System	Existing
ATMS10	Electronic Toll Collection	Existing
ATMS11	Emissions Monitoring and Management	Planned
ATMS13	Standard Railroad Grade Crossing	Existing
ATMS18	Reversible Lane Management	Existing
CVO03	Electronic Clearance	Existing
CVO04	CV Administrative Processes	Planned
CVO06	Weigh-In-Motion	Existing
CVO07	Roadside CVO Safety	Existing

Market Package	Market Package Name	Status
CVO10	HAZMAT Management	Planned
EM01	Emergency Call-Taking and Dispatch	Planned
EM02	Emergency Routing	Planned
EM03	Mayday and Alarms Support	Planned
EM04	Roadway Service Patrols	Existing
EM05	Transportation Infrastructure Protection	Planned
EM06	Wide-Area Alert	Planned
EM07	Early Warning System	Planned
EM08	Disaster Response and Recovery	Planned
EM09	Evacuation and Reentry Management	Planned
EM10	Disaster Traveler Information	Planned
MC01	Maintenance and Construction Vehicle and Equipment Tracking	Planned
MC02	Maintenance and Construction Vehicle Maintenance	Planned
MC03	Road Weather Data Collection	Planned
MC04	Weather Information Processing and Distribution	Existing
MC06	Winter Maintenance	Planned
MC07	Roadway Maintenance and Construction	Existing
MC08	Work Zone Management	Planned
MC09	Work Zone Safety Monitoring	Planned
MC10	Maintenance and Construction Activity Coordination	Planned

Incident Management, identified as ATMS08 in the above table, is one of the key services that is planned throughout the State of New York, and throughout the entire United States. Although it is technically called “Traffic Incident Management”, and identified numerically in the National ITS Architecture as ATMS08, a broader view of this service includes several market packages, including:

- ATMS03 – Surface Street Control
- ATMS04 – Freeway Control
- ATMS06 – Information Dissemination
- ATMS07 – Regional Traffic Control
- ATMS08 – Traffic Incident Management
- EM1 – Emergency Call-Taking and Dispatch
- EM2 – Emergency Routing

As indicated by Table 6 above, all of these services are identified as existing or planned for the New York Statewide Services ITS Architecture.

7. Interfaces and Information Exchanges

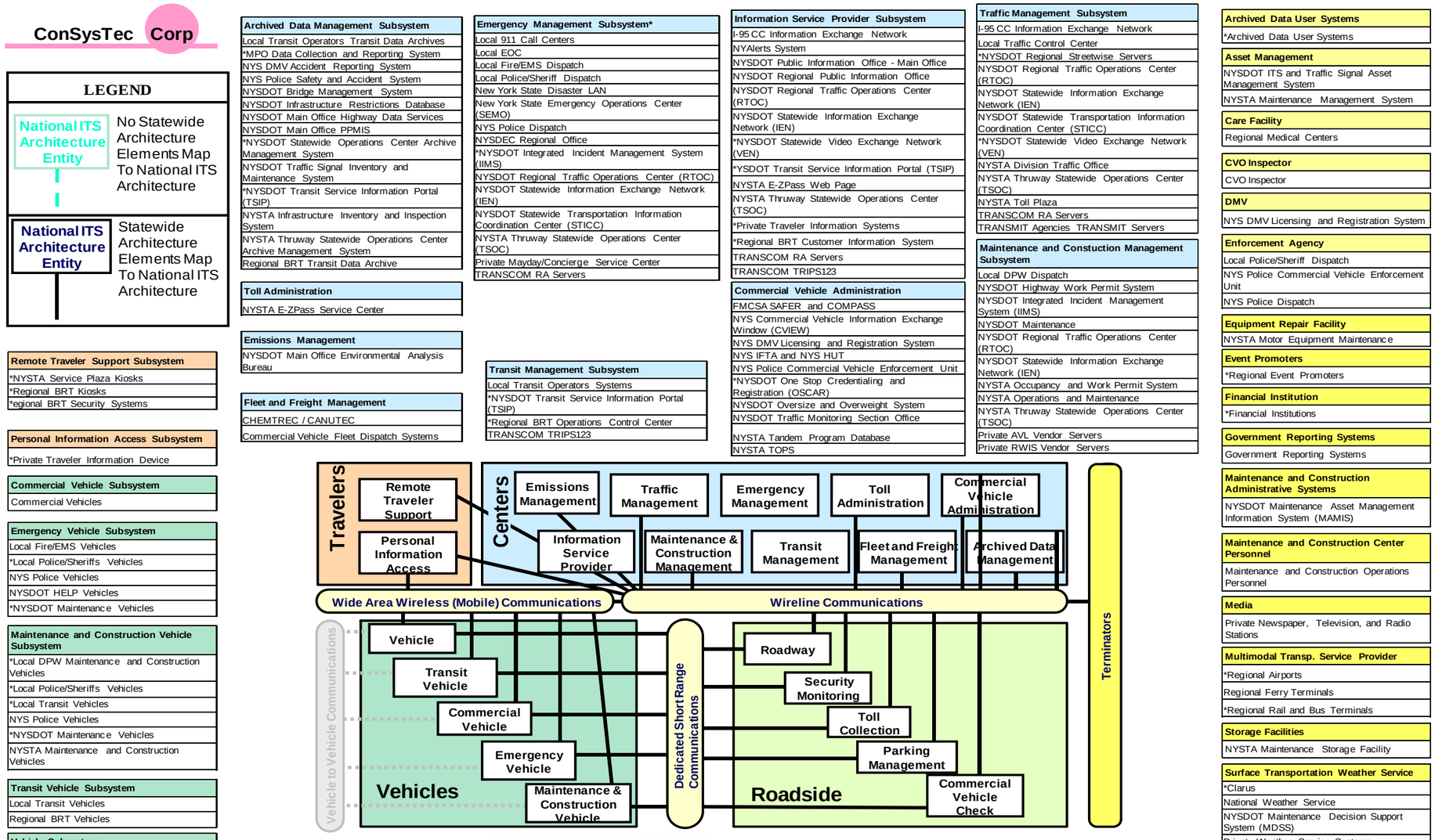
7.1. Top Level Regional System Interconnect Diagram

A system interconnect diagram, or sausage diagram, shows the systems and primary types of interconnections in the region. The National ITS Architecture interconnect diagram has been customized for New York based on the information gathered from the stakeholders and system inventory. Figure 5 on the following pages summarize the existing and planned ITS elements for the state in the context of a physical interconnect. Elements (and their primary associated National ITS Architecture entity) are called out in the boxes surrounding the main interconnect diagram. In the center of the figure, the rectangles represent the subsystems of the National ITS Architecture. The New York Statewide Services ITS Architecture has elements that map to all 22 possible subsystems of the National ITS Architecture. In addition, the Statewide Services ITS architecture has elements that map to 20 terminators of the National ITS Architecture. These terminators are shown on the right side (in yellow) of the diagrams below. Terminators include entities such as Care Facilities (which maps to Regional Medical Centers).

The diagram also identifies the three basic types of communications used to interconnect the elements of the architecture. These communications types are defined as:

- Fixed point to fixed point Communications: A communications link serving stationary sources. It may be implemented using a variety of public or private communications networks that may physically include wireless (e.g., microwave) as well as wireline infrastructure. Both dedicated and shared communications resources may be used.
- 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. These links support a range of services including real-time traveler information and various forms of fleet communications.
- 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, automated commercial vehicle operations and signal pre-emption or priority.

Figure 5. New York Statewide Services System Interconnect Diagram



New York Statewide Services ITS Architecture "Sausage Diagram"

Roadway Subsystem
- Local Traffic Field Equipment
- NYSDEC Field Equipment
- *NYSDOT CCTV
- NYSDOT Motorist Information Systems
- NYSDOT Traffic Count Stations
- NYSDOT Traffic Sensors
- NYSDOT Traffic Signals
- NYSTA CCTV
- *NYSTA Freeway Control Devices
- NYSTA Motorist Information Systems

Roadway Subsystem
- NYSTA RWIS/SWIS
- NYSTA Toll Plaza Lane Equipment
- NYSTA Traffic Sensors
- NYSTA Work Zone Equipment
- TRANSMIT Agencies Field Equipment

Toll Collection Subsystem
- NYSTA Electronic Toll Collection Equipment

Security Monitoring Subsystem
- *NYSDOT Infrastructure Security Monitoring Equipment

Commercial Vehicle Check Subsystem
- New York State CV Safety Roadside Inspection Operations
- *NYSTA CVO Inspection Stations

Parking Management Subsystem
- Regional Parking Management Systems

***** Elements are *planned*, not *existing*.

December 31, 2008

7.2. Customized Market Packages

The market packages identified in the National ITS Architecture (see Section 3) have been customized to reflect the unique systems and connections within the state, as well as connections to federal systems. Each market package can be shown graphically, with the market package name, the entity from the National ITS Architecture and the specific New York elements associated with the entity. In addition the market packages show the information flows that are exchanged (or will be exchanged) between elements.

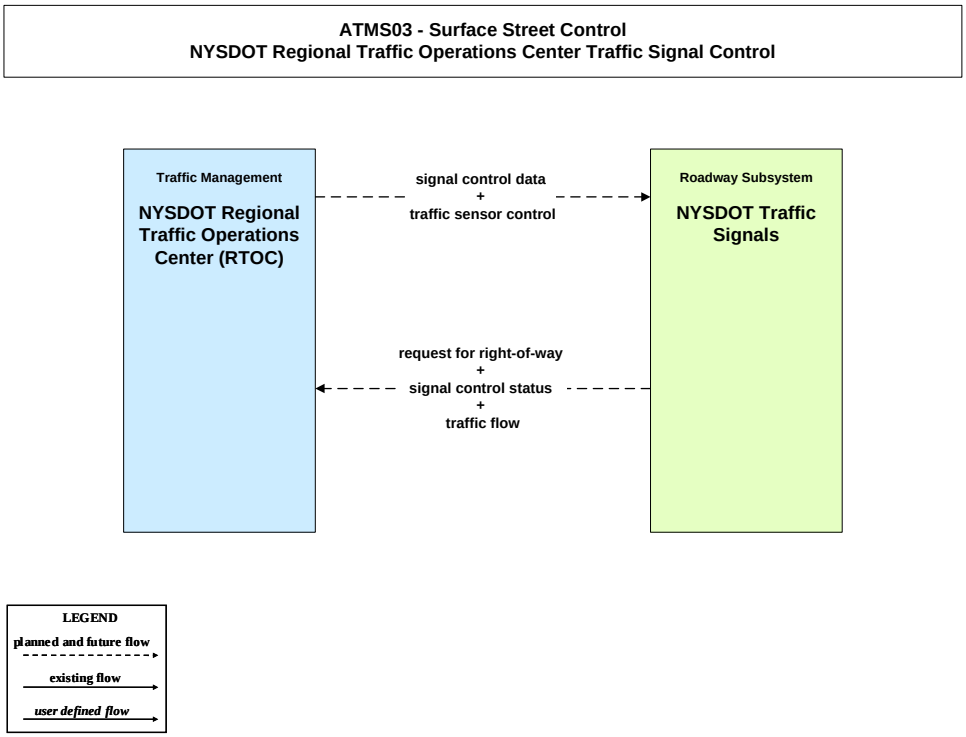


Figure 6. Example Customized Market Package

Figure 6 is an example of an ATMS market package for Surface Street Control that has been customized for the NYSDOT Traffic Signals. This market package shows the two subsystems, Traffic Management and Roadway, and the associated elements. Information flows (called "architecture flows" in the National ITS Architecture) between the subsystems indicate what information is being shared. The market packages that were customized for the New York Statewide Services ITS Architecture can be found on the Architecture web page by selecting the "Market Packages by Functional Area" button on the left side menu bar. Under the "Market Package by Functional Area" tab, market packages are grouped by functional areas (e.g. Traffic Management, Maintenance and Construction, and Public Transportation). Each set of customized market packages (based on the functional area) can be viewed by clicking on the Market Package Diagram icon under each area heading. It is important to note that while the market package table on the web page shows all of the market packages from the National ITS Architecture, only those selected for the state are

included in the diagrams. The selected market packages on the web page also are highlighted in the web page table with bold print and are indicated as existing or planned.

7.3. Regional Architecture Information Flows

While it is important to identify the various systems and stakeholders as part of a statewide ITS architecture, a primary purpose of the architecture is to identify the *connectivity* between transportation systems in the state. The interconnect (sausage) diagrams (shown previously in Figure 5) showed the high level relationships of the elements in the region. The market packages from the National ITS Architecture represent services that can be deployed as an integrated capability, and the customized market package diagrams show the information flows between the subsystems and terminators (e.g., elements) that are most important to the operation of the market packages. How these systems interface with each other is an integral part of the overall architecture.

There are 125 different elements identified as part of the New York Statewide Services ITS Architecture. These elements include municipal and state traffic operations centers, transit centers, transit vehicles, public safety dispatch centers, media outlets, and others—essentially all of the existing and planned physical components that contribute to the state's intelligent transportation system. Interfaces have been defined for each element in the architecture. For example, the NYSDOT Regional Traffic Operations Center (RTOC) has planned interfaces with 33 other elements in the region ranging from field equipment to transit centers. Some of the interfaces are far less complex. For example the NYSDOT Oversize and Overweight System has interfaces with only two other elements in the architecture. The New York Statewide Services ITS Architecture defines a total of 338 interfaces from one element to another.

Elements and their interfaces are accessible via the New York Statewide Services ITS Architecture web page by clicking on the "ITS Inventory" button. On the web page, elements are listed alphabetically in the column on the left, and the description of each element appears on the right. By clicking on (selecting) an element, the element detail page comes up where the user can view the element definition, who the stakeholder is, the current status of the element, and the other elements with which the selected element interfaces with. Figure 7 below is an example of an element detail page for the NYSDOT Regional Traffic Operations Center (RTOC). By clicking on (selecting) an interfacing element, more detailed information about the particular interface is pulled up (e.g. architecture flows).

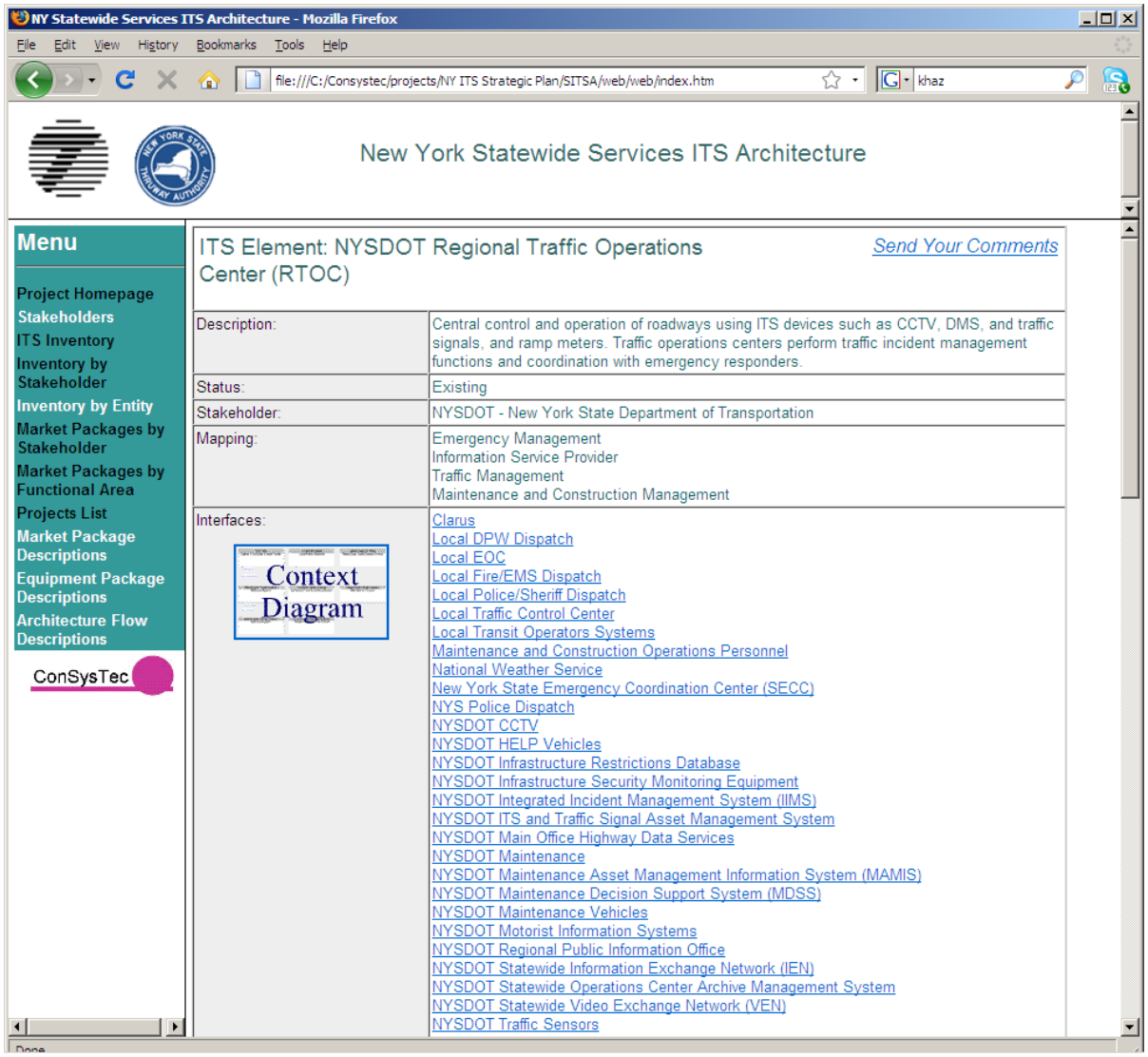


Figure 7. Example of Element Detail showing Interfaces

Architecture flows between elements define specific information that is exchanged by the elements. Each architecture flow has a direction, name and definition. Most of the architecture flows match ones from the National ITS Architecture (the mapping of elements to National ITS Architecture entities allowed the developers to match the architecture flows to the appropriate interfaces). In some cases, new "user defined" flows have been created for interfaces or connections that are not expressed in the National ITS Architecture (NOTE: User defined flows have a "_ud" at the end of the flow name to indicate they are user defined.). These architecture flows define the interface requirements between the various elements in the statewide ITS architecture. Considering a source element, architecture flow, destination element triplet, the New York Statewide Services ITS Architecture defines 1472 of these triplets.

An example of architecture flows between two elements is shown in Figure 8. In this interface, the architecture flows that go between the NYSDOT Regional Traffic Operations

Center (RTOC) and the NYS Police Dispatch are shown. Although both the NYSDOT Regional Traffic Operations Center (RTOC) and the NYS Police Dispatch are existing ITS elements, all of the architecture flows on this interface are shown as planned signifying these two elements, although existing, do not currently share data communications (since the architecture flows are all shown as planned).

Each of the individual element interfaces can be accessed on the New York Statewide Services ITS Architecture web page by following the instructions listed previously. Specifically, the user can click on the "ITS Inventory" button, select the element whose interfaces they are reviewing in order to bring up the element detail page. Once on the element detail page, scrolling down to the "Interfaces" and clicking on (selecting) an interfacing element, more detailed information about the particular interface is pulled up (e.g. architecture flows). Selecting any of the elements from the column on the right will display the set of interfaces to that element similar to the diagram shown in Figure 8. Selecting any of the architecture flows will provide a definition, and any standards associated with that architecture flow are noted.

Figure 8. Example of Architecture Flows Between Elements

8. The Application of the Statewide Services ITS Architecture

So far, the previous sections of the document defined the components that make up the Statewide Services ITS Architecture. However, the most important part of developing an ITS architecture is establishing an approach to using it. An ITS architecture provides guidance for planning ITS projects within a region or, in this case, the state. Planning processes are used to identify projects whose implementation will respond to state needs. These projects are placed in programming documents such as a Statewide Transportation Improvement Program (STIP) in order to secure funding for the projects. Once funded, the projects are implemented. The Statewide Services ITS Architecture supports all three of these major steps – planning, programming, and implementation.

A discussion on how the ITS Architecture can be incorporated into the transportation planning/ programming process can be found in Chapter 4, The Role of Regional ITS Architecture in Project Programming, of the New York State ITS Standards Specification Development Guide. This section focuses on the implementation step of the process, specifically how the ITS Architecture can be used in the initial stages of project definition and development.

The ITS Architecture links the objectives to the ITS projects that address them. The ITS Architecture was developed with these objectives in mind through the definition of ITS services or market packages. By defining the ITS Architecture with services that address the goals and objectives, projects can be defined through the planning process using the architecture that addresses these needs through deployment. Projects are the realization of the ITS architecture. This section discusses how projects are derived from the ITS architecture and recommends ITS projects and a sequence for deploying them. Once a project is defined, this section defines how high level functional requirements can be derived from the ITS architecture and how to determine what ITS standards may be applicable in the project. Finally, a discussion on what agreements may be needed between agencies to implement a project is provided.

8.1. Projects

The incorporation of an ITS architecture in an agency's project development planning process will ultimately yield projects that are linked to the ITS architecture. Through the deployment of projects produced from the planning process, the services supported in the ITS architecture will be implemented and made a reality in the transportation system. Project implementation completes the evolution from defining transportation needs to services, to functional descriptions in the ITS architecture, to project identification in the planning process and to project definition and deployment. The overarching goal of the ITS architecture development process is that this evolution takes place with the maximum amount of integration knowledge possible, so as to efficiently and economically implement the ITS systems required to serve the transportation community and users.

Key to this process or evolution is to understand what dependencies or relationships exist between systems and projects so that an order can be identified for deployment. Given the importance of integration of ITS, the dependencies of one system on another or one project on another, it is critical to view the entire transportation system at a high functional level. The ITS architecture provides this view point and makes possible the understanding of the relationships between the ITS systems in the region.

Project sequencing defines the order in which ITS projects should be implemented. A good sequence is based on a combination of transportation planning factors that are used to prioritize projects and the project dependencies that show how successive ITS projects can build on one another. In most cases, the first projects in the project sequence will already be programmed and will simply be extracted from existing transportation plans. Successive projects will then be added to the sequence based on the project dependencies and other planning factors (e.g. stakeholder priorities).

8.1.1. Process For Defining Projects

A two step process was used to define projects for the New York Statewide Services ITS Architecture:

- Review statewide and regional documents including (but not limited to) the regional ITS architectures within the State that were previously developed and the NYSDOT Statewide Transportation Improvement Plan (STIP). A complete list may be found in Table 7.
- Gather Stakeholder feedback through stakeholder meetings and e-mails.

The New York Statewide Services ITS Architecture was created based on the needs for the state over the next 10 years. The ITS architecture identifies which systems operated by agencies in the State of New York should be interfaced to maximize integration opportunities throughout the State. Based on the existing and future needs within the State, the first step of the process was to identify existing or future deployment opportunities throughout the state. In order to better identify these opportunities, statewide planning documents supplied by the stakeholders or located on the agency's websites were reviewed. Table 7 notes the sources (documents, workshops, or other) that were consulted in order to develop the final list of projects.

Table 7. List of Sources to Identify Projects

No.	Source
1	NYSDOT FY2008 - 2011 Statewide Transportation Improvement Program
2	Individual Stakeholder Meetings
3	Generated by the ConSysTec Architecture Development Team

The project documents and other inputs detailed many projects and programs scheduled to be implemented over a period of 1-20 years, with an emphasis on the next 3 – 5 years.

Although it is important for all of these documents to identify the ITS needs and priorities for specific stakeholders, ITS projects must be included in the Statewide TIP or in a regional TIP to receive most types of federal funding. The Statewide TIP (and the regional TIPs) provides a mechanism for locally elected officials and NYSDOT staff to review the region's capital programming. It represents a consensus among major transportation interests in the region as to what improvements should have priority for available funds.

Stakeholders then were asked to identify additional projects that did not appear on the STIP or TIPs, but were important in the development and integration of ITS throughout the state. In many cases projects were identified (or created) that were not covered in the STIP or TIPs. In addition, various "general" projects were identified and documented.

The second step in the process (after identifying which projects were ITS related) was to obtain stakeholder feedback on the proposed ITS projects and their prioritization. Input from stakeholders was used and later refined to establish which projects were allocated to the short term (0-5 years), medium term (5-10 years), and long term (over 10 years). Obtaining stakeholder feedback was necessary for the following reasons:

- Ensure the ITS Project was consistent with stakeholder needs.
- Establish an estimated timeline or priority for ITS Project deployment and denoting a general order for project implementation.
- Understand the relationship and traceability between ITS projects and the Statewide Services ITS Architecture (through customized market package prioritization).

Projects listed as part of the STIP process, or by any regional TIP, were identified as short term projects based on the implied relatively short timeframe of the related STIP (2008 to 2011) or TIP (varies).

A majority of this process was accomplished through the stakeholder meetings and discussions. From these meetings, a draft list of projects was created and input from the stakeholders was incorporated into the project list. Information about these ITS projects were provided by the stakeholders, when available. Discussions with stakeholders were held in an effort to fully understand and identify the projects and the project priorities for the stakeholders.

The ITS projects and their description resulting from the workshop, various stakeholder inputs after the workshop and through offline discussions, and the project sequencing analysis are provided in Table 8. The information included for each project is:

- **Project.** The name of the proposed project.
- **Category.** What area of ITS the projects relate to (e.g., advanced traffic management systems- ATMS)
- **Lead Agency.** The primary agency or stakeholder responsible for the initiation, implementation, and maintenance of the ITS project and its components

- **Description.** The description of the project or services to be provided.
- **Market Packages.** Maps the proposed ITS project to a transportation service (customized market package) identified in the New York Statewide Services ITS Architecture, which reflects traceability from ITS project to the Statewide ITS Architecture. It is important to note that if there are one or more customized market packages listed in this column then it is included as part of the Statewide ITS Architecture.

Table 8. Existing Projects

Project ID	Project	Category	Lead Agency	Project Description	Market Packages
1	New York State 5-1-1 Traveler Information	ATIS	NYSDOT	Traveler information system, including web site and interactive voice response (IVR), for traffic, transit, roadway, and weather information providing New York State travelers with up-to-date information on road conditions, traffic, construction, transit itinerary planning and other activity affecting transportation managed by NYSDOT.	ATMS01-3, ATMS01-1, ATMS01-2, ATMS02-1, ATMS06-1, ATIS01-3, APTS02-2, APTS04-2, APTS08-2, ATIS01-1, ATIS01-2, MC04-2, MC06-2, EM10-1
2	NYSDOT Statewide Information Exchange Network (IEN)	ATMS	NYSDOT	A network and statewide central system to facilitate information exchange between Regional TOCs, the STICC, and other New York State agencies.	ATMS01-3, ATMS06-4, ATMS08-7, MC04-3, MC10-2, ATMS01-1, ATMS02-1, ATMS06-1, ATMS06-3, ATMS07-1, ATMS08-1, ATMS08-3, ATMS08-4, ATIS01-1, ATIS01-2, MC04-1, MC04-2, MC06-2, MC06-3, MC07-1, MC07-2, MC10-1, EM01-1, EM04-1, EM04-2, EM05-1, EM05-2, EM06-1, EM06-2, EM06-3, EM06-4, EM07-1, EM07-2, EM07-3, EM07-4, EM08-2, EM08-4, EM08-5, EM08-6, EM09-2, EM09-3, EM09-4, EM10-1, EM10-2
3	NYSDOT Statewide Video Exchange Network (VEN)	ATMS	NYSDOT	A network and statewide central system to facilitate video exchange between Regional TOCs, the STICC, and other New York State agencies.	ATMS01-2, ATMS01-3, ATMS07-3

Project ID	Project	Category	Lead Agency	Project Description	Market Packages
4	NYSDOT Statewide Transportation Information Coordination Center (STICC)	ATMS	NYSDOT	The STICC provides a single point of collection of statewide or regional information for regional and statewide emergency transportation operations. The STICC coordinates NYSDOT response with the SEMO.	ATMS08-7, EM09-4, ATMS01-1, ATMS01-2, ATMS06-3, ATMS07-1, ATMS07-3, ATMS08-1, ATMS08-2, ATMS08-3, MC03-3, MC04-2, MC06-2, EM01-1, EM04-2, EM05-2, EM06-4, EM07-4, EM08-3, EM08-6, EM09-1, EM10-1, MC10-1
5	NYSDOT Streetwise	ATMS	NYSDOT	NYSDOT Regional Streetwise Servers provide central closed loop traffic signal control. The Regional Streetwise server includes center-based traffic signal control servers and network that supports this service.	ATMS03-2, ATMS13-1, EM02-3
6	NYSDOT Integrated Incident Management System (IIMS)	EM	NYSDOT	The Integrated Incident Management System (IIMS) provides an interface between emergency and maintenance vehicles and centers involved in incident management, for example, SEMO, STICC, RTOCs, Public Safety, and Maintenance centers.	ATMS08-9, ATMS08-3, ATMS08-4, MC07-2, EM04-2, EM06-5, EM07-5, EM08-7, EM09-5
7	Transit Service Information Portal (TSIP)	APTS	NYSDOT	The Transit Service Information Portal (TSIP) is a New York statewide information exchange system and archive for transit schedule, schedule adherence, ridership, and fare information.	APTS01-1, APTS01-2, APTS02-1, APTS02-2, APTS04-2, APTS08-1, APTS08-2, APTS10-1, APTS10-2, ATIS01-2, AD2-2
8	Regional Bus Rapid Transit (BRT)	APTS	NYSDOT	The Regional BRT represents a template for operations and maintenance of BRT systems statewide. The initial implementation will be the Tappan Zee BRT.	APTS01-1, APTS02-1, APTS02-2, APTS04-1, APTS05-1, APTS06-1, APTS07-1, APTS08-1, APTS08-2, APTS09-1, APTS09-2, APTS10-1, ATIS01-2, AD2-2

Project ID	Project	Category	Lead Agency	Project Description	Market Packages
9	One Stop Credentialing and Registration (OSCAR)	CVO	NYSDOT	CVO Credentialing, WIM Inspection, Real-time Information to Inspectors. This initiative integrates credentialing, commercial vehicle operational data (counts, weights, dimensions), and CVO inspector information. One Stop Credentialing and Registration (OSCAR) is a multi-agency web-based initiative that allows motor carriers to have a single point of contact in order to apply for their operating credentials. Previously, carriers were required to contact multiple NYS agencies in order to obtain all of the credentials necessary for traveling through NYS. The credentials available through OSCAR include: • International Registration Plan (IRP) • International Fuel tax Agreement (IFTA) • Highway Use Tax (HUT) • Single State Registration System (SSRS)	CVO03-1, CVO03-2, CVO04-1, CVO06-1, CVO07-1, CVO07-2
10	NYSDOT ITS and Traffic Signal Asset Management System	MCO	NYSDOT	NYSDOT system manages the attributes of ITS assets and makes information available to RTOCs and Maintenance.	MC07-1
11	Maintenance Asset Management Information System (MAMIS)	MCO	NYSDOT	Roadway asset and maintenance work order management system. Information is available to RTOCs.	MC06-1, MC07-1, EM08-8
12	NYSDOT Road Weather Information System (RWIS) + Maintenance Decision Support System (MDSS)	MCO	NYSDOT	The Maintenance Decision Support System (MDSS) is a decision support tool that integrates relevant road weather forecasts, coded maintenance rules of practice, and maintenance resource data to provide winter maintenance managers with recommended road treatment strategies.	MC03-1, MC03-2, MC03-3, MC04-1, MC04-2, MC06-1
13	NYSTA Electronic Toll Administration	ETC	NYSTA	The project describes New York statewide electronic toll administration functions.	ATMS10-1

Project ID	Project	Category	Lead Agency	Project Description	Market Packages
14	NYSDOT Regional TOCs and NYSTA TSOC	ATMS	NYSDOT, NYSTA	This project represents a comprehensive template for traffic operations center interfaces with main office and other statewide systems, e.g., IEN.	AD1-2, AD1-5, AD2-1, APTS02-1, APTS09-1, ATIS01-1, ATIS01-2, ATMS01-1, ATMS01-2, ATMS03-1, ATMS06-1, ATMS06-2, ATMS07-1, ATMS07-2, ATMS07-3, ATMS08-1, ATMS08-2, ATMS08-3, ATMS08-5, ATMS08-9, ATMS13-1, EM01-1, EM02-3, EM04-1, EM04-2, EM05-1, EM05-2, EM06-4, EM06-5, EM07-4, EM07-5, EM08-6, EM08-7, EM08-8, EM09-4, EM09-5, EM10-1, MC03-1, MC04-1, MC06-1, MC06-2, MC07-1, MC07-2, MC10-1

8.1.2. Gap Analysis

After the initial project list was completed, and input from the stakeholders was compiled, a comparative analysis was conducted to see if there were any "gaps" in the identification of projects. For the purposes of this section, a "gap" refers to a situation where a particular stakeholder has defined the priority of a market package to be high but no ITS project exists in the previous table that covers this service for this stakeholder.

This analysis was done by first taking a look at the projects that are currently being funded or that are in some stage of the planning process (usually in the STIP or TIP). These projects consisted of the ones defined in the project sequencing section of this document. Then the list of projects and their descriptions were compared to information received from stakeholders as to what the state's intelligent transportation priorities are. Understanding the stakeholder or agency role within the state and the ITS roles of each stakeholder or agency as it relates to the specific market package, were essential in determining the type of project that is suggested in Table 9.

The main purpose of this analysis was to make sure all of the high priority services are covered by some "project". The indication of "high priority" suggests that these market packages/projects are to be implemented in the short term – 1 to 5 years. Not having an ITS project defined that is related to a high priority market package could mean the window of opportunity for funding, the final goal of the planning process, may be missed. In order to receive funding, or to at least be able to apply for funding, these suggested projects, or ones similar to these projects, as they relate specifically to "high priority" market packages, must be defined or identified at this time.

The results of the gap analysis, and suggested project definitions, are provided in Table 9. The information included for each project includes:

- **ID.** The ID number associated with this project.
- **Project Name.** The name of the proposed ITS project.
- **Sample Project Description.** The detailed description of the project or services to be provided.
- **Lead Agency.** The primary agency or stakeholder responsible for the initiation, implementation, and maintenance of the ITS project and its components.
- **Market Packages.** Maps the proposed ITS project to a transportation service identified in the Statewide Services ITS Architecture and reflects traceability.
- **Comments.** Indicates whether this project would likely be implemented at a regional level or a statewide level.

Table 9. Projects Suggested by Gap Analysis

ID	Project Name	Sample Project Description	Lead Agency	Market Packages	Comments
1	NYSDOT Traffic Signals	Provide communications system to allow control and monitoring of regional NYSDOT traffic signals from the RTOCs.	NYSDOT	ATMS03-1	Regional projects.
2	NYSTA ITS Project	Installation of CCTV, VMS and TRANSMIT in other divisions.	NYSTA	ATMS02-1, ATMS04-1	Regional projects.
3	NYSDOT Motorist Information System	Installation of VMS and other Motorist Information Systems.	NYSDOT	ATMS06-1	Regional projects.
4	NYSDOT Information Sharing Network	Provide for information network to share road network, traffic and incident information between RTOCs and local agencies, such as local traffic agencies, transit providers, and public safety providers.	NYSDOT	ATMS06-2, ATMS07-2, ATMS08-2, MC04-1, MC06-1, MC06-2, MC10-1	Regional projects.
5	NYSTA Information Sharing Network	Provide for information network to share road network, traffic and incident information between the TSOC and local agencies, such as local traffic agencies, transit providers, and public safety providers.	NYSTA	ATMS08-5	Regional projects.
6	NYSTA Video Sharing Network	Provide for network to share video images between the TSOC and local agencies, such as local traffic agencies, transit providers, and public safety providers.	NYSTA	ATMS07-3	Regional projects.
7	NYSDOT Infrastructure Protection System	Install the devices (CCTV cameras, intrusion detectors, sensors, etc.) and communications link to monitor and secure NYSDOT infrastructure, such as bridges.	NYSDOT	EM05-1	Statewide project.
8	MDTs for Emergency Vehicles	Provide MDTs for emergency vehicles, including CAD, AVL, and reporting capabilities	Various	EM02	This suggested project could apply for all emergency agencies
9	NYSTA Maintenance Vehicle Tracking	Intended to be a deployment of AVL, vehicle sensors and other ITS devices on-board NYSTA maintenance vehicles to alert the dispatch function of vehicle location and road conditions, to alert equipment repair facilities of maintenance status, and to request motorist aid.	NYSTA	MC01-1, MC02-2, MC04-3, MC07-3, MC08-1	Statewide project.
10	NYSTA Weather Information Upgrades	Establish communications infrastructure to automate the collection of and distribution of road weather information internally and to other agencies.	NYSTA	MC04-3, MC06-4	Statewide project.

ID	Project Name	Sample Project Description	Lead Agency	Market Packages	Comments
11	NYSDOT Archive Data Warehouse	Provide the statewide connections from across the State of New York to the statewide data warehouses, including the data warehouse for accident information, DMV systems, violation databases, infrastructure databases, etc...).	NYSDOT	AD1, AD2, AD3	Statewide project.
12	NYSDOT Transit Data Archive	Regional Transit archive database for ridership information, schedule adherence, maintenance of vehicles, etc.	NYSDOT	AD2-2	Statewide project.
13	MPO Traffic Data Warehouses	Provide for the systems that support MPO data warehouses.	MPO	AD3-1	Regional projects.

8.1.3. How to Use the Projects

The recommended ITS project sequencing (Table 8 above) should be used as an input for the Statewide TIP of the state, or a TIP for an MPO participating in the project. The planning process allocates ITS projects funding in coordination with other transportation projects.

As displayed in Table 8 the key projects defined are all of the short-term timeframes. Note the projects listed in Table 9 represent those that go beyond the short-term timeframe. As these sequenced projects go through the planning process, they would be transitioned in the STIP, TIPs and/or Capital Plan/Budget. Since the table defines a short-term project as being deployed in 0-5 years and the STIP, TIPs and Capital Plan/Budget defines a project as being deployed in 1-3 years, stakeholders are required to further examine the short-term projects and determine which should be represented in each planning document.

The key question stakeholders may ask is, "Now that we have a list of key ITS projects, how do I use the?" To answer this question, stakeholders should focus on the following concepts:

- **Why is this Important?** Stakeholders should remember the reasons for going through the process of creating sequenced ITS projects. Ultimately they want to deploy projects that support the needs expressed in their ITS Architecture.
- **Who's in Charge?** Stakeholders should consider identifying a person or group that is responsible for managing how ITS Projects get deployed. This person or group would be aware of the big picture by familiarizing themselves with all of the planned activities and ensure integration opportunities are maximized in project deployments.
- **Systematic Process.** Stakeholders should ensure that projects are managed in a systematic manner.
- **Funding Allocation.** Stakeholders should ensure funding is allocated appropriately to support projects that have dependencies or synergies to be utilized. This is important if there are future projects that will depend on a short term or current project. The short term or current project must be funded appropriately to support the accommodation of known future project features or interfaces, thus avoiding redesign for future project accommodation.
- **Project List Management.** Stakeholders should prioritize projects within their common timeframes based on the aforementioned concepts. It is important for short-term projects to be reviewed by stakeholders prior to being transitioned into the STIP or TIPs. A person or group designated as a list manager should be responsible for removing projects from the Statewide list once implemented. Although project lists may reflect a single project, projects are typically broken into multiple phases and are implemented in an incremental manner. For example, many ITS projects are partially deployed as part of larger construction projects. A project's scope might

involve interfacing with ten agencies and funding constraints may require agencies to be interconnected one at a time. In this situation, a project might by implemented in five years, if two agencies are being interconnected per year. If a project is partially implemented due to unforeseen circumstances (e.g. limited funding received), then the list manager should update the project to reflect the remaining components that need to be implemented. The key point for project list management is projects will be implemented in an incremental manner, therefore the list manager should keep accurate records of the incremental process and meet with stakeholders to determine how funding should be reallocated.

- **Desired Outcome.** Stakeholders should remember the desired outcome which is to deploy projects to maximize integration opportunities throughout the state. Therefore, when projects are transitioned into the project development phase, stakeholders should always be aware of other project deployment activities (even if the other activities require a project to be deployed at a different time). This mindset will require stakeholders to be flexible in developing interfaces what will allow for future expansion based on overall regional needs.

An important issue to remember is when a project it to be implemented, stakeholders should convene to determine the specific details for deploying a project (e.g. how many phases will be required for this project and which components of market packages are allocated to a particular phase?). Tables 8 and 9 should be used as a guide to which agencies/systems and interfaces should be considered during the discussion and design phase for project implementation.

8.1.4. Recommendations

The identification of ITS projects, along with their priority and other information, is a key output of the ITS Architecture and should be updated periodically as part of the overall Statewide Services ITS Architecture maintenance updates. Consideration should be given to creating a table of completed projects at the next update so that the progression of projects from planning through implementation can be identified.

In addition, the Gap Analysis should be updated based upon the updates to the project list so that priorities are properly reflected in the planned projects and any additional gaps due to changing priorities are also identified.

8.2. Functional Requirements

Functional requirements are a description of the functions or activities that are currently performed by the ITS elements or that are planned to be performed in the future. For the Statewide Services ITS Architecture, these functions have been developed by using the functional assignments underlying the National ITS Architecture and the mapping from transportation services to the elements.

In the National ITS Architecture, a Market Package is defined by subsystems, equipment packages, and architecture flows, which operate together to perform a particular transportation service (see Section 3 above). Equipment Packages represent pieces of a subsystem that perform a single function. (NOTE: there are no equipment packages defined for the Terminators of the National ITS Architecture since they represent systems on the boundary of the architecture and, therefore, do not have functional descriptions within the architecture.) For example, the Surface Street Control (ATMS03) market package is composed of the three Traffic Management Subsystem equipment packages, Collect Traffic Surveillance, TMC Signal Control and Traffic Maintenance, and three Roadway Subsystem equipment packages, Roadway Basic Surveillance, Roadway Signal Control and Roadway Equipment Coordination. The definitions of these six equipment packages, copied from version 6.0 of the National ITS Architecture, are:

- Collect Traffic Surveillance -- This equipment package remotely monitors and controls traffic sensors and surveillance (e.g., CCTV) equipment, and collects, processes and stores the collected traffic data. Current traffic information and other real-time transportation information is also collected from other centers. The collected information is provided to traffic operations personnel and made available to other centers.
- TMC Signal Control – This equipment package provides the capability for traffic managers to monitor and manage the traffic flow at signalized intersections. This capability includes analyzing and reducing the collected data from traffic surveillance equipment and developing and implementing control plans for signalized intersections. Control plans may be developed and implemented that coordinate signals at many intersections under the domain of a single traffic management subsystem and are responsive to traffic conditions and adapt to support incidents, preemption and priority requests, pedestrian crossing calls, etc.
- Traffic Maintenance – This equipment package monitors the operational status of field equipment and detects failures. It presents field equipment status to Traffic Operations Personnel and reports failures to the Maintenance and Construction Management Subsystem. The equipment package tracks the repair or replacement of the failed equipment. The entire range of ITS field equipment may be monitored by this equipment package including sensors (traffic, infrastructure, environmental, security, speed, etc.) and devices (highway advisory radio, dynamic message signs, automated roadway treatment systems, barrier and safeguard systems, cameras, traffic signals and override equipment, ramp meters, beacons, security surveillance equipment, etc.).
- Roadway Basic Surveillance -- This equipment package monitors traffic conditions using fixed equipment such as loop detectors and CCTV cameras.
- Roadway Signal Controls – This equipment package includes the field elements that monitor and control signalized intersections. It includes the traffic signal controllers,

signal heads, detectors, and other ancillary equipment that supports traffic signal control. It also includes field masters, and equipment that supports communications with a central monitoring and/or control system, as applicable. The communications link supports upload and download of signal timings and other parameters and reporting of current intersection status. This equipment package represents the field equipment used in all levels of traffic signal control from basic actuated systems that operate on fixed timing plans through adaptive systems. It also supports all signalized intersection configurations, including those that accommodate pedestrians.

- Roadway Equipment Coordination – This equipment package supports direct communications between field equipment. It includes field elements that control and send data to other field elements. This includes coordination between remote sensors and field devices (e.g., Dynamic Message Signs) and coordination between the field devices themselves (e.g., direct coordination between traffic controllers that are controlling adjacent intersections.).

The approach used in the Statewide Services ITS Architecture was to begin with the mapping of equipment packages to elements (based on the mapping of elements to market packages within the architecture) as an initial definition of the functions being performed by each element. Then this mapping is tailored, or customized, in the Turbo Architecture tool to provide a more accurate picture of the functions performed by each element. The Turbo Architecture tool also contains a detailed mapping of functional requirements (written as "shall" statements) to each equipment package. This mapping to functional requirements has been selected so that detailed functional requirements for each element are available for use in project definition.

The mapping of elements to the basic functions (equipment packages) is provided on the hyperlinked web site version of the architecture. The detail page for each element (which is accessed by clicking on the hyperlinked element name within the "ITS Inventory", "Inventory by Stakeholder" or "Inventory by Entity" tabs) has a list of the equipment packages assigned to the element. Sometimes the user may need to scroll down to see the equipment packages.

For example, the 511NY.ORG element has the following equipment packages assigned to it:

- Basic Information Broadcast
- Infrastructure Provided Trip Planning
- ISP Emergency Traveler Information
- ISP Probe Information Collection
- ISP Traveler Data Collection
- Traveler Telephone Information

This represents a first level of detail that can be obtained in the hyperlinked web site in connection with functionality. The additional level of detail, or detailed functional requirements, can be accessed by clicking on any of the equipment packages associated with the element you have under review. Using the above example, viewing the 5112NY.ORG element detail page the user can see the equipment packages listed above. If the user were to select one of the equipment packages (all listed as hyperlinks), the equipment package detail page would appear. Along with a full description of what this equipment package contains, as well as a listing of all element that are associated with this equipment package, it lists the detailed functional requirements that may be applicable for the Statewide Services ITS Architecture.

8.3. Standards

The following subsections provide a short discussion of ITS standards and their relation to the Statewide Services ITS Architecture. Separate documents on the topic of ITS Standards were developed under this same contract, but under separate subtasks. These documents include:

- Review of National Standards and Testing Programs (Task 2.A.1)
- Best Practices for ITS Standards Specification Develop (Task 2.A.2)
- Key ITS Standards (Task 2.A.3)
- New York State ITS Standards Specification Development Guide (Task 2.A.4)

Links to each of these documents also can be found on the project website, under Project Documents.

8.3.1. Discussion of Key Standards for the State

ITS standards establish a common way in which devices connect and communicate with one another. This allows transportation agencies to implement systems that cost-effectively exchange pertinent data and accommodate equipment replacement, system upgrades, and system expansion. Standards benefit the traveling public by providing products that will function consistently and reliably throughout the region. ITS standards contribute to a safer and more efficient transportation system, facilitate regional interoperability, and promote an innovative and competitive market for transportation products and services.

The National ITS Architecture is the reference framework that spans all of ITS standards activities and provides a means of detecting gaps, overlaps, and inconsistencies between the standards. The National ITS Architecture provides a starting point for standards development activities by identifying the applicable architecture flows and data flows to be standardized in the National ITS Architecture and the way in which the information is exchanged across those interfaces. Figure 9 shows those interfaces in the National ITS Architecture that are addressed by one ore more family of ITS Standards.

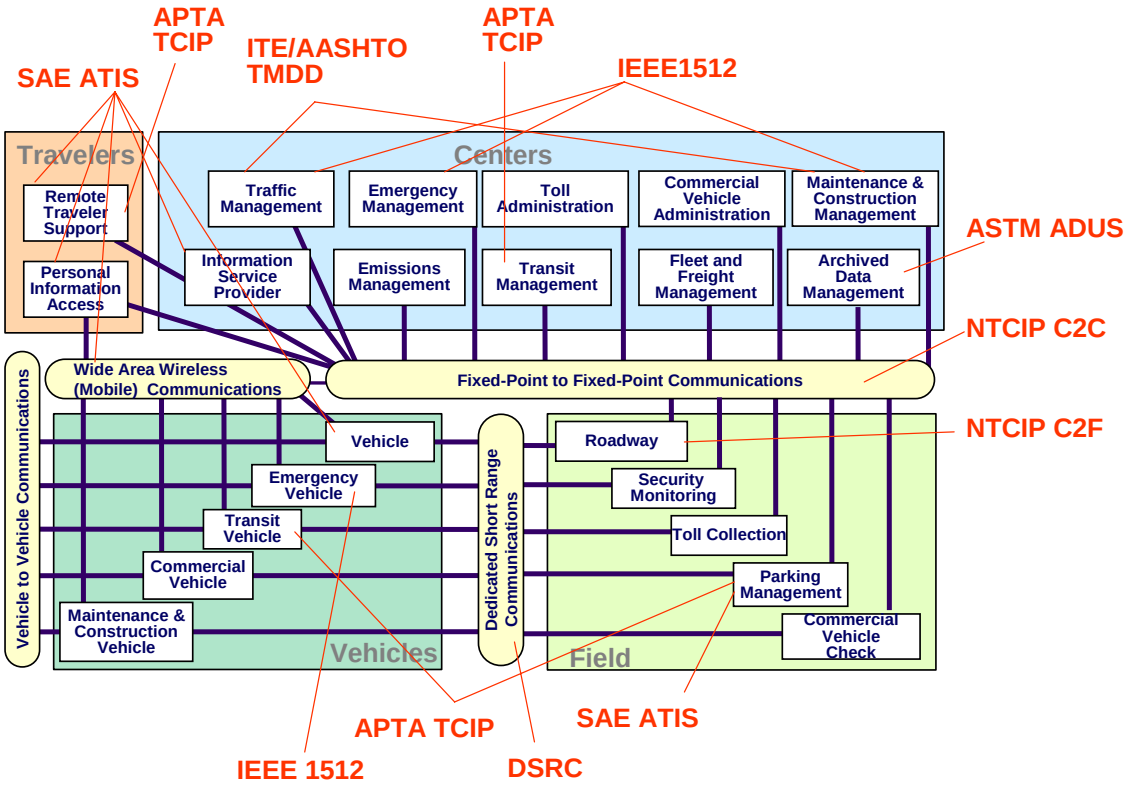


Figure 9. Relationship between the National ITS Architecture and ITS Standards

The use of ITS standards is very important to project development in the New York. Table 10 identifies the ITS standards that are potentially applicable to the state, as determined by the Statewide Services ITS Architecture. This table was created by taking the standards information available in the Turbo Architecture database (which identifies standards applicable to each architecture flow) and taking the total set of standards that result from all the architecture flows selected in the Statewide Services ITS Architecture.

The table provides the status of the standards effort as of April 2007 (the most recent update of the information). The table lists the abbreviation of Standards Development Organization (SDO) in the first column, the name of the standard in the second column and the standard identification number in the third column. Regular updates of SDO activities will help ensure that the latest standards are utilized. The SDOs involved in the development of ITS standards who are listed in the table include:

- American Association of State Highway and Transportation Officials (AASHTO)
- American National Standards Institute (ANSI)
- American Public Transportation Association (APTA)
- American Society for Testing and Materials (ASTM)
- Institute of Electrical and Electronics Engineers (IEEE)

- Institute of Transportation Engineers (ITE)
- National Equipment Manufacturers Association (NEMA)
- Society of Automotive Engineers (SAE)

Table 10. Applicable ITS Standards

SDO	Standard Title	Standard Doc ID
AASHTO/ITE	Traffic Management Data Dictionary and Message Sets for External TMC Communication (TMDD and MS/ETMCC)	ITE TMDD 2.1
AASHTO/ITE/NEMA	Octet Encoding Rules (OER) Base Protocol	NTCIP 1102
AASHTO/ITE/NEMA	Transportation Management Protocols (TMP)	NTCIP 1103
AASHTO/ITE/NEMA	Center-to-Center Naming Convention Specification	NTCIP 1104
AASHTO/ITE/NEMA	Global Object Definitions	NTCIP 1201
AASHTO/ITE/NEMA	Object Definitions for Actuated Traffic Signal Controller (ASC) Units	NTCIP 1202
AASHTO/ITE/NEMA	Object Definitions for Dynamic Message Signs (DMS)	NTCIP 1203
AASHTO/ITE/NEMA	Object Definitions for Environmental Sensor Stations (ESS)	NTCIP 1204
AASHTO/ITE/NEMA	Object Definitions for Closed Circuit Television (CCTV) Camera Control	NTCIP 1205
AASHTO/ITE/NEMA	Object Definitions for Data Collection and Monitoring (DCM) Devices	NTCIP 1206
AASHTO/ITE/NEMA	Object Definitions for Closed Circuit Television (CCTV) Switching	NTCIP 1208
AASHTO/ITE/NEMA	Data Element Definitions for Transportation Sensor Systems (TSS)	NTCIP 1209
AASHTO/ITE/NEMA	Field Management Stations (FMS) - Part 1: Object Definitions for Signal System Masters	NTCIP 1210
AASHTO/ITE/NEMA	Object Definitions for Signal Control and Prioritization (SCP)	NTCIP 1211
AASHTO/ITE/NEMA	Point to Multi-Point Protocol Using RS-232 Subnetwork Profile	NTCIP 2101
AASHTO/ITE/NEMA	Point to Multi-Point Protocol Using FSK Modem Subnetwork Profile	NTCIP 2102
AASHTO/ITE/NEMA	Point-to-Point Protocol Over RS-232 Subnetwork Profile	NTCIP 2103
AASHTO/ITE/NEMA	Ethernet Subnetwork Profile	NTCIP 2104
AASHTO/ITE/NEMA	Transportation Transport Profile	NTCIP 2201
AASHTO/ITE/NEMA	Internet (TCP/IP and UDP/IP) Transport Profile	NTCIP 2202
AASHTO/ITE/NEMA	Simple Transportation Management Framework (STMF) Application Profile	NTCIP 2301
AASHTO/ITE/NEMA	Trivial File Transfer Protocol (TFTP) Application Profile	NTCIP 2302
AASHTO/ITE/NEMA	File Transfer Protocol (FTP) Application Profile	NTCIP 2303
AASHTO/ITE/NEMA	Application Profile for DATEX-ASN (AP-DATEX)	NTCIP 2304
AASHTO/ITE/NEMA	Application Profile for XML Message Encoding and Transport in ITS Center-to-Center Communications (C2C XML)	NTCIP 2306
APTA	Standard for Transit Communications Interface Profiles	APTA TCIP-S-001 3.0.0
ASTM	Standard Specification for Telecommunications and Information Exchange Between Roadside and Vehicle Systems - 5 GHz Band Dedicated Short Range Communications (DSRC) Medium Access Control (MAC) and Physical Layer (PHY) Specifications	ASTM E2213-03

SDO	Standard Title	Standard Doc ID
ASTM	Standard Practice for Metadata to Support Archived Data Management Systems	ASTM E2468-05
ASTM	Standard Specifications for Archiving ITS-Generated Traffic Monitoring Data	ASTM WK7604
IEEE	Standard for Message Sets for Vehicle/Roadside Communications	IEEE 1455-1999
IEEE	Standard for Common Incident Management Message Sets for use by Emergency Management Centers	IEEE 1512 -2006
IEEE	Standard for Traffic Incident Management Message Sets for Use by Emergency Management Centers	IEEE 1512.1-2006
IEEE	Standard for Public Safety Traffic Incident Management Message Sets for Use by Emergency Management Centers	IEEE 1512.2-2004
IEEE	Standard for Hazardous Material Incident Management Message Sets for Use by Emergency Management Centers	IEEE 1512.3-2006
IEEE	Standard for the Interface Between the Rail Subsystem and the Highway Subsystem at a Highway Rail Intersection	IEEE 1570-2002
IEEE	Standard for Wireless Access in Vehicular Environments (WAVE) - Resource Manager	IEEE 1609.1-2006
IEEE	Standard for Wireless Access in Vehicular Environments (WAVE) - Security Services for Applications and Management Messages	IEEE 1609.2-2006
IEEE	Standard for Wireless Access in Vehicular Environments (WAVE) - Multi-Channel Operation	IEEE 1609.4-2006
IEEE	Standard for Common Traffic Incident Management Message Sets for Use in Entities External to Centers	IEEE P1512.4
IEEE	Standard for Wireless Access in Vehicular Environments (WAVE) - Networking Services	IEEE P1609.3
IEEE	Standard for Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part II: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications	IEEE P802.11p
SAE	Location Referencing Message Specification (LRMS)	SAE J2266
SAE	On-Board Land Vehicle Mayday Reporting Interface	SAE J2313
SAE	Message Set for Advanced Traveler Information System (ATIS)	SAE J2354
SAE	Standard for ATIS Message Sets Delivered Over Reduced Bandwidth Media	SAE J2369
SAE	Messages for Handling Strings and Look-Up Tables in ATIS Standards	SAE J2540
SAE	RDS (Radio Data System) Phrase Lists	SAE J2540/1
SAE	ITIS (International Traveler Information Systems) Phrase Lists	SAE J2540/2
SAE	National Names Phrase List	SAE J2540/3
SAE	Dedicated Short Range Communications (DSRC) Message Set Dictionary	SAE J2735

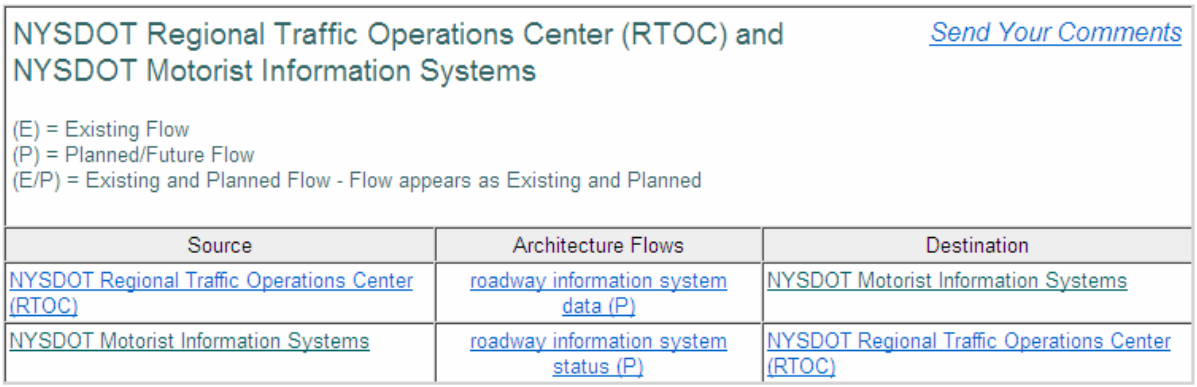
8.3.2. Reference to the Detailed Standards information on the Web Site

The previous section provides a general discussion of ITS standards and identifies those ITS standards that may be applicable in the state based on the Statewide Service ITS

Architecture. However the architecture does contain a far more detailed standards view, one that maps applicable standards to the individual information flows that goes from one element to another. Thus, when writing specifications to deploy the elements and the interfaces that are in depicted in the architecture, the architecture provides a source of information on what ITS Standards may be applicable to those interfaces.

This detailed information is contained in the hyperlinked web site and can be accessed through the links to the architecture flows shown as part of each interface. Each element details page has a set of links that describe the information flowing to and from the element to other elements of the architecture. Selecting any of these interface links brings the user an interface page.

For example, the interface between the NYSDOT Regional Traffic Operations Center (RTOC) and the NYSDOT Motorist Information Systems is shown in Figure 10. There is one architecture information flow going to the NYSDOT Motorist Information Systems element and one coming back from it. Clicking on one of the flows provides information regarding the flow and gives a list of ITS standards that are applicable to the flow. An example, the result of clicking on roadway information system data flow is shown in Figure 11.



NYSDOT Regional Traffic Operations Center (RTOC) and NYSDOT Motorist Information Systems

Send Your Comments

(E) = Existing Flow
(P) = Planned/Future Flow
(E/P) = Existing and Planned Flow - Flow appears as Existing and Planned

Source	Architecture Flows	Destination
NYSDOT Regional Traffic Operations Center (RTOC)	roadway information system data (P)	NYSDOT Motorist Information Systems
NYSDOT Motorist Information Systems	roadway information system status (P)	NYSDOT Regional Traffic Operations Center (RTOC)

Figure 10. Example of Interface Page

Architecture Flow: roadway information system data			Send Your Comments
Description:			
Information used to initialize, configure, and control roadside systems that provide driver information (e.g., dynamic message signs, highway advisory radio, beacon systems). This flow can provide message content and delivery attributes, local message store maintenance requests, control mode commands, status queries, and all other commands and associated parameters that support remote management of these systems.			
Communications Standards:			
NTCIP C2F	AASHTO-17	File Transfer Protocol (FTP) Application Profile	NTCIP 2303
NTCIP C2F	AASHTO-18	Trivial File Transfer Protocol (TFTP) Application Profile	NTCIP 2302
NTCIP C2F	AASHTO-21	Octet Encoding Rules (OER) Base Protocol	NTCIP 1102
NTCIP C2F	AASHTO-28	Ethernet Subnetwork Profile	NTCIP 2104
NTCIP C2F	AASHTO-30	Point-to-Point Protocol Over RS-232 Subnetwork Profile	NTCIP 2103
NTCIP C2F	AASHTO-31	Transportation Transport Profile	NTCIP 2201
NTCIP C2F	AASHTO-38	Transportation Management Protocols (TMP)	NTCIP 1103
NTCIP C2F	AASHTO-47	Point to Multi-Point Protocol Using FSK Modem Subnetwork Profile	NTCIP 2102
NTCIP C2F	NEMA-TS3.p	Point to Multi-Point Protocol Using RS-232 Subnetwork Profile	NTCIP 2101
NTCIP C2F	S-85	Simple Transportation Management Framework (STMF) Application Profile	NTCIP 2301
NTCIP C2F	S-88	Internet (TCP/IP and UDP/IP) Transport Profile	NTCIP 2202
Message Standards:			
NEMA TS3.4	NEMA TS3.4	Global Object Definitions	NTCIP 1201
NEMA-TS3.6	NEMA-TS3.6	Object Definitions for Dynamic Message Signs (DMS)	NTCIP 1203
Data Standards:			
No Data Standards			

Figure 11. Example of Standards Mapping Page

8.3.3. Using ITS Standards in Projects

This section discusses how the list of ITS standards can be used in the development of an ITS project. A project extracted from the ITS architecture can be defined in terms of the transportation services it will provide, the ITS elements that are included in the project, and the interfaces between those ITS elements.

For the Statewide Services ITS Architecture, this may be one or more (or a part of) customized market package diagram(s). Based on the customized market package diagram(s), the relevant information exchanges (architecture flows) between ITS systems to be included in the ITS project can be derived. From the ITS architecture, analyzing these architecture flows will yield a list of ITS standards that may be applicable to the project. Note that ITS projects that are federally funded are required to use applicable ITS standards and interoperability tests that have been officially adopted by U.S. DOT. However, as of the date of this report, no ITS standard or interoperability test has been officially adopted.

Although the Statewide Services ITS Architecture provides a list of possible national standards that may be applicable, the individual projects must determine which standards to use, and how to specify those standards. The interfaces between systems and the ITS standards identified in the ITS architecture should be evaluated by the project specification

writers. By evaluating interfaces rather than individual information flows, the amount of work required is reduced considerably.

Thus, the next step is to perform an analysis to determine what aspects of the standards on the list support the user and functional requirements that have been defined for the ITS project. Rarely will an agency need all the functions and messages that an ITS standard supports, thus the project specifications should detail the required data objects (center-to-field) or messages (center-to-center) for a project.

Conversely, there is also a possibility that an ITS standard does not support all the user and functional requirements that have been defined. Many of the ITS standards are still in development and only a handful of ITS standards can be considered mature at this time. By mature, it is meant that the standard has be deployed and tested by numerous agencies, and has industry-wide support. Although the standards development organizations attempt to support the most common user requirements and needs, it cannot always do so, or may satisfy those requirements and needs in a different manner. In this case, agency-specific objects or messages may be needed, and these requirements should be included in the specifications.

Based on the analysis, the stakeholders should agree what standards, if any, should be adopted for each interface. It may also be necessary to consider any regional standards that have been adopted in use in the region or state. Common examples of regional standards in New York State include the E-ZPass IAG data formats and interfaces or the TRANSMIT data interfaces. The procuring agency (or agencies) would then finalize the relevant details for implementing the standard, taking into account specific technology and communications choices, to achieve interoperability.

8.4. Agreements

The identification of institutional agreements required is crucial to the development of a consensus architecture. The following pages document the agreements associated with the Statewide Services ITS Architecture.

8.4.1. Types of Agreements

There are several types of arrangements associated with the interfaces included when deploying ITS projects within the state. This section gives a brief introduction to agreements.

Data exchanges between systems require agreements on the transmission protocol and data formats to ensure compatibility. Coordinating field device operations owned by different agencies requires defined procedures for submitting message requests and rules governing when such requests can be honored. Such coordination can be done with informal arrangements such as a Memorandum of Understanding (MOU). Sharing control of field devices operated by different agencies, on the other hand, involves more liability issues, which requires more formal agreements. Coordinated incident response may also

require formal agreements, but also requires group training of personnel from various agencies. While all interfaces involve agreements for data compatibility, agreements for procedure and operation as well as training can also be critical elements to optimizing the benefits of the architecture.

Table 11 identifies types of potential agreements that could be used by agencies in the state. It is recognized, however, that a specific agreement mechanism used among stakeholders may be different between them (for example the nature and limitations associated with a MOU might vary between stakeholders). This should be taken into consideration when identifying and pursuing the proper agreement mechanism.

Table 11. Types of Agreements

Type of Agreement	Description
Handshake Agreement	Early agreement between one or more partners
	Not recommended for long term operations.
Memorandum of Understanding	Initial agreement used to provide minimal detail and usually demonstrating a general consensus.
	Used to expand a more detailed agreement like an Interagency Agreement which may be broad in scope but contains all of the standard contract clauses required by a specific agency.
	May serve as a means to modify a much broader Master Funding Agreement, allowing the master agreement to cover various ITS projects throughout the region and the MOUs to specify the scope and differences between the projects.
Interagency Agreement	Between public agencies (e.g., transit authorities, cities, counties, etc.) for operations, services or funding
	Documents responsibility, functions and liability, at a minimum.
Intergovernmental Agreement	Between governmental agencies (e.g., Agreements between universities and State DOT, MPOs and State DOT, etc.)
Operational Agreement	Between any agency involved in funding, operating, maintaining or using the right-of-way of another public or private agency.
	Identifies respective responsibilities for all activities associated with shared systems being operated and/or maintained.
Funding Agreement	Documents the funding arrangements for ITS projects (and other projects)
	Includes at a minimum standard funding clauses, detailed scope, services to be performed, detailed project budgets, etc.
Master Agreements	Standard contract and/or legal verbiage for a specific agency and serving as a master agreement by which all business is done. These agreements can be found in the legal department of many public agencies.
	Allows states, cities, transit agencies, and other public agencies that do business with the same agencies over and over (e.g., cities and counties) to have one Master Agreement that uses smaller agreements (e.g., MOUs, Scope-of-Work and Budget Modifications, Funding Agreements, Project Agreements, etc.) to modify or expand the boundaries of the larger agreement to include more specific language.

In addition to the agreements noted above, one element that must be considered is data ownership. The type of agreement used to address this issue may vary depending upon agencies involved.

8.4.2. Existing Agreements

The identification of institutional agreements, along with if these agreements exist or need to be formulated, is a key output of the Statewide Services ITS Architecture, and should be updated periodically as part of the overall maintenance plan. During the initial review of the New York Statewide Services ITS Architecture, only one existing agreement was definitively identified, an External Network Connection Agreement between NYSDOT and NYSTA. This agreement enabled the sharing of data between the two agencies, such as for the New York State 5-1-1 Traveler Information System.

However, it is expected that a variety of other agreements currently exist in the state, although most likely at a regional level. Table 12 below identifies some generic agreements that probably exist between the agencies. The specific agreements that exist within a region should be indicated in the regional ITS architecture.

Table 12. Generic Statewide Agreements

Agencies		Type of Agreement	Reason
NYSDOT	Cities	Master Agreement	NYSDOT purchases traffic signal systems, operates them, and the cities take over their complete maintenance.
NYSDOT	Cities, Municipalities and Towns	Master Agreement	NYSDOT maintains the roadway that are owned and operated by NYSDOT but that run through any and all cities, municipalities, and towns.
NYSDOT	Municipalities	Operational Agreement	Operation of NYSDOT signals (based on geographic location).
NYSDOT	MPOs	Intergovernmental Agreement	Data sharing agreement.
NYSDOT	Local Transit Operators	Master Agreement	NYSDOT serves as the designated recipient of Federal Transit Administration (FTA) funds and provides or reimburses those funds to local transit operations. NYSDOT collects transit data from transit operators.
NYS Police	Local Public Safety Agencies	Master Agreement	Mutual aid agreement (including data sharing).
Local Public Safety Agencies	Municipalities	Operational Agreement	Consolidated dispatch agreements.

8.4.3. Potential Agreements

In addition to these existing agreements, the Statewide Services ITS Architecture was used to determine a set of agreements that may need to be put into place in order to implement the interconnections described by the architecture. For each customized market package

developed in the architecture, potential institutional agreements can be identified. Agreements are identified on the basis of information being shared across institutional boundaries. Instances that involve the sharing of information wholly within one institution do not require an agreement.

For example, Figure 12 illustrates incident management using the NYSDOT IEN with emergency management agencies. Taking a look at the "right" side of the diagram, the NYSDOT Statewide Information Exchange Network (IEN) is sharing information with NYSDOT Regional Traffic Operations Center (RTOC), the NYSDOT Statewide Transportation Information Coordination Center (STICC), and the NYSTA Thruway Statewide Operations Center (TSOC). With the NYSDOT RTOC and NYSDOT STICC, no institutional agreements are necessary because the sharing of information is between elements under the same institutional entity, in this case NYSDOT.

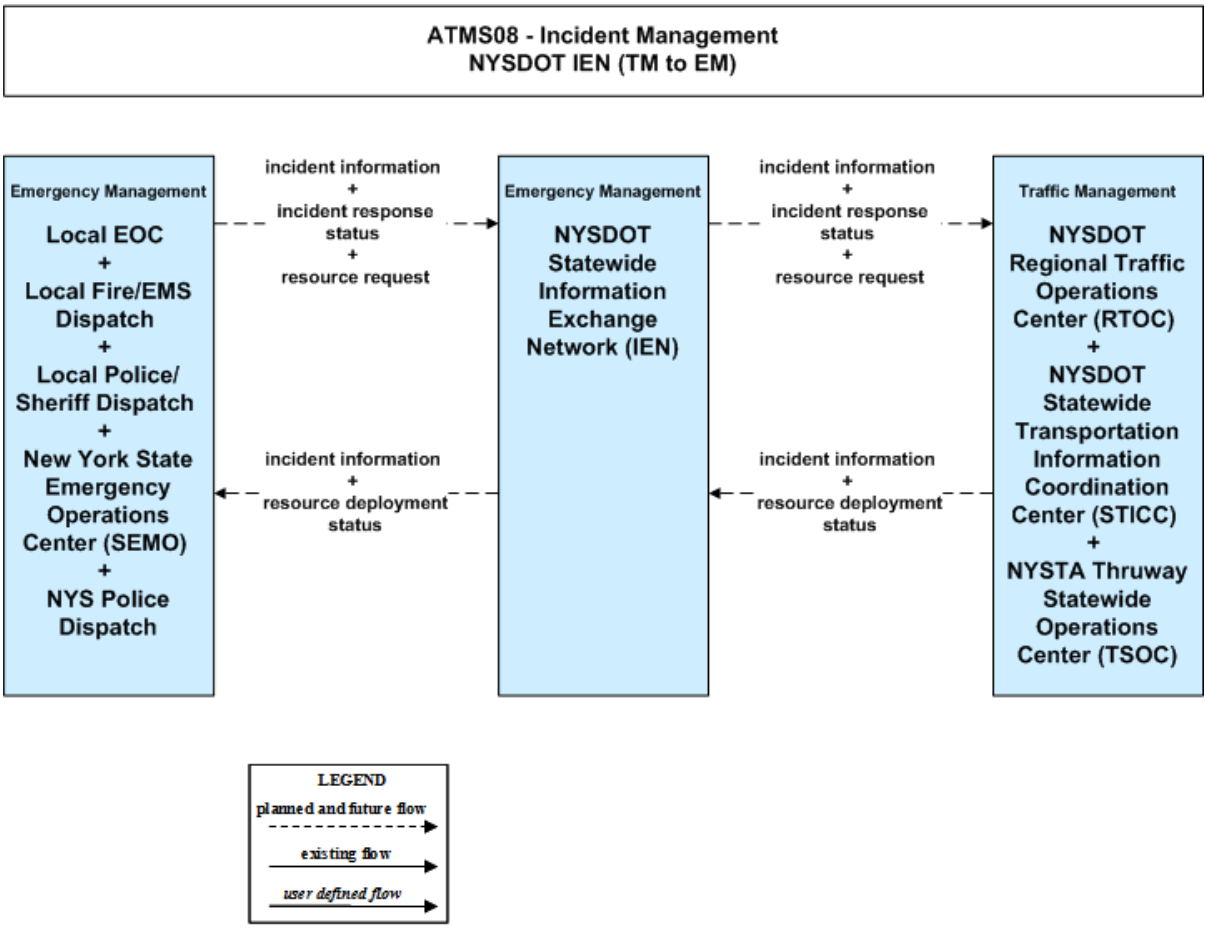


Figure 12. Example Market Package – ATMS08

However, the sharing of data between the NYSDOT IEN and the NYSTA TSOC yields a different institutional relationship. Since the elements are owned by different entities, institutional agreements may be necessary. In this particular example, the sharing of data between NYSDOT and NYSTA may already be covered by the External Network

Connection Agreement discussed earlier. However, the interfaces and agreements between the NYSDOT IEN and the various local public safety agencies on the "left" side of the diagram may require new institutional agreements.

Each market package identified in the Statewide Services ITS Architecture and selected as a "high priority market package" was analyzed using the same methodology as described above. Table 13 documents the results of this analysis and identifies where institutional agreements are needed and what the purpose of the agreement are (i.e. the information that is being shared that would require an agreement). The table is sorted by "Priority Service" or the transportation service where the agreement has been identified. The "Potential Partied to Agreement" identified the institutional entities that might share information, generally starting with the "source" entity. The "Purpose" column gives a short description of the information being shared. It is important to note that the entities listed in the following table have not been identified in this table as a source or destination for the information being shared, nor does this table contain the status of any institutional agreements. This table is intended to identify the possible agreements between entities. Therefore, this table should be used as a starting point when identifying or pursuing agreements between entities.

Table 13. Institutional Agreements

Priority Service	Potential Parties to Agreement	Purpose
Archive Data	NYS Police, NYS DMV	Provide crash and incident information
	NYSDOT, Local Transit Operators, Regional Bus Transit Operators	Provide transit archive information
	MPOs, NYSDOT, NYSTA	Archive coordination
	NYSDOT, NYSTA, Local DPW	Maintenance and construction archive data
Commercial Vehicle Operations	NYSDOT and FMCSA	Share credentials information
	NYSDOT, IFTA and IRP	Share credentials information
	NYSDOT and FMCSA	Share accident, safety inspection, safety status and violation information
Emergency Management	Local DPW, Local Public Safety Agencies, Local Traffic Management, Local Transit Operators, NYS Emergency Management Office, NYS Police, NYSDOT, NYSTA	Coordinate incident responses and provide incident reports
	Local Public Safety Agencies, NYS Police	Dispatch emergency vehicles
	Local Public Safety Agencies, NYS Police, Regional Hospital Organizations.	Share patient status and receive care facility status
	Local Public Safety Agencies, NYS Police, Regional Hospital Organizations.	Provide care facility status

Priority Service	Potential Parties to Agreement	Purpose
	Local Public Safety Agencies, NYS Police, NYSDOT	Provide emergency signal preemption
	Local DPW, Local Public Safety Agencies, Local Traffic Management, Local Transit Operators, NYS Emergency Management Office, NYS Police, NYSDOT, NYSTA	Coordinate incident and threat information
	Local Public Safety Agencies, Local Traffic Management, NYS Emergency Management Office, NYS Police, NYSDOT, NYSTA	Share secure area sensor and surveillance control
	Local Public Safety Agencies, Local Traffic Management, NYS Emergency Management Office, NYS Police, NYSDOT, NYSTA	Provide amber alerts
	Local DPW, Local Public Safety Agencies, Local Traffic Management, Local Transit Operators, NYS Emergency Management Office, NYS Police, NYSDOT, NYSTA	Coordinate emergency plans for disasters
	Local DPW, Local Public Safety Agencies, Local Traffic Management, Local Transit Operators, NYS Emergency Management Office, NYS Police, NYSDOT, NYSTA	Coordinate evacuations and reentry plans
	Local DPW, Local Public Safety Agencies, Local Traffic Management, Local Transit Operators, NYS Emergency Management Office, NYS Police, NYSDOT, NYSTA	Provide evacuation, incident and transportation system status information
	Local Public Safety Agencies, Local Traffic Management, Local Transit Operators, NYS Emergency Management Office, NYS Police, NYSDOT, NYSTA	Provide traveler information
Traffic Incident Management	Local Public Safety Agencies, Local Traffic Management, NYS Emergency Management Office, NYS Police, NYSDOT, NYSTA	Share incident information and incident video images
	Local DPW, Local Public Safety Agencies, Local Traffic Management, NYS Emergency Management Office, NYS Police, NYSDOT, NYSTA	Share incident information and maintenance and construction resources
	Regional Event Promoters, NYSDOT, NYSTA	Provide event plan information
	Local DPW, NYSDOT, NYSTA	Coordinate maintenance and construction resources
Traffic Management	Local DPW, Local Public Safety Agencies, Local Traffic Management, Local Transit Operators, NYS Emergency Management Office, NYS Police, NYSDOT, NYSTA	Share road network conditions
	Local Traffic Management, NYSDOT, NYSTA	Coordinate traffic information
Transit Management	Local Traffic Management, Local Transit Operators, NYSDOT	Share road network conditions
	Local Transit Operators, NYSDOT	Sharing transit schedule and fare information

Priority Service	Potential Parties to Agreement	Purpose
	Local Traffic Management, Local Transit Operators, NYSDOT, NYSTA	Sharing roadway maintenance and work zone information
Traveler Information	Local DPW, Local Public Safety Agencies, Local Traffic Management, Local Transit Operators, NYS Emergency Management Office, NYS Police, NYSDOT, NYSTA	Sharing incident data for broadcast
	Local Public Safety Agencies, Local Traffic Management, Local Transit Operators, NYS Police, NYSDOT, NYSTA	Sharing transit schedule, fare and incident information for broadcast
	Local Traffic Management, NYSDOT, NYSTA	Share road network conditions for broadcast
	Local DPW, NYSDOT, NYSTA	Share maintenance and construction and work zone information for broadcast
Maintenance and Construction Management	Local DPW, Local Public Safety Agencies, Local Traffic Management, NYS Emergency Management Office, NYS Police, NYSDOT, NYSTA	Share weather information
	Local DPW, Local Public Safety Agencies, Local Traffic Management, Local Transit Operators, NYS Emergency Management Office, NYS Police, NYSDOT, NYSTA	Share roadway maintenance status and work zone information
	Local DPW, NYSDOT, NYSTA	Coordinate work plans
	Local DPW, NYSDOT, NYSTA	Share maintenance and construction work plans

8.4.4. Recommendations

The identification of needed agreements is a key to the successful completion of ITS projects. One suggestion for the future is that as part of the system engineering analysis done for each ITS project, the needed agreements be detailed, along with the nature of the information sharing that causes the need for the agreement. Table 13 can be used as a starting point for identifying the needed agreements between agencies. At the very least it will identify that an agreement may need to be in place prior to going forward with additional ITS deployments. In addition, it may help to identify potential opportunities to leverage funding if one agency is willing to get and provide information that another agency needs (in accordance with the table).

It is recommended that the stakeholders review the table of needed agreements when the Statewide Services ITS Architecture undergoes a maintenance update, identifying those agreements that now exist (or are in the planning stage), and updating the future needs for agreements.

9. Maintaining the Architecture

The New York Statewide Services ITS Architecture is not a static set of outputs. It must change as plans change, ITS projects are implemented, and the ITS needs and services evolve in the region. This section describes the maintenance plan for maintaining the New York Statewide Services ITS Architecture. The plan covers the following four key areas:

- Who will be involved in the maintenance of the architecture?
- When will the architecture be updated?
- What will be maintained?
- How it will be maintained (i.e. what configuration control process will be used)?

The Statewide Services ITS Architecture is created as a consensus view of what ITS systems the stakeholders in the state have currently implemented and what systems they plan to implement in the future. The Statewide Services ITS Architecture will need to be updated to reflect changes resulting from project implementation or resulting from the planning process itself. Types of changes may include:

- **Changes for Project Definition.** When actually defined, a project may add, subtract or modify elements, interfaces, or information flows from the Statewide Services ITS Architecture. Because the Statewide Services ITS Architecture is meant to describe the current (as well as future) statewide implementation of ITS, it must be updated to correctly reflect how the developed projects integrate into the state's plans. Also, once projects are implemented interfaces that were shown in the architecture as planned should now be changed to existing.
- **Changes for Project Addition/Deletion.** Occasionally a project will be added or deleted through the planning process and some aspects of the Statewide Services ITS Architecture that are associated with the project may be expanded, changed or removed.
- **Changes in Project Priority.** Due to funding constraints, or other considerations, the planned project sequencing may change. Delaying a project may have a ripple effect on other projects that depend on it. Raising the priority for a project's implementation may impact the priority of other projects that are dependent upon it.
- **Changes in Statewide Needs.** Transportation planning is done to address statewide needs. Over time these needs can change and the corresponding aspects of the Statewide Services ITS Architecture that addresses these needs may need to be updated.
- **Changes in other Regional ITS Architectures.** Changes made in regional ITS architectures in the state (or in adjoining states) can affect the Statewide Services ITS Architecture, necessitating changes to maintain consistency between the architectures.

- **Changes in ITS standards applicable to ITS projects in the state.** The architecture maps ITS standards to interfaces (and hence to projects). Over time this mapping will need to be updated as standards release new versions, or as new standards are developed.

In addition, when new stakeholders come to the table, the Statewide Services ITS Architecture will need be updated to reflect their place in the statewide view of ITS elements, interfaces, and information flows.

Finally, the National ITS Architecture may be expanded and updated from time to time to include new user services or better define how existing elements satisfy the user services. These changes should also be considered as the Statewide Services ITS Architecture is updated. The National ITS Architecture may have expanded to include a user service that has been discussed in a region, but not been included in the Statewide Services ITS Architecture, or been included in only a very cursory manner.

9.1. Roles and Responsibilities for Maintenance

Responsibility for maintenance of the Statewide Services ITS Architecture lies with NYSDOT, since they perform the primary statewide planning organization functions, and are one of the primary users of the architecture. A group of core stakeholders will act as an "institutional framework" to review proposed changes to the architecture. This group of core stakeholders is important because the Statewide Services ITS Architecture is a consensus framework for integrating ITS systems. As it was a consensus-driven product in its initial creation, so it should remain a consensus-driven product as it is maintained. This section defines the stakeholders and their roles and responsibilities for the maintenance of the New York Statewide Services ITS Architecture.

9.1.1. Definitions

The following groups or persons have a role in the maintenance of the architecture:

- **Stakeholders.** Any government agency or private organization that has a role in providing transportation services in the region.
- **Maintenance Working Group.** A group of stakeholder representatives who are responsible for the technical review of updates/changes to the Statewide Services ITS Architecture, and for approving changes to go into the architecture.
- **Responsible Agency.** The stakeholder agency with primary responsibility for maintenance of the architecture.
- **Maintenance Manager.** The person responsible for overseeing and guiding the maintenance efforts.

9.1.2. Stakeholders

Stakeholders are any government agency or private organization that is involved with or has an interest in providing transportation services in the state. Each stakeholder owns, operates, and/or maintains one or more ITS element in the state and, therefore, the in architecture.

The success of the change management process outlined in this Maintenance Plan is highly dependent on the participation of the stakeholders identified in the architecture. Without stakeholders participation in tracking the development of their ITS systems, and properly updating the architecture, the change management process will not succeed and the usefulness of the architecture will diminish over time.

The primary responsibility of the stakeholder agencies is to submit changes to the Statewide Services ITS Architecture that are brought on by new plans or projects that are being planned or deployed for the stakeholder agency. The stakeholder agency must submit the changes in the Statewide Services ITS Architecture to the Maintenance Working Group.

If stakeholders desire more involvement in the architecture review process, they can get involved through voluntary participation in the Maintenance Working Group.

9.1.3. Maintenance Working Group

The New York Statewide Services ITS Architecture Maintenance Working Group, or the Maintenance Working Group for short, has the following responsibilities:

- Collecting and compiling proposed changes and updates to the architecture from stakeholder agencies.
- Evaluating each proposed change from a technical standpoint, and reaching a consensus on the proposed change (this may require contacting additional stakeholders if one or more of their systems are affected).
- Approving changes to the architecture.
- Making any institutional or policy related decisions that arise in the maintenance of the architecture

The maintenance working group for the State of New York is a subset of the stakeholders dealing with ITS throughout the state. In other words, representatives of stakeholder agencies who are represented in the Statewide Services ITS Architecture are candidates for a voluntary maintenance working group.

The maintenance working group will have as its core members key staff from NYSDOT who represent the different areas of transportation within the Department (e.g. operations, maintenance, and planning). Additionally, “major” stakeholders within the state will be encouraged to participate, including NYSTA. A major stakeholder is considered to be any stakeholder that has multiple ITS elements or systems represented throughout the Statewide Services ITS Architecture.

9.1.4. Responsible Agency

The Responsible Agency is the government agency (state agency) that formally maintains the architecture. The Responsible Agency assigns resources for making the physical changes to the architecture baseline, and for coordinating the maintenance of the architecture. The Responsible Agency for the New York Statewide Services ITS Architecture is NYSDOT, since they are the transportation planning organization for the state, and will be primary users of the architecture. The specific organization within NYSDOT that will be responsible for the maintenance effort is the Systems Optimization Bureau.

9.1.5. Maintenance Manager

The Responsible Agency will appoint a person to the role of Maintenance Manager to coordinate the maintenance activities of the Statewide Services ITS Architecture. The Maintenance Manager is the coordinator and main point of contact for all maintenance activities, including receiving Change Requests forms, tracking Change Requests, and distributing documentation.

The Maintenance Manager has the following responsibilities:

- Coordinate the activities of the Maintenance Working Group
- Receive Change Request forms and requests for documentation from stakeholders
- Distribute the baseline documents and outputs of the architectures to stakeholders.
- Maintain the “official” records of the Statewide Services ITS Architecture, including the baseline documents, meeting minutes, the Change Request Database, and the list of Points of Contacts for the Stakeholder
- Ensure the status of each Change Request is properly updated in the Change Request Database
- Maintain a complete contact list of all stakeholders within the state along with the maintenance schedule for their perspective ITS Architectures.

Some of these responsibilities may be delegated to staff or consultants.

9.2. Timetable for Maintenance

How often will the Statewide Services ITS Architecture be modified or updated? What events or timetable will be used for making updates or changes to the architecture? There are two basic approaches that the State of New York will utilize for maintaining the architecture:

- **Periodic Maintenance.** Update the architecture based upon one of the recurring activities of the transportation planning process. For example, it’s natural that the ITS architecture would be updated at the same frequency as the statewide

transportation plan is updated (every three to five years) or the Transportation Improvement Program is updated (at least every two years). The update of the architecture will occur several months prior to the transportation planning document update, so that the revised architecture could serve as an input to the planning update. Publication and versioning costs are minimized for the periodic maintenance approach since there is a new version only once in the maintenance cycle.

- **Exception Maintenance.** This approach will be followed if there is an urgent need to make a change, or if a minor change is desired to address some stakeholder need. In this case the change can be initiated as needed. Publication and versioning costs are dependent on the frequency of changes made to the Statewide Services ITS architecture.

9.2.1. Periodic Updates

A comprehensive architecture update will occur every three years, concurrent with the formal update of the STIP. This is a natural result of the New York Statewide Services ITS Architecture being a component of the statewide transportation planning process. The update is necessary to ensure that the architecture continues to accurately represent the statewide view of ITS Systems. The comprehensive update may include adding new stakeholders, reviewing transportation needs and services for the region, updating the status of projects, and reflecting new goals and strategies, as appropriate. Operational concepts, system functional requirements, project sequencing, ITS standards, and list of agency agreements may also be updated at this time.

Between major updates of the architecture, the following interim update actions will be performed:

On an annual basis, the Maintenance Manager will actively solicit changes from each key stakeholder a set of needed updates. The Maintenance Manager will contact the key stakeholders, via e-mail, written correspondence, or by telephone, and inquire if the stakeholder has any changes to the Statewide Services ITS Architecture. It is the responsibility of the stakeholders to complete and submit the Change Request Forms to the Maintenance Manager for consideration. Within a defined period, the submitted Change Request Forms will be collected and reviewed by the Maintenance Working Group for consideration in the next minor update of the Statewide Services ITS Architecture.

The Maintenance Plan will also be reviewed at the annual updates for required changes to the Maintenance Plan. Use of the Statewide Services ITS Architecture and modifications to it may differ from what was anticipated during the initial development of the Maintenance Plan. Revising the Maintenance Plan will ensure that the change management process defined is effective.

9.2.2. Event-Driven Updates

There are certain considerations listed above that may call for an event driven update to the architecture. In this case a stakeholder may submit a Change Request Form to the Maintenance Manager and request that the Maintenance Working Group review and approve the change request prior to the next scheduled update of the Statewide Services ITS Architecture. This may be necessary if a stakeholder suddenly requires federal funding for a previously unplanned ITS project, and needs the ITS project to be included in the Statewide Services ITS Architecture.

9.3. Architecture Baseline

Establishing an architecture baseline requires clear identification of the architecture products to be maintained, including specific format and version information. For the Statewide Services ITS Architecture the following are identified as the architecture baseline:

- New York Statewide Services ITS Architecture Document (this document)
- Set of Customized Market Packages (Visio file)
- Turbo Architecture Database
- Statewide Services ITS Architecture Web pages
- Change Database
- Stakeholder List

Regarding the Architecture, the original source document, in Microsoft Word format, will be held by the Maintenance Manager, while a PDF version of the documents will be available for general distribution. In addition, a version number and date will be included inside the cover page. Each document will use a versioning scheme that identifies the baseline and revision number. For example, since this architecture is an update of the initial release of the New York Statewide Services ITS Architecture, the documents at the conclusion of this effort will be version 2.00. Minor revisions will be 2.01, 2.02, etc. The next major revision to the document will be version 3.00. Regarding the set of customized market packages, the Visio file will be maintained by the Maintenance Manager.

Regarding the Turbo Architecture Database, the Maintenance Manager will maintain a zipped version of the final delivered New York Statewide Services ITS Architecture database. The name, date, and size of the database file inside the zipped file will be entered into an architecture log as version 2.0 of the architecture.

Regarding the web site, a CD-ROM version of the final web site will be maintained by the maintenance manager. The version number of the architecture will be clearly visible somewhere on the home page of the web site so that the version being viewed is immediately identifiable.

The Change database will be a Microsoft Access database with the version number in the name of the database.

The Stakeholder list will be a Microsoft Excel file with the version number in the name of the file.

9.4. Change Management Process

This change management process specifies how changes are identified, how often changes will be made, and how the changes will be reviewed, implemented, and released. The change management process involves five steps:

- **Identify Change.** Review what changes are needed and complete and submit a Change Request Form.
- **Evaluate and Review Change.** An initial evaluation of the change for completeness and consensus. The Maintenance Working Group will then review the results of the evaluation and approve the change.
- **Update Baseline.** Apply the approved changes to the Statewide Services ITS Architecture documents.
- **Notify Stakeholders.** Inform the stakeholders of the updated changes to the Statewide Services ITS Architecture documents, and distribute the documents as necessary.

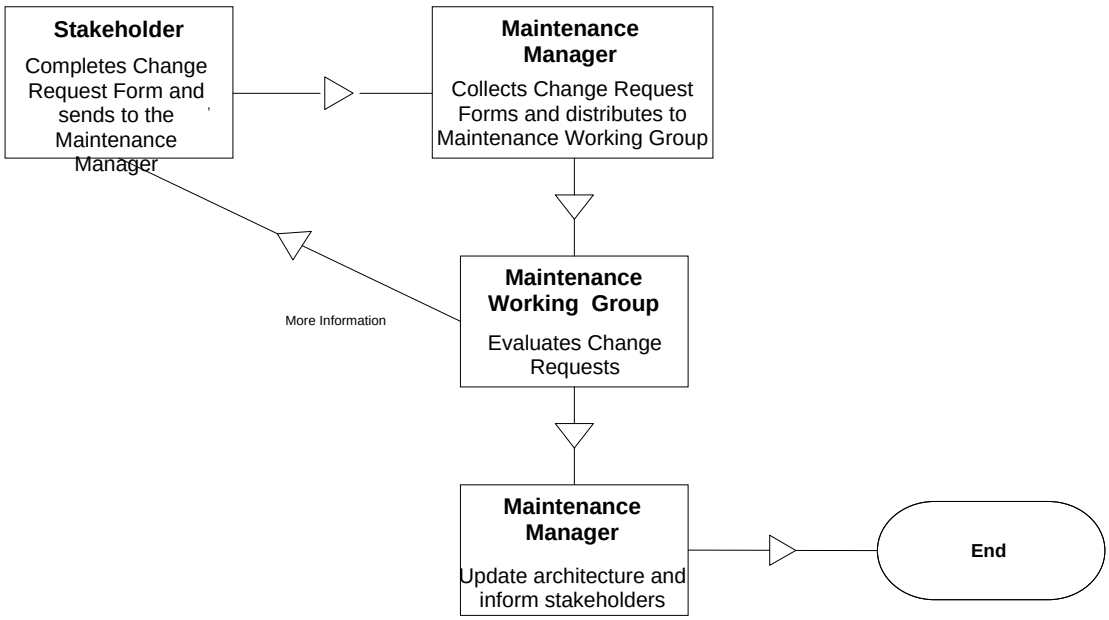


Figure 13. Change Management Process

The identification of who performs these steps is shown in Figure 13.

9.4.1. Identify Change

This involves two issues:

- who can identify a change to the architecture, and
- how will the change request be documented.

The question of who can make change requests is an important one. If literally anyone can input requests the region runs the risk of being overrun by requests that will tax scarce resources to review and deliberate the change request. On the other end of the spectrum, if too much formality or paperwork is added to the process then many valid or needed changes may go unexpressed.

Any Stakeholder identified in the Statewide Services ITS Architecture is allowed to submit a Change Request Form. This effectively indicates that all changes have the approval of an existing, defined stakeholder in the ITS Architecture. If the Change Request is to add a new Stakeholder and that Stakeholder's ITS Elements and Interfaces, the Responsible Agency for the architecture must submit the Change Request Form.

A Change Request Form will be used to submit changes for review. The Change Request Form for the New York Statewide Services ITS Architecture can be found in Appendix A. The Maintenance Change Request Form includes the following information:

- Name of change
- Description of change
- Part of baseline affected (could be check boxes for document, database, web site, and not known)
- Rationale for change
- Originator name or agency
- Date of origination

This information entered on the Change Request Form will be added to a change database, maintained by the Responsible Agency. The change database will include following additional fields of information:

- Change number (some unique identifier)
- Change disposition (accepted, rejected, deferred)
- Change type (minor or significant)
- Disposition comment
- Disposition date
- Who in the Maintenance Working Group was present in disposition determination.

9.4.2. Evaluate and Review the Change Request

Upon receiving a Change Request by the Maintenance Manager, an initial evaluation of the Change Request will be made for the impact to the overall architecture or the affected document. The purpose of the evaluation is two-fold:

- Verify that the Change Request Form and supporting materials is complete and correct
- Compare with other Change Request forms and determine if there are any conflicts

If the proposal for architecture modification has an impact on other stakeholders, the Maintenance Manager will contact the Stakeholders to confirm their agreement with the modification. All Stakeholders directly affected by the proposed change(s) must approve and sign-off the Change Request Form before the Maintenance Working Group considers the Change Request.

There are several options as to who performs the initial assessment, including:

- The Maintenance Manager
- Maintenance Working Group
- The person submitting the change
- A consultant, hired to support the maintenance activities of the architecture

Each of the above options has positive and negative implications, but the evaluator must have working knowledge of the architecture to evaluate the proposed changes. The Maintenance Manager or the Maintenance Working Group will assign the evaluation option to use for each change request evaluation received.

Upon completing the initial assessment, the Change Request Form will be reviewed by the Maintenance Working Group (either at a Maintenance Working Group meeting or via some electronic means). Maintenance Working Group meetings are called by the Maintenance Manager (or their designated representative).

Maintenance Working Group meetings called by the Maintenance Manager will occur at least on an annual basis. When calling the annual meeting, the Maintenance Manager will send a reminder to all Stakeholders to update their ITS Elements and Interfaces in the architecture, if necessary. If sufficient Change Request Forms are submitted, the Maintenance Manager may call a Maintenance Working Group meeting at more frequent intervals to review the Change Request forms. The Maintenance Manager will act as Chairperson for these meetings. The Maintenance Manager will distribute copies of all Change Request Forms submitted and all supporting materials to all Stakeholders prior to the meeting for their review and assemble an agenda. Maintenance Working Group meetings can also be requested by one of the stakeholders if there is an urgent need to update the architecture quickly.

The Maintenance Working Group will be provided sufficient time to review the Change Requests before the meeting. During the meeting, the Maintenance Working Group will review the proposed changes and offer any comments.

After each Change Request is reviewed, if no further comments are offered by the Maintenance Working Group, the Change Request will be considered approved, and the Maintenance Manager will sign off on the Change Request.

If additional comments are made that require action, those comments will be noted on the Change Request form. Where comments (or changes required) are minor in nature they can be made by the submitter of the Change Request form, or by resources designated by the Maintenance Manager and the change considered approved. In the case of major comments or changes to the Change Request, the approval of the change will be deferred until the next meeting of the Maintenance Working Group.

If a Change Request is to be withdrawn from consideration, the Maintenance Manager will be required to sign-off on the Change Request Form to close out the Change Request.

At the end of the meeting, the Maintenance Working Group will agree if all the approved changes to the architecture necessitate an immediate update to the baseline, or whether the update should await either additional changes or the next major revision. The decision should be based on the number of Change Requests approved and the nature of the approved changes.

Minutes will be kept for all Maintenance Working Group meetings. Minutes will include, at a minimum, an attendance list, comments made on each Change Request, and the disposition of each Change Request Form (Approved/Withdrawn/Deferred/Request More Information). Minutes will be distributed to all members of the Maintenance Working Group meeting approximately 5 working days after the meeting. Comments are due within 10 working days to the Maintenance Manager. Approved minutes will be signed by the Maintenance Manager and will be distributed to all Stakeholders and posted on the website. The minutes provide a recording process for the change management process and provide traceability.

The Maintenance Working Group will have the option to handling the review and approval process for minor Change Requests via e-mail exclusively rather than through face to face meetings.

9.4.3. Update Baseline

Upon approvals of the Change Request Forms, the decision agreed upon by the Maintenance Working Group is implemented. If the decision is to accept the change and update the baseline then the appropriate portions of the architecture baseline are updated and an updated architecture baseline is defined. In addition to updating the baseline documents, databases, or other outputs, the configuration status will be updated. In the discipline of Configuration Management this is known as Configuration Status Accounting.

This accounting is performed by having a document that defines the following information for each separate output of the architecture baseline:

- Output name;
- Output revision number;
- Date of latest revision;
- File Name; and
- Location/Point of Contact.

Periodically, the information in the various outputs of the architecture baseline will be audited to assure that the different representations of the architecture information (e.g. the database and document) are in sync. This configuration auditing will be performed by someone independent of the staff or resources used to actually enter the changes.

Update of the Turbo Architecture Database

The updates of the Turbo Architecture database require a knowledge of the tool as well as the National ITS Architecture on which it is based. This knowledge will reside in the Responsible Agency, either with agency staff or with consultants contracted to support the maintenance effort. The Responsible Agency will maintain the Turbo Architecture file.

9.4.4. Notify Stakeholders

Point of Contacts for each stakeholder will be notified by e-mail from the Maintenance Manager when baseline documents have been updated. All baseline documents will also be available to stakeholders from a website or other electronic location, such as an ftp site. It is the responsibility of the Maintenance Manager to ensure the most recent document is available from the website. The Configuration Status Document will be one of those outputs that are available.

Request for copies or access to the baseline documents will be made to the Maintenance Manager.

After major revisions to the architecture or the baseline documents, the Maintenance Working Group may elect to also provide all baseline documents to members on CD-ROMs, or secured-access files on the Architecture website.

Appendix A: Maintenance Change Request Form

New York Statewide Services ITS Architecture

Maintenance Change Request (MCR) Form

To Be Completed By Stakeholder(s) Requesting Changes		
Originator Name:		Date Submitted
Originator Telephone:	Originator Fax:	Originator E-Mail:
Originator Agency:		Functional Area:
Agency Authorized Signature:		Signature Date:
Description of Proposed Change:		
Rationale for Proposed Change:		
Affected Agency:	Authorized Signature:	Signature Date:
Affected Agency:	Authorized Signature:	Signature Date:
List Attachments:		
Baseline Documents Affected: _____ Website _____Turbo Architecture _____Customized MPs _____Arch Document _____ Strategic Plan _____ Standards Plan _____Other (describe)		

To Be Completed By Maintenance Manager		
Change Request Number:	Date CR Received:	Date CR Logged:
Date Initially Discussed:	Disposition: ☐ Accepted ☐ Rejected ☐ More Info	Disposition Comments
Date Discussed:	Disposition: ☐ Accepted ☐ Rejected ☐ More Info	Disposition Comments
Date Discussed:	Disposition: ☐ Accepted ☐ Rejected ☐ More Info	Disposition Comments
Date of Maintenance Working Group Approval (If Applicable):		
Baseline Documents Affected/Version implemented Turbo Architecture Date: _____ Version: _____ Website Date: _____ Version: ____ Customized MPs Date: _____ Version: _____ Strategic Plan Date: _____ Version: ____ Architecture Doc Date: _____ Version: _____ _____ Date: _____ Version: ____		