Mohawk Valley Regional
ITS Architecture

Architecture Document

September 17, 2010

Prepared for:

New York State Department of Transportation – Region 2

Submitted By:

ConSysTec

www.consystec.com

Table of Contents

Table of Contents ii
Table of Figures iv
List of Tables iv
Revision History iv
1. Introduction 1
1.1. Purpose 1
1.2. Document Overview 2
1.3. Scope of the Architecture 2
2. Architecture Development Process 4
2.1. Process to Create the Architecture 4
2.1.1. Kickoff Meeting and Stakeholder Review Workshop 4
2.1.2. Creation of an Initial Inventory and Services 5
2.1.3. Architecture Workshop 5
2.1.4. Creation of a Draft Architecture for Review 5
2.1.5. Finalize the Architecture Based on Review Comments 6
2.2. Requirements of the Final FHWA Rule and FTA Policy on Architecture 6
2.2.1. Specific Requirements of the Final FHWA Rule or FTA Policy 6
3. ITS Architecture Concepts 8
4. Identification of Stakeholders 12
4.1. Champion 12
4.2. Stakeholders 12
4.3. Operational Concept 15
5. Systems Inventory 23
5.1. Systems by Stakeholder 23
5.2. Systems by Architecture Entity 31
6. Services 36
7. Interfaces and Information Exchanges 38
7.1. Customized Market Packages 38
7.2. Regional Architecture Information Flows 39
8. Using the Mohawk Valley Regional ITS Architecture 42
8.1. Projects 42
8.1.1. Process For Defining Projects 43
8.1.2. How to Use the Projects 49
8.1.3. Recommendations 50
8.2. Functional Requirements 50
8.3. Standards 52
8.3.1. Discussion of Key Standards for the Region 53
8.3.2. Reference to the Detailed Standards information on the Web Site 55
8.3.3. Using ITS Standards in Projects 57
8.4. Agreements 58
8.4.1. Types of Agreements 58
8.4.2. Existing Agreements 60
8.4.3. Potential Agreements 60
8.4.4. Recommendations 64

9. Maintaining the Architecture 65
9.1. Roles and Responsibilities for Maintenance 66
9.1.1. Definitions 66
9.1.2. Stakeholders 67
9.1.3. Maintenance Working Group 67
9.1.4. Responsible Agency 68
9.1.5. Maintenance Manager 68
9.2. Timetable for Maintenance 68
9.2.1. Periodic Updates 69
9.2.2. Event-Driven Updates 69
9.3. Architecture Baseline 70
9.4. Change Management Process 71
9.4.1. Identify Change 71
9.4.2. Evaluate and Review the Change Request 72
9.4.3. Update Baseline 74
9.4.4. Notify Stakeholders 75
Appendix A: Maintenance Change Request Form 76

Table of Figures

Figure 1. Mohawk Valley Region 3
Figure 2. Information Flows 9
Figure 3. Example of National ITS Architecture Market Package 10
Figure 4. Example of A Customized Market Package 11
Figure 5. Example Customized Market Package 38
Figure 6. Example of Element Detail Showing Interfaces 40
Figure 7. Example of Architecture Flows Between Elements 41
Figure 8. Relationship between the National ITS Architecture and ITS Standards 53
Figure 9. Example of Interface Page 56
Figure 10. Example of Standards Mapping Page 57
Figure 11. Example Market Package – ATMS08 61
Figure 12. Change Management Process 71

List of Tables

Table 1. Mapping of Requirements to Architecture Outputs 6
Table 2. Stakeholders 12
Table 3. Stakeholder Roles and Responsibilities 16
Table 4. Inventory Sorted by Stakeholder 23
Table 5. Element Inventory Sorted by Entity 31
Table 6. Selected Regional Market Packages 36
Table 7. ITS Projects 45
Table 8. Applicable ITS Standards 54
Table 9. Types of Agreements 59
Table 10. Generic Statewide Agreements 60
Table 11. Institutional Agreements 62

Revision History

Filename	Version	Date	Author	Comment
Draft NYSDOT R2 Architecture Document	1.0	07/19/10	Chan	Draft document
Final NYSDOT R2 Architecture Document	1.0	9/17/10	Eisenhart	Final Document

1. Introduction

The **Mohawk Valley Regional Intelligent Transportation Systems (ITS) Architecture** is a roadmap for the integration of transportation systems in the Mohawk Valley region of New York State over the next 10 years. The Mohawk Valley region is the six-county region of Fulton, Hamilton, Herkimer, Madison, Montgomery, and Oneida Counties. This architecture has been developed through a cooperative effort by the region's transportation agencies, covering all modes and all roads in the region. 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 region.

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

- Operating Agencies to recognize and plan for transportation integration opportunities in the 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 region.

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 described by this document, by a Turbo Architecture database, and by a hyperlinked website that can be found at http://www.consystec.com/newyork/mohawkv/web/.

This 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.

1.1. Purpose

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

This Regional 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 Regional ITS Architecture allows the transportation agencies in the region 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 Regional ITS Architecture allows identified existing and planned projects in the region to be fully compliant with this Rule/Policy, which will facilitate the approval of federal funds to support ITS projects in the region.

1.2. 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 Regional ITS architecture. Section 3 gives a brief introduction and overview of the National ITS Architecture, and how it relates to this Regional 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 Regional 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.

1.3. Scope of the Architecture

The geographic scope of this Regional ITS Architecture is the Mohawk Valley region, defined as six-county region of Fulton, Hamilton, Herkimer, Madison, Montgomery, and Oneida counties. This six-county region is also the scope of New York State Department of Transportation (NYSDOT) Region 2. The Mohawk Valley Region has an approximate population of 480,000 people and covers 6,146 square miles. The residents inhabit 8 cities, 53 villages, and 89 towns, traveling on 1,335 centerline miles of state highways and 482 state bridges.

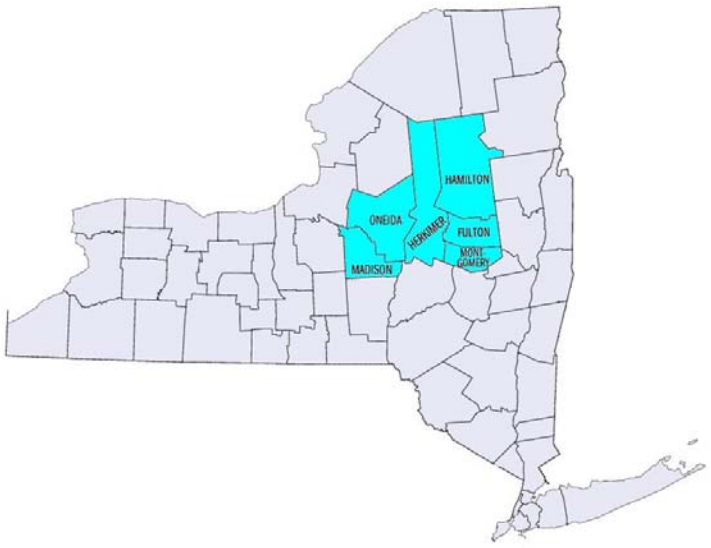


Figure 1. Mohawk Valley Region

The regional ITS architecture for the Mohawk Valley region provides approximately a ten year outlook for ITS activities in the region. The architecture addresses existing ITS systems as well as those planned for development over the next ten years. More specifically, it represents a snapshot of the currently anticipated projects based on information gathered from stakeholders. As such, the architecture will require regular updates to ensure that it maintains accurate representation of the region. This is addressed in more detail in Section 9, Maintaining the Architecture.

The Regional ITS Architecture covers services across a broad range of ITS, including traffic management, transit management, traveler information, emergency services, archived data management, and maintenance and construction operations. Commercial vehicle services and electronic payments are covered as they relate to regional integration, but a more complete coverage of these would be provided at a statewide architecture level.

2. Architecture Development Process

2.1. Process to Create the Architecture

Development of the Mohawk Valley Regional ITS Architecture relied heavily on stakeholder input to ensure that the ITS architecture reflected local and regional needs and plans. The following five-step process was used to develop the ITS architecture:

- Conduct a Kickoff Meeting and Stakeholder Workshop to gather information regarding inventory and services;
- Create an initial draft inventory of architecture elements and a draft set of customized ITS Services;
- Conduct an Architecture Workshop to review the draft inventory, the draft set of customized ITS Services and specific areas of interest or specific projects;
- Create a draft Regional ITS Architecture for review (web based);
- Allow stakeholder review of the draft Regional ITS Architecture; and
- Finalize the ITS architecture based on review comments.

2.1.1. Kickoff Meeting and Stakeholder Review Workshop

A one day kick-off meeting was held on April 1, 2010. The overall objective of the meeting was that the resultant Mohawk Valley Regional 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 including NYSDOT Region 2 staff, NYSDOT Main Office, and Federal Highway Administration.

The meeting included a discussion on the definition of a stakeholder, and whom to invite to participate in the Regional ITS Architecture development. A wide array of stakeholders, across all aspects of surface transportation, in the region was invited to a half-day workshop that was held on June 3, 2010. The purpose of this workshop was to review the purpose and scope of the Regional ITS Architecture, to identify stakeholders in the region, and to refine a draft inventory, with each participant's ITS elements being discussed and clarified. In addition the services and ITS projects planned at local, regional, and statewide levels were discussed.

The workshop included training in the National ITS Architecture and regional ITS architecture so that stakeholders would understand and more fully participate in the ITS Architecture development process.

2.1.2. Creation of an Initial Inventory and Services

An initial draft set of ITS elements, services and interconnections were created based upon the information gathered from the stakeholders during the Stakeholder Workshop and a review of existing documentation regarding NYSDOT's ITS projects in the region.

The Regional ITS Architecture elements identified and defined through this review were mapped to National ITS Architecture Version 6.1 entities (subsystems and terminators). This created an initial inventory for the region mapped to the National ITS Architecture entities. 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 4.1.

For each existing or future ITS service operating or expected in the region, 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 region. This would be the case if there were multiple agencies performing the same service within the region. This set of customized market packages using the draft elements created previously, was created in preparation for the Stakeholder Workshop so that each could be reviewed and further refined based on actual operating procedures (or theories) for each agency.

2.1.3. Architecture Workshop

A one-day Architecture Workshop was held on June 28, 2010. The purpose of this workshop was to review the initial draft of the Regional ITS Architecture. The workshop began with a review of and refinement of the draft inventory, with each participant's ITS elements being discussed and clarified. This was followed by a review of the customized market package diagrams, adding or deleting diagrams, elements, and interconnections when necessary. Other portions of the architecture were then discussed with the participants, including project sequencing, operational concepts, agreements, maintenance of the architecture, and existing and planned ITS projects.

2.1.4. Creation of a Draft Architecture for Review

Following the Architecture Workshop, a draft architecture was created. Using the customized market package diagrams (as modified during the workshop), the Turbo

Architecture database was completed to create a draft ITS architecture. This involved the following activities:

- Updating the ITS inventory
- Revising the customized market packages
- 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/mohawkv/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 provided by e-mail with the links to the draft architecture website and draft architecture document on July 20, 2010, and that a two-week review period has commenced, and feedback was solicited. Stakeholders were encouraged to review the draft Regional ITS Architecture on the website, and 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. Finalize the Architecture Based on Review Comments

Following the review period, 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. A final walkthrough of the Regional ITS Architecture with the stakeholders was performed on August 16, 2010. The architecture, Turbo Architecture database, web site and this architecture document then were updated as the final deliverables for the Mohawk Valley Regional ITS Architecture, and delivered on September 20, 2010.

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. Table 1 below shows how the requirements of the rule are met by the outputs developed for the Regional 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 1.3 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 Mohawk Valley Regional 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 are developed in order to provide a guide for the integration of transportation systems. This Regional ITS Architecture is based upon the US National ITS Architecture Version 6.1. 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 Mohawk Valley Regional ITS Architecture the elements represent actual systems, such as the NYSDOT Region 2 TOC. 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 Regional 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 6.1 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 6.1 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 Regional ITS Architecture called National Weather Service is mapped to the National ITS Architecture terminator Weather Service.

The information exchanged between elements (in the Regional 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 Regional 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 Regional ITS Architecture is shown in the bottom two boxes.

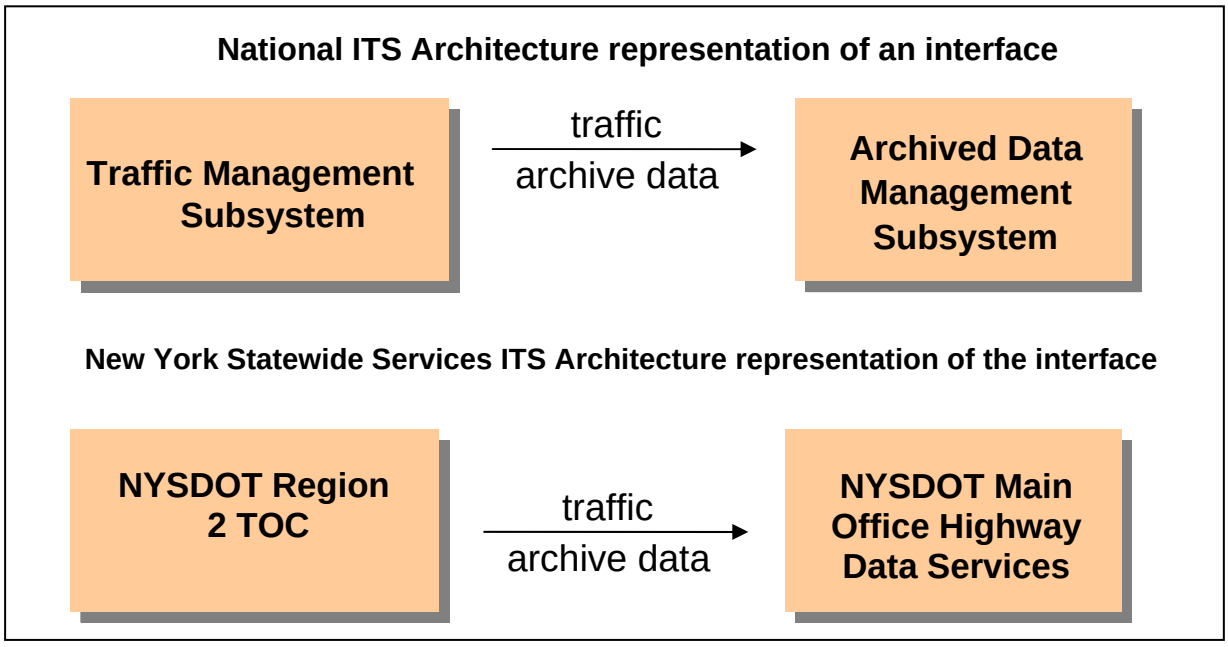


Figure 2. Information Flows

By mapping the Regional ITS Architecture elements (e.g., NYSDOT Region 2 TOC) 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 Regional 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 Regional ITS Architecture, a set of customized market packages were created that define the elements and interfaces used to provide the service in Regional ITS Architecture.

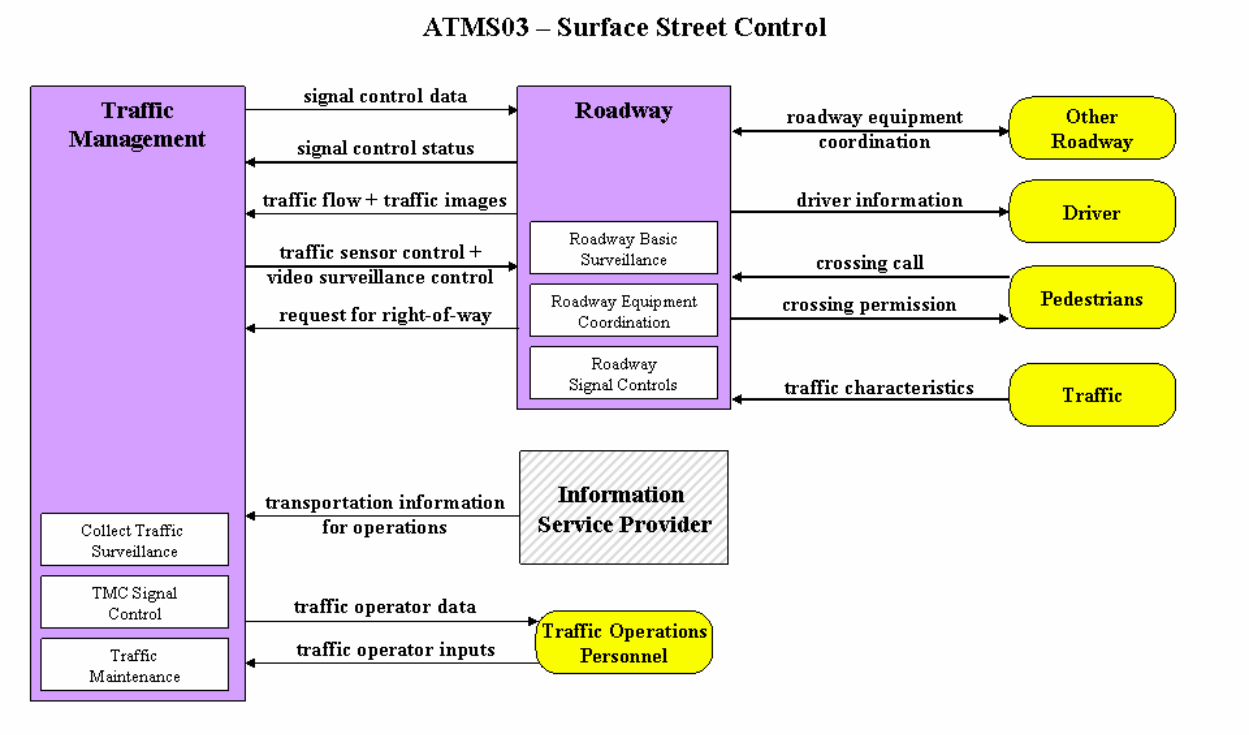


Figure 3. Example of National ITS Architecture Market Package

Figure 4 shows one of the customized market packages, in this case for the NYSDOT Region 2 TOC. This diagram shows how NYSDOT Region 2 might implement this service.

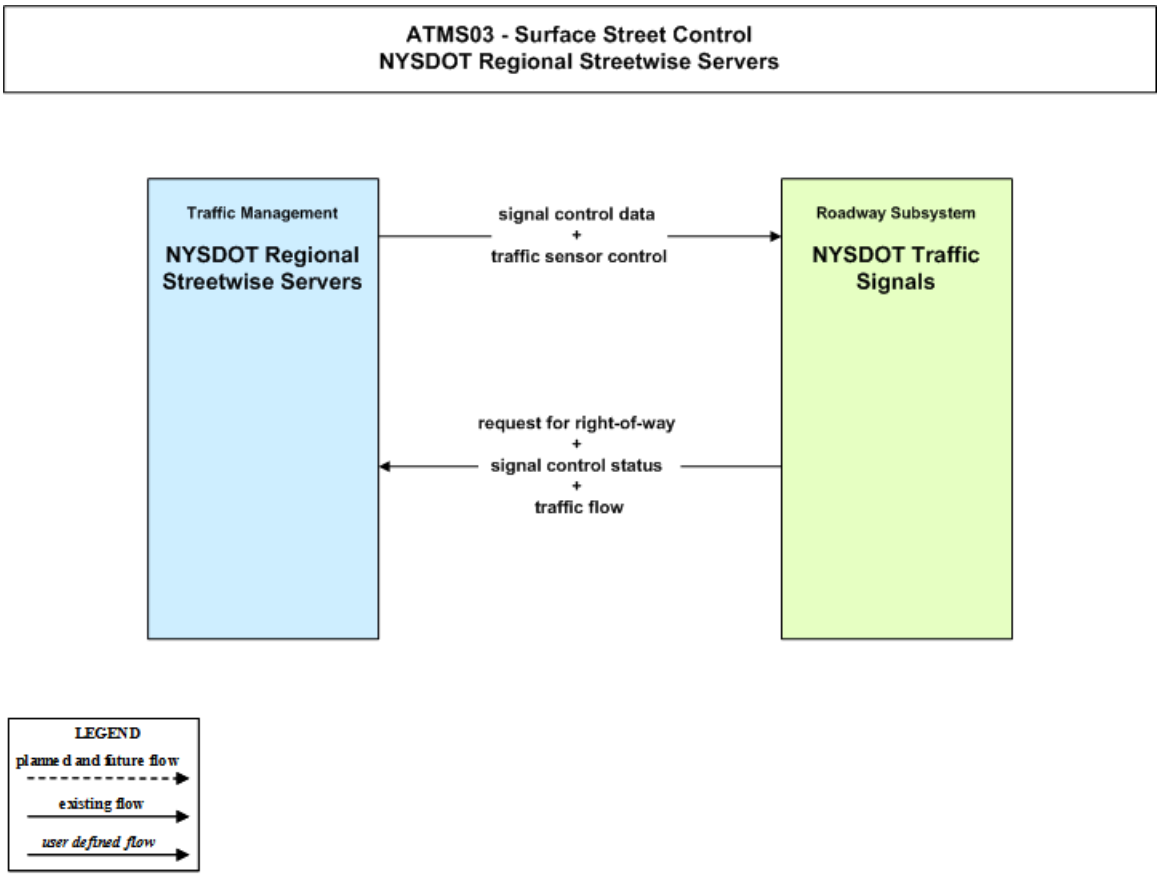


Figure 4. Example of A Customized Market Package

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 Regional 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 Regional ITS Architecture functions have been identified for the key elements using a mapping of equipment packages to each element. For example, the NYSDOT Region 2 TOC (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 Regional ITS Architecture, it is necessary to have a "champion" who can lead the effort from the region'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 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 Mohawk Valley Regional ITS Architecture is the NYSDOT Region 2 Traffic Engineer. This champion is supported by other members of the NYSDOT Region 2. The NYSDOT Region 2 Traffic Engineer will continue to champion the use and maintenance of the Regional 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. In addition, it is important to consider stakeholders at a statewide level or stakeholders in adjoining regions.

The Regional ITS Architecture includes a wide range of stakeholders. The Regional 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 Regional 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	This represents the systems that are used to access archived transportation, maintenance, construction, or transit data for research, planning, and other off-line uses.

Stakeholder	Stakeholder Description
CENTRO	Central New York Regional Transportation Authority (CNYRTA) regional transit agency. Covers Utica, Rome, Oneida, Oswego.
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.
Government Agencies	Represents national, state, and local government reporting agencies.
HOCTS	Herkimer-Oneida Counties Transportation Study (HOCTS) is the Metropolitan Planning Organization (MPO) for the region.
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 (county and municipal) 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 region that are not specifically called out by the architecture. Includes Birnie Bus (4 county line run, rural transit, motor coach, school bus, para transit), who scheduled routes coordinate with CENTRO; Gloversville Transit System; and the City of Amsterdam Bus.
NOAA - National Oceanic and Atmospheric Administration	National Oceanic and Atmospheric Administration. Includes the National Weather Service and the National Hurricane Center.
NYS Department of Motor Vehicles	New York State Department of Motor Vehicles is the agency responsible for motor vehicle licensing and registration.

Stakeholder	Stakeholder Description
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. Troop T, Troops B, D & G in the region.
NYSCC - New York State Canal Corporation	The New York State Canal Corporation is a subsidiary of the New York State Thruway Authority. It is responsible for operating and maintaining the New York State Canal System, which is a navigable 524-mile inland waterway that crosses upstate 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. 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. Also responsible for parking, particularly for commercial vehicles, along the Thruway.
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 region.
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.
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 region.

Stakeholder	Stakeholder Description
Regional Event Promoters	This general system represents the centers, music centers, sporting events and other venues that regularly host events that impact traffic. Specific examples in the region include: county fairs, The Boiler Maker (road race), special olympics, heart run walk, paddle fest, Cooperstown, Turning Stone (casino), etc...
Regional Hospital Organizations	Represents hospitals and trauma centers in the region. RESOURCE handles the emergency care and ambulances in the region.
Regional Multimodal Transportation Service Provider	Represents Amtrak, and inter-city bus terminals.
Regional Parking Providers	Represents parking providers and operators within the region. e.g., the City of Utica has a parking authority.
Regional School District	Each district has a bus dispatch. Coordinates resources for transportation of students.
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 regional ITS system. The operational concept documents these roles and responsibilities across a range of transportation services. The services covered by the Regional 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 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 enforce commercial vehicle regulations in the region so as to make it safer to operate a private or commercial vehicle on the regional 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
Archived Data Systems	NYSDOT - New York State Department of Transportation	Collect and archive traffic information from traffic sensors, including traffic volumes, speeds and occupancy.
		Collect and archive maintenance data including bridge and asset information
		Collect and archive transit information, such as transit fare information, passenger information, transit services, transit vehicle maintenance data, etc.
	HOCTS	Collect and archive transit information, such as transit fare information, passenger information, transit services, transit vehicle maintenance data, etc.
		Collect and archive traffic information from traffic sensors, including traffic volumes, speeds and occupancy.
Commercial Vehicle Operations	Local Public Safety Agencies	Receive spill notification for hazardous materials (HAZMAT) from private commercial fleets.
	Private Commercial Vehicle Freight and Fleet Operators	Send hazmat spill information to public safety agencies.
Emergency Management	Local Public Safety Agencies	Participate in incident response, coordination, and reporting for the regional incident and mutual aid network.
		Coordinate local evacuation and reentry efforts.
		Operate a local PSAP (public safety answering point).
		Coordinate regional disaster response and recovery.

Transportation Service	Stakeholder	Roles/ Responsibilities
		Provide incident information to the local traffic and maintenance agencies.
		Receive commercial vehicle reports of unusual activities.
		Coordinate wide area alert notifications with local traffic management agencies, emergency management agencies, maintenance and construction agencies; and local transit agencies
		Monitor and detect potential, looming, and actual disasters including natural disasters and man-made disasters.
		Coordinate emergency plans, emergency transit schedules, and the status of emergency transit systems with local transit agencies.
		Dispatch local public safety vehicles to respond to emergencies.
	Local Traffic Management	Coordinate wide area alert notifications with regional traffic management agencies; regional emergency management agencies; regional maintenance and construction agencies; and the regional transit agencies
		Coordinate regional emergency plans; evacuation and re-entry plans, and disaster management plans.
		Provide incident information to the regional traffic, maintenance, and construction agencies, as well as regional ISPs.
		Coordinate incident response and incident reports with the county sheriff/fire/EMS/EOC, local police/fire/EMS, and other public safety agencies.
		Participate in incident response, coordination, and reporting for the regional incident and mutual aid network.
		Coordinate evacuation and re-entry plans with the local EOC.
		Provide signal preemption for emergency vehicles.
	NYS Police	Dispatch New York State Police vehicles to respond to incidents in the jurisdiction.
		Provide incident information to the regional traffic, maintenance, and construction agencies, as well as regional ISPs.
		Coordinate incident response and incident reports with the county sheriff/fire/EMS/EOC, local police/fire/EMS, and other public safety agencies.
		Participate in incident response, coordination, and reporting for the regional incident and mutual aid network.
		Coordinate regional emergency plans; evacuation and re-entry plans, and disaster management plans.
	NYSDOT - New York State Department of Transportation	Coordinate evacuation and re-entry plans with the local EOC.
		Coordinate regional emergency plans; evacuation and re-entry plans, and disaster management plans.
		Provide signal preemption for emergency vehicles.
Freeway Management	NYSDOT - New York State Department of Transportation	Operate state arterial traffic information devices (e.g., DMS and HAR equipment)
		Control arterial traffic with lane control signals, including reversible lanes.

Transportation Service	Stakeholder	Roles/ Responsibilities
		Provide traffic information in a coordinated effort to the statewide traveler information system, websites and other traffic management agencies.
		Provide traffic images to other NYSDOT Regions, NYSDOT traveler information systems, and other local traffic and emergency agencies via the Video Exchange Network.
		Monitor and control traffic information devices of other traffic management agencies, such as dynamic message signs, during certain agreed upon conditions, such as specific hours or during specific emergencies.
		Collect traffic and incident information, and provide it to the media and private travelers.
		Monitor surveillance cameras on state arterials.
		Monitor traffic sensors on state arterials.
Incident Management	Local DPW	Provide maintenance resources in response to incidents on arterials.
	Local Public Safety Agencies	Coordinate operations with traffic management agencies during scheduled events.
		Coordinate incident response with other public safety agencies and traffic management agencies as appropriate.
		Dispatch public safety vehicles for incidents on arterials.
	Local Traffic Management	Coordinate operations with traffic management agencies during scheduled events.
		Coordinate maintenance resources in response to incidents with the county and municipal maintenance department, and the state regional maintenance section.
		Perform incident detection and verification for areas under its jurisdiction, and provide this information to traffic management agencies and other public safety agencies.
		Coordinate incident response with other public safety agencies and traffic management agencies as appropriate.
		Provide incident information to other traffic management and public safety agencies.
		Provide incident information to travelers via traffic information devices (e.g., dynamic message signs) on municipal and/or county operated roadways and through local or regional information service providers and website.
		Adjust signal timing patterns in response to incidents.
		Perform network surveillance for detection and verification of incidents and send traffic/incident information and traffic images to local and county public safety agencies and emergency operation centers.
	NYS Police	Coordinate incident response with other public safety agencies and traffic management agencies as appropriate.
		Dispatch state public safety vehicles for incidents on state operated roadways.
		Coordinate operations with traffic management agencies

Transportation Service	Stakeholder	Roles/ Responsibilities
		during scheduled events.
	NYSDOT - New York State Department of Transportation	Provide incident information to other traffic management and public safety agencies.
		Provide incident information to travelers via traffic information devices (e.g., dynamic message signs) on state operated roadways and through local or regional information service providers and website.
		Provide maintenance resources in response to incidents on state operated roadways.
		Adjust signal timing patterns in response to incidents.
		Perform network surveillance for detection and verification of incidents and send traffic/incident information and traffic images to local and county public safety agencies and emergency operation centers.
		Coordinate maintenance resource response to incidents within the state's jurisdiction with local public safety agencies.
Maintenance and Construction	Local DPW	Coordinate maintenance and construction activities with other county and city maintenance and the construction and maintenance section of NYSDOT and NYSTA.
		Coordinate maintenance resources for incidents with local maintenance and construction operations, NYSDOT and NYSTA.
		Manage work zones for all local maintenance and construction activities and monitor work zone safety with local DPW field equipment and vehicles.
		Provide maintenance and construction information to local traffic operations and to the traveling public through portable DMS devices.
		Perform winter road maintenance, including snowplowing and road clearing on local roadways.
		Distribute road weather information to local TOCs, local emergency management agencies, and local transit agencies.
		Receive AVL information from local DPW maintenance vehicles.
		Coordinate maintenance resources for incidents with other county and local maintenance and construction operations; NYSDOT, and NYSTA.
		Distribute maintenance and construction work plan information, and asset restrictions to local traffic agencies; regional transit providers; regional emergency services; and the media.
	NYSDOT - New York State Department of Transportation	Maintenance vehicles provide automated maintenance status information to district roadway maintenance and construction operations, as well as the region's equipment repair facility.
		Provide maintenance and construction information to regional traffic operations and to the traveling public through portable DMS devices.
		Coordinate maintenance resources for incidents with county and local maintenance and construction

Transportation Service	Stakeholder	Roles/ Responsibilities
		operations, other NYSDOT region's construction and maintenance sections, and NYSTA.
		Receive maintenance resource requests for incident response from local traffic management systems.
		Receive maintenance resource requests for incident response from county fire/EMS/sheriff, local police/fire/EMS, New York State Police and 911 emergency call centers.
		Distribute maintenance and construction work plan information, and asset restrictions to regional traffic agencies; regional transit providers; regional emergency services; and the media.
		Coordinate maintenance and construction activities with county and local maintenance, other NYSDOT region's construction and maintenance sections, and NYSTA.
		Manage work zones for all district maintenance and construction activities and monitor work zone safety with region's field equipment and vehicles.
		Receive AVL information from NYSDOT district maintenance vehicles.
		Receive road weather information from field equipment.
		Collect road weather information from field sensors.
		Distribute road weather information to local TOCs, regional emergency management agencies, regional transit agencies, and municipal maintenance sections.
		Perform winter road maintenance, including snowplowing and road clearing on state owned roadways.
		Perform maintenance on ITS field equipment owned by NYSDOT.
Surface Street Management	Local Traffic Management	Operate traffic signal systems on county-owned and/or municipal arterials.
		Monitor surveillance cameras on the surface streets.
		Provide signal preemption for emergency vehicles.
		Coordinate highway-rail intersection signal adjustments.
		Coordinate traffic information with NYSDOT and with other local traffic management agencies.
		Collect traffic data from the traffic signal system sensors.
	NYSDOT - New York State Department of Transportation	Provide signal preemption for emergency vehicles.
		Operate traffic signal systems on state, county-owned and/or municipal arterials.
		Coordinate highway-rail intersection signal adjustments.
		Collect traffic data from the traffic signal system sensors.
Transit Services	CENTRO	Provide transit schedule and fare information to private sector traveler information systems.
		Coordinate with the local traffic operations centers for traffic signal priority.
		Provide automated transit maintenance scheduling through automated vehicle condition.
		Coordinate transit schedules with other local transit agencies, particularly for transit connections at transit transfer points.

Transportation Service	Stakeholder	Roles/ Responsibilities
		Provide transit traveler information on the agency's traveler information systems and private sector traveler information services, as well as making it available on all vehicles.
		Monitor transit facilities for safety and security purposes using video surveillance and through transit user activated alarms.
		Coordinate transit security incidents with local police.
		Count the number of passengers entering and exiting a transit vehicle using sensors mounted on the vehicle and communicates the collected passenger data back to the operations center.
		Provide a demand-responsive transit plan to users/travelers via customer information systems.
		Provide automated dispatch and scheduling for the fixed-route system.
		Provide operator instructions to transit vehicles in service.
		Provide transit security on all transit vehicles through silent alarms and on-board video surveillance.
		Track and evaluate schedule performance on all transit vehicles.
		Track the location of transit vehicles.
		Provide fixed route and demand responsive transit service for the region.
		Provide transit passenger electronic fare payment capabilities on all transit vehicles and include smart card fare coordination with other regional transit agencies.
	Local Traffic Management	Provide intersection signal priority for transit vehicles.
	Local Transit Operators	Collect transit passenger information on all fixed-route vehicles.
		Provide transit passenger electronic fare payment capabilities on all transit vehicles and include smart card fare coordination with other regional transit agencies.
		Coordinate transit schedules with other local transit agencies, particularly at transit hubs and transit connection points.
		Provide fixed route and demand responsive transit service for the region.
		Track and evaluate schedule performance on all transit vehicles.
		Coordinate transit security incidents with local police.
		Count the number of passengers entering and exiting a transit vehicle using sensors mounted on the vehicle and communicates the collected passenger data back to the operations center.
		Provide a demand-responsive transit plan to users/travelers via customer information systems.
		Provide automated dispatch and scheduling for the fixed-route system.
		Track the location of transit vehicles.
		Provide transit traveler information on the agency's

Transportation Service	Stakeholder	Roles/ Responsibilities
		traveler information systems and private sector traveler information services, as well as making it available on all vehicles.
		Provide operator instructions to transit vehicles in service.
		Provide transit security on all transit vehicles through silent alarms and on-board video surveillance.
Traveler Information	Local Traffic Management	Provide maintenance and construction information to the traveling public through roadside equipment (e.g., DMS and HAR devices) and traveler information systems.
		Collect traffic and incident information, and provide it to the media and private travelers.
		Provide traffic information reports to other agencies
	NYSDOT - New York State Department of Transportation	Collect traffic and incident information, and provide it to the media and private travelers.
		Provide traffic information to travelers via website, 511 system, information service providers, and the media.
		Provide interactive traveler information, including trip planning services, through the Web site and kiosks at visitor centers, and service plazas.
		Provide traffic information reports to other agencies
		Provide maintenance and construction information to the traveling public through roadside equipment (e.g., DMS and HAR devices) and traveler information systems.

5. Systems Inventory

Each stakeholder agency, company, or group owns, operates, maintains or plans ITS systems in the region. The Mohawk Valley Regional 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).

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 "NYSDOT Region 2 TOC" and "CENTRO Transit Operations Center".

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 is 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/Sheriffs 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 Region 2 TOC) 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

Stakeholder	Element	Element Description	Status
CENTRO	CENTRO Customer Information System	Customer and traveler information systems for regional bus rapid transit operations.	Planned
	CENTRO Kiosks	Point of sale and traveler information kiosks located in regional transit facilities.	Planned
	CENTRO Transit Data Archive	This archive includes ridership, maintenance data, and operational data (e.g., route coverage) for transit properties in the region. This database can support federal reporting requirements (Section 5311). System designers may use the data to validate their work.	Existing
	CENTRO Transit Operations Center	Regional transit operations center systems. Transit center performs the dispatch function sand coordination point for transit, emergency, public safety, and traffic management.	Planned
	CENTRO Transit Security Systems	Represents on-board and fixed location security systems such as CCTV and alerting systems.	Planned
	CENTRO Transit Vehicles	Bus rapid transit vehicles.	Planned
	Regional Transit Operators Traveler Card	Transit fare payment card.	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
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
	Local Public Information Office	Represents the city and county public information offices that distribute information to the media.	Planned
HOCTS	HOCTS MPO Data Collection and Reporting System	A multimodal transportation data archive operated by the MPO for the region.	Planned
I-95 Corridor Coalition	I-95 CC Information Exchange Network	I-95 Corridor Coalition (eastern states) incident, traffic, and traveler information exchange network.	Existing
Local DPW	Local Asset Management Systems	This element represents a place-holder element for an asset management system for the municipalities within the Region (e.g. bridge restrictions, pavement management, etc.).	Planned
	Local DPW Dispatch	This includes city, county, and agency specific maintenance dispatch systems.	Existing

Stakeholder	Element	Element Description	Status
	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 SEMO 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/Sheriffs 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 Traveler Information Systems	Represents the systems operated by cities and counties to distribute local traveler information to the general public. Such information may include traffic conditions, roadway construction, and transit information.	Planned
	Other Local Traffic Control Centers	Represents adjacent traffic control centers that operate city and county ITS field equipment, including traffic signals, CCTV cameras and dynamic message signs.	Planned
Local Transit Operators	Local Transit Operators Systems	Represent regional, municipal, school district, 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

Stakeholder	Element	Element Description	Status
	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
NOAA - National Oceanic and Atmospheric Administration	National Weather Service	Service for national, regional, and local weather information.	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 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
	NY TransAlerts	System provides transportation incident alerts via e-mail and personal information devices (PDAs, phones).	Existing
	NYAlerts	Subscribers can receive warnings and emergency information via the web, cell phone, email and other technologies. The general public may subscribe via the New York State All-Hazards Alert and Notification web-based portal.	Existing
NYS Police	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 NYS Police vehicles.	Existing
NYSCC - New York State Canal Corporation	Internet Canal Advisory System (ICAS)	Alert system regarding major canal incidents and emergencies.	Existing
	NYS Canal Infrastructure Management System	Collects environmental data from field sensors, include precipitation gages and water level sensors.	Existing
	NYS Canal Precipitation Gages	Precipitation gages to measure rainfall and snowfall.	Planned
	NYS Canal Water Level Sensors	Water level sensors at key stream and reservoir locations to measure water level or stream flow.	Planned
NYSDEC - New York State Department of Environmental Conservation	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
	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 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 ITS and Traffic Signal Asset Management System	NYSDOT system manages the attributes of ITS assets.	Existing
	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 collect "Photolog" information, which is a series of photos of the state highway system.	Existing
	NYSDOT Maintenance Asset Management Information System (MAMIS)	Roadway asset and maintenance work order management system.	Existing

Stakeholder	Element	Element Description	Status
	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 Public Information Office	NYSDOT Main Office Public Information Officer distributes information to media.	Existing
	NYSDOT Region 2 Maintenance	Represents the dispatch function for maintenance and construction for routine and emergency road maintenance.	Existing
	NYSDOT Region 2 Public Information Office	NYSDOT regional public information office distributes information to media.	Existing
	NYSDOT Region 2 TOC	Traffic Operations Center (TOC) to monitor, control and operation of roadways using ITS devices such as CCTV, DMS, and traffic signals. The traffic operations centers perform traffic incident management functions and coordination with emergency responders.	Existing
	NYSDOT Region 9 TOC	Traffic Operations Center (TOC) for control and operation of roadways using ITS devices such as CCTV, DMS, and traffic signals, and ramp meters in NYSDOT Region 9. Located in Binghamton.	Planned
	NYSDOT Rest Areas/Truck Stops/Service Plaza Kiosks	Kiosks at rest areas and visitor centers. Tourist information, emergency evacuation information, and general traffic information could be provided in the future.	Planned
	NYSDOT Road Weather Information System (RWIS)	NYSDOT road weather information system performs data collection from environmental sensor stations in the field and maintenance vehicles.	Existing
	NYSDOT Speed Sensors	Represents the field equipment that monitors vehicle speeds for enforcement purposes or to advise motorists of their current speeds.	Planned
	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

Stakeholder	Element	Element Description	Status
	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 Sensors	Real-time traffic count, volume, occupancy, and speed monitoring equipment.	Existing
	NYSDOT Traffic Signals	Signal controllers operated and maintained by NYSDOT.	Existing
	NYSDOT Transit Service Information Portal (TSIP)	New York statewide information exchange system and archive for schedule, ridership, and fare information.	Planned
	Other NYSDOT Regional TOCs	Represents traffic operations centers in under NYSDOT regions that operate ITS field equipment, including traffic signals, CCTV cameras and dynamic message signs, on state roadways. This includes NYSDOT Region 9 TOC.	Existing
NYSTA - New York Thruway Authority	NYSTA Operations and Maintenance	Represents the dispatch function for Thruway maintenance and construction vehicles for routine and emergency road maintenance.	Existing
	NYSTA Thruway Statewide Operations Center (TSOC)	Thruway statewide management center that coordinates information and local Thruway operations center activities.	Existing
	NYSTA TransAlert	System provides transportation incident alerts via e-mail and personal information devices (PDAs, phones).	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 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

Stakeholder	Element	Element Description	Status
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
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 Event Promoters	Regional Event Promoters	Represents statewide and regional event information systems.	Planned
Regional Hospital Organizations	RESOURCE	Based out of St. Lukes hospital, RESOURCE determines which hospital is available or appropriate for medical emergencies in the region.	Existing
Regional Multimodal Transportation Service Provider	Regional Rail and Bus Terminals	Represents Amtrak and inter-city bus terminals.	Planned
Regional School District	School Bus Dispatch	Provides dispatch function for the region's school buses.	Planned
	School Buses	Represents the ITS equipment installed on school buses. General ITS capabilities are included here, omitting fare management capabilities, but with increased emphasis on the positive identification of students on the buses.	Planned

Stakeholder	Element	Element Description	Status
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

5.2. Systems by Architecture Entity

Each element in the Mohawk Valley Regional ITS Architecture inventory is mapped to one or more entities from the National ITS Architecture. In Version 6.1 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 the Regional 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 regional ITS architecture interfaces. Secondly, it allows the elements of the Regional 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 Regional 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: 10
- Emergency Management: 15
- Information Service Providers: 19
- Maintenance and Construction Management: 10
- Roadway Subsystem: 10
- Traffic Management: 10
- Transit Management: 4

Table 5. Element Inventory Sorted by Entity

Entity	Element	Stakeholder
Archived Data Management Subsystem	CENTRO Transit Data Archive	CENTRO
	HOCTS MPO Data Collection and Reporting System	HOCTS
	Local Transit Operators Transit Data Archives	Local Transit Operators
	NYS DMV Accident Reporting System	NYS Department of Motor Vehicles
	NYS Police Safety and Accident System	NYS Police
	NYSDOT Bridge Management System	NYSDOT - New York State Department of Transportation
	NYSDOT Infrastructure Restrictions Database	NYSDOT - New York State Department of Transportation
	NYSDOT Main Office Highway Data Services	NYSDOT - New York State Department of Transportation
	NYSDOT Statewide Operations Center Archive Management System	NYSDOT - New York State Department of Transportation
	NYSDOT Transit Service Information Portal (TSIP)	NYSDOT - New York State Department of Transportation
Archived Data User Systems	Archived Data User Systems	Archived Data Users
Asset Management	Local Asset Management Systems	Local DPW
	NYSDOT ITS and Traffic Signal Asset Management System	NYSDOT - New York State Department of Transportation
Care Facility	RESOURCE	Regional Hospital Organizations
Commercial Vehicle Subsystem	Commercial Vehicles	Private Commercial Vehicle Freight and Fleet Operators
Emergency Management	CENTRO Transit Operations Center	CENTRO
	Local 911 Call Centers	Local Public Safety Agencies
	Local EOC	Local Public Safety Agencies
	Local Fire/EMS Dispatch	Local Public Safety Agencies
	Local Police/Sheriffs Dispatch	Local Public Safety Agencies
	New York State Disaster LAN	NYS Emergency Management Office (SEMO)
	New York State Emergency Operations Center (SEMO)	NYS Emergency Management Office (SEMO)
	NYS Police Dispatch	NYS Police
	NYSDEC Regional Office	NYSDEC - New York State Department of Environmental Conservation
	NYSDOT Region 2 TOC	NYSDOT - New York State Department of Transportation
	NYSDOT Statewide Information Exchange Network (IEN)	NYSDOT - New York State Department of Transportation
	NYSDOT Statewide Transportation Information Coordination Center (STICC)	NYSDOT - New York State Department of Transportation
	NYSTA Thruway Statewide Operations Center (TSOC)	NYSTA - New York Thruway Authority
	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

Entity	Element	Stakeholder
	NYS Police Vehicles	NYS Police
	NYSDOT HELP Vehicles	NYSDOT - New York State Department of Transportation
Enforcement Agency	Local Police/Sheriffs Dispatch	Local Public Safety Agencies
	NYS Police Dispatch	NYS Police
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 - New York State Department of Transportation
	CENTRO Customer Information System	CENTRO
	I-95 CC Information Exchange Network	I-95 Corridor Coalition
	Internet Canal Advisory System (ICAS)	NYSCC - New York State Canal Corporation
	Local Public Information Office	Government Agencies
	Local Traveler Information Systems	Local Traffic Management
	NY TransAlerts	NYS Emergency Management Office (SEMO)
	NYAlerts	NYS Emergency Management Office (SEMO)
	NYSDOT Public Information Office	NYSDOT - New York State Department of Transportation
	NYSDOT Region 2 Public Information Office	NYSDOT - New York State Department of Transportation
	NYSDOT Statewide Information Exchange Network (IEN)	NYSDOT - New York State Department of Transportation
	NYSDOT Statewide Video Exchange Network (VEN)	NYSDOT - New York State Department of Transportation
	NYSDOT Transit Service Information Portal (TSIP)	NYSDOT - New York State Department of Transportation
	NYSTA Thruway Statewide Operations Center (TSOC)	NYSTA - New York Thruway Authority
	NYSTA TransAlert	NYSTA - New York Thruway Authority
	Private Traveler Information Systems	Private Traveler Information Providers
	Private Weather Service Systems	Private Weather Service Providers
	TRANSCOM RA Servers	TRANSCOM
	TRANSCOM TRIPS123	TRANSCOM
Maintenance and Construction Administrative Systems	NYSDOT Maintenance Asset Management Information System (MAMIS)	NYSDOT - New York State Department of Transportation
Maintenance and Construction Management	Local DPW Dispatch	Local DPW
	Local Traffic Control Center	Local Traffic Management
	NYS Canal Infrastructure Management System	NYSCC - New York State Canal Corporation

Entity	Element	Stakeholder
	NYSDOT Region 2 Maintenance	NYSDOT - New York State Department of Transportation
	NYSDOT Region 2 TOC	NYSDOT - New York State Department of Transportation
	NYSDOT Statewide Information Exchange Network (IEN)	NYSDOT - New York State Department of Transportation
	NYSTA Operations and Maintenance	NYSTA - New York Thruway Authority
	NYSTA Thruway Statewide Operations Center (TSOC)	NYSTA - New York Thruway Authority
	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 - New York State Department of Transportation
Media	Private Newspaper, Television, and Radio Stations	Private News Media
Multimodal Transportation Service Provider	Regional Airports	Regional Airport Authorities
	Regional Rail and Bus Terminals	Regional Multimodal Transportation Service Provider
Personal Information Access	Private Traveler Information Device	Private Travelers
Remote Traveler Support	CENTRO Kiosks	CENTRO
	CENTRO Transit Security Systems	CENTRO
	NYSDOT Rest Areas/Truck Stops/Service Plaza Kiosks	NYSDOT - New York State Department of Transportation
Roadway Subsystem	Local Traffic Field Equipment	Local Traffic Management
	NYS Canal Precipitation Gages	NYSCC - New York State Canal Corporation
	NYS Canal Water Level Sensors	NYSCC - New York State Canal Corporation
	NYSDOT CCTV	NYSDOT - New York State Department of Transportation
	NYSDOT Motorist Information Systems	NYSDOT - New York State Department of Transportation
	NYSDOT Road Weather Information System (RWIS)	NYSDOT - New York State Department of Transportation
	NYSDOT Speed Sensors	NYSDOT - New York State Department of Transportation
	NYSDOT Traffic Count Stations	NYSDOT - New York State Department of Transportation
	NYSDOT Traffic Sensors	NYSDOT - New York State Department of Transportation
	NYSDOT Traffic Signals	NYSDOT - New York State Department of Transportation
Security Monitoring Subsystem	NYSDOT Infrastructure Security Monitoring Equipment	NYSDOT - New York State Department of Transportation

Entity	Element	Stakeholder
Surface Transportation Weather Service	Clarus	CLARUS
	National Weather Service	NOAA - National Oceanic and Atmospheric Administration
	NYSDOT Maintenance Decision Support System (MDSS)	NYSDOT - New York State Department of Transportation
	Private Weather Service Systems	Private Weather Service Providers
Traffic Management	I-95 CC Information Exchange Network	I-95 Corridor Coalition
	Local Traffic Control Center	Local Traffic Management
	NYSDOT Region 2 TOC	NYSDOT - New York State Department of Transportation
	NYSDOT Region 9 TOC	NYSDOT - New York State Department of Transportation
	NYSDOT Statewide Information Exchange Network (IEN)	NYSDOT - New York State Department of Transportation
	NYSDOT Statewide Transportation Information Coordination Center (STICC)	NYSDOT - New York State Department of Transportation
	NYSDOT Statewide Video Exchange Network (VEN)	NYSDOT - New York State Department of Transportation
	NYSTA Thruway Statewide Operations Center (TSOC)	NYSTA - New York Thruway Authority
	Other NYSDOT Regional TOCs	NYSDOT - New York State Department of Transportation
	TRANSCOM RA Servers	TRANSCOM
Transit Management	CENTRO Transit Operations Center	CENTRO
	Local Transit Operators Systems	Local Transit Operators
	NYSDOT Transit Service Information Portal (TSIP)	NYSDOT - New York State Department of Transportation
	School Bus Dispatch	Regional School District
	TRANSCOM TRIPS123	TRANSCOM
Transit Vehicle Subsystem	CENTRO Transit Vehicles	CENTRO
	Local Transit Vehicles	Local Transit Operators
	School Buses	Regional School District
Traveler Card	Regional Transit Operators Traveler Card	CENTRO
Vehicle	Commercial Vehicles	Private Commercial Vehicle Freight and Fleet Operators
	NYSDOT Maintenance Vehicles	NYSDOT - New York State Department of Transportation
	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 region 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 region. 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 region.

Table 6. Selected Regional Market Packages

Market Package	Market Package Name	Status
AD1	ITS Data Mart	Existing
AD2	ITS Data Warehouse	Planned
APTS01	Transit Vehicle Tracking	Planned
APTS02	Transit Fixed-Route Operations	Planned
APTS03	Demand Response Transit 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
ATIS02	Interactive Traveler Information	Existing
ATMS01	Network 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
ATMS13	Standard Railroad Grade Crossing	Planned
ATMS19	Speed Monitoring	Planned
CVO10	HAZMAT Management	Planned
EM01	Emergency Call-Taking and Dispatch	Existing
EM02	Emergency Routing	Existing
EM03	Mayday and Alarms Support	Planned
EM04	Roadway Service Patrols	Planned
EM05	Transportation Infrastructure Protection	Planned

Market Package	Market Package Name	Status
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
MC03	Road Weather Data Collection	Existing
MC04	Weather Information Processing and Distribution	Existing
MC06	Winter Maintenance	Planned
MC07	Roadway Maintenance and Construction	Planned
MC08	Work Zone Management	Existing
MC09	Work Zone Safety Monitoring	Planned
MC10	Maintenance and Construction Activity Coordination	Planned
MC11	Environmental Probe Surveillance	Planned

Traffic Incident Management, identified as ATMS08 in the above table, is one of the key services that are planned in the region, 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 Mohawk Valley Regional ITS Architecture.

7. Interfaces and Information Exchanges

7.1. 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 region, as well as connections to state and 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.

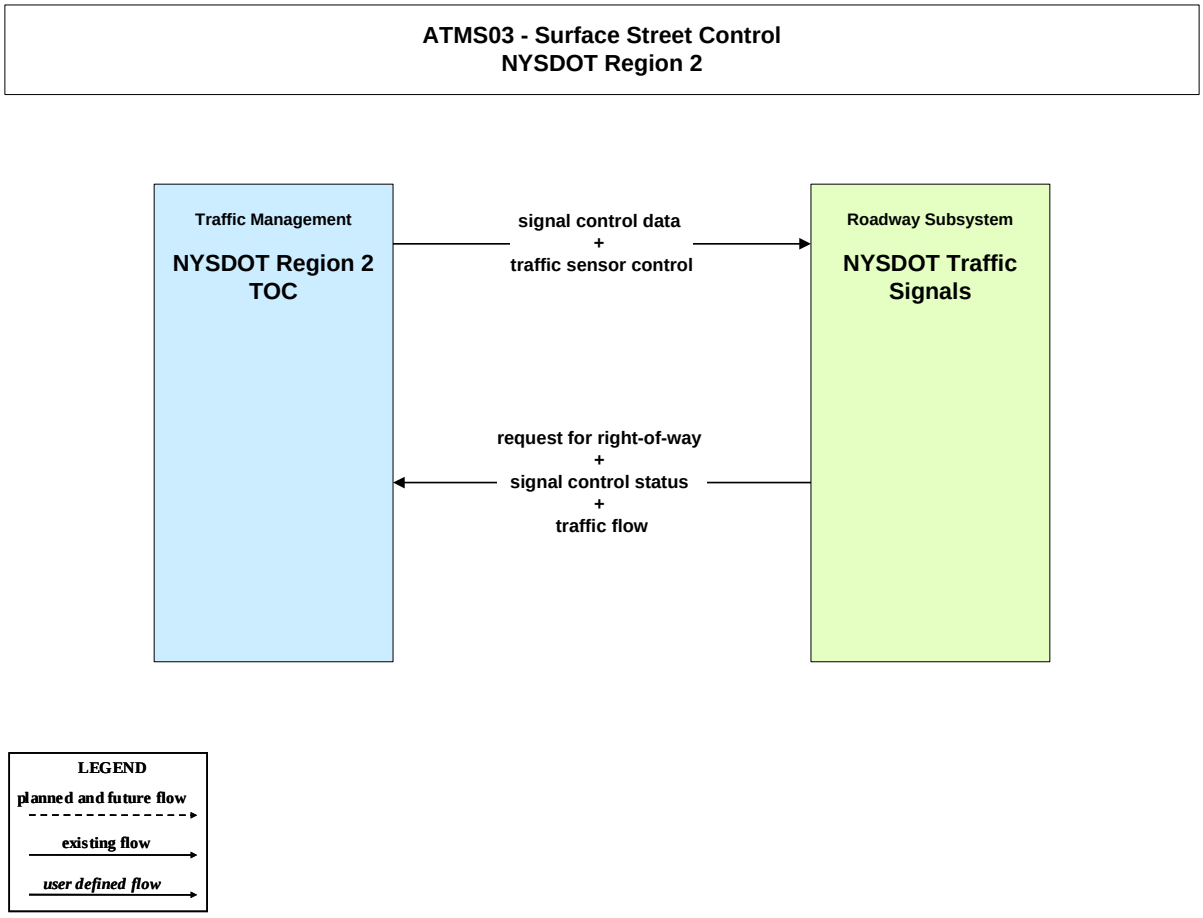


Figure 5. Example Customized Market Package

Figure 5 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 Mohawk Valley Regional ITS Architecture can be found on the Architecture web page by selecting the "Services" button on the left side menu bar. On the page the market packages

are organized by Area (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 region 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.

7.2. Regional Architecture Information Flows

While it is important to identify the various systems and stakeholders as part of a regional ITS architecture, a primary purpose of the architecture is to identify the *connectivity* between transportation systems in the region. The interconnect (sausage) diagrams (shown previously in **Error! Reference source not found.**) 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 96 different elements identified as part of the Mohawk Valley Regional ITS Architecture. These elements include local and NYSDOT 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 region's intelligent transportation system. Interfaces have been defined for each element in the architecture. For example, the NYSDOT Region 2 TOC has existing or planned interfaces with 34 other elements in the region ranging from field equipment to transit centers. Some of the interfaces are far less complex. For example the Centro Transit Data Archive has only a single interface with the CENTRO Transit Operations Center. The Mohawk Valley Regional ITS Architecture defines a total of 296 interfaces from one element to another.

Elements and their interfaces are accessible via the Mohawk Valley Regional ITS Architecture web page by clicking on the "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, the current status of the element, who the stakeholder is, and the other elements with which the selected element interfaces with. Figure 7 below is an example of part of the element detail page for the NYSDOT Region 2 TOC. By clicking on (selecting) an interfacing element, more detailed information about the particular interface is pulled up (e.g. architecture flows).

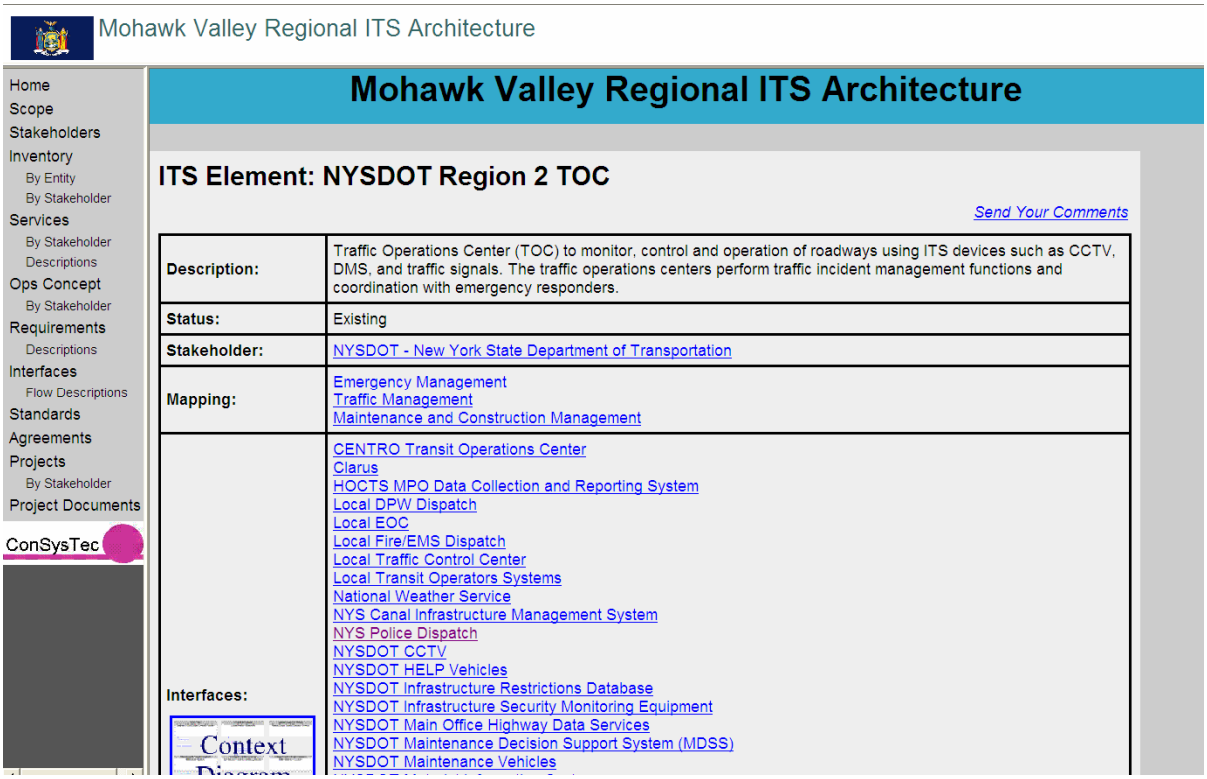


Figure 6. Example of Element Detail Showing Interfaces

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 Regional ITS Architecture. Considering a source element, architecture flow, destination element triplet, the Mohawk Valley Regional ITS Architecture defines 1328 of these triplets.

An example of architecture flows between two elements is shown in Figure 7. In this interface, the architecture flows that go between the NYSDOT Region 2 TOC and the NYS Police Dispatch are shown. Although both the NYSDOT Region 2 TOC 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 Mohawk Valley Regional ITS Architecture web page by following the instructions listed previously. Specifically, the user can click on the "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 7. Selecting any of the architecture flows will provide a definition, and any standards associated with that architecture flow are noted.

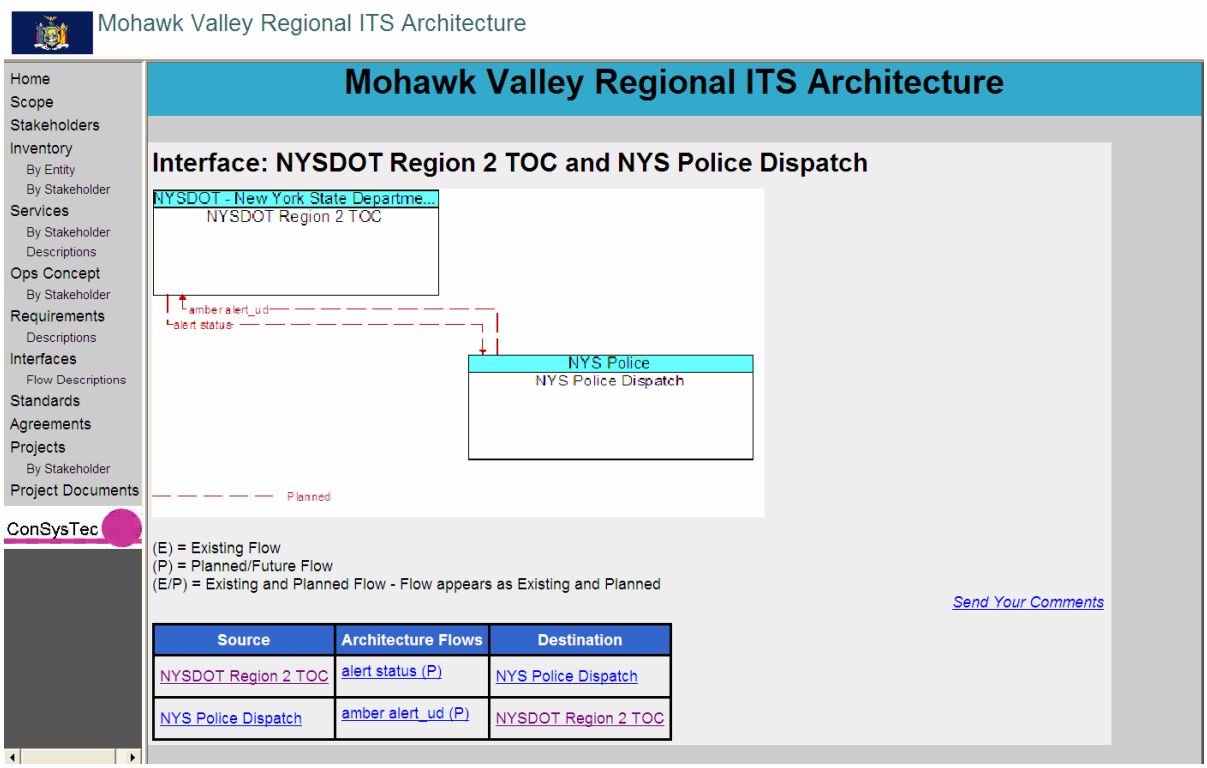


Figure 7. Example of Architecture Flows Between Elements

8. Using the Mohawk Valley Regional ITS Architecture

So far, the previous sections of the document defined the components that make up the Mohawk Valley Regional 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. Planning processes are used to identify projects whose implementation will respond to the region's needs. These projects are placed in programming documents such as a Transportation Improvement Program (TIP) in order to secure funding for the projects. Once funded, the projects are implemented. The Mohawk Valley Regional ITS Architecture supports all three of these major steps – planning, programming, and implementation.

The ITS Architecture links planning 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 is the final step in the process that begins with defining transportation needs, mapping these to services, defining an ITS architecture that supplies the services, and then identifying projects in the planning process to supply the services. The overarching goal of the ITS architecture development process is that this process 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.

One key to this process 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 as a part of ITS, considering the dependencies of one system on another or one project on another is an important aspect of project development. One benefit of architecture is that it allows the users to have a high level functional view of the

transportation system, which makes it possible to understand 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

The Mohawk Valley Regional ITS Architecture was created based on the needs for the region over the next 10 years. The ITS architecture identifies which systems operated by agencies in the region should be interfaced to maximize integration opportunities throughout the region. Based on the existing and future needs within the region, the first step of the process was to identify existing or future deployment opportunities throughout the region. The initial source of projects was the NYSDOT Region 2 Draft ITS Plan.

Stakeholders then were asked to identify additional projects that did not appear in the draft ITS Plan, but were important in the development and integration of ITS throughout the region.

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 (0-3 years), medium term (3-5 years), and long term (5-10 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 Mohawk Valley Regional ITS Architecture (through customized market package prioritization).

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 7. 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.
- **Project Geographic Scope.** A short description of the geographic area covered by the project.
- **Market Packages.** Maps the proposed ITS project to one or more transportation service(s) (customized market package) identified in the Mohawk Valley Regional ITS Architecture.

Table 7. ITS Projects

ID	Project Name	Category	Lead Stakeholder	Project Description	Timeframe	Project Geographic Scope	Market Packages
1	TSM - ITS Project 7	ATMS	NYSDOT	Dynamic Message Signs	ShortTerm	Route 1-790 and NYS Route 5/8/12, Utica	ATMS06-1
2	Utica Signal System Upgrade - Phase 1	ATMS	City of Utica	Update existing traffic signal system.	Short-Term	City of Utica.	ATMS03-2
3	Utica Signal System Upgrade - Phase 2	ATMS	City of Utica	Update existing traffic signal system.	Medium Term	City of Utica.	ATMS03-2
4	CENTRO ITS	APTS	CENTRO	Implementation of an ITS system for CENTRO. This project will add AVL equipment on CENTRO buses.	Short Term		APTS01-1
5	CENTRO ITS - Security Upgrades	APTS	CENTRO	Upgrade security equipment on CENTRO transit vehicles, including addition of cameras.	Medium Term		APTS05-1
6	Birnie Bus - Vehicle Upgrades	APTS	Birnie Bus	Addition of AVL equipment on transit buses.	Medium Term		APTS01-2
7	NYSTA Regional Coordination	ATMS	NYSDOT	Project to make CCTV camera images, dynamic message sign information and TRANSMIT data available to NYSDOT Region 2 TOC.	Short Term		ATMS07-1, ATMS07-2
8	Archive Warehouse	ADMS	HOCTS	Project to develop a transportation data archive warehouse for the region.	Medium Term	Mohawk Valley	AD2-3
9	Routes 5/8/12 ITS Improvements	ATMS	NYSDOT	Deploy ITS devices along state roadway.	Short Term	I-790 to Rte 840, Oneida County, City of Utica, Town of New Hartford.	ATMS01-1, ATMS03-1, ATMS06-1
10	Route 5A ITS Improvements	ATMS	NYSDOT	Deploy ITS devices along state roadway.	Short Term	Rte 5 to Henderson St, Oneida County, Town of New Hartford.	ATMS01-1

ID	Project Name	Category	Lead Stakeholder	Project Description	Timeframe	Project Geographic Scope	Market Packages
11	Route 5S ITS Improvements	ATMS	NYSDOT	Deploy ITS devices along state roadway.	Short Term	Route 5S, Broad St. to Schuyler St., City of Utica, Oneida County	ATMS01-1, ATMS03-1
12	Route 365 ITS Improvements	ATMS	NYSDOT	Deploy ITS devices along state roadway.	Existing and Short Term	Patrick Rd to Rte 31, Town of Vernon, Oneida County.	ATMS01-1, ATMS06-1
13	Route 69 (Town of Whitesboro) ITS Improvements	ATMS	NYSDOT	Deploy ITS devices along state roadway.	Short Term	Route 69, Whitestown Plaza to Westmoreland Rd., Town of Whitesboro, Oneida County.	ATMS01-1, ATMS03-1
14	Route 5 (Village of Herkimer) ITS Improvements	ATMS	NYSDOT	Deploy ITS devices along state roadway.	Short Term	Route 5, WalMart to Protection Ave., Village of Herkimer, Oneida County.	ATMS01-1
15	Route 30 ITS Improvements	ATMS	NYSDOT	Deploy ITS devices along state roadway.	Short Term	Route 30, City Line to Maple Avenue, Town of Amsterdam, Montgomery County.	ATMS01-1
16	Route 30A ITS Improvements	ATMS	NYSDOT	Deploy ITS devices along state roadway.	Short Term	Route 30A, Briggs St. to Townsend, Town of Johnstown, Fulton County.	ATMS01-1, ATMS03-1
17	Route 46/49/69 Erie Blvd ITS Improvements	ATMS	NYSDOT	Deploy ITS devices along state roadway.	Short Term	Route 46/49/69 Erie Blvd, S. madison Str to Rte 46 Black River Blvd, City of Rome, Oneida County	ATMS01-1, ATMS03-1

ID	Project Name	Category	Lead Stakeholder	Project Description	Timeframe	Project Geographic Scope	Market Packages
18	Route 46 (Oneida County) ITS Improvements	ATMS	NYSDOT	Deploy ITS devices along state roadway.	Short Term	Route 46, E. Dominick St to Chestnut St. City of Rome, Oneida County.	ATMS01-1, ATMS03-1
19	Route 46 (Madison County) ITS Improvements	ATMS	NYSDOT	Deploy ITS devices along state roadway.	Short Term	Route 46, Glenwood Plaza to Route 5, City of Oneida, Madison County	ATMS01-1, ATMS03-1
20	Route 5 and 30 ITS Improvements	ATMS	NYSDOT	Deploy ITS devices along state roadway.	Medium Term	Routes 5 and 30, from Route 5 to Route 67, City of Amsterdam, Montgomery County.	ATMS01-1, ATMS03-1
21	Route 69 (City of Rome) ITS Improvements	ATMS	NYSDOT	Deploy ITS devices along state roadway.	Medium Term	Route 69, From W. Dominick Street to WalMart, City of Rome, Oneida County.	ATMS01-1
22	Route 5 (Town of New Hartford) ITS Improvements	ATMS	NYSDOT	Deploy ITS devices along state roadway.	Short Term	Route 5, From Genesee St to Woods Highway, Town of New Hartford, Oneida County.	ATMS01-1, ATMS03-1
23	Route 5 and 30A ITS Improvements	ATMS	NYSDOT	Deploy ITS devices along state roadways.	Long Term	Routes 5 and 30A, from I-90 to Broadway, Village of Fonda, Montgomery County.	ATMS01-1, ATMS03-1
24	Middle Settlement Road ITS Improvements	ATMS	NYSDOT	Deploy ITS devices along state roadway.	Short Term	Middle Settlement Road, between Clinton Street and Rt 840 WB off-ramp, Town of New Hartford, Oneida County.	ATMS01-1, ATMS03-1

ID	Project Name	Category	Lead Stakeholder	Project Description	Timeframe	Project Geographic Scope	Market Packages
25	Route 365A (Route 5-Lowes) ITS Improvements	ATMS	NYSDOT	Deploy ITS devices on state roadways.	Short Term	Route 365A, from Route 5 to Lowes, City of Oneida, Madison County.	ATMS01-1, ATMS03-1
26	Route 365A (Route 365 to Willow Av) ITS Improvements	ATMS	NYSDOT	Deploy ITS devices on State roadways.	Short Term	Route 365A, Route 365 to Willow Avenue, City of Oneida, Madison County.	ATMS01-1, ATMS03-1
27	Route 49 ITS Improvements	ATMS	NYSDOT	Deploy ITS devices on State roadways.	Long Term	Route 49, between Route 825 to Routes 5/8/12, Cities of Rome and Utica and Town of March, Oneida County.	ATMS01-1, ATMS06-1
28	Route 49/365 ITS Improvements	ATMS	NYSDOT	Deploy ITS devices on State roadways.	Long Term	Routes 49/265, between James Street and Route 825, City of Rome, Oneida County.	ATMS01-1, ATMS06-1
29	Route 28 ITS Improvements	ATMS	NYSDOT	Deploy ITS Devices on State roadways.	Long Term	Route 28, between Tendera to Eagle Bay, Town of Webb, Herkimer County.	ATMS01-1, MC03-1
30	Route 20 ITS Improvements	ATMS	NYSDOT	Deploy ITS devices on State roadways.	Long Term	Route 20, between Route 12 and Route 8, Town of Sangerfield, Oneida County.	ATMS01-1, MC03-1

8.1.2. How to Use the Projects

The recommended ITS project sequencing (Table 7 above) should be used as an input to the planning process, whether at the statewide level (as part of the development of the Statewide TIP), or at a regional level (as part of the development of the TIP for the regional MPO). The planning process allocates ITS projects funding in coordination with other transportation projects.

As displayed in Table 8 the projects defined relate to a range of timeframes from short to long. 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, it is likely that many, if not all of the short-term projects are already in the STIP/ TIP/ or Capital Plans.

The key question stakeholders may ask is, "Now that we have a list of 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 project 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 additional 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 region. 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 is 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?). Table 7 should be used as a guide to which agencies/systems and interfaces should be considered during the discussion and design phase for project implementation.

8.1.3. 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 Mohawk Valley Regional 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.

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 Mohawk Valley Regional 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 6.1 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 are 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 Mohawk Valley Regional 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 "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 NYSDOT Motorist Information Systems element has the following equipment packages assigned to it:

- Roadway Traffic Information Dissemination
- Roadway Equipment Coordination
- Roadway Work Zone Traffic Control

Under each equipment package is a customized list of functional requirements that apply to the element. Selecting one of the Equipment Package links takes you to a page that provides a definition of the Equipment Package, the list of elements mapped to that Equipment Package, and the full set of requirements identified for that Equipment Package in the National ITS Architecture.

8.3. Standards

The following subsections provide a short discussion of ITS standards and their relation to the Regional ITS Architecture.

8.3.1. Discussion of Key Standards for the Region

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 8 shows those interfaces in the National ITS Architecture that is addressed by one ore more family of ITS Standards.

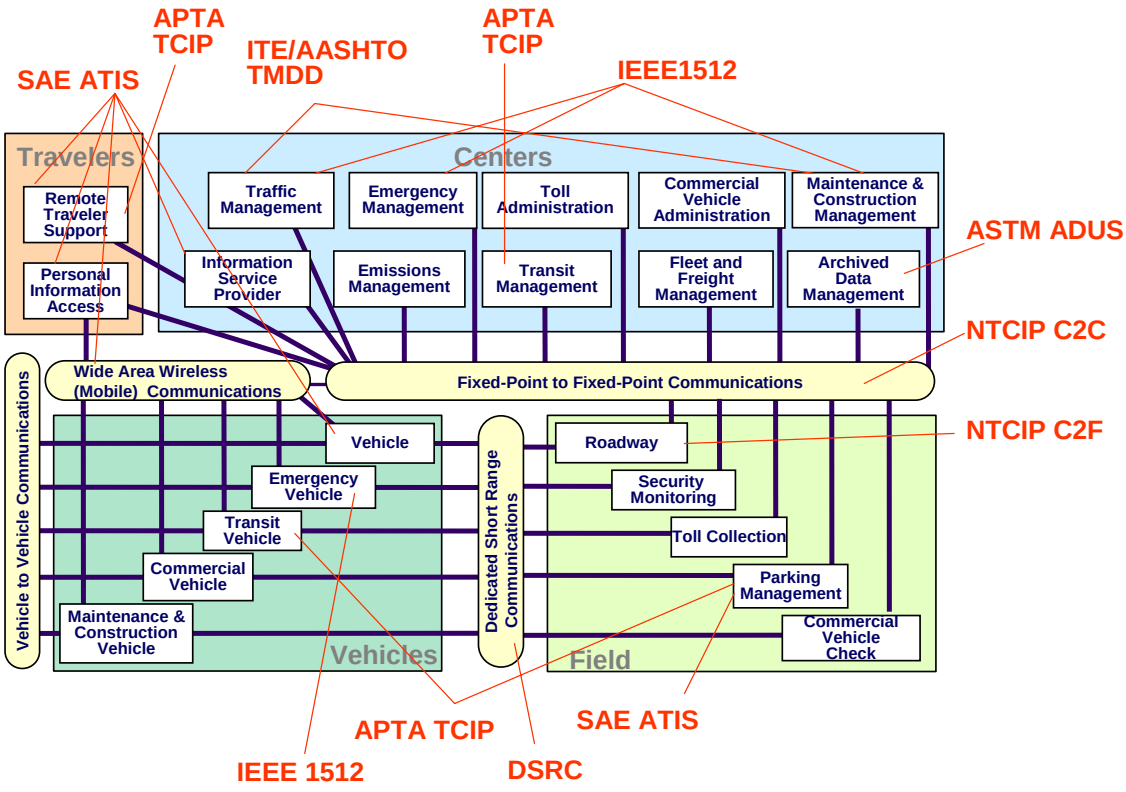


Figure 8. Relationship between the National ITS Architecture and ITS Standards

Use of ITS standards is very important to project development in the Mohawk Valley region. Table 10, below identifies the ITS standards that are potentially applicable to the region. 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 of the selected flows.

The following section explains how to identify the specific applicable standards for an individual interface. The table lists the name of the standard in the first column and the Standards Development Organization (SDO) and number of the standard in the second column. Regular updates of SDO activities will help ensure that the latest standards are utilized. The SDOs listed in the following 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 8. Applicable ITS Standards

SDO	Standard Title	Standard Doc ID
AASHTO/ITE	Traffic Management Data Dictionary (TMDD) and Message Sets for External TMC Communication (TMDD and MS/ETMCC)	ITE TMDD
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

SDO	Standard Title	Standard Doc ID
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 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 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 Common Traffic Incident Management Message Sets for Use in Entities External to Centers	IEEE P1512.4
SAE	Dedicated Short Range Communications (DSRC) Message Set Dictionary	SAE J2735

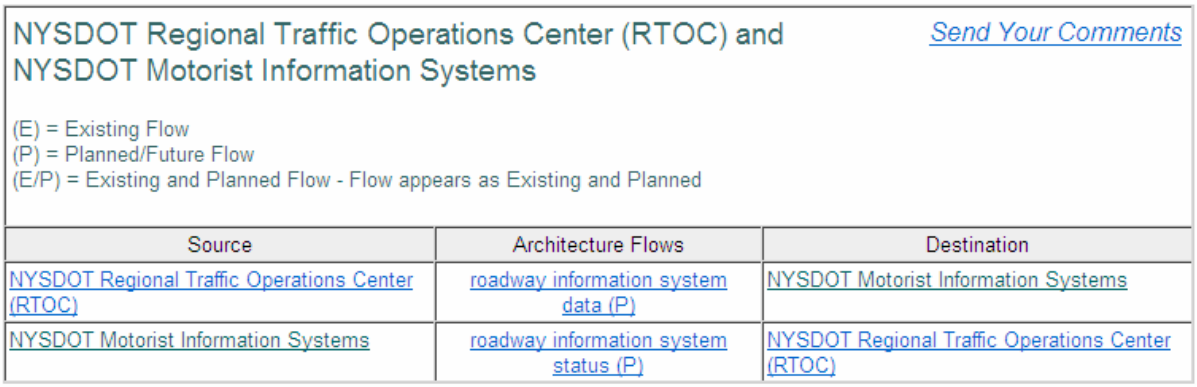
8.3.2. Reference to the Detailed Standards information on the Web Site

The previous section provides a general discussion of ITS standards and identifies those ITS standards that may be applicable in the region based on the Regional 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 9. 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 10.



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 9. 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 10. 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 Regional 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 Regional 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 Regional 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 region. 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 9 identifies types of potential agreements that could be used by agencies in the region. 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 9. 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 Regional ITS Architecture, and should be updated periodically as part of the overall maintenance plan. During the initial review of the Regional 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 10 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 10. 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 Regional 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 "left" side of the diagram, the NYSDOT Statewide Information Exchange Network (IEN) is sharing information with NYSDOT Regional 2 TOC, NYSDOT Region 9 TOC, the NYSDOT Statewide Transportation Information Coordination Center (STICC), and the NYSTA Thruway Statewide Operations Center (TSOC). Between the NYSDOT IEN and the NYSDOT Regional TOCs 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.

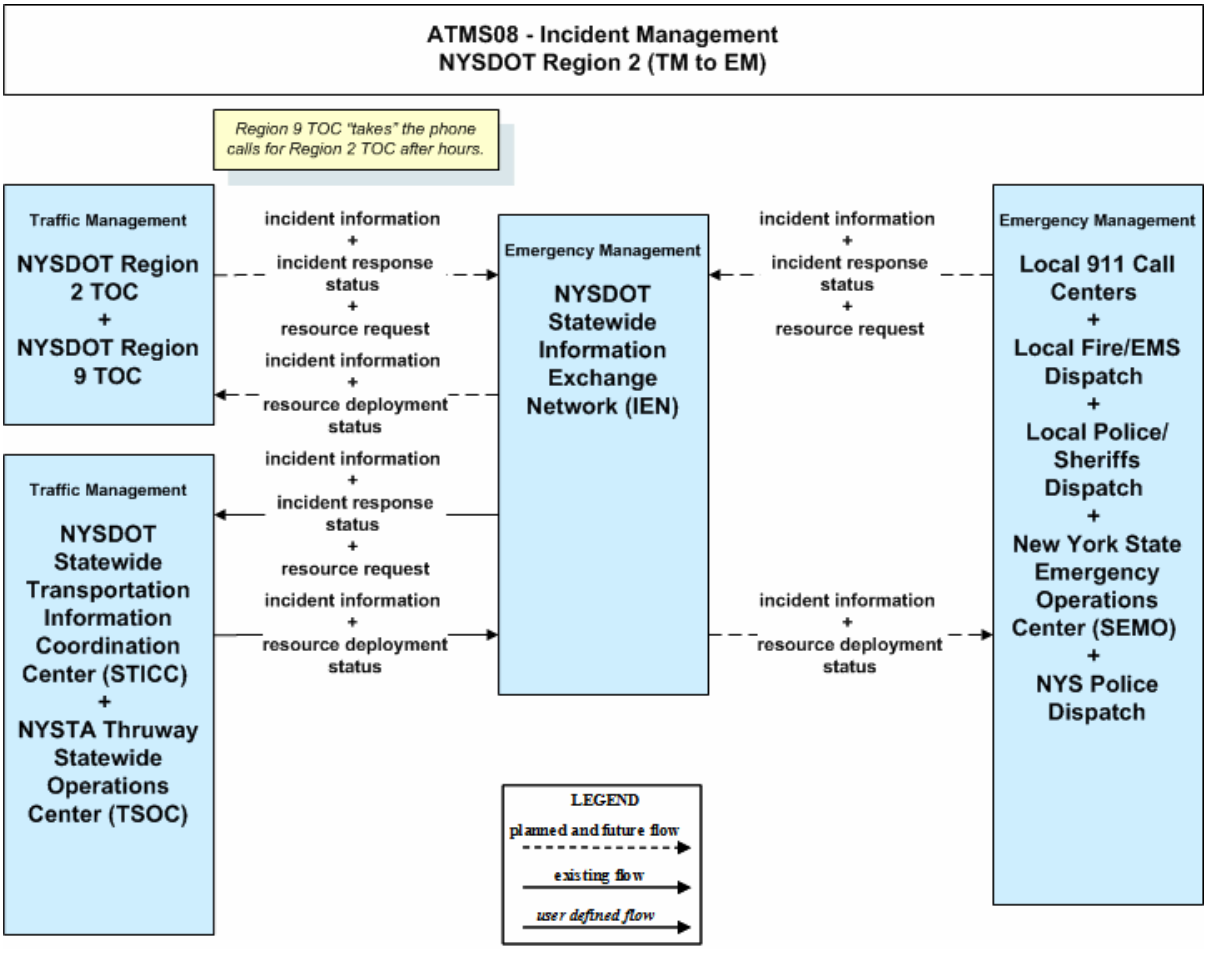


Figure 11. Example Market Package – ATMS08

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 stakeholders, 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 "right" side of the diagram may require new institutional agreements.

Each market package identified in the Regional ITS Architecture and selected as a "high priority market package" was analyzed using the same methodology as described above. Table 11 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 11. Institutional Agreements

Priority Service	Potential Parties to Agreement	Purpose
Archive Data	NYS Police, NYS DMV	Provide crash and incident information
	Local Traffic Management NYSDOT, NYSTA, HOCTS	Provide traffic archive information
	CENTRO, NYSDOT, Local Transit Operators, HOCTS	Provide transit archive information
	HOCTS, NYSDOT, NYSTA	Archive coordination
	NYSDOT, NYSTA, Local DPW, HOCTS	Maintenance and construction archive data
Commercial Vehicle Operations	NYCDEC, Local Public Safety Agencies	Coordinate HAZMAT responses
Emergency Management	Local DPW, Local Public Safety Agencies, Local Traffic Management, Local Transit Operators, 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
	Local Public Safety Agencies, NYS Police, NYSDOT	Provide emergency signal preemption
	Local DPW, Local Public Safety Agencies, Local Traffic Management, Local Transit Operators, NYS Police, NYSDOT, NYSTA	Coordinate incident and threat information

Priority Service	Potential Parties to Agreement	Purpose
	Local Public Safety Agencies, Local Traffic Management, NYS Police, NYSDOT, NYSTA	Share secure area sensor and surveillance control
	Local Public Safety Agencies, Local Traffic Management, 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 Police, NYSDOT, NYSTA	Share incident information and maintenance and construction resources
	Regional Event Promoters, Local Public Safety Agencies, Local Traffic Management, NYS Police, NYSDOT, NYSTA	Provide event plan information
	Local DPW, NYSDOT, NYSTA	Coordinate maintenance and construction resources
Traffic Management	CENTRO, 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	CENTRO, Local Traffic Management, Local Transit Operators, NYSDOT	Share road network conditions
	CENTRO, Local Transit Operators, NYSDOT	Sharing transit schedule and fare information
	CENTRO, Local Traffic Management, Local Transit Operators, NYSDOT, NYSTA	Sharing roadway maintenance and work zone information
Traveler Information	CENTRO, Local DPW, Local Public Safety Agencies, Local Traffic Management, Local Transit Operators, NYS Police, NYSDOT, NYSTA	Sharing incident data for broadcast

Priority Service	Potential Parties to Agreement	Purpose
	CENTRO, 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	CENTRO, Local DPW, Local Public Safety Agencies, Local Traffic Management, NYS Police, NYSDOT, NYSTA	Share weather information
	CENTRO, Local DPW, Local Public Safety Agencies, Local Traffic Management, Local Transit Operators, 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 11 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 Regional 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 Mohawk Valley Regional ITS Architecture is not a static set of outputs. The ITS Architecture will 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 Mohawk Valley Regional 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 Regional ITS Architecture is created as a consensus view of what ITS systems the stakeholders in the region have currently implemented and what systems they plan to implement in the future. The Regional 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 Regional ITS Architecture. Because the Regional ITS Architecture is meant to describe the current (as well as future) regional implementation of ITS, it must be updated to correctly reflect how the developed projects integrate into the regional transportation 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 Regional 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 Regional Needs.** Transportation planning is done to address regional needs. Over time these needs can change and the corresponding aspects of the Regional ITS Architecture that addresses these needs may need to be updated.
- **Changes in other Regional ITS Architectures.** Changes made in regional ITS architectures in adjoining regions or the New York Statewide Services ITS Architecture can affect the Mohawk Valley Regional ITS Architecture, necessitating changes to maintain consistency between the architectures.

- **Changes in ITS standards applicable to ITS projects in the region.** 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 Regional ITS Architecture will need be updated to reflect their place in the regional 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 Regional 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 Regional ITS Architecture, or been included in only a very cursory manner.

9.1. Roles and Responsibilities for Maintenance

Responsibility for maintenance of the Regional ITS Architecture lies with NYSDOT, since they are currently the primary deployers of ITS in the region, and thus will be 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 Regional 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 Regional 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 Regional 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 Mohawk Valley region. Each stakeholder owns, operates, and/or maintains one or more ITS element in the region and, therefore, the in the 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 Regional 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 Regional 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 Mohawk Valley Regional 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 is a subset of the stakeholders dealing with ITS throughout the region. In other words, representatives of stakeholder agencies who are represented in the Regional ITS Architecture are candidates for a voluntary maintenance working group.

The maintenance working group will include NYSDOT as a member. Additionally, “major” stakeholders within the region will be encouraged to participate, including NYSTA and CENTRO. A major stakeholder is considered to be any stakeholder that has multiple ITS elements or systems represented throughout the Regional ITS Architecture.

9.1.4. Responsible Agency

The Responsible Agency is the government 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 Mohawk Valley Regional ITS Architecture is NYSDOT, since they are currently the primary deployer and users of the architecture.

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 Regional 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 Regional ITS Architecture, including the baseline documents, meeting minutes, the Change Request Database, and the list of Points of Contacts for each 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 region 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 Regional 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 Mohawk Valley region 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 regional 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 Regional ITS Architecture.

9.2.1. Periodic Updates

A comprehensive architecture update will occur every three years, concurrent with the formal update of the TIP. This is a natural result of the Regional ITS Architecture being a component of the regional transportation planning process. The update is necessary to ensure that the architecture continues to accurately represent the regional 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 Regional 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 Regional ITS Architecture.

The Maintenance Plan will also be reviewed at the annual updates for required changes to the Maintenance Plan. Use of the Regional 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 Regional 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 Regional 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 Regional ITS Architecture the following are identified as the architecture baseline:

- Mohawk Valley Regional ITS Architecture Document (this document)
- Set of Customized Market Packages (Visio file)
- Turbo Architecture Database
- Mohawk Valley Regional ITS Architecture Web Site
- 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 initial release of the Mohawk Valley Regional ITS Architecture, the documents at the conclusion of this effort will be version 1.00. Minor revisions will be 1.01, 1.02, etc. The next major revision to the document will be version 2.00. 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 Regional 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 1.0 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 Regional ITS Architecture documents.
- **Notify Stakeholders.** Inform the stakeholders of the updated changes to the Regional ITS Architecture documents, and distribute the documents as necessary.

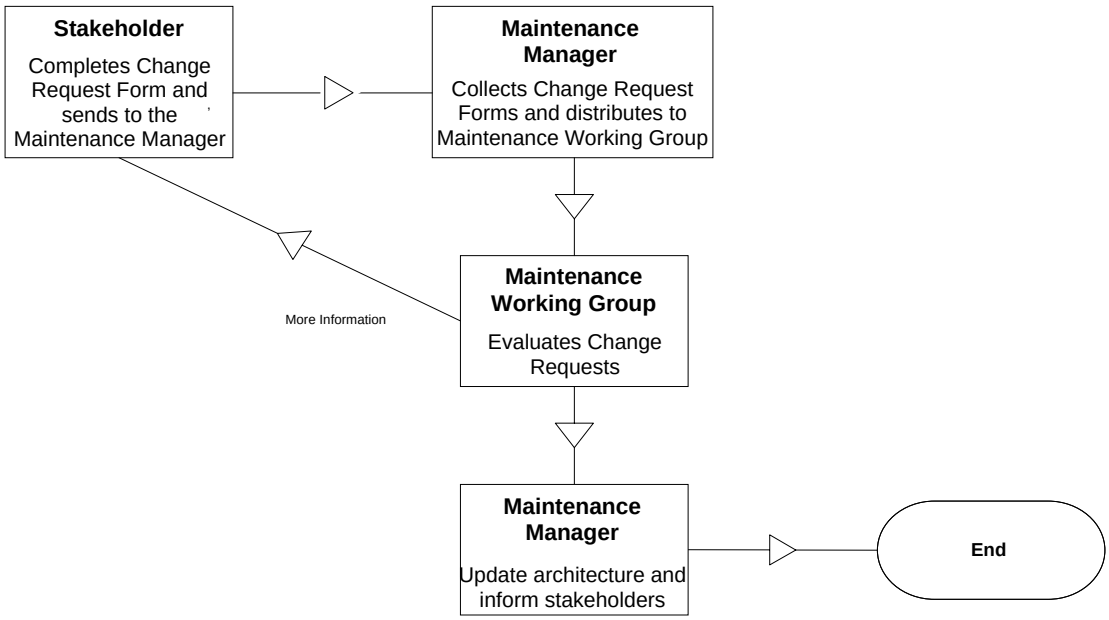


Figure 12. Change Management Process

The identification of who performs these steps is shown in Figure 12.

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 Regional 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 Regional 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 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 be responsible for keeping the official copy of the database and for modifying the Turbo Architecture file as required.

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

Mohawk Valley Regional 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 _____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: ____		